YAMAHA

Marine

Outboards

WORLD WIDE

40V, 50H

USA/CANADA

40W, 50W

SERVICE MANUAL

LIT-18616-01-81

290320

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.

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40V/50H
SERVICE MANUAL

1st Edition, August 1997

Printed in U.S.A.
LIT-18616-01-81

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.

An Index to contents is provided on the first page of each Section.

MODEL INDICATION

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

Model name	40VMH	40VMHD	40VMHO	40VMO	40VWH	40VE	40VEO	40VEHTO	40VET
USA and CANADA name	C40MH		40MH			C40ER	40ER	P40TH	C40TR
Indication	40VMH	40VMHD	40VMHO	40VMO	40VWH	40VE	40VEO	40VEHTO	40VET
Model name	40VETO	50HMHO	50HMHD	50HMO	50HMDO	50HWHD	50HEDO	50HET	50HETO
USA and CANADA name	40TR						50ER	C50TR	50TR
Indication	40VETO	50HMHO	50HMHD	50HMO	50HMDO	50HWHD	50HEDO	50HET	50HETO

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.

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.

SPECIFICATIONS

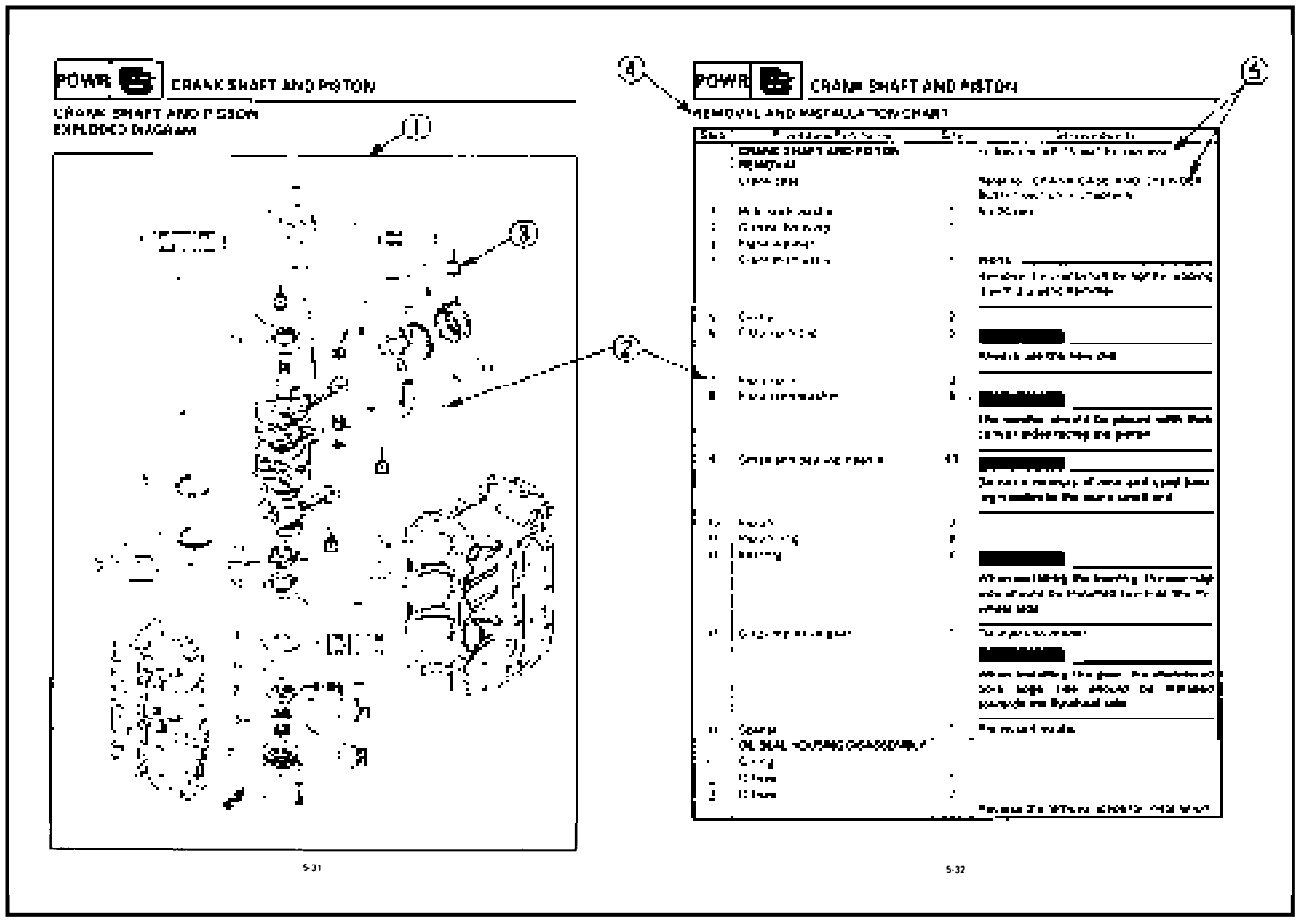
These are given in bold type at each procedure. It is not necessary to leave the section dealing with the procedure in order to look up the specifications.
It is important to note the differences in specifications of models. When a procedure relates to more than one model, the main differences in specifications will be shown in a following table.

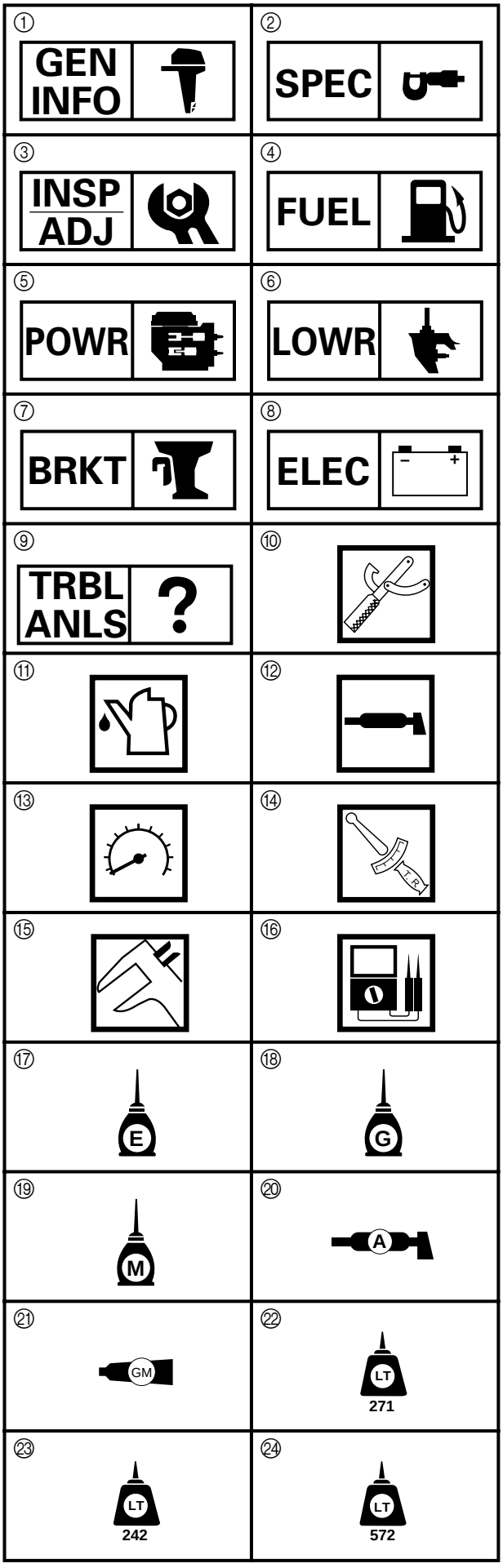
Model name	40VMH	40VMHD	40VMHO	40VMO	40VWH	40VE	40VEO	40VEHTO	40VET
Starting system	Manual	Manual	Manual	Manual	Manual & Electric	Electric	Electric	Electric	Electric
Control system	Tiller	Tiller	Tiller	Remote	Tiller	Remote	Remote	Tiller	Remote
Trim/Tilt system	Manual tilt	Hydro tilt	Manual tilt	Manual tilt	Hydro tilt	Manual tilt	Manual tilt	PTT	PTT
Lubrication system	Pre-Mixed	Pre-Mixed	Oil injection	Oil injection	Pre-Mixed	Pre-Mixed	Oil injection	Oil injection	Pre-Mixed
Warning indicator lamp	1	1	1	1	1	1	3	—	—
Enrichment system	Choke	Choke	Choke	Choke	Prime Start	Prime Start	Prime Start	Prime Start	Prime Start

Model name	40VETO	50HMHO	50HMHD	50HMO	50HMDO	50HWHD	50HEDO	50HET	50HETO
Starting system	Electric	Manual	Manual	Manual	Manual	Manual & Electric	Electric	Electric	Electric
Control system	Remote	Tiller	Tiller	Remote	Remote	Tiller	Remote	Remote	Remote
Trim/Tilt system	PTT	Manual tilt	Hydro tilt	Manual tilt	Hydro tilt	Hydro tilt	Hydro tilt	PTT	PTT
Lubrication system	Oil injection	Oil injection	Pre-Mixed	Oil injection	Oil injection	Pre-Mixed	Oil injection	Oil injection	Oil injection
Warning indicator lamp	3	1	1	1	1	1	3	—	—
Enrichment system	Prime Start	Choke	Choke	Choke	Choke	Prime Start	Prime Start	Prime Start	Prime Start

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.





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SYMBOLS

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

① General Information
② Specifications
③ Periodic Inspection and Adjustment
④ Fuel System
⑤ Power Unit
⑥ Lower Unit
⑦ Bracket Unit
⑧ Electrical System
⑨ Trouble-analysis

Symbols ⑩ to ⑯ indicate specific data:

⑩ Special tool
⑪ Specified liquid
⑫ Specified grease
⑬ Specified engine speed
⑭ Specified torque
⑮ Specified measurement
⑯ Specified electrical value
[Resistance (Ω), Voltage (V), Electric current (A)]

Symbol ⑰ to ⑳ in an exploded diagram indicate grade of lubricant and location of lubrication point:

⑰ Apply Yamaha 2-stroke outboard motor oil
⑱ Apply Yamaha gear-case lubricant
⑲ Apply molybdenum disulfide oil
⑳ Apply water resistant grease (Yamaha grease A, Yamaha marine grease)

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

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

NOTE:

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

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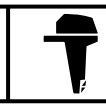
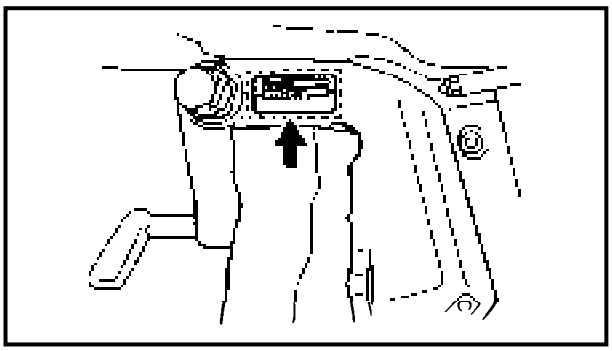
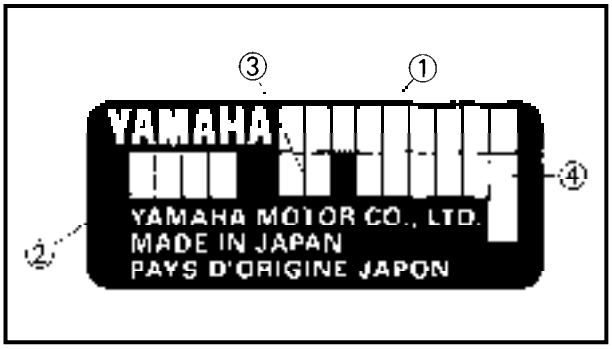


CHAPTER 1
GENERAL INFORMATION





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IDENTIFICATION

SERIAL NUMBER

The serial number of the outboard motor is stamped on a plate attached to the port side of the clamp bracket.

NOTE:

As an antitheft measure, a special label on which the outboard motor serial number is stamped is bonded to the portside 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

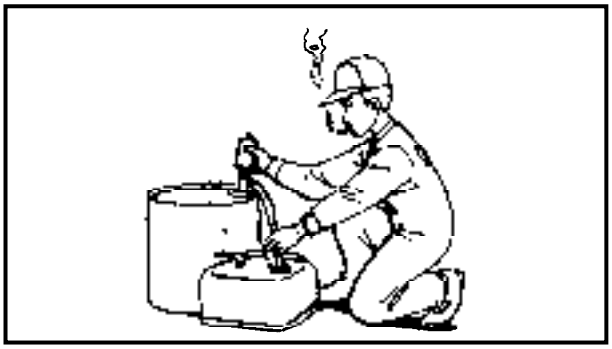
STARTING SERIAL NUMBERS

The starting serial number blocks are as follows:

Model		Approved model code	Starting serial No.	Model		Approved model code	Starting serial No.
World-wide	USA, CANADA			World-wide	USA, CANADA		
40VMH	C40MH	6H4	S: 010262 ~ L: 310801 ~	50HMHO	—	6H5	S: 190662 ~
				50HMHD	—		L: 310380 ~
40VMHD	—		L: 560290 ~	50HMO	—		S: 260189 ~
40VMHO	40MH		S: 191877 ~ L: 491566 ~	50HMDO	—		L: 560258 ~
				50HWHD	—		L: 850194 ~
40VMO	—		S: 290284 ~ L: 860312 ~	50HEDO	50ER		S: 090431 ~ L: 521079 ~
40VWH	—		L: 510116 ~	50HET	C50TR		L: 900101 ~
40VE	C40ER		S: 060285 ~ L: 360173 ~	50HETO	50TR		S: 210142 ~ L: 444058 ~
40VEO	40ER		S: 110760 ~ L: 842362 ~ X: 740146 ~				X: 750216 ~
40VEHTO	P40TH		L: 430386 ~				
40VET	C40TR		L: 921505 ~				
40VETO	40TR		S: 880367 ~ L: 544974 ~ X: 900196 ~				

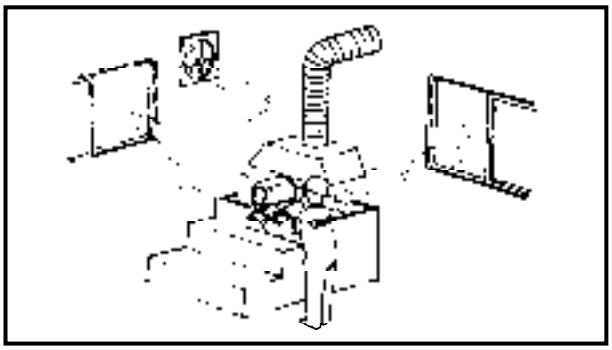
SAFETY WHILE WORKING

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



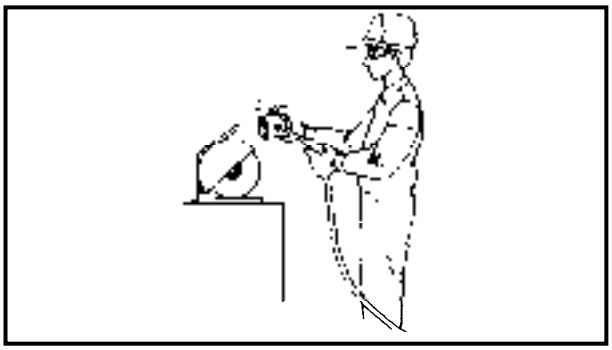
FIRE PREVENTION

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



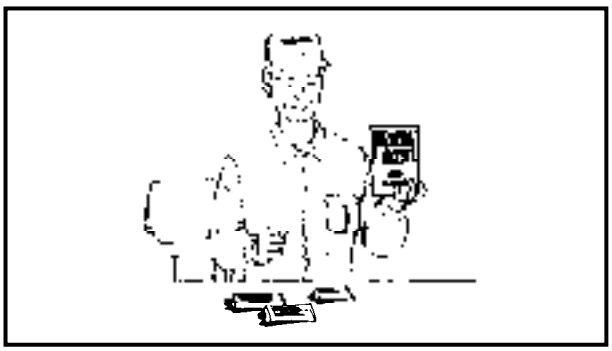
VENTILATION

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



SELF-PROTECTION

Protect your eyes with suitable safety glasses or safety goggles when 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.

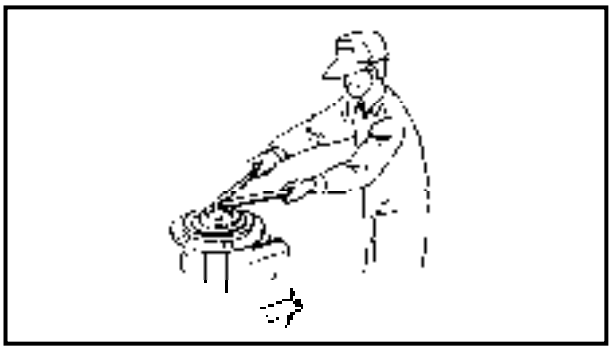


OILS, GREASES AND SEALING FLUIDS

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

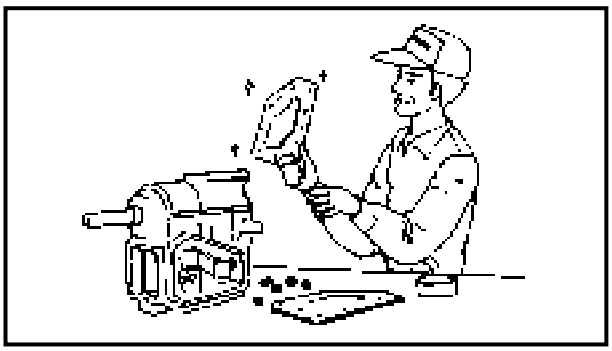
Under normal conditions of use, there should be no hazards from the use of the lubricants mentioned in this manual, but safety is all-important, and by adopting good safety practices, any risk is minimized.
A summary of the most important precautions is as follows:

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.

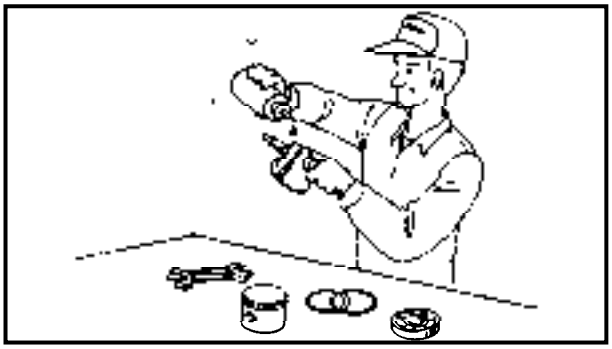


GOOD WORKING PRACTICES

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 large sizes first, and tighten inner-positioned fixings before outer-positioned ones.

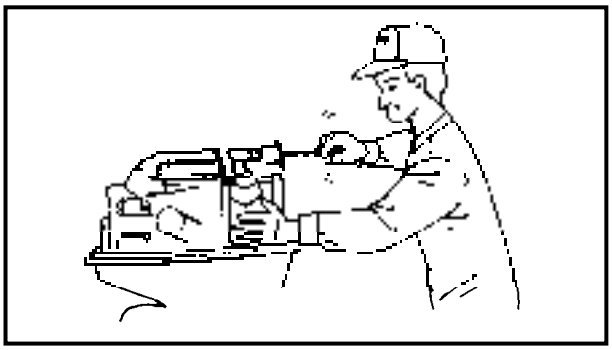


3. **Non-reusable items**
   Always use new gaskets, packings, O-rings, split-pins and circlips etc. on reassembly.



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.
5. When installing oil seals, apply a light coating of water-resistant grease to the outside diameter.

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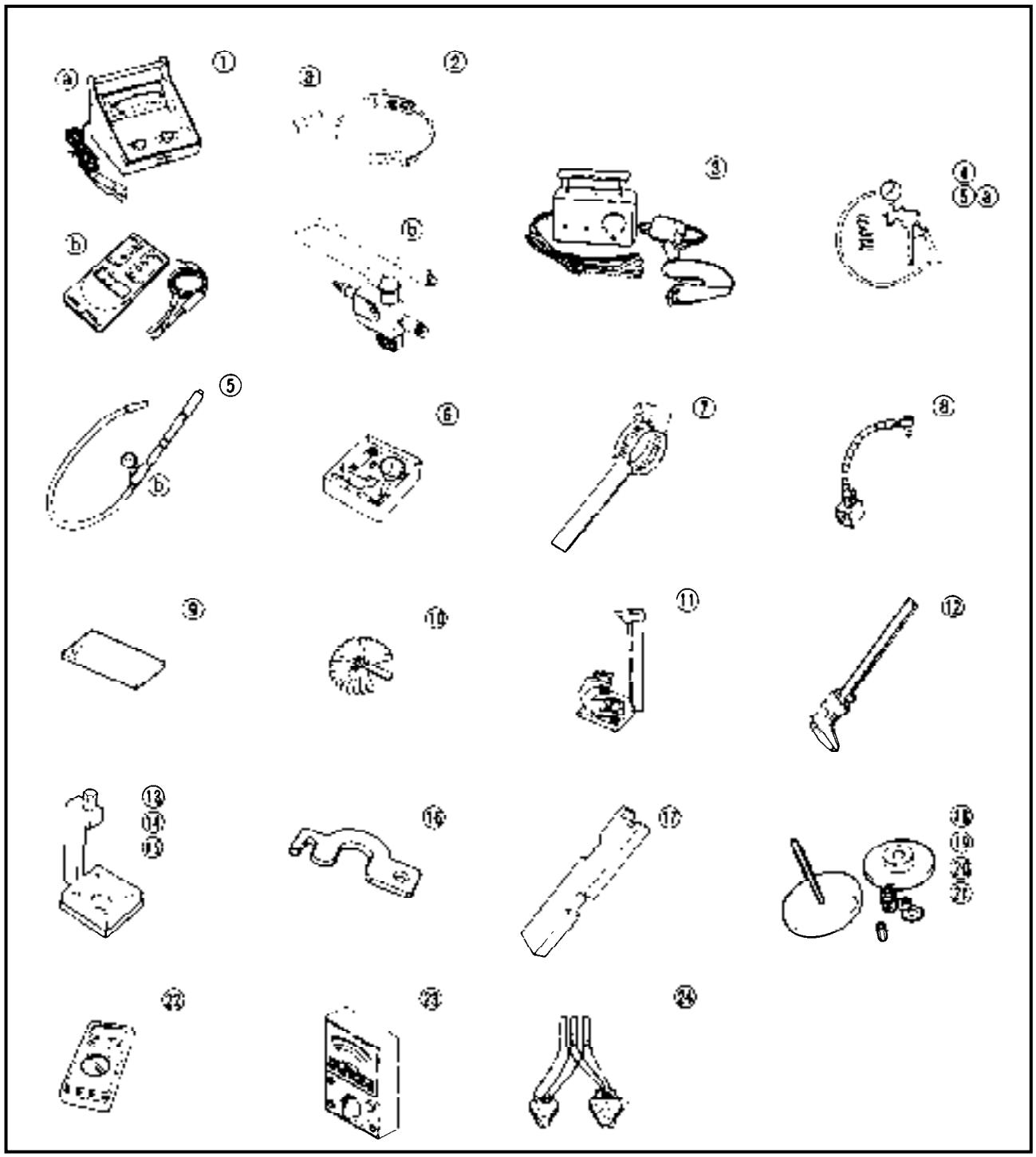
SPECIAL TOOLS

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.

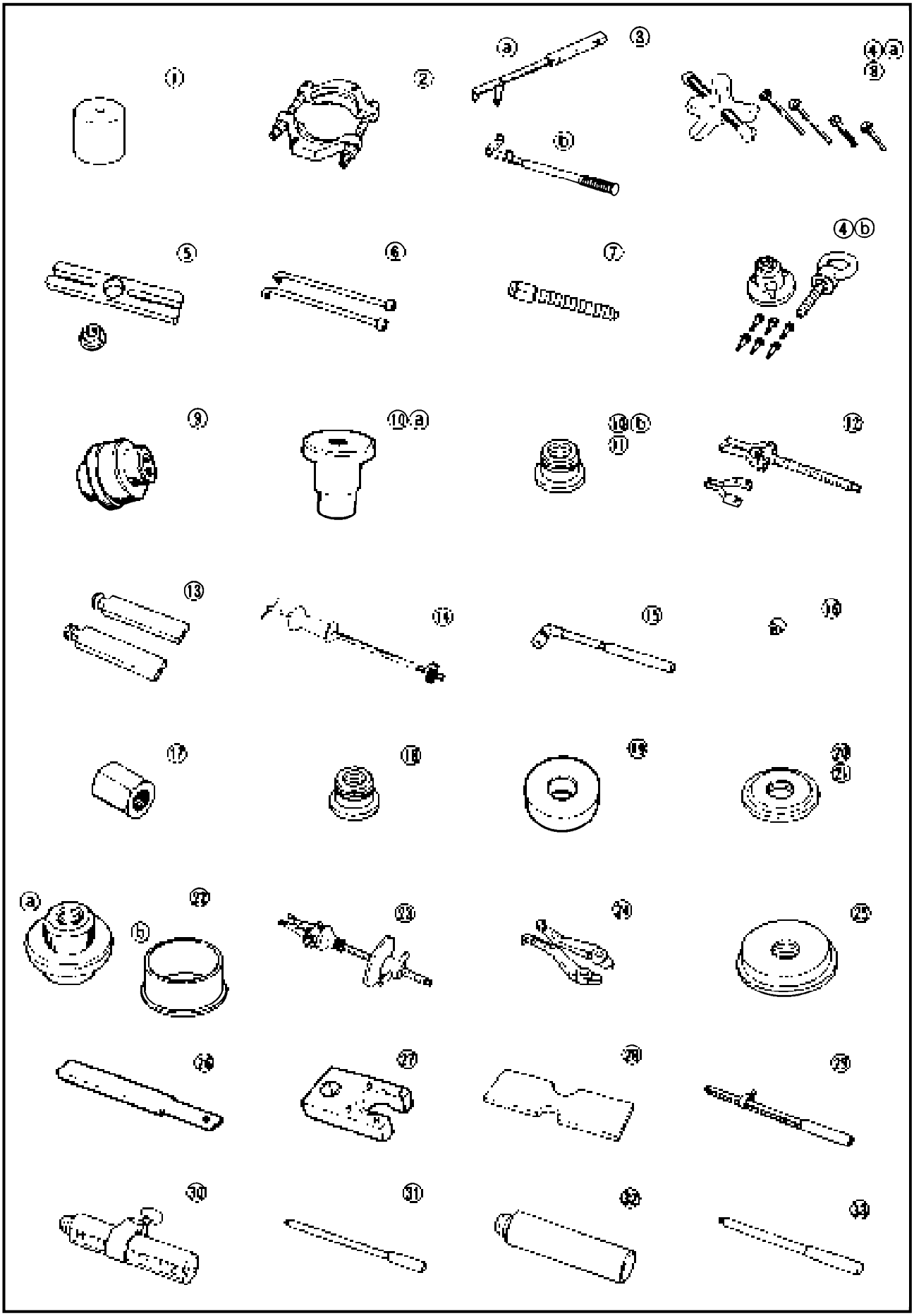
NOTE:

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



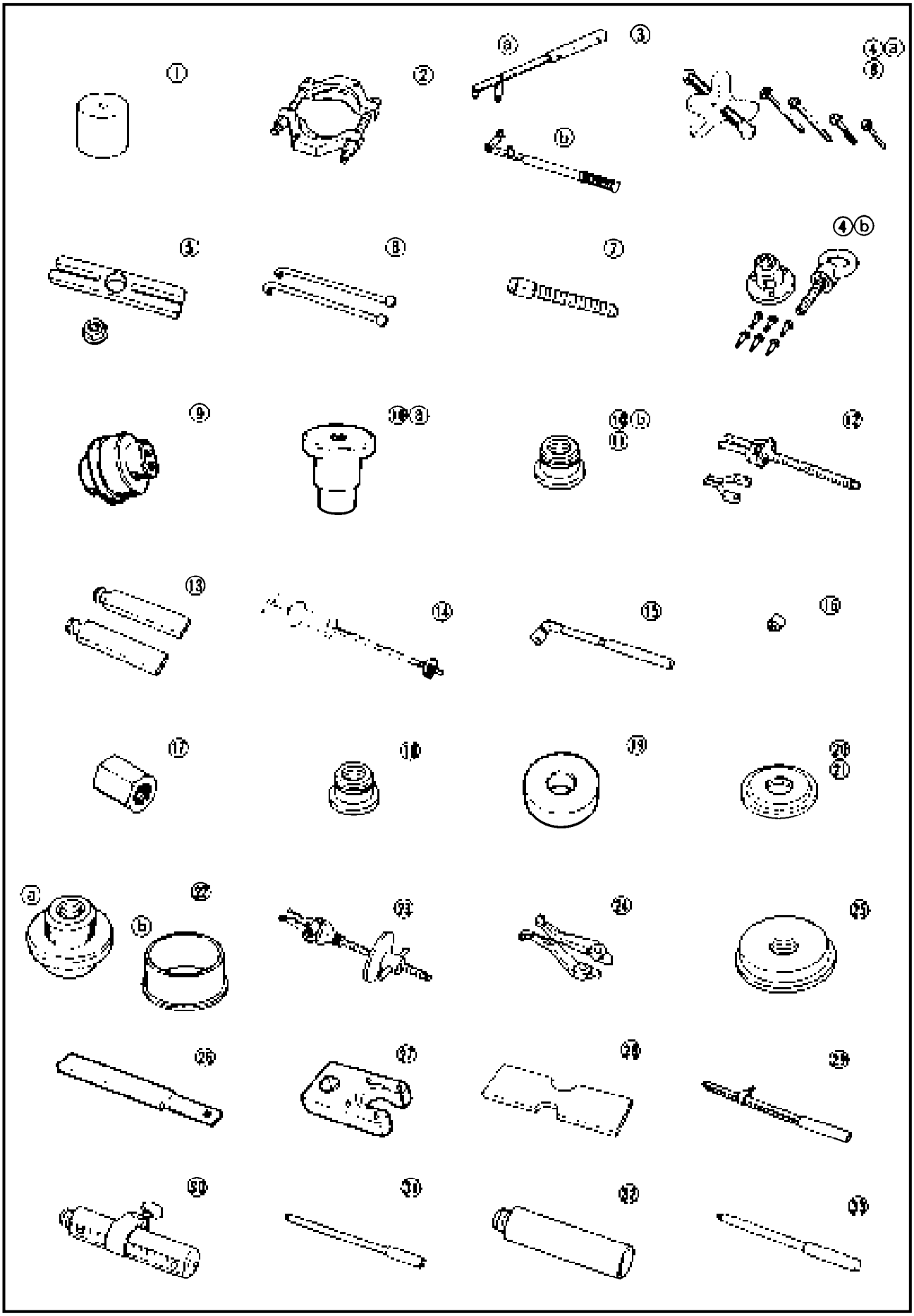
MEASURING

	Tool name	Tool No.		Use for:	
		USA and Canada ⓐ	Except for USA and Canada ⓑ		
1	Tachometer	YU-08036-A	90890-06760	Idle speed	
2	Dynamic spark tester	YM-34487	90890-06754	Ignition system	
3	C.D.I. tester	YU-91022-B	N.A.	Ignition system	
4	Mity Vac	YB-35956	90890-06756	Fuel joint	
5	Pressure tester	YB-35956	90890-06762	Lower case	
6	Dial indicator	YU-03097	90890-01252	Backlash	
7	Backlash indicator	YB-06265	90890-06706	Backlash	
8	Magnetic flexible stand	YU-34481	90890-06705	Backlash	
9	Backlash adjusting plate	YB-07003	N.A.	Backlash	
10	Thickness gauge	YU-26900-9	N.A.	Shimming	
11	Pinion height gauge	N.A.	90890-06702	Pinion shimming	
12	Digital caliper	N.A.	90890-06704	Pinion shimming	Forward shimming
13	Gauge block	YB-34432-9	N.A.	Pinion shimming	
14	Adapter plate	YB-34432-10	N.A.	Pinion shimming	
15	Gauge base	YB-34432-11	N.A.	Pinion shimming	
16	Clamp	YB-34432-17	N.A.	Pinion shimming	
17	Shimming plate	N.A.	90890-06701	Forward shimming	
18	Base plate	YB-34446-1	N.A.	Forward shimming	
19	Compression spring	YB-34446-3	N.A.	Forward shimming	
20	Press plate	YB-34446-4	N.A.	Forward shimming	
21	Gauge pin	YB-34446-7	N.A.	Forward shimming	
22	Digital multimeter	YU-34899-A	90890-06752	Electrical	
23	Pocket tester	YU-03112	90890-03112	Electrical	
24	Spins test harness	YB-06757	90890-06757	Peak voltage measurement	



REMOVAL AND INSTALLATION

	Tool name	Tool No.		Use for:	
		USA and Canada ⓐ	Except for USA and Canada ⓑ		
1	Small end bearing needle installer	YB-06106	90890-06526	Small end	
2	Bearing separator	YB-06219	90890-06534	Crank shaft bearing	Reverse gear bearing
					Forward gear inner bearing
3	Flywheel holder	YB-06139	90890-06522	Flywheel	
4	Flywheel puller	YB-06117	90890-06521	Flywheel	
5	Stopper guide plate	N.A.	90890-06501	Propeller shaft housing	Reverse gear bearing
					Drive shaft outer bearing
6	Bearing housing puller	YB-06234	90890-06503	Propeller shaft housing	
7	Center bolt	N.A.	90890-06504	Propeller shaft housing	
8	Universal puller	YB-06117	N.A.	Propeller shaft housing	
9	Oil seal installer	YB-06168	N.A.	Propeller shaft oil seal	
10	Needle bearing remover	YB-06112	90890-06614	Propeller shaft needle bearing	
11	Needle bearing installer	YB-06111	90890-06614	Propeller shaft needle bearing	
12	Bearing outer race puller clow	N.A.	90890-06535	Reverse gear bearing	
13	Stopper guide stand	N.A.	90890-06538	Reverse gear bearing	Forward gear outer bearing
14	Slide hammer set	YB-06096	N.A.	Reverse gear bearing	Drive shaft outer bearing
					Forward gear outer bearing
15	Pinion nut wrench	N.A.	90890-06505	Pinion nut	
16	Socket adapter	N.A.	90890-06506	Pinion nut	
17	Drive shaft holder	YB-06079	90890-06517	Pinion nut	
18	Needle bearing attachment	YB-06063	90890-06614	Drive shaft needle bearing	
19	Drive shaft needle bearing depth stop	YB-34473	N.A.	Drive shaft needle bearing	
20	Bearing installer	YB-06167	90890-06628	Drive shaft oil seal	
21	Bearing installer	YB-06110	90890-06627	Drive shaft outer bearing	
22	Bearing installer	YB-06270-A	90890-06640	Forward gear inner bearing	



	Tool name	Tool No.		Use for:	
		USA and Canada ⓐ	Except for USA and Canada ⓑ		
23	Bearing outer race puller	N.A.	90890-06523	Forward gear outer bearing	
24	Bearing outer race puller clow	N.A.	90890-06532	Forward gear outer bearing	
25	Bearing installer	YB-41446	90890-06626	Forward gear outer bearing	
26	Shift rod wrench	YB-06052	N.A.	Shift rod	
27	Tilt cylinder wrench	YB-06175-2B	90890-06544	PTT	
28	Bearing depth plate	N.A.	90890-06603	Propeller shaft needle bearing	Drive shaft needle bearing
29	Driver rod - SL	N.A.	90890-06602	Drive shaft needle bearing	
30	Driver rod - SS	N.A.	90890-06604	Propeller shaft needle bearing	
31	Driver rod - L	YB-06071	90890-06605	Bearing and oil seal	
32	Driver rod - S	N.A.	90890-06606	Bearing and oil seal	
33	Driver rod - M10	N.A.	90890-06652	Bearing and oil seal	

CHAPTER 2
SPECIFICATIONS

GENERAL SPECIFICATIONS

Item	Unit	Model				
Worldwide		40VMH	40VMHD	40VMHO	40VMO	40VWH
USA, CANADA		C40MH	—	40MH	—	—
DIMENSION:						
Over-all length	mm (in)	1,281 (50.4)			670 (26.4)	1,281 (50.4)
Over-all width	mm (in)	349 (13.7)				360 (14.2)
Over-all height S	mm (in)	1,223 (48.1)	—	1,223 (48.1)		—
L	mm (in)	1,350 (53.1)				
X	mm (in)	—				
Boat transom height						
S	mm (in)	381 (15.0)	—	381 (15.0)	381 (15.0)	—
L	mm (in)	508 (20.0)				
X	mm (in)	—				
WEIGHT: (with aluminum propeller)						
S	kg (lb)	74 (163)	—	75.8 (167)	71.5 (158)	—
L	kg (lb)	76.5 (169)	84 (185.2)	77.5 (171)	74 (163)	81.5 (179.7)
X	kg (lb)	—				
PERFORMANCE:						
Output (ISO)	kW (hp)/rpm	29.4 (40)/5,000				
Full throttle operating range	rpm	4,500 ~ 5,500				
Maximum fuel consumption	L (US gal, Imp gal)/ h at rpm	18.5 (4.9, 4.1) at 5,500				
ENGINE:						
Type		2 stroke - L				
Number of cylinder		3				
Total displacement	cm^3 (cu. in)	698 (42.6)				
Bore × Stroke	mm (in)	67.0 × 66.0 (2.64 × 2.60)				
Compression ratio		6.00				
Number of carburetor		3				
Intake system		Reed valve				
Scavenging system		Loop charge				
Control system		Tiller control			Remote control	Tiller control
Starting system		Manual				Manual & Electric
Ignition system		CDI				
Alternator output		80W	12-80	80W		12-6A
Enrichment system		Choke valve				Prime start
Advance type		Electric automatic				
Spark plug (NGK)		B7HS-10				
For CANADA and Europe		BR7HS-10				
Exhaust system		Through propeller boss				
Cooling system		Water				
Lubrication system		Pre-mixed fuel & oil		Oil injection		Pre-mixed fuel & oil

Item	Unit	Model				
Worldwide		40VMH	40VMHD	40VMHO	40VMO	40VWH
USA, CANADA		C40MH	—	40MH	—	—
FUEL AND LUBRICATION:						
Fuel type		Regular gasoline				
Fuel rating	P.O.N.*1	Min. 86				
Engine oil type/grade		2-stroke outboard motor oil / TC-W3				
Mixing ratio		50 : 1		—		50 : 1
Engine oil tank capacity	L (US qt, Imp qt)	—		1.5 (1.6, 1.3)		—
Gear oil type		Hypoid gear oil-SAE#90				
Gear oil quantity	cm^3 (US oz, Imp oz)	430 (14.5, 15.1)				
BRACKET:						
Trim/tilt system		Manual tilt				
Tilt angle	degree	8, 12, 16, 20, 24	—	8, 12, 16, 20, 24		—
Tilt-up angle	degree	66	69	66		
Trim angle	degree at 12° transom	—	–4 ~ 20	—		
Shallow water crushing angle	degree	Tilt angle +18	—	Tilt angle +18	—	Tilt angle +18
Steering angle	degree (left + right)	40 + 40				
DRIVE UNIT:						
Gear shift position		F-N-R				
Gear ratio		1.85 (24/13)				
Gear type		Spiral bevel gear				
Clutch type		Dog clutch				
Propeller direction		Clockwise				
Propeller drive system		Spline				
Propeller series mark		G				
ELECTRICAL:						
Battery capacity	Ah (kC)	—				70 (252)
Cold cranking	Amps	—				380

*1: Pump Octane Number ; (Research octane + Motor octane)/2

Item		Unit	Model				
Worldwide			40VE	40VEO	40VEHTO	40VET	40VETO
USA, CANADA			C40ER	40ER	P40TH	C40TR	40TR
DIMENSION:							
Over-all length		mm (in)	670 (26.4)		1,281 (50.4)	646 (25.4)	
Over-all width		mm (in)	349 (13.7)		360 (14.2)	350 (13.8)	
Over-all height	S	mm (in)	1,192 (46.9)		—		1,192 (46.9)
	L	mm (in)	1,319 (51.9)				
	X	mm (in)	—	1,433 (56.4)	—		1,433 (56.4)
Boat transom height							
	S	mm (in)	381 (15.0)		—		381 (15.0)
	L	mm (in)	508 (20.0)				
	X	mm (in)	—	635 (25.0)	—		635 (25.0)
WEIGHT: (with aluminum propeller)							
	S	kg (lb)	73.5 (162)	74.5 (164)	—		85.5 (189)
	L	kg (lb)	76 (168)	77.3 (170)	90 (198)	87 (191.8)	88 (194)
	X	kg (lb)	—	80.5 (177)	—		91.5 (201.7)
PERFORMANCE:							
Output (ISO)		kW (hp)/rpm	29.4 (40)/5,000				
Full throttle operating range		rpm	4,500 ~ 5,500				
Maximum fuel consumption		L (US gal, Imp gal)/ h at rpm	18.5 (4.9, 4.1) at 5,500				
ENGINE:							
Type			2 stroke - L				
Number of cylinder			3				
Total displacement		cm^3 (cu. in)	698 (42.6)				
Bore × Stroke		mm (in)	67.0 × 66.0 (2.64 × 2.60)				
Compression ratio			6.00				
Number of carburetor			3				
Intake system			Reed valve				
Scavenging system			Loop charge				
Control system			Remote control		Tiller control	Remote control	
Starting system			Electric				
Ignition system			CDI				
Alternator output			6A			12-6	6A
Enrichment system			Prime start				
Advance type			Electric automatic				
Spark plug (NGK)			B7HS-10				
For CANADA and Europe			BR7HS-10				
Exhaust system			Through propeller boss				
Cooling system			Water				
Lubrication system			Pre-mixed fuel & oil	Oil injection		Pre-mixed fuel & oil	Oil injection

Item	Unit	Model				
Worldwide		40VE	40VEO	40VEHTO	40VET	40VETO
USA, CANADA		C40ER	40ER	P40TH	C40TR	40TR
FUEL AND LUBRICATION:						
Fuel type		Regular gasoline				
Fuel rating	P.O.N.*1	Min. 86				
Engine oil type/grade		2-stroke outboard motor oil / TC-W3				
Mixing ratio		50 : 1	—		50 : 1	—
Engine oil tank capacity	L (US qt, Imp qt)	—	1.5 (1.6, 1.3)		—	1.5 (1.6, 1.3)
Gear oil type		Hypoid gear oil-SAE#90				
Gear oil quantity	cm^3 (US oz, Imp oz)	430 (14.5, 15.1)				
BRACKET:						
Trim/tilt system		Manual tilt		Power trim/ tilt	Manual tilt	Power trim/ tilt
Tilt angle	degree	8, 12, 16, 20, 24		—		
Tilt-up angle	degree	66		69		
Trim angle	degree at 12° transom	—		–4 ~ 20		
Shallow water crushing angle	degree	—	Tilt angle +18	—		
Steering angle	degree (left + right)	40 + 40				
DRIVE UNIT:						
Gear shift position		F-N-R				
Gear ratio		1.85 (24/13)				
Gear type		Spiral bevel gear				
Clutch type		Dog clutch				
Propeller direction		Clockwise				
Propeller drive system		Spline				
Propeller series mark		G				
ELECTRICAL:						
Battery capacity	Ah (kC)	70 (252)				
Cold cranking	Amps	385			380	385

*1: Pump Octane Number ; (Research octane + Motor octane)/2

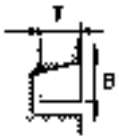
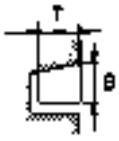
Item	Unit	Model							
Worldwide		50HMHO	50HMHD	50HMO	50HMDO	50HWHD	50HEDO	50HET	50HETO
USA, CANADA		—	—	—	—	—	50ER	C50TR	50TR
DIMENSION:									
Over-all length	mm (in)	1,281 (50.4)		670 (26.4)		1,281 (50.4)	670 (26.4)		
Over-all width	mm (in)	349 (13.7)	360 (14.2)	349 (13.7)	360 (14.2)				
Over-all height S	mm (in)	1,223 (48.1)	—	1,223 (48.1)	—		1,192 (46.9)	—	1,192 (46.9)
L	mm (in)	—	1,350 (53.1)	—	1,350 (53.1)		1,319 (51.9)		
X	mm (in)	—					—		1,433 (56.4)
Boat transom height									
S	mm (in)	381 (15.0)	—	381 (15.0)	—		381 (15.0)	—	381 (15.0)
L	mm (in)	—	508 (20.0)	—	508 (20.0)				
X	mm (in)	—					—		635 (25.0)
WEIGHT: (with aluminum propeller)									
S	kg (lb)	75 (165)	81.5 (180)	71.5 (158)	—		82 (181)	—	85.5 (188)
L	kg (lb)	—	84 (185)	—	81.5 (180)	90 (198)	84.5 (186)	87 (191.8)	88 (194)
X	kg (lb)	—							91.5 (202)
PERFORMANCE:									
Output (ISO)	kW (hp)/rpm	36.8 (50)/5,000							
Full throttle operation range	rpm	4,500 ~ 5,500							
Maximum fuel consumption	L (US gal, Imp gal)/ h at rpm	22 (5.8, 4.8) at 5,500							
ENGINE:									
Type		2 stroke - L							
Number of cylinder		3							
Total displacement	cm^3 (cu. in)	698 (42.6)							
Bore × Stroke	mm (in)	67.0 × 66.0 (2.64 × 2.60)							
Compression ratio		6.00							
Number of carburetor		3							
Intake system		Reed valve							
Scavenging system		Loop charge							
Control system		Tiller control		Remote control		Tiller control	Remote control		
Starting system		Manual				Manual & Electric	Electric		
Ignition system		CDI							
Alternator output		80W				6A			
Enrichment system		Choke valve				Prime start			
Advance type		Electric automatic							
Spark plug (NGK)		B8HS-10							
For CANADA and Europe		BR8HS-10							
Exhaust system		Through propeller boss							
Cooling system		Water							
Lubrication system		Oil injection	Pre-Mixed fuel & Oil	Oil injection		Pre-Mixed fuel & Oil	Oil injection	Pre-Mixed fuel & Oil	Oil injection

Item	Unit	Model							
Worldwide		50HMHO	50HMHD	50HMO	50HMDO	50HWHD	50HEDO	50HET	50HETO
USA, CANADA		—	—	—	—	—	50ER	C50TR	50TR
FUEL AND LUBRICATION:									
Fuel type		Regular gasoline							
Fuel rating	P.O.N.*1	Min. 86							
Engine oil type/grade		2-stroke outboard motor oil / TC-W3							
Mixing ratio		—	50 : 1	—		50 : 1	—	50 : 1	—
Engine oil tank capacity	L (US qt, Imp qt)	1.5 (1.6, 1.3)	—	1.5 (1.6, 1.3)		—	1.5 (1.6, 1.3)	—	1.5 (1.6, 1.3)
Gear oil type		Hypoid gear oil-SAE#90							
Gear oil quantity	cm^3 (US oz, Imp oz)	430 (14.5, 15.1)							
BRACKET:									
Trim/tilt system		Manual tilt	Hydro tilt	Manual tilt	Hydro tilt			Manual tilt	Power trim/tilt
Tilt angle	degree	8, 12, 16, 20, 24	—	8, 12, 16, 20, 24	—				
Tilt-up angle	degree	66	69	66	69				
Trim angle	degree at 12° transom	—	–4 ~ 20	—	–4 ~20				
Shallow water crushing angle	degree	—		Tilt angle +18	—				
Steering angle	degree (left + right)	40 + 40							
DRIVE UNIT:									
Gear shift position		F-N-R							
Gear ratio		1.85 (24/13)							
Gear type		Spiral bevel gear							
Clutch type		Dog clutch							
Propeller direction		Clockwise							
Propeller drive system		Spline							
Propeller series mark		G							
ELECTRICAL:									
Battery capacity	Ah (kC)	—				70 (252)			
Cold cracking	Amps	—				380			

*1: Pump Octane Number ; (Research octane + Motor octane)/2

MAINTENANCE SPECIFICATIONS

ENGINE

Item	Unit	Model	
		40 hp	50 hp
CYLINDER HEAD:			
Warpage limit	mm (in)	0.1 (0.004)	
CYLINDER:			
Bore size	mm (in)	67.00 ~ 67.02 (2.638 ~ 2.639)	
Wear limit	mm (in)	67.10 (2.642)	
Taper limi	mm (in)	0.08 (0.003)	
Out of round limit	mm (in)	0.05 (0.002)	
PISTON:			
Identification mark 	mm (in)	W	
Piston clearance	mm (in)	0.060 ~ 0.065 (0.0024 ~ 0.0026)	
Limit	mm (in)	0.115 (0.0045)	
Diameter D	mm (in)	66.940 ~ 67.000 (2.6354 ~ 2.6378)	
Measuring point H	mm (in)	10 (0.4)	
Pin boss inside diameter	mm (in)	18.008 ~ 18.015 (0.7090 ~ 0.7093)	
Ring groove clearance (installed)	mm (in)		
top	mm (in)	0.04 ~ 0.08 (0.002 ~ 0.003)	
2nd	mm (in)	0.03 ~ 0.07 (0.001 ~ 0.003)	
Over size piston	mm (in)		
Diameter 1st*1	mm (in)	67.25 (2.648)	
2nd	mm (in)	67.50 (2.657)	
PISTON PIN:			
Diameter	mm (in)	17.995 ~ 18.000 (0.7085 ~ 0.7087)	
PISTON RING (1st):			
Type 	mm (in)	Keystone	
Dimensions (B × T)	mm (in)	2.0 × 2.6 (0.08 × 0.10)	
End gap (installed)	mm (in)	0.40 ~ 0.60 (0.016 ~ 0.024)	
Limit	mm (in)	0.80 (0.031)	
PISTON RING (2nd):			
Type 	mm (in)	Keystone	
Dimensions (B × T)	mm (in)	2.0 × 2.6 (0.08 × 0.10)	
End gap (installed)	mm (in)	0.40 ~ 0.60 (0.016 ~ 0.024)	
Limit	mm (in)	0.80 (0.031)	
CONNECTING ROD:			
Small end diameter	mm (in)	22.005 ~ 22.008 (0.8663 ~ 0.8665)	
CRANK SHAFT ASSEMBLY:			
Crank width A 	mm (in)	53.90 ~ 53.95 (2.122 ~ 2.124)	
Crank width B	mm (in)	32.88 ~ 33.10 (1.294 ~ 1.303)	
Runout limit D	mm (in)	0.03 (0.001)	
Big end side clearance E	mm (in)	0.20 ~ 0.70 (0.008 ~ 0.028)	
Small end axial play limit F	mm (in)	2.0 (0.08)	

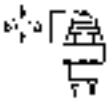
*1: Except for U.S.A.

Item	Unit	Model			
		40 hp		50 hp	
THERMOSTAT:					
Opening temperature	˚C (˚F)	48 ~ 52 (118 ~ 126)			
Full-opening temperature	˚C (˚F)	60 (140)			
Valve lift	mm (in)	3 (0.12)			
OIL INJECTION PUMP:					
Identification mark		63D00			
Specified discharge	cm^3 (US oz, Imp oz)	1.60 ± 0.50 (0.054 ± 0.017, 0.056 ± 0.018)			
REED VALVE:					
Valve stopper height	mm (in)	6.0 ± 0.2 (0.24 ± 0.01)			
Valve bending limit	mm (in)	0.2 (0.01)			
CARBURETOR:		(M model)	(E, W model)	(M model)	(E, W model)
Identification mark		63B00	63D00	62W00	62X00
Float height	mm (in)	15.0 ± 1.0 (0.59 ± 0.04)			
Valve seat size	mm (in)	1.2 (0.05)			
Main jet (M.J.)	#	115	118(M)	125	130
Main nozzle (M.N.)	mm (in)	3.0 (0.12)		3.2 (0.13)	3.0 (0.12)
Main air jet (M.A.J.)	#	160		130	140
Pilot jet (P.J.)	#	60		62	
Pilot air jet (P.A.J.)	#	75		90	80
Pilot screw (P.S.)	turns out	1-1/2 ± 1/4		1-5/8 ± 1/4	1-3/8 ± 1/4
Starter jet (S.J.)	mm (in)	—	1.0 (0.04)	—	1.0 (0.04)
Electrothermal valve resistance (color — color)	Ω (color)	—	2.32 ~ 3.48 (L — B)	—	2.32 ~ 3.48 (L — B)
Idle speed	rpm	800 ± 50			
RECOIL STARTER:					
Starter rope length	mm (in)	2,095 (82.5)			

LOWER

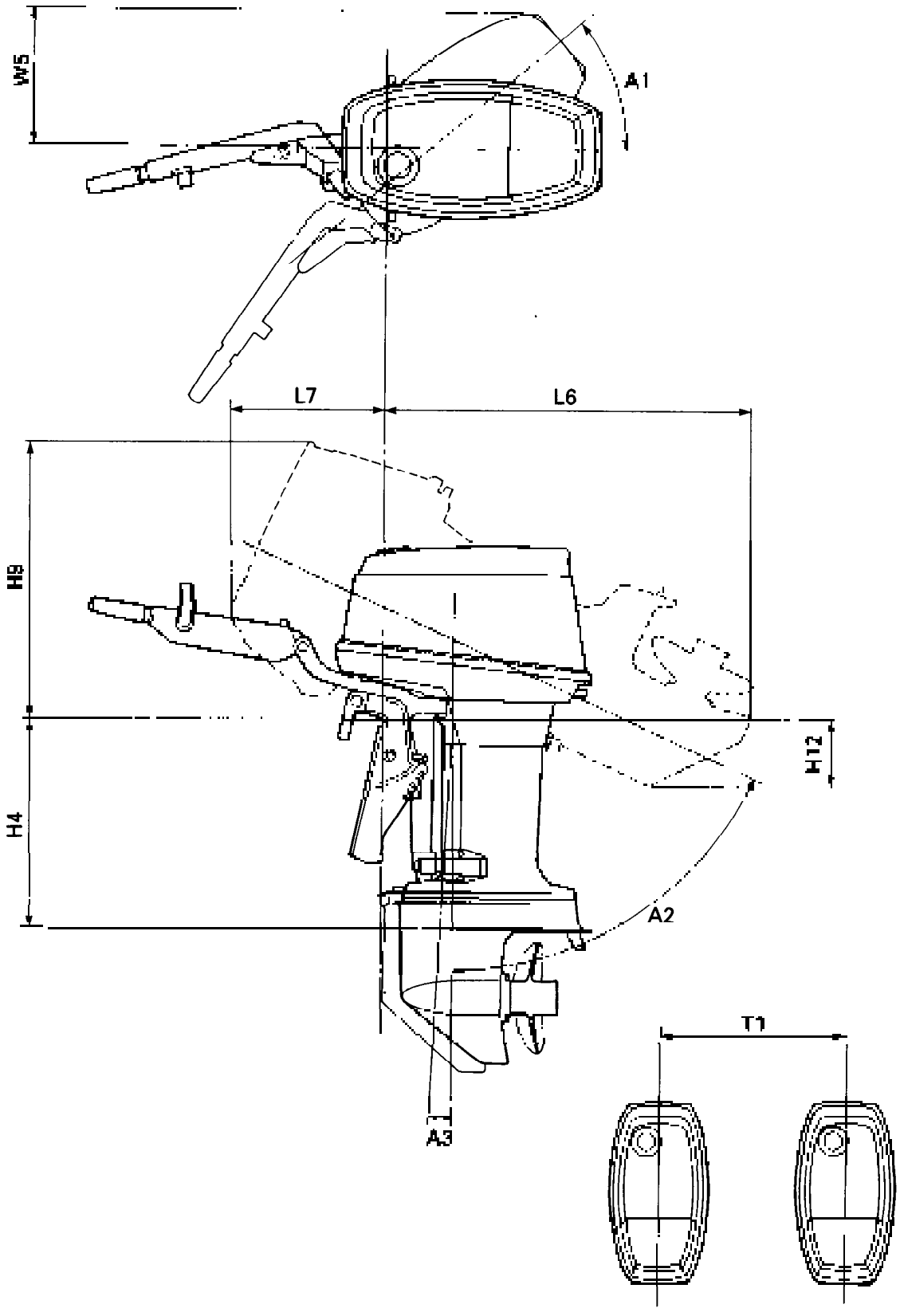
Item	Unit	Model	
		40 hp	50 hp
GEAR BACKLASH:			
Pinion - forward	mm (in)	0.18 ~ 0.45 (0.007 ~ 0.018)	
Pinion - reverse	mm (in)	0.71 ~ 0.98 (0.028 ~ 0.039)	
Pinion shims	mm (in)	0.05, 0.08, 0.12, 0.30, 0.50	
Forward shims	mm (in)	0.05, 0.08, 0.12, 0.30, 0.50	
Reverse shims	mm (in)	0.05, 0.08, 0.12, 0.30, 0.50	
PROPELLER:			
Material		Aluminum	Stainless steel
No. of blades × diameter × pitch	in	3 × 10 × 15 3 × 10-1/4 × 14 3 × 10-3/4 × 16 3 × 10-3/4 × 17 3 × 10-3/8 × 13 3 × 10-5/8 × 12 3 × 11-1/8 × 13 3 × 11-1/4 × 14 3 × 11-3/8 × 12 3 × 11-5/8 × 11 3 × 11-3/4 × 10 3 × 12-1/4 × 9	3 × 10-1/4 × 14 3 × 10-1/4 × 15 3 × 10-1/4 × 16 3 × 10-5/8 × 13 3 × 11-1/4 × 14 3 × 11-1/2 × 13 3 × 12 × 11 3 × 12 × 12
Test propeller 1		90890-01611	90890-01611
rpm	r/min	4,900 ~ 5,100	5,250 ~ 5,450
Test propeller 2		YB-1611	YB-1611
rpm	r/min	4,900 ~ 5,100	5,250 ~ 5,450
POWER TRIM AND TILT:			
Fluid type		ATF (Dexiron Ⅱ)	
Fluid capacity	cm^3 (US oz, Imp oz)	434 (14.7, 15.3)	
Brush length	mm (in)	10 (0.39)	
Wear limit	mm (in)	3.5 (0.14)	
Commutator diameter	mm (in)	22 (0.87)	
Limit	mm (in)	21 (0.83)	
Commutator under cut	mm (in)	1.5 (0.06)	

ELECTRICAL

Item	Unit	Model	
		40 hp	50 hp
IGNITION TIMING:			
Ignition timing (full retarded)	degree	A.T.D.C. 7 ± 1	
(full advanced)	degree	B.T.D.C. 25 $^{+3}_{-1}$	
(cam roller pick-up)	degree	A.T.D.C. 7	
Piston position (full advanced)	mm (in)	B.T.D.C. 3.93 $^{+0.97}_{-0.30}$ ($0.155\ ^{+0.038}_{-0.012}$)	
STARTER MOTOR:			
Type		Bendix	
Output	kW	0.6	
Brush length	mm (in)	12.5 (0.49)	
Wear limit	mm (in)	9.0 (0.35)	
Commutator diameter	mm (in)	30.0 (1.18)	
Limit	mm (in)	29.0 (1.14)	
Commutator under cut	mm (in)	0.8 (0.03)	
Limit	mm (in)	0.2 (0.01)	
Clutch type		Over running	
Pinion-ring gear gap	mm (in)	3.0 ~ 5.0 (0.12 ~ 0.20)	
Rating	Sec.	30	
RECTIFIER REGURATOR:			
Output peak voltage (R – B)			
@ cranking	V	8.5	
@ 1,500 r/min	V	25	
@ 3,500 r/min	V	25	
NEUTRAL SWITCH: 			
Length ⓐ (on)	mm (in)	18.5 ~ 19.5 (0.73 ~ 0.77)	
Length ⓑ (off)	mm (in)	19.5 ~ 20.5 (0.77 ~ 0.81)	
FUSE:			
Rating	V-A	12-10	
THERMO SWITCH (Pink lead):			
On temperature	˚C (˚F)	90 ~ 96 (194.0 ~ 204.8)	
Off temperature	˚C (˚F)	76 ~ 90 (168.0 ~ 194.0)	
THERMO SWITCH (Orange lead):			
On temperature	˚C (˚F)	38 ~ 52 (100.4 ~ 125.6)	
Off temperature	˚C (˚F)	26 ~ 34 (78.8 ~ 93.2)	
WARNING LAMP:			
Rating	V	1.7	
TRIM SENSOR:			
Resistance 1 (max)	Ω (color)	360 ~ 540 (P — B)	
Resistance 2 (max)	Ω (color)	800 ~ 1,200 (O — B)	
STATOR ASSEMBLY:			
Pulser coil resistance 1	Ω (color)	168 ~ 252 (W/R — B)	
Pulser coil resistance 2	Ω (color)	168 ~ 252 (W/B — B)	
Pulser coil resistance 3	Ω (color)	168 ~ 252 (W/G — B)	

Item	Unit	Model	
		40 hp	50 hp
Charge coil resistance	Ω (color)	368 ~ 552 (Br — L)	
Charging current (minimum)/rpm	A/rpm	3/3,000	
Charging current (maximum)/rpm	A/rpm	5 ~ 7/5,500	
Lighting voltage (minimum)/rpm	V/rpm	12.0/3,000	
Lighting voltage (maximum)/rpm	V/rpm	13.5 ~ 16.5/5,500	
Lighting coil resistance	Ω (color)	0.56 ~ 0.84 (G/W — G)	
Pole number		6	
Charge coil output peak voltage (minimum) (Br – L)			
@ cranking	V	145	
@ 1,500 r/min	V	160	
@ 3,500 r/min	V	130	
Pulser coil output peak voltage (minimum) (W/R, W/B, W/G – B)			
@ cranking	V	3.0	
@ 1,500 r/min	V	9.0	
@ 3,500 r/min	V	15.0	
C.D.I unit output peak voltage (minimum) (B/O, B/W, B/Y – B)			
@ cranking	V	125	
@ 1,500 r/min	V	140	
@ 3,500 r/min	V	110	
Lighting coil output peak voltage (minimum) (G – G/W)			
@ cranking	V	9.0	
@ 1,500 r/min	V	25	
@ 3,500 r/min	V	25	
CDI UNIT:			
Over revolution limiter revolution limit	rpm	5,800 ~ 6,200	
Over heat controlled revolution	rpm	1,600 ~ 2,400	
IGNITION COIL:			
Type		Single	
Primary coil resistance	Ω (color)	0.18 ~ 0.24 (B/W — B)	
Secondarily coil resistance	kΩ (color)	2.72 ~ 3.68 (B/W — High tension cord)	
SPARK PLUG:			
Gap	mm (in)	0.9 ~ 1.0 (0.035 ~ 0.039)	
ENGINE OIL LEVEL SENSOR:		Electric starting model	Manual starting model
Float position lower ⓐ 	mm (in)	56.8 ~ 59.8 (2.24 ~ 2.35)	56.8 ~ 59.8 (2.24 ~ 2.35)
Float position high ⓑ	mm (in)	32.8 ~ 35.8 (1.29 ~ 1.41)	—
OIL LEVEL WARNING LAMP:			
Rating:	V-mA	1.7-20 (Red)/ 2.2-20 (Yellow)/2.1-20 (Green)	

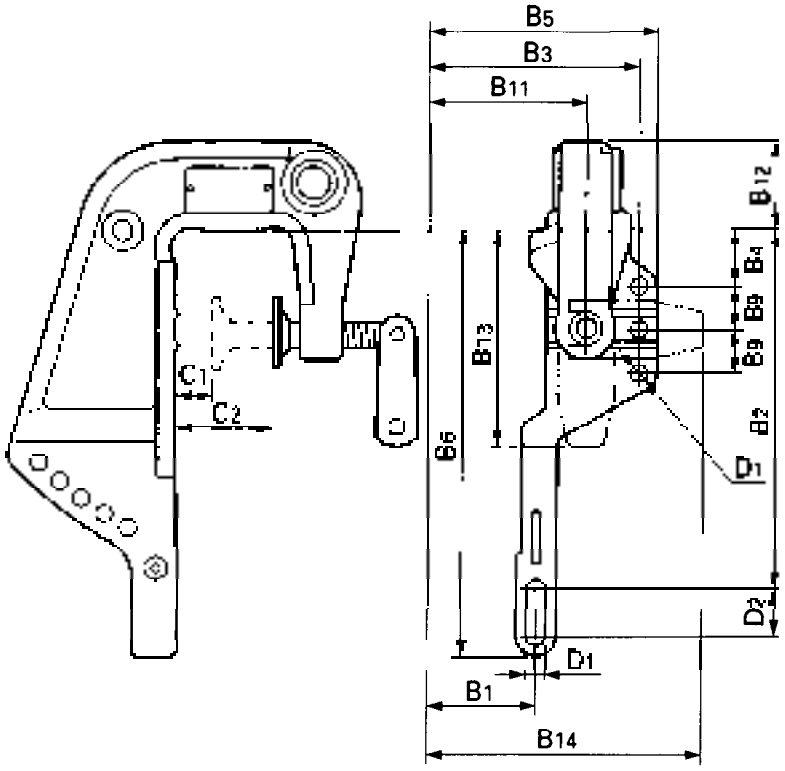
DIMENSION 1



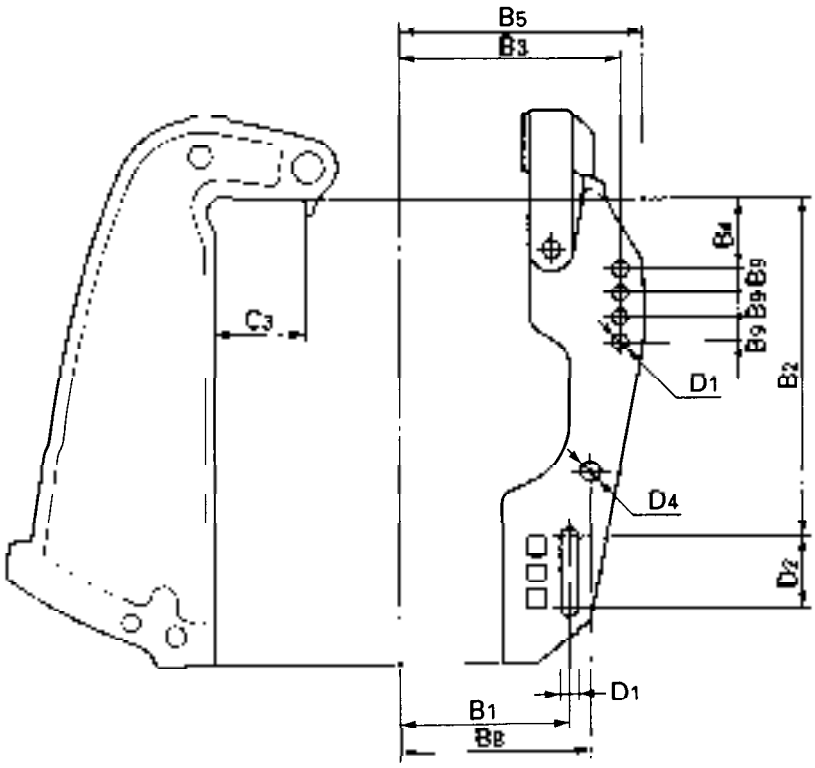
Symbol	Unit	Model						
		40VMH 40VMHO 40VWH 50HMHO	40VMO 50HMO	40VE 40VEO	50HMDO	40VMHD 50HMHD 50HWHD	40VEHTO	40VET 40VETO 50HEDO 50HET 50HETO
L6 :S	mm (in)	798 (31.4)			—	822 (32.4)	—	822 (32.4)
:L		910 (35.8)			937 (36.9)			
:UL		—		1,010 (39.8)	—	1,040 (40.9)	—	1,040 (40.9)
L7	mm (in)	433 (17.0)		401 (15.8)	418 (16.5)		387 (15.2)	
H4 :S	mm (in)	408 (16.1)			—	410 (16.1)	—	410 (16.1)
:L		535 (21.1)			537 (21.1)			
:UL		—		649 (25.6)	—	651 (25.6)	—	651 (25.6)
H9	mm (in)	683 (26.9)		671 (26.4)	696 (27.4)		688 (27.1)	
H12 :S	mm (in)	—				118 (4.6)	—	118 (4.6)
:L		—			171 (6.7)			
:UL		—				219 (8.6)	—	219 (8.6)
W5	mm (in)	340 (13.4)						
A1	degree	40						
A2	degree	62			65			
A3	degree	—			–4			
T1	mm (in)	600 (23.6)						

DIMENSION 2

MANUAL TILT MODEL



HYDRO TILT/PTT MODEL



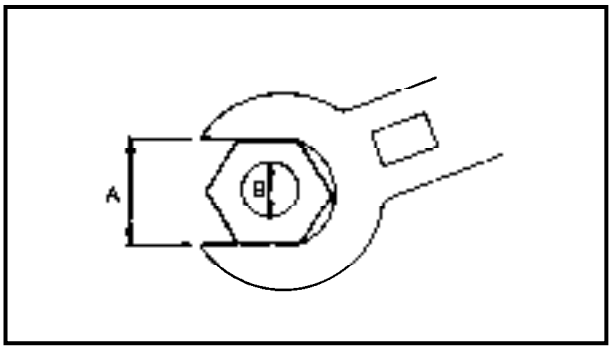
Symbol	Unit	Model	
		Manual tilt	Hydro and PTT
B1	mm (in)	62.5 (2.5)	126 (5.0)
B2	mm (in)	208 (8.2)	254 (10.0)
B3	mm (in)	121.5 (4.8)	163.5 (6.4)
B4	mm (in)	32 (1.3)	50.8 (2.0)
B5	mm (in)	131.5 (5.2)	180 (7.1)
B6	mm (in)	245 (9.6)	355 (14.0)
B9	mm (in)	25 (1.0)	18.5 (0.7)
B11	mm (in)	90.5 (3.6)	—
B12	mm (in)	57 (2.2)	—
B13	mm (in)	122 (4.8)	—
B14	mm (in)	156 (6.1)	—
D1	mm (in)	10.5 (0.4)	13 (0.5)
D2	mm (in)	26 (1.0)	55.5 (2.2)
C1	mm (in)	30 (1.2)	—
C2	mm (in)	66 (2.6)	—
C3	mm (in)	—	69 (2.7)

TIGHTENING TORQUE

SPECIFIED TORQUE

Part to tightened		Part name	Thread size	Q'ty	Tightening torque			Remarks
					Nm	m•kg	ft•lb	
ENGINE:								
Engine unit		Bolt	M8	8	21	2.1	15	
Flywheel		Nut	M16	1	110	11	80	E
Intake manifold	1st	Bolt	M6	12	4	0.4	2.9	
	2nd				8	0.8	5.8	
Reed valve		Bolt	M3	12	1	0.1	0.7	
Spark plug		Bolt	M14	3	25	2.5	18	
Cylinder head	1st	Bolt	M8	14	15	1.5	11	572
	2nd				28	2.8	20	
Exhaust cover	1st	Bolt	M6	14	4	0.4	2.9	572
	2nd				8	0.8	5.8	
Crank case	1st	Bolt	M6	6	5	0.5	3.6	
	2nd				11	1.1	8.0	
	1st		M8	8	15	1.5	11	
	2nd				28	2.8	20	
LOWER:								
Propeller		Nut	M16	1	30	3.0	22	
Lower unit		Bolt	M10	5	40	4.0	29	572
Propeller shaft housing		Bolt	M8	2	16	1.6	11	
Pinion nut		Nut	M12	1	75	7.5	54	
Water inlet		Bolt	M6	1	5	0.5	3.6	242
BRACKET:								
Tiller handle mounting		Nut	M10	2	38	3.8	27	
Steering friction mounting		Nut	7/8 UNF	2	20	2.0	14	
Tiller handle pivot		Bolt	M12	1	38	3.8	27	
Muffler		Bolt	M2	8	21	2.1	15	572
Exhaust manifold		Bolt	M3	8	21	2.1	15	
Exhaust guide		Bolt	M4	8	21	2.1	15	
Clamp bracket (manual tilt)		Nut	7/8 UNF	2	45	4.5	32	
Clamp bracket		Nut	7/8 UNF	2	24	2.4	17	
PTT UNIT:								
Plug screw		Bolt	M8	1	7	0.7	5.1	
Tilt cylinder ass'y		Bolt	M6	3	9	0.9	6.5	242
Motor unit		Bolt	M3	5	4	0.4	2.9	572
Tilt cylinder end bolt		Bolt	—	1	90	9.0	65	
Inner cylinder end bolt		Bolt	—	1	70	7.0	50	
Gear pump		Bolt	M4	4	4	0.4	2.9	
Bottom cover		Bolt	M6	4	7	0.7	5.1	572
Retaining plate		Bolt	M5	2	4	0.4	2.9	
Main valve		Bolt	—	2	11	1.1	8.0	

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



GENERAL TORQUE

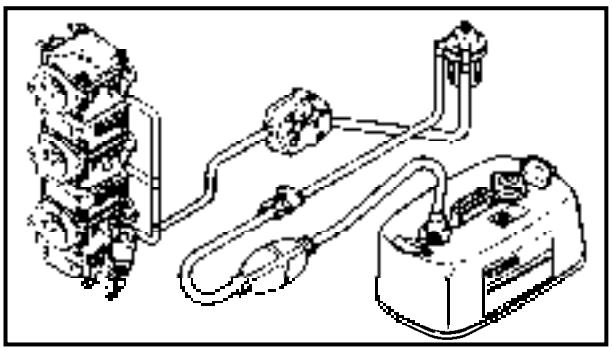
This chart specifies the torques for tightening standard fastners with standard clean dry ISO threads at room temperature. Torque specifications for special components or assemblies are given in applicable sections of this manual. To avoid causing warpage, tighten multifastener assemblies in crisscross 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				○	—
FUEL SYSTEM:						
Fuel line	Inspection	○		○	○	3-2
Fuel filter	Cleaning	○	○	○		4-3
Carburetor	Cleaning	○	○	○		4-9
POWER UNIT:						
Water leakage	Inspection	○	○	○		—
Motor exterior	Inspection	○	○	○		—
Exhaust leakage	Inspection	○	○	○		—
Cooling water passage	Cleaning		○	○		—
CONTROL SYSTEM:						
Throttle link	Inspection/Adjustment				○	3-2
Throttle cable	Inspection/Adjustment				○	3-3
Shift cable	Inspection/Adjustment				○	3-4
Start-in-gear projection	Inspection/Adjustment	○		○		3-5
Idle speed	Inspection/Adjustment	○		○		3-5
OIL INJECTION SYSTEM:						
Oil tank water drain hose	Cleaning	○	○	○		3-6
Oil pump link	Inspection/Adjustment	○		○		3-6
POWER TRIM AND TILT SYSTEM:						
Power trim and tilt fluid	Inspection	○	○	○	○	3-7
LOWER UNIT:						
Gear oil	Change	○		○		3-8
Lower unit leakage	Inspection				○	3-8
Propeller	Inspection	○	○	○		6-2
GENERAL:						
Anode	Inspection		○	○		3-9
Battery	Inspection	○	○	○		3-9
Spark plug	Cleaning/Adjustment/ Replacement	○	○	○		3-10
Wiring and connector	Adjustment/Reconnect	○	○	○		—
Bolts and nuts	Retightening	○	○	○		—
Grease points	Greasing			○		3-11

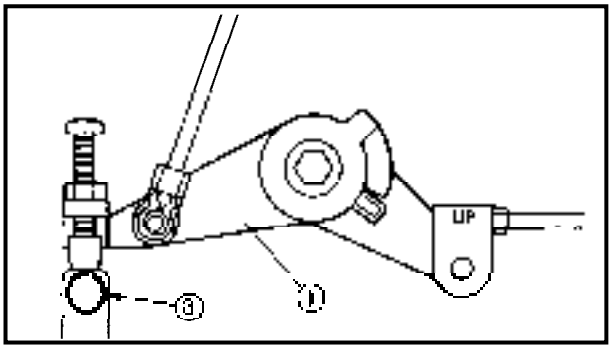


PERIODIC SERVICE

FUEL SYSTEM

Fuel line

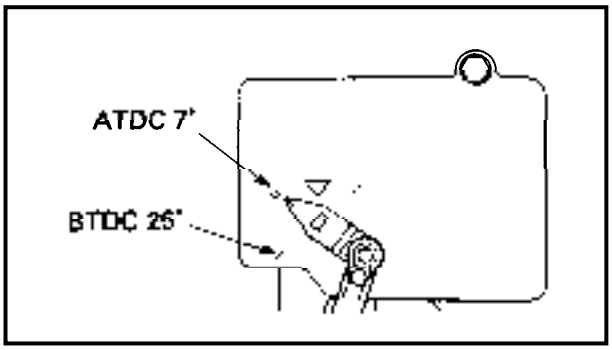
1. Inspect:
   - Fuel line
     Break/Leak/Damage → Replace.



CONTROL SYSTEM

Throttle link adjustment

1. Check:
   - CDI unit indicator
     Incorrect → Adjust.



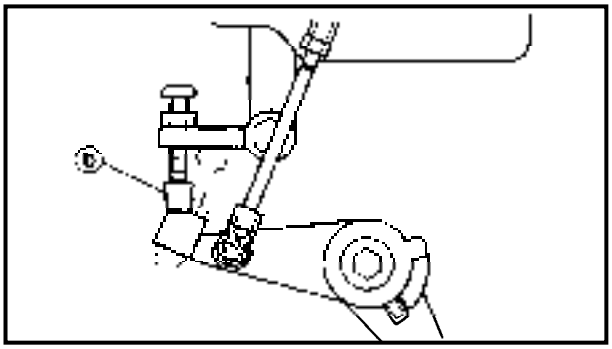
Checking steps:

- Turn the magneto control lever ① so that its adjusting screw contacts the full retarding stopper ⓐ.
- Check the CDI unit indicator so that it aligns with the specified marking on the plate.

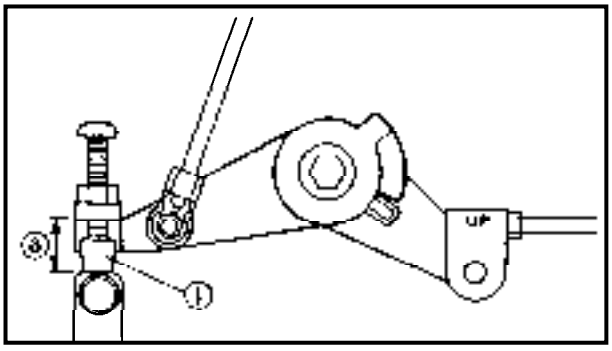
Full retarded position:
ATDC 7°

- Turn the magneto control lever so that it contacts the full advance adjusting screw ⓑ.
- Check the CDI unit indicator so that it aligns with specified marking on the plate.

Full advanced position:
BTDC 25°



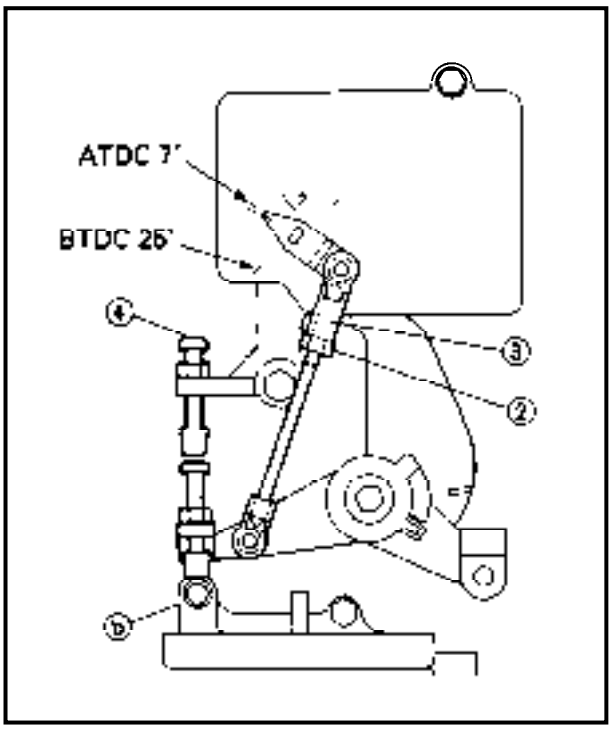
2. Adjust:
   - Ignition timing



Adjustment steps:

- Adjust the length ⓐ of the full retarding screw ① to specification.

Full retarding screw length:
20 mm (0.79 in)



- Loosen the lock nut ②.
- Disconnect the magneto control rod ③ at the CDI unit.
- Turn the magneto control lever so that its adjusting screw contacts the full retarding stopper ⓑ.
- Adjust the magneto control rod length so that the CDI unit indicator aligns with the specified marking on the plate.

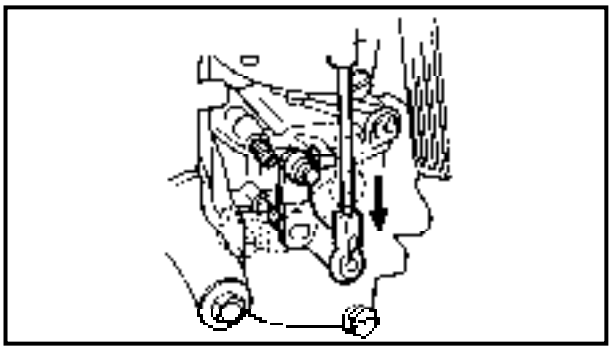
Full retarded position:
ATDC 7°

- Connect the magneto control rod.
- Turn the magneto control lever so that it contacts the full advance adjusting screw ④.
- Adjust the full advance adjusting screw so that the CDI unit indicator aligns with the specified marking on the plate.

Full advanced position:
BTDC 25°

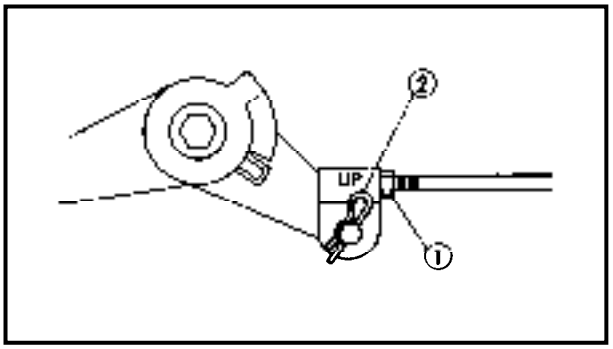
Throttle cable adjustment

NOTE:
Before adjusting the throttle cable, the throttle link should be adjusted.



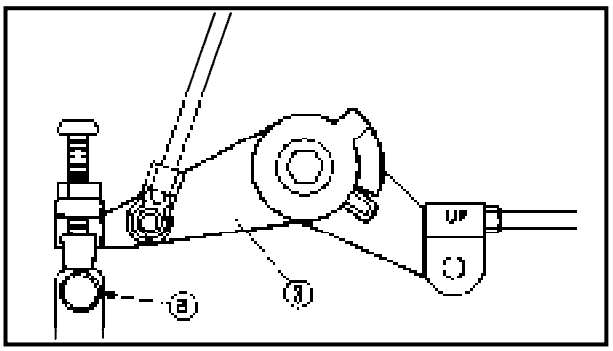
1. Check:
   - Full-open position
     Incorrect → Adjust.

Checking steps:
- Set the shift lever to the forward position.
- Open the throttle grip fully.
- Check the throttle valve lever so that it contacts the full opening stopper.



2. Adjust:
   - Throttle cable joint position

Adjustment steps:
- Loosen the lock nut ①.
- Remove the clip ②.
- Disconnect the cable joint at the magneto control lever.
- Close the throttle grip fully.



- Turn the magneto control lever ③ so that its adjusting screw contacts the full retarding stopper ⓐ.
- Adjust the position of the cable joint until its hole aligns with the set pin.
- Install the clip and tighten the lock nut.

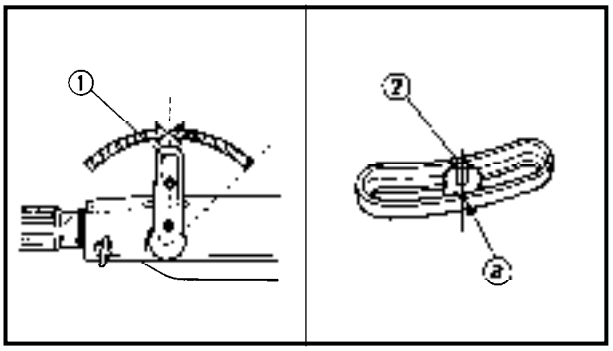
⚠ WARNING

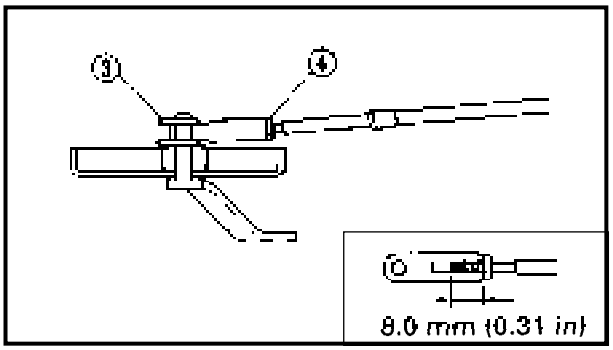
The cable joint should be screwed in more than 8 mm (0.31 in).

NOTE:

Put the "UP" mark upward.

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





Shift cable adjustment

1. Check:
   - Shift operation
     Incorrect → Adjust.
2. Adjust:
   - Shift cable joint position

Adjustment steps:

- Set the shift handle ① in neutral.
- Align the center of the set pin ② with the mark ⓐ on the bracket.
- Adjust the position of the cable joint until its hole aligns with the set pin.
- Install the clip ③ and tighten the lock nut ④.

⚠ WARNING

The cable joint should be screwed in more than 8 mm (0.31 in).

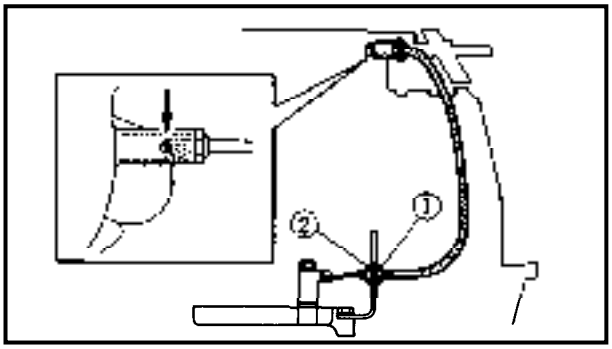
NOTE:

Put the "UP" mark upward (manual starter model only).

3. Check:
   - Shift operation
     Unsmooth 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 adjust nut ② so that the end of the starter stop-plunger aligns with the center of the hole in the starter case.
- Tighten the lock nut.

Idle speed adjustment

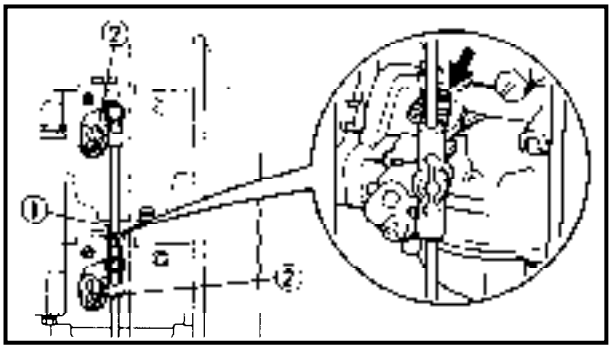
NOTE:
Before adjusting the idle speed, be sure to adjust the throttle link.

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

	Idle speed: **800 ± 50 rpm**

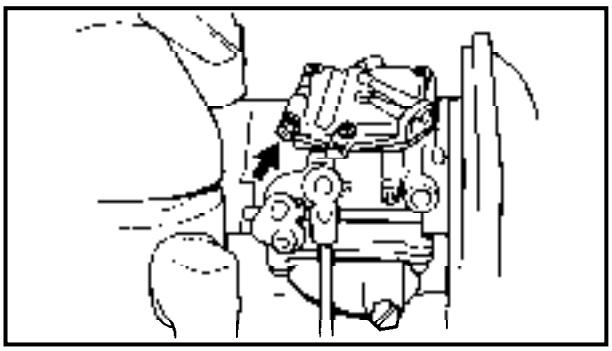
Measuring steps:
- Start the engine and allow it to warm up for a few minutes.
- Attach the tachometer to the high tension lead of the cylinder #1.

	Tachometer: **YU-08036-A/90890-06760**



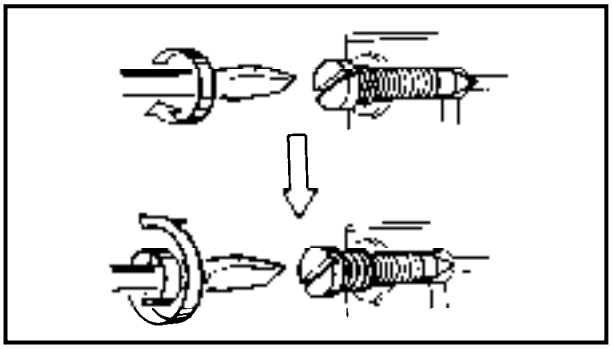
2. Adjust:
   - Idle speed

Adjustment steps:
- Loosen the idle adjusting screw ① and fully close the throttle valve.
- Loosen the throttle lever securing screws ② of upper and middle carburetors by turning the screws clockwise.



- Turn in the pilot screw until it is lightly seated.
- Turn out the pilot screw to specification.

Pilot screw (turns out):
40 hp: 1-1/2 ± 1/4
50 hp (M model): 1-5/8 ± 1/4
50 hp (EM, E model): 1-3/8 ± 1/4



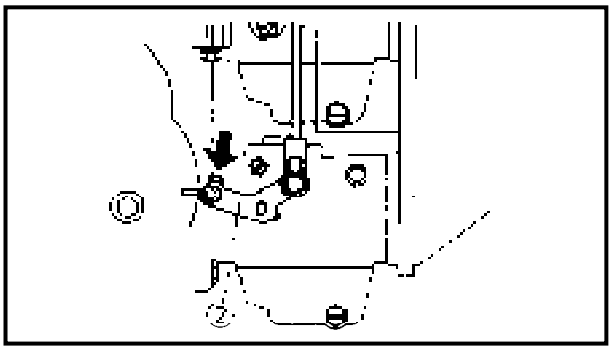
- Start the engine and allow it to warm up for a few minutes.
- Attach the tachometer to high tension lead of the cylinder #1.

Tachometer:
YU-08036-A/90890-06760

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

Turning in → Idle speed becomes higher.

Turning out → Idle speed becomes lower.

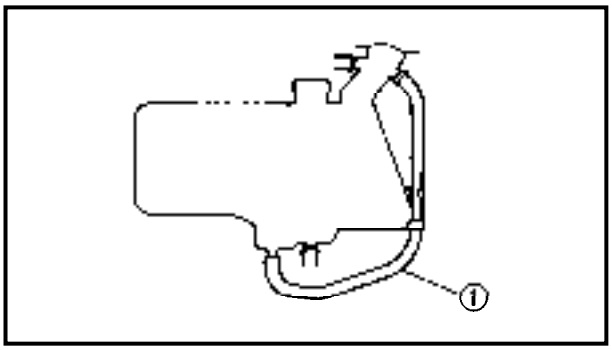


- While lightly pushing the throttle lever of the lower carburetor in the direction of the arrow (full-closed), tighten the throttle lever securing screw of the upper and middle carburetors by turning the screws counterclockwise.

OIL INJECTION SYSTEM

Oil tank water drain

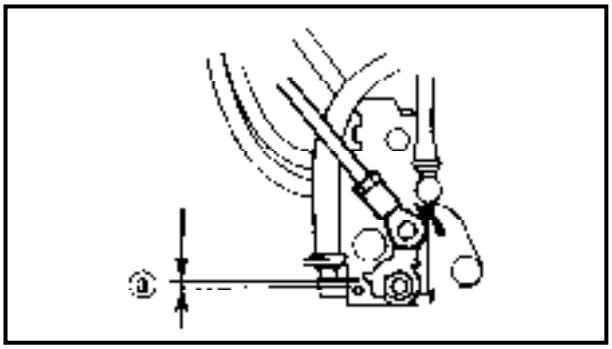
1. Check:
   - Drain hose ①
     Contamination → Drain.



NOTE:
Remove the drain hose at the upper side and drain the contaminates.

Oil pump link adjustment

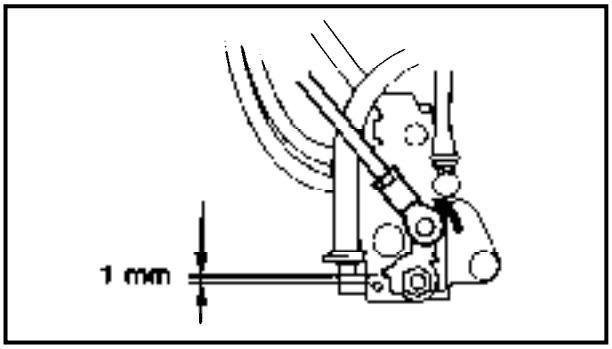
1. Check:
   - Clearance ⓐ
     Out of specification → Adjust.



Clearance ⓐ:
1.0 mm (0.04 in)

Checking steps:
- Fully open the carburetor throttle valve.
- Check the clearance ⓐ between the oil pump lever and full open side stopper.

2. Adjust:
   - Oil pump link joint position



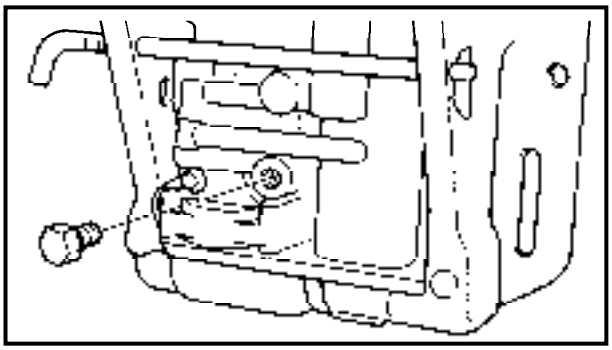
Adjustment steps:
- Loosen the lock nut.
- Remove the oil pump link joint at the pump.
- Fully open the carburetor throttle valve.
- Set the oil pump lever 1 mm off the full open side stopper.
- Adjust the position of the link joint until its hole aligns with the oil pump set pin.
- Connect the link joint.
- Check that the throttle valve opens fully.
- Tighten the lock nut.
- Install the washer and clip.

POWER TRIM AND TILT SYSTEM

Power trim and tilt fluid

1. Check:
   - Fluid level

   Fluid level is low → Fill.

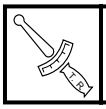


Checking steps:
- Tilt up the outboard, and lock it with the tilt lock lever.
- Remove the plug screw.
- Check that the fluid level is immediately below the fluid hole.

⚠ WARNING

To prevent the hydraulic fluid from spurting out by cancelling the internal pressure, the PTT unit should be kept fully tilted up (the tilt rod being fully lengthened).

2. Fill:
   - Yamaha power trim and tilt fluid

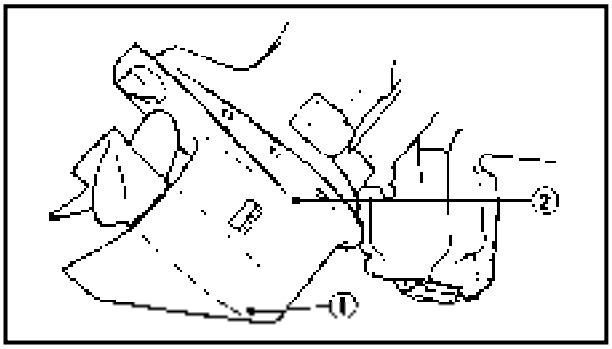


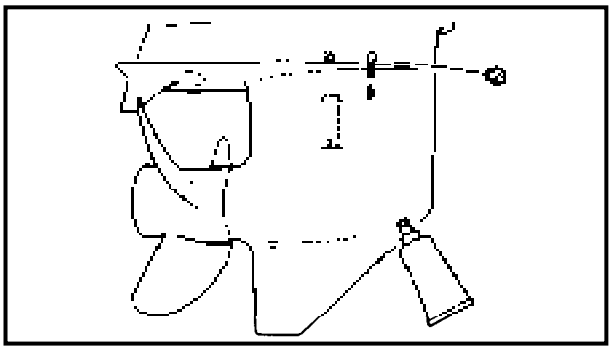
Plug screw:
7 Nm (0.7 m • kg, 5.1 ft • lb)

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





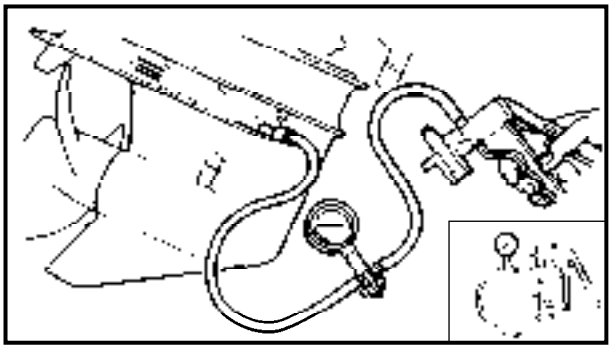
Replacement steps:
- Tilt up the motor.
- Place a pan under the drain plug ①.
- Remove the drain plug, then the oil level plug ② and drain the oil thoroughly.
- Place the outboard motor in an upright position.
- Fill the gear oil through the drain hole until it overflows at the level hole.

Recommended oil:
GEAR CASE LUBE (USA) or Hypoid gear oil, SAE #90
Oil capacity:
430 cm³ (14.5 US oz,15.1 Imp 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.



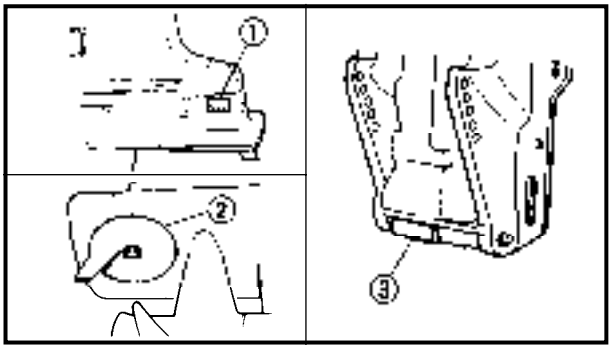
Checking steps:
- Attach the tester to the oil-level hole.

Pressure tester:
YB-35956/90890-06762

- 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 ①
   - Trim tab ②
   - Anode [(bracket bottom) except for manual tilt model] ③
     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.

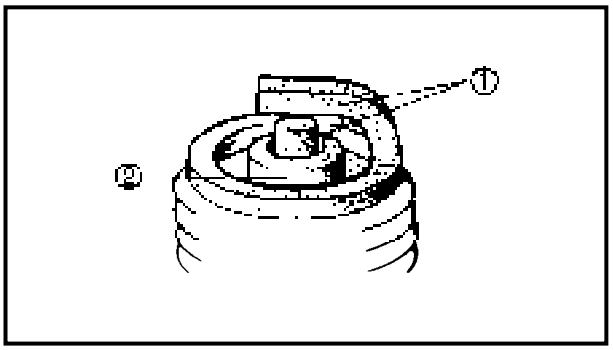
NOTE:

- 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
     Worn/Damaged → Replace.
   - Insulator color ②
     Distinctly different color → Check the engine condition.

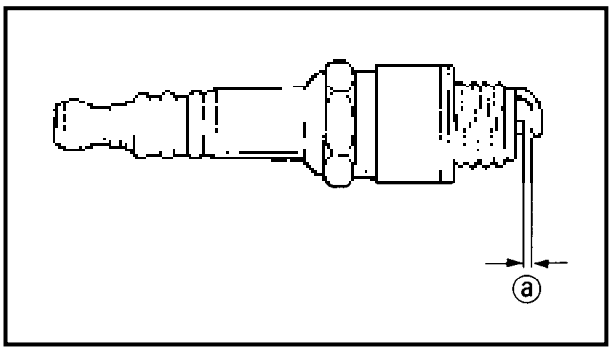


Color guide:
Normal:
Medium to light tan color
Whitish color: Lean fuel mixture
- **Plugged fuel mixture**
- **Air leak**
- **Wrong setting**

Blackish color:
Electrical malfunction
- **Defective spark plug**
- **Defective ignition system**
- **Rich mixture**
- **Excessive idling**

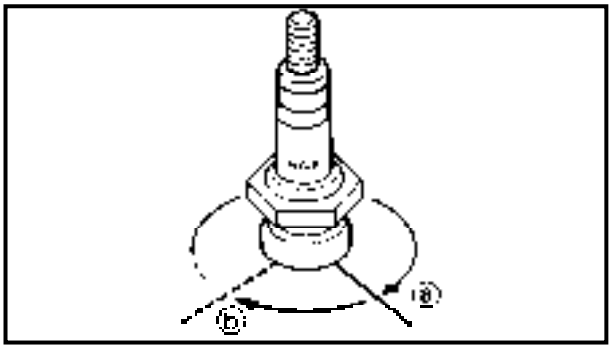
2. Clean:
   - Spark plug
     Clean the spark plug with a plug cleaner or wire brush.
3. Inspect:
   - Spark plug type

Standard spark plug:
40hp: B7HS-10
For CANADA and Europe:
BR7HS-10
50hp: B8HS-10
For CANADA and Europe:
BR8HS-10



4. Measure:
   - Electrodes gap ⓐ
     Out of specification → Regap.

	Gap: **0.9 ~1.0 mm (0.035 ~ 0.039 in)**

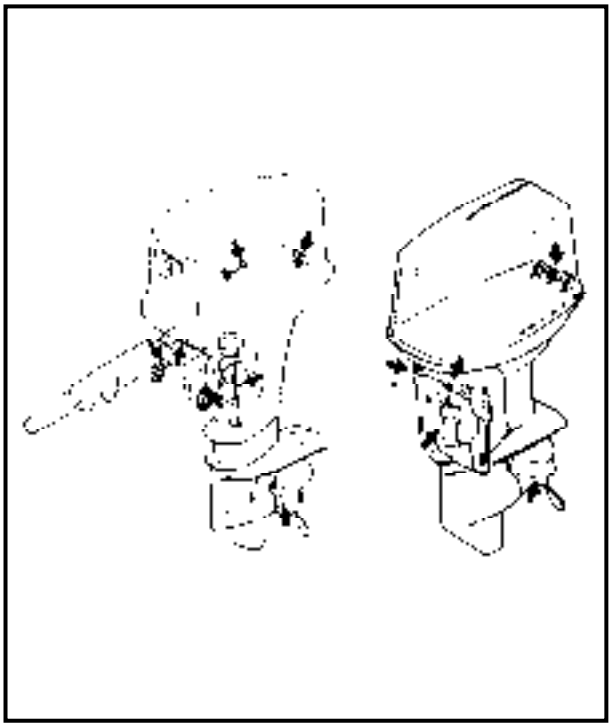


5. Tighten:
   - Spark plug

NOTE:
Before installing the spark plug, clean the gasket surface and the plug surface.

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

NOTE:
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.



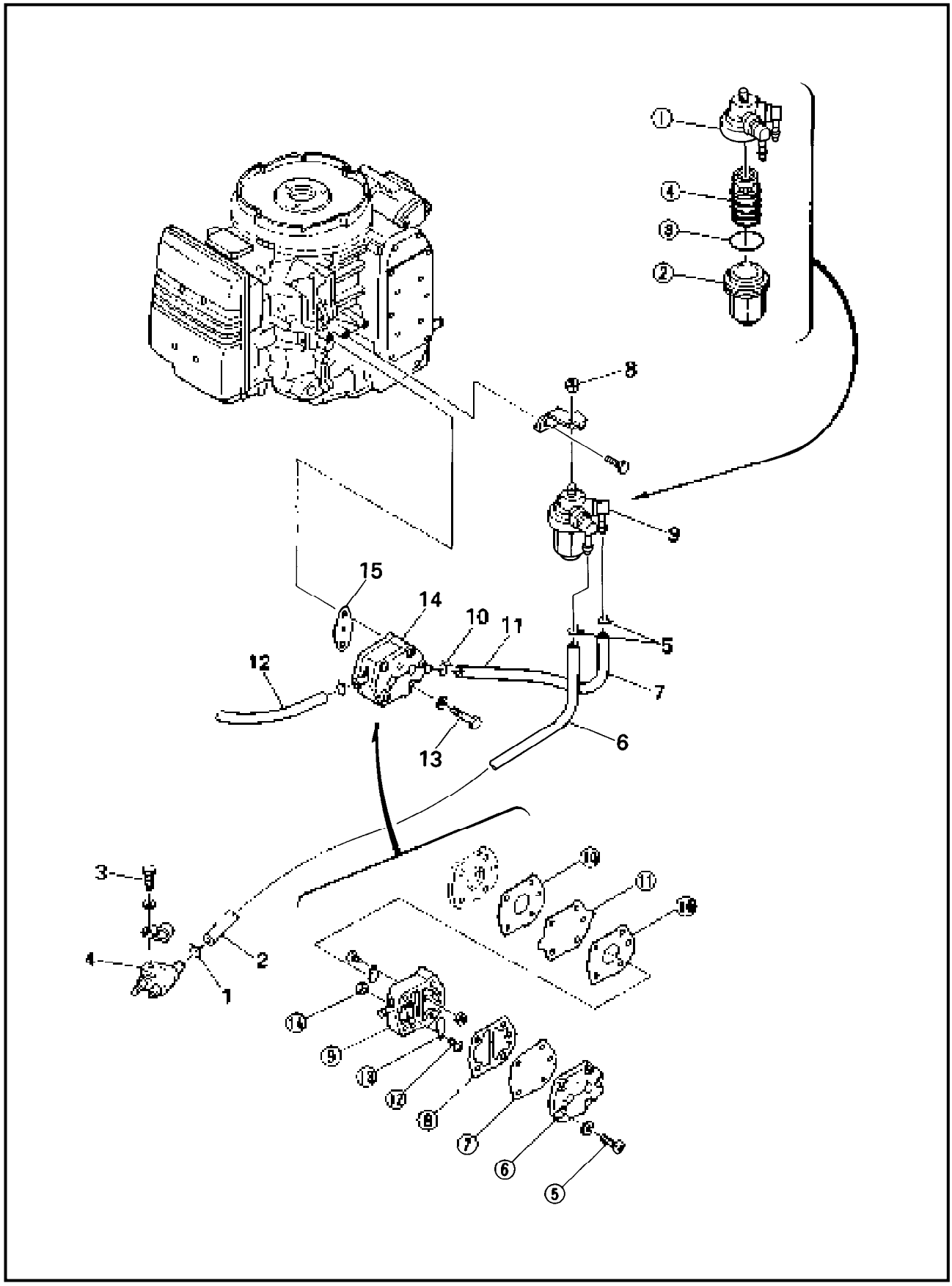
Grease points

1. Apply:
   - Water resistant grease

CHAPTER 4
FUEL SYSTEM

FUEL JOINT, FUEL FILTER AND FUEL PUMP

EXPLODED DIAGRAM



FUEL JOINT, FUEL FILTER AND FUEL PUMP

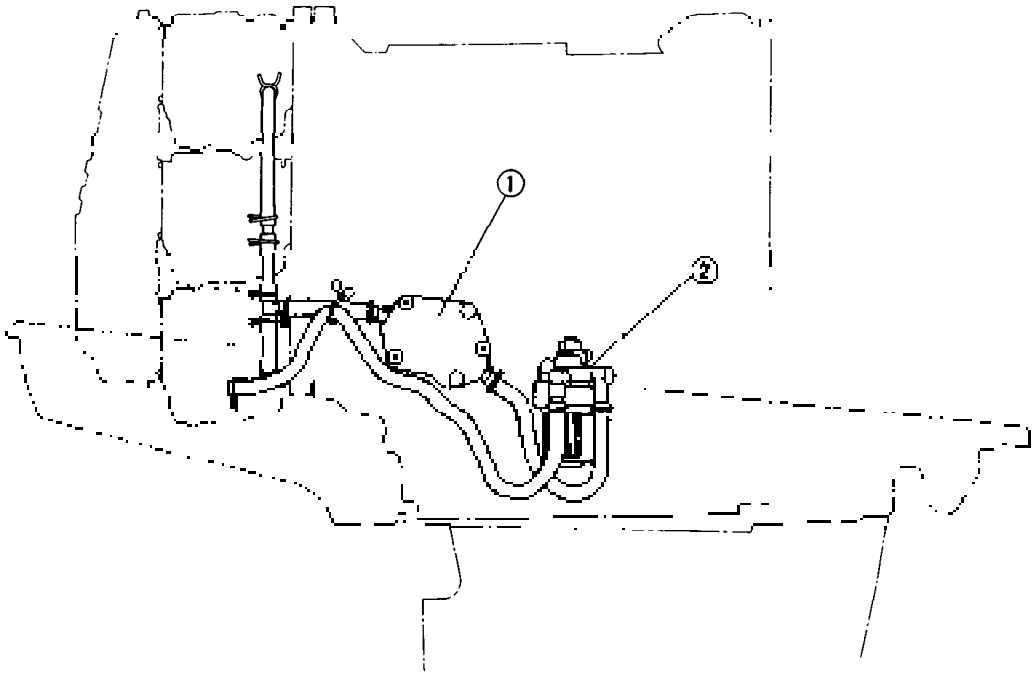
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	FUEL JOINT, FUEL FILTER AND FUEL PUMP REMOVAL		Follow the left "Step" for removal.
	Oil tank ass'y		Refer to "OIL TANK".
1	Clip	1	
2	Fuel hose (joint - filter)	1	
3	Bolt (with washer)	1	6 × 25 mm
4	Fuel joint	1	
5	Clip	2	
6	Fuel hose (joint - filter)	1	
7	Fuel hose (filter - pump)	1	
8	Nut	1	
9	Fuel filter	1	
10	Clip	2	
11	Fuel hose (filter - pump)	1	
12	Fuel hose (pump - joint pipe)	1	
13	Bolt (with washer)	2	6 × 40 mm
14	Fuel pump ass'y	1	
15	Fuel pump gasket	1	
	FUEL FILTER DISASSEMBLY		
①	Body cover	1	
②	Filter cup	1	
③	O-ring	1	
④	Filter element	1	
	FUEL PUMP DISASSEMBLY		
⑤	Screw (with washer)	3	
⑥	Body	1	
⑦	Diaphragm	1	
⑧	Gasket	1	
⑨	Body	1	
⑩	Diaphragm gasket	2	
⑪	Diaphragm	1	
⑫	Screw	2	
⑬	Seat valve	2	
⑭	Nut	2	
			Reverse the removal steps for installation.

FUEL LINE LAYOUT

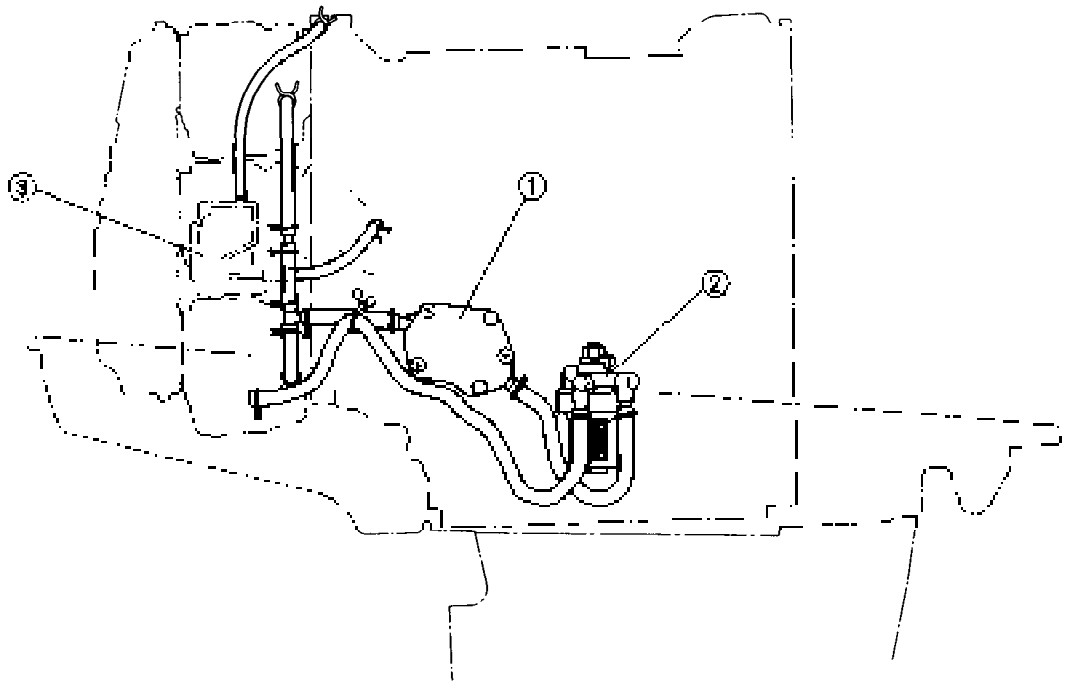
M model

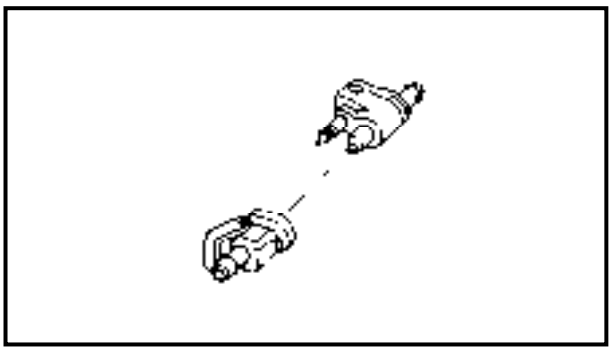
① Fuel pump
② Fuel filter



W, E model

① Fuel pump
② Fuel filter
③ Electrothermal valve

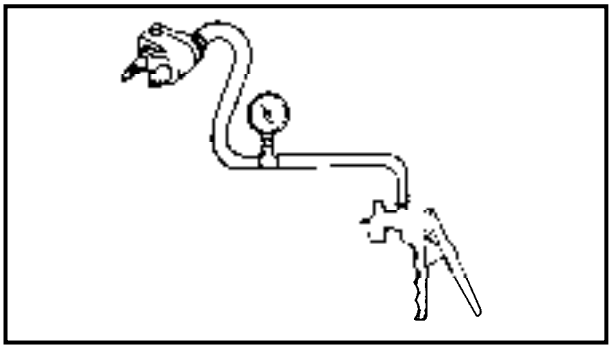




SERVICE POINTS

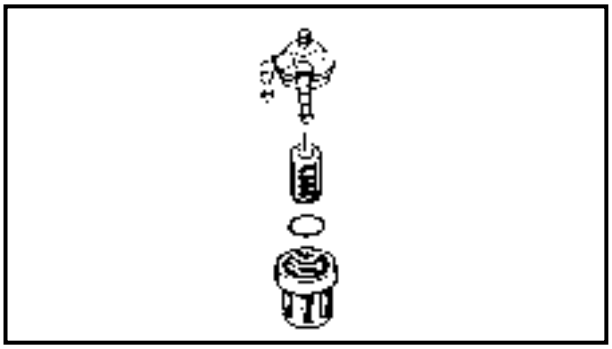
Fuel joint inspection

1. Inspect:
   - Fuel joint
     Crack/Leak/Damage → Replace.



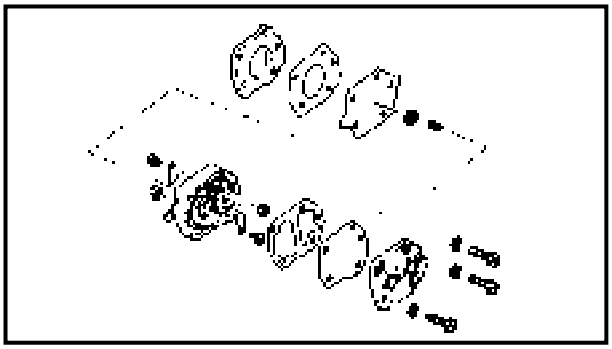
2. Measure:
   - Fuel joint operation
     Impossible to maintain the specified pressure for 10 sec. → Replace.

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.

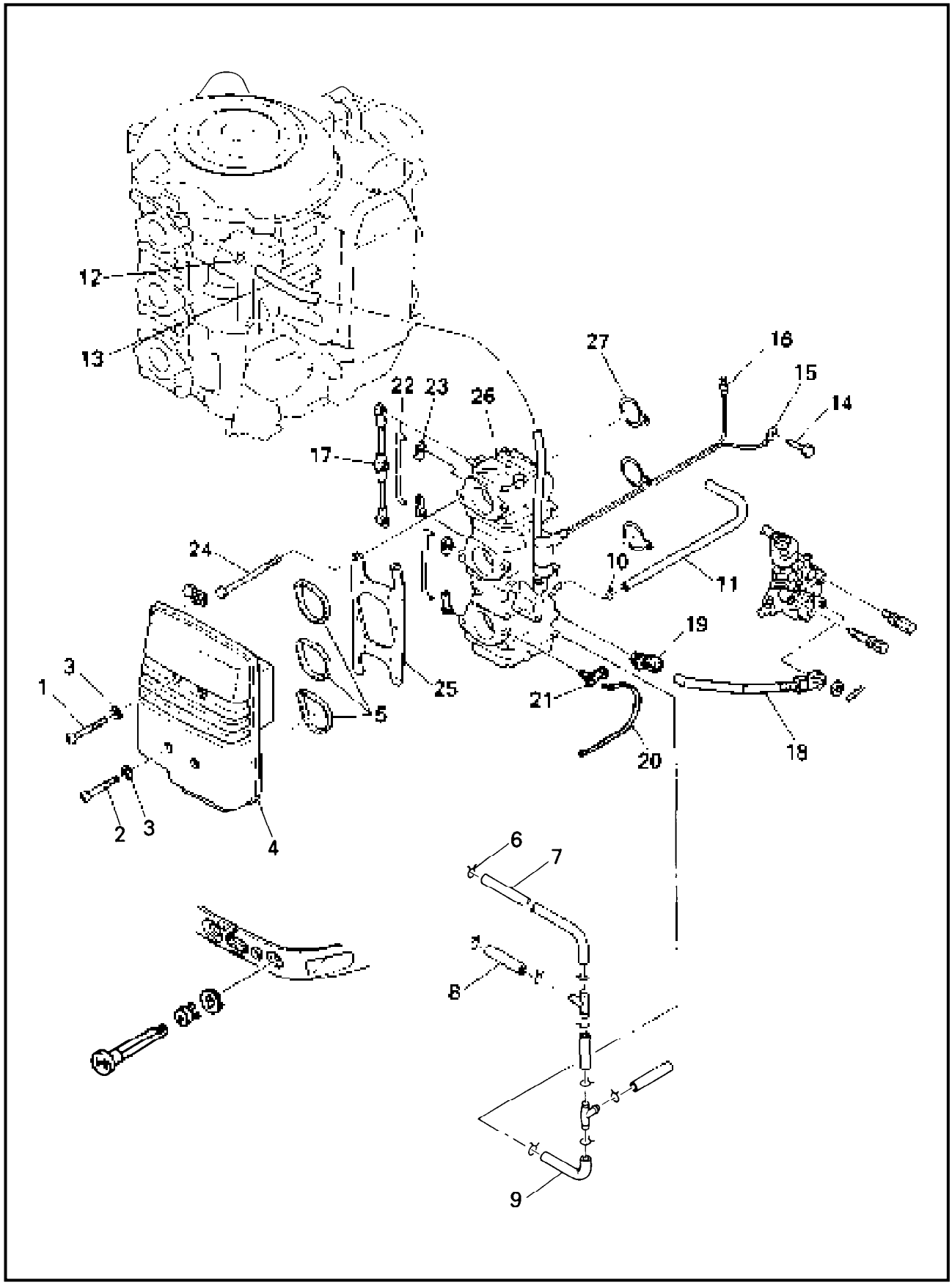


Fuel pump inspection

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

CARBURETOR REMOVAL

EXPLODED DIAGRAM

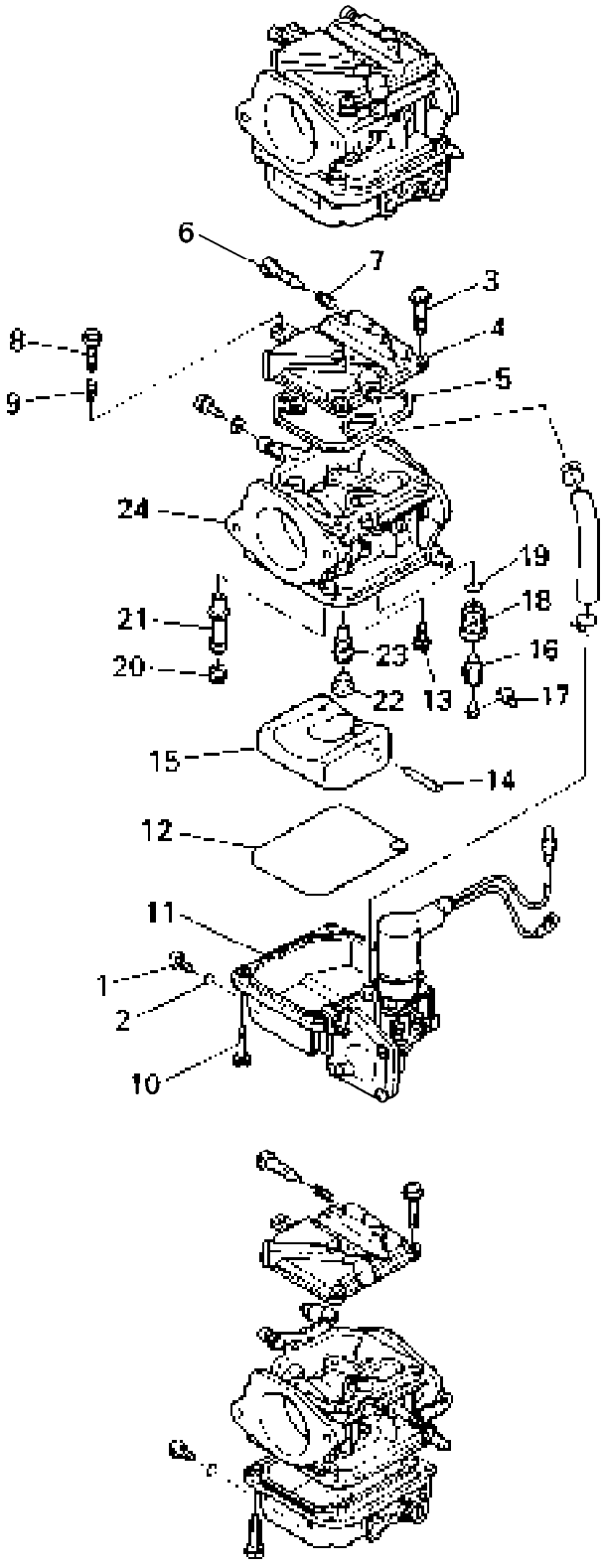


CARBURETOR REMOVAL

REMOVAL AND INSTALLATION CHART

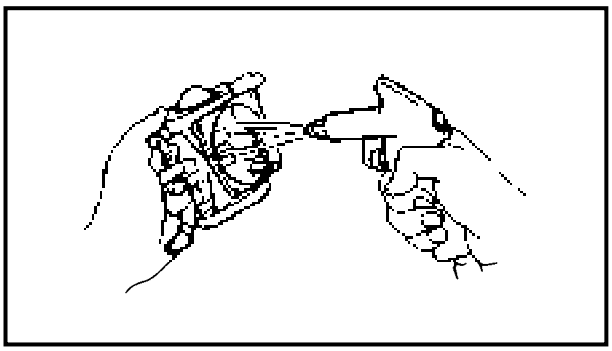
Step	Procedure/Part name	Q'ty	Service points
	CARBURETOR REMOVAL		Follow the left "Step" for removal.
	Oil tank ass'y		Refer to "OIL TANK".
1	Screw	2	6 × 40 mm
2	Screw	2	6 × 55 mm
3	Washer	4	
4	Silencer	1	
5	Seal	3	
6	Clip	3	
7	Fuel hose (joint pipe - cab.1)	1	**NOTE:** Disconnect the hose at the carburetor side.
8	Fuel hose (joint pipe - cab.2)	1	
9	Fuel hose (joint pipe - cab.3)	1	
10	Clip	1	E model
11	Pulser hose	1	**NOTE:** Disconnect the hose at the carburetor side.
12	Clip	1	
13	Fuel enrichment hose	1	**NOTE:** Disconnect the hose at the intake manifold side.
14	Bolt	1	
15	Electrothermal valve lead (black)	1	
16	Electrothermal valve lead (blue)	1	**NOTE:** Disconnect the coupler at the lighting coil.
17	Accelerator lever rod	1	
18	Oil pump link rod	1	Oil injection model
19	Link joint	1	
20	Choke link rod	1	M model
21	Link joint	1	**NOTE:** After installing, check the smooth movement of the choke knob.
22	Choke lever joint	2	
23	Link joint	4	
24	Bolt	6	6 × 95 mm
25	Carburetor bracket	1	
26	Carburetor ass'y	3	
27	Gasket	3	
			Reverse the removal steps for installation.

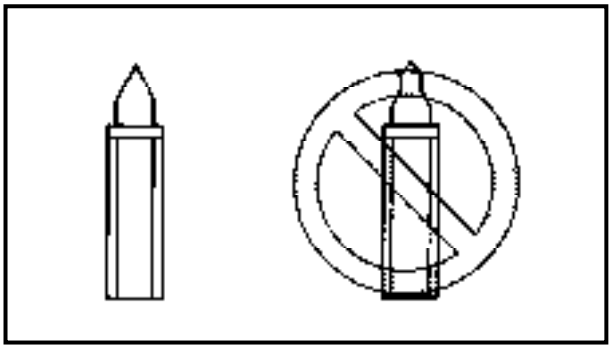
CARBURETOR
EXPLODED DIAGRAM

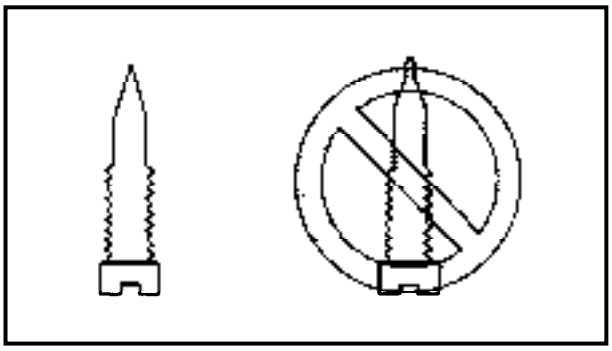


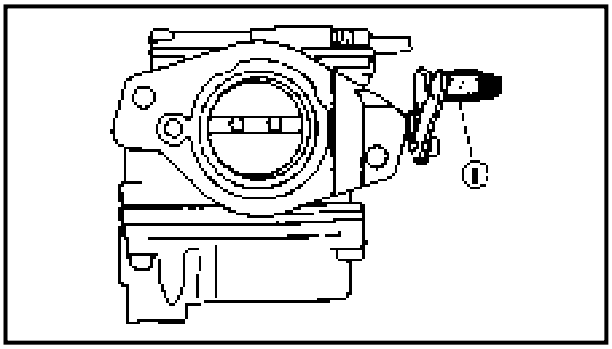
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CARBURETOR DISASSEMBLY		Follow the left "Step" for removal.
	Carburetor ass'y		Refer to "CARBURETOR REMOVAL".
1	Drain screw	1	
2	O-ring	1	
3	Screw (with washer)	3	4 × 14 mm
4	Carburetor cover	1	
5	Cover packing	1	
6	Pilot adjusting screw	1	**CAUTION:** **Do not damage the tip of the pilot screw by over-tighten it.**
7	Spring	1	
8	Stopping screw	1	Middle carburetor only
9	Spring	1	
10	Screw (with washer)	4	4 × 14 mm
11	Float chamber	1	
12	Float chamber packing	1	
13	Screw	1	4 mm
14	Arm pin	1	
15	Float	1	**NOTE:** The float is removed together with the needle valve and the clip.
16	Needle valve	1	
17	Needle valve clip	1	
18	Valve seat	1	
19	O-ring	1	
20	Main jet	1	
21	Main nozzle	1	
22	Cap	1	
23	Pilot jet	1	
24	Carburetor body	1	
			Reverse the removal steps for installation.









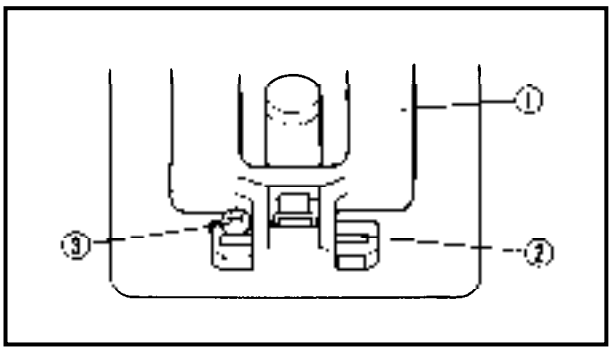
SERVICE POINTS

CAUTION:

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.
6. Inspect:
   - Collar ①
     Wear/Damage → Replace.

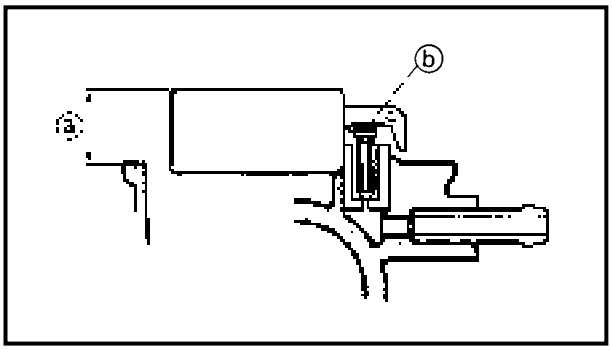


Carburetor assembly

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.
- When installing the float in the carburetor, place the needle valve in the valve seat.
- After installing, check the smooth movement of the float.



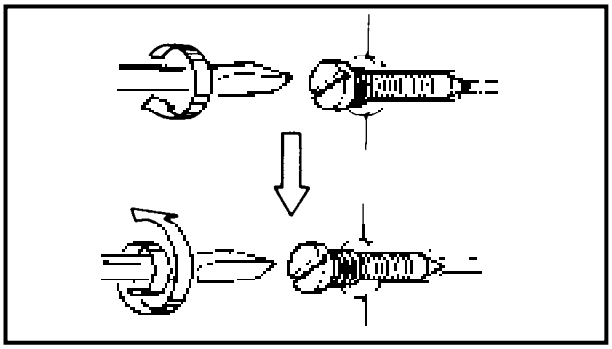
2. Measure:
   - Float height ⓐ
     Out of specification → Fold the tab ⓑ to adjust float arm height.

Float height ⓐ:
15.0 ± 1.0 mm (0.59 ± 0.04 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

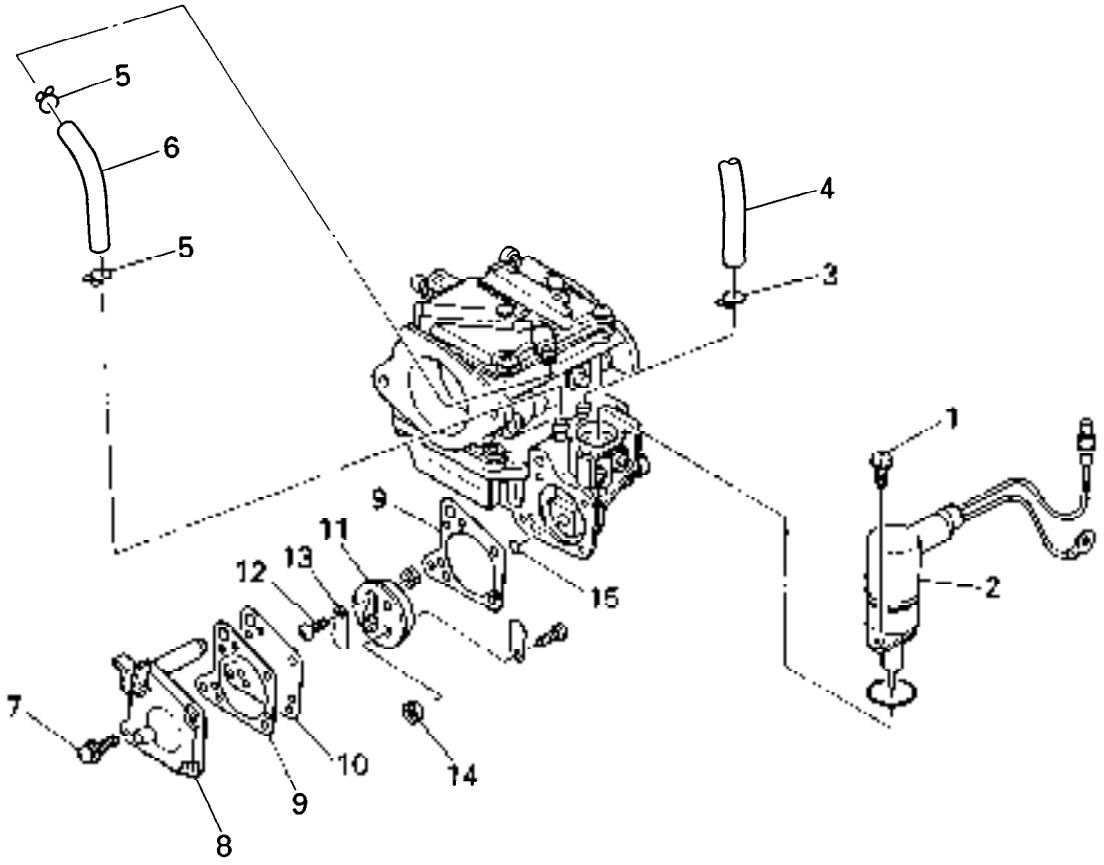


Adjustment steps:

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

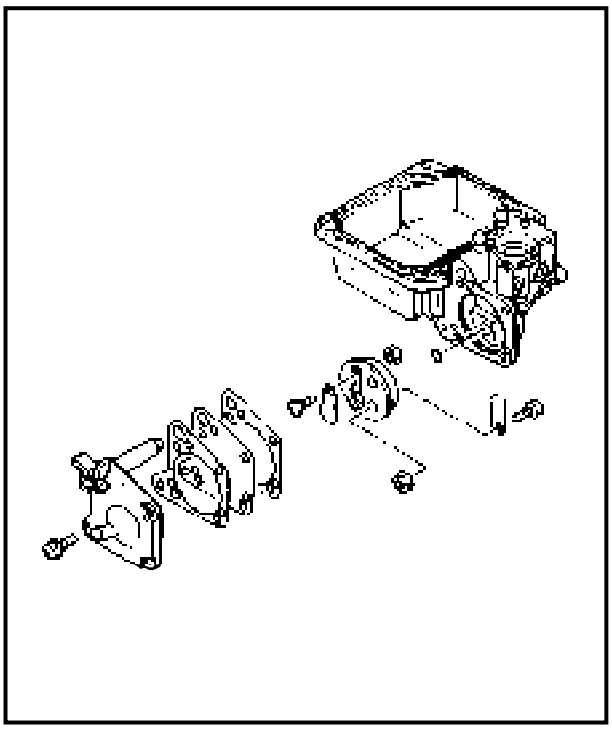
Pilot screw:
40hp: 1-1/2 ± 1/4 (turns out)
50hp:
M model: 1-5/8 ± 1/4 (turns out)
E, EM model: 1-3/8 ± 1/4 (turns out)

PRIME STARTER
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

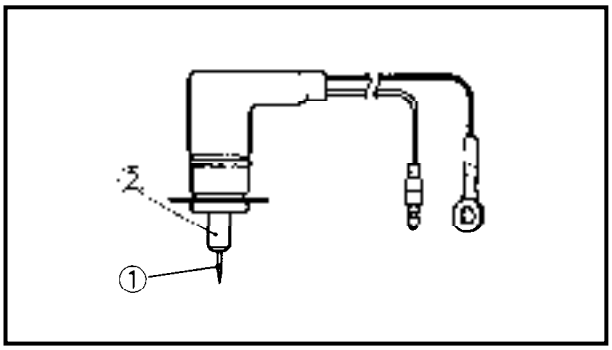
Step	Procedure/Part name	Q'ty	Service points
	PRIME STARTER DISASSEMBLY		Follow the left "Step" for removal.
	Carburetor ass'y		Refer to "CHARBURETOR REMOVAL".
1	Screw (with washer)	2	4 × 10 mm
2	Electrothermal valve	1	
3	Clip	1	
4	Fuel enrichment hose	1	
5	Clip	2	
6	Fuel hose (cover - chamber)	1	
7	Screw (with washer)	4	
8	Pump cover ass'y	1	
9	Diaphragm gasket	2	
10	Diaphragm	1	
11	Valve body	1	
12	Screw	2	M3
13	Seat valve	2	
14	Nut	2	
15	O-ring	1	
			Reverse the removal steps for installation.



SERVICE POINTS

Fuel enrichment pump inspection

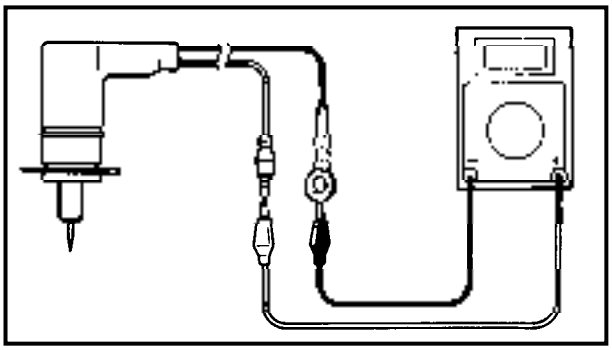
1. Inspect:
   - Body
     Crack/Leak/Damage → Replace.
2. Inspect:
   - Seat valve
     Crack/Distortion → Replace.
3. Inspect:
   - Diaphragm
     Damage → Replace.



Fuel enrichment valve inspection

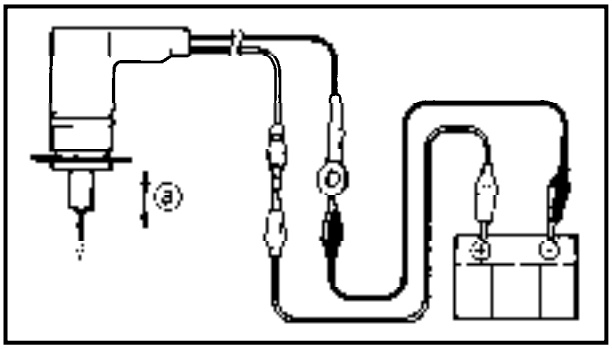
1. Inspect:
   - Needle valve ①
   - Piston valve ②
     Wear/Bend/Damage → Replace.
2. Measure:
   - Fuel enrichment valve resistance
     Out of specification → Replace.

Fuel enrichment valve resistance:
Blue - Black
2.32 ~ 3.48 Ω at 20°C (68°F)



NOTE:

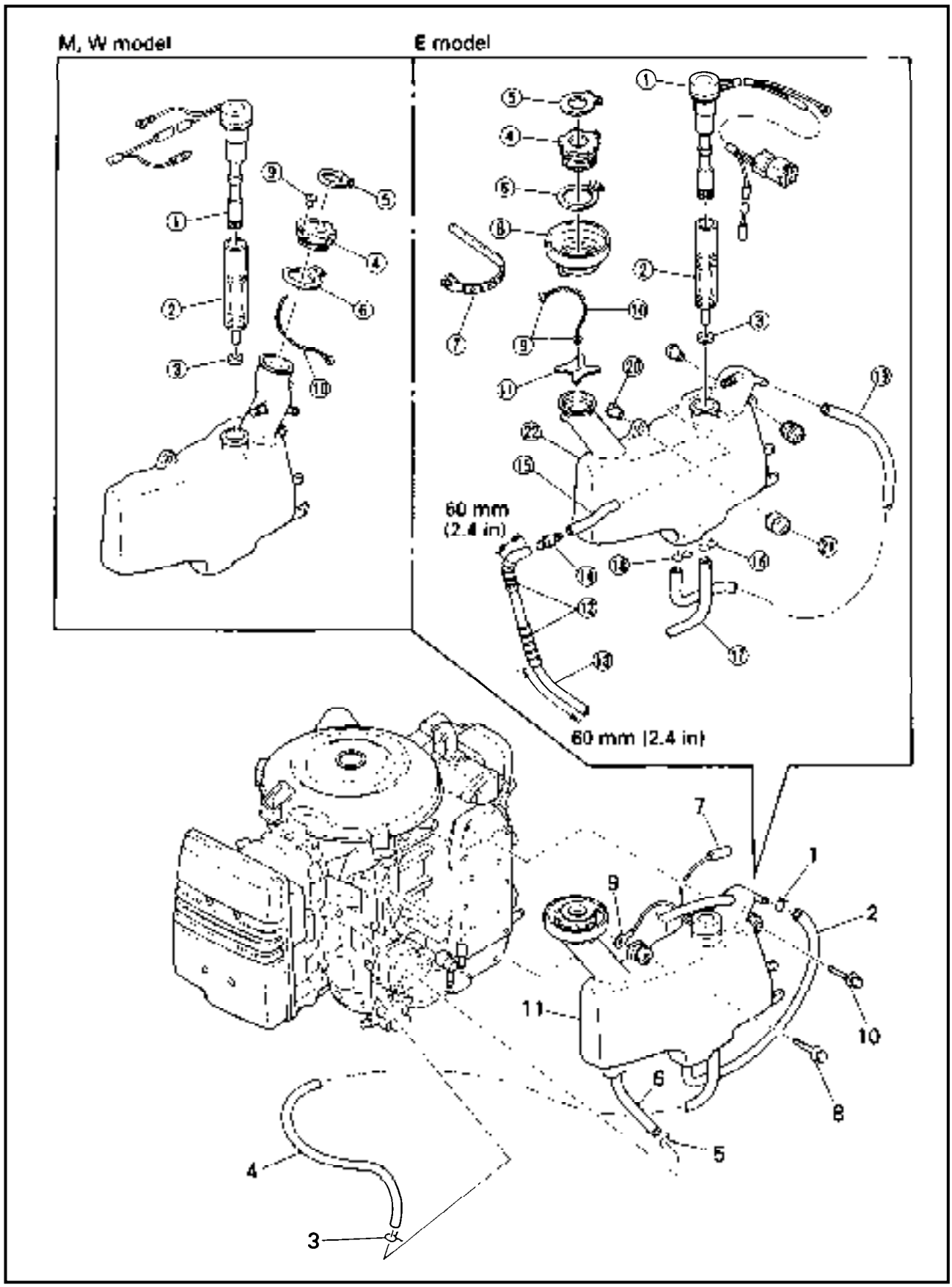
When measuring the resistance of 10 Ω or less using the digital tester, the correct measurement cannot be obtained. Refer to "Lower resistance measurement" section in chapter 8.



3. Measure:
   - Piston valve height ⓐ
     No change → Replace.

Checking steps:
- Connect the 12 V battery.
- Wait for several minutes.
- Check the piston height.

OIL TANK
EXPLODED DIAGRAM

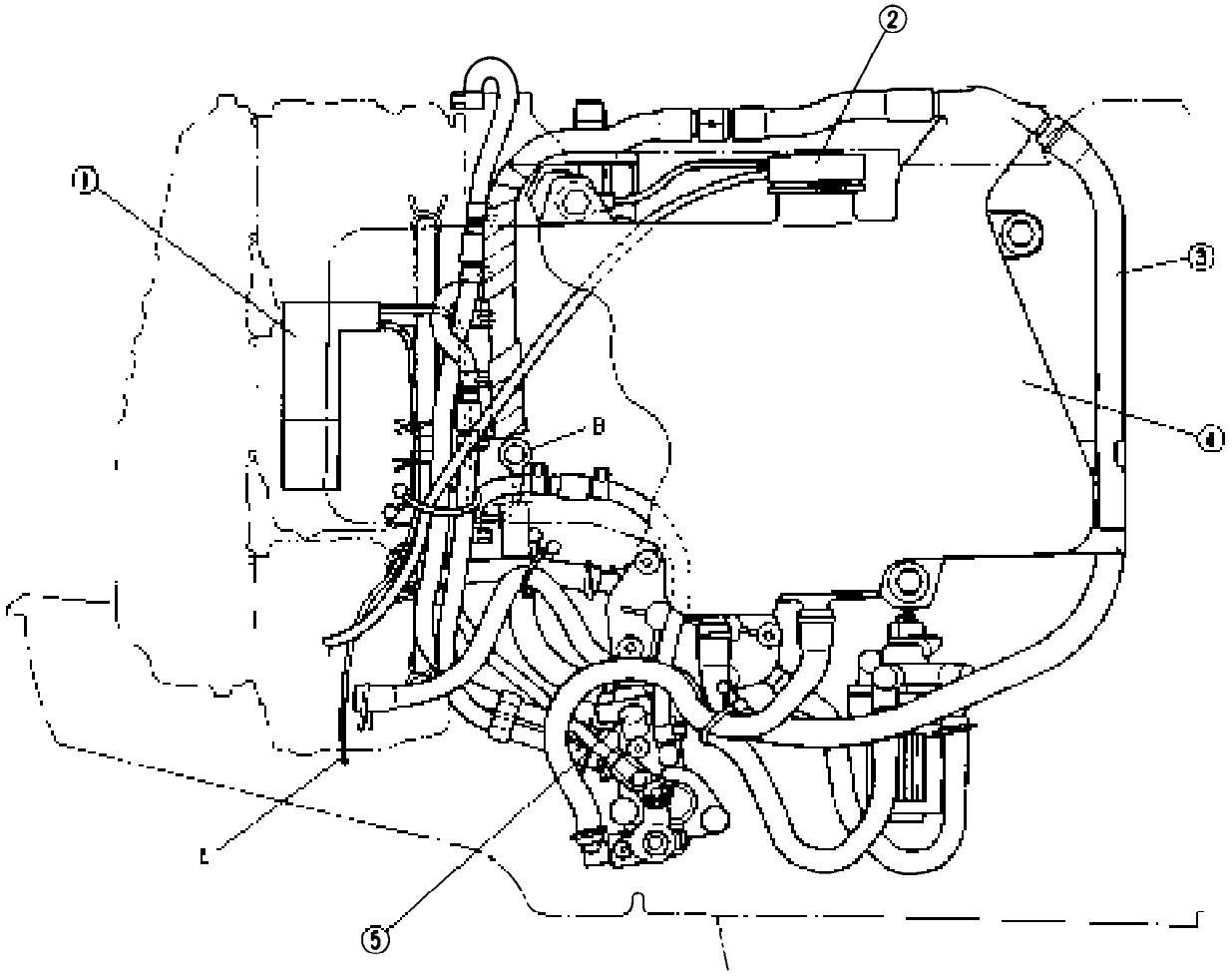


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	OIL TANK REMOVAL		Follow the left "Step" for removal.
1	Clip	1	
2	Oil drain hose	1	**NOTE:** Drain oil from the oil tank.
3	Clip	1	
4	Oil inlet hose	1	
5	Clip	1	
6	Oil return hose	1	
7	Oil level sensor lead coupler	1	**NOTE:** Disconnect the coupler.
8	Bolt (with washer)	2	
9	Oil level sensor lead	1	
10	Bolt (with washer)	1	
11	Oil tank ass'y	1	
	OIL TANK DISASSEMBLY		
①	Oil level sensor	1	
②	Oil strainer	1	
③	Strainer gasket	1	
④	Oil tank cap	1	
⑤	Hook	1	
⑥	Hook band	1	
⑦	Filler tube band	1	
⑧	Filler tube	1	
⑨	Special washer	2	
⑩	Ball chain	1	
⑪	Special washer	1	
⑫	Protector	2	
⑬	Oil return hose	1	
⑭	Check valve	1	
⑮	Oil return hose	1	
⑯	Clip	1	
⑰	Oil inlet hose	1	
⑱	Clip	1	
⑲	Oil drain hose	1	
⑳	Collar	3	
㉑	Grommet	3	
㉒	Oil tank	1	
			Reverse the removal steps for installation.

OIL LINE LAYOUT

① Electrothermal valve (EM, E model)
② Oil level sensor
③ Oil drain hose
④ Oil tank
⑤ Oil pump



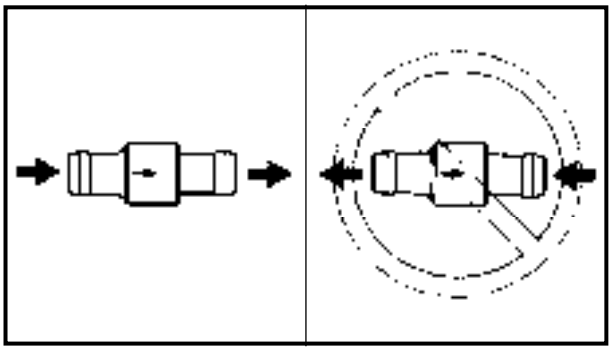
SERVICE POINTS

Oil tank inspection

1. Inspect:
   - Oil tank
     Crack → Replace.

Oil strainer inspection

1. Inspect:
   - Oil strainer
     Crack/Clog → Replace.
     Contamination → Clean.



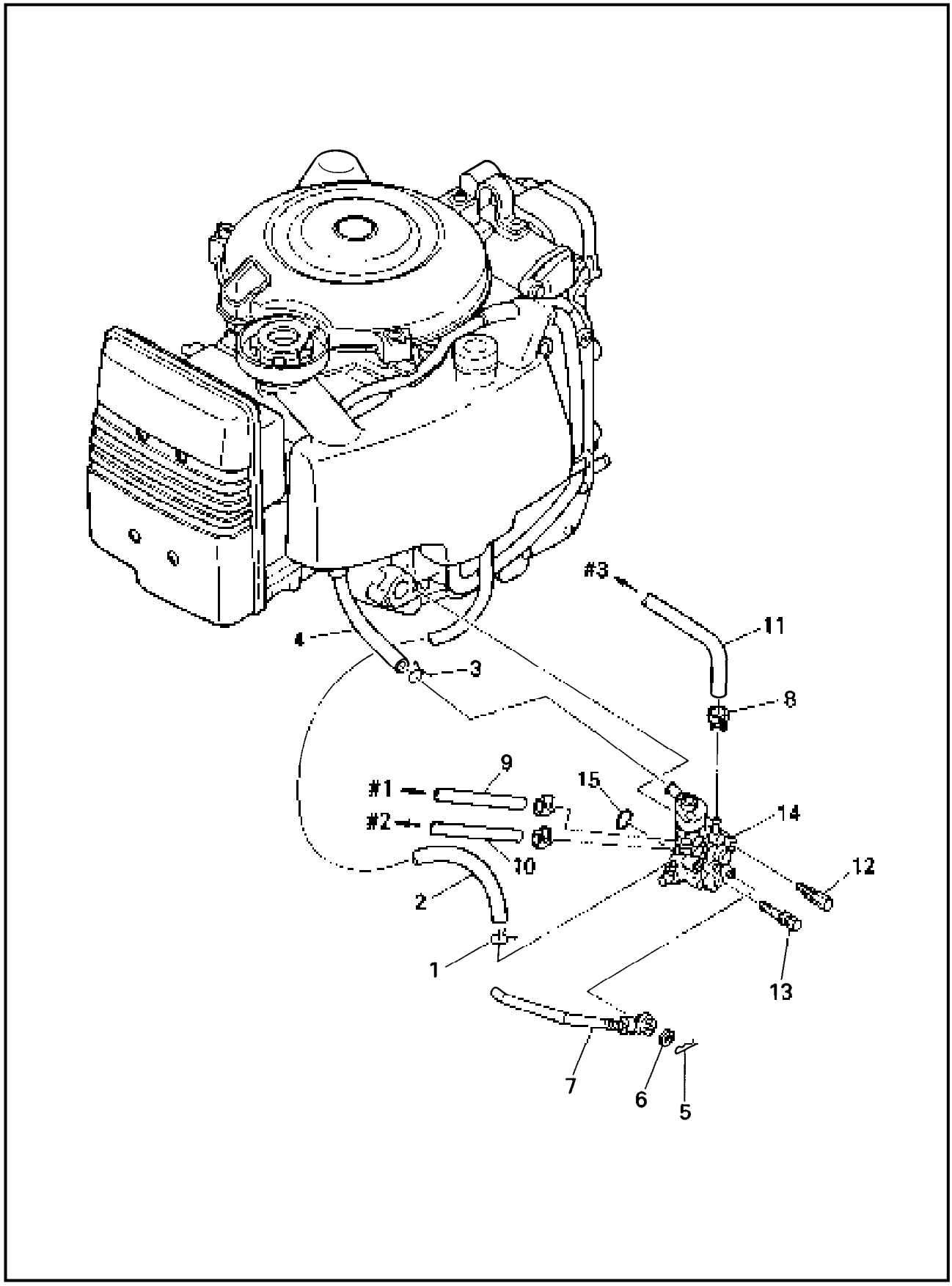
Check valve inspection

1. Check:
   - Check valve operation
     Does not function → Replace.

NOTE:

Check the operation of the check valve to ensure the air is blown only in the arrow direction.

OIL PUMP
EXPLODED DIAGRAM



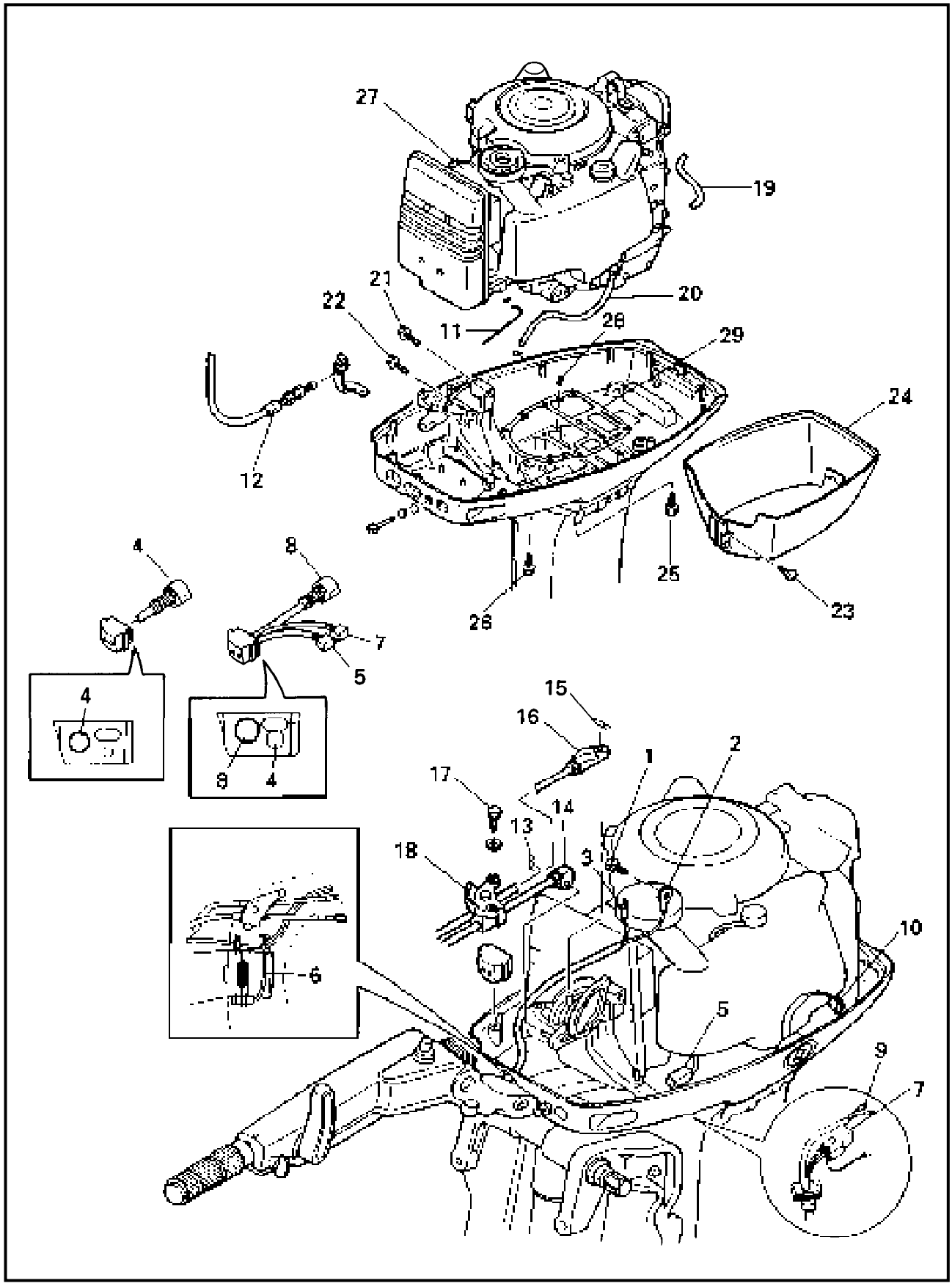
REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	OIL PUMP REMOVAL		Follow the left "Step" for removal.
	Engine oil		Refer to "OIL TANK".
1	Clip	1	
2	Oil inlet hose	1	
3	Clip	1	
4	Oil return hose	1	
5	Clip	1	
6	Plate washer	1	
7	Link joint	1	**NOTE:** Disconnect the joint at the pump side.
8	Clip	3	
9	Oil delivery hose #1	1	250 mm
10	Oil delivery hose #2	1	180 mm
11	Oil delivery hose #3	1	90 mm **NOTE:** When connecting the hose, feed oil into it while taking care not to allow air to enter.
12	Bolt	1	
13	Bolt	1	
14	Oil pump	1	
15	O-ring	1	
			Reverse the removal steps for installation.

CHAPTER 5
POWER UNIT

POWER UNIT REMOVAL

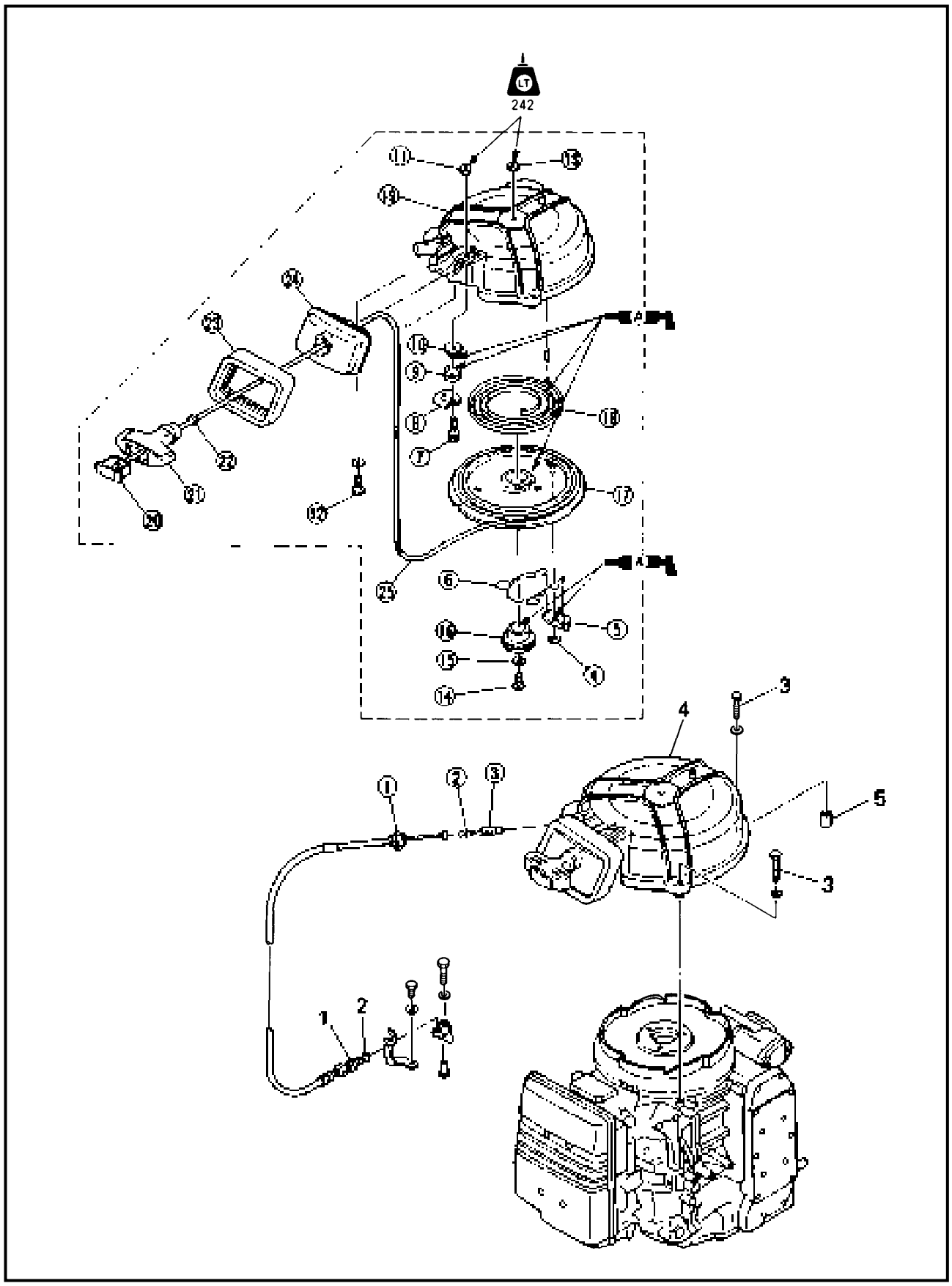
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

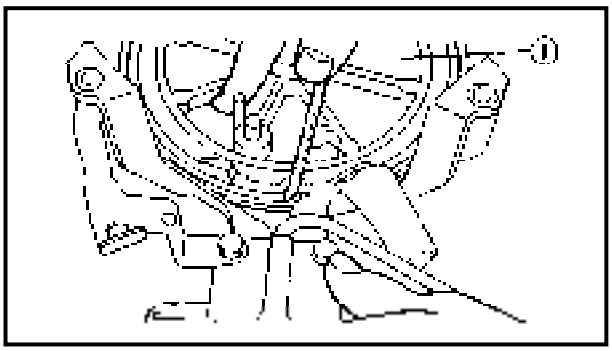
Step	Procedure/Part name	Q'ty	Service points
	POWER UNIT REMOVAL		Follow the left "Step" for removal.
1	Bolt	1	M model
2	Engine stop switch lead (black)	1	
3	Engine stop switch coupler (blue)	1	
4	Maine switch lead coupler	1	E model
5	Oil level sensor lead coupler	1	EHTO model
6	Oil level warning lamp lead	1	
7	Trim sensor lead coupler	1	
8	Extension wire lead coupler	1	
9	PTT motor lead	2	PTT model
10	PTT switch lead coupler	1	
11	Choke lever rod	1	M model
12	Start-in-gear projection wire	1	
13	Clip	1	
14	Shift cable	1	
15	Clip	1	
16	Throttle cable	1	
17	Bolt	2	
18	Fitting plate ass'y	1	**NOTE:** When installing the fitting plate, lift the tiller handle straight up.
19	Pilot water hose	1	
20	Fuel hose (Fuel joint - Fuel filter)	1	
21	Bolt (with washer)	1	6 × 45 mm
22	Bolt (with washer)	1	6 × 20 mm
23	Screw	2	
24	Apron	1	
25	Bolt (with washer)	6	
26	Bolt (with washer)	2	8 × 45 mm
27	Engine unit	1	
28	Dowel pin	2	
29	Upper case gasket	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	Lock nut	1	
2	Start-in-gear protection wire	1	**NOTE:** Disconnect the wire at the bottom cowling side.
3	Bolt (with washer)	3	6 × 35 mm
4	Recoil starter ass'y	1	
5	Dowel pin	1	
	RECOIL STARTER DISASSEMBLY		
①	Start-in-gear protection wire	1	
②	Spring	1	
③	Starter stopping plunger	1	
④	Circlip	1	
⑤	Drive pawl	1	
⑥	Drive pawl spring	1	
⑦	Bolt (with washer)	1	6 × 30 mm
⑧	Stay	1	
⑨	Rope roller	1	
⑩	Collar	1	
⑪	Nut	1	
⑫	Bolt (with washer)	2	6 × 12 mm
⑬	Nut	1	
⑭	Bolt (with washer)	1	6 × 20 mm
⑮	Plane washer	1	
⑯	Bushing	1	
⑰	Sheave drum	1	
⑱	Spiral spring	1	**NOTE:** ● When installing the new spiral spring, do not cut the wire holding the spring. ● When reusing the spiral spring, set the leading end first in the case and then fit one turn each time.
⑲	Starter case	1	
⑳	Cover	1	
㉑	Starter handle	1	
㉒	Damper	1	
㉓	Seal	1	
㉔	Rope guide	1	
㉕	Rope	1	2,095 mm 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.

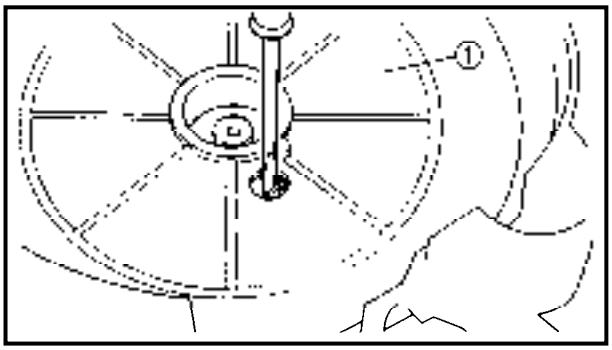
NOTE:

- 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 ①

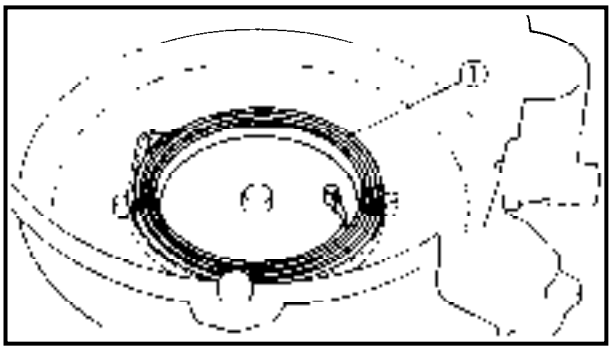
⚠ WARNING

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



NOTE:

Insert a slotted-head screwdriver into the hole in the sheave drum, and remove the spiral spring from the sheave drum by pushing the spring.



Spiral spring removal

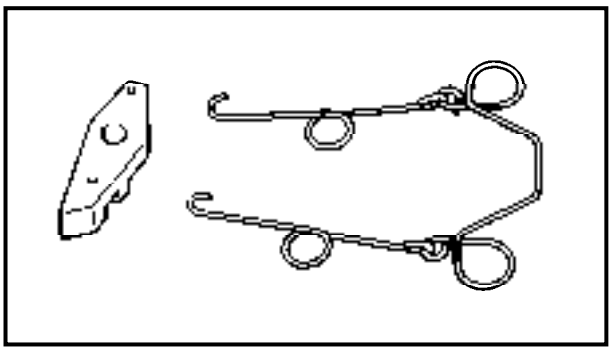
1. Remove:
   - Spiral spring ①

⚠ 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.

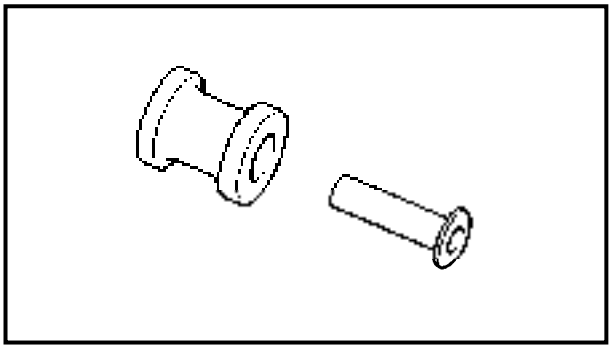
Starter stopping plunger inspection

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.

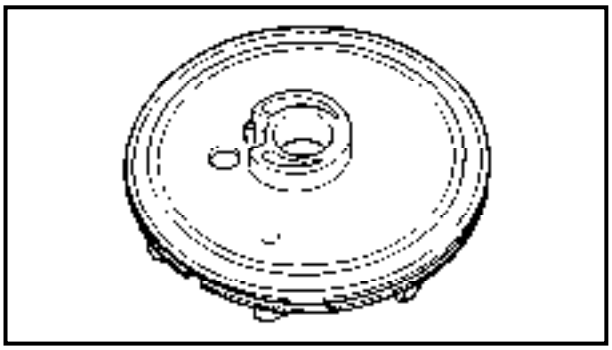


Rope roller and collar inspection

1. Inspect:
   - Rope roller
   - Collar
     Crack/Wear/Damage → Replace them as a set.

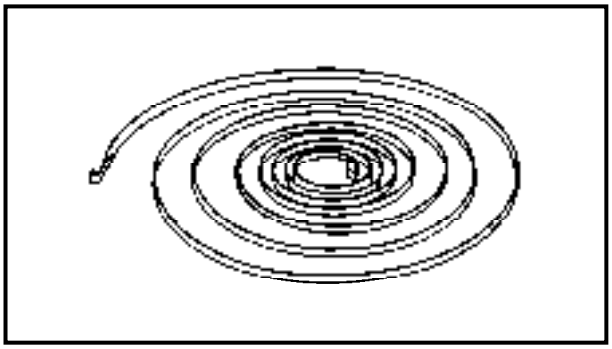
Bushing inspection

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



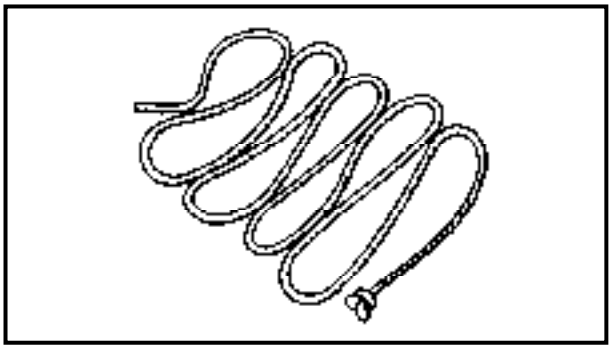
Sheave drum inspection

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



Spiral spring inspection

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



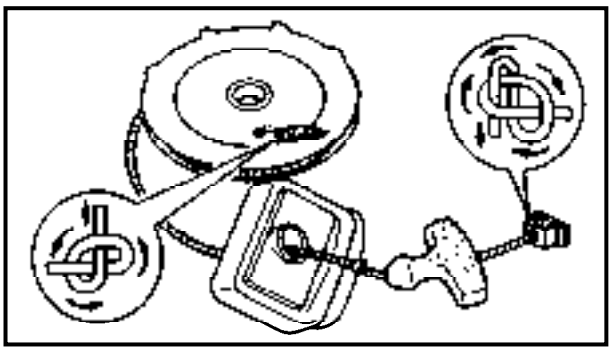
Starter rope inspection

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:
2,095 mm (82.5 in)

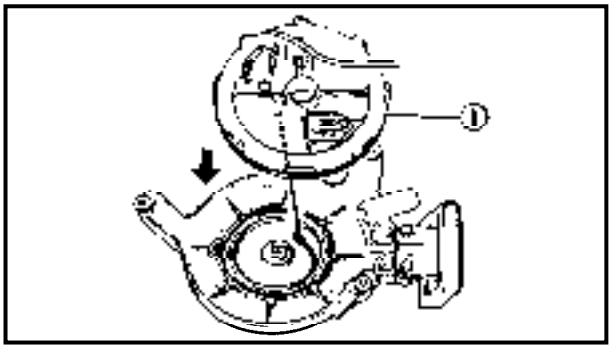


Starter rope installation

1. Install:
   - Starter rope

NOTE:

- Insert the rope through the rope holes and knot the end.
- Wind the rope 1-9/10 turns around the sheave drum.
- Place the rope at the cutaway.

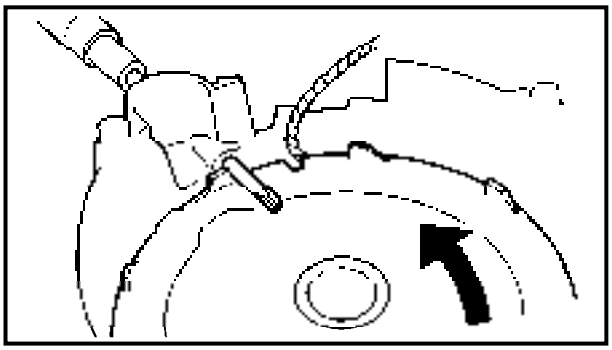


Sheave drum installation

1. Install:
   - Sheave drum ①

NOTE:

Position the inner end of the spiral spring on the retainer post of the sheave drum.

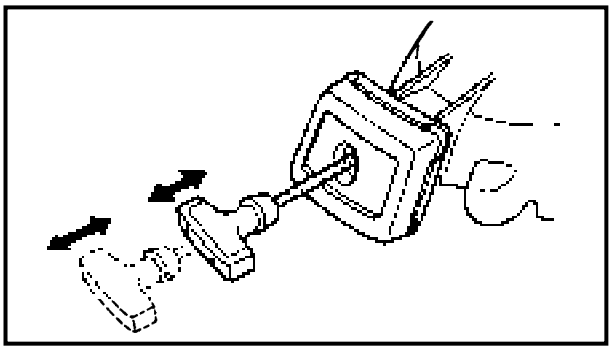


Spiral spring setting

1. Set:
   - Spiral spring

NOTE:

Wind up the spring 2-1/2 turns counter-clockwise with the starter rope.

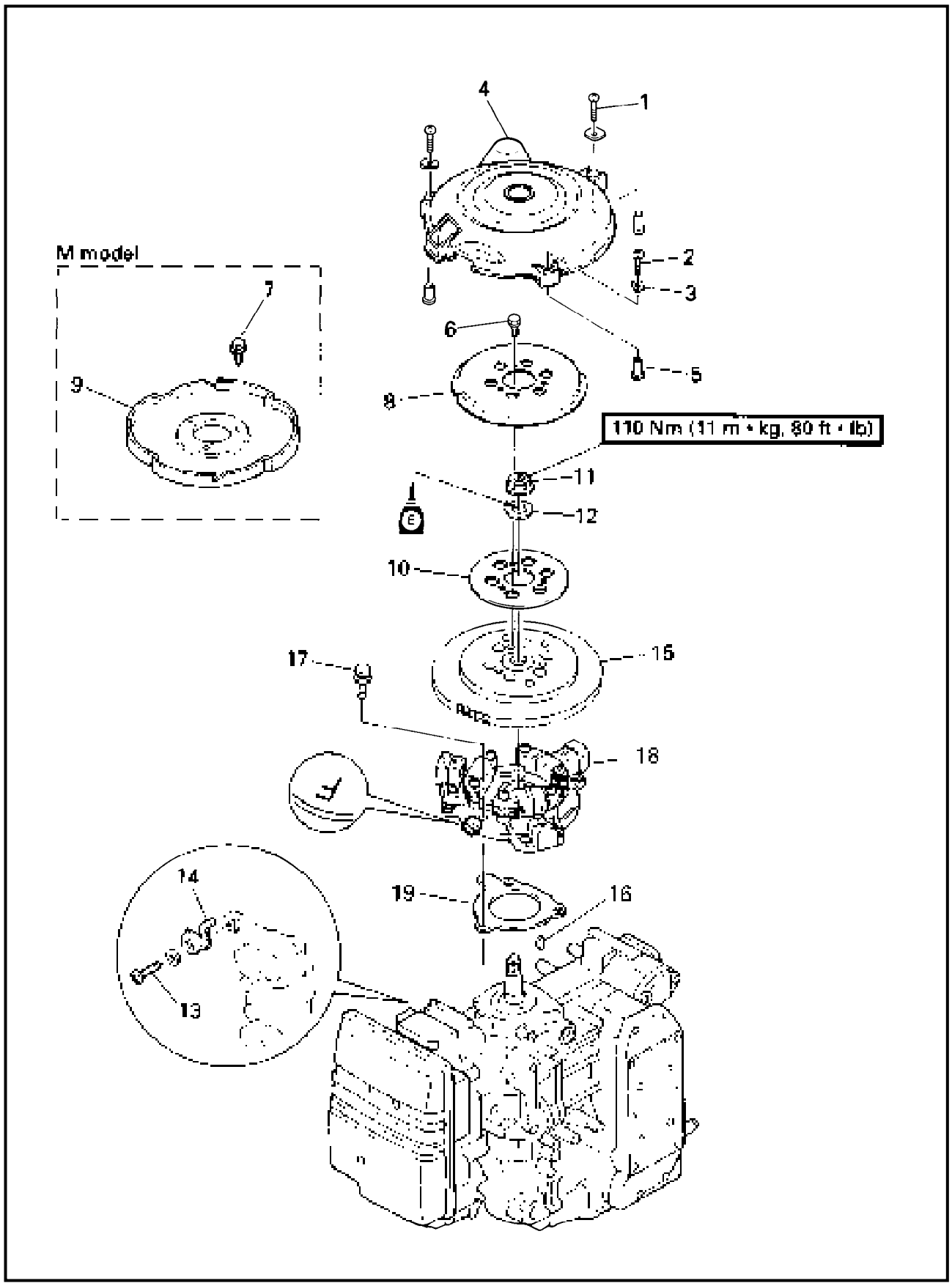


Recoil starter checking

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

FLYWHEEL MAGNETO AND MAGNETO BASE

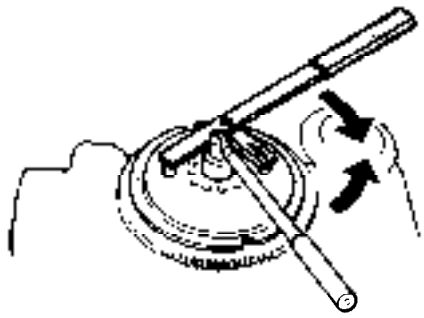
EXPLODED DIAGRAM



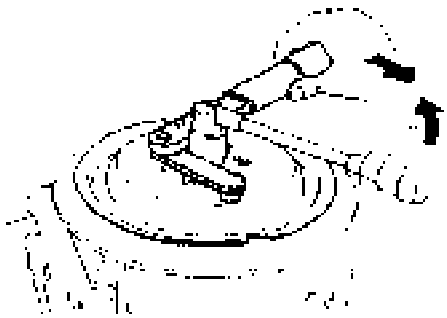
REMOVAL AND INSTALLATION CHART

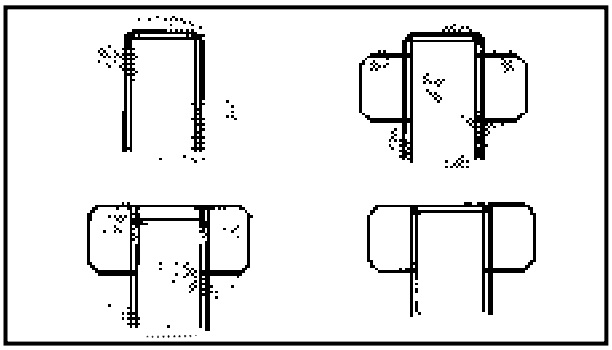
Step	Procedure/Part name	Q'ty	Service points
	FLYWHEEL MAGNETO AND MAGNETO BASE REMOVAL		Follow the left "Step" for removal.
	Recoil starter ass'y		Refer to "RECOIL STARTER".
1	Screw	1	6 × 40 mm
2	Screw	2	6 × 35 mm
3	Washer	3	
4	Flywheel cover	1	
5	Collar	3	
6	Bolt (E model)	3	8 × 14 mm
7	Bolt (M model)	3	8 × 20 mm
8	Starter pulley (E model)	1	
9	Starter pulley (M model)	1	
10	Packing	1	
11	Flywheel nut	1	
12	Washer	1	
13	Screw (with washer)	1	5 × 10 mm
14	Timing plate	1	
15	Flywheel magneto	1	
16	Woodruff key	1	
17	Bolt	3	6 × 18 mm
18	Base ass'y	1	
19	Gasket	1	
			Reverse the removal steps for installation.

A

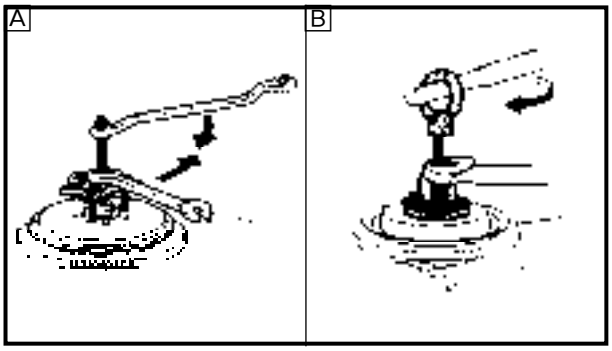


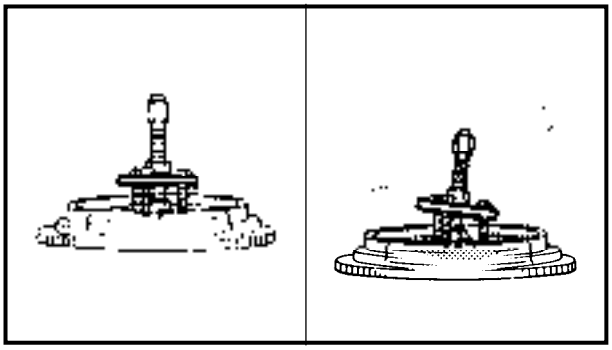
B





A B





SERVICE POINTS

Flywheel magneto removal

1. Remove:
   - 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.

2. Remove:
   - Flywheel magneto

Universal puller:
YB-06117/90890-06521

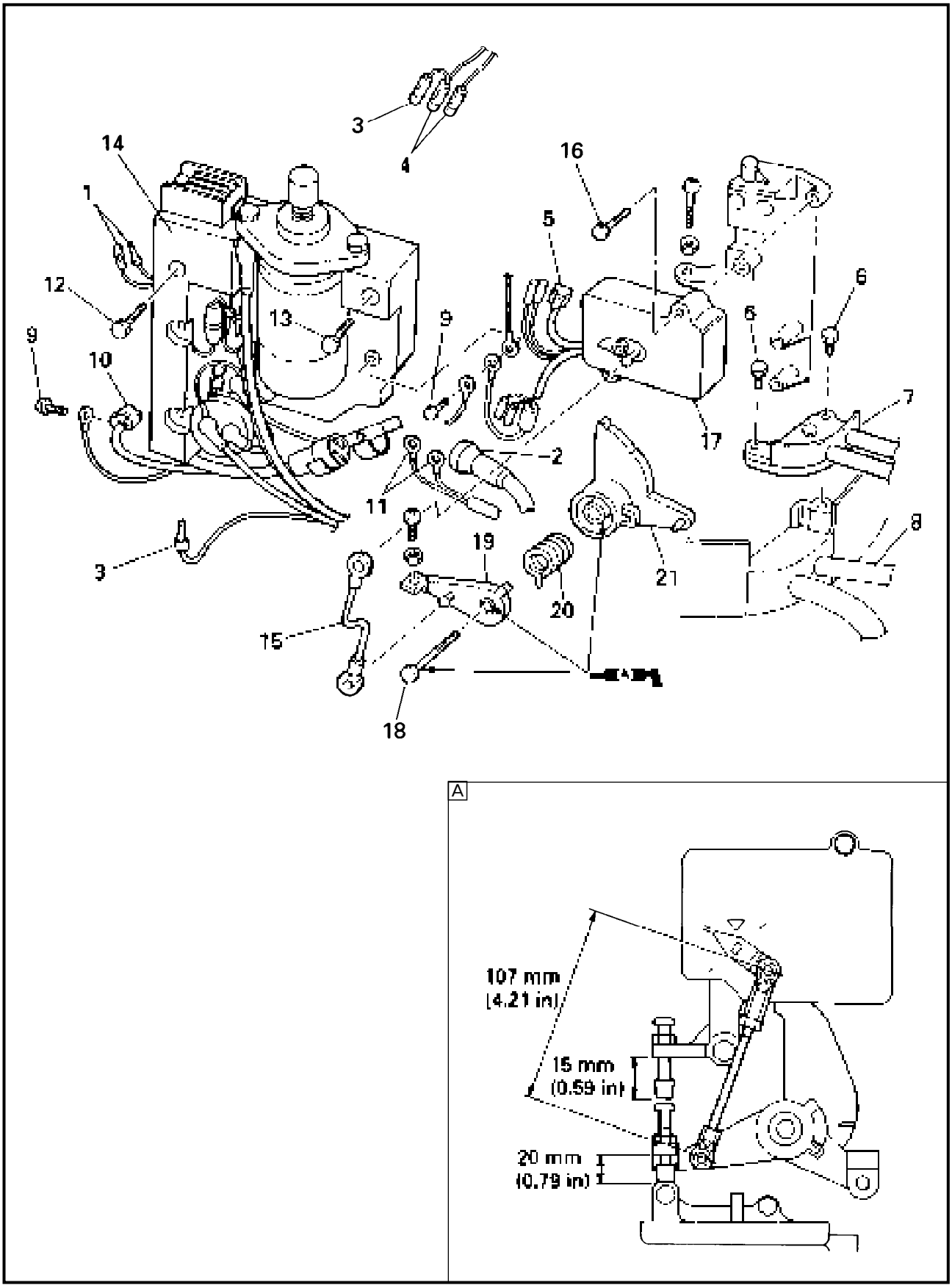
A For USA and CANADA
B Except for USA and CANADA

CAUTION:

- **Keep the nut side flush with the crankshaft end until the flywheel 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 REMOVAL

EXPLODED DIAGRAM

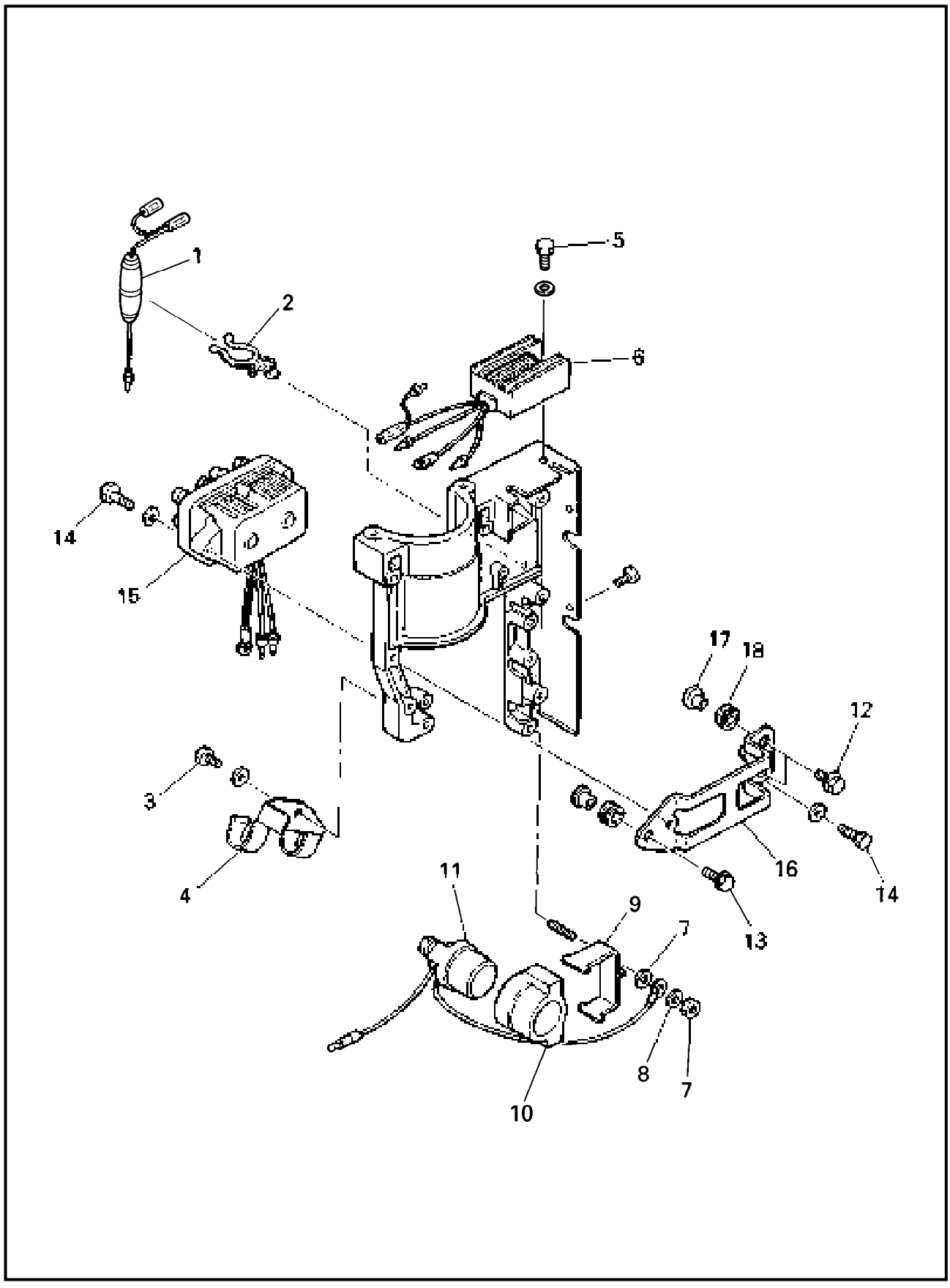


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	ELECTRICAL UNIT REMOVAL		Follow the left "Step" for removal.
1	Thermo switch coupler	2	Pink and black leads
2	Wire harness coupler	1	
3	Electrothermal valve lead	1	Blue lead
4	Lighting coil lead	2	Green leads
5	CDI unit lead coupler	7	
6	Bolt (with washer)	2	
7	Fitting plate ass'y	1	
8	Battery cable	1	**NOTE:** Remove the battery cable at the grommet.
9	Bolt (with washer)	2	
10	PTT switch coupler	1	PTT model
11	PTT motor lead	2	Sky blue and light green leads
12	Bolt (with washer)	4	6 × 30 mm
13	Bolt (with washer)	1	8 × 25 mm
14	Electrical unit	1	
15	Magneto control rod	1	**NOTE:** Disconnect the rod from the CDI unit.
16	Bolt (with washer)	2	
17	CDI unit	1	
18	Bolt	1	
19	Magneto control lever	1	
20	Spring	1	
21	Accelation cam	1	
			Reverse the removal steps for installation.

A: Setting length

ELECTRICAL UNIT
EXPLODED DIAGRAM

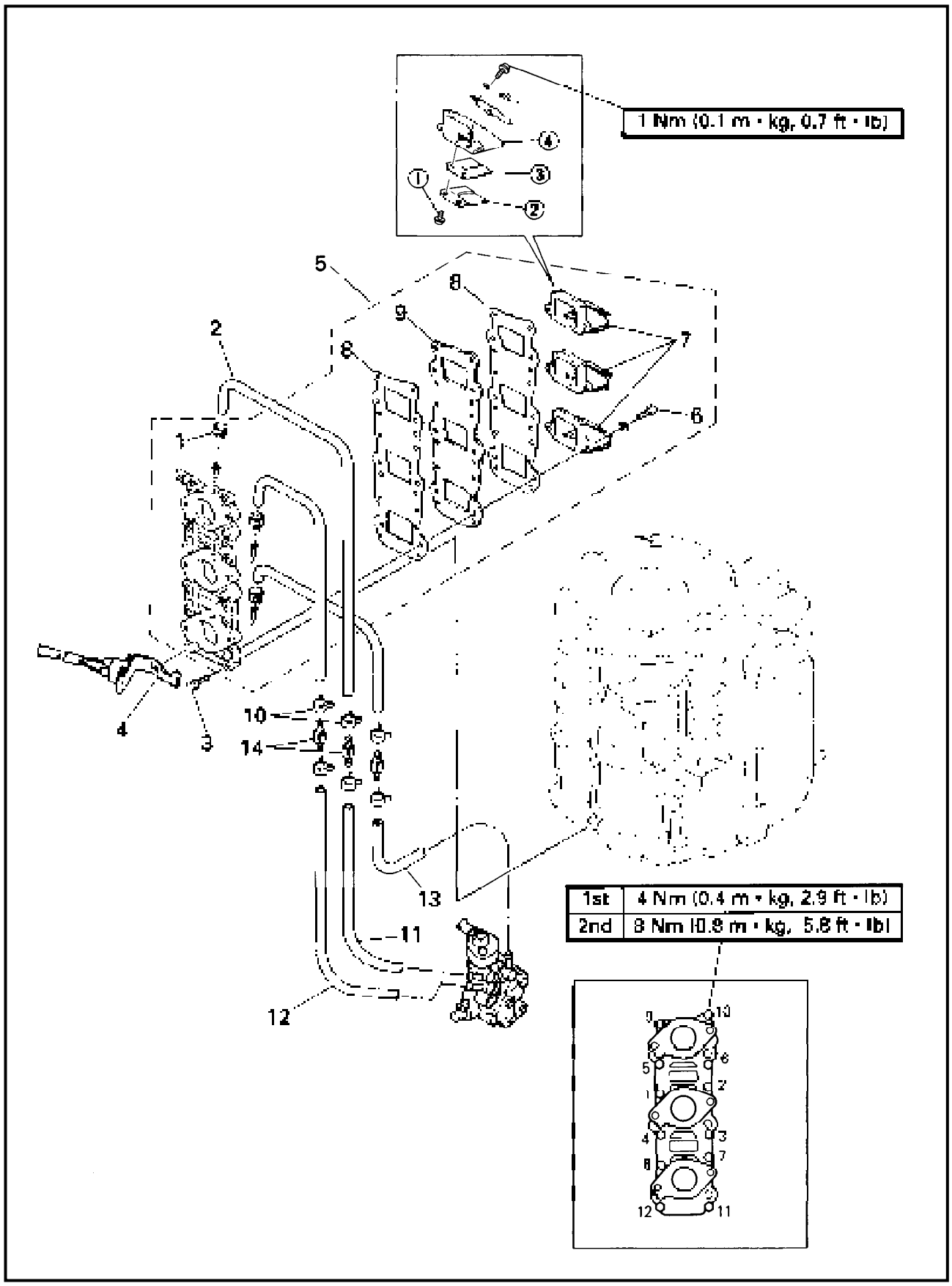


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	ELECTRICAL UNIT DISASSEMBLY		Follow the left "Step" for removal.
	Electrical unit		Refer to "ELECTRICAL UNIT REMOVAL".
1	Fuse	1	
2	Clamp	1	
3	Bolt (with washer)	1	
4	Clamp	1	
5	Bolt (with washer)	1	
6	Rectifier regurator	1	
7	Nut	2	
8	Spring washer	1	
9	Bracker	1	
10	Relay holder	1	
11	Starter relay	1	
12	Bolt (with washer)	2	PTT model
13	Bolt (with washer)	1	
14	Bolt (with washer)	2	
15	PTT relay	1	
16	Bracket	1	
17	Collar	3	
18	Grommet	3	
			Reverse the removal steps for installation.

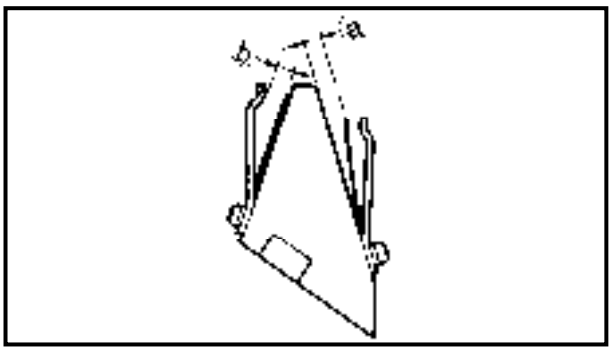
REED VALVE AND CHECK VALVE

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	REED VALVE AND CHECK VALVE REMOVAL		Follow the left "Step" for removal.
	Oil tank ass'y		Refer to "OIL TANK" in chapter 4.
	Carburetor ass'y		Refer to "CARBURETOR REMOVAL" in chapter 4.
1	Clip	3	Oil injection model
2	Oil delivery hose	3	
3	Bolt (with washer)	12	6 × 12 mm **NOTE:** Tighten the bolts in sequence and in two steps of torque.
4	Neutral switch stay	1	WH, EHTO model
5	Intake manifold ass'y	1	
6	Screw (with washer)	6	5 × 14 mm
7	Reed valve ass'y	3	
8	Valve plate gasket	2	
9	Reed valve plate	1	
10	Clip	6	Oil injection model
11	Oil delivery hose 1	1	250 mm
12	Oil delivery hose 2	1	180 mm
13	Oil delivery hose 3	1	90 mm **NOTE:** When connecting the hose, feed oil into it while taking care not to allow air to enter.
14	Check valve	3	
	REED VALVE DISASSEMBLY		
①	Screw (with washer)	4	
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.

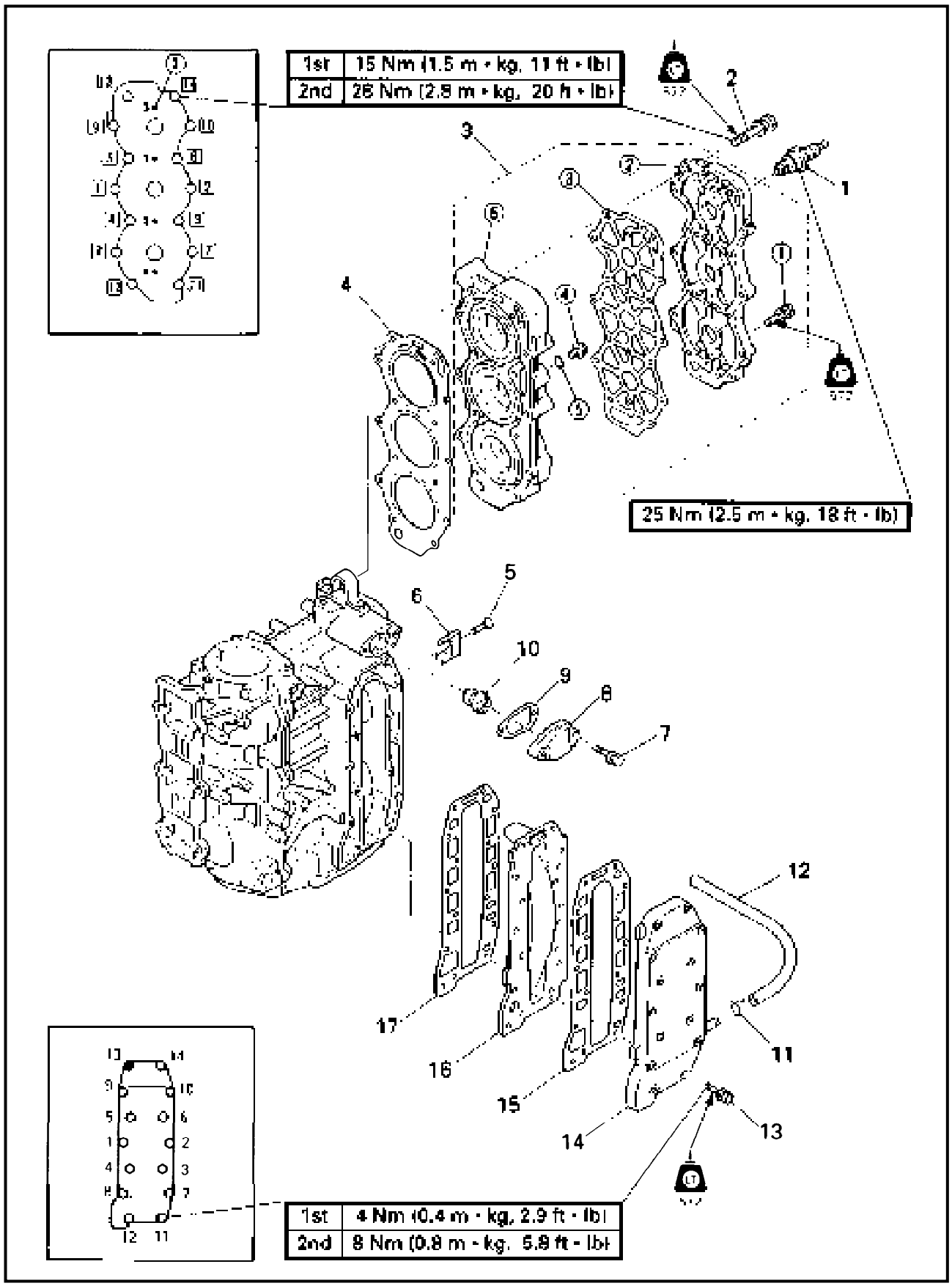
Valve bending limit:
0.2 mm (0.01 in)

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

Valve stopper height:
6.0 ± 0.2 mm (0.24 ± 0.01 in)

CYLINDER HEAD, THERMOSTAT AND EXHAUST COVER

EXPLODED DIAGRAM



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.
	Spark plug cap		Disconnect the cap from the plug.
1	Spark plug	3	
2	Bolt (with washer)	14	8 mm
			NOTE: Tighten the bolts in sequence and in two steps of torque.
3	Cylinder head ass'y	1	
4	Cylinder head gasket	1	
5	Flat head screw	2	
6	Anode	2	
	THERMOSTAT REMOVAL		
	Oil tank ass'y		Refer to "OIL TANK" in chapter 4.
7	Bolt (with washer)	2	6 × 25 mm
8	Thermostat cover	1	
9	Thermostat cover gasket	1	
10	Thermostat	1	
	EXHAUST COVER REMOVAL		
	Oil tank ass'y		Refer to "OIL TANK" in chapter 4.
11	Clip	1	
12	Pilot water hose	1	
13	Bolt (with washer)	14	6 × 35 mm
	Bolt (with washer)	13	Oil injection model
			NOTE: Tighten the bolts in sequence and in two steps of torque.
14	Exhaust outer cover	1	
15	Outer cover gasket	1	
16	Exhaust inner cover	1	
17	Inner cover gasket	1	
	CYLINDER COVER DISASSEMBLY		
①	Bolt (with washer)	4	6 × 25 mm
			NOTE: Tighten the bolts in sequence.
②	Cylinder head cover	1	
③	Head cover gasket	1	
④	Straight screw	1	
⑤	Gasket	1	
⑥	Cylinder head	1	
			Reverse the removal steps for installation.

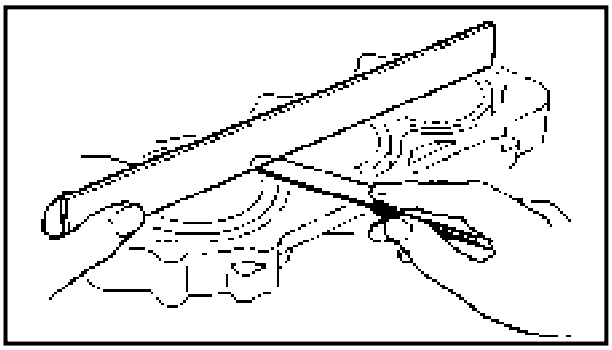
SERVICE POINTS

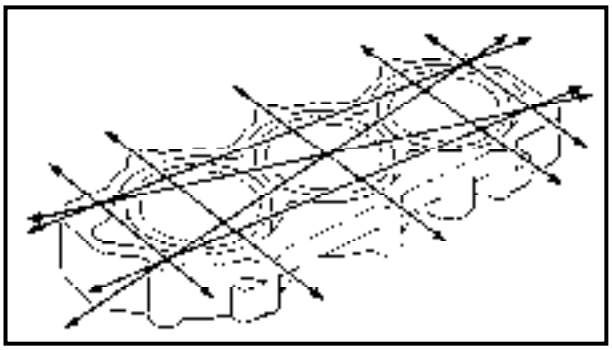
Cylinder head inspection

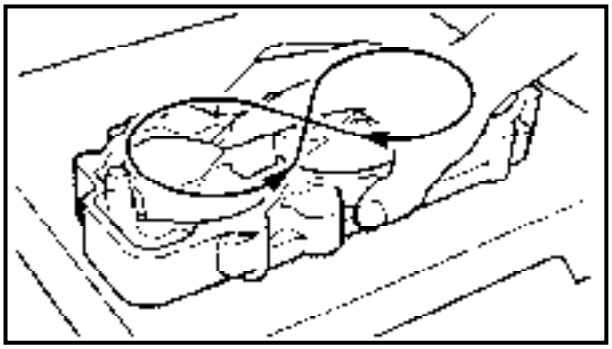
1. Inspect:
   - Water jacket
     Material deposit/Corrosion → Clean.
   - Cylinder inner surface
     Score marks → Clean.
     Use #600 ~ 800 grit wet sandpaper.

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.

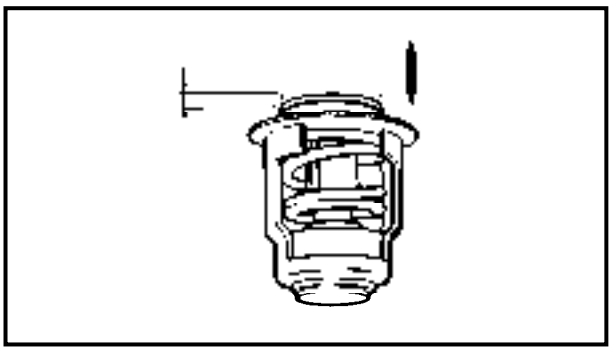
Warpage limit:
0.1 mm (0.004 in)

Resurfacing steps:

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

NOTE:

Rotate the head several times to avoid removing too much material from one side.



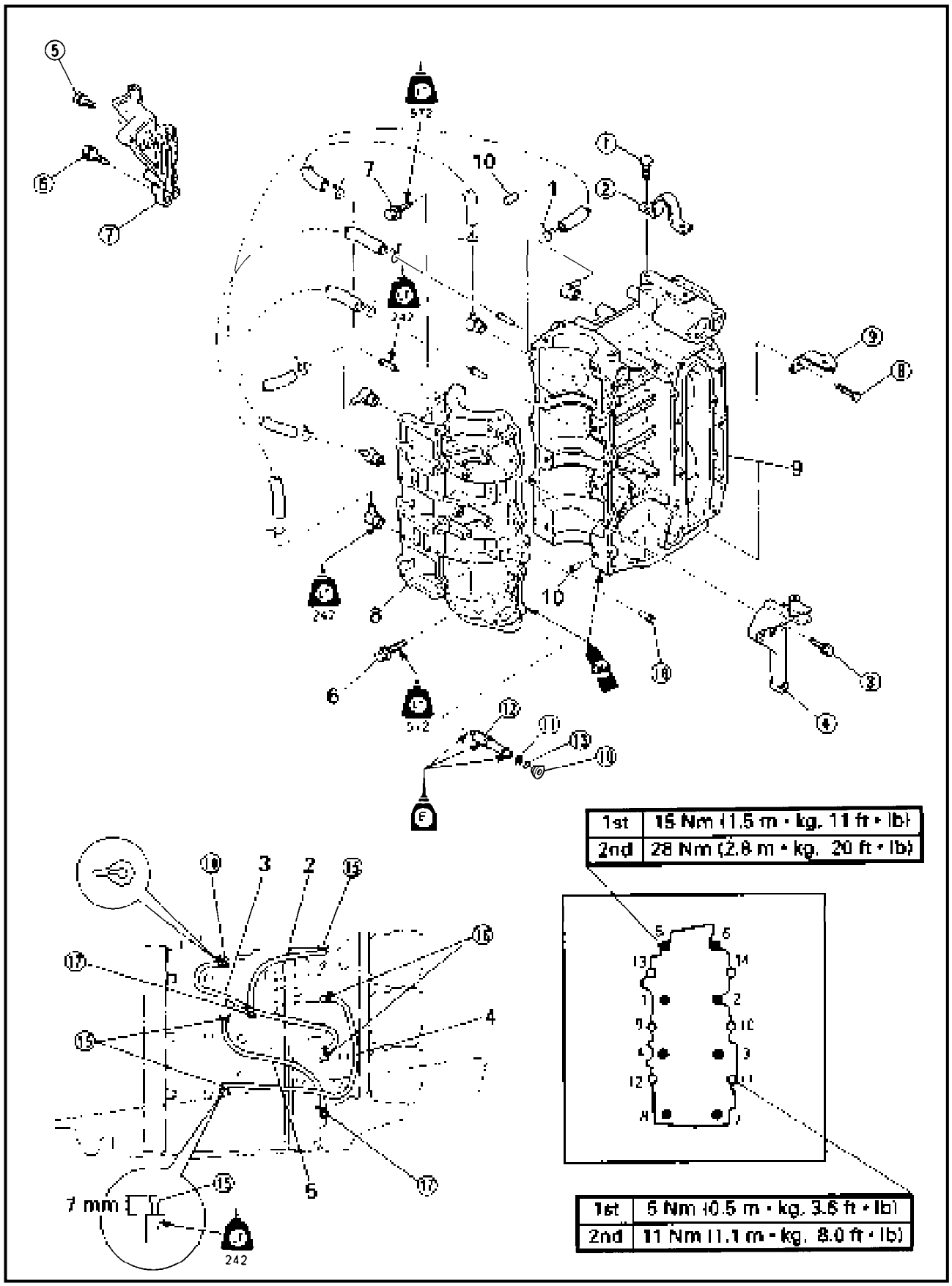
Thermostat inspection

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.

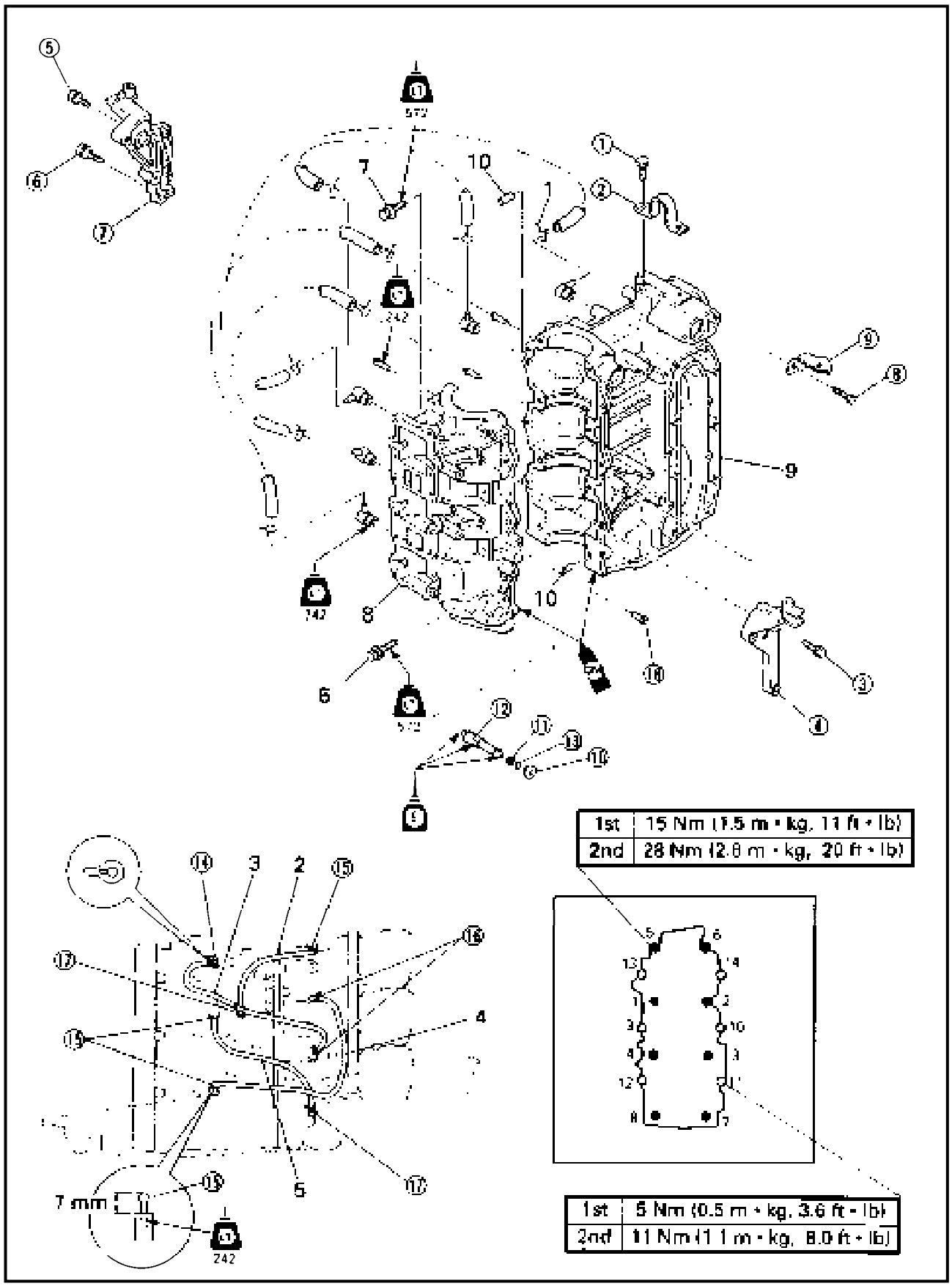
CRANKCASE AND CYLINDER BODY
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CRANK CASE AND CYLINDER BODY REMOVAL		Follow the left "Step" for removal.
	Oil tank ass'y		Refer to "OIL TANK" in chapter 4.
	Oil pump		Refer to "OIL PUMP" in chapter 4.
	Carburetor ass'y		Refer to "CARBURETOR REMOVAL" in chapter 4.
	Recoil starter ass'y		Refer to "RECOIL STARTER".
	Magneto base ass'y		Refer to "FLYWHEEL MAGNETO AND MAGNETO BASE".
	Power unit		Refer to "POWER UNIT REMOVAL".
1	Clip	8	
2	Drain less hose	1	200 mm
3	Drain less hose	1	310 mm
4	Drain less hose	1	360 mm
5	Drain less hose	1	240 mm
6	Bolt (with washer)	6	6 mm
7	Bolt (with washer)	8	8 mm
			NOTE: Tighten the bolts in sequence and in two steps of torque.
8	Crank case	1	
9	Cylinder body	1	**NOTE:** Film-coat the crank case mating surface with Gasket Maker or equivalent.
10	Dowel pin	2	
	CRANK CASE DISASSEMBLY		
①	Bolt (with washer)	2	6 × 14 mm
②	Engine hanger	1	
③	Bolt (with washer)	3	6 × 25 mm
④	Stay (left)	1	
⑤	Bolt (with washer)	1	6 × 20 mm
⑥	Bolt (with washer)	2	8 × 25 mm
⑦	Stay (right)	1	
⑧	Bolt (with washer)	1	6 × 14 mm
⑨	Fuel filter bracket	1	
⑩	Collar	1	Oil injection model
⑪	Plate washer	1	
⑫	Oil pump driven gear	1	
⑬	O-ring	1	

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
⑭	Hose nipple	1	
⑮	Hose joint	3	
⑯	Check valve	2	
⑰	Check valve	2	
⑱	Hose joint	1	
			Reverse the removal steps for installation.

SERVICE POINTS

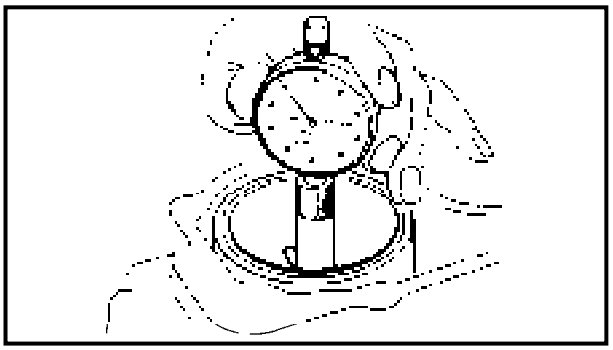
Cylinder body inspection

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.

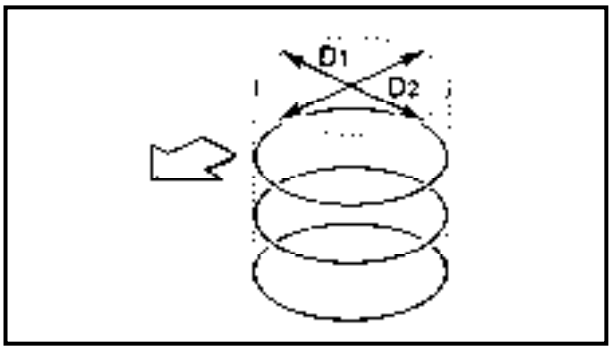
2. Inspect:
   - Exhaust wall
     Crack/Damage → Replace.
     Carbon deposit → Clean.
     Use a round scraper.

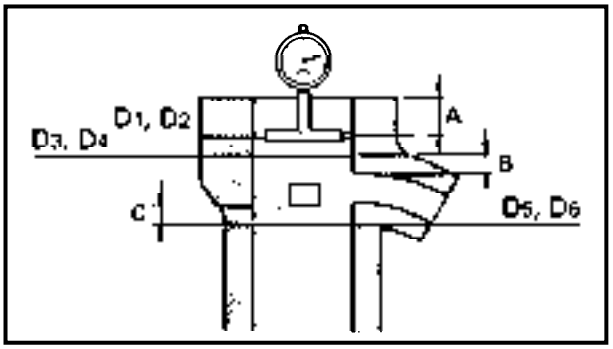
NOTE:
Do not scratch the fitting surfaces of the cylinder and exhaust cover.



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

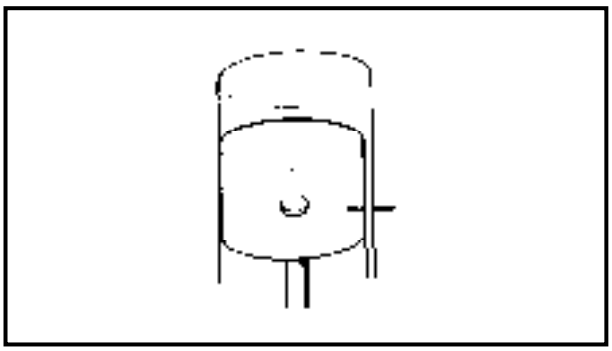
NOTE:
Measure the cylinder bore "D" in parallel. Then, find the average of the measurement.

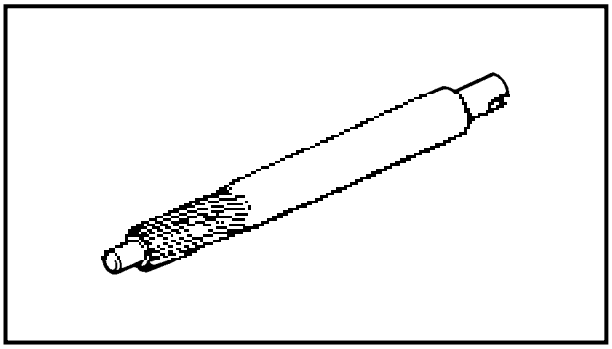


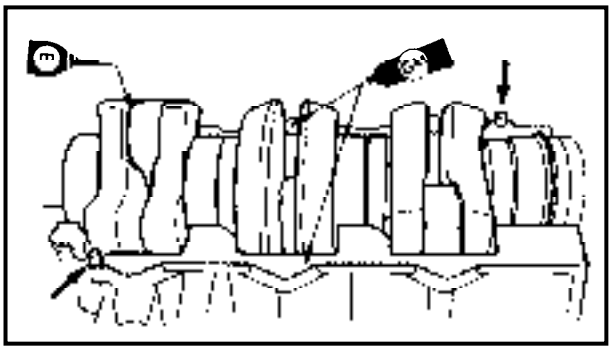


	Standard	Wear limit
Cylinder bore "D"	67.00 ~ 67.02 mm (2.638 ~ 2.639 in)	67.10 mm (2.642 in)
Taper limit T:	—	0.08 mm (0.003 in)
Out of round limit	—	0.05 mm (0.002 in)
D = Maximum Dia. (D_1 – D_6) T = (maximum D_1 or D_2) – (minimum D_5 or D_6)		

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:
0.060 ~ 0.065 mm
(0.0024 ~ 0.0026 in)

Oil pump driven gear inspection

1. Inspect:
   - Oil pump driven gear
     Crack/Pitting/Wear → Replace.

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 and the labyrinth seal locating pins in the cylinder body.

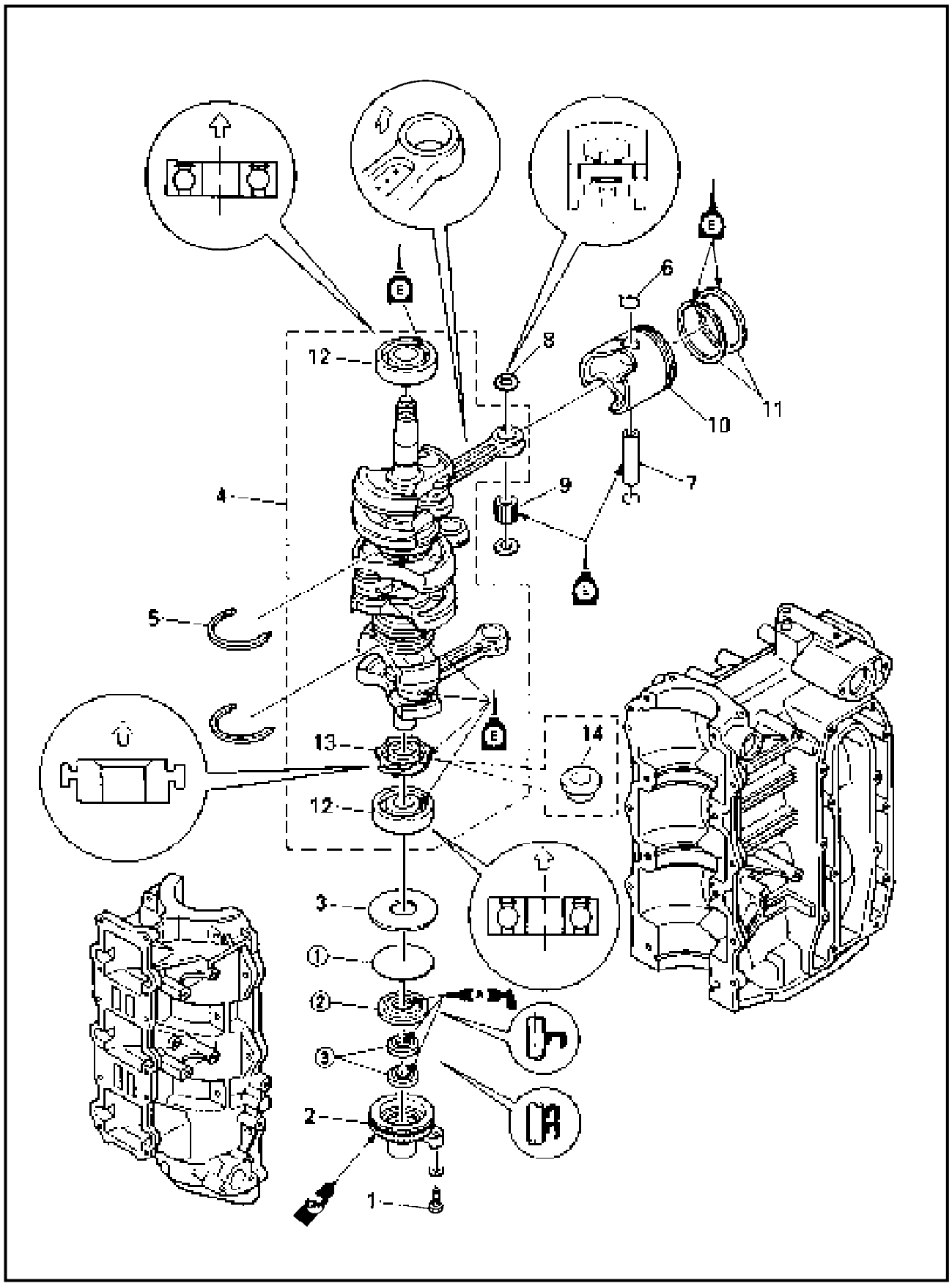
2. Apply:
   - Gasket maker
     Onto the connecting surfaces of the crankcase and cylinder body.

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.

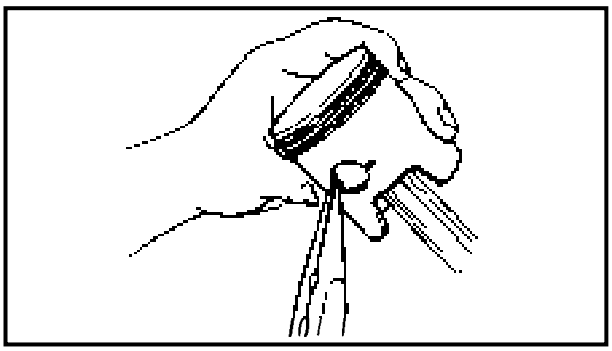
CRANK SHAFT AND PISTON

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CRANK SHAFT AND PISTON REMOVAL		Follow the left "Step" for removal.
	Crank case		Refer to "CRANK CASE AND CYLINDER BODY".
1	Bolt (with washer)	1	6 × 20 mm
2	Oil seal housing	1	
3	Plane washer	1	
4	Crankshaft ass'y	1	**NOTE:** Remove the crankshaft by lightly tapping it with a plastic hammer.
5	Circlip	2	
6	Piston pin clip	6	**CAUTION:** **Always use the new clip.**
7	Piston pin	3	
8	Piston pin washer	6	**CAUTION:** **The washer should be placed with their convex sides facing the piston.**
9	Small end bearing needle	3	**CAUTION:** **Do not a mixture of new and used bearing needles in the same small end.**
10	Piston	3	
11	Piston ring	6	
12	Bearing	2	**CAUTION:** **When installing the bearing, the seal-cap side should be installed towards the flywheel side.**
13	Oil pump drive gear	1	Oil injection model **CAUTION:** **When installing the gear, the chamfered bore edge side should be installed towards the flywheel side.**
14	Spacer	1	Pre-mixed model
	OIL SEAL HOUSING DISASSEMBLY		
①	O-ring	1	
②	Oil seal	1	
③	Oil seal	2	
			Reverse the removal steps for installation.



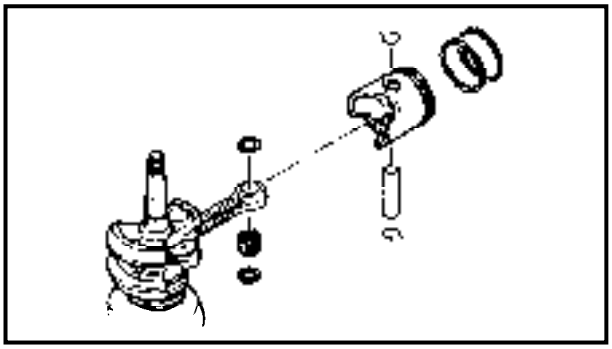
SERVICE POINTS

Piston pin clip removal

1. Remove:
   - Piston pin clip

NOTE:

Take care not to damage piston pin hole edge.

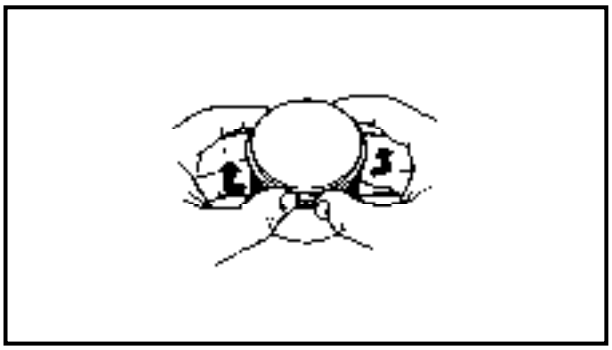


Piston pin and small end bearing removal

1. Remove:
   - Piston pin clip
   - Small end needle bearing

NOTE:

When the piston pins, pistons, and small end needle bearings are reused, they should be marked with No. 1, 2 and 3 so that they are not confused.

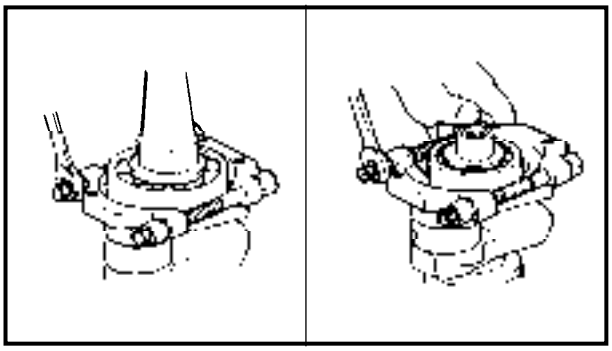


Piston ring removal

1. Remove:
   - Piston ring

NOTE:

Remove the piston ring from the piston by opening the ring to the least possible width.



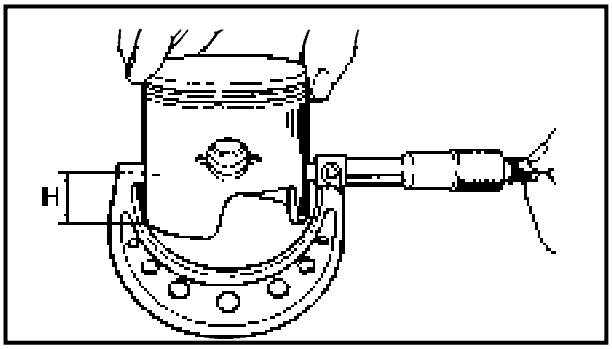
Bearing removal

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

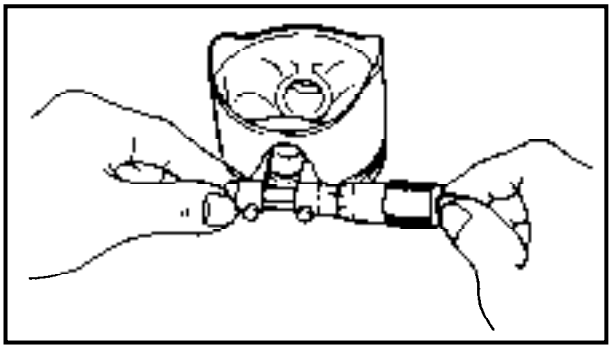


Piston inspection

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

	Measuring point "H"	Piston diameter
Standard	10 mm (0.4 in)	66.940 ~ 67.000 mm (2.6354 ~ 2.6378 in)

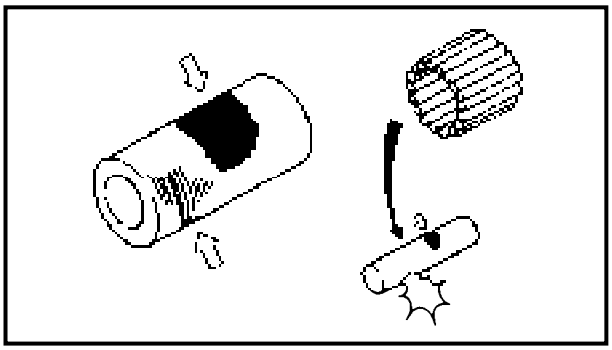
Over size piston diameter:
1*: 67.25 mm (2.648 in)
2: 67.50 mm (2.657 in)



*: Except for U.S.A.

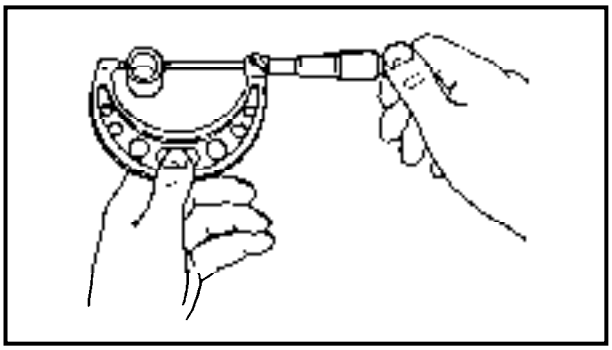
2. Measure:
   - Piston pin boss inside diameter
     Use a micrometer.
     Out of specification → Replace.

Piston pin boss inside diameter:
18.008 ~ 18.015 mm
(0.7090 ~ 0.7093 in)

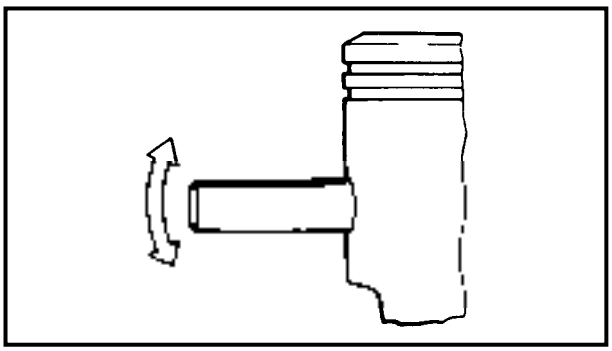


Piston pin and small end bearing inspection

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.



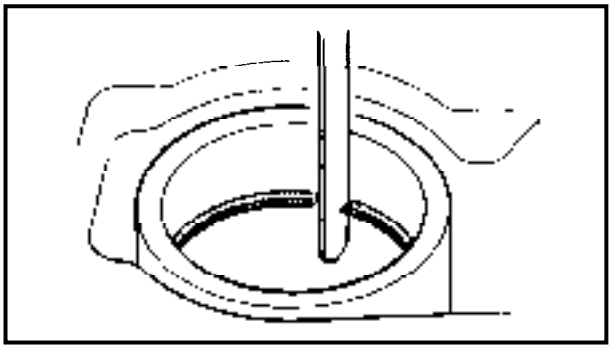
Piston pin diameter:
17.995 ~ 18.000 mm
(0.7085 ~ 0.7087 in)



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.

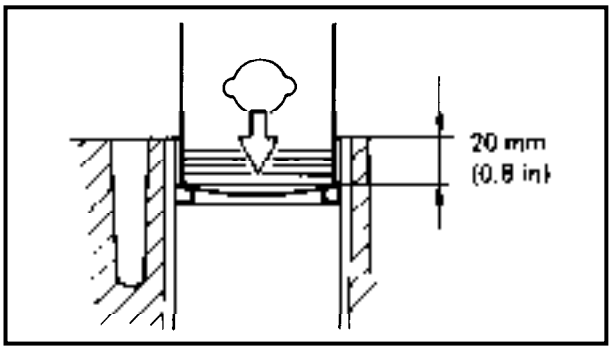
Piston ring inspection

1. Inspect:
   - Piston ring
     Breakage/Damage → Replace.

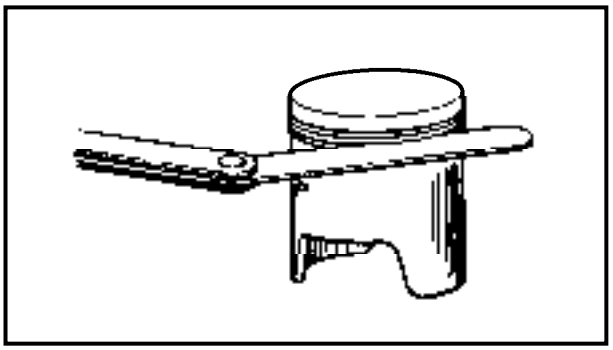


2. Measure:
   - End gap
     Use a feeler gauge.
     Out of specification → Replace.

End gap:
Top: 0.40 ~ 0.60 mm
(0.016 ~ 0.024 in)
2nd: 0.40 ~ 0.60 mm
(0.016 ~ 0.024 in)
End gap limit:
Top: 0.80 mm (0.031 in)
2nd: 0.80 mm (0.031 in)
Measuring point
20 mm (0.8 in)

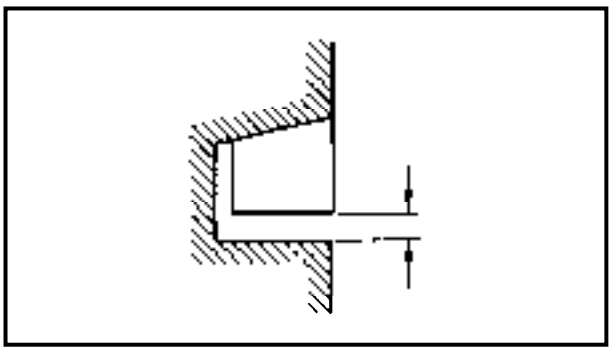


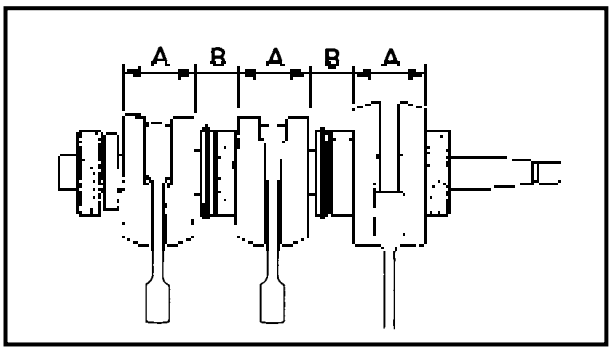
NOTE:
Install the piston ring into the cylinder. Push the ring with the piston crown.

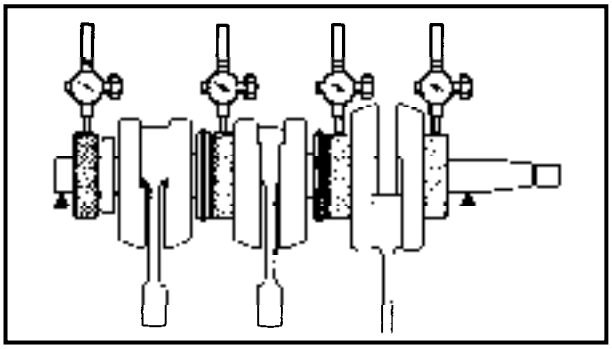


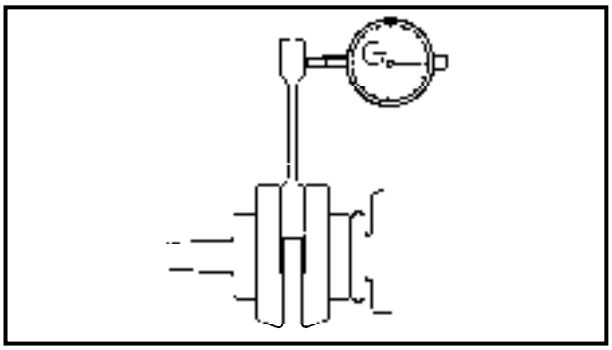
3. Measure:
   - Side clearance
     Use a thickness gauge.
     Out of specification → Replace piston and/or ring.

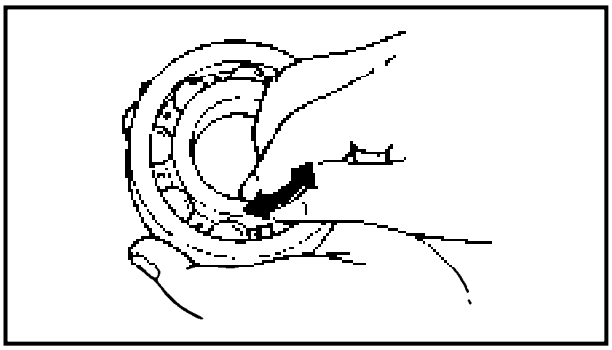
Side clearance:
Top: 0.04 ~ 0.08 mm
(0.002 ~ 0.003 in)
2nd: 0.03 ~ 0.07 mm
(0.001 ~ 0.003 in)

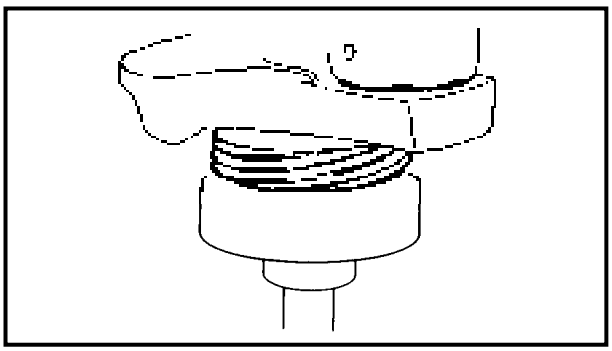












Crankshaft inspection

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

   Out of specification → Replace.

Crank width A:
53.90 ~ 53.95 mm
(2.122 ~ 2.124 in)
Crank width B:
32.88 ~ 33.10 mm
(1.294 ~ 1.303 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

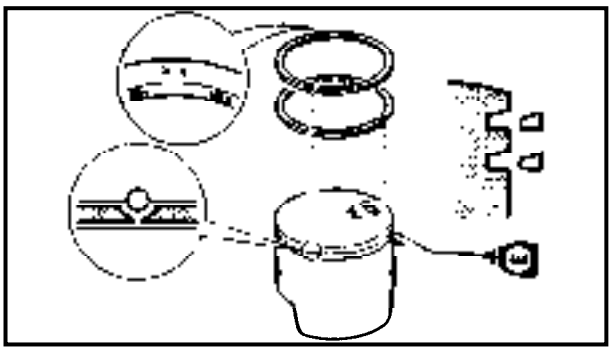
   Pitting/Rumbling → Replace.

CAUTION:

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

5. Inspect:
   - Oil pump drive gear

   Crack/Pitting/Wear → Replace.



Piston and piston ring installation

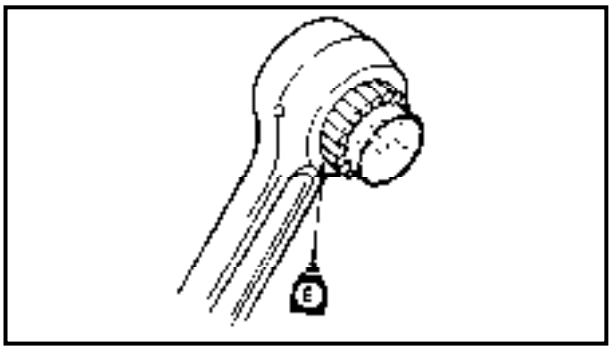
1. Install:
   - Piston ring (2nd)
   - Piston ring (top)

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:

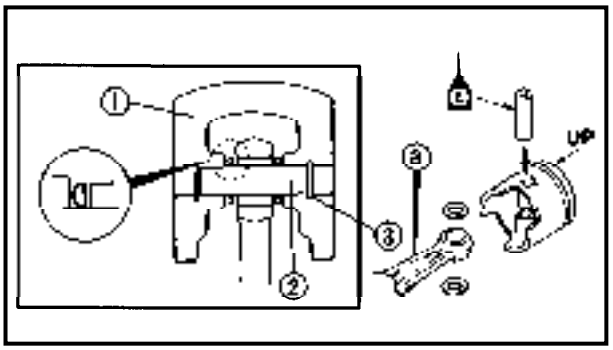
Piston rings should be replaced as a set.



Crankshaft and piston installation

1. Install:
   - Small end bearing needle

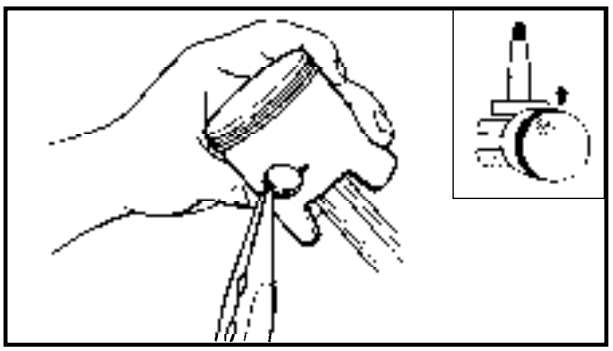
	**Needles per piston: 31 pieces**
	**Small end bearing needle installer: YB-06106/90890-06526**



2. Install:
   - Piston ①
   - Piston pin ②
   - Piston pin clip ③

CAUTION:

Do not allow the clip open ends to meet the piston pin slot.



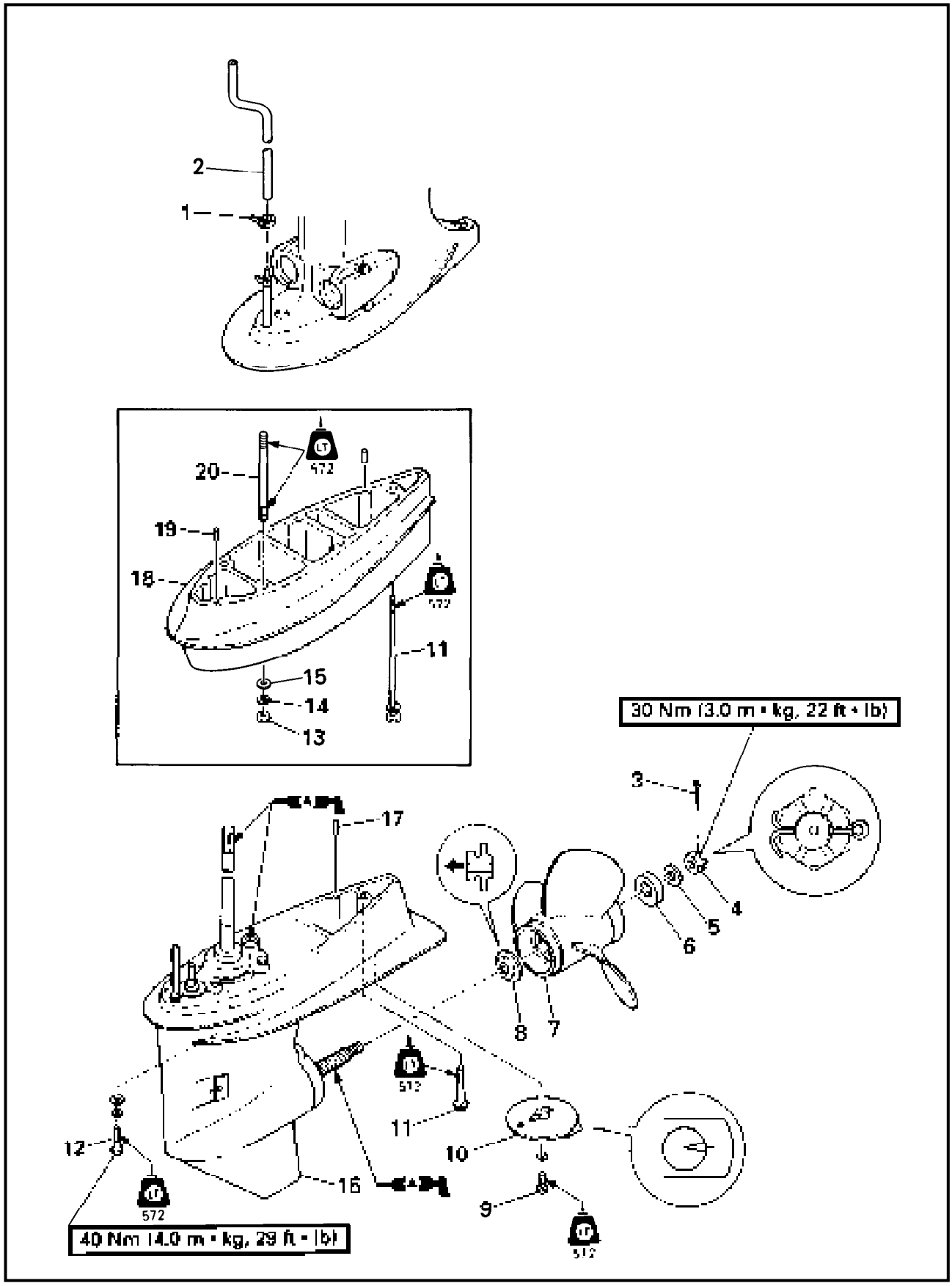
NOTE:

- Mold mark ⓐ faces in the same direction as the "UP" mark on the piston.
- When no piston is replaced, be sure to re-install the pistons in their original cylinder.

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	Clamp	1	
2	Hose	1	
3	Cotter pin	1	
4	Propeller nut	1	**NOTE:** If the propeller nut does not align with the propeller shaft hole when the nut is tightened to specification, turn it in further so that they align.
5	Plane washer	1	
6	Spacer	1	
7	Propeller	1	
8	Spacer	1	
9	Bolt (with washer)	1	8 × 25 mm
10	Trim tab	1	
11	Bolt (with washer)	1	
12	Bolt (with washer)	4	10 × 40 mm
13	Nut	4	X model
14	Spring washer	4	
15	Plane washer	4	
16	Lower unit	1	**NOTE:** Insert the drive shaft into the crankshaft. If the splines will not come in complete mesh, rotate the propeller shaft a little so that they are in mesh correctly.
17	Dowel pin	2	
18	Extension	1	X model
19	Dowel pin	2	
20	Stud bolt	4	
			Reverse the removal steps for installation.

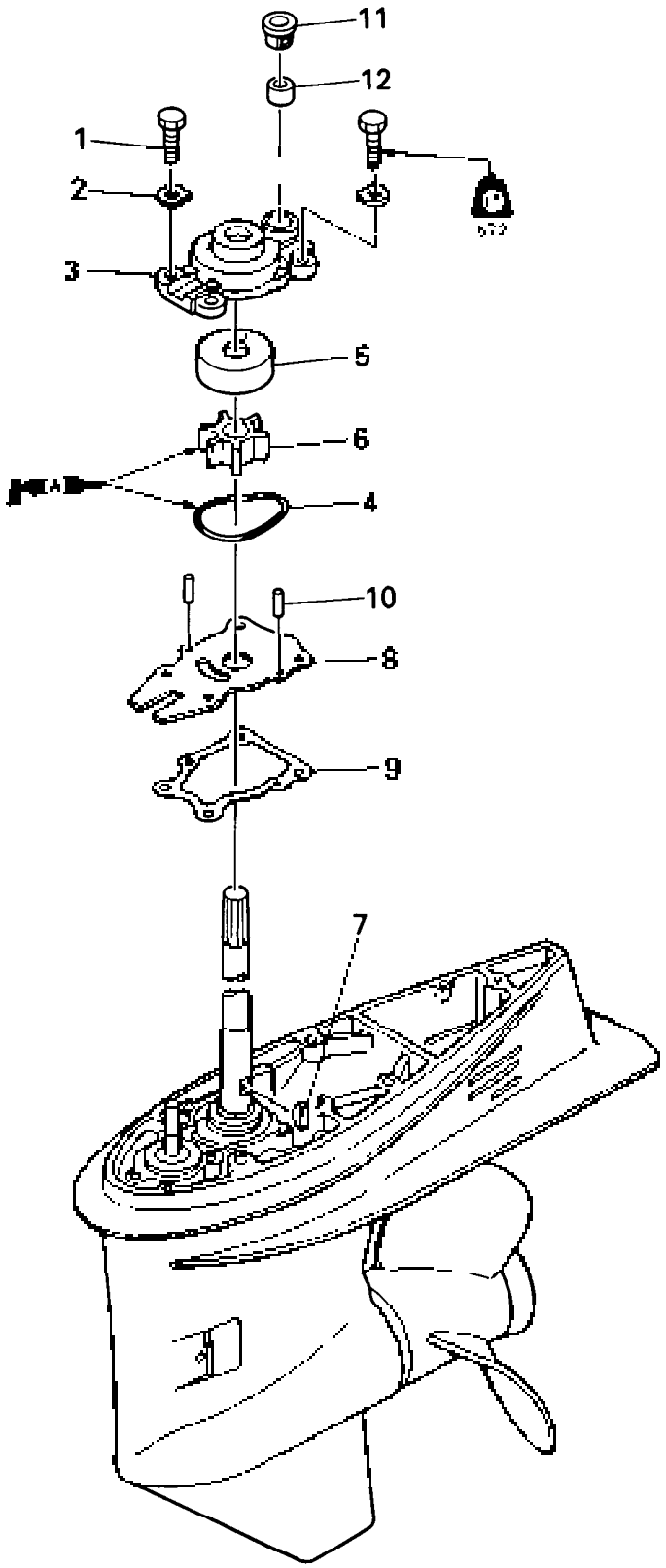
SERVICE POINTS

Propeller inspection

1. Inspect:
   - Blade
   - Spline

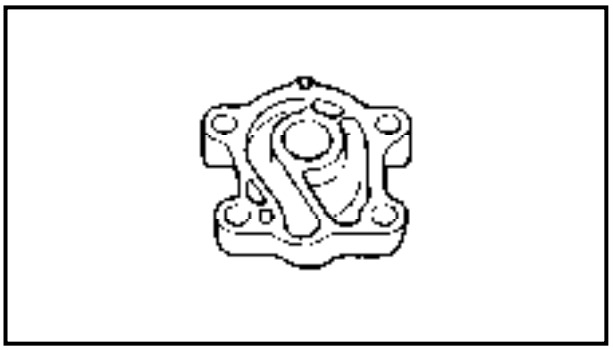
   Wear/Crack/Damage → Replace.

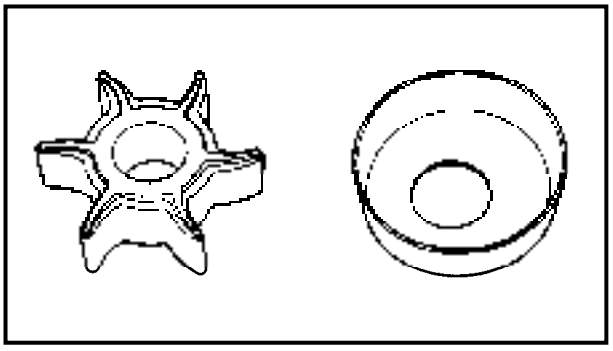
WATER PUMP
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	WATER PUMP REMOVAL		Follow the left "Step" for removal.
	Lower unit ass'y		Refer to "LOWER UNIT REMOVAL".
1	Bolt	4	8 × 30 mm
2	Washer	4	
3	Water pump housing	1	**NOTE:** When installing the water pump housing, align the hole in it with the projection in the insert cartridge.
4	O-ring	1	
5	Insert cartridge	1	**NOTE:** When installing the cartridge, turn the drive shaft clockwise.
6	Impeller	1	
7	Woodruff key	1	
8	Cartridge plate	1	
9	Plate gasket	1	
10	Pin	2	
11	Water seal cover	1	
12	Water seal rubber	1	
			Reverse the removal steps for installation.





SERVICE POINTS

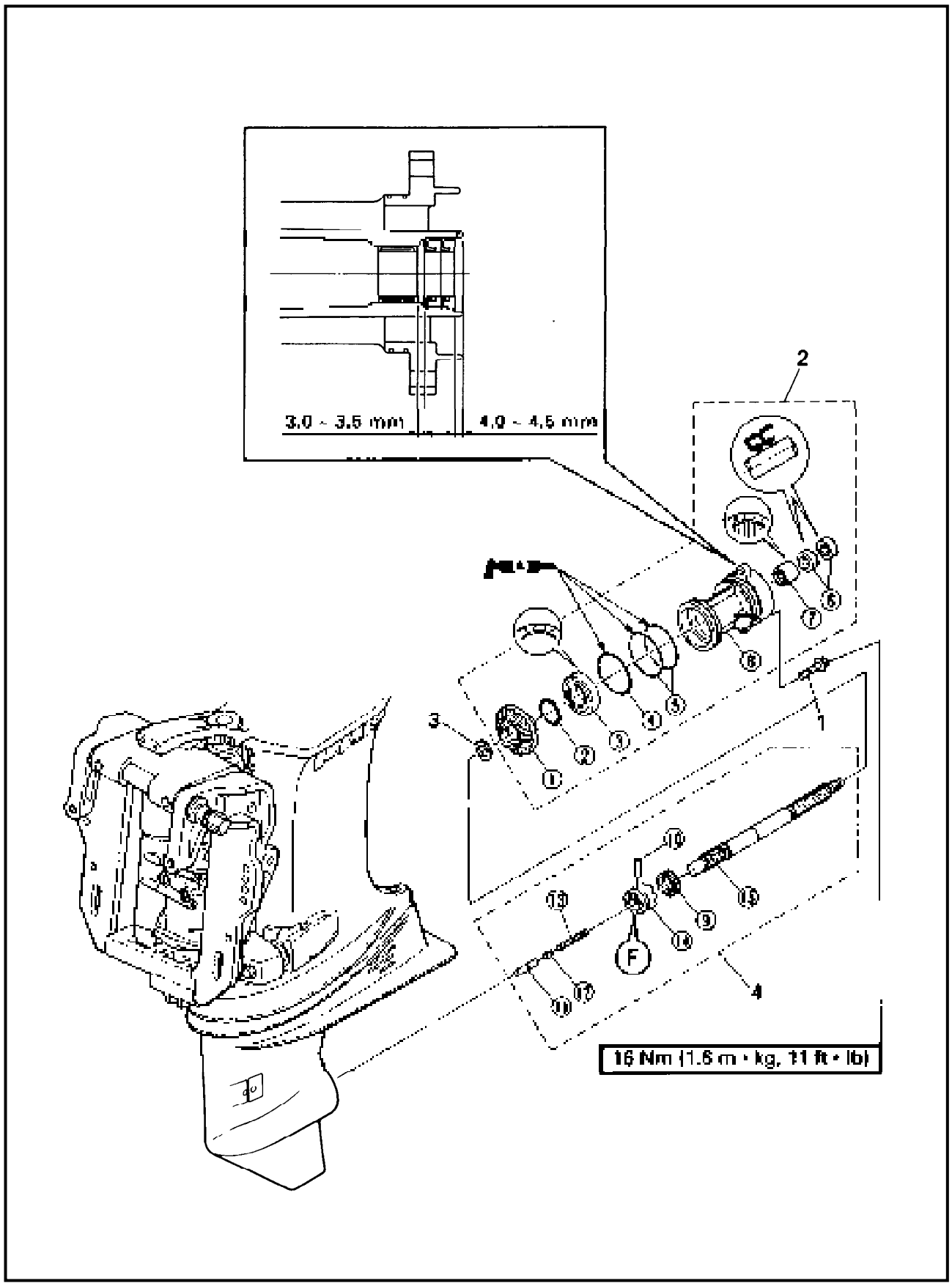
Water pump housing inspection

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

Impeller and insert cartridge inspection

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

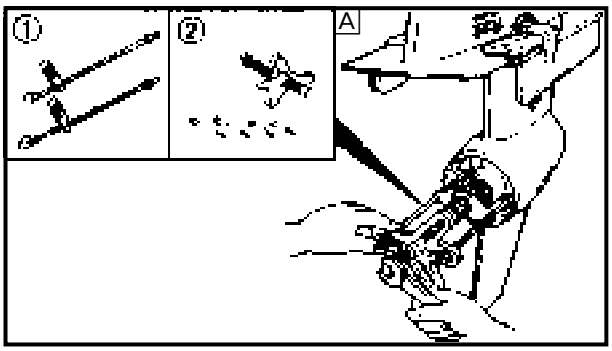
PROPELLER SHAFT AND REVERSE GEAR
EXPLODED DIAGRAM

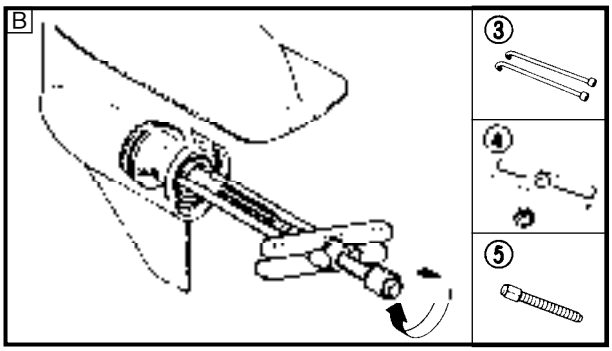


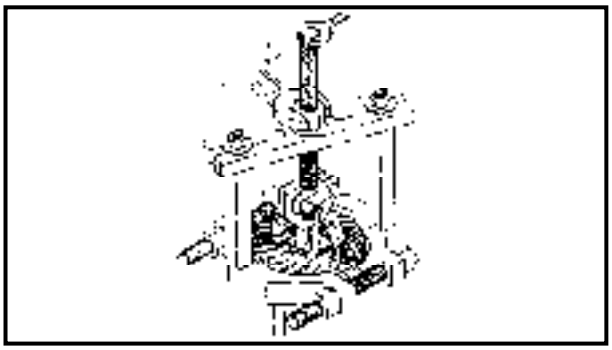
REMOVAL AND INSTALLATION CHART

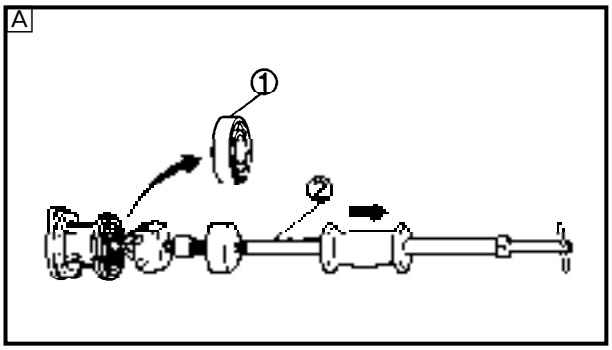
Step	Procedure/Part name	Q'ty	Service points
	PROPELLER SHAFT AND REVERSE GEAR REMOVAL		Follow the left "Step" for removal.
	Gear oil		Refer to "LOWER UNIT" in chapter 3.
	Propeller		Refer to "LOWER UNIT REMOVAL".
1	Flange bolt	2	
2	Propeller shaft housing ass'y	1	
3	Plane washer	1	
4	Propeller shaft ass'y	1	
	PROPELLER SHAFT HOUSING DISASSEMBLY		
①	Reverse gear	1	
②	Reverse gear shim	*	
③	Ball bearing	1	**NOTE:** Install the bearing with its manufacture's marks or numbers facing outward.
④	O-ring	1	
⑤	O-ring	2	
⑥	Oil seal	2	
⑦	Needle bearing	1	**NOTE:** Install the bearing with its manufacture's marks or numbers facing outward.
⑧	Propeller shaft housing	1	
	PROPELLER SHAFT DISASSEMBLY		
⑨	Cross pin ring	1	
⑩	Cross pin	1	**NOTE:** By pushing the shift plunger, bring the cross pin hole in the clutch dog with the hole in the shift slider.
⑪	Shift plunger	1	
⑫	Shift slider	1	
⑬	Spring	1	
⑭	Dog clutch	1	**NOTE:** Install the clutch with "F" mark toward the forward gear side.
⑮	Propeller shaft	1	Reverse the removal steps for installation.

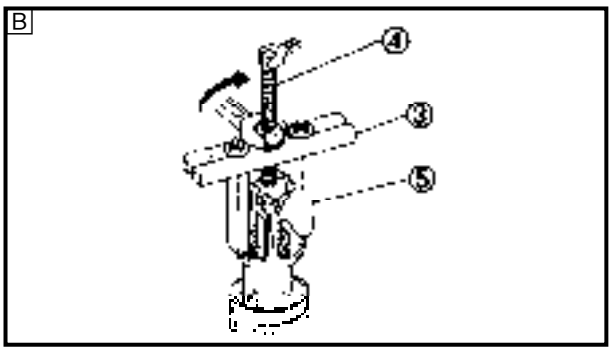
*: As required











SERVICE POINTS

Propeller shaft housing removal

1. Remove:
   - Propeller shaft housing ass'y

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

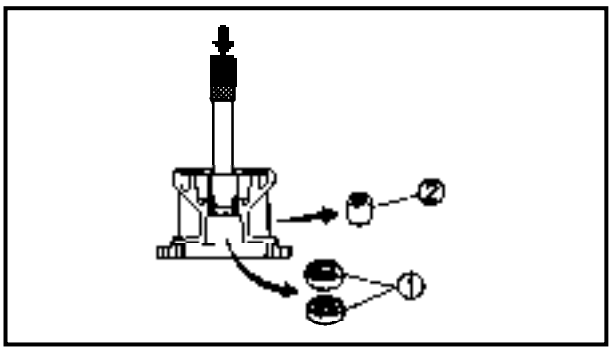
1. Remove:
   - Reverse gear

Bearing separator:
YB-06219/90890-06534
Stopper guide plate:
90890-06501
Bearing puller:
90890-06535
Stopper guide stand:
90890-06538

2. 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



3. Remove:
   - Oil seal ①
   - Needle bearing ②

Driver rod:
YB-06071/90890-06652
Needle bearing attachment:
YB-06112/90890-06614

Reverse gear inspection

1. Inspect:
   - Tooth
   - Dog

   Wear/Damage → Replace.

Bearing inspection

1. Inspect:
   - Bearing

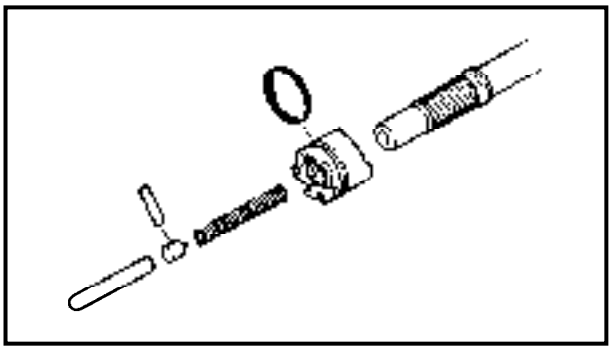
   Pitting/Rumbling → Replace.

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

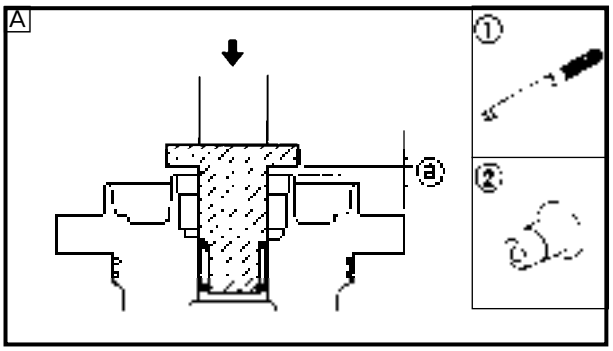
   Wear/Damage → Replace.

Propeller shaft inspection

1. Inspect:
   - Propeller shaft

   Wear/Damage → Replace.

A



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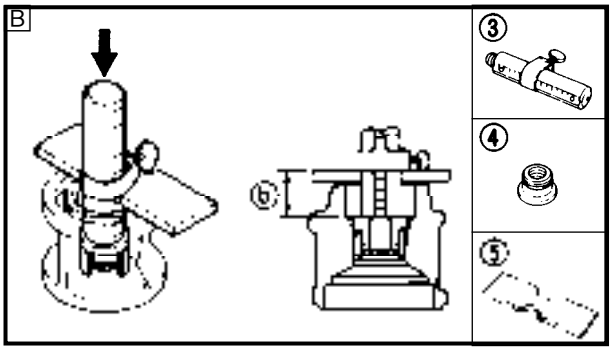
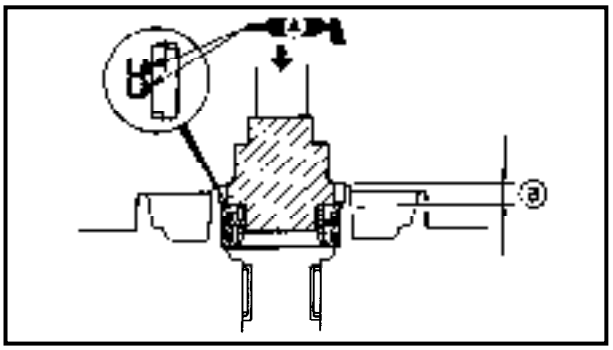




Propeller shaft housing assembly

1. Install:
   - Needle bearing

Depth ⓐ:
3.0 ~ 3.5 mm (0.12 ~ 0.14 in)
Depth ⓑ:
23.0 ~ 23.5 mm (0.91 ~ 0.93 in)

Driver rod:
YB-06071 ..... ①
90890-06604 ..... ③
Needle bearing attachment:
YB-06111 ..... ②
90890-06614 ..... ④
Bearing depth plate:
90890-06603 ..... ⑤

A For USA and CANADA
B Except for USA and CANADA

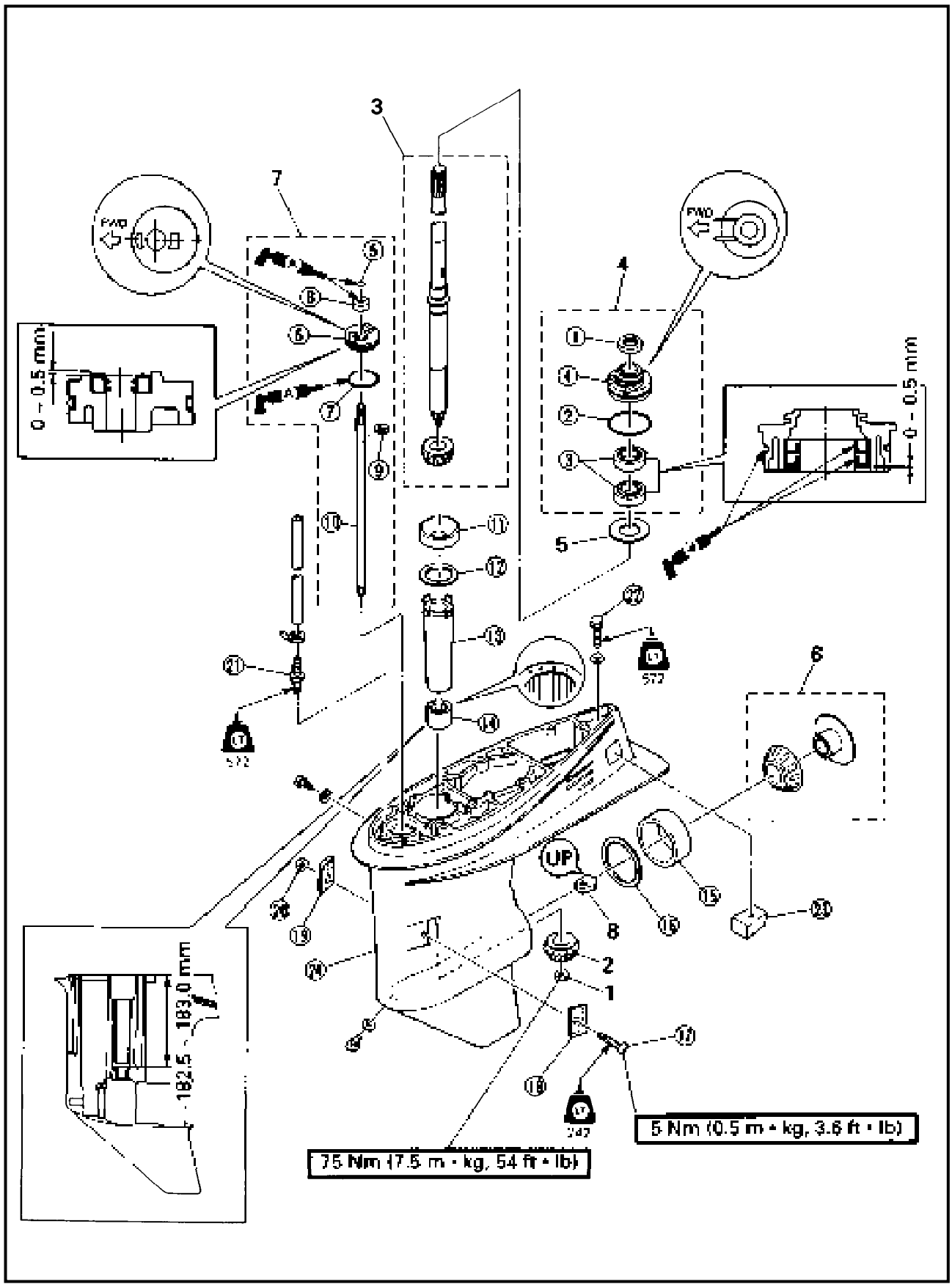
2. Install:
   - Oil seal

Depth ⓐ:
4.0 ~ 4.5 mm (0.16 ~ 0.18 in)

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

DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD

EXPLODED DIAGRAM

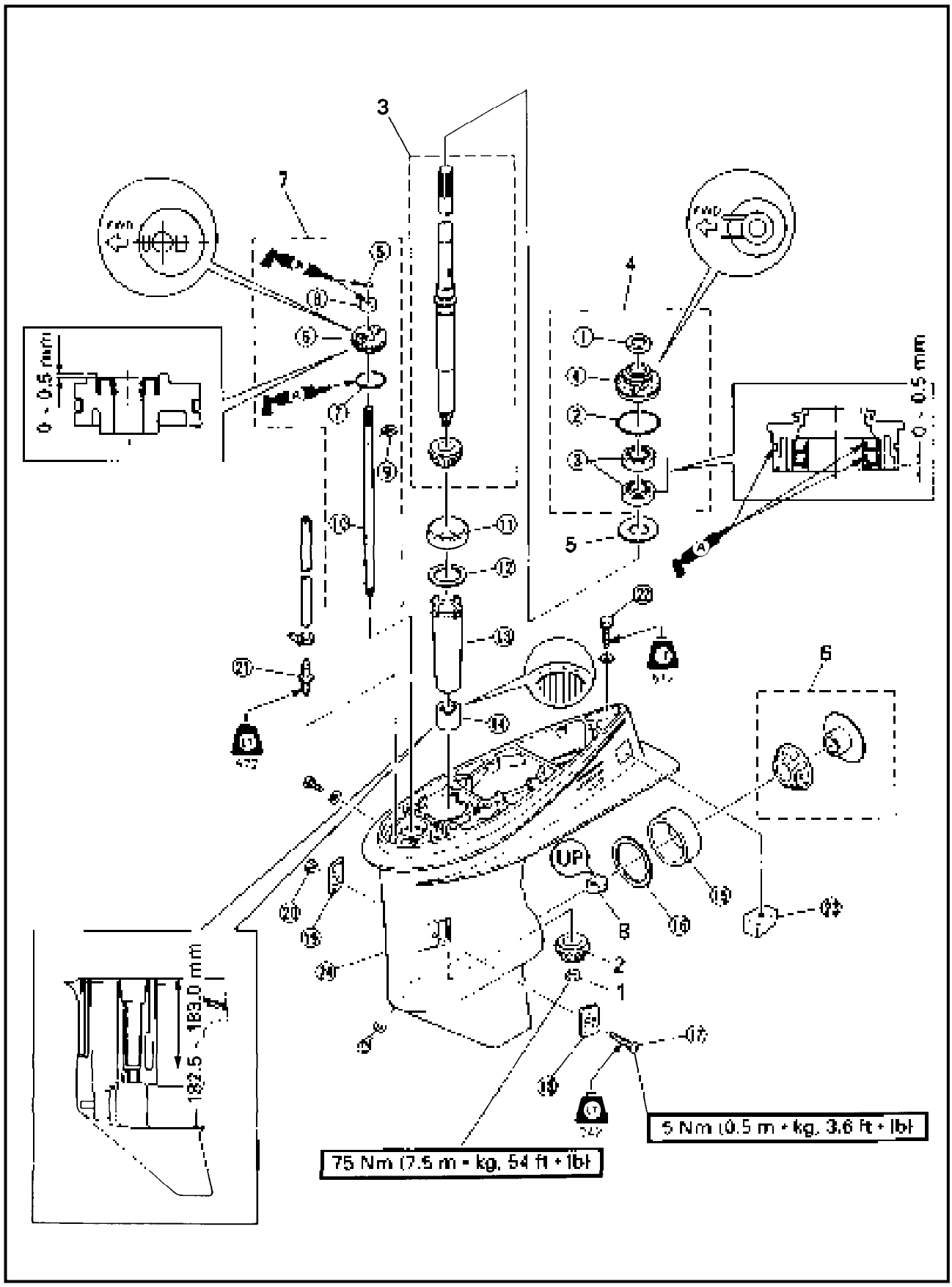


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	DRIVE SHAFT, FORWARD GEAR AND SHIFT ROD REMOVAL		Follow the left "Step" for removal.
	Gear oil		Refer to "LOWER UNIT" in chapter 3.
	Lower unit ass'y		Refer to "LOWER UNIT REMOVAL".
	Water pump		Refer to "WATER PUMP" in chapter 5.
	Propeller shaft ass'y		Refer to "PROPELLER SHAFT AND REVERSE GEAR".
1	Pinion nut	1	
2	Pinion gear	1	
3	Drive shaft	1	
4	Drive shaft oil seal housing ass'y	1	
5	Plane washer	1	
6	Forward gear ass'y	1	
7	Shift rod ass'y	1	
8	Shift cam	1	**NOTE:** Set the "UP" mark upward.
	DRIVE SHAFT OIL SEAL HOUSING DISASSEMBLY		
①	Oil seal cover	1	
②	O-ring	1	
③	Oil seal	2	
④	Drive shaft oil seal housing	1	
	SHIFT ROD DISASSEMBLY		
⑤	O-ring	1	
⑥	Shift rod oil seal housing	1	
⑦	O-ring	1	
⑧	Oil seal	1	
⑨	Circlip	1	
⑩	Shift rod	1	
	LOWER CASE DISASSEMBLY		
⑪	Drive shaft bearing outer race	1	
⑫	Pinon gear shim	*	
⑬	Drive shaft sleeve	1	**NOTE:** Align the sleeve locating-rib with the recess in the lower case.
⑭	Drive shaft needle bearing	1	**NOTE:** Install the bearing with its manufacture's marks or numbers facing outward.
⑮	Forward gear bearing outer race	1	

* As required

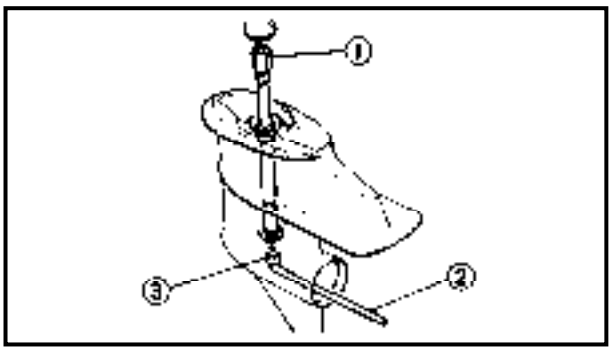
EXPLODED DIAGRAM

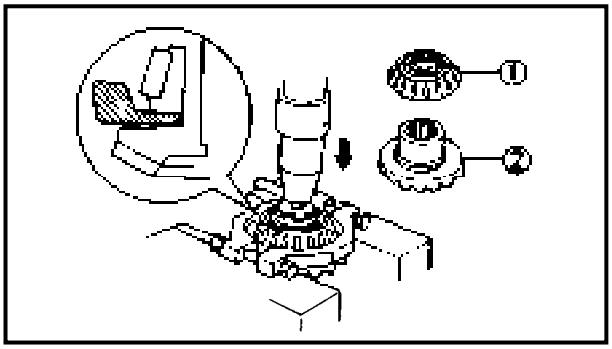


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
⑯	Forward gear shim	*	
⑰	Screw	1	
⑱	Water inlet cover 1	1	
⑲	Water inlet cover 2	1	
⑳	Nut	1	
㉑	Hose nipple	1	
㉒	Bolt (with washer)	1	
㉓	Anode	1	
㉔	Lower case	1	
			Reverse the removal steps for installation.

* As required





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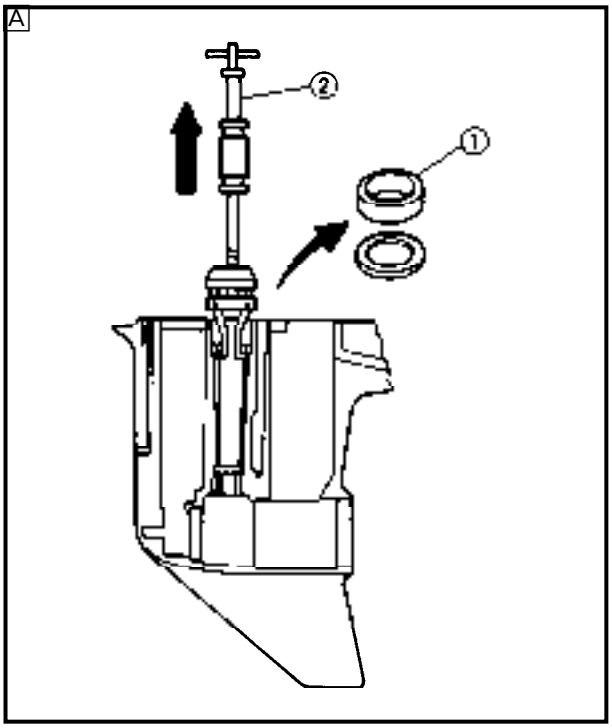
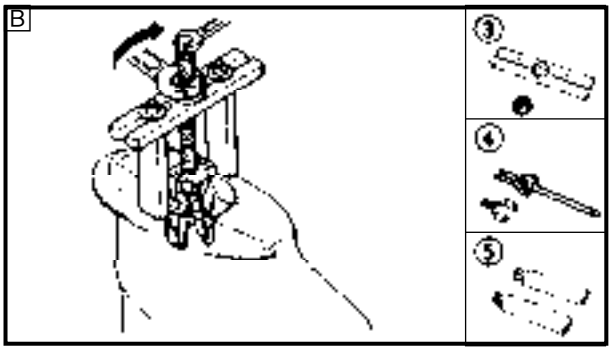


B



SERVICE POINTS

Pinion nut removal

1. Remove:
   - Pinion nut

Drive shaft holder:
YB-06079/90890-06517 ..... ①
Pinion nut wrench:
90890-06505..... ②
Socket adapter:
90890-06506..... ③

Forward gear disassembly

1. Remove:
   - Taper roller bearing ①
   - Forward gear ②

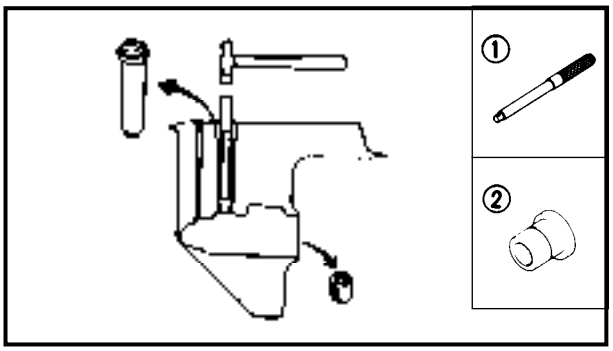
Bearing separator:
YB-06219/90890-06534

Lower case disassembly

1. Remove:
   - Drive shaft bearing outer race ①

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

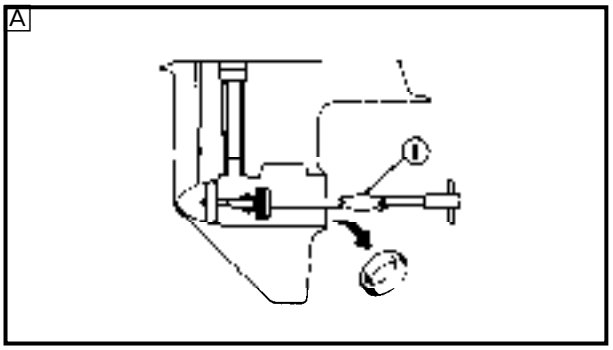
A For USA and CANADA
B Except for USA and CANADA



2. Remove:
   - Drive shaft needle bearing

	Needle bearing attachment:
	YB-06063/90890-06614 ..... ①
	Driver rod:
	YB-06071/90890-06652 ..... ②

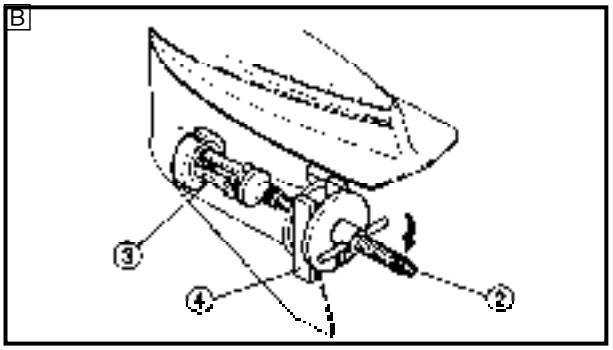
A



3. Remove:
   - Forward gear bearing outer race

	Slide hammer set:
	YB-06096 ..... ①
	Bearing outer race puller:
	90890-06523 ..... ②
	Bearing outer race puller claw:
	90890-06532 ..... ③
	Stopper guide stand:
	90890-06538 ..... ④

B



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

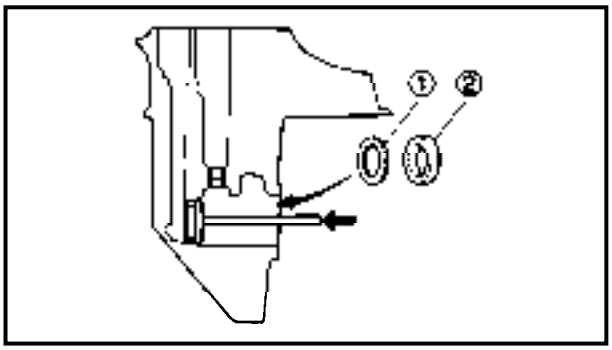
   Pitting/Rumbling → Replace.

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.

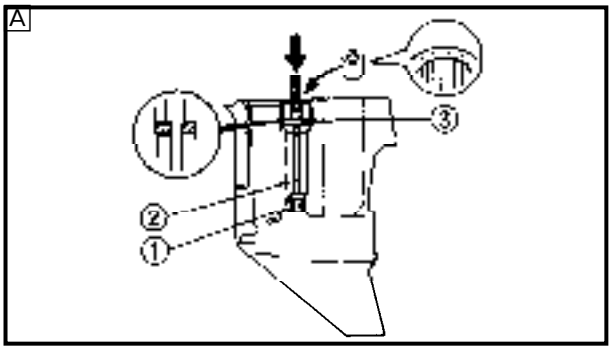


Lower case assembly

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

Bearing installer:
YB-41446/90890-06626
Driver rod:
YB-06071/90890-06605

A

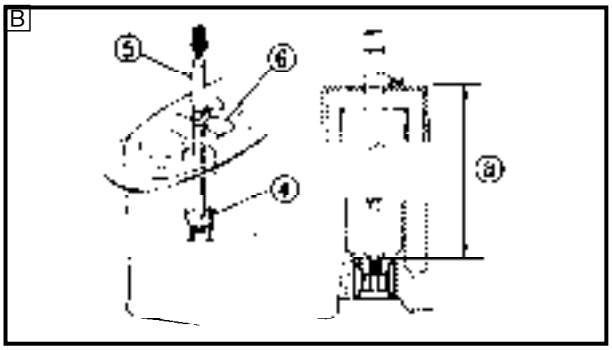


2. Install:
   - Drive shaft needle bearing

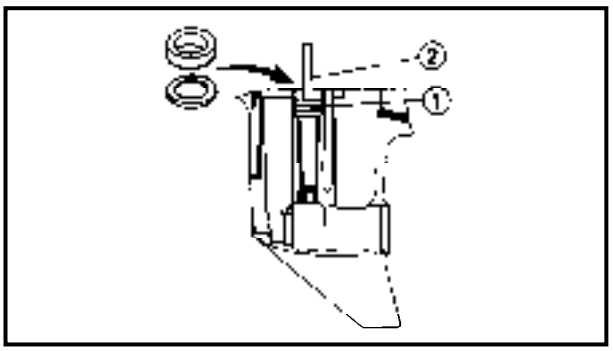
Depth ⓐ:
182.5 ~ 183 mm (7.19 ~ 7.20 in)

Bearing installer:
YB-06063 ..... ①
90890-06614 ..... ④
Driver rod:
YB-06071 ..... ②
90890-06602 ..... ⑤
Driveshaft needle bearing depth stop:
YB-34473 ..... ③
Bearing depth plate:
90890-06603 ..... ⑥

B

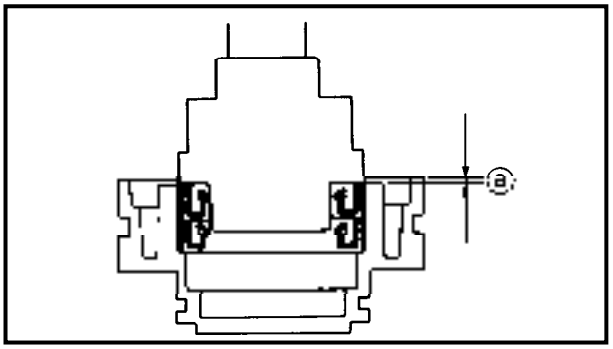


A For USA and CANADA
B Except for USA and CANADA



3. Install:
   - Pinion gear shim
   - Drive shaft bearing outer race

Bearing installer:
YB-06110/90890-06627 ..... ①
Driver rod:
YB-06071/90890-06606 ..... ②

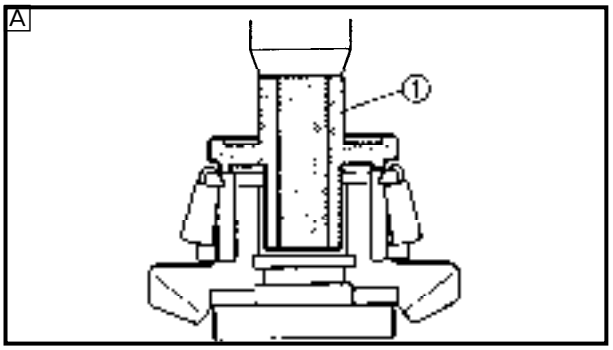


Drive shaft oil seal housing assembly

1. Install:
   - Oil seal ①

Depth ⓐ:
0.0 ~ 0.5 mm (0.00 ~ 0.02 in)

Bearing installer:
YB-06167/90890-06628
Driver rod:
YB-06071/90890-06605

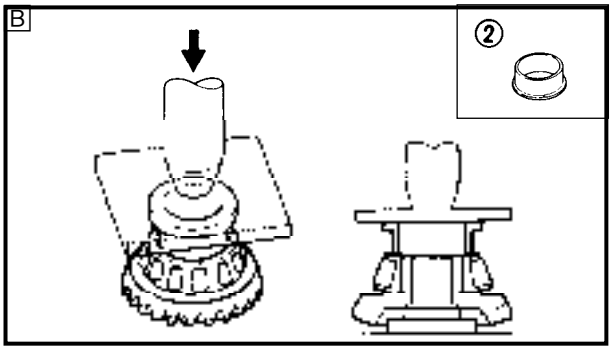


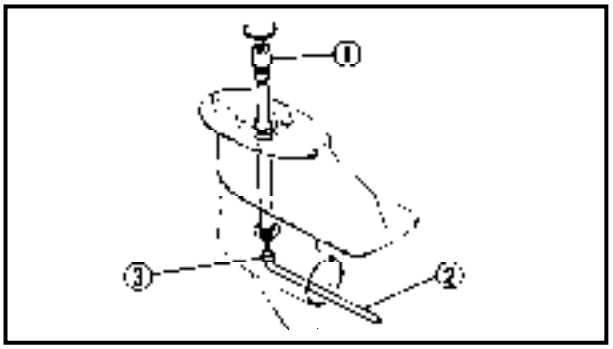
Forward gear assembly

1. Install:
   - Forward gear
   - Taper roller bearing

Bearing installer:
YB-06270-A ..... ①
90890-06640 ..... ②

A For USA and CANADA
B Except for USA and CANADA





Pinion nut installation

1. Install:
   - Pinion nut

Drive shaft holder:
YB-06079/90890-06517 ..... ①
Pinion nut wrench:
90890-06505 ..... ②
Socket adapter:
90890-06506 ..... ③

SHIMMING

NOTE:

Shim selection requirement guide:

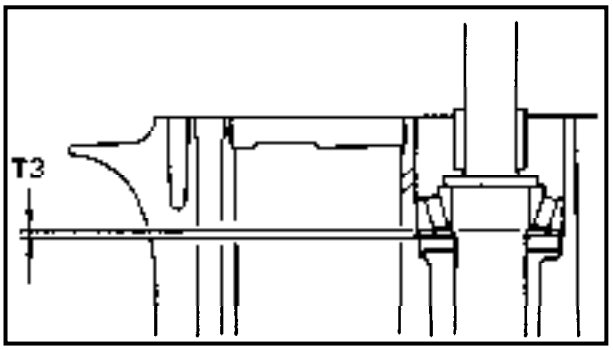
- Not required when;
  reassembling with original case and inner parts.
- Numeric calculation is required when;
  reassembling with original inner parts and the new case. (Difference between original and new case)
- Measurement and adjustment is required when;
  replacing the inner part(s).

SHIM SELECTION (FOR USA AND CANADA)

Pinion gear shim

NOTE:

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

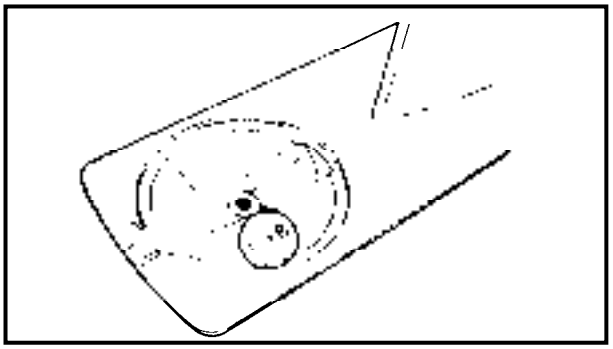


1. Calculate:
   - Specified measurement (M)

Specified measurement (M) = 0.30 mm + P/100

NOTE:

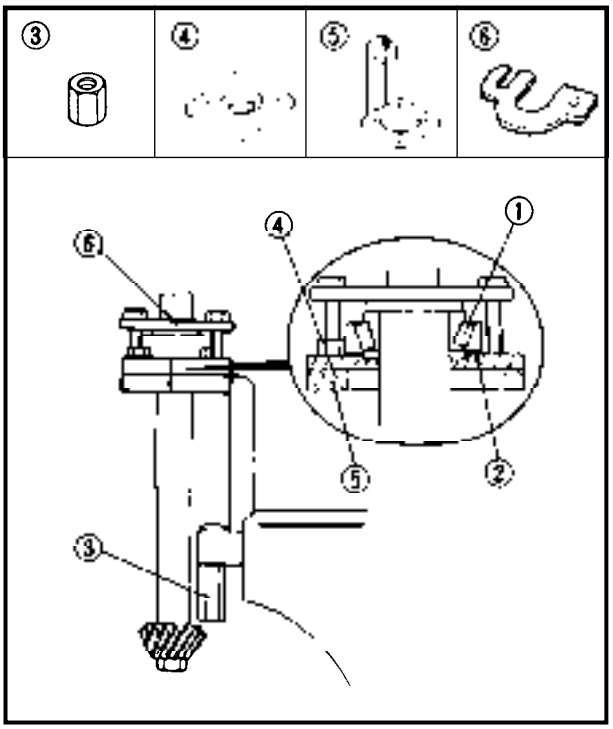
- P is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the P mark is missing or unreadable, assume a P mark of "0", and check the backlash when the unit is assembled.
- If the P value is negative (–), then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



Example:

If P mark is "+5", then M = 0.30 mm + (+5)/100
= 0.30 + 0.05 mm
= 0.35 mm

If P mark is "–5", then M = 0.30 mm + (–5)/100
= 0.30 – 0.05 mm
= 0.25 mm



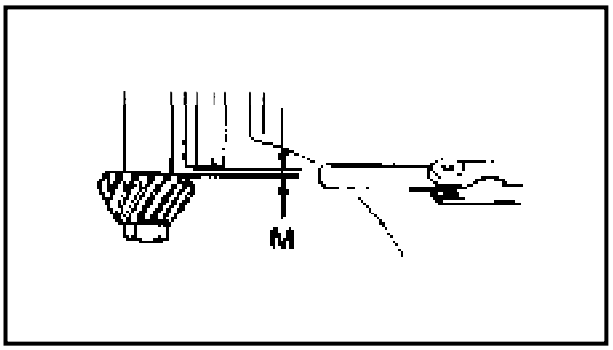
2. Install:
   - Shimming gauge
   - Drive shaft
   - Bearing ①
   - Shim(s) ②

Gauge block:
YB-34432-9 ..... ③
Adapter plate:
YB-34432-10 ..... ④
Gauge base:
YB-34432-11 ..... ⑤
Clamp:
YB-34432-17 ..... ⑥

NOTE:
- Attach the adapter plate to the gauge base using 4 bolts of appropriate sizes.
- Fix the shimming gauge to the drive shaft so that the shaft is at the center of the hole.
- If the original shim(s) is unavailable, start with a 0.50 mm shim.

3. Install:
   - Pinion
   - Pinion nut

Pinion nut:
75 Nm (7.5 m • kg, 54 ft • lb)



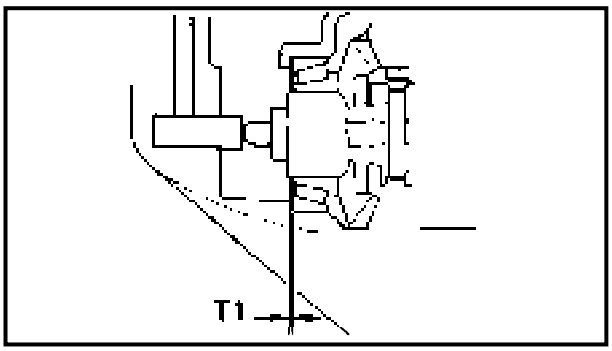
4. Check:
   - Specified measurement (M)
     Out of specified measurement → Adjust.

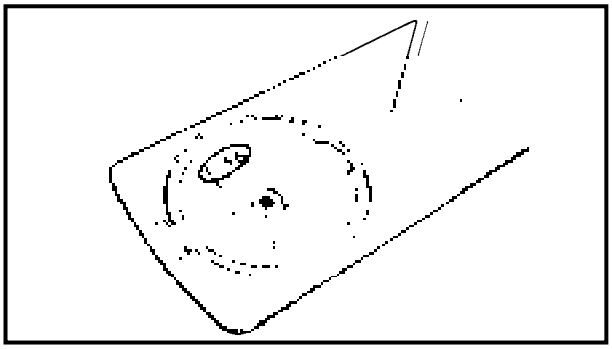
Thickness gauge:
YU-26900-9

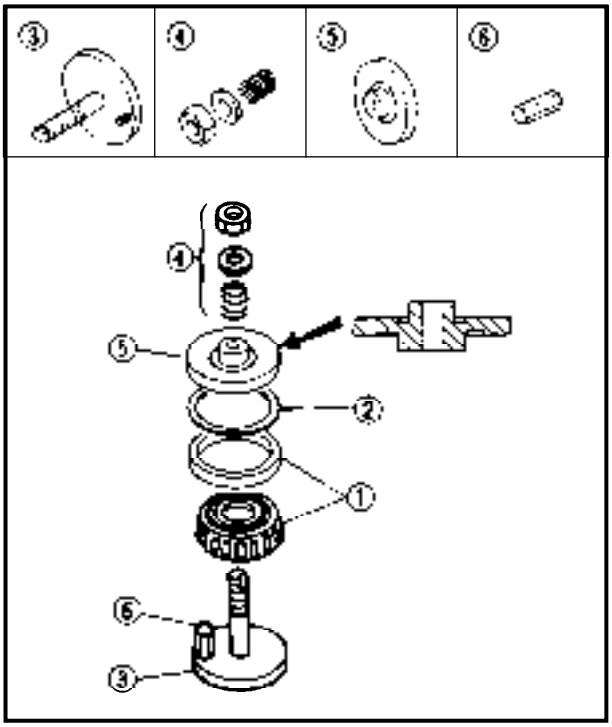
NOTE:
- Check the fit between the shimming gauge and lower surface of the pinion.
- Perform the same measurement at three points on the pinion nut.

5. Adjust:
   - Shim(s)
     Remove or add

Available shim thickness:
0.05, 0.08, 0.12, 0.30 and 0.50 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. Calculate:
   - Specified measurement (M)

Specified measurement (M) = 0.06 mm + F/100

NOTE:

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

Example:

If F mark is "+5", then M = 0.06 mm + (+5)/100
= 0.06 + 0.05 mm
= 0.11 mm

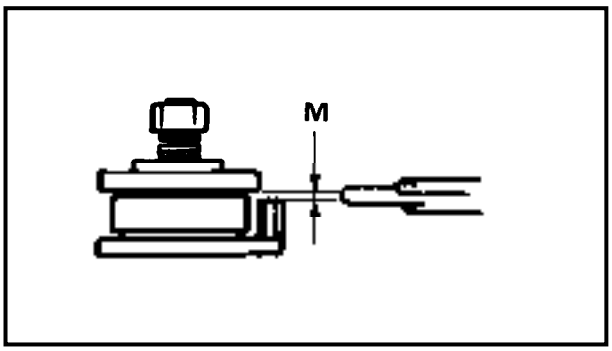
If F mark is "–5", then M = 0.06 mm + (–5)/100
= 0.06 – 0.05 mm
= 0.01 mm

2. Install:
   - Shimming gauge
   - Bearing ①
   - Shim(s) ②

Base plate:
YB-34446-1..... ③
Compression spring:
YB-34446-3..... ④
Press plate:
YB-34446-4..... ⑤
Gauge pin:
YB-34446-7..... ⑥

NOTE:

- Tighten the nut four turns after contact with the spring.
- If the original shim(s) is unavailable, start with a 0.50 mm shim.



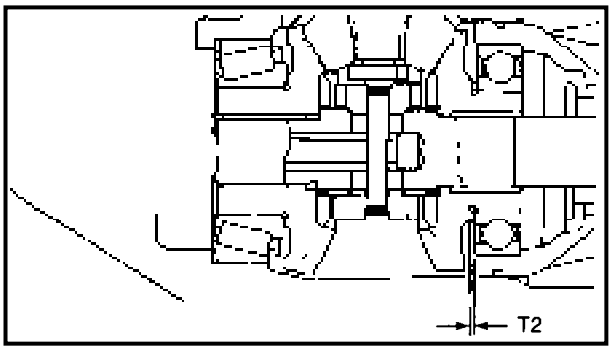
3. Check:
   - Specified measurement (M)
     Out of specified measurement → Adjust.

	Thickness gauge: **YU-26900-9**

NOTE:
Check the fit between the shimming gauge and lower surface of the press plate.

4. Adjust:
   - Shim(s)
     Remove or add.

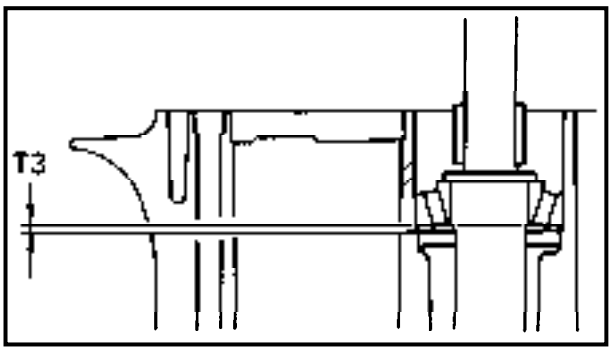
	Available shim thickness: **0.05, 0.08, 0.12, 0.30 and 0.50 mm**

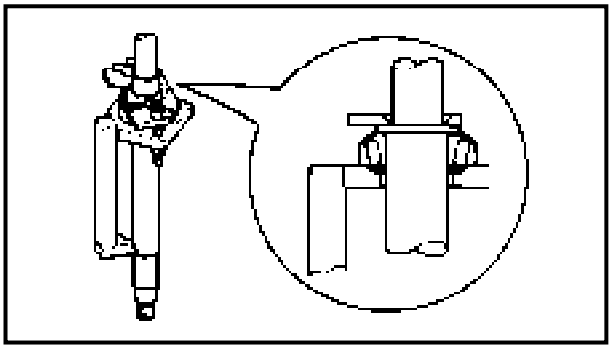


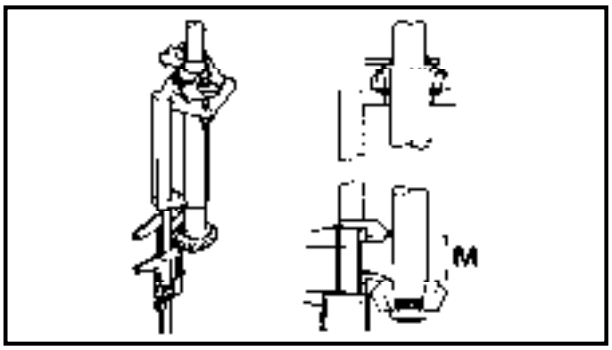
Reverse gear shim

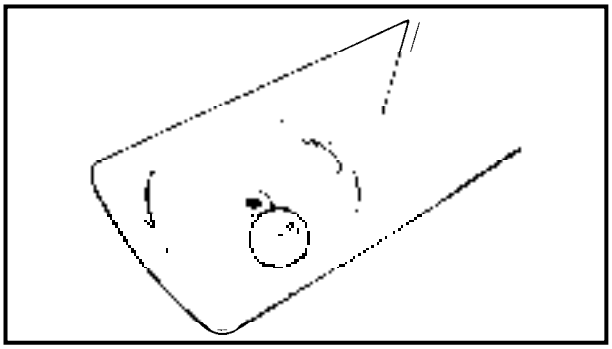
NOTE:
- Find reverse gear shim thickness (T2) by backlash measurement.
- Measure the backlash with the original shim(s).
- If the original shim(s) is unavailable, start with a 0.50 mm shim.

	Available shim thickness: **0.05, 0.08, 0.12, 0.30 and 0.50 mm**









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. Install:
   - Pinion height gauge
   - Drive shaft
   - Bearing

	Pinion height gauge: 90890-06702

NOTE:

- Fix the pinion height gauge to the drive shaft so that the shaft is at the center of the hole.
- Tighten the wing nuts 1/4 turn after contacting the fixing plate.

2. Install:
   - Pinion
   - Pinion nut

	Pinion nut: 75 Nm (7.5 m • kg, 54 ft • lb)

3. Measure:
   - Measurement (M)

	Digital caliper: 90890-06704

NOTE:

- Measure the fit between the pinion height gauge and lower surface of the pinion.
- Perform the same measurement at three points on the pinion.

4. Calculate:
   - Pinion gear shim thickness (T3)

	Pinion gear shim thickness (T3) = M – 11.30 mm + P/100

NOTE:

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

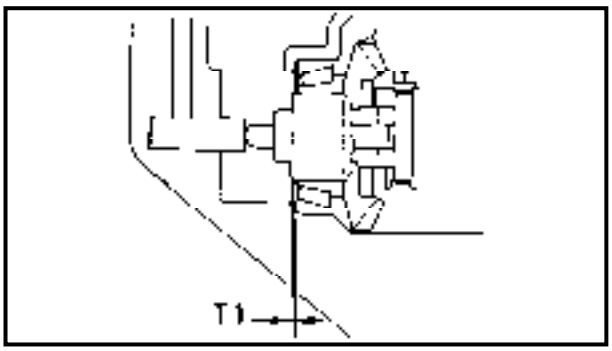
Example:
If M is "11.70 mm" and P mark is "+5",
then T3 = 11.70 mm – 11.30 + (+5)/100
= 0.40 + 0.05 mm
= 0.45 mm
If M is "11.70 mm" and P mark is "–5",
then T3 = 11.70 mm – 11.30 + (–5)/100
= 0.40 – 0.05 mm
= 0.35 mm

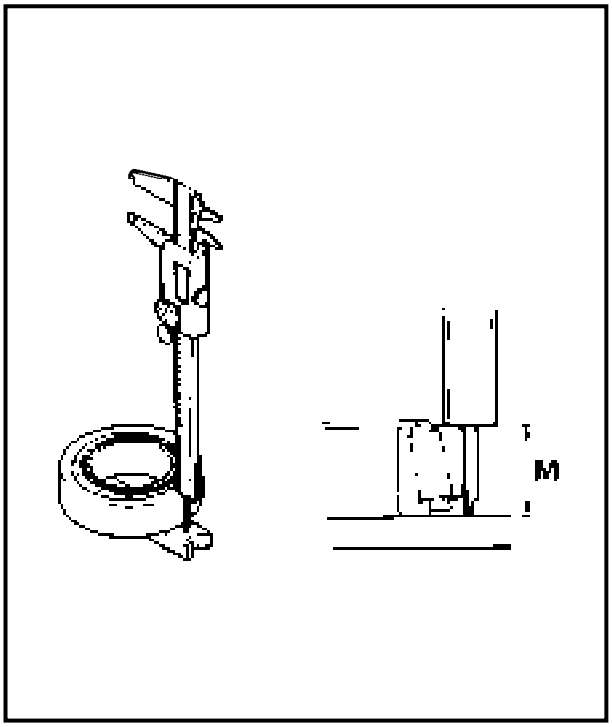
5. Select:
   - Pinion gear shim

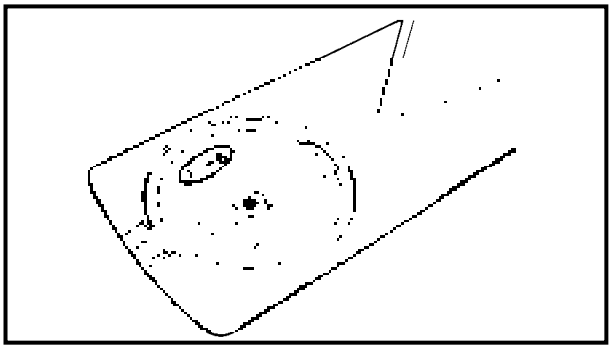
Calculated numeral at 1/100th place		Rounded numeral
more than	or less	
0.00	0.02	0.02
0.02	0.05	0.05
0.05	0.08	0.08
0.08	0.10	0.10

Available shim thickness:
0.05, 0.08, 0.12, 0.30 and 0.50 mm

Example:
If T3 is "0.44 mm",
then pinion gear shim = 0.45 mm
If T3 is "0.39 mm",
then pinion gear shim = 0.40 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) = 22.75 + F/100 – M

NOTE:

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

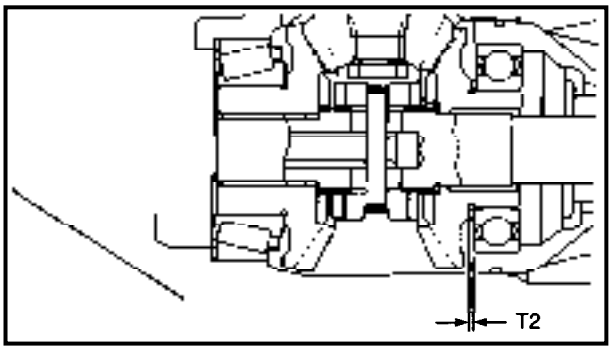
Example:
If M is "22.30 mm" and F mark is "+5",
then T1 = 22.75 mm + (+5)/100 – 22.30
= 0.45 + 0.05 mm
= 0.50 mm
If M is "22.30 mm" and F mark is "–5",
then T1 = 22.75 mm + (–5)/100 – 22.30
= 0.45 – 0.05 mm
= 0.40 mm

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:
0.05, 0.08, 0.12, 0.30 and 0.50 mm

Example:
If T1 is "0.45 mm",
then forward gear shim = 0.42 mm
If T1 is "0.50 mm",
then forward gear shim = 0.48 mm



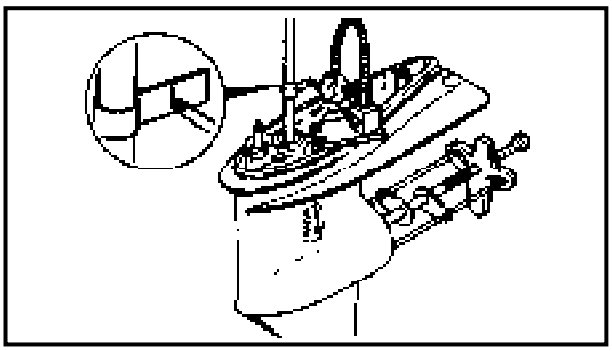
Reverse gear shim

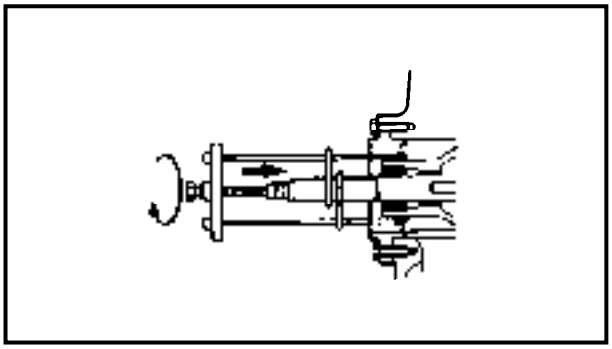
NOTE:
- Find reverse gear shim thickness (T2) by backlash measurement.
- Measure the backlash with the original shim(s).
- If the original shim(s) is unavailable, start with a 0.50 mm shim.

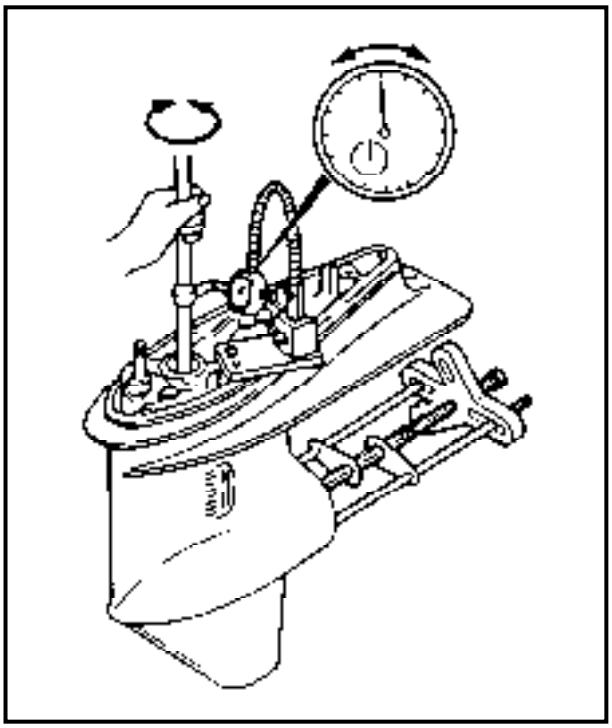
Available shim thickness:
0.05, 0.08, 0.12, 0.30 and 0.50 mm

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:
0.18 ~ 0.45 mm (0.007 ~ 0.018 in)

Measuring steps:

- Set the bearing housing puller for pushing the propeller shaft.

Bearing housing puller:
YB-6234/90890-06503
Universal puller:
YB-6117
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 (18 mm in diameter).

Backlash indicator:
YB-6265/90890-06706

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

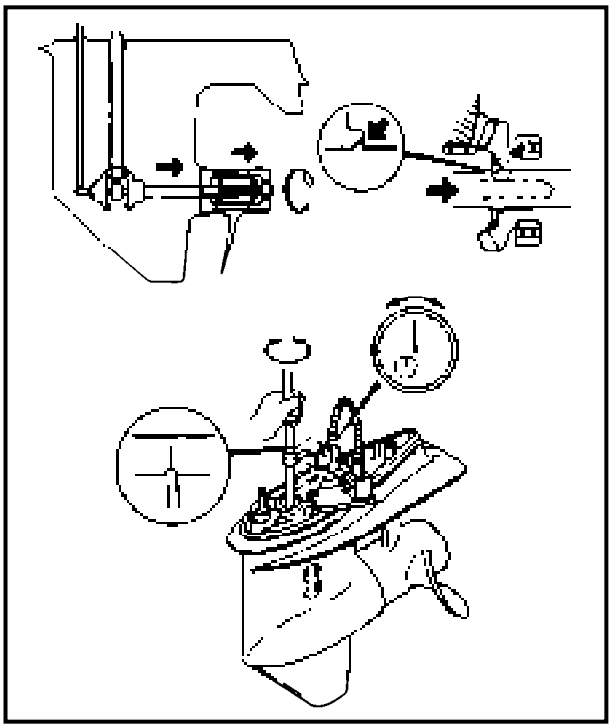
Backlash adjusting plate:
YB-07003
Dial gauge:
YU-03097/90890-01252
Magnet base:
YU-34481/90890-06705

- 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 gear backlash	Shim thickness
Less than 0.18 mm	To be decreased by (0.31 – measurement) × 0.56
More than 0.45 mm	To be increased by (measurement – 0.31) × 0.56
Available shim thickness: 0.05, 0.08, 0.12, 0.30 and 0.50 mm	



Reverse gear

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

Backlash:
0.71 ~ 0.98 mm (0.028 ~ 0.039 in)

Measuring steps:

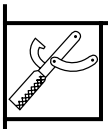
- Load the reverse gear by installing the propeller with the front side facing backward, and tighten the propeller nut.

Propeller nut:
5 Nm (0.5 m • kg, 3.6 ft • lb)

- Attach the backlash indicator on the drive shaft (18 mm in diameter).

Backlash indicator:
YB-6265/90890-06706

- Attach the dial gauge on the gear 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 at each direction.

2. Adjust:
   - Reverse gear shim(s)

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

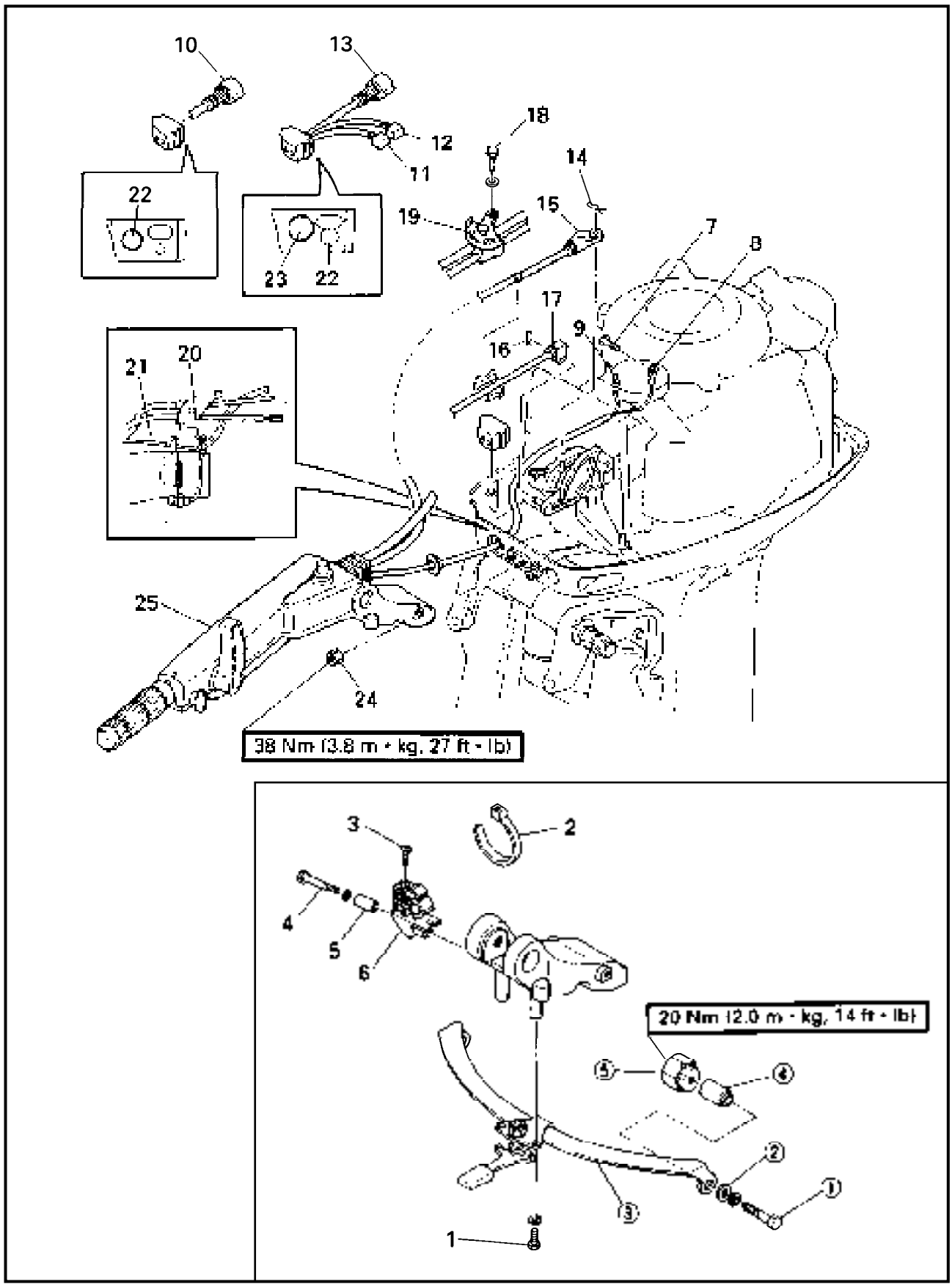
Reverse gear backlash	Shim thickness
Less than 0.71 mm	To be decreased by (0.85 – measurement) × 0.56
More than 0.98 mm	To be increased by (measurement – 0.85) × 0.56

Available shim thickness:
0.05, 0.08, 0.12, 0.30 and 0.50 mm

CHAPTER 7
BRACKET UNIT

TILLER HANDLE REMOVAL

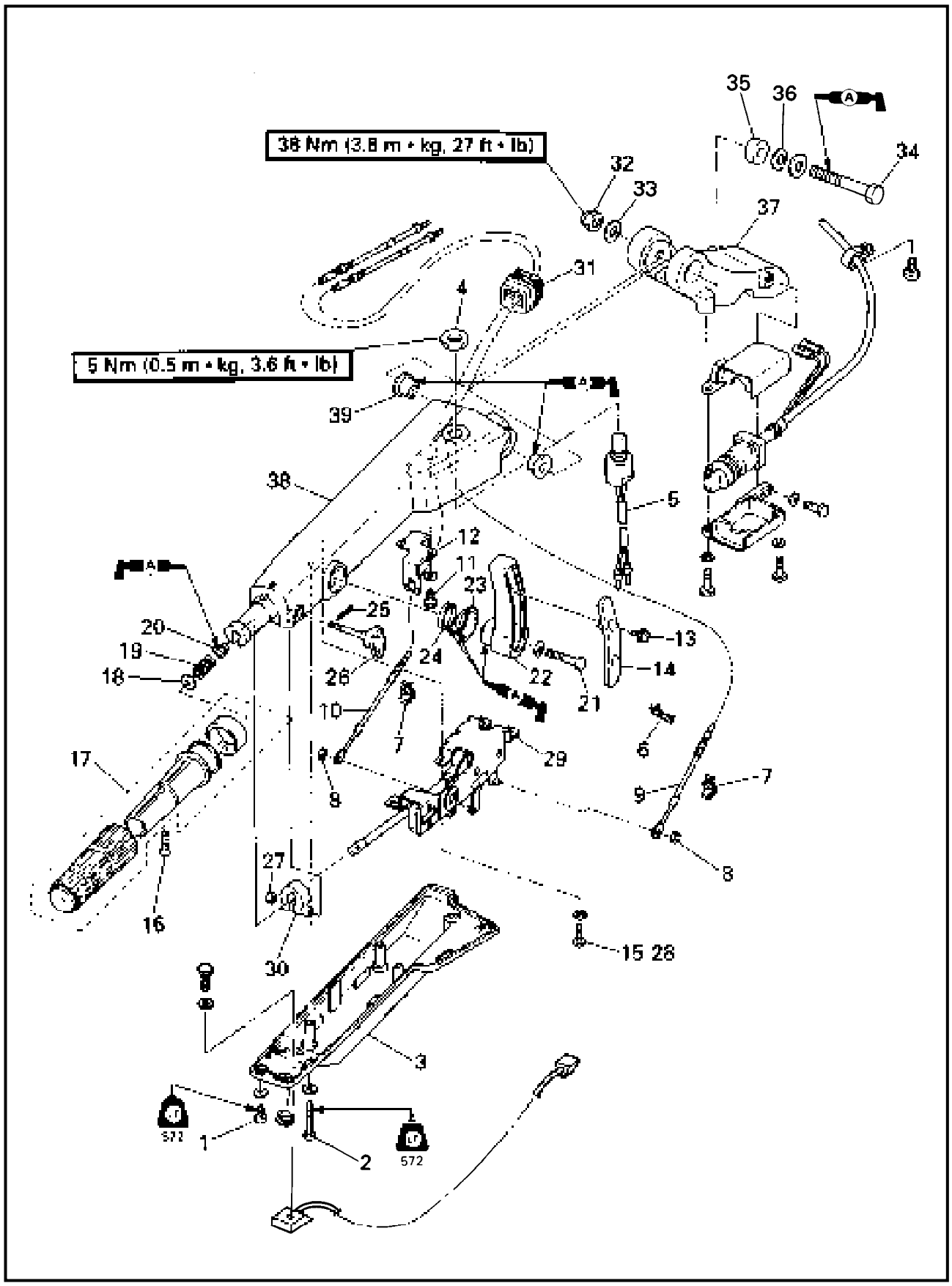
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	TILLER HANDLE REMOVAL		Follow the left "Step" for removal.
1	Bolt	2	Steering friction model
2	Clamp	1	E model
3	Screw	1	Steering friction model
4	Bolt	1	
5	Collar	1	
6	Clamp	1	
7	Bolt	1	M model
8	Engine stop switch lead (black)	1	
9	Engine stop switch coupler (blue)	1	
10	Main switch lead coupler	1	E model
11	Oil level sensor lead coupler	1	EHTO/TH model
12	Trim sensor lead coupler	1	
13	Extension wire lead coupler	1	
14	Clip	1	
15	Shift cable	1	
16	Clip	1	
17	Throttle cable	1	
18	Bolt	2	
19	Fitting plate ass'y	1	**NOTE:** When installing the fitting plate, lift the tiller handle straight up.
20	Clamp	1	M model
21	Engine stop switch lead	1	
22	Main switch lead	1	**NOTE:** Align the taped end of the battery cable and the extension wire lead with the end of the grommet.
23	Extension wire lead	1	
24	Nut	2	
25	Tiller handle ass'y	1	
	STEERING FRICTION DISASSEMBLY		
①	Bolt (with washer)	2	
②	Plane washer	2	
③	Friction plate ass'y	1	
④	Collar	2	
⑤	Nut	2	
			Reverse the removal steps for installation.

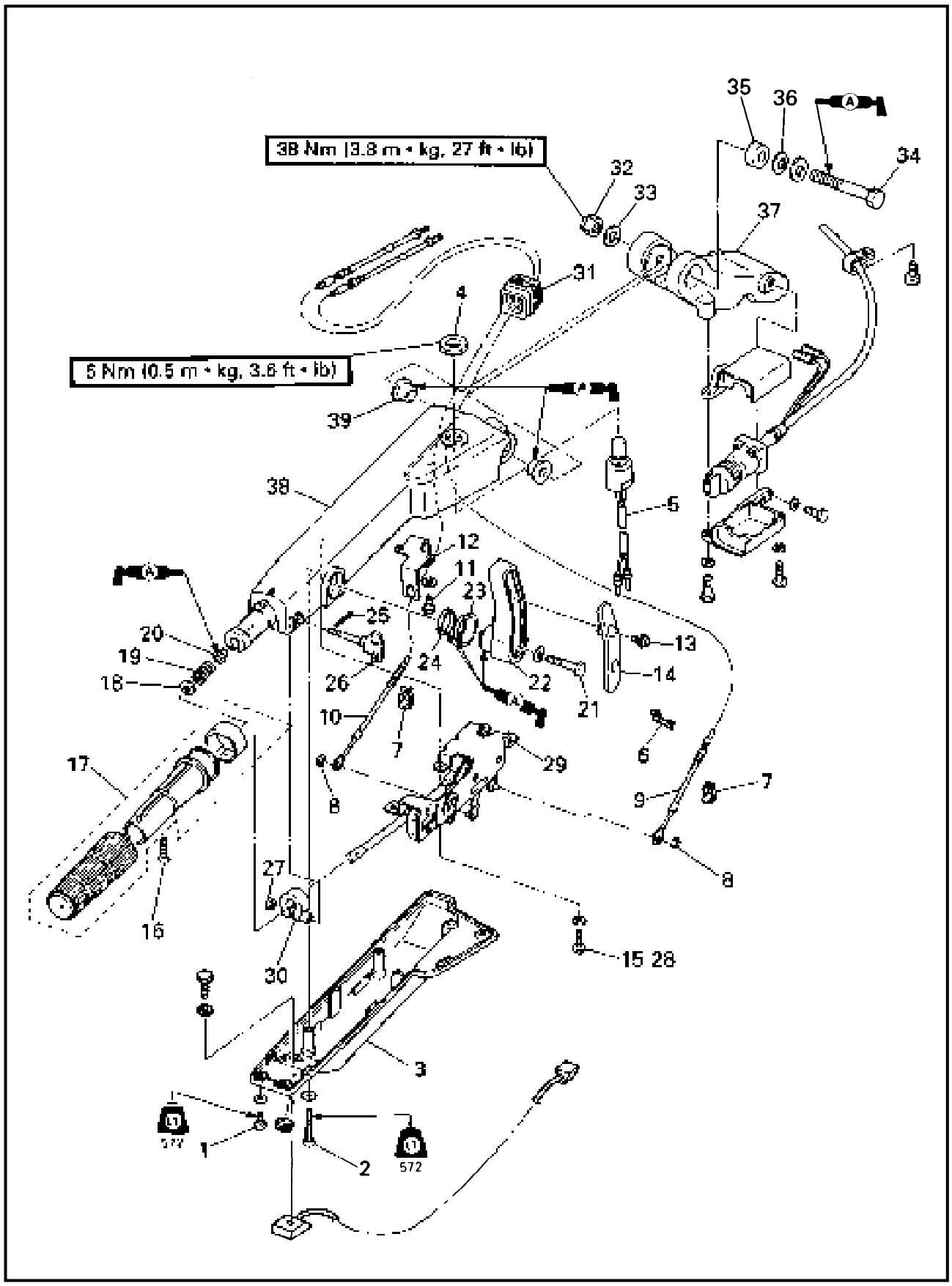
TILLER HANDLE
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	TILLER HANDLE DISASSEMBLY		Follow the left "Step" for removal.
	Tiller handle ass'y		Refer to "TILLER HANDLE REMOVAL".
1	Screw	4	6 × 16 mm
2	Screw	3	6 × 40 mm
3	Cover	1	
4	Nut	1	
5	Engine stop switch ass'y	1	
6	Clamp	1	
7	Cable clamp	2	
8	Circlip	2	
9	Throttle cable	1	Shorter cable
10	Shift cable	1	Longer cable
11	Bolt (with washer)	2	6 × 16 mm
12	Cable bracket	1	
13	Screw (with washer)	2	
14	Shift lever cover	1	
15	Bolt (with washer)	4	**NOTE:** Loosen the bolts temporarily.
16	Screw	1	
17	Handle grip ass'y	1	
18	Plain washer	1	
19	Spring	1	
20	Bushing	1	
21	Bolt (with washer)	1	
22	Shift lever	1	
23	Bushing	1	
24	Washer	1	
25	Cotter pin	1	
26	Friction knob	1	
27	Nut	1	
28	Bolt (with washer)	4	6 × 16 mm **NOTE:** When installing the bolts, tighten them temporarily.
29	Link ass'y	1	
30	Friction piece	1	
31	Grommet	1	
32	Nylon nut	1	
33	Plane washer	1	
34	Bolt	1	

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
35	Collar	1	
36	Wave washer	1	
37	Bracket	1	
38	Steering handle	1	
39	Bushing	2	
			Reverse the removal steps for installation.

SERVICE POINTS

Control cable inspection

1. Inspect:
   - Throttle cable
   - Shift cable

   Kink/Fray/Stick → Replace.

Bushing inspection

1. Inspect:
   - Bushing

   Wear/Crack/Damage → Replace.

Shift lever inspection

1. Inspect:
   - Shift lever

   Wear/Crack/Damage → Replace.

Friction piece inspection

1. Inspect:
   - Friction piece

   Wear/Crack/Damage → Replace.

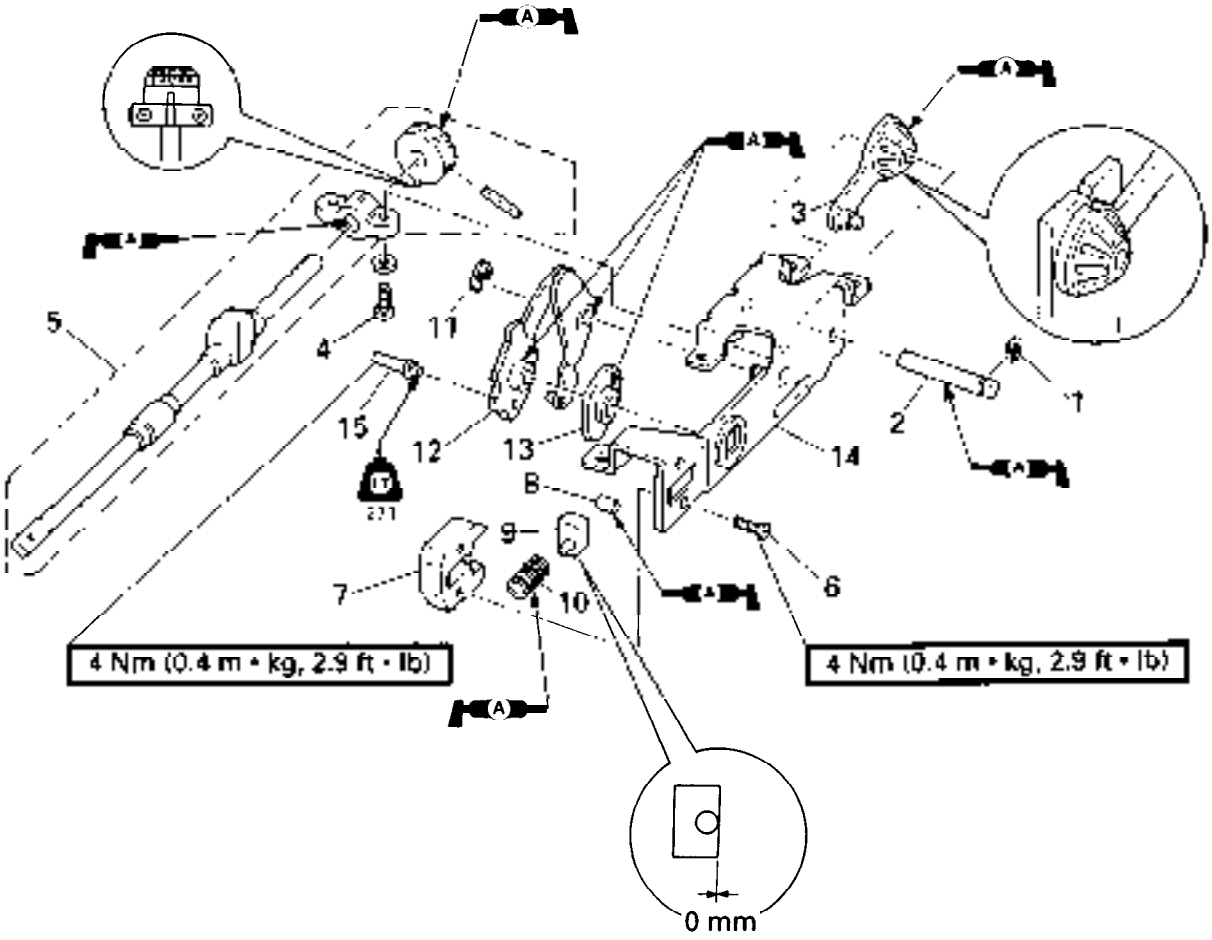
Steering handle inspection

1. Inspect:
   - Steering handle

   Wear/Crack/Damage → Replace.

LINK ASS'Y DISASSEMBLY

EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	LINK ASS'Y DISASSEMBLY		Follow the left "Step" for removal.
1	Circlip	1	
2	Throttle arm shaft	1	
3	Throttle arm	1	
4	Screw (with washer)	2	6 × 16 mm
5	Throttle shaft ass'y	1	
6	Screw	2	
7	Spring guide	1	
8	Roller	1	
9	Actuator	1	
10	Spring	1	
11	Circlip	1	
12	Cam plate	1	
13	Bushing	1	
14	Frame	1	
15	Stopper	1	Neutral opening limit model
			Reverse the removal steps for installation.

SERVICE POINTS

Throttle arm inspection

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

Throttle shift ass'y inspection

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

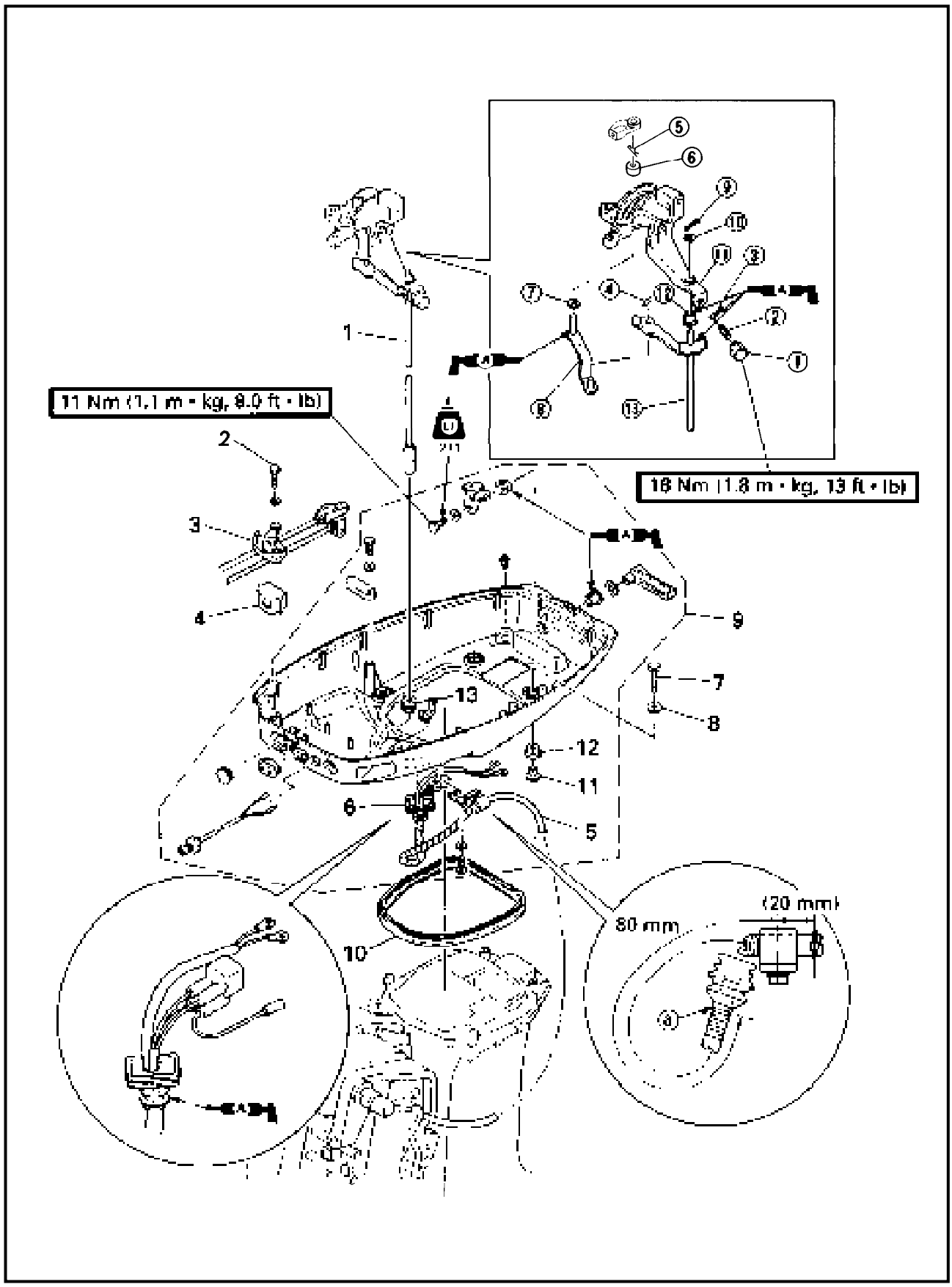
Cam plate inspection

1. Inspect:
   - Cam plate
     Wear/Crack/Damage → Replace.

Bushing inspection

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

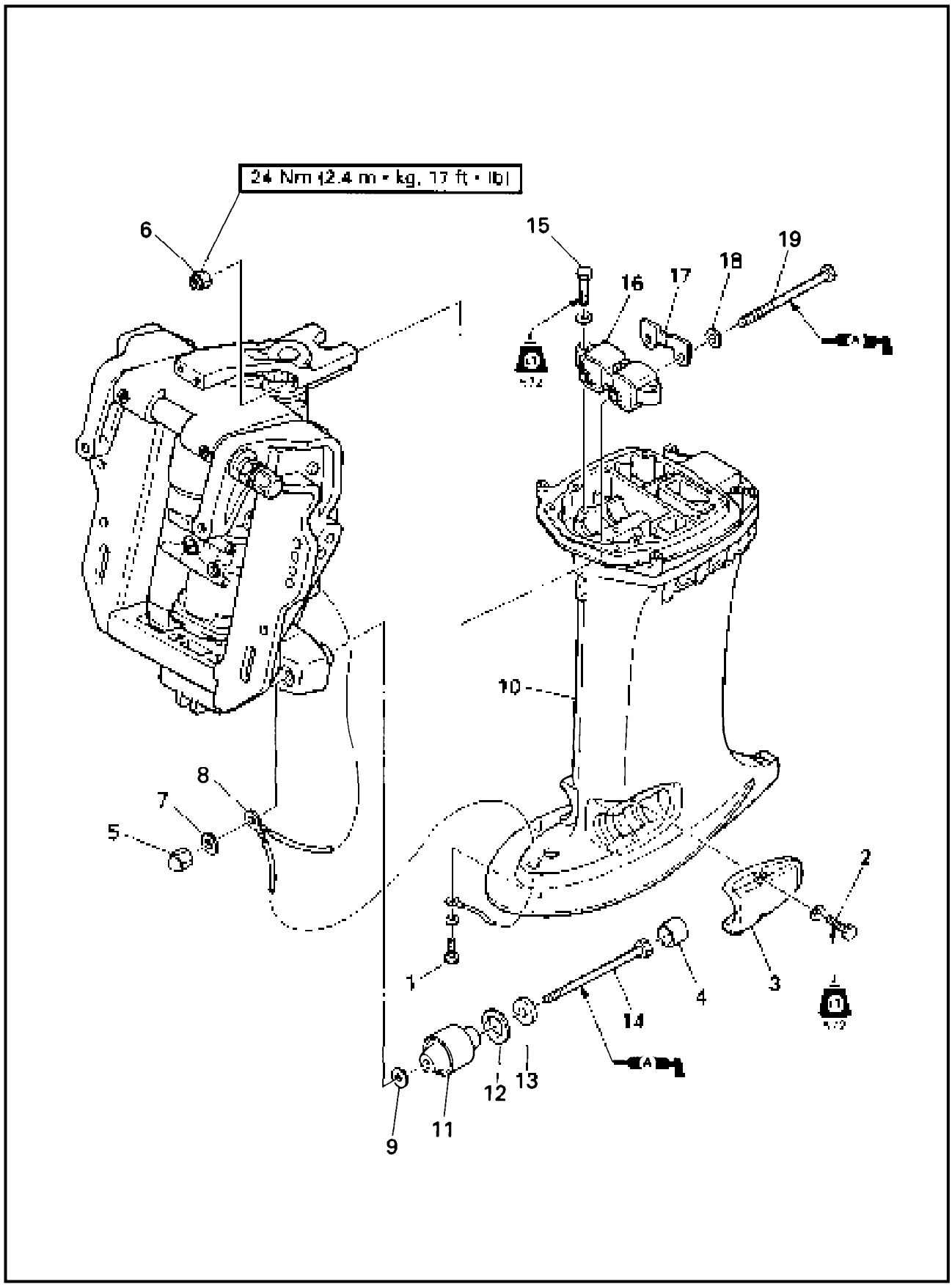
SHIFT ACTUATOR AND BOTTOM COWLING
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	SHIFT ACTUATOR AND BOTTOM COWLING REMOVAL		Follow the left "Step" for removal.
	Power unit ass'y		Refer to "POWER UNIT REMOVAL" in chapter 5.
1	Shift actuator ass'y	1	
2	Bolt (with washer)	2	
3	Fitting plate ass'y	1	
4	Grommet	1	
5	PTT motor lead and trim sensor lead	1	PTT model **NOTE:** Disconnect the leads from the clamp.
6	Grommet	1	**NOTE:** When installing the trim sensor leads and PTT motor leads, align the taped end ⓐ of the PTT motor leads with the end of the grommet.
7	Bolt	4	6 × 30 mm
8	Plane washer	4	
9	Bottom cowling ass'y	1	
10	Seal rubber	1	
11	Collar	4	
12	Grommet	4	
13	Grommet	1	
	SHIFT ACTUATOR ASS'Y		
①	Plug screw	1	
②	Spring	1	
③	Ball	1	
④	Clip	1	
⑤	Clip	1	
⑥	Bushing	1	
⑦	Plane washer	1	
⑧	Shift rod lever	1	
⑨	Cotter pin	1	
⑩	Plane washer	1	
⑪	Shift actuator	1	
⑫	Bushing	1	
⑬	Shift rod	1	
			Reverse the removal steps for installation.

UPPER CASE REMOVAL
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	UPPER CASE REMOVAL		Follow the left "Step" for removal.
	Power unit		Refer to "POWER UNIT REMOVAL" in chapter 5.
	Lower unit ass'y		Refer to "LOWER UNIT REMOVAL" in chapter 6.
	Bottom cowling		Refer to "SHIFT ACTUATOR AND BOTTOM COWLING".
1	Bolt (with washer)	1	6 × 12 mm
2	Bolt (with washer)	4	8 × 30 mm
3	Lower mount housing	2	
4	Mount damper	2	
5	Nut	2	
6	Nut	2	
7	Plane washer	2	12.8 × 22.5 mm
8	Lead wire	1	
9	Plane washer	2	12.8 × 22.5 mm
10	Upper case ass'y	1	
11	Lower rubber mount	2	
12	Washer	2	
13	Plane washer	2	13 × 34 mm
14	Mounting bolt	2	
15	Bolt (with washer)	3	8 × 35 mm
16	Upper rubber mount	1	
17	Plate	1	
18	Plane washer	2	
19	Mounting bolt	2	
			Reverse the removal steps for installation.

SERVICE POINTS

Rubber mount inspection

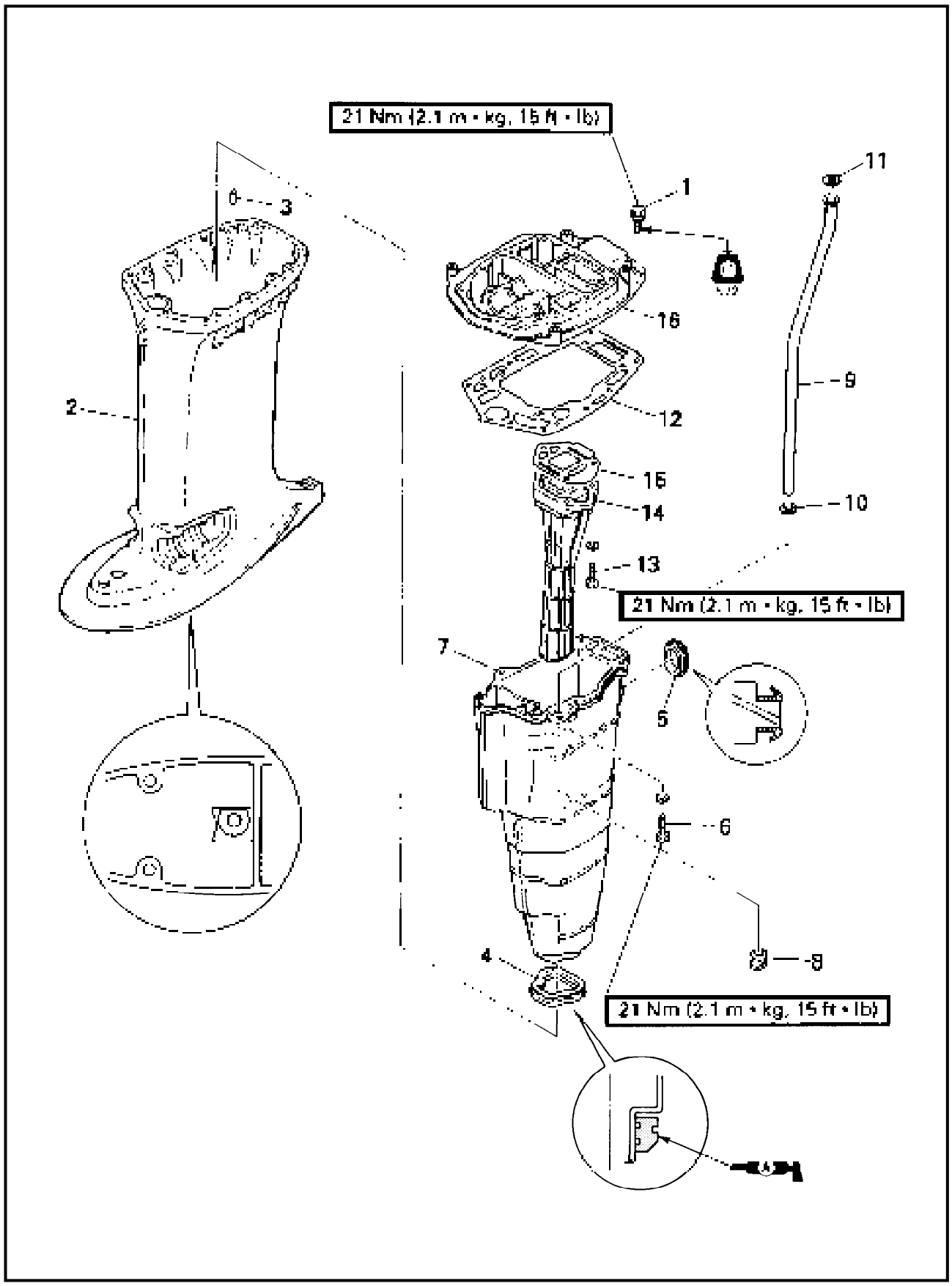
1. Inspect:
   - Rubber mount
     Wear/Crack/Damage → Replace.

Mount bolt inspection

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

UPPER CASE AND EXHAUST MANIFOLD

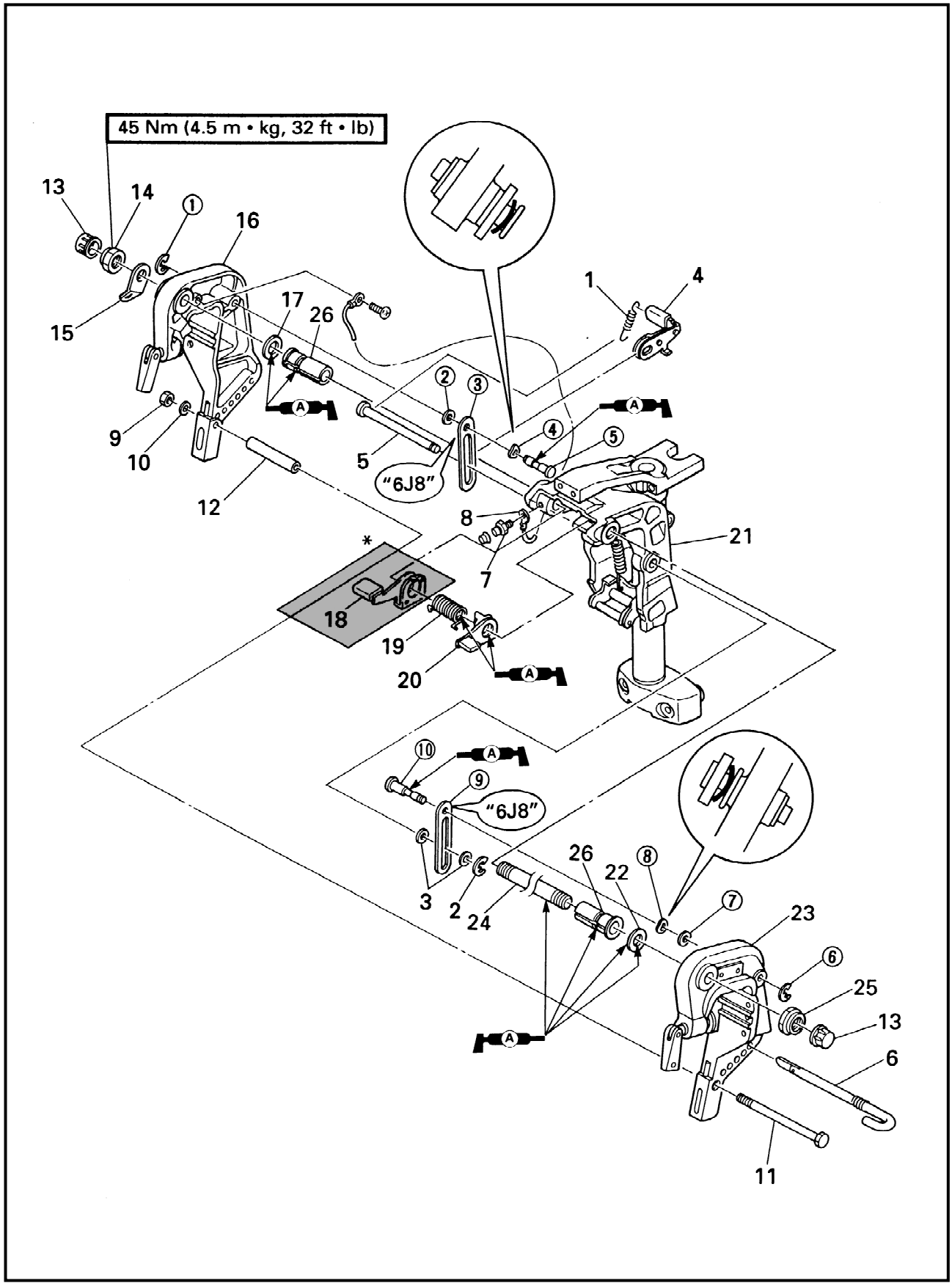
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	UPPER CASE AND EXHAUST MANIFOLD		Follow the left "Step" for removal.
	Upper case ass'y		Refer to "UPPER CASE REMOVAL".
1	Bolt (with washer)	2	
2	Upper case	1	
3	Dowel pin	2	
	EXHAUST MANIFOLD REMOVAL		
4	Muffler seal	1	
5	Seal rubber	1	
6	Bolt (with washer)	4	8 × 30 mm
7	Exhaust guide	1	
8	Grommet	1	
9	Water tube	1	
10	Seal rubber	1	
11	Washer	1	
12	Upper case gasket	1	
13	Bolt (with washer)	3	8 × 30 mm
14	Exhaust manifold	1	
15	Exhaust manifold gasket	1	
16	Muffler	1	
			Reverse the removal steps for installation.

CLAMP BRACKET (Manual tilt)
EXPLODED DIAGRAM

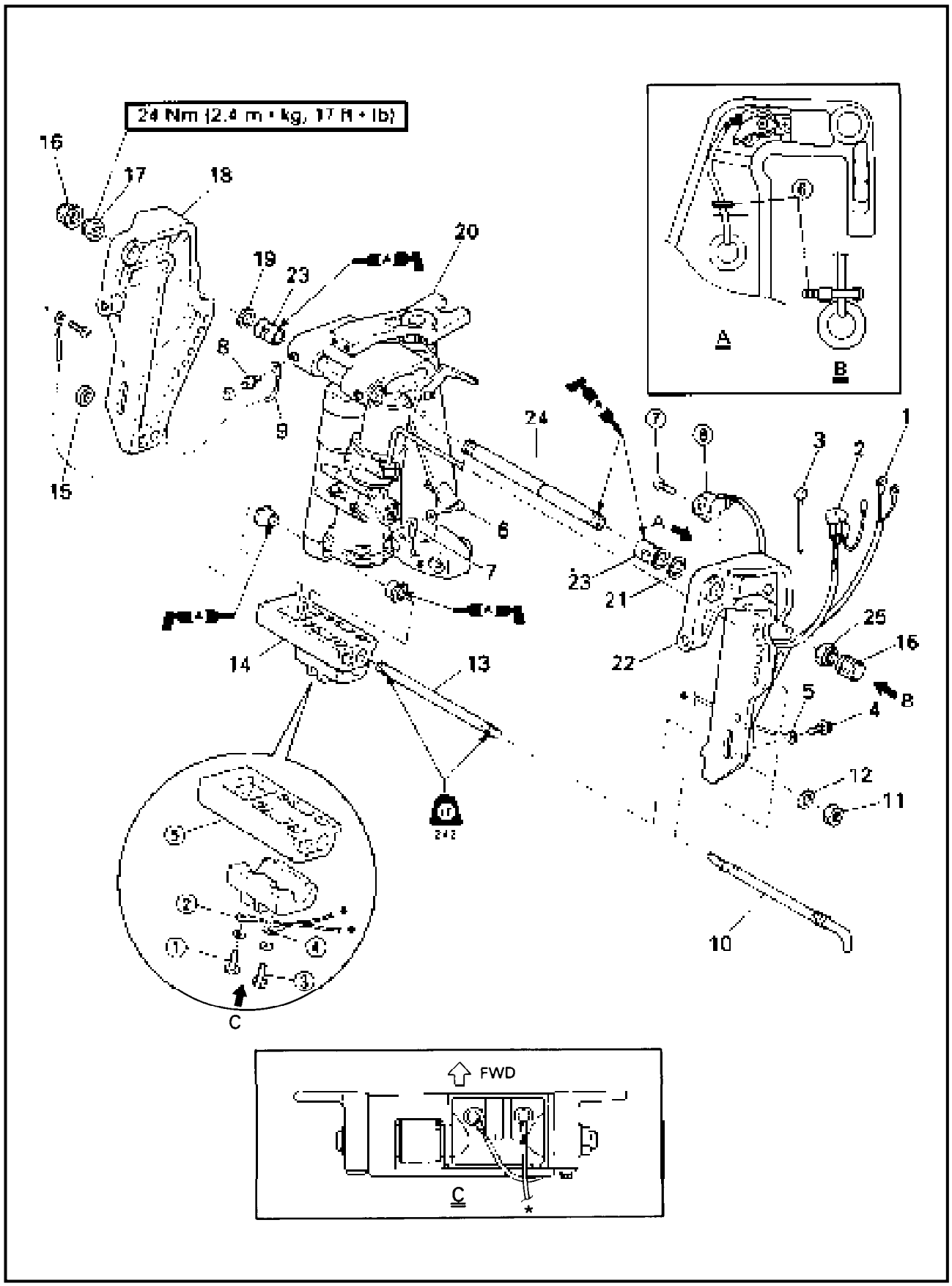


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CLAMP BRACKET REMOVAL (Manual tilt)		Follow the left "Step" for removal.
	Upper case ass'y		Refer to "UPPER CASE REMOVAL".
1	Spring	1	
2	Circlip	1	
3	Plane washer	2	
4	Tilt stop lever	1	
5	Pin	1	
6	Tilt pin	1	
7	Grease nipple	1	
8	Lead wire	1	
9	Nut	1	
10	Plane washer	1	
11	Bolt	1	
12	Collar	1	
13	Cap	2	
14	Self lock nut	1	
15	Clamp bracket plate	1	
16	Clamp bracket 2 ass'y	1	
17	Plane washer	1	
18	Shallow water drive lever	1	*: Shallow water drive model
19	Spring	1	
20	Tilt lever	1	
21	Swivel bracket ass'y	1	
22	Plane washer	1	
23	Clamp bracket 1 ass'y	1	
24	Clamp bracket bolt	1	
25	Self lock nut	1	
26	Bushing	2	
	CLAMP BRACKET DISASSEMBLY		
①	Circlip	1	
②	Plane washer	1	
③	Clamp bracket plate	1	
④	Wave washer	1	
⑤	Pin	1	
⑥	Circlip	1	
⑦	Plane washer	1	
⑧	Wave washer	1	
⑨	Clamp bracket plate	1	
⑩	Pin	1	
			Reverse the removal steps for installation.

CLAMP BRACKET (Hydro tilt, Power trim and tilt)

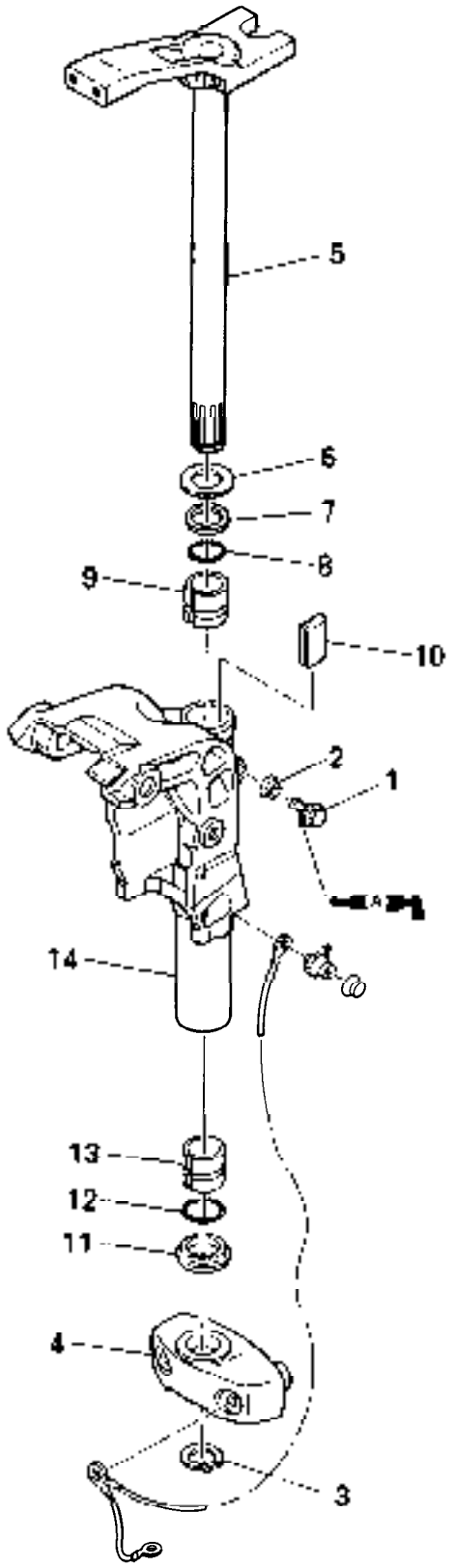
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	CLAMP BRACKET REMOVAL (Hydro tilt, Power trim and tilt)		Follow the left "Step" for removal.
	Upper case ass'y		Refer to "UPPER CASE REMOVAL".
1	PTT motor lead	1	PTT model
2	Trim sensor coupler	1	
3	Band	3	PTT motor lead - Trim sensor lead
4	Bolt (with washer)	1	6 × 10 mm
5	Wire lead	1	
6	Bolt (with washer)	1	PTT model 6 × 10 mm
7	Wire lead	1	
8	Grease nipple	1	
9	Wire lead	1	
10	Tilt rod ass'y	1	
11	Nut	1	
12	Plane washer	1	
13	Stud bolt	1	
14	Clamp bracket spacer ass'y	1	
15	Nut	1	
16	Cap	2	
17	Self lock nut	1	
18	Clamp bracket 2	1	
19	Plane washer	1	
20	Swivel bracket ass'y	1	
21	Plane washer	1	
22	Clamp bracket 1	1	
23	Bushing	2	
24	Clamp bracket bolt	1	
25	Self lock nut	1	**NOTE:** Before installing the clamp bracket bolt, tighten the nut on its grooved side until it stops.
	ANODE REMOVAL		
①	Bolt (with washer)	1	
②	Wire lead	1	
③	Bolt (with washer)	1	PTT model
④	Wire lead	1	
⑤	Anode	1	
	TRIM SENSOR REMOVAL		
⑥	Band	1	PTT model
⑦	Screw	2	6 × 16 mm
⑧	Trim sensor	1	
			Reverse the removal steps for installation.

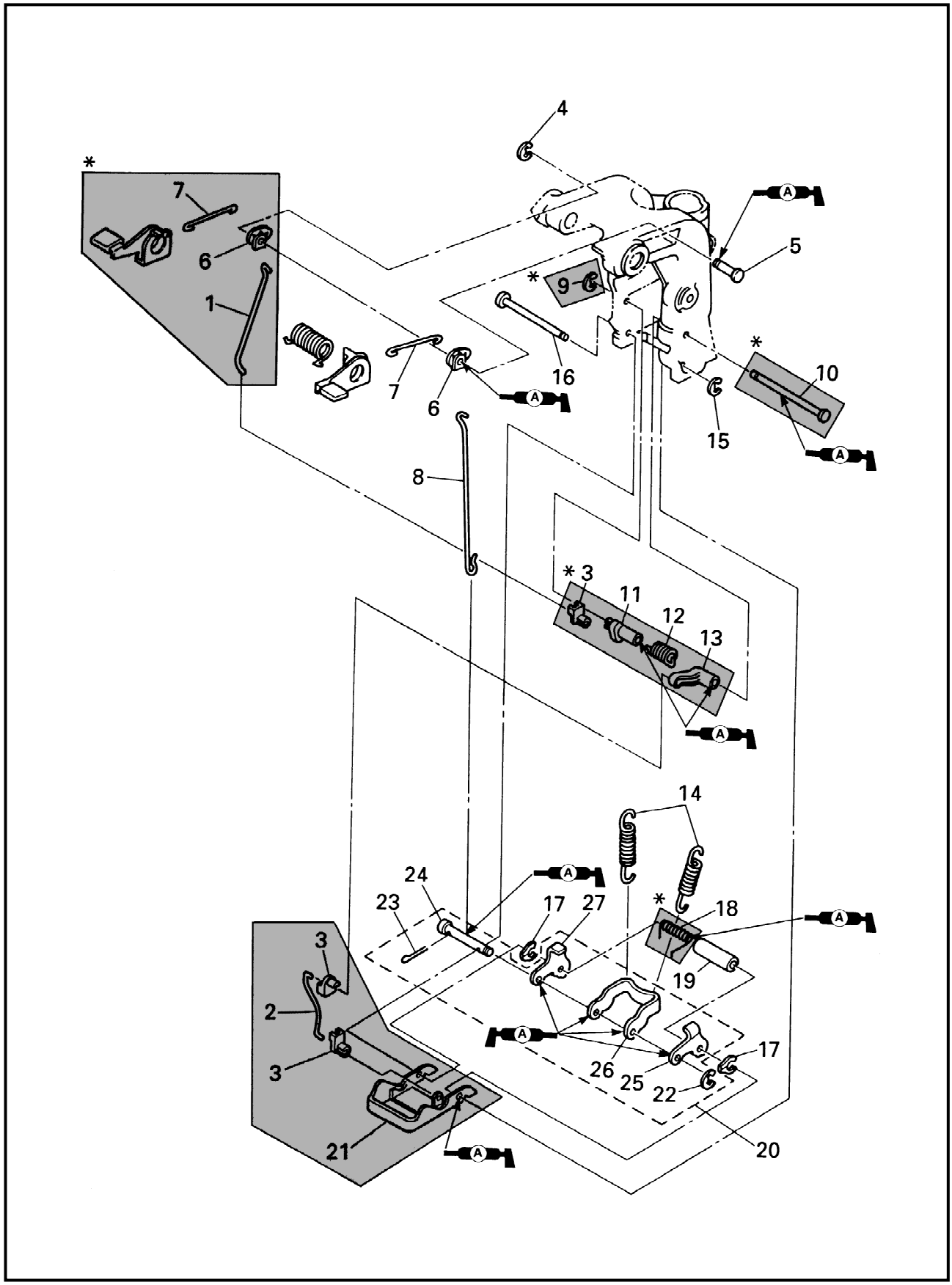
STEERING BRACKET
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	STEERING BRACKET REMOVAL		Follow the left "Step" for removal.
	Upper case ass'y		Refer to "UPPER CASE REMOVAL".
1	Flange bolt	1	Manual tilt model
2	Seal rubber	1	
3	Circlip	1	
4	Lower mount housing	1	
5	Steering bracket	1	
6	Plane washer	1	
7	Bushing	1	
8	O-ring	1	
9	Bushing	1	
10	Friction piece	1	Manual tilt model
11	Bushing	1	
12	O-ring	1	
13	Bushing	1	
14	Swivel bracket ass'y	1	
			Reverse the removal steps for installation.

SWIVEL BRACKET
EXPLODED DIAGRAM

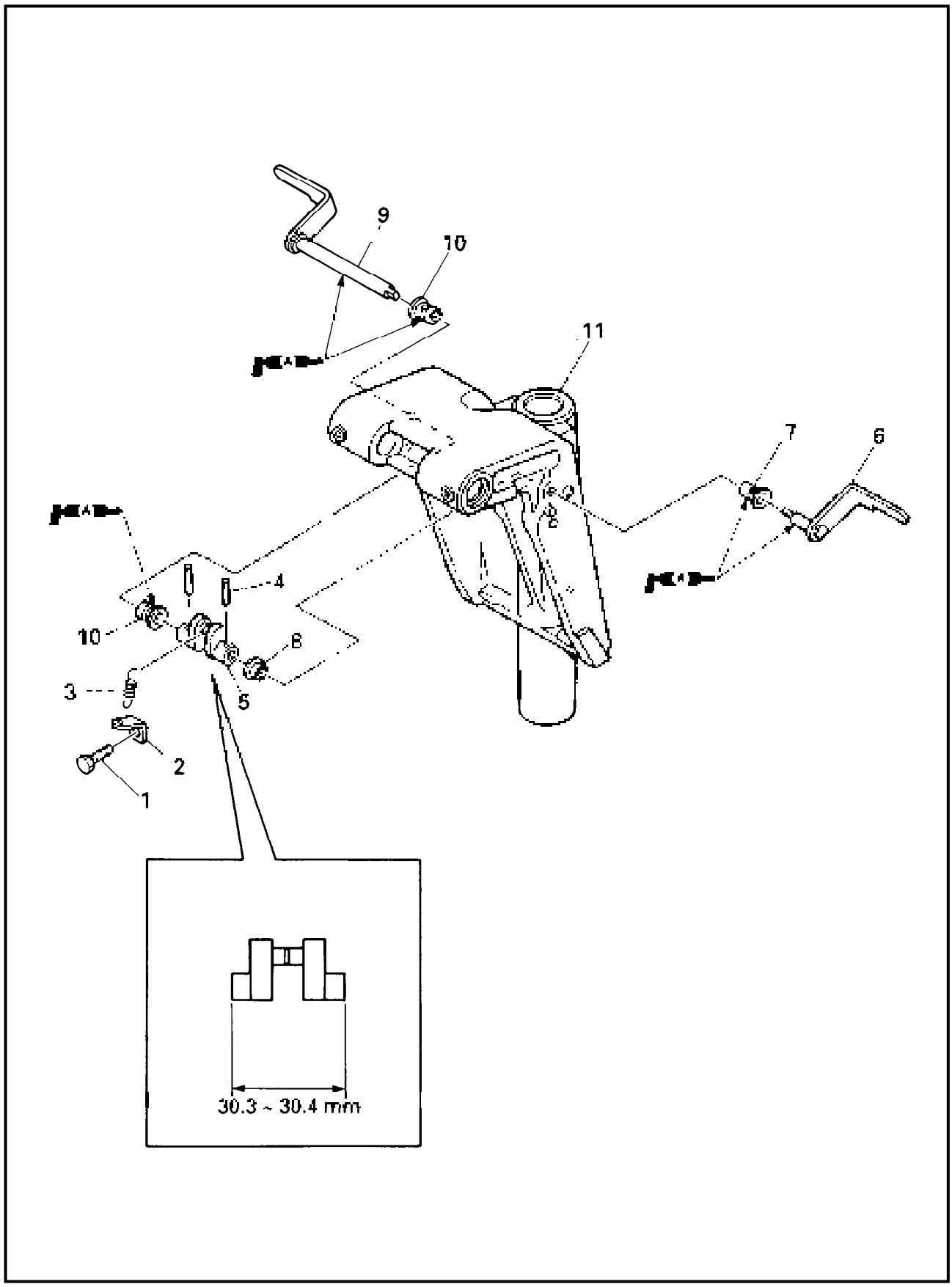


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	SWIVEL BRACKET REMOVAL (Manual tilt)		Follow the left "Step" for removal.
	Upper case ass'y		Refer to "UPPER CASE REMOVAL".
	Clamp bracket		Refer to "CLAMP BRACKET".
	Steering bracket		Refer to "STEERING BRACKET".
1	Tilt lock rod 1	1	Shallow water drive model
2	Tilt lock rod 2	1	
3	Rod joint	3	
4	Clip	1	
5	Tilt lever shaft	1	
6	Tilt lever	1, 2*	*: Shallow water drive model
7	Tilt lock rod 3	1, 2*	
8	Tilt lock rod 4	1	
9	Clip	1	*: Shallow water drive model
10	Pin	1	
11	Lever 1	1	
12	Spring	1	
13	Lever 2	1	
14	Spring	2	
15	Clip	1	
16	Tilt lock plate shaft	1	
17	Washer	2	
18	Spring	1	*: Shallow water drive model
19	Collar	1	
20	Tilt lock ass'y	1	
21	Shallow water drive lever	1	*: Shallow water drive model
22	Clip	1	
23	Cotter pin	2	
24	Tilt lock shaft	1	
25	Tilt lock plate 1	1	
26	Tilt lock arm	1	
27	Tilt lock plate 2	1	
			Reverse the removal steps for installation.

SWIVEL BRACKET DISASSEMBLY

EXPLODED DIAGRAM



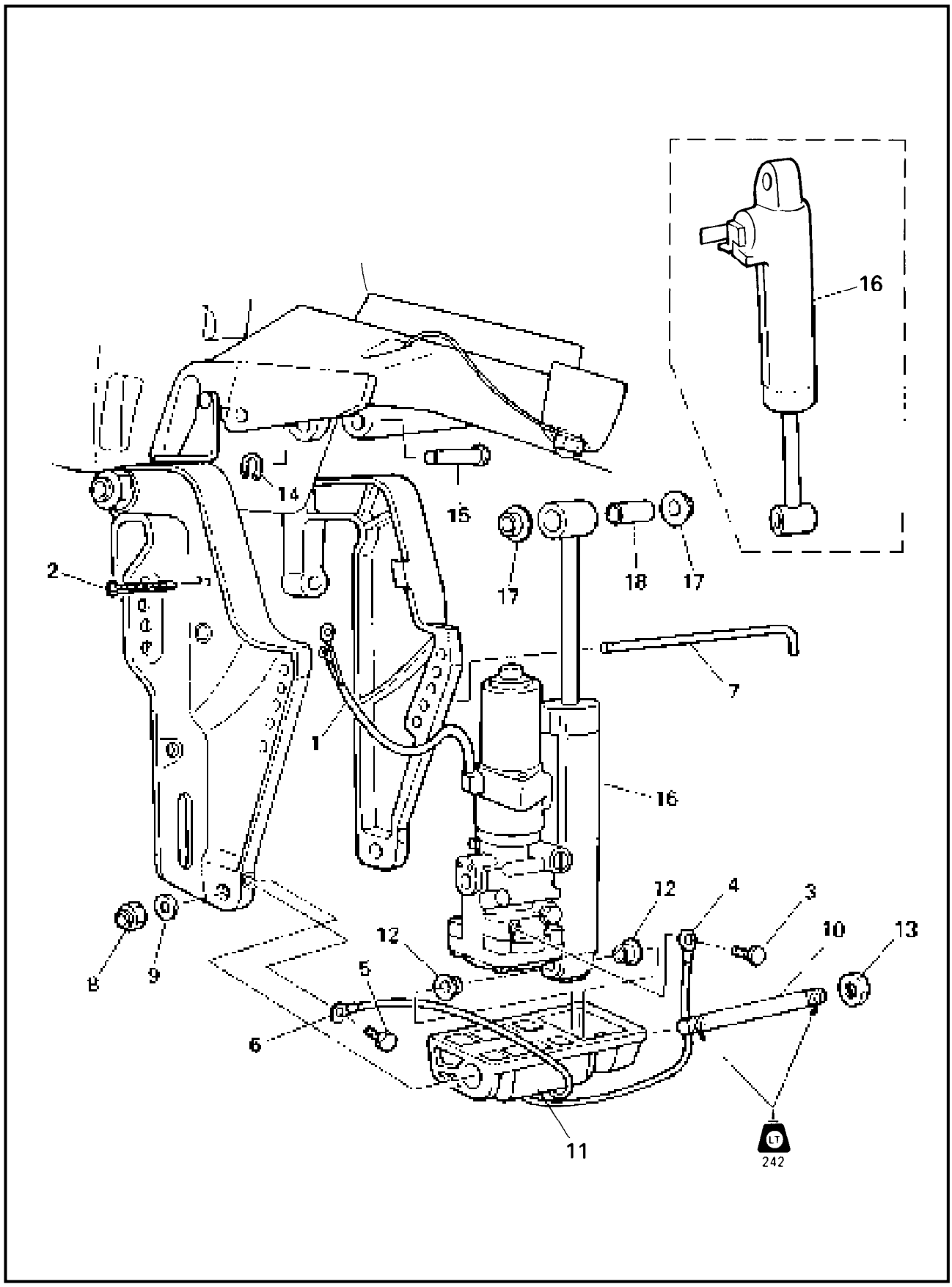
SWIVEL BRACKET DISASSEMBLY

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	SWIVEL BRACKET REMOVAL (Hydro tilt, power trim and tilt)		Follow the left "Step" for removal.
	Upper case ass'y		Refer to "UPPER CASE REMOVAL".
	Clamp bracket		Refer to "CLAMP BRACKET".
	Steering bracket		Refer to "STEERING BRACKET".
1	Bolt (with washer)	1	6 × 10 mm
2	Spring hook	1	
3	Spring	1	
4	Spring pin	2	
5	Distance collar ass'y	1	
6	Tilt support lever 1	1	
7	Bushing	1	
8	Bushing	1	
9	Tilt support lever 2	1	
10	Bushing	2	
11	Swivel bracket	1	
			Reverse the removal steps for installation.

TILT UNIT REMOVAL

EXPLODED DIAGRAM

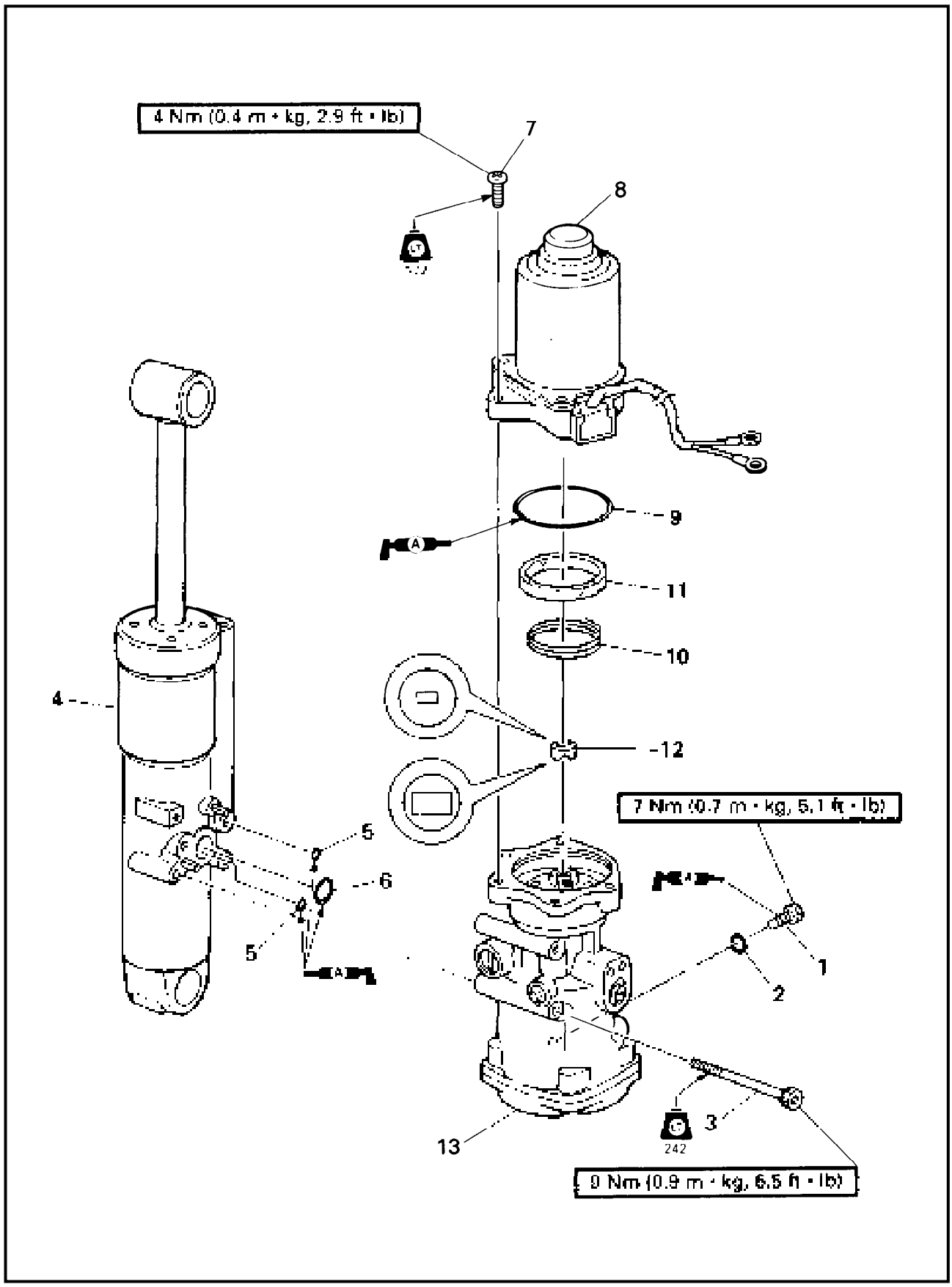


REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	TILT UNIT REMOVAL		Follow the left "Step" for removal.
	Tilt up		**NOTE:** Turn the tilt support lever toward clamp bracket and support the outboard.
1	PTT motor lead	1	PTT model
2	Band	3	PTT motor lead - Trim sensor lead
3	Bolt (with washer)	1	6 × 10 mm
4	Wire lead	1	
5	Bolt (with washer)	1	
6	Wire lead	1	
7	Tilt rod ass'y	1	
8	Nut	1	
9	Plane washer	1	
10	Stud bolt	1	
11	Clamp bracket spacer ass'y	1	
12	Bushing	2	
13	Nut	1	
14	Crip	2	
15	Shaft pin	1	
16	Tilt unit	1	
17	Bushing	2	
18	Collar	1	
			Reverse the removal steps for installation.

TILT CYLINDER, PUMP HOUSING AND MOTOR REMOVAL

EXPLODED DIAGRAM



TILT CYLINDER, PUMP HOUSING AND MOTOR REMOVAL

REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	TILT CYLINDER, PUMP HOUSING AND MOTOR REMOVAL		Follow the left "Step" for removal.
	Power trim and tilt unit		Refer to "TILT UNIT REMOVAL".
1	Plug screw	1	Drain hydraulic oil.
			⚠ WARNING **When removing the plug screw, PTT unit should be fully tilt up positioned.**
2	O-ring	1	12.6 × 8.8 mm
3	Socket bolt	3	
4	Tilt cylinder ass'y	1	
5	O-ring	2	8.5 × 5.5 mm
6	O-ring	1	17.5 × 14.5 mm
7	Screw	3	
8	PTT motor ass'y	1	
9	O-ring	1	65.3 × 59.4 mm
10	Spring	1	
11	Filter	1	
12	Connector shaft	1	
13	Pump housing ass'y	1	
			Reverse the removal steps for installation.

SERVICE POINTS

⚠ WARNING

- **The PTT unit should be fully tilt up positioned (all the tilt rod should be fully lengthen) for disassembly to cancel the internal pressure and prevent the hydraulic fluid from spurting out.**
- **After removing the tilt motor or oil reservoir, do not push down the tilt rod. It may cause hydraulic fluid to spurt out from the port.**

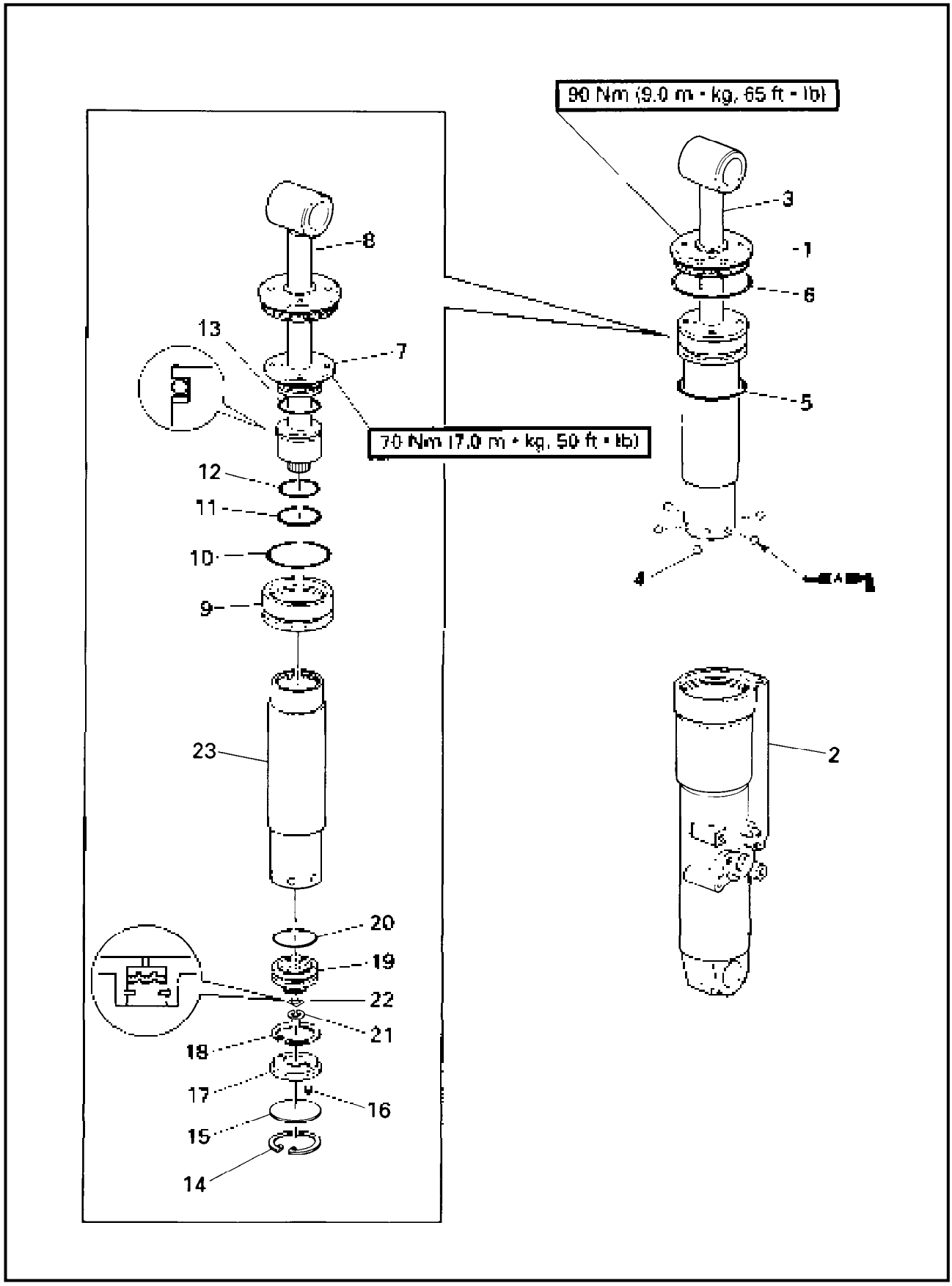
CAUTION:

Do not wipe components of the hydraulic system with rags, paper, tissues, or the like as fibers from such material will cause malfunction if they enter the system.

NOTE:

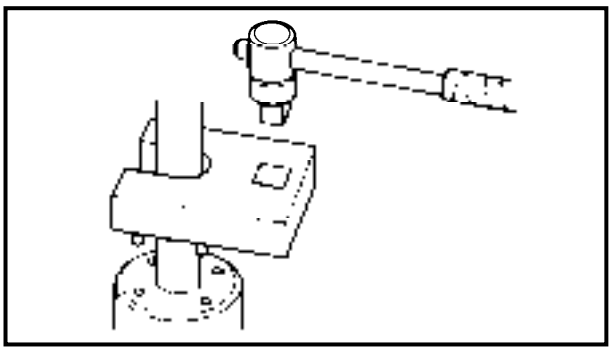
Tilt cylinder removal is not required for the cylinder repair.

TILT CYLINDER
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

Step	Procedure/Part name	Q'ty	Service points
	TILT CYLINDER DISASSEMBLY		Follow the left "Step" for removal.
	Tilt cylinder ass'y		Refer to "TILT CYLINDER, PUMP HOUSING AND MOTOR REMOVAL".
1	Tilt cylinder end screw	1	
2	Tilt cylinder	1	
3	Tilt rod ass'y	1	
4	Ball	6	3.18 mm
			NOTE: Be sure to remove the steel balls on the lower side of the inner cylinder when removing the tilt cylinder.
5	O-ring	1	54.7 × 47.7 mm
6	O-ring	1	58.5 × 54.5 mm
7	Inner cylinder end screw	1	
8	Tilt rod sub ass'y	1	
9	Trim piston	1	
10	O-ring	1	50.7 × 43.7 mm
11	Backup ring	1	
12	O-ring	1	35.7 × 28.7 mm
13	O-ring	1	39.0 × 35.0 mm
14	Circlip (larger)	1	
15	Valve plate	1	
16	Spring	2	
17	Stopper plate	1	
18	Circlip (smaller)	1	
19	Free piston	1	
20	O-ring	1	35.7 × 28.7 mm
21	Circlip	1	
22	Valve seal	1	
23	Inner cylinder	1	
			Reverse the removal steps for installation.



SERVICE POINTS

Tilt cylinder disassembly

1. Loosen:
   - Tilt cylinder end screw

	**Tilt cylinder wrench: YB-06175-2B/90890-06544**

Inner cylinder disassembly

1. Loosen:
   - Inner cylinder end screw

	**Tilt cylinder wrench: YB-06175-2B/90890-06544**

CAUTION:

Vise the top of the inner cylinder with the tilt rod pulled out in its full length, or the cylinder may be deformed.

Tilt rod inspection

1. Inspect:
   - Tilt rod
     Bend/Excessive corrode → Replace.
     Rust lightly → Polish (with #400-600 abrasive paper).

Tilt cylinder inspection

1. Inspect:
   - Tilt cylinder
     Crack/Excessive corrosion → Replace.
2. Inspect:
   - Cylinder inner
     Scratch on the cylinder inner wall → Replace.

Tilt piston inspection

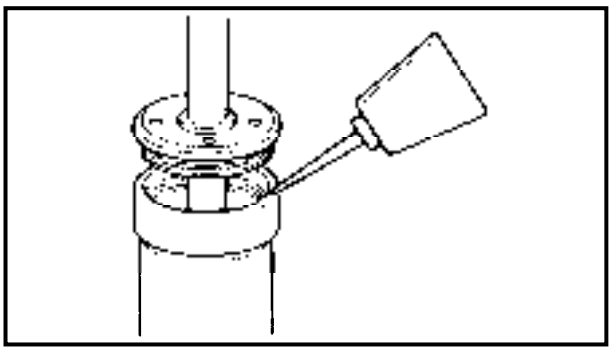
1. Inspect:
   - Tilt piston
     Excessive scratch → Replace.

Spring inspection

1. Inspect:
   - Spring
     Crack/Deformation → Replace.

Free piston inspection

1. Inspect:
   - Free piston
     Excessive scratch → Replace.

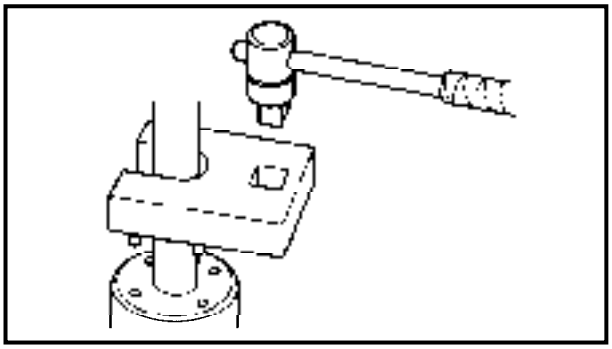


Inner cylinder assembly

1. Fill:
   - ATF (Dexiron type Ⅱ) to inner cylinder.

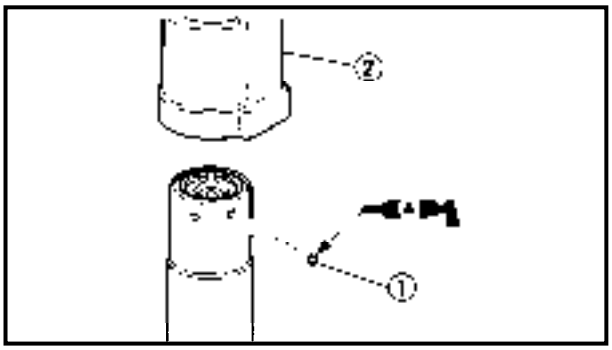
NOTE:

Depress the tilt rod fully and fill the inner cylinder with ATF before installing the end screw.



2. Tighten:
   - Inner cylinder end screw

	**Tilt cylinder wrench: YB-06175-2B/90890-06544**

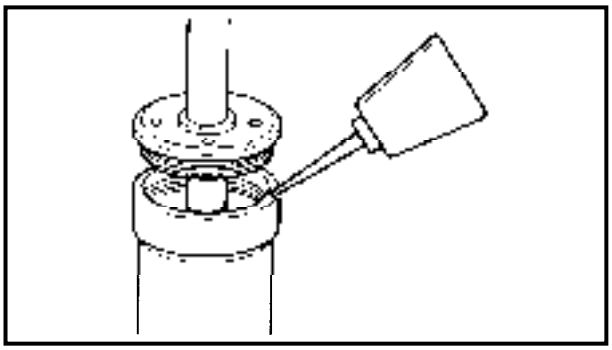


Tilt cylinder assembly

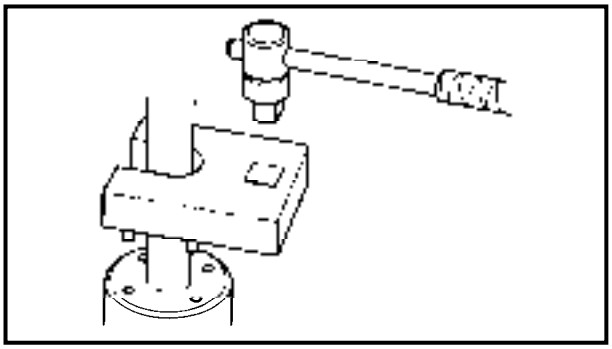
1. Install:
   - Ball ①
   - Tilt cylinder ②

NOTE:

- Apply the grease to the balls to prevent them from falling down.
- To find any ball that may fall, turn the inner cylinder unit upside down to install the tilt cylinder.



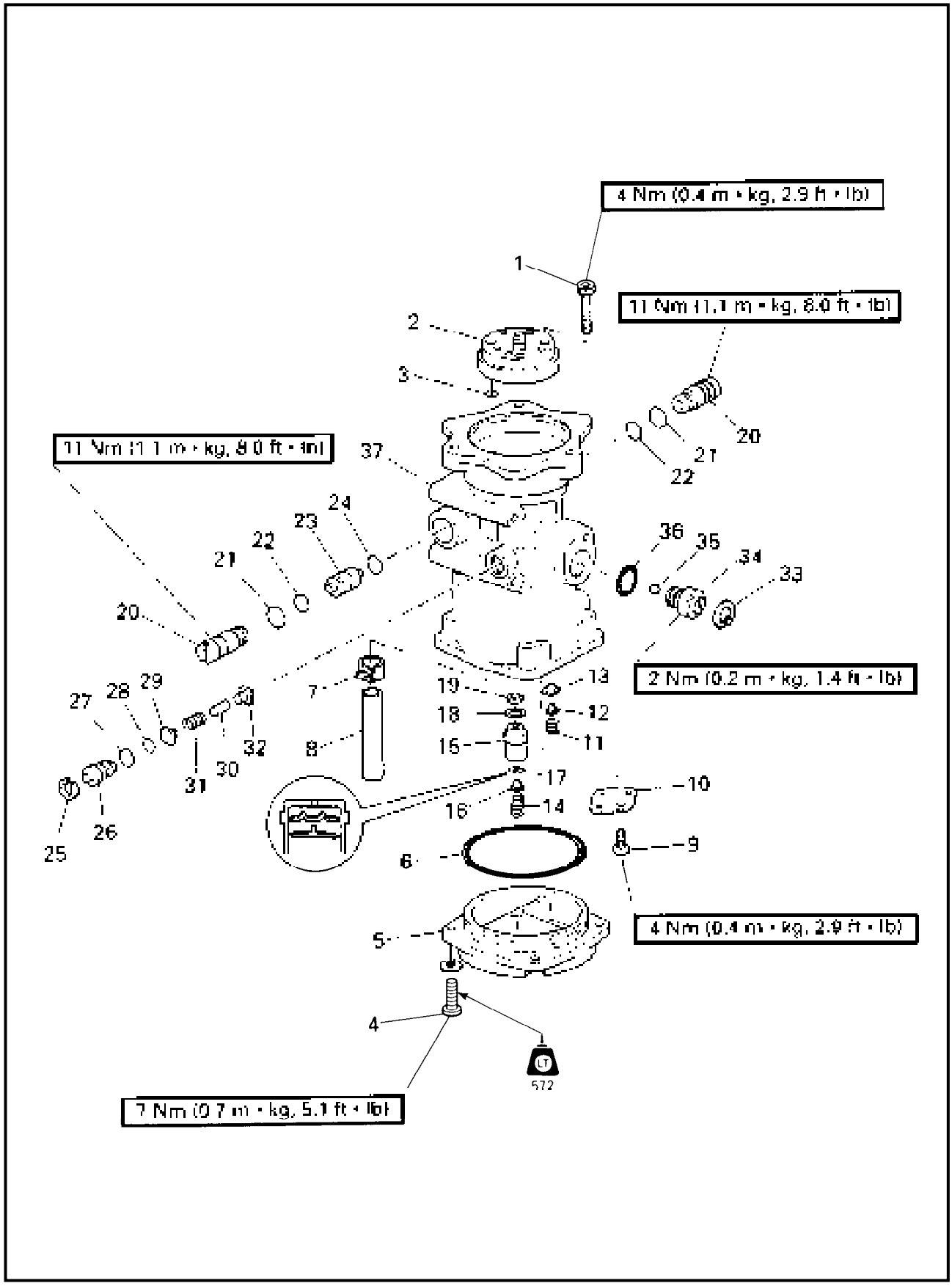
2. Fill:
   - ATF (Dexiron type Ⅱ) to tilt cylinder.



3. Tighten:
   - Tilt cylinder end screw

	**Tilt cylinder wrench: YB-06175-2B/90890-06544**

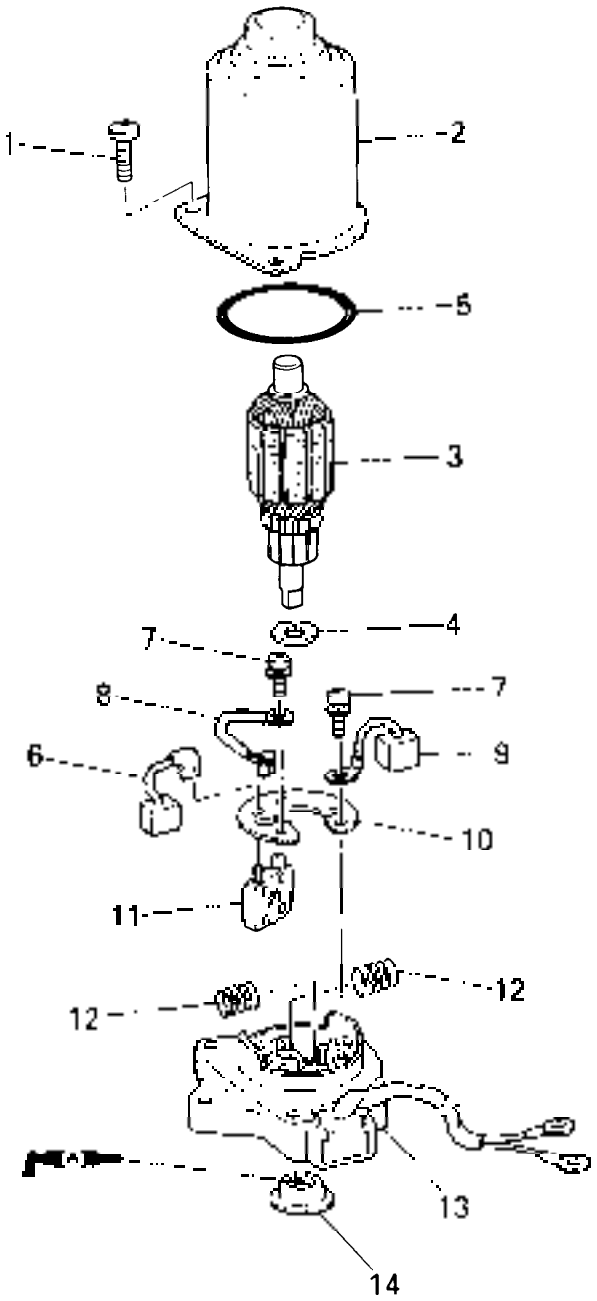
PUMP HOUSING
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

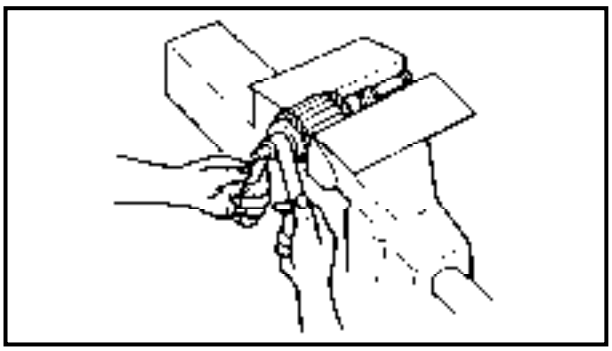
Step	Procedure/Part name	Q'ty	Service points
	PUMP HOUSING DISASSEMBLY		Follow the left "Step" for removal.
	Pump housing ass'y		Refer to "TILT CYLINDER, PUMP HOUSING AND MOTOR REMOVAL".
1	Socket bolt	4	
2	Gear pump	1	
3	O-ring	2	8.5 × 5.5 mm
4	Bolt (with washer)	4	
5	Bottom cover	1	
6	O-ring	1	78.5 × 74.5 mm
7	Clip	1	
8	Inlet hose	1	55 ~ 59 mm
9	Screw	2	
10	Retaining plate	1	
11	Spring	1	8.8 × 4.3 mm
12	Valve support pin	1	
13	Valve seat	1	
14	Spring	1	8.8 × 21.8 mm
15	Valve seat	1	
16	Valve support pin	1	
17	Valve seat	1	
18	O-ring	1	13.7 × 10.7 mm
19	Filter	1	
20	Main valve	2	
21	O-ring	2	17.1 × 12.3 mm
22	O-ring	2	14.5 × 11.5 mm
23	Shuttle piston	1	
24	O-ring	1	12.6 × 8.8 mm
25	Circlip	1	
26	Valve body	1	
27	O-ring	1	10.6 × 6.8 mm
28	O-ring	1	9.6 × 5.8 mm
29	Valve seal	1	
30	Spring	1	6.2 × 27.0 mm
31	Pin	1	
32	Valve seal	1	
33	Circlip	1	
34	Manual valve	1	
35	Ball	1	3.97 mm
36	O-ring	1	22.6 × 17.8 mm
37	Pump housing	1	
			Reverse the removal steps for installation.

PTT MOTOR
EXPLODED DIAGRAM



REMOVAL AND INSTALLATION CHART

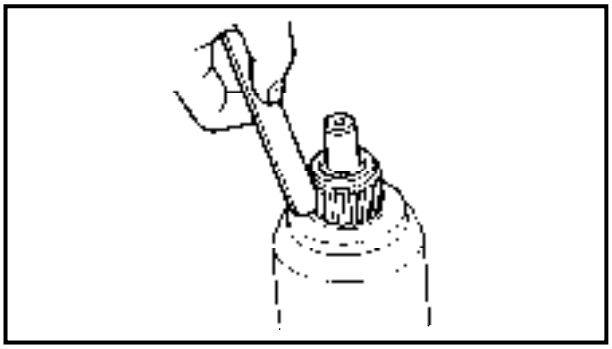
Step	Procedure/Part name	Q'ty	Service points
	POWER TRIM AND TILT MOTOR DISASSEMBLY		Follow the left "Step" for removal.
	Power trim and tilt motor ass'y		Refer to "TILT CYLINDER, PUMP HOUSING AND MOTOR REMOVAL".
1	Screw	3	
2	Stator	1	
3	Armature ass'y	1	**NOTE:** When installing the armature, hold the armature shaft to prevent the armature coming off from the base assembly.
4	Plane washer	1	
5	O-ring	1	55.8 × 52.0 mm
6	Brush ass'y	1	
7	Screw (with washer)	2	
8	Lead wire	1	
9	Brush ass'y	1	
10	Cover plate	1	
11	Circuit breaker	1	
12	Brush spring	2	
13	Base	1	
14	Oil seal	1	
			Reverse the removal steps for installation.



SERVICE POINTS

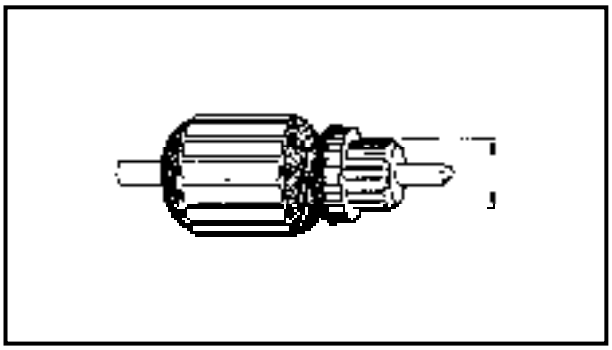
Motor inspection

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



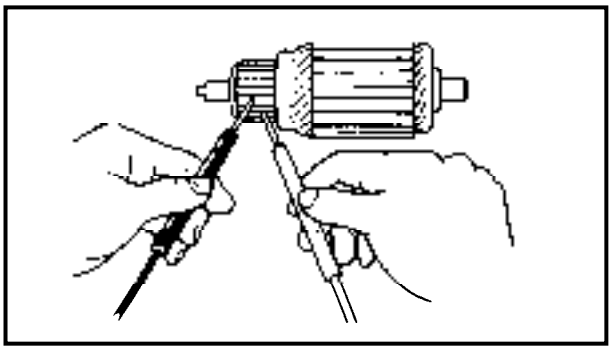
2. Inspect:
   - Segment undercut
     Clog → Clean.

NOTE:
Remove all particles of metal with compressed air.



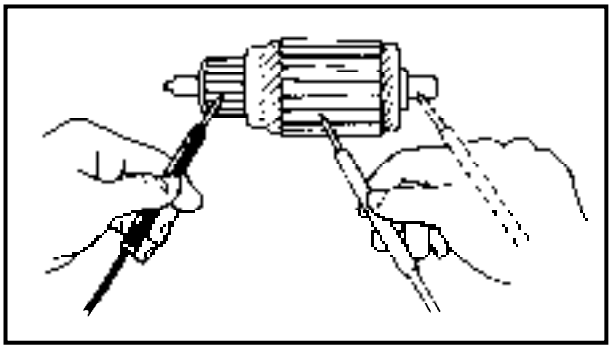
3. Measure:
   - Commutator diameter
     Out of specification → Replace.

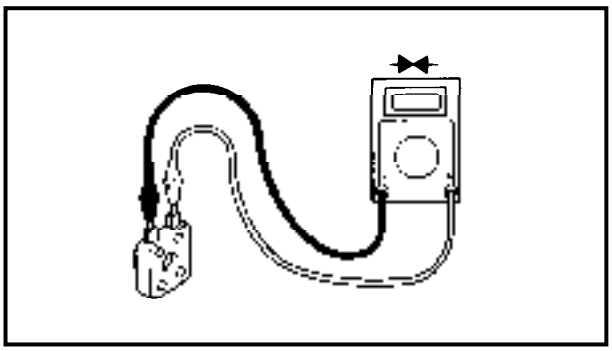
	Commutator diameter: **Limit 21 mm (0.83 in)**



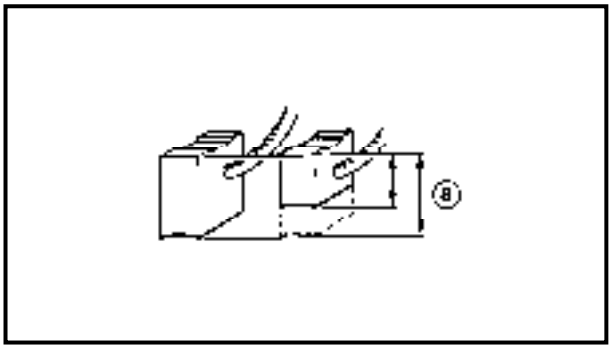
4. Inspect:
   - Armature coil continuity
     Out of specification → Replace.

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



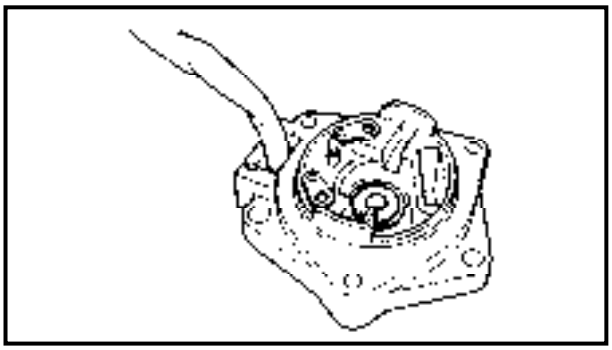


5. Inspect:
   - Circuit breaker
     Discontinuity → Replace.
6. Inspect:
   - Lead wire
     Discontinuity → Replace.



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

	Brush length ⓐ: **Limit 3.5 mm (0.14 in)**



8. Inspect:
   - Base
     Crack/Damage → Replace.
9. Inspect:
   - Stator bushing
   - Base bushing
     Wear/Damage → Replace the stator or the base.
10. Inspect:
    - Base oil seal
      Wear/Damage → Replace.

Motor assembly

1. Check:
   - Motor operation
     Out of specification → Repair.

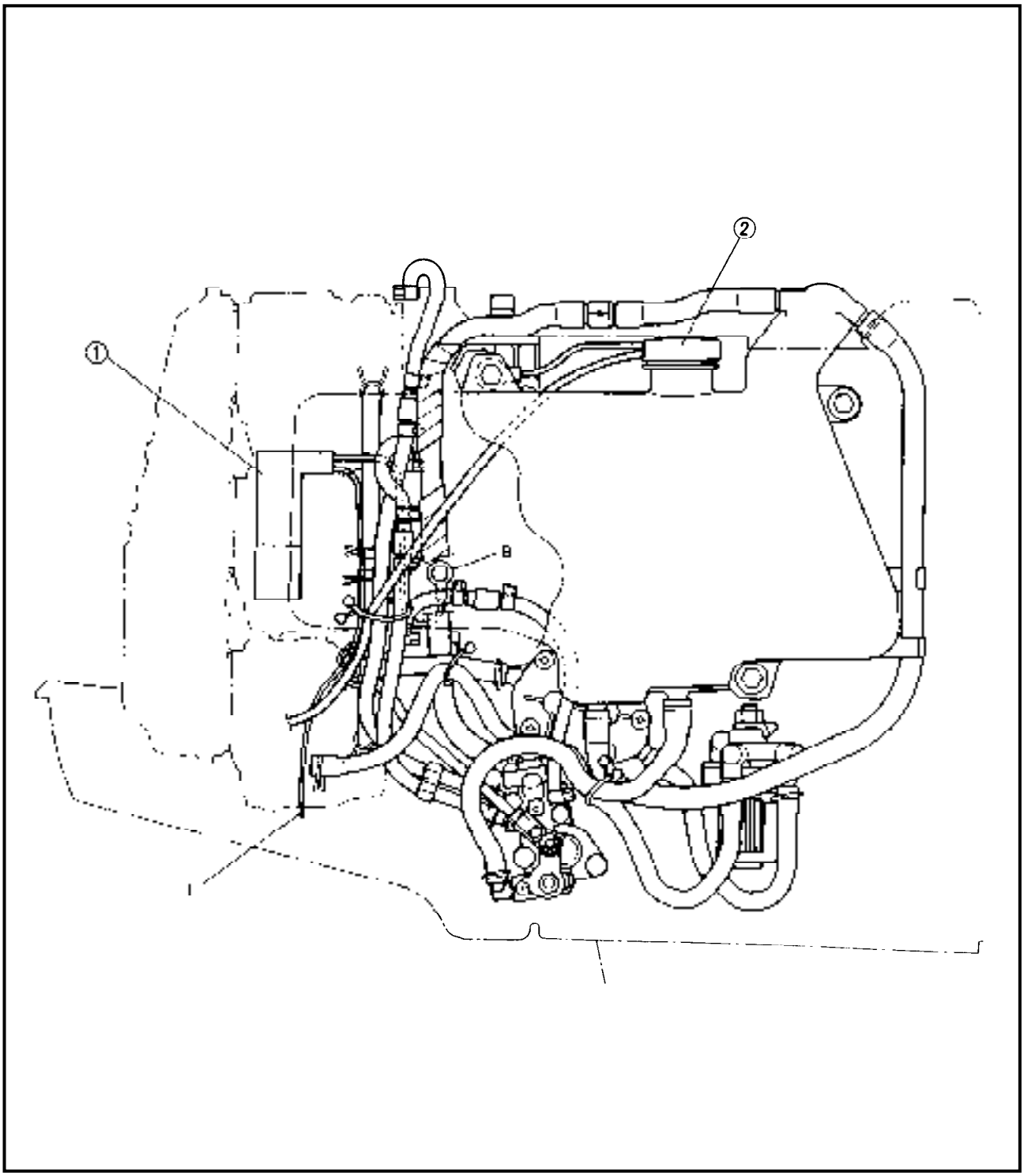
Motor operation:	
Blue (+), Green (–)	**Clockwise**
Green (+), Blue (–)	**Counterclockwise**

CHAPTER 8
ELECTRICAL SYSTEM

ELECTRICAL COMPONENTS
OIL INJECTION MODEL

① Electrothermal valve
② Oil level sensor

L : Blue
B : Black



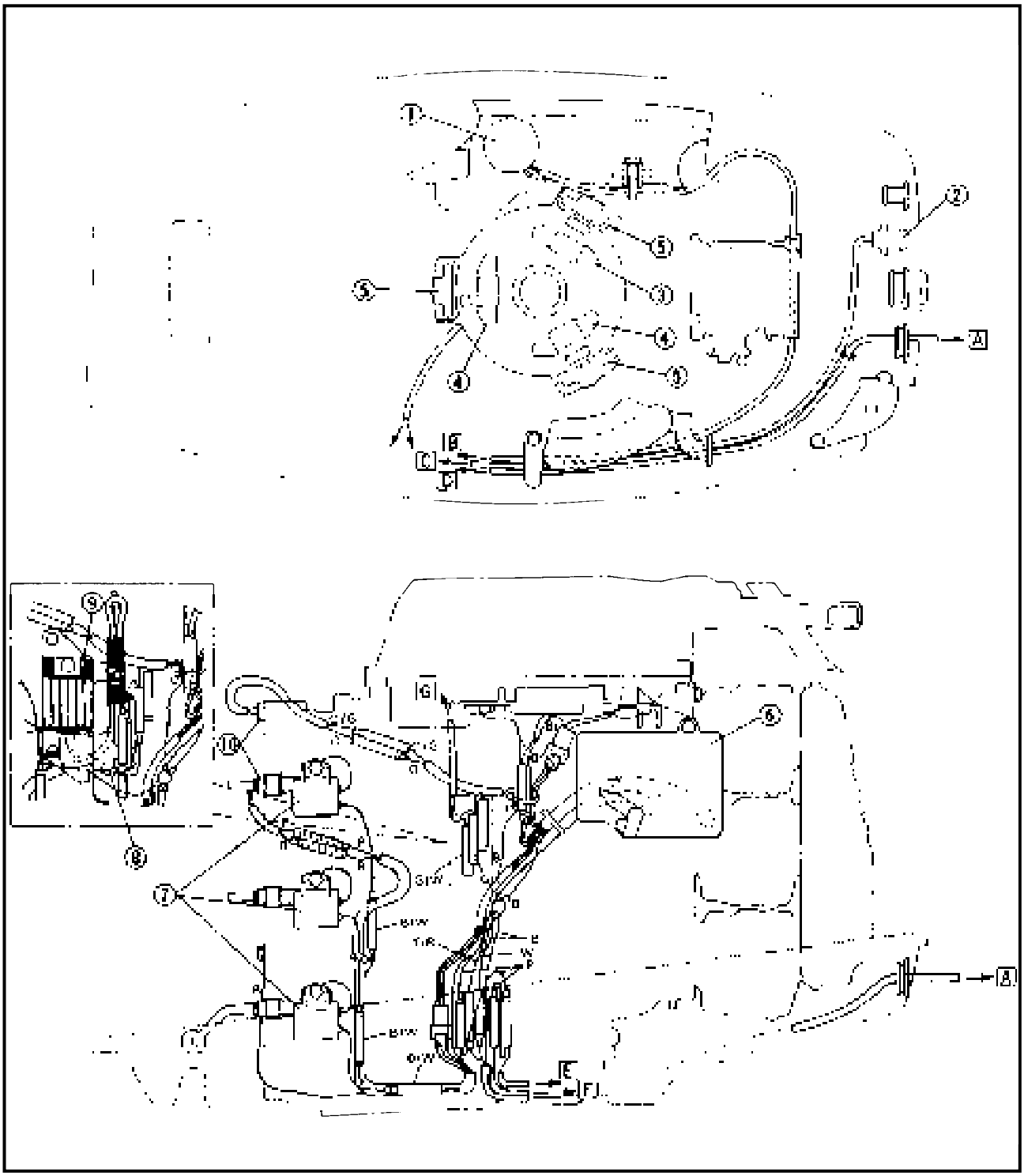
MH, MHO, MO, MDO MODEL

① Oil level sensor
② Warning lamp
③ Charge coil
④ Lighting coil
⑤ Pulser coil
⑥ CDI unit
⑦ Ignition coil
⑧ 2P consent*
⑨ Rectifier regulator*
⑩ Thermo switch

A To engine stop switch
B To ⑥
C To ⑥
D To ⑥
E To ①
F To ②
G To ④

*: Europe model

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

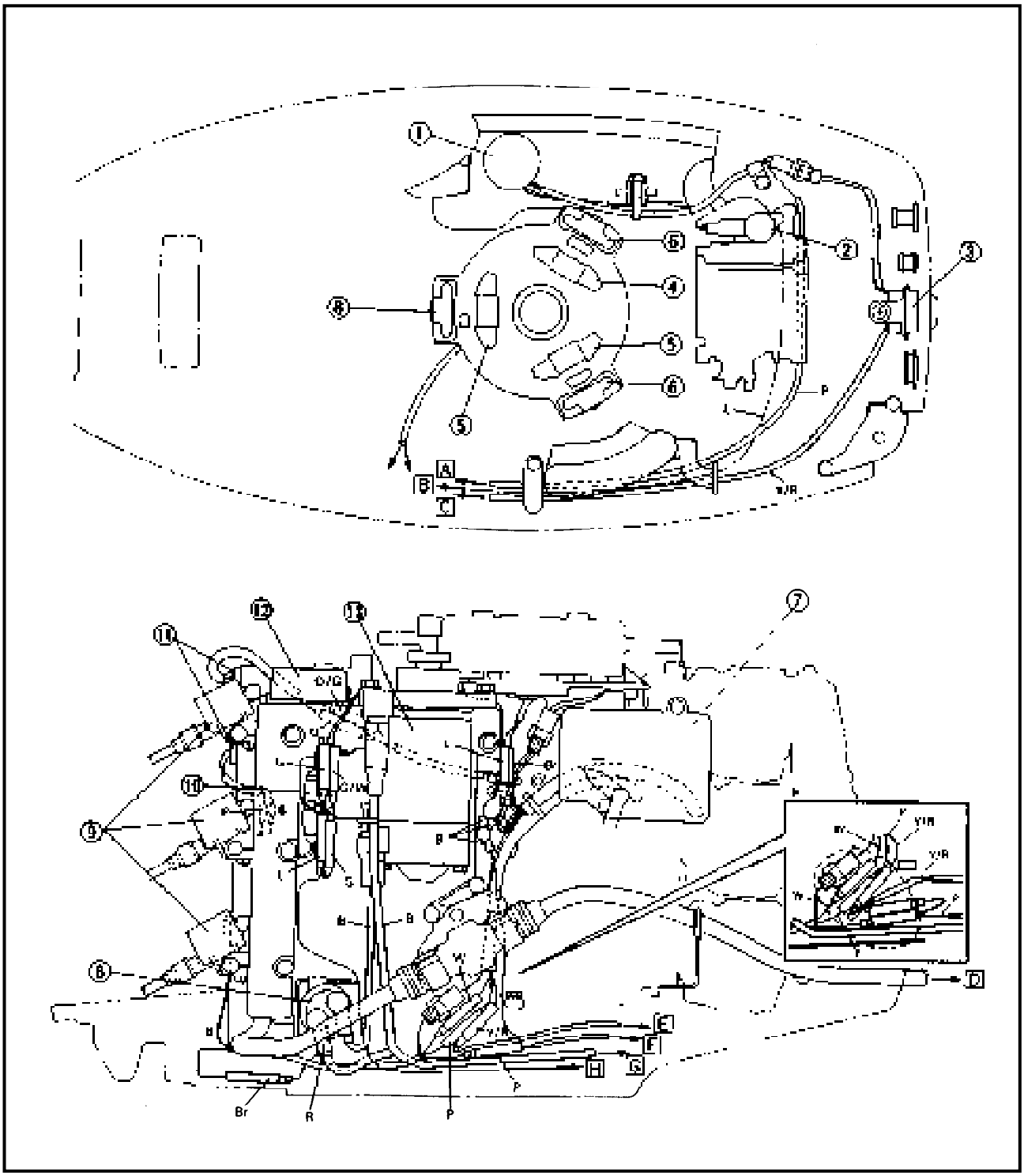


WHD, WH, E, EDO, EO MODEL

① Oil level sensor
② Electrothermal valve
③ Oil level warning lamp
④ Charge coil
⑤ Lighting coil
⑥ Pulser coil
⑦ CDI unit
⑧ Starter relay
⑨ Ignition coil
⑩ Fuse
⑪ Thermo switch
⑫ Rectifier regulator
⑬ Starter motor

A To wire harness
B To ⑤
C To ⑦
D To remote control
E To ③
F To ①
G To battery
H To ②
*: Single lamp model

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

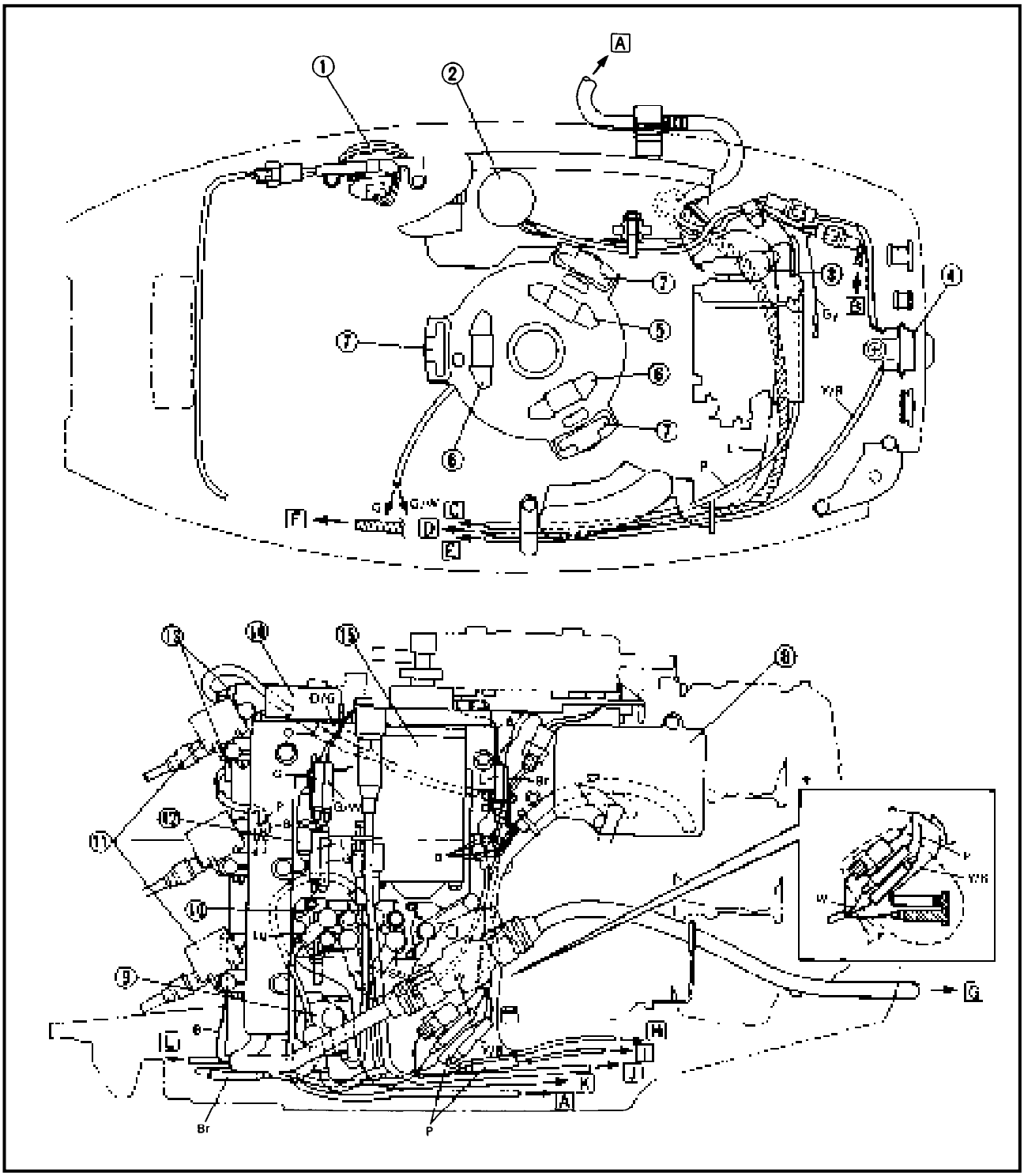


ET, ETO MODEL

① P.T.T. switch
② Oil level sensor
③ Electrothermal valve
④ Oil level warning lamp
⑤ Charge coil
⑥ Lighting coil
⑦ Pulser coil
⑧ CDI unit
⑨ Starter relay
⑩ P.T.T. relay
⑪ Ignition coil
⑫ Fuse
⑬ Thermo switch
⑭ Rectifier regulator
⑮ Starter motor

[A] To P.T.T. motor
[B] To trim meter
[C] To wire harness
[D] To ⑥
[E] To ⑧
[F] To ⑩
[G] To remote control
[H] To ④
[I] To ②
[J] To battery
[K] To ③
[L] To ①
*: ET model

B : Black
Br : Brown
B/O : Black/Orange
B/W : Black/White
B/Y : Black/Yellow
L : Blue
Lg : Light green
O : Orange
O/G : Orange/Green
P : Pink
Sb : Sky blue
Y/R : Yellow/Red
W : White

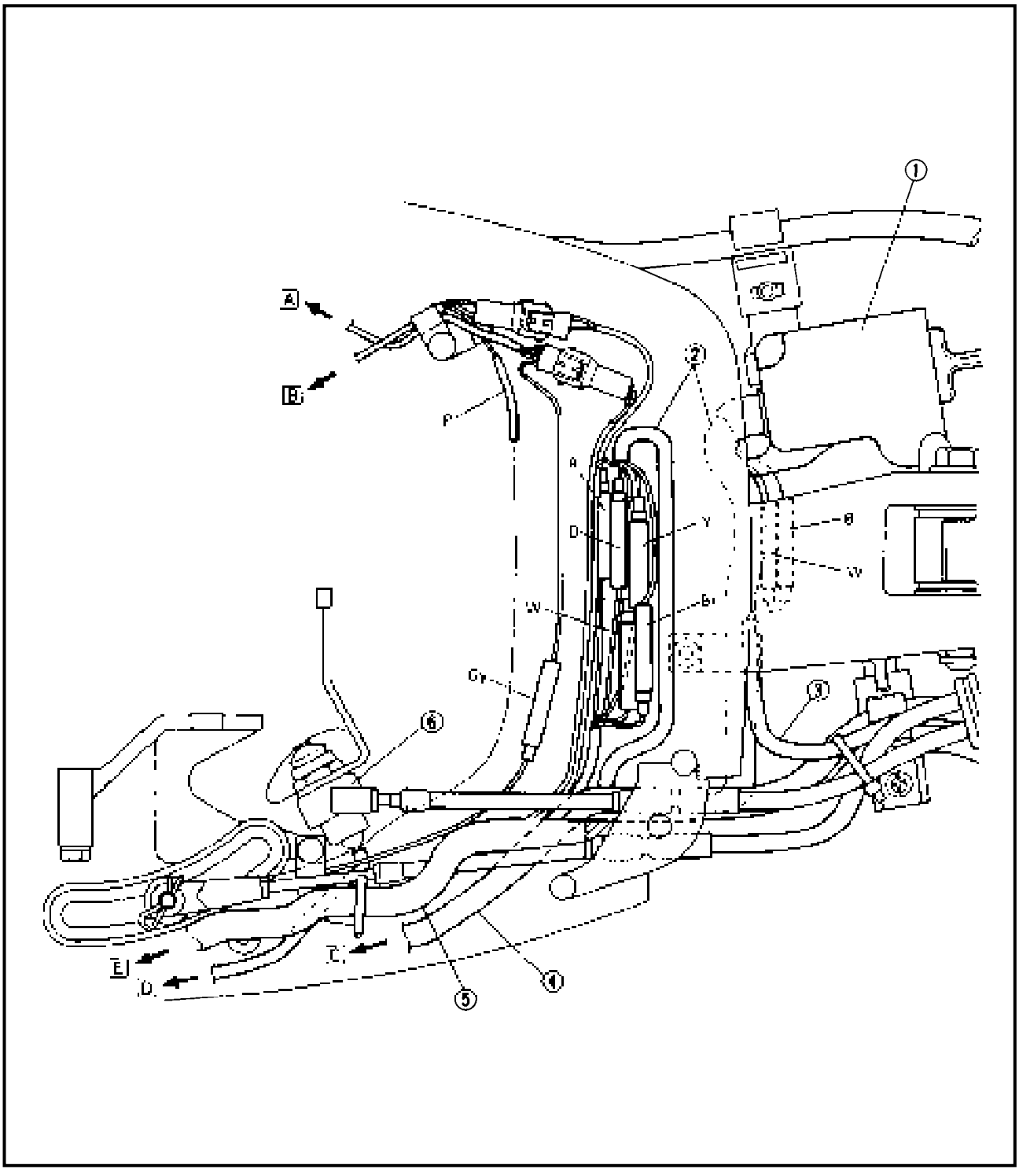


EHTO MODEL

① Main switch
② Main switch lead
③ Engine stop switch lead
④ Battery cable
⑤ Extension wire harness
⑥ Neutral switch

A To trim sensor
B To oil level sensor
C To starter motor and starter relay
D To starter relay
E To 10P coupler

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

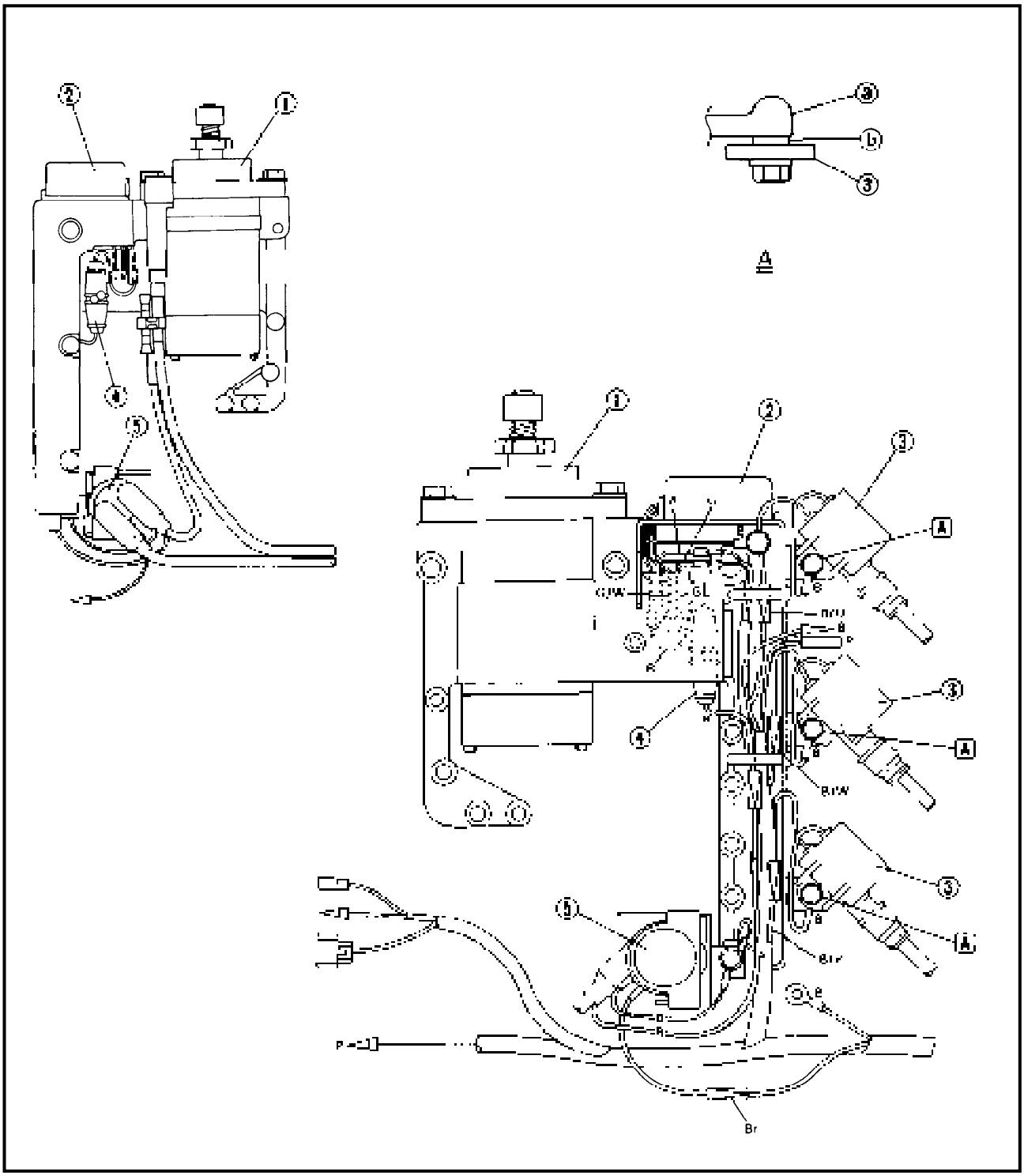


ELECTRICAL UNIT COMPONENTS
E, EO MODEL

① Starter motor
② Rectifier regulator
③ Ignition coil
④ Fuse
⑤ Starter relay

ⓐ Bracket
ⓑ Ground terminal

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

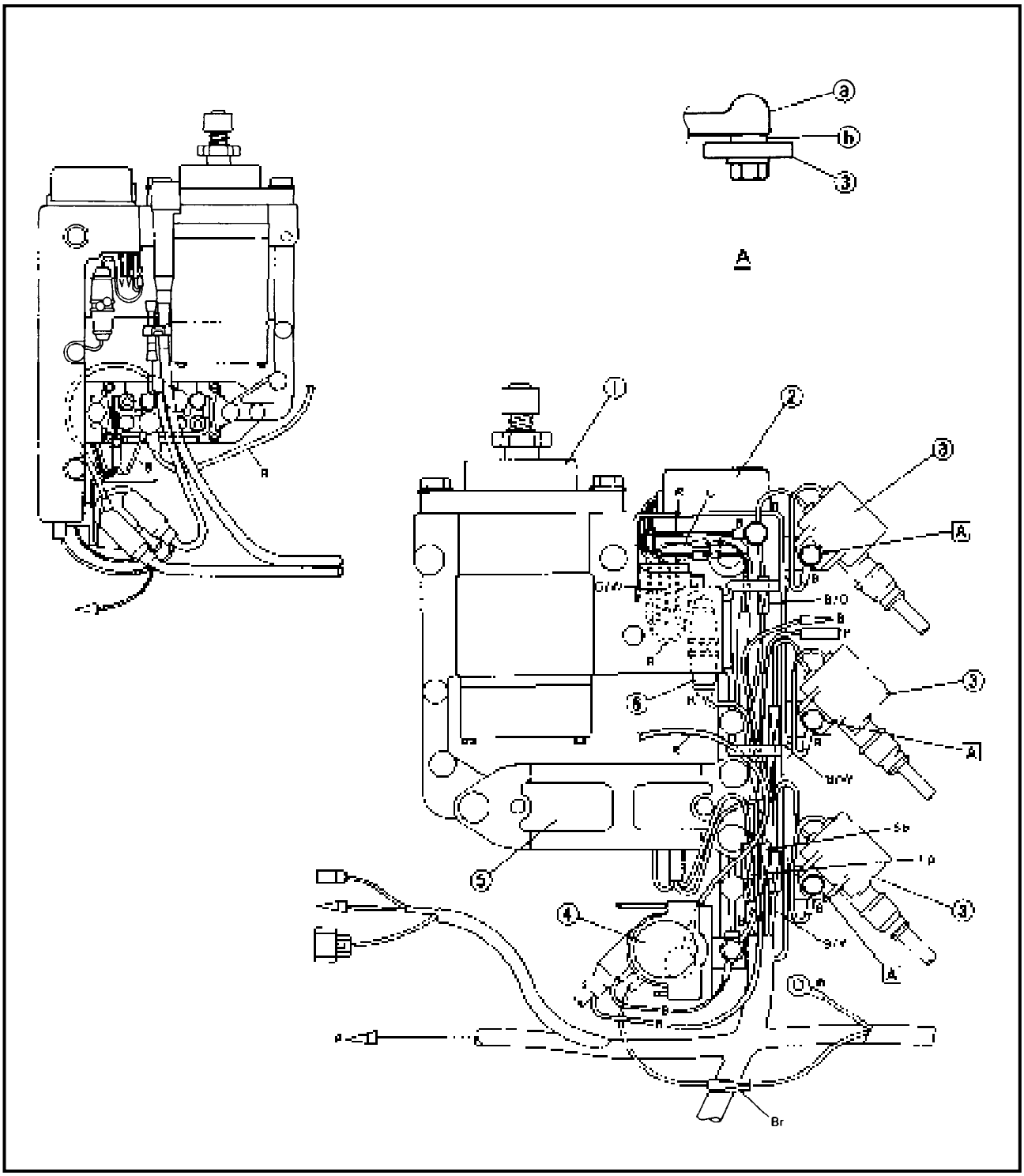


ET, ETO MODEL

① Starter motor
② Rectifier regulator
③ Ignition coil
④ Starter relay
⑤ P.T.T. relay
⑥ Fuse

ⓐ Bracket
ⓑ Ground terminal

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



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, the latter 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 at cranking speed.
- Cranking a cold engine with the plugs in and a weak battery does not enable proper readings.

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

Low resistance measurement

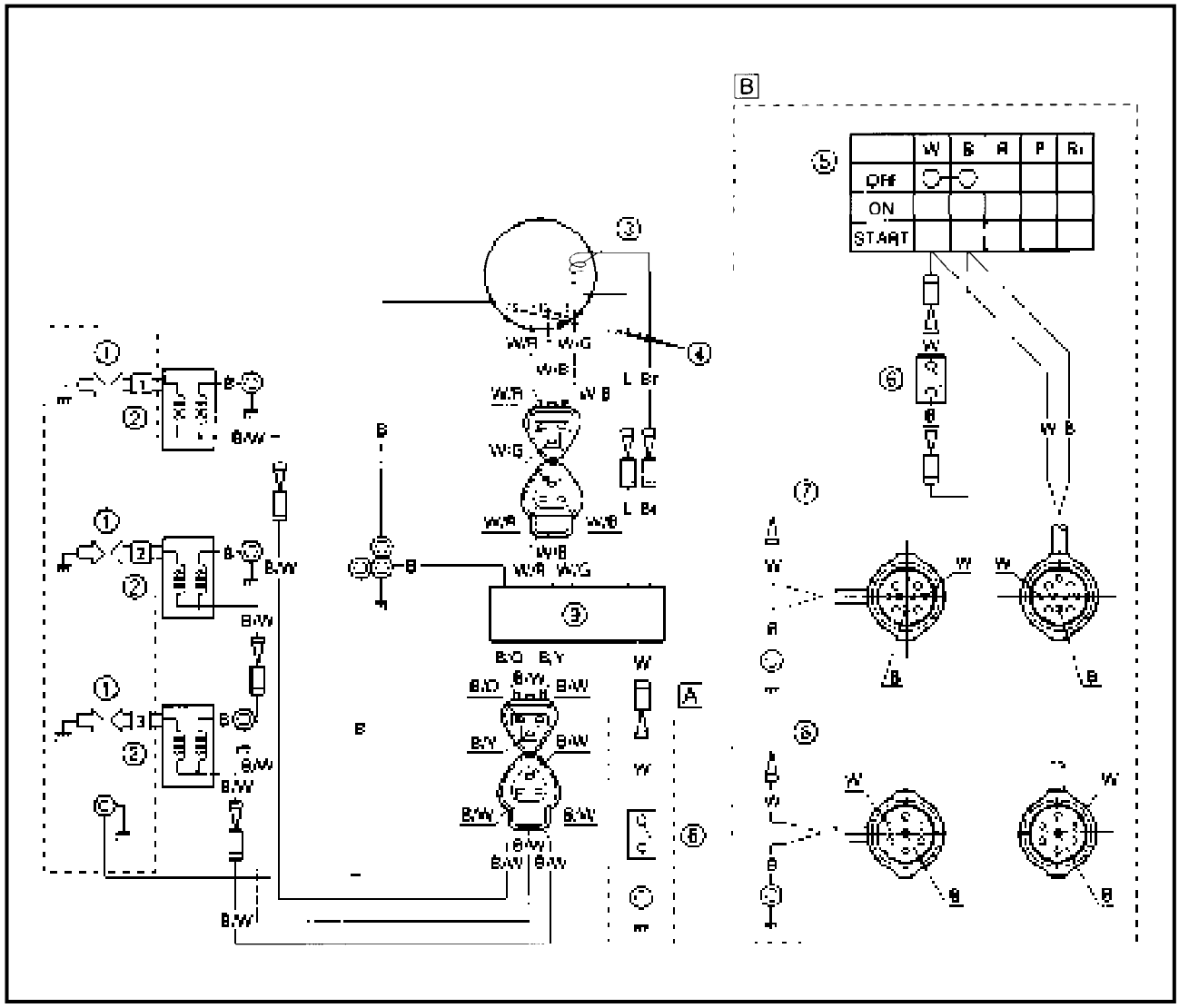
When measuring a resistance of 10 Ω or less using the digital tester, the correct measurement cannot be obtained because of the tester's internal resistance.
To obtain the correct value, subtract this internal resistance from the displayed measurement.

Correct value =
Displayed measurement –
Internal resistance

NOTE:

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

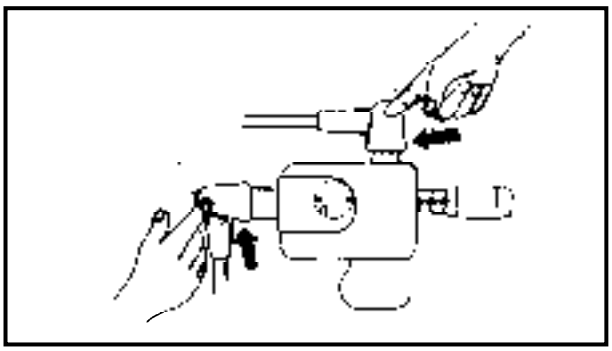
IGNITION SYSTEM

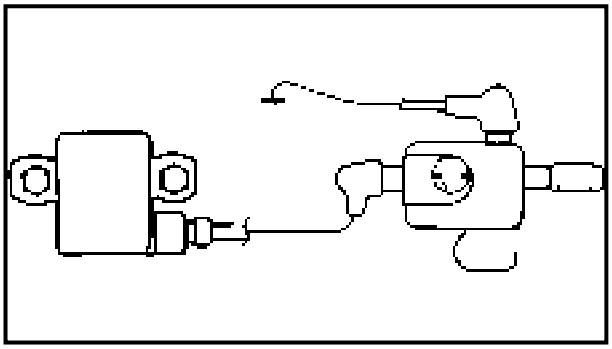


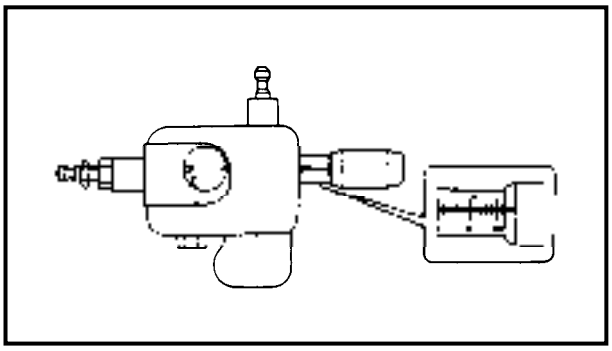
① Spark plug
② Ignition coil
③ Charge coil
④ Pulser coil
⑤ Main switch
⑥ Engine stop switch
⑦ 10P coupler
⑧ 7P coupler
⑨ CDI unit

A Manual starter model
B Electrical starter model

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







IGNITION SPARK GAP

⚠ WARNING

- **While checking the spark 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 plug cap which has been removed.**
- **This check is likely to produce sparks, so be sure that no flammable gas or fluid is present.**

1. Check:
   - Ignition spark gap
     Out of specification → Replace.

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.
- Crank the engine and check the sparks from the ignition system through the discharge window.

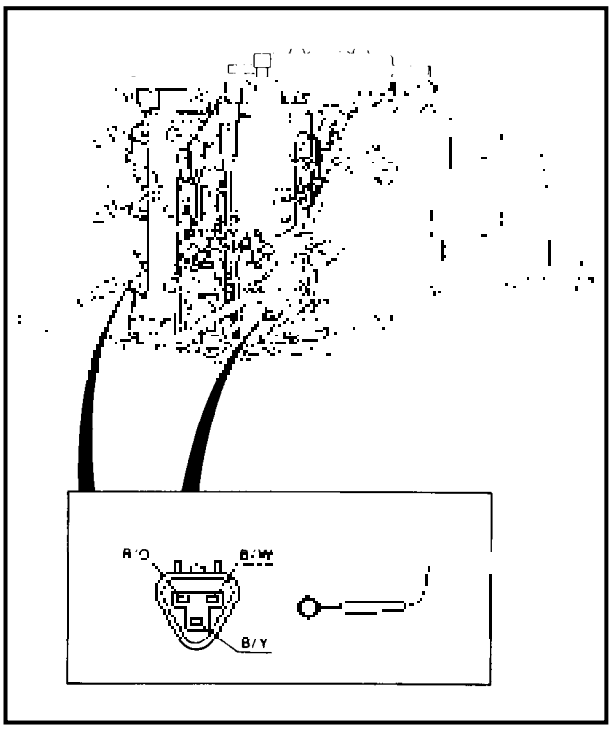
CDI SYSTEM PEAK VOLTAGE

⚠ WARNING

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

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)
     Beyond specification → Replace ignition coil.
     Below specification → Measure charge coil output.
     Repeat checking two times.

CDI output:
125 V @ cranking
140 V @ 1,500 r/min
110 V @ 3,500 r/min

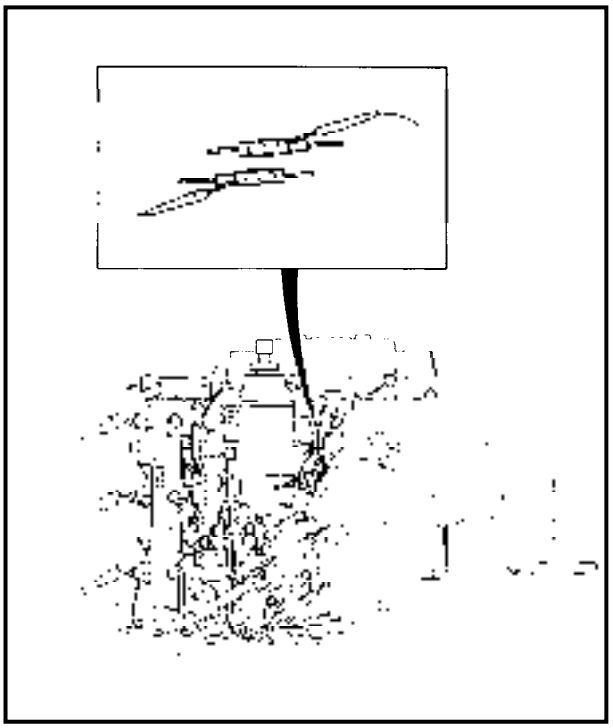
Measuring steps:
- Disconnect the ignition coil couple. Connect the 3 pins test harness.

3 pins test harness:
YB-06443, 90890-06757

- Connect the tester to the measurement terminal.
- Set the tester dial to specification.

Range:
V

- Crank or start the engine.



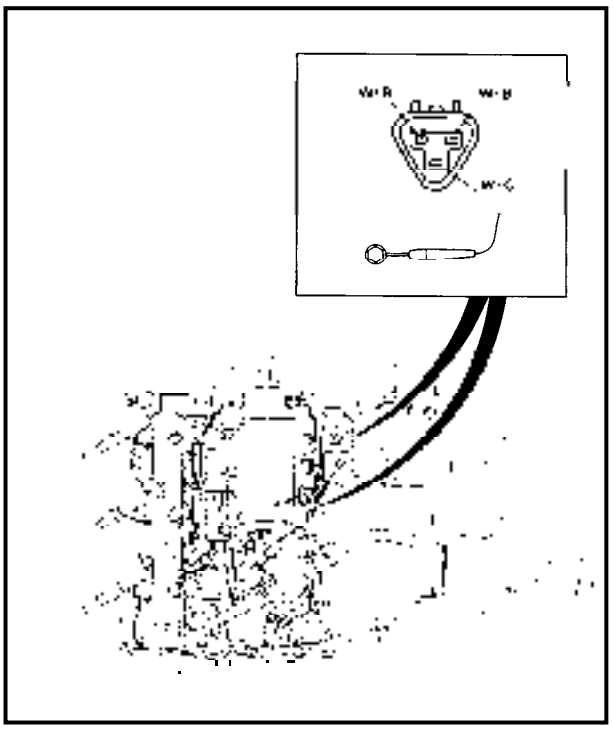
2. Measure:
   - Charge coil output (test #2)
     Below specification → Replace charge coil.
     Beyond specification → Measure pulser coil output.

Charge coil output:
(Br – L) 145 V @ cranking
160 V @ 1,500 r/min
130 V @ 3,500 r/min

Measuring steps:
- Connect the tester to the charge coil.
- Set the tester dial to specification.

Range:
V

- Crank or start the engine.



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

Pulser coil output:
3.0 V @ cranking
9.0 V @ 1,500 r/min
15.0 V @ 3,500 r/min

Measuring steps:
- Disconnect the pulse coil couple. Connect the 3 pins test harness.

3 pins test harness:
YB-06443, 90890-06757

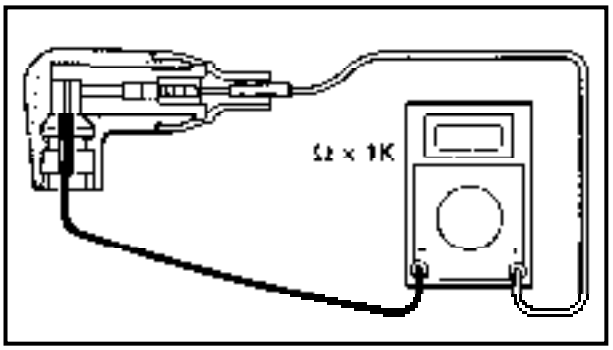
- Connect the tester to the measurement terminal.
- Set the tester dial to specification.

Range:
V

- Crank or start the engine.

SPARK PLUG

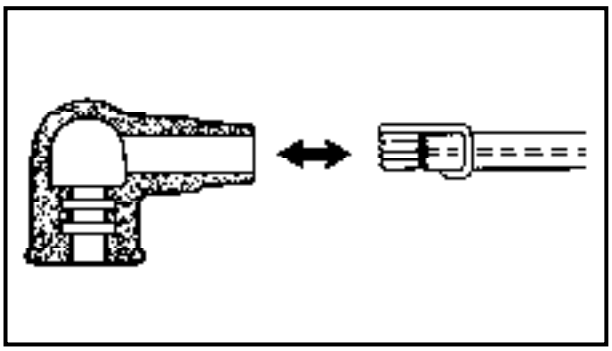
Refer to "GENERAL" in chapter 3.

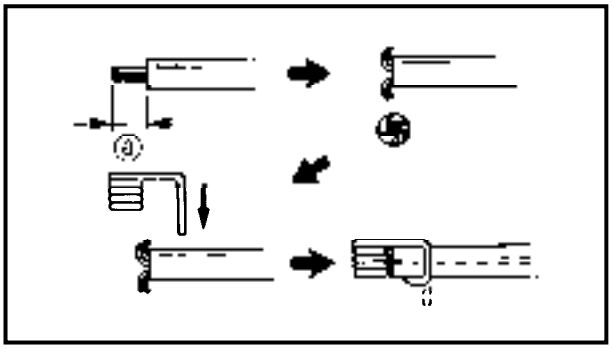


SPARK PLUG CAP

1. Inspect:
   - Spark plug cap
     Loosen → Tighten.
     Crack/Damage → Replace.
2. Measure: (For Canada and Europe)
   - Spark plug cap resistance
     Out of specification → Replace.

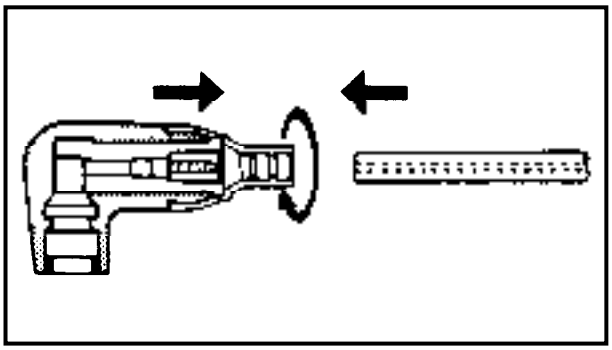
Spark plug cap resistance:
4.0 ~ 6.0 kΩ





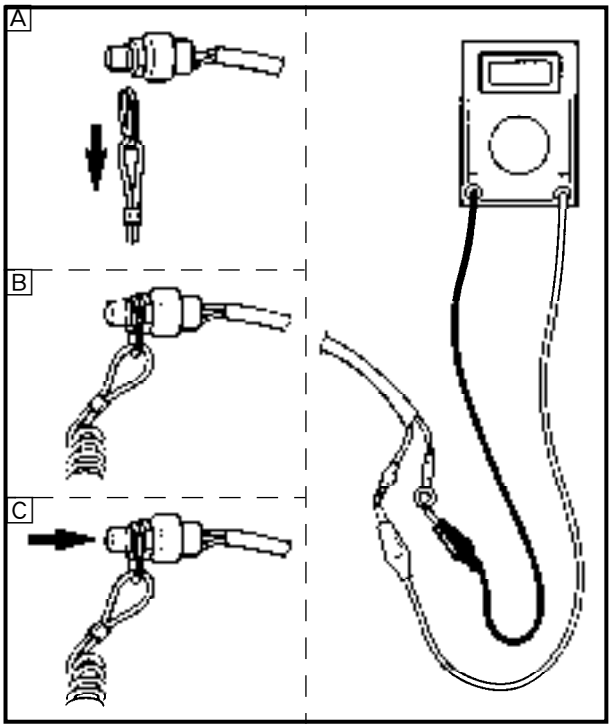
Replacement steps:
(Except for Canada and Europe)

- 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)

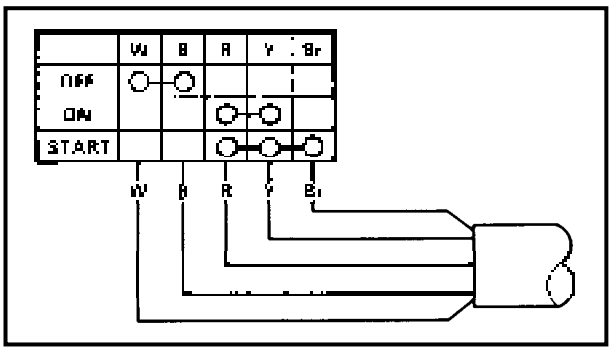
- Remove the spark-plug cap by turning the cap counterclockwise.
- Install the spark-plug cap by turning the cap clockwise until it stops.



ENGINE STOP SWITCH

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

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

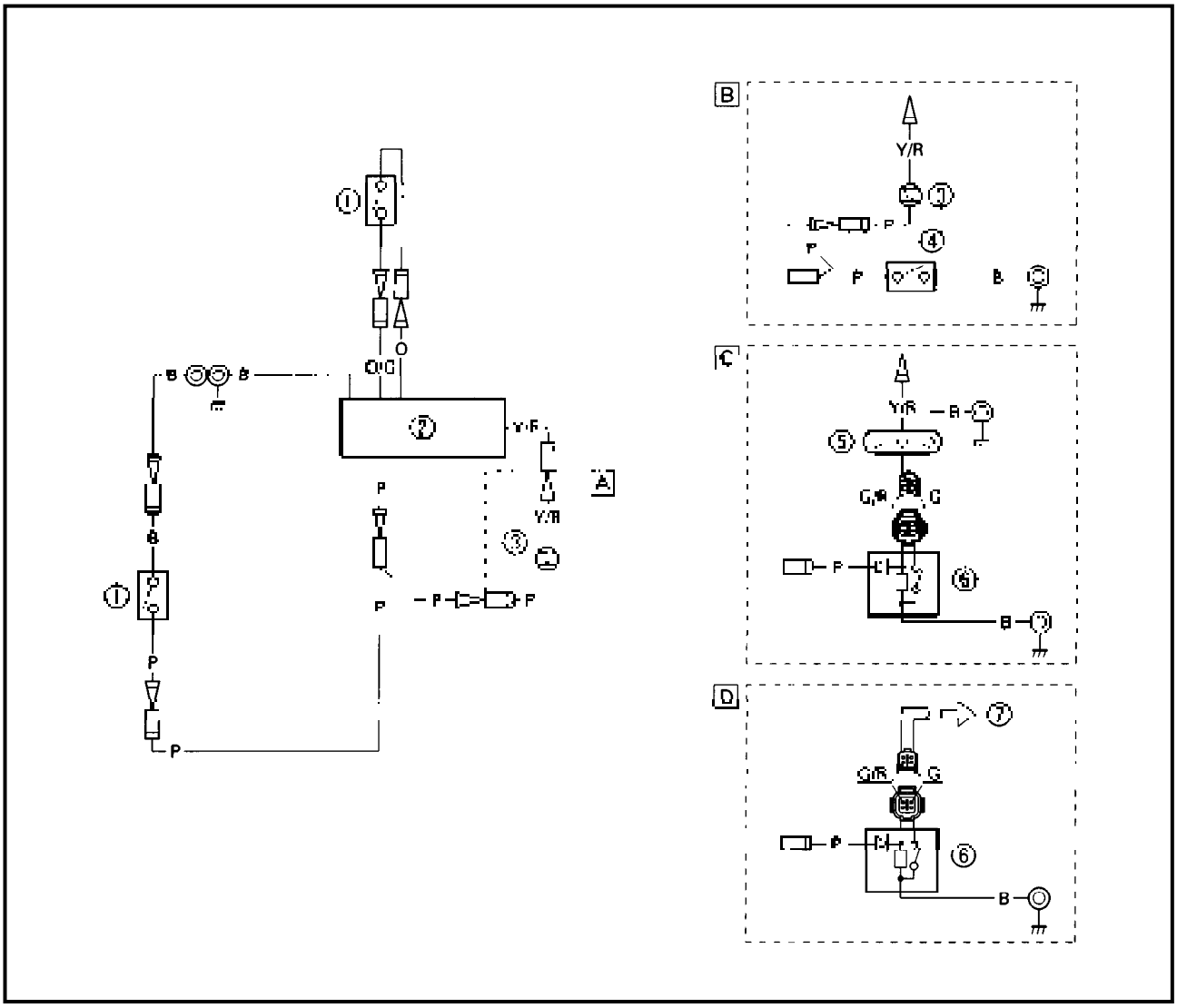


MAIN SWITCH

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

Switch position	Checking leads color				
	White	Black	Red	Yellow	Brown
OFF	○	○			
ON			○	○	
START			○	○	○

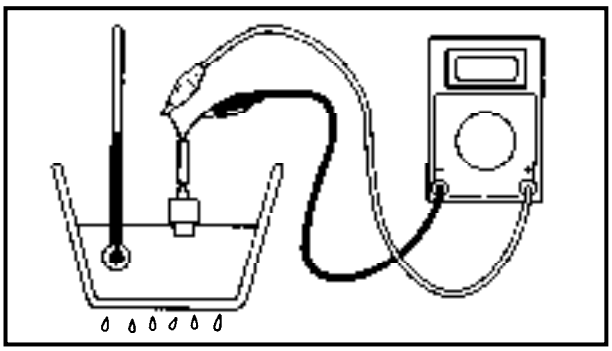
IGNITION CONTROL SYSTEM

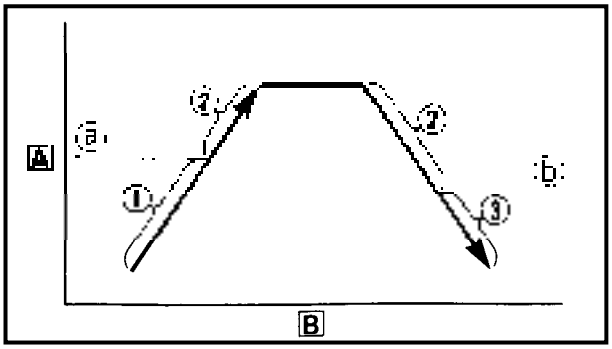


① Thermo switch
② CDI unit
③ Warning lamp
④ Oil level sensor
⑤ Oil level warning lamp
⑥ Oil level sensor
⑦ Meter

Y/R : Yellow/Red
P : Pink
O : Orange
O/G : Orange/Green
B : Black

A Pre-mixed model
B Oil injection and warning lamp model
C Oil injection and oil level warning lamp model
D Oil injection and meter warning lamp model





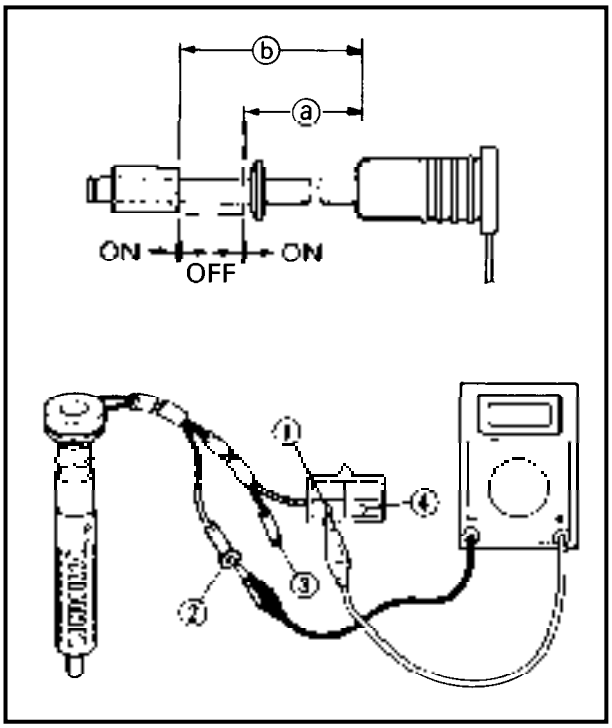
THERMO SWITCH

1. Measure:
   - Thermo switch continuity
     Out of specification → Replace.

Thermo switch continuity temperature:
Orange (O) — Orange/Green (O/G)
ⓐ 38 ~ 52°C (100.4 ~ 125.6°F)
ⓑ 26 ~ 34°C (78.8 ~ 93.2°F)
Pink (P) — Black (B)
ⓐ 90 ~ 96°C (194.0 ~ 204.8°F)
ⓑ 76 ~ 90°C (168.0 ~ 194.0°F)

① Discontinuity
② Continuity
③ Discontinuity
A Temperature
B Time

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

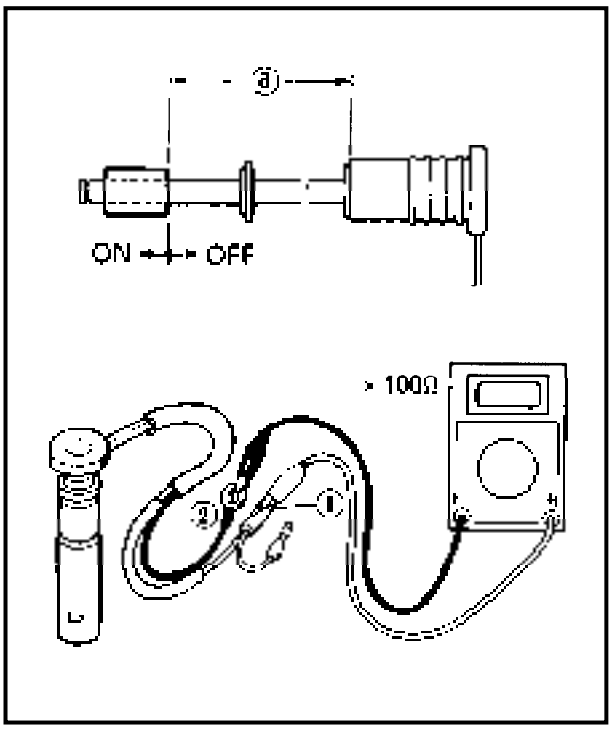


OIL LEVEL SENSOR

1. Measure:
   - Oil level sensor continuity
     Out of specification → Replace.

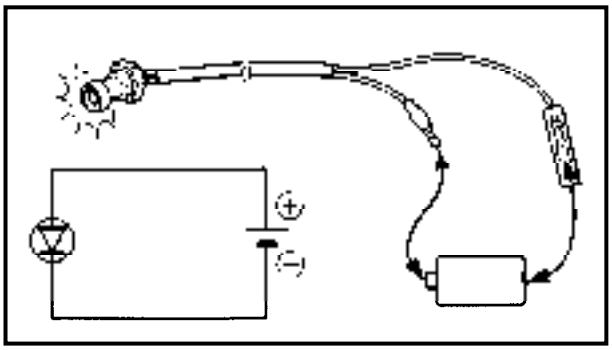
Float position	Checking leads color			
	① G	② B	③ P	④ G/R
ⓐ ON	○——	——○		
ⓐ OFF				
ⓑ OFF				
ⓑ ON		○	——	○

Float length:
ⓐ 56.8 ~ 59.8 mm (2.24 ~ 2.35 in)
ⓑ 32.8 ~ 35.8 mm (1.29 ~ 1.41 in)



Float position	Checking leads color	
	① P	② B
ⓐ OFF		
ⓐ ON	○———	———○

Float length:
ⓐ 56.8 ~ 59.8 mm (2.24 ~ 2.35 in)



WARNING LAMP

1. Check:
   - LED (Light emitting diode) lighting
     No lighting → Replace.

Battery voltage:
1.5 V

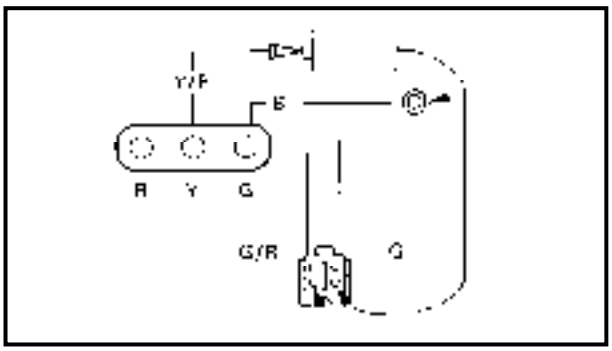
Yellow/Red lead → Positive terminal.
Pink lead → Negative terminal.

CAUTION:

Use only originally pen light battery (1.5 V), other than batteries such as alkaline battery / higher voltage one will be burnt the diode.

NOTE:

LED has an direction for electrical current. Therefore try reverse connection if there is no lighting.



OIL LEVEL WARNING LAMP

1. Check:
   - LED (Light emitting diode) lighting
     No lighting → Replace.

	Battery voltage: 1.5 V
Green LED **Yellow/Red lead → Positive terminal.** **Green lead → Negative terminal.**	
Yellow LED **Yellow/Red lead → Positive terminal.** **Black lead → Negative terminal.**	
Red LED **Yellow/Red lead → Positive terminal.** **Green/Red lead → Negative terminal.**	

CAUTION:

Use only ordinally pen light battery (1.5 V), other than batteries such as alkaline battery / higher voltage one will be burnt the diode.

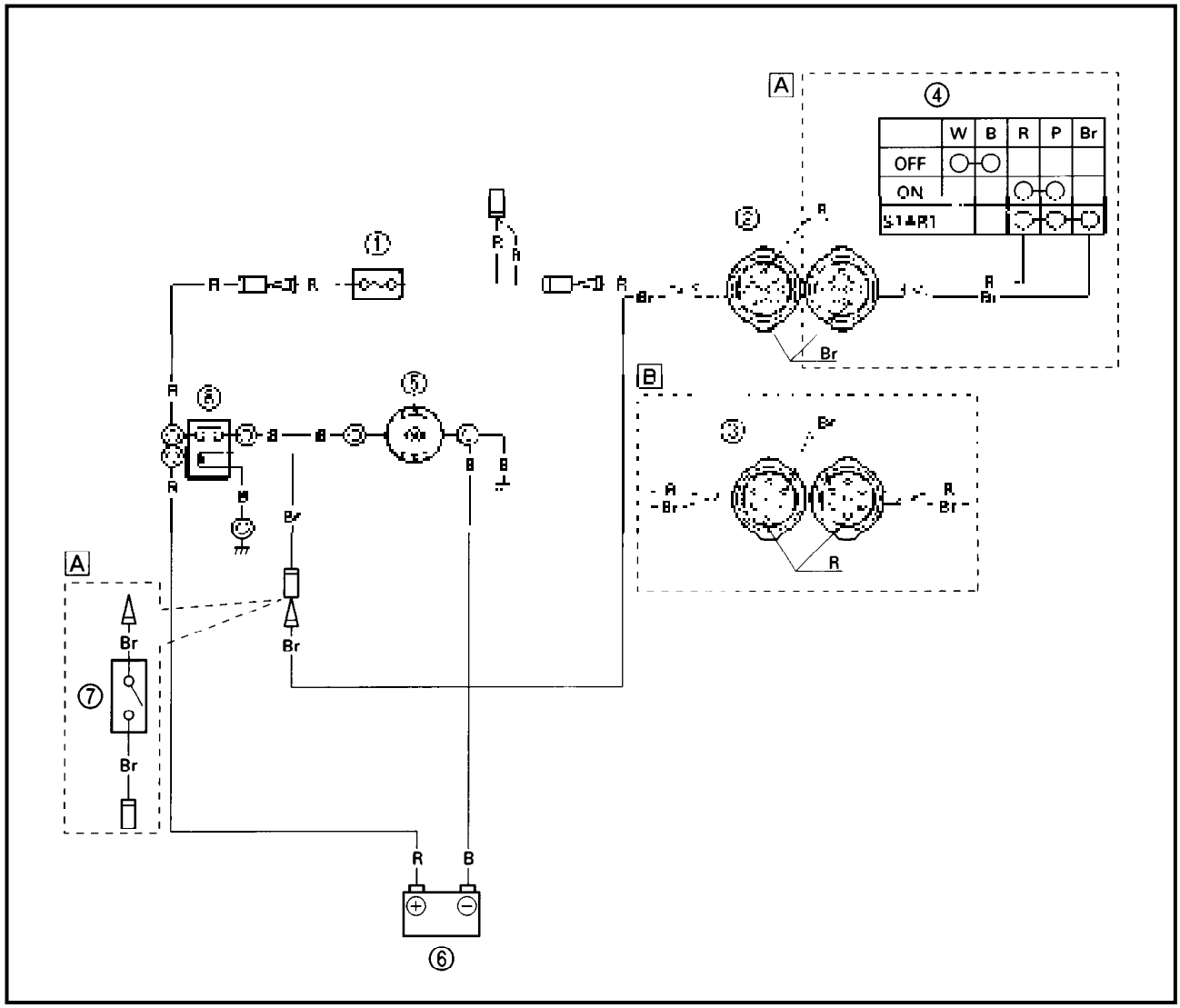
NOTE:

LED has an direction for electrical current. Therefore try reverse connection if there is no lighting.

CDI UNIT

Refer to “IGNITION SYSTEM”.

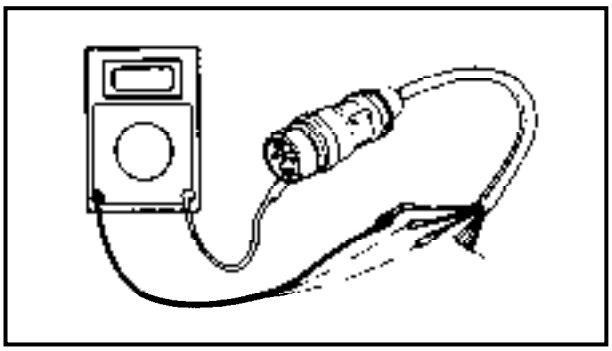
STARTING SYSTEM



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

A Except for remote control model
B Remote control model

B : Black
Br : Brown
R : Red



BATTERY

Refer to “GENERAL” in chapter 3.

WIRING HARNESS

1. Check:
   - Continuity
     Discontinuity → Replace.

WIRING CONNECTION

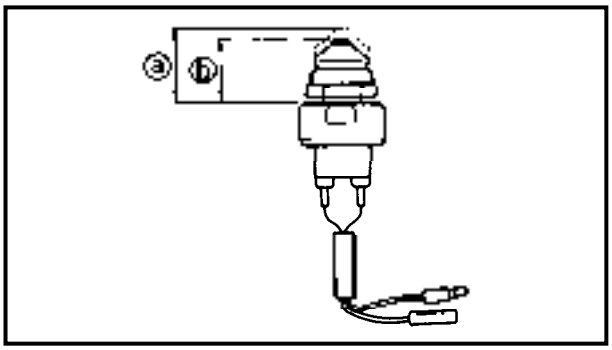
1. Check:
   - Wiring connection
     Poor connection → Correct.

ENGINE STOP SWITCH

Refer to “IGNITION SYSTEM”.

MAIN SWITCH

Refer to “IGNITION SYSTEM”.



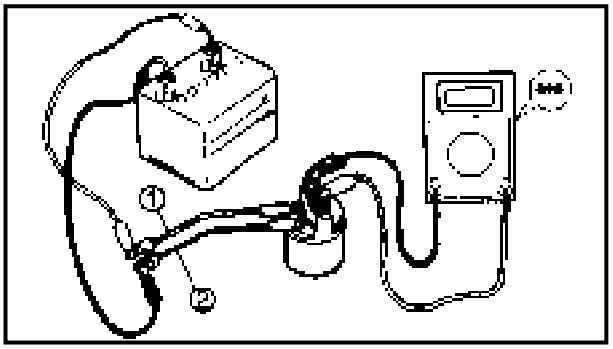
NEUTRAL SWITCH

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

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

STARTER RELAY

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

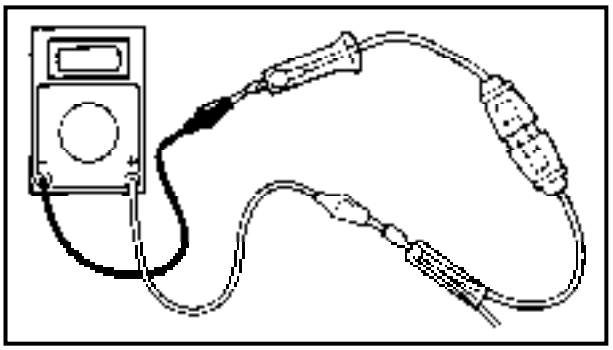


2. Check:
   - Relay operation
   Does not function → Replace.

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.

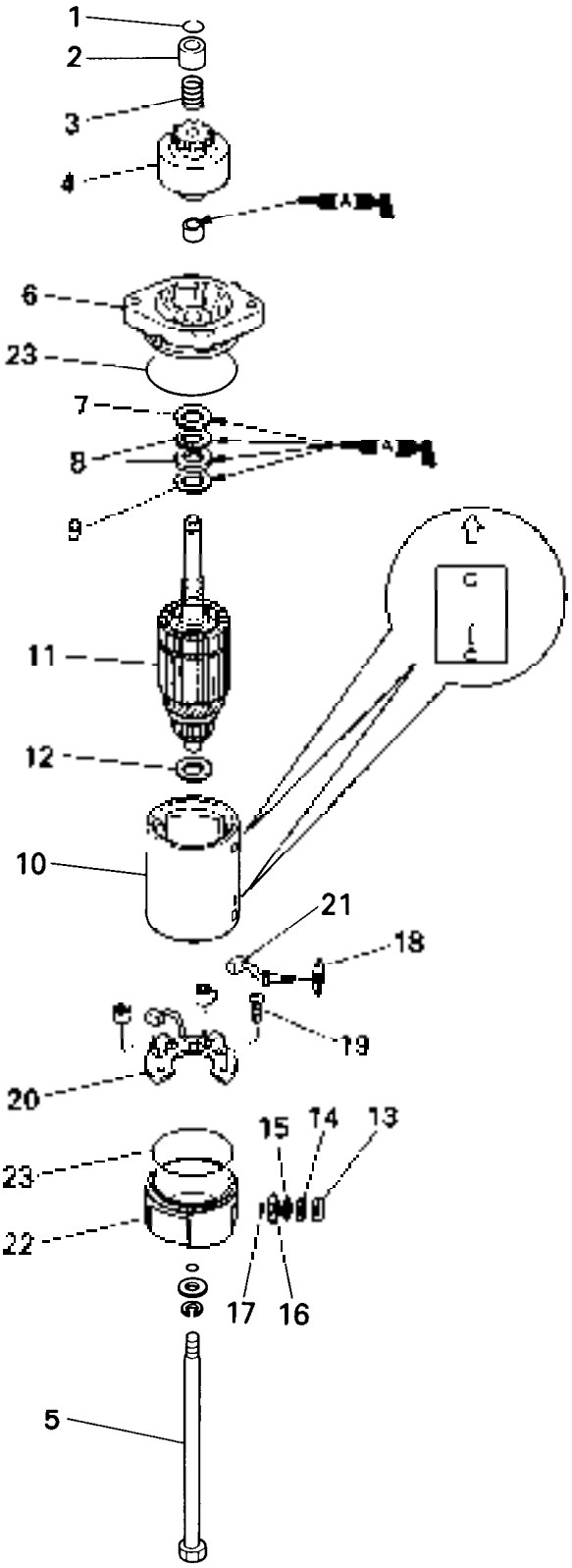


FUSE

1. Check:
   - Fuse
   Blown → Replace.

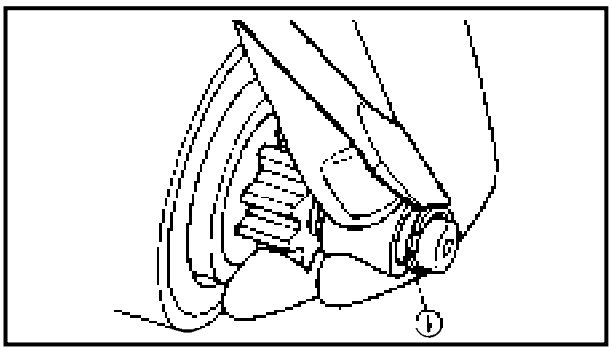
Fuse rating:
12 V - 10 A

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 ass'y		Refer to "ELECTRICAL UNIT REMOVAL" in chapter 5.
1	Clip	1	**NOTE:** Using a pry bar, pry off the clip.
2	Pinion stopper	1	
3	Spring	1	
4	Pinion	1	
5	Through bolt	2	
6	Front cover	1	
7	Washer	1	25 × 1.0 mm
8	Washer	2	25 × 0.15 mm
9	Washer	1	25 × 2.0 mm
10	Starter ass'y	1	
11	Armature ass'y	1	
12	Washer	1	16 × 0.25 mm
13	Nut	1	
14	Spring washer	1	
15	Plain washer	1	
16	Bushing	1	
17	O-ring	1	
18	Bushing	1	
19	Screw	2	
20	Brush holder	1	
21	Brush (+)	1	
22	Rear cover	1	
23	O-ring	2	
			Reverse the removal steps for installation.



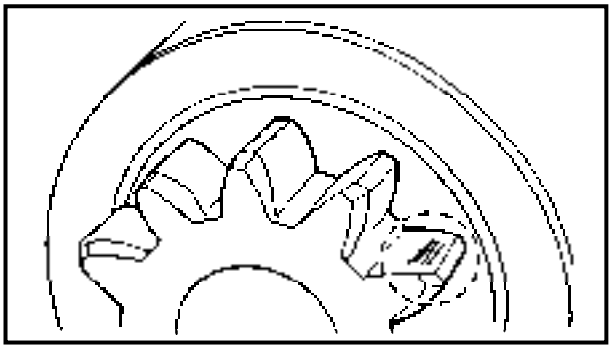
SERVICE POINTS

Pinion removal

1. Remove:
   - Clip ①

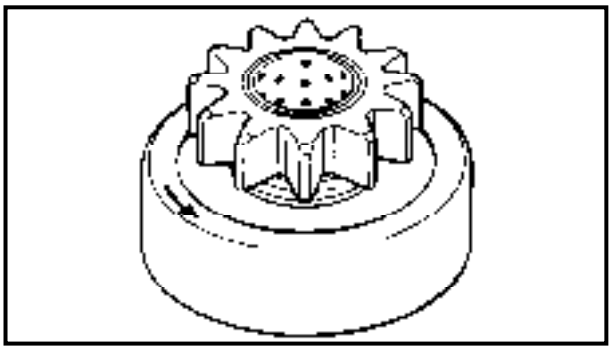
NOTE:

Using a pry-bar, pry off the clip.



Pinion inspection

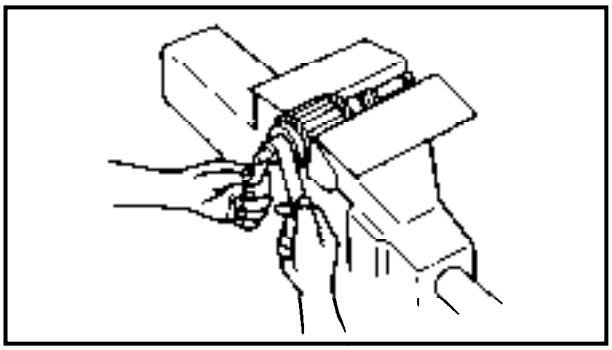
1. Inspect:
   - Pinion teeth
     Wear/Damage → Replace.



2. Check:
   - Clutch movement
     Damage → Replace.

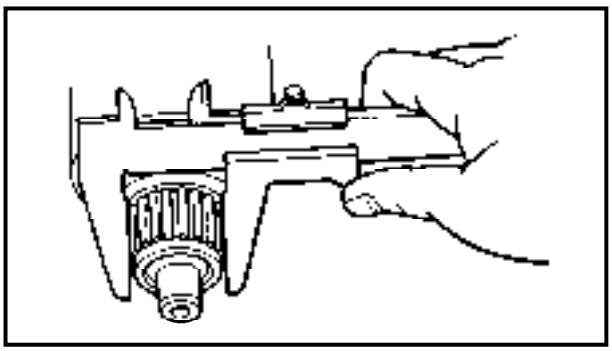
NOTE:

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



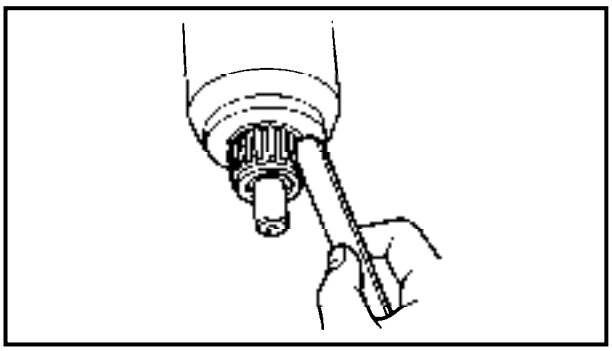
Armature inspection

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



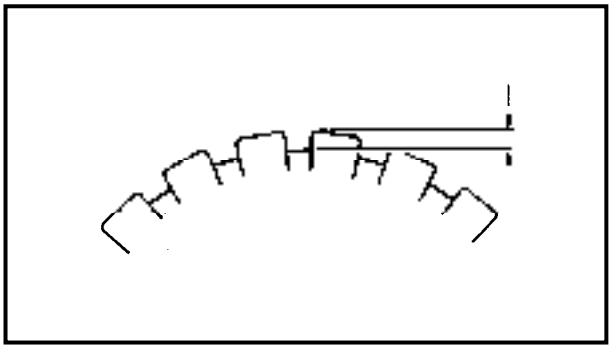
2. Measure:
   - Commutator diameter
     Out of specification → Replace.

	Commutator diameter: **Limit 29 mm (1.14 in)**



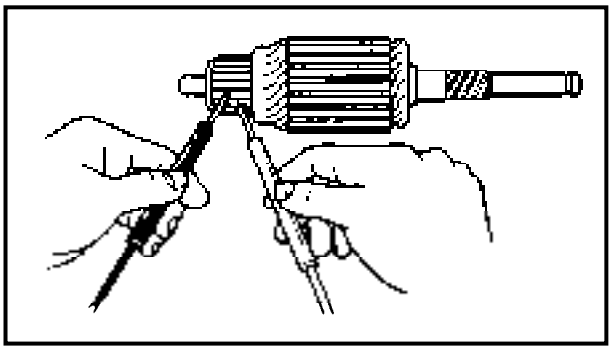
3. Check:
- Commutator under cut
  Clog/Dirty → Clean.

NOTE:
Removal all particles of mica and metal by compressed air.



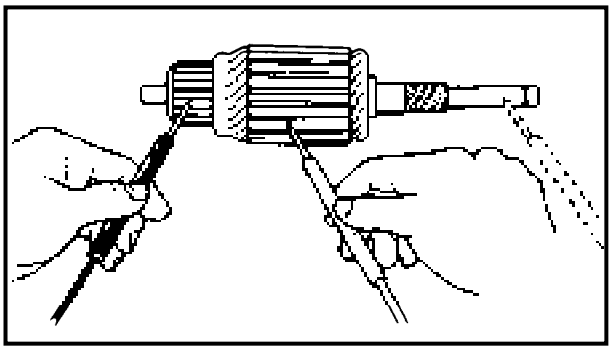
4. Measure:
- Commutator under cut
  Out of specification → Replace.

	Commutator under cut: **Limit 0.2 mm (0.01 in)**



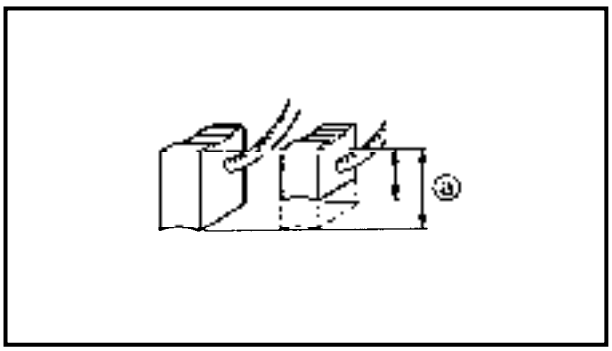
5. Inspect:
- Armature coil continuity
  Out of specification → Replace.

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

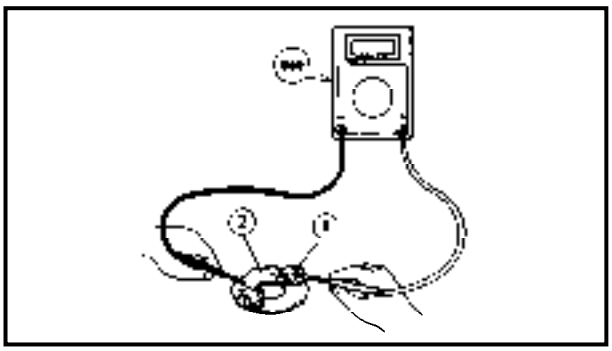


Brush holder inspection

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



	Brush length ⓐ: **Limit 9.0 mm (0.35 in)**



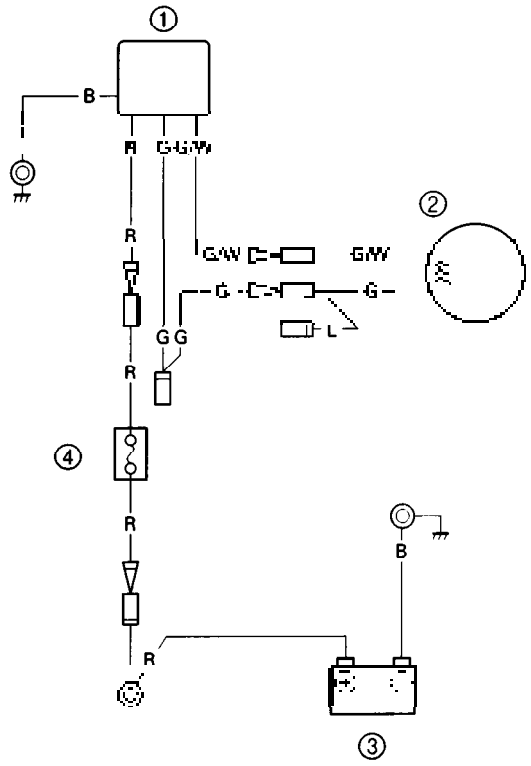
2. Check:
   - Brush holder continuity
     Out of specification → Replace.

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

Cover inspection

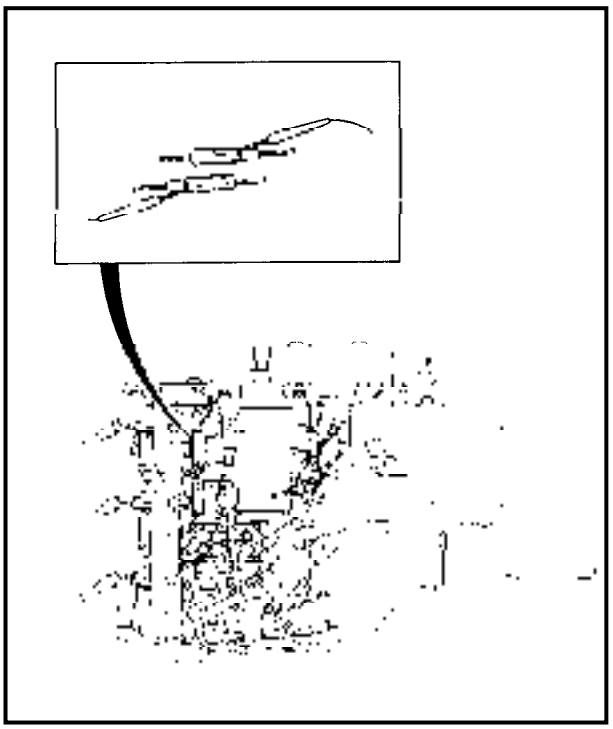
1. Inspect:
   - Cover bushing
     Wear/Damage → Replace the cover.

CHARGING SYSTEM



① Rectifier regulator
② Lighting coil
③ Battery
④ Fuse

G : Green
G/W : Green/White
R : Red
B : Black



CHARGING SYSTEM PEAK VOLTAGE

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

Rectifier regurator input:
(electrical model)
8.5 V @ cranking
25 V @ 1,500 r/min
25 V @ 3,500 r/min

Measuring steps:
- Connect the tester to the rectifier/regulator as shown.
- Set the tester dial to specification.

Range:
V

- Crank or start the engine.

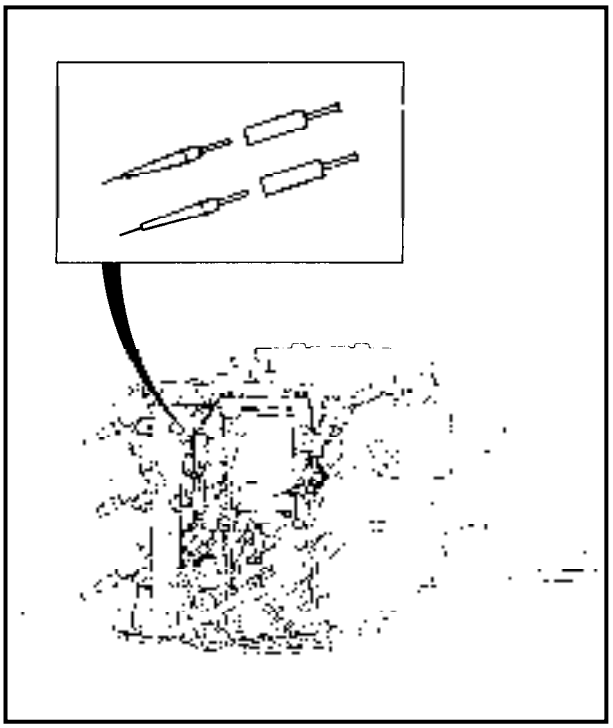
2. Measure:
   - Lighting coil output
     Beyond specification → Replace rectifier/regulator.
     Below specification → Replace lighting coil.

Lighting coil output:
9.0 V @ cranking
25 V @ 1,500 r/min
25 V @ 3,500 r/min

Measuring steps:
- Connect the tester to the lighting coil as shown.
- Set the tester dial to specification.

Range:
V

- Start the engine.



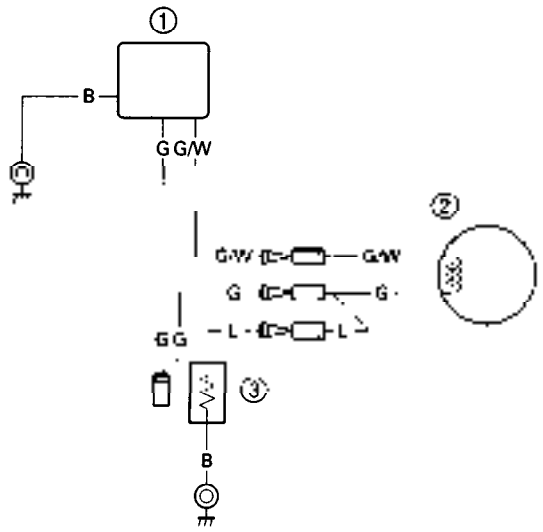
FUSE

Refer to “STARTING SYSTEM”.

BATTERY

Refer to “GENERAL” in chapter 3.

ENRICHMENT CONTROL SYSTEM



① Rectifier regulator
② Lighting coil
③ Electrothermal valve

G : Green
G/W : Green/White
L : Blue
B : Black

LIGHTING COIL

Refer to “CHARGING SYSTEM”.

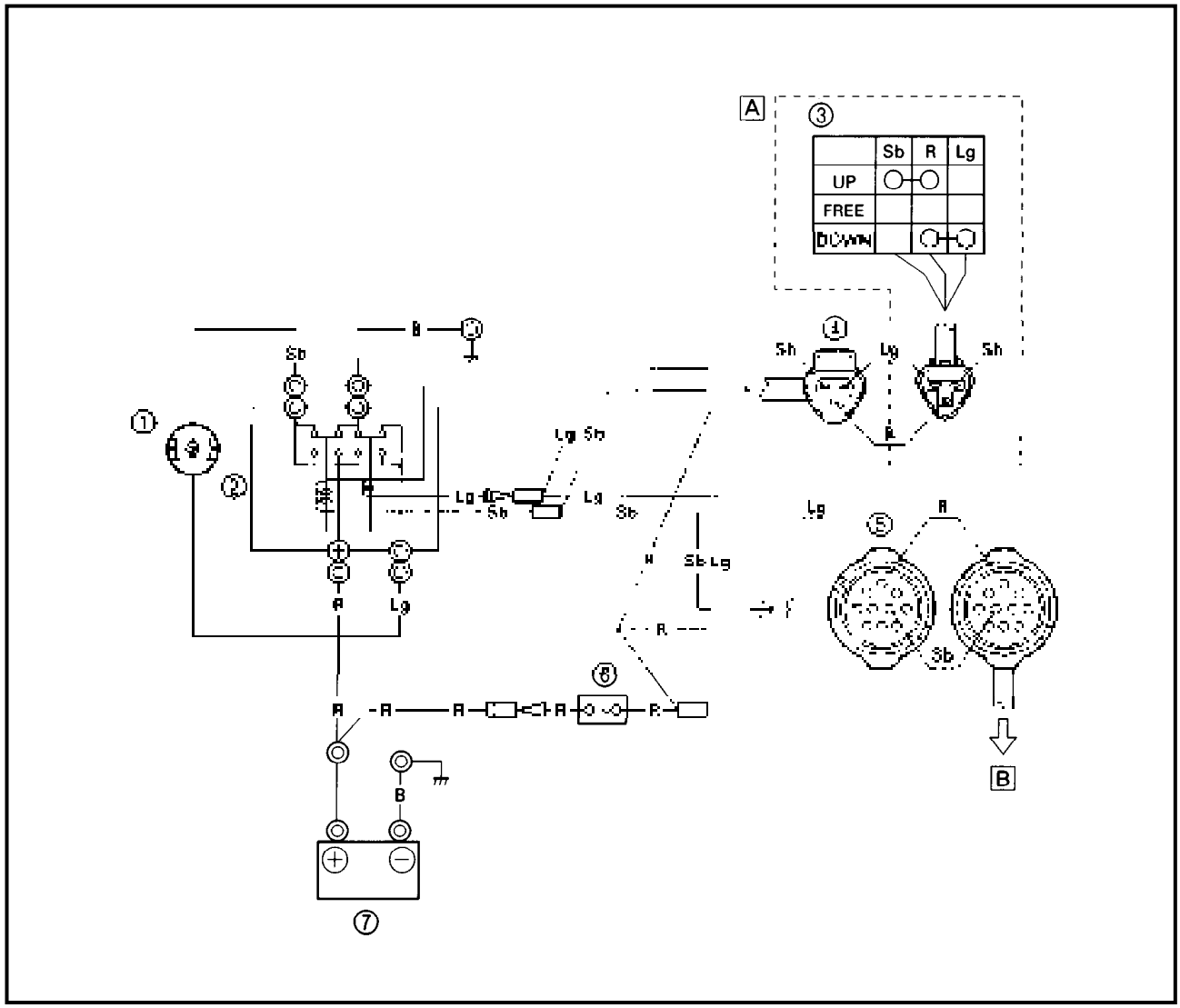
ELECTROTHERMAL VALVE

Refer to “PRIME STARTER” in chapter 4.

RECTIFIER REGULATOR

Refer to “CHARGING SYSTEM”.

POWER TRIM AND TILT CONTROL SYSTEM



① P.T.T. motor
② P.T.T. relay
③ P.T.T. switch
④ 3P coupler (Black)
⑤ 10P coupler
⑥ Fuse
⑦ Battery

R : Red
Lg : Light green
Sb : Sky blue
B : Black

A Bottom cowl P.T.T. switch model
B To remote control

BATTERY

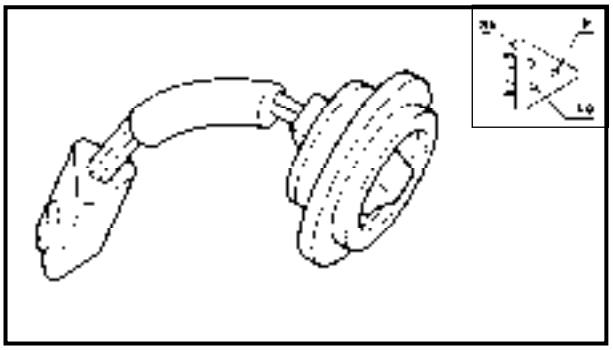
Refer to "GENERAL" in chapter 3.

FUSE

Refer to "STARTING SYSTEM".

PTT SWITCH

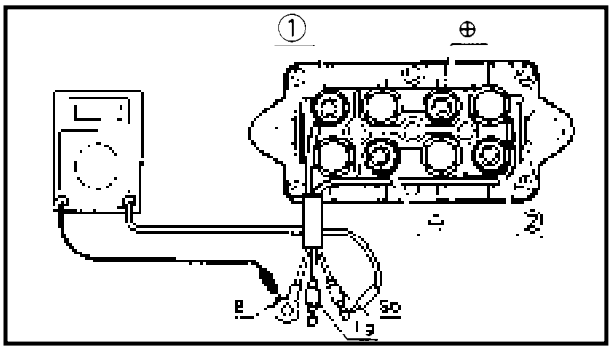
1. Check:
   - Continuity
     Out of specification → Replace.



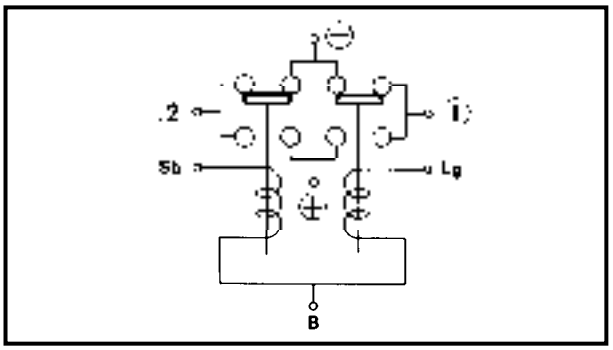
Switch position	Checking leads color		
	Sky blue	Red	Light green
UP	○——	——○	
Free			
DN		○——	——○

PTT RELAY

1. Inspect:
   - PTT relay continuity
     Out of specification → Replace.



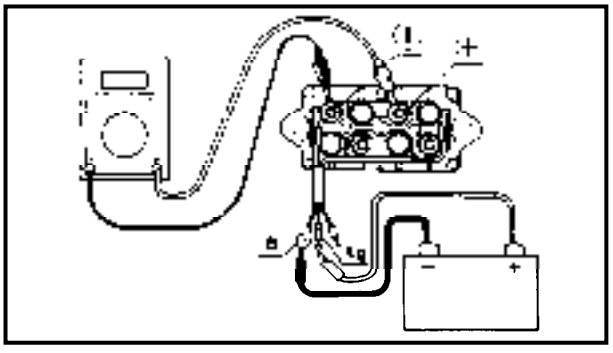
PTT relay continuity:	
Sky blue (Sb) - Black (B) Light green (Lg) - Black (B)	Continuity
Terminal ① - Terminal ⊖ Terminal ② - Terminal ⊖	Continuity
Terminal ① - Terminal ⊕ Terminal ② - Terminal ⊕	Discontinuity



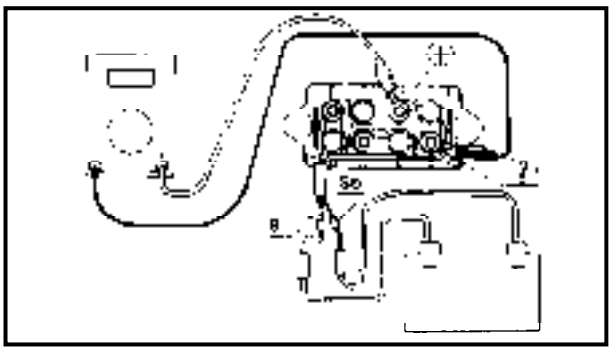
2. Check:
   - Relay operation
     Does not function → Replace.

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

Light green (Lg) lead → Positive terminal
Black (B) → Negative terminal



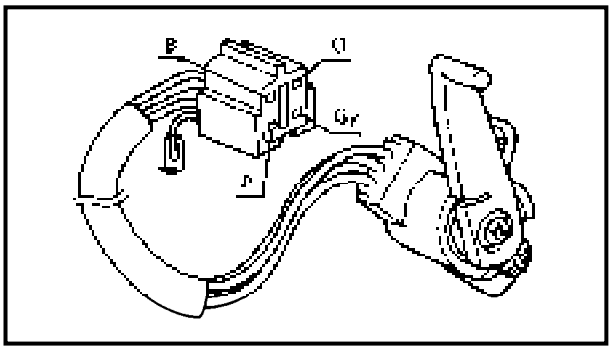
- Check that there is continuity between the PTT relay terminals.



- Connect the tester between the terminals of the PTT relay as shown.
- Connect a 12 V battery.

Sky blue (Sb) lead → Positive terminal
Black (B) → Negative terminal

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



TRIM SENSOR

1. Measure:
   - Trim sensor resistance
     Out of specification → Replace.

Trim sensor resistance:
Pink (P) - Black (B)
360 ~ 540 Ω
Orange (O) - Black (B)
800 ~ 1200 Ω

NOTE:
Turn the lever and measure the resistance changing gradually.

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	LOOSE TILT HOLDING	TILT MOTOR WILL NOT RUN	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference Chapter
												FUEL SYSTEM	
○		○		○								Fuel hose	4
○		○		○								Fuel joint	4
○	○	○		○								Fuel filter	4
○		○		○								Fuel pump	4
○	○	○		○								Carburetor	4
		○		○	○							Pilot screw setting	4
		○		○								Idle speed	3
												POWER UNIT	
○	○			○								Compression	5
○	○			○								Reed valve	5
○	○											Cylinder head gasket	5
○				○								Seal	5
○				○								Cylinder body	5
○				○								Piston ring	5
○				○								Crank case	5
○												Piston	5
	○			○								Link adjustment	3
				○								Bearing	5
					○							Thermostat	5
					○							Water passage	5

TROUBLE ANALYSIS

Trouble mode												Check elements	
ENGINE WILL NOT START	ROUGH IDLING	ENGINE STALLS	ENGINE WILL NOT STOP	POOR PERFORMANCE	OVERHEATING	LOOSE STEERING	LOOSE TILT HOLDING	TILT MOTOR WILL NOT RUN	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference Chapter
												LOWER UNIT	
○									○			Neutral position	6
○									○			Clutch	6
○									○			Gear	6
				○	○							Water inlet	6
				○	○							Water pump	6
				○								Propeller shaft	6
									○			Shifter/Pin	6
									○			Shift cam	6
									○			Shift shaft	6
									○			Lower case	6
												BRACKET UNIT	
						○						Bracket	7
						○						Mount rubber	7
									○			Shift actuator	7
												PTT unit	
							○					Fluid level	7
							○					Relief valve	7
							○					Fluid passage	7
								○				PTT motor	7
								○				PTT control system	8
												ELECTRICAL	
○	○	○		○	○							Ignition system	8
○			○									Starting system	8
	○	○		○								Enrichment control system	8
		○		○						○		Ignition control system	8
											○	Charging system	8

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