YAMAHA

Marine

Outboards

148

USA, CANADA

9.9V, 15V

SERVICE MANUAL

LIT-18616-01-65

A20000-0

NOTICE

This manual has been prepared by the Yamaha Motor Company 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*

9.9F, 15F
SERVICE MANUAL

1st Edition, May 1996

P/N LIT-18616-01-65

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 complied 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/Damage → Replace.

To assist you to find your way about this manual, the Section Title and Major Heading is given at the head of every page.

On the first page of each Section is an Index of that section's contents.

MODEL INDICATION

Multiple models are shown in this manual. These indications are noted as follows.

Model name	9.9F	15F
USA and CANADA name	9.9MH, 9.9EH, 9.9ER	15MH, 15EH
Indication	9.9	15

THE ILLUSTRATIONS

Some illustrations in this manual may differ from the model you have. This is because a procedure described may relate to several models, though only one may be illustrated. (The name of model described will be mentioned in the description).

REFERENCES

These have been kept to a minimum; however, when you are referred to another section of the manual, you are told the page number to go to.

HOW TO READ DESCRIPTIONS

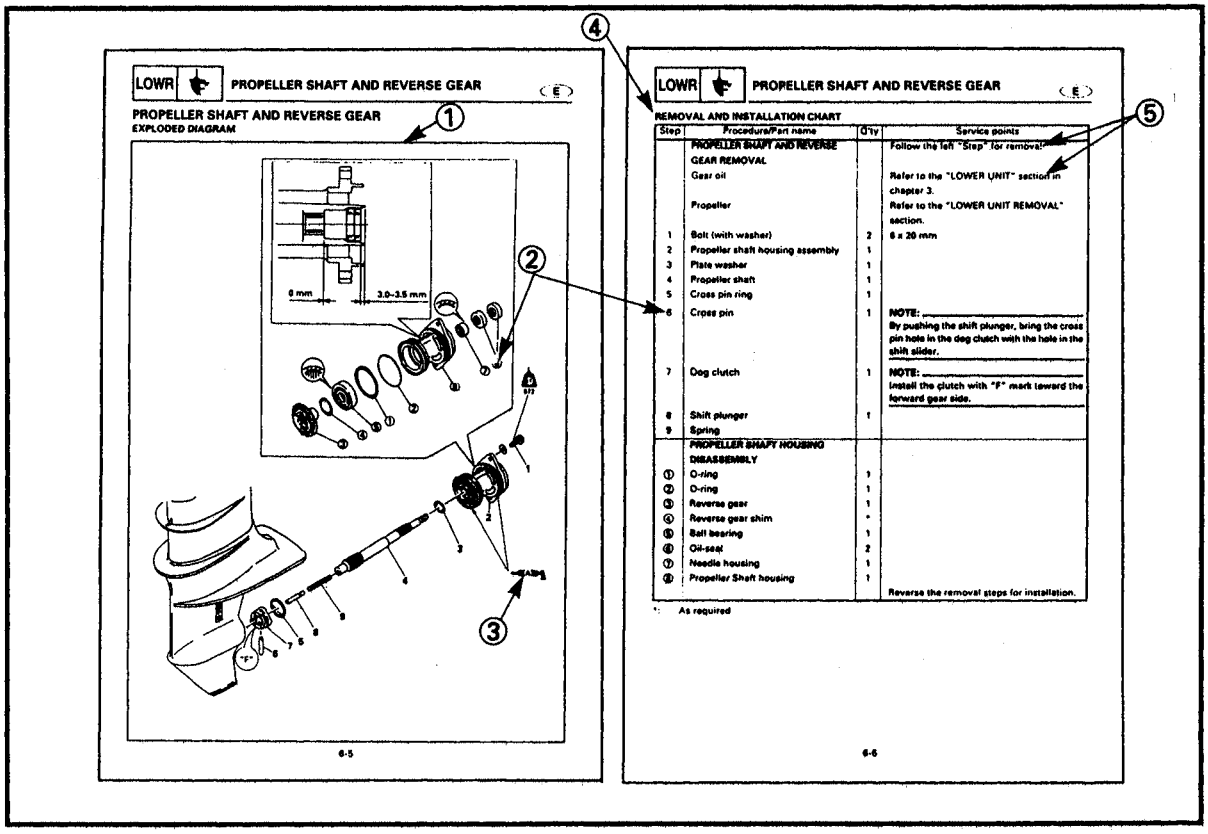
1. A disassembly installation job mainly consists of the exploded diagram ①.

2. The numerical figures represented by the number ② indicates the order of the job steps.

3. The symbols represented by the number ③ indicates the contents and notes of the job. For the meanings of the symbols, refer to the next page(s).

4. The REMOVAL AND INSTALLATION CHART ④ is attached to the exploded diagram and explains the job steps, part names, notes for the jobs, etc.

5. The SERVICE POINTS, other than the exploded diagram, explains in detail the items difficult to explain in the exploded diagram or REMOVAL AND INSTALLATION CHART, the Service points requiring the detailed description ⑤ ,etc.



WARNINGS, CAUTIONS AND NOTES

Attention is drawn to the various Warnings, Cautions and Notes which distinguish important information in this manual in the following ways.

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

⚠WARNING

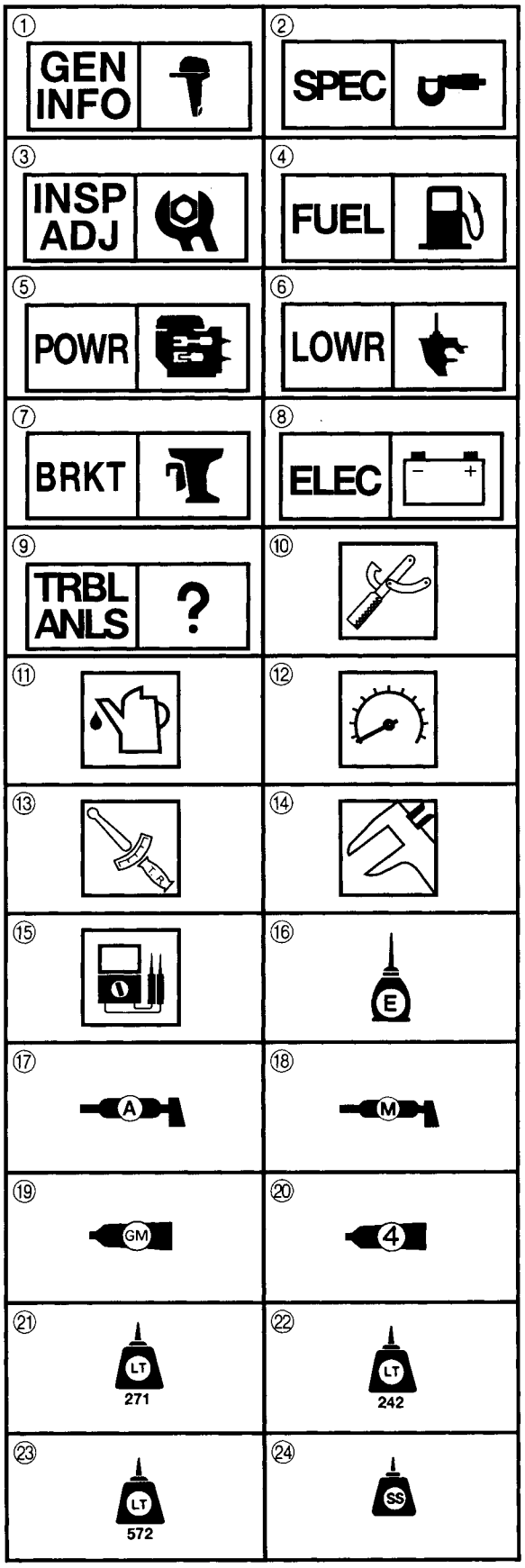
Failure to follow WARNING instructions could result in severe injury or death to the machine operator, a bystander, or a person inspecting or repairing the outboard motor.

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.



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 valve
[Resistance (Ω), Voltage (V), Electric current (A)]

Symbol ⑯ to ⑱ in an exploded diagram indicate grade of lubricant and location of lubrication point:

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

Symbols ⑲ to ㉔ in an exploded diagram indicate grade of sealing or locking agent, and location of application point:

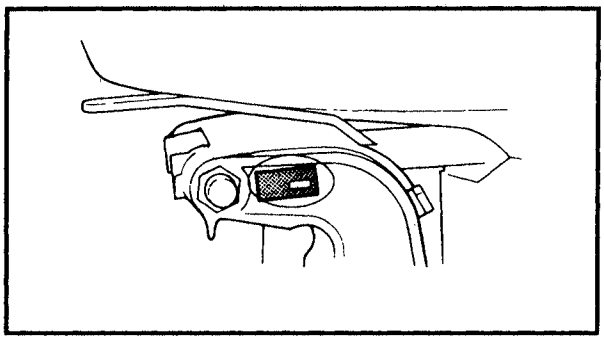
⑲ Apply Gasket Maker®
⑳ Apply Yamabond #4 (Yamaha bond No. 4)
㉑ Apply LOCTITE® No. 271 (Red LOCTITE)
㉒ Apply LOCTITE® No. 242 (Blue LOCTITE)
㉓ Apply LOCTITE® No. 572
㉔ Apply Silicon sealant

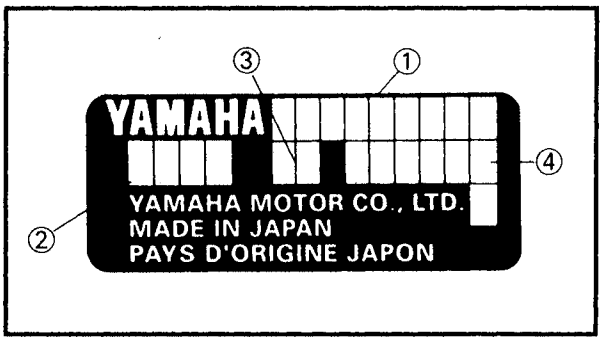
NOTE:

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

INDEX

CHAPTER 1
GENERAL INFORMATION





IDENTIFICATION

SERIAL NUMBER

The serial number of the outboard motor is stamped on the label 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 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 cracks across the serial number.

① Model name
② Approved model No.
③ Transom height
④ Serial number

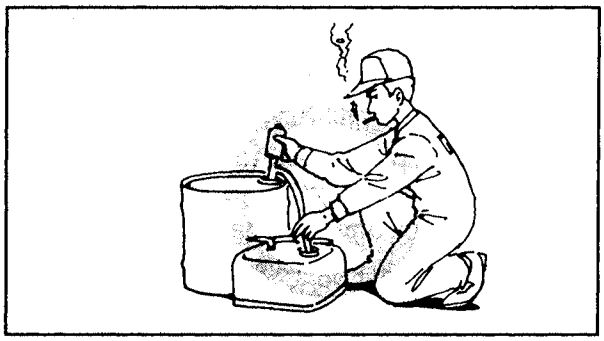
STARTING SERIAL NUMBERS

The starting serial number blocks are as follows:

Model		Approved model code	Starting serial No.
World-wide	USA, CANADA		
9.9FMH	9.9MH	682C	S: 155562~ L: 455181~ SUL: 850196~
9.9FEMH	9.9EH		S: 700301~ L: 600791~ SUL: 900141~
9.9FEMHR	—		S: 630246~ L: 660183~
9.9FEMR	9.9ER		L: 690256~
15FMH	15MH	684C	S: 405497~ L: 153352~ SUL: 830146~
15FEMH	15EH		S: 300231~ L: 600511~ SUL: 900131~
15FEMHR	—		S: 380261~ L: 650243~

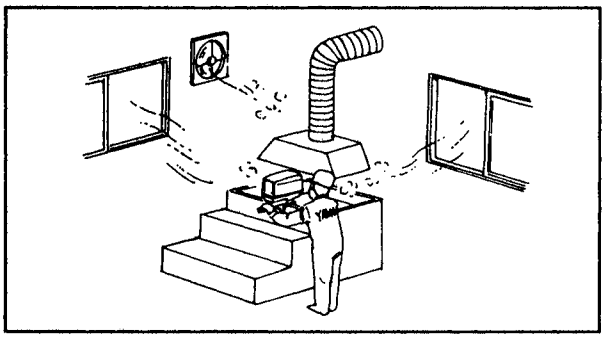
SAFETY WHILE WORKING

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



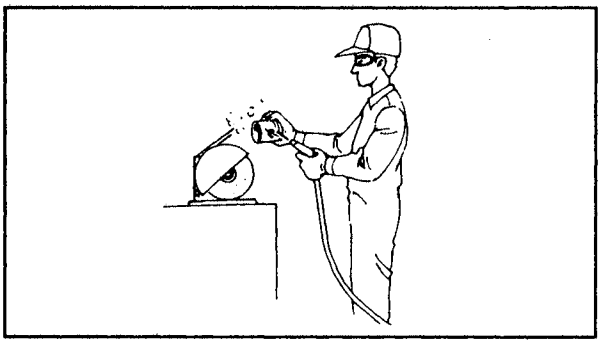
FIRE PREVENTION

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



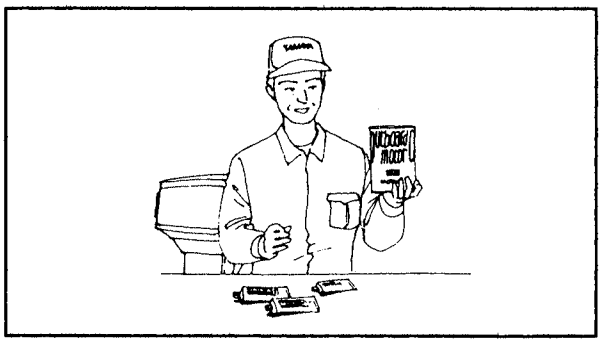
VENTILATION

Petroleum vapor is heavier than air and if inhaled in large quantities will not support life. Engine exhaust gases are harmful to breathe. When test-running an engine indoors, maintain good ventilation.



SELF-PROTECTION

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



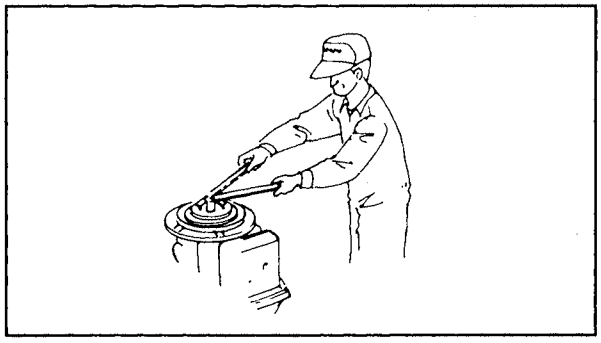
OILS, GREASES AND SEALING FLUIDS

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

SAFETY WHILE WORKING

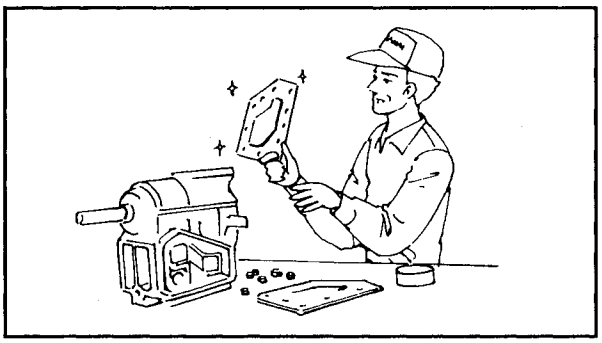
Under normal conditions of use, there should be no hazards from the use of the lubricants mentioned in this manual, but safety is all-important, and by adopting good safety practices, any risk is minimized. A summary of the most important precautions is as follows:

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 one's 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.

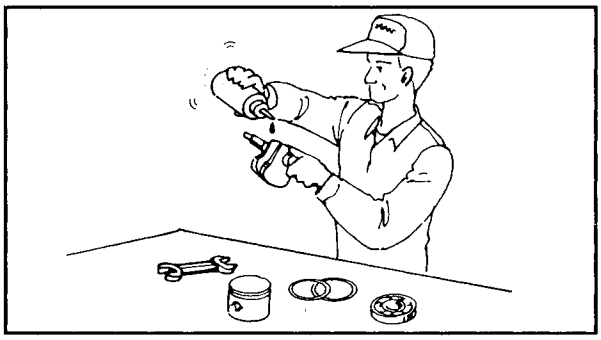


GOOD WORKING PRACTICES

1. **The right tools**
   Use the special tools that are advised to protect parts from damage. Use the right tool in the right manner – don't improvise.
2. **Tightening torque**
   Follow the torque tightening instructions. When tightening bolts, nuts and screws, tighten the larger sizes first, and tighten inner-positioned fixings before outer-positioned ones.



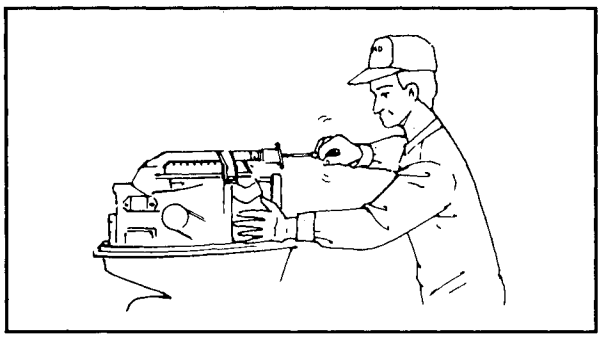
3. **Nonreusable items**
   Always use new gaskets, packings, O-rings, oil seals, split-pins and circlips etc. on reassembly.



DISASSEMBLY AND ASSEMBLY

1. Clean parts with compressed-air on disassembling them.

2. Oil the contact surfaces of moving parts on assembly.



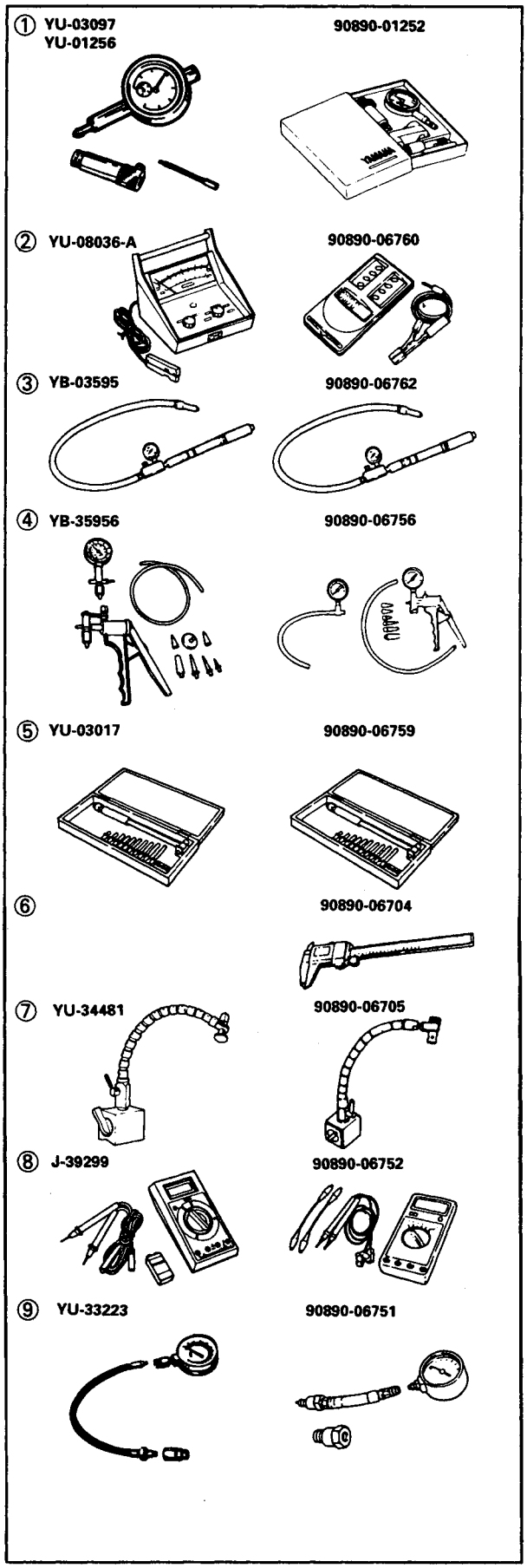
3. After assembly, check that moving parts operate normally.

4. Install bearings with the manufacturer's markings on the side exposed to view, and liberally oil the bearings.

CAUTION:

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

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.

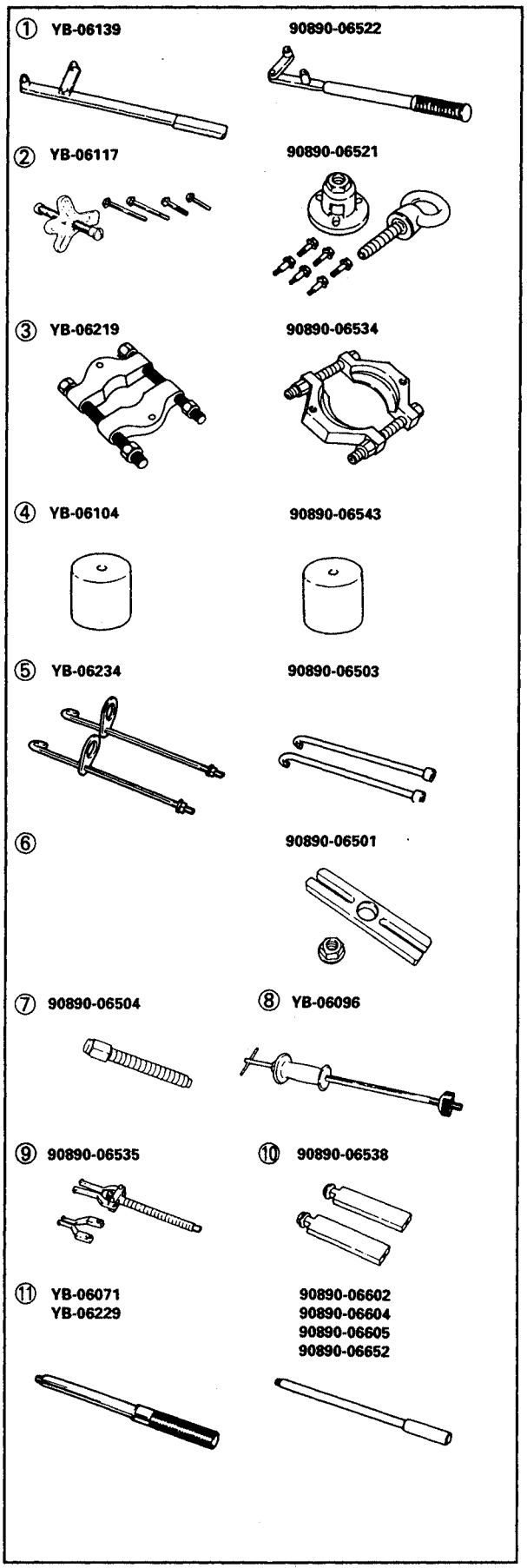
NOTE:

- 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. Dial gauge and stand
   P/N. YU-03097, YU-01256
   90890-01252
2. Tachometer
   P/N. YU-08036-A
   90890-06760
3. Pressure tester
   P/N. YB-03595
   90890-06762
4. Mity vac
   P/N. YB-35956
   90890-06756
5. Cylinder gauge set
   P/N. YU-03017
   90890-06759
6. Digital caliper
   P/N. 90890-06704
7. Magnet base
   P/N. YU-34481
   90890-06705
8. Digital multi meter
   P/N. J-39299
   90890-06752
9. Compression gauge
   P/N. YU-33223
   90890-06751

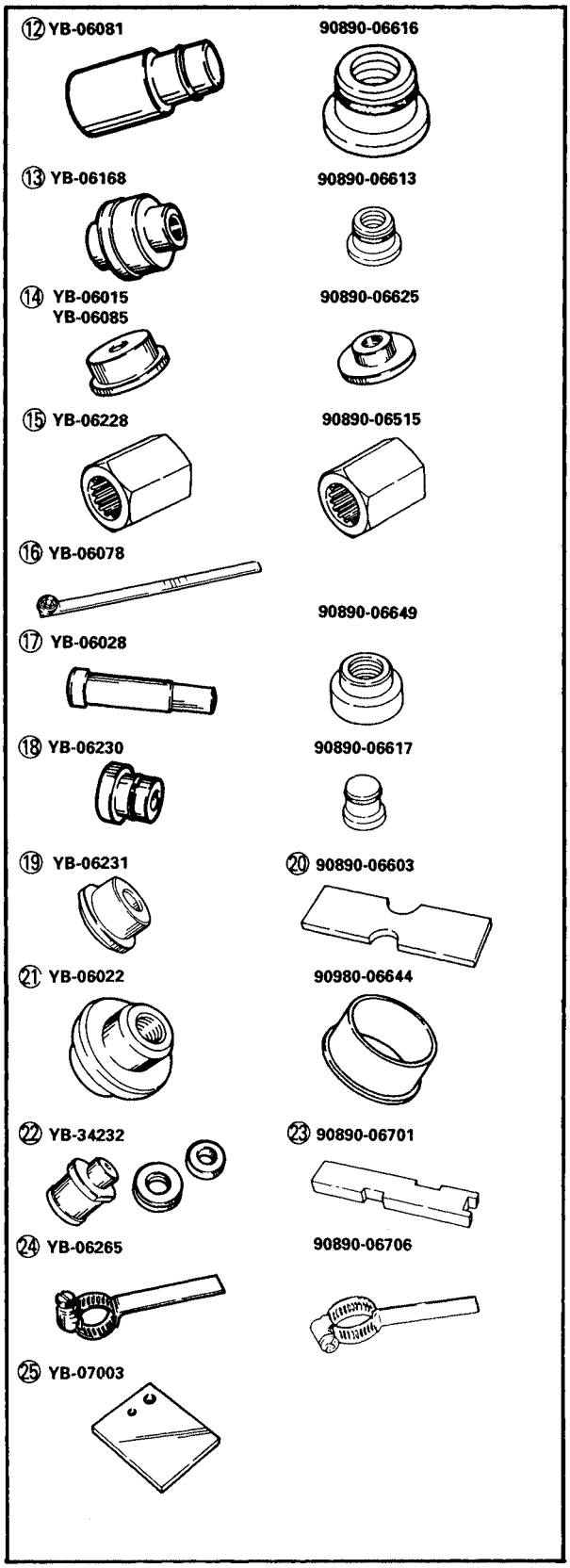
SPECIAL TOOLS



REMOVAL AND INSTALLATION

1. Flywheel holder
   P/N. YB-06139
   90890-06522
2. Flywheel puller
   P/N. YB-06117
   90890-06521
3. Bearing separator
   P/N. YB-06219
   90890-06534
4. Small end bearing needle installer
   P/N. YB-06104
   90890-06543
5. Bearing housing puller
   P/N. YB-06234
   90890-06503
6. Stopper guide plate
   (Propeller shaft housing,
   Reverse gear bearing)
   P/N. 90890-06501
7. Center bolt (Propeller shaft housing)
   P/N. 90890-06504
8. Slide hammer set (Reverse gear bearing)
   P/N. YB-06096
9. Bearing puller (Reverse gear bearing)
   P/N. 90890-06535
10. Stopper guide stand (Reverse gear bearing)
    P/N. 90890-06538
11. Driver rod
    P/N. YB-06071, YB-06229
    90890-06602, 90890-06604,
    90890-06605, 90890-06652

SPECIAL TOOLS



12. Needle bearing attachment
    (Propeller shaft)
    P/N. YB-06081
    90890-06616
13. Oil seal installer (Propeller shaft)
    P/N. YB-06168
    90890-06613
14. Bearing installer
    P/N. YB-06015, (Reverse gear)
    YB-06085 (Forward gear)
    90890-06625 (Forward gear)
15. Drive shaft holder
    P/N. YB-06228
    90890-06515
16. Pinion nut holder
    P/N. YB-06078
17. Bushing attachment
    (Drive shaft housing)
    P/N. YB-06028
    90890-06649
18. Needle bearing attachment
    (Drive shaft)
    P/N. YB-06230
    90890-06617
19. Driver shaft needle bearing depth stop
    P/N. YB-06231
20. Bearing depth plate
    90890-06603
21. Bearing installer
    P/N. YB-06022 (Drive shaft oil seal)
    90980-06644 (Forward gear)
22. Pinion height gauge
    P/N. YB-34232
23. Shimming plate
    P/N. 90890-06701
24. Backlash indicator
    P/N. YB-06265
    90890-06706
25. Backlash adjusting plate
    P/N. YB-07003

CHAPTER 2
SPECIFICATIONS

GENERAL SPECIFICATIONS

Item		Unit	9.9	15
DIMENSION:				
Over-all Length		mm (in)	873 (34.4)	
Over-all Width		mm (in)	332 (13.1)	
Over-all Height	S	mm (in)	1040 (40.9)	
	L	mm (in)	1167 (45.9)	
	SUL	mm (in)	1309 (51.5)	
WEIGHT:				
Weight (Al.)	S	kg (lb)	36 (79.4)	
	L	kg (lb)	37.5 (82.7)	
	SUL	kg (lb)	39 (86.0)	
PERFORMANCE:				
Full Throttle Operating Range		r/min	4500~5500	
Output (ISO)		kW (hp)/ at r/min	7.4 (9.9) / 5000	11.2 (15) / 5000
Maximum Fuel Consumption		L (US gal , Imp gal)/h at r/min	5.1 (1.35,1.12) at 5500	7.3 (1.93,1.61) at 5500
ENGINE:				
Type			2 stroke - L	
Cylinders			2	
Total Displacement		cm^3 (cu. in)	246 (15.01)	
Bore X Stroke		mm (in)	56.0 x 50.0 (2.20 x 1.97)	
Compression Ratio			6.80	
Carburetor Quantity			1	
Intake System			Reed Valve	
Induction System			Loop Charge	
Starting System			MH Manual	EMH (EH), EMHR, EMR (ER) Manual & Electric
Control system			MH, EMH (EH) Tiller control	EMHR Tiller & Remote control / EMR (ER) Remote control
Ignition System			CDI	
Alternator Output			MH 12 - 80W	EMH (EH),EMHR 12 - 6A
Enrichment System			Choke Valve	
Advance Type			Mecanical	
Spark Plug	(NGK)		B7HS-10 BR7HS-10	
Exhaust System			Through Prop Boss	
Cooling System			Water	
Lubrication System			Pre-Mixed Fuel & Oil	
FUEL AND OIL:				
Fuel Type			Reguler Gasoline	
Engine Oil Type / Grade			2 stroke outboard motor oil / TC-W3	
Gear Oil Type			Hypoid Gear Oil-SAE#90	
Gear Oil Quantity		cm^3 (US oz, Imp oz)	250 (8.45,8.80)	
Mixing Ratio			100:1(JPN/GEN 50:1)	

GENERAL SPECIFICATIONS

Item	Unit	9.9	15
BRACKET:			
Tilt Angle	degrees	8,12,16,20	
Tilt-up Angle	degrees	67	
Shallow Water Crushing Angle	degrees	30,36	
Steering Angle	degrees (left+right)	45+40	
DRIVE UNIT:			
Gear Shift Position		F-N-R	
Gear Ratio		2.08 (27/13)	
Gear Type		Spiral Bevel Gear	
Clutch Type		Dog clutch	
Propeller Direction		Clockwise	
Propeller Drive System		Spline	
Propeller Series Mark		J	
ELECTRICAL:		MH	EMH (EH), EMHR, EMR (ER)
Battery Capacity	Ah (kC)	–	40 (144)
Cold Cranking	Amps	–	210

MAINTENANCE SPECIFICATIONS

ENGINE

Item		Unit	9.9	15
CYLINDER HEAD:				
Warpage limit		mm (in)	0.1 (0.004)	
CYLINDER:				
Bore size		mm (in)	56.00~56.02 (2.205~2.206)	
Wear limit		mm (in)	56.1 (2.21)	
Taper limit		mm (in)	0.08 (0.003)	
Out of round limit		mm (in)	0.05 (0.002)	
PISTON:				
Piston clearance		mm (in)	0.035~0.040 (0.0014~0.0016)	
Limit		mm (in)	0.090 (0.0035)	
Diameter	D	mm (in)	55.940~55.985 (2.2024~2.2041)	
Measuring point	H	mm (in)	10 (0.39)	
Pin boss inside diameter		mm (in)	14.004~14.015 (0.5513~0.5518)	
Ring groove clearance	top	mm (in)	0.02~0.06 (0.001~0.002)	
	2nd	mm (in)	0.04~0.08 (0.002~0.003)	
Over size diameter	1st*1	mm (in)	56.25 (2.215)	
	2nd	mm (in)	56.50 (2.224)	
PISTON PIN:				
Diameter		mm (in)	13.996~14.000 (0.5510~0.5512)	
PISTON RING: 1st				
Type			Keystone	
Dimensions	(B x T)	mm (in)	2.0x2.5 (0.08x0.10)	
End gap	(installed)	mm (in)	0.15~0.35 (0.006~0.014)	
Limit		mm (in)	0.55 (0.022)	
PISTON RING: 2nd				
Type			Barrel	
Dimensions	(B x T)	mm (in)	2.0x2.5 (0.08x0.10)	
End gap	(installed)	mm (in)	0.15~0.35 (0.006~0.014)	
Limit		mm (in)	0.55 (0.022)	
CONNECTING ROD:				
Small end diameter		mm (in)	18.000~18.011 (0.7087~0.7091)	
CRANK SHAFT:				
Crank width	A	mm (in)	46.90~46.95 (1.846~1.848)	
	B	mm (in)	25.90~26.10 (1.020~1.028)	
Runout limit	D	mm (in)	0.03 (0.001)	
Big end side clearance	E	mm (in)	0.30~0.80 (0.012~0.031)	
Maximum small end axial play	F	mm (in)	2.0 (0.08)	
THERMOSTAT:				
Opening temperature		°C (°F)	48~52 (118~126)	
Full-opening temperature		°C (°F)	60 (140)	
Valve lift		mm (in)	3 (0.12)	
REED VALVE:				
Valve stopper height		mm (in)	0.7±0.1 (0.03±0.00)*2 1.3±0.1 (0.05±0.00)*3	6.0±0.1 (0.24±0.00)
Valve warpage limit		mm (in)	0.2 (0.01)	

*1: Except for USA

*2: Except for Europe

*3: For Europe

MAINTENANCE SPECIFICATIONS

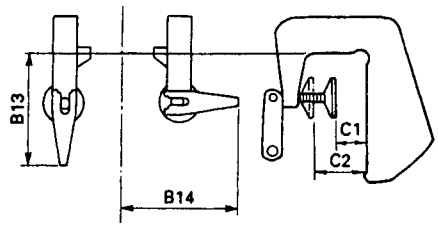
Item		Unit	9.9	15
CARBURETOR:				
Identification mark			63V00	
Float height		mm (in)	14.0±1.5 (0.55±0.06)	
Valve seat size		mm (in)	1.2 (0.05)	
Main jet	(M.J.)	#	110	
Main nozzle	(M.N.)	mm (in)	3.0 (0.12)	
Main air jet	(M.A.J.)	#	120	
Pilot jet	(P.J.)	#	48	
Pilot air jet	(P.A.J.)	#	75	
Pilot screw	(P.S.)	turns out	1-1/2±1/4	
ENGINE SPEED:				
Idle speed		r/min	750±50	
Trolling speed		r/min	650±50	
RECOIL STARTER:				
Starter rope length		mm (in)	1800 (70.9)	

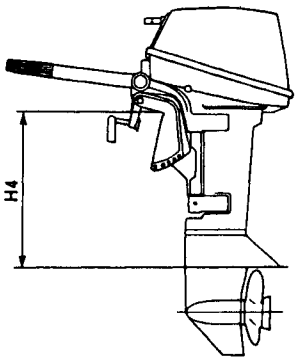
LOWER

Item	Unit	9.9	15
GEAR BACKLASH:			
Pinion - Forward	mm (in)	0.19~0.86 (0.007~0.034)	
Pinion - Reverse	mm (in)	0.95~1.65 (0.037~0.065)	
Pinion shims	mm	1.13,1.2	
Forward shims	mm	0.10,0.12,0.15,0.18,0.30,0.40,0.50	
Reverse shims	mm	0.1,0.2,0.3,0.4,0.5	
PROPELLER:			
Material		Aluminium	Dual thrust
Blade x Diameter x Pitch	in	3 x 9-1/4 x 8 - J	683-45947-12 00
		3 x 9-1/4 x 9 - J	3 x 9-3/4 x 8 - J
		3 x 9-1/4 x 9-3/4 - J	683-45949-12 01
		3 x 9-1/4 x 10-1/2 - J	3 x 9-3/4 x 6-1/2 - J
		3 x 9-1/4 x 12 - J	
		3 x 9-1/2 x 6-1/2 - J	
Test propeller (except for USA and Canada)		90890-01619	
	r/min	5000~5200	5200~5400
(for USA and Canada)		YB-01619	
	r/min	5000~5200	5200~5400

ELECTRICAL

Item		Unit	9.9	15
IGNITION SYSTEM:				
Ignition timing	(full retard)	degrees	A.T.D.C. 5±1	
	(full advanced)	degrees	B.T.D.C. 30±1	
Piston position	(full retard)	mm (in)	A.T.D.C. 0.12±0.04 (0.005±0.002)	
	(full advanced)	mm (in)	B.T.D.C. 4.22 +0.28 -0.27 (0.166 +0.011 -0.011)	
Pulser coil resistance		Ω(color)	352~528 (W/R-B)	
Charge coil resistance		Ω(color)	248~372 (Br-L)	
Ignition coil resistance				
	primary coil	Ω(color)	0.05~0.07 (B/W-B)	
	secondarily coil	kΩ(color)	1.68~2.52 (B/W-High tension cord)	
Spark plug gap		mm (in)	0.9~1.0 (0.035~0.039)	
Charging current	(minimum)	A at r/min	1.9~4.9/3000	
	(maximum)	A at r/min	4.7~7.7/5500	
STARTING SYSTEM:			MH	EMH (EH), EMHR, EMR (ER)
Fuse		V-A	—	12-20
Neutral switch	on	mm (in)	—	18.5~19.5 (0.73~0.77)
	off	mm (in)	—	19.5~20.5 (0.77~0.81)
STARTER MOTOR:			MH	EMH (EH), EMHR, EMR (ER)
Type			—	Bendix
Output		kW	—	0.4
Brush length		mm (in)	—	7.5 (0.30)
Wear limit		mm (in)	—	4.5 (0.18)
Commutator diameter		mm (in)	—	20.0 (0.79)
Limit		mm (in)	—	19.4 (0.76)
Clutch type			—	Over running
Rating		Sec.	—	30
CHARGING SYSTEM:				
Lighting coil resistance		Ω(color)	0.16~0.24 (G-G)	
Lighting voltage (minimum)		V at r/min	11.5/3000	
Lighting voltage (maximum)		V at r/min	14~17.5/5500	





DIMENSION

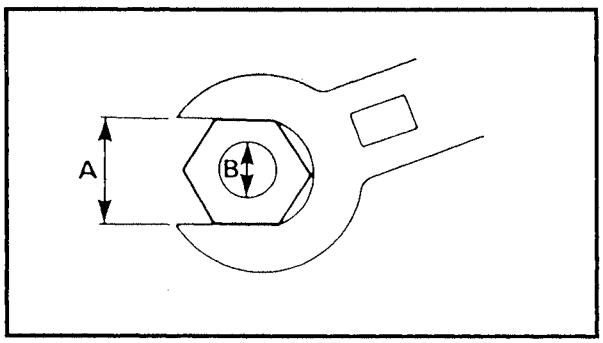
Symbol		Unit	9.9	15
H4	:S	mm (in)	440 (17.3)	
	:L	mm (in)	567 (22.3)	
	:SUL	mm (in)	709 (27.9)	
B13		mm (in)	134 (5.3)	
B14		mm (in)	133.5 (5.3)	
C1		mm (in)	31 (1.2)	
C2		mm (in)	64 (2.5)	

TIGHTENING TORQUE

SPECIFIED TORQUE

Part to tightened		Part name	Thread size	Q'ty	Tightening torque			Remarks
					Nm	m•Kg	ft•lb	
ENGINE:								
Flywheel		Nut	M12	1	105	10.5	75	E
Spark plug		Bolt	M14	2	25	2.5	18	
Cylinder head	1st	Bolt	M7	11	8	0.8	5.8	E
	2nd				17	1.7	12	
Exhaust cover	1st	Bolt	M6	13	6.0	0.6	4.3	
	2nd				12	1.2	8.7	
Crank case	1st	Bolt	M8	6	15	1.5	11	E
	2nd				30	3.0	22	
LOWER:								
Propeller		Nut	M10	1	17	1.7	12	
Pinion nut		Nut	M8	1	26	2.6	19	
BRACKET:								
Clamp bracket		Nut	7/8 UNF	2	13	1.3	9.4	
Upper rubber mounting		Nut	M8	2	21	2.1	15	
Lower front rubber mounting		Nut	M6	4	13	1.3	9.4	

Nut Ⓐ	Bolt Ⓑ	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

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 clamp	Inspection				O	–
FUEL SYSTEM:						
Fuel line	Inspection	O		O	O	3-2
Fuel filter	Cleaning	O	O	O		4-2
Carburetor	Cleaning	O	O	O		4-7
POWER UNIT:						
Water leakage	Inspection	O	O	O		–
Motor exterior	Inspection	O	O	O		–
Exhaust leakage	Inspection	O	O	O		–
Cooling water passage	Cleaning		O	O		–
CONTROL SYSTEM:						
Ignition timing	Inspection/Adjustment	O		O		3-2
Throttle link	Inspection/Adjustment				O	3-4
Throttle cable	Inspection/Adjustment				O	3-4
Start-in-gear protection	Inspection/Adjustment	O		O		3-5
Idle speed	Inspection/Adjustment	O		O		3-5
LOWER UNIT:						
Gear oil	Change	O		O		3-6
Lower unit leakage	Inspection				O	3-7
Propeller	Inspection	O	O	O		6-2
GENERAL:						
Anode	Inspection		O	O		3-7
Battery	Inspection	O	O	O		3-8
Spark plug	Cleaning/Adjustment/ Replacement	O	O	O		3-9
Wiring and connector	Adjustment/Reconnect	O	O	O		–
Bolts and nuts	Retightening	O	O	O		–
Grease points	Greasing			O		3-10

PERIODIC SERVICE
FUEL SYSTEM

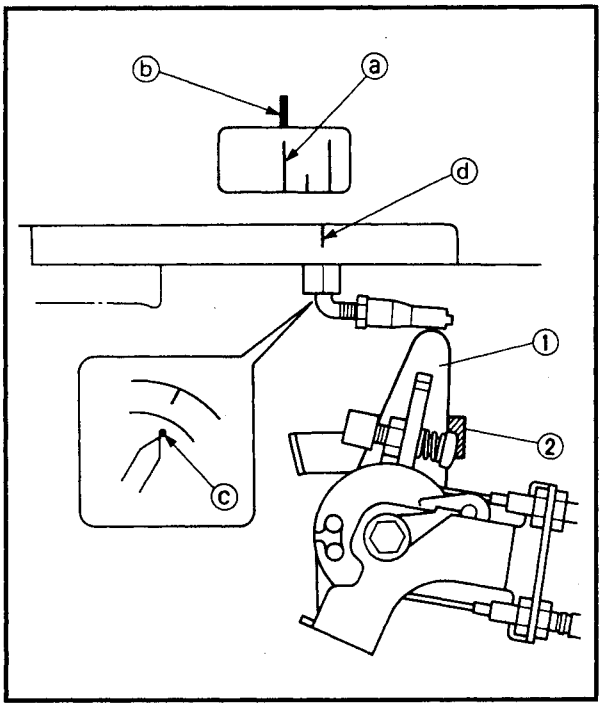
Fuel line

1. Inspect:
   - Fuel line
     Break/Leak/Damage → Replace.

CONTROL SYSTEM

Ignition timing adjustment

1. Check:
   - Fully advanced ignition timing
     Incorrect → Adjust.

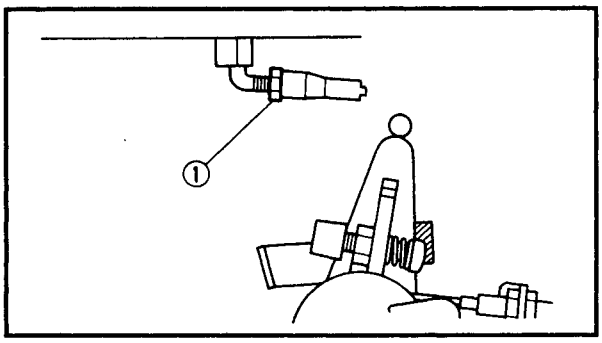


Checking steps:

- Turn the flywheel clockwise so that its specified marking ⓐ aligns with the starter cover marking ⓑ.

Fully advanced position:
30° BTDC

- Turn the magneto control lever ① so that it contacts the fully advanced stopper ②.
- Check the timing indicator ⓒ so that it aligns with the marking ⓓ on the flywheel.

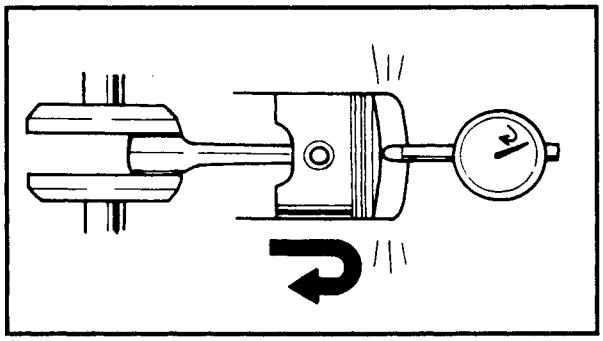


2. Adjust:
   - Link joint

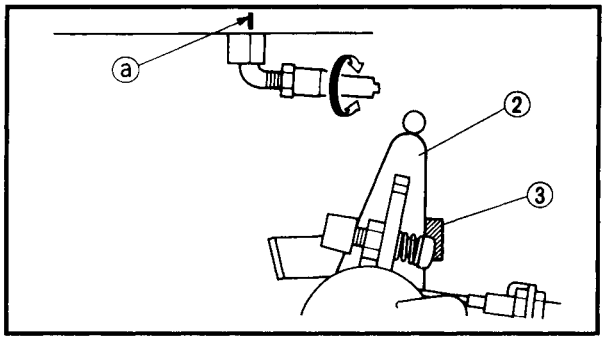
Adjustment steps:

- Loosen the lock nut ①.
- Disconnect the link joint from the magneto control lever.
- Remove the spark plug of No. 1 cylinder
- Attach the dial gauge to the spark plug hole.

Dial gauge:
YU-03097 / 90890-01252
Dial gauge stand:
YU-01256



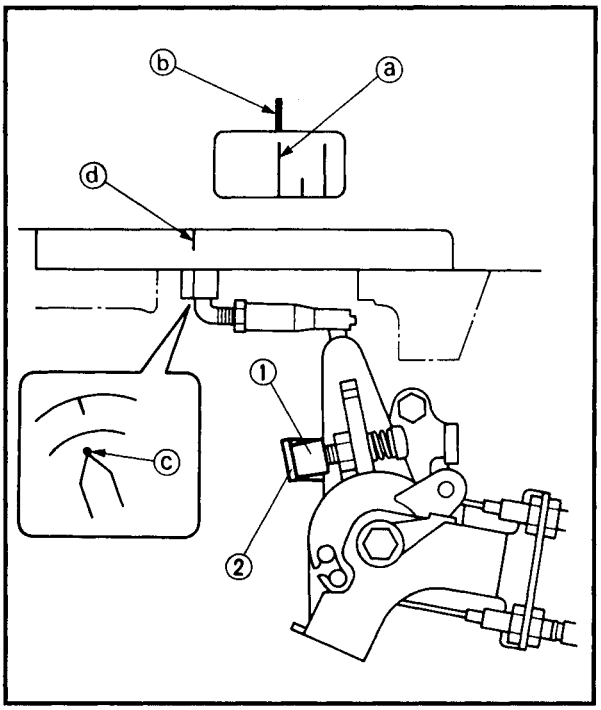
- Slowly turn the flywheel clockwise until the piston reaches top dead center (TDC).



- Set the dial gauge to zero at TDC.
- Turn the flywheel counterclockwise until the dial gauge indicates that the piston position is at a specified distance from TDC.

Piston position:
4.22 mm (0.166 in) BTDC

- Turn the magneto control lever ② so that it contacts the fully advanced stopper ③.
- Adjust the link joint length so that the timing indicator aligns with the marking ⓐ on the flywheel.
- Tighten the lock nut.

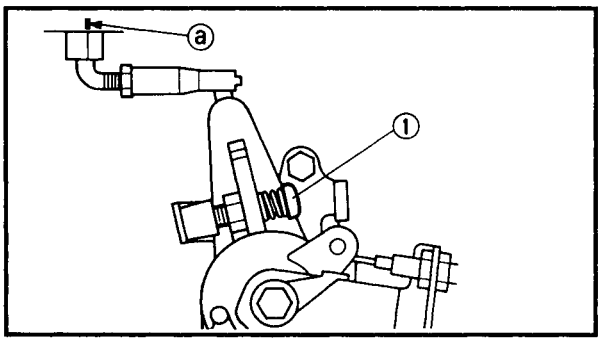


3. Check:
   - Fully retard ignition timing
     Incorrect → Adjust.

Checking steps:
- Turn the flywheel clockwise so that the its specified marking ⓐ aligns with the starter cover marking ⓑ.

Fully retard position:
5° ATDC

- Turn the magneto control lever so that the fully retard screw ① contacts the fully retard stopper ②.
- Check the timing indicator ⓒ so that it aligns with the marking ⓓ on the flywheel.

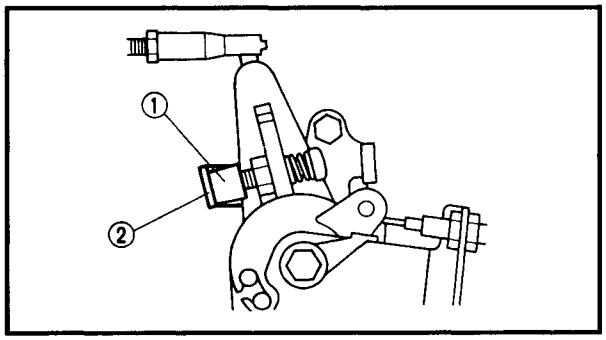


4. Adjust:
   - Fully retard screw

Adjustment steps:
- Turn the flywheel clockwise until the dial gauge indicates that the piston position is at specified distance from TDC.

Piston position:
0.12 mm (0.005 in) ATDC

- Turn the magneto control lever so that the fully retard screw contacts the fully retard stopper.
- Adjust the fully retard screw ① so that the timing indicator aligns with the marking ⓐ on the flywheel.



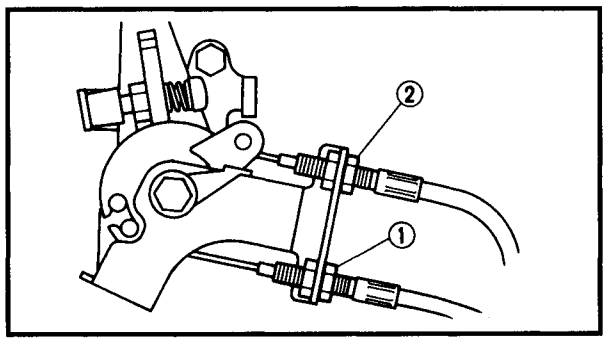
Throttle link adjustment

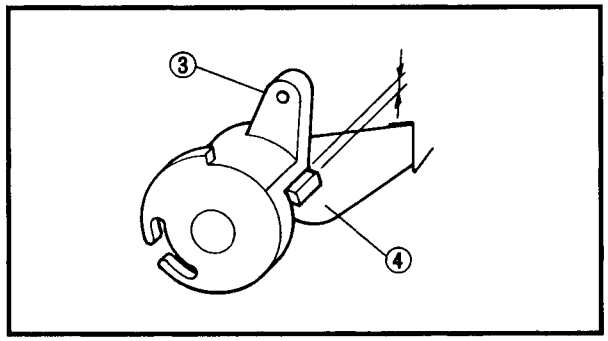
NOTE:

Before adjusting the throttle link, the ignition timing should be adjusted.

1. Inspect:
   - Fully closed position
     Incorrect → Adjust.

Checking steps:
- Close the throttle grip fully.
- Check the fully retard screw ① so that it contacts the fully retard stopper ②.



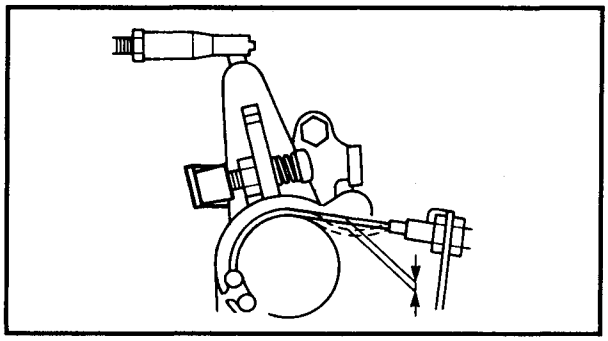


2. Adjust:
   - Throttle cable adjuster

Adjustment steps:
- Loosen the lock nuts ①,②.
- Turn the magneto control lever until the fully retard screw contacts the fully retard stopper.
- Adjust the throttle cable adjuster until there is specified free play between the stoppers of the pulley ③ and free acceleration lever ④.

Free play:
1 mm (0.04 in)

- Tighten the lock nut ①.



- Adjust the throttle cable adjuster until there is specified free play on the throttle cable.

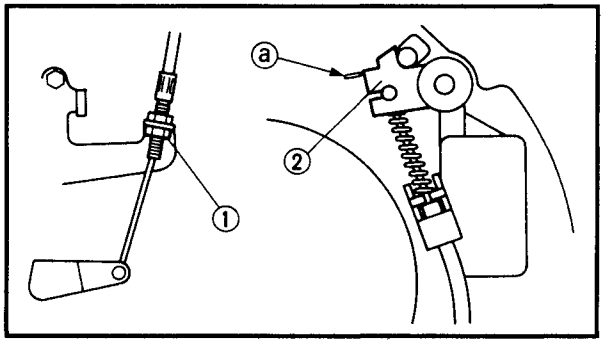
Free play:
1 mm (0.04 in)

- Tighten the lock nut ②.

3. Check:
- Throttle operation
  Rough operation → Repair.

Start-in-gear protection adjustment

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 lock nut ①.
- Adjust the start-in-gear protection wire adjuster so that the end of the stopper ② aligns with the marking ⓐ of the starter case.
- Tighten the lock nut.

Idle speed adjustment

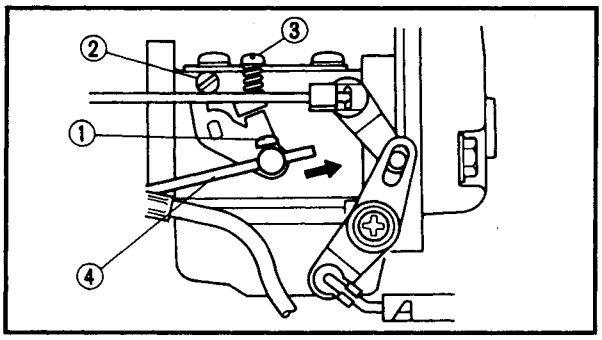
NOTE:
Before adjusting the idle speed, be sure to adjust the throttle link.

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

Idle speed:
750 ± 50 rpm

Measuring steps:
- Start the engine and allow it to warm up for a few minutes.
- Attach the tachometer to the high tension lead of the cylinder #1.

Tachometer:
YU-08036-A / 90890-06760



2. Adjust:
   - Idle speed

Adjustment steps:
- Loosen the screw ① of the carburetor throttle lever.
- Turn in the pilot screw ② until it is lightly seated.
- Turn out the pilot screw to specification.

Pilot screw (turns out):
1-1/2 ± 1/4

- Adjust the throttle stop screw ③ in or out until specified idle speed is obtained.

Turning in → Idle speed becomes higher.
Turning out → Idle speed becomes lower.

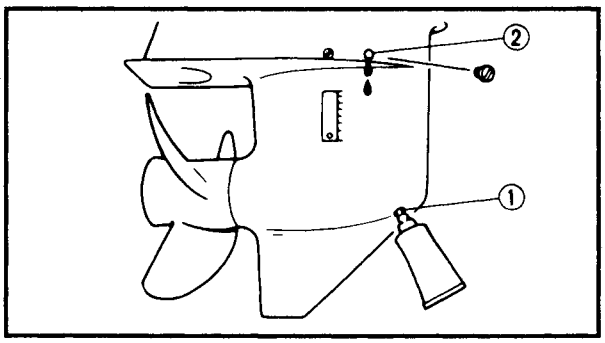
- Pull the acceleration rod ④ until the fully retard screw contacts the fully retard stopper.
- Tighten the screw ①.

Screw:
1 Nm (0.1 m•kg, 0.7 ft•lb)

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
     Oil level is low → Add oil to proper level.
3. Replace:
   - Gear oil



Replacement steps:
- Tilt up the motor.
- Place a pan under the drain plug ①.
- Remove the drain plug, then the oil level plug ② and drain the oil thoroughly.
- Place the outboard motor in an upright position.

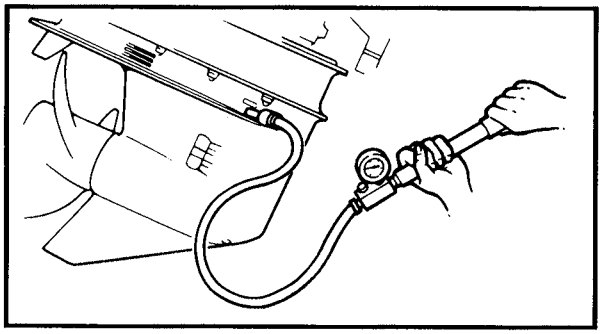
- Fill the gear oil through the drain hole until it overflows at the level hole.

Recommended oil:
GEAR CASE LUBE (USA) or Hypoid gear oil, SAE #90
Oil capacity:
250 cm³ (8.45 US oz, 8.80Imp oz)

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

Lower unit leakage check

1. Check:
   - Pressure holding
     Pressure falls → Inspect seals and component parts.



Checking steps:
- Attach the tester to the oil-level hole.

Pressure tester:
YB-03595/90890-06762

- Apply the specified pressure.

Pressure:
100 kPa (1.0 kg/cm², 14.2 psi)

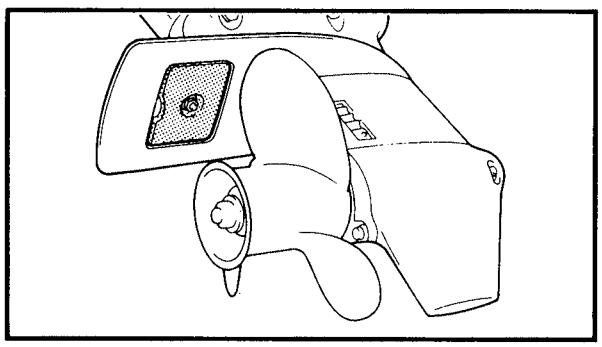
- Check that the pressure is held as specified for 10 seconds.

NOTE:
Do not over-pressurize. Excess pressure may cause the air to leak out.

GENERAL

Anode

1. Inspect:
   - Anode
     Scale → Clean.
     Oil/grease → Clean.
     Wear/Excessively consumed → Replace.



CAUTION:
Do not oil, grease or paint the anode, or the function of the sacrificial anode will be spoiled.

Battery

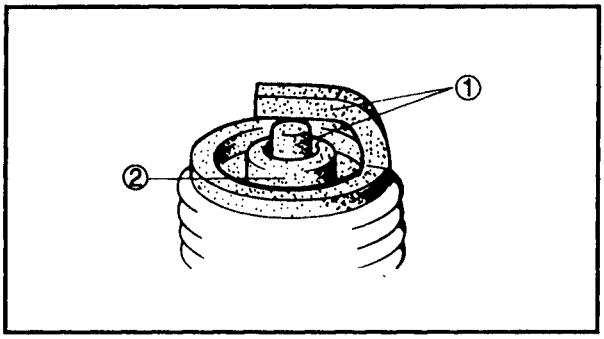
⚠ WARNING

Battery electrolyte is poisonous and dangerous, causing severe burns, etc. It contains sulfuric acid. Avoid contact with skin, eyes, or clothing.
Antidote:
EXTERNAL; Flush with water.
INTERNAL; Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.
EYES; Flush with water for 15 minutes and get prompt medical attention.
Batteries produce explosive gases: Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in a closed space. Always wear eye protection when working near batteries.
KEEP OUT OF REACH OF CHILDREN.

NOTE:

- Batteries vary among manufacturers. Therefore the following procedures may not always apply. Consult your battery manufacturer's instructions.
- Disconnect the black negative lead first to prevent the risk of shorting.

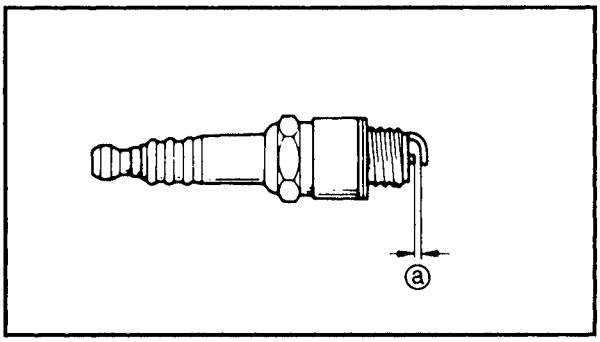
1. Inspect:
   - Battery fluid level
   - Battery fluid specific gravity



Spark plug

1. Inspect:
   - Electrode ①
     Wear/Damage → 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 fuel mixture
Air leak
Wrong settings
Blackish color:Overly rich mixture
Electrical malfunction
Excess oil used
Defective spark plug

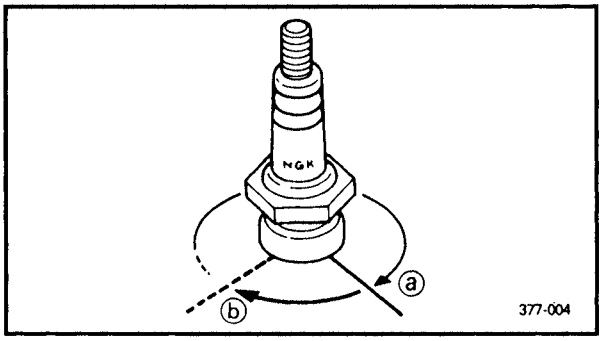


2. Clean:
   - Spark plug
     Clean the spark plug with a spark plug cleaner or wire brush.
3. Measure:
   - Spark plug gap ⓐ
     Out of specification → Alter gap.
     Use a wire gauge.

Spark plug gap:
0.9 ~ 1.0 mm (0.035 ~ 0.039 in)

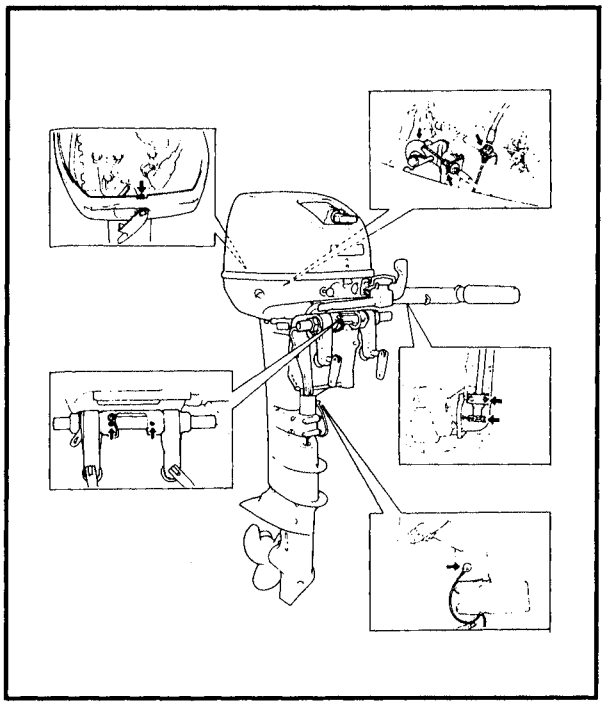
4. Tighten:
   - Spark plug

Spark plug:
25 Nm (2.5 m • kg, 18 ft • lb)



NOTE:

- Before installing a spark plug, clean the gasket surface and plug surface. Also it is suggested to apply a thin film of Anti Seize Compound to the spark plug threads to prevent future thread seizure.
- If a torque wrench is not available, a good estimate of the correct torque is a further 1/4 to 1/2 turns ⓑ on finger tightened ⓐ spark plug.



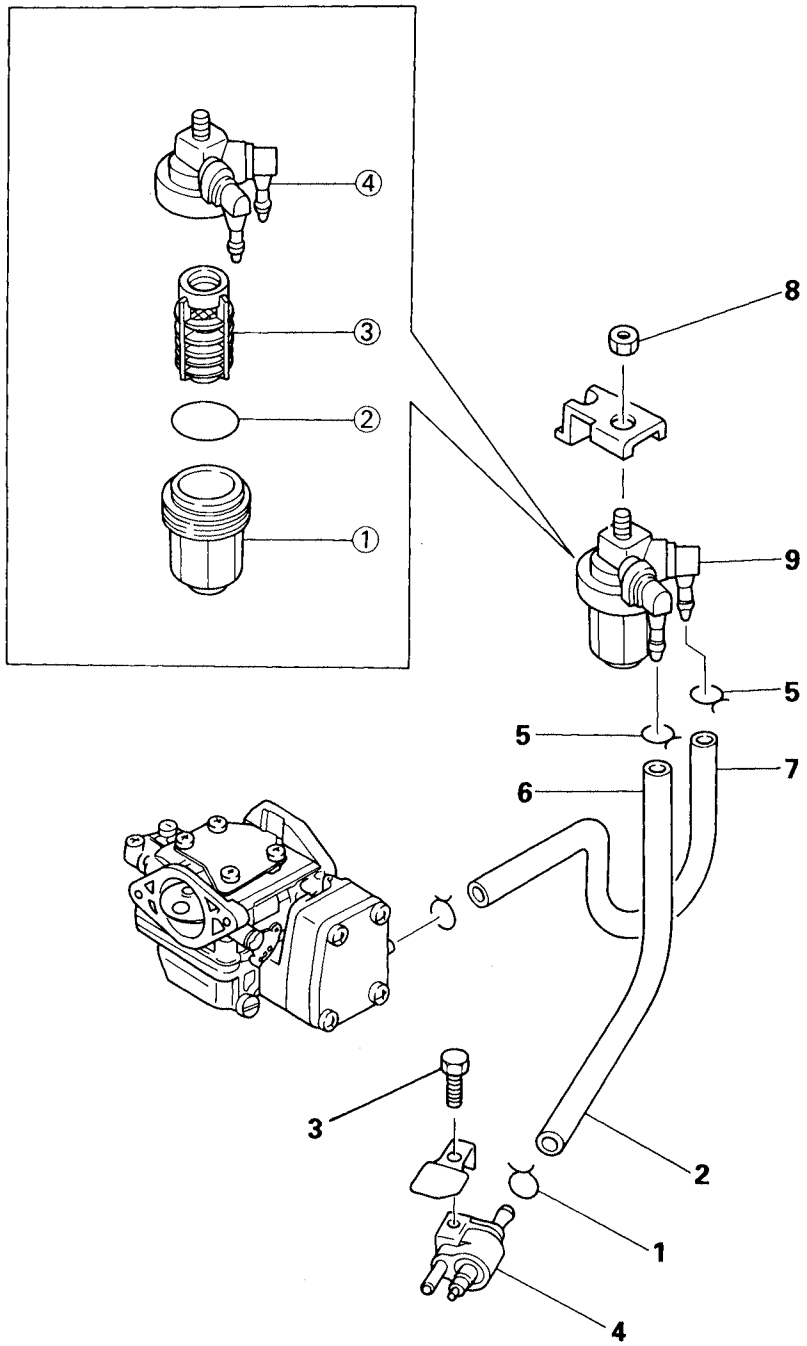
Greasing point

1. Apply:
   - Water resistant grease

CHAPTER 4
FUEL SYSTEM

FUEL JOINT AND FUEL FILTER

EXPLODED DIAGRAM



FUEL JOINT AND FUEL FILTER

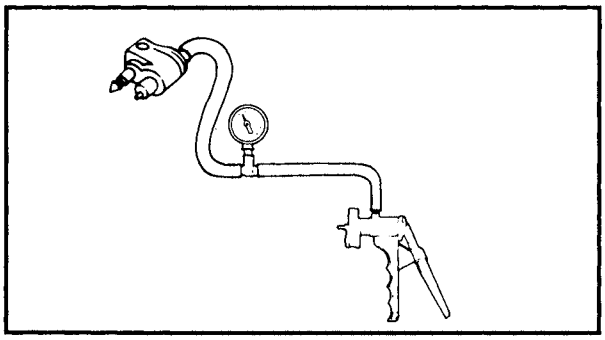
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	FUEL JOINT AND FUEL FILTER REMOVAL		Follow the left "Step" for removal.
1	Clip	1	
2	Fuel hose (joint - filter)	1	
3	Bolt (with washer)	1	
4	Fuel joint	1	
5	Clip	2	
6	Fuel hose (joint - filter)	1	
7	Fuel hose (filter - carburetor)	1	
8	Nut	1	
9	Fuel filter	1	
	FUEL FILTER DISASSEMBLY		
①	Filter cup	1	
②	O-ring	1	
③	Filter element	1	
④	Body cover	1	
			Reverse the removal steps for installation.

SERVICE POINTS

Fuel joint inspection

1. Inspect:
   - Fuel joint
     Crack/Leak/Damage → Replace.
2. Measure:
   - Fuel joint operation
     Impossible to maintain the specified pressure for 10 sec. → Replace.



Measuring steps:

- Attach the Mity vac.

Mity vac:
YB-35956/90890-06756

- Apply the specified pressure.

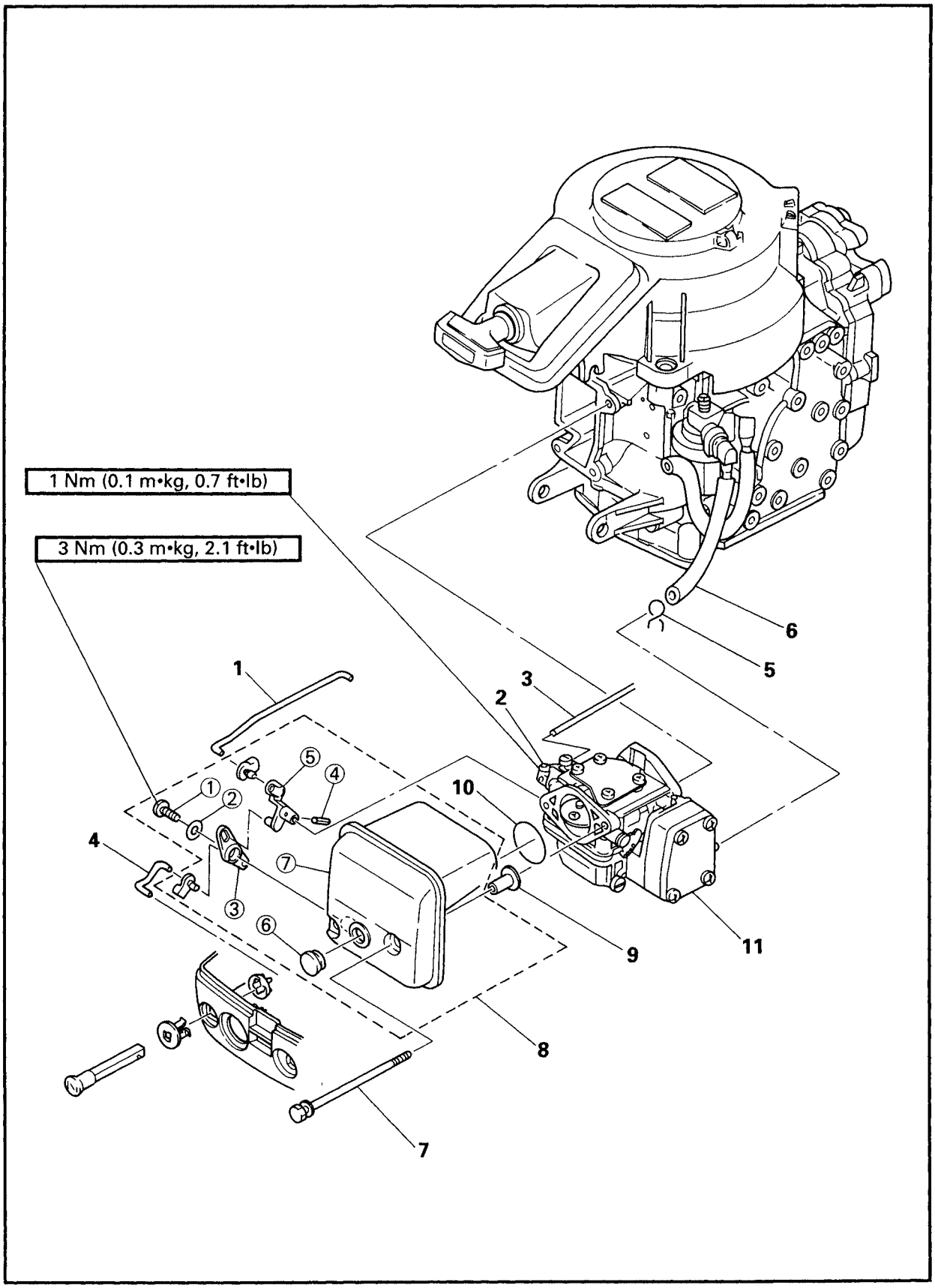
Specified pressure:
50 kPa (0.5 kg/cm², 7.1 psi)

Fuel filter inspection

1. Inspect:
   - Filter element
   - Filter cup
     Crack/Leak/Clog → Replace.
     Contamination → Clean.

CARBURETOR REMOVAL

EXPLODED DIAGRAM



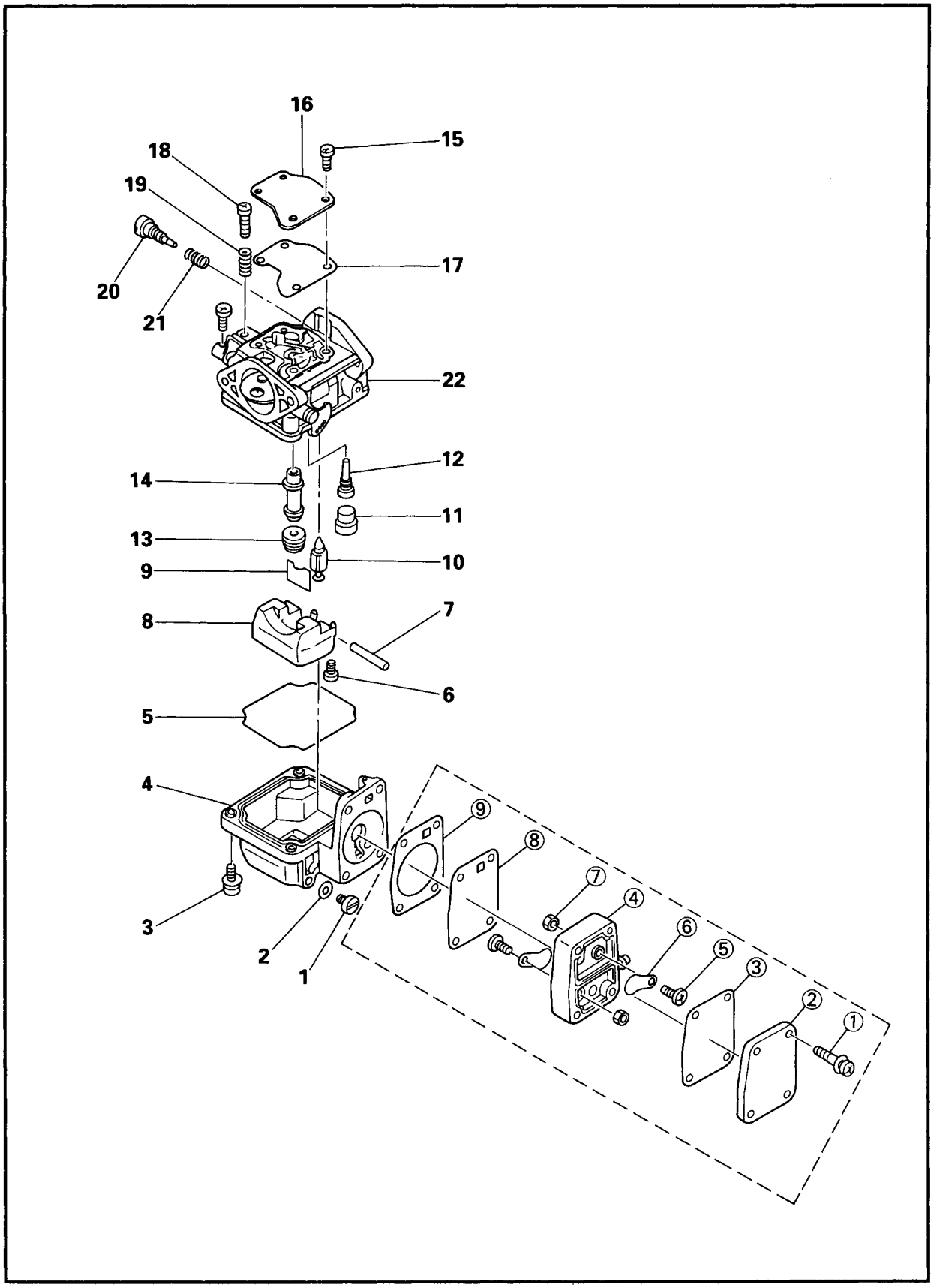
CARBURETOR REMOVAL

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CARBURETOR REMOVAL		Follow the left "Step" for removal.
1	Choke rod	1	
2	Screw	1	
3	Acceleration rod	1	
4	Choke knob rod	1	
5	Clip	1	
6	Fuel hose	1	
7	Bolt (with washer)	2	
8	Silencer assembly	1	
9	Collar	2	
10	O-ring	1	
11	Carburetor assembly	1	
	SILENCER DISASSEMBLY		
①	Tapping screw	1	
②	Plane washer	1	
③	Choke lever joint	1	
④	Spring pin	1	
⑤	Choke lever	1	
⑥	Fogging hole grommet	1	
⑦	Silencer	1	
			Reverse the removal steps for installation.

CARBURETOR

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

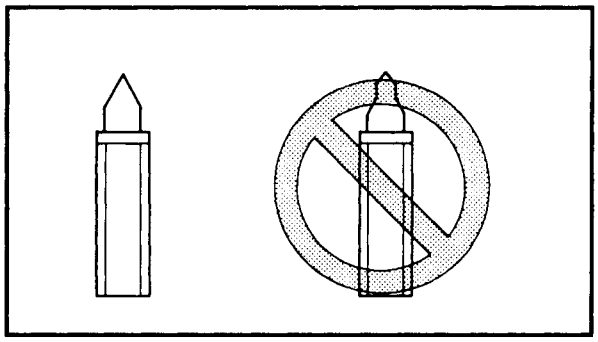
Step	Procedure/Part name	Q'ty	Service points
	CARBURETOR DISASSEMBLY		Follow the left "Step" for removal.
	Carburetor assembly		Refer to the "CARBURETOR REMOVAL" section in chapter 4.
1	Drain screw	1	
2	Washer	1	
3	Screw (with washer)	4	4 x 14 mm
4	Float chamber	1	
5	Float chamber packing	1	
6	Screw	1	
7	Arm pin	1	
8	Float	1	
9	Clip	1	
10	Needle valve	1	
11	Cap	1	
12	Pilot jet	1	
13	Main jet	1	
14	Main nozzle	1	
15	Screw (with washer)	4	4 x 10 mm
16	Plate	1	
17	Packing	1	
18	Stopping screw	1	
19	Spring	1	
20	Pilot adjusting screw	1	
21	Spring	1	
22	Carburetor body	1	
	FUEL PUMP DISASSEMBLY		
①	Screw (with washer)	4	
②	Pump cover	1	
③	Diaphragm	1	
④	Pump body	1	
⑤	Screw	2	
⑥	Seat valve	2	
⑦	Nut	2	
⑧	Diaphragm	1	
⑨	Diaphragm gasket	1	
			Reverse the removal steps for installation.

SERVICE POINTS

NOTE:
Do not use steelwire for cleaning the jets as this may enlarge the jet diameters and seriously affect performance.

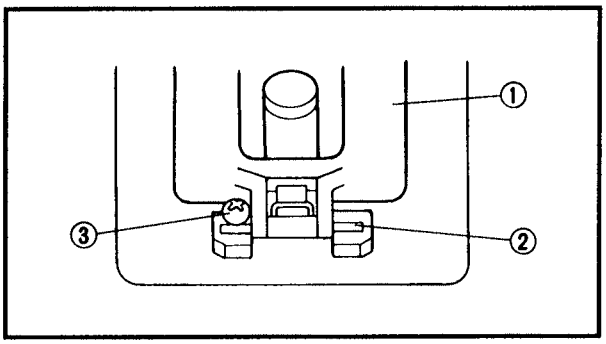
Carburetor inspection

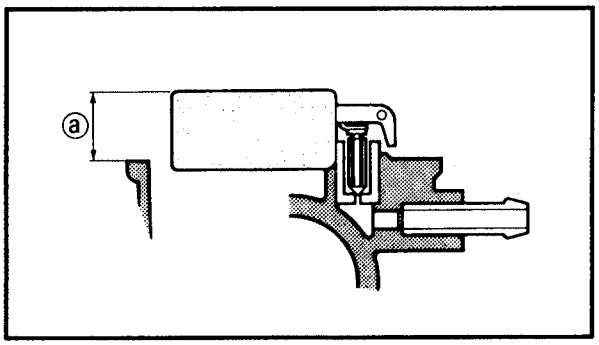
1. Inspect:
   - Carburetor body
     Crack/Damage → Replace.
     Contamination → Clean.
2. Inspect:
   - Pilot screw
     Bend/Wear → Replace.
3. Inspect:
   - Main jet
   - Pilot jet
   - Main nozzle
     Contamination → Replace.
4. Inspect:
   - Needle valve
     Grooved wear → Replace.
5. Inspect:
   - Float
     Crack/Damage → Replace.



Fuel pump inspection

1. Inspect:
   - Body
     Crack/Leak/Damage → Replace.
2. Inspect:
   - Seat valve
     Crack/Distortion → Replace.
3. Inspect:
   - Diaphragm
     Damage → Replace.





Carburetor assembly

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

NOTE:

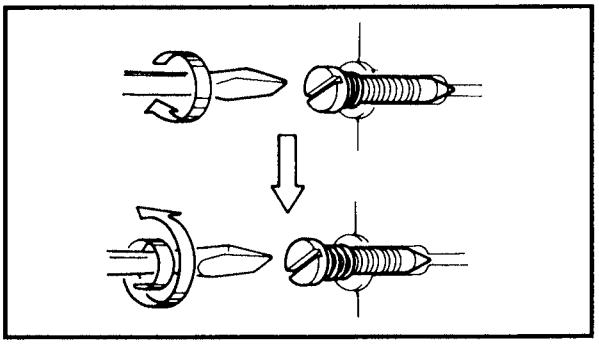
- The float pin should be fit in the slit the carburetor and locked with the screw.
- After installing, check the smooth movement of the float.

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

Float height ⓐ:
14.0 ± 1.5 mm (0.55 ± 0.06 in)

NOTE:

- The float should be resting on the needle valve, but not compressing the needle valve.
- Take measurement at the end surface of the float opposite to its pivoted side.



3. Adjust:
   - Pilot screw

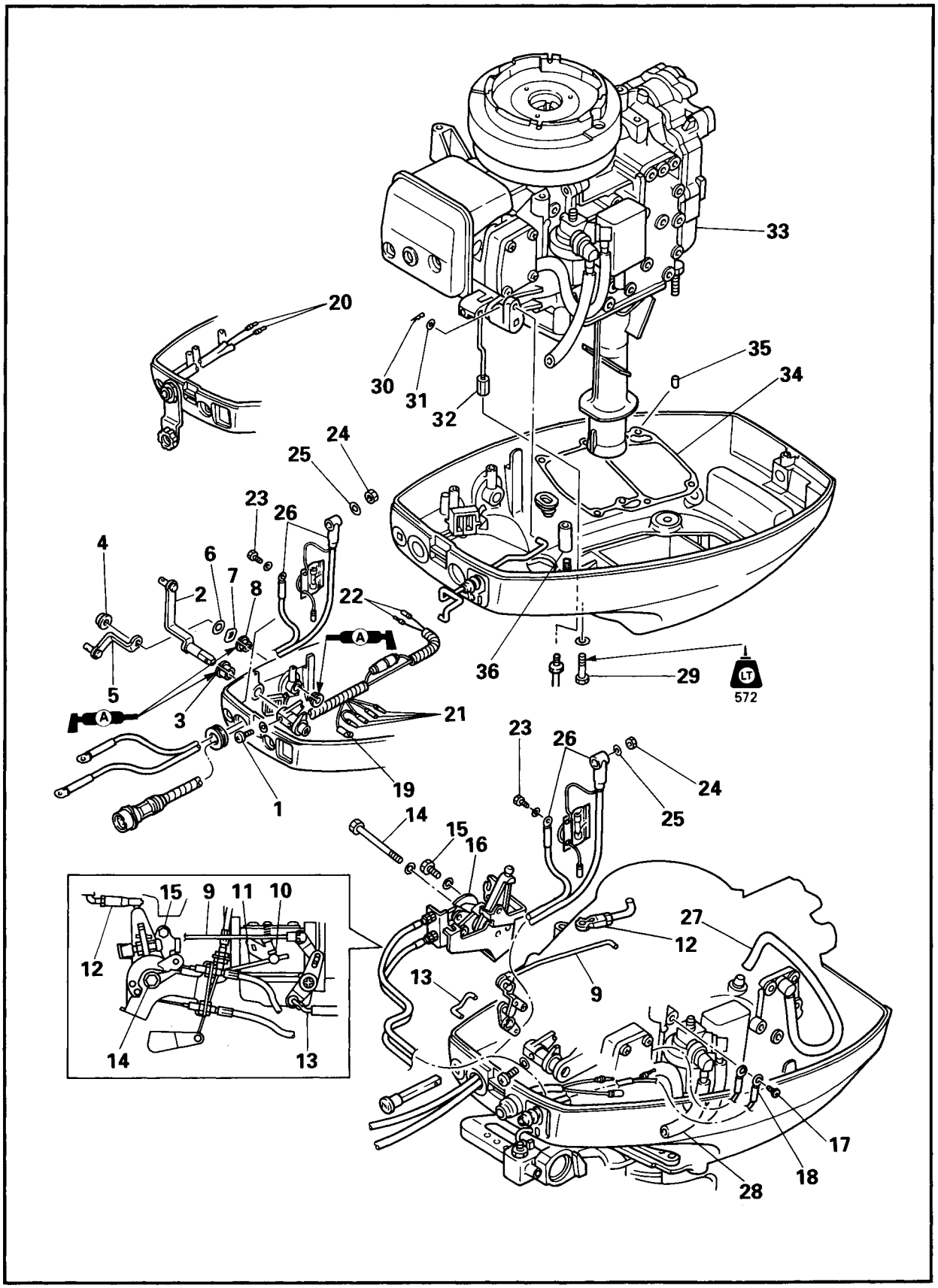
Adjustment steps:
- Screw in the pilot screw until it is lightly seated
- Back out by the specified number of turns.

Pilot screw:
1-1/2 ± 1/4 (turns out)

CHAPTER 5
POWER UNIT

POWER UNIT REMOVAL

EXPLODED DIAGRAM



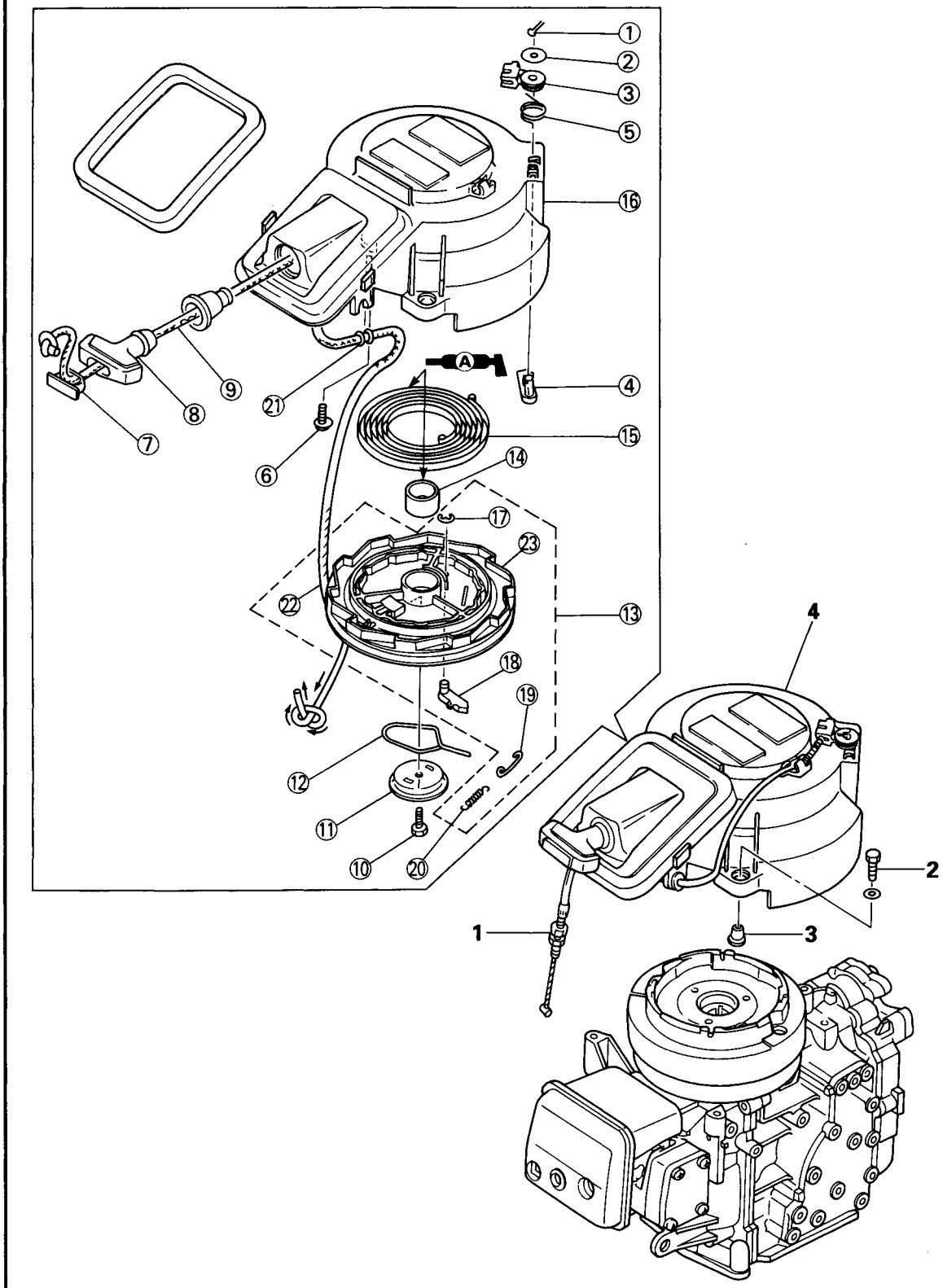
POWER UNIT REMOVAL

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	POWER UNIT REMOVAL		Follow the left "Step" for removal.
1	Screw (with washer)	1	for remote model
2	Shift lever link	1	
3	Bushing	1	
4	Nut	1	
5	Throttle lever link	1	
6	Plane washer	1	
7	Wave washer	1	
8	Bushing	2	
9	Choke link rod	1	
10	Screw	1	
11	Acceleration rod	1	
12	Link joint	1	
13	Choke knob rod	1	
14	Bolt (with washer)	1	
15	Bolt (with washer)	1	
16	Control pulley bracket assembly	1	
17	Bolt (with washer)	1	
18	Engine stop switch lead	2	Except for remote model
19	Wire harness ground lead	1	for remote model
20	2P connector lead	2	for 2P connector model
21	Wire harness rectifier lead	4	for remote model
22	Wire harness starter relay lead	2	
23	Bolt (with washer)	1	Electrical starter model.
24	Nut	1	
25	Spring washer	1	
26	Battery cable	1	
27	Pilot water hose	1	
28	Fuel hose	1	
29	Bolt (with washer)	6	8 x 30 mm
30	Clip	1	
31	Plane washer	1	
32	Shift lever rod	1	
33	Engine unit	1	
34	Upper case gasket	1	
35	Dowel pin	2	
36	Collar	1	
			Reverse the removal steps for installation.

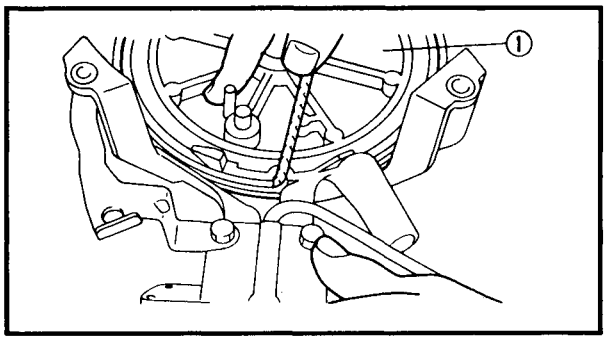
RECOIL STARTER

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	RECOIL STARTER REMOVAL		Follow the left "Step" for removal.
1	Start-in-gear protection wire	1	for start-in-gear protection model
2	Bolt (with washer)	3	6 x 20 mm
3	Collar	3	
4	Recoil starter assembly	1	
	RECOIL STARTER DISASSEMBLY		
①	Cotter pin	1	for start-in-gear protection model
②	Plane washer	1	
③	Reel stopper	1	
④	Stopper arm	1	
⑤	Spring	1	
⑥	Screw	1	
⑦	Cover	1	
⑧	Starter handle	1	
⑨	Starter rope	1	
⑩	Bolt (with washer)	1	
⑪	Drive plate	1	
⑫	Drive pawl spring	1	
⑬	Sheave drum assembly	**1**	**NOTE:** • Position the inner end of the spiral spring on the retainer post of the sheave drum. • Wind up the spring 2-1/2 turns counter-clockwise with the starter rope.
⑭	Bushing	1	
⑮	Spiral spring	1	
⑯	Starter case	1	
	SHEAVE DRUM DISASSEMBLY		
⑰	Circlip	1	
⑱	Drive pawl	1	
⑲	Spring	1	
⑳	Return spring	1	
㉑	Rope guide	1	
㉒	Starter rope	**1**	**NOTE:** Wind the rope 2 turns around the sheave drum.
㉓	Sheave drum	1	
			Reverse the removal steps for installation.



SERVICE POINTS

Sheave drum removal

1. Turn:
   - Sheave drum ①
     Turn the sheave drum clockwise until the spiral spring is free.

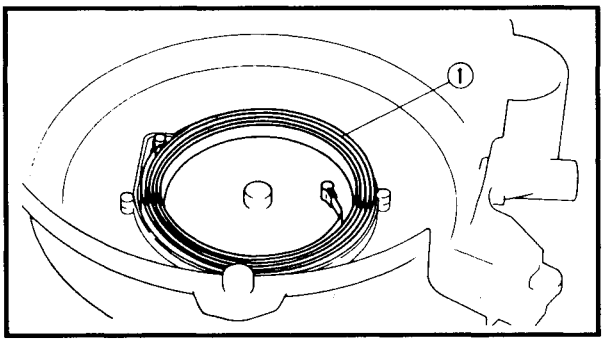
NOTE:

- 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:
   - Sheave drum

⚠WARNING

When removing the 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 pop out when removing it. Remove it by allowing it out one turn of the winding each time.

Starter stopping plunger inspection

1. Inspect:
   - Starter stopping plunger
     Crack/Wear/Damage → Replace.

Drive pawl and spring inspection

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

Bushing inspection

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

Sheave drum inspection

1. Inspect:
   - Sheave drum
     Crack/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 to the specified length and burn the rope end so that it will not travel.

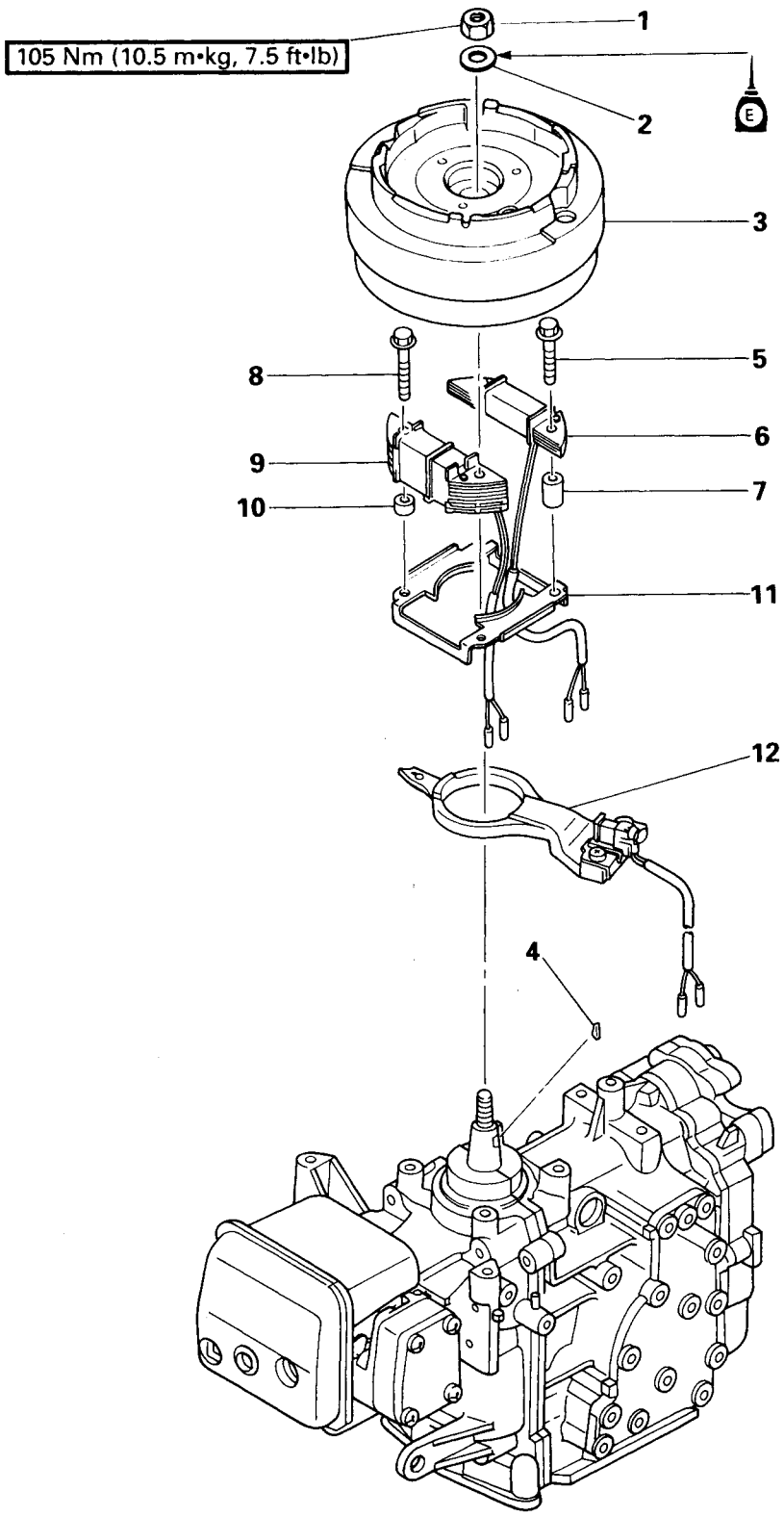
Starter rope length:
1,800 mm (70.9 in)

Recoil starter checking

1. Check:
   - Starter operation
     Rough operation → Repair.

FLYWHEEL MAGNETO AND MAGNETO BASE

EXPLODED DIAGRAM

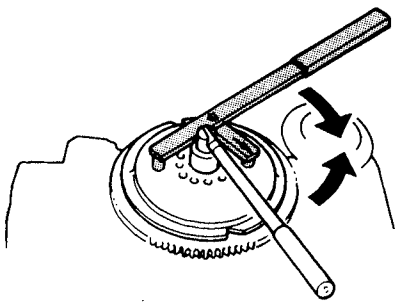


FLYWHEEL MAGNETO AND MAGNETO BASE

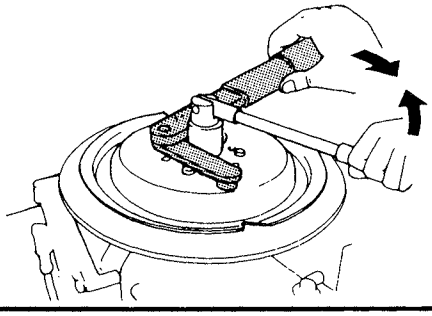
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	FLYWHEEL MAGNETO AND MAGNETO BASE REMOVAL		Follow the left "Step" for removal.
	Recoil starter assembly		Refer to the "RECOIL STARTER" section.
1	Nut	1	
2	Plane washer	1	
3	Flywheel	1	
4	Woodruff key	1	
5	Bolt (with washer)	2	
6	Charge coil	1	
7	Collar	2	
8	Bolt (with washer)	2	
9	Lighting coil	1	
10	Collar	2	
11	Magneto base plate	1	
12	Pulser coil assembly	1	
			Reverse the removal steps for installation.

A



B



SERVICE POINTS

Flywheel magneto removal

1. Remove and install:
   - Flywheel nut

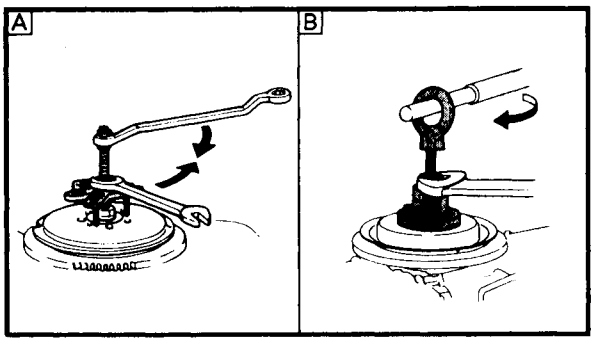
Flywheel holder:
YB-06139/90890-06522

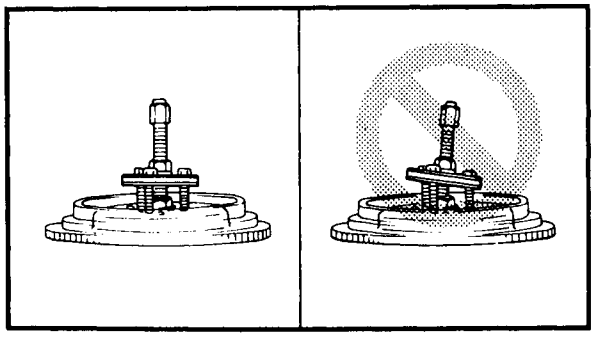
A For USA and CANADA
B Except for USA and CANADA

CAUTION:

The major load should be carried in the direction of the arrows. If not, the holder may easily slip off.

FLYWHEEL MAGNETO AND MAGNETO BASE





2. Remove:
   - Flywheel magneto

	Flywheel puller: **YB-06117/90890-06521**

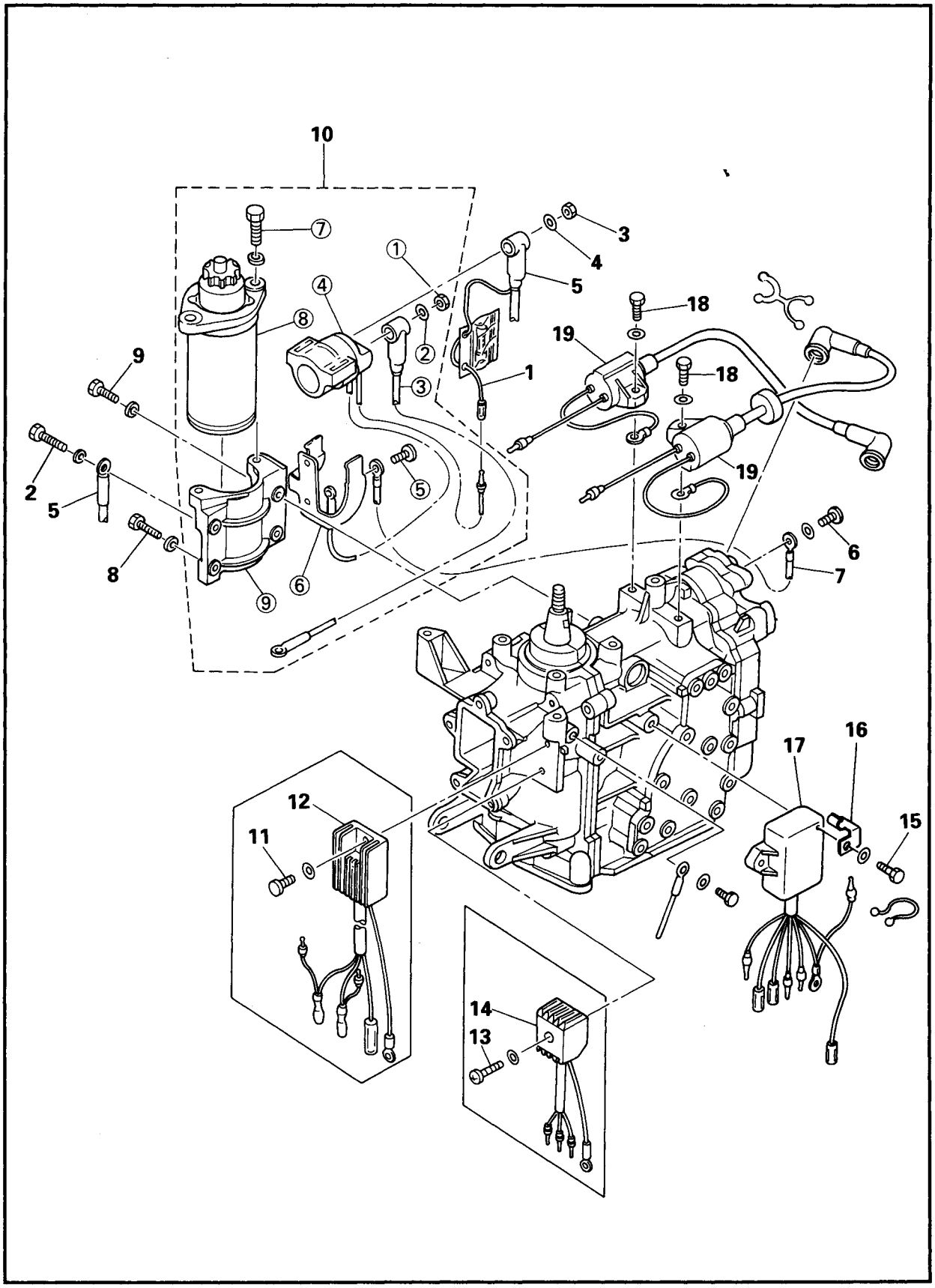
A For USA and CANADA
B Except for USA and CANADA

CAUTION:

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

ELECTRICAL UNIT

EXPLODED DIAGRAM

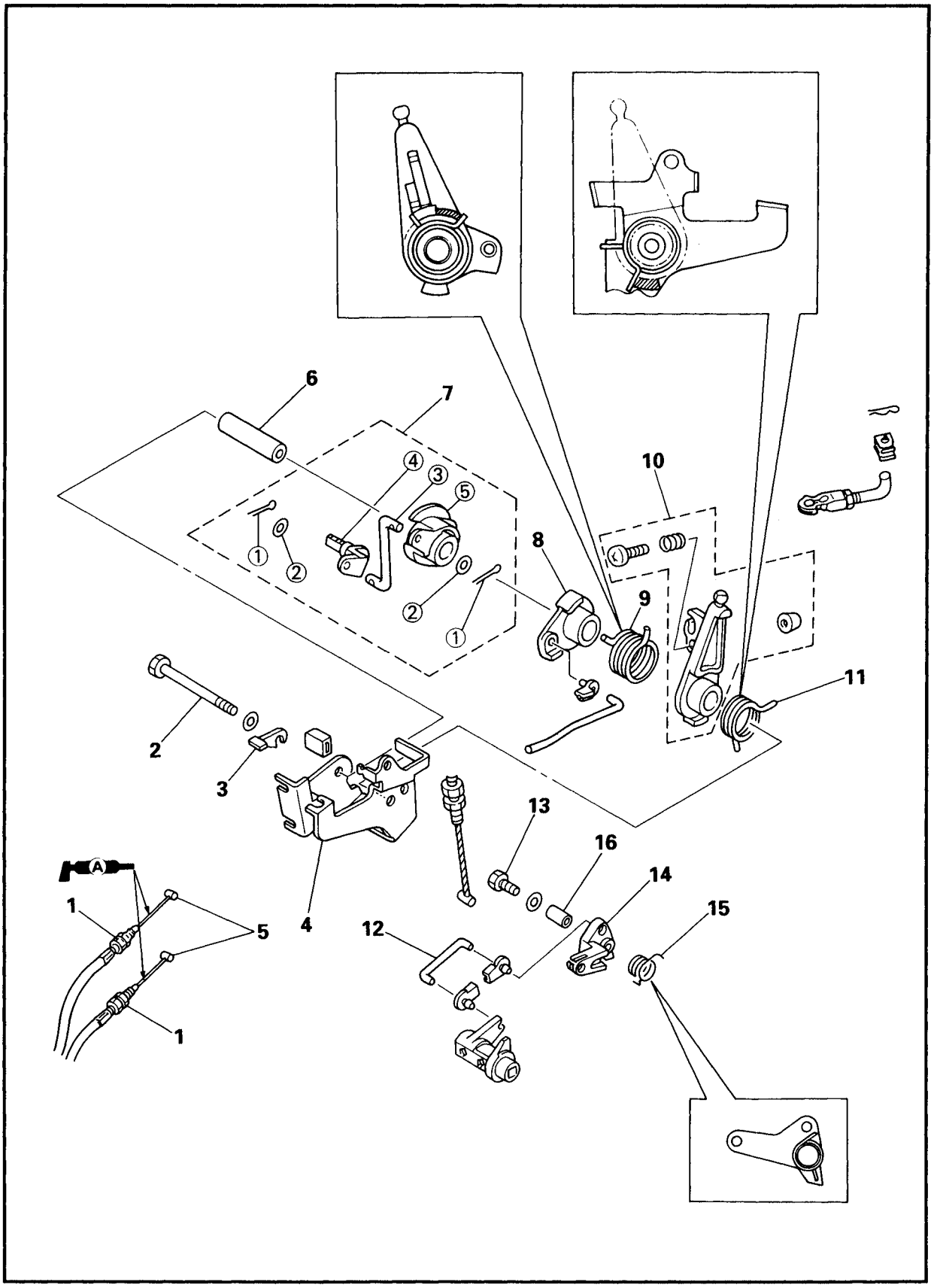


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	ELECTRICAL UNIT REMOVAL		Follow the left "Step" for removal.
1	Starter relay lead	2	for electrical starter model
2	Bolt (with washer)	1	6 x 30 mm
3	Nut	1	
4	Spring washer	1	
5	Battery cable	1	
6	Bolt (with washer)	1	
7	Cylinder head ground lead	1	
8	Bolt (with washer)	1	6 x 25 mm
9	Bolt (with washer)	2	6 x 20 mm
10	Electrical unit	1	
11	Bolt (with washer)	1	for 2P connector model: 6 x 16 mm
12	Rectifier regulator	1	
13	Screw (with washer)	1	for electrical starter model
14	Rectifier	1	
15	Bolt (with washer)	2	6 x 20 mm
16	Clamp	1	
17	CDI unit	1	
18	Bolt (with washer)	2	6 x 18 mm
19	Ignition coil	2	
	ELECTRICAL UNIT DISASSEMBLY		
①	Nut	1	
②	Spring washer	1	
③	Lead wire	1	
④	Starter relay	1	
⑤	Bolt (with washer)	2	6 x 14 mm
⑥	Starter relay bracket	1	
⑦	Bolt (with washer)	2	
⑧	Starter motor	1	
⑨	Starter motor bracket	1	
			Reverse the removal steps for installation.

CONTROL UNIT

EXPLODED DIAGRAM

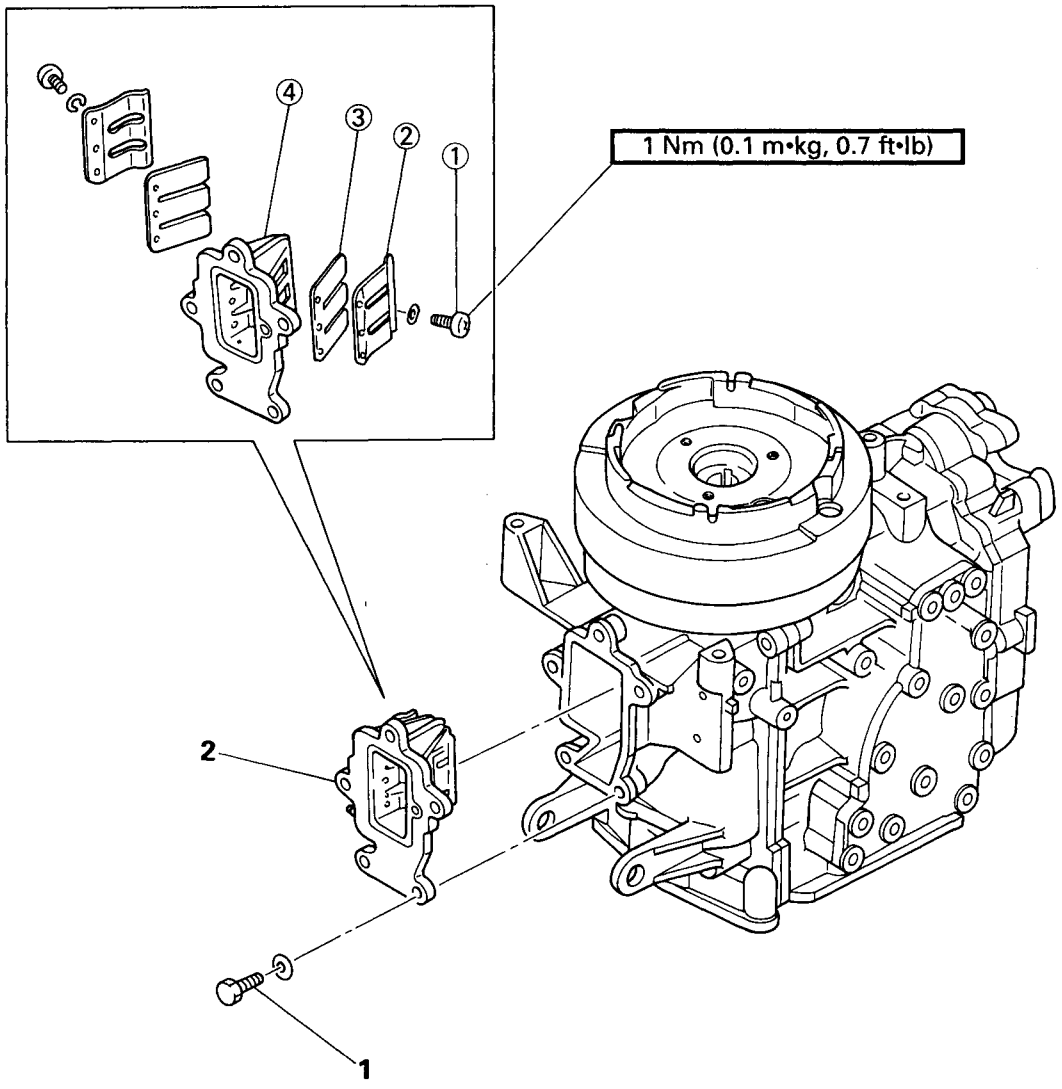


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CONTROL UNIT DISASSEMBLY		Follow the left "Step" for removal
	Control pully bracket assembly		Refer to the "POWER UNIT REMOVAL" section.
1	Throttle cable lock nut	2	
2	Bolt (with washer)	1	
3	Plate	1	for over revolution limit model
4	Control pully bracket	1	
5	Throttle cable	2	
6	Collar	1	
7	Control pully assembly	1	
8	Accelerator lever	1	
9	Accelerator lever spring	1	
10	Magneto control lever	1	
11	Magneto control lever spring	1	
12	Start-in-gear lever rod	1	
13	Bolt (with washer)	1	6 × 20mm
14	Start-in-gear lever	1	
15	Start-in-gear lever spring	1	
16	Collar	1	
	CONTROL PULLY DISASSEMBLY		
①	Cotter pin	2	
②	Plane washer	2	
③	Control pully rod	1	
④	Control pully lever	1	
⑤	Control pully	1	
			Reverse the removal steps for installation.

REED VALVE

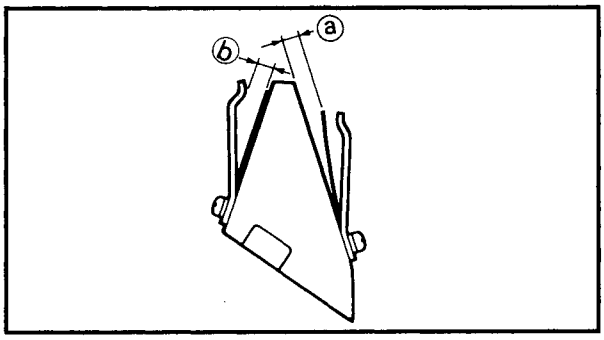
EXPLODED DIAGRAM



REED VALVE

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	REED VALVE REMOVAL		Follow the left "Step" for removal.
	Carburetor assembly		Refer to the "CARBURETOR REMOVAL" section in chapter 4.
1	Bolt (with washer)	3	6 x 20 mm
2	Reed valve assembly	1	
	REED VALVE DISASSEMBLY		
①	Screw (with washer)	6	
②	Valve stopper	2	
③	Reed valve	2	
④	Reed valve body	1	
			Reverse the removal steps for installation.



SERVICE POINTS

Reed valve inspection

1. Inspect:
   - Reed valve
     Crack/Damage → Replace.
2. Measure:
   - Valve bending ⓐ
     Out of specification → Replace.

Valve bending limit:
0.2 mm (0.01 in)

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

Valve stopper height:
9.9:
except for Europe
0.7 ± 0.1 mm (0.03 ± 0.004 in)
for Europe
1.3 ± 0.1 mm (0.05 ± 0.004 in)
15:
6.0 ± 0.1 mm (0.24 ± 0.004 in)

CYLINDER HEAD, THERMOSTAT AND EXHAUST COVER

EXPLODED DIAGRAM

Fig.1

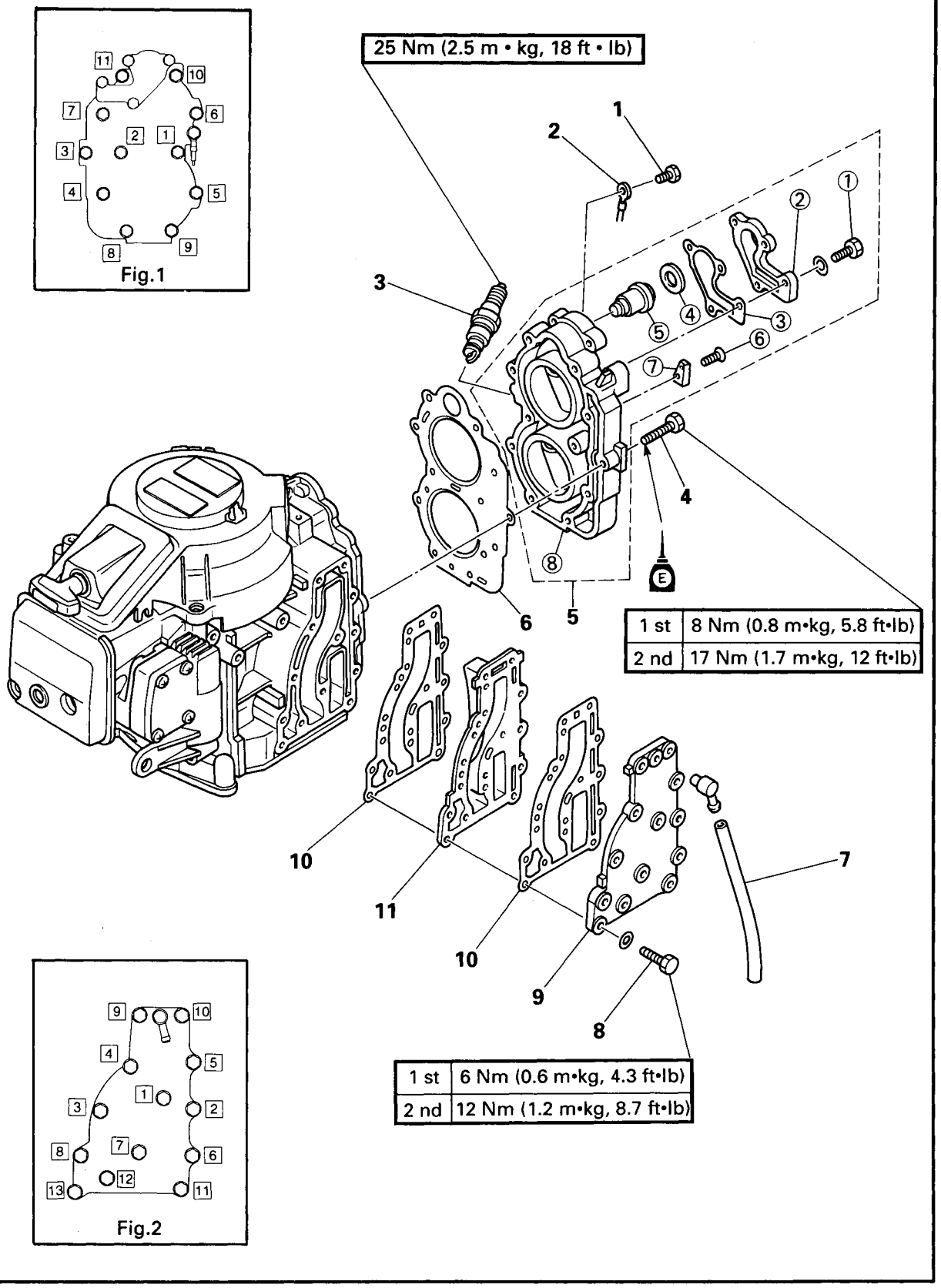


Fig.2

CYLINDER HEAD, THERMOSTAT AND EXHAUST COVER REMOVAL AND INSTALLATION CHART

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CYLINDER HEAD, THERMOSTAT AND EXHAUST COVER REMOVAL		Follow the left "Step" for removal.
1	Bolt (with washer)	1	6 x 12 mm
2	Cylinder head ground lead	1	
3	Spark plug	2	
4	Flange bolt	11	**NOTE:** Tighten the bolts in sequence and in two steps of torque. (Refer to fig.1)
5	Cylinder head assembly	1	
6	Cylinder head gasket	1	
7	Pilot water hose	1	
8	Bolt (with washer)	13	**NOTE:** Tighten the bolts in sequence and in two steps of torque. (Refer to fig.2)
9	Exhaust outer cover	1	
10	Exhaust cover gasket	2	
11	Exhaust inner cover	1	
	CYLINDER HEAD DISASSEMBLY		
①	Bolt (with washer)	4	6 x 20 mm
②	Thermostat cover	1	
③	Thermostat cover gasket	1	
④	Plane washer	1	
⑤	Thermostat	1	
⑥	Screw	1	
⑦	Anode	1	
⑧	Cylinder head	1	
			Reverse the removal steps for installation.

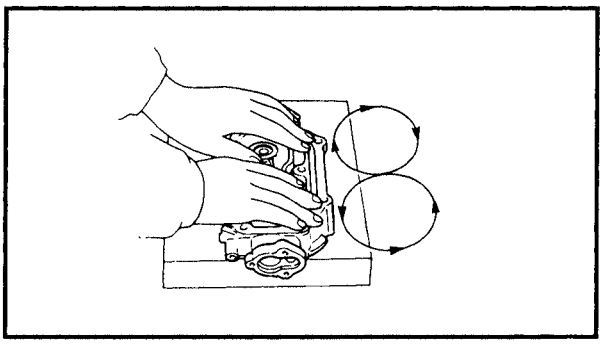
SERVICE POINTS

Cylinder head inspection

1. Inspect:
   - Water jacket
     Material deposit/Corrosion → Clean.
   - Cylinder inner surface
     Score marks → Clean.
     Use #600 ~ 800 grit wet sandpaper.

CAUTION:

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



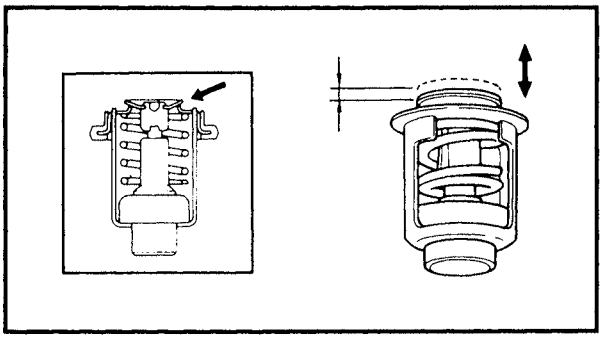
2. Measure:
   - Cylinder head warpage
     Use a straightedge and thickness gauge.
     Out of specification → Resurface or replace.

Warpage limit:
0.1 mm (0.004 in)

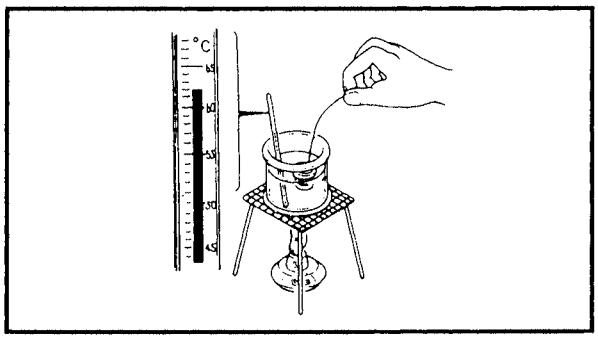
Resurfacing steps:
- Place a 400 ~ 600 grit wet sandpaper on the surface plate.
- Resurface the head using a figure-eight sanding pattern.

Thermostat inspection

1. Inspect:
   - Thermostat
     Stick/Damage → Replace.
2. Measure:
   - Valve opening temperature
   - Valve lift
     Out of specification → Replace.



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



Measuring steps:
- Suspend thermostat in a vessel.
- Place reliable thermometer in a water.
- Heat water slowly.
- Observe thermometer, while stirring water continually.

CRANKCASE AND CYLINDER BODY

EXPLODED DIAGRAM

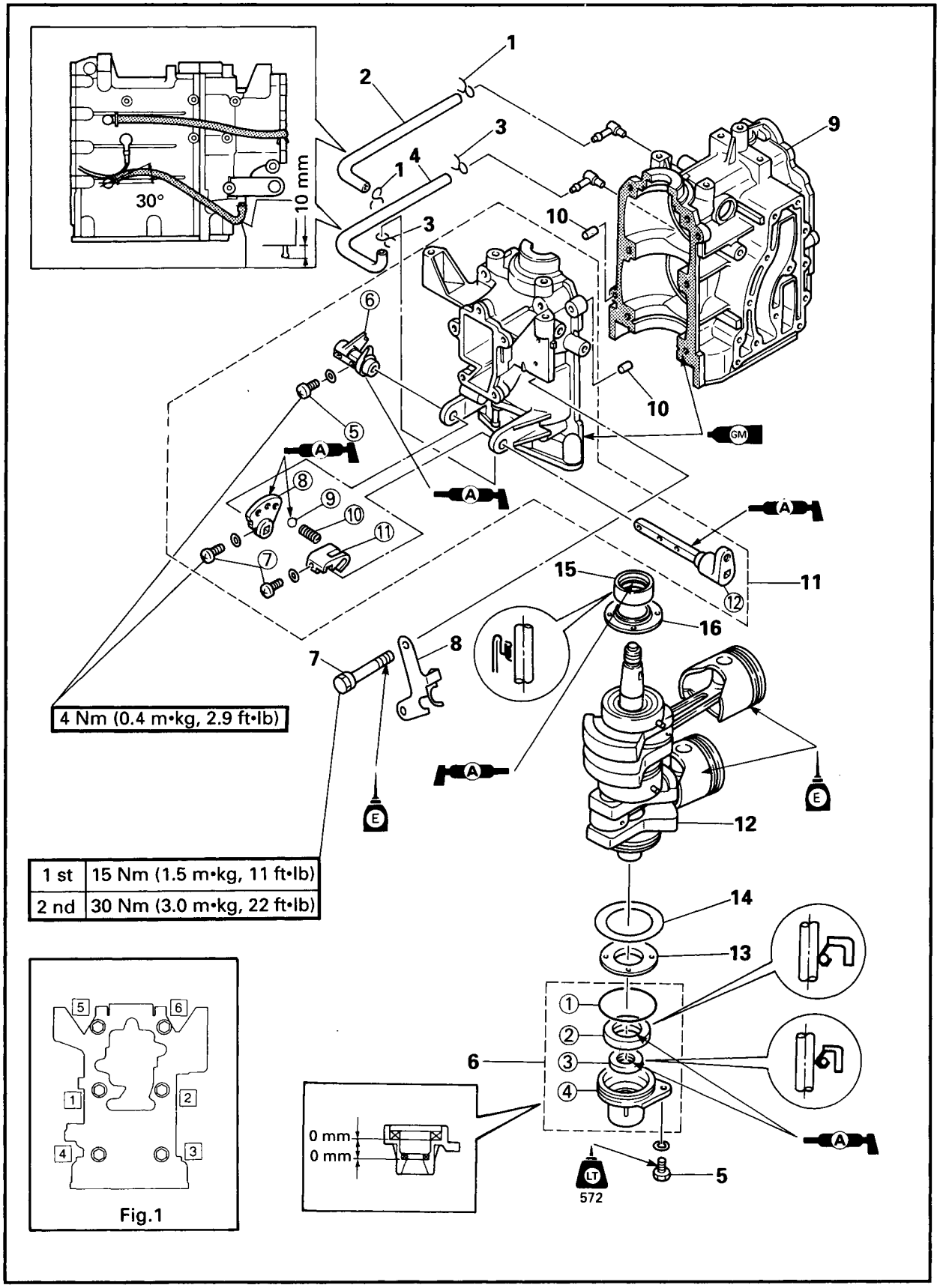


Fig.1

CRANKCASE AND CYLINDER BODY

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CRANK CASE AND CYLINDER BODY REMOVAL		Follow the left "Step" for removal.
1	Clip	2	
2	Hose	1	
3	Clip	2	
4	Hose	1	
5	Bolt (with washer)	1	6 x 16 mm
6	Oil seal housing	1	
7	Bolt (with washer)	6	**NOTE:** Tighten the bolts in sequence and in two steps of torque. (Refer to fig.1)
8	Neutral switch bracket	1	for electrical starter model
9	Cylinder body	1	
10	Dowel pin	2	
11	Crank case assembly	1	
12	Crank shaft assembly	1	
13	Plate	1	
14	Plane washer	1	
15	Oil seal	1	
16	Plate	1	
	OIL SEAL HOUSING DISASSEMBLY		
①	O-ring	1	
②	Oil seal	1	
③	Oil seal	1	
④	Oil seal housing	1	
	CRANK CASE DISASSEMBLY		
⑤	Screw (with washer)	1	5 x 12 mm
⑥	Shift lever bushing	1	
⑦	Screw (with washer)	2	5 x 12 mm
⑧	Cam plate	1	
⑨	Ball	1	
⑩	Spring	1	
⑪	Shaft rod lever	1	
⑫	Shift arm shaft	1	
			Reverse the removal steps for installation.

SERVICE POINTS

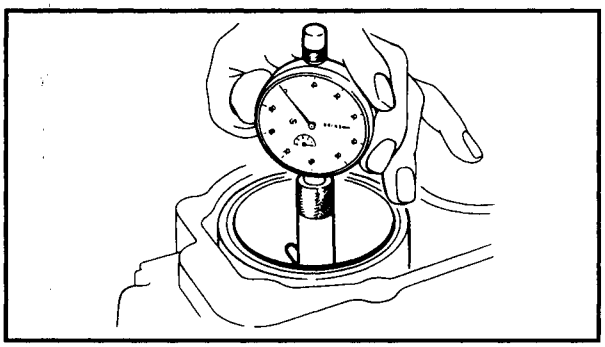
Cylinder body inspection

1. Inspect:
   - Water jacket
     Material deposit/Corrosion → Clean.
   - Cylinder inner surface
     Score marks → Clean.
     Use #600 ~ 800 grit wet sandpaper.

NOTE:
Do not scratch the fitting surfaces of the crank case and cylinder head.

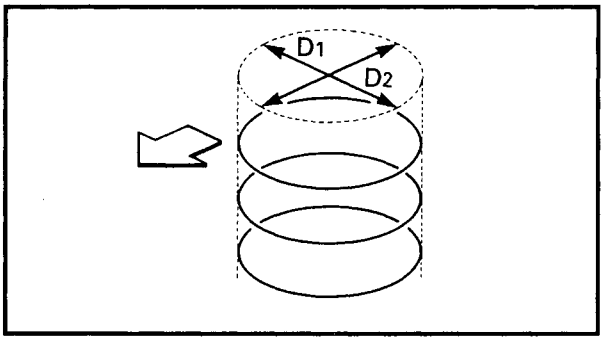
2. Inspect:
   - Exhaust wall
     Crack/Damage → Replace.
     Carbon deposit → Clean.
     Use a round scraper.

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



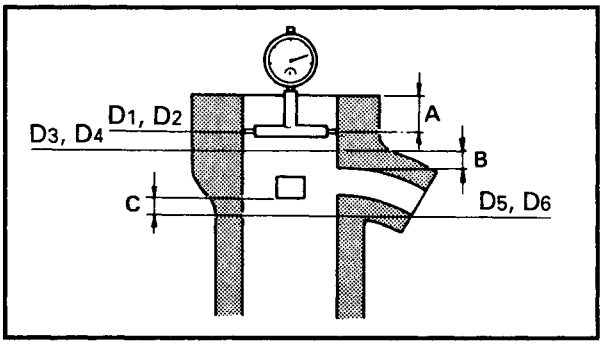
3. Measure:
   - Cylinder bore "D"
     Use cylinder gauge.
     Out of specification → Rebore or replace.

NOTE:
Measure the cylinder bore "D" in parallel. Then, find the average of the measurement.

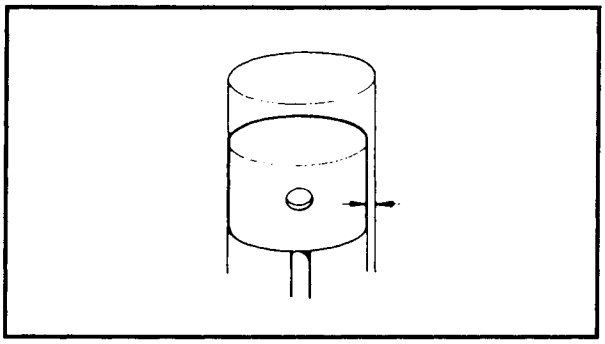


	Standard	Wear limit
Cylinder bore "D"	56.00 ~ 56.02 mm (2.205 ~ 2.206 in)	56.1 mm (2.21 in)
Taper limit T:	—	0.08 mm (0.003 in)
Out of round limit	—	0.05 mm (0.002 in)

D = Maximum Dia. (D1 – D6)
T = (maximum D1 or D2) – (minimum D5 or D6)



A: 10 mm (0.4 in) below the cylinder top
B: 5 mm (0.2 in) above the exhaust port
C: 5 mm (0.2 in) below the scavenging port

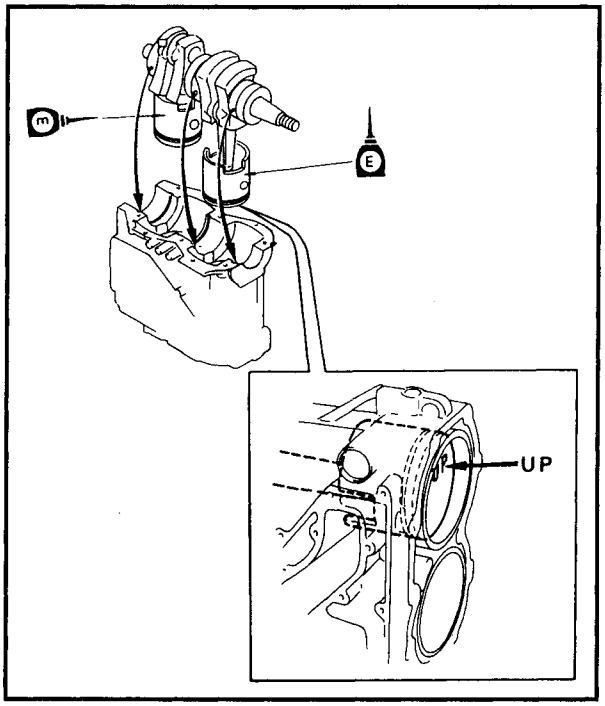


Piston to cylinder clearance

1. Calculate:
   - Piston clearance
     Out of specification → Replace piston and piston ring and/or cylinder.

Piston clearance	=	Cylinder bore	−	Piston diameter

Piston clearance:
0.035 ~ 0.040 mm
(0.0014 ~ 0.0016 in)

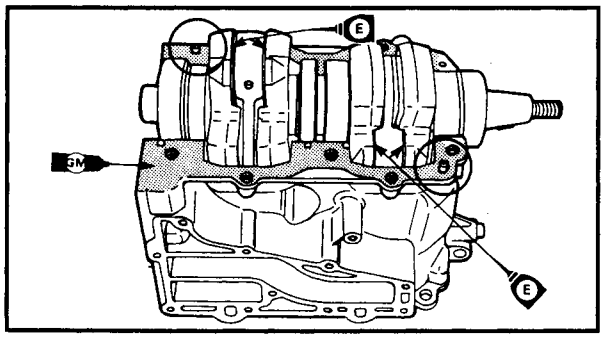


Cylinder body and crankcase installation

1. Install:
   - Cylinder body
   - Crankshaft and piston

NOTE:

- Align the piston ring end gaps with the respective locating pins.
- Fit the bearing locating pins in the cylinder body.



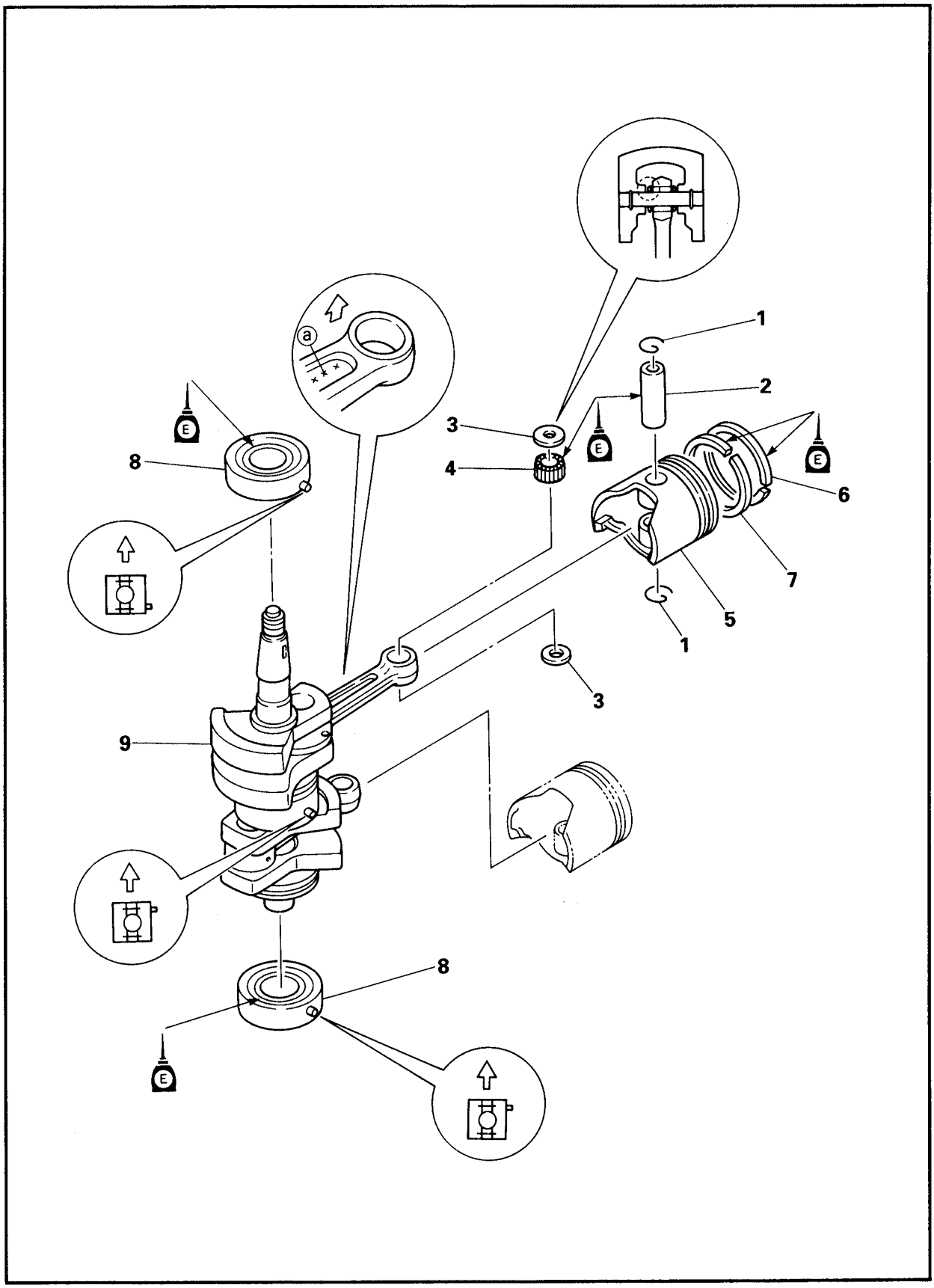
2. Apply:
   - Gasket maker
     Onto the connecting surfaces of the crankcase and cylinder body.

NOTE:

- Clean the connecting surfaces of the crankcase and cylinder body before applying the Gasket maker.
- Gasket maker should be so applied that it does not overflow the contacting surface.

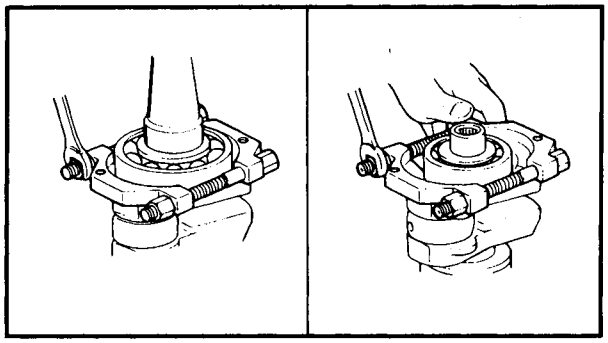
CRANK SHAFT AND PISTON

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CRANK SHAFT AND PISTON DISASSEMBLY		Follow the left "Step" for removal.
	Crank shaft asembly		Refer to the "CRANKCASE AND CYLINDER BODY" section.
1	Piston pin clip	4	**NOTE:** Take care not to damage piston pin hole edge. **CAUTION:** **Always use the new clip.**
2	Piston pin	2	**NOTE:** When the piston pins, pistons, and small end needle bearings are reused, they should be marked with No. 1 and 2 so that they are not confused.
3	Piston pin washer	4	**CAUTION:** **The washer should be placed with their convex sides facing the piston.**
4	Small end bearing needle	50	**CAUTION:** **Do not a mixture of new and used bearing needles in the same small end.**
5	Piston	2	**NOTE:** Mold mark ⓐ faces in the same direction as the "UP" mark on the piston.
6	Top piston ring	2	**NOTE:**
7	2nd piston ring	2	Remove the piston ring from the piston by opening the ring to the least possible width.
8	Bearing	2	
9	Crank shaft	1	
			Reverse the removal steps for installation.



SERVICE POINTS

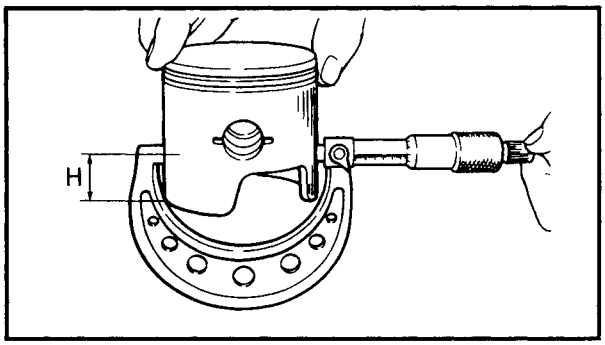
Bearing removal

1. Remove:
   - Bearing

NOTE:

Hold the bearing with the bearing separator, and forth out the crankshaft with a press.

	Bearing separator: **YB-06219/90890-06534**



Piston inspection

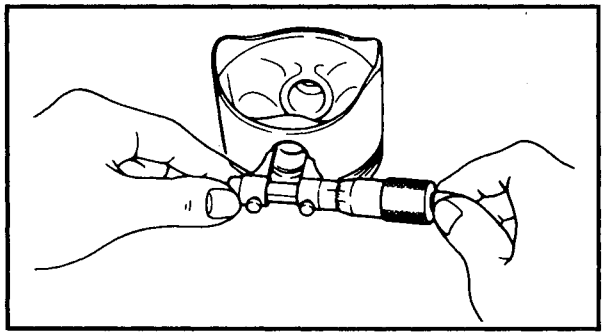
1. Measure:
   - Piston diameter
     Use a micrometer.
     Out of specification → Replace.

	Measuring point "H"	Piston diameter
Standard	10 mm (0.4 in)	55.940 ~ 55.985 mm (2.2024 ~ 2.2041 in)

	Over size piston diameter: **1*: 56.25 mm (2.215 in)** **2: 56.50 mm (2.224 in)**

*: Except for U.S.A.

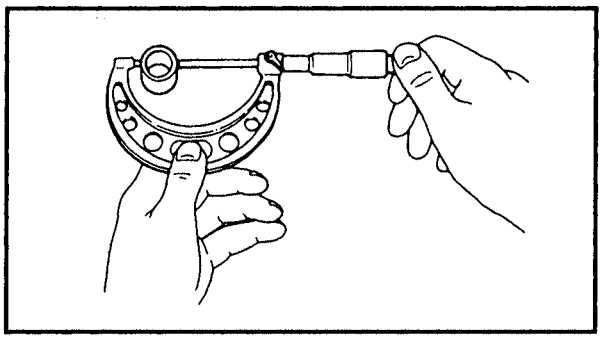
2. Measure:
   - Piston pin boss inside diameter
     Use a micrometer.
     Out of specification → Replace.

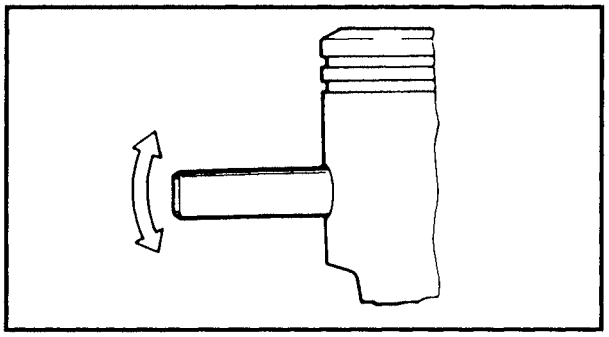


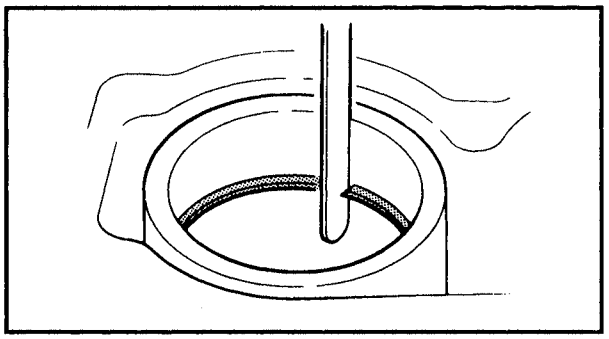
	Piston pin boss inside diameter: **14.004 ~ 14.015 mm** **(0.5513 ~ 0.5518 in)**

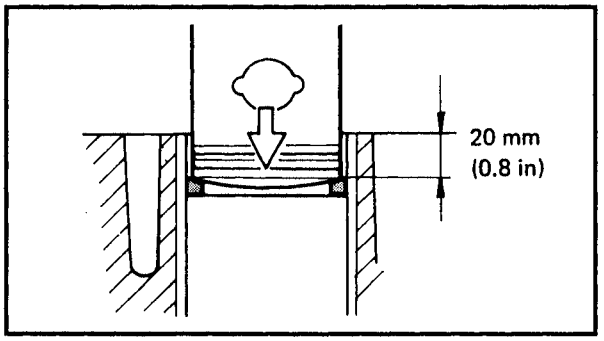
Piston pin and small end bearing inspection

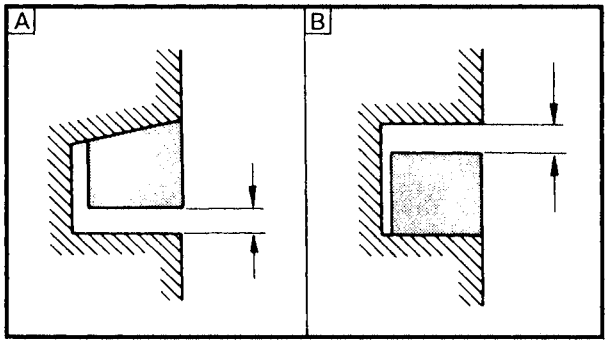
1. Inspect:
   - Piston pin
   - Small end bearing
     Signs of heat discoloration → Replace.
     Scratch/Damage → Replace.











2. Measure:
   - Piston pin diameter
     Use a micrometer.
     Out of specification → Replace.

Piston pin diameter:
13.996 ~ 14.000 mm
(0.5510 ~ 0.5512 in)

3. Check:
   - Free play (when the piston pin is inserted in the piston.)
     There should be no noticeable for the play.
     Free play exists → Replace the pin and/or piston.

Piston ring inspection

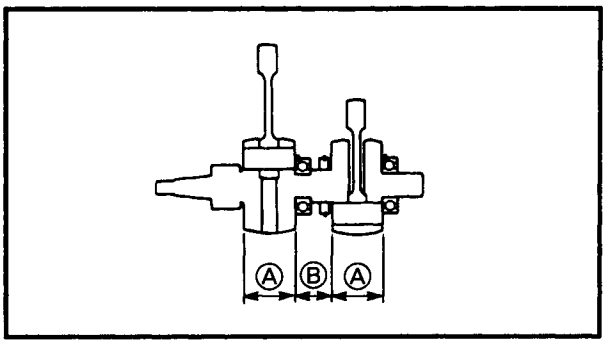
1. Inspect:
   - Piston ring
     Breakage/Damage → Replace.
2. Measure:
   - End gap
     Use a feeler gauge.
     Out of specification → Replace.

End gap:
Top: 0.15 ~ 0.35 mm
(0.006 ~ 0.014 in)
2nd: 0.15 ~ 0.35 mm
(0.006 ~ 0.014 in)
End gap limit:
Top: 0.55 mm (0.022 in)
2nd: 0.55 mm (0.022 in)
Measuring point
20 mm (0.8 in)

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

3. Measure:
   - Side clearance
     Use a thickness gauge.
     Out of specification → Replace piston and/or ring.

Side clearance:
Top [A]: 0.02 ~ 0.06 mm
(0.001 ~ 0.002 in)
2nd [B]: 0.04 ~ 0.08 mm
(0.002 ~ 0.003 in)

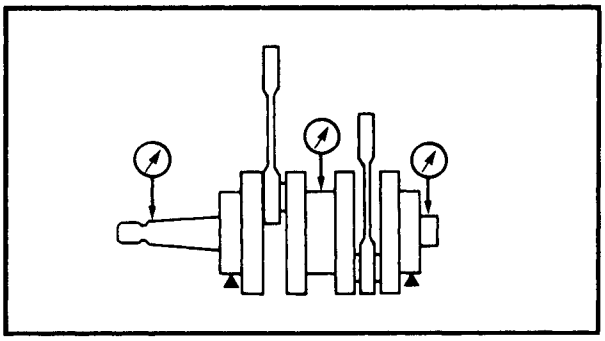


Crankshaft inspection

1. Measure:
   - Crank width Ⓐ
   - Crank width Ⓑ

   Out of specification → Replace.

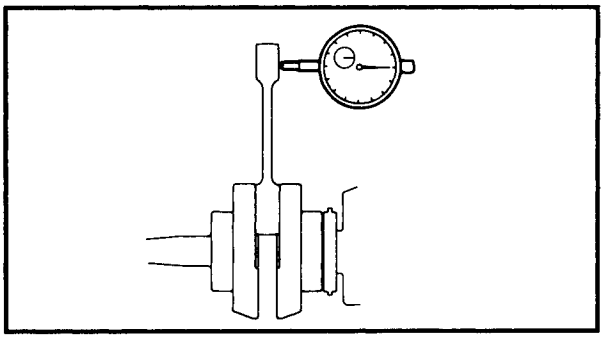
Crank width Ⓐ:
46.90 ~ 46.95 mm (1.846 ~ 1.848 in)
Crank width Ⓑ:
25.90 ~ 26.10 mm (1.020 ~ 1.028 in)



2. Measure:
   - Runout

   Use a V-blocks and dial gauge.
   Out of specification → Replace.

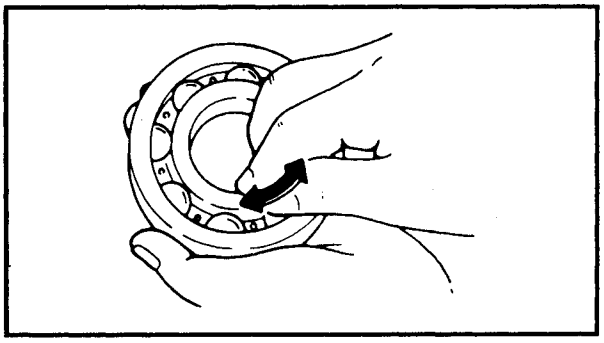
Runout limit:
0.03 mm (0.001 in)



3. Measure:
   - Axial play

   Out of specification → Replace.

Axial play limit:
2.0 mm (0.08 in)

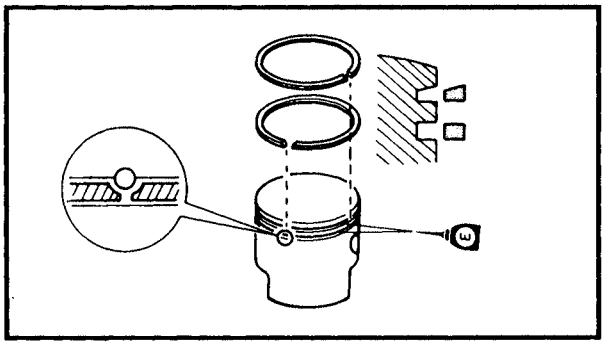


4. Inspect:
   - Crankshaft bearing

   Pitting/Rumbling → Replace.

CAUTION:

- **Do not spin bearing with air blow; this can damage the bearing.**
- **Also take care not to scratch the bearing balls when cleaning.**



Piston and piston ring installation

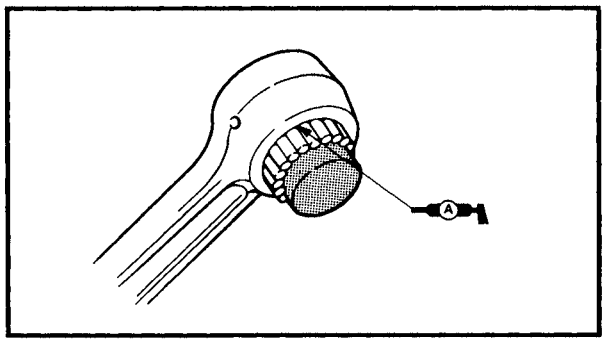
1. Install:
   - Piston ring (2nd)
   - Piston ring (top)

CAUTION:

- **Take care not to scratch the piston or break piston rings.**
- **Align the each ring end gap with their locating pins.**
- **After fitting the rings, check that they move smoothly.**

NOTE:

Piston rings should be replaced as a set.



Crankshaft and piston installation

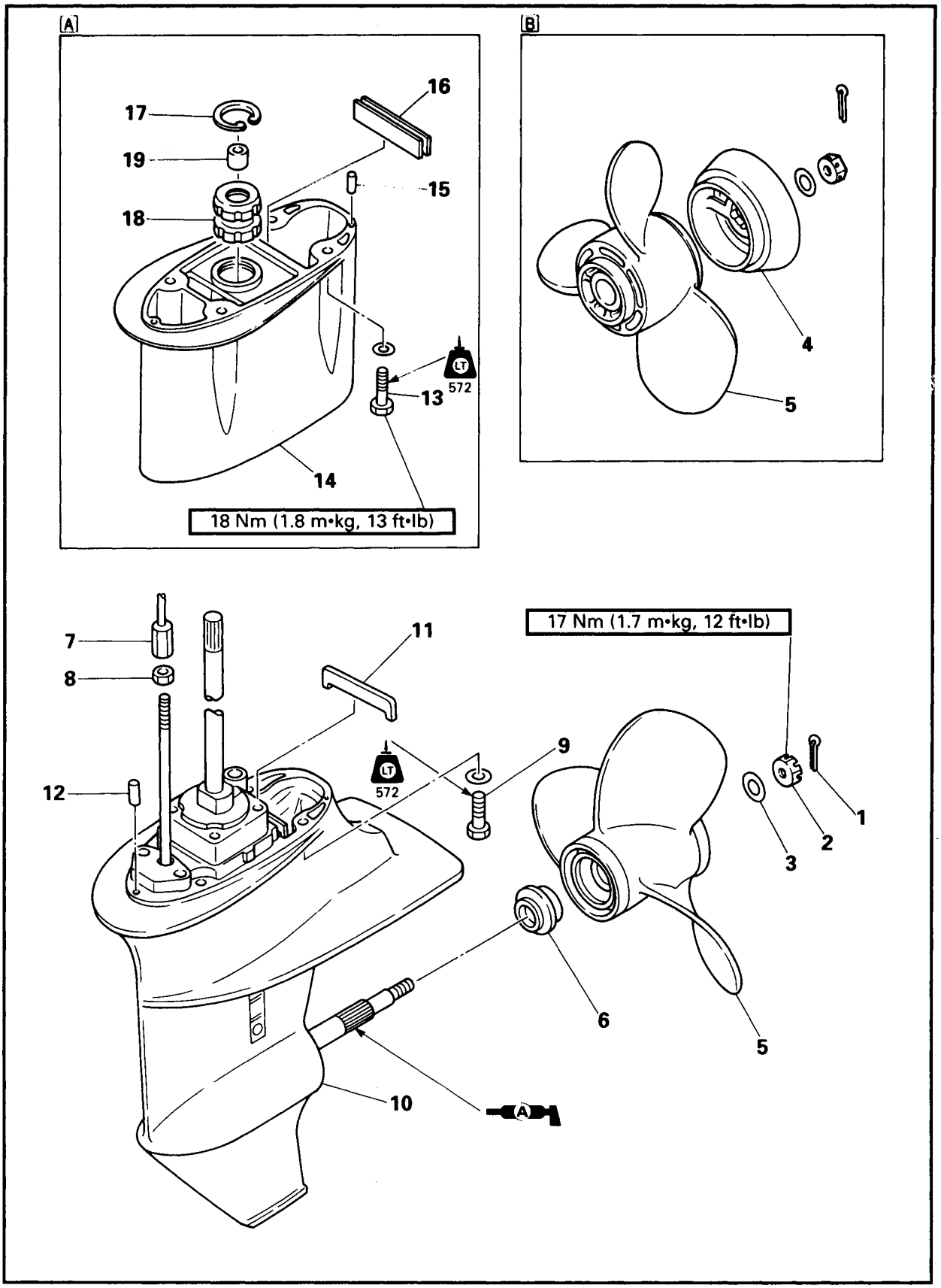
1. Install:
   - Small end bearing needle

	Needles per piston: 25 pieces
	Small end bearing needle installer: YB-06104/90890-06543

CHAPTER 6
LOWER UNIT

LOWER UNIT REMOVAL

EXPLODED DIAGRAM



LOWER UNIT REMOVAL

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	LOWER UNIT REMOVAL		Follow the left "Step" for removal.
1	Cotter pin	1	
2	Propeller nut	1	**NOTE:**
3	Plane washer	1	If the propeller nut does not align with the
4	Deflection ring	1	propeller shaft hole when the nut is tightened
5	Propeller	1	to specification, turn it in further so that they
6	Spacer	1	align.
7	Adjusting nut	1	**NOTE:**
8	Locknut	1	When connecting the adjusting nut, set the
9	Bolt (with washer)	4	shift lever and shift cam to reverse position.
10	Lower unit	1	**NOTE:**
11	Seal rubber	1	Insert the drive shaft into the crankshaft. If the
12	Pin	2	splines will not come in complete mesh,
13	Bolt (with washer)	4	rotate the propeller shaft a little so that they
14	Extension	1	are in mesh correctly.
15	Pin	2	
16	Seal rubber	1	
17	Circlip	1	
18	Damper	1	
19	Bushing	1	
			Reverse the removal steps for installation.

[A] : For super long model
[B] : For dual thrust model

SERVICE POINTS

Propeller inspection

1. Inspect:
   - Blade
   - Spline

   Wear/Crack/Damage → Replace.

Lower unit installation

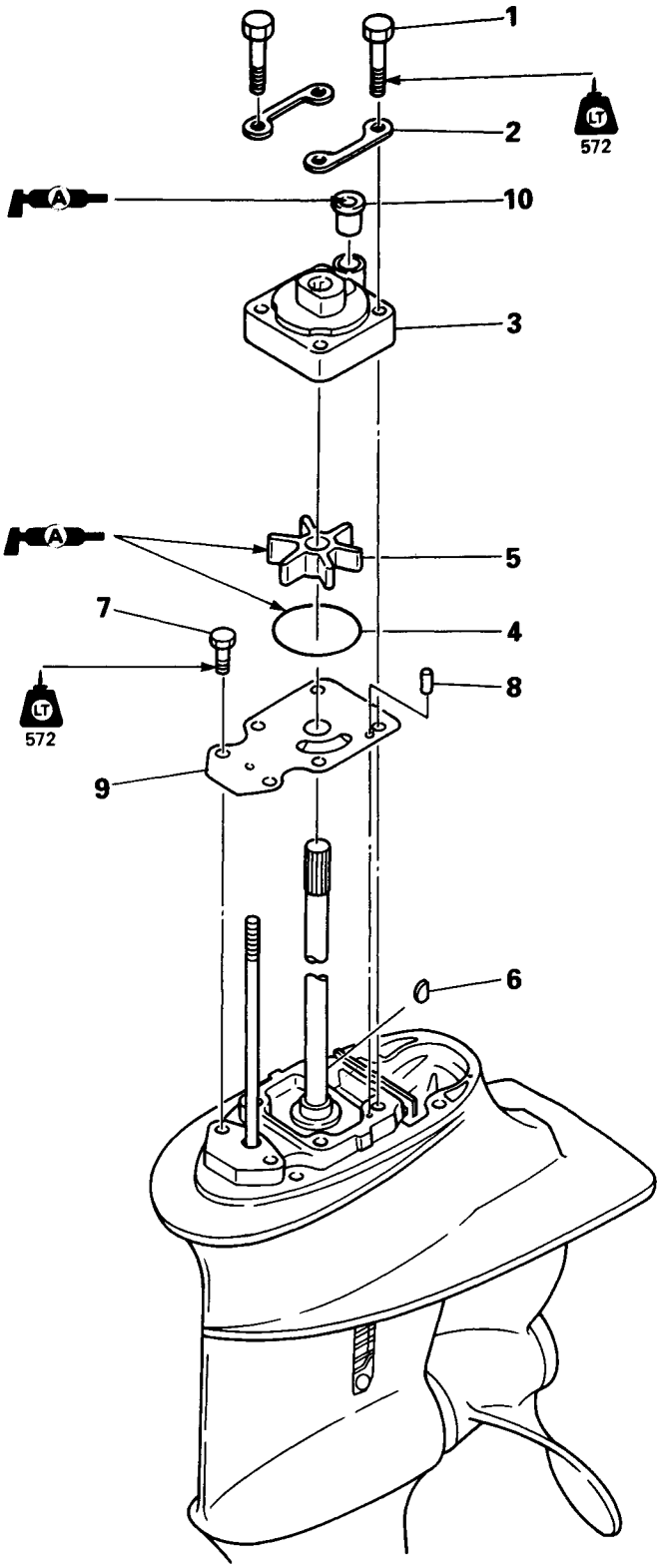
1. Install:
   - Adjusting nut

⚠ WARNING

The adjusting nut should be screwed in more than 8 mm (0.31 in).

WATER PUMP

EXPLODED DIAGRAM



WATER PUMP

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	WATER PUMP REMOVAL		Follow the left "Step" for removal.
	Lower unit assembly		Refer to the "LOWER UNIT REMOVAL" section.
1	Bolt	4	
2	Plate	2	
3	Water pump housing	1	**NOTE:** When installing the water pump housing, turn the drive shaft clockwise.
4	O-ring	1	
5	Impeller	1	
6	Woodruff key	1	
7	Bolt	2	8 x 25 mm
8	Pin	2	
9	Cartridge plate	1	
10	Water seal rubber	1	
			Reverse the removal steps for installation.

SERVICE POINTS

Water pump housing inspection

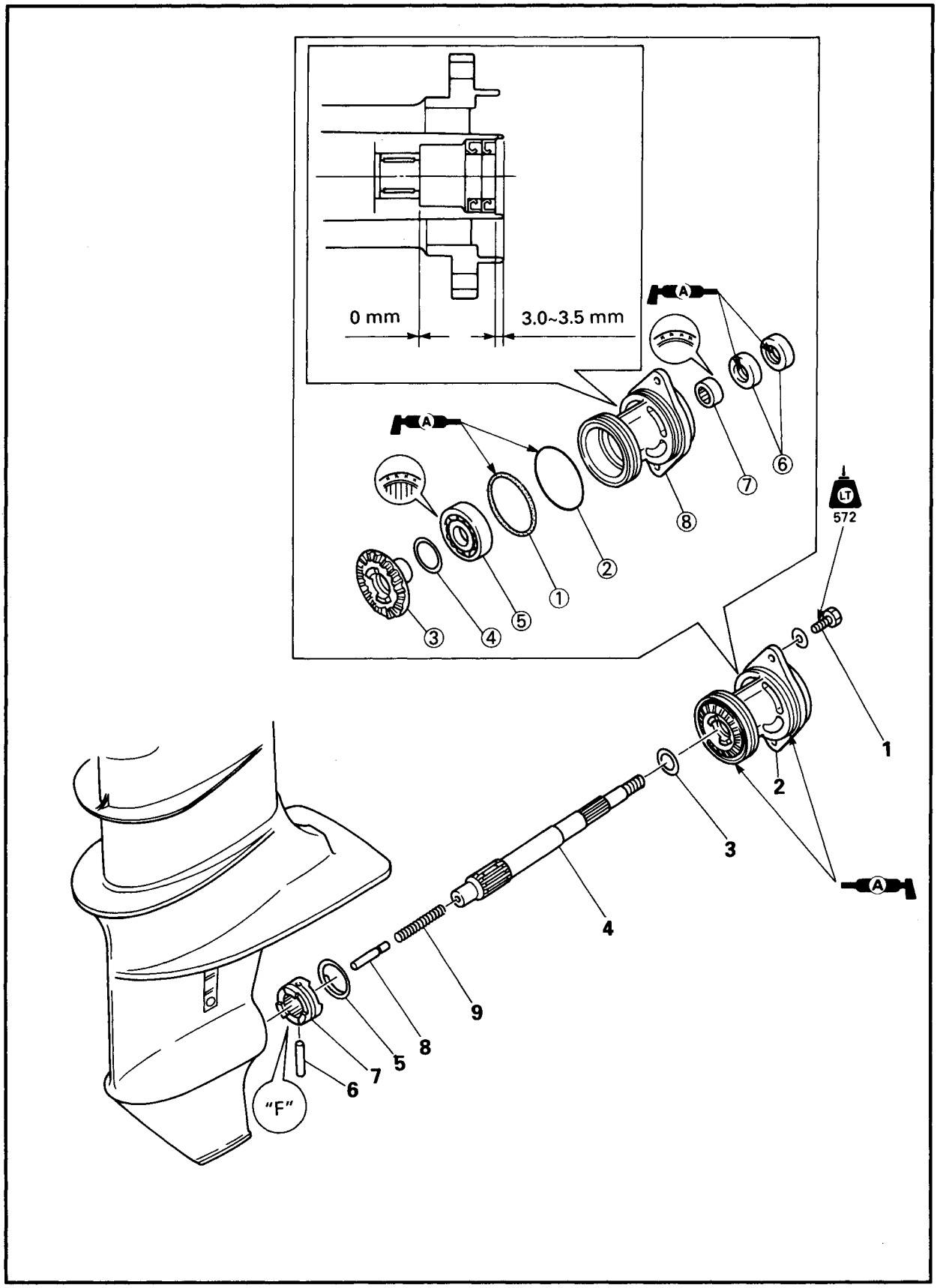
1. Inspect:
   - Water pump housing
     Crack/Damage → Replace.

Impeller and insert cartridge inspection

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

PROPELLER SHAFT AND REVERSE GEAR

EXPLODED DIAGRAM

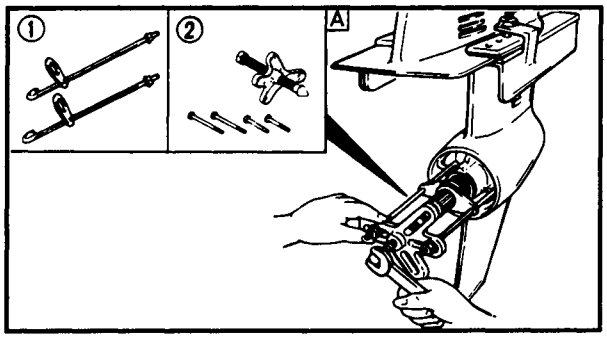


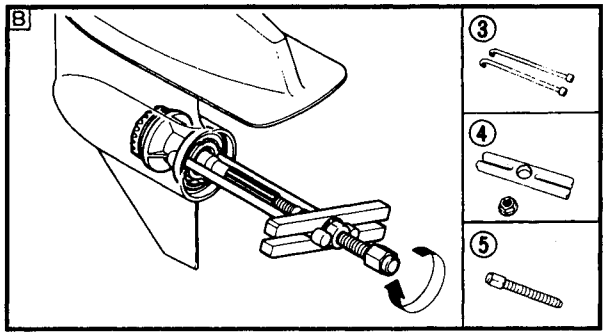
PROPELLER SHAFT AND REVERSE GEAR

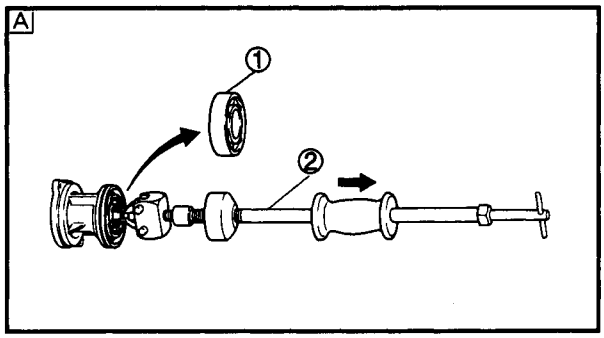
REMOVAL AND INSTALLATION CHART

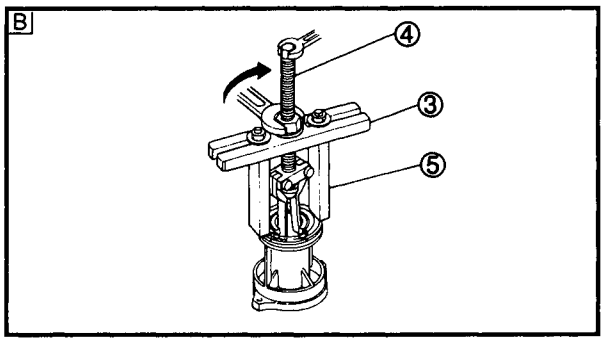
Step	Procedure/Part name	Q'ty	Service points
	PROPELLER SHAFT AND REVERSE GEAR REMOVAL		Follow the left "Step" for removal.
	Gear oil		Refer to the "LOWER UNIT" section in chapter 3.
	Propeller		Refer to the "LOWER UNIT REMOVAL" section.
1	Bolt (with washer)	2	6 x 20 mm
2	Propeller shaft housing assembly	1	
3	Plate washer	1	
4	Propeller shaft	1	
5	Cross pin ring	1	
6	Cross pin	1	**NOTE:** By pushing the shift plunger, bring the cross pin hole in the dog clutch with the hole in the shift slider.
7	Dog clutch	1	**NOTE:** Install the clutch with "F" mark toward the forward gear side.
8	Shift plunger	1	
9	Spring	1	
	PROPELLER SHAFT HOUSING DISASSEMBLY		
①	O-ring	1	
②	O-ring	1	
③	Reverse gear	1	
④	Reverse gear shim	*	
⑤	Ball bearing	1	
⑥	Oil-seal	2	
⑦	Needle housing	1	
⑧	Propeller Shaft housing	1	
			Reverse the removal steps for installation.

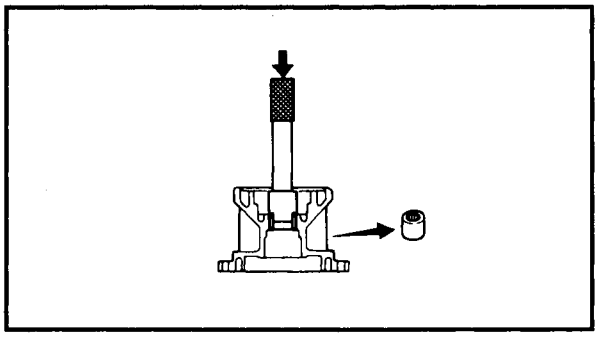
*: As required











SERVICE POINTS

Propeller shaft housing removal

1. Remove:
   - Propeller shaft housing assembly

Bearing housing puller:
YB-06234 ..... ①
90890-06503 ..... ③
Universal puller:
YB-06117 ..... ②
Stopper guide plate:
90890-06501 ..... ④
Center bolt:
90890-06504 ..... ⑤

A For USA and CANADA
B Except for USA and CANADA

Propeller shaft housing disassembly

1. Remove:
   - Ball bearing ①

Slide hammer set:
YB-06096 ..... ②
Stopper guide plate:
90890-06501 ..... ③
Bearing puller:
90890-06535 ..... ④
Stopper guide stand:
90890-06538 ..... ⑤

A For USA and CANADA
B Except for USA and CANADA

2. Remove:
   - Needle bearing

Driver rod:
YB-06071/90890-06604
Needle bearing attachment:
YB-06081/90890-06616

Reverse gear inspection

1. Inspect:
   - Tooth
   - Dog

   Wear/Damage → Replace.

Bearing inspection

1. Inspect:
   - Bearing

   Pitting/Rumbling → Replace.

Propeller shaft housing inspection

1. Clean:
   - Propeller shaft housing

   Use a soft brush and solvent.
2. Inspect:
   - Propeller shaft housing

   Crack/Damage → Replace.

Dog clutch inspection

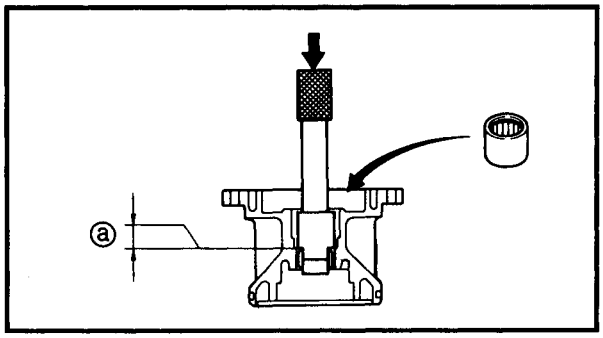
1. Inspect:
   - Dog clutch

   Wear/Damage → Replace.

Propeller shaft inspection

1. Inspect:
   - Propeller shaft

   Wear/Damage → Replace.

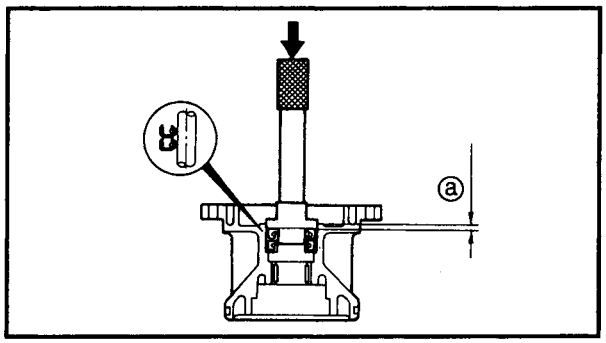


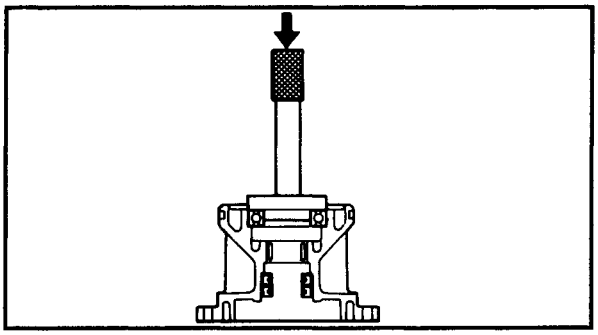
Propeller shaft housing assembly

1. Install:
   - Needle bearing

Depth ⓐ:
0 mm (0 in)

Driver rod:
YB-06071/90890-06604
Needle bearing attachment:
YB-06081/90890-06616





2. Install:
- Oil seal

Depth ⓐ:
3.0 ~ 3.5 mm (0.12 ~ 0.14 in)

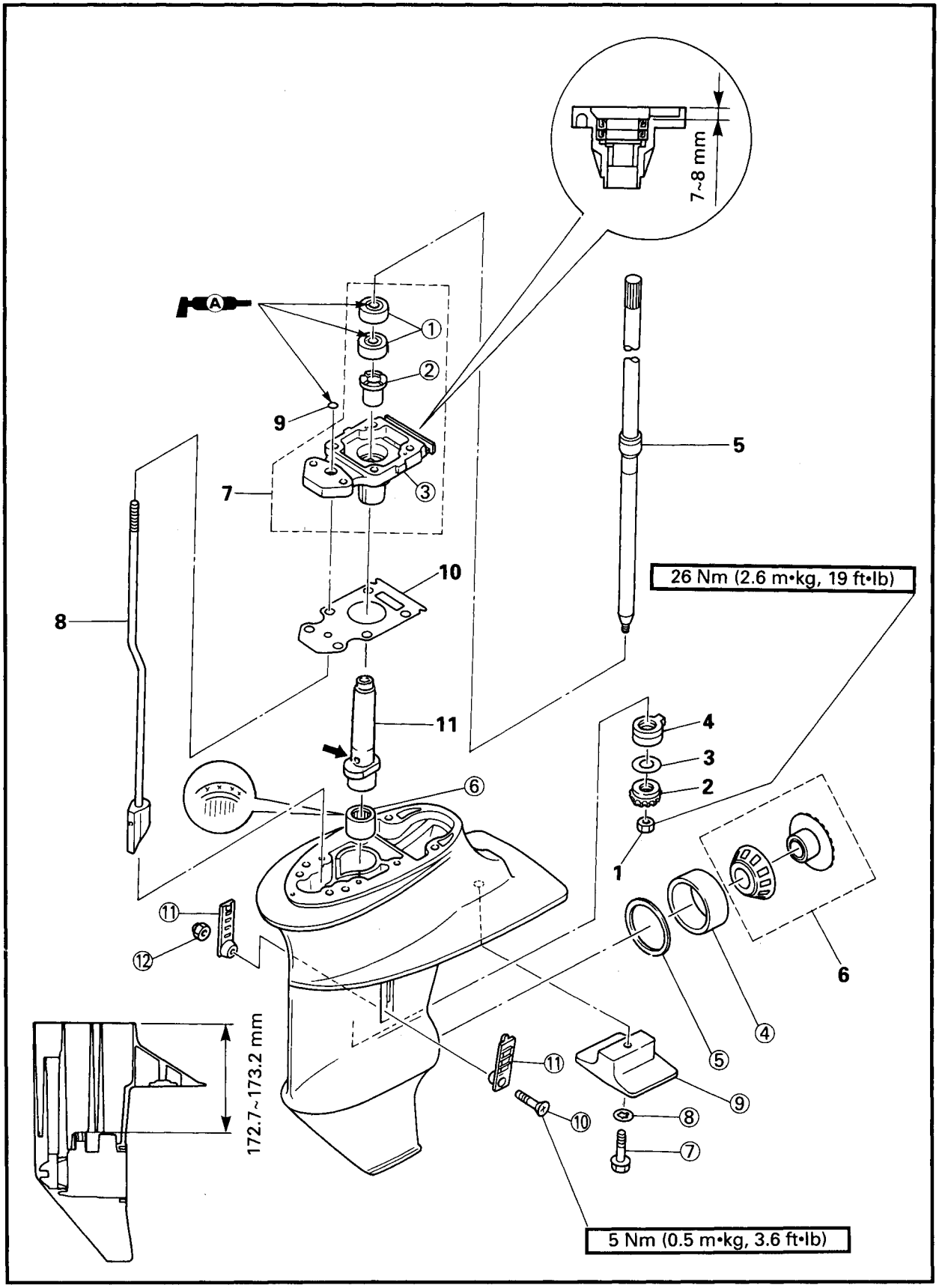
Oil seal installer:
YB-06168
Driver rod:
YB-06071

3. Install:
- Ball bearing

Bearing installer:
YB-06015
Driver rod:
YB-06071

DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD

EXPLODED DIAGRAM



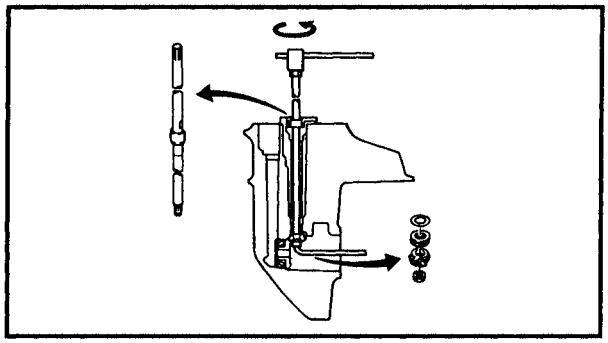
DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD REMOVAL		Follow the left "Step" for removal.
	Propeller shaft		Refer to the "PROPELLER SHAFT AND REVERSE GEAR" section.
	Impeller		Refer to the "WATER PUMP" section.
1	Pinion nut	1	
2	Pinion gear	1	
3	Shim	1	
4	Thrust bearing	1	
5	Drive shaft	1	
6	Forward gear assembly	1	
7	Bearing housing	1	
8	Shift rod	1	
9	O-ring	1	
10	Bearing housing gasket	1	
11	Sleeve	1	**NOTE:** Install the sleeve with its hole frontward.
	BEARING HOUSING DISASSEMBLY		
①	Oil seal	2	
②	Bushing	1	
③	Bearing housing	1	
	LOWER CASE DISASSEMBLY		
④	Forward gear bearing outer race	1	
⑤	Forward gear shim	*	
⑥	Needle bearing	1	
⑦	Bolt	1	8 x 30 mm
⑧	Toothed washer	1	
⑨	Anode	1	
⑩	Screw	1	
⑪	Water inlet cover	2	
⑫	Nut	1	
			Reverse the removal steps for installation.

*:As required

DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD

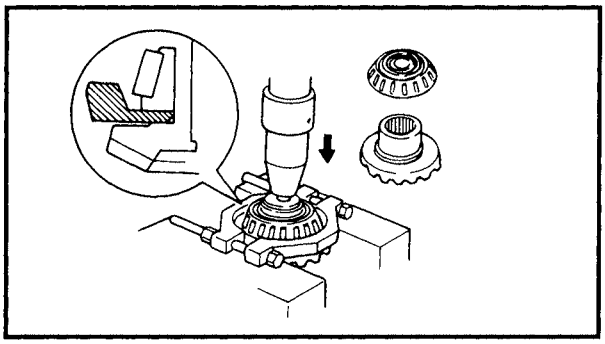


SERVICE POINTS

Pinion nut removal and installation

1. Remove and install:
   - Pinion nut

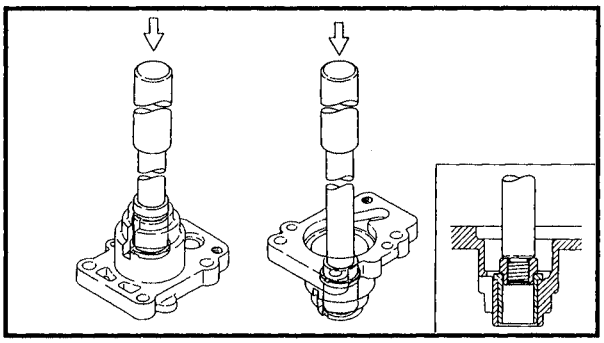
Drive shaft holder:
YB-06228/90890-06515
Pinion nut holder:
YB-06078



Forward gear disassembly

1. Remove:
   - Taper roller bearing
   - Forward gear

Bearing separator:
YB-06219/90890-06534

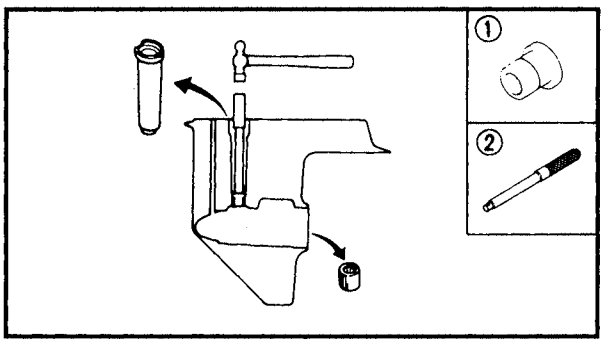


Bearing housing disassembly and assembly

1. Remove and install:
   - Bushing

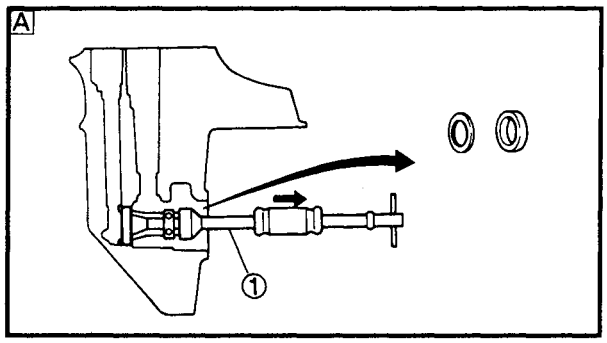
Bushing attachment:
YB-06028/90890-06649
Driver rod:
YB-06229/90890-06652

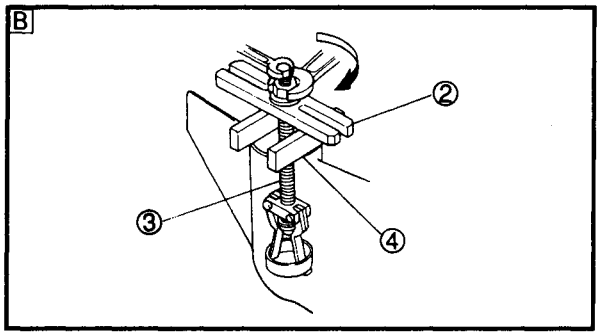
Lower case disassembly



1. Remove:
   - Drive shaft needle bearing

Needle bearing attachment:
YB-06230/90890-06617 ..... ①
Driver rod:
YB-06229/90890-06602 ..... ②





2. Remove:
   - Forward gear bearing outer race

Slide hammer set:
YB-06096 ..... ①
Stopper guide plate:
90890-06501 ..... ②
Bearing outer race puller:
90890-06535 ..... ③
Stopper guide stand:
90890-06538 ..... ④

A For USA and CANADA
B Except for USA and CANADA

Pinion and forward gear inspection
1. Inspect:
   - Tooth
   - Dog

   Wear/Damage → Replace.

Drive shaft inspection
1. Inspect:
   - Drive shaft

   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

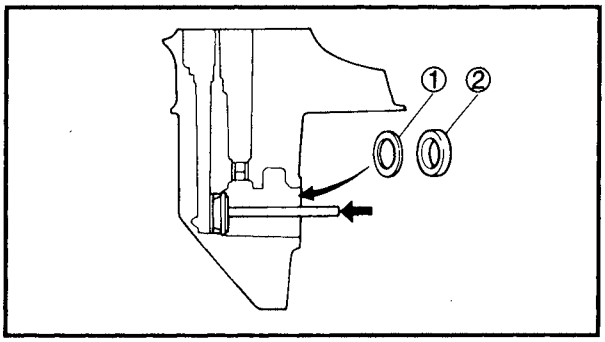
   Wear/Damage → Replace.

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.

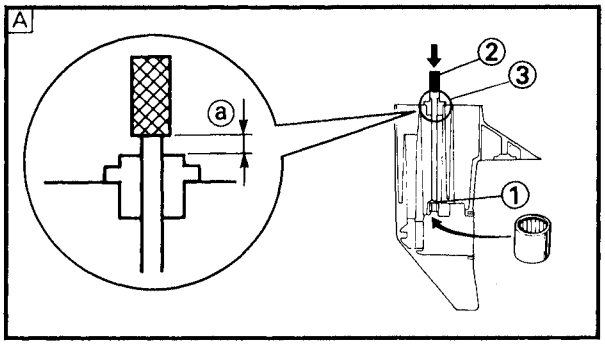
Lower case assembly

1. Install:
   - Forward gear shim ①
   - Forward gear bearing outer race ②



Bearing installer:
YB-06085/90890-06625
Driver rod:
YB-06071/90890-06605

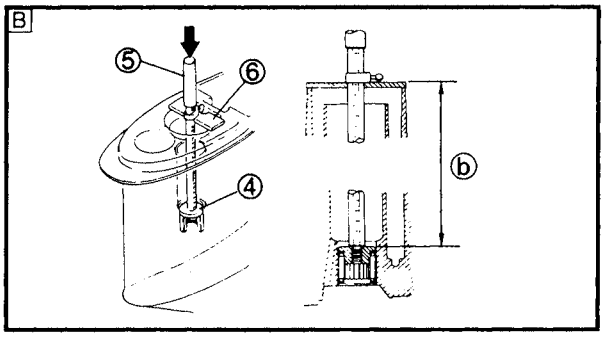
A



2. Install:
   - Drive shaft needle bearing

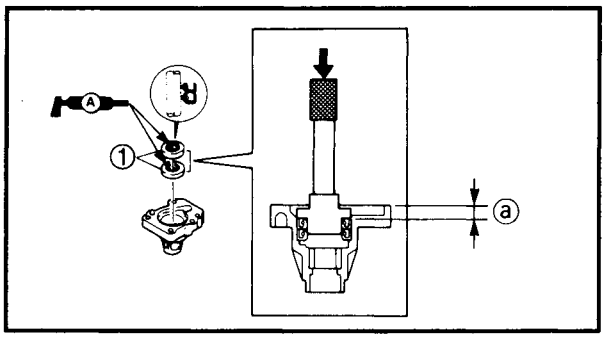
Depth ⓐ:
17.8 mm (0.70 in)
Depth ⓑ:
172.7~173.2 mm (6.80~6.82 in)

B



Bearing attachment:
YB-06230 ..... ①
90890-06617 ..... ④
Driver rod:
YB-06229 ..... ②
90890-06602 ..... ⑤
Driveshaft needle bearing depth stop:
YB-06231 ..... ③
Bearing depth plate:
90890-06603 ..... ⑥

A For USA and CANADA
B Except for USA and CANADA

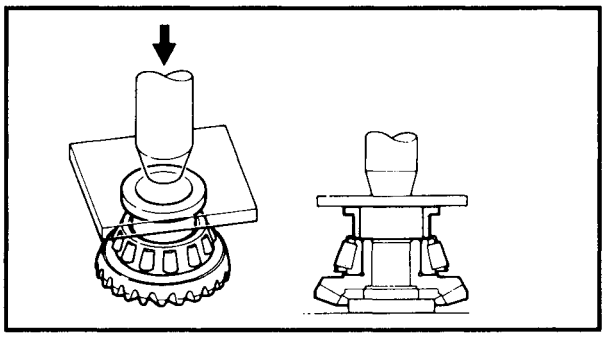


Drive shaft oil seal housing assembly

1. Install:
   - Oil seal ①

	Depth ⓐ: **7.0 ~ 8.0 mm (0.28 ~ 0.31 in)**

	Bearing installer: **YB-06022** **Driver rod:** **YB-06071**



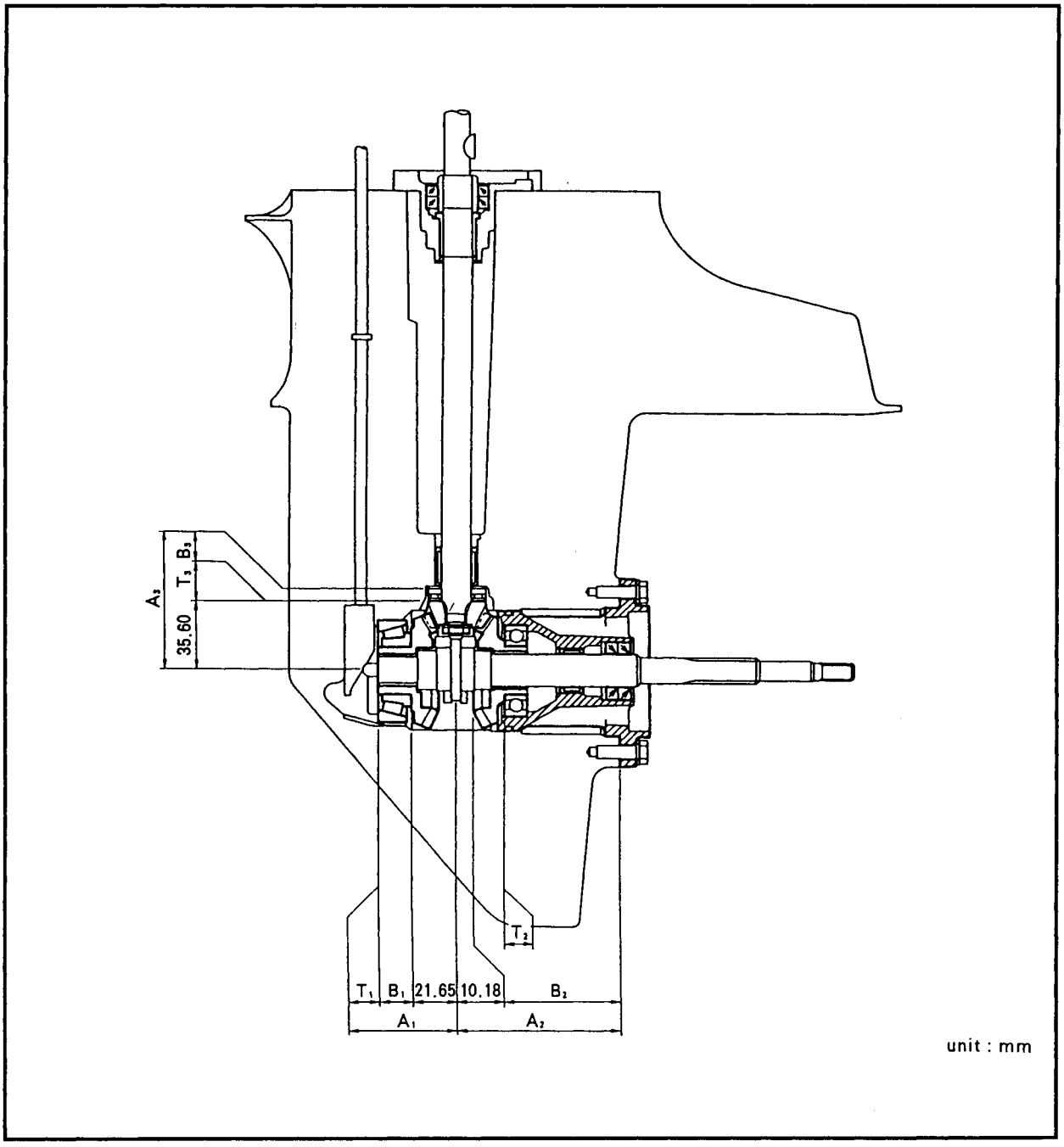
Forward gear assembly

1. Install:
   - Forward gear
   - Taper roller bearing

	Bearing installer: **90890-06644**

SHIMMING

EXPLODED DIAGRAM

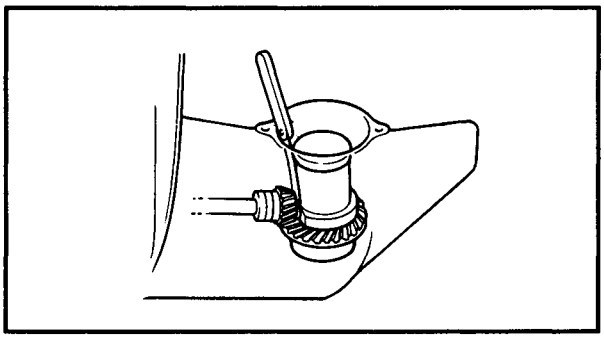


unit : mm

NOTE:

Shim selection requirement guide:

- Not required when;
  reassembling with original case and inner parts.
- Numeric calculation is required when;
  reassembling with original inner parts and the new case. (Difference between original and new case)
- Measurement and adjustment is required when;
  replacing the inner part(s).



SHIM SELECTION (FOR USA AND CANADA)

Pinion gear shim

1. Measure:
   - Pinion gear clearance
     Out of specification → Adjust.

	Clearance: **1.15 ~ 1.25 mm**

Measuring steps:

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

	Pinion nut: **26 Nm (2.6 m • kg, 19 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

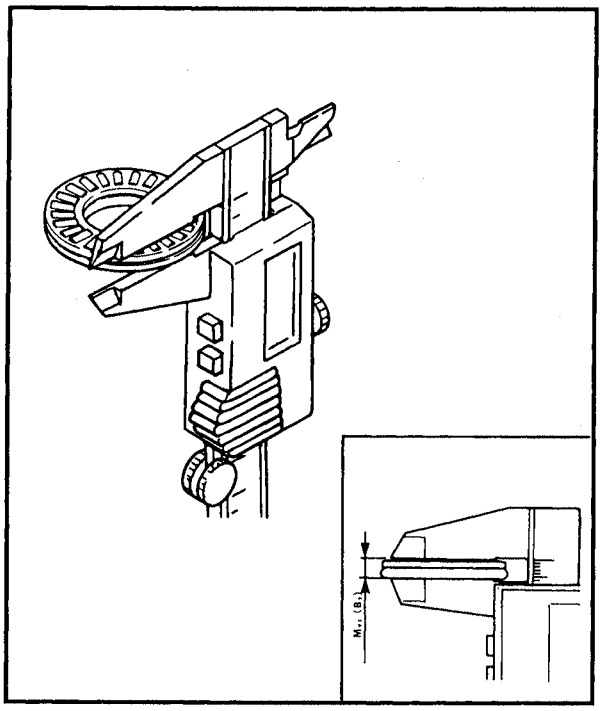
NOTE:
Find forward and reverse gear shim thickness by backlash measurement.

SHIM SELECTION (EXCEPT FOR USA AND CANADA)

Pinion gear shim

NOTE:

Find pinion gear shim thickness (T3) by selecting shims until the specified measurement is obtained with the special tool.



1. Measure:
   - Measurement (M)

	Digital caliper: 90890-06704

NOTE:

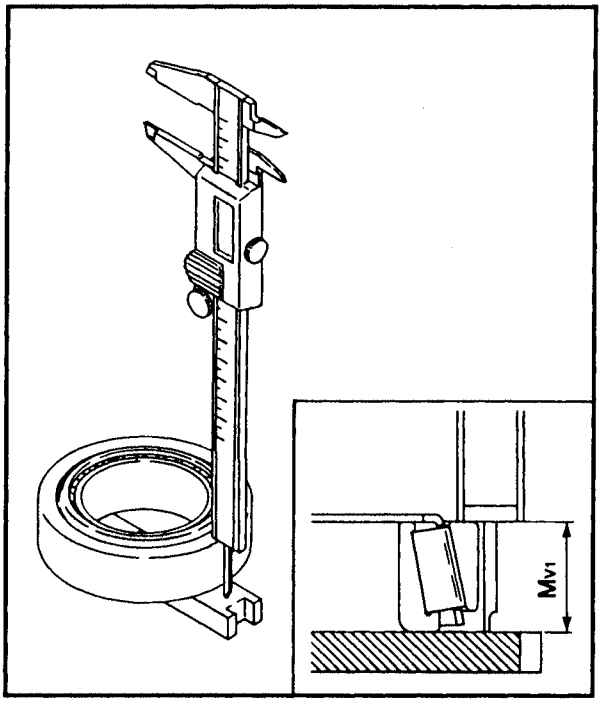
Measure the thicknesses (Mv3) of bearing and washer.

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 (M) is obtained with the special tool.

1. Measure:
   - Measurement (M)

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)

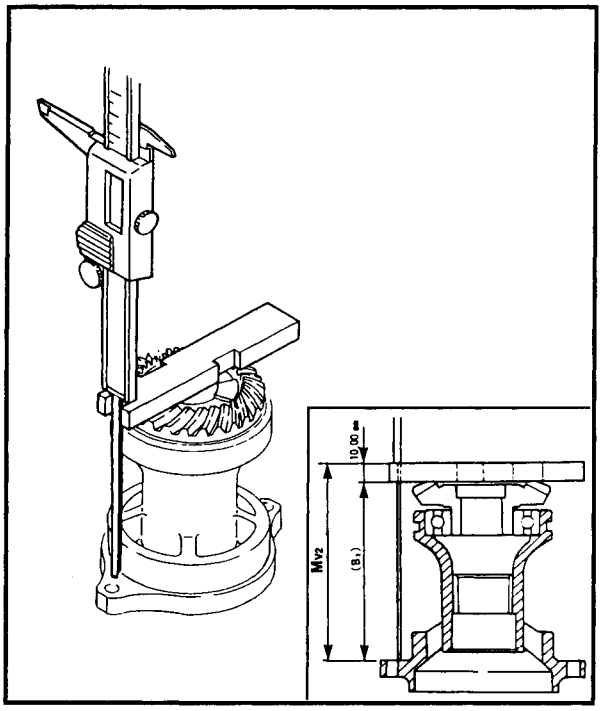
Forward gear shim thickness
(T1) = 16.60 - Mv1

3. Select:
   - Forward gear shim

Calculated numeral at 1/100th place		Rounded numeral
more than	or less	
0.00	0.02	0.00
0.02	0.05	0.02
0.05	0.08	0.05
0.08	0.10	0.08

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

Example:
If T1 is "0.44 mm",
then forward gear shim = 0.42 mm
If T1 is "0.45 mm",
then forward gear shim = 0.45 mm



Reverse gear shim

NOTE:

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

1. Measure:
   - Measurement (M)

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

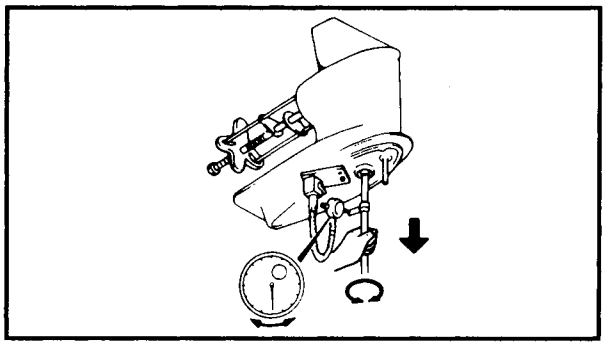
Calculated numeral		Using shim
more than	or less	
0.30	0.40	0.30
0.40	0.50	0.40
0.50	0.60	0.50
0.60	0.70	0.60

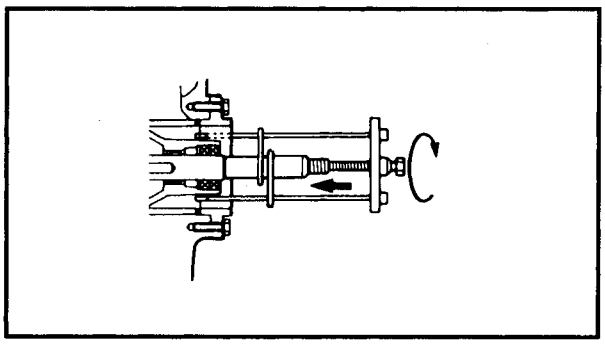
Available shim thickness:
0.10, 0.20, 0.30, 0.40 and 0.50 mm

BACKLASH MEASUREMENT

NOTE:

- Do not install the water pump components when measuring the backlash.
- Both forward and reverse gear backlashes should be measured.
- If both the forward and reverse gear backlashes are large than specified, the pinion may be too high.
- If both forward and reverse gear backlashes are smaller than specified, the pinion may be too low.
- If either of these conditions exists, then check the pinion shim selection.





Forward gear

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

Backlash:
0.19 ~ 0.86 mm (0.007 ~ 0.034 in)

Measuring steps:

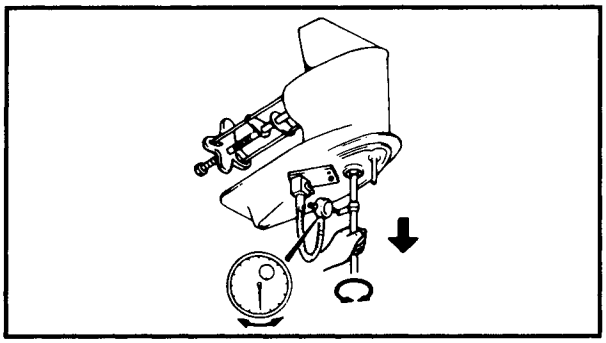
- Set the shift shaft in the forward position.
- Set the bearing housing puller for pushing the propeller shaft.

Bearing housing puller:
YB-06234/90890-06503
Universal puller:
YB-06117
Stopper guide plate:
90890-06501
Center bolt:
90890-06504

Center bolt:
5 Nm (0.5 m • kg, 3.6 ft • lb)

- Set the lower unit upside down.
- Attach the backlash indicator on the drive shaft (12.8 mm in diameter).

Backlash indicator:
YB-06265/90890-06706



- Attach the dial gauge on the lower case, and make the dial gauge stem contact the mark on the indicator.

Backlash adjusting plate:
YB-07003
Dial gauge:
YU-03097/90890-01252
Magnet base:
YU-34481/90890-06705

- While pulling the drive shaft, slowly turn the drive shaft clockwise and counterclockwise; then, measure the backlash when the drive shaft stops in each direction.

2. Adjust:
   - Forward gear shim(s)

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

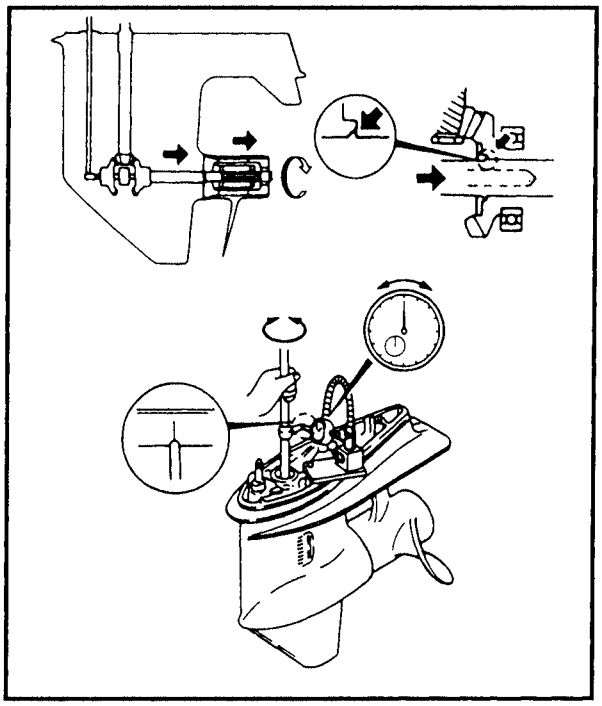
Forward gearbacklash	Shim thickness
Less than 0.19 mm	To be decreased by $\frac{(0.53 - \text{measurement})}{2.1}$
More than 0.86 mm	To be increased by $\frac{(\text{measurement} - 0.53)}{2.1}$

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.

Backlash:
0.95 ~ 1.65 mm (0.037 ~ 0.065 in)



Measuring steps:
- Set the shift shaft in the reverse position.
- Load the reverse gear by installing the propeller with the front side facing backward, and tighten the propeller nut.

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 on the lowercase, and make the dial gauge stem contact the mark on the indicator.

Backlash adjusting plate:
YB-07003
Dial gauge:
YU-03097/90890-01252
Magnet base:
YU-34481/90890-06705

- While pulling the drive shaft, slowly turn the drive shaft clockwise and counterclockwise; then, measure the backlash when the drive shaft stops at each direction.

2. Adjust:
   - Reverse gear shim(s)

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

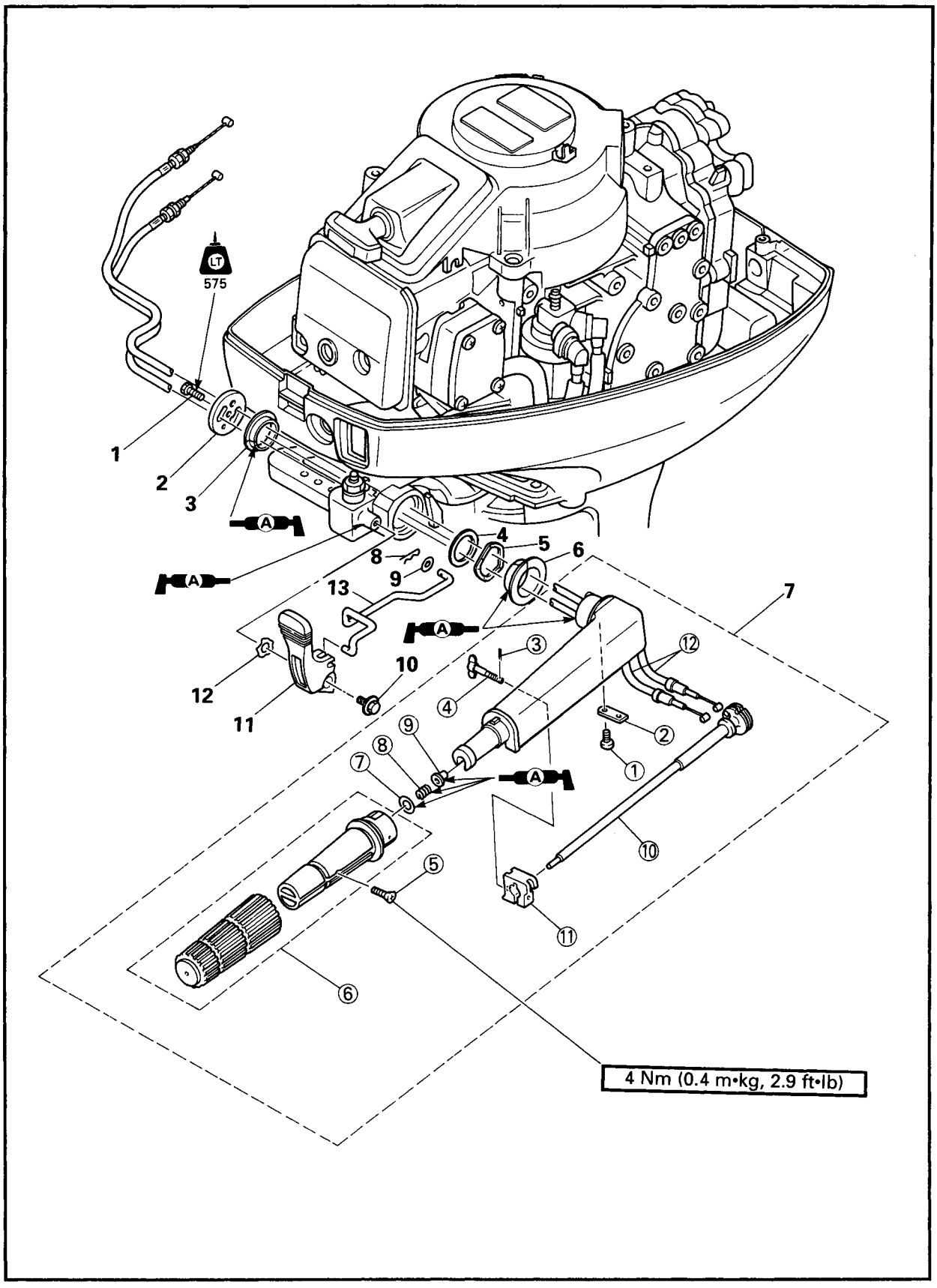
Reverse gear backlash	Shim thickness
Less than 0.95 mm	To be decreased by $\frac{(1.30 - \text{measurement})}{2.1}$
More than 1.65 mm	To be increased by $\frac{(\text{measurement} - 1.30)}{2.1}$

Available shim thickness:
0.10, 0.20, 0.30, 0.40 and 0.50 mm

CHAPTER 7
BRACKET UNIT

STEERING HANDLE AND SHIFT LEVER

EXPLODED DIAGRAM



STEERING HANDLE AND SHIFT LEVER

REMOVAL AND INSTALLATION CHART AND SHIFT LEVER

Step	Procedure/Part name	Q'ty	Service points
	STEERING HANDLE REMOVAL		Follow the left "Step" for removal.
	Control pulley bracket assembly		Refer to the "POWER UNIT REMOVAL" section in chapter 5.
1	Bolt	1	6 X 16 mm
2	Plate	1	
3	Bushing	1	
4	Plane washer	1	
5	Wave washer	1	
6	Bushing	1	
7	Steering handle assembly	1	
	SHIFT LEVER REMOVAL		
8	Clip	1	
9	Plane washer	1	
10	Bolt	1	6 x 12 mm
11	Shift lever	1	
12	Wave washer	1	
13	Shift link rod	1	
	STEERING HANDLE DISASSEMBLY		
①	Screw	2	
②	Plate	1	
③	Clip	1	
④	Friction adjusting screw	1	
⑤	Screw	1	
⑥	Steering grip	1	
⑦	Plane washer	1	
⑧	Spring	1	
⑨	Bushing	1	
⑩	Throttle shaft	1	
⑪	Friction piece	1	
⑫	Throttle cable	2	
			Reverse the removal steps for installation.

SERVICE POINTS

Control cable inspection

1. Inspect:
   - Throttle cable
     Kink/Fray/Stick → Replace.

Bushing inspection

1. Inspect:
   - Bushing
     Wear/Crack/Damage → Replace.

Friction piece inspection

1. Inspect:
   - Friction piece
     Wear/Crack/Damage → Replace.

Steering handle inspection

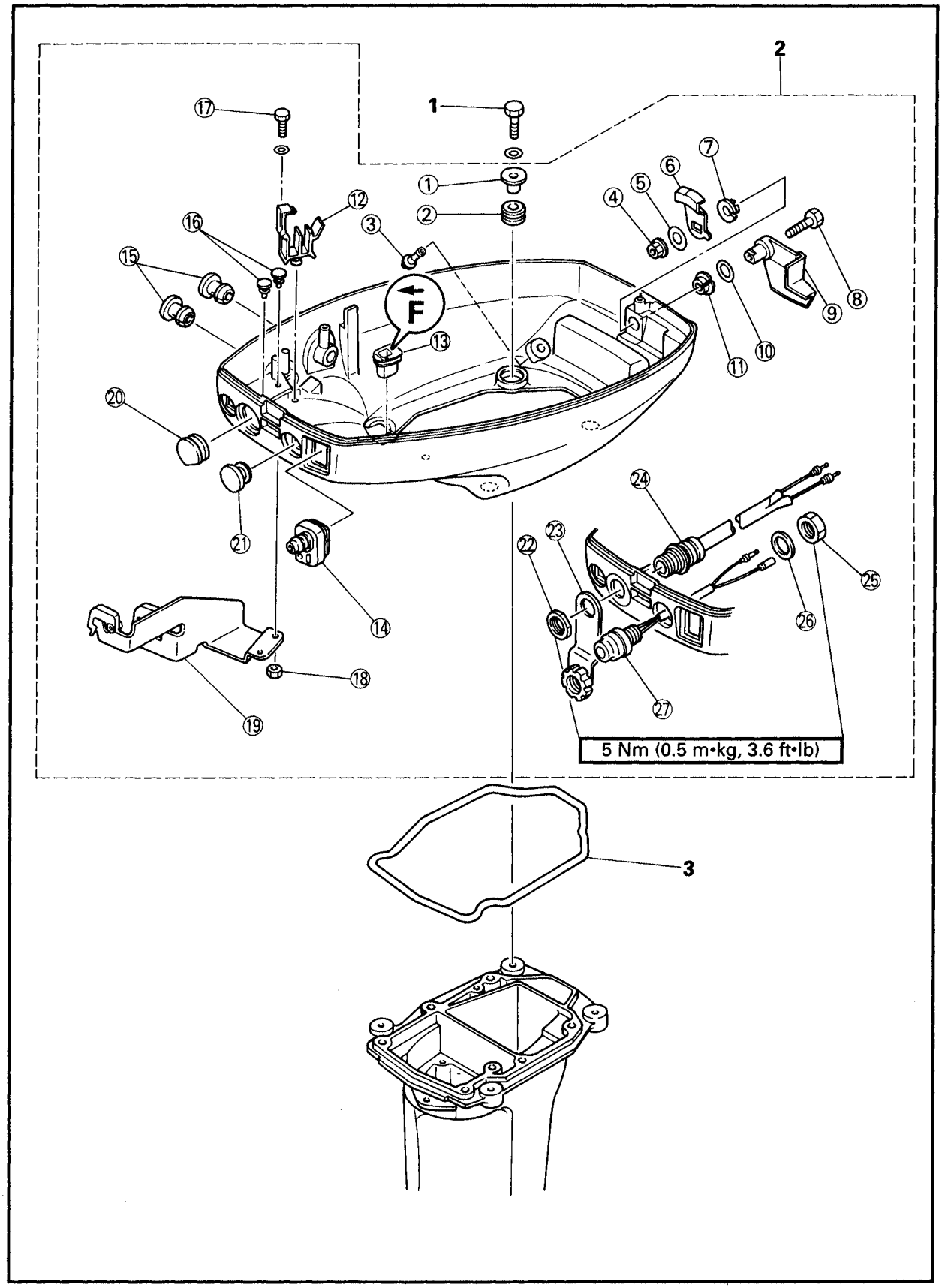
1. Inspect:
   - Steering handle
     Wear/Crack/Damage → Replace.

Throttle shaft inspection

1. Inspect:
   - Throttle shaft
     Wear/Bent/Damage → Replace.

BOTTOM COWLING

EXPLODED DIAGRAM



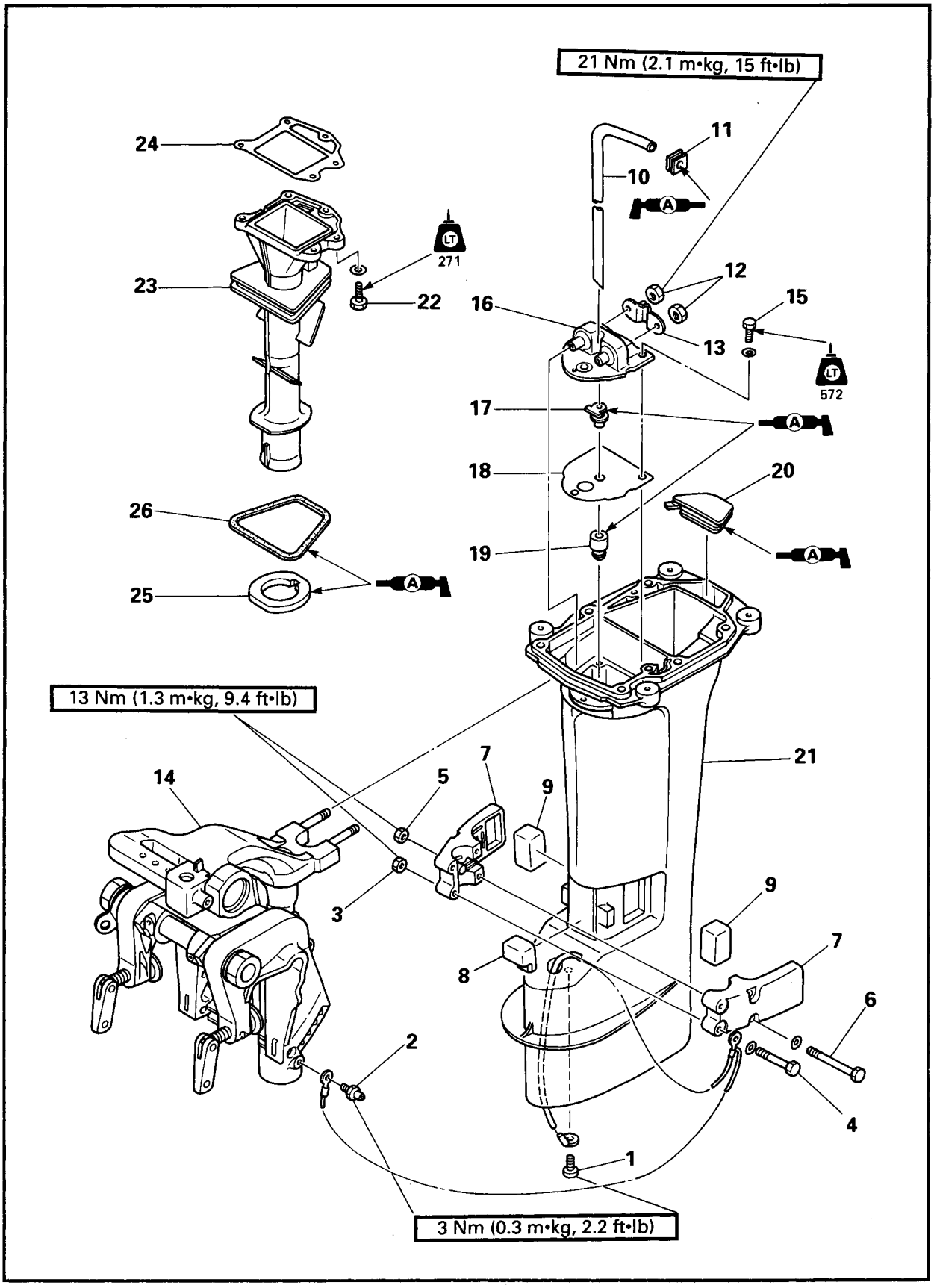
BOTTOM COWLING

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	BOTTOM COWLING REMOVAL		Follow the left "Step" for removal.
	Power unit		Refer to the "POWER UNIT REMOVAL" section in chapter 5.
1	Bolt (with washer)	4	6 x 25 mm
2	Bottom cowling assembly	1	
3	Seal rubber	1	
	BOTTOM COWLING DISASSEMBLY		
①	Collar	4	
②	Grommet	4	
③	Hose nipple	1	
④	Nut	1	
⑤	Plane washer	1	
⑥	Clamp hook	1	
⑦	Bushing	1	
⑧	Bolt	1	6 x 25 mm
⑨	Clamp lever	1	
⑩	Wave washer	1	
⑪	Bushing	1	
⑫	Fitting plate	1	
⑬	Grommet	1	
⑭	Grommet	1	
⑮	Grommet	2	except for remote model
⑯	Grommet	2	
⑰	Bolt (with washer)	2	for remote model: 6 x 16 mm
⑱	Nut	2	
⑲	Remote bracket	1	
⑳	Grommet	1	except for electrical starter model
㉑	Grommet	1	
㉒	Nut	1	for 2P connector
㉓	Cap	1	
㉔	2P connector	1	
㉕	Nut	1	for starter switch model
㉖	Plane washer	1	
㉗	Starter switch	1	
			Reverse the removal steps for installation.

UPPER CASE AND EXHAUST MANIFOLD

EXPLODED DIAGRAM



UPPER CASE AND EXHAUST MANIFOLD

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	UPPER CASE REMOVAL		Follow the left "Step" for removal.
	Bottom cowling assembly		Refer to the "BOTTOM COWLING REMOVAL" section.
	Lower unit		Refer to the "LOWER UNIT REMOVAL" section in chapter 6.
1	Screw	1	
2	Nipple	1	
3	Nut	2	
4	Bolt (with washer)	2	6 × 55 mm
5	Nut	2	
6	Bolt (with washer)	2	6 × 75 mm
7	Lower mount rubber housing	2	
8	Front mount rubber	1	
9	Side mount rubber	2	
10	Water tube	1	
11	Seal rubber	1	
12	Nut	2	
13	Plate	1	
14	Bracket unit assembly	1	
15	Bolt (with washer)	3	6 × 18 mm
16	Upper rubber mount	1	
17	Water rubber seal	1	
18	Upper casing gasket	1	
19	Water rubber seal	1	
20	Plane rubber	1	
21	Upper case	1	
	EXHAUST MANIFOLD REMOVAL		
	Power unit		Refer to the "POWER UNIT REMOVAL" section in chapter 5.
22	Bolt (with washer)	5	6 × 20 mm
23	Exhaust manifold	1	
24	Exhaust manifold gasket	1	
25	Exhaust manifold packing	1	
26	O-ring	1	
			Reverse the removal steps for installation.

SERVICE POINTS

Rubber mount inspection

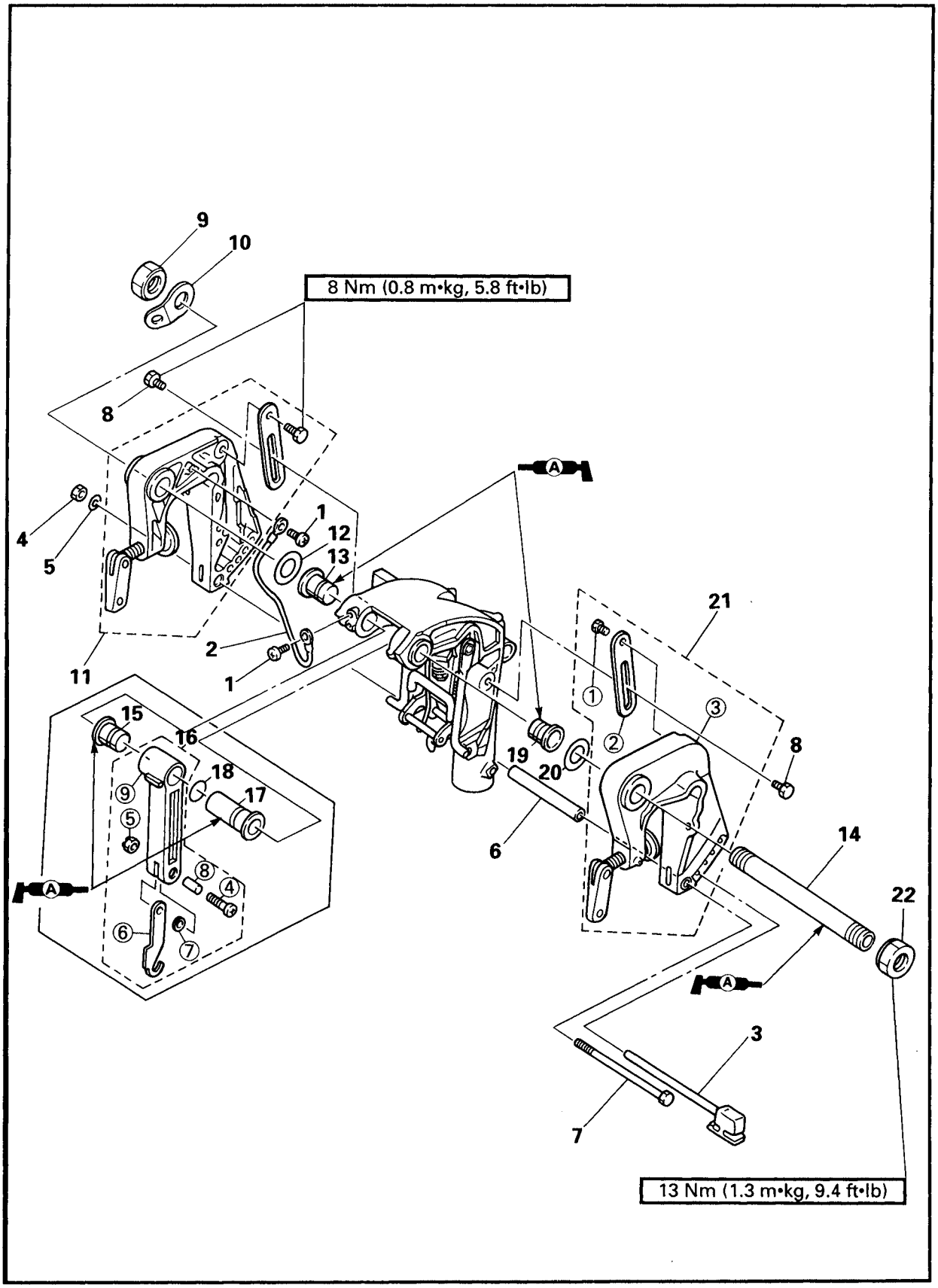
1. Inspect:
   - Rubber mount
     Wear/Crack/Damage → Replace.

Mount bolt inspection

1. Inspect:
   - Mount bolt
     Wear/Bent/Damage → Replace.

CLAMP BRACKET

EXPLODED DIAGRAM



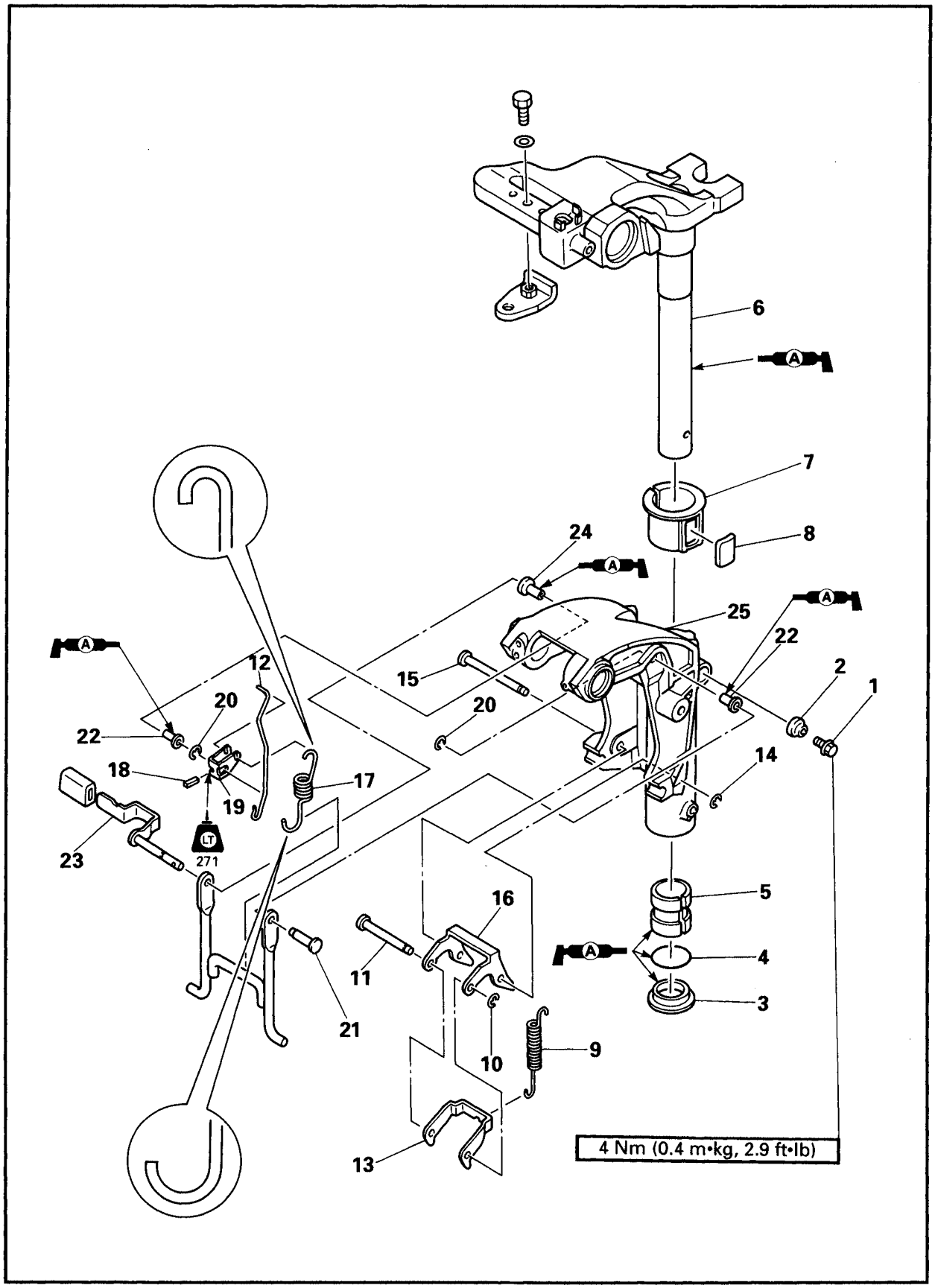
CLAMP BRACKET

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CLAMP BRACKET REMOVAL		Follow the left "Step" for removal.
1	Screw	2	
2	Lead wire	1	
3	Tilt pin	1	
4	Nut	1	
5	Plane washer	1	
6	Collar	1	
7	Bolt	1	
8	Bolt	2	
9	Nut	1	
10	Clamp bracket plate	1	
11	Clamp bracket assembly 1	1	
12	Plane washer	1	
13	Bushing	1	
14	Clamp bracket bolt	1	
15	Bushing	1	Carrying handle model
16	Carrying handle assembly	1	
17	Bushing	1	
18	O-ring	1	
19	Bushing	1	
20	Plane washer	1	
21	Clamp bracket assembly 2	1	
22	Nut	1	
	CLAMP BRACKET DISASSEMBLY		
①	Bolt	2	
②	Tilt stop lever	2	
③	Clamp bracket	2	
	CARRYING HANDLE DISASSEMBLY		
④	Screw	1	Carrying handle model
⑤	Nut	1	
⑥	Hook	1	
⑦	Wave washer	1	
⑧	Coller	1	
⑨	Carrying handle	1	
			Reverse the removal steps for installation.

STEERING AND SWIVEL BRACKET

EXPLODED DIAGRAM



STEERING AND SWIVEL BRACKET

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	STEERING BRACKET REMOVAL		Follow the left "Step" for removal.
	Clamp bracket assembly		Refer to the "BOTTOM COWLING" section.
			section.
1	Flange bolt	1	
2	Seal rubber	1	
3	Bushing	1	
4	O-ring	1	
5	Bushing	1	
6	Steering bracket	1	
7	Bushing	1	
8	Friction piece	1	
	SWIVEL BRACKET DISASSEMBLY		
9	Spring	1	
10	Clip	1	
11	Tilt lock shaft	1	
12	Tilt lock rod	1	
13	Tilt lock arm	1	
14	Clip	1	
15	Tilt lock plate shaft	1	
16	Shallow water drive lever	1	
17	Spring	1	
18	Pin	1	
19	Tilt lever	1	
20	Clip	2	
21	Shaft pin	1	
22	Bushing	2	
23	Control lever	1	
24	Bushing	1	
25	Swivel bracket	1	
			Reverse the removal steps for installation.

CHAPTER 8
ELECTRICAL UNIT

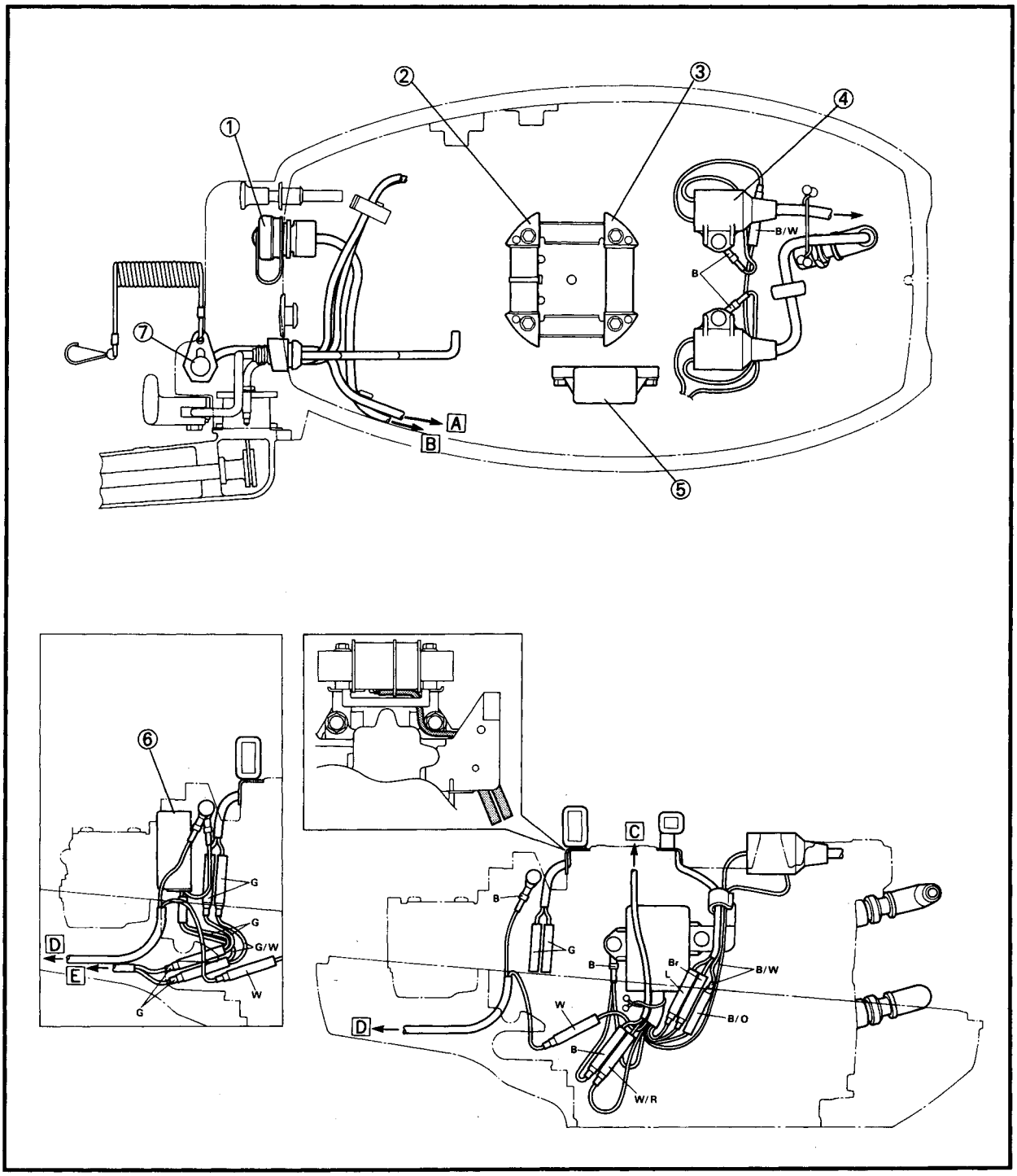
ELECTRICAL COMPONENTS

MANUAL STARTER MODEL

① 2P connector*
② Lighting coil
③ Charge coil
④ Ignition coil
⑤ CDI unit
⑥ Rectifier regulator*
⑦ Engine stop switch

*:Europe model
[A] To ⑤
[B] To ④, ⑤
[C] To pulser coil
[D] To ⑦
[E] To ①

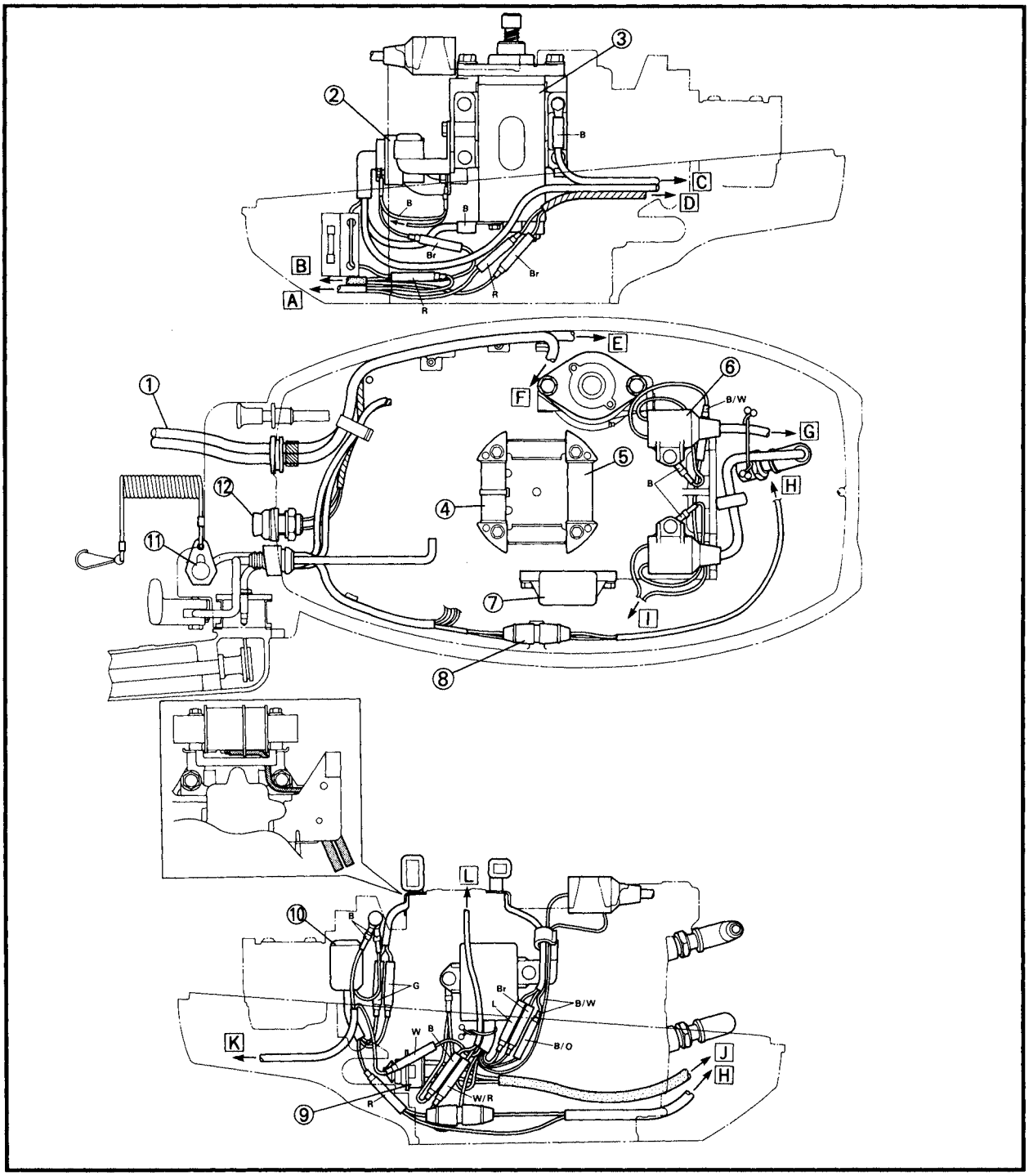
B : Black
Br : Brown
B/O : Black/Orange
B/W : Black/White
G : Green
G/W : Green/White
L : Blue
W : White
W/R : White/Red



ELECTRICAL STARTER MODEL

① Battery cable
② Starter relay
③ Starter motor
④ Lighting coil
⑤ Charge coil
⑥ Ignition coil
⑦ CDI unit
⑧ Fuse
⑨ Neutral switch
⑩ Rectifier
⑪ Engine stop switch
⑫ Starter switch
[A] To ⑩
[B] To ⑨
[C] To battery
[D] To ⑫
[E] To ②
[F] To ③
[G] To spark plug
[H] To ②, ⑫
[I] To ⑦
[J] To ②, ⑫
[K] To ⑪
[L] To pulser coil

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

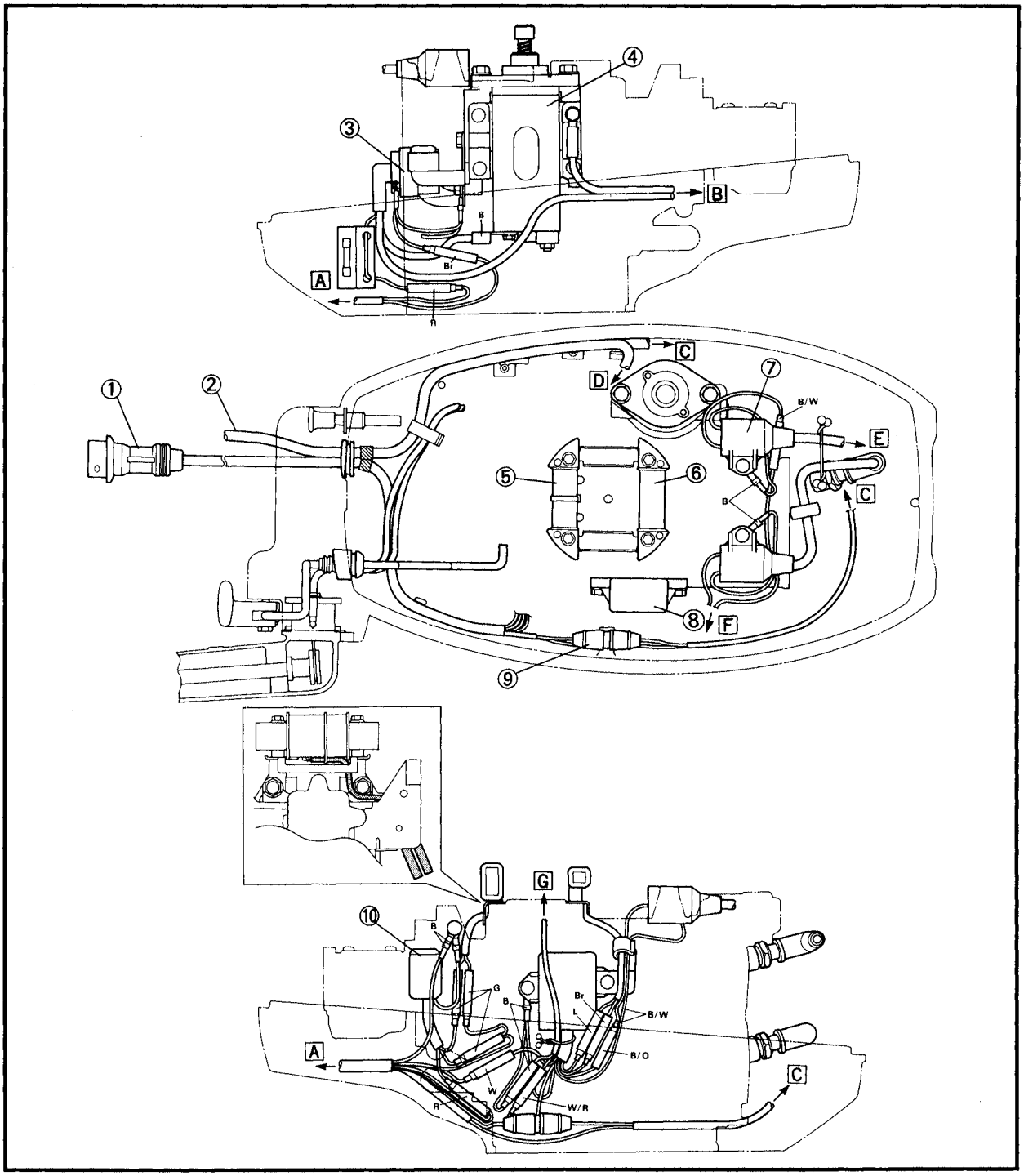


ELECTRICAL COMPONENTS

REMOTE CONTROL MODEL

① Wire harness
② Battery cable
③ Starter relay
④ Starter motor
⑤ Lighting coil
⑥ Charge coil
⑦ Ignition coil
⑧ CDI unit
⑨ Fuse
⑩ Rectifier
[A] To ①
[B] To battery
[C] To ③
[D] To ④
[E] To spark plug
[F] To ⑧
[G] To pulser coil

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



ELECTRICAL ANALYSIS

INSPECTION

CAUTION:

All measuring instruments should be handled with special care, or the correct measurement is impossible.
On an instrument powered by dry batteries, they should be checked for voltage periodically and replaced, if necessary.

NOTE:

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

Peak voltage measurement

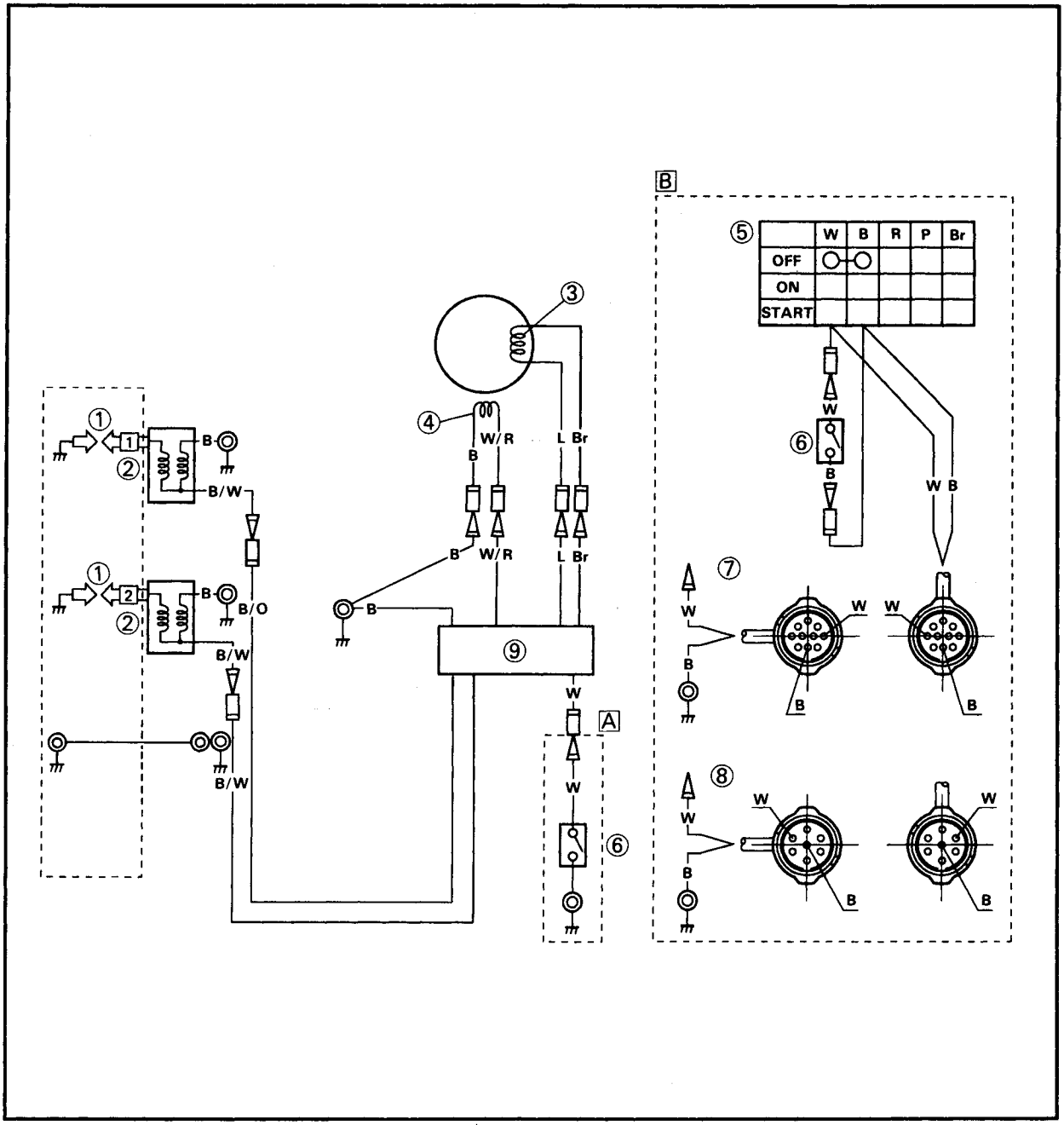
NOTE:

- The coil output varies greatly cranking speed.
- Cranking the cold engine with the plugs in and a weak battery cannot be found proper readings.

Digital tester:
J-39299
Peak volt adapter
YU-39991

IGNITION SYSTEM

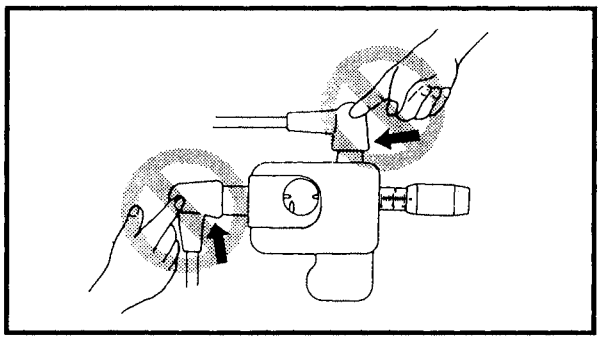
WIRING DIAGRAM

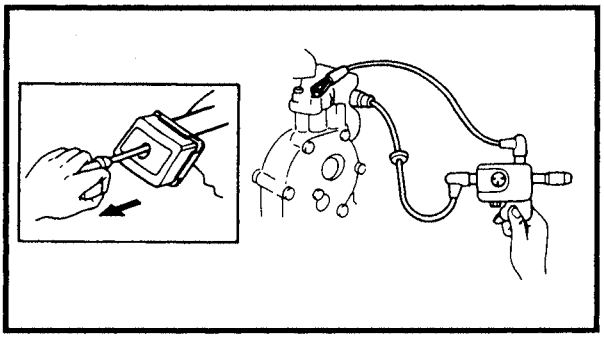


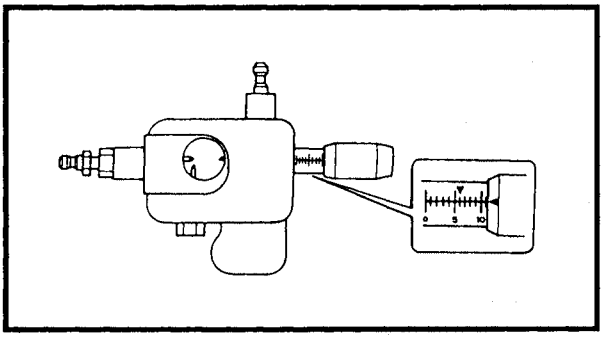
① Spark plug
② Ignition coil
③ Charge coil
④ Pulser coil
⑤ Main switch
⑥ Engine stop switch
⑦ 10P coupler
⑧ 7P coupler
⑨ CDI unit

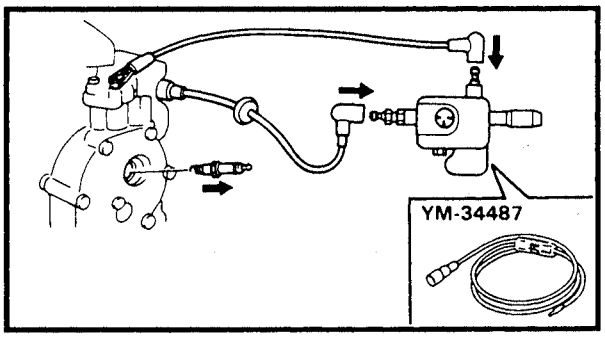
Br : Brown
L : Blue
W/R : White/Red
B/O : Black/Orange
B/W : Black/White
W : White
B : Black

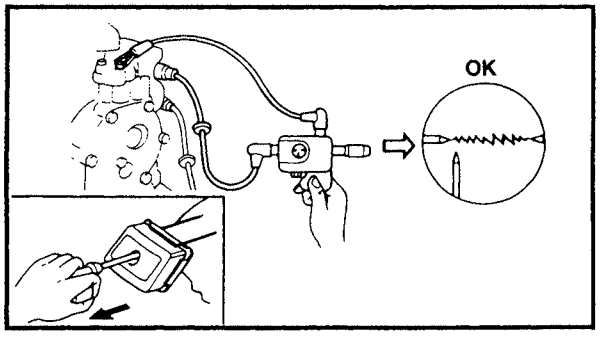
A except for remote control model
B for remote control model











IGNITION SPARK GAP

⚠WARNING

- **While taking spark check be careful not to touch any connection of lead wires of the "Ignition spark gap tester".**
- **When doing the spark test, take special care not to allow leakage from the removed plug cap.**
- **This check is likely to produce sparks, so be sure that no flammable gas or fluid is in the vicinity.**

1. Check:
   - Ignition spark gap
     Out of specification → Peak voltage measurement.

Spark gap:
9 mm (0.35 in)

Checking steps:

- Adjust the spark gap to specification by turning the adjusting knob.

Spark gap tester:
YM-34487/90890-06754

- Connect the spark-plug cap to the spark gap tester.
- Remove the spark plugs from the engine.
- Cranking the engine and check sparks of ignition system seen through discharge window.

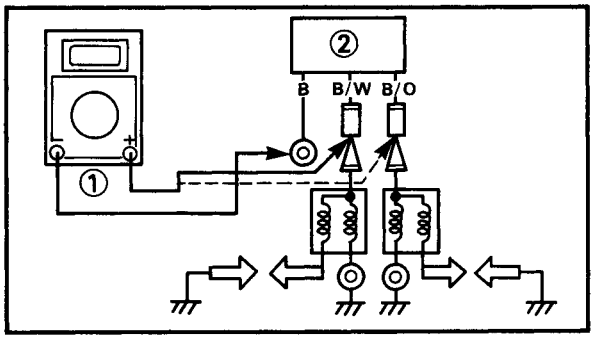
CDI SYSTEM PEAK VOLTAGE

⚠WARNING

While taking CDI unit check be careful not to touch any connection of lead wires.

NOTE:

- If there is no spark, or the spark is weak, continue with the CDI test.
- If a good spark is obtained, the problem is not with the CDI system, but possibly the spark plug or other component is defective.



1. Measure:
   - CDI unit output (test #1)
     Below specification → Replace ignition coil.
     Repeat checking two times.

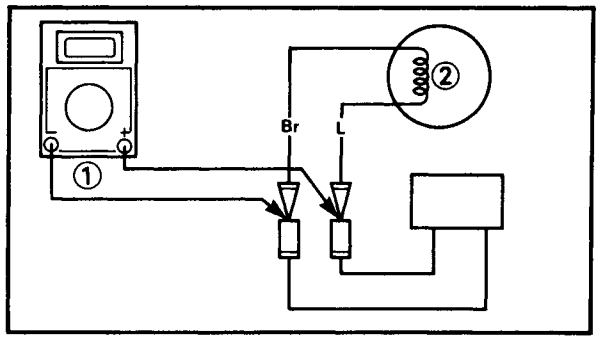
CDI output:
170 V at cranking
215 V at 1500 r/min

Measurement steps:

- Connect the tester ① to the CDI unit ② as shown.
- Set the tester dial to specification.

Range: ⎓ V

- Cranking or starting the engine.



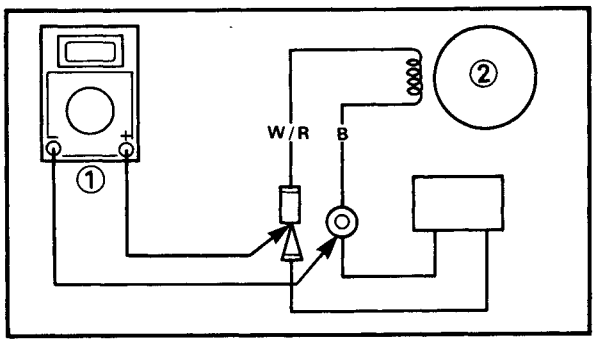
2. Measure:
- Charge coil output (test #2)
  Below specification → Replace charge coil.

Charge coil output:
200 V at cranking
250 V at 1500 r/min

Measurement steps:
- Connect the tester ① to the charge coil ② as shown.
- Set the tester dial to specification.

Range:
V

- Cranking or starting the engine.



3. Measure:
- Pulser coil output (test #3)
  Beyond specification → Replace CDI unit.
  Below specification → Replace pulser coil.

Pulser coil output:
5 V at cranking
5 V at 1500 r/min

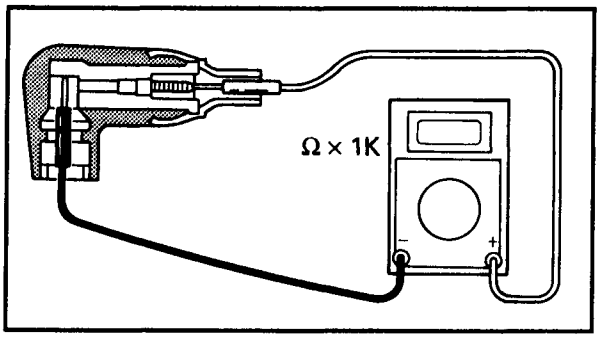
Measurement steps:
- Connect the tester ① to the pulser coil ② as shown.
- Set the tester dial to specification.

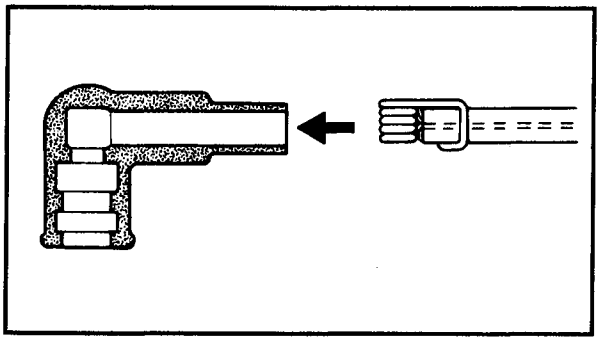
Range:
V

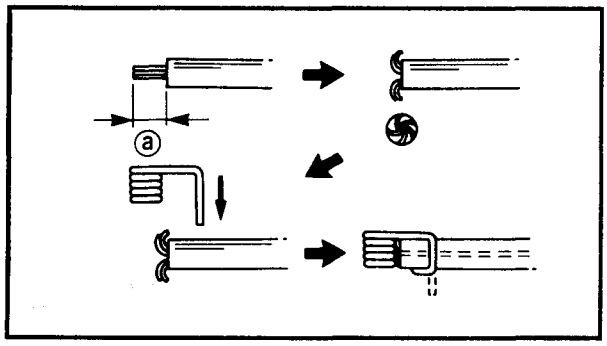
- Cranking or starting the engine.

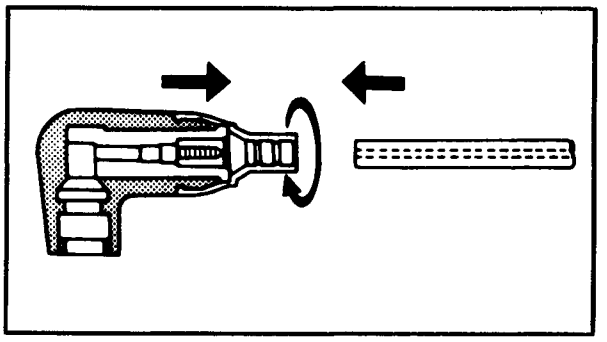
SPARK PLUG

Refer to the "GENERAL" section in chapter 3.









SPARK PLUG CAP

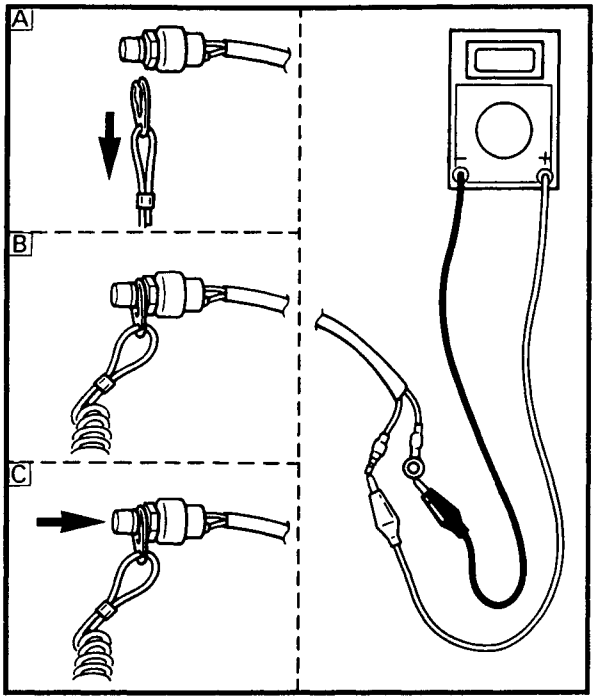
1. Inspect:
   - Spark plug cap
     Loosen → Tighten.
     Crack/Damage → Replace.

2. Measure: (For Canada and Europe)
   - Spark plug cap resistance
     Out of specification → Replace.

Spark plug cap resistance:
4.0 ~ 6.0 kΩ

Replacement steps: (Except for Canada and Europe)
- Remove the spark-plug cap by pulling the spark-plug cap.
- Remove the plug-cap spring.
- Strip the insulation cover 5 mm (0.2 in) ⓐ and spread the core wires outward.
- Fit the plug-cap spring close to the spread core wires and bend the spring end for clamping.
- Install the plug-cap spring into the spark-plug cap.

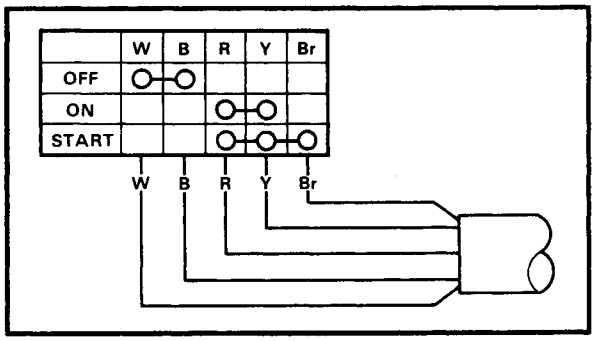
Replacement steps: (For Canada and Europe)
- Remove the spark-plug cap by turning the cap counterclockwise.
- Install the spark-plug cap by turning the cap clockwise until it stops.



ENGINE STOP SWITCH

1. Check:
   - Continuity
     Out of specification → Replace.

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



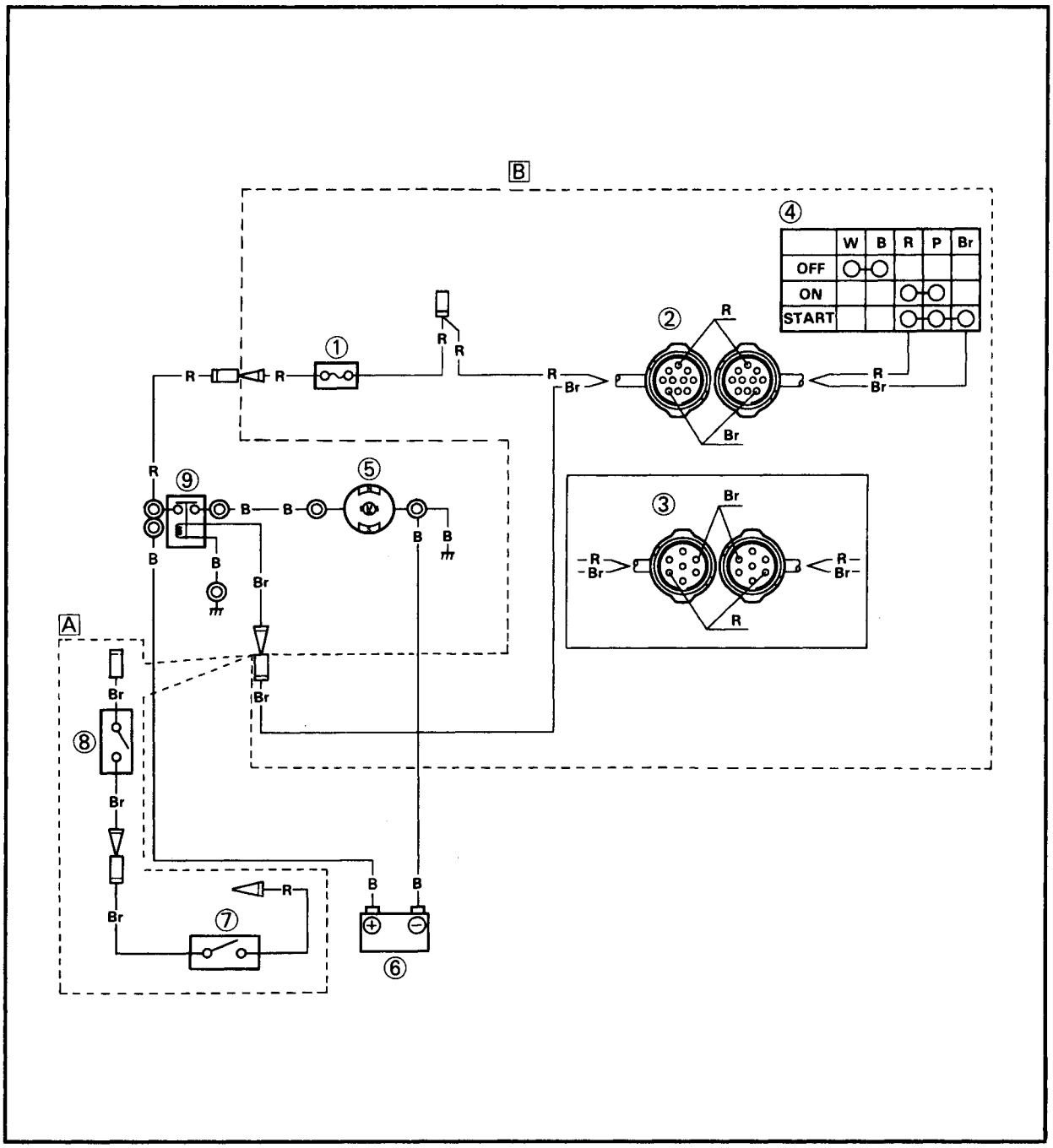
MAIN SWITCH

1. Check:
   - Continuity
     Out of specification → Replace.

	Leads color				
Switch position	White	Black	Red	Yellow	Brown
OFF	○——	——○			
ON			○——	——○	
START			○——	——○	——○

STARTING SYSTEM

WIRING DIAGRAM



① Fuse
② 10P coupler
③ 7P coupler
④ Main switch
⑤ Starter motor
⑥ Battery
⑦ Starter switch
⑧ Neutral switch
⑨ Starter relay

A Except for remote control model
B Remote control model
B : Black
Br : Brown
R : Red

BATTERY
Refer to the "GENERAL" section in chapter 3.

FUSE
1. Check:
   - Fuse
     Blown → Replace.

	Fuse rating: **12 V - 20 A**

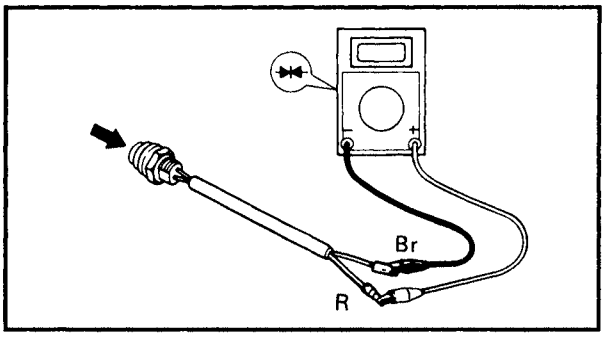
WIRING HARNESS
1. Check:
   - Continuity
     Discontinuity → Replace.

WIRING CONNECTION
1. Check:
   - Wiring connection
     Poor connection → Correct.

ENGINE STOP SWITCH
Refer to the "IGNITION SYSTEM" section.

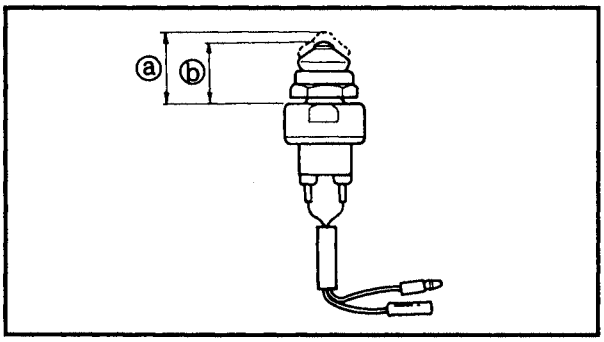
MAIN SWITCH
Refer to the "IGNITION SYSTEM" section.

STARTER SWITCH
1. Check:
   - Continuity
     Out of specification → Replace.

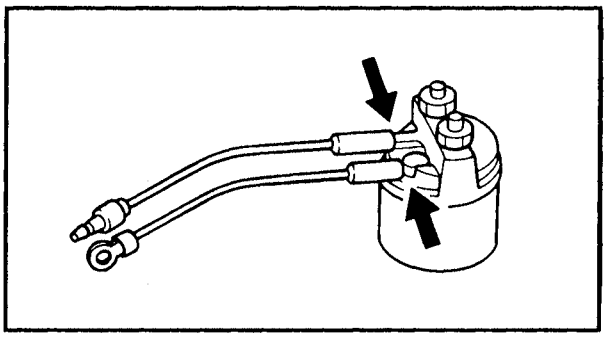


	Leads color	
	Red	Brown
Free		
Push	○	○

NEUTRAL SWITCH
1. Check:
   - Continuity
     Out of specification → Replace.

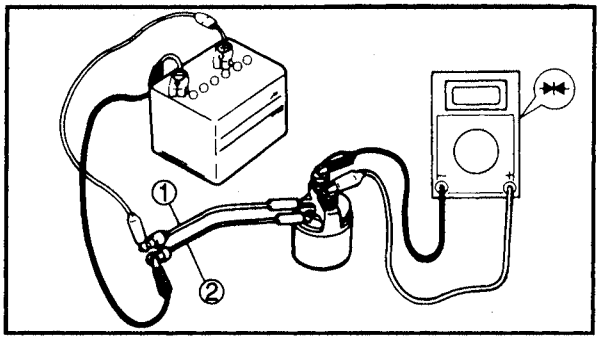


	Length	Leads color	
		Brown	Brown
Free ⓐ	19.5 ~ 20.5 mm (0.77 ~ 0.81 in)		
Push ⓑ	18.5 ~ 19.5 mm (0.73 ~ 0.77 in)	○	○



STARTER RELAY

1. Inspect:
   - Brown lead terminal
   - Black lead terminal
   Loose → Tighten.



2. Check:
   - Relay operation
   Does not function → Replace.

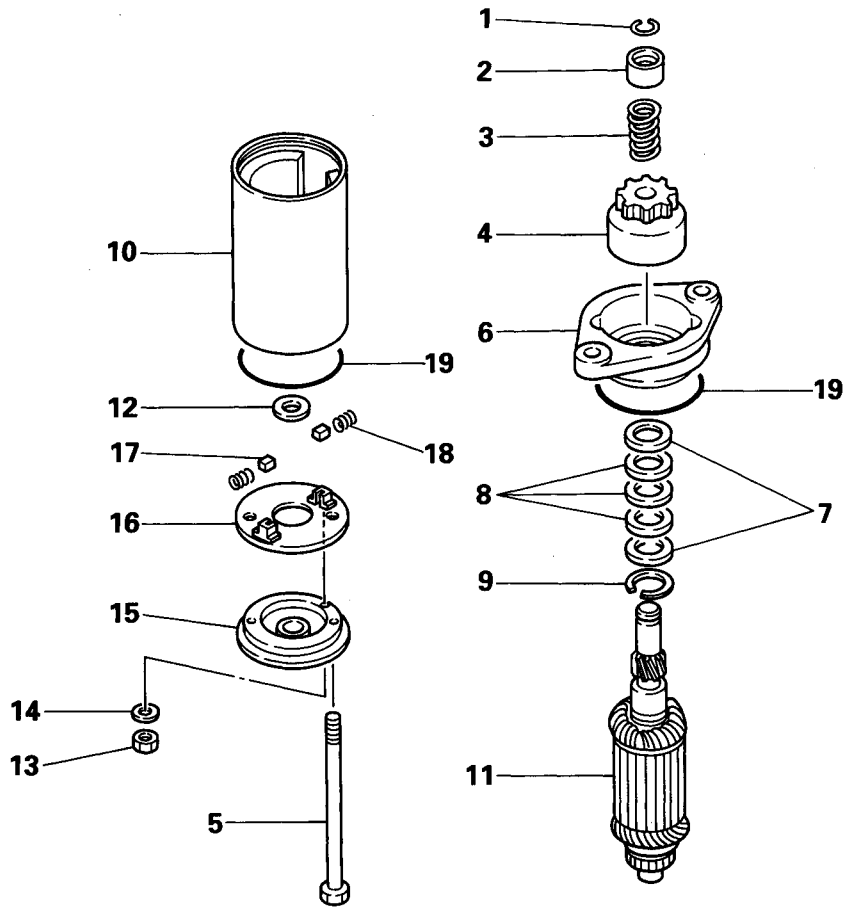
Checking steps:
- Connect the tester between the terminals of the starter relay as shown.
- Connect a 12 V battery.

Brown lead ① → Positive terminal
Black lead ② → Negative terminal

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

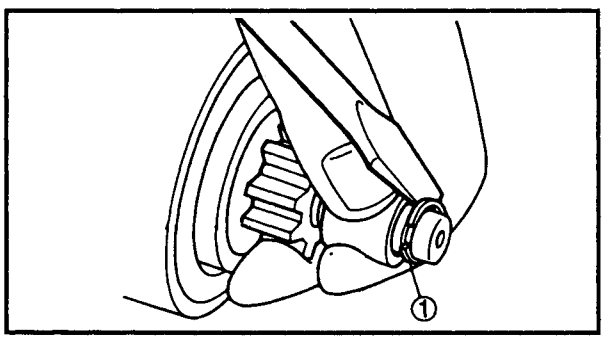
STARTER MOTOR

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	STARTER MOTOR DISASSEMBLY		Follow the left "Step" for removal.
	Starter motor assembly		Refer to the "ELECTRICAL UNIT REMOVAL" section in chapter 5.
1	Clip	1	
2	Pinion stopper	1	
3	Spring	1	
4	Pinion	1	
5	Through bolt	2	
6	Front cover	1	
7	Washer	2	0.5 mm
8	Washer	3	0.25 mm
9	Circlip	1	
10	Starter assembly	1	
11	Armature assembly	1	
12	Washer	1	1.0 mm
13	Nut	1	
14	Spring washer	1	
15	Rear cover	1	
16	Brush holder	1	
17	Brush	1	
18	Spring	2	
19	O-ring	2	
			Reverse the removal steps for installation.



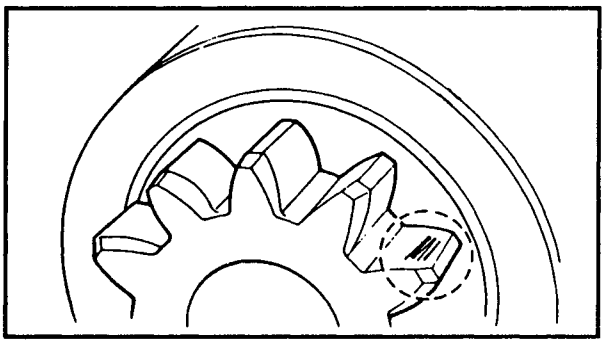
SERVICE POINTS

Pinion removal

1. Remove:
   - Clip ①

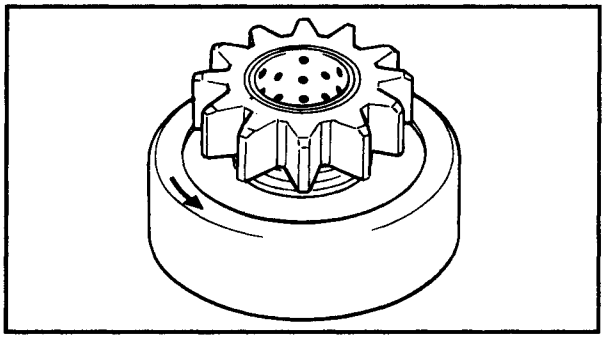
NOTE:

Using a pry-bar, pry off the clip.



Pinion inspection

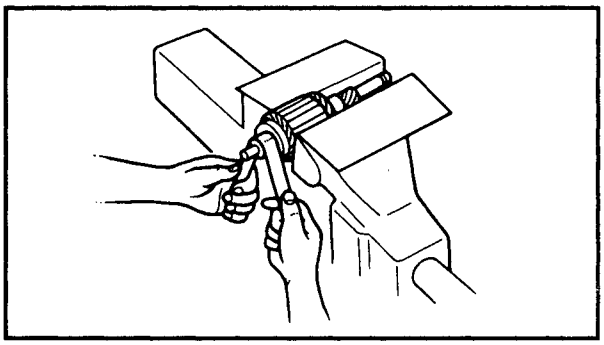
1. Inspect:
   - Pinion teeth
     Wear/Damage → Replace.



2. Check:
   - Clutch movement
     Damage → Replace.

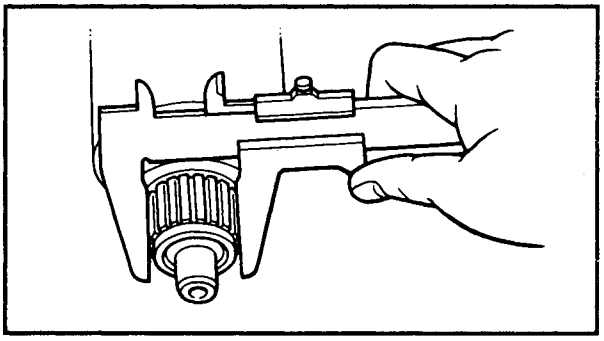
NOTE:

Rotate the pinion clockwise, and check that it freely. Also try to rotate the pinion counterclockwise and confirm that it locks.



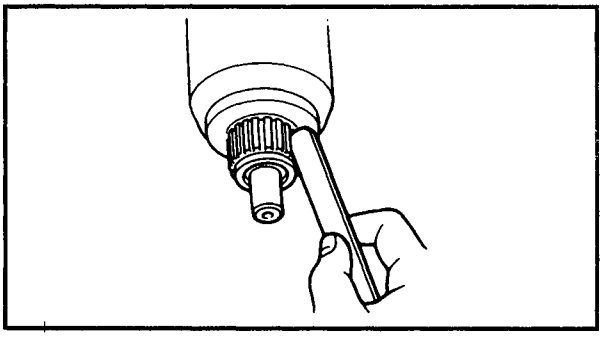
Armature inspection

1. Inspect:
   - Commutator
     Dirty → Clean with #600 abrasive paper.



2. Measure:
   - Commutator diameter
     Out of specification → Replace.

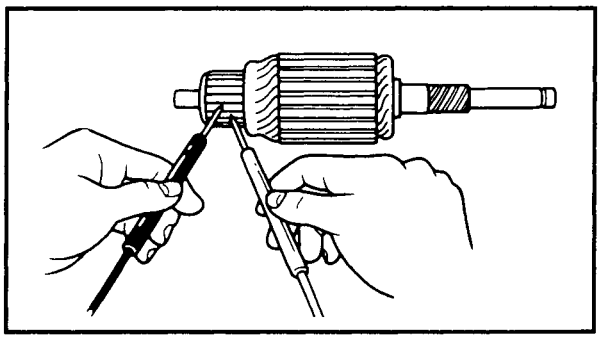
Commutator diameter:
Limit 19.4 mm (0.76 in)



3. Check:
   - Commutator under cut
     Clog/Dirty → Clean.

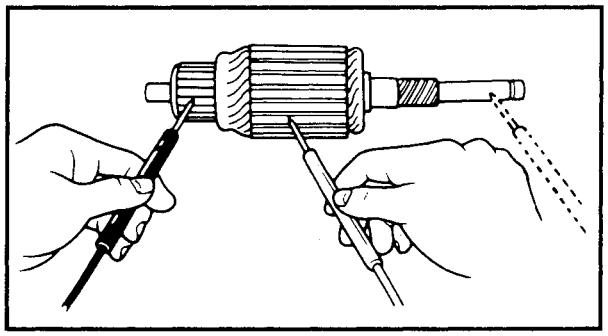
NOTE:

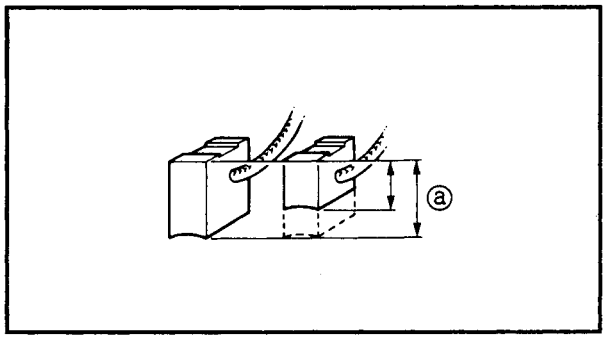
Removal all particles metal by compressed air.



4. Inspect:
   - Armature coil continuity
     Out of specification → Replace.

Armature coil continuity:	
Commutator segments	**Continuity**
Segment - Laminations	**Discontinuity**
Segment - Shaft	**Discontinuity**

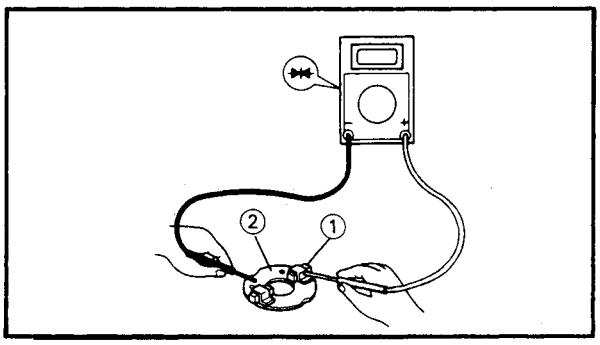




Brush holder inspection

1. Measure:
   - Brush length ⓐ
     Out of specification → Replace.

Brush length ⓐ: Limit 4.5 mm (0.18 in)



2. Check:
   - Brush holder continuity
     Out of specification → Replace.

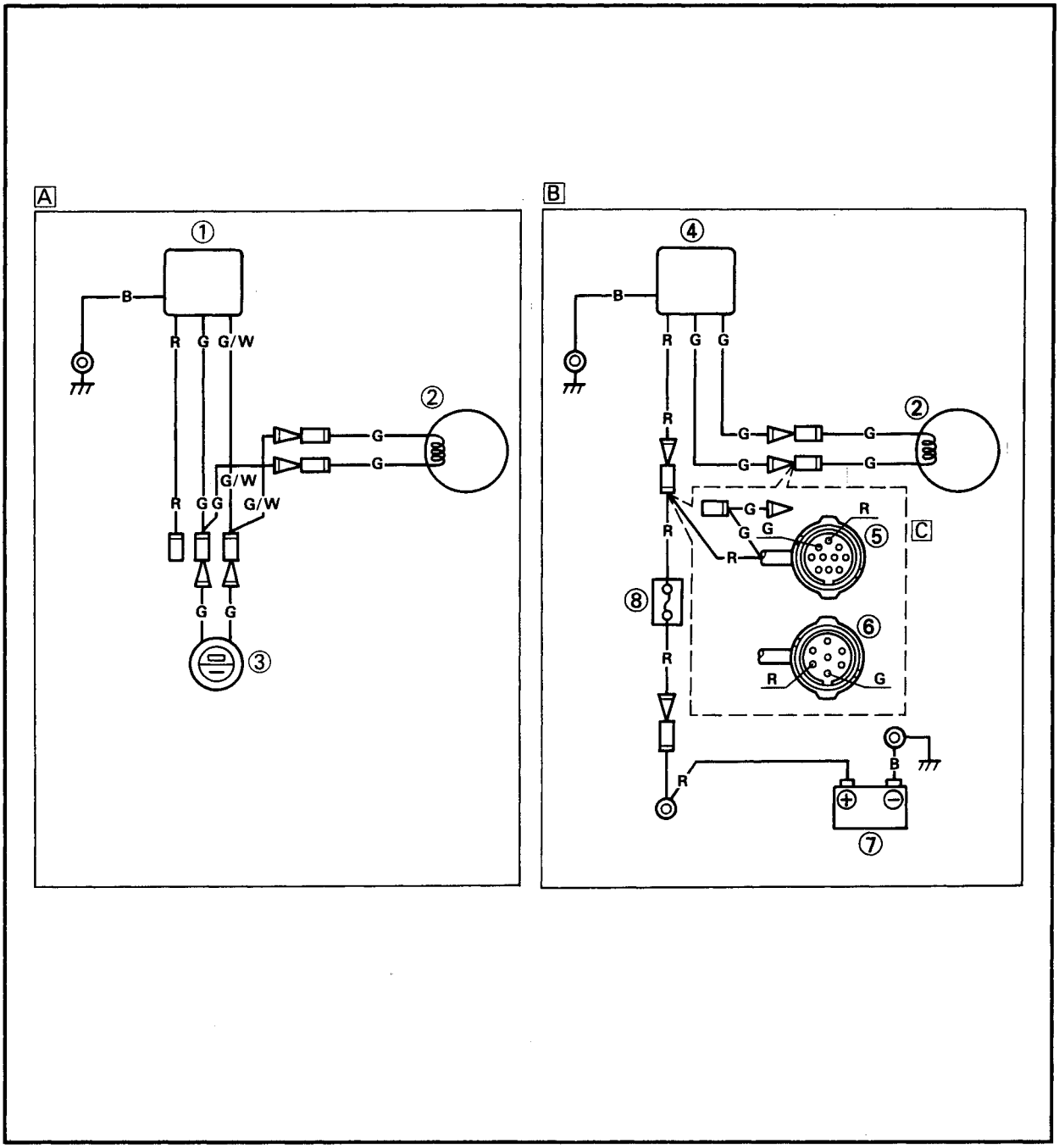
Burush holder continuity:	
Burush holder ① - Base ②	**Discontinuity**

Cover inspection

1. Inspect:
   - Cover bushing
     Wear/Damage → Replace the cover.

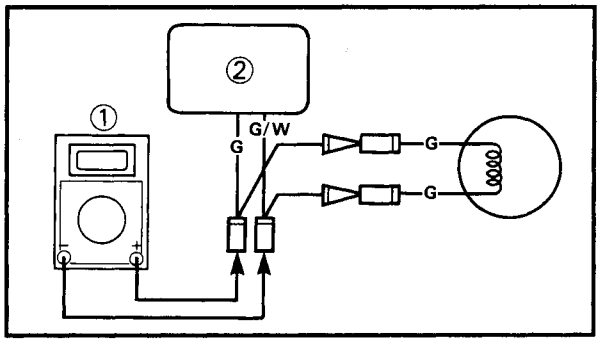
CHARGING SYSTEM

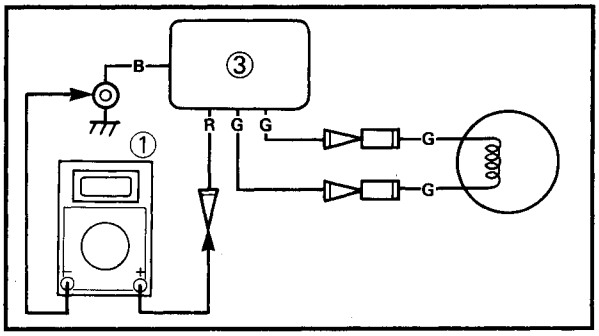
WIRING DIAGRAM

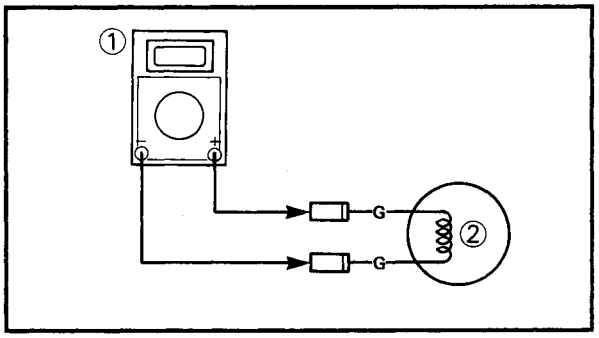


① Rectifier regulator
② Lighting coil
③ 2P connector
④ Rectifier
⑤ 10 P coupler
⑥ 7P coupler
⑦ Battery
⑧ Fuse

[A] for manual starter Europe model
[B] for electrical starter model
[C] for remote control model
G : Green
G/W: Green/White
R : Red
B : Black







CHARGING SYSTEM PEAK VOLTAGE

1. Measure:
   - Rectifier output
     Below specification → Lighting coil measurement.

Rectifier regulator output:
(2P connector model)
11 V at cranking
13 V at 1500 r/min
Rectifier output: (electrical model)
11 V at cranking
13 V at 1500 r/min

Measurement steps:
- Connect the tester ① to the rectifier regulator ② / rectifier ③ as shown.
- Set the tester dial to specification.

Range:
⎓ V

- Cranking or starting the engine.

2. Measure:
   - Lighting coil output
     Beyond specification → Replace rectifier regulator/rectifier.
     Below specification → Replace lighting coil.

Lighting coil output:
12 V at 1500 r/min

Measurement steps:
- Connect the tester ① to the lighting coil ② as shown.
- Set the tester dial to specification.

Range:
⎓ V

- Starting the engine.

FUSE

Refer to the "STARTING SYSTEM" section.

BATTERY

Refer to the "GENERAL" section in chapter 3.

TRBL ANLS ?

CHAPTER 9
TROUBLE ANALYSIS

TROUBLE ANALYSIS

NOTE:

Following items should be obtained before "trouble analysis".

1. Battery is charged and its specified gravity is in specification.
2. There is no incorrect wiring connection.
3. Wiring connections are surely engaged and without any rust.
4. Lanyard is installed to the engine stop switch.
5. Shift position is in neutral.
6. Fuel is coming to the carburetor.
7. Correct rigging and engine setting are obtained.
8. 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	POOR BATTERY CHARGING					Relative part	Reference Chapter
													FUEL SYSTEM	
O		O		O									Fuel hose	4
O		O		O									Fuel joint	4
O	O	O		O									Fuel filter	4
O		O		O									Fuel pump	4
O	O	O		O									Carburetor	4
		O		O	O								Pilot screw setting	4
		O		O									Idle speed	3
													POWER UNIT	
O	O			O									Compression	5
O	O			O									Reed valve	5
O	O												Cylinder head gasket	5
O				O									Seal	5
O				O									Cylinder body	5
O				O									Piston ring	5
O				O									Crank case	5
O													Piston	5
	O			O									Control unit adjustment	3
				O									Bearing	5
					O								Thermostat	5
					O								Water passage	5

TRBL ANLS ?

TROUBLE ANALYSIS

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

YAMAHA
YAMAHA MOTOR CO., LTD.
Printed in USA

9.9/15V 1997 Service Manual