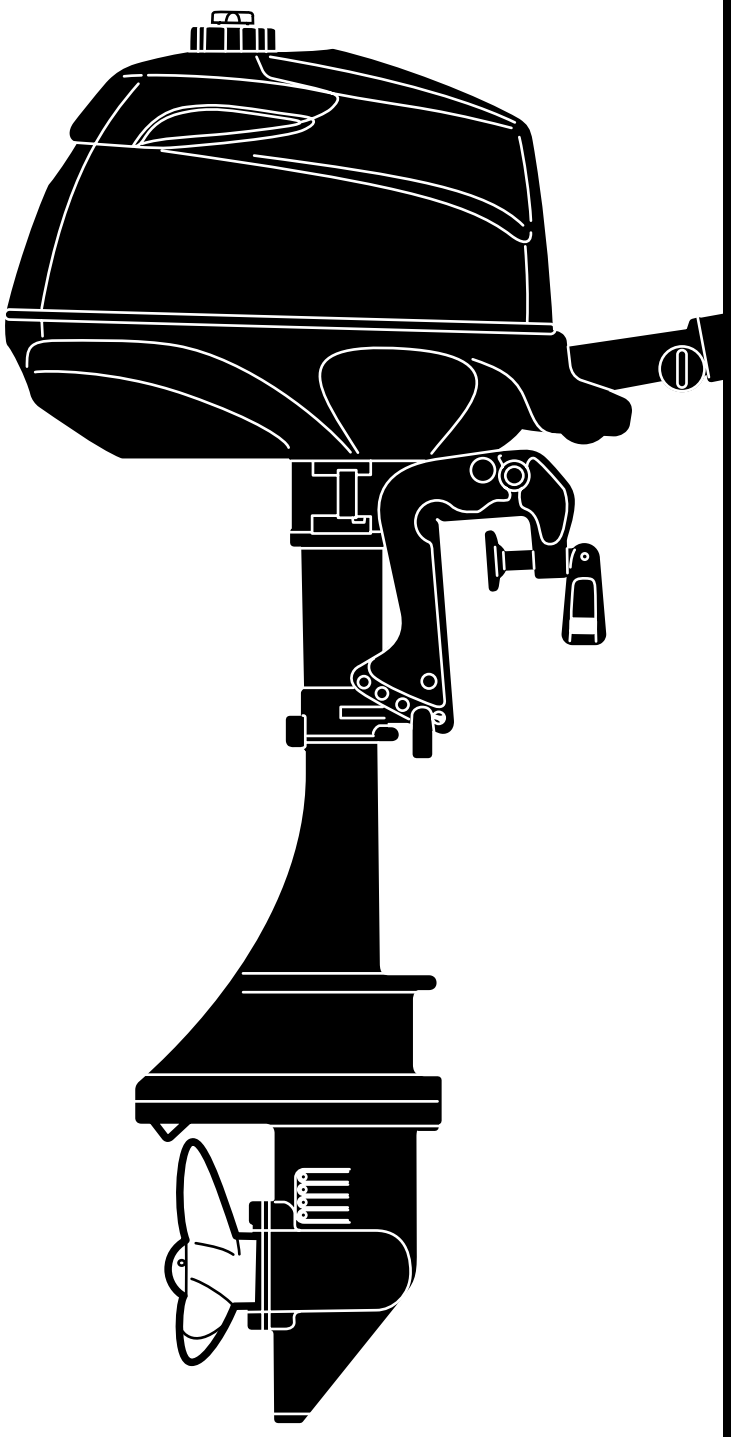
SERVICE MANUAL

TOHATSU
Outboards



4 Stroke
MFS 2/2.5/3.5B Models

OB No.003-21058-1
12-04 NB

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 comfortable use of the products 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.

Information for securing of safety

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 damages:

⚠ 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

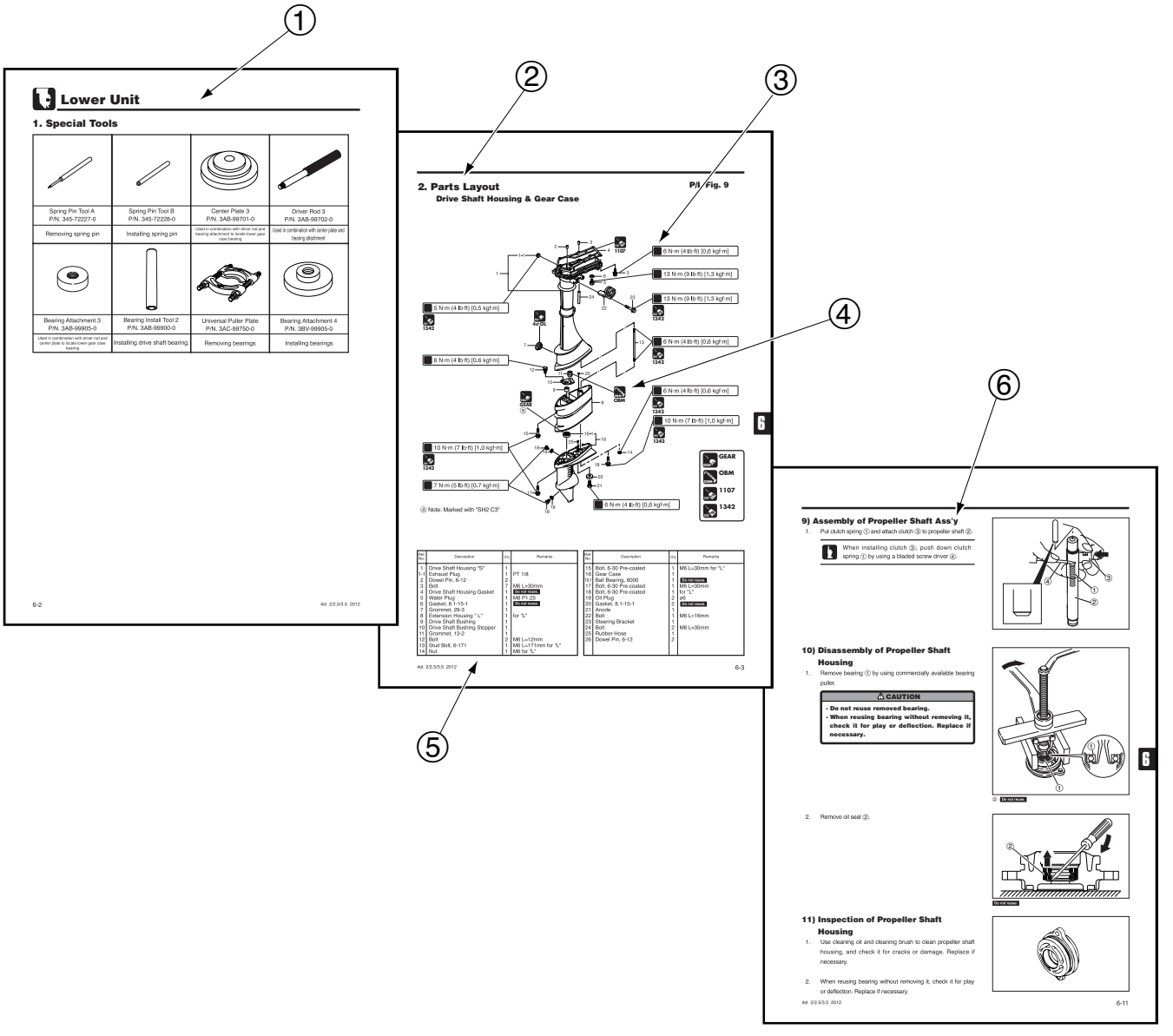
Indicates the presence of a hazard or an unsafe activity which, if ignored, could result in minor personal injury or damage to the products or facilities.

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 figure out 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. This manual newly adopts the international unit construction system (SI unit system) followed by the conventional imperial and metric systems enclosed by ( ) and [ ] as described below.

Example : <Pressure>

0.90 MPa (128 psi) [9.0 kgf/cm^2]

- [9.0 kgf/cm^2] — Conventional system (kilo-gram meter unit)
- (128 psi) — Conventional system (US pound inch unit)
- 0.90 MPa — SI unit (1 kgf/cm^2 = 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 cm^3 (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.

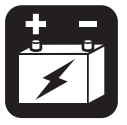
The new unit system is called "International System of Units" because it was established for the purpose of unifying the different unit systems.

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".

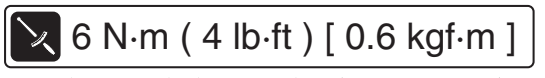
For example, conventional metric system uses the unit of mass (kg) and unit of force (kg or kgf) without discriminating them, but the SI unit system uses, for example, "kg" as the unit of mass, and "N" as the unit of force, aiming to apply a kind of unit for a kind of physical quantity.

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 	Example :  6 N·m (4 lb·ft) [0.6 kgf·m]		

SI unit | US unit | Former units (conventional)

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

4 stroke Engine Oil 	2 stroke Engine Oil 	Gear Oil 	ATF DEXRON Ⅲ 
Waterproof Grease 	Teflon® Grease TEFLON 	Low Temperature Resistant Lithium Grease 	Insulating Grease INS 
Oil Compound [Shinetsu Silicon] S.O.C 	[Konishi Bond] • G17 	Screw Lock Agent [Loctite®] • 271 	Gasket Seal Agent [Loctite®] • 518 
Gasket Seal Agent • 1107 	Screw Lock Agent [Three Bond®] • 1342 	Screw Lock Agent [Three Bond®] • 1373B 	

1.Service Information

2.Service Data

3.Maintenance

4.Fuel System (Carburetor)

5.Power Unit

6.Lower Unit

7.Bracket

8.Electrical System

9.Troubleshooting

INDEX

1

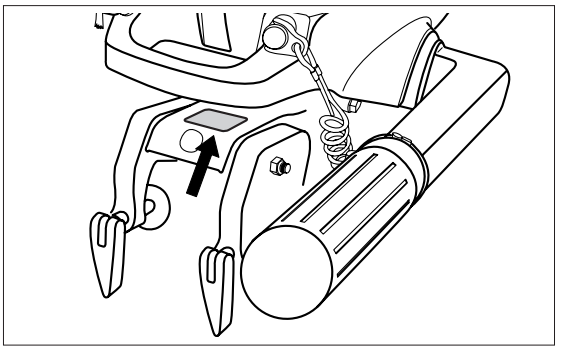
Service Information

1. Identification (Engine Serial Number)

Engine serial number is stamped on the swivel bracket of outboard motor body.

① Model Name
② Model Type
③ Serial Number

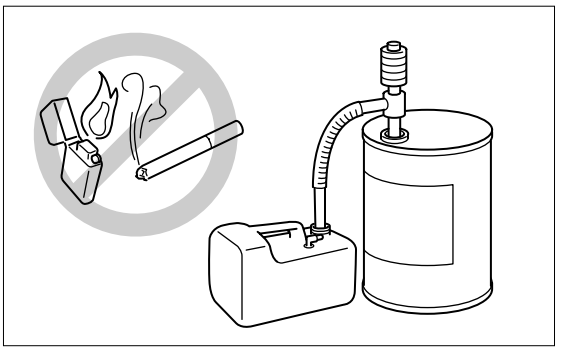
Outboard Motor
② 3BR (F3.5B) ①
Rated Power: 2.6 kW-5500r/min
Mass: 18-20 Kg
Serial No. XXXXXXXX ③



2. Securing of work safety

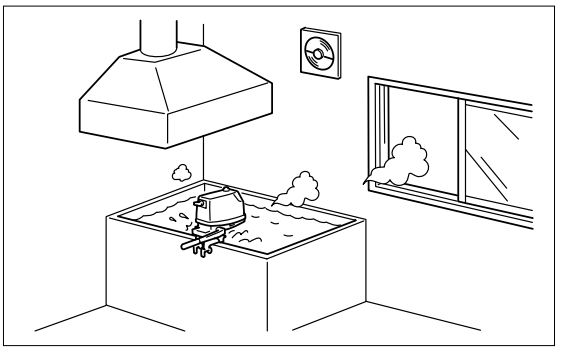
1) Fire Prevention

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



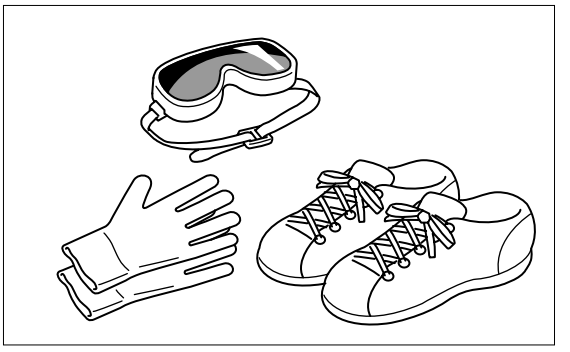
2) Ventilation

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



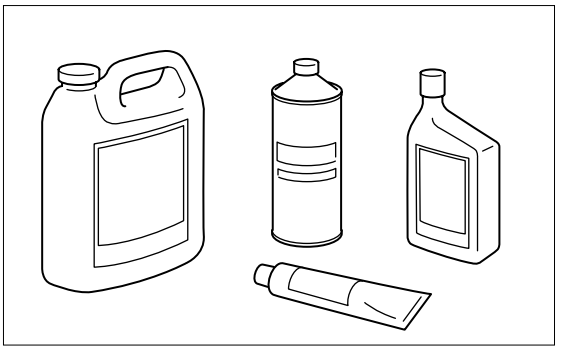
3) Protection

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



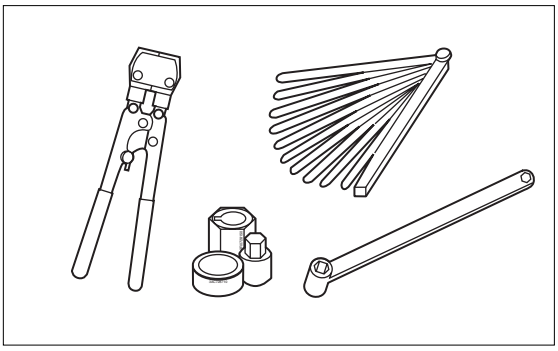
4) Genuine Parts

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



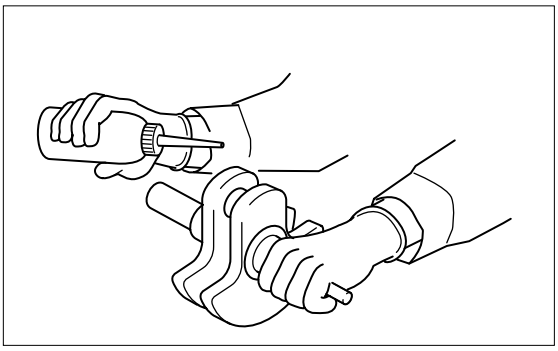
5) Tools

Use specified special tools to prevent damage to parts and to perform work safely and correctly. Be sure to follow installation procedures described in this manual and use tightening torque specified.



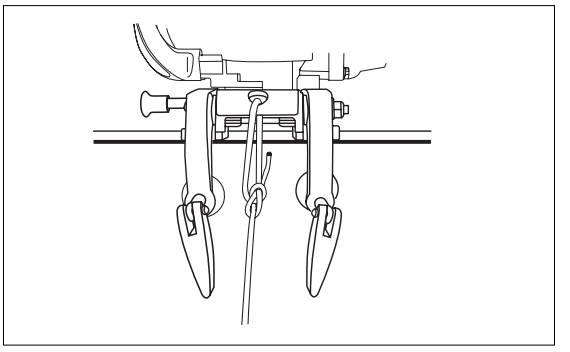
6) Recommendations on Service

Remove foreign substances and dirt from outboard motor and individual parts by cleaning. Apply recommended oil or grease to rotating areas and sliding surfaces. Always perform verifications such as ensuring smooth movement and sealing.



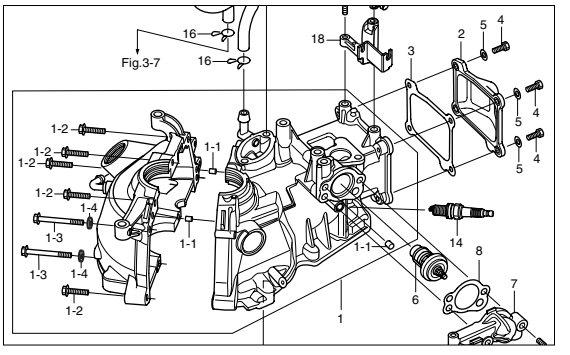
7) Cautions in Disassembling and Assembling Components

(1) Secure outboard motor to dedicated stand firmly.



(2) Take special care not to scratch painted surface or mating surfaces of cylinder and crankcase.

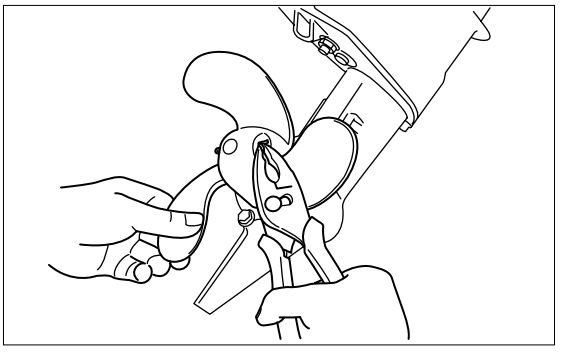
(3) Replace unreusable parts such as packings, gaskets, O rings, oil seals, spring pins or split pins with new ones after they were removed. Replace deformed snap rings with new ones.



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

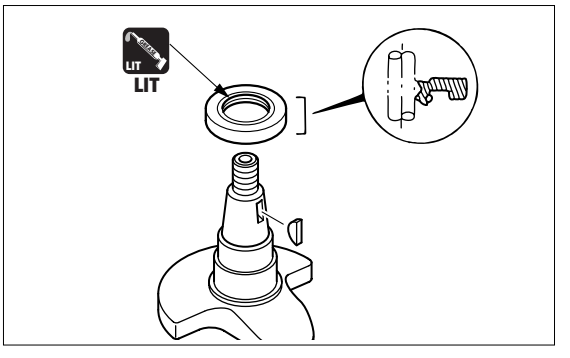
(5) Be sure to use special tools that are specified, and perform the work properly.

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



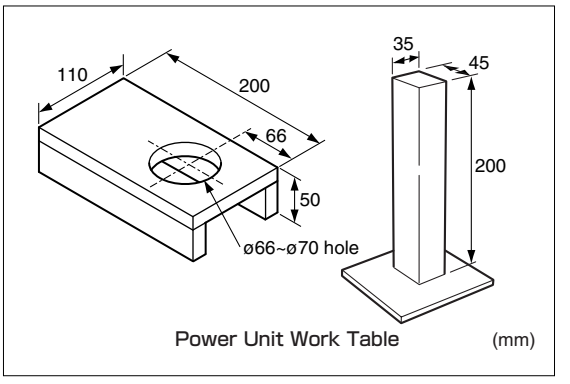
(7) Clean individual parts that have been removed, and check their condition.

(8) When reassembling parts, take sufficient care also for details such as fit, repair limits, air tightness, cleanliness of oil holes for lubrication and greasing, packings, wirings and piping. For components using many bolts and nuts for assembling, such as cylinder head and crankcase, tighten all the fasteners evenly to their specified torque clockwise in two or three stages, inner ones first and then outer ones. (Reverse the order when disassembling.)



(9) When installing bearings, bring the flat (numbered) side of the component to the special assembling 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 orientation. Apply recommended grease to the lip before installation.

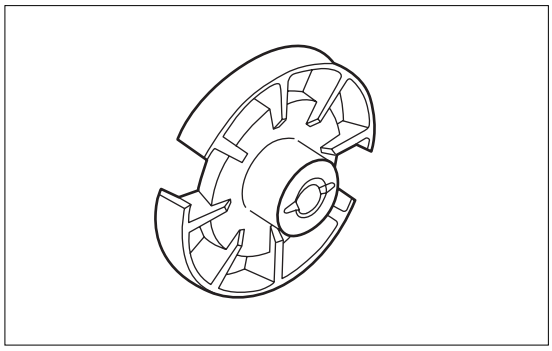


(11) When applying liquid packing, take sufficient care of the thickness and quantity. Excessive application may ooze out, adversely affecting interior of the crankcase. Use adhesive after thoroughly reading the instructions.

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

3. Tools and Instruments

1) Test Propeller



P/N. 3AB-64111-0

Outer diameter : 120mm

Width : 16mm

(Reference value)

Model	Speed at WOT (Wide Open Throttle) (r/min)
F2B/F2.5B	4,500 – 5,500
F3.5B	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 or air temperature, and thus, the measurement is not for confirmation or power of the engine.

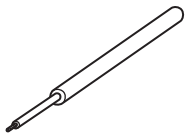
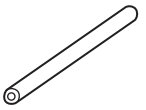
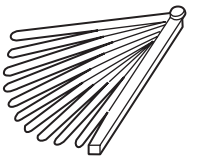
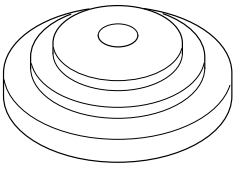
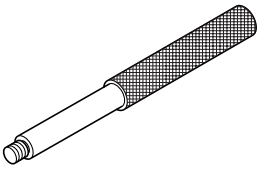
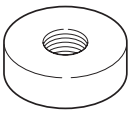
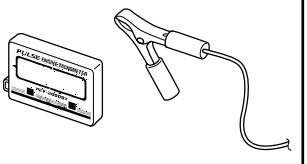
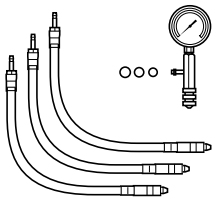
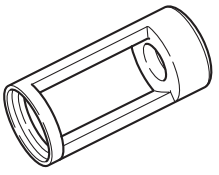
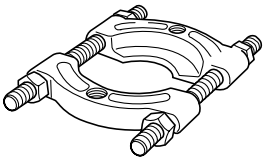
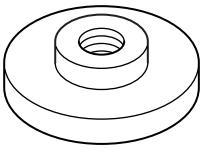
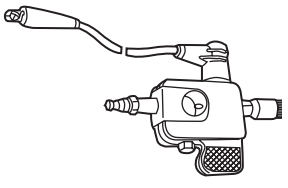
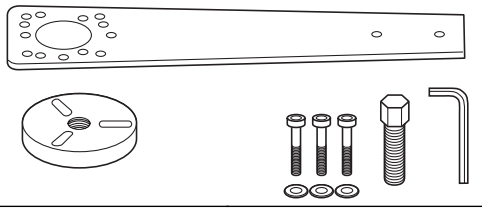
2) Instruments

For the following measuring instruments, use commercially available ones.

Circuit tester	(Resistance : 1 Ω, 10 Ω, 10 k Ω, AC voltage : 30 - 300V, DC voltage : 30V)
Vernier calipers	(JIS B 7507 : M1 type, 300 mm)
Micrometer	(JIS B 7502 : minimum graduation of 0.01 mm, outer, 0 - 25 mm, 25 - 50 mm, 50 - 75 mm)
Cylinder gauge	(JIS B 7515 : 4 - 6 mm, 10 - 25 mm, 25 - 50 mm, 50 - 75 mm)
Ring gauge	(JIS B 7420 : ø5.5, ø14, ø20, ø47, ø55)
Dial gauge	(JIS B 7503 : minimum graduation of 0.01 mm)
Thickness gauge	(JIS B 7524 : 0.03 - 0.3 mm)
V block	(JIS B 7540)
Surface plate	(JIS B 7513 : 500 mm x 500 mm)

Dial gauge magnet base or dial gauge stand

3) List of Special Tool

			
Spring Pin Tool A P/N. 345-72227-0	Spring Pin Tool B P/N. 345-72228-0	Thickness Gauge P/N. 353-72251-0	Center Plate 3 P/N. 3AB-99701-0
Removing spring pin	Installing spring pin	Measuring gaps	Used in combination with driver rod and bearing attachment to locate lower gear case bearing
			
Driver Rod 3 P/N. 3AB-99702-0	Bearing Attachment 3 P/N. 3AB-99905-0	Bearing Install Tool 2 P/N. 3AB-99900-0	Tachometer P/N. 3AC-99010-0
Used in combination with center plate and bearing attachment	Used in combination with driver rod and center plate to locate lower gear case bearing	Installing drive shaft bearing.	Measuring engine revolution speed
			
Compression Gauge P/N. 3AC-99030-0	Valve Spring Compressor Attachment P/N. 3AB-99076-0	Universal Puller Plate P/N. 3AC-99750-0	Bearing Attachment 4 P/N. 3BV-99905-0
Measuring compression pressure	Removing or installing valve springs	Removing or installing flywheel	Installing bearings
			
Spark Tester P/N. 3F3-72540-0	Flywheel Puller Kit P/N. 3AB-72211-0		
Inspecting sparks	Removing flywheel		

4. Predelivery Inspection

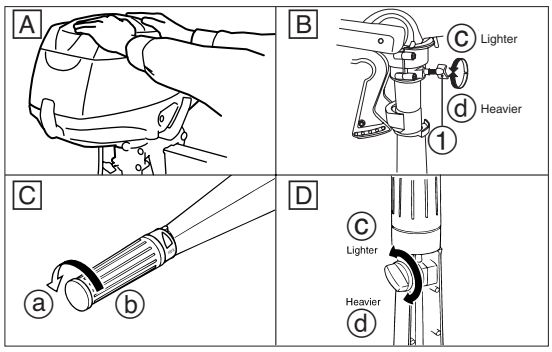
1) Steering Handle

A Check installations for tension and play.

B Adjust steering friction.

C Check throttle grip for movement.
(Fully Open ⓐ / Fully Closed ⓑ)

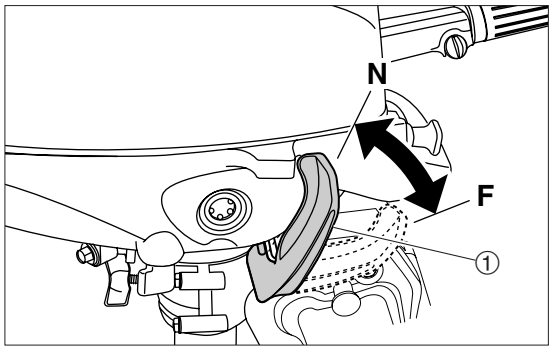
D Adjust throttle friction.



① Steering Adjust Screw ⓒ Lighter ⓓ Heavier

2) Gear Shift

1. Check shift lever ① and propeller shaft for smooth movement of the shift between forward (F) and neutral (N) while engine is operating.



3) Engine Oil

1. Set outboard motor straight ahead and vertical.

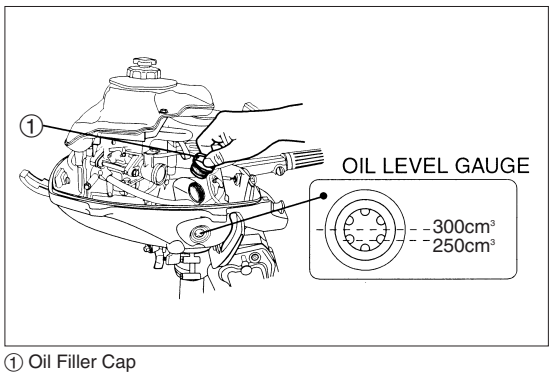
2. Fill with Engine Oil.

4 Stroke Engine Oil :
300cm³ (10 fl.oz)

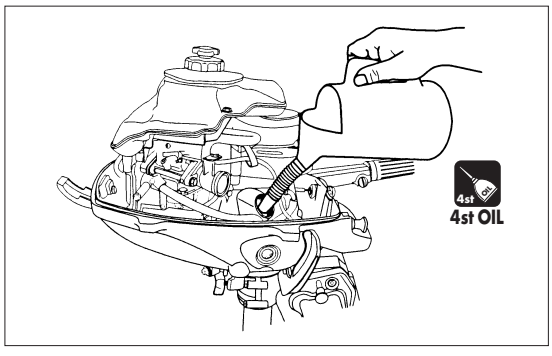
3. Use oil level gauge to check oil quantity.
(Straight ahead and vertical)

⚠ CAUTION

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



① Oil Filler Cap

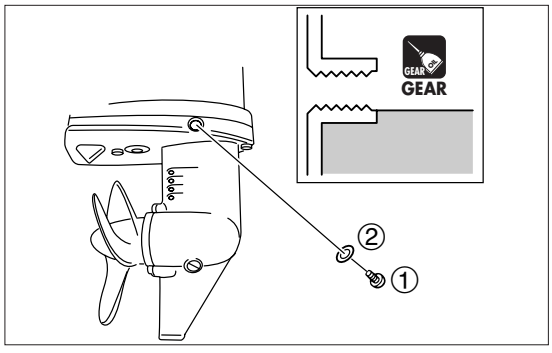


4) Gear Oil

1. Check quantity of gear oil.

Gear Oil :
180cm³ (6 fl.oz)

Spilling of oil from upper plug when removed indicates that gear case is filled with specified quantity of gear oil.



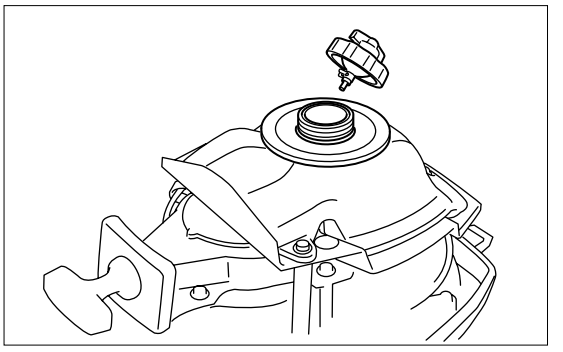
① Oil Plug ② Gasket **Do not reuse.**

5) Fuel Tank and Fuel Line

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

⚠ CAUTION

Since this is a 4 stroke engine model, do not use fuel mixed with engine oil. Use of fuel mixed with engine oil will cause engine trouble.



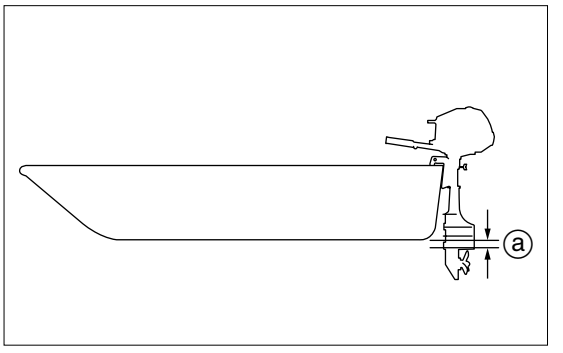
6) Rigging

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

2. Check location of anti-ventilation plate relative to boat bottom, and, if necessary, adjust to prevent decrease in performance force and engine overheating.

Test-run to determine the best installation height.

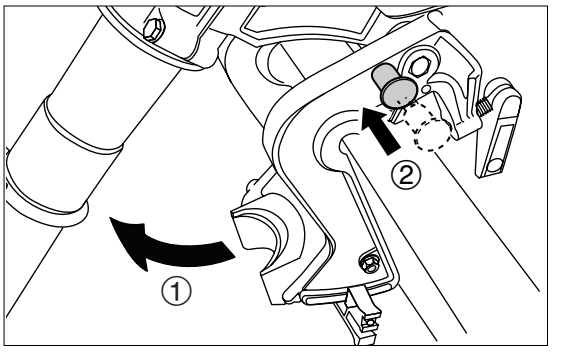
Location of anti-ventilation plate : Standard value
30 - 50 mm (1.2 - 2.0in) from boat bottom



ⓐ 30 - 50 mm (1.2 - 2.0 in)

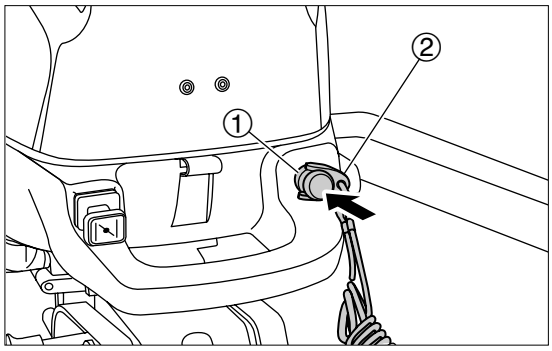
7) Inspection of Tilt Stopper

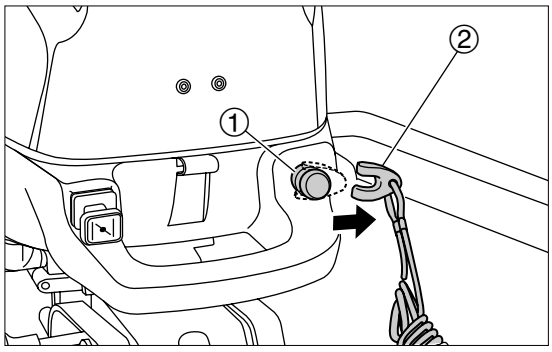
1. Fully tilt up the outboard motor ①, lock with the tilt stopper ②, and then check that the holding mechanism functions normally.



8) Inspection of Stop Switch

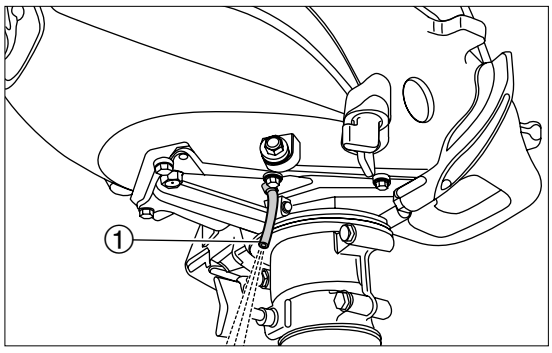
1. Press stop switch ① hard or pull out lock ② from stop switch ① to check that engine stops.





9) Cooling Water Check Port

1. Check that cooling water check port ① discharges water during engine runs.



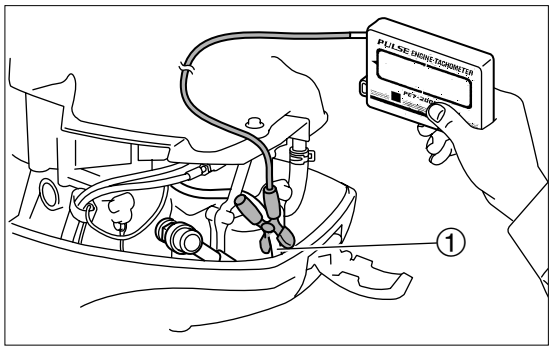
10) Idle Operation

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

· Use tachometer to measure after warm up operation.
· Set the measurement mode to 4 stroke 2 cylinder · 2 stroke 1 cylinder.

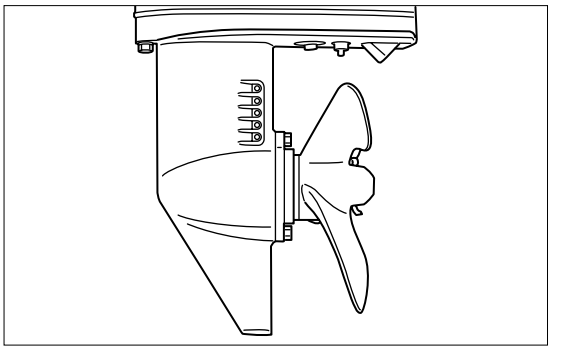
Idle Engine Speed :
1,250 - 1,350 r/min

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



① High Tension Cord

11) Propeller Selection



1. Select a propeller that is best-suited to type of boat and application.

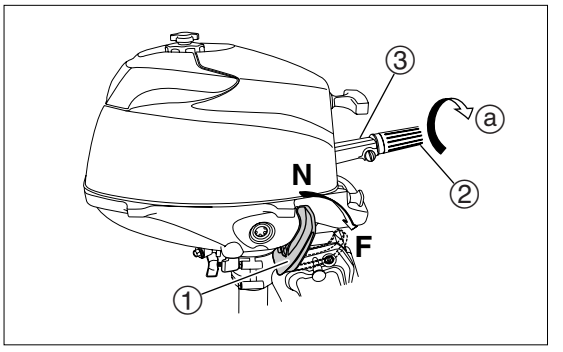
Range of operating engine revolution at WOT
F2/2.5 : 4,500 - 5,500r/min
F3.5 : 5,000 - 6,000r/min

⚠ CAUTION

Incorrect-selection of propeller can cause adverse effects on engine life, fuel consumption, etc. as well as on performance.

Propeller [Marking] No. of Blades x Diameter x Pitch in (mm)	[I 7]	3 x 7 3/8 x 7	(3 x 188 x 178)	Plastic	Standard
	[F6/B6]	3 x 7 3/8 x 6	(3 x 188 x 145)	Plastic/Aluminum	Option
	[ ]	3 x 7 3/8 x 4.5	(3 x 188 x 110)	Plastic	Option

12) Inspection of Forward and Reverse Shifts

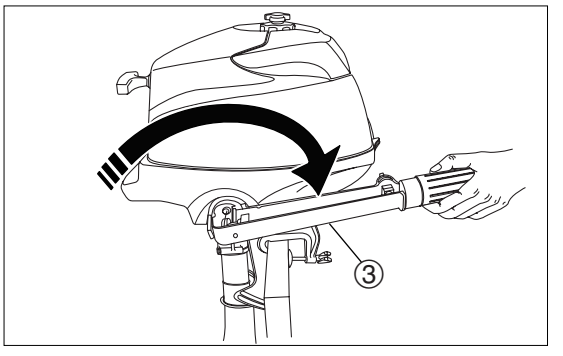


① Shift Lever

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

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

2. Reverse
In the same way as forward shift inspection, set the engine to idle speed, shift into ① to neutral (N), put up handle ③, turn outboard motor 180 degrees, and then, shift into forward (F) 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.

⚠ 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.

⚠ CAUTION

Shear pin is designed to be broken when the propeller receives damaging impact. However, it may be broken when shifting at high engine speed because of high shear stress applied to the pin.

5. Break-in Operation

Break-in operation is needed to smooth sliding surfaces 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 r/min	3/4 of WOT or less at approximately 4,000 r/min	3/4 of WOT at approximately 4,000 r/min	Regular Operation
	Running at the slowest possible speed		WOT run for approximately 1 minute can be included every 10 minutes of run.	WOT run for approximately 2 minute can be included every 10 minutes of run.	

6. Test Run

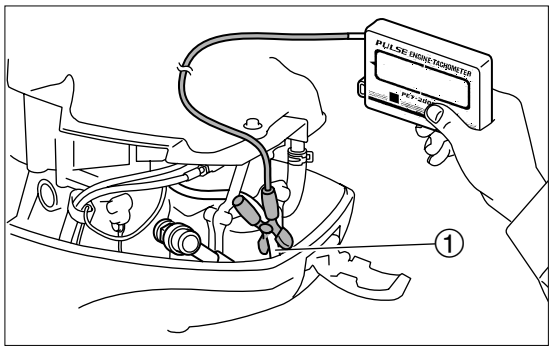
1. Start engine and check if shifting is smooth.

2. After completing warm-up operation, check idle engine speed.

   · Use tachometer to measure after warm up operation.
   · Set the measurement mode to 4 stroke 2 cylinder · 2 stroke 1 cylinder.

   Idle Engine Speed :
   1,250 - 1,350 r/min

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



① High Tension Cord

3. Shift gear into forward (F) and run at idle speed (for approximately 10 minutes).

   Trolling Engine Speed :
   1,150 - 1,250 r/min

4. Run at 3,000 r/min or half of WOT for initial 2 hours, then at 4,000 r/min or 3/4 of WOT for 1 hour.

5. Check that shifting into reverse will not tilt up outboard motor and allow water to run into boat.

   Complete test run during break-in operation.

7. Checks After Test Run

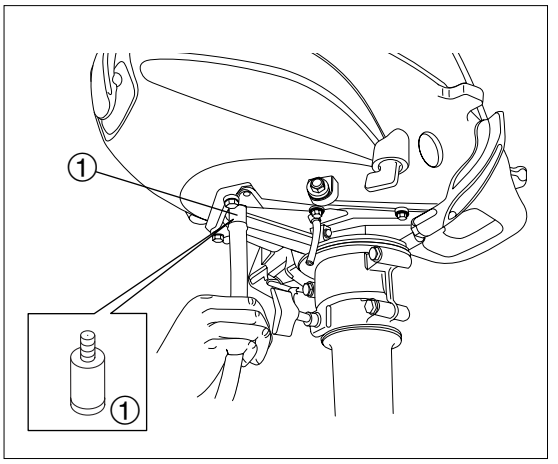
1. Check that power unit, lower unit and bracket are free of looseness or play.

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. If using in salt water after test run, use flushing attachment ① (optional) and fresh water to wash cooling water path by idling engine.



① Flushing Attachment (optional)

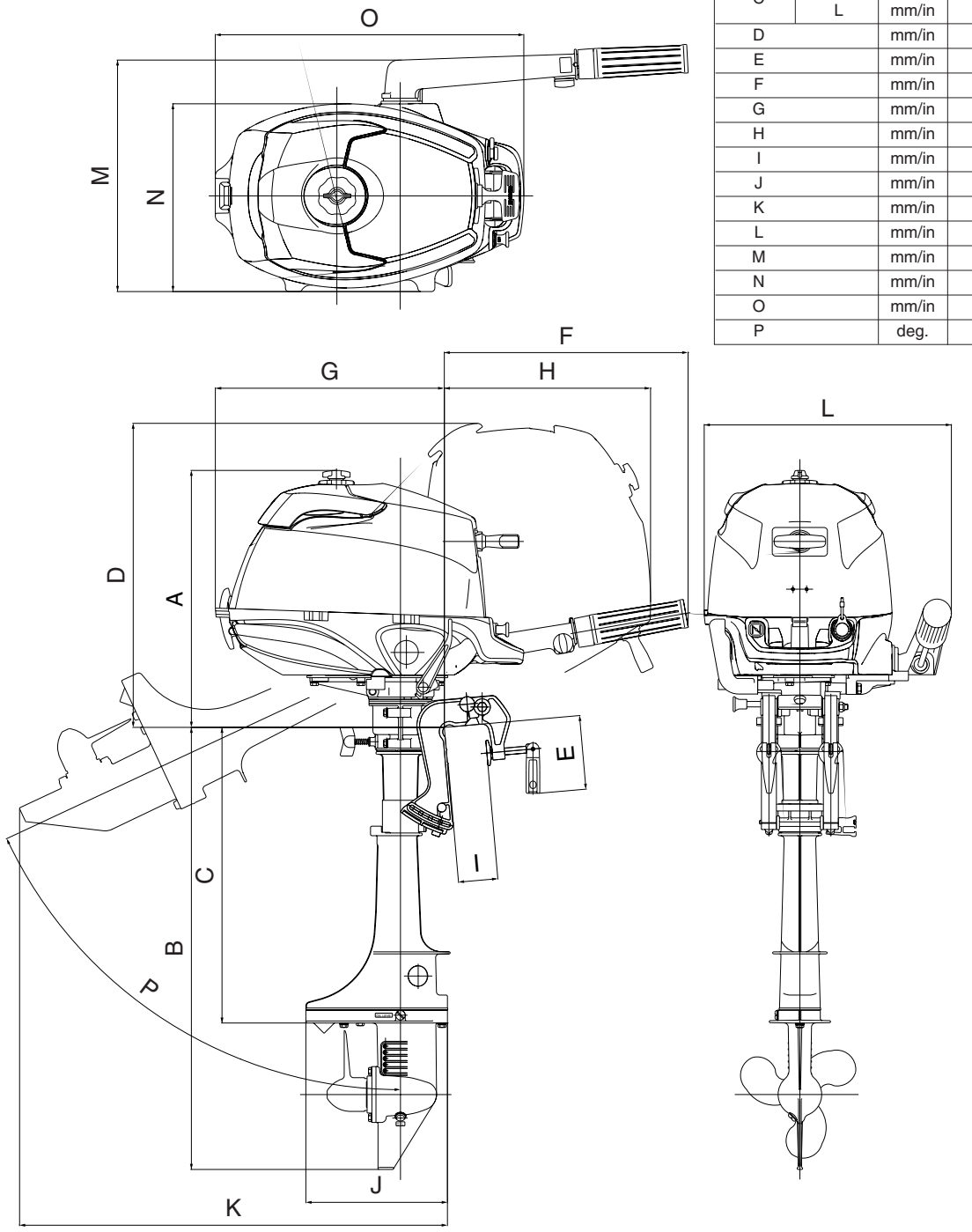
2

Service Data

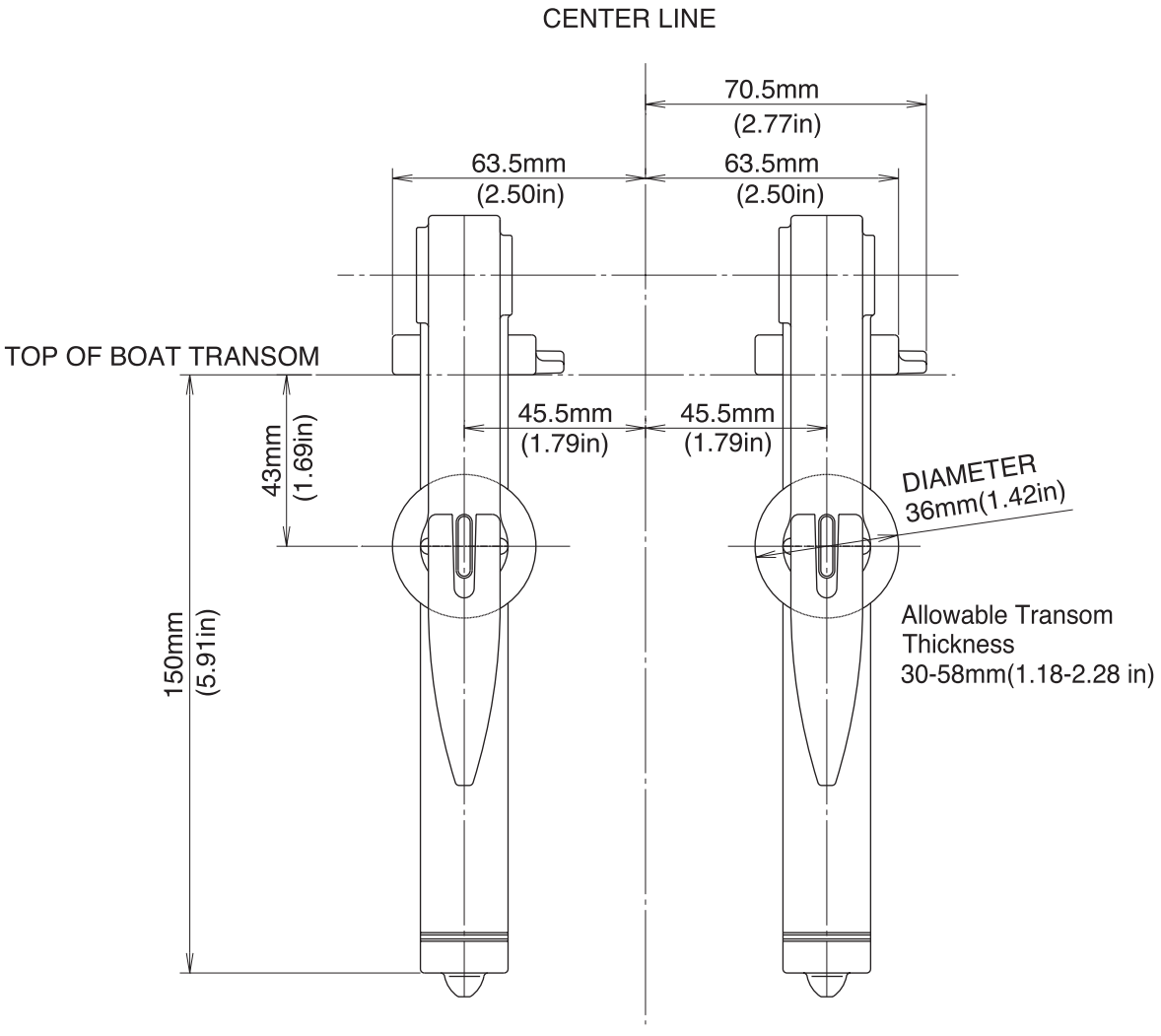
1.Outline Dimensions

1）Engine Dimensions

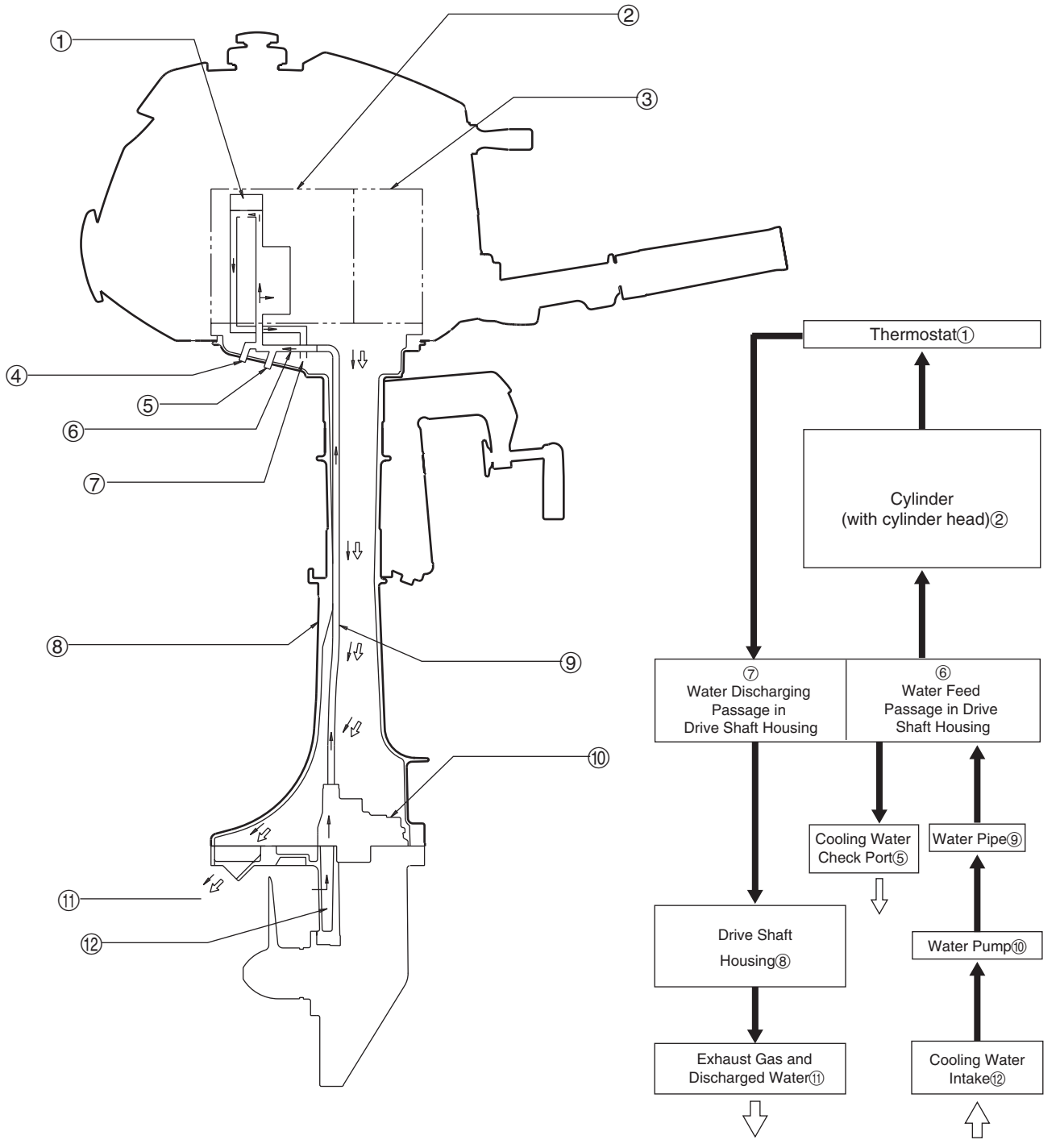
Item	Type	Unit	mm	in
A		mm/in	377	14.84
B	S	mm/in	649	25.55
	L	mm/in	776	30.55
C	S	mm/in	435	17.13
	L	mm/in	562	22.13
D		mm/in	446	17.56
E		mm/in	108	4.25
F		mm/in	354	13.94
G		mm/in	336	13.23
H		mm/in	303	11.93
I		mm/in	58	2.28
J		mm/in	208	8.19
K		mm/in	628	24.72
L		mm/in	363	14.29
M		mm/in	340	13.39
N		mm/in	276	10.87
O		mm/in	447	17.60
P		deg.	65	



2) Clamp Dimensions

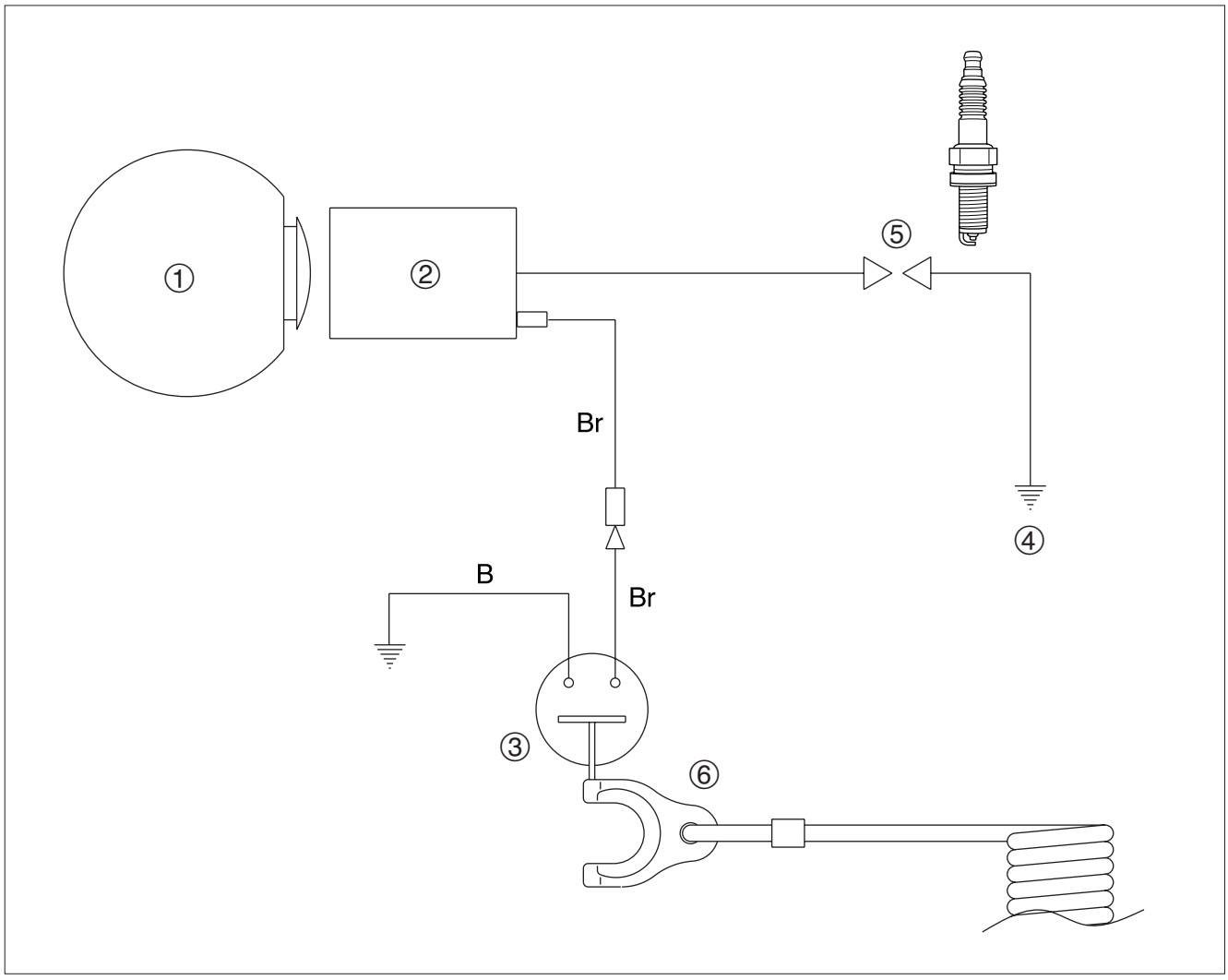


2.Cooling Water System Diagram



①Thermostat
②Cylinder (with cylinder head)
③Crankcase
④Flushing Plug
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

3.Wiring Diagram



①Flywheel
②Igniter
③Stop Switch
④Ground
⑤Spark Plug
⑥Stop Switch Lanyard

B: Black
Br: Brown

4.Specifications

Item		Unit	Outboard Model		
			F2B	F2.5B	F3.5B
Dimensions (approximate)					
Overall Length		mm (in)	690 (27.2)		
Overall Width		mm (in)	363 (14.3)		
Overall Height	S	mm (in)	1,026 (40.4)		
	L	mm (in)	1,153 (45.4)		
Transom Length	S	mm (in)	435 (17.1)		
	L	mm (in)	562 (22.1)		
Weight (approximate)					
	S	kg (lbs)	18.4 (41)		
	L	kg (lbs)	19.4 (43)		
Performance					
Max. Output		kW (ps)	1.47 (2.0)	1.8 (2.5)	2.6 (3.5)
Full-Throttle Revolution Speed Range		r/min	4,500 - 5,500		5,000 - 6,000
Max. Fuel Consumption		L(gal.)/hr	1.0 (0.26)	1.0 (0.26)	1.4 (0.37)
Idling Speed Range (Neutral Shift)		r/min	approx 1,300		
Trolling (Forward Shift)		r/min	approx 1,200		
Power Unit					
Engine Type			4-Stroke Gasoline Engine		
No. of Cylinders			1		
Total Displacement		㎤ (cu in)	85.5 (5.2)		
Valve System			OHV Cross Flow		
Bore x Stroke		mm (in)	55 x 36 (2.17 x 1.42)		
Compression Ratio			9		
Shift Operation System			Side Shift (Manual)		
Starting System			Recoil Starting		
Lubrication System			Wet Sump		
Cooling System			Water Cooling (Impeller System)		
Exhaust System			Below-The-Water-Exhaust		
Ignition System			Digital CDI		
Range of Ignition Angle			BTDC 3° - BTDC 25° (ECU Timing Control)		
Spark Plug			DCPR6E [NGK]		
Fuel Feed System			Carburetor (Horizontal Butterfly Valve System)		
Compression Pressure (Reference)		kg/㎠ (MPA)	11.5 (1.13) ± 10% (500 rpm/min)		

Item			Unit	Outboard Model		
				F2B	F2.5B	F3.5B

Fuel & Oil

Type of Fuel				Unleaded Gasoline (Research Octan Number 90 or over, Pump posted Octane Number 87 or over)
Fuel Tank Capacity			L (US gal.)	1.0 (0.26) [Integral Fuel Tank]
Starting Fuel Enrichment System				Choke Valve System
Fuel Pumping (Feed) System				None (Gravitational System)
Engine Oil	Type			4-Stroke Engine (Motor) Oil
	Grade		API	SF, SG, SH
			SAE	10W-30, 10W-40
			NMMA	FC-W Certified 10W-30
	Quantity		cm³ (fl.oz)	300 (10)
Gear Oil	Type			Hypoid Gear Oil
	Grade	*1	API	GL-5
		*1	SAE	#90
	Quantity		cm³ (fl.oz)	180 (6)

Lower Unit

Gear Shift Positions			Forward(F) - Neutral(N)
Gear Ratio			2.15(13 : 28)
Type of Gears			Spiral Bevel Gear
Clutch			Dog Clutch
Propeller Shaft Driving			Shear Pin
Propeller Rotation Direction			Clockwise at forward (F) shift as viewed from rear
Propeller (Standard)		[Marking] in(mm)	[I7] 3 x 7 3/8 x 7 (3 x 188 x 178) Plastic

Bracket

No. of Trim Steps		Steps	4
Trim Angle (Transom 12°)	*2	Degrees	-7° - +8°
Max. Tilt Angle	*3	Degrees	65°
Steering Angle	*4	Degrees	360°
Max. Allowable Transom Thickness		mm(in)	30 - 58 (1.18 - 2.28)

*1 Requirements of both API and SAE shall be met.
*2 Angle of propeller shaft relative to horizon when transom angle is 12 degrees.
*3 Range of tilt angle
*4 Starboard-port full steering range

Warning System

Over-revolution Protection			Controls engine speed to 6,300 r/ min or lower (High Speed ESG)

Optional Parts

Propeller (No. of Blades x Diameter x Pitch)		[Marking] in(mm)	[F6] 3 x 7 3/8 x 6 (3 x 188 x 145) · Plastic
			[F6] 3 x 7 3/8 x 6 (3 x 188 x 145) · Aluminum
			[ ] 3 x 7 3/8 x 4.5 (3 x 188 x 110) · Plastic

5.Maintenance Data

	Description	Item		Standard Values
Engine Parts	Cylinder Block/ Cylinder Head	Build up of carbon in combustion chamber		
		Deposits in water jacket		
		Wear of bore : Use cylinder gauge to measure inner diameter.		55.00mm (2.1654in)
		Seizure, cylinder liner damage, or wear Taper Out-of-roundness		
	Piston	Outer Diameter ・Measure outer diameter at 7mm (0.28in) above lower end of piston skirt (at right angle to piston pin). ・Piston Clearance		54.96mm (2.1638in) 0.020 - 0.060mm (0.00079 - 0.00236in)
		Carbon build up on piston crown and in ring grooves		
		Scratch on the sliding surface		
		Measure side clearance between piston ring and ring groove.		Top Ring : 0.04 - 0.08mm (0.0016 - 0.0031in)
				Second Ring : 0.03 - 0.07mm (0.0012 - 0.0028in)
				Oil Ring : 0.05 - 0.15mm (0.0020 - 0.0059in)
		Measure piston pin hole diameter.		Pin clearance to be 0.002 - 0.012mm (0.00008 - 0.00047in).
	Piston Pin	Outer Diameter		14.00mm (0.5512in)
	Piston Ring	Ring End Gap	Note : Measurement of ring end gap : If ring gauge is not available, use cylinder bore top or bottom where the wear is small.	
		Top Ring		Top Ring : 0.15 - 0.30mm (0.0059 - 0.0118in)
		Second Ring		Second Ring : 0.30 - 0.45mm (0.0118 - 0.0177in)
		Oil Ring		Oil Ring : 0.20 - 0.70mm (0.0079 - 0.0276in)
	Connecting Rod	Small End Inner Diameter		14.01mm (0.5516in)
		Big End Oil Clearance		0.015 - 0.041mm (0.00059 - 0.00161in)
		Big End Side Clearance		0.10 - 0.25mm (0.0039 - 0.0098in)
		Big End Inner Diameter		20.010mm (0.78780in)
	Crankshaft	Crank pin outer diameter		19.98mm (0.7866in)
		Crankshaft roundness : Use V blocks to support crankshaft at bearings of both ends.		Less than 0.05mm (0.0020in) at both ends
	Intake Valve Exhaust Valve	Valve Clearance	IN EX	0.06 - 0.14mm (0.0024 - 0.0055in) 0.11 - 0.19mm (0.0043 - 0.0075in)
		Valve Stem Outer Diameter	IN EX	5.47mm (0.2154in) 5.46mm (0.2150in)
		Valve Guide Inner Diameter	IN EX	5.51mm (0.2169in) 5.51mm (0.2169in)
		Clearance between valve guide and valve stem	IN EX	0.018 - 0.045mm (0.00071 - 0.00177in) 0.025 - 0.052mm (0.00098 - 0.00205in)
		Width of contact with valve seat	IN EX	1.0mm (0.04in) 1.0mm (0.04in)
	Valve Spring	Free Length		35.0mm (1.38in)
	Cam Shaft	Cam Height (Both IN and EX)		24.04mm (0.9464in)
		Journal Outer Diameter	Flywheel side Lower unit side	11.97mm (0.4713in) 12.97mm (0.5106in)
		Cam Shaft Swing		
	Engine Block	Compression Pressure (Reference)	at 500r/min	1.13MPa (164psi) 11.5kgf/㎠ ±10%

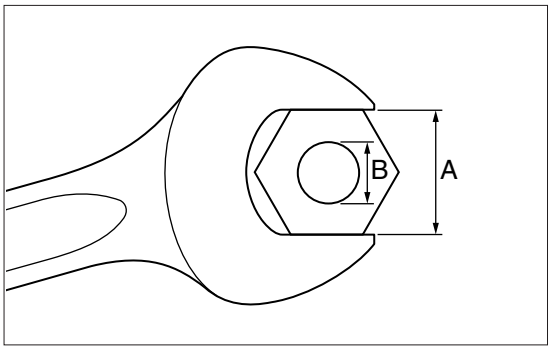
Functional Limit	Action To Be Taken
	Clean to remove.
	Clean to remove.
55.06mm (2.1677in)	Replace if over specified limit.
0.06mm (0.0024in) 0.06mm (0.0024in)	Replace if severely damaged on the piston sliding surface, which cannot be repaired with sand paper of No. 400 to 600, or if damaged over specified limit.
54.90mm (2.1614in) 0.150mm (0.00591in)	Replace if under specified limit. Replace if over specified limit.
	Clean to remove.
	Correct if possible (with #400 to 600 water proof sand paper), or replace.
Top Ring : 0.10mm (0.0039in)	Replace if over specified limit. Replace oil ring when top ring or second ring is replaced.
Second Ring : 0.09mm (0.0035in)	
Oil Ring : 0.17mm (0.0067in)	
0.040mm(0.00157in)	Replace if over specified limit.
13.97mm(0.5500in)	Replace if under specified limit.
Top Ring : 0.50mm (0.0197in)	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 : 0.70mm (0.00276in)	
14.04mm(0.5528in)	Replace if over specified limit.
0.060mm (0.00236in)	Replace if over specified limit.
0.60mm (0.0236in)	Replace if over specified limit.
20.015mm (0.78799in)	Replace if over specified limit.
19.95mm (0.7854in)	Replace if under specified limit.
0.05mm (0.0020in)	Replace if over specified limit.
	Adjust into specified range.
5.45mm (0.2146in) 5.44mm (0.2142in)	Replace if under specified limit.
5.55mm (0.2185in) 5.57mm (0.2193in)	Replace if over specified limit.
0.070mm (0.00276in) 0.080mm (0.00315in)	Replace if over specified limit.
2.0mm (0.08in) 2.0mm (0.08in)	Repair or replace if over specified limit.
33.2mm (1.31in)	Replace if under specified limit.
23.78mm (0.9362in)	Replace if under specified limit.
11.95mm (0.4705in) 12.95mm (0.5098in)	Replace if under specified limit.
0.03mm (0.0012in)	Replace if over specified limit.
	Check if rotating parts, sliding parts and sealing parts cause compression leakage.

	Description	Item	Standard Values		
Fuel & Lubrication Parts	Carburetor		F2B	F2.5B	F3.5B
		Setting Mark	3GTA	3GJA	3GVA
		Venturi Diameter	φ7.5	φ9	φ13
		Throttle Bore Diameter	φ16	φ16	φ19
		Main Jet (MJ)	#58	#62	#68
		Main Nozzle Inner Diam. (MN)	φ1.4	φ1.4	φ1.8
		Slow Jet (SJ)	#115	#125	#115
		Throttle Opening (at WOT)	76°	77°	77°
		Oil Level (from flange surface to float marking)	10.0mm	10.0mm	10.0mm
Electrical Parts	Magneto/Igniter	Range of Ignition Timing	BTDC3° - BTDC25° (Electronic Control)		
		Spark Performance at 500r/min	5mm (0.2in) or over		
		Air Gap	0.2 - 0.4mm (0.008 - 0.016in)		
		Igniter Diode Polarity 〔Reference〕 ・ Red tester lead to brown (Br) lead ・ Black tester lead to black (B) lead	* Measurement value with HIOKI Analog 3030 (100Ω range) Conductive (5 to 9kΩ)		
		・ Red tester lead to black (B) lead 〔Reference〕 ・ Black tester lead to brown (Br) lead	* Measurement value with HIOKI Analog 3030 (100Ω range) Non-conductive (Resistance = Infinite)		
		Igniter Secondary Coil Resistance 〔KΩ Range〕 ・Between high tension cord and black (B) lead 〔20℃〕 ・Between spark plug cap and black (B) lead	2.0 - 3.0kΩ 5.5 - 9.5kΩ		
	Spark Plug Cap	Resistance between terminals 〔20℃〕〔kΩ range〕	3.0 - 7.0kΩ		
	Spark Plug Gap	Plug Type Spark Plug Gap	DCPR6E [NGK] 0.8 - 0.9mm (0.031 - 0.035in)		
Cooling System	Thermostat	Valve Operation Starting Temperature (Submerged)	52℃±2℃ (125° F±4° F)		
		Valve Full Open Temperature (Submerged)	65℃±2℃(150° F±4° F)		
		Valve Full Open Lift (Submerged)	3.0mm (0.12in) or over		
	Pump Impeller	Wear, Crack			
	Pump Case (Liner)	Wear			
	Guide Plate	Wear			
Lower Unit	Anode	Wear			
	Clutch Spring	Free Length	25.0mm (0.984in)		
	Propeller Shaft	Bearing Wear and Damage			
		Oil Seal Lip Wear			
		Propeller Shaft Runout			
	Bevel Gears	Backlash between forward gear and pinion (A and B gears)	0.05 - 0.15mm(0.0020 - 0.0059in)		
	Propeller	Wear, Bend, Crack, Break	188 x 178mm (7 3/8 x 7in)		
	Drive Shaft	Spline (Upper) Base Tangent Length, 2 Gears	3.85mm (0.1516in)		
		Bearing Wear and Damage			
		Oil Seal Lip Wear			
		Drive Shaft Runout			
	Drive Shaft Bushing	Gap between the bushing and drive shaft	0.016 - 0.073mm (0.00062 - 0.00287in)		
Other	Oil Seals	Wear, Damage			

Functional Limit	Action To Be Taken
	Adjust or replace.
5mm (0.2in)	Replace if under specified limit.
	Adjust into specified range.
	Replace if out of specified range. * A digital tester may display values of reversed polarity and/or measurement values ranging from 2 - 6MΩ.
	Replace if out of specified range. * A digital tester may display values of reversed polarity.
	Replace if out of specified range.
	Replace if out of specified range.
1.0mm (0.039in)	Clean to remove carbon deposit and dirt. Adjust the gap by moving side electrode. Replace if electrodes are severely worn.
Valve opens even a little under ambient temperature.	Replace if out of specified range.
Since the thermostat operation has a time delay, measure the valve open lift after maintaining the temperature at around 65˚C(150˚F) for approximately 5 minutes.	
3.0mm (0.12in)	Replace if under specified limit.
The impeller is worn cracked or damaged on the tips or upper and lower surface lips.	Replace pump case liner and guide plate as a set.
	Replace if severely worn.
	Replace if severely worn.
	Replace if severely worn.
23.5mm (0.925in)	Replace if under specified limit.
	Replace if necessary.
0.4mm (0.016in)	Replace if over specified limit.
0.05mm (0.0020in)	Replace if over specified limit.
0.03 - 0.20mm (0.0012 - 0.0079in)	Adjust or replace.
State of outer diameter reduction, blade bend or damage	Replace if necessary.
3.70mm (0.1457in)	Replace if under specified limit.
	Replace if necessary.
0.4mm (0.016in)	Replace if over specified limit.
0.5mm (0.020in)	Replace if over specified limit.
0.500mm (0.01968in)	Replace if over specified limit.
Lip deteriorated, degraded or damaged, or tightening margin reduced to 0.5mm (0.020in) due to wear	Replace if out of specified range.

6.Tightening Torque Data

	Fastened Components	Wrench A	Screw B x Pitch	Type of Fastener	Tightening Torque		
					N・m	lb・ft	kgf・m
Engine	Crankcase	10	M6 x 1.0	Bolt	First Tightening Torque		
					6	4	0.6
					Second Tightening Torque		
					8.8	6.5	0.9
	Oil Pan	10	M6 x 1.0	Bolt	First Tightening Torque		
					6	4	0.6
					Second Tightening Torque		
					8.8	6.5	0.9
	Connecting Rod	10	M6 x 1.0	Bolt	First Tightening Torque		
					5	4	0.5
					Second Tightening Torque		
					10	7	1.0
	Oil Drain Bolt	10	M8 x 1.25	Bolt	18	13	1.8
	Pivot Bolt	13	M8 x 1.25	Bolt	25	18	2.5
	Pivot Lock Nut	10	M6 x 0.75	Nut	10	7	1.0
	Intake Manifold	10	M6 x 1.0	Bolt	10	7	1.0
	Flywheel	17	M10 x 1.25	Nut	43	31	4.3
	Spark Plug	16	M12 x 1.25	–	18	13	1.8
	Igniter	10	M6 x 1.0	Bolt	6	4	0.6
	Thermostat Cap	10	M6 x 1.0	Bolt	6	4	0.6
	Cylinder Head Cover	10	M6 x 1.0	Bolt	6	4	0.6
	Fuel Tank 1342	10	M6 x 1.0	Bolt	6	4	0.6
	Power Unit Installation	10	M6 x 1.0	Bolt	6	4	0.6



Value enclosed by ( ) is hex hole size.

	Fastened Components	Wrench A	Screw B x Pitch	Type of Fastener	Tightening Torque		
					N・m	lb・ft	kgf・m
Swivel Clamp Bracket	Bracket Bolt 1342	13	M8 x 1.25	Nylon Nut	7	5	0.7
	Swivel Bracket Bolt 1342	10	M6 x 1.0	Bolt	10	7	1.0
	Distance Piece 1342	10	M6 x 1.0	Bolt	6	4	0.6
	Steering Stopper 1342	10	M6 x 1.0	Bolt	6	4	0.6
Drive Shaft Housing	Exhaust Plug 1342	(3/16 in)	PT1/8	Plug	5	4	0.5
	Shift Rod Lever 1342	8	M5 x 0.8	Bolt	4	3	0.4
	Water Plug	13	M8 x 1.25	Bolt	13	9	1.3
Lower Unit Installation	Lower Unit Installation 1342	10	M6 x 1.0	Bolt	10	7	1.0
		10	M6 x 1.0	Nut	6	4	0.6
	Extension Housing 1342	10	M6 x 1.0	Bolt	10	7	1.0
	Pump Case (upper) 1342	10	M6 x 1.0	Bolt	6	4	0.6
	Propeller Shaft Housing 1342	10	M6 x 1.0	Bolt	6	4	0.6
Cowl	Bottom Cowl 1342	10	M6 x 1.0	Bolt	6	4	0.6
	Stop Switch	—	M16 x 1.5	Nut	2.3	1.7	0.23
	Cowl Latch 1342	10	M6 x 1.0	Bolt	6	4	0.6
	Top Cowl (Tilt Handle) 1342	10	M6 x 1.0	Nut	2	1.5	0.2
Tiller Handle	Steering Bracket 1342	13	M8 x 1.25	Bolt	13	9	1.3

Standard Torque	M5 Bolts and Nuts	8	M5 x 0.8	Bolts and Nuts	4	3	0.4
	M6 Bolts and Nuts	10	M6 x 1.0	Bolts and Nuts	6	4	0.6
	M8 Bolts and Nuts	13	M8 x 1.25	Bolts and Nuts	13	9	1.3
	M10 Bolts and Nuts	17	M10 x 1.25	Bolts and Nuts	27	20	2.7

7.Sealant Application Locations

		Applied to	Screw Lock Agent		Gasket Seal Agent		Adheasive	Low Temperature Resistant Lithium Grease LIT	Waterproof Grease OBM	Teflon Grease TEF	Silicon Grease SOC	4-stroke Engine Oil	Gear Oil	Remarks
			Loctite	Three Bond	Loctite	Three Bond	Konishi	Chuo Yuka			Shin etsu Silicones			
			271	1342	518	1107	G1 7	Centax L2	FM-531	LM-902	KS-64			
Engine	Cylinder Block/ Crankcase	Camshaft										●		Area of bearings, cams and gears
		Lifter										●		Cam sliding face, push rod insertion area
		Push Rod										●		Both ends
		Push Rod Plate										●		Push rod pass hole end face
		Rocker Arm										●		Push rod sliding area, pivot sliding area
		Rocker Arm Pivot										●		Locker arm sliding face
		Valves (IN, EX)										●		Shaft area, stem head area
		Valve Spring										●		Whole area of the part
		Retainer, Cotter										●		Whole area of the part
		Valve Stem Seal (IN, EX)										●		Lip area and interior
		Slinger Pin	●											Inner face of pin insertion hole
		O-Ring (Filler Cap)										●		Whole area of the part
		Cylinder Liner										●		Inner wall
		Piston										●		Ring grooves and circumference
		Piston Rings										●		Whole area of the part
		Piston Pins										●		Outer circumference
		Connecting Rod										●		Inner surface of big and small ends
		Connecting Rod Cap										●		Inner surface
		Crankshaft										●		Sliding area, and areas of bearings and gears
		Oil Seal (Crankshaft)						●						Lip area
		Thrust Plate (Crankshaft)										●		Whole area of the part
		Crank Case-Cylinder Mating Face			●									
	Oil Pan	Oil Level Gauge										●		Outer circumference
		Oil Seal										●		Outer circumference
								●						Lip area
		Oil Seals (2 pcs. In the crank case head)						●						Lip area
		Engine Base Gasket				●								Both faces
	Intake Manifold	Throttle Drum							●					Inner surface
		Throttle Opener							●					Inner surface
		Throttle Rod							●					Both ends hole insertion area
	Electrical Parts	Spark Plug Cap									●			Spark plug insertion area
							●							High tension cord area

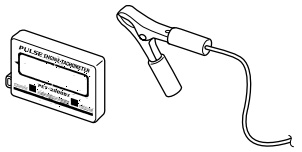
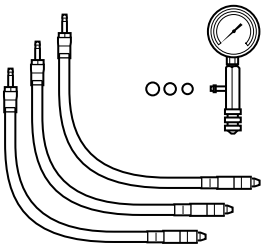
	Applied to	Screw Lock Agent		Gasket Seal Agent		Adheasive	Low Temperature Resistant Lithium Grease LIT	Waterproof Grease OBM	Teflon Grease TEF	Silicon Grease SOC	4-stroke Engine Oil	Gear Oil	Remarks
		Loctite	Three Bond	Loctite	Three Bond	Konishi	Chuo Yuka			Shin etsu Silicones			
		271	1342	518	1107	G1 7	Centax L2	FM-531	LM-902	KS-64			
Lower Unit	Shift Lever	Shift Lever Body							●					Betweenthe body and O-Ring
		O-Rings (2 pcs.)							●					Whole area of the part
		Spring							●					Whole area of the part
		Ceramic Ball							●					Whole area of the part
	Drive Shaft Housing	Exhaust Plug		●										Outer circumference of insertion area
		Shift Rod Lever		●										Threaded areaof Lever bolt and shift rod
									●					Inner area of shift lever shaft insertion hole
		Grommet										●		Drive shaft housing contact area
	Extension Housing	Bolt,Stud Bolt (Drive Shaft Housing Joint)		●										Threaded area
		Nut (Drive Shaft Housing Joint)		●										Threaded area
	Gear Case	Drive Shaft								●				Crankshaft side spline
		Ball Bearings (2 pcs.)											●	At press fit
		Bolts (Lower Unit)		●										Threaded area
		Bolts (Pump Case)		●										Threaded area
		Oil Seal (Pump Case Lower)							●					Lip area
													●	Outer circumference, at press fit
		Grommet										●		Insertion area outer circumference, at press fit
		O-Rings 2 pcs. (Cam Rod Bushing)							●					Whole area of the part
	Propeller Shaft Housing	Bolts (Propeller Shaft Housing)		●										Threaded area
		O-Ring							●					Whole area of the part
		Oil Seal							●					Lip area
													●	Outer circumference, at press fit
		Propeller Shaft							●					Propeller contact area
	Bracket	Clamp Screw							●					Threaded area
		Tilt Stopper							●					Entire circumference of shaft area
		Thrust Supporter							●					Sliding area
		Steering Bushing							●					Sliding area
		Thrust Bushing							●					Sliding area
		Steering Stopper							●					Inner area of split pin insertion hole
		Bolt (Steering Stopper)		●										Threaded area
		Stopper Spring							●					Coil area, both ends
		Stopper Lever							●					Inner area of split pin insertion hole
		Friction Adjust Screw							●					Threaded area
		Clamp Bracket							●					Inside of sliding area
		Swivel Bracket		●										Threaded area
		Bolts (Bracket) Nylon Nuts		●										Threaded area
		Bolts (Distance Piece) Nuts		●										Threaded area

	Applied to	Screw Lock Agent		Gasket Seal Agent		Adheasive	Low Temperature Resistant Lithium Grease LIT	Waterproof Grease OBM	Teflon Grease TEF	Silicon Grease SOC	4-stroke Engine Oil	Gear Oil	Remarks
		Loctite	Three Bond	Loctite	Three Bond	Konishi	Chuo Yuka			Shin etsu Silicones			
		271	1342	518	1107	G 1 7	Centax L2	FM-531	LM-902	KS-64			
Lower Unit — Tiller Handle	Steering Bracket		●										Threaded area
	Bushing (Tiller Handle)							●					Inner and outer faces
	Throttle Shaft							●					Groove area, sliding area
	Spring (Friction)							●					Whole area of the part
	Throttle Shaft Damper							●					Inner surface
	Bushing (Throttle Shaft)							●					Whole area of the part
	Throttle Wire							●					Wire area
Cowl	Bolts (Cowl Latch)		●										Threaded area
	Bolts (Bottom Cowl)		●										Threaded area
	Bolts (Tiller Handle)		●										Threaded area
Fuel Tank	Bolts (Tank Installation)		●										Threaded area
	Grease Nipples		●										Press fit area
	Engine Oil										●		Copacity : 300㎤ (10fl.oz)
	Gear Oil											●	Copacity : 180㎤ (6 fl.oz)

3

Maintenance

1. Special Tool

	
Tachometer P/N. 3AC-99010-0	Compression Gauge P/N. 3AC-99030-0
Measuring engine revolution speed	Measuring compression pressure

2. Inspection Schedule

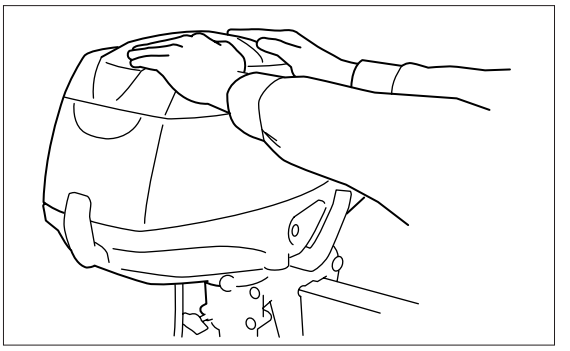
	Inspection Part	Inspection Period				Inspection Item	Remarks
		Initial 20 hours or initial 1 month	50 hours or Every 3 months	100 hours or Every 6 months	200 hours or Every year		
Fuel System	Carburetor			o	o	Disassembly, cleaning and adjustment	
	Fuel Filter (Fuel Cock)	o	o	o	o	Checking, and removing clogging.	Cleaning or replacement
	Piping/Hoses	o	o	o	o	Pipe damage Leak through pipe joint	
	Fuel Tank	o	o	o	o	Dirt, water	Cleaning
	Fuel tank cap	o	o	o	o	Check and clean or Replace if necessary.	
	Fuel pump *1	o	o	o	o	Check and clean or Replace if necessary.	
Ignition System	Spark Plug	o		o	o	Gap Removing carbon	0.8 - 0.9mm （0.031 - 0.035in）
	Ignition timing	o		o	o	Check timing	
Starting System	Starter Rope	o	o	o	o	Wear	
Engine	Engine Oil	o Replace.		o Replace.	o Replace.		300cm³（10fl.oz）
	Valve Clearance	o		o	o	Inspection and adjustment	
	Compression Pressure				o	Inspection	
	Thermostat			o	o	Rust, closing, damage	
Lower Unit	Propeller	o	o	o	o	Bending, damage and wear of blades	
	Gear Oil	o Replace.	o	o Replace.	o Replace.	Oil replacement or replenishment Check for water leak	GL5, SAE90 180cm³（6fl.oz）
	Water Strainer	o	o	o	o	Clogging	Cleaning
	Water Pump Impeller		o	o	o	Wear and crack	Replacement
Bolts and Nuts		o	o	o	o	Retightening	
Throttle Cable				o	o	Elongation and damage	Replacement
Sliding or Rotating Parts		o	o	o	o	Application of grease	
Anode			o	o	o	Check for corrosion and deformation.	Replace if necessary.

*1 Equipped for US and CANADA model.

3. Inspection Items

1) Inspection of Top Cowl

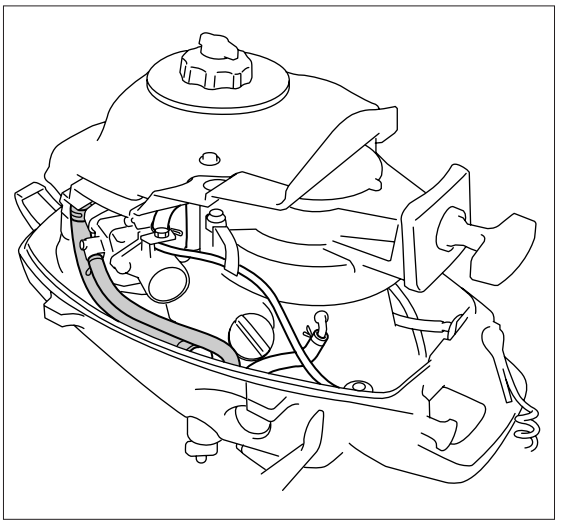
1. Push top cowl to check for looseness and state of closing.



2) Inspection of Fuel System

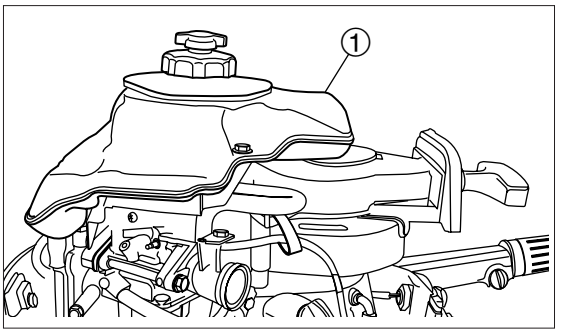
Check piping

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



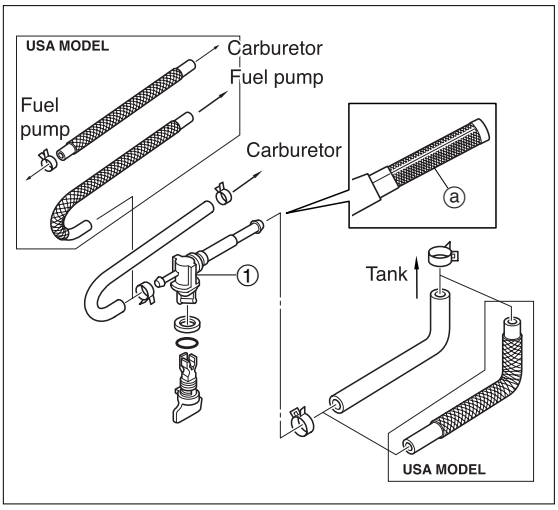
3) Inspection of Fuel Tank

1. Remove dirt and water from fuel tank ① if any.



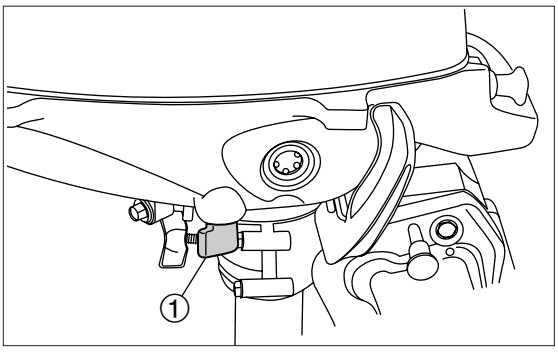
4) Inspection of Fuel Cock (Fuel Filter)

1. Check fuel cock ① (fuel filter ⓐ) for dirt and clogging, and clean if necessary.



5) Inspection of Fuel Cock

1. Check that fuel cock ① can be opened and closed normally.

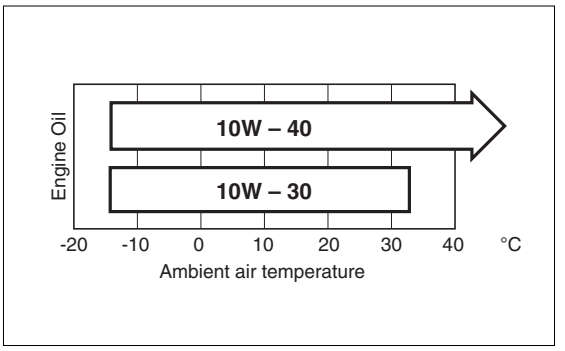


6) Replacement of Engine Oil

1. Oil Level

2. Oil Specification

Engine Oil :
4 Stroke Engine Oil
API : SF, SG, SH
SAE : 10W-30, 10W-40
NMMA : FC-W Certified 10W-30
Quantity of Engine Oil :
300cm³ (10 fl.oz)



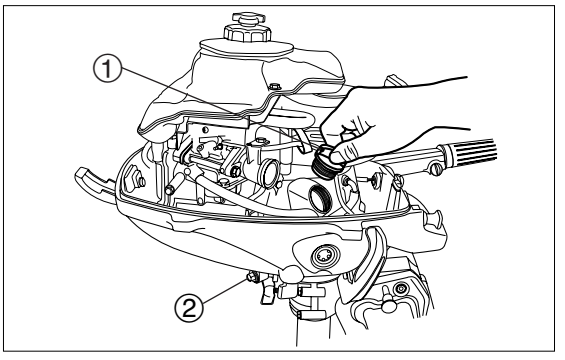
Use oil with viscosity that is suited to ambient air temperature of the operating region.

3. Engine Oil Replacement Procedure

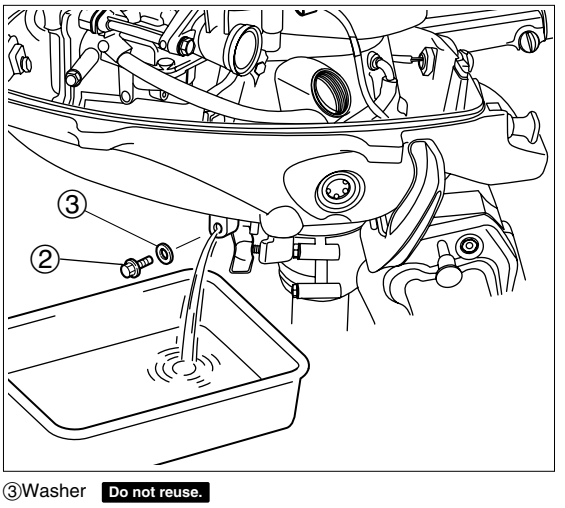
Use of engine oil containing dirt or water can significantly shorten the lives of rotating and sliding parts of engine.

Replacement of Engine Oil :

1. Stop the engine and set outboard motor straight ahead and vertical.
2. Remove top cowl and then oil filler cap ①.



3. Place drain oil pan below drain bolt ②.
4. Remove drain bolt ② to drain oil.
5. Tighten drain bolt ② to specified torque.



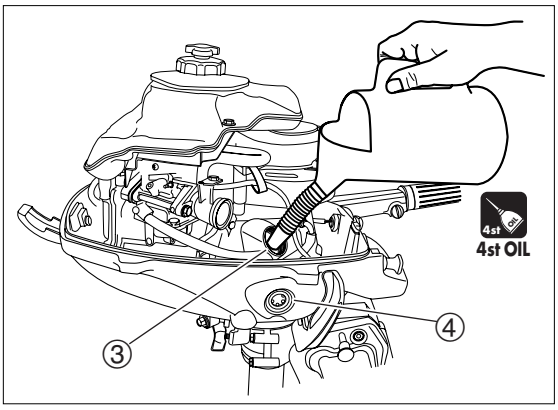
Apply oil to washer ③ of drain bolt ②.

Drain Bolt :
18N·m (13 lb·ft) [1.8kgf·m]

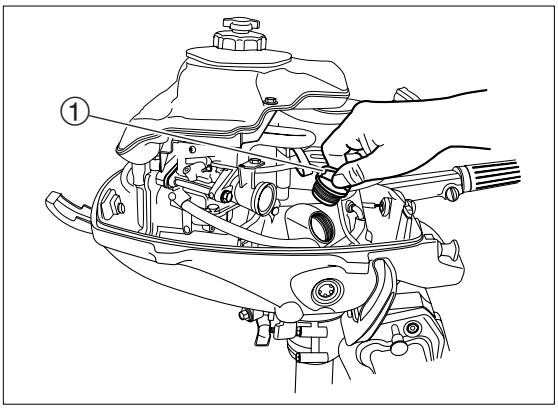
③Washer **Do not reuse.**

6. Pour new engine oil into oil inlet ③ until oil level reaches upper limit mark (center) of oil level gauge ④.

Quantity of Engine Oil :
300cm³（10 fl.oz）



7. Attach oil filler cap ①, start engine and idle for 5 minutes to warm up.
8. Stop engine and check oil level and for oil leaks after 5 minutes.



3

7) Inspection of Gear Oil Quantity

1. Tilt down outboard motor down to the vertical position.

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

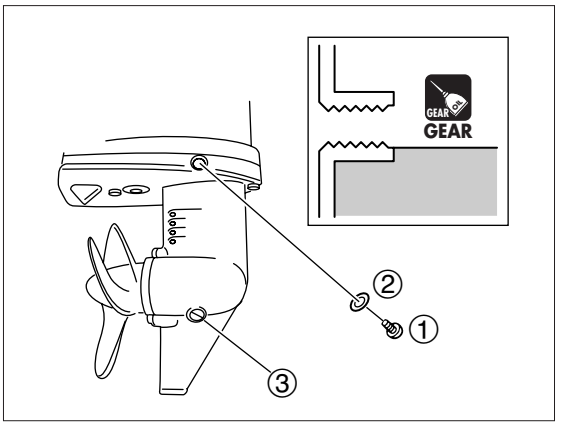
> Over flow of some oil from plug hole as plug is removed indicates that gear case is filled with specified quantity of gear oil.

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

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

> If the oil is low, add through lower oil plug hole ③.

4. Attach upper oil plug ①.



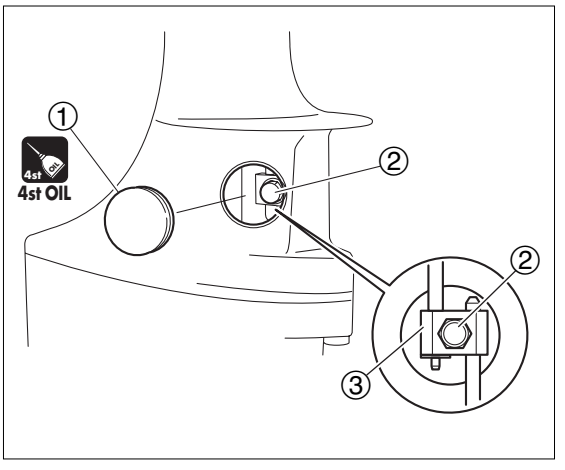
②Gasket **Do not reuse.**

8) Inspection of Water Pump

> Inspection of water pump does not require removal of power unit from outbord motor body. Tilt up and lock with tilt stopper.

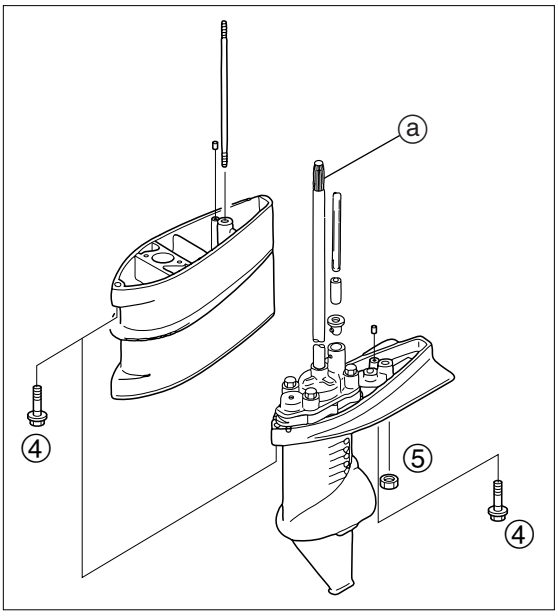
1. Remove grommet ① and loosen bolt ②.

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



2. Remove lower unit installation bolts ④ and nut ⑤, and pull lower unit ass'y downward to remove.

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



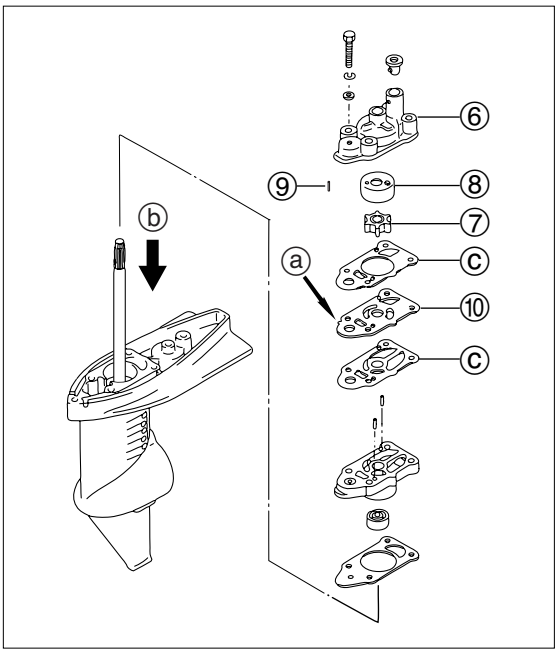
3. Remove bolt, and then, pump case (upper) ⑥ while pushing drive shaft downward ⓑ.

- 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) gear to drop into the gear case.

4. Remove impeller ⑦.

5. Check pump case (upper) ⑥ for deformation. Replace if necessary.

6. Check impeller ⑦, pump case liner ⑧ and guide plate ⑩ for cracks and wear. Replace if necessary.

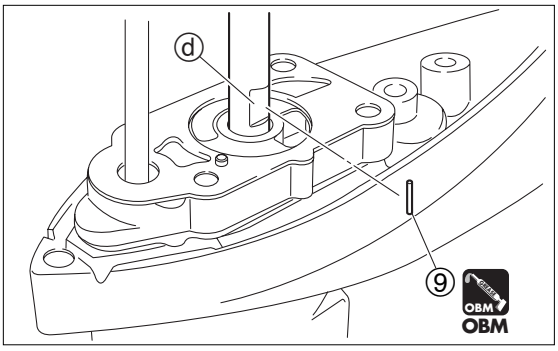


ⓐ Projection ⓒ **Do not reuse.**

7. Check key ⑨ and drive shaft groove ⓓ for wear. Replace if necessary.

8. Reinstall the components removed. For details, refer to Chapter 6.

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



9) Replacement of Gear Oil

1. Set outboard motor vertical.

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

> Remove lower oil plug ① first when draining.

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

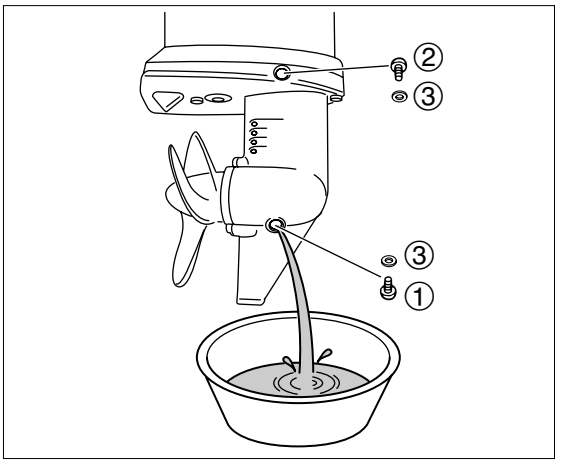
4. Fill with gear oil (from oil tube or pump) through lower plug hole ① until gear oil starts to flow from upper oil plug ② hole ⓐ without air bubbles.

Gear Oil :
Hypoid Gear Oil
API : GL-5 SAE : #90
Quantity of Gear Oil :
180 cm^3 (6 fl.oz)

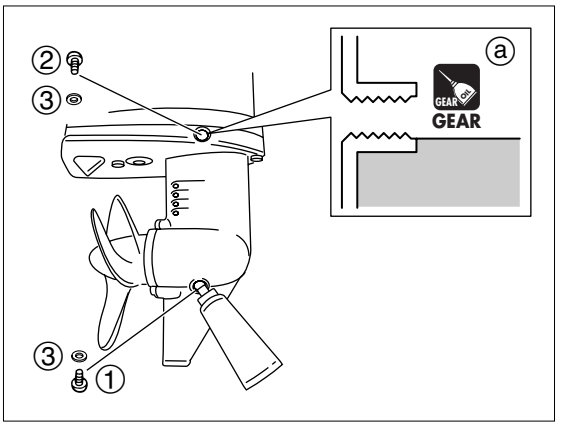
> Use lower plug hole ① when filling with gear oil. Upper hole ② should not be used because doing so will not allow air to escape from gear case.

5. Attach new gasket ③ and upper oil plug ②, and then new gasket ③ and lower oil plug ① quickly.

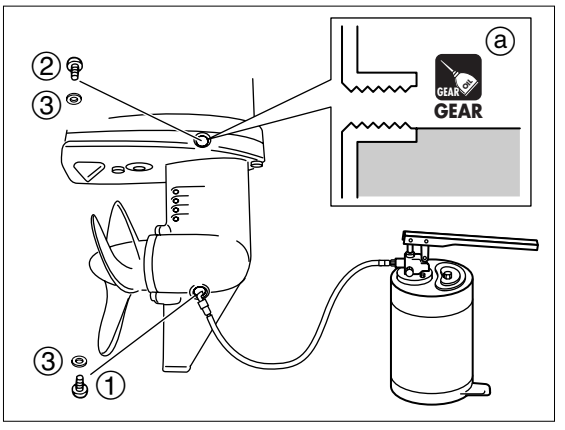
> When fully filled with oil, attach upper oil plug ② first.



③Gasket **Do not reuse.**



③Gasket **Do not reuse.**

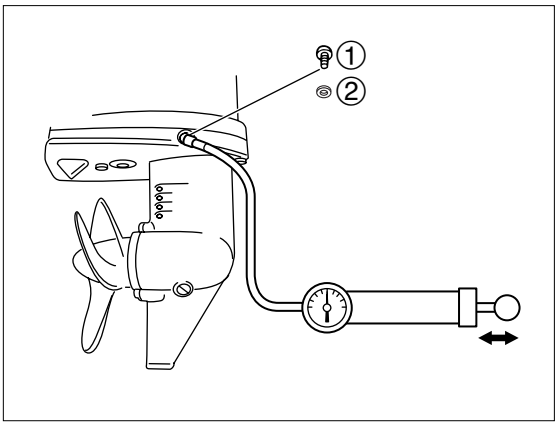


③Gasket **Do not reuse.**

10) Inspection of Gear Case (for leakage)

1. Drain gear oil. Refer to "9) Replacement of Gear Oil" in Chapter 3.

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



②Gasket **Do not reuse.**

3. Apply specified pressure to gear base, 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]

- Rotating propeller shaft while maintaining pressure and testing with gear oil drained make it easy to find leakage due to wear of oil seal lip.
- Depressurize gear case and cover oil plug area with a piece of rag before disconnecting leakage tester.

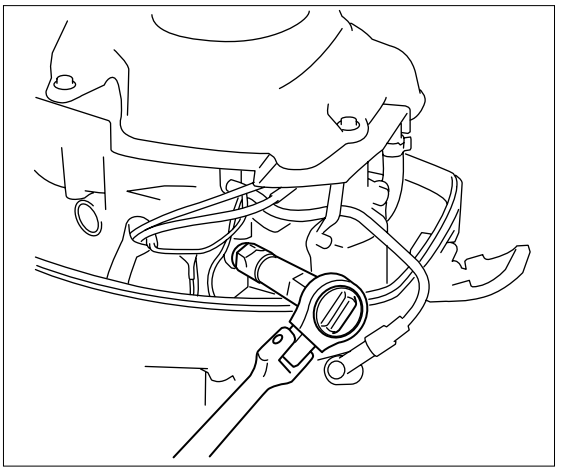
⚠ CAUTION

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 rings of cam rod and propeller shaft housing for damage.

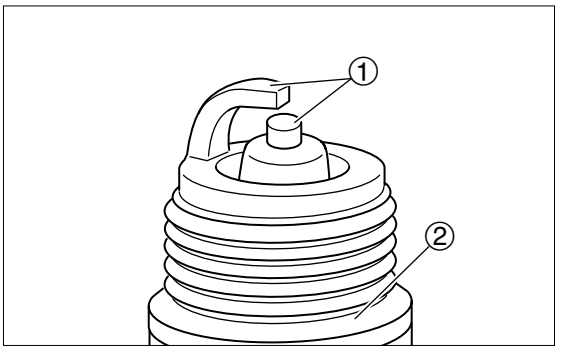
11) Inspection of Spark Plug

1. Remove plug cap and then spark plug.



2. Use spark plug cleaner or wire brush to clean spark plug electrode ①. Replace if necessary.

3. Check electrode ① for corrosion or excessive build up of carbon, and washer ② for damage. Replace if necessary.

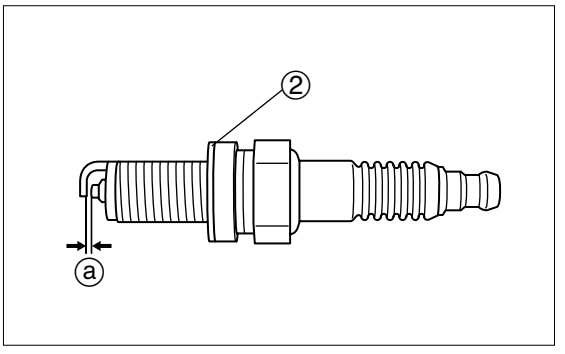


4. Check spark plug gap ⓐ. Replace if the gap is over specified value. Adjust gap if it is out of specified range.

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

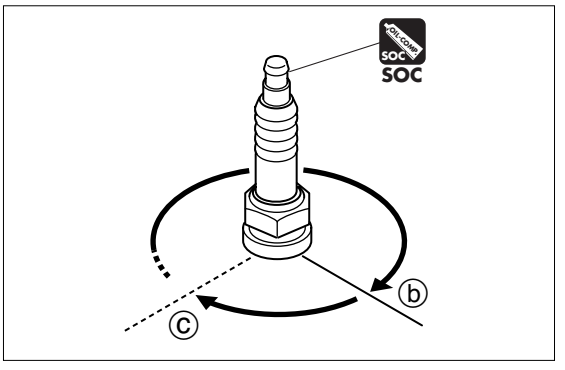
Functional Limit :
1.0 mm (0.039 in)

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]



12) Inspection of Compression Pressure

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

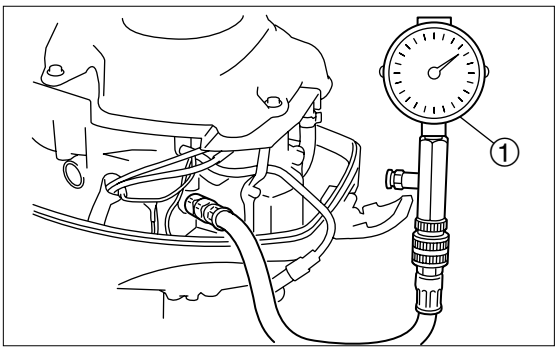
2. Shift gear into neutral (N).

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

> **⚠ CAUTION**
>
> **To prevent accidental start of the engine, remove lock plate (of stop switch lanyard) from stop switch before measuring compression pressure.**

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.**

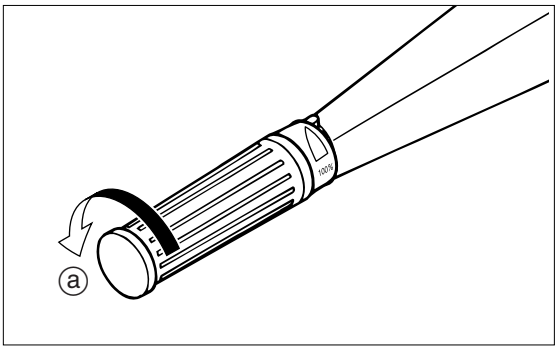


5. Install compression gauge ① to plug hole.

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

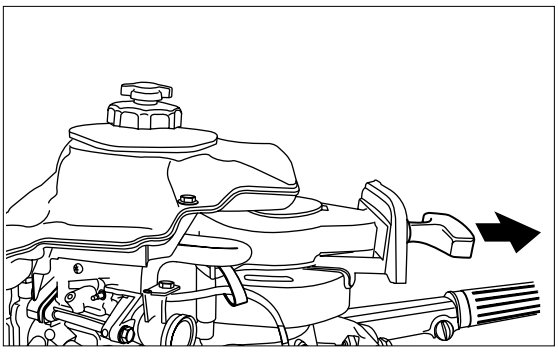
6. Fully open throttle ⓐ, crank engine until compression gauge indication ① stabilizes, and then measure compression pressure.

> **Compression Pressure (Reference) :**
> 1.13 MPa (164 psi) [11.5 kgf/cm^2] ± 10%



- Compression pressure is affected much by cranking speed, and normally changes approximately 10%.
- 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.

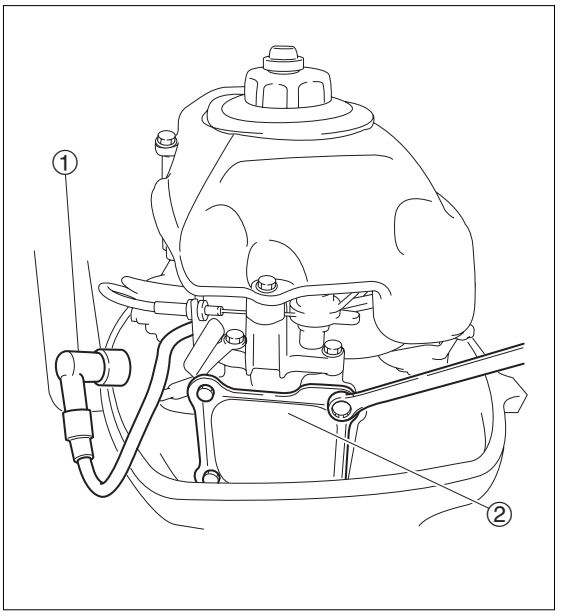


- If compression pressure increases after the above measure, check piston and piston rings for wear. Replace if necessary.
- If compression pressure does not increase after the above measure, check valve clearances, valves, valve seats and cylinder head. Adjust or replace if necessary.

13) Inspection and Adjustment of Valve Clearances

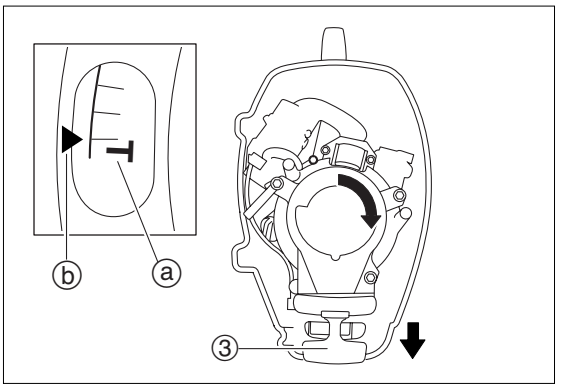
1. Disconnect plug cap ① connection, and then, remove spark plug and cylinder head cover ②.

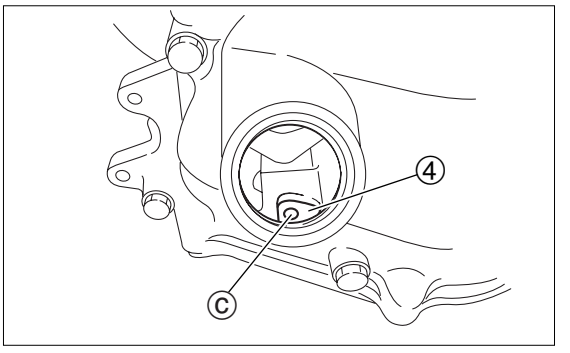
When removing or installing cylinder head cover without removing power unit, use 10 mm box wrench with large offset angle.



2. Pull recoil starter ③ to turn flywheel clockwise until flywheel "T" mark ⓐ is brought to flywheel cover "▲" mark ⓑ.

- Set piston to top dead center of compression stroke.
- Remove oil filler cap and check that ø5 mm (0.2 in) hole ⓒ of cam shaft gear ④ can be seen.

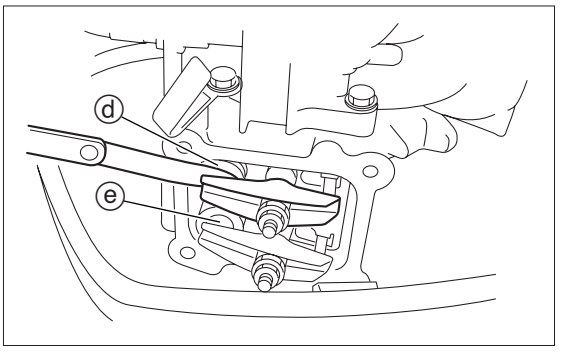




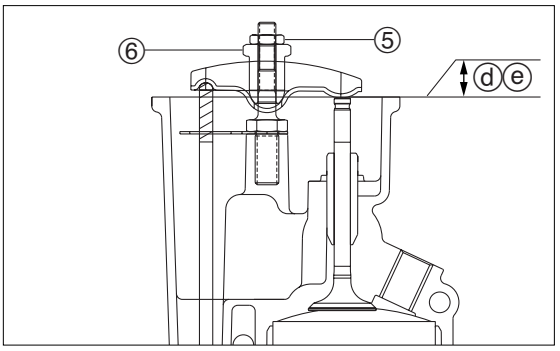
3. Check clearances of intake valve ⓓ and exhaust valve ⓔ. Adjust gap if it is out of specified range.

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 - 0.19 mm
(0.0043 - 0.0075 in)

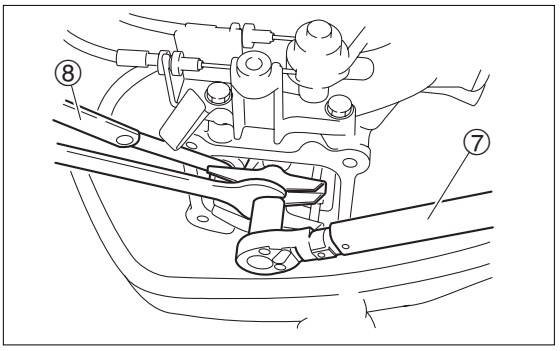


4. Loosen pivot lock nut ⑤ and then turn the pivot ⑥ so that valve clearance reaches specified value.



- Turning pivot ⑥ clockwise makes valve clearance smaller.
- Turning pivot ⑥ counterclockwise makes valve clearance larger.

5. Tighten pivot lock nut ⑤ to specified torque, and check valve clearance again. Readjust if necessary.



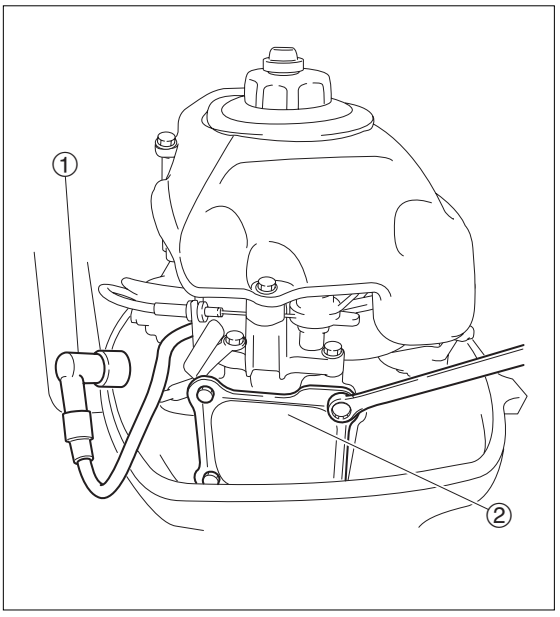
Pivot Lock Nut ⑤ :
10 N·m (7 lb·ft) [1.0 kgf·m]

Torque Wrench ⑦ :
Use commercially available item.
Thickness Gauge ⑧ :
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 - 0.19 mm
(0.0043 - 0.0075 in)

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



When removing or installing cylinder head cover without removing power head, use 10 mm box wrench with large offset angle.

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

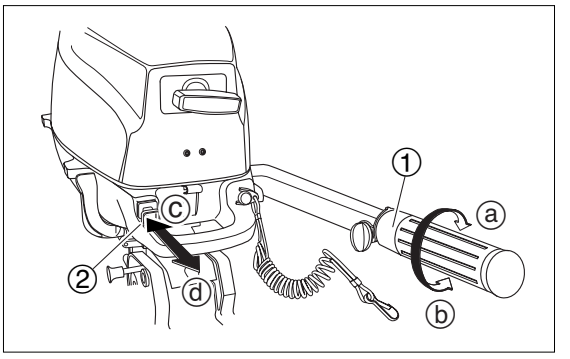
Spark Plug :
18 N·m (13 lb·ft) [1.8 kgf·m]

7. Reconnect plug cap ①.

14) Adjustment of Throttle Cable

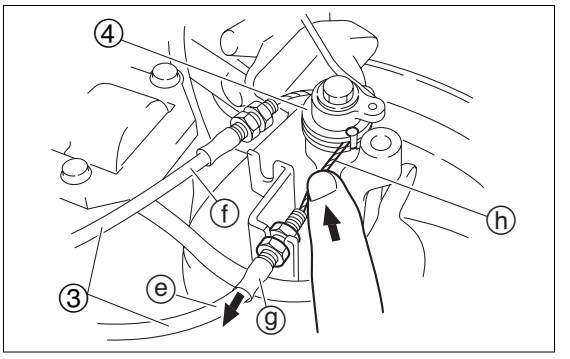
1. Turn throttle grip ① to full close position ⓐ.

2. Pull choke rod ② fully ⓓ.



3. Attach throttle cable ③ to throttle drum ④ taking care of the positions of low speed side cable ⓔ and high speed cable side ⓕ.

4. Pull outer cable ⓖ of throttle cable ③ to the side shown with the arrow by hand, and lock it with the nut while applying tension to the cable.

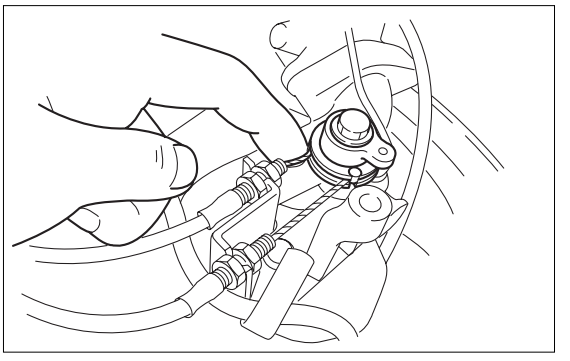


> Push inner cable ⓗ with a finger to check that the cable deflects approximately 1 mm (0.04 in) at the center.

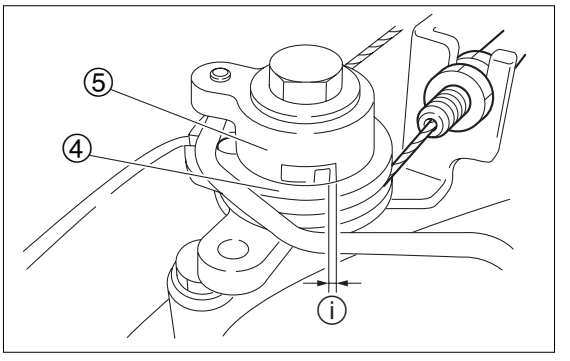
5. Attach high speed side ⓕ cable and low speed side ⓔ cable by using the same way.

6. Push back choke rod ② fully ⓒ. (wide open choke)

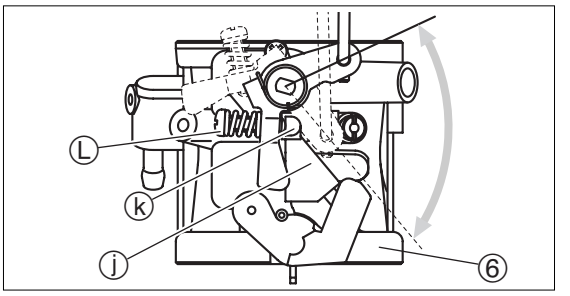
7. Turn throttle grip ① to full close position ⓐ.



> Check that the gap ⓘ between the projection of throttle drum ④ and dent of throttle opener ⑤ is within the range from 0.5 - 1.0 mm (0.020 - 0.040 in).

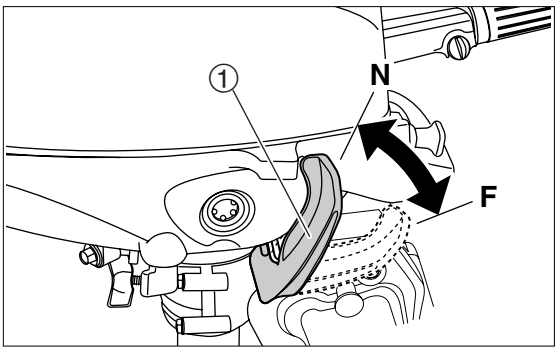


8. Turn throttle grip ① from full close position ⓐ to full open position ⓑ, and check that the throttle lever of carburetor ⑥ touches the full open stopper ⓙ. Then, return the throttle grip ① from full open position ⓑ to full close position ⓐ, and check that the throttle lever of carburetor touches the full close stopper ⓚ (throttle stop screw Ⓛ).



15) Inspection of Gear Shift Operation

Shift the lever ① from neutral (N) to while rotating propeller, and then back to neutral (N) to check that shift operation is performed smoothly. Adjust positions of shift rod ② and joint ③ if necessary.

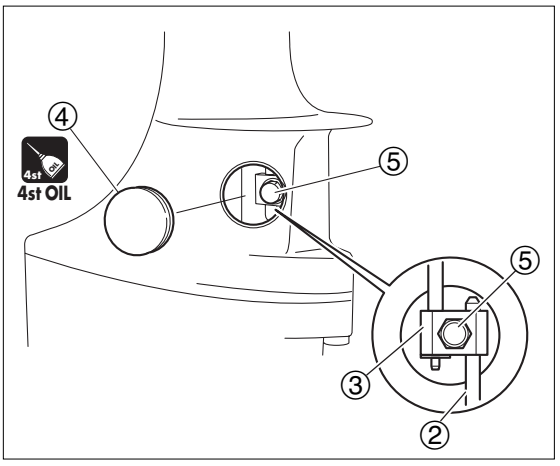


1. Shift lever ① into neutral (N).

Check that propeller shaft rotates smoothly at neutral (N) position when turned by hand.

2. Remove grommet ④ and loosen bolt ⑤.

Bolt ⑤ should be loosened, not be removed from joint ③.



3. Check positions of cam rod ② and joint ③, and adjust if necessary.

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

4. Attach grommet ④.

16) Flushing with Water

⚠ CAUTION

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

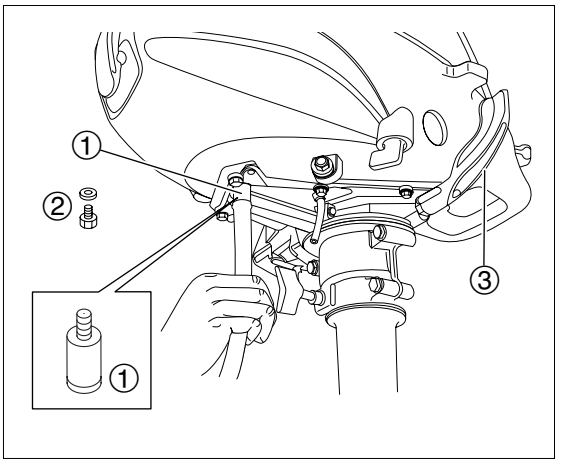
⚠ WARNING

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 water using flushing attachment ① (hose adapter)

1. Remove propeller.
2. Remove water plug ② of outboard motor, and attach flushing attachment ①.
3. Put water hose on flushing attachment ① and run water.
4. Set shift lever ③ to neutral (N) and start engine.
5. Check that cooling water check port discharges water, and run engine for 3 to 5 minutes at low speed.
6. Stop engine and stop water supply, remove flushing attachment ①, attach and tighten water plug ②, and then, reinstall propeller.

Water Plug :
13 N·m (9 lb·ft) [1.3 kgf·m]



①Flushing Attachment (optional)

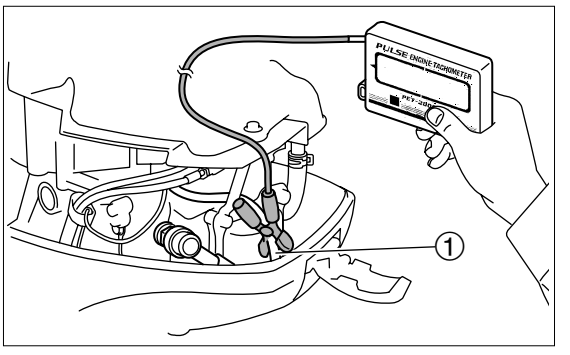
17) Inspection of Idle Engine Speed

1. Start engine and run for 5 minutes to warm up.
2. Attach tachometer to high tension cord ① to check idle engine speed.

· Use tachometer to measure after warm up operation.
· Set the measurement mode to 4 stroke 2 cylinder · 2 stroke 1 cylinder.

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

Idle Engine Speed :
1,250 - 1,350r/min



①High Tension Cord

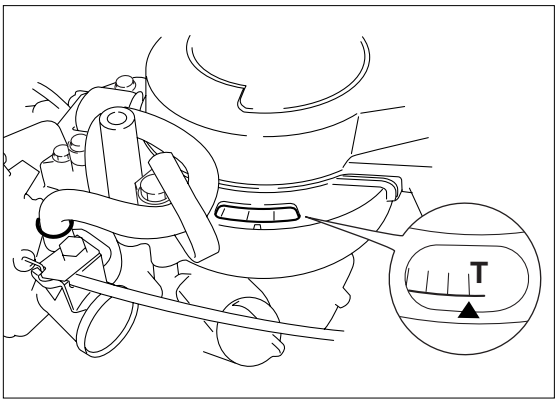
18) Inspection of Ignition Timing

Adjusting system :

Automatic control, requiring no manual adjustment.

Run engine and use timing light to check ignition timing. 7 timings marks are found on the top of flywheel (TDC0˚ ("T"), BTDC5˚, 10˚, 15˚, 20˚, 25˚, 30˚). Read ignition timing with mark on the center of flywheel cover window.

Model	Range of Timing Angle
F2/2.5/3.5B	BTDC 3˚ - BTDC 25˚



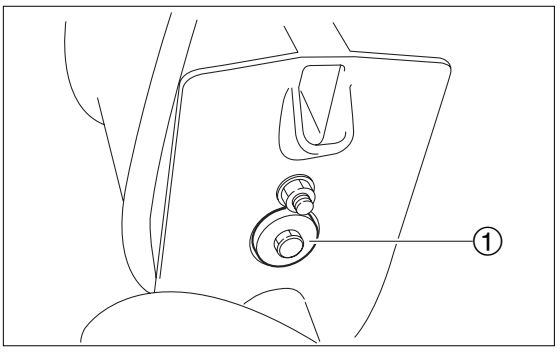
19) Inspection of Anode

1. Check anode ① for build up of scale and adherence of grease and oil. Clean, or replace if necessary.

⚠ CAUTION

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

When it is necessary to disassemble outboard motor for inspection of anode, refer to disassembly described in this manual.



2. Replace anode ① if it is corroded excessively.

20) Replacement of Anode

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

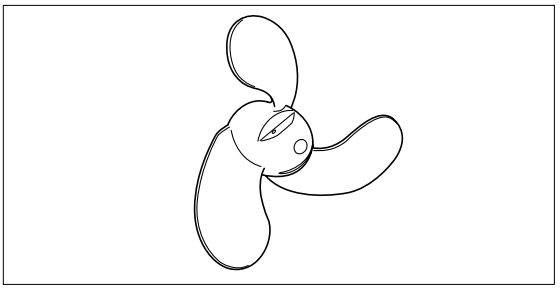
The anode is attached to gear case.

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

Do not coat anode with oil or paint.

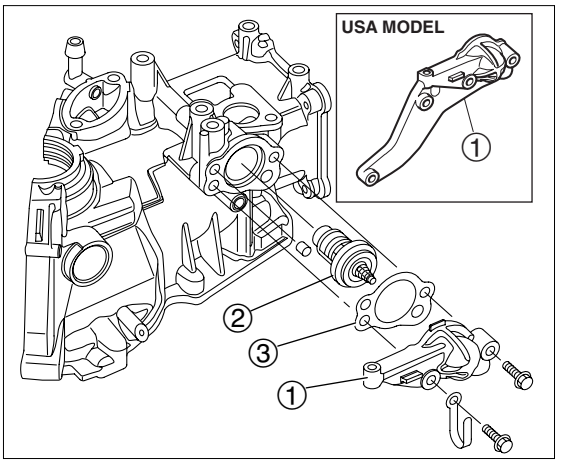
21) Inspection of Propeller

1. Check propeller blades and shear pin for cracks, damages, wear and corrosion. Replace if necessary.

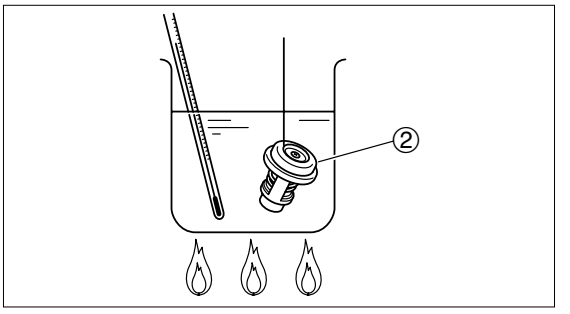


22) Inspection of Thermostat

1. Remove bolts, and then thermostat cap ① and thermostat ②.



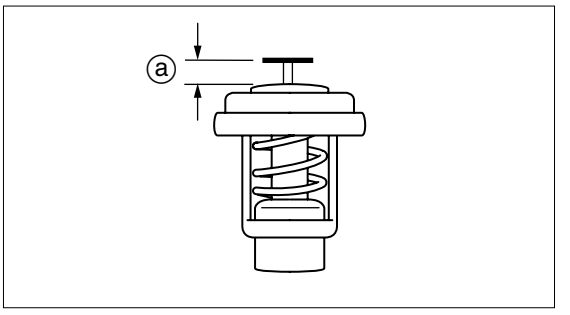
2. Hang thermostat ② in the water contained in vessel.
3. Put thermometer in the water, and warm up water to measure valve opening temperature.



Put a piece of thread in the closed valve gap and hang it in the water. Valve opening moment can be known when thermostat ② is released to drop due to opening with rise of temperature.

Valve Opening Temperature :
52˚C±2˚C(125˚F±4˚F)
(Valve starts to open at this temperature.)

4. Measure valve lift ⓐ of thermostat ② when prescribed temperature has been reached. Replace if the length is less than specified value.



Water Temperature	Valve Liftⓐ
65˚C±2˚C(150˚F±4˚F)	3.0 mm (0.12 in) or more

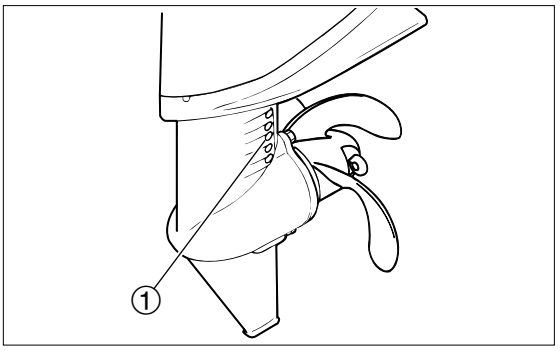
Since thermostat starts to open a few minutes after the opening temperature is reached, measure the lift ⓐ after maintaining it for approximately 5 minutes at around 65˚C(150˚F).

5. Install thermostat ②, new gasket ③ and then cap ①.

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

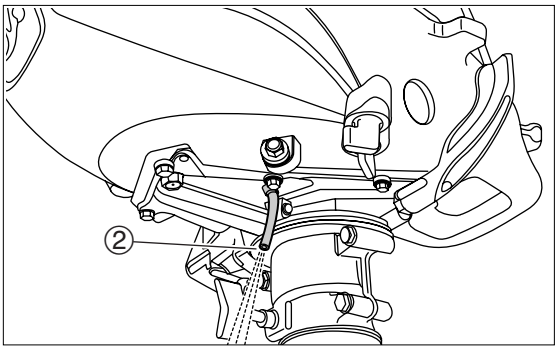
23) Inspection of Cooling Water Passages

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



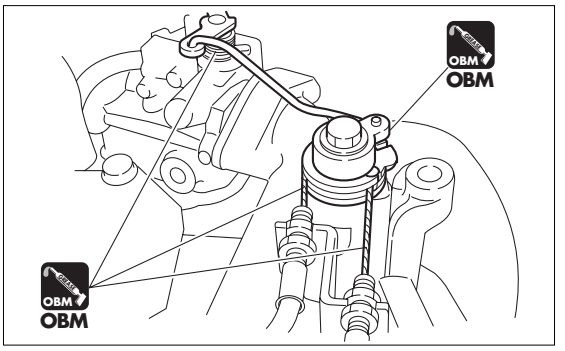
2. Set outboard motor in the water and start engine.

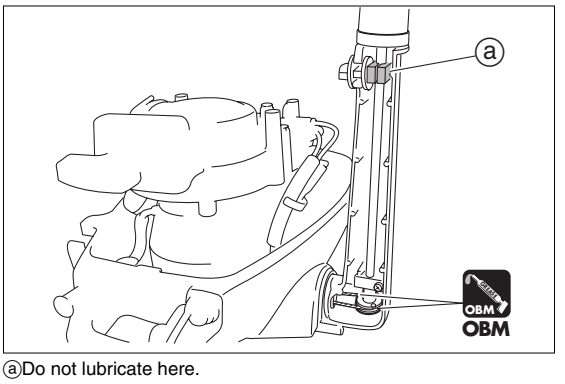
3. Check that cooling water is discharged from cooling water check port ②. If not, check water pump and cooling water passage in the engine.



24) Greasing Points

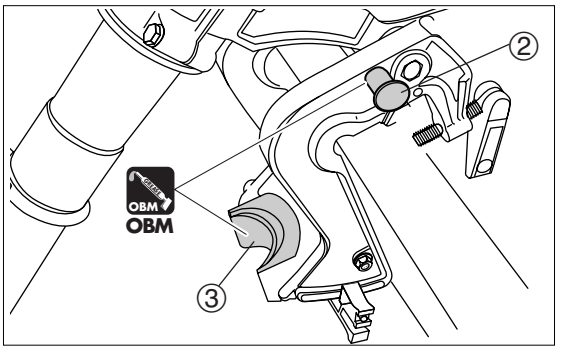
1. Apply grease to throttle cable and sliding areas.



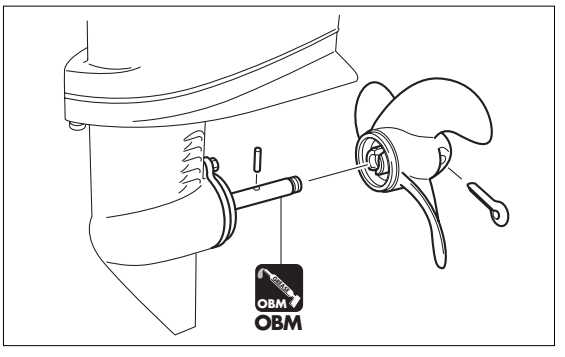


ⓐDo not lubricate here.

2. Apply grease to pin of tilt stopper ② and thrust supporter ③.



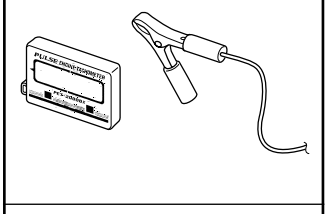
3. Apply grease to propeller shaft.



4

Fuel System (Carburetor)

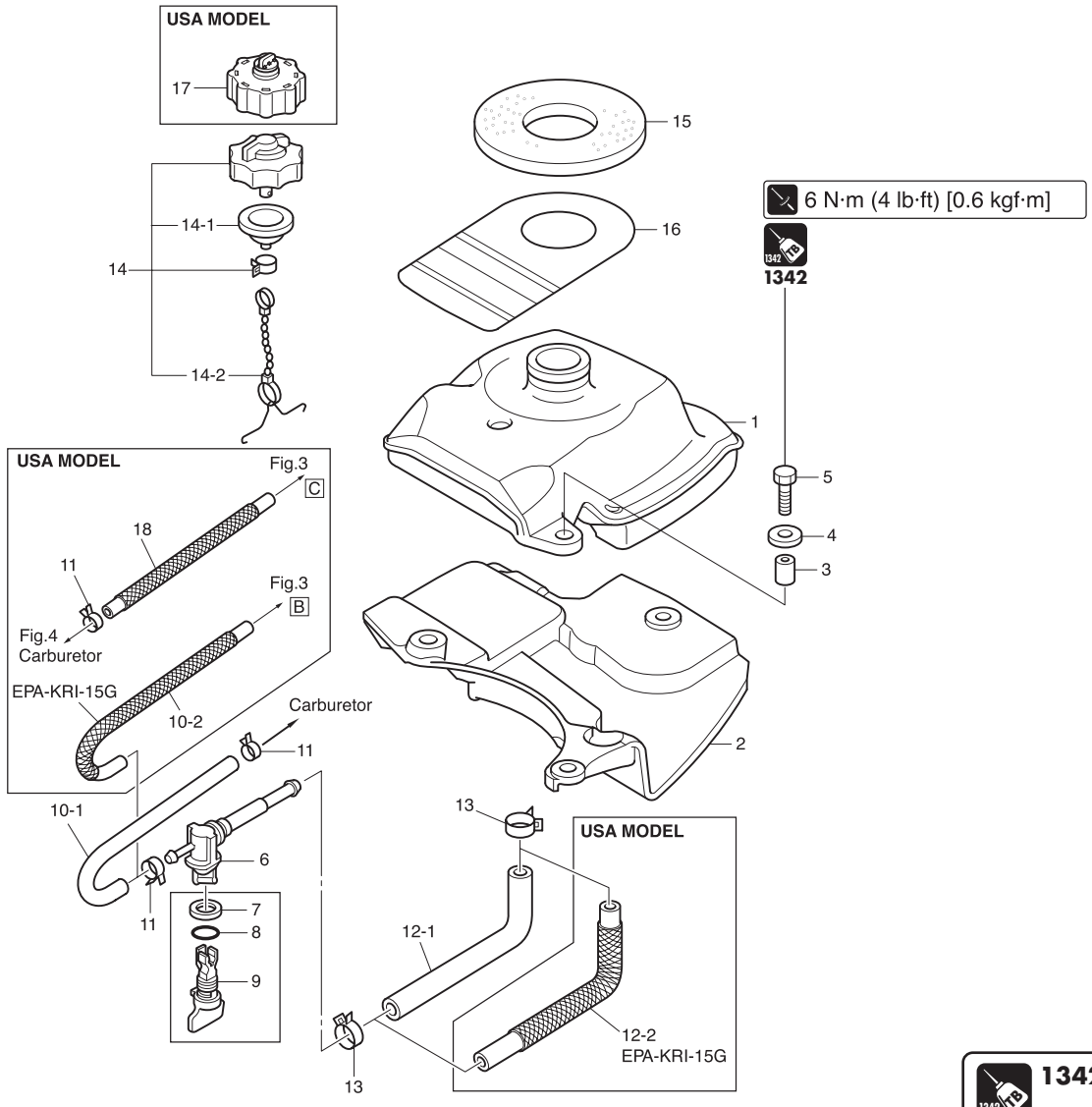
1.Special Tool


Tachometer P/N. 3AC-99010-0
Measuring engine revolution speed

2. Parts Layout

P/L Fig. 14

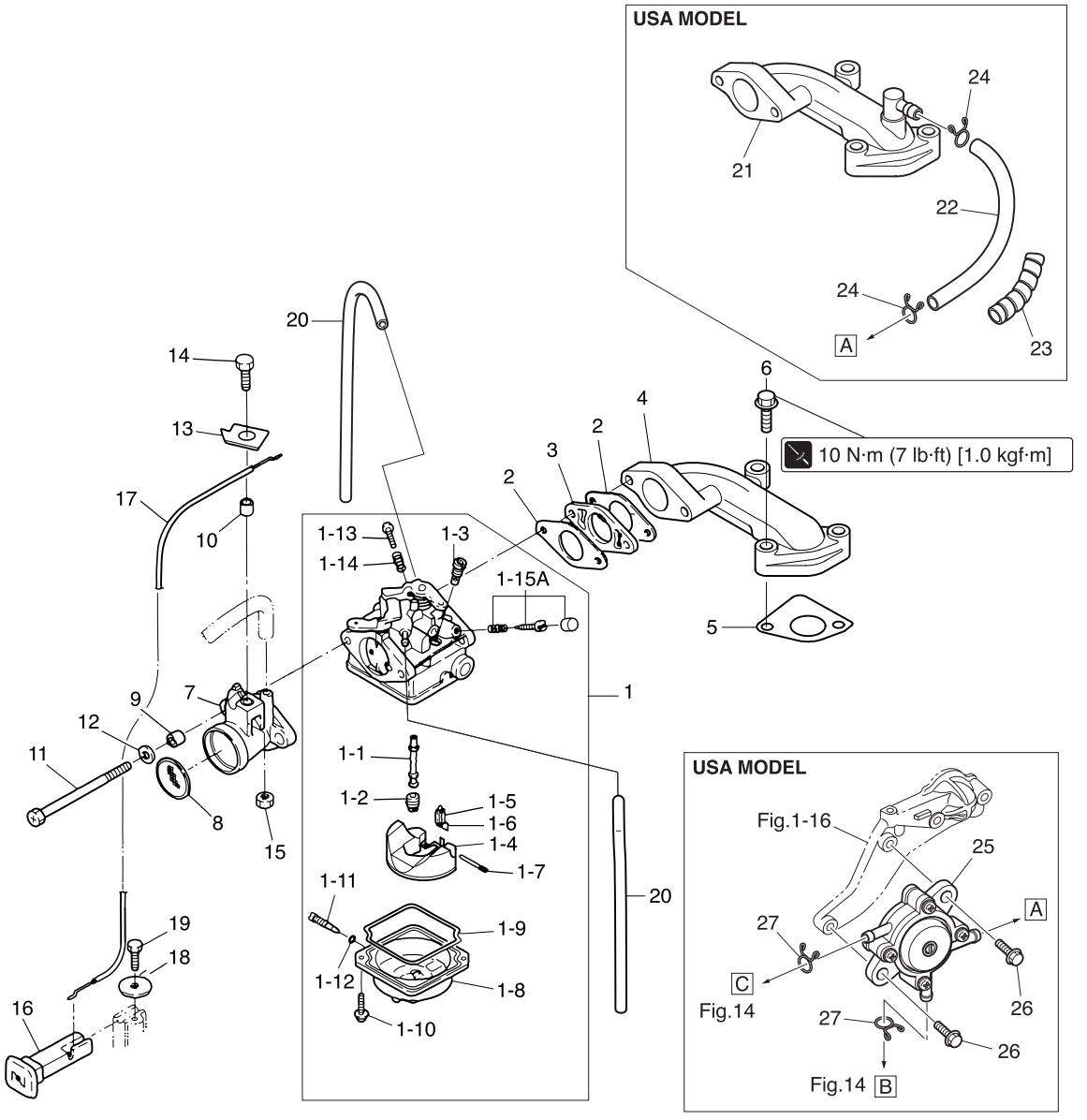
Fuel Tank



Ref. No.	Description	Q'ty	Remarks
1	Fuel Tank	1	
2	Fuel Tank Cover	1	
3	Collar, 6.2-9-10.7	3	
4	Washer, 6-16-1.5	3	
5	Bolt	3	M6 L=25mm
6	Fuel Cock	1	
7	Seal Ring	1	
8	O-Ring	1	Do not reuse.
9	Fuel Cock Knob	1	
10-1	Fuel Hose	1	
10-2	Fuel Hose	1	for USA
11	Clip, ø9.5	2	3:for USA
12-1	Fuel Hose	1	
12-2	Fuel Hose	1	for USA
13	Clip, ø15	2	
14	Fuel Tank Cap Ass'y	1	
14-1	Tank Cap Gasket	1	
14-2	Tank Cap Hook	1	
15	Fuel Tank Seal	1	
16	Caution Decal "B"	1	
17	Fuel Tank Cap Ass'y	1	for USA
18	Fuel Hose	1	for USA

Carburetor

Fig. 3



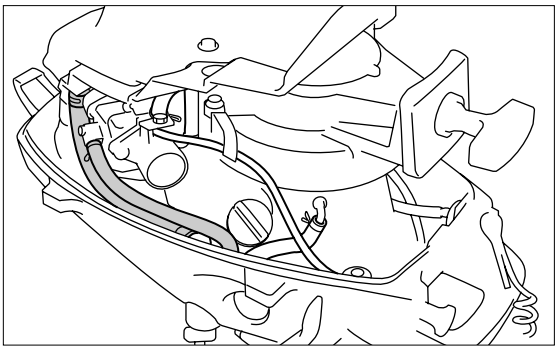
Ref. No.	Description	Q'ty	Remarks
1	Carburetor	1	
1-1	Main Nozzle	1	
1-2	Main Jet	1	
1-3	Slow Jet	1	
1-4	Float	1	
1-5	Float Valve	1	
1-6	Clip	1	
1-7	Float Arm Pin	1	
1-8	Float Chamber	1	
1-9	Float Chamber O-Ring	1	Do not reuse.
1-10	Screw	2	
1-11	Drain Screw	1	
1-12	Drain Screw O-Ring	1	Do not reuse.
1-13	Stop Screw	1	
1-14	Stop Screw Spring	1	
1-15A	Pilot Screw Set	1	
2	Carburetor Gasket	2	Do not reuse.
3	Insulator	1	
4	Intake Manifold	1	
5	Intake Manifold Gasket	1	Do not reuse.
6	Bolt	2	M6 L=30mm
7	Intake Silencer	1	
8	Flame Arrester	1	
9	Collar, 6.2-9-7.5	2	

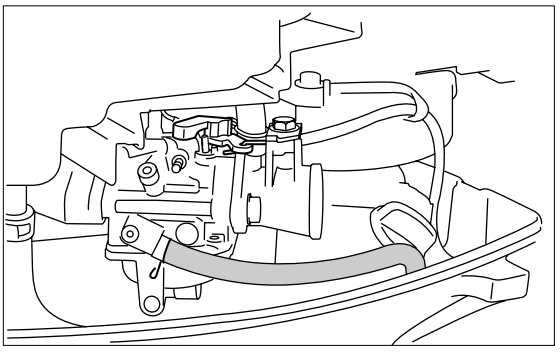
Ref. No.	Description	Q'ty	Remarks
10	Collar, 6.2-9-7	1	
11	Bolt	2	M6 L=85mm
12	Washer	2	
13	Cable Holder	1	
14	Bolt	1	M6 L=16mm
15	Nut	1	M6
16	Choke Rod	1	
17	Choke Link Cable	1	
18	Washer, 6.5-21-1	1	
19	Bolt	1	M6 L=12mm
20	Rubber Hose	2	
21	Intake Manifold Ass'y	1	for USA
22	Hose	1	for USA
23	Spiral Tube Protector ø10-100	1	for USA
24	Clip ø12	2	for USA
25	Fuel Pump Ass'y	1	for USA
26	Bolt	2	for USA
27	Clip ø10	2	for USA

3. Inspection Items

1) Inspection of Fuel Feed System Piping

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



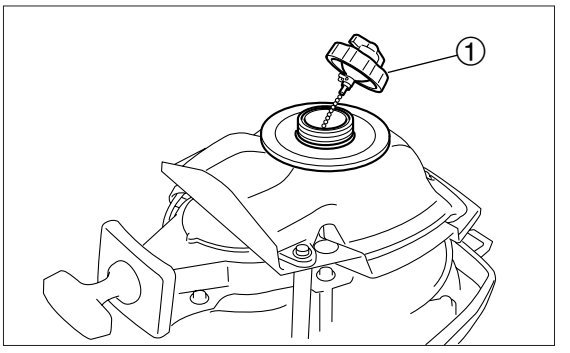


2) Draining Fuel

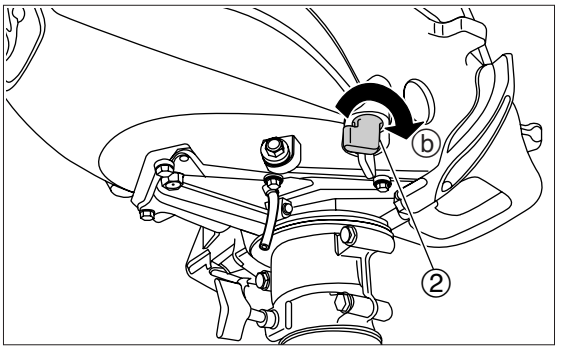
⚠ WARNING

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.

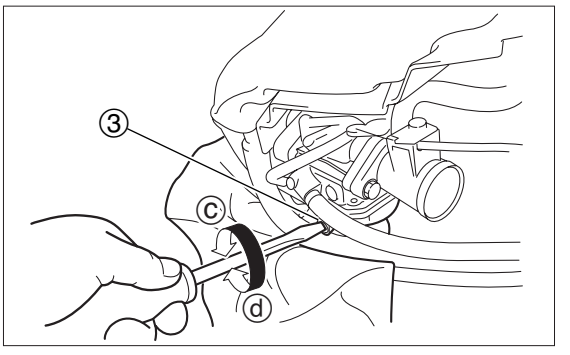


2. Set fuel cock knob ② to full open position ⓑ.



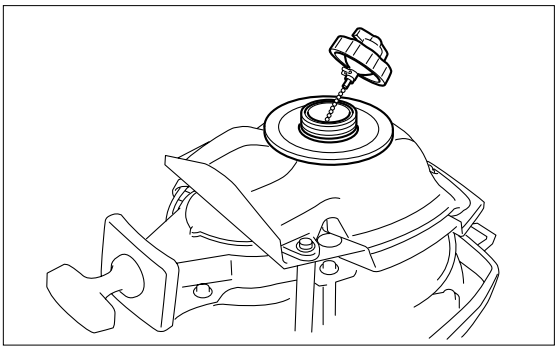
3. Place a piece of rag below the carburetor, and loosen ⓒ drain screw ③ to drain all fuel.

4. Retighten drain screw ③.



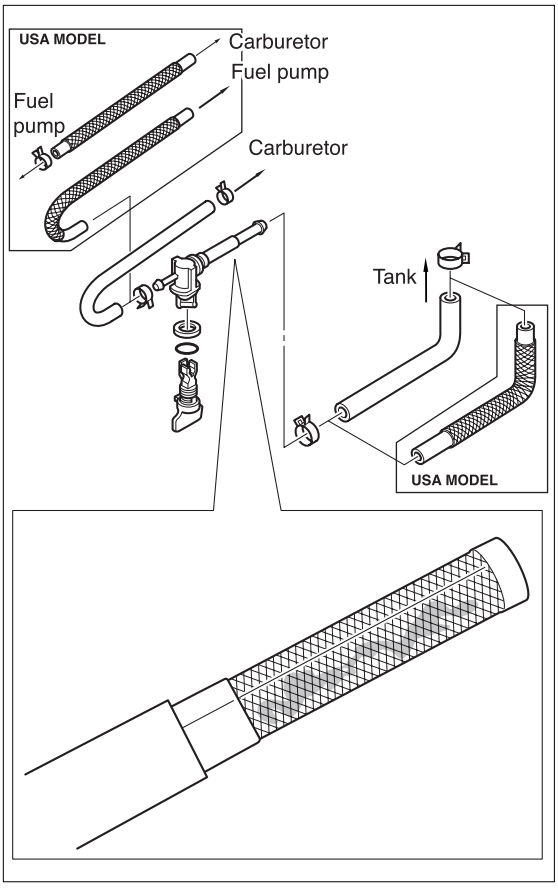
3) Inspection of Fuel Tank and Fuel Tank Cap

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 (fuel cock) for dirt and clogging, and clean if necessary.

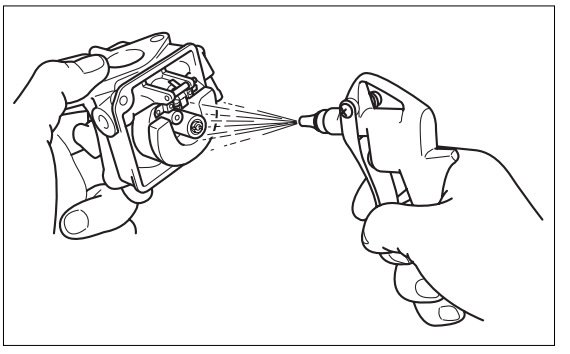
6) Inspection of Carburetor

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

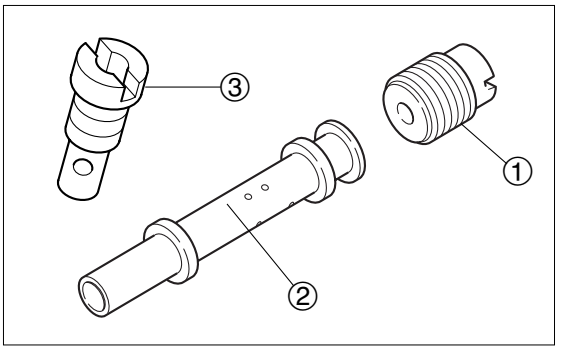
2. Squirt all passages and jet with compressed air.

⚠ CAUTION

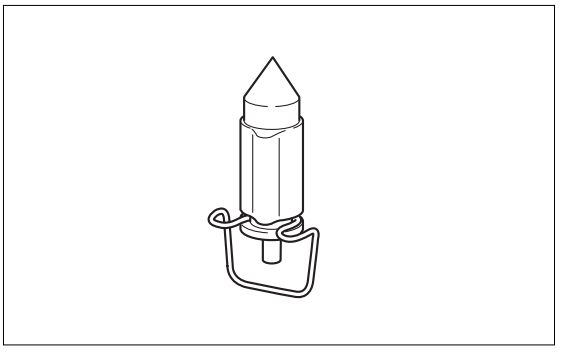
- **Point the compressed air downward, taking care that detergent and dust do not enter the eyes and do not damage small parts of the carburetor.**
- **Do not use wire to clean the jet. Doing so may enlarge the jet hole, resulting in significantly reducing the performance.**



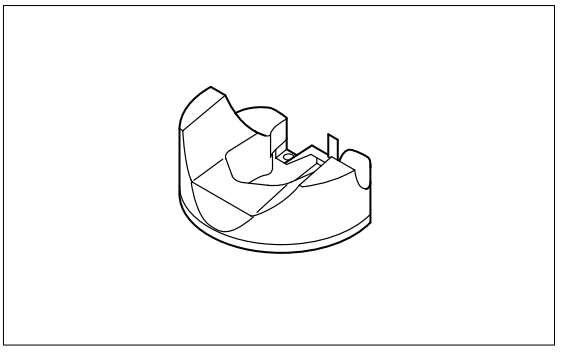
3. Check main jet ①, main nozzle ② and slow jet ③ for dirt. Clean or replace if necessary.



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



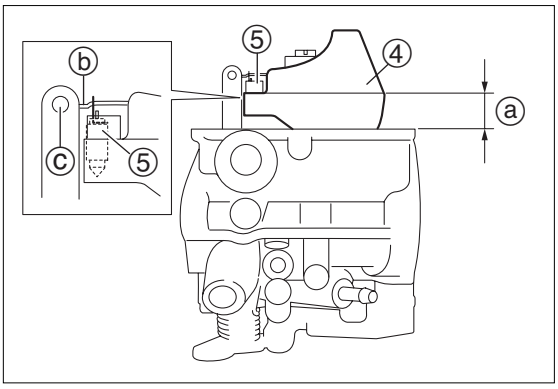
5. Check float for deformation. Replace if necessary.



6. Measure height a of float ④. Adjust height ⓐ of float ④ by bending tab ⓑ if the height is out of specified range.

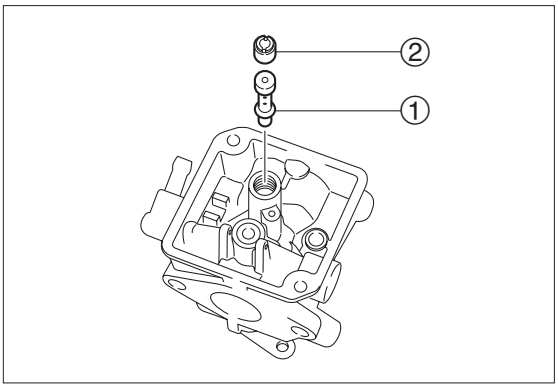
Float Height ⓐ :
9.0 - 10.0 mm (0.354 - 0.394 in)

- Bring tab ⓑ of float ④ into light contact with top of float valve ⑤.
- Measure the height at the marking line that is located opposite to pivot ⓒ side.



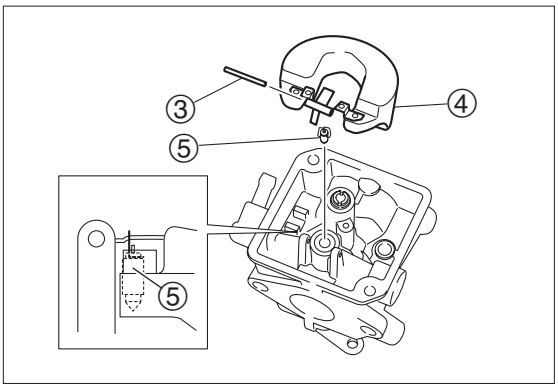
7) Assembling of Carburetor

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



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

- When attaching float to carburetor body, put float valve ⑤ in the valve seat.
- Put float arm pin in the horizontal hole on the carburetor, and tap lightly to set the location.



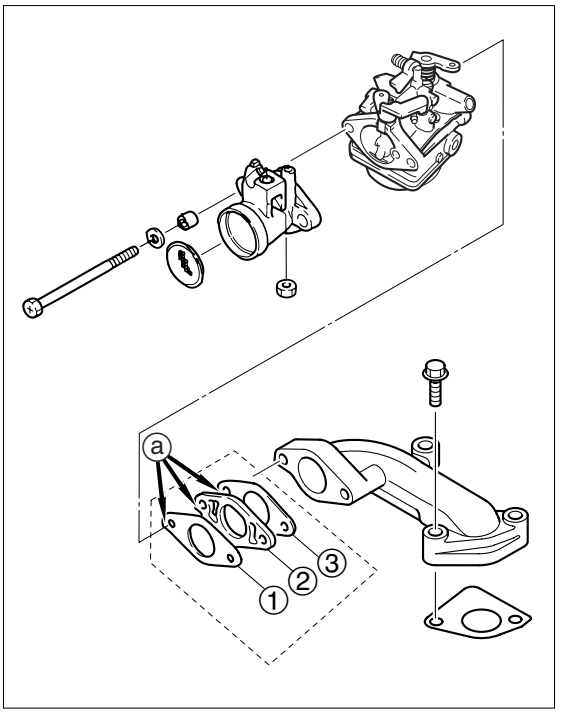
3. Attach slow jet and float chamber.

8) Assembling Carburetor

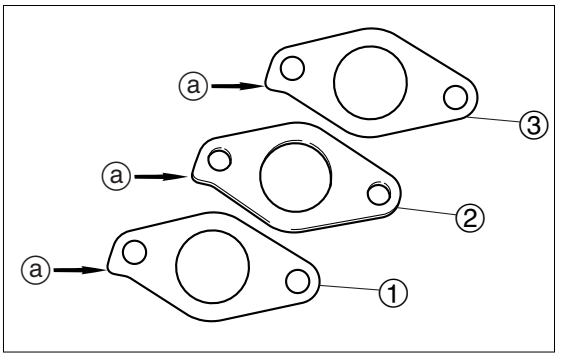
1. Attach carburetor ass'y to intake manifold.

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

Put carburetor gaskets ① and ③ and insulator ② together with their projections ⓐ at the same side, and install carburetor.

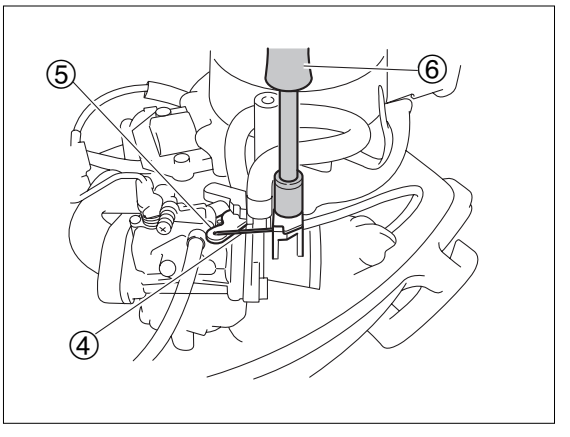


ⓐ Projections ① and ③ **Do not reuse.**



ⓐ Projections ① and ③ **Do not reuse.**

2. Attach choke wire ④ to choke lever ⑤ of carburetor.

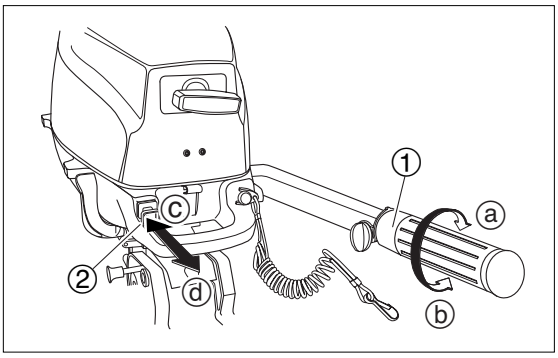


⑥ 10 mm Wrench

9) Adjustment of Throttle Cable

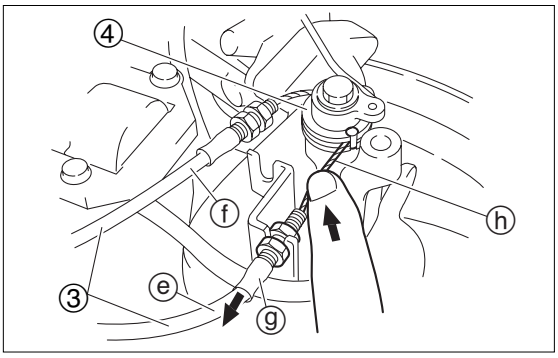
1. Turn throttle grip ① to full close position ⓐ.

2. Pull choke rod ② fully ⓓ.



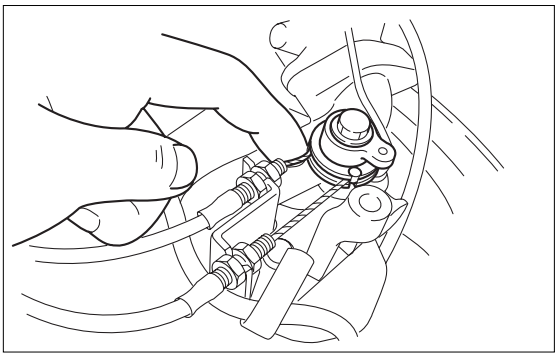
3. Attach throttle cable ③ to throttle drum ④ taking care of the positions of low speed side ⓔ and high speed side ⓕ.

4. Pull outer cable ⓖ of throttle cable ③ to the side shown with the arrow by hand, and lock it with the nut while applying tension to the cable.



> Push inner cable ⓗ with a finger to check that the cable deflects approximately 1mm (0.04in) at the center.

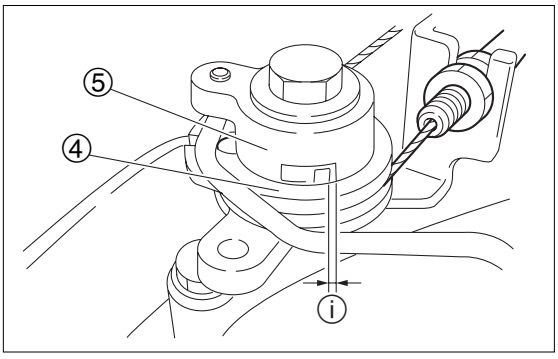
5. Attach high speed side ⓕ cable and low speed side ⓔ cable by using the same way.



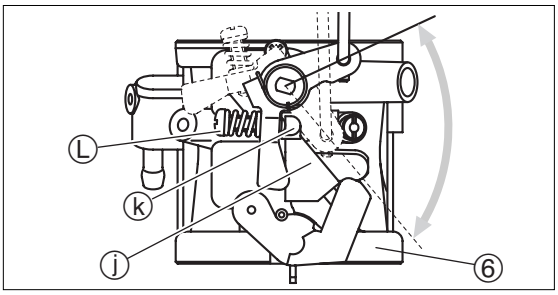
6. Push back choke rod ② fully ⓒ. (wide open choke)

7. Turn throttle grip ① to full close position ⓐ.

> Check that the gap ⓘ between the projection of throttle drum ④ and dent of throttle opener ⑤ is within the range from 0.5 - 1.0 mm (0.020 - 0.040 in).



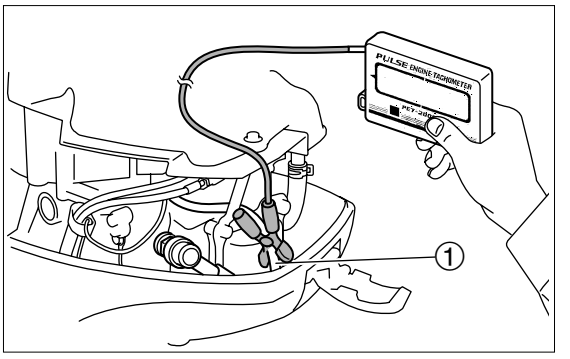
8. Turn throttle grip ① from full close position ⓐ to full open position ⓑ, and check that the throttle lever of carburetor ⑥ touches the full open stopper ⓙ. Then, return the throttle grip ① from full open position ⓑ to full close position ⓐ, and check that the throttle lever of carburetor touches the full close stopper ⓚ (throttle stop screw Ⓛ).



10) Inspection of Idle Engine Speed

1. Start engine and run for 5 minutes to warm up.

2. Check idle engine speed.



· Use tachometer to measure after warm up operation.
· Set the measurement mode to 4 stroke 2 cylinder · 2 stroke 1 cylinder.

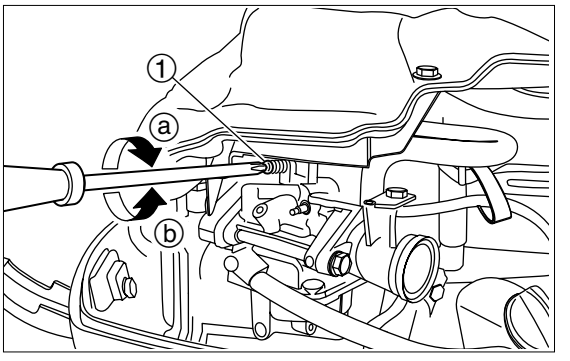
Tachometer :
P/N. 3AC-99010-0

Idle Engine Speed :
1,250 - 1,350r/min

11) Adjustment of Idle Engine Speed

1. Start engine and run for 5 minutes to warm up.

2. Turn throttle stop screw ① to direction ⓐ or ⓑ to adjust idle engine speed.



· Turning throttle stop screw to direction ⓐ increases the idle speed.
· Turning throttle stop screw to direction ⓑ decreases the idle speed.

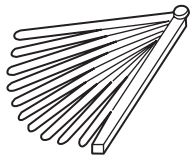
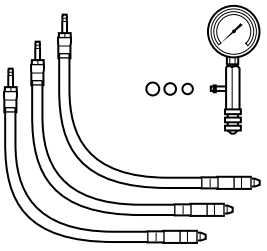
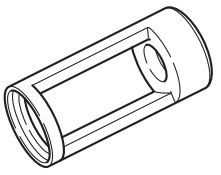
Idle Engine Speed :
1,250 - 1,350r/min

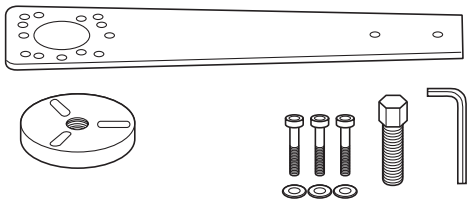
3. After adjusting idle engine speed, open throttle several times, and then, continue idle operation for more than 15 seconds to check that engine idles consistently.

5

Power Unit

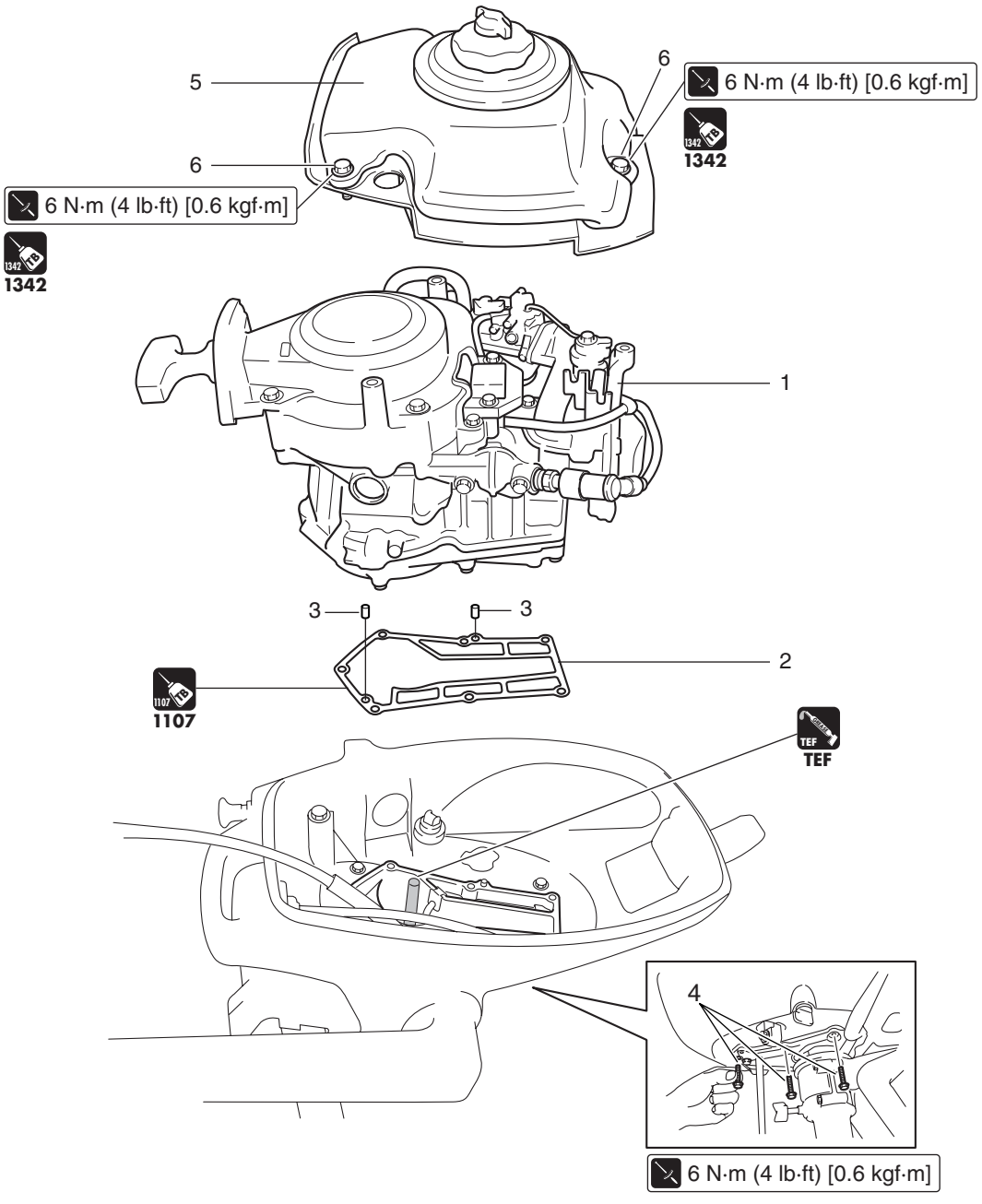
1.Special Tools

		
Thickness Gauge P/N. 353-72251-0	Compression Gauge P/N. 3AC-99030-0	Valve Spring Compressor Attachment P/N. 3AB-99076-0
Measuring gaps	Measuring compression pressure	Removing or installing valve springs


Flywheel Puller Kit P/N. 3AB-72211-0
Removing flywheel

2.Parts Layout

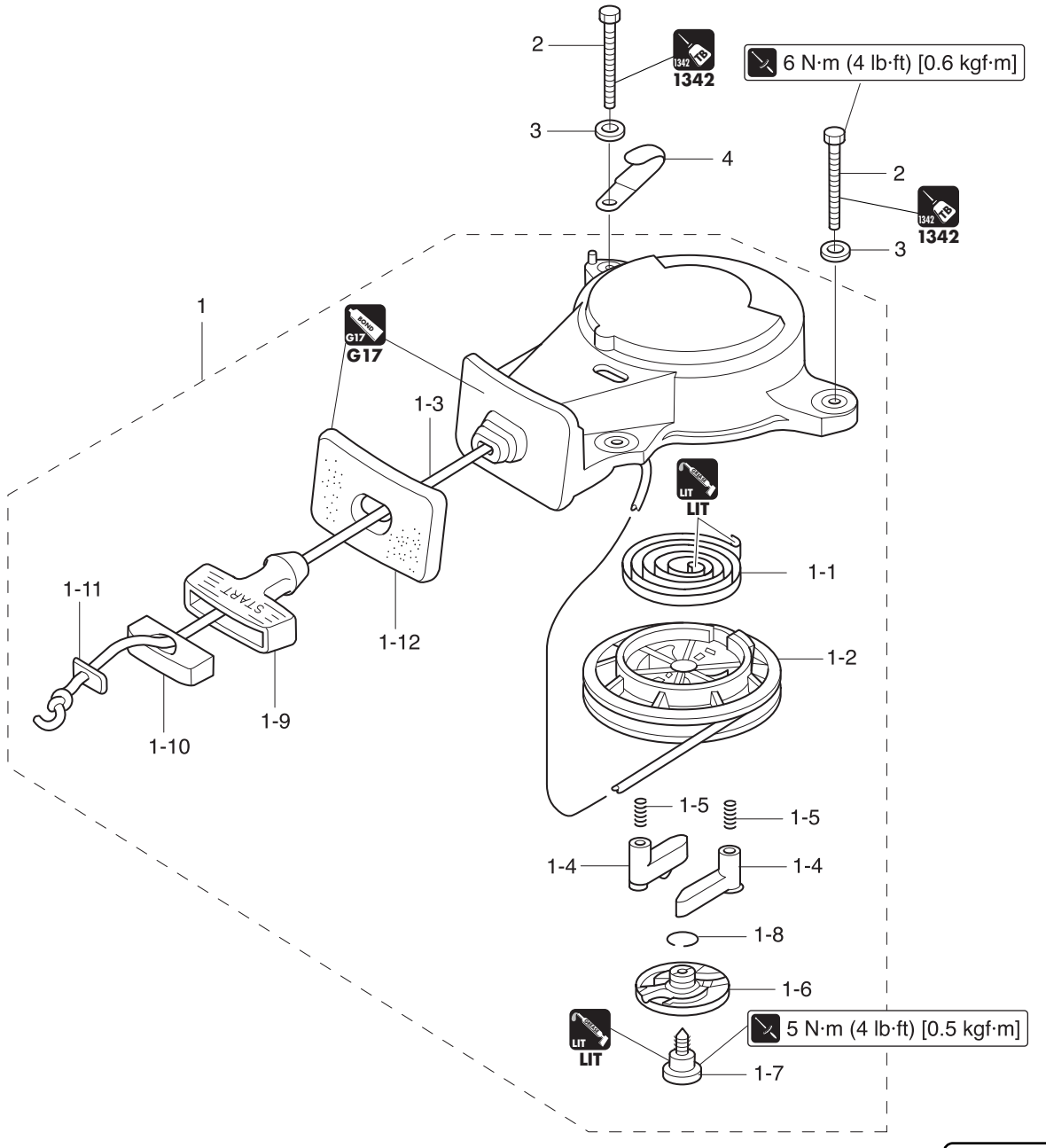
Engine



Ref. No.	Part Name	Q'ty	Remarks
1	Power Unit	1	
2	Gasket	1	Do not reuse.
3	Dowel Pin	2	
4	Bolt	7	M6 L=30mm
5	Fuel Tank	1	
6	Bolt	3	M6 L=25mm

Recoil Starter

P/L Fig. 8

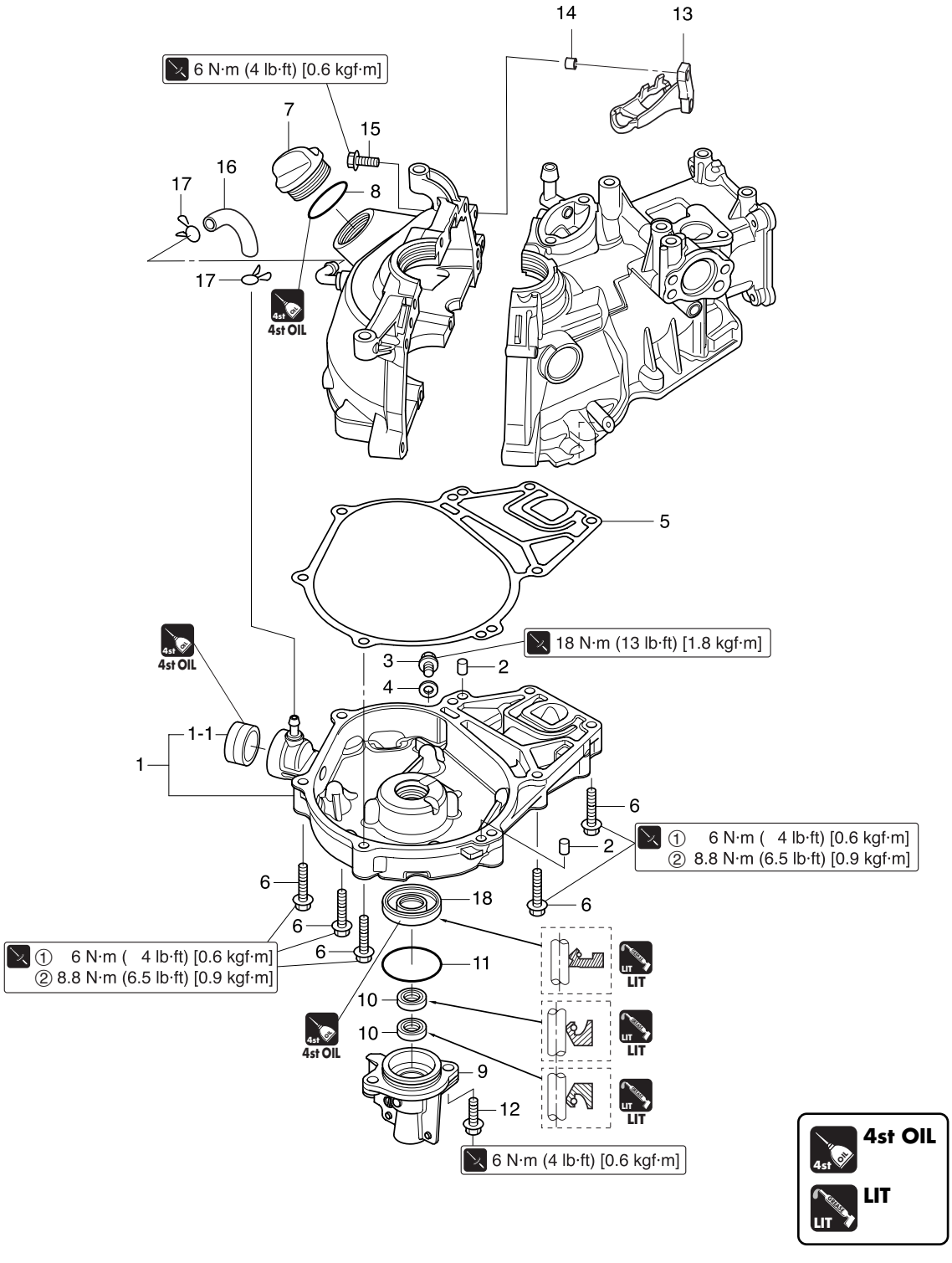


Ref. No.	Part Name	Q'ty	Remarks
1	Recoil Starter	1	
1-1	Starter Spring	1	
1-2	Reel	1	
1-3	Starter Rope	1	ø3.5-L=1200
1-4	Ratchet	2	
1-5	Return Spring	2	
1-6	Friction Plate	1	
1-7	Starter Shaft Screw	1	
1-8	Friction Spring	1	
1-9	Starter Handle	1	
1-10	Rope Anchor	1	
1-11	Rope Anchor Plate	1	

Ref. No.	Part Name	Q'ty	Remarks
1-12	Starter Seal	1	Do not reuse.
2	Bolt	3	M6 L=60mm
3	Washer, 6-16-1.5	3	
4	Clamp, 6.5-67P	1	

Oil Pan

P/L Fig. 4

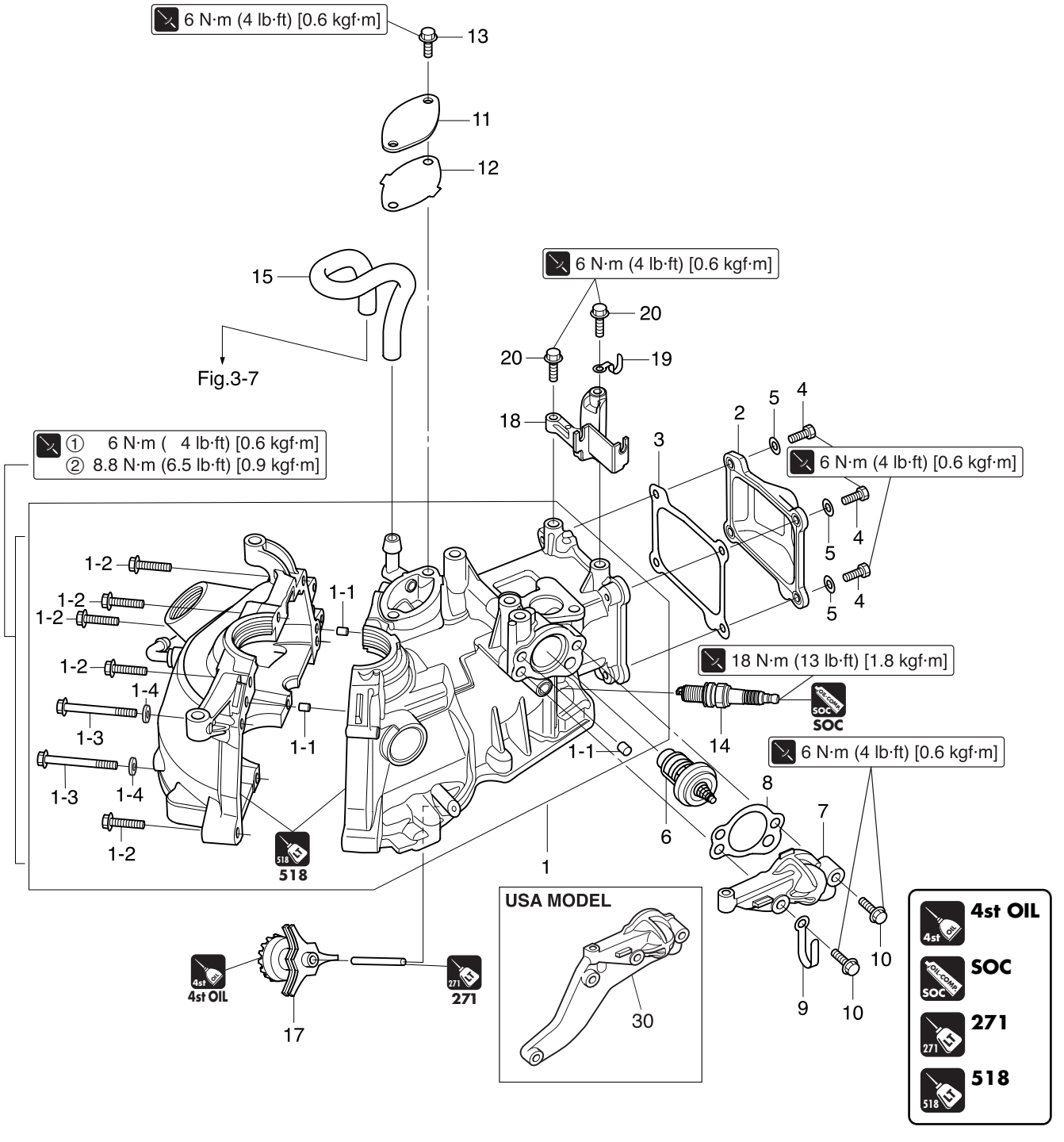


Ref. No.	Part Name	Q'ty	Remarks
1	Oil Pan Ass'y	1	
1-1	Oil Level Gauge	1	Do not reuse.
2	Dowel Pin, 6-12	2	
3	Drain Bolt	1	M10 - P1.25
4	Washer, 10.2-19-1	1	Do not reuse.
5	Oil Pan Gasket	1	Do not reuse.
6	Bolt	8	M6 L=35mm
7	Engine Oil Filler Cap	1	
8	O-Ring, 3.1-24.4	1	
9	Crank Case Head	1	
10	Oil Seal, 10.1-20-7	2	Do not reuse.
11	O-Ring, 2.4-35.2	1	Do not reuse.

Ref. No.	Part Name	Q'ty	Remarks
12	Bolt	2	M6 L=20mm
13	Stopper Bracket	1	
14	Collar, 6.2-9-7.4	2	
15	Bolt	2	M6 L=20mm
16	Rubber Hose	1	
17	Clip, ø10	2	
18	Oil Seal, 20-35-7	1	Do not reuse.

Cylinder

P/L Fig. 1

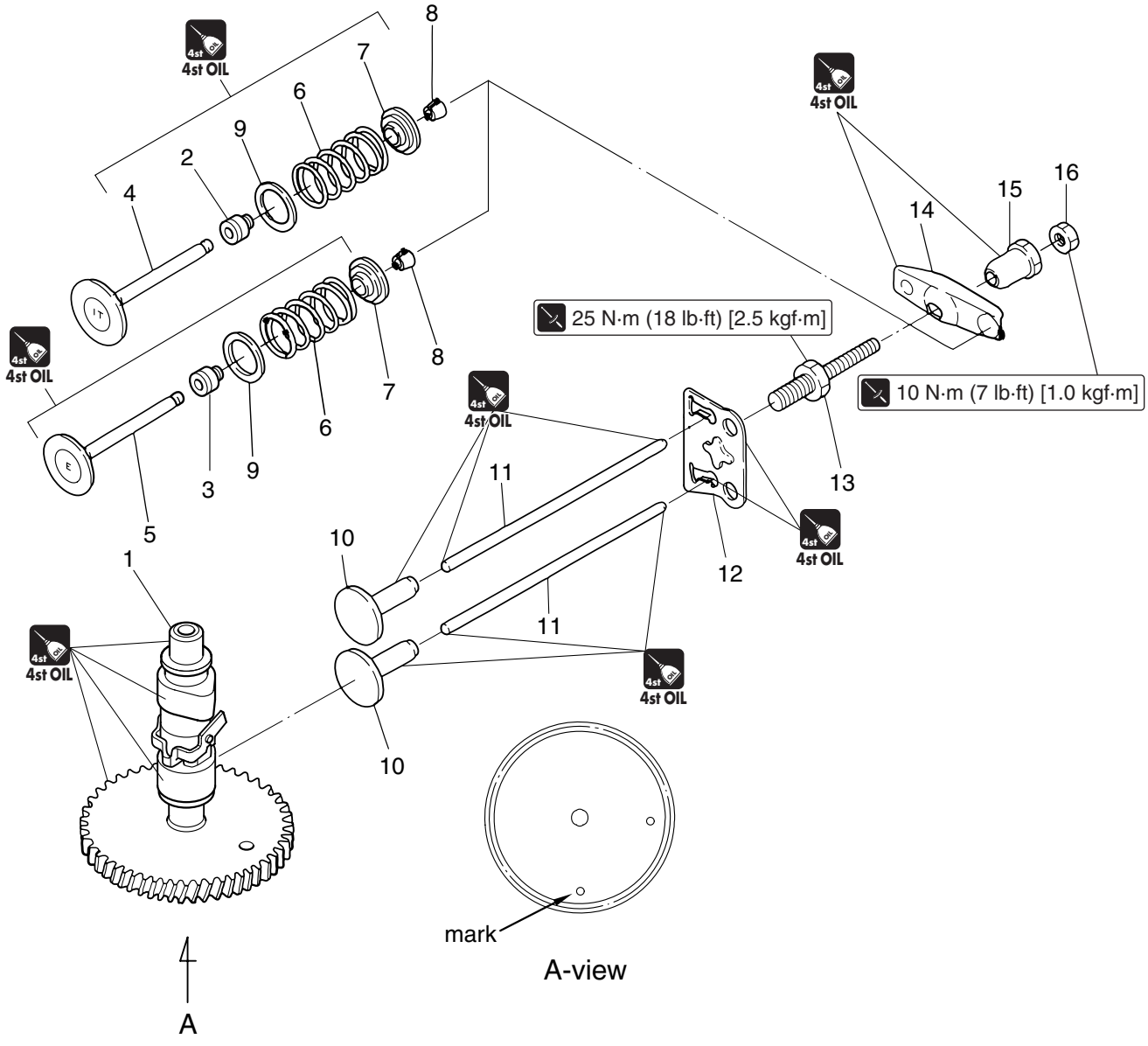


Ref. No.	Part Name	Q'ty	Remarks
1	Cylinder-Crankcase	1	with Nipple
1-1	Dowel Pin, 6-12	3	
1-2	Bolt	6	M6 L=35mm
1-3	Bolt	2	M6 L=75mm
1-4	Washer	2	
2	Cylinder Head Cover	1	
3	Cylinder Head Cover Gasket	1	Do not reuse.
4	Bolt	4	M6 L=16mm
5	Washer, 6-16-1.5	4	
6	Thermostat	1	52˚C Mark 5B or 52B
7	Thermostat Cap	1	
8	Thermostat Cap Gasket	1	Do not reuse.

Ref. No.	Part Name	Q'ty	Remarks
9	Clamp, 6.5-67P	1	
10	Bolt	2	M6 L=30mm
11	Breather Chamber Cover	1	
12	Breather Chamber Cover Gasket	1	Do not reuse.
13	Bolt	2	M6 L=16mm
14	Spark Plug M12-P1.25	1	DCPR6E [NGK]
15	Breather Hose	1	
16	Thermostat cap	1	for USA
17	Slinger	1	
18	Throttle Cable Bracket	1	
19	Clamp, 6.5-67P	1	
20	Bolt	2	M6 L=25mm

Cam Shaft & Valve

P/L Fig. 5



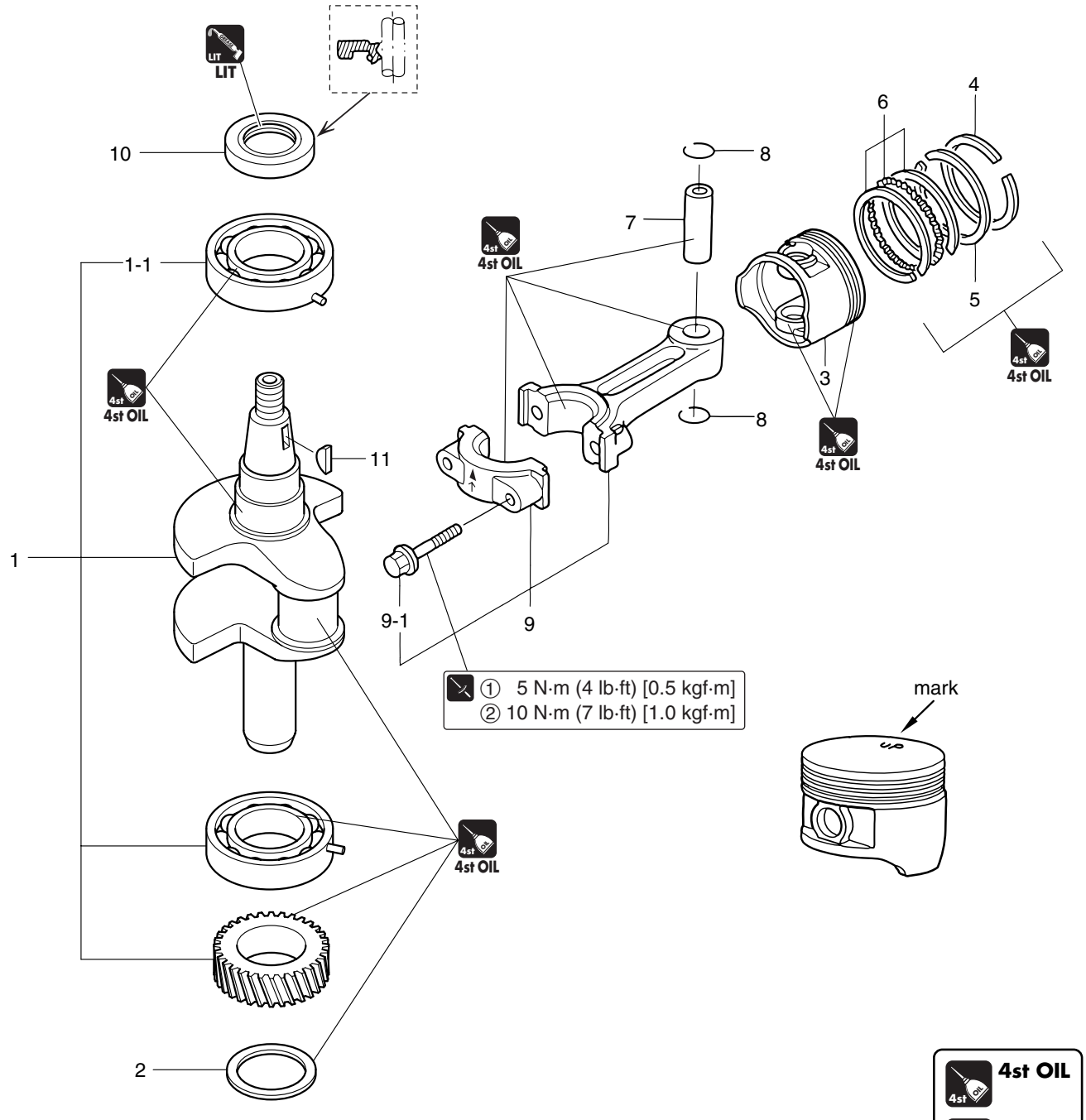
4st OIL

Ref. No.	Part Name	Q'ty	Remarks
1	Camshaft Ass'y	1	
2	Intake Valve Stem Seal	1	Black **Do not reuse.**
3	Exhaust Valve Stem Seal	1	Green **Do not reuse.**
4	Intake Valve	1	IT Mark
5	Exhaust Valve	1	E Mark
6	Valve Spring	2	L=35
7	Retainer	2	
8	Cotter	4	
9	Valve Spring Seat	2	
10	Lifter	2	
11	Push Rod	2	
12	Push Rod Plate	1	

Ref. No.	Part Name	Q'ty	Remarks
13	Pivot Bolt	2	M8 P1.25
14	Rocker Arm	2	
15	Rocker Arm Pivot	2	
16	Adjusting Nut M6 P0.5	2	

Piston & Crank Shaft

P/L Fig. 2



Ref. No.	Part Name	Q'ty	Remarks
1	Crankshaft Ass'y	1	with Gear
1-1	Ball Bearing, 6204	1	Do not reuse.
2	Thrust Plate, 20.2-32-1	1	
3	Piston	1	
4	Piston Ring Top	1	
5	Piston Ring 2nd	1	
6	Piston Ring Oil	1	
7	Piton Pin	1	
8	Piton Pin Clip	2	Do not reuse.
9	Connecting Rod Ass'y	1	
9-1	Connecting Rod Bolt	2	
10	Oil Seal, 20-35-7	1	Do not reuse.
11	Magneto Key	1	

3. Inspection Items

1) Inspection of Compression Pressure

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

2. Shift gear into neutral (N).

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

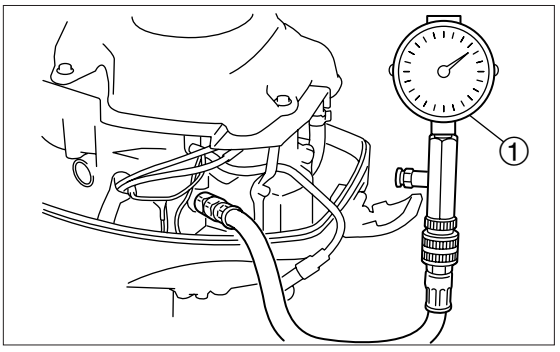
⚠ CAUTION

To prevent accidental start of the engine, remove lock plate (of stop switch lanyard) from stop switch before measuring compression pressure.

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.

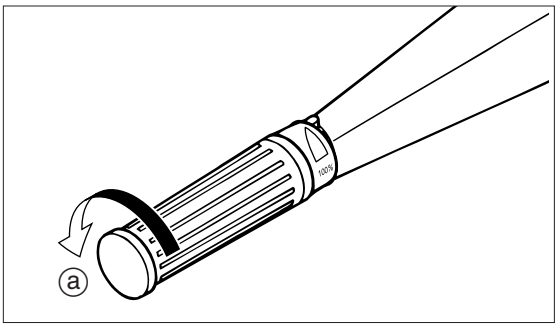


5. Install compression gauge ① to plug hole.

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

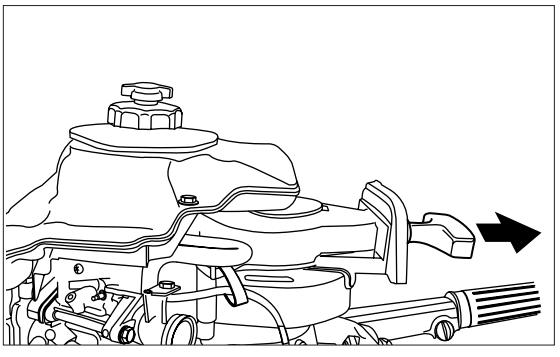
6. Fully open throttle ⓐ, crank engine until compression gauge indication ① stabilizes, and then measure compression pressure.

Compression Pressure (Reference) :
1.13 MPa (164 psi) [11.5 kgf/cm^2] ± 10%



- Compression pressure is affected much by cranking speed, and normally changes approximately 10%.
- 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.

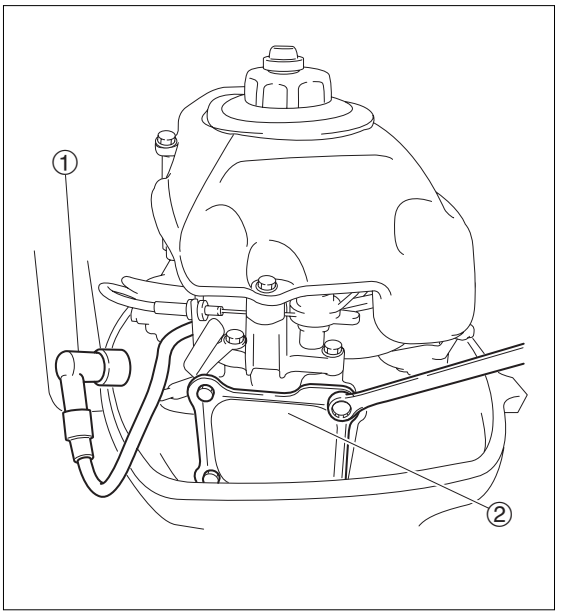


- If compression pressure increases after the above measure, check piston and piston rings for wear. Replace if necessary.
- If compression pressure does not increase after the above measure, check valve clearances, valves, valve seats and cylinder head. Adjust or replace if necessary.

2) Inspection of Valve Clearance

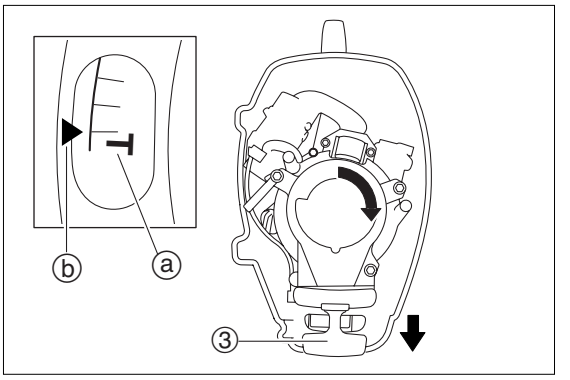
1. Disconnect plug cap ① connection, and then, remove spark plug and cylinder head cover ②.

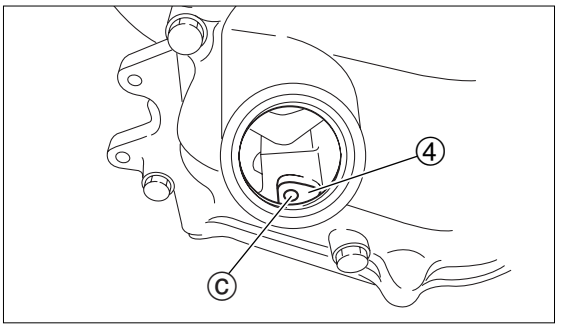
When removing or installing cylinder head cover without removing power unit, use 10 mm box wrench with large offset angle.



2. Pull recoil starter ③ to turn flywheel clockwise until flywheel "T" mark ⓐ is brought to flywheel cover "▲" mark ⓑ.

· Set piston to top dead center of compression stroke.
· Remove oil filler cap and check that ø5 mm (0.2 in) hole ⓒ of cam shaft gear ④ can be seen.

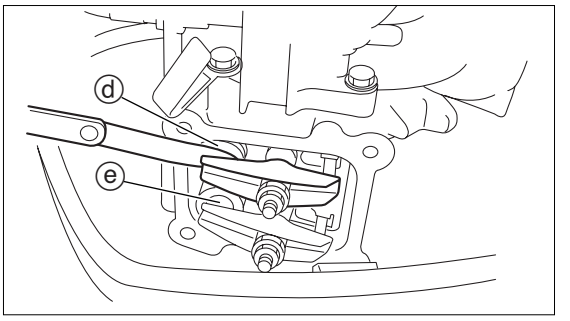




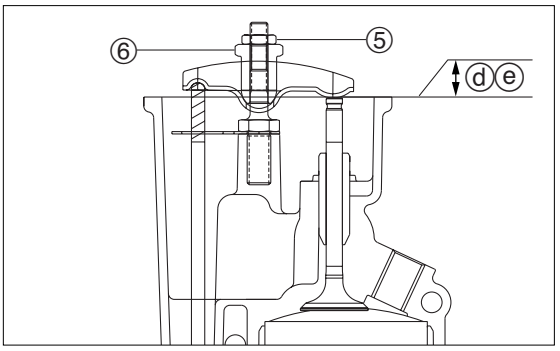
3. Check clearances of intake valve ⓓ and exhaust valve ⓔ. Adjust gap if it is out of specified range.

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)

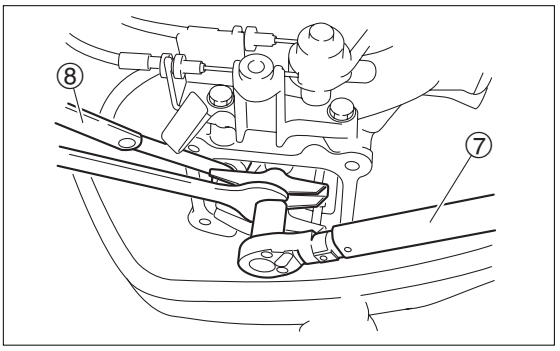


4. Loosen pivot lock nut ⑤ and then turn the pivot ⑥ so that valve clearance reaches specified value.



· Turning pivot ⑥ clockwise makes valve clearance smaller.
· Turning pivot ⑥ counterclockwise makes valve clearance larger.

5. Tighten pivot lock nut ⑤ to specified torque, and check valve clearance again. Readjust if necessary.



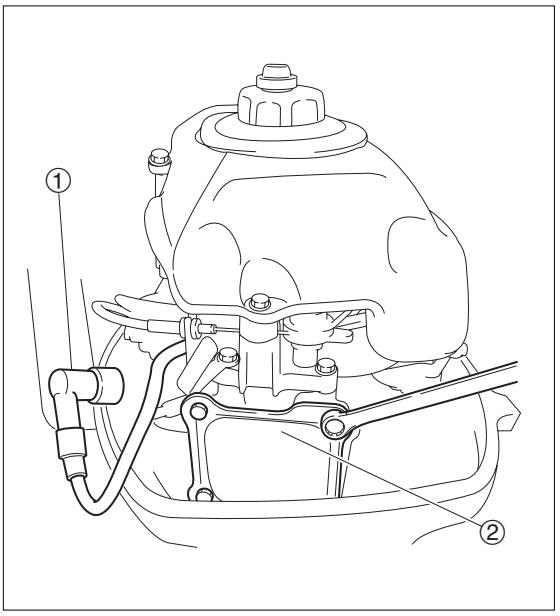
Pivot Lock Nut ⑤ :
10 N · m (7 lb · ft) [1.0 kgf · m]

Torque Wrench ⑦ :
Use commercially available item.
Thickness Gauge ⑧ :
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)

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



When removing or installing cylinder head cover without removing power head, use 10 mm box wrench with large offset angle.

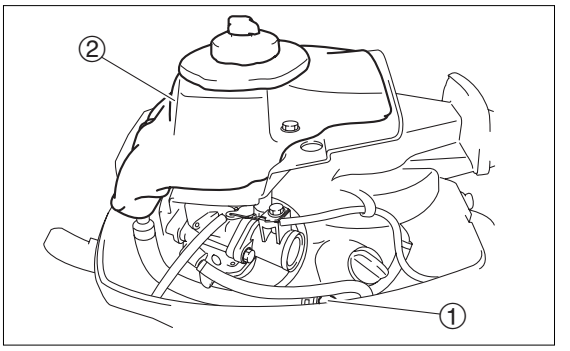
Cylinder Head Cover :
6 N · m (4 lb · ft) [0.6 kgf · m]

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

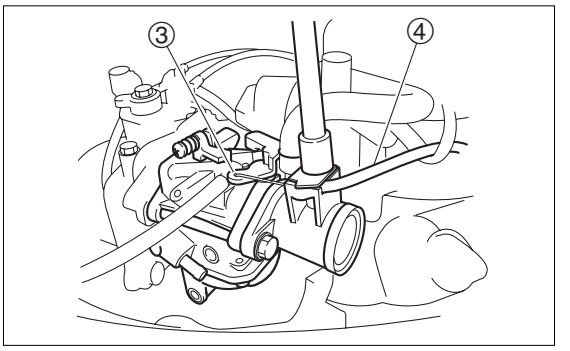
7. Reconnect plug cap ①.

3) Removing Power Unit

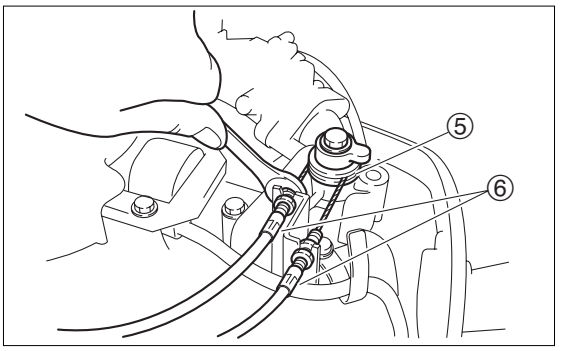
1. Turn fuel cock ① to OFF and remove fuel tank ass'y ② and fuel cock ass'y ①.



2. Remove choke cable ④ from carburetor ③.

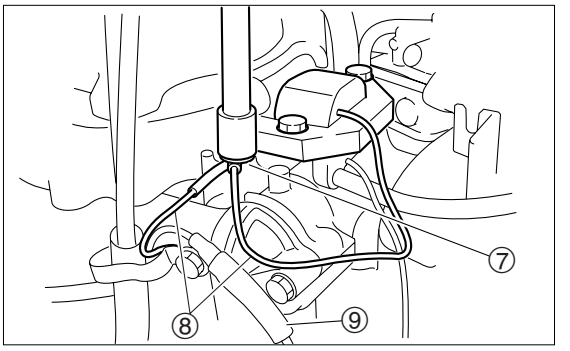


3. Turn throttle grip to full close position, and disconnect throttle cables ⑥ (2 pcs.) from throttle drum ⑤.



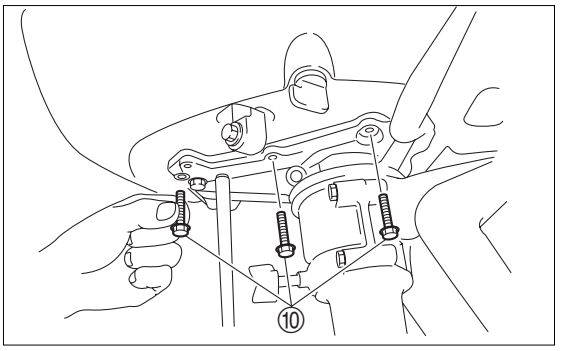
4. Remove bolt ⑦ and disconnect leads (black) ⑧ of igniter and stop switch.

5. Disconnect lead ⑨ (brown) of igniter.



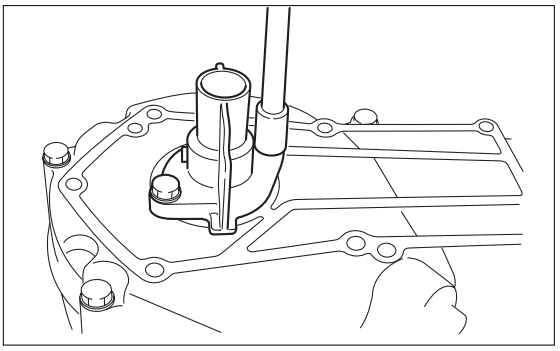
6. Remove bolts ⑩ (7 pcs.), and then, lift power unit to remove.

When lifting power unit, perform the work carefully while checking if cables and hoses are caught by other parts.

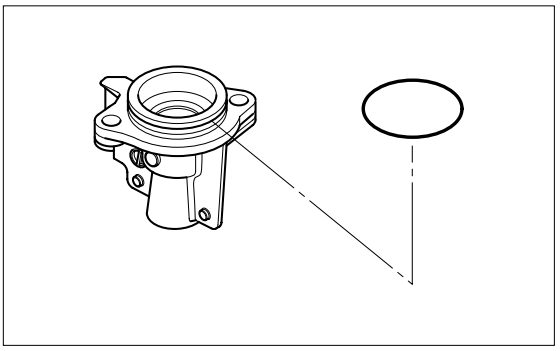


4) Removal and Disassembly of Crank Case Head

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

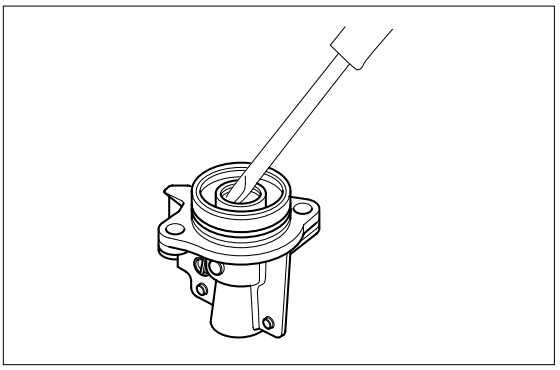


2. Remove O ring.



Do not reuse.

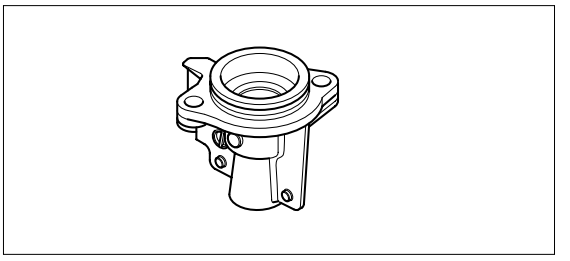
3. Remove oil seal.



Do not reuse.

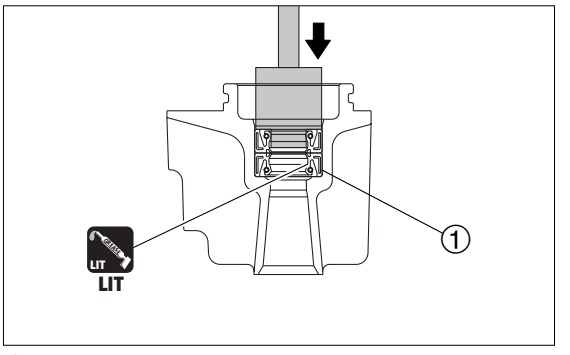
5) Inspection of Crank Case Head

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



6) Assembly of Crank Case Head

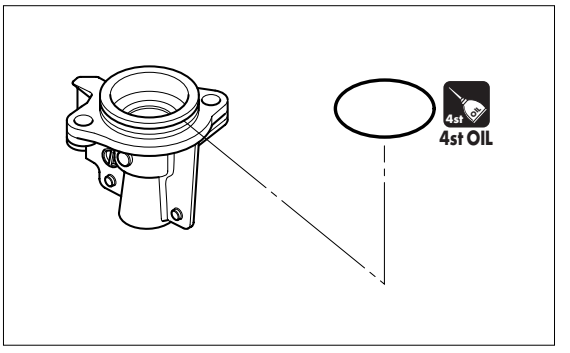
1. Attach new oil seal ① to crank case head by using a commercially available mandrel. Apply lithium grease to the lip of oil seal.



① Do not reuse.

7) Installation of Crank Case Head

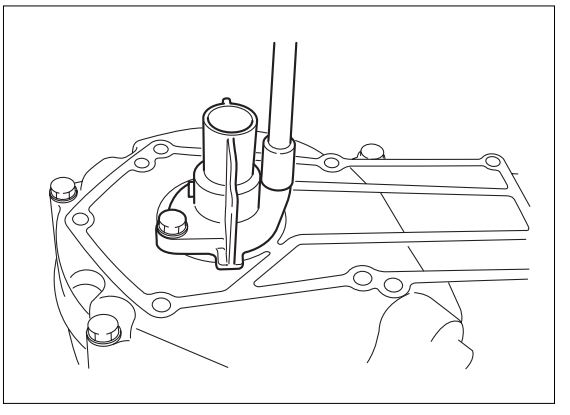
1. Attach a new O ring.



Do not reuse.

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

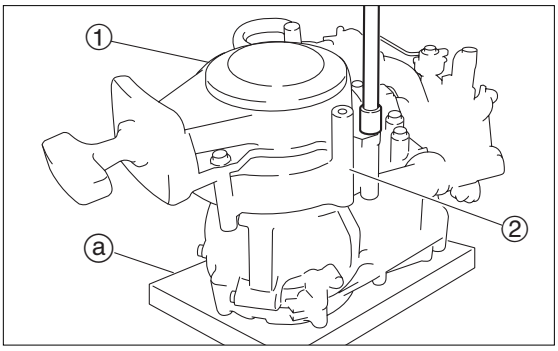
Crank Case Head Bolt :
6 N · m (4 lb · ft) [0.6 kgf · m]



8) Disassembly of Power Unit

1. Place power unit on the work bench ⓐ.

2. Remove recoil starter ① and flywheel cover ②.

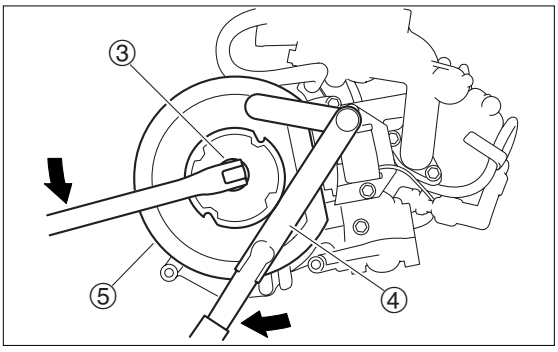


3. Remove flywheel nut ③.

Flywheel Holder ④ :
Commercially available item

⚠ CAUTION

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

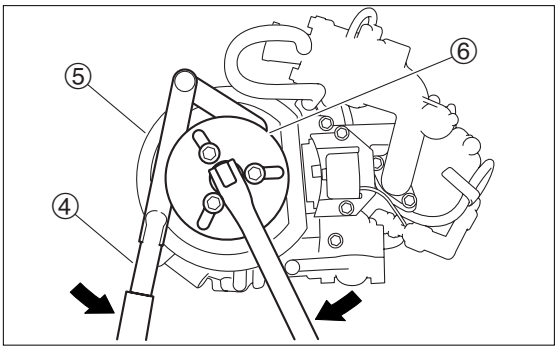


4. Remove flywheel ⑤ and key.

Flywheel Holder ④ :
Commercially available item
Flywheel Puller Kit ⑥ :
P/N. 3AB-72211-0
M6, L = 60mm, Bolts (3 pcs.)
(or recoil starter bolts and washers)

⚠ CAUTION

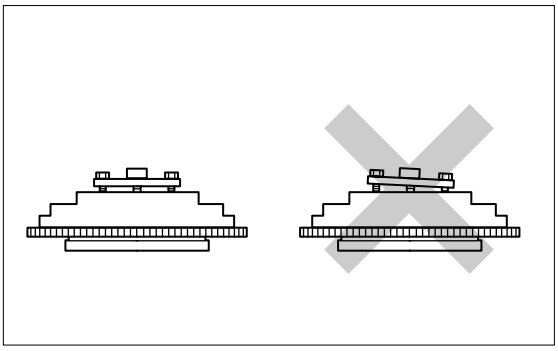
Apply forces to tools toward directions as shown, and perform work taking care not to allow flywheel holder to slip.



- Screw puller onto crank shaft end until flywheel is disengaged from tapered section of crank shaft.
- If bolts with specified size are not available, use recoil starter bolts, or if they are deformed, use new bolts.
- Set flywheel holder before attaching flywheel puller.

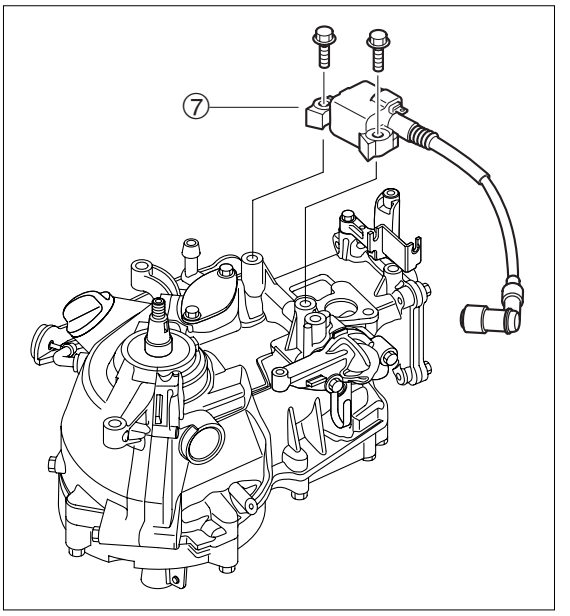
⚠ CAUTION

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



5

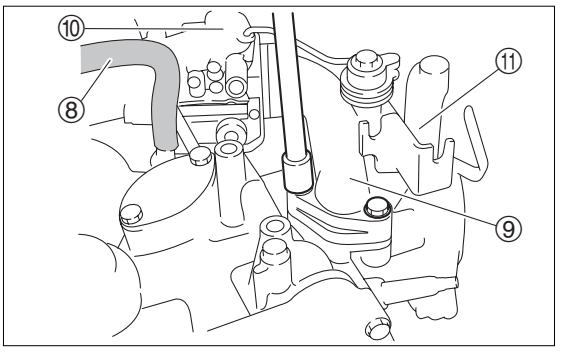
5. Remove bolts, and then igniter ⑦.



6. Remove breather pipe ⑧.

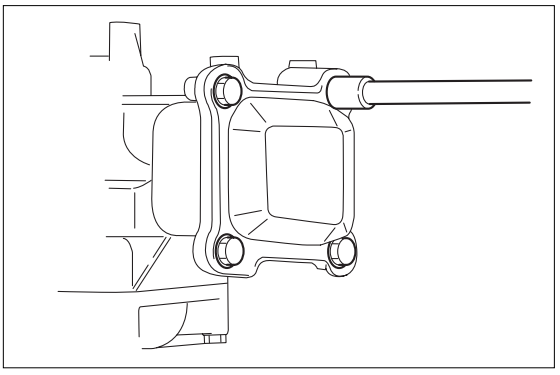
7. Remove intake manifold ⑨ and carburetor ⑩.

8. Remove throttle cable bracket ⑪.



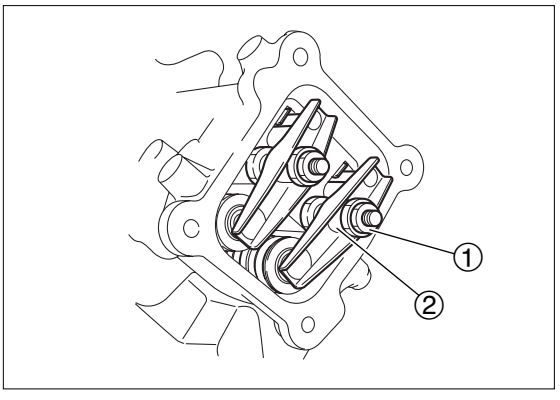
9) Removal of Rocker Arm

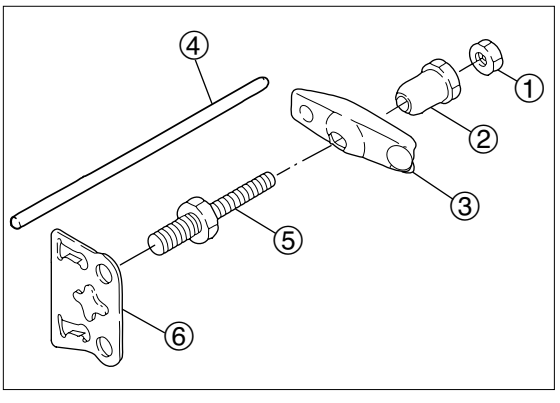
1. Remove bolts and then cylinder head cover.



2. Remove lock nut ①, and then pivot ②, rocker arm ③ and push rod ④.

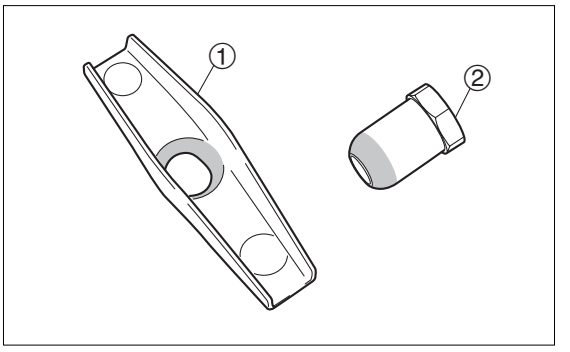
3. Remove pivot bolt ⑤, and then push rod plate ⑥.





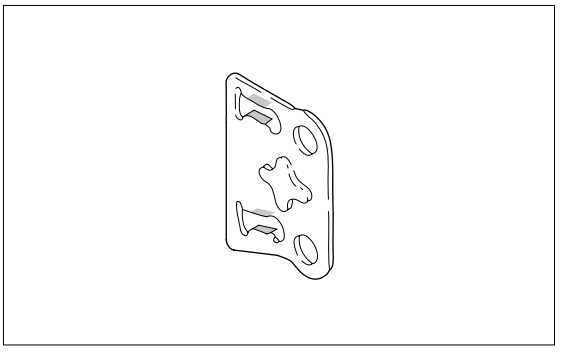
10) Inspection of Rocker Arm and Pivot

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



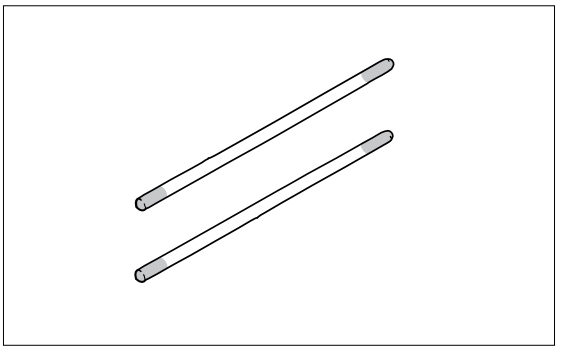
11) Inspection of Push Rod Plate

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



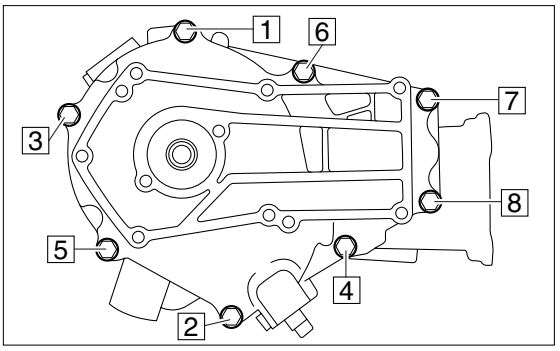
12) Inspection of Push Rod

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



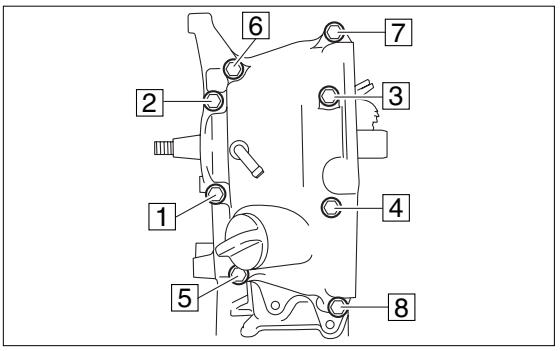
13) Disassembly of Cylinder Block

1. Remove thermostat cap bolts, and then thermostat cap and thermostat.
2. Remove breather cover.
3. Loosen oil pan bolts in the order reverse to the numbers shown, and remove oil pan. [8] - [1]

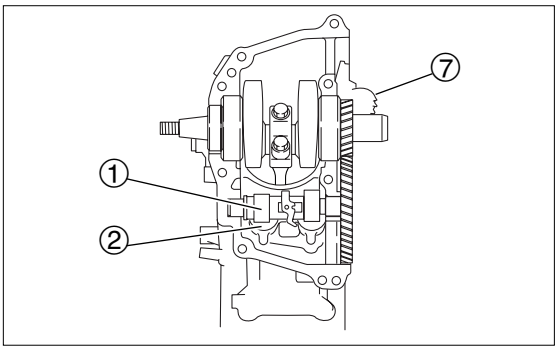


> Wipe off spilled oil completely.

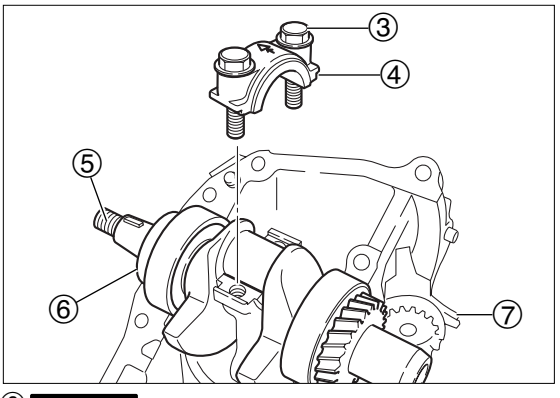
4. Loosen crank case bolts in the order reverse to the numbers shown, and remove crank case. [8] - [1]



5. Remove cam shaft ① and lifter ②.



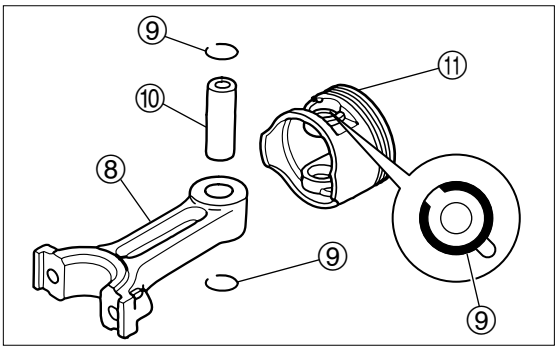
6. Remove connecting rod bolts ③ and connecting rod cap ④, and then, crank shaft ⑤ and oil seal ⑥.
7. Remove oil slinger ⑦.
8. Remove connecting rod ⑧ and piston ass'y from cylinder block.



⑥ **Do not reuse.**

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

9. Remove piston pin clip ⑨ and piston pin ⑩ from piston and connecting rod ass'y, and then remove piston ⑪.



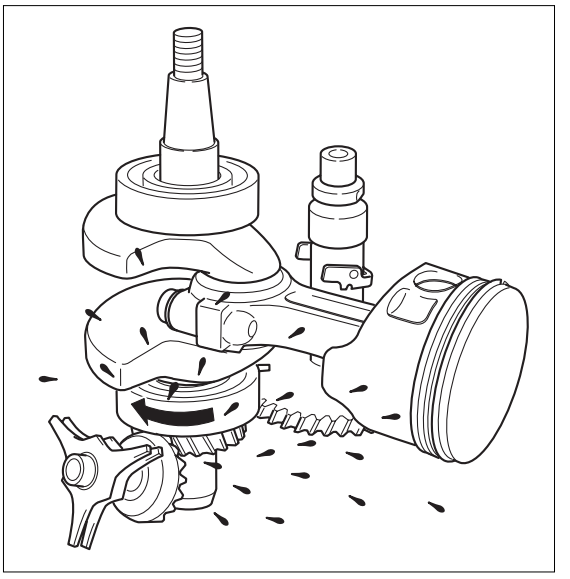
⑨ **Do not reuse.**

14) Inspection of Slinger

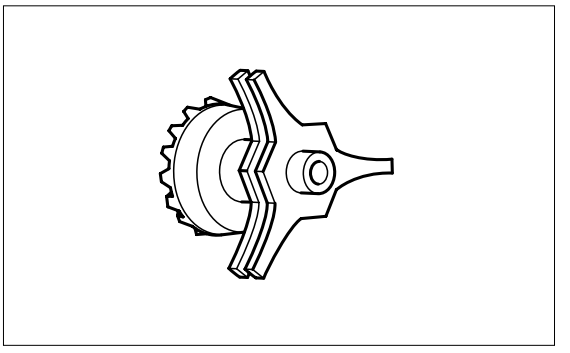
Splash Lubrication

Adopts splash lubrication system that is simple in structure.

Slinger is driven by the gear of crank shaft, and splashes oil collected in oil pan over the crank case parts.

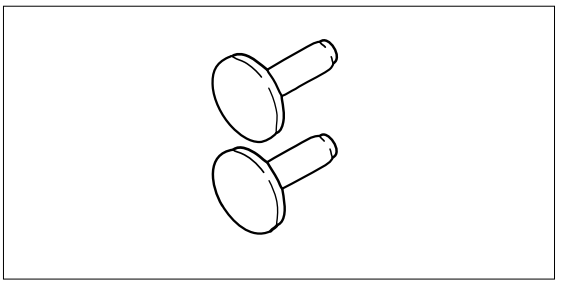


1. Check slinger for crack, damage and wear. Replace if necessary.



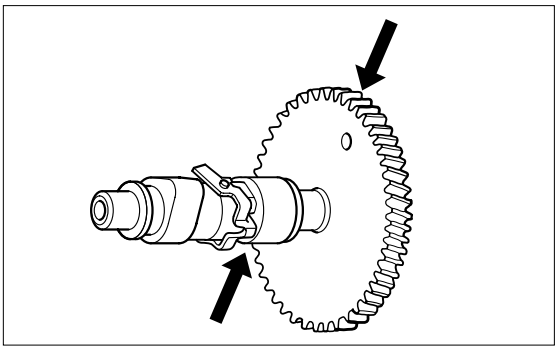
15) Inspection of Lifter

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



16) Inspection of Cam Shaft

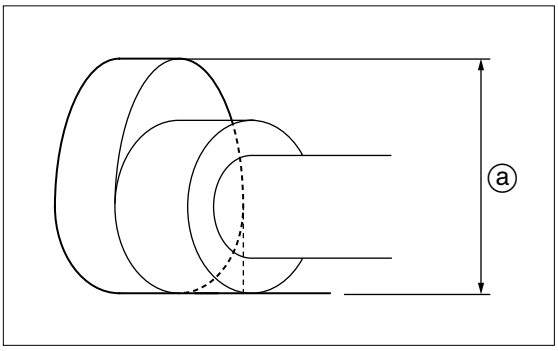
1. Check cam shaft gear and decompressor for damage and wear. Replace if necessary.



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

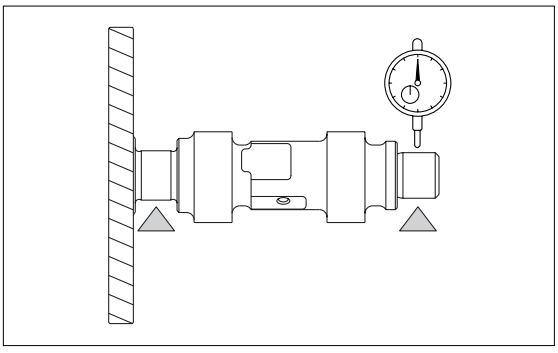
Cam Height ⓐ, both intake and exhaust :
Standard value
24.04 mm (0.9464 in)

Functional Limit :
23.78 mm (0.9362 in)



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

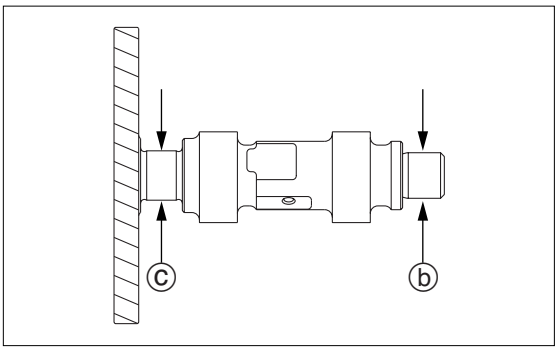
Cam Shaft Runout Limit :
0.03 mm (0.0012 in)



4. Measure cam shaft journal outer diameters ⓑ and ⓒ. Replace if it is less than specified value.

Cam Shaft Journal Outer Diameter ⓑ : Standard value
11.97 mm (0.4713 in)
Cam Shaft Journal Outer Diameter ⓒ : Standard value
12.97 mm (0.5106 in)

Functional Limit ⓑ :
11.95 mm (0.4705 in)
Functional Limit ⓒ :
12.95 mm (0.5098 in)

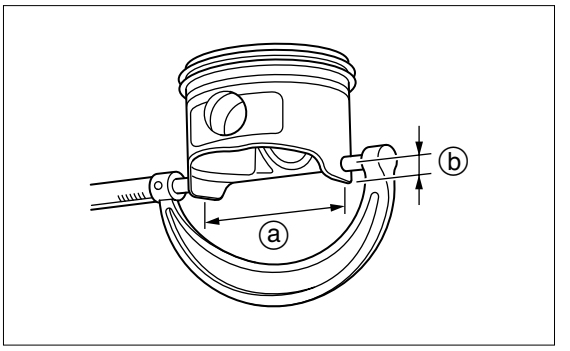


17) Inspection of Piston Outer Diameter

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

Piston Outer Diameter ⓐ : Standard value
54.96 mm (2.1638 in)
Measuring Point ⓑ :
7mm (0.28 in) upward from the bottom of piston skirt

Functional Limit :
54.90 mm (2.1614 in)



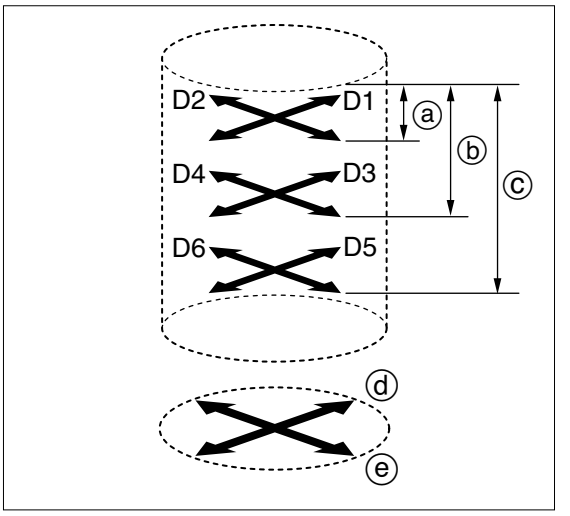
18) Inspection of Cylinder Inner Diameter

1. Measure cylinder inner diameters (D1 - D6) at ⓐ, ⓑ and ⓒ in crank shaft 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
55.00mm (2.1654in)

Functional Limit :
55.06mm (2.1677in)

Note : Measure at the maximum wear points.



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

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)

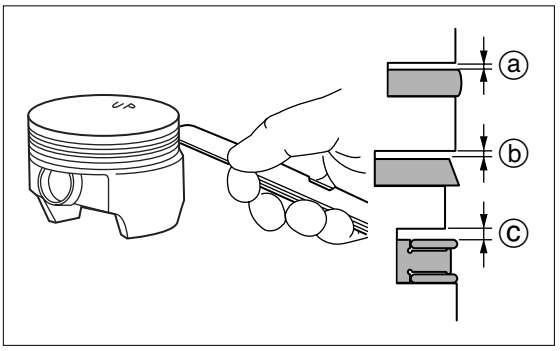
19) Inspection of Piston Clearance

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

Piston Clearance :
0.020 - 0.060 mm (0.00079 - 0.00236 in)

Functional Limit :
0.150 mm (0.00591 in)

20) Inspection of Piston Ring Side Clearance

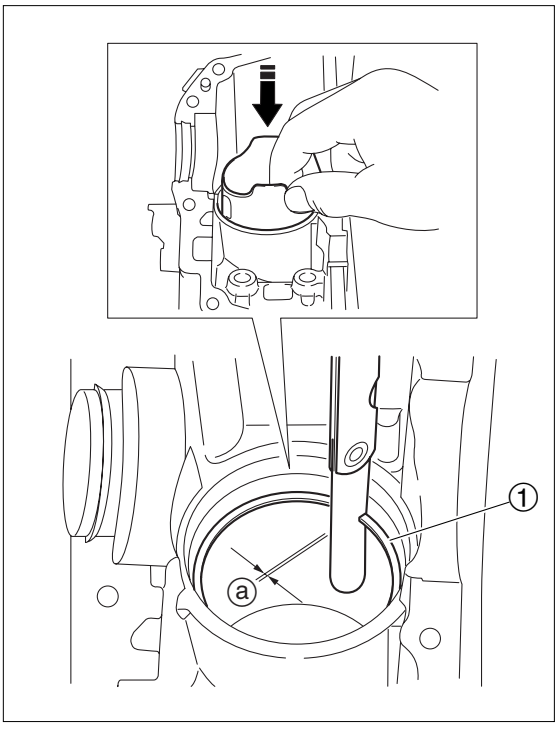


1. Measure piston ring side clearance. Replace piston and piston rings as a set if the clearance is over specified value.

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 ⓒ : 0.05 - 0.15mm (0.0020 - 0.0059 in)

Functional Limit
Top Ring ⓐ : 0.10 mm (0.0039 in)
Second Ring ⓑ : 0.09 mm (0.0035 in)
Oil Ring ⓒ : 0.17 mm (0.0067 in)

21) 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.

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 - 0.0118 in)
Second Ring : 0.30 - 0.45 mm (0.0118 - 0.0177 in)
Oil Ring : 0.20 - 0.70 mm (0.0079 - 0.0276 in)

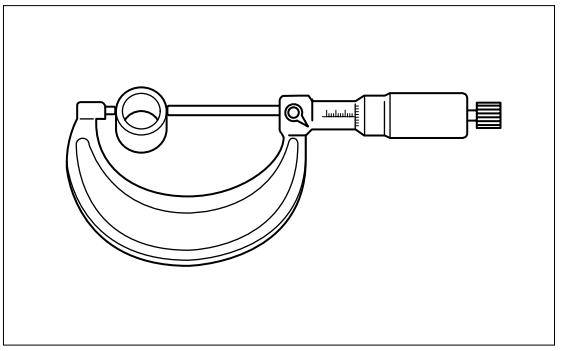
Functional Limit :
Top Ring : 0.50 mm (0.0197 in)
Second Ring : 0.70 mm (0.0276 in)

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

22) Inspection of Piston Pin

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

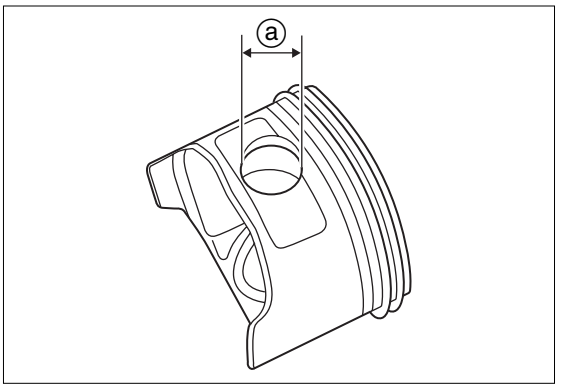
Piston Pin Outer Diameter : Standard value 14.00 mm (0.5512in)
Functional Limit : 13.97 mm (0.5500 in)



2. Measure piston pin boss inner diameter ⓐ.

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

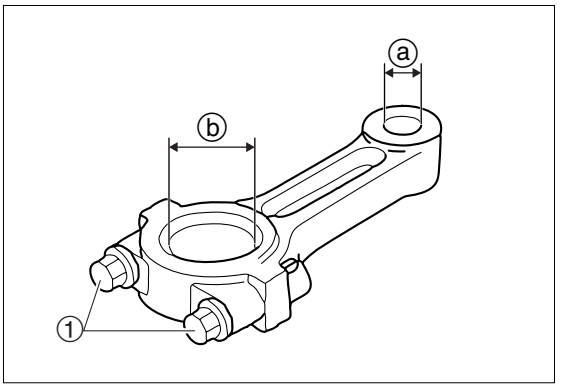
Clearance between Piston Pin and Pin Hole : 0.002 - 0.012 mm (0.00008 - 0.00047 in)
Functional Limit : 0.040 mm (0.00157 in)



23) 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)



24) Inspection of Connecting Rod Big End Inner Diameter

1. Tighten connecting rod cap bolts to specified torque, and measure connecting rod big end inner diameter ⓑ. Replace if it is over specified value.

Connecting Rod Bolts ① : 1st tightening torque : 5 N · m (4 lb · ft) [0.5 kgf · m] 2nd tightening torque : 10 N · m (7 lb · ft) [1.0 kgf · m]

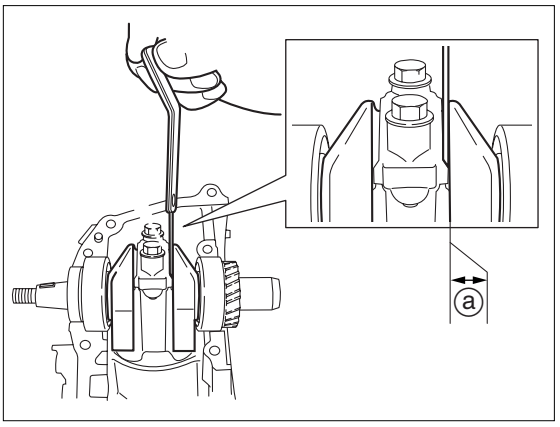
Connecting Rod Big End Inner Diameter ⓑ : Standard value 20.010 mm (0.78780 in)
Functional Limit : 20.015 mm (0.78799 in)

25) 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 crank shaft if the clearance is over specified value.

Connecting Rod Big End Side Clearance ⓐ :
0.10 - 0.25 mm (0.0039 - 0.0098 in)

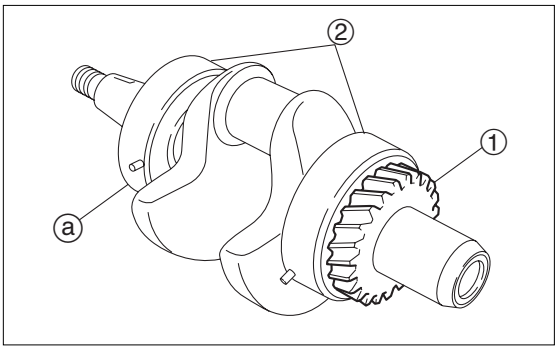
Functional Limit :
0.60 mm (0.0236 in)



26) Inspection of Crank Shaft

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

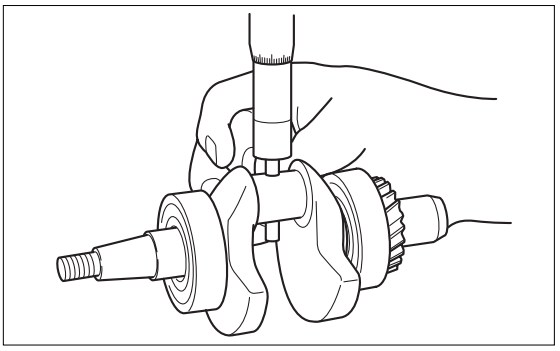
Flywheel side ⓐ bearing can be replaced with new one as a single unit.



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

Crank Pin Outer Diameter : Standard value
19.98mm (0.7866 in)

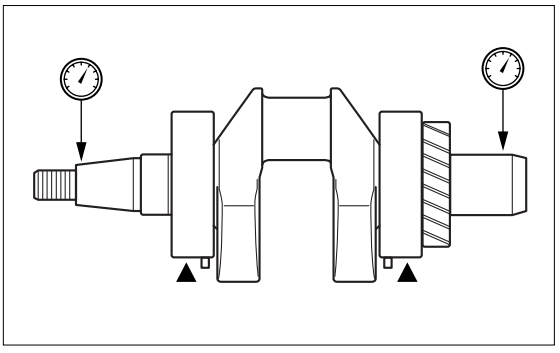
Functional Limit :
19.95mm (0.7854 in)



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

Crank Shaft Runout Limit :
0.05 mm (0.0020 in)

Use V blocks to support crank shaft at bearings.



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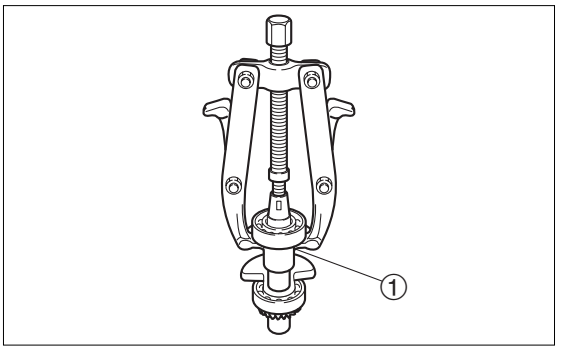
27) Disassembly and Assembly of Crank Shaft

1. Remove bearing ① from crank shaft by using a commercially available bearing puller.

⚠ CAUTION

Do not reuse removed bearing. Replace with new one.

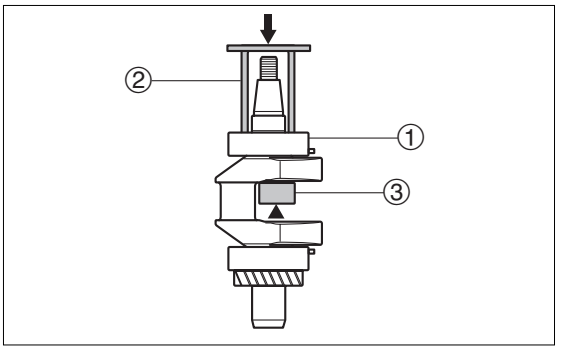
Only flywheel side bearing ① can be replaced.



① Do not reuse.

2. Install new bearing ① to crank shaft.

Pipe ② :
ø22mm
Flat Bar ③



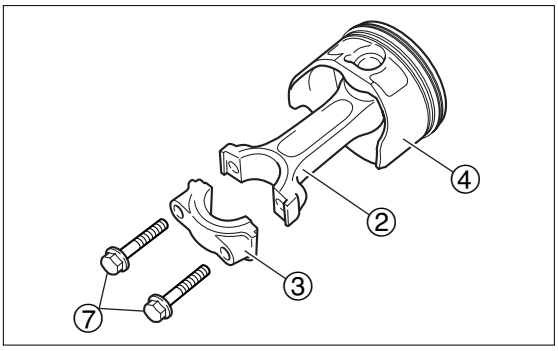
① Do not reuse.

28) Inspection of Crank Pin Oil Clearance

1. Clean crank shaft ① and connecting rod parts ② and ③.

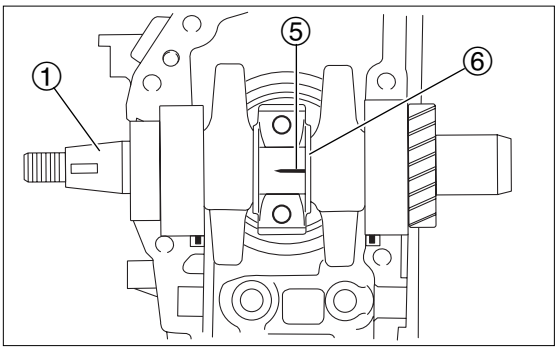
2. Place cylinder block upside down on the work bench. Install piston ④ to connecting rod ②, and then, install the assembly to cylinder block.

   Do not attach piston rings in this step.



3. Install crank shaft ① to cylinder block.

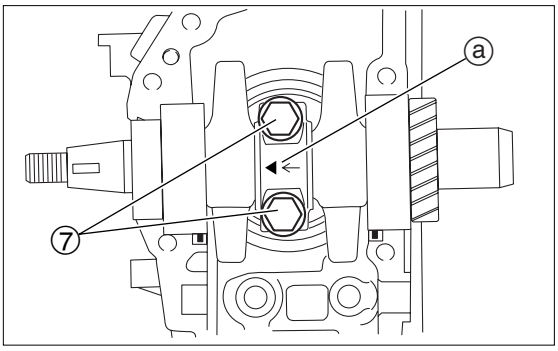
   When installing, bring projection of bearing to notch of cylinder block.



4. Place a commercially available plasti-gauge ⑤ on the crank pin ⑥ so that is parallel to crank shaft ①.

5. Install connecting rod ② and cap ③ to crank pin ⑥.

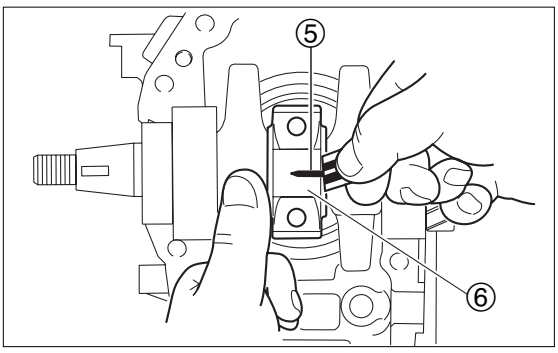
   · Be sure to install the cap ③ in original position (direction).
   · Be sure that connecting rod "▲" mark ⓐ points crank shaft flywheel side.



6. Tighten connecting rod bolts ⑦ in two steps to specified torque.

   Do not move connecting rod and crankshaft until oil clearance measurement is completed.

   Connecting Rod Bolts :
   1st tightening torque : 5 N · m (4 lb · ft) [0.5 kgf · m]
   2nd tightening torque : 10 N · m (7 lb · ft) [1.0 kgf · m]



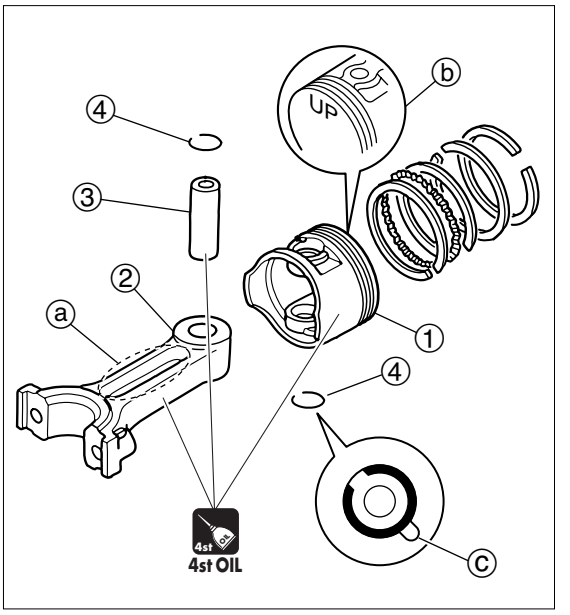
7. Remove connecting rod cap ③ and measure width of crushed plasti-gauge ⑤ on the crank pin ⑥. Replace connecting rod ② or crank shaft ① if the measurement (converted value) is over the limit.

   Big End Oil Clearance : Converted value
   0.015 - 0.041 mm (0.00059 - 0.00161 in)

   Functional Limit :
   0.060 mm (0.00236 in)

29) Installation of Piston and Connecting Rod

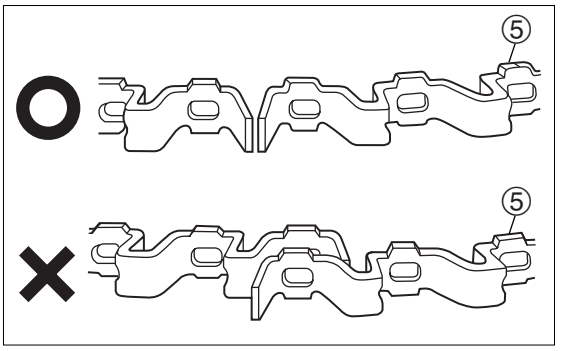
1. Install connecting rod ②, piston pin ③, and piston pin clip ④ to piston ①.



④ Do not reuse.

- 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).

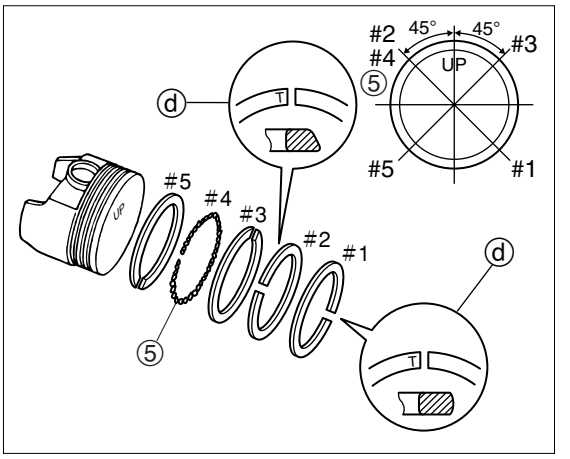
2. Put expander ⑤ (#4) in the oil ring groove, and check that ring end makes gap as shown.



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.

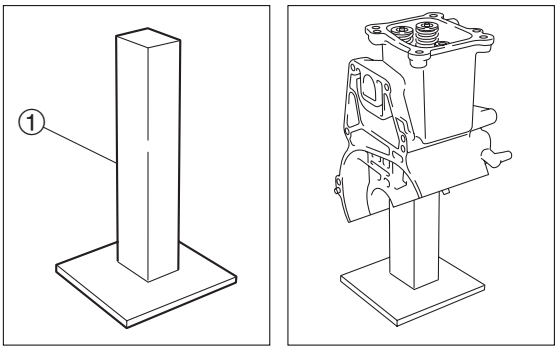
- Install piston rings so that their gaps are away also from thrust direction of piston and direction piston pin.
- After installing piston rings, check that they move smoothly.

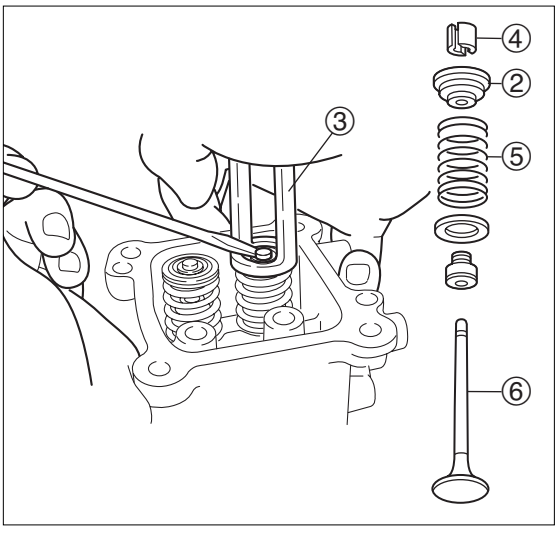
30) Removal of Valves and Springs

1. Place cylinder block on the work bench ①. Push in valve spring retainer ② by using valve spring compressor attachment ③, remove cotter pin ④, and then, remove spring ⑤ and valve ⑥.

Valves, springs and other related parts should be arranged in the order they are removed.

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



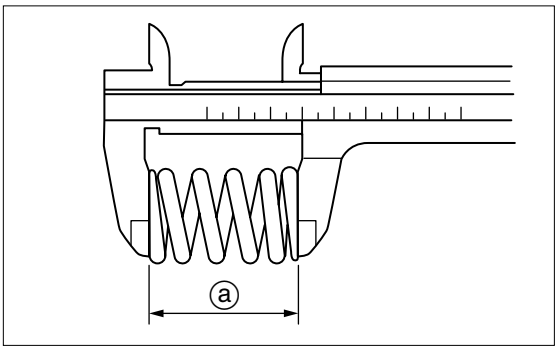


31) Inspection of Valve Springs

1. Measure valve spring free length ⓐ. Replace if the length is less than specified value.

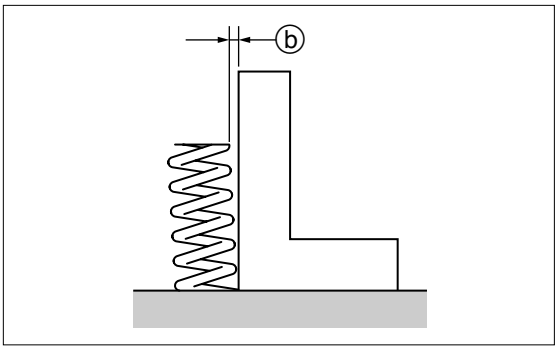
Valve Spring Free Length ⓐ : Standard value
35.0 mm (1.38 in)

Functional Limit :
33.2 mm (1.31 in)



2. Measure valve spring inclination ⓑ. Replace if it is over specified value.

Valve Spring Inclination Limit ⓑ :
1.5 mm (0.06 in)



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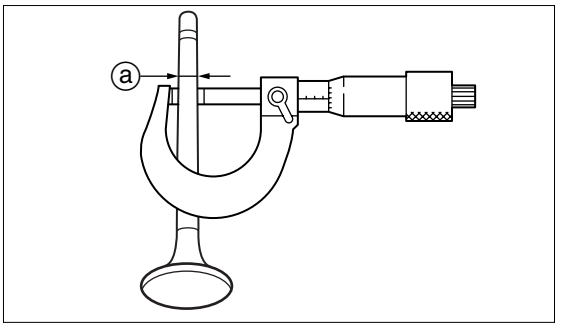
32) Inspection of Valve

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.

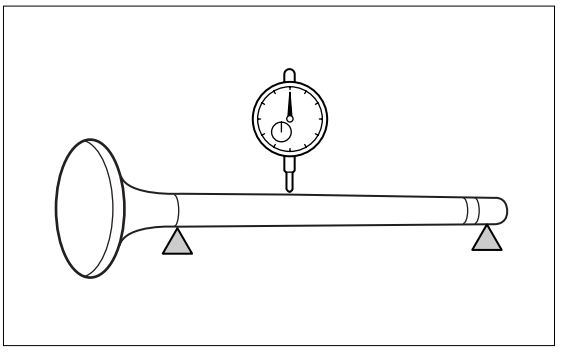
Valve Stem Outer Diameter ⓐ : Standard value
Intake Side (IT) : 5.47 mm (0.2154 in)
Exhaust Side (E) : 5.46 mm (0.2150 in)

Functional Limit :
Intake Side (IT) : 5.45 mm (0.2146 in)
Exhaust Side (E) : 5.44 mm (0.2142 in)



3. Measure valve stem runout. Replace if it is over specified value.

Valve Stem Runout Limit :
Intake Side (IT) : 0.05 mm (0.0020 in)
Exhaust Side (E) : 0.03 mm (0.0012 in)



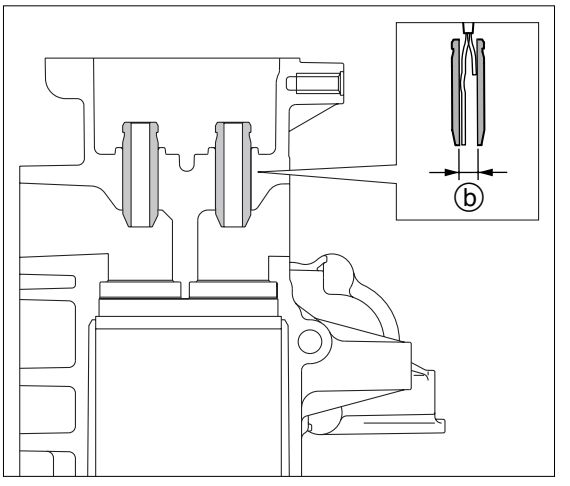
33) Inspection of Valve Guide

Before inspecting valve guide, check that valve stem outer diameter is within specified range.

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)

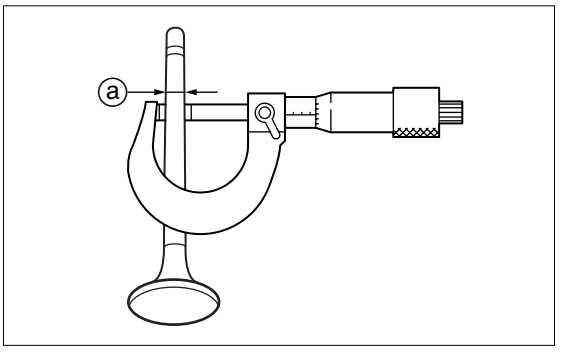
Functional Limit :
Intake Side (IT) : 5.55 mm (0.02185 in)
Exhaust Side (E) : 5.57 mm (0.02193 in)



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 (IT) : 0.018 - 0.045 mm (0.00071 - 0.00177 in)
Exhaust Side (E) : 0.025 - 0.052 mm (0.00098 - 0.00205 in)

Functional Limit
Intake Side (IT) : 0.070 mm (0.00276 in)
Exhaust Side (E) : 0.080 mm (0.00315 in)



34) Inspection of Valve Seat

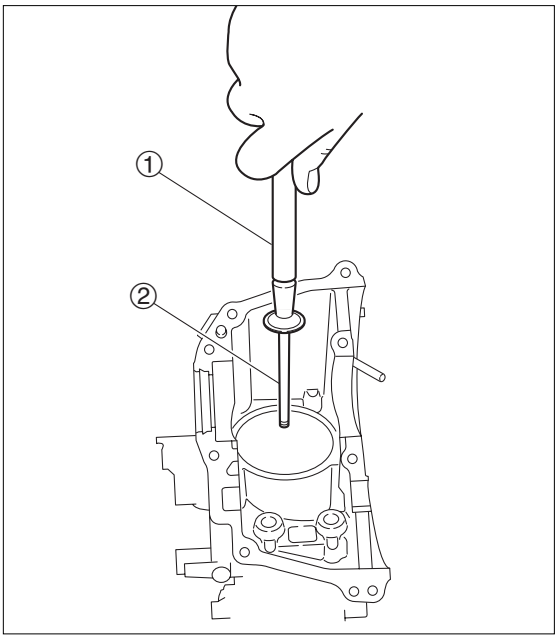
1. Remove carbon built up on the valve.

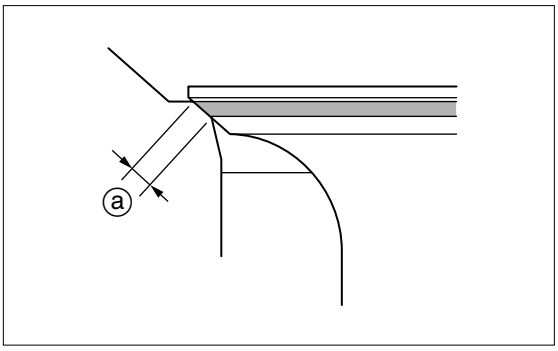
2. Apply thin coat of red lead on the valve seat.

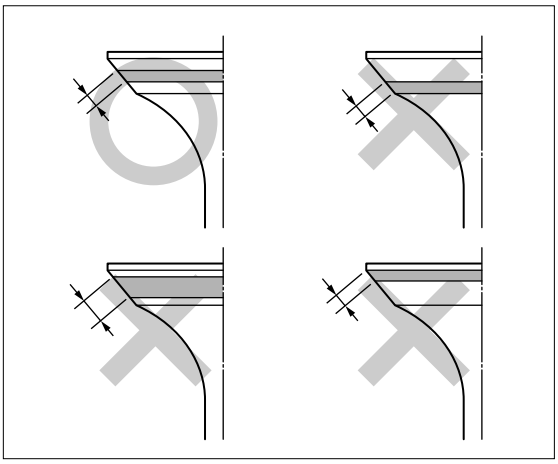
3. Use valve lapper ① (commercially available item) as shown to push valve ② onto valve seat lightly.

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 : 1.0 mm (0.04 in)
	Functional Limit : Intake and Exhaust Sides : 2.0 mm (0.08 in)



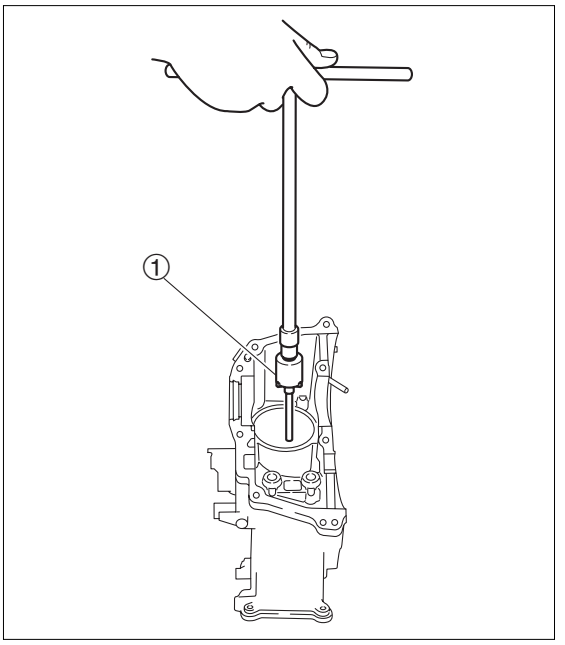


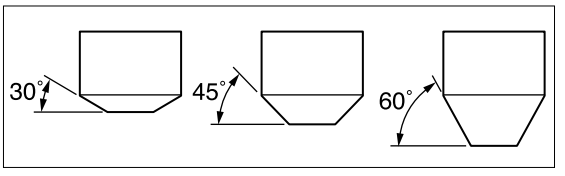


5

35) Correction of Valve Seat

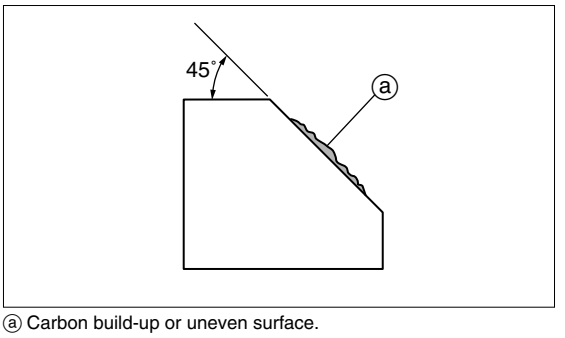
1. Use valve seat cutter ① (commercially available item) to correct valve seat.





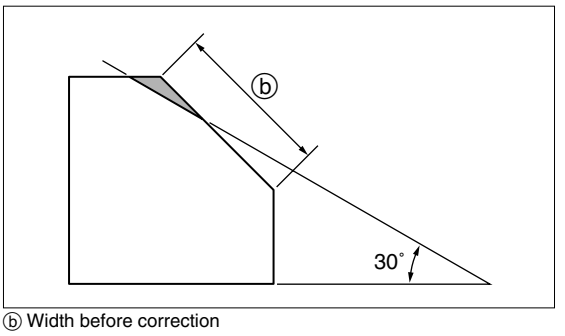
2. Turn 45 degree cutter clockwise to cut valve seat surface to make it smooth.

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



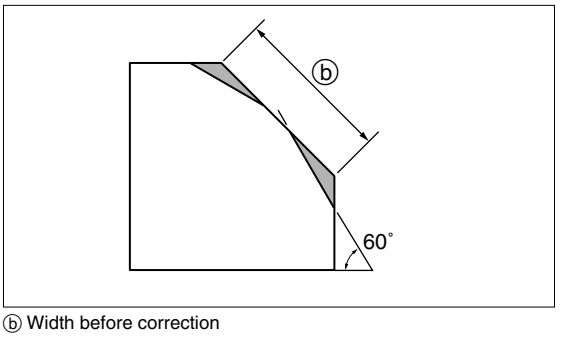
ⓐ Carbon build-up or uneven surface.

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



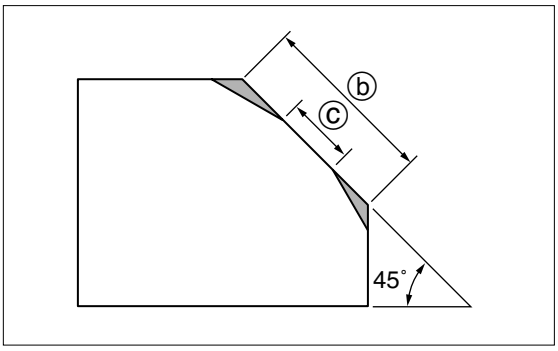
ⓑ Width before correction

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



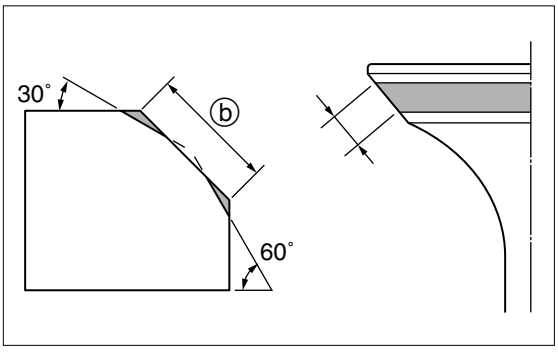
ⓑ Width before correction

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



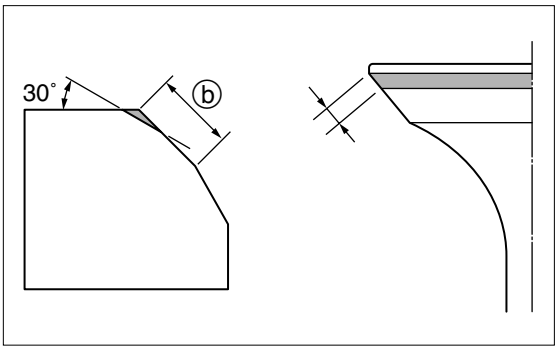
ⓑ Width before correction
ⓒ Specified width

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.



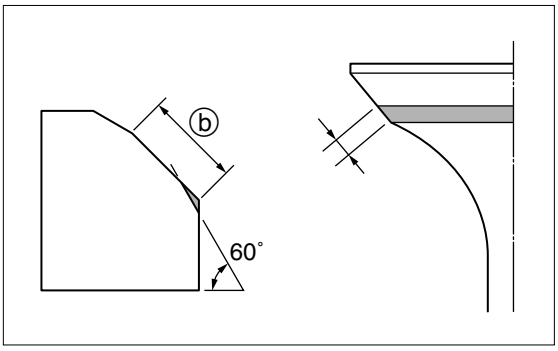
ⓑ Width before correction

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 ① (commercially available item) while tapping valve.

⚠ CAUTION

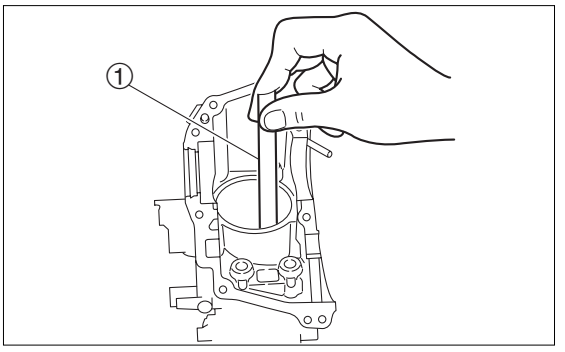
Perform the work by taking care not to allow abrasive compound to adhere to valve stem and valve guide.

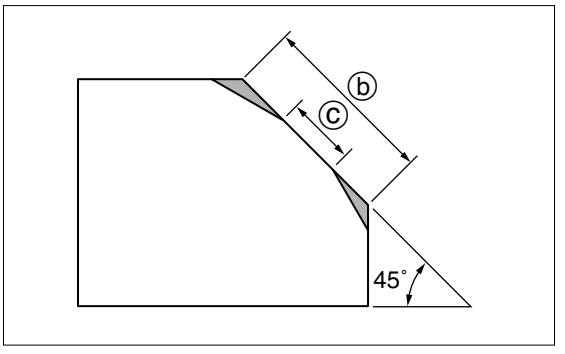
- Use finer abrasive compound to finish.
- When changing abrasive compound to finer one, remove present one completely.
- After completion of lapping, wipe off the compound and then clean.

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
1.0 mm (0.04 in)

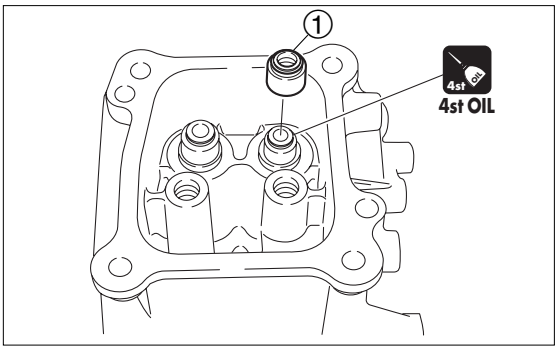




ⓑ Width before correction
ⓒ Specified width

36) Installation of Valves

1. Place cylinder block on the work bench. Apply oil to valve guide and attach new valve stem seal ①.

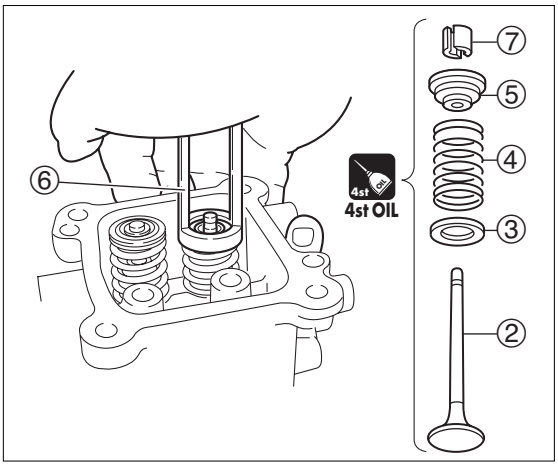


① Do not reuse.

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

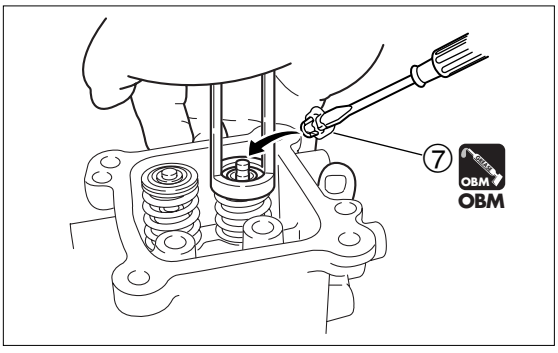
2. Assemble valve ②, valve spring seat ③, valve spring ④ and retainer ⑤ in this order, and then, push in the assembly by using valve spring compressor attachment ⑥.

Valve Spring Compressor Attachment ⑥ :
P/N. 3AB-99076-0

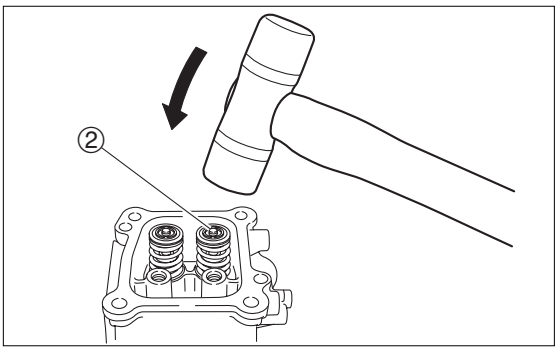


Valve spring can be put from any end.

3. With valve spring ④ being pushed in, use small screw driver with small amount of grease at the tip to put cotter ⑦.

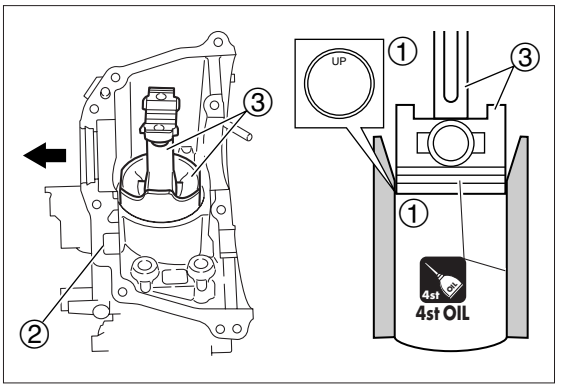


4. Remove cylinder block from work bench. Tap valve ② with plastic hammer to fix cotter ⑦ securely.



5

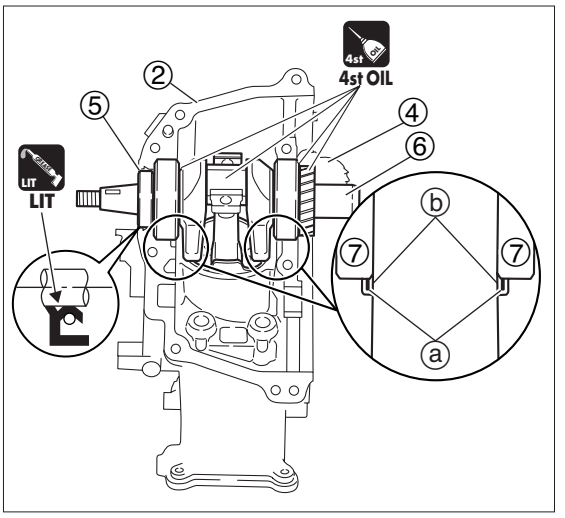
37) Assembly of Cylinder and Crank Case



1. Place cylinder block upside down on the work bench.

2. Bring piston crown ① "UP" mark to flywheel side ←, set piston ass'y ③ on the cylinder block ② to assemble.

> Before assembling, apply engine oil to piston peripheral surfaces, piston rings and cylinder liner.



3. Attach slinger ④.

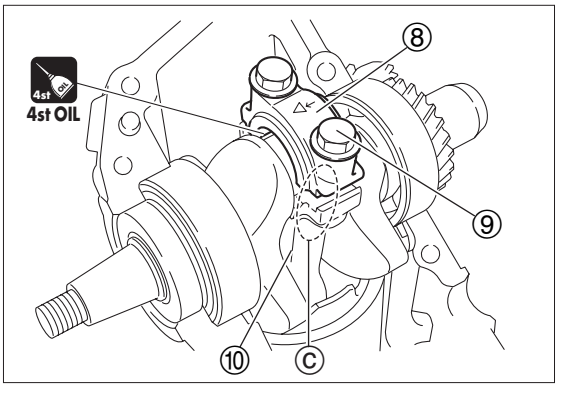
4. Install oil seal ⑤ to crank shaft ass'y ⑥.

> Apply grease to lip of oil seal before installing it.

5. Install crank shaft ass'y ⑥ to cylinder block ② as shown.

> When installing, bring projection ⓐ of bearing ⑦ to notch ⓑ of cylinder block ②.

6. Apply engine oil to bearing, crank shaft and connecting rod big end.

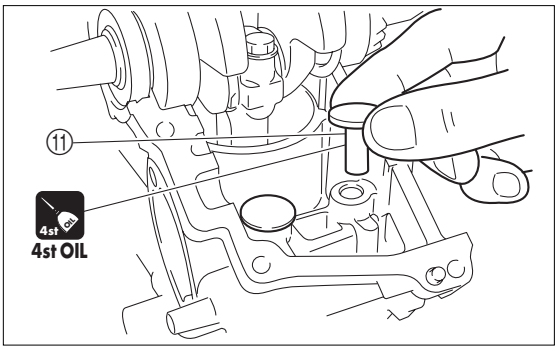


7. Attach connecting rod cap ⑧ to connecting rod ⑩, and tightening connecting rod bolts ⑨ in two steps to specified torque.

> · Install connecting rod cap ⑧ after applying engine oil to inside of the part.
> · Bring locating marks ⓒ of connecting rod cap ⑧ and connecting rod ⑩, and install in original position (direction).

Connecting Rod Bolts ⑨ :
1st tightening torque : 5 N · m (4 lb · ft) [0.5 kgf · m]
2nd tightening torque : 10 N · m (7 lb · ft) [1.0 kgf · m]

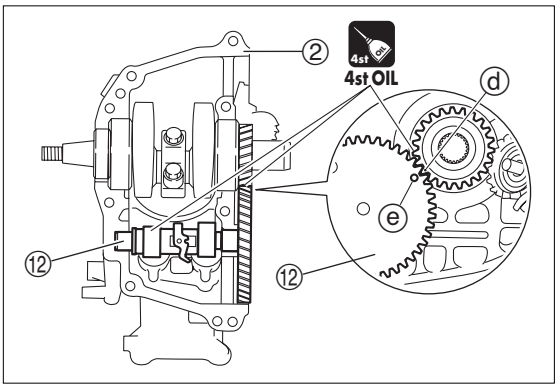
8. Install lifter ⑪ to cylinder block.



9. Install cam shaft ⑫ to cylinder block ② as shown.

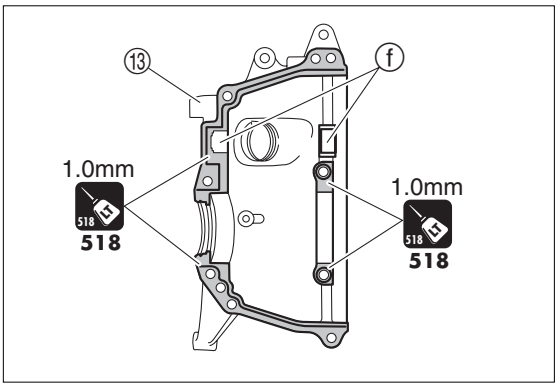
Bring crank shaft mark ⓓ to cam shaft ⑫ mark ⓔ.

10. Apply 4 stroke engine oil to crank shaft and cam shaft.



11. Apply Loctite 518 to crank case ⑬ mating face (one side) with width of 1.0 mm (0.04 in).

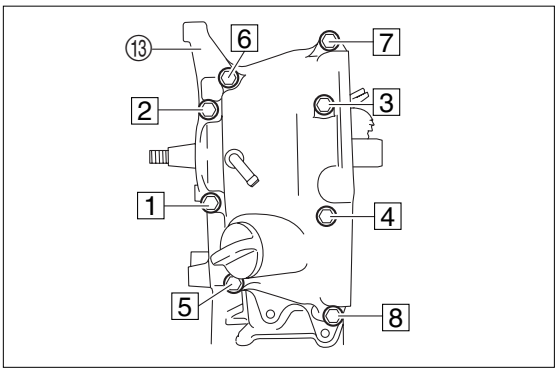
- Degrease mating surfaces of cylinder and crank case.
- Be careful not to allow sealing agent to adhere to journal area ⓕ.
- Apply Loctite 518 to mating surface of one of crank case halves. Be careful not to apply the agent excessively.



12. Install crank case ⑬ to cylinder block ②.

13. Tighten crank case bolts in two steps to specified torque in the order shown.

Crank Case Bolts 1 - 8
1st tightening torque : 6 N · m (4 lb · ft) [0.6 kgf · m]
2nd tightening torque : 8.8 N · m (6.5 lb · ft) [0.9 kgf · m]



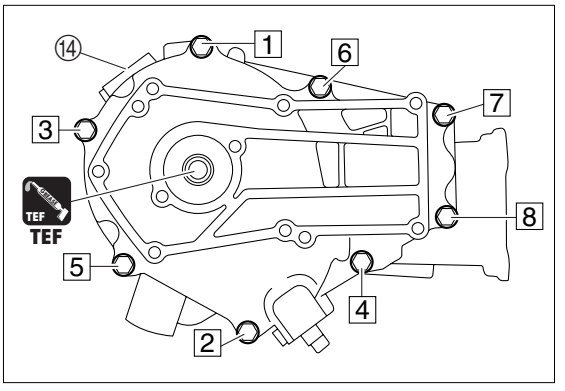
14. Attach dowel pin, new gasket and thrust plate.

15. Install oil pan ⑭ and tighten bolts to specified torque.

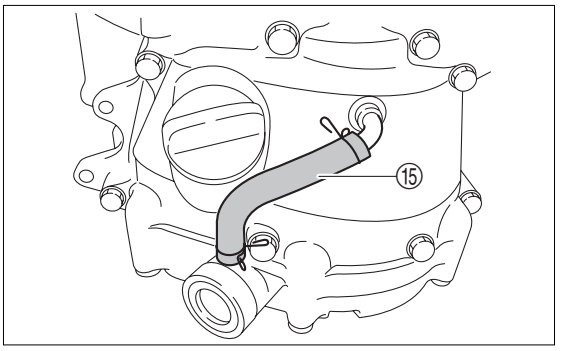
Do not reuse removed gasket. Replace with new one.

Oil Pan Bolts : 1 → 8
1st tightening torque : 6 N · m (4 lb · ft) [0.6 kgf · m]
2nd tightening torque : 8.8 N · m (6.5 lb · ft) [0.9 kgf · m]

Apply Teflon grease to crank shaft spline.



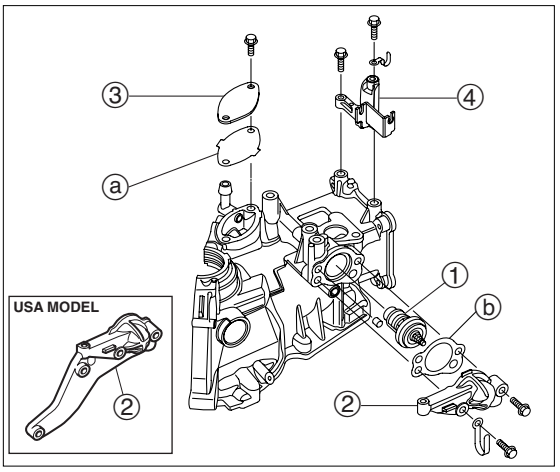
16. Reconnect rubber hose ⑮.



38) Assembly to Power Unit

1. Install thermostat ①, new gasket and thermostat cover ②.
2. Install breather cover ③.
3. Install throttle cable bracket ④.

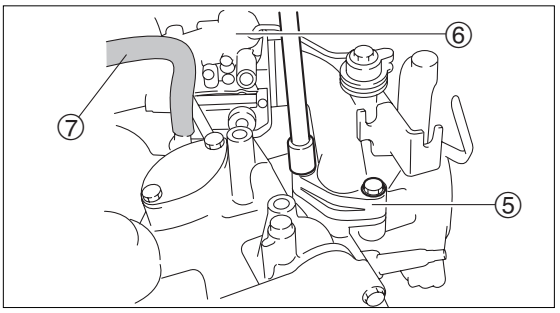
Thermostat Cap Bolts :
Breather Cover Bolts :
Throttle Cable Bracket Bolts :
6 N · m (4 lb · ft) [0.6 kgf · m]



ⓐ ⓑGaskets **Do not reuse.**

4. Install intake manifold ⑤ and carburetor ass'y ⑥ and tighten the bolts to specified torque.

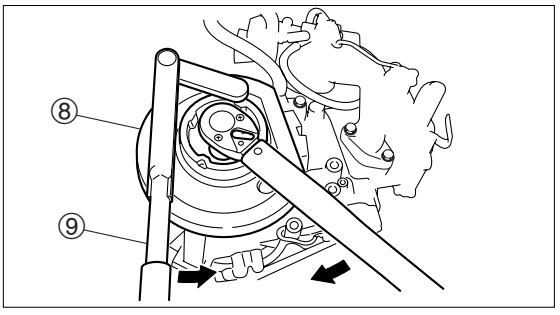
Intake Manifold Bolts :
10 N · m (7 lb · ft) [1.0 kgf · m]



5. Attach breather hose ⑦.
6. Reinstall key and flywheel ⑧ and tighten flywheel nut to specified torque.

⚠ CAUTION
Apply forces to tools toward directions as shown, and perform work taking care not to allow flywheel holder to come off.

Flywheel Holder ⑨ :
Commercially available item

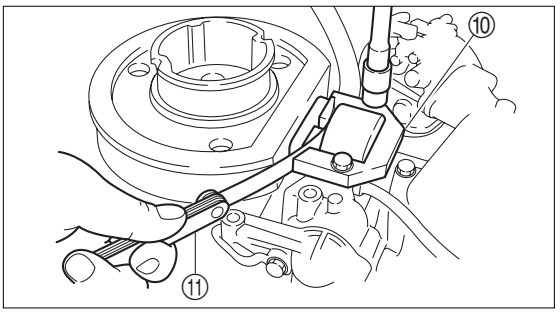


Flywheel Nut :
43 N · m (31 lb · ft) [4.3 kgf · m]

7. Attach igniter ⑩.

Thickness Gauge ⑪ :
P/N. 353-72251-0

Igniter Clearance :
0.2 - 0.4mm (0.008 - 0.016in)



8. Install flywheel cover ⑫ and recoil starter ⑬.

Recoil Starter Bolts :
6 N · m (4 lb · ft) [0.6 kgf · m]

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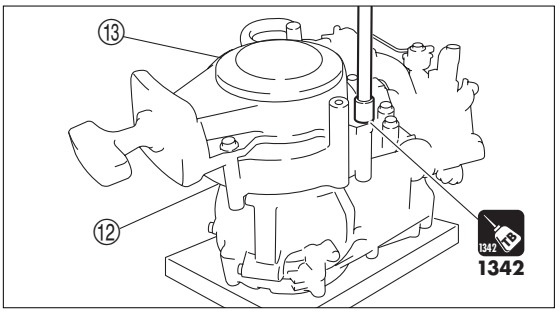


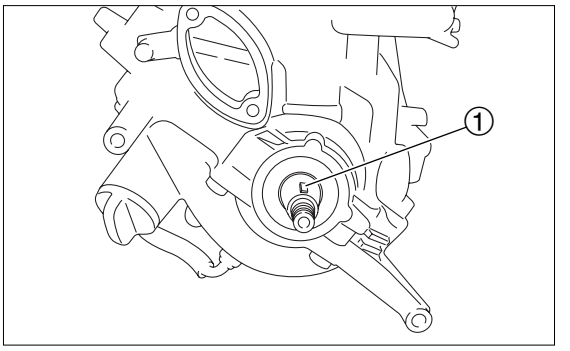
9. Tighten spark plug to specified torque and connect plug cap.

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

39) Assembly of Rocker Arm

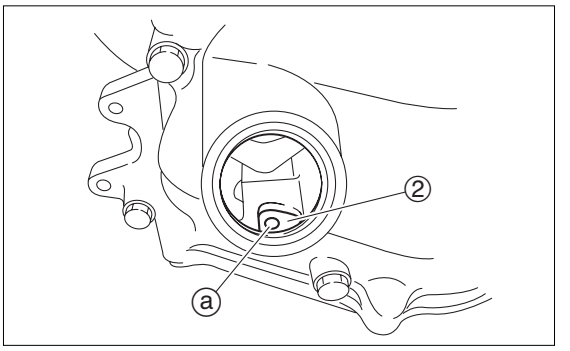
1. Direct magneto key groove ① to piston top dead center.

Set piston to top dead center of compression stroke. Remove oil filler cap and check that ø5mm (0.2 in) hole ⓐ of cam shaft gear ② can be seen.



2. Install push rod plate ③ and tighten pivot bolt ④ to specified torque.

Pivot Bolt :
25 N · m (18 lb · ft) [2.5 kgf · m]

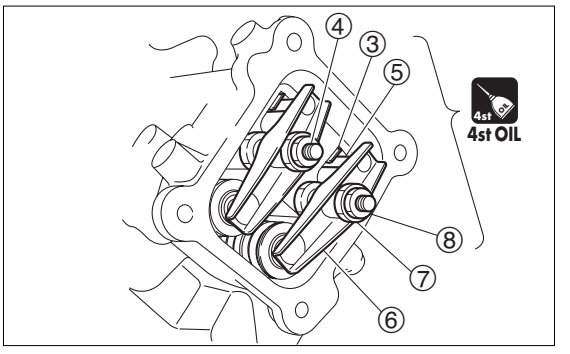


3. Attach push rod ⑤, rocker arm ⑥ and pivot ⑦, and then, attach pivot lock nut ⑧.

4. Adjust valve clearance.

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

Perform adjustment of valve clearances when engine is cold.

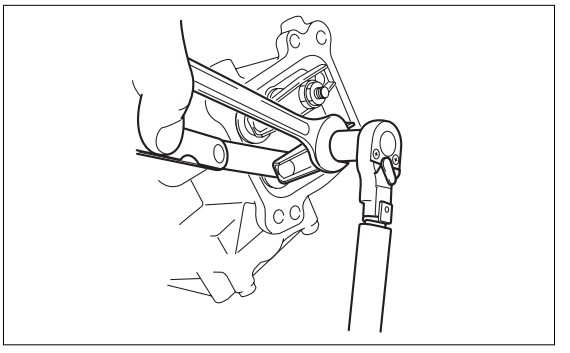


5. Tighten pivot lock num ⑧ to specified torque.

⚠ CAUTION

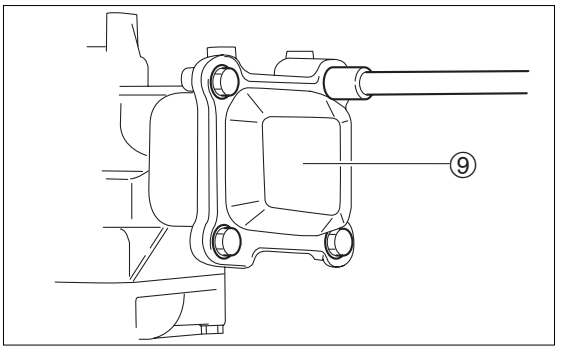
Do not turn flywheel while the locker arm is free. Doing so can make push rod and rocker arm interfere with each other, resulting in damages to these parts.

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



6. Install cylinder head cover ⑨ and tighten to specified torque.

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



40) Assembly of Power Unit

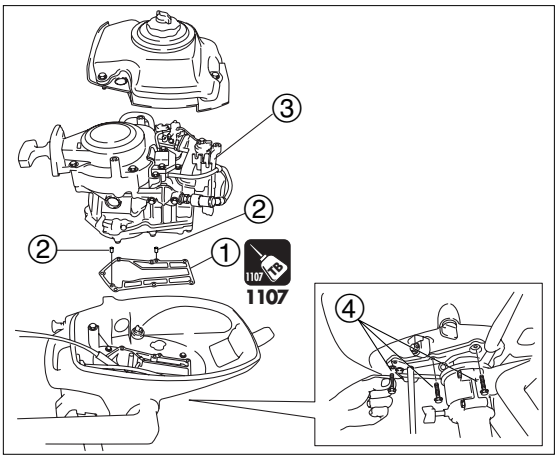
1. Apply ThreeBond 1107 to both faces of new gasket, and attach dowel pins ② (2 pcs.) and gasket ①.

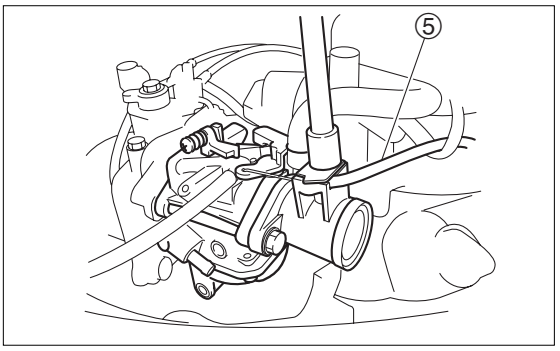
2. Install power unit ③, and tighten bolts ④ (7 pcs.) in two or three steps to specified torque.

Power Unit Installation Bolt :
6 N · m (4 lb · ft) [0.6 kgf · m]

3. Connect igniter leads and stop switch leads (two leads respectively).

4. Connect choke wire ⑤.





5. Connect throttle cable ⑥. Refer to 3.4.7.

6. Apply grease to sliding parts such as rods and cables.

7. Install fuel tank ⑦ and fuel cock ass'y ⑧, and tighten the bolts to specified torque.

Fuel Tank Bolts :
6 N · m (4 lb · ft) [0.6 kgf · m]

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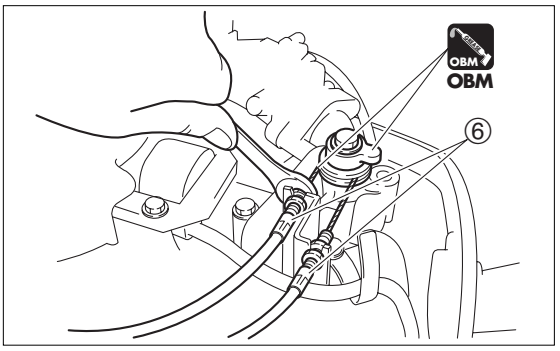
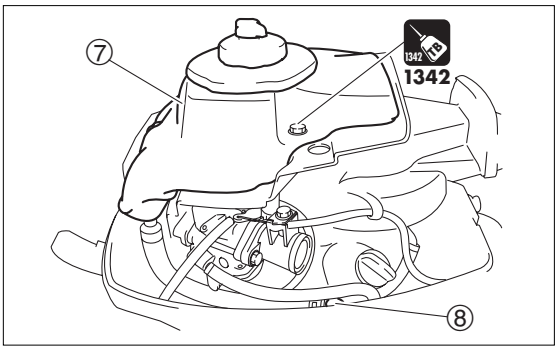
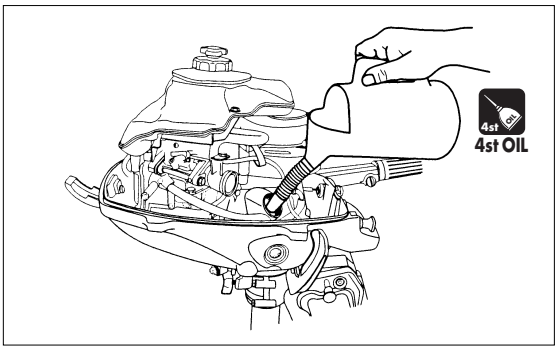




8. Fill with specified amount of engine oil.

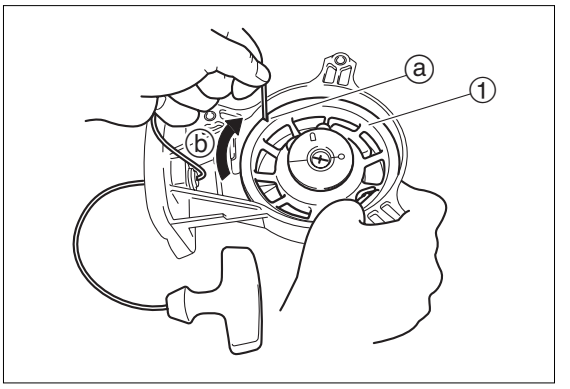
Engine Oil :
4 Stroke Engine Oil
API : SF, SG, SH
SAE : 10W-30, 10W-40
NMMA : FC-W Certified 10W-30
Quantity of Engine Oil : 300 cm³ (10 fl.oz)



41) Disassembly of Recoil Starter

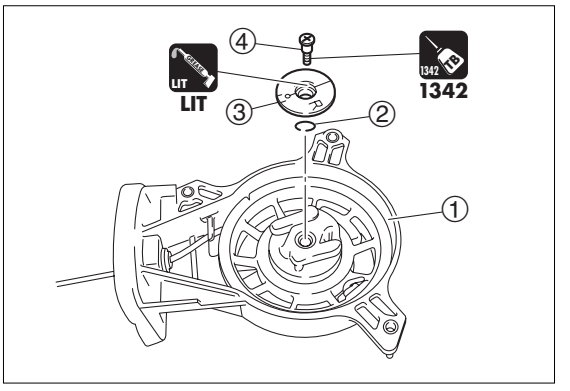
1. Remove bolts and recoil starter and flywheel cover ass'y.

2. Put rope in the groove ⓐ of reel ① and gently turn reel ① clockwise ⓑ to release tension of starter spring.



① Reel

3. Remove starter shaft screw ④, and then, friction plate ③, ratchet and spring ②.

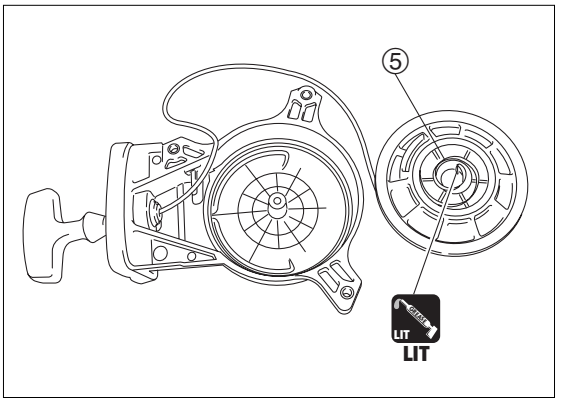


② Friction Spring
③ Friction Plate
④ Starter Shaft Screw

4. Take out reel ① carefully.

5. Remove starter spring ⑤.

> It is not necessary to remove starter spring from reel if it is not necessary to replace it. Starter spring can be inspected without removing from reel.



⑤ Starter Spring

42) Inspection of Recoil Starter

1. Check ratchet and all springs. Replace if any deformation, wear or damage is found.

2. Check reel and starter case. Replace if any crack or damage is found.

3. Check starter rope. Replace if any wear, unraveling or damage is found.

43) Assembly of Recoil Starter

Reverse disassembly procedure to assemble by taking care of the following matters.

1. When setting starter spring into reel ①, face starter spring outer edge hook to the right and set it into peripheral cut of starter case.

2. Run starter rope through rope guide ② and connect to reel ①.

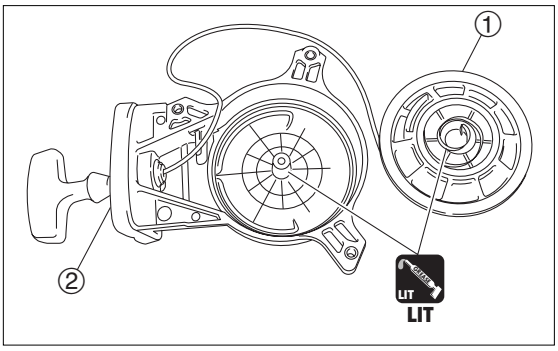
3. When installing reel ① into starter case, set projection of starter case in the internal hook of starter spring.

4. Apply low temperature resistant lithium grease.
   · Starter Spring
   · Friction Plate

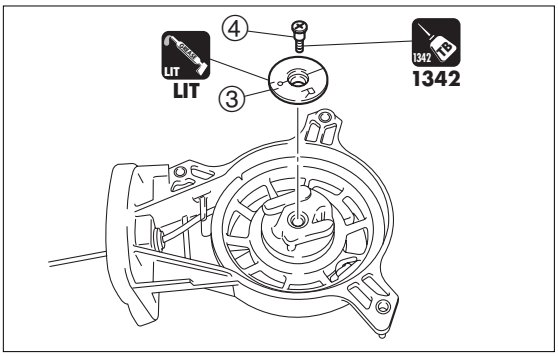
5. Put starter shaft screw and tighten to specified torque.

   Starter Shaft Screw :
   5 N · m (4 lb · ft) [0.5 kgf · m]

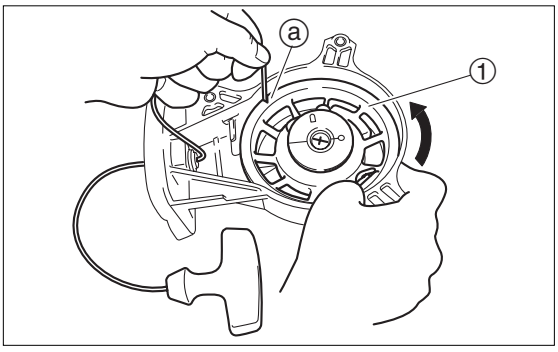
6. When applying tension to starter spring, hook starter rope into reel groove ⓐ, and turn reel 4 to 5 times to direction to which the reel rotates when pulling out starter rope (counterclockwise).



② Rope Guide



③ Friction Plate
④ Starter Shaft Screw



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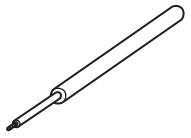
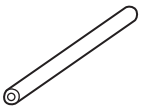
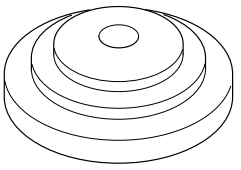
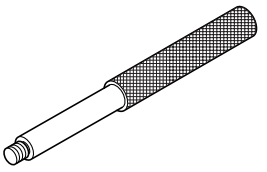
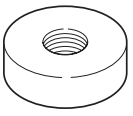
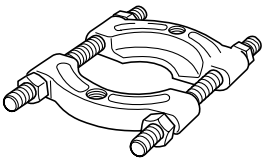
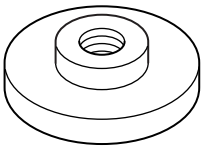
6

Lower Unit

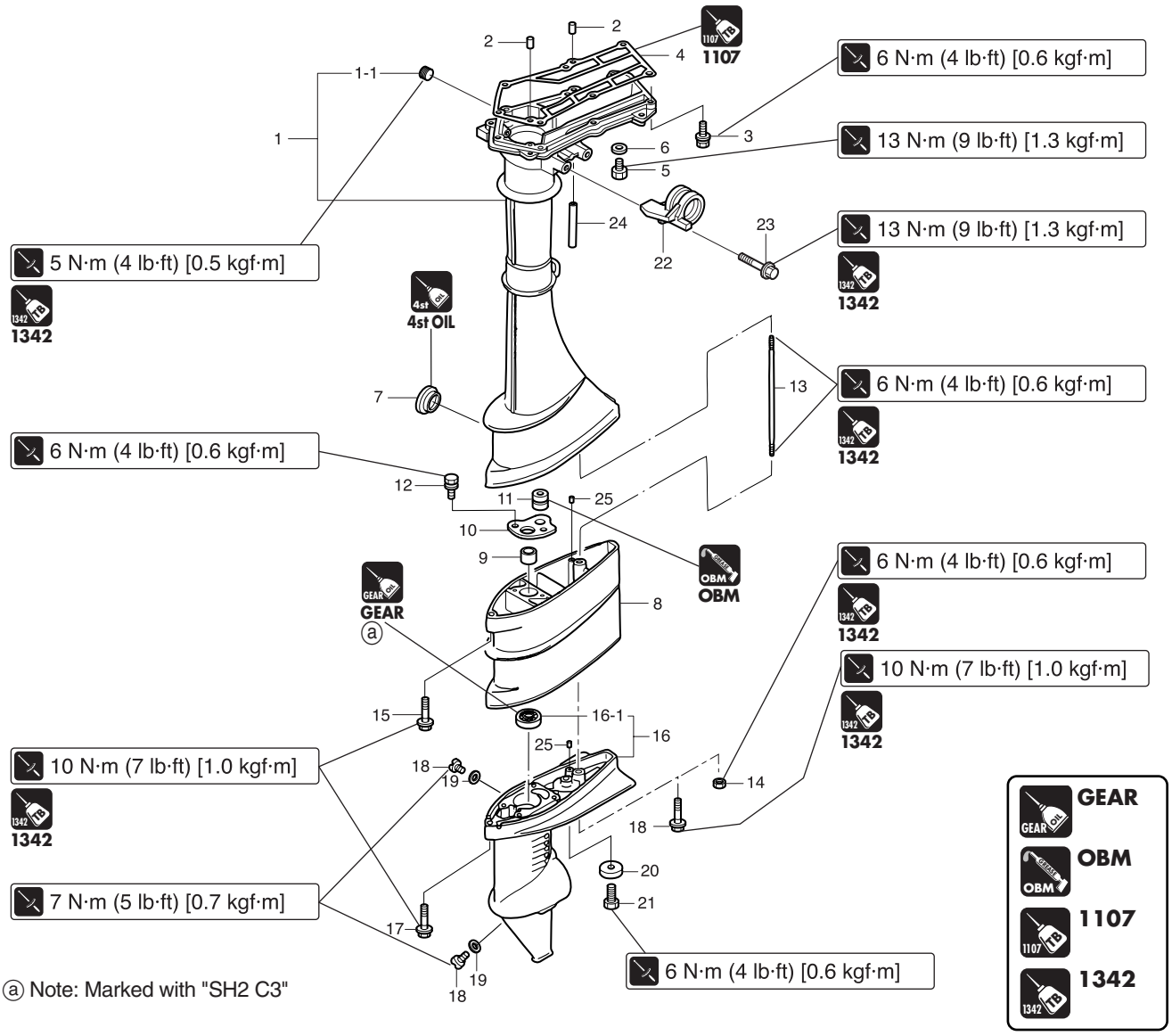
1. Special Tools

			
Spring Pin Tool A P/N. 345-72227-0	Spring Pin Tool B P/N. 345-72228-0	Center Plate 3 P/N. 3AB-99701-0	Driver Rod 3 P/N. 3AB-99702-0
Removing spring pin	Installing spring pin	Used in combination with driver rod and bearing attachment to locate lower gear case bearing	Used in combination with center plate and bearing attachment
			
Bearing Attachment 3 P/N. 3AB-99905-0	Bearing Install Tool 2 P/N. 3AB-99900-0	Universal Puller Plate P/N. 3AC-99750-0	Bearing Attachment 4 P/N. 3BV-99905-0
Used in combination with driver rod and center plate to locate lower gear case bearing	Installing drive shaft bearing.	Removing bearings	Installing bearings

2. Parts Layout

P/L Fig. 9

Drive Shaft Housing & Gear Case



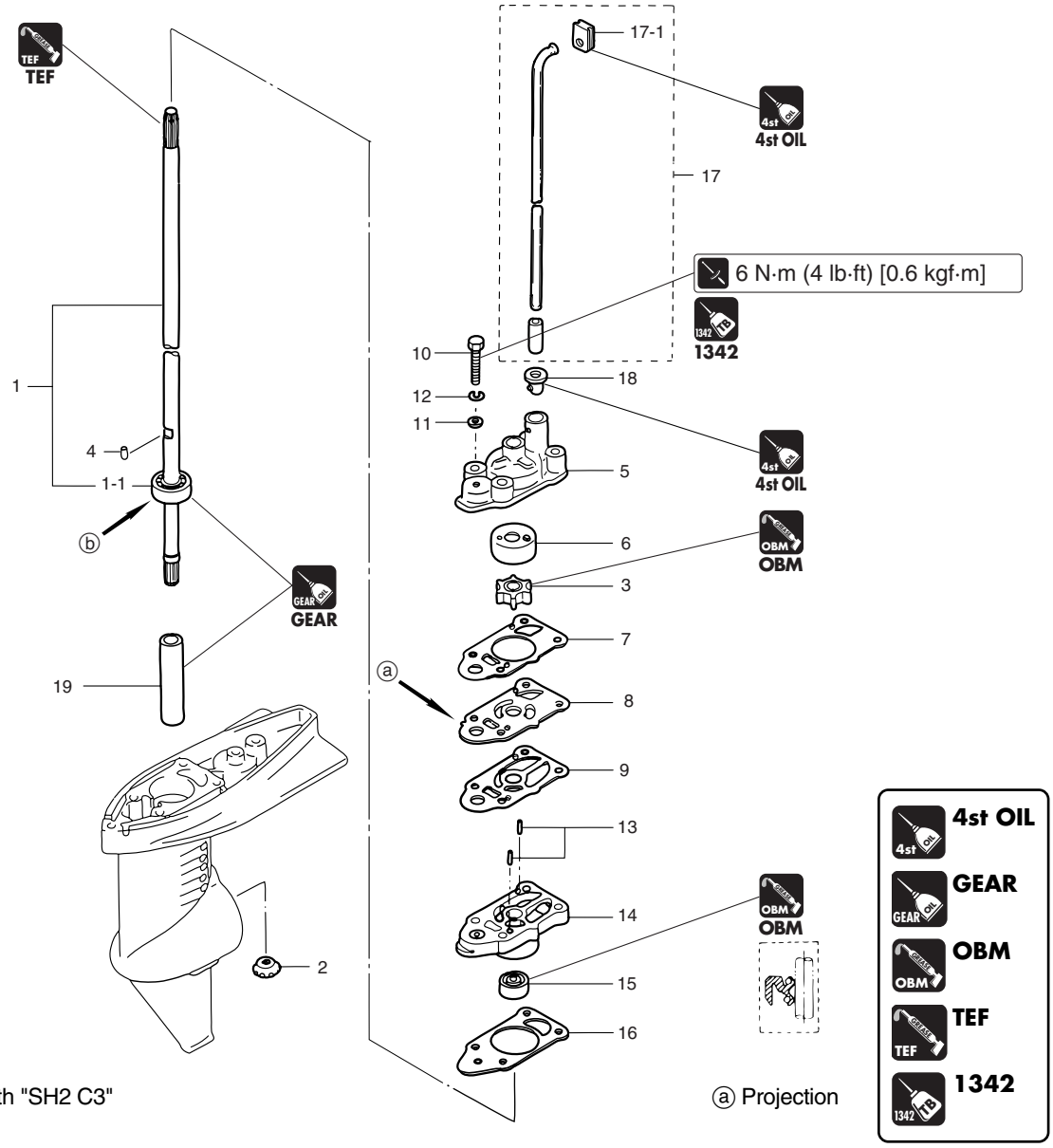
ⓐ Note: Marked with "SH2 C3"

Ref. No.	Description	Q'ty	Remarks
1	Drive Shaft Housing "S"	1	
1-1	Exhaust Plug	1	PT 1/8
2	Dowel Pin, 6-12	2	
3	Bolt	7	M6 L=30mm
4	Drive Shaft Housing Gasket	1	Do not reuse.
5	Water Plug	1	M8 P1.25
6	Gasket, 8.1-15-1	1	Do not reuse.
7	Grommet, 29-3	1	
8	Extension Housing " L"	1	for "L"
9	Drive Shaft Bushing	1	
10	Drive Shaft Bushing Stopper	1	
11	Grommet, 13-2	1	
12	Bolt	2	M6 L=12mm
13	Stud Bolt, 6-171	1	M6 L=171mm for "L"
14	Nut	1	M6 for "L"

Ref. No.	Description	Q'ty	Remarks
15	Bolt, 6-30 Pre-coated	1	M6 L=30mm for "L"
16	Gear Case	1	
16-1	Ball Bearing, 6000	1	Do not reuse.
17	Bolt, 6-30 Pre-coated	1	M6 L=30mm
18	Bolt, 6-30 Pre-coated	1	for "L"
19	Oil Plug	2	ø6
20	Gasket, 8.1-15-1	2	Do not reuse.
21	Anode	1	
22	Bolt	1	M6 L=16mm
23	Steering Bracket	1	
24	Bolt	2	M8 L=35mm
25	Rubber Hose	1	
26	Dowel Pin, 6-12	2	

Gear Case (Drive Shaft)

P/L Fig. 10



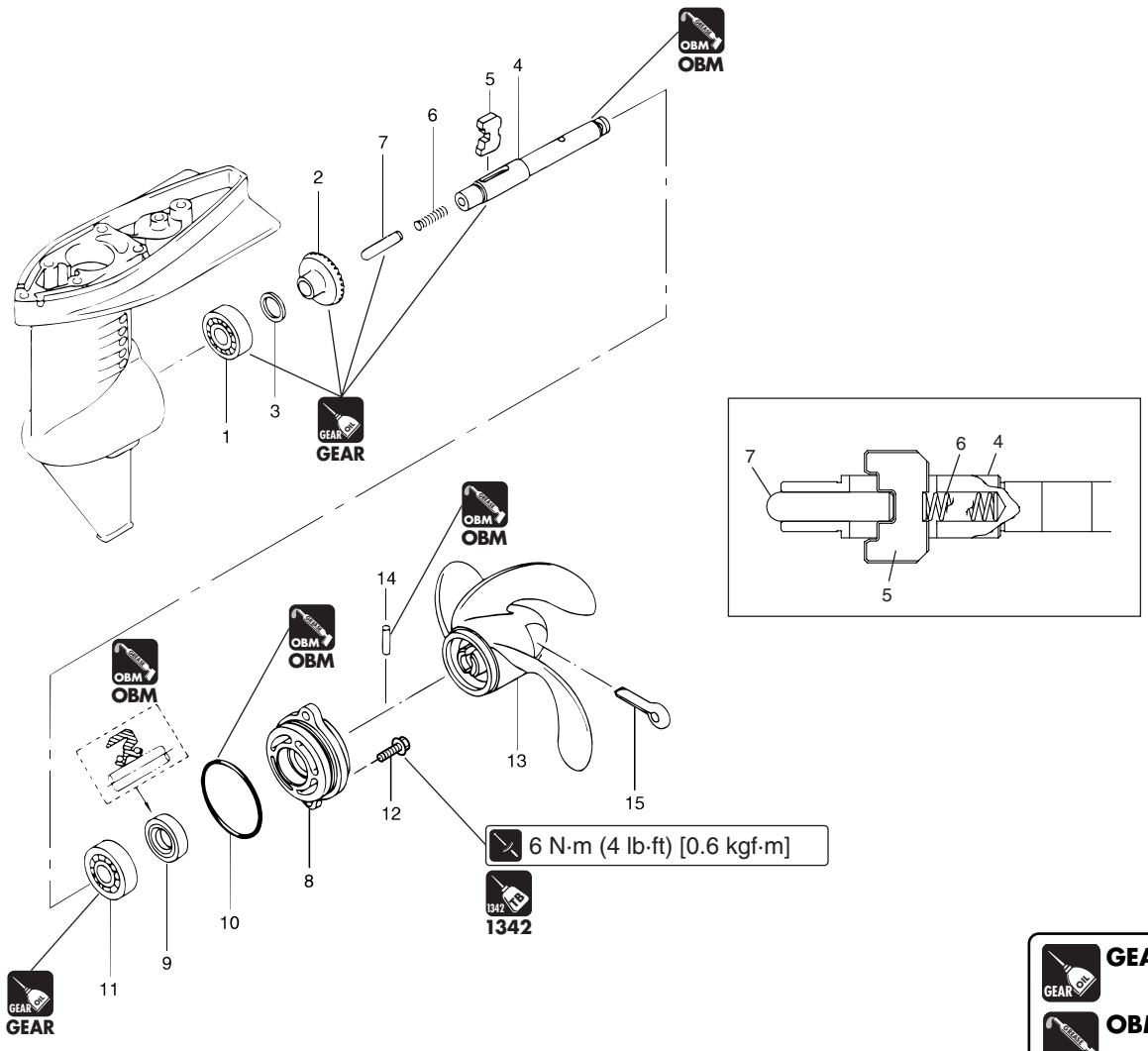
ⓑ Note: Marked with "SH2 C3"

ⓐ Projection

Ref. No.	Description	Q'ty	Remarks
1	Drive Shaft "S"	1	for "S"
	Drive Shaft "L"	1	for "L"
1-1	Ball Bearing, 6000	1	Do not reuse.
2	Pinion Gear ("B"Gear)	1	
3	Water Pump Impeller	1	
4	Water Pump Impeller Key	1	
5	Pump Case (Upper)	1	
6	Pump Case Liner	1	
7	Pump Case Gasket (Upper)	1	Do not reuse.
8	Water Pump Guide Plate	1	
9	Pump Guide Plate Gasket	1	Do not reuse.
10	Bolt	4	M6 L=45mm
11	Washer	4	
12	Spring Washer	4	
13	Dowel Pin, 2-11	2	
14	Pump Case (Lower)	1	with Bushing & O-ring
15	Oil Seal, 10-22-8	1	Do not reuse.
16	Pump Case Gasket (Lower)	1	Do not reuse.
17	Water Pipe "S"	1	for "S"
	Water Pipe "L"	1	for "L"
17-1	Water Pipe Grommet (Upper)	1	
18	Water Pipe Grommet (Lower)	1	
19	Spacer, 10.1-15-72	1	

Gear Case (Propeller Shaft)

P/L Fig. 11



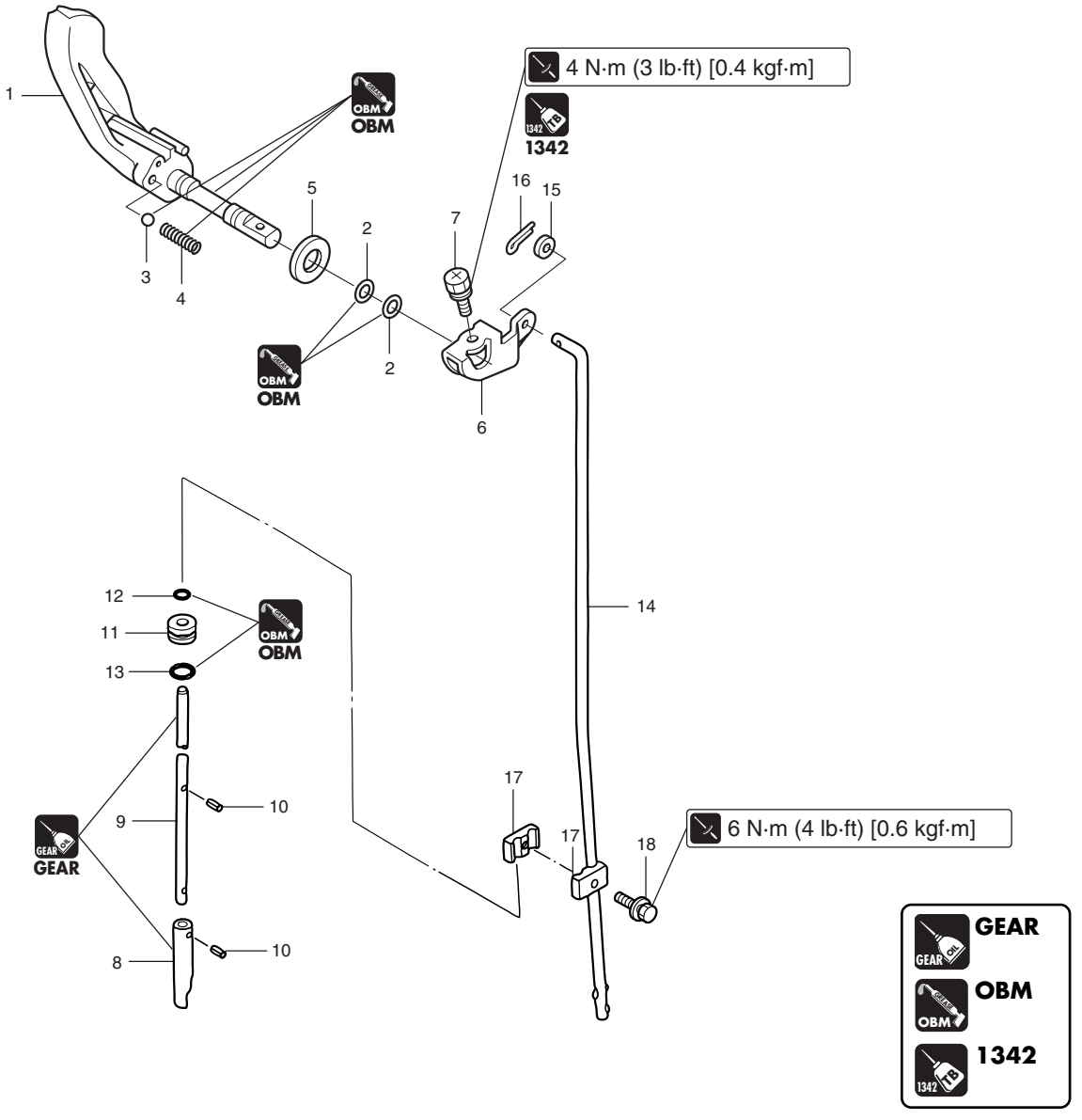
Ref. No.	Description	Q'ty	Remarks
1	Ball Bearing, 6004	1	Do not reuse.
2	Forward Gear("A"Gear)	1	
3	Shim, 21-28-0.1	AR	
	Shim, 21-28-0.15	AR	
4	Propeller Shaft	1	
5	Clutch	1	
6	Clutch Spring	1	
7	Clutch Push Rod	1	
8	Propeller Shaft Housing	1	
9	Oil Seal, 12-24-8	1	Do not reuse.
10	O-Ring, 3.2-47	1	Do not reuse.
11	Ball Bearing, 6001	1	Do not reuse.
12	Bolt	2	M6 L=20mm
13	Propeller 7(Plastic), 3 x 7.4 x 7	1	Standard
	Propeller 6(Aluminum), 3 x 7.4 x 6	1	Option
	Propeller 6(Plastic), 3 x 7.4 x 6	1	Option
	Propeller 4.5(Plastic), 3 x 7.4 x 4.5	1	Option
14	Shear Pin, 4-24	1	Do not reuse.
15	Split Pin, 4-35	1	Do not reuse.

GEAR
OBM
1342

6

Shift

P/L Fig. 12



Ref. No.	Description	Q'ty	Remarks
1	Shift Lever	1	
2	O-Ring, 1.9-6.8	2	Do not reuse.
3	Ceramic Ball, 7.7	1	
4	Shift Lever Stopper Spring	1	
5	Washer, 10.5-18-1.5	1	
6	Shift Rod Lever	1	
7	Bolt	1	M6 L=12mm
8	Clutch Cam	1	
9	Cam Rod "S"	1	for "S"
	Cam Rod "L"	1	for "L"
10	Spring Pin, 3-8	2	Do not reuse.
11	Cam Rod Bushing	1	
12	O-Ring, 2.5-4.9	1	Do not reuse.
13	O-Ring, 2.4-9.5	1	Do not reuse.
14	Shift Rod	1	
15	Washer	1	
16	Split Pin, 2-12	1	Do not reuse.
17	Shift Rod Joint	1set	
18	Bolt	1	M6 L=16mm

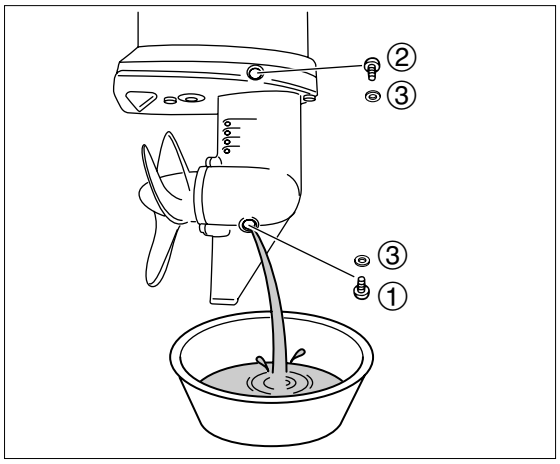
3. Inspection Item

1) Draining Gear Oil

1. Set outboard motor vertical.

2. 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

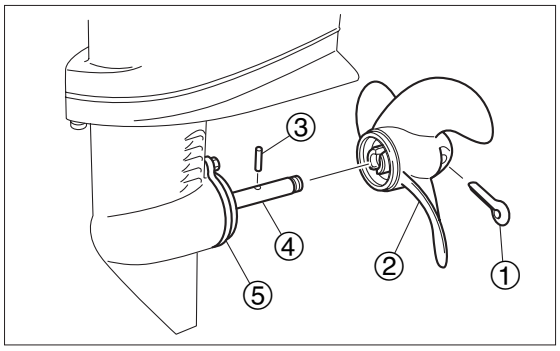
1. Shift gear into neutral (N).

2. Remove lock plate (of stop switch lanyard) from stop switch.

3. Straighten and pull out split pin ①, and then, remove shear pin ③ and propeller ②.

⚠ WARNING

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



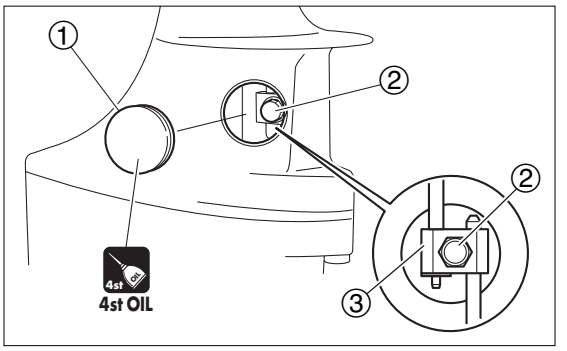
① Split Pin
② Propeller
③ Shear Pin
④ Propeller Shaft
⑤ Propeller Shaft Housing

6

3) Removing Lower Unit

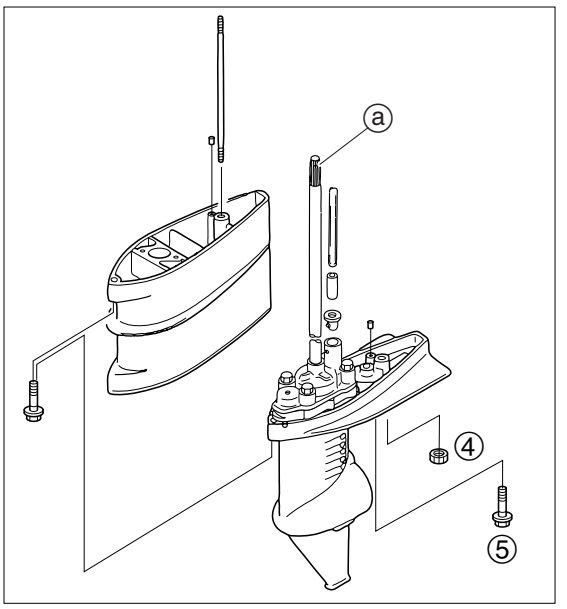
Removal of lower unit does not require removal of power unit from outboard motor body. Tilt up and lock with tilt stopper.

1. Remove grommet ① and loosen bolt ②.



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

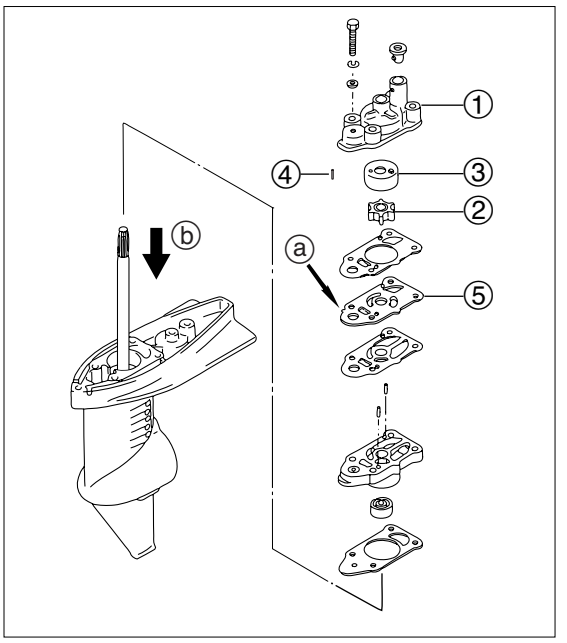
2. Remove lower unit installation bolts ⑤ and nut ④, and pull lower unit ass'y downward to remove.



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

4) Disassembly of Water Pump

1. Remove bolt, and then, pump case (upper) ① while pushing drive shaft downward ⓑ.



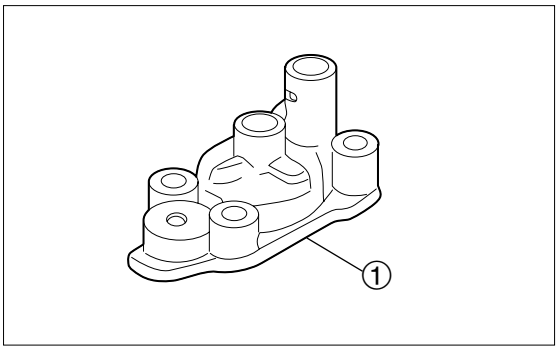
ⓐ Projection

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.

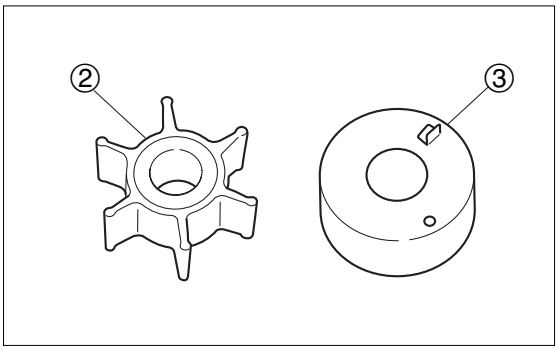
2. Remove impeller ②.

5) Inspection of Water Pump

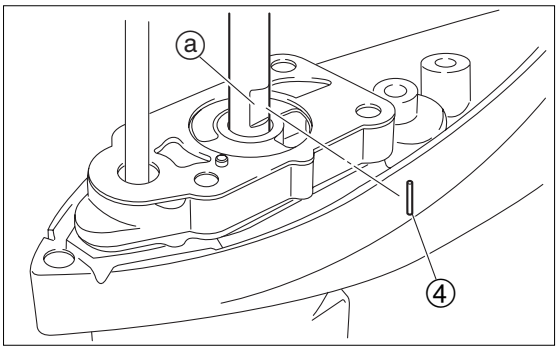
1. Check upper pump case (upper) ① for deformation. Replace if necessary.



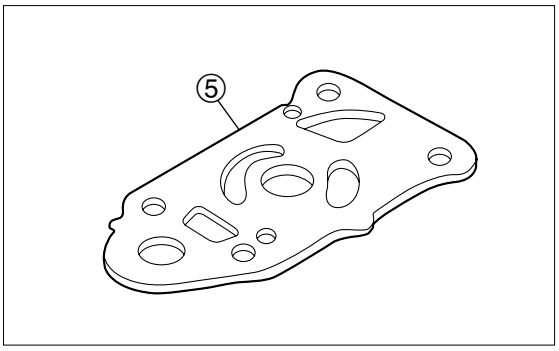
2. Check impeller ② and pump case liner ③ for cracks and wear. Replace if necessary.



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.

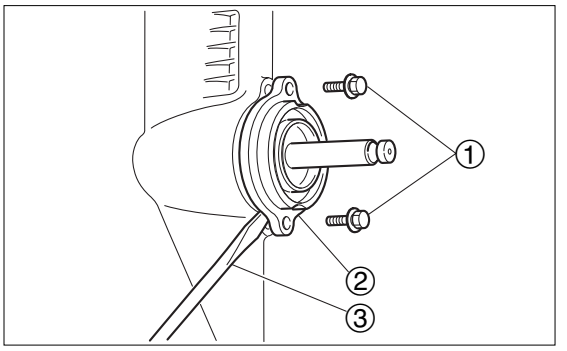


6) Removing Propeller Shaft Housing Ass'y

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

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

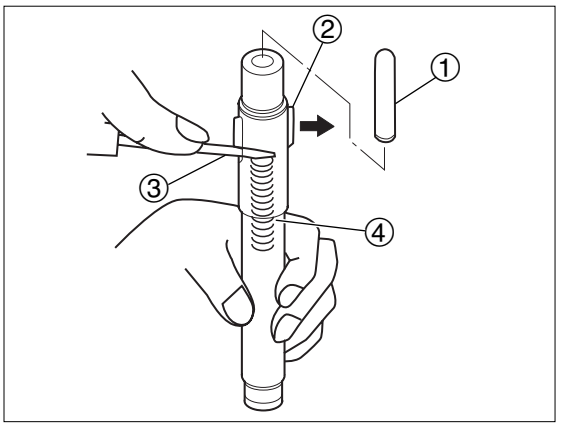
2. Remove propeller shaft ass'y.



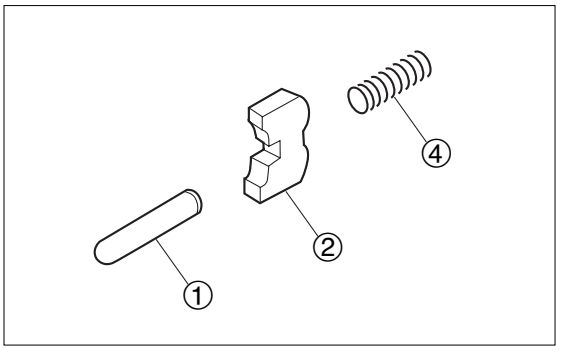
7) Disassembly of Propeller Shaft Ass'y

1. Remove clutch push rod ① and then clutch ② and clutch spring ④.

> When removing clutch, push down clutch spring by using bladed screw driver ③ with thin tip.



2. Check clutch ②, clutch push rod ①, and clutch spring ④ for cracks and wear. Replace if necessary.

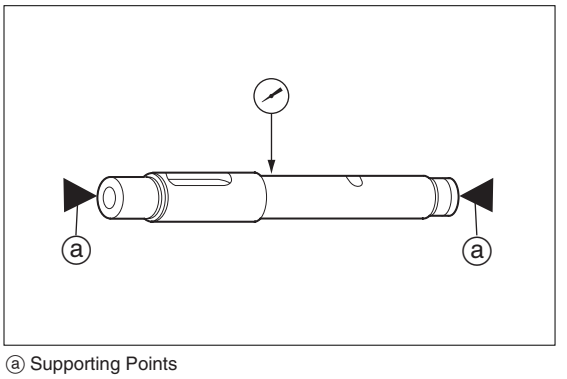


8) Inspection of Propeller Shaft

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

2. Measure propeller shaft runout.

Propeller Shaft Runout Limit :
0.05 mm (0.0020 in)

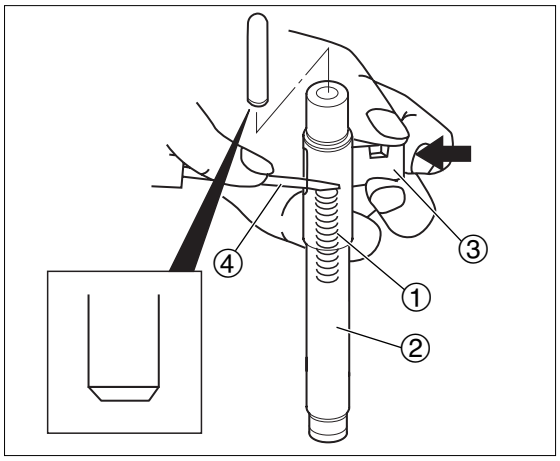


ⓐ Supporting Points

9) Assembly of Propeller Shaft Ass'y

1. Put clutch spring ① and attach clutch ③ to propeller shaft ②.

When installing clutch ③, push down clutch spring ① by using a bladed screw driver ④.

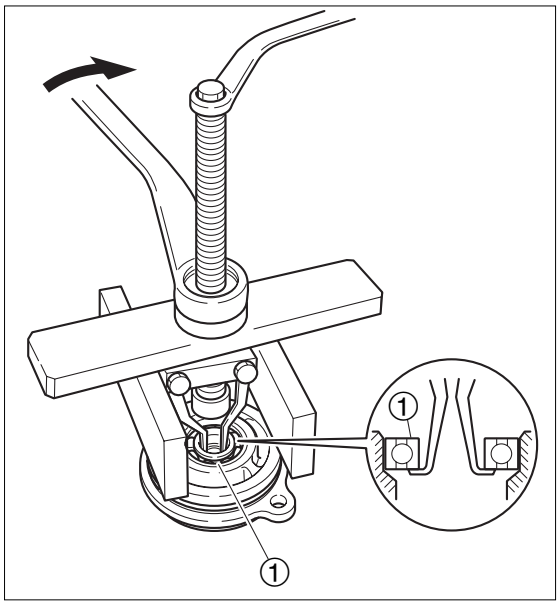


10) Disassembly of Propeller Shaft Housing

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

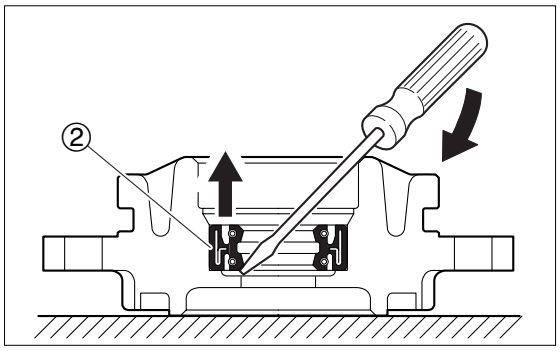
⚠ CAUTION

- **Do not reuse removed bearing.**
- **When reusing bearing without removing it, check it for play or deflection. Replace if necessary.**



① Do not reuse.

2. Remove oil seal ②.

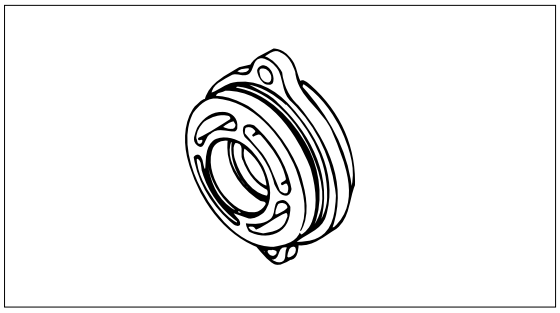


② Do not reuse.

11) Inspection of Propeller Shaft Housing

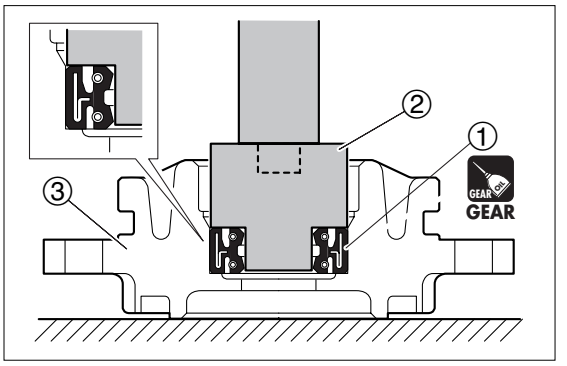
1. Use cleaning oil and cleaning brush to clean propeller shaft housing, and check it for cracks or damage. Replace if necessary.

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



12) Assembly of Propeller Shaft Housing

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.

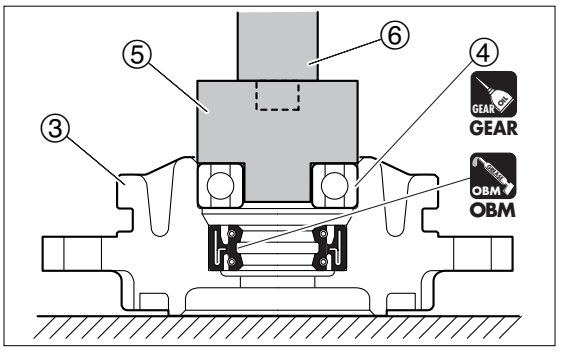


① **Do not reuse.**

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

Do not reuse removed bearing.

Bearing Attachment 2 ⑤ :
P/N.3BV-99905-0
Driver Rod 3 ⑥ :
P/N.3AB-99702-0



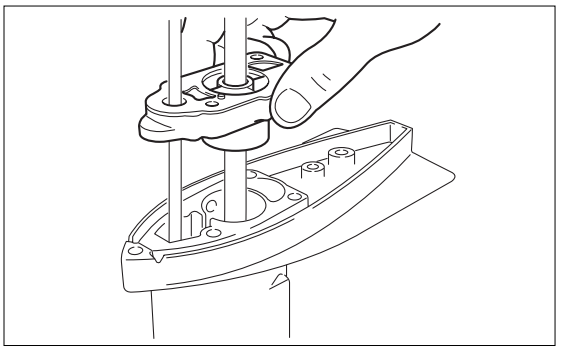
④ **Do not reuse.**

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

13) Removing Pump Case (Lower)

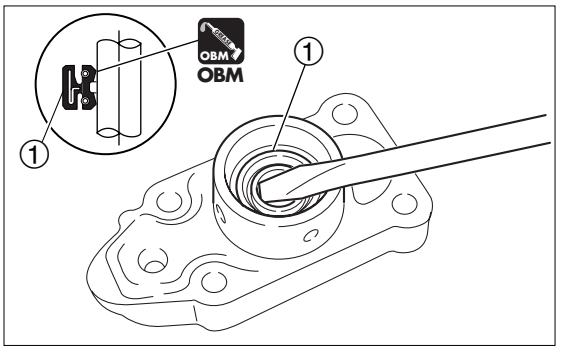
1. Remove pump case (lower) and cam rod bushing while pressing down drive shaft.

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.



14) Disassembly of Pump Case (Lower)

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

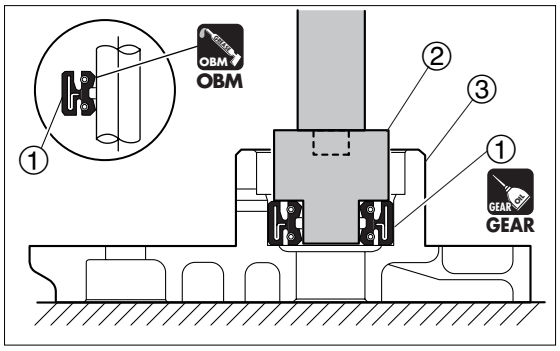


① **Do not reuse.**

15) 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.

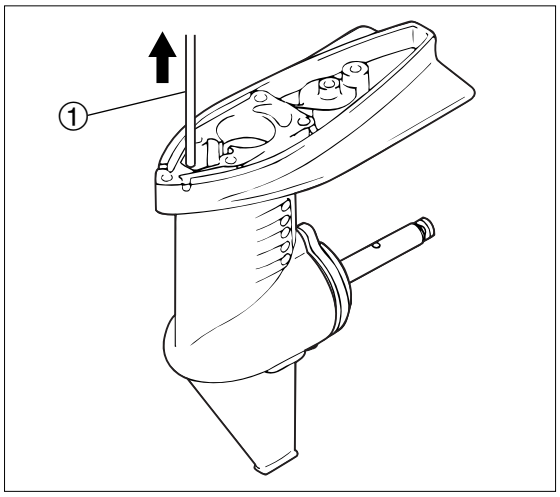
2. Apply OBM grease to lip of oil seal ①.



② **Do not reuse.**

16) Removing Clutch Cam and Cam Rod

1. Pull cam rod ass'y ① upward to remove.



17) Disassembly of Clutch Cam and Cam Rod

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

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

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

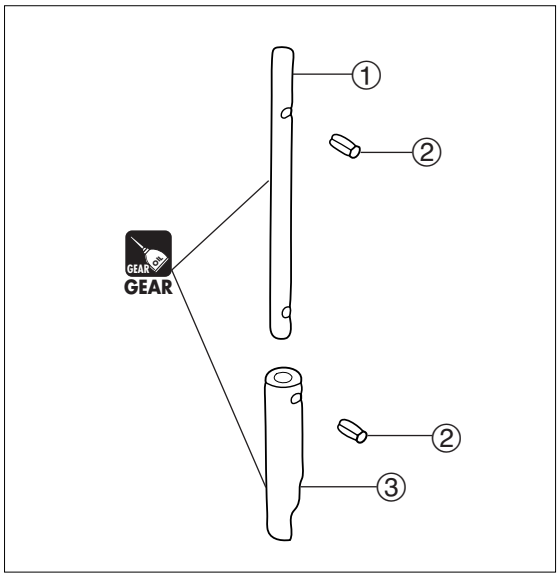
18) Inspection of Clutch Cam and Cam Rod

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

19) Assembly of Clutch Cam and Cam Rod

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

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



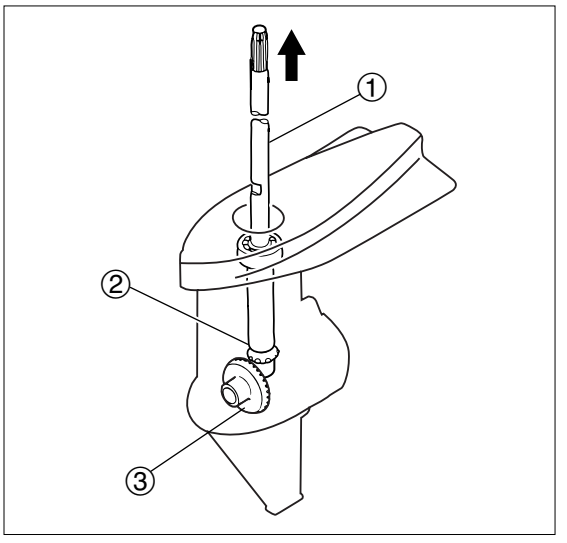
② **Do not reuse.**

6

20) Removing Drive Shaft

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

· When removing forward (A) gear, 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.



21) Disassembly of Drive Shaft

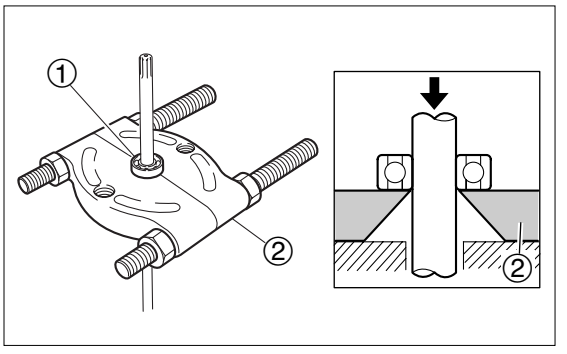
1. Remove drive shaft bearing ①.

· Before removing, check bearing for play or deflection. Replace if necessary.
· Be sure to remove or install from bearing of pinion (B) gear side.

⚠ CAUTION

Do not reuse bearing. Be sure to replace with new one.

Universal Puller Plate ② :
P/N. 3AC-99750-0



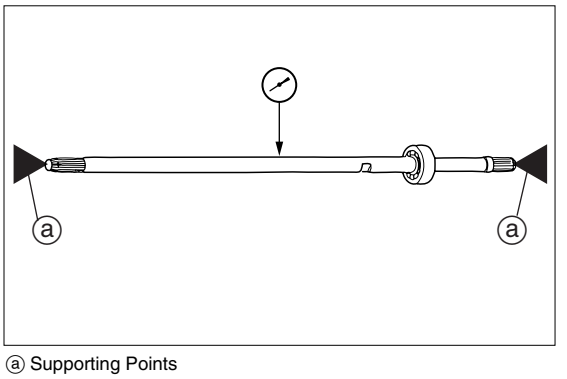
① Do not reuse.

22) Inspection of Drive Shaft

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

2. Measure drive shaft runout.

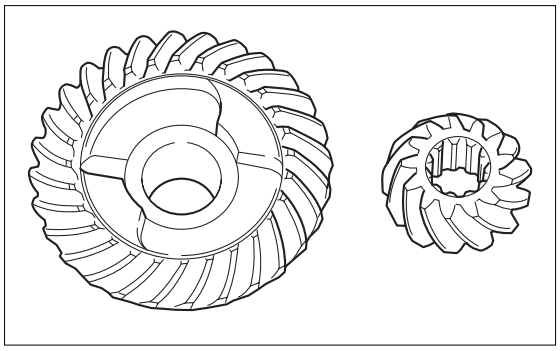
Drive Shaft Runout Limit :
0.5 mm (0.020 in)



ⓐ Supporting Points

23) Inspection of Forward Gear and Pinion Gear (A and B Gears)

1. Check teeth and jaw of forward (A) gear and pinion (B) gear and jaw of clutch for cracks and wear. Replace if necessary.



24) Assembly of Drive Shaft

1. Use a press device to install new drive shaft bearing ① to drive shaft ② with the numbered side up.

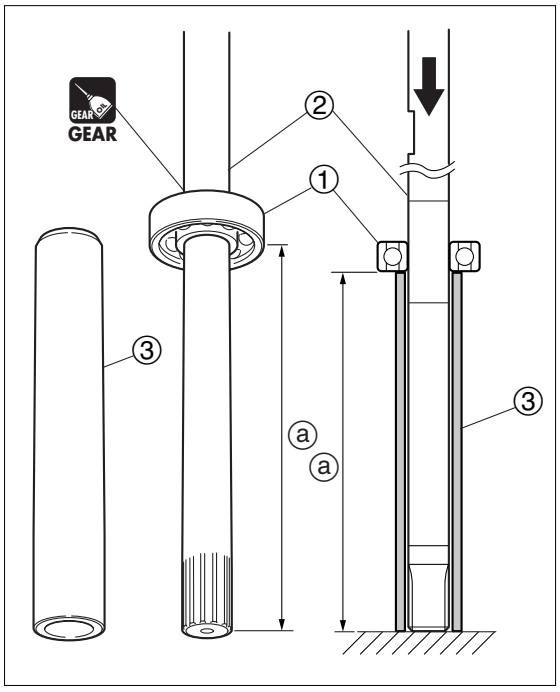
Bearing Install Tool 2 ③ :
P/N. 3AB-99900-0

⚠ CAUTION

Do not reuse bearing. Be sure to replace with new one.

Installation Depth ⓐ :
92.00 mm±0.15 mm (3.6220 in±0.0006 in)

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



① **Do not reuse.**

6

25) Disassembly of Gear Case

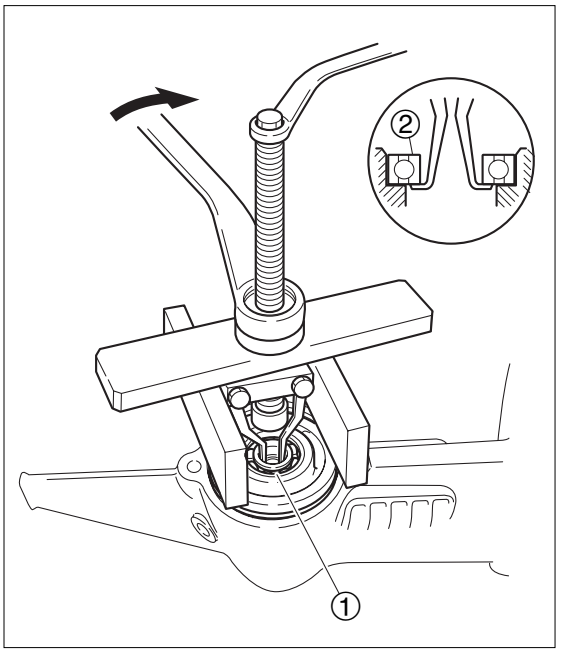
1. Check bearings ① and ② for cracks and generation of abnormal noise. Replace if necessary.

⚠ 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.

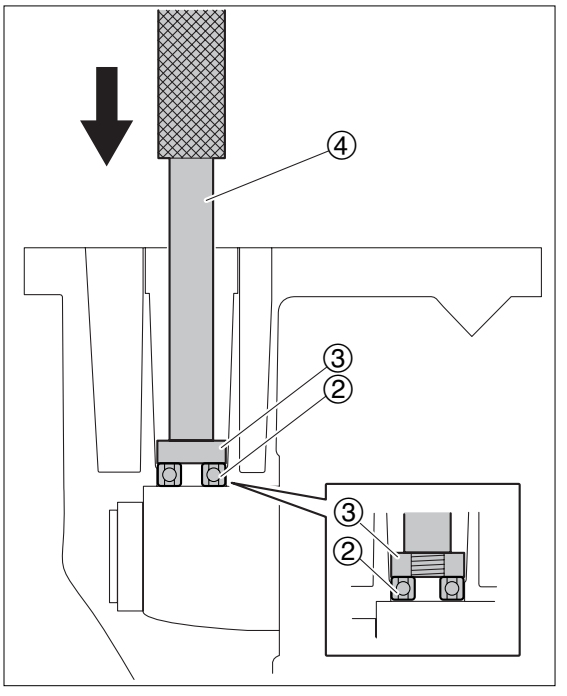
2. Remove bearing ① by using commercially available bearing puller.



① **Do not reuse.**

3. Remove bearing ②.

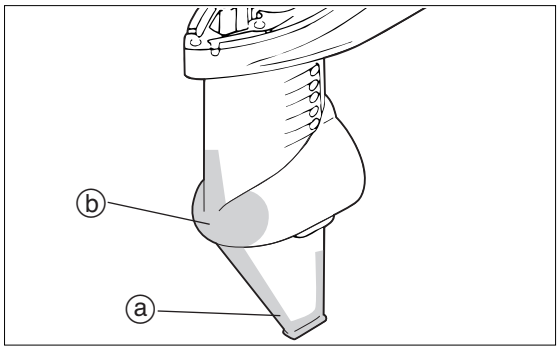
Bearing Attachment 3 ③ :
P/N. 3AB-99905-0
Driver Rod 3 ④ :
P/N. 3AB-99702-0



② **Do not reuse.**

26) Inspection of Gear Case

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



27) Assembly of Gear Case

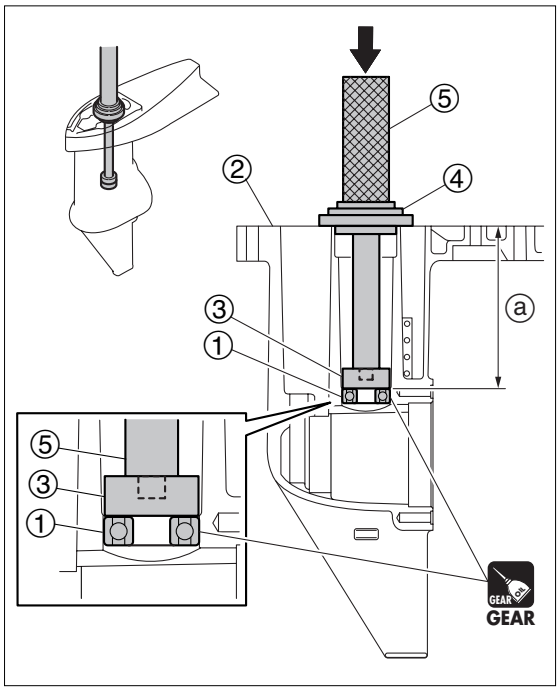
Do not reuse removed bearing.

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

Installation Depth ⓐ :
88.10 mm±0.05 mm (3.4685 in±0.0020 in)

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

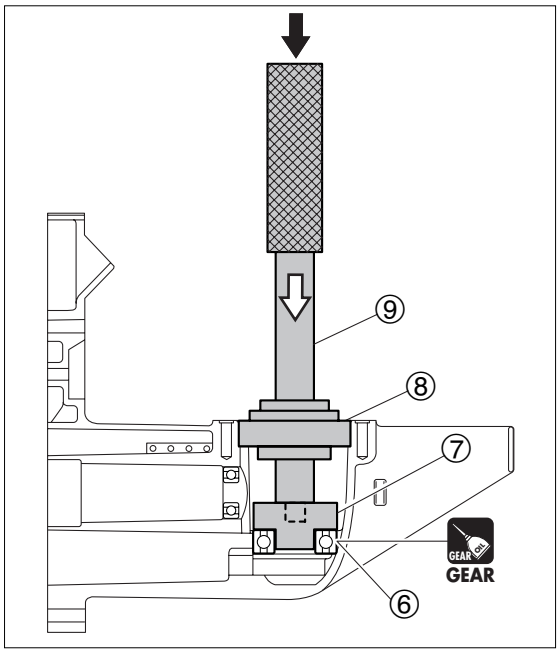
Bearing Attachment 3 ③ :
P/N. 3AB-99905-0
Center Plate 3 ④ :
P/N. 3AB-99701-0
Driver Rod 3 ⑤ :
P/N. 3AB-99702-0



① **Do not reuse.**

2. Install new bearing ⑥ with numbered side up.

Bearing Attachment 4 ⑦ :
P/N. 3BV-99905-0
Center Plate 3 ⑧ :
P/N. 3AB-99701-0
Driver Rod 3 ⑨ :
P/N. 3AB-99702-0



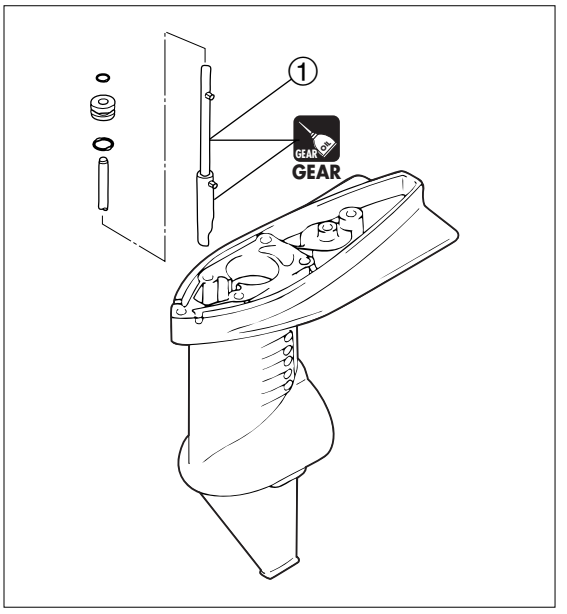
⑥ **Do not reuse.**

6

28) Installation of Clutch Cam and Cam Rod

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

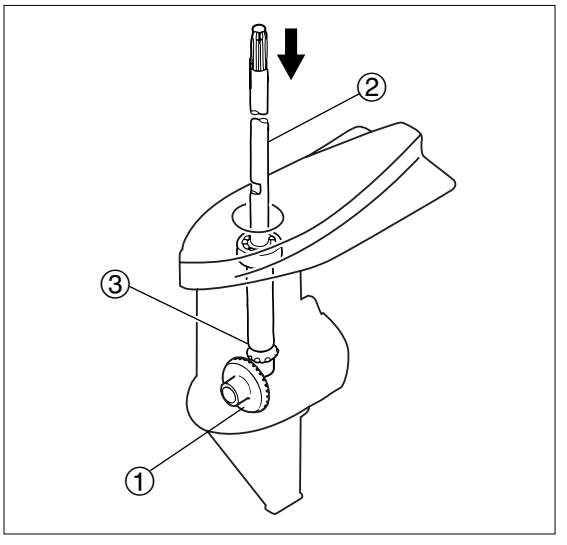
Be careful of direction of cam rod.



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

1. Install removed shims and forward (A) gear ① , and then, drive shaft ass'y ② and pinion (B) gear ③.

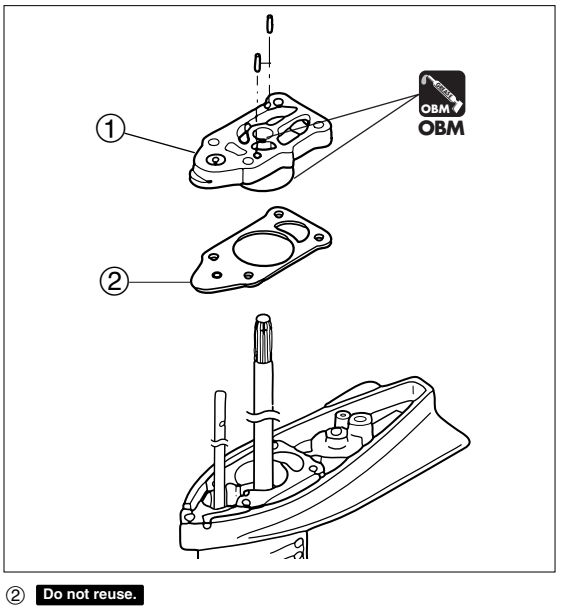
· Replace shim with new one of the same thickness if any deformation or damage is found on removed shim.



30) Installation of Pump Case (Lower)

1. Apply OBM grease to oil seal.

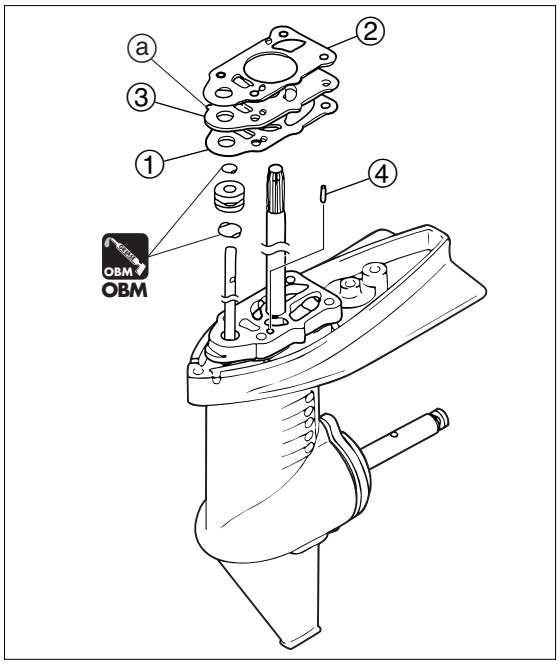
2. Install new gasket ② and pump case (lower) ①.



② **Do not reuse.**

31) Installation of Water Pump

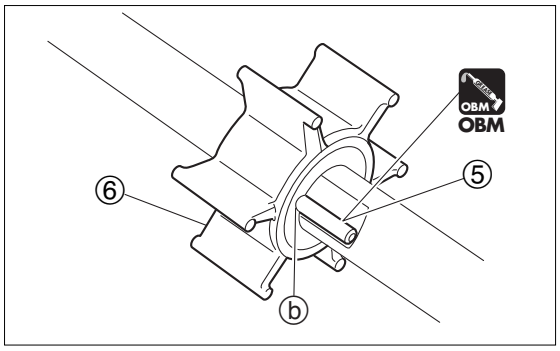
1. Attach new gaskets ① and ②, water pump guide plate ③ and dowel pin ④.



ⓐ Projection ① and ② **Do not reuse.**

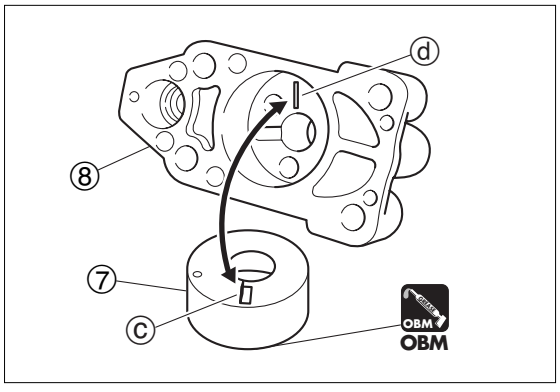
2. Attach key ⑤ to drive shaft.

3. Bring impeller ⑥ groove ⓑ to key ⑤ and install impeller to drive shaft.



· Apply grease to the key to prevent it from dropping when attaching.

4. Attach pump case liner ⑦ to pump case (upper) ⑧, and apply grease to interior of pump case liner ⑦.



Bring pump case liner projection ⓒ to pump case (upper) groove ⓓ.

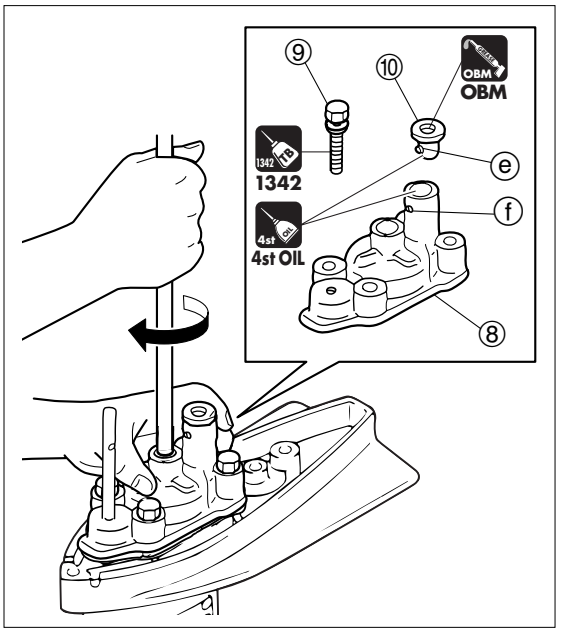
5. Install pump case (upper) ass'y ⑧ on the gear case, and tighten bolts ⑨ in two or three steps to specified torque.

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]

1342

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



32) Installation of Propeller Shaft Housing

1. Check that OBM grease is applied to housing ass'y ① oil seal ②.

2. Install propeller shaft ass'y ③ to propeller shaft housing ass'y ①.

3. Apply grease to new O-ring ④ and install it.

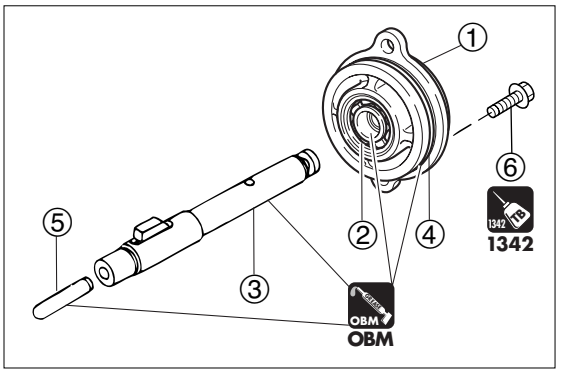
4. Apply grease to clutch push rod ⑤ and install it to propeller shaft ass'y ③.

5. Attach propeller shaft housing ass'y ④ 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]

1342

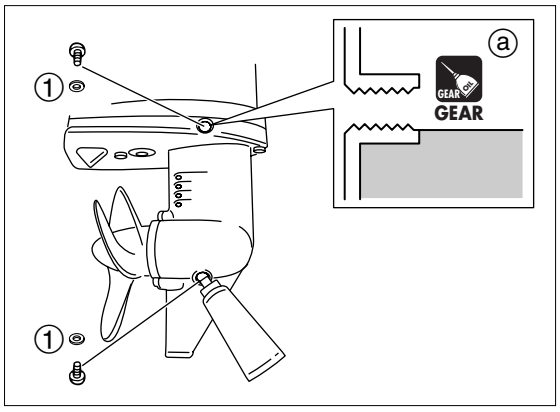
· Apply grease to clutch push rod to prevent it from dropping when attaching.
· When installing housing ass'y to gear case, tighten upper and lower bolts in 2 or 3 steps evenly to specified torque.



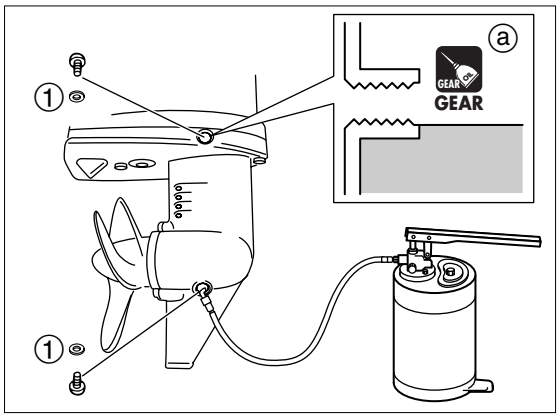
33) Filling with Gear Oil

1. Feed gear oil to specified quantity ⓐ. "Refer to Chapter 3."

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



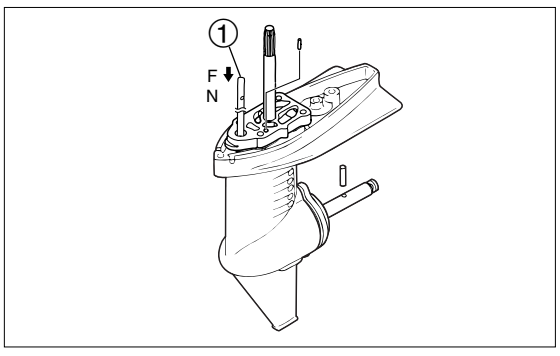
① Gasket **Do not reuse.**



① Gasket **Do not reuse.**

34) Installation of Lower Unit

1. Set cam rod ① to neutral (N) position.



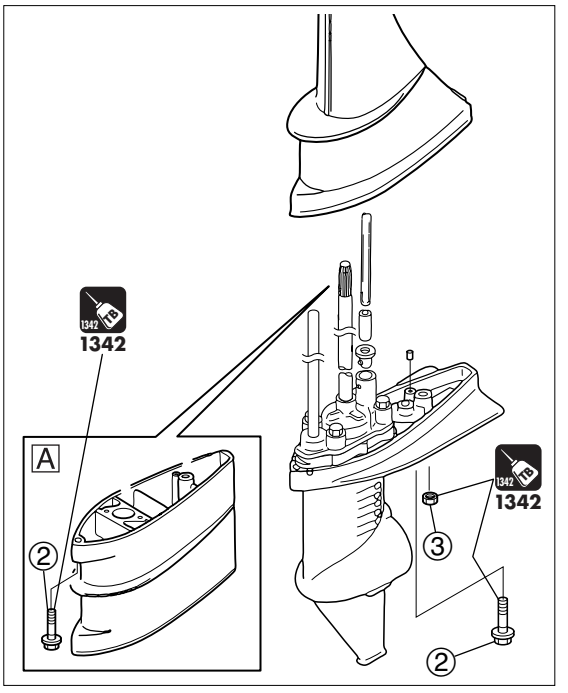
6

2. Attach lower unit ass'y to drive shaft housing, and tighten lower unit 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 Installation Bolts ② :
10 N · m (7 lb · ft) [1.0 kgf · m]
Lower Unit Installation Nut ③ :
6 N · m (4 lb · ft) [0.6 kgf · m]

1342



A L-Transom Model

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

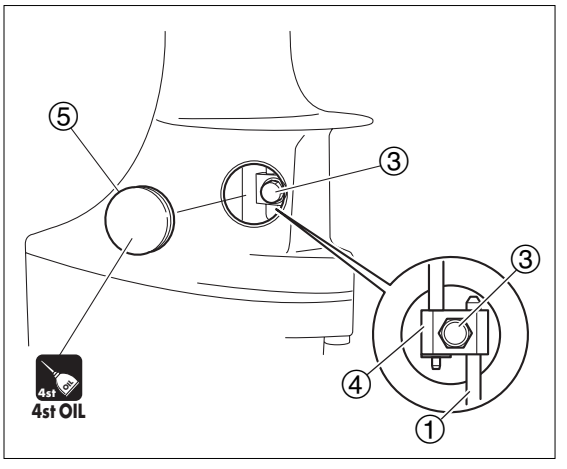
Joint Bolt ③ :
6 N · m (4 lb · ft) [0.6 kgf · m]

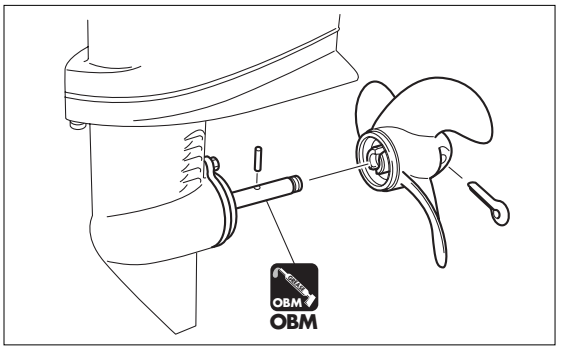
4. Attach grommet ⑤ to drive shaft housing.

5. Attach shear pin and propeller, insert split pin, and bend the tip.

⚠ WARNING

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





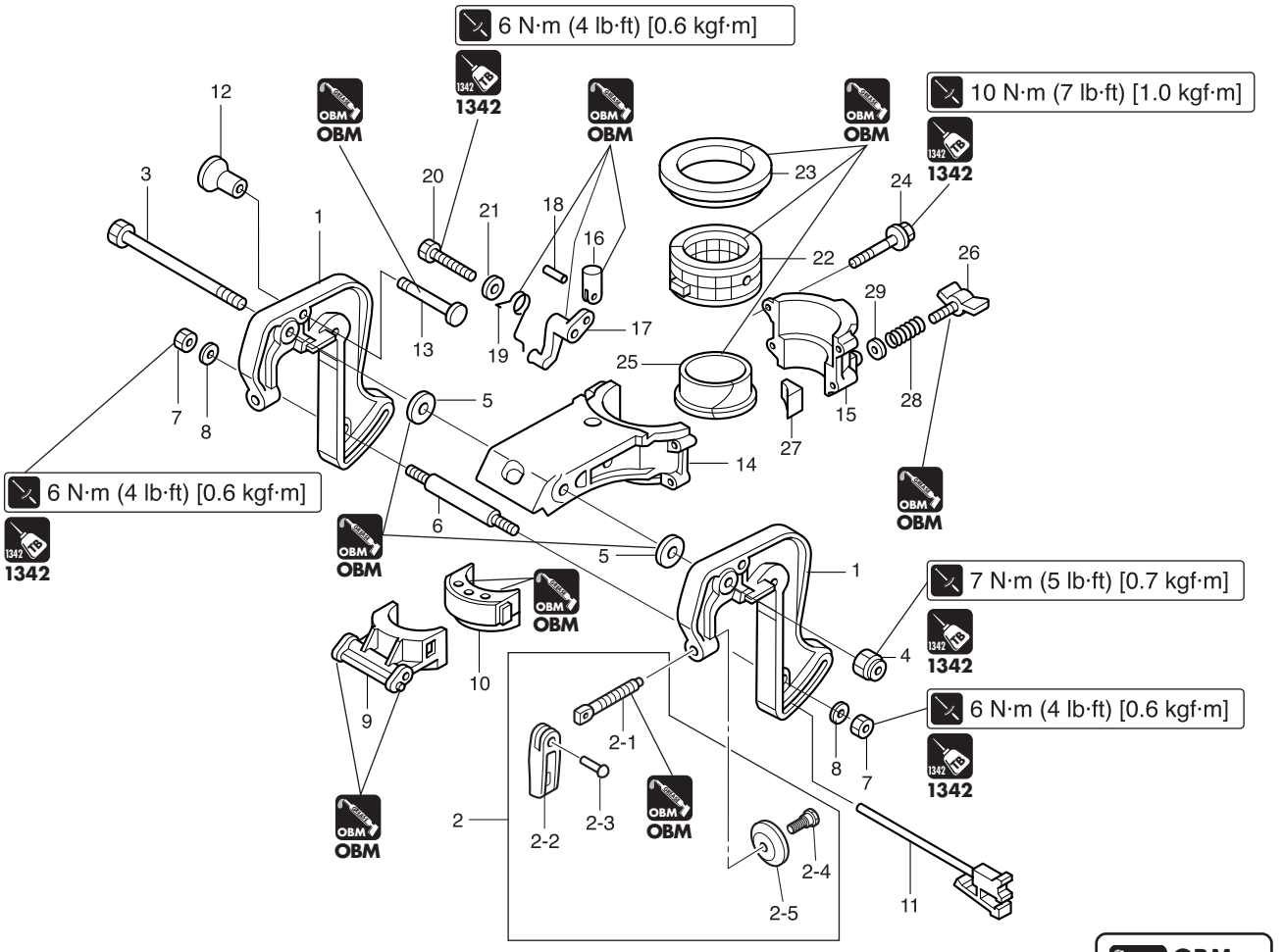
7

Bracket

1. Parts Layout

P/L Fig. 13

Clamp Bracket & Swivel Bracket

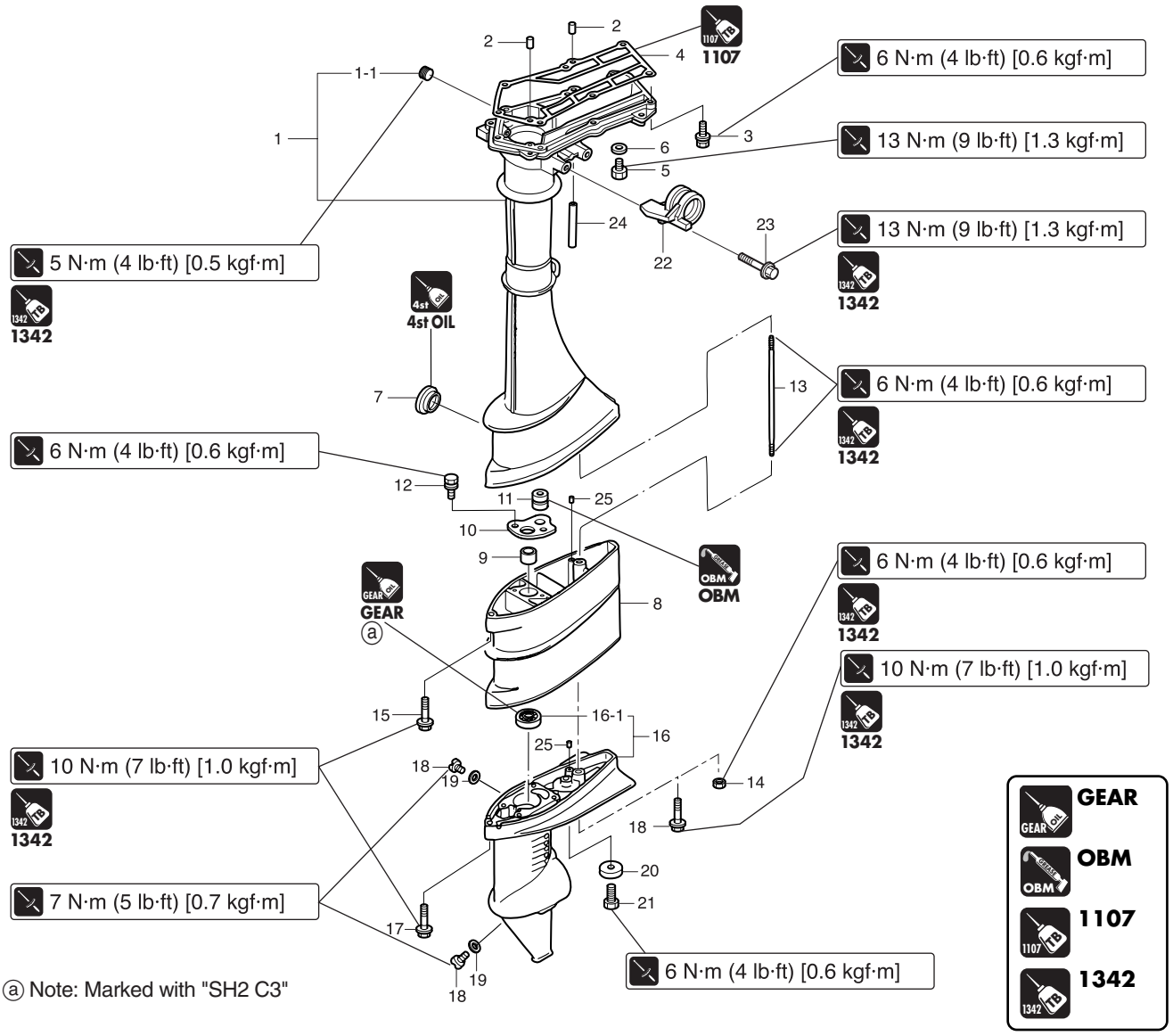


Ref. No.	Part Name	Q'ty	Remarks
1	Clamp Bracket	2	
2	Clamp Screw Ass'y	2	
2-1	Clamp Screw	2	
2-2	Clamp Screw Handle	2	
2-3	Rivet, 3-22	2	Do not reuse.
2-4	Shoulder Bolt	2	for repair
2-5	Clamp Screw Pad	2	
3	Bolt, 8-122	1	M8 L=122mm
4	Nylon Nut, 8-P1.25	1	M8
5	Washer, 8.5-28-1	2	
6	Distance Piece	1	M6
7	Nut	2	M6
8	Washer	2	M6 L=12mm
9	Thrust Supporter	1	
10	Damper (Lower)	1	
11	Thrust Rod	1	
12	Tilt Stopper Knob	1	Do not reuse.
13	Tilt Stopper	1	
14	Swivel Bracket "A"	1	
15	Swivel Bracket "B"	1	
16	Steering Stopper	1	
17	Stopper Lever	1	
18	Spring Pin, 2-12	1	Do not reuse.
19	Stopper Lever Spring	1	

Ref. No.	Part Name	Q'ty	Remarks
20	Bolt	1	M6 L=50mm
21	Washer	1	
22	Steering Busing	1	
23	Thrust Bushing	1	
24	Bolt, 6-35 Pre-coated	4	M6 L=35mm
25	Pivot Bushing	1	
26	Friction Plate Screw	1	
27	Friction Plate	1	
28	Friction Spring	1	
29	Washer	1	

Drive Shaft Housing & Gear Case

P/L Fig. 9



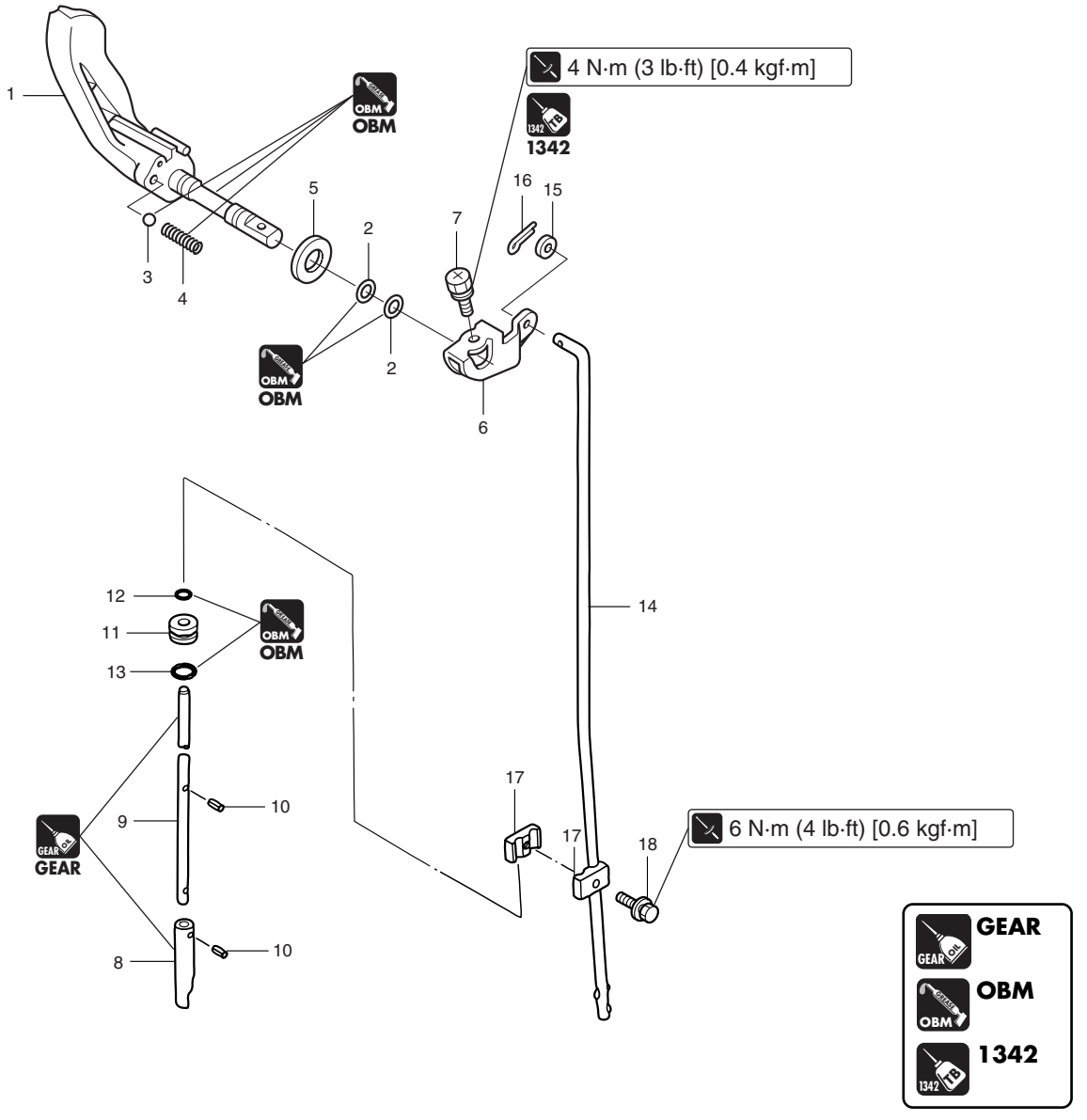
ⓐ Note: Marked with "SH2 C3"

Ref. No.	Description	Q'ty	Remarks
1	Drive Shaft Housing "S"	1	
1-1	Exhaust Plug	1	PT 1/8
2	Dowel Pin, 6-12	2	
3	Bolt	7	M6 L=30mm
4	Drive Shaft Housing Gasket	1	Do not reuse.
5	Water Plug	1	M8 P1.25
6	Gasket, 8.1-15-1	1	Do not reuse.
7	Grommet, 29-3	1	
8	Extension Housing " L"	1	for "L"
9	Drive Shaft Bushing	1	
10	Drive Shaft Bushing Stopper	1	
11	Grommet, 13-2	1	
12	Bolt	2	M6 L=12mm
13	Stud Bolt, 6-171	1	M6 L=171mm for "L"
14	Nut	1	M6 for "L"

Ref. No.	Description	Q'ty	Remarks
15	Bolt, 6-30 Pre-coated	1	M6 L=30mm for "L"
16	Gear Case	1	
16-1	Ball Bearing, 6000	1	Do not reuse.
17	Bolt, 6-30 Pre-coated	1	M6 L=30mm
18	Bolt, 6-30 Pre-coated	1	for "L"
19	Oil Plug	2	ø6
20	Gasket, 8.1-15-1	2	Do not reuse.
21	Anode	1	
22	Bolt	1	M6 L=16mm
23	Steering Bracket	1	
24	Bolt	2	M8 L=35mm
25	Rubber Hose	1	
26	Dowel Pin, 6-12	2	

Shift

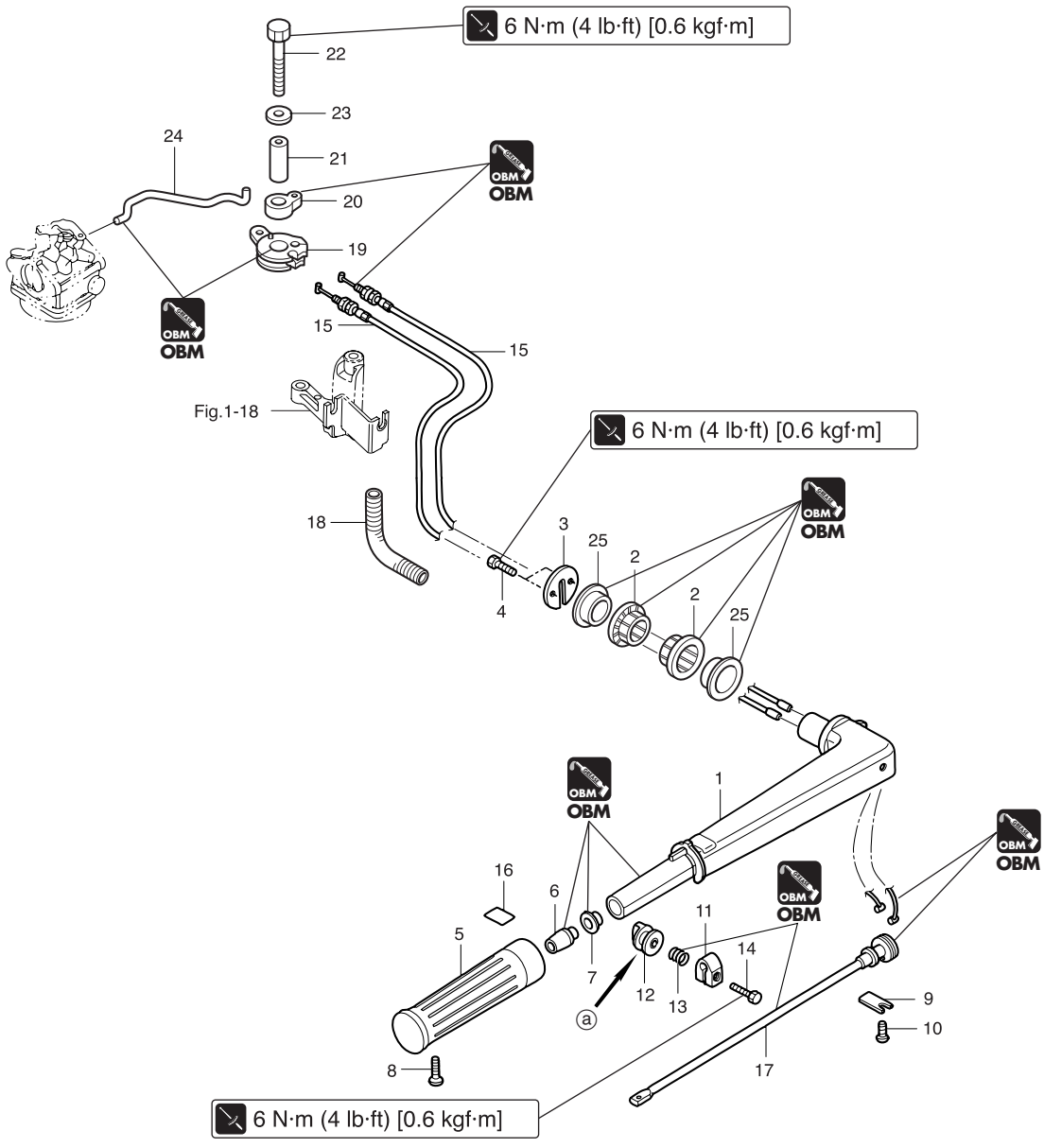
P/L Fig. 12



Ref. No.	Part Name	Q'ty	Remarks
1	Shift Lever	1	
2	O-Ring, 1.9-6.8	2	Do not reuse.
3	Ceramic Ball, 7.7	1	
4	Shift Lever Stopper Spring	1	
5	Washer, 10.5-18-1.5	1	
6	Shift Rod Lever	1	
7	Bolt	1	M6 L=12mm
8	Clutch Cam	1	
9	Cam Rod "S"	1	for "S"
	Cam Rod "L"	1	for "L"
10	Spring Pin, 3-8	2	Do not reuse.
11	Cam Rod Bushing	1	
12	O-Ring, 2.5-4.9	1	Do not reuse.
13	O-Ring, 2.4-9.5	1	Do not reuse.
14	Shift Rod	1	
15	Washer	1	
16	Split Pin, 2-12	1	Do not reuse.
17	Shift Rod Joint	1set	
18	Bolt	1	M6 L=16mm

Tiller Handle & Throttle

P/L Fig. 7



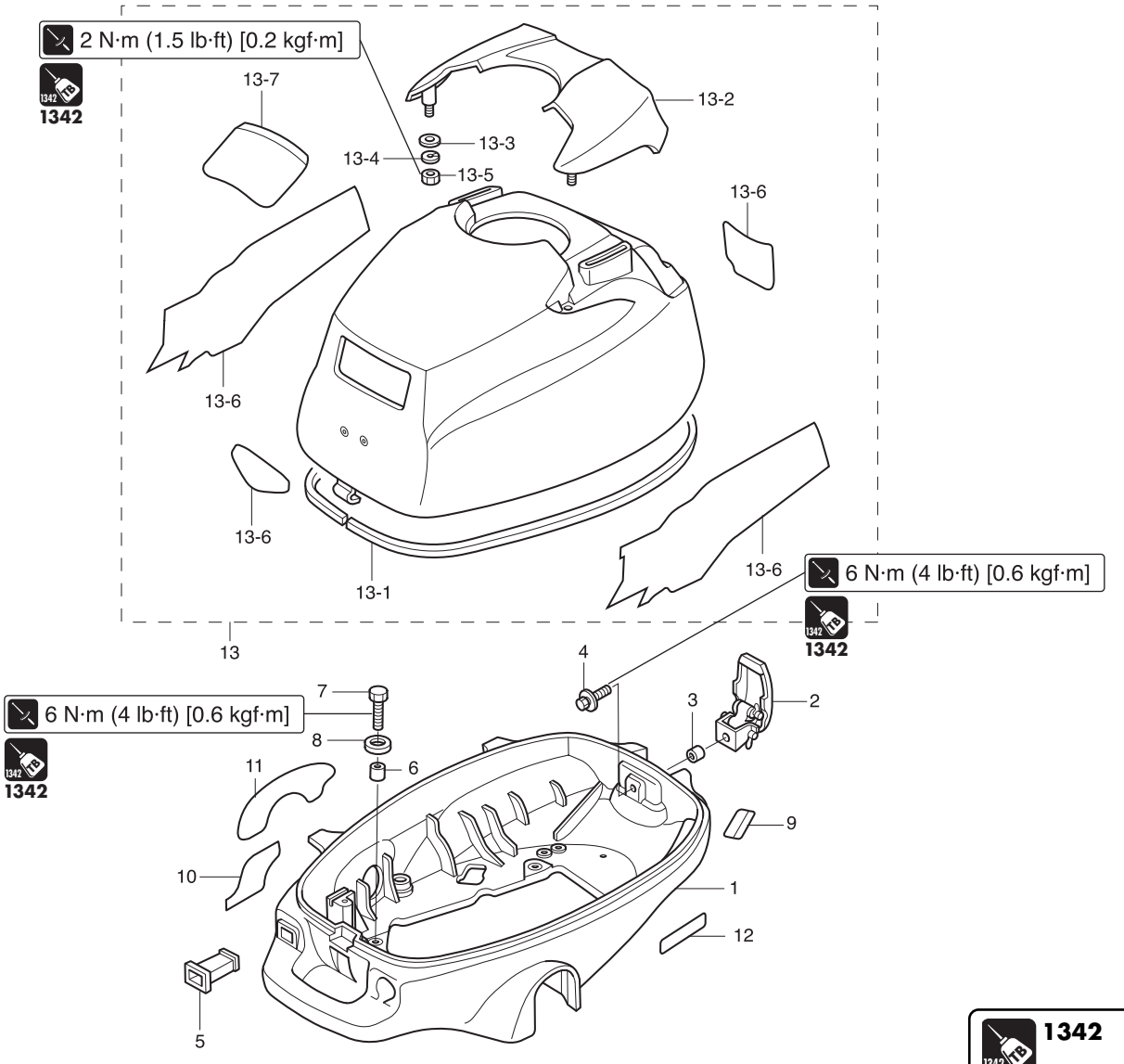
ⓐ Adjust.

Ref. No.	Part Name	Q'ty	Remarks
1	Tiller Handle	1	
2	Tiller Handle Bushing	2	
3	Cover	1	
4	Bolt	2	M6 L=16mm
5	Grip	1	
6	Throttle Shaft Damper	1	
7	Bushing, 14-15.8-7	1	
8	Screw	1	ø5 L=18mm
9	Throttle Shaft Supporter	1	
10	Screw	1	ø6 L=21mm
11	Friction Piece	1	
12	Adjusting Nut	1	
13	Spring	1	
14	Bolt	1	M6 L=25mm

Ref. No.	Part Name	Q'ty	Remarks
15	Throttle Cable	2	
16	Throttle Decal	1	
17	Throttle Shaft	1	
18	Throttle Cable Protector	1	
19	Throttle Drum	1	
20	Throttle Opener	1	
21	Collar, 6.5-10.5-22.6	1	
22	Bolt	1	M6 L=35mm
23	Washer, 6-16-1.5	1	
24	Throttle Rod	1	
25	Tiller Handle Bushing	2	

Cowl

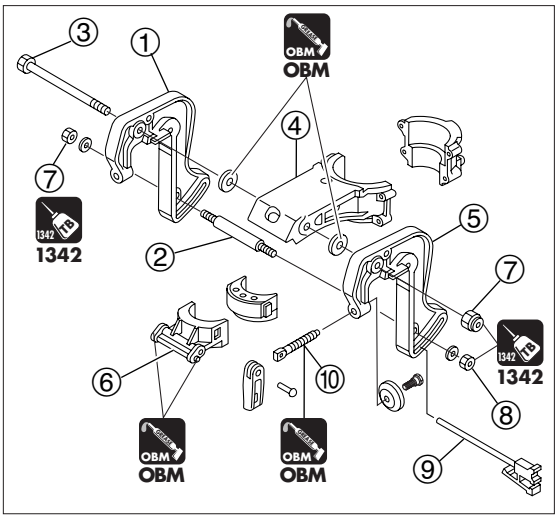
P/L Fig. 15



Ref. No.	Part Name	Q'ty	Remarks
1	Bottom Cowl	1	
2	Cowl Latch	1	
3	Collar, 6.2-9-7.4	1	
4	Bolt	1	M6 L=16mm
5	Choke Rod Bushing	1	
6	Collar, 6.4-10-4.7	4	
7	Bolt	4	M6 L=16mm
8	Washer, 6-16-1.5	4	
9	Spark Plug Decal (with Resistance)	1	
10	Shift Decal (F-N)	1	
11	Fuel Lever Decal	1	
12	Storage Decal	1	
13	Top Cowl	1	
13-1	Top Cowl Seal	1	L=1100
13-2	Tilt Handle	1	
13-3	Washer	4	
13-4	Spring Washer	4	M6
13-5	Nut	4	
13-6	Decal Set	1set	
13-7	Caution Decal "A"	1	

2. Assembling Procedure

1) Assembly of Clamp Bracket



1. Attach distance piece ② and bracket bolt ③ to clamp bracket ①.

2. Assemble swivel bracket ④ and clamp bracket ⑤, thrust supporter ⑥,and tighten nylon nut ⑦ and nut ⑧ to specified torque.

Nylon Nut ⑦ and Bracket Bolt ③ :
7 N · m (5 lb · ft) [0.7 kgf · m]

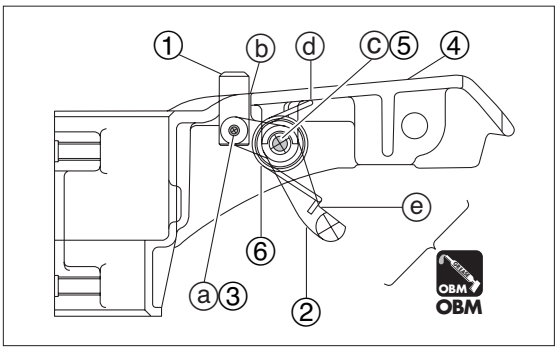
1342

Distance Piece Nut ⑧ :
6 N · m (4 lb · ft) [0.6 kgf · m]

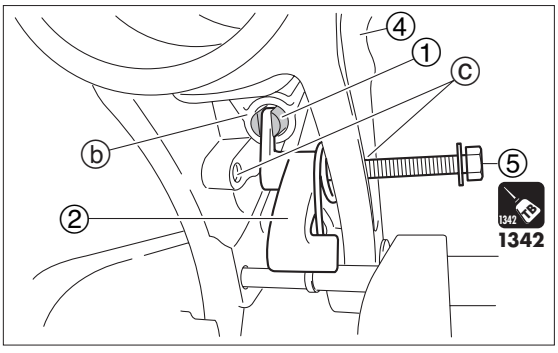
1342

3. Install thrust rod ⑨ and tighten clamp screw ⑩.

2) Installation of Steering Stopper

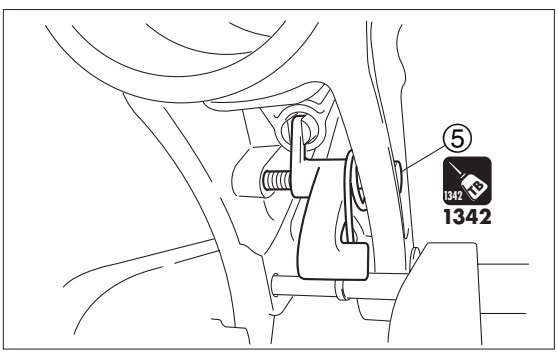


1. Align holes ⓐ of steering stopper ① and stopper lever ②, and press fit pin ③.



2. Put steering stopper ass'y ① into swivel bracket ④ hole ⓑ, and align it with stopper lever ② and swivel bracket ④ holes ⓒ, and insert bolt ⑤.

Hook spring ⑥ on the part ⓔ of stop lever ②, and insert bolt ⑤ while pushing the spring against swivel bracket ④ part ⓓ.



3 Tighten steering stopper bolt ⑤ to specified torque.

Steering Stopper Bolt:
6 N · m (4 lb · ft) [0.6 kgf · m]

1342

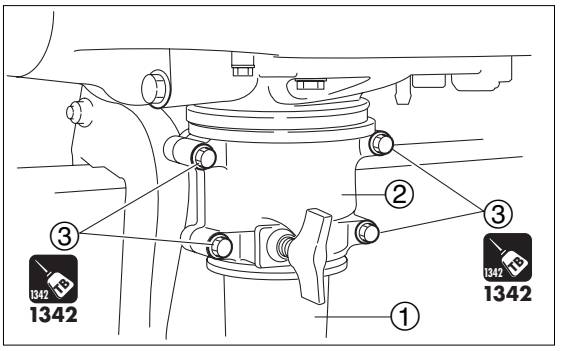
3) Installation of Drive Shaft Housing

1. Install drive shaft housing ① to swivel bracket ② and tighten bolts ③ to specified torque.

Swivel Bracket Bolts ③ :
10 N · m (7 lb · ft) [1.0 kgf · m]

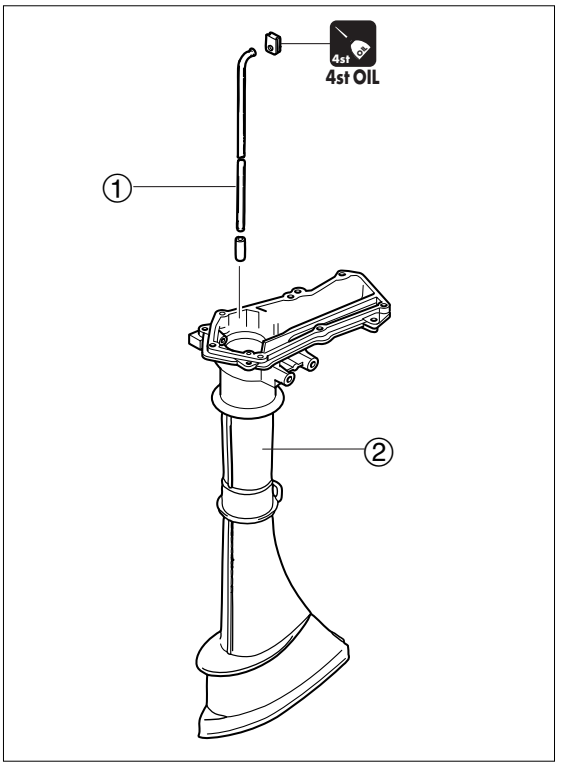
1342

Bring projection steering bushing to dent of swivel bracket when installing the part.



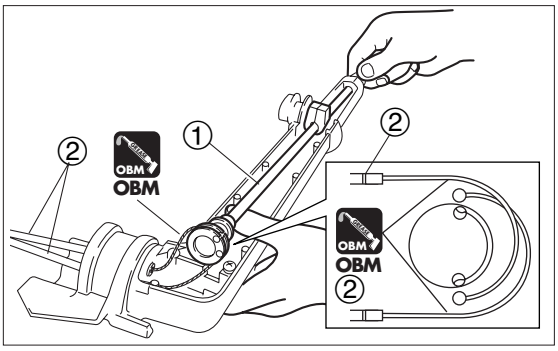
4) Installation of Water Pipe

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



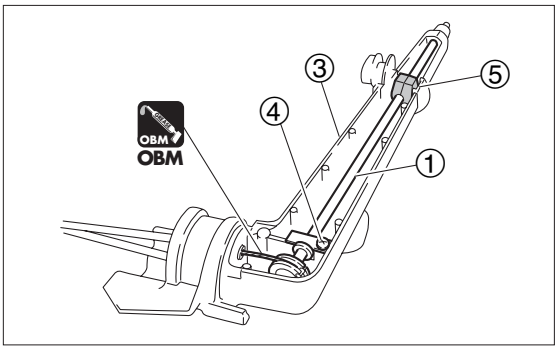
5) Installation of Tiller Handle

1. Attach throttle cable ② to throttle shaft ① as shown.



2. Install throttle shaft ① with throttle cable ② to tiller handle ③, and tighten screw ④ securely.

Be careful of location of throttle friction ⑤.



⑤ Do not apply grease here.

3. Install throttle grip ⑥ to tiller handle.

4. Install bushing ⑦ on the steering bracket ⑧.

5. Attach tiller handle ③ ass'y to steering bracket ⑧, and tighten bolt ⑨ to specified torque.

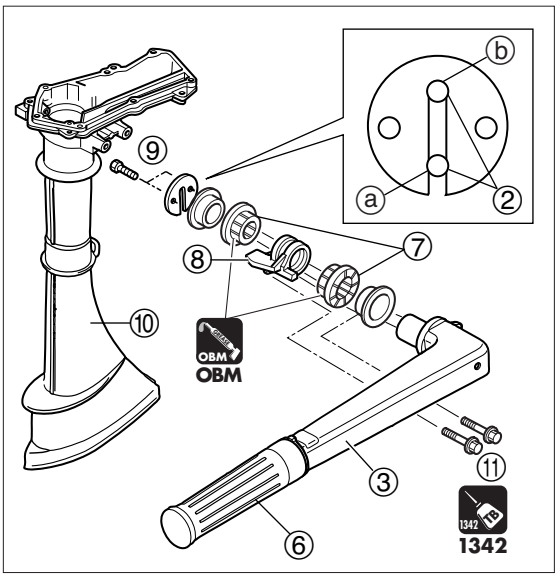
Arrange throttle cable ② as shown.
〈ⓐ : High Speed Side ⓑ : Low Speed Side〉

Cover Bolt ⑨ :
6 N · m (4 lb · ft) [0.6 kgf · m]

6. Install tiller handle ③ and steering bracket ④ ass'y to drive shaft housing ⑩.

Steering Bracket Bolt ⑪ :
13 N · m (9 lb · ft) [1.3 kgf · m]

1342

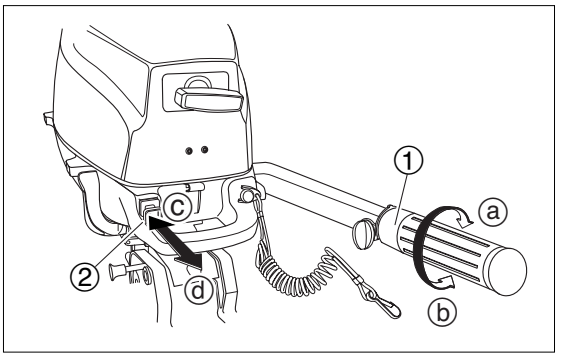


7

6) Adjustment of Throttle Cable

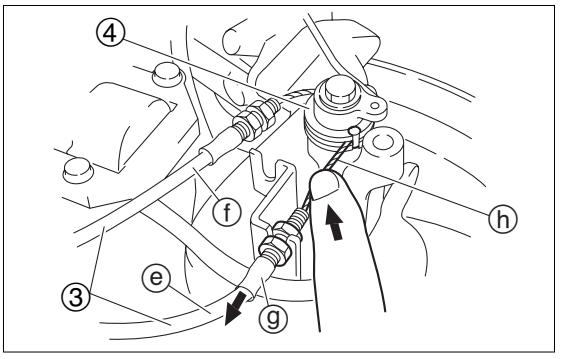
1. Turn throttle grip ① to full close position ⓐ.

2. Pull choke rod ② fully ⓓ.



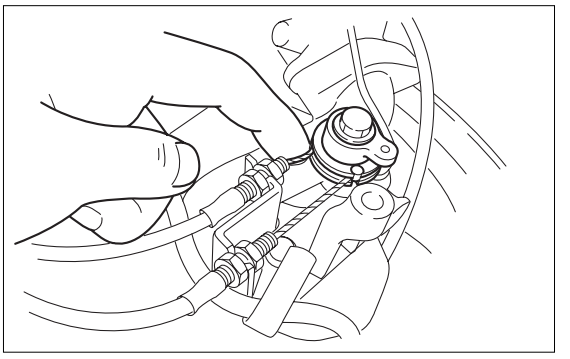
3. Attach throttle cable ③ to throttle drum ④ taking care of positions of low speed side ⓔ and high speed side ⓕ.

4. Pull outer cable ⓖ of throttle cable ③ to the side shown with the arrow by hand, and lock it with the nut while applying tension to the cable.



> Push inner cable ⓗ with a finger to check that the cable deflects approximately 1mm (0.04in) at the center.

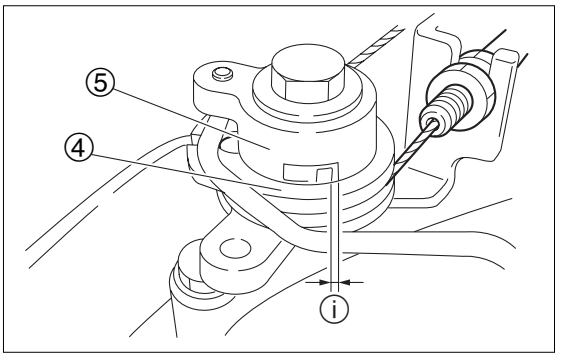
5. Attach high speed side ⓕ cable and low speed side ⓔ cable by using the same way.



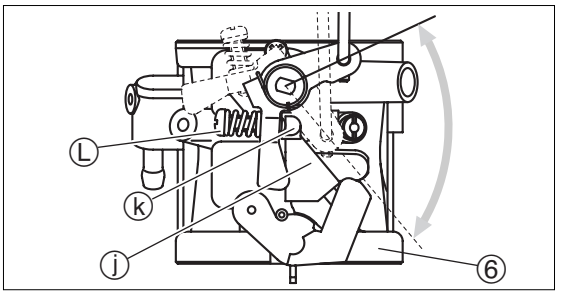
6. Push back choke rod ② fully ⓒ. (wide open choke)

7. Turn throttle grip ① to full close position ⓐ.

> Check that the gap ⓘ between the projection of throttle drum ④ and dent of throttle opener ⑤ is within the range from 0.5 - 1.0 mm (0.020 - 0.040 in).

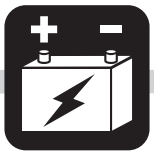


8. Turn throttle grip ① from full close position ⓐ to full open position ⓑ, and check that the throttle lever of carburetor ⑥ touches the full open stopper ⓙ. Then, return the throttle grip ① from full open position ⓑ to full close position ⓐ, and check that the throttle lever of carburetor touches the full close stopper ⓚ (throttle stop screw Ⓛ).

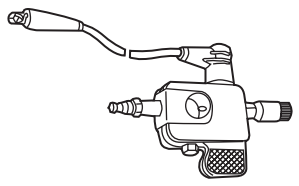


8

Electrical System



1. Special Tools



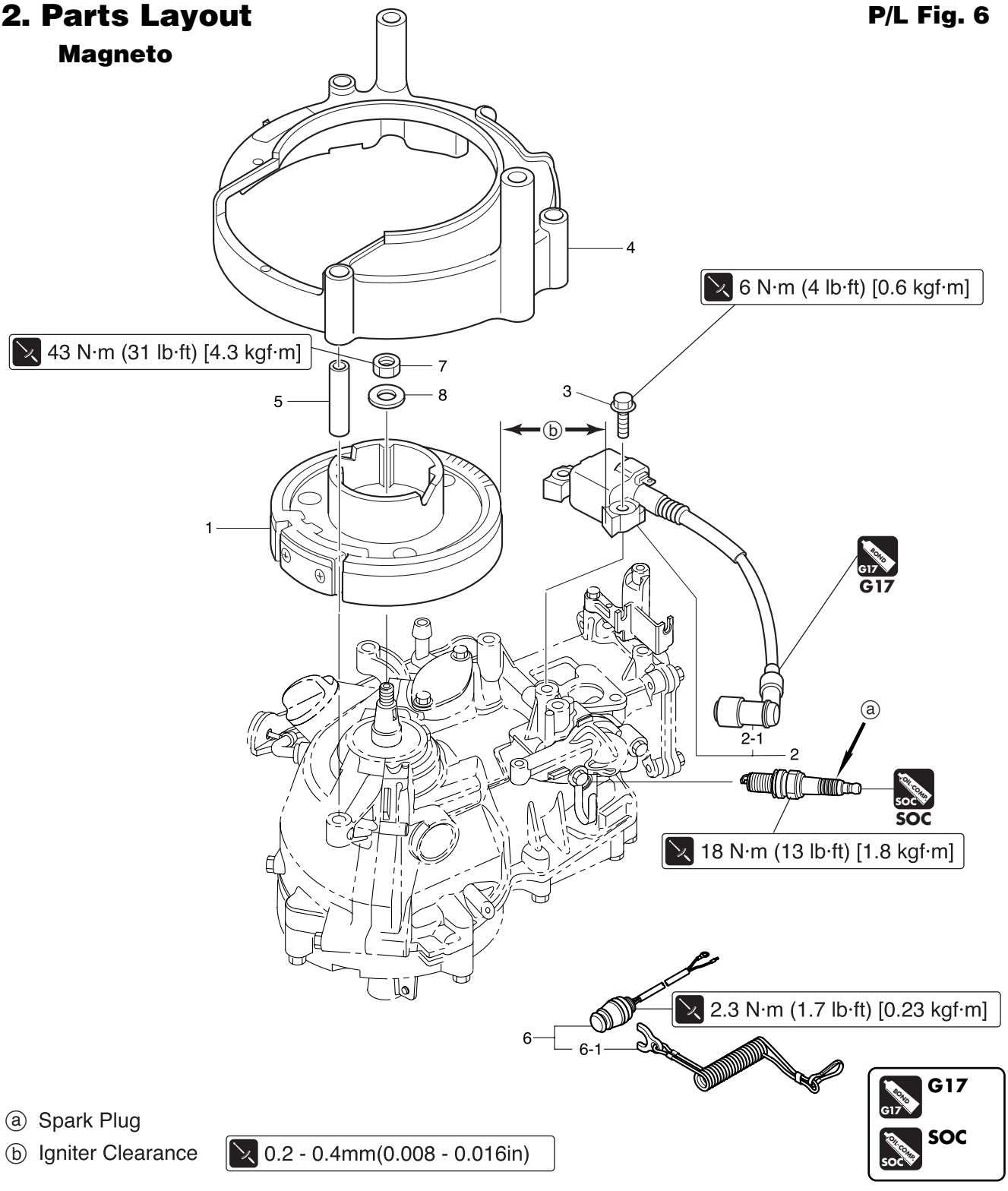
Spark Tester
P/N. 3F3-72540-0

Inspecting sparks

2. Parts Layout

P/L Fig. 6

Magneto



ⓐ Spark Plug

ⓑ Igniter Clearance 0.2 - 0.4mm(0.008 - 0.016in)

Ref. No.	Part Name	Q'ty	Remarks
1	Flywheel	1	
2	Igniter	1	
2-1	Plug Cap (with Resistance)	1	
3	Bolt	2	M6 L=20mm
4	Flywheel Cover	1	
5	Collar, 6.2-9-35	3	
6	Stop Switch	1	
6-1	Stop Switch Lanyard	1	
7	Magneto Nut (10P-1.25)	1	M10
8	Washer	1	

3. Ignition System and Ignition Control System

1) Inspection of Ignition Spark

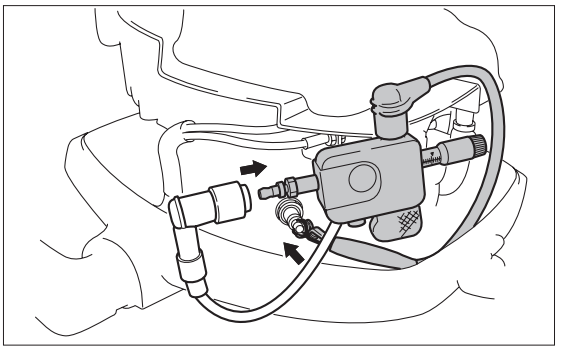
1. Disconnect plug cap from spark plug.

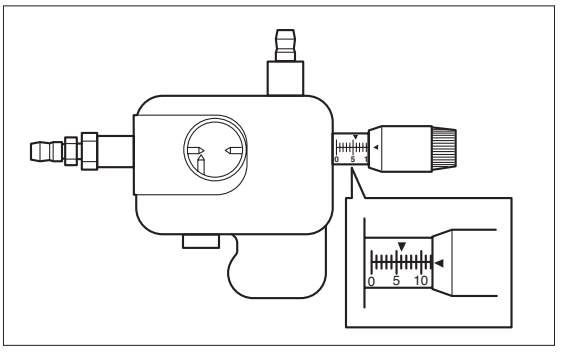
2. Connect plug cap to spark tester.

3. Connect spark tester clip to spark plug tip electrode.

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

Spark Performance:
5mm (0.2in) or over



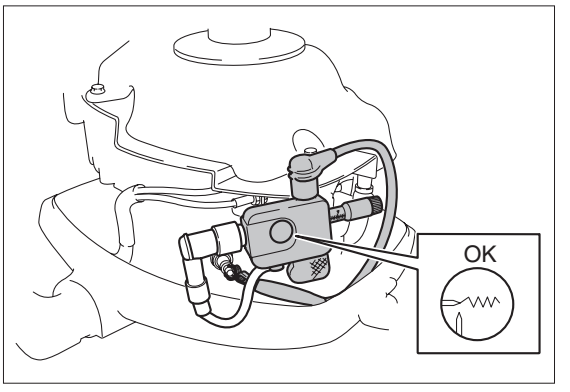


4. Start engine and check spark. If spark is weak, check igniter (including igniter clearance) and/or plug cap.

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.**

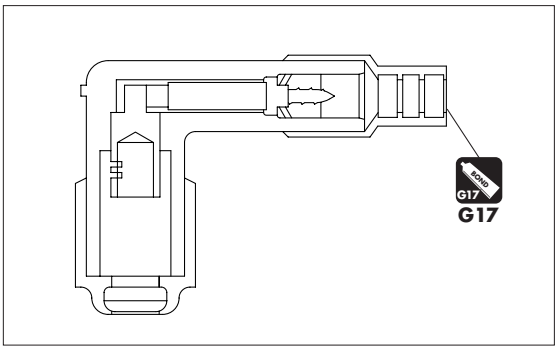


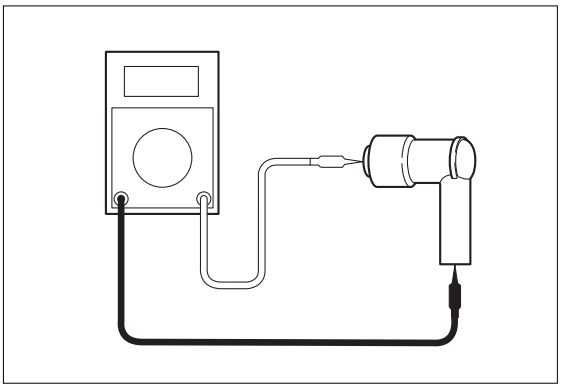
2) Inspection of Plug Cap

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





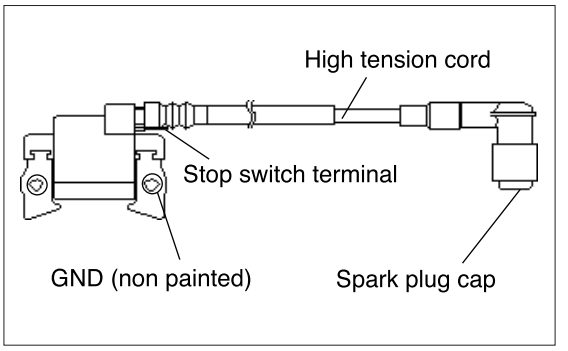
8

3) Inspection of Igniter

1. Remove igniter, and turn plug cap counterclockwise to remove it from high tension cord.

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

Remove the part and test it as a separate unit.



Igniter tester check chart

		Tester "+" terminal			
		Stop terminal	GND	High tension cord	Spark plug cap
Tester "—" terminal	Stop terminal		∞	∞	∞
	GND	13.8 kΩ		(8 Ω)	(12.8 kΩ)
	High tension cord	28 kΩ	8 Ω		—
	Spark plug cap	(34 kΩ)	(12.8 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.

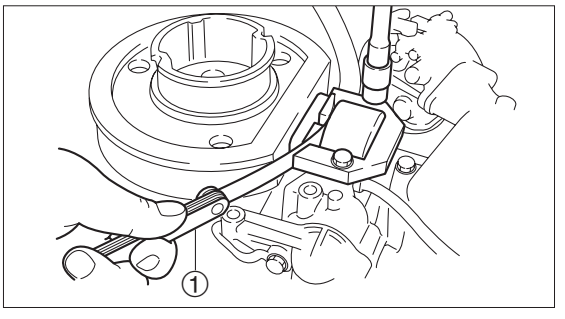
3. Install plug cap onto high tension cord by twisting clockwise.

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

Thickness Gauge ①:
P/N. 353-72251-0

Igniter Clearance:
0.2 - 0.4mm(0.008 - 0.016in)

Igniter Bolts:
6 N · m (4 lb · ft) [0.6 kgf · m]



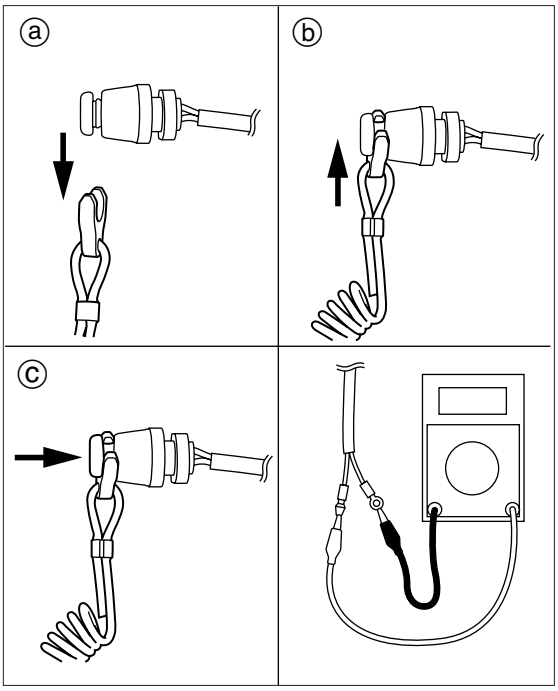
5. Connect igniter lead to stop switch.

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. ⓒ	○———	———○



9

Troubleshooting

Troubleshooting

1.Troubleshooting List

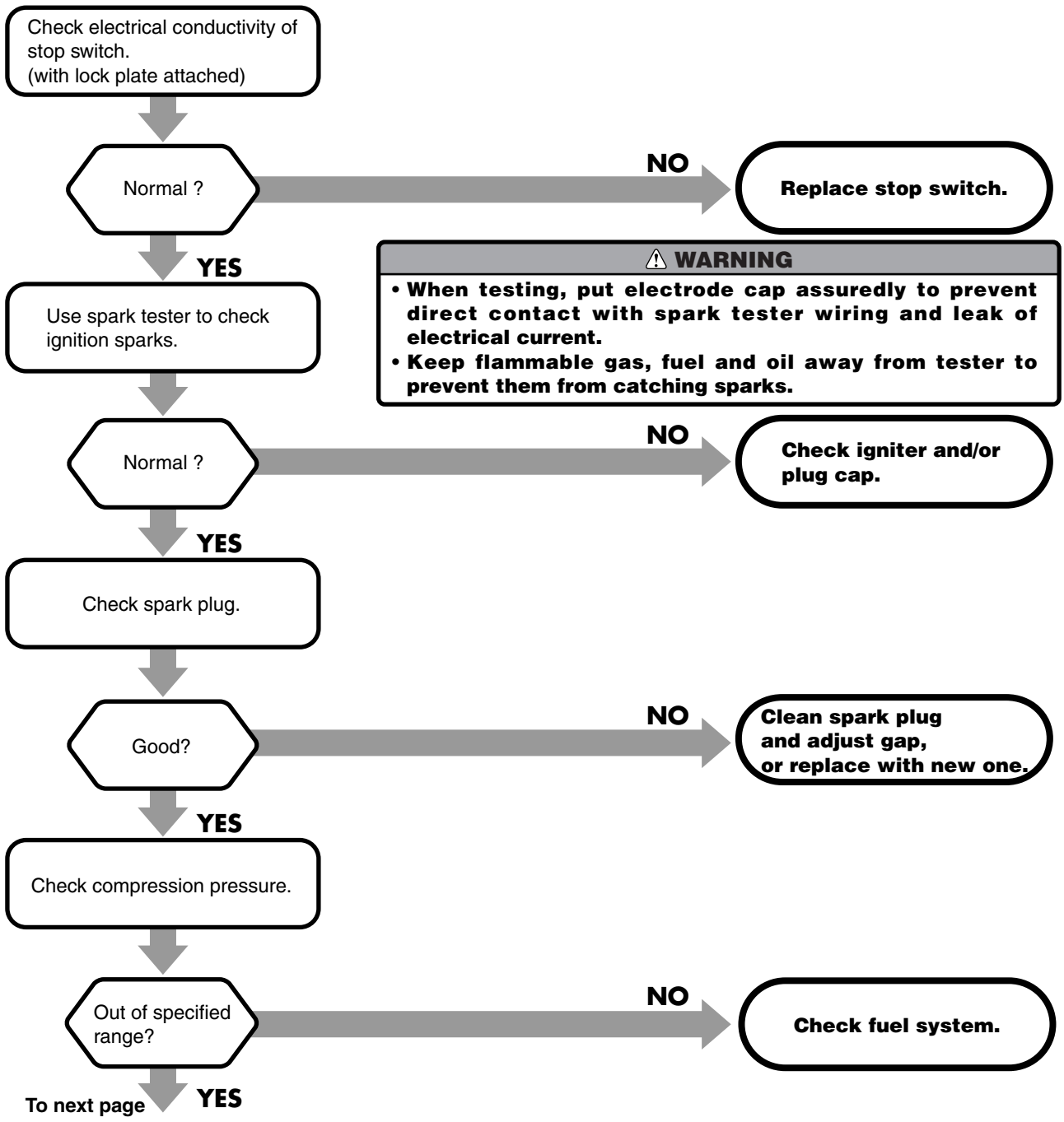
	Engine will not start.	Engine stalls immediately after starting.	Idles abnormally.	Defective acceleration.	Engine speed is very high causing high speed ESG to operate.	Engine speed is low.	Boat cannot run at high speed.	Engine overheats.	Probable Cause
Fuel & Lubrication System	○	○							Fuel level is low in the tank.
	○	○	○	○		○	○	○	Fuel system connection is incomplete.
	○	○	○	○		○	○	○	Fuel system sucks air.
	○	○	○	○		○	○		Fuel pipe is twisted.
	○	○	○	○		○	○	○	Air vent screw is closed.
	○	○	○	○		○	○	○	Fuel cock or carburetor is clogged.
	○	○	○	○			○	○	Low quality gasoline
	○	○	○	○					Fuel is fed excessively.
	○	○	○	○		○	○	○	Carburetor is maintained poorly.
			○	○		○	○	○	Engine oil is deteriorated.
			○	○		○	○		Engine oil level is too high.
								○	Engine oil lacks.
Ignition System	○	○	○	○		○	○	○	Use of spark plugs not specified
	○	○	○	○		○	○		Spark plug carbon deposit or bridge
	○	○	○	○		○	○		No sparks or weak spark
	○								Stop switch short-circuited
	○								Stop switch lock is not put.
	○	○	○	○		○	○		Ignition timing is not properly adjusted.
Compression	○	○	○	○		○	○		Valve timing is wrong.
	○	○	○	○		○	○		Valve clearance is wrong.
	○	○	○	○			○		Valve seat sealing is defective.
	○	○	○	○		○	○		Piston, piston ring and/or cylinder is worn excessively.
			○					○	Combustion chamber carbon deposition is too much.
			○	○			○	○	Spark plug is loose.
Others			○				○	○	(Cooling water is lacking.) Water pump is defective or clogged.
			○				○	○	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.

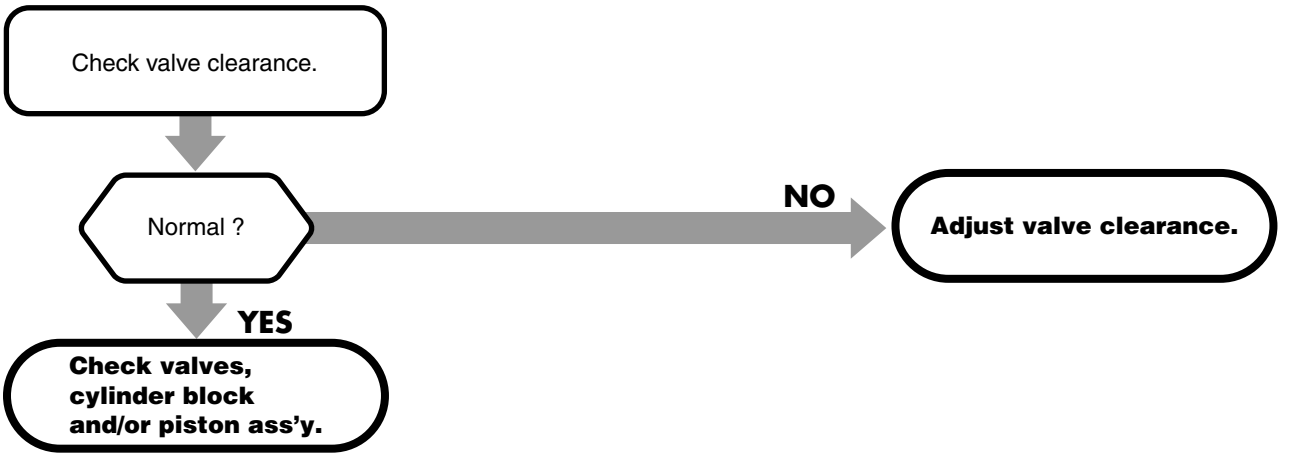
Before working on the outboard motor, check the hull, rigging, installation of outboard motor, fuel level, and wire connections. For mechanical troubleshooting, refer to relevant troubleshooting section in this chapter. For checking and servicing outboard motor, refer to service procedures described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

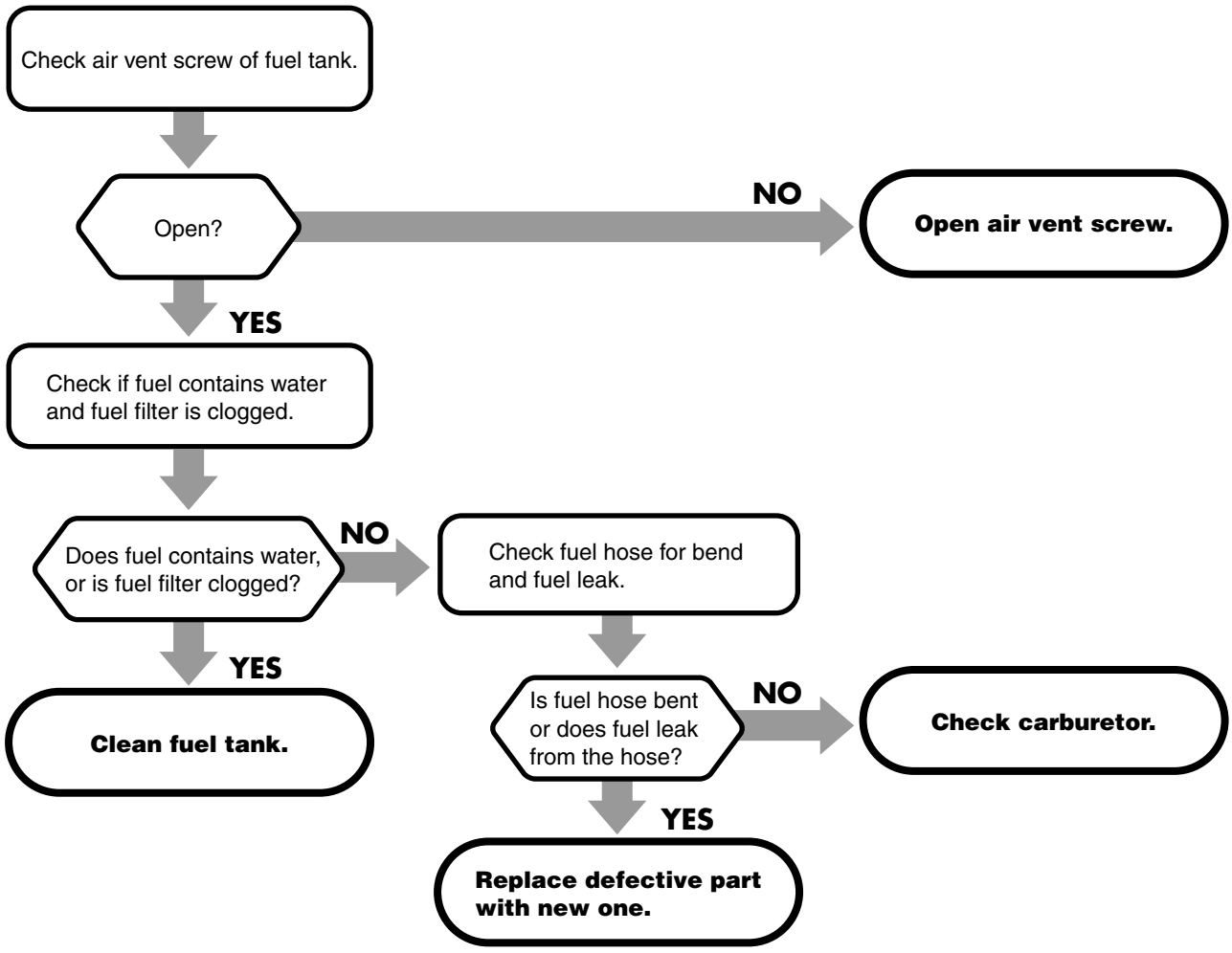



Check valve clearance.
Normal ?
NO
Adjust valve clearance.
YES
Check valves,
cylinder block
and/or piston ass'y.

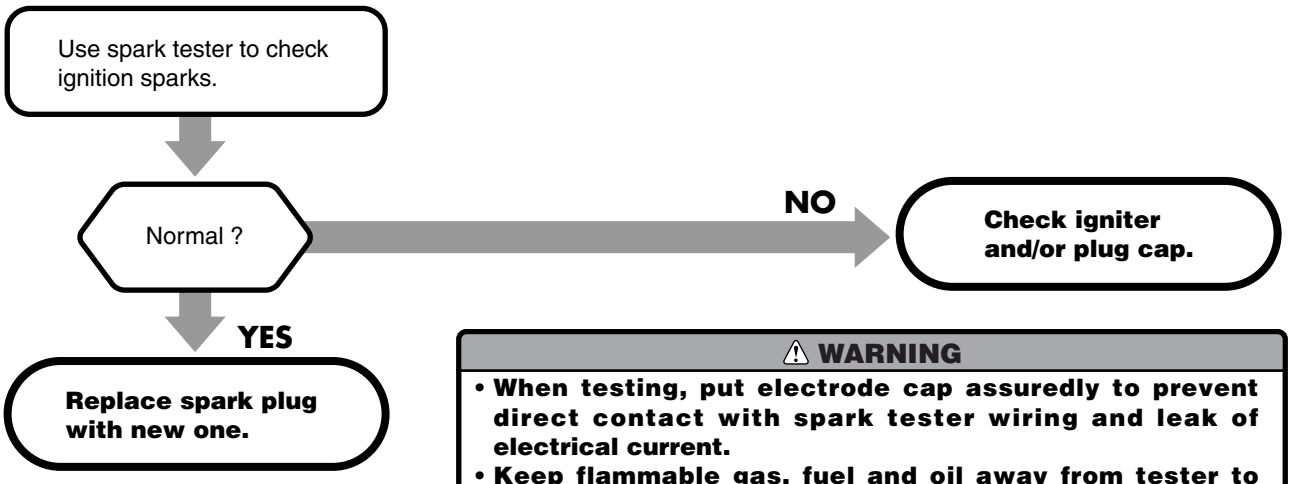
Trouble 2 **Engine starts but stalls soon.**

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

Fuel System



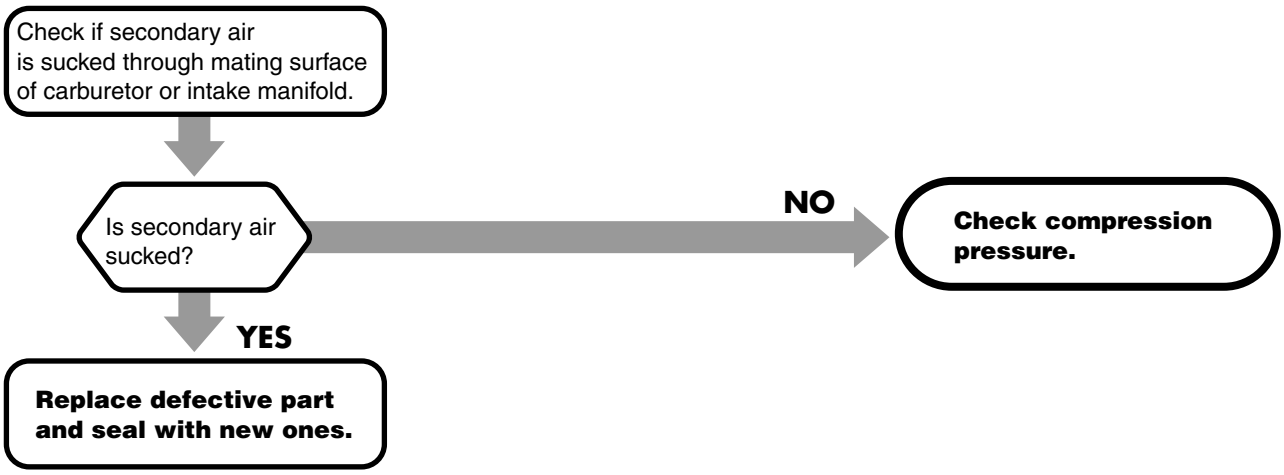
Ignition System



⚠ WARNING

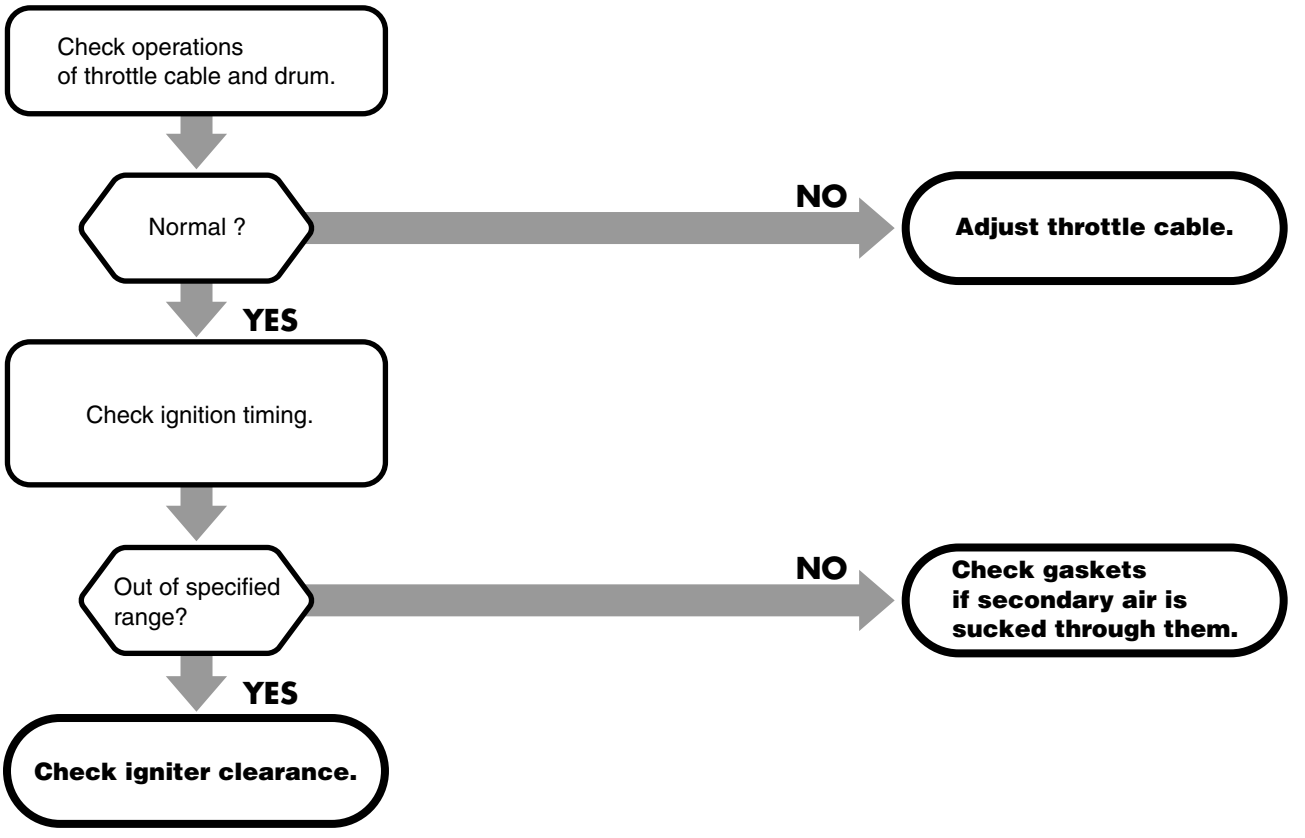
- **When testing, put electrode cap assuredly to prevent direct contact with spark tester wiring and leak of electrical current.**
- **Keep flammable gas, fuel and oil away from tester to prevent them from catching sparks.**

Compression Pressure



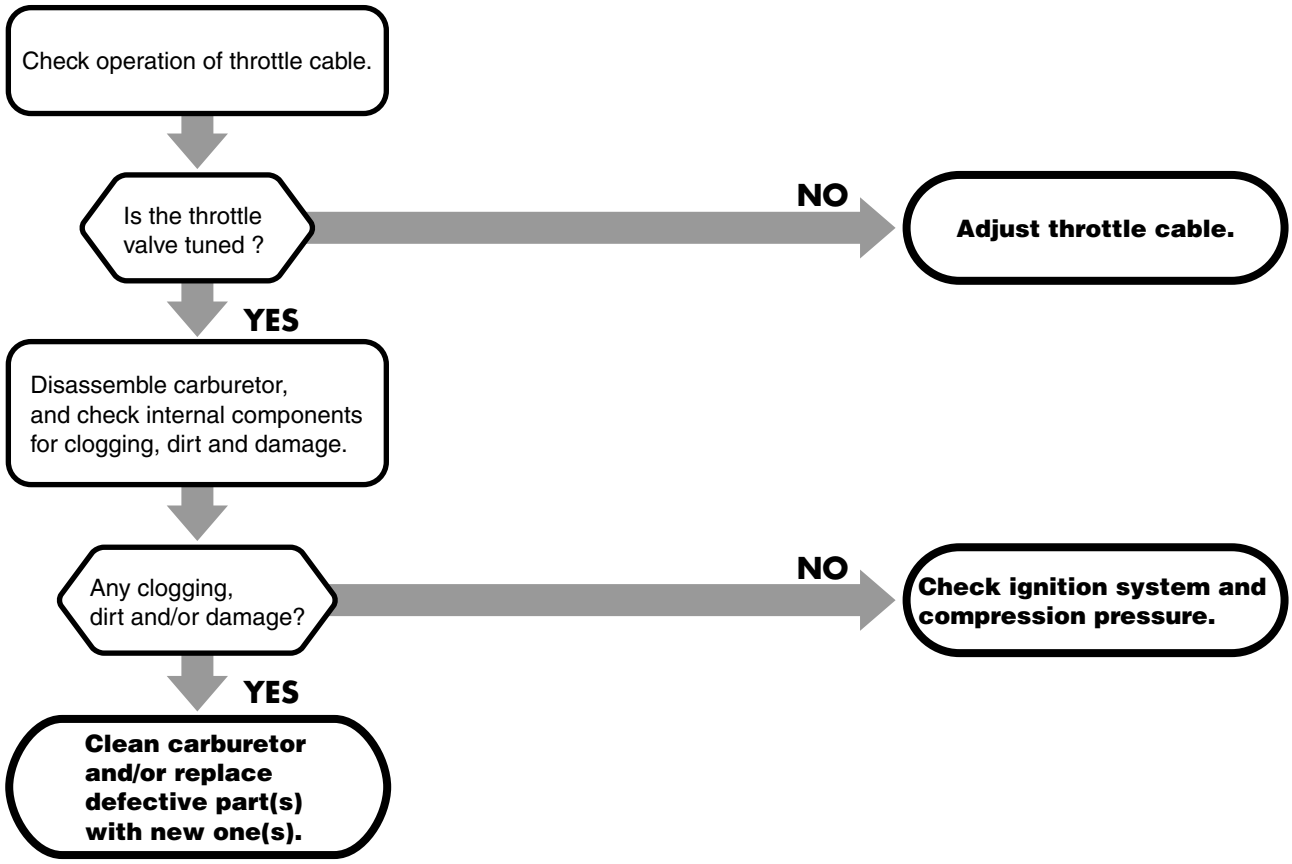
Trouble 3 **Idle engine speed will not stabilize.**

• Inspection of Intake Manifold, Air Intake System and Ignition System

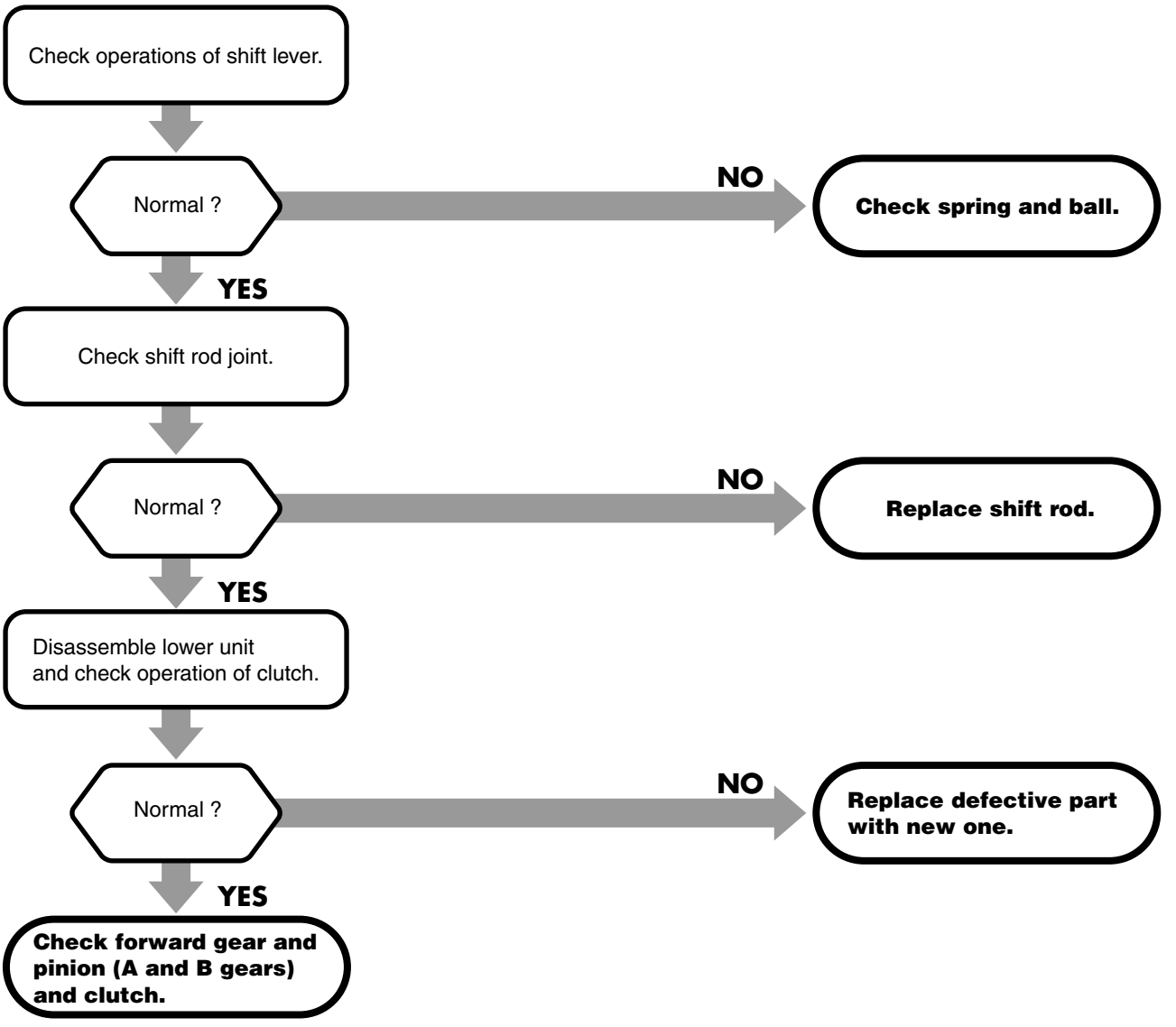


Trouble 4 Rough acceleration.

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.**



TOHATSU
Outboards

SERVICE MANUAL

4 Stroke MFS 2/2.5/3.5B Models

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