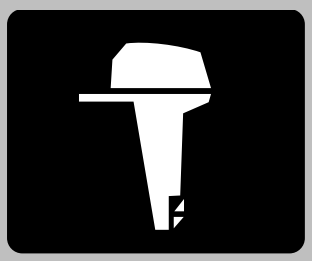
YAMAHA



EK25BMH

SERVICE MANUAL

290404

69T-28197-ZA-11

NOTICE

This manual has been prepared by Yamaha primarily for use by Yamaha dealers and their trained mechanics when performing maintenance procedures and repairs to Yamaha equipment. It has been written to suit the needs of persons who have a basic understanding of the mechanical and electrical concepts and procedures inherent in the work, for without such knowledge attempted repairs or service to the equipment could render it unsafe or unfit for use.

Because Yamaha has a policy of continuously improving its products, models may differ in detail from the descriptions and illustrations given in this publication. Use only the latest edition of this manual. Authorized Yamaha dealers are notified periodically of modifications and significant changes in specifications and procedures, and these are incorporated in successive editions of this manual.

EK25BMH
SERVICE MANUAL

1st Edition, October 2000

Printed in Japan

HOW TO USE THIS MANUAL

MANUAL FORMAT

All of the procedures in this manual are organised in a sequential, step-by-step format. The information has been compiled to provide the mechanic with an easy to read, handy reference that contains comprehensive explanations of all disassembly, repair, assembly, and inspection operations.
In this revised format, the condition of a faulty component will precede an arrow symbol and the course of action required will follow the symbol, e.g.,

- Bearings
  Pitting/scratches → Replace.

To assist you in finding your way through this manual, the section title and major heading is given at the top of every page.

MODEL INDICATION

Multiple models are referred to in this manual and their model indications are noted as follows.

Model name	EK25BMH
Indication	EK25BMH

ILLUSTRATIONS

The illustrations within this service manual represent all of the designated models.

CROSS REFERENCES

The cross references have been kept to a minimum. Cross references will direct you to the appropriate section or chapter.

IMPORTANT INFORMATION

In this Service Manual particularly important information is distinguished in the following ways.

⚠ The safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

⚠ WARNING

Failure to follow WARNING instructions could result in severe injury or death to the machine operator, a bystander or a person inspecting or repairing the outboard motor.

CAUTION:

A CAUTION indicates special precautions that must be taken to avoid damage to the outboard motor.

NOTE:

A NOTE provides key information to make procedures easier or clearer.

HOW TO USE THIS MANUAL

① The main points regarding removing/installing and disassembling/assembling procedures are shown in the exploded views.

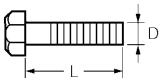
② The numbers in the exploded views indicate the required sequence of the procedure and should be observed accordingly.

③ Symbols are used in the exploded views to indicate important aspects of the procedure. A list of meanings for these symbols is provided on the following page.

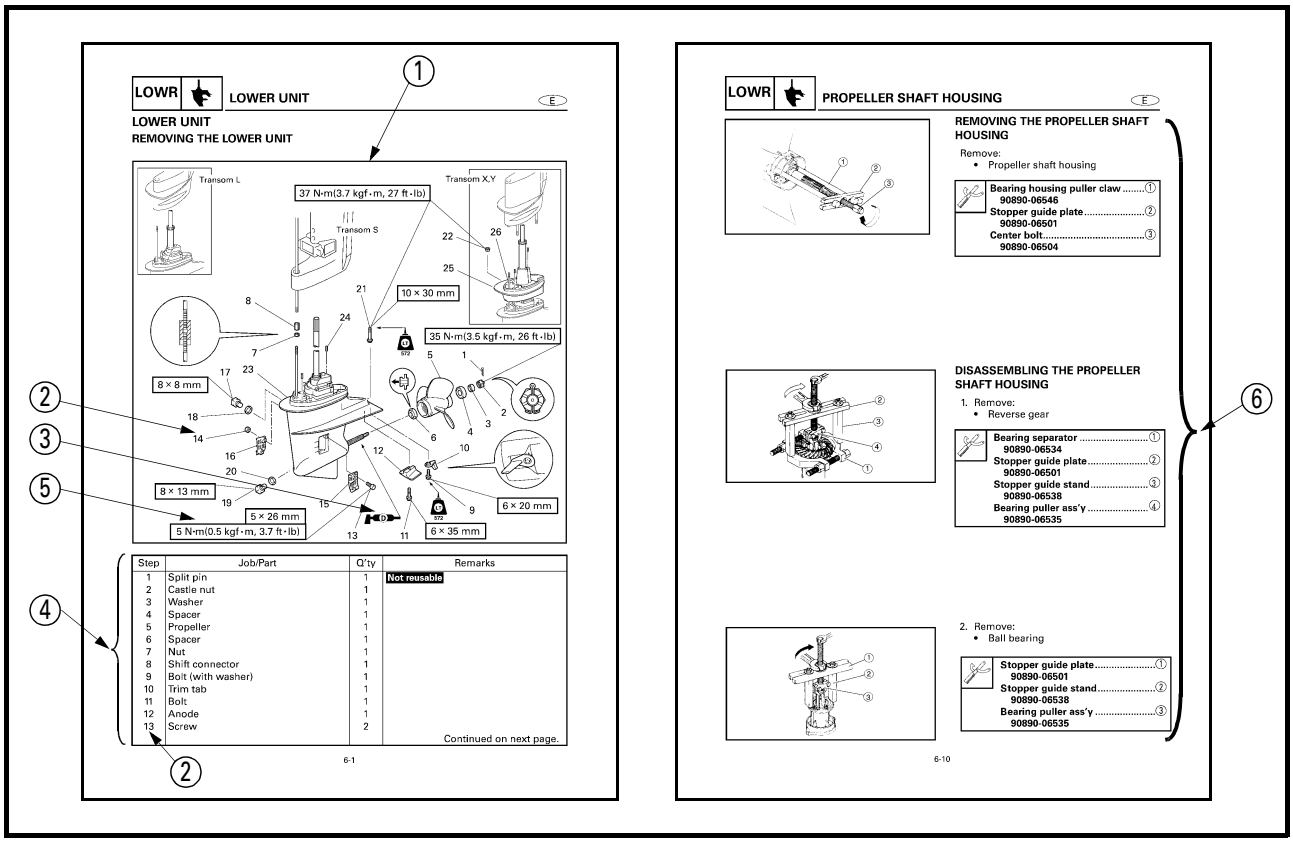
④ It is important to refer to the job instruction charts at the same time as the exploded views. These charts list the sequence that the procedures should be carried out in, as well as providing explanations on part names, quantities, dimensions and important points relating to each relevant task.

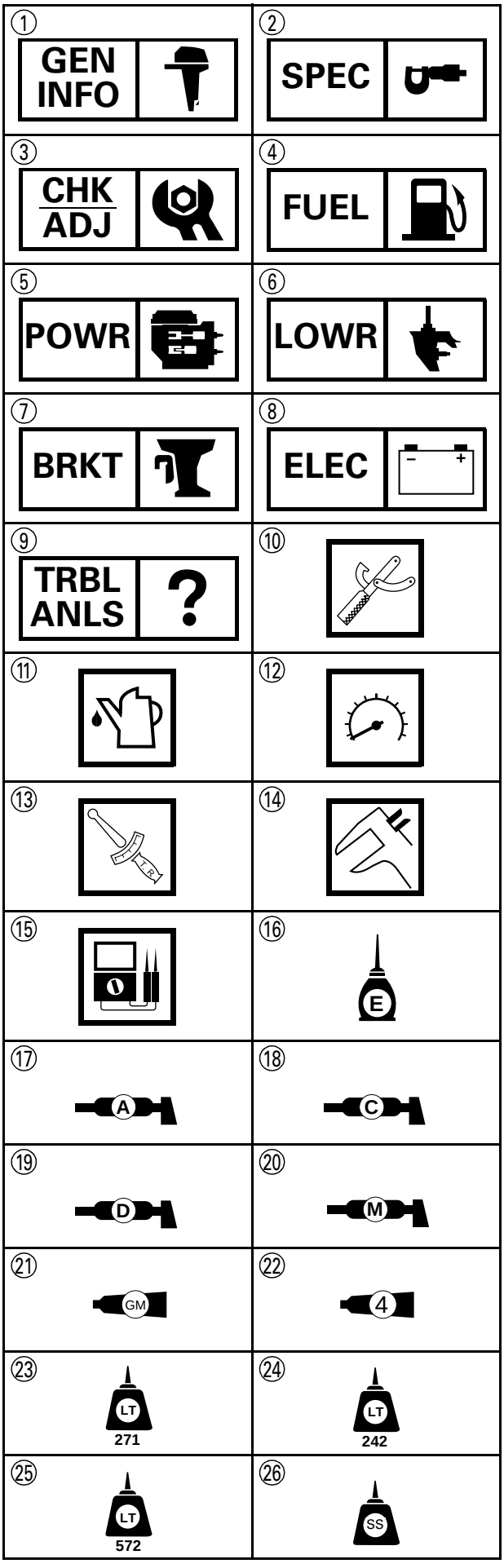
⑤ In addition to tightening torques, the dimensions of the bolts and screws are also mentioned.

Example:
Bolt and screw size 10 × 25 mm : bolt and screw diameter (D) × lenght (L)



⑥ In addition to the exploded views and job instruction charts, this manual provides individual illustrations when further explanations are required to explain the relevant procedure.





SYMBOLS

Symbols ① to ⑨ are designed as thumb-tabs to indicate the content of a chapter.

① General information
② Specifications
③ Periodic check and adjustments
④ Fuel system
⑤ Power unit
⑥ Lower unit
⑦ Bracket unit
⑧ Electrical systems
⑨ Trouble analysis

Symbols ⑩ to ⑮ indicate specific data.

⑩ Special tool
⑪ Specified liquid
⑫ Specified engine speed
⑬ Specified torque
⑭ Specified measurement
⑮ Specified electrical value [Resistance (Ω), Voltage (V), Electric current (A)]

Symbol ⑯ to ⑳ in an exploded diagram indicate the grade of lubricant and the location of the lubrication point.

⑯ Apply Yamaha 2-stroke motor oil
⑰ Apply water resistant grease (Yamaha grease A, Yamaha marine grease)
⑱ Apply water resistant grease (Yamaha grease C, Yamaha marine grease)
⑲ Apply water resistant grease (Yamaha grease D, Yamaha marine grease)
⑳ Apply molybdenum disulfide grease

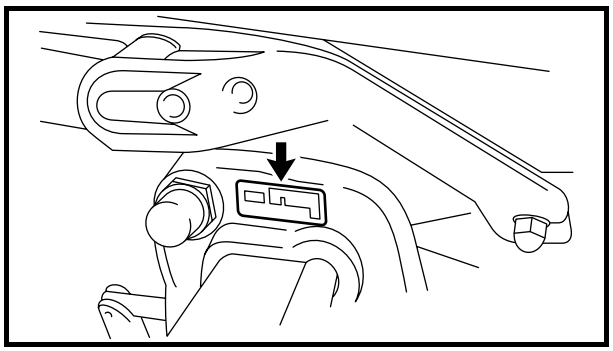
Symbols ㉑ to ㉖ in an exploded diagram indicate the grade of the sealing or locking agent and the location of the application point.

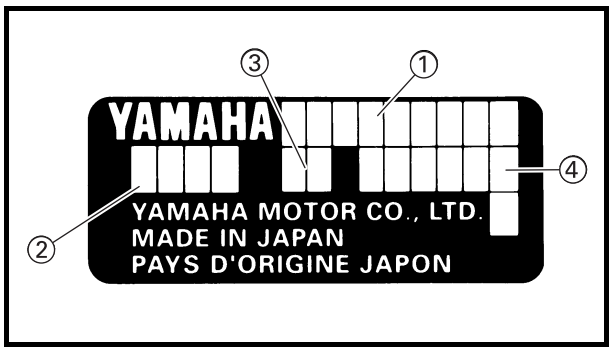
㉑ Apply Gasket Maker®
㉒ Apply Yamabond #4 (Yamaha bond number 4)
㉓ Apply LOCTITE® No.271 (Red LOCTITE)
㉔ Apply LOCTITE® No.242 (Blue LOCTITE)
㉕ Apply LOCTITE® No.572
㉖ Apply silicon sealant

E

CONTENTS

CHAPTER 1
GENERAL INFORMATION





IDENTIFICATION

SERIAL NUMBER

The outboard motor's serial number is stamped on a label which is attached to the port clamp bracket.

NOTE:

As an antitheft measure, a special label on which the outboard motor's serial number is stamped is bonded to the port clamp bracket. The label is specially treated so that peeling it off causes cracks across the serial number.

① Model name
② Approval model code
③ Transom height
④ Serial number

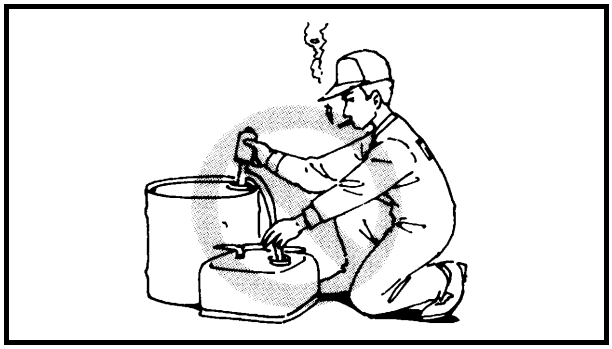
STARTING SERIAL NUMBERS

The starting serial number blocks are as follows:

Model name Worldwide	Approval model code	Starting serial number
EK25BMH	62C	S:100101
		L:400101
		Y:750101

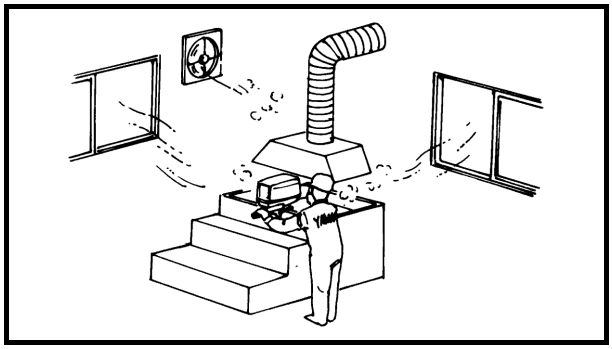
SAFETY WHILE WORKING

The procedures given in this manual are those recommended by Yamaha to be followed by Yamaha dealers and their mechanics.



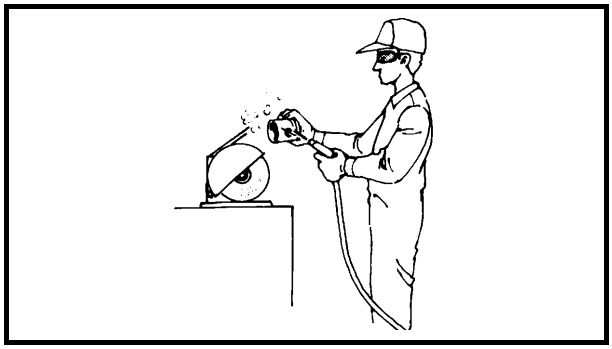
FIRE PREVENTION

Gasoline (petrol) is highly flammable.
Petroleum vapor is explosive if ignited.
Do not smoke while handling gasoline and keep it away from heat, sparks and open flames.



VENTILATION

Petroleum vapor is heavier than air and is deadly if inhaled in large quantities. Engine exhaust gases are harmful to breathe.
When test-running an engine indoors, maintain good ventilation.



SELF-PROTECTION

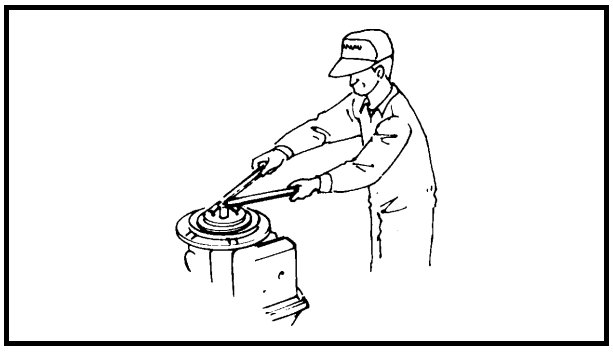
Protect your eyes with suitable safety glasses or safety goggles, when grinding or when doing any operation which may cause particles to fly off. Protect hands and feet by wearing safety gloves or protective shoes if appropriate to the work you are doing.

OILS, GREASES AND SEALING FLUIDS

Use only genuine Yamaha oils, greases and sealing fluids or those recommended by Yamaha.

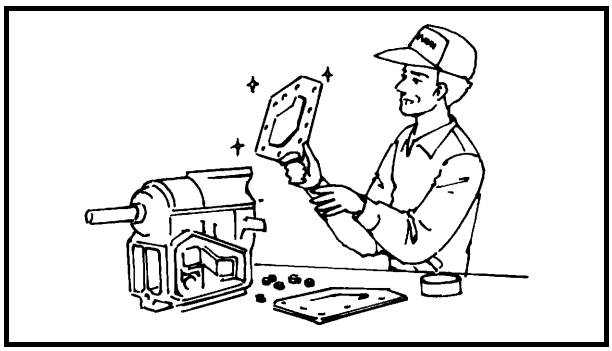
Under normal conditions or use, there should be no hazards from the use of the lubricants mentioned in this manual, but safety is all-important, and by adopting good safety practices, any risk is minimized. A summary of the most important precautions is as follows:

1. While working, maintain good standards of personal and industrial hygiene.
2. Clothing which has become contaminated with lubricants should be changed as soon as practicable, and laundered before further use.
3. Avoid skin contact with lubricants; do not, for example, place a soiled wiping-rag in your pocket.
4. Hands and any other part of the body which have been in contact with lubricants or lubricant-contaminated clothing, should be thoroughly washed with hot water and soap as soon as practicable.
5. To protect the skin, the application of a suitable barrier cream to the hands before working, is recommended.
6. A supply of clean lint-free cloths should be available for wiping purposes.

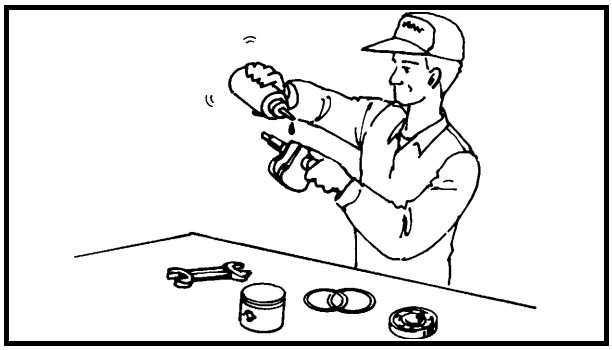


GOOD WORKING PRACTICES

1. The right tools
   Use the recommended special tools to protect parts from damage. Use the right tool in the right manner - do not improvise.
2. Tightening torque
   Follow the tightening torque instructions. When tightening bolts, nuts and screws, tighten the large sizes first, and tighten inner-positioned fixings before outer-positioned ones.

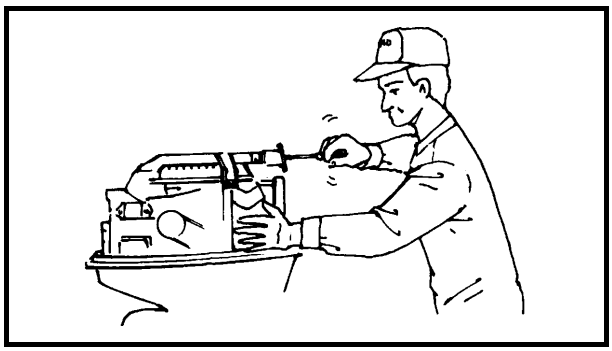


3. Non-reusable items
   Always use new gaskets, packings, O-rings, split-pins, circlips, etc., on reassembly.



DISASSEMBLY AND ASSEMBLY

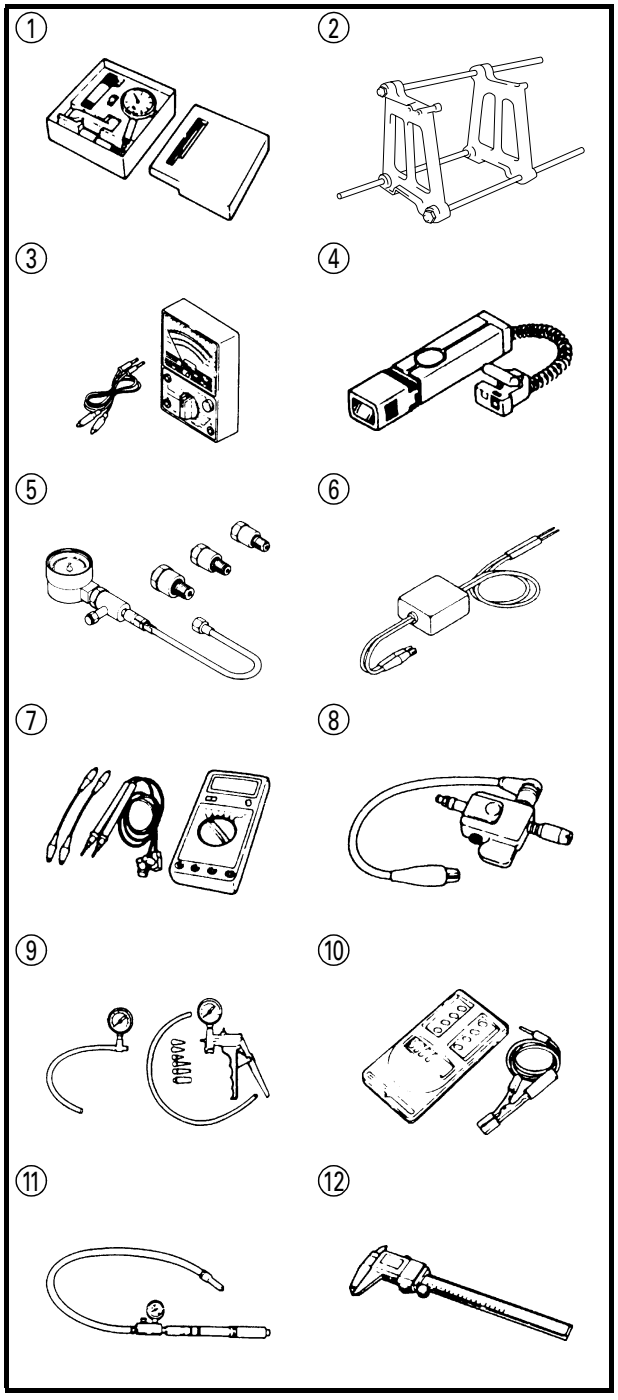
1. Clean parts with compressed air when disassembling.
2. Oil the contact surfaces of moving parts before assembly.



3. After assembly, check that moving parts operate normally.
4. Install bearings with the manufacturer's markings on the side exposed to view, and liberally oil the bearings.
5. When installing oil seals, apply a light coating of water-resistant grease to the outside diameter.

SPECIAL TOOLS

Using the correct special tools recommended by Yamaha, will aid the work and enable accurate assembly and tune-up. Improvising and using improper tools can damage the equipment.



MEASURING

① Dial gauge set
P/N. 90890-01252

② Crank stand alignment
P/N. 90890-03107

③ Pocket tester
P/N. 90890-03112

④ Timing light
P/N. 90890-03141

⑤ Compression Gauge
P/N. 90890-03160

⑥ Peak voltage adaptor
P/N. 90890-03172

⑦ Digital circuit tester
P/N. 90890-03174

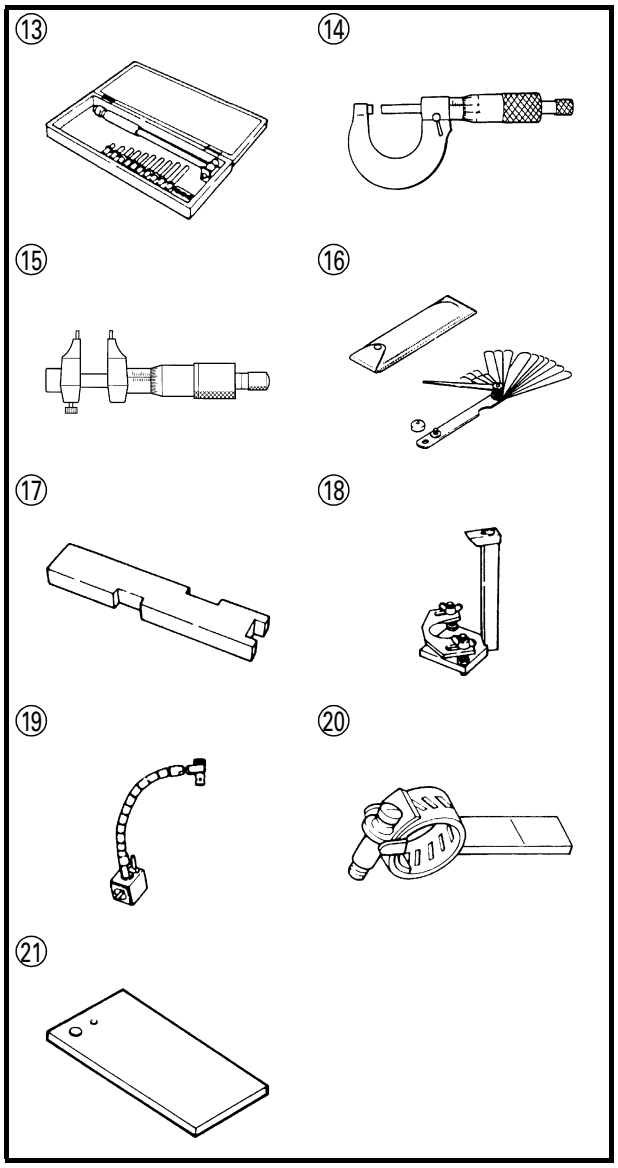
⑧ Ignition tester
P/N. 90890-06754

⑨ Vacuum/pressure pump gauge set
P/N. 90890-06756

⑩ Digital tachometer
P/N. 90890-06760

⑪ Leakage tester
P/N. 90890-06762

⑫ Digital caliper
P/N. 90890-06704



⑬ Cylinder gauge
P/N. 90890-06759

⑭ Outside micrometer
P/N. 90890-03006
P/N. 90890-03008

⑮ Inside micrometer
P/N. 90890-03010

⑯ Thickness gauge
P/N. 90890-03079

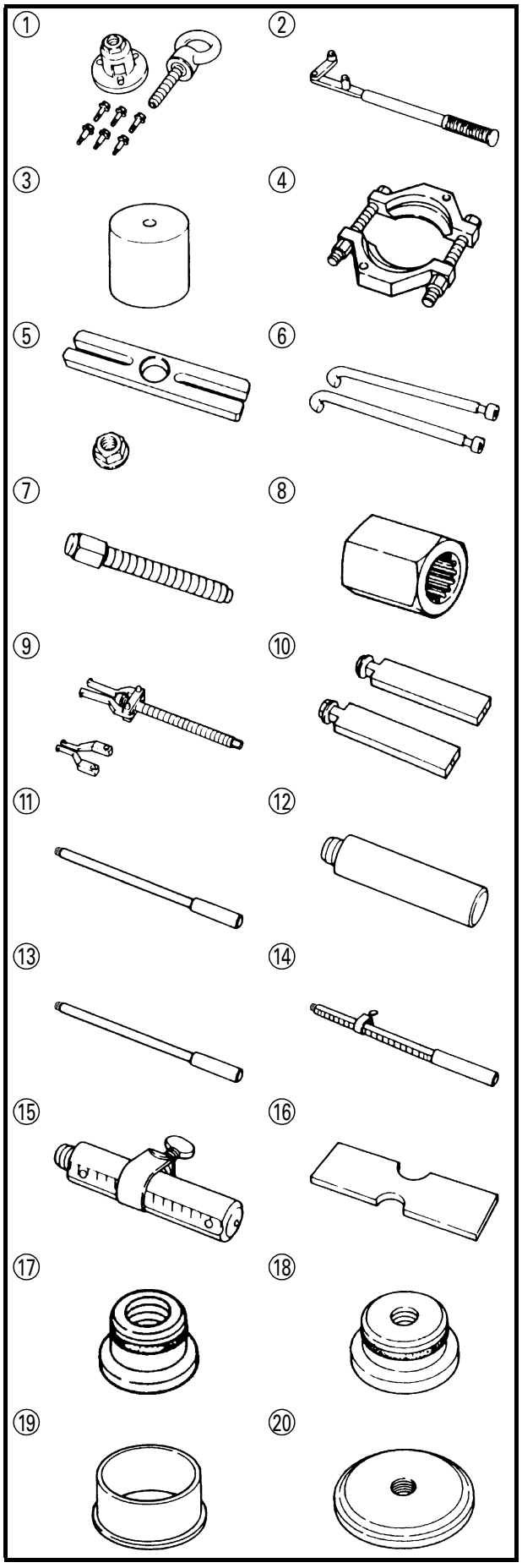
⑰ Shimming plate
P/N. 90890-06701

⑱ Pinion height gauge
P/N. 90890-06702

⑲ Magnet base
P/N. 90890-06705

⑳ Backlash indicator
P/N. 90890-06706

㉑ Magnet base plate
P/N. 90890-07003



REMOVING AND INSTALLING

① Flywheel puller
P/N. 90890-06521

② Flywheel holder
P/N. 90890-06522

③ Small end bearing installer
P/N. 90890-06527

④ Bearing separator
P/N. 90890-06534

⑤ Stopper guide plate
P/N. 90890-06501

⑥ Bearing housing puller claw
P/N. 90890-06564

⑦ Center bolt
P/N. 90890-06504

⑧ Drive shaft holder 3
P/N. 90890-06517

⑨ Bearing puller ass'y
P/N. 90890-06535

⑩ Stopper guide stand
P/N. 90890-06538

⑪ Driver rod LL
P/N. 90890-06605

⑫ Driver rod LS
P/N. 90890-06606

⑬ Driver rod L3
P/N. 90890-06652

⑭ Driver rod SL
P/N. 90890-06602

⑮ Driver rod SS
P/N. 90890-06604

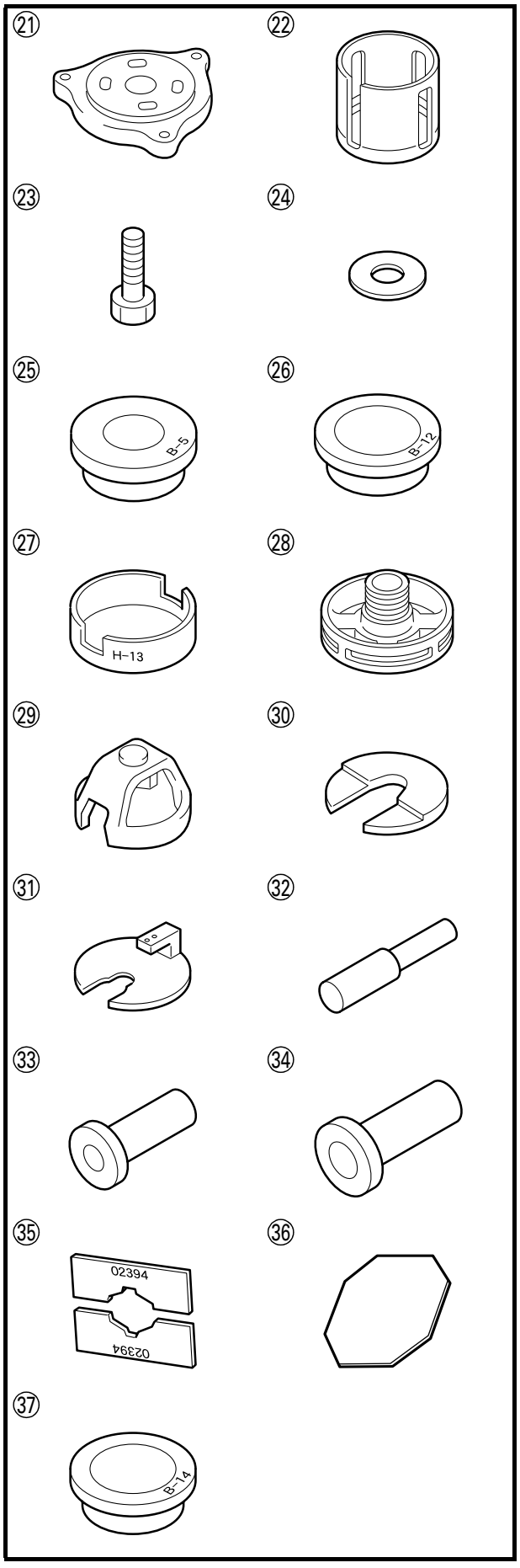
⑯ Bearing depth plate
P/N. 90890-06603

⑰ Needle bearing attachment
P/N. 90890-06608
P/N. 90890-06611
P/N. 90890-06615

⑱ Ball bearing attachment
P/N. 90890-06633

⑲ Bearing inner race attachment
P/N. 90890-06643
P/N. 90890-06644
P/N. 90890-06645

⑳ Bearing outer race attachment
P/N. 90890-06622
P/N. 90890-06628



Crank jig ass'y
P/N. 90890-02421

㉑ Frange
P/N. 90890-02351

㉒ Body
P/N. 90890-02352

㉓ Bolt
P/N. 90890-02353

㉔ Washer
P/N. 90890-02354

㉕ Bushing-5 (D25)
P/N. 90890-02359

㉖ Bushing-12 (D35)
P/N. 90890-02366

㉗ Height ring-13 (H57)
P/N. 90890-02379

㉘ Pressure Plate
P/N. 90890-02384

㉙ Press body
P/N. 90890-02385

㉚ Plate A
P/N. 90890-02386

㉛ Plate B
P/N. 90890-02387

㉜ Pressure pin B
P/N. 90890-02390

㉝ Bearing pressure B
P/N. 90890-02392

㉞ Bearing pressure C
P/N. 90890-02393

㉟ Support
P/N. 90890-02394

㊱ Spacer B
P/N. 90890-02396

㊲ Bushing-14
P/N. 90890-02419

FEATURES AND BENEFITS

POWER UNIT

The EK25B is designed to provide superior fuel economy, serviceability, and durability.
They are based on the previous EK25A with newly designed linkage to control both throttle opening and ignition timing mechanically and simultaneously.
Special attention was paid on the crankshaft bearings. Collar is now added to the upper main journal of the crankshaft. Roller bearing is applied for the center bearing.
The collar added on the upper main journal contributes to get and better serviceability.

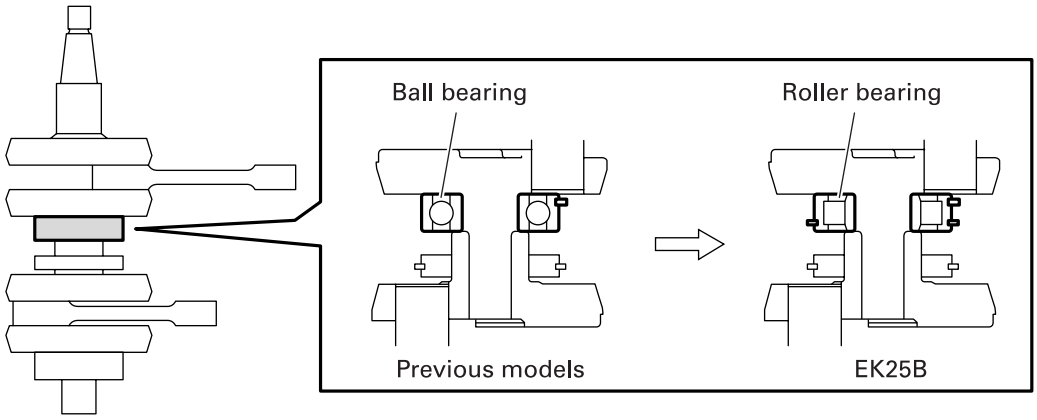


Fig. 1

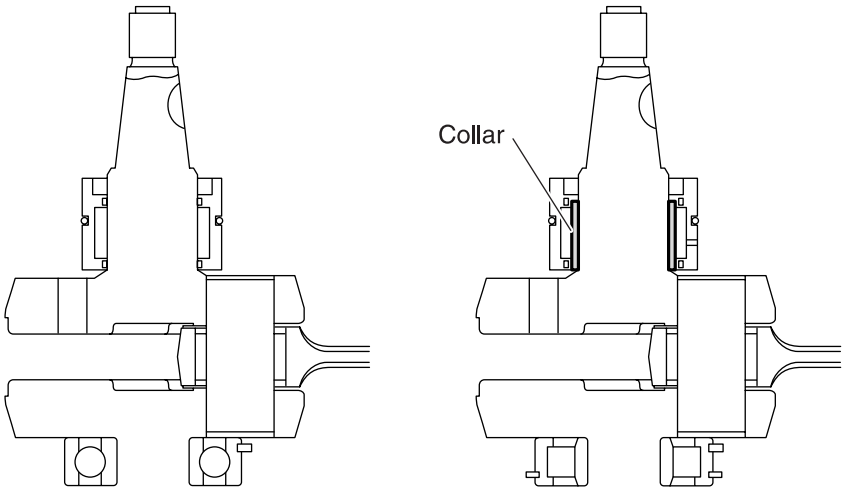


Fig. 2

IGNITION SYSTEM

Ignition system on the EK25B consists of flywheel magnet, charge coil, pulser coil, CDI unit, and ignition coil.
Similar to the previous EK25A, the engine has the mechanical ignition timing advance system that works by way of the linkage.
Superior fuel economy is attained by the modified ignition timing control arrangement.
Also the system restricts the ignition timing advance to prevent engine kickback when the shift is in neutral.

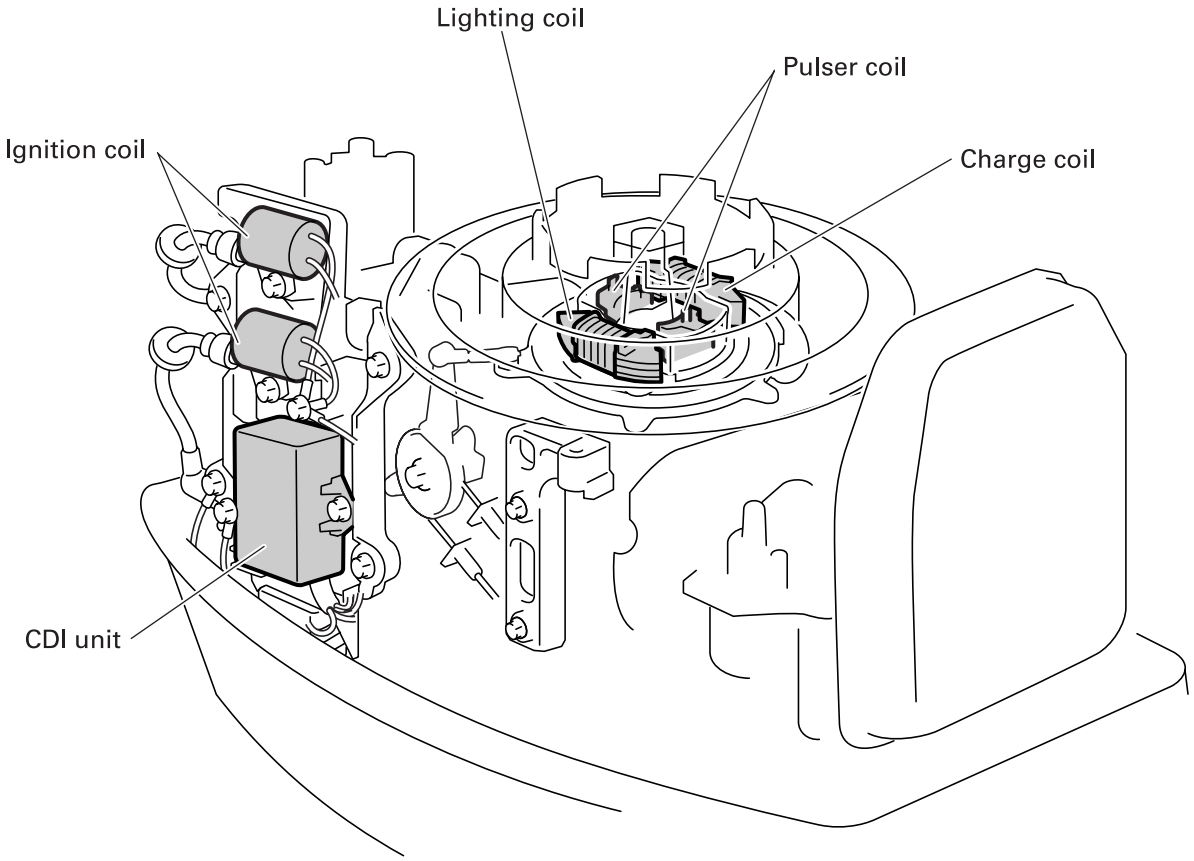


Fig. 3

COOLING SYSTEM

New structure applied to the cooling system provides additional cooling capacity in the upper casing.
With additional cooling water passage (indicated by ⇦), water walls contained in the new upper casing contribute to the reduction of outer surface temperature.

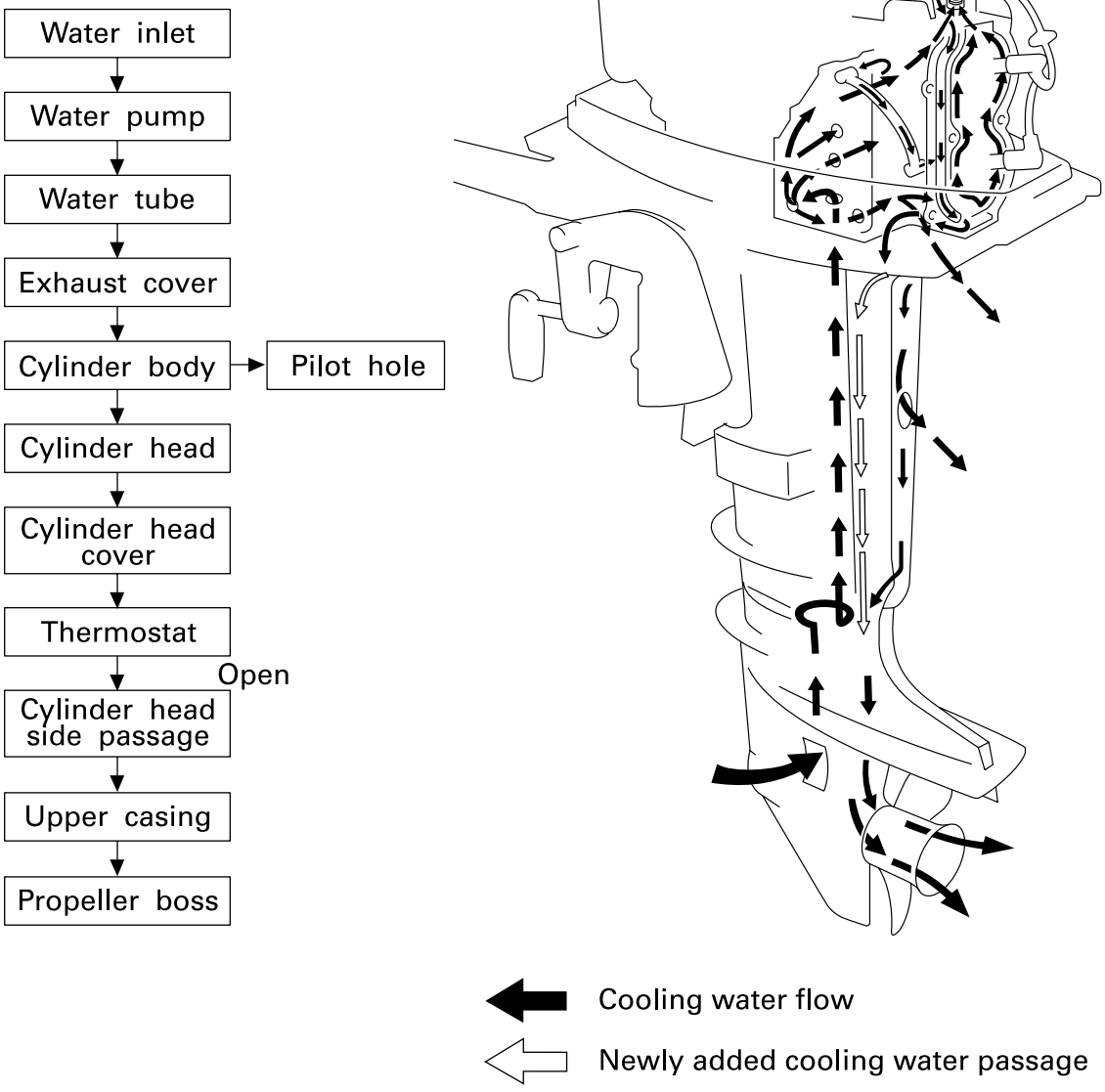


Fig. 4

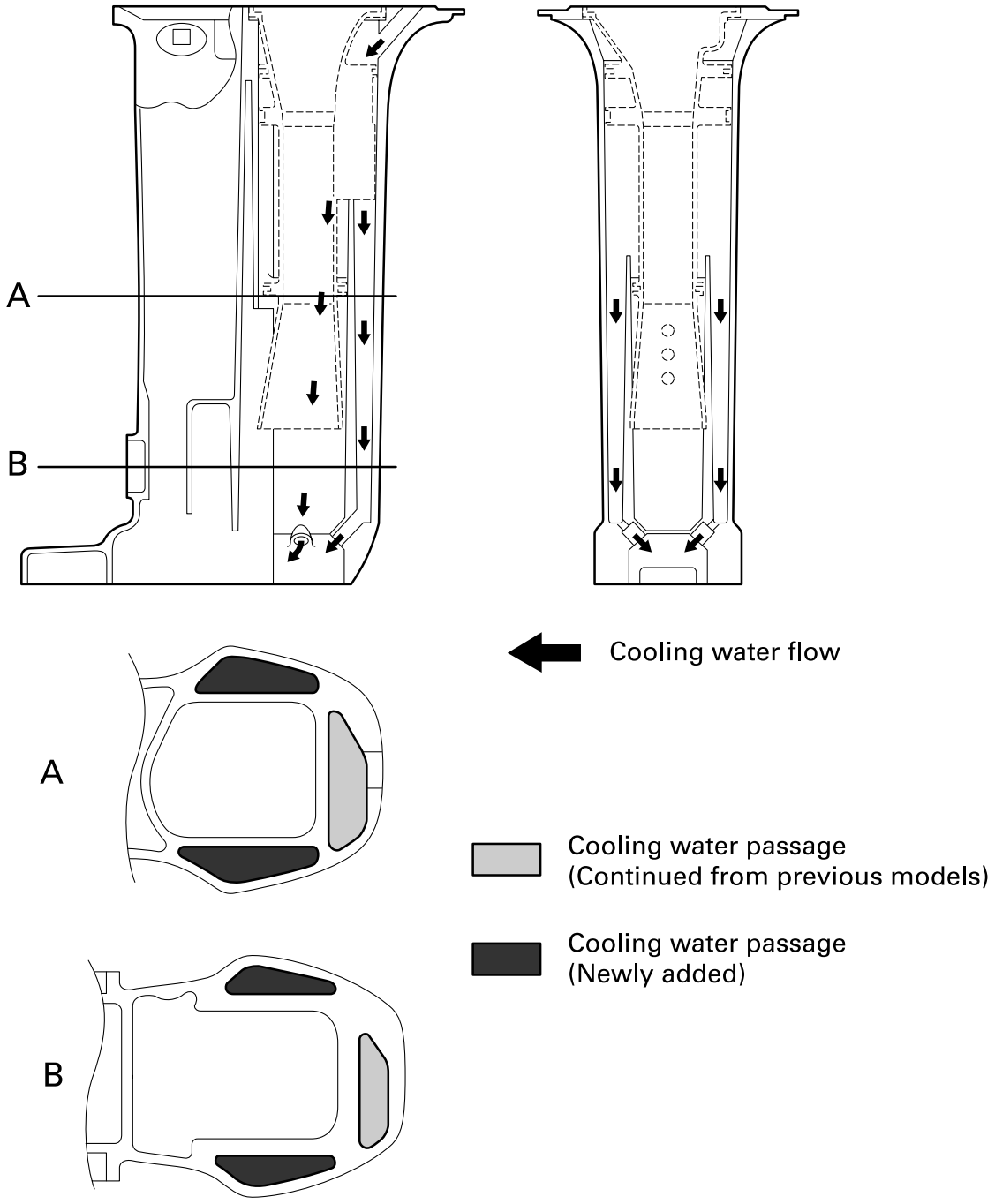

A
B
Cooling water flow
A
B
Cooling water passage
(Continued from previous models)
Cooling water passage
(Newly added)

Fig. 5

TILLER HANDLE

For the throttle grip on the steering handle of the EK25B, 100 degrees of opening angle covers all ranges from full-closed to wide-open positions.
Also, new steering handle parts were developed to assume the long use. Inner diameter of the steering handle engagement area, and both inner and outer diameters of steering bracket are increased.
Please note that if the new steering handle is installed on the previous models, Steering handle 2, Steering bracket, Collar, and Washer must be replaced.

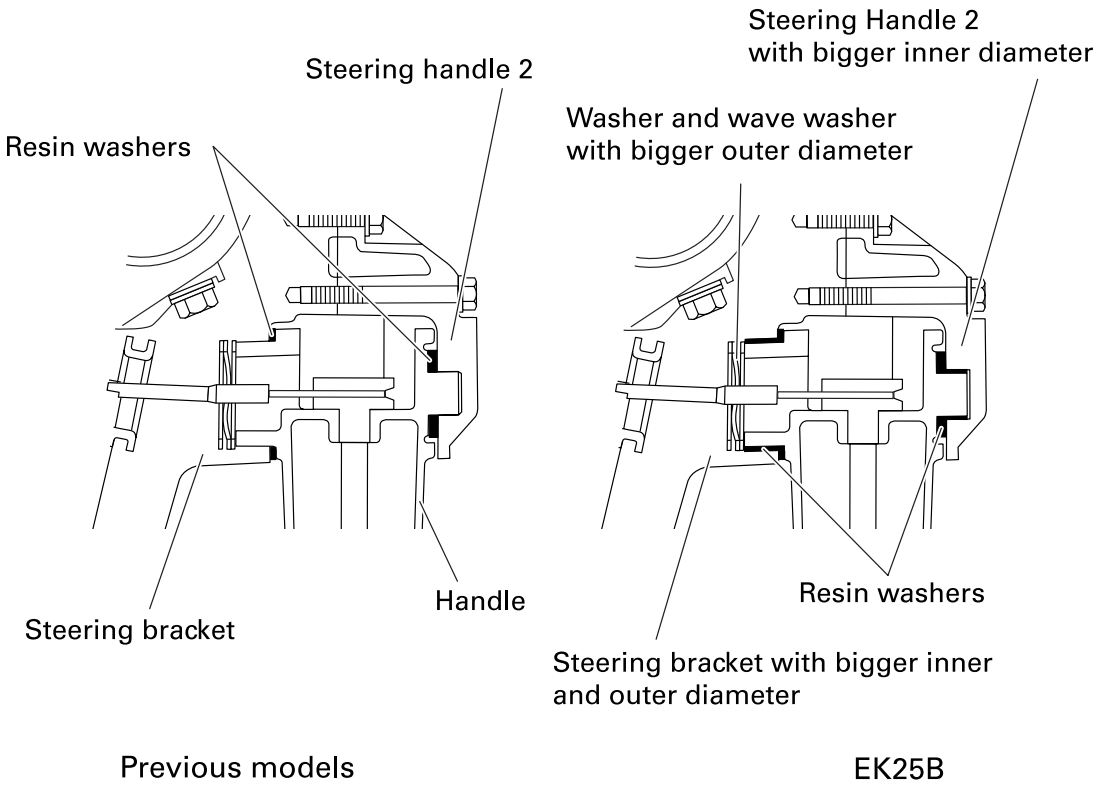


Fig. 6

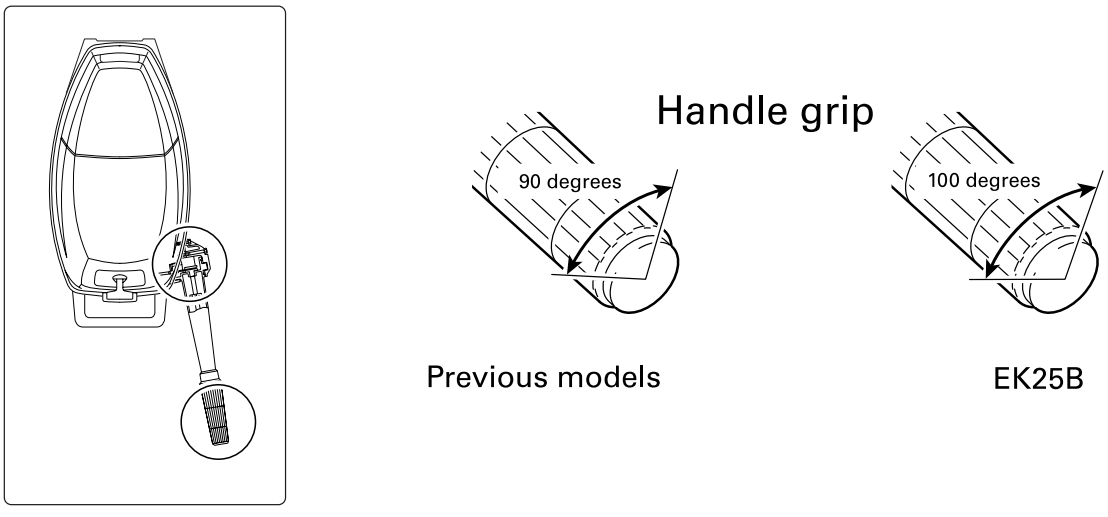


Fig. 7

BRACKET AND BOTTOM COWLING

The Bracket 1 is modified on the EK25B, and newly designed rubber seal is added to provide better sealing ability for the bottom cowling.

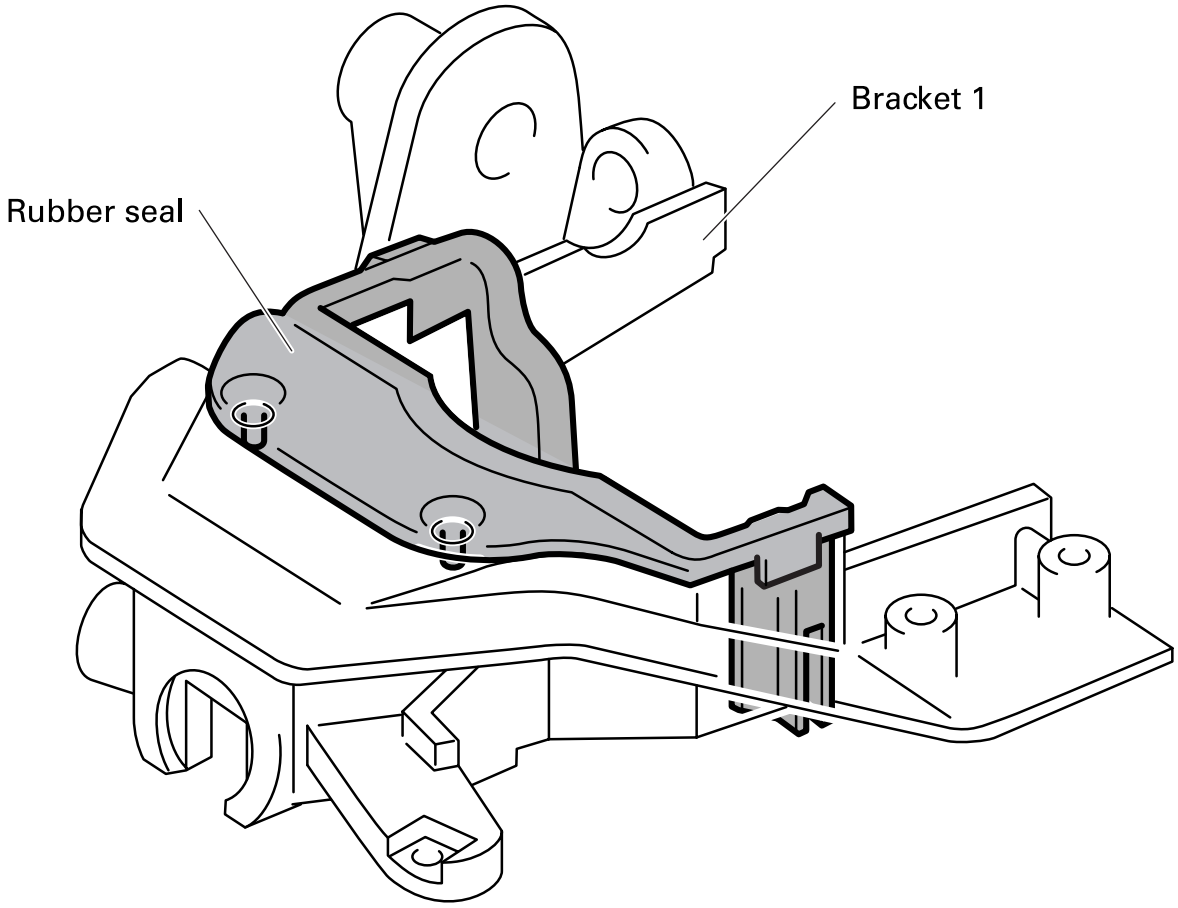


Fig. 8

CHAPTER 2
SPECIFICATIONS

GENERAL SPECIFICATIONS

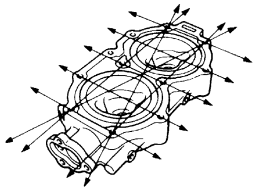
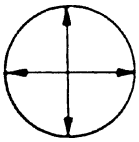
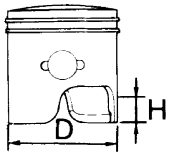
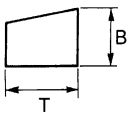
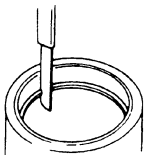
Item	Unit	Model
Worldwide		EK25BMH
DIMENSIONS		
Overall length	mm (in)	843 (33.2)
Overall width	mm (in)	399 (15.7)
Overall height		
(S)	mm (in)	1,146 (45.1)
(L)	mm (in)	1,273 (50.1)
(Y)	mm (in)	1,320 (52.0)
Boat transom height		
(S)	mm (in)	381 (15.0)
(L)	mm (in)	508 (20.0)
(Y)	mm (in)	559 (22.0)
WEIGHT		
(S)	kg (lb)	53.0 (116.9)
(L)	kg (lb)	54.5 (120.2)
(Y)	kg (lb)	55.0 (121.3)
PERFORMANCE		
Maximum output (ISO)	kW (hp) @5,000 r/min	18.4 (25.0)
Full throttle operating range	r/min	4,500 - 5,500
Maximum fuel consumption	L (US gal, Imp gal) @5,500 r/min	13.8 (3.6, 3.0) Gasoline / Kerosene
POWER UNIT		
Type		2 stroke
Number of cylinders		2
Displacement	cm^3 (cu. in)	496 (30.3)
Bore and stroke	mm (in)	72.0 × 61.0 (2.83 × 2.40)
Compression ratio	kPa (kgf/cm^2, psi)	#1: 5.3 (0.05, 0.8), #2: 5.7 (0.06, 0.8)
Compression pressure	kPa (kgf/cm^2, psi)	#1: 680 (6.8, 98.6), #2: 730 (7.3, 105.9)
<Minimum>	kPa (kgf/cm^2, psi)	#1: 540 (5.4, 78.3), #2: 580 (5.8, 84.1)
Spark plug(NGK)		B7HS-10
Number of carburetor		1
Enrichment system		Chock valve
Intake system		Reed valve
Induction system		Loop charge
Exhaust system		Through propeller boss

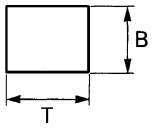
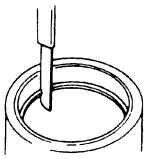
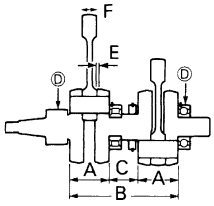
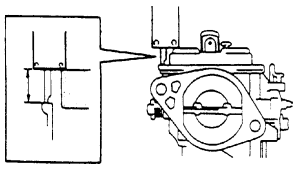
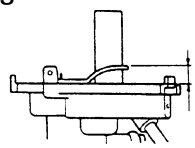
GENERAL SPECIFICATIONS

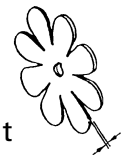
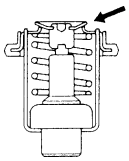
Item (Worldwide)	Unit	Model EK25BMH
Lubrication system		Mixed (Gasoline and oil, Kerosene and oil)
Cooling system		Water
Ignition control system		CDI
Alternator output	V - W	12 - 80
POWER UNIT		
Starting system		Manual
Control system		Mechanical
Advanced system		Mechanical
CARBURETOR		
ID mark		69T00
FUEL AND OIL		
Fuel type		
(Main)		Kerosene
Mixing ratio		30 : 1
(Sub)		Unleaded regular gasoline
Mixing ratio		50 : 1
Engine oil type		2 stroke outboard engine oil
Engine oil grade		TC - W3
Gear oil		Hypoid gear oil
Gear oil grade		SAE #90 (API GL - 4)
Gear oil capacity	cm^3(US oz, Imp oz)	320 (10.8, 11.3)
BRACKET		
Tilt angle	Degree	4, 8, 12, 16, 20
Tilt-up angle	Degree	76
Shallow water angle from transom	Degree	Tilt angle + 20
Steering angle	Degree	40 + 40
DRIVE UNIT		
Gear shift positions		F - N - R
Gear ratio		2.08 (27/13)
Gear type		Spiral bevel
Propeller direction (rear view)		Clockwise
Propeller drive system		Spline
Propeller mark		F

MAINTENANCE SPECIFICATIONS

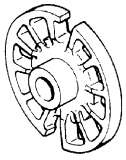
POWER UNIT

Item	Unit	Model
Worldwide		EK25BMH
CYLINDER HEAD		
Warpage limit	mm (in)	0.1 (0.004)
 (lines indicate straightedge position)		
CYLINDERS		
Bore size 	mm (in)	72.00 - 72.02 (2.8346 - 2.8354)
Wear limit	mm (in)	72.10 (2.8386)
Taper limit	mm (in)	0.08 (0.0031)
Out-of-round limit	mm (in)	0.05 (0.0020)
PISTON		
Piston side "D"	mm (in)	71.94 - 71.96 (2.8323 - 2.8331)
Measuring point "H" 	mm (in)	10.0 (0.3937)
Piston-cylinder clearance	mm (in)	0.060 - 0.065 (0.0024 - 0.0026)
<Limit>	mm (in)	0.1 (0.0039)
Oversize piston diameter 1st	mm (in)	72.25 (2.8445)
2nd	mm (in)	72.50 (2.8543)
Pin boss inside diameter	mm (in)	19.904 - 19.915 (0.7836 - 0.7841)
PISTON PINS		
Outside diameter	mm (in)	19.895 - 19.900 (0.7833 - 0.7835)
PISTON RING (1st)		
Type 		Keystone
(B)	mm (in)	2.0 (0.079)
(T)	mm (in)	3.0 (0.118)
End gap (installed) 	mm (in)	0.20 - 0.35 (0.008 - 0.014)
<Limit>	mm (in)	0.35 (0.014)
Side clearance	mm (in)	0.03 - 0.05 (0.0012 - 0.0020)
<Limit>	mm (in)	0.05 (0.0020)

Item	Unit	Model	
Worldwide		EK25BMH	
PISTON RING (2nd)			
Type 		Plain	
(B)	mm (in)	2.0 (0.079)	
(T)	mm (in)	3.0 (0.118)	
End gap (installed) 	mm (in)	0.20 - 0.35 (0.0079 - 0.0137)	
<Limit>	mm (in)	0.35 (0.014)	
Side clearance	mm (in)	0.03 - 0.07 (0.0012 - 0.0028)	
<Limit>	mm (in)	0.07 (0.0028)	
CRANKSHAFT			
Crank width (A)	mm (in)	56.90 - 56.95 (2.2401 - 2.2421)	
 (B)	mm (in)	153.7 - 154.0 (6.0512 - 6.0630)	
(C)	mm (in)	39.9 - 40.1 (1.5709 - 1.5787)	
Runout limit (D)	mm (in)	0.03 (0.0012)	
Side clearance (E)	mm (in)	0.2 - 0.7 (0.0079 - 0.0276)	
Maximum axial play (F)	mm (in)	2.0 (0.079)	
CONNECTING ROD			
Small end diameter	mm (in)	23.904 - 23.917 (0.941 - 0.942)	
CARBURETOR		Kerosene carburetor	Gasoline carburetor
Main jet (M.J.)	#	155	—
Main air jet (M.A.J.)	ϕmm (in)	1.3 (0.051)	—
Main nozzle (M.N.)	ϕmm (in)	2.8 (0.110)	—
Pilot jet (P.J.)	#	50	48
Pilot air jet (P.A.J.)	mm (in)	0.92 (0.036)	0.90 (0.035)
Pilot screw (P.S.)	turns out	1/2 + 2 1/2 - 1/2	1 - 1/2 ± 1/2
Valve seat size (V.S.)	mm (in)	1.4 (0.055)	1.2 (0.047)
Float height 	mm (in)	18 (0.079)	—
Float arm height 	mm (in)	—	3 (0.118)
Idle speed	r/min	1,300 ± 50	

Item (Worldwide)	Unit	Model EK25BMH
REED VALVES 		
Thickness		0.2 (0.008)
Valve stopper height		
(Standard)	mm (in)	3.46 - 3.50 (0.136 - 0.138)
(for Sri Lanka)	mm (in)	4.20 - 4.60 (0.165 - 0.181)
Valve bending limit	mm (in)	0.2 (0.008)
THERMOSTAT		
Valve opening temperature 	°C (°F)	48 - 52 (118 - 126)
Full-open temperature	°C (°F)	60 (140)
Minimum valve lift	mm (in)	3 (0.12)

LOWER UNIT

Item (Worldwide)	Unit	Model EK25BMH
GEAR BACKLASH		
Pinion - forward gear	mm (in)	0.31 - 0.72 (0.012 - 0.028)
Pinion - reverse gear	mm (in)	0.93 - 1.65 (0.037 - 0.065)
Pinion gear shims	mm	0.7 / 1.0 / 1.1 / 1.2 / 1.3 / 1.4 / 1.5 / 1.6
Forward gear shims	mm	1.0 / 1.1 / 1.2 / 1.3 / 1.4
Reverse gear shims	mm	1.0 / 1.1 / 1.2 / 1.3
PROPELLER		
Material		Aluminium
No. of blades × diameter × pitch	in	3 × 9 - 7/8 × 11 - 1/4 3 × 9 - 7/8 × 8 3 × 9 - 7/8 × 9 3 × 9 - 7/8 × 10 - 1/2 3 × 9 - 7/8 × 12 3 × 9 - 7/8 × 13 3 × 9 - 7/8 × 14
Test propeller 	P/N.	90890-01629
	r/min	5,250 - 5,450

ELECTRICAL

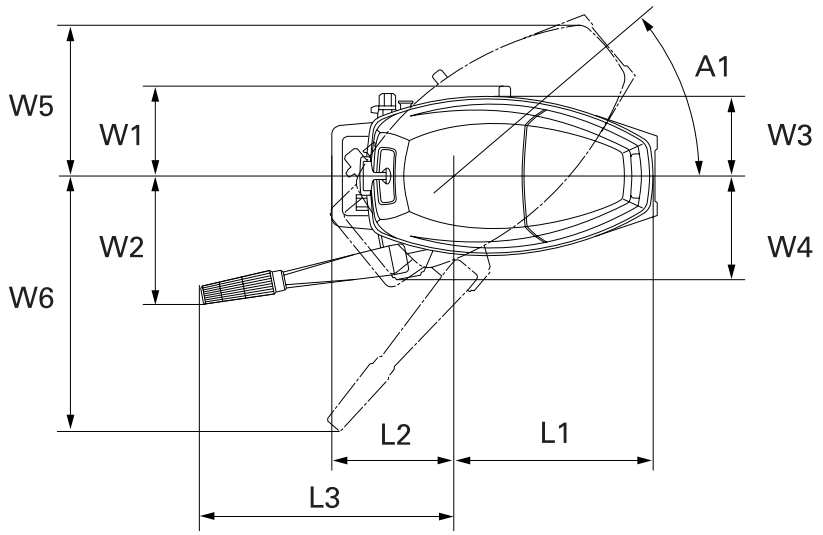
Item	Unit	Model
Worldwide		EK25BMH
IGNITION SYSTEM		
Ignition timing		
(Full retard)	Degree	ATDC 2 ± 2
(Full advanced)	Degree	BTDC 22 ± 2
Spark plug gap	mm (in)	0.9 - 1.0 (0.035 - 0.039)
Ignition spark gap		
(Minimum)	mm (in)	8.0 (0.31)
Ignition coil resistance		
(Primary)	Ω	0.18 - 0.24
(Secondary)	kΩ	2.70 - 3.70
Charge coil resistance (Br - L)	Ω	342 - 418
Charge coil output peak voltage (Br - L)		
@ cranking 1*1	V	146
@ cranking 2*1	V	146
@ 1,500 r/min	V	150
@ 3,500 r/min	V	150
Pulser coil resistance (W/R - B , W/B - B)	Ω	311 - 381
Pulser coil output peak voltage (W/R - B , W/B - B)		
@ cranking 1*1	V	6.8
@ cranking 2*1	V	6.7
@ 1,500 r/min	V	16.0
@ 3,500 r/min	V	26.0
CDI unit resistance	Ω	Refer to the "CDI UNIT" on page 8-10
CDI unit output peak voltage (B/O - B , B/W - B)		
@ cranking 1*1	V	5.5
@ cranking 2*1	V	130.0
@ 1,500 r/min	V	135.0
@ 3,500 r/min	V	135.0

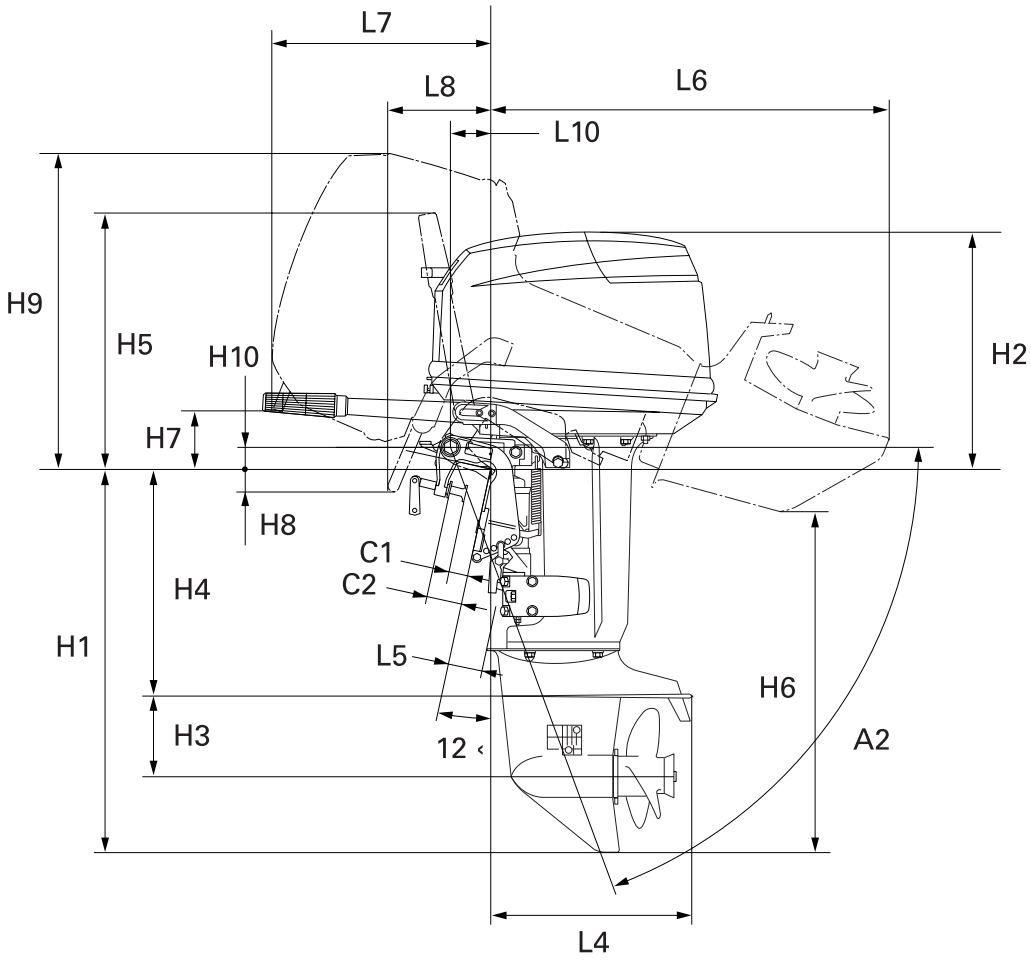
*1 Cranking 1: Open circuit.
Cranking 2: Related parts are connected.

Item	Unit	Model
Worldwide		EK25BMH
CHARGING SYSTEM		
Lighting coil resistance (G - G)	Ω	0.31 - 0.37
Lighting coil output peak voltage (G - G)		
@ cranking 1*1	V	4.6
@ cranking 2*1	V	—
@ 1,500 r/min	V	—
@ 3,500 r/min	V	—
@ 1,500 r/min (Open circuit)	V	14.7
@ 3,500 r/min (Open circuit)	V	30.0

*1 Cranking 1: Open circuit.
Cranking 2: Related parts are connected.

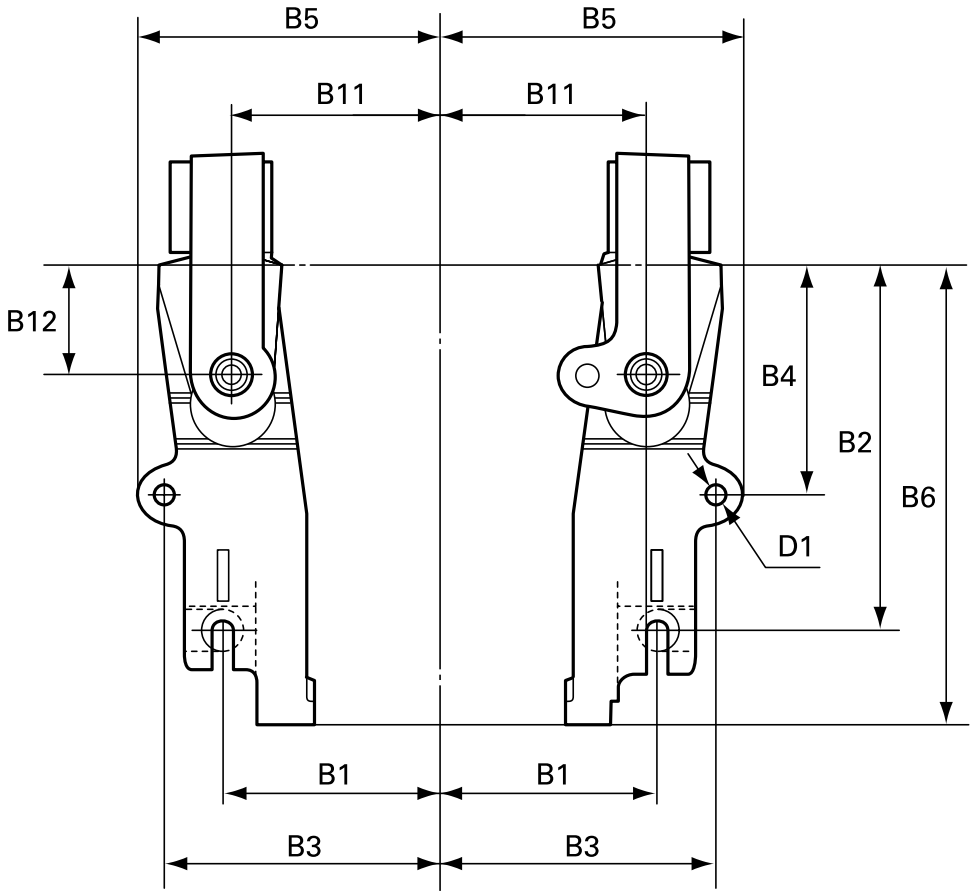
DIMENSIONS


W5
W1
W2
W6
A1
W3
W4
L2
L1
L3


L7
L8
L6
L10
H9
H5
H10
H7
H8
H2
C1
C2
H4
H1
L5
H6
H3
12 ‹
A2
L4

DIMENSIONS

Symbol	Worldwide	Unit	Model
			EK25BMH
L1		mm (in)	429 (16.89)
L2		mm (in)	180 (7.09)
L3		mm (in)	420 (16.54)
L4		mm (in)	385 (15.16)
L5	(S)	mm (in)	61 (2.40)
	(L)	mm (in)	83 (3.27)
	(Y)	mm (in)	83 (3.27)
L6	(S)	mm (in)	736 (28.98)
	(L)	mm (in)	854 (33.62)
	(Y)	mm (in)	897 (35.31)
L7		mm (in)	405 (15.94)
L8		mm (in)	195 (7.68)
L10		mm (in)	74.2 (2.92)
H1	(S)	mm (in)	707 (27.83)
	(L)	mm (in)	834 (32.83)
	(Y)	mm (in)	881 (34.68)
H2		mm (in)	439 (17.28)
H3		mm (in)	144 (5.67)
H4	(S)	mm (in)	423 (16.65)
	(L)	mm (in)	550 (21.65)
	(Y)	mm (in)	597 (23.50)
H5		mm (in)	466 (18.35)
H6	(S)	mm (in)	621 (24.45)
	(L)	mm (in)	701 (27.60)
	(Y)	mm (in)	730 (28.74)
H7		mm (in)	118 (4.65)
H8		mm (in)	30 (1.18)
H9		mm (in)	596 (23.46)
H10		mm (in)	40.3 (1.59)
W1		mm (in)	166 (6.54)
W2		mm (in)	233 (9.17)
W3		mm (in)	148 (5.83)
W4		mm (in)	192 (7.56)
W5		mm (in)	302 (11.89)
W6		mm (in)	472 (18.58)
A1		Degree	40
A2		Degree	68
C1		mm (in)	35 (1.38)
C2		mm (in)	65 (2.56)



Symbol	Worldwide	Unit	Model
			EK25BMH
B1		mm (in)	89 (3.50)
B2		mm (in)	140 (5.51)
B3		mm (in)	112.5 (4.43)
B4		mm (in)	96.5 (3.80)
B5		mm (in)	122.5 (4.82)
B6		mm (in)	176 (6.93)
B11		mm (in)	85 (3.35)
B12		mm (in)	51 (2.01)
D1		ϕmm (in)	8.5 (0.33)

TIGHTENING TORQUES

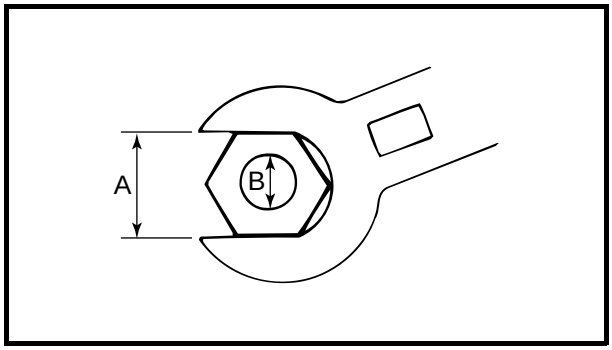
SPECIFIED TORQUES

Part to be tightened		Part name	Thread size	Q'ty	Tightening torques			Remarks
					N•m	kgf•m	ft•lb	
POWER UNIT								
Recoil starter mounting		Bolt	M6	3	12	1.2	8.9	
Recoil starter center boit		Bolt	M12	1	15	1.5	11	
Recoil starter center Nut		Nut	—	1	10	1.0	7.4	
Flywheel magnet		Nut	M12	1	140	14	103	E
Power unit mounting	1st	Bolt	M8	6	11	1.1	8.1	572
	2nd				22	2.2	16	
Intake manifold mounting	1st	Bolt	M6	9	4	0.4	3.0	572
	2nd				8	0.8	5.9	
Spark plug		—	M14	2	25	2.5	18	
Cylinder head mounting	1st	Bolt	M8	11	15	1.5	11	572
	2nd				30	3.0	22	
Exhaust cover mounting	1st	Bolt	M6	15	4	0.4	3.0	572
	2nd				8	0.8	5.9	
Crankcase mounting	1st	Bolt	M8	10	15	1.5	11	572
	2nd				30	3.0	22	
LOWER UNIT								
Propeller		Nut	—	1	35	3.5	26	D
Lower unit mounting		Bolt	M10	6	37	3.7	27	572
		Nut	M10	6	37	3.7	27	572
Propeller shaft housing		Bolt	M6	2	11	1.1	8.1	572
Pinion gear nut		Nut	M8	1	50	5.0	37	
Water inlet		Bolt	M5	2	5	0.5	3.7	
BRACKET								
Shift actuator mounting		Bolt	M6	4	11	1.1	8.1	
		Nut	M10	1	17	1.7	13	572
Shift lever		Bolt	M6	1	11	1.1	8.1	241
Mount rubber(side upper)		Nut	M10	2	17	1.7	13	572
Mount rubber(lower front)		Bolt	M8	2	17	1.7	13	572
Steering bracket mounting		Bolt	M6	4	11	1.1	8.1	241
Clamp bracket nylon		Nut	—	2	45	4.5	33	
ELECTRICAL								
CDI unit		Bolt	M6	2	4	0.4	3.0	
Ignition coil		Bolt	M6	2	8	0.8	5.9	
Engine stop switch		Nut	M16	1	35	3.5	26	

* Do not apply too much torque.

TIGHTENING TORQUES

Nut (A)	Bolt (B)	General torque specifications		
		N•m	kgf•m	ft•lb
8 mm	M5	5	0.5	3.7
10 mm	M6	8	0.8	5.9
12 mm	M8	18	1.8	13
14 mm	M10	36	3.6	27
17 mm	M12	43	4.3	32



GENERAL TORQUES

This chart specifies tightening torques for standard fasteners with a standard ISO thread pitch. Tightening torque specifications for special components or assemblies are provided in applicable sections of this manual. To avoid warpage, tighten multi-fastener assemblies in a crisscross fashion and progressive stages until the specified tightening torque is reached. Unless otherwise specified, tightening torque specifications require clean, dry threads.
Components should be at room temperature.

CHAPTER 3
PERIODIC CHECK AND ADJUSTMENT

MAINTENANCE INTERVAL CHART

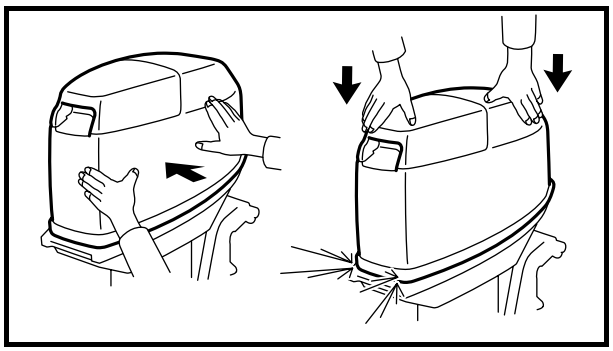
Frequency of maintenance operations may be adjusted according to the operating conditions, but the following table gives general guidelines.

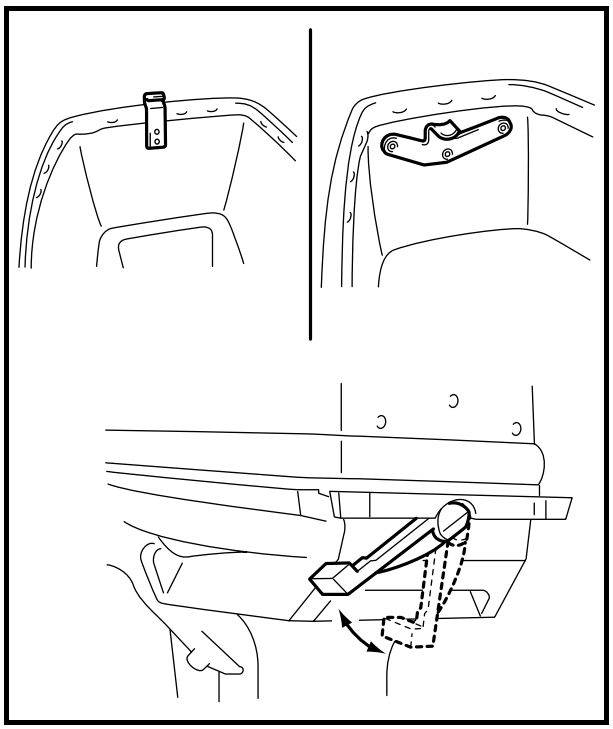
The mark (●) indicates the check-ups which maybe carried out by owner.
The mark (○) indicates work to be carried out by Yamaha dealer.

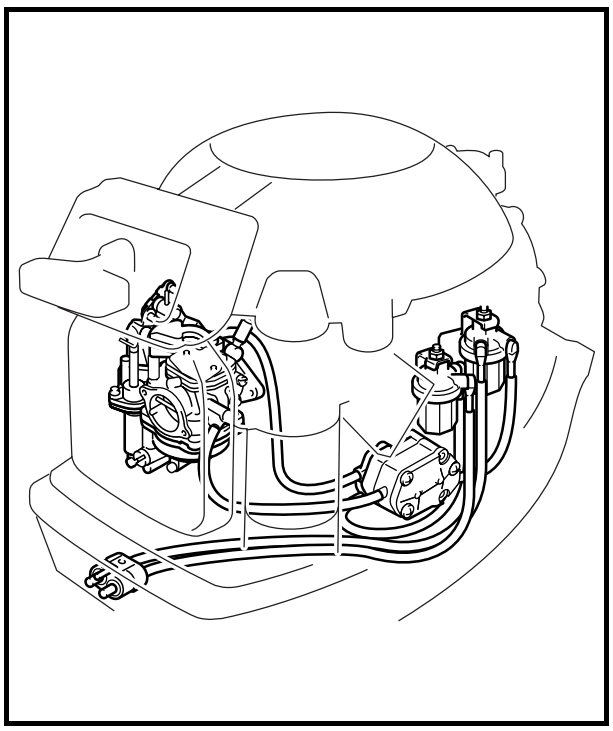
Item	Remarks	Initial		Every		Refer page
		10 hours	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	
FUEL SYSTEM						
Fuel filter	Clean	●	●	●		3-3
Fuel system	Check			○		3-2
Fuel tank	Clean				●	—
POWER UNIT						
Carburetor setting	Check	○		○		3-15
	Adjust	○		○		3-15
Cooling water passage	Clean	●		●	○	—
Exhaust leakage	Check	○	○	○		—
Water leakage	Check	○	○	○		—
CONTROL SYSTEM						
Ignition timing	Check	○		○		3-4
	Adjust	○		○		3-4
Idle speed	Check			○		3-15
	Adjust			●		3-15
LOWER UNIT						
Gear oil	Change	●		●		3-19
Propeller	Check		○	○		3-23
GENERAL						
Spark plug	Clean	●	●	●		3-22
	Adjust	●	●	●		3-22
	Replace	●	●	●		3-22
Wiring and connectors	Check	○	○	○		—
Greasa points	Grease			●		3-24
Bolts and nuts	Retighten	○		○		3-23
Anode	Check	○	○	○		3-21
Motor exterior	Check		○	○		—

NOTE:

Cooling water passages:
When operating in salt water, turbid or muddy water, the engine should be flushed with clean water after each use.







TOP COWLING

CHECKING THE TOP COWLING FIT

Check:

- Top cowling
  Cracks/damage → Replace.
- Hook
  Bent → Correct.
- Rivet
  Damage → Repair.
- Rubber of trim
  Peel/tear → Repair.

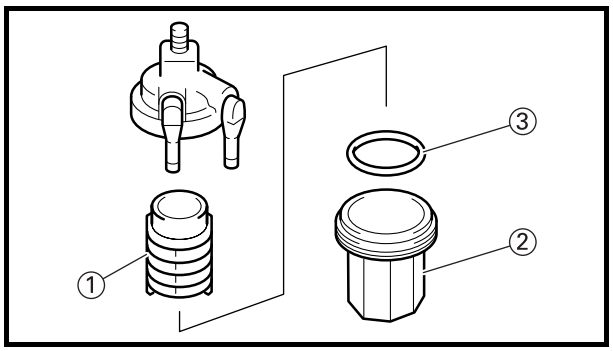
NOTE:
Hooks and latches are unadjustable.

FUEL SYSTEM

CHECKING THE FUEL LINE

Check:

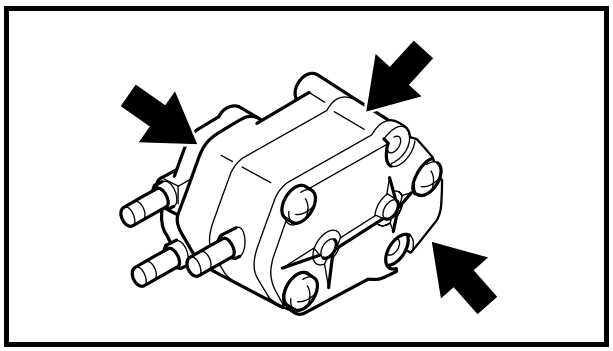
- Fuel hose
  Cracks/damage/leak → Replace.
  Refer to "FUEL JOINT, FUEL FILTER, AND FUEL PUMP" on page 4-1.



CHECKING THE FUEL FILTER

Check:

- Fuel filter element ①
  Foreign matter → Clean.
- Fuel filter cup ②
  Cracks/damage/leak → Replace.
- O-ring ③
  Cracks/damage → Replace.

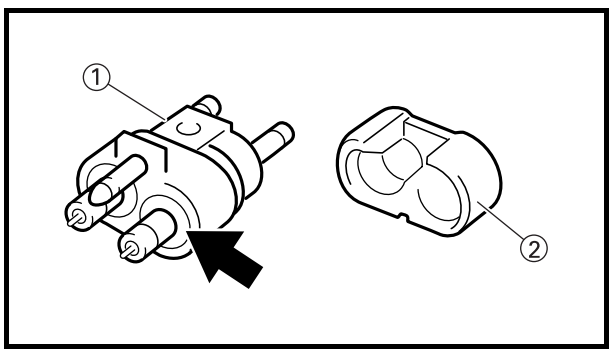


CHECKING THE FUEL PUMP

Check:

- Fuel pump
  Cracks/damage/leak → Repair/replace.
  Refer to "DISASSEMBLING THE FUEL PUMP" on page 4-4.

NOTE:
Observe pump with naked eyes.



CHECKING THE FUEL JOINT

Check:

- Fuel joint ①
  Cracks/damage/leak → Replace.
- Seal ②
  Cracks/damage → Replace.

CONTROL SYSTEM

ADJUSTING THE IGNITION TIMING

CAUTION:

Ignition timing adjustment on the running engine must be performed in the test tank with a test propeller installed on the engine.

Test propeller
90890-01629

⚠ WARNING

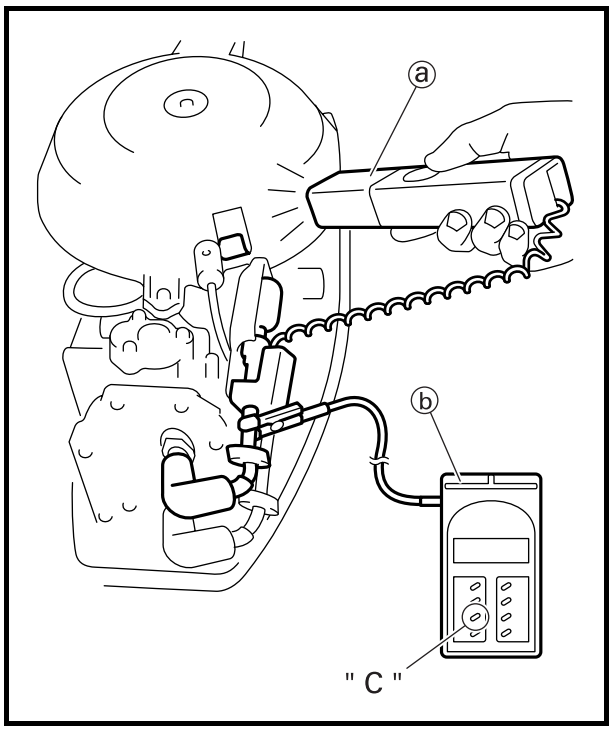
While checking the engine, do not touch the rotating part (flywheel), CDI unit, ignition coil, and any other hazardous areas.

1. Check:
   - Ignition timing

     Out of specification → Adjust.

Ignition timing (at idle)
ATDC 2° ± 2°
Ignition timing (at full advance)
BTDC 22° ± 2°

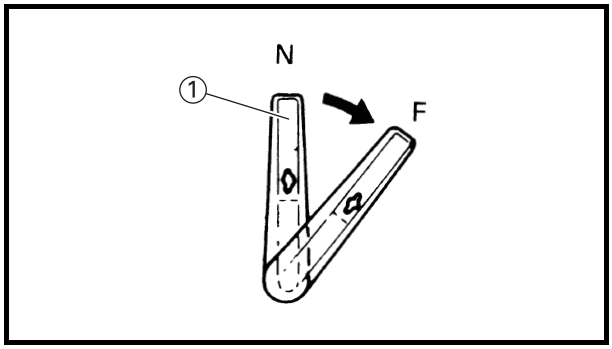
Engine idle speed
1,300 ± 50 r/min
Full throttle operating range
5,350 ± 100 r/min



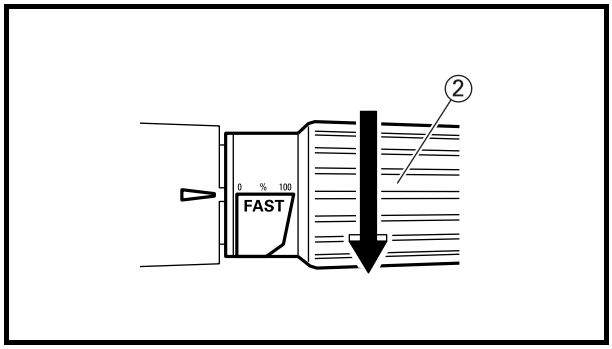
Checking steps

(1) Install the timing light ⓐ onto the spark plug lead of cylinder #1.
(2) Install the digital tachometer ⓑ onto the spark plug lead of cylinder #1.
(3) Press the position key "C" on the digital tachometer.
(4) Start the engine and allow it to warm up for a few minutes.

Timing light ..... ⓐ
90890-03141
Digital tachometer ..... ⓑ
90890-06760

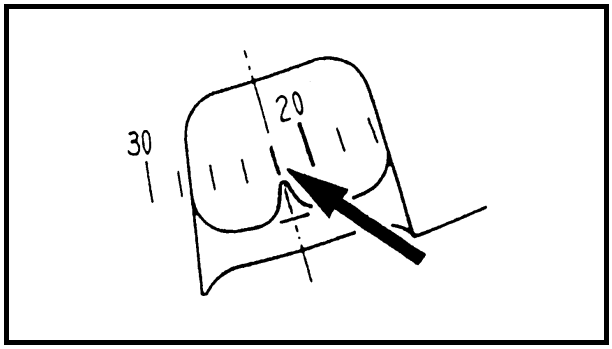


(5) Set the shift lever ① in forward position.



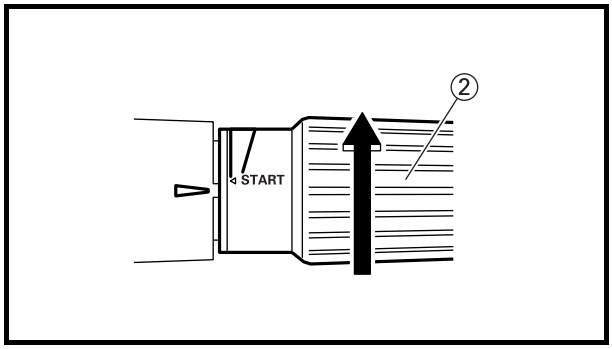
(6) Fully open the throttle by moving the throttle ② to the "FAST" position.

Full throttle operating range
5,350 ± 100 r/min



(7) Check the ignition timing by pointing the timing light at the timing indicator on the starter case.

Ignition timing (at full advance)
BTDC 22° ± 2°

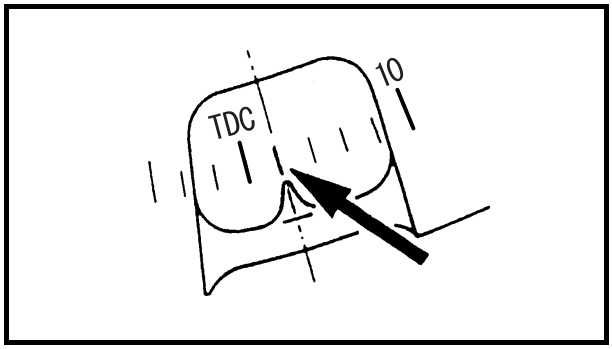


(8) Move the throttle ② to full-close position.

Engine idle speed
1,300 ± 50 r/min

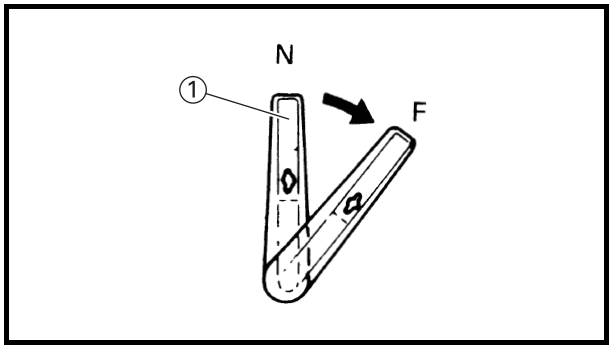
(9) Check the ignition timing by pointing the timing light at the timing indicater on the starter case.

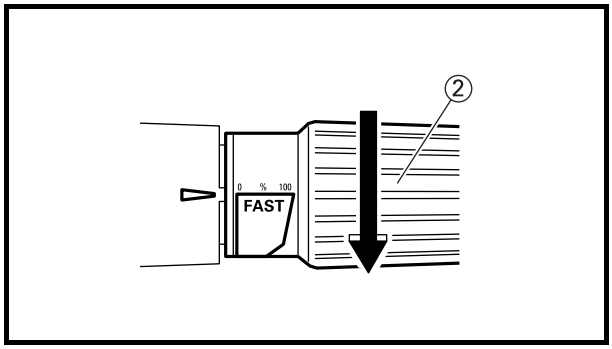
Ignition timing (at idle)
ATDC 2° ± 2°

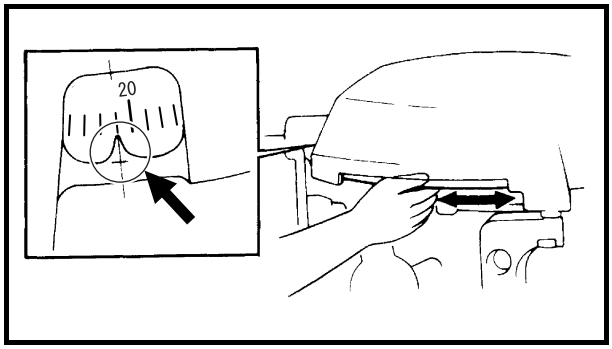


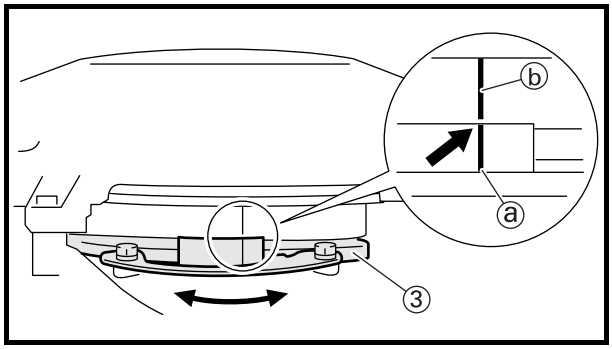
NOTE:

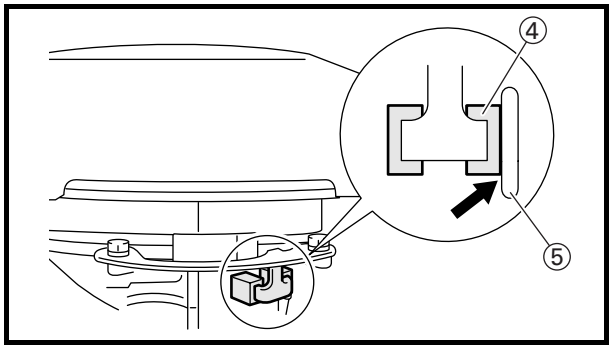
- Ignition timing adjustment is not required if the timing indicator reading falls within the specification.
- If the reading is out of specification, adjust the timing by the following procedure.











2. Adjustment with full-open throttle:
   - Magnet base stopper

CAUTION:

- **Make sure that engine is not running.**
- **Remove the plug caps.**

Adjustment steps

(1) Set the shift lever ① in forward position.

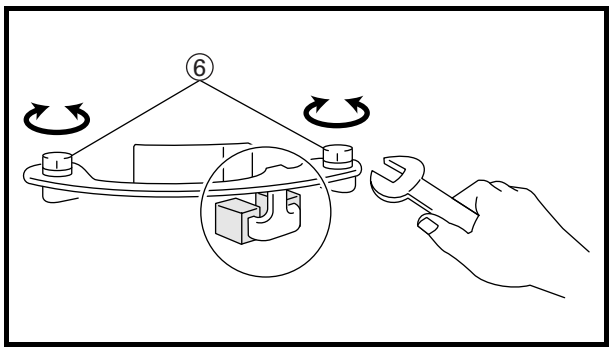
(2) Move the throttle ② to full-open position.

(3) Slowly turn the flywheel clockwise to align the full advanced timing mark with the specified position on the timing indicator.

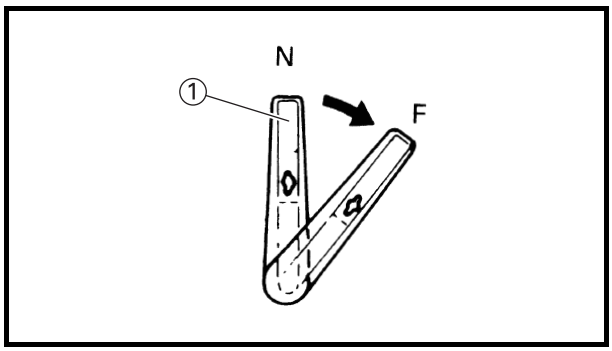
Ignition timing (at full advance)
BTDC 22° ± 2°

(4) Turn the magnet base ③ until the timing mark ⓐ stamped on the port side comes in line with the ignition mark ⓑ on the rotor.

(5) Check that the magnet base stopper ④ is in contact with the stopper on the engine body (full-open end stopper) ⑤.



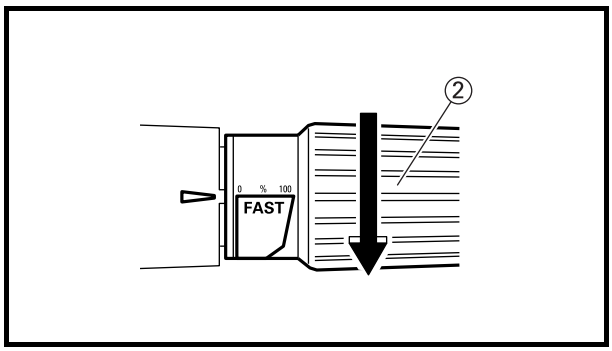
(6) If they are not in contact, loosen the set bolt ⑥, adjust until they are correctly in contact with each other, and secure the bolt again.



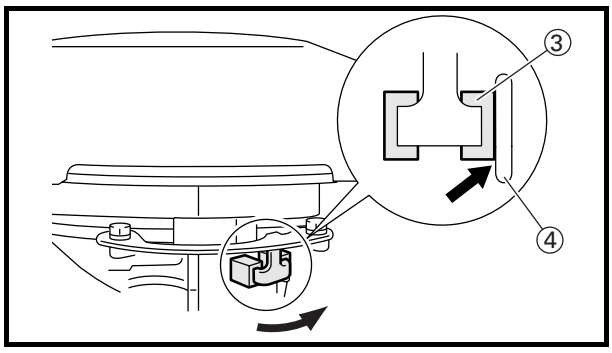
3. Adjusting the carburetor control link:
   - Accelerator cam
   - Carburetor control link

Adjustment steps

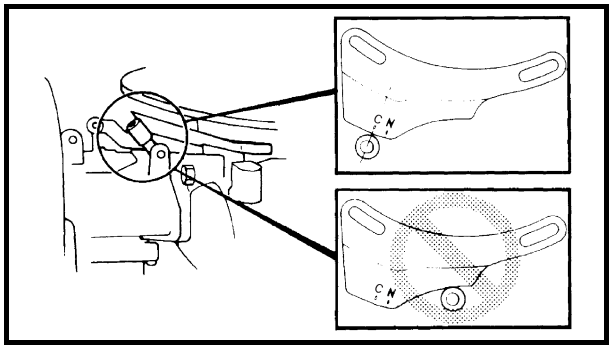
(1) Set the shift lever ① in forward position.



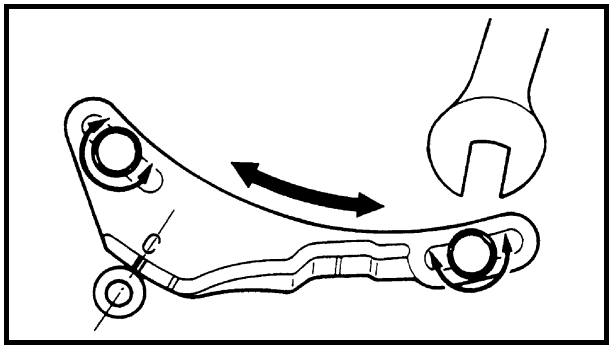
(2) Move the throttle ② to full-open position.



(3) Make sure that the magnet base stopper ③ is in contact with the stopper on the engine body (full-open end stopper)④.

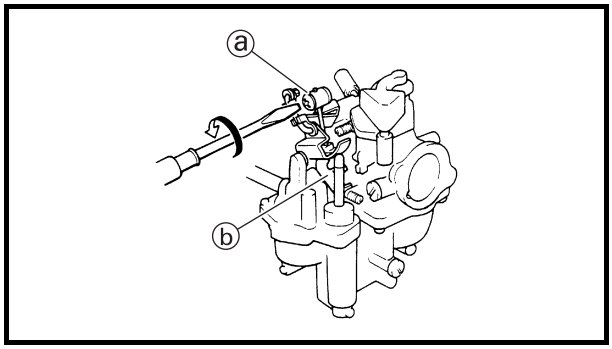


(4) Check to see that the full-open marking "C" on the accelerator cam aligns with the center of the cam roller.



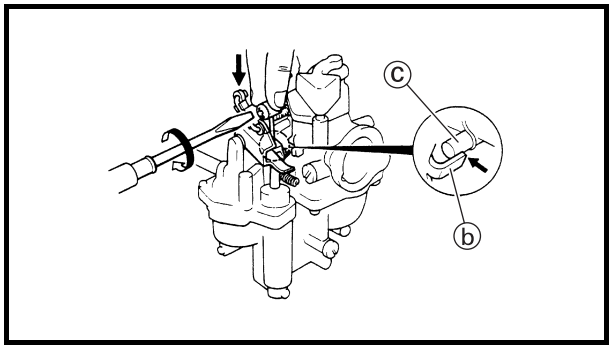
(5) "Loosen the bolt, and align the full-open marking "C" with the center of carburetor throttle roller, and tighten the set-bolt."

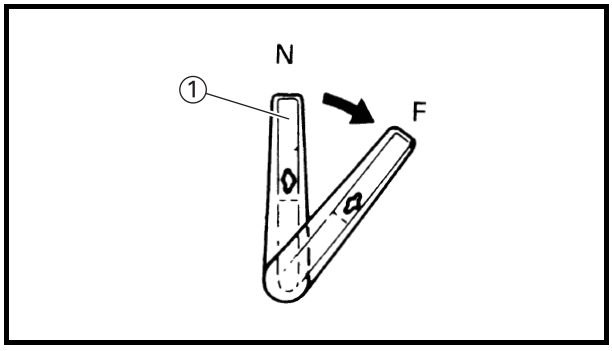
NOTE:
Remove the manual starter before adjusting.



(6) "Loosen the rod tightening screw ⓐ. While pushing the rod with your finger, tighten the screw so that the throttle is full-open (the full-open stopper ⓑ is pushed against the stopper ⓒ), and lock the screw."

NOTE:
After adjustment, open and close the throttle repeatedly for several times to reassure that the full-open position of the accelerator cam and the positioning of the carburetor control link stopper are correct.

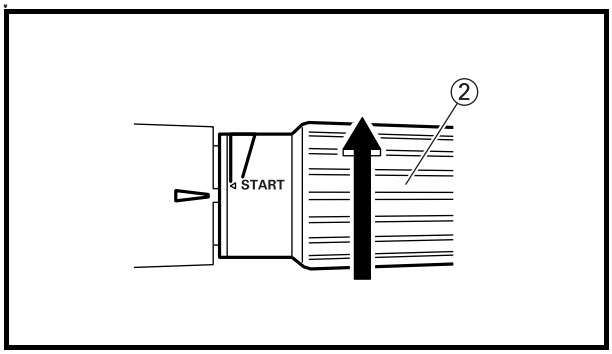




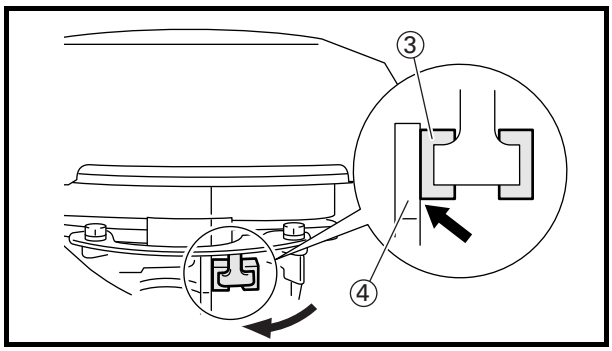
4. Adjustment with full-closed throttle:
   - Accelerator cam
   - Carburetor control link

Adjustment steps

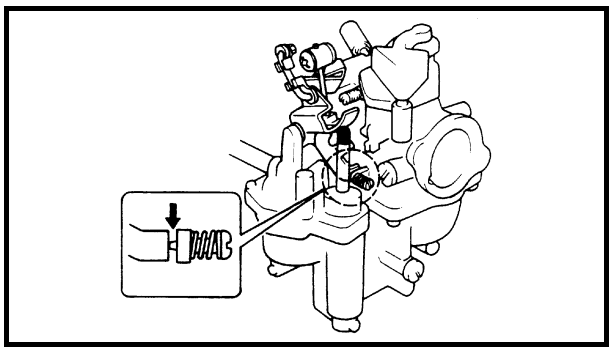
(1) Set the shift lever ① in forward position.



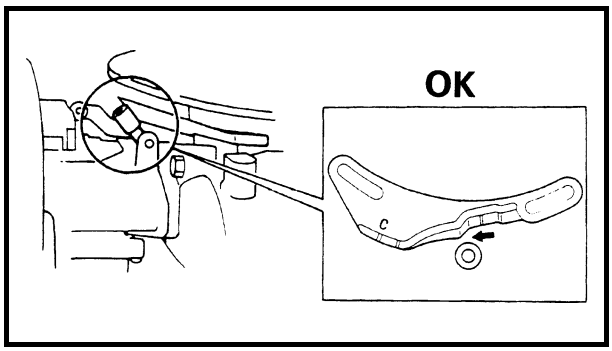
(2) Move the throttle ② to full-close position.



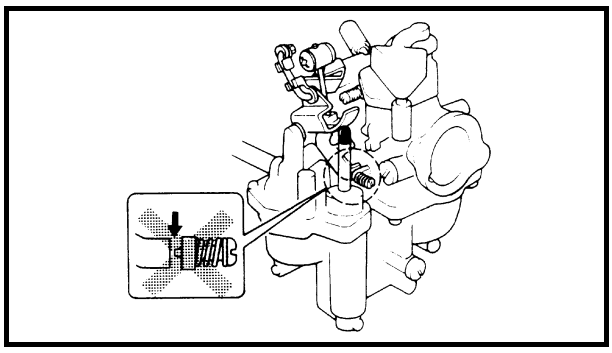
(3) Make sure that the magnet base stopper ③ is in contact with the stopper on the engine body (full-close end stopper)④.



(4) Make sure that the lever is in contact with the carburetor throttle stop screw.



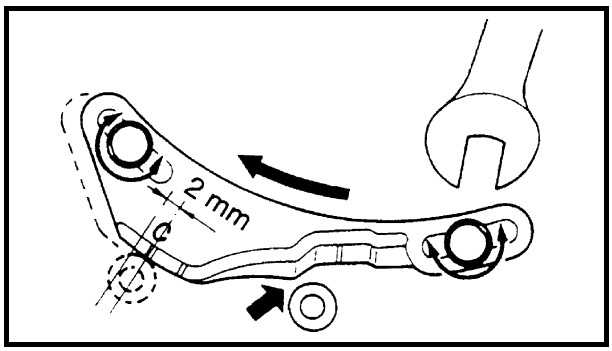
(5) Correct adjustment has been established if the cam roller is not in contact with the accelerator cam.

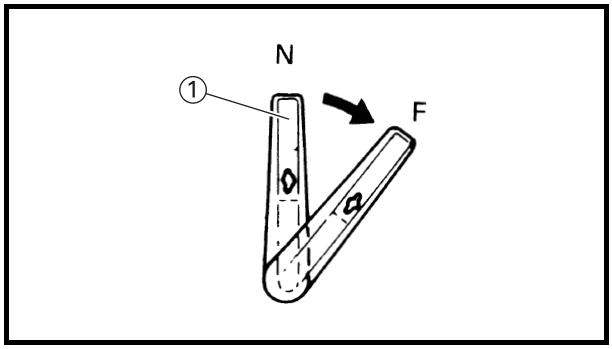


(6) If the lever is not in contact with the throttle stop screw move the plate cam to the left so that the lever comes to contact with the throttle stop screw.

NOTE:

- When shifting the plate cam slightly, do not shift it more than 2 mm (0.079 in) to the left from the point at which the marking line of the full-open mark "C" aligns with the centerline of the roller cam at full-throttle.
- After adjustment, open and close the throttle for several times, and reassure that the lever is in contact with the throttle stop screw on the carburetor, and that the cam roller is not in contact with the accelerator cam.



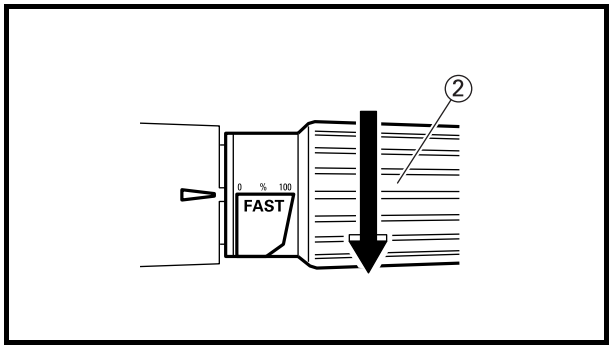


5. Adjusting the throttle cable
- Throttle cable

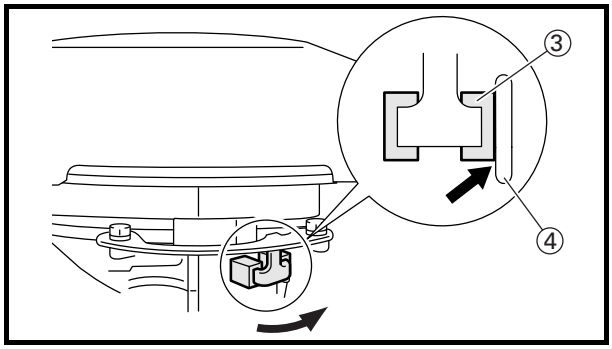
Adjusting steps

NOTE:
After adjustment, open and close the throttle for several times for reassurance.

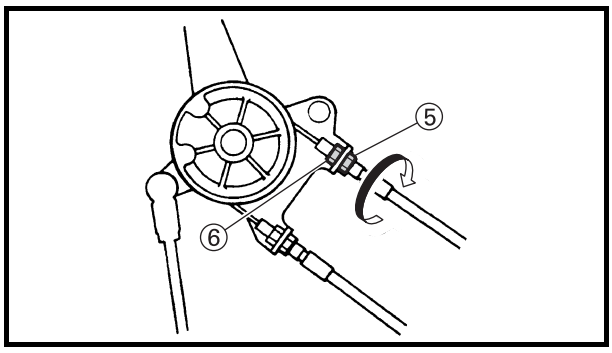
(1) Set the shift lever ① in forward position.



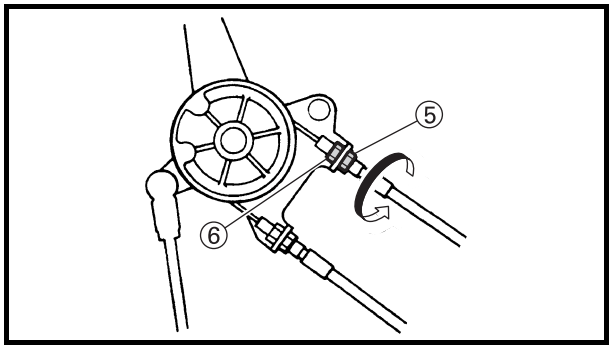
(2) Move the throttle ② to full-open position.



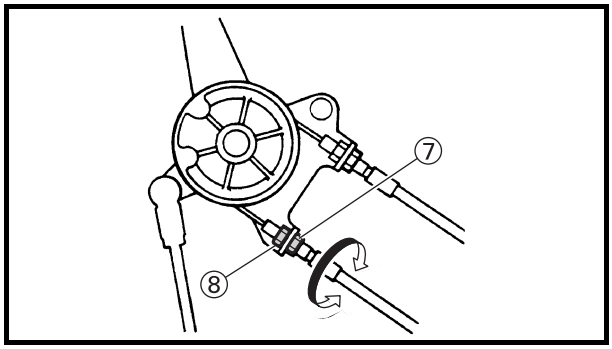
(3) Check that the magnet base stopper ③ is in contact with the stopper on the engine body (full-open end stopper) ④.



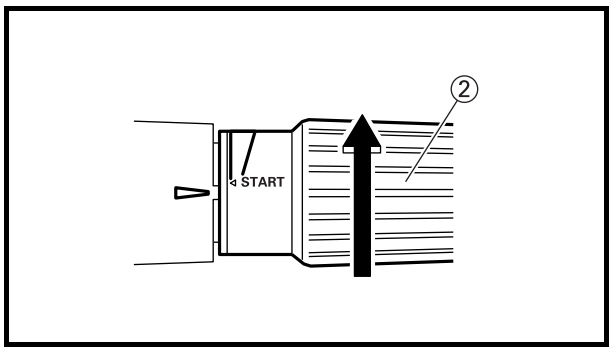
(4) If the stoppers come in contact before the throttle is fully open, loosen the lock nut ⑥ on the throttle-opening cable, turn-in the adjusting nut ⑤ until the cerrect positioning is attained, and then secure it by the lock nut ⑥.



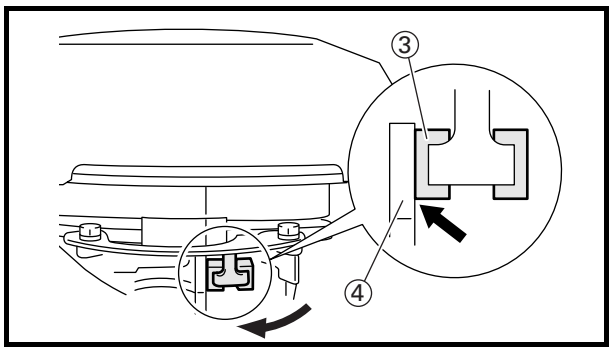
(5) If the stoppers do not come in contact at full-open throttle, then turn-out the adjusting nut ⑤ on the throttle-opening cable until the correct positioning is attained, and secure it by the lock nut ⑥.



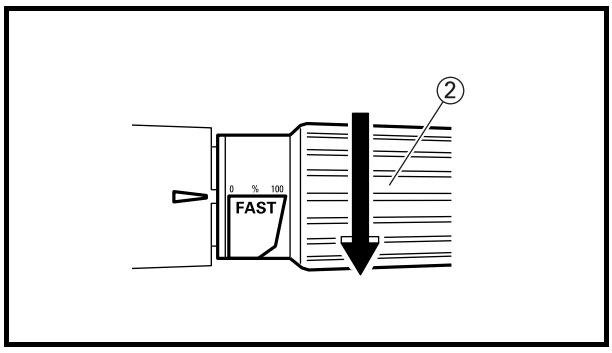
(6) After confirming the positive contact of stoppers at full-open throttle position, turn the adjusting nut ⑦ on the throttle-closing cable so that the cable has a little slack, and then secure it by the lock nut ⑧.



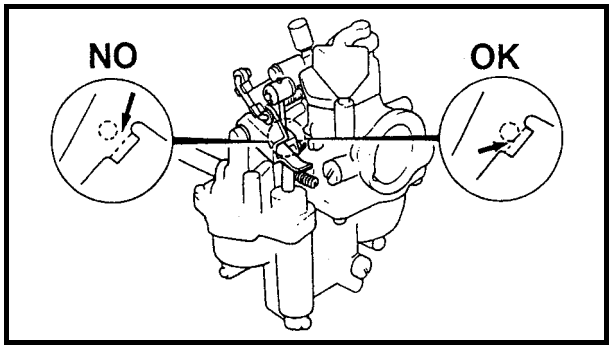
(7) Once the adjustment under full-open throttle is completed, move the throttle ② to full-close position.



(8) Make sure that the magnet base stopper ③ is in contact with the stopper on the engine body (full-close end stopper) ④.



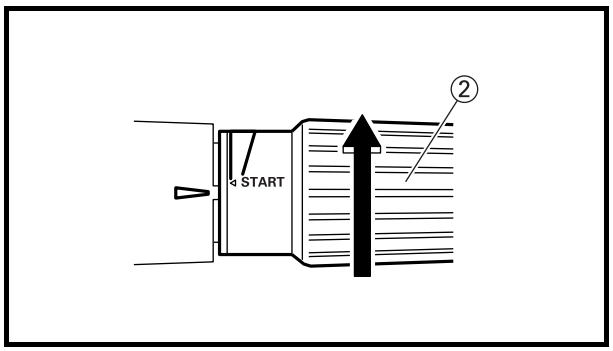
(9) Move the throttle ② to full-open position.



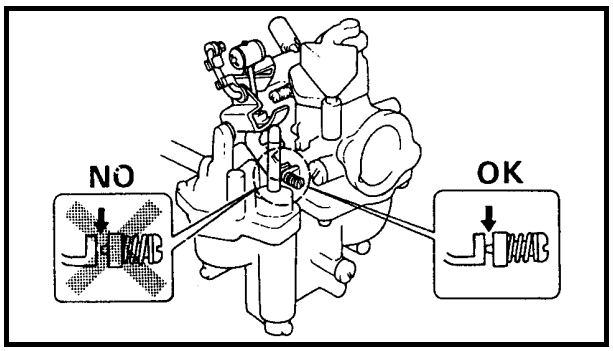
(10) In this condition, make sure that the full-open stopper is in contact with the stopper.

NOTE:
If they are not in contact, adjust the carburetor control link.

Refer to "Adjusting the carburetor control link:" on page 3-7.



(11) Move the throttle ② to full-close position.

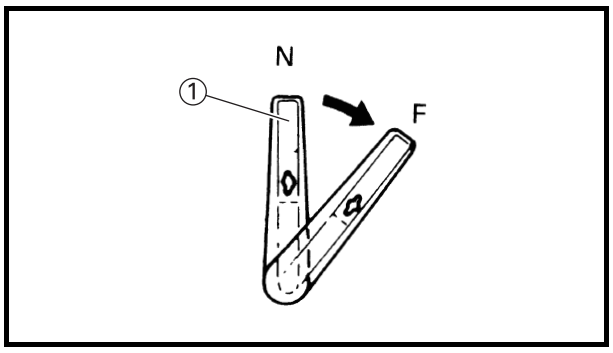


(12) At this point, make sure that the throttle lever is in contact with the throttle stop screw on the carburetor.

NOTE:

- After adjustment, open and close the throttle for several times for reassurance.
- If they are not in contact, adjust the carburetor control link.

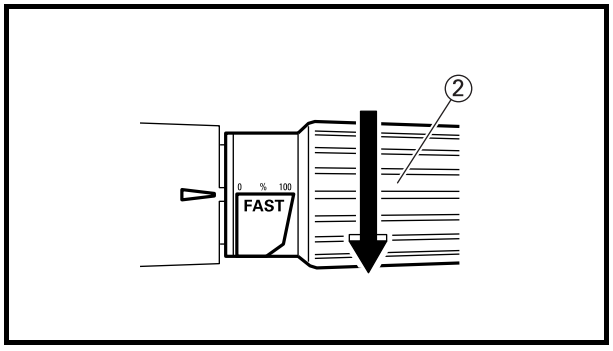
Refer to "Adjusting the carburetor control link:" on page 3-7.



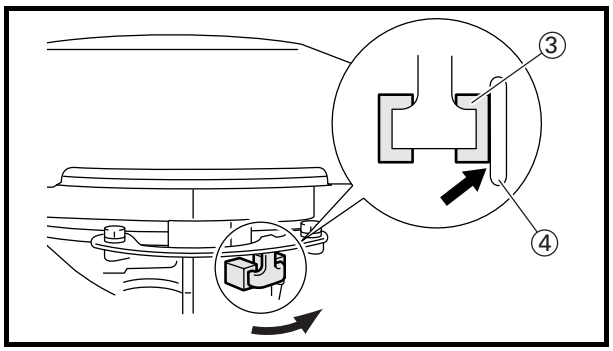
6. Adjusting the throttle control lever:
   - Throttle control lever

Adjustment steps

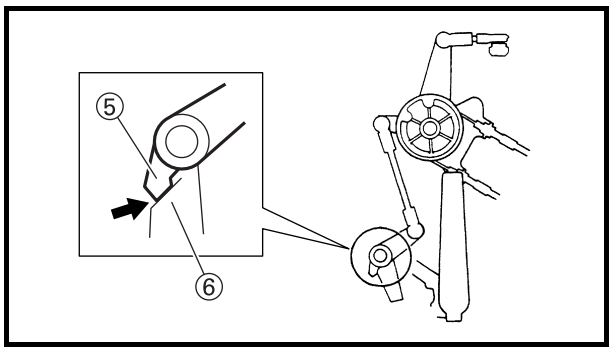
(1) Set the shift lever ① at the forward position.



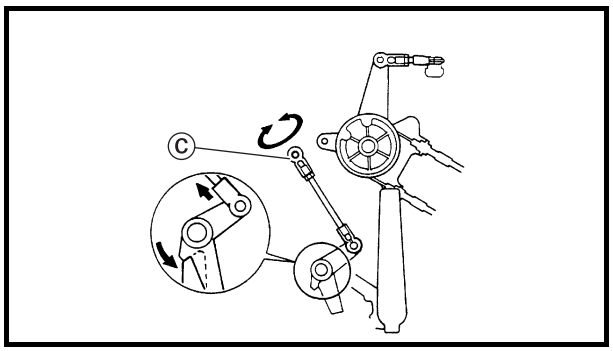
(2) Move the throttle ② to full-open position.



(3) Check that the magnet base stopper ③ is in contact with the stopper on the engine body (full-open end stopper) ④.

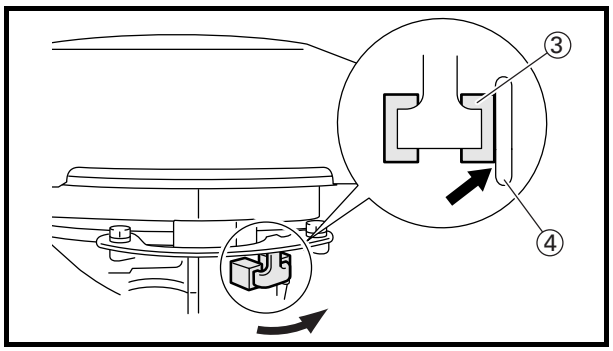


(4) Check that the throttle control lever ⑤ is in contact with the stopper ⑥ on the bottom cowling.



(5) If they are not in contact, adjust the length of the joint link ⓒ so that the throttle control lever seats on the stopper on the bottom cowling.

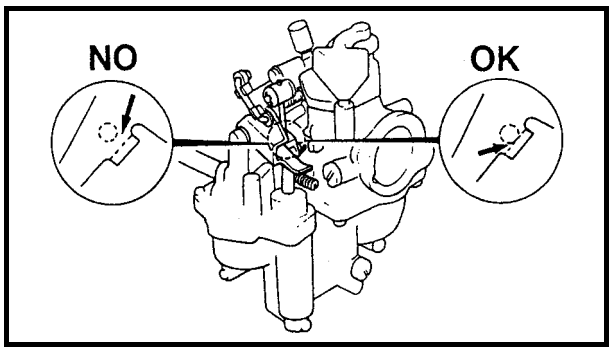
NOTE:
After adjustment, open and close the throttle repeatedly for several times to reassure the correct positioning.



(6) Check that the magnet base stopper ③ is in contact with the stopper on the engine body (full-open end stopper) ④.

NOTE:
If they are not in contact, perform the adjustment with full-open throttle.

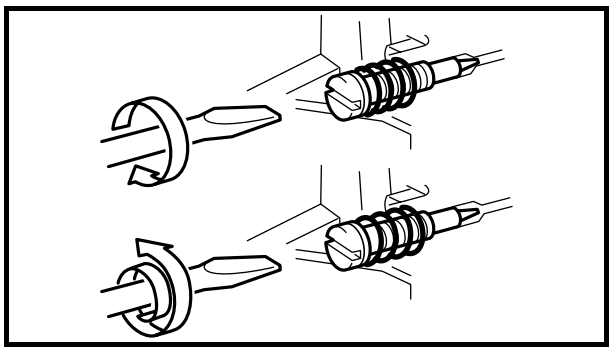
Refer to "Adjustment with full-open throttle:" on page 3-6.

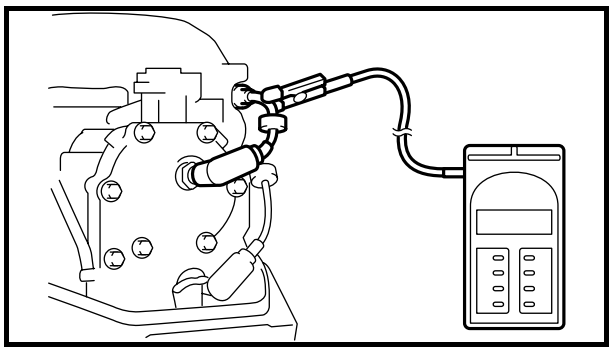


(7) In this condition, make sure that the full-open stopper is in contact with the stopper.

NOTE:
If they are not in contact, adjust the carburetor control link.

Refer to "Adjusting the carburetor control link:" on page 3-7.





7. Adjusting the engine idle speed:
   - Engine idle speed

Adjustment steps

(1) Adjust the pilot screw.

Pilot screw turn-out
Gasoline carburetor:
1 - 1/2 ± 1/2
Kerosene carburetor:
1/2 + 2
1/2 - 1/2

(2) Adjust the idling stop screw

Engine idle speed
1,300 ± 50 r/min

Refer to "ADJUSTING THE ENGINE IDLE SPEED" on page 3-15.

ADJUSTING THE ENGINE IDLE SPEED

NOTE:
- The engine should be warmed up for the adjustment. Correct adjustment cannot be obtained when the engine is cold.
- Make sure that the pilot screw adjustment is normal before implementing idling stop screw adjustment.

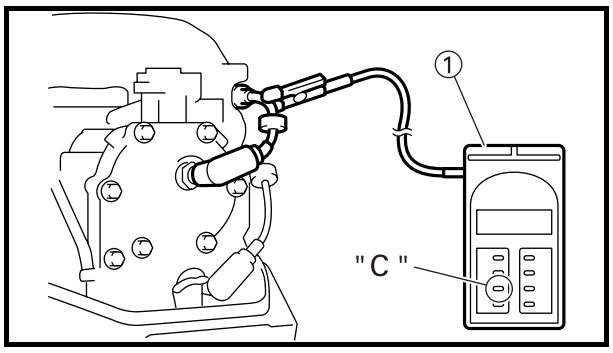
1. Measure:
   - Engine idle speed

     Out of specification → Adjust.

	Engine idle speed **1,300 ± 50 r/min**

CAUTION:

Install the engine in the test tank to check the engine idle speed.



Measuring steps

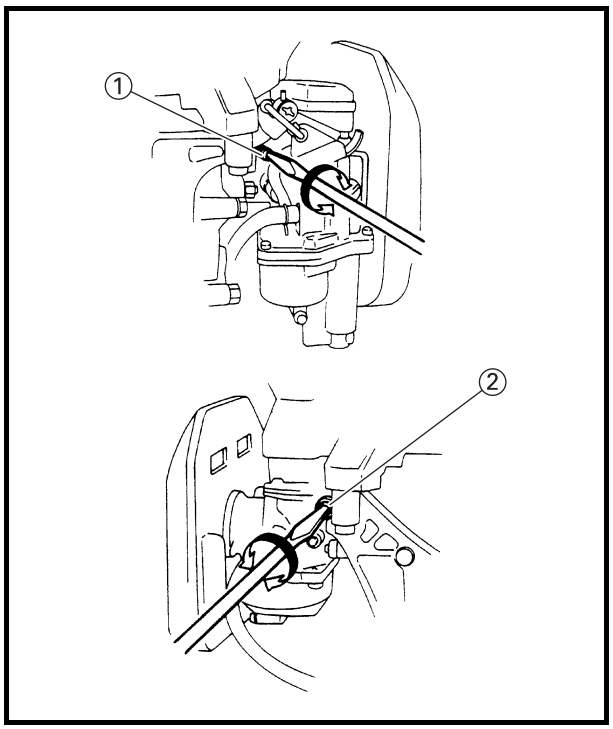
(1) Start the engine and allow it to warm up for a few minutes.

(2) Install the digital tachometer ① onto the spark plug lead of cylinder #1.

(3) "Press the position key "C" on the digital tachometer."

	Digital Tachometer.....① **90890-06760**

2. Adjust:
- Carburetor pilot screw



CAUTION:

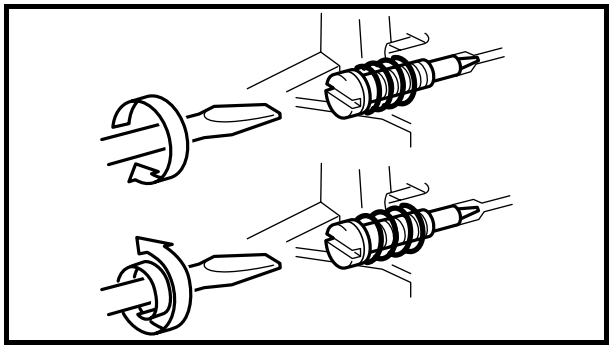
Do not adjust the carburetor when it is operating properly. Excessive adjustment may cause the engine poor performance.

Adjustment steps

(1) Turn in the pilot screw (①:Gasoline, ②:Kerosene) until they are lightly seated.

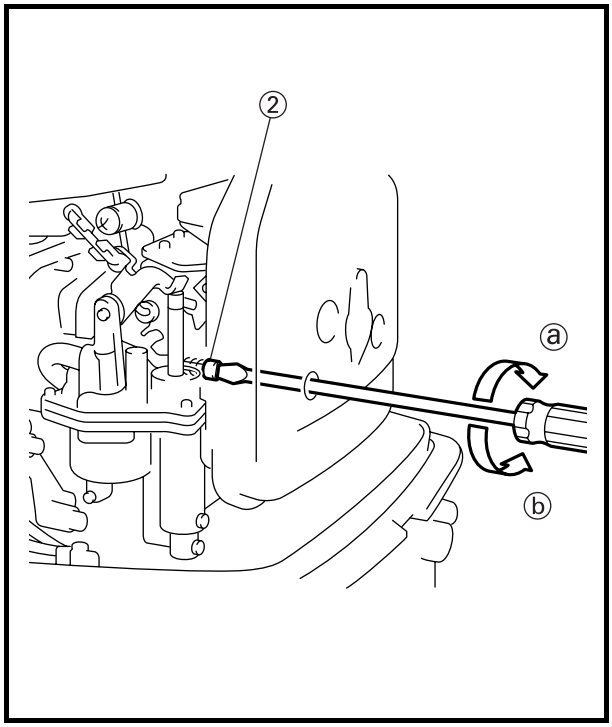
(2) Turn out the pilot screws by specified number of turns.

	Pilot screw turn-out **Gasoline carburetor:** **1 - 1/2 ± 1/2** **Kerosene carburetor:** **1/2 + 2** **1/2 - 1/2**



(3) Make sure that the idle speed is stable when the throttle is opened and closed for several times.

NOTE:
If the idle speed is not stable, disassemble and readjust the carburetor.



3. Adjust:
   • Engine idle speed

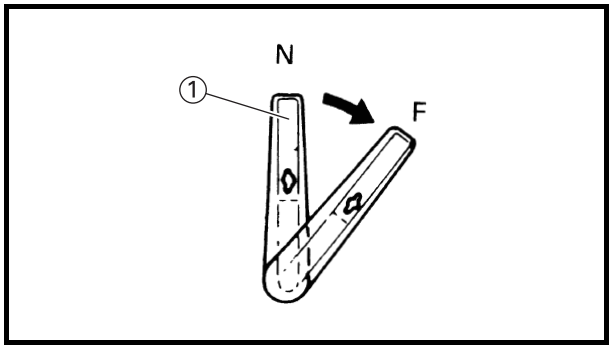
Adjustment steps

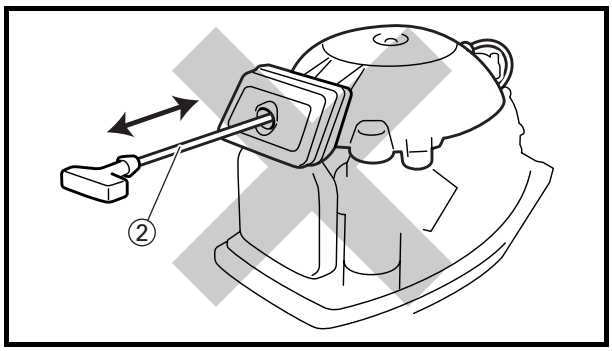
(1) Turn the idling stop screw ② of carburetor in direction ⓐ or ⓑ until the specified engine idle speed is obtained.

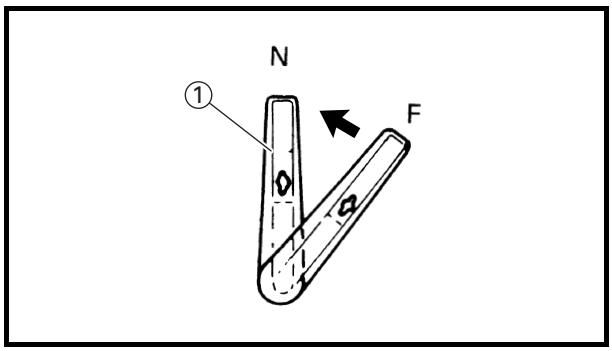
Direction ⓐ	Engine idle speed **increases.**
Direction ⓑ	Engine idle speed **decreases.**

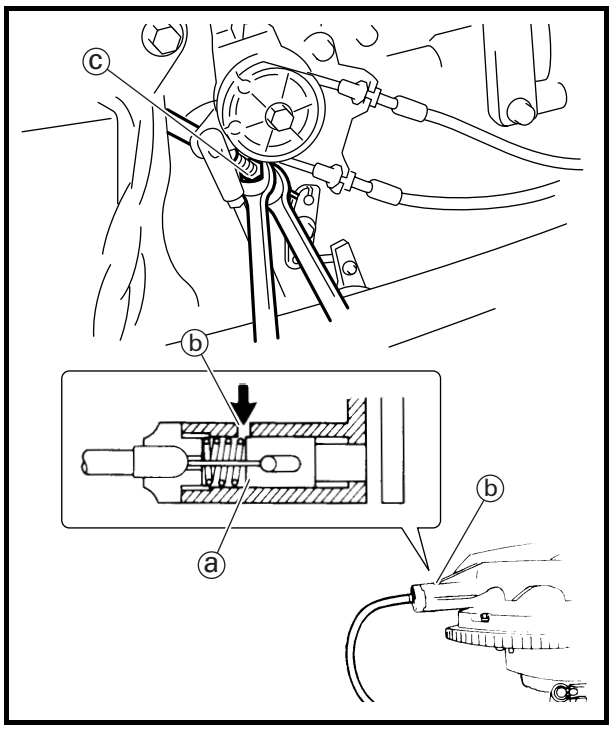
(2) Check the engine idling stability by opening and closing the throttle for several times. If engine idling is unstable, adjust the pilot screw.

NOTE:
After adjustment, open and close the throttle for several times and keep it idling for at least 15 seconds. Check if engine idle speed is stable.









ADJUSTING THE START-IN-GEAR PROTECTION DEVICE

CAUTION:

- **Make sure that the engine is not running.**
- **Remove the plug caps.**

1. Check:
   - Start-in-gear protection device

Checking steps

(1) Set the shift lever ① in forward or reverse position.

(2) Check that the starter rope ② cannot be pulled out.

(3) If the starter rope can be pulled out, perform the adjustment.

2. Adjust:

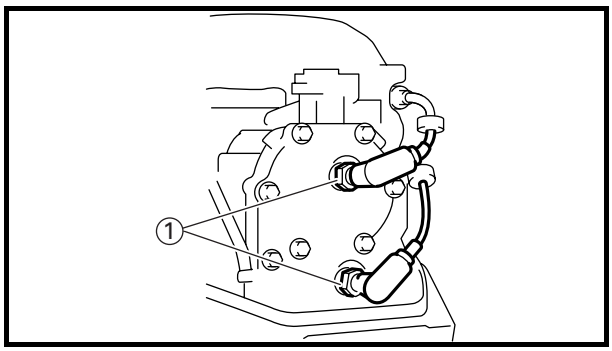
Adjustment steps

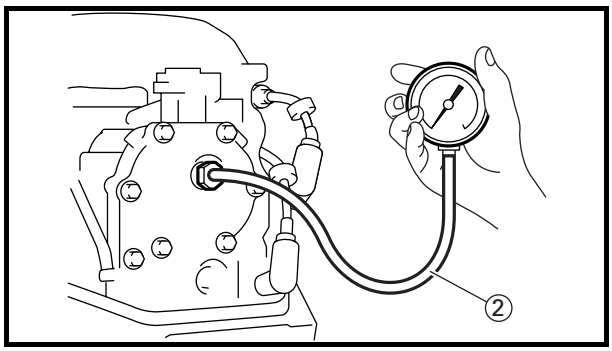
(1) Set the shift lever ① in neutral position.

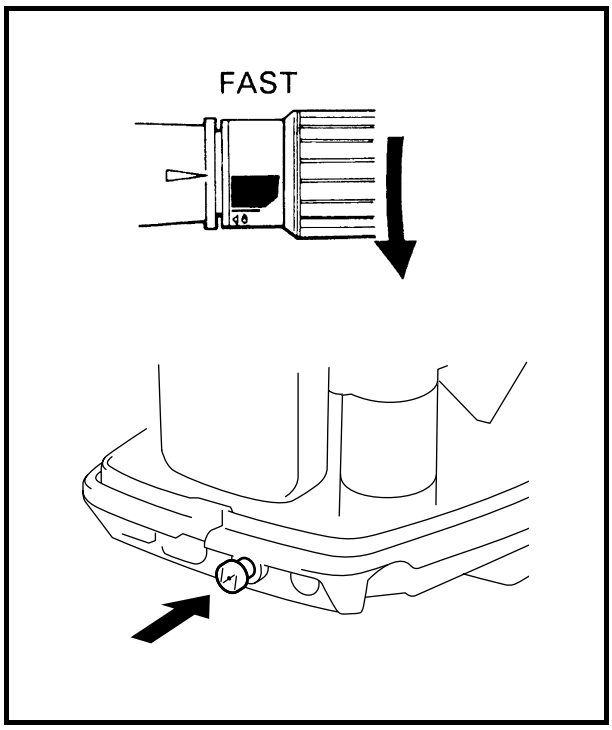
(2) Turn in or out the adjusting nut ⓒ on the starter stop wire so that the starter stopper end ⓐ is aligned with the hole on the starter case ⓑ.

NOTE:

- Check again that the starter rope can not be pulled out when the shift is engaged.
- Check again that the starter rope can be pulled out when the shift is in neutral.







POWER UNIT

MEASURING THE COMPRESSION PRESSURE

NOTE:

The engine should be warmed up before measuring the compression pressure. Correct measurement cannot be obtained when the engine is cold.

1. Measure:
   - Compression pressure

     Below minimum compression pressure → Check or replace piston, piston rings, cylinder head, and cylinder head gasket.

Compression pressure (reference value)
#1: 680 kPa (6.8 kgf/cm^2, 98.6 psi)
#2: 730 kPa (7.3 kgf/cm^2, 105.9 psi)
Minimum compression pressure
#1: 540 kPa (5.4 kgf/cm^2, 78.3 psi)
#2: 580 kPa (5.8 kgf/cm^2, 84.1 psi)

Measuring steps

(1) Remove the spark plug ①.

CAUTION:

Before removing the spark plug, clean the spark plug well arec to prevent any dirt from falling into the cylinder that is being checked.

(2) Install the compression gauge ② into the spark plug hole.

Compression gauge
90890-03160

(3) Fully open the throttle.

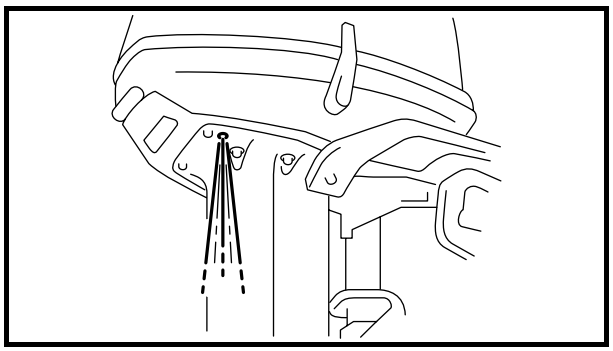
(4) Fully open the choke. (Make the choke valve ineffective.)

(5) Crank the engine by means of recoil starter (MH model) or starter motor (W, WC, and WH models) until the compression gauge gives stable reading.

(6) Remove the compression gauge ②.

(7) Install the spark plug ①.

Spark plug
25 N•m (2.5 kgf•m, 18 ft•lb)



COOLING SYSTEM

CHECKING THE COOLING WATER DISCHARGE

Check:
- Pilot water

  Does not flow → Clean and check the cooling water passage.

Checking steps

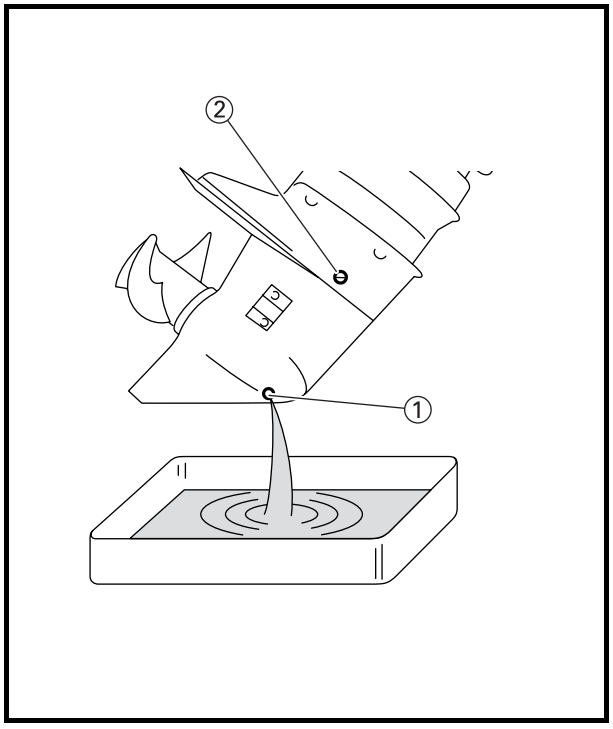
(1) Place the lower unit in water.
(2) Start the engine.
(3) Check that water flows from the pilot water outlet.

LOWER UNIT

CHECKING THE GEAR OIL LEVEL

Check:
- Gear oil level

  Level is low → Add gear oil to the proper level.



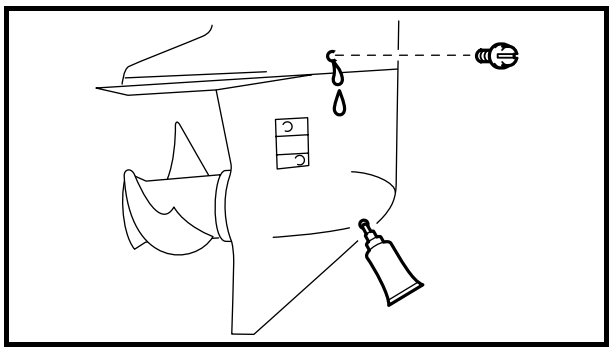
CHANGING AND CHECKING THE GEAR OIL

1. Check:
   - Gear oil

     Milky oil → Replace the oil seal.
     Slug oil → Check the oil gears, bearings, and clutch dog.

Checking steps

(1) Tilt up the outboard slightly.
(2) Place a container under the gear oil drain screw ①.
(3) Remove the gear oil drain screw and gear oil level check screw ②.



2. Fill:
   - Gear oil

     (with the specified amount of the recommended gear oil.)

Recommended gear oil
Hypoid gear oil, SAE #90 (API GL-4)
Oil capacity
320 cm³ (10.8 US oz, 11.3 Imp oz)

Filling steps

(1) Place the outboard in an upright position.

(2) Insert the gear oil tube into the drain hole and slowly fill the gear oil until oil flows out of the check hole and no air bubbles are visible.

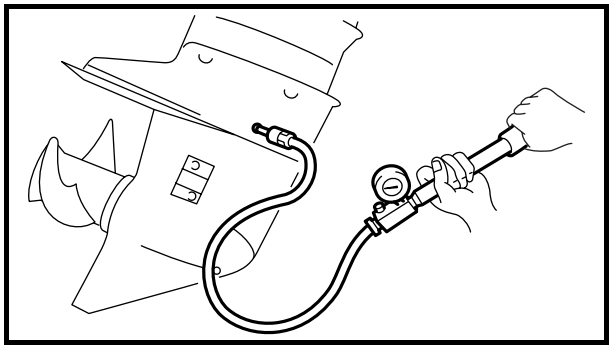
(3) Install the gear oil level check screw and then quickly install the gear oil drain screw.

CHECKING THE LOWER UNIT (FOR AIR LEAKS)

Check:
- Lower unit holding pressure

  Pressure drops → Check the seal and components.

Lower unit holding pressure
100 kPa (1.0 kg/cm², 14.5 psi) for 10 seconds



Checking steps

CAUTION:

Do not overpressurize the lower unit. Excessive pressure may damage the oil seals.

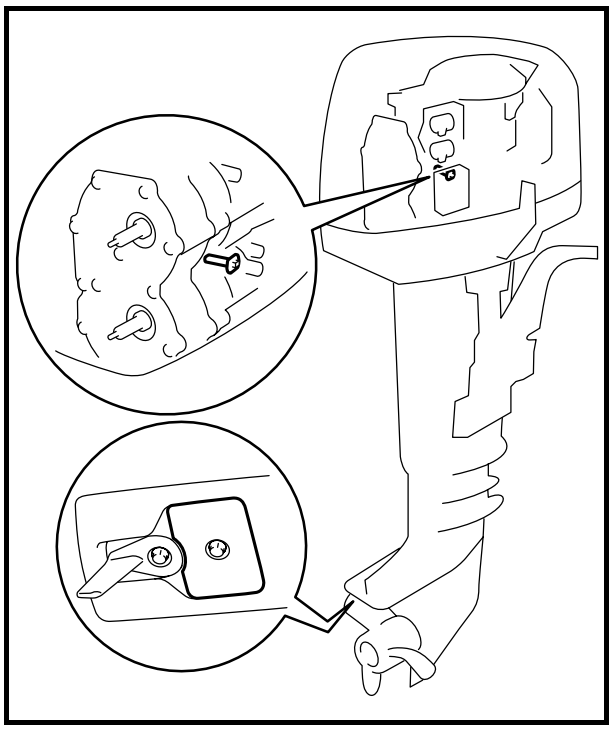
(1) Remove the gear oil level check screw.

(2) Install the pressure tester into the check hole.

Leakage tester
90890-06762

(3) Apply the specified pressure.

(4) The lower unit should hold the specified pressure for 10 seconds.



GENERAL

CHECKING THE ANODE

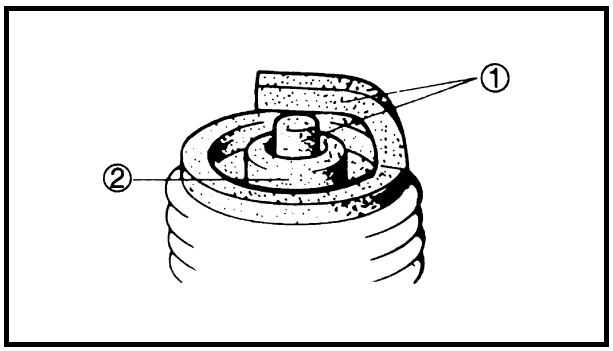
Check:

- Anodes

  Scales → Clean.
  Oil/grease → Clean.
  Excessive wear → Replace.

CAUTION:

Do not oil, grease, or paint the anode, or it will not operate properly.



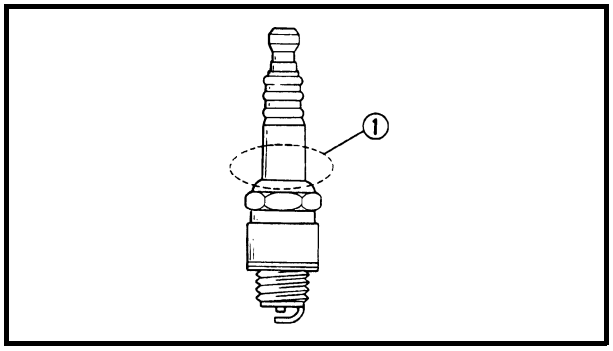
CHECKING THE SPARK PLUGS

1. Check:
   - Electrodes ①
     Cracks/excessive wear → Replace.
   - Insulator color ②
     Distinctly different color → Check the engine condition.

Color guide:
Medium to light tan color
Normal
Whitish color
- Lean fuel mixture
- Plugged jet (s)
- Wrong setting

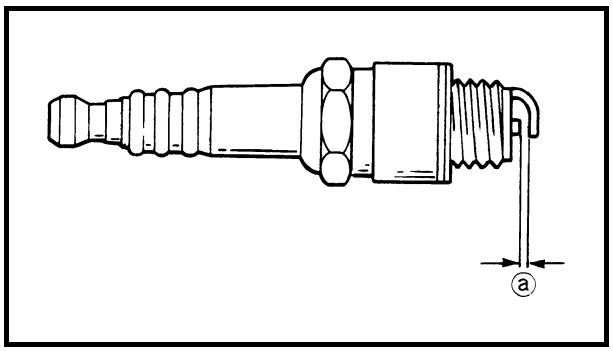
Blackish color
- Rich mixture
- Excessive oil usage
- Defective ignition system
- Defective spark plug

2. Clean:
   - Spark plug
     (use a spark plug cleaner or wire brush)



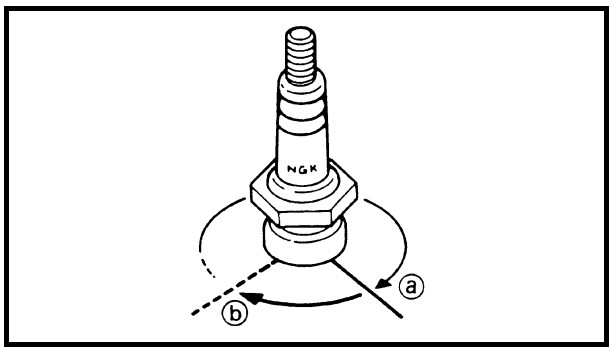
3. Check:
   - Spark plug type ①
     Incorrect → Replace.

Standard spark plug
NGK B7HS-10



4. Measure:
   - Spark plug gap ⓐ
     Out of specification → Replace.

Spark plug gap
0.9-1.0 mm (0.035-0.039 in)

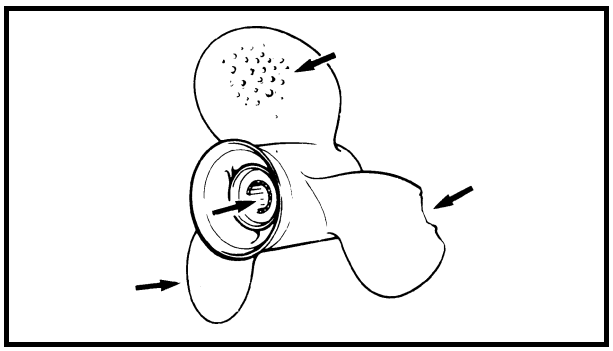


5. Tighten:
   - Spark plug

	Spark plug **25 N•m (2.5kgf•m, 18 ft•lb)**

NOTE:

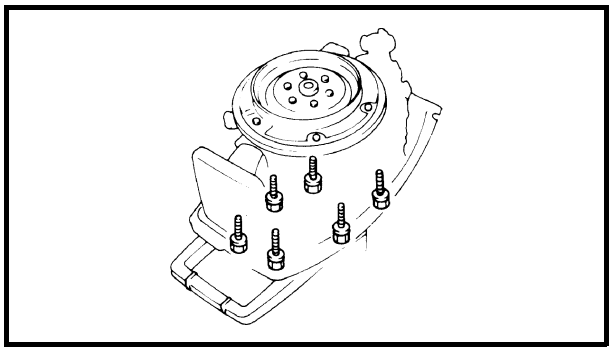
- Before installing the spark plug, clean the gasket surface and spark plug surface. Also, it it suggested to apply a thin film of anti-seize compound to the spark plug threads to prevent thread seizure.
- If a torque wrench is not available, a good estimate of the correct tightening torque is to finger tighten ⓐ the spark plug and then tighten it another 1/4 to 1/2 of a turn ⓑ.



CHECKING THE PROPELLER

Check:
- Propeller
- Spline

  Wear/cracks/damage → Replace.

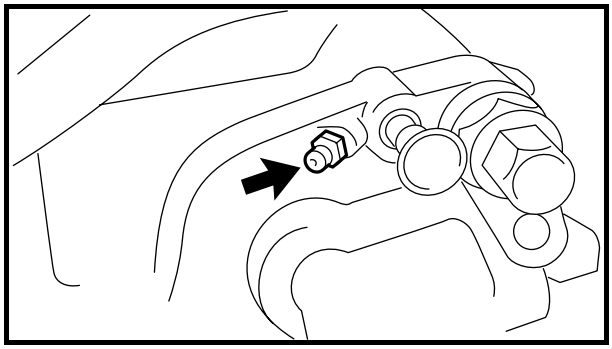


CHECKING BOLTS AND NUTS

Check:
- Power unit mount bolt
- Flywheel nut

  Loose bolts / nuts → Tighten to the specified torque.

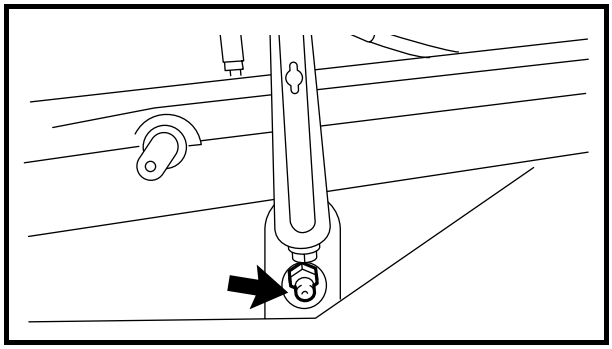
	Power unit mount bolt **1st 11 N•m (1.1 kgf•m, 8.1 ft•lb)** **2nd 22 N•m (2.2 kgf•m, 16 ft•lb)** **Flywheel nut** **140 N•m (14 kgf•m, 103 ft•lb)**



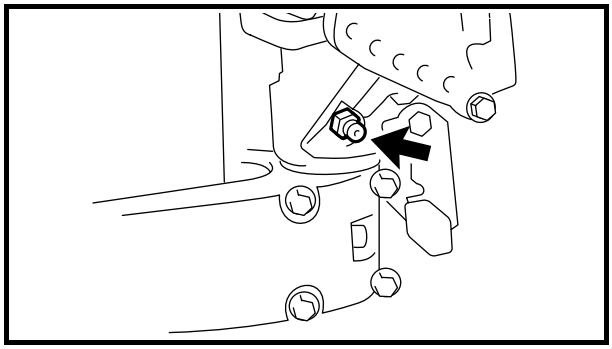
LUBRICATION POINTS

1. Apply:
   - Yamaha grease A

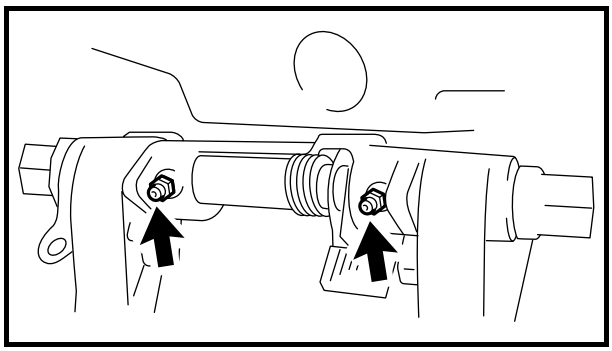
NOTE:
Using a grease gun, fill in the grease until it comes out of the bushing.



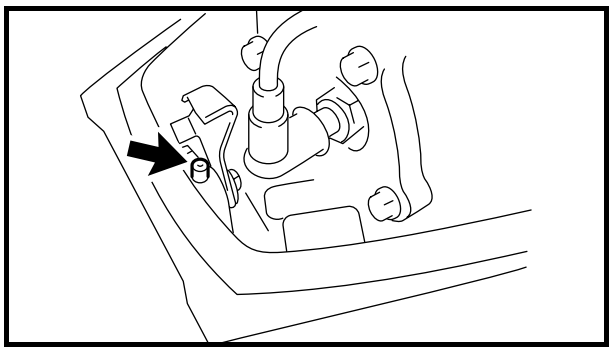
NOTE:
Use a grease gun.



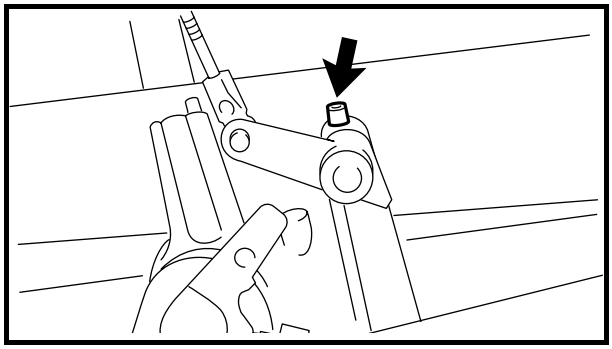
NOTE:
Using a grease gun, fill in the grease until it comes out of the bushing.



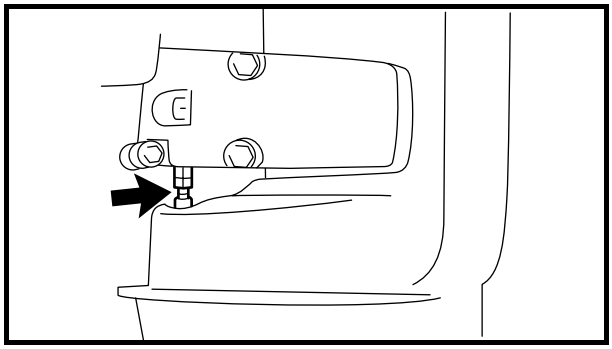
NOTE:
Using a grease gun, fill in the grease until it comes out of the bushing.



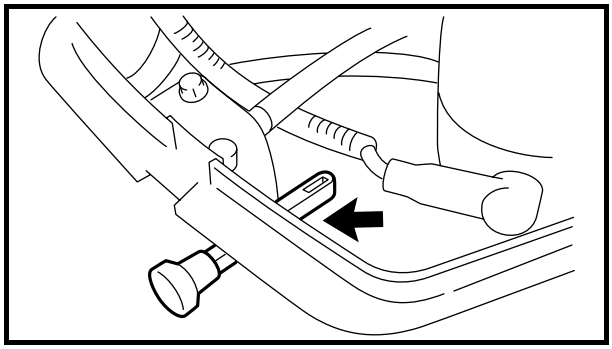
NOTE:
Use a grease gun.



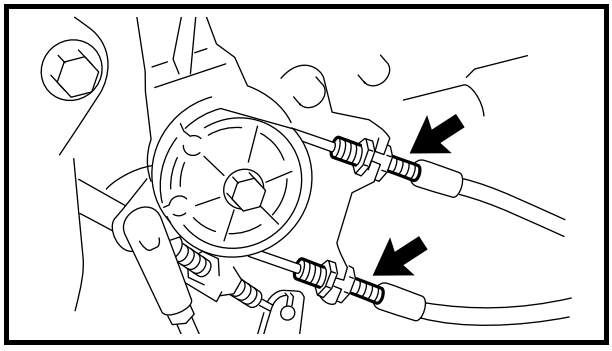
NOTE:
Use a grease gun.



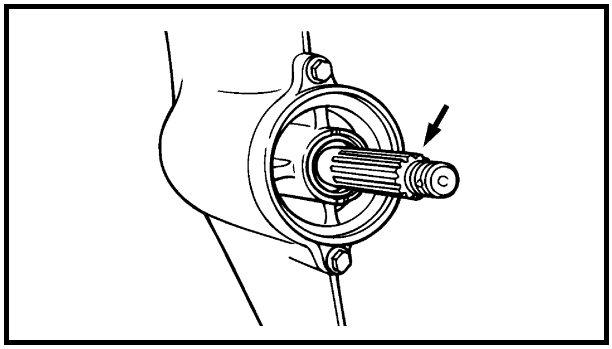
NOTE:
Grease the area where shift rod, shift connector, and the nut are fastened.



NOTE:
Grease the sliding face of the choke knob.



NOTE:
Grease the inner cable and the lock nut.

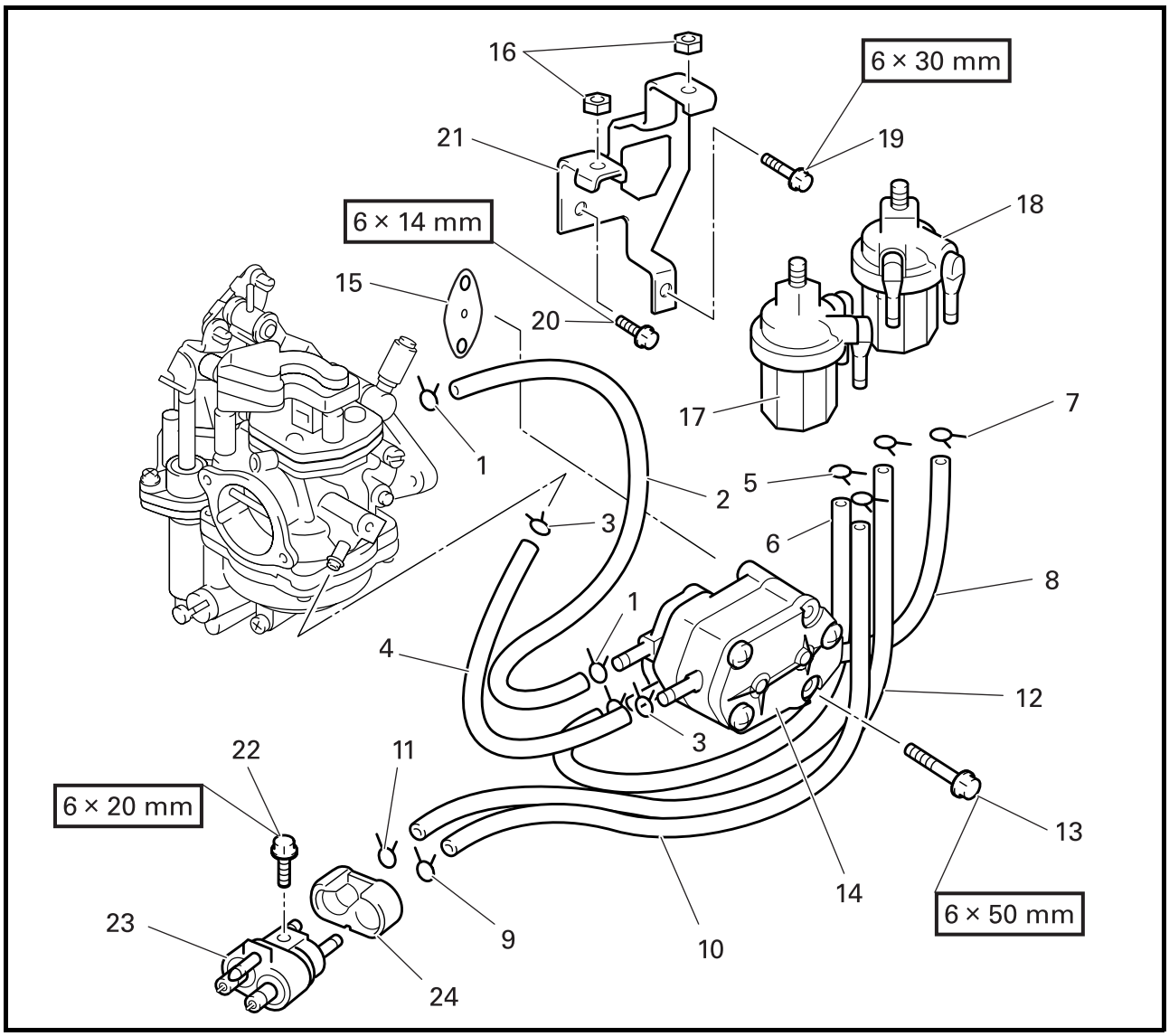


2. Apply:
   - Yamaha grease D

CHAPTER 4
FUEL SYSTEM

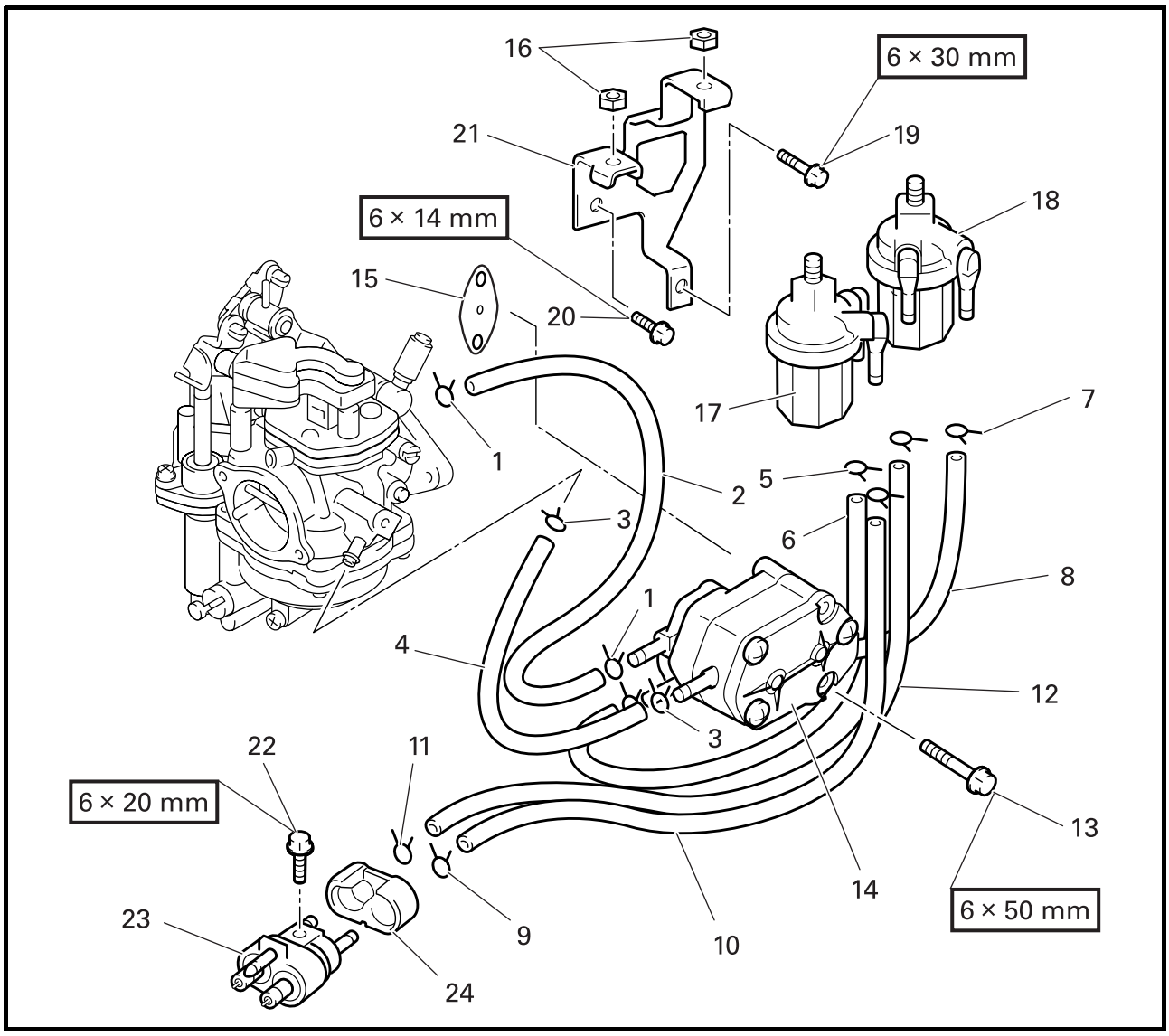
FUEL JOINT, FUEL FILTER, AND FUEL PUMP

REMOVING THE FUEL JOINT, FUEL FILTER AND FUEL PUMP

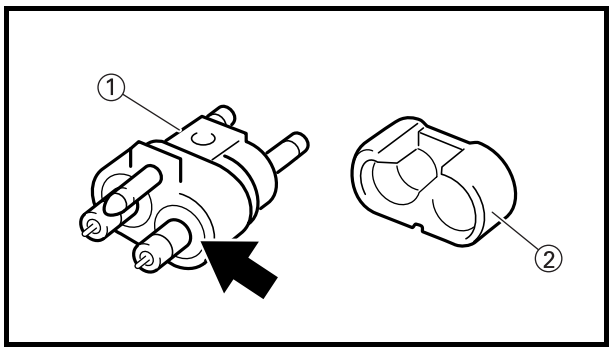


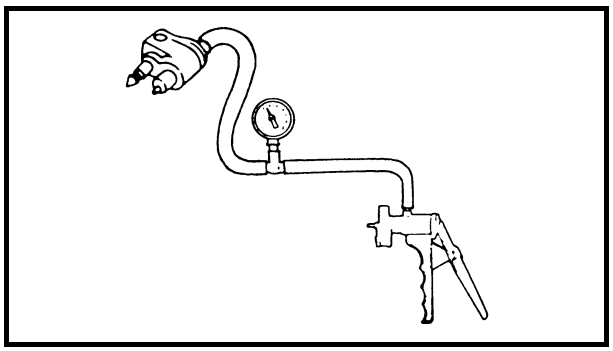
Step	Job/Parts	Q'ty	Remarks
1	Clip	2	
2	Fuel hose (fuel pump to carburetor)	1	Gasoline
3	Clip	2	
4	Fuel hose (fuel pump to carburetor)	1	Kerosene
5	Clip	2	
6	Fuel hose (fuel filter to fuel pump)	1	Gasoline
7	Clip	2	
8	Fuel hose (fuel filter to fuel pump)	1	Kerosene
9	Clip	2	
10	Fuel hose (fuel joint to fuel filter)	1	Gasoline
11	Clip	2	
12	Fuel hose (fuel joint to fuel filter)	1	Kerosene
13	Bolt	2	

Continued on next page.



Step	Job/Parts	Q'ty	Remarks
14	Fuel pump	1	
15	Gasket	1	**Not reusable**
16	Nut	2	
17	Fuel filter	1	Gasoline
18	Fuel filter	1	Kerosene
19	Bolt	1	
20	Bolt	1	
21	Filter bracket	1	
22	Bolt	1	
23	Fuel joint	1	
24	Seal	1	





CHECKING THE FUEL JOINT

1. Check:
   - Fuel joint ①
     Cracks/damage/leak → Replace.
   - Seal ②
     Cracks/damage → Replace.
2. Measure:
   - Fuel joint operation
     Impossible to maintain the specified pressure for 10 sec. → Replace.

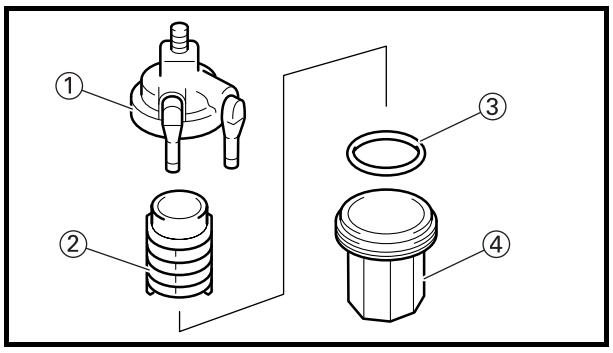
Measuring steps

(1) Attach the vacuum/pressure pump gauge.

	Vacuum/pressure pump gauge set 90890-06756

(2) Apply the specified pressure.

	Specified pressure 50 kPa (0.5 kg/cm^2, 7.25 psi)



CHECKING THE FUEL FILTER

Check:

- Filter cap ①
  Cracks/damage→ Replace.
- Filter element ②
  Cracks/damage/leak → Replace.
- O-ring ③
  Cracks/damage → Replace.
- Cup ④
  Foreign matter → Clean.

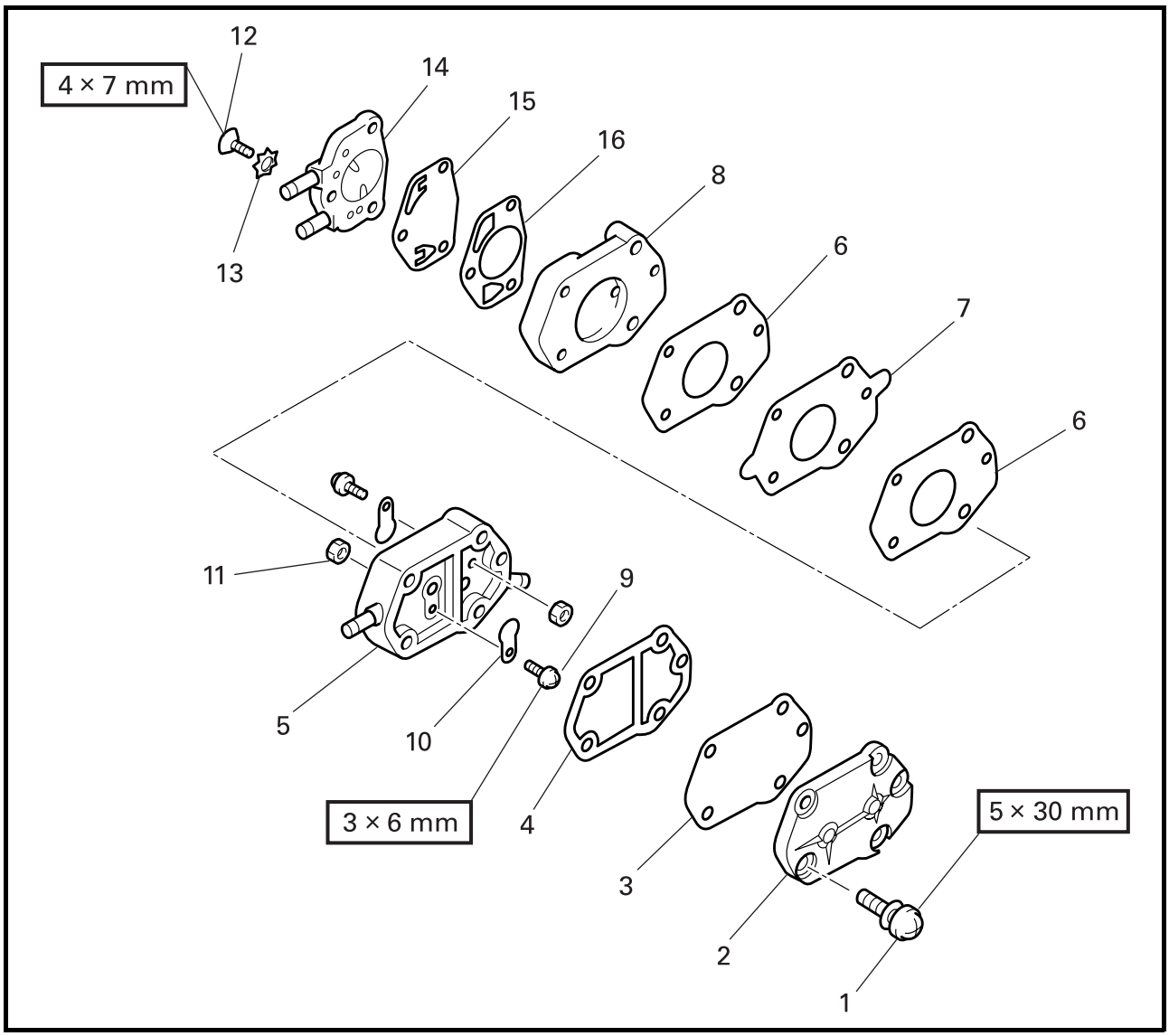
ASSEMBLING THE FUEL FILTER

(1) Install filter element to cap.
(2) Install O-ring to filter cup.
(3) Assemble cap and filter cup.

NOTE:
Start the engine and confirm the proper function.

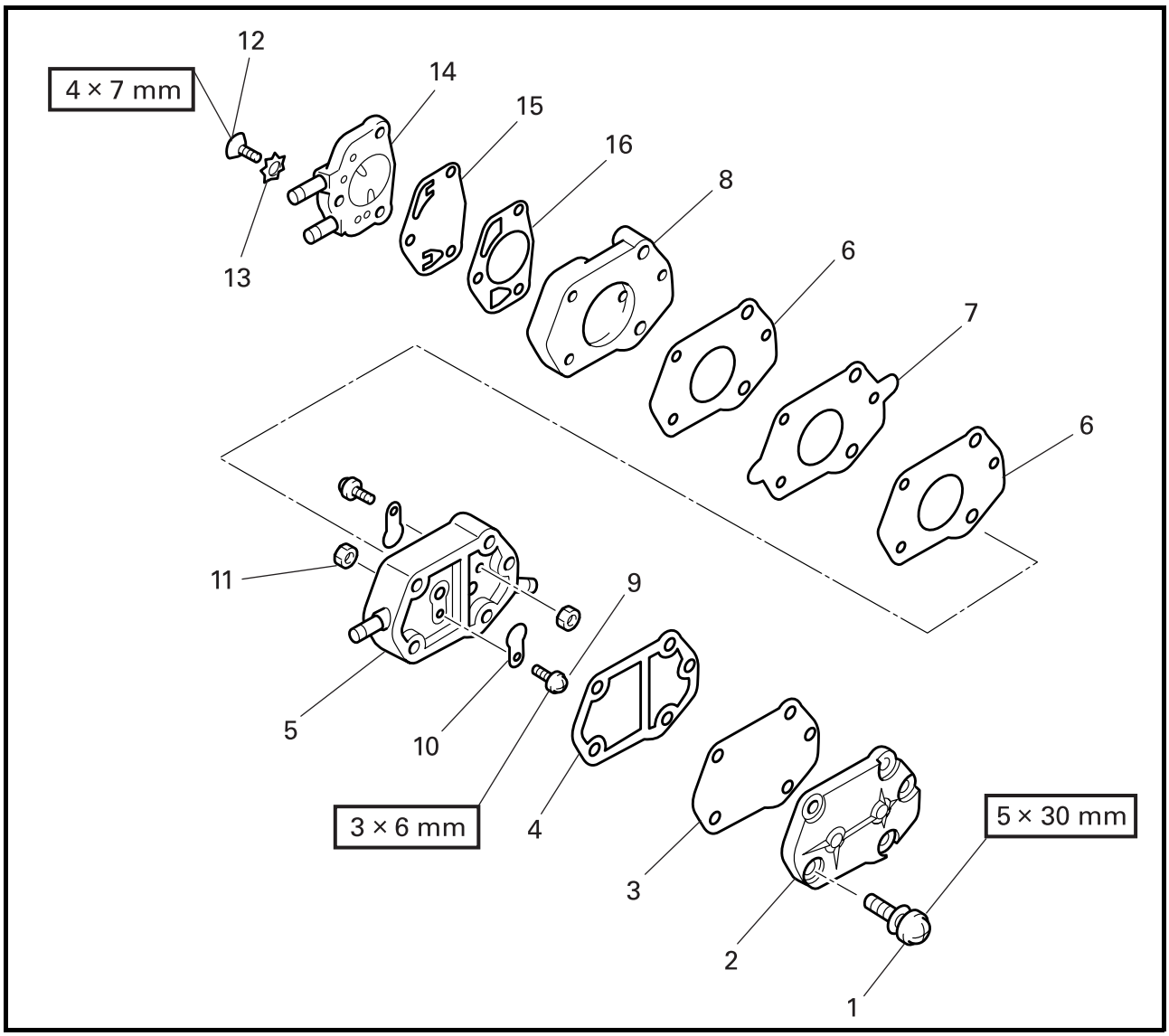
FUEL PUMP

DISASSEMBLING THE FUEL PUMP

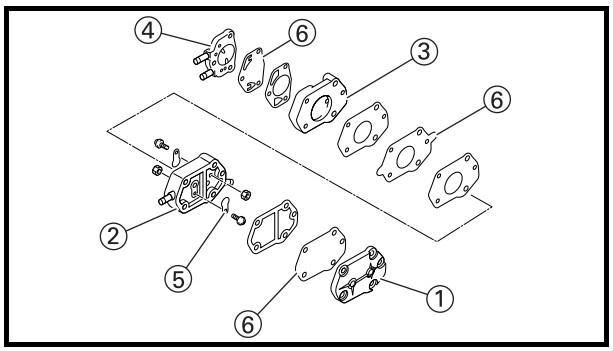


Step	Job/Part	Q'ty	Remarks
1	Screw (with washer)	3	
2	Body	1	
3	Diaphragm	1	
4	Gasket	1	**Not reusable**
5	Body	1	
6	Diaphragm gasket	2	**Not reusable**
7	Diaphragm	1	
8	Body	1	
9	Screw	2	
10	Seat valve	2	
11	Nut	2	
12	Screw	3	
13	Washer	3	

Continued on next page.

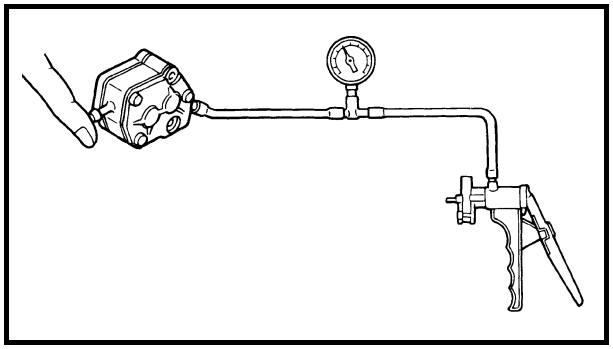


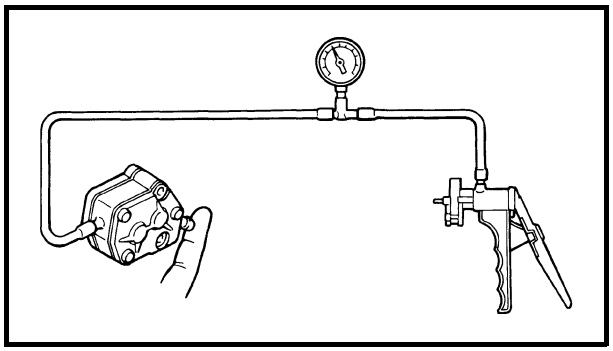
Step	Job/Part	Q'ty	Remarks
14	Body	1	
15	Diaphragm	1	
16	Diaphragm gasket	1	



CHECKING THE FUEL PUMP

1. Check:
   - Body ①
   - Body ②
   - Body ③
   - Body ④
     Cracks/damage/leak → Replace.
     Foreign matters → Clean.
   - Seat valve ⑤
     Cracks/ damage → Replace.
   - Diaphragm ⑥
     Damage → Replace.





2. Check:
   - Fuel pump
     Reverse air flow → Replace.

Checking steps

NOTE:
Do not overpressurize the fuel pump. Excessive pressure may cause air to leak out.

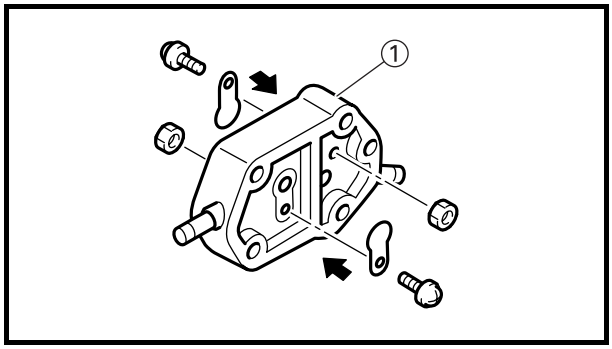
(1) Install the Vacuum/pressure pump gauge set onto the fuel pump as shown.

	Vacuum/pressure pump gauge set 90890-06756

(2) Apply the specified pressure with the Vacuam/pressure pump gauge set.

	Fuel pump pressure 50 kPa (0.5 kg/cm^2, 7.25 psi)

NOTE:
- Make sure no air comes out of the opposite side of the fuel pump.
- Start the engine and confirm the proper function.

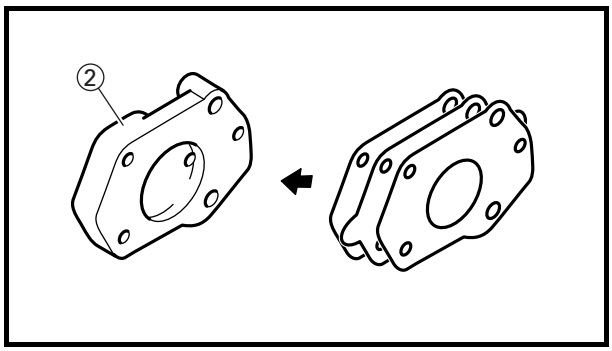


ASSEMBLING THE FUEL PUMP

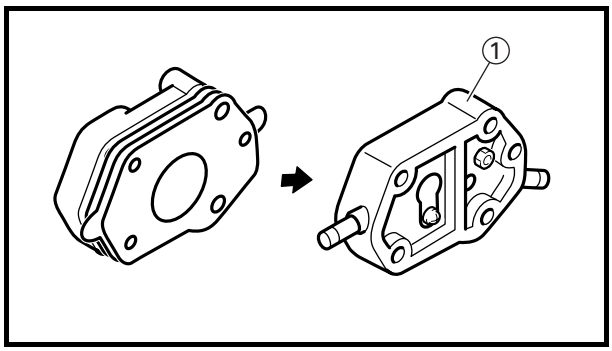
NOTE:
Clean all parts before assembly.

Assembly steps

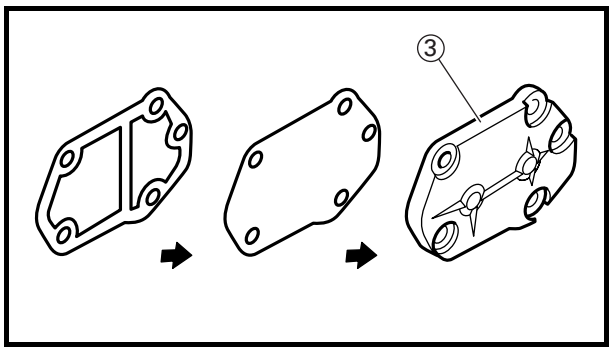
(1) Assemble Body ① and seat valve.



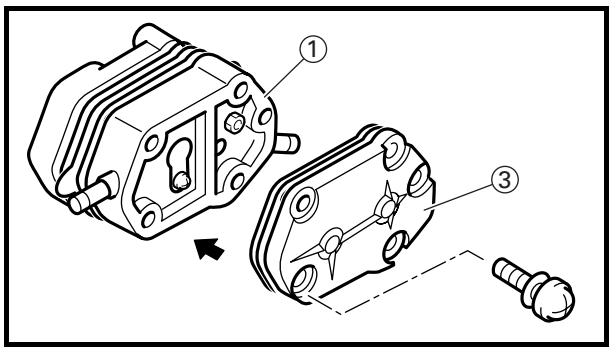
(2) Insert the diaphragm between the diaphragm gaskets, and set them on Body ②.



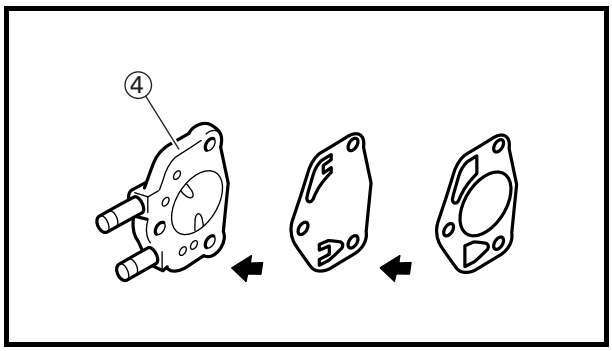
(3) Set Body ① on the diaphragm gasket.



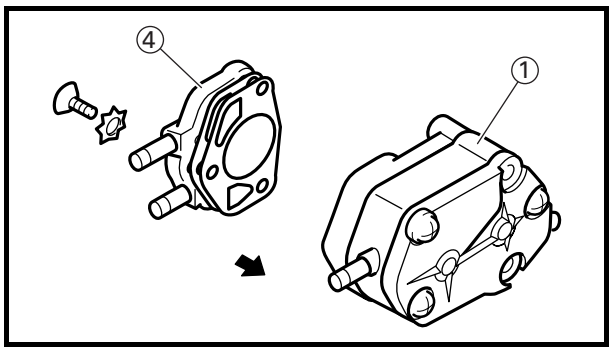
(4) Fit diaphragm and gasket on Body ③.



(5) Assemble Body ③ as has been fitted in (4) to Body ①.



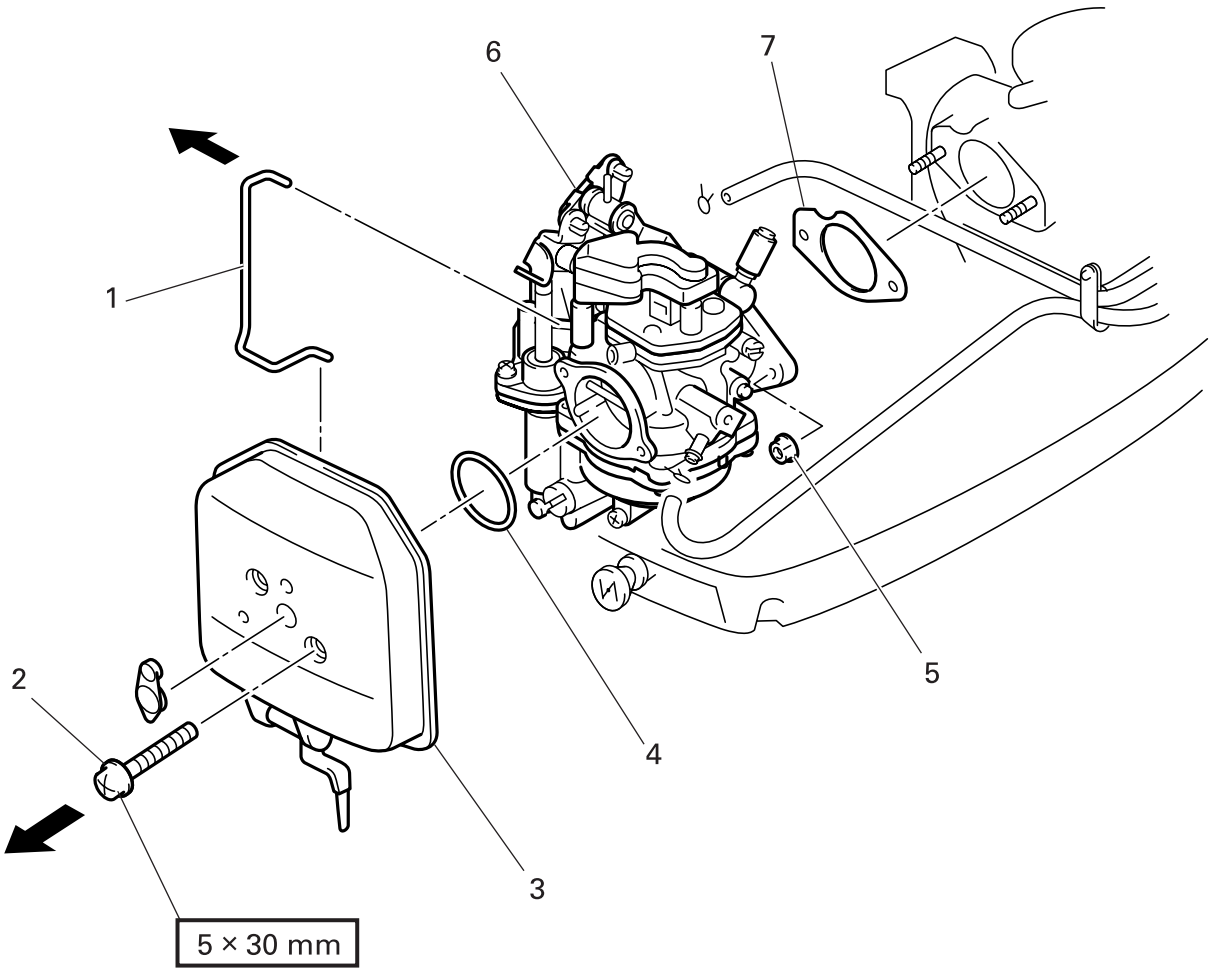
(6) Assemble body ④, diaphragm, and diaphragm gasket in this order.



(7) Assemble body ④ and body ①, and fasten them with the screw.

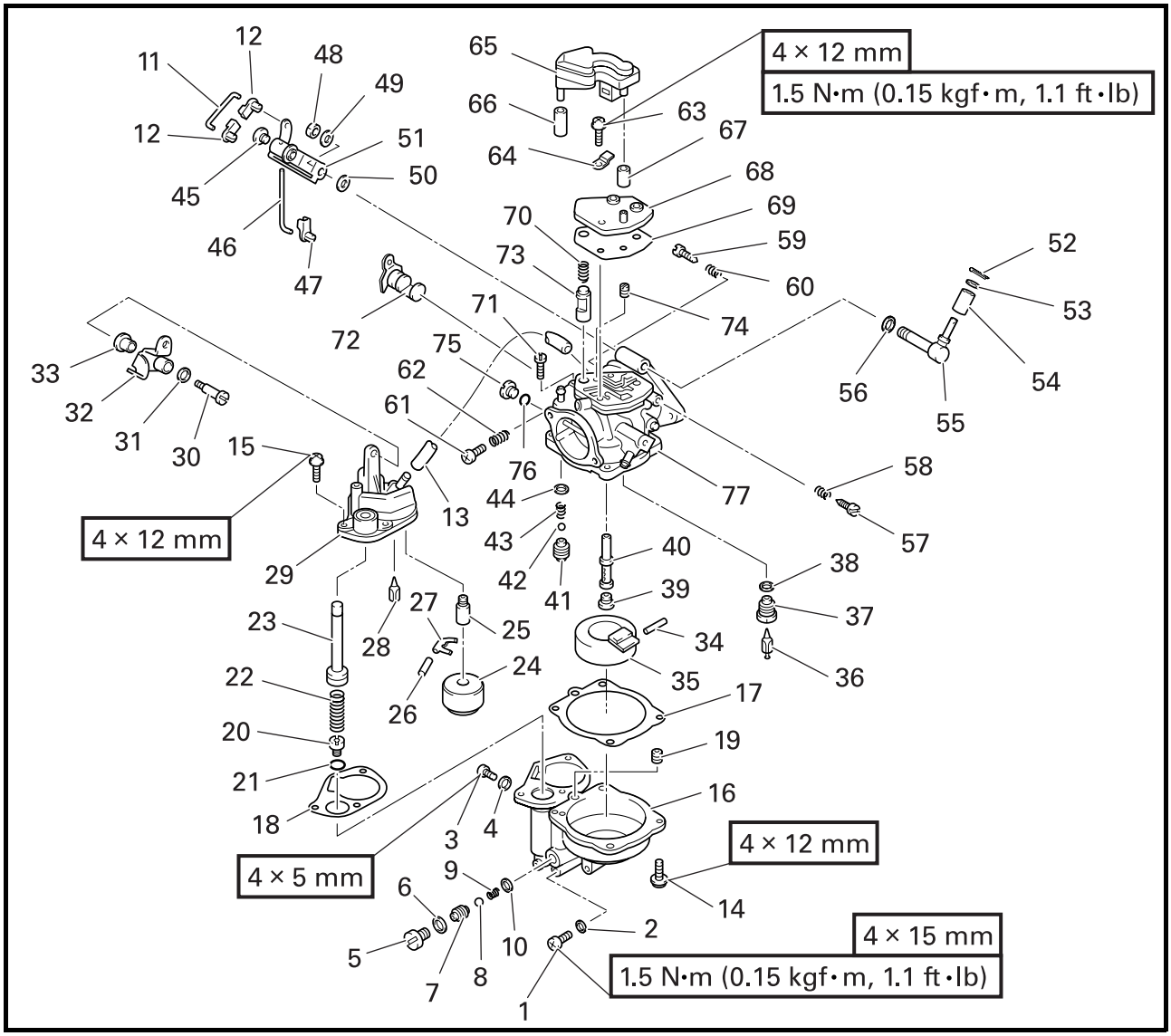
CARBURETOR

REMOVING THE CARBURETOR



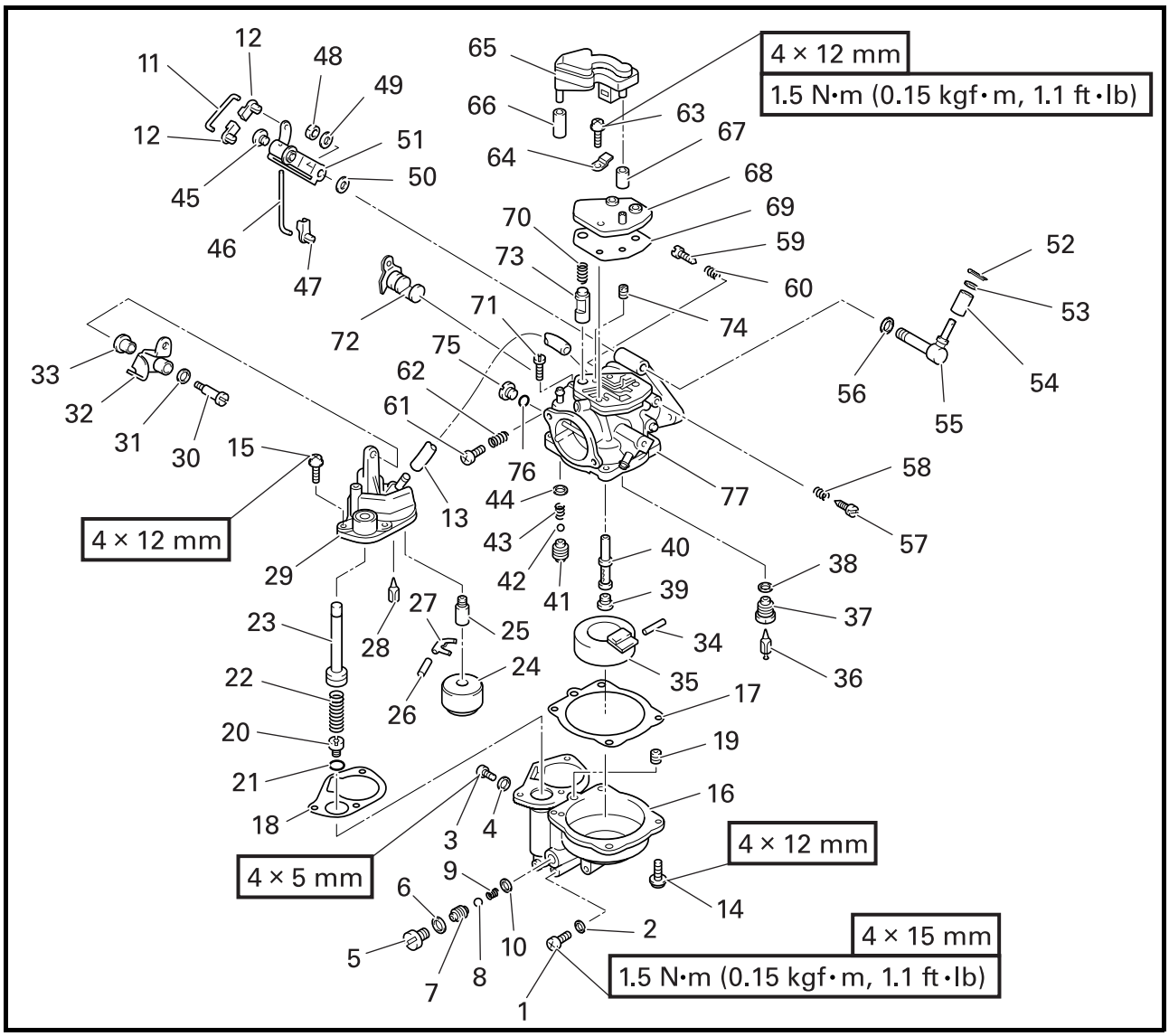
Step	Job/Part	Q'ty	Remarks
1	Rod	1	
2	Bolt	2	
3	Intake silencer	1	
4	O-ring	1	**Not reusable**
5	Nut	2	
6	Carburetor	1	
7	Gasket	1	**Not reusable**

DISASSEMBLING THE CARBURETOR



Step	Job/Part	Q'ty	Remarks
1	Drain screw	1	
2	Drain gasket	1	**Not reusable**
3	Drain screw	1	
4	Drain gasket	1	**Not reusable**
5	Drain screw	1	
6	Packing	1	**Not reusable**
7	Steel ball seat	1	
8	Steel ball	1	
9	Check valve spring	1	
10	Check valve seat packing	1	
11	Rod	1	
12	Lever joint	2	
13	Hose	1	

Continued on next page.



Step	Job/Part	Q'ty	Remarks
14	Bolt	4	
15	Bolt	3	
16	Float chamber	1	
17	Float chamber packing	1	
18	Chamber packing	1	
19	Starter jet	1	
20	Check valve	1	
21	O-ring	1	**Not reusable**
22	Pump spring	1	
23	Pump plunger	1	
24	Float	1	
25	Pilot jet	1	
26	Pin	1	

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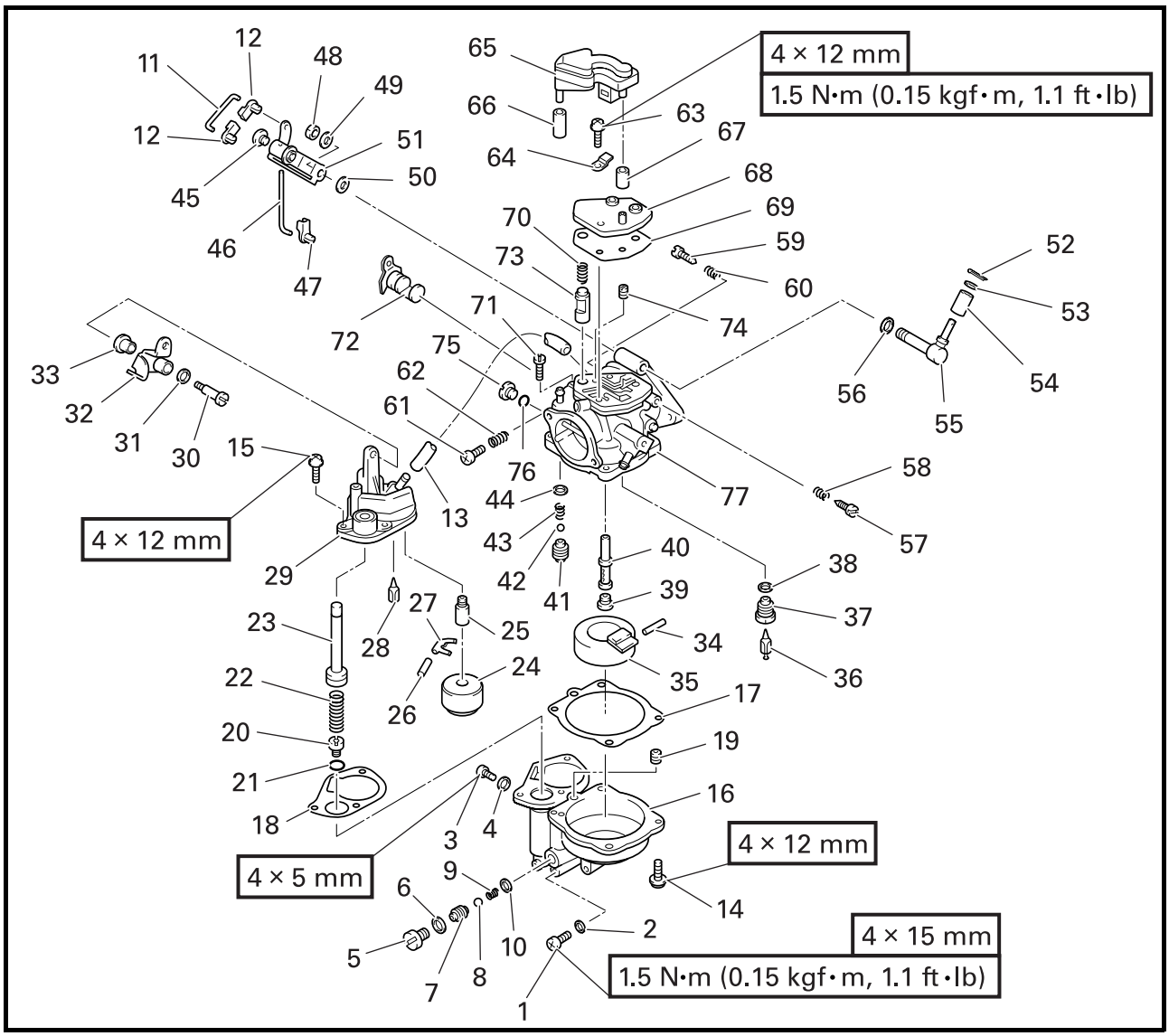

Step	Job/Part	Q'ty	Remarks
27	Float arm	1	
28	Needle valve	1	
29	Chamber cover	1	
30	Set screw	1	
31	Washer	1	
32	Pump lever	1	
33	Coller	1	
34	Pin	1	
35	Float	1	
36	Needle valve	1	
37	Valve seat	1	
38	Packing	1	**Not reusable**
39	Main jet	1	

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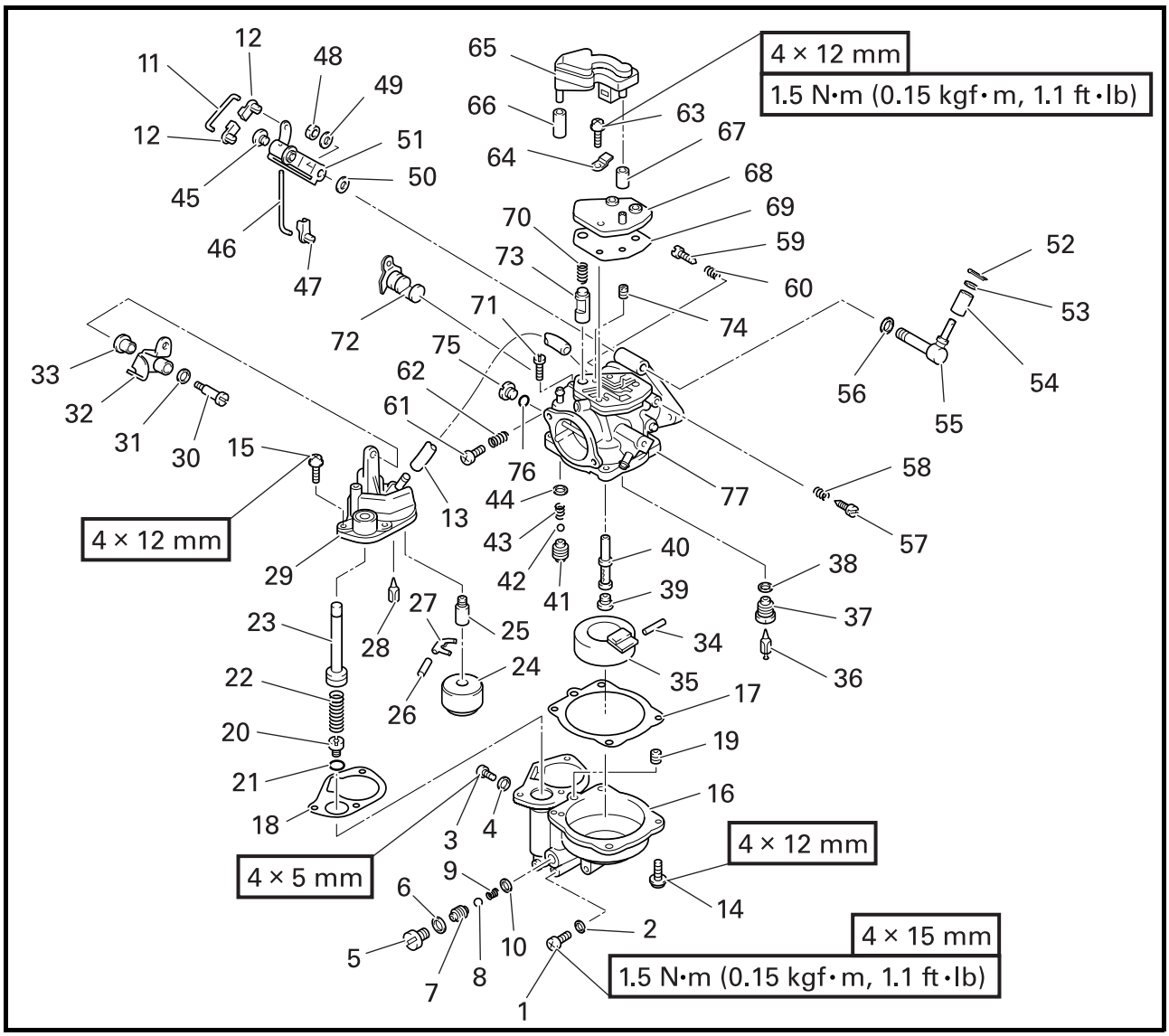

Step	Job/Part	Q'ty	Remarks
40	Main nozzle	1	
41	Steel ball seat	1	
42	Steel ball	1	
43	Check valve spring	1	
44	Check valve seat packing	1	
45	Screw	1	
46	Rod	1	
47	Lever joint	1	
48	Nut	1	
49	Spring washer	1	
50	Coller	1	
51	Accel arm	1	
52	Cotter pin	1	**Not reusable**

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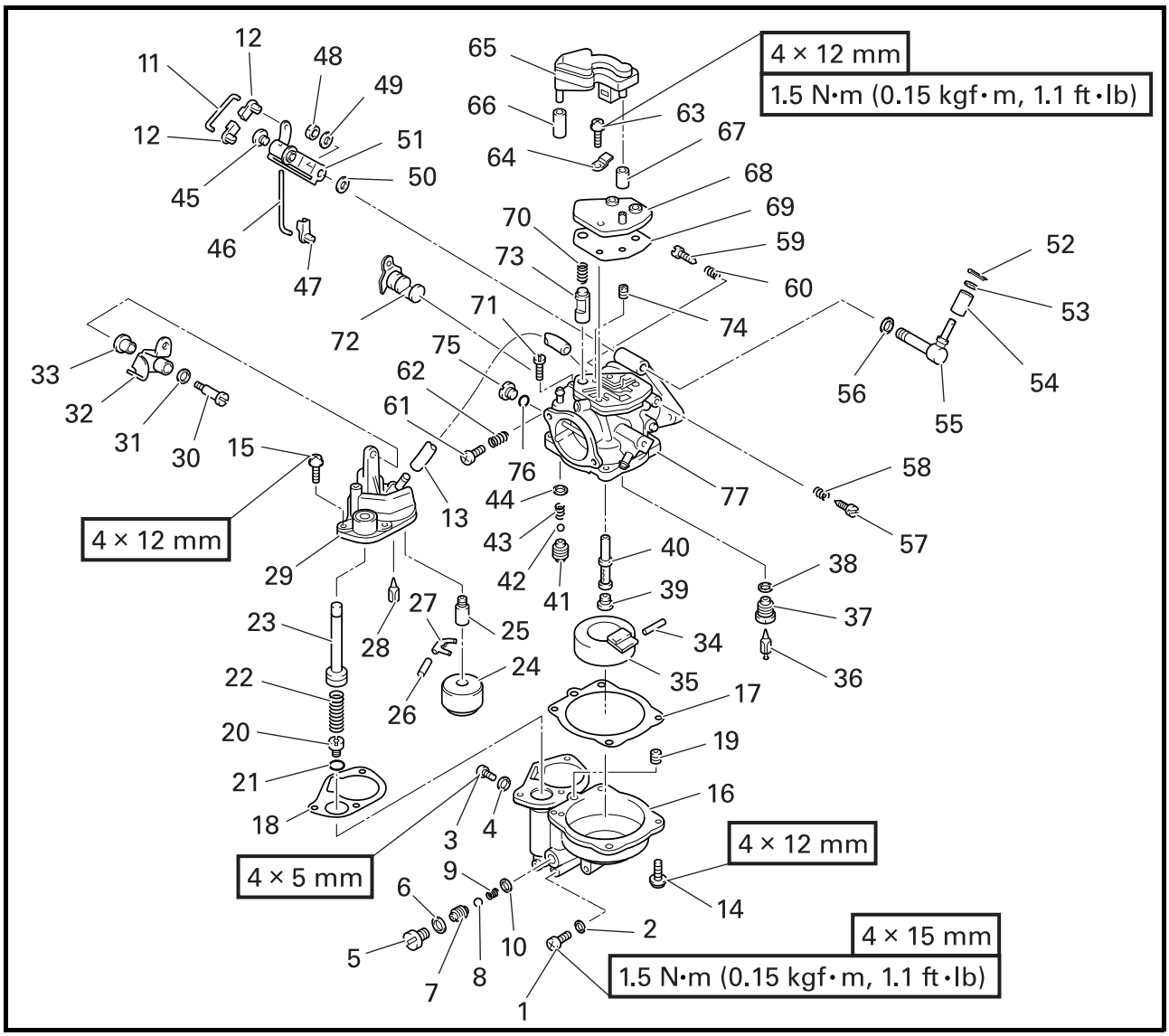

Step	Job/Part	Q'ty	Remarks
53	Washer	1	
54	Accel roller	1	
55	Accel link shaft	1	
56	Coller	1	
57	Pilot screw	1	Kerosene
58	Spring	1	
59	Pilot screw	1	Gasoline
60	Spring	1	
61	Idling stop screw	1	
62	Spring	1	
63	Bolt	3	
64	Plate	1	
65	Damper	1	

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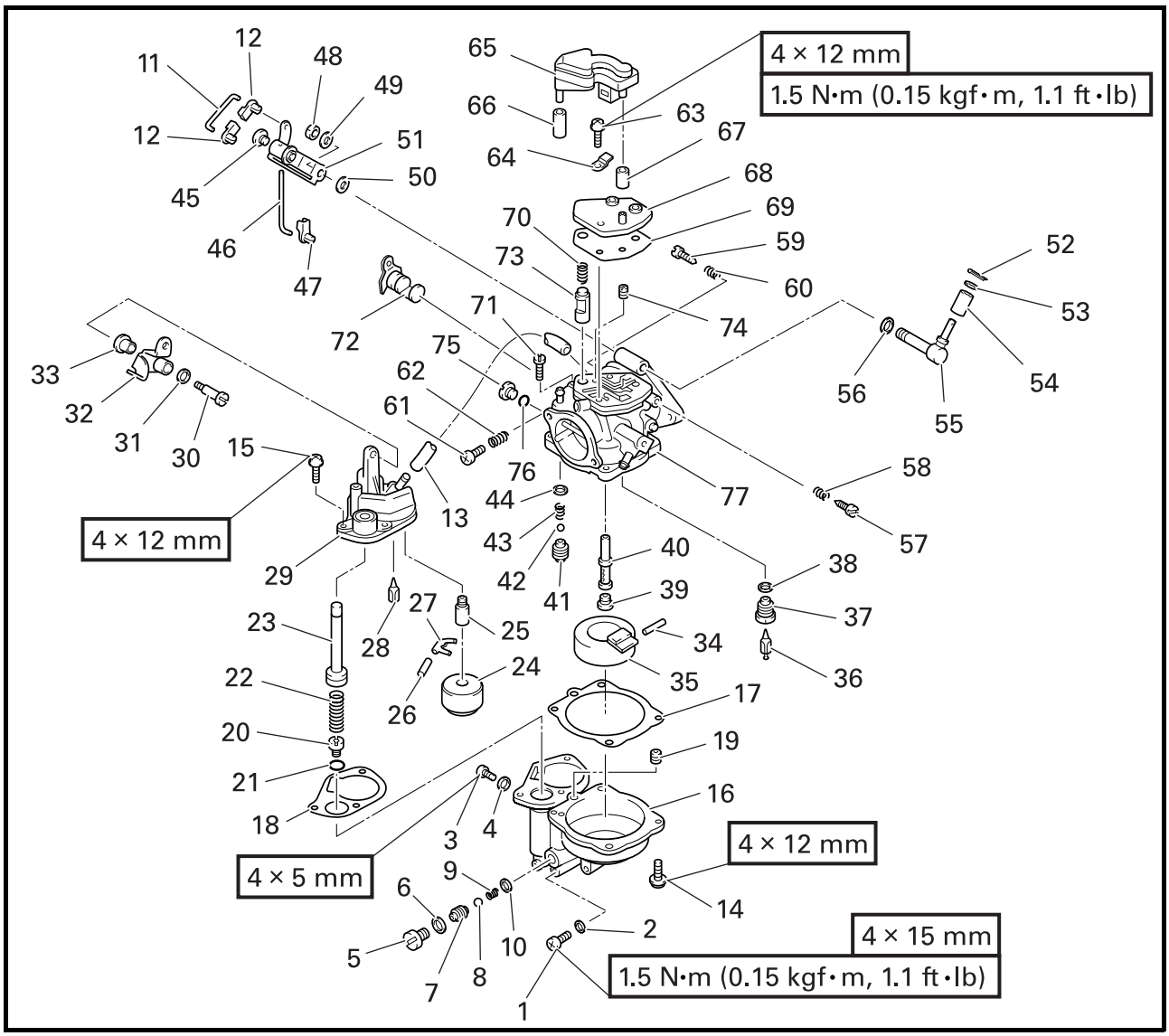
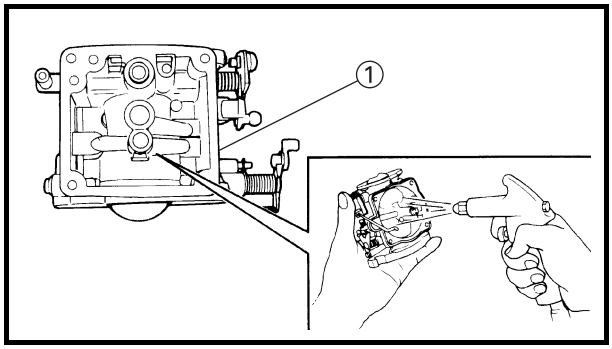
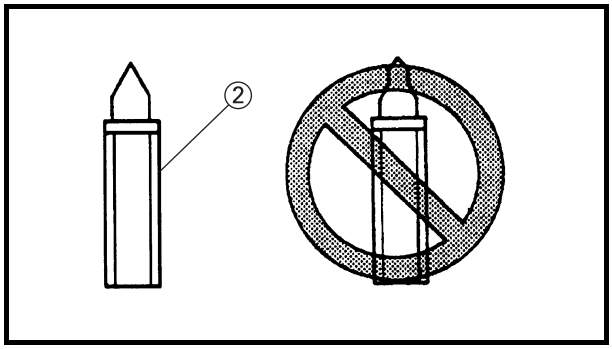
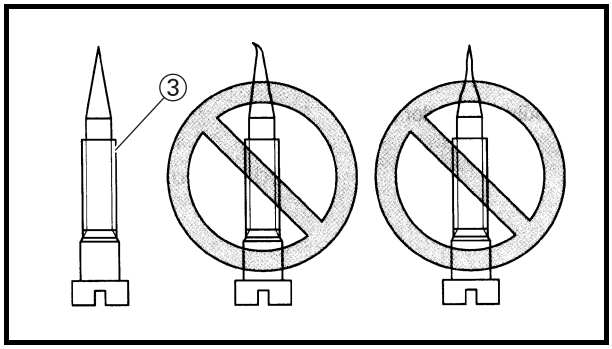
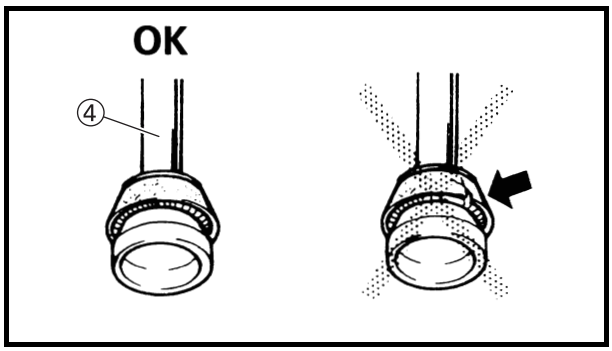


Step	Job/Part	Q'ty	Remarks
66	Hose	1	
67	Hose	1	
68	Cover plate	1	
69	Cover plate packing	1	
70	Plunger spring	1	
71	Guide screw	1	
72	Starter lever	1	
73	Starter plunger	1	
74	Pilot jet	1	
75	Drain screw	1	
76	O-ring	1	**Not reusable**
77	Carburetor body	1	









CHECKING THE CARBURETOR

CAUTION:

Do not use steel-wire to clean the jets. This may enlarge the jet diameters and seriously affect performance.

Check:

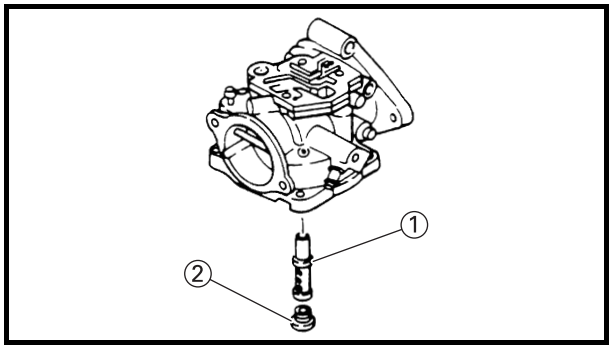
- Carburetor body ①
  Cracks/damage → Replace.
  Contamination → Clean.
- Needle valve ②
  Grooved wear → Replace.
- Pilot screw ③
  Bent/wear → Replace.
- Main jet
  Contamination → Clean.
- Pilot jet
  Contamination → Clean.
- Main nozzle
  Contamination → Clean.
- Float
  Cracks/damage → Replace.
- Pump plunger ④
  Cracks/damage → Replace.
- Fuel passage
  Clog → Clean.
- Air passage
  Clog → Clean.

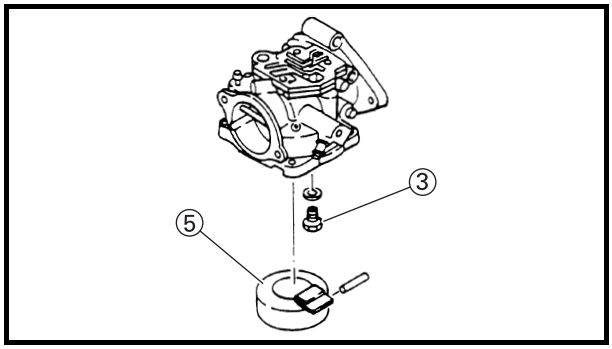
NOTE:

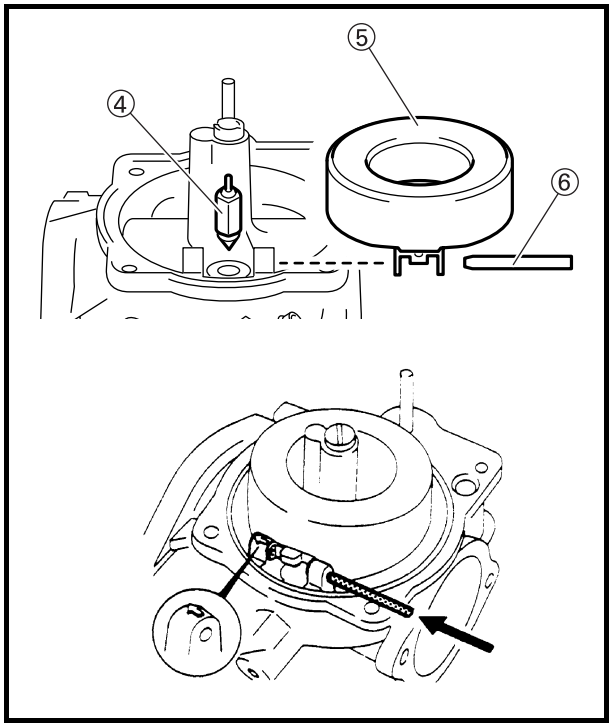
Use a suitable cleaning solvent and blow out clogged passages with compressed air.

⚠ WARNING

Protect your eyes with suitable safety spectacles or safety goggles when using compressed air.



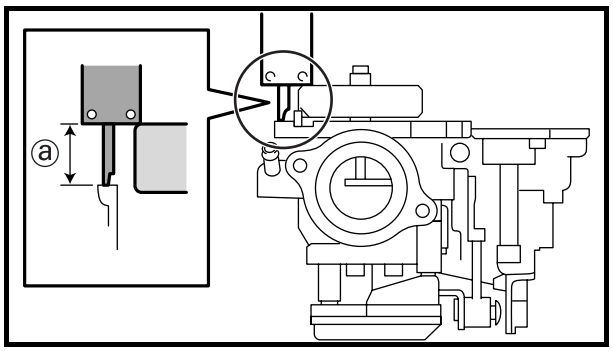




ASSEMBLING THE CARBURETOR

1. Install:
   - Main nozzle ①
   - Main jet ②
   - Valve seat ③
   - Needle valve ④
   - Float ⑤
   - Float pin ⑥

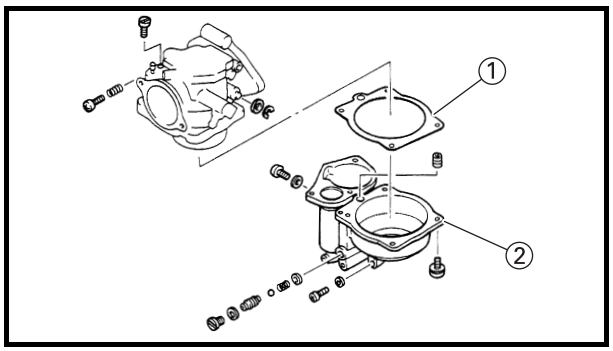
NOTE:
When installing the float into the carburetor, place the needle valve into the needle valve seat.



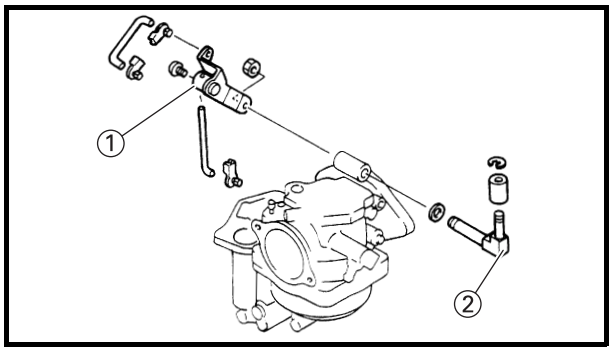
2. Measure:
   - Float height ⓐ
     Out of specification → Replace

Float height
18.0 mm (0.709 in)

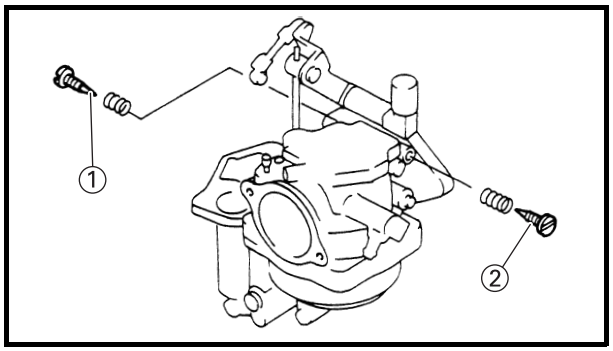
NOTE:
- The float should be resting on the needle valve, but not compressing the needle valve.
- Take measurement at the top of the float flange opposite to its pivoted side.
- Float height which is out of specification cannot be adjust. Replace the float with a new one.



3. Install:
   - Float chamber packing ①
   - Float chamber ②

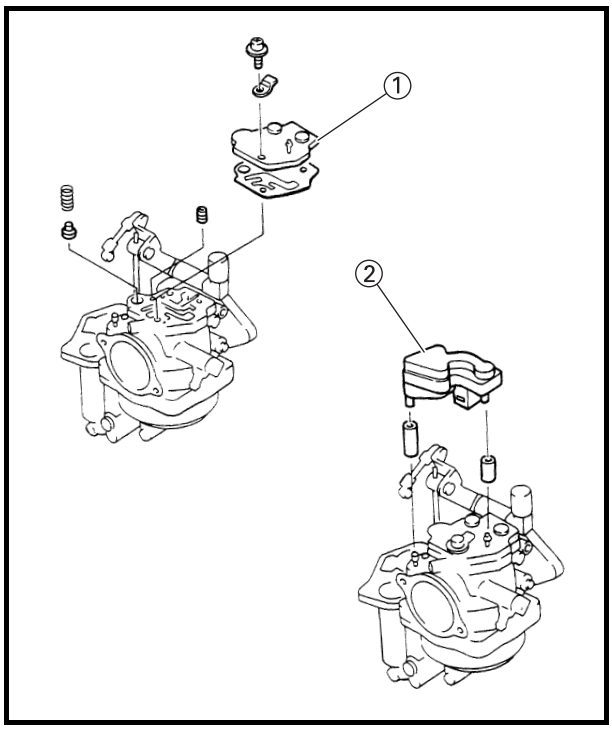


4. Install:
   - Accel arm ①
   - Accel link shaft ②

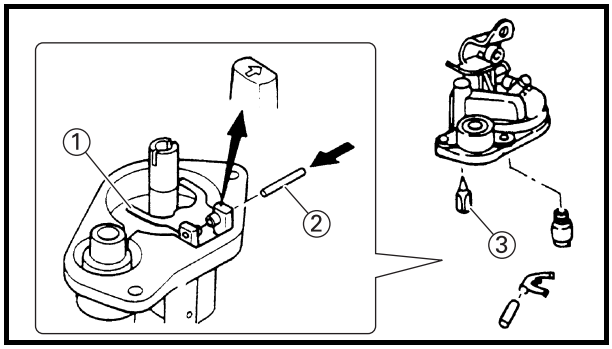


5. Install:
   - Pilot screw ① (Gasoline)
   - Pilot screw ② (Kerosene)

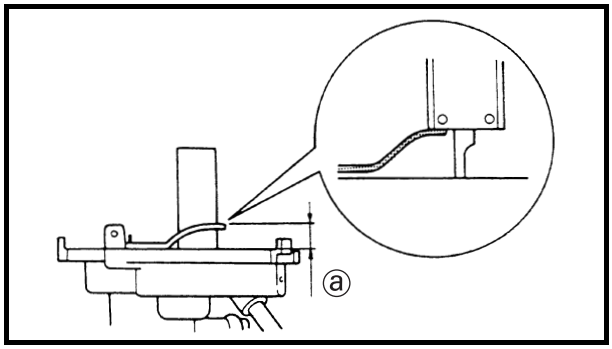
CAUTION:
Do not cause damage to the tip of the pilot screw by over-tightening it.



6. Install:
   - Cover plate ①
   - Damper ②



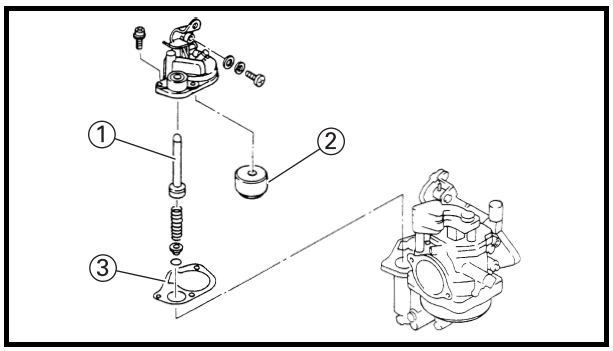
7. Install:
   - Float arm ①
   - Pin ②
   - Needle valve ③



8. Measure:
   - Float arm height ⓐ
     Out of specification → Adjust

	Float arm height **3.0 mm (0.118 in)**

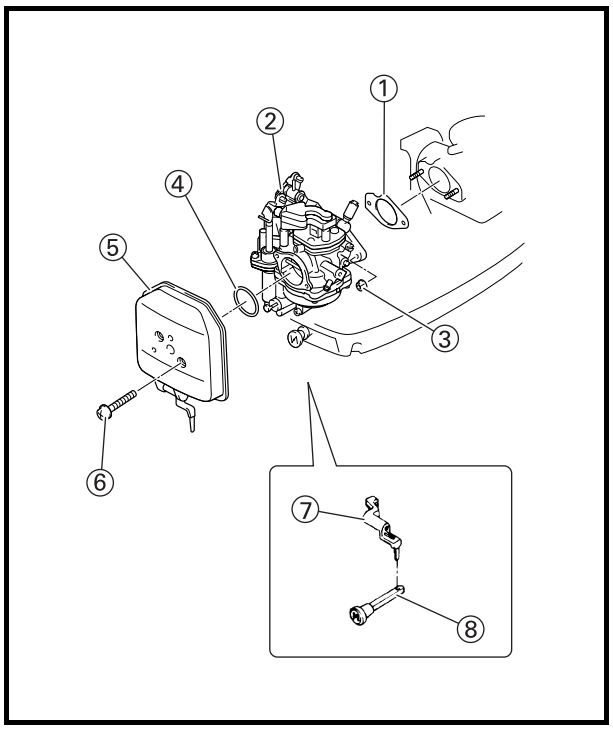
NOTE:
Adjust the heights of both float arms so that they are on the same level.



9. Install:
   - Pump plunger ①
   - Float ②
   - Chamber packing ③

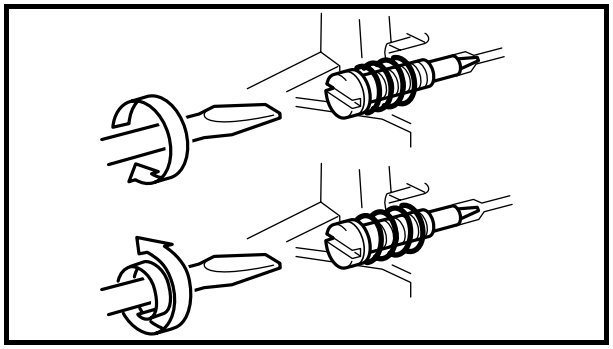
NOTE:
Make sure the plunger seal is not turned up.

INSTALLING THE CARBURETOR



1. Install:
   - Gasket ①
   - Carburetor ②
   - Nut ③
   - O-ring ④
   - Intake silencer ⑤
   - Bolt ⑥

NOTE:
Insert the projection of choke lever ⑦ into the choke knob hole ⑧.



2. Adjust:
   - Pilot screw

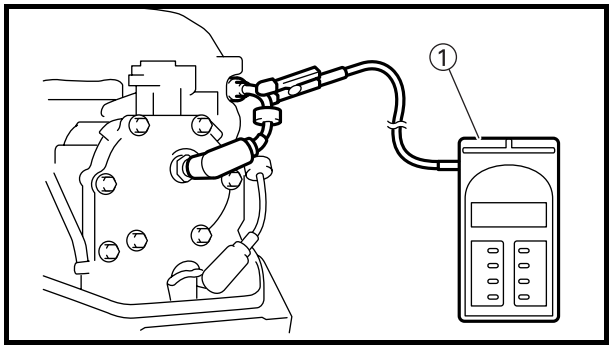
Adjusting steps

(1) Turn in all of the pilot screw until they are lightly seated.

(2) Turn out the pilot screws to specified number of turns.

Pilot screw turn-out
Gasoline carburetor :
1 – 1/2 ± 1/2
Kerosene carburetor :
1/2 + 2
1/2 - 1/2

(3) Make sure that the idle speed is stable when the throttle is opened and closed for several times.



3. Measure:
   - Engine idle speed

     Out of specification → adjust.

	Engine idle speed **1,300 ± 50 r/min**

Measuring steps

(1) Start the engine and allow it to warm up for a few minutes.

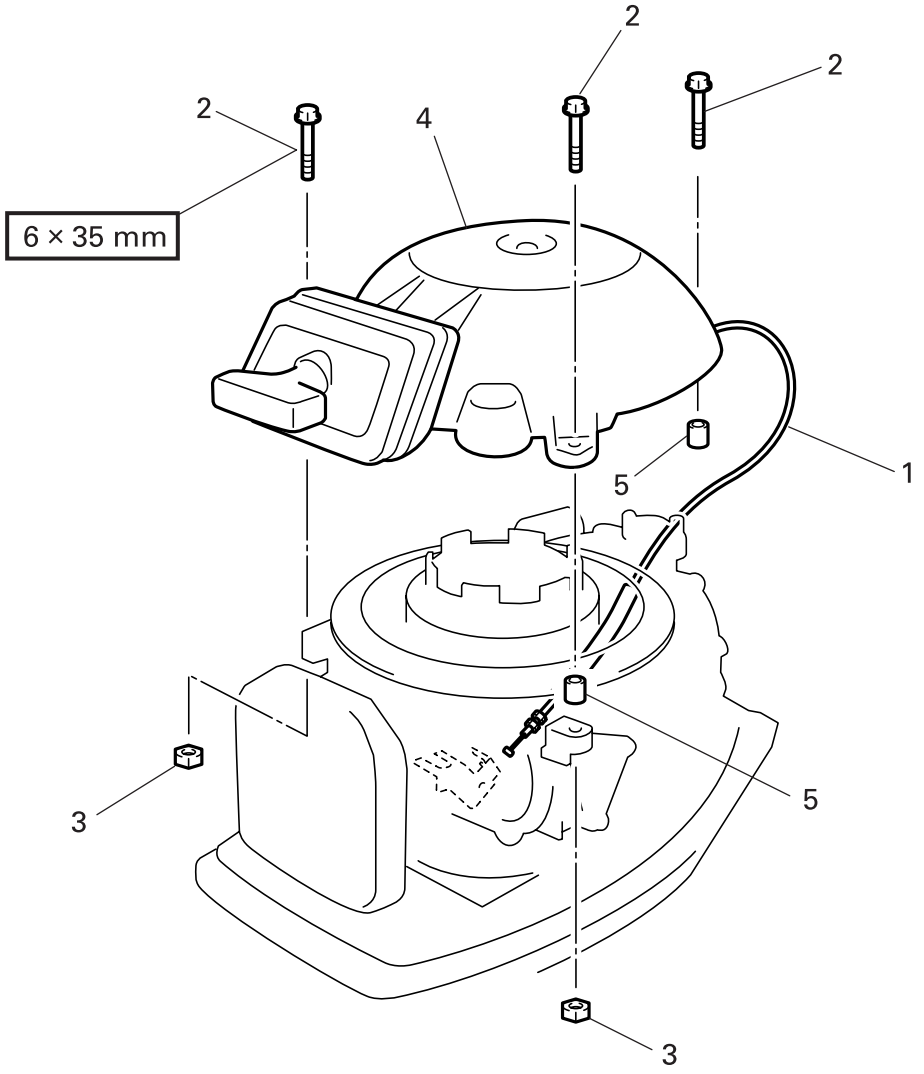
(2) Install the Digital tachometer ① onto the spark plug lead of cylinder #1.

	Digital Tachometer **90890-06760**

CHAPTER 5
RECOIL STARTER

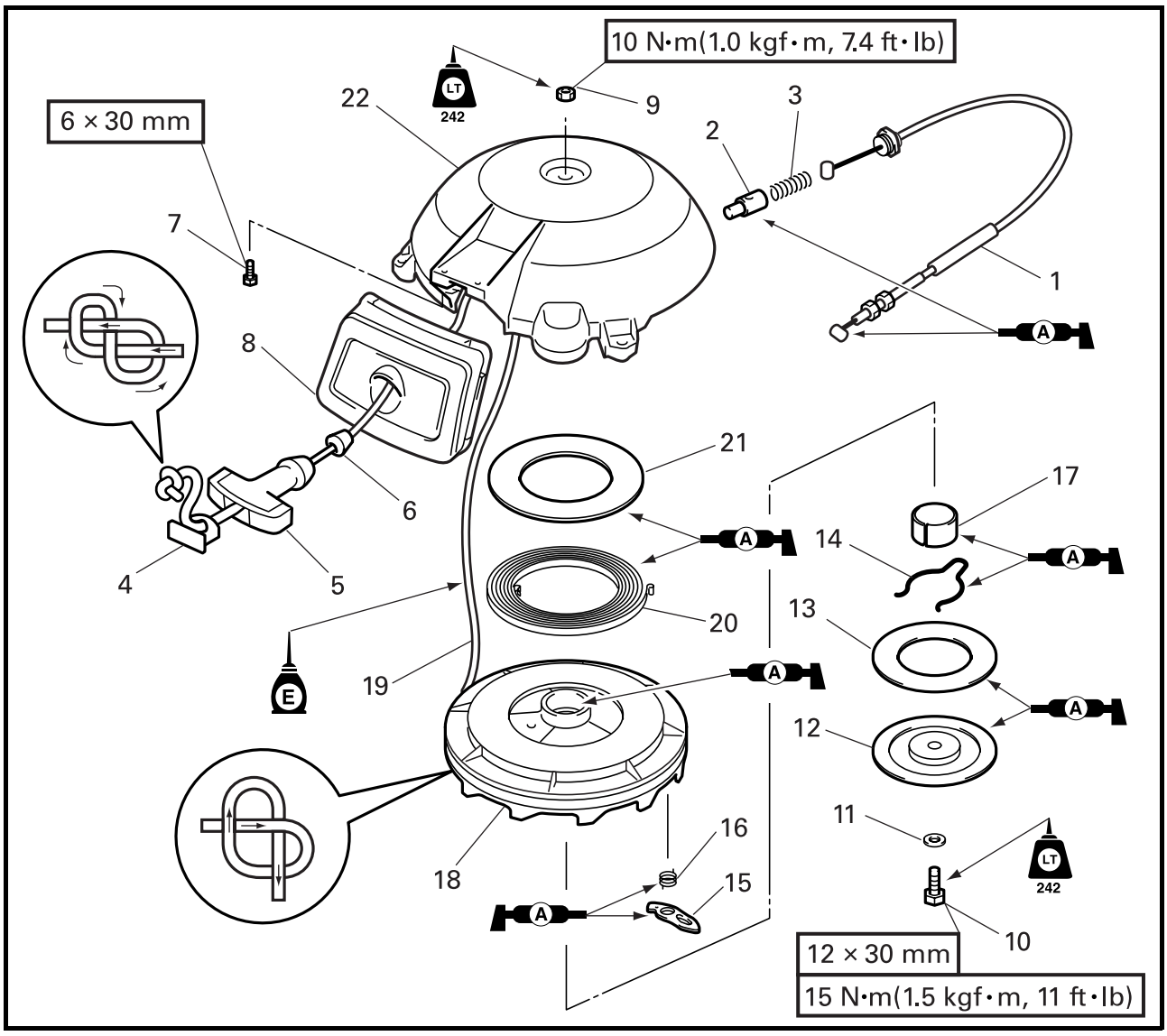
RECOIL STARTER

REMOVIING THE RECOIL STARTER



Step	Job/Parts	Q'ty	Remarks
1	Starter stop wire	1	
2	Bolt (with washer)	3	
3	Nut	2	
4	Recoil starter	1	
5	Collar	2	

DISASSEMBLING THE RECOIL STARTER



Step	Job/Parts	Q'ty	Remarks
1	Starter stop wire	1	
2	Starter stop plunger	1	
3	Spring	1	
4	Cover	1	
5	Starter handle-grip	1	
6	Damper	1	
7	Bolt (with washer)	2	
8	Rope guide	1	
9	Nut	1	
10	Center bolt	1	
11	Thrust washer	1	
12	Friction plate	1	
13	Collar 1	1	

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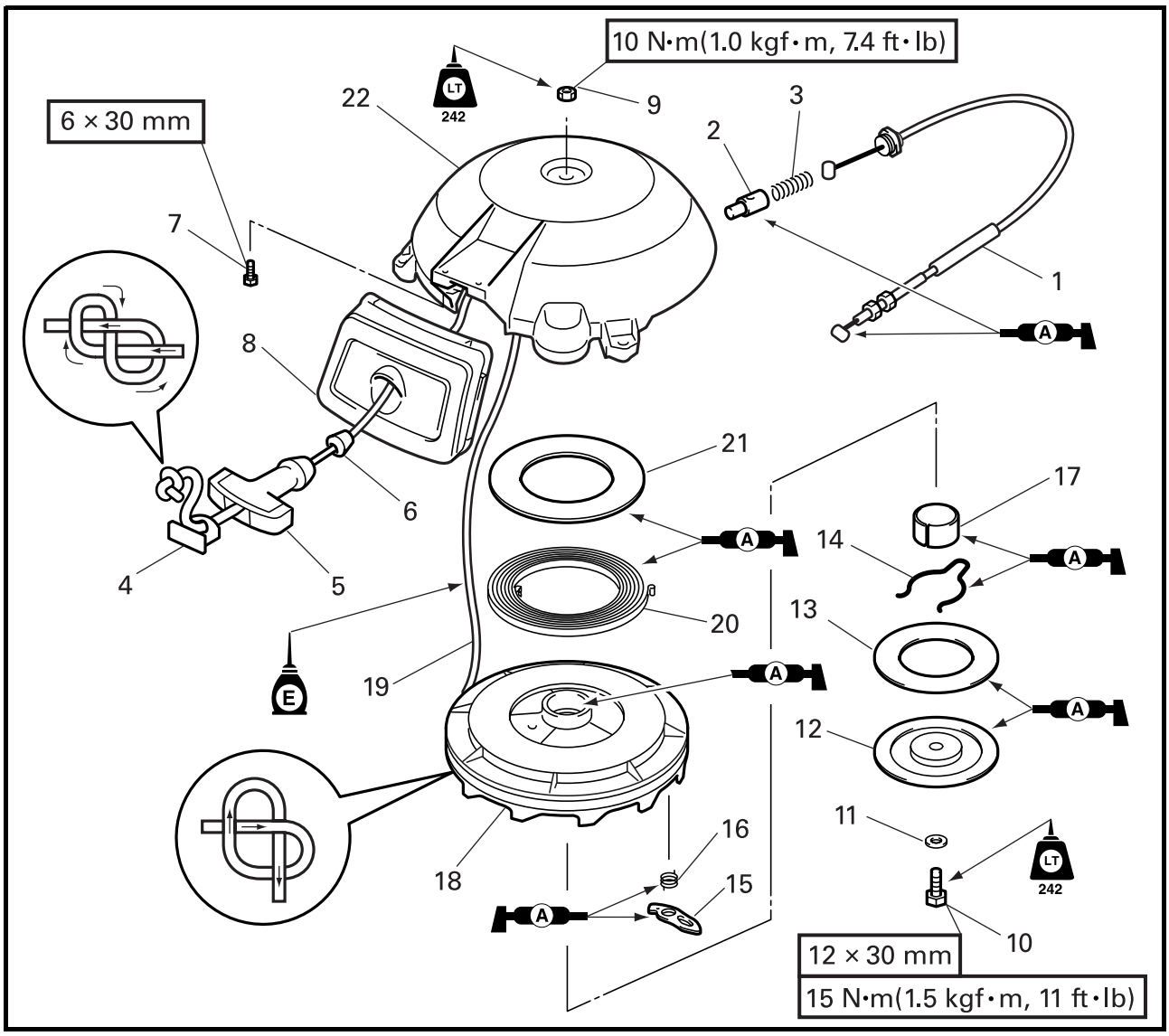
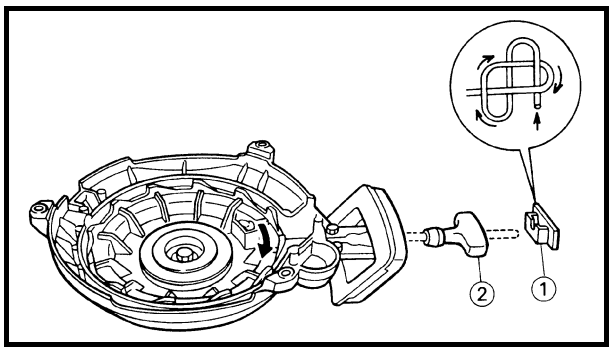


Step	Job/Parts	Q'ty	Remarks
14	Friction spring	1	
15	Drive pawl	1	
16	Return spring	1	
17	Bushing	1	
18	Sheave drum	1	
19	Starter rope	1	
20	Spiral spring	1	
21	Thrust washer	1	
22	Starter case	1	

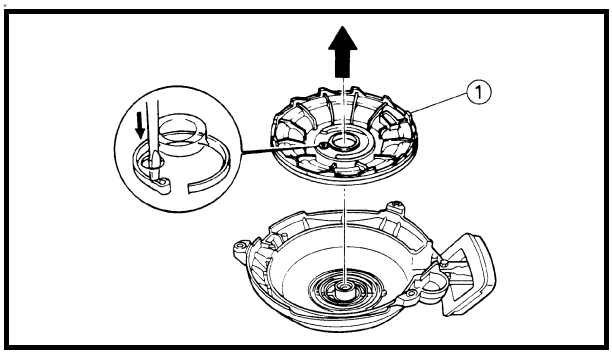


CHECKING THE RECOIL STARTER

1. Remove:
   - Cover ①
   - Starter handle-grip ②

NOTE:
Undo the knot in the starter rope, and wind the rope around the sheave drum.

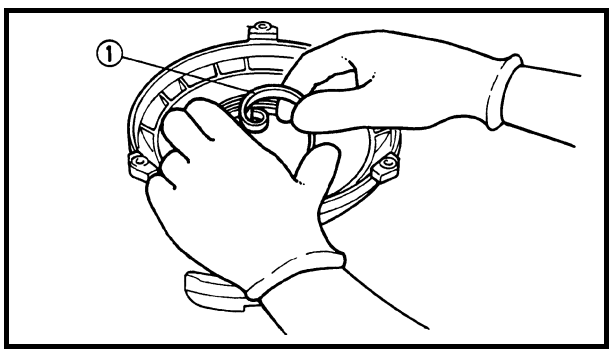
CAUTION:
Be careful not to touch the sheave drum which is rotating at high speeds.



2. Remove:
   - Sheave drum ①

NOTE:
When removing the sheave drum from the starter case, hold down the spiral spring with screwdriver inserted into the hole in the sheave drum, so that the spiral spring will not spring out.

⚠ WARNING
When removing the sheave drum, be sure to set the spring free and remove the sheave retainer bolt. Otherwise, the spiral spring may jump out, endangering other person.

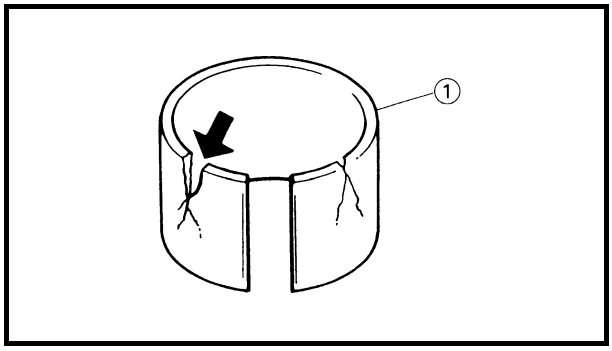


3. Remove:
   - Spiral spring ①

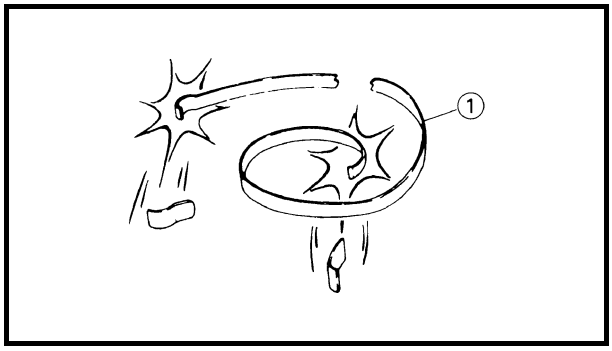
NOTE:
Hold the spring with one hand, and unfold the spring from its center with the other hand. Be careful so that the spring does not jump out.

⚠ WARNING

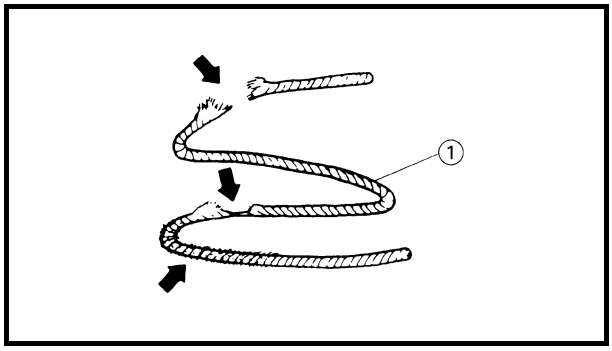
When removing or installing the spiral spring, use care not to injure your hand. It is advisable to wear gloves.



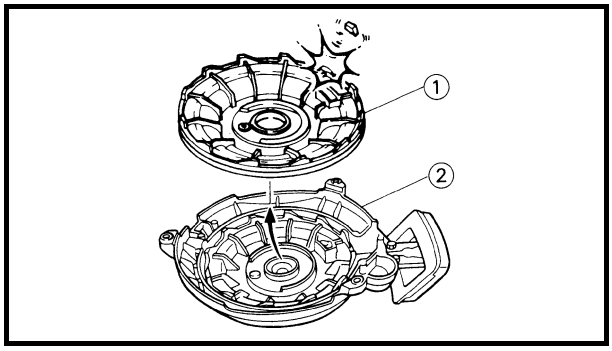
4. Check:
   - Bushing ①
     Cracks/damage/wear → Replace.



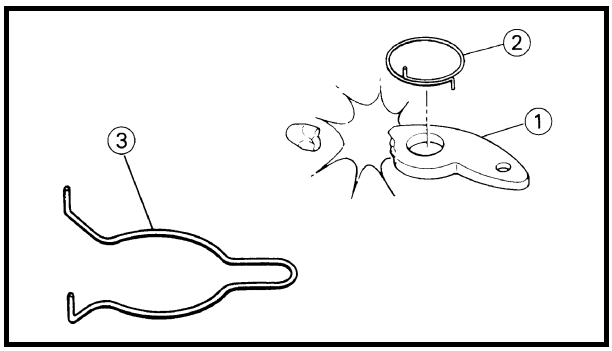
5. Check:
   - Spiral spring ①
     Bent/broken/damage → Replace.



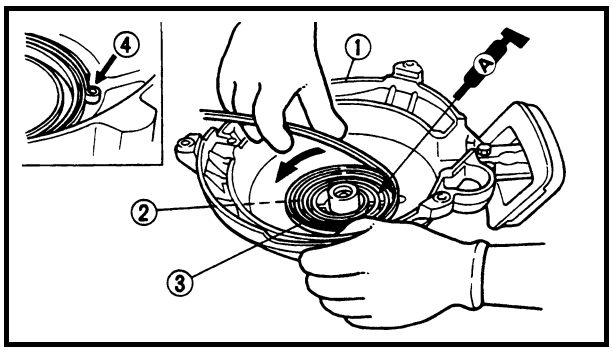
6. Check:
   - Starter rope ①
     Damage/frays/wear→ Replace.



7. Check:
   - Sheave drum ①
   - Starter case ②
     Cracks/damage/wear → Replace.



8. Check:
   - Drive pawl ①
     Cracks/damage/wear → Replace.
   - Return spring ②
   - Friction spring ③
     Bent/broken/damage → Replace.



ASSEMBLING THE RECOIL STARTER

CAUTION:

New spiral springs come held in a steel hoop. To install, hook the outer end onto the spring pin first, place into the starter case, and then remove the steel hoop.

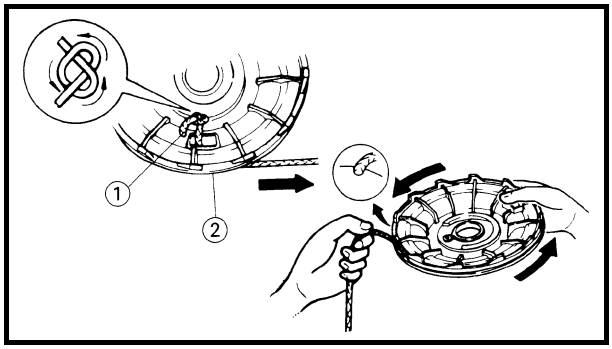
1. Install:
   - Starter case ①
   - Thrust washer ②
   - Spiral spring ③

NOTE:

Hook the outer end ④ of the spiral spring onto the spring pin attached to the starter case, and put the spring into the starter case by winding it counterclockwise.

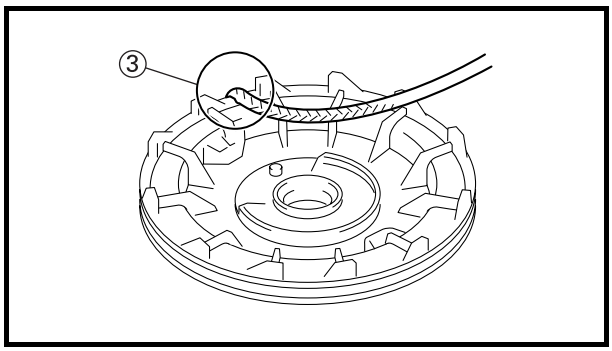
⚠ WARNING

When removing or installing the spiral spring, use care not to injure your hand. It is advisable to wear gloves.

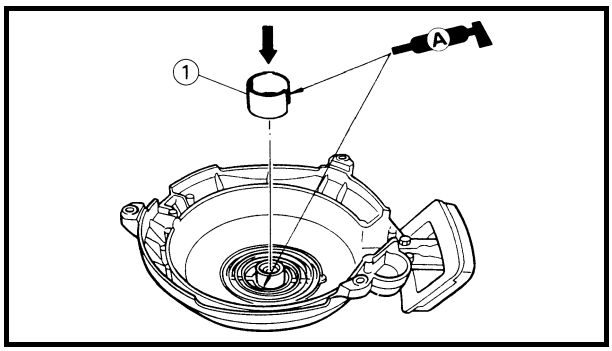


2. Install:
   - Starter rope ①
   - Sheave drum ②

NOTE:
- Insert the rope through the rope hole and knot the end as shown.
- Wind the rope 1-1/2 turns counterclockwise onto the sheave drum.
- Place the rope at the cutaway ③.

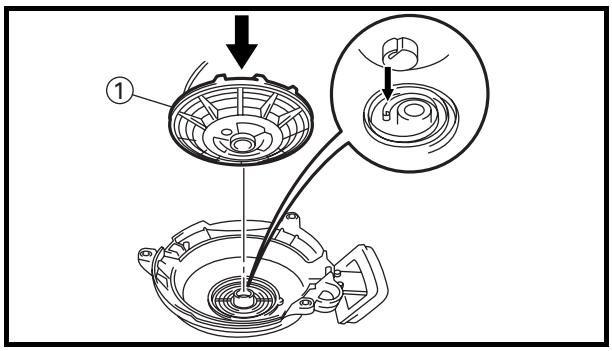


⚠ WARNING
- Do not use a damaged starter rope, it could cause injury.



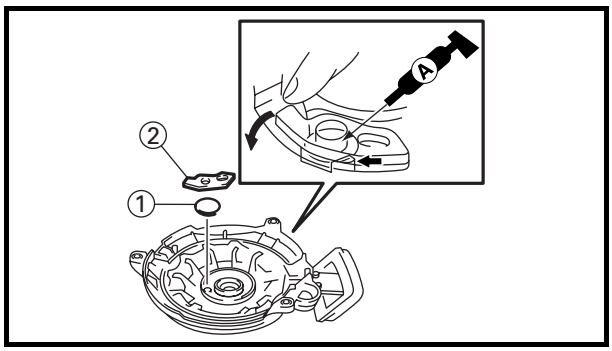
3. Install:
   - Bushing ①

NOTE:
Mount the bushing on the starter case shaft.



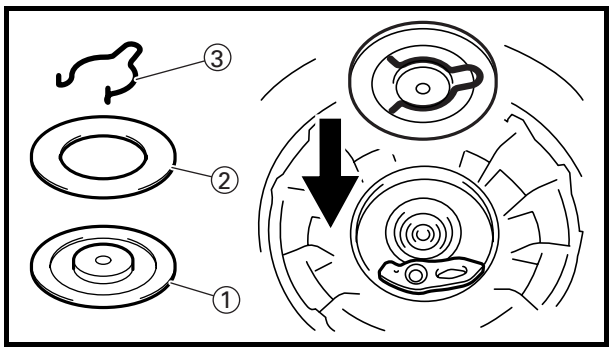
4. Install:
   - Sheave drum ①

NOTE:
While turning the sheave drum, fit the sheave drum shaft slot into the spiral spring hook, and then place the sheave drum shaft into the starter case boss.

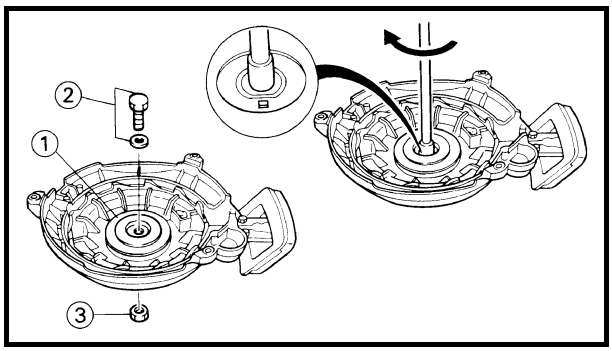


5. Install:
   - Return spring ①
   - Drive pawl ②

NOTE:
Hook the end of the return spring onto the drive pawl, and check to see that the drive pawl returns smoothly.

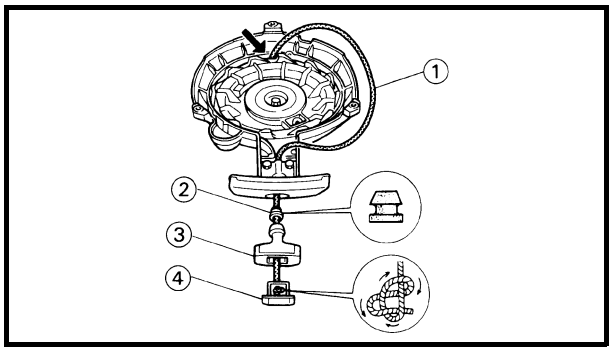


6. Install:
   - Friction plate ①
   - Collar 1 ②
   - Friction spring ③

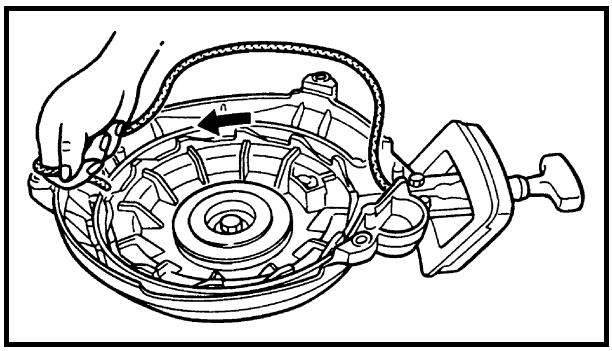


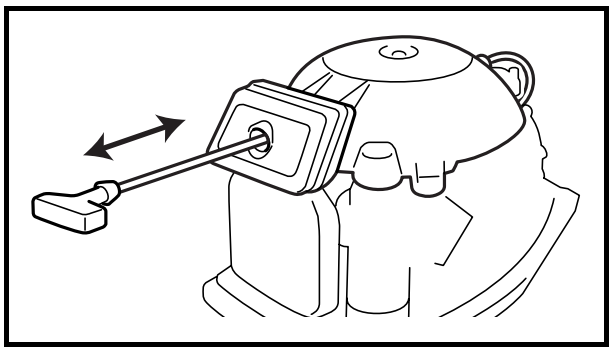
7. Install:
   - Friction plate ①
     (with friction spring etc.)
   - Center bolt ②
   - Nut ③

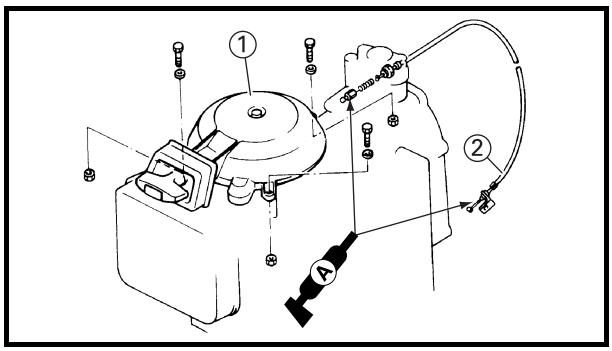
	Center bolt **15 N•m (1.5 kgf•m, 11 ft•lb)** **Nut** **10 N•m (1.0 kgf•m, 7.4 ft•lb)**



8. Install:
   - Starter rope ①
   - Damper ②
   - Starter handle-grip ③
   - Cover ④







NOTE:

- Set the sheave drum so that the cut in the sheave drum is diametrically opposite the starter handle-grip.
- Pass the rope through the starter handle-grip, and make a knot in the end of the rope as shown.
- After assembling, wind the rope 3 turns counterclockwise around the sheave drum to contract the spring.
- By pulling out the rope, check the operation of the starter.

INSTALLING THE RECOIL STARTER

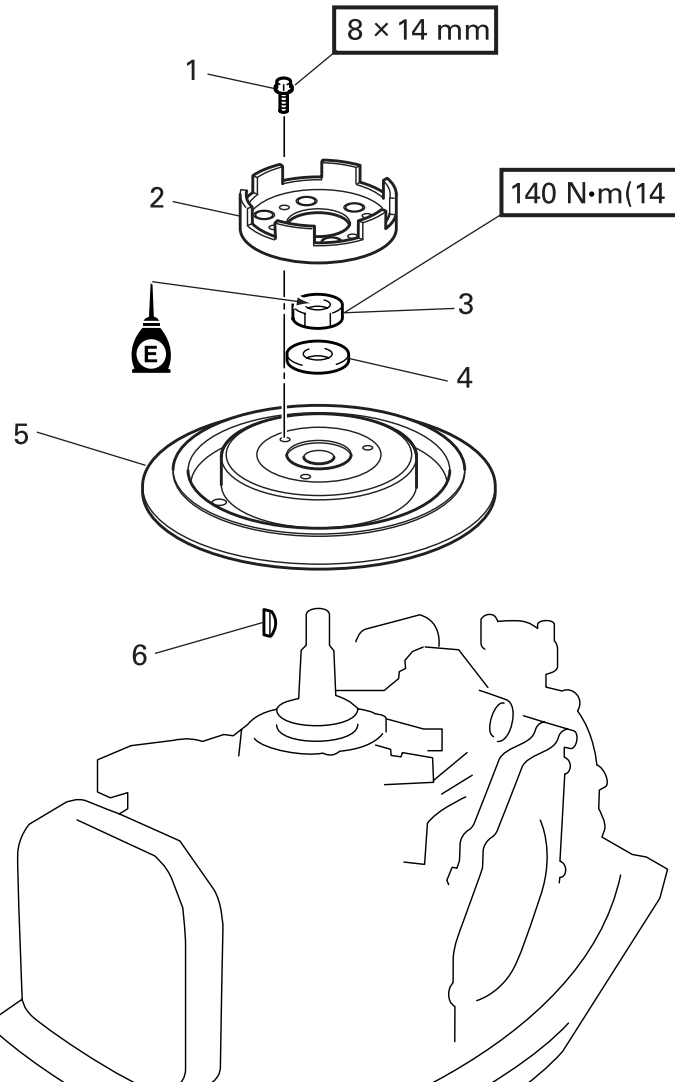
Install:

- Recoil starter ①
- Starter stop wire ②

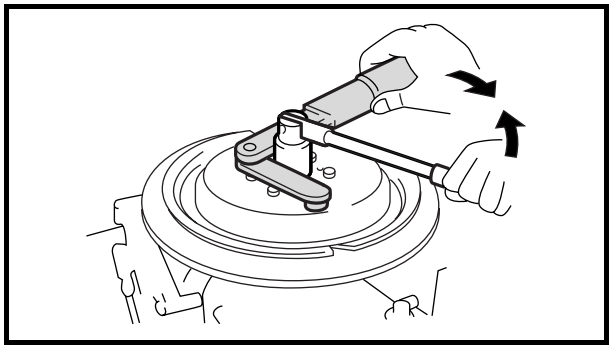
  Refer to the "ADJUSTING THE START-IN-GEAR PROTECTION DEVICE" on page 3-17.

FLYWHEEL MAGNET

REMOVIING THE FLYWHEEL MAGNET



Step	Job/Part	Q'ty	Remarks
1	Bolt	3	
2	Starter pulley	1	
3	Nut	1	
4	Washer	1	
5	Flywheel magnet	1	
6	Woodruf key	1	



Remove:
- Flywheel magnet

Removing steps

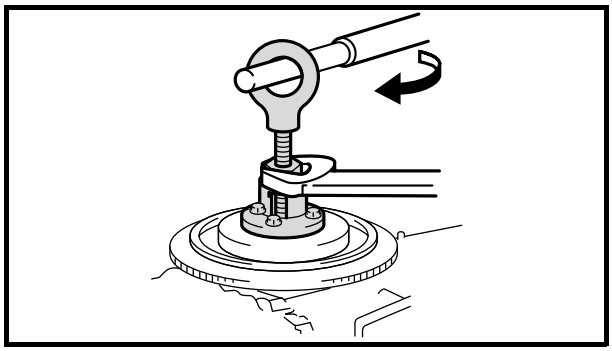
(1) Remove the starter pulley

(2) Remove the flywheel magnet nut.

	Flywheel holder **90890-06522**

NOTE:

The major load should be applied in the direction of the arrows. If the load is not applied as shown, the flywheel holder may easily slip off of the flywheel magnet.

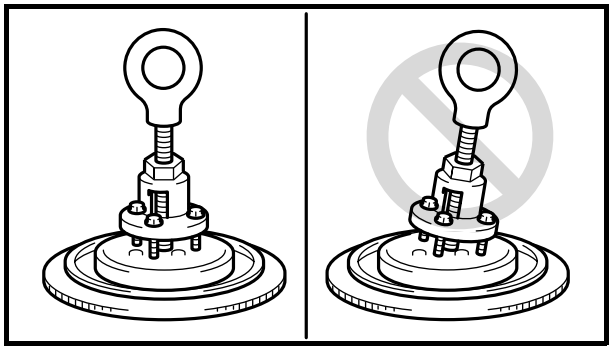


(3) Remove the flywheel magnet.

	Flywheel puller **90890-06521**

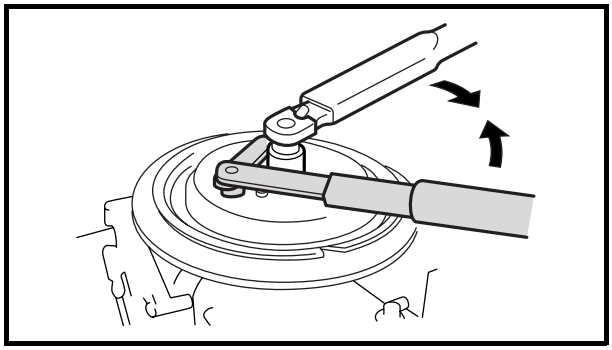
NOTE:

- The major load should be applied in the direction of the arrows.
- Apply the load until the flywheel magnet comes off the tapered portion of the crankshaft.



CAUTION:

To prevent damage to the engine or tools, screw in the flywheel puller set-bolts evenly and completely so that the puller plate is parallel to the flywheel magnet.



INSTALLING THE FLYWHEEL MAGNET

Install:
- Flywheel magnet

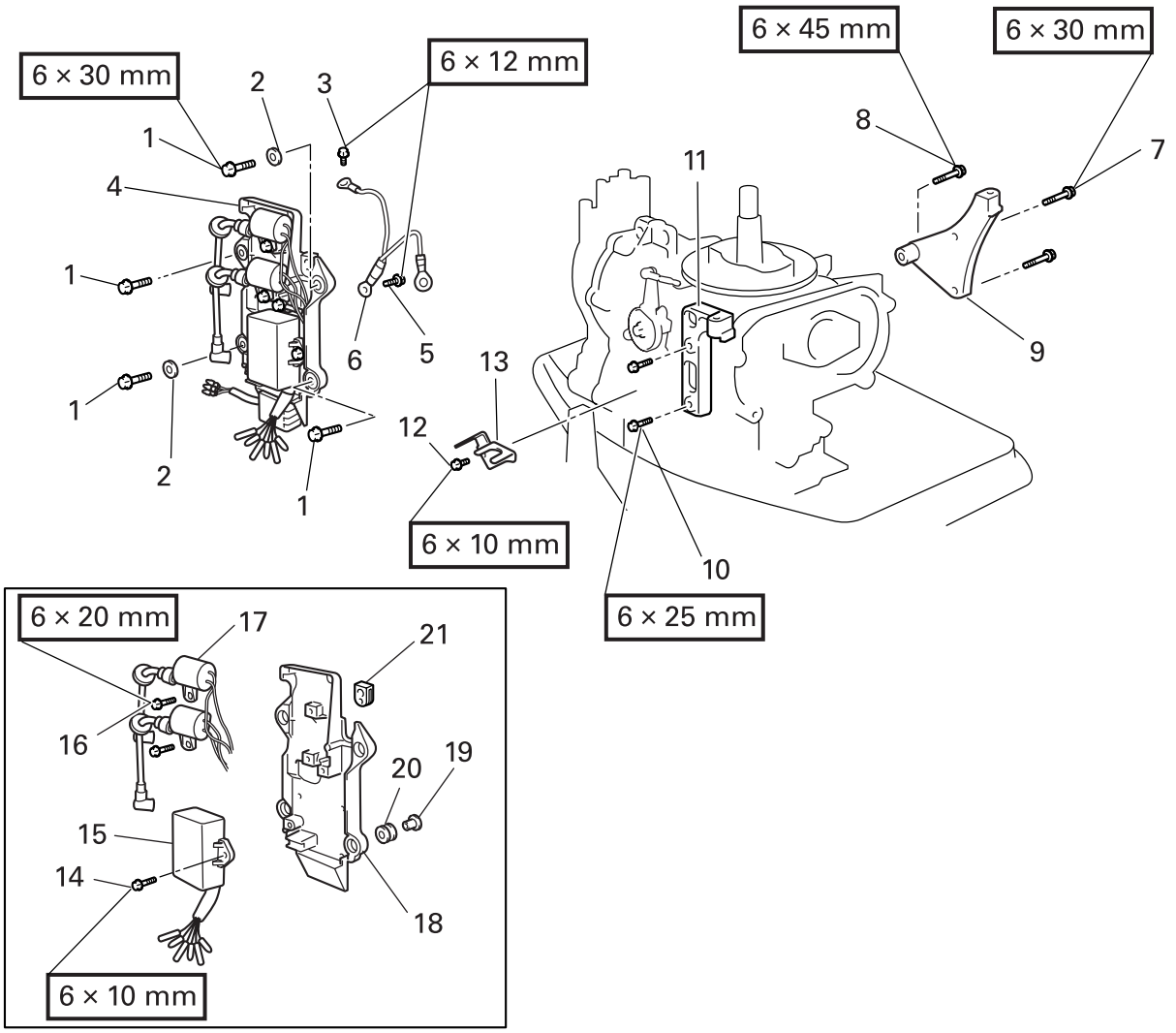
	Flywheel holder **90890-06522**

NOTE:

The major load should be applied in the direction of the arrows. If the load is not applied as shown, the flywheel holder may easily slip off of the flywheel magnet.

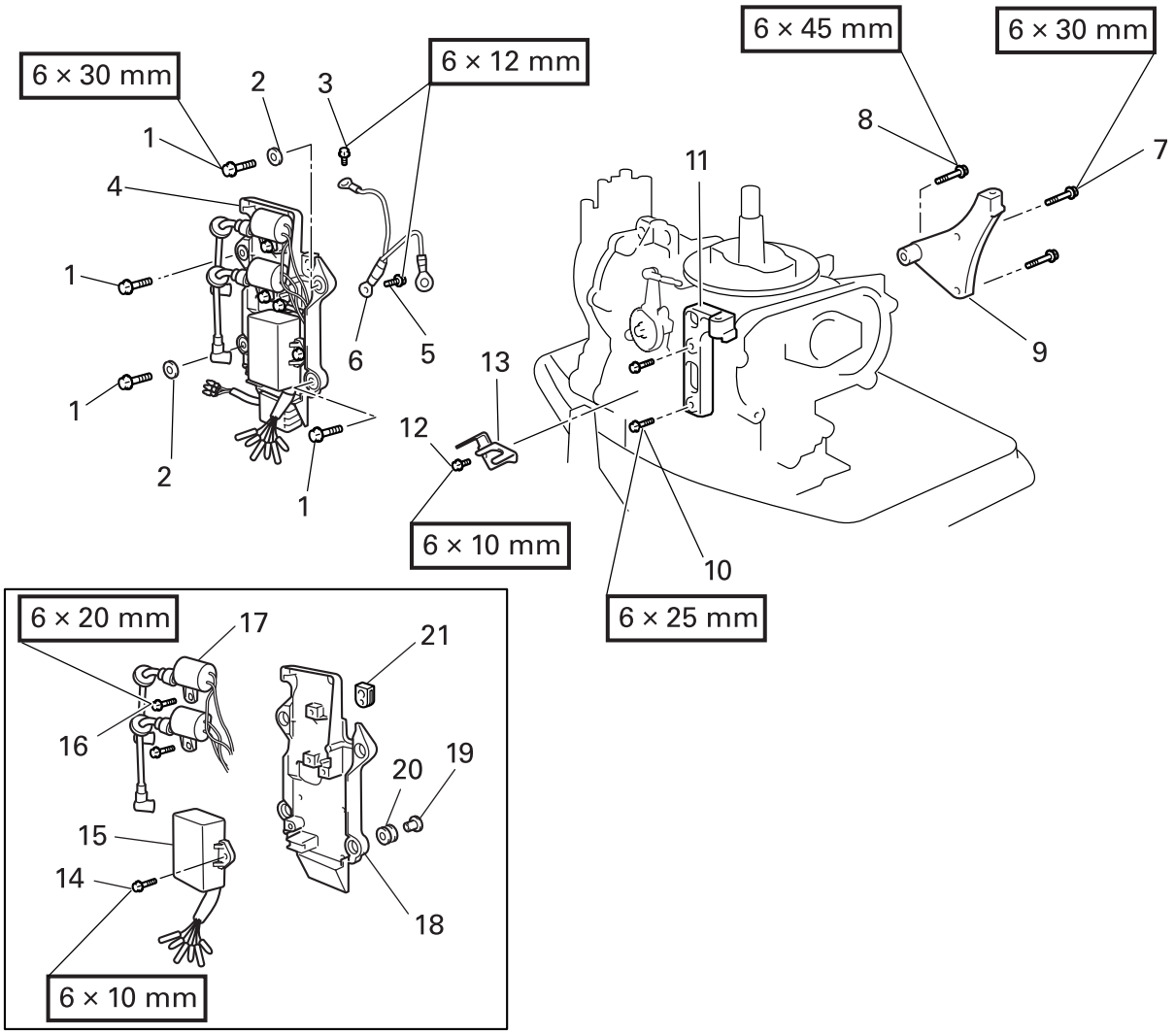
POWER UNIT

DISCONNECTING THE LEADS AND STAYS



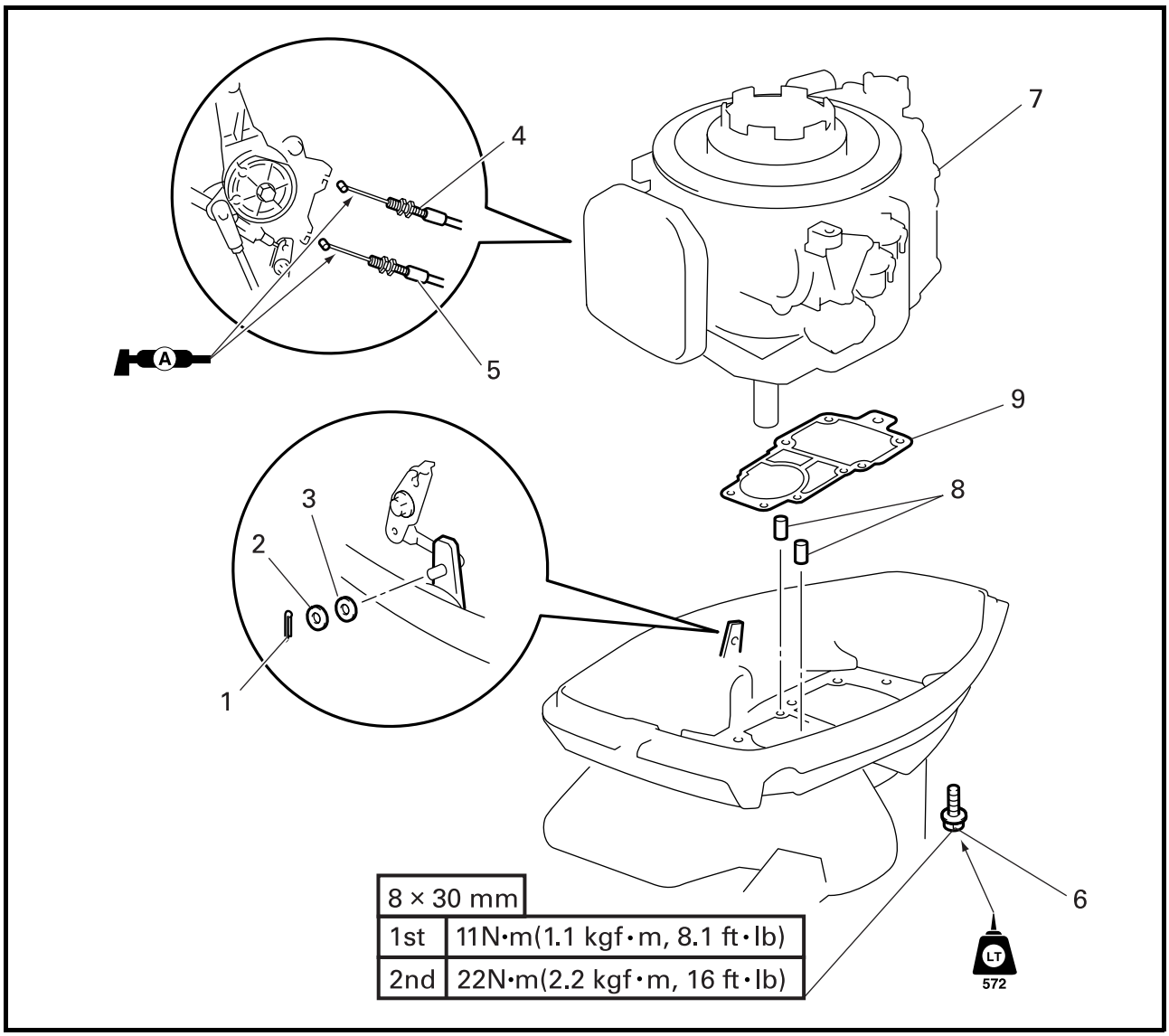
Step	Job/Part	Q'ty	Remarks
1	Bolt	4	
2	Washer	2	
3	Bolt	1	
4	Electrical unit	1	
5	Bolt	1	
6	Earth lead	1	
7	Bolt	2	
8	Bolt	1	
9	Stay	1	
10	Bolt	2	
11	Stay	1	
12	Bolt	1	
13	Stay	1	

Continued on next page.



Step	Job/Part	Q'ty	Remarks
14	Bolt	2	
15	CDI unit	1	
16	Bolt	2	
17	Ignition coil	2	
18	Bracket	1	
19	Pipe	4	
20	Damper	4	
21	Grommet	1	

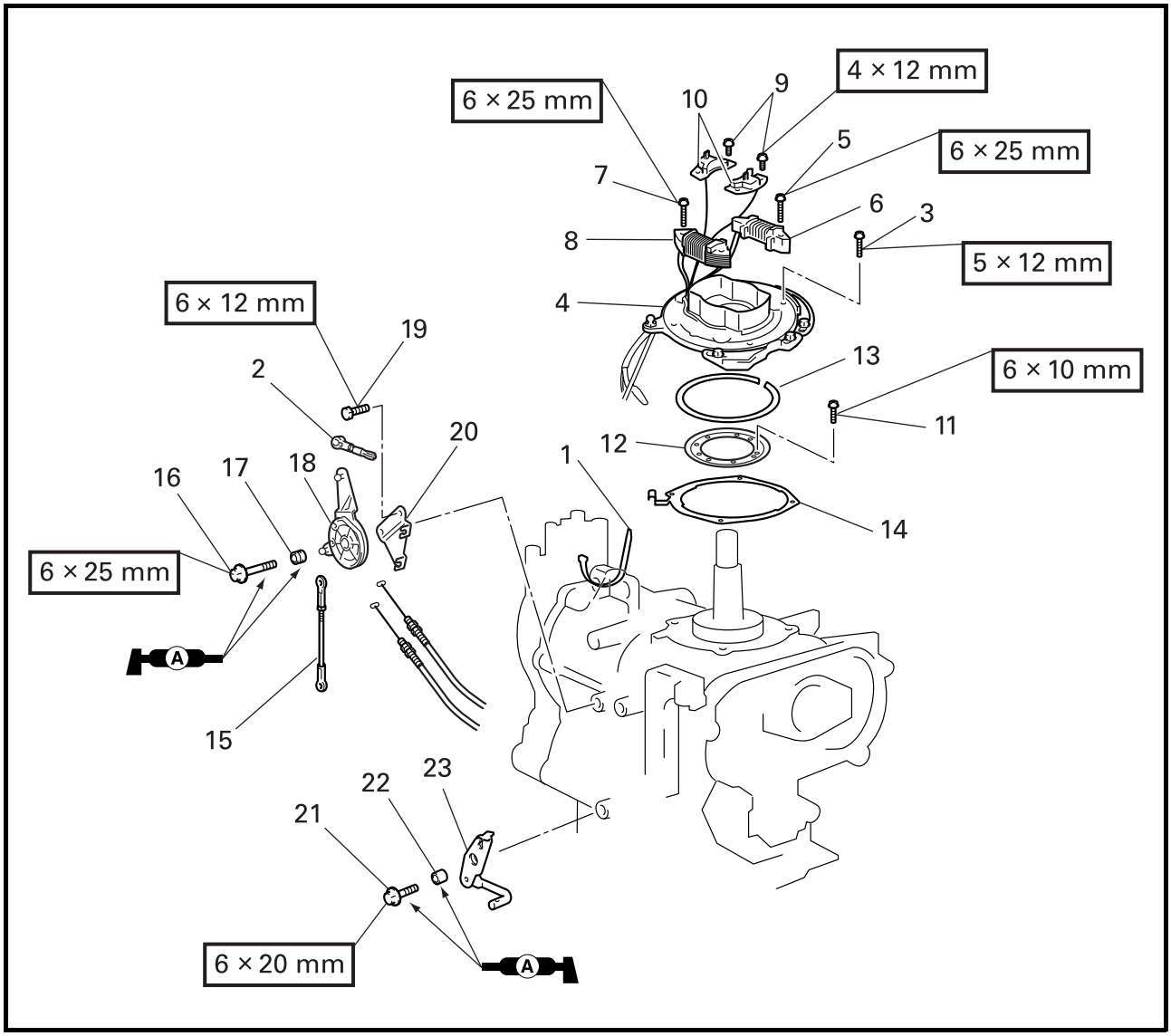
REMOVING THE POWER UNIT



Step	Job/Part	Q'ty	Remarks
1	Cotter pin	1	**Not reusable**
2	Washer	1	
3	Wavewasher	1	
4	Throttle cable 1	1	
5	Throttle cable 2	1	
6	Bolt (with washer)	6	
7	Power unit	1	
8	Dowel pin	2	
9	Gasket	1	**Not reusable**

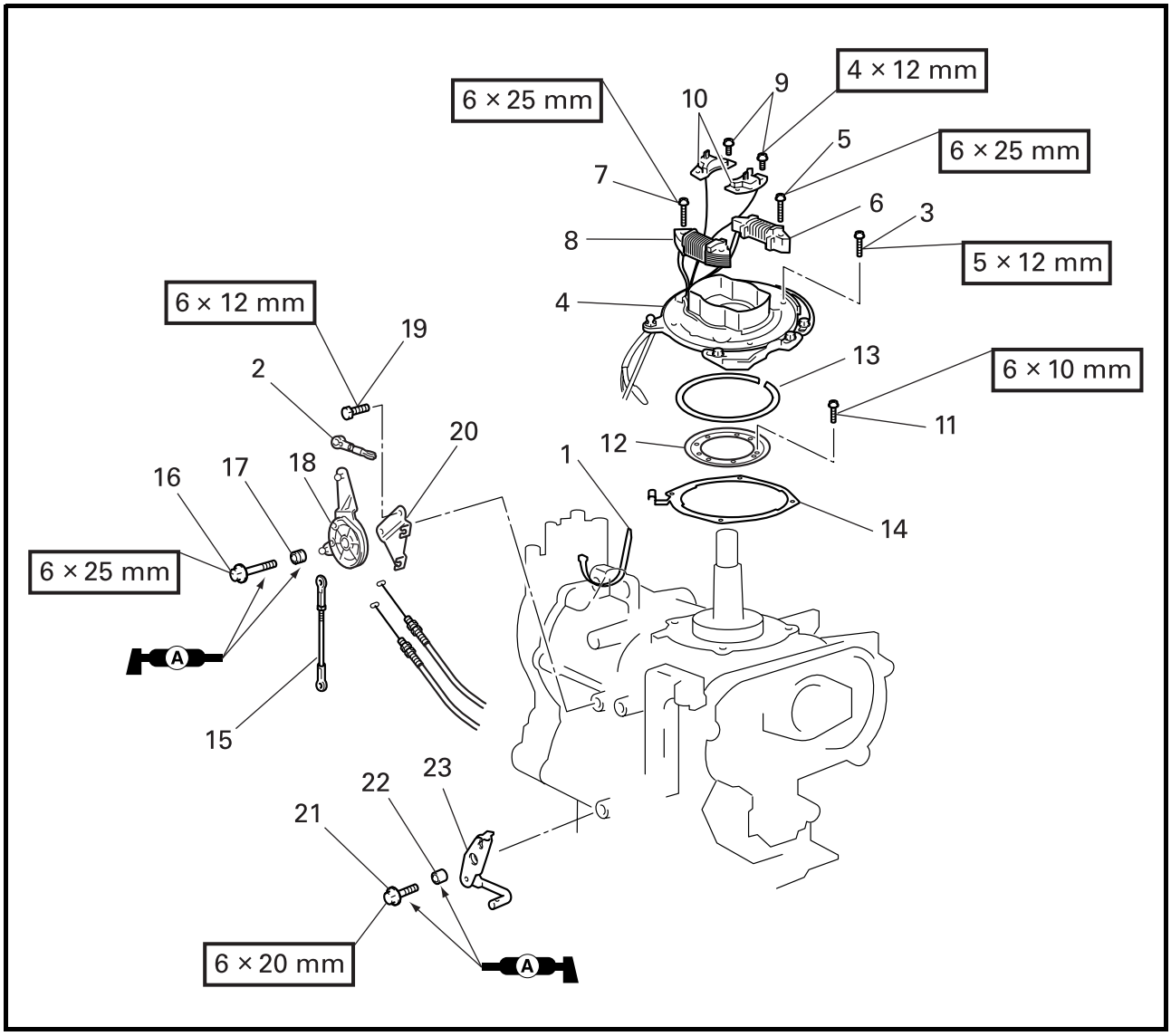
MAGNET BASE AND CONTROL LEVER

REMOVING THE MAGNET BASE AND MAGNET CONTROL LEVER



Step	Job/Part	Q'ty	Remarks
1	Clamp	1	
2	Joint link	1	
3	Bolt	4	
4	Magnet base	1	
5	Screw	2	
6	Change coil	1	
7	Screw	2	
8	Lighting coil	1	
9	Screw	4	
10	Pulser coil	2	
11	Screw	4	
12	Magnet base retainer 2	1	
13	Magnet base retainer 1	1	

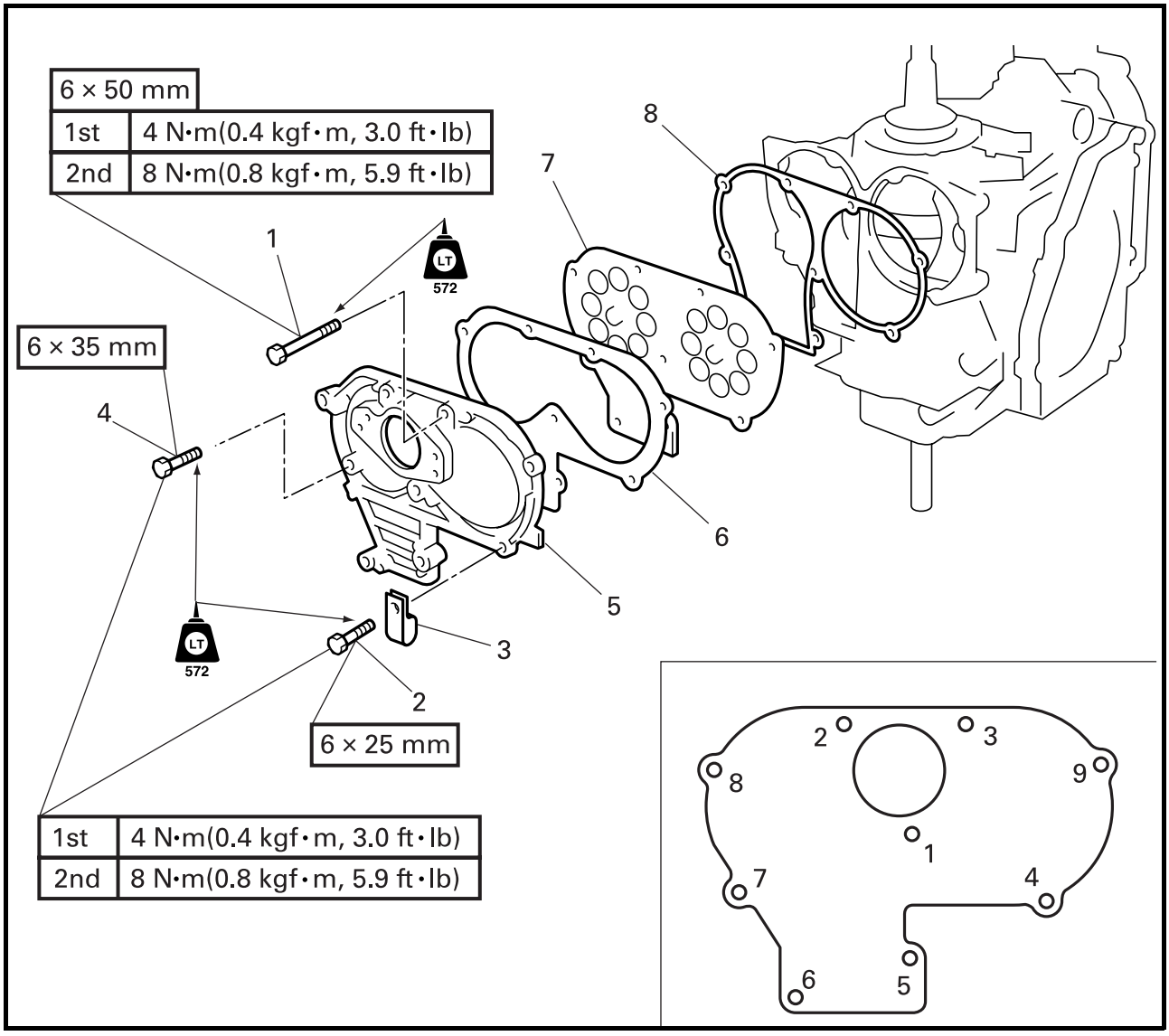
Continued on next page.



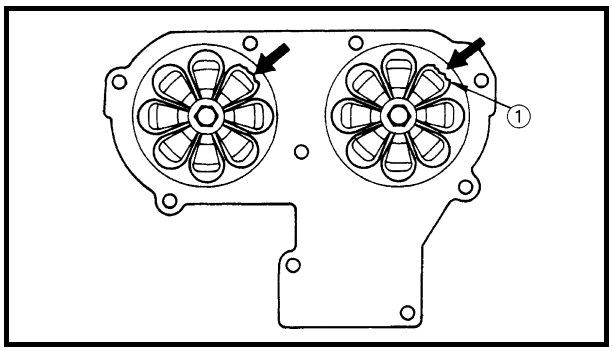
Step	Job/Part	Q'ty	Remarks
14	Magnet base friction plate	1	
15	Joint link	1	
16	Bolt (with washer)	1	
17	Collar	1	
18	Magneto control lever	1	
19	Bolt (with washer)	1	
20	Throttle cable stay	1	
21	Bolt (with washer)	1	
22	Collar	1	
23	Arm	1	

INTAKE MANIFOLD AND REED VALVES

REMOVING THE INTAKE MANIFOLD AND REED VALVES

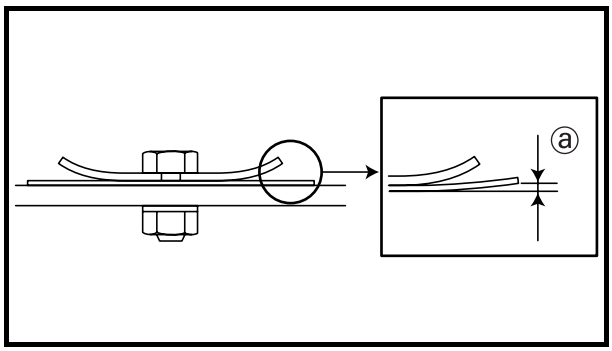


Step	Job/Part	Q'ty	Remarks
1	Bolt (with washer)	1	
2	Bolt (with washer)	2	
3	Clamp (Fuel hose)	1	
4	Bolt (with washer)	6	
5	Intake manifold	1	
6	Intake manifold gasket	1	**Not reusable**
7	Reed valve	1	
8	Gasket	1	**Not reusable**



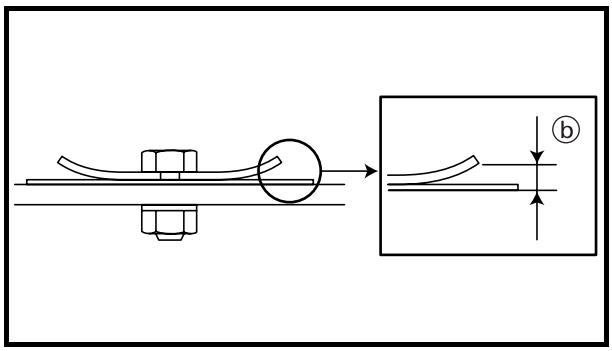
CHECKING THE REED VALVES

1. Check:
   - Reed valve ①
     Cracks/damage → Replace.



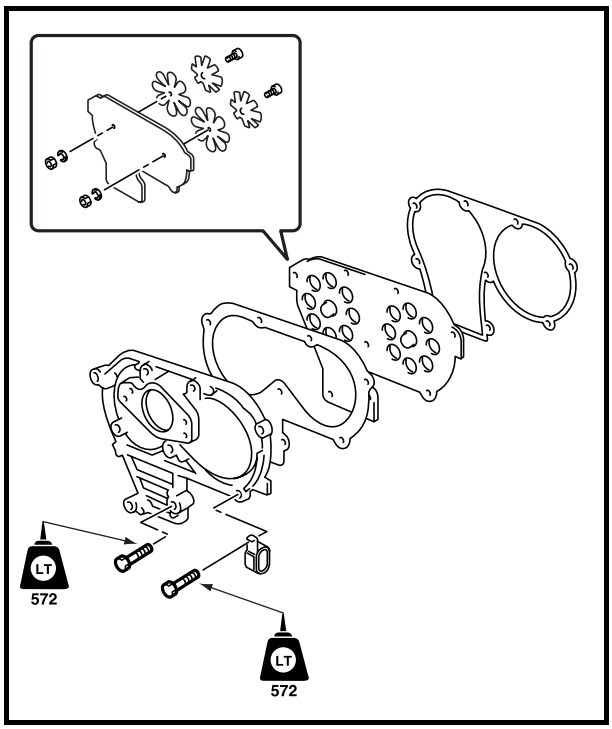
2. Measure:
   - Valve bending ⓐ
     Out of specification → Replace.

Valve bending limit
0.2 mm (0.008 in)



3. Measure:
   - Valve stopper height ⓑ
     Out of specification → Replace.

Valve stopper height
Standard:
3.46 - 3.50 mm (0.136 - 0.138 in)
for Sri Lanka:
4.20 - 4.60 mm (0.165 - 0.181 in)



INSTALLING THE INTAKE MANIFOLD

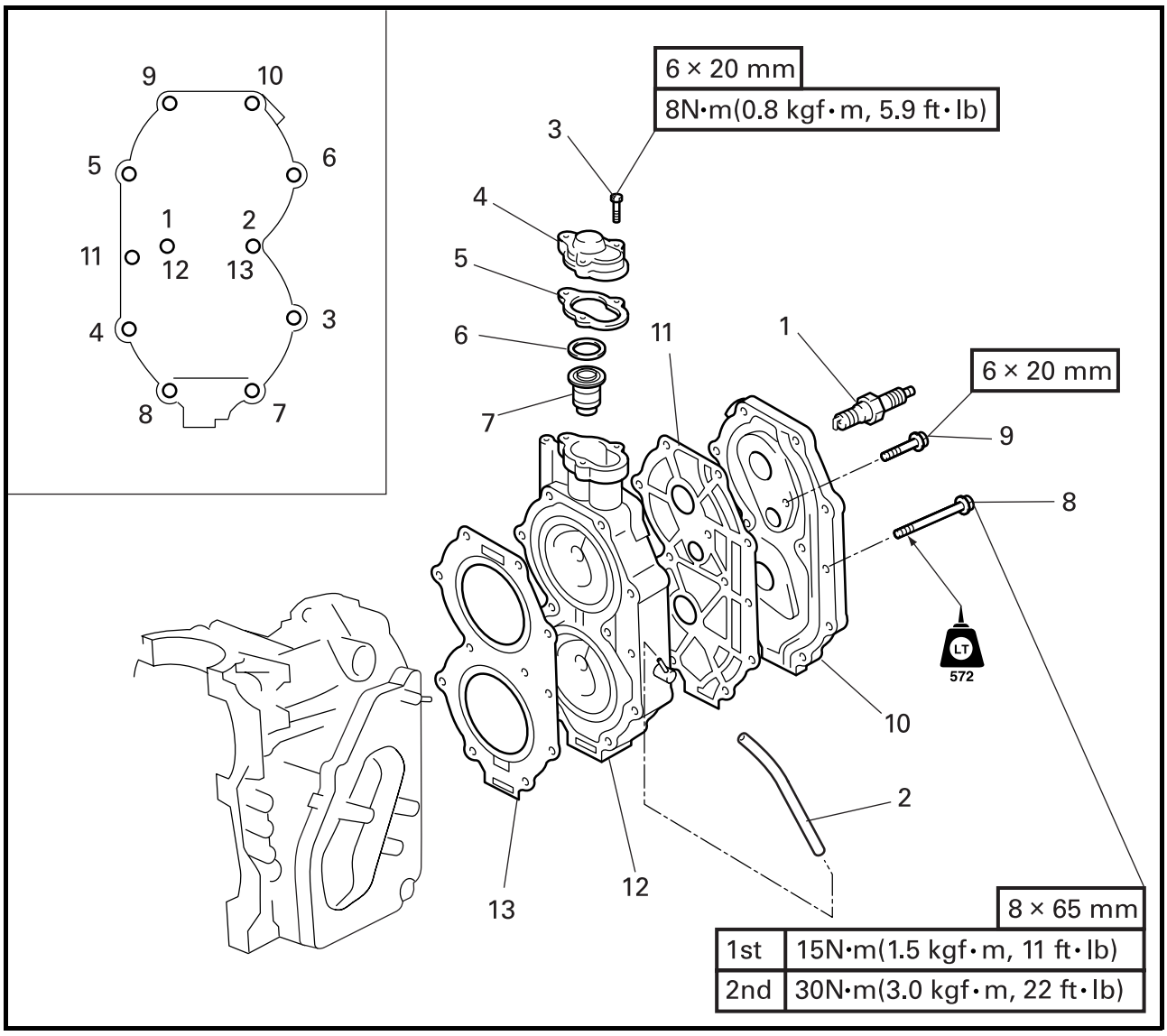
Install:
- Intake manifold

NOTE:
- Tighten the intake manifold mounting bolts in two steps of torque.
- Apply LOCTITE® No.572 on the bolts.

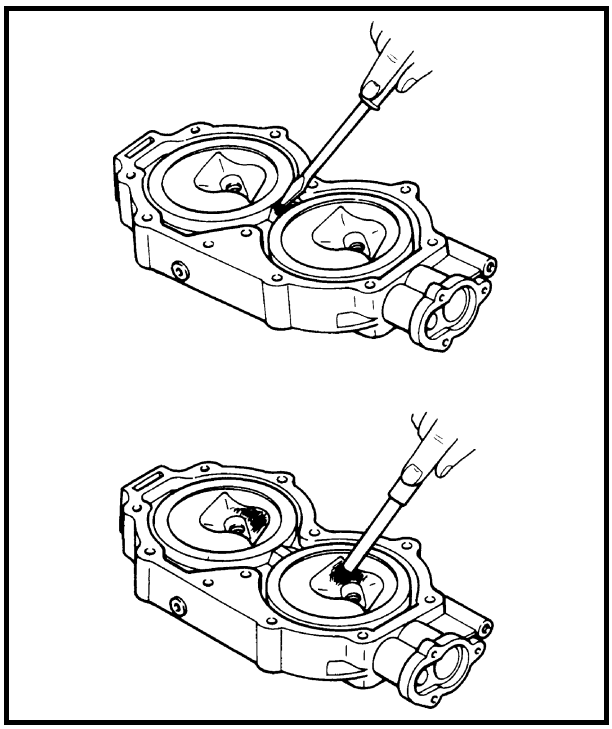
Intake manifold mounting bolt
1st: 4 N•m (0.4 kgf•m, 3.0 ft•lb)
2nd: 8 N•m (0.8 kgf•m, 5.9 ft•lb)

CYLINDER HEAD

REMOVING THE CYLINDER HEAD



Step	Job/Part	Q'ty	Remarks
1	Spark plug	2	
2	Hose	1	
3	Bolt (with washer)	3	
4	Thermostat cover	1	
5	Gasket	1	**Not reusable**
6	Plain washer	1	
7	Thermostat	1	
8	Bolt (with washer)	11	
9	Bolt (with washer)	2	
10	Cylinder head cover	1	
11	Head cover gasket	1	**Not reusable**
12	Cylinder head	1	
13	Cylinder head gasket	1	**Not reusable**

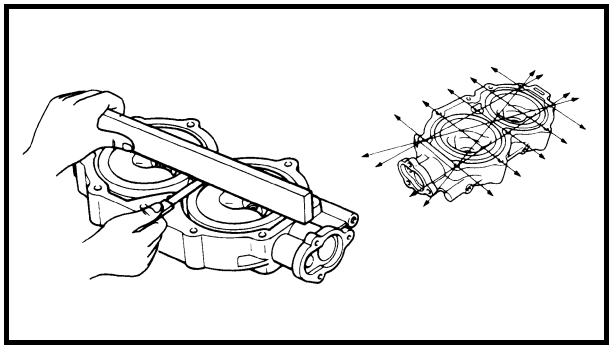


CHECKING THE CYLINDER HEAD

1. Check:
   - Combustion chamber
     Carbon deposits → Clean.
   - Water jacket
     Mineral deposits/rust → Clean.

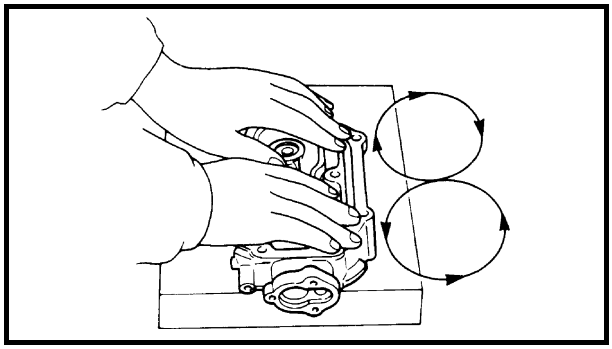
CAUTION:

Do not scratch the contacting surface of the cylinder head and cylinder head cover.



2. Measure:
   - Cylinder head warpage
     (use a straightedge and thickness gauge)
     Out of specification → Resurface/ replace.

Warpage limit
0.1 mm (0.004 in)



Resurfacing steps

(1) Place a 400 – 600 grit wet sandpaper on the surface plate.

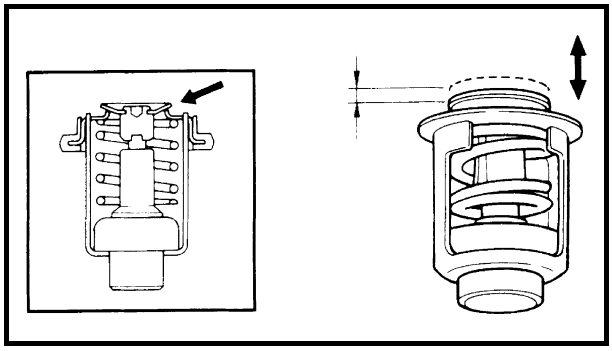
(2) Resurface the cylinder head by moving it in a figure-eight motion along the sandpaper.

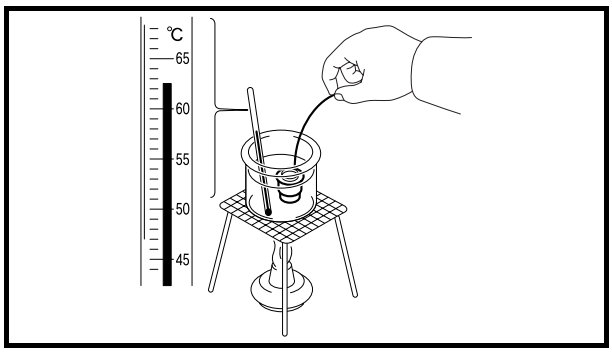
NOTE:

Rotate the cylinder head several times to ensure an even surface.

CHECKING THE THERMOSTAT

1. Check:
   - Thermostat
     Damage/stick → Replace.



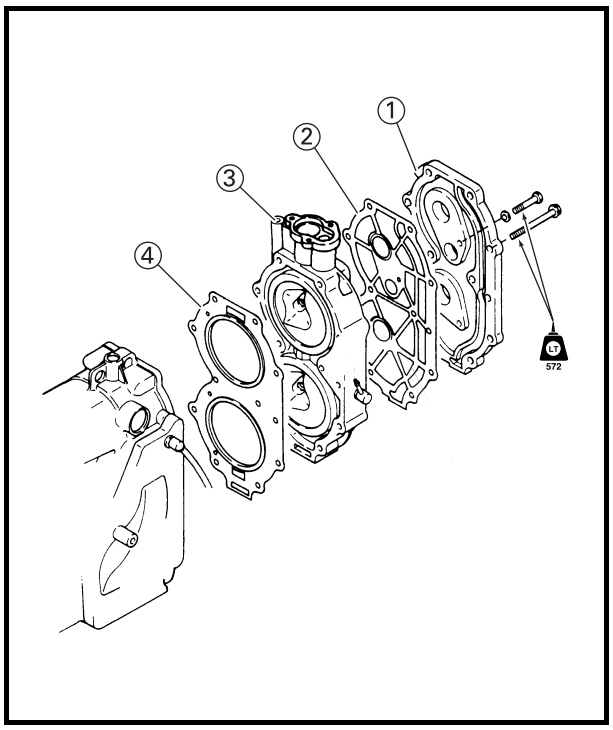


2. Measure:
   - Valve opening temperature
   - Valve lift
     Out of specification → Replace.

	Water temperature	Valve lift
	Below 48 – 52°C (118 – 126°F)	0 mm (0 in)
	Above 60°C (140°F)	Min. 3 mm (0.12 in)

Measuring steps

(1) Suspend the thermostat in a container filled with water.
(2) Place a thermometer in the water.
(3) Slowly heat the water.
(4) While stirring the water, check that the thermostat opens at the specified temperature.



INSTALLING THE CYLINDER HEAD AND CYLINDER HEAD COVER

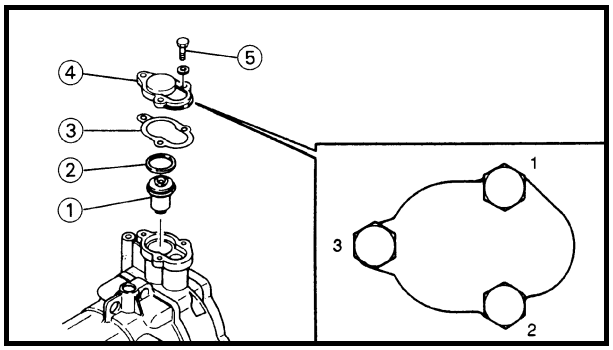
Install:

- Cylinder head ③ and cylinder head cover ①

NOTE:

- Temporarily assemble; cylinder head cover ①, cylinder head cover gasket ②, cylinder head ③, and cylinder head gasket ④ in that order, and then install the assembled parts onto the crankcase.
- Apply LOCTITE® No.572 on the bolts.
- Tighten the cylinder head mounting bolts and nut in sequence and in two steps of torque.

Cylinder head mounting bolts
1st: 15 N•m (1.5 kgf•m, 11 ft•lb)
2nd:30 N•m (3.0 kgf•m, 22 ft•lb)



INSTALLING THE THERMOSTAT

Install:

- Thermostat ①
- Plain washer ②
- Gasket ③
- Thermostat cover ④
- Bolt ⑤

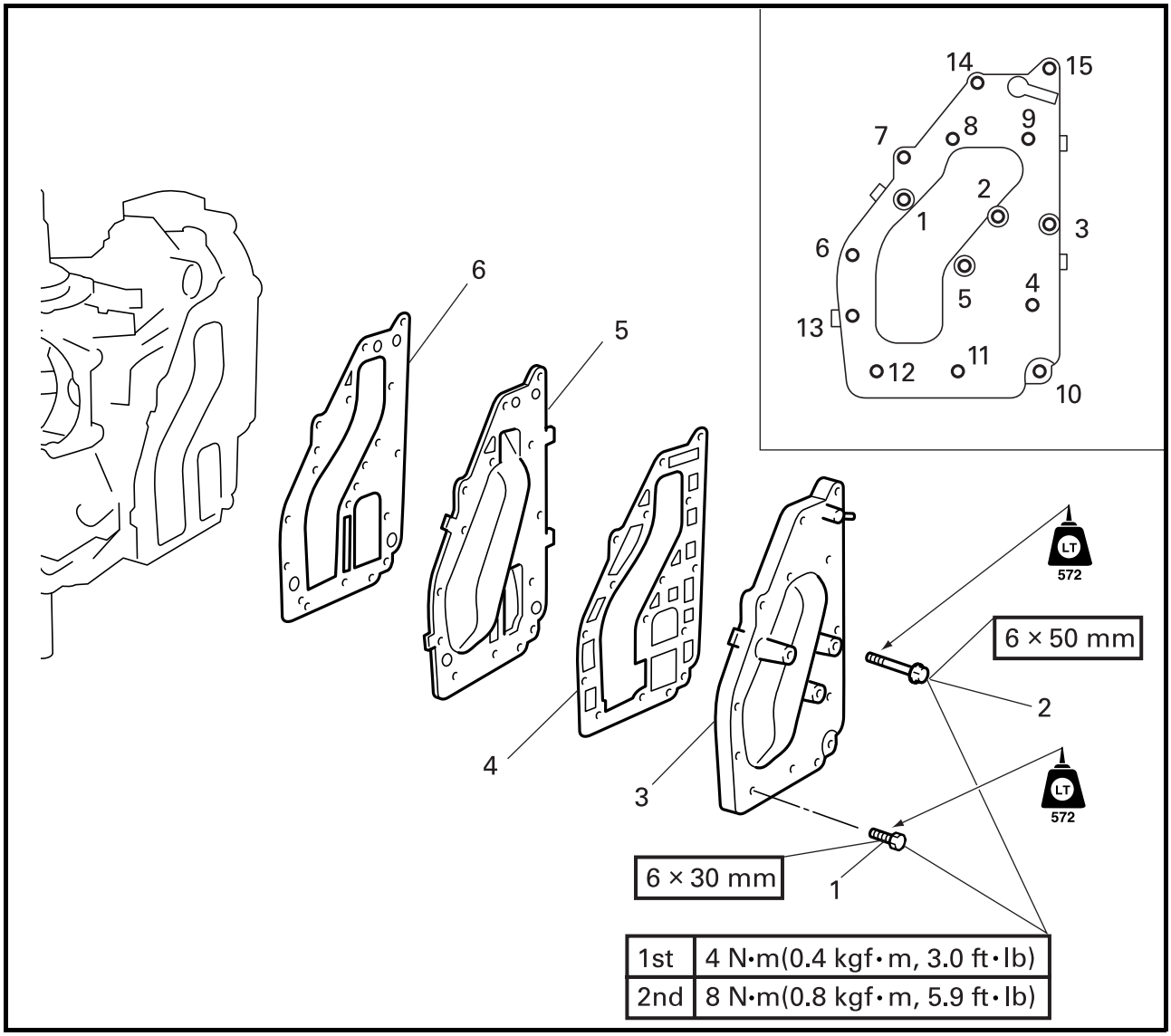
NOTE:

- Always use the new gasket.
- Tighten the bolts in sequence.

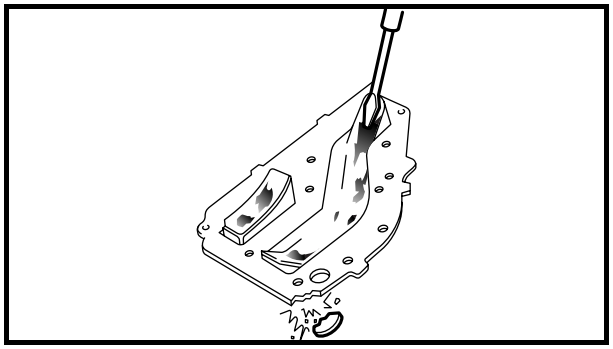
Thermostat cover bolts
8 N•m (0.8 kgf•m, 5.9 ft•lb)

EXHAUST COVER

REMOVING THE EXHAUST COVER



Step	Job/Part	Q'ty	Remarks
1	Bolt (with washer)	12	
2	Bolt (with washer)	3	
3	Exhaust outer cover	1	
4	Gasket	1	**Not reusable**
5	Exhaust inner cover	1	
6	Gasket	1	**Not reusable**



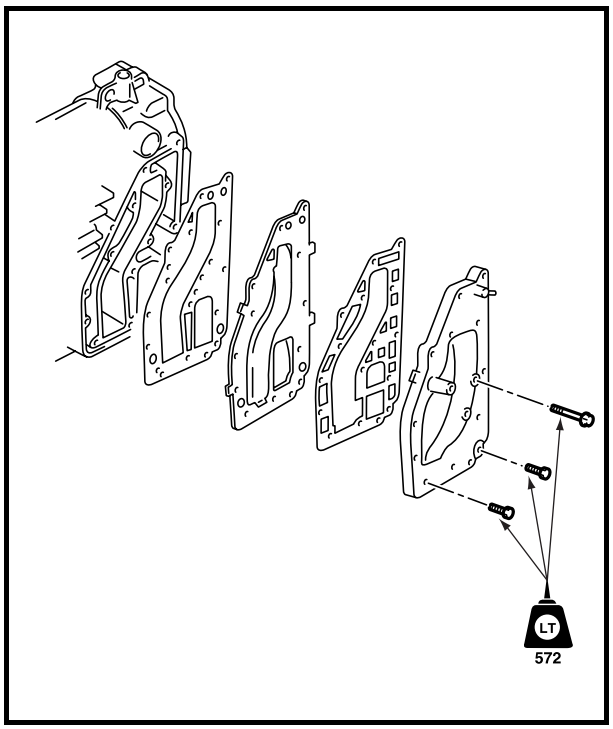
CHECKING THE EXHAUST COVER

Check:

- Exhaust inner cover
  Cracks/damage → Replace.
  Carbon deposits → Clean.
  (use a round scraper)
- Exhaust outer cover
  Cracks/damage → Replace.

CAUTION:

Do not scratch the fitting surfaces of the cylinder and exhaust cover.



INSTALLING THE EXHAUST COVER

Install:

- Exhaust cover

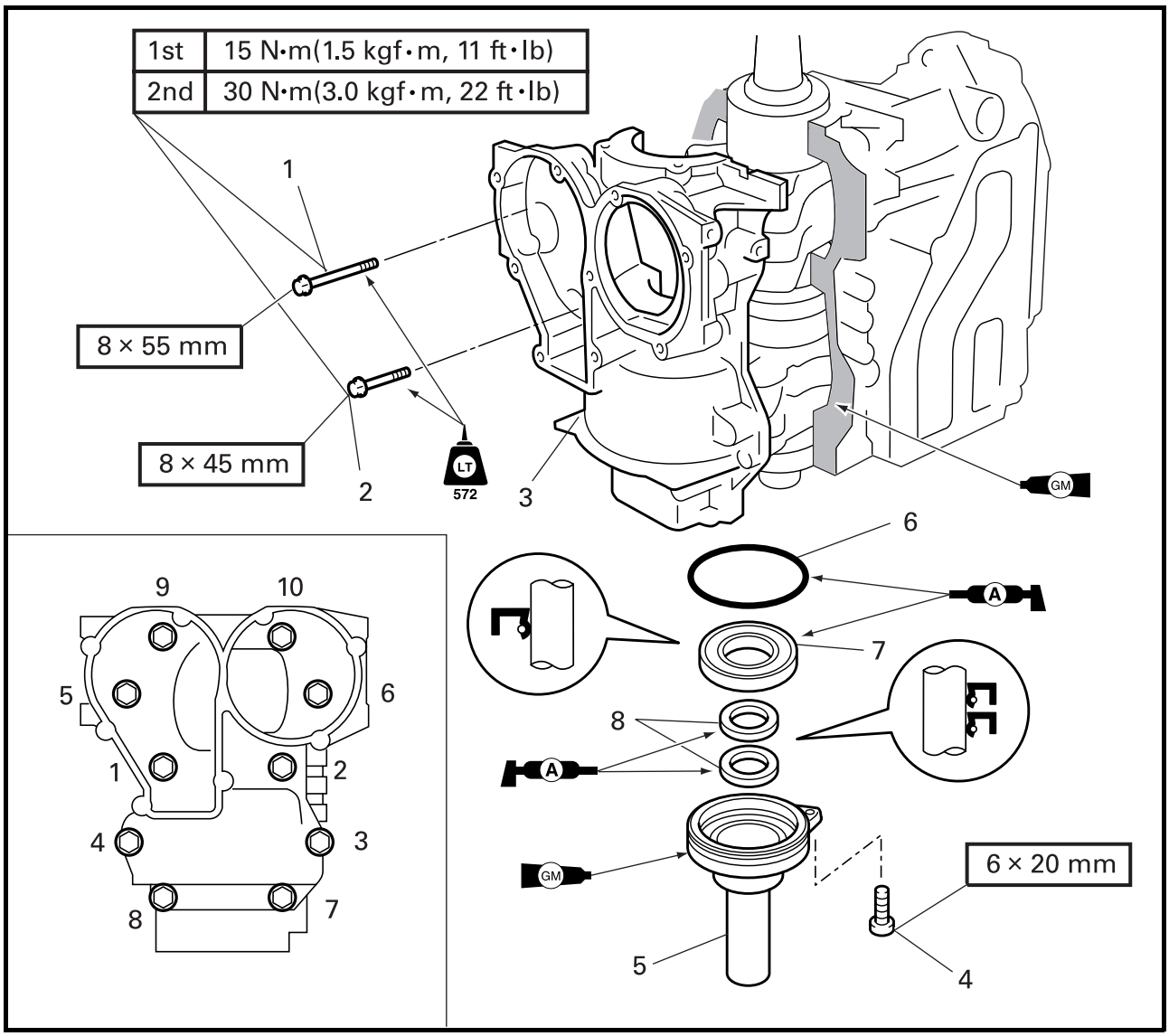
NOTE:

- Apply LOCTITE® No.572 on the bolts.
- Tighten the exhaust cover mounting bolts in sequence and in two steps of torque.

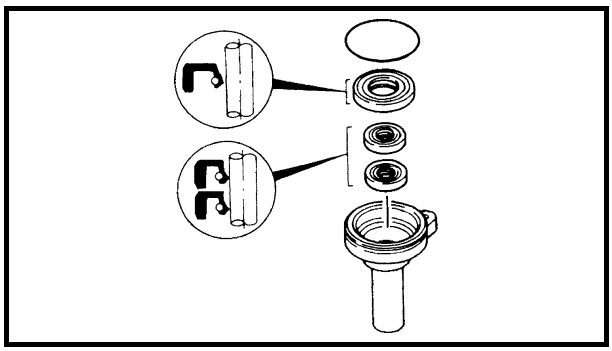
Exhaust cover mounting bolts
1st: 4 N•m (0.4 kgf•m, 3.0 ft•lb)
2nd: 8 N•m (0.8 kgf•m, 5.9 ft•lb)

CRANKCASE

REMOVING THE CRANKCASE



Step	Job/Part	Q'ty	Remarks
1	Bolt (with washer)	8	
2	Bolt (with washer)	2	
3	Crankcase	1	
4	Bolt (with washer)	1	
5	Oil seal housing	1	
6	O-ring	1	**Not reusable**
7	Oil seal	1	**Not reusable**
8	Oil seal	2	**Not reusable**

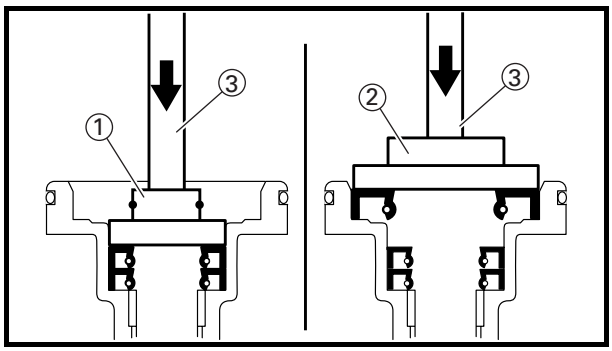


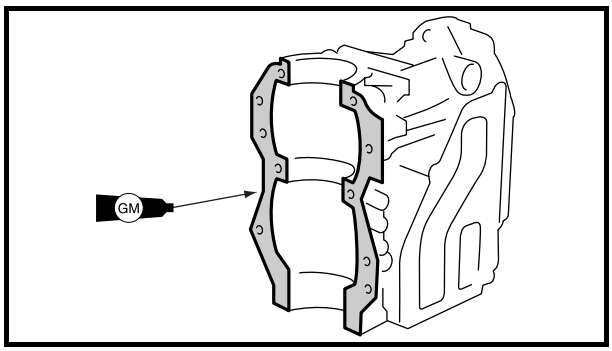
ASSEMBLING THE OIL SEAL HOUSING

Install:
- Oil seal

	Needle bearing attachment .....① **90890-06608**
	Ball bearing attachment.....② **90890-06633**
	Driver rod L3.....③ **90890-06652**

NOTE:
Apply Yamaha grease A (water resistant grease) on the oil seals.





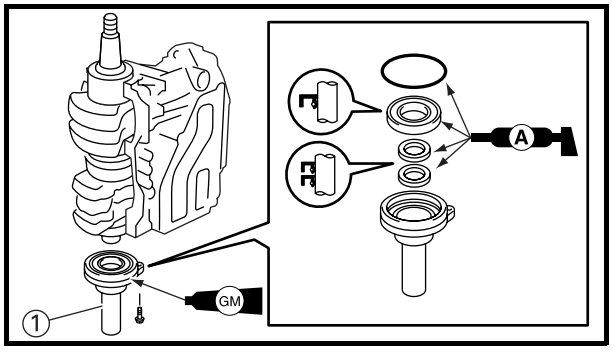
IINSTALLING THE CRANKCASE

1. Apply:
   - Gasket Maker®

Applying steps

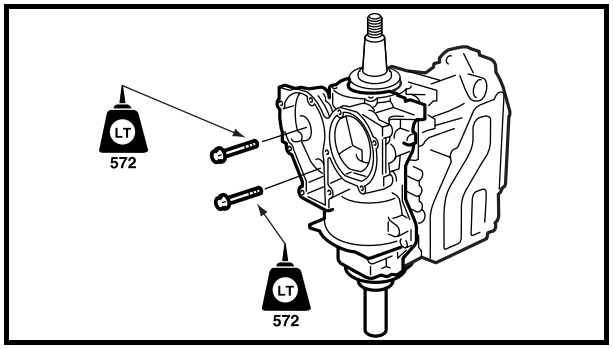
(1) Clean the matching surfaces of the crankcase and cylinder body.
(2) Apply Gasket Maker® onto the matching surfaces of the cylinder body and the crankcase.
(3) Also apply Gasket Maker® on the oil seal housing.

NOTE:
Do not allow any sealant to overflow from the matching surfaces.



2. Install:
   - Oil seal housing ①

NOTE:
Do not give any damage to the lip when installing the oil seal.



3. Install:
   - Crankcase

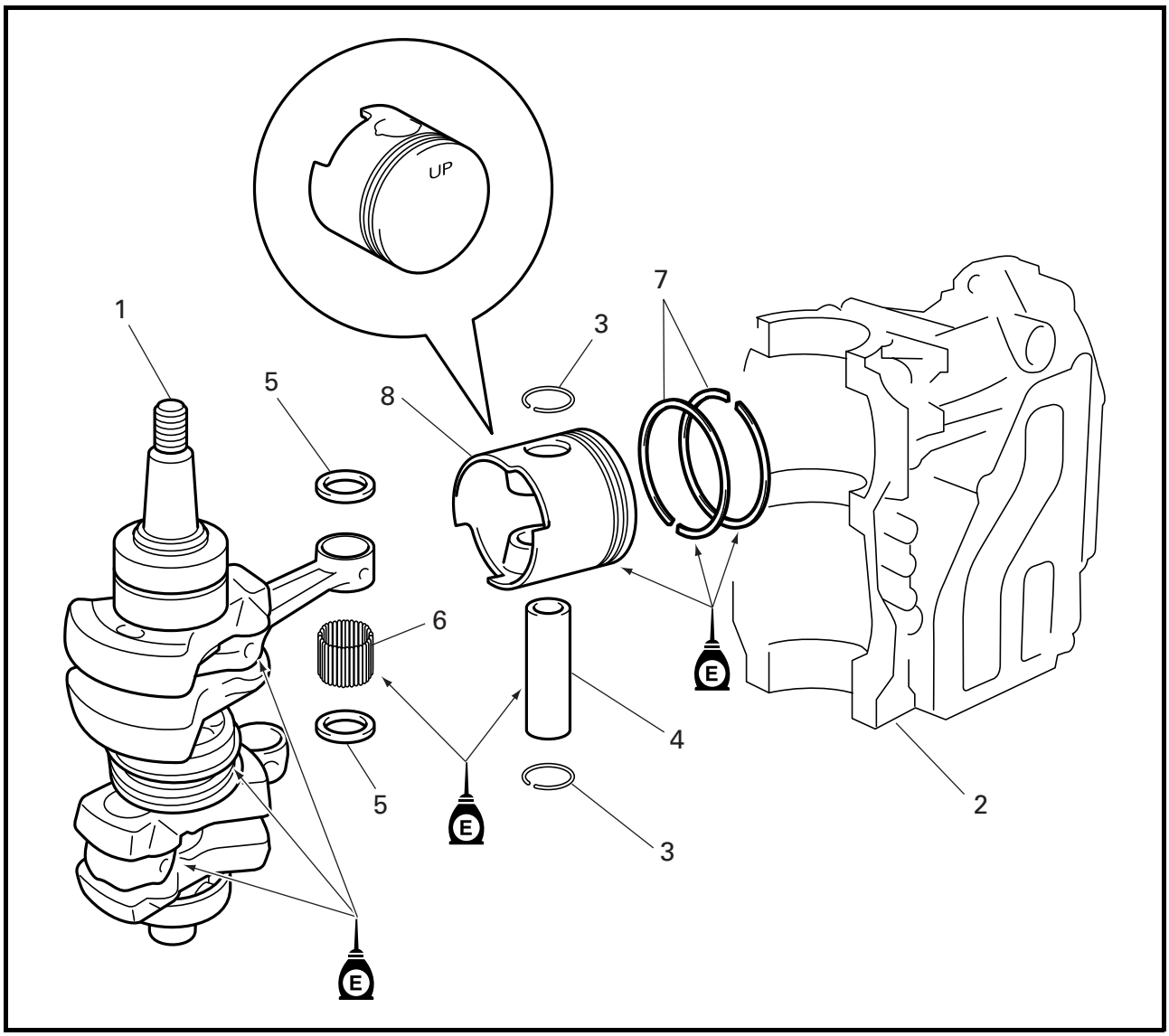
NOTE:

- Apply LOCTITE® No.572 on the bolts.
- Tighten the crankcase mounting bolts in sequence and in two steps of torque.

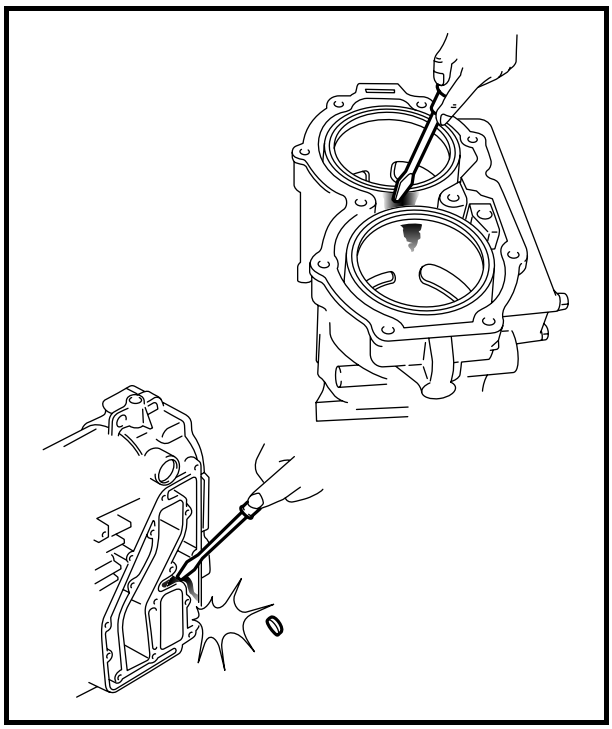
Crankcase mounting bolts
1st: 15 N•m (1.5 kgf•m, 11 ft•lb)
2nd: 30 N•m (3.0 kgf•m, 22 ft•lb)

CRANKSHAFT AND CYLINDER BODY

REMOVING THE CRANKSHAFT AND CYLINDER BODY



Step	Job/Part	Q'ty	Remarks
1	Crankshaft	1	
2	Cylinder body	1	
3	Piston pin clip	4	
4	Piston pin	2	
5	Piston pin washer	4	
6	Small end bearing	68	34 pins/1set
7	Piston ring	4	
8	Piston	2	



CHECKING THE CYLINDER BODY

1. Check:
   - Cylinder inner surface
     Score mark → Repair/replace.
     (use #600 – 800 grit wet sandpaper)
   - Water jacket
     Mineral deposits/rust/corrosion → Clean/replace.

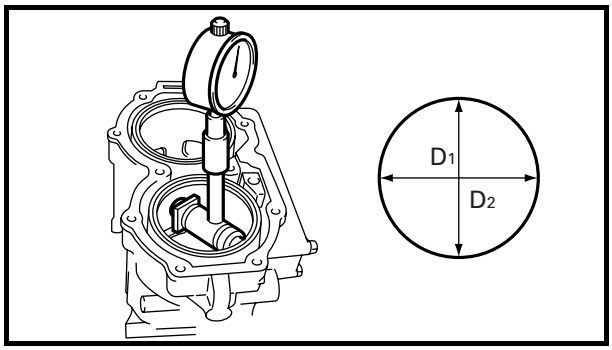
CAUTION:

Do not scratch the contacting surfaces of the crankcase and cylinder head.

2. Check:
   - Exhaust passage
     Cracks/damage → Replace.
     Carbon deposits → Clean.
     (use a round scraper)

CAUTION:

Do not scratch the contacting surfaces of the cylinder and exhaust cover.

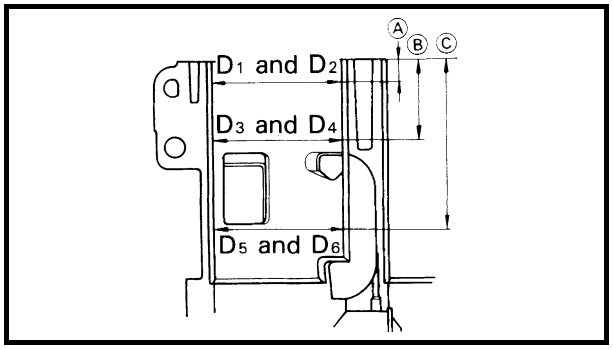


3. Measure:
   - Cylinder bore "D"
     (use a cylinder gauge)
     Out of specification → Rebore/replace.

	Cylinder gauge **90890-06759**

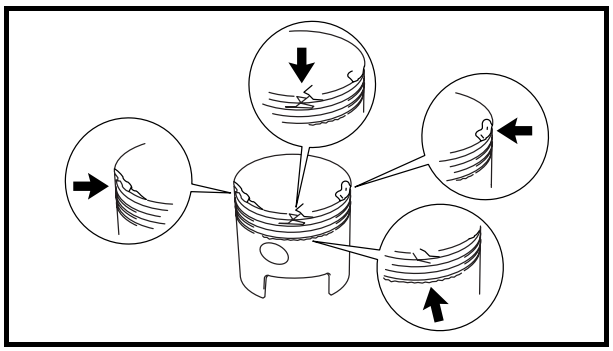
NOTE:

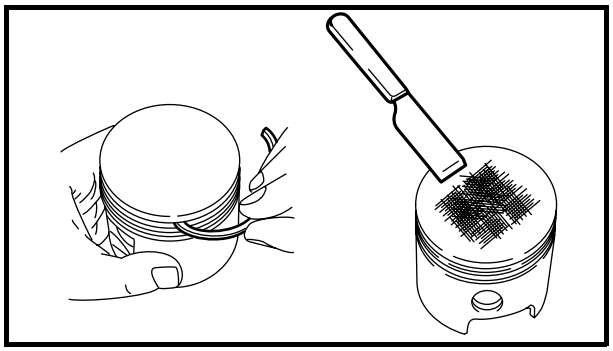
Measure the cylinder bore diameter at three positions for both D1 and D2. Then, average the measurement.



	Standard	Wear limit
Cylinder bore diameter "D"	72.00 -72.02 mm (2.8346 – 2.8354 in)	72.10 mm (2.8386 in)
Taper limit "T"	–	0.08 mm (0.0031 in)
Out of round limit "R"	–	0.05 mm (0.0020 in)
D = Maximum D1, D2, D3, D4, D5 or D6 T = (Maximum D1 or D2) – (Minimum D5 or D6) R = Maximum (D1 – D2) or (D3 – D4) or (D5 – D6)		

A: 15 mm (0.59 in) below the cylinder top
B: 25 mm (0.98 in) above the exhaust port
C: 100 mm (3.94 in) below the scavenging port



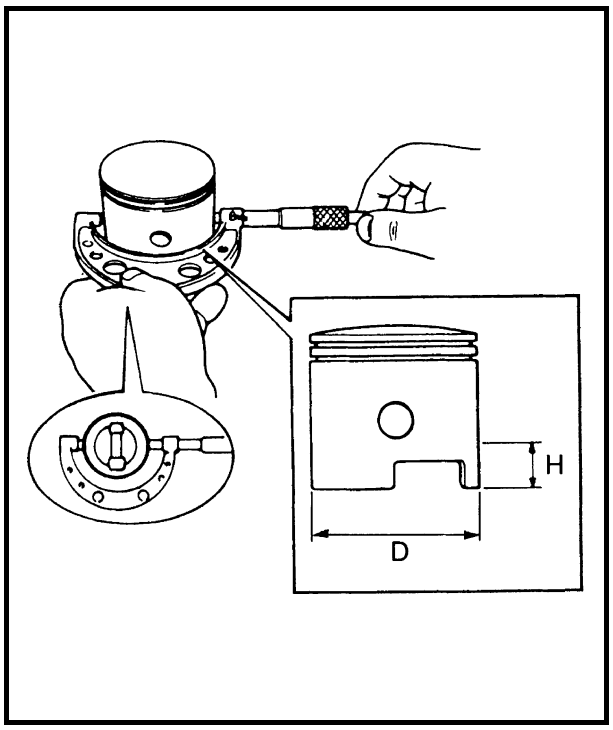


CHECKING THE PISTON

1. Check:
   - Piston wall
     Wear/scratch/damage → Replace.
2. Check:
   - Piston head
   - Piston ring groove
     Carbon deposits → Clean.

CAUTION:

Take care not to scratch or cut the aluminum surface.



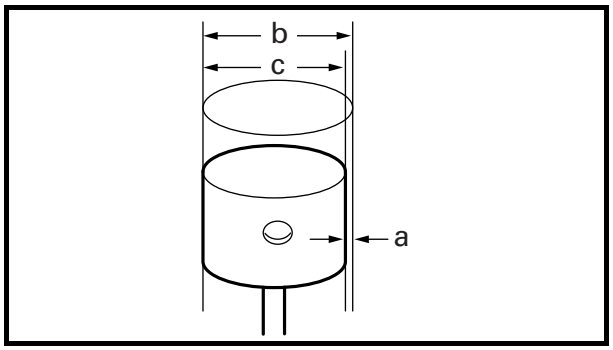
3. Measure:
   - Piston diameter

     (use an outside micrometer)
     Out of specification → Replace.

	Outside micrometer **90890-03008**

	Measuring point "H"	**Piston diameter**
Standard	**10.0 mm (0.3937 in)**	**71.94 – 71.96 mm (2.8323 – 2.8331 in)**
Over size piston diameter: **1: 72.25 mm (2.8445 in)** **2: 72.50 mm (2.8543 in)**		

NOTE:
When measuring the piston diameter, position the micrometer in relation to the piston pin hole as shown.



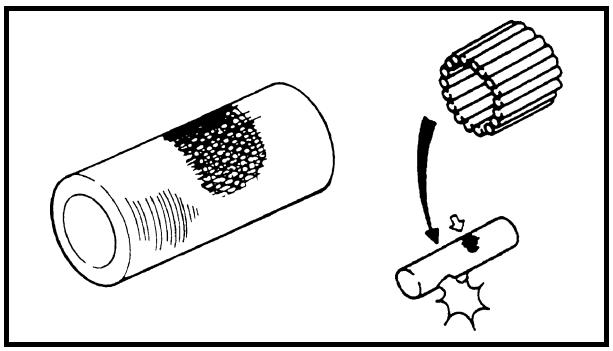
CALCULATING THE PISTON-TO-CYLINDER CLEARANCE

Calculate:
- Piston-to-cylinder clearance.

  Out of specification → Replace the piston and piston rings, the cylinder or both.

Piston-to-cylinder clearance	=	Cylinder bore diameter	–	Piston diameter

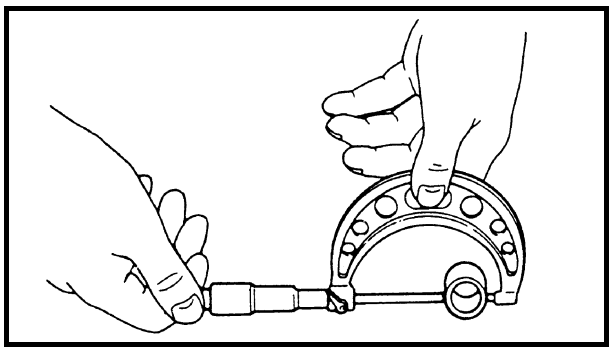
	Piston-to-cylinder clearance **0.060 – 0.065 mm** **(0.0024 – 0.0026 in)**



CHECKING THE PISTON PINS AND SMALL-END BEARINGS

1. Check:
   - Piston pin
   - Small-end bearing

   Heat discoloration → Replace.
   Damage/scratches → Replace.

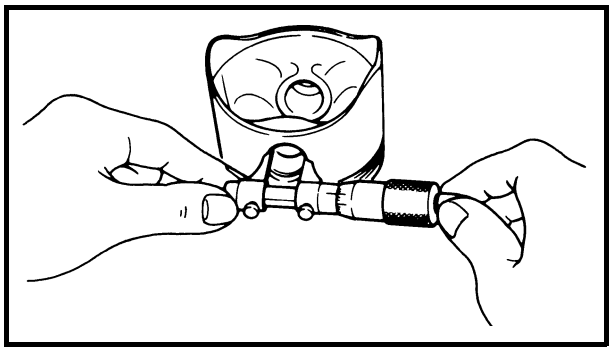


2. Measure:
   - Piston pin outside diameter

   (use an outside micrometer)
   Out of specification → Replace.

	**Outside micrometer** **90890-03006**

	**Piston pin outside diameter** **19.895 – 19.900 mm** **(0.7833 – 0.7835 in)**

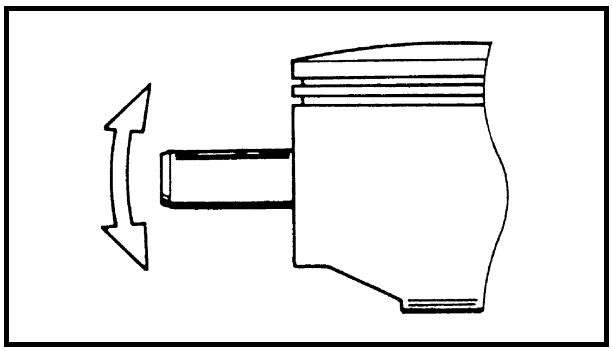


3. Measure:
   - Piston pin boss inside diameter

   (use an inside micrometer)
   Out of specification → Replace.

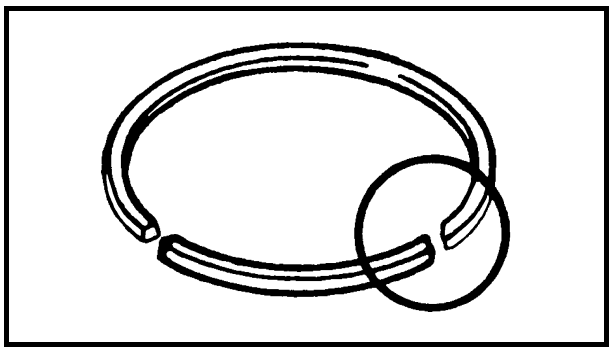
	**Inside micrometer** **90890-03010**

	**Piston pin boss inside diameter** **19.904 - 19.915 mm** **(0.7836 - 0.7841 in)**



4. Check:
   - Free play (when piston pin is in place of the piston).

     There should be no noticeable play.
     Free play exists → Replace the pin and/or piston.

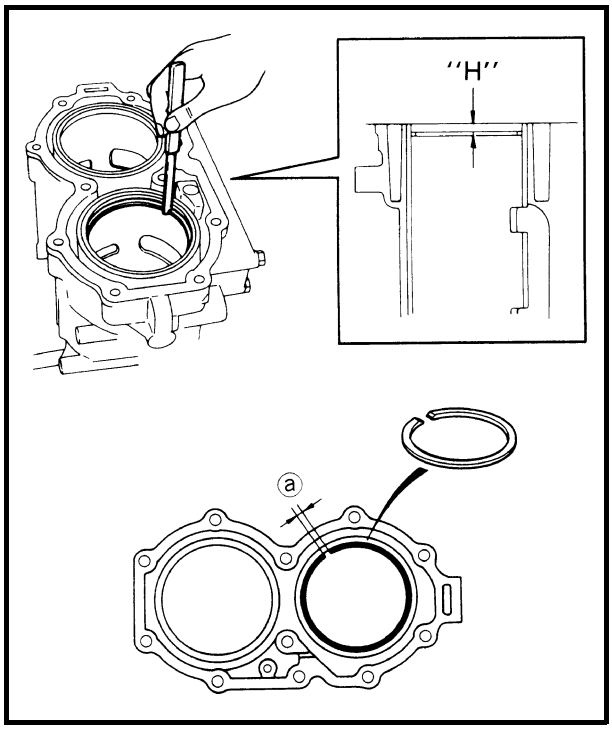


CHECKING THE PISOTN RINGS

NOTE:
- Before checking the piston rings, be sure to check the cylinder body.
- Piston rings should be replaced as a set (per piston).

1. Check:
   - Piston ring

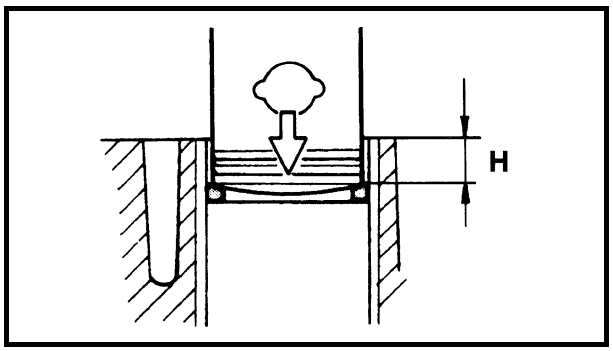
     Broken/damage → Replace.



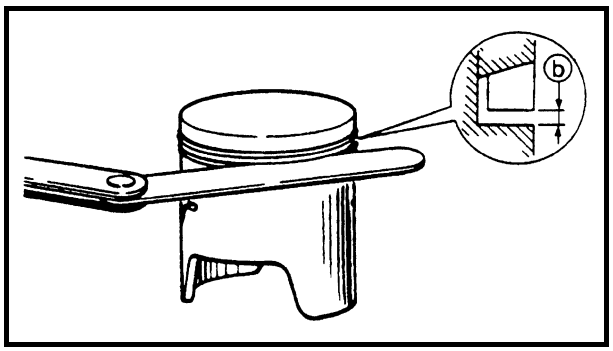
2. Measure:
   - Piston ring end gap ⓐ

     (use a thickness gauge)
     Out of specification → Replace.

Piston ring end gap
0.20 - 0.35 mm (0.0079 - 0.0137 in)
Piston ring end gap limit
0.35 mm (0.014 in)
Measuring point "H"
15 mm (0.591 in)



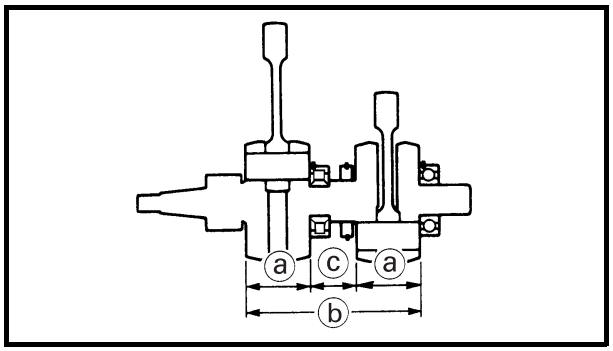
NOTE:
Push the piston ring into the cylinder with the piston crown.



3. Measure:
   - Piston ring side clearance ⓑ
     (use a thickness gauge)
     Out of specification → Replace.

Piston ring side clearance
Top: 0.03 - 0.05 mm
(0.0012 - 0.0020 in)
2nd: 0.03 - 0.07 mm
(0.0012 - 0.0028 in)

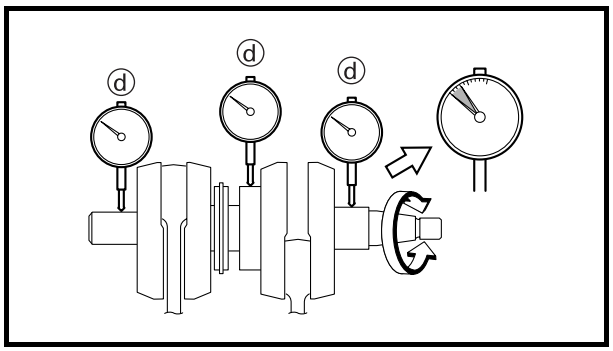
NOTE:
When measuring the piston ring side clearance, the outside of the piston ring should be flush with the piston wall.



CHECKING THE CRANKSHAFT

1. Measure:
   - Crank width
     (use the digital caliper)
     Out of specification →
     Repair/replace.

Crank width ⓐ
56.90 - 56.95 mm
(2.2401 - 2.2421 in)
Crank width ⓑ
153.7 - 154.0 mm
(6.0512 - 6.0630 in)
Crank width ⓒ
39.9 - 40.1 mm
(1.5709 - 1.5787 in)

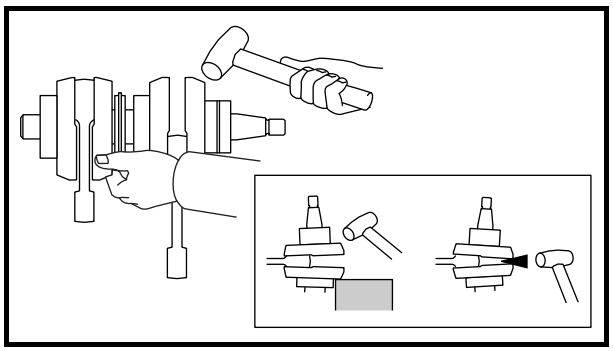


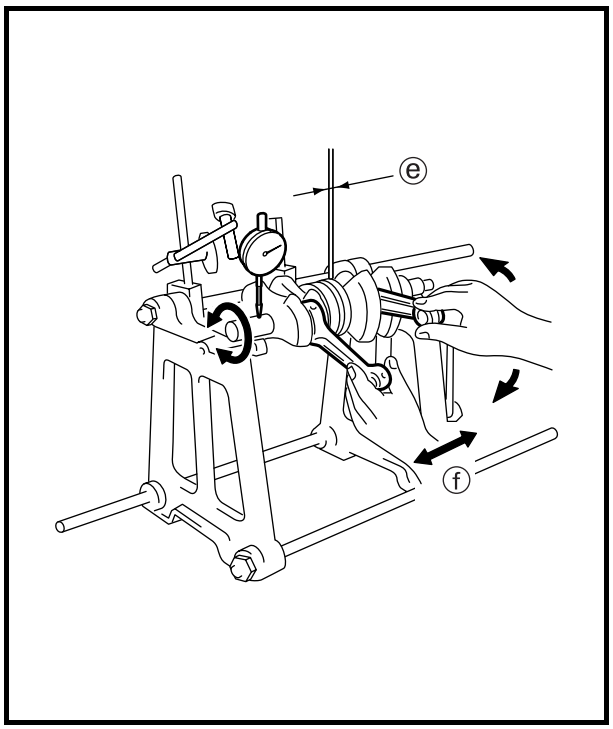
2. Measure:
   - Runout

   (Use a crank stand alignment and dial gauge.)
   Out of specification →
   Repair/replace.

Crank stand alignment
90890-03107
Dial gauge set
90890-01252

Runout limit ⓓ
0.03 mm (0.0012 in)





3. Measure:
   - Connecting rod side clearance

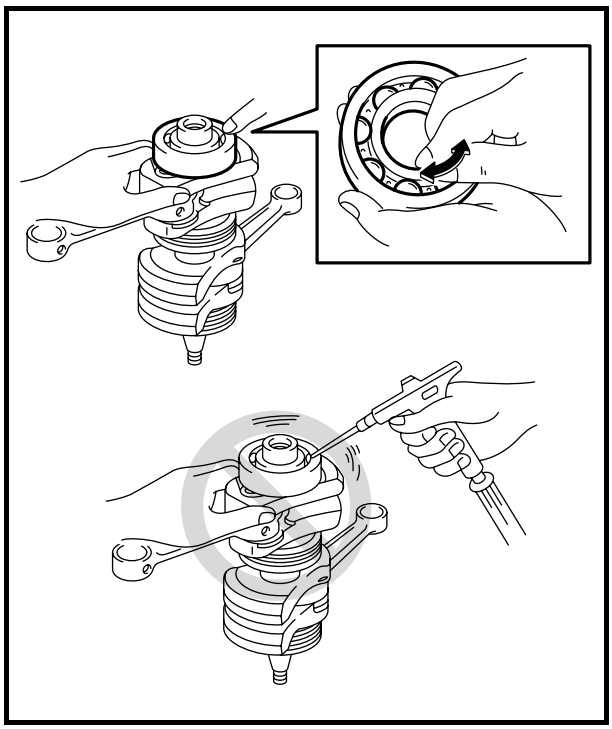
   (Use a thickness gauge.)
   Out of specification →
   Repair/replace.

Connecting rod side clearance ⓔ
0.2 - 0.7 mm (0.0079 - 0.0276 in)

4. Measure:
   - Axial play

   Out of specification →
   Repair/replace.

Maximum axial play ⓕ
2.0 mm (0.079 in)



5. Check:
   - Crankshaft bearings

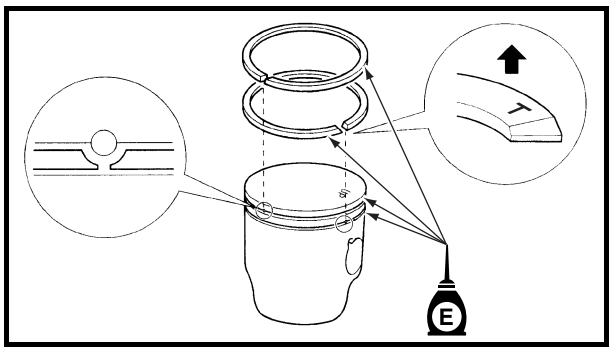
     Abnormal noise/damage / roughness → Replace.

CAUTION:

Do not use compressed air to spin the bearings dry. This causes damage to the bearing surfaces.

NOTE:

Do not reuse the bearing, always replace it with a new one.

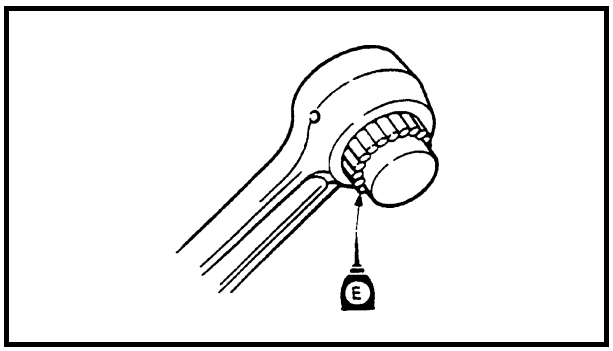


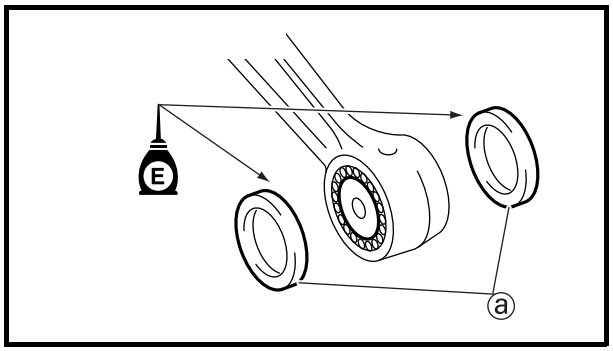
INSTALLING THE PISTON AND PISTON RINGS

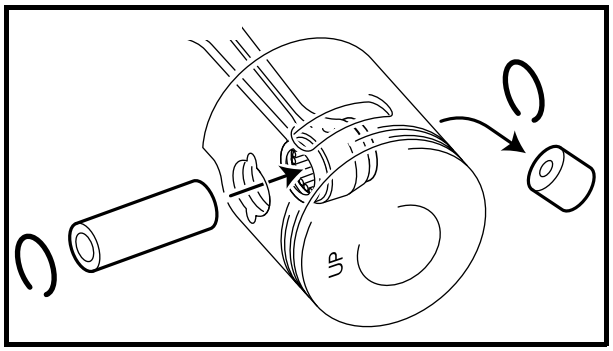
Install:
- 2nd piston ring
- Top piston ring

CAUTION:
- **Install the piston ring with the T mark facing up.**
- **Align each piston ring end gap with its respective locating pin.**
- **After installing the piston rings, check that they move smoothly.**

NOTE:
Apply Yamaha 2-stroke motor oil on the piston ring and piston ring groove.







INSTALLING THE CRANKSHAFT AND PISTON

1. Install:
   - Small-end bearing

Needles per piston
34 pieces

Small-end bearing installer
90890-06527

2. Install:
   - Piston

Installing steps

(1) Assemble the washer ⓐ and the piston to the crankshaft.

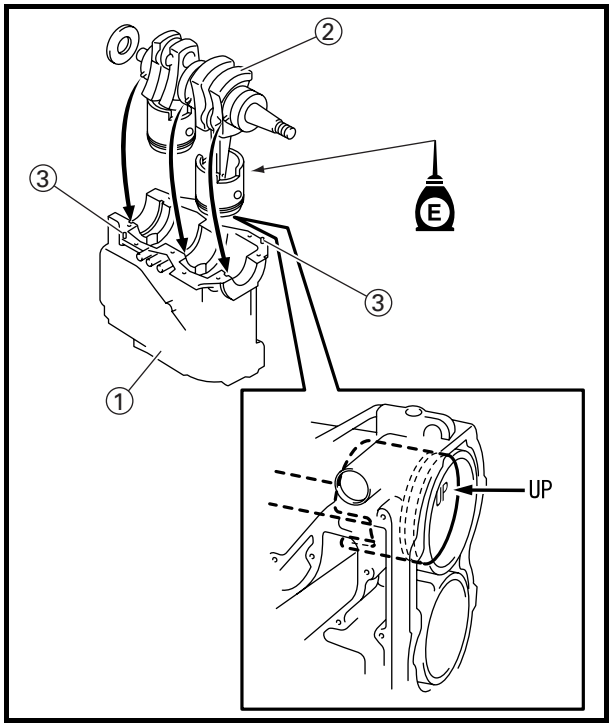
(2) Push out the small-end bearing installer with piston pin.

(3) Install circlip.

CAUTION:

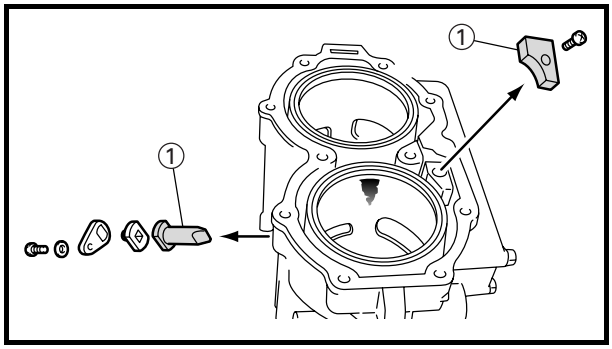
Install the piston with "UP" mark on the piston crown facing towards the flywheel side.

NOTE:
Apply Yamaha 2-stroke motor oil on the small-end bearing and piston pin.



3. Install:
   - Cylinder body ①
   - Crankshaft and piston ②
   - Dowel pin ③

NOTE:
- Apply Yamaha 2-stroke motor oil to each cylinder wall and piston and their ring grooves.
- Coat all the crankshaft bearings with the engine oil.
- The crankshaft bearing locating pin should fit into the slit in the cylinder.
- The UP mark on the piston crown should be on the flywheel side.



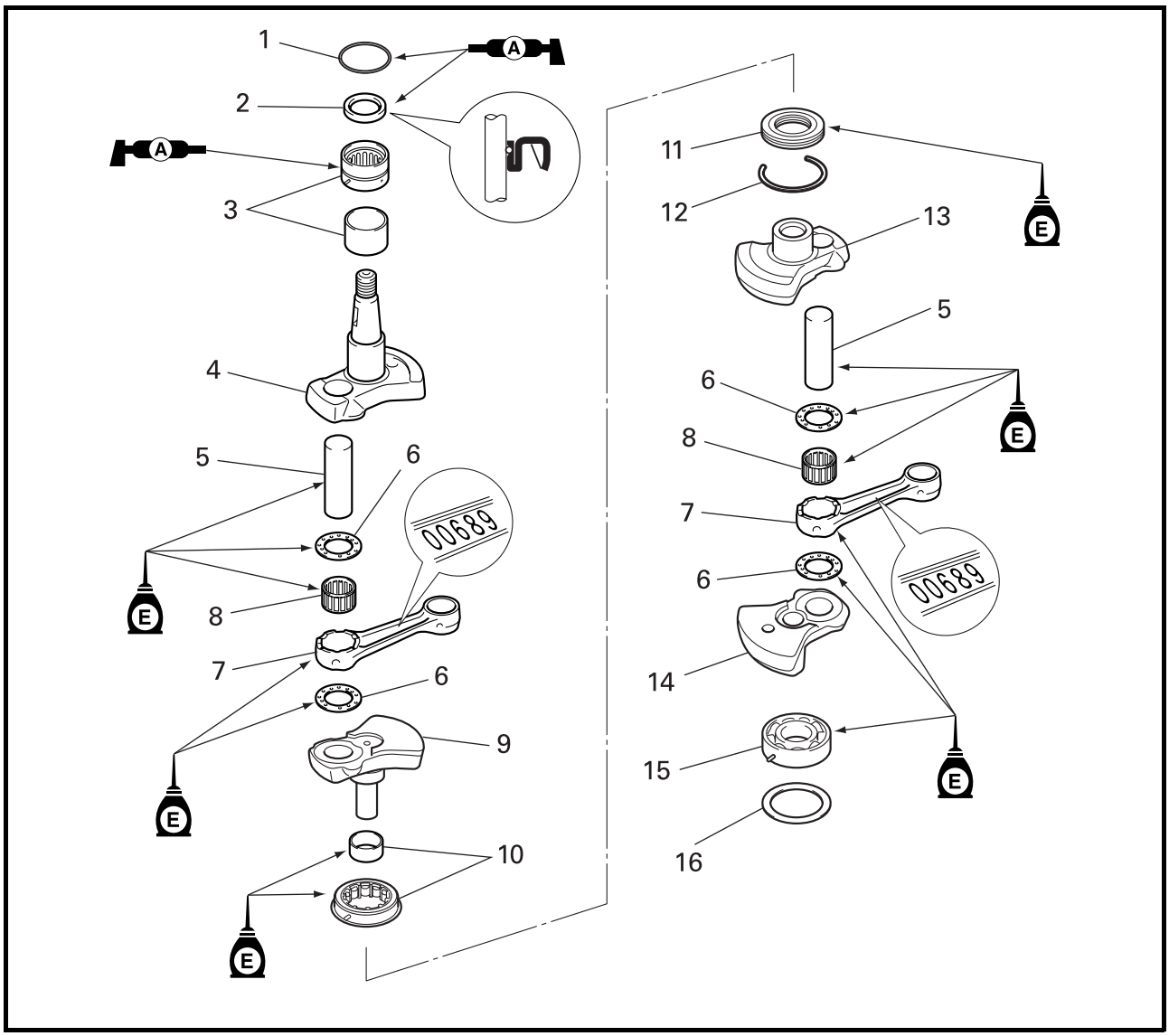
CHECKING THE ANODE

Check:
- Anode ①
  Wear → Replace.
  Corrosion → Sand.

NOTE:
When it is reduced to the size of one-third (1/3), replace it.

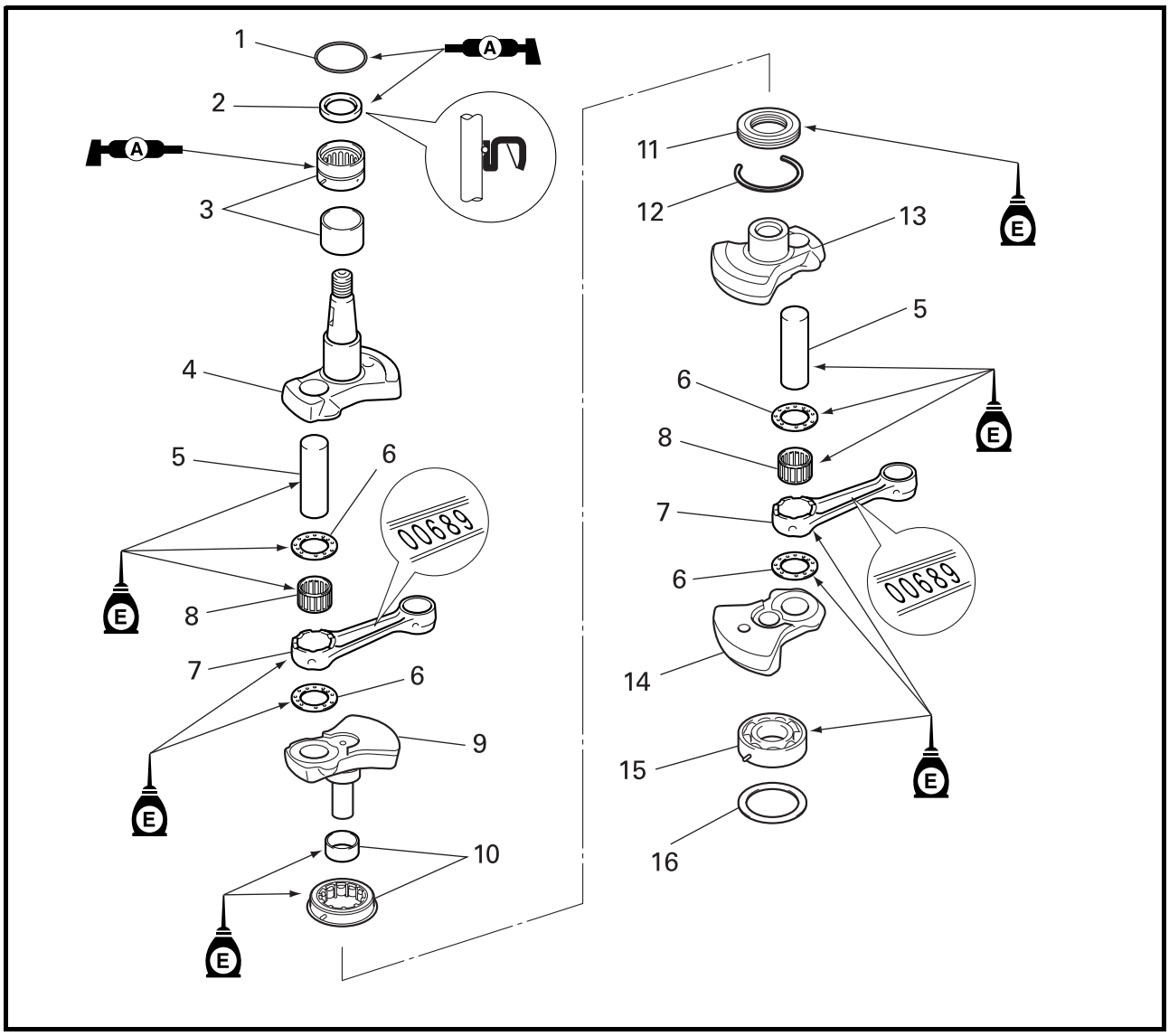
CRANK SHAFT

DISASSEMBLING THE CRANKSHAFT

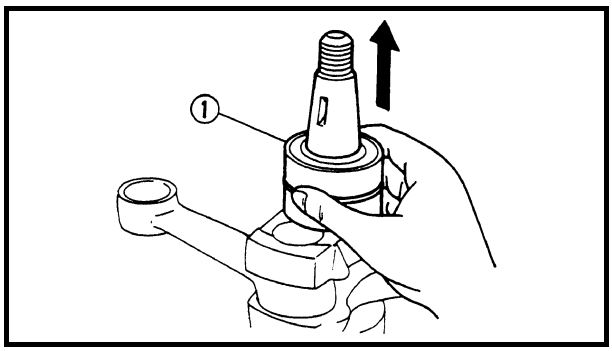


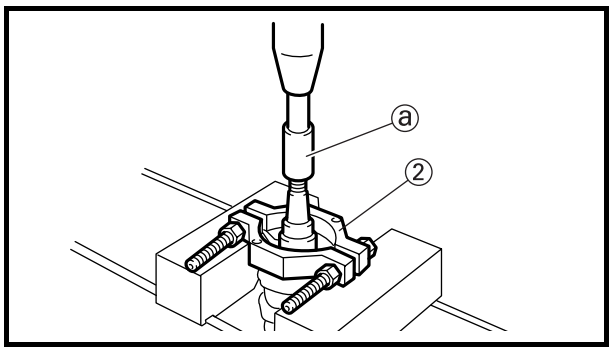
Step	Job/Part	Q'ty	Remarks
1	O-ring	1	**Not reusable**
2	Oil seal	1	**Not reusable**
3	Bearing	1	
4	Collar	1	
5	Crank 1	1	
6	Crank pin	2	
7	Washer	4	
8	Connecting rod	2	
9	Bearing	2	
10	Crank 2	1	
11	Bearing	1	
12	Labyrinth seal	1	
13	Clip	1	

Continued on next page.



Step	Job/Part	Q'ty	Remarks
14	Crank 3	1	
15	Crank 4	1	
16	Bearing	1	
17	Washer	1	





REMOVING THE CRANKSHAFT BEARING

Upper bearing

1. Remove:
   - Upper bearing ①

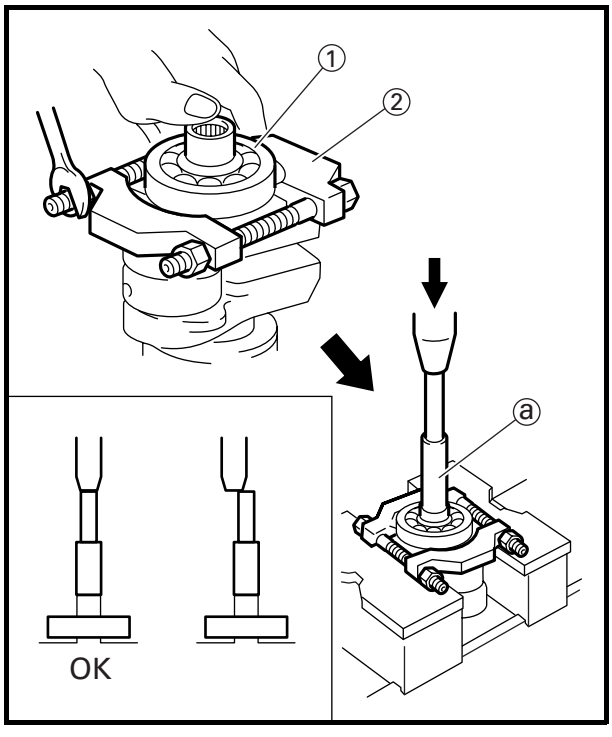
   Remove the upper bearing with hands.

2. Remove:
   - Collar

	Pressure pin B ..... ⓐ **90890-02390** **Bearing separator** ..... ② **90890-06534**

NOTE:

- By forcing the pressure pin B ⓐ with a hydraulic press, remove the bearing.
- When forcing out the crank pin, use care so that the crankshaft does not fall off.
- The upper bearing and the collar should always be replaced as a set.
- Once removed, do not reuse the collar. Always replace it with a new one.



Lower bearing

Remove:

- Lower bearing ①

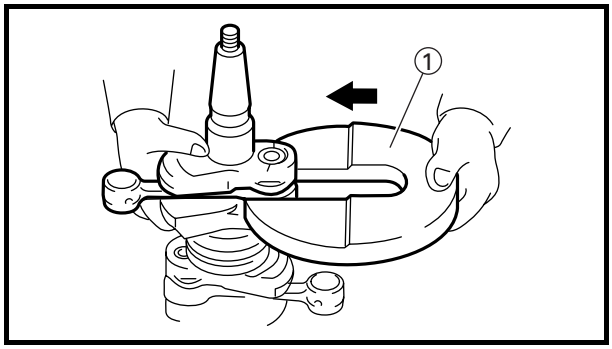
	Pressure pin B ..... ⓐ **90890-02390** **Bearing separator** ..... ② **90890-06534**

NOTE:

- By forcing the pressure pin B ⓐ with a hydraulic press, remove the bearing.
- When forcing out the crank pin, use care so that the crankshaft does not fall off.

CAUTION:

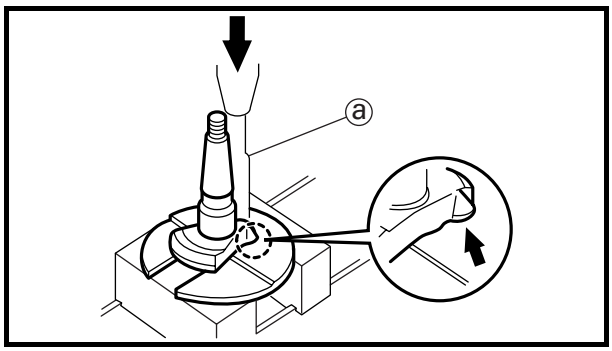
- **Apply pressure to the pressure pin B ⓐ slowly.**
- **Hold the pressure pin in line with the press screw spindle.**



Crank 1 and crank 4 removal

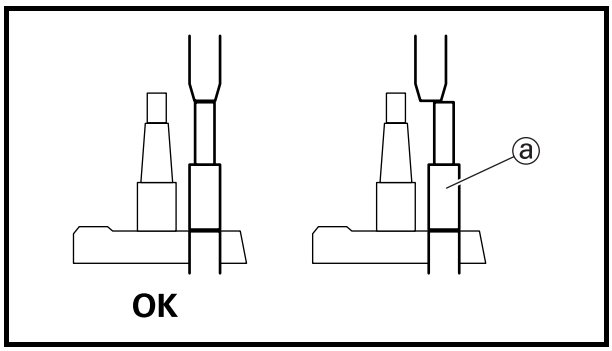
Remove:
- Crank 1
- Crank 4

Plate A.....①
90890-02386
Pressure pin B .....ⓐ
90890-02390

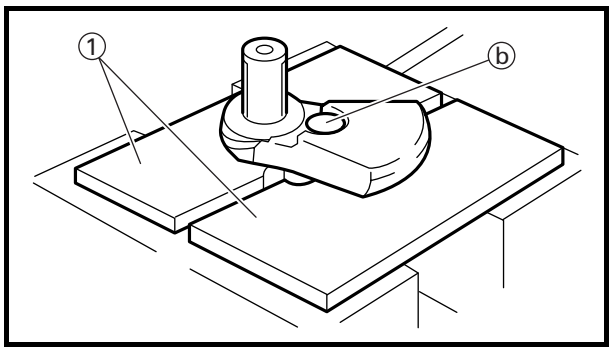


Removing steps

(1) By forcing the pressure pin B ⓐ with a hydraulic press, remove the crank pin.
(2) When forcing out the crank pin, use care so that the crankshaft does not fall off.
(3) To remove crank 4, follow the same procedure.



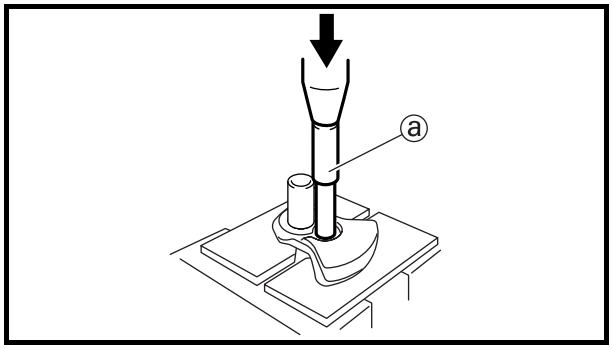
CAUTION:
- **Apply pressure to the pressure pin B ⓐ slowly.**
- **Hold the pressure pin B ⓐ in line with the press screw spindle.**



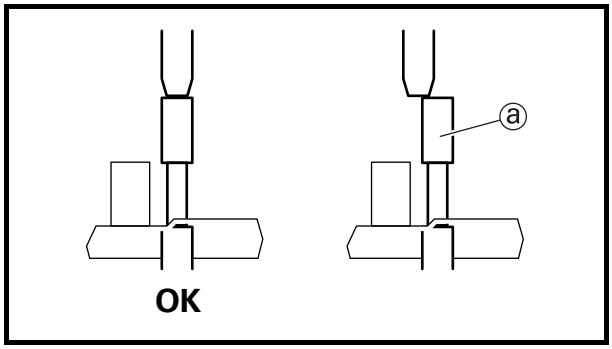
Crank 2 and crank 3 removal

1. Remove:
   - Crank 2
   - Crank 3

Support.....①
90890-02394
Pressure pin B .....ⓐ
90890-02390

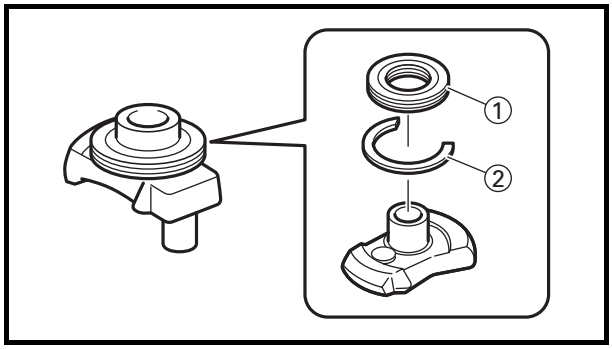


NOTE:
- Place the pressure pin B ⓐ on the crank 2 center shaft ⓑ, and force it out using a press.
- When forcing out the crank pin, use care so that the crank does not fall off.

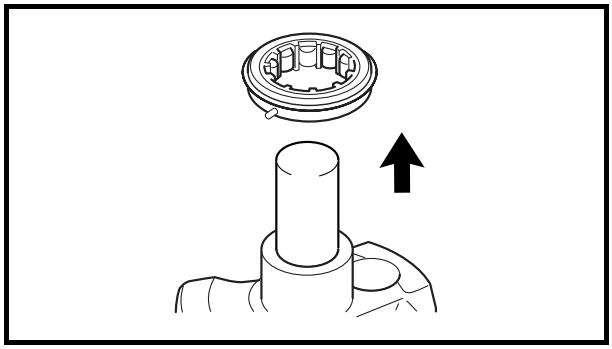


CAUTION:

- **Apply pressure to the pressure pin B ⓐ slowly.**
- **Hold the pressure pin B ⓐ in line with the press screw spindle.**



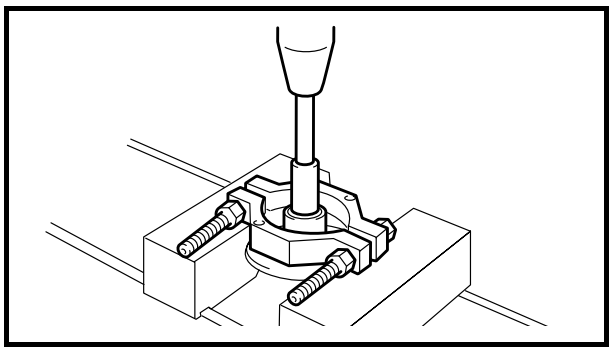
2. Remove:
   - Labyrinth seal ①
   - Clip ②



3. Remove:
   - Bearing

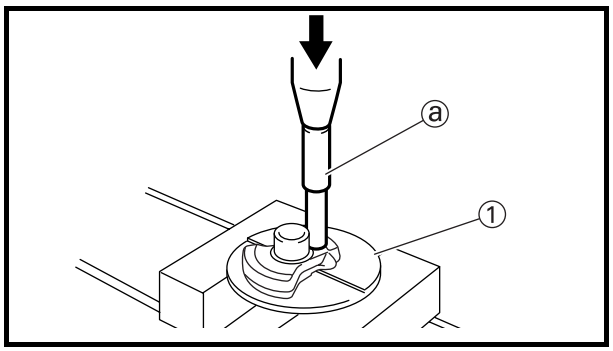
Removing steps

(1) Remove roller bearing (outer race)



(2) Remove roller bearing (inner race) using hydraulic press.

	**Bearing separator** **90890-06534**



Crank pin removal

Remove:
- Crank pin

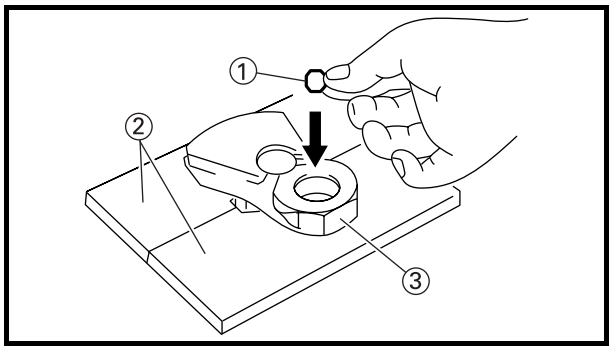
	Plate A ..... ① **90890-02386**
	Pressure pin B ..... ⓐ **90890-02390**

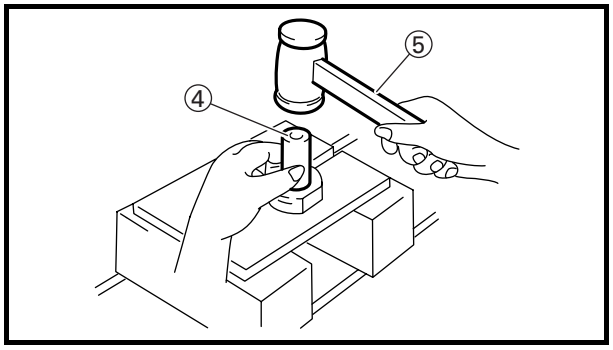
Removing steps

(1) By forcing the pressure pin B ⓐ with a hydraulic press, remove the crank pin.
(2) Remove the crank pins from Crank 2 and Crank 3.
(3) Pressure pin should be pressed down straight.

ASSEMBLING THE CRANKSHAFT

CAUTION:
- **When reassembling the crankshaft, wash all component parts in suitable cleaning solvent.**
- **Always use new bearings and crank pins.**





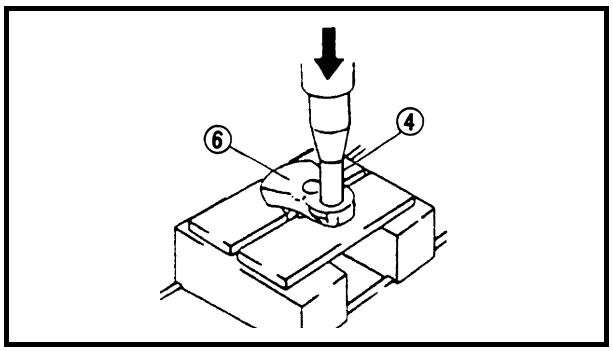
Fitting the crank pin (to the crank 2 and crank 4)

1. Install:
   - Spacer B ① (to crank pin hole)
   - Crank 2 ③

	Spacer B ..... ① **90890-02396**
	Support ..... ② **90890-02394**

2. Install:
   - Crank pin ④ (new)

NOTE:
- Insert the crank pin into the pin hole by tapping it with a copper hammer ⑤.
- Apply Yamaha 2-stroke motor oil on the crank pin.

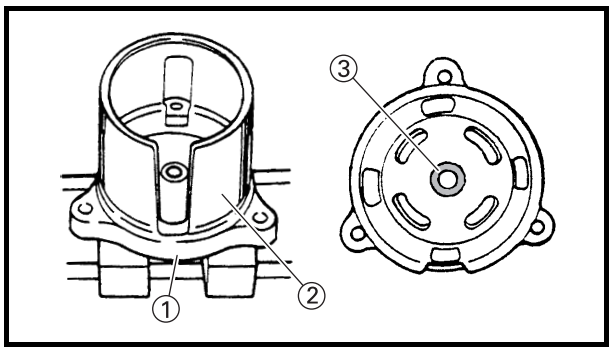


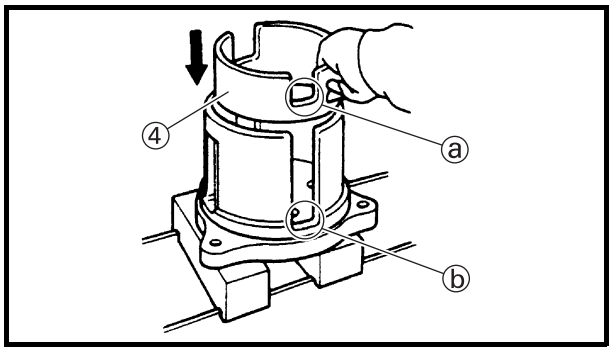
3. Press-fit:
   - Crank pin ④

NOTE:
- Don't apply force in excess of 5 tons.
- The crank pin should be press-fitted into both crank 2 and crank 4.

CAUTION:

Take care so that the crank pin ④ is set squarely to the crank web ⑥.



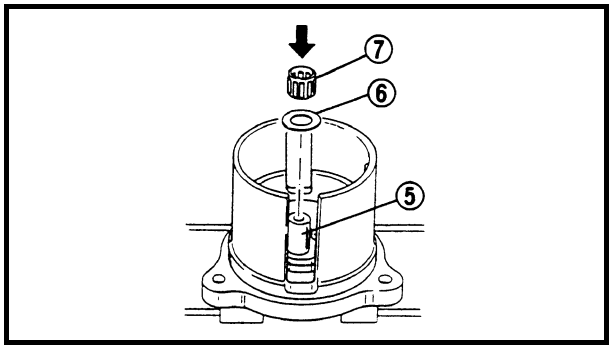


Assembling cranks 1 and 2,3 and 4

1. Install (special service tools):
   - Flange ①
   - Body ②
   - Bolt
   - Washer
   - Bushing-5 (D25) ③
   - Height ring-13 (H57) ④

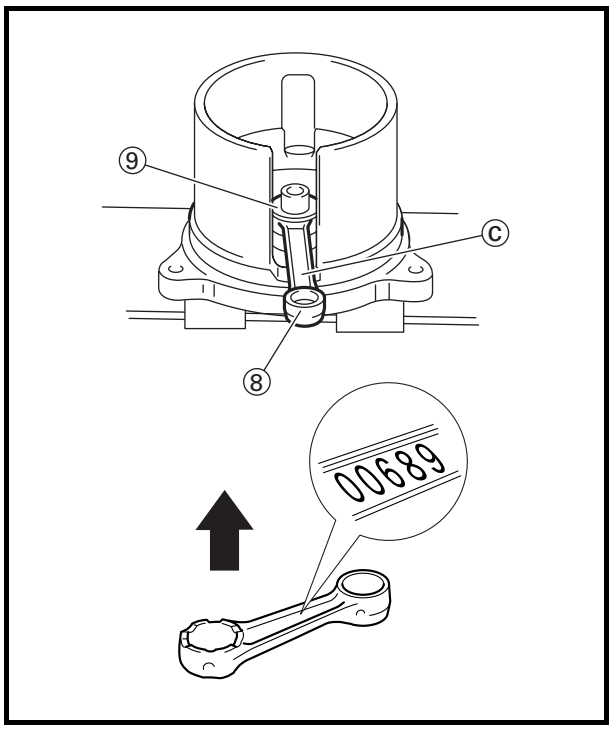
NOTE:
Align the cut in the height ring ⓐ with cut in the body ⓑ.

Flange ..... ①
90890-02351
Body ..... ②
90890-02352
Bolt
90890-02353
Washer
90890-02354
Bushing-5 (D25) ..... ③
90890-02359
Height ring-13 (H57) ..... ④
90890-02379



2. Install:
   - Crank 2 ⑤ or crank 4
   - Washer ⑥
   - Bearing ⑦

NOTE:
Apply Yamaha 2-stroke motor oil on the washer and big end bearing.

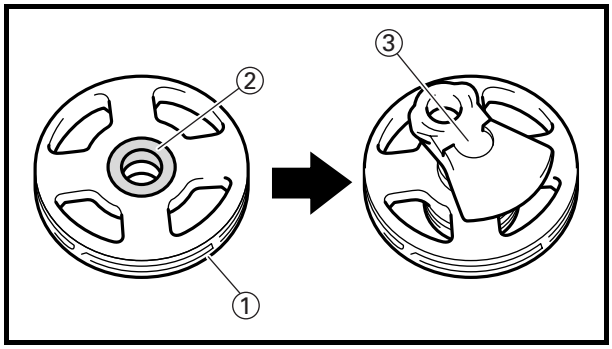


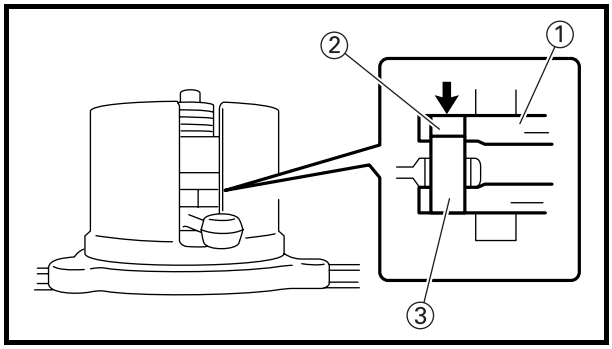
3. Install:
   - Connecting rod ⑧
   - Washer ⑨

CAUTION:
- **The model No. ⓒ facing upward (crank 1 or crank 3 side).**
- **Apply Yamaha 2-stroke motor oil on the connecting rod and washer.**

4. Install (special service tools):
   - Pressure plate ①
   - Bushing-14 (for crank 1)or Bushing-12 (for crank 3) ②
5. Install:
   - Crank 1 ③ or crank 3 (on the bushing)

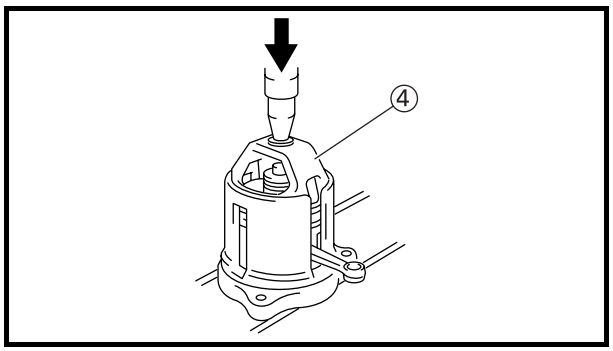
Bushing-14 (for crank 1) .....②
90890-02419
Bushing-12 (D35) (for crank 3) ....②
90890-02366
Pressure plate.....①
90890-02384





6. Install:
   - Crank 1 ① or crank 3 (use pressure plate)

NOTE:
- Align the crank pin hole ② with the crank pin ③ fitted to crank 2 or crank 4.
- Apply Yamaha 2-stroke motor oil on the crank 1 or crank 3.

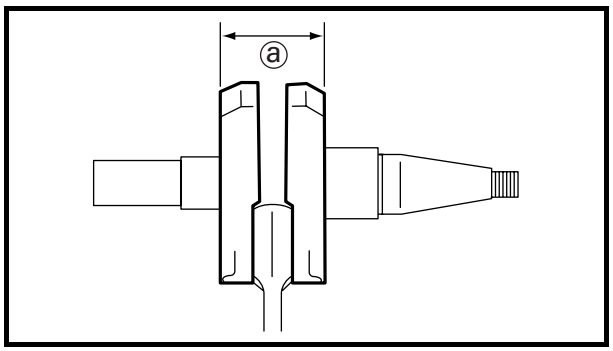


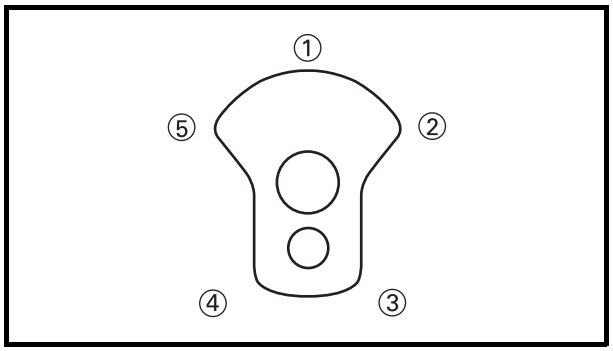
7. Press-fit:
   - Crank 1 or crank 3

	Press body ..... ④ **90890-02385**

CAUTION:

- **Be sure to press-fit the crank 1 or crank 3 squarely onto the crank pin.**
- **Apply Yamaha 2-stroke motor oil on the crank pin.**





8. Measure:
   - Crank width ⓐ
     Use the digital caliper.
     Out of specification → Reassemble/ repress.

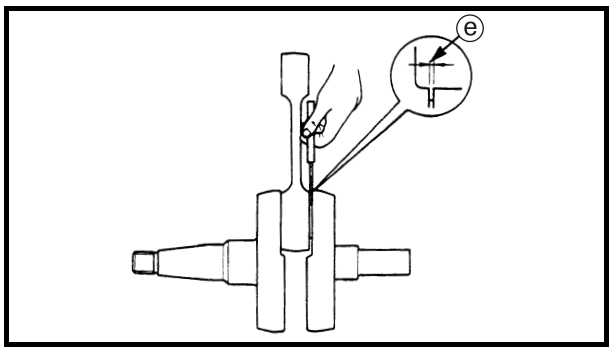
	Digital caliper **90890-06704**

Measurements should be made at ① to ⑤.

	Crank width ⓐ **56.90 - 56.95 mm** **(2.2401 - 2.2421 in)**

NOTE:

If either distance is out of specification, reassemble or repress the crankshaft.

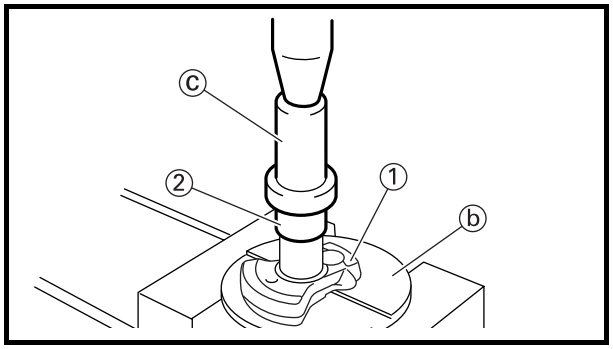


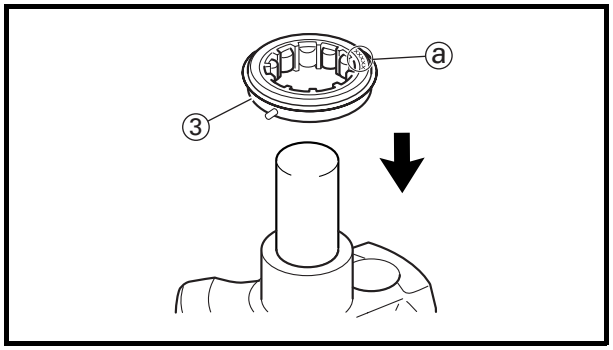
9. Measure:
   - Connecting rod side clearance ⓔ
     (Use the thickness gauge.)
     Out of specification → Reassemble.

	Thickness gauge (mm) **90890-06054**

	Connecting rod side clearance ⓔ **0.2 - 0.7 mm (0.0079 - 0.0276 in)**

NOTE:
If side clearance exceeds tolerance, disassemble the crankshaft and replace any worn parts.





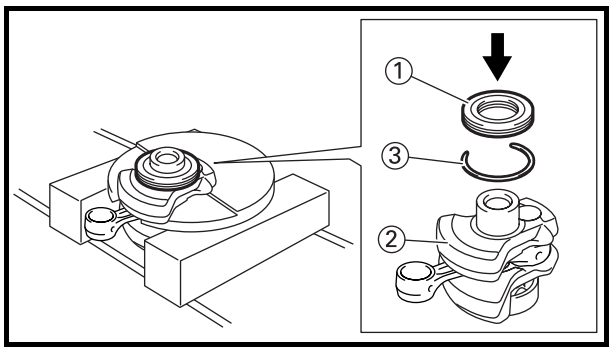
10. Install:
    - Roller bearing (on the crank 2) ①
11. Press-fit:
    - Roller bearing (inner race) ②

NOTE:
- Position the roller bearing with the stamped mark ⓐ facing upward and press-fit it until it contacts the crank 2.
- Apply Yamaha 2-stroke motor oil on the roller bearing.

	Plate A.....ⓑ **90890-02386** **Bearing pressure B**.....ⓒ **90890-02392**

CAUTION:
Be sure to press-fit the roller bearing squarely onto crank 2.

12. Install:
    - Roller bearing (outer race) ③

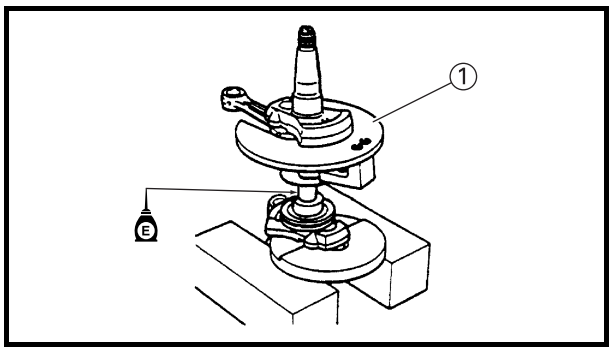


Connecting the No. 1 cylinder crankshaft to the No. 2 cylinder crankshaft

1. Install:
   - Labyrinth seal ① (to crank 3 ②)
   - Clip ③

	Plate A **90890-02386**

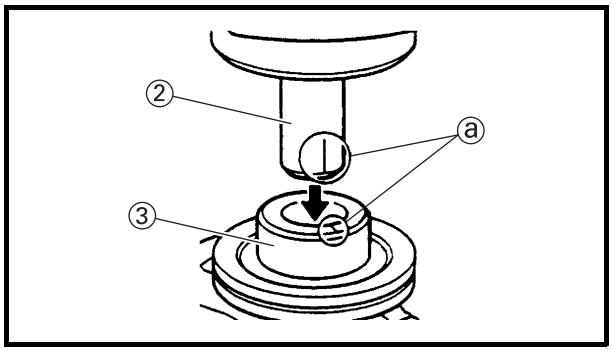
NOTE:
Apply Yamaha 2-stroke motor oil on the labyrinth seal.

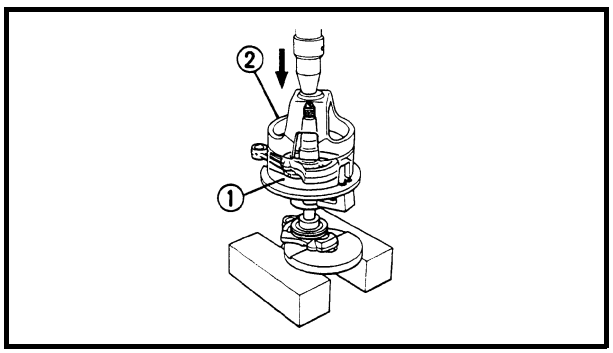


2. Install:
   - Plate B ① (between crank 1 and crank 2)
   - Crank 1 and crank 2 ② (on the crank 3 ③)

	Plate B.....① **90890-02387**

CAUTION:
- **Align the match marks ⓐ on crank 3 and 2.**
- **Apply Yamaha 2-stroke motor oil on the crank 3 and 2.**



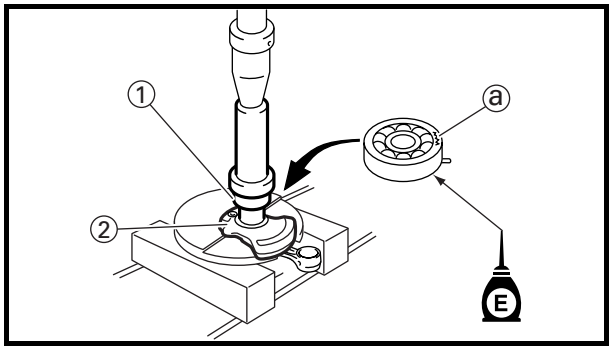


3. Press-fit:
   - Crank 2 and crank 3
     (apply a force of 7 ton)

	Height ring-13 (H57) .....① **90890-02379** **Press body**.....② **90890-02385**

CAUTION:

Be sure to press-fit the No. 1 crank squarely onto No. 2 crank.



INSTALLING CRANKSHAFT BEARING

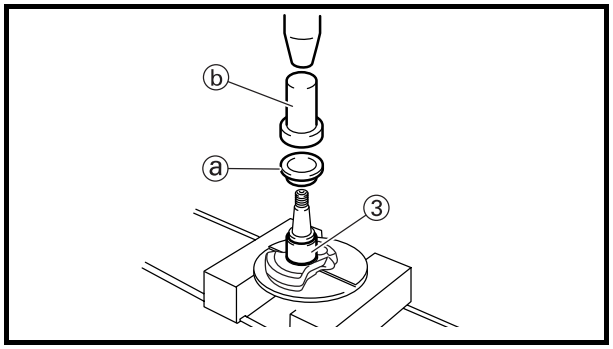
Lower bearing (for crank 4)

1. Install:
   - Bearing ① (to crank 4 ②)

	Bearing pressure B **90890-02392**

CAUTION:

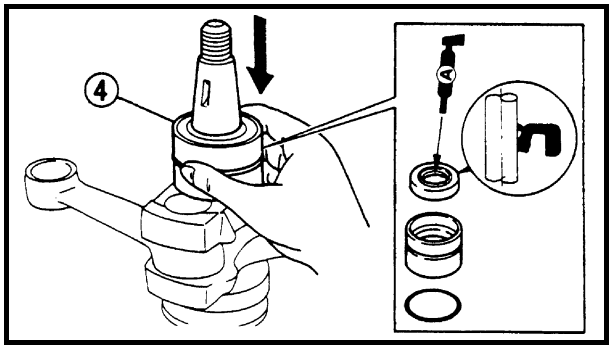
- **Install the bearing with its stamped mark ⓐ facing upward.**
- **Apply Yamaha 2-stroke motor oil on the bearing.**
- **Be sure to press-fit the ball bearing squarely onto crank 4.**



Upper bearing (for crank 1)

1. Install:
   - Collar ③

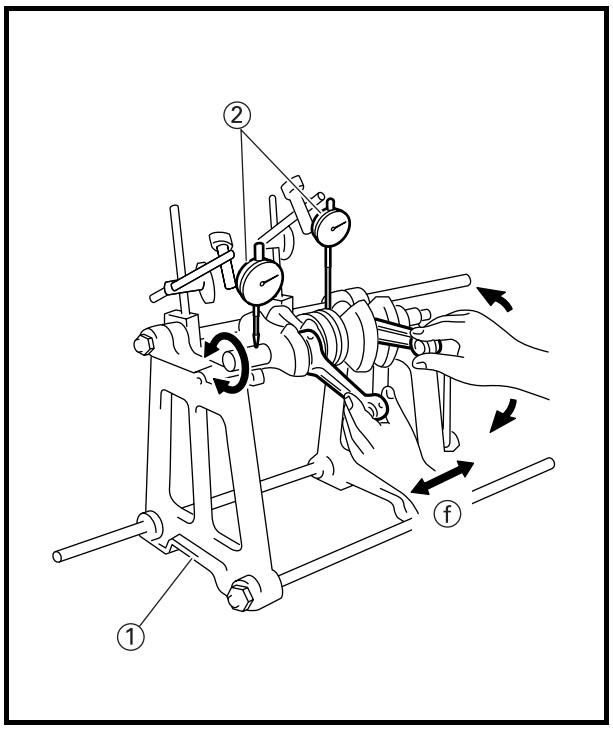
	Bushing-5 (D25) .....ⓐ **90890-02359** **Bearing pressure C**.....ⓑ **90890-02393**



2. Install:
   - Upper bearing ④ (to crank 1)
     Install the upper bearing with hands.

NOTE:

Apply Yamaha grease A (water resistant grease) on the collar and upper bearing.



Run-out check

1. Measure:
   - Runout

     Use the crank stand alignment ① and digital gauge ②.
     Out of specification → Adjust.

Crank stand alignment
90890-03107
Digital gauge set
90890-01252

Runout limit
0.03 mm (0.0012 in)

NOTE:
If the dial gauge reading is 0.03 mm (0.0012 in) or more, adjust the crankshaft so that the reading is less than 0.03 mm (0.0012 in). Use a copper hammer, as shown.

2. Measure:
   - Axial play

     Out of specification → Repair/replace.

Maximum axial play "ⓕ"
2.0 mm (0.079 in)

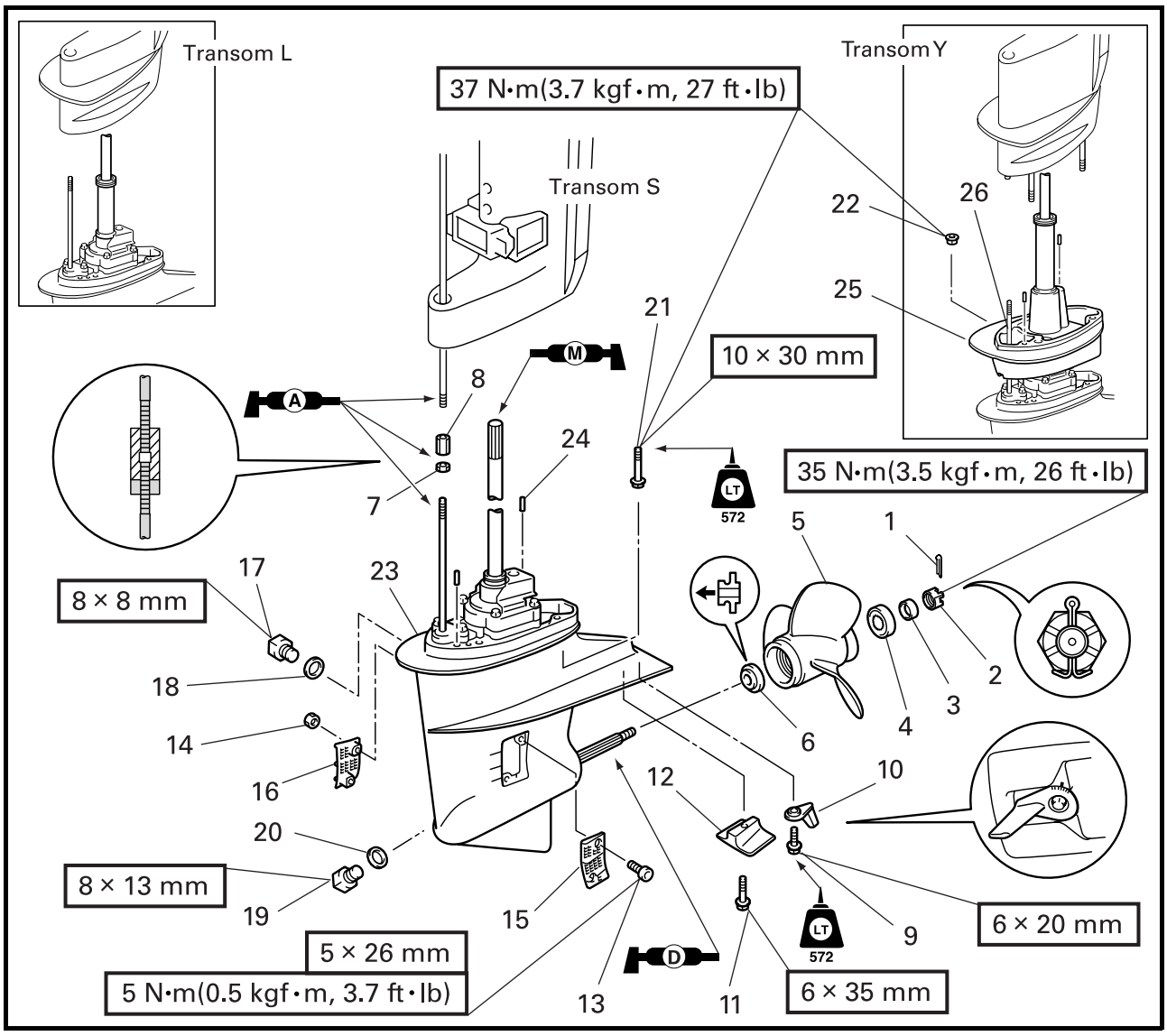
CHECKING THE CRANKSHAFT

Refer to "CHECKING THE CRANKSHAFT" on page 5-34.

CHAPTER 6
LOWER UNIT

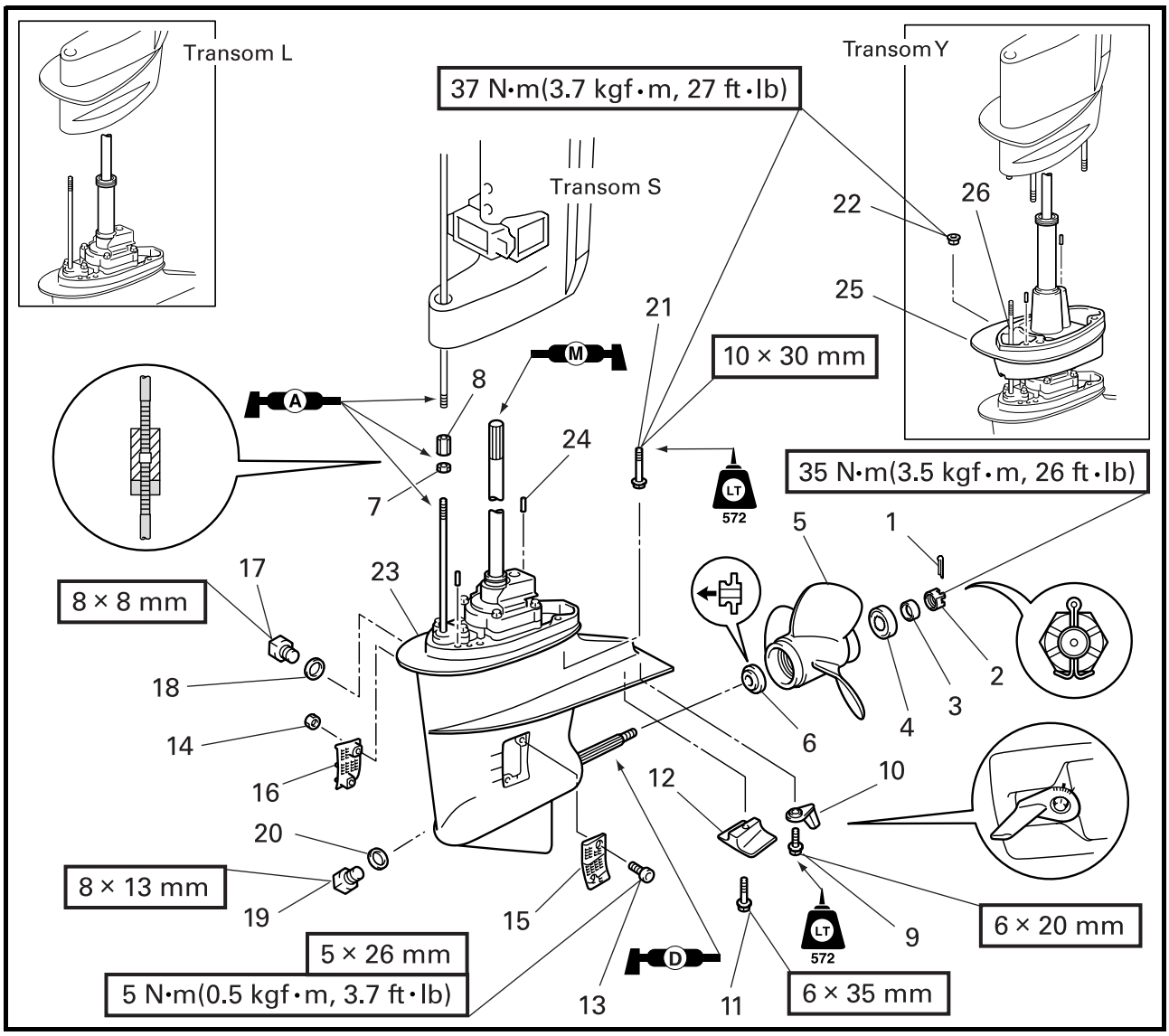
LOWER UNIT

REMOVING THE LOWER UNIT

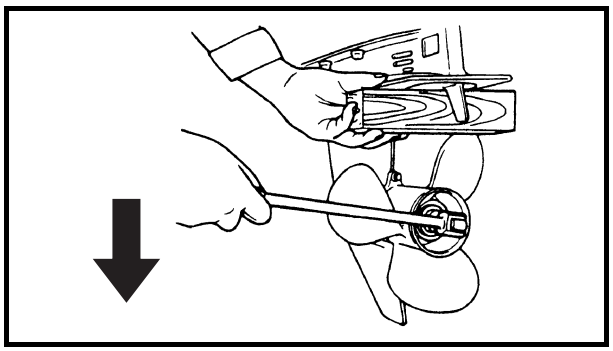


Step	Job/Part	Q'ty	Remarks
1	Cotter pin	1	**Not reusable**
2	Castle nut	1	
3	Washer	1	
4	Spacer	1	
5	Propeller	1	
6	Spacer	1	
7	Nut	1	
8	Shift connector	1	
9	Bolt (with washer)	1	
10	Trim tab	1	
11	Bolt	1	
12	Anode	1	
13	Screw	2	

Continued on next page.



Step	Job/Part	Q'ty	Remarks
14	Nut	2	
15	Water inlet cover 1	1	
16	Water inlet cover 2	1	
17	Gear oil level check screw	1	
18	Gasket	1	
19	Gear oil drain screw	1	
20	Gasket	1	
21	Bolt	4	Transom S, L
22	Nut	4	Transom Y
23	Lower unit	1	
24	Pin	2	
25	Extension	1	Transom Y
26	Pin	2	Transom Y



REMOVING THE PROPELLER

Remove:
- Propeller

⚠ WARNING

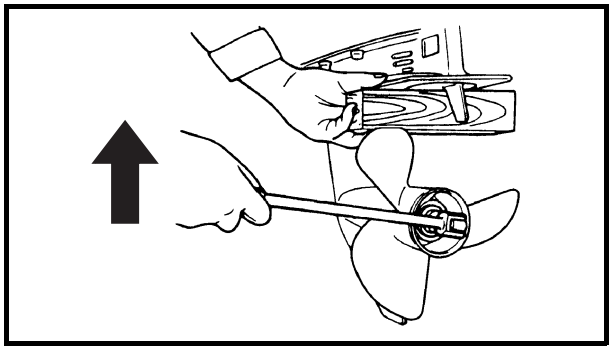
Do not hold the propeller with your hands when removing or installing it. Be sure to remove the battery leads from the batteries and the lanyard engine stop switch. Put a block of wood between the cavitation plate and propeller to keep the propeller from turning.

CHECKING THE PROPELLER

Check:
- Blades
- Splines

  Bent/cracks/damage/wear → Replace.
- Bushing

  Slippage → Replace.



INSTALLING THE PROPELLER

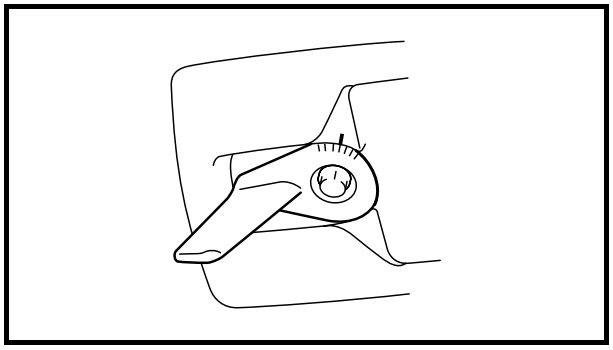
Install:
- Propeller

⚠ WARNING

Do not hold the propeller with your hands when removing or installing it. Be sure to remove the battery leads from the batteries and the lanyard engine stop switch. Put a block of wood between the cavitation plate and propeller to keep the propeller from turning.

NOTE:

If the groove in the propeller nut is not aligned with the cotter pin hole, tighten the nut further until they are aligned.



INSTALLING THE TRIM TAB

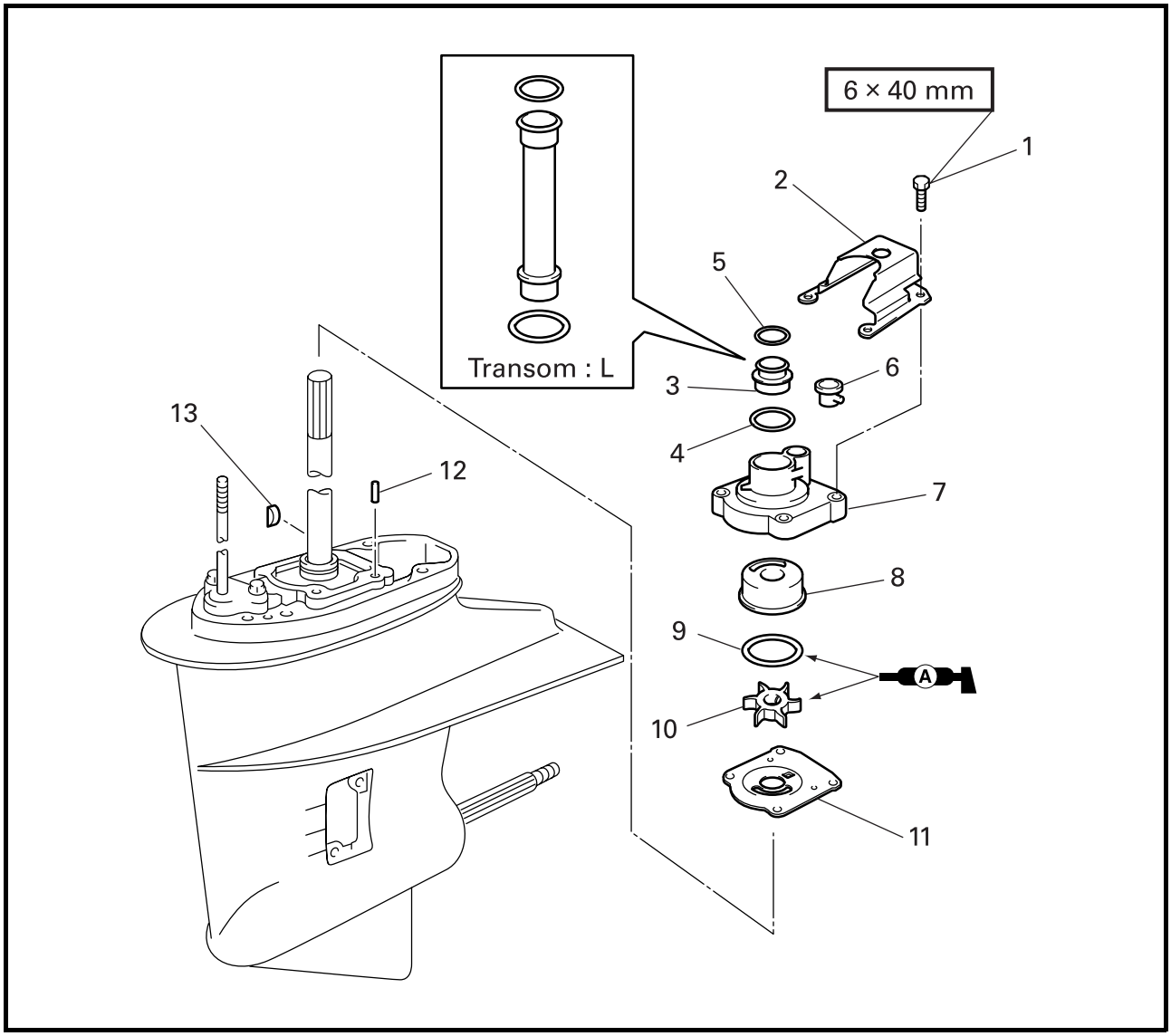
Install:
- Trim tab

NOTE:

- To ease installation, mark the original position of the trim tab.
- Steering load varies depending on the trim tab position as installed.

WATER PUMP

REMOVING THE WATER PUMP



Step	Job/Part	Q'ty	Remarks
1	Bolt	4	
2	Plate	1	Transom S, L
3	Water tube	1	
4	O-ring	1	**Not reusable**
5	O-ring	1	**Not reusable**
6	Water seal rubber	1	
7	Water pump housing	1	
8	Insert cartridge	1	
9	O-ring	1	**Not reusable**
10	Impeller	1	
11	Impeller plate	1	
12	Dowel pin	1	
13	Woodruff key	1	

CHECKING THE WATER PUMP HOUSING

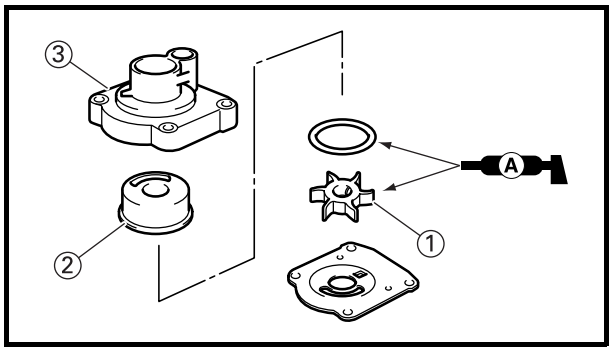
Check:
- Water pump housing
  Cracks/damage → Replace.

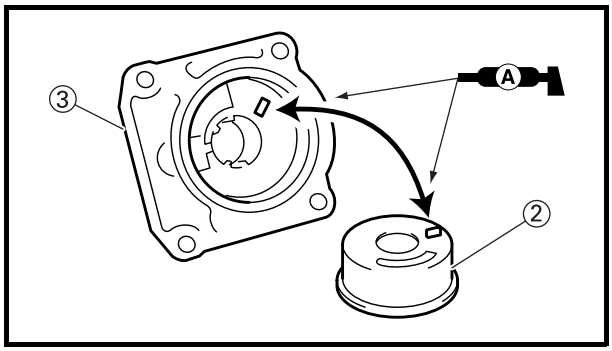
CHECKING THE IMPELLER AND INSERT CARTRIDGE

Check:
- Impeller
- Insert cartridge
  Cracks/damage/wear → Replace.

CHECKING THE WOODRUFF KEY

Check:
- Woodruff key
  Damage/wear → Replace.





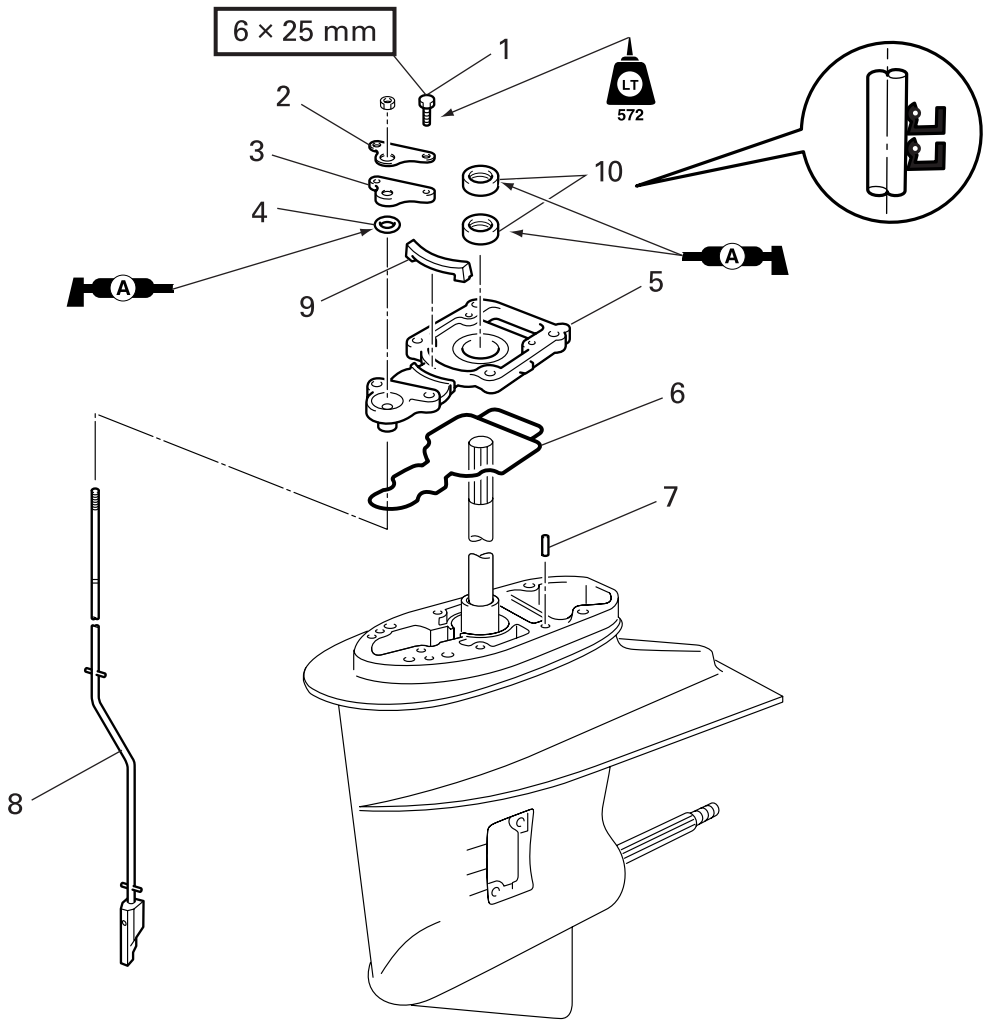
INSTALLING THE IMPELLER AND WATER PUMP HOUSING

Install:
- Impeller ①
- Insert cartridge ②
- Water pump housing ③

NOTE:
- When installing the insert cartridge ②, align its projection with the hole in the water pump housing ③.
- When installing the water pump housing, turn the drive shaft clockwise.
- Apply Yamaha grease A (water resistant grease) on the impeller ①, the insert cartridge ②, and the water pump housing ③.

SHIFT ROD

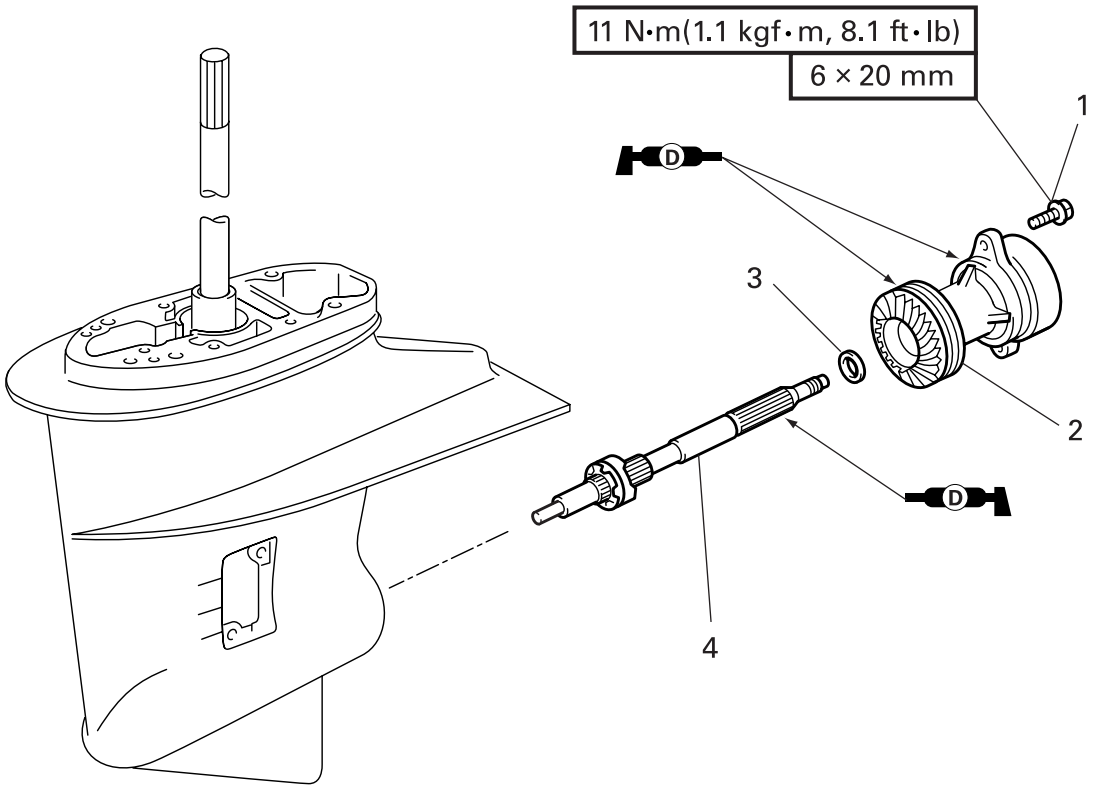
REMOVING THE SHIFT ROD



Step	Job/Part	Q'ty	Remarks
	Impeller plate		Refer to "WATER PUMP" on page 6-4.
1	Bolt	2	
2	Bracket	1	
3	Plate	1	
4	O-ring	1	**Not reusable**
5	Oil seal housing	1	
6	Lower casing packing	1	**Not reusable**
7	Dowel pin	1	
8	Shift rod	1	
9	Rubber seal	1	
10	Oil seal	2	

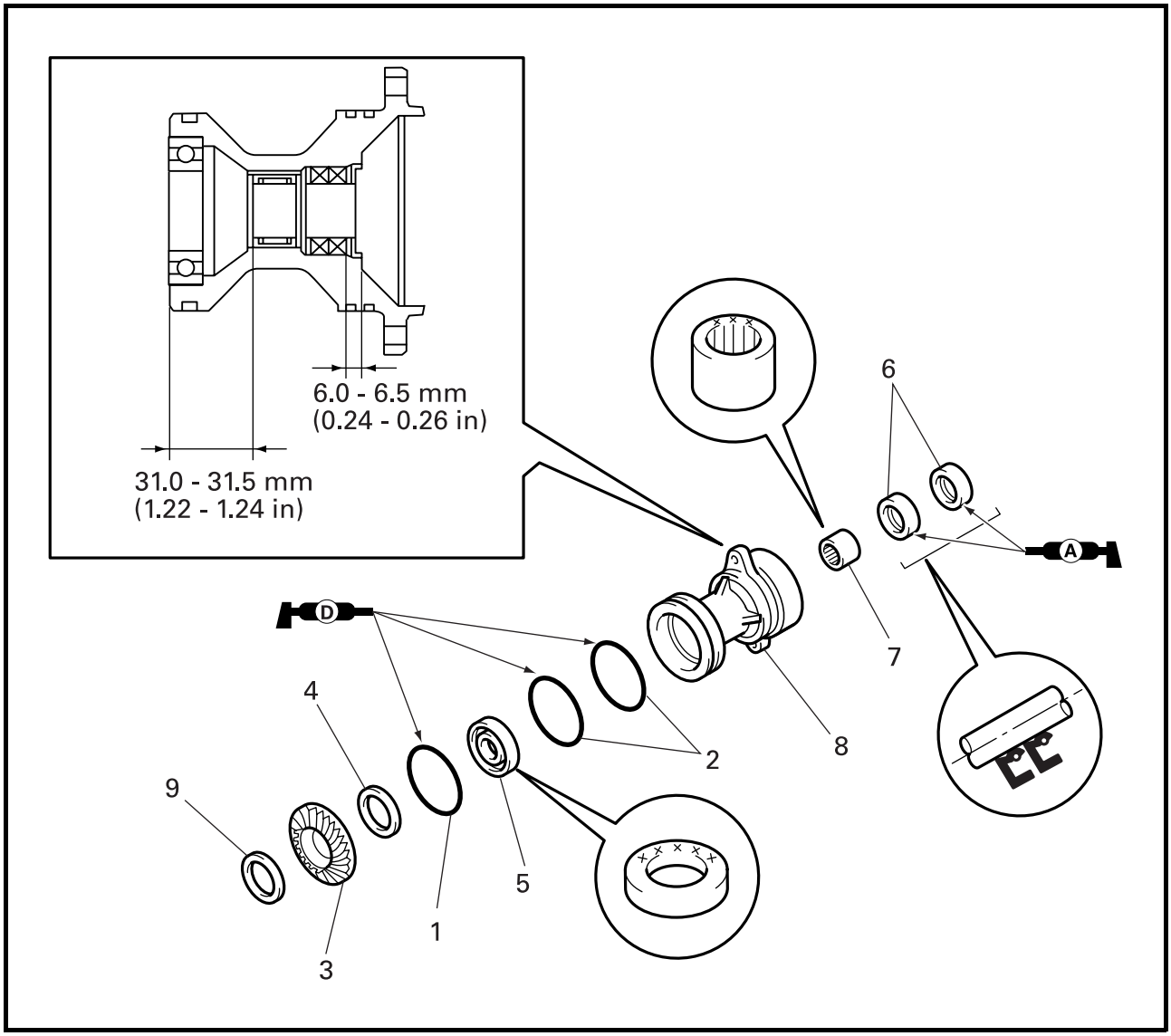
PROPELLER SHAFT HOUSING

REMOVING THE PROPELLER SHAFT HOUSING



Step	Job/Part	Q'ty	Remarks
	Gear oil		Refer to "CHANGING AND CHECKING THE GEAR OIL" on page 3-19.
	Shift rod assembly		Refer to "SHIFT ROD" on page 6-6.
1	Bolt	2	
2	Propeller shaft housing	1	
3	Washer	1	
4	Propeller shaft	1	

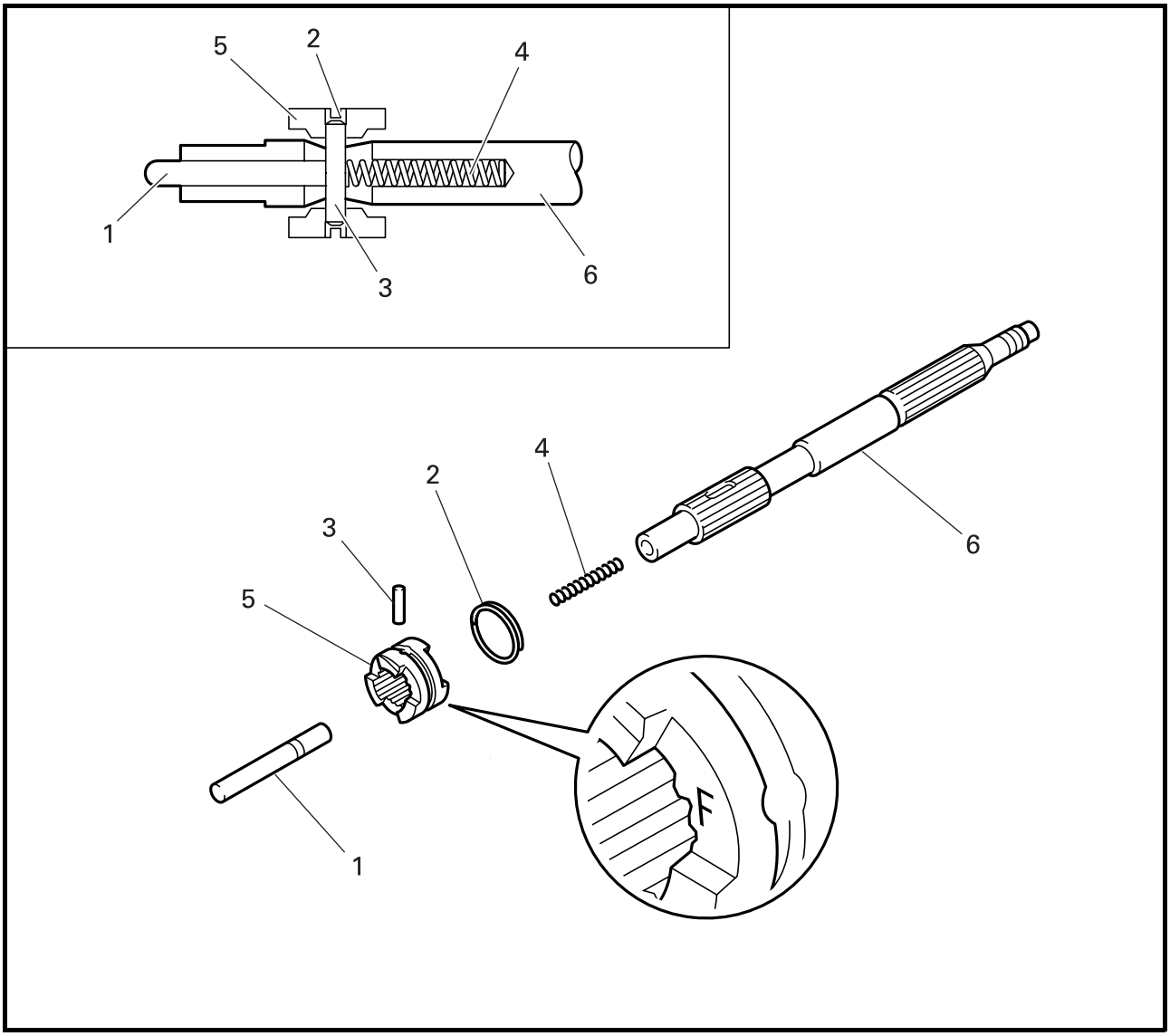
DISASSEMBLING THE PROPELLER SHAFT HOUSING



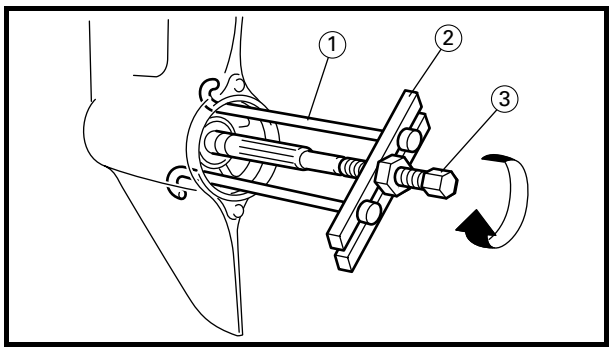
Step	Job/Part	Q'ty	Remarks
1	O-ring	1	**Not reusable**
2	O-ring	2	**Not reusable**
3	Reverse gear	1	
4	Reverse gear shim	*	
5	Ball bearing	1	
6	Oil seal	2	
7	Needle bearing	1	
8	Propeller shaft housing	1	
9	Washer	1	

* As required

DISASSEMBLING THE PROPELLER SHAFT



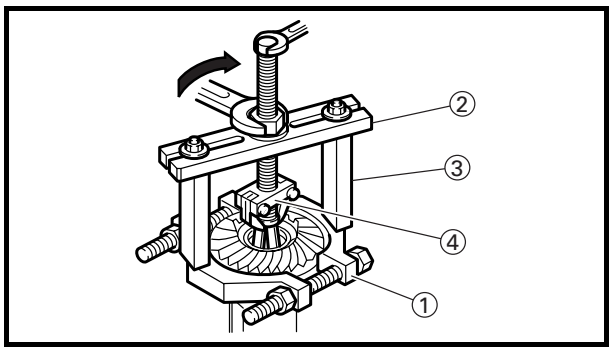
Step	Job/Part	Q'ty	Remarks
1	Shift plunger	1	
2	Cross pin ring	1	
3	Cross pin	1	
4	Spring	1	
5	Dog clutch	1	
6	Propeller shaft	1	

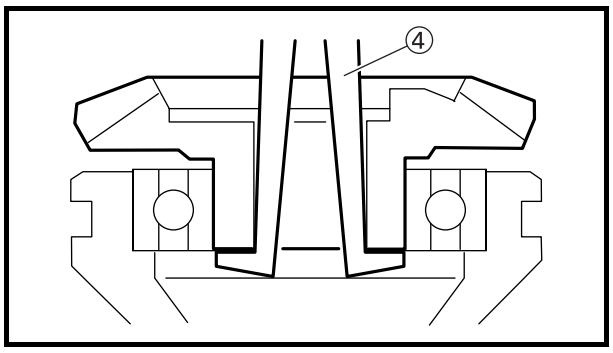


REMOVING THE PROPELLER SHAFT HOUSING

Remove:
- Propeller shaft housing

Bearing housing puller claw ..... ①
90890-06546
Stopper guide plate ..... ②
90890-06501
Center bolt ..... ③
90890-06504

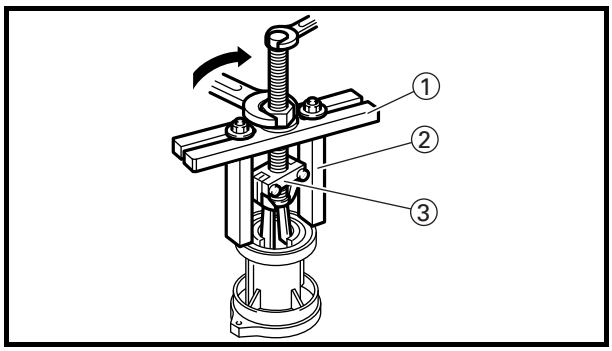




DISASSEMBLING THE PROPELLER SHAFT HOUSING

1. Remove:
   - Reverse gear

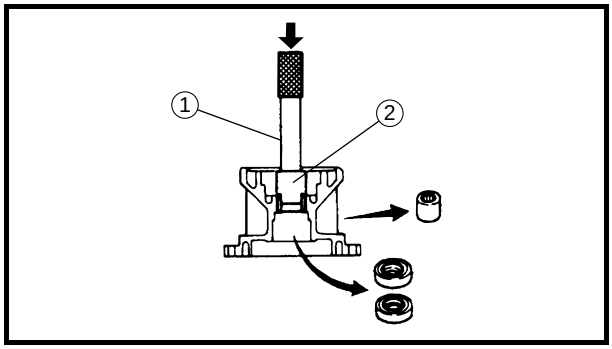
Bearing separator ..... ①
90890-06534
Stopper guide plate ..... ②
90890-06501
Stopper guide stand ..... ③
90890-06538
Bearing puller ass'y ..... ④
90890-06535



2. Remove:
   - Ball bearing

Stopper guide plate ..... ①
90890-06501
Stopper guide stand ..... ②
90890-06538
Bearing puller ass'y ..... ③
90890-06535

NOTE:
Do not reuse the bearing. Always replace it with a new one.



3. Remove:
   - Oil seal
   - Needle bearing

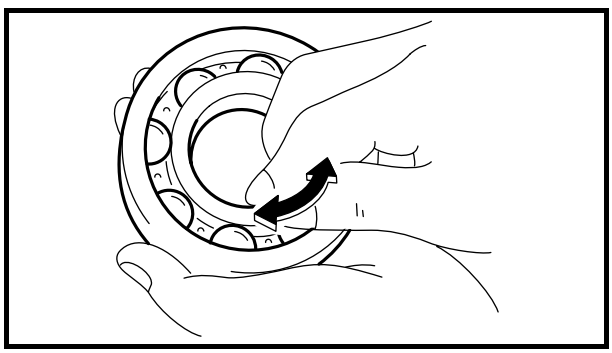
Driver rod L3 ..... ①
90890-06652
Needle bearing attachment ..... ②
90890-06615

CHECKING THE REVERSE GEAR

Check:
- Teeth
- Dogs

  Damage/wear → Replace.

CHECKING THE BEARING



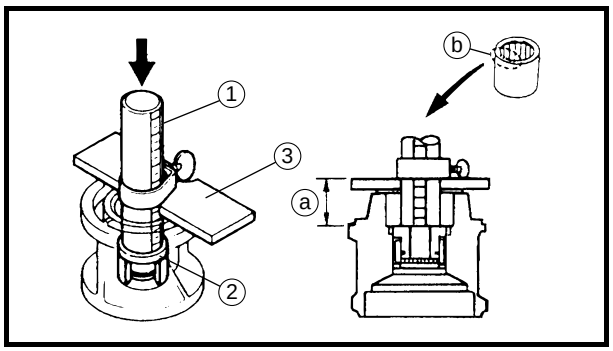
Check:
- Bearing

  Pitting/rumbling → Replace.

CHECKING THE PROPELLER SHAFT HOUSING

Check:
- Propeller shaft housing

  Cracks/damage → Replace.



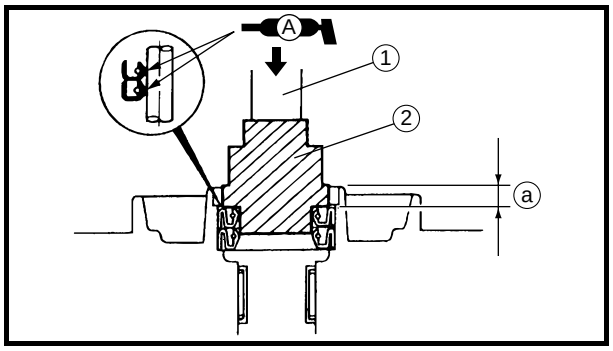
ASSEMBLING THE PROPELLER SHAFT HOUSING

1. Install:
   - Needle bearing

Needle bearing position ..... ⓐ
31.0 - 31.5 mm (1.24 in)

Driver rod-SS ..... ①
90890-06604
Needle bearing attachment ..... ②
90890-06615
Bearing depth plate ..... ③
90890-06603

NOTE:
Install the needle bearing with its manufacturer's marks ⓑ facing up. Apply Yamaha motor oil.

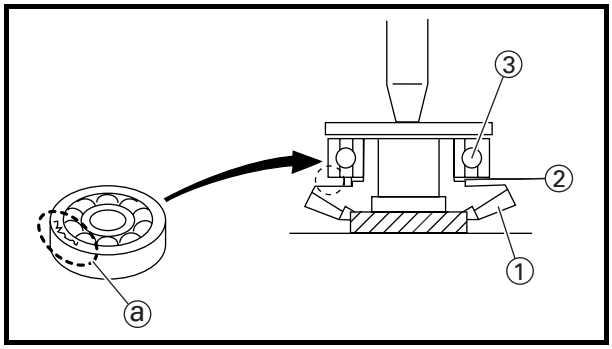


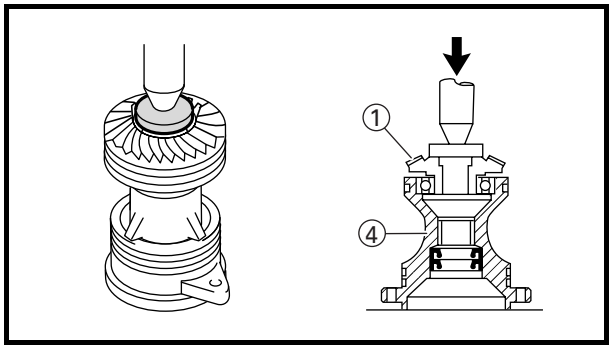
2. Install:
   - Oil seals

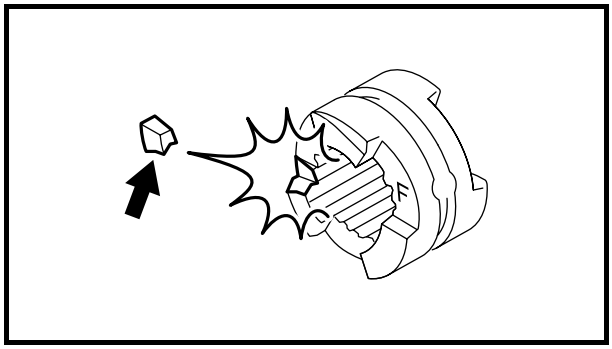
Oil seal position ..... ⓐ
6.0 - 6.5 mm (0.26 in)

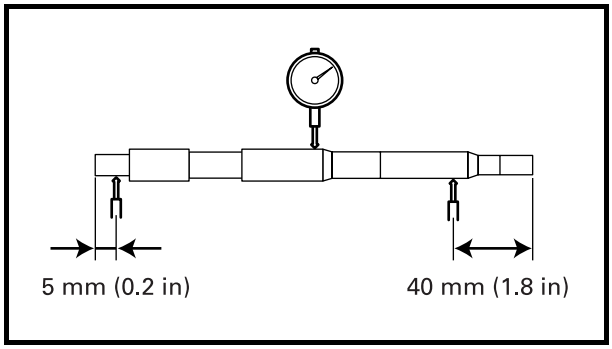
Driver rod L3 ..... ①
90890-06652
Needle bearing attachment ..... ②
90890-06611

CAUTION:
It is essential that the oil seals are installed correctly (as shown in the illustration). If they are installed the wrong way round, oil or water will leak out.









3. Install:
   - Reverse gear ①
   - Reverse gear shim(s) ②
   - Ball bearing ③
   - Propeller shaft housing ④

NOTE:
- Before press-fitting the ball bearing, install the reverse gear shim(s).
- Install the ball bearing with its manufacturer's marks ⓐ facing the reverse gear.

CAUTION:
Place a suitable base under the gear to protect it from damages.

CHECKING THE DOG CLUTCH

Check:
- Dog clutch
  Damage/wear → Replace.

CHECKING THE PROPELLER SHAFT

Check:
- Propeller shaft
  Damage/wear → Replace.

Maximum runout
0.1 mm (0.004 in)

CHECKING THE SHIFT PLUNGER

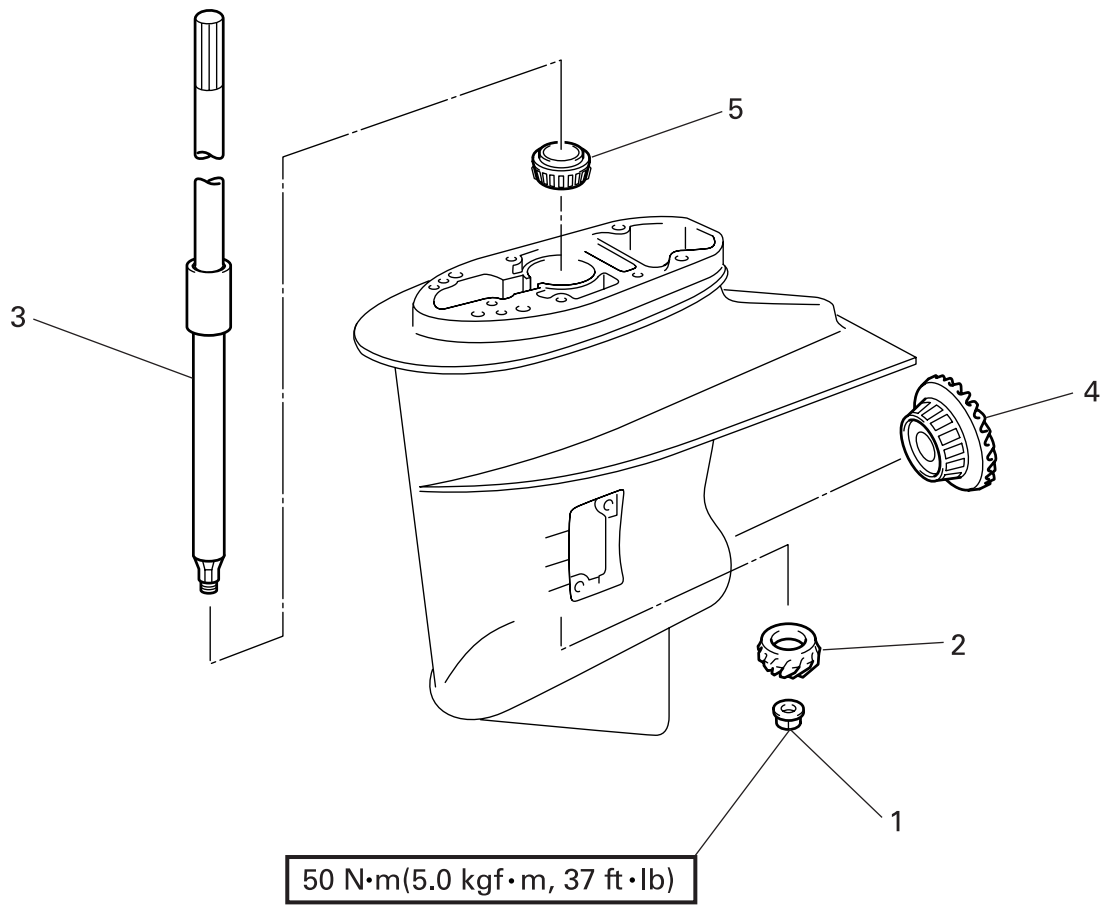
Check:
- Shift plunger
  Wear → Replace.

CHECKING THE SHIFT SPRING

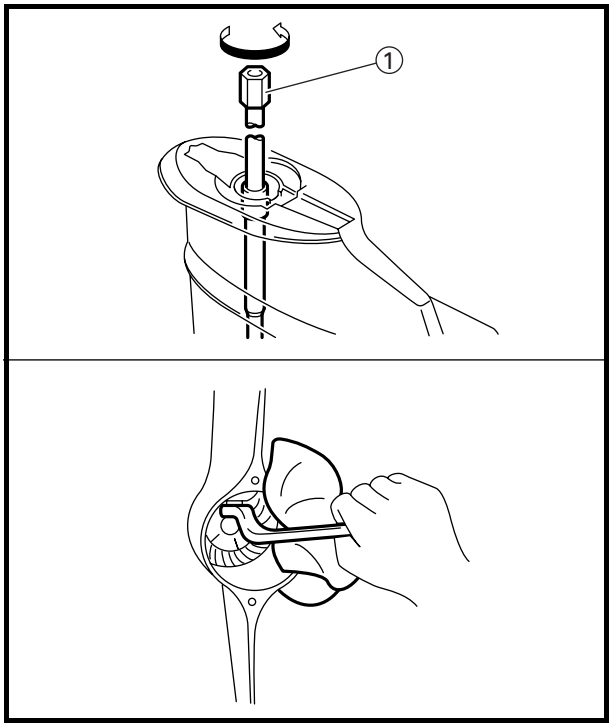
Check:
- Spring
  Wear → Replace.

DRIVE SHAFT

REMOVING THE DRIVE SHAFT



Step	Job/Part	Q'ty	Remarks
	Propeller shaft housing		Refer to "PROPELLER SHAFT HOUSING" on page 6-7.
1	Pinion gear nut	1	
2	Pinion gear	1	
3	Drive shaft	1	
4	Forward gear	1	
5	Drive shaft bearing	1	



REMOVING THE DRIVE SHAFT

Remove:
- Pinion gear nut
- Drive shaft

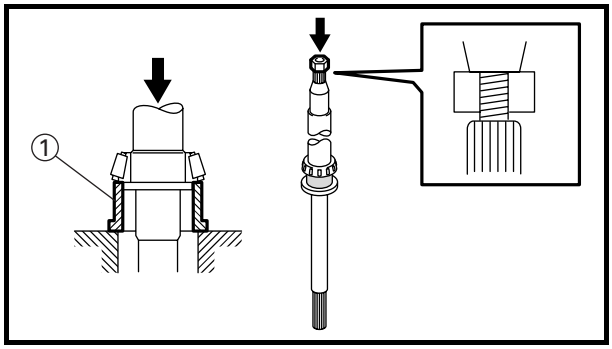
	Drive shaft holder 3 .....① **90890-06517**

Removing Steps

(1) Apply 12mm wrench on the pinion gear nut.

(2) Support the lower case with rags to hold the wrench in position.

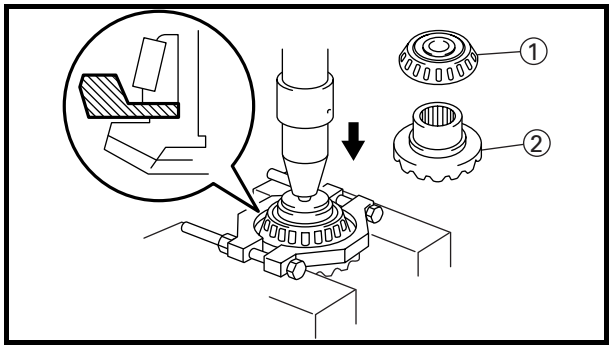
(3) Turn the drive shaft holder ①.



REMOVING THE DRIVE SHAFT BEARING

Remove:
- Taper roller bearing

	Bearing inner race attachment ....① **90890-06643**



DISASSEMBLING THE FORWARD GEAR

Remove:
- Taper roller bearing ①
- Forward gear ②

	Bearing separator **90890-06534**

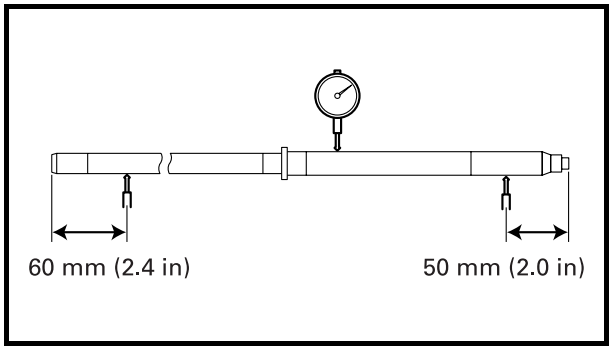
CAUTION:

Place a suitable base on the gear axle to prevent damage to the top of the axle.

CHECKING THE PINION AND FORWARD GEAR

Check:
- Teeth
- Dogs

Damage/wear → Replace.

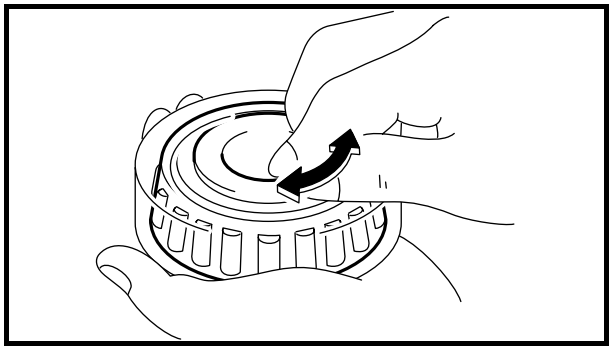


CHECKING THE DRIVE SHAFT

Check:
- Drive shaft

Damage/wear → Replace.

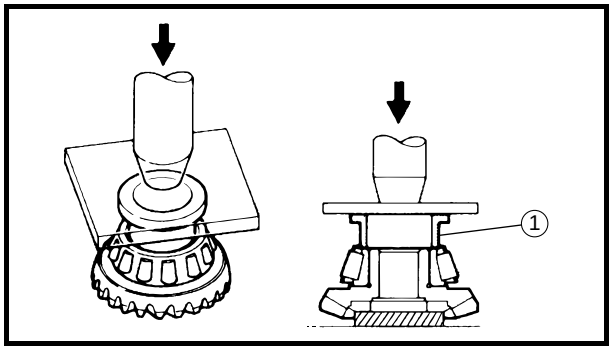
Maximum runout
0.5 mm (0.020 in)



CHECKING THE BEARINGS

Check:
- Bearings

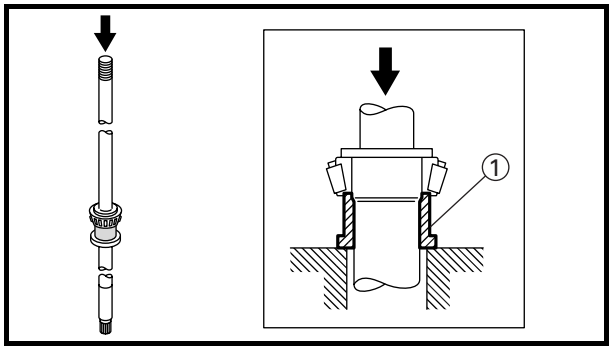
Pitting/rumbling → Replace.



ASSEMBLING THE FORWARD GEAR

Install:
- Forward gear
- Taper roller bearing

Bearing inner race attachment ....① 90890-06644



INSTALLING THE DRIVE SHAFT BEARING

Install:
- Drive shaft bearing

Bearing inner race attachment ....① 90890-06645

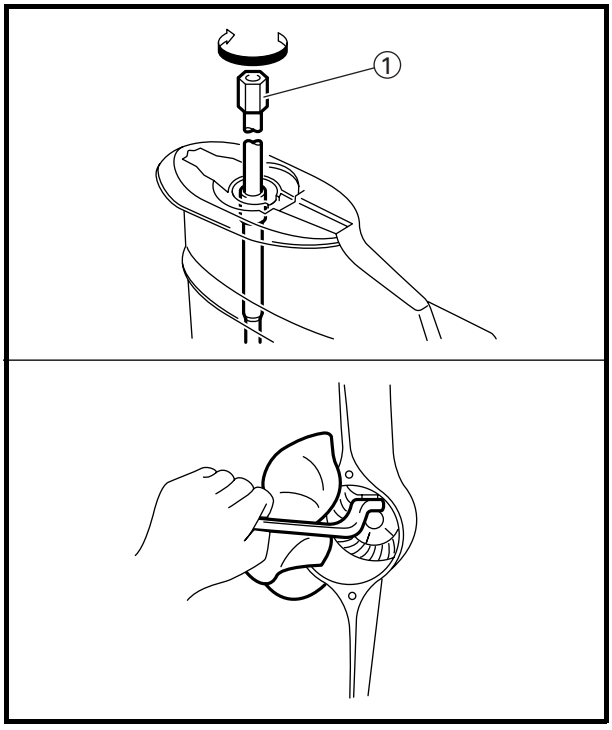
INSTALLING THE DRIVE SHAFT

1. Install:
   - Forward gear
     (with the tapered roller bearing)
   - Drive shaft
     (with the tapered roller bearing)
   - Pinion gear

	**Drive shaft holder 3 .....①** **90890-06517**

2. Tighten:
   - Pinion gear nut

	**Pinion gear nut** **50 Nm (5.0 kgf•m, 37 ft•lb)**



Tightening steps

(1) Apply 12mm wrench on the pinion gear nut.

(2) Support the lower case with rags to hold the wrench in position.

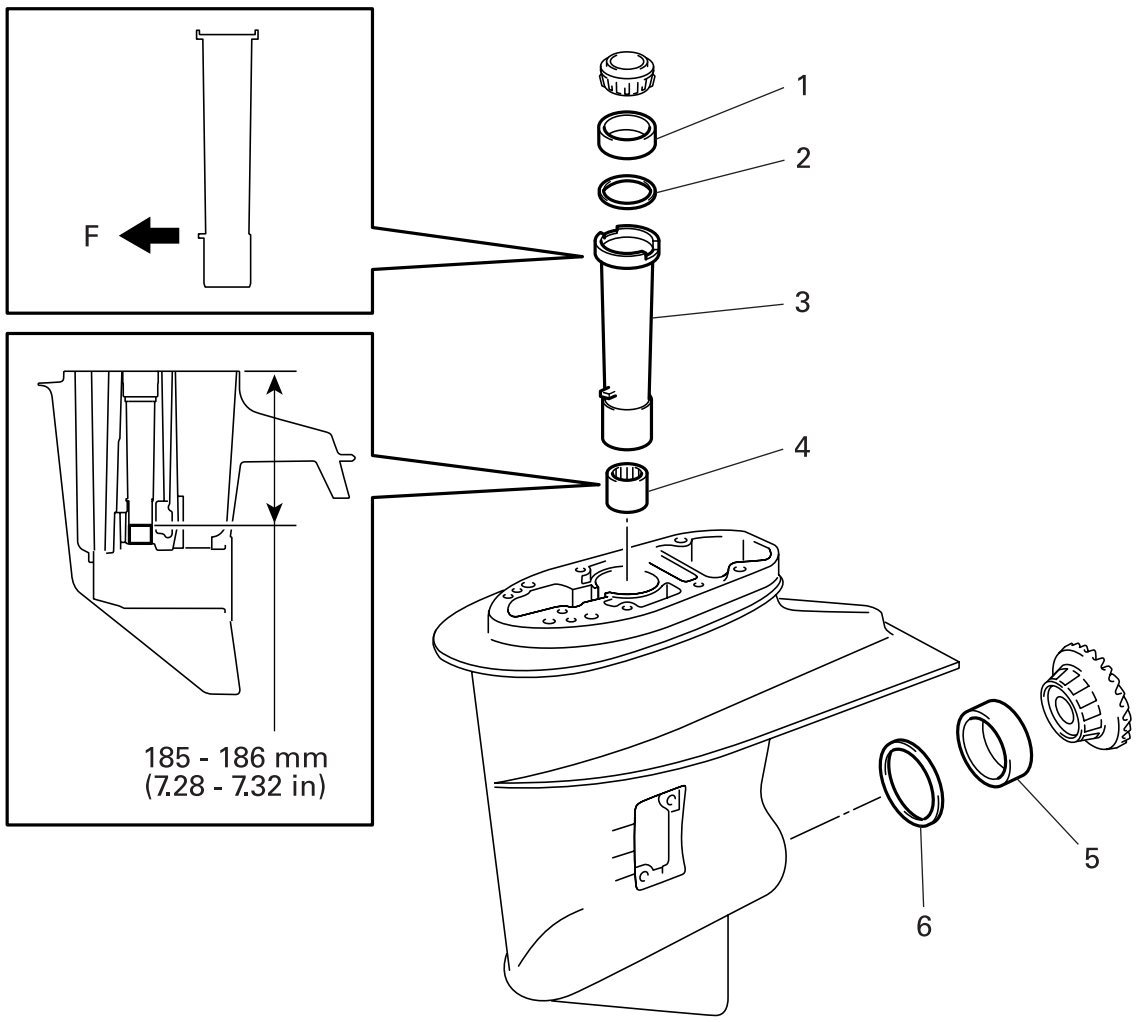
(3) Turn the drive shaft holder ①.

NOTE:

Tighten the pinion gear nut with the same tools that were used for removal.

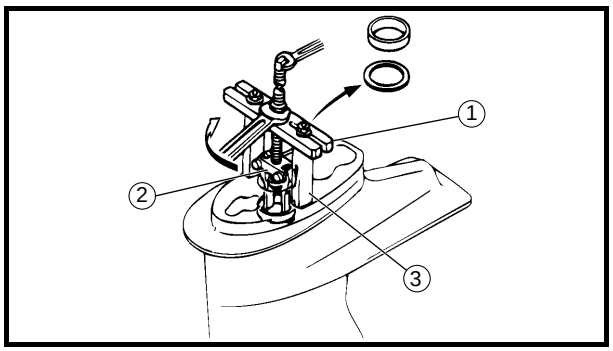
LOWER CASE

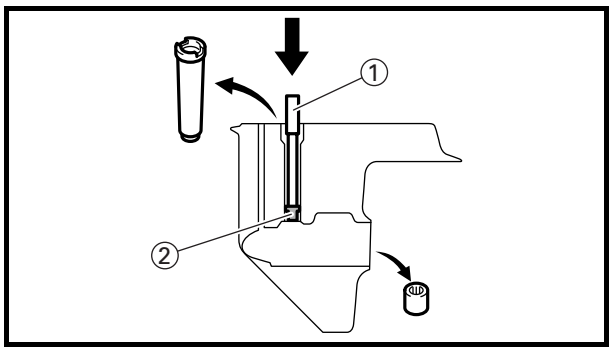
DISASSEMBLING THE LOWER CASE

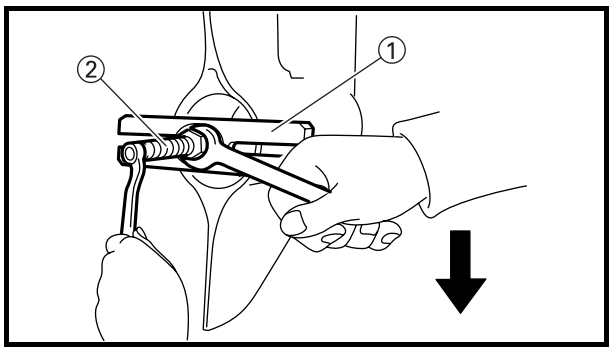


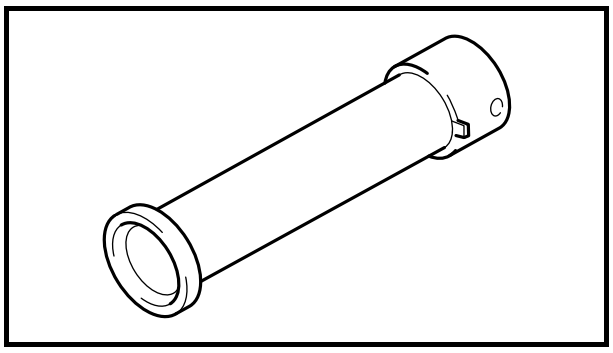
Step	Job/Part	Q'ty	Remarks
1	Drive shaft bearing outer race	1	
2	Pinion gear shim	*	
3	Drive shaft sleeve	1	
4	Needle bearing	1	
5	Tapered roller bearing outer race	1	
6	Forward gear shim	*	

* As required









1. Remove:
   - Drive shaft bearing outer race
   - Pinion gear shim(s)

Stopper guide plate ..... ①
90890-06501
Bearing puller ass'y ..... ②
90890-06535
Stopper guide stand ..... ③
90890-06538

2. Remove:
   - Drive shaft needle bearing and sleeve

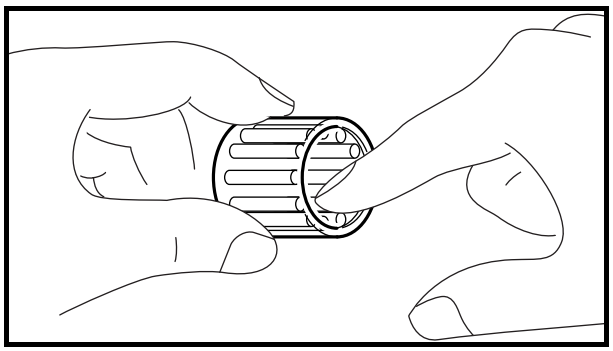
Driver rod L3 ..... ①
90890-06652
Needle bearing attachment ..... ②
90890-06615

3. Remove:
   - Forward gear bearing outer race and shim (s)

Stopper guide plate ..... ①
90890-06501
Bearing puller ass'y ..... ②
90890-06535

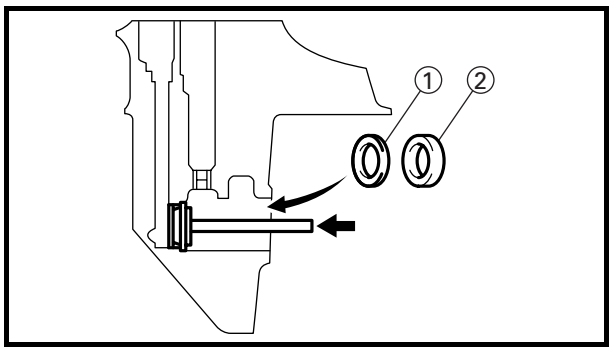
CHECKING THE DRIVE SHAFT SLEEVE

Check:
- Drive shaft sleeve
  Damage/wear → Replace.



CHECKING THE NEEDLE BEARING

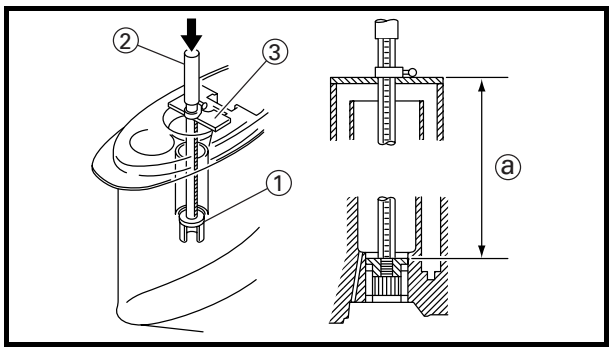
Check:
- Needle bearing
  Pitting/rumbling → Replace.



ASSEMBLING THE LOWER CASE

1. Install:
   - Forward gear shim(s) ①
   - Tapered roller bearing outer race ②

	Bearing outer race attachment **90890-06622** **Driver rod LL** **90890-06605**

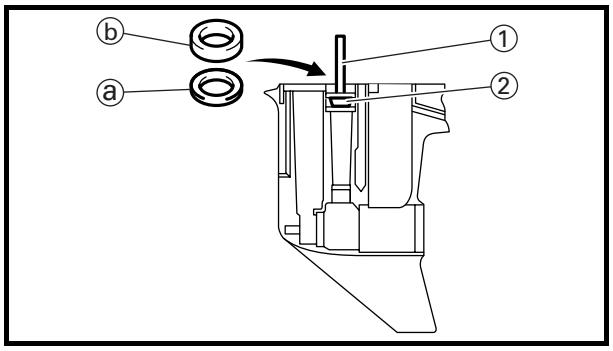


2. Install:
   - Drive shaft needle bearing

	Depth ⓐ **185.0 - 186.0 mm (7.32 in)**

	Needle bearing attachment ..... ① **90890-06615** **Driver rod SL** ..... ② **90890-06602** **Bearing depth plate** ..... ③ **90890-06603**

NOTE:
Install the drive shaft needle bearing with the manufactuer's marks facing up.



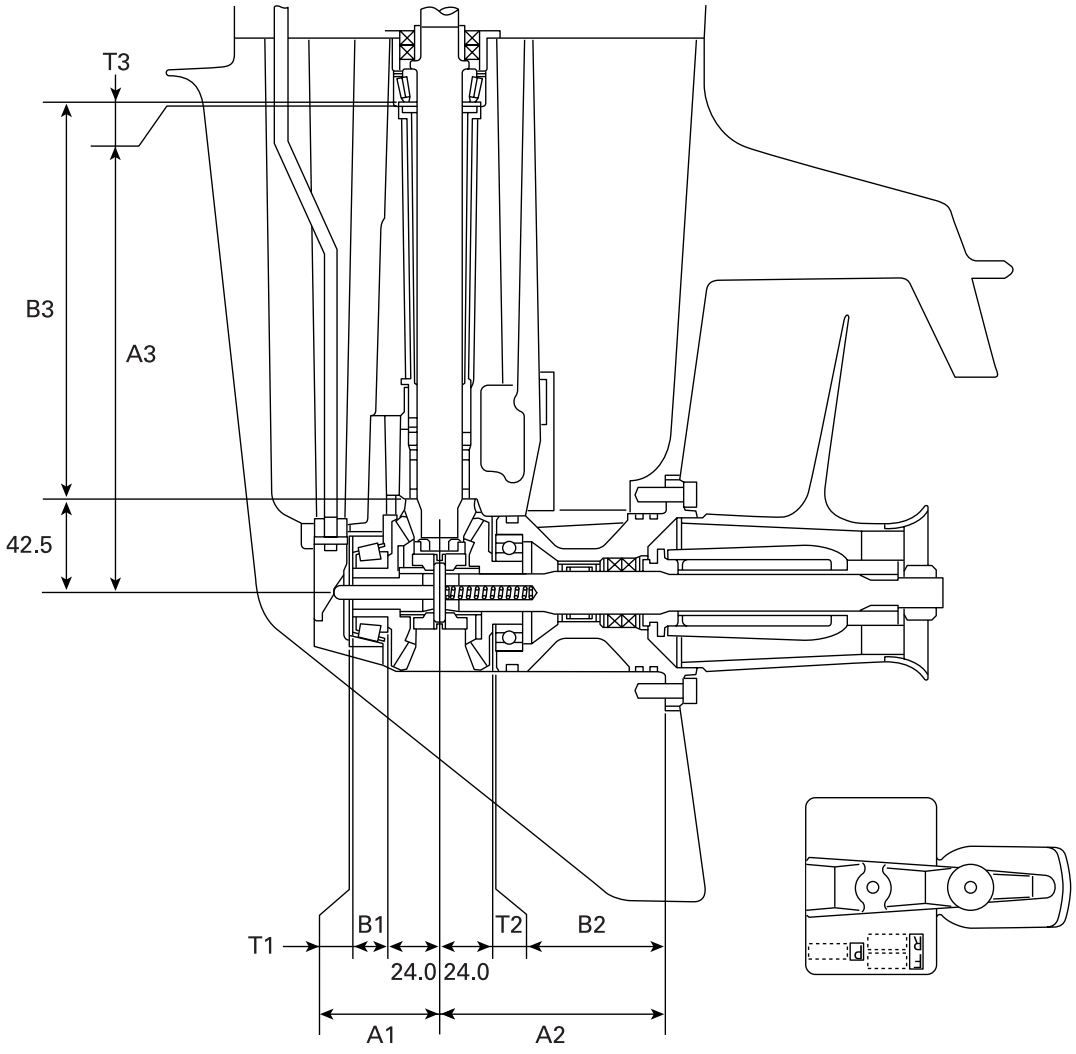
3. Install:
   - Pinion gear shim(s) ⓐ
   - Drive shaft bearing outer race ⓑ

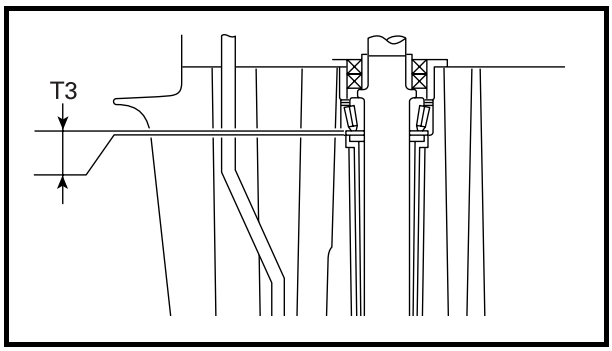
	Driver rod LS ..... ① **90890-06606** **Bearing outer race attachment** .... ② **90890-06628**

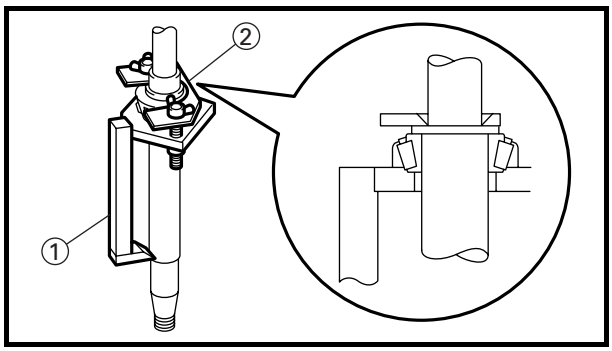
SHIMMING

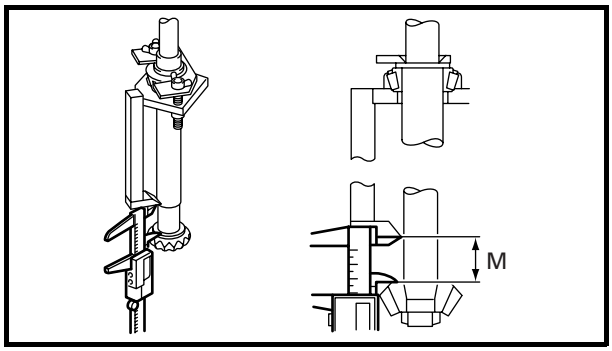
NOTE:

- There is no need to select shims when reassembling with the original case and inner parts.
- Shim calculations are required when reassembling with the original inner parts and a new case (the difference between the original inner parts and the new case).
- Measurements and adjustments are required when replacing the inner part(s).









SELECTING THE PINION SHIMS

NOTE:
Select the shim thickness (T3) by using the specified measurement(s) and the calculation formula.

Select:
- Shim thickness (T3)

Selecting steps

(1) Install the pinion height gauge, drive shaft and bearing (with bearing race).

	Pinion height gauge .....① **90890-06702** **Drive shaft holder 3 .....②** **90890-06517**

NOTE:
- Attach the pinion height gauge to the drive shaft so that the shaft is at the center of the hole.
- After the wing nuts contact the fixing plate, tighten them another 1/4 of a turn.

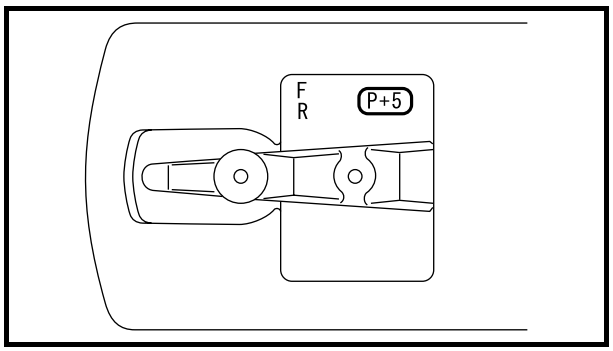
(2) Install the pinion gear and pinion gear nut.

	Pinion gear nut **50 N•m (5.0 kgf•m, 37 ft•lb)**

(3) Measure (M).

	Digital caliper **90890-06704**

NOTE:
- Measure the clearance between the pinion height gauge and the pinion, as shown.
- Perform the same measurement at three points on the pinion.
- Find the average of the measurements (M).
- When using the digital caliper, be sure to place it at right angles to the pinion. Otherwise, measurement will be incorrect.



(4) Calculate the pinion gear shim thickness (T3).

Pinion gear shim thickness (T3) = M - 27 mm - P/100 mm

NOTE:

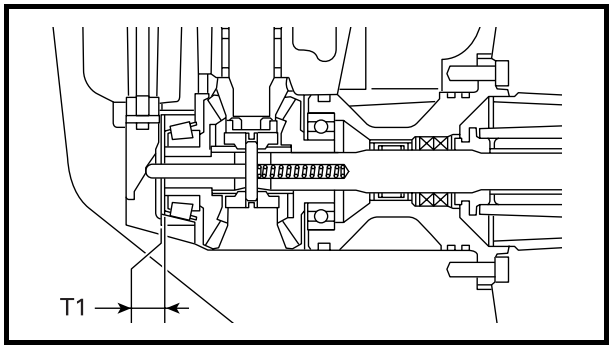
- "P" is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the "P" mark is missing or unreadable, assume a "P" value of "0", and check the backlash when the unit is assembled.
- If the "P" mark is negative (-), then add the "P" value to the measurement.

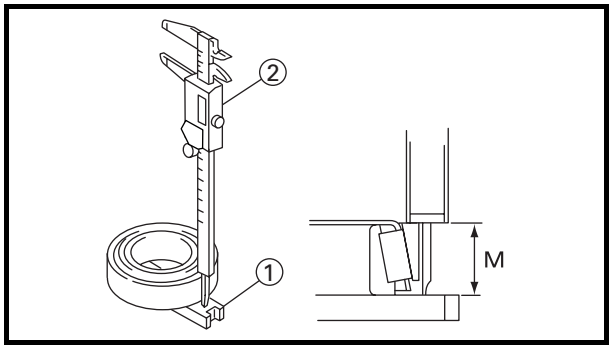
Example:
If M is "28.30 mm" and "P" is "+5", then:
T3 = 28.30 mm - 27 mm - (+5)/100 mm
= 1.3 mm - 0.05 mm
= 1.25 mm (0.049 in)
If M is "28.24 mm" and "P" is "-3", then:
T3 = 28.24 mm - 27 mm - (-3)/100 mm
= 1.24 mm + 0.03 mm
= 1.27 mm (0.05 in)

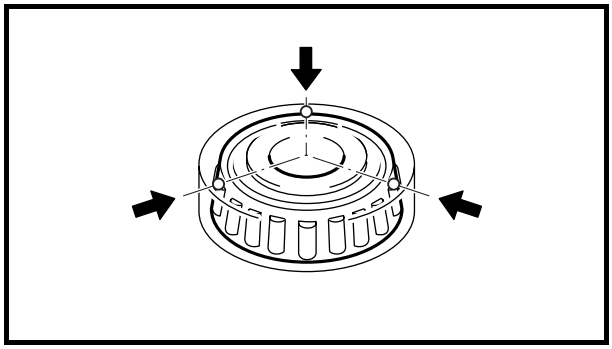
(5) Select the pinion gear shim(s) (T3).

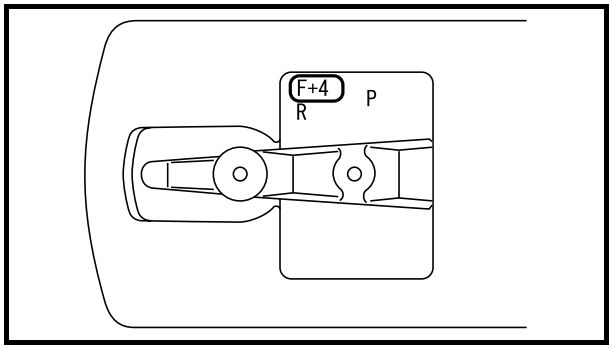
Calculated numeral at 1/100th place		Using shim
more than	or less	
1.10	1.20	1.2
1.20	1.30	1.3
1.30	1.40	1.4
1.40	1.50	1.5
1.50	1.60	1.6
1.60	1.70	0.7, 1.0
1.70	1.83	0.7, 1.1

Available shim thickness
0.7, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5 and 1.6 mm









SELECTING THE FORWARD GEAR SHIMS

NOTE:

Select the shim thickness (T1) by using the specified measurement(s) and the calculation formula.

Select:
- Shim thickness (T1)

Selecting steps

(1) Measure (M).

	Shimming plate ..... ① **90890-06701**
	Digital caliper ..... ② **90890-06704**

NOTE:

- Turn the tapered roller bearing outer race two or three times so that the rollers seat.
  Then, measure the height of the bearing, as shown.
- Perform the same measurement at three points on the tapered roller bearing outer race.
- Find the average of the measurements (M).
- When using the digital caliper, be sure to place it at right angles to the shimming plate.
  Otherwise, measurement will be incorrect.

(2) Calculate the forward gear shim thickness (T1).

	Forward gear shim thickness (T1) = 17.5 mm + F/100 mm - M

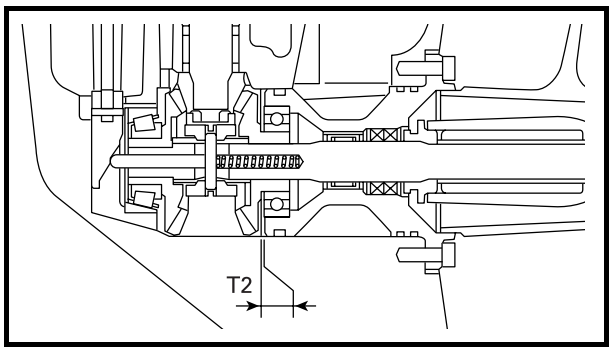
NOTE:

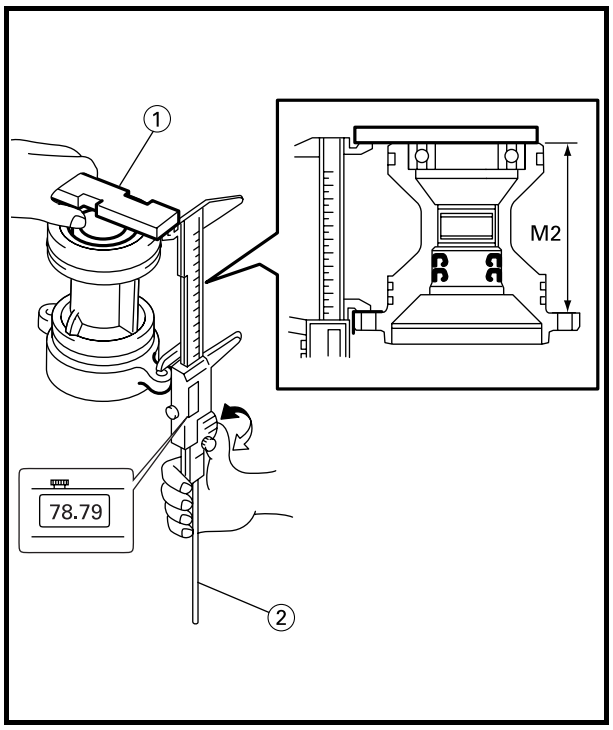
- "F" is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the "F" mark is missing or unreadable, assume an "F" value of "0", and check the backlash when the unit is assembled.
- If the "F" mark is negative (-), then subtract the "F" value from the measurement.

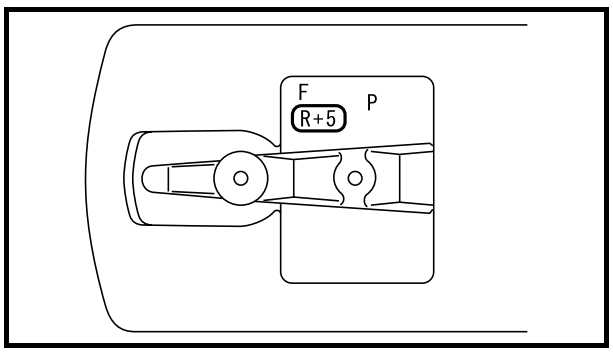
Example:
If M is "16.25 mm" and "F" is "+4", then:
T1 = 17.5 mm + (+4)/100 - 16.25 mm
= 17.5 mm + 0.04 - 16.25 mm
= 1.29 mm (0.051 in)
If M is "16.26 mm" and "F" is "-3", then:
T1 = 17.5 mm + (-3)/100 - 16.26 mm
= 17.5 mm - 0.03 - 16.26 mm
= 1.21 mm (0.048 in)

(3) Select the forward gear shim(s) (T1).

Calculated numeral at 1/100th place		Using shim
more than	or less	
1.00	1.10	1.0
1.10	1.20	1.1
1.20	1.30	1.2
1.30	1.40	1.3
1.40	1.50	1.4
	Available shim thickness 1.0, 1.1, 1.2, 1.3 and 1.4 mm	







SELECTING THE REVERSE GEAR SHIMS

NOTE:

Select the shim thickness (T2) the specified measurement(s) and the calculation formula.

Select:
- Shim thickness (T2)

Selecting steps

(1) Measure (M2).

Shimming plate ..... ①
90890-06701
Digital caliper ..... ②
90890-06704

NOTE:

- Measure the height of the gear as shown.
- Perform the same measurement at three points on the gear.
- Find the average of the measurements (M2).
- When using the digital caliper, be sure to place it at right angles to the shimming plate.
  Otherwise, measurement will be incorrect.

(2) Calculate the reverse gear shim thickness (T2).

Reverse gear shim thickness (T2) = 80 mm + R/100 - M2

NOTE:

- "R" is the deviation of the lower case dimension from standard. It is stamped on the anode mounting surface of the lower case in 0.01 mm units. If the "R" mark is missing or unreadable, assum a "R" value of "0", and check the backlash when the unit is assembled.
- If the "R" mark is negative (-), then subtract the "R" value from the measurement.

Example:
If M2 is "78.79 mm" and "R" is "+5", then:
T2 = 80 mm + (+5)/100 - 78.79 mm
= 80 mm + 0.05 mm - 78.79 mm
= 1.26 mm (0.050 in)
If M2 is "78.75 mm" and "R" is "-3", then:
T2 = 80 mm + (-3)/100 - 78.75 mm
= 80 mm - 0.03 mm - 78.75 mm
= 1.22 mm (0.048 in)

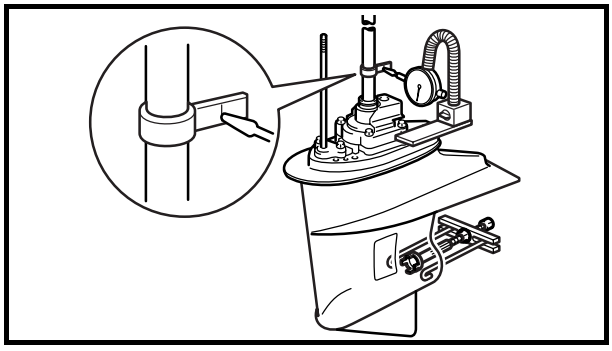
(3) Select the reverse gear shim(s) (T2).

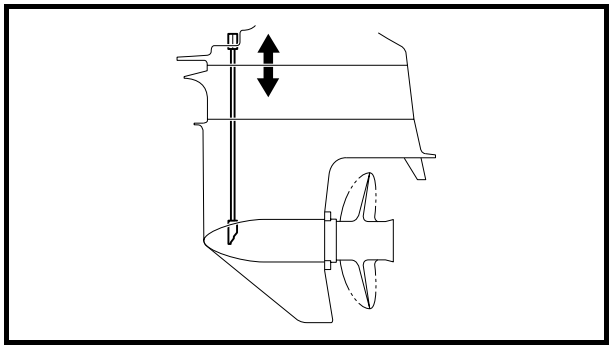
Calculated numeral at 1/100th place		Using shim
more than	or less	
1.00	1.10	1.0
1.10	1.20	1.1
1.20	1.30	1.2
1.30	1.32	1.3

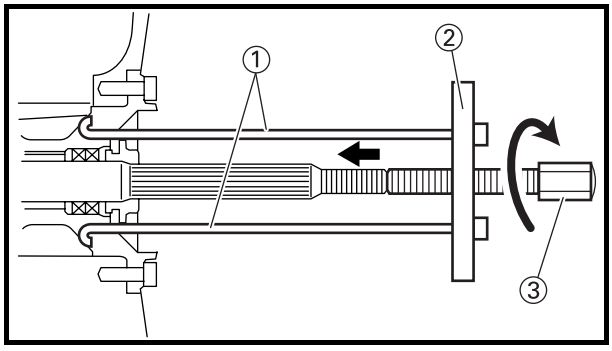
Available shim thickness
1.0, 1.1, 1.2 and 1.3 mm

BACKLASH

NOTE:
- Do not install the water pump components when measuring the backlash.
- Measure both the forward and reverse gear backlashes.
- If both the forward and reverse gear backlashes are larger than specification, the pinion gear may be too high.
- If both the forward and reverse gear backlashes are smaller than specification, the pinion gear may be too low.







MEASURING THE FORWARD GEAR BACKLASH

1. Measure:
   - Forward gear backlash
     Out of specification → Adjust.

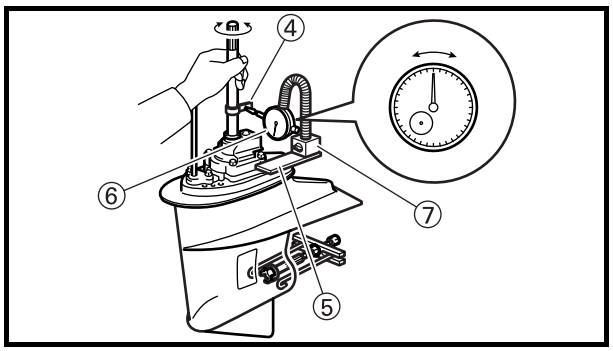
	Forward gear backlash **0.31 - 0.72 mm (0.012 - 0.028 in)**

Measuring steps

(1) Set the shift rod into the neutral position.

(2) Install the propeller shaft housing puller so it pushes against the propeller shaft.

	Bearing housing puller claw .....① **90890-06564** **Stopper guide plate .....②** **90890-06501** **Center bolt.....③** **90890-06504**
	Center bolt **5 N•m (0.5 kgf•m, 3.7 ft•lb)**



(3) Install the backlash indicator onto the drive shaft (16mm (0.63 in) diameter).

	Backlash indicator .....④ **90890-06706**

(4) Install the dial gauge onto the lower unit and have the dial gauge plunger contact the mark on the backlash indicator.

	Magnet base plate .....⑤ **90890-07003** **Dial gauge set .....⑥** **90890-01252** **Magnet base .....⑦** **90890-06705**

(5) Slowly turn the drive shaft clockwise and counterclockwise. When the drive shaft stops in each direction, measure the backlash.

2. Adjust:
   - Forward gear backlash

     Remove or add shim(s).

Forward gear backlash	**Shim thickness**
Less than 0.31 mm (0.012 in)	**To be decreased by (0.52 - M) × 0.49**
More than 0.72 mm (0.028 in)	**To be increased by (M - 0.52) × 0.49**
Available shim thickness: 1.0, 1.1, 1.2, 1.3 and 1.4 mm	

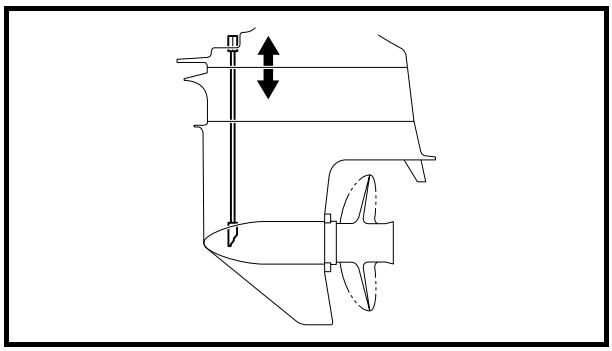
M : Measurement

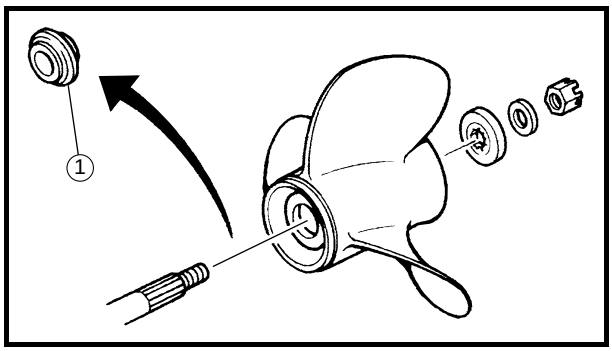
MEASURING THE REVERSE GEAR BACKLASH

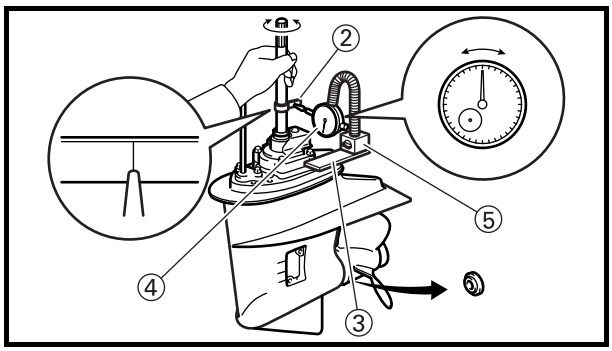
1. Measure:
   - Reverse gear backlash

     Out of specification → Adjust.

	Reverse gear backlash **0.93 - 1.65 mm (0.037 - 0.065 in)**







Measuring steps

(1) Set the shift rod into the neutral position.

(2) Load the reverse gear by installing the propeller without the collar ①, and then tighten the propeller nut.

	Propeller nut **5 N•m (0.5 kgf•m, 3.7 ft•lb)**

(3) Install the backlash indicator onto the drive shaft (16 mm (0.63 in) diameter).

	Backlash indicator .....② **90890-06706**

(4) Install the dial gauge onto the lower unit and have the dial gauge plunger contact the mark on the backlash indicator.

	Magnet base plate .....③ **90890-07003** **Dial gauge set .....④** **90890-01252** **Magnet base .....⑤** **90890-06705**

(5) Slowly turn the drive shaft clockwise and counterclockwise. When the drive shaft stops in each direction, measure the backlash.

2. Adjust:
   - Reverse gear backlash

     Remove or add shim(s).

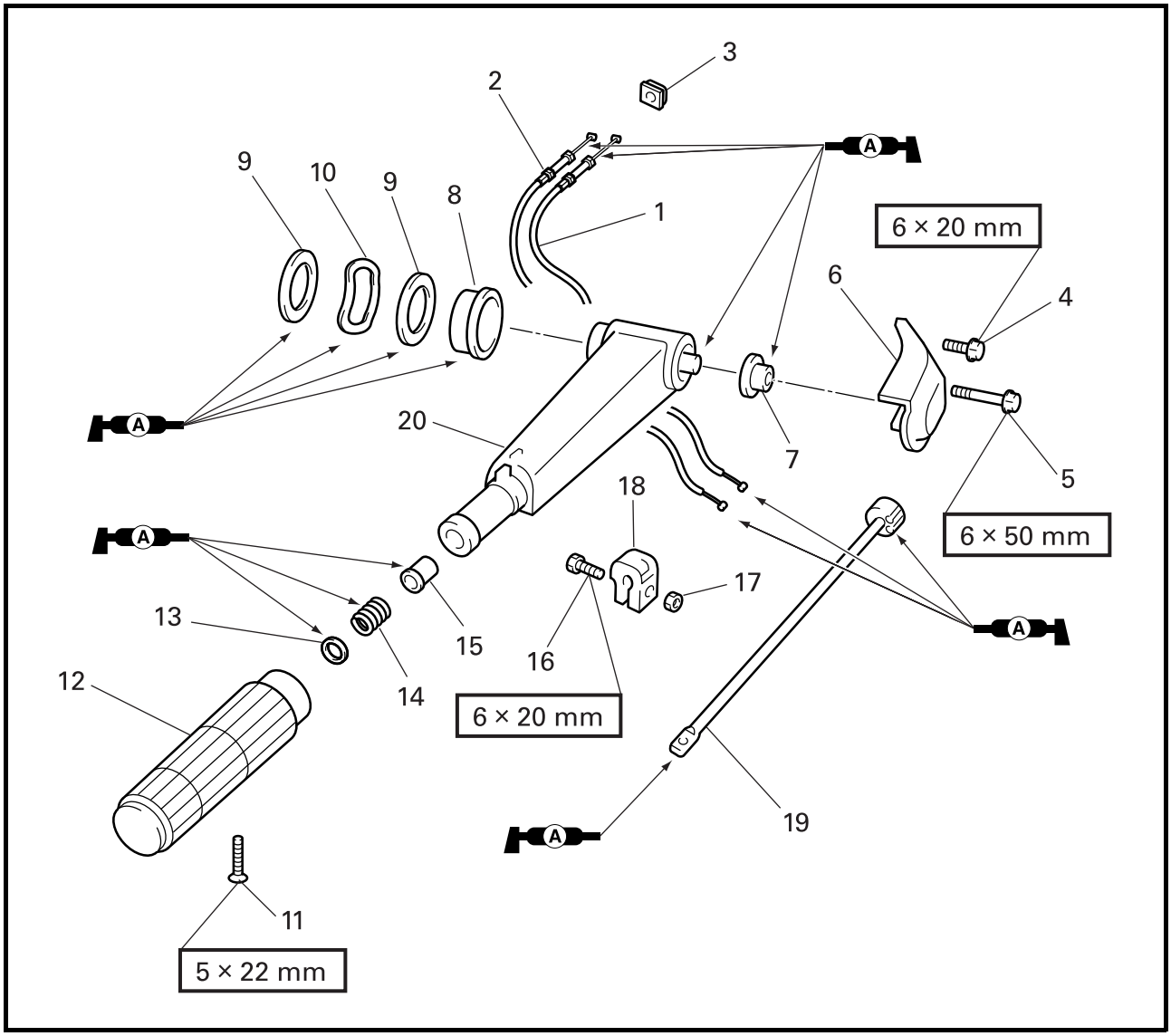
	Reverse gear backlash	**Shim thickness**
	Less than 0.93 mm (0.037 in)	**To be decreased by (1.29 - M) × 0.49**
	More than 1.65 mm (0.065 in)	**To be increased by (M - 1.29) × 0.49**
	Available shim thickness 1.0, 1.1, 1.2 and 1.3 mm	

M : Measurement

CHAPTER 7
BRACKET UNIT

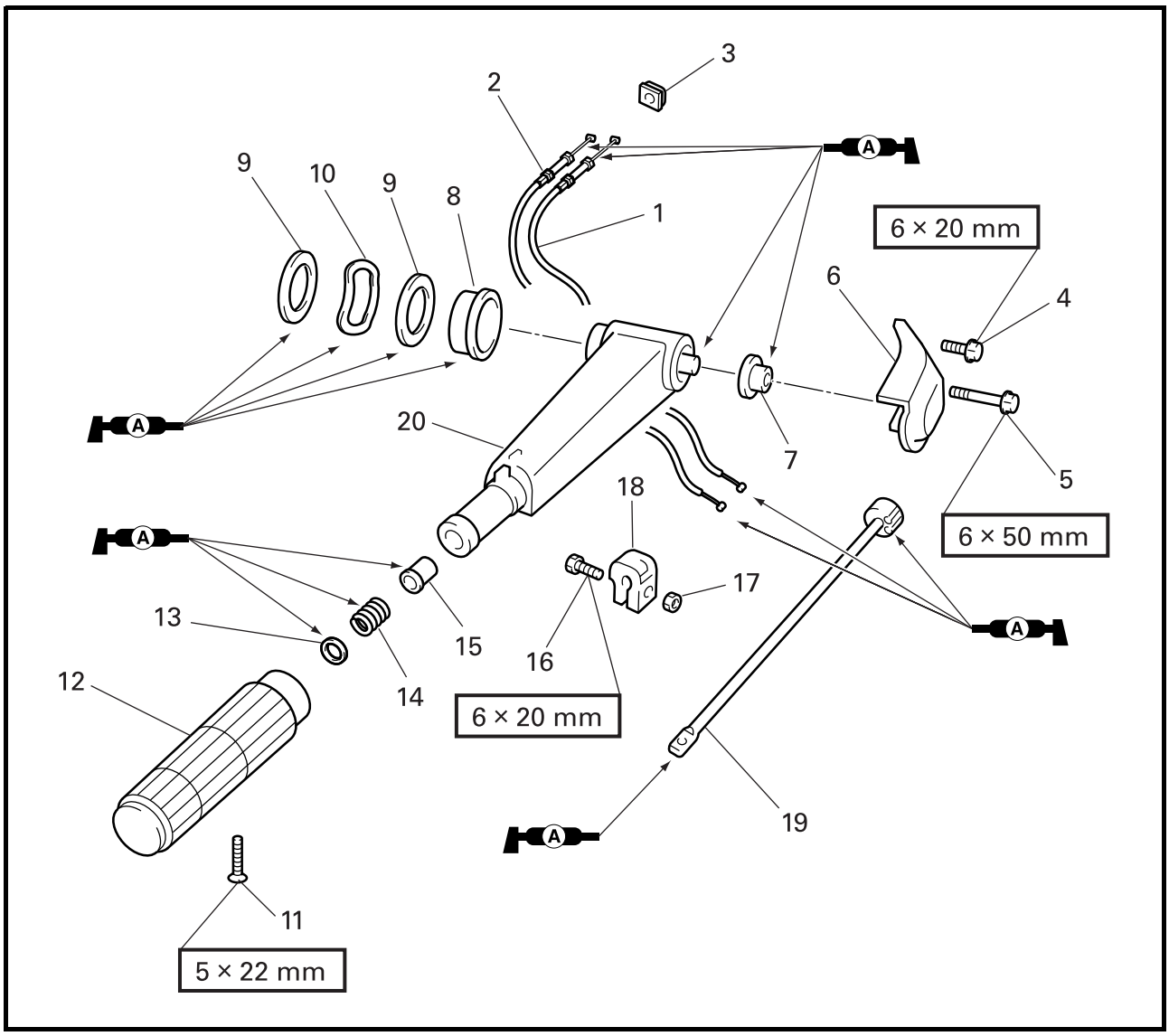
STEERING HANDLE

DISASSEMBLING THE STEERING HANDLE

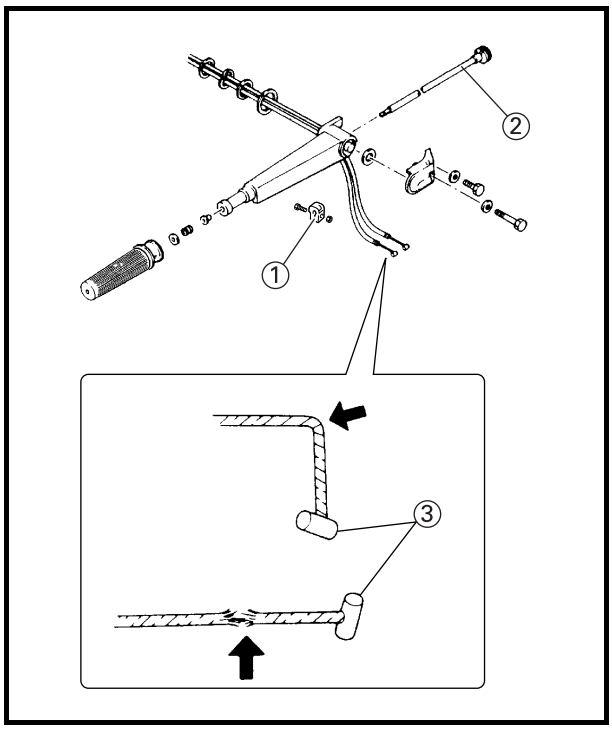


Step	Job/Part	Q'ty	Remarks
1	Throttle cable	1	
2	Throttle cable	1	
3	Grommet	1	
4	Bolt (with washer)	1	
5	Bolt (with washer)	1	
6	Steering handle cover	1	
7	Collar	1	
8	Collar	1	
9	Plain washer	2	
10	Wave washer	1	
11	Screw	1	
12	Handle	1	
13	Washer	1	

Continued on next page.



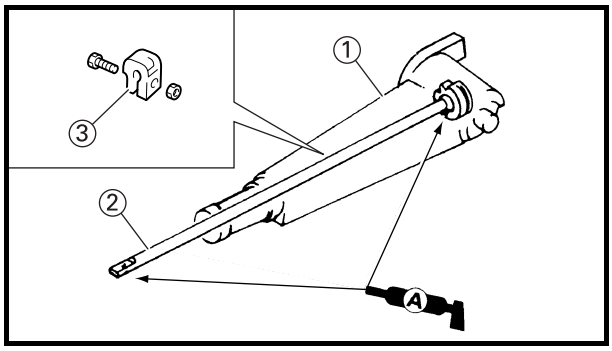
Step	Job/Part	Q'ty	Remarks
14	Compression spring	1	
15	Bushing	1	
16	Bolt	1	
17	Self-locking nut	1	
18	Steering friction	1	
19	Throttle lever	1	
20	Steering handle 1	1	



CHECKING THE STEERING HANDLE

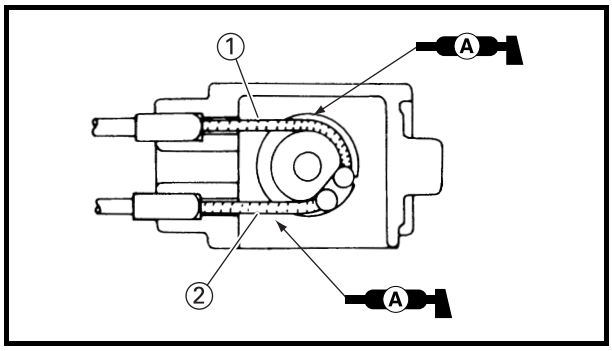
Check:

- Steering friction ①
- Throttle lever ②
  Crack/damage → Replace.
- Throttle cable ③
  Bent/broken → Replace.



ASSEMBLING THE STEERING HANDLE

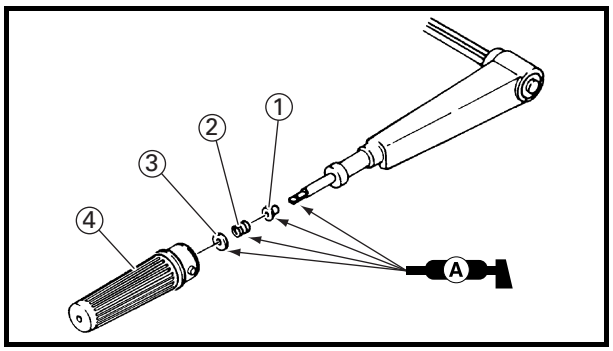
1. Install:
   - Steering handle 1 ①
   - Throttle lever ②
   - Throttle friction ③



2. Connect:
   - Throttle cable ① (loose cable side)
   - Throttle cable ② (tight cable side)

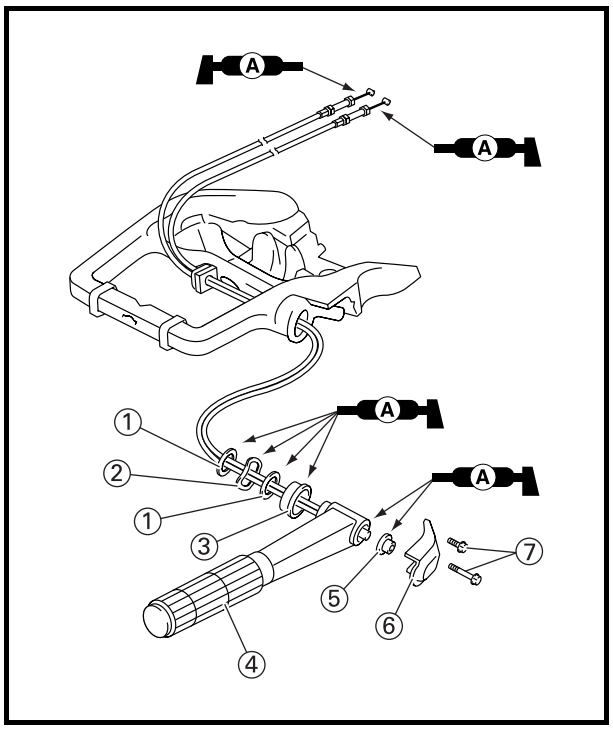
NOTE:

- Connect the inner cable end in the groove, and fit the outer cable end into the hole.
- Apply Yamaha grease A (water resistant grease) to the throttle lever and throttle cable.



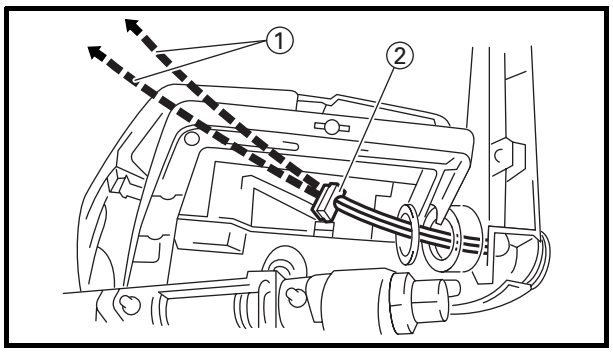
3. Install:
   - Bushing ①
   - Compression spring ②
   - Washer ③
   - Handle ④

NOTE:
- Align the throttle lever shaft end with the hole in the handle.
- After installing steering handle, make sure the movement of throttle cables by moving it.



4. Install:
   - Plain washer ①
   - Wave washer ②
   - Collar ③
   - Steering handle ④
   - Collar ⑤
   - Steering handle cover ⑥
   - Bolt ⑦

NOTE:
Apply Yamaha grease A (water resistant grease) to the throttle cables, washers and the steering handle crown.

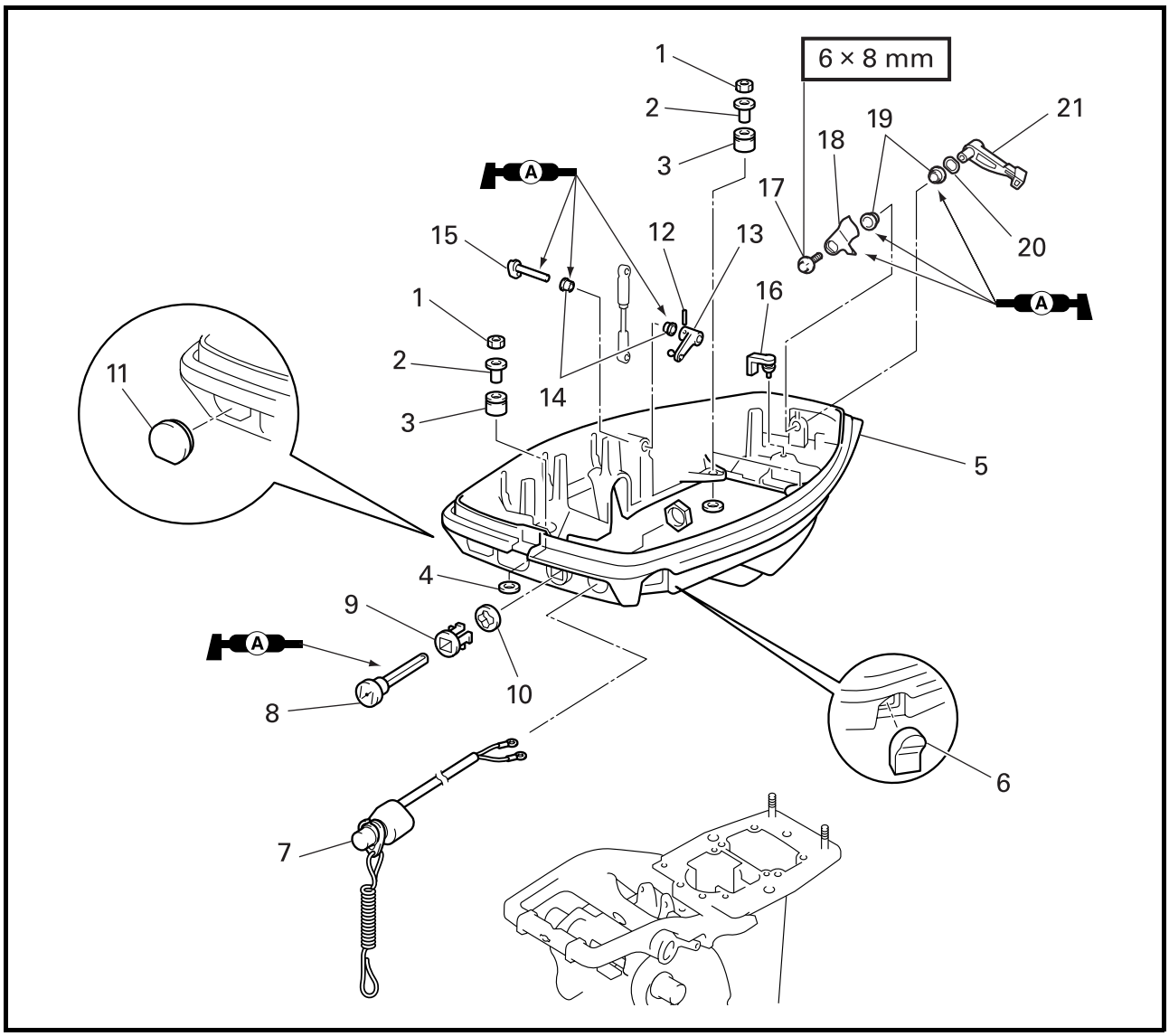


5. Install:
   - Throttle cables ①
     (through bottom cowling)
   - Grommet ②

NOTE:
Pass the throttle cables through the steering handle on the steering bracket. Be sure the throttle cable is routed correctly.

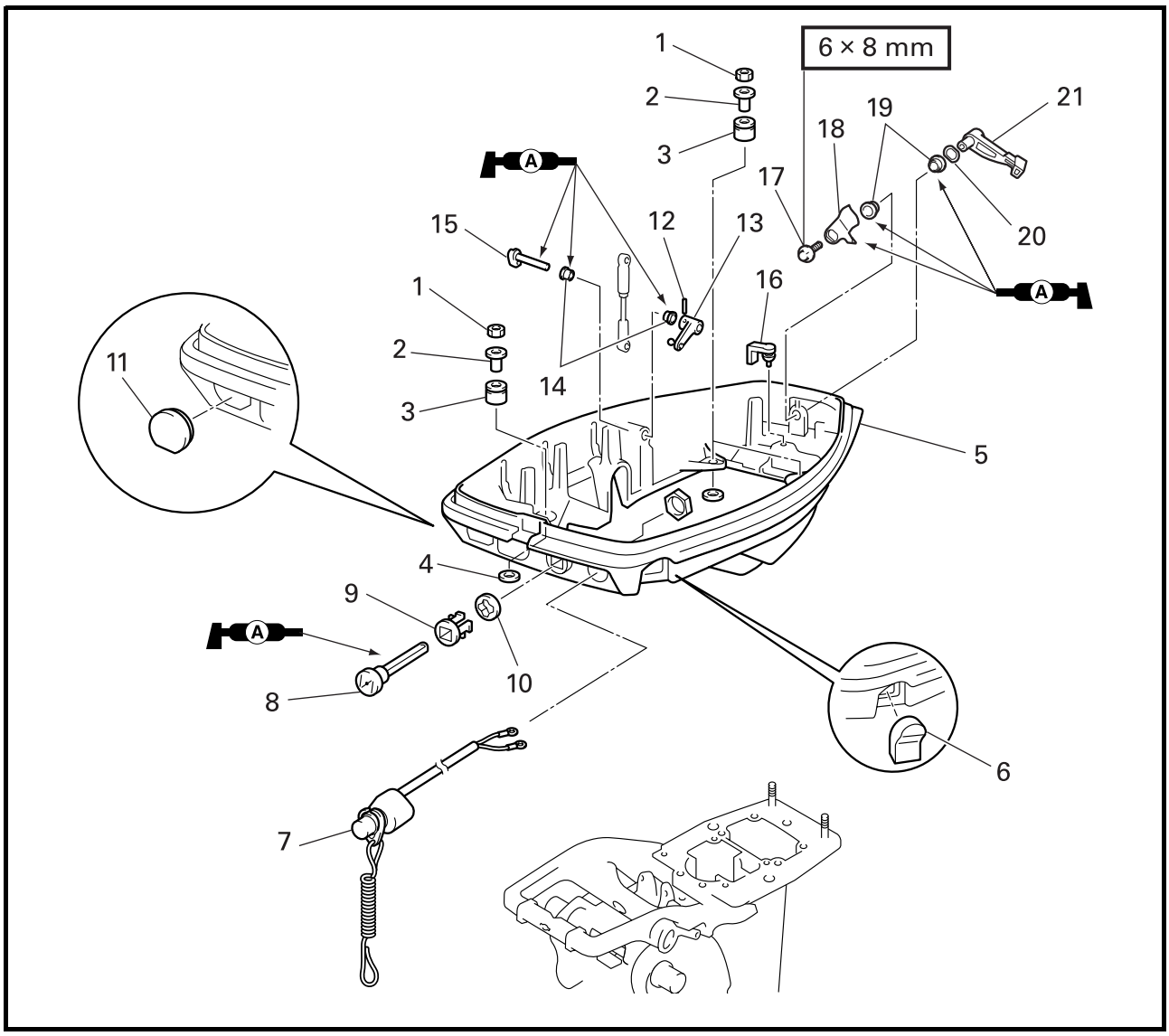
BOTTOM COWLING

REMOVING THE BOTTOM COWLING

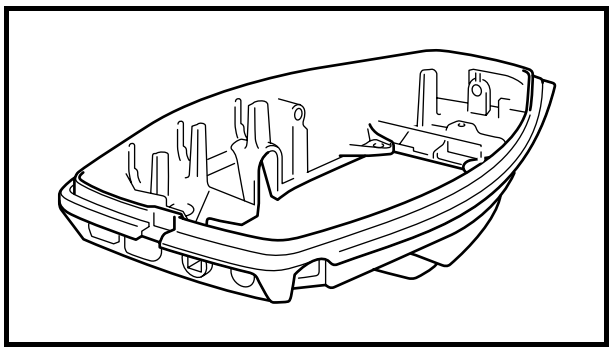


Step	Job/Part	Q'ty	Remarks
1	Nut	4	
2	Collar	4	
3	Grommet	4	
4	Washer	4	
5	Bottom cowling	1	
6	Grommet	1	
7	Engine stop switch	1	
8	Choke knob	1	
9	Grommet	1	
10	Grommet	1	
11	Grommet	1	
12	Spring pin	1	
13	Throttle lever	1	

Continued on next page.

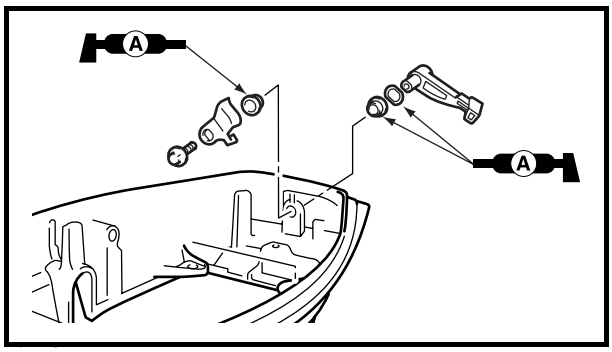


Step	Job/Part	Q'ty	Remarks
14	Bushing	2	
15	Throttle control shaft	1	
16	Friction spacer	1	
17	Bolt (with washer)	1	
18	Clamp lever 2	1	
19	Bushing	2	
20	Wave washer	1	
21	Clamp lever 1	1	



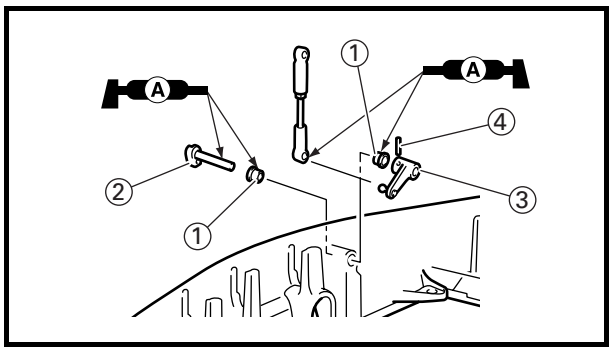
CHECKING THE BOTTOM COWLING

1. Check:
   - Bottom cowling
     Crack/damage → Replace.



2. Check:
   - Clamp lever
     Wear/damage → Replace.

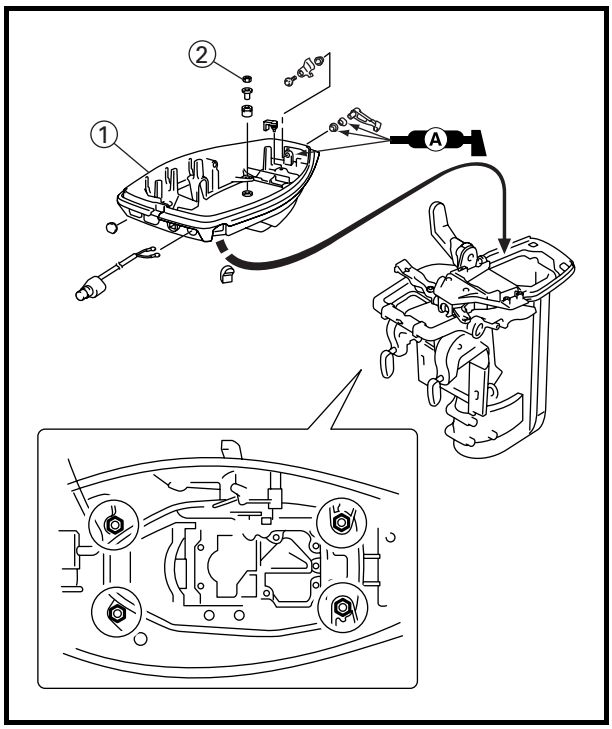
NOTE:
Apply Yamaha grease A (water resistant grease) or replace parts as required.



INSTALLING THE BOTTOM COWLING

1. Install:
   - Bushing ①
   - Throttle control shaft ②
   - Throttle lever ③
   - Spring pin ④

NOTE:
Always use the new spring pin.

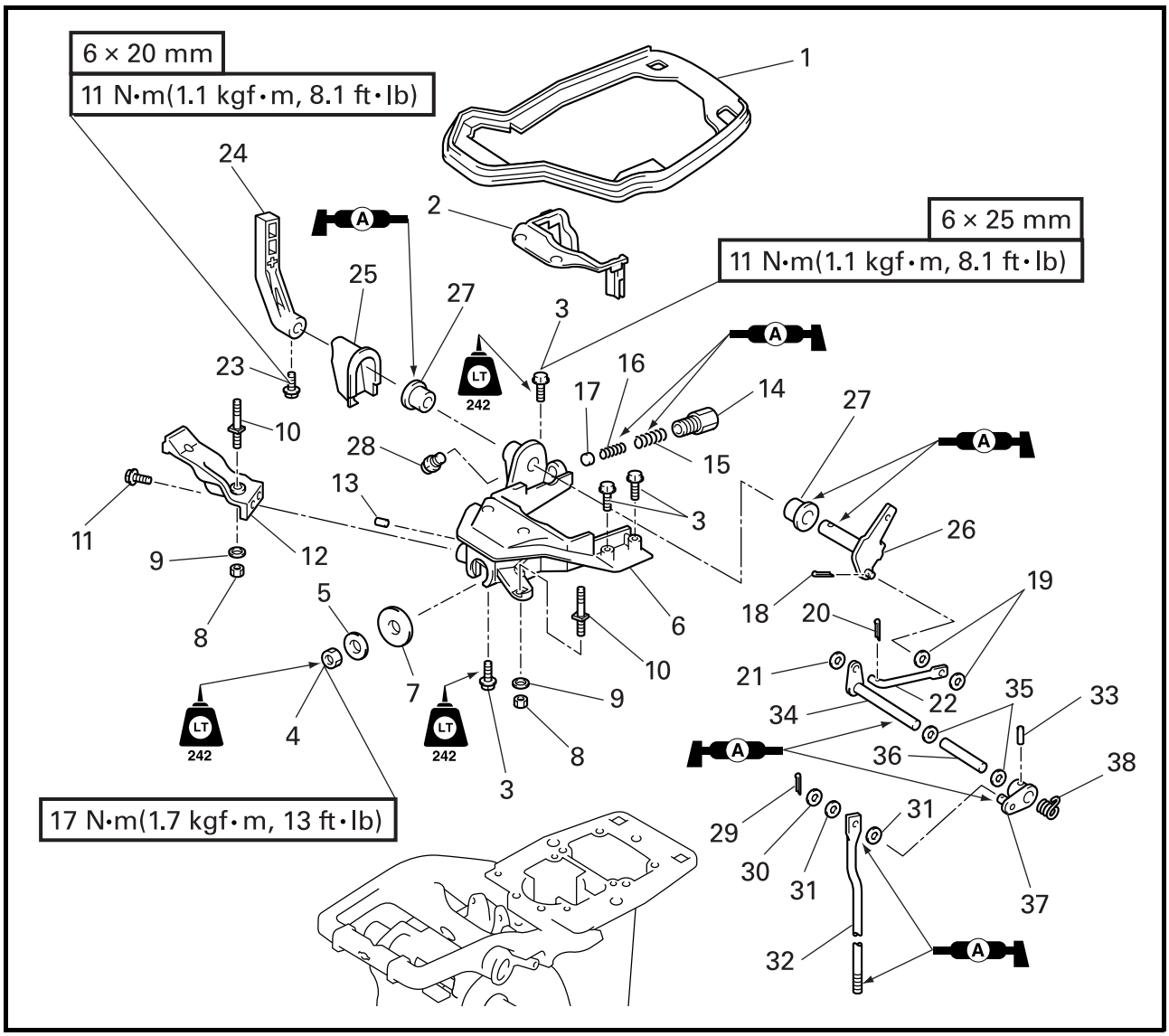


2. Install:
   - Bottom cowling ①
   - Nuts ②

NOTE:
Apply Yamaha grease A (water resistant grease) to the clamp lever shaft.

SHIFT ACTUATOR

DISASSEMBLING THE SHIFT ACTUATOR



Step	Job/Part	Q'ty	Remarks
1	Rubber seal	1	
2	Rubber seal 2	1	
3	Bolt (with washer)	4	
4	Nut	1	
5	Washer	1	
6	Bracket	1	
7	Gasket	1	
8	Nut	2	
9	Washer	2	
10	Bolt	2	
11	Bolt (with washer)	1	
12	Bracket	1	
13	Dowel pin	1	

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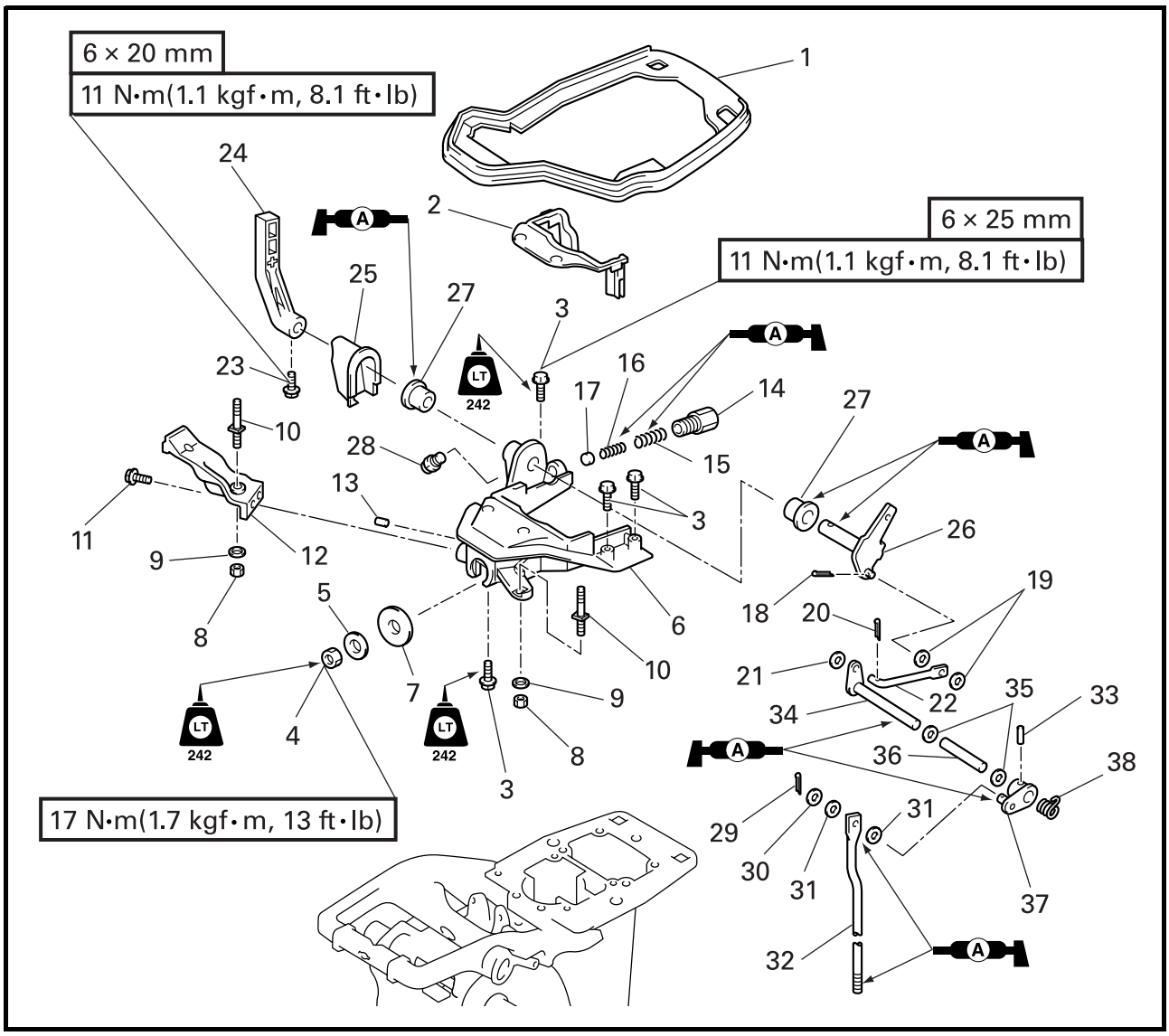

Step	Job/Part	Q'ty	Remarks
14	Bushing 2	1	
15	Compression spring	1	
16	Compression spring	1	
17	Shift cam plunger	1	
18	Cotter pin	1	**Not reusable**
19	Washer	2	
20	Cotter pin	1	**Not reusable**
21	Washer	1	
22	Joint	1	
23	Bolt	1	
24	Shift lever	1	
25	Grommet	1	
26	Cam plate	1	

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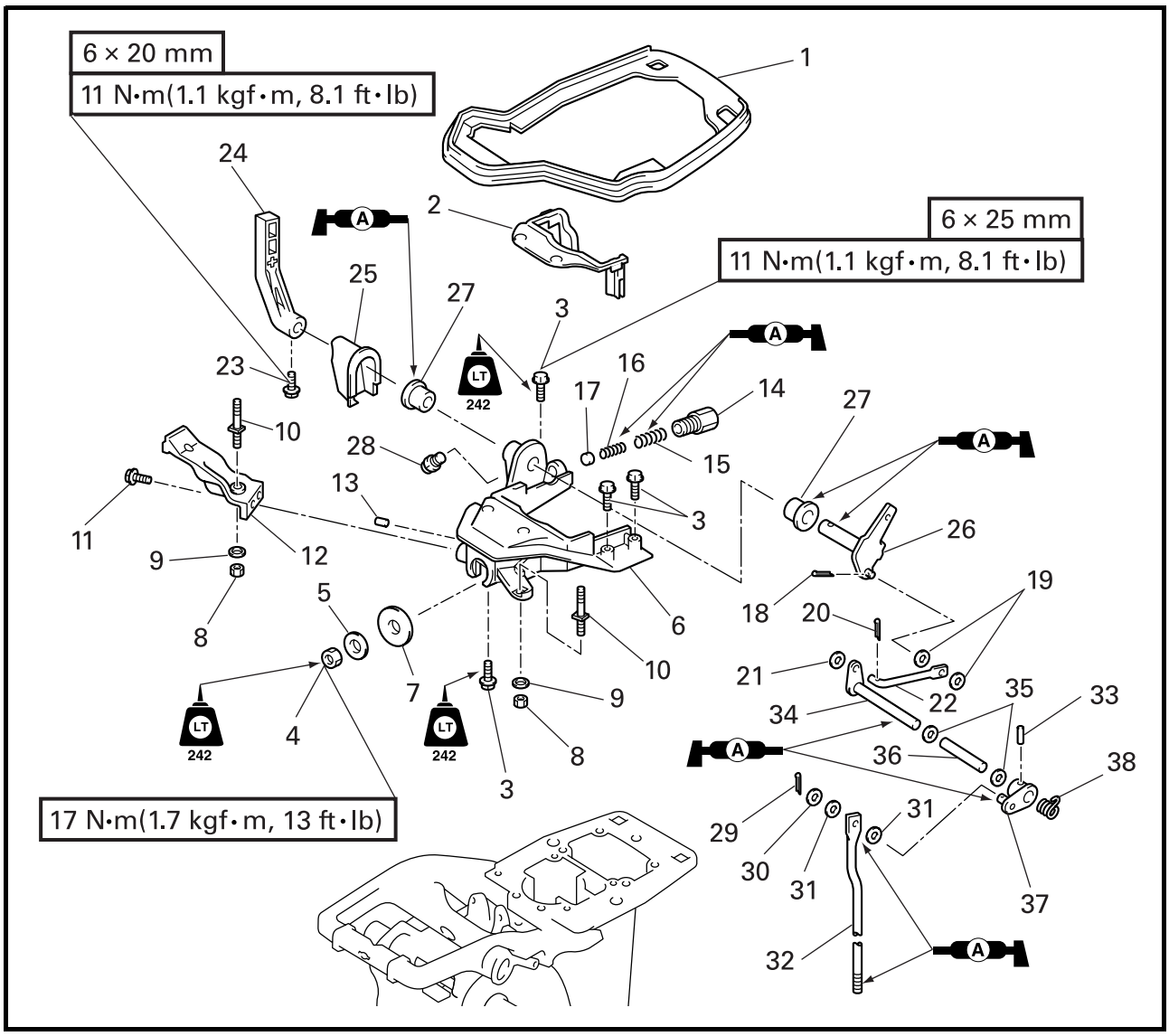
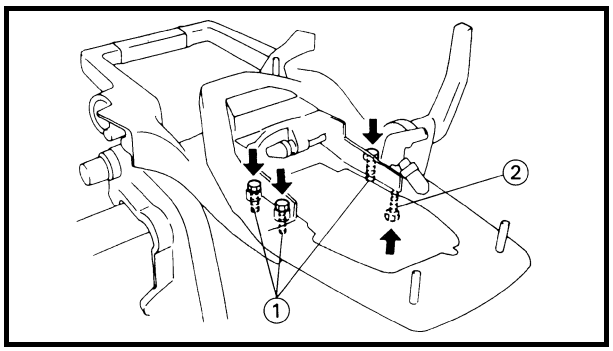


Step	Job/Part	Q'ty	Remarks
27	Bushing	2	
28	Grease nipple	1	
29	Cotter pin	1	**Not reusable**
30	Washer	1	
31	Plate washer	2	
32	Shift rod 1	1	
33	Spring pin	1	**Not reusable**
34	Shift rod lever	1	
35	Plate washer	2	
36	Collar	1	
37	Shift rod	1	
38	Torsion spring	1	



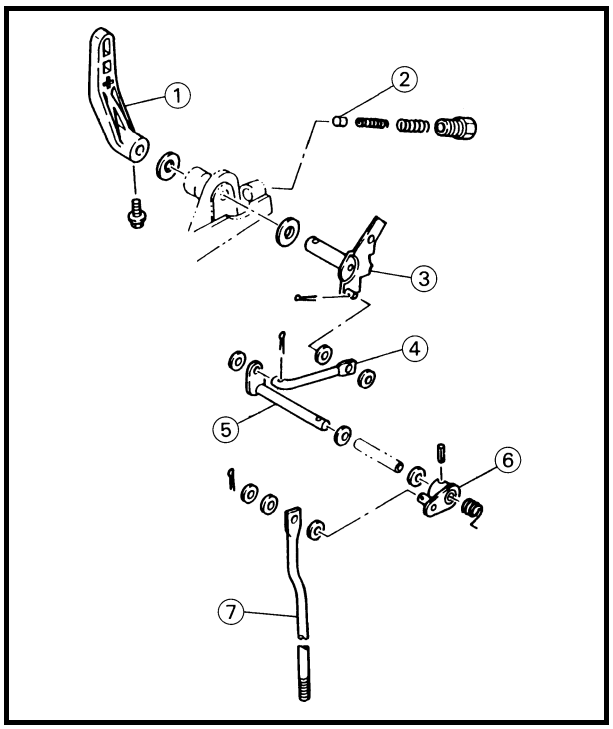
REMOVING THE BRACKET

Remove

- Bolts ① (upper side)
- Bolt ② (under side)

NOTE:

The bolt ② (under side) must be removed from the bottom side of the upper case.



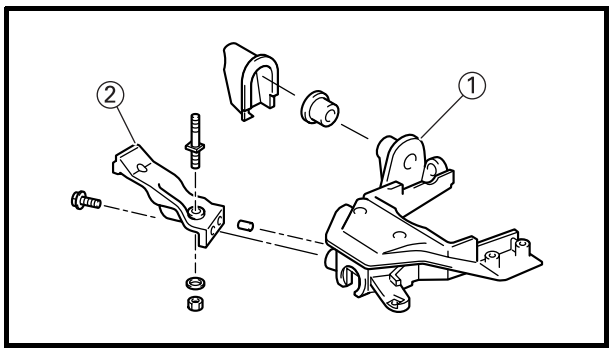
CHECKING THE SHIFT ACTUATOR

1. Check:
   - Shift lever ①
   - Shift cam plunger ②
   - Cam plate ③
   - Joint ④
   - Shift rod lever ⑤
   - Shift rod ⑥
   - Shift rod 1 ⑦

     Wear/damage → Replace.

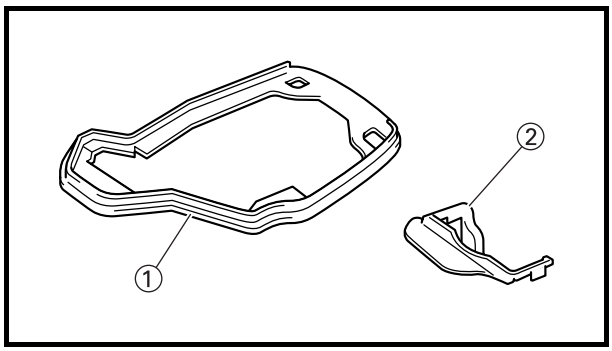
NOTE:

Apply Yamaha grease A (water resistant grease) or replace parts as required.



2. Check:
   - Bracket ①
   - Bracket ② (remote control attachment)

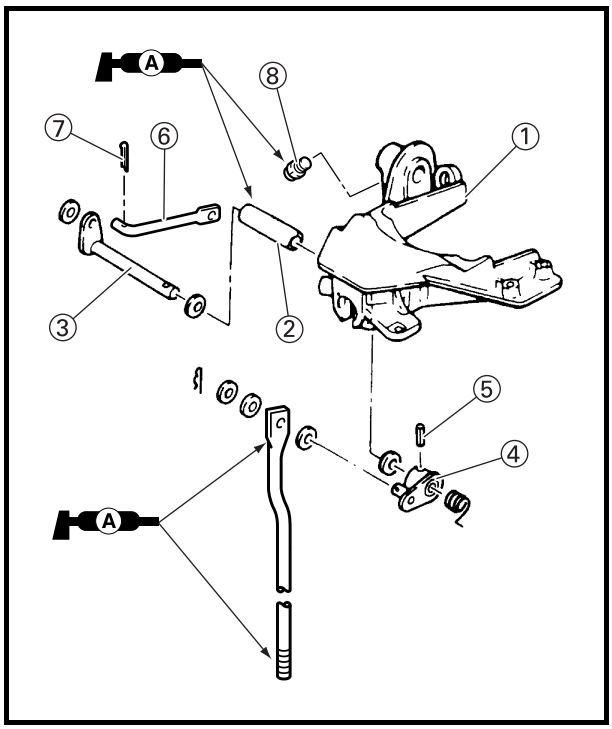
     Crack/damage → Replace.



3. Check:
   - Rubber seal ①
   - Rubber seal ②

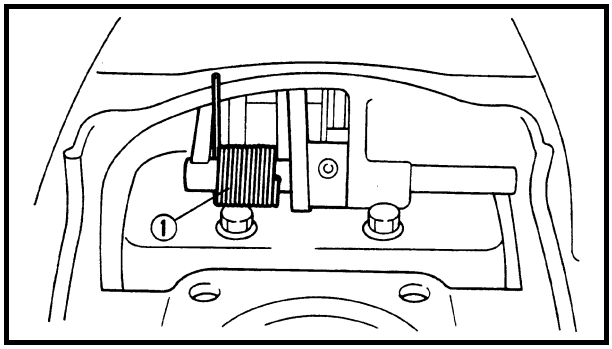
   Crack/damage → Replace.

ASSEMBLING THE SHIFT ACTUATOR



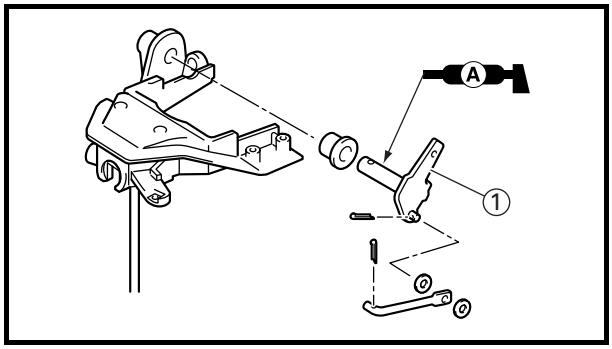
1. Install:
   - Bracket ①
   - Collar ②
   - Shift rod lever ③
   - Shift rod ④
   - Spring pin ⑤
   - Joint ⑥
   - Cotter pin ⑦
   - Grease nipple ⑧

NOTE:
- Always use the new spring pin and the cotter pin.
- Apply Yamaha grease A (water resistant grease) to the collar inner surface, grease nipple and shift rod 1.



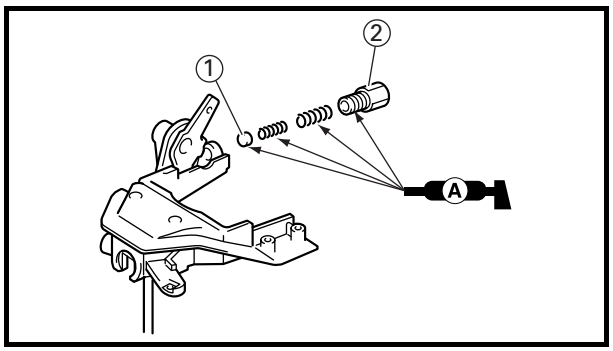
2. Hook:
   - Torsion spring ①

NOTE:
Hook it onto the shift rod lever and the bracket.



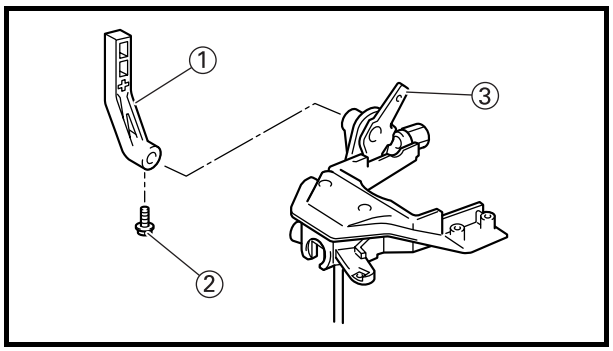
3. Install:
   - Cam plate ①

NOTE:
Apply Yamaha grease A (water resistant grease) to the cam plate shaft.



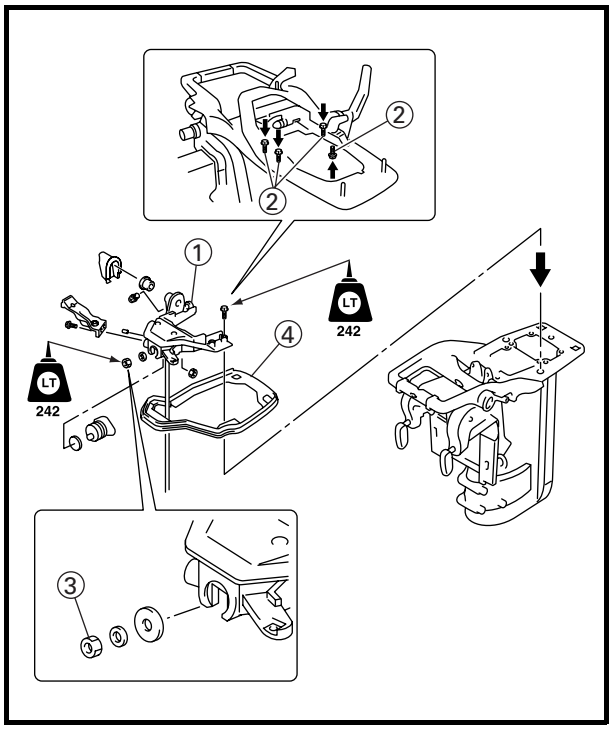
4. Install:
   - Shift cam plunger ①
   - Compression spring
   - Bushing ②

NOTE:
Apply Yamaha grease A (water resistant grease) to the shift cam plunger.



5. Install:
   - Shift lever ①
   - Bolt ②
   - Arm ③

	Bolt ② **11 N•m (1.1 kgf•m, 8.1 ft•lb)**

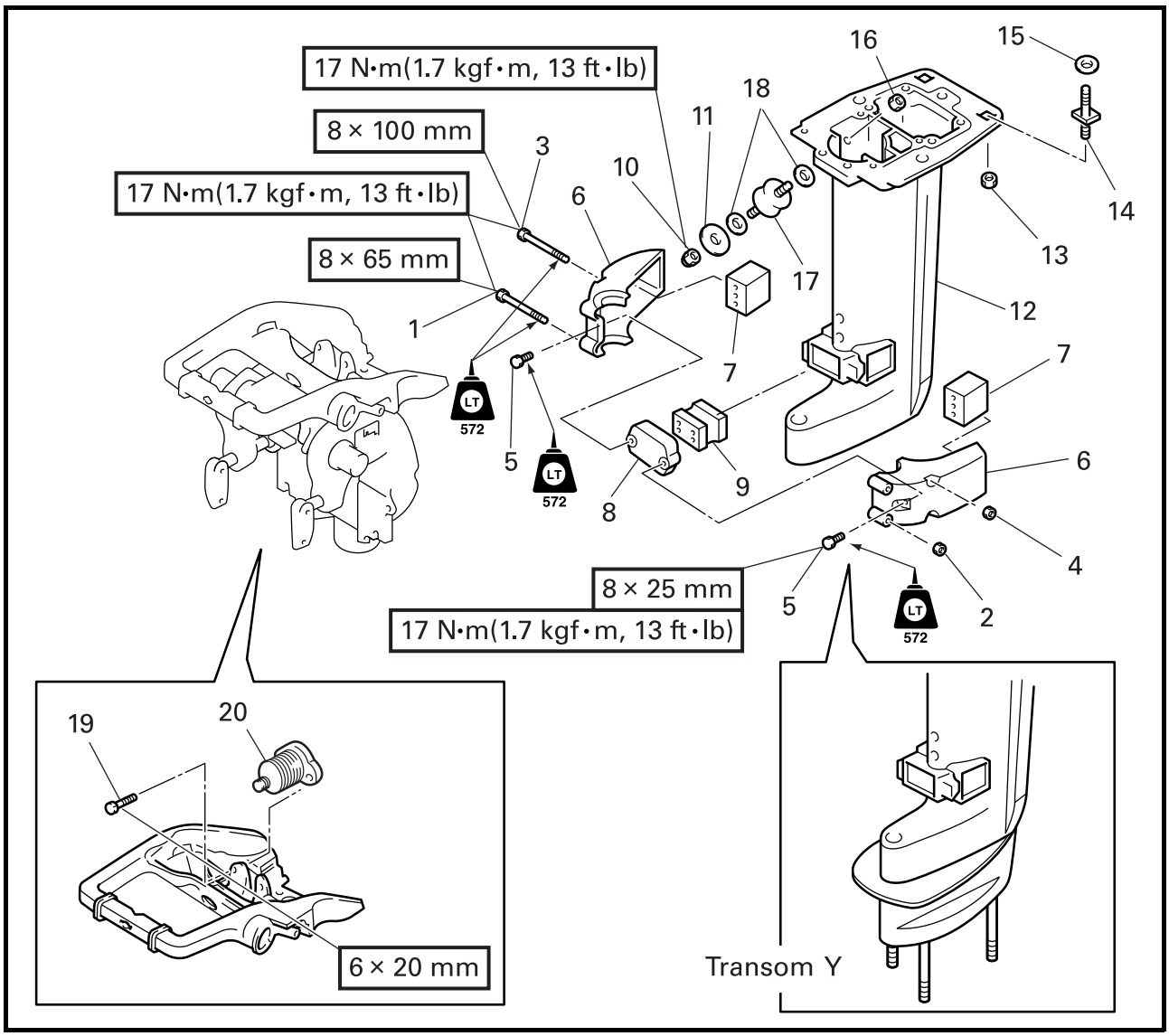


6. Install:
   - Bracket ① (to upper casing)
   - Bolts ②
   - Nut ③ (mount rubber front upper)
   - Rubber seal ④ (over the bracket)

	Bolt ② **11 N•m (1.1 kgf•m, 8.1 ft•lb)** **Nut ③** **17 N•m (1.7 kgf•m, 13 ft•lb)**

UPPER CASE

REMOVING THE UPPER CASE



Step	Job/Part	Q'ty	Remarks
1	Bolt (with washer)	2	
2	Nut	2	
3	Bolt (with washer)	2	
4	Nut	2	
5	Bolt (with washer)	2	
6	Lower mount rubber housing	2	
7	Mount rubber (side lower)	2	
8	Lower mount cover	1	
9	Mount rubber (front lower)	1	
10	Nut	2	
11	Washer	2	
12	Upper case	1	
13	Nut	2	

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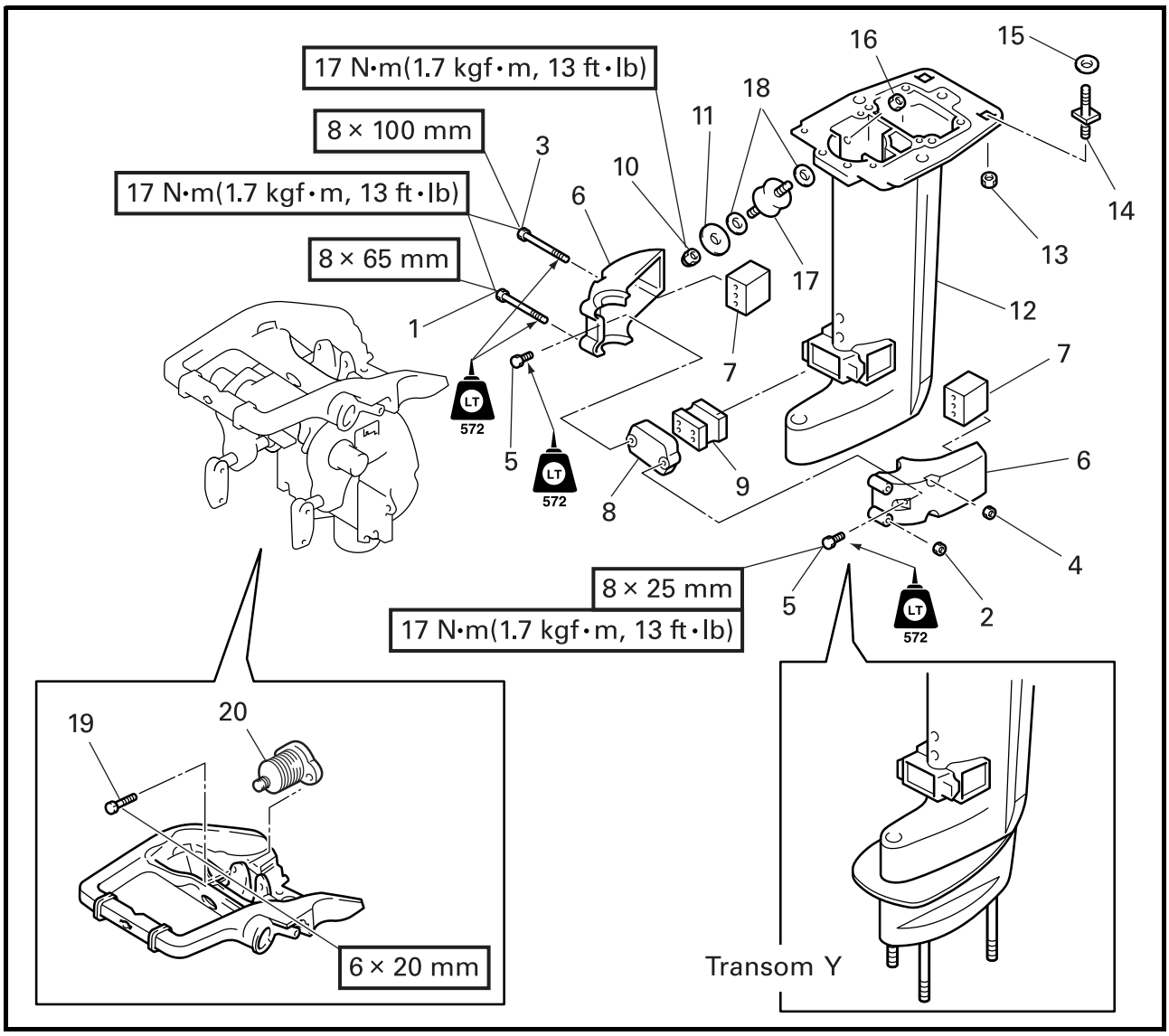
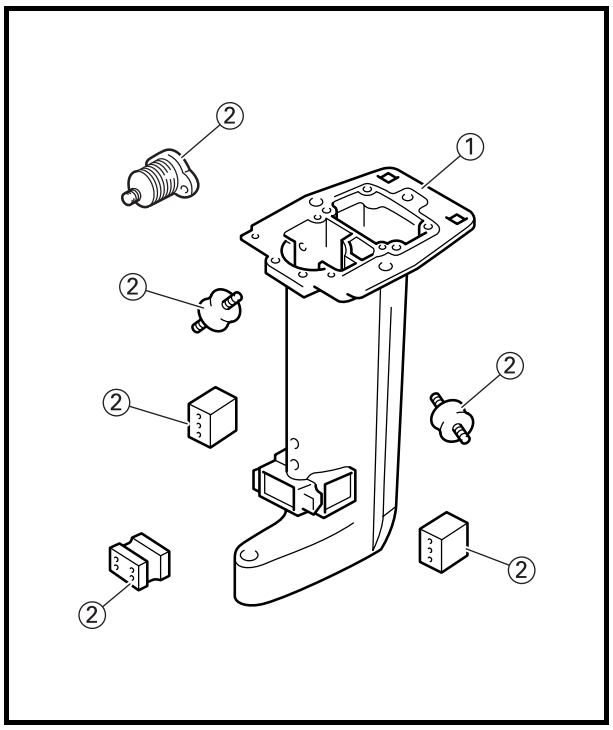


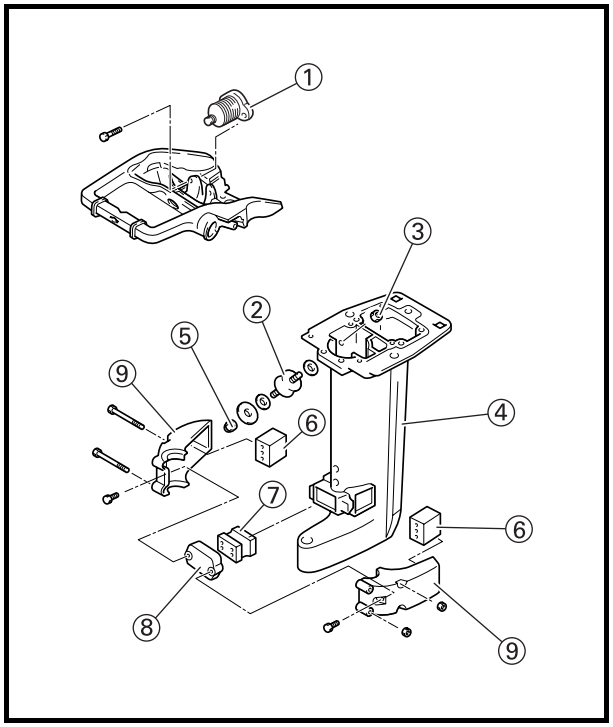
Step	Job/Part	Q'ty	Remarks
14	Bolt	2	
15	Washer	2	
16	Nut	2	
17	Mount rubber (side upper)	2	
18	Gasket	4	
19	Bolt (with washer)	2	
20	Mount rubber (front upper)	1	



CHECKING THE UPPER CASE

Check:

- Upper case ①
  Crack/damage → Replace.
- Mount rubber ②
  Wear/crack/damage → Replace.

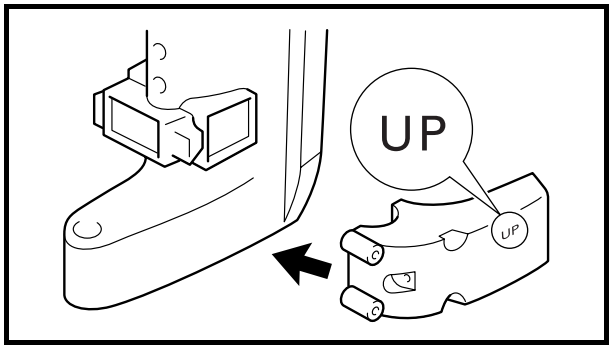


INSTALLING THE UPPER CASE

Install:

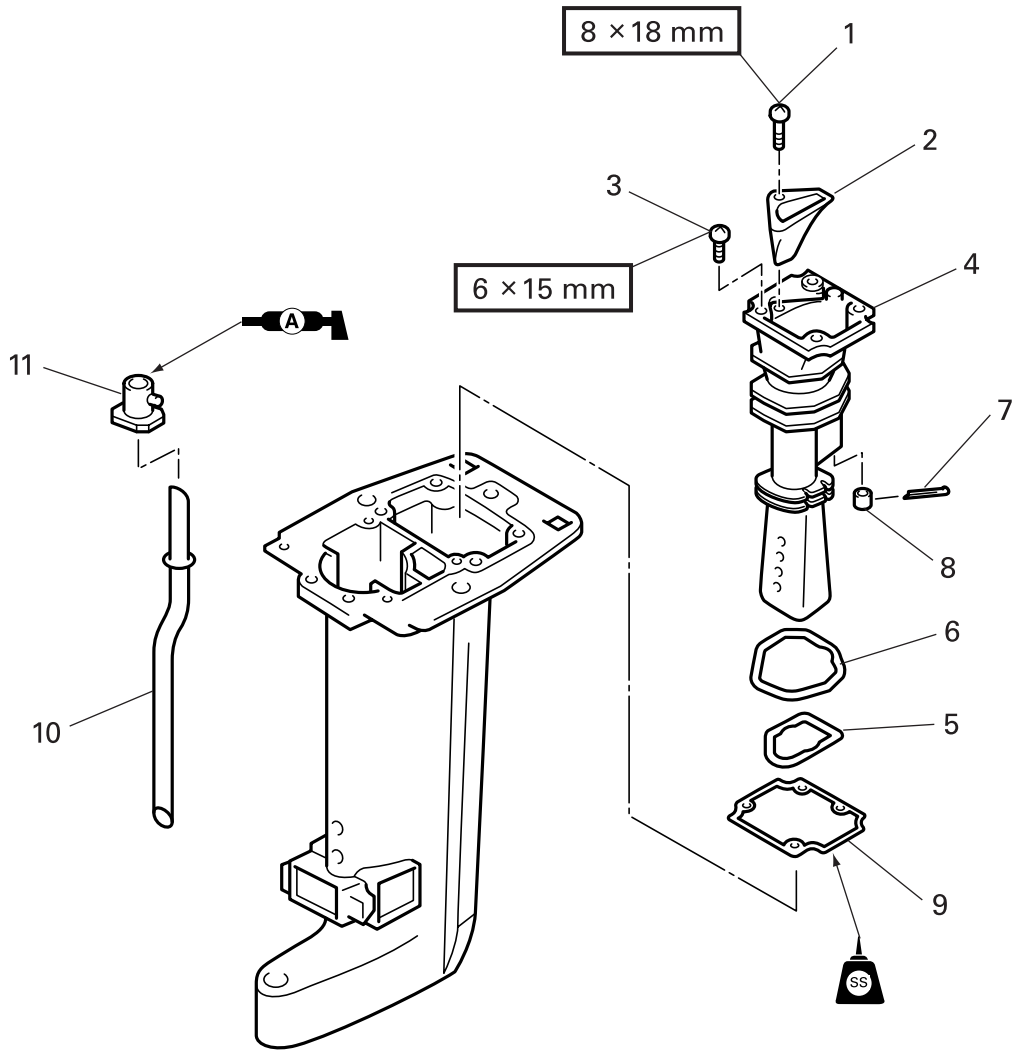
- Mount rubber ① (front upper)
- Mount rubber ②
  (side upper) – with gaskets
- Nut ③
- Upper case ④ (to swivel bracket)
- Nut ⑤ (side upper)
- Mount rubber ⑥ (side lower)
- Mount rubber ⑦ (front lower)
- Lower mount cover ⑧
- Lower mount rubber housing ⑨

Nut ⑤
17 N•m (1.7 kgf•m, 13 ft•lb)
Bolt
(lower mount rubber housing ⑨)
17 N•m (1.7 kgf•m, 13 ft•lb)

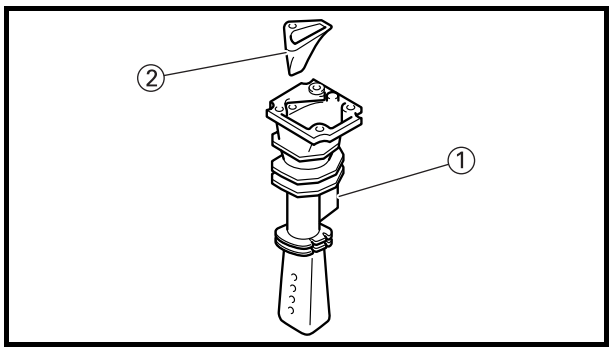


NOTE:
Make sure the lower mount rubber housing is installed with the "UP" mark pointing upward.

DISASSEMBLING THE UPPER CASE



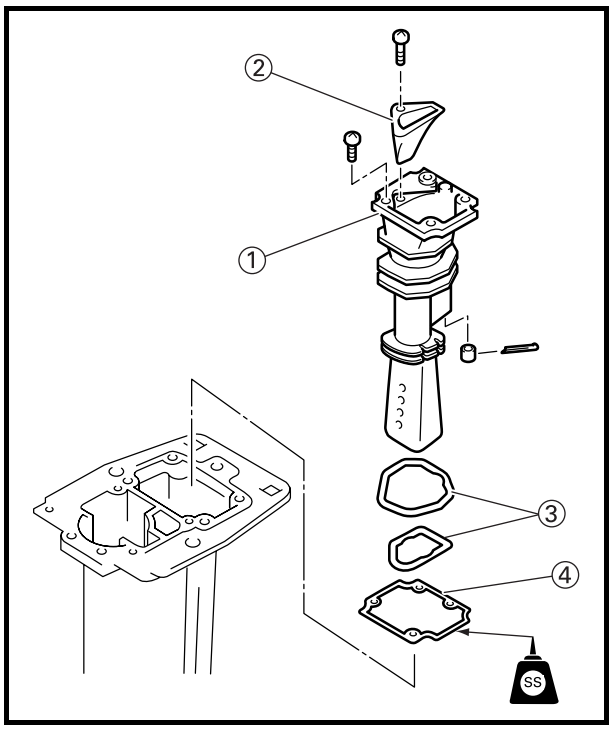
Step	Job/Part	Q'ty	Remarks
1	Bolt	1	
2	Exhaust guide	1	
3	Bolt	4	
4	Exhaust manifold	1	
5	Exhaust seal 2	1	**Not reusable**
6	Exhaust seal 1	1	**Not reusable**
7	Cotter pin	1	**Not reusable**
8	Gasket	1	
9	Gasket	1	**Not reusable**
10	Water tube	1	
11	Water seal rubber	1	



CHECKING THE EXHAUST MANIFOLD

Check:

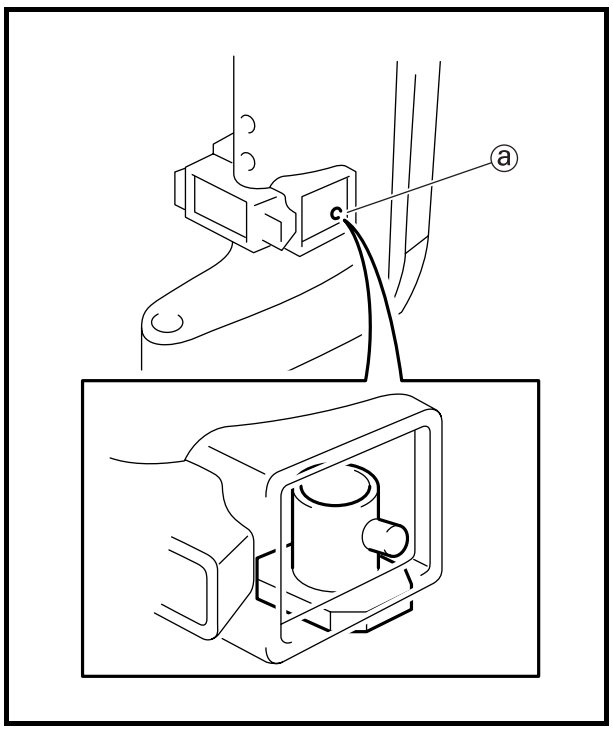
- Exhaust manifold ①
- Exhaust guide ②
  Carbon deposits → Clean.
  Crack/corrosion → Replace.



ASSEMBLING THE UPPER CASE

1. Install:
   - Exhaust manifold ①
   - Exhaust guide ②
   - Exhaust seals ③
   - Gasket ④

NOTE:
Always use new gaskets and exhaust seals. If old ones are used, gas leakage may result due to invisible scratches or stretches.

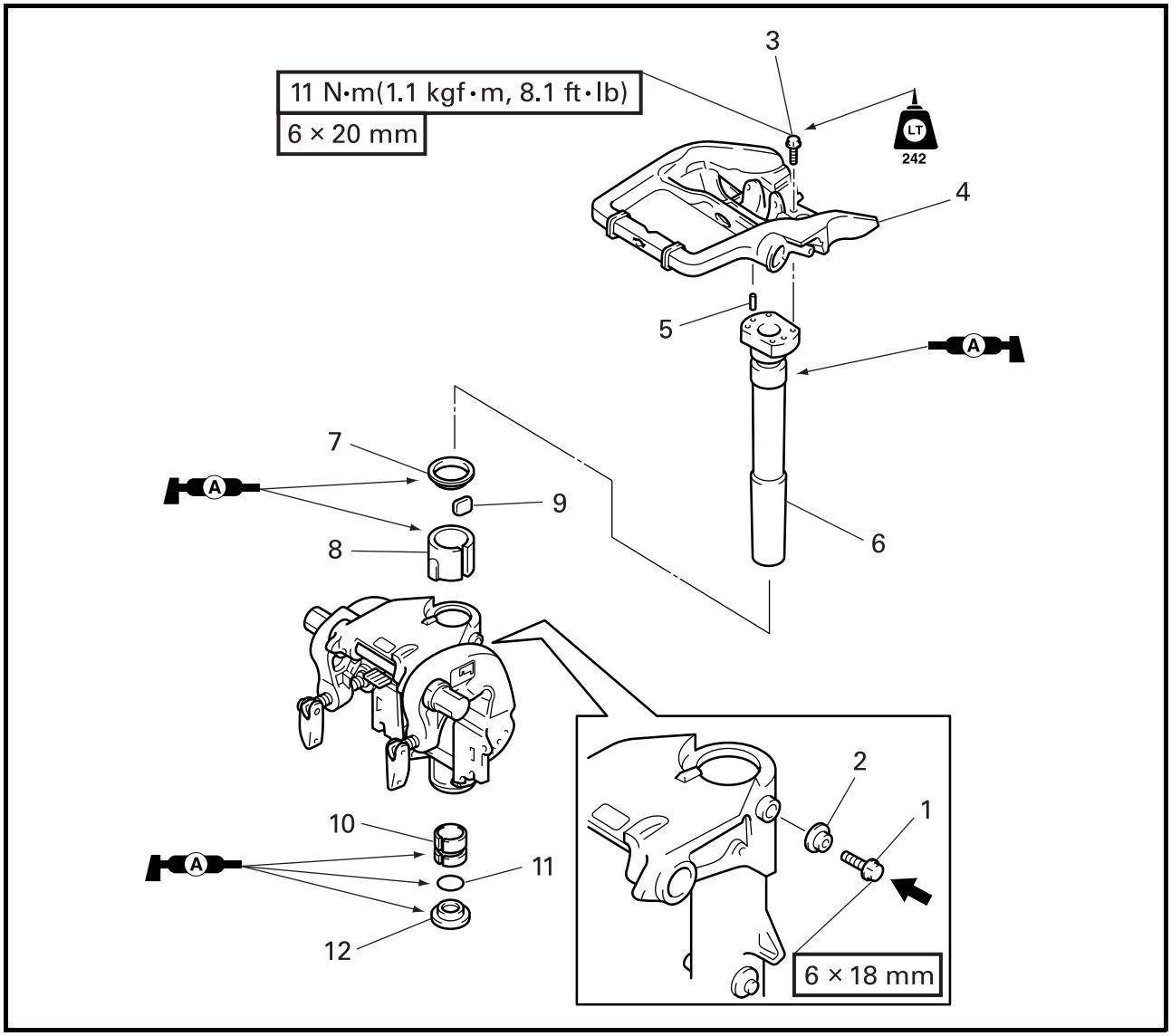


2. Install:
   - Water seal rubber
   - Water tube

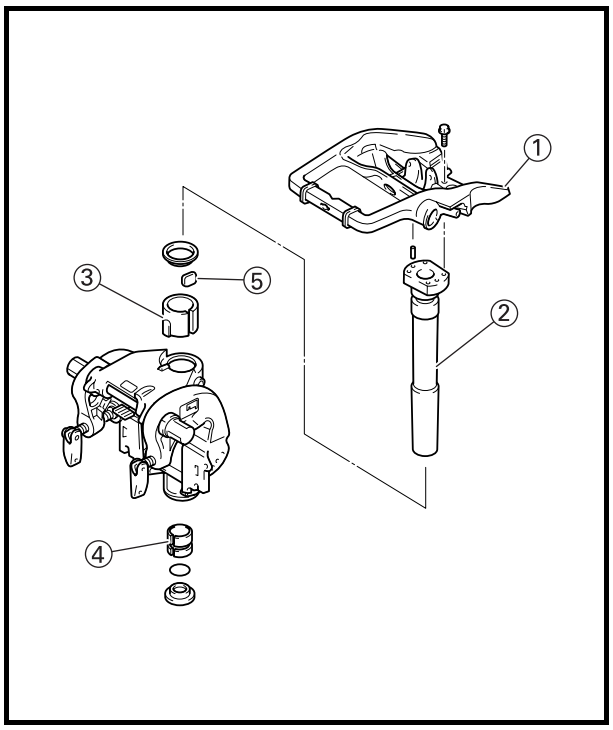
NOTE:
Install the water seal rubber so that it aligns with the locating hole ⓐ in the upper case.

STEERING ARM

REMOVING THE STEERING ARM

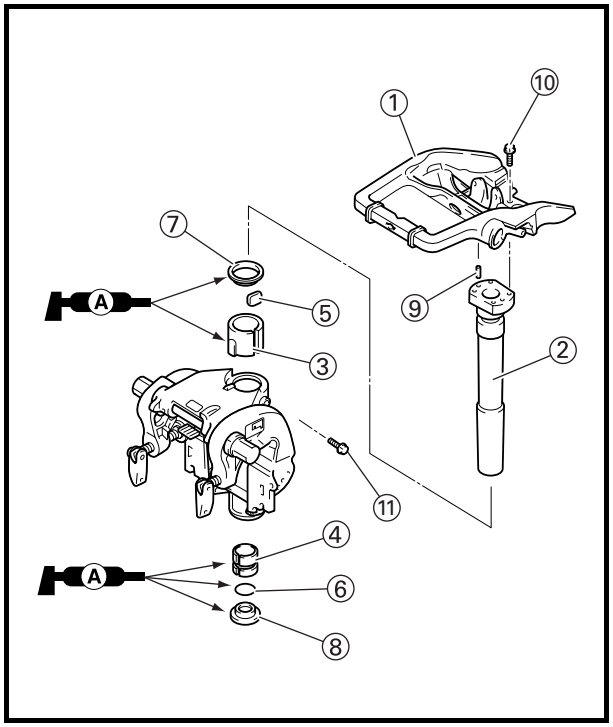


Step	Job/Part	Q'ty	Remarks
1	Bolt	1	
2	Seal rubber	1	
3	Bolt	4	
4	Bracket	1	
5	Dowel pin	2	
6	Steering pivot shaft	1	
7	Washer	1	
8	Bushing	1	
9	Friction piece	1	
10	Bushing	1	
11	O-ring	1	**Not reusable**
12	Bushing	1	



CHECKING THE STEERING ARM

1. Check:
   - Bracket ①
   - Steering pivot shaft ②
     Crack/damage → Replace.
2. Check:
   - Bushing ③
   - Bushing ④
   - Friction piece ⑤
     Wear/damage → Replace.



INSTALLING THE STEERING ARM

Install:

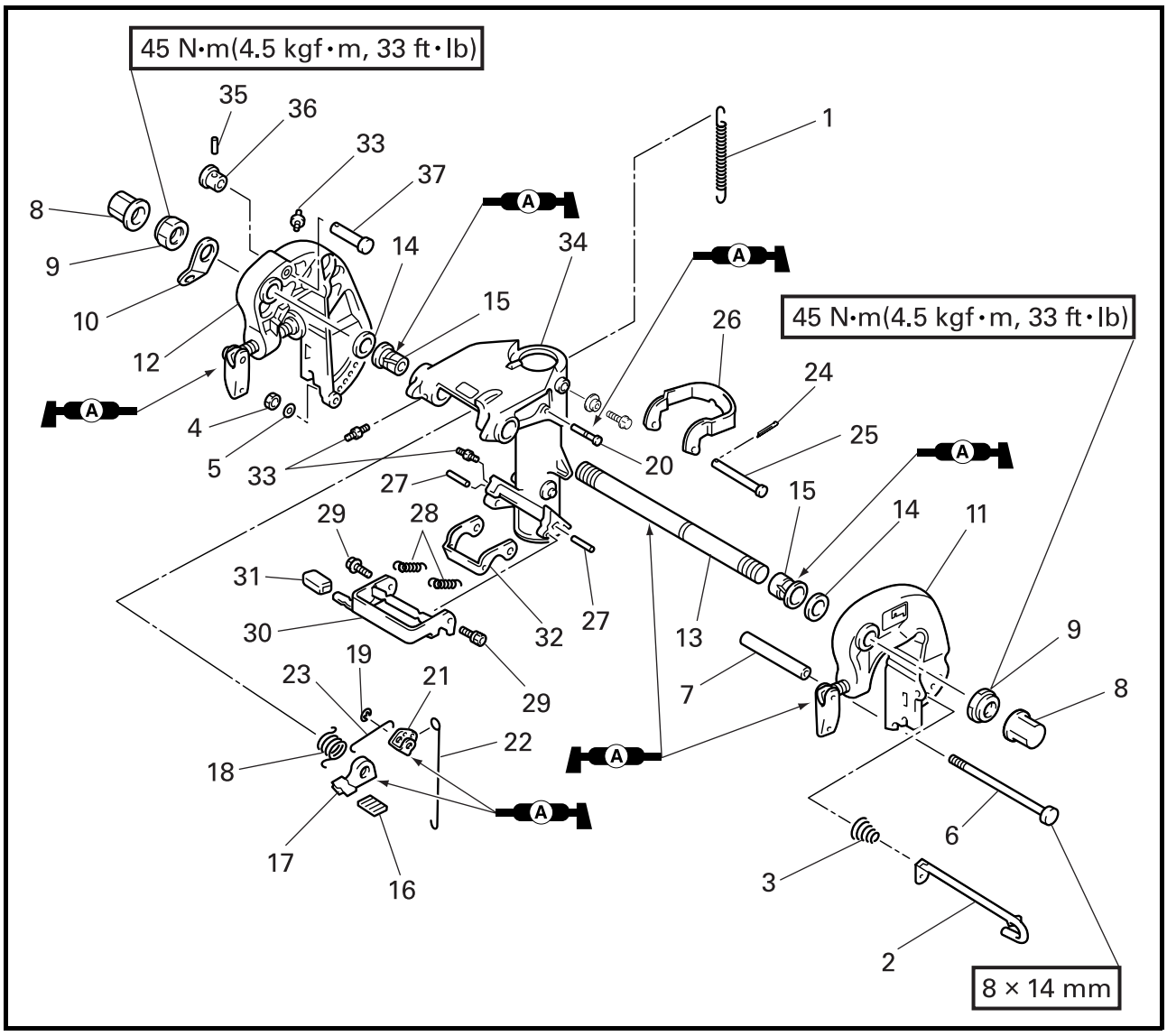
- Bracket ①
- Steering pivot shaft ②
- Bushing ③
- Bushing ④
- Friction piece ⑤
- O-ring ⑥
- Washer ⑦
- Washer ⑧
- Dowel pin ⑨ (to pivot shaft)
- Bolt ⑩
- Bolt ⑪ (steering friction)

NOTE:

- Always use the new O-ring.
- Apply Yamaha grease A (water resistant grease) to the busing, O-ring and the grease nipples.
- After installing the steering bracket, make sure the movement of steering pivot shaft by moving it.

CLAMP BRACKETS

REMOVING THE CLAMP BRACKETS



Step	Job/Part	Q'ty	Remarks
1	Tension spring	1	
2	Tilt rod	1	
3	Conical spring	1	
4	Nut	1	
5	Washer	1	
6	Bolt	1	
7	Collar	1	
8	Clamp bracket cap	2	
9	Nut	2	
10	Clamp bracket plate	1	
11	Clamp bracket 1	1	
12	Clamp bracket 2	1	
13	Clamp bracket bolt	1	

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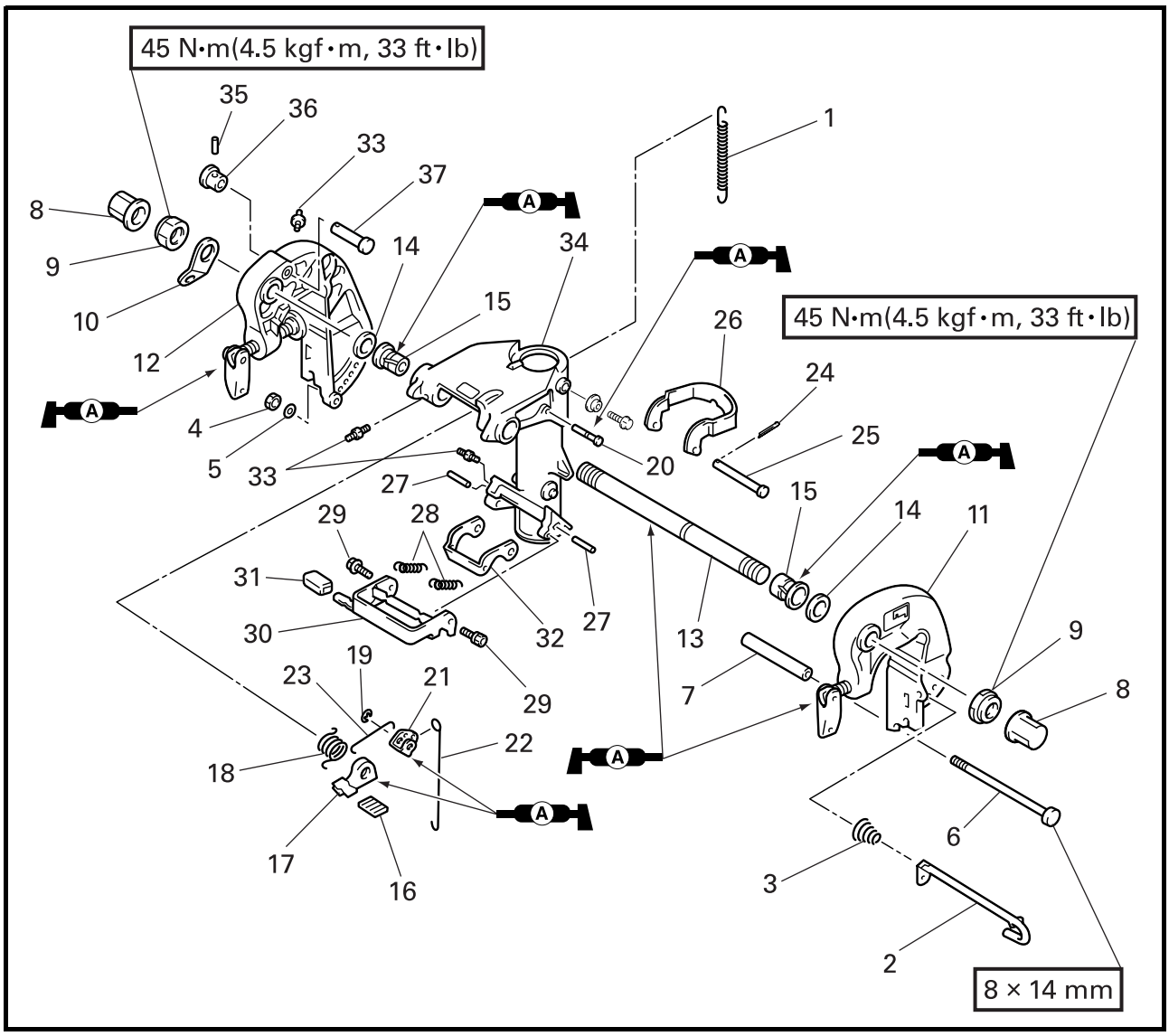

Step	Job/Part	Q'ty	Remarks
14	Washer	2	
15	Bushing	2	
16	Tilt lever cover	1	
17	Tilt lever	1	
18	Torsion spring	1	
19	Circlip	1	
20	Pin	1	
21	Spring return lever	1	
22	Tilt lock rod	1	
23	Tilt lock rod	1	
24	Cotter pin	1	
25	Pin	1	
26	Tilt lock plate (outer)	2	

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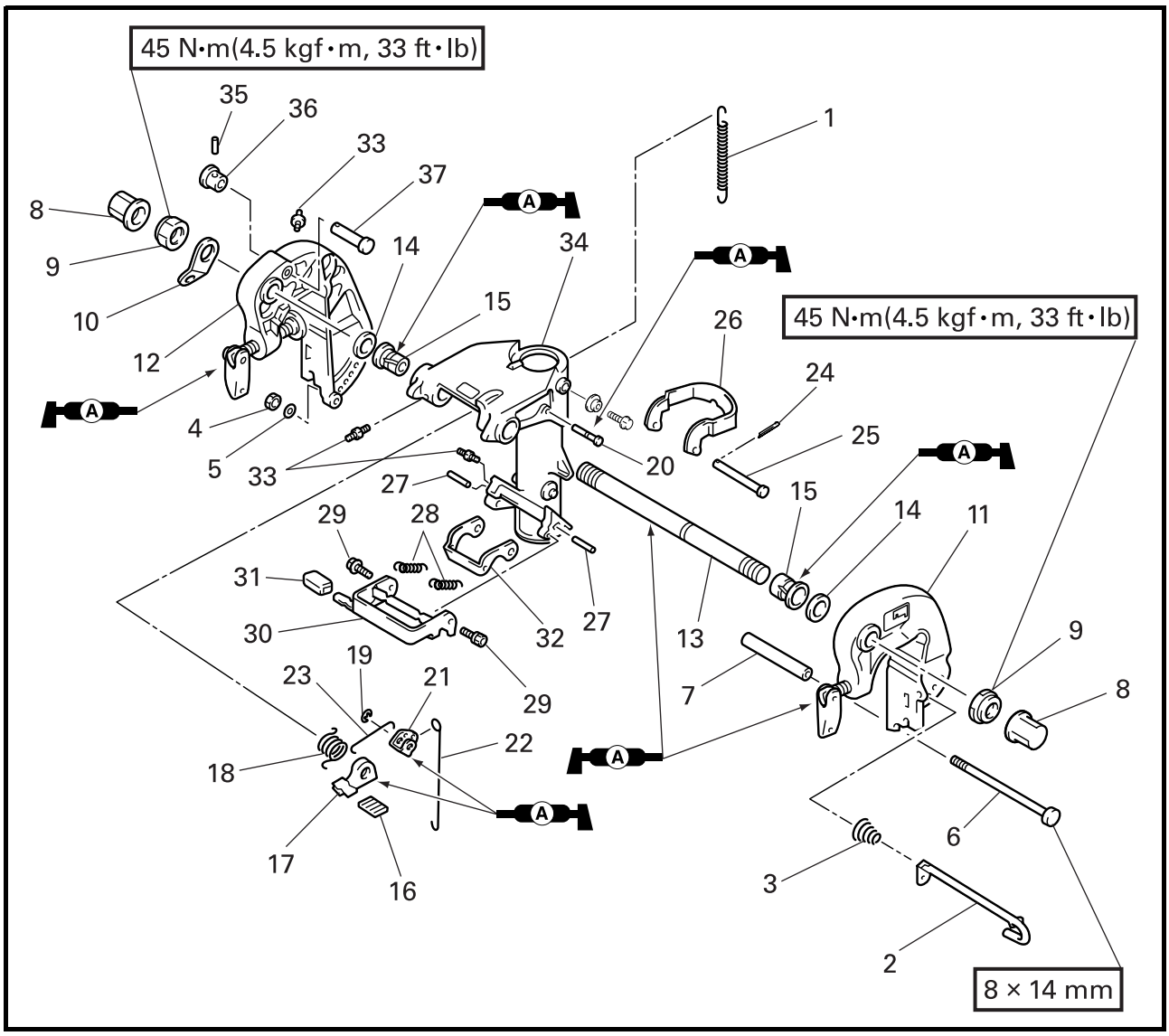
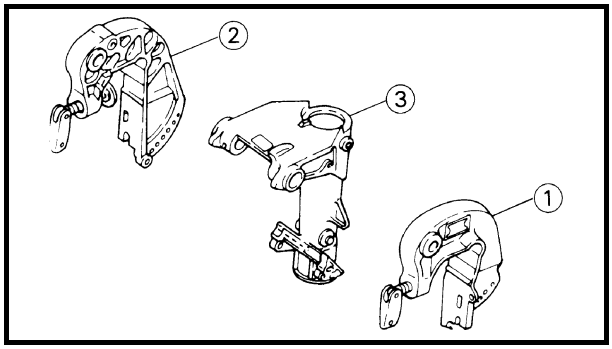
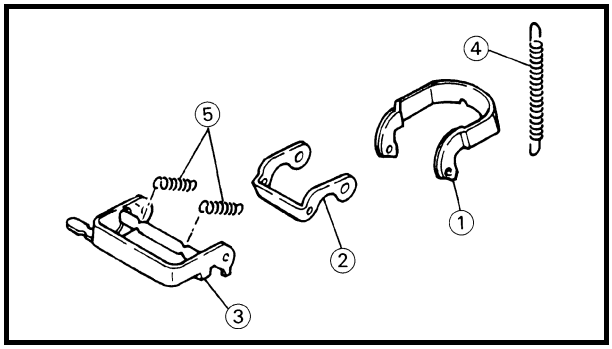


Step	Job/Part	Q'ty	Remarks
27	Pin	2	
28	Tension spring	2	
29	Bolt	2	
30	Shallow water lever	1	
31	Cover	1	
32	Tilt lock plate (inner)	1	
33	Grease nipple	4	
34	Swivel bracket	1	
35	Spring pin	1	
36	Stopper knob	1	
37	Stopper shaft	1	

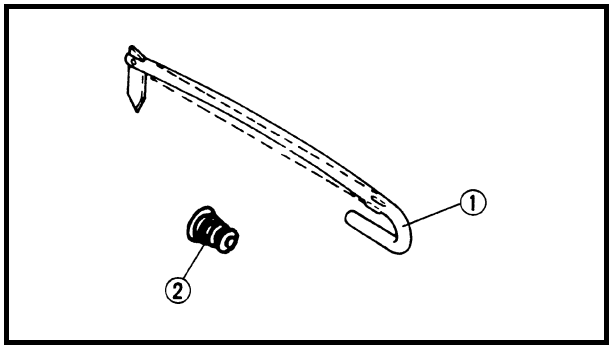


CHECKING THE CLAMP BRACKETS

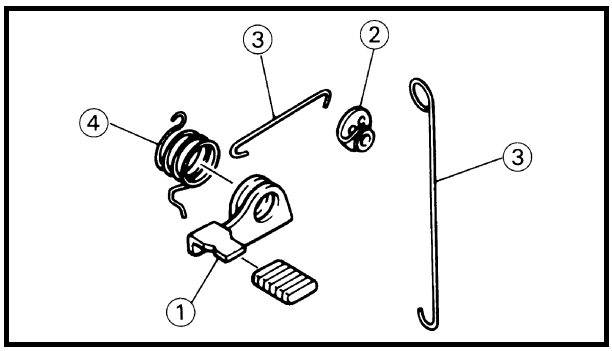
1. Check:
   - Clamp bracket ① (port side)
   - Clamp bracket ② (starboard side)
   - Swivel bracket ③
     Crack/damage → Replace.



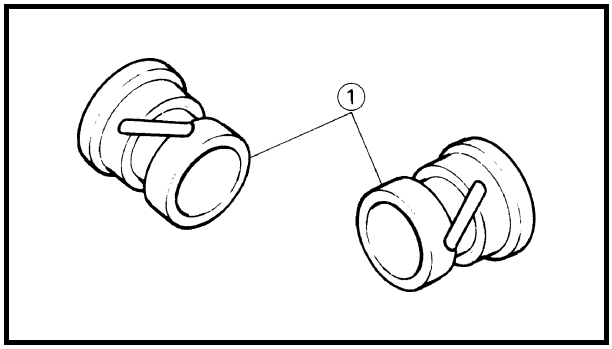
2. Check:
   - Tilt lock plate ① (outer)
   - Tilt lock plate ② (inner)
   - Shallow water lever ③
   - Tension spring ④
   - Tension springs ⑤
     Bent/crack/damage → Replace.



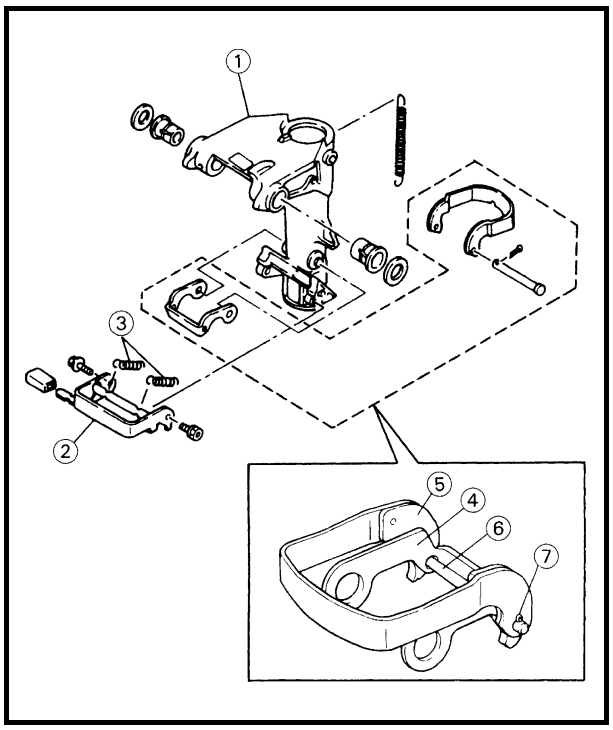
3. Check:
   - Tilt rod ①
     Bent/damage → Replace.
   - Conical spring ②
     Crack/damage → Replace.



4. Check:
   - Tilt lever 1 ①
   - Tilt lever 2 ②
   - Tilt lock rod ③
   - Torsion spring ④
     Crack/damage → Replace.



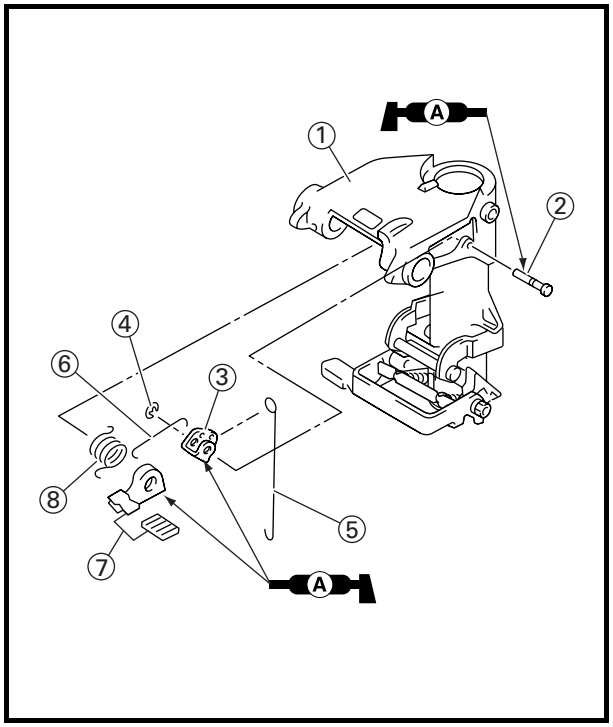
5. Check:
   - Bushing ①
     Wear/damage → Replace.



INSTALLING THE CLAMP BRACKETS

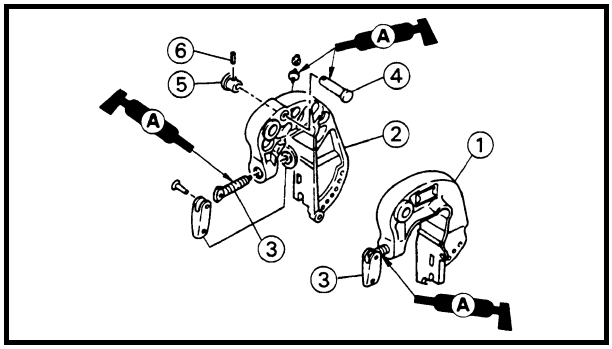
1. Install:
   - Swivel bracket ① (with bushings)
   - Shallow water lever ②
   - Tension springs ③
   - Tilt lock lever ④ (inner) – front side
   - Tilt lock lever ⑤ (outer) – rear side
   - Pin ⑥
   - Cotter pin ⑦

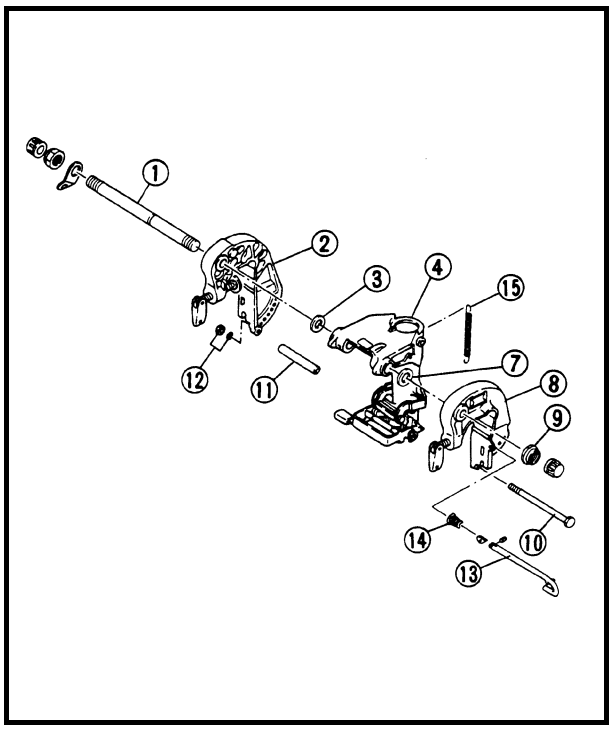
NOTE:
- Always use the new cotter pin.
- Apply grease to parts when specified.

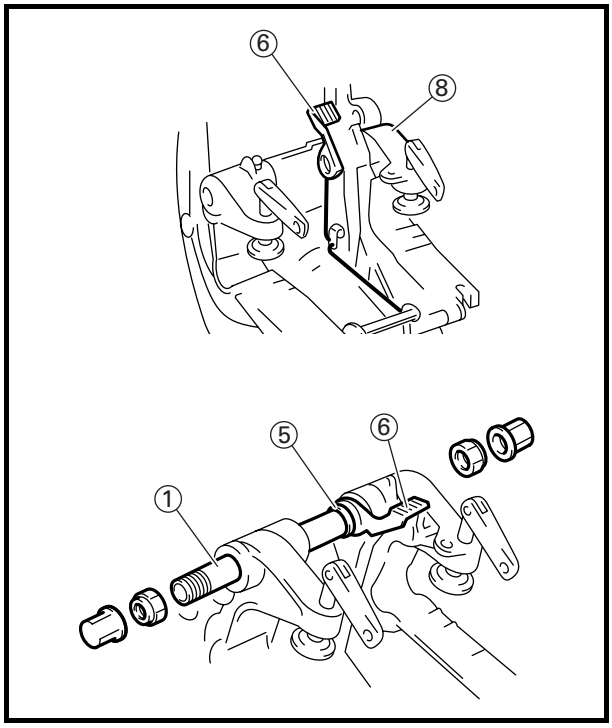


2. Install:
   - Swivel bracket ①
   - Pin ②
   - Tilt lever ③
   - Circlip ④
   - Tilt lock rod ⑤
     (hook to inner tilt lock plate)
   - Tilt lock rod ⑥ (hook to tilt lever 1 ⑦)
   - Torsion spring ⑧

NOTE:
- Always use the new circlip.
- Apply water resistant grease to the pin and tilt levers.







3. Install:
   - Clamp bracket ① (port side)
   - Clamp bracket ② (starboard side)
   - Transom clamp handle ③
   - Stopper shaft ④
   - Stopper knob ⑤
   - Spring pin ⑥

NOTE:
- Always use the new pin and a spring pin.
- Apply Yamaha grease A (water resistant grease) to the transom clamp screw, stopper shaft and the grease nipple.

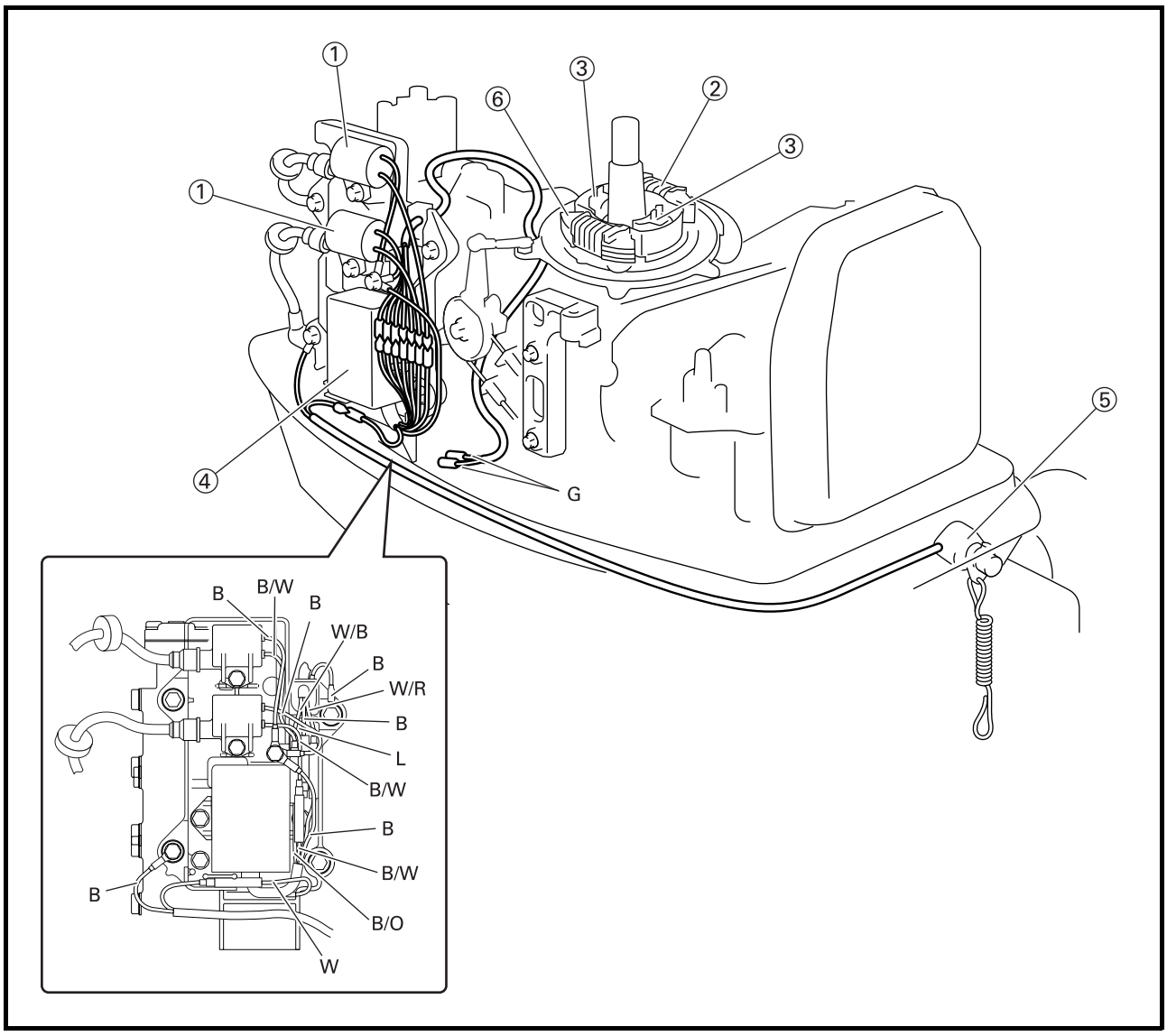
4. Install:
   - Clamp bracket bolt ①
   - Clamp bracket ② (starboard side)
   - Washer ③
   - Swivel bracket ④
   - Torsion spring ⑤
   - Tilt lever ⑥
   - Washer ⑦
   - Clamp bracket ⑧ (port side)
   - Nut ⑨ (clamp bracket bolt)
   - Bolt ⑩
   - Collar ⑪
   - Nut ⑫
   - Tilt rod ⑬ (with conical spring ⑭)
   - Tension spring ⑮

NOTE:
Place the tilt lever ⑥ inside the clamp bracket ⑧ (port side) as shown.

	Nut ⑨ **45 N•m(4.5 kgf•m, 33 ft•lb)**

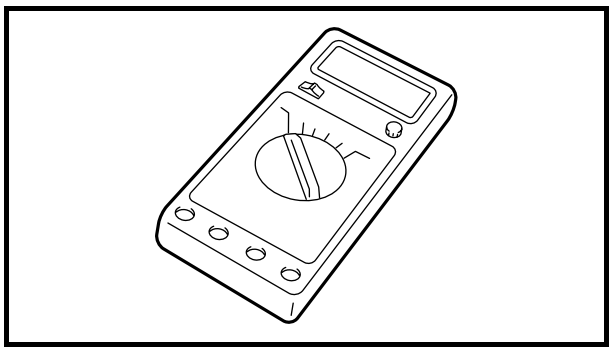
CHAPTER 8
ELECTRICAL SYSTEM

ELECTRICAL COMPONENT



① Ignition coil
② Charge coil
③ Pulser coil
④ CDI unit
⑤ Engine stop switch
⑥ Lighting coil

B : Black
Br : Brown
G : Green
L : Blue
W : White
B/O : Black/Orange
B/W : Black/White
W/B : White/Black
W/R : White/Red



ELECTRICAL COMPONENTS ANALYSIS

DIGITAL CIRCUIT TESTER

	Digital circuit tester **90890-03174**

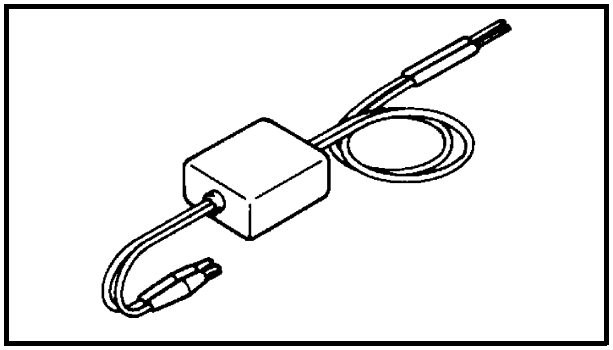
NOTE:
"○——○" indicates a continuity of electricity which means a closed circuit at the respective switch position.

MEASURING THE PEAK VOLTAGE

⚠ WARNING

When checking the peak voltage, do not touch any of the connections of the digital tester lead wires.

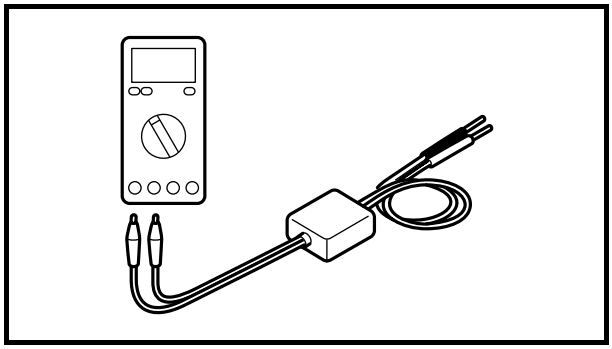
NOTE:
- When checking the condition of the ignition system, it is useful to know the peak voltage.
- Cranking speed is dependant on many factors (e.g., fouled or weak spark plugs, a weak battery). If one of three is defective, the peak voltage will be lower than specification.
- If the peak voltage measurement is not within specification, the engine will not operate properly.



PEAK VOLTAGE ADAPTER

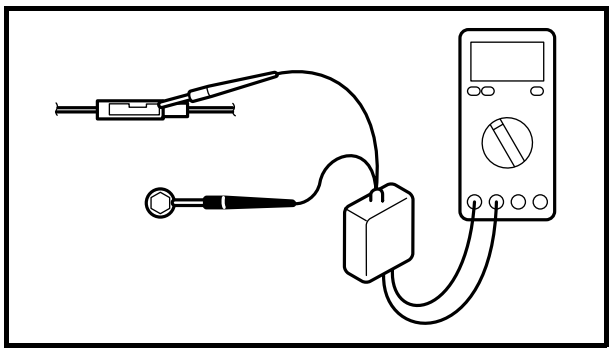
NOTE:
The peak voltage adapter should be used with the digital circuit tester.

	Peak voltage adapter **90890-03172**



NOTE:

- When measuring the peak voltage, set the selector to the DC voltage mode.
- Make sure the peak voltage adapter lead are properly installed in the digital tester.
- Make sure the positive pin (the "+" mark facing up as shown) on the peak voltage adapter is installed into the positive terminal of the digital tester.
- The test harness is needed for the following tests.



Measuring steps

(1) Connect the peak voltage adapter probes to the connectors.
(2) Start or crank the engine and observe the measurement.

MEASURING A LOW RESISTANCE

When measuring a resistance of 10Ω or less with the digital tester, the correct measurement cannot be obtained because of the tester's internal resistance.
To obtain the correct value, subtract the internal resistance from the displayed measurement.

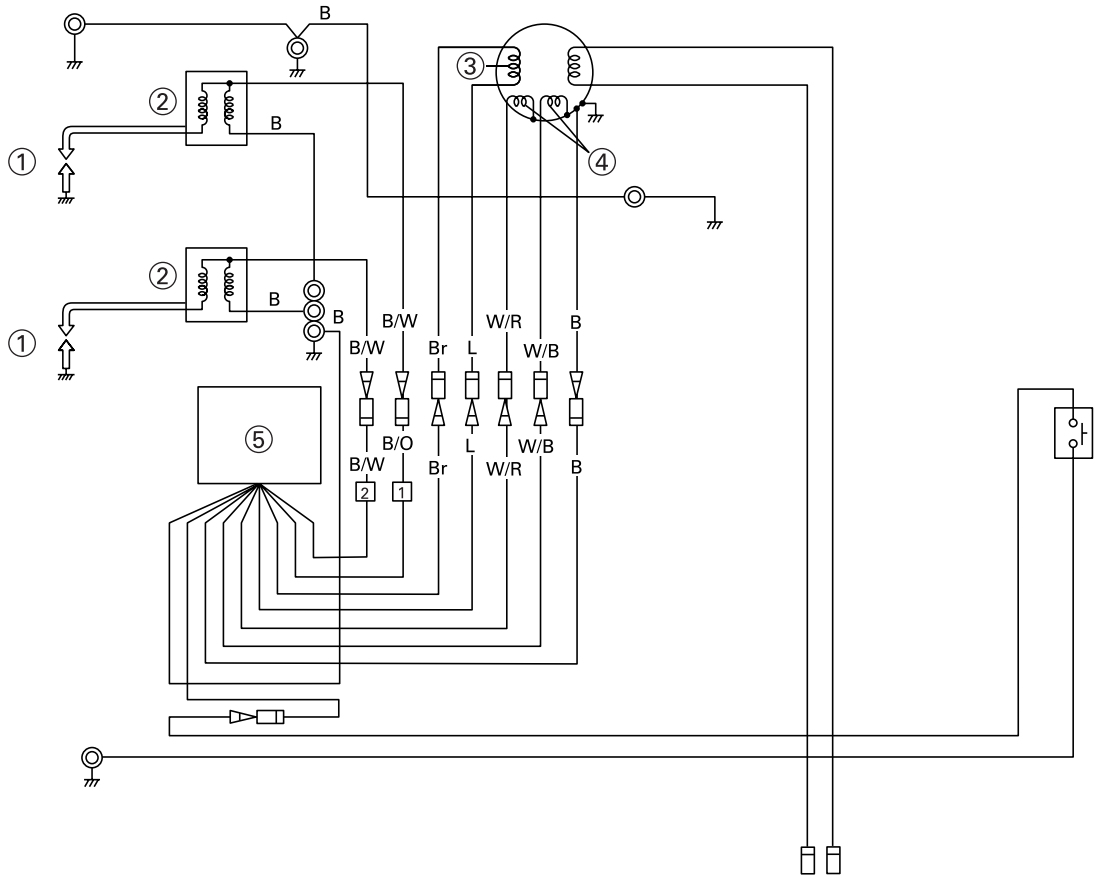
Correct value
Displayed measurement - internal resistance

NOTE:

The internal resistance of the digital tester can be obtained by connecting both of its probes.

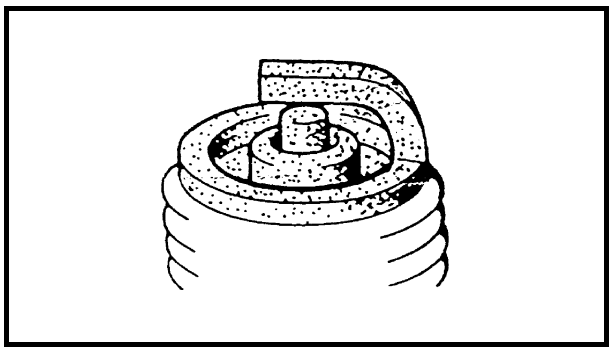
IGNITION SYSTEM

WIRING DIAGRAM



① Spark plug
② Ignition coil
③ Charge coil
④ Pulser coil
⑤ CDI unit

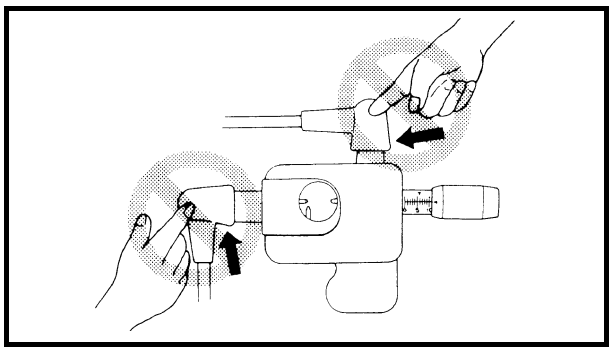
B : Black
Br : Brown
L : Blue
B/O : Black/Orange
B/W : Black/White
W/B : White/Black
W/R : White/Red



CHECKING THE SPARK PLUGS

Refer to "CHECKING THE SPARK PLUGS" on page 3-22.

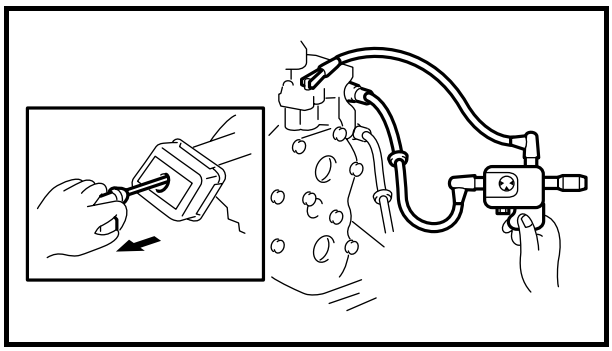
Standard spark plug
NGK B7HS-10



CHECKING THE IGNITION SPARK GAP

⚠ WARNING

- **Do not touch any of the connections of the spark gap tester lead wires.**
- **Do not let sparks leak out of the removed spark plug cap.**
- **Keep flammable gas or liquids away, since this test can produce sparks.**

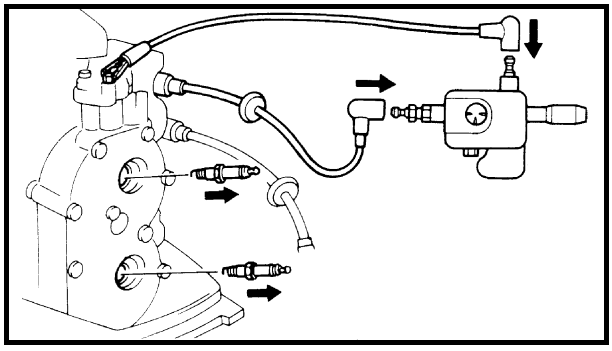


Check:

- Ignition spark gap

  Below specification → Check the ignition system.

Minimum ignition spark gap
8.0 mm (0.31 in)

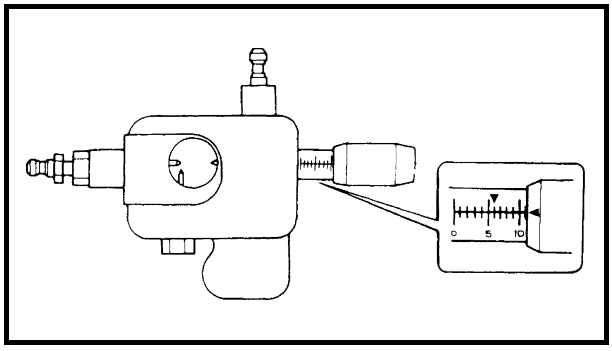


Checking steps

(1) Remove the spark plugs from the engine.

(2) Connect a spark plug cap to the ignition tester.

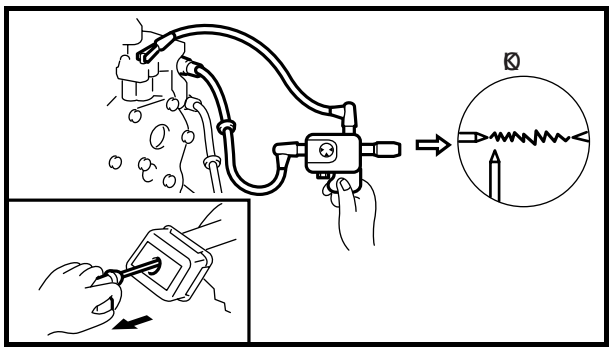
Ignition tester
90890-06754



(3) Adjust the ignition spark gap to 11 mm (0.43 in) by turning the adjust knob.

NOTE:

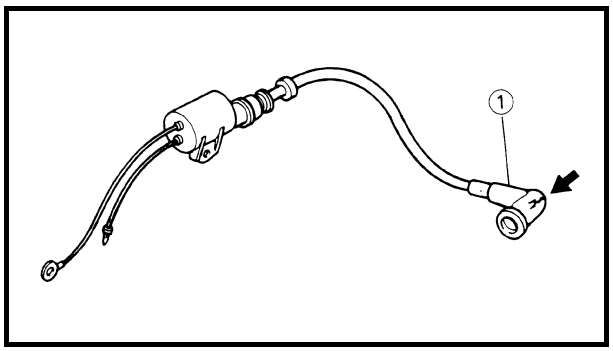
Be careful so that the spark gap does not come excessively off the measuring position [11 mm (0.43 in)].



(4) Crank the engine and observe the spark through the discharge window of the ignition tester.

NOTE:

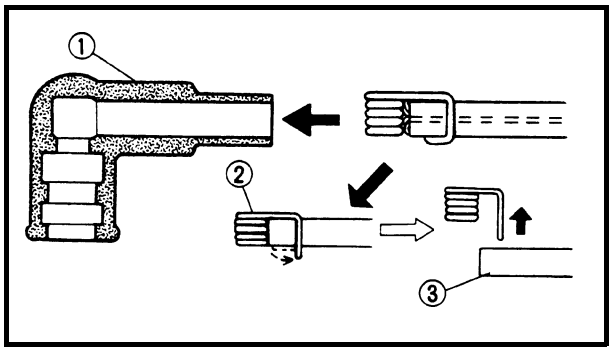
- If there is no spark or the spark is weak, check spark plug cap, ignition coil, pulser coil, charge coil and CDI unit.
- If a good spark is obtained, the problem is not with the ignition system, but possibly with the spark plug(s) or another component.



CHECKING THE SPARK PLUG CAPS

Check

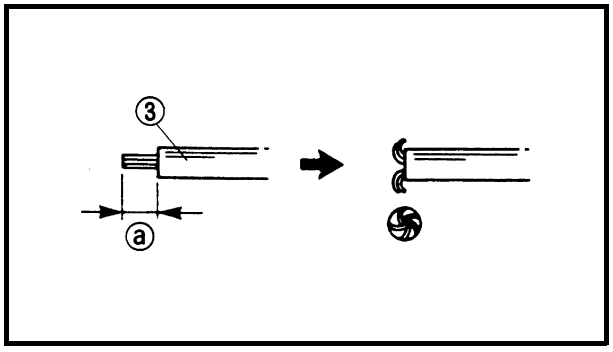
- Spark plug cap ①
  Crack/damage → Replace.



REMOVING THE SPARK PLUG CAPS (STANDARD TYPE)

Removing steps

(1) Remove the spark-plug cap ① by pulling the cap, and remove the plug-cup spring ② from the high-tension cable ③.

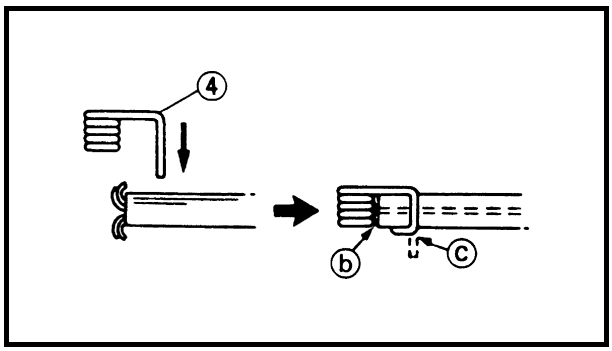


INSTALLING THE SPARK PLUG CAPS (STANDARD TYPE)

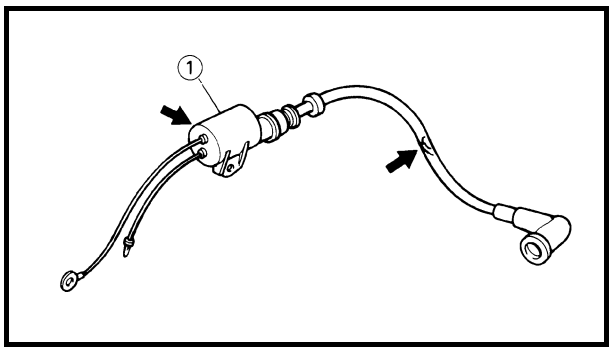
Installing steps

(1) Cut about length ⓐ off the end of the high-tension cable ③.

	Length ⓐ **5mm (0.20 in)**

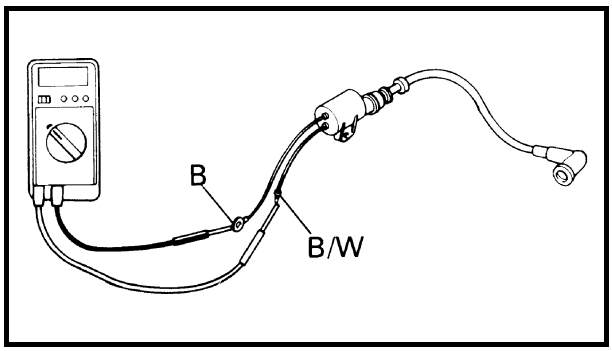


(2) Press in the plug cap spring ④ until it touches the high tension cable at ⓑ, then bend ⓒ as shown.

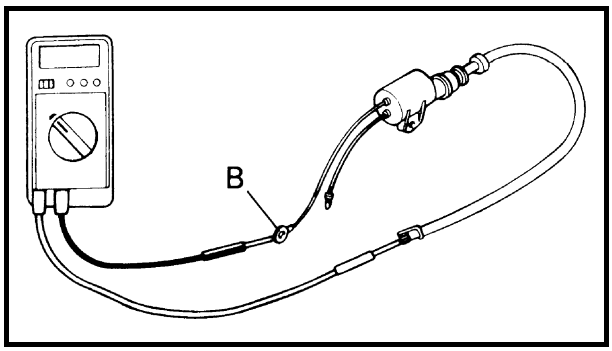


CHECKING THE IGNITION COILS

1. Check:
   - Ignition coil ①
     Crack/damage → Replace.

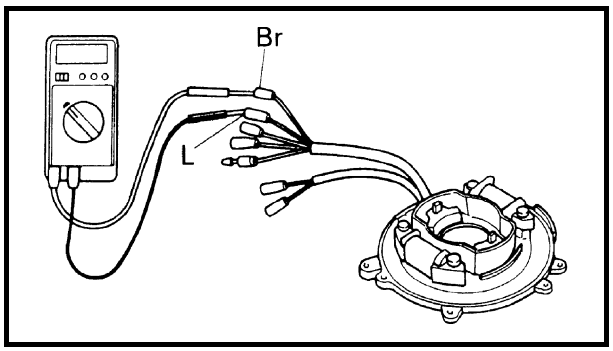


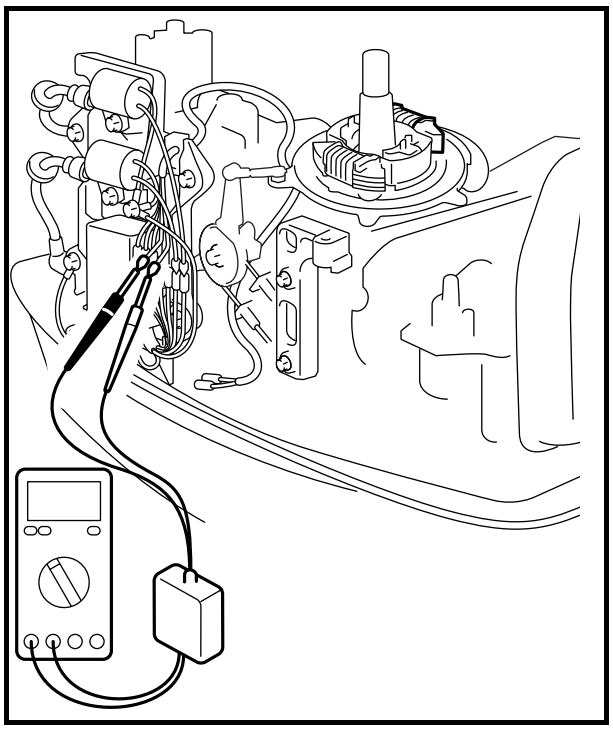
2. Measure:
   - Ignition coil resistance
     Out of specification → Check the peak voltage (charge coil, pulser coil, CDI unit)/Replace.

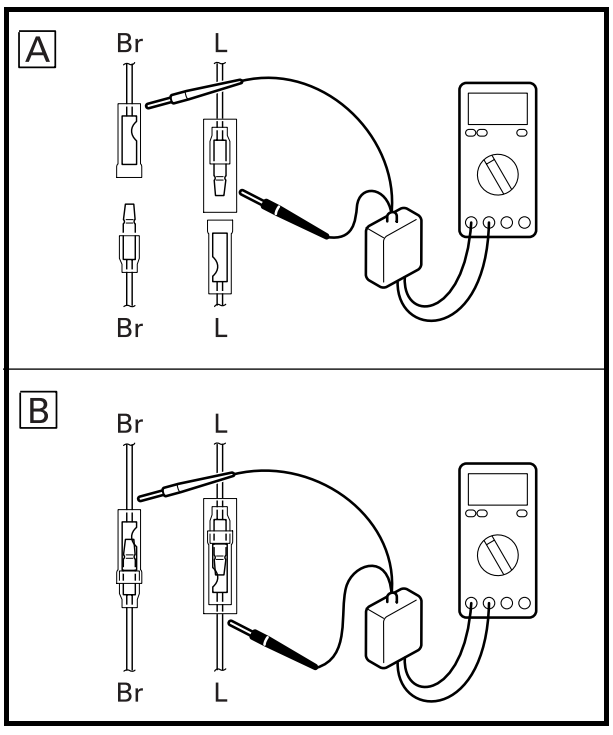


	Ignition coil resistance	
	Primary B/W - B	Secondary B - output
	0.18 - 0.24 Ω	2.70 - 3.70 kΩ

NOTE:
When making secondary leads resistance test, disconnect spark plug cap.







CHECKING THE CHARGE COIL

1. Measure:
   - Charge coil resistance

   Out of specification → Check the peak voltage.

Charge coil resistance
Br - L
342 - 418 Ω

Measuring steps

(1) Disconnect the Brown (Br) and Blue (L) leads from the wire harness.

(2) Connect the tester to the charge coil as shown.

2. Measure:
   - Charge coil output peak voltage

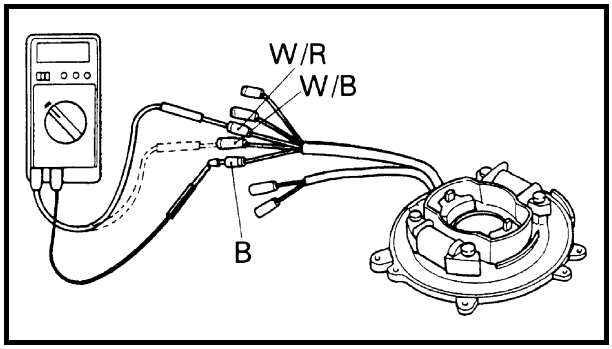
   Below specification → Replace.

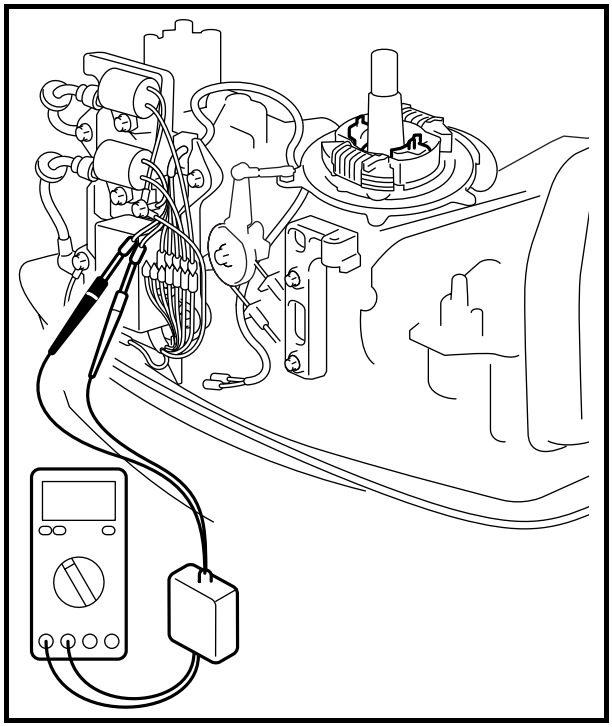
Charge coil output peak voltage
Br – L

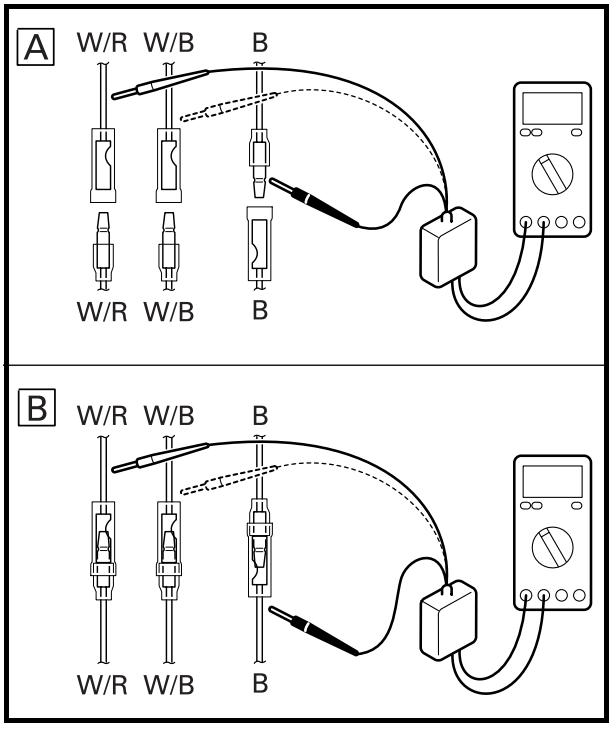
r/min	Cranking		1,500	3,500
	Opened	Closed		
D.C.V.	146	146	150	150

NOTE:

For the peak voltage measurement, connect the adaptor as the illustration A for the open circuit, and as the illustration B for the closed circuit.







CHECKING THE PULSER COIL

1. Measure:
   - Pulser coil resistance

   Out of specification → Check the peak voltage.

Pulser coil resistance
W/R - B (#1), W/B - B (#2)
311 - 381 Ω

Measuring steps

(1) Disconnect the White/Red (W/R), White/Black (W/B) and Black (B) leads from the wire harness.

(2) Connect the tester to the pulser coil as shown.

2. Measure:
   - Pulser coil output peak voltage

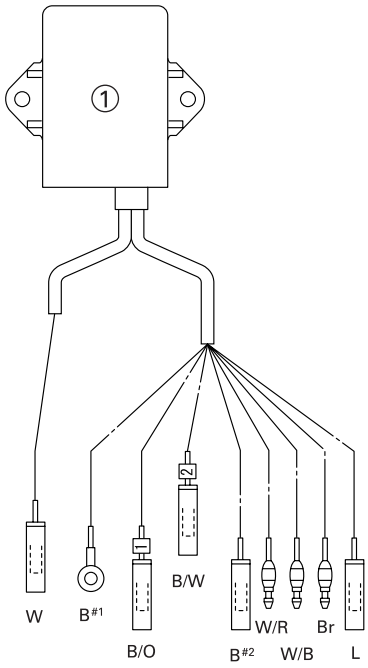
   Below specification → Replace.

Pulser coil output peak voltage
W/R – B (#1), W/B – B (#2)

r/min	Cranking		1,500	3,500
	Opened	Closed		
D.C.V.	6.8	6.7	16.0	26.0

NOTE:
For the peak voltage measurement, connect the adaptor as the illustration A for the open circuit, and as the illustration B for the closed circuit.

CDI UNIT



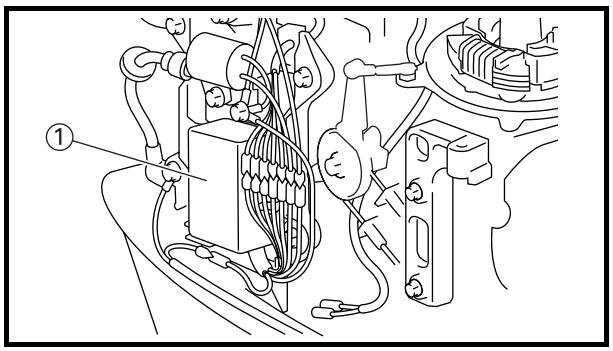
〔Ω〕

Tester ⊖ \ Tester ⊕	W	B#1	B/O	B/W	B#2	W/R	W/B	Br	L
W		∞	∞	∞	∞	∞	∞	∞	∞
B#1	40K – ∞		2K – 8K	2K – 8K	0	10K – 30K	∞	3K – 10K	0
B/O	∞	∞		∞	∞	∞	∞	∞	∞
B/W	∞	∞	∞		∞	∞	∞	∞	∞
B#2	40K – ∞	0	2K – 8K	2K – 8K		10K – 30K	∞	3K – 10K	0
W/R	∞	∞	10K – 30K	∞	∞		∞	∞	∞
W/B	∞	∞	∞	10K – 30K	∞	∞		∞	∞
Br	80K – 1M	80K – 300K	80K – 1M	80K – 1M	80K – 300K	100K – 1M	∞		80K – 300K
L	40K – ∞	0	2K – 8K	2K – 8K	0	10K – 30K	∞	3K – 10K	

∞ : No continuity

① CDI unit

B : Black
Br : Brown
L : Blue
W : White
B/O : Black/Orange
B/W : Black/White
W/B : White/Black
W/R : White/Red



CHECKING THE CDI UNIT

1. Measure:
   - CDI unit ① resistance
     Out of specification → Check the peak voltage.

	Pocket tester **90890-03112**

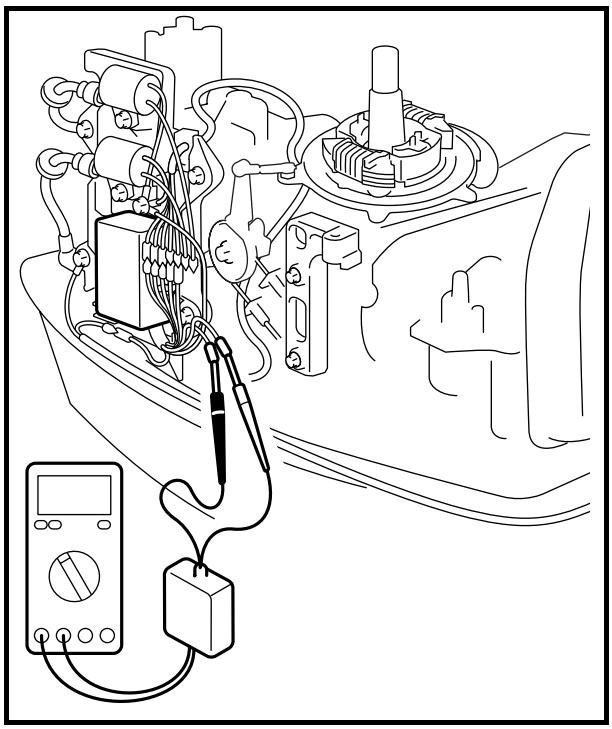
NOTE:
- Digital circuit tester cannot be used for this check. Use analogue tester.
- CDI resistance values will vary from meter to meter, especially with electronic digital meters. For some testers, polarity of leads is reversed.

Measuring steps

(1) Disconnect the CDI unit ① leads from the wire harness.

(2) Connect the pocket tester (Ω × 1K) to the CDI unit as shown list.
Refer to "CDI UNIT" on page 8-10.

NOTE:
There is a point at which the pointer swings greatly and swings back. Read the point where the point has returned to stop.



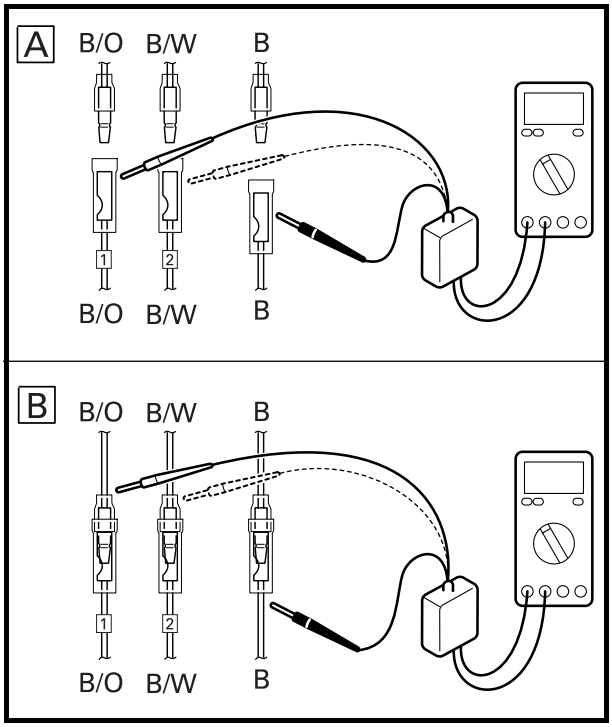
2. Measure:
   - CDI unit output peak voltage

   Below specification → Replace.

CDI unit output peak voltage B/O - B, B/W - B				
r/min	Cranking		1,500	3,500
	Opened	Closed		
D.C.V.	5.5	130.0	135.0	135.0

NOTE:

Before measuring CDI unit output peak voltage, make sure that no abnormality is observed on the charge coil and the pulser coil.

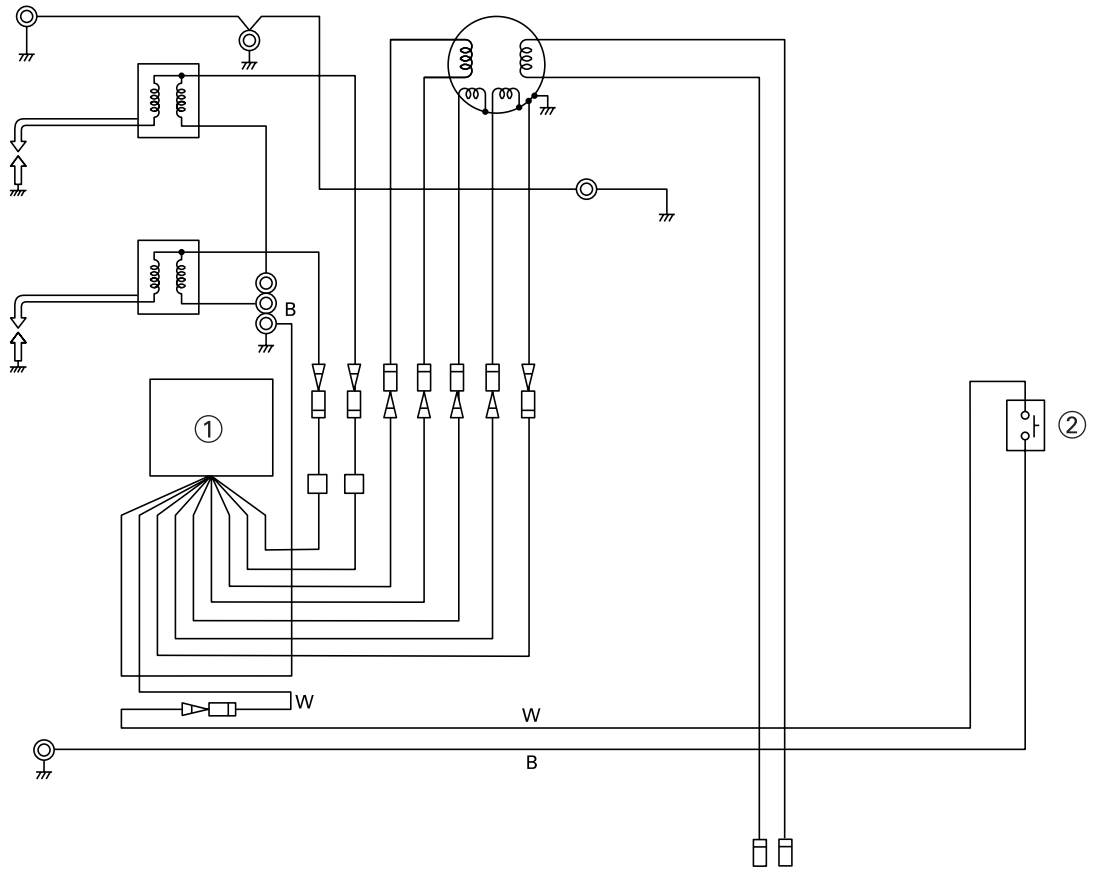


NOTE:

For the peak voltage measurement, connect the adaptor as the illustration A for the open circuit, and as the illustration B for the closed circuit.

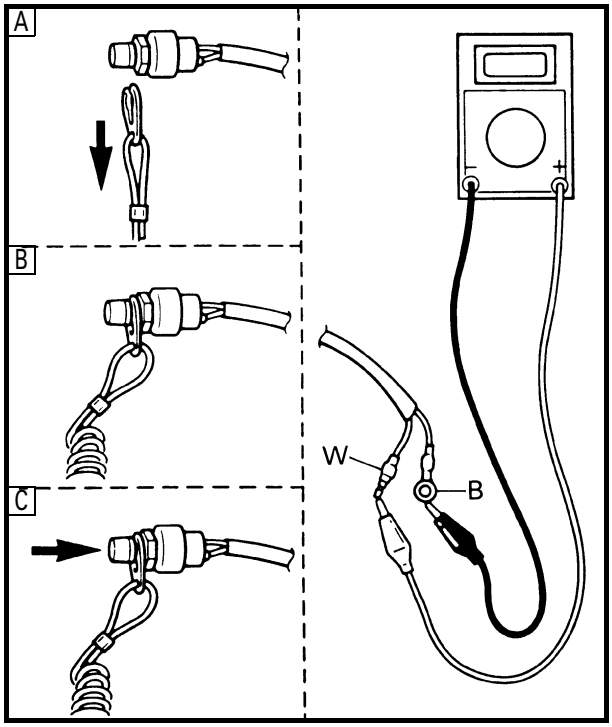
IGNITION CONTROL SYSTEM

WIRING DIAGRAM



① CDI unit
② Engine stop switch

B : Black
W : White



CHECKING THE ENGINE STOP SWITCH

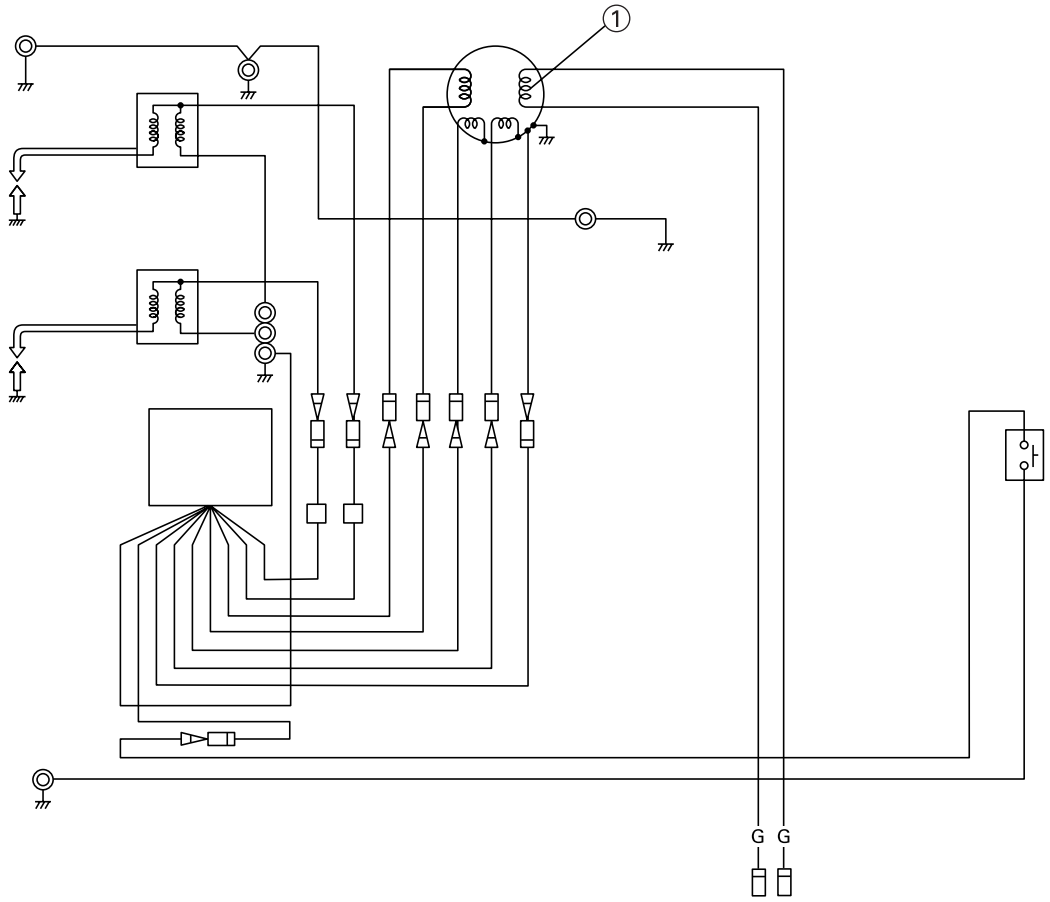
Check:

- Continuity
  Out of specification → Replace.

	Lead color	
	White	Black
Remove the lock-plate A	○———	———○
Install the lock-plate B		
Push the button C	○———	———○

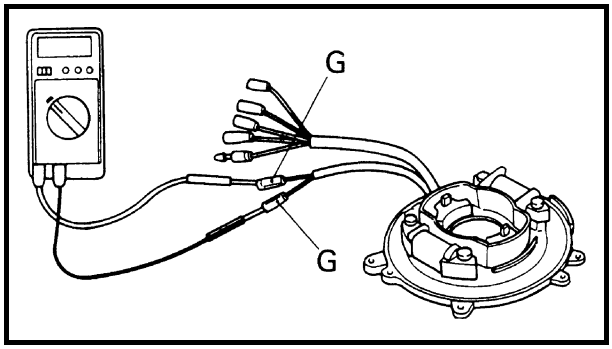
CHARGING SYSTEM

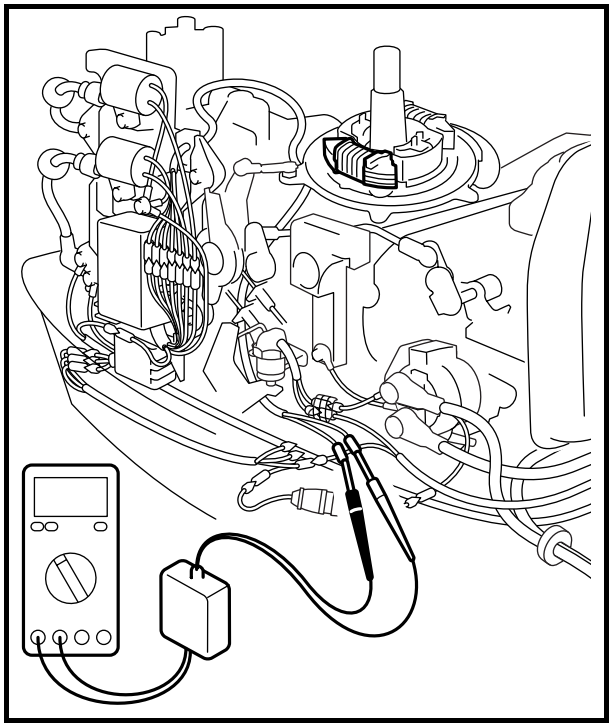
WIRING DIAGRAM



① Lighting coil

G : Green





CHECKING THE LIGHTING COIL

1. Measure:
   - Lighting coil resistance

   Out of specification → Checking the peak voltage.

Lighting coil resistance:
G – G
0.31 - 0.37 Ω

Measuring steps

(1) Connect the tester to the lighting coil as shown.

NOTE:
When measuring the resistance of 10 Ω or less using the digital tester, the correct measurement cannot be obtained.
Refer to "MEASURING A LOW RESISTANCE" on page 8-3.

2. Measure:
   - Lighting coil output peak voltage

   Below specification → Replace.

Lighting coil output peak voltage
G – G

r/min	Cranking			
	Opened		Closed	
D.C.V.	4.6		–	
r/min	1,500	3,500	1,500	3,500
	Closed		Opened	
D.C.V.	–	–	14.7	30.0

CHAPTER 9
TROUBLE ANALYSIS

TROUBLE ANALYSIS

NOTE:

The following items should be checked before the "TROUBLE ANALYSIS CHART" is consulted.

1. The battery is charged and its specific gravity is within specification.
2. There are no incorrect wiring connections.
3. Wiring connections are properly secured and are not rusty.
4. The lanyard is installed onto the engine stop switch.
5. The shift position is in neutral.
6. Fuel is reaching the carburetor/vapor separator.
7. The rigging and engine setting are correct.
8. The engine is free from any "Hull problem".

TROUBLE ANALYSIS CHART

Trouble mode														Check elements	
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOOSE STEERING	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference Chapter
														FUEL SYSTEM	
○				○			○							Fuel line	4
○				○			○							Fuel joint	4
○	○	○		○			○							Fuel filter	4
○				○			○							Fuel pump	4
○	○	○		○	○		○							Carburetor	4
		○	○	○	○		○							• Idle speed adjustment	3
○				○			○							• Pilot screw adjustment	3
		○	○				○							Link adjustment	3
														POWER UNIT	
○	○	○					○							Compression	3
○	○	○		○										Reed valves	5
○	○	○					○		○					Cylinder head gasket	5

TROUBLE ANALYSIS

Trouble mode														Check elements	
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOOSE STEERING	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference Chapter
○	○	○			○									Seal	5
○							○							Cylinder body	5
○							○							Pistons	5
○							○							Piston rings	5
○							○							Crankcase	5
○							○							Crankshaft	5
							○							Bearing	5
									○					Thermostat	5
									○					Water passage	5
														LOWER UNIT	
○				○							○			Neutral position	6
				○							○			Dog clutch	6
											○			Gears	6
							○		○					Water inlets	6
							○		○					Water pump	6
							○							Propeller shaft	6
							○							Propeller	6
											○			Shift rod joint/Pin	6
											○			Shift rod	6
							○							Lower case	6
														BRACKET UNIT	
										○				Bracket	7
										○				Rubber mount	7
											○			Shift actuator	7
														ELECTRICAL SYSTEMS	
														Ignition system	
○	○	○	○	○	○	○	○		○					• Spark plugs	8

TROUBLE ANALYSIS

Trouble mode														Check elements	
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOOSE STEERING	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference Chapter
○	○				○		○							• Ignition coils	8
○			○					○	○					• Charge coil	8
○	○	○		○	○		○							• Pulser coil	8
○			○			○	○	○						• CDI unit	8
														Ignition control system	
○						○								• Engine stop switch	8
														Charging system	
													○	• Lighting coil	8

TROUBLE SHOOTING FOR PEAK VOLTAGE

Items	Symptoms
1. Poor starting	• No firing. The starter motor cranks the engine, but no firing takes place in the cylinder. • Firing takes place in the cylinder, but the engine stops soon. • Start-up time is too long. The engine will not start up easily.
2. Unstable idle speed	• The engine speed is not stable at idle. • The engine stalls when the throttle lever is opened. • The engine stalls after it is warmed up.
3. Unstable engine speed	• The engine does not run smoothly. • The engine speed drops during acceleration.

Check the ignition system.

1) Check the lead to ignition coil, CDI unit, pulser coil and charge coil.
   - NG → Contamination, Loose connection Corrosion → Clean Correct
   - OK
2) Check the spark gap.
   - NG → Above specification → Replace the spark plug.
   - OK
3) Check the plug cap (resistance).
   - NG → Out of specification → Replace.
   - OK
4) Check the ignition coils (resistance).
   - NG → Out of specification → Replace.
   - OK
5) Check the CDI unit resistance and output peak voltage.
   - OK → Above specification → Replace the ignition coil.
   - NG
6) Check the charge coil resistance and output peak voltage.
   - NG → Below specification → Replace the charge coil.
   - OK
7) Check the pulser coil resistance and output peak voltage.
   - NG → Below specification → Replace the pulser coil.
   - OK

Replace the CDI unit.

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（英）

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WIRING DIAGRAM EK25BMH

B	Black
Br	Brown
G	Green
L	Blue
R	Red
W	White
B/O	Black/orange
B/W	Black/white
G/W	Green/white
W/B	White/black
W/R	White/red