

YAMAHA

Marine

Outboards

WORLD WIDE

F15A

USA/CANADA

F15

SERVICE MANUAL

NOTICE

This manual has been prepared by the Yamaha Motor Company, Ltd. 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 the Yamaha Motor Company, Ltd. 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.

A10001-0*

F15

SERVICE MANUAL

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HOW TO USE THIS MANUAL

MANUAL FORMAT

All of the procedures in this manual are organized 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 to find your way through this manual, the section title and major heading is given at the top of every page.

ILLUSTRATIONS

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

CROSS REFERENCE

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.

SPECIFIC COMPARISON

These are given in bold type at each procedure. It is not necessary to the section dealing with the procedure in order to look up the specifications.

It is important to note the difference in specifications of modelos. When a procedure relates to more than one model, the main differences in specifications will be shown in a following table.

Model Item	USA/CANADA/OCEANIA		EUROPE		
	F15AMH F15MHW	F15AEH F15EHW	F15AMH	F15AEH	F15AE
Steering friction	○ (*—)	○ (*—)	—	—	—
Steering hook		—	—	—	○
Ring gear	— (**○)	○		○	○
Lighting current	AC 6A (12V-80W)	—	12V-80W	—	—
Charging current	—	10A	6A	6A	10A
Rectifire	—	—	—	6G1	—
Rectifire/regurator	—	6G8-A1	6J8	—	6G8-A1
Fuse	—	20A	—	10A	20A

* :OCEANIA

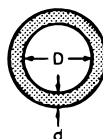
** :USA

HOW TO USE THIS MANUAL

- ① To help identify parts and clarify procedure steps, there are exploded diagrams at the start of each removal and disassembly section.
- ② Numbers are given in the order of the jobs in the exploded diagram. A circled number indicates a disassembly step.
- ③ Symbols indicate parts to be lubricated or replaced (see "SYMBOLS").
- ④ A job instruction chart accompanies the exploded diagram, providing the order of jobs, names of parts, notes in jobs, etc.

Example:

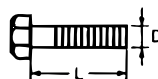
O-ring size 39.5 x 2.5 mm: Inside diameter (D) x ring diameter (d)



- ⑤ Dimension figures and the number of parts, are provided for fasteners that require a tightening torque:

Example:

Bolt or screw size 10 x 25 mm (2) : M10(D) x 25 mm (L) (2pieces)



- ⑥ Jobs requiring more information (such as special tools and technical data) are described sequentially.

LOWER UNIT

LOWER UNIT EXPLODED DIAGRAM

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Qty	Service points
LOWER REMOVAL			
1	Cotter pin	1	Follow the left "Step" for removal.
2	Propeller nut	1	Not reusable
3	Spacer	1	
4	Propeller	1	
5	Collar	1	
6	Locknut	1	
7	Adjusting nut	1	
8	Bolt (lower case)	4	
9	Lower unit	1	
10	Dowel pins	2	
11	Seal rubber	1	

PROPELLER SHAFT HOUSING ASS'Y

SERVICE POINTS
Propeller shaft housing ass'y disassembly

1. Remove:

- Reverse gear
- Reverse gear shim (s)
- Ball bearing ①

Slide hammer set ②:
YB-06096

Stopper guide plate ③:
90890-06501

Bearing puller ④:
90890-06535

Stopper guide stand ⑤:
90890-06538

Gears inspection
1. Inspect:

- Tooth
- Dog

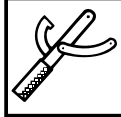
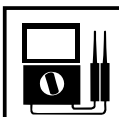
Wear/Damage → Replace.

Bearings inspection
1. Inspect:

- Bearing

Pitting/Rumbling → Replace.

NOTE:
Turn the bearing by fingers and check the bearing pitching

① GEN INFO 	② SPEC 
③ INSP ADJ 	④ FUEL 
⑤ POWR 	⑥ LOWR 
⑦ BRKT 	⑧ ELEC 
⑨ TRBL SHTG 	⑩ 
⑪ 	⑫ 
⑬ 	⑭ 
⑮ 	⑯ 
⑰ 	⑱ 
⑲ 	⑳ 
㉑ 	㉒ 
㉓ 	㉔ 

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SYMBOLS

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

- ① General Information
- ② Specifications
- ③ Periodic Inspection and Adjustment
- ④ Fuel System
- ⑤ Power Unit
- ⑥ Lower Unit
- ⑦ Bracket Unit
- ⑧ Electrical System
- 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 ⑲ in an exploded diagram indicate the grade of lubricant and location of the lubrication point:

- ⑯ Apply Yamaha 4-stroke outboard motor oil
- ⑰ Apply molybdenum disulfide oil
- ⑱ Apply water resistant grease (Yamaha grease A, Yamaha marine grease)
- ⑲ Apply molybdenum disulfide grease

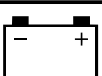
Symbols ㉑ to ㉔ in an exploded diagram indicate grade of sealing or locking agent, and location of application point:

- ㉑ Apply Gasket maker®
- ㉒ Apply LOCTITE® No. 271 (Red LOCTITE)
- ㉓ Apply LOCTITE® No. 242 (Blue LOCTITE)
- ㉔ Apply LOCTITE® No. 572
- ㉔ Apply Silicon sealant

NOTE:

In this manual, the above symbols may not be used in every case.

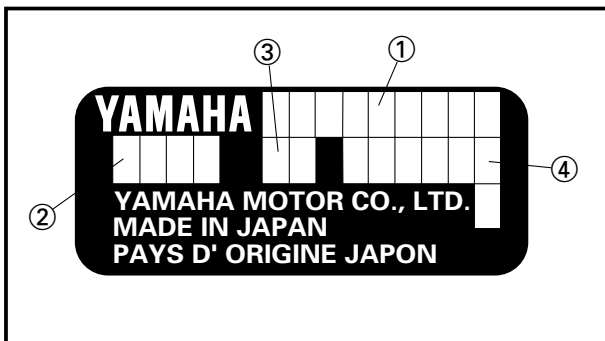
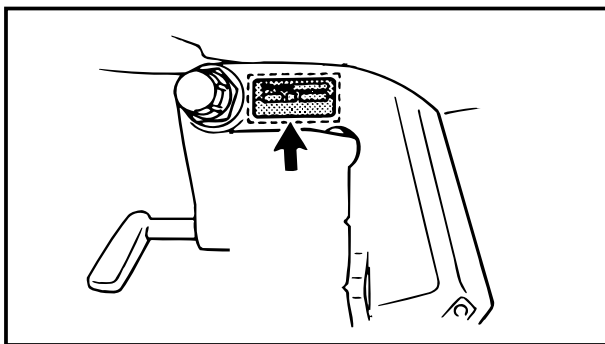
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CHAPTER 1

GENERAL INFORMATION

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IDENTIFICATION

SERIAL NUMBER

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

NOTE: _____

For USA model:

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

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

STARTING SERIAL NUMBERS

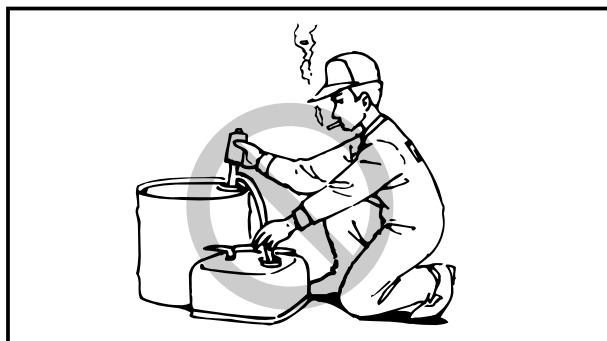
The starting serial number blocks are as follows:

Model name		Approved model code	Starting serial number
World wide	USA/ CANADA		
F15AMH	F15MSHW	66M	S: 000101~
	F15MLHW		L: 300101~
F15AEH	F15ESHW	66M	S: 200101~
	F15ELHW		L: 500101~
F15AE	—	66M	S: 100101~
			L: 400101~



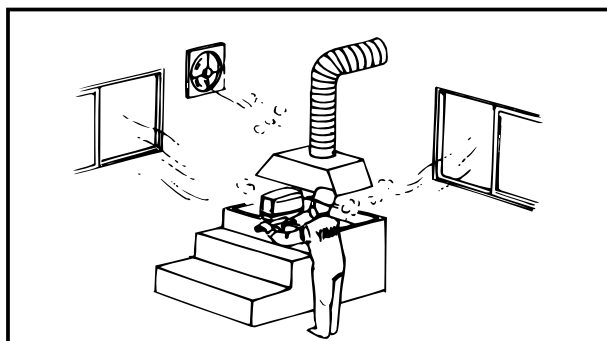
SAFETY WHILE WORKING

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



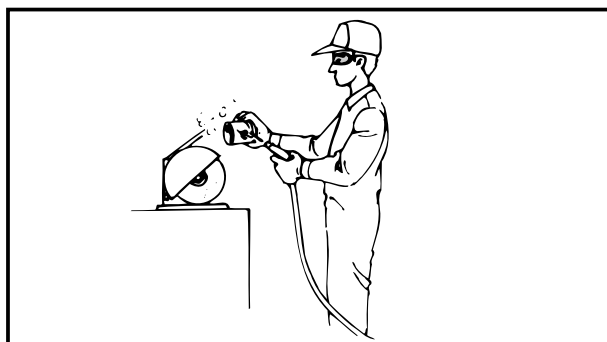
FIRE PREVENTION

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 of 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.



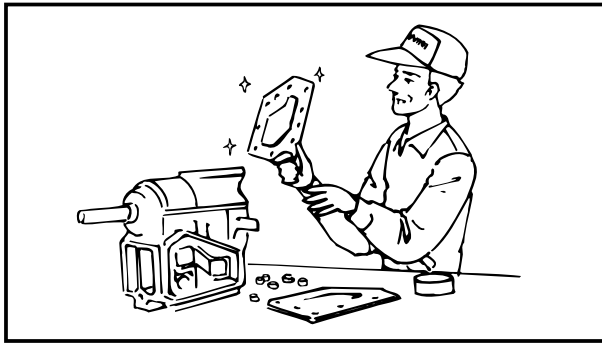
GOOD WORKING PRACTICES

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.

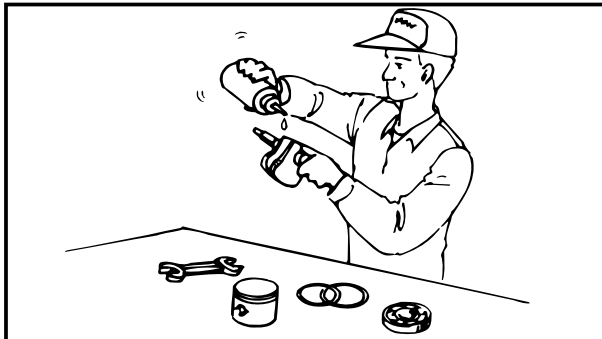
2. Tightening torque

Follow the tightening torque instructions. When tightening bolts, nuts and screws, tighten the large sizes first, and tighten inner-positioned fixings before



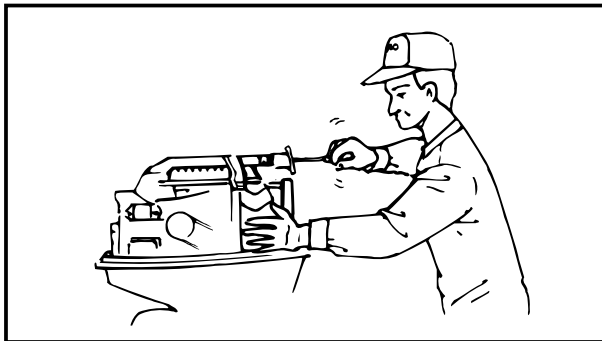
3. Non-reusable items

Always use new gaskets, packings, O-rings, split-pins and circlips etc. on reassembly.

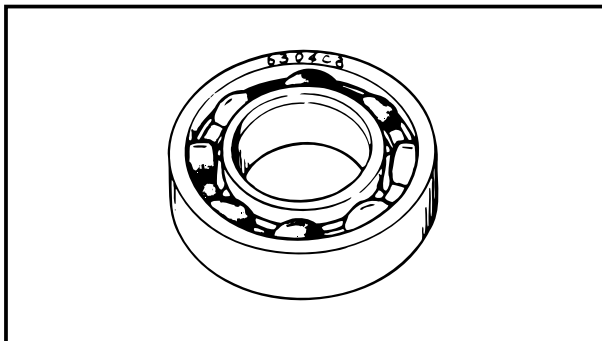


DISASSEMBLY AND ASSEMBLY

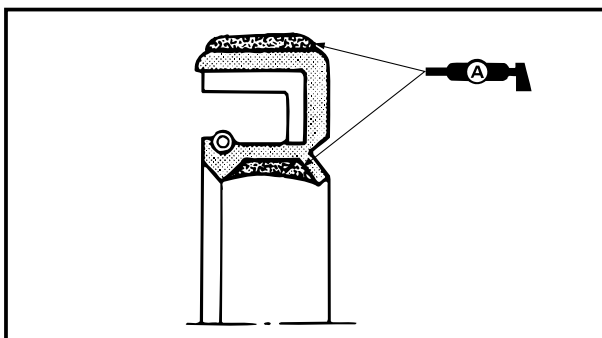
1. Clean parts with compressed air when disassembling.
2. Oil the contact surfaces of moving parts before assembly.



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

The use of correct special tools recommended by Yamaha will aid the work and enable accurate assembly and tune-up. Improvisations and use of improper tools can cause damage to the equipment.

NOTE: _____

- For U.S.A. and Canada, use part number starting with "J-", "YB-", "YM-" "YU-" or "YW-".
- For others, use part number starting with "90890-".

MEASURING

1. Tachometer

① a P/N. YU-08036-A

① b 90890-06760

2. Mity vac

P/N. YB-35956

90890-06756

3. Leakage tester

P/N. YB-03595

90890-06762

4. Pinion height gauge

P/N. YB-34232

N.A.

5. Digital caliper

P/N. N.A.

90890-06704

6. Shimming plate

P/N. N.A.

90890-06701

7. Dial gage set

P/N. YU-03097

90890-01252

8. Backlash indicator

P/N. YB-06265

90890-06706

9. Magneto base

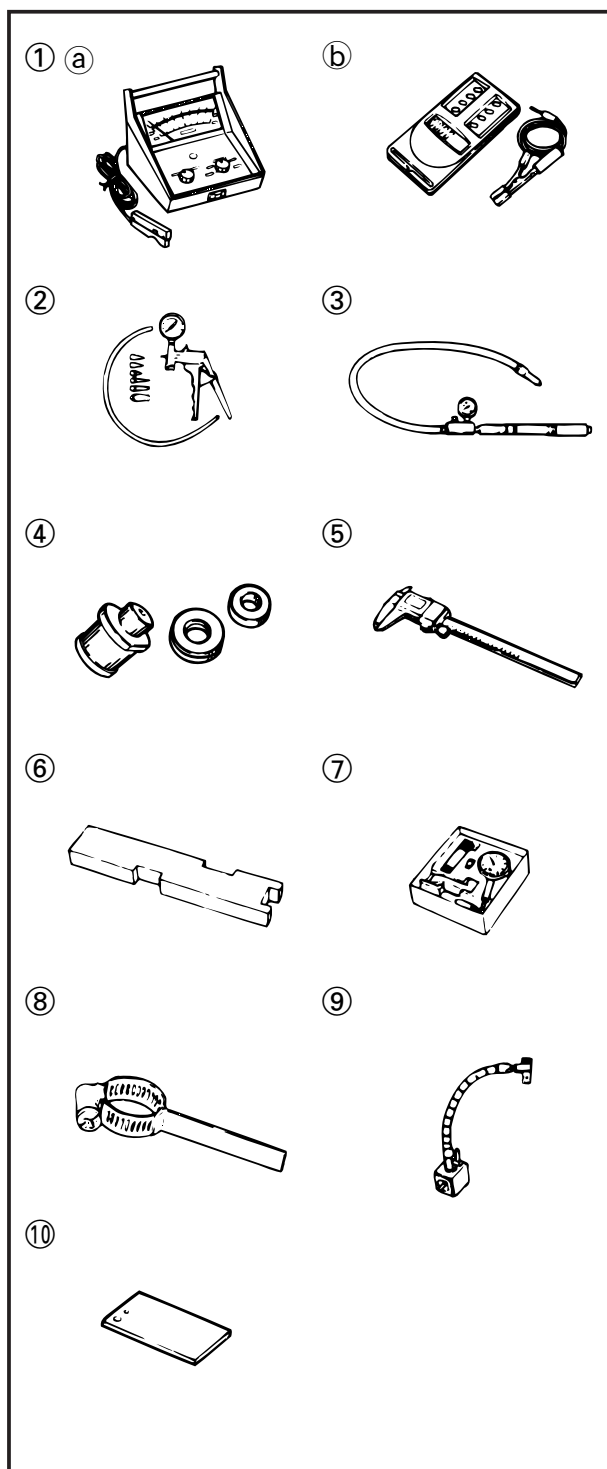
P/N. YU-34481

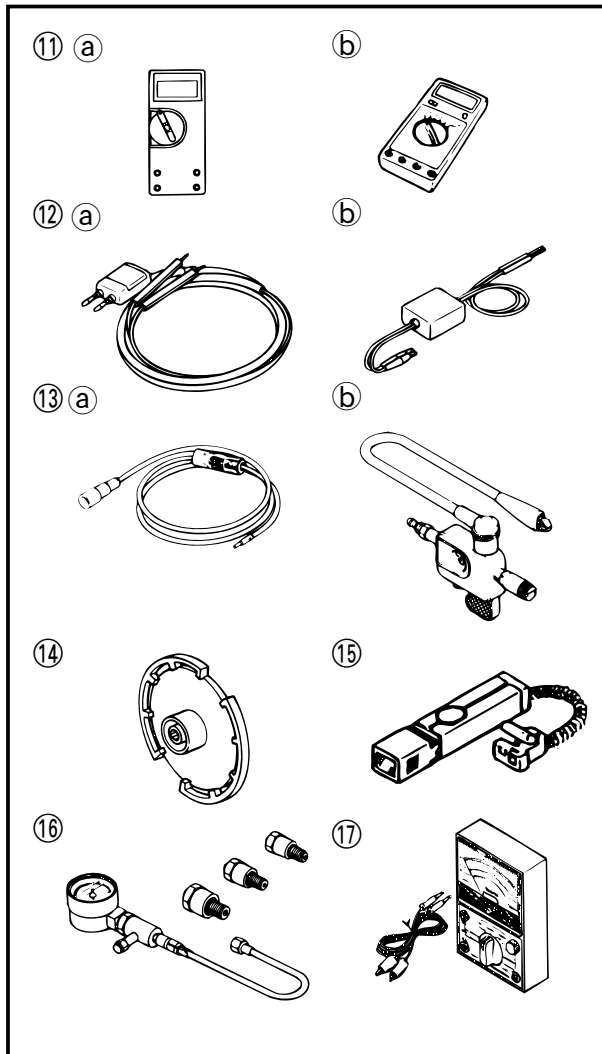
90890-06705

10. Base plate

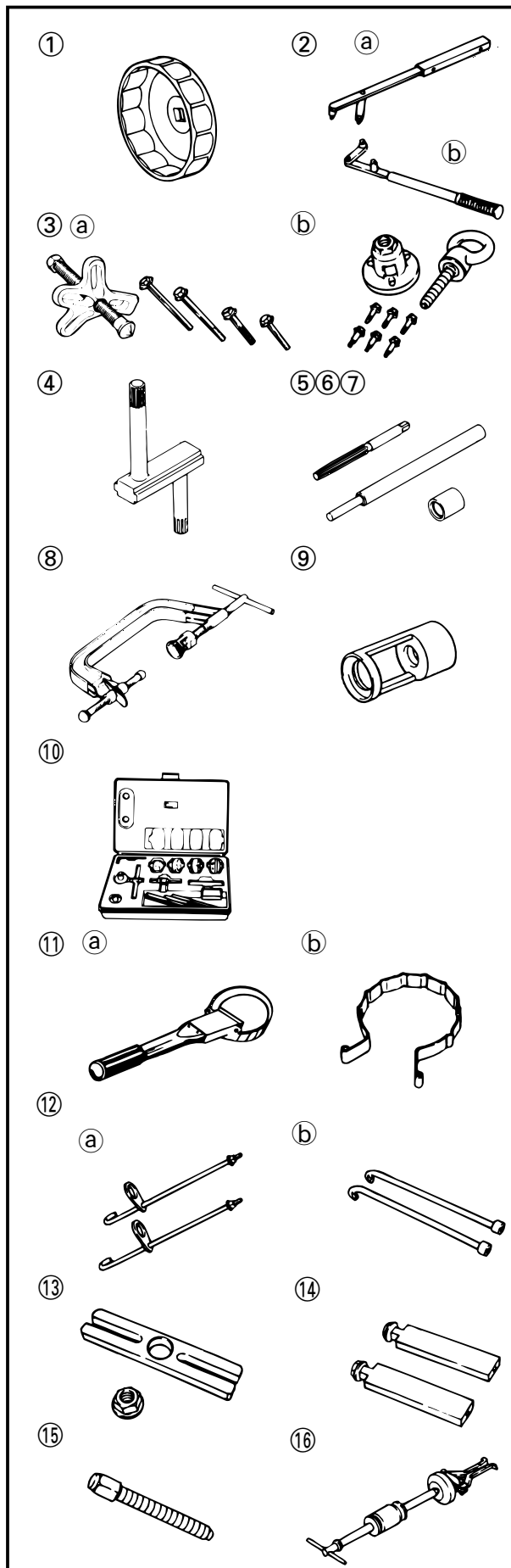
P/N. YB-07003

N.A.

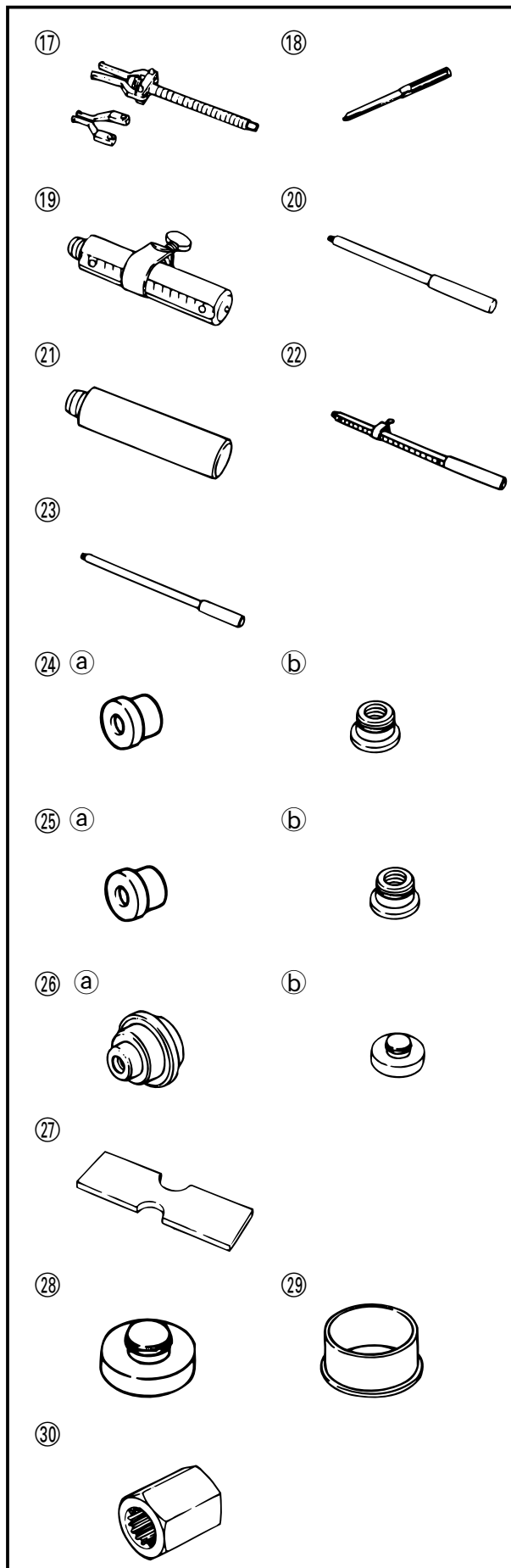




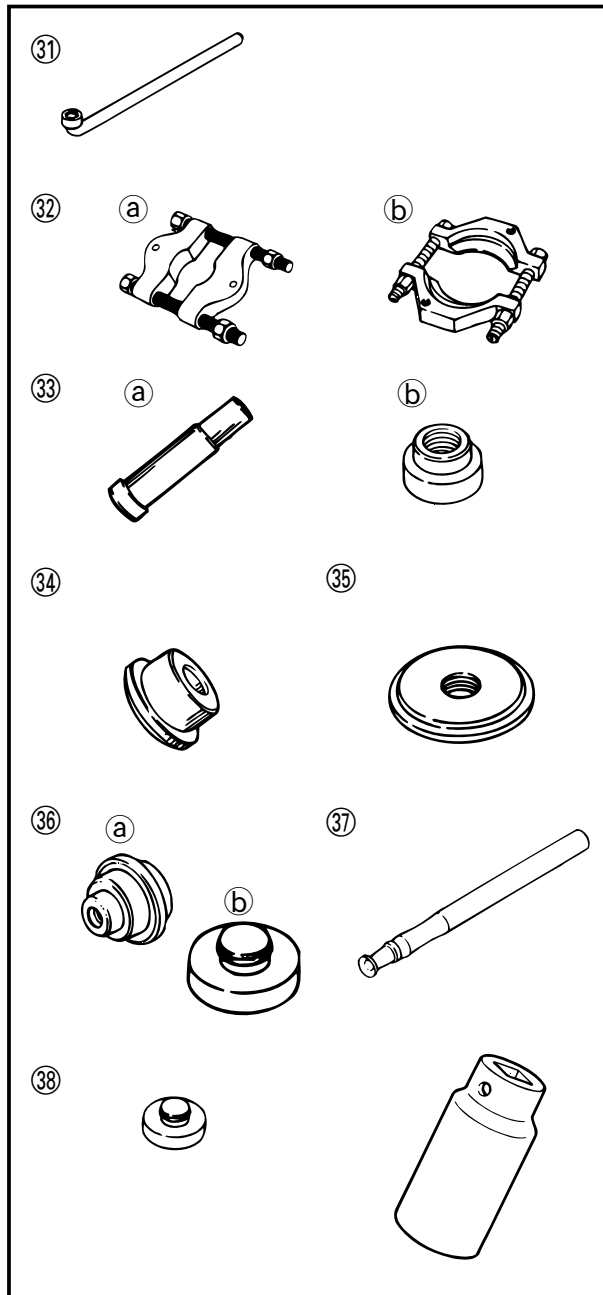
11. Digital circuit tester
 - (a) P/N. J-39299
 - (b) 90890-06752
12. Peak voltage adapter
 - (a) P/N. YU-39991
 - (b) 90890-03169
13. Spark gap tester
 - (a) P/N. YM-34487
 - (b) 90890-06754
14. Test propeller
P/N. YB-01619
90890-01619
15. Timing light
P/N. YU-33277-A
90890-03141
16. Compression gauge
P/N. YU-33223
90890-03160
17. Yamaha pocket tester
P/N. YU-03112
90890-03112


REMOVAL AND INSTALLATION

1. Oil filter wrench
P/N. YU-38411
90890-01426
2. Flywheel holder
(a) P/N. YB-06139
(b) 90890-06522
3. Universal puller
(a) P/N. YB-06117
(b) 90890-06521
4. Shaft holder
P/N. N.A.
90890-06069
5. Valve guide installer
P/N. YB-6308
90890-06802
6. Valve guide remover
P/N. YM-01122
90890-06801
7. Valve guide reamer
P/N. YM-01196
90890-06804
8. Valve spring compressor
P/N. YM-01253
90890-04019
9. Attachment
P/N. YM-04114
90890-04018
10. Valve seat cutter set
P/N. YM-91043-C
90890-06803
11. Piston slider
(a) P/N. YB-34454
(b) 90890-06529
12. Bearing housing puller claw
(a) P/N. YB-06234
(b) 90890-06503
13. Stopper guide plate
P/N. N.A.
90890-06501
14. Stopper guide stand
P/N. N.A.
90890-06538
15. Center bolt
P/N. N.A.
90890-06504
16. Slide hammer set
P/N. YB-06096
N.A.



17. Bearing outer race puller
P/N. N.A.
90890-06535
18. Driver rod
P/N. YB-06229
19. Driver rod
P/N. 90890-06604
20. Driver rod
P/N. YB-06071
21. Driver rod
P/N. 90890-06606
22. Driver rod
P/N. 90890-06602
23. Driver rod
P/N. 90890-06605
24. Needle bearing attachment
(a) P/N. YB-06081
(b) 90890-06616
25. Needle bearing attachment
(a) P/N. YB-06230
(b) 90890-06617
26. Oil seal installer
(Needle bearing attachment)
(a) P/N. YB-06168
(b) 90890-06613
27. Bearing depth plate
P/N. N.A.
90890-06603
28. Ball bearing attachment
(a) P/N. YB-06015
(b) 90890-06632
29. Bearing inner race attachment
P/N. N.A.
90890-06644
30. Drive shaft holder
P/N. YB-06228
90890-06515



- 31. Pinion nut holder
P/N. YB-06078
- 32. Bearing separator
 - (a) P/N. YB-06219
 - (b) 90890-06534
- 33. Busing attachment
 - (a) P/N. YB-06028
 - (b) 90890-06649
- 34. Drive shaft needle bearing depth stop
P/N. YB-06231
N.A.
- 35. Bearing outer race attachment
P/N. YB-06085
90890-06625
- 36. Bearing installer
(Bearing inner race attachment)
 - (a) P/N. YB-06022
 - (b) 90890-06613
- 37. Valve lapper
P/N. N.A.
90890-06805
- 38. Oil seal installer
P/N. N.A.
90890-06614

GENERAL TOOL

Reference tool:

Deep socket (36 mm)

CHAPTER 2

SPECIFICATIONS

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GENERAL SPECIFICATIONS

Item	Unit	Model		
		F15AMH	F15AEH	F15AE
		F15MHW	F15EHW	—
DIMENSION				
Overall length	mm (in)	1,003 (39.5)	1,003 (39.5)	643 (25.3)
Overall width	mm (in)	427 (16.8)	427 (16.8)	369 (14.5)
Overall height				
(S)	mm (in)	1,080 (42.5)		
(L)	mm (in)	1,207 (47.5)		
WEIGHT				
(With aluminum proper)				
(S)	kg (lb)	45.0 (99.2)	48.0 (105.8)	47.0 (103.6)
(L)	kg (lb)	47.0 (103.6)	50.0 (110.2)	49.0 (108.0)
PERFORMANCE				
Maximum output (ISO)	kW (hp) @ r/min	11.0 (15)/@ 5,000		
Full throttle operating	r/min	4,500~5,500		
Maximum fuel consumption	L (U,S, gal, Imp gal) @ 5,500 r/min	5.3 (1.39, 1.16)		
POWER UNIT				
Type		4 stroke, OHC, in-line		
Number of cylinders		2		
Displacement	cm³ (cu. in)	323 (19.7)		
Bore x stroke	mm (in)	59.0x59.0 (2.32x2.32)		
Compression ratio		9.19		
Compression pressure	kPa (kg/cm², psi)	1,196 (12.2, 173.5)		
Number of carburetors		1		
Control system		Tiller control		Remote control
Starting system		Recoil starter	Electric motor	
Ignition control system		C.D.I.		
Lighting coil		Single phase		
Lighting coil output	V-W / V-A	AC12-80	DC12-6/12-10 with rectifier	
Starting enrichment		Choke valve		
Spark plug		DPR6EA-9		
Exhaust system		Propeller hub		
Lubrication system		Wet sump		
Ignition timing	Degree°(BTDC)	5 ~30		
FUEL AND OIL				
Fuel type		Unleaded regular gasoline		
Fuel rating	PON*	86		
	(*PON: Pump Octane Number)			
	RON*	91		
	(*RON:Research Octane Number)			



Item	Unit	Model		
		F15AMH	F15AEH	F15AE
		F15MHW	F15EHW	—
Engine oil		4-stroke engine oil		
Engine oil grade		API SE, SF, SG or SH		
		SAE 10W-30, 10W40, 20W-40		
Total quantity				
With oil filter	cm ³ (US oz, imp oz)	1,200 (40.6, 42.2)		
With out oil filter	cm ³ (US oz, imp oz)	1,000 (33.8, 35.2)		
Gear oil		Hypoid gear oil		
Gear oil grade		SAE# 90		
Total quantity	cm ³ (US oz, imp oz)	250 (8.45, 8.80)		
BRACKET				
Tilt angle	Degree°	67		
Tilt-up angle	Degree°	8, 12, 16, 20		
Steering angle	Degree°	40+45		
DRIVE UNIT				
Gear positions		F-N-R		
Gear ratio		2.08 (27:13)		
Gear type		Spiral bevel gear		
Propeller direction		Clockwise		
Propeller drive system		Spline		
ELECTRICAL				
Battery capacity	Ah (kC)	40 (144)		
Cold cranking performance	A	380		



MAINTENANCE SPECIFICATIONS

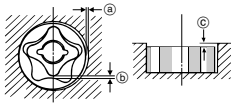
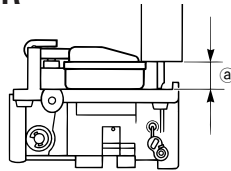
POWER UNIT

Item	Unit	Model
		F15A/F15
CYLINDER HEAD		
Warpage limit	mm (in)	0.1 (0.004)
CYLINDER		
Bore	mm (in)	59.00~59.02 (2.323~2.324)
Taper limit	mm (in)	0.08 (0.003)
Out of round limit	mm (in)	0.05 (0.002)
Cylinder block inside diameter	mm (in)	A : Blue 38.033~38.040 (1.4974~1.4976) B : Black 38.025~38.032 (1.4970~1.4973) C : Brown 38.016~38.024 (1.4967~1.4970)
CAMSHAFT		
Intake (A)	mm (in)	23.895~23.995 (0.9407~0.9447)
Exhaust (A)	mm (in)	23.917~24.017 (0.9416~0.9456)
Intake (B)	mm (in)	19.950~20.050 (0.7854~0.7894)
Exhaust (B)	mm (in)	19.950~20.050 (0.7854~0.7894)
Camshaft journal diameter	mm (in)	15.973~15.984 (0.6289~0.6293)
	mm (in)	17.975~17.991 (0.7077~0.7088)
Oil pump housing journal diameter	mm (in)	16.000~16.0188 (0.6299~0.63066)
Cylinder head journal diameter	mm (in)	18.000~18.018 (0.7087~0.7094)
Camshaft round limit	mm (in)	0.03 (0.001)
TIMING BELT		
Slack	mm (in)	0~10 (0~0.4)
ROCKER ARM SHAFT		
Outside diameter	mm (in)	12.941~12.951 (0.5095~0.5099)
ROCKER ARM		
Inside diameter	mm (in)	13.000~13.018 (0.5118~0.5125)
VALVES		
Face angle	Degree°	90.5~91.5
Valve clearance (cold)		
Intake	mm (in)	0.20±0.05 (0.008~0.002)
Exhaust	mm (in)	0.25±0.05 (0.010~0.002)
Head diameter (A)		
Intake	mm (in)	27.9~28.1 (1.10~1.11)
Exhaust	mm (in)	21.9~22.1 (0.86~0.87)
Face width (B)		
Intake	mm (in)	2.0~3.1 (0.079~0.122)
Exhaust	mm (in)	2.0~3.1 (0.079~0.122)



Item	Unit	Model
		F15A/F15
Seat width (C)	mm (in)	0.6~0.8 (0.02~0.03)
Margin thickness (D)		
Intake	mm (in)	0.50~0.90 (0.020~0.035)
Exhaust	mm (in)	0.50~0.90 (0.020~0.035)
Stem outside diameter		
Intake	mm (in)	5.475~5.490 (0.2155~0.2161)
Exhaust	mm (in)	5.460~5.475 (0.2150~0.2156)
Guide inside diameter	mm (in)	5.500~5.512 (0.2165~0.2170)
Stem to guide clearance		
Intake	mm (in)	0.010~0.037 (0.0004~0.0015)
Exhaust	mm (in)	0.025~0.052 (0.0010~0.0020)
Stem runout limit	mm (in)	0.016 (0.0006)
VALVE SPRING		
Free length	mm (in)	34.4 (1.35)
Free length limit	mm (in)	32.7 (1.29)
Set length	mm/kg (in/lb)	25.4/11.0 (1.00/24.2)
Tilt limit	mm (in)	1.5 (0.06)
PISTON		
Piston-to-cylinder clearance	mm (in)	0.035~0.065 (0.0014~0.0026)
Piston diameter (D)		
Standard	mm (in)	58.950~58.965 (2.3206~2.3215)
Measuring point (H)	mm (in)	5 (0.20)
Pin boss inside diameter	mm (in)	14.004~14.015 (0.5513~0.5518)
Oversize piston diameter		
1st*	mm (in)	59.25 (2.333)* ¹ Except for USA
2nd	mm (in)	59.50 (2.343)
PISTON PIN		
Outside diameter	mm (in)	13.996~14.000 (0.5510~0.5512)
PISTON RINGS		
Top ring		
Type		Barrel
Dimensions (BxT)	mm (in)	1.2 x 2.3 (0.05 x 0.09)
End gap (installed)	mm (in)	0.15~0.30 (0.006~0.012)
Wear limit	mm (in)	0.50 (0.020)
Side clearance (installed)	mm (in)	0.013~0.035 (0.0005~0.0013)
2nd ring		
Type		Plane
Dimensions (BxT)	mm (in)	1.5 x 2.6 (0.06 x 0.10)
End gap (installed)	mm (in)	0.30~0.50 (0.012~0.020)
Ware limit	mm (in)	0.70 (0.028)
Side clearance (installed)	mm (in)	0.02~0.04 (0.001~0.002)



Item	Unit	Model
		F15A/F15
Oil ring		
Dimensions (BxT) 	mm (in)	2.4 x 2.5 (0.09 x 0.10)
End gap (installed)	mm (in)	0.2~0.7 (0.008~0.028)
Wear limit	mm (in)	0.9 (0.04)
CONNECTING ROD		
Small end inside diameter	mm (in)	14.015~14.029 (0.5518~0.5523)
Big end oil clearance	mm (in)	0.021~0.045 (0.0008~0.0018)
CRANKSHAFT		
Crankshaft width	mm (in)	126.70~126.90 (4.99~5.00)
Radial clearance	mm (in)	0.05 (0.002)
Crankshaft big end side clearance	mm (in)	0.05~0.22 (0.002~0.009)
Crankcase mark - bearing color		A:Blue B:Black C:Brown
Crankshaft journal clearance	mm (in)	0.012~0.045 (0.0005~0.0018)
Runout Limit	mm (in)	0.03 (0.0012)
THERMOSTAT		
ID mark		S60°C
Valve opening temperature	°C (°F)	58~62 (136.4~143.6)
Full-open temperature	°C (°F)	70 (158)
Valve lift	mm (in)	3 (0.12)
FUEL PUMP		
Discharge	L (US gal, Imp gal)/h @3,000 r/min	25 (6.60, 5.50)
Pressure	kPa (kg/cm ² , psi)	117.6 (1.2, 17.07)
Diaphragm stroke	mm (in)	2.4~4.8 (0.094~0.189)
Plunger stroke	mm (in)	3.52~6.57 (0.139~0.259)
OIL PUMP		
Type 		Trochoid
Outer rotor-to-housing clearance (a)	mm (in)	0.10~0.15 (0.004~0.006)
Outer rotor-to-inner rotor clearance (b)	mm (in)	0.04~0.14 (0.002~0.006)
Rotor-to-cover clearance (c)	mm (in)	0.03~0.09 (0.001~0.004)
Relief valve operating pressure	kPa (kg/cm ² , psi)	388~450 (3.88~4.50, 55.2~64.0)
CARBURETOR		
ID mark 		66M00/66M10 (for USA)
Main jet	#	104
Pilot jet	#	45
Pilot screw	turns out	1-1/4±1/2 (USA : N.A.)
Float height (a)	mm (in)	10±0.5 (0.4±0.02)
Idle speed	r/min	950±50
Trolling speed	r/min	850±50



LOWER

Item	Unit	Model
		F15A/F15
GEAR BACKLASH (SST indicator)		
Pinion - forward		
Minimum	mm	0.19
Mid-point	mm	0.53
Maximum	mm	0.86
Pinion - reverse		
Minimum	mm	0.95
Mid-point	mm	1.30
Maximum	mm	1.65
Pinion shim	mm	1.13/1.2
Forward shim	mm	0.10/0.12/0.15/0.18/0.30/0.40/0.50
Reverse shim	mm	0.1/0.2/0.3/0.4/0.5
TEST PROPELLER		
Test propeller	Parts No.	YB-1619/90890-01619
Specific revolution	r/min	5,200~5,400

ELECTRICAL

Item	Unit	Model
		F15A/F15
IGNITION SYSTEM		
Ignition timing	Degree° (BTDC)	5~30±3
Charge coil output peak voltage (Br-L)		
@ cranking 1 (500 r/min) open	V	130
@ cranking 2 (500 r/min) loaded	V	135
@ 1,500 r/min	V	180
@ 3,500 r/min	V	180
Pulsar coil output peak voltage (W/G-B)		
@ cranking 1 (500 r/min) open	V	4.0
@ cranking 2 (500 r/min) loaded	V	3.5
@ 1,500 r/min	V	11.0
@ 3,500 r/min	V	23.0
CDI unit output peak voltage (Or-B)		
@ cranking 1 (500 r/min) open	V	120
@ cranking 2 (500 r/min) loaded	V	115/120 (10A model)
@ 1,500 r/min	V	160
@ 3,500 r/min	V	160
Spark plug gap	mm (in)	0.9 (0.04)



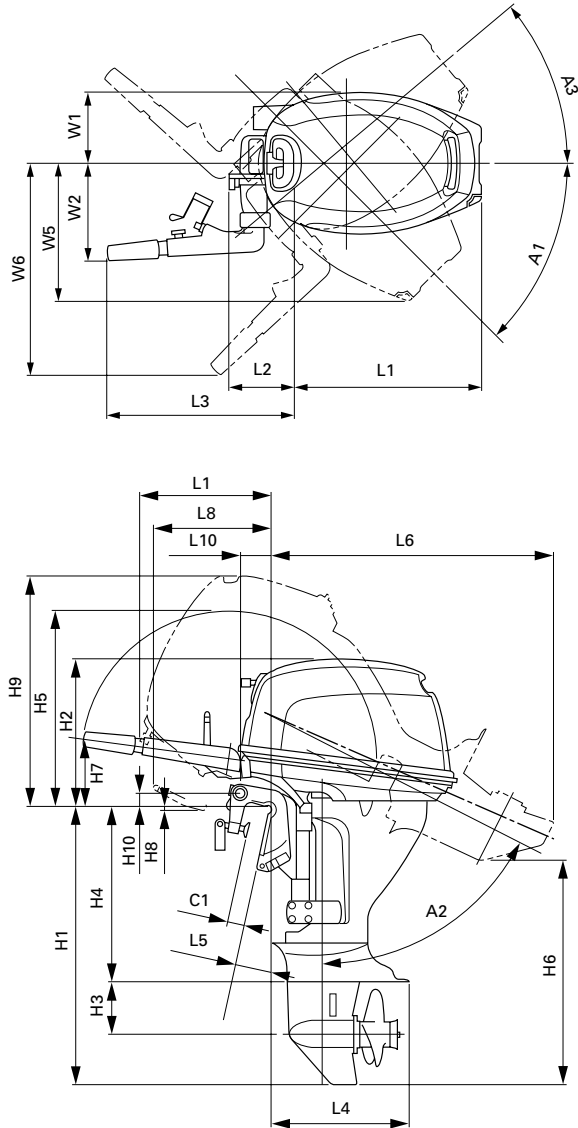
Item	Unit	Model		
		F15AMH	F15AEH	F15AE
		F15MHW	F15EHW	—
Charge coil resistance (Br-L)	Ω	272~408		
Pulsar coil resistance (W/G-B)	Ω	234~348		
Ignition coil resistance (O-B)				
Primary	Ω	0.16~0.24		
Secondary	k Ω	3.94~5.88		
IGNITION CONTROL SYSTEM				
Oil pressure switch	kPa (kg/cm ² , psi)	14.7 (0.15, 2.13)		
Engine speed limiter				
Rated timing	r/min	6,200		
Ignition off	r/min	6,800		
Reset	r/min	6,000		
STARTING SYSTEM				
Fuse*	A	—	10/20*	
STARTING MOTOR				
Type		—	Bendix	
Rating	Second	—	30	
Output	kW	—	1.1	
Brush length	mm (in)	—	12.6 (0.5)	
Limit	mm (in)	—	6.4 (0.25)	
Commutator undercut	mm (in)	—	2 (0.08)	
Limit	mm (in)	—	0.8 (0.03)	
CHARGING SYSTEM				
Lighting coil output peak voltage				
V ₁ (G-G/W)				
@ cranking 1 (500 r/min) open	V	—	6.5	
@ cranking 2 (500 r/min) loaded	V	—	6.0	
@ 1,500 r/min	V	—	21	
@ 3,500 r/min	V	—	46	
Rectifier output peak voltage				
V ₂ (R-B)				
@ cranking 1 (500 r/min) open	V	—	6.0	
@ 1,500 r/min	V	—	20	
@ 3,500 r/min	V	—	46	
Charging current*	A @ 20°C (68°F)	—	6/10*	
Lighting coil resistance 6A(G-G)	Ω @ 20°C (68°F)	0.48~0.72	0.48~0.72 (for 6A Model)	
10A:(G-G/W)			0.24~0.36 (for 10A Model)	

* Charging current 6A → Fuse 10A
 Charging current 10A → Fuse 20A



DIMENSIONS

Outboard dimension

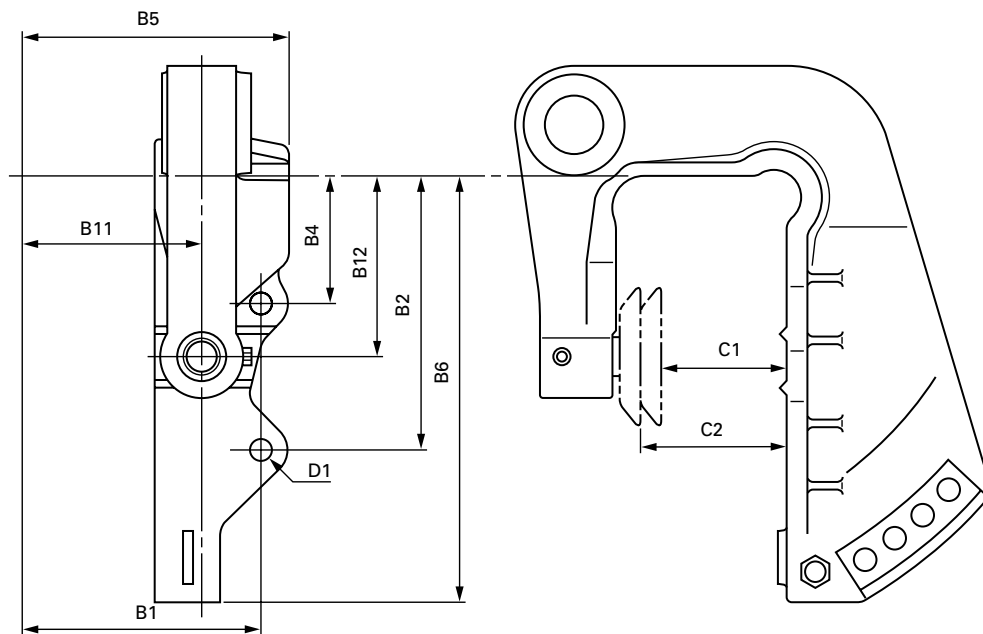


Symbol	Unit	Model(s)		
		F15AMH	F15AEH	F15AE
		F15MHW	F15EHW	—
L1	mm (in)	475 (18.7)	475 (18.7)	475 (18.7)
L2	mm (in)	168 (6.6)	168 (6.6)	160.5 (6.3)
L3	mm (in)	526 (20.7)	526 (20.7)	—
L4	mm (in)	355.5 (14.0)	355.5 (14.0)	355.5 (14.0)
L5	:S mm (in)	78 (3.1)	78 (3.1)	78 (3.1)
L6	:L mm (in)	105 (4.1)	105 (4.1)	105 (4.1)
L7	:S mm (in)	718 (28.3)	718 (28.3)	718 (28.3)
L8	:L mm (in)	831 (32.7)	831 (32.7)	831 (32.7)
L10	mm (in)	330.5 (13.0)	317 (12.5)	317 (12.5)
H1	mm (in)	297 (11.7)	297 (11.7)	—
H2	mm (in)	74.5 (2.9)	74.5 (2.9)	74.5 (2.9)
H3	:S mm (in)	706 (27.8)	706 (27.8)	706 (27.8)
H4	:L mm (in)	833 (32.8)	833 (32.8)	833 (32.8)
H5	mm (in)	375 (14.8)	375 (14.8)	375 (14.8)
H6	mm (in)	135 (5.3)	135 (5.3)	135 (5.3)
H7	:S mm (in)	440 (17.3)	440 (17.3)	440 (17.3)
H8	:L mm (in)	568 (22.4)	568 (22.4)	568 (22.4)
H9	mm (in)	549 (21.6)	549 (21.6)	—
H10	:S mm (in)	572 (22.5)	572 (22.5)	572 (22.5)
H1	:L mm (in)	641 (25.2)	641 (25.2)	641 (25.2)
H2	mm (in)	166.5 (6.6)	262 (10.3)	262 (10.3)
H3	mm (in)	10 (0.4)	10 (0.4)	—
H4	mm (in)	589 (23.2)	589 (23.2)	589 (23.2)
H5	mm (in)	35 (1.4)	35 (1.4)	35 (1.4)
H6	mm (in)	183 (7.2)	183 (7.2)	183 (7.2)
H7	mm (in)	244.5 (9.6)	244.5 (9.6)	—
H8	mm (in)	350 (13.8)	350 (13.8)	350 (13.8)
H9	mm (in)	576 (22.7)	576 (22.7)	—
H10	mm (in)	45 (1.8)	45 (1.8)	45 (1.8)
A1	degree°	45	45	45
A2*	degree°	63	63	63
A3	degree°	40	40	40



Outboard dimension

Symbol	Unit	Model(s)		
		F15AMH	F15AEH	F15AE
		F15MHW	F15EHW	—
B1	mm (in)	92.5 (3.6)	92.5 (3.6)	92.5 (3.6)
B2	mm (in)	103.5 (4.1)	103.5 (4.1)	103.5 (4.1)
B4	mm (in)	49 (1.9)	49 (1.9)	49 (1.9)
B5	mm (in)	103 (4.1)	103 (4.1)	103 (4.1)
B6	mm (in)	164 (6.5)	164 (6.5)	164 (6.5)
B11	mm (in)	70.5 (2.8)	70.5 (2.8)	70.5 (2.8)
B12	mm (in)	49 (1.9)	49 (1.9)	49 (1.9)
C1	mm (in)	44 (1.7)	44 (1.7)	44 (1.7)
C2	mm (in)	55 (2.2)	55 (2.2)	55 (2.2)
D1	mm (in)	8.3 (0.3)	8.3 (0.3)	8.3 (0.3)





TIGHTENING TORQUE

SPECIFIED TORQUE

Part to be tightened		Part name	Thread size	Q'ty	Tightening torque		
					Nm	m•kg	ft•lb
POWER UNIT							
Power unit mounting		Bolt	M8	6	21	2.1	15.2
Fly wheel		Nut	M16	1	110	11.0	80
Carburetor		Bolt	M6	2	10	1.0	7.2
Oil filter		—	—	1	18	1.8	13
Oil filter plug (cylinder block)		—	M20	1	40	4.0	29
Spark plug		—	M12	2	18	1.8	13
Drive sprocket		Nut	M28	1	40	4.0	29
Driven sprocket		Bolt	M6	1	13	1.3	9.4
Cylinder head cover		Bolt	M6	4	8	0.8	5.8
Cylinder head		Bolt	M8	6	30	3.0	21.7
		Bolt	M6	3	12	1.2	8.7
Valve adjusting screws		—	M6	4	14	1.4	10.0
Oil pump cover		Screw	M6	2	4	0.4	2.9
Exhaust cover		Bolt	M6	7	12	1.2	8.7
Crank case	1st	Bolt	M8	4	15	1.5	10.8
	2nd				30	3.0	22
	1st	Bolt	M6	6	6	0.6	4.5
	2nd				12	1.2	8.7
Connecting rod	1st	Bolt	M7	4	10	1.0	7.2
	2nd				22	2.2	16
Anode mount		Bolt	M5	1	5	0.5	3.6
Starting motor mounting		Bolt	M8	3	29	2.9	21
LOWER UNIT							
Propeller		Nut	M10	1	17	1.7	12
Lower unit mounting		Bolt	M8	4	18	1.8	13
Pinion nut		Nut	M8	1	25	2.5	18
BRACKET							
Tiller handle mounting (pivot)		Bolt	M8	1	37	3.7	26.8
Steering friction piece		Bolt	M6	1	4	0.4	2.9
Tilt stop lever		Bolt	M6	4	8	0.8	5.8
Upper rubber mount		Nut	M8	2	21	2.1	15
Lower rubber mount		Bolt/Nut	M8	4	32	3.2	23
Cramp bracket		Nut	M22	2	12	1.2	8.7
Upper casing		Bolt	M8	6	18	1.8	13

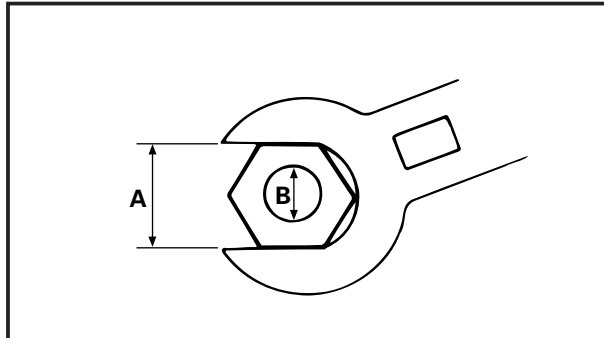


Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		
				Nm	m•kg	ft•lb
Oil drain plug	Bolt	M14	1	27	2.7	19.5
Exhaust manifold	Bolt	M6	2	11	1.1	8.0
Propeller	Nut	M10	1	17	1.7	12.3
Water inlet cover	Screw	M5	1	5	0.5	3.6
ELECTRICAL						
Oil pressure switch	Bolt	—	1	8	0.8	5.8
Starting motor terminal (A=7/16")	Nut	1/4"	1	9	0.9	6.5
Starting motor through bolt (A=3/8")	Bolt	3/16"	2	8	0.8	5.8

Nut (A)	Bolt (B)	General torque specifications		
		Nm	m•kg	ft•lb
8 mm	M5	5.0	0.5	3.6
10 mm	M6	8.0	0.8	5.8
12 mm	M8	18	1.8	13
14 mm	M10	36	3.6	25
17 mm	M12	43	4.3	31

GENERAL TORQUE

This chart specifies the torques for tightening standard fasteners with standard clean dry ISO threads at room temperature. Torque specifications for special components or assemblies are given in applicable sections of this manual. To avoid causing warpage, tighten multifastener assemblies in crisscross fashion, in progressive stages until the specified torque is reached.



CHAPTER 3

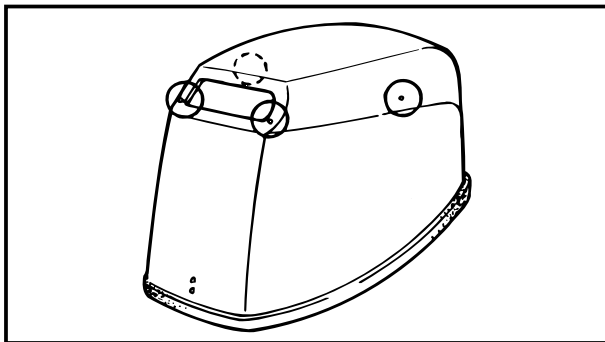
PERIODIC INSPECTION AND ADJUSTMENT

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MAINTENANCE INTERVAL CHART

The following chart should be considered strictly as a guide to general maintenance intervals. Depending on operating conditions, the intervals of maintenance should be changed.

Item	Remarks	Initial		Every		Refer page
		10 hours (Break-in)	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	
COWLING:						
Cowling drain hole	Inspection	○			○	3-2
FUEL SYSTEM:						
Fuel line	Inspection			○	○	3-2
Fuel filter	Inspection/replacement	○	○	○		4-3
CONTROL SYSTEM:						
Throttle cables	Inspection/Adjustment	○			○	3-2
Throttle link rod	Inspection/Adjustment				3-3	
Idle speed	Inspection/Adjustment				○	3-6
Shift control cable	Inspection/Adjustment				○	3-5
Start-in-gear projection	Inspection/Adjustment	○		○		3-7
POWER UNIT:						
Engine oil	Inspection/change	○	○	○	○	3-8
Oil filter	Replace		○	○		3-8
Timing belt	Inspection/replacement		○	○		3-9
Valve clearance	Inspection/adjustment	○				3-9
Spark timing	Inspection					3-11
Thermostat	Inspection /replacement			○		5-31
Water leakage	Inspection	○				—
Motor exterior	Inspection	○				—
Exhaust leakage	Inspection	○	○	○		—
Cooling water passage	Inspection/cleaning		○	○		—
LOWER UNIT:						
Gear oil	Change	○		○	○	3-12
Impeller	Inspection			○		6-4
Lower unit leakage	Inspection			○		3-13
Propeller	Inspection		○	○		—
GENERAL:						
Anode	Inspection	○	○	○	○	3-13
Battery	Inspection		EVERY MONTH			3-14
Spark plug	Cleaning/Adjustment/ Replacement		○	○		3-15 3-15
Wiring and connector	Adjustment/Reconnect	○		—		
Bolts and nuts	Retightening		○	○		—
Grease points	Greasing			○		3-18



PERIODIC SERVICE

INSPECTION AND ADJUSTMENT

COWLING

Water separator drain hole

1. Inspect:
 - Water separator drain hole
Obstruction → Clean.

NOTE:

Use vinyl wire and pass through into the each drain holes (four place).

FUEL SYSTEM

Fuel line

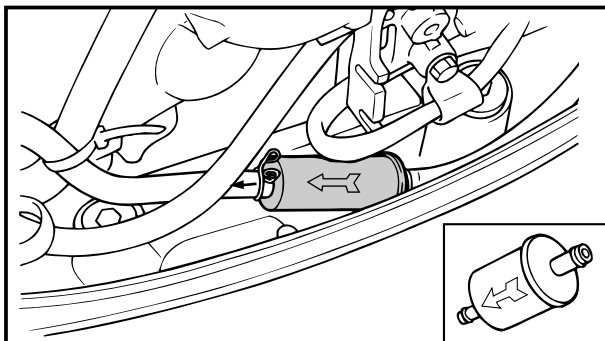
1. Inspect:
 - Fuel line
Cracks/damage/leaks → Replace the defective part(s).

Fuel filter replacement

1. Remove:
 - Fuel filter
2. Install:
 - Fuel filter

CAUTION:

The allow mark of the fuel filter must face towards the fuel pump.



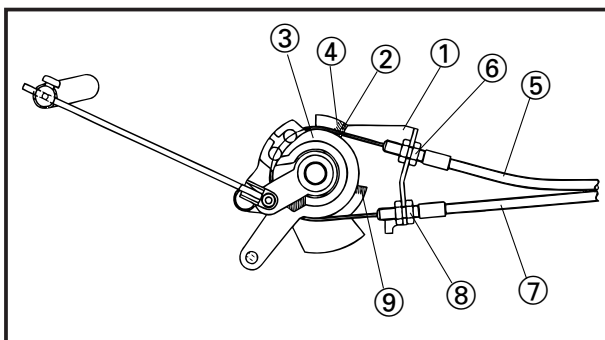
CONTROL SYSTEM

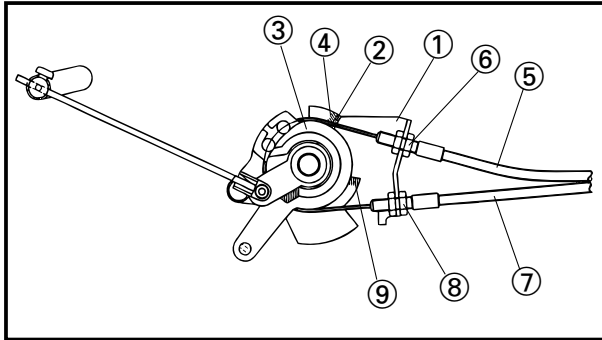
Throttle cables (F15AMH, F15AEH)

1. Inspect:
 - Throttle cables
Slacken → Adjust.
Damage → Replace.
2. Adjust:
 - Throttle cable set condition

Adjustment steps:

- Set the throttle lever to the fully opened position.
- Contact the stopper ② on the bracket ① to the full open side stopper ④ on the throttle control cam ③, then adjust the length of the throttle cable ⑤ with the adjusting nut ⑥ and tighten it.
- Adjust the length of the throttle cable ⑦ with the adjusting nut ⑧ and tighten it.





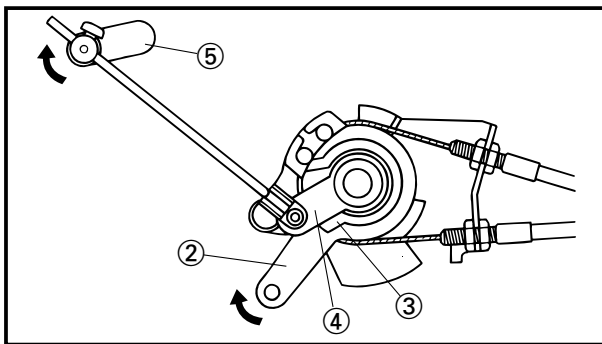
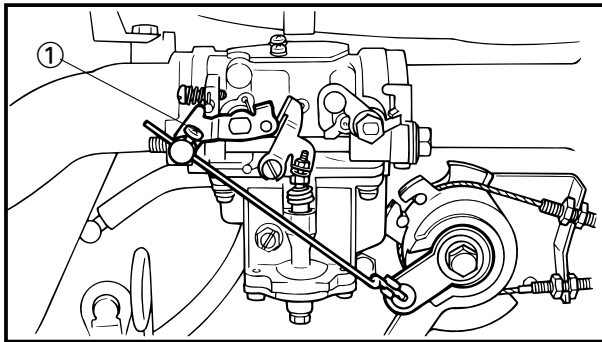
- Fully open and fully close the throttle grip and check that the full-open side stopper ④ and the full-close side stopper ⑨ on the throttle control cam ③ contact the stopper ② on the bracket ①.
- If not, repeat the above adjustment steps.

Throttle link rod (F15AMH, F15AEH)

NOTE:

Before adjusting the throttle link rod, the throttle cable should be properly adjusted.

1. Inspect:
 - Throttle link rod
Loosen/pitting → Adjust.
Bend/damage → Adjust.
2. Adjust:
 - Throttle link rod



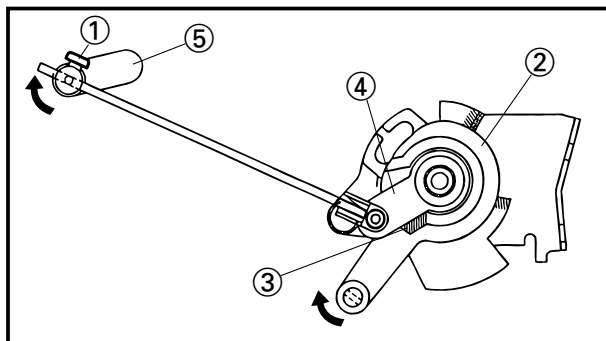
Adjustment steps:

- Loosen the screw ①.
- Fully open the throttle grip to contact the full-open stopper.
- With the free accelerator opening portion ③ of the throttle control cam ② contacting the throttle control lever ④, push the throttle link (carburetor) ⑤ to the full-open side (the allow direction) and tighten the screw ①.
- Fully open and fully close the throttle grip and check that the throttle link (carburetor) ⑤ is set to the full open and full-close.
- If not, repeat that the above adjustment steps.

Throttle link rod (F15AE)

NOTE: _____

Before adjusting the throttle link rod, the throttle cable should be properly adjusted.



1. Inspect:
 - Throttle link rod
 - Loosen/pitting → Adjust.
 - Bend/damage → Adjust.
2. Adjust:
 - Throttle link rod

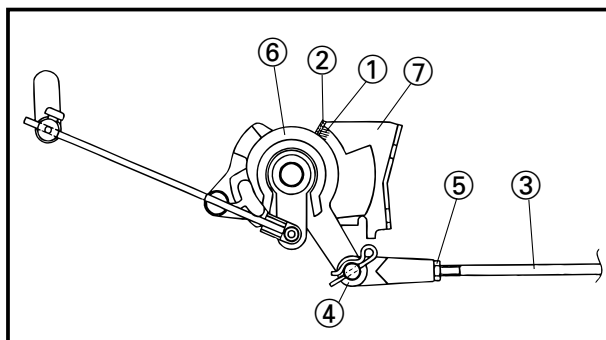
Adjustment steps:

- Loosen the screw ①.
- With the throttle control lever opening portion ③ of the throttle control cam ② contacting the throttle control lever ④, push the throttle link (carburetor) ⑤ to the full-open side (the allow direction) and tighten the screw ①.
- Fully open and fully close the throttle grip and check that the throttle link (carburetor) ⑤ is set to the full open and full-close.
- If not, repeat that the above adjustment steps.

Throttle control cables (F15AE)

NOTE: _____

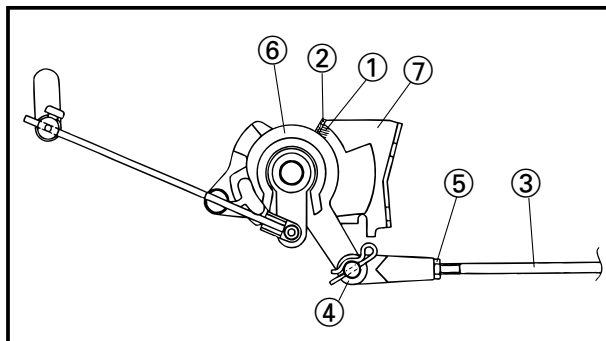
Before adjusting the throttle cable, the throttle link rod should be properly adjusted.



1. Inspect:
 - Throttle cables
 - Slacken → Adjust.
 - Damage → Replace.
2. Adjust:
 - Throttle cable set condition

Adjustment steps:

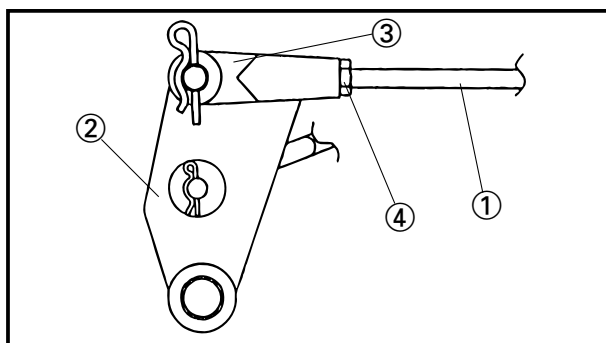
- Set the shift lever to the forward position.
- Contact the stopper ② on the bracket to the fully-close side stopper ① on the throttle control cam.



- Pull the inner part of the remote control cable ③ to decrease the backlash, then install the remote control cable end ④ to the threaded part and adjust the length by the adjusting screw ⑤ and tighten it.
- Operate the remote control lever to the full-open and full-close.
- Check that the full-open side stopper and the full-close side stopper on the throttle control cam ⑥ contact the stopper on the bracket ⑦.
- If not repeat the above adjustment.

Shift cable (F15AE)

1. Inspect:
 - Shift cable
 - Slacken → Adjust.
 - Damage → Replace.
2. Adjust:
 - Shift cable set condition



Adjustment steps:

- Set the shift link rod (engine side) to the neutral position.
- Set the remote control lever to the neutral position.
- Install the remote control cable end ③ to the threaded portion of the remote control cable ① to connect the remote control lever and shift link rod ② in middle range of both freeplay. Adjust the cable length and secure the remote control cable end with the adjust screw ④.
- Operate the shift control lever to the forward , neutral and reverse.
- Check that the shift control to the forward , neutral and reverse position
- If not return the same adjusting steps.

Idle speed (for USA)
NOTE: _____

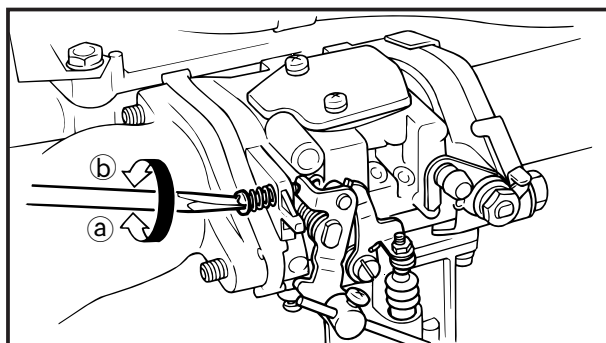
Before adjusting the idle speed, the throttle link rod should be properly adjusted.

1. Measure:
 - Idle speed
 Out of specification → Adjust.

	Idle speed: 950 ± 50r/min.
Measurement steps: • Start the engine and allow it to warm up for a few minutes. • Attach the tachometer to the spark plug lead of cylinder #1.	
	Tachometer: YU-08036-A

2. Adjust:
 - Idle speed

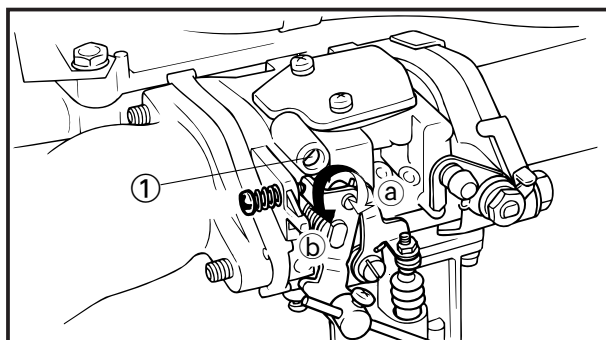
Adjustment steps: • Turn the throttle stop screw in direction (a) or (b) until the specified idle speed is obtained.	
Turning in (a) → Idle speed is increases. Turning out (b) → Idle speed is decreases.	


Idle speed (Except for USA)
NOTE: _____

Before adjusting the idle speed, the throttle link rod should be properly adjusted.

1. Turn the pilot screw ① until is lightly seated.
2. Turn the pilot screw out by the specified number of turns.

	Pilot screw: 1-1/4 ± 1/2 turns out
---	---



3. Measure:

- Idle speed

Out of specification → Adjust.

	Idle speed: 950 ± 50r/min.
Measurement steps: • Start the engine and allow it to warm up for a few minutes. • Attach the tachometer to the spark plug lead of cylinder #1.	
	Tachometer: 90890-06760

4. Adjust:

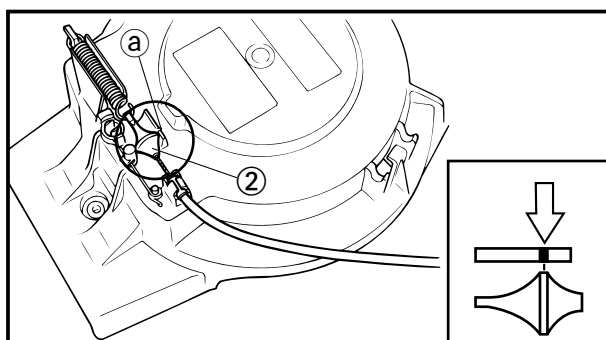
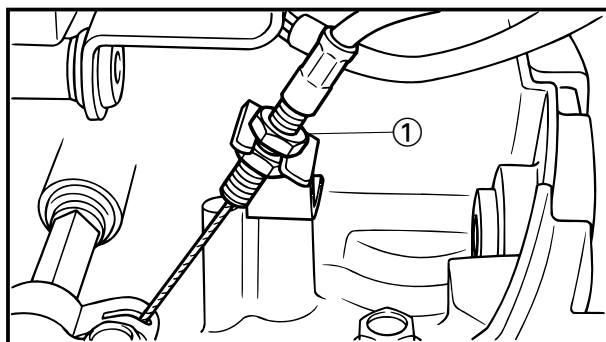
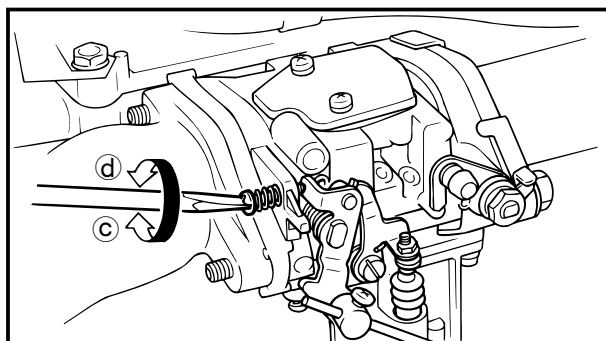
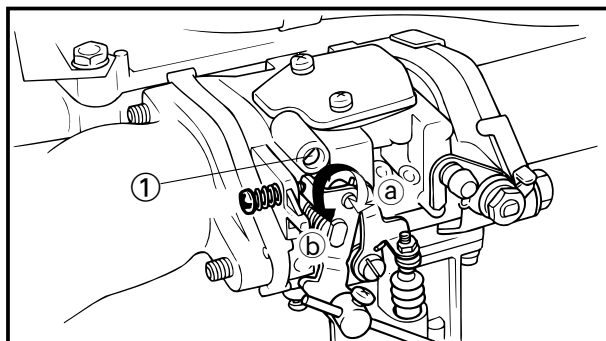
- Idle speed

Adjustment steps:

- Turn the pilot screw ① in direction ③ or ④ until the idle speed is highest position.
- Turn the throttle stop screw in direction ③ or ④ until the specified idle speed is obtained.

Turning in ③ → Idle speed is increases.

Turning out ④ → Idle speed is decreases.


Start-in-gear protection adjustment (F15AMH)
1. Check:

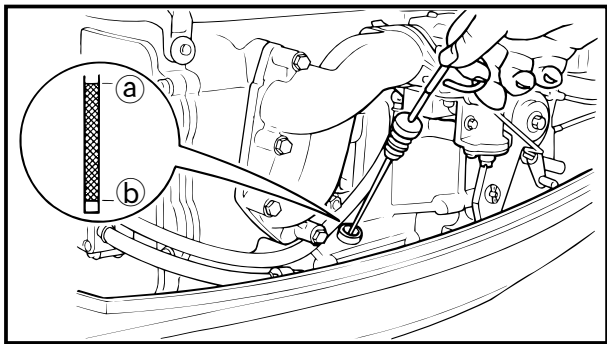
- Start-in-gear protection operation
Incorrect → Adjust.

2. Adjust:

- Start-in-gear protection wire

Adjustment steps:

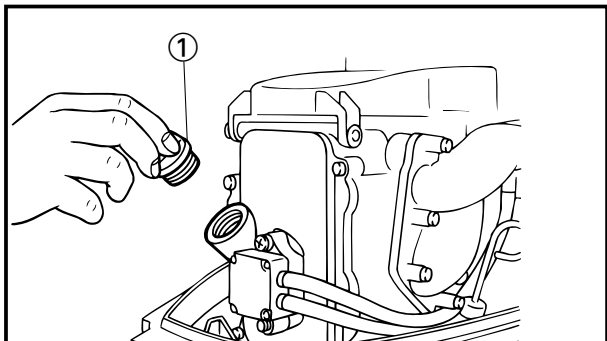
- Set the shift lever in neutral.
- Loosen the locknut ①.
- Adjust the start-in-gear protection wire adjuster so that the marking a of wire end ② aligns with the marking ③ of the starter case.
- Tighten the locknut.



POWER UNIT

Engine oil level

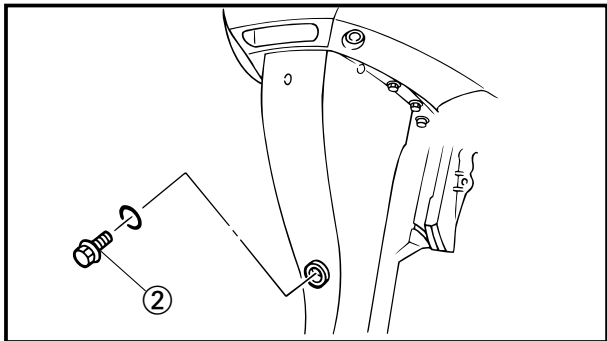
- Check:
 - Engine oil level
 - Above ① → Check for diluted engine oil and or any water leaks.
 - Bellow ② → Add engine oil so that the level is between ① and ②.



Engine oil replacement

- Remove:
 - Oil filler cap ①
 - Drain plug ②
- Remove:
 - Oil filter ③

Oil filter wrench:
YU-38411/90890-01426

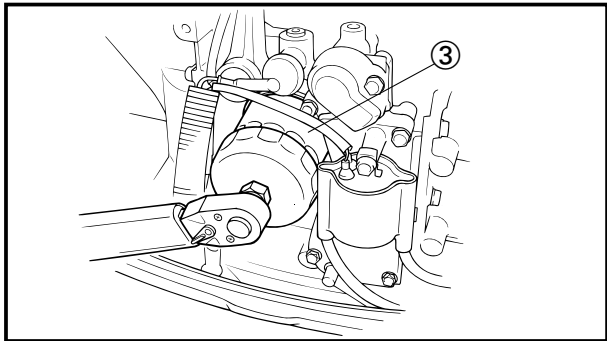


- Install:
 - Drain plug ②
- Install:
 - Oil filter ③

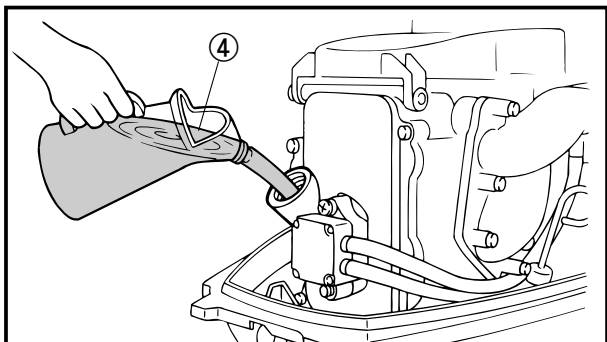
Oil filter:
18 Nm (1.8 m•kg, 13 ft•lb)

NOTE:

- Lubricate the lubber seal with engine oil and tighten the oil filter by hand.
- Then, tighten the oil filter to the specified tightening torque with the oil filter wrench.



- Fill:
 - Engine oil ④
(into the crank case)

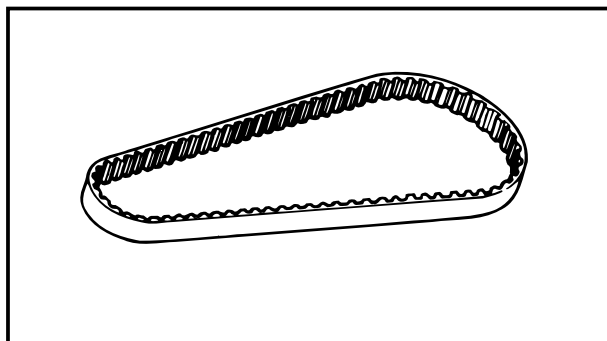


Recommended engine oil:
API: SE, SF, SG, or SH
SAE: 10W-30, 10W-40, or 20W-40
Oil quantity:
With new oil filter
1,200 cm³
(40.6 US oz, 42.2 Imp oz)
With reused oil filter
1,000 cm³
(33.8 US oz, 35.2 Imp oz)

6. Install:
 - Oil filler cap
7. Check:
 - Engine oil level
 Refer to "Engine oil level".

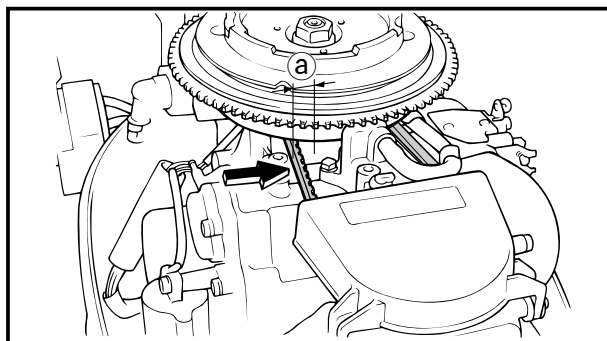
NOTE: _____

- Run the engine for several minutes, turn it off, and check the engine oil level.
- If the engine oils still not with in the proper level, add/drain as needed.



Timing belt

1. Inspect:
 - Timing belt
 Wear/damage → Replace.



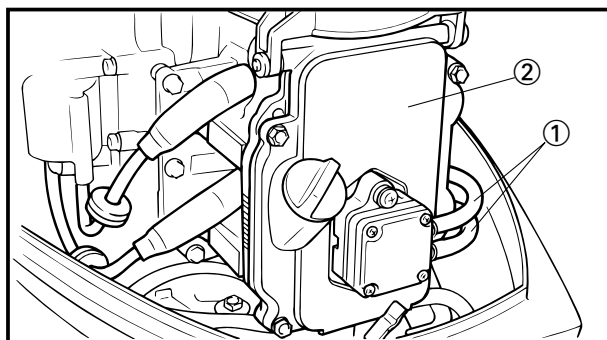
2. Check:
 - Timing belt slack ①
 Push the timing belt with your finger.
 Out of specification → Replace.



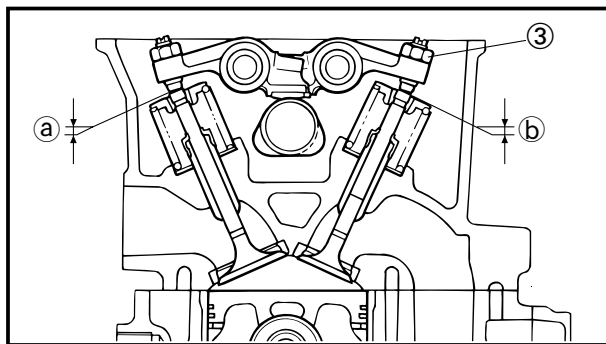
Timing belt slack ①:
0~10 mm (0~0.4 in)

Valve clearance

NOTE: _____
 Valve clearance adjustment should be made on a cold engine, at room temperature.



1. Remove:
 - Top cowl
 - Flywheel cover (F15AEH/F15AE)
 - Manual starter (F15AMH)
 - Driven sprocket cover
 - Spark plug
2. Disconnect:
 - Fuel hoses ①
3. Remove:
 - Cylinder head cover ②



4. Inspect:
- Valve clearance
- Use feeler gauge.


Valve clearance

Intake: 0.20 ± 0.05 mm
(0.008 ± 0.002 in)

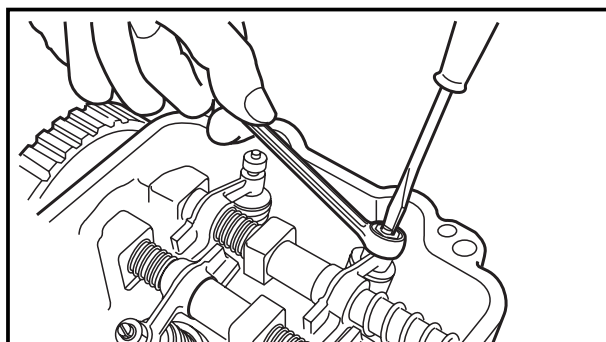
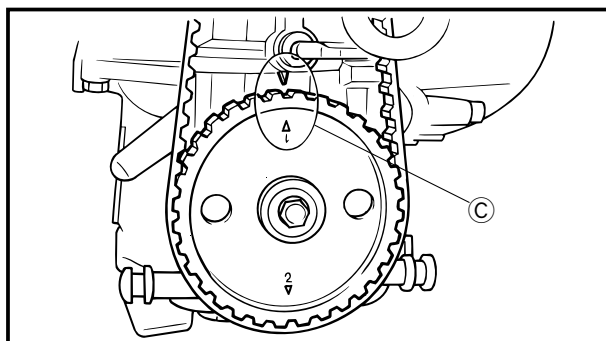
Exhaust: 0.25 ± 0.05 mm
(0.010 ± 0.002 in)

Out of specification → Adjust.

5. Loosen:
- lock nut (tappet)

NOTE: _____
 When loose the lock nut ③, lock the adjust screw, so that the screw dose not move.

6. Adjust:
- Intake valve clearance ①
 - Exhaust valve clearance ②


Adjustment steps:

- Turn the timing sprocket and align the "embossed number 1 or Δ" ③ on the sprocket with "Δ" on the cylinder block.
- Adjust the intake and exhaust valve clearance for cylinder #1.
- Turn the timing sprocket 180° (crank shaft 360°) and align the "embossed number 2 or Δ" on the sprocket with "Δ" on the cylinder block.
- Adjust the intake and exhaust valve clearance for cylinder #2.

7. Tighten:
- lock nut


Lock nut (valve tappet):

14 Nm (1.4 m•kg, 10.0 ft•lb)

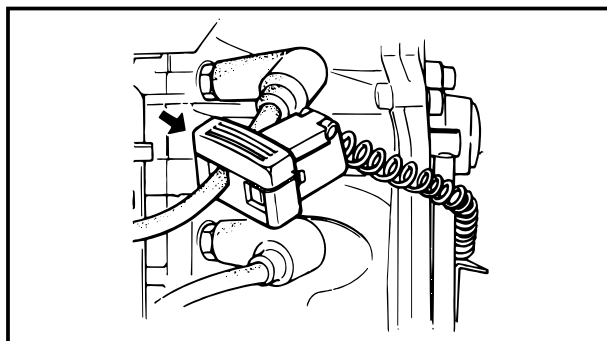
NOTE: _____
 Lock the adjust screw, so that the screw dose not move.

8. Install:
- Cylinder head cover
9. Connect:
- Fuel hose
10. Install:
- Spark plug

Checking the spark timing

NOTE:

Spark timing is advanced by the CDI unit automatically. Therefore only the checking procedure is shown in this section.



1. Attach:

- Tachometer
- Timing light

To spark plug lead for #1 cylinder.



Tachometer:

YU-8036-A/90890-06760

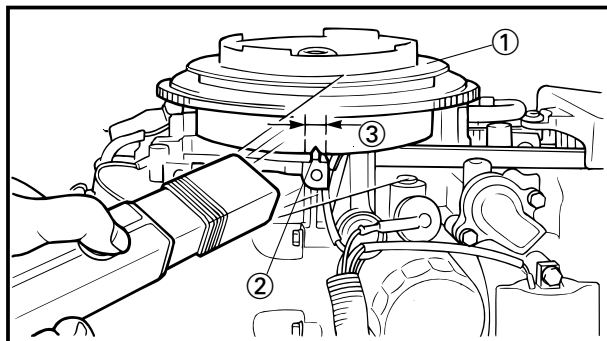
Timing light:

YU-33277-A/90890-03141

2. Check:

- Spark timing

Incorrect firing range → Check the ignition system.



Checking steps 1:

- Warm up the engine and set it at the specified speed.



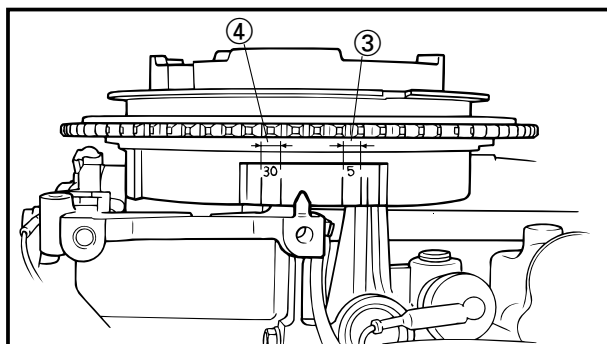
Engine idling speed:

950 ± 50r/min.

- Direct the timing light toward the fly-wheel ①.
- Visually check the stationary pointer ② to verify it is within the required firing range ③ indicated on the fly wheel.

Checking steps 2:

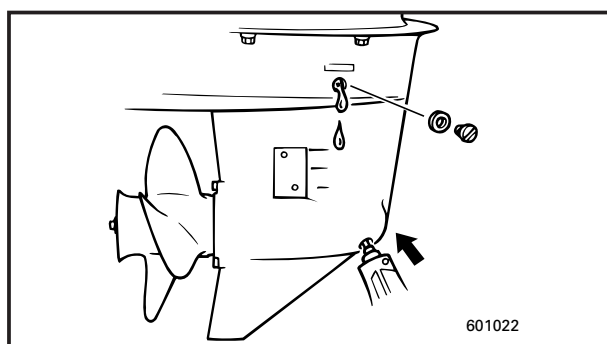
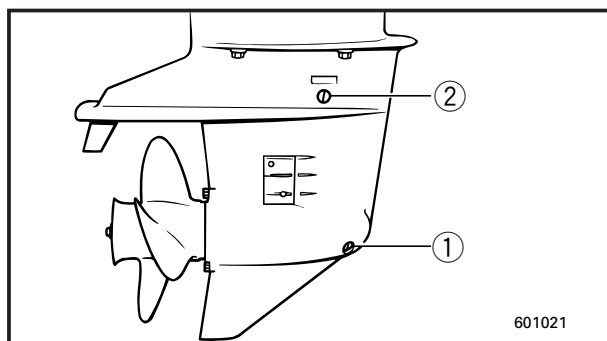
- Increase the engine speed more 3,000 r/min.
- Verify the firing range ④ indicated on the fly wheel to advance the automatically.



LOWER UNIT

Gear oil

1. Check:
 - Gear oil
 - Milky oil → Replace the oil seal.
 - Slag oil → Check the gear, bearing and dog.
2. Check:
 - Gear oil level
 - level is low → Add oil to the proper level.
3. Replace:
 - Gear oil



Replacement steps:

- Tilt up the outboard motor slightly.
- Place a container under the drain plug ①.
- Remove the drain plug, the oil level plug ②, and then drain the gear oil.
- Place the outboard in an upright position.
- Add gear oil through the drain hole until it overflows at the oil level checking hole.



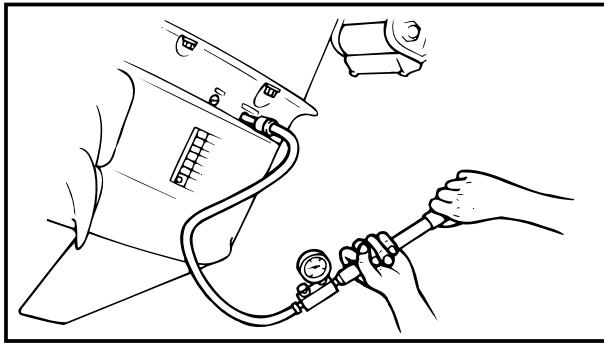
Recommended engine oil:
GEAR CASE LUB (USA) or
Hypoid gear oil, SAE #90

Total amount:

250 cm³

(8.45 US oz, 8.80 Imp oz)

- Install the oil level plug and then the drain plug.



Lower unit leakage check

1. Check:

- Pressure

Pressure drops → Inspect the oil seals and components.

Checking steps:

- Connect the leakage tester to the oil level checking hole.



Leakage tester:

YB-03595/90890-06762

- Apply the specified pressure.



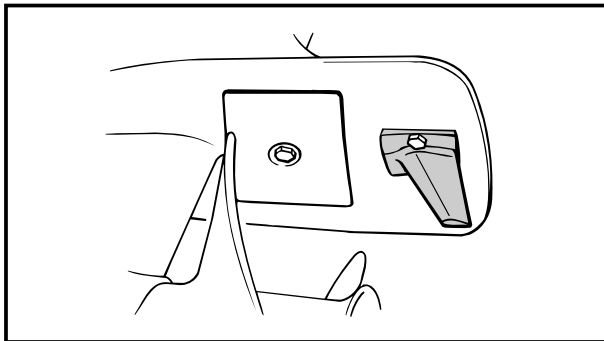
Pressure:

100 kPa (1.0 kg/cm², 14.2 psi)

- Check that the lower unit holds the specified pressure for ten seconds.

NOTE:

Do not overpressurize the lower unit. Excessive pressure may cause the air to leak out.

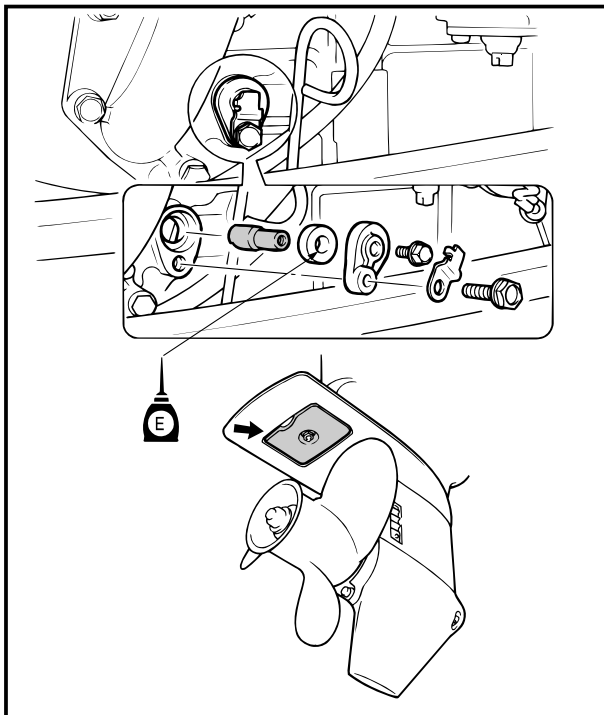


Trim tab check (for S-transom model)

1. Inspect:

- Trim tab

Damage/Cracks/Bend → Replace.



GENERAL

Anode

1. Inspect:

- Anode (engine)
- Anode (lower unit)

Scales → Clean.

Oil/Grease → Clean.

Wear (1/2)/Damage → Replace.

CAUTION:

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

Battery (F15AEH, AE)
⚠ WARNING

Battery electrolyte is dangerous; it contains sulfuric acid which is poisonous and highly caustic.

Always follow these preventive measures:

- Avoid bodily contact with electrolyte as it can cause severe burns or permanent eye injury.
- Wear protective eye gear when handling or working near batteries.

Antidote (EXTERNAL):

- SKIN - Wash with water.
- EYES - Flush with water for 15 minutes and get immediate medical attention.

Antidote (INTERNAL):

- Drink large quantities of water or milk followed with milk of magnesia, beaten egg or vegetable oil. Get immediate medical attention.

Batteries generate explosive, hydrogen gas. Always follow these preventive measures:

- Charge batteries in a well-ventilated area.
- Keep batteries away from fire, sparks or open flames (e.g., welding equipment, lighted cigarettes, etc.).
- DO NOT SMOKE when charging or handling batteries.

KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.

NOTE: _____

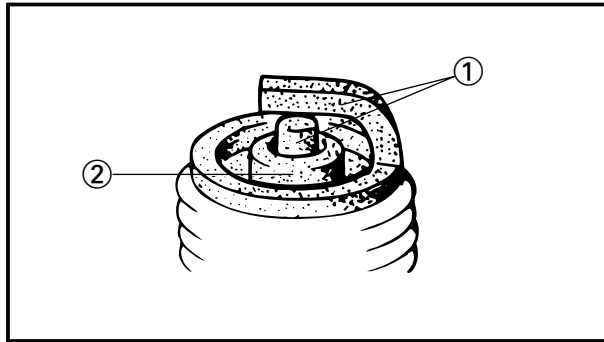
- Batteries vary among manufacturers. Consult your battery manufacturer's instructions.
- First, disconnect the negative lead, then the positive lead.

1. Check:

- Battery fluid level
Below the minimum level mark → Add distilled water to the proper level.
- Battery fluid specific gravity
Less than 1.280 → Recharge the battery.



**Battery fluid specific gravity:
1.280 at 20°C (68°F)**



Spark plugs

1. Remove:
 - Spark plug
2. Inspect:
 - 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:

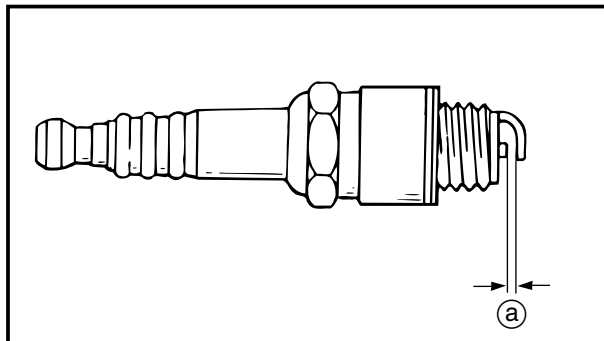
- Lean fuel mixture
- Plugged jet(s)
- Wrong setting

Blackish color:

- Rich mixture
- Defective ignition system
- Excessive idling
- Wrong spark plug

3. Clean:
 - Spark plugs
(with a spark plug cleaner or wire brush)

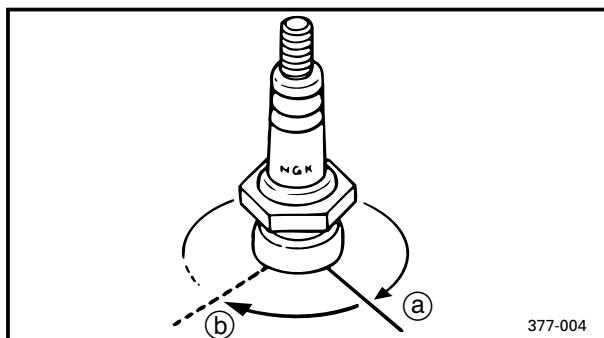
**Spark plug type (NGK):
DPR6EA-9**



4. Measure:
 - Spark plug gap ④
Out of specification → Regap
Use a wire gauge.



**Spark plug gap:
0.9 mm (0.04 in)**



5. Tighten:
 - Spark plugs



**Spark plug:
18 Nm (1.8 m•kg, 13 ft•lb)**

377-004

NOTE: _____

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

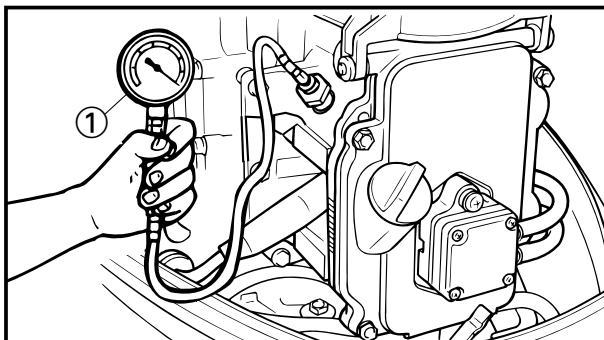
Compression pressure measurement
NOTE: _____

Insufficient compression pressure will result in performance loss.

1. Check:
 - Valve clearance
Out of specification → Adjust.
Refer to "VALVE CLEARANCE ADJUSTMENT" section.
3. Start the engine and let it warm up for several minutes.
4. Turn off the engine.
5. Remove:
 - Spark plug

CAUTION: _____

Before removing the spark plug, use compressed air to blow away any dirt accumulated in the spark plug well to prevent it from falling into the cylinder.



6. Attach:
 - Compression gauge (1)



Compression gauge:
YU-33223
90890-03160

Compression pressure (With oil applied into cylinder)	
Reading	Diagnosis
Higher than without oil	Worn or damaged pistons
Same as without oil	Possible defective ring(s), valves, cylinder head gasket or piston → Repair.

7. Measure:

- **Compression pressure**

If it exceeds the maximum pressure allowed → Inspect the cylinder head, valve surfaces and piston crown for carbon deposits.

If it is below the minimum pressure → Squirt a few drops of oil into the affected cylinder and measure again.

Follow the table below.

	Compression pressure: Standard: 1,196 kPa (12.2 Kg/cm² , 173.5 psi)
--	---

Measurement steps:

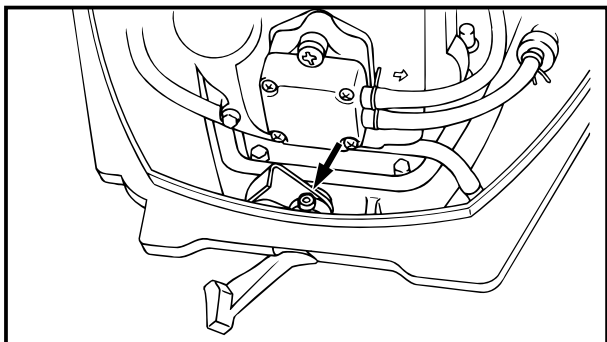
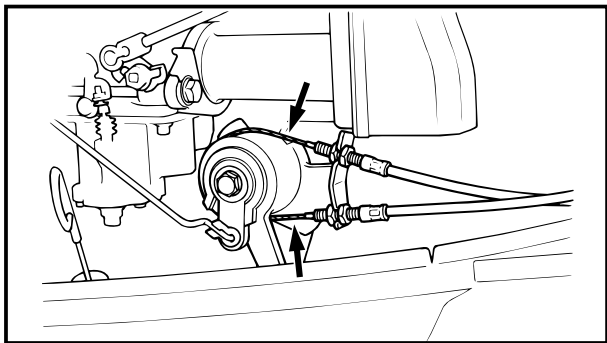
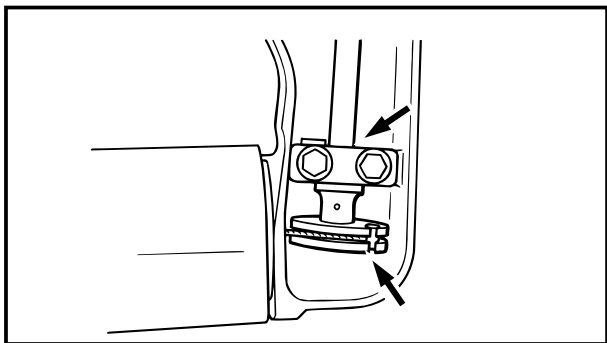
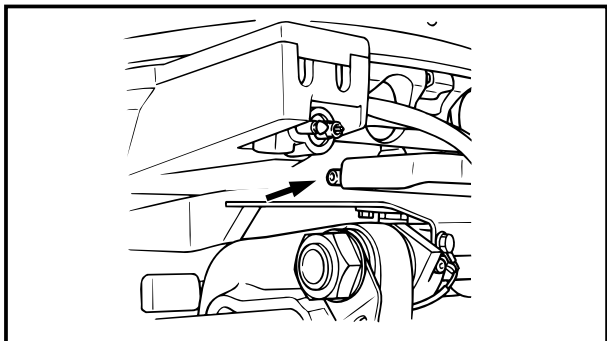
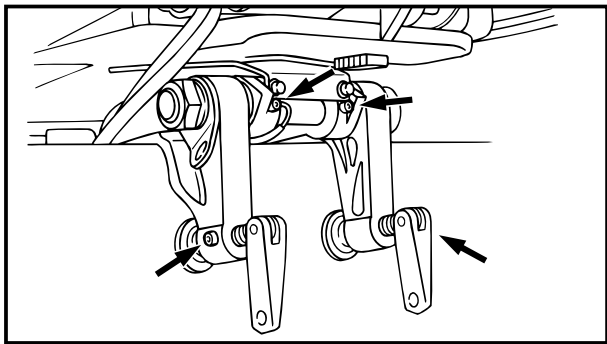
- Crank the engine with the throttle wide-open until the reading on the compression gauge stabilizes.

⚠ WARNING

Before cranking the engine, ground all spark plug leads to prevent sparking.

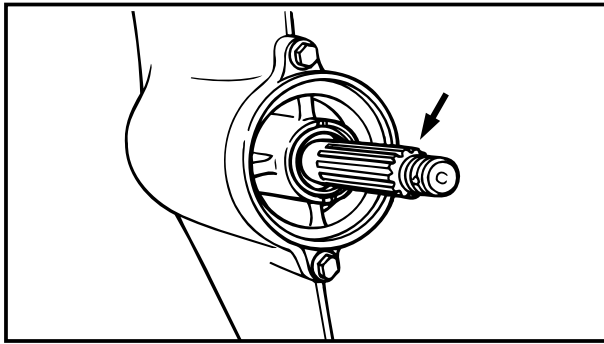
8. Install:

- Spark plug

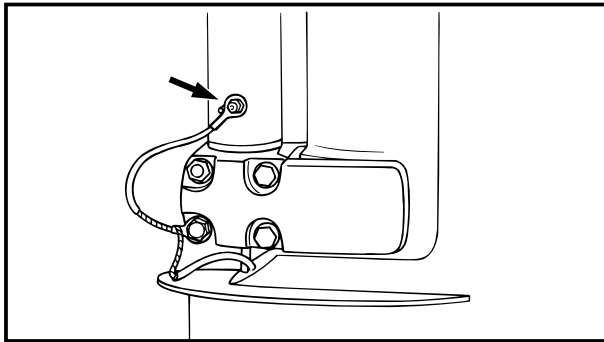


Lubrication points

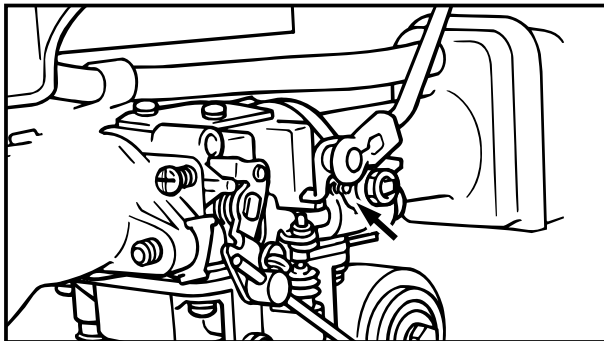
1. Apply:
 - Water resistant grease
Refer the illustration for greasing points .
 - Grease nipple (clamp bracket bolt)
 - Grease nipple
(clamp handle screw: for AMH and AEH)
 - Grease nipple
(steering friction lever:for AMH and AEH)
 - Throttle shaft inner surface
(for AMH and AEH)
 - Throttle cable inner wire
(carburetor side)
 - Grease nipple (cowling lock lever)



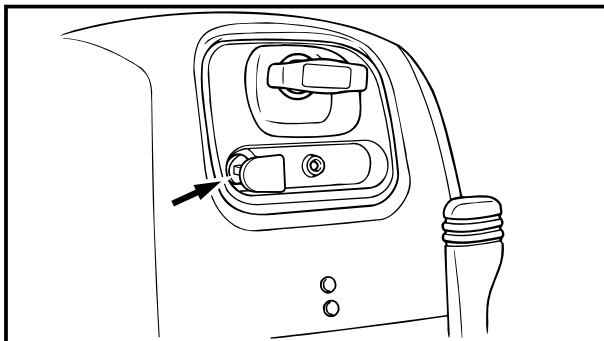
- Propeller shaft spline



- Grease nipple (swivel bracket)



- Choke lever sliding surface
(carburetor side: for AMH and AEH)



- Choke knob sliding surface
(for AMH and AEH)



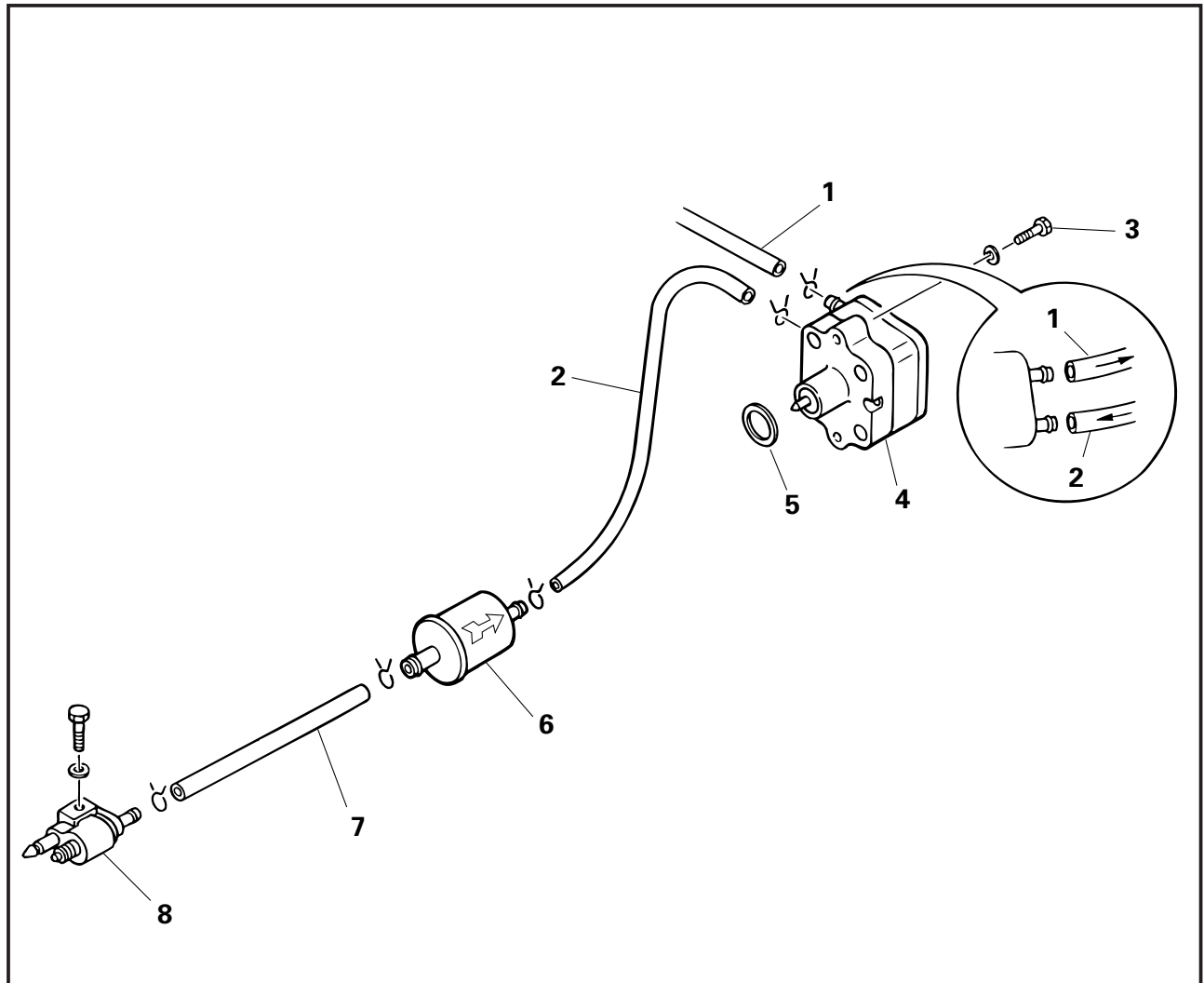
CHAPTER 4

FUEL SYSTEM

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FUEL JOINT, FUEL FILTER, AND FUEL PUMP EXPLODED DIAGRAM

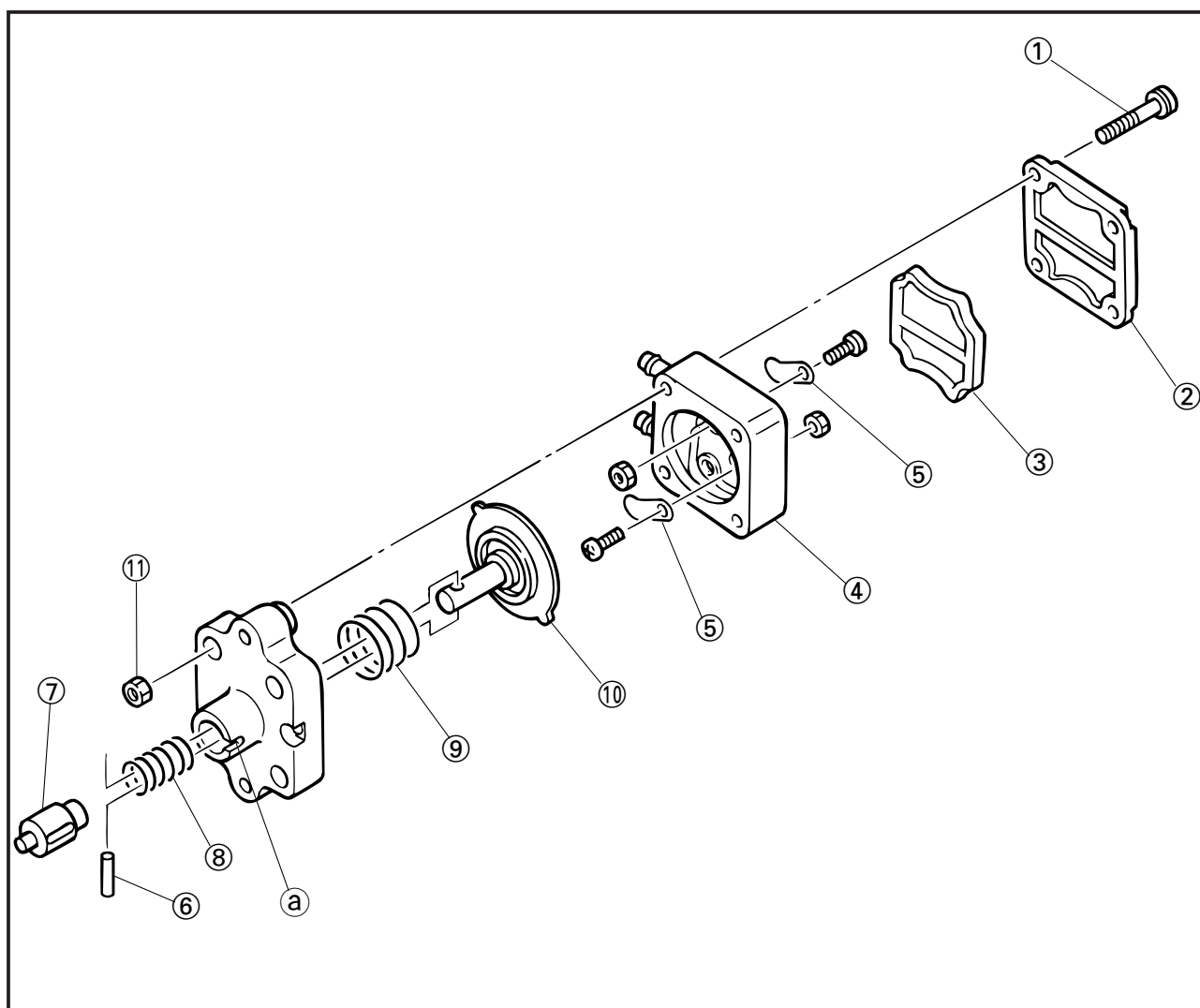


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	FUEL JOINT, FUEL FILTER AND FUEL PUMP REMOVAL		Follow the left "Step" for removal.
1	Fuel hose (fuel pump-to-carburetor)	1	
2	Fuel hose (fuel filter-to-fuel pump)	1	
3	Screw with washer	2	M6 x 30 mm
4	Fuel pump ass'y	1	
5	O-ring	1	Not reusable
6	Fuel filter	1	NOTE: _____ In this installation, make sure the arrow mark face the fuel pump side. _____
7	Fuel hose (fuel joint-to-fuel filter)	1	
8	Fuel joint	1	
			Reverse the removal steps for installation.

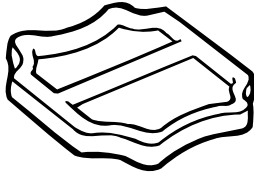


FUEL PUMP EXPLODED DIAGRAM

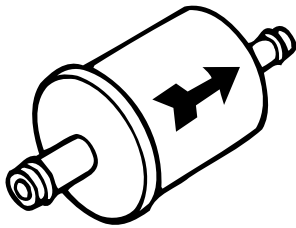


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	FUEL PUMP DISASSEMBLY		
①	Screw with washer	4	Follow the left "Step" for disassembly. NOTE: _____ When remove the pin, push turn and align the slot ⑥ on the plunger. _____ Reverse the disassembly steps for installation.
②	Fuel pump cover	1	
③	Diaphragm	1	
④	Fuel pump body	1	
⑤	Seat valve	2	
⑥	Pin	1	
⑦	Plunger	1	
⑧	Plunger spring	1	
⑨	Diaphragm spring	1	
⑩	Diaphragm	1	
⑪	Nut	4	

**SERVICE POINTS****Fuel pump inspection**

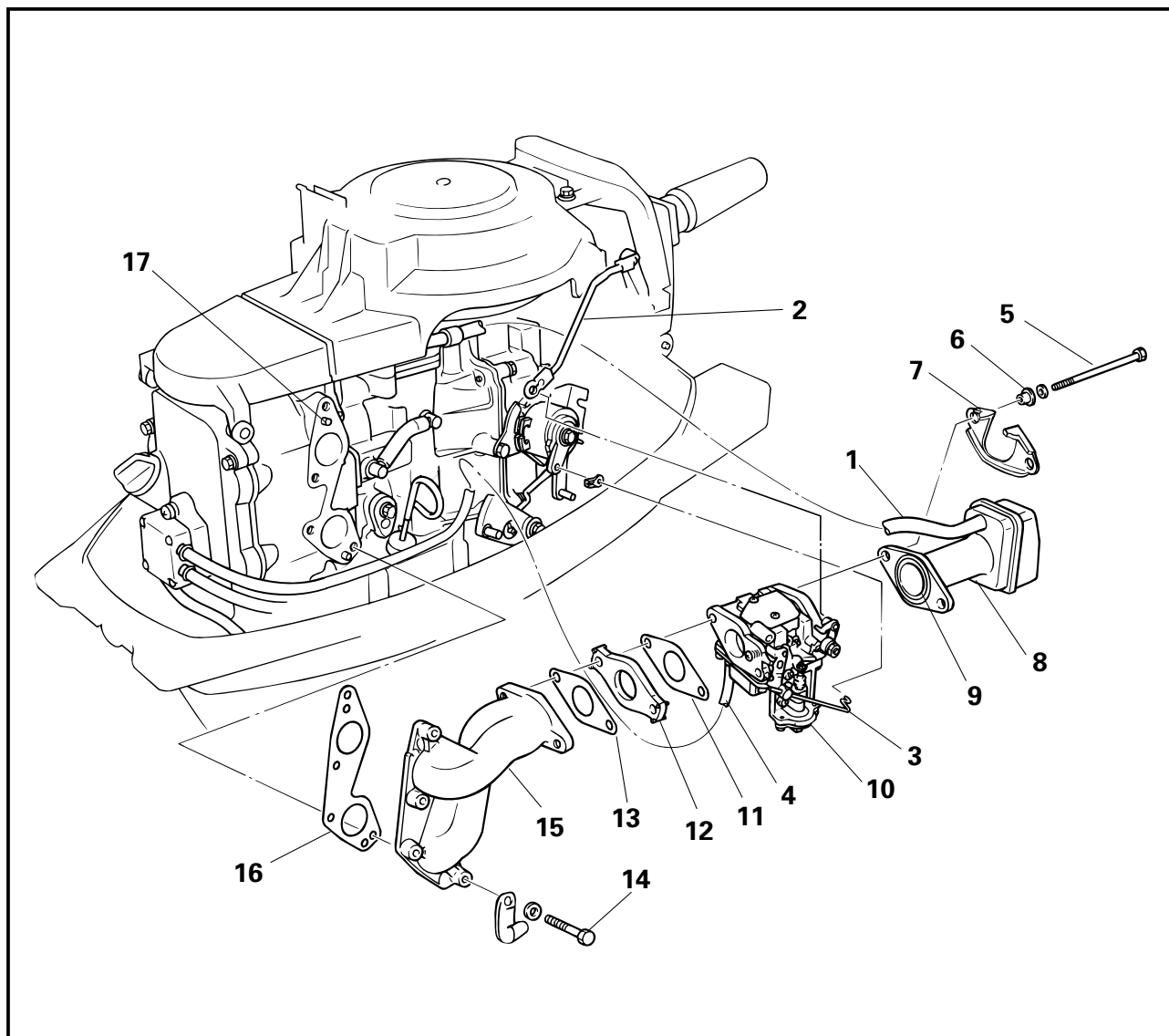
1. Inspect:
 - DiaphragmDamage → Replace.

**Fuel filter inspection**

1. Inspect:
 - Fuel filterCrack/Leak/Clog → Replace.



INTAKE SYSTEM EXPLODED DIAGRAM

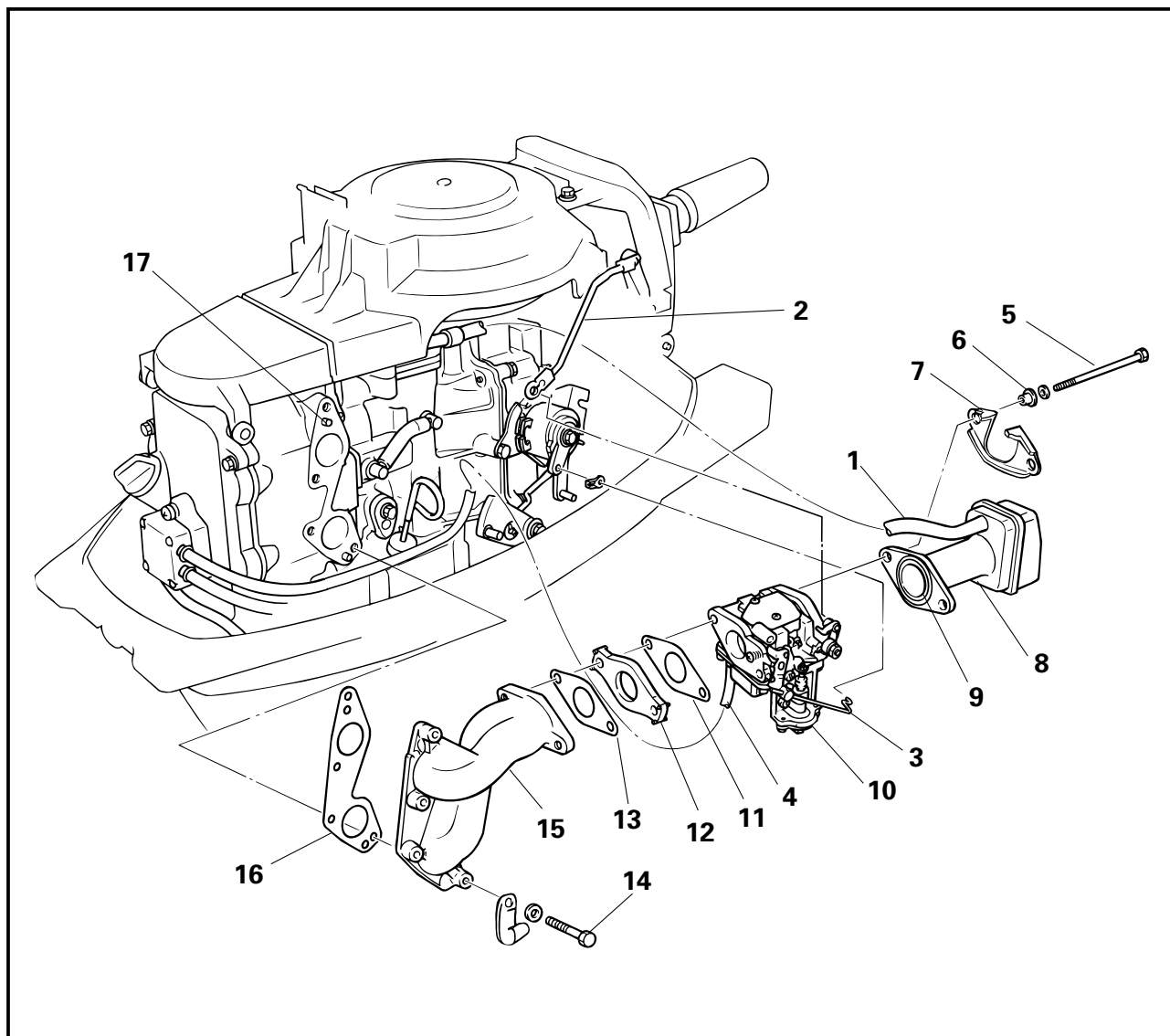


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	INTAKE SYSTEM REMOVAL		
1	Breather hose	1	Follow the left "Step" for removal.
2	Choke rod	1	NOTE: _____ When remove the snap connector of the carburetor side, pull the choke knob.
3	Throttle link rod	1	
4	Fuel hose	1	
5	Bolt	2	M6x100 mm
6	Collar	2	
7	Plate	1	



EXPLODED DIAGRAM

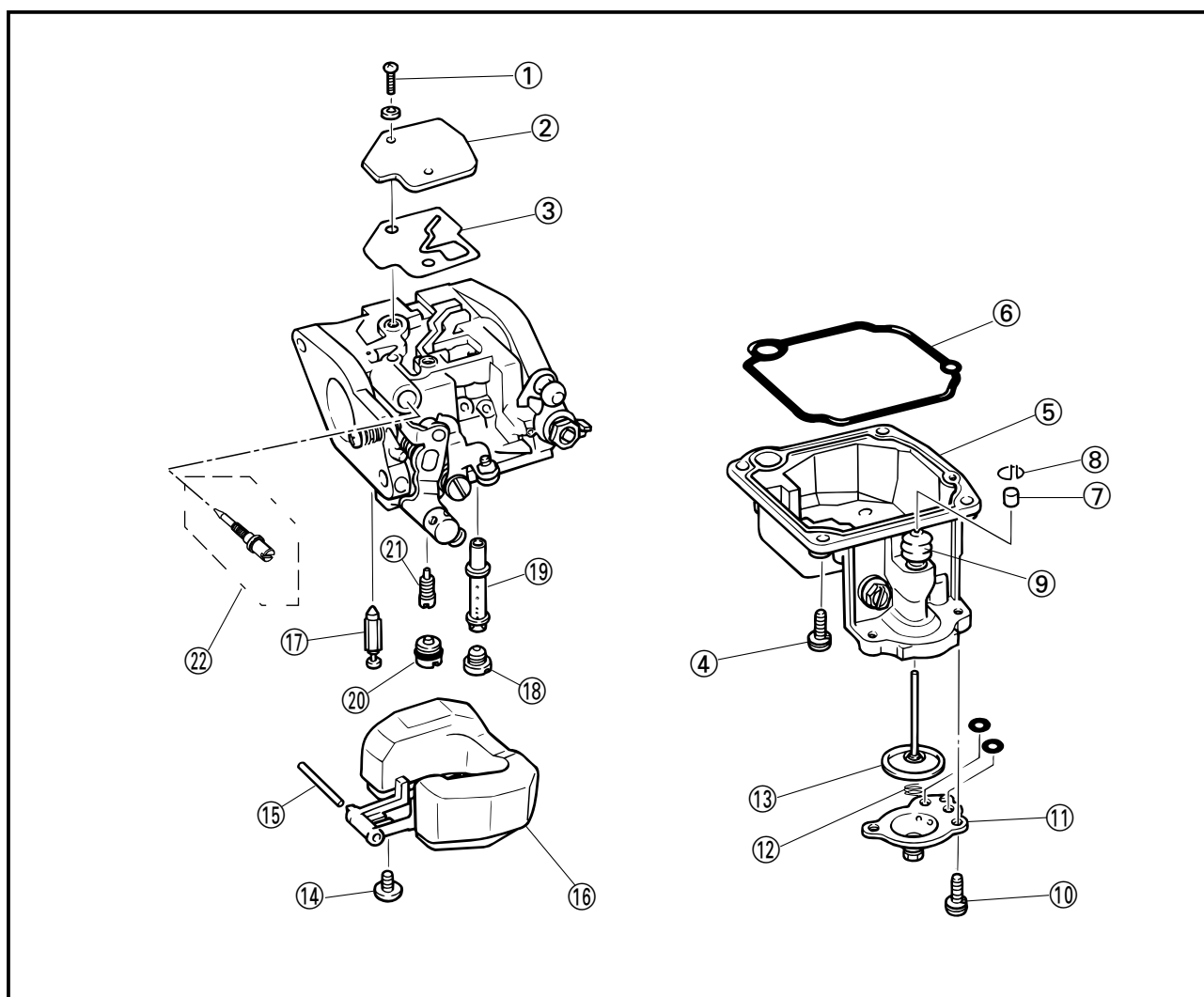


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
8	Air funnel duct	1	M6x40 mm
9	O-ring	1	
10	Carburetor assembly	1	
11	Gasket	1	
12	Spacer	1	
13	Gasket	1	
14	Bolt	4	
15	Intake manifold	1	
16	Gasket	1	
17	Dowel pin	2	
			Reverse the removal steps for installation.



CARBURETOR EXPLODED DIAGRAM

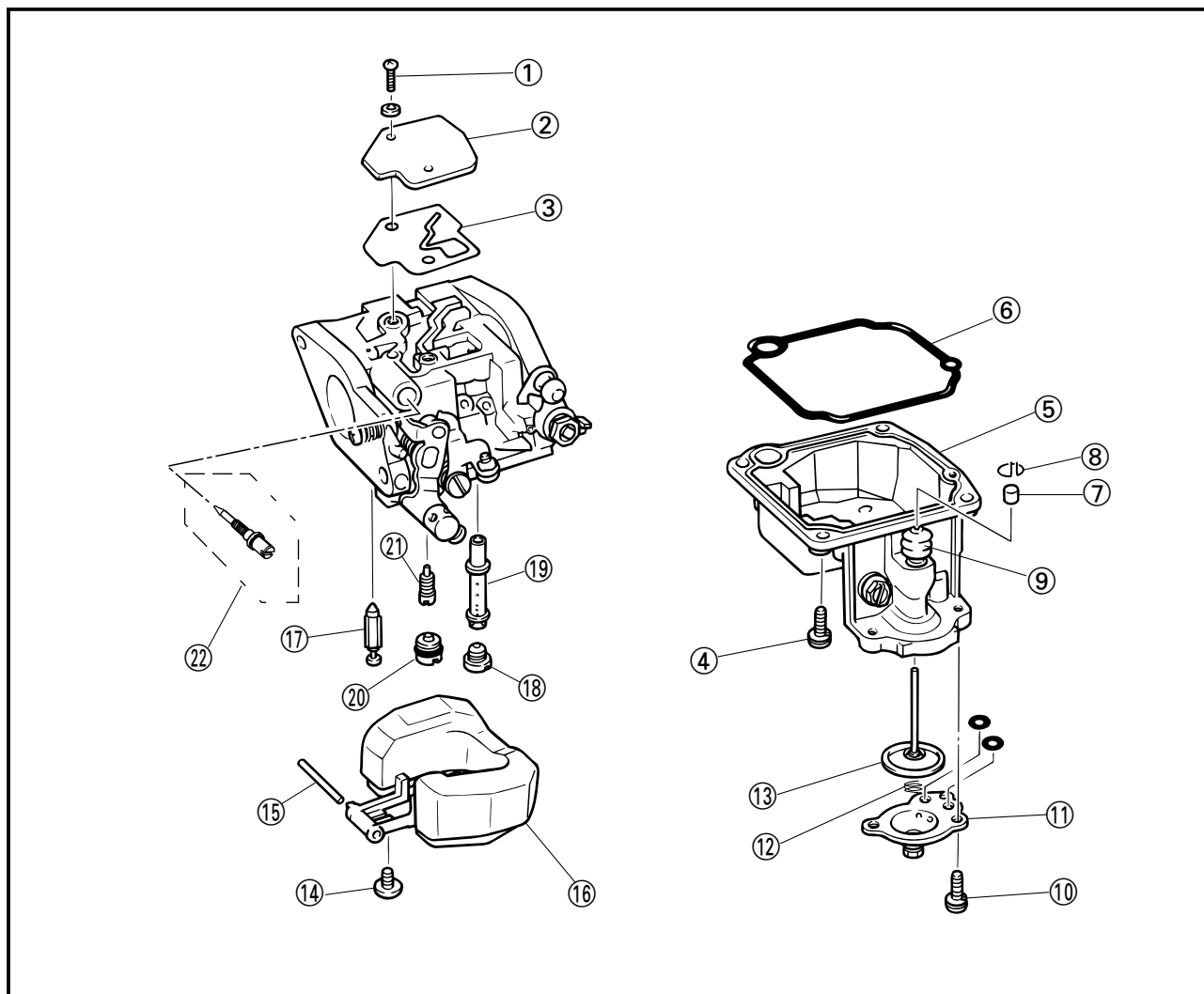


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CARBURETOR DISASSEMBLY		Follow the left "Step" for disassembly.
	Carburetor assembly		
①	Screw	2	
②	Carburetor top cover	1	
③	Gasket (carburetor top cover)	1	
④	Screw (float chamber)	4	
⑤	Float chamber	1	
⑥	Packing	1	
⑦	Plunger rod cap	1	
⑧	Clip	1	
⑨	Rubber boot	1	
⑩	Screw	3	
⑪	Diaphragm cover	1	
⑫	Spring	1	

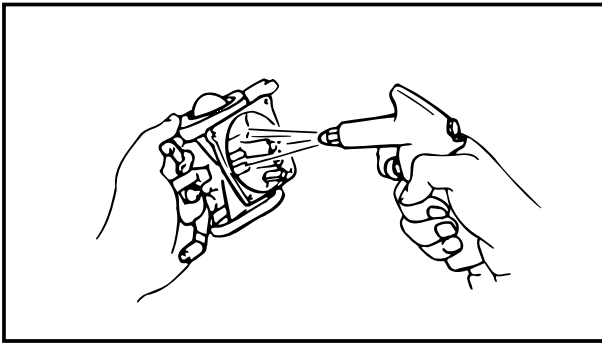


EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
⑬	Diaphragm	1	Except for USA Reverse the disassembly steps for assembly.
⑭	Screw	1	
⑮	Float pin	1	
⑯	Float	1	
⑰	Needle valve	1	
⑱	Main jet	1	
⑲	Main nozzle	1	
⑳	Plug	1	
㉑	Pilot jet	1	
㉒	Pilot screw	1	



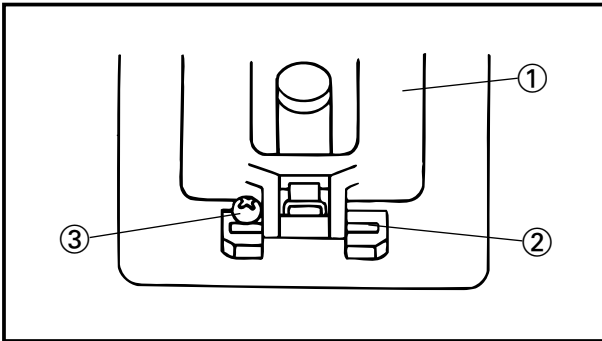
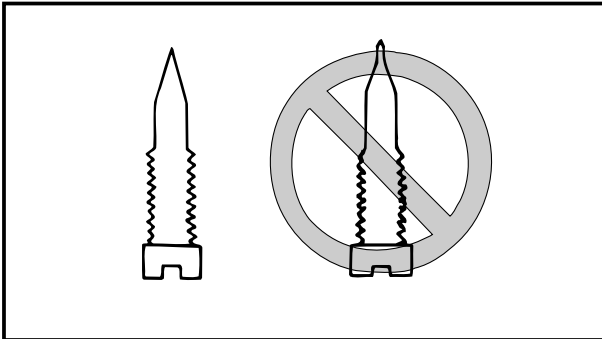
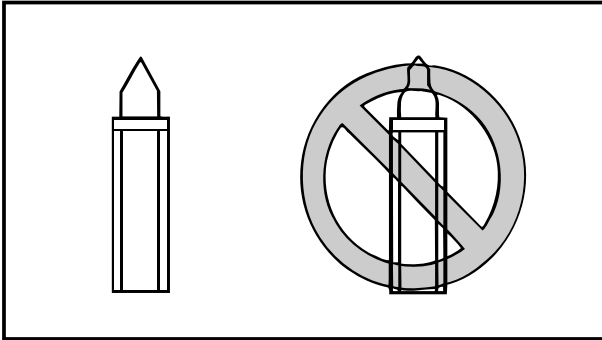
SERVICE POINTS

CAUTION:

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

Carburetor inspection

1. Inspect:
 - Carburetor body
Cracks/damage → Replace.
 - Contamination → Clean.
2. Inspect:
 - Main jet
 - Pilot jet
 - Main nozzle
 - Contamination → Clean.
3. Inspect:
 - Needle valve
 - Pilot screw (Except for USA)
Grooved wear → Replace.
4. Inspect:
 - Float
Cracks/damage → Replace.

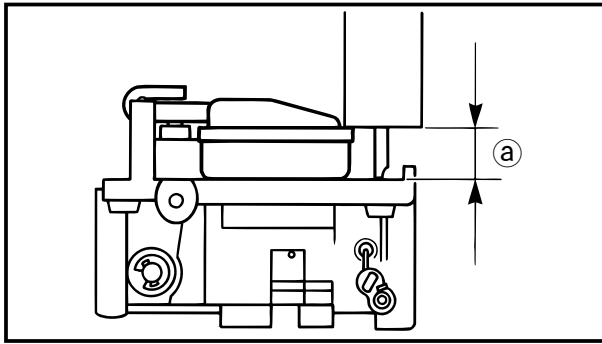


Carburetor

1. Install:
 - Needle valve
 - Float ①
 - Float pin ②
 - Screw ③

NOTE:

- The float pin should fit into the slit in the carburetor and be retained with the screw.
- When installing the float into the carburetor, place the needle valve into the needle valve seat.
- After installation, make sure that the float operates smoothly.



2. Measure:

- Float height (a)

Out of specification → Replace.



Float height:

10.0 ± 0.5 mm (0.4 ± 0.02 in)

NOTE:

- The float should be resting on the needle valve, but not compressing it.
- Take measurement at the middle of the float, opposite the side it pivots on.



CHAPTER 5

POWER UNIT

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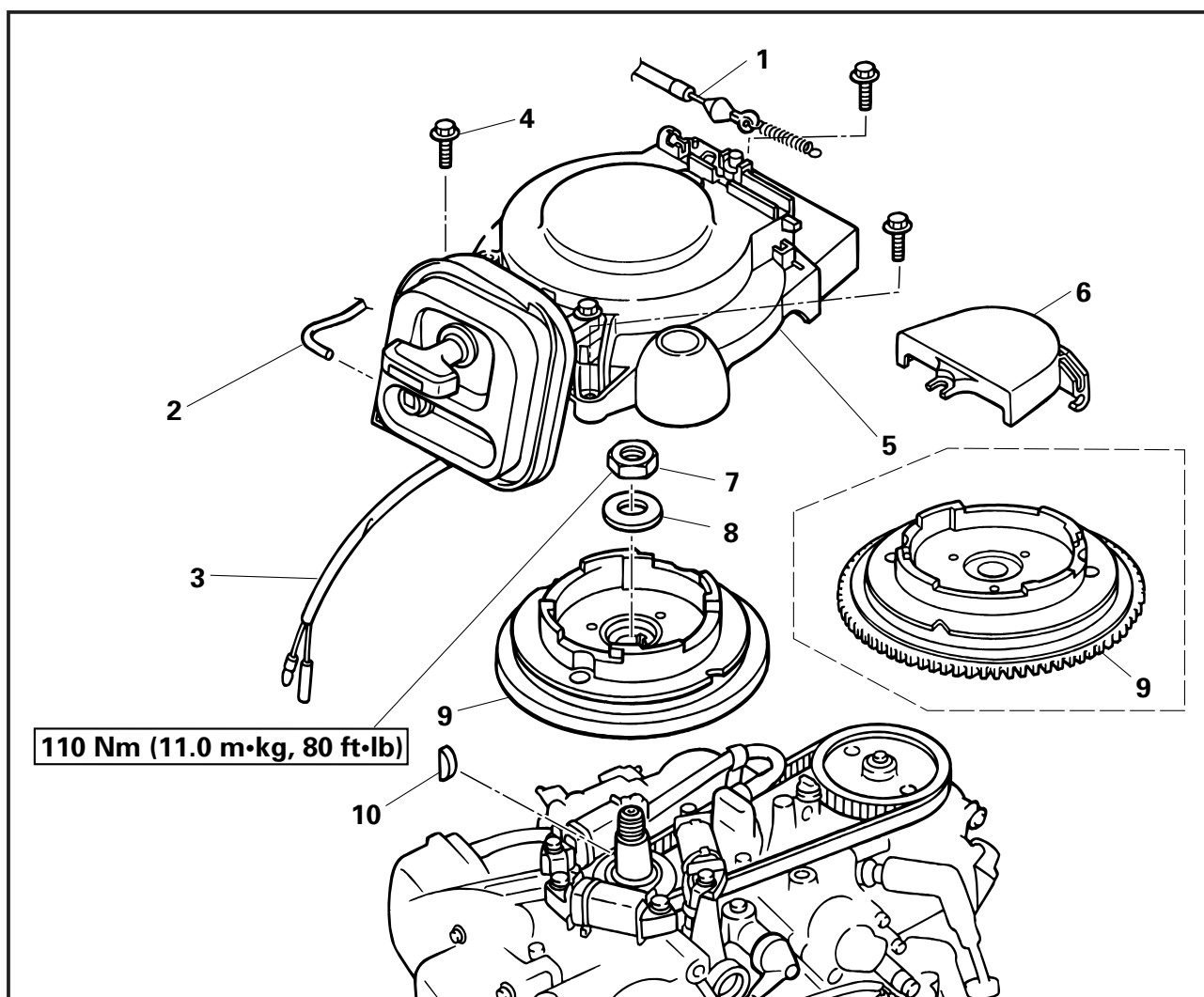


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MANUAL STARTER (AMH)

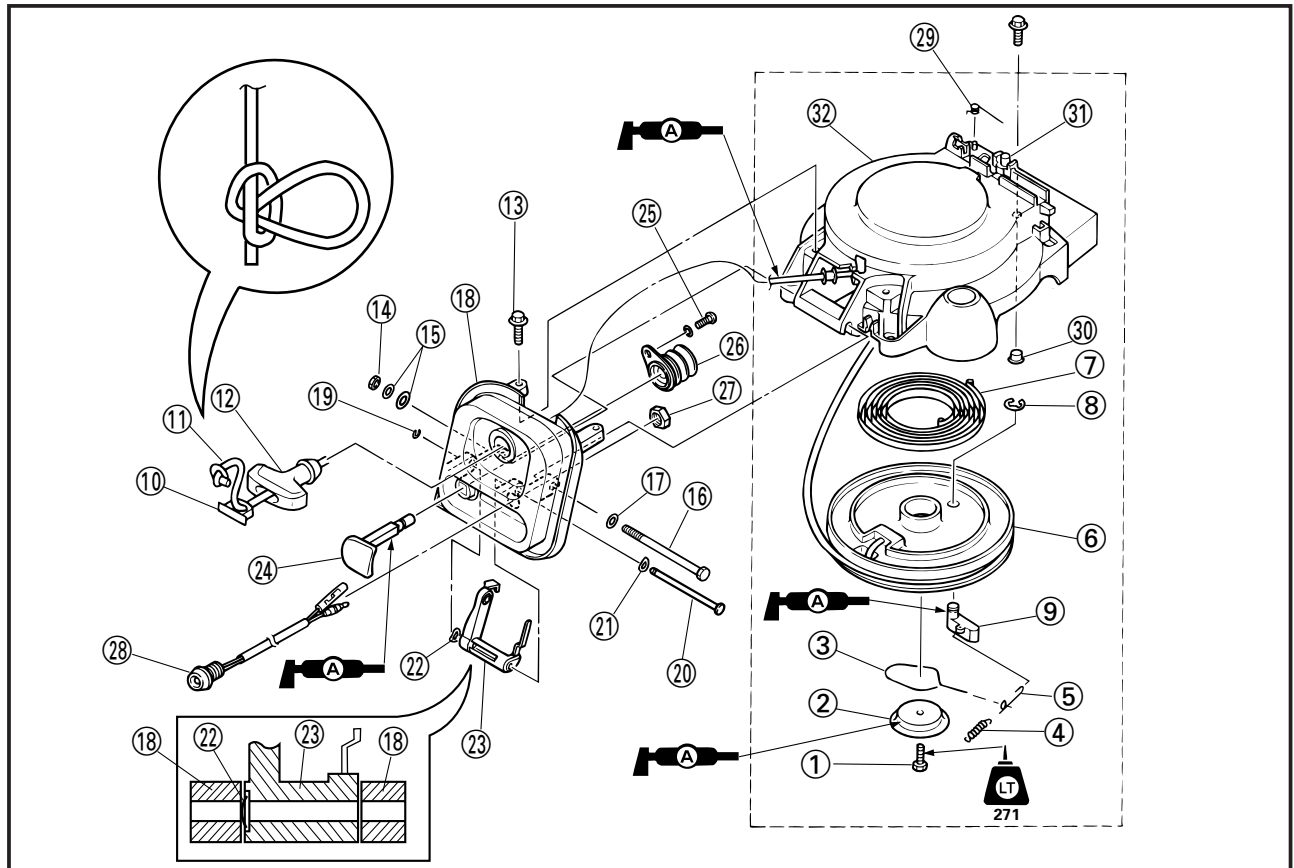
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	MANUAL STARTER REMOVAL		
1	Start-in-gear protection cable	1	Follow the left "Step" for removal.
2	Choke rod	1	With spring
3	Warning lamp connector (P, Y/R)	2	
4	Bolt (manual starter)	3	M6 x 25 mm
5	Manual starter ass'y	1	
6	Driven sprocket cover	1	
	FLYWHEEL MAGNETO REMOVAL		
7	Nut (flywheel)	1	
8	Washer	1	
9	Flywheel	1	With ring gear : for USA
10	Woodruff key	1	
			Reverse the removal steps for installation.

EXPLODED DIAGRAM

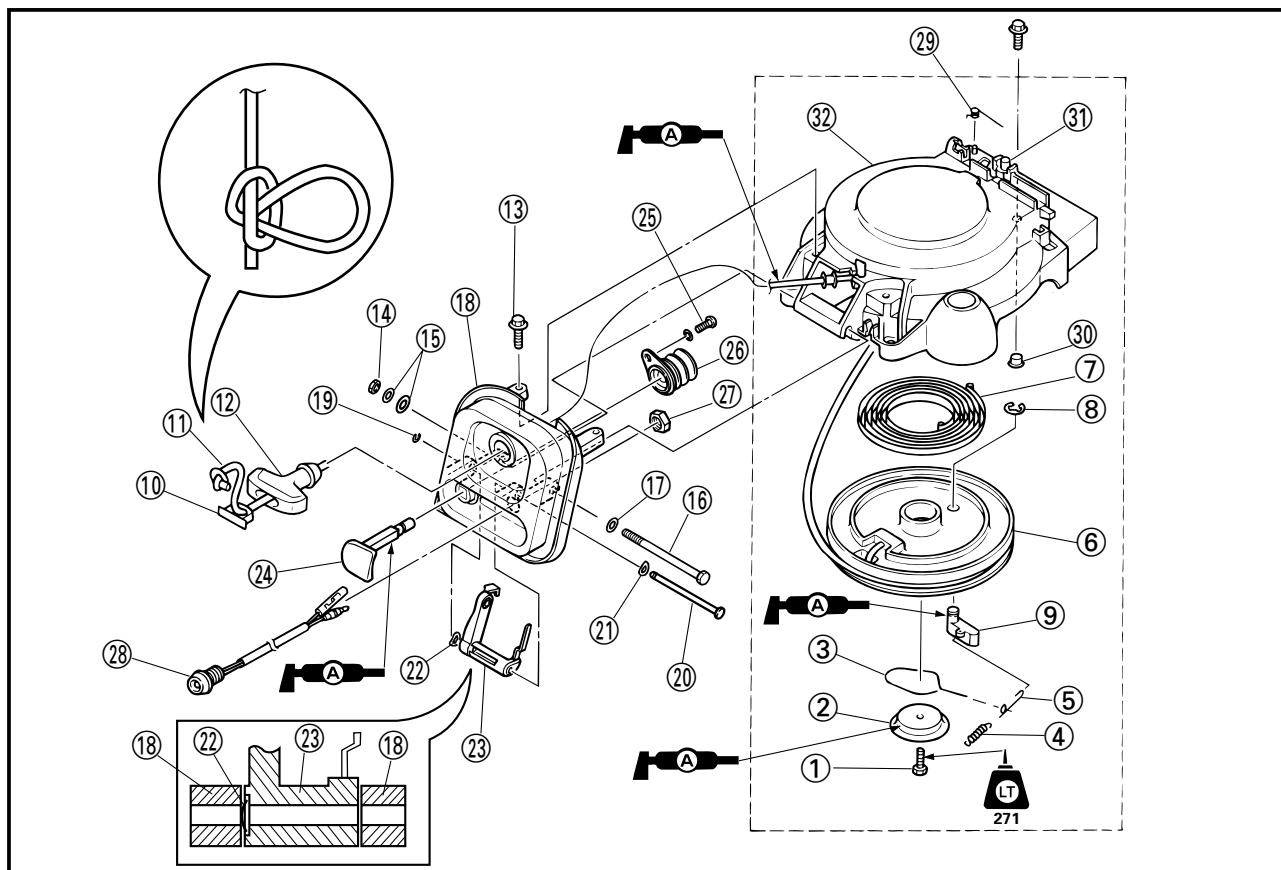


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	MANUAL STARTER DISASSEMBLY		Follow the left "Step" for disassembly.
①	Bolt (drive plate)	1	
②	Drive plate	1	
③	Drive pawl spring	1	
④	Coil spring	1	
⑤	Pawl spring	1	
⑥	Sheave drum	1	
⑦	Spiral spring	1	
⑧	E-clip (drive pawl)	1	
⑨	Drive pawl	1	
⑩	Plate (starter handle)	1	
⑪	Starter rope	1	Apply grease
⑫	Starter handle	1	
⑬	Bolt (starter panel)	2	
⑭	Nut	1	
⑮	Plane washer	2	
⑯	Bolt	1	
⑰	Spring washer	1	

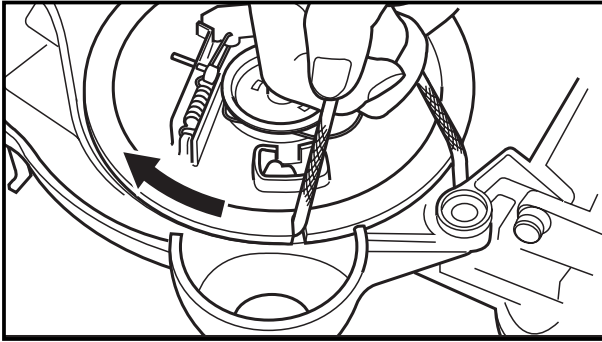


EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
⑱	Starter panel ass'y	1	Reverse the disassembly steps for assembly.
⑲	E-clip (choke lever)	1	
⑳	Shaft (choke lever)	1	
㉑	Wave washer (choke lever)	1	
㉒	Wave washer (choke lever)	1	
㉓	Choke lever	1	
㉔	Choke knob	1	
㉕	Screw	1	
㉖	Boots	1	
㉗	Nut	1	
㉘	Warning lamp ass'y	1	
㉙	Spring	1	
㉚	Collar	1	
㉛	Start-in-gear protection lever	1	
㉜	Cover	1	



SERVICE POINTS

Sheave drum removal

1. Rotate:

- Sheave drum

Turn the sheave drum clockwise until the spring is free.

NOTE:

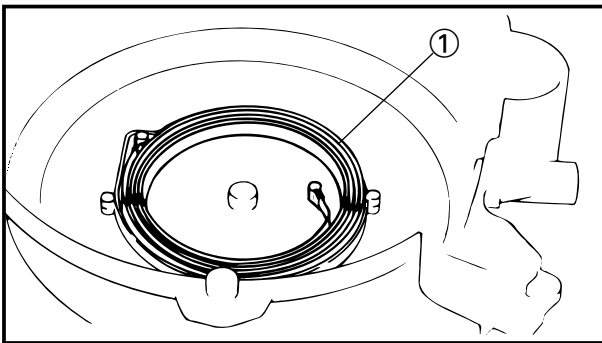
- Turn the sheave drum so that the cutaway on the outer surface of the sheave drum faces toward the starter handle.
- Pass the starter rope through the cut.

2. Remove:

- Drive plate
- Sheave drum

⚠ WARNING

When removing the drive plate and sheave drum, be sure to turn the sheave drum upside down to prevent the spiral spring from popping up at you.



Spiral spring removal

1. Remove:

- Spiral spring ①

⚠ WARNING

Be careful so that the spiral spring does not popout when removing it. remove it by allowing it out one turn of the winding each time.

**Start-in-gear protection lever inspection**

1. Inspect:
 - Start-in-gear protection lever
Crack/Wear/Damage → Replace.

Drive pawl and spring inspection

1. Inspect:
 - Drive pawl
Crack/Wear/Damage → Replace.
 - Drive pawl spring inspection
Broken/Bent/Damage → Replace.

Busing inspection

1. Inspect:
 - Busing
Crack/Damage → Replace.

Sheave drum inspection

1. Inspect:
 - Sheave drum
Crack/Wear/Damage → Replace.

Spiral spring inspection

1. Inspect:
 - Spiral spring
Broken/Bent/Damage → Replace.

Starter rope inspection

1. Inspect:
 - Starter rope
Fray/Wear/Damage → Replace.

NOTE: _____

- When replacing the rope, cut it the specified length and burn the rope end so that it will not travel.
- Apply water resistant grease sufficiently on the new starter rope.



Starter rope length:
1,500 mm (70.9 in)

**Spiral spring installation.**

1. Install:

- Spiral spring
to Manual starter casing

⚠WARNING

When installing the spiral spring to the starter case, use care so that the spiral spring does not pop out and compress it by winding from outside one turn.

NOTE:

- Set the drive pawl spring and pass its end through the coil of the pawl spring.
- Align the slit with the rope guide and pass the rope through the slit. Lift up the rope and turn it counterclockwise by 4 turns by holding the sheave drum. Wind the rope clockwise by removing it from the slit and returning the sheave drum.

Recoil starter checking

1 Check:

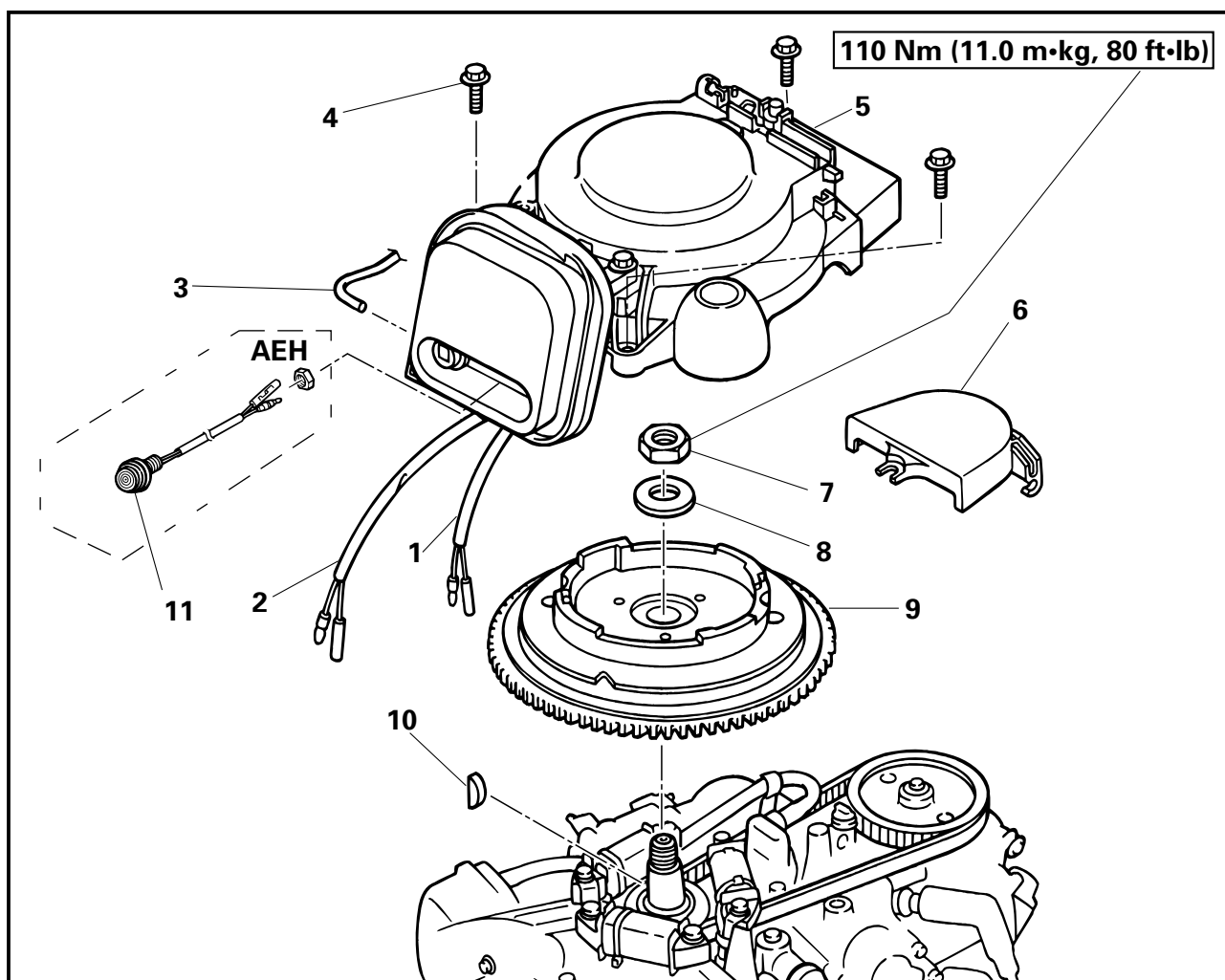
- Starter operation
Rough operation → Repair.

NOTE:

- When checking the manual starter only, move out the start-in-gear protection lock.
- Adjust the start-in-gear protection wire, before install the manual starter ass'y to the power unit. Refer to page 3-7.

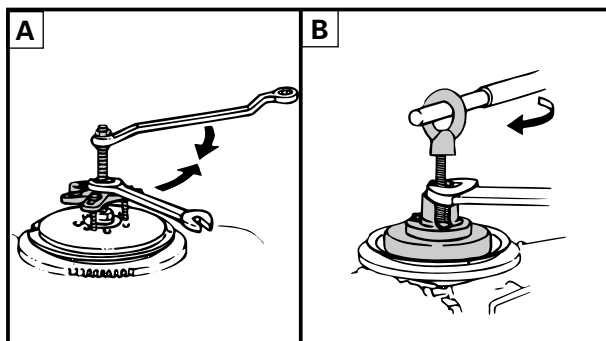
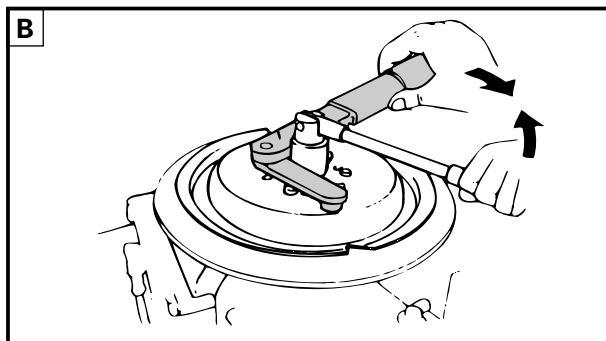
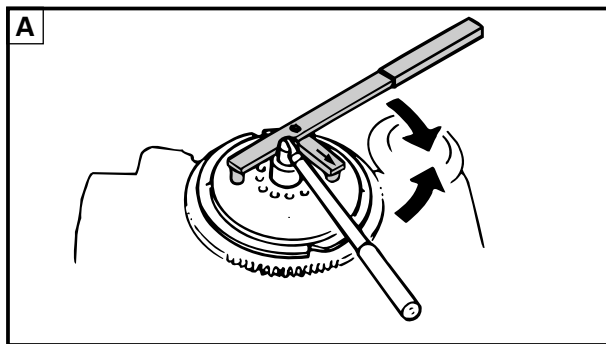


FLYWHEEL MAGNETO EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	FLYWHEEL MAGNETO REMOVAL		
	Battery cable (AEH, AE)		Follow the left "Step" for removal. At the battery side.
1	Low-oil-pressure warning indicator leads	2	
2	Starter switch leads (AEH)	2	
3	Choke rod	1	
4	Bolt	3	M6 x 25 mm
5	Flywheel magneto cover	1	
6	Driven sprocket cover	1	
7	Nut	1	
8	Washer	1	
9	Flywheel magneto	1	
10	Woodruff key	1	
11	Starter switch (AEH)	1	
			Reverse the removal steps for installation.

**SERVICE POINTS****Flywheel magneto removal**

1. Remove:
 - Flywheel magneto unit



Flywheel holder:
YB-06139/90890-06522

- ☐ A For USA and CANADA
☐ B Except for USA and CANADA

CAUTION:

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

2. Remove:
 - Flywheel magneto



Universal puller:
YB-06117/90890-06521

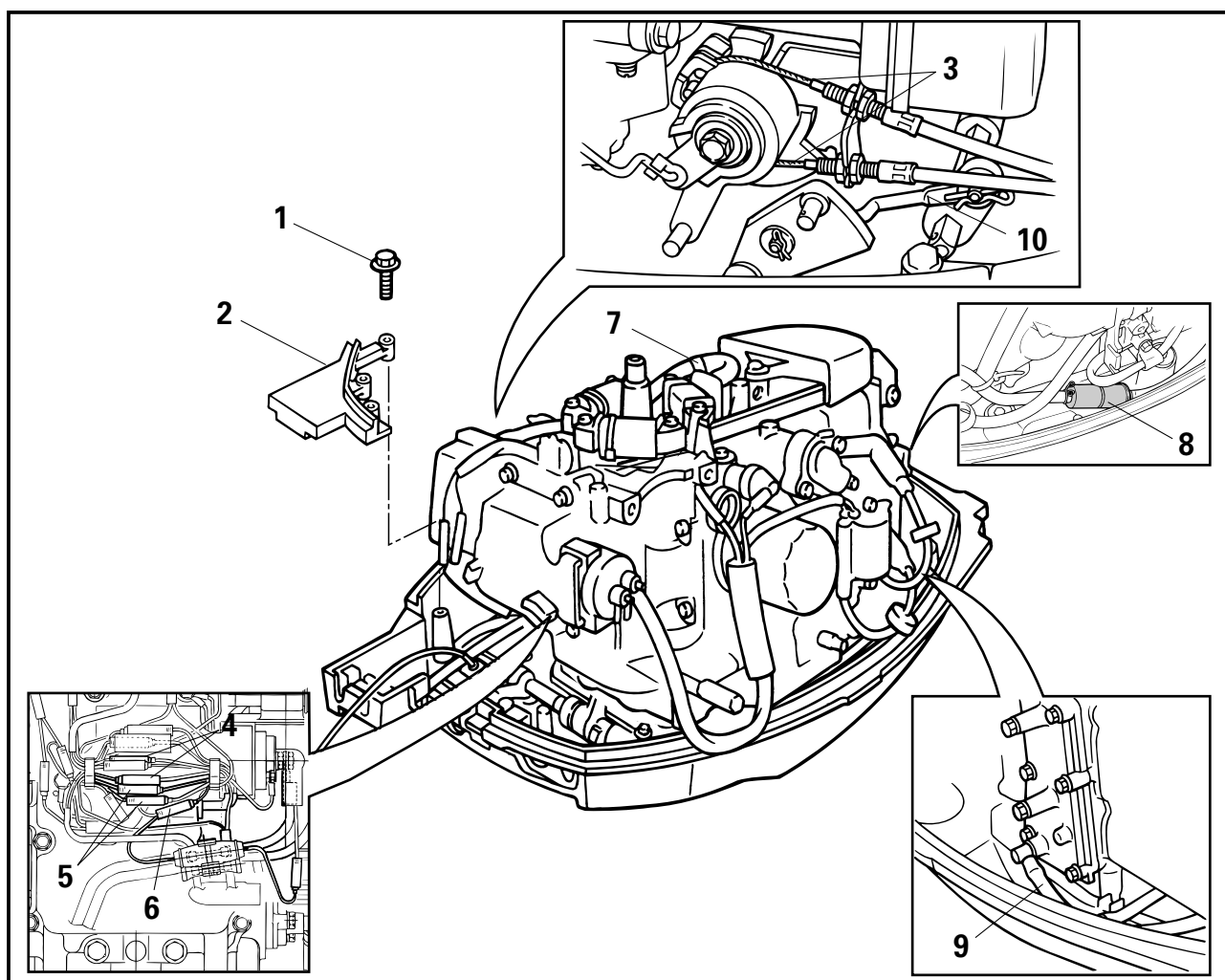
- ☐ A For USA and CANADA
☐ B Except for USA and CANADA

CAUTION:

- Keep the nut side flush with the crankshaft end until the flywheel magneto comes off the tapered portion of the crankcase.
- To prevent damage to the engine or tools, screw in the universal-puller set bolts evenly and completely so that the universal puller plate is parallel to the flywheel magneto.



POWER UNIT EXPLODED DIAGRAM

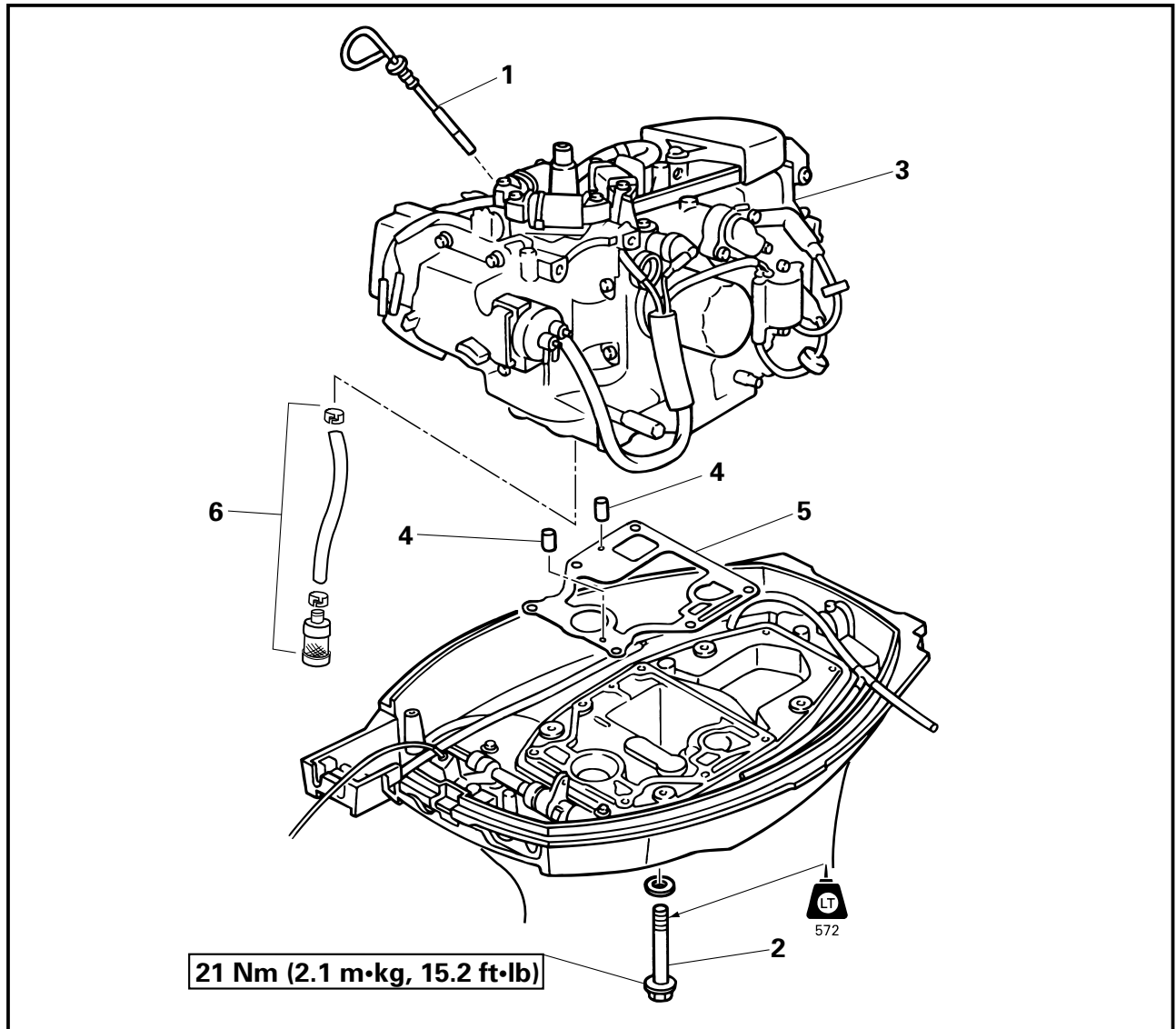


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	POWER UNIT REMOVAL 1		Follow the left "Step" for removal.
	Battery cables (at the starter motor side)(AEH,AE)		
1	Bolt (fitting plate)	3	
2	Fitting plate	1	
3	Throttle cables	2	
4	Engine stop switch lead (AMH, AEH)	1	
5	Neutral switch lead (AEH)	1	
6	Fuse lead (AEH, AE)	1	
7	Crankcase breather hose (EX. cover side)	1	
8	Fuel hose (fuel filter to fuel pump)	1	
9	Pilot water hose	1	
10	Shift link rod	1	
			Reverse the removal steps for installation.



EXPLODED DIAGRAM

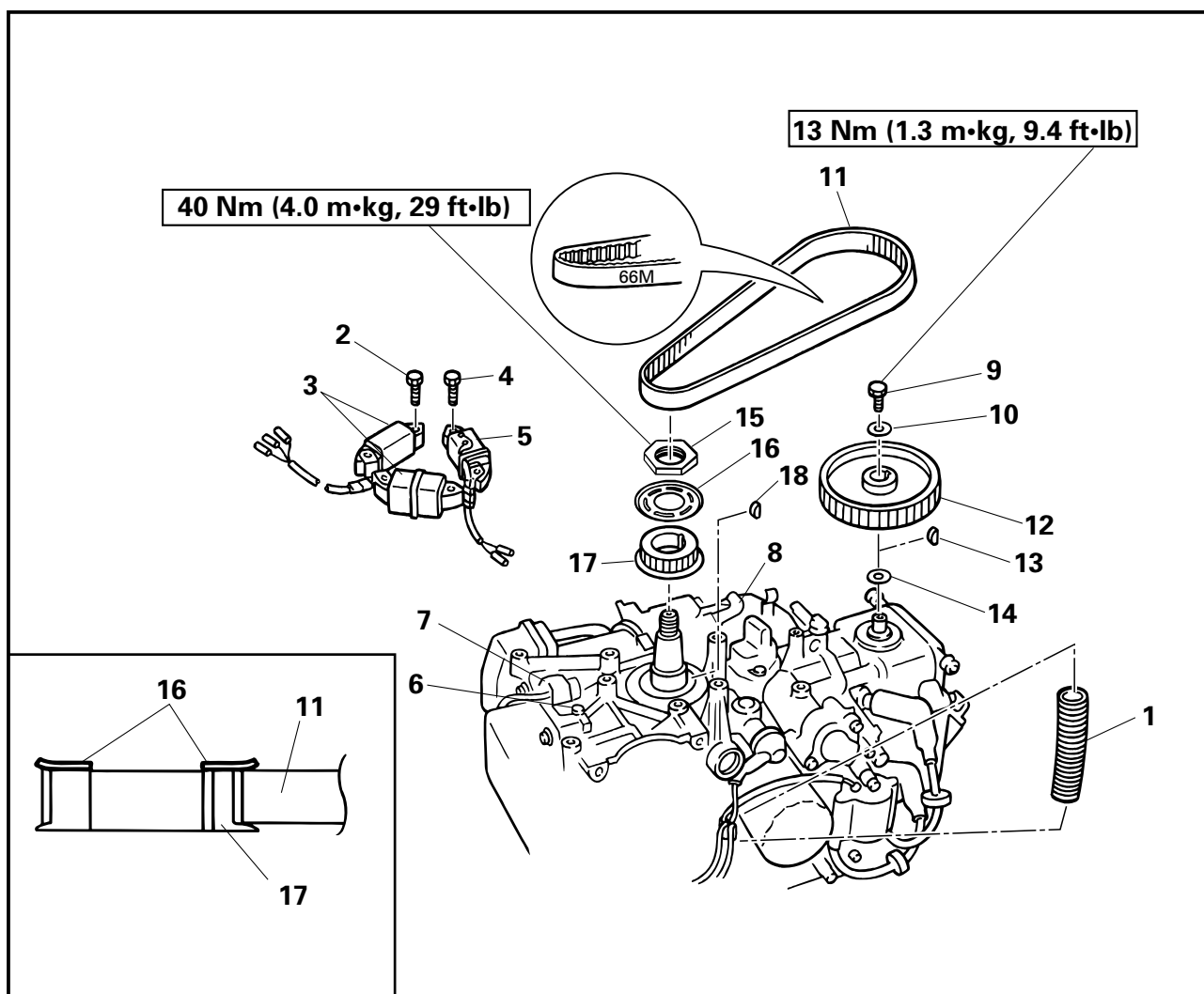


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	POWER UNIT REMOVAL 2		
1	Oil level gauge	1	Follow the left "Step" for removal.
2	Bolt	6	M8 x 45 mm
3	Power unit	1	
4	Dowel pins (upper casing)	2	
5	Gasket (upper casing)	1	Not reusable
6	Oil strainer ass'y	1	Reverse the removal steps for installation.



COILS AND TIMING BELT EXPLODED DIAGRAM

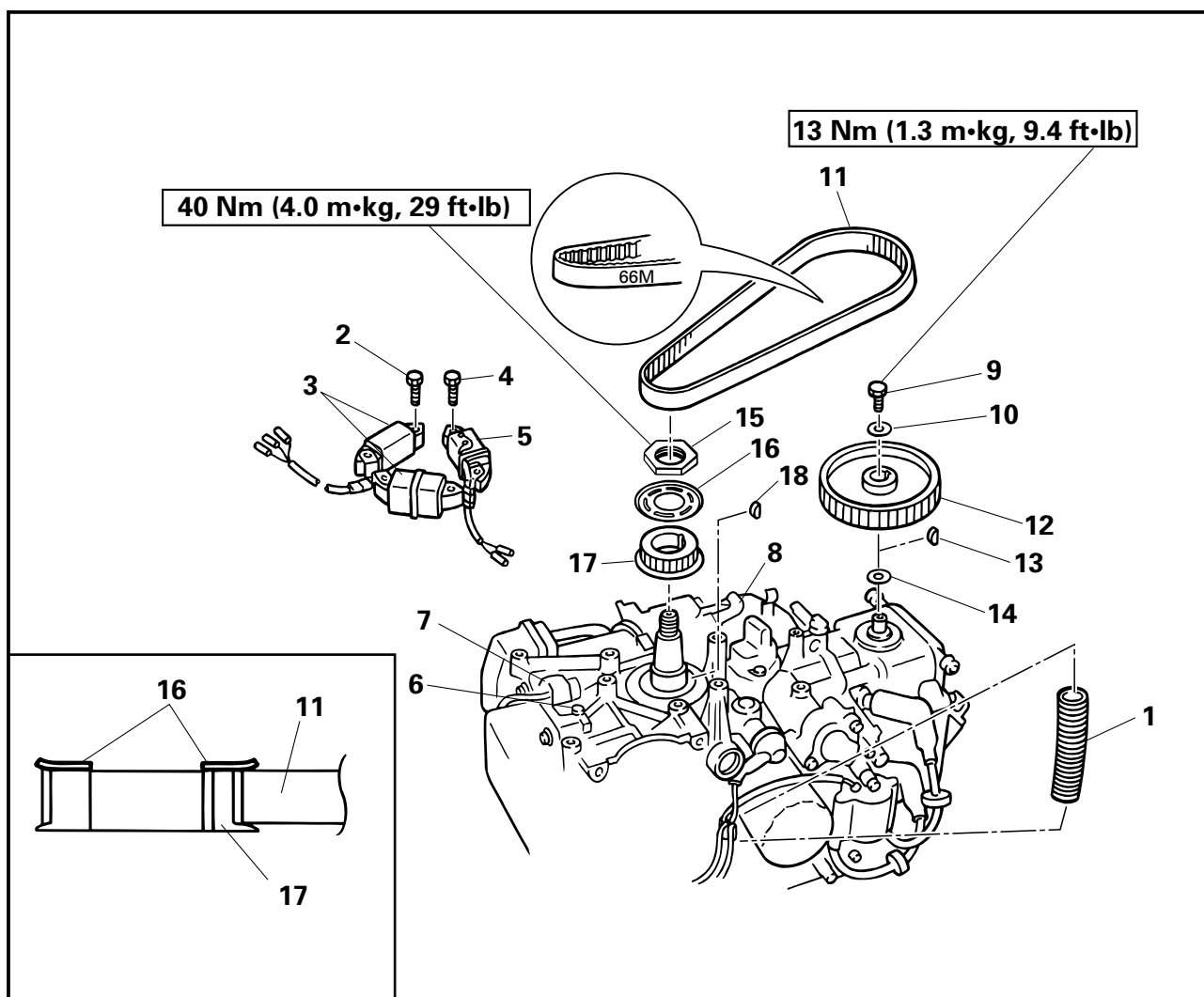


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	TIMING BELT AND COILS REMOVAL		Follow the left "Step" for removal.
1	Connector cover	1	
2	Bolt (lighting coil)	4	
3	Lighting coil	2	
4	Bolt (charge coil)	2	
5	Charge coil	1	
6	Bolt (pulsar coil)	2	
7	Pulsar coil	1	
8	Breather hose	1	
9	Bolt (driven sprocket)	1	
10	Washer (driven sprocket)	1	

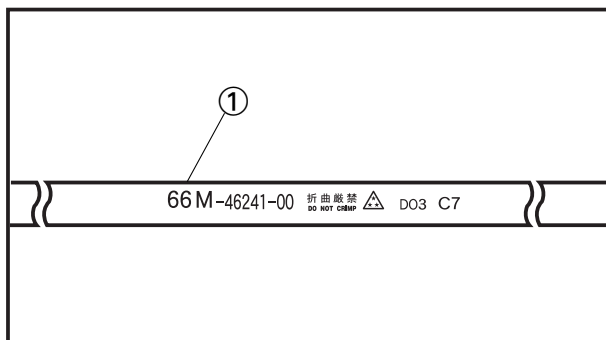
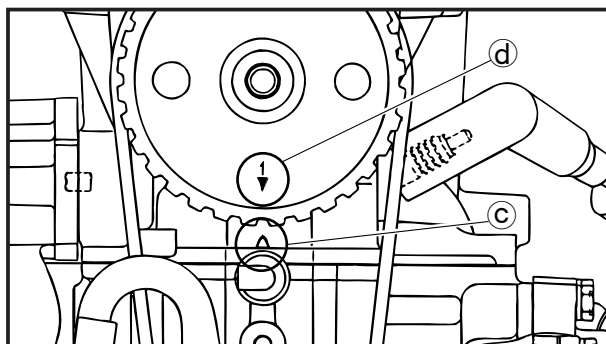
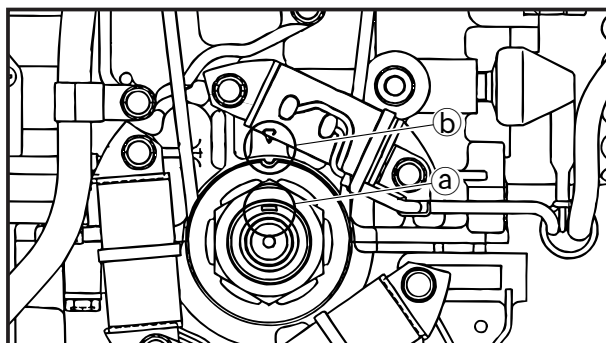
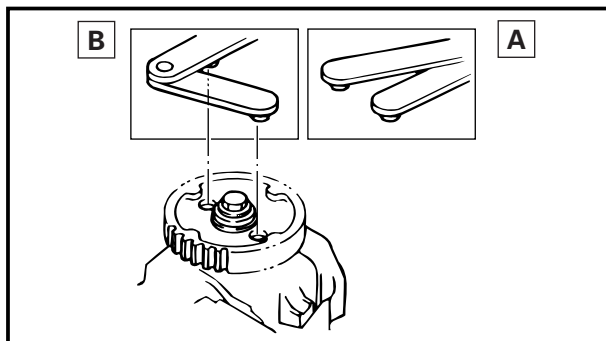
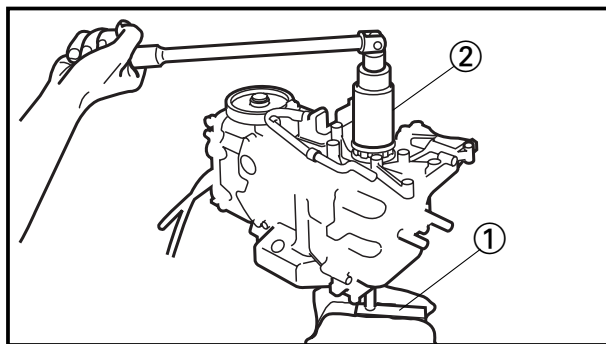


EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
11	Timing belt	1	NOTE: _____ Remove the timing belt at the driven sprocket side. _____ Reverse the removal steps for installation.
12	Driven sprocket	1	
13	Woodruff key (driven sprocket)	1	
14	Washer (driven sprocket)	1	
15	Nut (drive sprocket)	1	
16	Washer	1	
17	Drive sprocket	1	
18	Woodruff key (drive sprocket)	1	



SERVICE POINTS

Drive sprocket removal

1. Remove:
 - Timing belt
 - Drive sprocket



Shaft holder ①:
NA/90890-06069

NOTE:

Loose the sprocket nut, use deep socket ②:36mm. (general tool)

Driven sprocket removal

1. Remove:
 - Driven sprocket



Flywheel holder:
YB-06139/90890-06522

A For USA and CANADA

B Except for USA and CANADA

Timing belt installation

1. Position:
 - Drive sprocket
 - Driven sprocket

NOTE:

- Align the woodruff key hole **a** on the crankshaft, with the mark "Δ" **b** of the cylinder crankcase.
- Align the mark "Δ or 1" **c** on the driven sprocket with mark "Δ" **d** on the cylinder head.

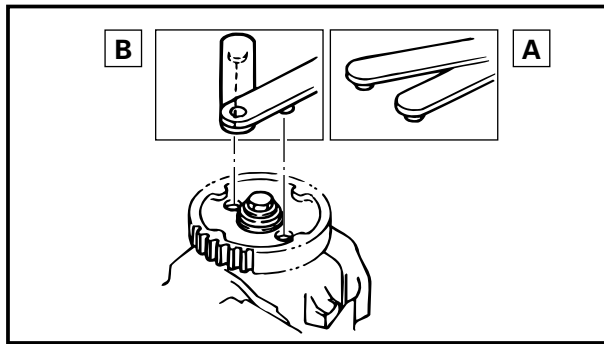
2. Install:
 - Timing belt

Installation steps:

- Attach the timing belt to the drive sprocket.
- Then, install the timing belt onto the driven sprocket. Alternately push down on the drive and then the driven sprocket until the belt is properly seated.

NOTE:

Install the timing belt ①, parts name up ward.

**Driven sprocket installation**

1. Install:
 - Bolt

**Flywheel holder:****YB-06139/90890-06522**

- ☐ A For USA and CANADA
☐ B Except for USA and CANADA

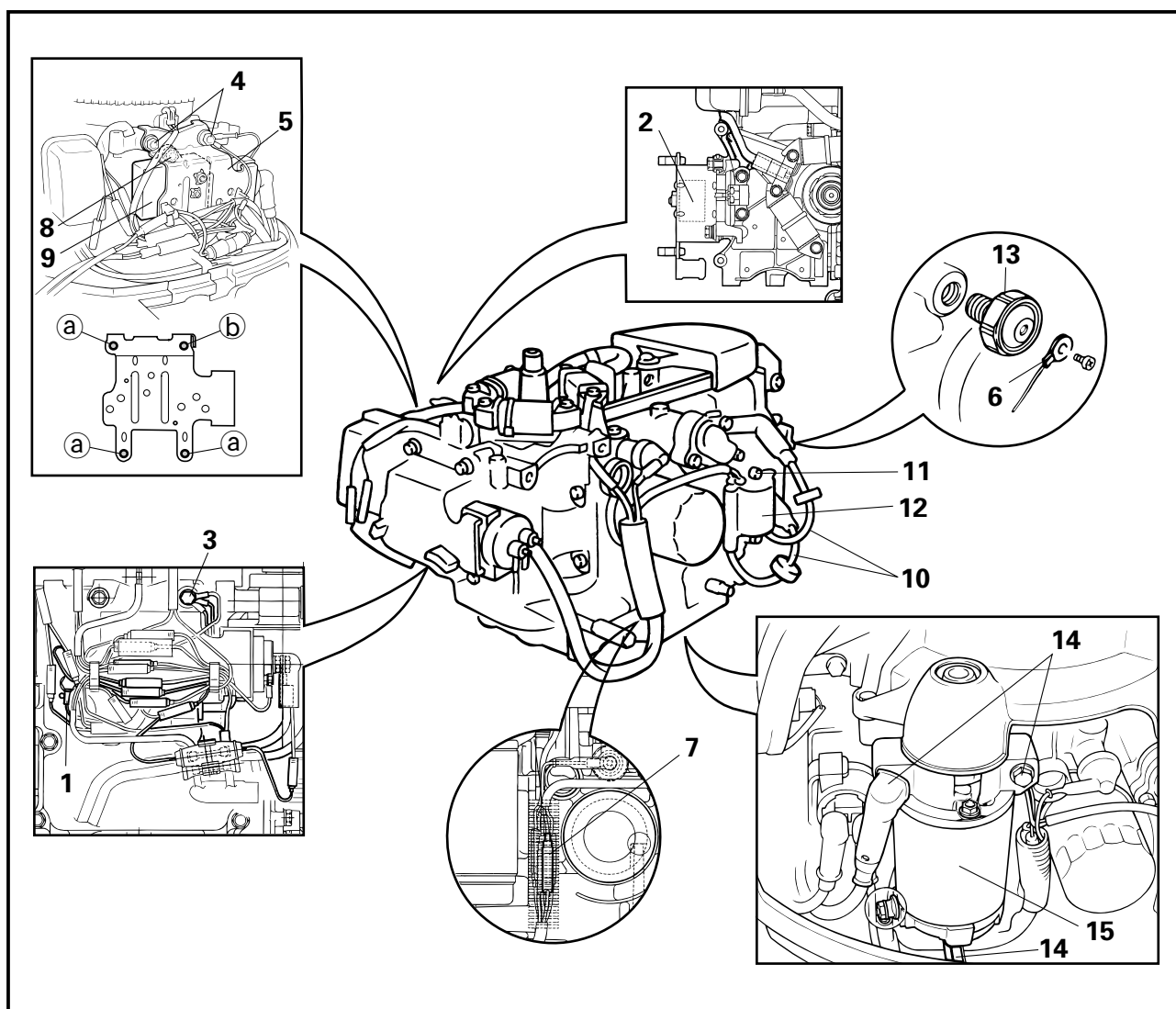
Timing belt slack inspection

1. Inspect:
 - Timing belt slack

Out of specification → Replace.
Refer to the "POWER UNIT inspection" in chapter 3.



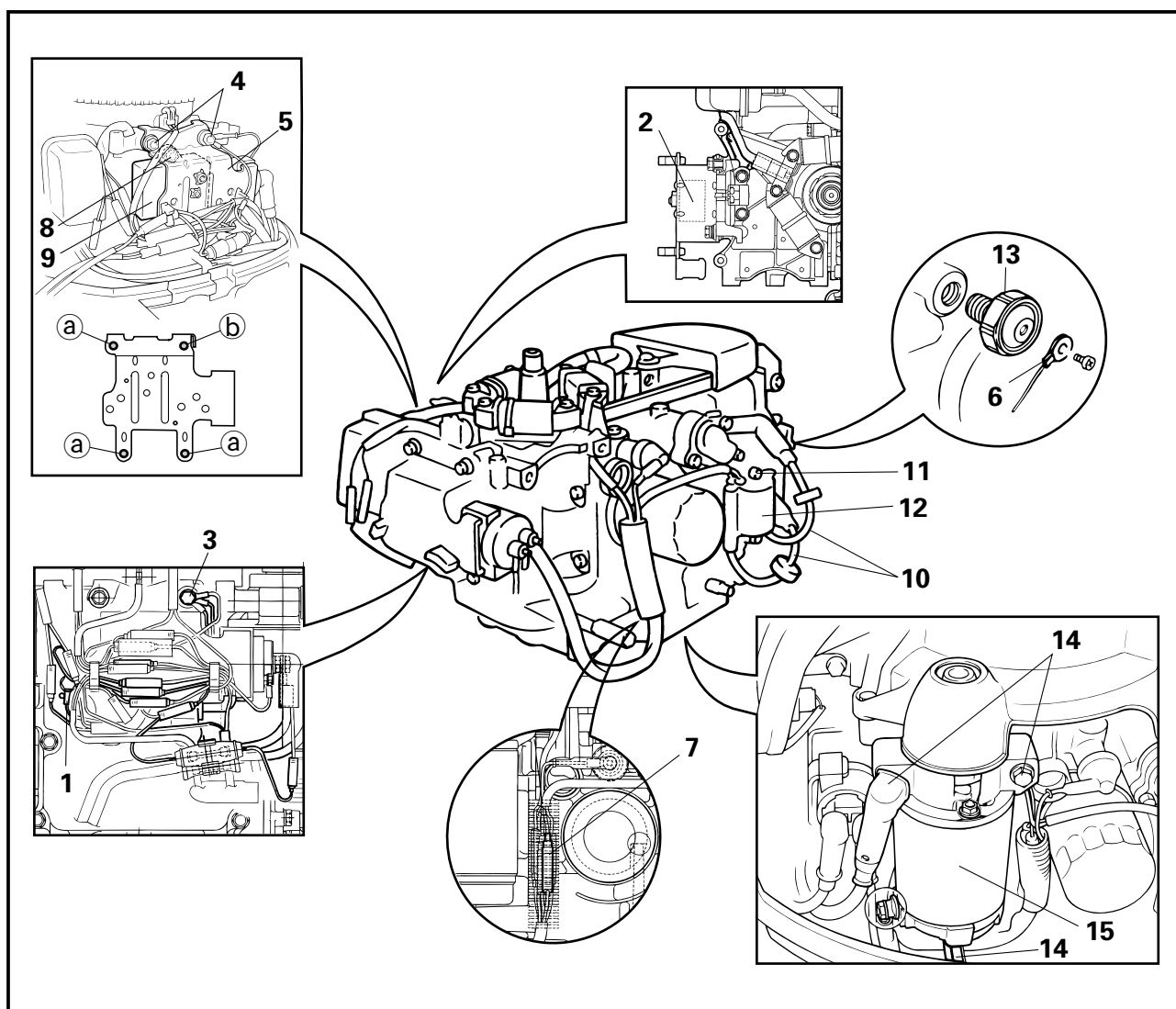
ELECTRICAL UNIT EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	ELECTRICAL UNIT REMOVAL		Follow the left "Step" for removal.
	Fuel pump		
	Carburetor unit		
	Intake manifold		
1	Rectifier ground lead (AEH, for Europe)	1	6G1
2	Rectifier regulator/Rectifier	1	6G8, 6J8/6J1
3	CDI unit ground lead	4	
4	Bolt (bracket ass'y)	4	(a : M6x20 mm-3, b : M6x25 mm-1)
5	Electrical unit bracket ass'y	1	
6	Oil pressure switch lead	2	
7	Ignition coil lead	2	
8	Bolt (CDI unit)	2	M6 x 20 mm
9	CDI unit	1	

EXPLODED DIAGRAM

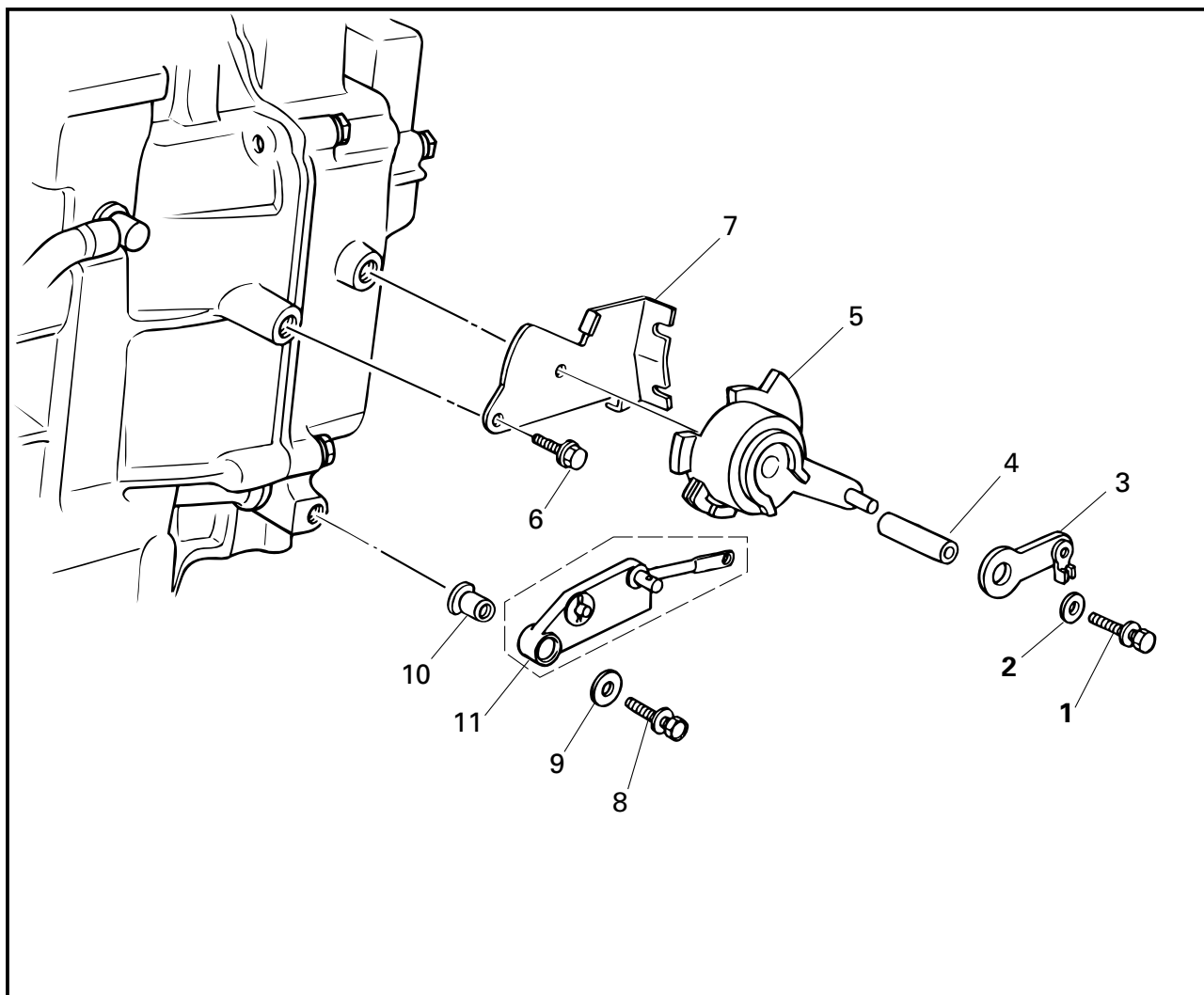


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
10	Spark plug leads	2	M6 x 20 mm
11	Bolt (ignition coil)	2	
12	Ignition coil	1	
13	Oil pressure switch	1	
14	Bolt (starting motor)	3	
15	Starter motor	1	Reverse the removal steps for installation.



CONTROL UNIT EXPLODED DIAGRAM

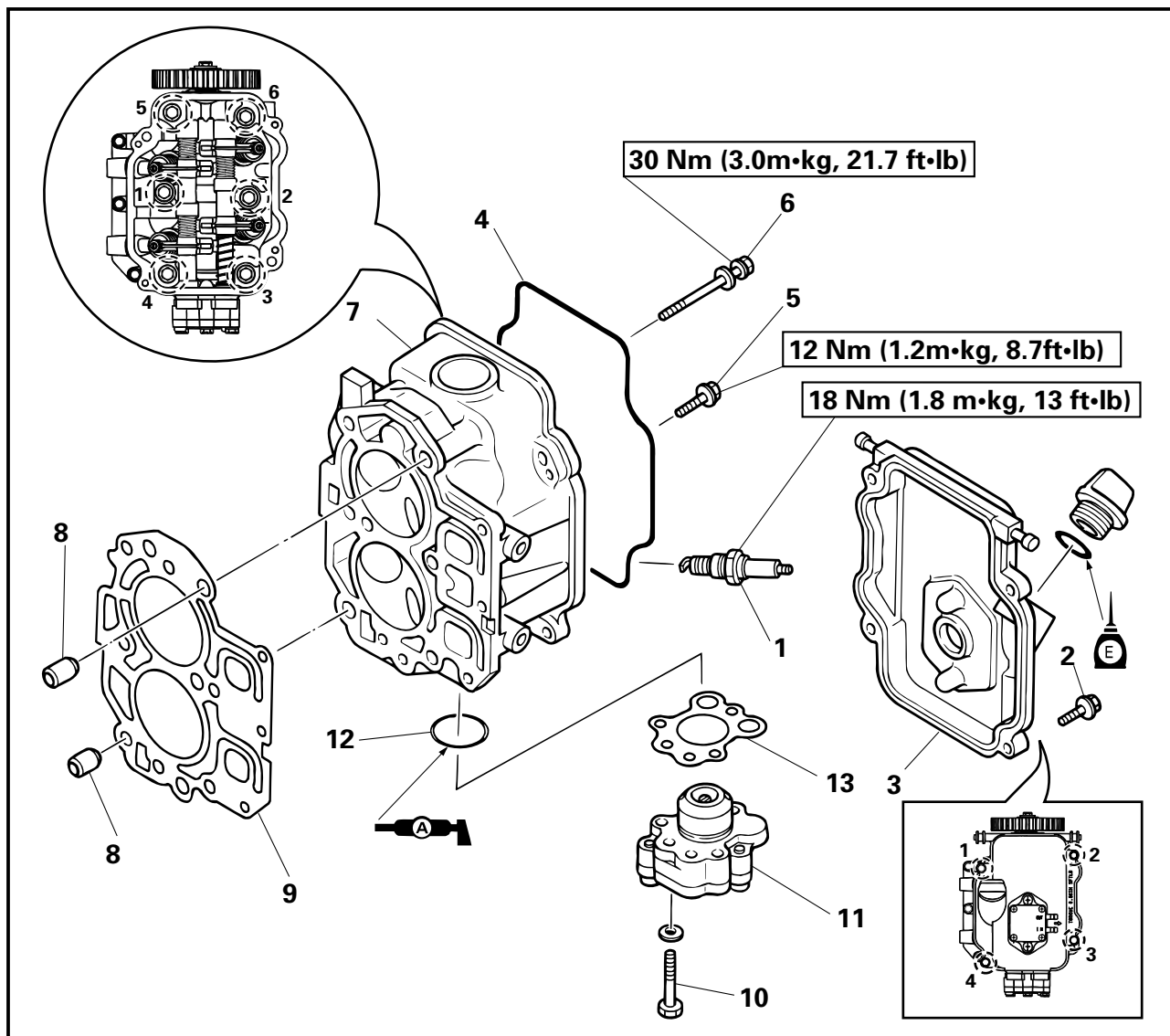


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CONTROL UNIT REMOVAL		Follow the left "Step" for removal.
1	Bolt (control cam)	1	
2	Washer	1	
3	Throttle control lever	1	
4	Collar	1	
5	Throttle control cam	1	
6	Bolt	1	
7	Bracket	1	
8	Bolt (link rod)	1	
9	Washer	1	
10	Collar	1	
11	Shift link rod ass'y	1	Except for Europe Reverse the removal steps for installation.



CYLINDER HEAD AND OIL PUMP EXPLODED DIAGRAM

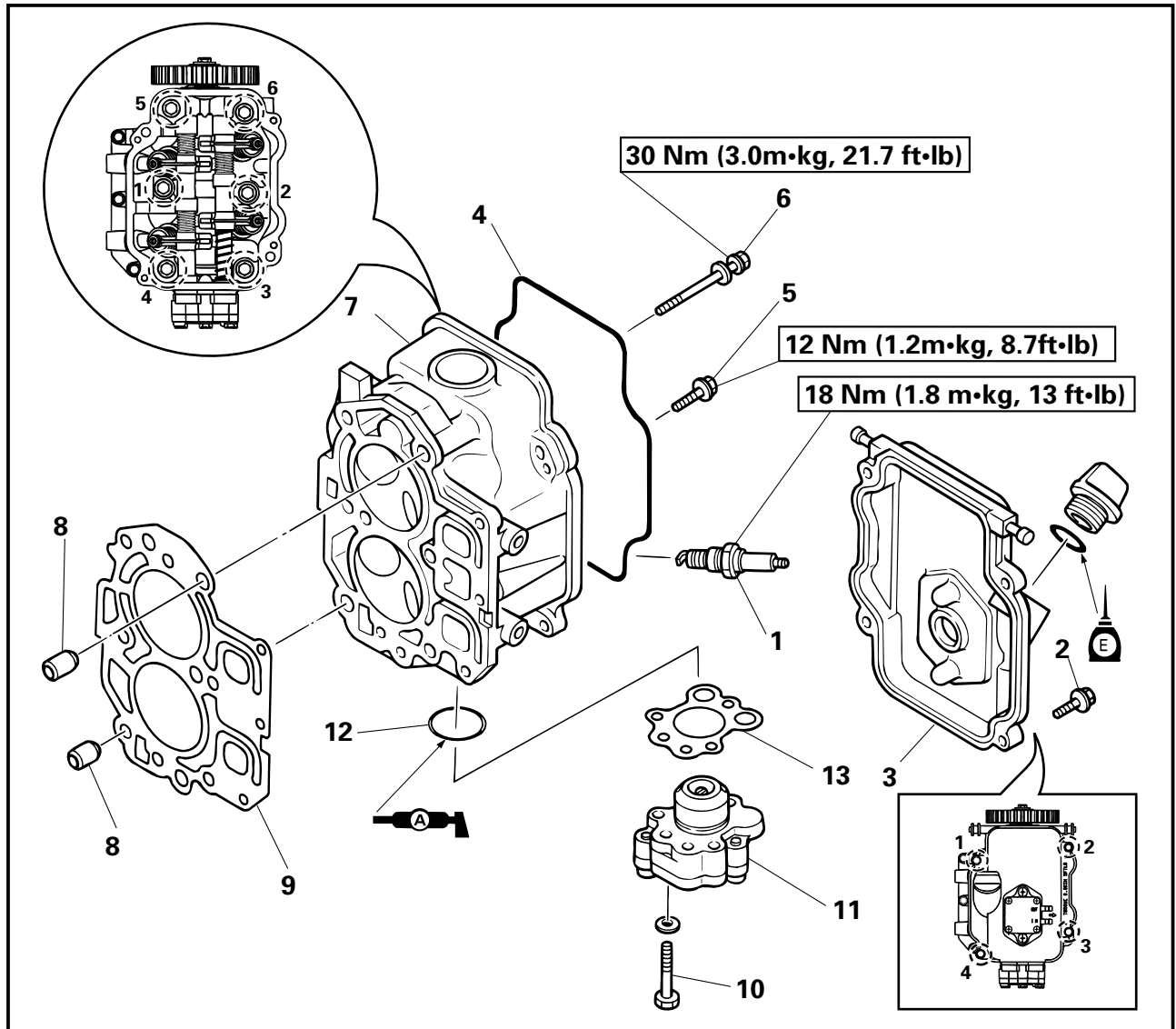


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CYLINDER HEAD AND OIL PUMP REMOVAL		Follow the left "Step" for removal.
1	Spark plugs	2	
2	Bolt (cylinder head cover)	4	
3	Cylinder head cover	1	
4	Rubber gasket (cylinder head cover)	1	Not reusable
5	Bolt (cylinder head)	3	M6 x 25 mm
6	Bolt (cylinder head)	6	M8 x 74 mm
7	Cylinder head ass'y	1	
8	Dowel pins	2	
9	Gasket (cylinder head)	1	Not reusable



EXPLODED DIAGRAM

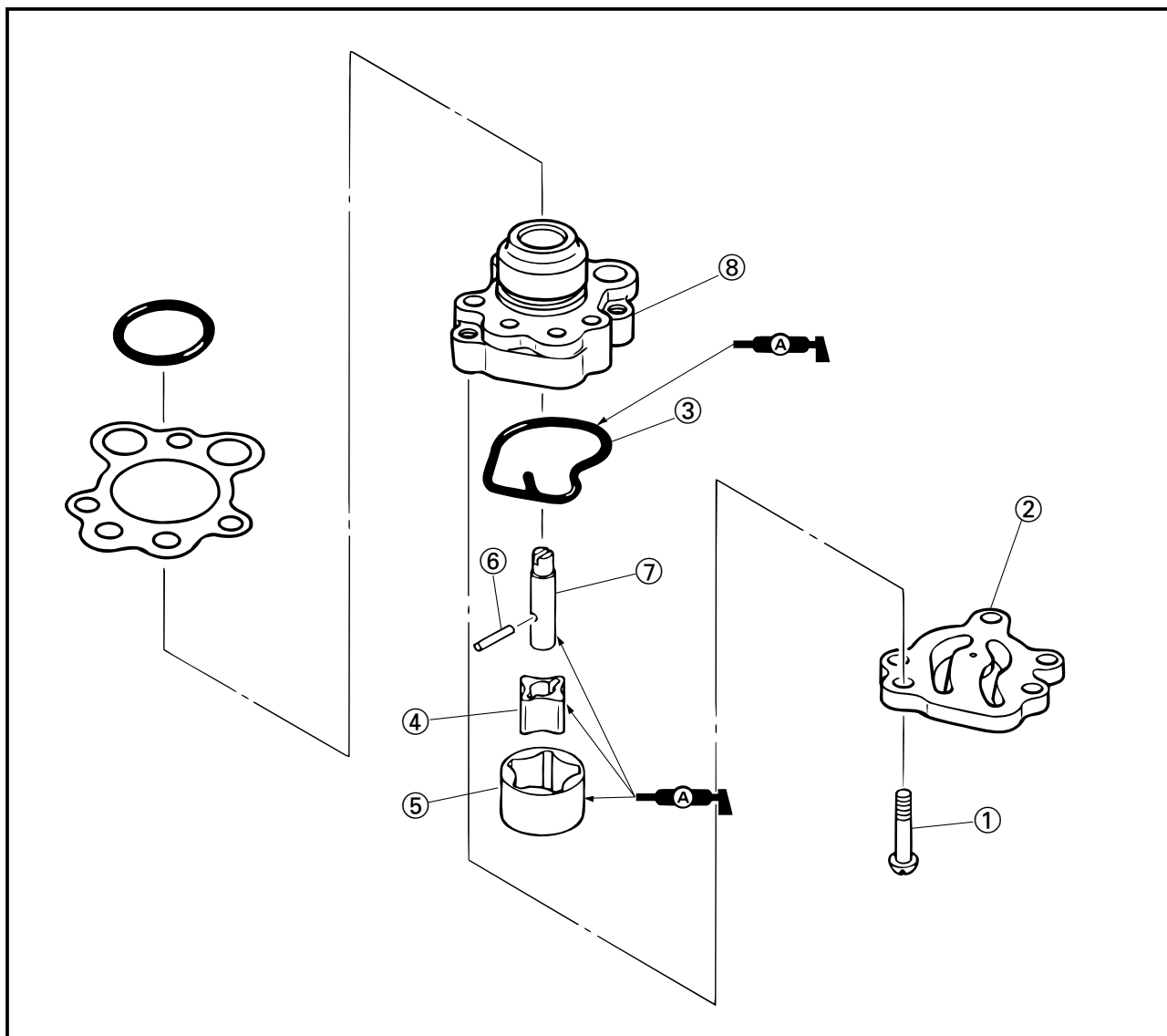


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
10	Bolt (oil pump)	3	M6 x 35mm
11	Oil pump ass'y	1	
12	O-ring	1	Not reusable
13	Gasket	1	
Reverse the removal steps for installation.			

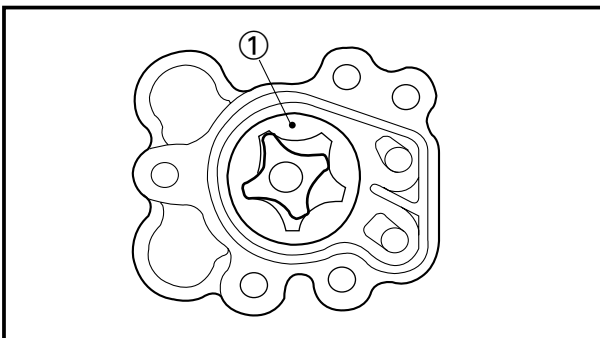
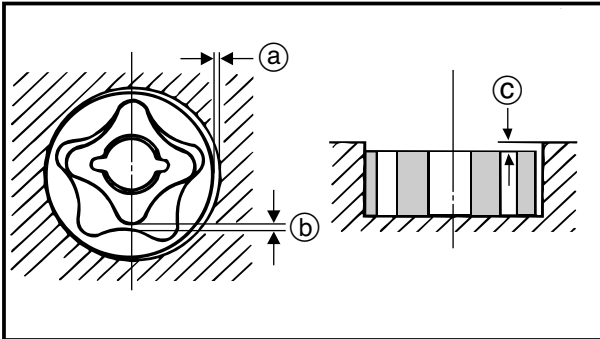
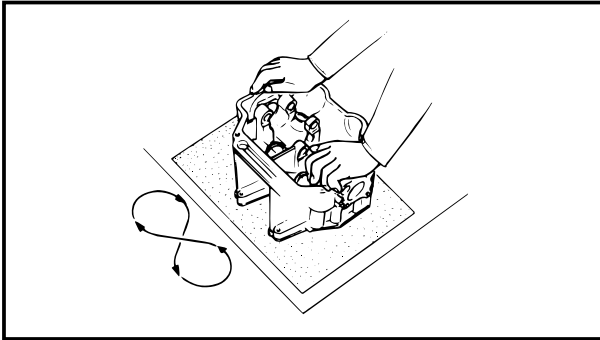
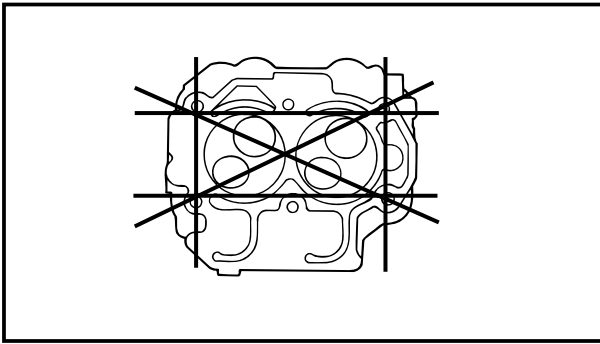


OIL PUMP EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	OIL PUMP DISASSEMBLY		Follow the left "Step" for disassembly.
	Oil pump ass'y		
①	Screw (oil pump cover)	2	M6 x 20mm
②	Oil pump cover	1	
③	Rubber gasket (oil pump)	1	Not reusable
④	Inner rotor	1	
⑤	Outer rotor	1	
⑥	Pin	1	
⑦	Shaft	1	
⑧	Oil pump housing	1	
			Reverse the disassembly steps for installation.



SERVICE POINTS

Cylinder head inspection

1. Measure:

- Cylinder head warpage

Out of specification → Resurface or replace the cylinder head.



Warpage limit:

0.1 mm (0.004 in)

Resurfacing steps:

- Place a 400 ~ 600 grit wet sandpaper on the surface plate.
- Resurface the cylinder head using a figure-eight sanding pattern. To ensure an even surface, rotate the cylinder head several times.

NOTE:

To ensure an even surface, rotate the cylinder head several times.

Oil pump inspection

1. Measure:

- Clearances ①, ②, and ③

Out of specification → Replace the oil pump.



Clearance:

- ①: 0.10 ~ 0.15 mm
(0.004 ~ 0.006 in)
- ②: 0.04 ~ 0.14 mm
(0.002 ~ 0.006 in)
- ③: 0.03 ~ 0.09 mm
(0.001 ~ 0.004 in)

Oil pump assembly

1. Assemble:

- Outer rotor

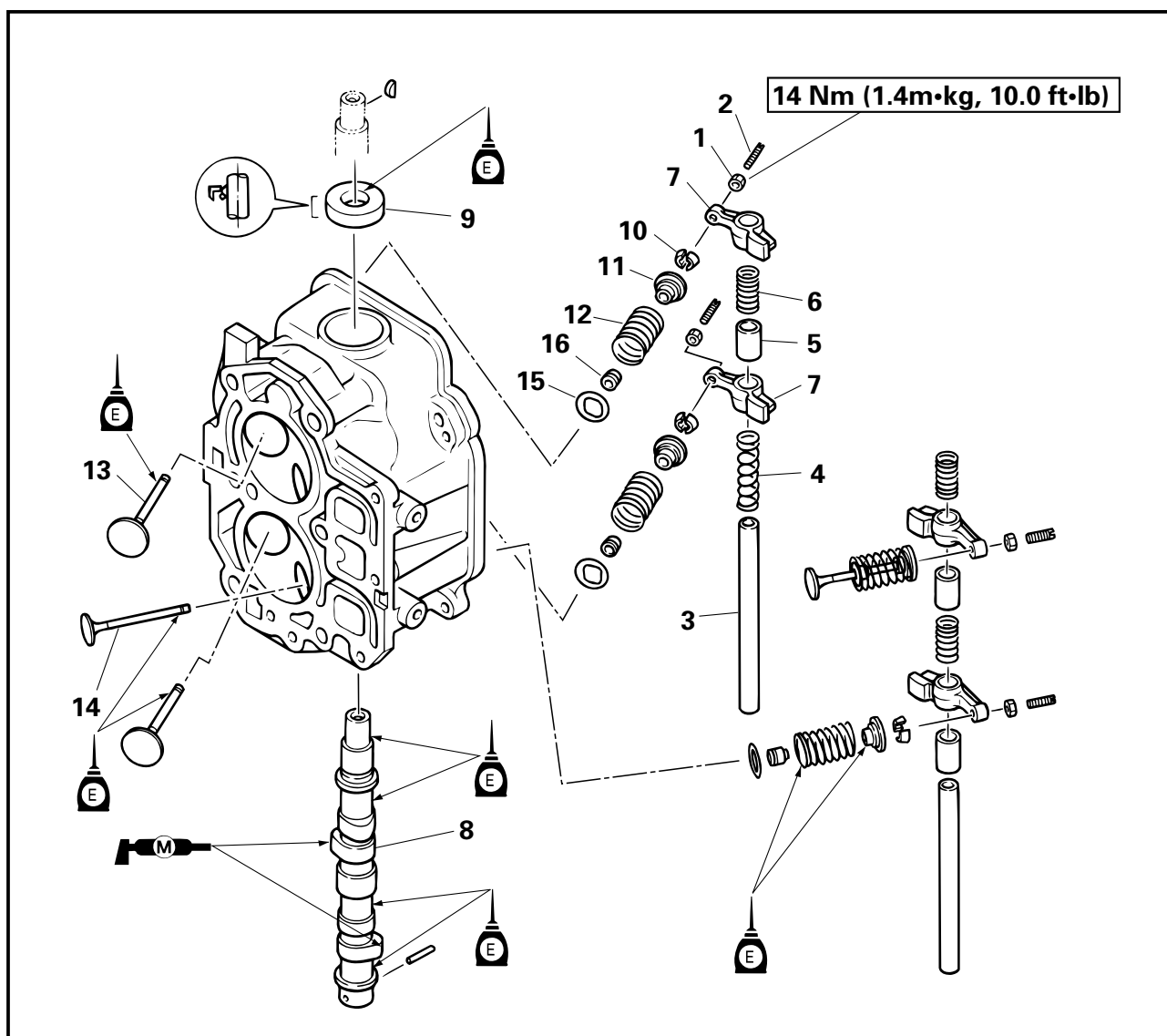
NOTE:

Make sure to assemble the oil pump ass'y so that the "●" mark ① on the outer rotor faced to the oil pump cover side.



CAMSHAFT AND VALVES

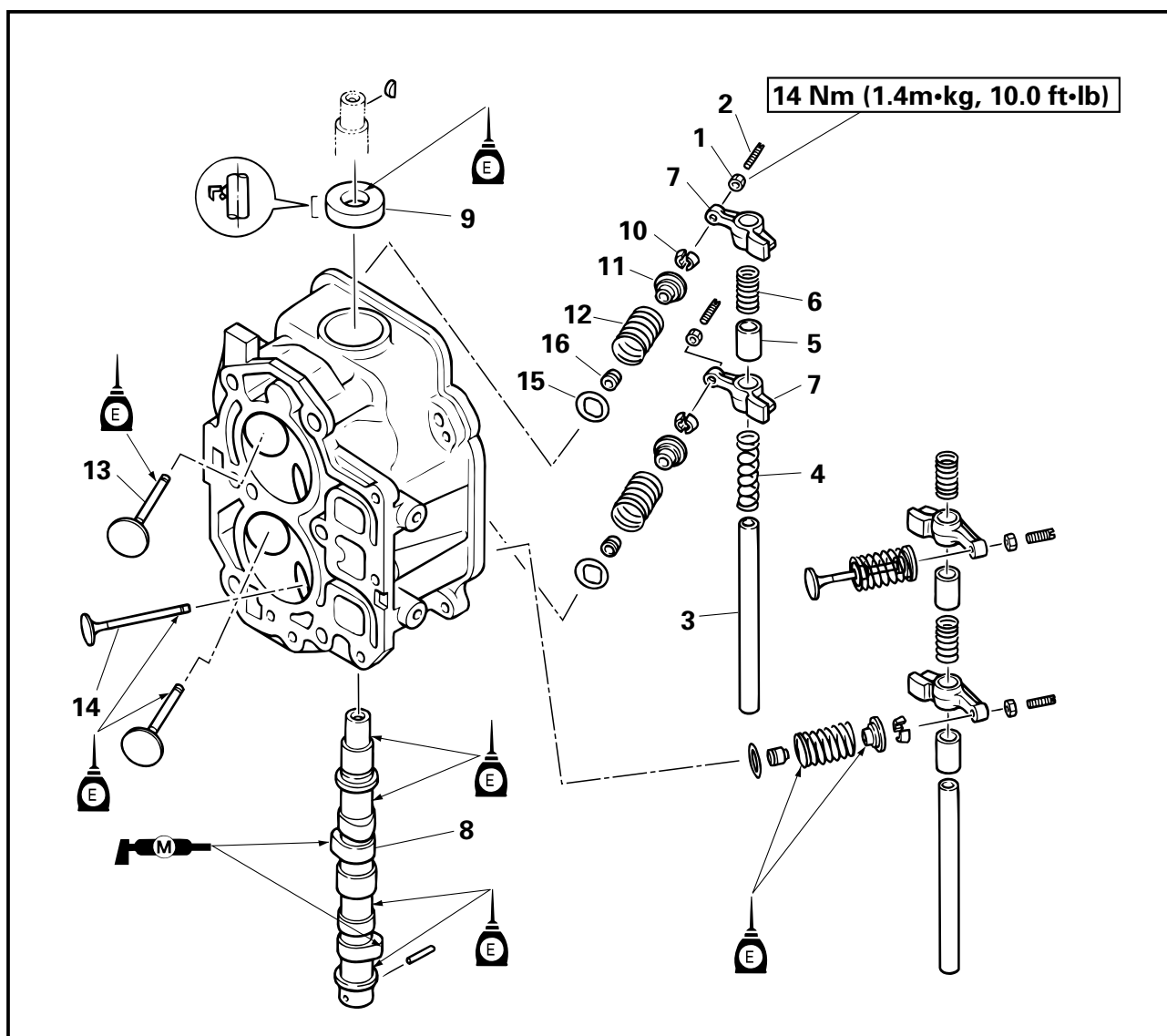
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

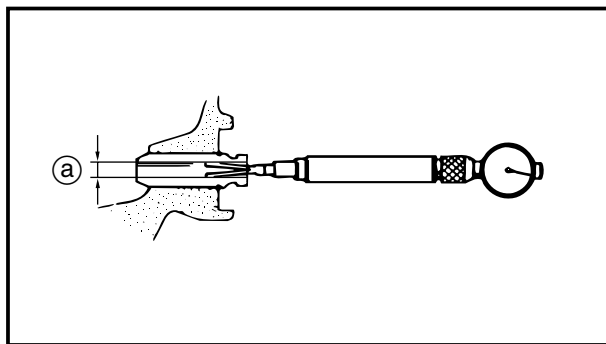
Step	Procedure/Part name	Q'ty	Service points
	CAMSHAFT AND VALVE REMOVAL		Follow the left "Step" for removal.
1	Locknuts	4	
2	Valve adjusting screws	4	
3	Rocker arm shaft	2	
4	Spring 1	1	
5	Collar	3	
6	Spring 2	3	
7	Rocker arms	4	
8	Camshaft	1	
9	Oil seal	1	

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
10	Valve cotter pins	8	Not reusable Reverse the removal steps for installation.
11	Valve spring seats (upper)	4	
12	Valve springs	4	
13	Intake valves	2	
14	Exhaust valves	2	
15	Valve spring seats (lower)	4	
16	Valve seals	4	

**SERVICE POINTS****Valve inspection**

1. Measure:

- Valve guide inside diameter (a)

Out of specification → Replace the valve guide.

**Valve guide inside diameter:**

5.500 ~ 5.512 mm

(0.2165 ~ 0.2170 in)

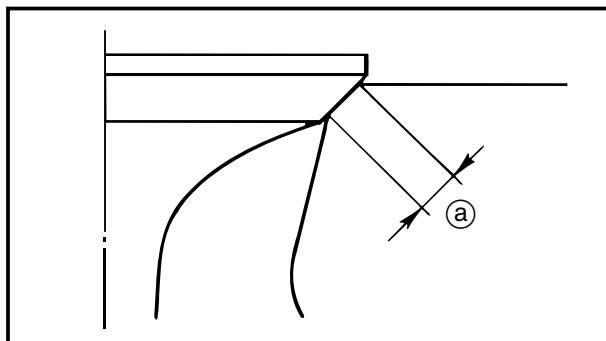
2. Measure:

- Valve seat width (a)

Out of specification → Reface the valve seat.

**Valve seat width :**

2.0 ~ 3.1 mm (0.079 ~ 0.122 in)



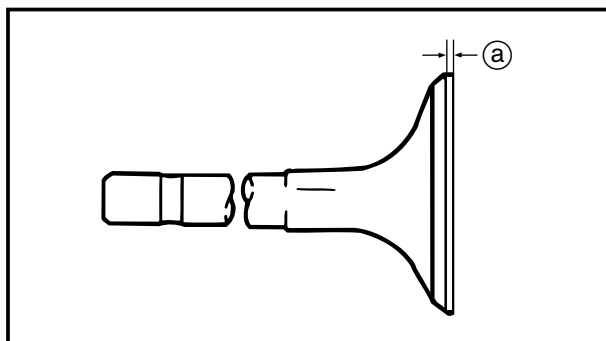
3. Measure:

- Margin thickness (a)

Out of specification → Replace the valve.

**Margin thickness:**

0.50 ~ 0.90 mm (0.020 ~ 0.035 in)



4. Measure:

- Valve stem diameter (a)

Out of specification → Replace the valve.

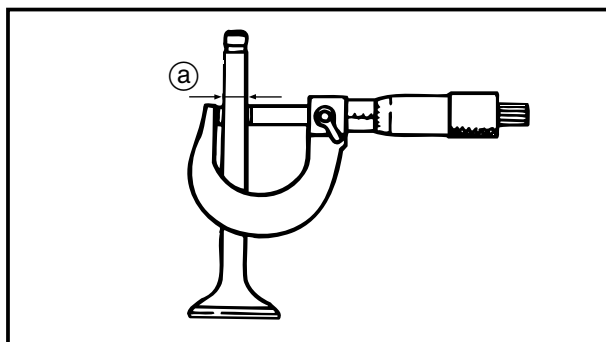
**Diameter:**

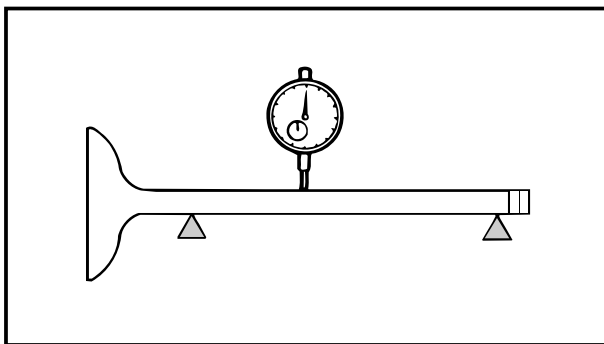
IN : 5.475 ~ 5.490 mm

(0.2155 ~ 0.2161 in)

EX: 5.460 ~ 5.475 mm

(0.2150 ~ 0.2156 in)





5. Measure:

- Valve stem runout

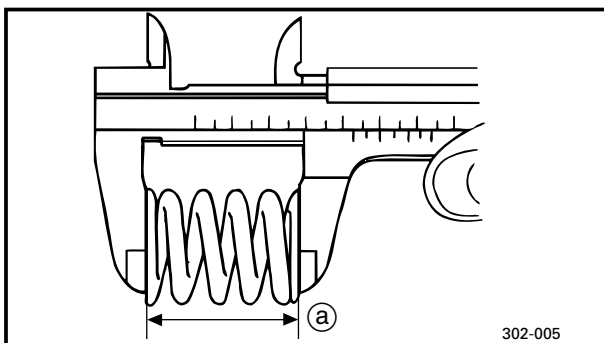
Out of specification → Replace the valve.



Valve stem runout limit:
0.016 mm (0.0006 in)

NOTE:

When replacing the valve, always use a new valve guide and valve seal.

**Valve spring inspection**

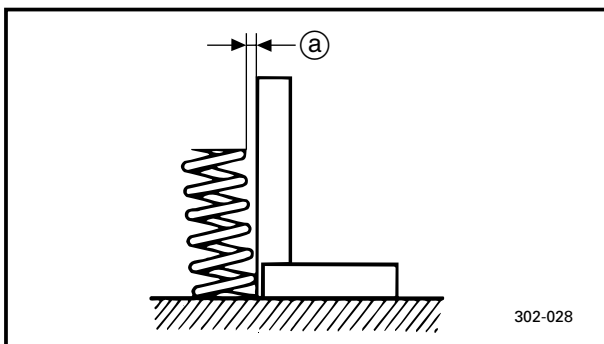
1. Measure:

- Valve spring free length (a)

Out of specification → Replace the valve spring.



Valve spring free length limit:
32.7 mm (1.29 in)



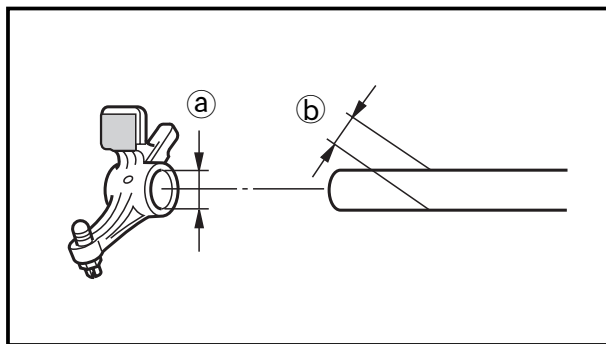
2. Measure:

- Valve spring tilt (a)

Out of specification → Replace the valve spring.



Valve spring tilt limit:
1.5 mm (0.06 in)



Rocker arm and rocker arm shaft inspection

1. Measure:

- Rocker arm inside diameter (a)
 - Rocker arm shaft outside diameter (b)
- Out of specification → Replace the defective part(s).

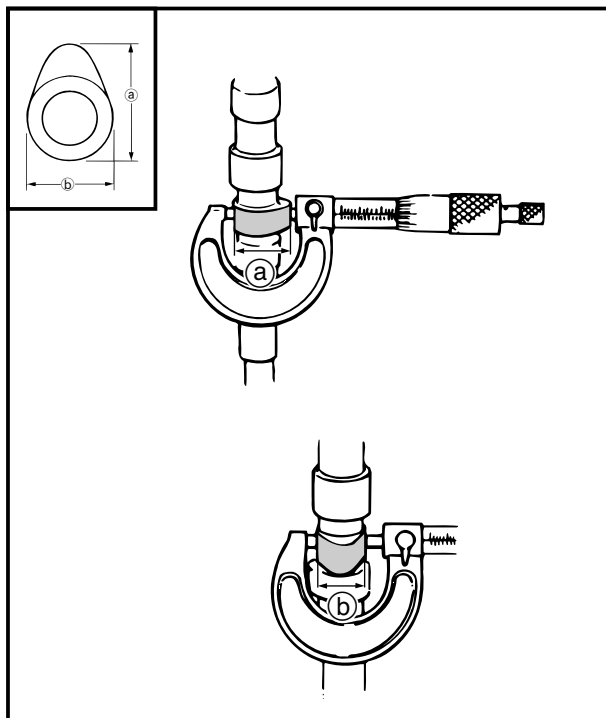


Rocker arm inside diameter:

13.000 ~ 13.018 mm
(0.5118 ~ 0.5125 in)

Rocker arm shaft outside diameter:

12.941 ~ 12.951 mm
(0.5095 ~ 0.5099 in)



Camshaft inspection

1. Measure:

- Camshaft lobe dimensions (a) and (b)
- Out of specification → Replace the camshaft.



Camshaft lobe diameter:

(a) IN : 23.895 ~ 23.995 mm
(0.9407 ~ 0.9447 in)

(b) IN: 19.950 ~ 20.050 mm
(0.7854 ~ 0.7894 in)

(a) EX : 23.917 ~ 24.017 mm
(0.9416 ~ 0.9456 in)

(b) EX: 19.950 ~ 20.050 mm
(0.7854 ~ 0.7894 in)

Valve guide replacement

Replacement steps:

NOTE:

Heat the cylinder in an oven to 200°C (392°F) to ease valve guide removal and installation and to maintain the correct interference fit.

- Remove the valve guide with the valve guide remover

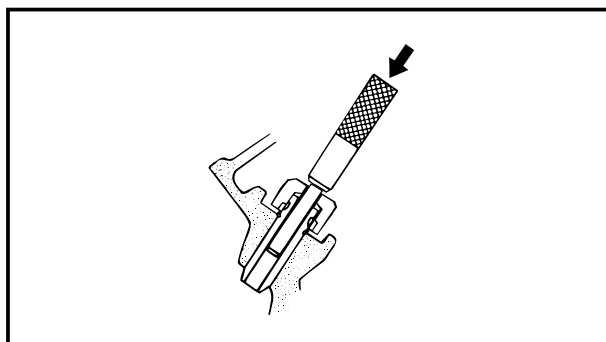
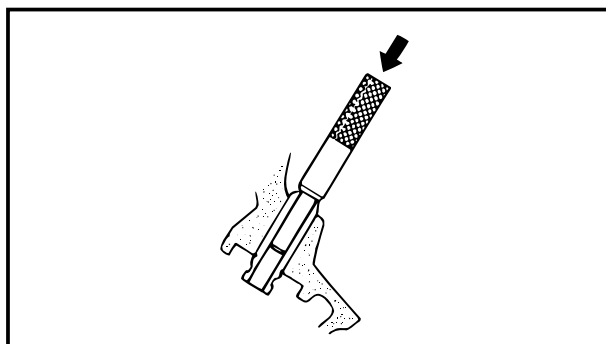


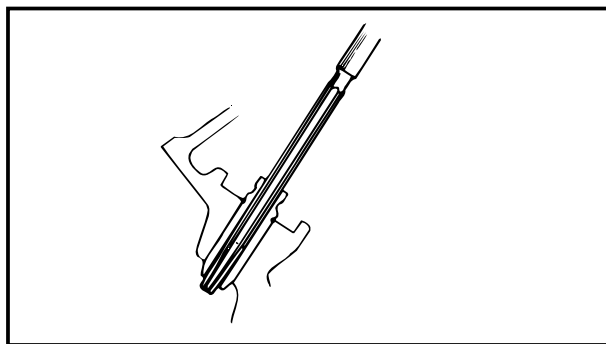
Valve guide remover:
YM-01122/90890-06801

- Install the circlip and the new valve guide with the valve guide installer and valve guide remover.



Valve guide installer:
YB-6308/90890-06802

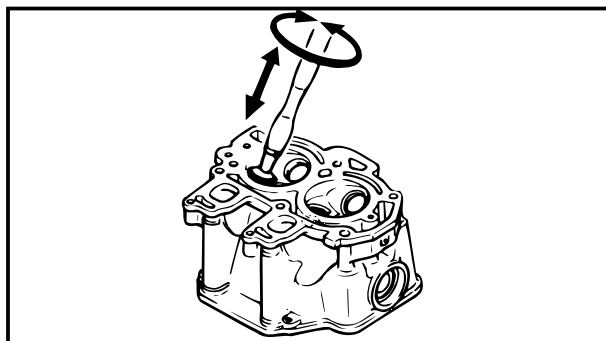




- After installing the valve guide, bore the valve guide with the valve guide reamer to obtain the proper valve stem-to-valve guide clearance.



Valve guide reamer:
YM-01196/90890-06804



Valve seat refacing

NOTE:

After refacing the valve seat or replacing the valve and valve guide, lap the valve seat and valve face.

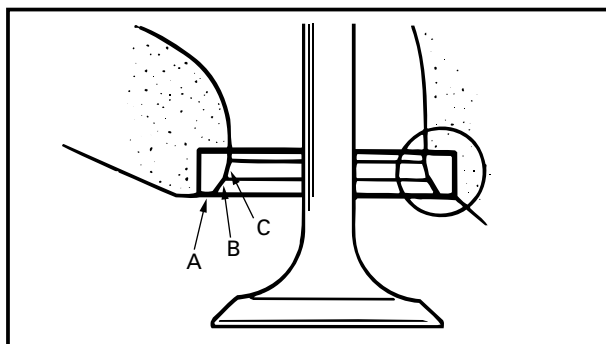
CAUTION:

To prevent chatter marks, turn the valve seat cutter with an even, downward pressure (4 ~ 5 kg).

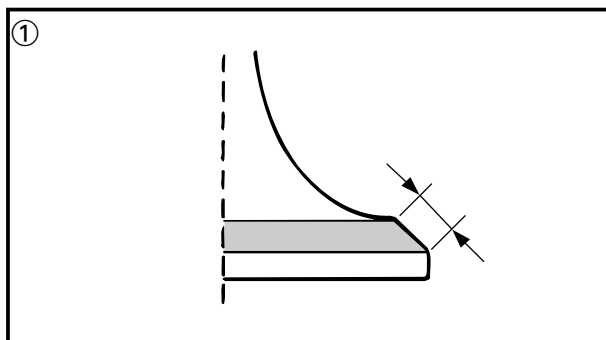


Valve seat cutter set:
YM-91043-C/90890-06803
Valve seat lapper:
N.A./90890-06805

- Refer to the following chart to determine the appropriate valve seat cutter.



Valve seat area	Valve cutter
A	90°
B	45°
C	30°



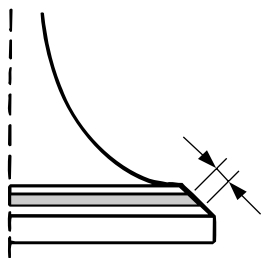
Valve seat cutting guidelines

- ① The valve seat is centred on the valve face, but is too wide.

Valve seat cutter set		Desired result
Use lightly	First: 90° cutter Second: 30° cutter	To reduce the valve seat width.



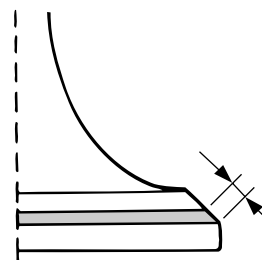
②



- ② The valve seat is in the middle of the valve face, but is too narrow.

Valve seat cutter set		Desired result
Use	45° cutter	To achieve a uniform valve seat width.

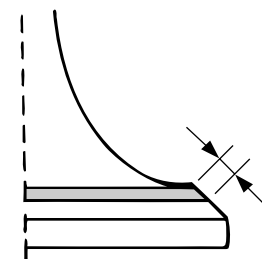
③



- ③ The valve seat is too narrow and is near the valve margin.

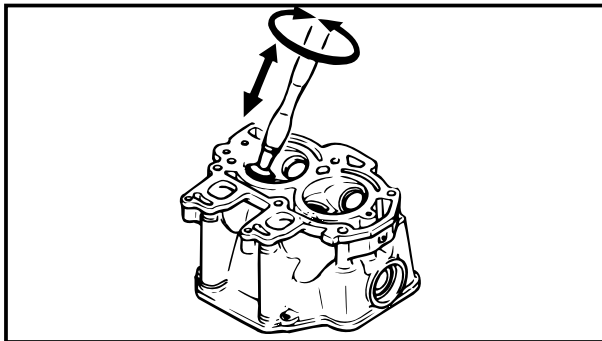
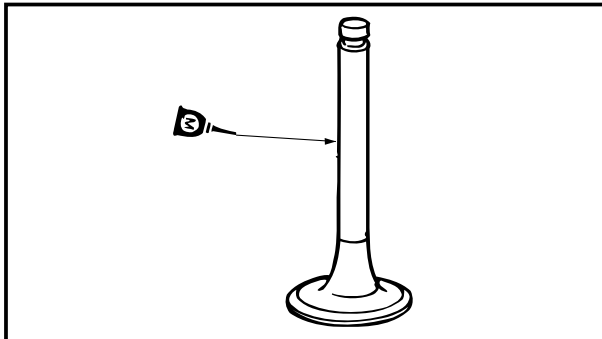
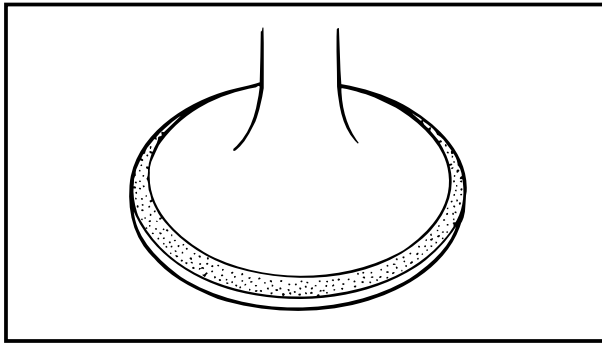
Valve seat cutter set		Desired result
Use	First: 90° cutter Second: 45° cutter	To achieve a centred valve seat with the proper width.

④



- ④ The valve seat is too narrow and is near the bottom edge of the valve face.

Valve seat cutter set		Desired result
Use	First: 30° cutter Second: 45° cutter	To centred the valve seat and increase its width.



Valve lapping

NOTE: _____

After refacing the valve seat or replacing the valve and valve guide, the valve seat and valve face should be lapped

Lapping steps:

- Apply a coarse lapping compound to the valve face.

CAUTION: _____

Be sure no compound enters the gap between the valve stem and guide.

- Apply a molybdenum disulfide oil to the valve stem.
- Install the valve in to the cylinder head.
- Turn the valve until the valve face and valve seat are evenly polished, then clean off all compound.

NOTE: _____

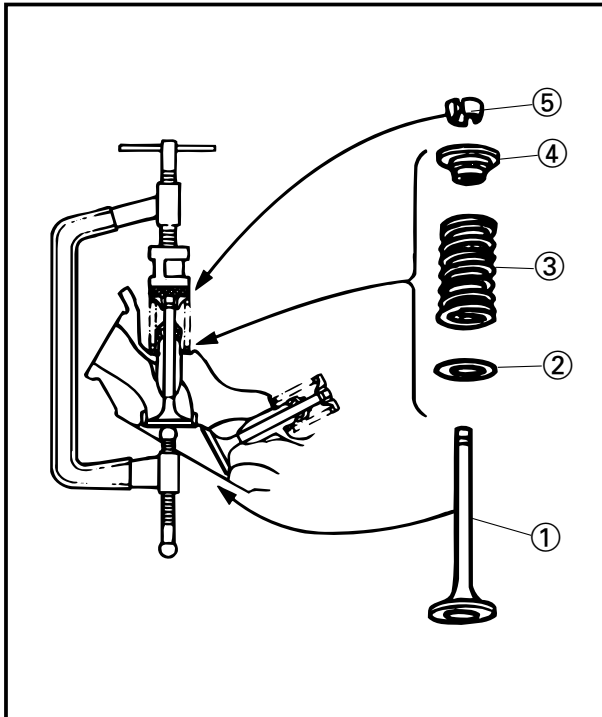
To obtain the best lapping results, lightly tap the valve seat while rotating the valve back and forth between your hands.

- Apply the fine lapping compound to the valve face and repeat the above steps.

NOTE: _____

Be sure to clean off all compound to the valve face and valve seat after every lapping operation.

- Apply the Mechanic's bluing dye to the valve face.
- Install the valve into the cylinder head.
- Press the valve through the valve guide and onto the valve seat to mark a clear pattern.
- Measure the valve seat width again. If the valve seat width is out of specification, reface and lap the valve seat.

**Valve installation****1. Install:**

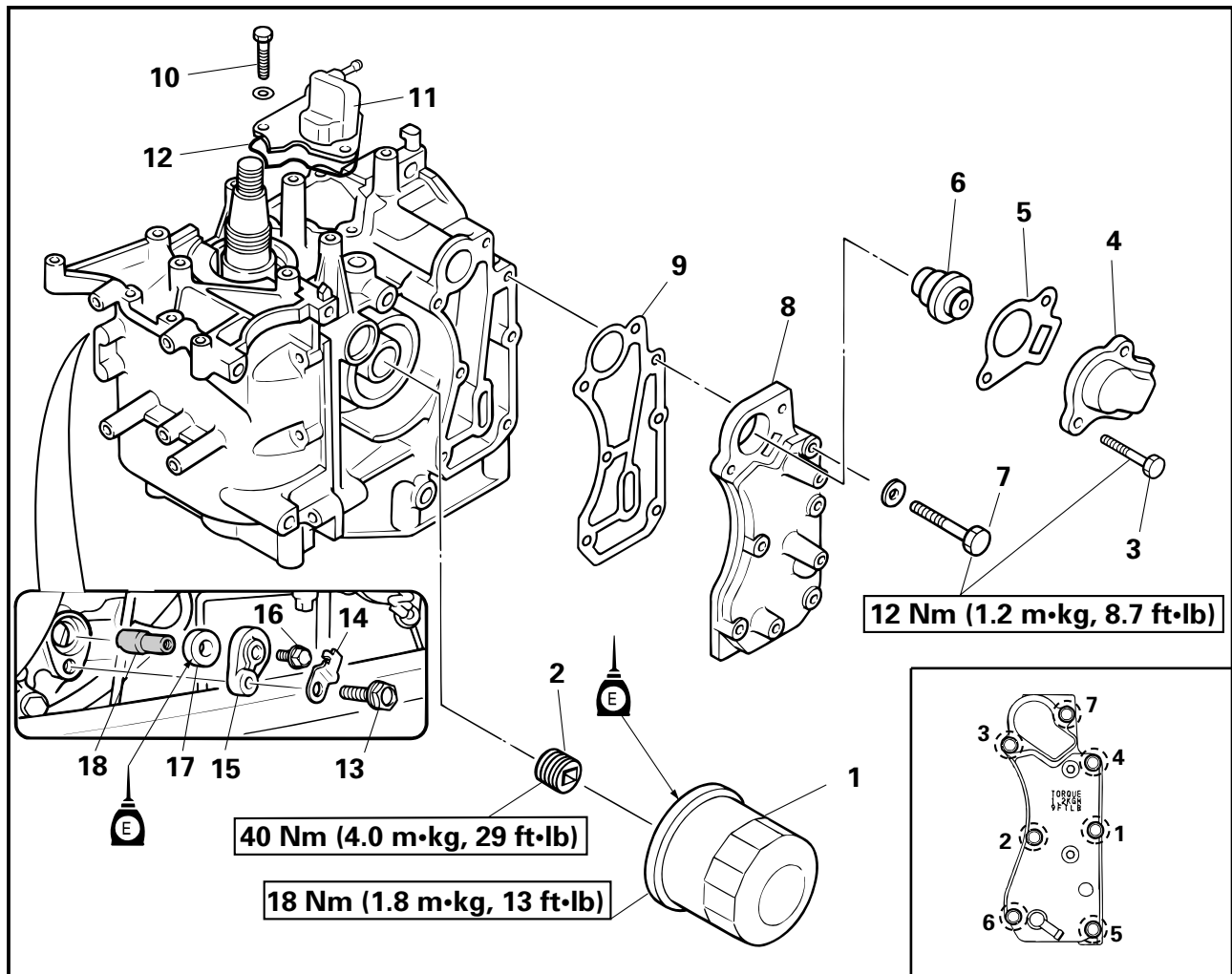
- Valve ①
- Spring seat ②
- Valve spring ③
- Spring retainer ④
- Valve cotter ⑤

**Valve spring compressor:****YM-01253/90890-04019****Attachment:****YM-04114/90890-04018**

NOTE: _____
Set the attachment on the center of spring
retainer.



OIL FILTER, THERMOSTAT AND EXHAUST COVER EXPLODED DIAGRAM

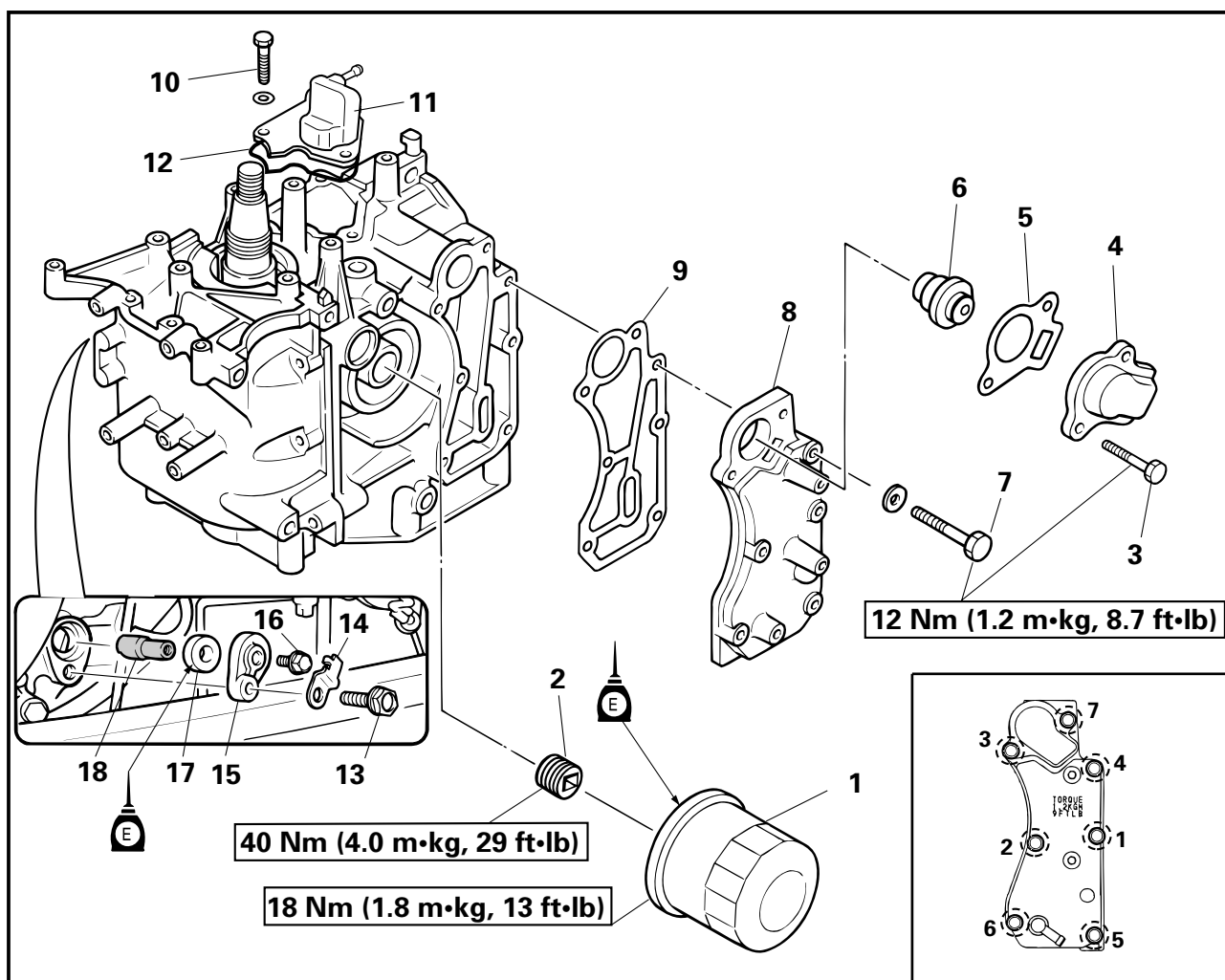


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	OIL FILTER, THERMOSTAT AND EXHAUST COVER REMOVAL		Follow the left "Step" for removal.
1	Oil filter	1	
2	Oil filter plug	1	
3	Bolt (thermostat cover)	2	M6 x 30 mm
4	Thermostat cover	1	
5	Gasket (thermostat)	1	Not reusable
6	Thermostat	1	
7	Bolt (exhaust cover)	5	M6 x30 mm
8	Exhaust cover	1	
9	Gasket (exhaust cover)	1	
10	Bolt (breather cover)	3	M6 x20 mm
11	Breather cover	1	
12	Gasket (breather cover)	1	Not reusable

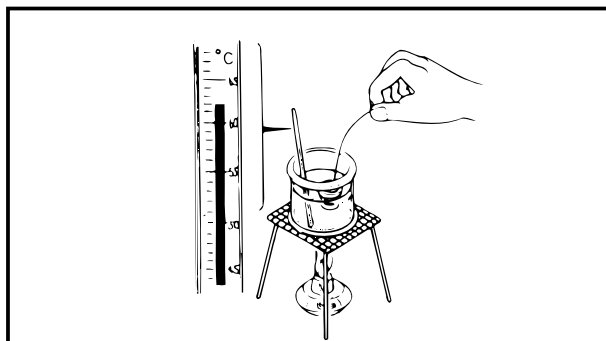
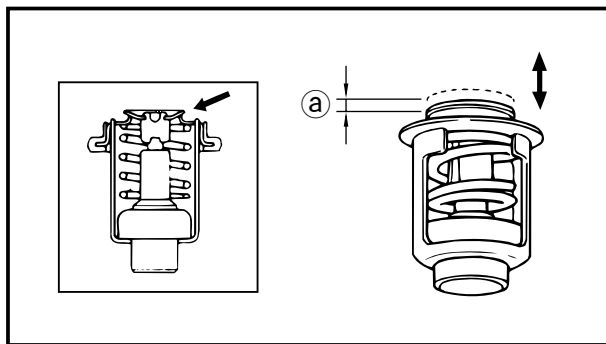


EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
13	Bolt (plate)	1	NOTE: _____ Remove with the ass'y.
14	Plate	1	
15	Anode cover	1	
16	Bolt (anode cover)	1	NOTE: _____ Apply oil on the outer surface.
17	Rubber packing	1	
18	Anode	1	Reverse the removal steps for installation.



SERVICE POINTS

Thermostat inspection

1. Measure:

- Valve operating temperature
- Valve lift (a)

Out of specification → Replace the thermostat

 Water temperature	Valve lift
Below 60°C (140°F)	0 mm (0 in)
Above 70°C (158°F)	3 mm (0.12 in)

Measuring steps:

- Suspend the thermostat in a container filled with water.
- Slowly heat the water.
- Place a thermometer in the water.
- While stirring the water, observe the thermometer's indicated temperature.

Anode inspection

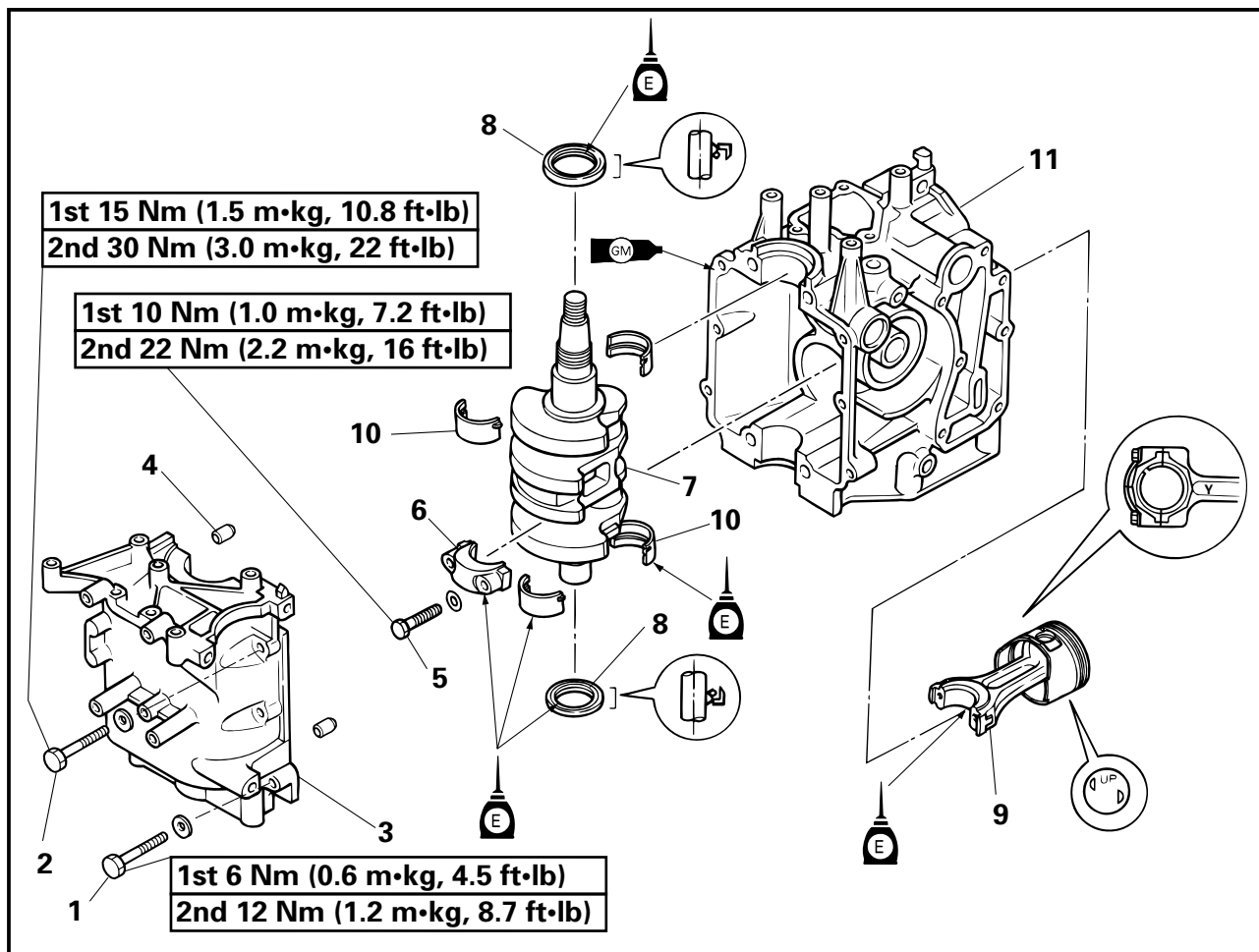
1. Inspect:

- Anode

Refer to the "ANODE" in chapter 3.



CRANKCASE AND CRANKSHAFT EXPLODED DIAGRAM

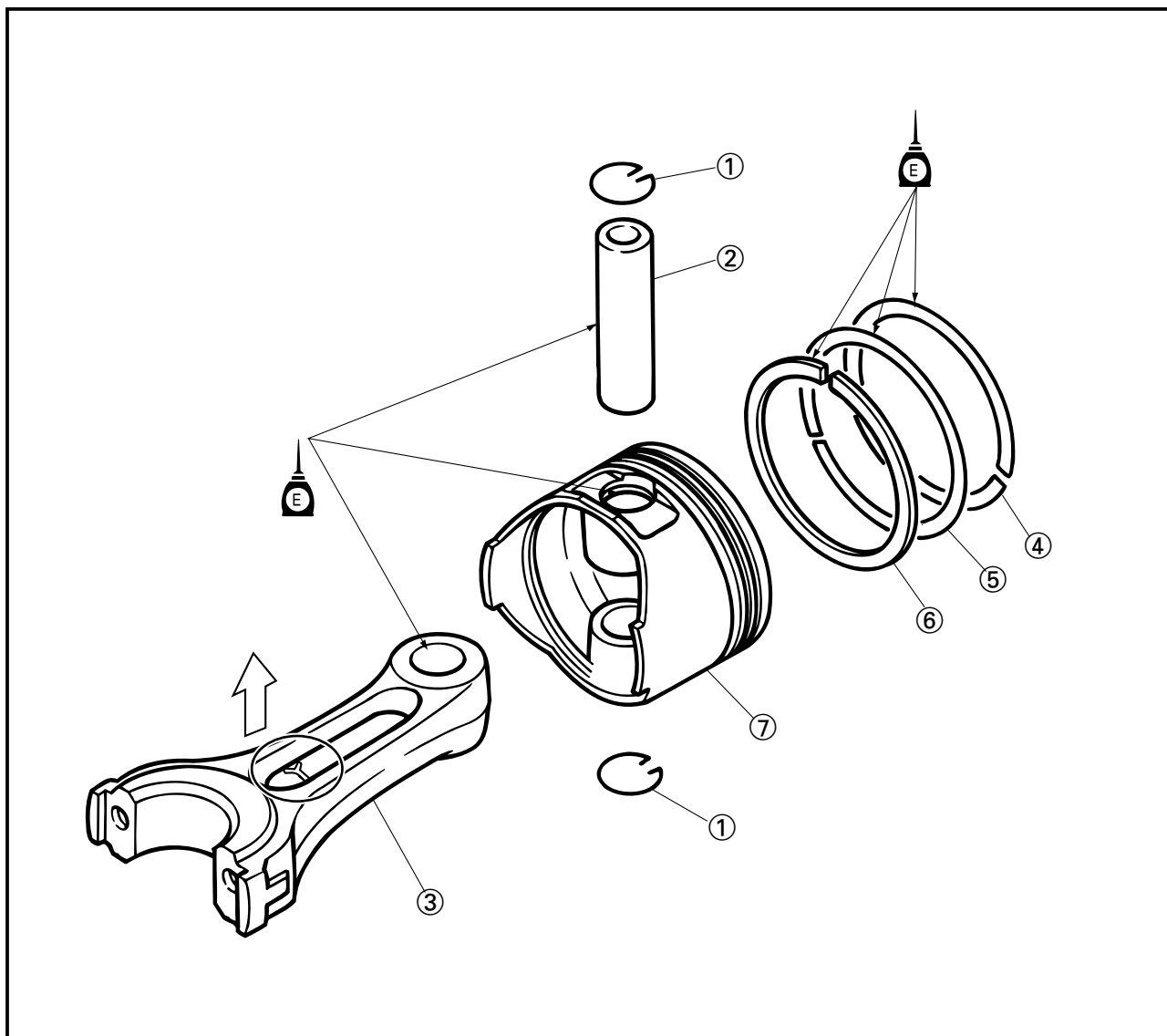


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CRANKCASE AND CRANKSHAFT DISASSEMBLY		Follow the left "Step" for disassembly.
1	Bolt (crankcase)	6	M6 x 35 mm
2	Bolt (crankcase)	4	M8 x 55 mm
3	Crankcase	1	
4	Dowel pins	2	
5	Bolt (connecting rod cap)	4	M7 x 38 mm (Exclusive part)
6	Connecting rod cap	2	
7	Crankshaft	1	
8	Oil seal	2	
9	Connecting rod and piston ass'y	2	NOTE: _____ Install the connecting rod and piston ass'y upward "Y" mark side. _____
10	Main bearings	4	
11	Cylinder body	1	Reverse the disassembly steps for assembly.

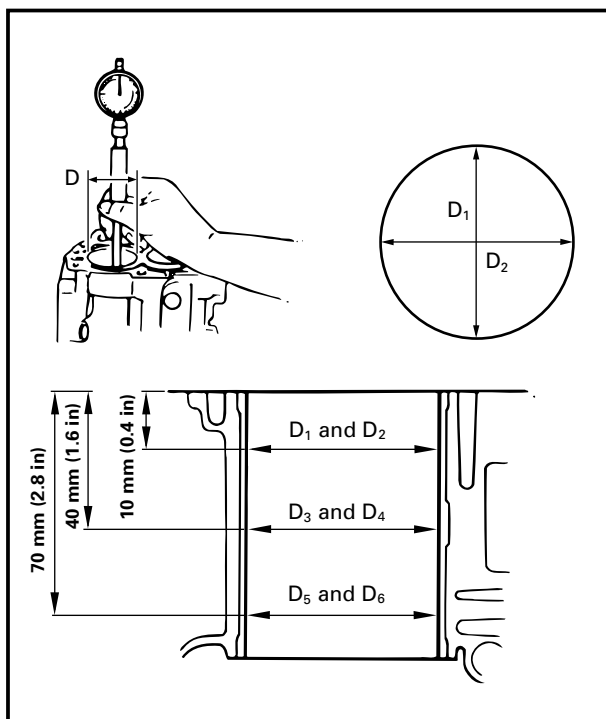


CONNECTING ROD AND PISTON EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CONNECTING ROD AND PISTON DISASSEMBLY		Follow the left "Step" for disassembly.
①	Piston pin clip	4	NOTE: _____ When the piston pins, pistons and piston rings (top, 2nd and oil-ring) are reused, they should be marked with No.1 and 2 so they are not confused. _____ Reverse the disassembly steps for assembly.
②	Piston pin	2	
③	Connecting rod	2	
④	Top ring	2	
⑤	2nd ring	2	
⑥	Oil ring	2	
⑦	Piston	2	



SERVICE POINTS

Cylinder inspection

1. Measure:

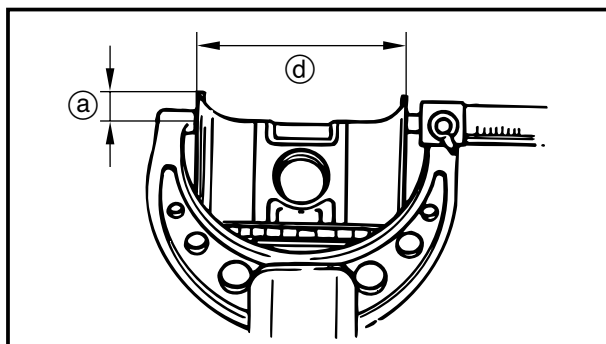
- Cylinder bore

Out of specification → Rebore or replace the cylinder.

NOTE: _____

Measure the cylinder bore in parallel and at (a) right angle to the crankshaft. Then, average the measurements.

	Standard	Wear limit
Cylinder bore "D"	59.00 ~ 59.02 mm (2.323 ~ 2.324 in)	—
Taper limit "T"	—	0.08 mm (0.003 in)
Out of round limit	—	0.05 mm (0.002 in)
D=Maximum Dia. (D₁~D₆) T=(maximum D₁ or D₂) ~ (minimum D₅ or D₆)		



Piston inspection

1. Measure:

- Piston diameter

Out of specification → Replace the piston.

	Distance (a)	Piston diameter (d)
Standard	5 mm (0.20 in)	58.950 ~58.965 mm (2.3206 ~ 2.3215 in)

	Oversize piston diameter: *Over size 1 :59.25 mm (2.333 in) Over size 2 : 59.50 mm (2.343 in)	
---	--	--

*Except for USA



Piston-to-cylinder clearance

1. Calculate:

- Piston-to-cylinder clearance

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

Piston-to-
cylinder
clearance

=

Cylinder
bore

-

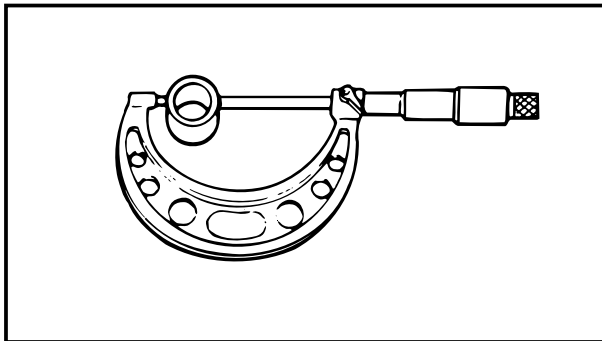
Piston
diameter



Piston-to-cylinder clearance:

0.035 ~ 0.065 mm

(0.0014 ~ 0.0026 in)



Piston pin inspection

1. Measure:

- Piston pin outside diameter

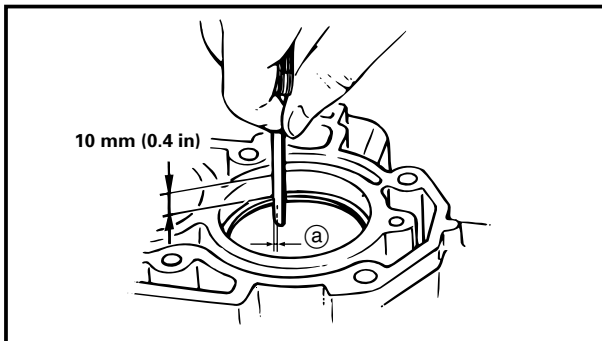
Out of specification → Replace the piston pin.



Piston pin outside diameter:

13.996 ~ 14.000 mm

(0.551 ~ 0.5512 in)



Piston ring inspection

1. Measure:

- End gap (a)

Out of specification → Replace the piston ring.



End gap (installed)

Top ring:

0.15 ~ 0.30 mm

(0.006 ~ 0.012 in)

2nd ring:

0.30 ~ 0.50 mm

(0.012 ~ 0.020 in)

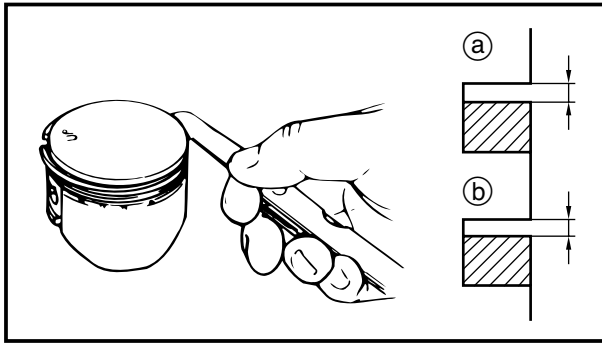
Oil ring:

0.20 ~ 0.70 mm

(0.008 ~ 0.028 in)

NOTE:

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



2. Measure:

- Side clearance

Out of specification → Replace the piston and piston rings as a set.

**Side clearance:****Top ring: (a)**

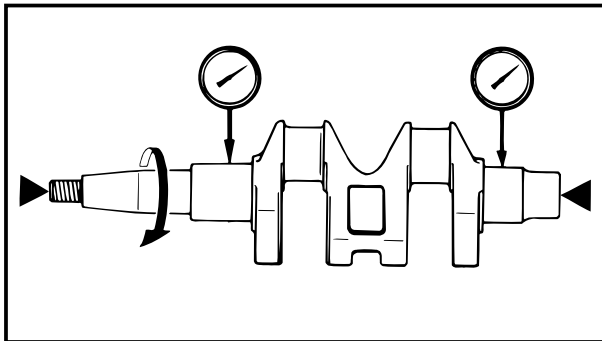
0.013 ~ 0.035 mm

(0.0005 ~ 0.0013 in)

2nd ring: (b)

0.02 ~ 0.04 mm

(0.001 ~ 0.002 in)

**Crankshaft inspection**

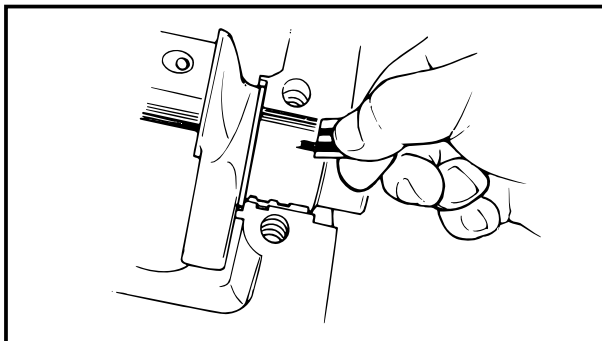
1. Measure:

- Crankshaft runout

Out of specification → Replace the crankshaft.

**Crankshaft runout limit:**

0.03 mm (0.0012 in)

**Crankshaft journal oil clearance**

1. Measure:

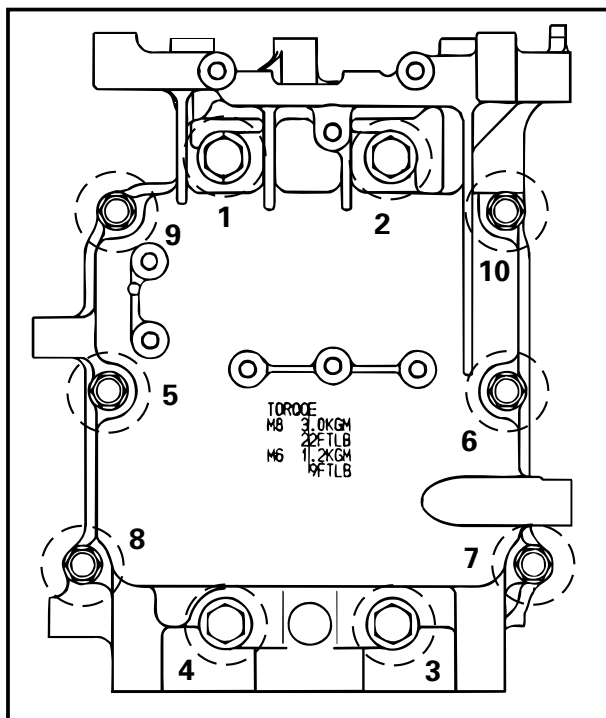
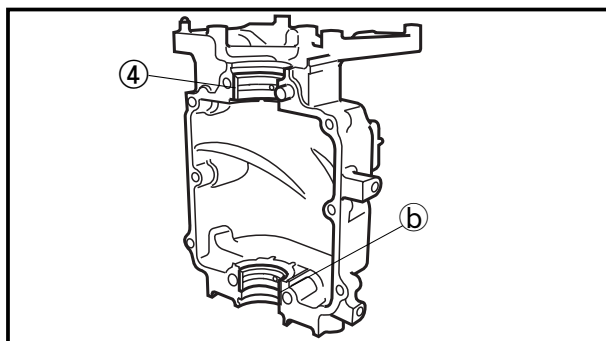
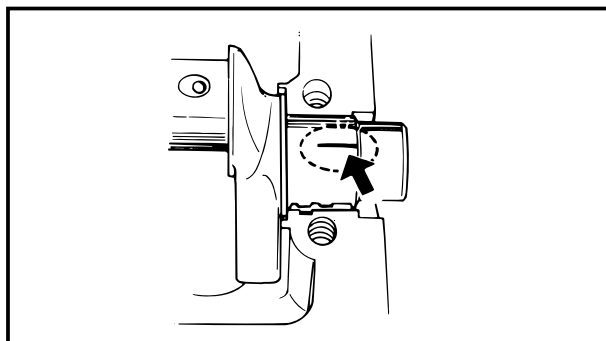
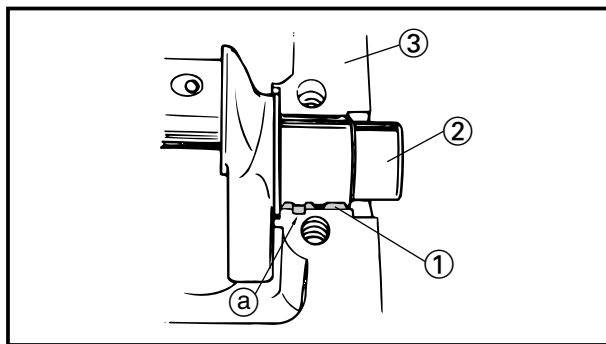
- Crankcase journal oil clearance

Out of specification → Replace the bearings as a set.

**Crankshaft journal oil clearance:**

0.012 ~ 0.045 mm

(0.0005 ~ 0.0018 in)

**Measuring steps:****CAUTION:**

Install the bearings in their original positions. Incorrect oil clearance measurements can lead to engine damage.

- Clean the bearings, main journals, and bearing portions of the crankcase and cylinder body.
- Place the cylinder body upside down on a bench.
- Install half of the bearings ① and the crankshaft ② into the cylinder body ③.

NOTE:

Align each bearing projection ① with the notch in the cylinder body.

- Put a piece of Plastigauge® on each main journal.

NOTE:

Do not put the Plastigauge® over the oil hole in the main journal of the crankshaft.

- Install the other half of the bearings ④ into the crankcase.
- Install the crankcase onto the cylinder body.
- Tighten the bolts in the proper sequence and in two stages.
- Align each bearing projection ⑥ with the notch in the crankcase.
- Do not move the crankshaft until the main-bearing oil clearance measurement has been completed.

**Bolt (M8): (1~4)**

1st :15 Nm

(1.5 m•kg, 10.8 ft•lb)

2nd:30 Nm

(3.0 m•kg, 22 ft•lb)

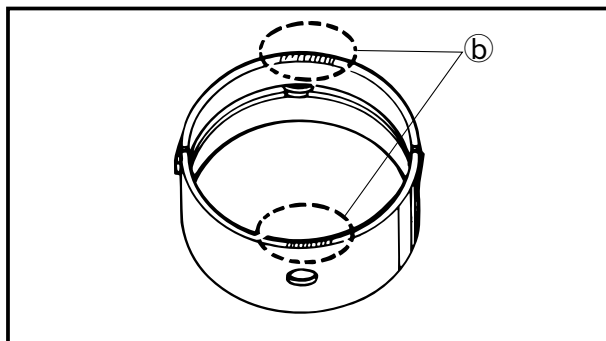
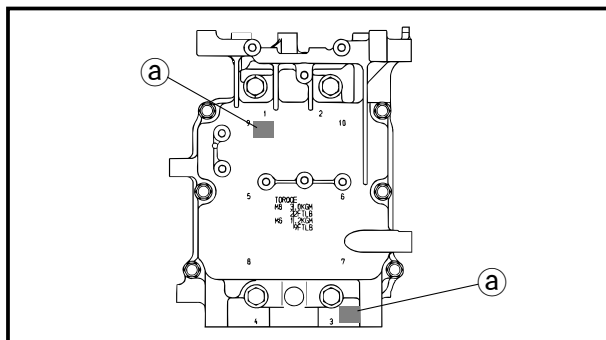
Bolt (M6): (5~10)

1st :6 Nm

(0.6 m•kg, 4.5 ft•lb)

2nd:12 Nm

(1.2 m•kg, 8.7 ft•lb)



- Remove the crankcase.
- Measure the width of the compressed Plastigauge® on each main journal.



Crankcase main journal color code indicator (a):

A : Blue

B : Black

C : Brown

Bearing color code (b):

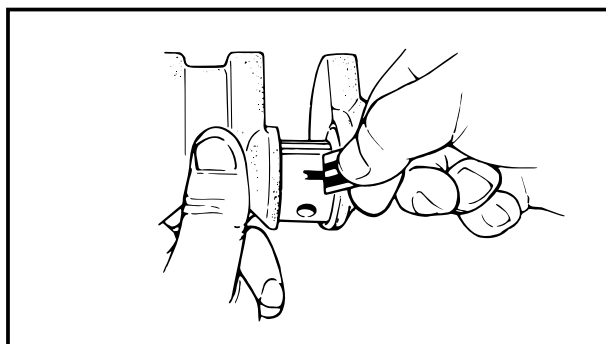
A : Blue

B : Black

C : Brown

NOTE:

- The crankcase color code indicator is marked on the cylinder block, as shown.
- Use the same bearing color as the color which is indicated on the crankcase (e.g., A(Blue) → Blue, etc.).



Connecting rod oil clearance

1. Measure:

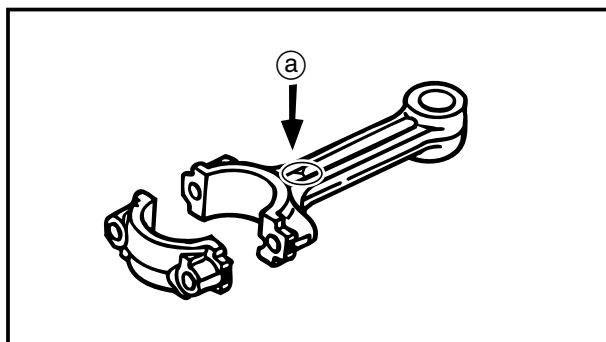
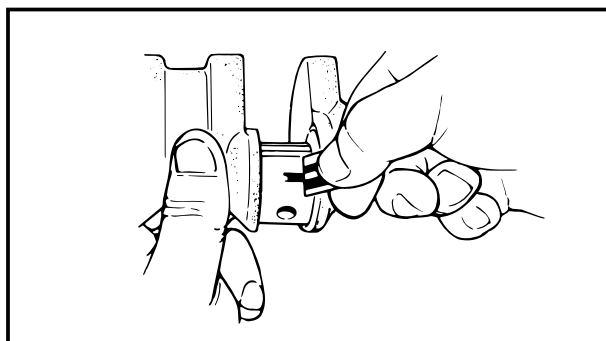
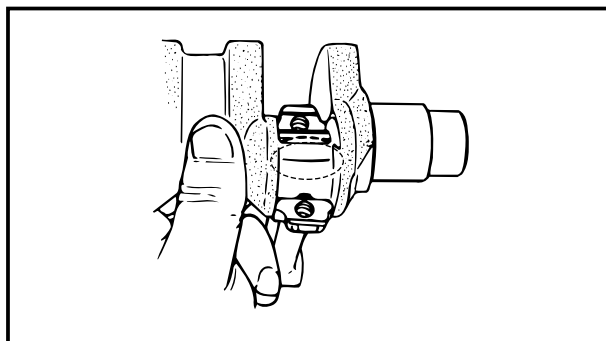
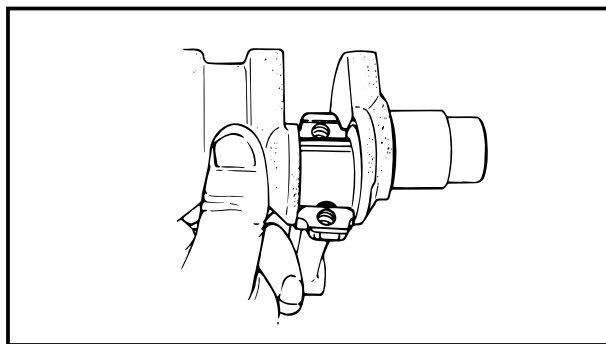
- Connecting rod big end oil clearance
Out of specification → Replace the connecting rod as a set.



Big end oil clearance:

0.021 ~ 0.045 mm

(0.0008 ~ 0.0018 in)

**Measuring steps:****CAUTION:**

- Assemble the connecting rod and the cap referring the marking.
- Do not assemble connecting rod and the cap with #1 and #2 together.

- Clean the bearing portions of the connecting rod.
- Install the connecting rod to the crankshaft.
- Put a piece of Plastigauge® onto the crank pin.
- Assemble the connecting rod halves onto the crank pin.

NOTE:

- Make sure that the "Y" mark (a) on the connecting rod faces upward the fly-wheel magneto.
- Do not move the crankshaft until the big-end oil clearance measurement has been completed.

- Tighten the bolts in the proper sequence and in two stages.

**Bolt:**

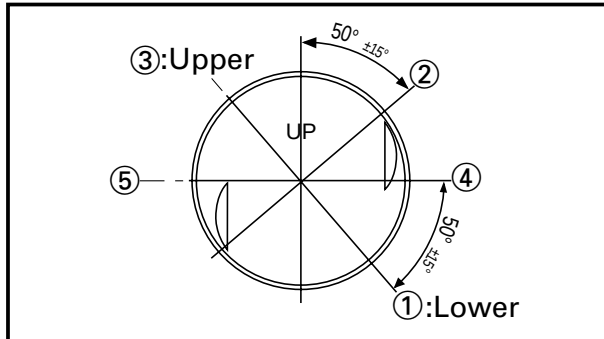
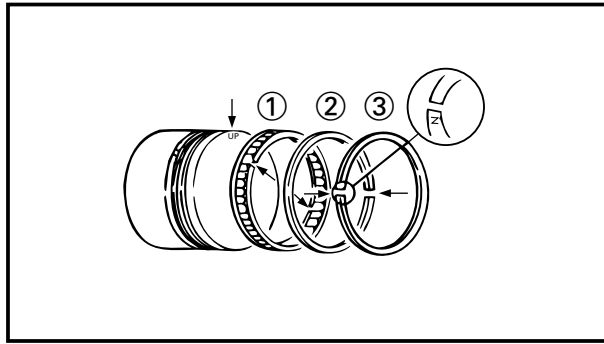
1st :10 Nm
(1.0 m•kg, 7.2ft•lb)

2nd :22 Nm
(2.2 m•kg, 16 ft•lb)

- Remove the connecting rod cap.
- Measure the width of the compressed Plastigauge® on each crank pin.

NOTE:

- Make sure that the "Y" mark (a) on the connecting rod faces upward the fly-wheel magneto.
- Do not move the crankshaft until the big-end oil clearance measurement has been completed.



Piston ring installation

1. Install:

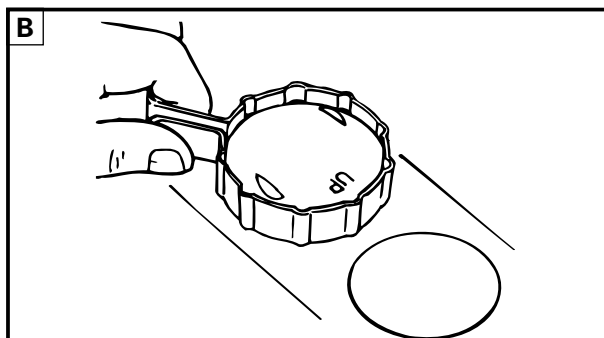
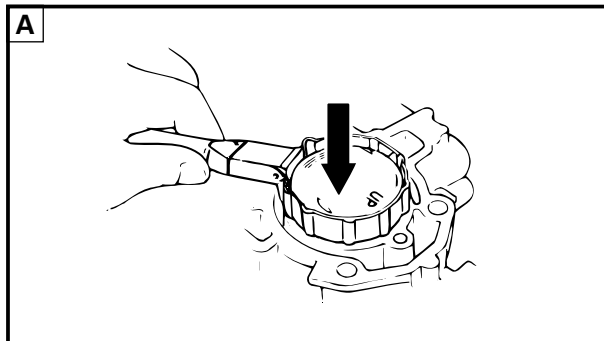
- Oil ring ①
- 2nd piston ring ②
- Top piston ring ③

NOTE:

- Make sure that the "N" mark on the piston ring upward to install the piston ring.
- Install the oil ring, first installing the expander ring and installing the side rail as next.
- After installing the piston rings, check that they move smoothly.

2. Offset the piston ring and oil ring end gaps as shown.

- Oil ring end gap ① (lower rail)
- Oil ring end gap ② (expander ring)
- Oil ring end gap ③ (upper rail)
- 2nd piston ring end gap ④
- Top piston ring end gap ⑤



Piston installation

1. Install:

- Piston



Piston slider:

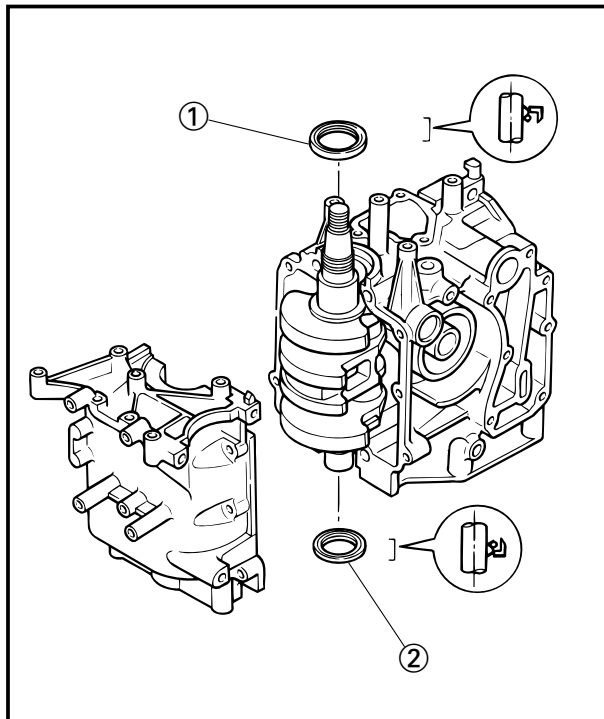
YB-34454/90890-06529

CAUTION:

- Make sure that the upper oil ring's end gap is positioned correctly, then install the piston.
- Install the piston with the "UP" mark on the piston crown facing toward the fly-wheel side.

A For USA and CANADA

B Except for USA and CANADA

**Oil seal installation**

1. Install:

- Oil seal ① and ②

CAUTION:

Do not install the oil seals after tightening the crankcase bolts; this can damage the oil seals.



CHAPTER 6

LOWER UNIT

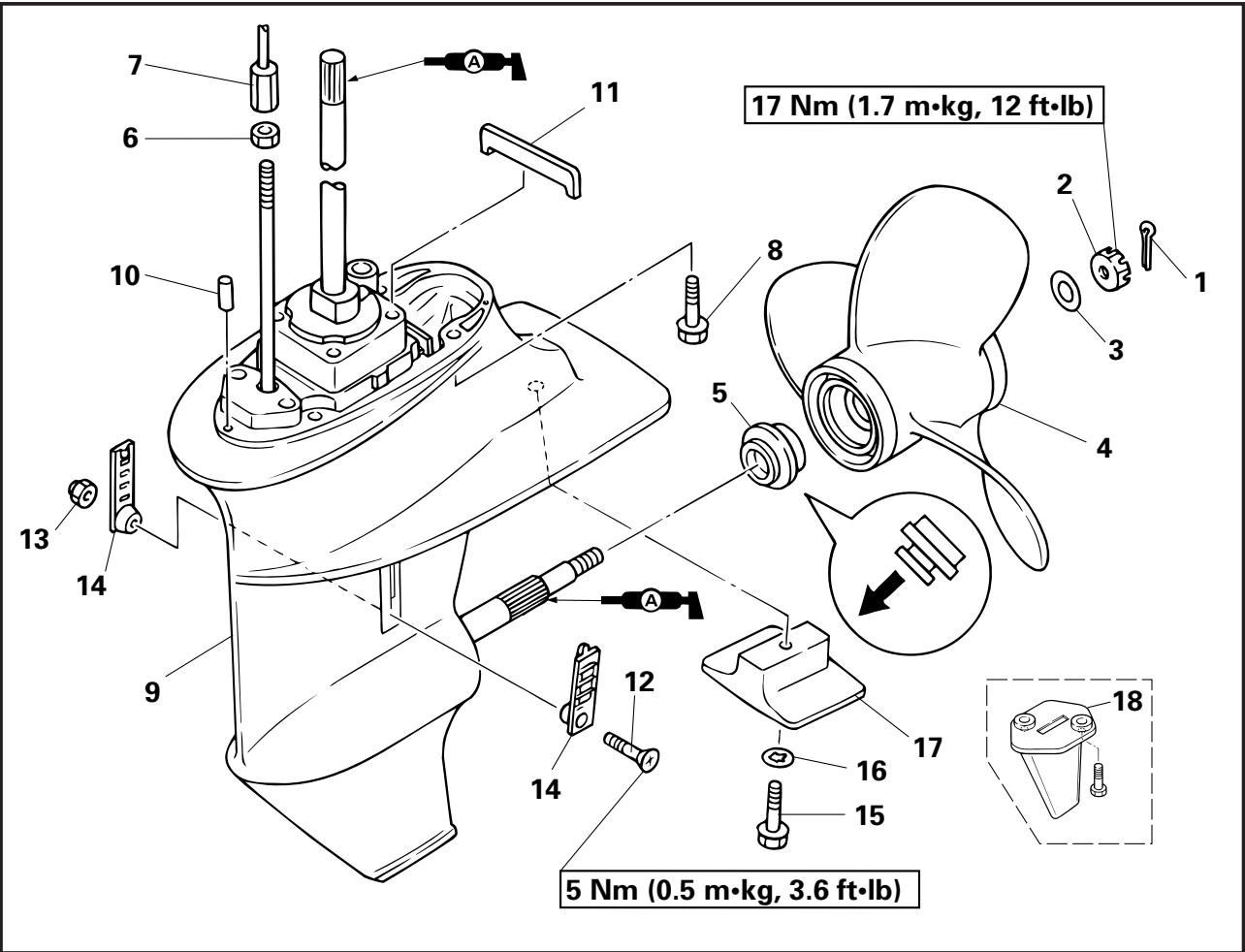
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LOWER UNIT

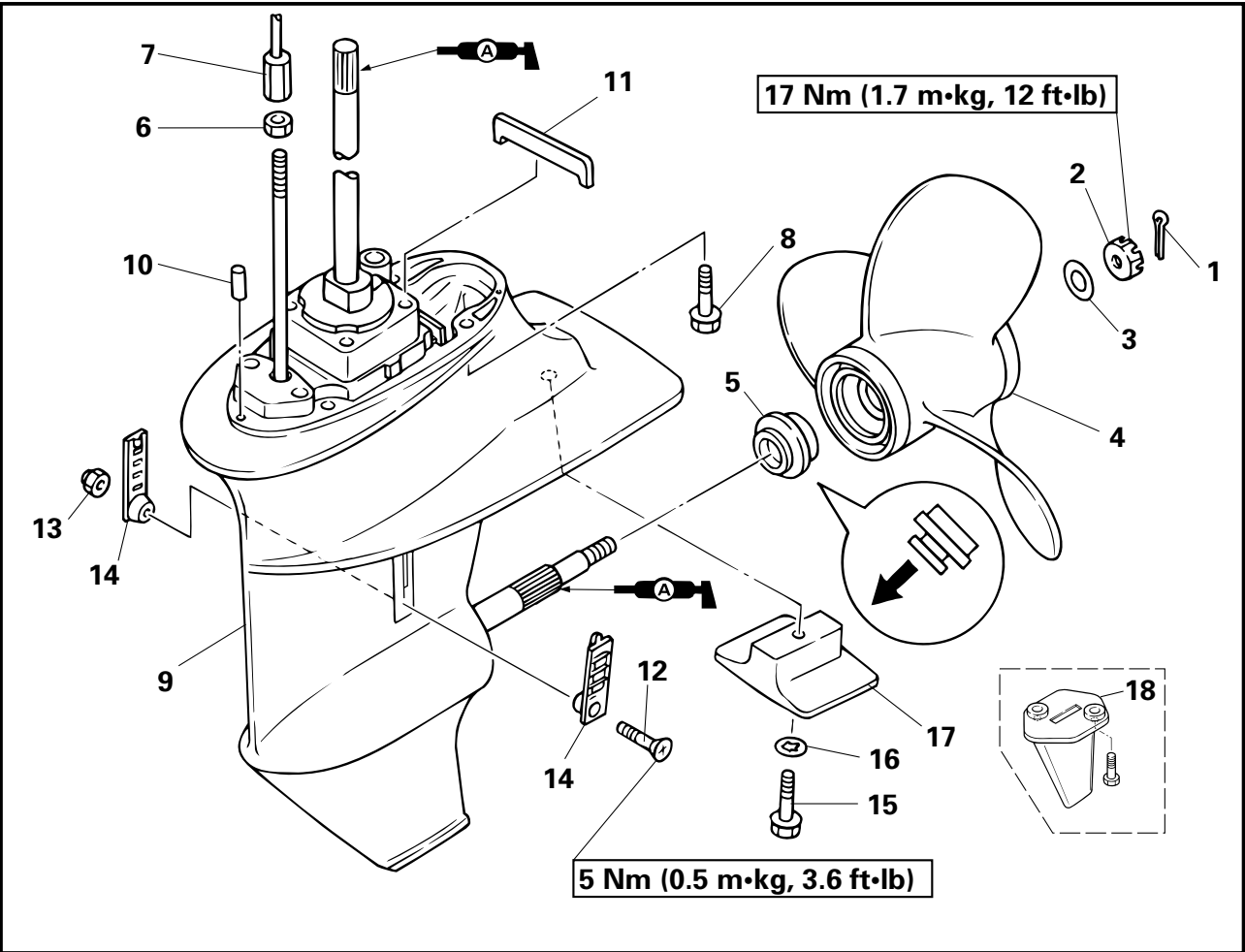
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
LOWER REMOVAL			Follow the left "Step" for removal. Not reusable
1	Cotter pin	1	
2	Propeller nut	1	
3	Spacer	1	
4	Propeller	1	
5	Collar	1	
6	Locknut	1	
7	Adjusting nut	1	
8	Bolt (lower case)	4	
9	Lower unit	1	
10	Dowel pins	2	
11	Seal rubber	1	

EXPLODED DIAGRAM

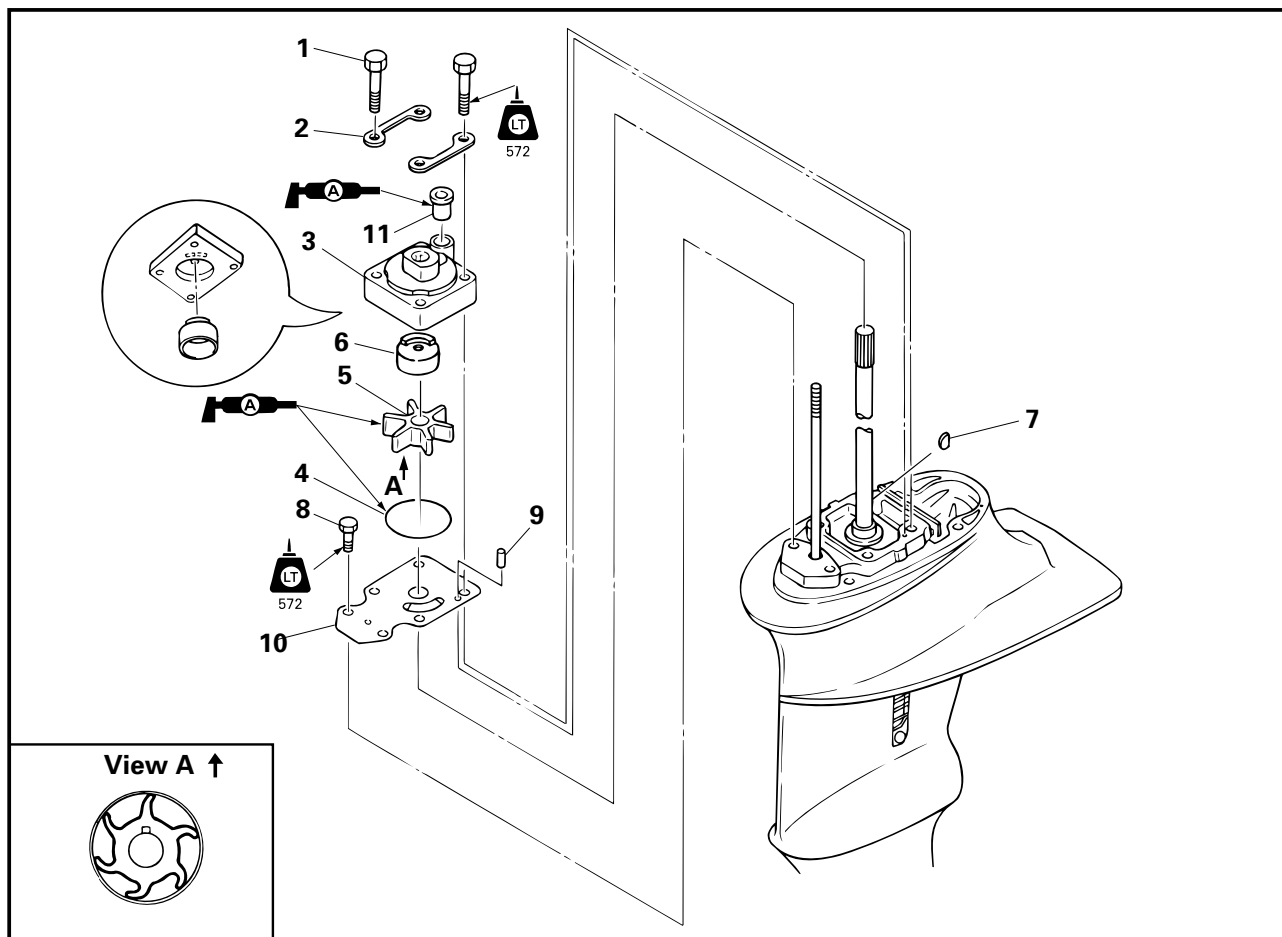


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
12	Screw (water inlet grill)	1	For S-transom model Reverse the removal steps for installation.
13	Nut (water inlet grill)	1	
14	Water inlet grill	2	
15	Bolt (anode)	1	
16	Toothed washer (anode)	1	
17	Anode	1	
18	Trim tab	1	

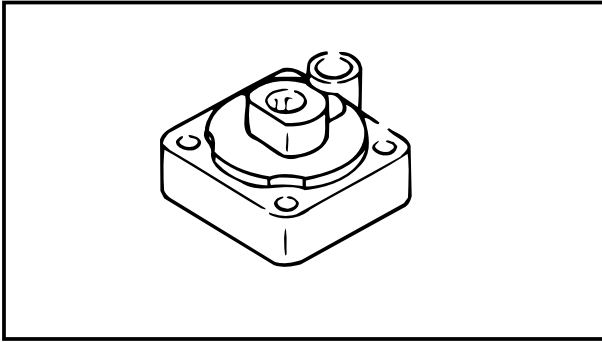


WATER PUMP EXPLODED DIAGRAM

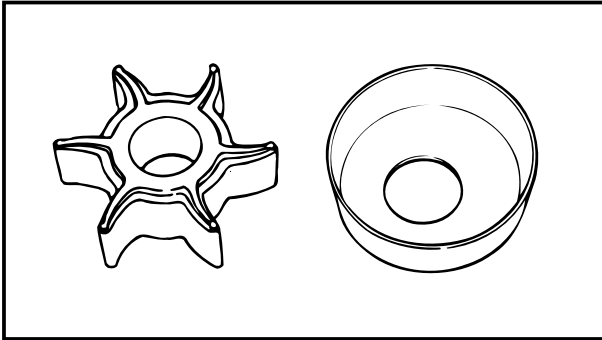


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	WATER PUMP REMOVAL		Follow the left "Step" for removal.
	Lower unit ass'y		
1	Bolt (water pump)	4	
2	Plate	2	
3	Water pump housing	1	
4	O-ring (water pump housing)	1	
5	Impeller	1	
6	Insert cartridge	1	NOTE: _____ To install the insert cartridge, turn the drive shaft clockwise. _____
7	Woodruff key	1	
8	Bolt (cartridge plate)	2	
9	Dowel pins	2	
10	Cartridge plate	1	
11	Water seal rubber	1	
			Reverse the removal steps for installation.

**SERVICE POINTS****Water pump housing inspection**

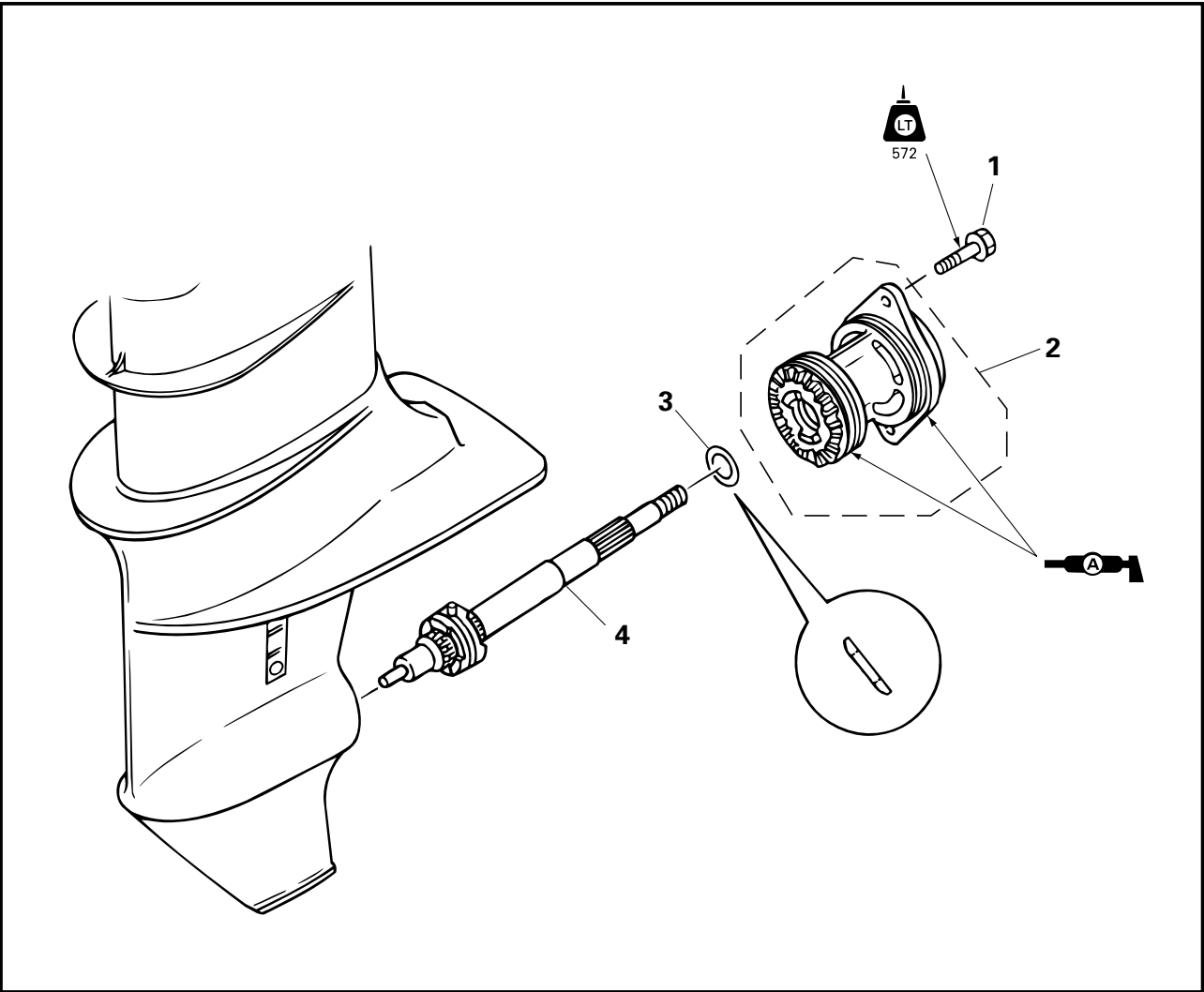
1. Inspect:
 - Water pump housing
Crack/Damage → Replace.

**Impeller and insert cartridge inspection**

1. Inspect:
 - Impeller
 - Insert cartridge
Crack/Damage → Replace.

PROPELLER SHAFT HOUSING AND PROPELLER SHAFT

EXPLODED DIAGRAM

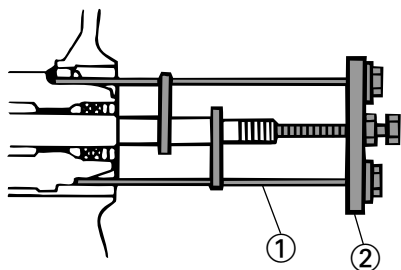


REMOVAL AND INSTALLATION CHART

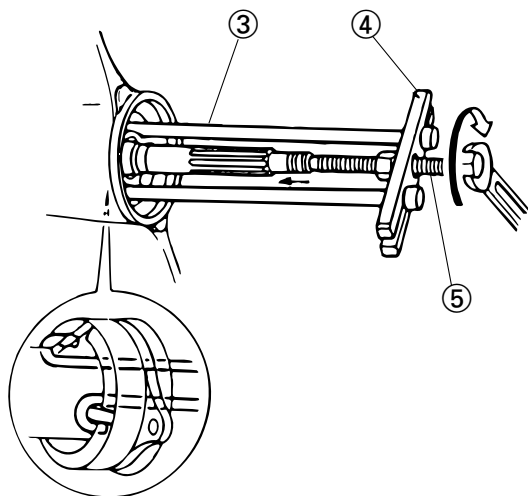
Step	Procedure/Part name	Q'ty	Service points
	PROPELLER SHAFT HOUSING AND PROPELLER SHAFT REMOVAL		Follow the left "Step" for removal.
	Gear oil		
	Propeller		
1	Bolt (shaft housing)	2	
2	Propeller shaft housing ass'y	1	
3	Thrust washer	1	
4	Propeller shaft ass'y	1	
			Reverse the removal steps for installation.



A



B



SERVICE POINTS

Propeller shaft housing ass'y removal

1. Remove:

- Propeller shaft housing ass'y.



Bearing housing puller claw:

YB-06234 ①/90890-06503 ③

Universal puller ②:

YB-06117

Stopper guide plate ④:

90890-06501

Center bolt ⑤:

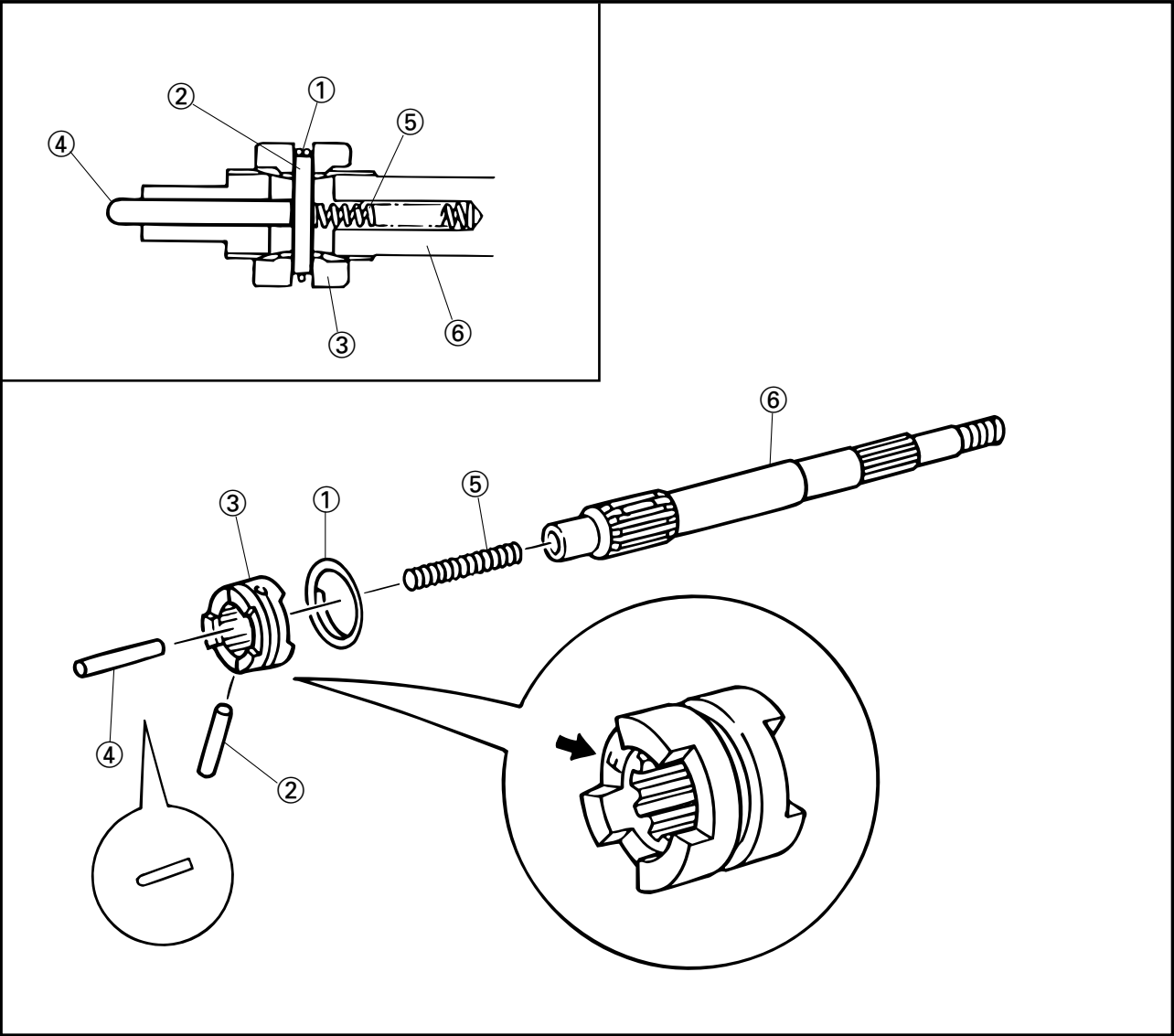
90890-06504

A For USA and CANADA

B Except for USA and CANADA

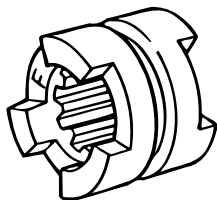
PROPELLER SHAFT ASS'Y

EXPLODED DIAGRAM

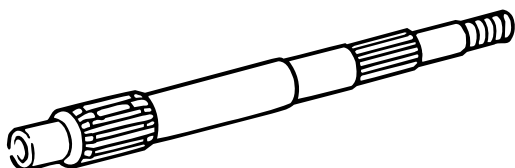


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	PROPELLER SHAFT ASS'Y DISASSEMBLY		Follow the left "Step" for disassembly.
①	Cross pin ring	1	
②	Cross pin	1	
③	Dog clutch	1	
④	Shift plunger	1	
⑤	Spring	1	
⑥	Propeller shaft	1	
			Reverse the disassembly steps for assembly.

**SERVICE POINTS****Dog clutch inspection**

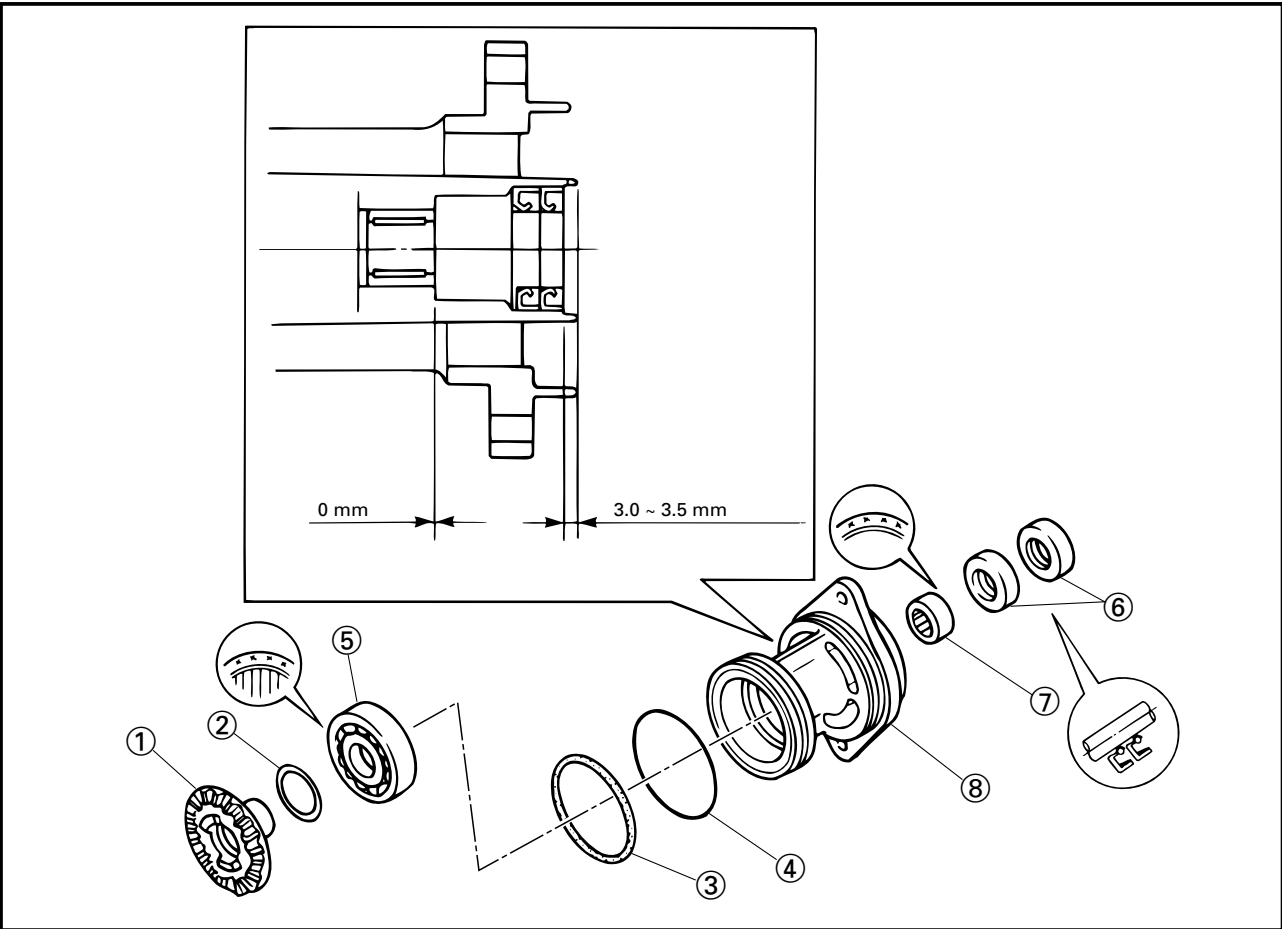
1. Inspect:
 - Dog clutch
Wear/Damage → Replace.

**Propeller shaft inspection**

1. Inspect:
 - Propeller shaft
Wear/Damage → Replace.

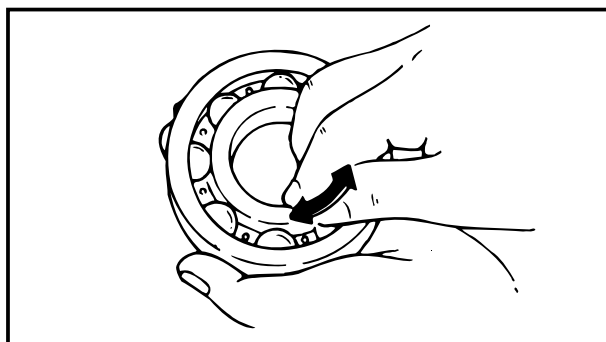
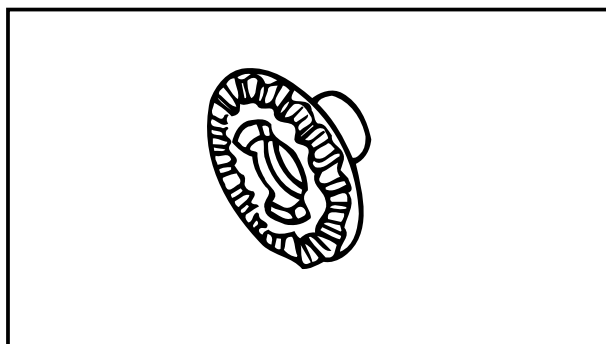
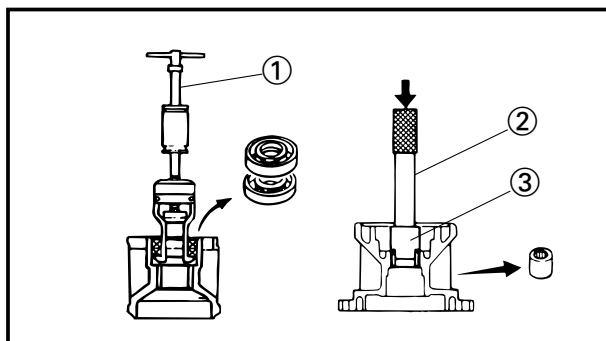
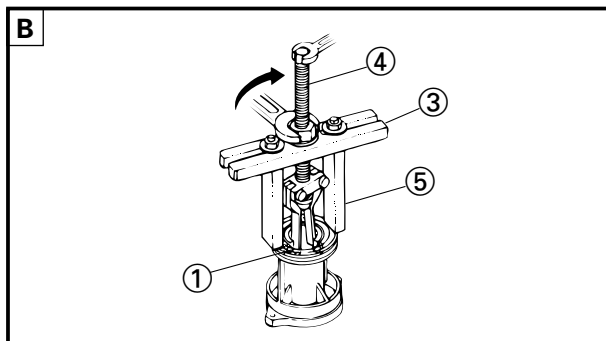
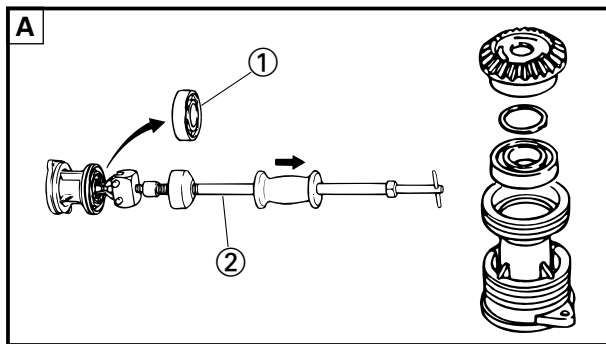
PROPELLER SHAFT HOUSING ASS'Y

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	PROPELLER SHAFT HOUSING ASS'Y DISASSEMBLY		Follow the left "Step" for disassembly.
	Propeller shaft housing ass'y	1	
①	Reverse gear	1	
②	Reverse gear shim (s)	1	
③	O-ring	1	Not reusable
④	O-ring	1	Not reusable
⑤	Ball bearing	1	
⑥	Oil seals	2	Not reusable
⑦	Needle bearing	1	
⑧	Propeller shaft housing	1	
			Reverse the disassembly steps for assembly.

**SERVICE POINTS****Propeller shaft housing ass'y disassembly****1. Remove:**

- Reverse gear
- reverse gear shim (s)
- Ball bearing ①

**Slide hammer set ②:****YB-06096****Stopper guide plate ③:****90890-06501****Bearing puller ④:****90890-06535****Stopper guide stand ⑤:****90890-06538****A** For USA and CANADA**B** Except for USA and CANADA**2. Remove:**

- Oil seals
- Needle bearing

**Slide hammer set ①:****YB-06096****Driver rod ②:****YB-06071/90890-06604****Needle bearing attachment ③:****YB-06081/90890-06616****Gears inspection****1. Inspect:**

- Tooth
- Dog

Wear/Damage → Replace.

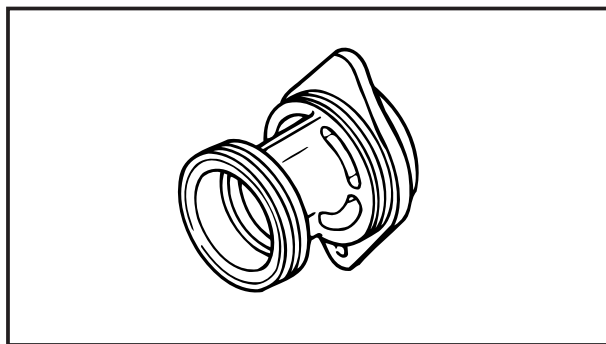
Bearings inspection**1. Inspect:**

- Bearing

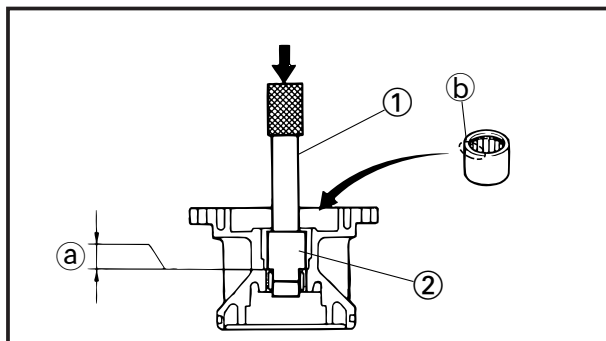
Pitting/Rumbling → Replace.

NOTE:

Turn the bearing by fingers and check the bearing pitching

**Propeller shaft housing inspection**

1. Clean:
 - Propeller shaft housing
Use a soft brush and solvent.
2. Inspect:
 - Propeller shaft housing
Crack/Damage → Replace.

**Propeller shaft housing assembly**

1. Install:
 - Needle bearing



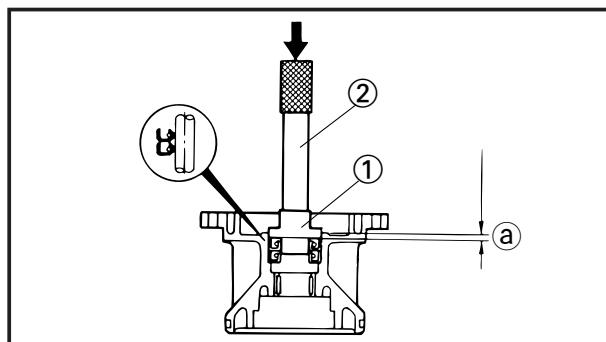
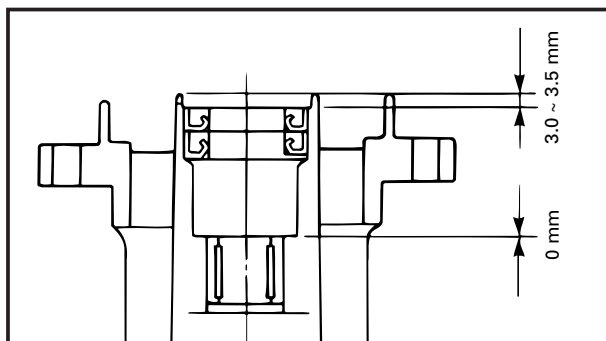
Needle bearing depth (a):
0 mm (0 in)



Driver rod (1):
YB-06071/90890-06604
Needle bearing attachment (2):
YB-06081/90890-06616

NOTE:

Install the needle bearing with its manufacturer's marks (b) facing up.



2. Install:
 - Oil seals



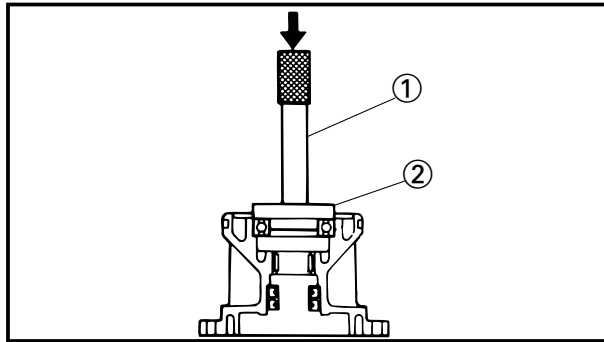
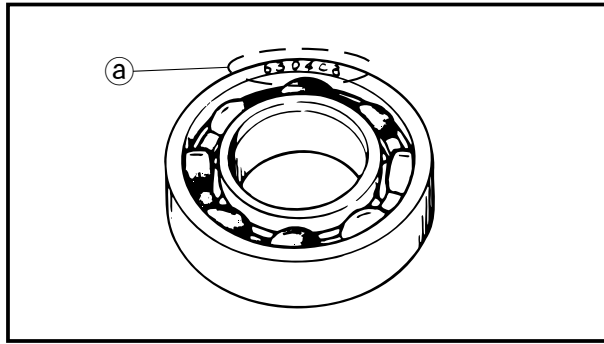
Oil seal depth (a):
3.0 ~ 3.5 mm (0.12 ~ 0.14 in)



Oil seal installer (1):
(Needle bearing attachment)
N.A./90980-06614
Driver rod (2):
YB-06071/90890-06604

NOTE:

Insert the oil seals one by one until housing stopper.



3. Install:
- Ball bearing

NOTE: _____

Install the ball bearing with its manufacturer's marks (a) facing the reverse gear.



Driver rod ①:

YB-06071/90890-06606

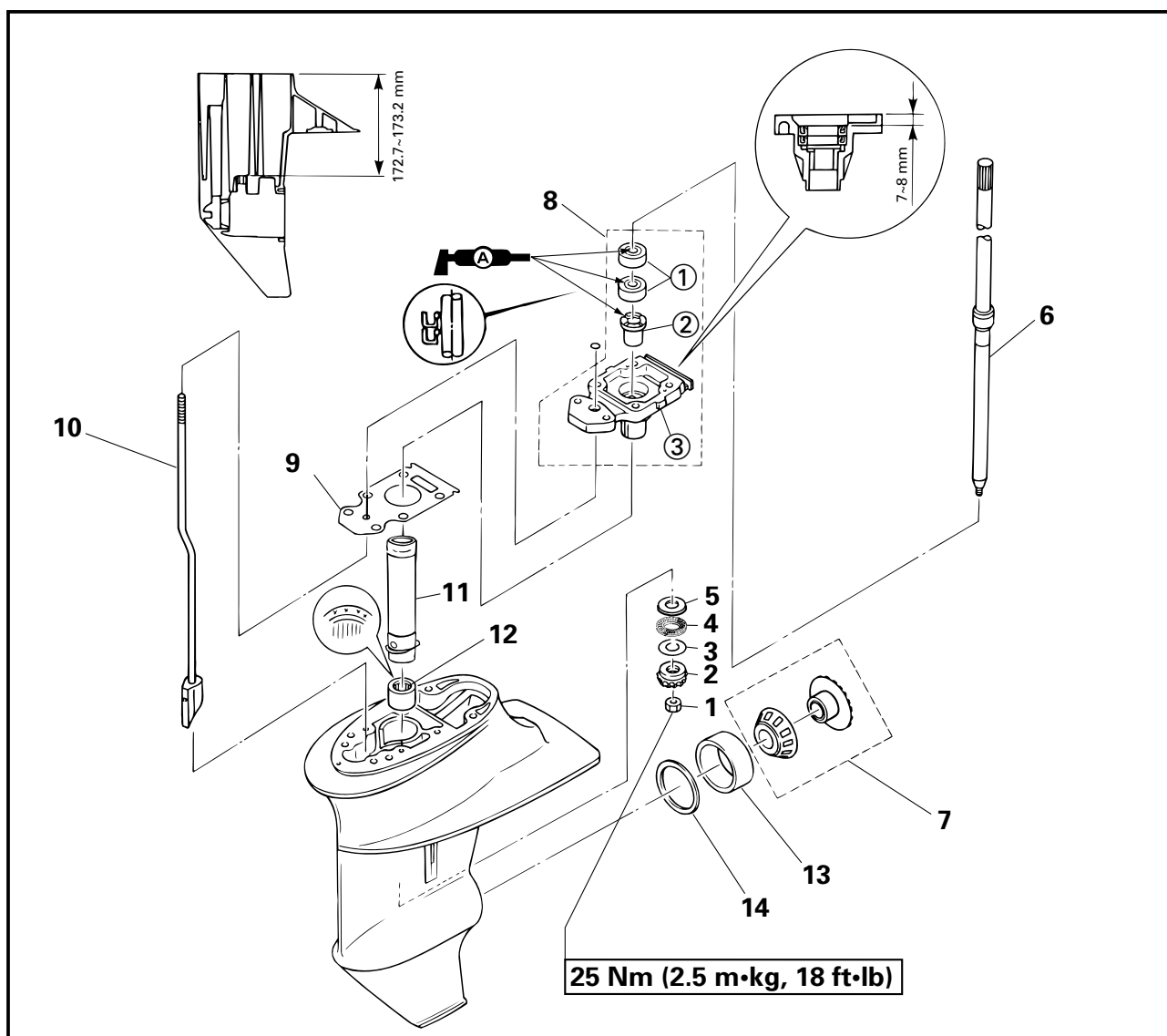
Ball bearing attachment ②:

YB-06015/90890-06632

4. Install:
- Reverse gear shim(s)
 - Reverse gear



DRIVE SHAFT, FORWARD GEAR, SHIFT ROD AND OIL SEAL HOUSING EXPLODED DIAGRAM

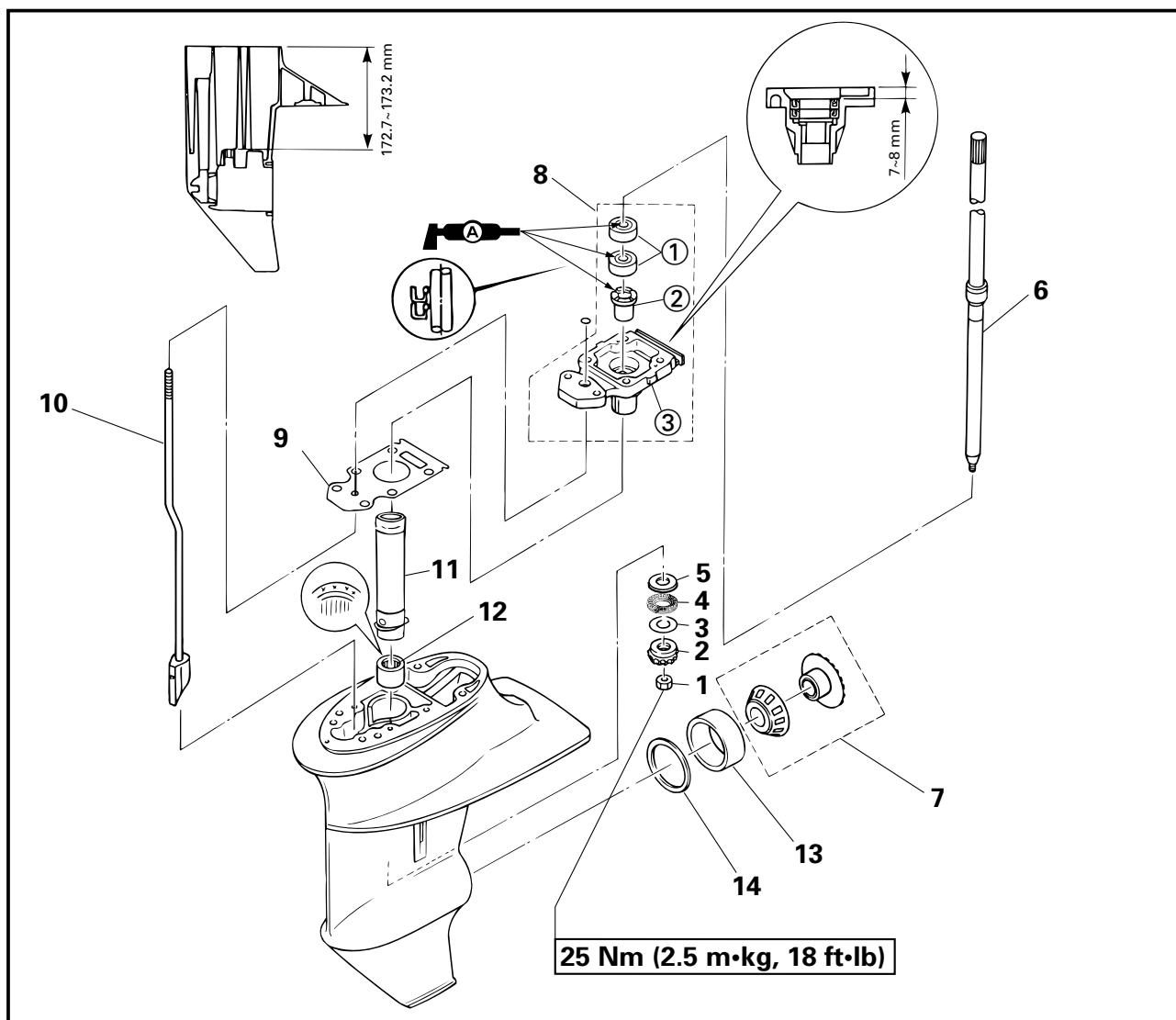


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	DRIVE SHAFT, FORWARD GEAR AND SHAFT ROD REMOVAL		Follow the left "Step" for removal.
	Propeller shaft ass'y		
	Impeller		
1	Pinion gear nut	1	
2	Pinion gear	1	
3	Pinion gear shim	1	
4	Thrust bearing	1	
5	Plate washer	1	
6	Drive shaft	1	
7	Forward gear ass'y (with the tapered roller bearing)	1	

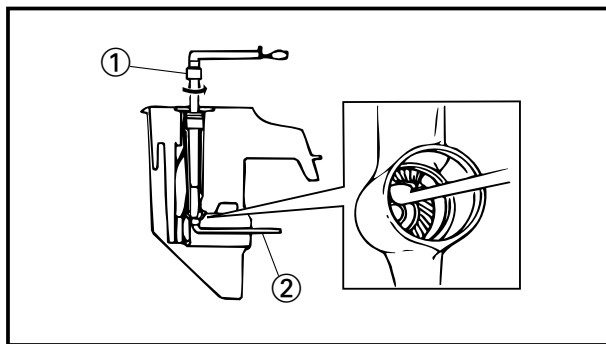


EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
8	Oil seal housing ass'y	1	Reverse the removal steps for installation.
9	Gasket (oil seal housing)	1	
10	Shift rod	1	
11	Sleeve	1	
12	Needle bearing	1	
13	Forward gear bearing outer race	1	
14	Forward gear shim	1	
OIL SEAL HOUSING DISASSEMBLY			Follow the left "Step" for disassembly.
①	Oil seal	2	Reverse the disassembly steps for assembly.
②	Busing	1	
③	Oil seal housing	1	



SERVICE POINTS

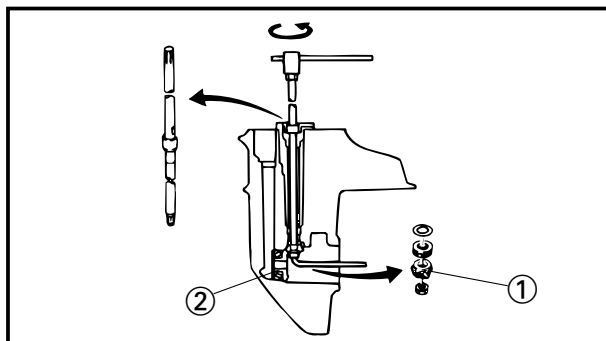
Pinion and forward gear removal

1. Remove :

- Pinion gear nut

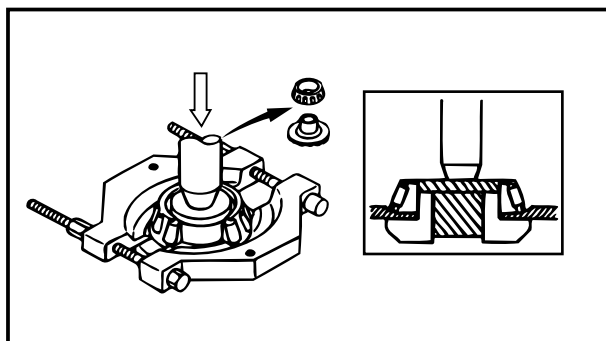


Drive shaft holder ①:
YB-06228/90890-06515
Pinion nut holder ②:
YB-06078/N.A.



2. Remove :

- Pinion gear ①
- Forward gear ②
(with the tapered roller bearing)



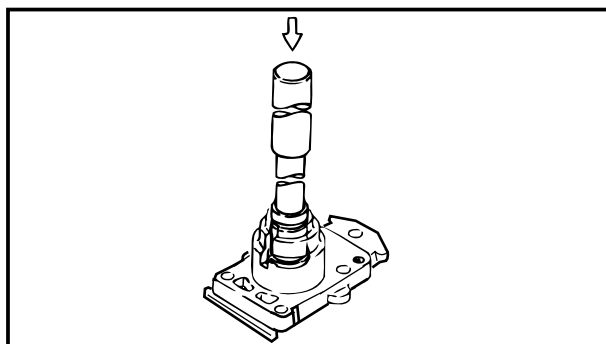
Forward gear disassembly

1. Remove:

- Tapered roller bearing
(from the forward gear ass'y)



Bearing separator:
YB-06219/90890-06534



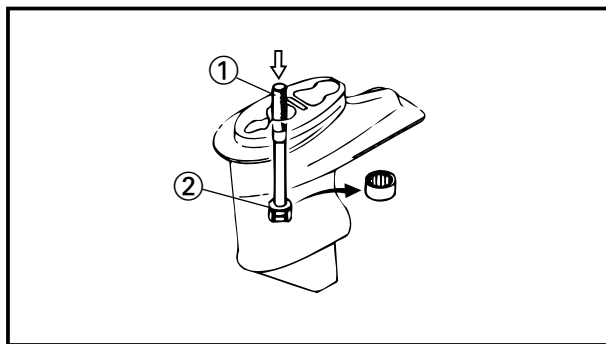
Oil seal housing disassembly

1. Remove:

- Busing



Bushing attachment:
YB-06028/90890-06649
Driver rod:
YB-06229/90890-06604



Lower case disassembly

1. Remove:

- Needle bearing

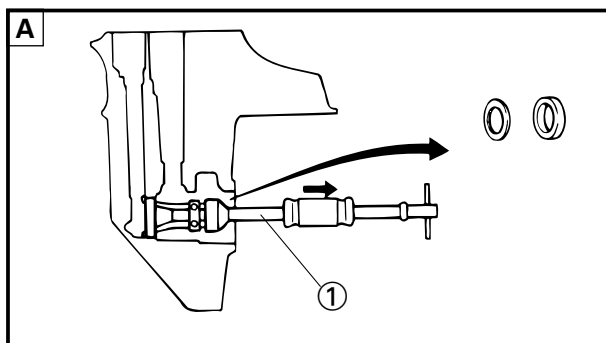


Driver rod ①:

YB-06229/90890-06602

Needle bearing attachment ②:

YB-06230/90890-06617



2. Remove:

- Forward gear bearing outer race
- Forward gear shim(s)



Slide hammer set ①:

YB-06096

Stopper guide plate ②:

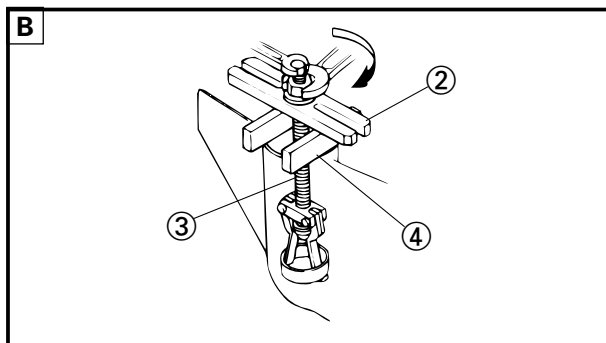
90890-06501

Bearing outer race puller ③:

90890-06535

Stopper guide stand ④:

90890-06538



A For USA and CANADA

B Except for USA and CANADA

NOTE: _____

Make sure that the bearing outer race puller sliding on the gear case center lib, attaching to the outer race and shim's bottom at horizontally.



Pinion and forward gear inspection

1. Inspect:
 - Tooth
 - Dog
 Wear/Damage → Replace.

Drive shaft inspection

1. Inspect:
 - Bearing
 Wear/Damage → Replace.

Shift cam inspection

1. Inspect:
 - Shift cam
 Wear/Damage → Replace.

Bearing inspection

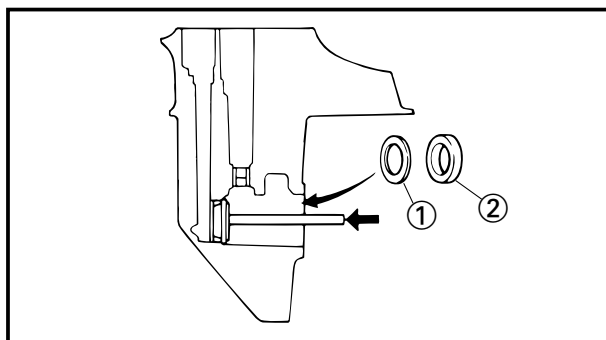
1. Inspect:
 - Bearing
 Pitting/Rumbling → Replace.

Sleeve inspection

1. Inspect:
 - Sleeve
 Wear/Damage → Replace.

Lower case inspection

1. Clean:
 - Gear case
 Use a soft brush and solvent.
2. Inspect:
 - Water passage
 Mineral deposits/Corrosion → Clean.
3. Inspect:
 - Lower case
 Crack/Damage → Replace.

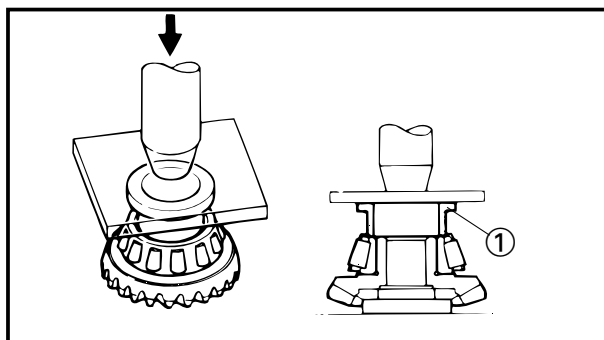
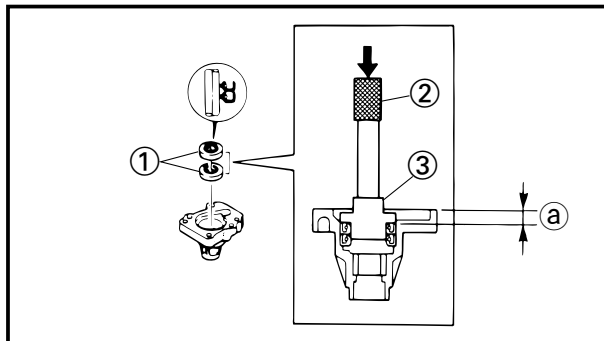
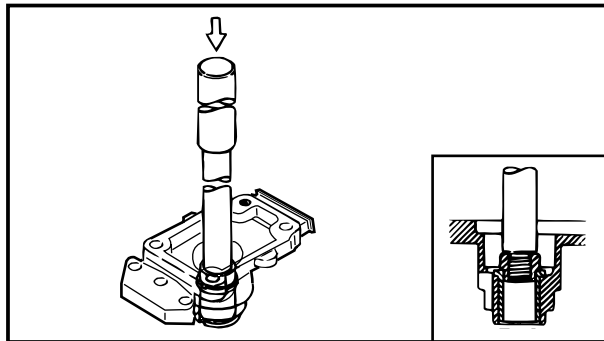
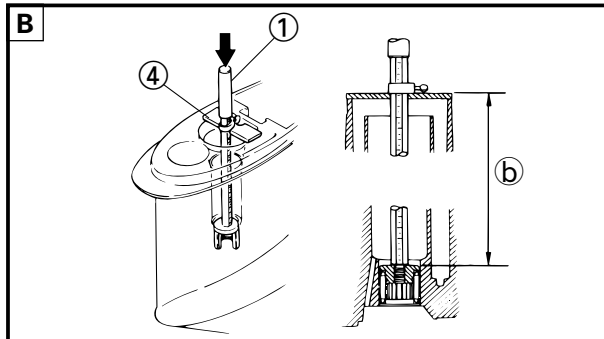
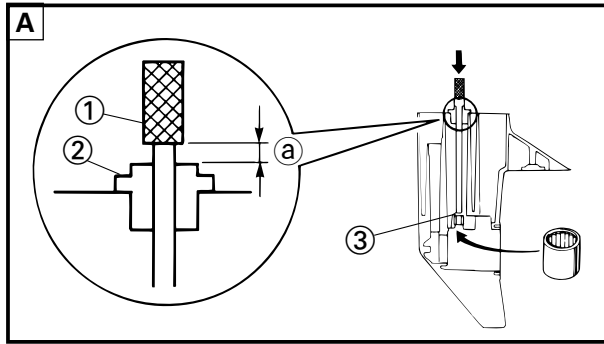


Lower case assembly

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



Bearing installer:
(Bearing outer race attachment)
 YB-06085/90890-06625
Driver rod:
 YB-06071/90890-06605



2. Install:

- Needle bearing



Needle bearing depth (a):
17.8 mm (0.70 in)

Needle bearing depth (b):
172.7~173.2 mm (6.08~6.82 in)



Driver rod (1):

YB-06229/90890-06602

Drive shaft needle bearing

depth stop (2):

YB-06231

Needle bearing attachment (3):

YB-06230/90890-06617

Bearing depth plate (4):

90890-06603

A For USA and CANADA

B Except for USA and CANADA

NOTE:

Install the drive shaft needle bearing with the manufacturer's marks facing up.

Oil seal housing assembly

1. Install:

- Busing



Bushing attachment:

YB-06028/90890-06649

Driver rod:

YB-06229/90890-06604

2. Install:

- Oil seal (1)



Depth (a):

7.0 ~ 8.0 mm (0.28 ~ 0.31 in)



Driver rod (2):

YB-06071/90890-06604

Bearing installer (3):

(Bearing inner race attachment)

YB-06022/90890-06613

Forward gear assembly

1. Install:

- Tapered roller bearing
(to the forward gear)



Bearing inner race attachment (1):

90890-06644



SHIMMING (FOR ALL AREA)

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 an inner part(s).

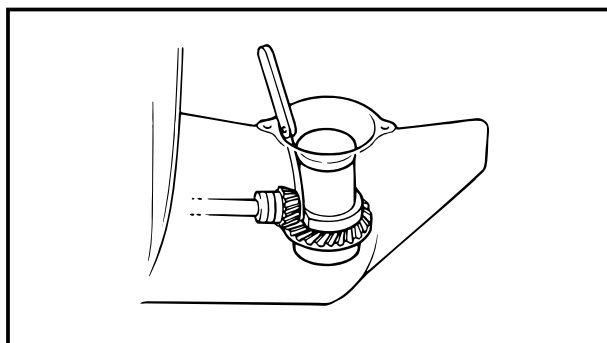
SHIM SELECTION

(FOR USA AND CANADA)

Pinion gear shim

1. Measure:

- Pinion gear clearance
Out of specification → Adjust.



Specified clearance:

1.15 mm ~ 1.25 mm

Measurement steps:

- Install the drive shaft components and tighten the pinion nut.



Pinion nut:

25 Nm (2.5 m•kg, 18 ft•lb)

- Attach the shimming tool into the gear case.



Pinion height gauge:

YB-34232

- Measure the clearance and determine the shim thickness.

Less than
1.15 mm

To be decreased by
(1.20 - measurement)

More than
1.25 mm

To be increased by
(measurement - 1.20)

**Example:**

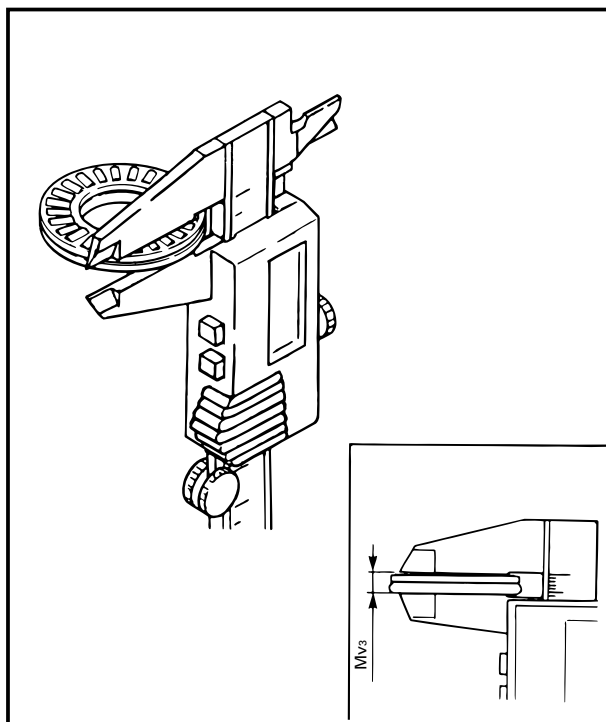
If measurement = 1.02 mm
 decrease shim thickness by
 $= 1.20 - 1.02$
 $= 0.18$ mm
 If measurement = 1.32 mm
 increase shim thickness by
 $= 1.32 - 1.20$
 $= 0.12$ mm



Available shim thickness:
1.13 and 1.20 mm

NOTE: _____

Find forward and reverse gear shim thickness by backlash measurement.

**SHIM SELECTION (EXCEPT FOR USA AND CANADA)****Pinion gear shim**

1. Measure:

- Measurement (Mv3)



Digital caliper:
90890-06704

NOTE: _____

Measure the thickness (Mv3) of bearing and washer.

2. Calculate:

- Pinion gear shim thickness (T3)



Pinion gear shim thickness:
(T3) = 6.05 - Mv3 mm

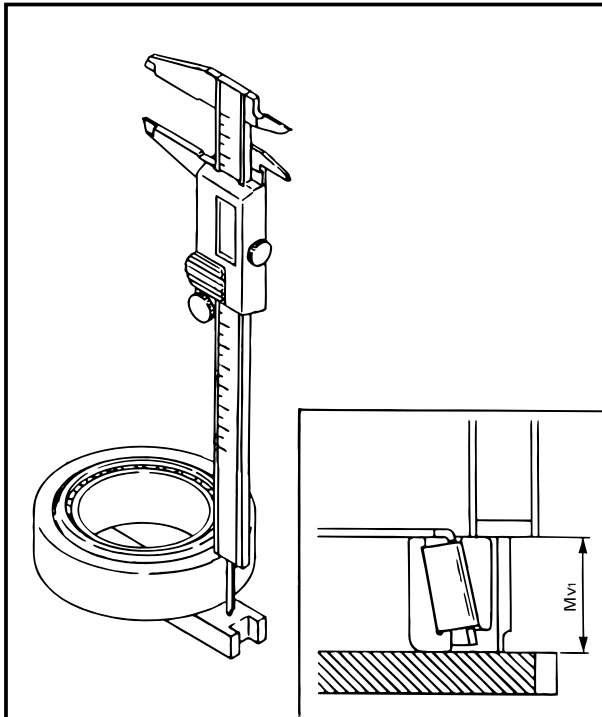
3. Select:

- Pinion gear shim

Calculated numeral		Using shim
more than	or less	
1.13	1.20	1.13
1.20	1.30	1.20



Available shim thickness:
1.13 and 1.20 mm

**Forward gear shim****NOTE:**

Find forward gear shim thickness (T1) by selecting shims until the specified measurement (Mv1) is obtained with the special tool.

1. Measure:

- Measurement (Mv1)

**Shimming plate:****90890-06701****Digital caliper:****90890-06704****NOTE:**

Measure the length between the shimming plate and the bearing outer race after turning the outer race 2 to 3 times.

2. Calculate:

- Forward gear shim thickness (T1)

**Forward gear shim thickness:**

$$(T1) = 16.60 - Mv1$$

3. Select:

- Forward gear shim

Calculated numeral at 1/100 th place	Proper numeral
0 ~ 2	0
3 ~ 5	2
6 ~ 8	5
9	8

**Available shim thickness:**

0.10, 0.12, 0.15, 0.18, 0.30,
0.40 and 0.50 mm

Example:

If T1 is "0.41 mm" → refer to "0 ~ 2",
then using gear shim = 0.40 mm

If T1 is "0.43 mm" → refer to "3 ~ 5",
then using gear shim = 0.42 mm

If T1 is "0.48 mm" → refer to "6 ~ 8",
then using gear shim = 0.45 mm

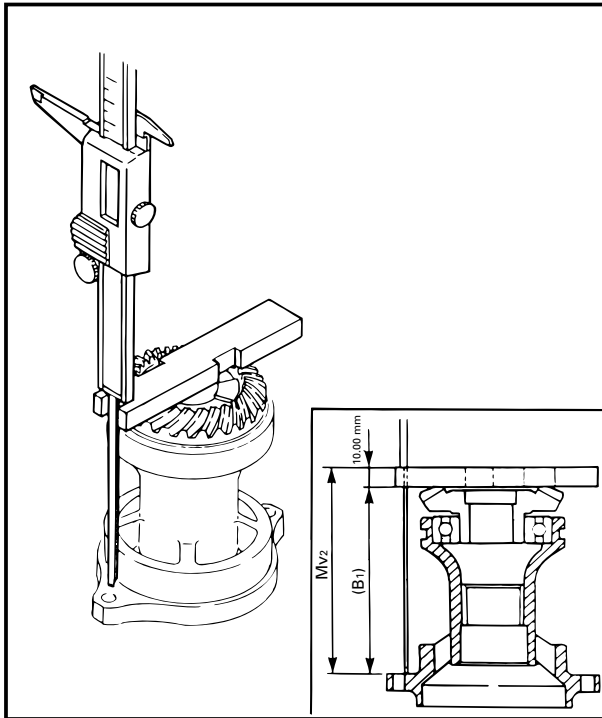
If T1 is "0.49 mm" → refer to "9",
then using gear shim = 0.48 mm



Reverse gear shim

NOTE:

Find reverse gear shim thickness (T2) by selecting shims until the specified measurement (Mv2) is obtained with the special tool.



1. Measure:

- Measurement (Mv2)



Shimming plate:

90890-06701

Digital caliper:

90890-06704

NOTE:

Remove the shim(s) before measurement.

2. Calculate:

- Reverse gear shim thickness (T2)



Reverse gear shim thickness:

(T2) = 80.57 - Mv2

3. Select:

- Reverse gear shim

Calculated numeral at 1/100 th place	Proper numeral
31 ~ 40	30
41 ~ 50	40
51 ~ 60	50
61 ~ 70	60



Available shim thickness:

**0.10, 0.20, 0.30,
0.40 and 0.50 mm**

Example:

If T2 is "0.31 mm" → refer to "31 ~ 40",
then using gear shim = 0.30 mm

If T2 is "0.43 mm" → refer to "41 ~ 50",
then using gear shim = 0.40 mm

If T2 is "0.55 mm" → refer to "51 ~ 60",
then using gear shim = 0.50 mm

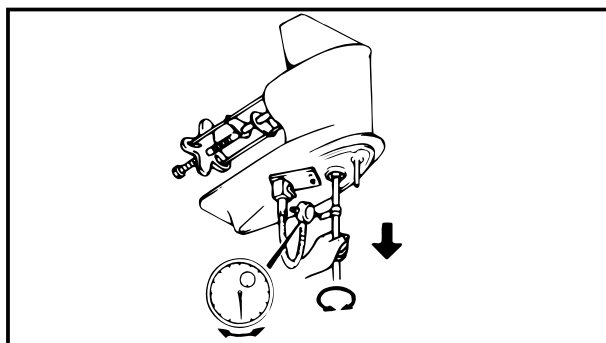
If T2 is "0.67 mm" → refer to "61 ~ 70",
then using gear shim = 0.60 mm



BACKLASH MEASUREMENT

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.
- If either of these conditions exist, then check the pinion gear shim(s) selection.



Forward gear

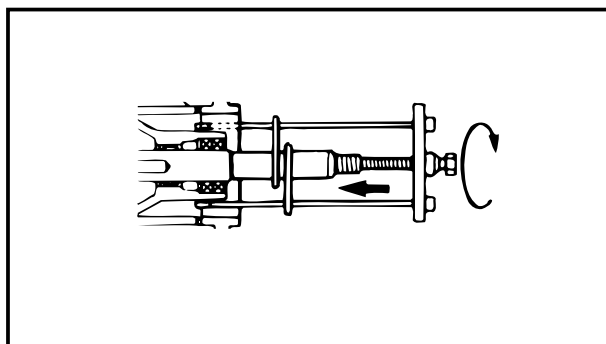
1. Measure:

- Forward gear backlash
- Out of specification → Adjust.



Forward gear backlash:

0.19 ~ 0.86 mm (0.007 ~ 0.034 in)



Measurement steps:

- Position the bearing housing puller so that it pushes against the propeller shaft.



Bearing housing puller claw:

YB-06234/90890-06503

Universal puller:

YB-06117

Stopper guide plate:

90890-06501

Center bolt:

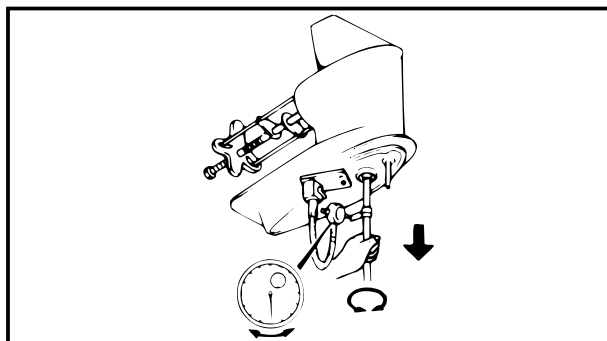
90890-06504

- Set the lower unit upside down.



Center bolt:

5 Nm (0.5 m•kg, 3.6 ft•lb)



- Attach the backlash indicator on the drive shaft (12.8 mm in diameter).



Backlash indicator:
YB-06265/90890-06706

- Attach the dial gauge onto the lower unit and have the dial gauge plunger contact the mark on the backlash indicator.



Base plate:
YB-07003
Dial gauge set:
YU-03097/90890-01252
Magneto base:
YU-34481/90890-06705

- 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).

NOTE: _____

Adjust the shim(s) to be added or removed according to specification.

 Forward gear backlash	Shim thickness
Less than 0.19 mm (0.007 in)	To be decreased by <u>(0.53 - measurement)</u> 2.3
More than 0.86 mm (0.034 in)	To be decreased by <u>(Measurement - 0.53)</u> 2.3
Available shim thickness: 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm	

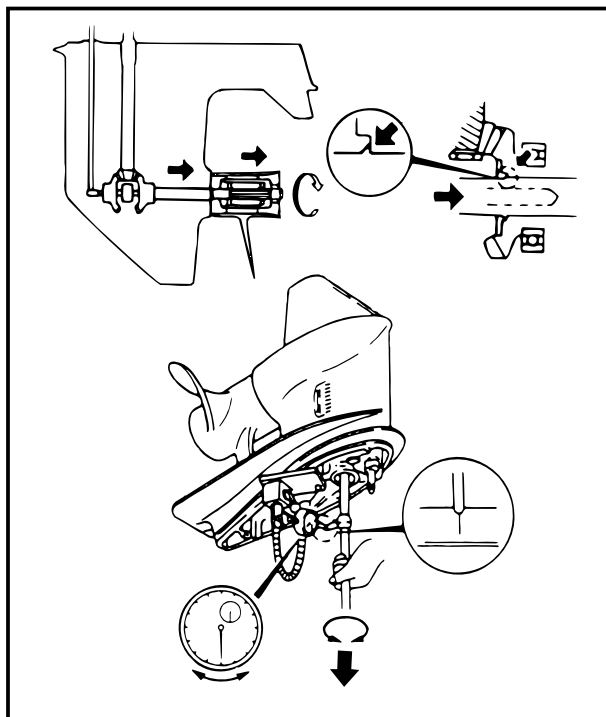
Reverse gear

1. Measure:

- Reverse gear backlash
Out of specification → Adjust.



Reverse gear backlash:
0.95 ~ 1.65 mm (0.037 ~ 0.064 in)

**Measurement steps:**

- Load the reverse gear by installing the propeller without the front side collar and tighten it.

**Propeller nut:**

5 Nm (0.5 m•kg, 3.6 ft•lb)

- Attach the backlash indicator on the drive shaft (12.8 mm in diameter).

**Backlash indicator:**

YB-06265/90890-06706

- Attach the dial gauge onto the lower unit and have the dial gauge plunger contact the mark on the backlash indicator.

**Base plate:**

YB-07003

Dial gauge set:

YU-03097/90890-01252

Magneto base:

YU-34481/90890-06705

- Slowly turn the drive shaft clockwise and counterclockwise, and when the drive shaft stops in each direction, measure the backlash.

2. Adjust:

Reverse gear backlash

Remove or add shim(s).

NOTE: _____

Adjust the shim(s) to be added or removed according to specification.

	Reverse gear backlash	Shim thickness
	Less than 0.95 mm (0.037 in)	To be decreased by (1.30 - measurement) 2.3
	More than 1.65 mm (0.064 in)	To be decreased by (Measurement - 1.30) 2.3
Available shim thickness: 0.10, 0.20 0.18, 0.30, 0.40 and 0.50 mm		



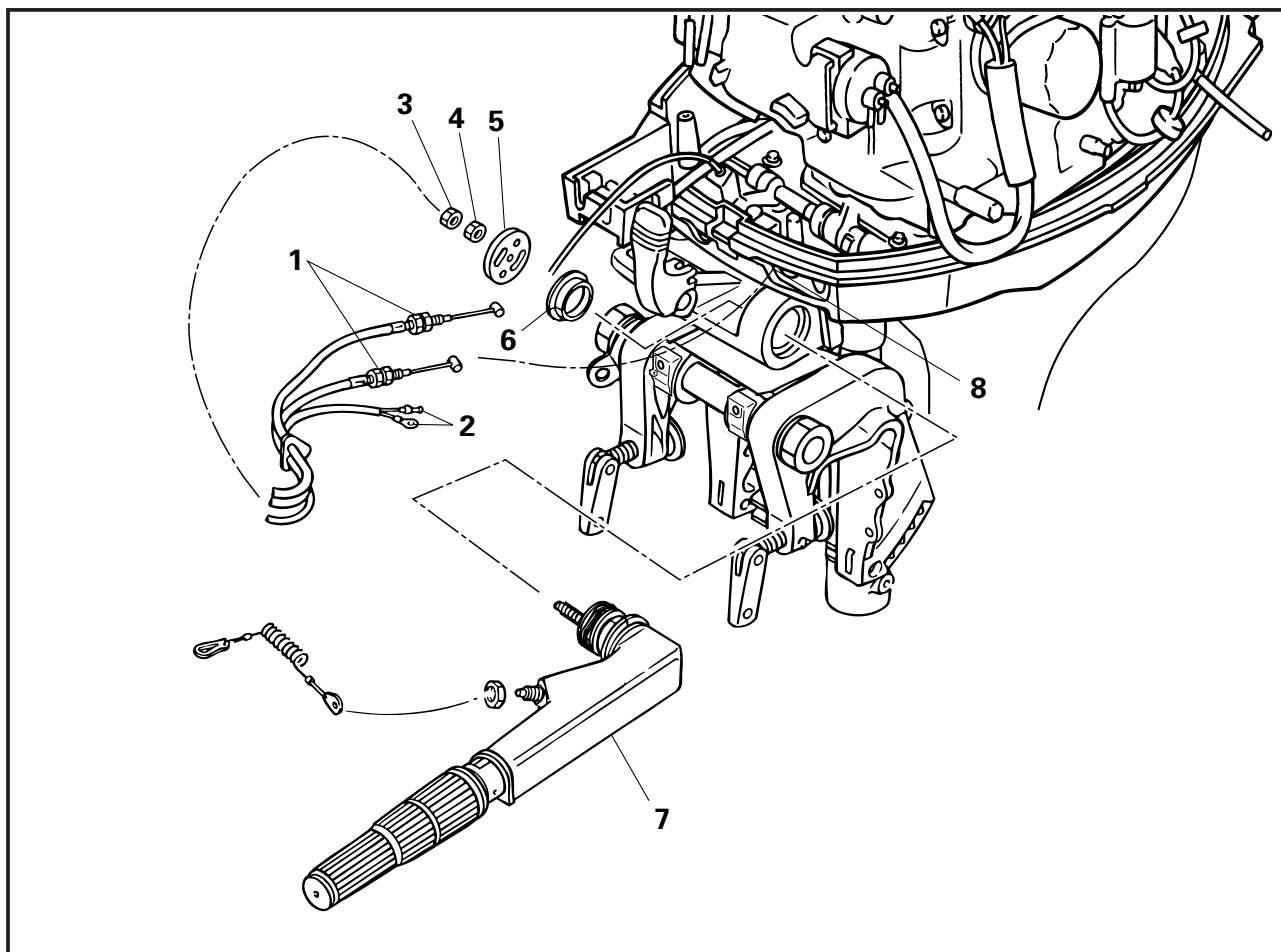
CHAPTER 7

BRACKET UNIT

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STEERING HANDLE EXPLODED DIAGRAM

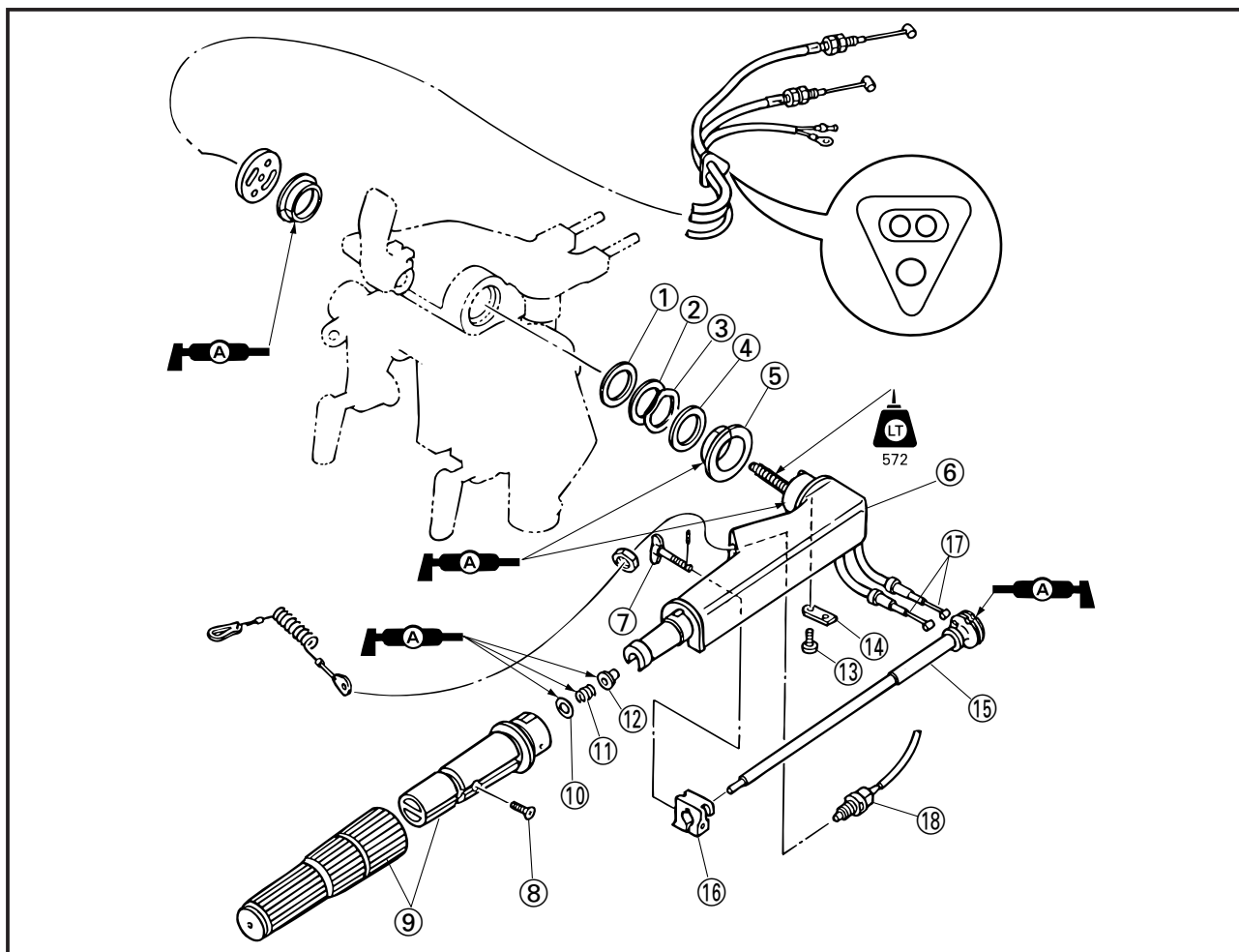


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
1	STEERING HANDLE REMOVAL Flywheel magneto cover (AEH, AE) Manual starter (AMH) Throttle cable	2	Follow the left "Step" for removal. NOTE: _____ When adjusting the throttle cables, make sure that the throttle control cam stopped touches the bracket stopper (throttle fully-opened) and then tighten the locknuts.
2	Engine stop switch lead	1	
3	Locknut	1	
4	Nut	1	
5	Plate	1	
6	Bushing	1	
7	Steering handle ass'y (AMH,AEH)	1	
8	Grommet	1	
			Reverse the removal steps for installation.



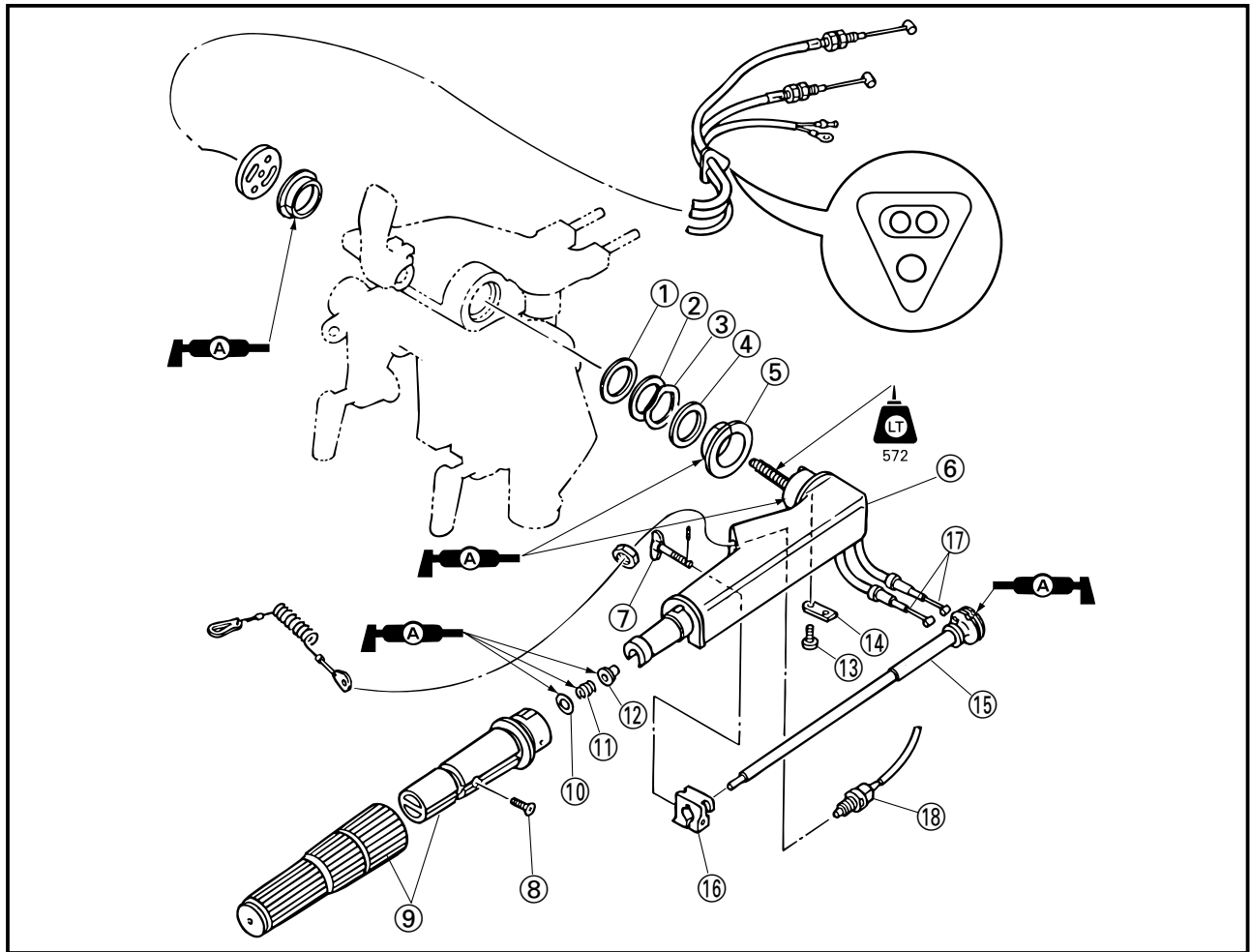
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	STEERING HANDLE DISASSEMBLY		Follow the left "Step" for disassembly.
	Steering handle ass'y		
①	Plastic washer	1	
②	Metal washer	1	
③	Wave washer	1	
④	Metal washer	2	
⑤	Busing	1	
⑥	Steering handle bracket	1	
⑦	Friction adjusting screw	1	
⑧	Screw	1	
⑨	Steering grip	1	
⑩	Washer	1	
⑪	Spring	1	

EXPLODED DIAGRAM

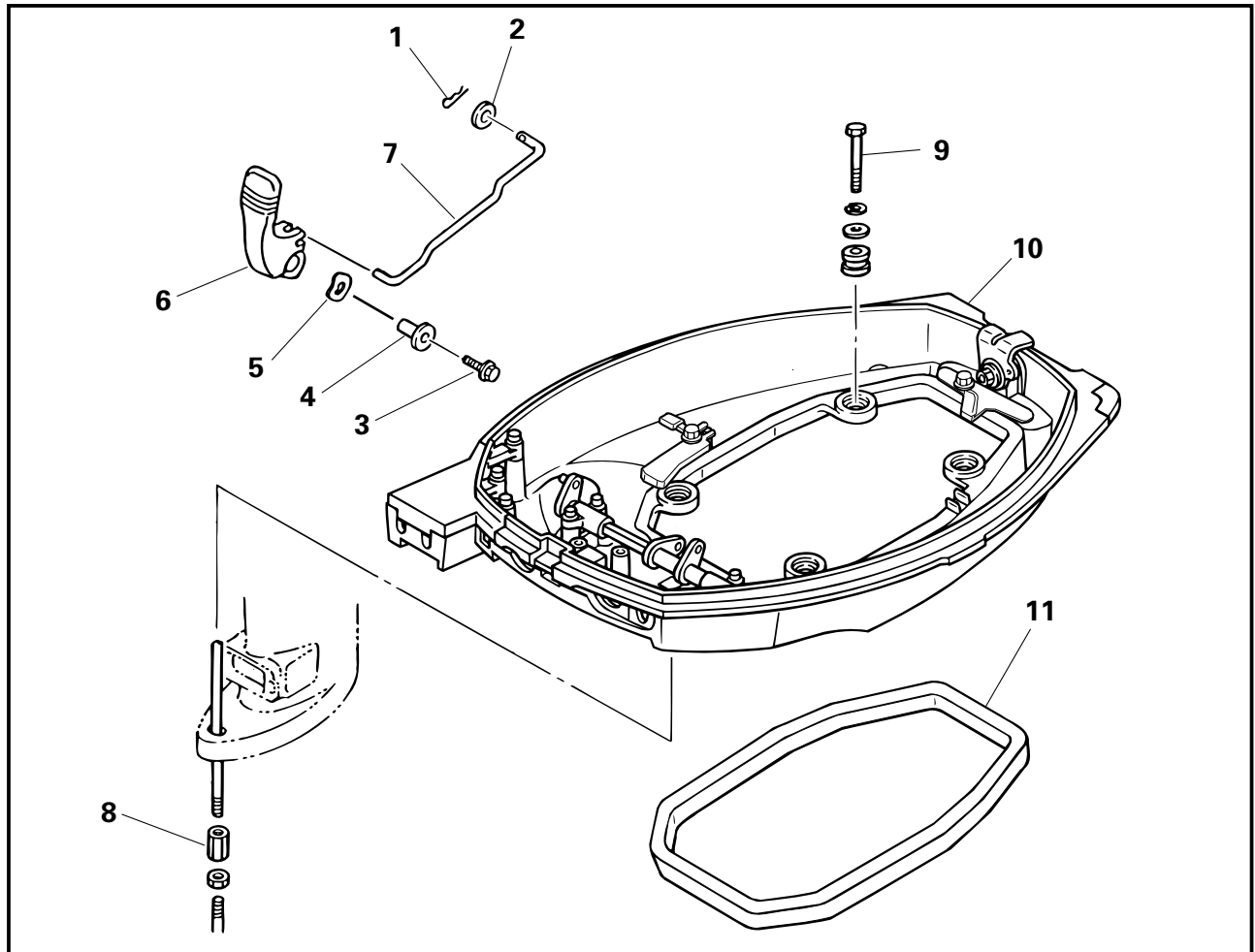


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
⑫	Bushing	1	Self tapping bolt: M6
⑬	Bolt	2	
⑭	Plate	1	
⑮	Throttle shaft	1	
⑯	Friction piece	1	
⑰	Throttle cable	2	
⑱	Engine stop switch	1	
			Reverse the disassembly steps for assembly.



BOTTOM COWLING EXPLODED DIAGRAM

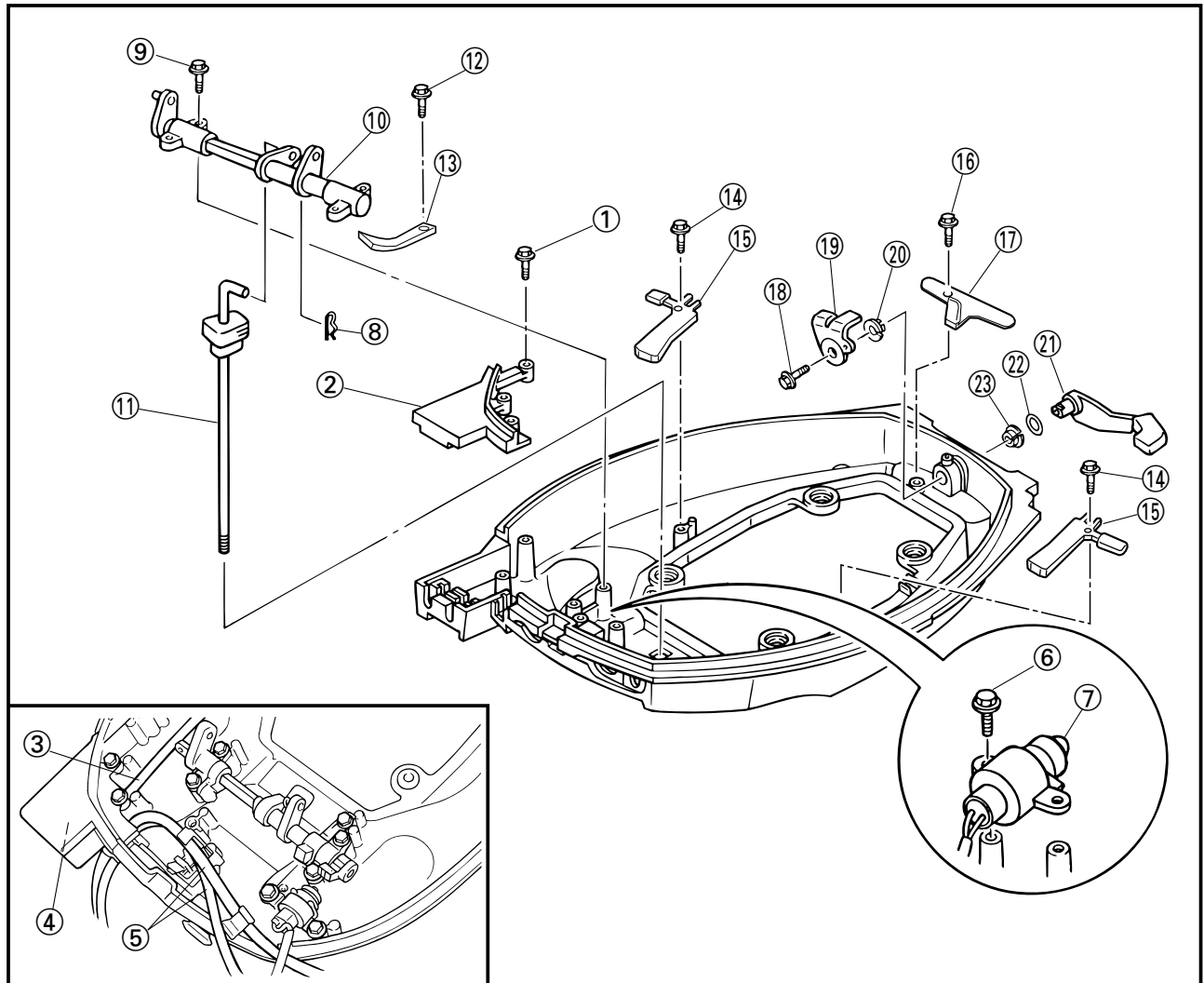


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	BOTTOM COWLING REMOVAL		
1	Clip	1	Follow the left "Step" for removal.
2	Washer	1	
3	Bolt	1	
4	Collar	1	
5	Wave washer	1	
6	Shift lever	1	
7	Shift link rod	1	
8	Shift rod nut	1	
9	Bolt	4	M6 x 30 mm
10	Bottom cowling ass'y	1	
11	Rubber seal	1	Reverse the removal steps for installation.



EXPLODED DIAGRAM

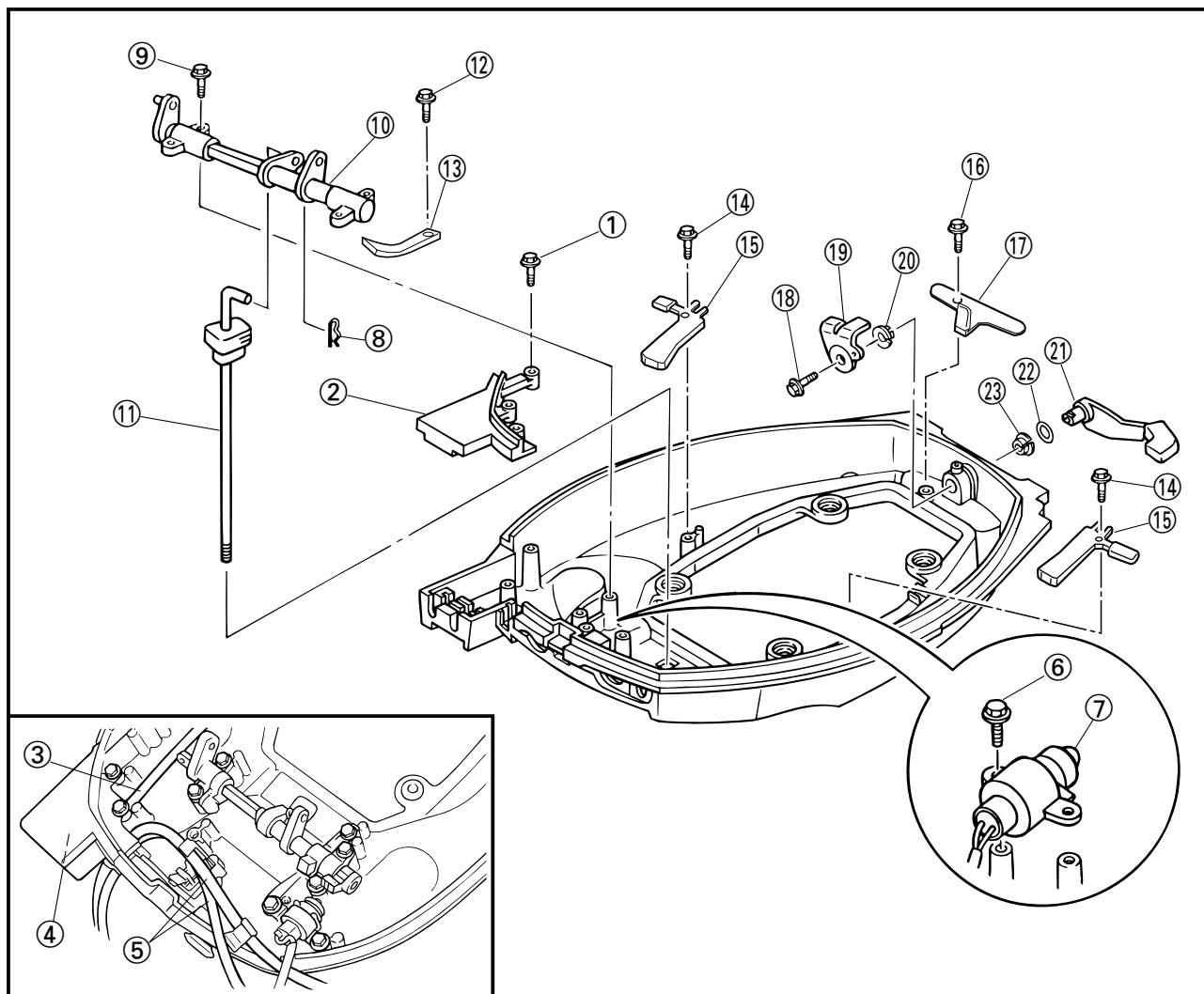


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	BOTTOM COWLING DISASSEMBLY		
①	Bolt	3	Follow the left "Step" for disassembly. M6 x 30 mm
②	Fitting plate	1	
③	Fuel hose	2	
④	Fuel joint	1	
⑤	Battery cable (AEH, AE)	1	M6 x 20 mm
⑥	Bolt	2	
⑦	Neutral switch ass'y (AEH)	1	M6 x 25 mm
⑧	Clip	1	
⑨	Bolt	4	
⑩	Shift rod lever	1	
⑪	Shift rod ass'y	1	M6 x 20 mm
⑫	Bolt	1	
⑬	Spring	1	



EXPLODE DIAGRAM

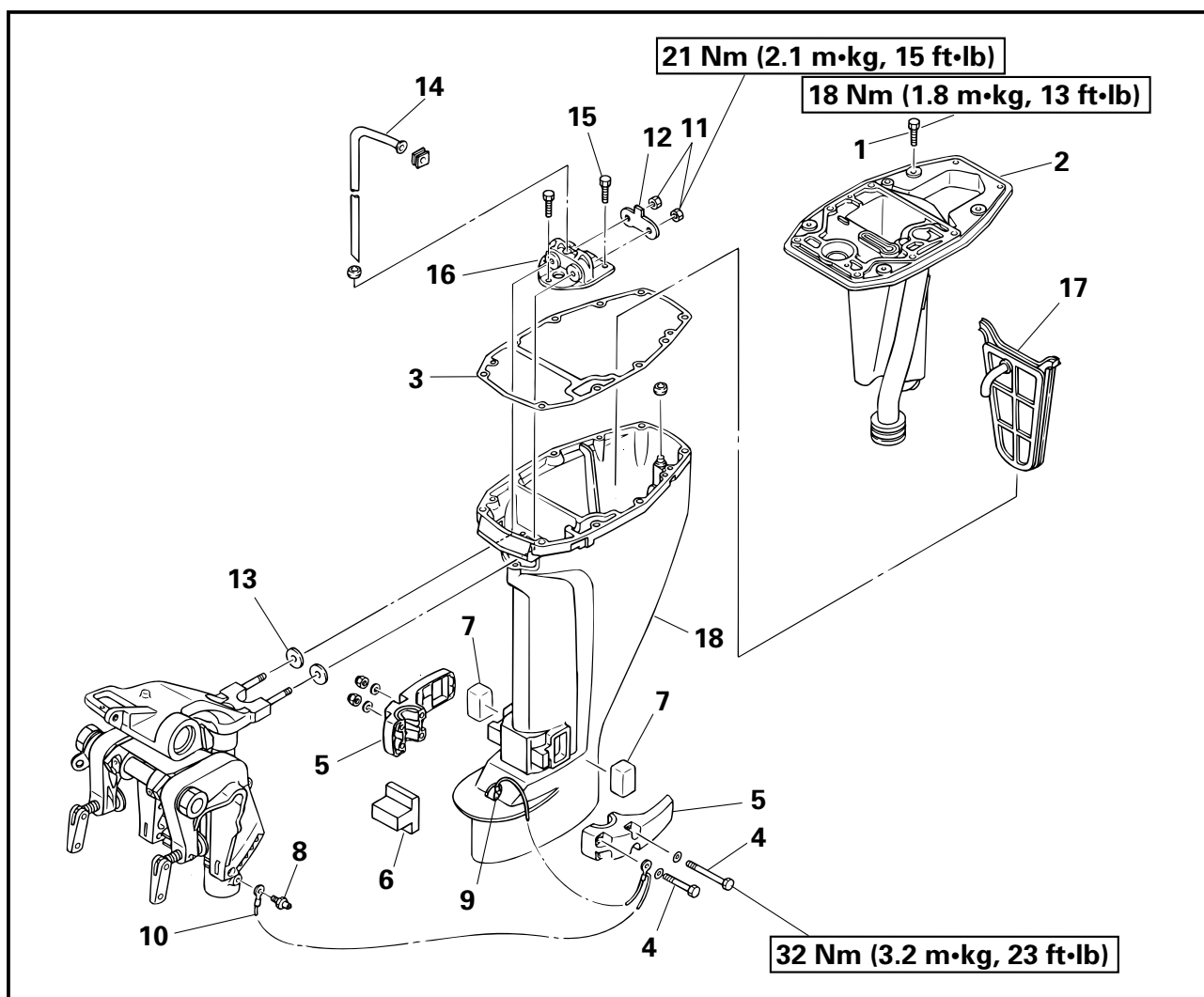


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
⑭	Bolt	2	M6 x 12 mm
⑮	Bracket1	2	
⑯	Bolt	1	
⑰	Bracket2	1	
⑱	Bolt	1	
⑲	Plate	1	
⑳	Collar	1	
㉑	Cowling lock lever ass'y	1	
㉒	Washer	1	
㉓	Collar	1	
Reverse the disassembly steps for assembly.			



UPPER CASE ASS'Y EXPLODED DIAGRAM

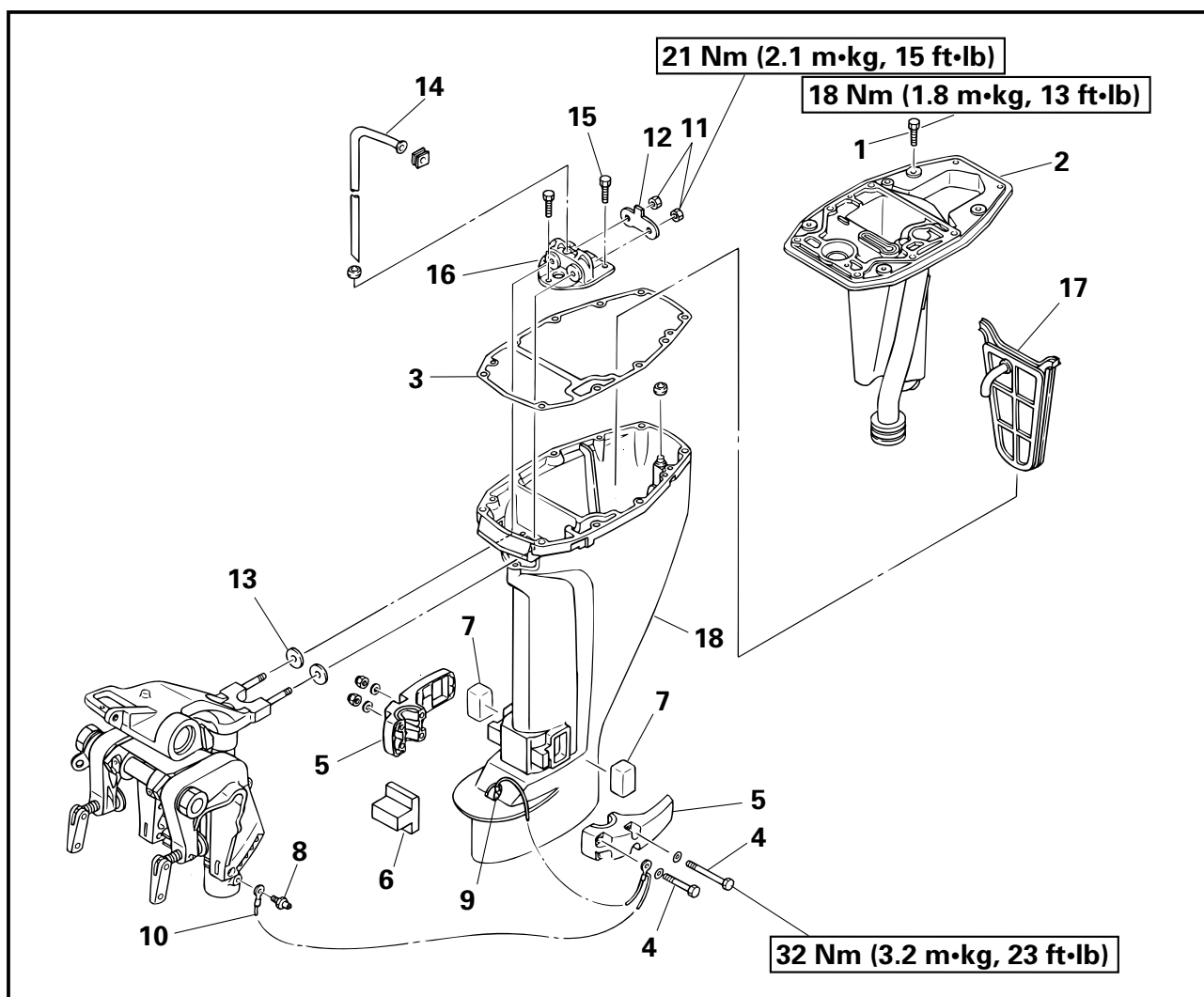


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	UPPER CASE ASS'Y REMOVAL		
1	Bolt (oil pan)	2	Follow the left "Step" for removal. F: M10 x 70 mm/R: M10 x 100 mm
2	Oil pan ass'y	1	
3	Gasket (upper case)	1	
4	Bolt (rubber housing)	4	
5	Lower mount rubber housing	2	
6	Lower rubber damper (front)	1	
7	Lower rubber damper (side)	2	
8	Grease nipple	1	
9	Screw	1	
10	Ground lead	1	
11	Nut	2	NOTE: _____ Remove the lead at different points.
12	Plate	1	



EXPLODED DIAGRAM

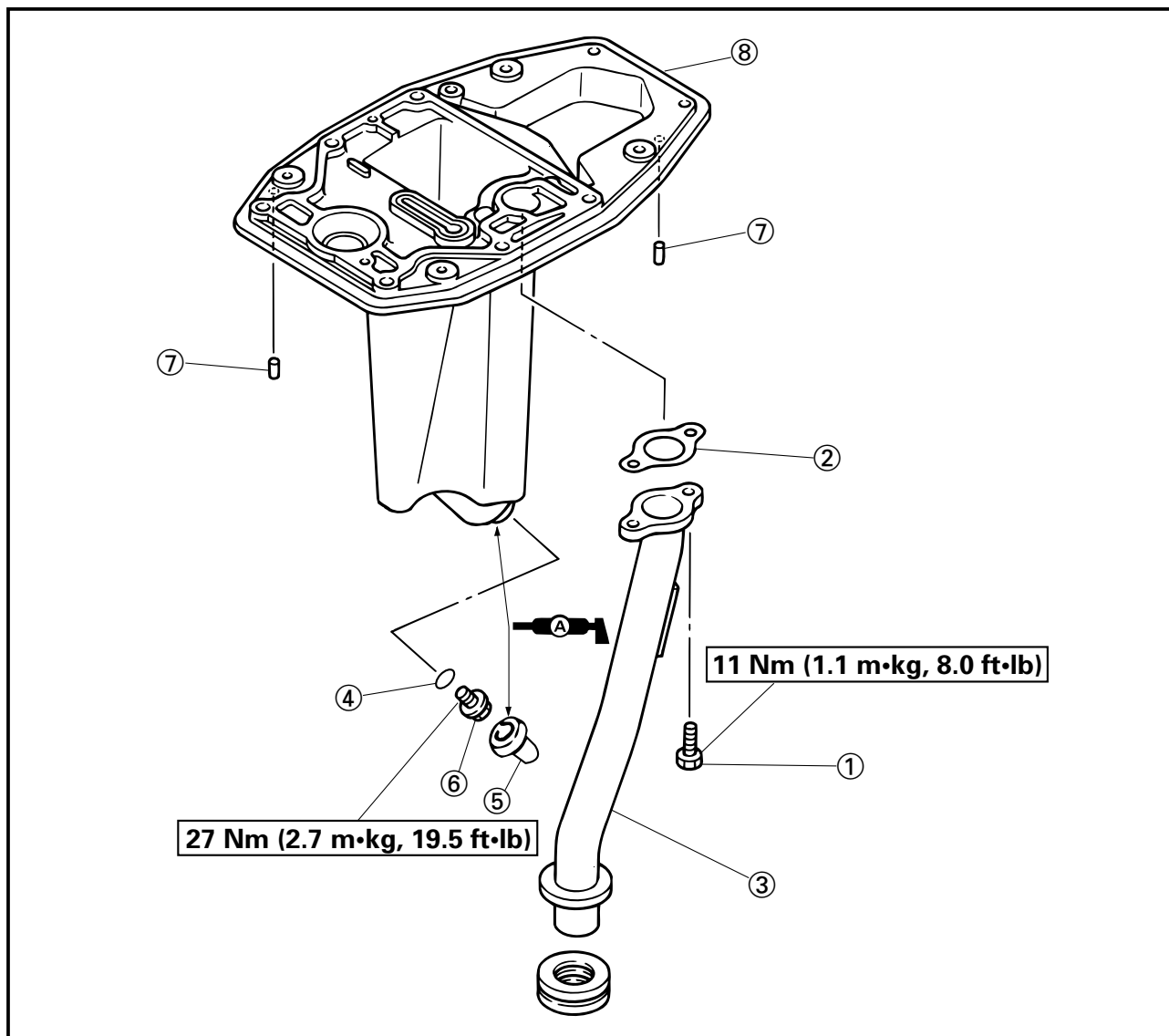


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
13	Washer	2	Reverse the disassembly steps for installation.
14	Water tube	1	
15	Bolt	3	
16	Upper damper	1	
17	Baffle plate	1	
18	Upper case ass'y	1	



OIL PAN EXPLODED DIAGRAM

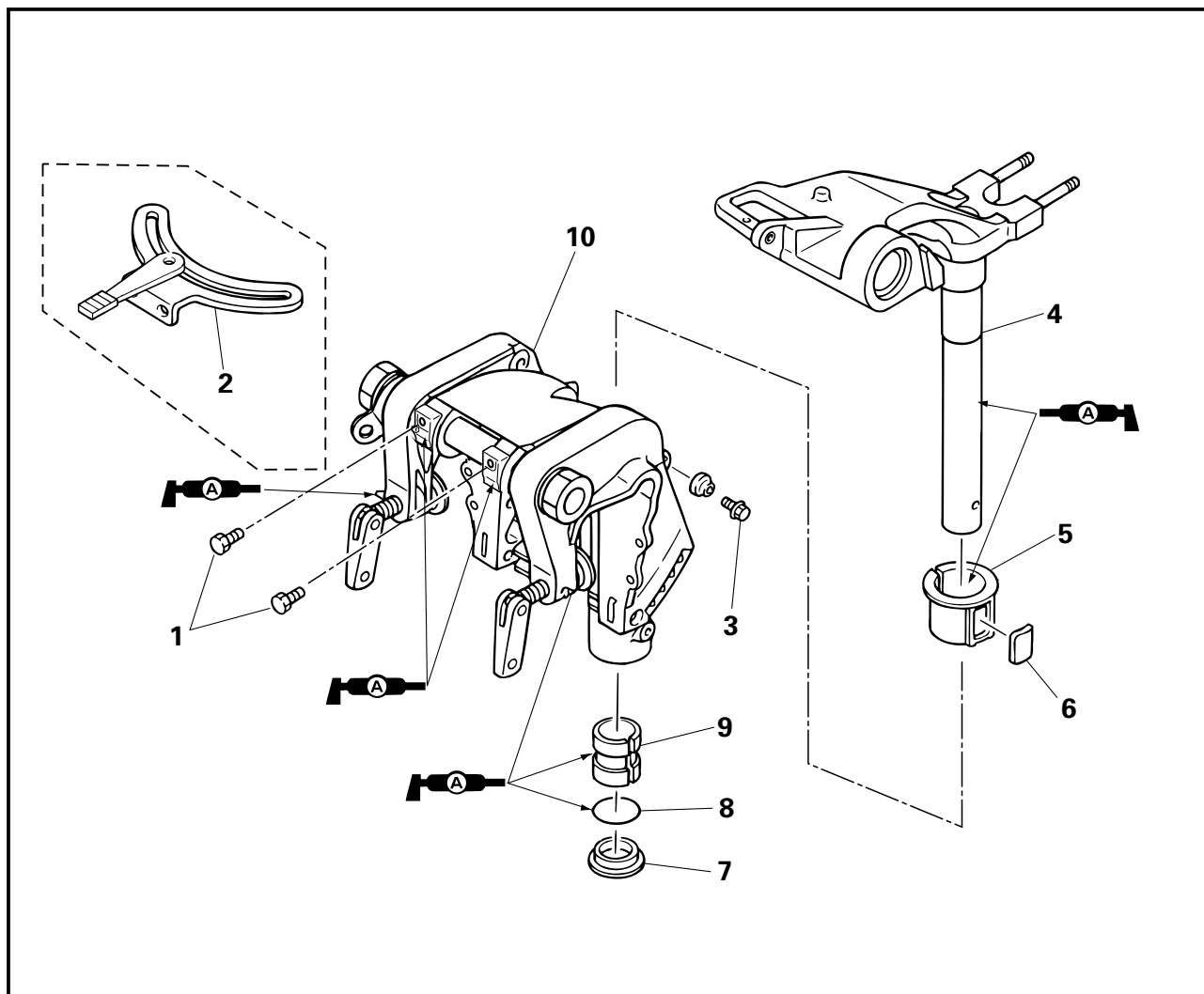


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	OIL PAN DISASSEMBLY		Follow the left "Step" for disassembly.
①	Bolt	2	
②	Gasket	1	
③	Exhaust pipe	1	
④	Gasket (drain bolt)	1	
⑤	Drain bolt cap	1	
⑥	Drain bolt	1	
⑦	Dowel pins	2	
⑧	Oil pan	1	
			Reverse the disassembly steps for assembly.

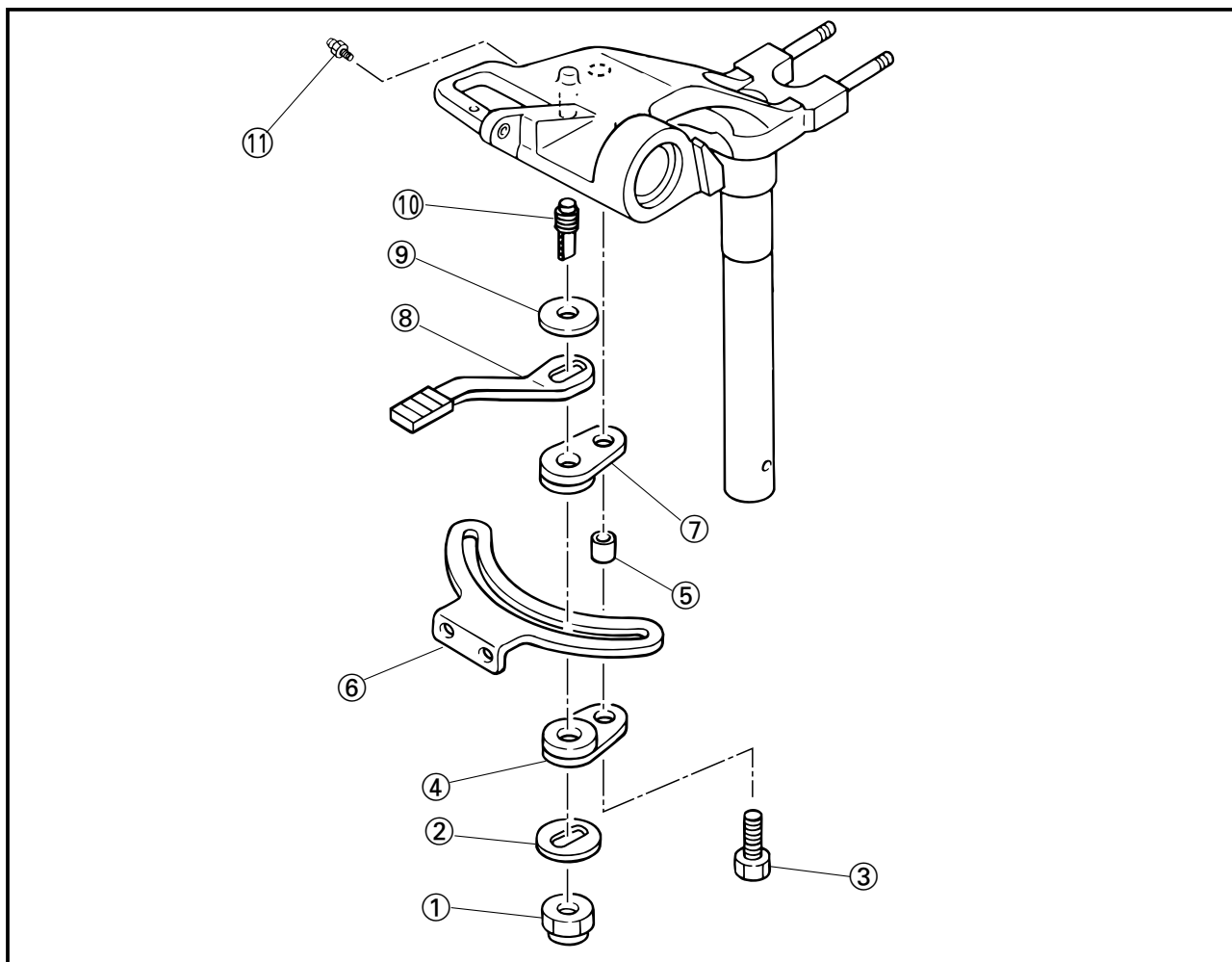


SWIVEL AND STEERING BRACKET EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	SWIVEL AND STEERING BRACKET REMOVAL		Follow the left "Step" for removal.
1	Bolt (AEH)	2	
2	Steering friction ass'y (AMH, AEH)	1	NOTE: _____
3	Friction bolt	1	Loosen the friction bolt.
4	Steering bracket	1	
5	Bushing	1	
6	Key	1	
7	Bushing	1	
8	O-ring	1	
9	Bushing	1	
10	Swivel bracket ass'y	1	
			Reverse the removal steps for installation.

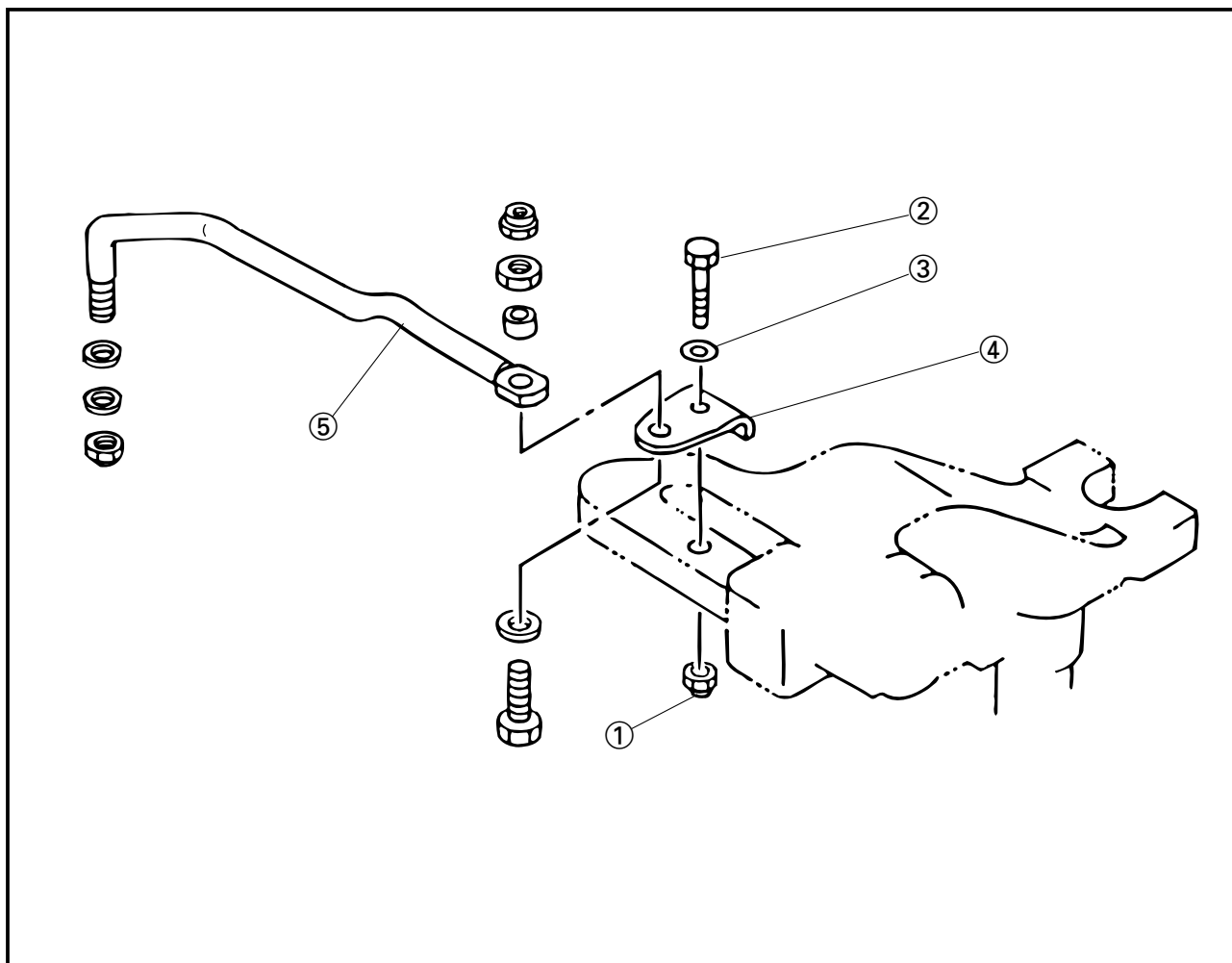

FRICTION LEVER (AEH, AMH for USA and CANADA)
EXPLODED DIAGRAM

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	STEERING FRICTION DISASSEMBLY (AEH, AMH for USA and CANADA)		Follow the left "Step" for disassembly.
①	Lock nut	1	
②	Plate washer	1	
③	Bolt	1	
④	Friction piece	1	
⑤	Collar	1	
⑥	Friction plate	1	
⑦	Friction piece	1	
⑧	Friction lever	1	
⑨	Washer	1	
⑩	Steering lock shaft	1	
⑪	Grease nipple	1	
			Reverse the disassembly steps for assembly.



STEERING RIDE GUIDE (AE for Europe)

EXPLODED DIAGRAM

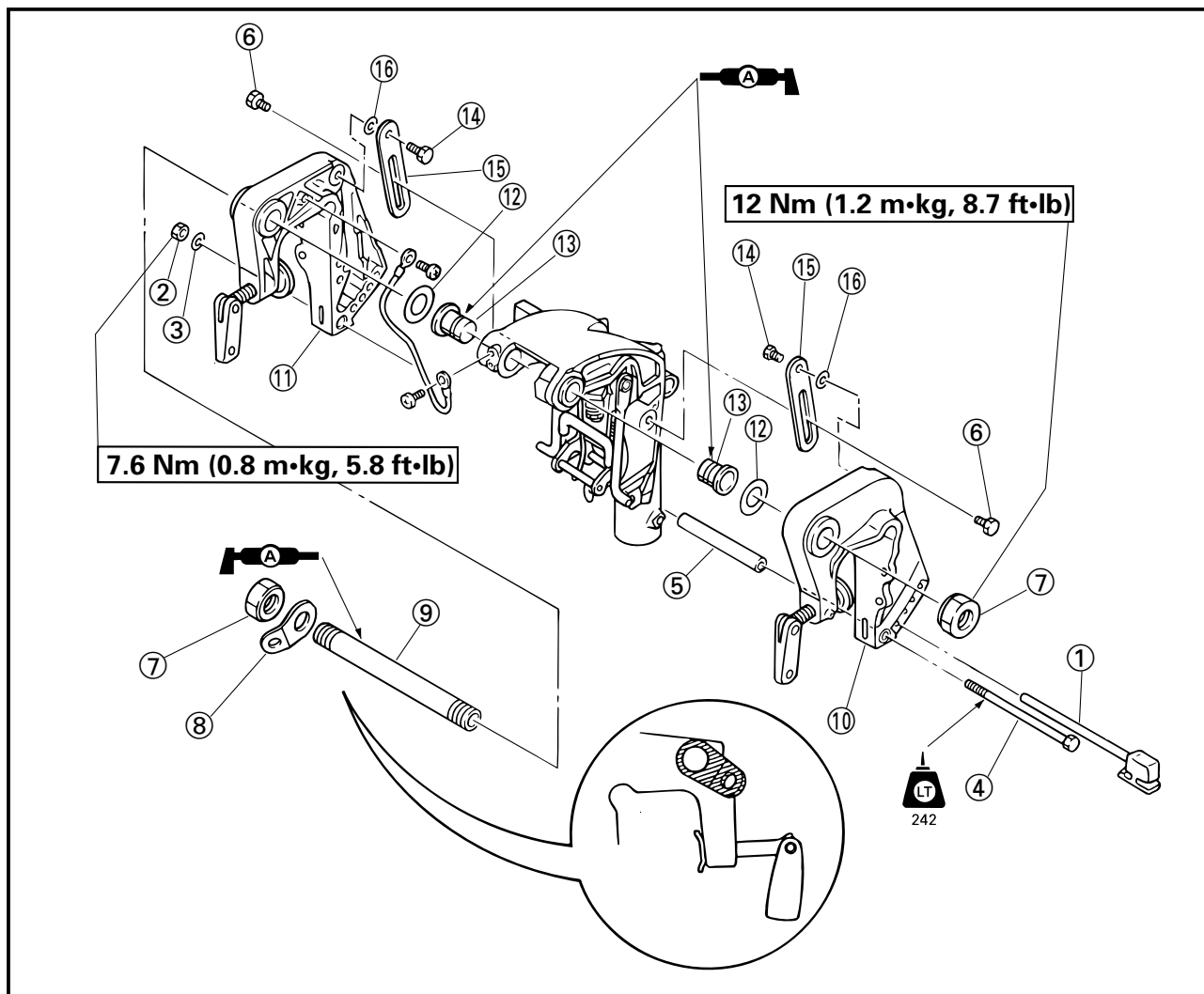


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	STEERING RIDE GUIDE DISASSEMBLY (AE for Europe)		Follow the left "Step" for disassembly.
①	Nut	1	
②	Bolt	1	
③	Washer	1	
④	Plate (ride guide)	1	
⑤	Rod	1	
			Reverse the disassembly steps for assembly.



CLAMP BRACKET EXPLODED DIAGRAM

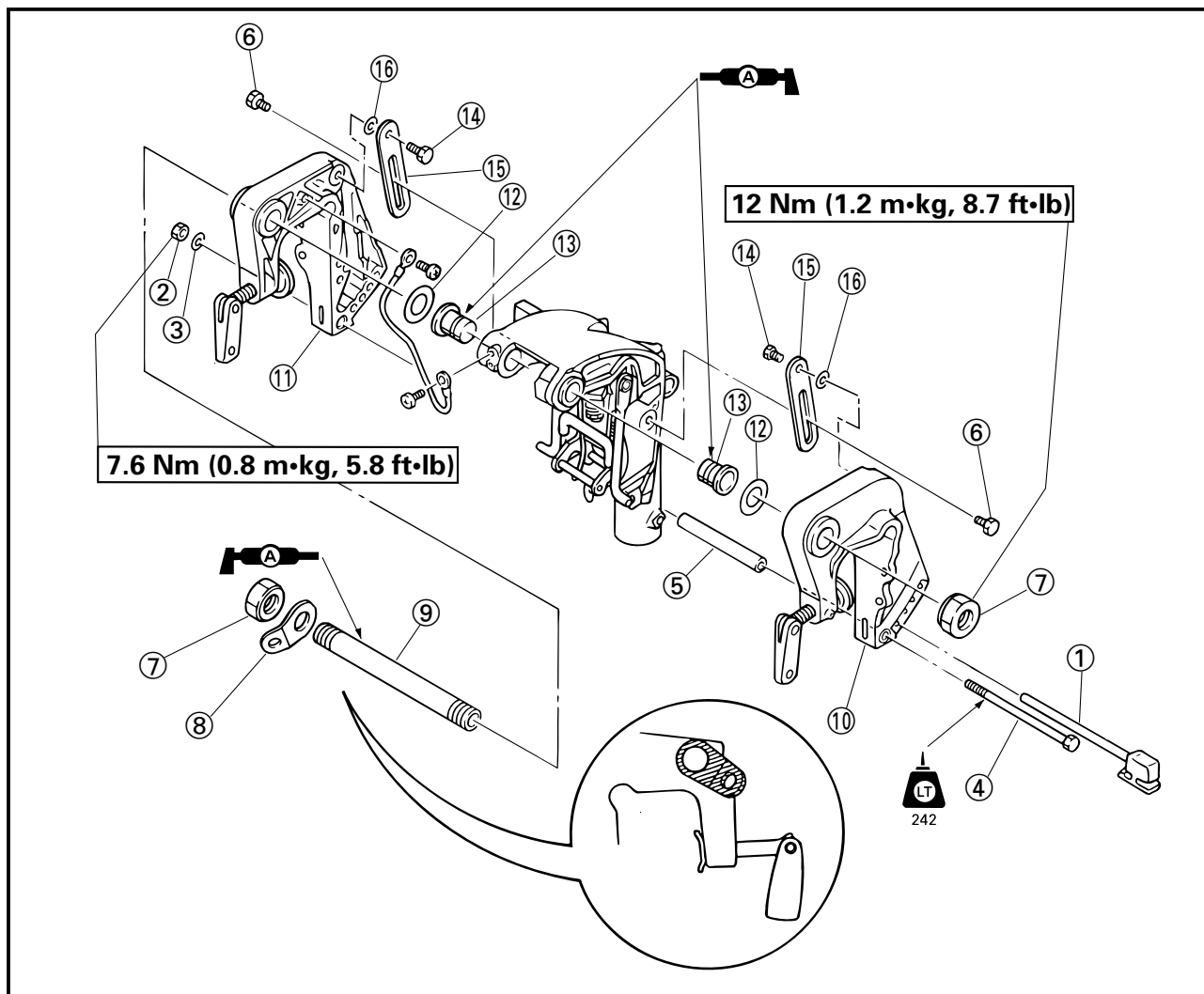


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CRAMP BRACKET DISASSEMBLY		Follow the left "Step" for disassembly.
①	Tilt pin	2	
②	Nut	1	
③	Washer	1	
④	Bolt	2	
⑤	Collar	1	
⑥	Bolt	2	
⑦	Nut	2	
⑧	Clamp bracket plate	1	
⑨	Clamp bracket bolt	1	



CLAMP BRACKET EXPLODED DIAGRAM

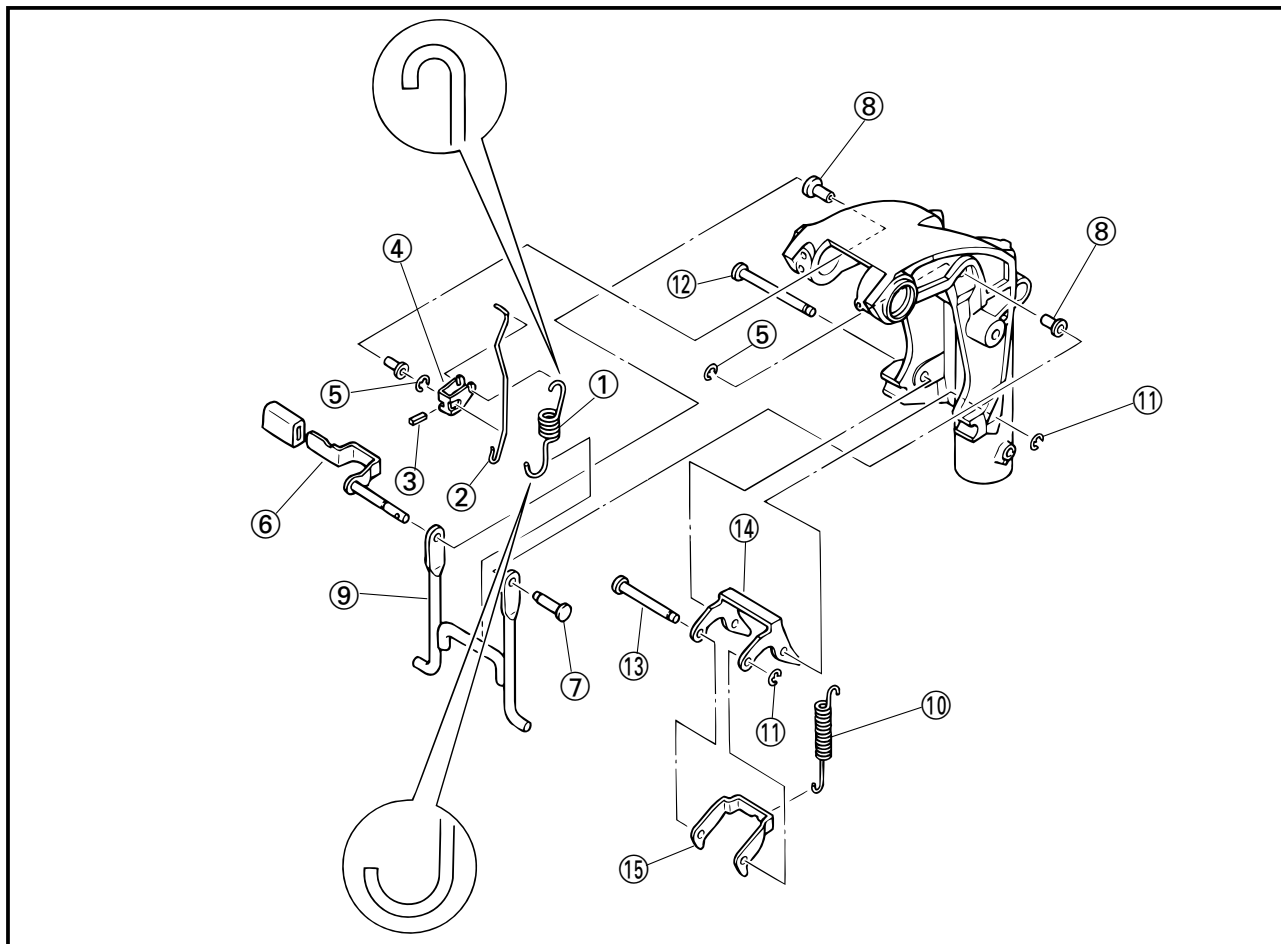


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CRAMP BRACKET DISASSEMBLY		Follow the left "Step" for disassembly.
①	Tilt pin	2	
②	Nut	1	
③	Washer	1	
④	Bolt	2	
⑤	Collar	1	
⑥	Bolt	2	
⑦	Nut	2	
⑧	Clamp bracket plate	1	
⑨	Clamp bracket bolt	1	

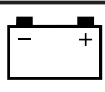


SWIVEL BRACKET EXPLODED DIAGRAM



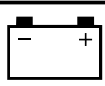
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	SWIVEL BRACKET DISASSEMBLY		Follow the left "Step" for disassembly.
①	Spring	1	
②	Tilt lock rod	1	
③	Pin	1	
④	Tilt lever	1	
⑤	E-clip	2	
⑥	Control lever	1	
⑦	Shaft pin	1	
⑧	Busing	2	
⑨	Tilt lock arm	1	
⑩	Spring	2	
⑪	E-clip	2	
⑫	Tilt lock shaft	1	
⑬	Reverse lock arm shaft	1	
⑭	Tilt lock plate	1	
⑮	Reverse lock arm	1	
			Reverse the disassembly steps for assembly.

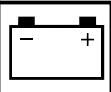


CHAPTER 8 ELECTRICAL

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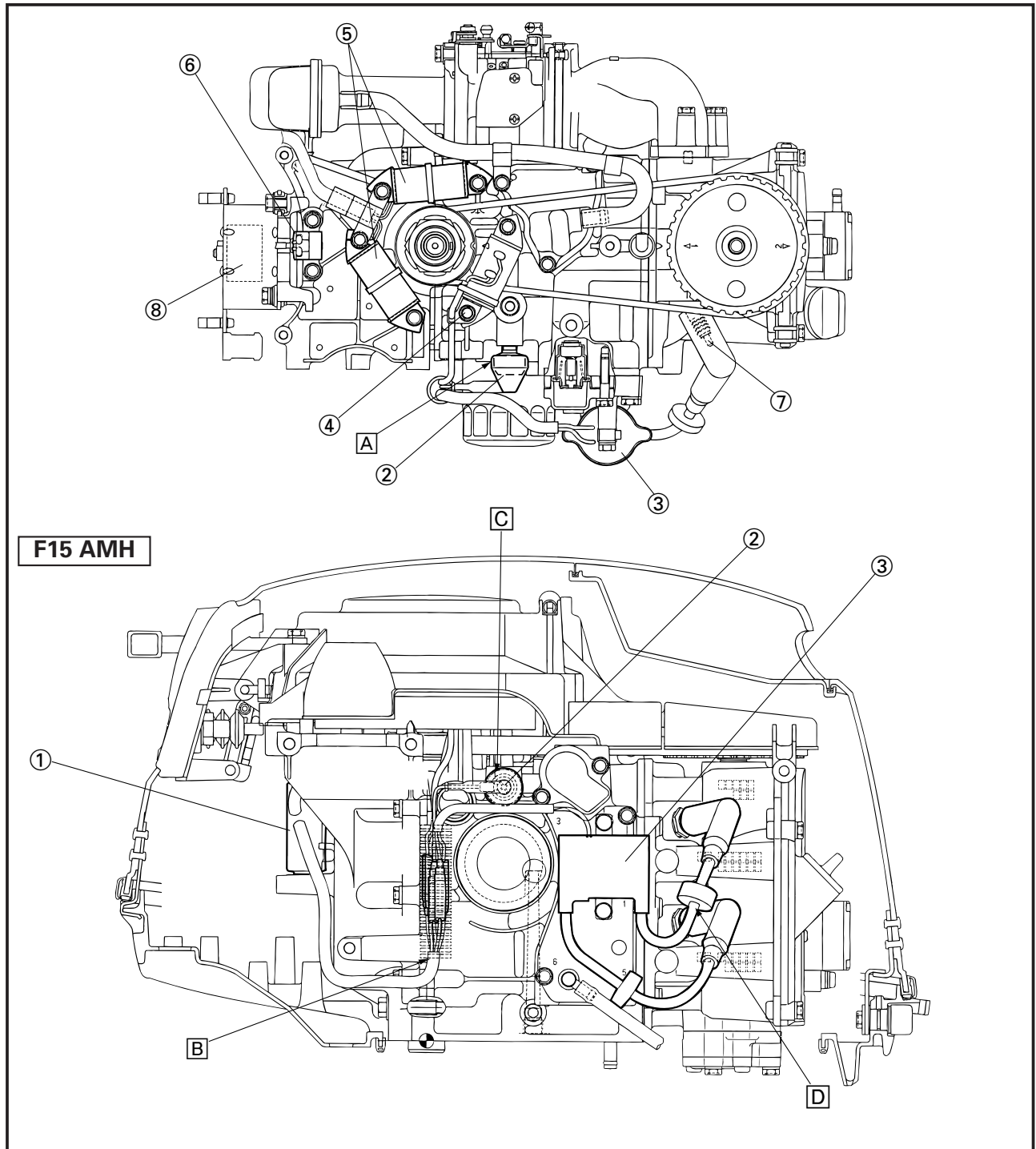


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ELECTRICAL COMPONENTS

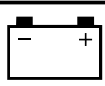
(Top view and port side view)



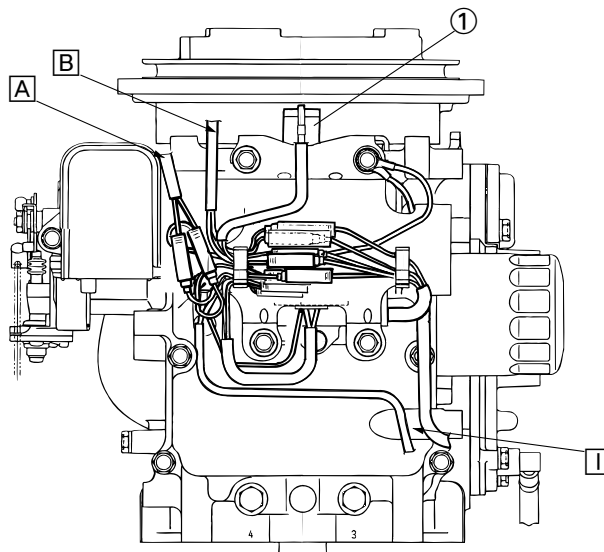
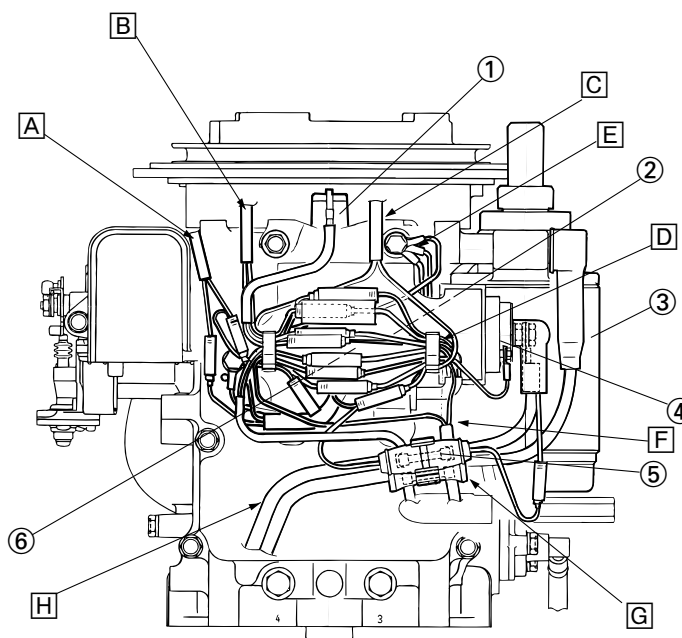
- ① CDI unit
- ② Oil pressure switch
- ③ Ignition coil
- ④ Charge coil
- ⑤ Lighting coil
- ⑥ Pulser coil
- ⑦ Spark plugs
- ⑧ Rectifier (6G1)
Rectifier regulator (6G8/6J8)

- [A] Install the Pink lead to the oil pressure switch. Cover the oil pressure switch after tightening.
- [B] Cover the oil pressure switch lead, ignition coil lead and charge coil lead for the tube after connecting the same color.

- [C] Connector direction as shown.
- [D] Pass each high tension cord to the grommet.



(Rear views)

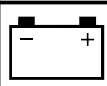
F15 AMH**F15 AEH**

- ① Pulser coil
- ② CDI unit
- ③ Starting motor (AEH)
- ④ Starter relay (AEH)
- ⑤ Fuse (AEH : 10A/20A)
- ⑥ Rectifier-regulator (AM, AEH)
Rectifier (AEH)

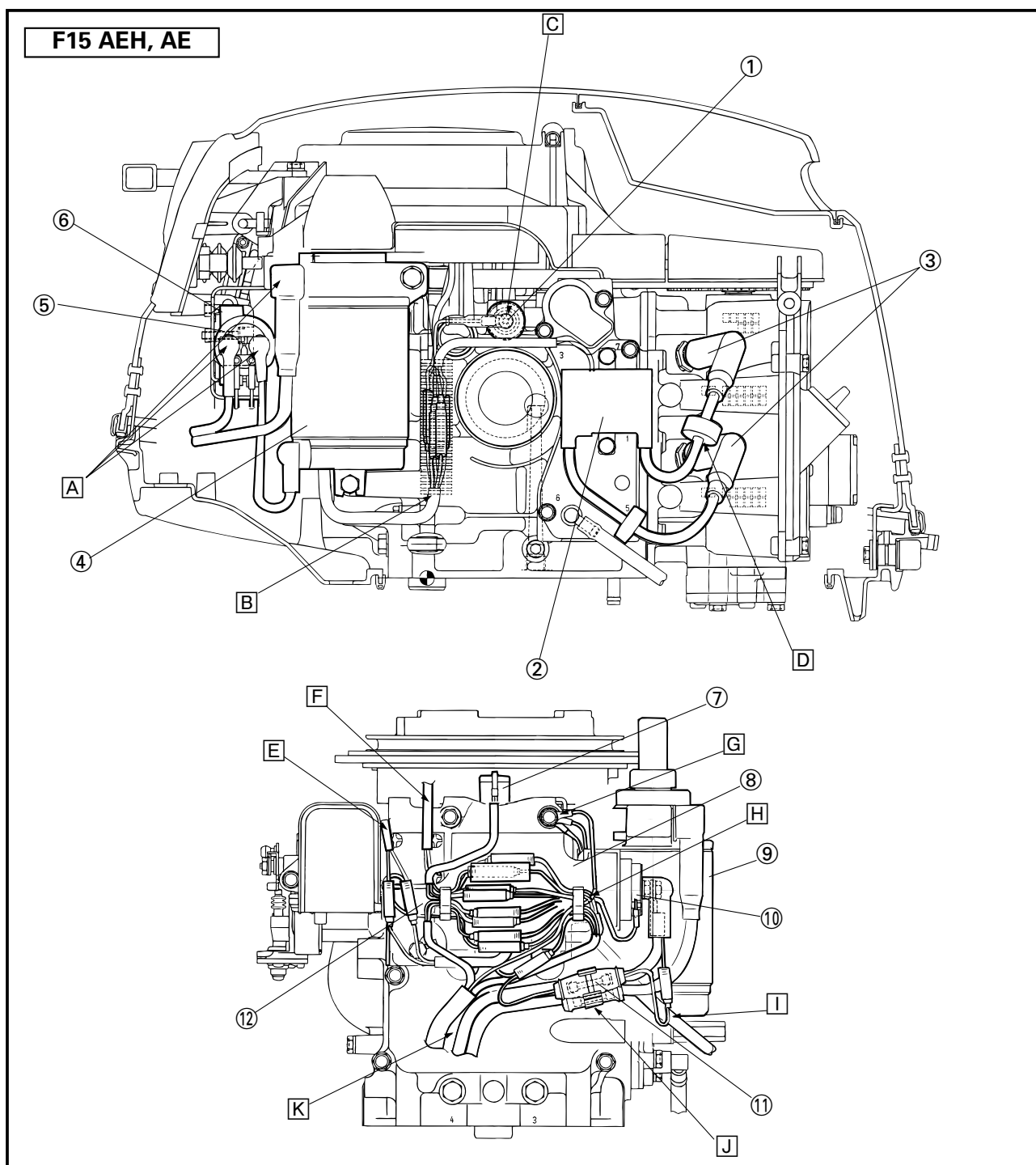
- [A] To lighting coil.
- [B] To low-oil-pressure warning indicator.
- [C] To starter switch. (AEH)
- [D] Clamp with the CDI unit lead and stop switch lead.
- [E] Mount with the CDI unit ground lead and the wireharness ground lead. (AEH :

with starter relay ground lead)

- [F] To neutral switch.
- [G] Clamp the fuse holder to the battery lead. (AEH)
- [H] To wireharness.
- [I] To stop switch.



(Port side view and rear views)



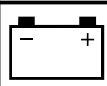
- ① Oil pressure switch
- ② Ignition coils
- ③ Spark plugs
- ④ Starting motor
- ⑤ Starter relay
- ⑥ Rectifier-regulator (6G8)
Regulator (6G1)
- ⑦ Pulser coil
- ⑧ CDI unit

- ⑨ Starting motor
- ⑩ Starter relay
- ⑪ Fuse (10A/20A)
- ⑫ Choke solenoid (AE)

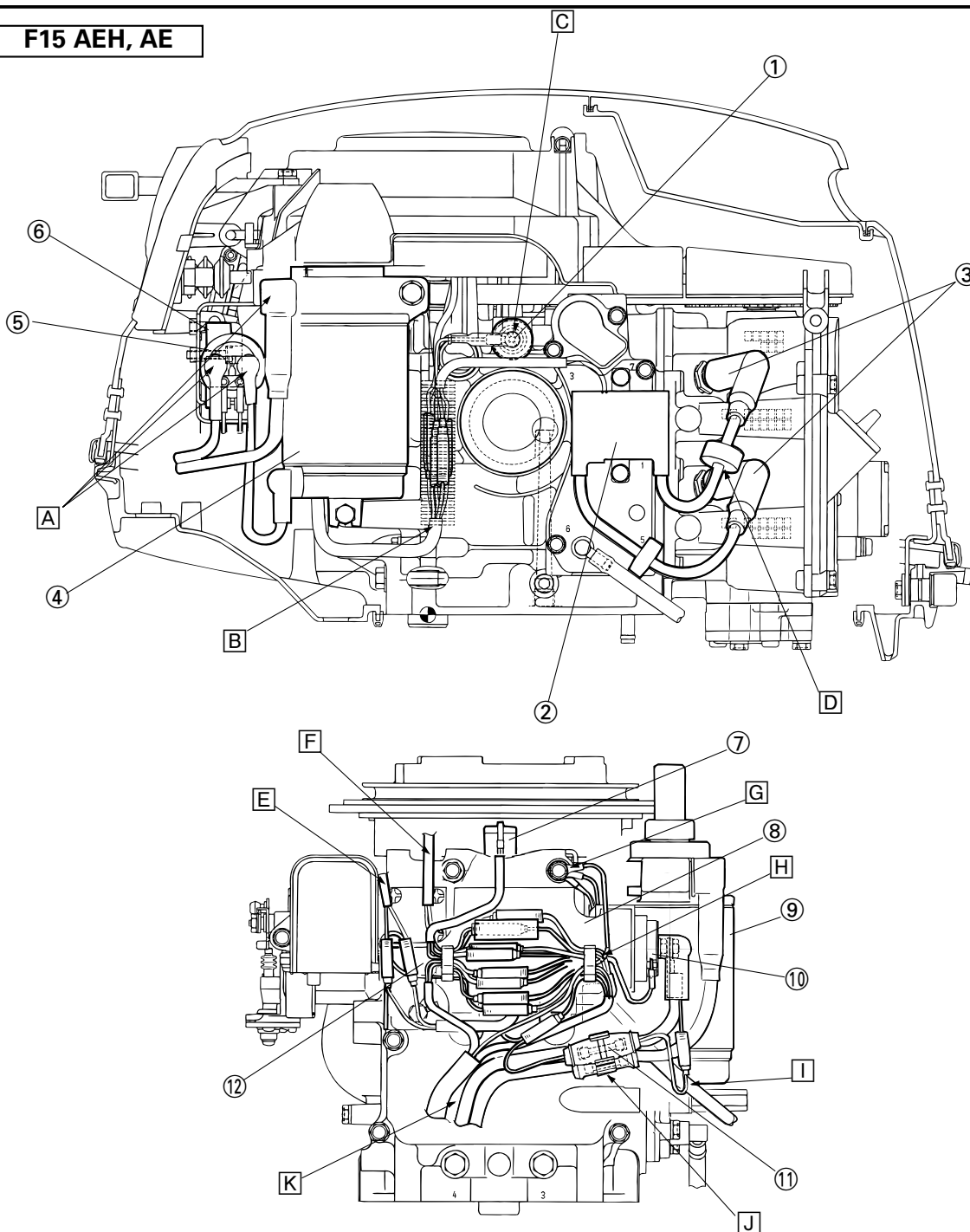
- [A] Cover the battery lead and wire lead after tighten the nut and apply grease.
- [B] Cover the oil pressure switch

lead, ignition coil lead and charge coil lead for the tube after connecting the same color.

- [C] Connector direction as shown.
- [D] Pass each high tension cord to the grommet.



F15 AEH, AE



E To lighting coil.

F To low-oil-pressure warning indicator.

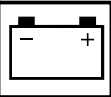
G Mount with the CDI unit ground lead, starter relay ground lead and the wireharness ground lead.

H Clamp with the CDI unit lead and stop switch lead.

I To CDI unit.

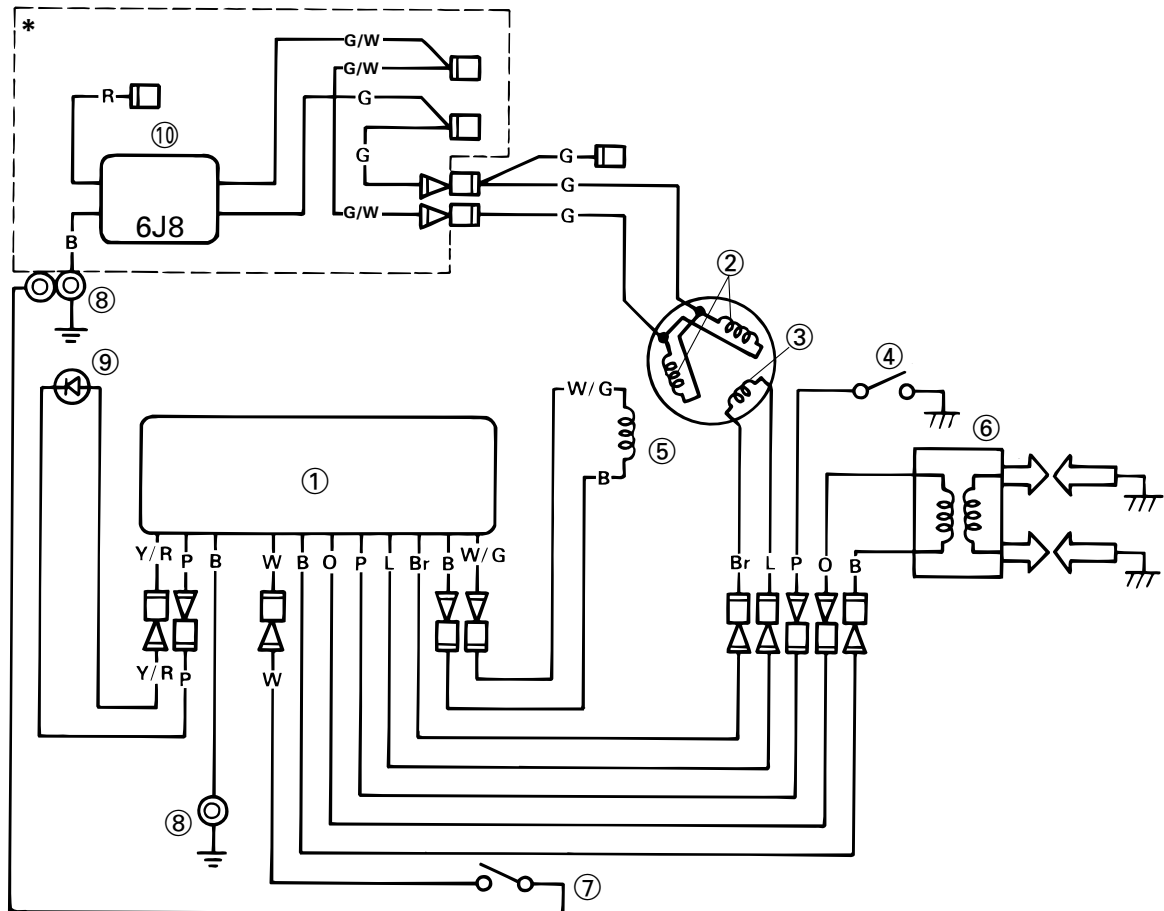
J Clamp the fuse holder to the battery lead.

K To wireharness



WIRING DIAGRAM

F15AMH

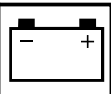


- ① CDI unit
- ② Lighting coil
- ③ Charge coil
- ④ Oil pressure switch
- ⑤ Pulser coil
- ⑥ Ignition coil
- ⑦ Engine stop switch
- ⑧ Ground

- ⑨ Low-oil-pressure warning indicator (LED)
- ⑩ Rectifier regulator (6J8) (*For Europe)

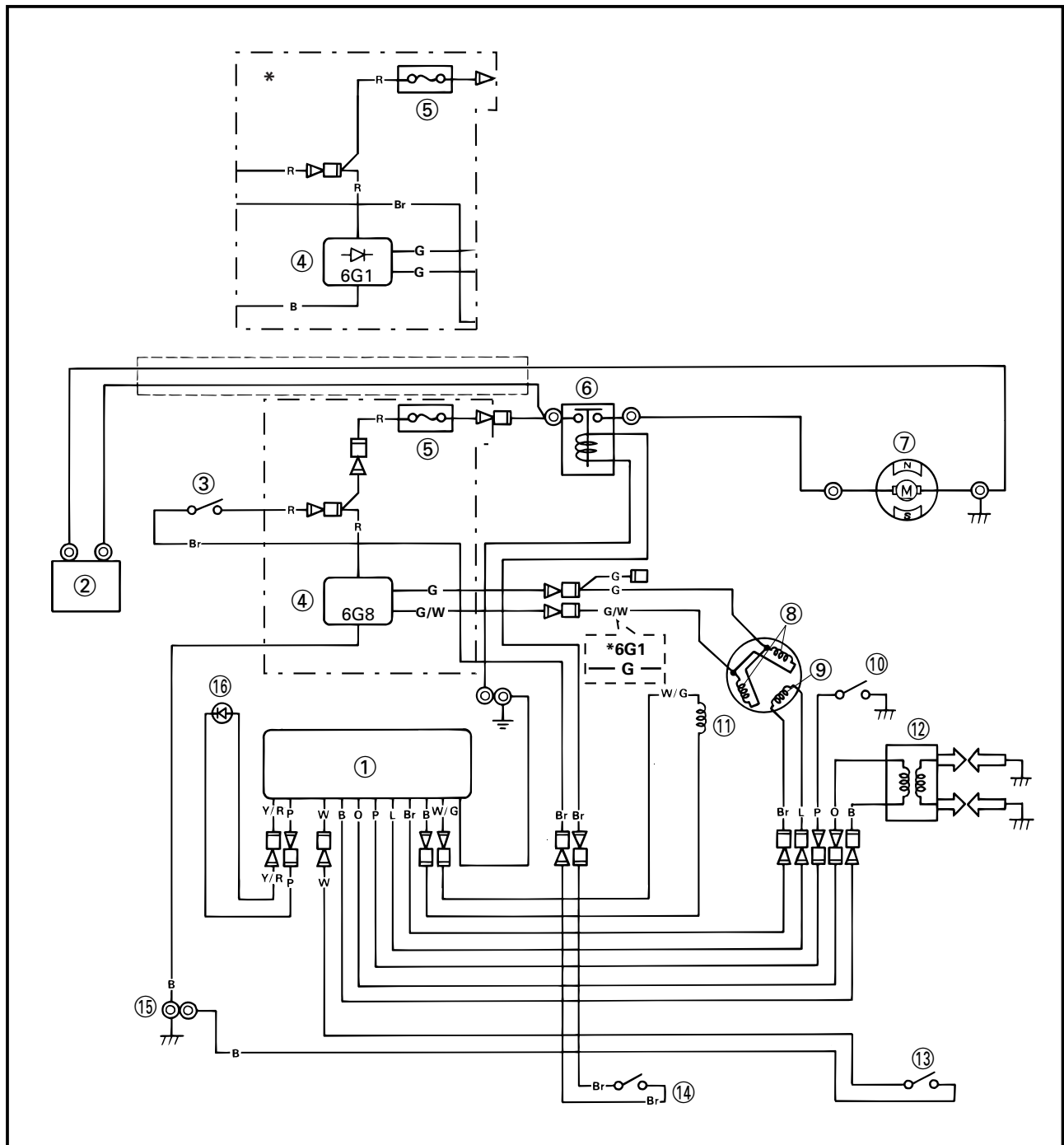
B :Black
 L :Blue
 Br :Brown
 G :Green
 O :Orange

P :Pink
 W :White
 R :Red
 W/G :White/Green
 Y/R :Yellow/Red
 G/W :Green/White



WIRING DIAGRAM

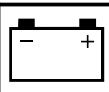
F15AEH



- ① CDI unit
- ② Battery
- ③ Starter switch
- ④ Rectifier regulator (6G8)
*(For Europe 6G1 : Rectifier)
- ⑤ Fuse (10A)/(20A)
- ⑥ Starter relay
- ⑦ Starter motor
- ⑧ Lighting coil
- ⑨ Charge coil

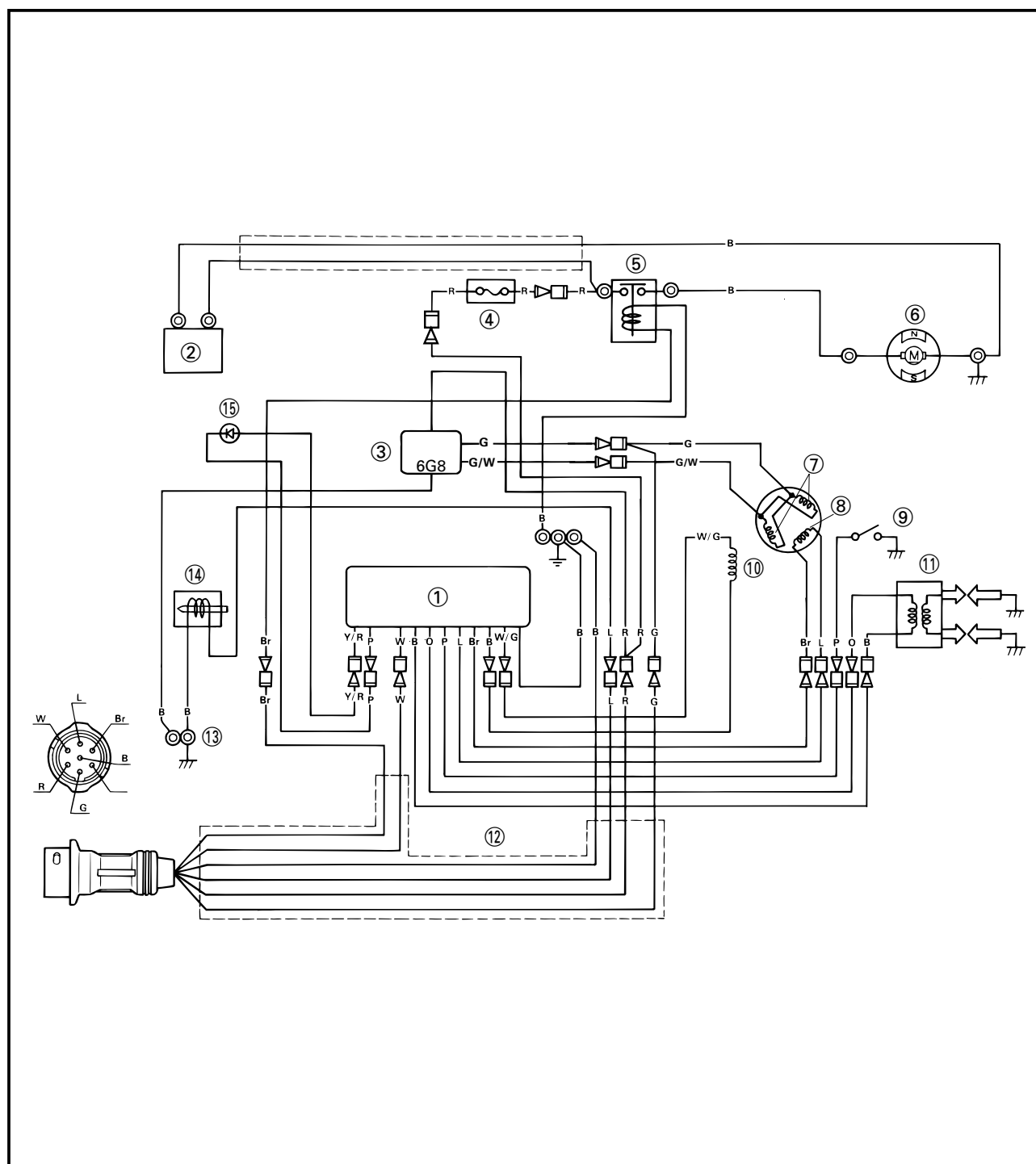
- ⑩ Oil pressure switch
- ⑪ Pulser coil
- ⑫ Ignition coil
- ⑬ Engine stop switch
- ⑭ Neutral switch
- ⑮ Ground
- ⑯ Low-oil-pressure warning indicator (LED)

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



WIRING DIAGRAM

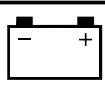
F15AE (For Europe)



- ① CDI unit
- ② Battery
- ③ Rectifier regulator (6G8)
- ④ Fuse (20A)
- ⑤ Starter relay
- ⑥ Starter motor
- ⑦ Lighting coil
- ⑧ Charge coil
- ⑨ Oil pressure switch
- ⑩ Pulser coil

- ⑪ Ignition coil
- ⑫ Wire harness
- ⑬ Ground
- ⑭ Solenoid
- ⑮ Low-oil-pressure warning indicator (LED)

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



ELECTRICAL ANALYSIS INSPECTION

Digital circuit tester

NOTE: _____

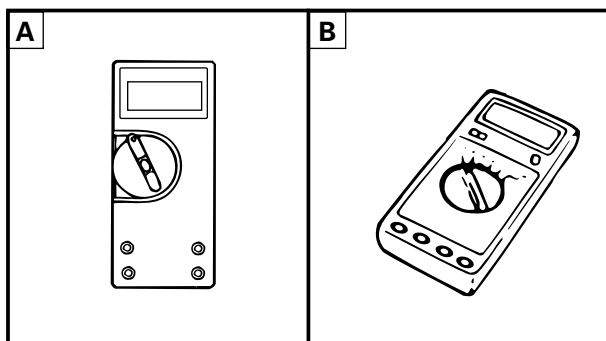
Throughout this chapter the digital circuit tester's part number has been omitted. Refer to the following part number.



Digital circuit tester:
J-39299/90890-06752

NOTE: _____

"○—○" indicates a continuity of electricity; i.e., a closed circuit at the respective switch position.



Peak voltage measurement

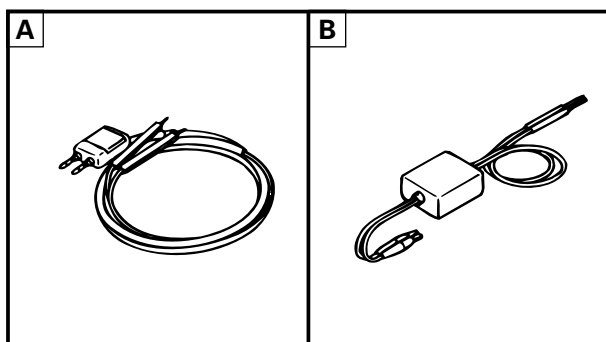
NOTE: _____

- When checking the condition of the ignition system it is vital to know the peak voltage.
- Cranking speed is dependant on many factors (e.g., fouled or weak spark plugs, a weak battery, etc.). If one of these is defected, the peak voltage will be lower than specification.
- If the peak voltage measurement is not within specification the engine will not operate properly.
- A low peak voltage will also cause components to prematurely wear.

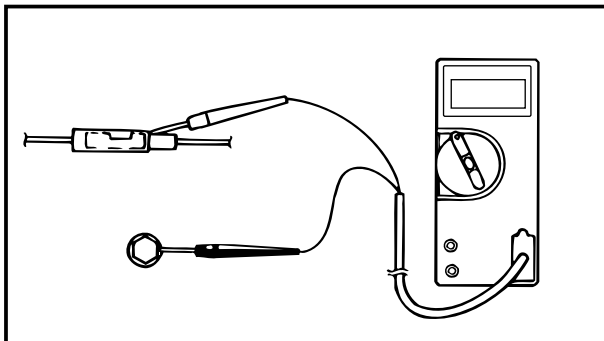
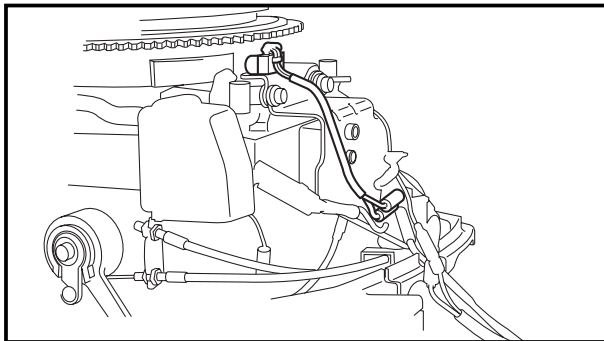
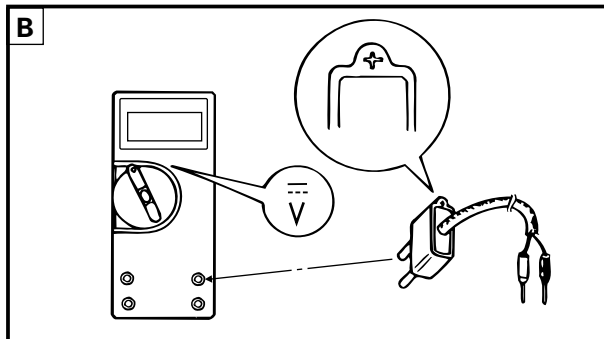
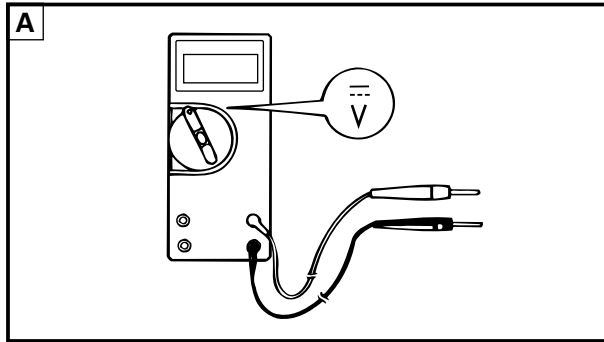
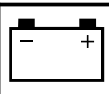
Peak voltage adaptor

NOTE: _____

- Throughout this chapter the peak voltage adaptor's part number has been omitted. Refer to the following part number.
- The peak voltage adaptor should be used with the digital circuit tester.



Peak voltage adaptor:
YU-39991/90890-03169



- When measuring the peak voltage, connect the peak voltage adaptor to the digital tester and switch the selector to the DC voltage mode.

NOTE: _____

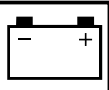
- Make sure that the adaptor leads are properly installed in the digital circuit tester.
- Make sure that the positive pin (the "+" mark facing up as shown) on the adaptor is installed into the positive terminal of the tester.
- The test harness is needed for the following tests.

A Voltage measurement

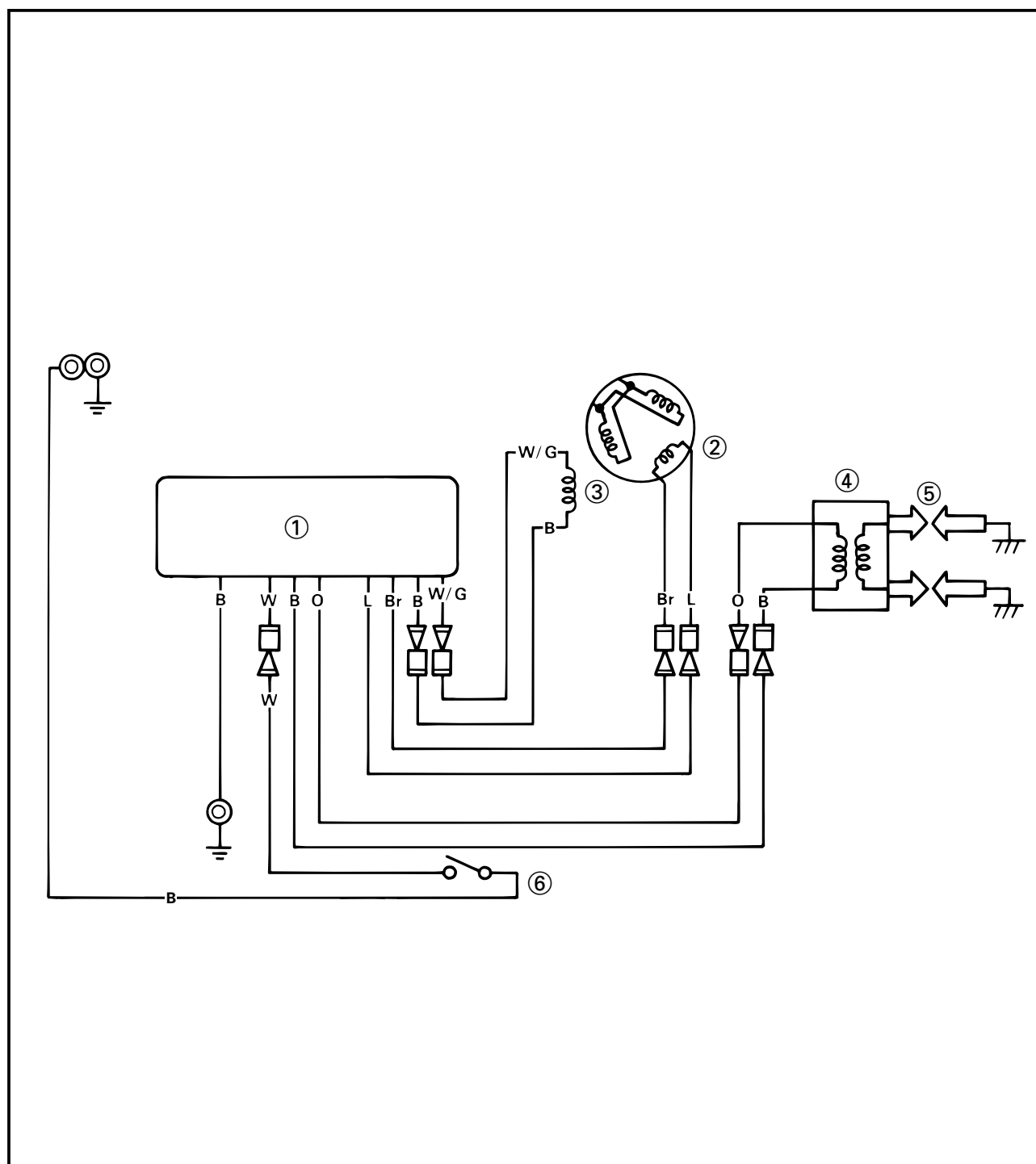
B Peak voltage measurement

Checking steps:

- Disconnect the connectors from pulsar coil.
- Connect the tester terminals to the terminals which are being checked.
- Start or crank the engine and observe the measurement.

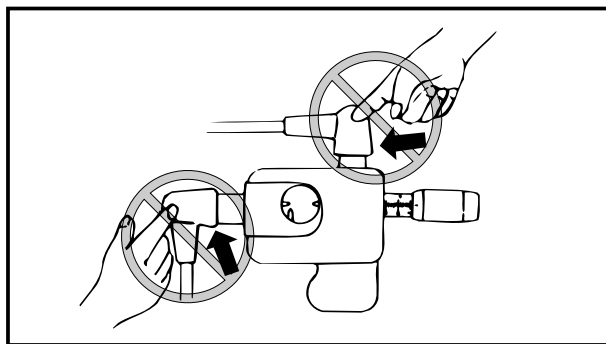
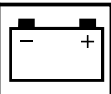


IGNITION SYSTEM WIRING DIAGRAM



- ① CDI unit
- ② Charge coil
- ③ Pulser coil
- ④ Ignition coil
- ⑤ Spark plugs
- ⑥ Engine stop switch

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



SERVICE POINTS

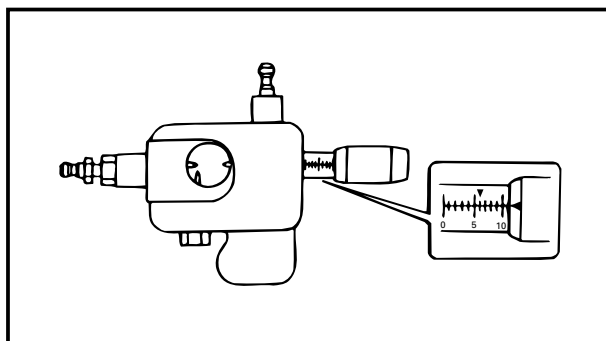
IGNITION SPARK GAP

⚠ WARNING

- When checking the spark gap, do not touch any of the connections of the spark gap tester lead wires.
- When performing the spark gap test, take special care not to let sparks leak out of the removed spark plug cap.
- When performing the spark gap check, keep flammable gas or liquids away, since this test can produce sparks.

1. Check:

- Ignition spark gap
Less than specification → Continue to check the CDI unit output.



SPARK GAP:
9 mm (0.4 in)

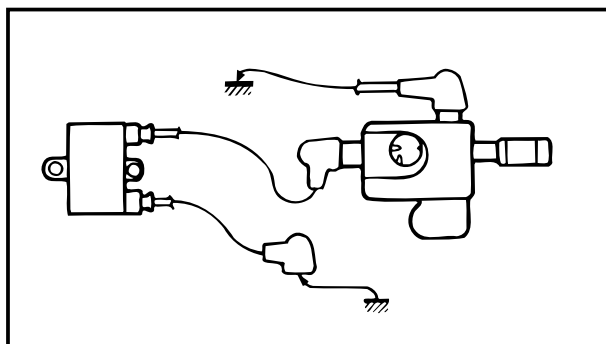
Checking steps:

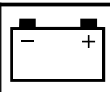
- Remove the spark plugs from the engine.
- Connect the spark plug cap to the spark gap tester.
- Set the spark gap length on the adjusting knob.



Spark gap tester:
YM-34487/90890-06754

- Crank the engine and observe the ignition system spark through the discharge window.

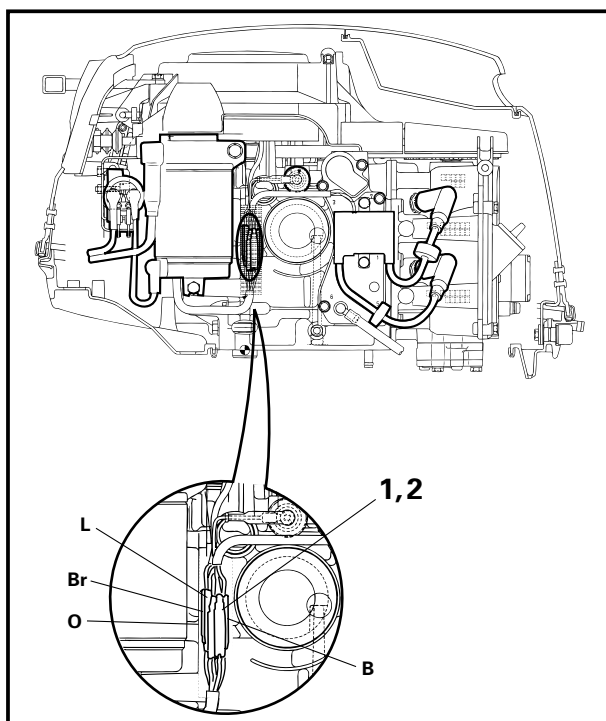




IGNITION SYSTEM PEAK VOLTAGE

⚠ WARNING

When checking the CDI unit do not touch any of the connections of the digital tester lead wires.



1. Measure:

- CDI unit output peak voltage
Below specification → Replace the ignition coil or check the CDI unit.

6A model

Output peak voltage O-B				
r/min	Cranking		1,500	3,500
	Opened	Closed		
V	120	115	160	160

10A model

Output peak voltage O-B				
r/min	Cranking		1,500	3,500
	Opened	Closed		
V	120	120	160	160

2. Measure:

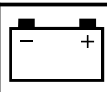
- Charge coil output peak voltage
Below specification → Replace the charge coil.

6A model

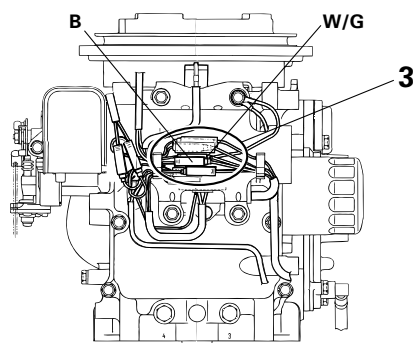
Output peak voltage Br-L				
r/min	Cranking		1,500	3,500
	Opened	Closed		
V	130	135	180	180

10A model

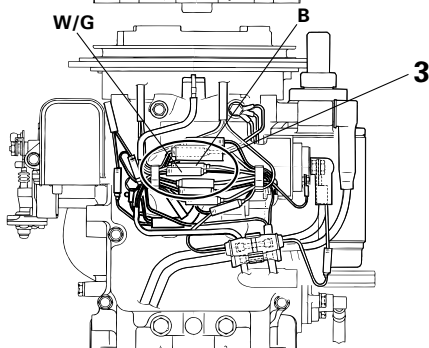
Output peak voltage Br-L				
r/min	Cranking		1,500	3,500
	Opened	Closed		
V	130	135	180	180



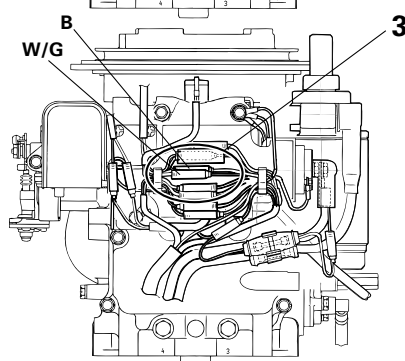
AMH



AEH



AE



3. Measure:

- Pulsar coil output peak voltage

Below specification → Replace the pulsar coil.

6A model

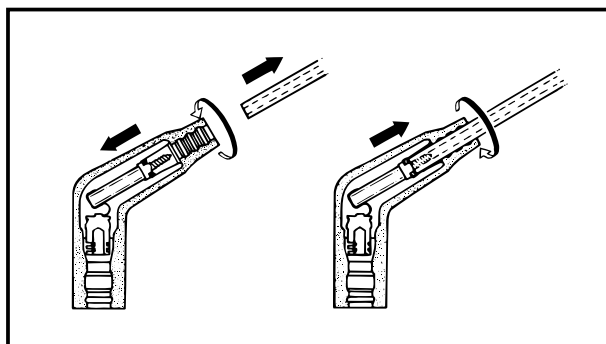
Output peak voltage
W/G-B

r/min	Cranking		1,500	3,500
	Opened	Closed		
V	4.0	3.5	11.0	23

10A model

Output peak voltage
W/G-B

r/min	Cranking		1,500	3,500
	Opened	Closed		
V	4.0	3.5	11.0	23



SPARK PLUG

Refer to "GENERAL" in chapter 3.

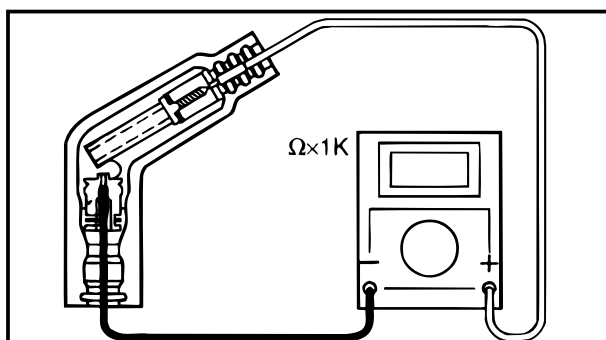
SPARK PLUG CAP

1. Inspect:

- Spark plug cap
- Loose → Tighten.
Cracks/damage → Replace.

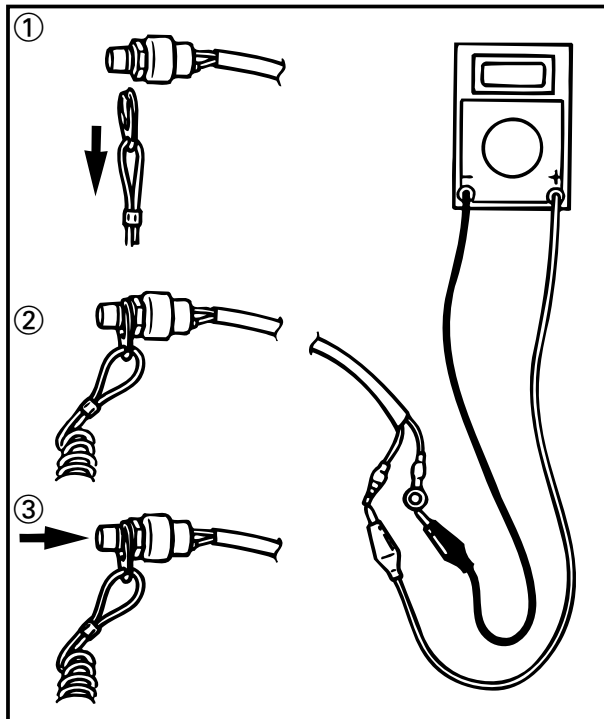
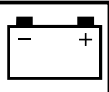
2. Measure:

- Spark plug cap resistance
- Out of specification → Replace.

Spark plug cap resistance
4.0 ~ 6.0 kΩ

Replacement steps:

- To remove the spark plug cap turn it counterclockwise.
- To install the spark plug cap turn it clockwise until it is tight.



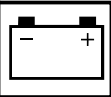
ENGINE STOP SWITCH

1. Check:

- Continuity

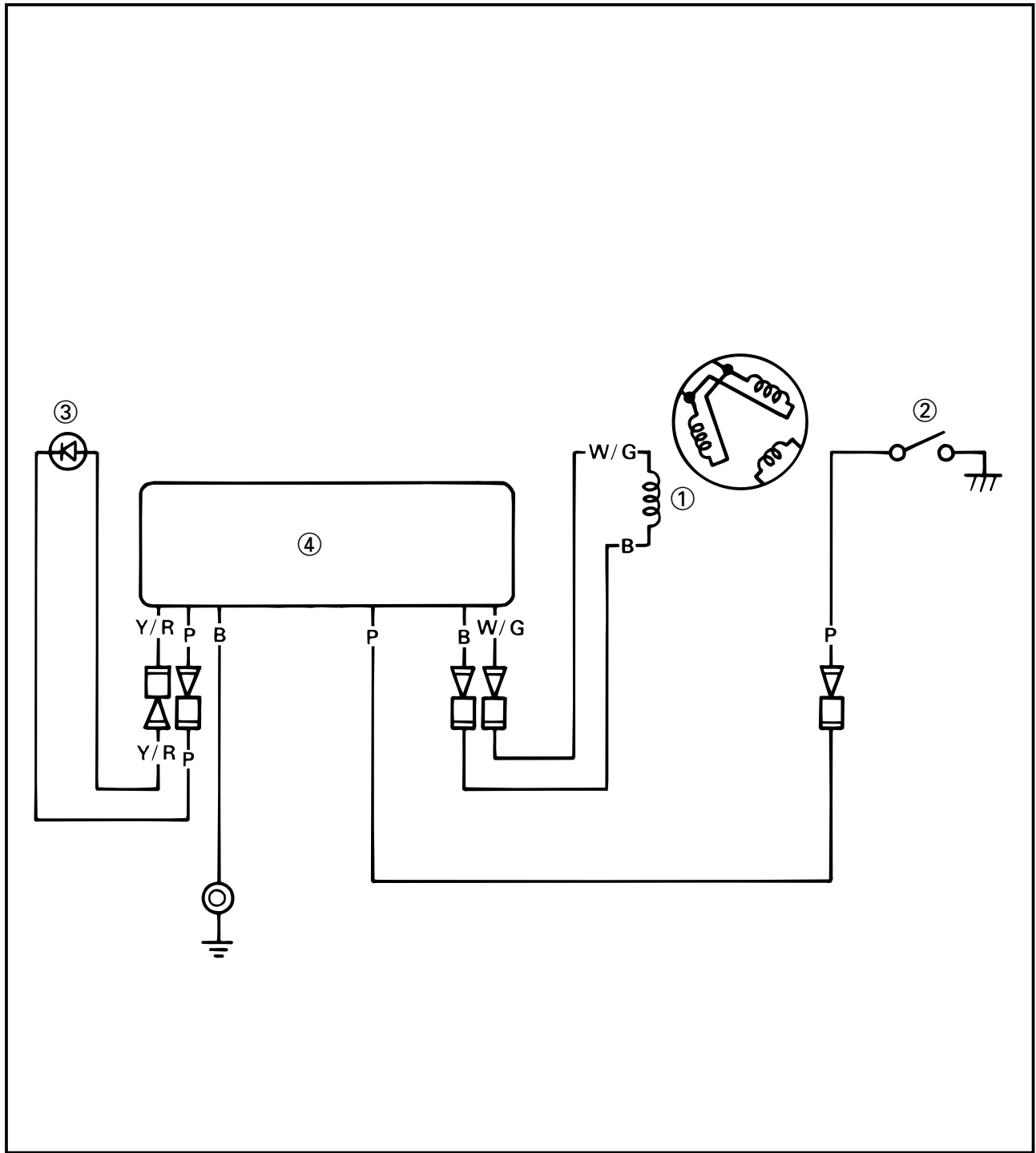
No continuity → Replace.

	Lead color	
	White	Black
Remove the lock plate ①.		
Install the lock lever ②.		
Push the Button ③.		

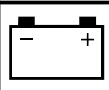


IGNITION CONTROL SYSTEM (AMH, AEH)

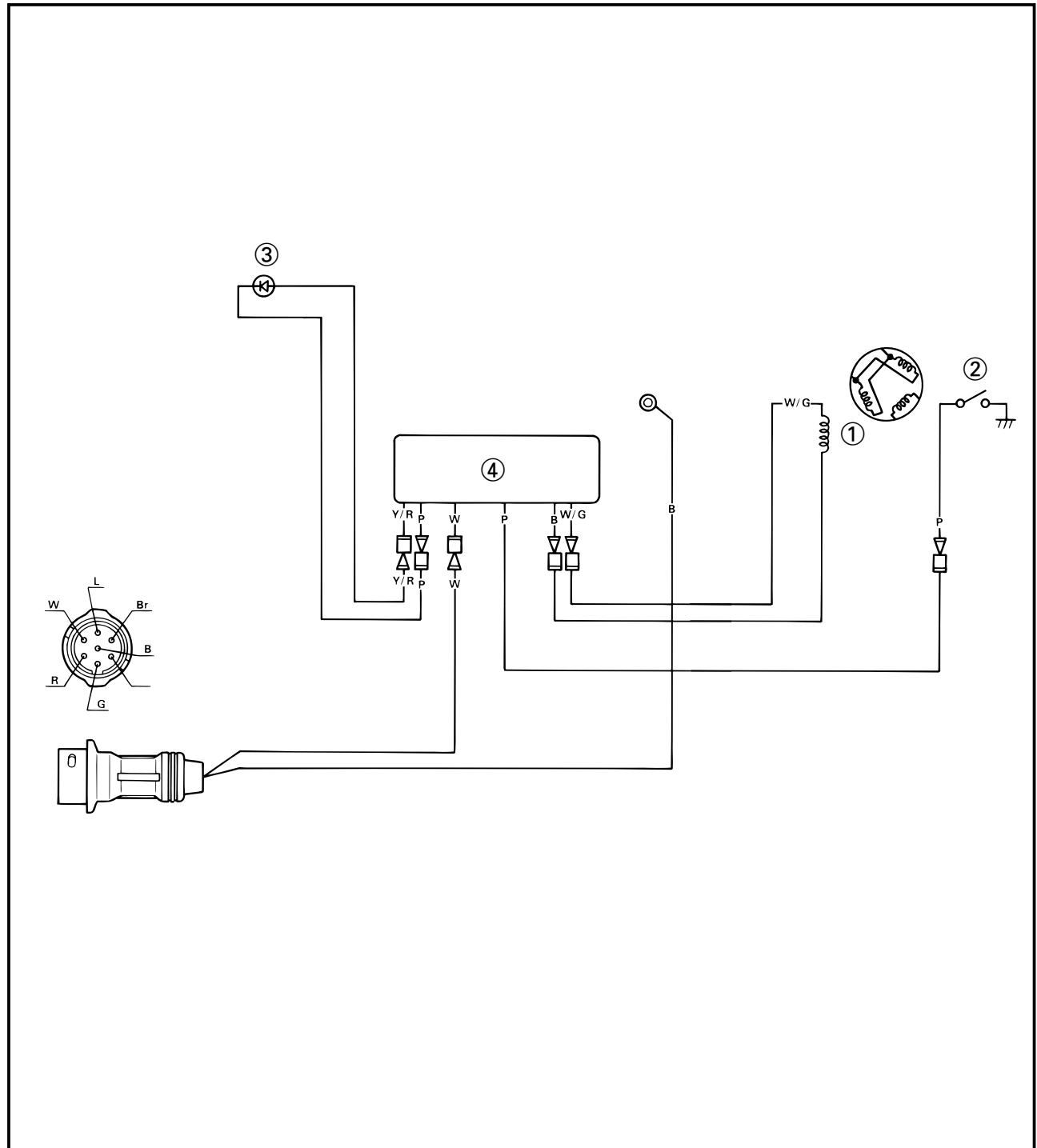
WIRING DIAGRAM



- ① Pulsar coil
 - ② Oil pressure switch
 - ③ low-oil-pressure warning indicator (L.E.D)
 - ④ CDI unit
- B :Black
 P :Pink
 W/G :White/Green
 Y/R :Yellow/Red

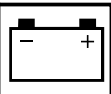


IGNITION CONTROL SYSTEM (AE) WIRING DIAGRAM



- ① Pulsar coil
- ② Oil pressure switch
- ③ low-oil-pressure warning indicator (L.E.D)
- ④ CDI unit

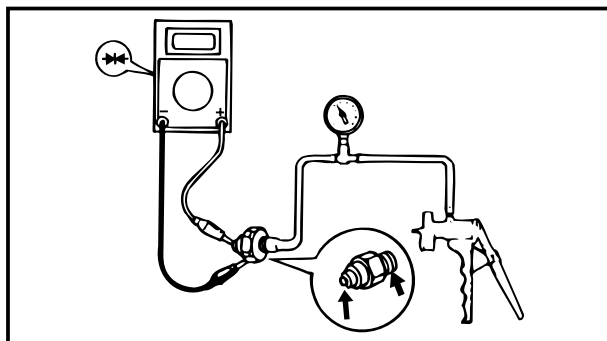
B :Black
 L :Blue
 Br :Brown
 G :Green
 P :Pink
 W :White
 R :Red
 W/G :White/Green
 Y/R :Yellow/Red



SERVICE POINTS

PULSAR COIL

Refer to "IGNITION SYSTEM".



OIL PRESSURE SWITCH

1. Measure:

- Oil pressure switch continuity
- Out of specification → Replace.



Mity vac:

YB-35956/90890-06756



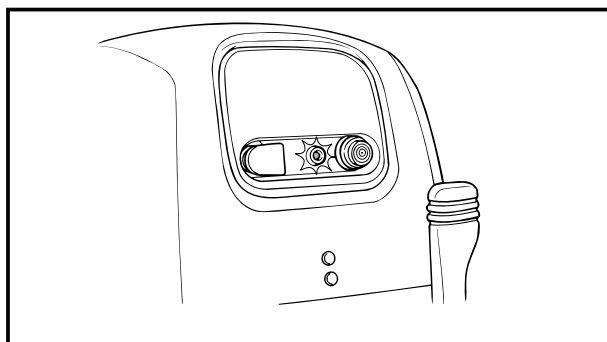
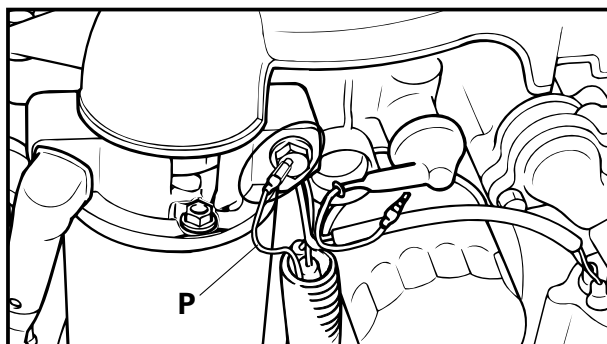
Oil pressure switch continuity pressure:

**14.7 kPa (0.15 kg/cm²,
2.13 psi) and above**

No continuity

**14.7 kPa(0.15 kg/cm²,
2.13 psi) and below**

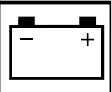
Continuity



LOW-OIL-PRESSURE WARNING INDICATOR

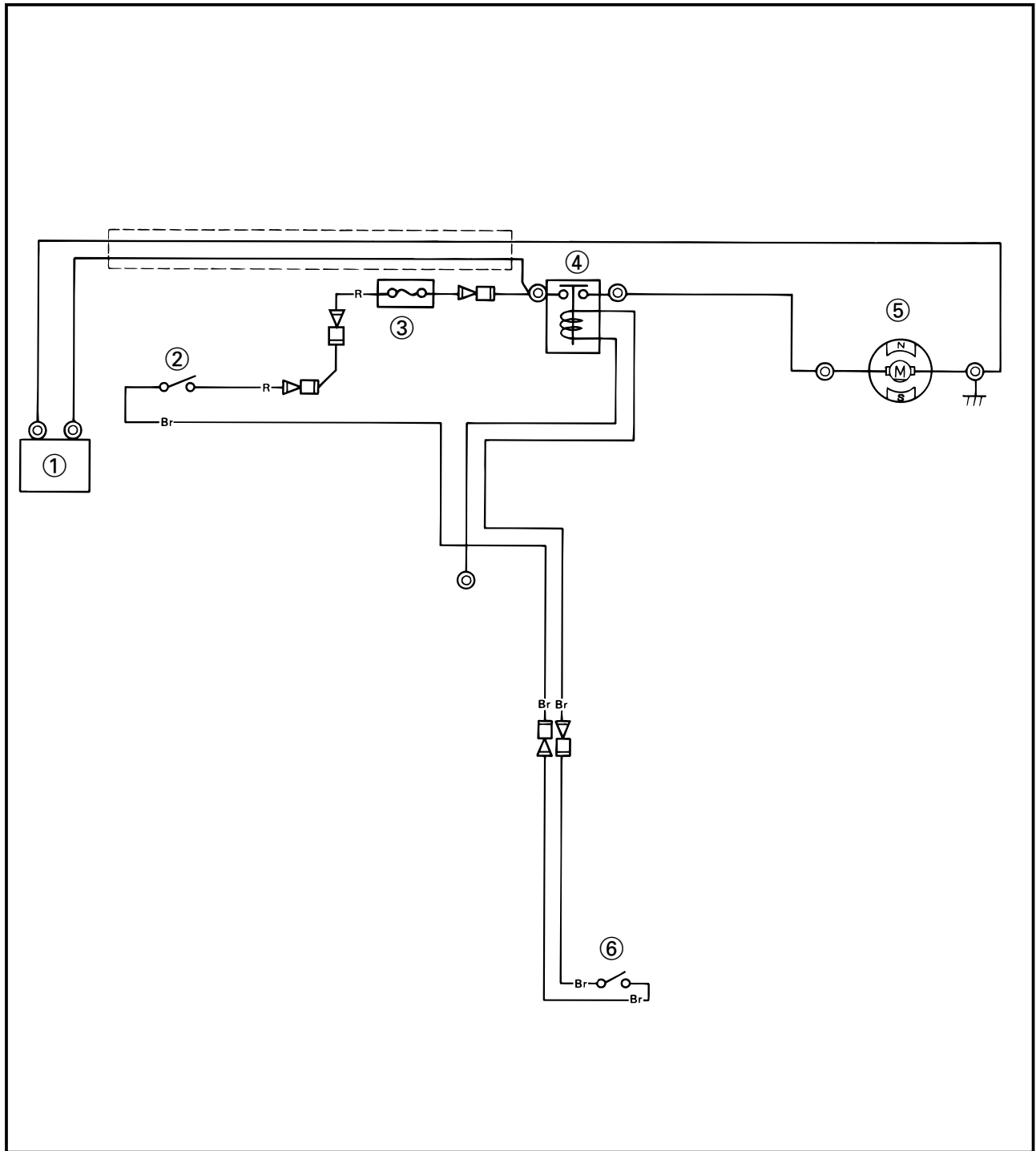
1. Disconnect the oil pressure switch lead connector (P).
2. Starting the engine.
3. Connect the oil pressure switch lead (P) to the ground.
4. Check:
 - LED (Light emitting diode) lighting

No lighting → Replace.



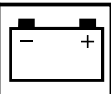
STARTING SYSTEM (AEH)

WIRING DIAGRAM



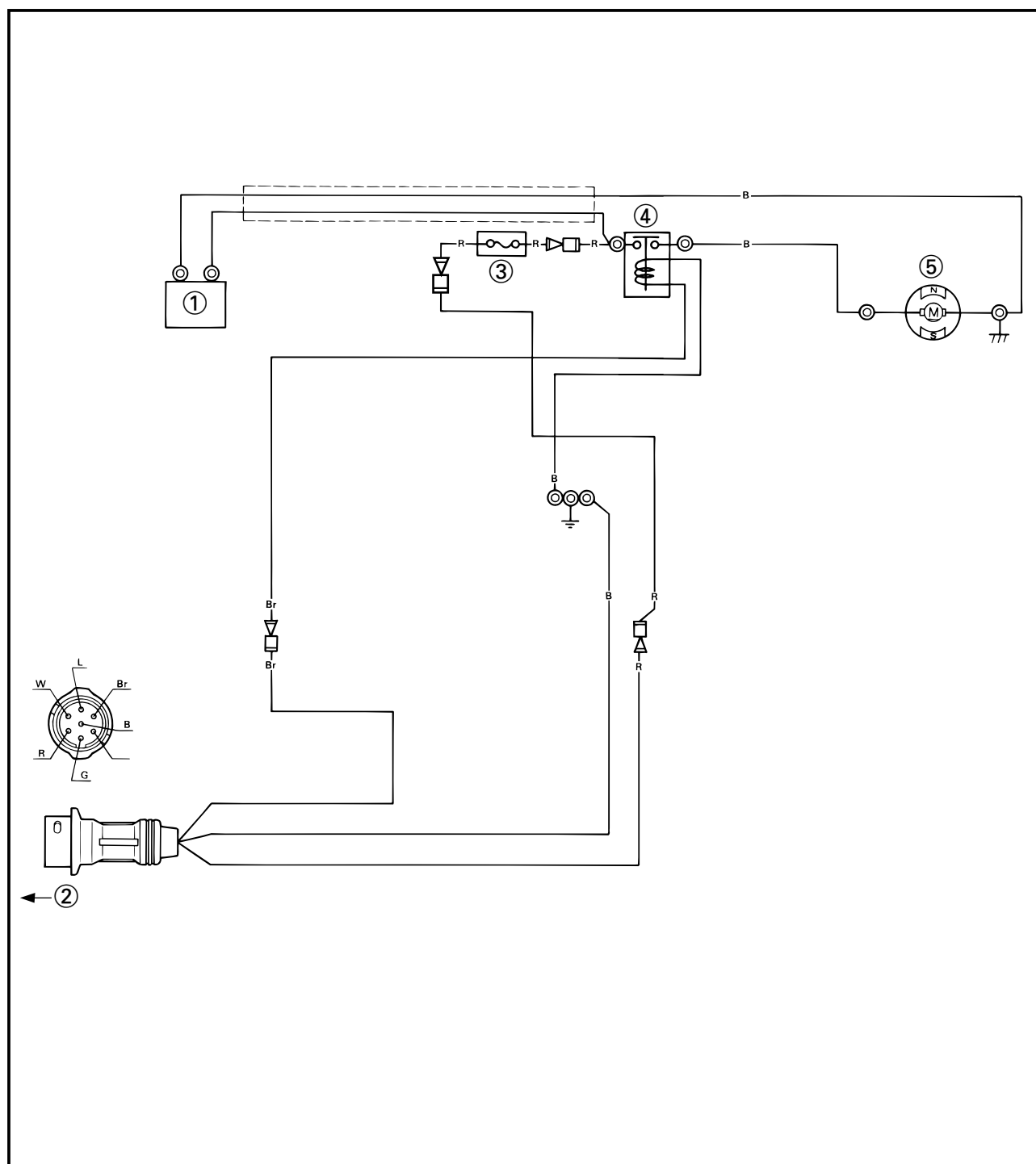
- ① Battery
- ② Starter switch
- ③ Fuse
- ④ Starter relay
- ⑤ Starter motor
- ⑥ Neutral switch

Br :Brown
R :Red



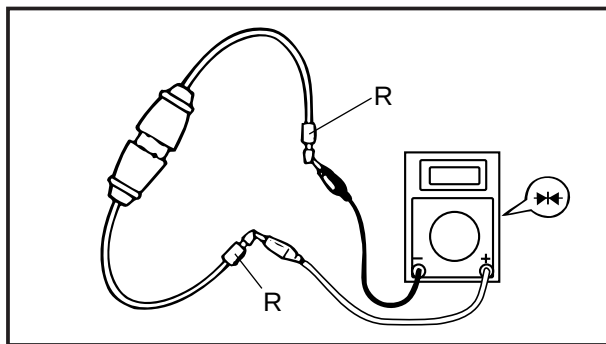
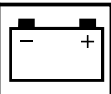
STARTING SYSTEM (AE)

WIRING DIAGRAM



- ① Battery
- ② Starter switch (to Remote control)
- ③ Fuse
- ④ Starter relay
- ⑤ Starter motor
- ⑥ Neutral switch
- ⑦ Connector

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



SERVICE POINTS

FUSE (AEH, AE)

1. Check:
 - Fuse holder
 - No continuity → Check the fuse holder leads.
 - Fuse holder leads
 - No continuity → Replace.
 - Continuity → Check the fuse.
2. Check:
 - Fuse
 - No continuity → Replace.



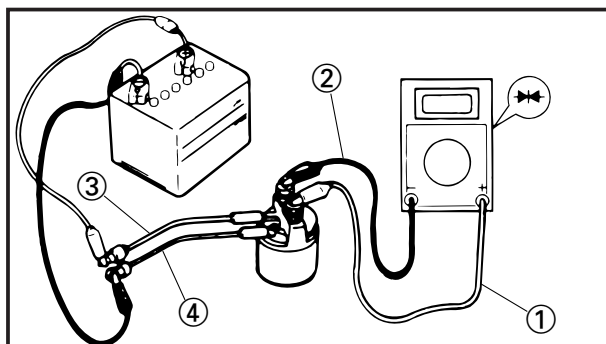
Fuse rating:
12 V-10/20 A

WIRE HARNESS

1. Check:
 - Continuity
 - No continuity → Replace.

WIRE CONNECTIONS

1. Check:
 - Wire connections
 - Poor connections → Properly connect.



STARTER RELAY (AEH, AE)

1. Check:
 - Starter relay condition
 - Out of specification → Replace.

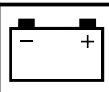
Checking steps:

- Connect the tester between the starter relay terminals as shown.

Tester positive lead ① →
Starter relay terminal

Tester negative lead ② →
Starter relay terminal

- Check that there is no continuity between the starter relay terminals.
- Connect the tester and battery between the starter relay terminals.



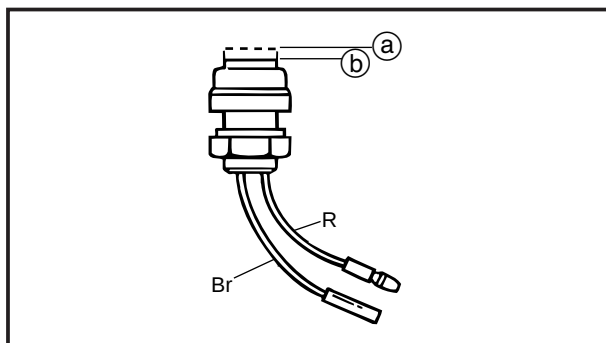
Tester positive lead ① →
Starter relay terminal

Tester negative lead ② →
Starter relay terminal

Battery positive terminal →
Brown terminal ③

Battery negative terminal →
Black terminal ④

- Check that there is continuity between the starter relay terminals.

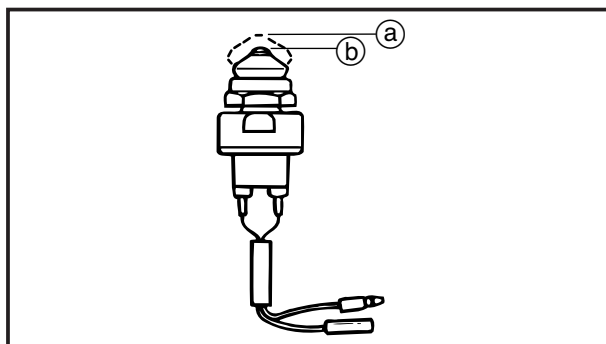


STARTER SWITCH (AEH)

1. Check:

- Continuity
- No continuity → Replace.

	Switch Position	Lead color	
		Red	Brown
(a)	Home position		
(b)	Depressed	○ — ○	○ — ○

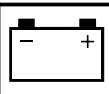


NEUTRAL SWITCH (AEH)

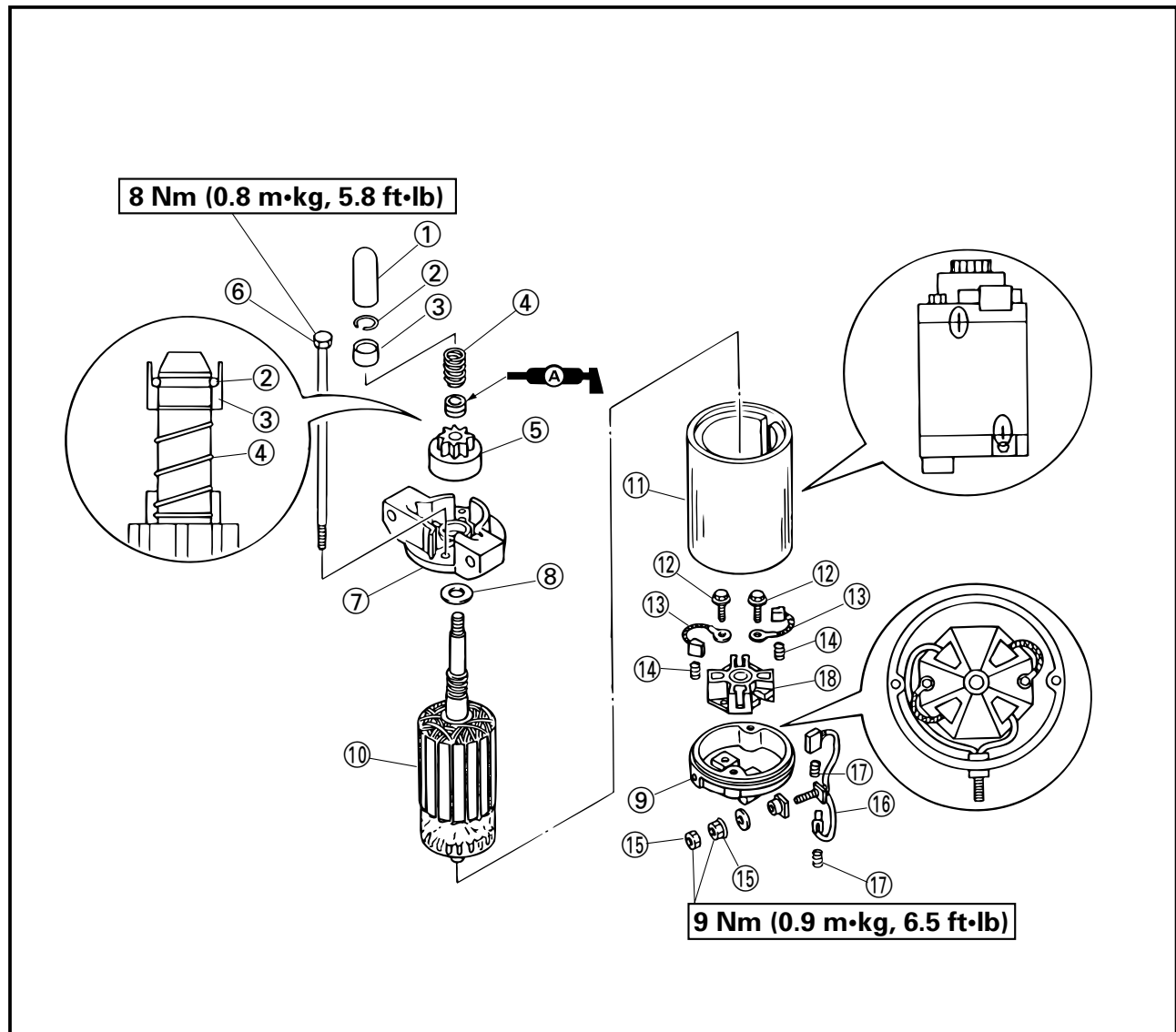
1. Check:

- Continuity
- No continuity → Replace.

	Switch Position	Lead color	
		Brown	Brown
(a)	Home position		
(b)	Depressed	○ — ○	○ — ○

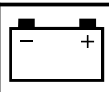


STARTING MOTOR (AEH, AE) EXPLODED DIAGRAM

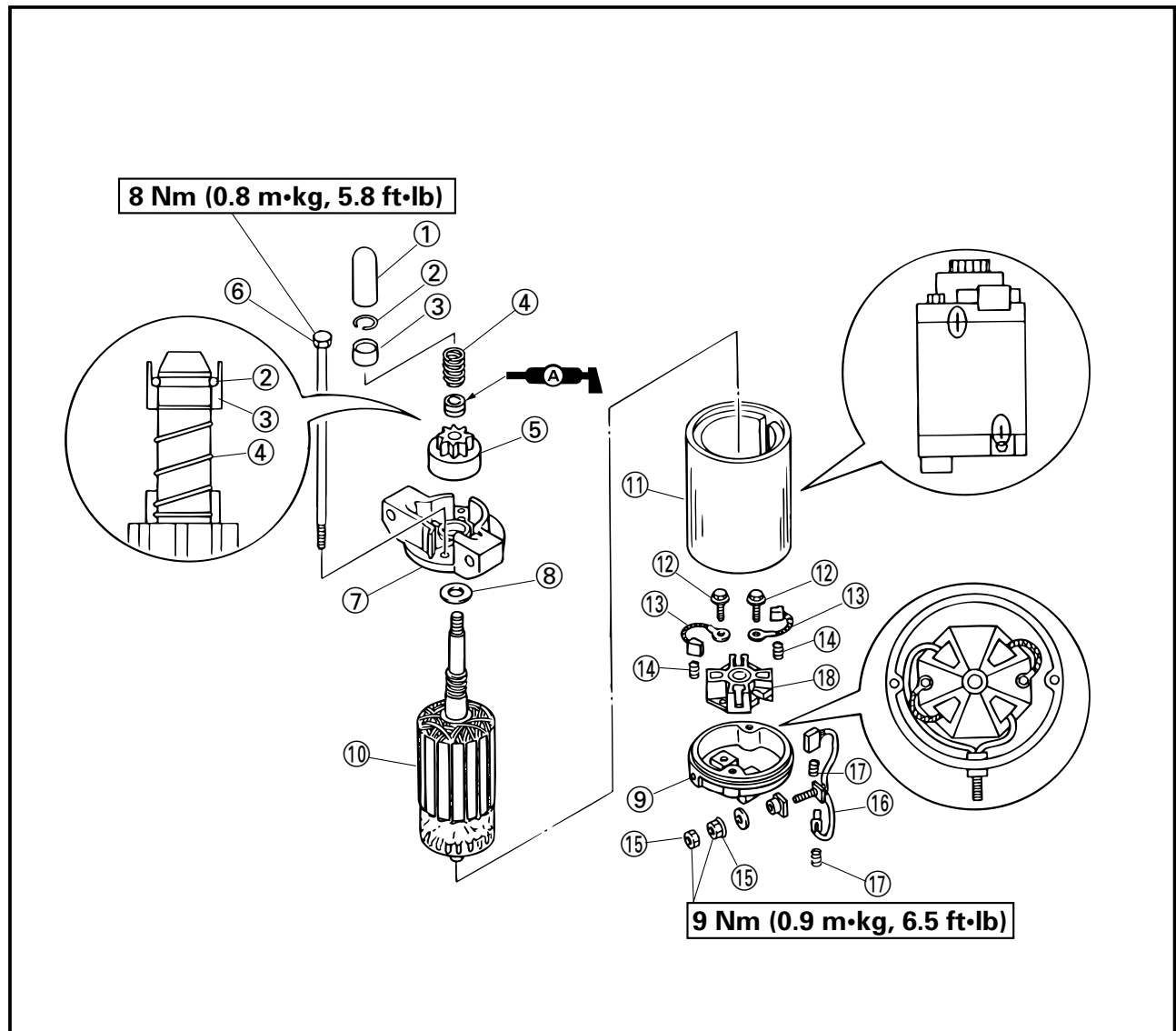


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	STARTING MOTOR DISASSEMBLY		
①	Cap	1	Follow the left "Step" for disassembly. 3/16" (3/8" Tool)
②	Clip	1	
③	Pinon stopper	1	
④	Spring	1	
⑤	Pinion	1	
⑥	Bolt	2	
⑦	Front bracket	1	
⑧	Washer	1	
⑨	Rear bracket	1	
⑩	Armature	1	

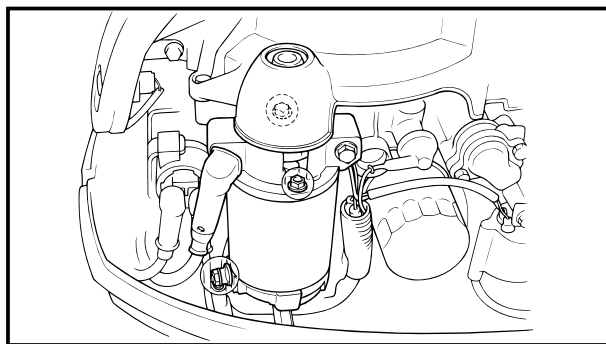
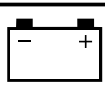


EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

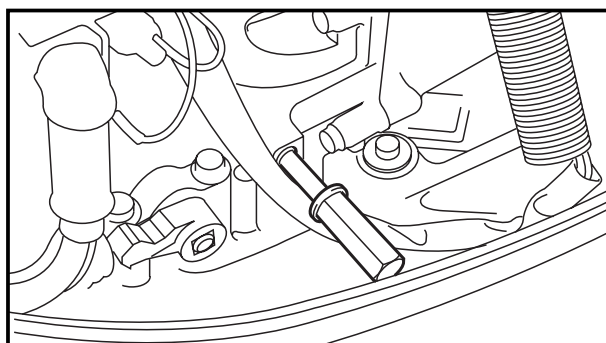
Step	Procedure/Part name	Q'ty	Service points
⑪	Stator	1	
⑫	Bolt	2	(5/16" Tool)
⑬	Brush set	2	
⑭	Spring	2	
⑮	Nut	2	1/4" (7/16" Tool)
⑯	Brush set	1	
⑰	Spring	2	
⑱	Brush holder	1	
Reverse the disassembly steps for assembly.			

**SERVICE POINTS****Starting motor removal**

1. Disconnect:
 - Starting motor leads

NOTE:

When disconnect the starting motor lead, use SAE regulation wrench.



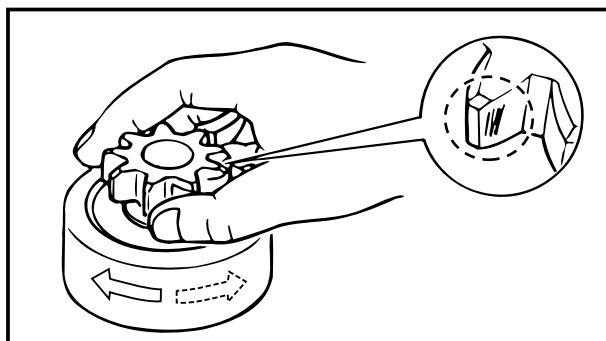
2. Remove:
 - Mount bolts (starting motor)

Pinion inspection

1. Inspect:
 - Pinion teeth
Damage/wear → Replace.
2. Check:
 - Clutch movement
Incorrect → Replace.

NOTE:

Rotate the pinion clockwise to check that it moves freely. Also, rotate the pinion counterclockwise to make sure that it locks.

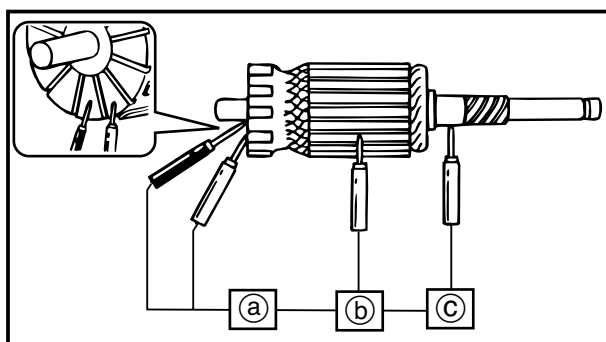
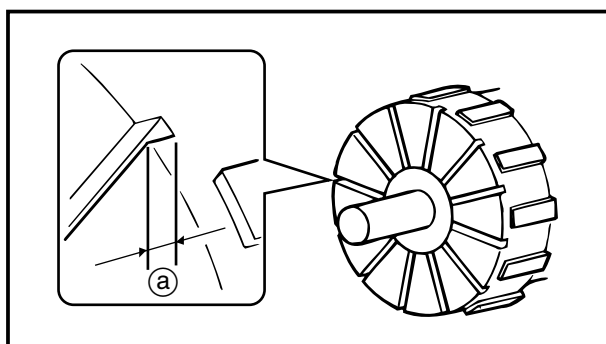
**Armature inspection**

1. Measure:
 - Commutator undercut (a)
Out of specification → Replace.

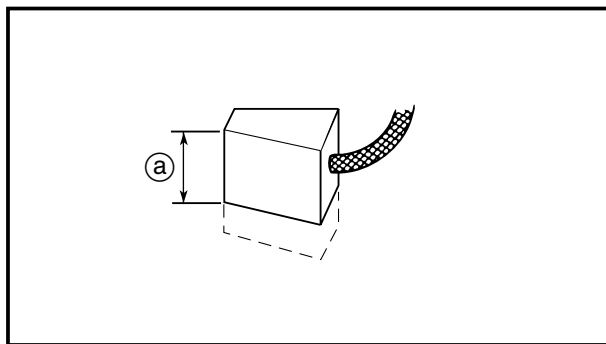
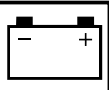


Commutator undercut limit
0.8 mm (0.03 in)

2. Check:
 - Armature coil continuity
Out of specification → Replace.

**Armature coil continuity:**

Commutator segments (a)	Continuity
Segment-Armature core (b)	No continuity
Segment-Armature shaft (c)	No continuity

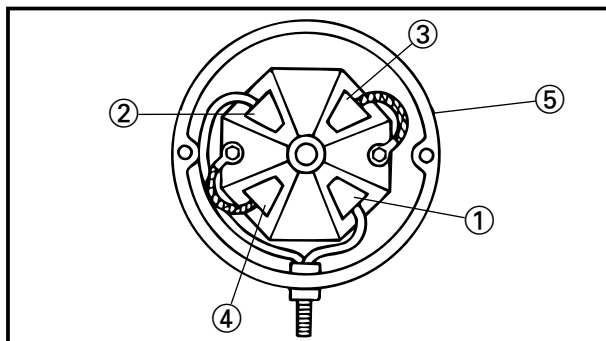
**Brush holder inspection**

1. Measure:

- Brush length (a)
Out of specification → Replace.



Brush length limit:
6.4 mm (0.25 in)

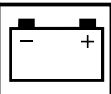


2. Check:

- Brush unit continuity
Out of specification → Replace.

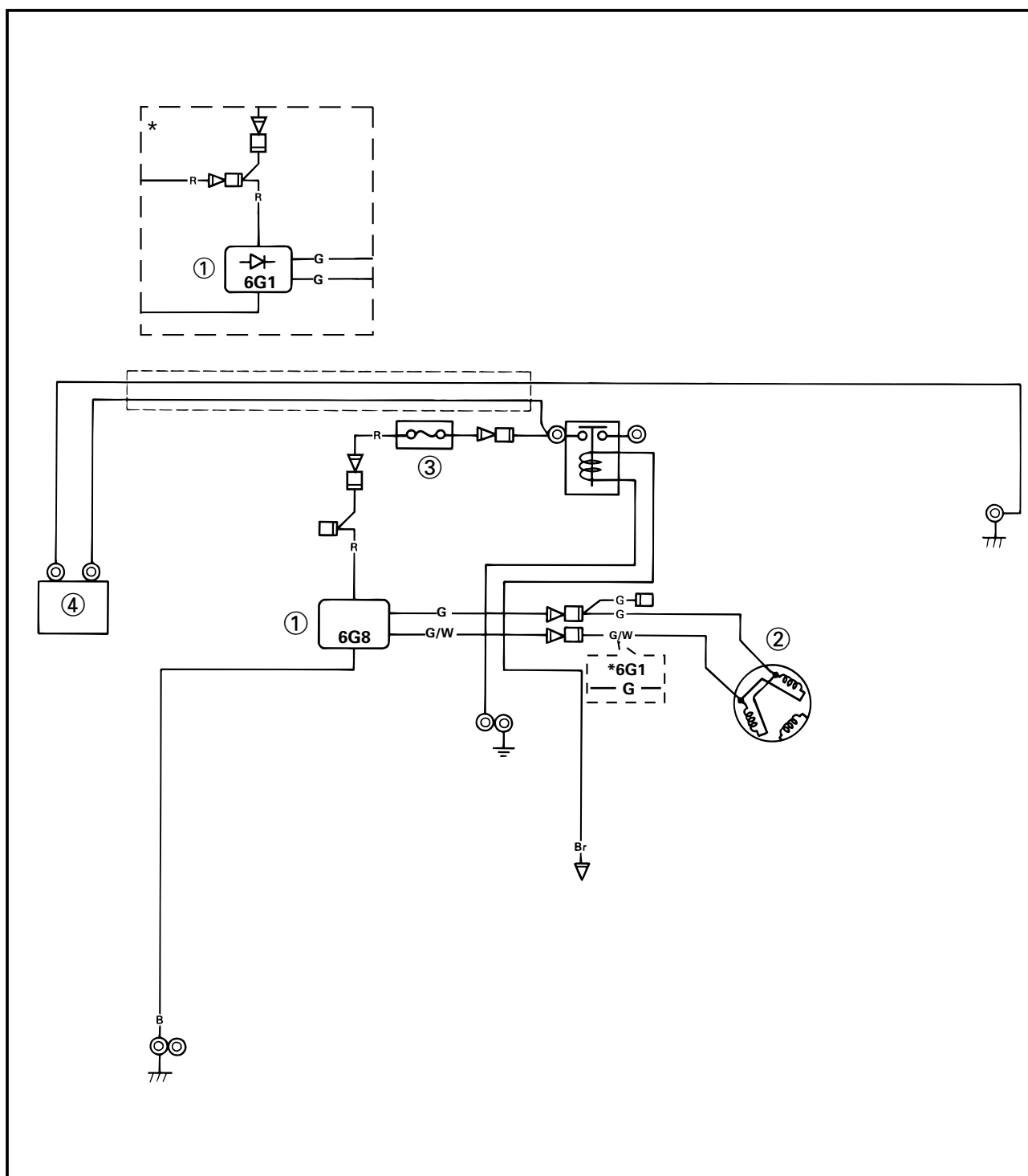
**Brush unit continuity:**

Brush ①-Brush ②	Continuity
Brush ③-Brush ④	Continuity
Brush ①, ②-Bracket ⑤	No continuity
Brush ③, ④-Bracket ⑤	Continuity



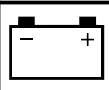
CHARGING SYSTEM (AEH)

WIRING DIAGRAM



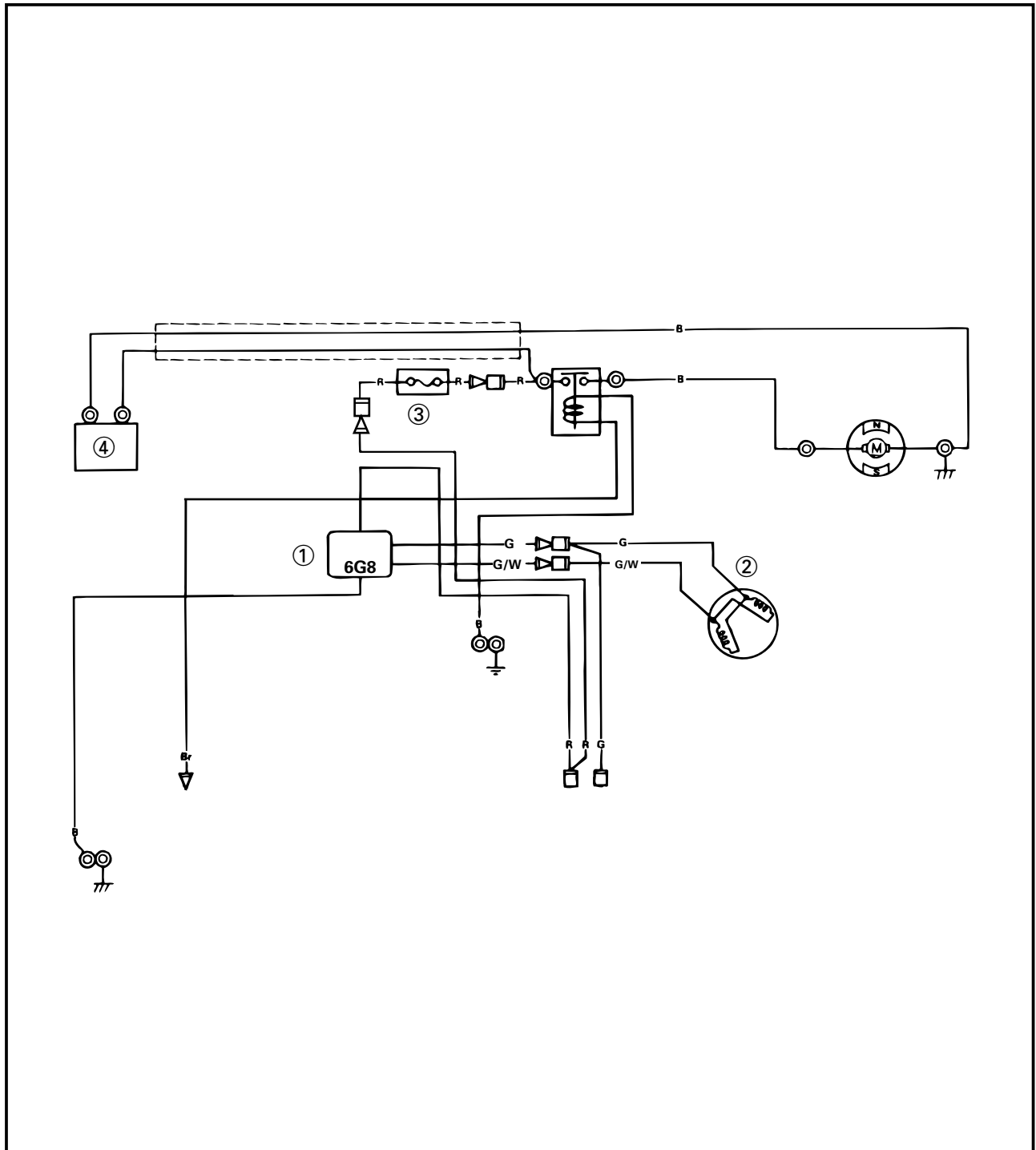
- ① Rectifier regulator
(For USA : 6G8)
*Rectifier (For Europe : 6G1)
- ② Lighting coil
- ③ Fuse
- ④ Battery

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



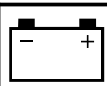
CHARGING SYSTEM (AE)

WIRING DIAGRAM

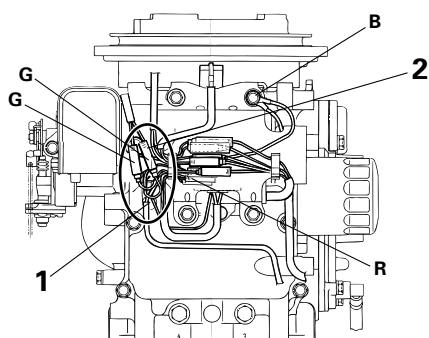


- ① Rectifier regulator
(For Europe : 6G8)
- ② Lighting coil
- ③ Fuse
- ④ Battery

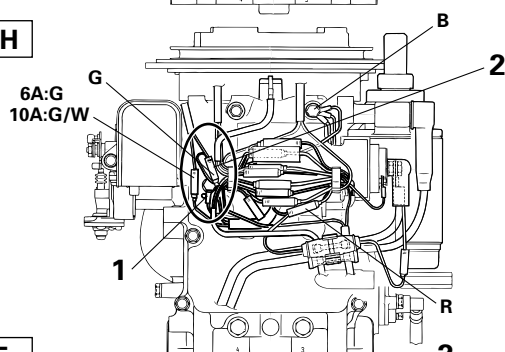
B :Black
 L :Blue
 Br :Brown
 G :Green
 W :White
 R :Red
 G/W :Green/White



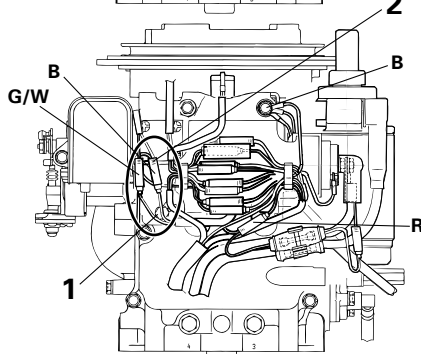
AMH



AEH



AE



SERVICE POINTS

CHARGING SYSTEM PEAK VOLTAGE

1. Measure:

- Rectifier-regulator output peak voltage
Excessively over specification → Replace.
Excessively below specification → Check the lighting coil.

6A model

Output peak voltage: R-B				
r/min	Cranking		1,500	3,500
	+	*	+	*
V	6.0	—	20	46

+ : Circuit

* : Loaded

10A model

Output peak voltage: R-B				
r/min	Cranking		1,500	3,500
	+	*	+	*
V	6.0	—	20	46

+ : Circuit

* : Loaded

2. Measure:

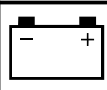
- Lighting coil output peak voltage
Below specification → Replace.

6A model

Output peak voltage: G-G				
r/min	Cranking		1,500	3,500
	+	*	+	*
V	6.5	6.0	21	46

+ : Circuit

* : Loaded



10A model

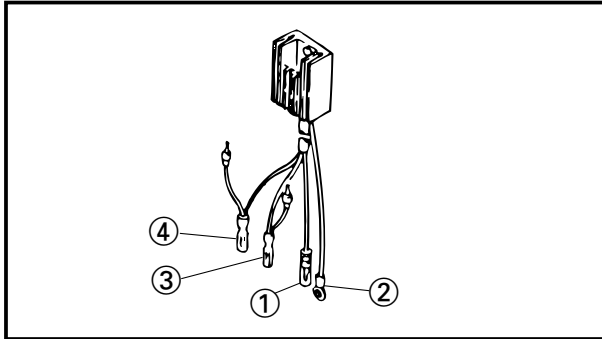


Output peak voltage:
G-G/W

r/min	Cranking		1,500	3,500
	+	*	+	*
V	6.5	6.0	21	46

+ : Circuit

* : Loaded



RECTIFIER REGULATOR (AMH), (For Europe)

1. Measure:

- Continuity and resistance
- Out of specification → Replace.



Yamaha pocket tester:
YU-03112/90890-03112

Measurement steps:

- Select the function switch of digital tester to Diode inspection mode.
- Measure the voltage drop.

6J8

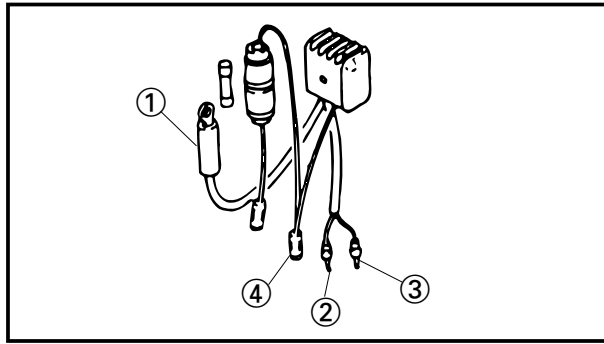
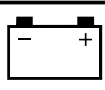
Unit:Ω

Tester ⊖ Tester	⊕	① Red	② Black	③ Green	④ Green/ White
① Red			∞	∞	∞
② Black		100		30	30
③ Green		30	∞		∞
④ Green/White		30	∞	∞	

∞: No continuity

NOTE: _____
Digital tester can not be used for this inspection.

* Measured value is not affected by tester leads connection.

**RECTIFIER (AEH), (For Europe)**

1. Measure:

- Continuity

Out of specification → Replace.



Yamaha pocket tester:
YU-03112/90890-03112

6G1

Tester ⊖ ⊕	① Black	② Green	③ Green	④ Red
① Black		∞	○	○
② Green	∞		○	∞
③ Green	∞	∞		∞
④ Red	○	○	○	

NOTE:

Digital tester can not be used for this inspection.

○: Continuity

∞: No continuity

* Measured value is not affected by tester leads connection.

RECTIFIER REGULATOR (AEH, AE)

1. Measure:

- Continuity and resistance

Out of specification → Replace.



Yamaha pocket tester:
YU-03112/90890-03112

6G8

Unit:Ω

Tester ⊖ ⊕	① Red	② Black	③ Green	④ Green/White
① Red		∞	∞	∞
② Black	100		30	30
③ Green	30	∞		∞
④ Green/White	30	∞	∞	

∞: No continuity

NOTE:

Digital tester can not be used for this inspection.

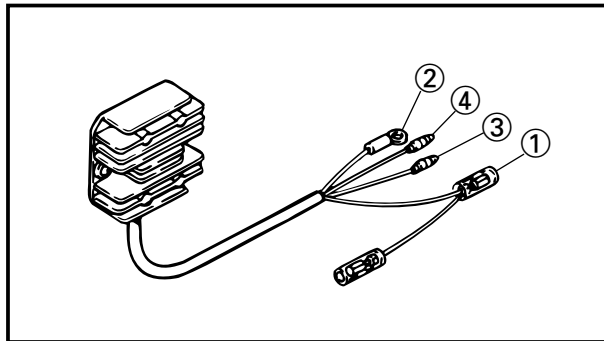
* Measured value is not affected by tester leads connection.

FUSE

Refer to "STARTING SYSTEM".

BATTERY

Refer to "GENERAL" in the chapter 3.



CHAPTER 9

TROUBLE-ANALYSIS

TROUBLE ANALYSIS.....

9-1

TROUBLE ANALYSIS CHART

9-1

TROUBLE ANALYSIS

NOTE:

The following items should be checked before the "Trouble analysis" chart is consulted.

- 1.The battery is charged and its specified 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 attached to the engine stop switch.
- 5.The shift position is in neutral.
- 6.Fuel is reaching the carburetor.
- 7.The rigging and engine settings are correct.
- 8.The engine is free from any "Hull problem".

TROUBLE ANALYSIS CHART

Trouble mode										Check elements	
ENGINE WILL NOT START	ROUGH IDLING	ENGINE STALLS	ENGINE WILL NOT STOP	POOR PERFORMANCE	OVERHEATING	LOOSE STEERING	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference Chapter
										FUEL SYSTEM	
☐		☐		☐						Fuel hose	4
☐				☐						Fuel joint	4
☐	☐			☐						Fuel filter	4
☐				☐						Fuel pump	4
☐	☐			☐						Carburetor	4
	☐	☐		☐						• Idle speed	3
	☐	☐		☐	☐					• Pilot screw*	*
☐	☐	☐		☐	☐					• Pilot jet	3
		☐		☐						Throttle cable	3
										POWER UNIT	
☐	☐	☐	☐		☐					Spark plugs	3
☐	☐			☐						Compression	3
☐										Timing belt	5
☐										Valve clearance	3
☐	☐			☐						Intake and exhaust valves	5
☐	☐			☐						Intake and exhaust valve seat	5
☐	☐									Cylinder head gasket	5
☐				☐						Piston rings	5
☐				☐						Piston	5
					☐					Thermostat	5
					☐					Water passage	5

*Except for USA

Trouble mode										Check elements	
ENGINE WILL NOT START	ROUGH IDLING	ENGINE STALLS	ENGINE WILL NOT STOP	POOR PERFORMANCE	OVERHEATING	LOOSE STEERING	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference Chapter
										LOWER UNIT	
☐							☐			Neutral position	6
☐							☐			Clutch	6
☐							☐			Gear	6
				☐	☐					Water inlet	6
				☐	☐					Water pump	6
				☐						Propeller shaft	6
							☐			Shifter/Pin	6
							☐			Shift cam	6
							☐			Shift rod	6
							☐			Lower case	6
				☐						Shim adjustment	6
										BRACKET UNIT	
						☐				Bracket	7
						☐				Mount rubber	7
										Shift actuator	7
						☐				Steering friction	7
										ELECTRICAL	
☐	☐	☐		☐						Ignition coil	8
☐			☐							Starting system	8
	☐	☐		☐				☐		Ignition control system	8
☐	☐	☐		☐					☐	Charging system	8

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