YAMAHA

Marine

Outboards

150A, 150F, L150F, D150H, 175D, 200F, L200F, 200G, 225D

SERVICE MANUAL

64C-28197-Z8-11

PREFACE

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

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

150A, 150F, L150F, D150H, 175D,
200F, L200F, 200G, 225D
SERVICE MANUAL

1st Edition, October 1998

HOW TO USE THIS MANUAL

MANUAL FORMAT

All of the procedures in this manual are organized in a sequential, step-by-step format. The information has been compiled to provide the mechanic with an easy to read, handy reference that contains comprehensive explanations of all disassembly, repair, assembly, and inspection operations.

For instance, the condition of a faulty component will precede an arrow symbol and the course of action required will follow the symbol.

- Bearings

  Pitting/scratches → Replace.

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

MODEL INDICATION

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

Model name	150AET	L150AET	150FETO		L150FETO		150GETO
USA and Canada name	C150TR	—	—	S150TR	—	L150TR	P150TR
Indication	150AET	L150AET	150FETO	S150FETO	L150FETO	LS150FETO	150GETO
Model name	D150HETO	175AET	175DETO		175FETO	200AET	L200AET
USA and Canada name	D150TR	—	—	S175TR	P175TR	—	—
Indication	D150HETO	175AET	175DETO	S175DETO	175FETO	200AET	L200AET
Model name	200FETO		L200FETO		200GETO	225DET	225DETO
USA and Canada name	200TR	S200TR	—	L200TR	P200TR	—	—
Indication	200FETO	S200FETO	L200FETO	LS200FETO	200GETO	225DET	225DETO

ILLUSTRATIONS

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

CROSS REFERENCES

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

IMPORTANT INFORMATION

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

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

⚠ WARNING

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

CAUTION:

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

NOTE:

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

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 table similar to the following.

Model name	150AET	L150AET	150FETO		L150FETO		150GETO
USA and Canada name	C150TR	—	—	S150TR	—	L150TR	P150TR
Lubrication system	Pre-mixed	Pre-mixed	Oil injection		Oil injection		Oil injection
Model name	D150HETO	175AET	175DETO		175FETO	200AET	L200AET
USA and Canada name	D150TR	—	—	S175TR	P175TR	—	—
Lubrication system	Oil injection	Pre-mixed	Oil injection		Oil injection	Pre-mixed	Pre-mixed
Model name	200FETO		L200FETO		200GETO	225DET	225DETO
USA and Canada name	200TR	S200TR	—	L200TR	P200TR	—	—
Lubrication system	Oil injection		Oil injection		Oil injection	Pre-mixed	Oil injection

HOW TO USE THIS MANUAL

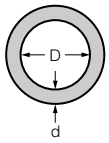
① The main points regarding removing/installing and disassembling/assembling procedures are shown in the exploded views.

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

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

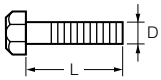
④ It is important to refer to the job instruction charts at the same time as the exploded views. These charts list the sequence that the procedures should be carried out in, as well as providing explanations on part names, quantities, dimensions and important points relating to each relevant task.

Example:
O-ring size 39.5 × 2.5 mm: inside diameter (D) × ring diameter (d)

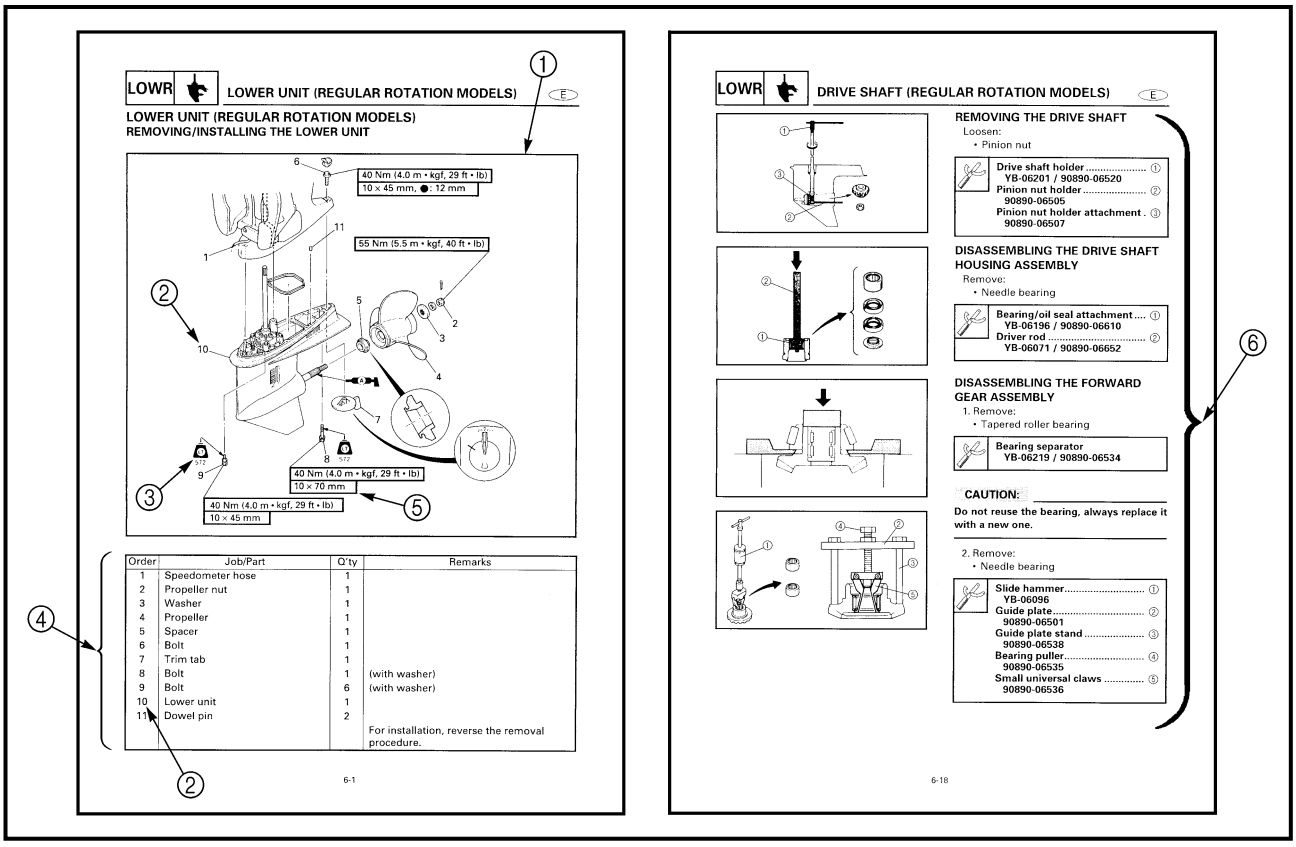


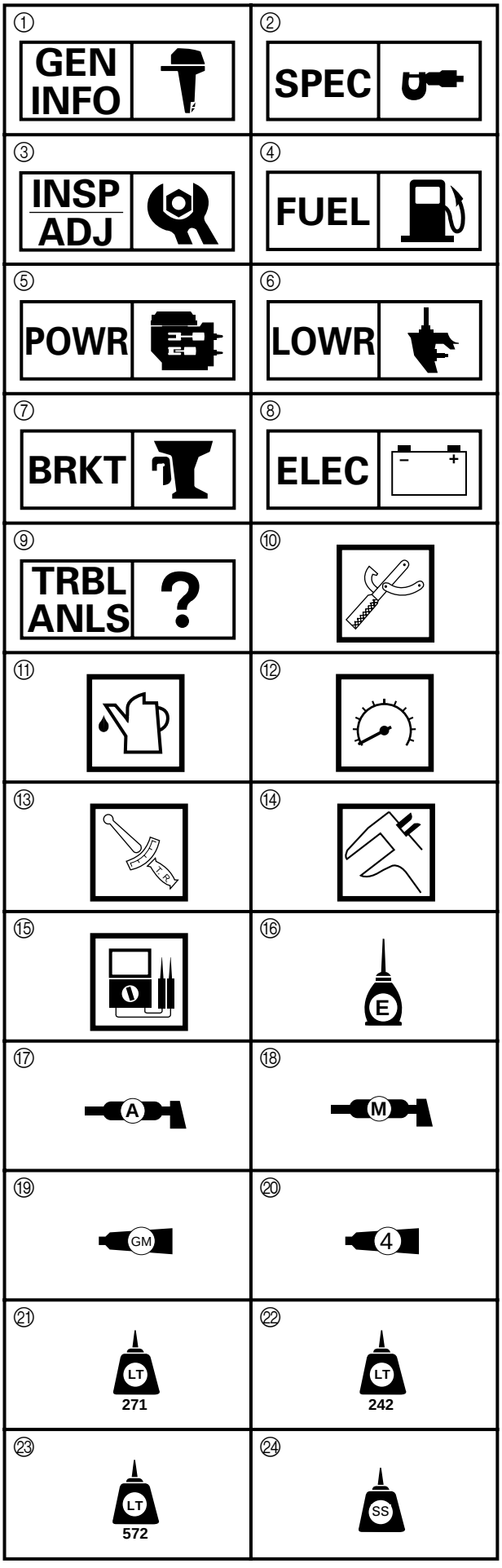
⑤ In addition to tightening torques, the dimensions of the bolts and screws are also mentioned.

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



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





SYMBOLS

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

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

Symbols ⑩ to ⑮ indicate specific data.

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

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

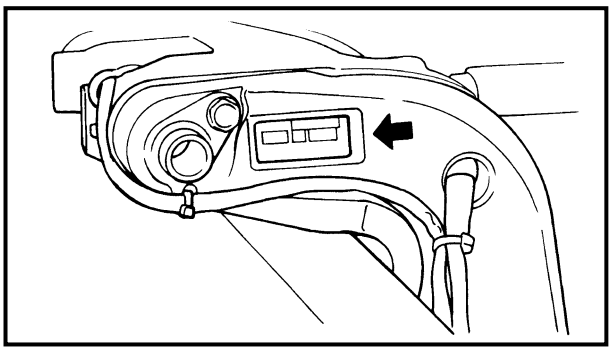
⑯ Apply Yamaha 2-stroke outboard motor oil (TC-W3)
⑰ Apply water resistant grease
(Yamaha grease A, Yamaha marine grease)
⑱ Apply molybdenum disulfide oil

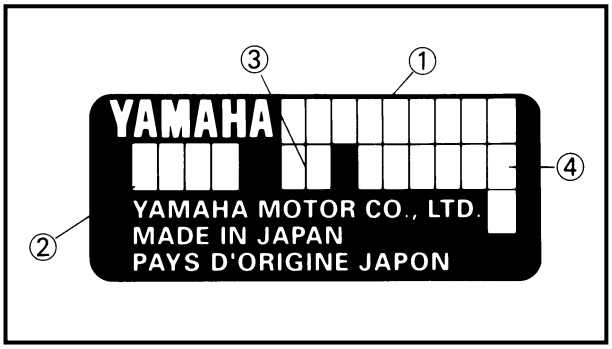
Symbols ⑲ to ㉔ in an exploded diagram indicate the grade of the sealing or locking agent and the location of the application point.

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

CONTENTS

CHAPTER 1
GENERAL INFORMATION





IDENTIFICATION

SERIAL NUMBER

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

NOTE:

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

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

STARTING SERIAL NUMBERS

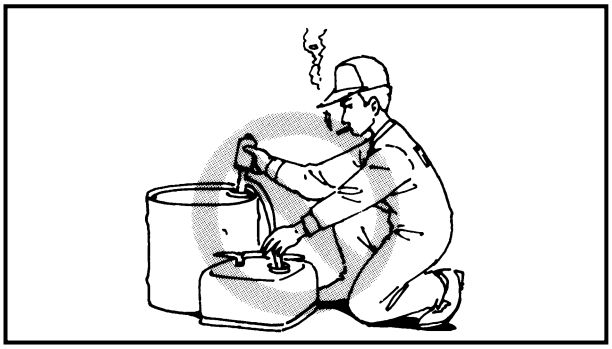
The starting serial number blocks are as follows:

Model name			Approval model code	Starting serial number
World-wide	USA	Canada		
150AET	C150TR	—	6G4	L: 305521 -
				X: 704396 -
L150AET	—		6K0	X: 750347 -
150FETO	—		6G4	L: 352137 -
	S150TR			X: 504118 -
L150FETO	—		6K0	L: 350142 -
	L150TR	—		X: 501152 -
150GETO	P150TR		6J9	L: 502379 -
D150HETO	D150TR	—		L: 601301 -
175AET	—		6G5	L: 302440 -
				X: 701017 -
175DETO	—			L: 350273 -
	S175TR	—		X: 501252 -

Model name			Approval model code	Starting serial number
World-wide	USA	Canada		
175FETO	P175TR		62H	L: 500647 -
200AET	—		6G6	L: 308781 -
				X: 707018 -
L200AET	—		6K1	X: 752202 -
200FETO	200TR	—	6G6	L: 350991 -
	S200TR			X: 506004 -
L200FETO	—		6K1	L: 350141 -
	L200TR	—		X: 501625 -
200GETO	P200TR		61H	L: 502516 -
225DET	—		6K7	L: 400393 -
				X: 500160 -
225DETO	—			L: 450255 -
				X: 550266 -

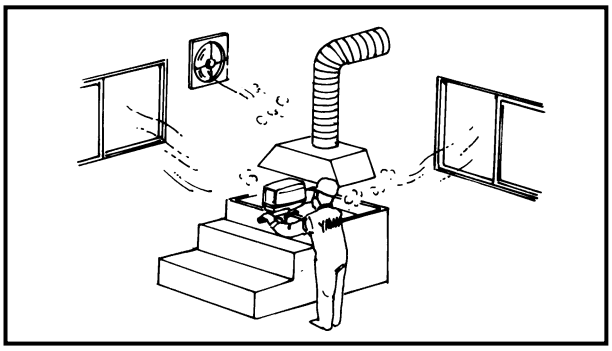
SAFETY WHILE WORKING

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



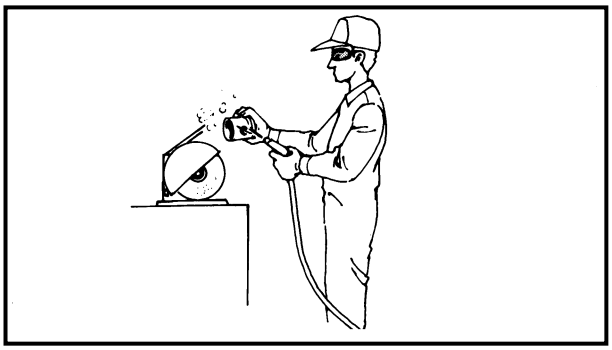
FIRE PREVENTION

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



VENTILATION

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



SELF-PROTECTION

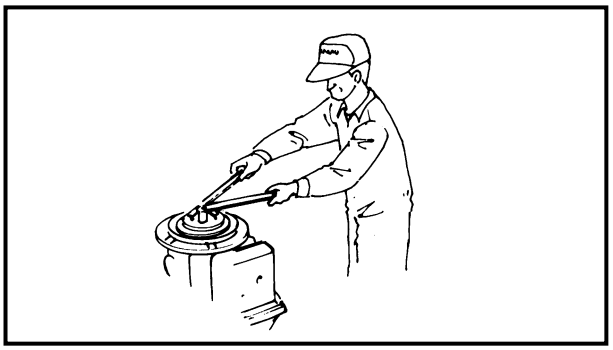
Protect your eyes with suitable safety glasses or safety goggles, when grinding or when doing any operation which may cause particles to fly off. Protect hands and feet by wearing safety gloves or protective shoes if appropriate to the work you are doing.

OILS, GREASES AND SEALING FLUIDS

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

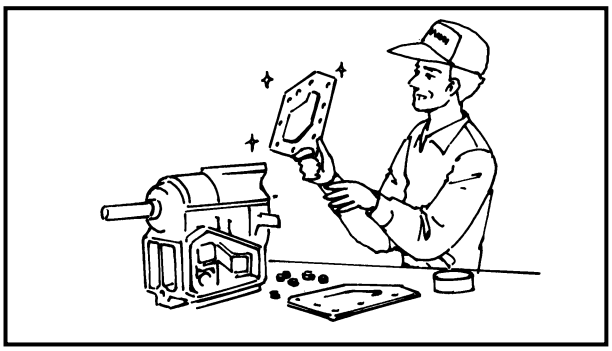
Under normal conditions of use, there should be no hazards from the use of the lubricants mentioned in this manual, but safety is all-important, and by adopting good safety practices, any risk is minimized. A summary of the most important precautions is as follows:

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

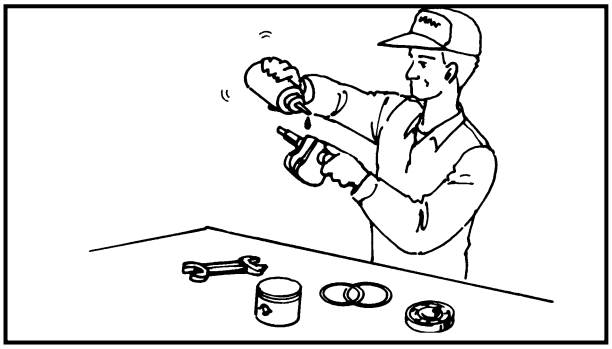


GOOD WORKING PRACTICES

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

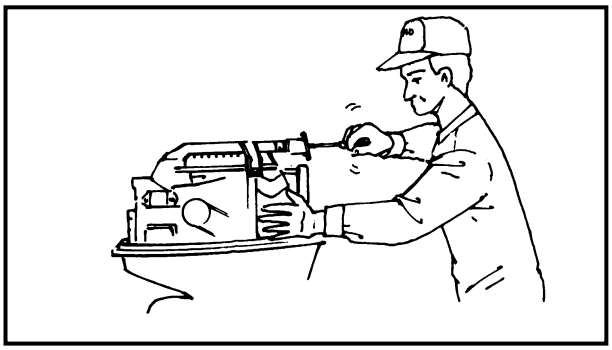


3. Non-reusable items
   Always use new gaskets, packings, O-rings, split-pins, circlips, etc., on reassembly.

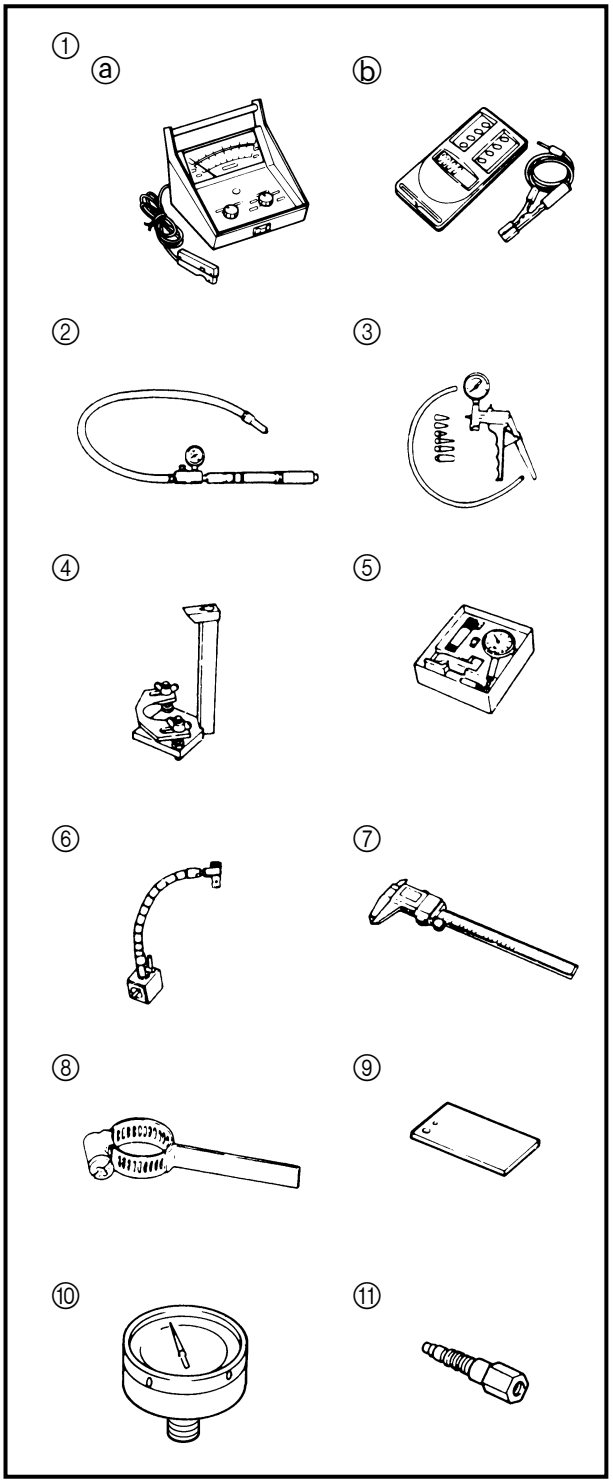


DISASSEMBLY AND ASSEMBLY

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



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



SPECIAL TOOLS

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

NOTE:

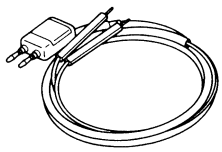
- For U.S.A. and Canada, use part numbers that start with "J-", "YB-", "YM-", "YU-" or "YW-".
- For others countries, use part numbers that start with "90890-".

MEASURING

① Tachometer
P/N. YU-08036-A ..... ⓐ
90890-06760 ..... ⓑ
② Pressure tester
P/N. YB-35956
90890-06762
③ Mity vac
P/N. YB-35956
90890-06756
④ Pinion height gauge
P/N. YB-34432-7, YB-34432-11,
YB-34432-97
90890-06702
⑤ Dial gauge set
P/N. YU-03097
90890-01252
⑥ Magnetic base
P/N. YU-34481
90890-06705
⑦ Digital caliper
P/N. 90890-06704
⑧ Backlash indicator
P/N. YB-06265
90890-06706
⑨ Magnetic base attaching plate
P/N. YB-07003
90890-07003
⑩ Hydraulic pressure gauge
P/N. 90890-06776
⑪ Up-relief valve attachment
P/N. 90890-06773
Down-relief valve attachment
P/N. 90890-06774

⑫

⑬ ⓐ



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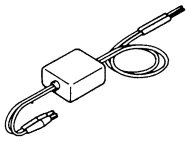

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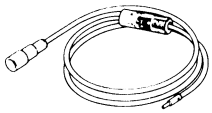

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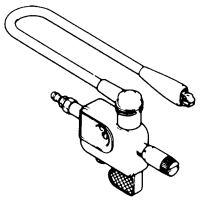

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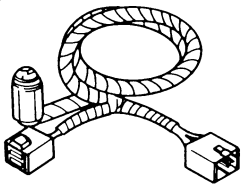

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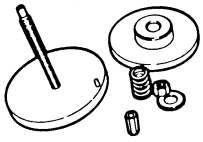

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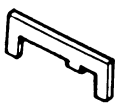

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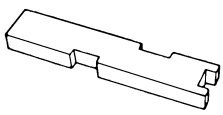

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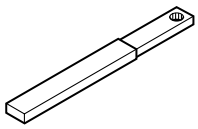

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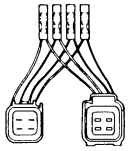


⑫ Digital tester
P/N. J-39299
90890-06752

⑬ Peak voltage adapter
P/N. YU-39991 ..... ⓐ
90890-03169 ..... ⓑ

⑭ Spark gap tester
P/N. YM-34487 ..... ⓐ
90890-06754 ..... ⓑ

⑮ Diagnostic indicator
P/N. YB-06765
90890-06765

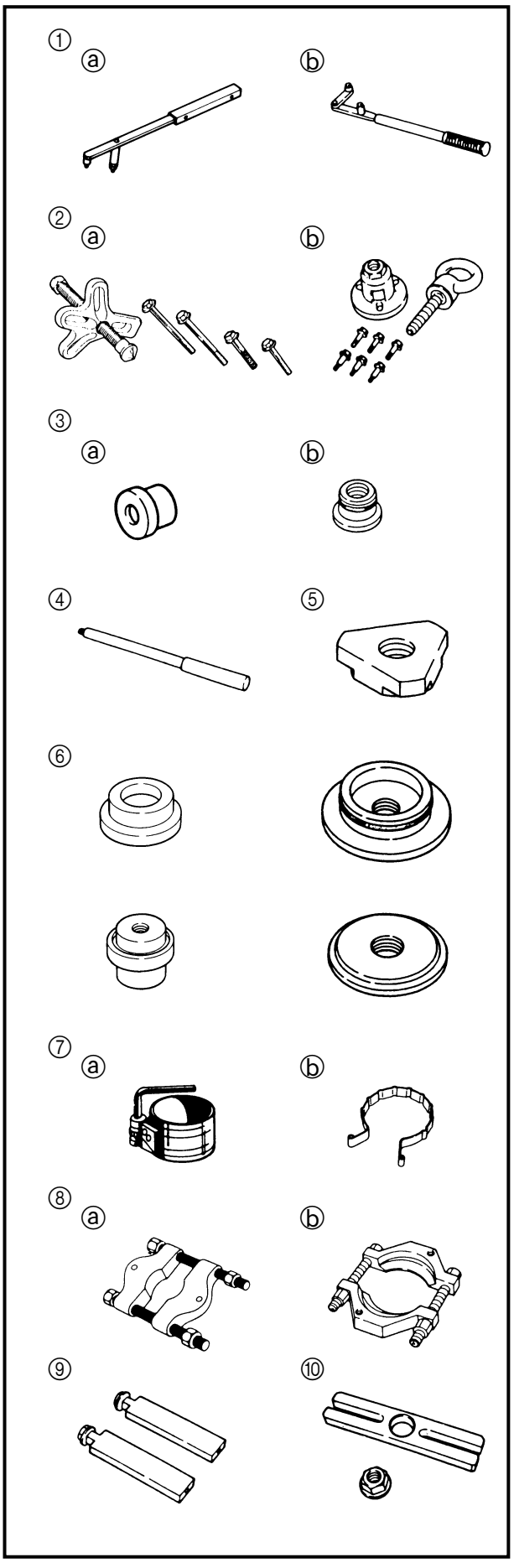
⑯ Shimming gauge
P/N. YB-34446-1, YB-34446-3,
YB-34446-4, YB-34446-7,
YB-34446-8

⑰ Shimming gauge
P/N. YB-34468-1, YB-34468-2,
YB-34468-6

⑱ Shimming plate
P/N. 90890-06701

⑲ Shift rod wrench
P/N. YB-06052
90890-06052

⑳ Test harness
P/N. YB-06770, YB-38831,
YB-38832
90890-06770, 90890-06771,
90890-06772



REMOVING AND INSTALLING

① Flywheel magnet assembly holder
P/N. YB-06139 ..... ⓐ
90890-06522 ..... ⓑ

② Universal puller
P/N. YB-06117 ..... ⓐ
90890-06521 ..... ⓑ

③ Bearing/oil seal attachment
P/N. YB-06196 ..... ⓐ
90890-06610, 90890-06637 .... ⓑ

④ Driver rod
P/N. YB-06071
90890-06602, 90890-06604,
90890-06605, 90890-06606,
90890-06652

⑤ Bearing/oil seal attachment
P/N. YB-06205
90890-06663

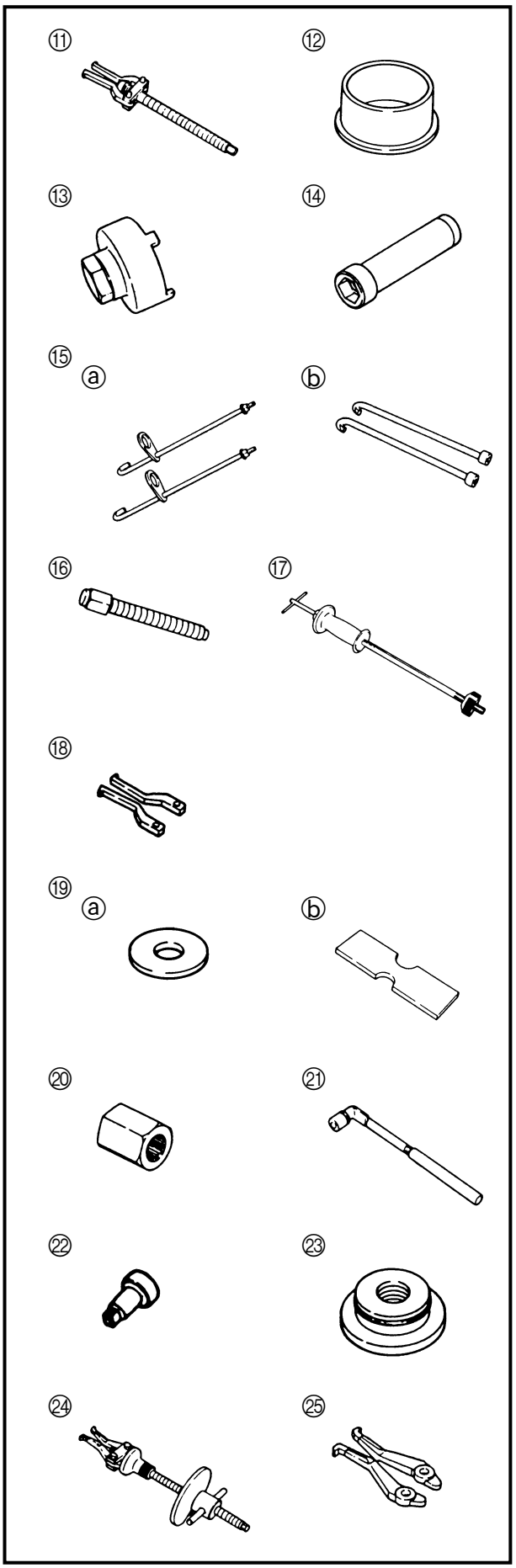
⑥ Bearing/oil seal attachment
P/N. YB-06194, YB-06195,
YB-06200, YB-06246,
YB-06258, YB-06276,
YB-06336
90890-06619, 90890-06622,
90890-06623, 90890-06624,
90890-06629

⑦ Piston ring compressor
P/N. YU-33294 ..... ⓐ
90890-06530 ..... ⓑ

⑧ Bearing separator
P/N. YB-06219 ..... ⓐ
90890-06534 ..... ⓑ

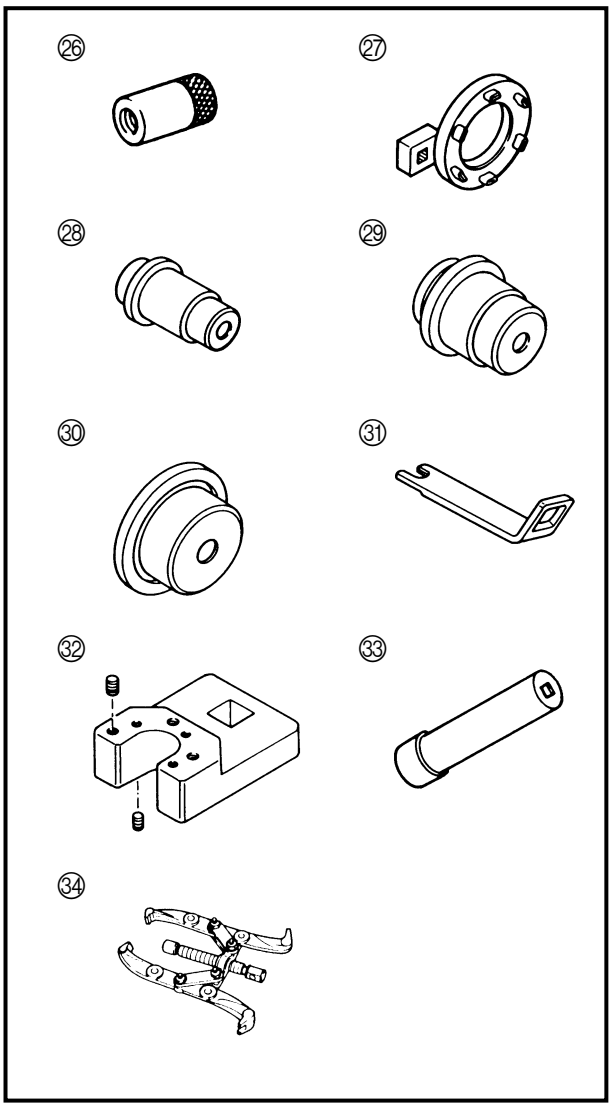
⑨ Guide plate stand
P/N. 90890-06538

⑩ Guide plate
P/N. 90890-06501



⑪ Bearing puller
P/N. 90890-06535
⑫ Bearing/oil seal attachment
P/N. 90890-06659, 90890-06660, 90890-06661, 90890-06662
⑬ Ring nut wrench
P/N. YB-34447
90890-06512
⑭ Ring nut wrench extension
P/N. YB-06513
90890-06513
⑮ Propeller shaft housing puller
P/N. YB-06207 ..... ⓐ
YB-06502 ..... ⓑ
90890-06502
⑯ Center bolt
P/N. 90890-06504
⑰ Slide hammer
P/N. YB-06096
90890-06531
⑱ Small universal claws
P/N. 90890-06536
⑲ Bearing/oil seal depth plate
P/N. YB-06213, YB-34474 ..... ⓐ
90890-06603 ..... ⓑ
⑳ Drive shaft holder
P/N. YB-06201
90890-06520
㉑ Pinion nut holder
P/N. 90890-06505
㉒ Pinion nut holder attachment
P/N. 90890-06508
㉓ Bearing/oil seal attachment
P/N. 90890-06609, 90890-06612, 90890-06631, 90890-06633, 90890-06636, 90890-06653
㉔ Bearing puller
P/N. YB-06029, YB-06247
90890-06523
㉕ Large universal claws
P/N. 90890-06532

SPECIAL TOOLS



㉖ Slide hammer attachment
P/N. YB-06335
90890-06514
㉗ Ring nut wrench
P/N. YB-42223
㉘ Bearing/oil seal attachment
P/N. YB-42225
㉙ Bearing/oil seal attachment
P/N. YB-42227
㉚ Bearing/oil seal attachment
P/N. YB-42229
90890-06607
㉛ Pinion nut holder
P/N. YB-42224
㉜ End screw wrench
P/N. YB-06548
90890-06548
㉝ End screw wrench
P/N. YB-06175-1A
㉞ Universal puller
P/N. YB-06540
90890-06540

CHAPTER 2
SPECIFICATIONS

GENERAL SPECIFICATIONS

Item	Worldwide	Unit	Model				
			150AET	L150AET	175AET	200AET	L200AET
	USA		C150TR	—	—	—	—
	Canada		—	—	—	—	—
DIMENSION							
Overall length		mm (in)	828 (32.6)				
Overall width		mm (in)	600 (23.6)				
Overall height							
(L)		mm (in)	1,577 (62.1)	—	1,577 (62.1)		—
(X)		mm (in)	1,703 (67.0)				
Boat transom height							
(L)		mm (in)	508 (20.0)	—	508 (20.0)		—
(X)		mm (in)	635 (25.0)				
WEIGHT							
(with aluminum propeller)							
(L)		kg (lb)	178 (392.4)	—	178 (392.4)		—
(X)		kg (lb)	182 (401.2)	—	182 (401.2)		—
(with stainless steel propeller)							
(L)		kg (lb)	180 (396.8)	—	180 (396.8)		—
(X)		kg (lb)	184 (405.6)	186 (410.1)	184 (405.6)		186 (410.1)
PERFORMANCE							
Maximum output		kW (hp) @ 5,000 r/min	110.3 (150)		128.7 (175)	147.1 (200)	
Full throttle operating range		r/min	4,500 - 5,500				
Maximum fuel consumption		L (US gal, Imp gal)/hr @ 5,500 r/min	72 (19.0, 15.8)		75 (19.8, 16.5)	81 (21.4, 17.8)	
POWER UNIT							
Type			2 stroke - V				
Number of cylinders			6				
Displacement		cm^3 (cu. in)	2,596 (158.4)				
Bore × stroke		mm (in)	90.0 × 68.0 (3.54 × 2.68)				
Compression ratio			6.2		6.0	5.9	
Compression pressure		kPa (kg/cm^2)	745 (7.45)		892 (8.92)		
Spark plugs (NGK)			BR8HS-10/BR8HS-10[*1]				
Number of carburetors			3				
Enrichment system			Choke valve				
Intake system			Reed valve				
Induction system			Loop charge				
Exhaust system			Through prop boss				
Lubrication system			Pre-mix				
Cooling system			Water				

[*1]: For china

Item		Unit	Model				
	Worldwide		150AET	L150AET	175AET	200AET	L200AET
	USA		C150TR	—	—	—	—
	Canada		—	—	—	—	—
Ignition system			CDI				
Starting system			Electric				
Advance type			Mechanical				
FUEL AND OIL							
Fuel type			Unleaded regular gasoline				
Fuel rating		*PON	86				
		RON	91				
Engine oil type			2-stroke outboard engine oil				
Engine oil grade			TC-W3				
Engine oil capacity							
(engine oil tank)		L (US qt, Imp qt)	—				
(sub-oil tank)		L (US qt, Imp qt)	—				
Gear oil type			Hypoid gear oil SAE 90				
Gear oil total quantity		cm^3 (US oz, Imp oz)	980 (33.1, 34.5)	870 (29.4, 30.6)	980 (33.1, 34.5)		870 (29.4, 30.6)
BRACKET							
Trim angle (at 12° boat transom)		Degree	–4 - 16				
Tilt-up angle		Degree	70				
Steering angle		Degree	35 + 35				
DRIVE UNIT							
Gear shift positions			F-N-R				
Gear ratio			1.86 (26/14)				
Reduction gear type			Spiral bevel gear				
Clutch type			Dog clutch				
Propeller shaft type			Spline				
Propeller direction (rear view)			Clockwise	Counter-clockwise	Clockwise		Counter-clockwise

* PON: Pump Octane Number
RON: Research Octane Number

Item	Unit	Model							
Worldwide		150FETO		L150FETO		150GETO	D150HETO	175DETO	
USA		—	S150TR	—	L150TR	P150TR	D150TR	—	S175TR
Canada		—	—	—	—	P150TR	—	—	—
DIMENSION									
Overall length	mm (in)	823 (32.4)					896 (35.3)	823 (32.4)	
Overall width	mm (in)	577 (22.7)							
Overall height									
(L)	mm (in)	1,615 (63.6)			—	1,637 (64.4)	1,573 (61.9)	1,615 (63.6)	—
(X)	mm (in)	1,742 (68.6)				—		1,742 (68.6)	
Boat transom height									
(L)	mm (in)	508 (20.0)			—	508 (20.0)			—
(X)	mm (in)	635 (25.0)				—		635 (25.0)	
WEIGHT									
(with aluminum propeller)									
(L)	kg (lb)	192 (423.3)		—				192 (423.3)	—
(X)	kg (lb)	196 (432.1)		—				196 (432.1)	
(with stainless steel propeller)									
(L)	kg (lb)	194 (427.7)		196 (432.1)	—	194 (427.7)	198.5 (437.6)	194 (427.7)	—
(X)	kg (lb)	198 (436.5)		200 (440.9)		—		198 (436.5)	
PERFORMANCE									
Maximum output	kW (hp) @ 5,000 r/min	110.3 (150)						128.7 (175)	
Full throttle operating range	r/min	4,500 - 5,500							
Maximum fuel consumption	L (US gal, lmp gal)/hr @ 5,500 r/min	72 (19.0, 15.8)	69 (18.2, 15.2)	72 (19.0, 15.8)	69 (18.2, 15.2)	75 (19.8, 16.5)			74 (19.6, 16.3)
POWER UNIT									
Type		2 stroke - V							
Number of cylinders		6							
Displacement	cm^3 (cu. in)	2,596 (158.4)							
Bore × stroke	mm (in)	90.0 × 68.0 (3.54 × 2.68)							
Compression ratio		6.2				5.9		6.0	
Compression pressure	kPa (kg/cm^2)	—							
Spark plugs (NGK)		BR7HS-10					BR8HS-10		
Number of carburetors		3							
Enrichment system		Choke valve							
Intake system		Reed valve							
Induction system		Loop charge							
Exhaust system		Through prop boss							
Lubrication system		Oil injection							

Item		Unit	Model							
	Worldwide		150FETO		L150FETO		150GETO	D150HETO	175DETO	
	USA		—	S150TR	—	L150TR	P150TR	D150TR	—	S175TR
	Canada		—	—	—	—	P150TR	—	—	—
Cooling system			Water							
Ignition system			Microcomputer (CDI)							
Starting system			Electric							
Advance type			Mechanical and microcomputer							
FUEL AND OIL										
Fuel type			Unleaded regular gasoline							
Fuel rating		*PON	86							
		RON	91							
Engine oil type			2-stroke outboard engine oil							
Engine oil grade			TC-W3							
Engine oil capacity										
(engine oil tank)		L (US qt, Imp qt)	0.9 (0.95, 0.79)							
(sub-oil tank)		L (US qt, Imp qt)	10.5 (11.1, 9.2)							
Gear oil type			Hypoid gear oil SAE 90							
Gear oil total quantity		cm^3 (US oz, Imp oz)	980 (33.1, 34.5)		870 (29.4, 30.6)		980 (33.1, 34.5)	900 (30.4, 31.7)	980 (33.1, 34.5)	
BRACKET										
Trim angle (at 12° boat transom)		Degree	–4 - 16							
Tilt-up angle		Degree	70							
Steering angle		Degree	35 + 35							
DRIVE UNIT										
Gear shift positions			F-N-R							
Gear ratio			1.86 (26/14)				2.00 (28/14)	2.00 (26/13)	1.86 (26/14)	
Reduction gear type			Spiral bevel gear							
Clutch type			Dog clutch							
Propeller shaft type			Spline							
Propeller direction (rear view)			Clockwise		Counterclock-wise		Clock-wise	Forward: Counter-clockwise Rear: Clockwise	Clockwise	

* PON: Pump Octane Number
RON: Research Octane Number

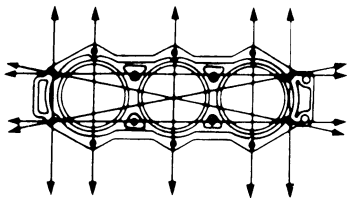
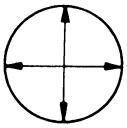
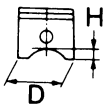
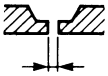
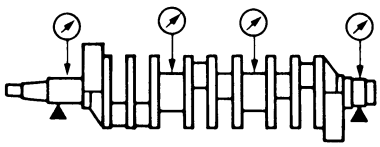
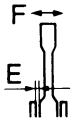
Item		Unit	Model							
	Worldwide		175FETO	200FETO		L200FETO		200GETO	225DET	225DETO
	USA		P175TR	200TR	S200TR	—	L200TR	P200TR	—	—
	Canada		P175TR	—	S200TR	—	—	P200TR	—	—
DIMENSION										
Overall length		mm (in)	823 (32.4)							
Overall width		mm (in)	577 (22.7)							
Overall height										
(L)		mm (in)	1,637 (64.4)	1,615 (63.6)	—	1,615 (63.6)	—	1,637 (64.4)	1,615 (63.6)	
(X)		mm (in)	—	1,742 (68.6)				—	1,742 (68.6)	
Boat transom height										
(L)		mm (in)	508 (20.0)		—	508 (20.0)	—	508 (20.0)		
(X)		mm (in)	—	635 (25.0)				—	635 (25.0)	
WEIGHT										
(with aluminum propeller)										
(L)		kg (lb)	—	192 (423.3)	—				191 (421.1)	192 (423.3)
(X)		kg (lb)	—	196 (432.1)		—			195 (429.9)	196 (432.1)
(with stainless steel propeller)										
(L)		kg (lb)	194 (427.7)		—	196 (432.1)	—	194 (427.7)	193 (425.5)	194 (427.7)
(X)		kg (lb)	—	198 (436.5)		200 (440.9)		—	197 (434.3)	198 (436.5)
PERFORMANCE										
Maximum output		kW (hp) @ 5,000 r/min	128.7 (175)	147.1 (200)					165.5 (225)	
Full throttle operating range		r/min	4,500 - 5,500					5,000 - 6,000		
Maximum fuel consumption		L (US gal, lmp gal)/hr @ 5,500 r/min	78 (20.6, 17.2)	81 (21.4, 17.8)	82 (21.7, 18.0)	81 (21.4, 17.8)	82 (21.7, 18.0)	88 (23.2, 19.4)	87 (23.0, 19.1)	
POWER UNIT										
Type			2 stroke - V							
Number of cylinders			6							
Displacement		cm^3 (cu. in)	2,596 (158.4)							
Bore × stroke		mm (in)	90.0 × 68.0 (3.54 × 2.68)							
Compression ratio			6.0	6.2				6.05		
Compression pressure		kPa (kg/cm^2)	—	892 (8.92)				834 (8.34)		
Spark plugs (NGK)			BR8HS-10							
Number of carburetors			3							
Enrichment system			Choke valve							
Intake system			Reed valve							
Induction system			Loop charge							

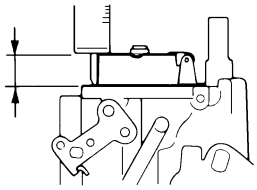
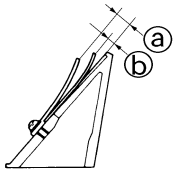
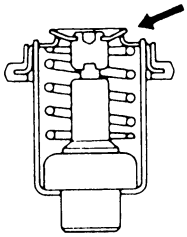
Item		Unit	Model						
	Worldwide		175FETO	200FETO		L200FETO		200GETO	225DET	225DETO
	USA		P175TR	200TR	S200TR	—	L200TR	P200TR	—	—
	Canada		P175TR	—	S200TR	—	—	P200TR	—	—
Exhaust system			Through prop boss							
Lubrication system			Oil injection						Pre-mix	Oil injection
Cooling system			Water							
Ignition system			Microcomputer (CDI)							
Starting system			Electric							
Advance type			Mechanical and microcomputer							
FUEL AND OIL										
Fuel type			Unleaded regular gasoline							
Fuel rating		*PON	86							
		RON	91							
Engine oil type			2-stroke outboard engine oil							
Engine oil grade			TC-W3							
Engine oil capacity										
(engine oil tank)		L (US qt, Imp qt)	0.9 (0.95, 0.79)						—	0.9 (0.95, 0.79)
(sub-oil tank)		L (US qt, Imp qt)	10.5 (11.1, 9.2)						—	10.5 (11.1, 9.2)
Gear oil type			Hypoid gear oil SAE 90							
Gear oil total quantity		cm^3 (US oz, Imp oz)	980 (33.1, 34.5)			870 (29.4, 30.6)		980 (33.1, 34.5)		
BRACKET										
Trim angle (at 12° boat transom)		Degree	–4 - 16							
Tilt-up angle		Degree	70							
Steering angle		Degree	35 + 35							
DRIVE UNIT										
Gear shift positions			F-N-R							
Gear ratio			1.86 (26/14)							
Reduction gear type			Spiral bevel gear							
Clutch type			Dog clutch							
Propeller shaft type			Spline							
Propeller direction (rear view)			Clockwise			Counterclock-wise		Clockwise		

* PON: Pump Octane Number
  RON: Research Octane Number

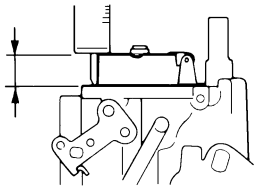
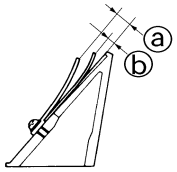
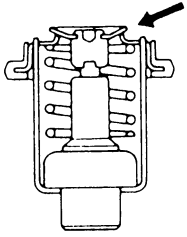
MAINTENANCE SPECIFICATIONS

POWER UNIT

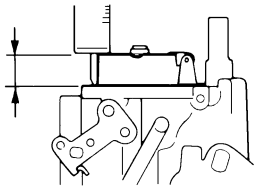
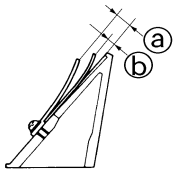
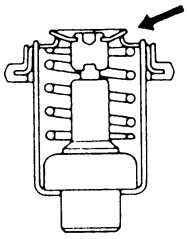
Item	Unit	Model			
		150 hp	175 hp	200 hp	225 hp
CYLINDER HEADS					
Warpage limit	mm (in)	0.10 (0.004)			
 (lines indicate straightedge position)					
CYLINDERS					
 Bore size	mm (in)	90.00 - 90.02 (3.543 - 3.544)			
Wear limit	mm (in)	90.1 (3.55)			
Taper limit	mm (in)	0.08 (0.003)			
Out-of-round limit	mm (in)	0.05 (0.002)			
PISTONS					
 Piston diameter (D)	mm (in)	89.895 - 89.915 (3.5392 - 3.5400)			
Measuring point (H)	mm (in)	10 (0.4)			
Piston-to-cylinder clearance	mm (in)	0.100 - 0.106 (0.0039 - 0.0042)			
<Limit>	mm (in)	0.156 (0.0061)			
Oversize piston diameter					
1st	mm (in)	90.15 (3.549)			
2nd	mm (in)	90.40 (3.559)			
PISTON RINGS					
 Type		Keystone			
 (B)	mm (in)	2.0 (0.079)			
(T)	mm (in)	2.8 (0.110)			
End gap (installed)	mm (in)	0.30 - 0.40 (0.012 - 0.016)			
 <Limit>	mm (in)	0.60 (0.024)			
Side clearance	mm (in)	0.02 - 0.06 (0.001 - 0.002)			
CRANKSHAFT					
Runout limit	mm (in)	0.05 (0.002)			
					
CONNECTING RODS					
 Small-end axial play (F)	mm (in)	0.12 - 0.26 (0.005 - 0.010)			
Big-end side clearance (E)	mm (in)	2.0 (0.08)			

Item	Unit	Model				
Worldwide		150AET	L150AET	175AET	200AET	L200AET
USA		C150TR	—	—	—	—
Canada		—	—	—	—	—
CARBURETORS						
ID mark		64C00		64D00	64E00	
Main jet	#	150, 154 (PU, PM)*, 158 (PL)*			150,152 (SL)*, 154 (PU, PM)*, 158 (PL)*	
Main air jet	#	310		280	270	
Main nozzle (inside diameter)	mm (in)	4.2 (0.17)			4.5 (0.18)	
Pilot jet	#	84				
Pilot air jet	#	60				
Pilot screw	Turn out	1 ± 1/4		1-1/16 ± 1/4	1-1/8 ± 1/4	
Float height	mm (in)	16.0 ± 0.5 (0.63 ± 0.02)				
						
Valve seat diameter	mm (in)	1.2 (0.05)				
Idling speed	r/min	700 ± 25				
Trolling speed	r/min	575 ± 25				
OIL INJECTION PUMP						
ID mark		—				
Oil discharge (for 3 minutes)	cm^3 (US oz, Imp oz) @ 1,500 r/min	—				
Bleeding		—				
REED VALVES						
Reed valve stopper height ⓐ	mm (in)	6.5 ± 0.3 (0.26 ± 0.01)				
						
Warpage limit ⓑ	mm (in)	0.2 (0.008)				
THERMOSTATS						
Opening temperature	˚C (˚F)	48 - 52 (118 - 126)				
Full-open temperature	˚C (˚F)	60 (140)				
						
Valve open lower limit	mm (in)	3 (0.12)				

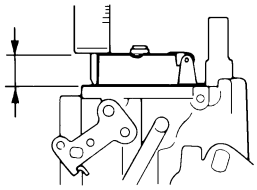
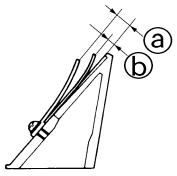
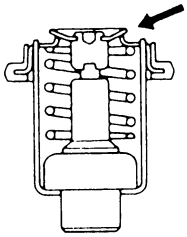
*: (PL) Port lower (PU) Port upper
(PM) Port middle (SL) Starboard lower

Item	Unit	Model					
Worldwide		150FETO		L150FETO		150GETO	D150HETO
USA		—	S150TR	—	L150TR	P150TR	D150TR
Canada		—	—	—	—	P150TR	—
CARBURETORS							
ID mark		64C00	64CS0	64C00	64CS0	64K00	
Main jet	#	150, 154 (PU, PM)*, 158 (PL)*	142	150, 154 (PU, PM)*, 158 (PL)*	142	152, 154 (PU, PM)*, 158 (PL)*	
Main air jet	#	310					
Main nozzle (inside diameter)	mm (in)	4.2 (0.17)	4.0 (0.16)	4.2 (0.17)	4.0 (0.16)	4.2 (0.17)	
Pilot jet	#	84					
Pilot air jet	#	60					
Pilot screw	Turn out	1 ± 1/4	1-1/4 ± 1/4	1 ± 1/4	1-1/4 ± 1/4	1-9/16 ± 1/4 (S)* 1-1/16 ± 1/4 (P)*	
Float height	mm (in)	16.0 ± 0.5 (0.63 ± 0.02)					
							
Valve seat diameter	mm (in)	1.2 (0.05)					
Idling speed	r/min	700 ± 25					
Trolling speed	r/min	575 ± 25					—
OIL INJECTION PUMP							
ID mark		6R400					
Oil discharge (for 3 minutes)	cm^3 (US oz, Imp oz) @ 1,500 r/min	3.4 ± 0.7 (0.115 ± 0.024, 0.120 ± 0.025)					
Bleeding		Screw type					
REED VALVES							
Reed valve stopper height ⓐ	mm (in)	6.5 ± 0.3 (0.26 ± 0.01)					
							
Warpage limit ⓑ	mm (in)	0.2 (0.008)					
THERMOSTATS							
Opening temperature	˚C (˚F)	48 - 52 (118 - 126)					
Full-open temperature	˚C (˚F)	60 (140)					
							
Valve open lower limit	mm (in)	3 (0.12)					

*: (P) Port (PM) Port middle (PL) Port lower
(PU) Port upper (S) Starboard

Item	Unit	Model				
Worldwide		175DETO		175FETO	200FETO	
USA		—	S175TR	P175TR	200TR	S200TR
Canada		—	—	P175TR	—	S200TR
CARBURETORS						
ID mark		64D00	64DS0	64L00	64E00	64ES0
Main jet	#	150, 154 (PU, PM)*, 158 (PL)*	142	152, 154 (PU, PM)*, 158 (PL)*	150, 152 (SL)*, 154 (PU, PM)*, 158 (PL)*	146
Main air jet	#	280	310	280	270	310
Main nozzle (inside diameter)	mm (in)	4.2 (0.17)	4.0 (0.16)	4.2 (0.17)	4.5 (0.18)	4.0 (0.16)
Pilot jet	#	84		80	84	
Pilot air jet	#	60				
Pilot screw	Turn out	1-1/16 ± 1/4	1-1/8 ± 1/4	1-5/8 ± 1/4 (S)* 1-1/8 ± 1/4 (P)*	1-1/8 ± 1/4	1-1/8 ± 1/4 (S)* 5/8 ± 1/4 (P)*
Float height	mm (in)	16.0 ± 0.5 (0.63 ± 0.02)				
						
Valve seat diameter	mm (in)	1.2 (0.05)				
Idling speed	r/min	700 ± 25				
Trolling speed	r/min	575 ± 25		570 ± 25	575 ± 25	
OIL INJECTION PUMP						
ID mark		6R400			6R510	
Oil discharge (for 3 minutes)	cm^3 (US oz, Imp oz) @ 1,500 r/min	3.4 ± 0.7 (0.115 ± 0.024, 0.120 ± 0.025)			4.8 ± 1.1 (0.162 ± 0.037, 0.169 ± 0.039)	
Bleeding		Screw type				
REED VALVES						
Reed valve stopper height ⓐ	mm (in)	6.5 ± 0.3 (0.26 ± 0.01)				
						
Warpage limit ⓑ	mm (in)	0.2 (0.008)				
THERMOSTATS						
Opening temperature	˚C (˚F)	48 - 52 (118 - 126)				
Full-open temperature	˚C (˚F)	60 (140)				
						
Valve open lower limit	mm (in)	3 (0.12)				

*: (P) Port (PM) Port middle (S) Starboard
(PL) Port lower (PU) Port upper (SL) Starboard lower

Item		Unit	Model				
	Worldwide		L200FETO		200GETO	225DET	225DETO
	USA		—	L200TR	P200TR	—	—
	Canada		—	—	P200TR	—	—
CARBURETORS							
ID mark			64E00	64ES0	64F00		
Main jet		#	150,152 (SL)*, 154 (PU, PM)*, 158 (PL)*	146	150, 154 (PU, PM)*, 158 (PL)*		
Main air jet		#	270	310	260		
Main nozzle (inside diameter)		mm (in)	4.5 (0.18)	4.0 (0.16)	4.5 (0.18)		
Pilot jet		#	84		80		
Pilot air jet		#	60				
Pilot screw		Turn out	1-1/8 ± 1/4	1-1/8 ± 1/4 (S)* 5/8 ± 1/4 (P)*	1-1/4 ± 1/4 (S)* 3/4 ± 1/4 (P)*		
Float height		mm (in)	16.0 ± 0.5 (0.63 ± 0.02)				
							
Valve seat diameter		mm (in)	1.2 (0.05)				
Idling speed		r/min	700 ± 25				
Trolling speed		r/min	575 ± 25		600 ± 25		
OIL INJECTION PUMP							
ID mark			6R510			—	6R510
Oil discharge (for 3 minutes)		cm^3 (US oz, Imp oz) @ 1,500 r/min	4.8 ± 1.1 (0.162 ± 0.037, 0.169 ± 0.039)			—	4.8 ± 1.1 (0.162 ± 0.037, 0.169 ± 0.039)
Bleeding			Screw type			—	Screw type
REED VALVES							
Reed valve stopper height ⓐ		mm (in)	6.5 ± 0.3 (0.26 ± 0.01)				
							
Warpage limit ⓑ		mm (in)	0.2 (0.008)				
THERMOSTATS							
Opening temperature		˚C (˚F)	48 - 52 (118 - 126)				
Full-open temperature		˚C (˚F)	60 (140)				
							
Valve open lower limit		mm (in)	3 (0.12)				

*: (P) Port (PM) Port middle (S) Starboard
(PL) Port lower (PU) Port upper (SL) Starboard lower

LOWER UNIT

Item		Unit	Model			
	Worldwide		L150AET	L150FETO	L200AET	L200FETO
	USA		—	L150TR	—	L200TR
	Canada		—	—	—	—
GEAR BACKLASH						
Pinion - forward gear		mm (in)	0.21 - 0.43 (0.008 - 0.017)			
Pinion - reverse gear		mm (in)	0.97 - 1.29 (0.038 - 0.051)			
Pinion shims		mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			
Forward gear shims		mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			
Reverse gear shims		mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			

Item		Unit	Model						
	Worldwide		150AET	150FETO	150GETO	D150HETO	175AET	175DETO	175FETO
	USA		C150TR	S150TR	P150TR	D150TR	—	S175TR	P175TR
	Canada		—	—	P150TR	—	—	—	P175TR
GEAR BACKLASH									
Pinion - forward gear		mm (in)	0.25 - 0.46 (0.010 - 0.018)		0.71 - 1.01 (0.028 - 0.040)	0.19 - 0.59 (0.007 - 0.023)	0.25 - 0.46 (0.010 - 0.018)		
Pinion - reverse gear		mm (in)	0.74 - 1.29 (0.029 - 0.051)		0.79 - 1.38 (0.031 - 0.054)	0.39 - 0.70 (0.015 - 0.028)	0.74 - 1.29 (0.029 - 0.051)		
Pinion shims		mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50						
Forward gear shims		mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50						
Reverse gear shims		mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50						

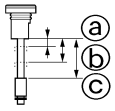
Item		Unit	Model				
	Worldwide		200AET	200FETO	200GETO	225DET	225DETO
	USA		—	(S)200TR	P200TR	—	—
	Canada		—	S200TR	P200TR	—	—
GEAR BACKLASH							
Pinion - forward gear		mm (in)	0.25 - 0.46 (0.010 - 0.018)				
Pinion - reverse gear		mm (in)	0.74 - 1.29 (0.029 - 0.051)				
Pinion shims		mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50				
Forward gear shims		mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50				
Reverse gear shims		mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50				

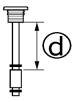
ELECTRICAL

Item	Unit	Model	
		Oil injection (and 225DET)	Pre-mix (except for 225DET)
IGNITION SYSTEM			
Ignition timing			
Full retard	Degrees	ATDC 7	
Full advance	Degrees	BTDC 19 (150A, L150A, 175A/C150TR) BTDC 18 (200A, L200A) BTDC 22 (150F, L150F, D150H, 175D, S175D/D150TR, S175TR) BTDC 23 (S150F, LS150F, 175F, 200G/S150TR, L150TR, P175TR, P200TR) BTDC 20 (150G, 200F, L200F/P150TR, 200TR) BTDC 21 (S200F, LS200F, 225D/S200TR, L200TR)	
Piston position	mm (in)	2.28 (0.09) (150A, L150A, 175A/C150TR) 2.05 (0.08) (200A, L200A) 3.05 (0.12) (150F, L150F, D150H, 175D, S175D/D150TR, S175TR) 3.33 (0.13) (S150F, LS150F, 175F, 200G/S150TR, L150TR, P175TR, P200TR) 2.53 (0.10) (150G, 200F, L200F/P150TR, 200TR) 2.78 (0.11) (S200F, LS200F, 225D/S200TR, L200TR)	
CDI unit			
Output peak voltage lower limit (B/W – B)			
@ cranking 1	V	—	—
@ cranking 2	V	130	65
@ 1,500 r/min	V	145	140
@ 3,500 r/min	V	145	135
Charge coil			
Output peak voltage lower limit (B/R – L)			
@ cranking 1	V	40	30
@ cranking 2	V	55	30
@ 1,500 r/min	V	165	160
@ 3,500 r/min	V	165	170
(R – Br)			
@ cranking 1	V	140	80
@ cranking 2	V	160	90
@ 1,500 r/min	V	165	165
@ 3,500 r/min	V	165	165

* Cranking 1: Open circuit voltage.
  Cranking 2: Loaded circuit voltage.

Item	Unit	Model	
		Oil injection (and 225DET)	Pre-mix (except for 225DET)
Pulser coil			
Output peak voltage lower limit (W/R – W/G, W/Y – W/Br, W/B – W/L)			
@ cranking 1	V	3.0	2.5
@ cranking 2	V	2.0	2.0
@ 1,500 r/min	V	8.0	9.5
@ 3,500 r/min	V	14	16
IGNITION CONTROL SYSTEM			
Crank position sensor			
Output peak voltage lower limit (G – G)			
@ cranking 1	V	3.0	
@ cranking 2	V	2.0	
@ 1,500 r/min	V	5.5	
@ 3,500 r/min	V	6.0	
Engine cooling water temperature sensor			
Resistance (B/Y – B/Y)			
@ 5°C (41°F)	kΩ	128	
@ 20°C (68°F)	kΩ	54 - 69	
@ 100°C (212°F)	kΩ	3.02 - 3.48	
Thermo switch (P – B)			
OFF → ON	°C (°F)	84 - 90 (183 - 194)	
ON → OFF	°C (°F)	60 - 74 (140 - 165)	
Oil level sensor (engine oil tank)			
Float position ⓐ "OFF"	mm (in)	3 - 6 (0.12 - 0.24)	
Float position ⓑ "ON"	mm (in)	33 - 36 (1.30 - 1.42)	
Float position ⓒ "ON"	mm (in)	53 - 56 (2.09 - 2.20)	
Oil level gauge (sub-oil tank)			
Float position ⓓ "ON"	mm (in)	150 - 153 (5.91 - 6.02)	
STARTING SYSTEM			
Fuse 1	V-A	12-30	12-30
Fuse 2	V-A	12-20	—
Fuel enrichment valve			
Resistance (L – B)	Ω	3.4 - 4.0	



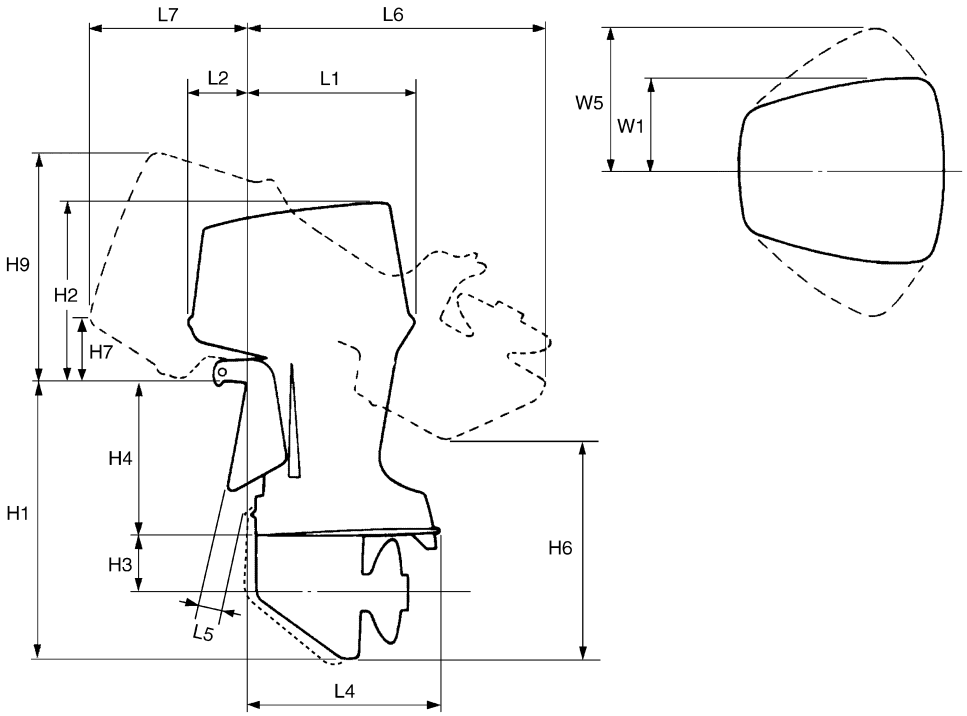


* Cranking 1: Open circuit voltage.
Cranking 2: Loaded circuit voltage.

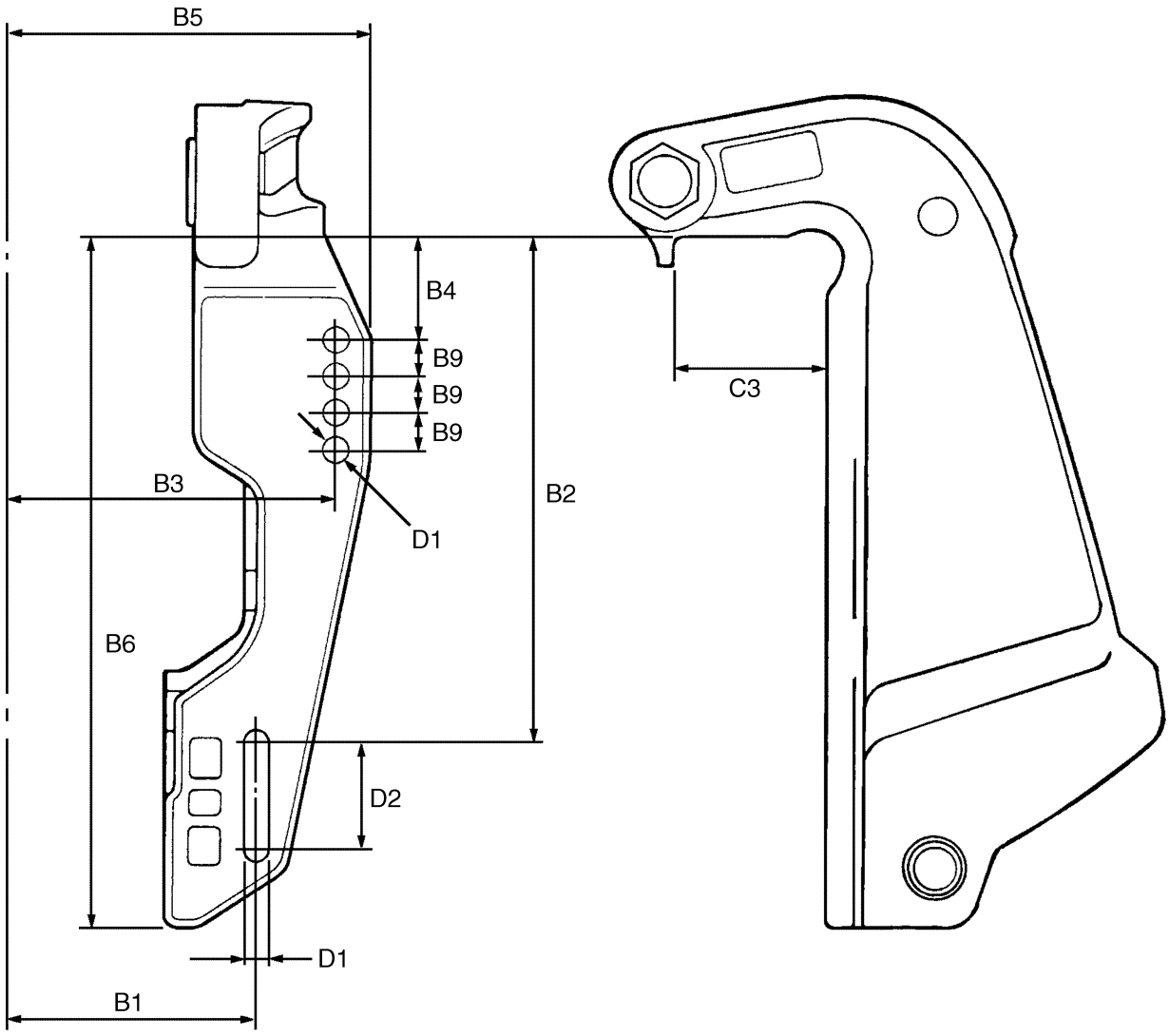
Item	Unit	Model	
		Oil injection (and 225DET)	Pre-mix (except for 225DET)
STARTER MOTOR			
Type		Bendix	
Output	kW	1.1	
Rating	Second	30	
Brushes			
Standard length	mm (in)	16.0 (0.63)	
Wear limit	mm (in)	12.0 (0.47)	
Commutator			
Standard diameter	mm (in)	33.0 (1.30)	
Wear limit	mm (in)	31.0 (1.22)	
Mica			
Standard undercut	mm (in)	0.8 (0.03)	
Wear limit	mm (in)	0.2 (0.01)	
CHARGING SYSTEM			
Lighting coil			
Output peak voltage lower limit (G – G)			
@ cranking 1	V	—	—
@ cranking 2	V	—	—
@ 1,500 r/min	V	35	20
@ 3,500 r/min	V	85	50
POWER TRIM AND TILT SYSTEM			
Trim sensor			
Resistance (P – B)	Ω	582 - 873	
Resistance (O – B)	Ω	800 - 1,200	
POWER TRIM AND TILT MOTOR			
Fluid type		ATF Dexron II	
Brushes			
Standard length	mm (in)	9.8 (0.39)	
Wear limit	mm (in)	4.8 (0.19)	
Commutator			
Standard diameter	mm (in)	22.0 (0.87)	
Wear limit	mm (in)	21.0 (0.83)	
Mica			
Standard undercut	mm (in)	1.35 (0.05)	
Wear limit	mm (in)	0.85 (0.03)	

* Cranking 1: Open circuit voltage.
  Cranking 2: Loaded circuit voltage.

DIMENSIONS



Symbol		Unit	Models				
	Worldwide		150FETO, S150FETO, L150FETO, LS150FETO, 175DETO, S175DETO, 200FETO, S200FETO, L200FETO, LS200FETO, 225DET, 225DETO	150GETO, 175FETO, 200GETO	D150HETO	150AET, 175AET, 200AET	L150AET, L200AET
	USA		S150TR, L150TR, S175TR, 200TR, S200TR, L200TR	P150TR, P175TR, P200TR	D150TR	C150TR	—
	Canada		S200TR	P150TR, P175TR, P200TR	—	—	—
L1		mm (in)	550 (21.7)	557 (21.9)			
L2		mm (in)	179 (7.0)				
L4		mm (in)	647 (25.5)		717 (28.2)	631 (24.8)	634 (25.0)
L5	(L)	mm (in)	61 (2.4)		44 (1.7)		—
	(X)	mm (in)	80 (3.1)	—			
L6	(L)	mm (in)	1,036 (40.8)		1,033 (40.7)	1,0.32 (40.6)	—
	(X)	mm (in)	1,152 (45.4)	—		1,148 (45.2)	1,144 (45.0)
L7		mm (in)	587 (23.1)			568 (22.4)	577 (22.7)
H1	(L)	mm (in)	946 (37.2)		882 (34.7)	943 (37.1)	—
	(X)	mm (in)	1,072 (42.2)	—		1,070 (42.1)	1,072 (42.2)
H2		mm (in)	670 (25.3)	—		635 (25.0)	657 (25.9)
H3		mm (in)	210 (8.3)				
H4	(L)	mm (in)	516 (20.3)		452 (17.8)	513 (20.2)	—
	(X)	mm (in)	642 (25.3)	—		640 (25.2)	642 (25.3)
H6	(L)	mm (in)	773 (30.4)		695 (27.4)		—
	(X)	mm (in)	849 (33.4)	—			
H7		mm (in)	241 (9.5)				
H9		mm (in)	791 (31.1)	864 (34.0)		777 (30.6)	775 (30.5)
W1		mm (in)	290 (11.4)			297 (11.7)	291 (11.5)
W5		mm (in)	406 (16.0)			422 (16.6)	408 (16.1)



Symbol	Unit	Models				
Worldwide		150FETO, S150FETO, L150FETO, LS150FETO, 175DETO, S175DETO, 200FETO, S200FETO, L200FETO, LS200FETO, 225DET, 225DETO	150GETO, 175FETO, 200GETO	D150HETO	150AET, 175AET, 200AET	L150AET, L200AET
USA		S150TR, L150TR, S175TR, 200TR, S200TR, L200TR	P150TR, P175TR, P200TR	D150TR	C150TR	—
Canada		S200TR	P150TR, P175TR, P200TR	—	—	—
B1	mm (in)	125.4 (4.9)				
B2	mm (in)	254 (10.0)				
B3	mm (in)	163.5 (6.4)				
B4	mm (in)	50.8 (2.0)				
B5	mm (in)	180 (7.1)				
B6	mm (in)	367 (14.4)				
B9	mm (in)	18.5 (0.7)				
C3	mm (in)	82 (3.2)				
D1	mm (in)	13 (0.5)				
D2	mm (in)	55.5 (2.2)				

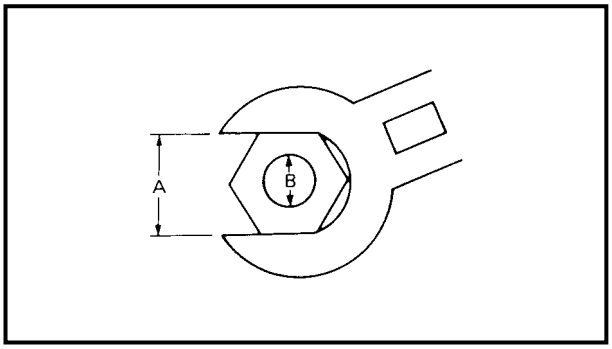
TIGHTENING TORQUES

SPECIFIED TORQUES

Part to be tightened		Thread size	Tightening torques		
			Nm	m•kgf	ft•lb
POWER UNIT					
Fuel pump		M5	3	0.3	2.2
Intake silencer		M6	3	0.3	2.2
Carburetor drain plug		—	5	0.5	3.6
Pilot jet plug		—	3	0.3	2.2
Oil pump		M6	7	0.7	5.1
Flywheel magnet assembly (oil injection and 225DET)		M20	190	19	137
Flywheel magnet assembly (pre-mix except for 225DET)		M20	165	16.5	120
Negative battery lead		M8	7	0.7	5.1
Positive battery lead		M6	4	0.4	2.9
Power unit mount		M8	21	2.1	15
Ignition coil		M6	8	0.8	5.8
Emergency switch		—	4	0.4	2.9
Starter motor lead		M6	9	0.9	6.5
Relay assembly lead		M6	4	0.4	2.9
Starter motor		M8	30	3.0	22
Intake manifold	1st	M6	4	0.4	2.9
	2nd		8	0.8	5.8
Reed valve		M5	3	0.3	2.2
Reed valve stopper		M3	1	0.1	0.7
Spark plug		M14	25	2.5	18
Thermostat cover	1st	M6	4	0.4	2.9
	2nd		8	0.8	5.8
Cylinder head cover	1st	M6	4	0.4	2.9
	2nd		8	0.8	5.8
Cylinder head	1st	M8	15	1.5	11
	2nd		30	3.0	22
Engine cooling water temperature sensor		—	18	1.8	13
Cooling water pressure control valve cover	1st	M6	4	0.4	2.9
	2nd		8	0.8	5.8
Exhaust port outer cover	1st	M6	4	0.4	2.9
	2nd		8	0.8	5.8
Crankcase	1st	M8	10	1.0	7.2
	2nd		18	1.8	13
	1st	M10	20	2.0	14
	2nd		40	4.0	29

Part to be tightened		Thread size	Tightening torques		
			Nm	m•kgf	ft•lb
Connecting rod	1st	M8	19	1.9	14
	2nd		37	3.7	27
	3rd		0	0	0
	4th		19	1.9	14
	5th		37	3.7	27
LOWER UNIT					
Propeller		M18	55	5.5	40
Rear propeller (for D150H/D150TR)		M18	55	5.5	40
Forward propeller (for D150H/D150TR)		M45	65	6.5	47
Lower unit		M10	40	4.0	29
Ring nut		—	145	14.5	105
Pinion nut		M22	95	9.5	68
Gear oil drain screw		—	7	0.7	5.1
Gear oil level check screw		—	7	0.7	5.1
BRACKET UNIT					
Flushing hose		M5	5	0.5	3.6
Shift rod detent mechanism screw		—	24	2.4	17
Upper mount		M12	53	5.3	38
Lower mount		M14	73	7.3	53
Exhaust manifold assembly		M8	21	2.1	15
Muffler		M8	18	1.8	13
Exhaust manifold		M8	18	1.8	13
Lower exhaust manifold guide		M8	18	1.8	13
Clamp bracket		M22	15	1.5	11
Trim sensor stopper		M6	2	0.2	1.4
Trim stopper		—	37	3.7	27
POWER TRIM AND TILT UNIT					
Power trim and tilt reservoir cap		—	8	0.8	5.8
Power trim and tilt reservoir		1/4″	5	0.5	3.6
Power trim and tilt motor		1/4″	5	0.5	3.6
Manual valve		—	4	0.4	2.9
Tilt ram end screw		—	130	13	94
Gear pump unit		5/16″	9	0.9	6.5
Gear pump		—	6	0.6	4.3
Trim ram end screw		—	80	8.0	52

Nut (A)	Bolt (B)	General torque specifications		
		Nm	m•kgf	ft•lb
8 mm	M5	5	0.5	3.6
10 mm	M6	8	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 TORQUES

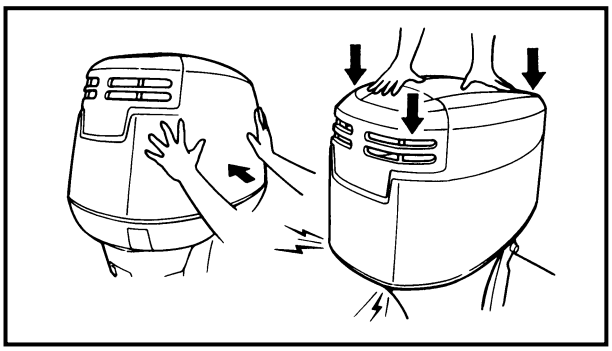
This chart specifies tightening torques for standard fasteners with a standard ISO thread pitch. Tightening torque specifications for special components or assemblies are provided in applicable sections of this manual. To avoid warpage, tighten multi-fastener assemblies in a crisscross fashion and progressive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

CHAPTER 3
PERIODIC INSPECTIONS AND ADJUSTMENTS

MAINTENANCE INTERVAL CHART

Use the following chart as a guide to general maintenance intervals.
Dependant on operating conditions, adjust the maintenance intervals accordingly.

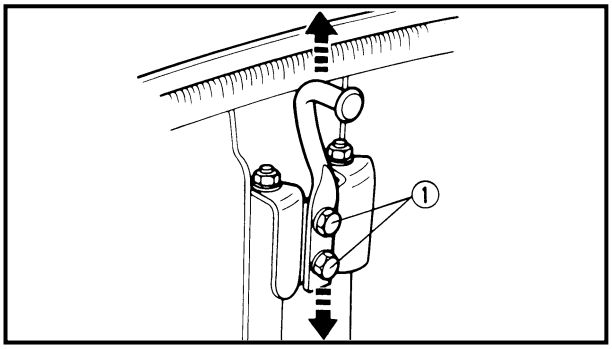
Item	Remarks	Initial		Every		Refer to page
		10 hours (Break-in)	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	
TOP COWLING						
Top cowling fit	Inspect				○	3-2
FUEL SYSTEM						
Fuel line	Inspect	○		○	○	3-2
Fuel filter	Clean/inspect	○	○	○		3-3
Carburetor	Clean	○	○	○		4-17
POWER UNIT						
Water leakage	Inspect	○	○	○		—
Motor exterior	Inspect	○	○	○		—
Exhaust leakage	Inspect	○	○	○		—
Cooling water passage	Clean/flush		○	○		—
CONTROL SYSTEM						
Carburetor synchronization	Inspect/adjust				○	3-6
Engine idling speed	Inspect/adjust	○		○		3-7
Remote control shift cable	Inspect/adjust				○	3-11
Remote control throttle cable	Inspect/adjust				○	3-11
OIL INJECTION SYSTEM						
Oil tank water drain	Clean	○	○	○		—
Oil pump lever	Inspect/adjust	○				3-12
POWER TRIM AND TILT UNIT						
Power trim and tilt fluid	Inspect	○	○	○	○	3-16
LOWER UNIT						
Gear oil	Change	○		○		3-17
Lower unit leakage	Inspect				○	3-19
Propeller	Inspect	○	○	○		6-3, 6-27, 6-51
GENERAL						
Anodes	Inspect/replace		○	○		3-19
Battery	Inspect/charge	(every month)				3-20
Spark plugs	Clean/adjust/replace	○	○	○		3-21
Wiring and connectors	Adjust/reconnect	○	○	○		—
Bolts and nuts	Tighten	○	○	○		—
Lubrication points	Grease			○		3-23



TOP COWLING

INSPECTING THE TOP COWLING FIT

1. Inspect:
   • Top cowling fitting
   Loose/unlatched → Adjust the top cowling hook.



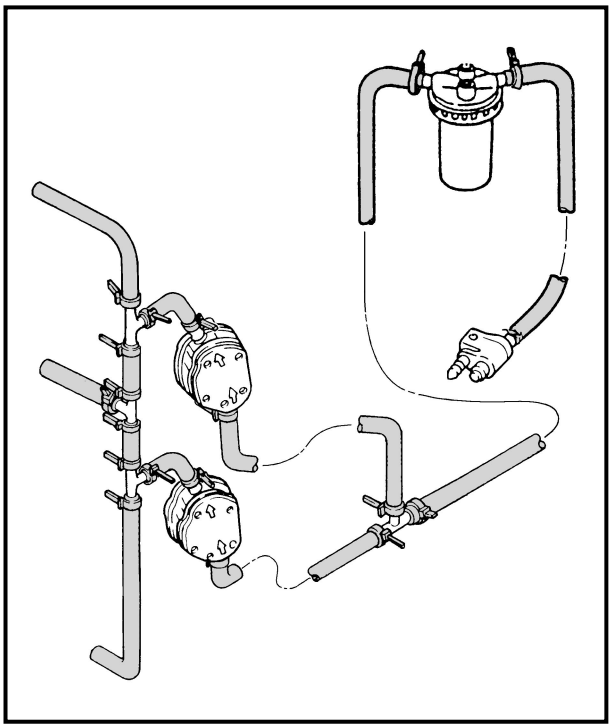
2. Adjust:
   • Top cowling hook position

Adjustment steps

(1) Loosen the bolts ① approximately 1/4 of a turn.
(2) Move the top cowling hook either up or down slightly.
(3) Secure the bolts.
(4) Check the top cowling fitting and repeat the adjustment if necessary.

NOTE:

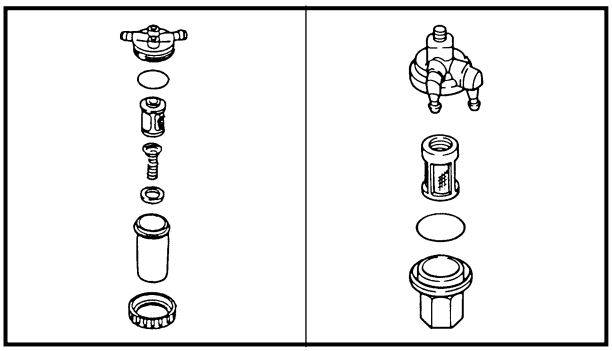
- Moving the latch towards the seal will loosen the top cowling.
- Moving the latch away from the seal will tighten the top cowling.



FUEL SYSTEM

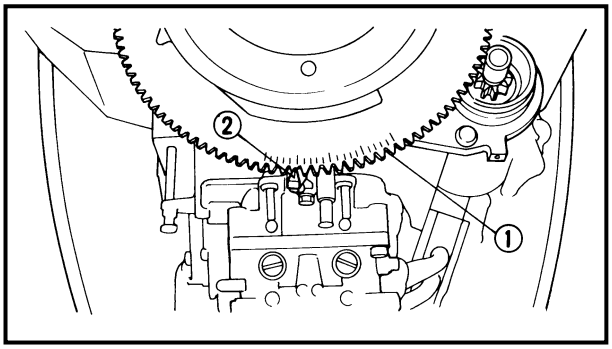
INSPECTING THE FUEL LINE

1. Inspect:
   • Plastic locking tie
   Loosen → Retighten or replace.
2. Inspect:
   • Fuel line
   Cracks/damage/leaks → Replace.
   Refer to "FUEL JOINT AND FUEL FILTER" on page 4-1.
   Refer to "FUEL PUMP" on page 4-6.



INSPECTING THE FUEL FILTER

Inspect:
- Fuel filter element
- Fuel filter cup
  Clogs/cracks/leaks → Replace.
  Foreign matter → Clean.
  Refer to "FUEL JOINT AND FUEL FILTER" on page 4-1.



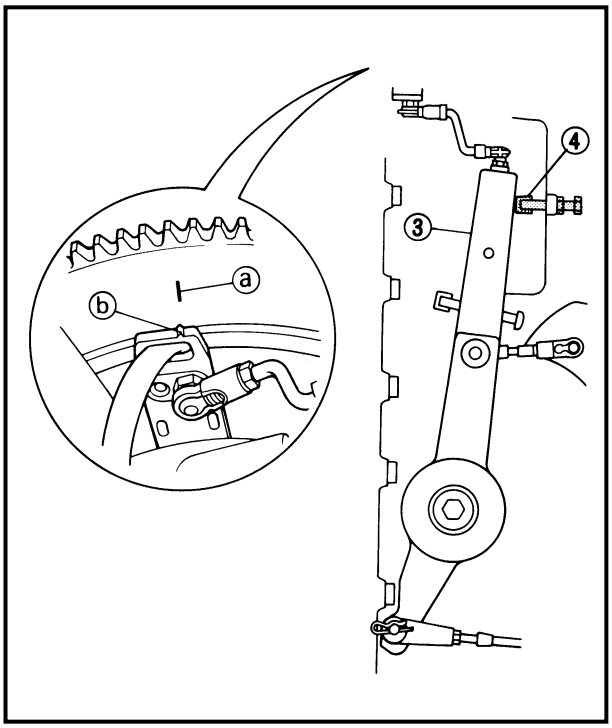
CONTROL SYSTEM

ADJUSTING THE IGNITION TIMING

1. Inspect:
   - Ignition timing (full advance)
     Incorrect → Adjust.

Inspecting steps

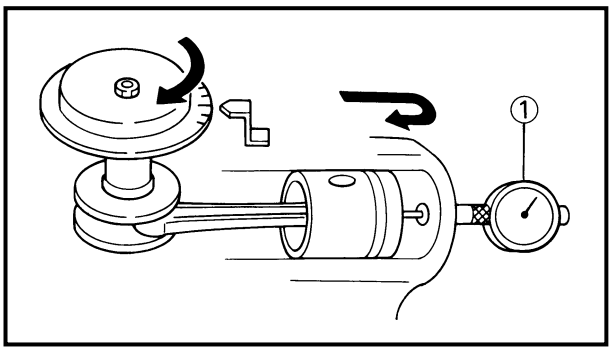
(1) Remove the flywheel magnet assembly cover.
(2) Turn the flywheel magnet assembly ① clockwise and align the timing plate ② with the specified mark.



Flywheel magnet assembly position

150A, L150A, 175A/ C150TR:	**BTDC 19°**
200A, L200A:	**BTDC 18°**
150F, L150F, D150H, 175D, S175D/D150TR, S175TR:	**BTDC 22°**
S150F, LS150F, 175F, 200G/S150TR, L150TR, P175TR, P200TR:	**BTDC 23°**
150G, 200F, L200F/ P150TR, 200TR:	**BTDC 20°**
S200F, LS200F, 225D/ S200TR, L200TR:	**BTDC 21°**

(3) Turn the magneto control lever ③ so that it contacts the full advance adjusting screw ④.
(4) Check that the mark ⓐ on the flywheel magnet assembly aligns with the mark ⓑ on the pulser coil assembly.



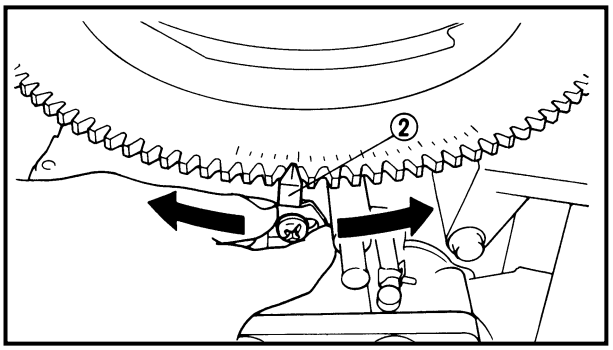
2. Adjust:
   • Ignition timing (full advance)

Adjustment steps
(1) Remove all of the spark plugs.
(2) Remove the intake silencer.
(3) Install the dial gauge ① into cylinder #1's spark plug hole.
(4) Slowly turn the flywheel magnet assembly clockwise and stop it when the piston is at TDC.
(5) Set the dial gauge to "0".
(6) Turn the flywheel magnet assembly clockwise until the dial gauge indicates the proper specification.

NOTE:
Turn the flywheel magnet assembly clockwise to locate BTDC.

Piston position

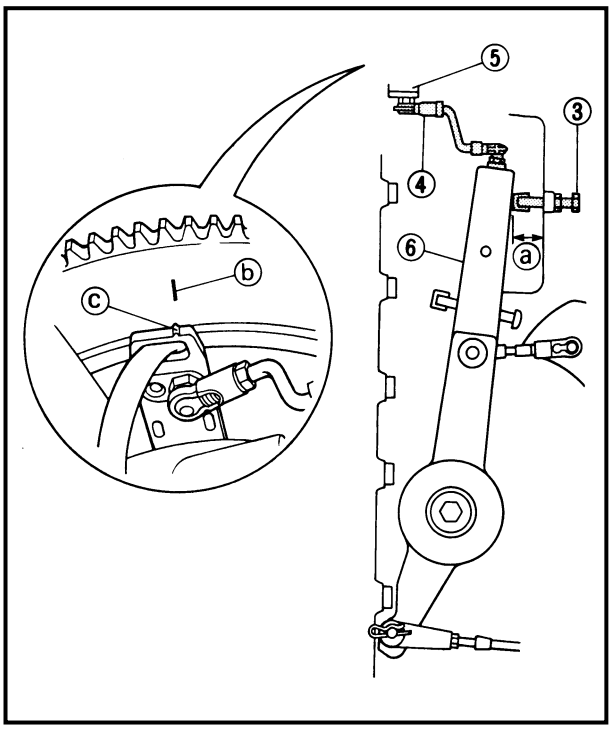
150A, L150A, 175A/ C150TR:	**2.28 mm (0.09 in)**
200A, L200A:	**2.05 mm (0.08 in)**
150F, L150F, D150H, 175D, S175D/D150TR, S175TR:	**3.05 mm (0.12 in)**
S150F, LS150F, 175F, 200G/ S150TR, L150TR, P175TR, P200TR:	**3.33 mm (0.13 in)**
150G, 200F, L200F/P150TR, 200TR:	**2.53 mm (0.10 in)**
S200F, LS200F, 225D/S200TR, L200TR:	**2.78 mm (0.11 in)**



(7) Align the timing plate ② with the specified mark on the flywheel magnet assembly.

Timing plate position

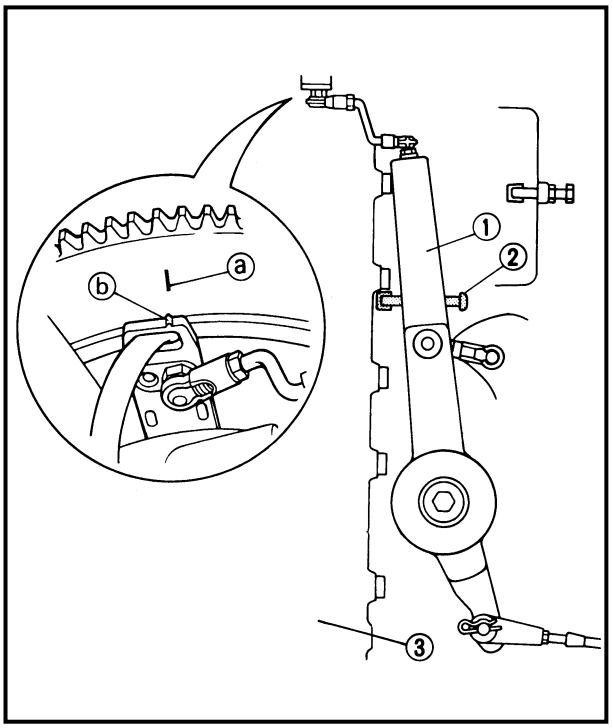
150A, L150A, 175A/ C150TR:	**BTDC 19°**
200A, L200A:	**BTDC 18°**
150F, L150F, D150H, 175D, S175D/ D150TR, S175TR:	**BTDC 22°**
S150F, LS150F, 175F, 200G/S150TR, L150TR, P175TR, P200TR:	**BTDC 23°**
150G, 200F, L200F/ P150TR, 200TR:	**BTDC 20°**
S200F, LS200F, 225D/ S200TR, L200TR:	**BTDC 21°**



(8) Secure the timing plate.
(9) Adjust the length ⓐ of the full advance adjusting screw ③ to specification.

Full advance adjusting screw length ⓐ
150A, L150A, 175A/C150TR: 23.5 mm (0.93 in)
200A, L200A: 25.0 mm (0.98 in)
150F, L150F, S150F, LS150F/S150TR, L150TR: 21.5 mm (0.85 in)
D150H/D150TR: 41.2 mm (1.62 in)
150G, P150TR: 43.5 mm (1.71 in)
200F, L200F/200TR: 24.0 mm (0.94 in)
175F, 200G/P175TR, P200TR: 40.0 mm (1.57 in)
S200F, LS200F, 225D/S200TR, L200TR: 42.5 mm (1.67 in)

(10) Disconnect the magneto control link ④ from the pulser coil assembly ⑤.
(11) Turn the magneto control lever ⑥ so that it contacts the full advance adjusting screw ③.
(12) Adjust the length of the magneto control link ④ so that the mark ⓑ on the flywheel magnet assembly aligns with the mark ⓒ on the pulser coil assembly ⑤.

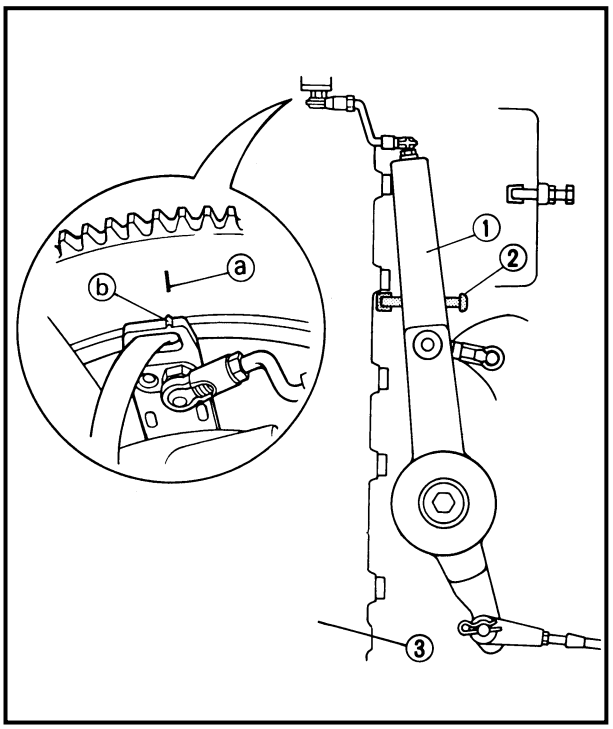


3. Inspect:
• Ignition timing (full retard)
Out of specification → Adjust.

Inspecting steps
(1) Turn the flywheel magnet assembly clockwise and align the timing plate and the specified mark.

Flywheel magnet assembly position
ATDC 7°

(2) Turn the magneto control lever ① so that the full retard adjusting screw ② contacts the crankcase ③.
(3) Check that the mark ⓐ on the flywheel magnet assembly aligns with the mark ⓑ on the pulser coil assembly.



4. Adjust:
   • Ignition timing (full retard)

Adjustment steps

(1) Turn the flywheel magnet assembly clockwise and align the timing plate and the specified mark.

Flywheel magnet assembly position
ATDC 7°

(2) Turn the magneto control lever ① to the full retard position.
(3) Adjust the full retard adjusting screw ② so that the mark ⓐ on the flywheel magnet assembly aligns with the mark ⓑ on the pulser coil assembly.

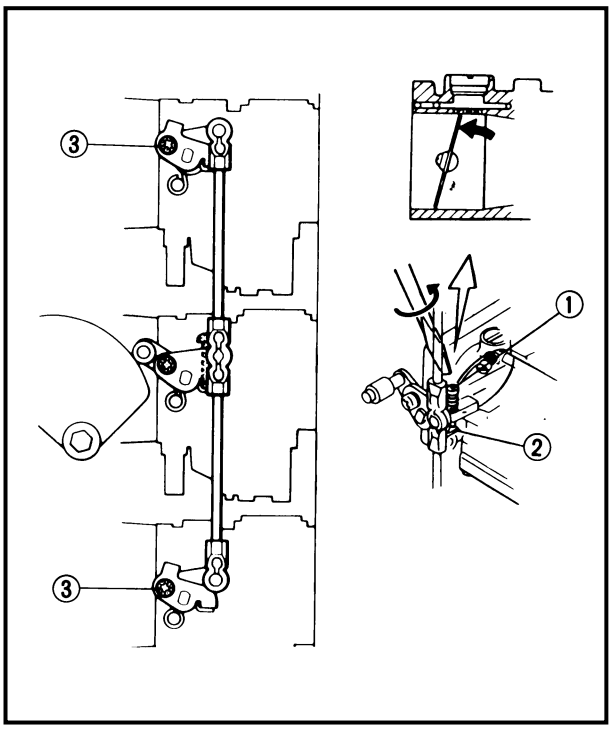
SYNCHRONIZING THE CARBURETOR

NOTE:
Before synchronizing the carburetor, be sure to adjust the ignition timing.

1. Inspect:
   • Carburetor synchronization
   Incorrect → Adjust.

Inspecting steps

(1) Remove the intake silencer.
(2) While turning the middle throttle lever, check that all throttle valves become fully closed at the same time.



2. Adjust:
   • Carburetor synchronization

Adjustment steps

(1) Loosen the idle adjusting screw ① until it does not touch the throttle arm stopper ②.
(2) Loosen the upper and lower carburetor's throttle lever securing screws ③ by turning them clockwise.
(3) While lightly pushing the middle carburetor's throttle lever in the direction of the arrow (fully closed), tighten the upper and lower carburetor's throttle lever securing screws ③ by turning them counterclockwise.
(4) Turn the middle throttle lever and make sure that all of the throttle valves are synchronized.

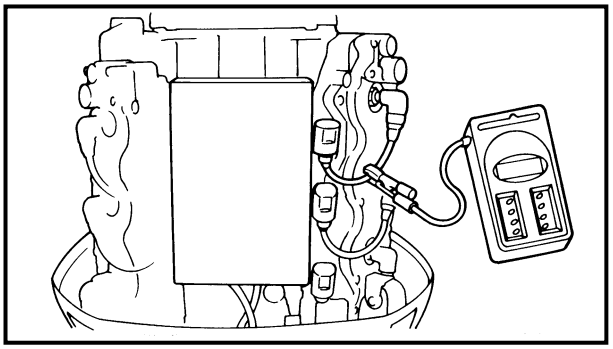
ADJUSTING THE ENGINE IDLING SPEED

NOTE:

Before adjusting the engine idling speed, be sure to synchronize the carburetor and ignition timing.

CAUTION:

Twin-barrel carburetors have two independent pilot screws. Therefore, all of the pilot screws should be properly adjusted before adjusting the carburetors.



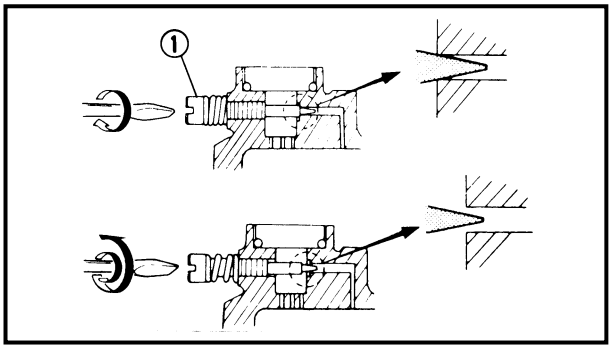
1. Measure:
   • Engine idling speed
   Out of specification → Adjust.

	Engine idling speed **700 ± 25 r/min**

Measuring steps

(1) Start the engine and allow it to warm up for a few minutes.
(2) Install the tachometer onto the spark plug lead of cylinder #1.

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



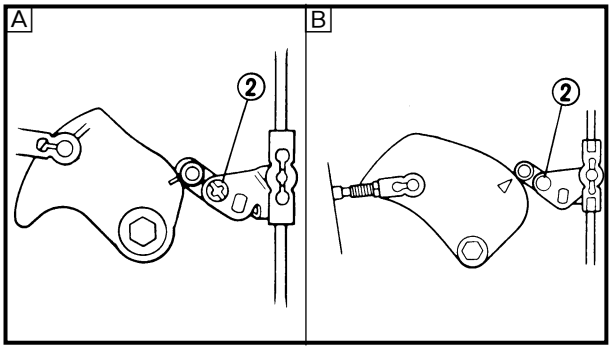
2. Adjust:
   • Engine idling speed

Adjustment steps

(1) Turn in the pilot screw ① until it is lightly seated.
(2) Turn out the pilot screw ① the specified number of turns.

Pilot screw (turns out)

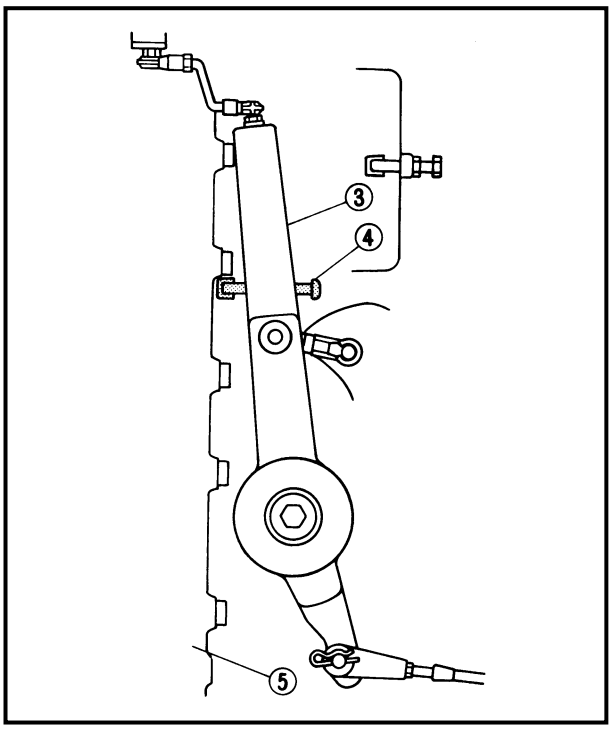
150A, L150A, 150F/ C150TR:	**1 ± 1/4**
S150F, LS150F/ S150TR, L150TR:	**1-1/4 ± 1/4**
150G, D150H/ P150TR, D150TR:	
	(S) 1-9/16 ± 1/4
	(P) 1-1/16 ± 1/4
175A, 175D:	**1-1/16 ± 1/4**
S175D/S175TR:	**1-1/8 ± 1/4**
200A, L200A, 200F, L200F/200TR:	**1-1/8 ± 1/4**
175F/P175TR:	**(S) 1-5/8 ± 1/4**
	(P) 1-1/8 ± 1/4
S200F, LS200F/ S200TR, L200TR:	**(S) 1-1/8 ± 1/4**
	(P) 5/8 ± 1/4
200G, 225D/P200TR:	
	(S) 1-1/4 ± 1/4
	(P) 3/4 ± 1/4



(3) Loosen the throttle roller adjusting screw ②.

NOTE:

Depending on the model, refer to the appropriate illustration (A or B).



(4) Start the engine and allow it to warm up for a few minutes.
(5) Install the tachometer onto the spark plug lead of cylinder #1.

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

(6) Turn the magneto control lever ③ so that the full retard adjusting screw ④ contacts the crankcase ⑤.
(7) Turn the throttle stop screw in or out until the specified engine idling speed is obtained.

Turning in	**Engine idling speed increases.**
Turning out	**Engine idling speed decreases.**

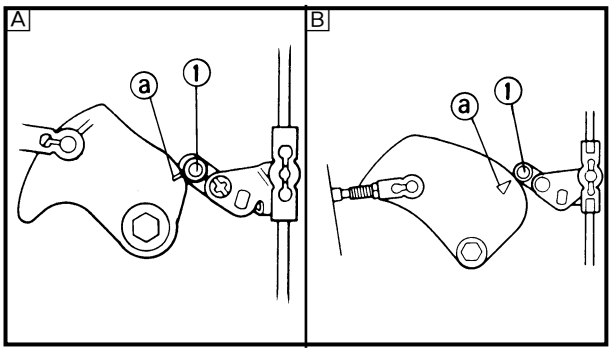
	Engine idling speed **700 ± 25 r/min**

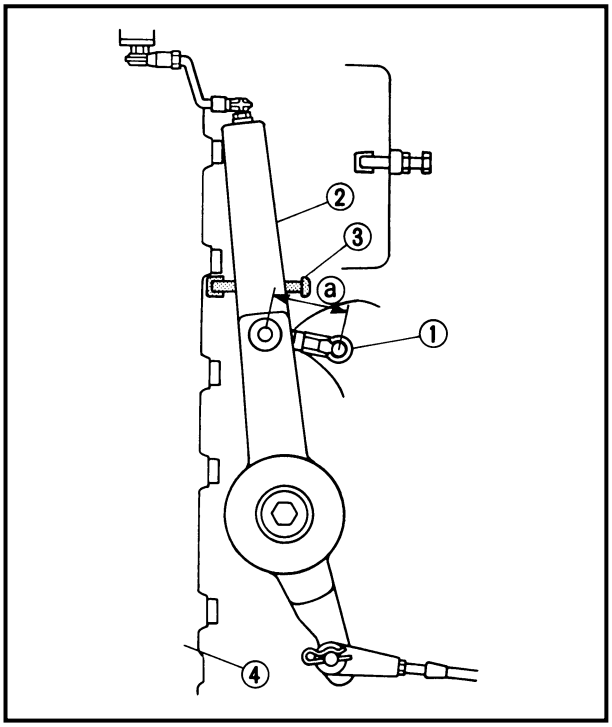
(8) Tighten the throttle roller adjusting screw ②.

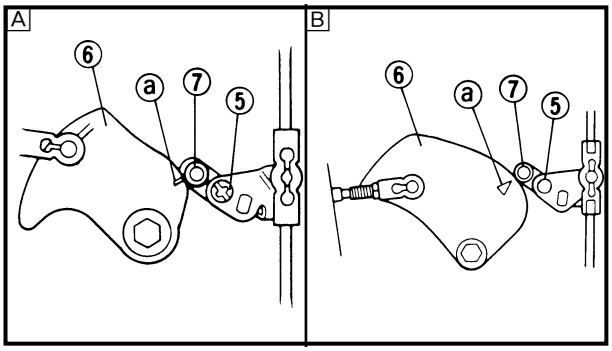
ADJUSTING THE CARBURETOR PICKUP TIMING

NOTE:
Before adjusting the carburetor pickup timing, be sure to adjust the ignition timing, carburetor synchronization and engine idling speed.

1. Inspect:
   • Pickup timing
   Incorrect → Adjust.







Inspecting steps

(1) Turn the magneto control lever so that the full retard adjusting screw contacts the crankcase.
(2) Check that the mark ⓐ on the throttle cam aligns with the center of the throttle roller ①.

NOTE:

Depending on the model, refer to the appropriate illustration (A or B).

2. Adjust:
   • Pickup timing

Adjustment steps

(1) Adjust the throttle cam control link ① to the specified length ⓐ.

Throttle cam control link length
150A, L150A, 150F, L150F, S150F, LS150F, 175A, 175D, S175D, 200A, L200A, 200F, L200F/C150TR, S150TR, L150TR, S175TR, 200TR:
42.5 mm (1.67 in)
150G, D150H, 175F, 200G, S200F, LS200F, 225D/P150TR, D150TR, P175TR, P200TR, S200TR, L200TR:
52.5 mm (2.07 in)

(2) Turn the magneto control lever ② so that the full retard adjusting screw ③ contacts the crankcase ④.
(3) Loosen the throttle roller adjusting screw ⑤.
(4) Align the mark ⓐ on the throttle cam ⑥ with the center of the throttle roller ⑦.
(5) Tighten the throttle roller adjusting screw ⑤.

NOTE:

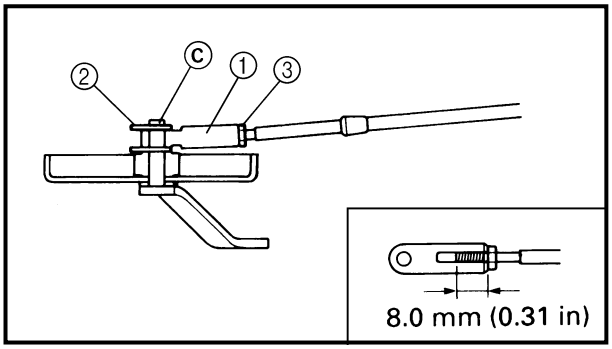
Depending on the model, refer to the appropriate illustration (A or B).

ADJUSTING THE REMOTE CONTROL SHIFT CABLE

1. Inspect:
   • Shift operation
   Incorrect → Adjust.
2. Adjust:
   • Remote control shift cable length

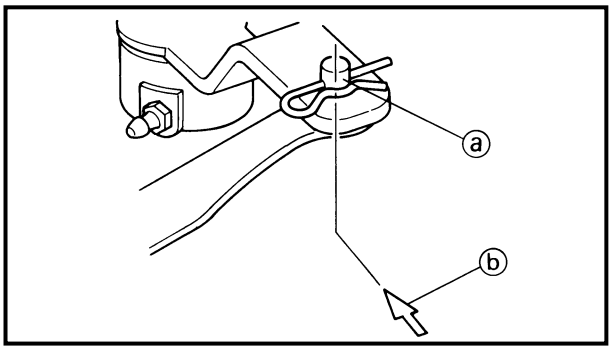
Adjustment steps

(1) Disconnect the shift cable joint ①.
(2) Set the remote control lever to the neutral position.
(3) Align the center of the set pin ⓐ with the mark ⓑ on the bottom cowling.
(4) Adjust the position of the shift cable joint until its hole aligns with the set pin ⓒ.
(5) Install the clip ② and tighten the locknut ③.



CAUTION:

The remote control cable joint must be screwed in more than 8 mm (0.31 in).



ADJUSTING THE REMOTE CONTROL THROTTLE CABLE

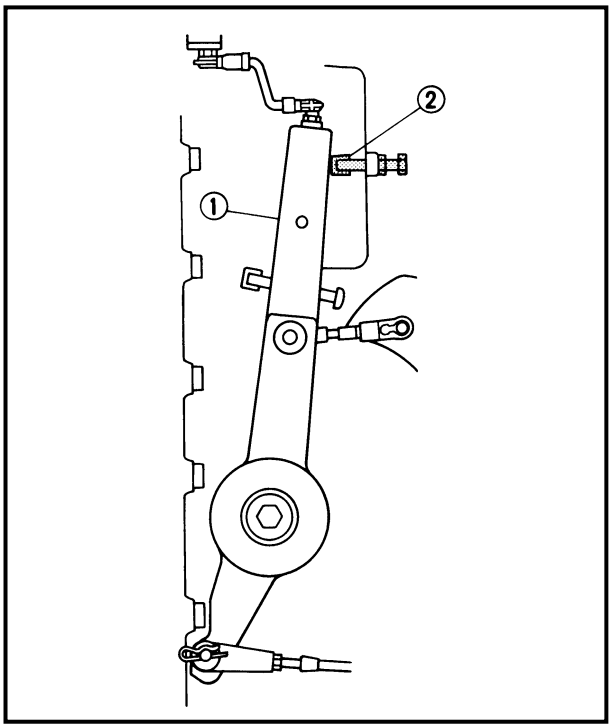
NOTE:

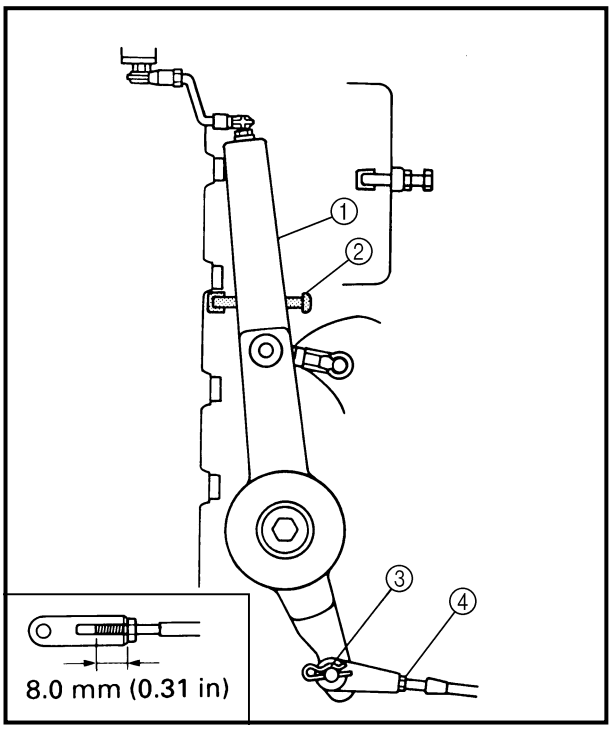
Before adjusting the remote control throttle cable, be sure to adjust the ignition timing and carburetor synchronization.

1. Inspect:
   • Throttle operation
   Incorrect → Adjust.

Inspecting steps

(1) Turn the throttle lever fully.
(2) Check the magneto control lever ① so that it contacts the full advance adjusting screw ②.



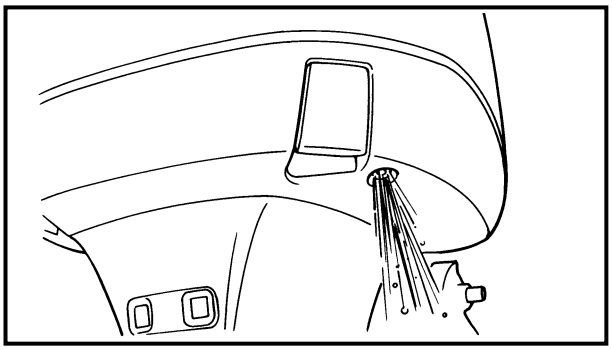


2. Adjust:
   • Remote control throttle cable length

Adjustment steps
(1) Loosen the locknut.
(2) Remove the clip.
(3) Disconnect the cable joint at the magneto control lever ①.
(4) Close the throttle grip fully.
(5) Turn the magneto control lever so that the full retard adjusting screw ② contacts the crankcase.
(6) Adjust the position of the throttle cable joint until its hole aligns with the set pin.
(7) Install the clip ③ and tighten the locknut ④.

CAUTION:

The remote control cable joint must be screwed in more than 8 mm (0.31 in).

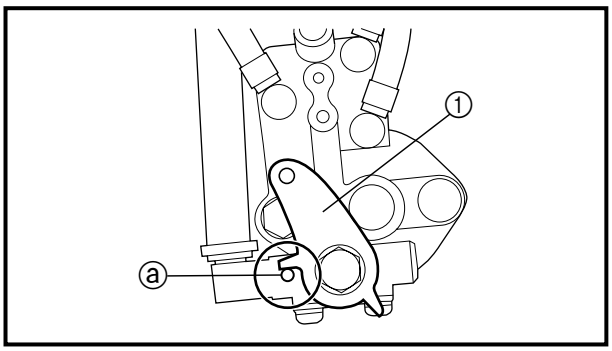


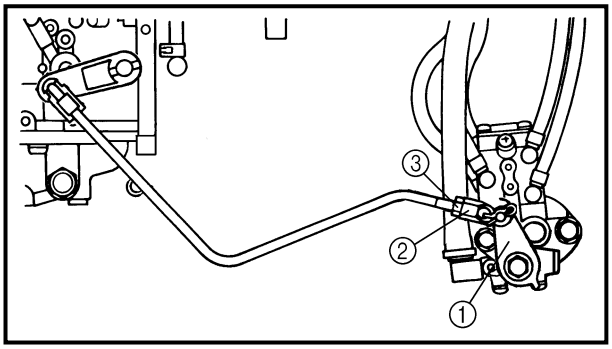
COOLING SYSTEM

INSPECTING THE COOLING WATER DISCHARGE

Inspect:
   • Cooling water discharge
     No discharge → Clean and inspect the cooling water passage.

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





OIL INJECTION SYSTEM

SYNCHRONIZING THE OIL PUMP

1. Inspect:
   • Oil pump lever position
   Incorrect → Adjust.

NOTE:

Make sure the oil pump lever ① touches the stopper ⓐ (fully closed position) when the throttle valves are closed.

2. Adjust:
   • Oil pump lever position

Adjustment steps

(1) Disconnect the oil pump link rod joint ②.
(2) Fully close the throttle valves.
(3) Turn the oil pump lever ① so it contacts the stopper ⓐ (fully closed position).
(4) Adjust the position of the oil pump link rod joint until its hole aligns with the set pin on the oil pump lever ①.
(5) Tighten the locknut ③.
(6) Install the washer and clip.

CAUTION:

After adjustment, make sure the oil pump lever operates properly.

AIR BLEEDING THE OIL INJECTION SYSTEM

Bleed:
• Air bubbles
(from the oil injection system)

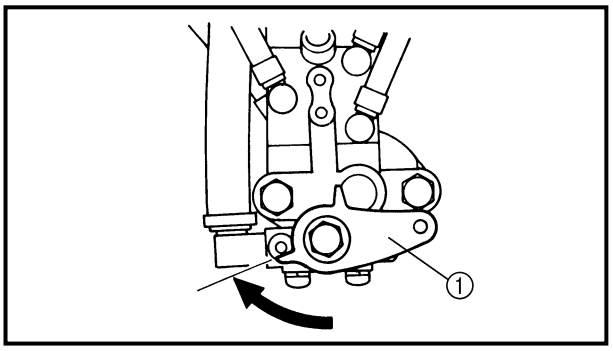
Bleeding steps

(1) Fill the fuel tank with the fuel/oil mixture (50:1).

Recommended fuel
Fuel type
Unleaded regular gasoline
Fuel rating
PON: 86
RON: 91
Recommended engine oil
Engine oil type
2-stroke outboard engine oil
Engine oil grade
TC-W3

CAUTION:

Only use the fuel/oil mixture (50:1) or engine malfunctions or seizure may result.

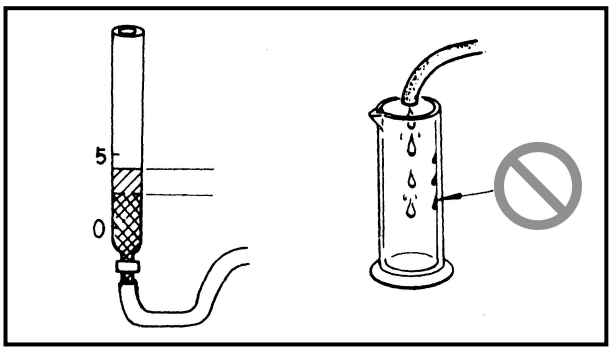


(2) Disconnect the oil pump link rod joint from the oil pump lever.
(3) Start the engine.
(4) Turn the oil pump lever ① and keep it in the fully-opened position until the fuel/oil mixture flows out of the oil pump feed hoses.

MEASURING THE OIL PUMP DISCHARGE

Measure:
- Oil pump discharge
  Out of specification → Check all of the oil pump components and replace any defective parts.

Engine oil discharge
(3 minutes/1 cylinder)
150F, L150F, S150F, LS150F, 150G, 175F, D150H, 175D, S175D/S150TR, L150TR, P150TR, P175TR, D150TR, S175TR
3.40 ± 0.70 cm^3
(0.115 ± 0.024 US oz, 0.120 ± 0.025 Imp oz)
200F, L200F, S200F, LS200F, 200G, 225D/200TR, S200TR, L200TR, P200TR
4.80 ± 1.10 cm^3
(0.162 ± 0.037 US oz, 0.169 ± 0.039 Imp oz)



NOTE:

When measuring the oil pump discharge, observe the following.

- The engine oil temperature should be 10 - 30 ˚C (50 - 86 ˚F).
- Before measuring the oil pump discharge, completely bleed any air from the oil injection system and make sure that no air bubbles are present in the engine oil which is flowing out of the oil feed hose.
- When using the graduated cylinder, make sure no engine oil clings to its walls; otherwise, the measurement will be incorrect.
- Use only the specified engine oil of the proper viscosity. If the viscosity is too high or too low, the discharge measurement will be incorrect.
- Calculate the rate of discharge per minute. The longer the measurement time, the higher the accuracy of the measurement.

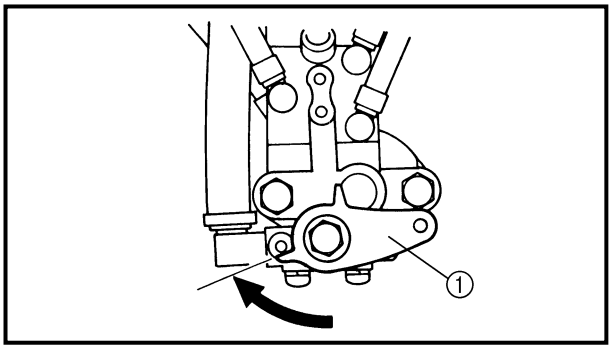
Measuring steps

(1) Fill the fuel tank with the fuel/oil mixture (50:1) and fill the oil tank with engine oil.

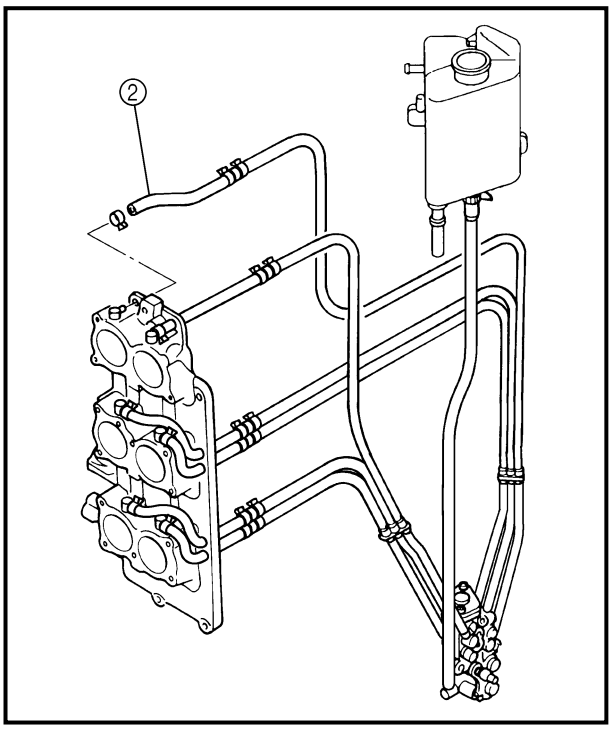
Recommended fuel
Fuel type
Unleaded regular gasoline
Fuel rating
PON: 86
RON: 91
Recommended engine oil
Engine oil type
2-stroke outboard engine oil
Engine oil grade
TC-W3

CAUTION:

Only use the fuel/oil mixture (50:1) or engine malfunctions or seizure may result.



(2) Disconnect the oil pump link rod joint from the oil pump lever.
(3) Move the oil pump lever ① to the fully-opened position.



(4) Remove the oil inlet hose ② from the vapor separator.
(5) Install the oil inlet hose onto the graduated cylinder.

NOTE:
The measuring range on the graduated cylinder should be divided into 0.1-cc increments.

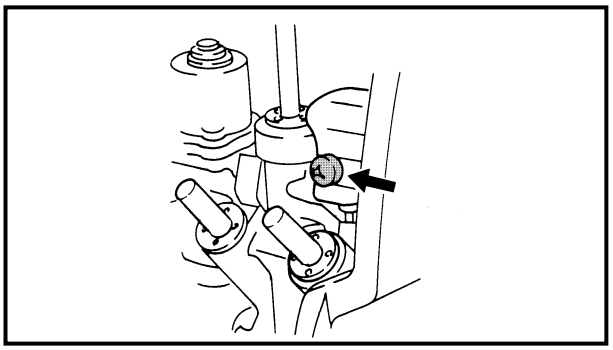
(6) Start the engine.
(7) Set the engine idling speed at 1,500 r/min.
Refer to "ADJUSTING THE ENGINE IDLING SPEED" on page 3-7.
(8) Measure the engine oil discharge for 3 minutes.

POWER TRIM AND TILT SYSTEM

INSPECTING THE POWER TRIM AND TILT FLUID LEVEL

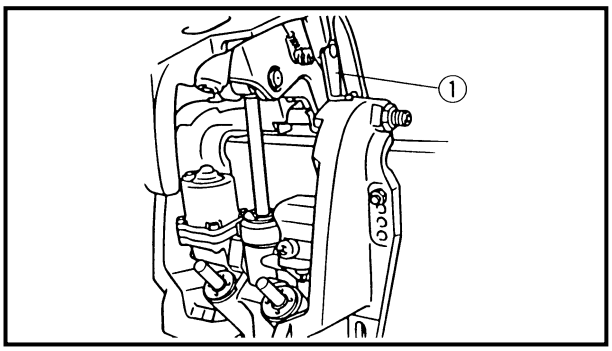
Inspect:
- Power trim and tilt fluid level
  Level is low → Add power trim and tilt fluid to the proper level.

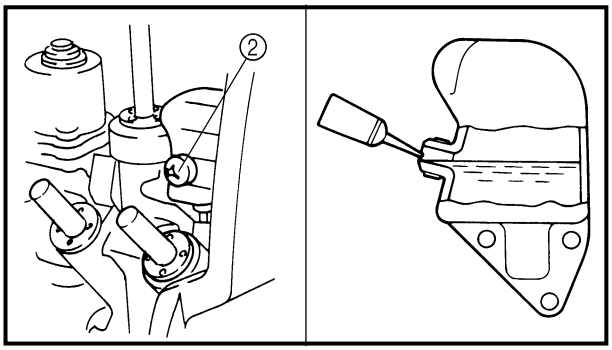
Recommended power trim and tilt fluid
ATF Dexron II



⚠ WARNING

When removing the power trim and tilt reservoir cap, the power trim and tilt fluid may spurt out due to internal pressure. Therefore, fully tilt up the outboard (the tilt ram assembly fully extended) and then slowly remove the power trim and tilt reservoir cap.





Inspecting steps

(1) Tilt the outboard all the way up and lock it with the tilt stop levers ①.

⚠ WARNING

After tilting up the outboard, be sure to support it with the tilt stop levers.
Otherwise, the outboard could suddenly lower if the power trim and tilt unit should lose fluid pressure.

(2) Remove the reservoir cap ② and inspect the fluid level.

NOTE:

The fluid level should be directly below the check hole as shown.

(3) Add power trim and tilt fluid if needed, and then install the reservoir cap.

	Reservoir cap **8 Nm (0.8 m • kgf, 5.8 ft • lb)**

LOWER UNIT

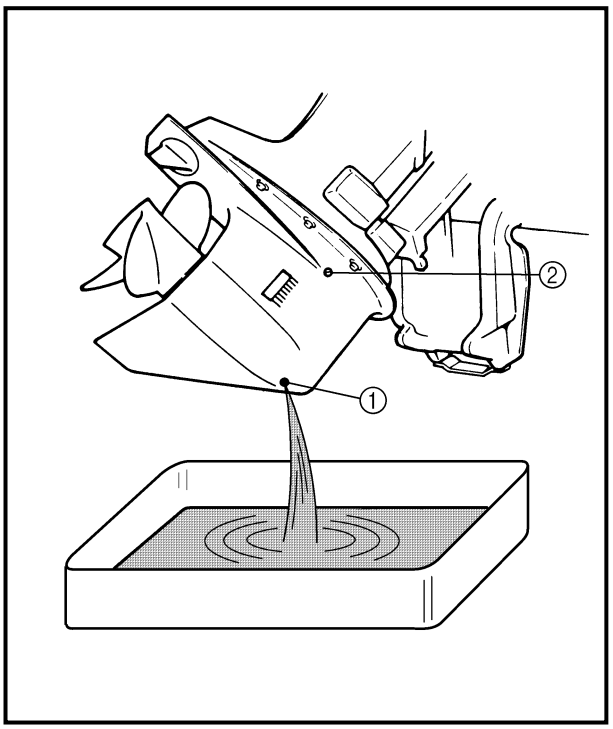
INSPECTING THE GEAR OIL LEVEL

Inspect:

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

CHANGING AND INSPECTING THE GEAR OIL

1. Inspect:
   - Gear oil
     Milky oil → Replace the oil seal.
     Slag oil → Check the gears, bearings, and clutch dog.

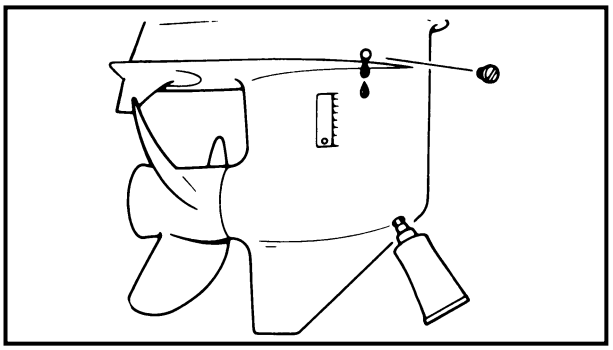


Inspecting steps

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

2. Fill:
   • Gear oil
   (with the specified amount of the recommend gear oil)

Recommended gear oil
GEAR CASE LUBE (USA) or Hypoid gear oil, SAE 90
Total amount
Regular rotation models
980 cm³
(33.1 US oz, 34.5 Imp oz)
Counter rotation models
870 cm³
(29.4 US oz, 30.6 Imp oz)
Dual propeller models
900 cm³
(30.4 US oz, 31.7 Imp oz)



Filling steps

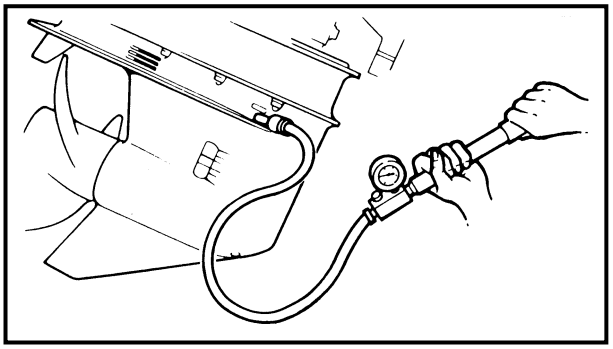
(1) Place the outboard in an upright position.
(2) Insert the gear oil tube into the drain hole and slowly fill the gear oil until oil flows out of the check hole and no air bubbles are visible.
(3) Install the gear oil level check screw and then quickly install the gear oil drain screw.

Gear oil level check screw
7 Nm (0.7 m • kgf, 5.1 ft • lb)
Gear oil drain screw
7 Nm (0.7 m • kgf, 5.1 ft • lb)

INSPECTING THE LOWER UNIT (FOR AIR LEAKS)

Inspect:
- Lower unit holding pressure
  Pressure drops → Inspect the seals and components.

Lower unit holding pressure
100 kPa (1.0 kg/cm², 14.2 psi)



Inspecting steps

CAUTION:

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

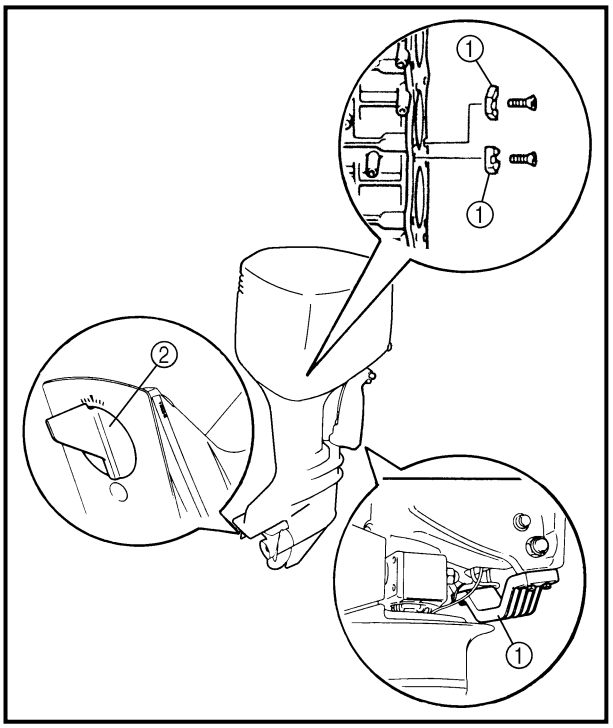
(1) Remove the gear oil level check screw.
(2) Install the pressure tester into the check hole.

Pressure tester
YB-35956 / 90890-06762

(3) Apply the specified pressure.

NOTE:

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



GENERAL

INSPECTING THE ANODES

Inspect:
- Anodes ①
- Trim tab ②
  (except for D150H/D150TR)
  Scales → Clean.
  Grease/oil → Clean.
  Excessive wear → Replace.

CAUTION:

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

INSPECTING THE BATTERY

⚠ WARNING

Battery electrolytic fluid is dangerous; it contains sulfuric acid and therefore is poisonous and highly caustic.
Always follow these preventive measures:
- **Avoid bodily contact with electrolytic fluid as it can cause severe burns or permanent eye injury.**
- **Wear protective eye gear when handling or working near batteries.**

Antidote (EXTERNAL):
- **SKIN - Flush with water.**
- **EYES - Flush with water for 15 minutes and get immediate medical attention.**

Antidote (INTERNAL):
- **Drink large quantities of water or milk followed by milk of magnesia, beaten egg, or vegetable oil. Get immediate medical attention.**

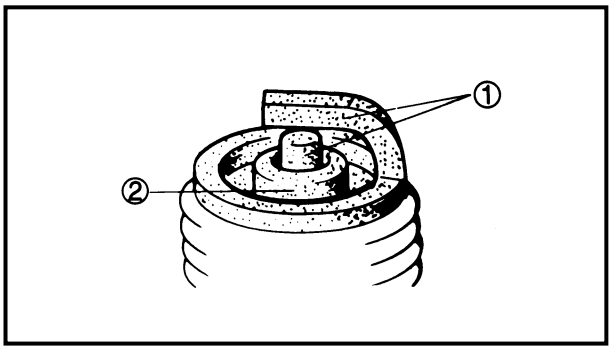
Batteries also generate explosive hydrogen gas; therefore, you should always follow these preventive measures:
- **Charge batteries in a well-ventilated area.**
- **Keep batteries away from fire, sparks, or open flames (e.g., welding equipment, lighted cigarettes, etc.).**
- **DO NOT SMOKE when charging or handling batteries.**

KEEP BATTERIES AND ELECTROLYTIC FLUID OUT OF REACH OF CHILDREN.

NOTE:
- Batteries vary among manufacturers. Therefore, the following procedures may not always apply. Consult your battery manufacturer's instructions.
- First, disconnect the negative lead, then the positive lead.

Inspect:
- Electrolyte level
  Below the minimum level mark → Add distilled water to the proper level.
- Electrolyte specific gravity
  Less than specification → Recharge the battery.

Electrolyte specific gravity
1.280 at 20°C (68°F)



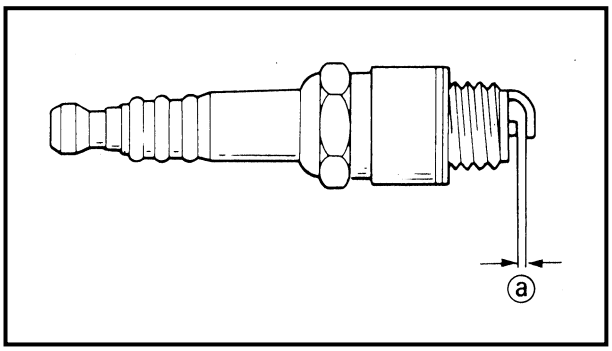
INSPECTING THE SPARK PLUGS

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

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

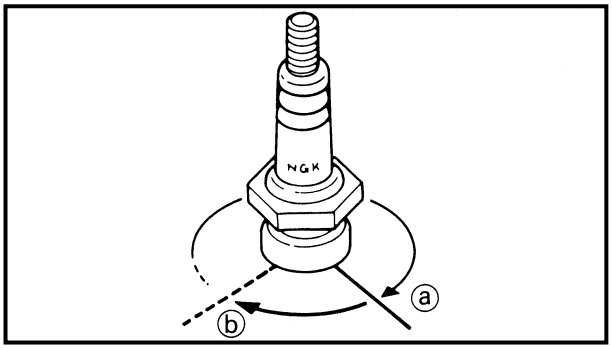
Blackish color
- **Rich mixture**
- **Excessive oil usage**
- **Defective ignition system**
- **Defective spark plug**

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



3. Measure:
   • Spark plug gap ⓐ
     Out of specification → Regap.

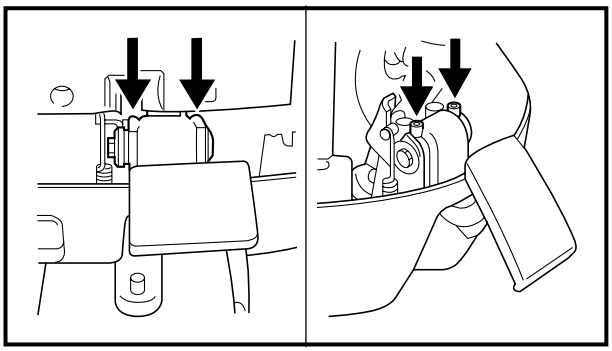
	Spark plug gap **0.9 - 1.0 mm (0.035 - 0.039 in)**

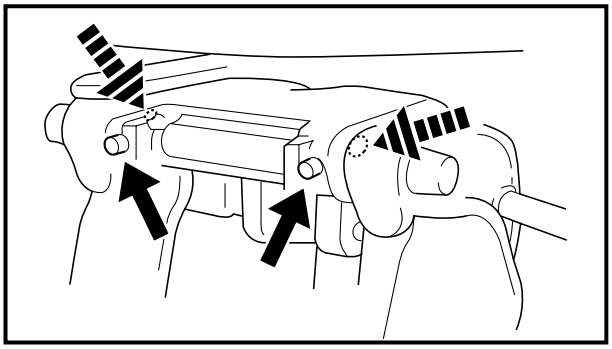


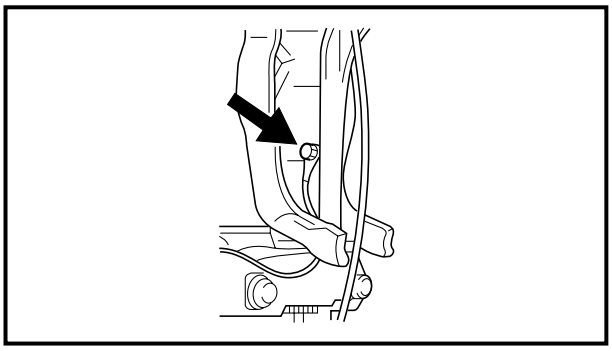
4. Tighten:
   • Spark plug

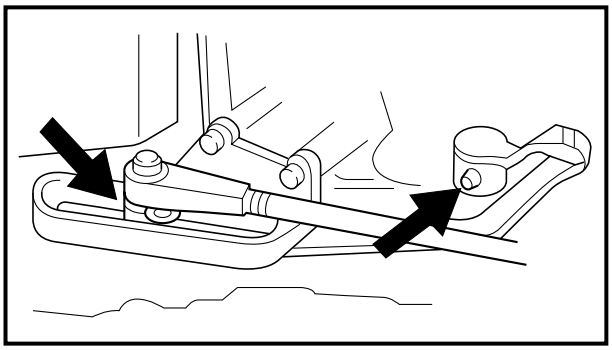
	Spark plug **25 Nm (2.5 m • kgf, 18 ft • lb)**

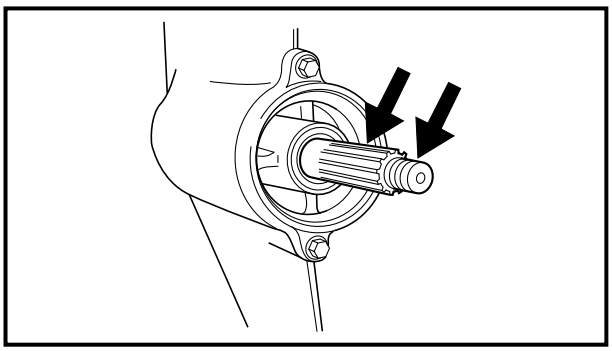
NOTE:
- Before installing the spark plug, clean the gasket surface and spark plug surface. Also, it is suggested to apply a thin film of anti-seize compound to the spark plug threads to prevent thread seizure.
- If a torque wrench is not available, a good estimate of the correct tightening torque is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











LUBRICATION POINTS

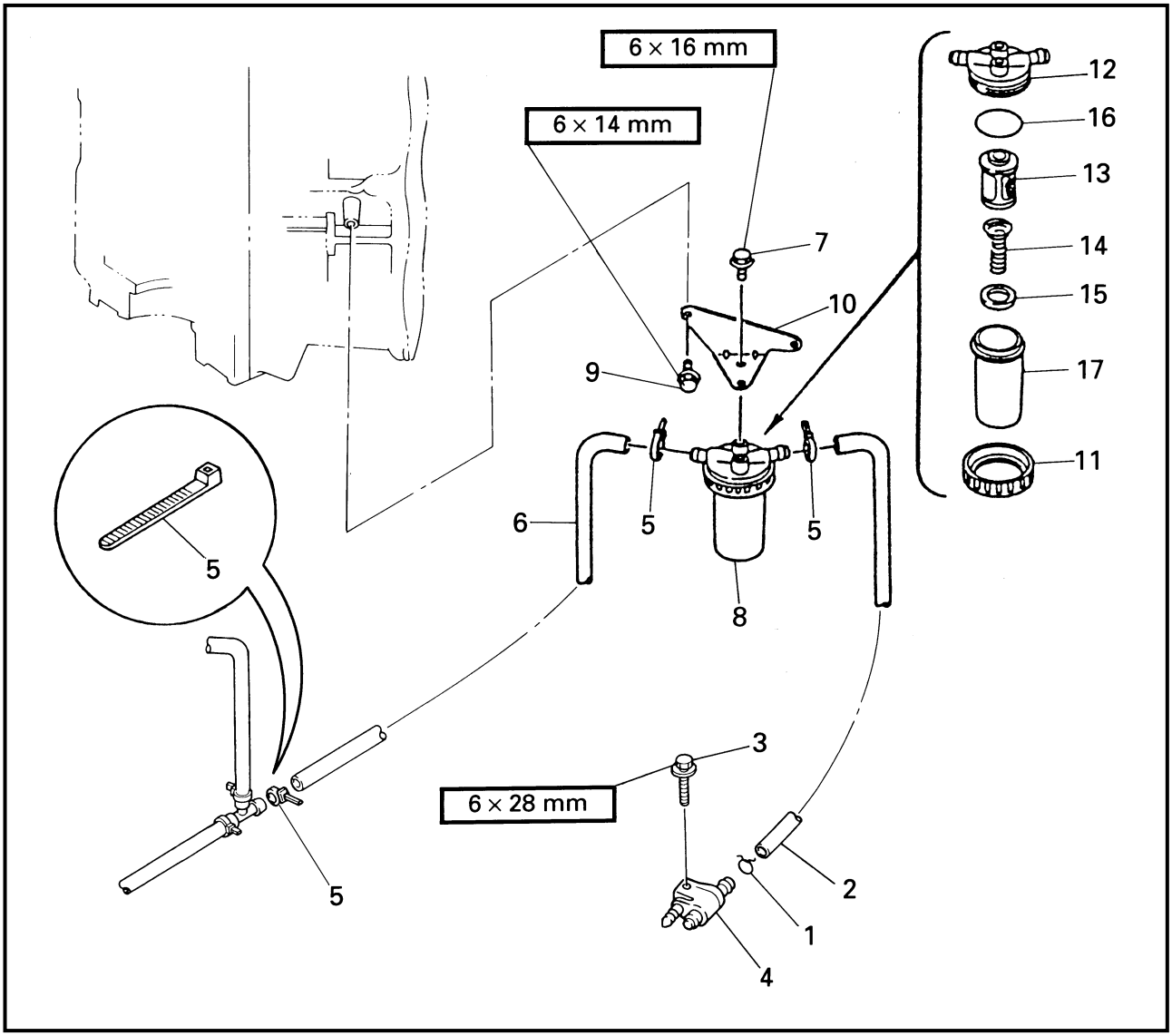
Apply:

- Water resistant grease

CHAPTER 4
FUEL SYSTEM

FUEL JOINT AND FUEL FILTER

REMOVING/INSTALLING THE FUEL JOINT AND FUEL FILTER (FOR PRE-MIX MODELS, EXCEPT FOR 225DET)



Order	Job/Part	Q'ty	Remarks
1	Clip	1	
2	Fuel hose	1	(fuel joint-to-fuel filter)
3	Bolt	1	
4	Fuel joint	1	
5	Plastic locking tie	3	**Not reusable**
6	Fuel hose	1	(fuel filter-to-fuel pump)
7	Bolt	1	
8	Fuel filter	1	
9	Bolt	1	

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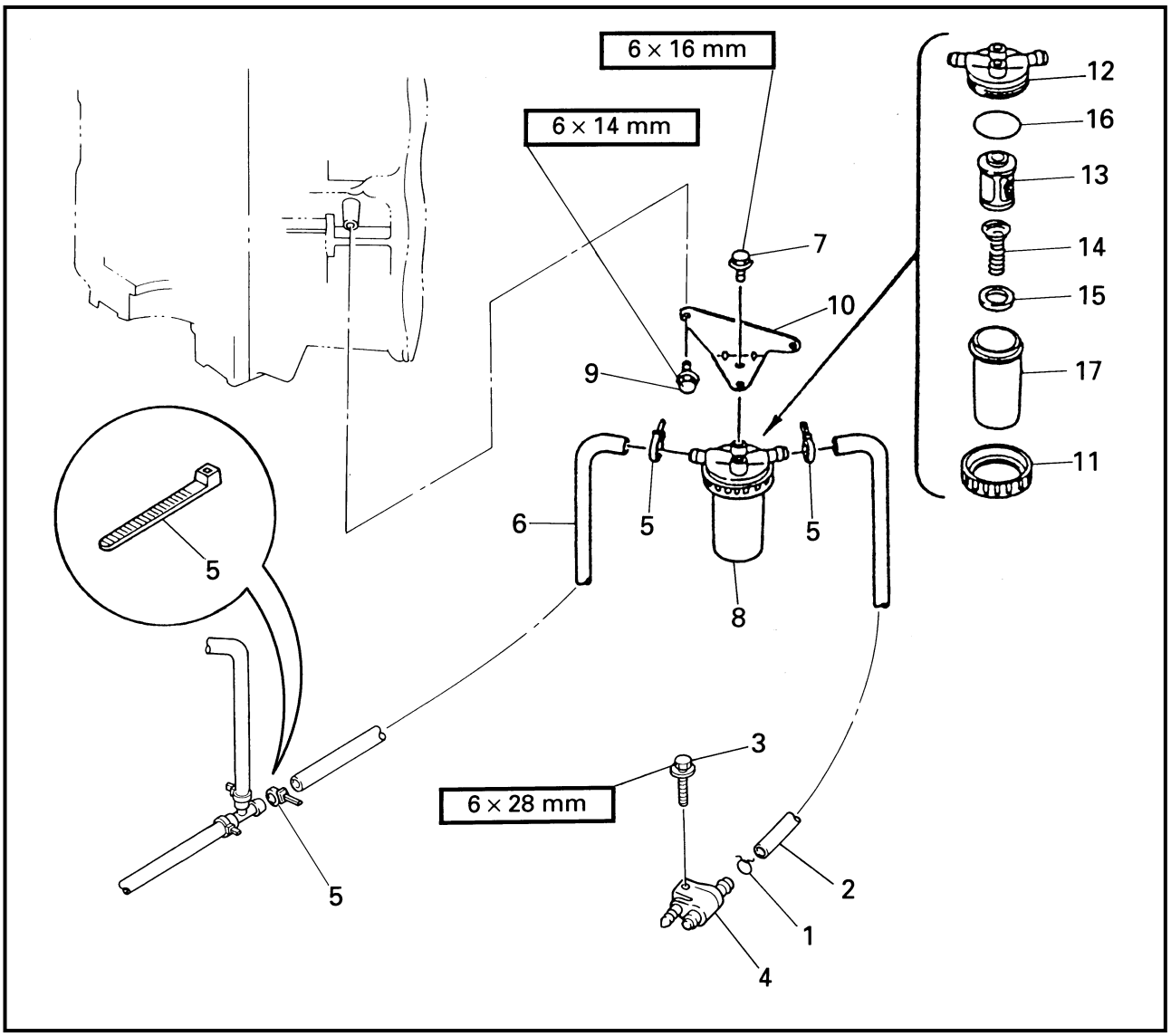
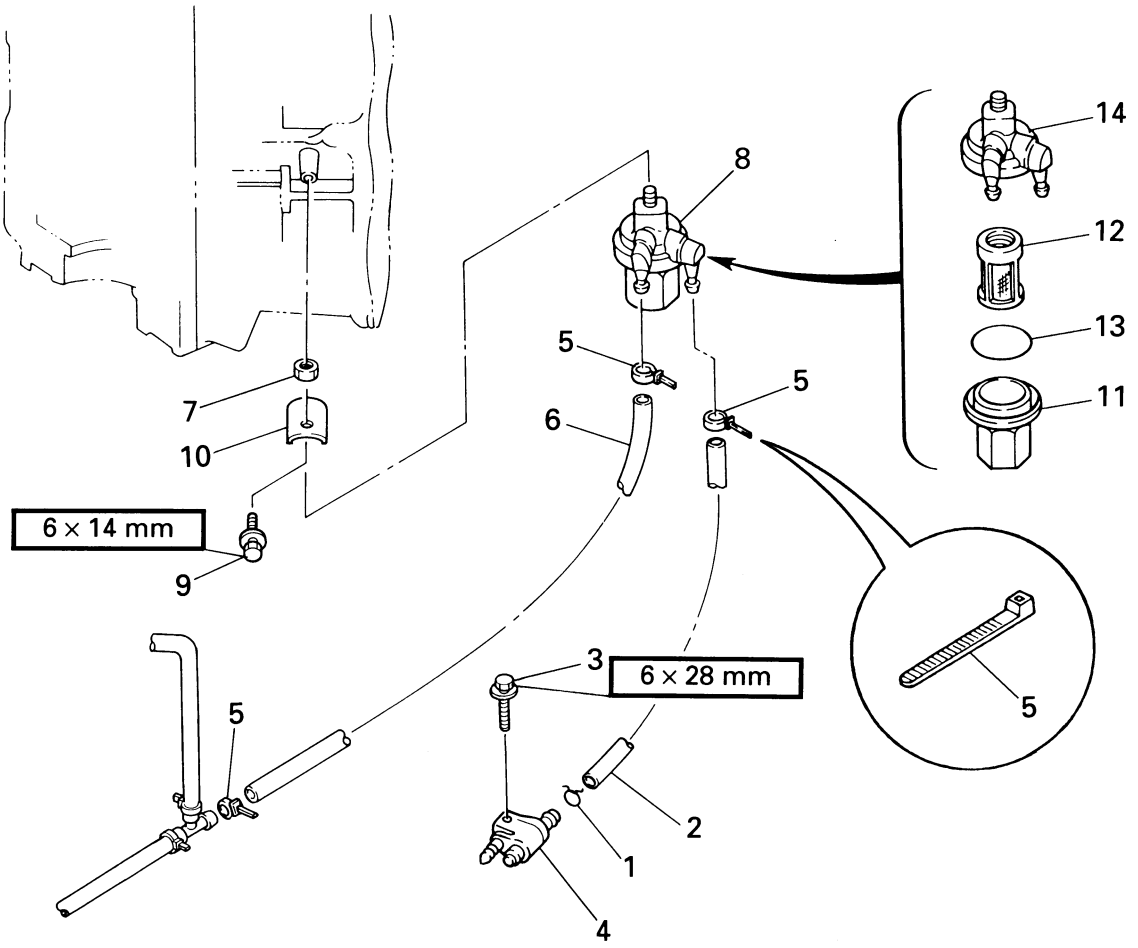


Order	Job/Part	Q'ty	Remarks
10	Fuel filter bracket	1	
11	Fuel filter nut	1	
12	Fuel filter cap	1	
13	Fuel filter element	1	
14	Spring	1	
15	Float	1	
16	O-ring	1	
17	Fuel filter cup	1	
			For installation, reverse the removal procedure.

REMOVING/INSTALLING THE FUEL JOINT AND FUEL FILTER (FOR OIL INJECTION MODELS, AND 225DET)



Order	Job/Part	Q'ty	Remarks
1	Clip	1	
2	Fuel hose	1	(fuel joint-to-fuel filter)
3	Bolt	1	
4	Fuel joint	1	
5	Plastic locking tie	3	**Not reusable**
6	Fuel hose	1	(fuel filter-to-fuel pump)
7	Nut	1	

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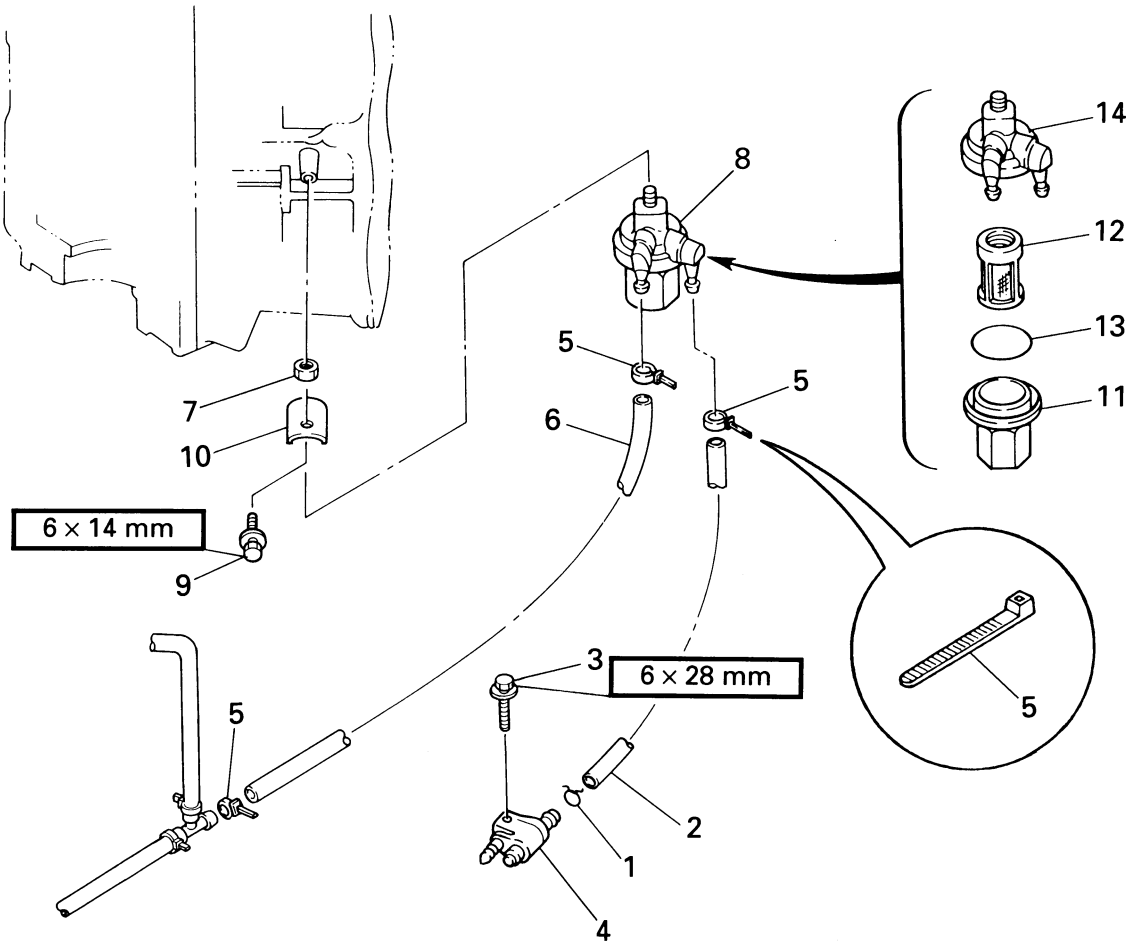
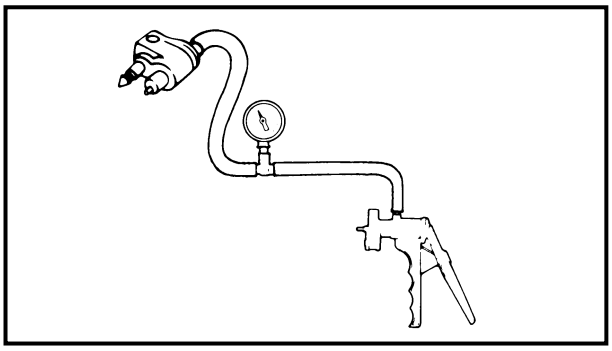


Order	Job/Part	Q'ty	Remarks
8	Fuel filter	1	
9	Bolt	1	
10	Fuel filter bracket	1	
11	Fuel filter cap	1	
12	Fuel filter element	1	
13	O-ring	1	
14	Fuel filter cup	1	
			For installation, reverse the removal procedure.



INSPECTING THE CHECK VALVE

1. Inspect:
   - Fuel joint
     Cracks/damage/leaks → Replace.
2. Inspect
   - Fuel joint operation
     Pressure cannot be maintained for 10 seconds → Replace.

Inspecting steps

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

(1) Install the Mity vac onto the fuel joint as shown.

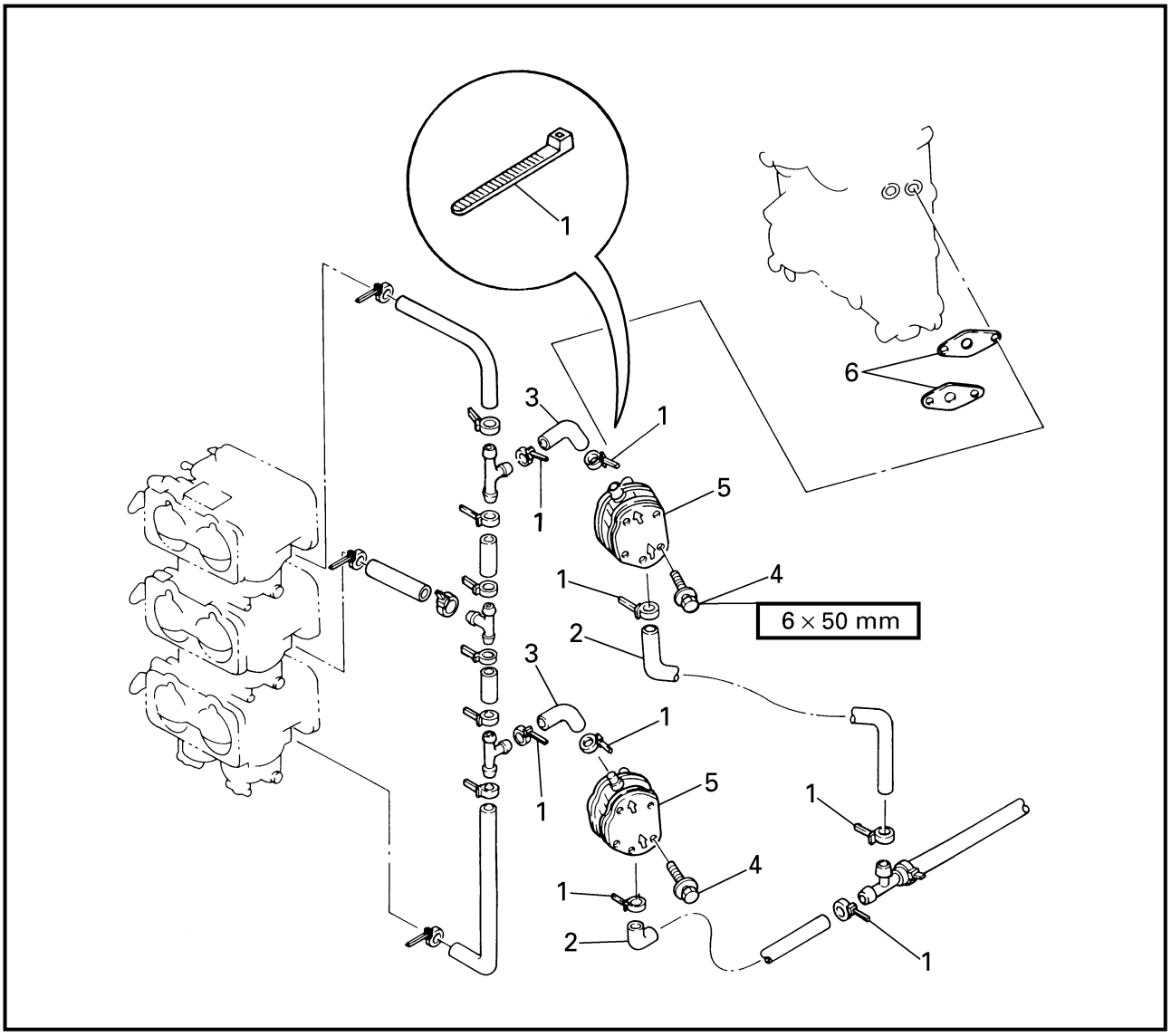
	**Mity vac** **YB-35956 / 90890-06756**

(2) Apply the specified pressure with the Mity vac.

	**Check valve pressure** **50 kPa (0.5 kg/cm^2, 7.1 psi)**

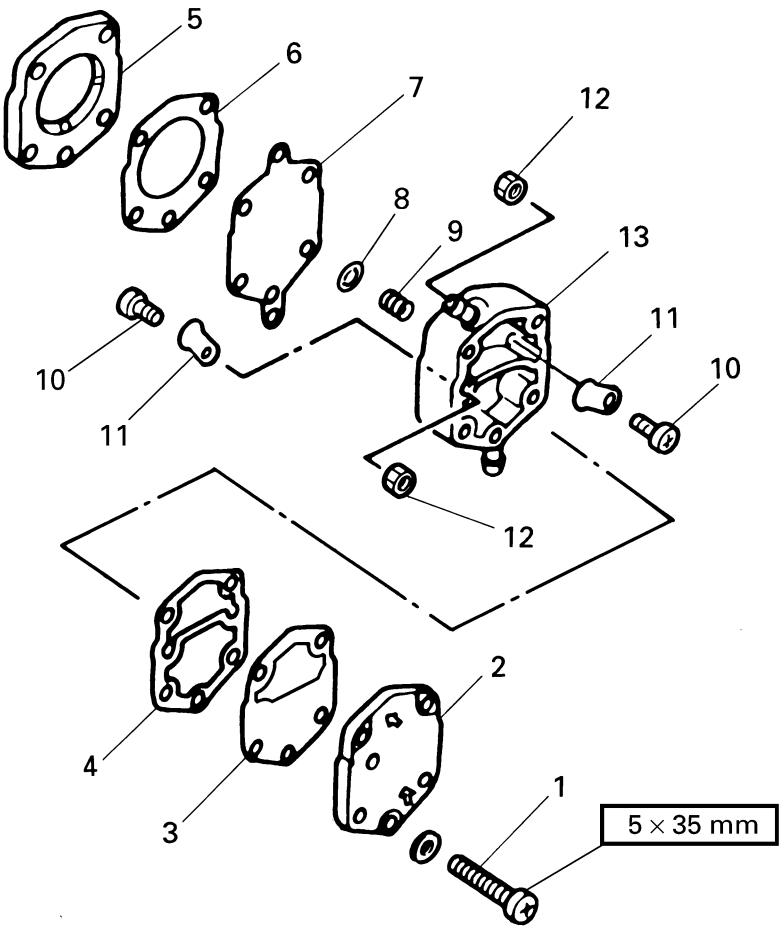
FUEL PUMP

REMOVING/INSTALLING THE FUEL PUMP



Order	Job/Part	Q'ty	Remarks
1	Plastic locking tie	8	**Not reusable**
2	Fuel hose	2	(fuel filter-to-fuel pump)
3	Fuel hose	2	(fuel pump-to-carburetor)
4	Bolt	2	
5	Fuel pump	2	
6	Gasket	2	**Not reusable** For installation, reverse the removal procedure.

DISASSEMBLING/ASSEMBLING THE FUEL PUMP



Order	Job/Part	Q'ty	Remarks
1	Screw	3	
2	Diaphragm body	1	
3	Diaphragm	1	
4	Gasket	1	**Not reusable**
5	Fuel pump base	1	
6	Gasket	1	**Not reusable**
7	Diaphragm	1	

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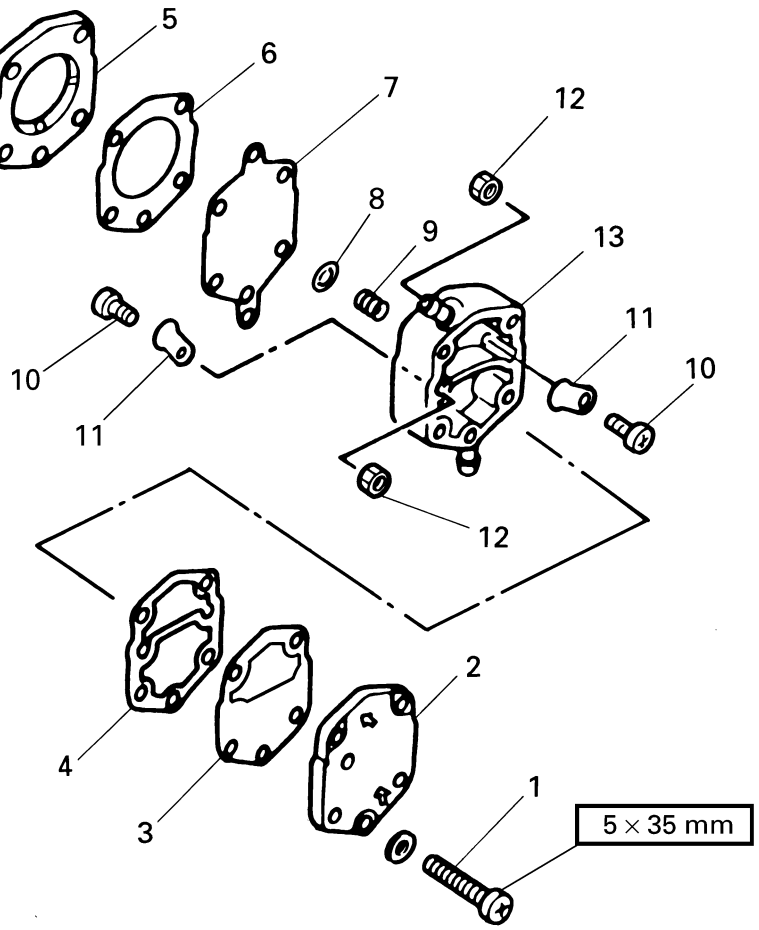
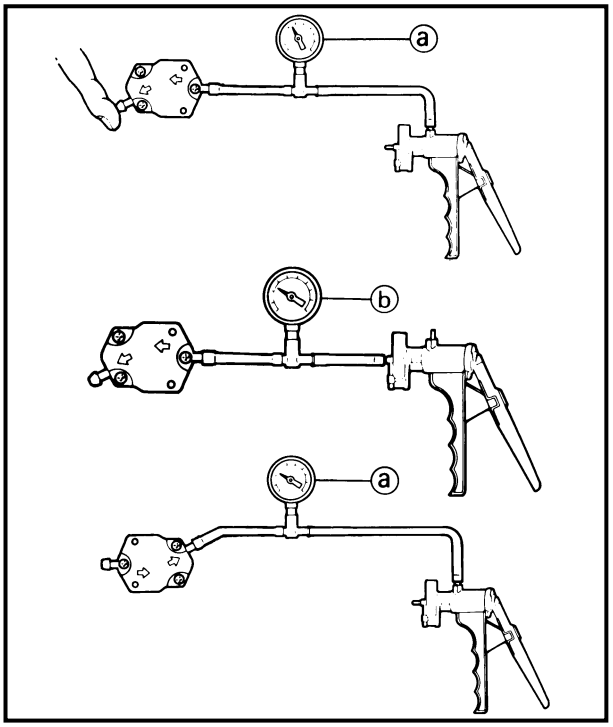


Order	Job/Part	Q'ty	Remarks
8	Spring seat	1	
9	Spring	1	
10	Screw	4	
11	Fuel pump valve	4	
12	Nut	4	
13	Fuel pump body	1	
			For assembly, reverse the disassembly procedure.

INSPECTING THE FUEL PUMPS

1. Inspect:
   - Diaphragm
   - Fuel pump valves
   Damage → Replace.
2. Inspect:
   - Fuel pump
   Reverse air flow → Replace.



Inspecting steps

NOTE:

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

(1) Install the Mity vac onto the fuel pump as shown.

Mity vac
YB-35956 / 90890-06756

(2) Apply the specified pressure with the Mity vac.

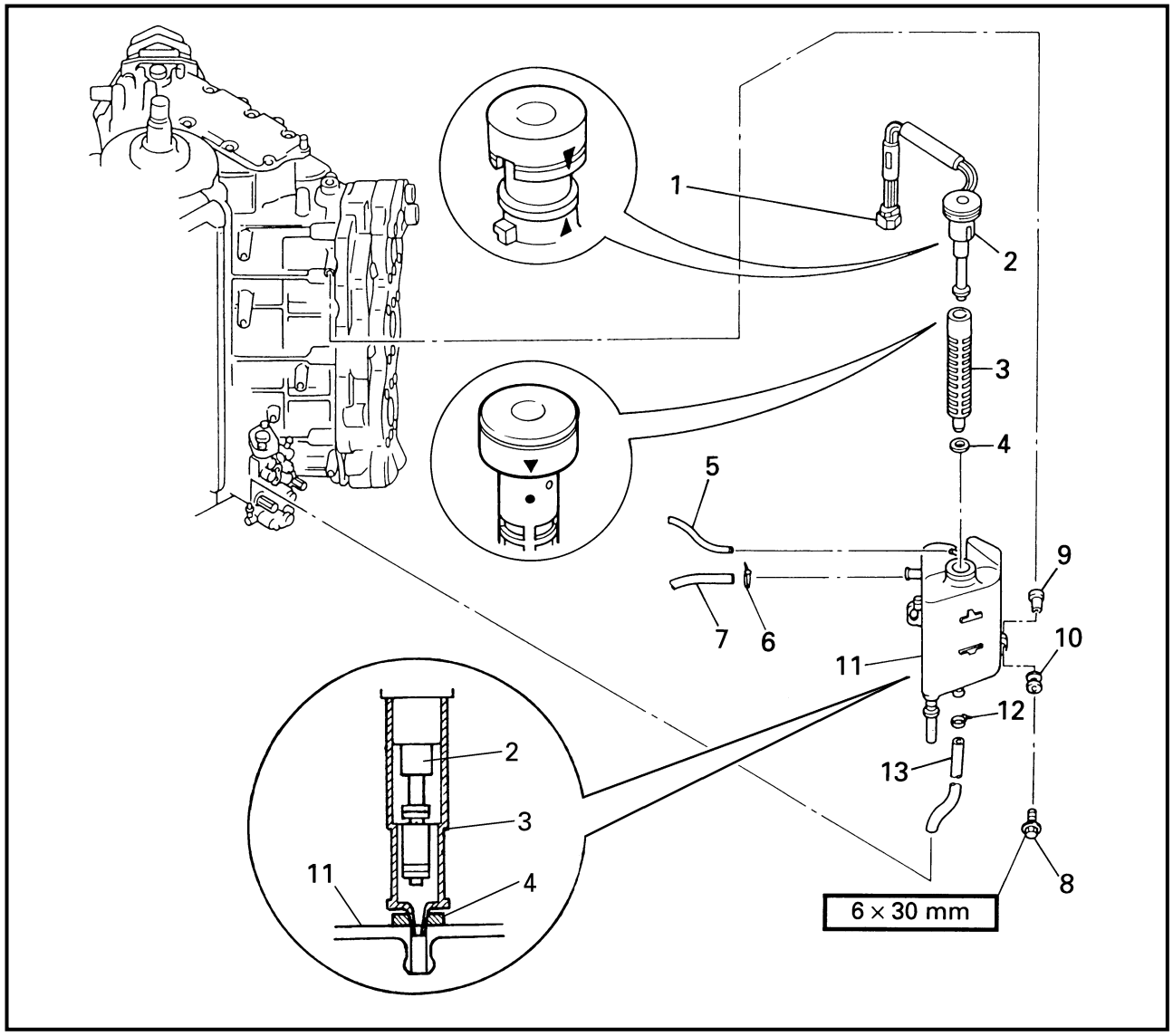
Fuel pump pressure ⓐ
50 kPa (0.5 kg/cm², 7.1 psi)
Fuel pump negative pressure ⓑ
30 kPa (0.3 kg/cm², 4.3 psi)

NOTE:

- Make sure no air comes out of the opposite side of the fuel pump.
- To eliminate any gaps between the fuel pump valves and the fuel pump body, and to ensure a better seal, make sure the inside of the fuel pump is wet (i.e., with gas).

OIL TANK

REMOVING/INSTALLING THE OIL TANK



Order	Job/Part	Q'ty	Remarks
	Flywheel magnet assembly cover		Refer to "FLYWHEEL MAGNET ASSEMBLY" on page 5-1.
	CDI unit cover		Refer to "STATOR ASSEMBLY" on page 5-8.
1	Oil level sensor coupler	1	
2	Oil level sensor	1	
3	Oil strainer	1	
4	Washer	1	
5	Oil tank air vent hose	1	(oil tank-to-intake silencer)
6	Plastic locking tie	1	**Not reusable**
7	Oil hose	1	(sub oil tank-to-oil tank)

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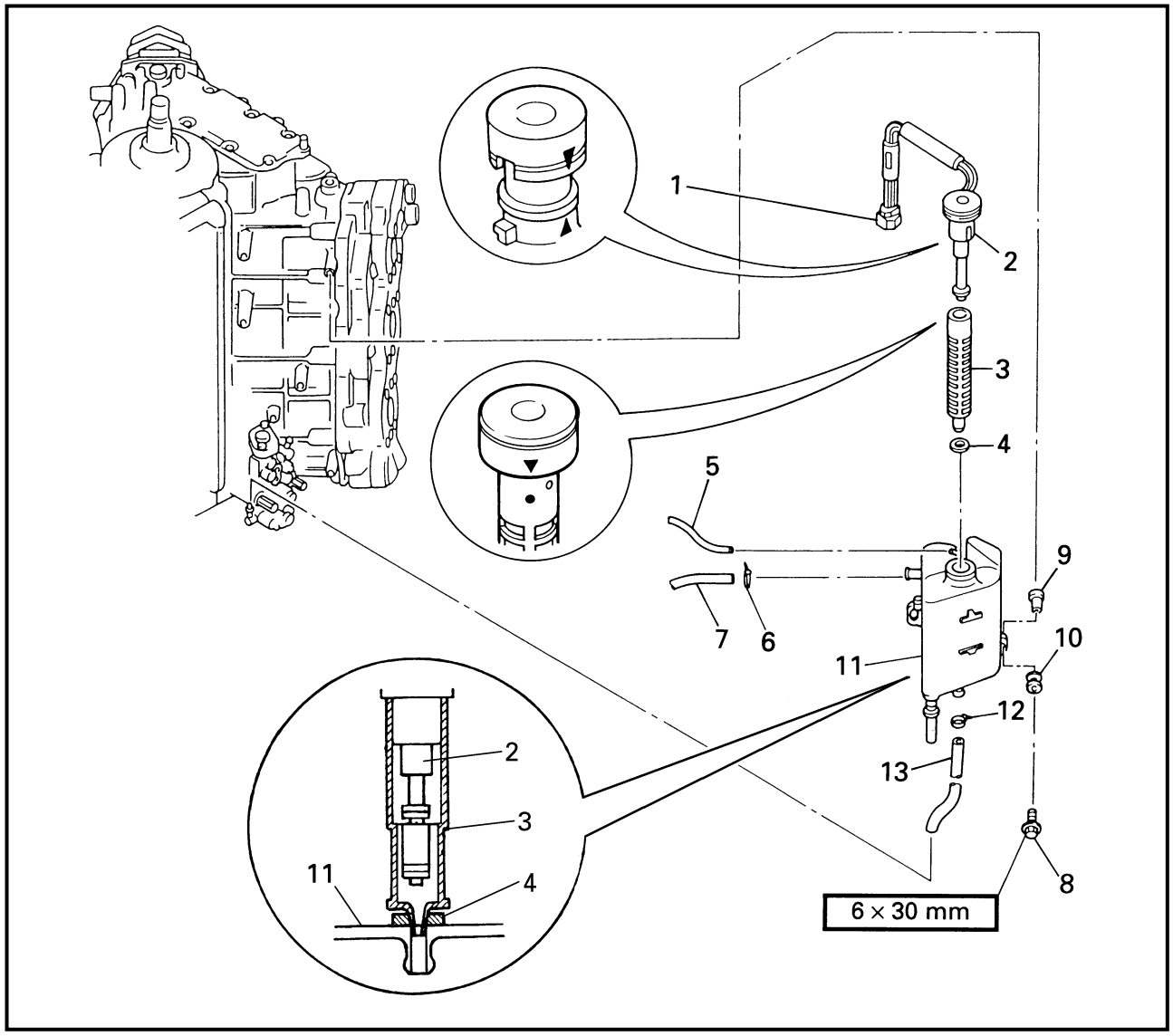
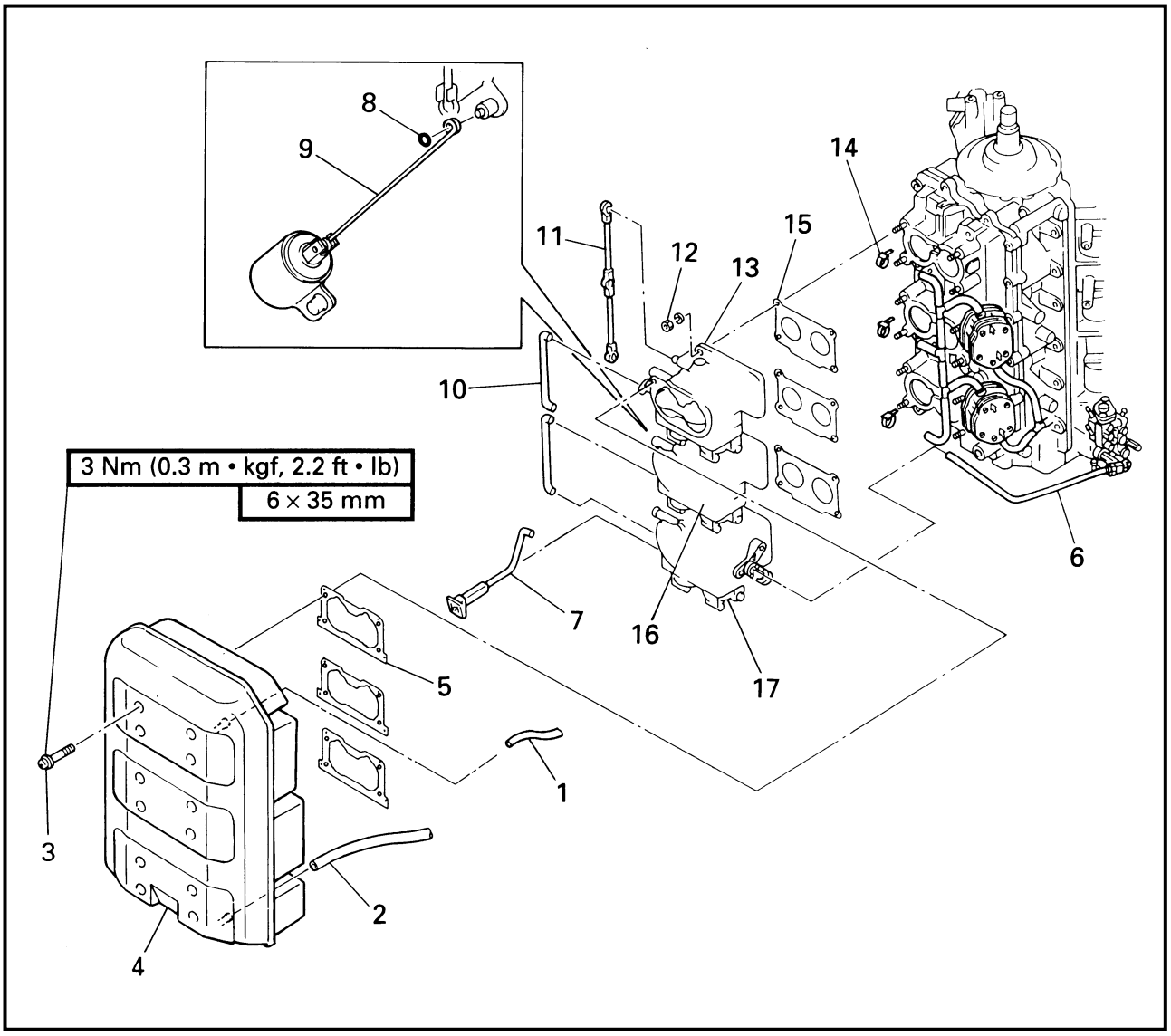


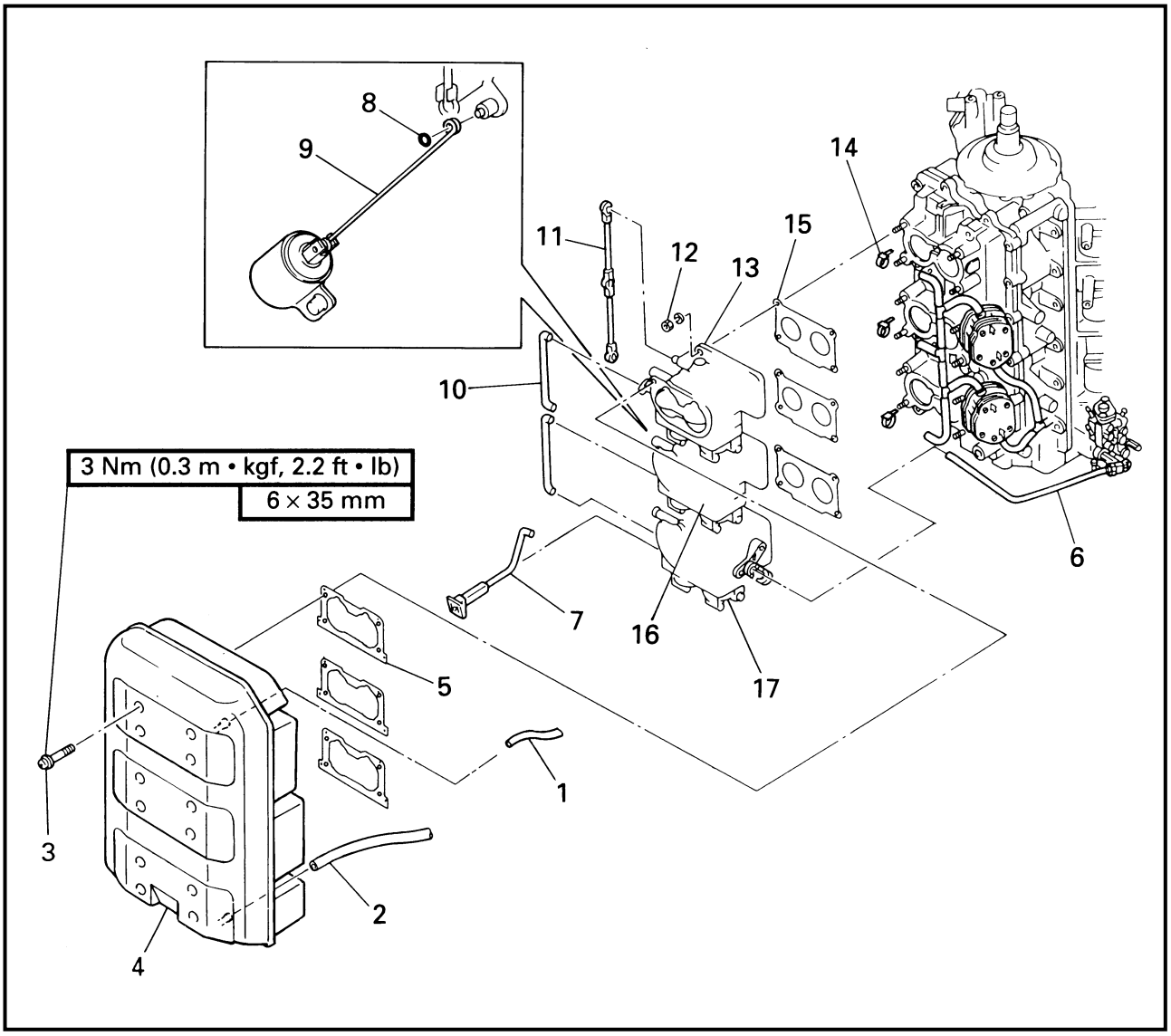
Order	Job/Part	Q'ty	Remarks
8	Bolt	3	
9	Collar	3	
10	Grommet	3	
11	Oil tank	1	
12	Plastic locking tie	1	**Not reusable**
13	Oil hose	1	(oil tank-to-oil pump)
			For installation, reverse the removal procedure.

CARBURETOR
REMOVING/INSTALLING THE CARBURETOR



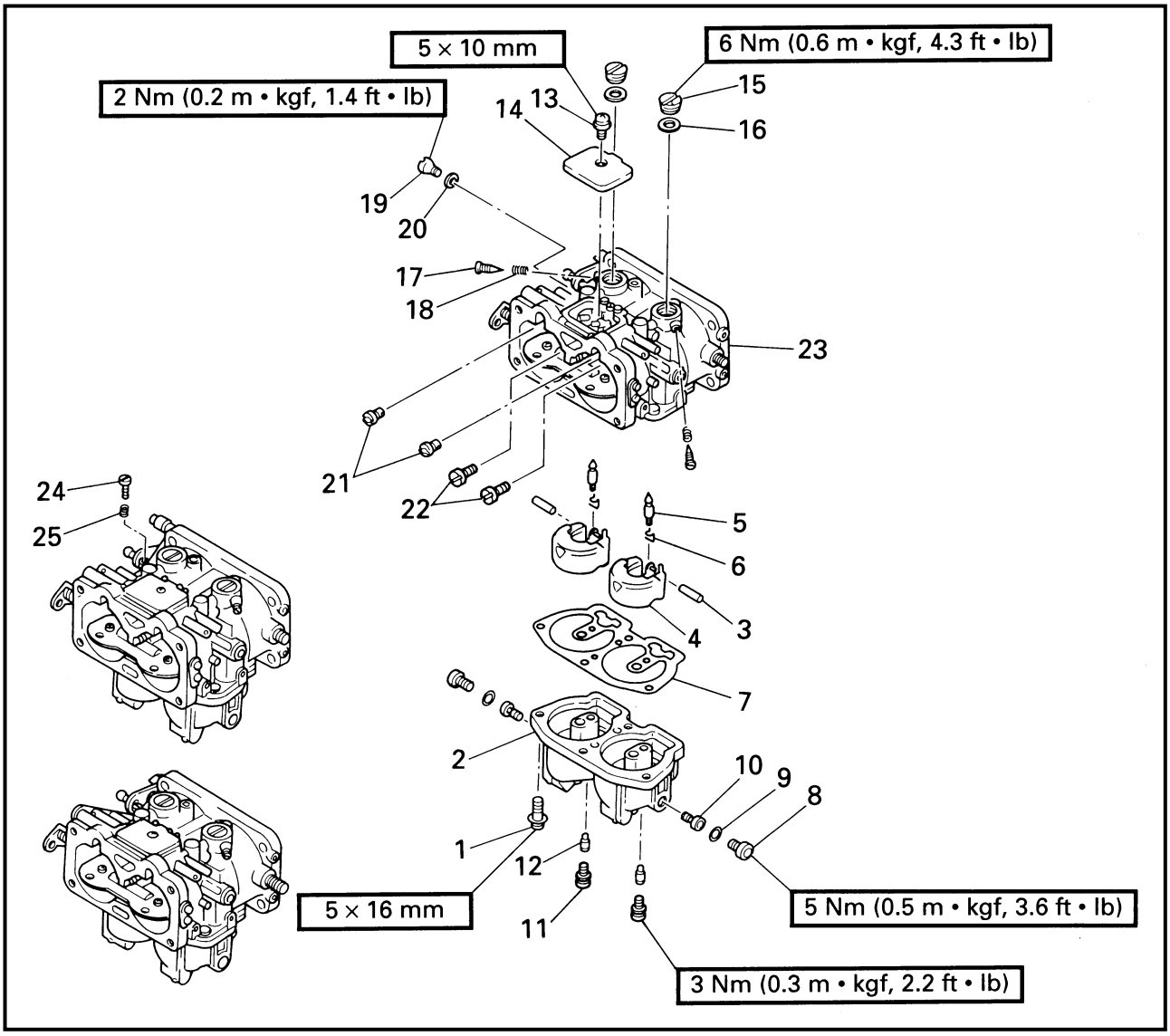
Order	Job/Part	Q'ty	Remarks
1	Oil tank air vent hose	1	(intake silencer-to-oil tank) Oil injection modes
2	Intake manifold air vent hose	1	(intake silencer-to-intake manifold)
3	Screw	12	
4	Intake silencer	1	
5	Rubber gasket	3	
6	Oil pump link rod	1	Oil injection models
7	Choke link rod	1	
8	O-ring	1	
9	Fuel enrichment valve rod	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
10	Fuel enrichment valve link rod	2	
11	Throttle link rod	1	
12	Nut	12	
13	Carburetor #1	1	
14	Plastic locking tie	3	**Not reusable**
15	Gasket	3	**Not reusable**
16	Carburetor #2	1	
17	Carburetor #3	1	
			For installation, reverse the removal procedure.

DISASSEMBLING/ASSEMBLING THE CARBURETOR



Order	Job/Part	Q'ty	Remarks
1	Screw	4	
2	Float chamber	1	
3	Float pin	2	
4	Float	2	
5	Needle valve	2	
6	Clip	2	
7	Gasket	1	
8	Drank bolt	2	
9	Gasket	2	**Not reusable**

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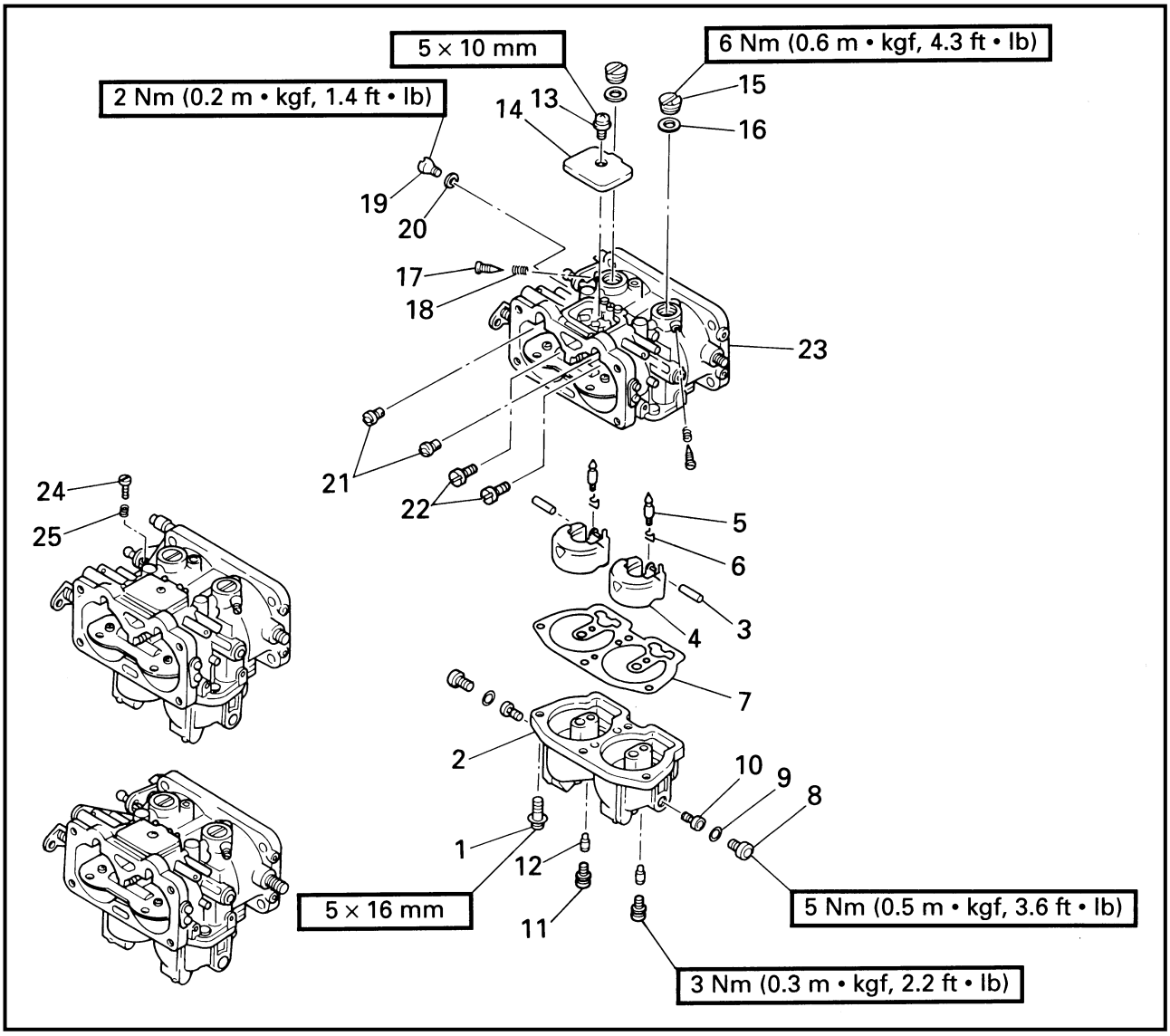

Order	Job/Part	Q'ty	Remarks
10	Main jet	2	
11	Pilot jet plug	2	
12	Pilot jet	2	
13	Screw	1	
14	Carburetor top cover	1	
15	Screw	2	
16	Gasket	2	
17	Screw	2	
18	Spring	2	

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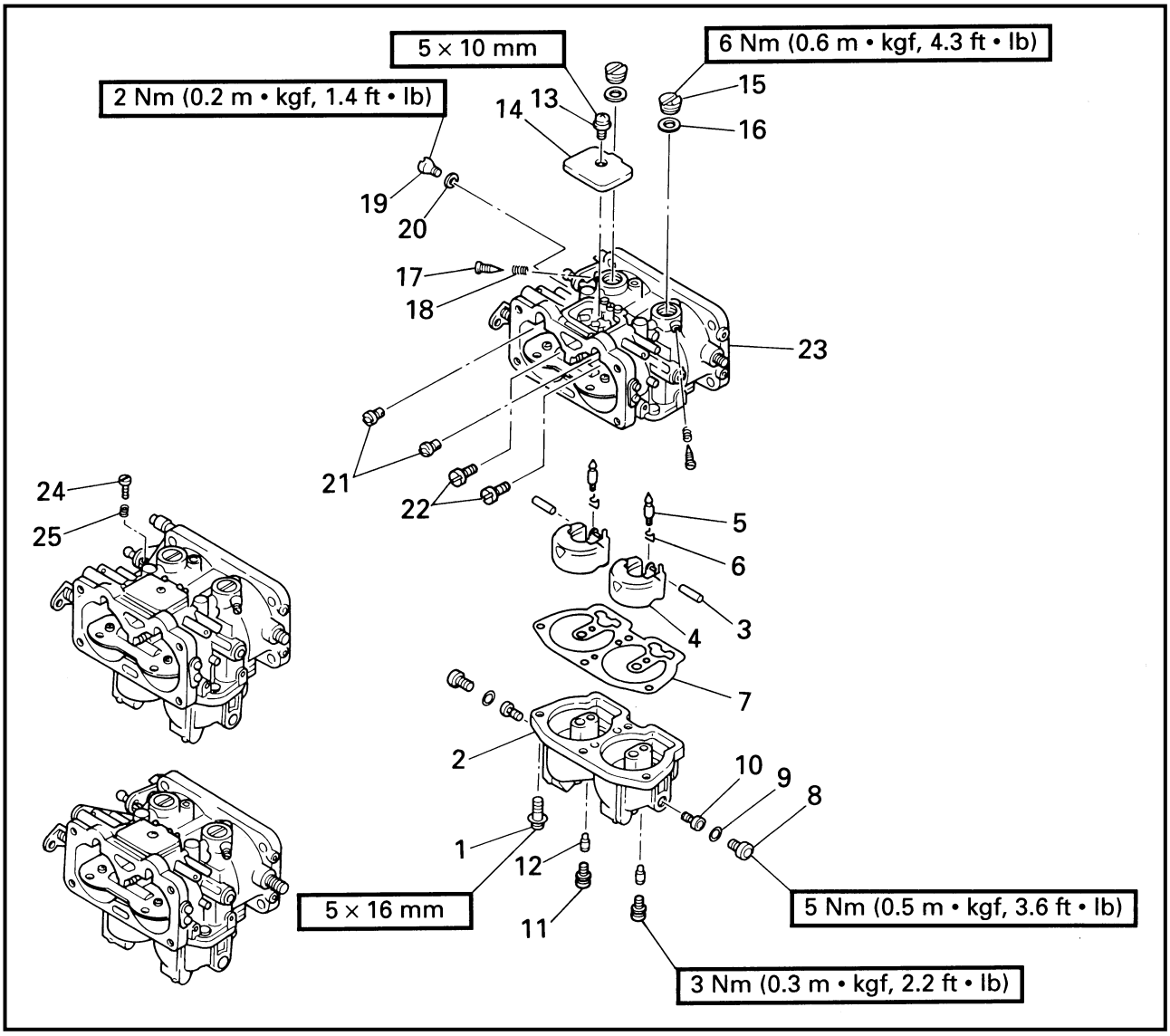
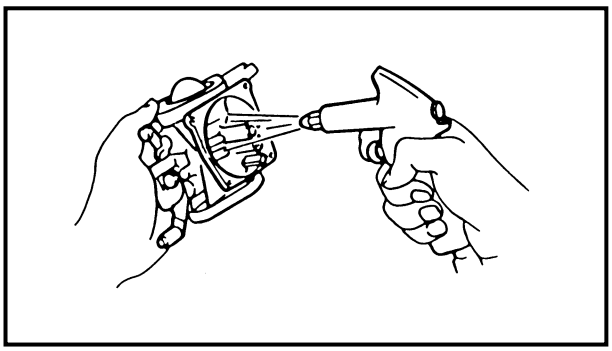
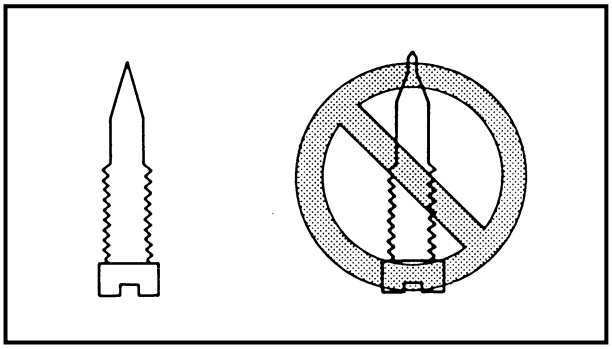
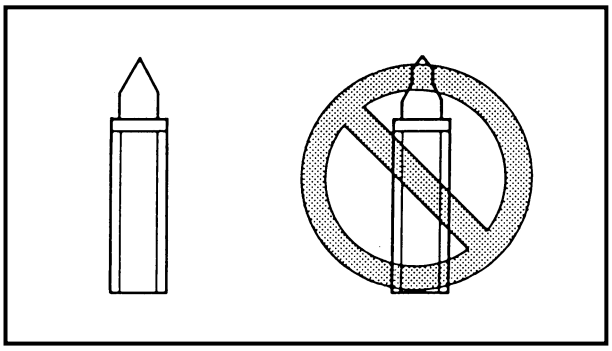
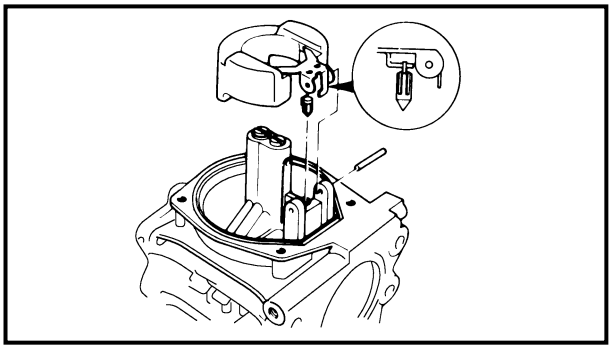


Order	Job/Part	Q'ty	Remarks
19	Screw	1	
20	Gasket	1	
21	Pilot air jet	2	
22	Screw	2	
23	Carburetor body	1	
24	Throttle stop screw	1	
25	Spring	1	
			For assembly, reverse the disassembly procedure.









INSPECTING THE CARBURETOR

CAUTION:

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

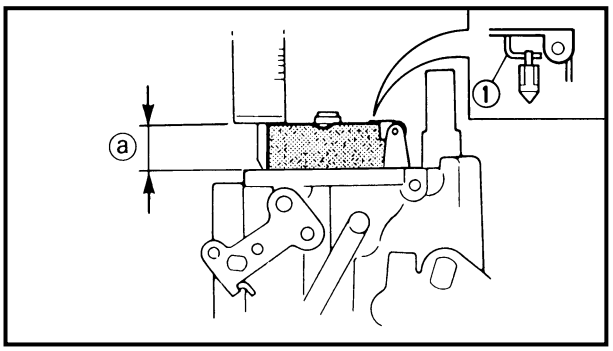
1. Inspect:
   - Carburetor body
     Cracks/damage → Replace.
     Contamination → Clean.
2. Inspect:
   - Pilot screw
     Bends/wear → Replace.
3. Inspect:
   - Main jet
   - Pilot jet
   - Pilot air jet
     Contamination → Clean.
4. Inspect:
   - Needle valve
     Grooved wear → Replace.
5. Inspect:
   - Float
     Cracks/damage → Replace.

ASSEMBLING THE CARBURETOR

1. Install:
   - Needle valve
   - Float
   - Float pin

NOTE:

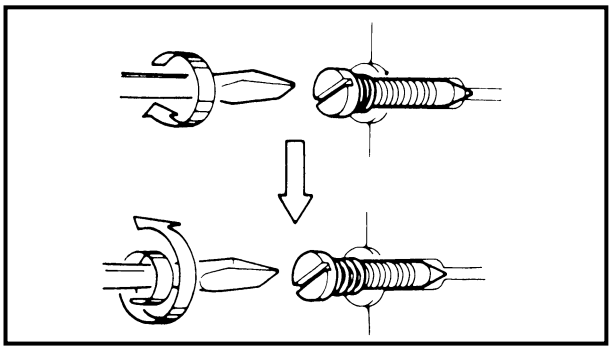
- When installing the float into the carburetor, place the needle valve into the needle valve seat.
- After installation, make sure that the float operates smoothly.



2. Measure:
   • Float height ⓐ
   (without the gasket)
   Out of specification → Adjust the float height by bending the tab ①.

Float height
16.0 ± 0.5 mm (0.63 ± 0.02 in)

NOTE:
- The float should be resting on the needle valve, but not compressing it.
- Take measurements at the end of the float, opposite the side it pivots on.



3. Adjust:
   • Pilot screw

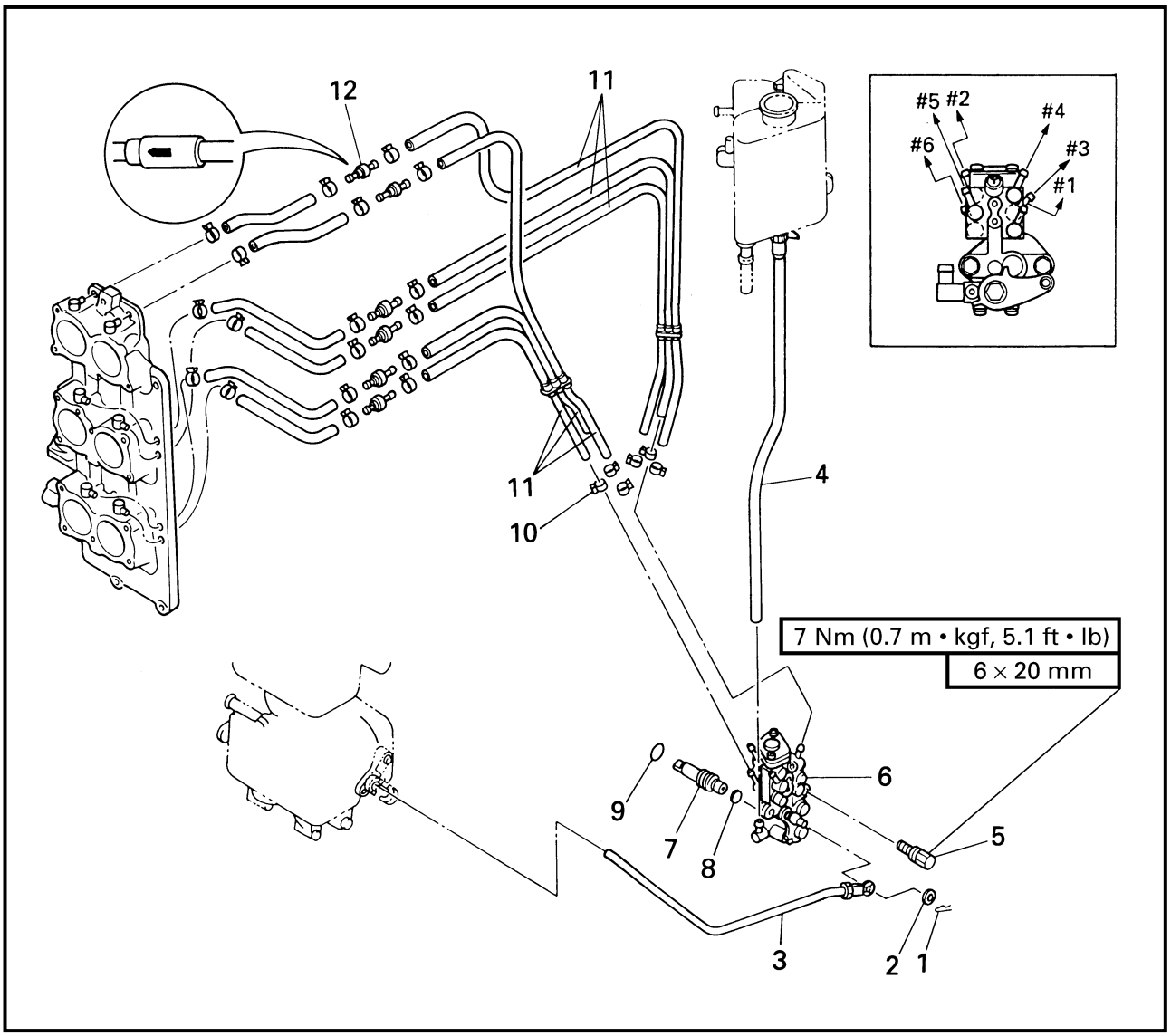
Adjustment steps
(1) Turn in the pilot screw until it is lightly seated.
(2) Turn out the pilot screw to specification.

Pilot screw (turns out)

150A, L150A, 150F/ C150TR:	1 ± 1/4
S150F, LS150F/ S150TR, L150TR:	1-1/4 ± 1/4
150G, D150H/ P150TR, D150TR:	
	(S) 1-9/16 ± 1/4
	(P) 1-1/16 ± 1/4
175A, 175D:	1-1/16 ± 1/4
S175D/S175TR:	1-1/8 ± 1/4
200A, L200A, 200F, L200F/200TR:	1-1/8 ± 1/4
175F/P175TR:	(S) 1-5/8 ± 1/4
	(P) 1-1/8 ± 1/4
S200F, LS200F/ S200TR, L200TR:	(S) 1-1/8 ± 1/4
	(P) 5/8 ± 1/4
200G, 225D/P200TR:	
	(S) 1-1/4 ± 1/4
	(P) 3/4 ± 1/4

OIL PUMP

REMOVING/INSTALLING THE OIL PUMP (FOR 150G, 175F, S200F, 200G, 225D/ P150TR, P175TR, S200TR P200TR MODELS)



Order	Job/Part	Q'ty	Remarks
1	Clip	1	
2	Washer	1	
3	Oil pump link rod	1	
4	Oil hose	1	(oil tank-to-oil pump)
5	Bolt	2	
6	Oil pump	1	

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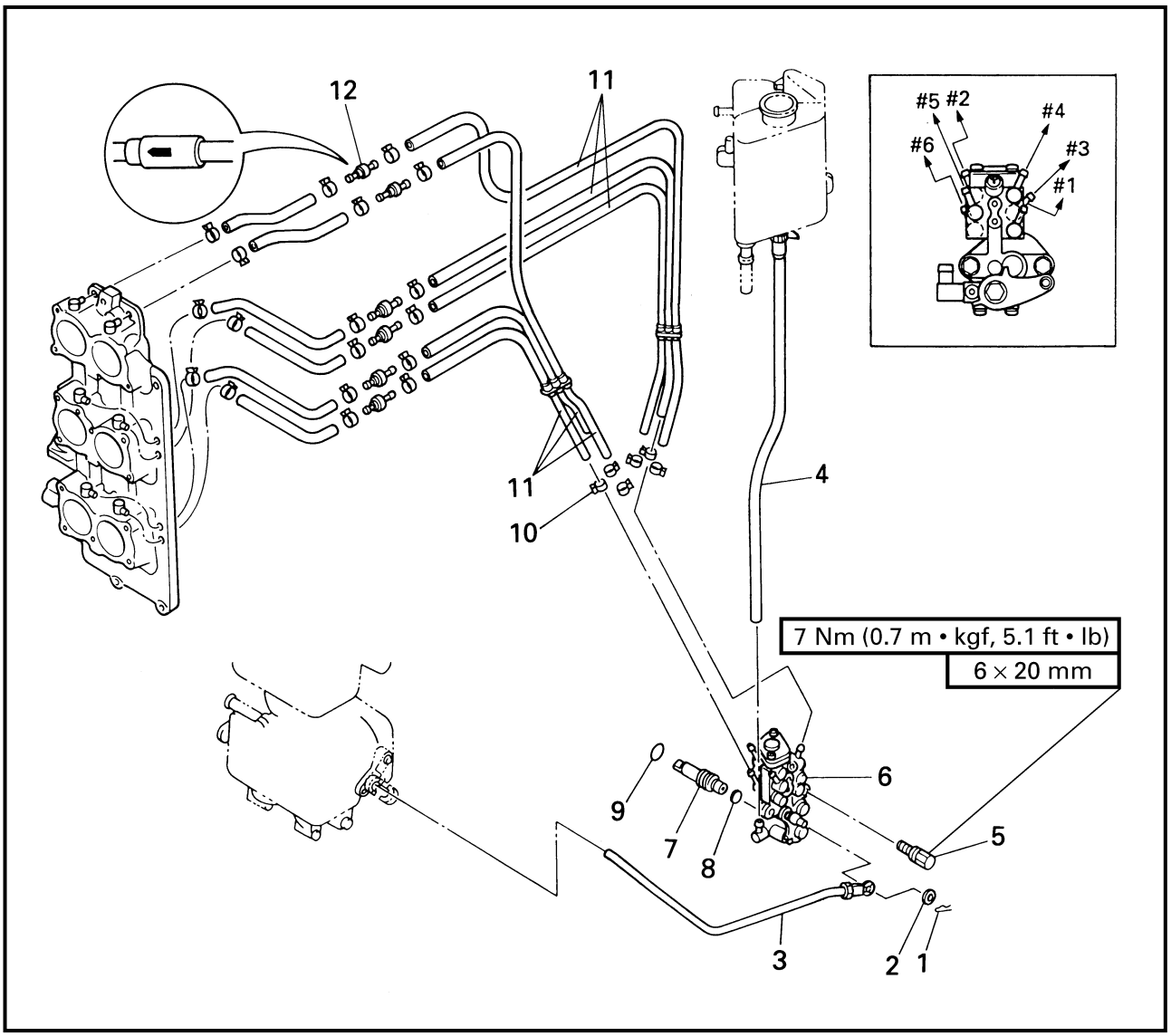
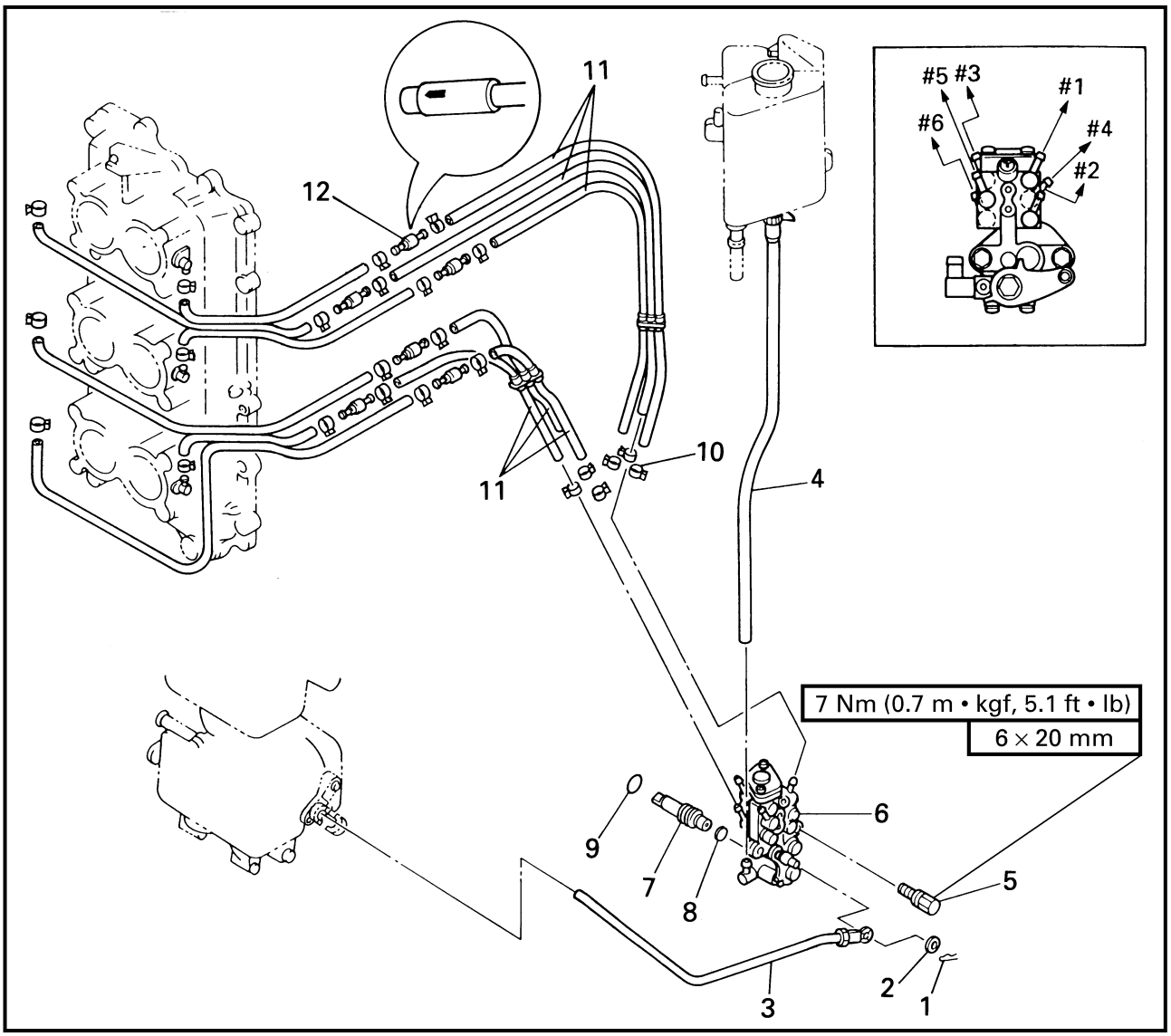


Order	Job/Part	Q'ty	Remarks
7	Oil pump drive gear	1	
8	Metal plate	1	
9	O-ring	1	**Not reusable**
10	Clip	24	
11	Oil delivery hose	12	(oil pump-to-intake manifold)
12	Check valve	6	
			For installation, reverse the removal procedure.

REMOVING/INSTALLING THE OIL PUMP (EXCEPT FOR 150G, 175F, S200F, 200G, 225D/P150TR, P175TR, S200TR, P200TR MODELS)



Order	Job/Part	Q'ty	Remarks
1	Clip	1	
2	Washer	1	
3	Oil pump link rod	1	
4	Oil hose	1	(oil tank-to-oil pump)
5	Bolt	2	
6	Oil pump	1	

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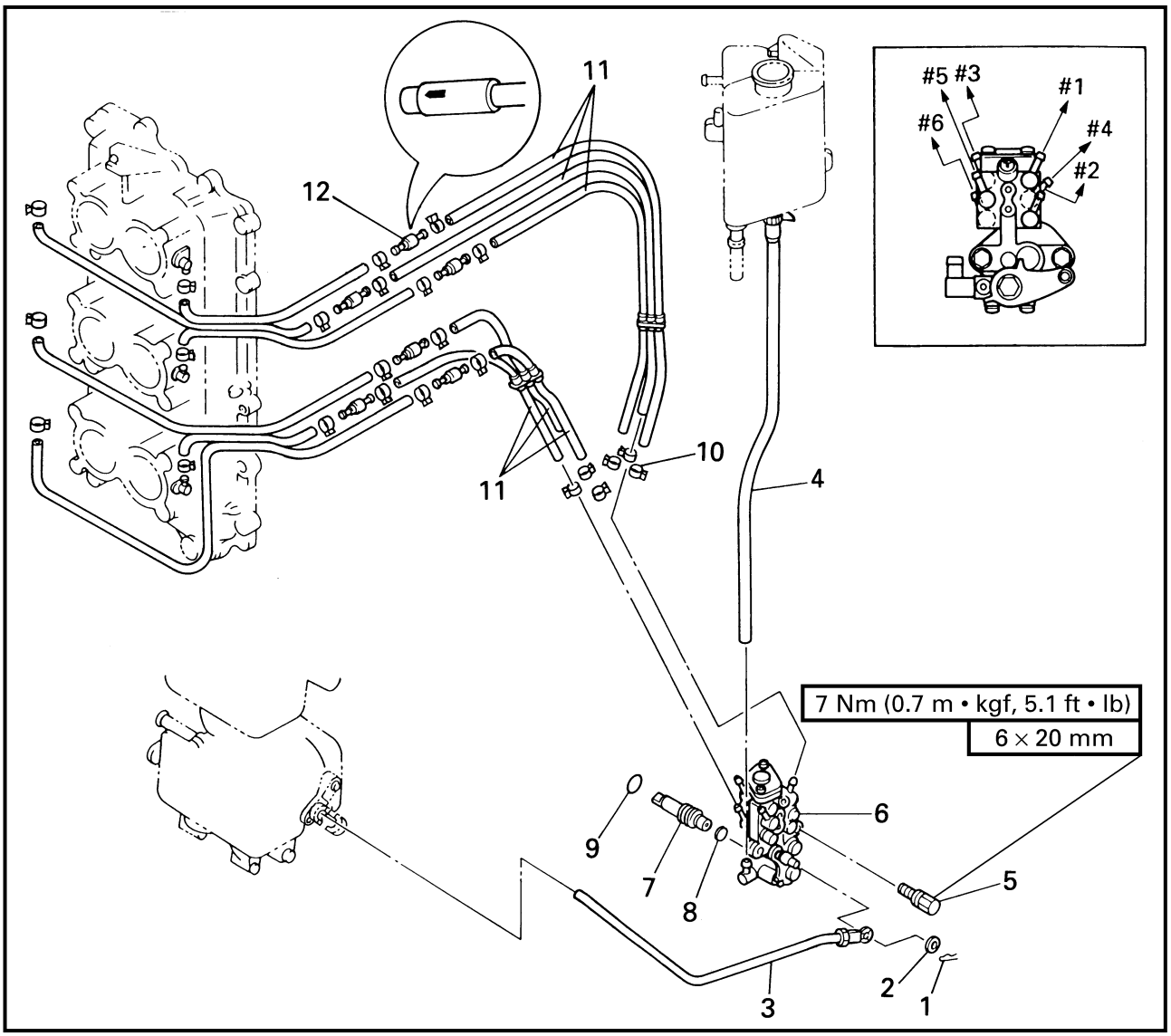


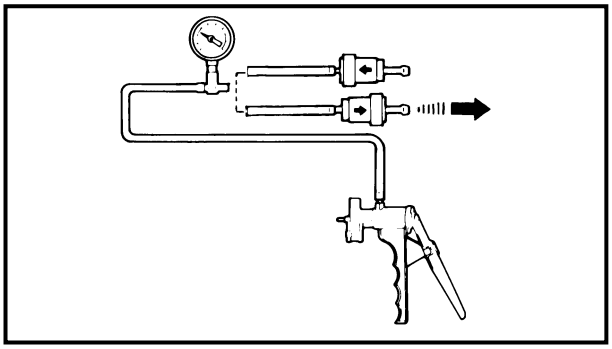
Order	Job/Part	Q'ty	Remarks
7	Oil pump drive gear	1	
8	Metal plate	1	
9	O-ring	1	**Not reusable**
10	Clip	24	
11	Oil delivery hose	12	(oil pump-to-intake manifold)
12	Check valve	6	
			For installation, reverse the removal procedure.

INSPECTING THE CHECK VALVE

Inspect:
- Check valve operation
  Damage/reverse air flow → Replace.

Inspecting steps

NOTE:
Do not overpressurize the check valve. Excessive pressure may cause air to leak out.



(1) Install the Mity vac onto the check valve as shown.

	**Mity vac** **YB-35956 / 90890-06756**

(2) Apply the specified pressure with the Mity vac.

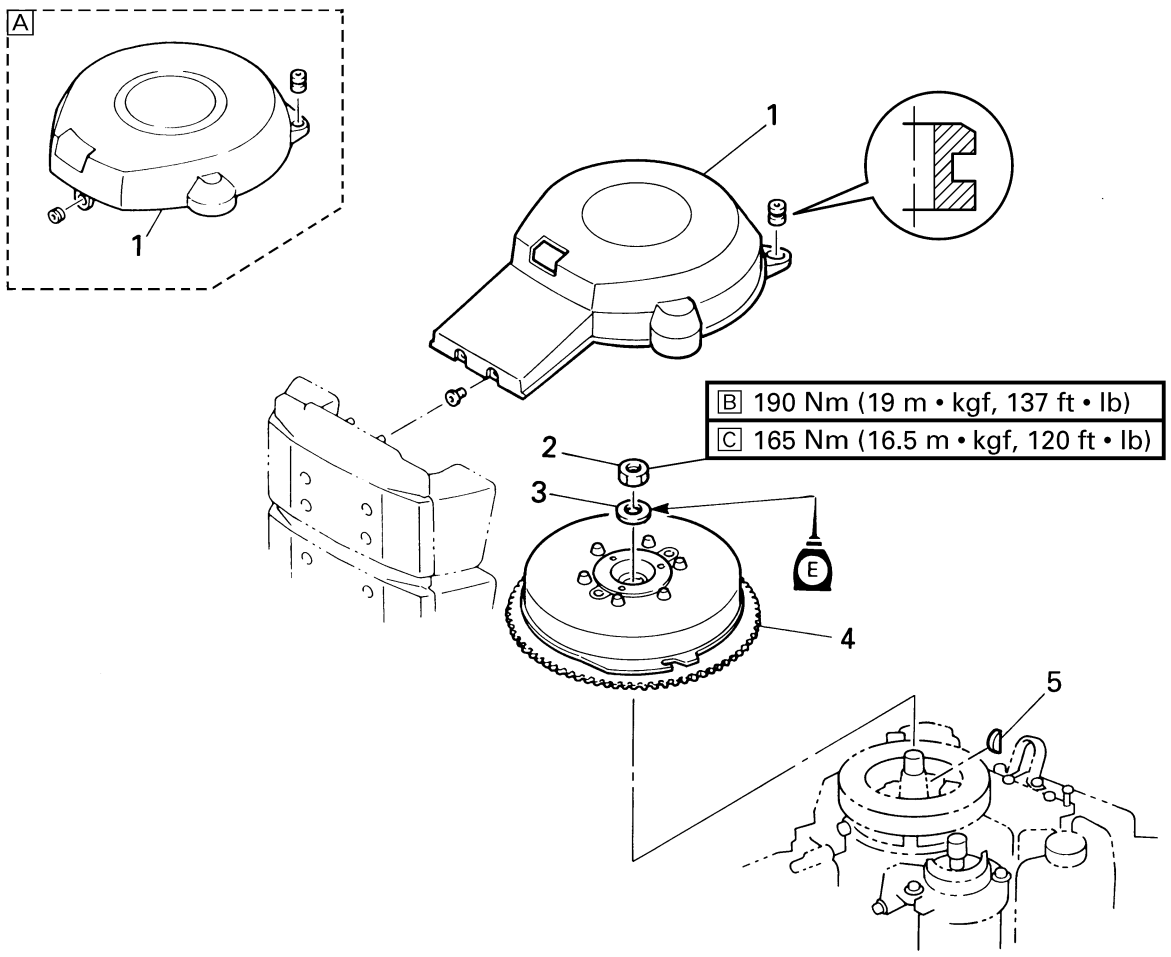
	**Check valve pressure** **80 kPa (0.8 kg/cm^2, 11.4 psi)**

NOTE:
Make sure no air comes out of the opposite side of the check valve.

CHAPTER 5
POWER UNIT

FLYWHEEL MAGNET ASSEMBLY

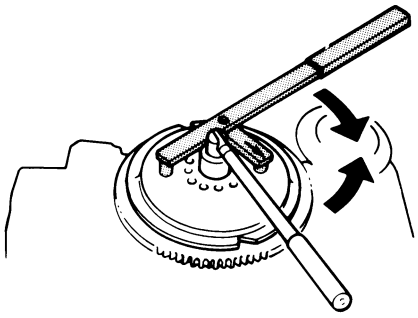
REMOVING/INSTALLING THE FLYWHEEL MAGNET ASSEMBLY



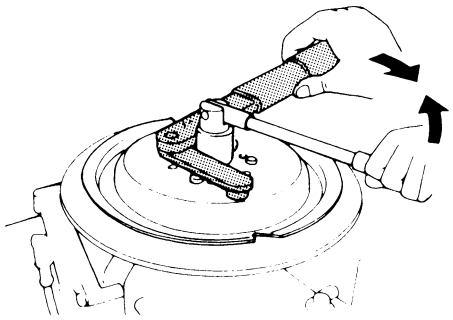
Order	Job/Part	Q'ty	Remarks
1	Flywheel magnet assembly cover	1	
2	Flywheel magnet assembly nut	1	
3	Washer	1	
4	Flywheel magnet assembly	1	
5	Woodruff key	1	
			For installation, reverse the removal procedure.

A S150F, LS150F, S175D, S200F, LS200F/S150TR, L150TR, S175TR, S200TR, L200TR
B Oil injection and 225DET models
C Pre-mix except for 225DET models

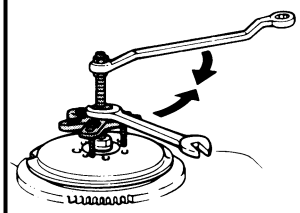
A



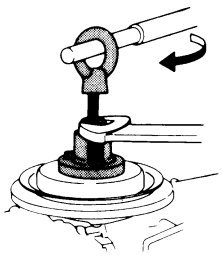
B

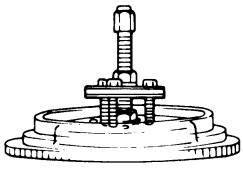


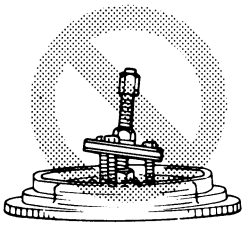
A



B







REMOVING THE FLYWHEEL MAGNET ASSEMBLY

Remove:
- Flywheel magnet assembly

Removing steps

(1) Remove the flywheel magnet assembly nut.

Flywheel magnet assembly holder
YB-06139 / 90890-06522

A For USA and Canada
B Except for USA and Canada

NOTE:

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

(2) Remove the flywheel magnet assembly.

Universal puller
YB-06117 / 90890-06521

A For USA and Canada
B Except for USA and Canada

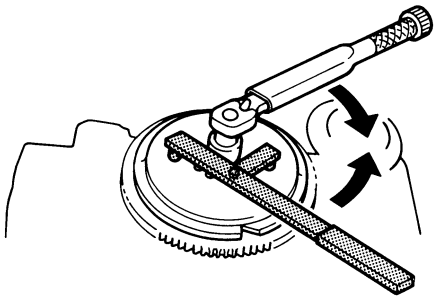
NOTE:

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

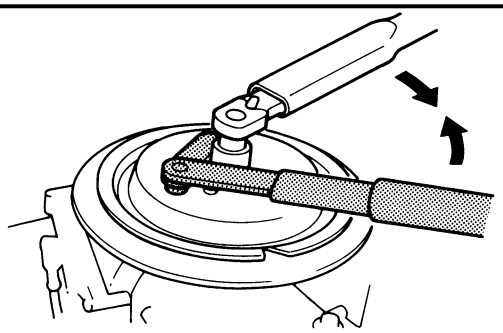
CAUTION:

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

A



B



INSTALLING THE FLYWHEEL MAGNET ASSEMBLY

Install:

- Flywheel magnet assembly nut

Flywheel magnet assembly holder
YB-06139 / 90890-06522

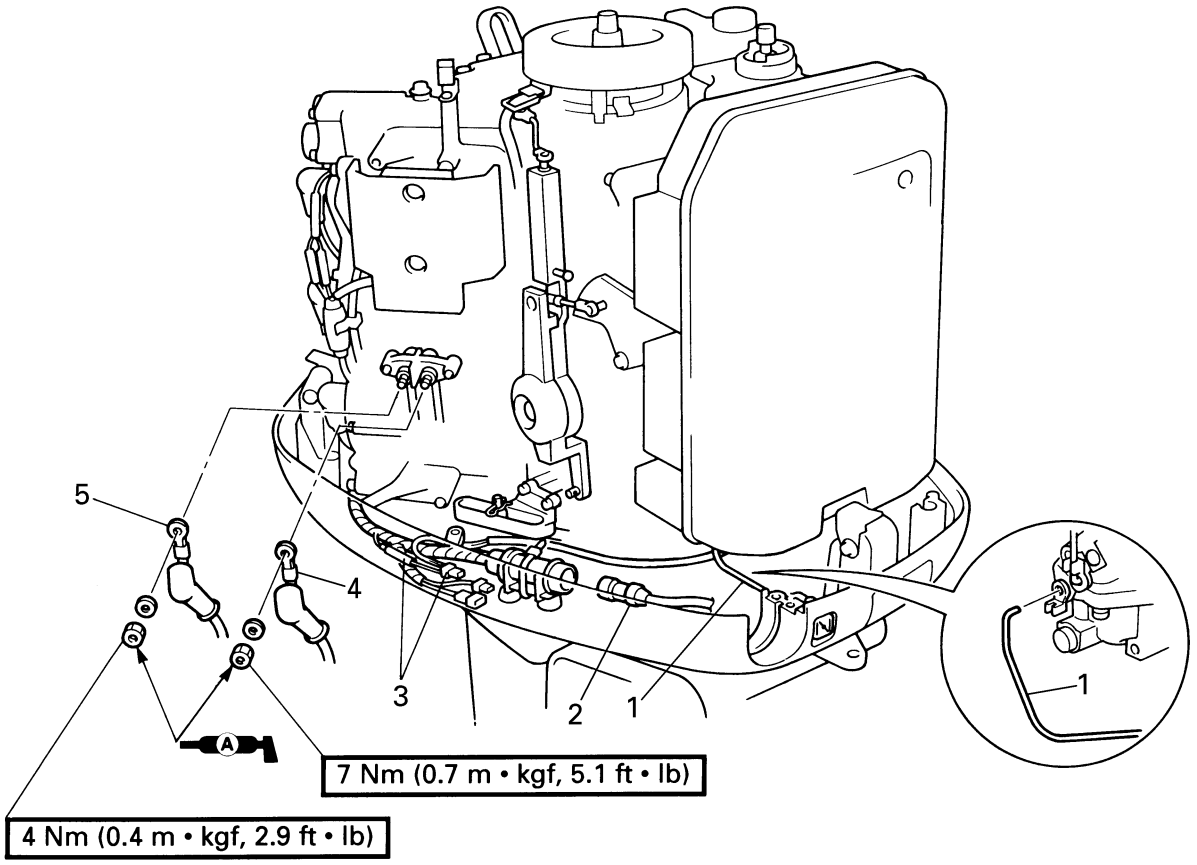
A For USA and Canada
B Except for USA and Canada

NOTE:

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

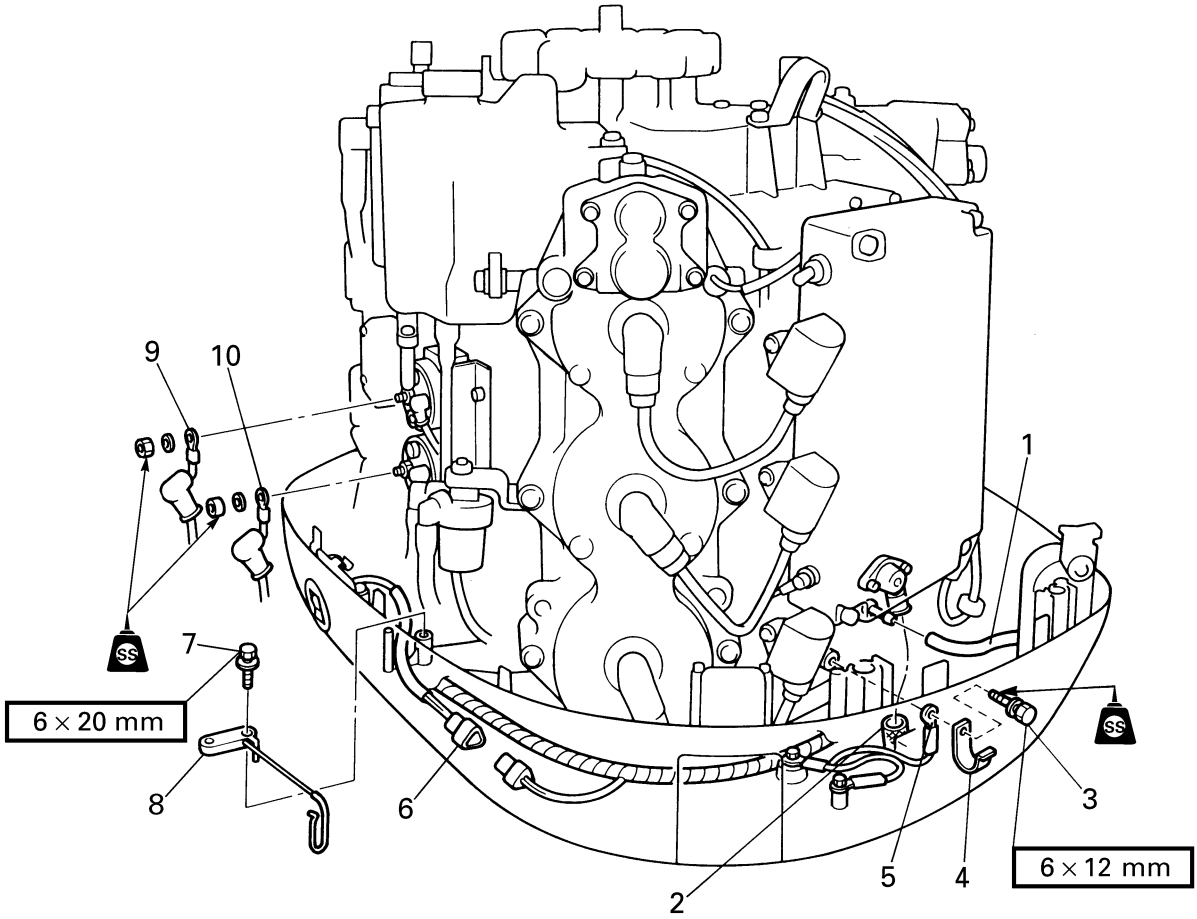
Flywheel magnet assembly nut (oil injection and 225DET models)
190 Nm (19 m • kgf, 137 ft • lb)
Flywheel magnet assembly nut (pre-mix except for 225DET models)
165 Nm (16.5 m • kgf, 120 ft • lb)

POWER UNIT
DISCONNECTING/CONNECTING THE LEADS



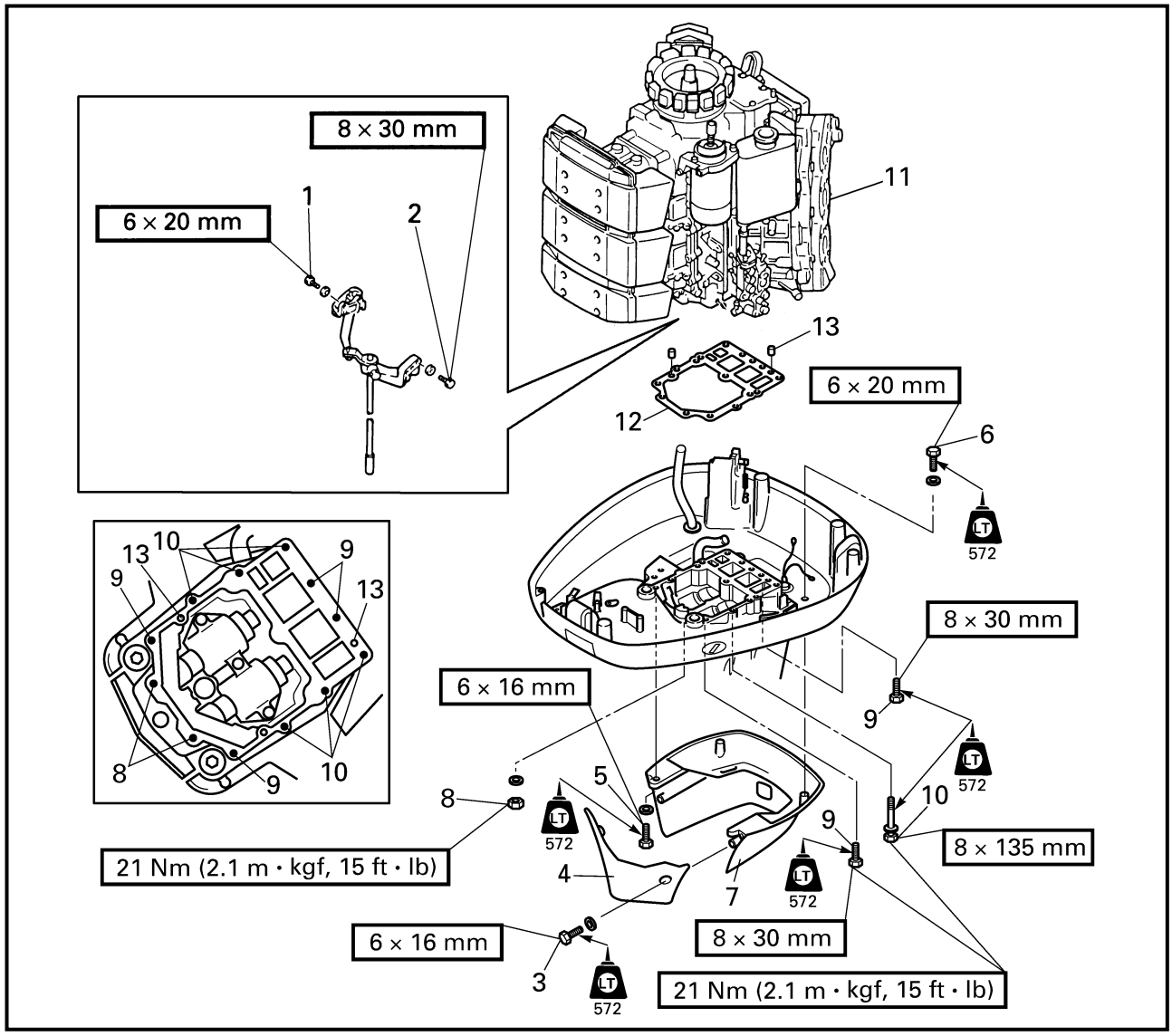
Order	Job/Part	Q'ty	Remarks
	Battery leads		(from the battery)
	Remote control shift and throttle rods and cables		
1	Choke rod	1	
2	Remote control coupler	1	
3	Trim sensor coupler and connector	2	
4	Negative battery lead	1	
5	Positive battery lead	1	
			For installation, reverse the removal procedure.

DISCONNECTING/CONNECTING THE HOSES



Order	Job/Part	Q'ty	Remarks
1	Pilot water hose	1	
2	Cooling water hose	1	
3	Bolt	1	
4	Metal clamp	1	
5	Ground lead	1	
6	Trailer switch coupler	1	
7	Bolt	1	
8	Cable guide	1	
9	Power trim and tilt lead	1	(blue)
10	Power trim and tilt lead	1	(green)
			For installation, reverse the removal procedure.

REMOVING/INSTALLING THE POWER UNIT



Order	Job/Part	Q'ty	Remarks
1	Bolt	2	
2	Bolt	2	
3	Bolt	2	
4	Forward apron	1	
5	Bolt	2	
6	Bolt	2	
7	Rear apron	1	

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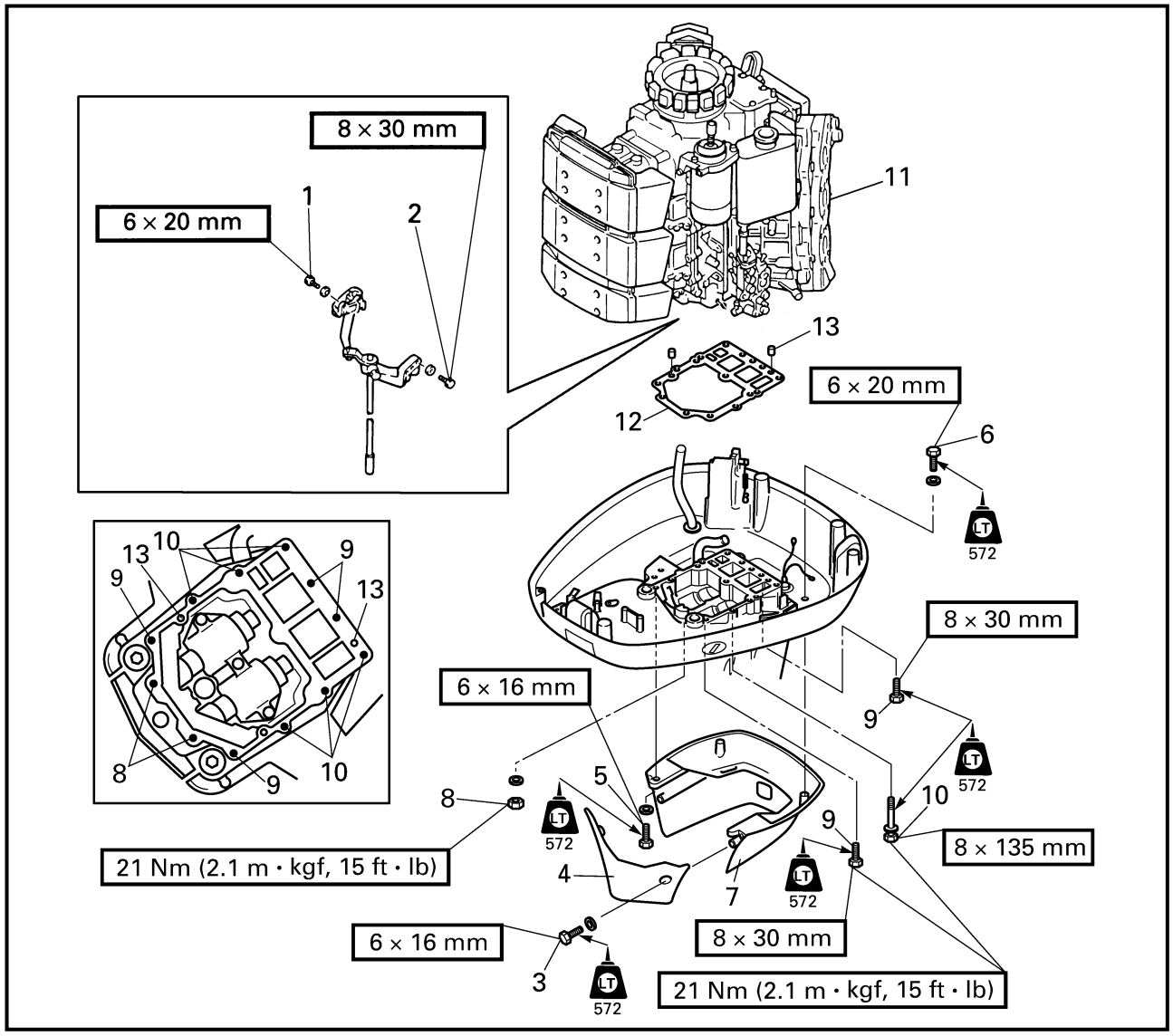
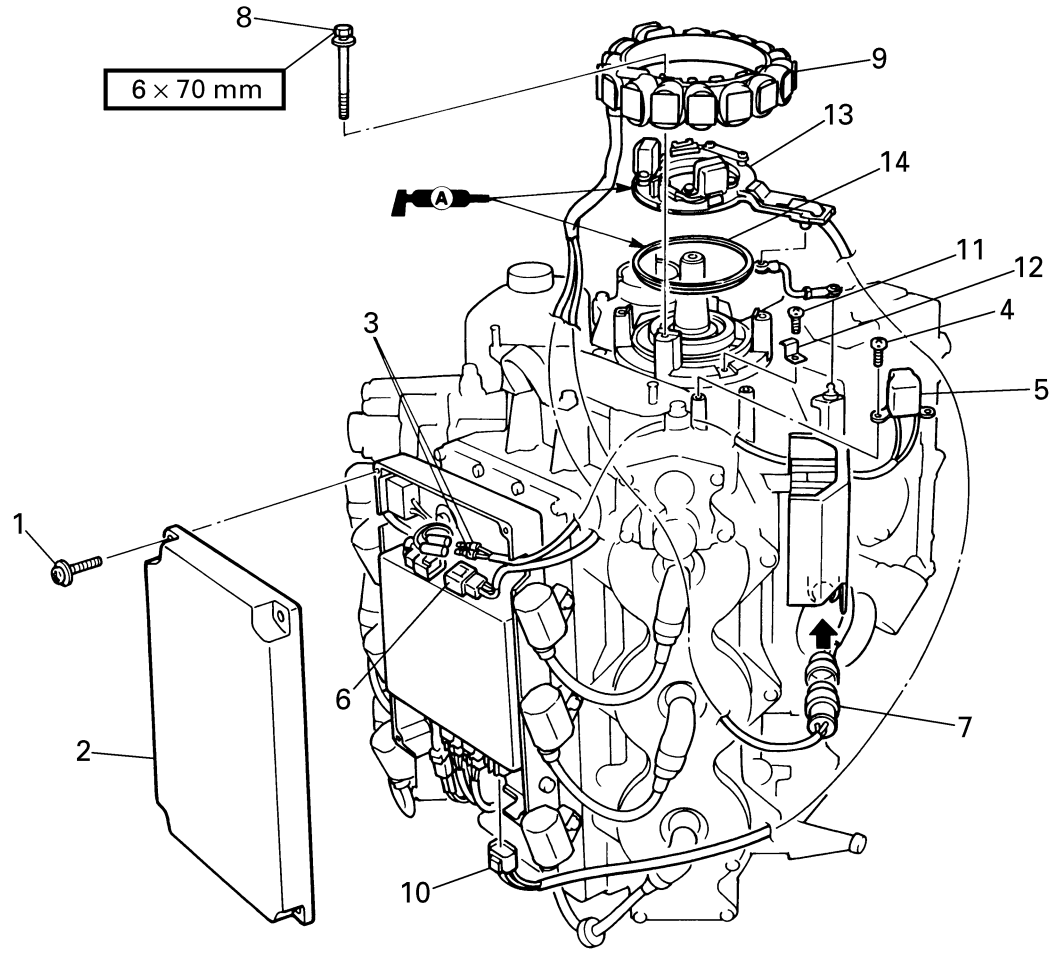


Order	Job/Part	Q'ty	Remarks
8	Nut	2	
9	Bolt	4	
10	Bolt	6	
11	Power unit	1	
12	Gasket	1	**Not reusable**
13	Dowel pin	2	
			For installation, reverse the removal procedure.

STATOR ASSEMBLY

REMOVING/INSTALLING THE STATOR ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Flywheel magnet assembly		Refer to "FLYWHEEL MAGNET ASSEMBLY" on page 5-1.
1	Screw	4	
2	CDI unit cover	1	
3	Crank position sensor connector	2	Oil injection and 225DET models
4	Screw	2	Oil injection and 225DET models
5	Crank position sensor	1	Oil injection and 225DET models
6	Charge coil coupler	1	
7	Lighting coil coupler	1	

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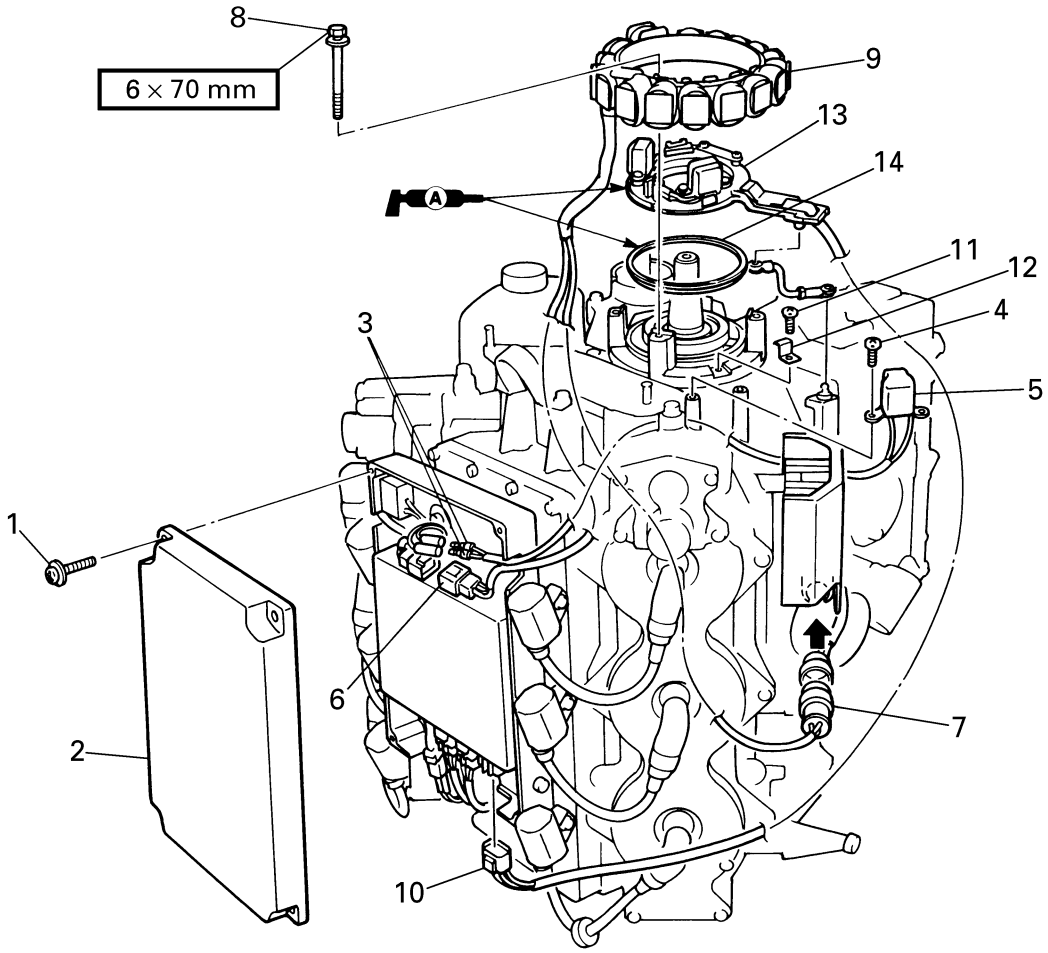
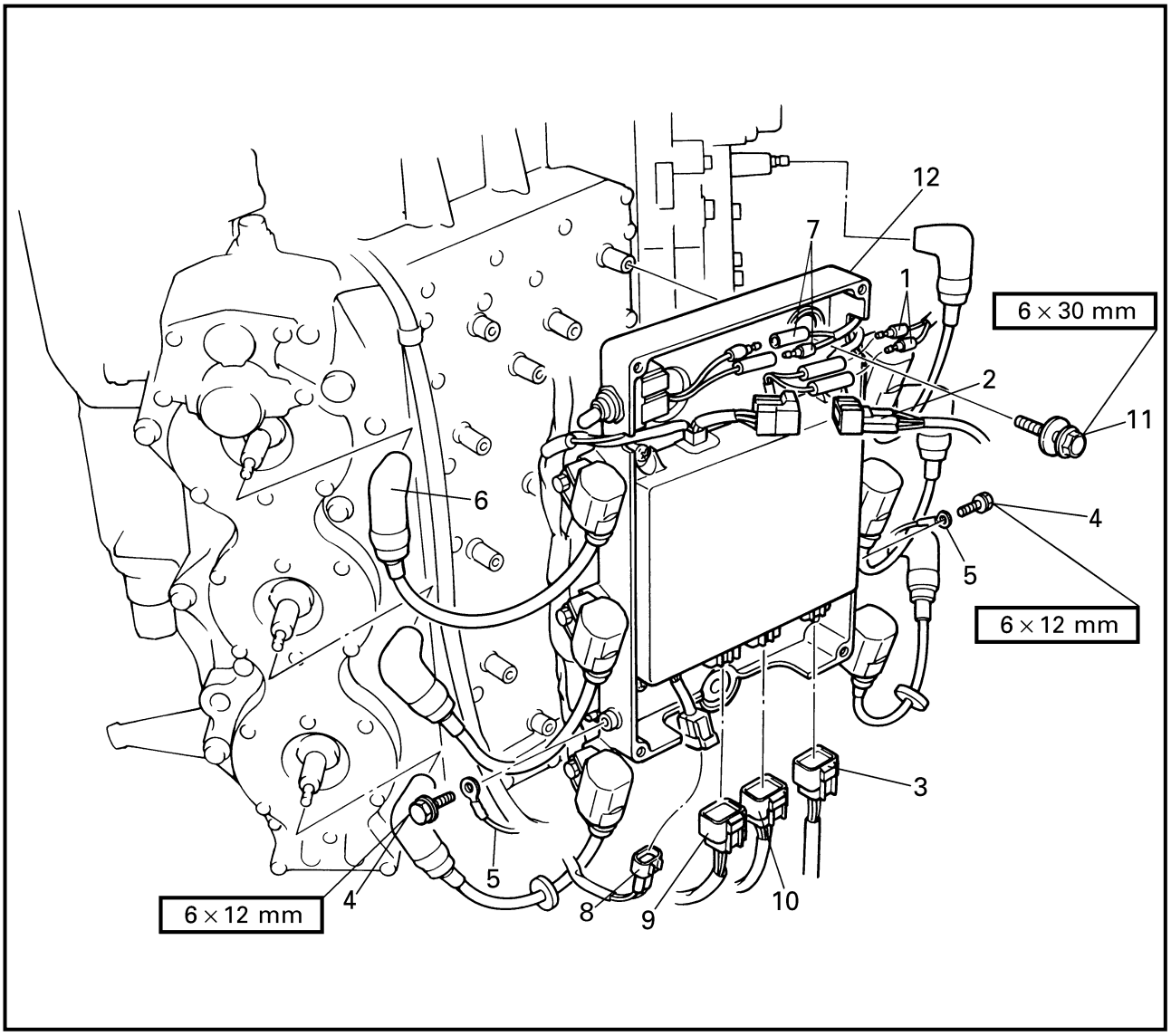


Order	Job/Part	Q'ty	Remarks
8	Bolt	4	
9	Stator assembly	1	
10	Pulser coil coupler	1	
11	Screw	4	
12	Pulser coil bushing retainer	4	
13	Pulser coil assembly	1	
14	Pulser coil bushing	1	
			For installation, reverse the removal procedure.

CDI UNIT

REMOVING/INSTALLING THE CDI UNIT ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	CDI unit cover		Refer to "DISCONNECTING/CONNECTING THE HOSES" on page 5-5.
1	Crank position sensor connector	2	
2	Charge coil coupler	1	
3	Pulser coil coupler	1	
4	Bolt	2	
5	Ground lead	2	
6	Spark plug cap	6	

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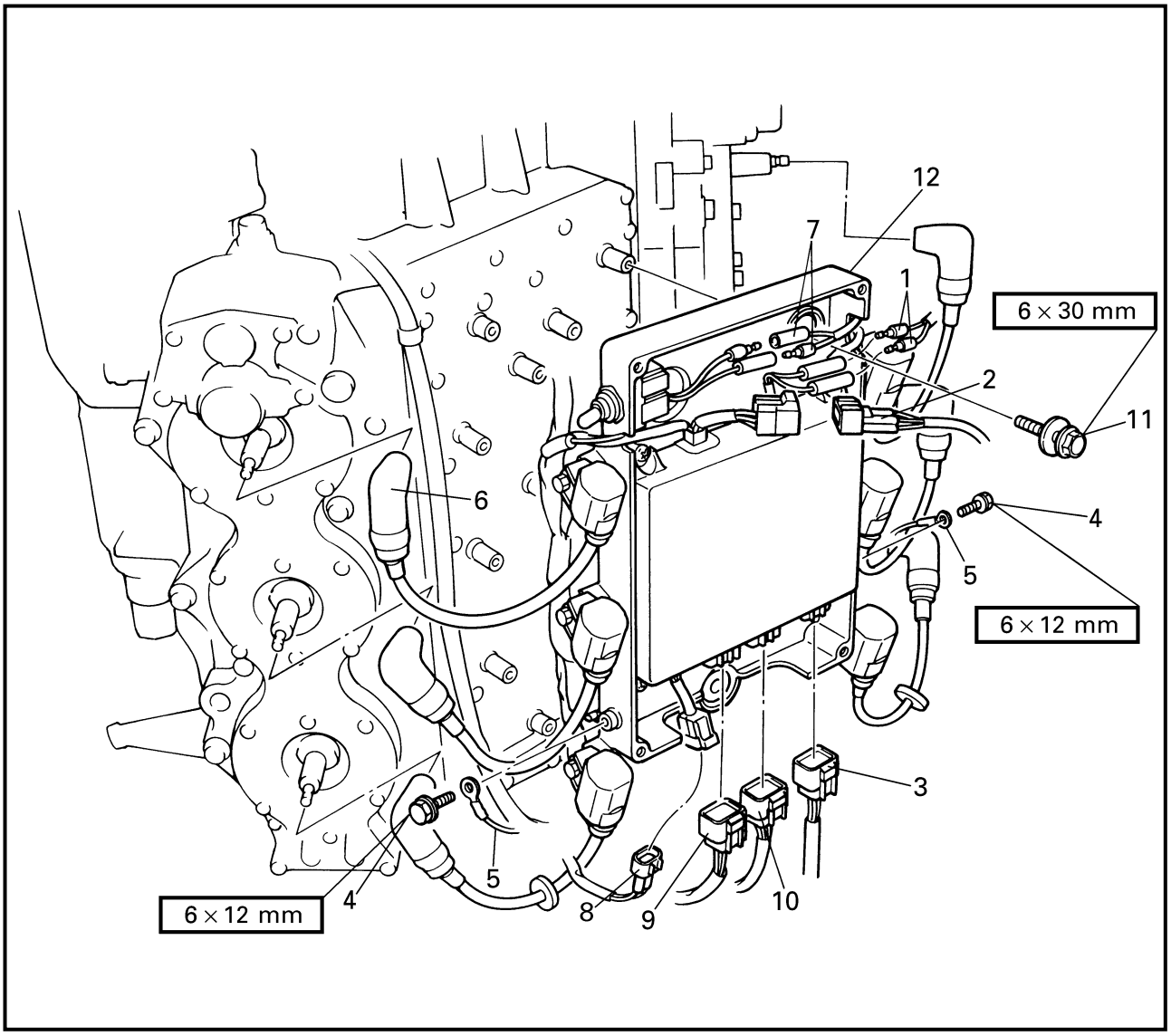
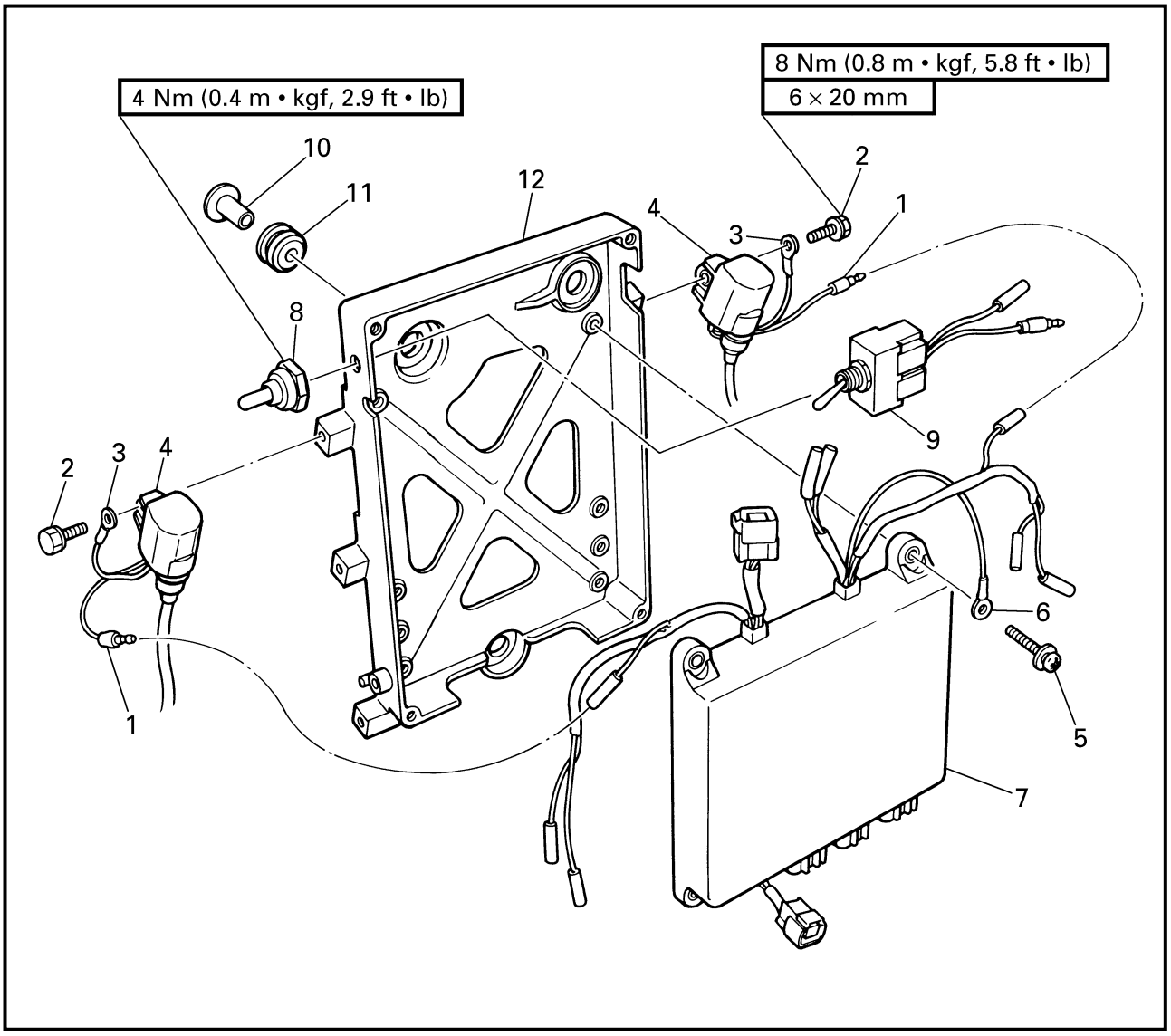


Order	Job/Part	Q'ty	Remarks
7	Emergency switch connector	2	
8	Engine cooling water temperature sensor coupler	1	
9	Oil level sensor coupler	1	
10	CDI unit coupler	1	
11	Bolt	3	
12	CDI unit assembly	1	For installation, reverse the removal procedure.

REMOVING/INSTALLING THE CDI UNIT



Order	Job/Part	Q'ty	Remarks
1	Ignition coil connector	6	
2	Bolt	6	
3	Ground lead	6	
4	Ignition coil	6	
5	Screw	4	
6	Ground lead	1	
7	CDI unit	1	

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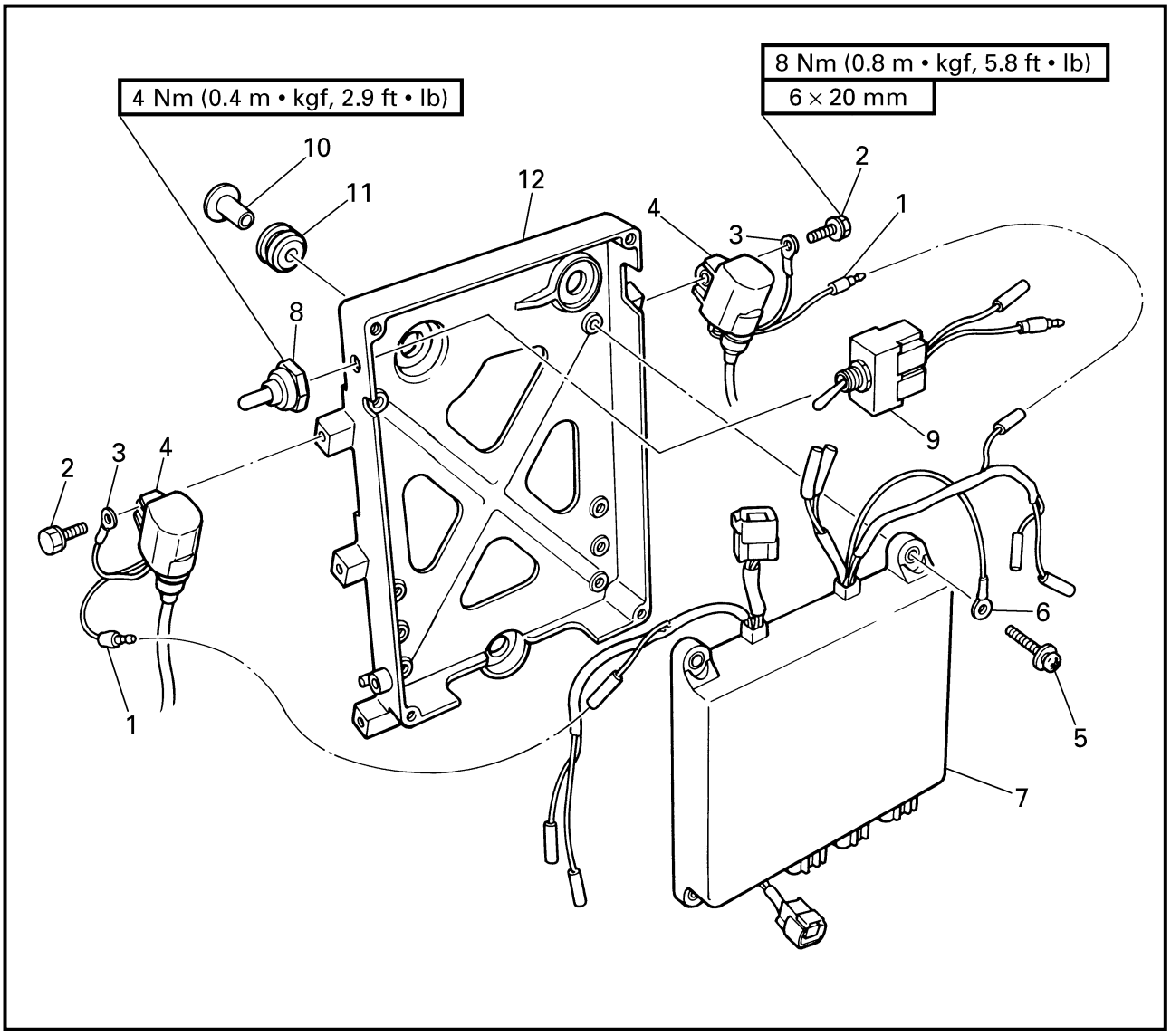
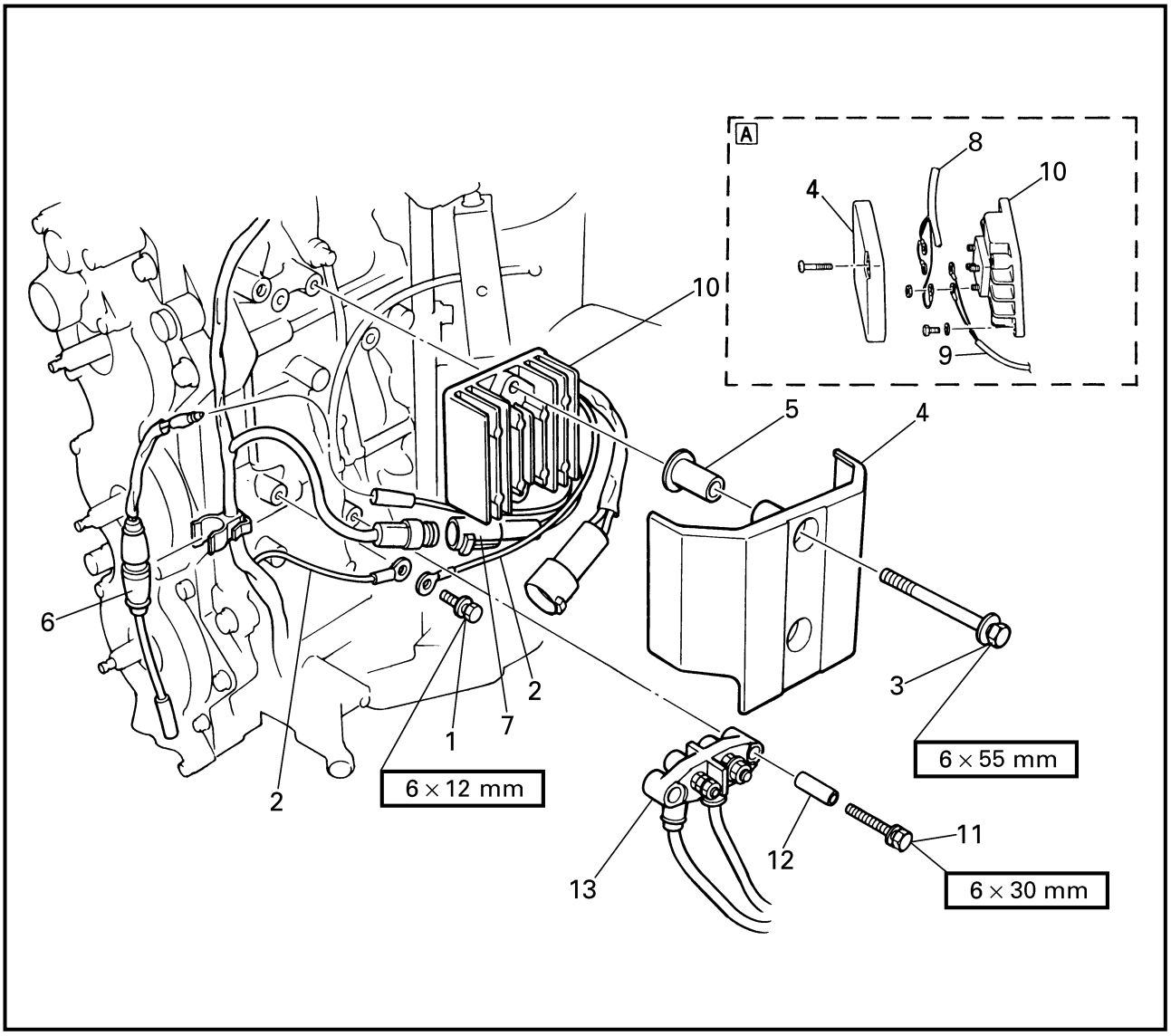


Order	Job/Part	Q'ty	Remarks
8	Emergency switch cap	1	
9	Emergency switch	1	
10	Collar	3	
11	Grommet	3	
12	CDI unit case	1	
			For installation, reverse the removal procedure.

RECTIFIER/REGULATOR

REMOVING/INSTALLING THE RECTIFIER/REGULATOR



Order	Job/Part	Q'ty	Remarks
	Negative battery lead		Refer to "POWER UNIT" on page 5-4.
	Positive battery lead		Refer to "POWER UNIT" on page 5-4.
	Lighting coil coupler		Refer to "STATOR ASSEMBLY" on page 5-8.
1	Bolt	1	
2	Ground lead	2	
3	Bolt	2	
4	Rectifier/regulator cover	1	
5	Collar	2	

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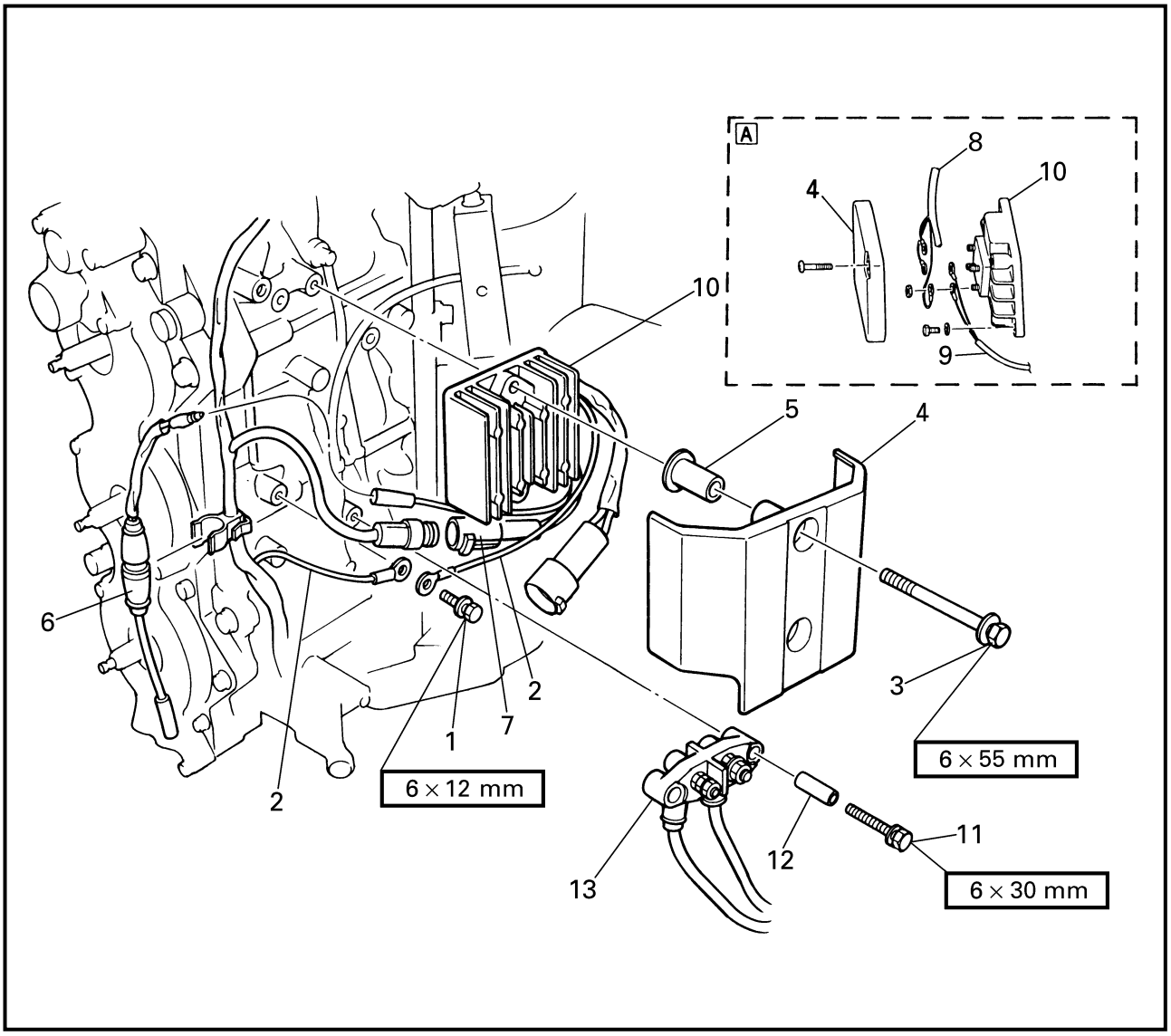
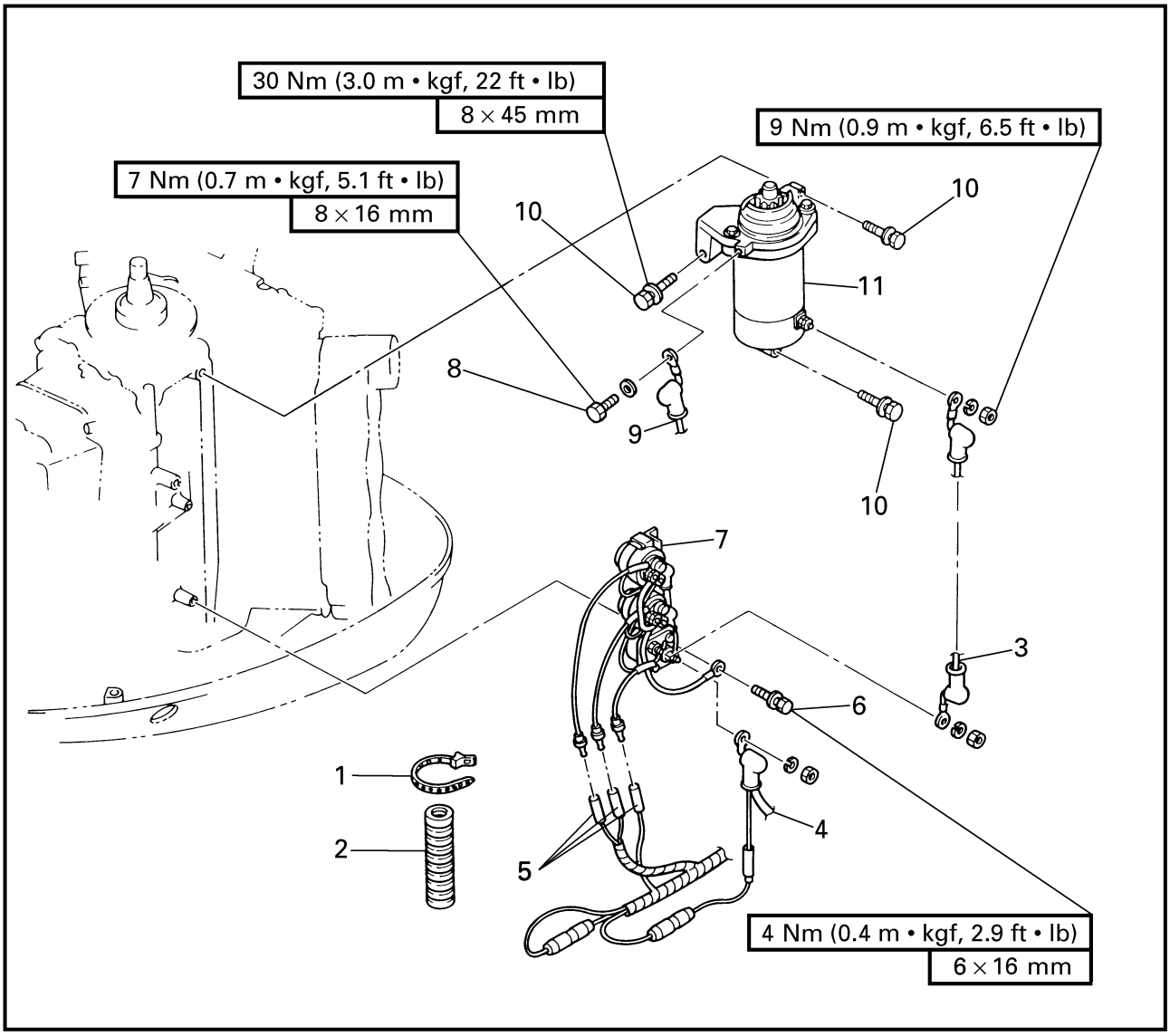


Order	Job/Part	Q'ty	Remarks
6	Accessory lead	1	
7	Rectifier/regulator coupler	1	
8	Rectifier/regulator lead	3	Pre-mix models (except for 225DET)
9	Lighting coil lead	2	Pre-mix models (except for 225DET)
10	Rectifier/regulator	1	
11	Bolt	2	
12	Spacer	2	
13	Battery lead terminal	1	
			For installation, reverse the removal procedure.

A Pre-mix models (except for 225DET)

RELAY ASSEMBLY AND STARTER MOTOR

REMOVING/INSTALLING THE RELAY ASSEMBLY AND STARTER MOTOR



Order	Job/Part	Q'ty	Remarks
	Power trim and tilt leads		Refer to "POWER UNIT" on page 5-4.
	Oil tank		Refer to "OIL TANK" on page 4-10.
1	Plastic locking tie	1	
2	Plastic tube	1	
3	Starter motor lead	1	
4	Positive battery lead	1	
5	Relay assembly lead	3	
6	Bolt	2	

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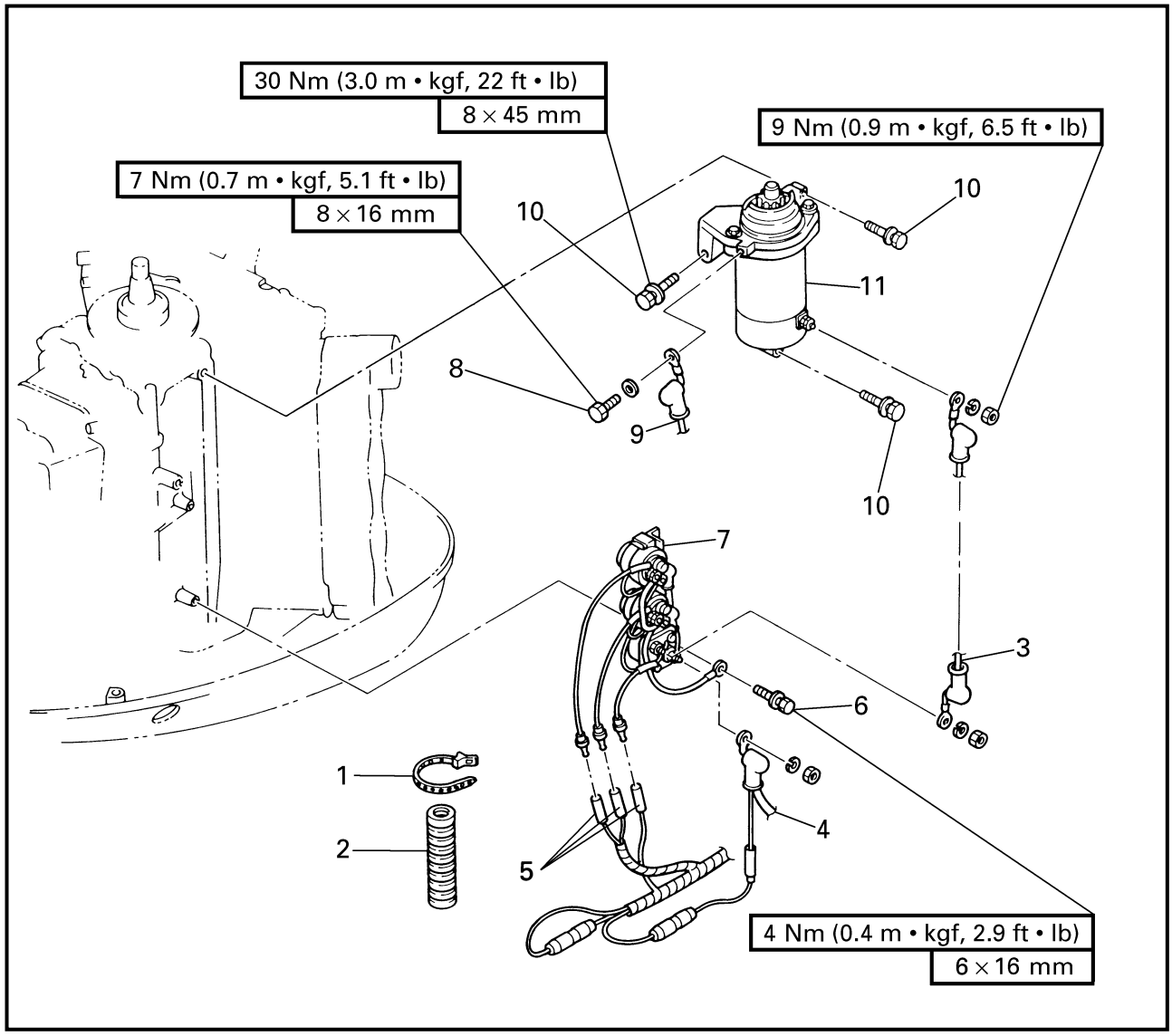
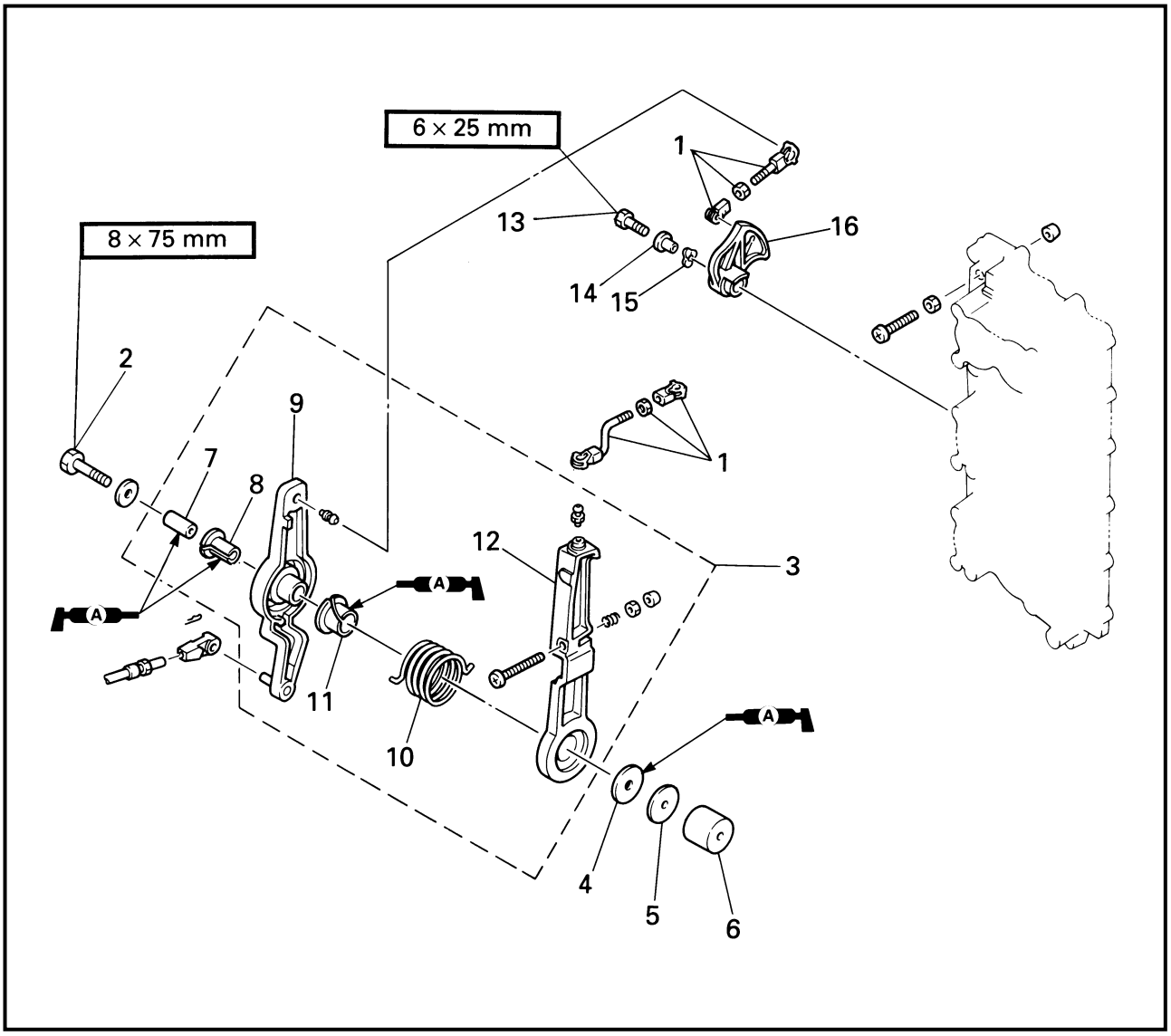


Order	Job/Part	Q'ty	Remarks
7	Relay assembly	1	
8	Bolt	1	
9	Negative battery lead	1	
10	Bolt	3	
11	Starter motor	1	
			For installation, reverse the removal procedure.

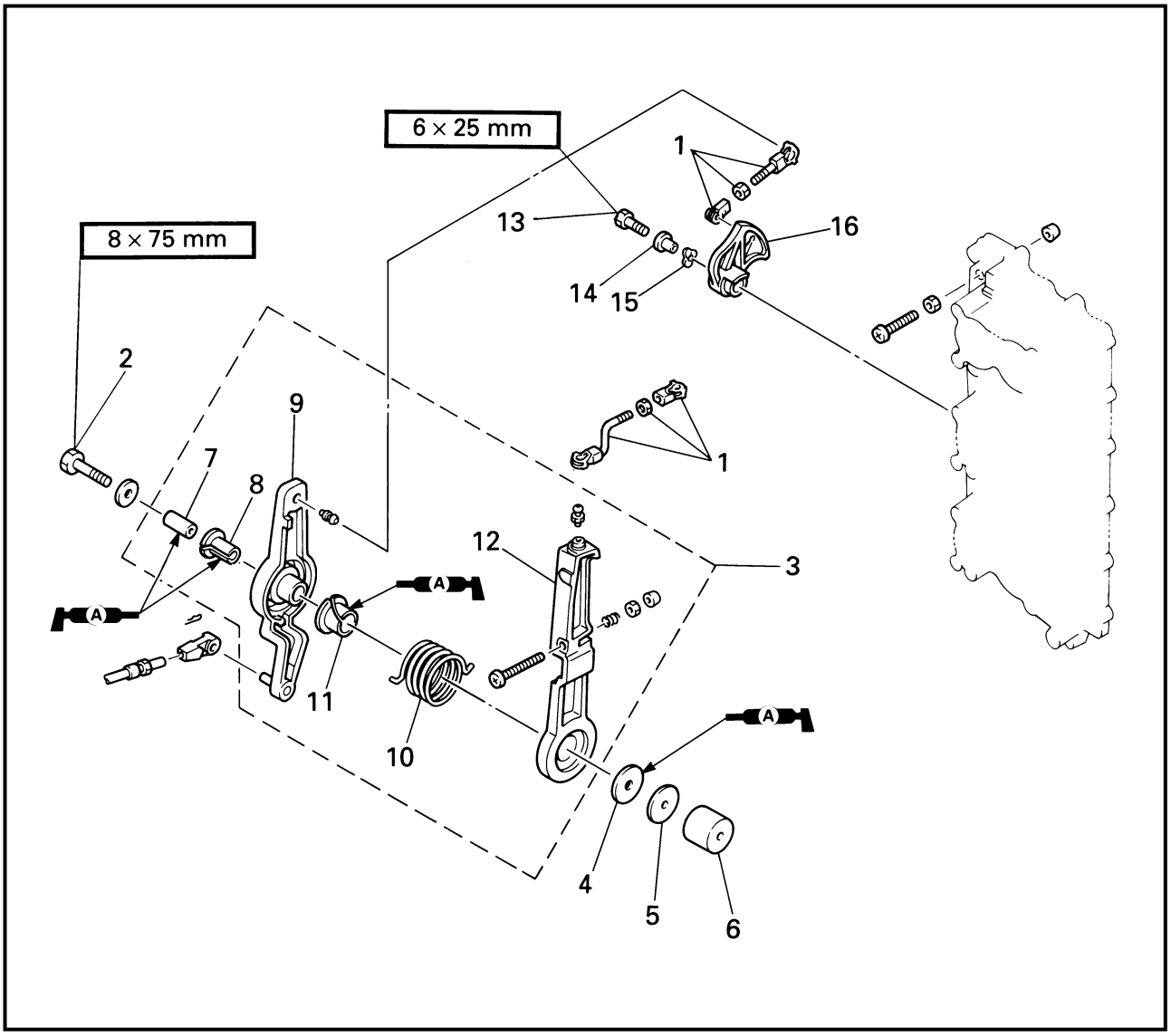
CONTROL UNIT

REMOVING/INSTALLING THE CONTROL UNIT

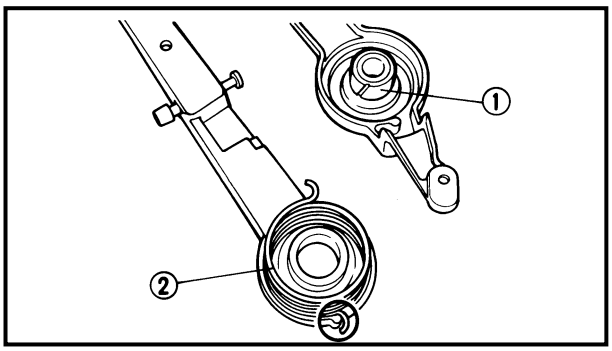


Order	Job/Part	Q'ty	Remarks
1	Throttle cam control link	2	
2	Bolt	1	
3	Accelerator control lever assembly	1	
4	Nylon washer	1	
5	Washer	1	
6	Spacer	1	
7	Spacer	1	
8	Bushing	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
9	Throttle lever	1	
10	Spring	1	
11	Bushing	1	
12	Accelerator control lever	1	
13	Bolt	1	
14	Collar	1	
15	Wave washer	1	
16	Throttle cam	1	
			For installation, reverse the removal procedure.

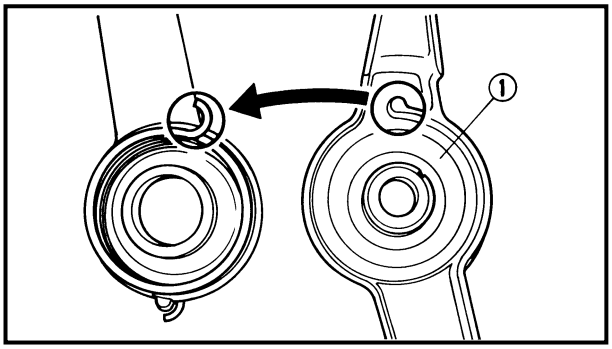


INSTALLING THE CONTROL UNIT

1. Install:
   - Bushing ①
   - Spring ②

NOTE:

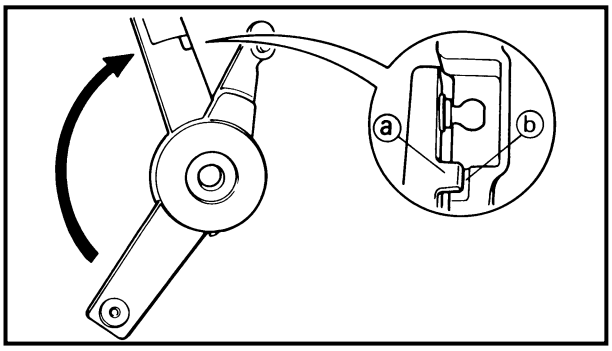
Mesh the spring hook with the slit in the accelerator control lever.



2. Install:
   - Throttle lever ①

NOTE:

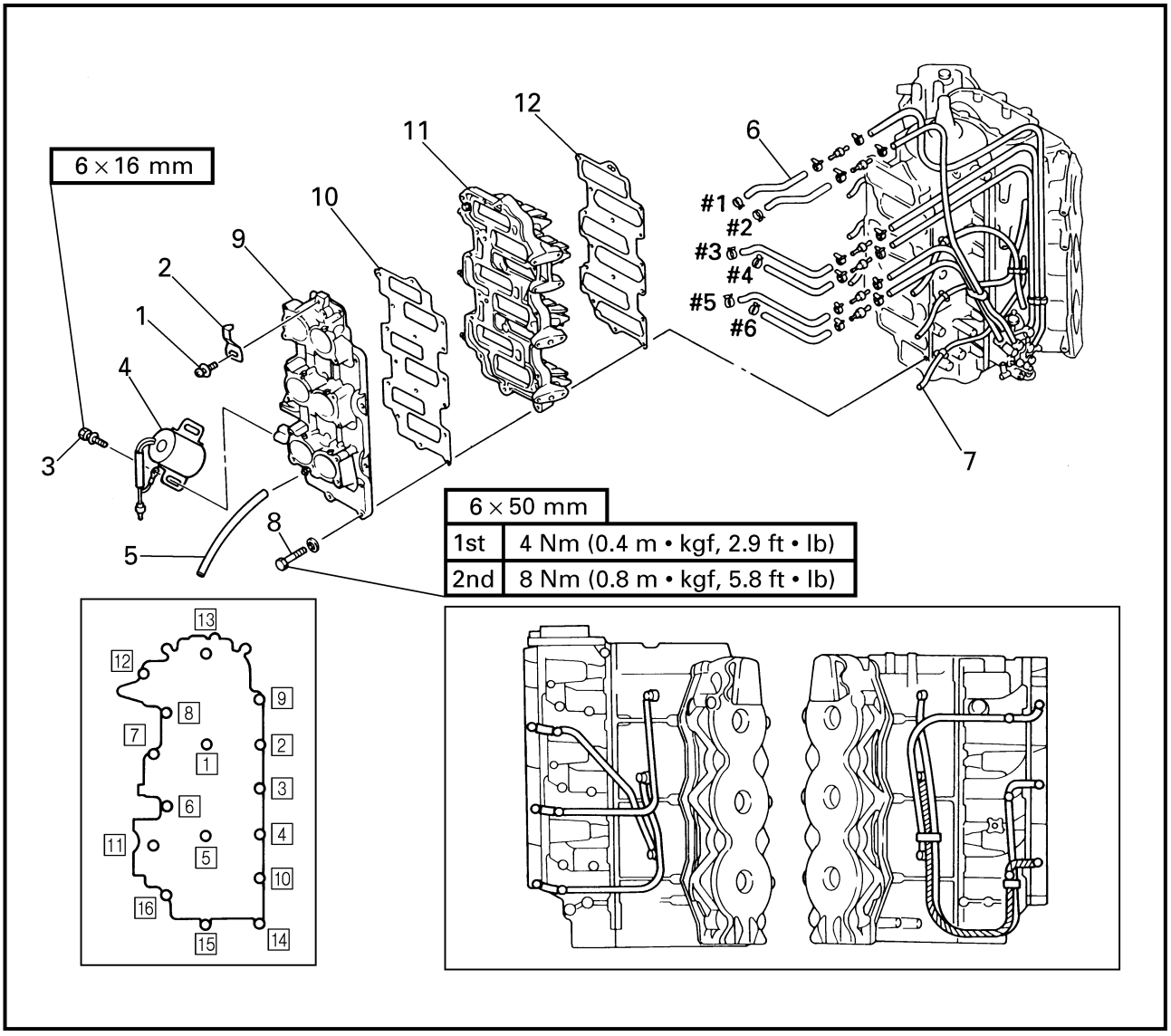
- Mesh the throttle lever hook with the spring hook.
- Turn the throttle lever clockwise and hook the projection ⓐ on the throttle lever with the notch ⓑ in the accelerator control lever.



3. Adjust:
   - Ignition timing
     Refer to "CONTROL SYSTEM" on page 3-3.

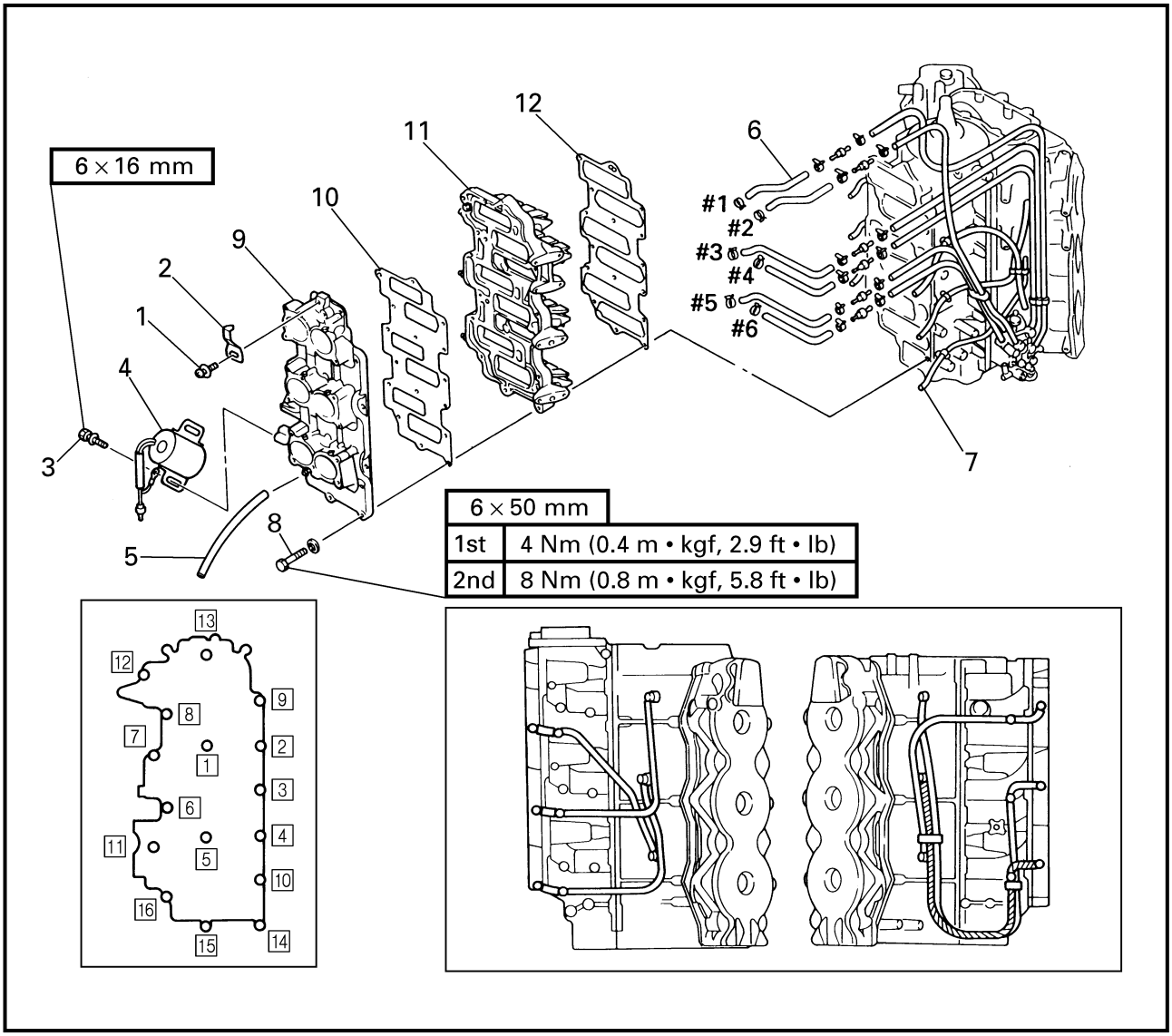
INTAKE MANIFOLD

REMOVING/INSTALLING THE INTAKE MANIFOLD (FOR 150G, 175F, S200F, 200G, 225D/P150TR, P175TR, S200TR, P200TR MODELS)



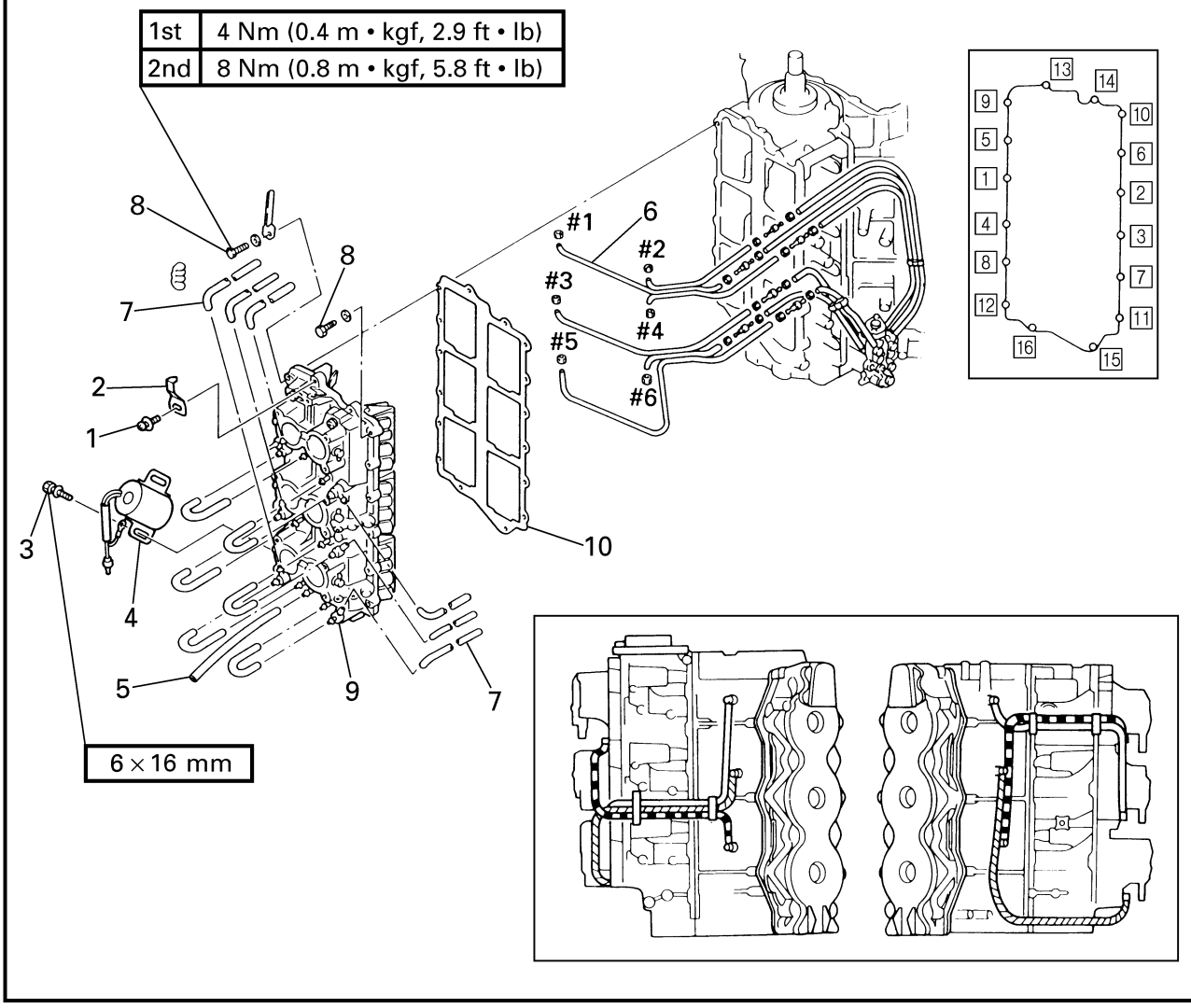
Order	Job/Part	Q'ty	Remarks
	Carburetor assembly		Refer to "CARBURETOR" on page 4-12.
	Fuel pump		Refer to "FUEL PUMP" on page 4-6.
1	Screw	1	
2	Timing plate	1	
3	Bolt	2	
4	Fuel enrichment valve	1	
5	Intake manifold air vent hose	1	
6	Oil hose	6	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
7	Recirculation hose	6	
8	Bolt	16	
9	Intake manifold	1	
10	Gasket	1	**Not reusable**
11	Reed valve plate	1	
12	Gasket	1	**Not reusable**
			For installation, reverse the removal procedure.

REMOVING/INSTALLING THE INATAKE MANIFOLD (EXCEPT FOR 150G, 175F, S200F, 200G, 225D/P150TR, P175TR, S200TR, P200TR MODELS)



Order	Job/Part	Q'ty	Remarks
	Carburetor assembly		Refer to "CARBURETOR" on page 4-12.
	Fuel pump		Refer to "FUEL PUMP" on page 4-6.
1	Screw	1	
2	Timing plate	1	
3	Bolt	2	
4	Fuel enrichment valve	1	
5	Intake manifold air vent hose	1	

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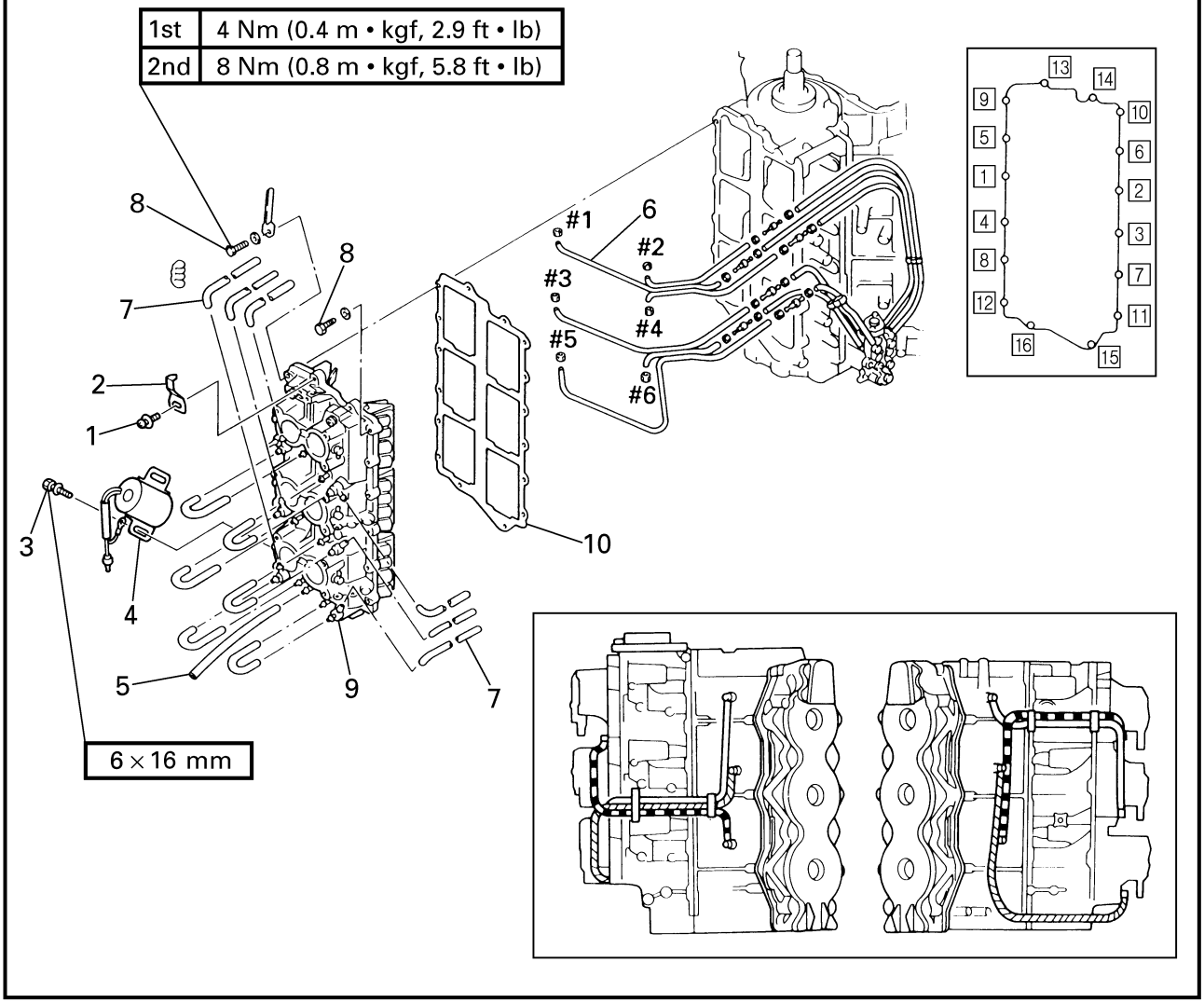
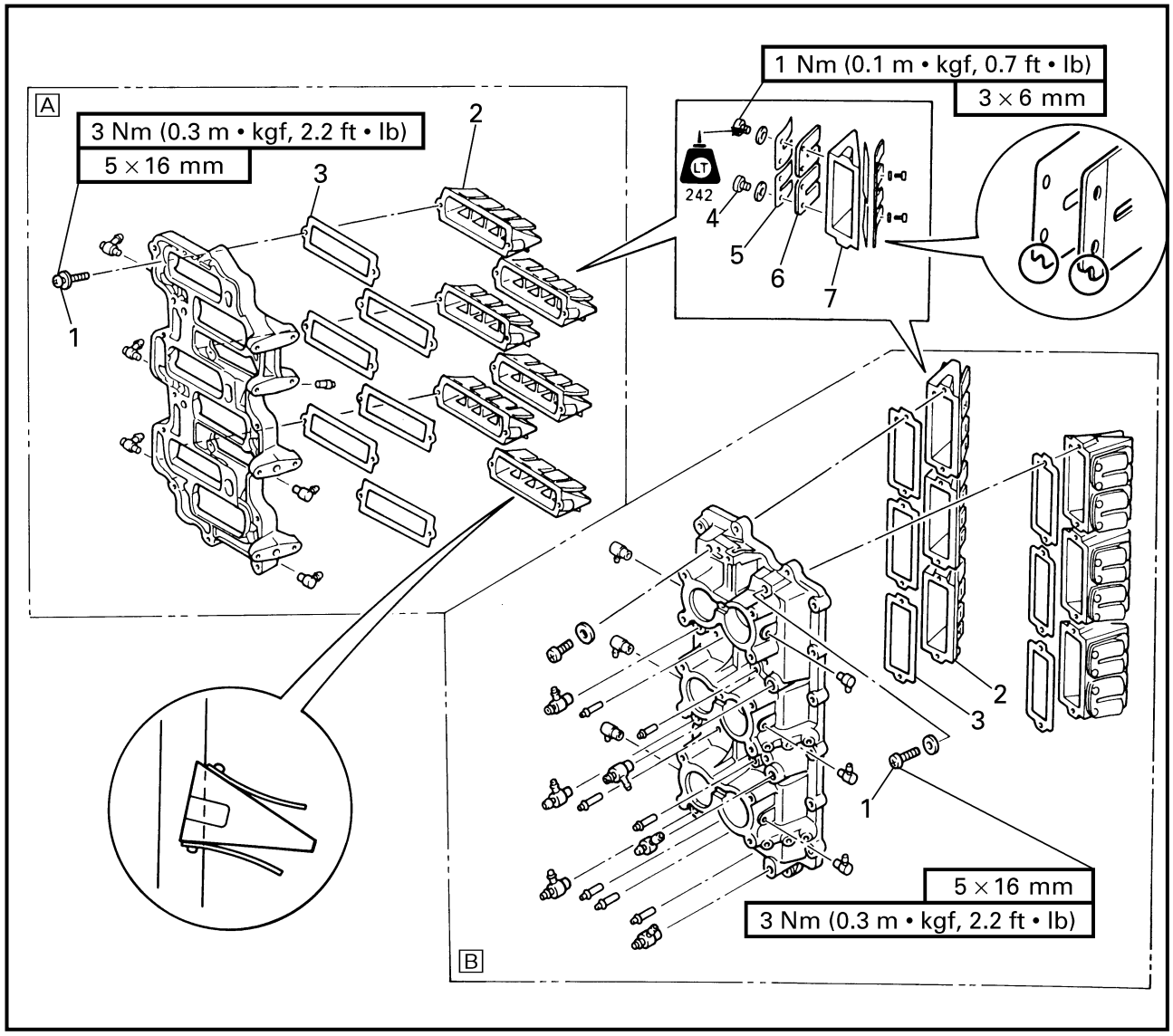


Order	Job/Part	Q'ty	Remarks
6	Oil hose	6	
7	Recirculation hose	12	
8	Bolt	16	
9	Intake manifold	1	
10	Gasket	1	**Not reusable** For installation, reverse the removal procedure.

REED VALVES

REMOVING/INSTALLING THE REED VALVES

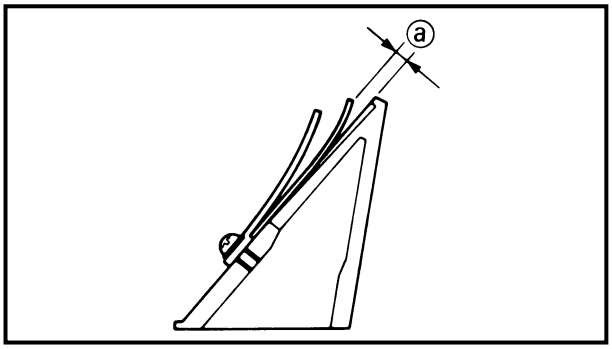


Order	Job/Part	Q'ty	Remarks
	Intake manifold		Refer to "INTAKE MANIFOLD" on page 5-21.
1	Screw	12	
2	Reed valve assembly	6	
3	Gasket	6	**Not reusable**
4	Screw	8 (4)	(Pre-mix 150 models)
5	Reed valve stopper	4 (2)	(Pre-mix 150 models)
6	Reed valve	4 (2)	(Pre-mix 150 models)
7	Reed valve seat	1	
			For installation, reverse the removal procedure.

A For 150G, 175F, S200F, 200G, 225D/P150TR, P175TR, S200TR, P200TR models
B Except for 150G, 175F, S200F, 200G, 225D/P150TR, P175TR, S200TR, P200TR models

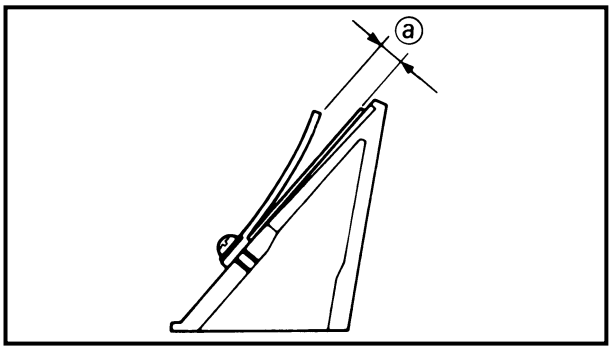
INSPECTING THE REED VALVE ASSEMBLY

1. Inspect:
   • Reed valve
   Cracks/damage → Replace.



2. Measure:
   • Warpage limit ⓐ
   Out of specification → Replace.

Warpage limit
0.2 mm (0.008 in)

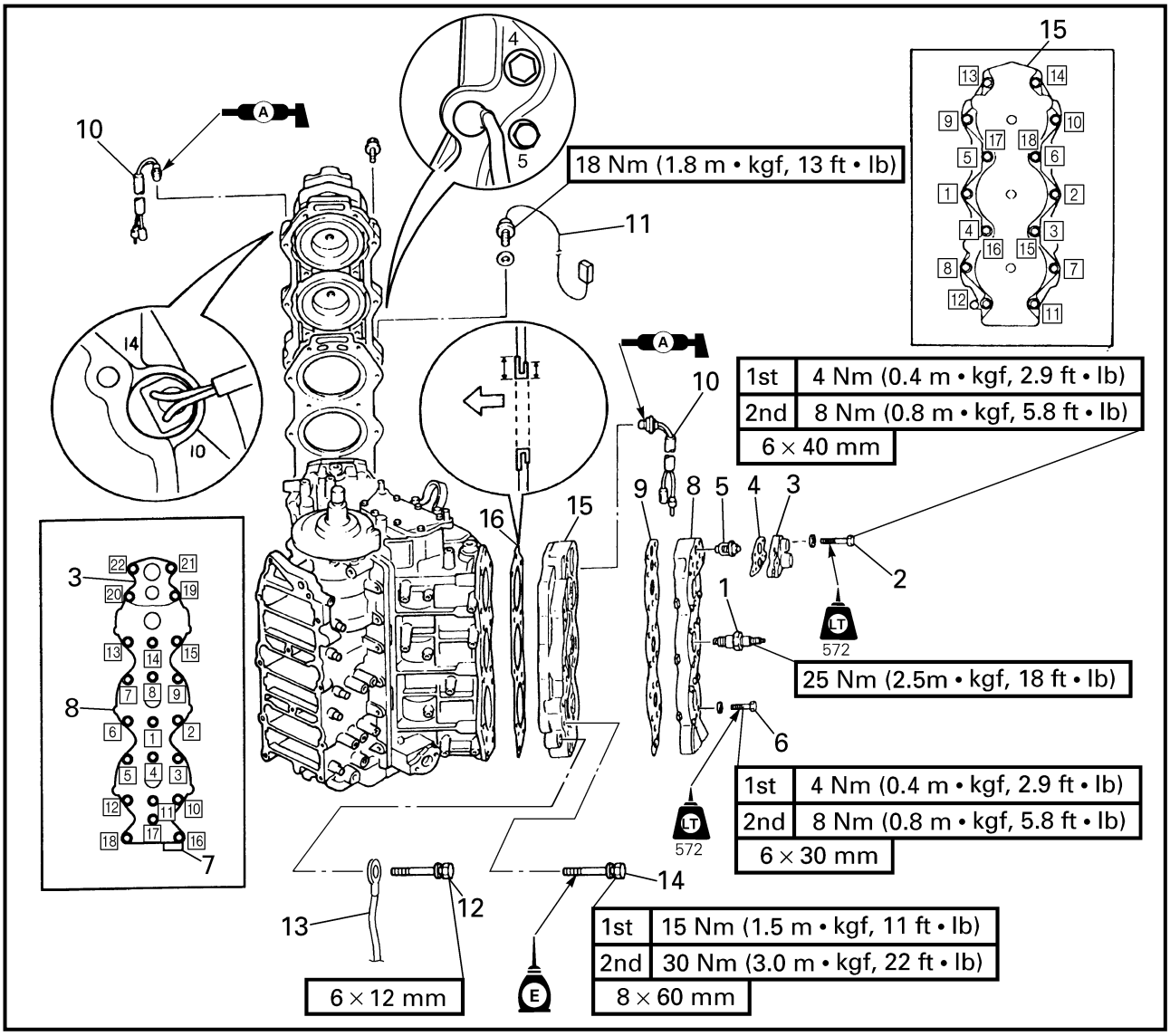


3. Measure:
   • Reed valve stopper height ⓐ
   Out of specification → Replace.

Reed valve stopper height
6.5 ± 0.3 mm (0.26 ± 0.01 in)

CYLINDER HEADS

REMOVING/INSTALLING THE CYLINDER HEADS



Order	Job/Part	Q'ty	Remarks
	Spark plug cap		Refer to "CDI UNIT" on page 5-10.
1	Spark plug	6	
2	Bolt	8	
3	Thermostat cover	2	
4	Gasket	2	**Not reusable**
5	Thermostat	2	
6	Bolt	36	
7	Clamp	1	(starboard side)
8	Cylinder head cover	2	

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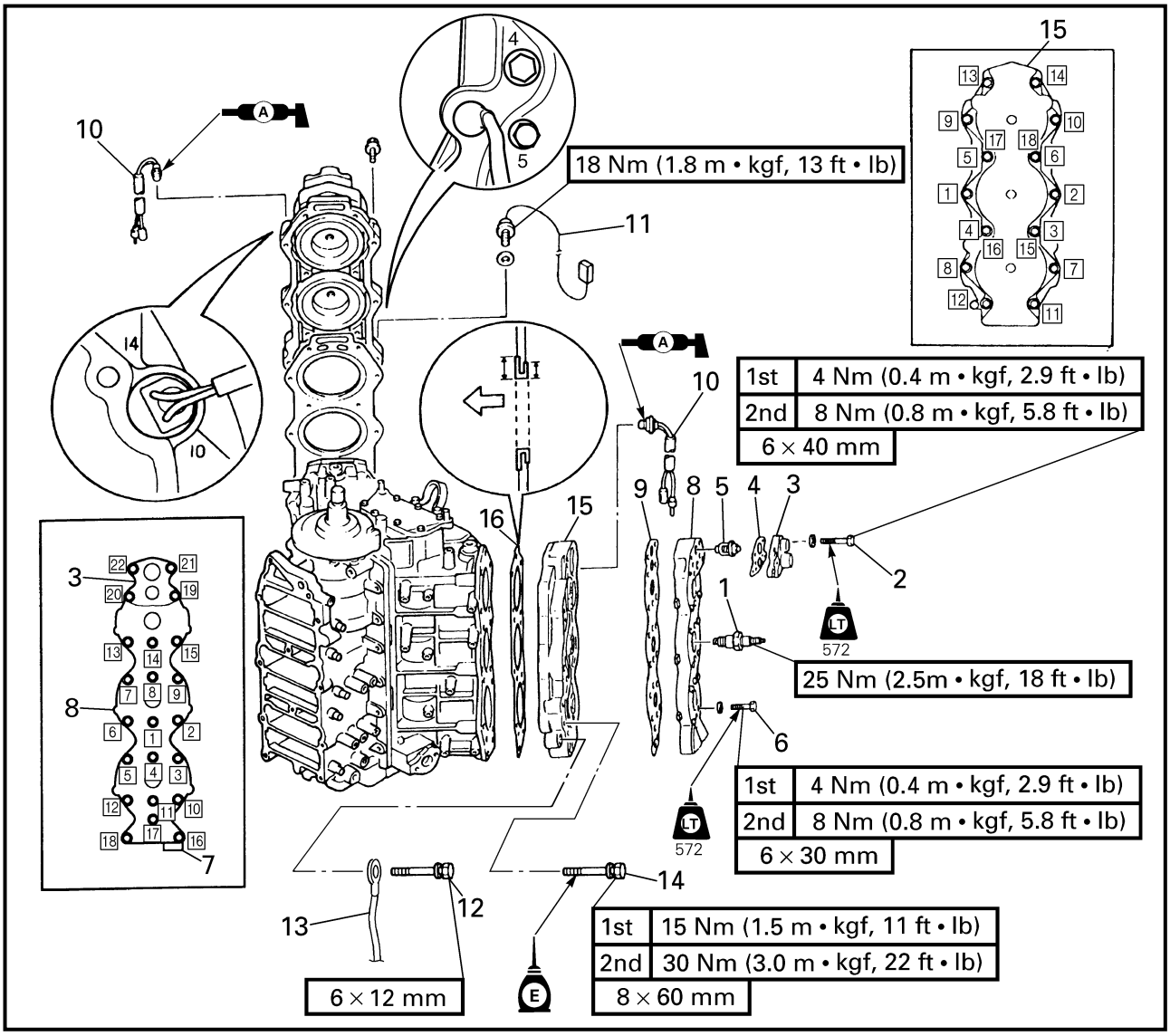
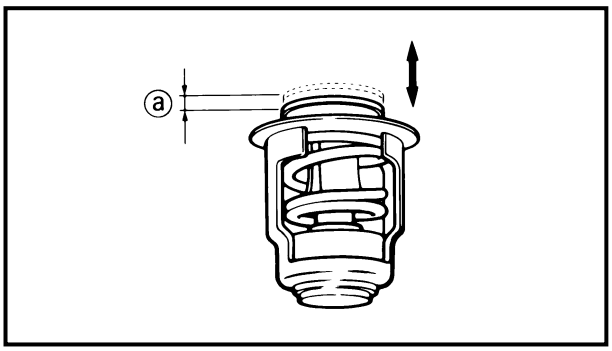


Order	Job/Part	Q'ty	Remarks
9	Gasket	2	**Not reusable**
10	Thermo switch	2	
11	Engine cooling water temperature sensor	1	
12	Bolt	2	
13	Ground lead	2	
14	Bolt	28	
15	Cylinder head	2	
16	Gasket	2	**Not reusable** For installation, reverse the removal procedure.



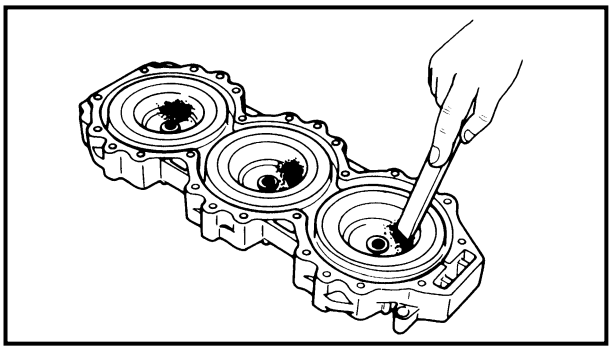
INSPECTING THE THERMOSTATS

1. Inspect:
   - Thermostat
     Damage/valve does not open → Replace.
2. Measure:
   - Thermostat opening temperature
   - Valve lift ⓐ
     Out of specification → Replace.

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

Measuring steps

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

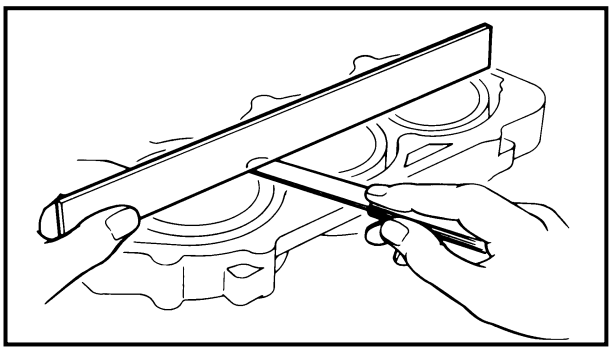


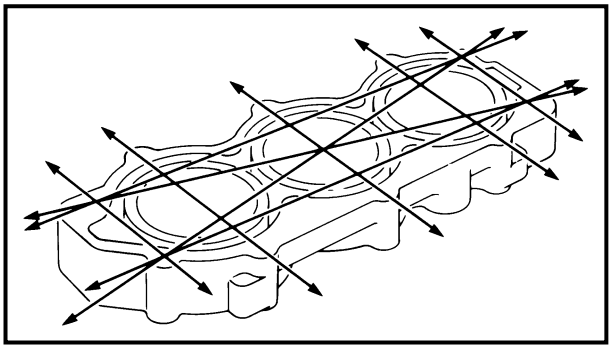
INSPECTING THE CYLINDER HEADS

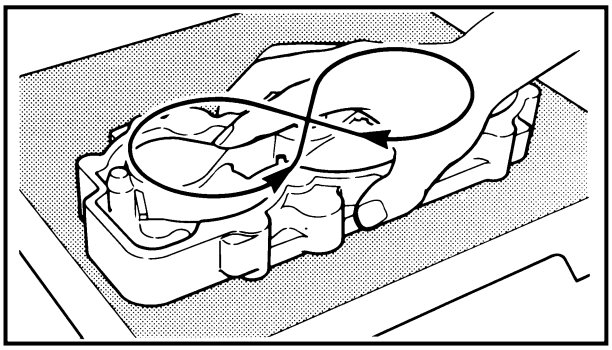
1. Inspect:
   - Combustion chamber
     Carbon deposits → Clean.
   - Water jacket
     Mineral deposits/rust→ Clean.

CAUTION:

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







2. Measure:
   • Cylinder head warpage
   (with a straightedge and thickness gauge)
   Out of specification → Resurface or replace.

	Warpage limit **0.1 mm (0.004 in)**

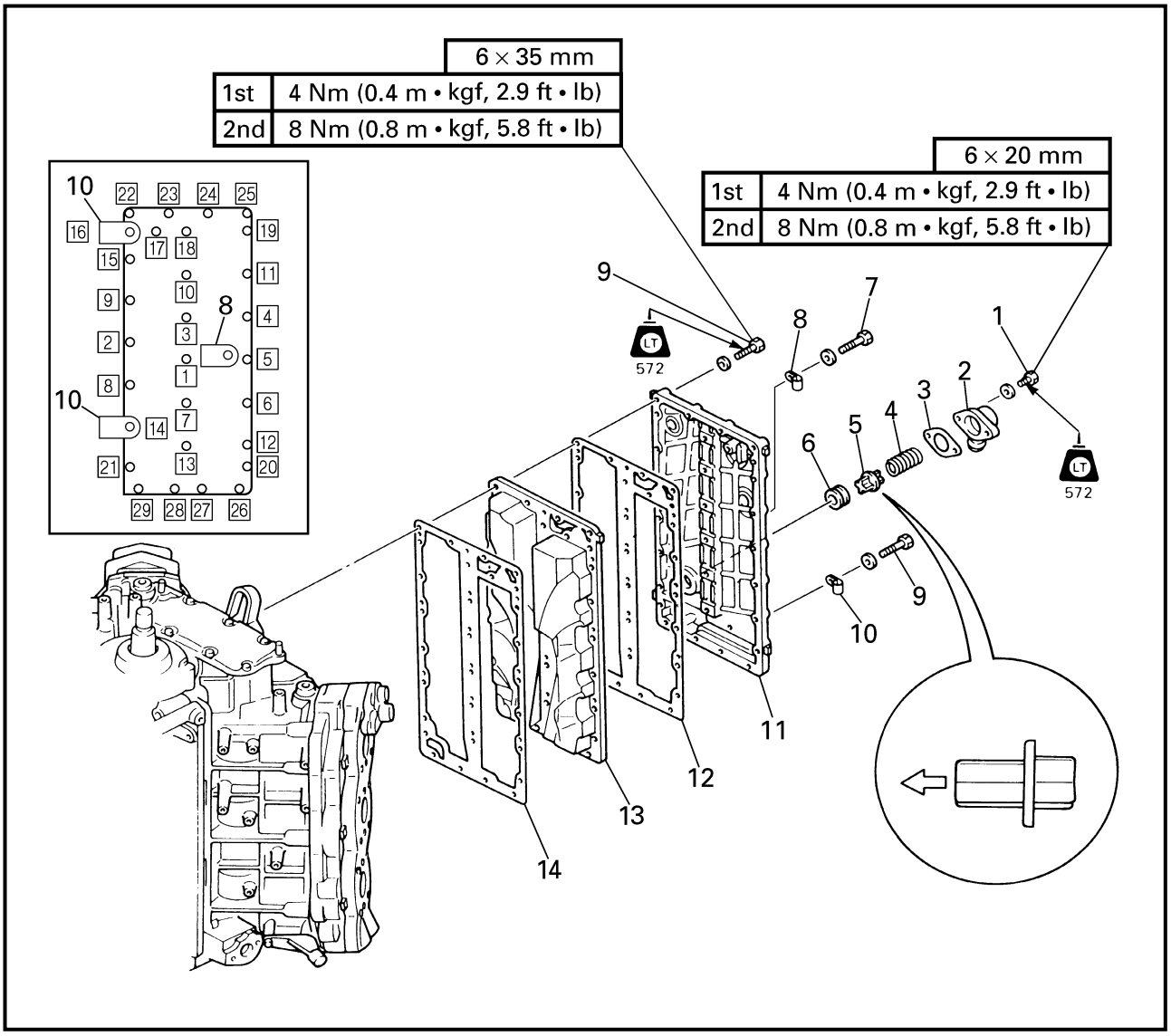
Resurfacing steps

(1) Place a 400 - 600 grit wet sandpaper on the surface plate.
(2) Resurface the cylinder head by moving it in a figure-eight motion along the sandpaper.

NOTE:

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

EXHAUST COVERS
REMOVING/INSTALLING THE EXHAUST COVERS



Order	Job/Part	Q'ty	Remarks
	Pilot water hose		Refer to "POWER UNIT" on page 5-4.
	Cooling water hose		Refer to "POWER UNIT" on page 5-4.
	CDI unit assembly		Refer to "CDI UNIT" on page 5-10.
1	Bolt	2	
2	Pressure control valve cover	1	
3	Gasket	1	**Not reusable**
4	Spring	1	
5	Pressure control valve	1	
6	Pressure control valve seat	1	

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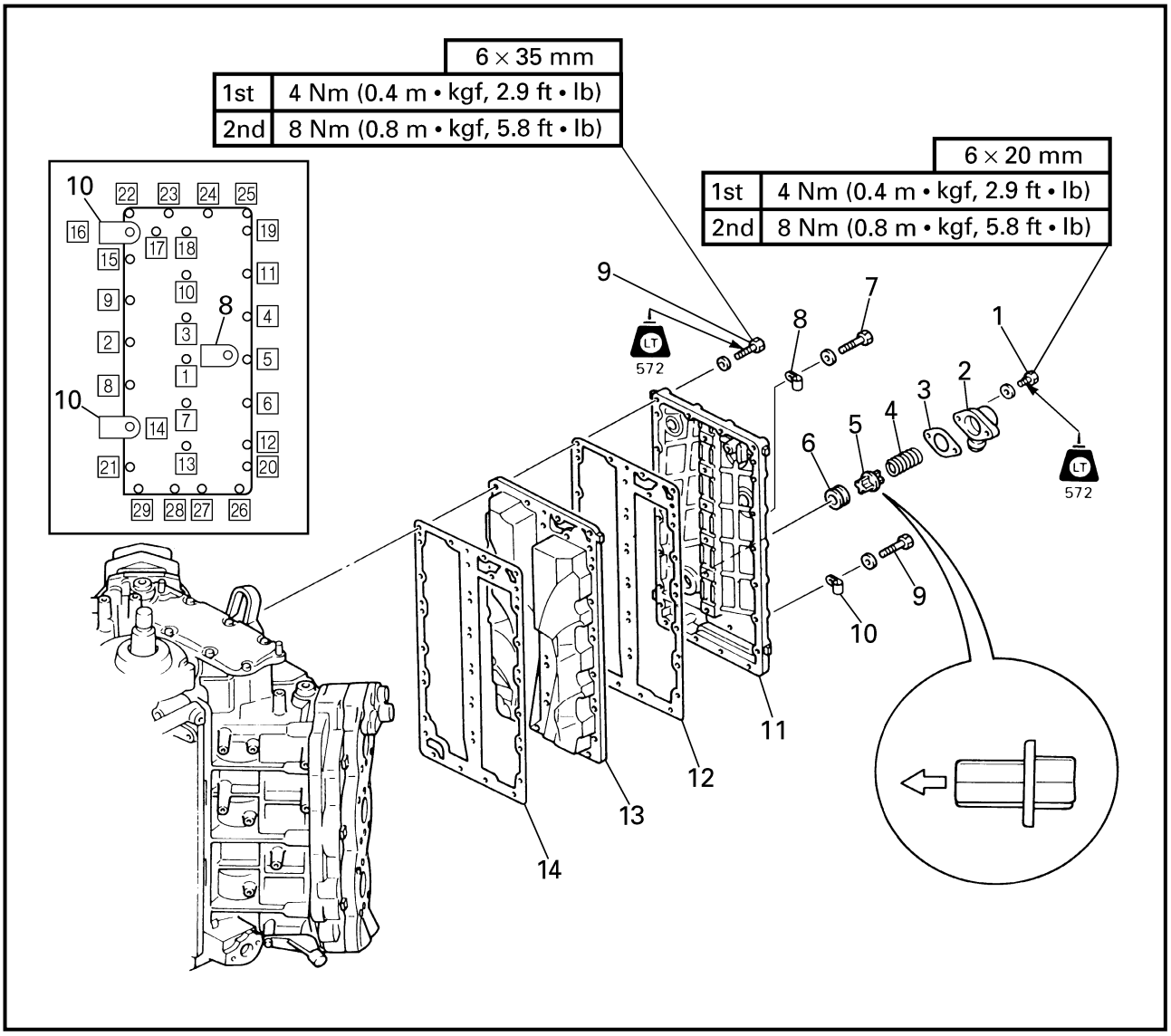
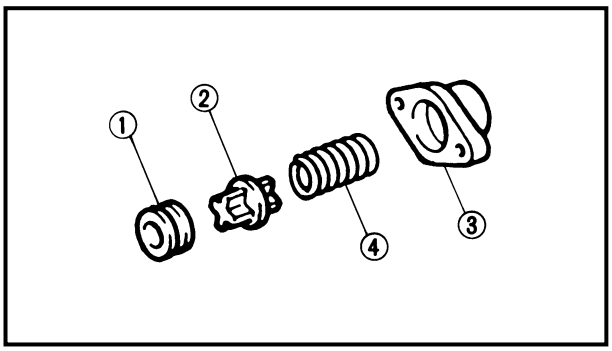


Order	Job/Part	Q'ty	Remarks
7	Bolt	1	
8	Lead holder	1	
9	Bolt	29	
10	Lead holder	2	
11	Exhaust outer cover	1	
12	Gasket	1	**Not reusable**
13	Exhaust inner cover	1	
14	Gasket	1	**Not reusable** For installation, reverse the removal procedure.

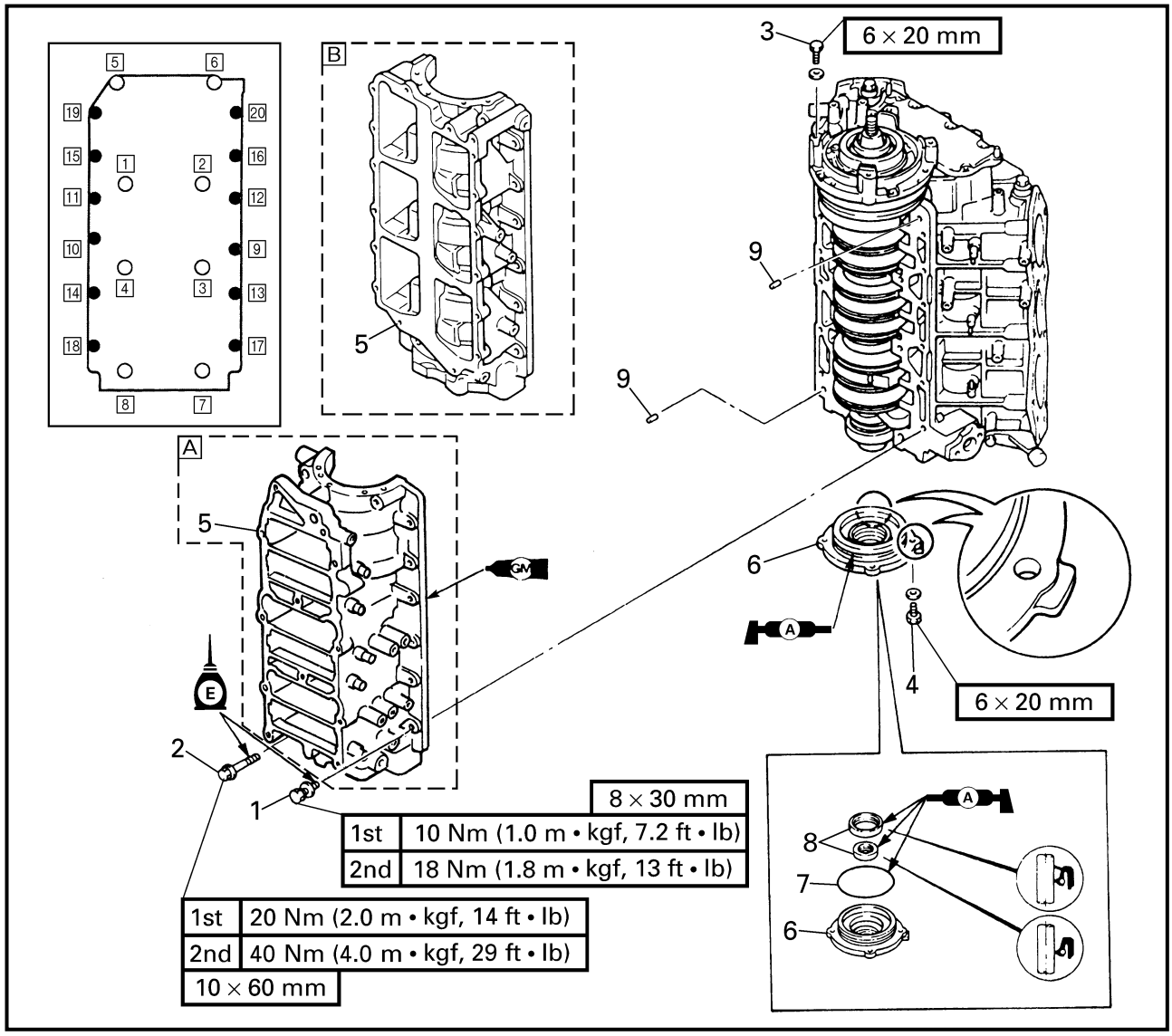


INSPECTING THE PRESSURE CONTROL VALVE

Inspect:

- Pressure control valve seat ①
- Pressure control valve ②
- Pressure control valve cover ③
  Cracks/damage → Replace any defective parts.
- Spring ④
  Damage/wear → Replace.

CRANKCASE
REMOVING/INSTALLING THE CRANKCASE



Order	Job/Part	Q'ty	Remarks
	Flywheel magnet assembly		Refer to "FLYWHEEL MAGNET ASSEMBLY" on page 5-1.
	Power unit		Refer to "POWER UNIT" on page 5-4.
	Pulser coil bushing		Refer to "STATOR ASSEMBLY" on page 5-8.
	Intake manifold		Refer to "INTAKE MANIFOLD" on page 5-21.
1	Bolt	12	
2	Bolt	8	
3	Bolt	3	

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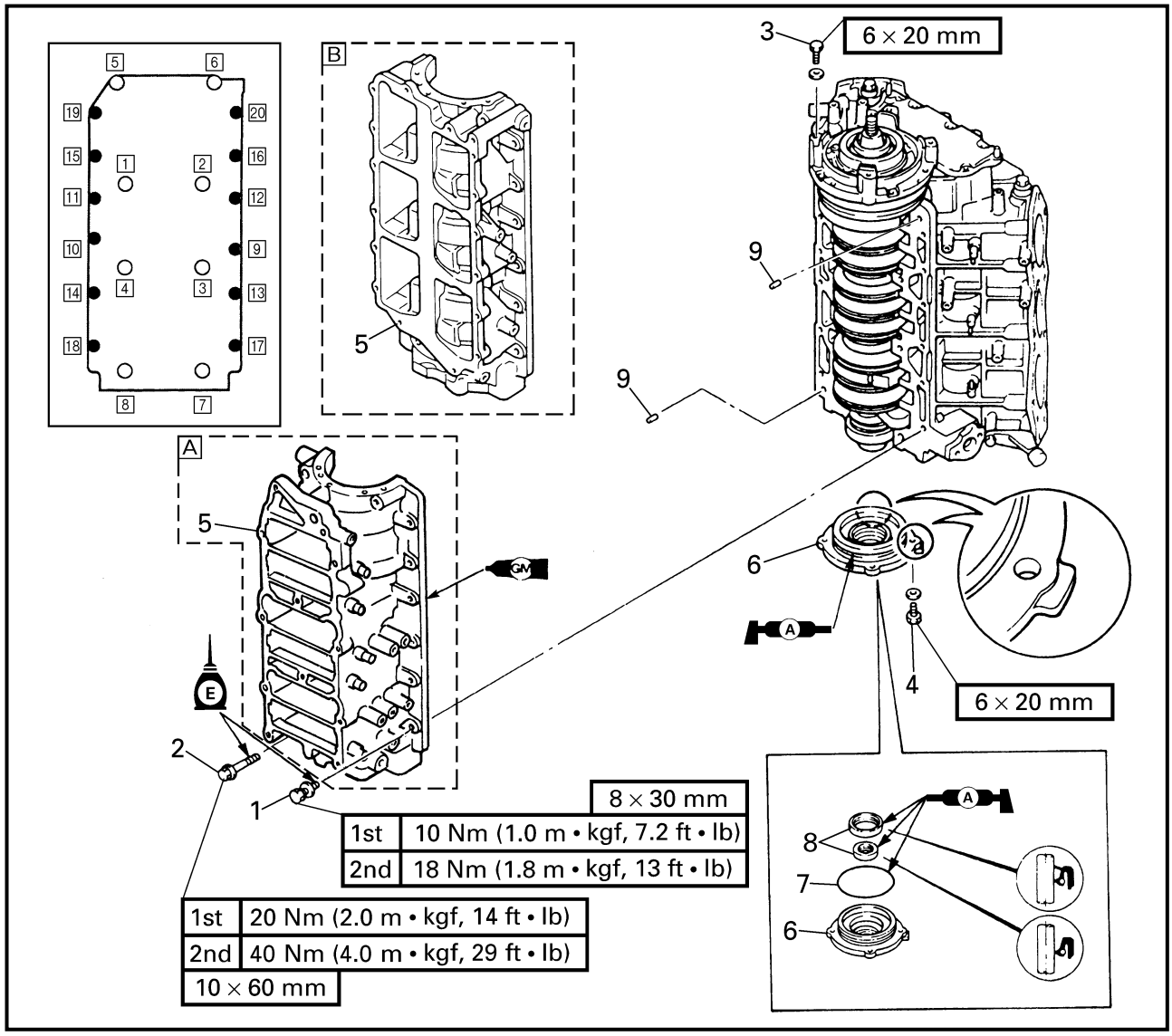
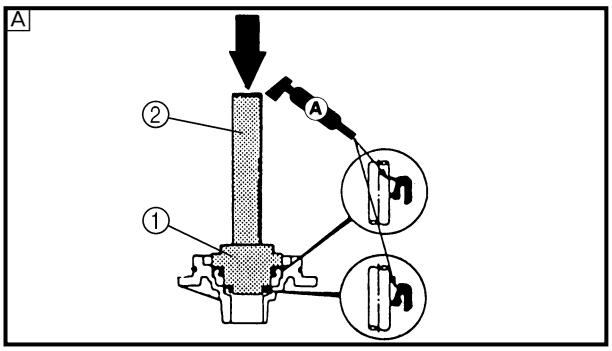


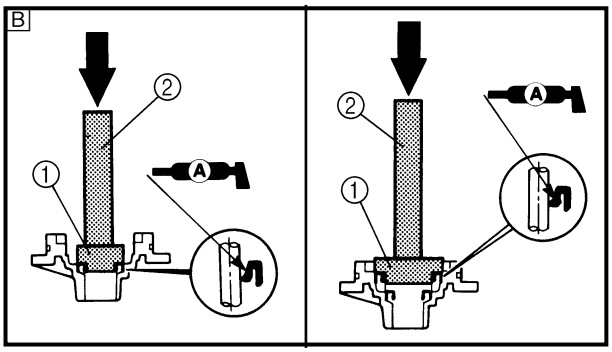
Order	Job/Part	Q'ty	Remarks
4	Bolt	4	
5	Crankcase	1	
6	Oil seal housing	1	
7	O-ring	1	
8	Oil seal	2	
9	Dowel pin	2	
			For installation, reverse the removal procedure.

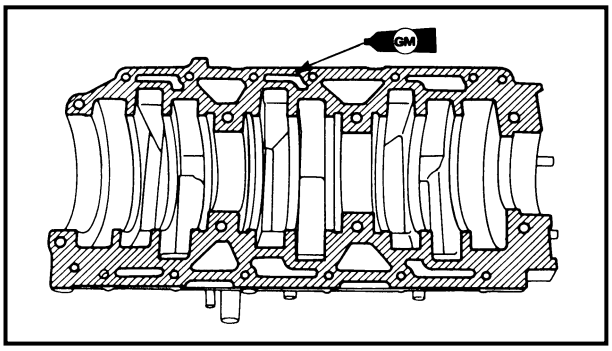
A For 150G, 175F, S200F, 200G, 225D/P150TR, P175TR, S200TR, P200TR models
B Except for 150G, 175F, S200F, 200G, 225D/P150TR, P175TR, S200TR, P200TR models

A



B





ASSEMBLING THE OIL SEAL HOUSING

Install:
- Oil seal

Bearing/oil seal attachment .... ①
YB-06195 / 90890-06637
90890-06631
Driver rod ..... ②
YB-06071 / 90890-06606

A For USA and Canada
B Except for USA and Canada

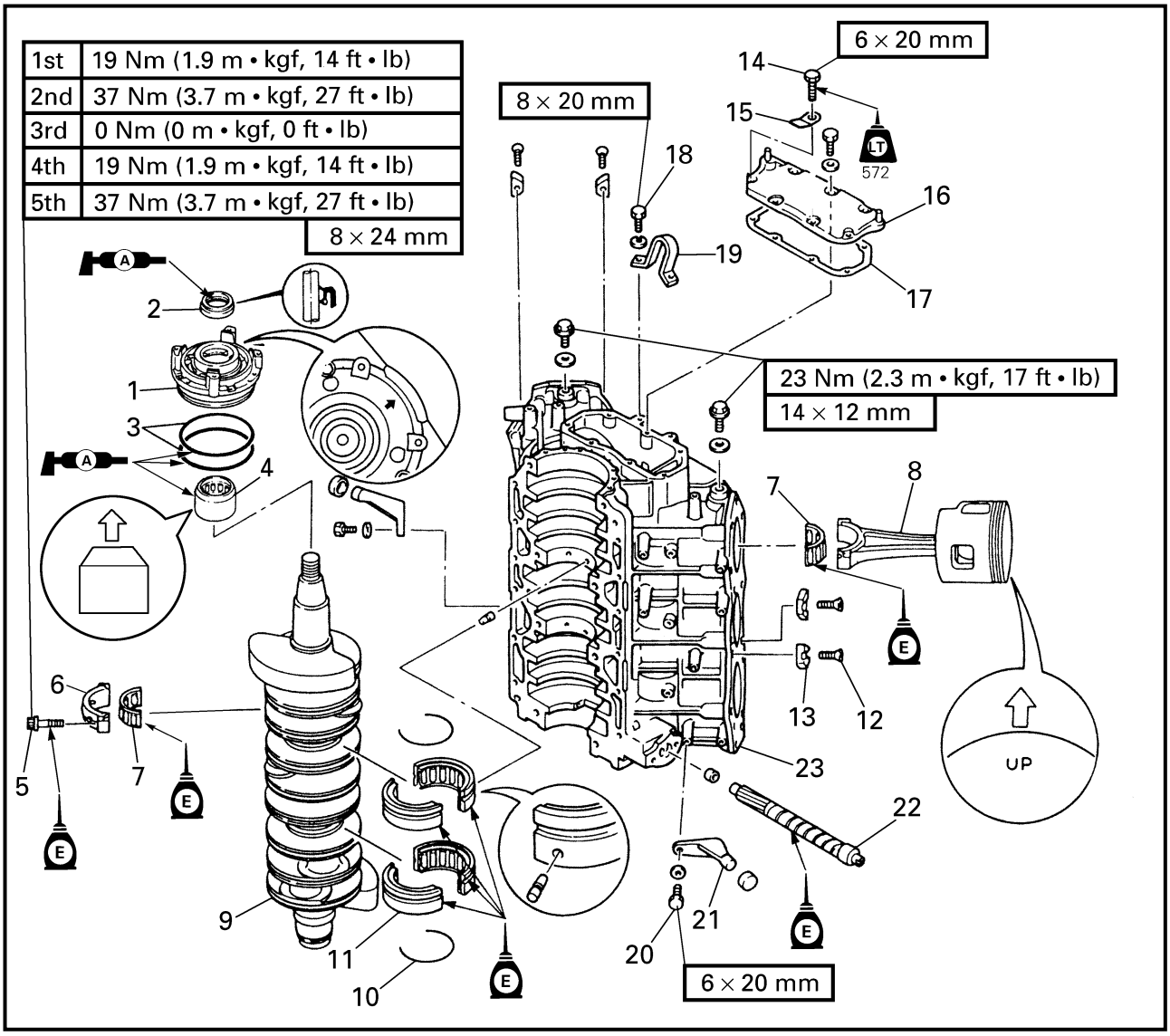
INSTALLING THE CRANKCASE

Apply:
- Gasket Maker®
  (onto the crankcase mating surfaces)

NOTE:
- Clean the mating surfaces of the crankcase and cylinder body before applying Gasket Maker®.
- Do not allow any sealant to overflow from the mating surfaces.

CYLINDER BODY ASSEMBLY

DISASSEMBLING/ASSEMBLING THE CYLINDER BODY ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Cylinder heads		Refer to "CYLINDER HEADS" on page 5-27.
	Crankcase		Refer to "CRANKCASE" on page 5-34.
1	Upper bearing housing	1	
2	Oil seal	1	
3	O-ring	2	
4	Needle bearing	1	
5	Connecting rod bolt	12	
6	Connecting rod cap	6	
7	Big-end bearing	6	

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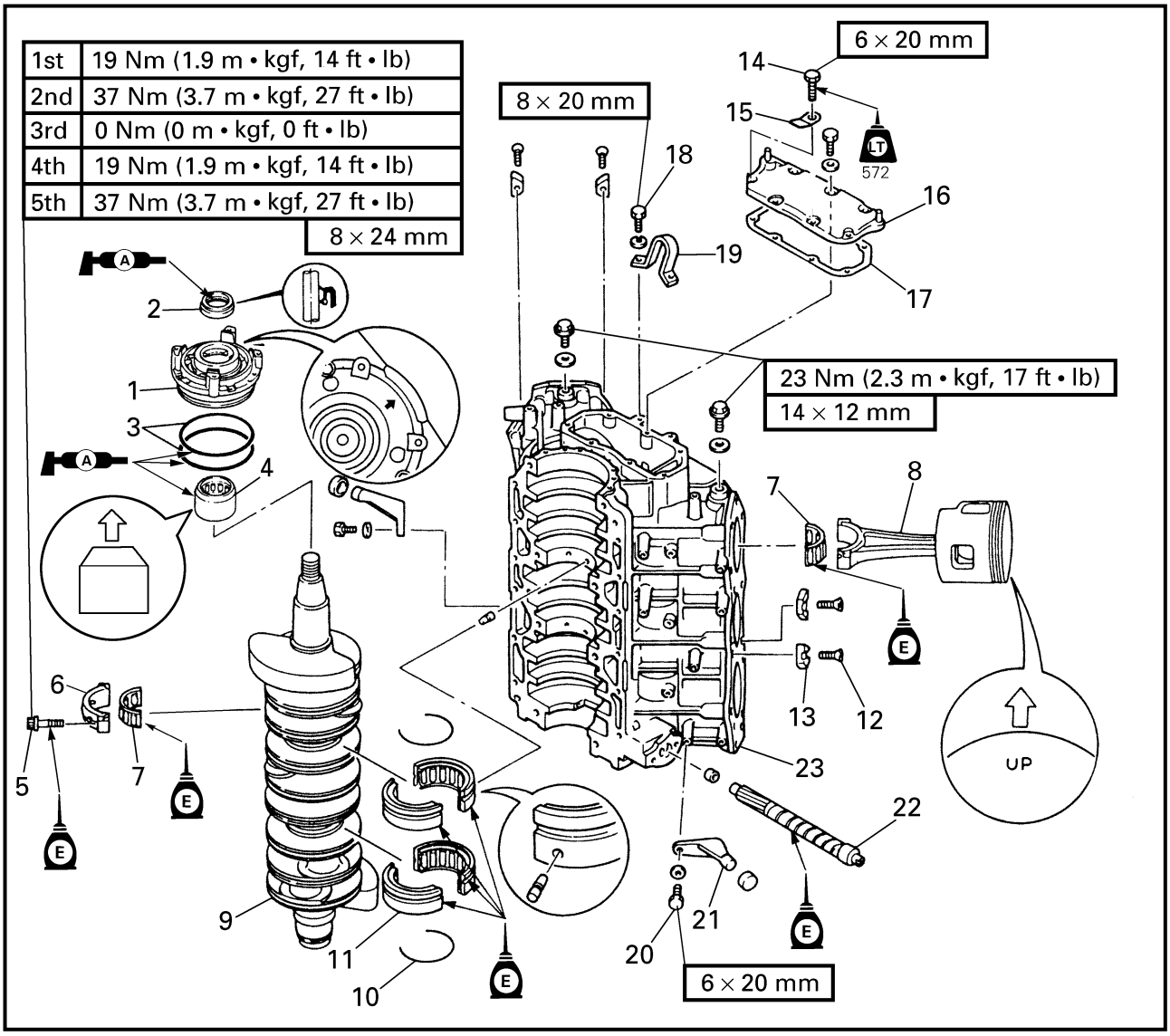
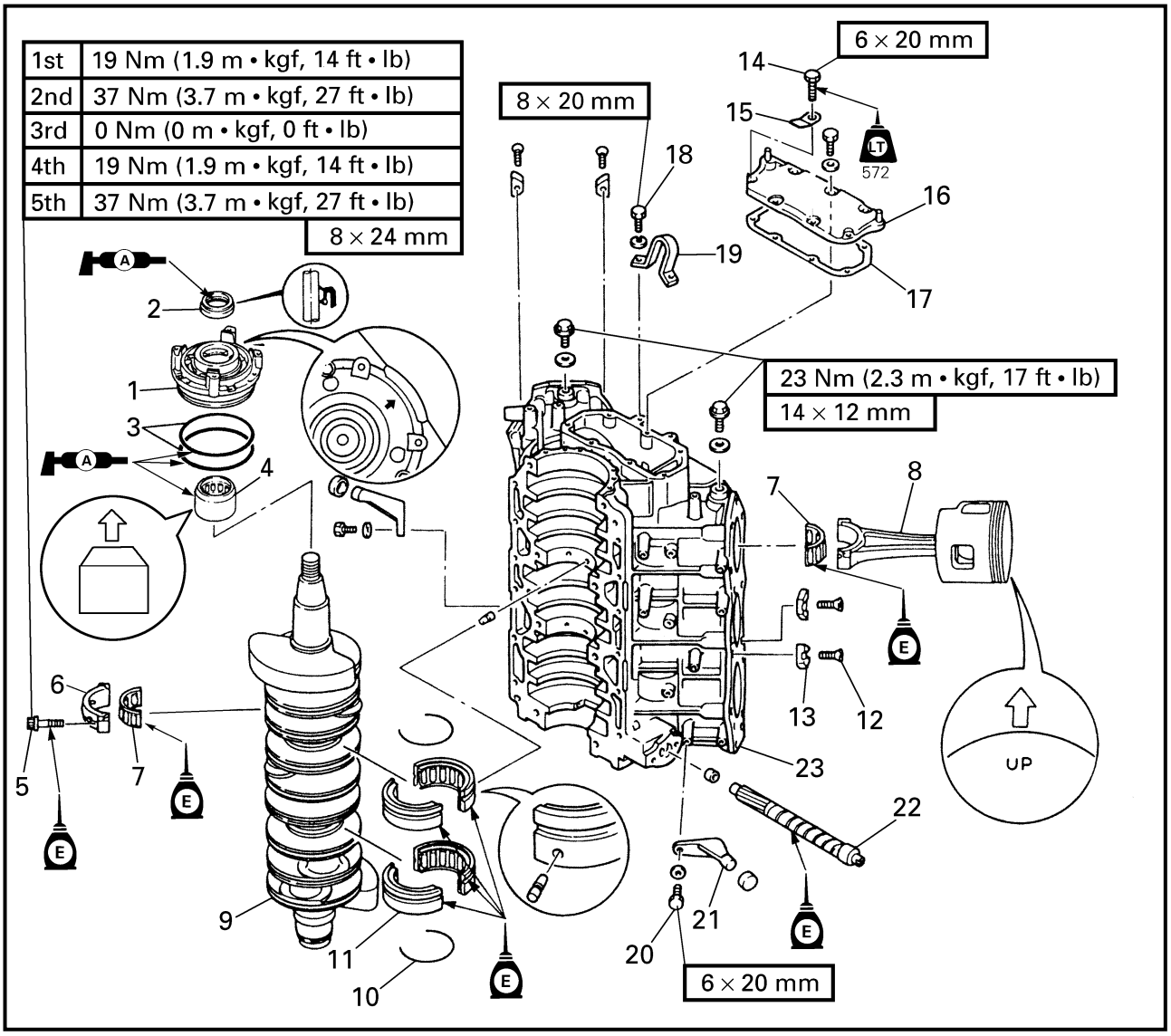


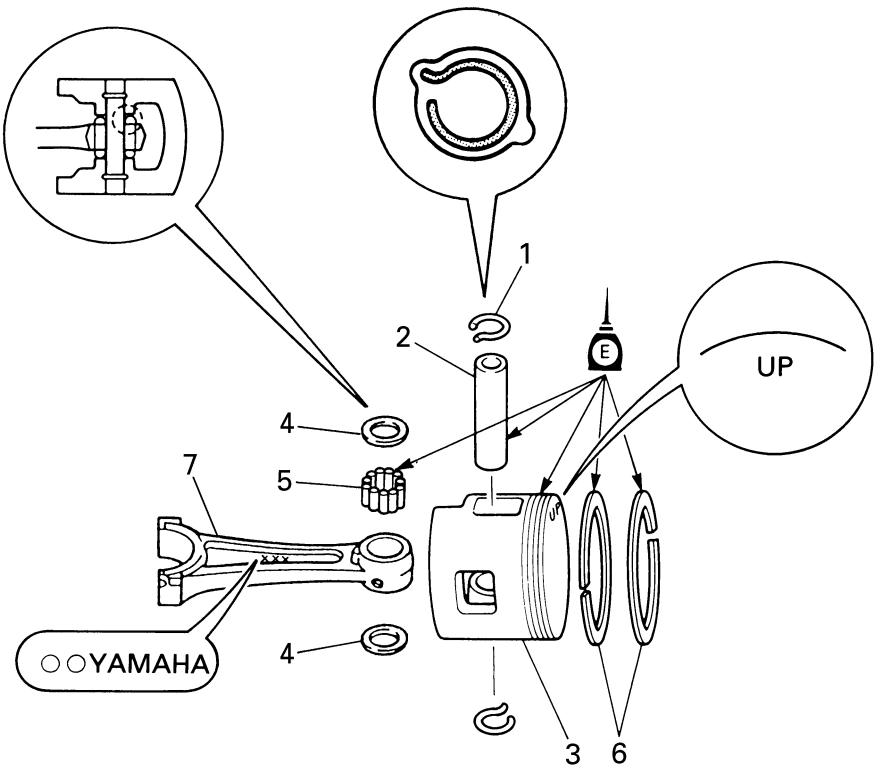
Order	Job/Part	Q'ty	Remarks
8	Piston/connecting rod assembly	6	
9	Crankshaft assembly	1	
10	Clip	2	
11	Main journal bearing	2	
12	Screw	8	
13	Anode	8	
14	Bolt	7	
15	Lead holder	1	
16	Cylinder cover	1	

Continued on next page.



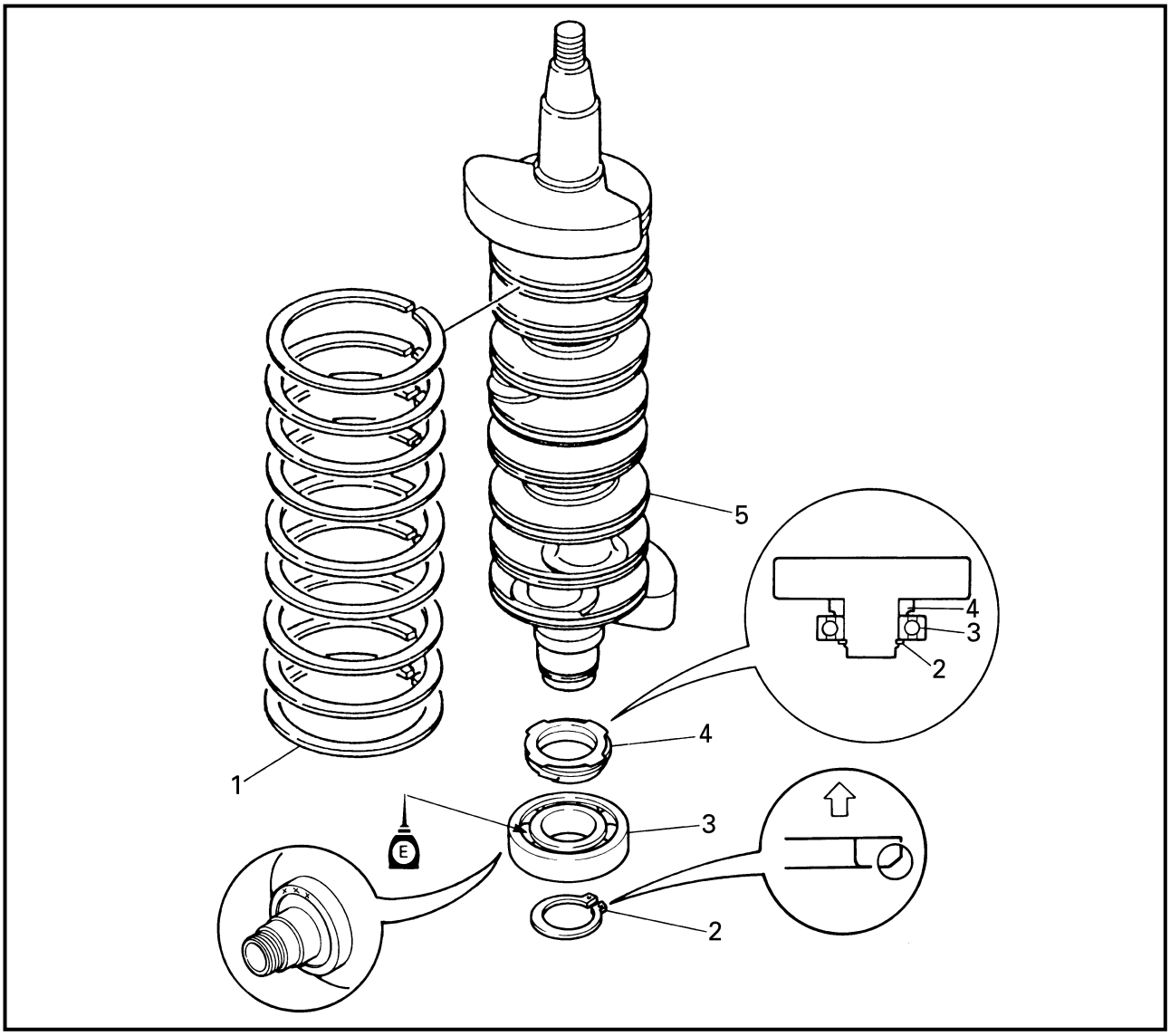
Order	Job/Part	Q'ty	Remarks
17	Gasket	1	**Not reusable**
18	Bolt	2	
19	Engine hanger	1	
20	Bolt	4	
21	Damper bracket	2	
22	Oil pump driven gear	1	Oil injection models
23	Cylinder body	1	
			For assembly, reverse the disassembly procedure.

DISASSEMBLING/ASSEMBLING THE PISTON AND CONNECTING ROD ASSEMBLIES



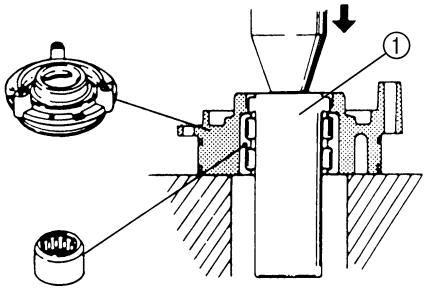
Order	Job/Part	Q'ty	Remarks
1	Piston pin clip	12	**Not reusable**
2	Piston pin	6	
3	Piston	6	
4	Washer	12	
5	Small-end bearing	6	
6	Piston ring	12	
7	Connecting rod	6	
			For assembly, reverse the disassembly procedure.

DISASSEMBLING/ASSEMBLING THE CRANKSHAFT ASSEMBLY

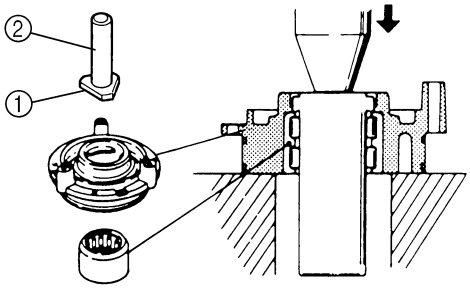


Order	Job/Part	Q'ty	Remarks
1	Labyrinth ring	9	
2	Circlip	1	
3	Ball bearing	1	
4	Oil pump drive gear	1	Oil injection models
5	Crankshaft	1	
			For assembly, reverse the disassembly procedure.

A



B



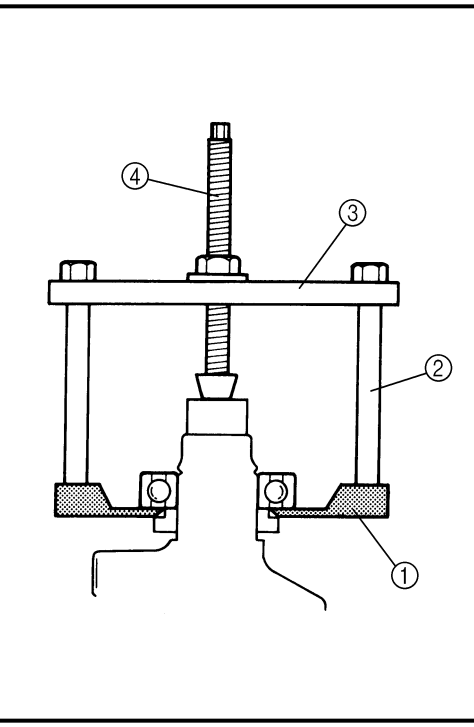
DISASSEMBLING THE UPPER BEARING HOUSING

Remove:

- Needle bearing

Needle bearing attachment..... ①
YB-06205 / 90890-06663
Driver rod ..... ②
90890-06606

A For USA and Canada
B Except for USA and Canada



REMOVING THE BEARING AND OIL PUMP DRIVE GEAR

Remove:

- Bearing
- Oil pump drive gear

Bearing separator ..... ①
YB-06219 / 90890-06534
Guide plate stand ..... ②
90890-06538
Guide plate..... ③
90890-06501
Bearing puller..... ④
90890-06535

INSPECTING THE CYLINDER BODY

1. Inspect:
   - Cylinder sleeves
     Cracks/score marks → Replace.
   - Cylinder body water jacket
     Mineral deposits/rust → Clean.

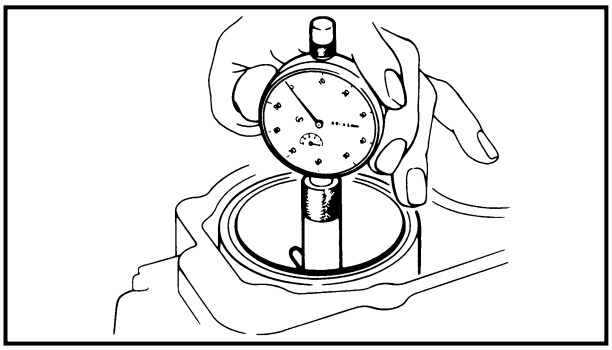
CAUTION:

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

2. Inspect:
   - Exhaust passages
     Cracks/damage → Replace.
     Carbon deposits → Clean.

CAUTION:

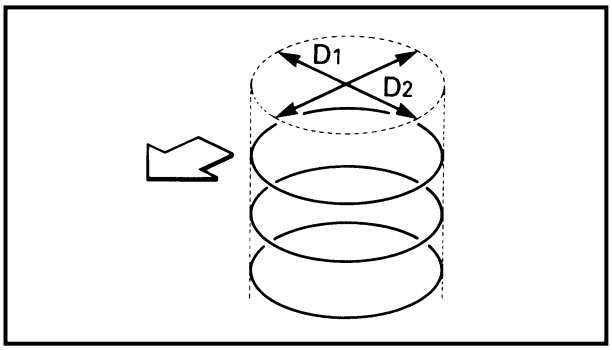
Do not scratch the contacting surfaces of the cylinder and exhaust inner cover.

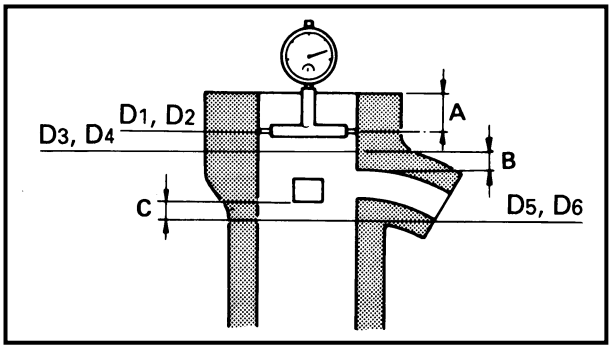


3. Measure:
   - Cylinder bore diameter "D"
     (with a cylinder bore gauge)
     Out of specification → Replace.

NOTE:

Measure the cylinder bore diameter at three positions for both D_1 and D_2. Then, average the measurements.

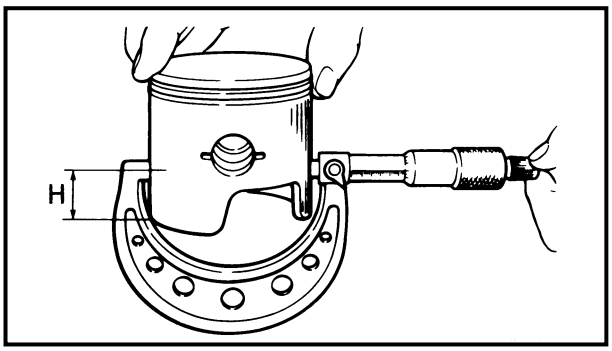




	Standard	Wear limit
Cylinder bore diameter "D"	90.00 - 90.02 mm (3.543 - 3.544 in)	90.1 mm (3.55 in)
Taper limit T	—	0.08 mm (0.003 in)
Out of round limit R	—	0.05 mm (0.002 in)

T = (maximum D_1 or D_2) – (minimum D_5 or D_6)
R = Maximum ($D_1 – D_2$) or ($D_3 – D_4$) or ($D_5 – D_6$)

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



INSPECTING THE PISTONS

Measure:

- Piston diameter
  (with a micrometer)
  Out of specification → Replace.

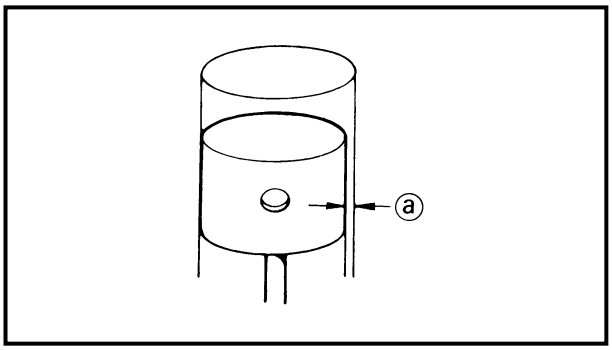
	Measuring point "H"	Piston diameter
Standard	10 mm (0.4 in)	89.895 - 89.915 mm (3.5392 - 3.5400 in)

Oversize piston diameter
1st oversize*
90.15 mm (3.549 in)
2nd oversize
90.40 mm (3.559 in)

*: Except for USA

NOTE:

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



CALCULATING THE PISTON-TO-CYLINDER CLEARANCE

Calculate:

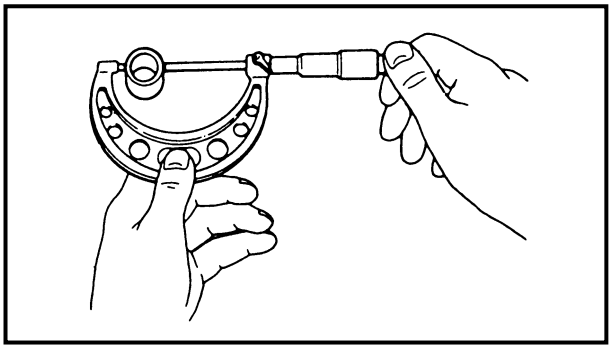
- Piston-to-cylinder clearance ⓐ
  Out of specification → Replace the piston and piston rings, the cylinder or both.

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

Piston-to-cylinder clearance
0.100 - 0.106 mm
(0.0039 - 0.0042 in)

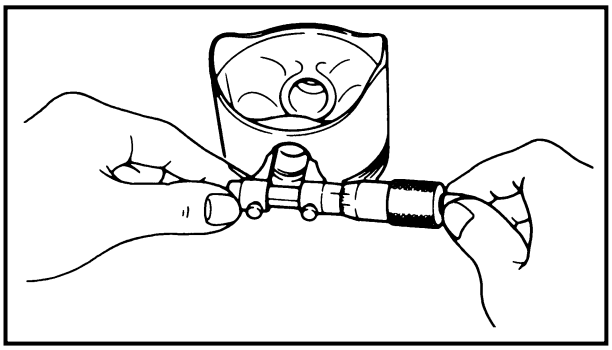
INSPECTING THE PISTON PINS AND SMALL-END BEARINGS

1. Inspect:
   - Piston pin
   - Small-end bearing
     Heat discoloration → Replace.
     Damage/scratches → Replace.



2. Measure:
   - Piston pin diameter
     (with a micrometer)
     Out of specification → Replace.

Piston pin diameter
23.065 - 23.070 mm
(0.9081 - 0.9083 in)

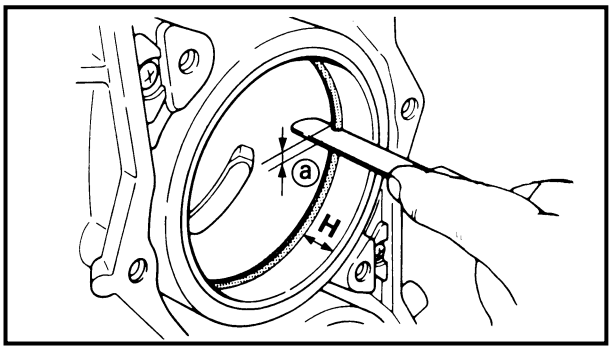


3. Measure:
   - Piston pin boss diameter
     (with a micrometer)
     Out of specification → Replace.

Piston pin boss diameter
23.074 - 23.085 mm
(0.9084 - 0.9089 in)

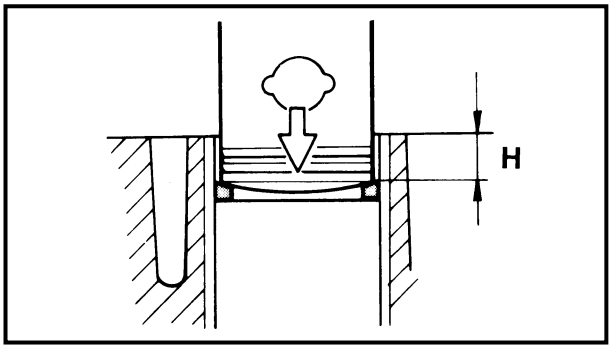
INSPECTING THE PISTON RINGS

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

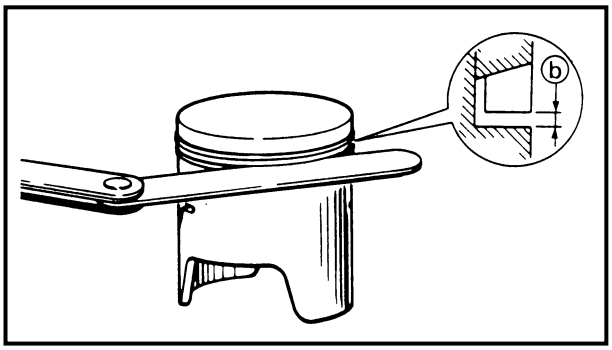


1. Measure:
   • Piston ring end gap ⓐ
   (with a thickness gauge)
   Out of specification → Replace.

Piston ring end gap
0.30 - 0.40 mm
(0.012 - 0.016 in)
Piston ring end gap limit
0.60 mm (0.024 in)
Measuring point "H"
20 mm (0.8 in)



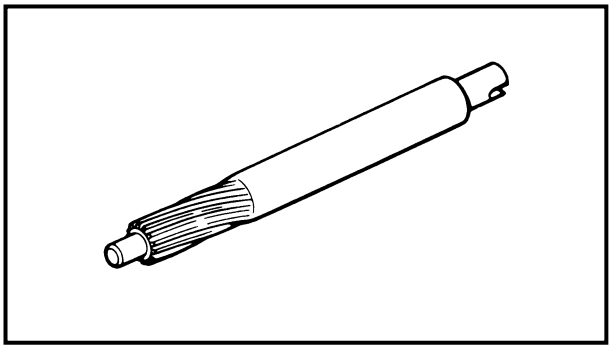
NOTE:
Push the piston ring into the cylinder with the piston crown.



2. Measure:
   • Piston ring side clearance ⓑ
   (with a thickness gauge)
   Out of specification → Replace the piston and piston rings as a set.

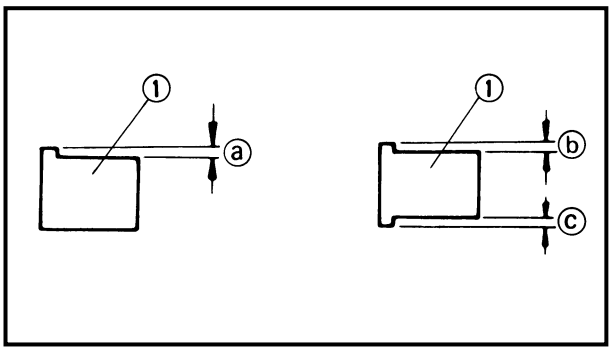
Piston ring side clearance
0.02 - 0.06 mm
(0.001 - 0.002 in)

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



INSPECTING THE OIL PUMP DRIVEN GEAR

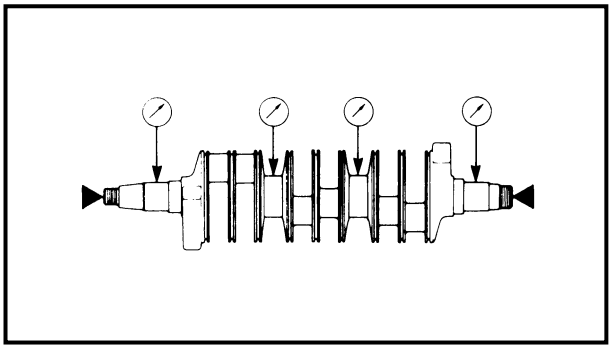
Inspect:
• Oil pump driven gear
Cracks/pitting/wear → Replace.



INSPECTING THE LABYRINTH RINGS

1. Inspect:
   • Labyrinth ring ①
   Cracks/damage/wear → Replace.
2. Measure:
   • Labyrinth ring wear ⓐ or ⓑ + ⓒ
   Out of specification → Replace.

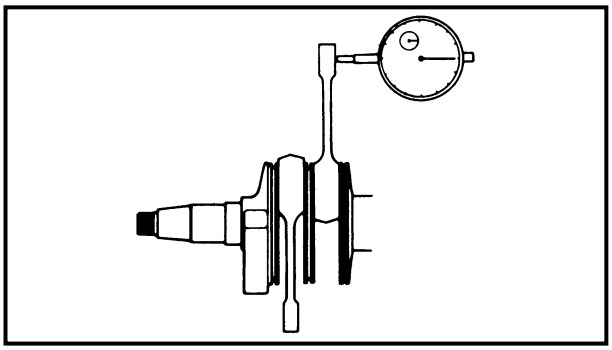
Labyrinth ring wear limit
0.10 mm (0.004 in)



INSPECTING THE CRANKSHAFT

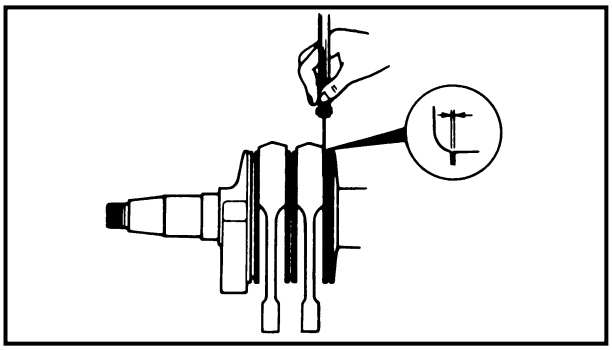
1. Measure:
   • Crankshaft runout
   (with V-blocks and a dial gauge)
   Out of specification → Replace.

Runout limit
0.05 mm (0.002 in)



2. Measure:
   • Small-end axial play
   Out of specification → Replace the connecting rod.

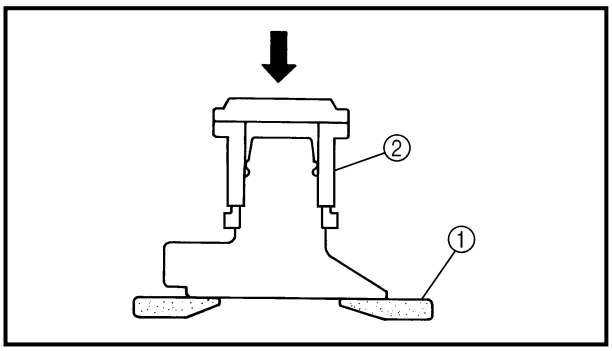
Small-end axial play limit
2.0 mm (0.08 in)



3. Measure:
   • Big-end side clearance
   Out of specification → Replace the connecting rod.

Big-end side clearance
0.12 - 0.26 mm (0.005 - 0.010 in)

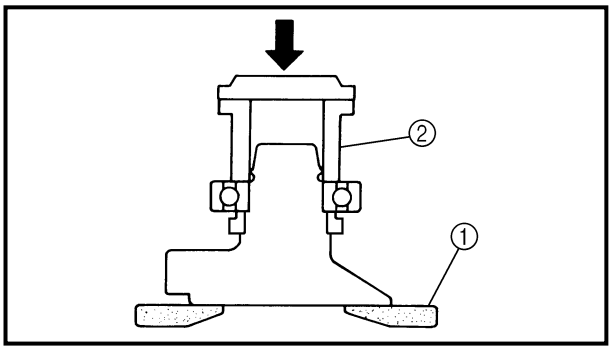
4. Inspect:
   • Crankshaft bearing
   Pitting/rumbling → Replace.
5. Inspect:
   • Oil pump drive gear
   Cracks/pitting/wear → Replace.



INSTALLING THE OIL PUMP DRIVE GEAR

Install:
- Oil pump drive gear

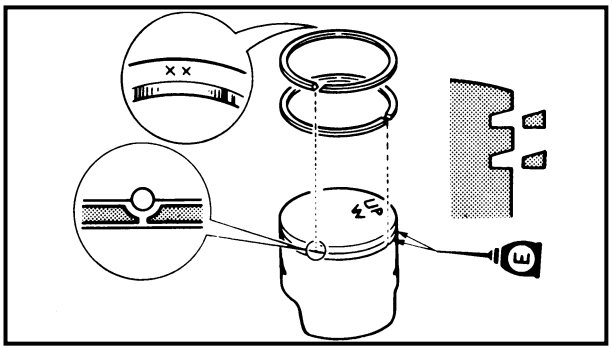
Bearing separator ..... ①
YB-06219 / 90890-06534
Bearing/oil seal attachment .... ②
90890-06661
90890-06622



INSTALLING THE BEARING

Install:
- Bearing

Bearing separator ..... ①
YB-06219 / 90890-06534
Bearing/oil seal attachment .... ②
90890-06662
90890-06622

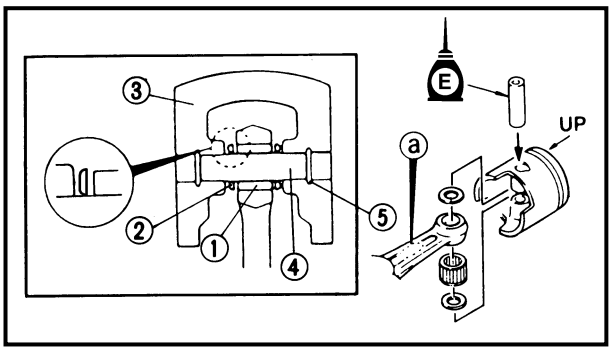


INSTALLING THE PISTON RINGS AND PISTON

1. Install:
   - 2nd piston ring
   - Top piston ring

CAUTION:

- **Align each piston ring end gap with its respective locating pin.**
- **After installing the piston rings, check that they move smoothly.**



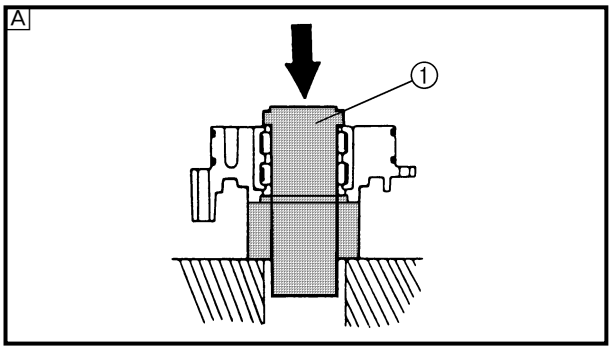
2. Install:
   - Small-end bearing ①
   - Washers ②
   - Piston ③
   - Piston pin ④
   - Piston pin clips ⑤

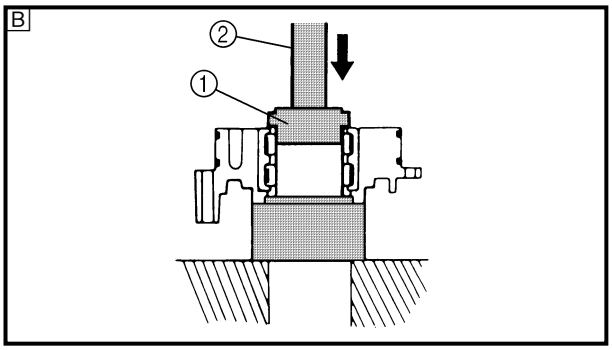
CAUTION:

The washers must be installed with their convex sides facing towards the piston.

NOTE:

The embossed YAMAHA mark ⓐ on the connecting rod must face the same direction as the "UP" mark on the piston.



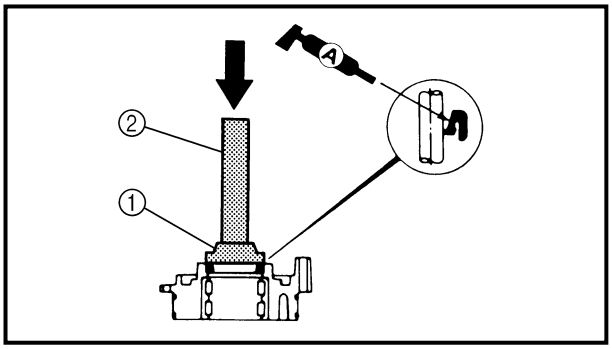


ASSEMBLING THE UPPER BEARING HOUSING

1. Install:
   - Needle bearing

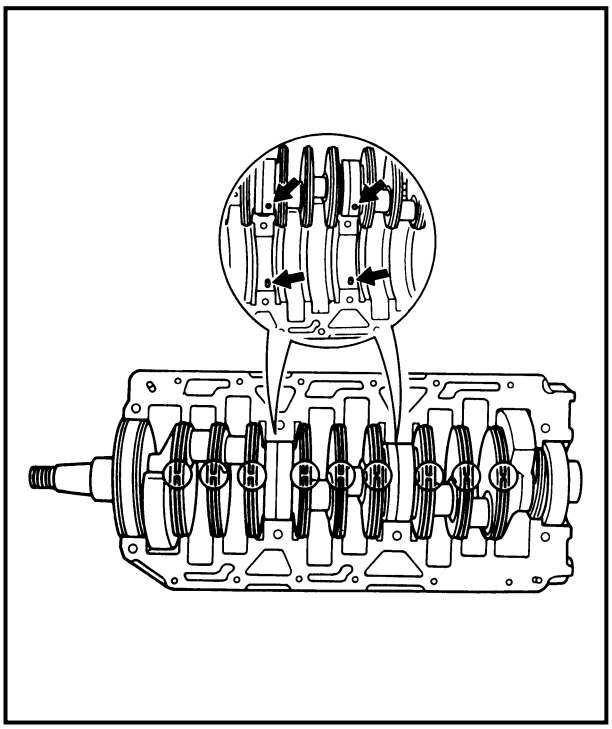
Needle bearing attachment ..... ①	**YB-06205 / 90890-06663**
Driver rod ..... ②	**90890-06606**

A For USA and Canada
B Except for USA and Canada



2. Install:
   - Oil seal

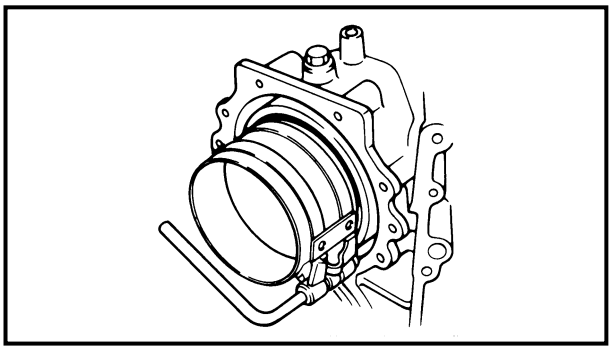
Bearing/oil seal attachment .... ①	**YB-06195 / 90890-06624**
Driver rod ..... ②	**YB-06071 / 90890-06606**

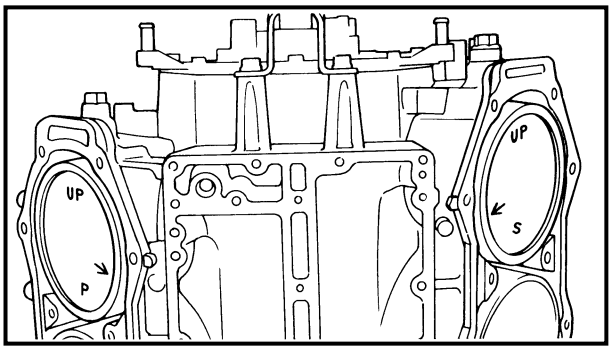


INSTALLING THE CRANKSHAFT ASSEMBLY

Install:
- Cylinder body
- Crankshaft assembly

NOTE:
- Align the crankshaft labyrinth ring end gaps with their respective locating pins.
- Install the bearing locating pins into the cylinder body.





INSTALLING THE PISTON AND CONNECTING ROD ASSEMBLIES

Install:
- Piston and connecting rod assembly

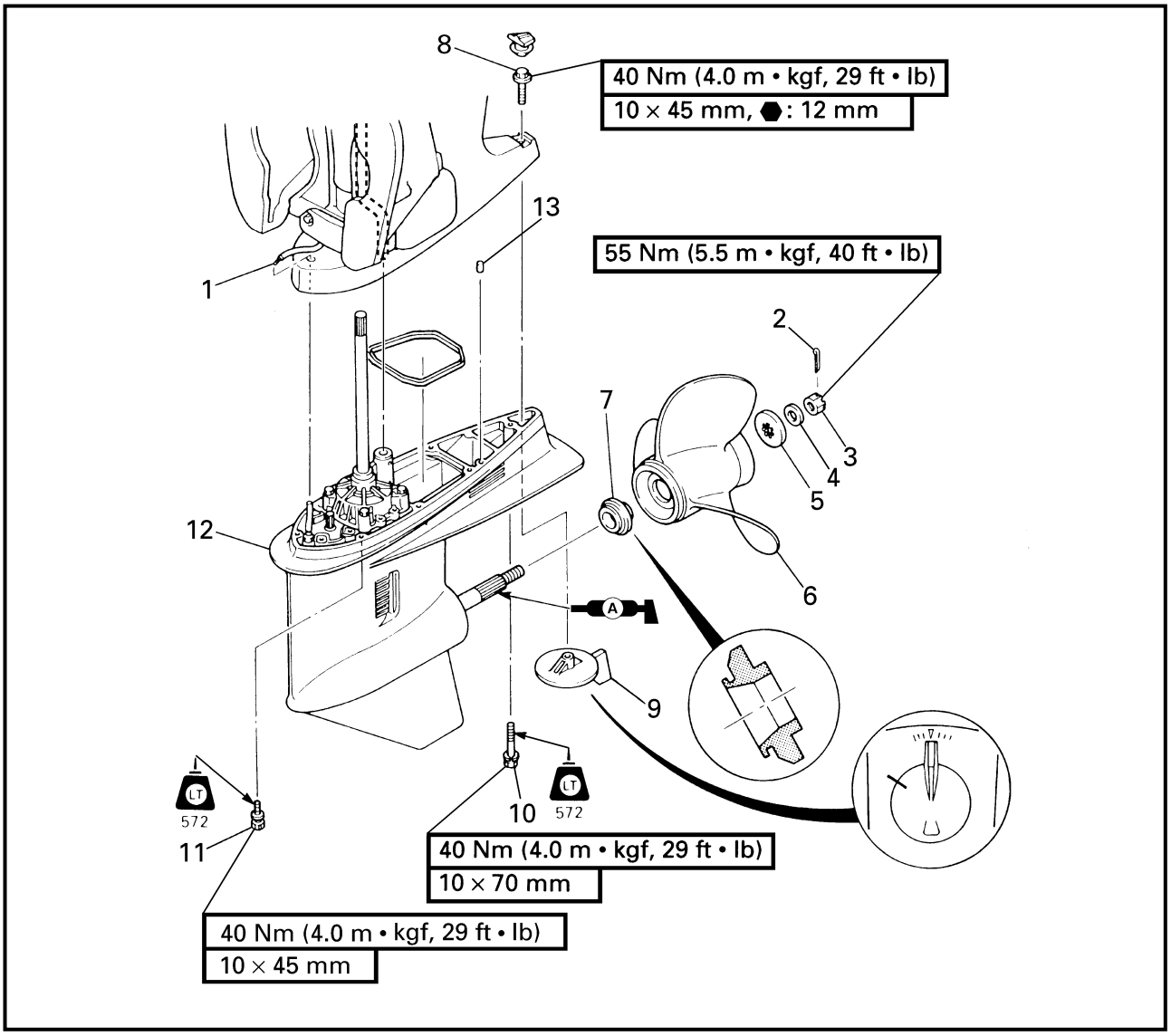
	**Piston ring compressor YU-33294 / 90890-06530**

NOTE:
- Before installing the piston and connecting rod assemblies, lubricate the cylinder walls with 2-stroke outboard engine oil.
- Reinstall the piston and connecting rod assemblies in their original cylinders.
- Install the piston and connecting rod assemblies with the "S" mark in the starboard side cylinders, and those with the "P" mark in the port side cylinders.
- The "UP" mark on the piston crown must face towards the flywheel.

CHAPTER 6
LOWER UNIT

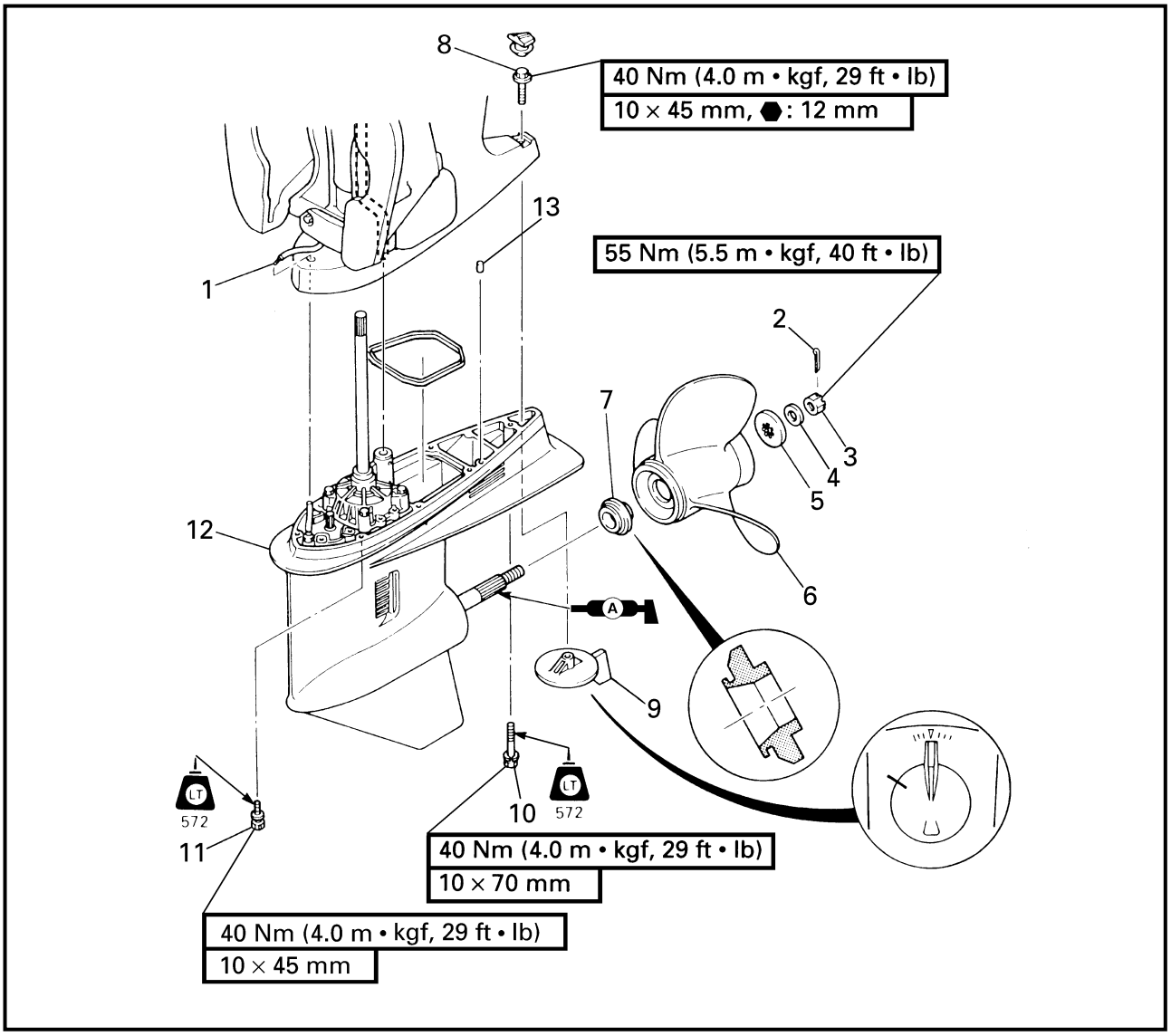
LOWER UNIT (REGULAR ROTATION MODELS)

REMOVING/INSTALLING THE LOWER UNIT

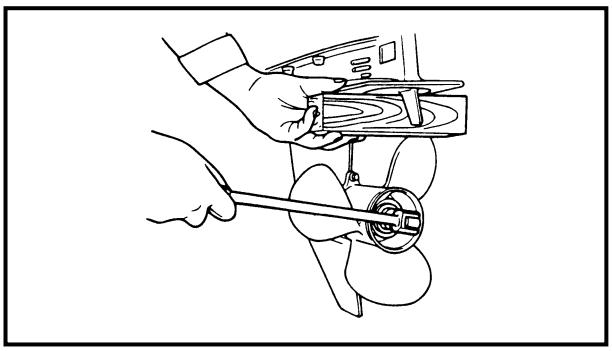


Order	Job/Part	Q'ty	Remarks
1	Speedometer hose	1	
2	Cotter pin	1	
3	Propeller nut	1	
4	Washer	1	
5	Washer	1	
6	Propeller	1	
7	Spacer	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Bolt	1	
9	Trim tab	1	
10	Bolt	1	(with washer)
11	Bolt	6	(with washer)
12	Lower unit	1	
13	Dowel pin	2	
			For installation, reverse the removal procedure.



REMOVING THE PROPELLER

Remove:
- Propeller

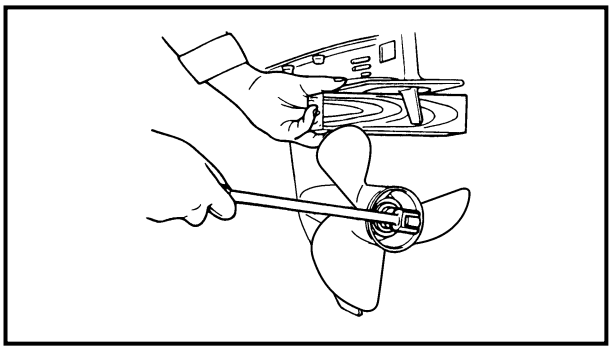
⚠ WARNING

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

INSPECTING THE PROPELLER

Inspect:
- Blades
- Splines

  Cracks/damage/wear → Replace.



INSTALLING THE PROPELLER

Install:
- Propeller

⚠ WARNING

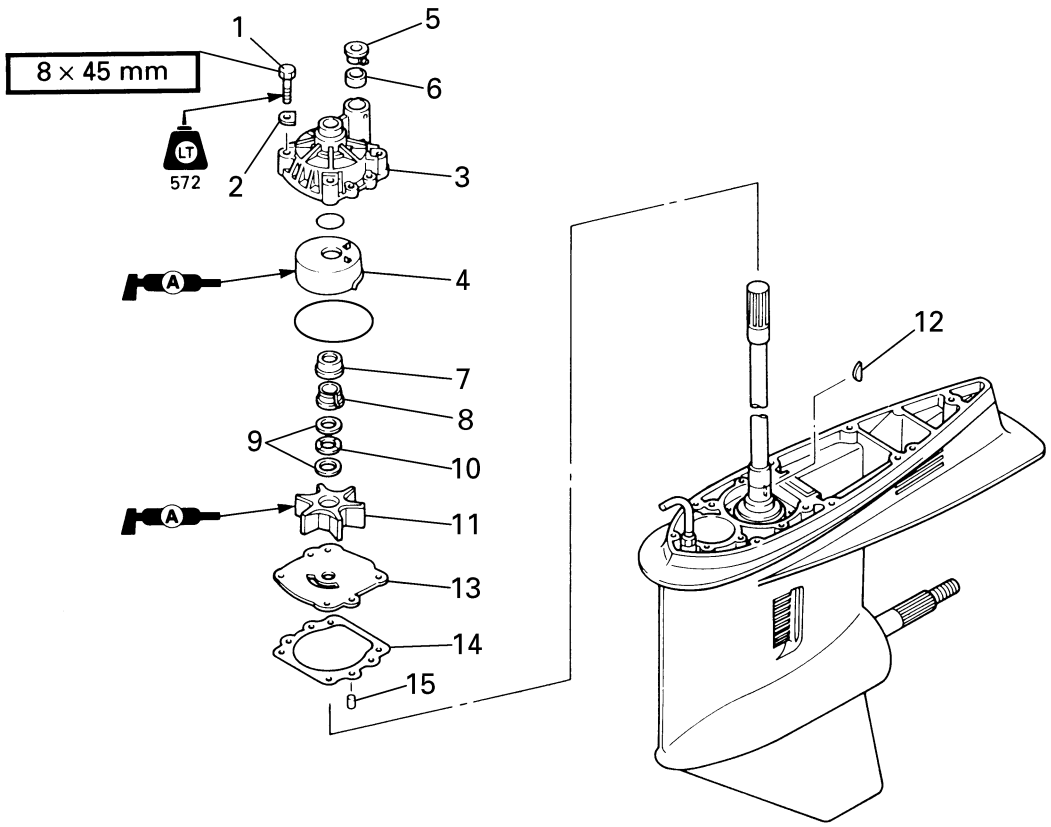
Do not hold the propeller with your hands when removing or installing it. Be sure to remove the battery leads from the batteries and the lanyard engine stop switch. Put a block of wood between the cavitation plate and propeller to keep the propeller from turning.

NOTE:

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

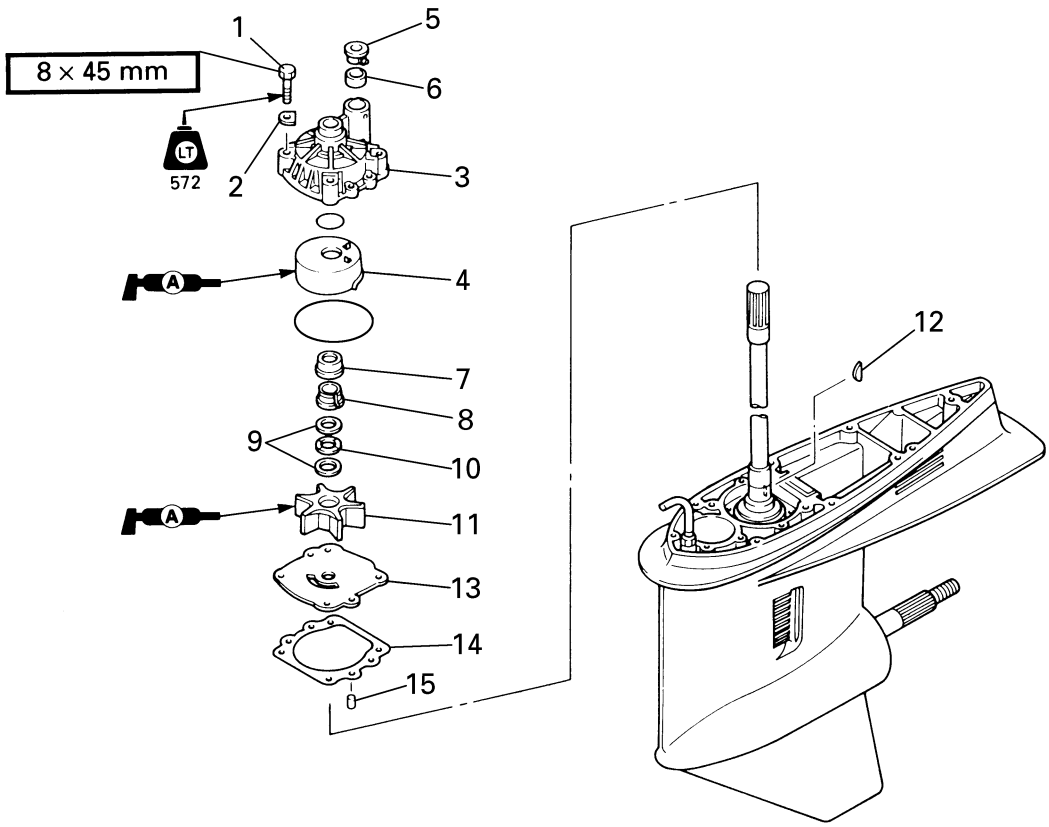
WATER PUMP (REGULAR ROTATION MODELS)

REMOVING/INSTALLING THE WATER PUMP



Order	Job/Part	Q'ty	Remarks
	Lower unit		Refer to "LOWER UNIT (REGULAR ROTATION MODELS)" on page 6-1.
1	Bolt	4	
2	Plate washer	4	
3	Impeller housing	1	
4	Impeller housing cup	1	
5	Grommet	1	
6	Spacer	1	
7	Collar	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Spacer	1	
9	Washer	2	
10	Wave washer	1	
11	Impeller	1	
12	Woodruff key	1	
13	Impeller plate	1	
14	Gasket	1	**Not reusable**
15	Dowel pin	2	
			For installation, reverse the removal procedure.

INSPECTING THE IMPELLER HOUSING

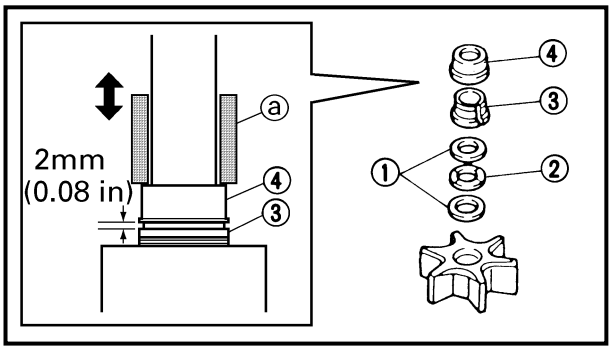
Inspect:
- Impeller housing
  Cracks/damage → Replace.

INSPECTING THE IMPELLER AND IMPELLER HOUSING CUP

Inspect:
- Impeller
- Impeller housing cup
  Cracks/damage → Replace any defective parts.

INSPECTING THE WOODRUFF KEY

Inspect:
- Woodruff key
  Damage/wear → Replace.

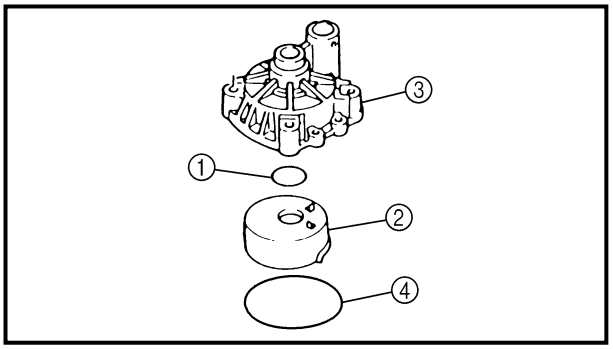


INSTALLING THE IMPELLER AND IMPELLER HOUSING

1. Install:
   - Washers ①
   - Wave washer ②
   - Spacer ③
   - Collar ④

NOTE:
- The collar and spacer should fit together firmly.
- Install the collar with some appropriate tool ⓐ that fits over the drive shaft as shown.

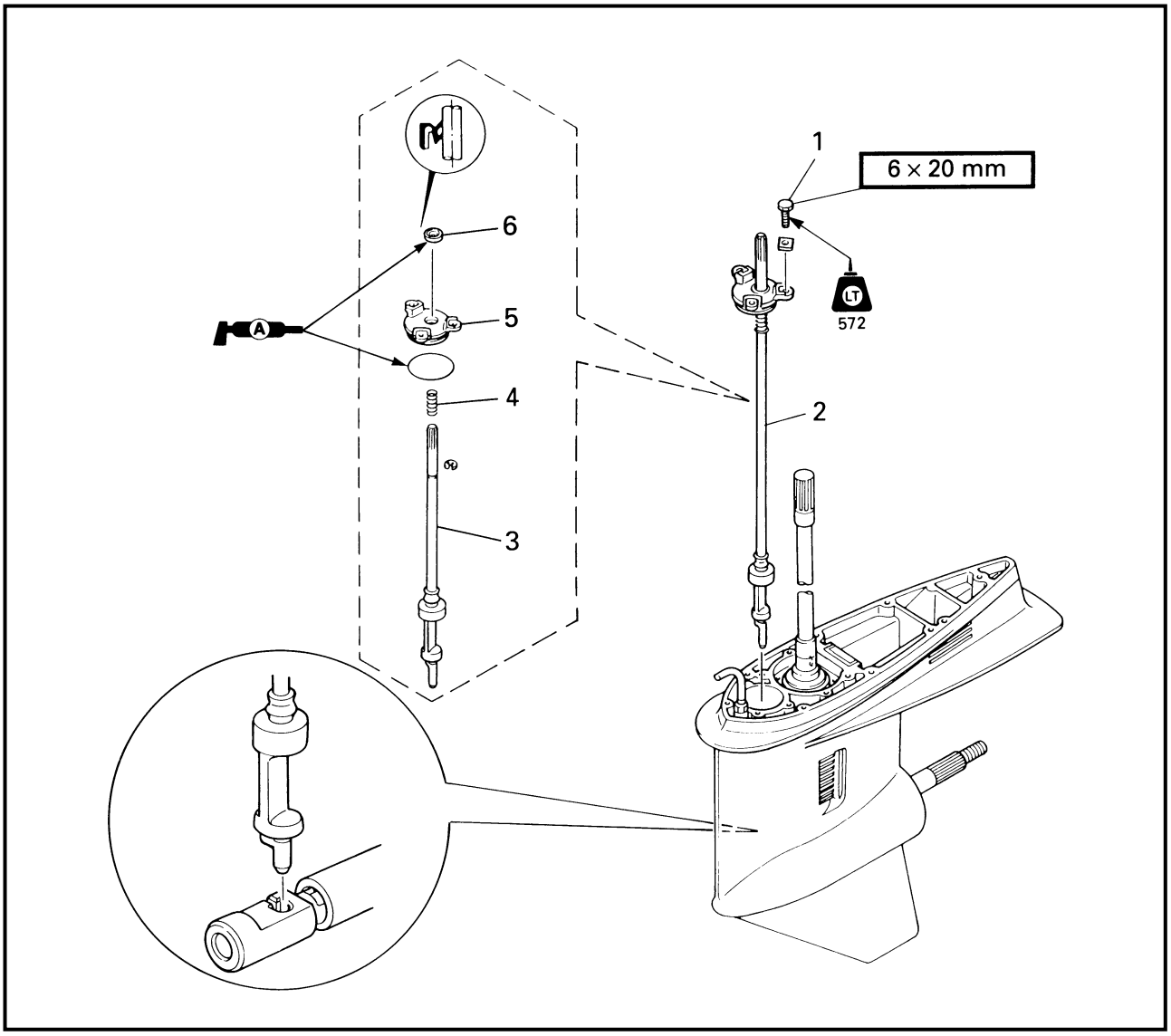
2. Install:
   - O-ring ①
   - Impeller housing cup ②
   - Impeller housing ③
   - O-ring ④



NOTE:
- When installing the impeller housing cup, align its projection with the hole in the impeller housing.
- When installing the water pump housing, turn the drive shaft clockwise.

SHIFT ROD ASSEMBLY (REGULAR ROTATION MODELS)

REMOVING/INSTALLING THE SHIFT ROD ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Impeller plate		Refer to "WATER PUMP (REGULAR ROTATION MODELS)" on page 6-4.
1	Bolt	3	(with washer)
2	Shift rod assembly	1	
3	Shift rod	1	
4	Spring	1	
5	Oil seal housing	1	
6	Oil seal	1	
			For installation, reverse the removal procedure.

REMOVING THE SHIFT ROD ASSEMBLY

Remove:

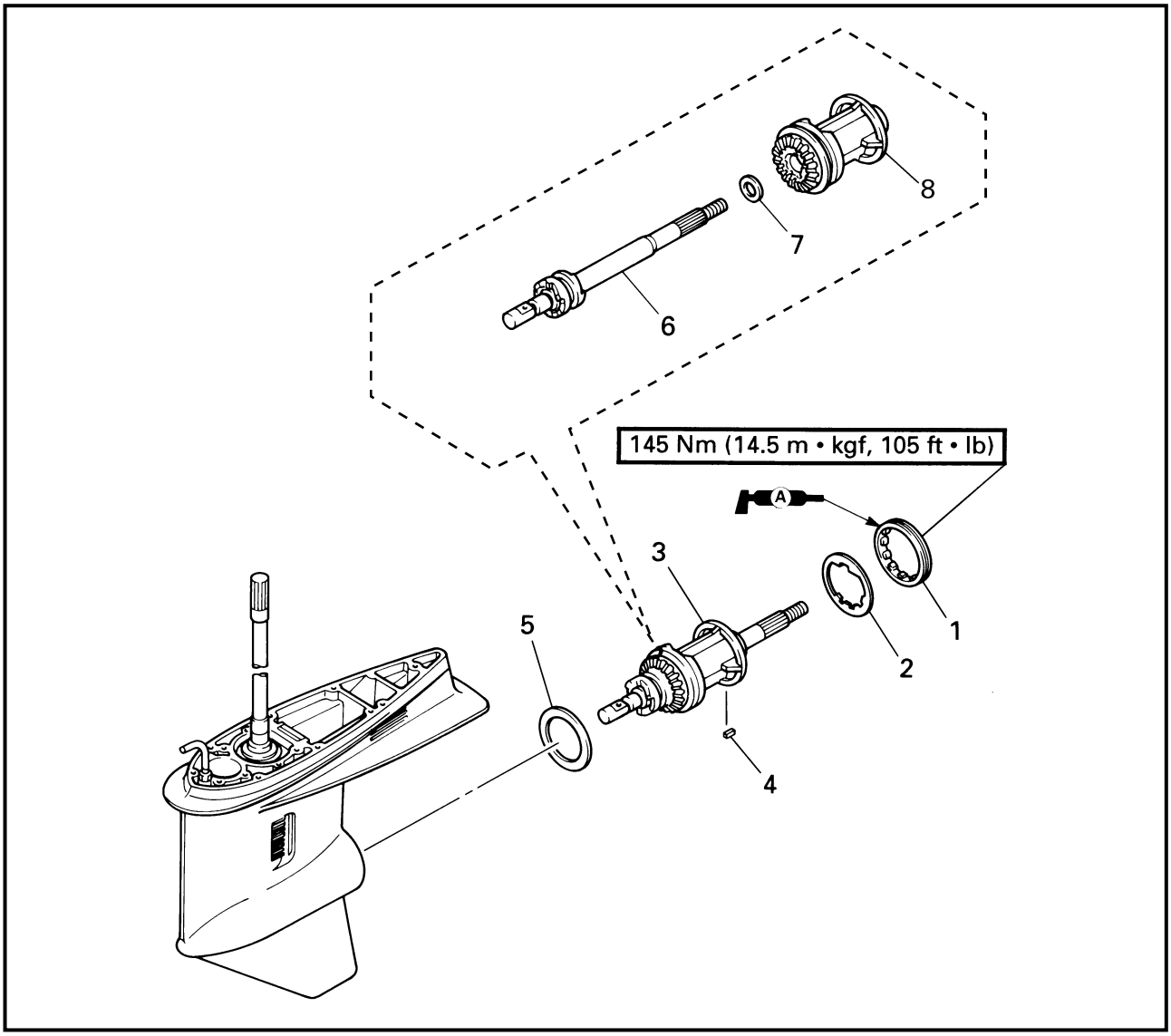
- Shift rod assembly

NOTE:

Remove the shift rod assembly when the shift rod is in the neutral position.

PROPELLER SHAFT HOUSING ASSEMBLY (REGULAR ROTATION MODELS)

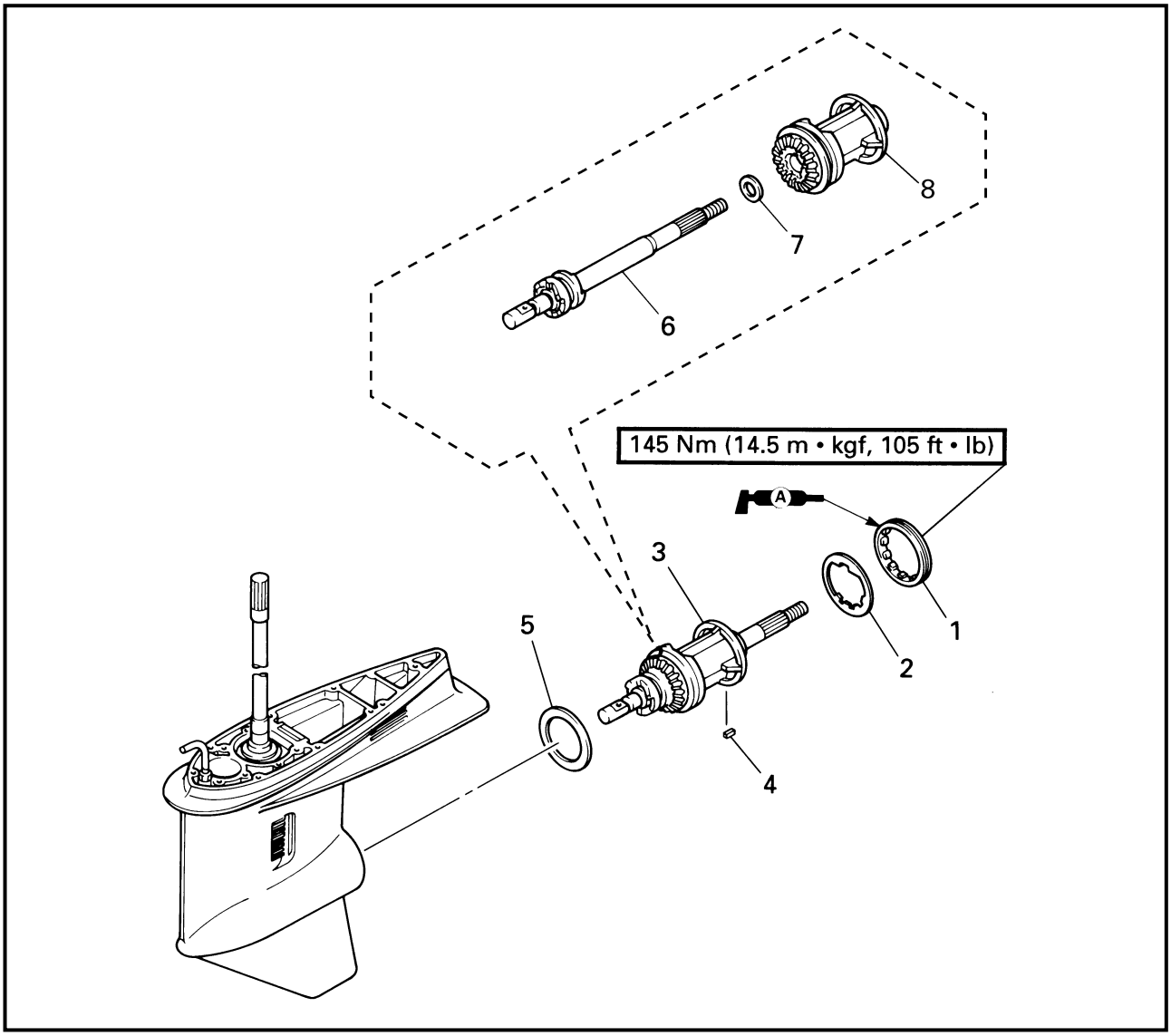
REMOVING/INSTALLING THE PROPELLER SHAFT HOUSING ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Gear oil		Refer to "CHANGING AND INSPECTING THE GEAR OIL" on page 3-17.
	Shift rod assembly		Refer to "SHIFT ROD ASSEMBLY (REGULAR ROTATION MODELS)" on page 6-7.
1	Ring nut	1	
2	Claw washer	1	
3	Propeller shaft housing assembly	1	
4	Straight key	1	

Continued on next page.

PROPELLER SHAFT HOUSING ASSEMBLY (REGULAR ROTATION MODELS)

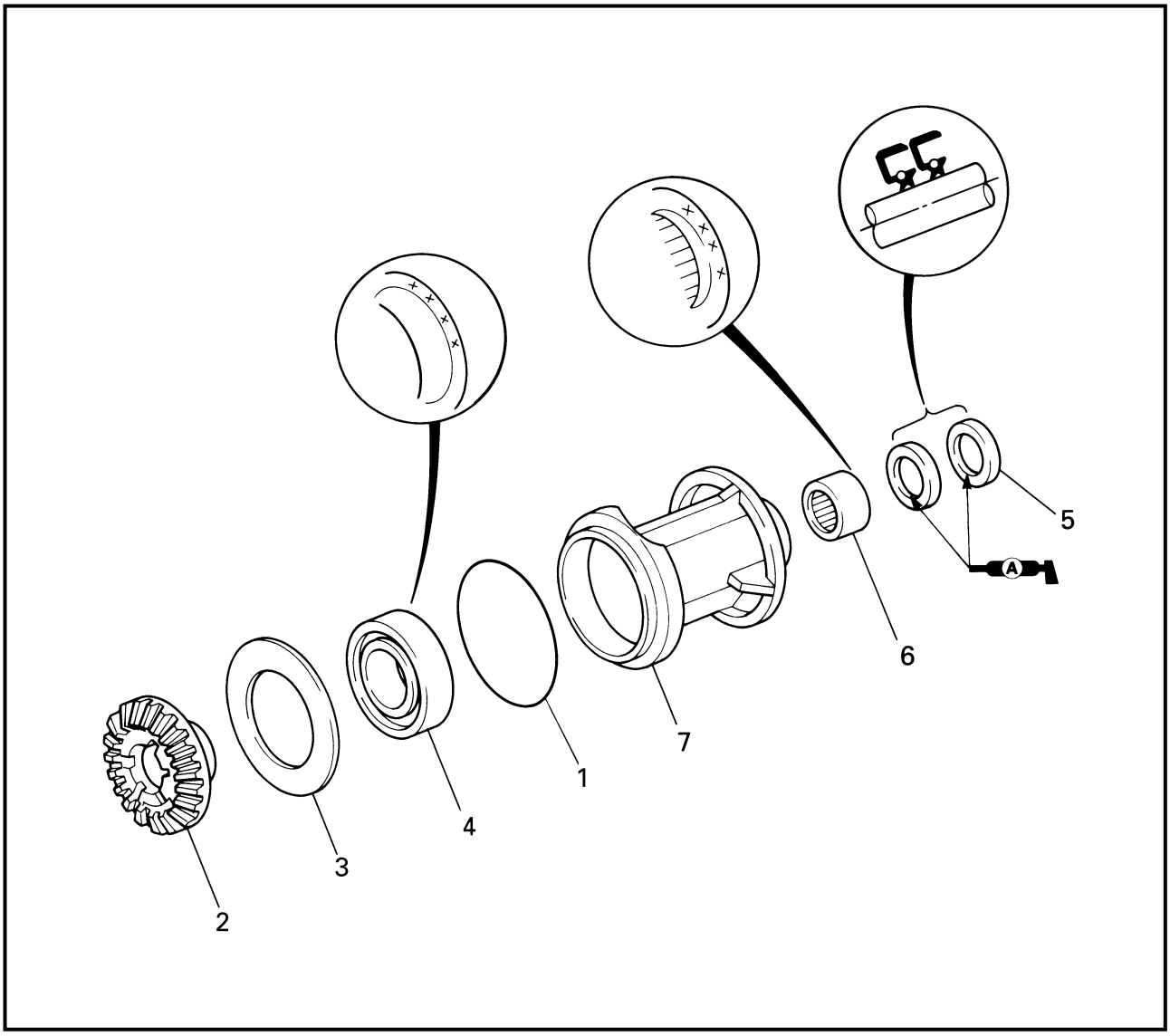


Order	Job/Part	Q'ty	Remarks
5	Reverse gear shim	*	
6	Propeller shaft assembly	1	
7	Washer	1	
8	Propeller shaft housing	1	
			For installation, reverse the removal procedure.

*: As required

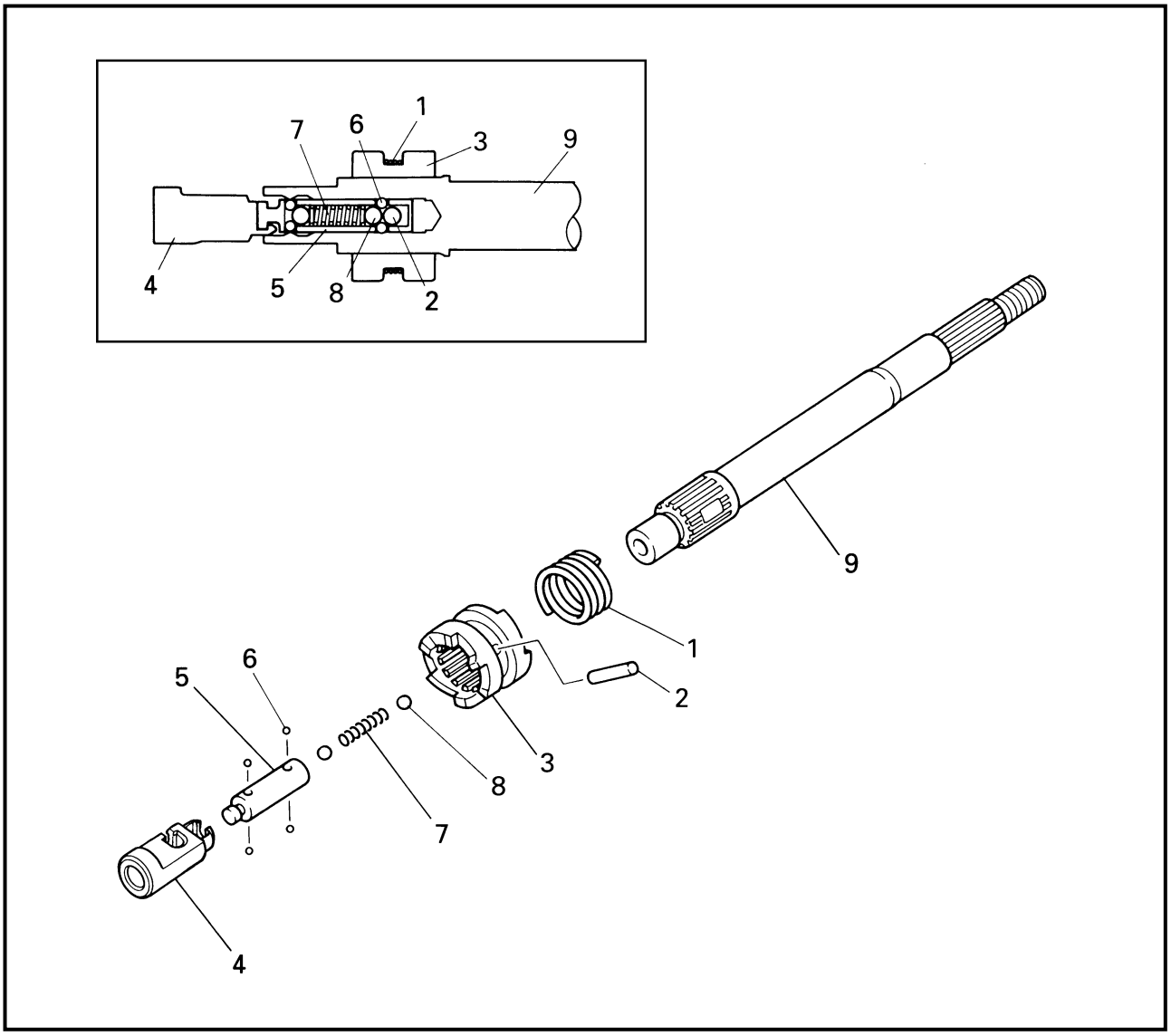
PROPELLER SHAFT HOUSING ASSEMBLY (REGULAR ROTATION MODELS)

DISASSEMBLING/ASSEMBLING THE PROPELLER SHAFT HOUSING



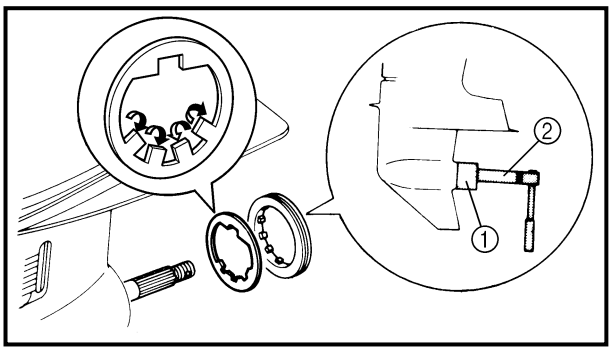
Order	Job/Part	Q'ty	Remarks
1	O-ring	1	
2	Reverse gear	1	
3	Thrust washer	1	
4	Ball bearing	1	
5	Oil seal	2	
6	Needle bearing	1	
7	Propeller shaft housing	1	
			For assembly, reverse the disassembly procedure.

DISASSEMBLING/ASSEMBLING THE PROPELLER SHAFT ASSEMBLY

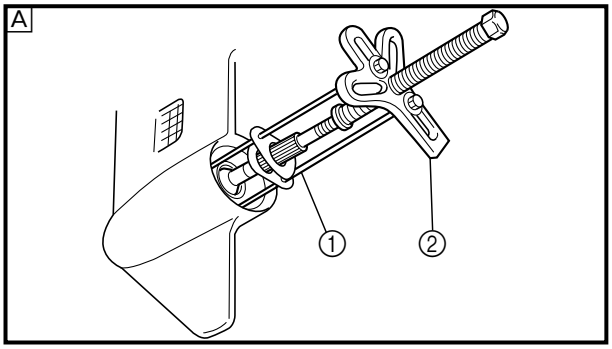


Order	Job/Part	Q'ty	Remarks
1	Spring	1	
2	Pin	1	
3	Dog clutch	1	
4	Shift rod joint	1	
5	Shift rod joint slider	1	
6	Ball	4	
7	Spring	1	
8	Ball	2	
9	Propeller shaft	1	
			For assembly, reverse the disassembly procedure.

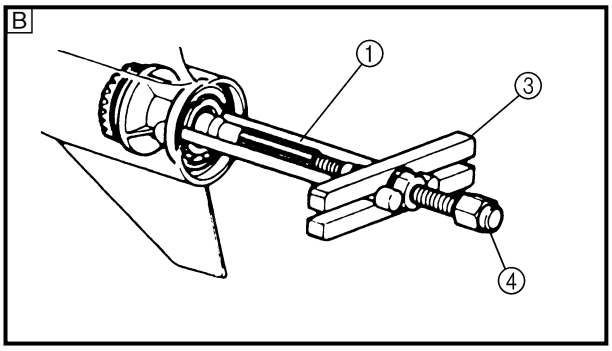
PROPELLER SHAFT HOUSING ASSEMBLY (REGULAR ROTATION MODELS)



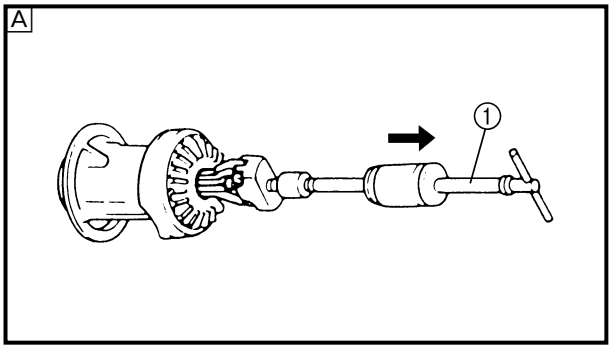
A



B



A



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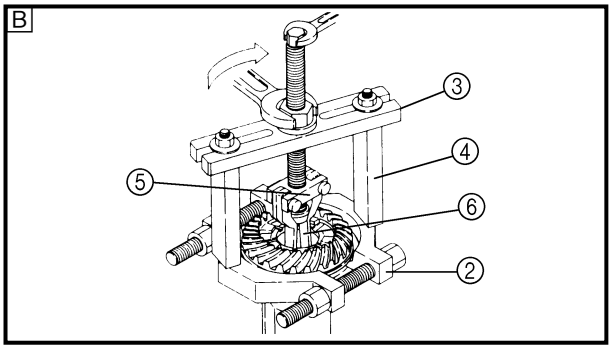


REMOVING THE PROPELLER SHAFT HOUSING ASSEMBLY

1. Straighten:
   - Claw washer tabs
2. Remove:
   - Ring nut
   - Claw washer

Ring nut wrench ..... ①
YB-34447 / 90890-06512
Ring nut wrench extension ..... ②
90890-06513

3. Remove:
   - Propeller shaft housing assembly

Propeller shaft housing puller . ①
YB-06207 / 90890-06502
Universal puller..... ②
YB-06117
Guide plate..... ③
90890-06501
Center bolt ..... ④
90890-06504

A For USA and Canada
B Except for USA and Canada

DISASSEMBLING THE PROPELLER SHAFT HOUSING

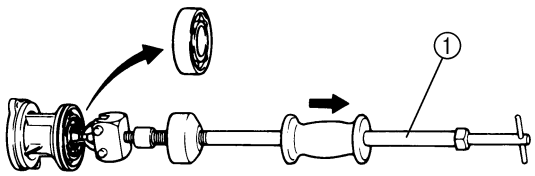
1. Remove:
   - Reverse gear

Slide hammer..... ①
YB-06096
Bearing separator ..... ②
90890-06534
Guide plate..... ③
90890-06501
Guide plate stand ..... ④
90890-06538
Bearing puller..... ⑤
90890-06535
Small universal claws ..... ⑥
90890-06536

A For USA and Canada
B Except for USA and Canada

PROPELLER SHAFT HOUSING ASSEMBLY (REGULAR ROTATION MODELS)

A



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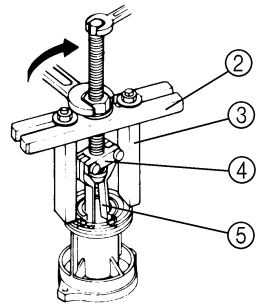
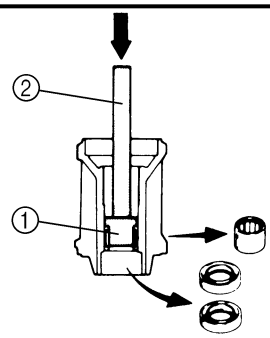




2. Remove:
   - Ball bearing

Slide hammer	①
YB-06096	
Guide plate	②
90890-06501	
Guide plate stand	③
90890-06538	
Bearing puller	④
90890-06535	
Small universal claws	⑤
90890-06536	

A For USA and Canada
B Except for USA and Canada

3. Remove:
   - Oil seal
   - Needle bearing

Bearing/oil seal attachment	①
YB-06196 / 90890-06610	
Driver rod	②
YB-06071 / 90890-06652	

INSPECTING THE REVERSE GEAR

Inspect:
- Teeth
- Dogs

Wear/damage → Replace the reverse gear.

INSPECTING THE BEARING

Inspect:
- Bearing

Pitting/rumbling → Replace.

INSPECTING THE PROPELLER SHAFT HOUSING

Inspect:
- Propeller shaft housing

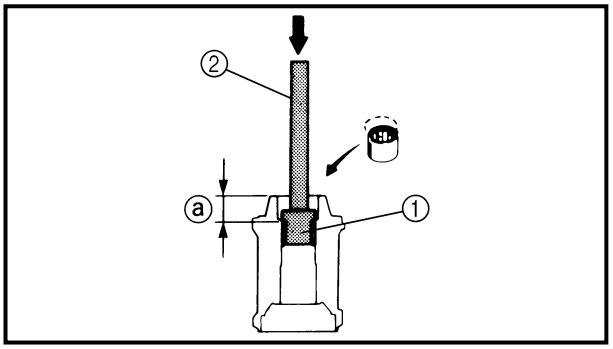
Cracks/damage → Replace.

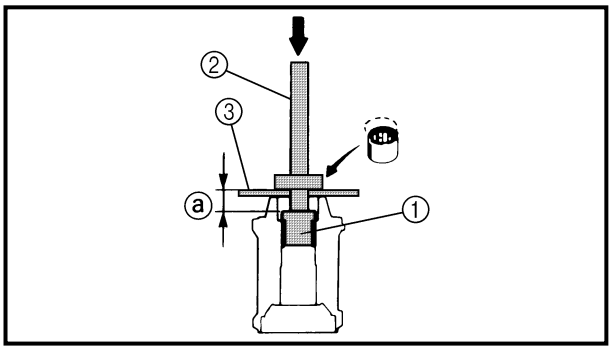
INSPECTING THE DOG CLUTCH

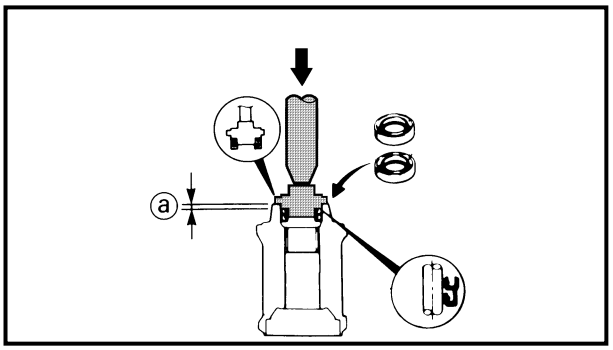
Inspect:
- Dog clutch
  Damage/wear → Replace.

INSPECTING THE PROPELLER SHAFT

Inspect:
- Propeller shaft
  Damage/wear → Replace.







ASSEMBLING THE PROPELLER SHAFT HOUSING

1. Install:
   - Needle bearing

Needle bearing installation position ⓐ
24.75 - 25.25 mm
(0.974 - 0.994 in)

Bearing/oil seal attachment .... ①
YB-06196 / 90890-06610
Driver rod ..... ②
YB-06071 / 90890-06604
Bearing/oil seal depth plate .... ③
90890-06603

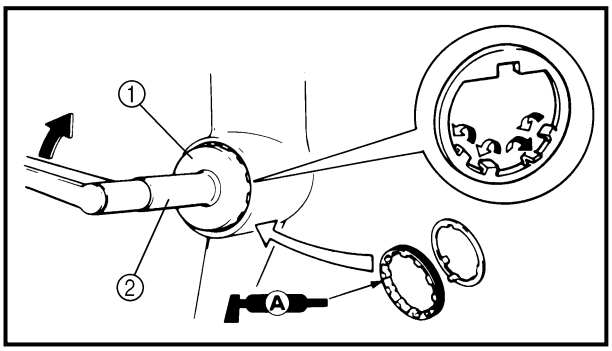
A For USA and Canada
B Except for USA and Canada

2. Install:
   - Oil seal

Oil seal installation position ⓐ
4.75 - 5.25 mm (0.187 - 0.207 in)

Bearing/oil seal attachment
YB-06195 / 90890-06633

PROPELLER SHAFT HOUSING ASSEMBLY (REGULAR ROTATION MODELS)



INSTALLING THE PROPELLER SHAFT HOUSING ASSEMBLY

Install:

- Propeller shaft housing assembly
- Claw washer
- Ring nut

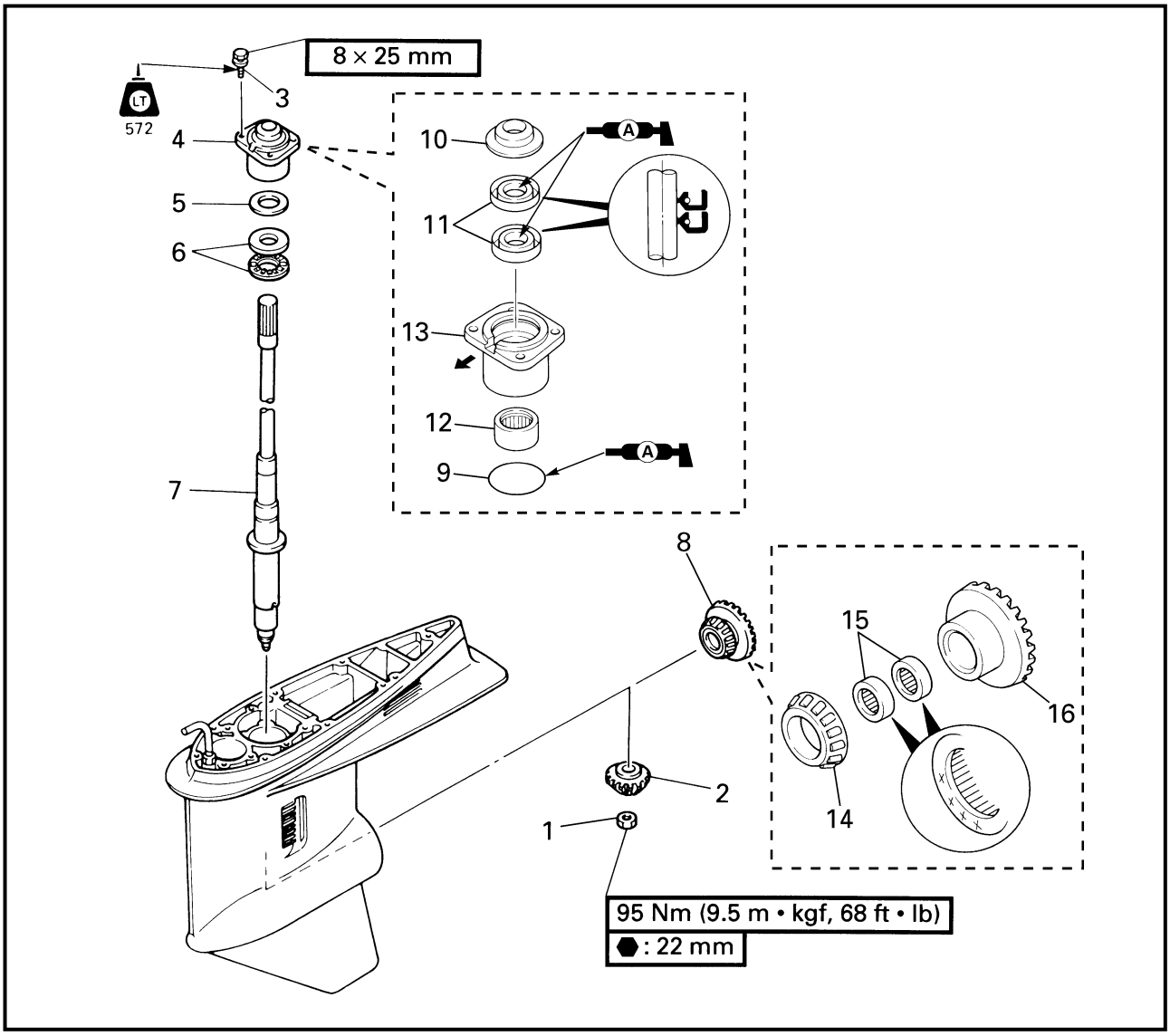
Ring nut wrench ..... ①
YB-34447 / 90890-06512
Ring nut wrench extension ..... ②
90890-06513

NOTE:

To secure the ring nut, bend one tab into the slot in the ring nut and the other tabs toward the propeller shaft housing assembly.

DRIVE SHAFT (REGULAR ROTATION MODELS)

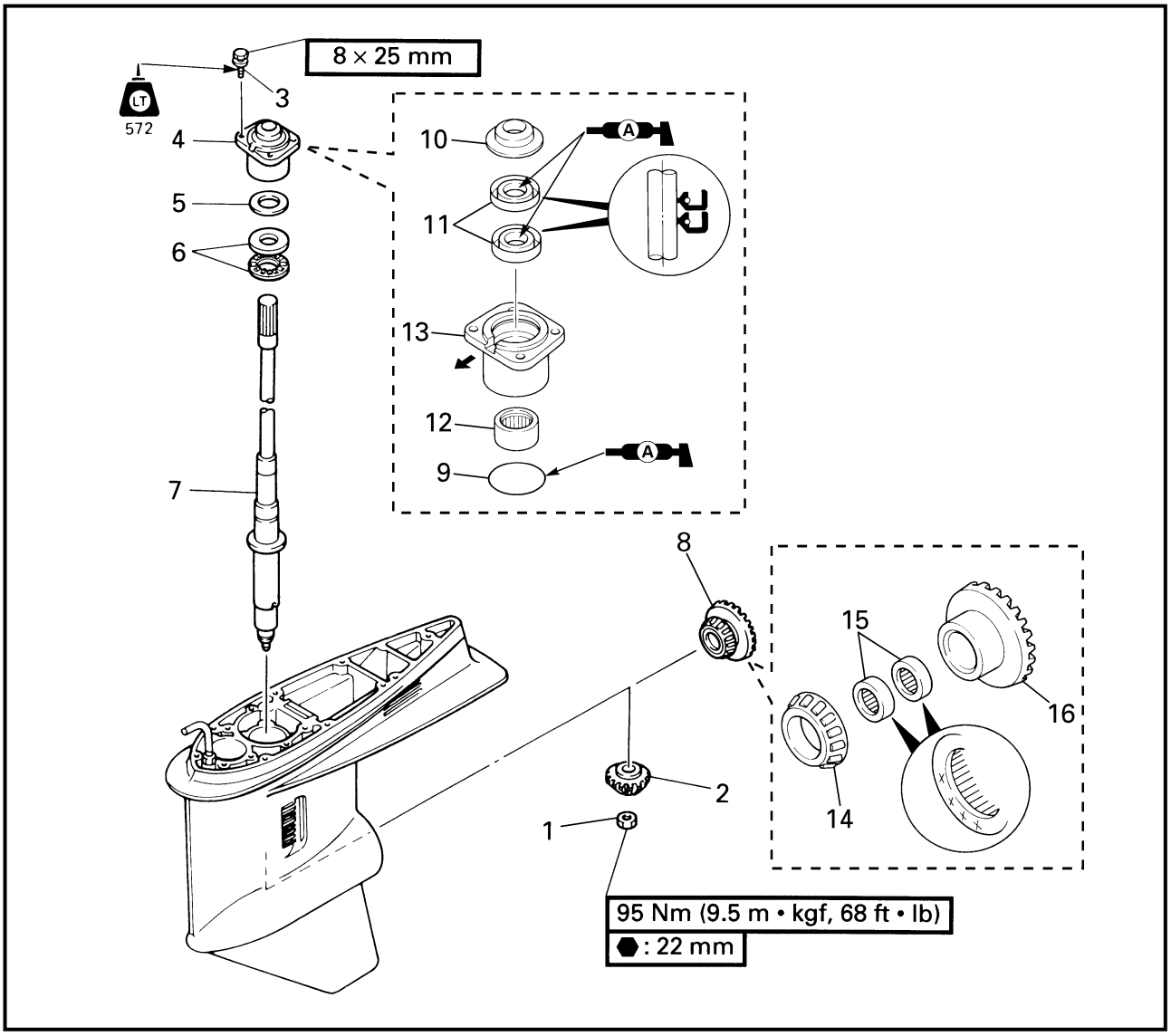
REMOVING/INSTALLING THE DRIVE SHAFT



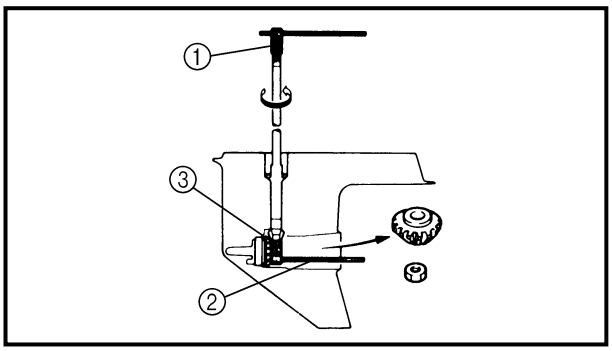
Order	Job/Part	Q'ty	Remarks
	Propeller shaft housing assembly		Refer to "PROPELLER SHAFT HOUSING ASSEMBLY (REGULAR ROTATION MODELS)" on page 6-9.
1	Nut	1	
2	Pinion	1	
3	Bolt	4	(with washer)
4	Drive shaft housing assembly	1	
5	Pinion shim	*	
6	Thrust bearing	1	
7	Drive shaft	1	

Continued on next page.

*: As required



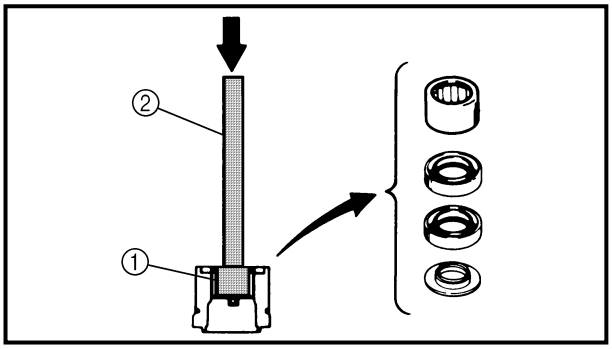
Order	Job/Part	Q'ty	Remarks
8	Forward gear assembly	1	
9	O-ring	1	
10	Oil seal cover	1	
11	Oil seal	2	
12	Needle bearing	1	
13	Drive shaft housing	1	
14	Tapered roller bearing	1	**Not reusable**
15	Needle bearing	2	
16	Forward gear	1	
			For installation, reverse the removal procedure.



REMOVING THE DRIVE SHAFT

Loosen:
- Pinion nut

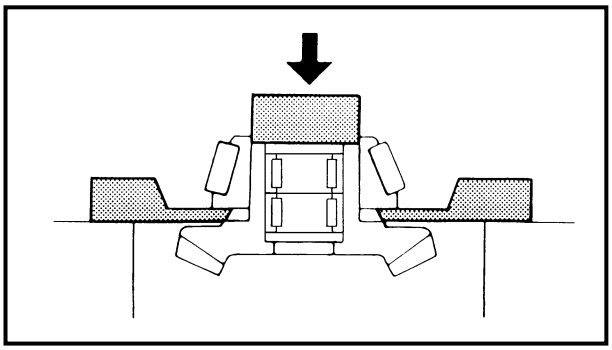
Drive shaft holder ..... ①
YB-06201 / 90890-06520
Pinion nut holder ..... ②
90890-06505
Pinion nut holder attachment . ③
90890-06508



DISASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY

Remove:
- Needle bearing

Bearing/oil seal attachment .... ①
YB-06196 / 90890-06610
Driver rod ..... ②
YB-06071 / 90890-06652



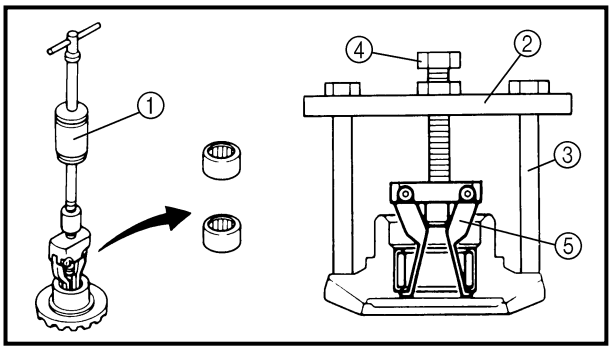
DISASSEMBLING THE FORWARD GEAR ASSEMBLY

1. Remove:
   - Tapered roller bearing

Bearing separator
YB-06219 / 90890-06534

CAUTION:

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



2. Remove:
   - Needle bearing

Slide hammer..... ①
YB-06096
Guide plate..... ②
90890-06501
Guide plate stand ..... ③
90890-06538
Bearing puller..... ④
90890-06535
Small universal claws ..... ⑤
90890-06536

INSPECTING THE PINION

Inspect:
- Teeth
  Damage/wear → Replace.

INSPECTING THE DRIVE SHAFT

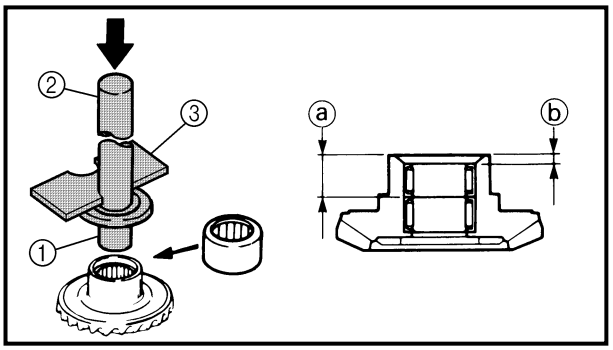
Inspect:
- Drive shaft
  Damage/wear → Replace.

INSPECTING THE DRIVE SHAFT HOUSING

Inspect:
- Drive shaft housing
  Cracks/damage → Replace.

INSPECTING THE BEARINGS

Inspect:
- Bearings
  Pitting/rumbling → Replace.

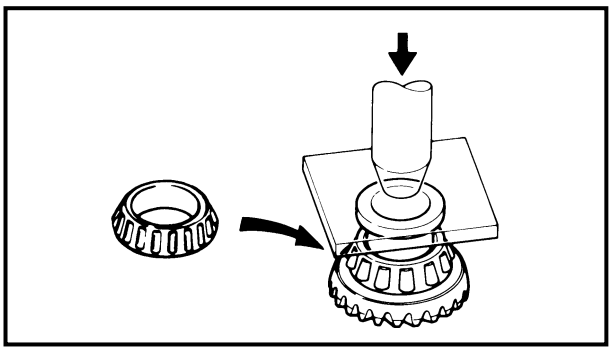


ASSEMBLING THE FORWARD GEAR ASSEMBLY

1. Install:
   - Needle bearing

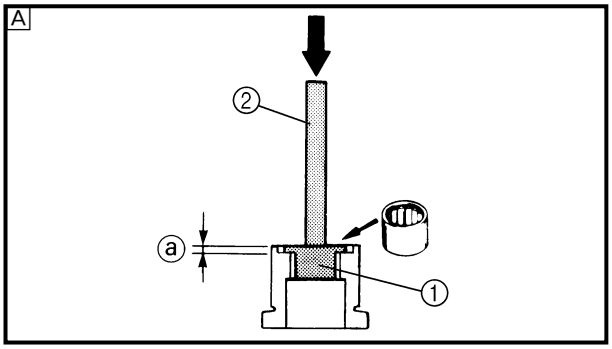
Needle bearing installation position ⓐ
21.0 - 21.4 mm (0.827 - 0.843 in)
Needle bearing installation position ⓑ
4.5 - 4.9 mm (0.177 - 0.193 in)

Bearing/oil seal attachment .... ①
YB-06200 / 90890-06612
Driver rod ..... ②
YB-06071 / 90890-06604
Bearing/oil seal depth plate .... ③
90890-06603



2. Install:
   • Tapered roller bearing

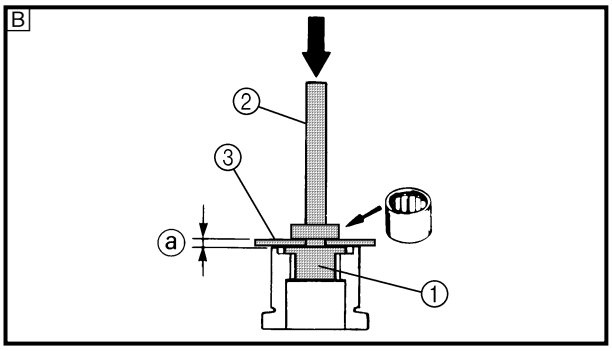
	Bearing/oil seal attachment **90890-06659**



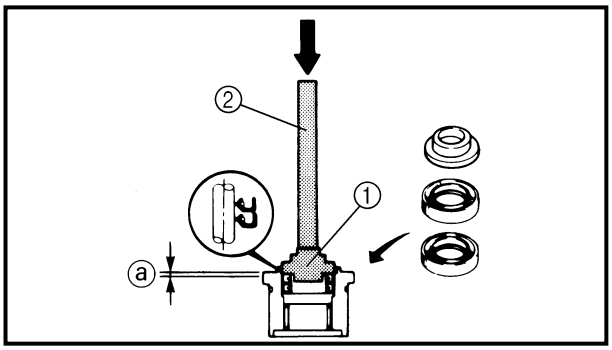
ASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY

1. Install:
   • Needle bearing

	Position ⓐ **5.75 - 6.25 mm (0.226 - 0.246 in)**
	Bearing/oil seal attachment .... ① **YB-06196 / 90890-06610** **Driver rod ..... ②** **YB-06071 / 90890-06604** **Bearing/oil seal depth plate .... ③** **90890-06603**



A For USA and Canada
B Except for USA and Canada



2. Install:
   • Oil seal

	Oil seal installation position ⓐ **0.25 - 0.75 mm (0.010 - 0.030 in)**
	Bearing/oil seal attachment .... ① **YB-06195 / 90890-06633** **Driver rod ..... ②** **YB-06071 / 90890-06652**

INSTALLING THE DRIVE SHAFT

Tighten:
- Pinion nut

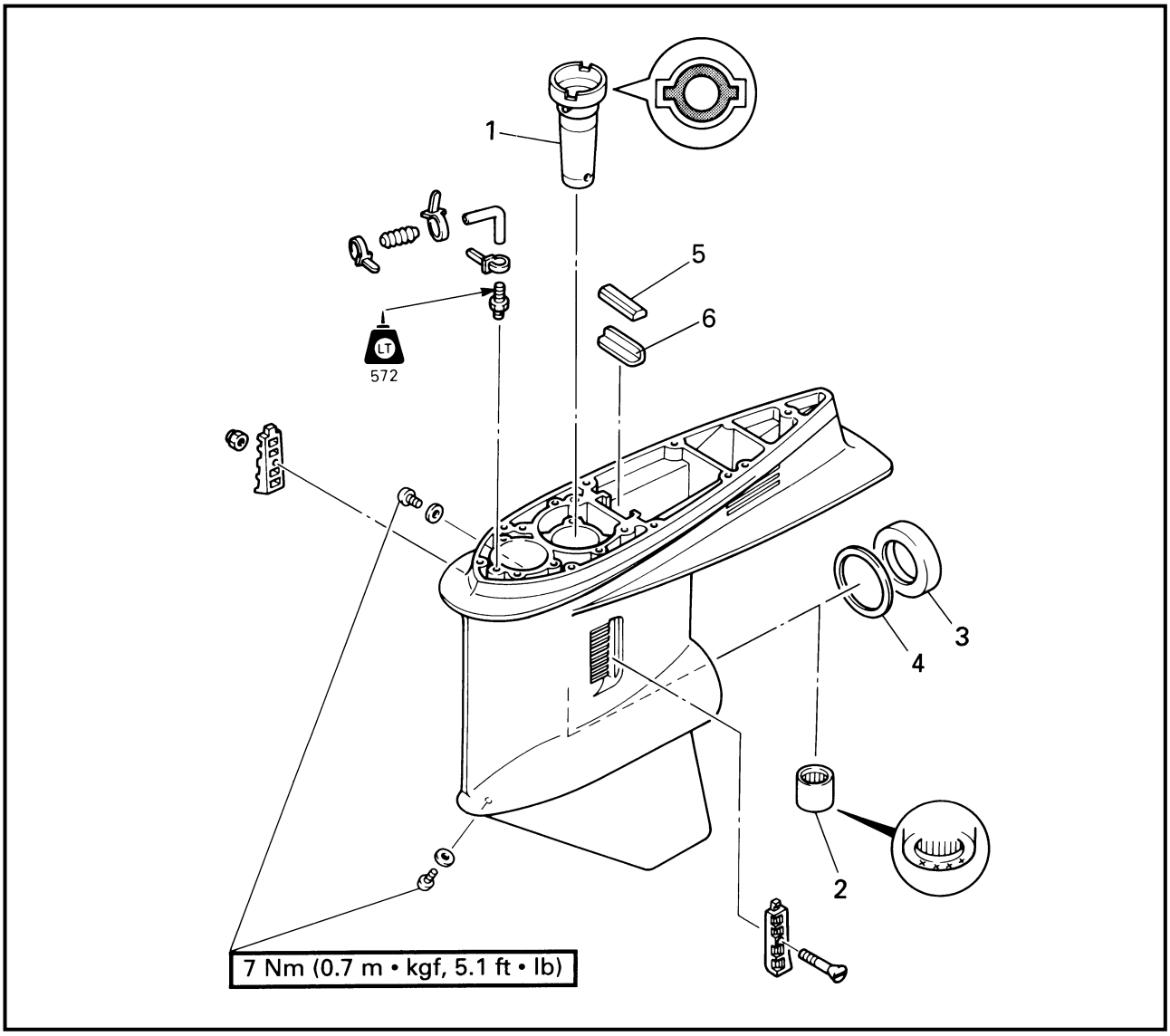
	**Pinion nut** **95 Nm (9.5 m • kgf, 68 ft • lb)**

NOTE:

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

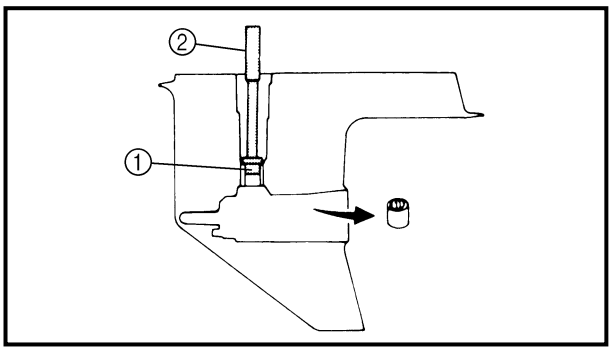
LOWER CASE ASSEMBLY (REGULAR ROTATION MODELS)

DISASSEMBLING/ASSEMBLING THE LOWER CASE ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Forward gear		Refer to "DRIVE SHAFT (REGULAR ROTATION MODELS)" on page 6-17.
1	Drive shaft sleeve	1	
2	Needle bearing	1	
3	Tapered roller bearing outer race	1	
4	Forward gear shim	*	
5	Water seal	1	
6	Plate	1	
			For assembly, reverse the disassembly procedure.

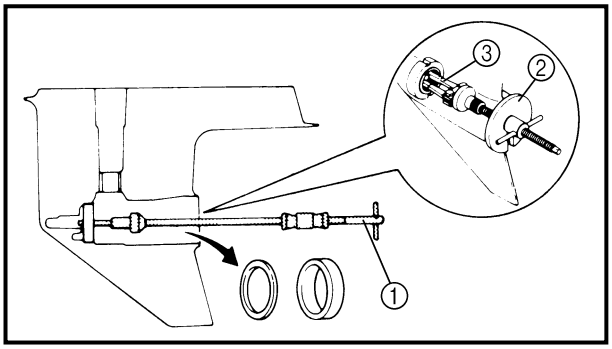
*: As required



DISASSEMBLING THE LOWER CASE ASSEMBLY

1. Remove:
   • Needle bearing

Bearing/oil seal attachment .... ①
YB-06194 / 90890-06636
Driver rod ..... ②
YB-06071 / 90890-06605



2. Remove:
   • Tapered roller bearing outer race

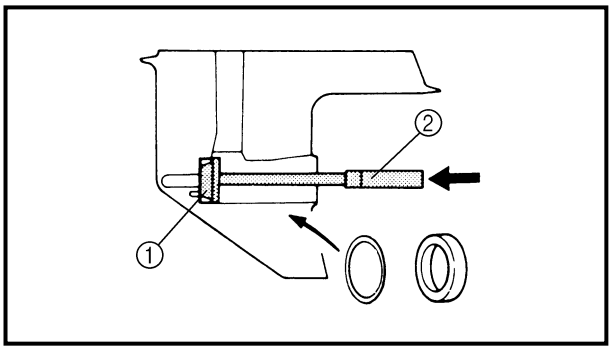
Slide hammer..... ①
YB-06096
Bearing puller..... ②
90890-06523
Large universal claws..... ③
90890-06532

INSPECTING THE DRIVE SHAFT SLEEVE

Inspect:
• Drive shaft sleeve
Damage/wear → Replace.

INSPECTING THE NEEDLE BEARING

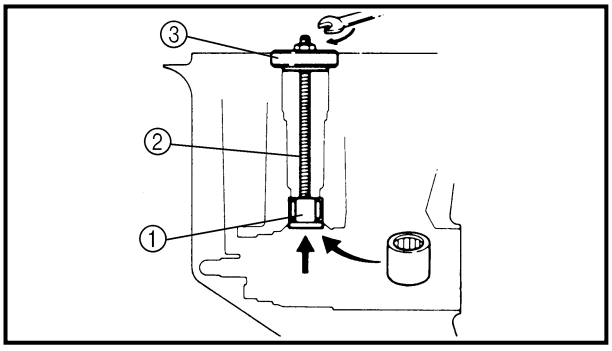
Inspect:
• Needle bearing
Pitting/rumbling → Replace.



ASSEMBLING THE LOWER CASE ASSEMBLY

1. Install:
   • Tapered roller bearing outer race

Bearing/oil seal attachment .... ①
YB-06258 / 90890-06619
Driver rod ..... ②
YB-06071 / 90890-06605

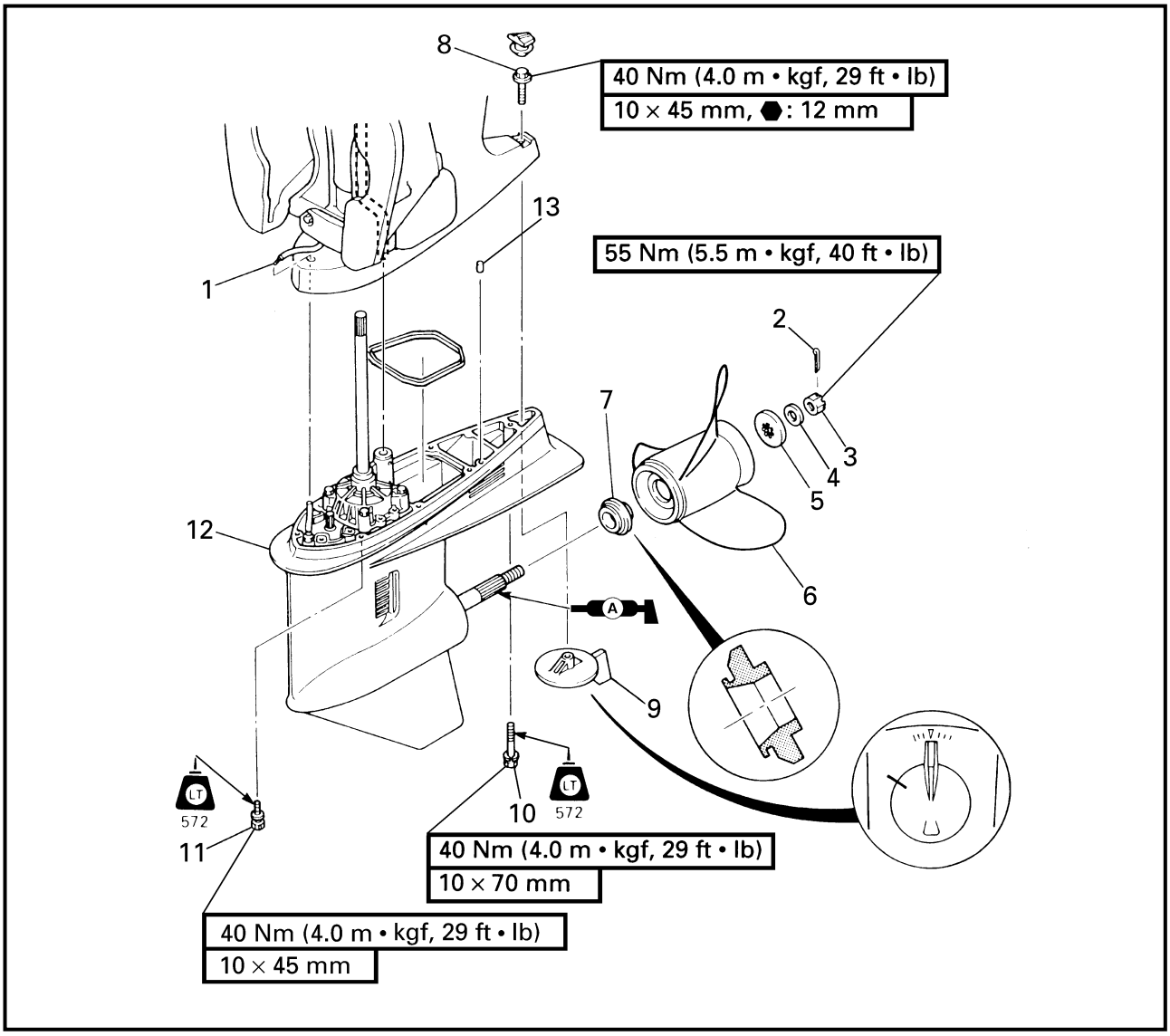


2. Install:
   • Needle bearing

Bearing/oil seal attachment .... ①
YB-06246 / 90890-06636
Bearing puller..... ②
YB-06029 / 90890-06523
Needle bearing installation plate ..... ③
YB-06247

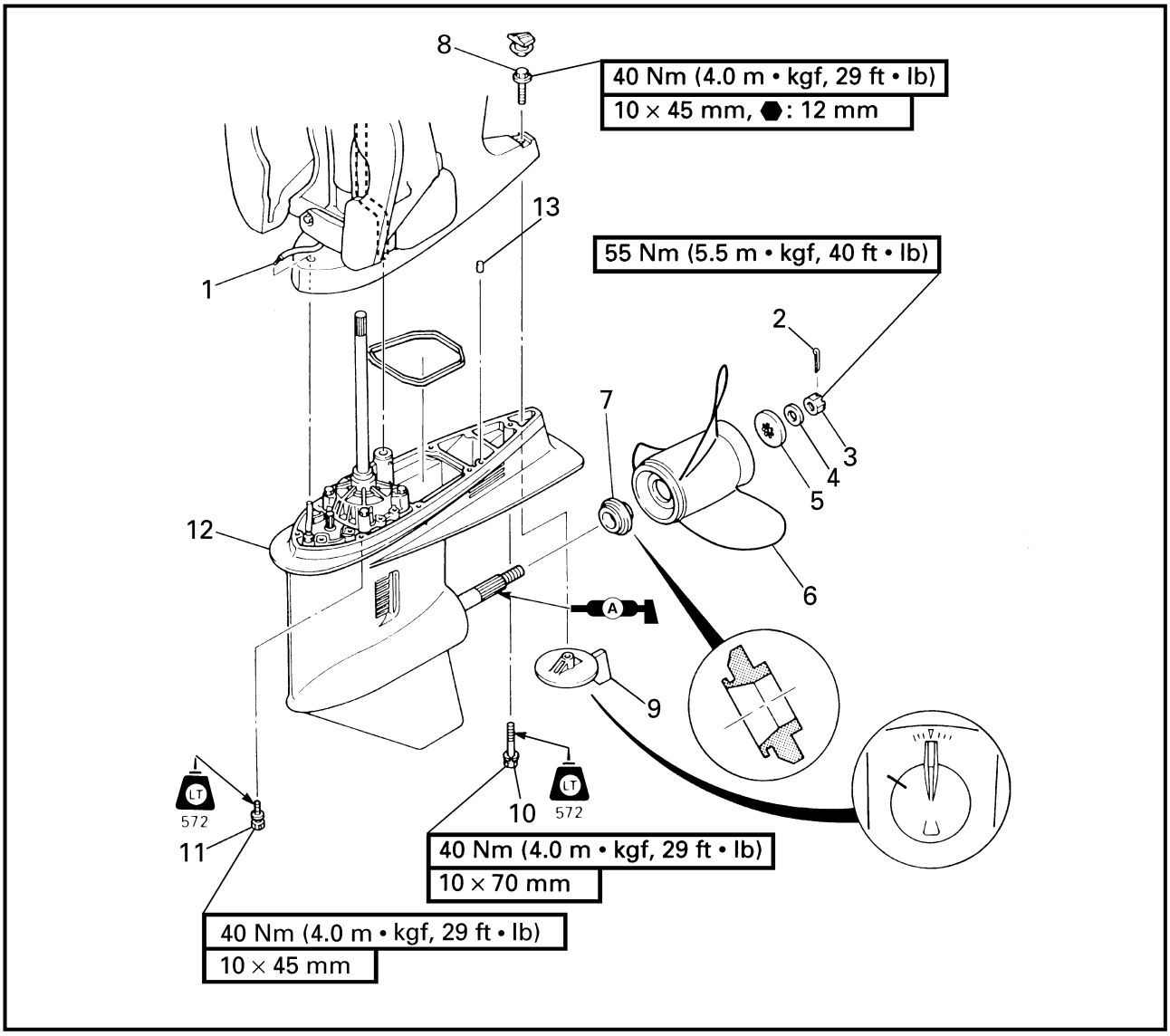
LOWER UNIT (COUNTER ROTATION MODELS)

REMOVING/INSTALLING THE LOWER UNIT

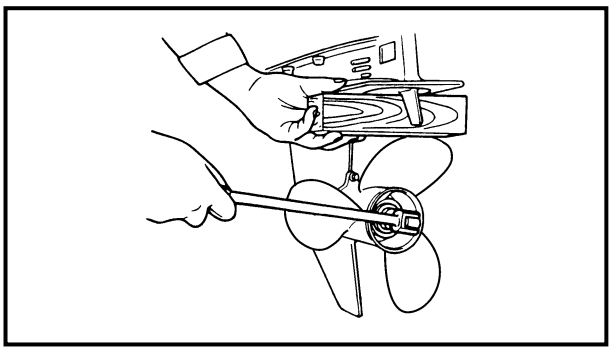


Order	Job/Part	Q'ty	Remarks
1	Speedometer hose	1	
2	Cotter pin	1	
3	Propeller nut	1	
4	Washer	1	
5	Washer	1	
6	Propeller	1	
7	Spacer	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Bolt	1	
9	Trim tab	1	
10	Bolt	1	(with washer)
11	Bolt	6	(with washer)
12	Lower unit	1	
13	Dowel pin	2	
			For installation, reverse the removal procedure.



REMOVING THE PROPELLER

Remove:
- Propeller

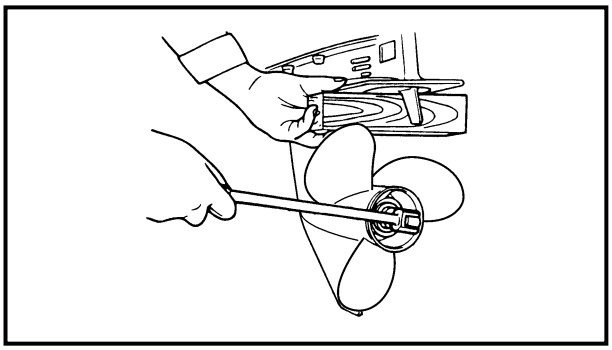
⚠ WARNING

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

INSPECTING THE PROPELLER

Inspect:
- Blades
- Splines

  Cracks/damage/wear → Replace.



INSTALLING THE PROPELLER

Install:
- Propeller

⚠ WARNING

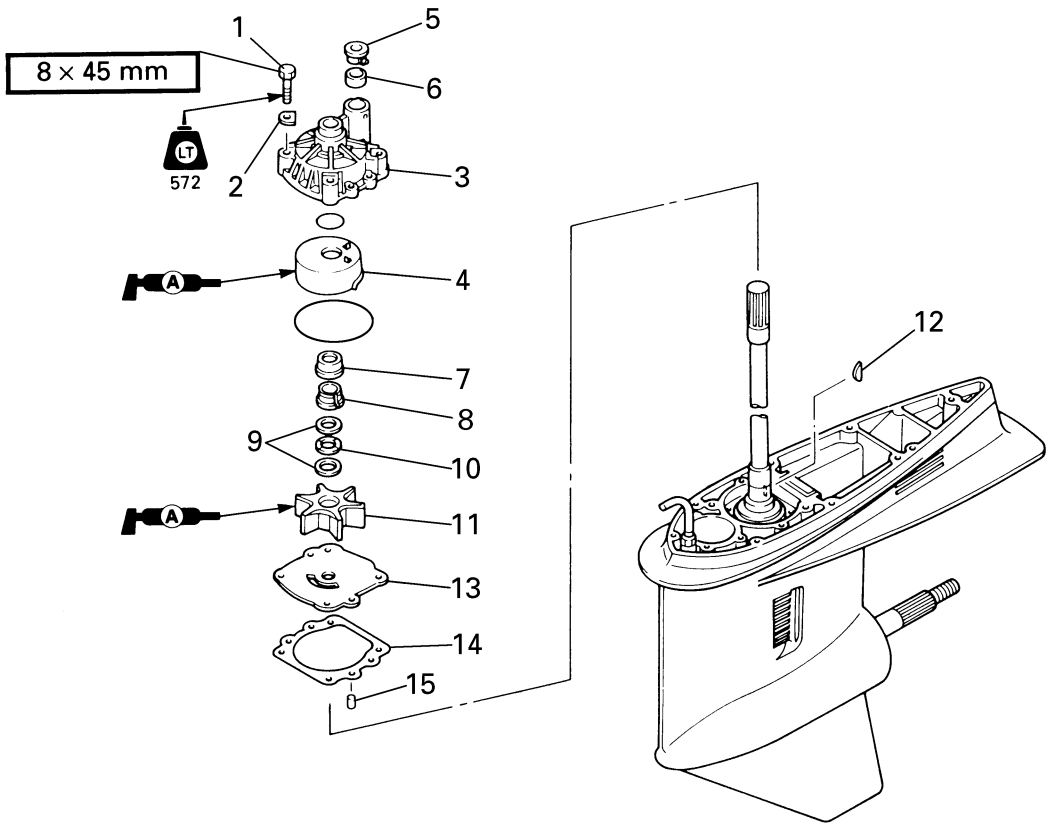
Do not hold the propeller with your hands when removing or installing it. Be sure to remove the battery leads from the batteries and the lanyard engine stop switch. Put a block of wood between the cavitation plate and propeller to keep the propeller from turning.

NOTE:

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

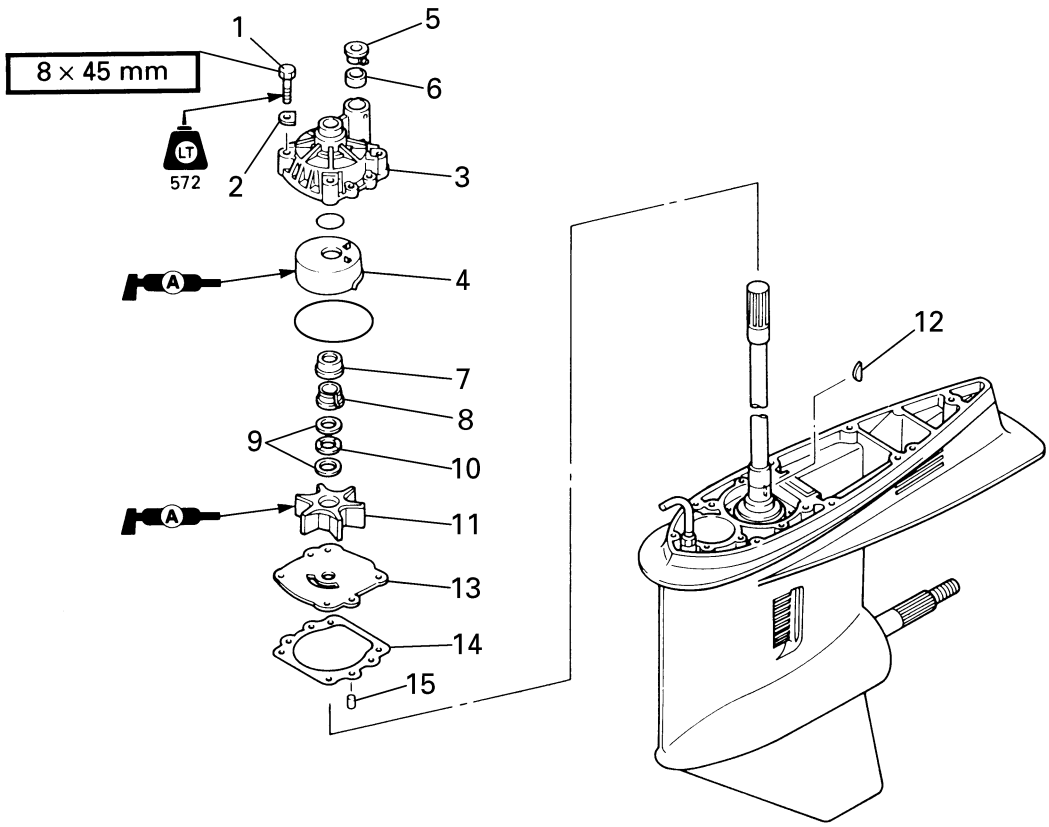
WATER PUMP (COUNTER ROTATION MODELS)

REMOVING/INSTALLING THE WATER PUMP



Order	Job/Part	Q'ty	Remarks
	Lower unit		Refer to "LOWER UNIT (COUNTER ROTATION MODELS)" on page 6-25.
1	Bolt	4	
2	Plate washer	4	
3	Impeller housing	1	
4	Impeller housing cup	1	
5	Grommet	1	
6	Spacer	1	
7	Collar	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Spacer	1	
9	Washer	2	
10	Wave washer	1	
11	Impeller	1	
12	Woodruff key	1	
13	Impeller plate	1	
14	Gasket	1	**Not reusable**
15	Dowel pin	2	
			For installation, reverse the removal procedure.

INSPECTING THE IMPELLER HOUSING

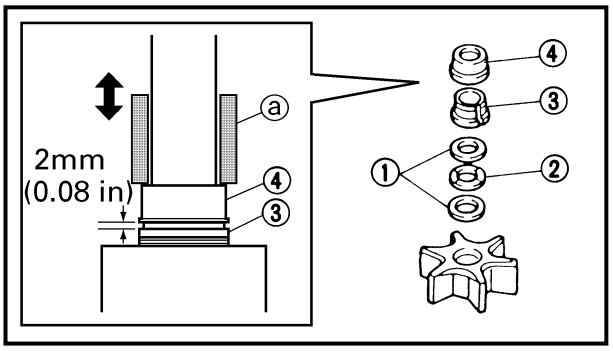
Inspect:
- Impeller housing
  Cracks/damage → Replace.

INSPECTING THE IMPELLER AND IMPELLER HOUSING CUP

Inspect:
- Impeller
- Impeller housing cup
  Cracks/damage → Replace any defective parts.

INSPECTING THE WOODRUFF KEY

Inspect:
- Woodruff key
  Damage/wear → Replace.

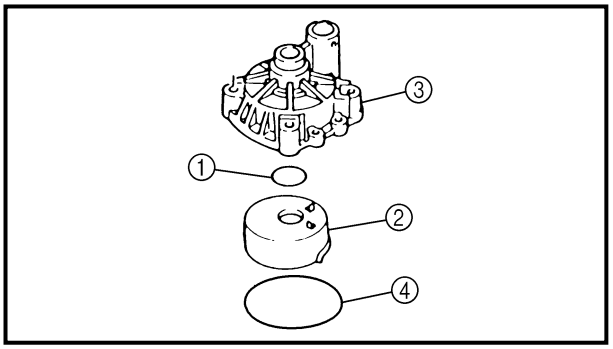


INSTALLING THE IMPELLER AND IMPELLER HOUSING

1. Install:
   - Washers ①
   - Wave washer ②
   - Spacer ③
   - Collar ④

NOTE:
- The collar and spacer should fit together firmly.
- Install the collar with some appropriate tool ⓐ that fits over the drive shaft as shown.

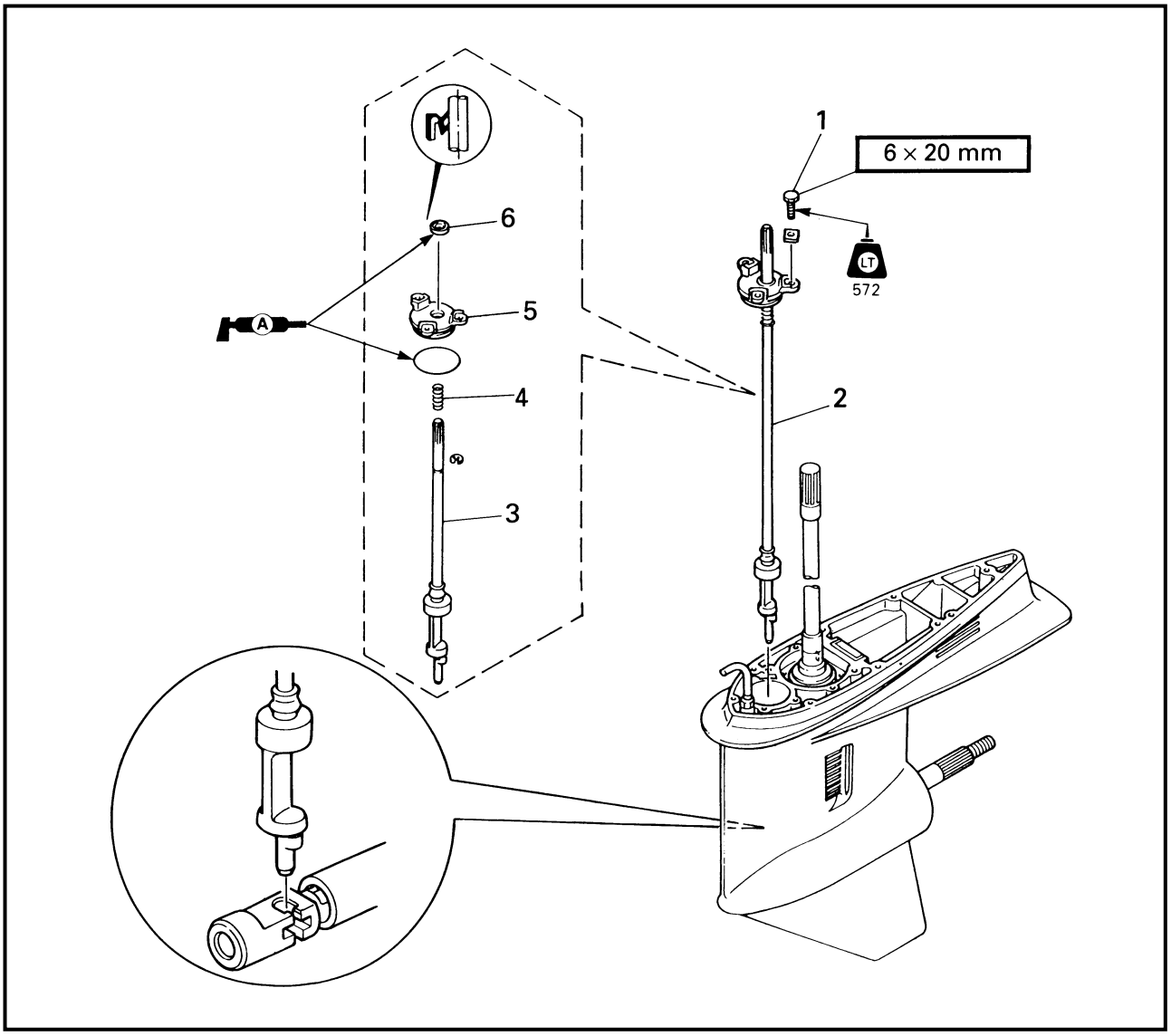
2. Install:
   - O-ring ①
   - Impeller housing cup ②
   - Impeller housing ③
   - O-ring ④



NOTE:
- When installing the impeller housing cup, align its projection with the hole in the impeller housing.
- When installing the water pump housing, turn the drive shaft clockwise.

SHIFT ROD ASSEMBLY (COUNTER ROTATION MODELS)

REMOVING/INSTALLING THE SHIFT ROD ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Impeller plate		Refer to "WATER PUMP (COUNTER ROTATION MODELS)" on page 6-28.
1	Bolt	3	(with washer)
2	Shift rod assembly	1	
3	Shift rod	1	
4	Spring	1	
5	Oil seal housing	1	
6	Oil seal	1	
			For installation, reverse the removal procedure.

REMOVING THE SHIFT ROD ASSEMBLY

Remove:

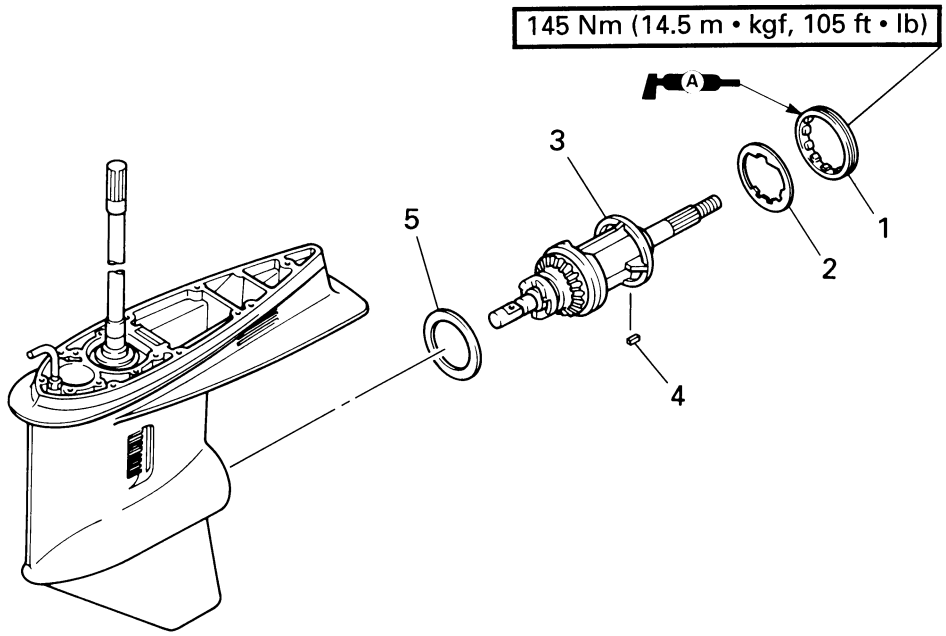
- Shift rod assembly

NOTE:

Remove the shift rod assembly when the shift rod is in the neutral position.

PROPELLER SHAFT HOUSING ASSEMBLY (COUNTER ROTATION MODELS)

REMOVING/INSTALLING THE PROPELLER SHAFT HOUSING ASSEMBLY

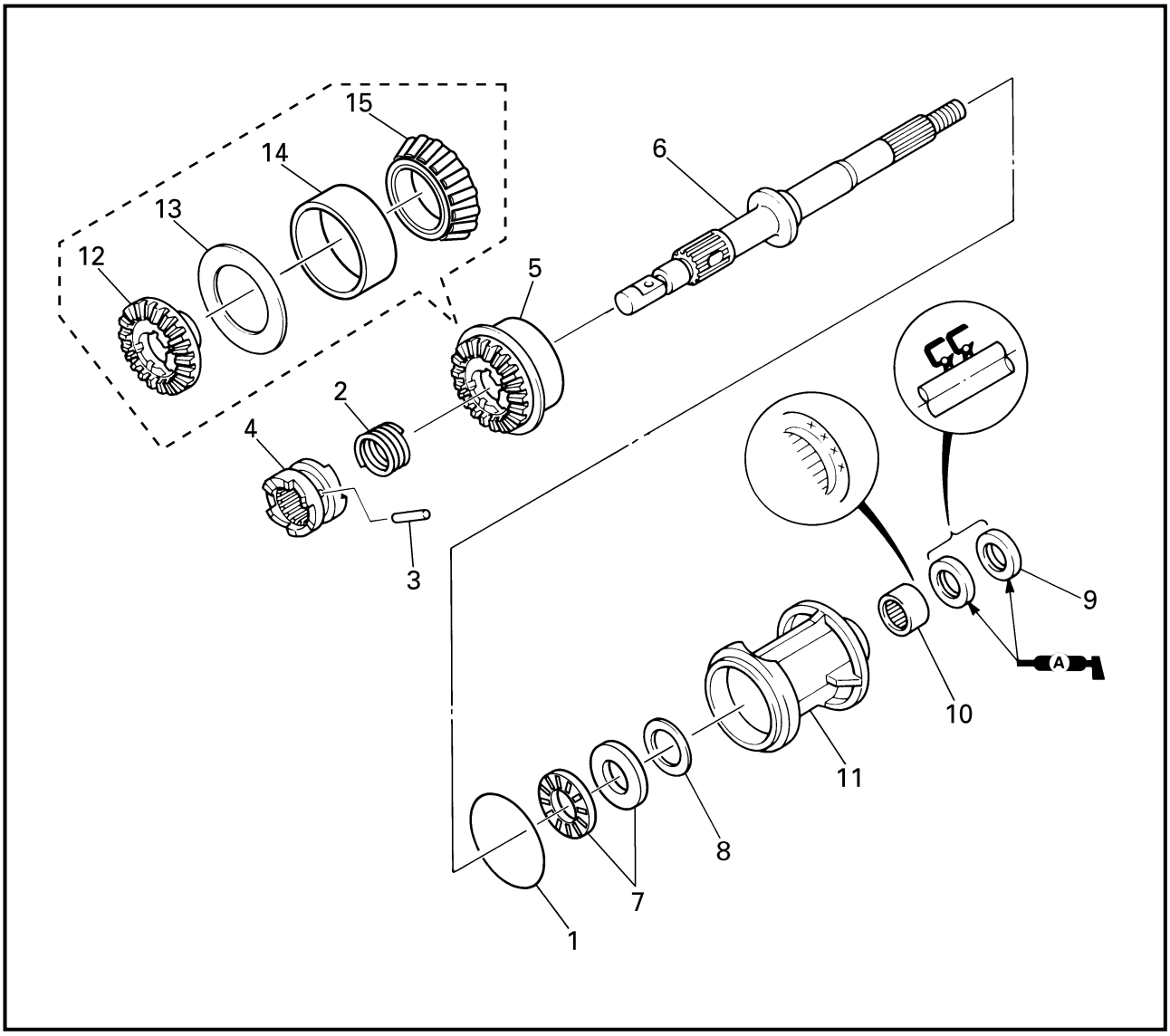


Order	Job/Part	Q'ty	Remarks
	Gear oil		Refer to "CHANGING AND INSPECTING THE GEAR OIL" on page 3-17.
	Shift rod assembly		Refer to "SHIFT ROD ASSEMBLY (COUNTER ROTATION MODELS)" on page 6-31.
1	Ring nut	1	
2	Claw washer	1	
3	Propeller shaft housing assembly	1	
4	Straight key	1	
5	Reverse gear shim	*	
			For installation, reverse the removal procedure.

*: As required

PROPELLER SHAFT HOUSING ASSEMBLY (COUNTER ROTATION MODELS)

DISASSEMBLING/ASSEMBLING THE PROPELLER SHAFT HOUSING ASSEMBLY

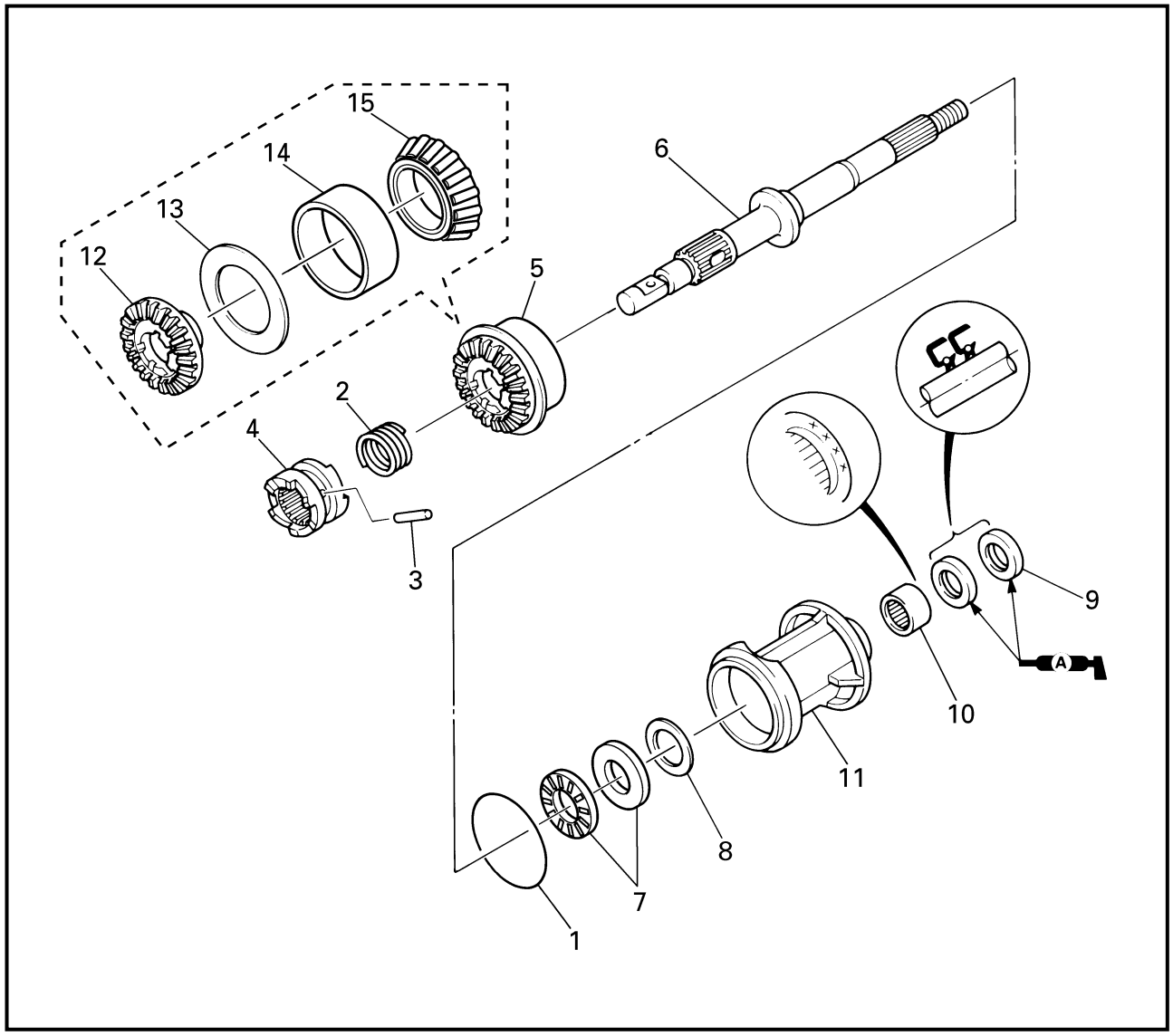


Order	Job/Part	Q'ty	Remarks
1	O-ring	1	
2	Spring	1	
3	Pin	1	
4	Dog clutch	1	
5	Forward gear assembly	1	
6	Propeller shaft assembly	1	
7	Thrust bearing	1	
8	Propeller shaft shim	*	

Continued on next page.

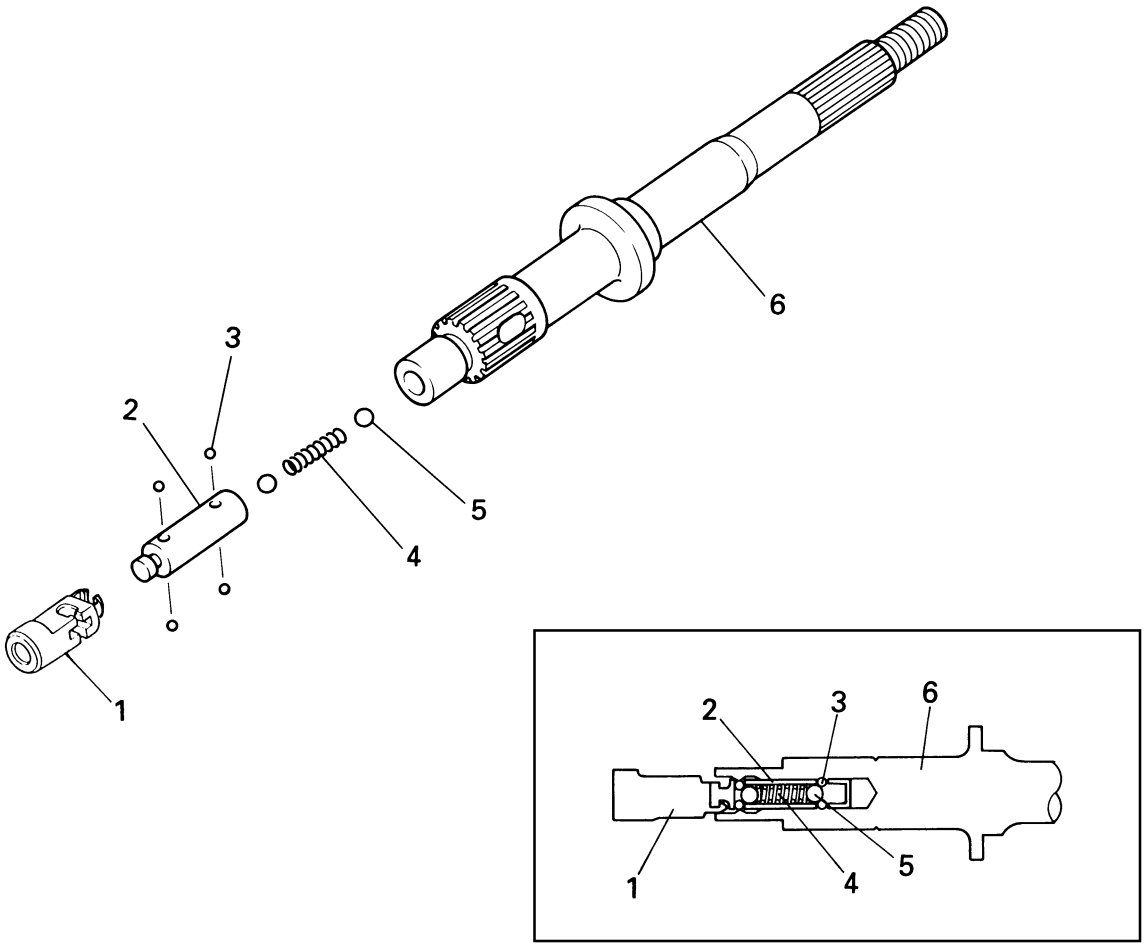
*: As required

PROPELLER SHAFT HOUSING ASSEMBLY (COUNTER ROTATION MODELS)



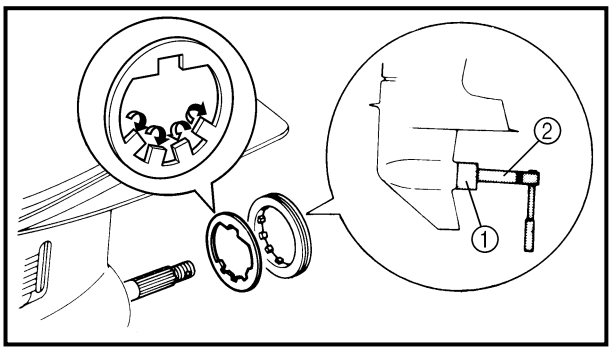
Order	Job/Part	Q'ty	Remarks
9	Oil seal	2	
10	Needle bearing	1	
11	Propeller shaft housing	1	
12	Forward gear	1	
13	Thrust washer	1	
14	Tapered roller bearing outer race	1	
15	Tapered roller bearing	1	**Not reusable** For assembly, reverse the disassembly procedure.

DISASSEMBLING/ASSEMBLING THE PROPELLER SHAFT ASSEMBLY



Order	Job/Part	Q'ty	Remarks
1	Shift rod joint	1	
2	Shift rod joint slider	1	
3	Ball	4	
4	Spring	1	
5	Ball	2	
6	Propeller shaft	1	
			For assembly, reverse the disassembly procedure.

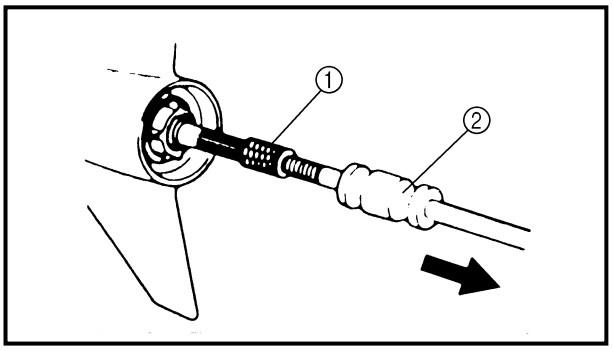
PROPELLER SHAFT HOUSING ASSEMBLY (COUNTER ROTATION MODELS)



REMOVING THE PROPELLER SHAFT HOUSING ASSEMBLY

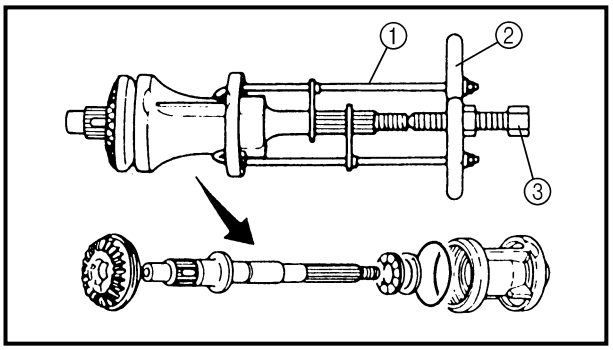
1. Straighten:
   - Claw washer tabs.
2. Remove:
   - Ring nut
   - Claw washer

Ring nut wrench ..... ①
YB-34447 / 90890-06512
Ring nut wrench extension ..... ②
90890-06513



3. Remove:
   - Propeller shaft housing assembly

Slide hammer attachment..... ①
YB-06335 / 90890-06514
Slide hammer..... ②
YB-06096 / 90890-06531

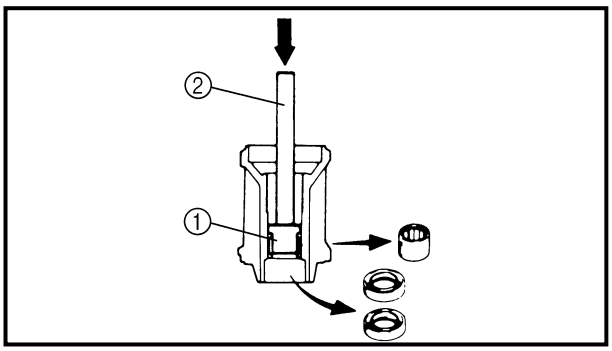


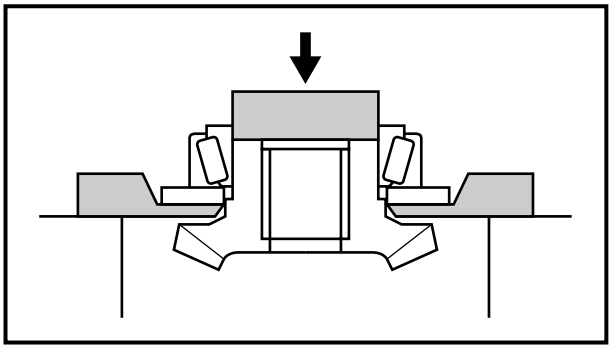
REMOVING THE PROPELLER SHAFT ASSEMBLY

Remove:
- Propeller shaft assembly
- Forward gear assembly

Propeller shaft housing puller . ①
YB-06207 / 90890-06502
Universal puller
YB-06117
Guide plate..... ②
90890-06501
Center bolt ..... ③
90890-06504

PROPELLER SHAFT HOUSING ASSEMBLY (COUNTER ROTATION MODELS)





DISASSEMBLING THE PROPELLER SHAFT HOUSING ASSEMBLY

Remove:
- Oil seal
- Needle bearing

Bearing/oil seal attachment .... ①
YB-06196 / 90890-06653
Driver rod ..... ②
YB-06071 / 90890-06652

DISASSEMBLING THE FORWARD GEAR ASSEMBLY

Remove:
- Tapered roller bearing

Bearing separator
YB-06219 / 90890-06534

CAUTION:

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

INSPECTING THE FORWARD GEAR

Inspect:
- Teeth
- Dogs

Damage/wear → Replace.

INSPECTING THE BEARING

Inspect:
- Bearing

Pitting/rumbling → Replace.

INSPECTING THE PROPELLER SHAFT HOUSING

Inspect:
- Propeller shaft housing

Cracks/damage → Replace.

INSPECTING THE DOG CLUTCH

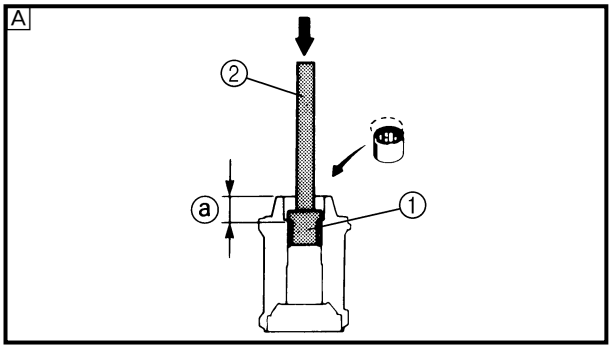
Inspect:
- Dog clutch
  Damage/wear → Replace.

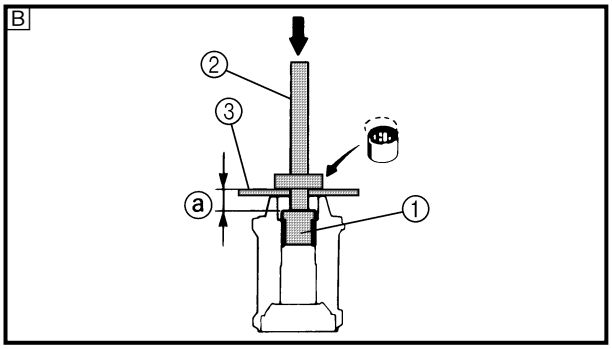
INSPECTING THE PROPELLER SHAFT

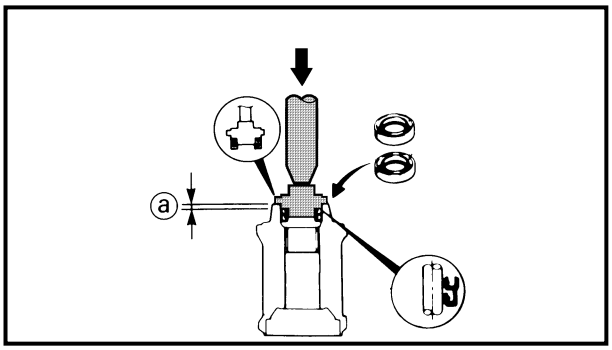
Inspect:
- Propeller shaft
  Damage/wear → Replace.

ASSEMBLING THE PROPELLER SHAFT HOUSING

1. Install:
   - Needle bearing







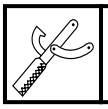
Needle bearing installation position ⓐ
24.75 - 25.25 mm (0.974 - 0.994 in)

Bearing/oil seal attachment .... ①
YB-06196 / 90890-06610
Driver rod ..... ②
YB-06071 / 90890-06604
Bearing/oil seal depth plate .... ③
90890-06603

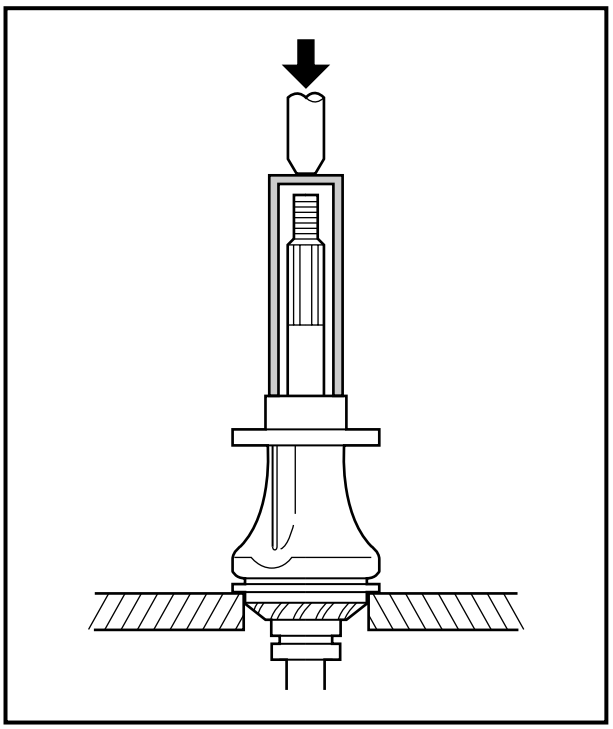
A For USA and Canada
B Except for USA and Canada

2. Install:
   - Oil seal

Oil seal installation position ⓐ
4.75 - 5.25 mm (0.187 - 0.207 in)

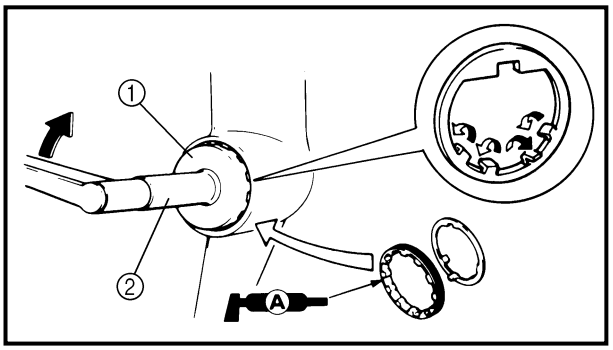


Bearing/oil seal attachment
YB-06195 / 90890-06633



INSTALLING THE PROPELLER SHAFT ASSEMBLY

Install:
- Forward gear assembly
- Propeller shaft assembly



INSTALLING THE PROPELLER SHAFT HOUSING ASSEMBLY

Install:
- Propeller shaft housing assembly
- Claw washer
- Ring nut

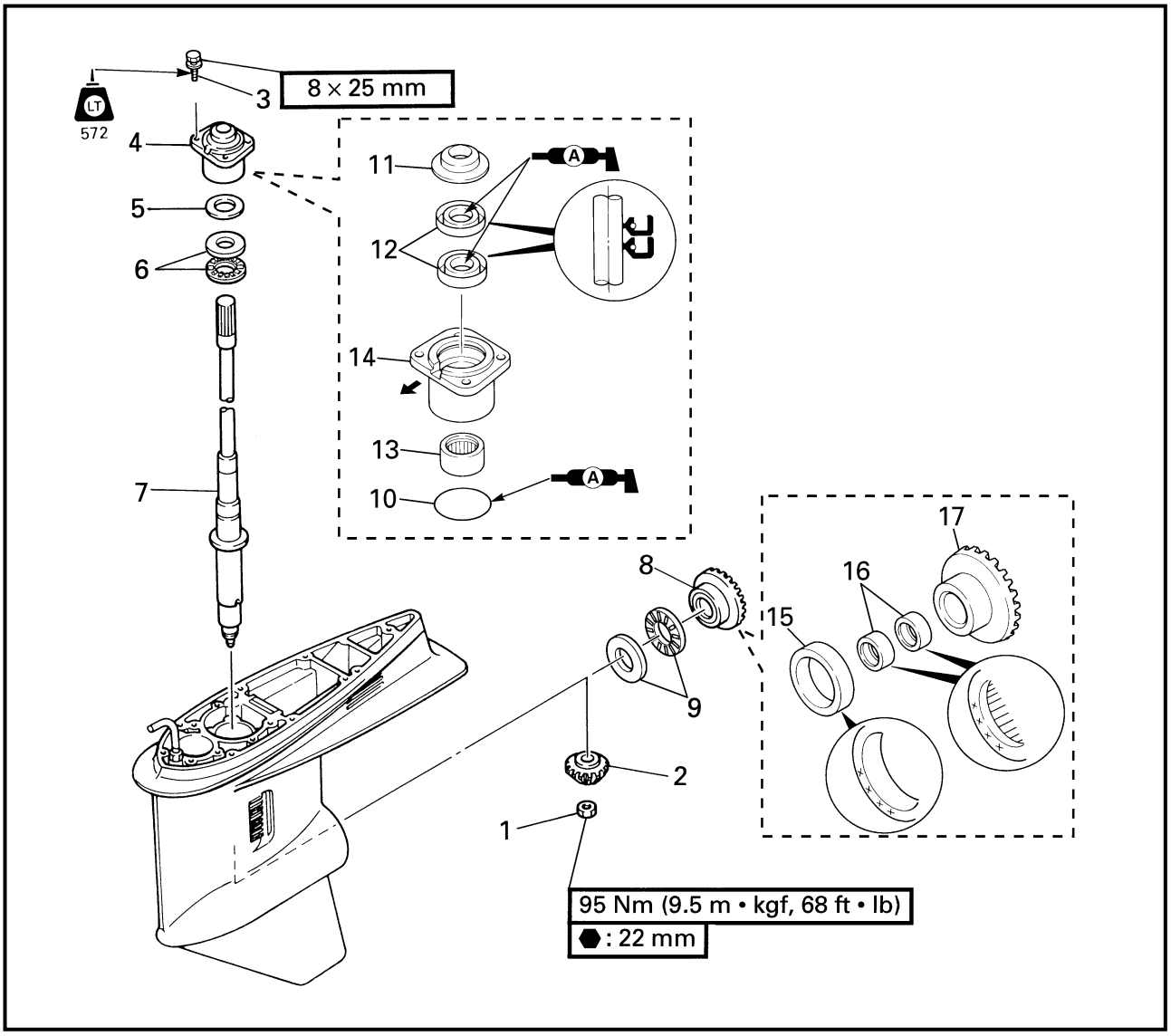
Ring nut wrench ..... ①
YB-34447 / 90890-06512
Ring nut wrench extension ..... ②
90890-06513

NOTE:

To secure the ring nut, bend one tab into the slot in the ring nut and the other tabs toward the propeller shaft housing assembly.

DRIVE SHAFT (COUNTER ROTATION MODELS)

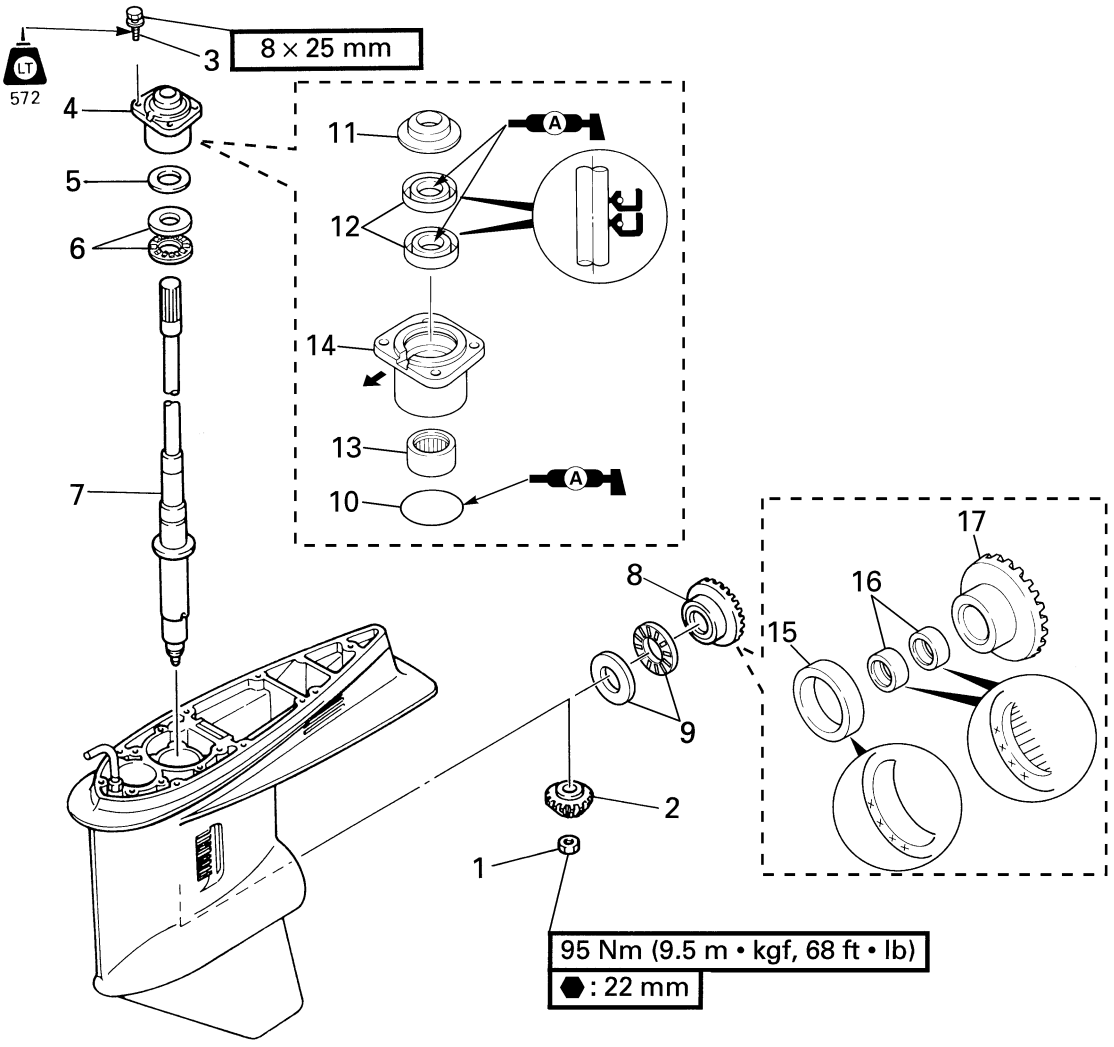
REMOVING/INSTALLING THE DRIVE SHAFT



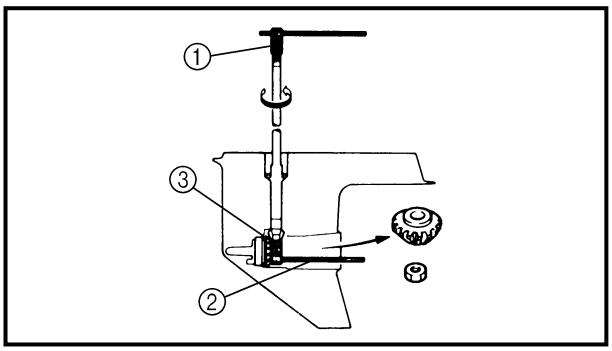
Order	Job/Part	Q'ty	Remarks
	Propeller shaft housing assembly		Refer to "PROPELLER SHAFT HOUSING ASSEMBLY (COUNTER ROTATION MODELS)" on page 6-33.
1	Nut	1	
2	Pinion	1	
3	Bolt	4	(with washer)
4	Drive shaft housing assembly	1	
5	Pinion shim	*	
6	Thrust bearing	1	
7	Drive shaft	1	

Continued on next page.

*: As required



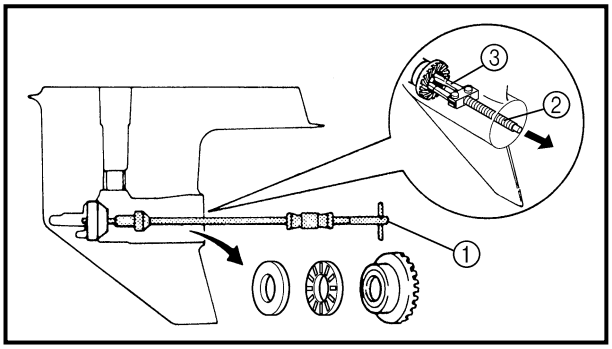
Order	Job/Part	Q'ty	Remarks
8	Reverse gear assembly	1	
9	Thrust bearing	1	
10	O-ring	1	
11	Oil seal cover	1	
12	Oil seal	2	
13	Needle bearing	1	
14	Drive shaft housing	1	
15	Roller bearing inner race	1	
16	Needle bearing	2	
17	Reverse gear	1	
			For installation, reverse the removal procedure.



REMOVING THE DRIVE SHAFT

Loosen:
- Pinion nut

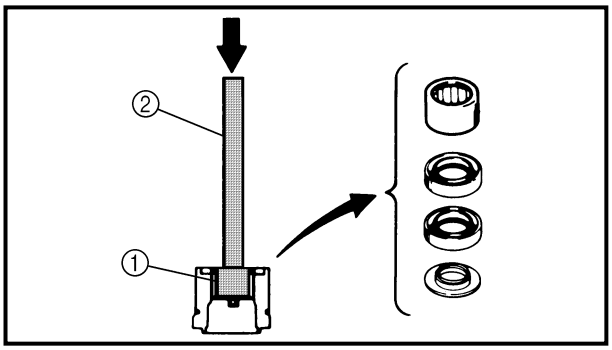
Drive shaft holder ..... ①	**YB-06201 / 90890-06520**
Pinion nut holder ..... ②	**90890-06505**
Pinion nut holder attachment . ③	**90890-06508**



REMOVING THE REVERSE GEAR

Remove:
- Reverse gear assembly
- Thrust bearing

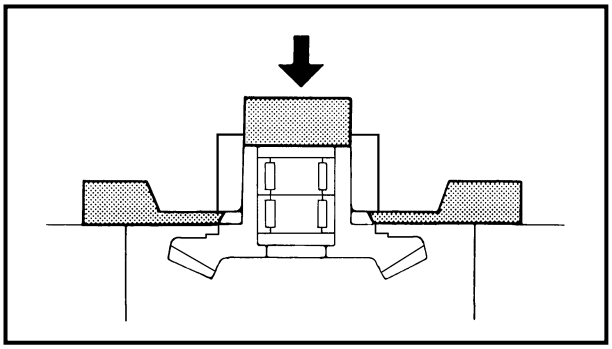
Slide hammer..... ①	**YB-06096**
Bearing puller..... ②	**90890-06535**
Small universal claws ..... ③	**90890-06536**



DISASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY

Remove:
- Needle bearing

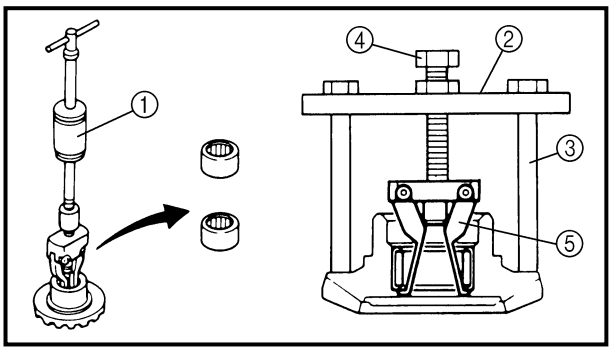
Bearing/oil seal attachment.... ①	**YB-06196 / 90890-06610**
Driver rod ..... ②	**YB-06071 / 90890-06652**



DISASSEMBLING THE REVERSE GEAR ASSEMBLY

1. Remove:
   - Roller bearing inner race

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



2. Remove:
   • Needle bearing

Slide hammer ..... ①
YB-06096
Guide plate ..... ②
90890-06501
Guide plate stand ..... ③
90890-06538
Bearing puller ..... ④
90890-06535
Small universal claws ..... ⑤
90890-06536

INSPECTING THE PINION

Inspect:
• Teeth
Damage/wear → Replace.

INSPECTING THE DRIVE SHAFT

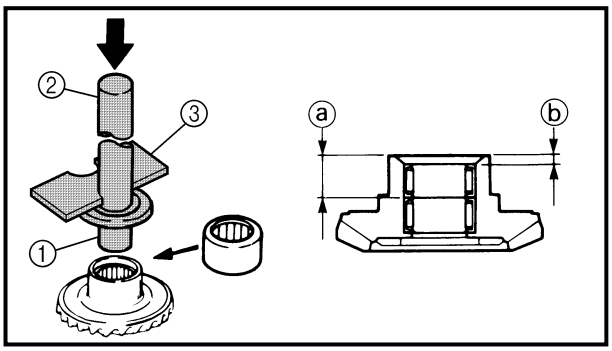
Inspect:
• Drive shaft
Damage/wear → Replace.

INSPECTING THE DRIVE SHAFT HOUSING

Inspect:
• Drive shaft housing
Cracks/damage → Replace.

INSPECTING THE BEARINGS

Inspect:
• Bearings
Pitting/rumbling → Replace.

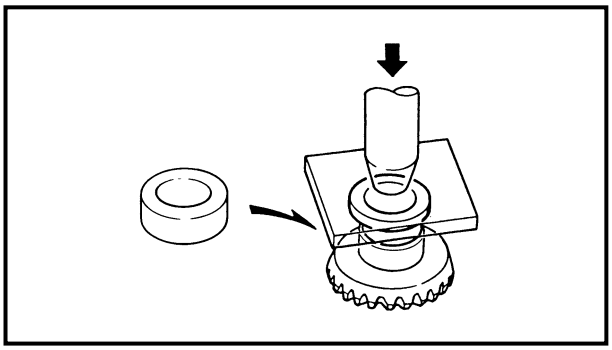


ASSEMBLING THE REVERSE GEAR ASSEMBLY

1. Install:
   • Needle bearing

Needle bearing installation position ⓐ
21.0 - 21.4 mm (0.827 - 0.843 in)
Needle bearing installation position ⓑ
4.5 - 4.9 mm (0.177 - 0.193 in)

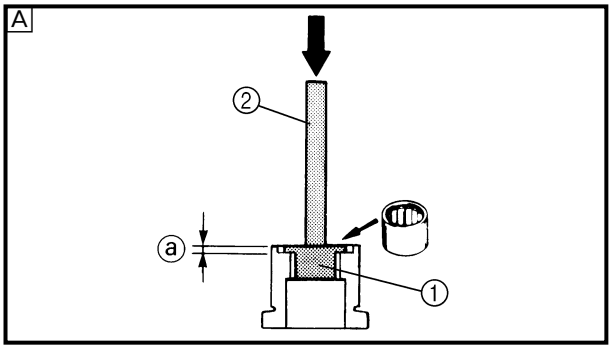
Bearing/oil seal attachment .... ①
YB-06200 / 90890-06612
Driver rod ..... ②
YB-06071 / 90890-06604
Bearing/oil seal depth plate .... ③
90890-06603



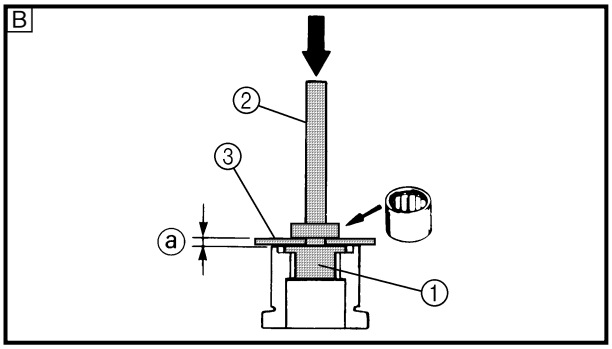
2. Install:
   • Roller bearing inner race

Bearing/oil seal attachment
90890-06660

A



B



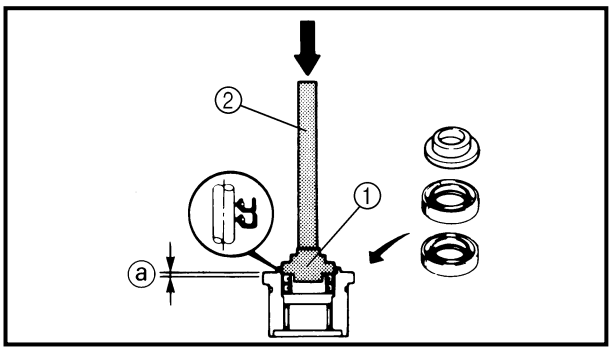
ASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY

1. Install:
   • Needle bearing

Position ⓐ
5.75 - 6.25 mm (0.226 - 0.246 in)

Bearing/oil seal attachment .... ①
YB-06196 / 90890-06610
Driver rod ..... ②
YB-06071 / 90890-06604
Bearing/oil seal depth plate .... ③
90890-06603

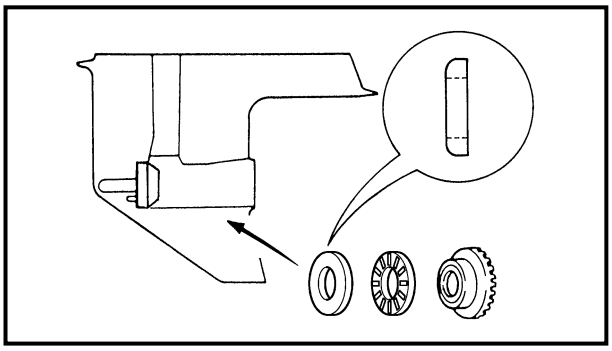
A For USA and Canada
B Except for USA and Canada



2. Install:
   • Oil seal

Oil seal installation position ⓐ
0.25 - 0.75 mm (0.010 - 0.030 in)

Bearing/oil seal attachment .... ①
YB-06195 / 90890-06633
Driver rod ..... ②
YB-06071 / 90890-06652



INSTALLING THE REVERSE GEAR

Install:
- Thrust bearing
- Reverse gear assembly

NOTE:
Install the thrust bearing onto the reverse gear assembly and position the thrust bearing so its rounded side faces away from the reverse gear.

INSTALLING THE DRIVE SHAFT

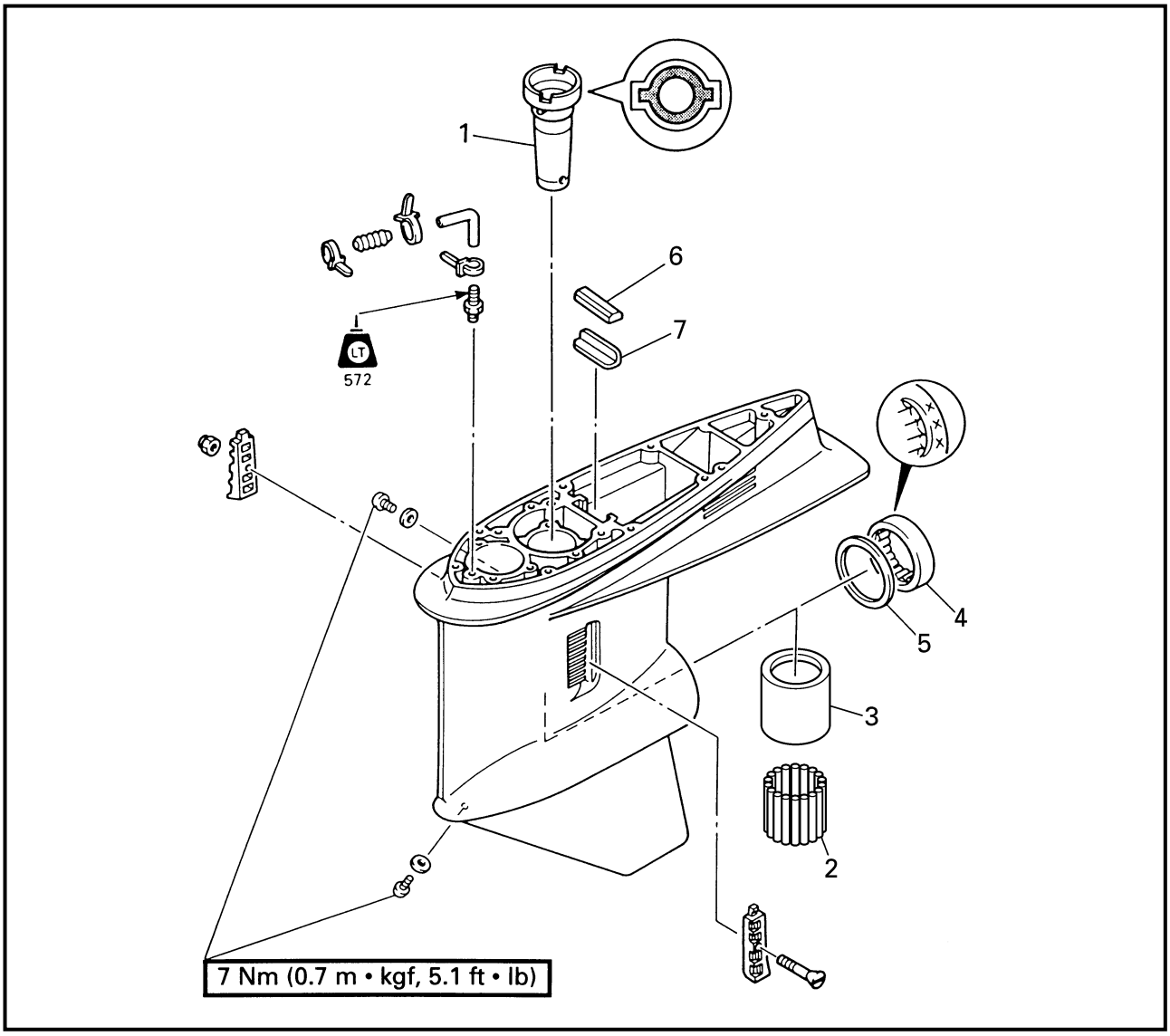
Tighten:
- Pinion nut

Pinion nut
95 Nm (9.5 m • kgf, 68 ft • lb)

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

LOWER CASE ASSEMBLY (COUNTER ROTATION MODELS)

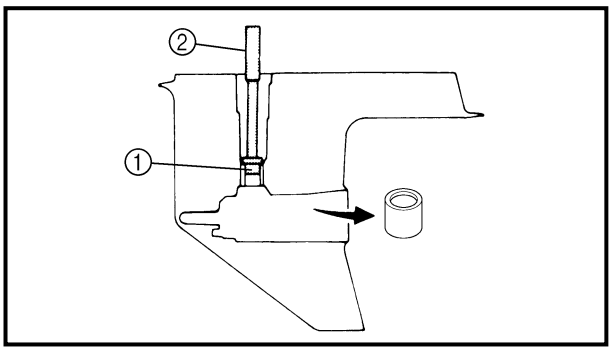
DISASSEMBLING/ASSEMBLING THE LOWER CASE ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Reverse gear		Refer to "DRIVE SHAFT (COUNTER ROTATION MODELS)" on page 6-41.
1	Drive shaft sleeve	1	
2	Needle bearing	18	
3	Needle bearing outer case	1	
4	Roller bearing	1	
5	Reverse gear shim	*	
6	Water seal	1	
7	Plate	1	
			For assembly, reverse the disassembly procedure.

*: As required

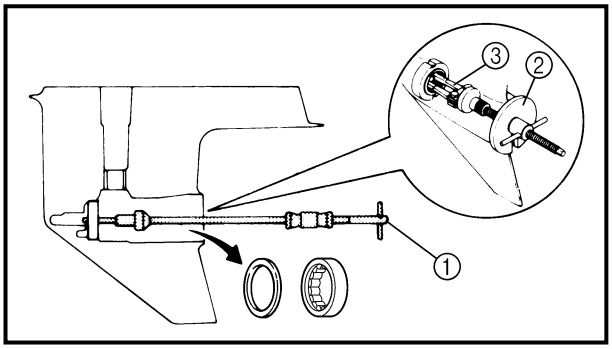
LOWER CASE ASSEMBLY (COUNTER ROTATION MODELS)



DISASSEMBLING THE LOWER CASE ASSEMBLY

1. Remove:
   • Needle bearing outer race

Bearing/oil seal attachment .... ①
YB-06194 / 90890-06636
Driver rod ..... ②
YB-06071 / 90890-06605



2. Remove:
   • Roller bearing

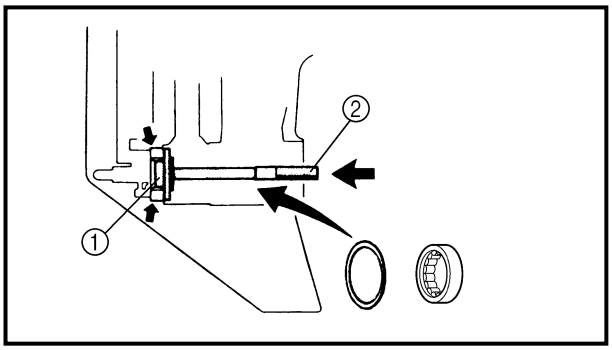
Slide hammer..... ①
YB-06096
Bearing puller..... ②
90890-06523
Large universal claws..... ③
90890-06532

INSPECTING THE DRIVE SHAFT SLEEVE

Inspect:
• Drive shaft sleeve
Damage/wear → Replace.

INSPECTING THE NEEDLE BEARING

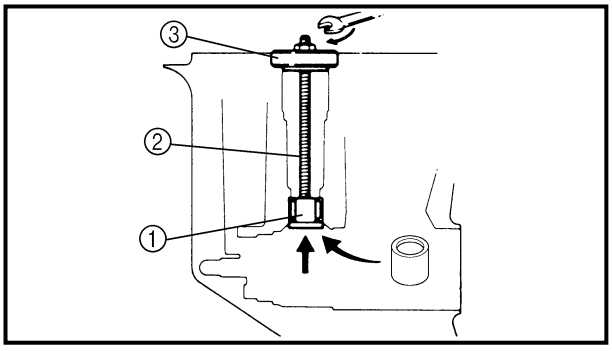
Inspect:
• Needle bearing
Pitting/rumbling → Replace.



ASSEMBLING THE LOWER CASE ASSEMBLY

1. Install:
   • Roller bearing

Bearing/oil seal attachment .... ①
YB-06336 / 90890-06629
Driver rod ..... ②
YB-06071 / 90890-06605

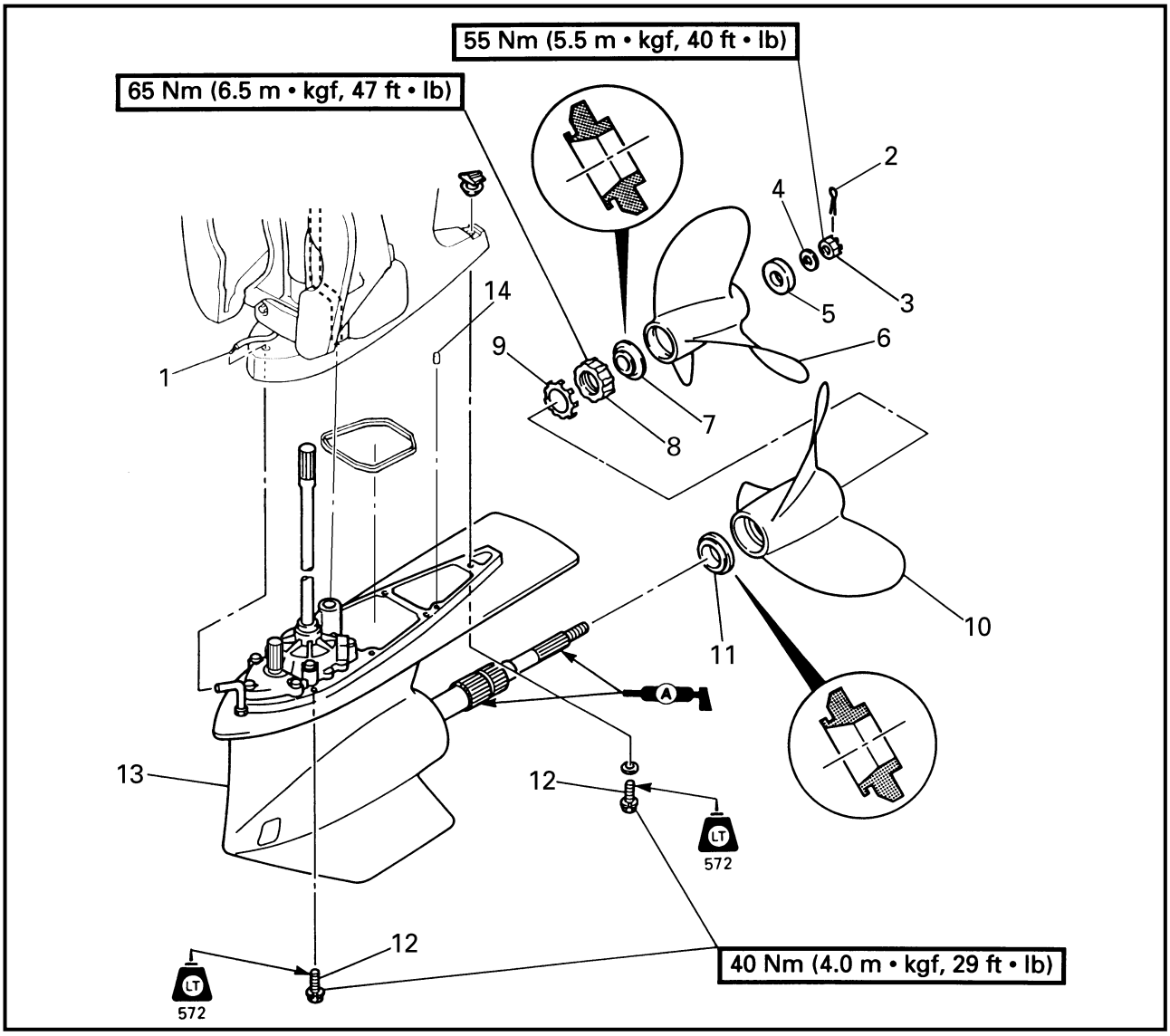


2. Install:
   • Needle bearing outer race

Bearing/oil seal attachment .... ①
YB-06246 / 90890-06636
Bearing puller..... ②
YB-06029 / 90890-06523
Needle bearing installation plate ..... ③
YB-06247

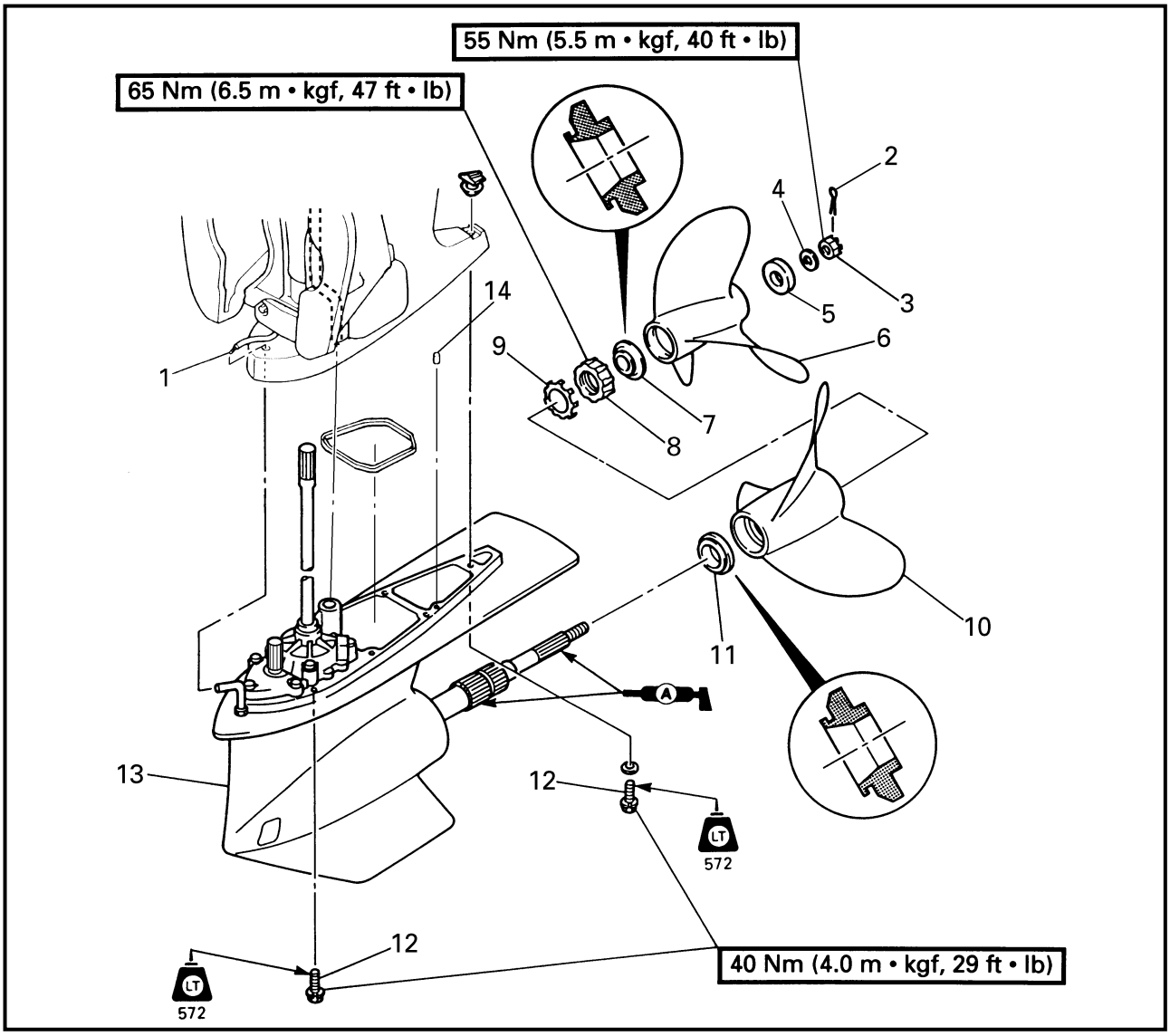
LOWER UNIT (DUAL PROPELLER MODELS)

REMOVING/INSTALLING THE LOWER UNIT

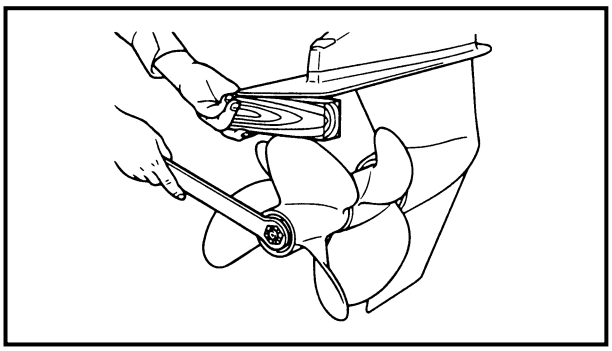


Order	Job/Part	Q'ty	Remarks
1	Speedometer hose	1	
2	Cotter pin	1	
3	Propeller nut	1	
4	Washer	1	
5	Washer	1	
6	Rear propeller	1	
7	Rear spacer	1	
8	Propeller nut	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
9	Toothed washer	1	
10	Forward propeller	1	
11	Forward spacer	1	
12	Bolt	7	(with washer)
13	Lower unit	1	
14	Dowel pin	2	
			For installation, reverse the removal procedure.



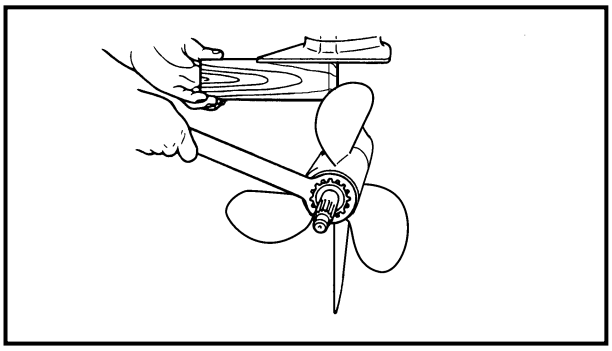
REMOVING THE PROPELLERS

1. Remove:
   • Rear propeller

⚠ WARNING

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

2. Straighten:
   • Toothed washer teeth



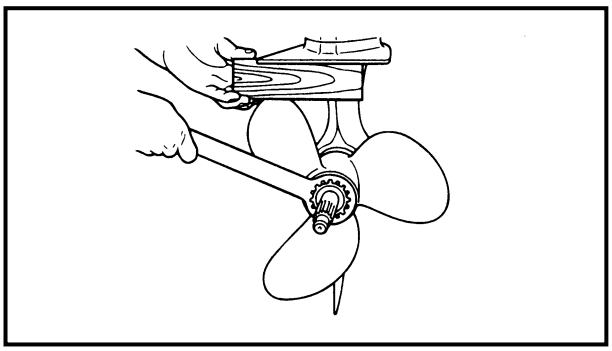
3. Remove:
   • Forward propeller

⚠ WARNING

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

INSPECTING THE PROPELLERS

Inspect:
• Blades
• Splines
Cracks/damage/wear → Replace.

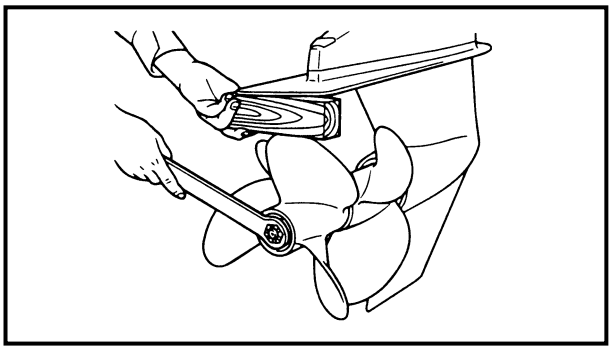


INSTALLING THE PROPELLERS

1. Install:
   • Forward propeller

⚠ WARNING

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



2. Bend:
   • Toothed washer teeth
3. Install:
   • Rear propeller

⚠ WARNING

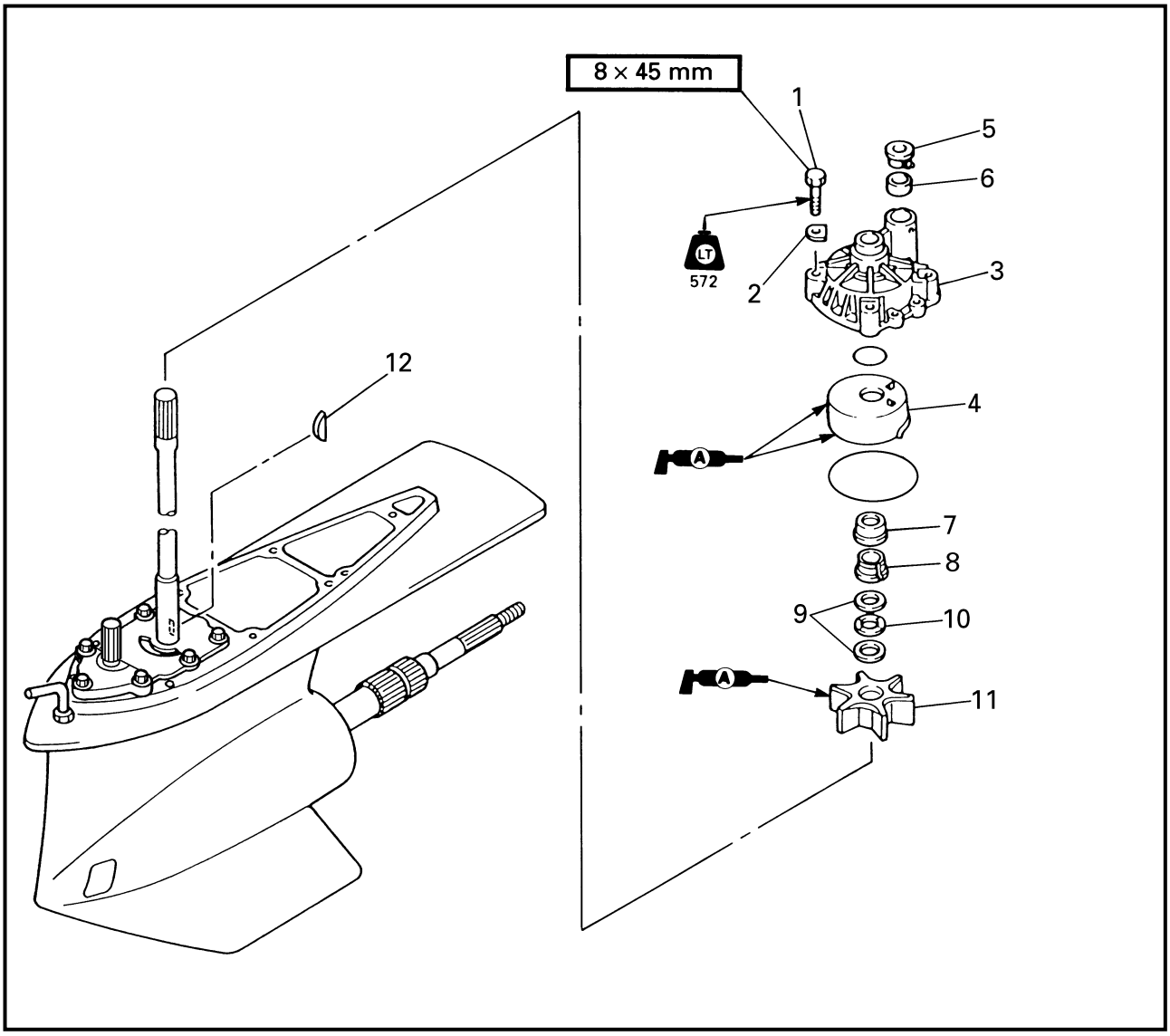
Do not hold the propeller with your hands when removing or installing it. Be sure to remove the battery leads from the batteries and the lanyard engine stop switch. Put a block of wood between the cavitation plate and propeller to keep the propeller from turning.

NOTE:

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

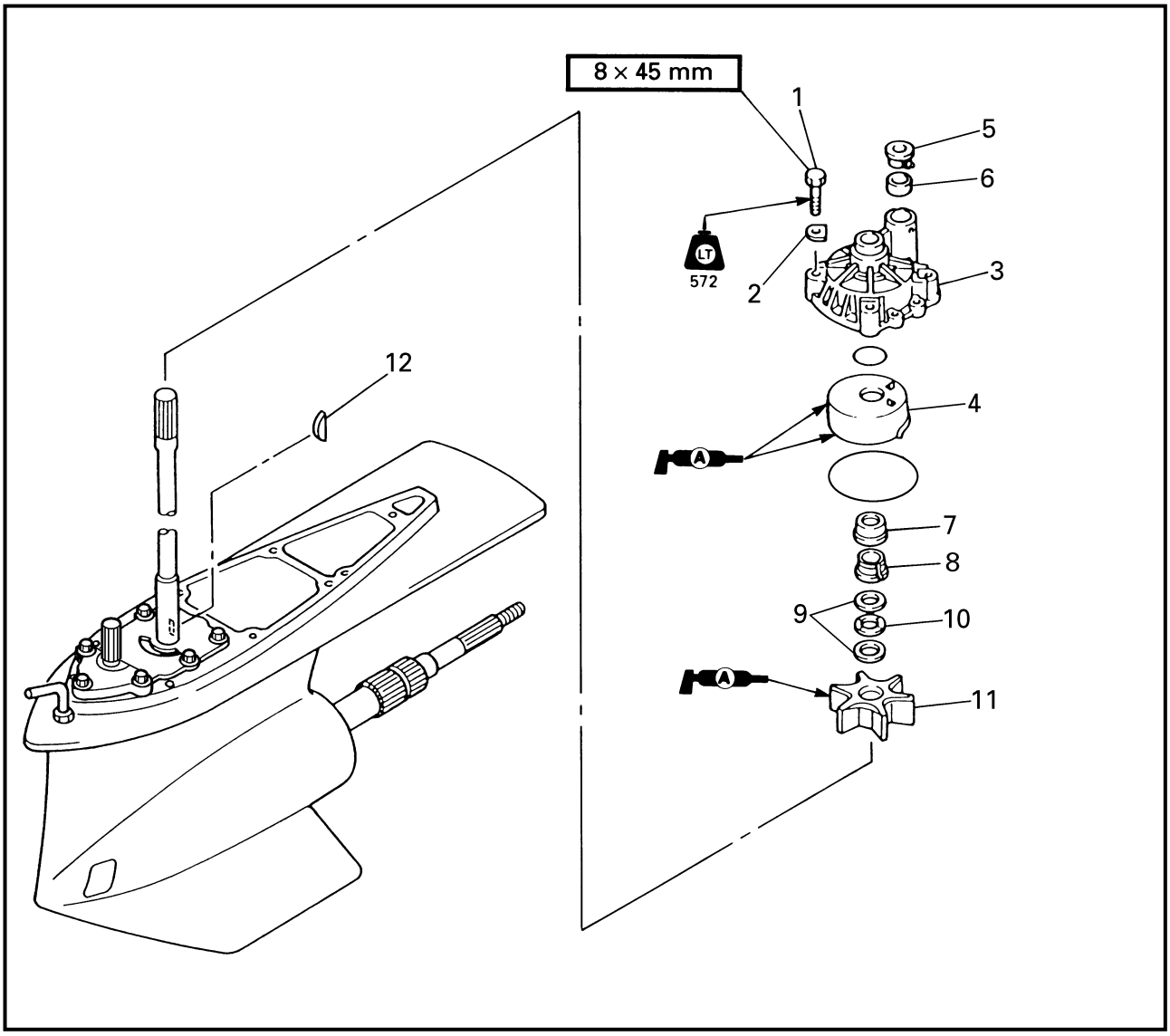
WATER PUMP (DUAL PROPELLER MODELS)

REMOVING/INSTALLING THE WATER PUMP



Order	Job/Part	Q'ty	Remarks
	Lower unit		Refer to "LOWER UNIT (DUAL PROPELLER MODELS)" on page 6-49.
1	Bolt	4	
2	Plate washer	4	
3	Impeller housing	1	
4	Impeller housing cup	1	
5	Grommet	1	
6	Spacer	1	
7	Drive shaft collar	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Spacer	1	
9	Washer	2	
10	Wave washer	1	
11	Impeller	1	
12	Woodruff key	1	
			For installation, reverse the removal procedure.

INSPECTING THE IMPELLER HOUSING

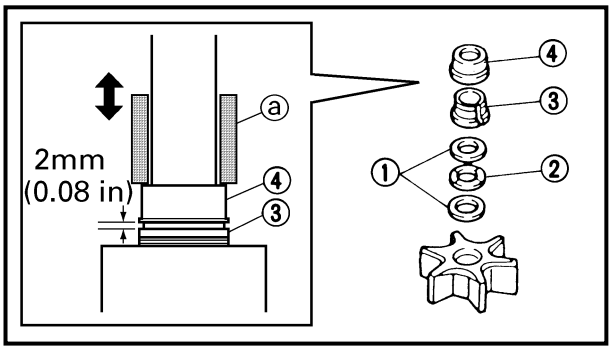
Inspect:
- Impeller housing
  Cracks/damage → Replace.

INSPECTING THE IMPELLER AND IMPELLER HOUSING CUP

Inspect:
- Impeller
- Impeller housing cup
  Cracks/damage → Replace any defective parts.

INSPECTING THE WOODRUFF KEY

Inspect:
- Woodruff key
  Damage/wear → Replace.

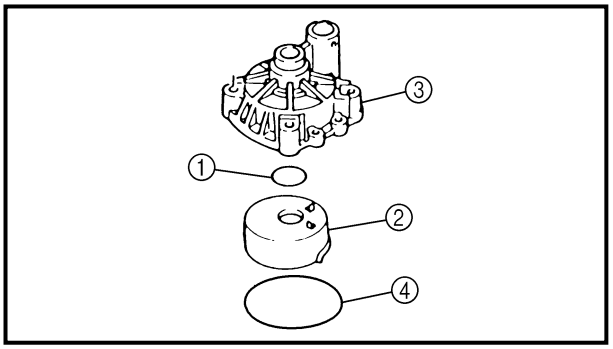


INSTALLING THE IMPELLER AND IMPELLER HOUSING

1. Install:
   - Washers ①
   - Wave washer ②
   - Spacer ③
   - Collar ④

NOTE:
- The collar and spacer should fit together firmly.
- Install the collar with some appropriate tool ⓐ that fits over the drive shaft as shown.

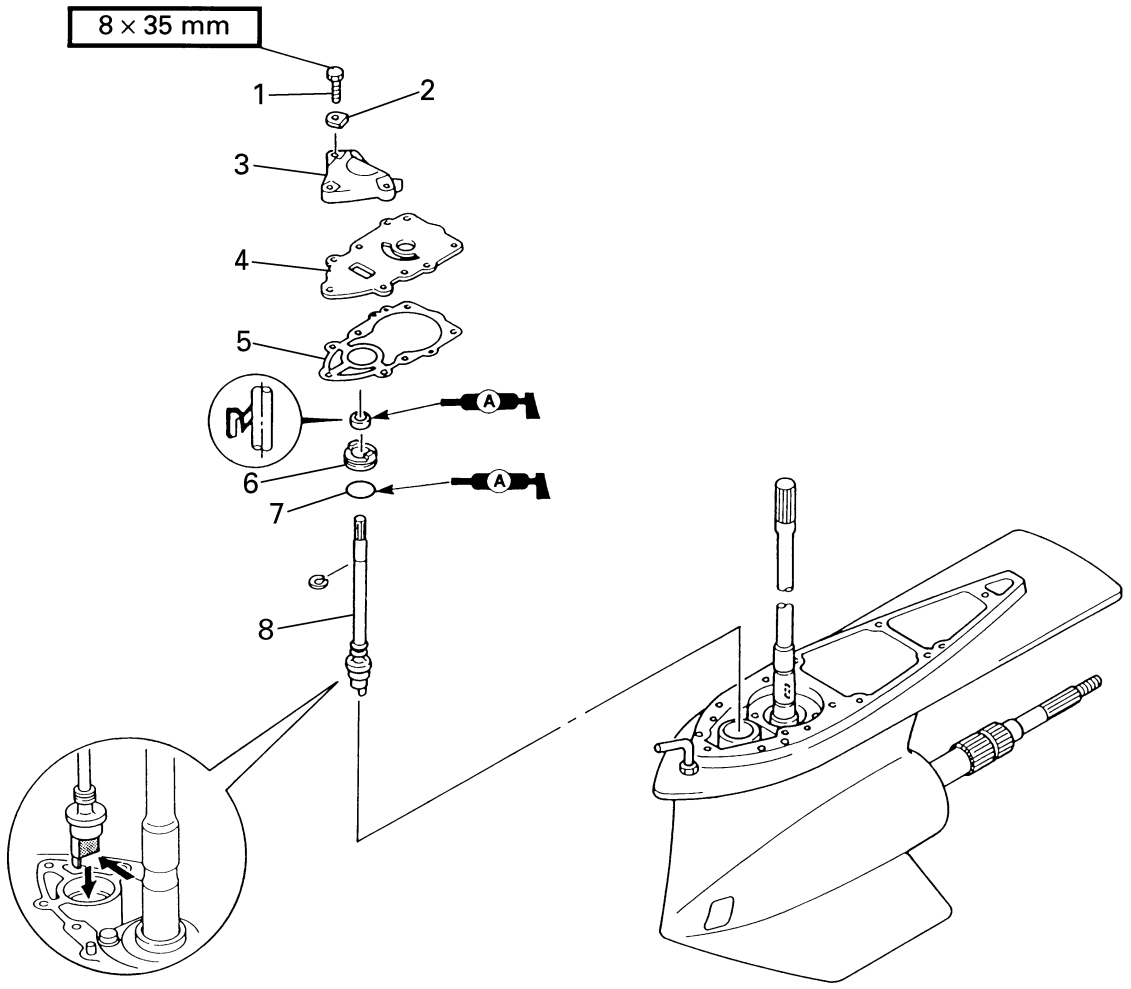
2. Install:
   - O-ring ①
   - Impeller housing cup ②
   - Impeller housing ③
   - O-ring ④



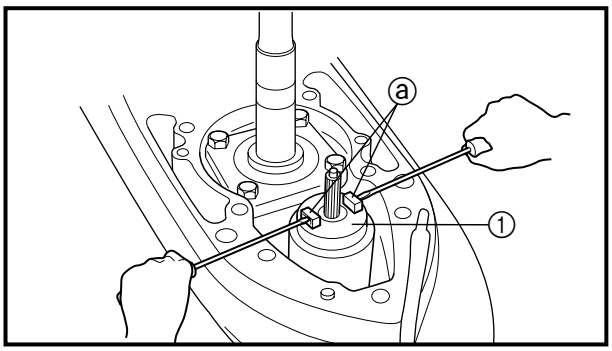
NOTE:
- When installing the impeller housing cup, align its projection with the hole in the impeller housing.
- When installing the water pump housing, turn the drive shaft clockwise.

SHIFT ROD (DUAL PROPELLER MODELS)

REMOVING/INSTALLING THE SHIFT ROD



Order	Job/Part	Q'ty	Remarks
	Woodruff key		Refer to "WATER PUMP (DUAL PROPELLER MODELS)" on page 6-53.
1	Bolt	3	(with washer)
2	Plate washer	3	
3	Oil seal housing cover	1	
4	Impeller plate	1	
5	Gasket	1	**Not reusable**
6	Oil seal housing	1	**Not reusable**
7	O-ring	1	
8	Shift rod	1	
			For installation, reverse the removal procedure.



REMOVING THE SHIFT ROD

1. Remove:
   • Oil seal housing

Removing steps

(1) Insert a flat-head screwdriver under each projection ⓐ.
(2) Alternating between each side of the oil seal housing ①, slowly lift the oil seal housing until it is fully removed from the lower unit.

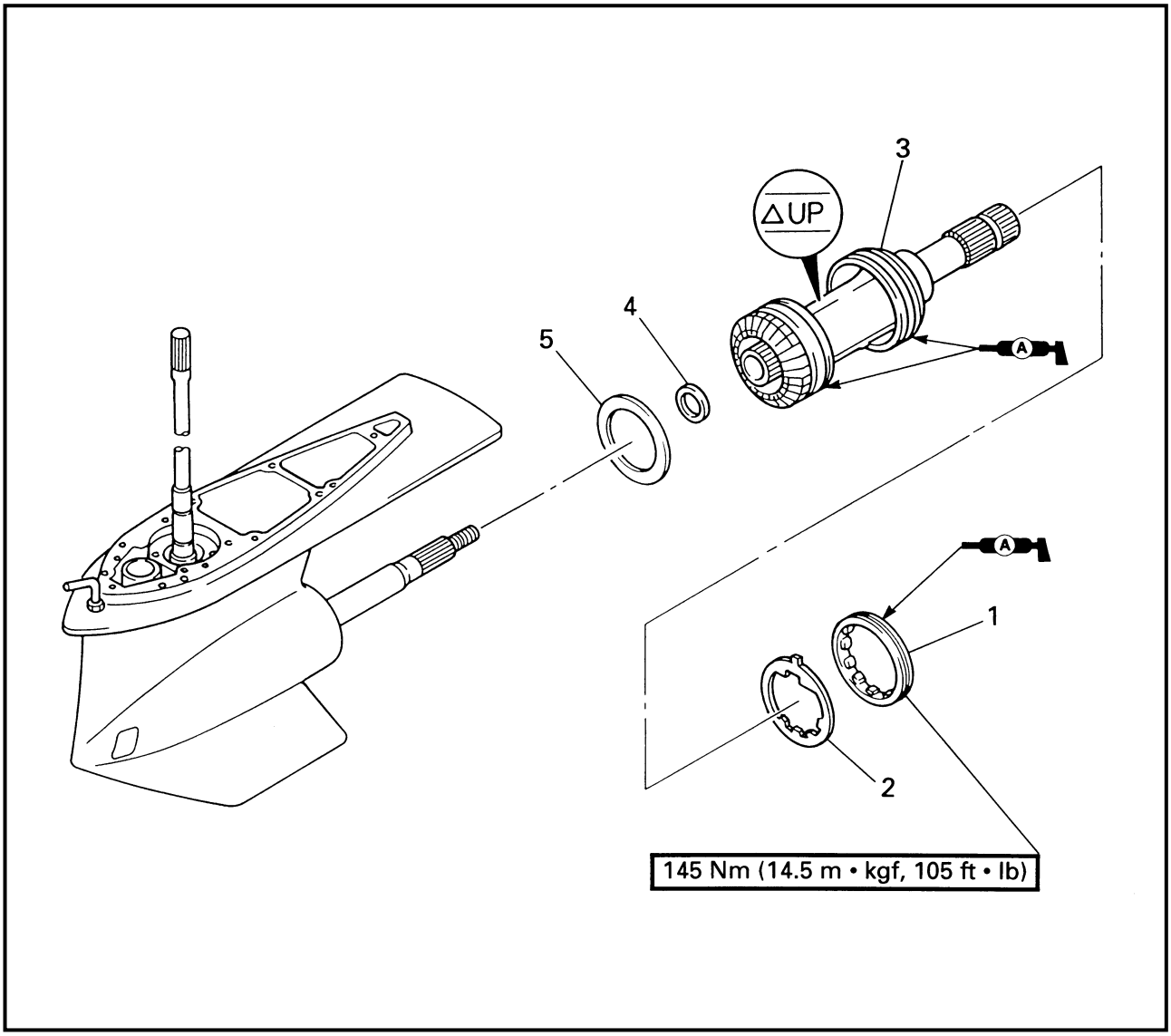
2. Remove:
   • Shift rod

NOTE:

Remove the shift rod when it is in the neutral position.

PROPELLER SHAFT HOUSING ASSEMBLY (DUAL PROPELLER MODELS)

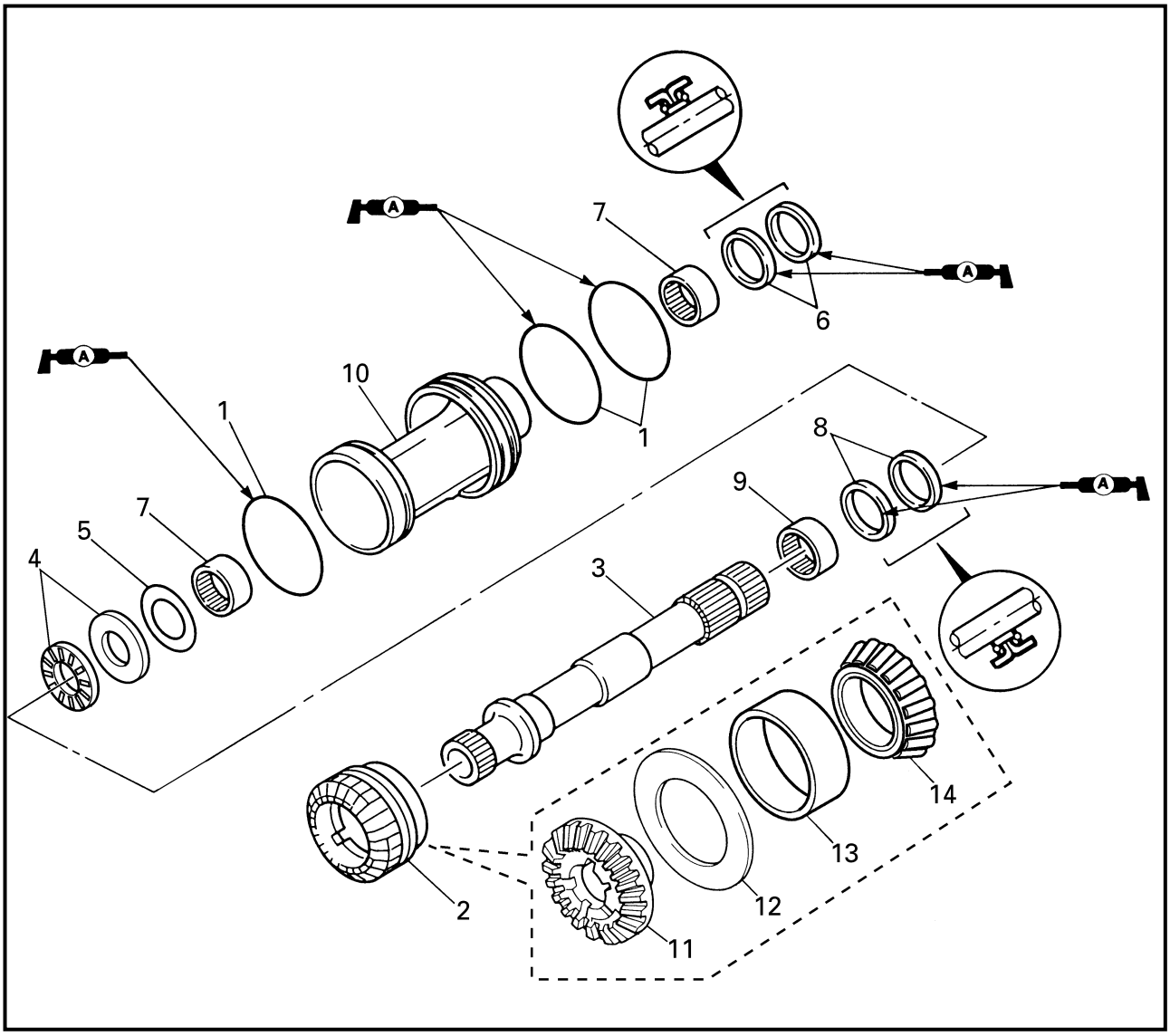
REMOVING/INSTALLING THE PROPELLER SHAFT HOUSING ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Gear oil		Refer to "CHANGING AND INSPECTING THE GEAR OIL" on page 3-17.
1	Ring nut	1	
2	Claw washer	1	
3	Propeller shaft housing assembly	1	
4	Washer	1	
5	Rear gear shim	*	
			For installation, reverse the removal procedure.

*: As required

DISASSEMBLING/ASSEMBLING THE PROPELLER SHAFT HOUSING ASSEMBLY

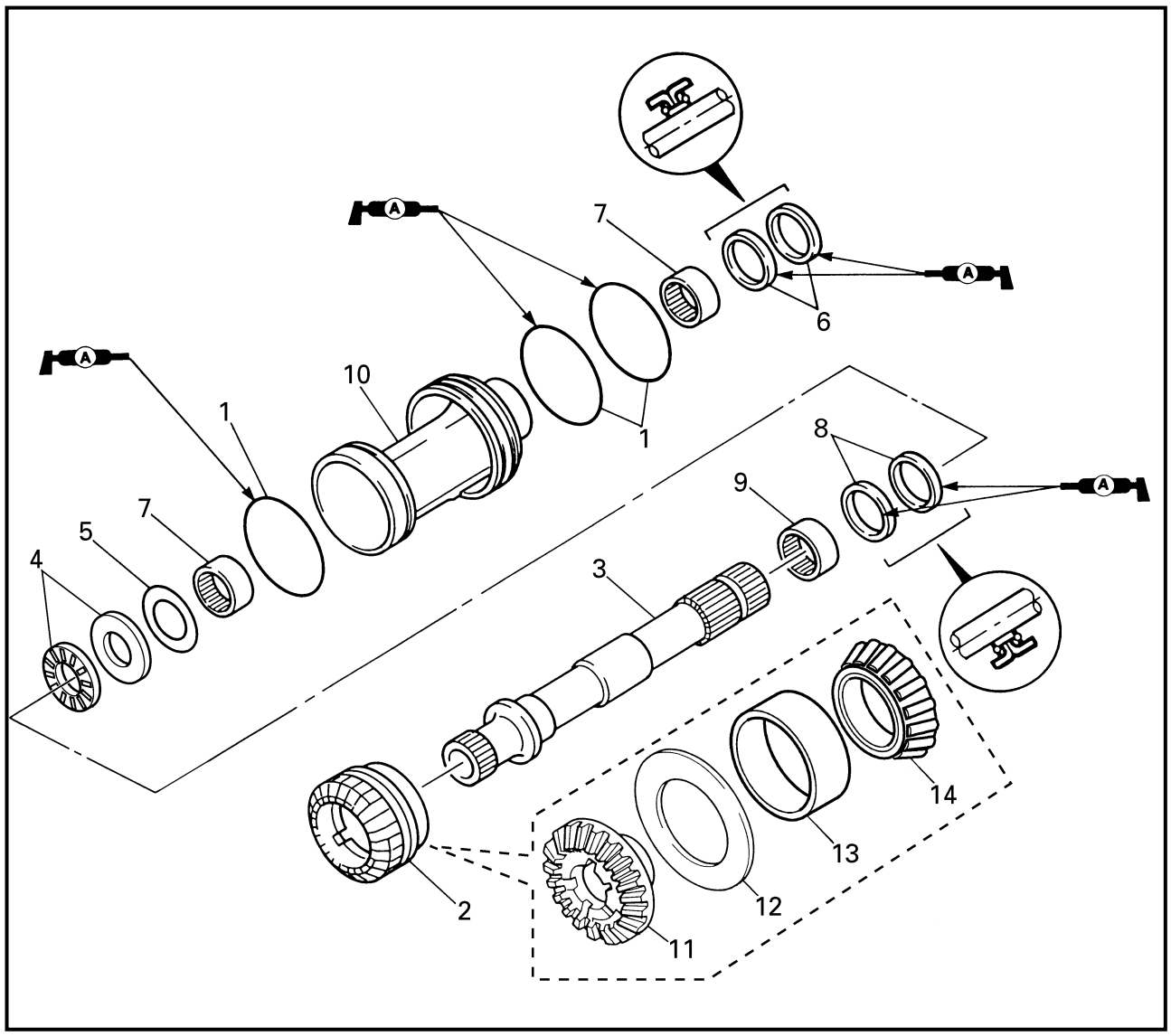


Order	Job/Part	Q'ty	Remarks
1	O-ring	3	
2	Rear gear assembly	1	
3	Outer propeller shaft	1	
4	Thrust bearing	1	
5	Outer propeller shaft shim	*	
6	Oil seal	2	
7	Needle bearing	2	

Continued on next page.

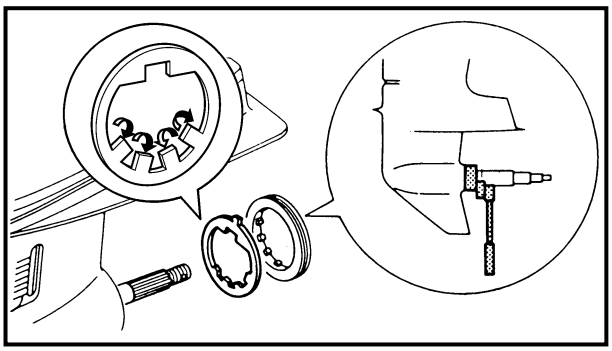
*: As required

PROPELLER SHAFT HOUSING ASSEMBLY (DUAL PROPELLER MODELS)



Order	Job/Part	Q'ty	Remarks
8	Oil seal	2	
9	Needle bearing	1	
10	Propeller shaft housing	1	
11	Rear gear	1	
12	Thrust washer	1	
13	Tapered roller bearing outer race	1	
14	Tapered roller bearing	1	
			For assembly, reverse the disassembly procedure.

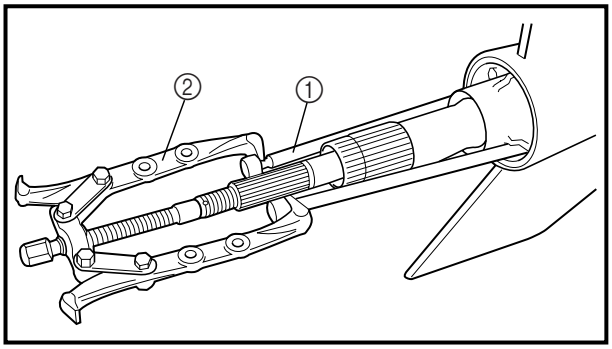
PROPELLER SHAFT HOUSING ASSEMBLY (DUAL PROPELLER MODELS)



REMOVING THE PROPELLER SHAFT HOUSING ASSEMBLY

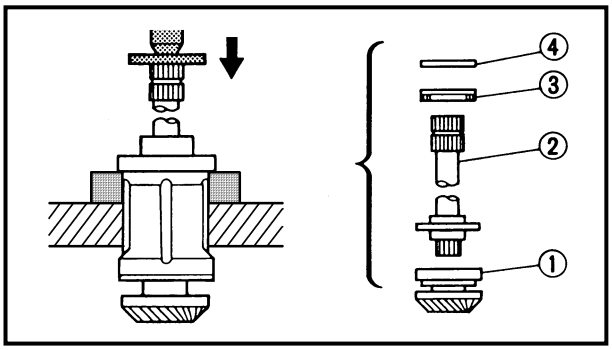
1. Straighten:
   - Claw washer tabs
2. Remove:
   - Ring nut
   - Claw washer

	**Ring nut wrench** **YB-42223**



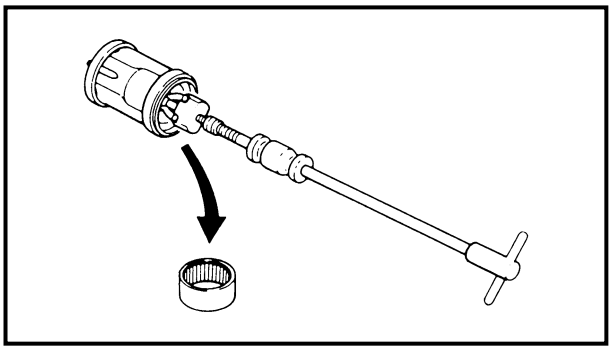
3. Remove:
   - Propeller shaft housing

	**Propeller shaft housing puller . ①** **YB-06502 / 90890-06502** **Universal puller..... ②** **YB-06540 / 90890-06540**



REMOVING THE OUTER PROPELLER SHAFT

Remove:
- Rear gear assembly ①
- Outer propeller shaft ②
- Thrust bearing ③
- Outer propeller shaft shim ④

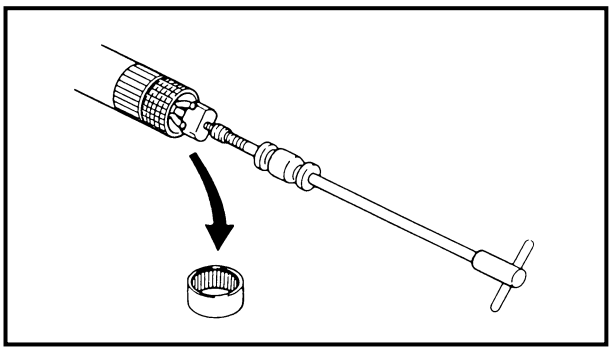


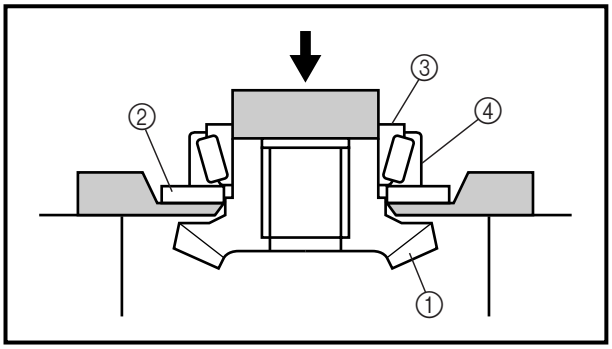
DISASSEMBLING THE PROPELLER SHAFT HOUSING ASSEMBLY

Remove:
- Needle bearing

	**Slide hammer** **YB-06096**

PROPELLER SHAFT HOUSING ASSEMBLY (DUAL PROPELLER MODELS)





DISASSEMBLING THE OUTER PROPELLER SHAFT ASSEMBLY

Remove:
- Needle bearing

	Slide hammer **YB-06096**

REMOVING THE REAR GEAR ASSEMBLY

Remove:
- Rear gear ①
- Thrust washer ②
- Tapered roller bearing ③
- Tapered roller bearing outer race ④

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

INSPECTING THE BEARINGS

Inspect:
- Needle bearing
- Thrust bearing
- Tapered roller bearing

  Pitting/rumbling → Replace.

INSPECTING THE PROPELLER SHAFT HOUSING

Inspect:
- Propeller shaft housing

  Cracks/damage → Replace.

INSPECTING THE OUTER PROPELLER SHAFT

Inspect:
- Splines

  Damage/wear → Replace.

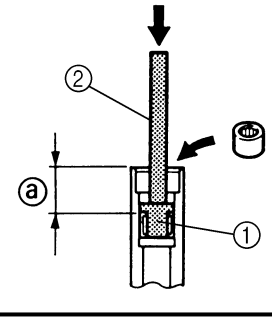
INSPECTING THE REAR GEAR

Inspect:
- Teeth
- Dogs

  Damage/wear → Replace.

PROPELLER SHAFT HOUSING ASSEMBLY (DUAL PROPELLER MODELS)

A



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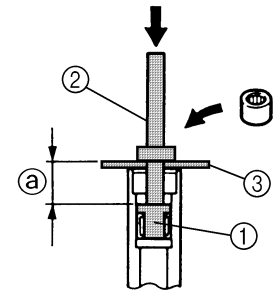

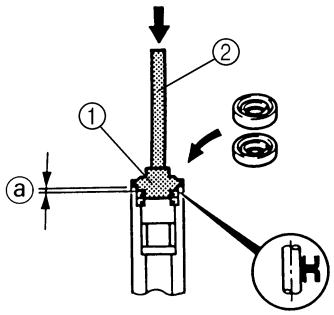

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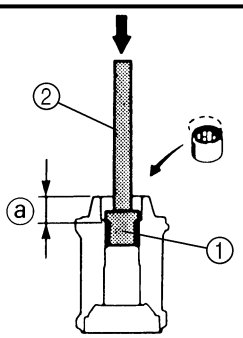

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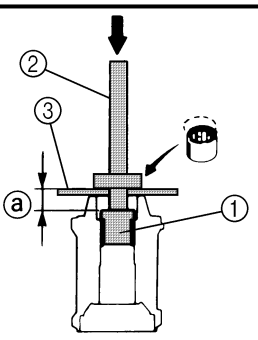


ASSEMBLING THE OUTER PROPELLER SHAFT ASSEMBLY

1. Install:
   - Needle bearing

Needle bearing installation position ⓐ
34.75 - 35.25 mm
(1.368 - 1.388 in)

Bearing/oil seal attachment .... ①
YB-42225 / 90890-06653
Driver rod ..... ②
YB-06071 / 90890-06604
Bearing/oil seal depth plate .... ③
90890-06603

A For USA and Canada
B Except for USA and Canada

2. Install:
   - Oil seal

Oil seal installation position ⓐ
2.75 - 3.25 mm (0.108 - 0.128 in)

Bearing/oil seal attachment .... ①
YB-42225 / 90890-06636
Driver rod ..... ②
YB-06071 / 90890-06606

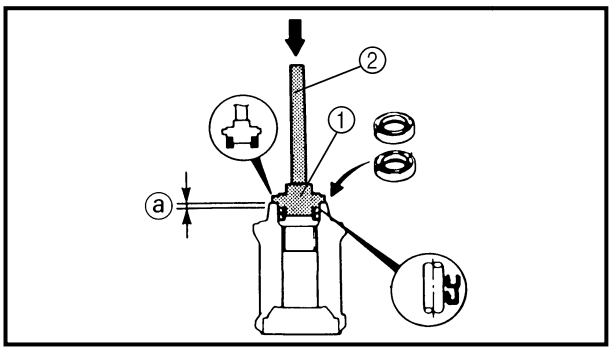
ASSEMBLING THE PROPELLER SHAFT HOUSING ASSEMBLY

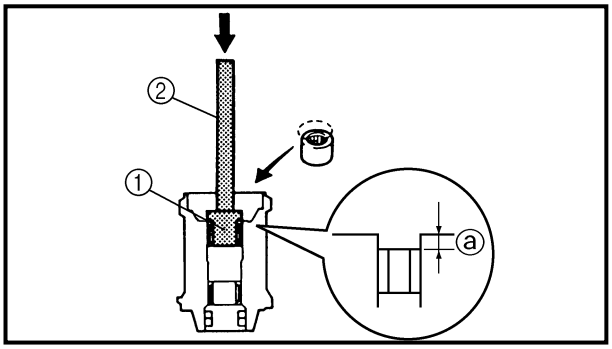
1. Install:
   - Rear needle bearing

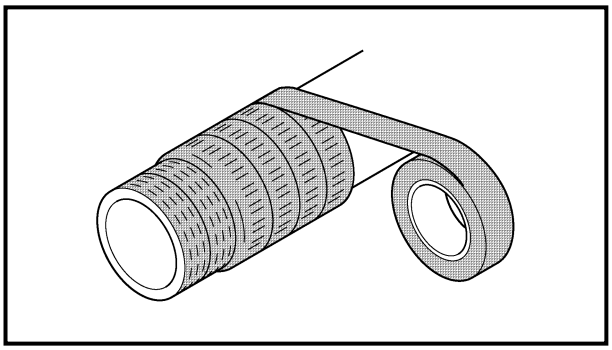
Rear needle bearing installation position ⓐ
24.75 - 25.25 mm
(0.974 - 0.994 in)

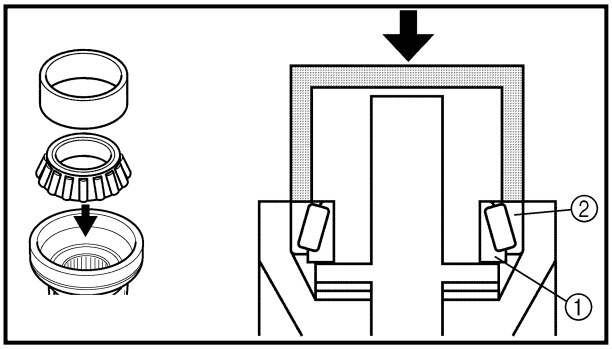
Bearing/oil seal attachment .... ①
YB-42227 / 90890-06607
Driver rod ..... ②
YB-06071 / 90890-06604
Bearing/oil seal depth plate .... ③
90890-06603

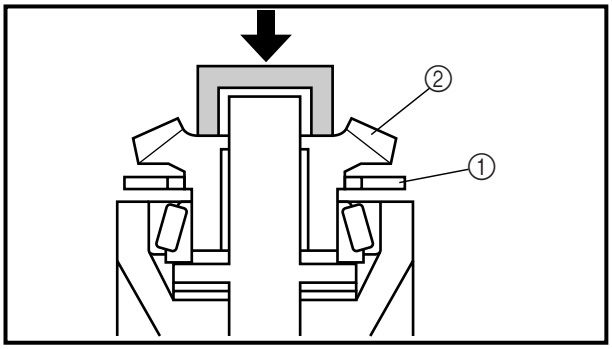
A For USA and Canada
B Except for USA and Canada











2. Install:
   • Oil seal

Oil seal installation position ⓐ
4.75 - 5.25 mm (0.187 - 0.207 in)

Bearing/oil seal attachment .... ①
YB-42227 / 90890-06623
Driver rod ..... ②
YB-06071 / 90890-06606

3. Install:
   • Front needle bearing

Front needle bearing installation position ⓐ
0.75 - 1.25 mm (0.030 - 0.049 in)

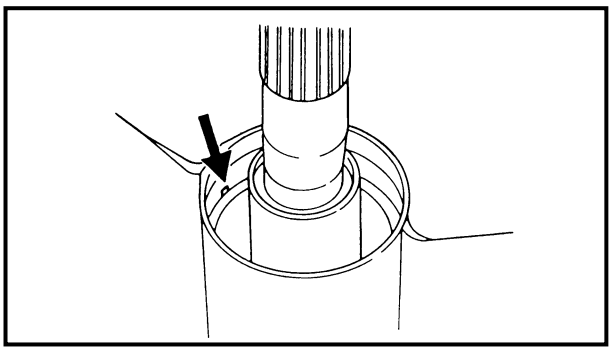
Bearing/oil seal attachment .... ①
YB-42229 / 90890-06607
Driver rod ..... ②
YB-06071 / 90890-06604

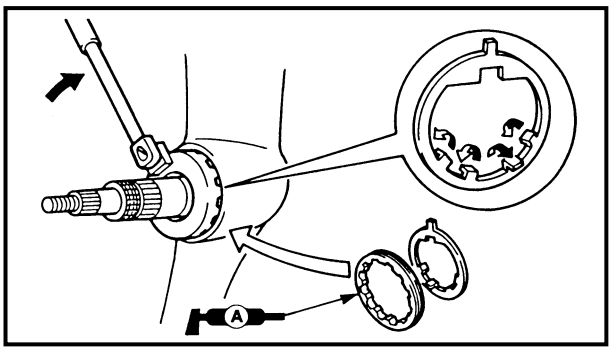
4. Install:
   • Outer propeller shaft

NOTE:
When installing the outer propeller shaft into the propeller shaft housing assembly, wrap the entire threaded and splined portion of the outer propeller shaft to protect the oil seal lip from damage.

5. Install:
   • Tapered roller bearing ①
   • Tapered roller bearing outer race ②

6. Install:
   • Thrust washer ①
   • Rear gear ②





INSTALLING THE PROPELLER SHAFT HOUSING ASSEMBLY

1. Install:
   - Propeller shaft housing assembly

NOTE:

Engage the pinion with the rear gear by turning the drive shaft to the right and left. Then, push the propeller shaft housing assembly into the lower case until the claw washer's insertion slot comes out.

2. Install:
   - Claw washer
   - Ring nut

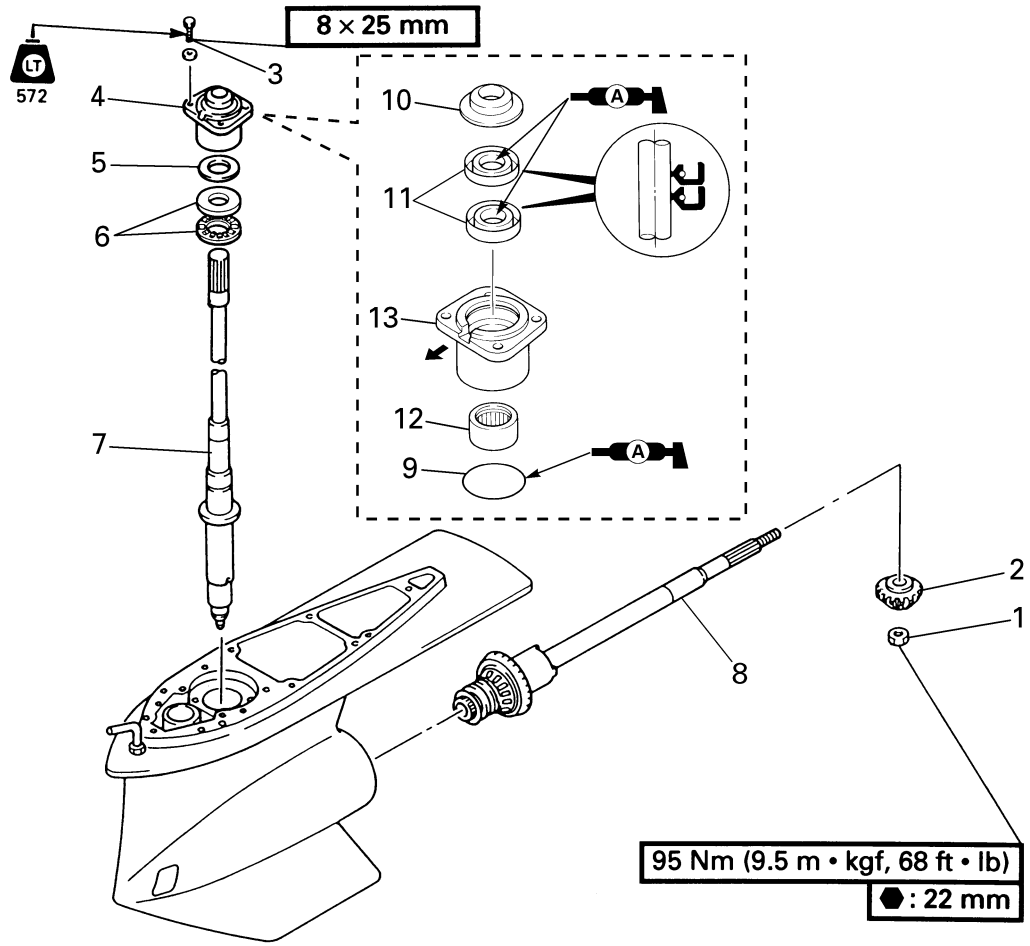
	Ring nut wrench **YB-42223**

NOTE:

- To secure the ring nut, bend one tab into the slot in the ring nut and the other tabs toward the propeller shaft housing assembly
- Check that the outer propeller shaft turns smoothly by turning the drive shaft clockwise.

DRIVE SHAFT (DUAL PROPELLER MODELS)

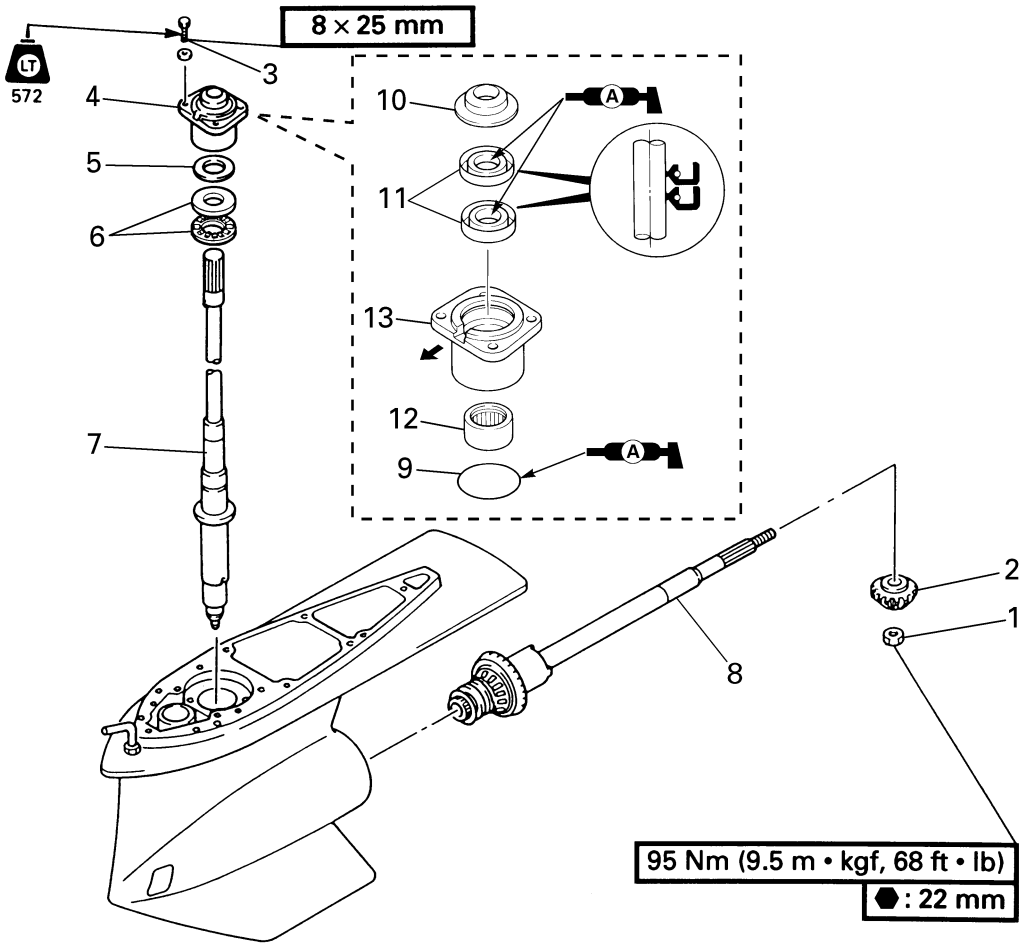
REMOVING/INSTALLING THE DRIVE SHAFT



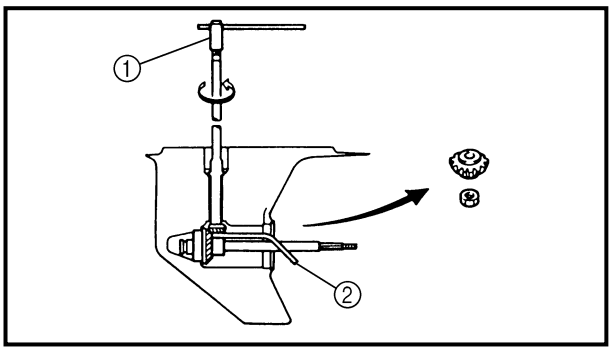
Order	Job/Part	Q'ty	Remarks
	Propeller shaft housing assembly		Refer to "PROPELLER SHAFT HOUSING ASSEMBLY (DUAL PROPELLER MODELS)" on page 6-58.
	Shift rod		Refer to "SHIFT ROD (DUAL PROPELLER MODELS)" on page 6-56.
1	Nut	1	
2	Pinion	1	
3	Bolt	4	
4	Drive shaft housing assembly	1	
5	Pinion shim	*	

Continued on next page.

*: As required



Order	Job/Part	Q'ty	Remarks
6	Thrust bearing	1	
7	Drive shaft	1	
8	Inner propeller shaft assembly	1	
9	O-ring	1	
10	Oil seal cover	1	
11	Oil seal	2	
12	Needle bearing	1	
13	Drive shaft housing	1	
			For installation, reverse the removal procedure.



REMOVING THE DRIVE SHAFT

Loosen:
- Pinion nut

Drive shaft holder ..... ① **YB-06201 / 90890-06520**	
Pinion nut holder ..... ② **YB-42224**	

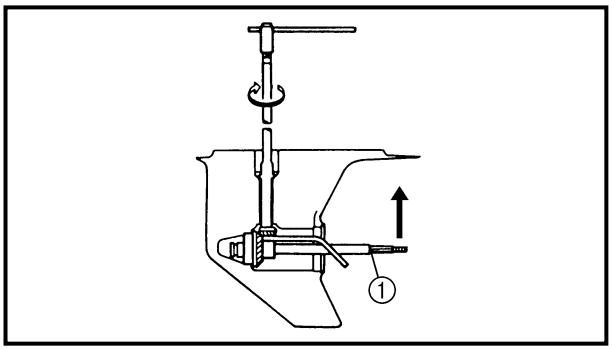
NOTE:
- First, loosen the drive shaft housing assembly bolts. Then, pull up the drive shaft and insert the pinion nut holder.
- Retighten the drive shaft housing assembly bolts and then loosen the pinion nut.

INSPECTING THE PINION

Inspect:
- Teeth
  Damage/wear → Replace.

INSPECTING THE DRIVE SHAFT

Inspect:
- Drive shaft
  Damage/wear → Replace.

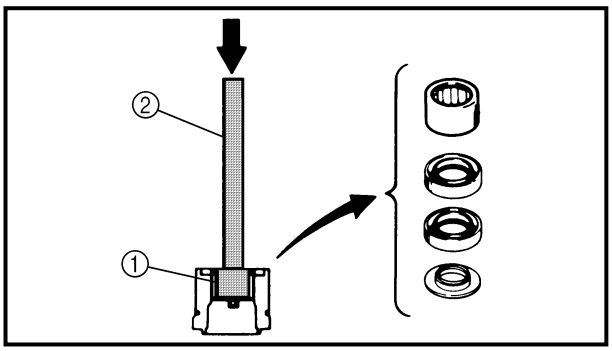


INSTALLING THE DRIVE SHAFT

Tighten:
- Pinion nut

Pinion nut **95 Nm (9.5 m • kgf, 68 ft • lb)**	

NOTE:
- Tighten the pinion nut with the same tools that were used for removal.
- Tighten the pinion nut while slightly lifting the inner propeller shaft assembly ①.



DISASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY

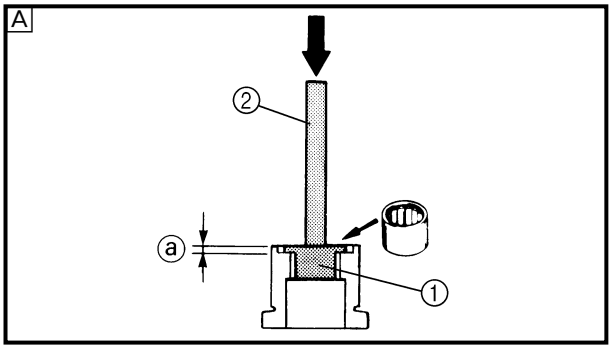
Remove:
- Needle bearing

Bearing/oil seal attachment .... ①
YB-06196 / 90890-06610
Driver rod ..... ②
YB-06071 / 90890-06652

INSPECTING THE DRIVE SHAFT HOUSING

Inspect:
- Drive shaft housing
  Cracks/damage → Replace.

A



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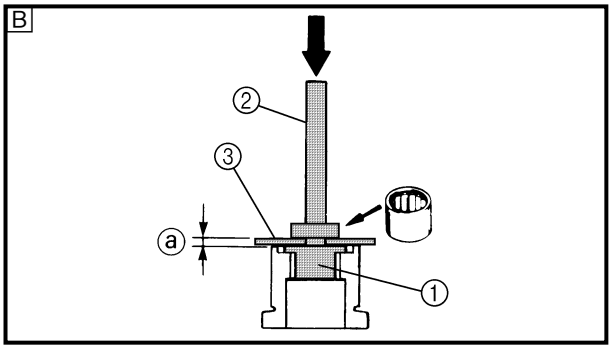
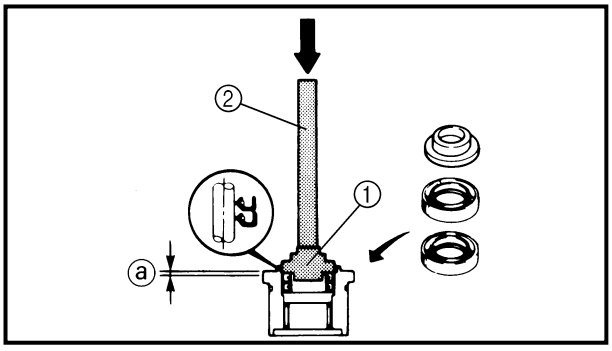




ASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY

1. Install:
   - Needle bearing

Position ⓐ
5.75 - 6.25 mm (0.226 - 0.246 in)

Bearing/oil seal attachment .... ①
YB-06196 / 90890-06610
Driver rod ..... ②
YB-06071 / 90890-06604
Bearing/oil seal depth plate .... ③
90890-06603

A For USA and Canada
B Except for USA and Canada

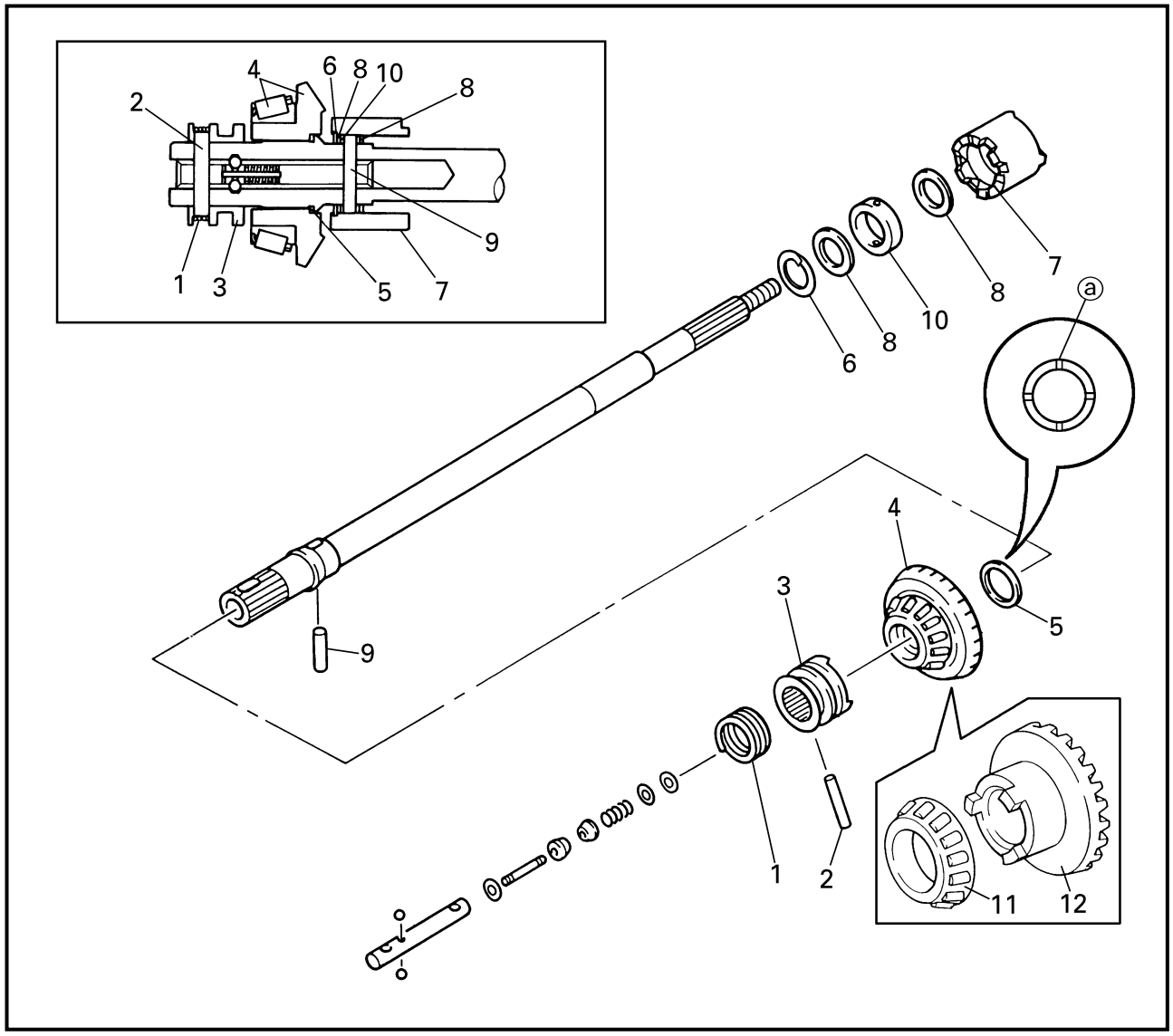
2. Install:
   - Oil seal

Oil seal installation position ⓐ
0.25 - 0.75 mm (0.010 - 0.030 in)

Bearing/oil seal attachment .... ①
YB-06195 / 90890-06633
Driver rod ..... ②
YB-06071 / 90890-06652

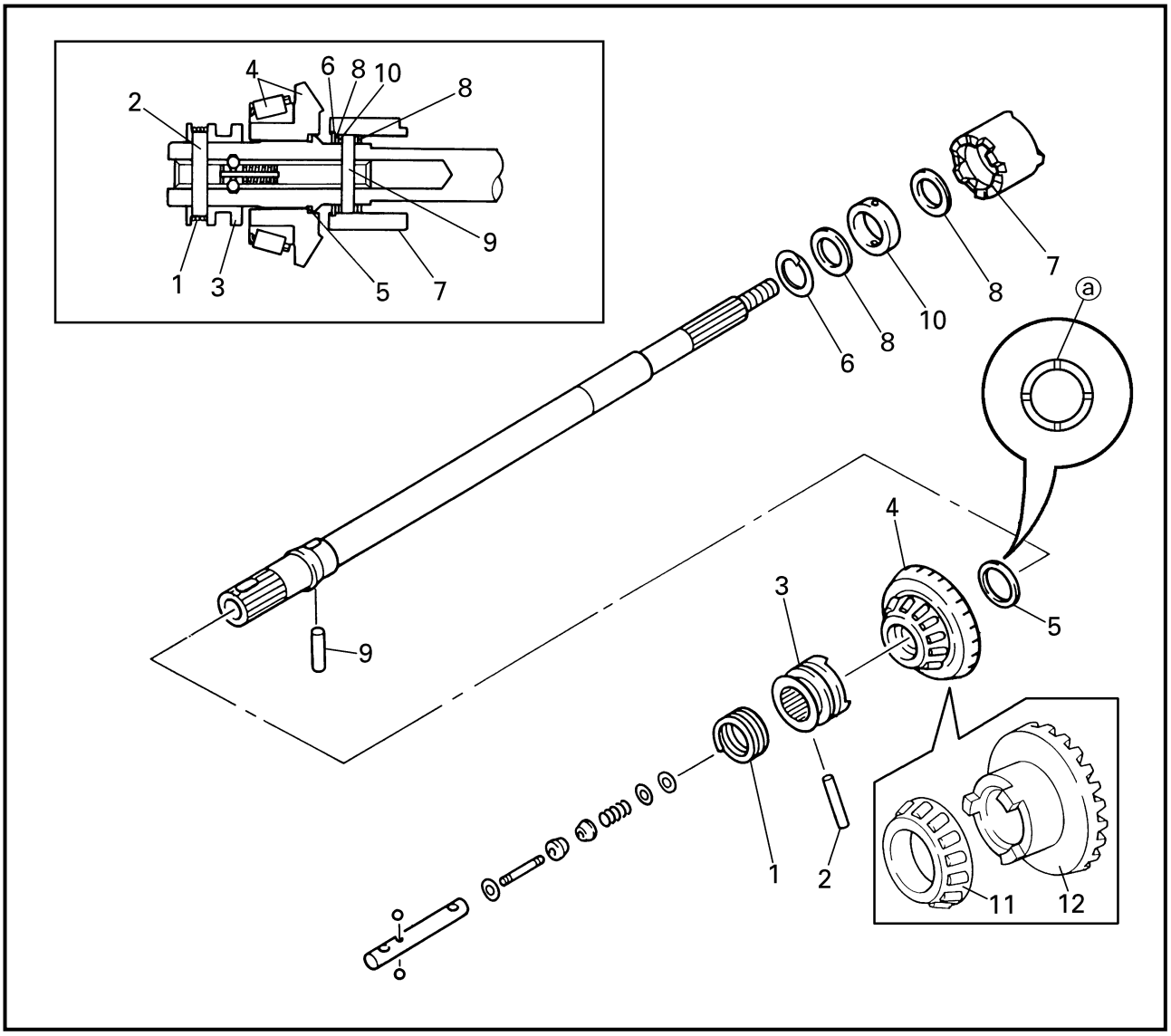
INNER PROPELLER SHAFT ASSEMBLY (DUAL PROPELLER MODELS)

DISASSEMBLING/ASSEMBLING THE INNER PROPELLER SHAFT ASSEMBLY

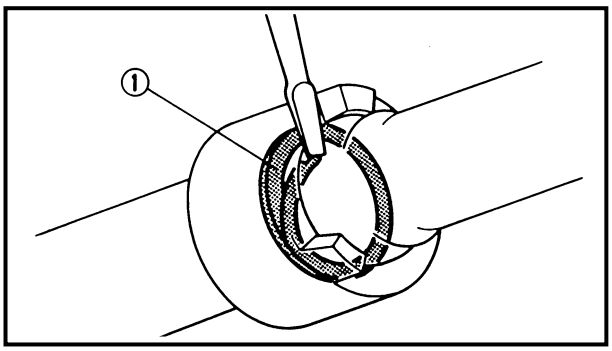


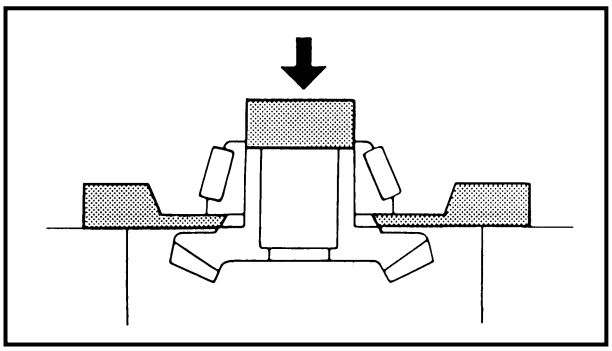
Order	Job/Part	Q'ty	Remarks
1	Spring	1	
2	Pin	1	
3	Front dog clutch	1	
4	Front gear assembly	1	
5	Washer	1	(with oil groove ⓐ)
6	Spring	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
7	Rear dog clutch	1	
8	Washer	2	
9	Pin	1	
10	Collar	1	
11	Tapered roller bearing	1	**Not reusable**
12	Front gear	1	
			For assembly, reverse the disassembly procedure.





REMOVING THE SPRING

Remove:
- Spring ①

NOTE:

Pry the end of the spring out of the groove in the dog clutch and then gradually remove it.

DISASSEMBLING THE FRONT GEAR ASSEMBLY

Remove:
- Bearing inner race

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

CAUTION:

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

INSPECTING THE DOG CLUTCHES

Inspect:
- Dog clutches
  Damage/wear → Replace.

INSPECTING THE INNER PROPELLER SHAFT

Inspect:
- Inner propeller shaft
  Damage/wear → Replace.

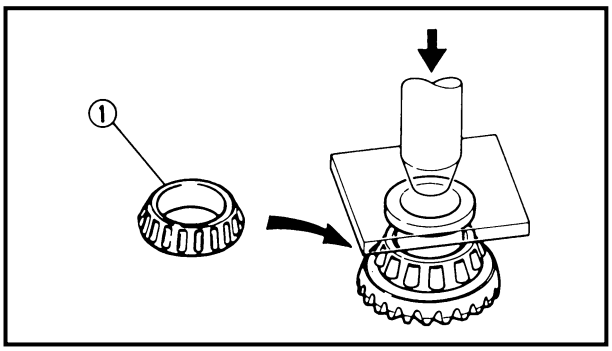
INSPECTING THE BEARING

Inspect:
- Tapered roller bearing
  Pitting/rumbling → Replace.

INSPECTING THE FRONT GEAR

Inspect:
- Teeth
- Dogs
  Damage/wear → Replace.

INNER PROPELLER SHAFT ASSEMBLY (DUAL PROPELLER MODELS)

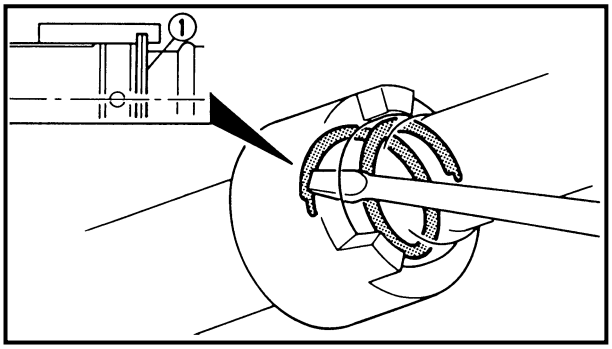


ASSEMBLING THE FRONT GEAR ASSEMBLY

Install:

- Bearing inner race ①

	Bearing/oil seal attachment YB-06276 / 90890-06659



INSTALLING THE SPRING

Install:

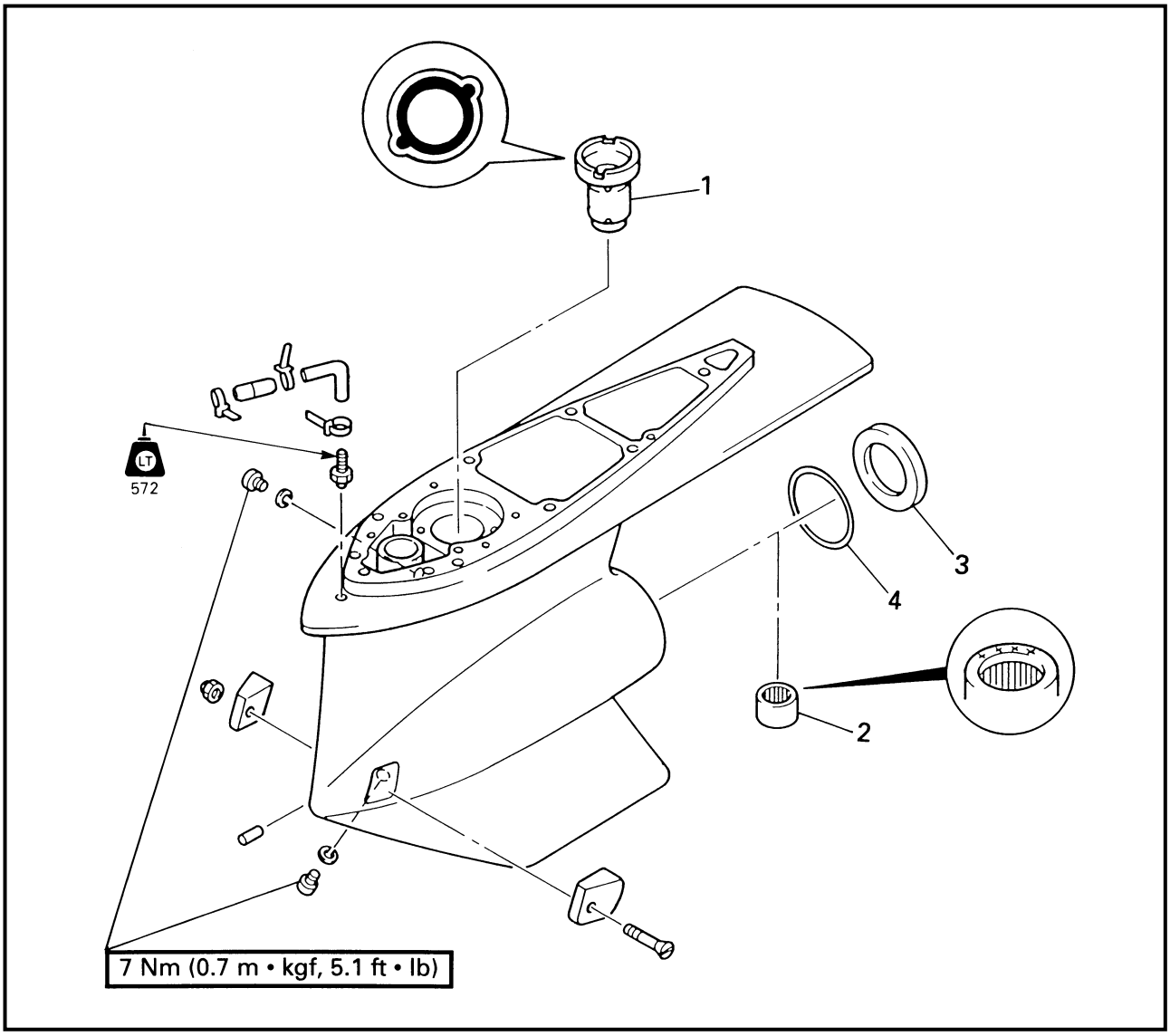
- Spring ①

NOTE:

Push the end of the spring into the groove in the dog clutch and then gradually install it.

LOWER CASE ASSEMBLY (DUAL PROPELLER MODELS)

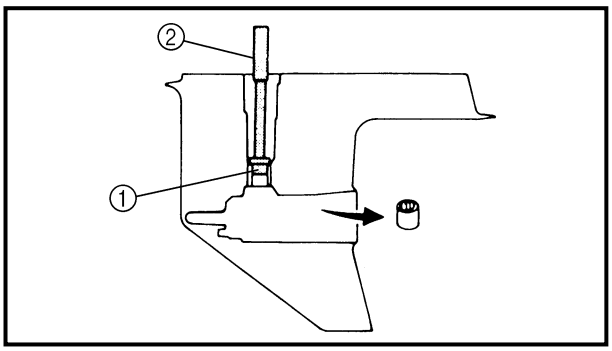
DISASSEMBLING/ASSEMBLING THE LOWER CASE ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Inner propeller shaft assembly		Refer to "DRIVE SHAFT (DUAL PROPELLER MODELS)" on page 6-66.
1	Drive shaft sleeve	1	
2	Needle bearing	1	
3	Tapered roller bearing outer race	1	
4	Front gear shim	*	
			For assembly, reverse the disassembly procedure.

*: As required

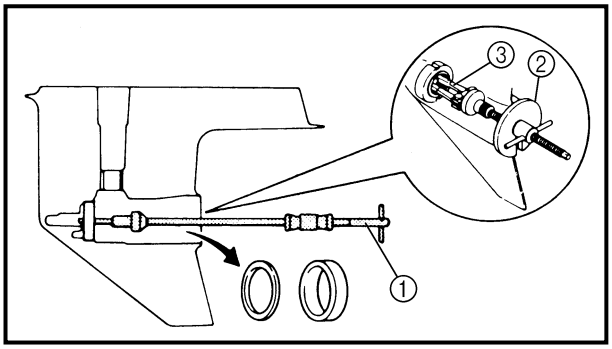
LOWER CASE ASSEMBLY (DUAL PROPELLER MODELS)



DISASSEMBLING THE LOWER CASE ASSEMBLY

1. Remove:
   • Needle bearing

Bearing/oil seal attachment .... ①
YB-06194 / 90890-06636
Driver rod ..... ②
YB-06071 / 90890-06605



2. Remove:
   • Tapered roller bearing outer race

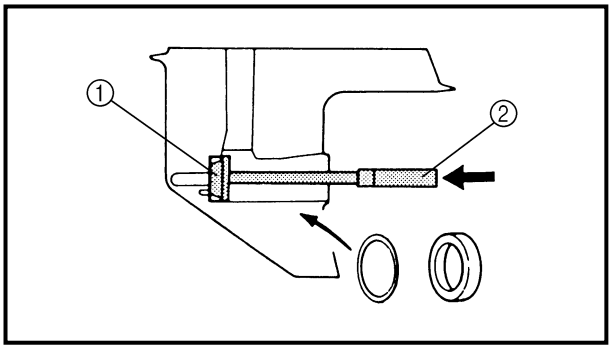
Slide hammer..... ①
YB-06096
Bearing puller..... ②
90890-06523
Large universal claws..... ③
90890-06532

INSPECTING THE DRIVE SHAFT SLEEVE

Inspect:
• Drive shaft sleeve
Damage/wear → Replace.

INSPECTING THE NEEDLE BEARING

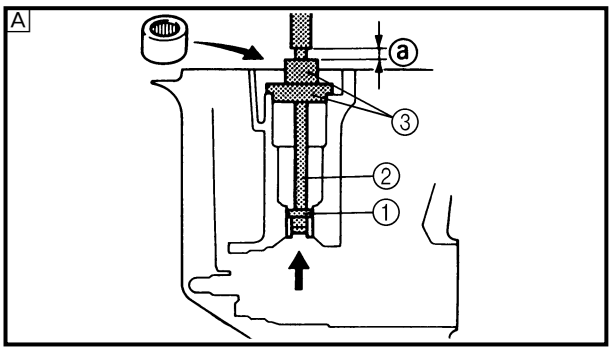
Inspect:
• Needle bearing
Pitting/rumbling → Replace.

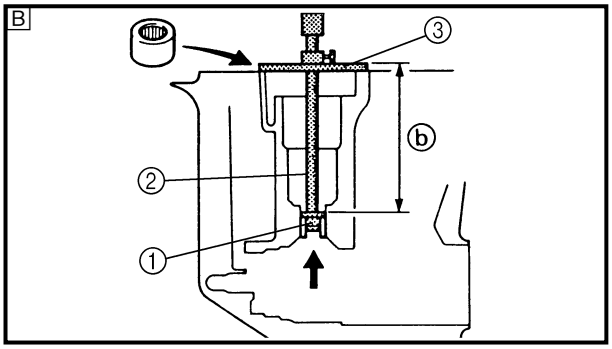


ASSEMBLING THE LOWER CASE ASSEMBLY

1. Install:
   • Tapered roller bearing outer race

Bearing/oil seal attachment .... ①
YB-06258 / 90890-06619
Driver rod ..... ②
YB-06071 / 90890-06605





2. Install:
   • Needle bearing

Needle bearing installation position ⓐ
10.0 mm (0.39 in)
Needle bearing installation position ⓑ
139.0 mm (5.47 in)

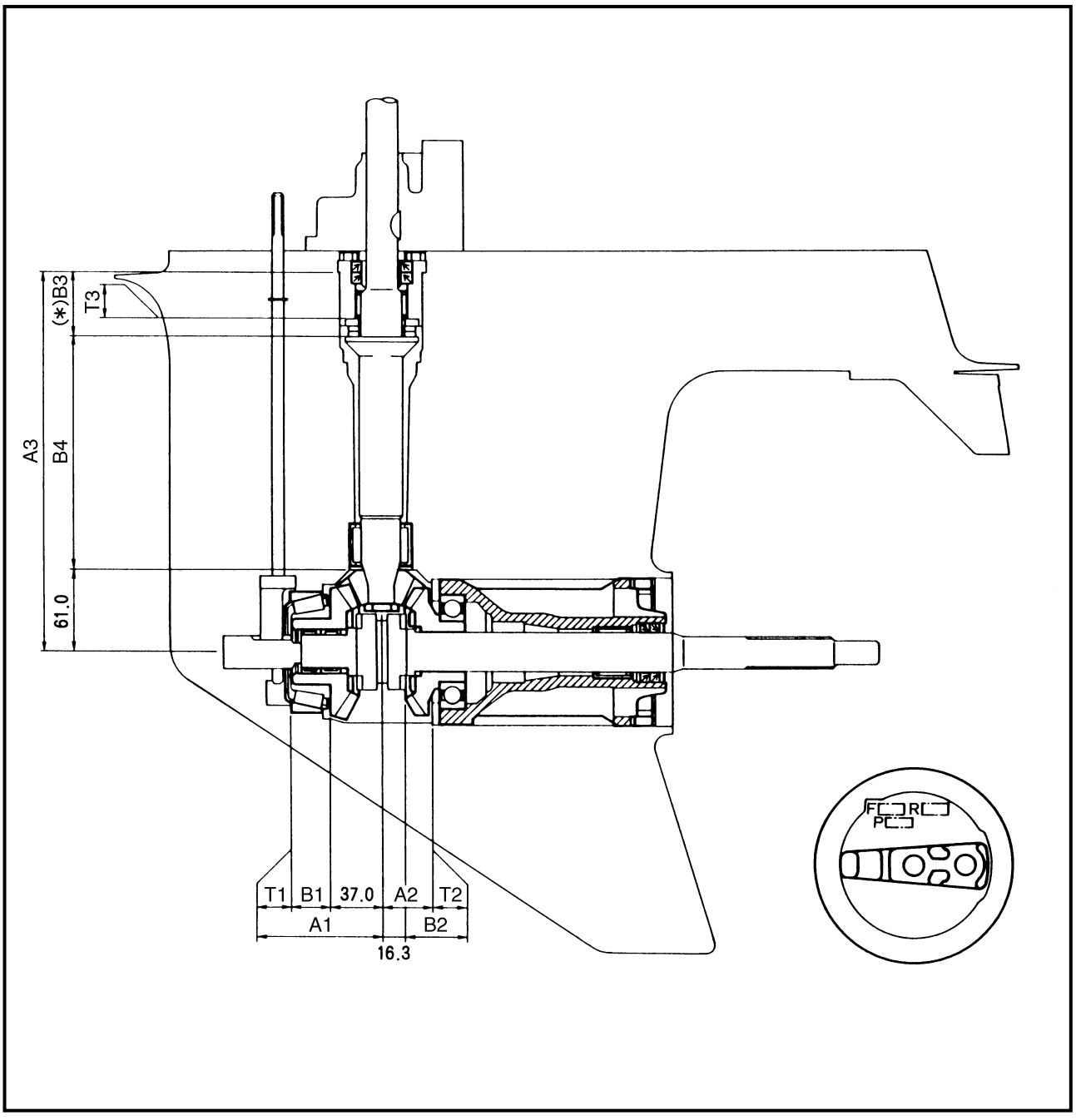
Bearing/oil seal attachment .... ①
YB-06194 / 90890-06609
Driver rod ..... ②
YB-06071 / 90890-06602
Bearing/oil seal depth plate .... ③
YB-06213 / 90890-06603
YB-34474

A For USA and Canada
B Except for USA and Canada

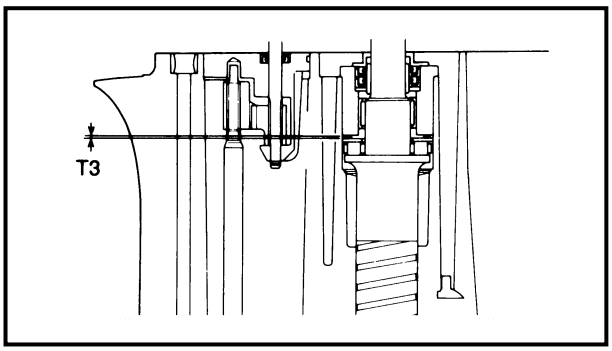
SHIMMING (REGULAR ROTATION MODELS)

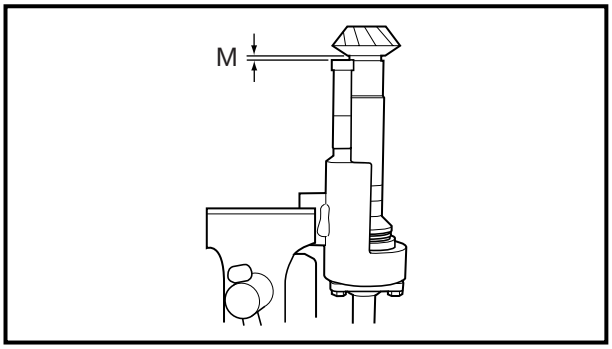
NOTE:

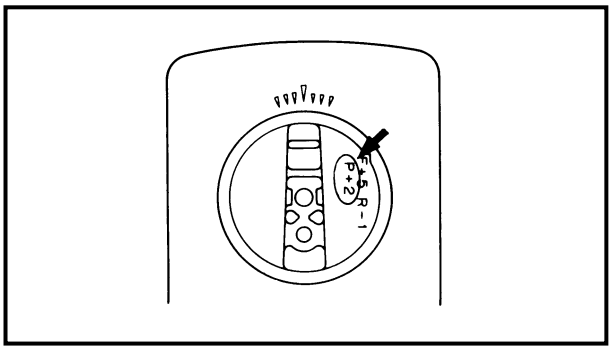
- There is no need to select shims when reassembling with the original case and inner parts.
- Shim calculations are required when reassembling with the original inner parts and a new case (the difference between the original inner parts and the new case).
- Measurements and adjustments are required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



SHIMMING (REGULAR ROTATION MODELS) (FOR USA AND CANADA)







SELECTING THE PINION SHIMS

NOTE:

Find the shim thickness (T3) by selecting shims until the specified value (M0) is obtained with the special tool.

1. Measure:
   • Specified measurement (M)
   Out of specified value (M0) → Adjust.

Specified value (M0) =
1.00 + P/100 mm

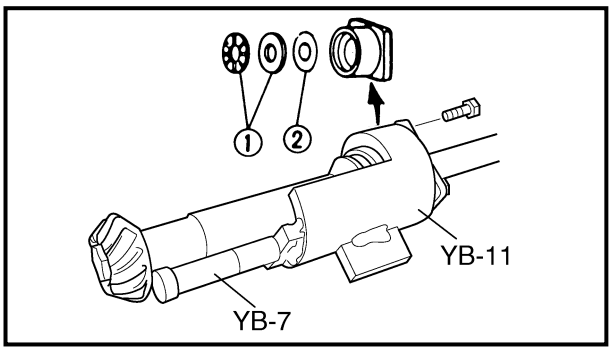
Measuring steps

(1) Calculate the specified value (M0).

NOTE:

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

Example:
If "P" is "+5", then
M0 = 1.00 + (+5)/100 mm
= 1.00 + 0.05 mm
= 1.05 mm
If "P" is "–3", then
M0 = 1.00 + (–3)/100 mm
= 1.00 – 0.03 mm
= 0.97 mm



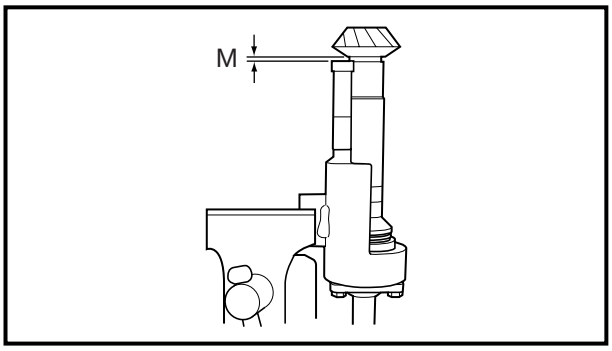
(2) Install the pinion height gauge, drive shaft, thrust bearing ①, and shim(s) ②.

	Pinion height gauge **YB-34432-7, -11**

NOTE:
If the original shim(s) is unavailable, start with a 0.50-mm shim.

(3) Install the pinion and pinion nut.

	Pinion nut **95 Nm (9.5 m • kgf, 69 ft • lb)**



(4) Measure the specified measurement (M).

NOTE:
- Measure the clearance between the pinion height gauge and the lower surface of the pinion as shown.
- Perform the same measurement at three points on the pinion.
- Find the average of the measurements (M).

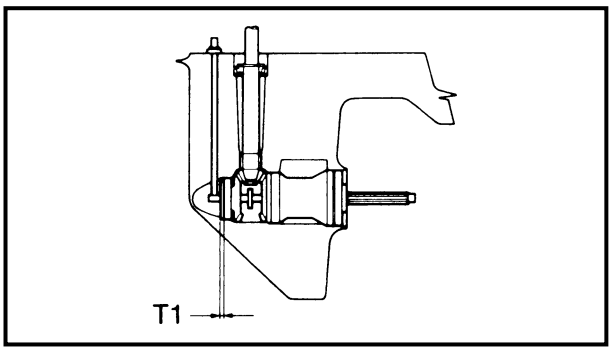
2. Adjust:
   - Shim thickness (T3)

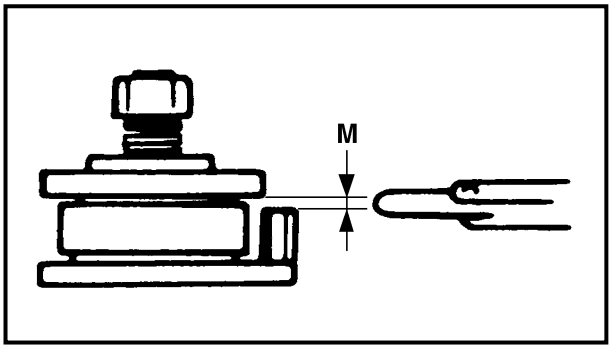
   Remove or add shim(s).

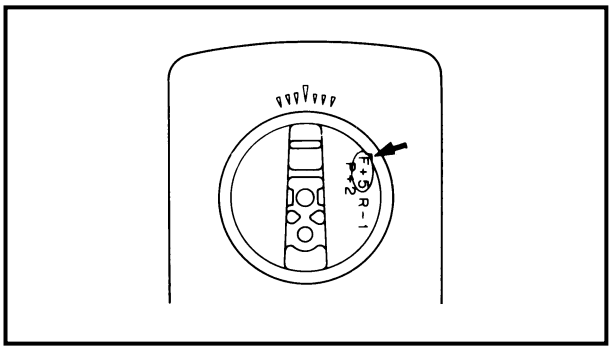
	Available shim thickness **0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm**

NOTE:
(M0) – (M) should be as close to "0" as possible.

SHIMMING (REGULAR ROTATION MODELS) (FOR USA AND CANADA)







SELECTING THE FORWARD GEAR SHIMS

NOTE:

Find the shim thickness (T1) by selecting shims until the specified value (M0) is obtained with the special tool.

1. Measure:
   • Specified measurement (M)
   Out of specified value (M0) → Adjust.

Specified value (M0) =
1.60 + F/100 mm

Measuring steps

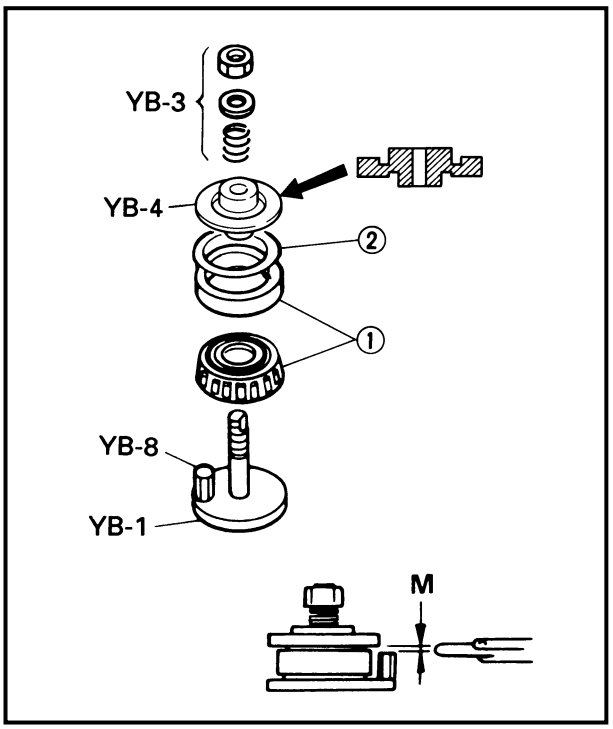
(1) Calculate the specified value (M0).

NOTE:

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

Example:
If "F" is "+5", then
M0 = 1.60 + (+5)/100 mm
= 1.60 + 0.05 mm
= 1.65 mm
If "F" is "–3", then
M0 = 1.60 + (–3)/100 mm
= 1.60 – 0.03 mm
= 1.57 mm

SHIMMING (REGULAR ROTATION MODELS) (FOR USA AND CANADA)



(2) Install the shimming gauge, bearing ①, and shim(s) ②.

	Shimming gauge **YB-34446-1, -3, -4, -8**

NOTE:

If the original shim(s) is unavailable, start with a 0.50-mm shim.

(3) Measure the specified measurement (M).

2. Adjust:
   - Shim thickness (T1)

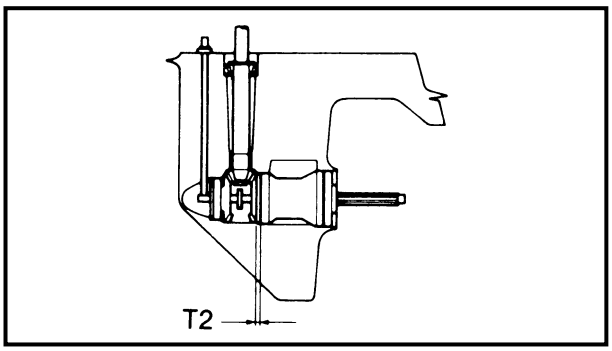
   Remove or add shim(s).

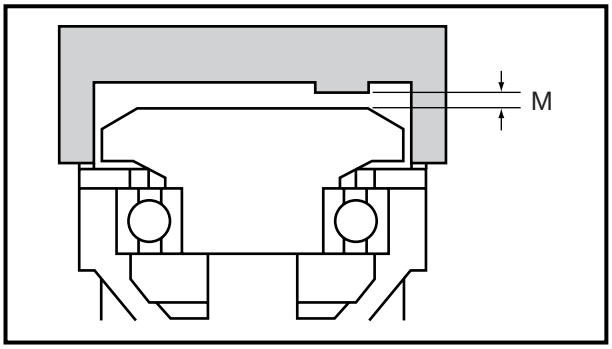
	Available shim thickness **0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm**

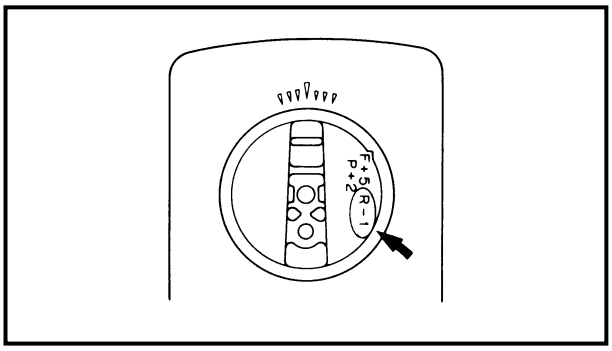
NOTE:

(M0) – (M) should be as close to "0" as possible.

SHIMMING (REGULAR ROTATION MODELS) (FOR USA AND CANADA)







SELECTING THE REVERSE GEAR SHIMS

NOTE:

Find the shim thickness (T2) by selecting shims until the specified value (M0) is obtained with the special tool.

1. Measure:
   - Specified measurement (M)
     Out of specified value (M0) → Adjust.

Specified value (M0) =
(150A - 225D/C150TR - P200TR models)
1.80 – R/100 mm
(150G/P150TR models)
1.30 – R/100 mm

Measuring steps

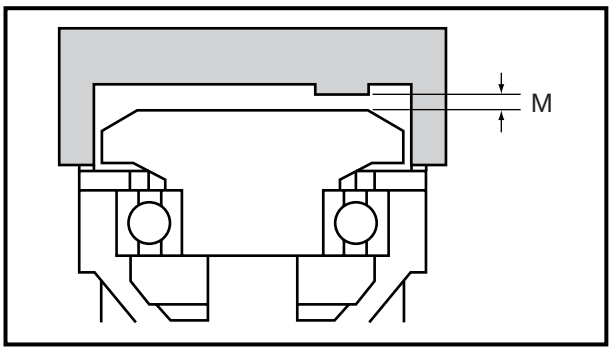
(1) Calculate the specified value (M0).

NOTE:

- "R" 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 "R" mark is missing or unreadable, assume an "R" value of "0", and check the backlash when the unit is assembled.
- If the "R" mark is negative (–), then add the "R" value to the measurement.

Example (150G/P150TR models):
If "R" is "+5", then
M0 = 1.30 – (+5)/100 mm
= 1.30 – 0.05 mm
= 1.25 mm
If "R" is "–3", then
M0 = 1.30 – (–3)/100 mm
= 1.30 + 0.03 mm
= 1.33 mm

SHIMMING (REGULAR ROTATION MODELS) (FOR USA AND CANADA)



(2) Install the shimming gauge, bearing, thrust washer, reverse gear, and shim(s).

Shimming gauge
(150A - 225D/C150TR - P200TR models)
YB-34468-1
(150G/P150TR models)
YB-34468-6

NOTE:

- If the original shim(s) is unavailable, start with a 0.50-mm shim.
- Turn the reverse gear assembly a few times until the gear and bearing are horizontal.

(3) Measure the specified measurement (M).

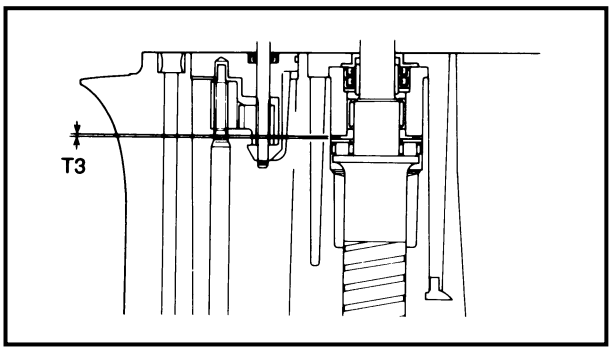
2. Adjust:
   - Shim thickness (T2)

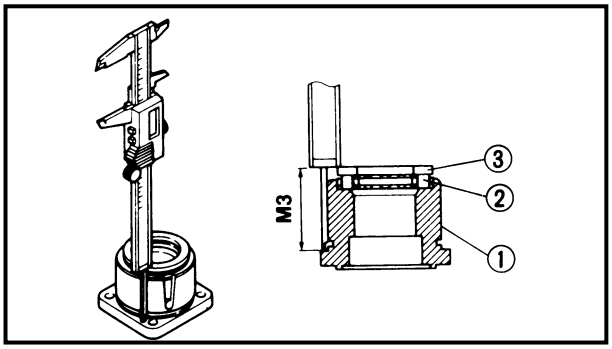
   Remove or add shim(s).

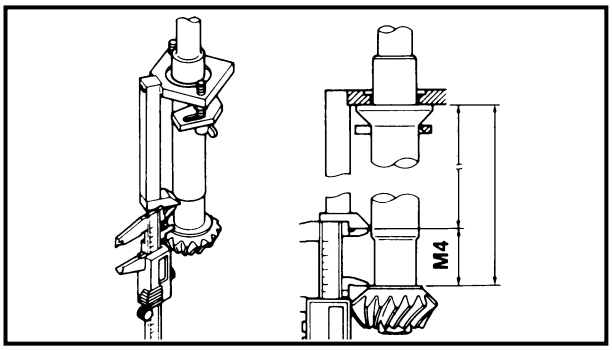
Available shim thickness
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

NOTE:

(M0) – (M) should be as close to "0" as possible.







SELECTING THE PINION SHIMS

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

Select:
- Shim thickness (T3)

Selecting steps
(1) Measure (M3).

	Digital caliper **90890-06704**

NOTE:
Install the bearing housing ①, thrust bearing ②, and washer ③.

(2) Install the pinion and pinion nut.

	Pinion nut **95 Nm (9.5 m • kgf, 69 ft • lb)**

(3) Install the pinion height gauge.

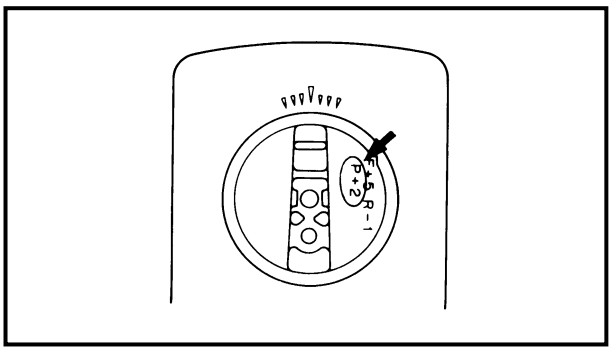
	Pinion height gauge **90890-06702**

NOTE:
After the wing nuts contact the fixing plate, tighten them another 1/4 of a turn.

(4) Measure (M4).

	Digital caliper **90890-06704**

NOTE:
- Measure the clearance between the pinion height gauge and the pinion, as shown.
- Perform the same measurement at three points on the pinion.
- Find the average of the measurements (M4).



(5) Calculate the pinion shim thickness (T3).

Pinion shim thickness (T3) =
80.0 + P/100 – M3 – M4

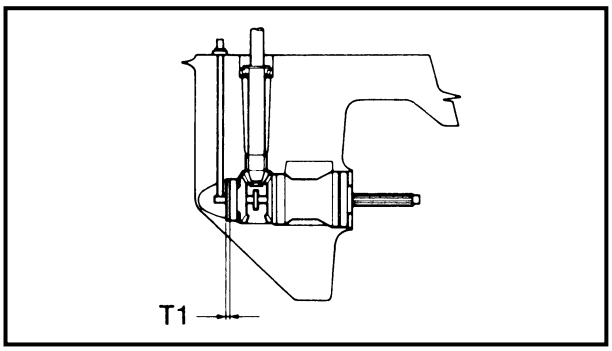
NOTE:
- "P" is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01-mm units. If the "P" mark is missing or unreadable, assume a "P" value of "0", and check the backlash when the unit is assembled.
- If the "P" mark is negative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

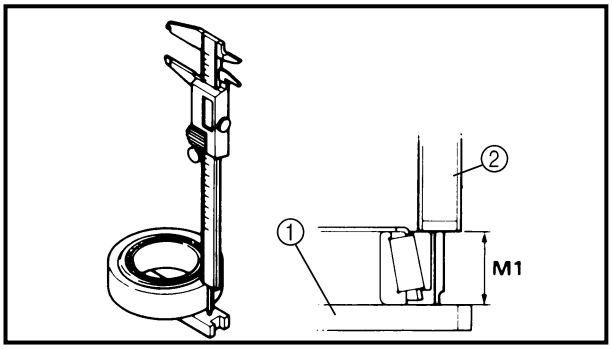
Example:
If M3 is "46.85 mm", M4 is "32.52 mm" and P is "-5", then
T3 = 80.0 + (–5)/100 – 46.85 – 32.52 mm
= 80.0 – 0.05 – 46.85 – 32.52 mm
= 0.58 mm

(6) Select the pinion shim(s) (T3).

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

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





SELECTING THE FORWARD GEAR SHIMS

NOTE:

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

Select:
- Shim thickness (T1)

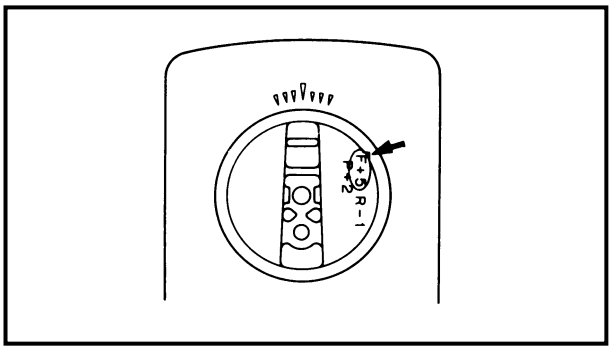
Selecting steps

(1) Measure (M1).

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

NOTE:

- Turn the roller bearing outer race two or three times so the rollers seat. Then, measure the height of the bearing, as shown.
- Perform the same measurement at three points on the roller bearing outer race.
- Find the average of the measurements (M1).



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

Forward gear shim thickness (T1)
(T1) = 28.6 + F/100 – M1

NOTE:

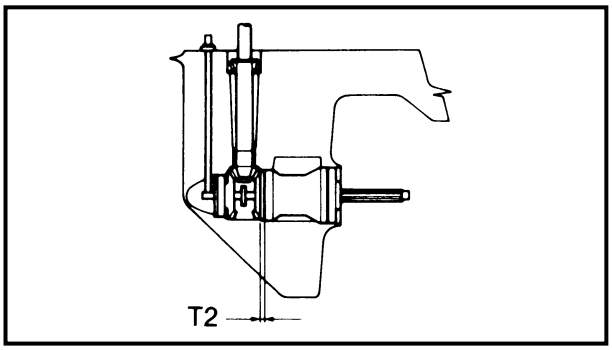
- "F" is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01-mm units. If the "F" mark is missing or unreadable, assume an "F" value of "0", and check the backlash when the unit is assembled.
- If the "F" mark is negative (–),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

Example:
If M1 is "28.10 mm" and F is "+5", then
T1 = 28.6 + (+5)/100 – 28.10 mm
= 28.6 + 0.05 – 28.10 mm
= 0.55 mm

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

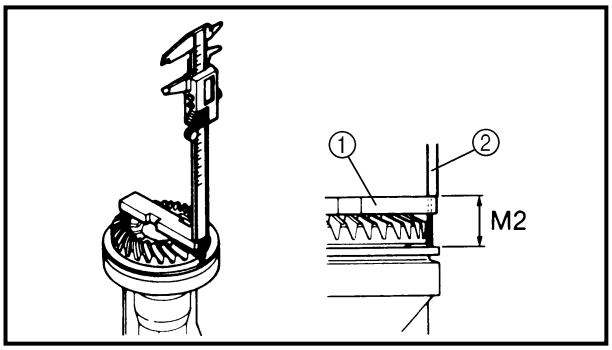
Calculated numeral at 1/100th place		Rounded numeral
More than	or less	
0.00	0.02	0.00
0.02	0.05	0.02
0.05	0.08	0.05
0.08	0.10	0.08

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



SELECTING THE REVERSE GEAR SHIM

NOTE:
Select the shim thickness (T2) by using the specified measurement(s) and the calculation formula.



Select:
• Shim thickness (T2)

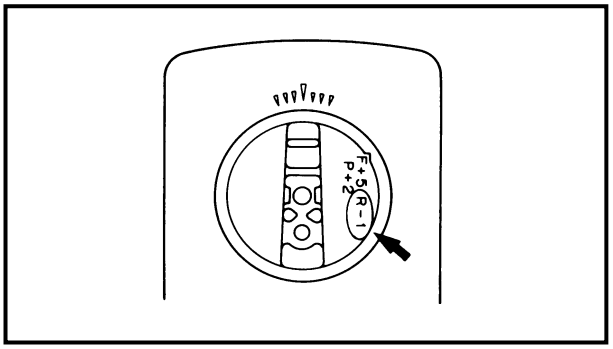
Selecting steps
(1) Measure (M2).

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

NOTE:
• Measure the height of the gear as shown.
• Perform the same measurement at three points on the gear.
• Find the average of the measurements (M2).

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

Reverse gear shim thickness
(150A - 225D/C150TR - P200TR models)
(T2) = M2 – 29.0 – R/100
(150G/P150TR models)
(T2) = M2 – 29.9 – R/100



NOTE:

- "R" 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 "R" mark is missing or unreadable, assume a "R" value of "0", and check the backlash when the unit is assembled.
- If the "R" mark is negative (–), then subtract the "R" value from the measurement.

Example (150G/P150TR models):
If M2 is "30.50 mm", R is "+2", then
T2 = 30.50 – 29.9 – (+2)/100 mm
= 30.50 – 29.9 – 0.02 mm
= 0.58 mm

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

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

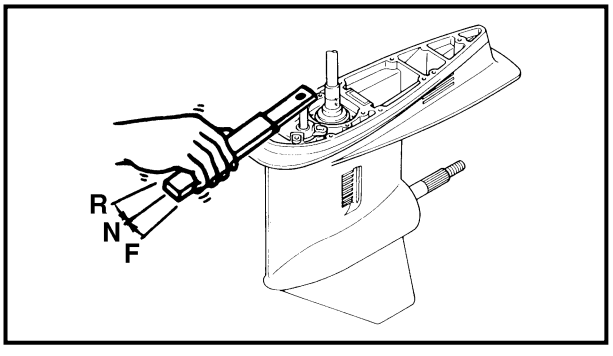
BACKLASH (REGULAR ROTATION MODELS)

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

MEASURING THE FORWARD GEAR BACKLASH

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

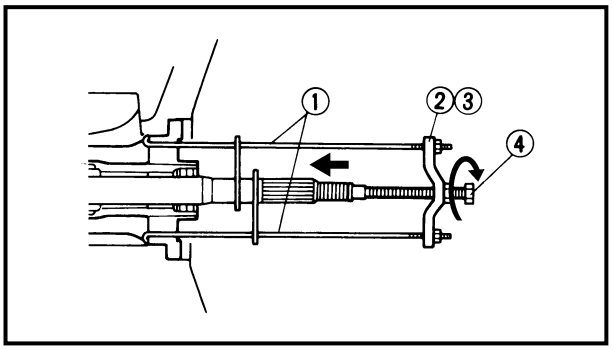
Forward gear backlash
(150A - 225D/C150TR - P200TR models)
0.25 - 0.46 mm
(0.010 - 0.018 in)
(150G/P150TR models)
0.71 - 1.01 mm
(0.028 - 0.040 in)



Measuring steps

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

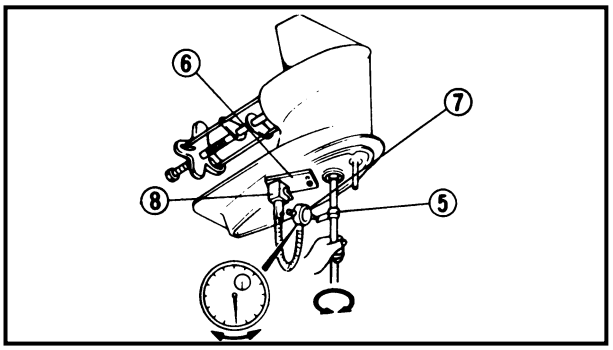
Shift rod wrench
YB-06052 / 90890-06052



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

Propeller shaft housing puller . ①
YB-06207 / 90890-06502
Universal puller..... ②
YB-06117
Guide plate..... ③
90890-06501
Center bolt ..... ④
90890-06504

Center bolt
10 Nm (1.0 m • kgf, 7.2 ft • lb)



(3) Install the backlash indicator onto the drive shaft (on the 22.4 mm (0.88 in) diameter portion of the drive shaft).

Backlash indicator ..... ⑤
YB-06265 / 90890-06706

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

Magnetic-base plate..... ⑥
YB-07003 / 90890-07003
Dial gauge set ..... ⑦
YU-03097 / 90890-01252
Magnetic base..... ⑧
YU-34481 / 90890-06705

(5) Set the lower unit upside down.
(6) Slowly turn the drive shaft clockwise and counterclockwise. When the drive shaft stops in each direction, measure the backlash.

2. Adjust:
   • Forward gear shim
   Remove or add shim(s).

Forward gear backlash	Shim thickness
Less than (150A - 225D/ C150TR - P200TR models) 0.25 mm (0.010 in) (150G/P150TR models) 0.71 mm (0.028 in)	To be decreased by (150A - 225D/ C150TR - P200TR models) (0.36 – M) × 0.54 (150G/P150TR models) (0.86 – M) × 0.54
More than (150A - 225D/ C150TR - P200TR models) 0.46 mm (0.018 in) (150G/P150TR models) 1.01 mm (0.040 in)	To be increased by (150A - 225D/ C150TR - P200TR models) (M – 0.36) × 0.54 (150G/P150TR models) (M – 0.86) × 0.54

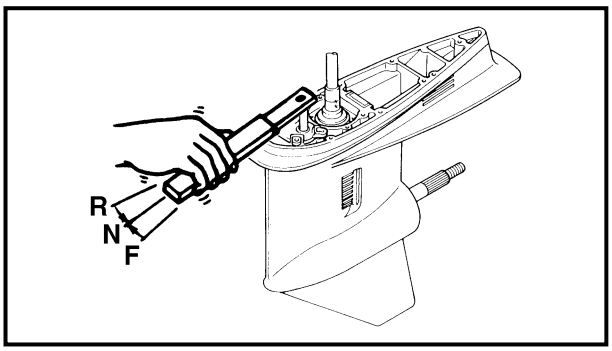
M: Measurement

MEASURING THE REVERSE GEAR BACKLASH

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

Reverse gear backlash
(150A - 225D/C150TR - P200TR models)
0.74 - 1.29 mm
(0.029 - 0.051 in)
(150G/P150TR models)
0.79 - 1.38 mm
(0.031 - 0.054 in)

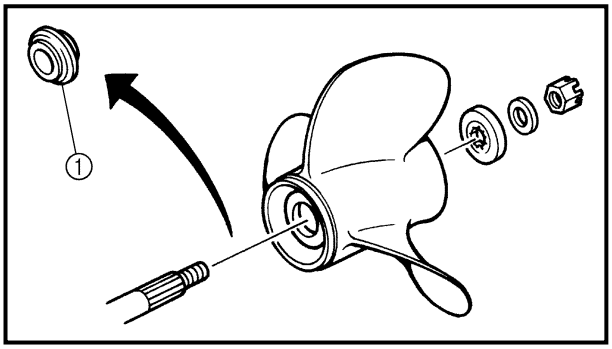
BACKLASH (REGULAR ROTATION MODELS)



Measuring steps

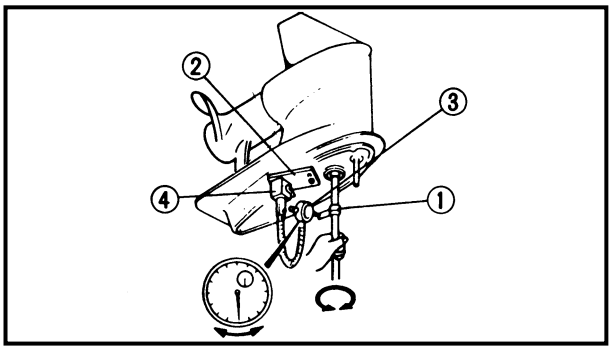
(1) Set the shift rod into the neutral position.

	**Shift rod wrench** **YB-06052 / 90890-06052**



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

	**Propeller nut** **10 Nm (1.0 m • kgf, 7.2 ft • lb)**



(3) Install the backlash indicator onto the drive shaft (on the 22.4 mm (0.88 in) diameter portion of the drive shaft).

	**Backlash indicator** ..... ① **YB-06265 / 90890-06706**

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

	**Magnetic-base plate**..... ② **YB-07003 / 90890-07003** **Dial gauge set** ..... ③ **YU-03097 / 90890-01252** **Magnetic base**..... ④ **YU-34481 / 90890-06705**

(5) Set the lower unit upside down.

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

2. Adjust:
   • Reverse gear shim
   Remove or add shim(s).

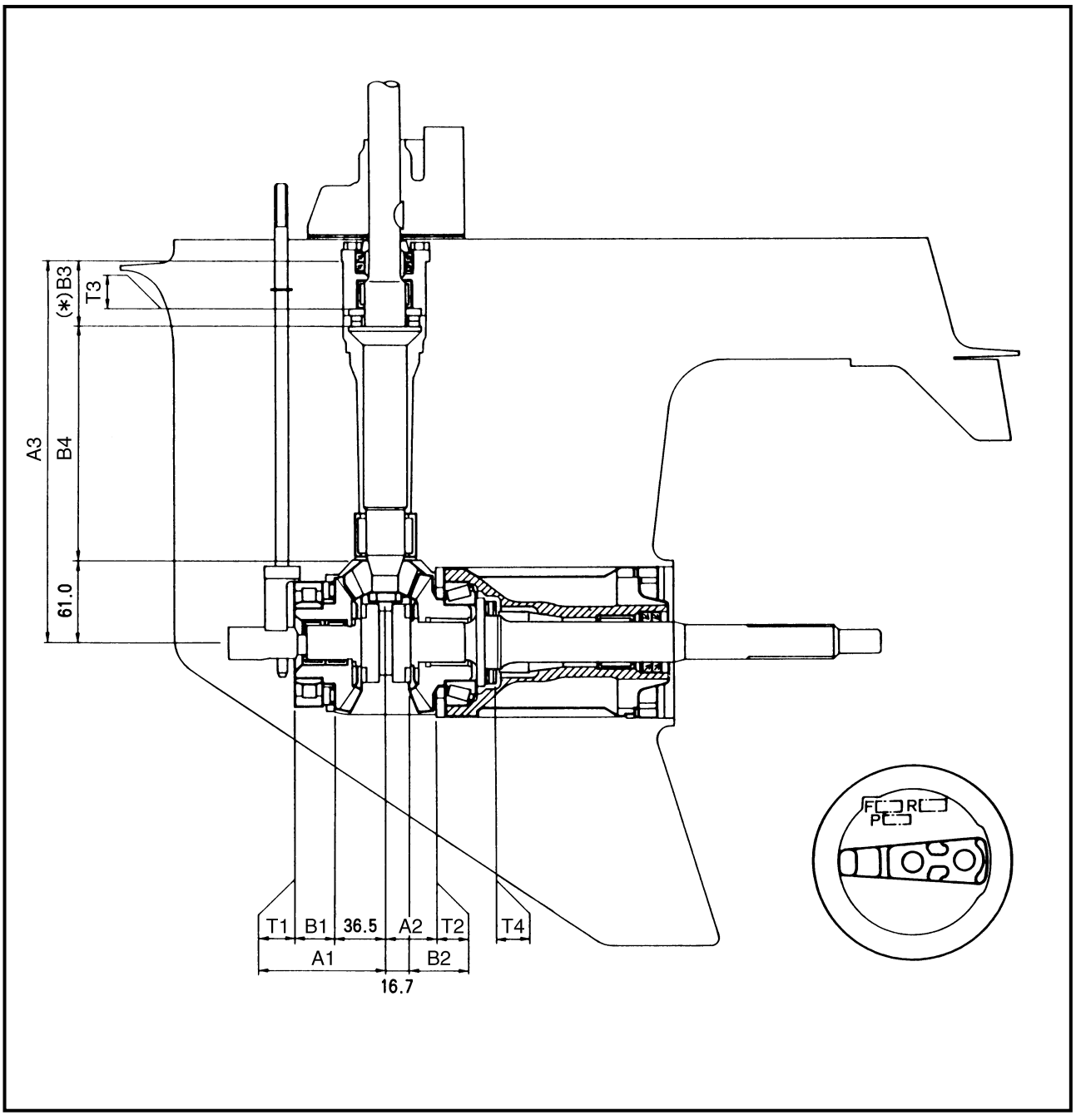
 Reverse gear backlash	Shim thickness
Less than (150A - 225D/ C150TR - P200TR models) 0.74 mm (0.029 in) (150G/P150TR models) 0.79 mm (0.031 in)	To be increased by (150A - 225D/ C150TR - P200TR models) (1.02 – M) × 0.54 (150G/P150TR models) (1.09 – M) × 0.54
More than (150A - 225D/ C150TR - P200TR models) 1.29 mm (0.051 in) (150G/P150TR models) 1.38 mm (0.054 in)	To be decreased by (150A - 225D/ C150TR - P200TR models) (M – 1.02) × 0.54 (150G/P150TR models) (M – 1.09) × 0.54

M: Measurement

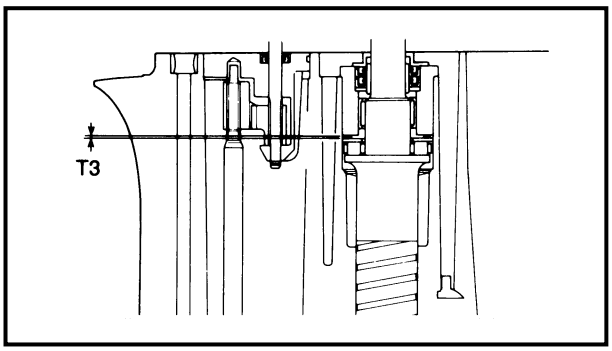
SHIMMING (COUNTER ROTATION MODELS)

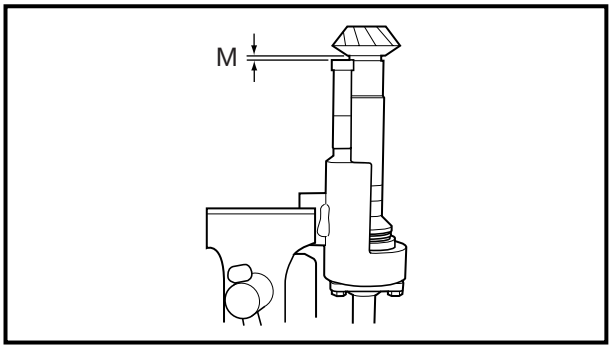
NOTE:

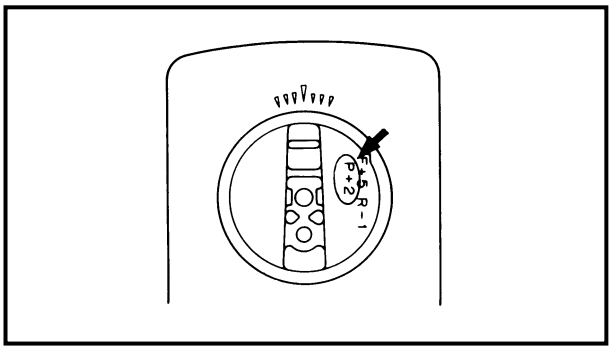
- There is no need to select shims when reassembling with the original case and inner parts.
- Shim calculations are required when reassembling with the original inner parts and a new case (the difference between the original inner parts and the new case).
- Measurements and adjustments are required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



SHIMMING (COUNTER ROTATION MODELS) (FOR USA AND CANADA)







SELECTING THE PINION SHIMS

NOTE:

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

1. Measure:
   • Specified measurement (M)
   Out of specified value (M0) → Adjust.

Specified value (M0) =
1.00 + P/100 mm

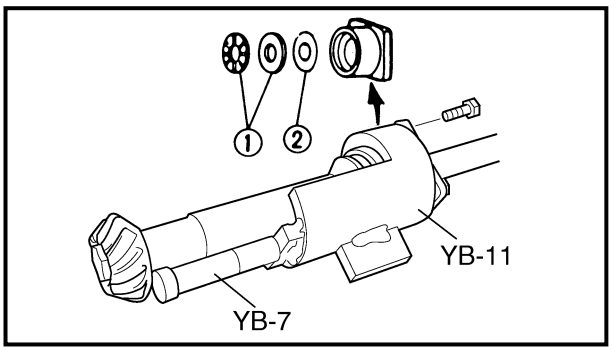
Measuring steps
(1) Calculate the specified value (M0).

NOTE:

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

Example:
If "P" is "+5", then
M0 = 1.00 + (+5)/100 mm
= 1.00 + 0.05 mm
= 1.05 mm
If "P" is "–3", then
M0 = 1.00 + (–3)/100 mm
= 1.00 – 0.03 mm
= 0.97 mm

SHIMMING (COUNTER ROTATION MODELS) (FOR USA AND CANADA)



(2) Install the pinion height gauge, drive shaft, thrust bearing ①, and shim(s) ②.

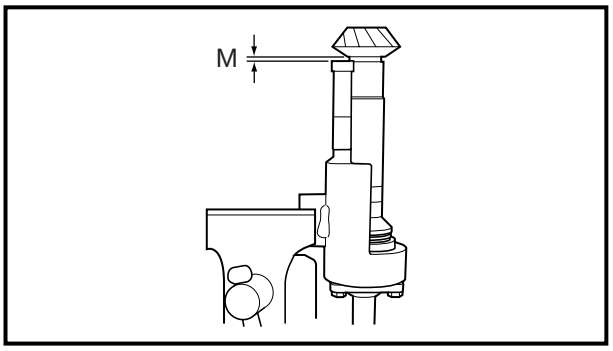
	Pinion height gauge **YB-34432-7, -11**

NOTE:

If the original shim(s) is unavailable, start with a 0.50-mm shim.

(3) Install the pinion and pinion nut.

	Pinion nut **95 Nm (9.5 m • kgf, 69 ft • lb)**



(4) Measure the specified measurement (M).

NOTE:

- Measure the clearance between the pinion height gauge and the lower surface of the pinion as shown.
- Perform the same measurement at three points on the pinion.
- Find the average of the measurements (M).

2. Adjust:
   - Shim thickness (T3)

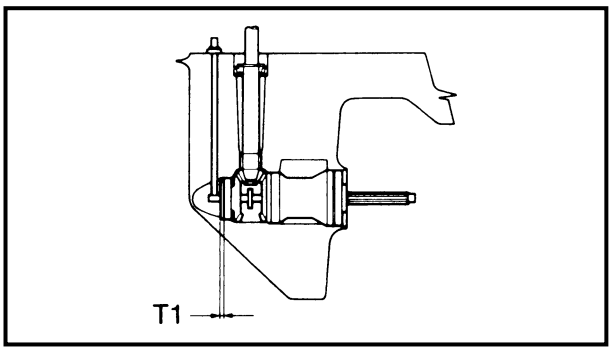
   Remove or add shim(s).

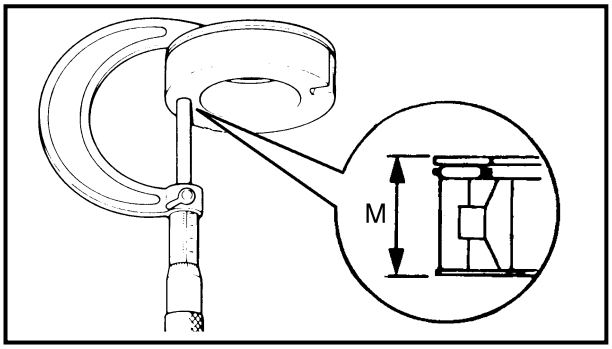
	Available shim thickness **0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm**

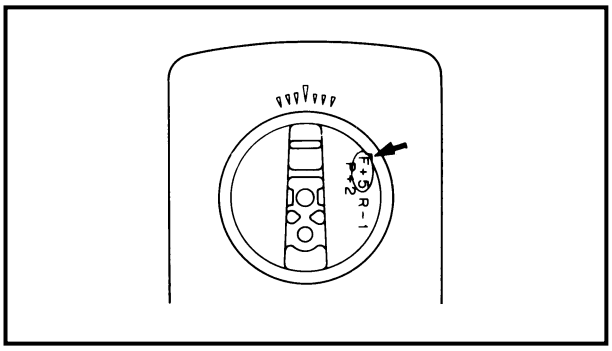
NOTE:

(M0) – (M) should be as close to "0" as possible.

SHIMMING (COUNTER ROTATION MODELS) (FOR USA AND CANADA)







SELECTING THE REVERSE GEAR SHIMS

NOTE:

Find the shim thickness (T1) by selecting shims until the specified value (M0) is obtained with the special tool.

1. Measure:
   • Specified measurement (M)
   Out of specified value (M0) → Adjust.

	Specified value (M0) = 29.10 + F/100 mm

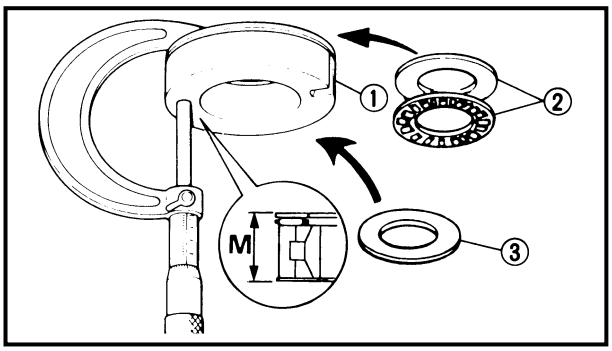
Measuring steps

(1) Calculate the specified value (M0).

NOTE:

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

Example:
If "F" is "+5", then
M0 = 29.10 + (+5)/100 mm
= 29.10 + 0.05 mm
= 29.15 mm
If "F" is "–3", then
M0 = 29.10 + (–3)/100 mm
= 29.10 – 0.03 mm
= 29.07 mm



(2) Install the roller bearing ①, thrust bearing ②, and shim(s) ③.

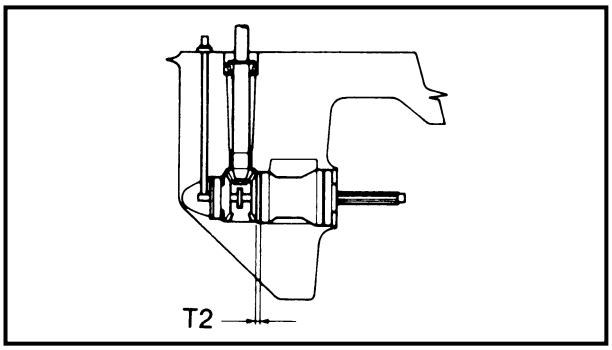
NOTE:
If the original shim(s) is unavailable, start with a 0.50-mm shim.

(3) Measure the specified measurement (M).

2. Adjust:
• Shim thickness (T1)
Remove or add shim(s).

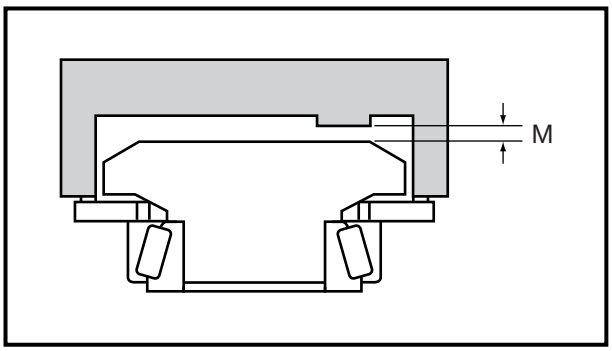
Available shim thickness
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

NOTE:
(M0) – (M) should be as close to "0" as possible.



SELECTING THE FORWARD GEAR SHIMS

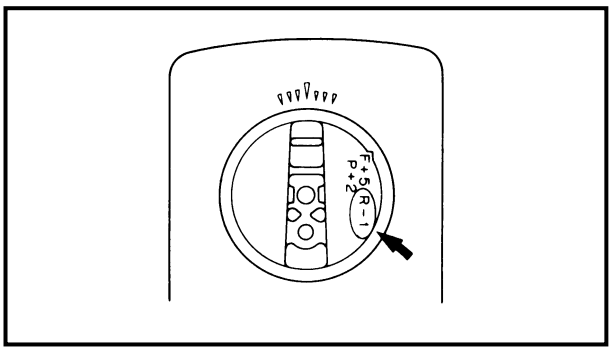
NOTE:
Find the shim thickness (T2) by selecting shims until the specified value (M0) is obtained with the special tool.



1. Measure:
• Specified measurement (M)
Out of specified value (M0) → Adjust.

Specified value (M0) =
1.30 – R/100 mm

SHIMMING (COUNTER ROTATION MODELS) (FOR USA AND CANADA)



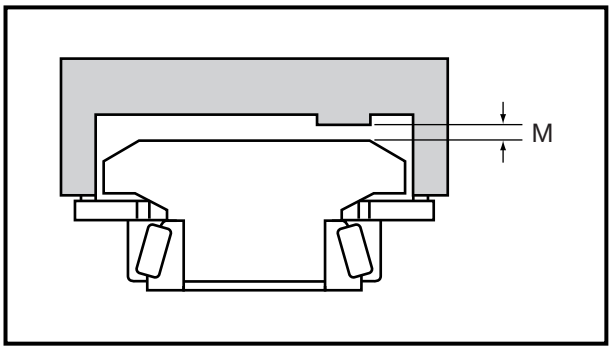
Measuring steps

(1) Calculate the specified value (M0).

NOTE:

- "R" 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 "R" mark is missing or unreadable, assume an "R" value of "0", and check the backlash when the unit is assembled.
- If the "R" mark is negative (–), then add the "R" value to the measurement.

Example:
If "R" is "+5", then
M0 = 1.30 – (+5)/100 mm
= 1.30 – 0.05 mm
= 1.25 mm
If "R" is "–3", then
M0 = 1.30 – (–3)/100 mm
= 1.30 + 0.03 mm
= 1.33 mm



(2) Install the shimming gauge, bearing, thrust washer, forward gear, and shim(s).

	**Shimming gauge** **YB-34468-2**

NOTE:

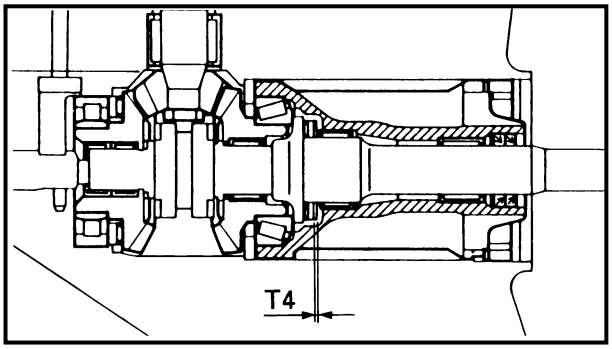
- If the original shim(s) is unavailable, start with a 0.50-mm shim.
- Turn the forward gear assembly a few times until the gear and bearing are horizontal.

(3) Measure the specified measurement (M).

2. Adjust:
   • Shim thickness (T2)
   Remove or add shim(s).

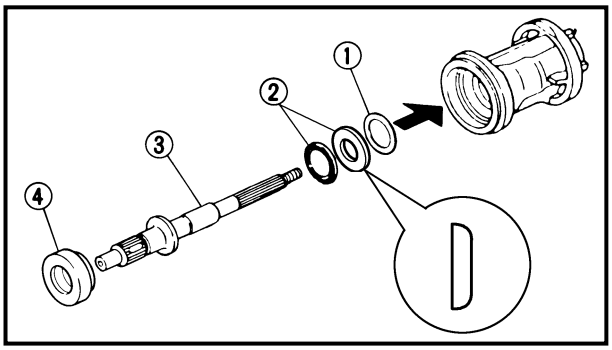
Available shim thickness
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

NOTE:
(M0) – (M) should be as close to "0" as possible.

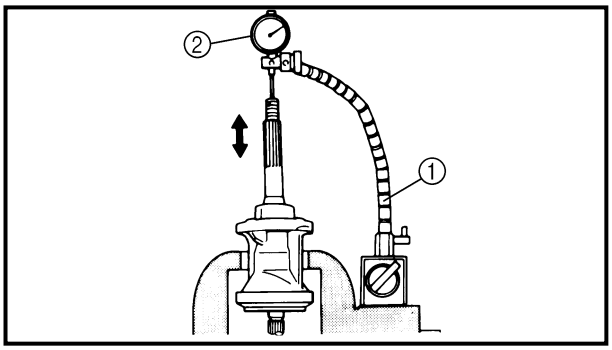


SELECTING THE PROPELLER SHAFT SHIMS

NOTE:
Find the shim thickness (T4) by selecting shims until the specified measurement is obtained with the special tool.



1. Install:
   • Shim(s) ①
   • Thrust bearing ②
   • Propeller shaft ③
   • Tapered roller bearing ④



2. Measure:
   • Propeller shaft free play
   Out of specification → Adjust.

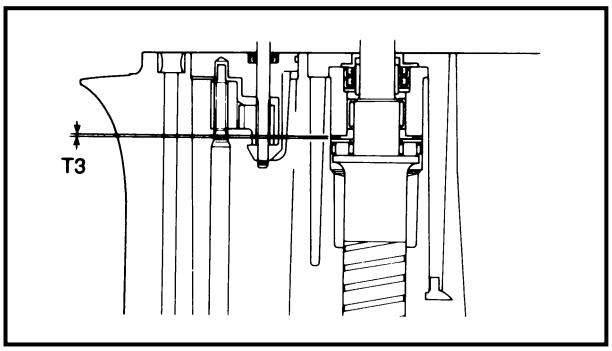
Propeller shaft free play
0.30 ± 0.05 mm

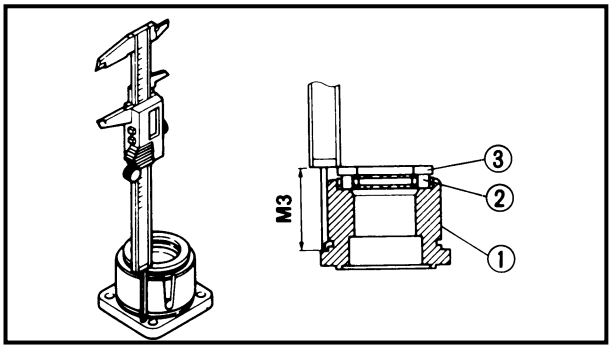
Magnetic base..... ①
YU-34481
Dial gauge set ..... ②
YU-03097

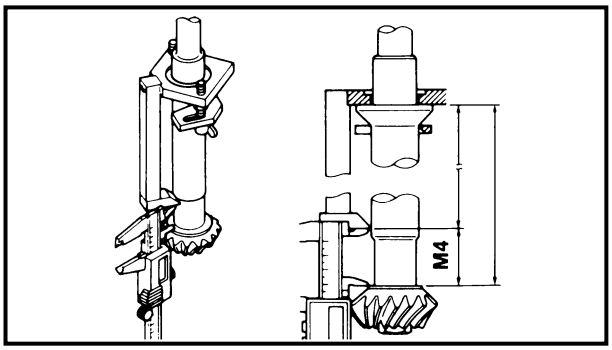
3. Adjust:
   • Propeller shaft free play
   Remove or add shim(s).

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

SHIMMING (COUNTER ROTATION MODELS) (EXCEPT FOR USA AND CANADA)







SELECTING THE PINION SHIMS

NOTE:

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

Select:
- Shim thickness (T3)

Selecting steps

(1) Measure (M3).

	Digital caliper **90890-06704**

NOTE:

Install the bearing housing ①, thrust bearing ②, and washer ③.

(2) Install the pinion and pinion nut.

	Pinion nut **95 Nm (9.5 m • kgf, 69 ft • lb)**

(3) Install the pinion height gauge.

	Pinion height gauge **90890-06702**

NOTE:

After the wing nuts contact the fixing plate, tighten them another 1/4 of a turn.

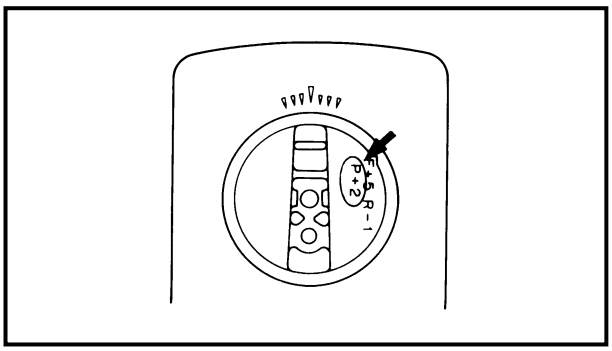
(4) Measure (M4).

	Digital caliper **90890-06704**

NOTE:

- Measure the clearance between the pinion height gauge and the pinion, as shown.
- Perform the same measurement at three points on the pinion.
- Find the average of the measurements (M4).

SHIMMING (COUNTER ROTATION MODELS) (EXCEPT FOR USA AND CANADA)



(5) Calculate the pinion shim thickness (T3).

Pinion shim thickness (T3) =
80.0 + P/100 – M3 – M4

NOTE:

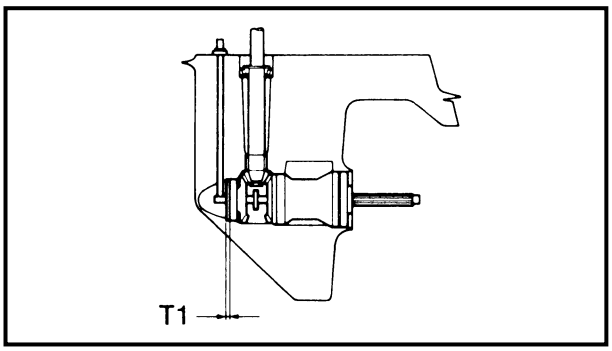
- "P" is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01-mm units. If the "P" mark is missing or unreadable, assume a "P" value of "0", and check the backlash when the unit is assembled.
- If the "P" mark is negative (–),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

Example:
If M3 is "46.85 mm", M4 is "32.52 mm" and P is "–5", then
T3 = 80.0 + (–5)/100 – 46.85 – 32.52 mm
= 80.0 – 0.05 – 46.85 – 32.52 mm
= 0.58 mm

(6) Select the pinion shim(s) (T3).

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

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



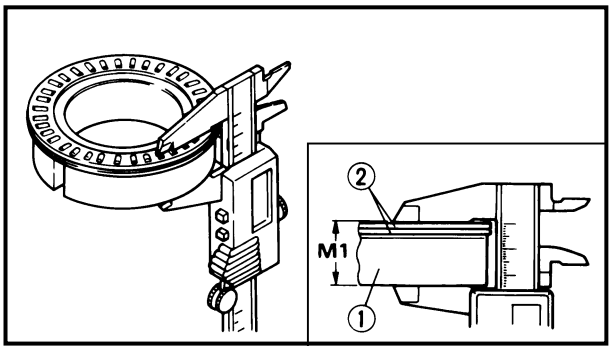
SELECTING THE REVERSE GEAR SHIMS

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

Select:
- Shim thickness (T1)

Selecting steps
(1) Measure (M1).

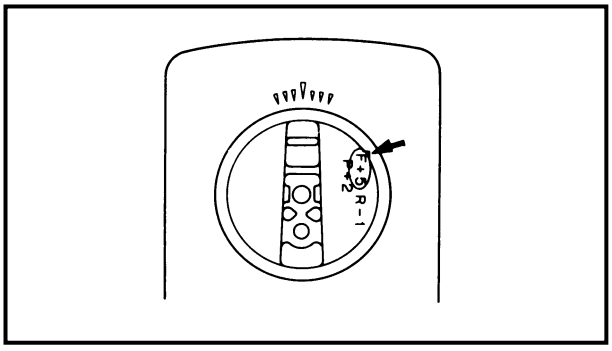
	Digital caliper **90890-06704**



NOTE:
- Measure the combined thickness of the roller bearing ① and thrust bearing ②.
- Turn the roller bearing outer race two or three times so the rollers seat. Then, measure the height of the bearing, as shown.
- Perform the same measurement at three points on the roller bearing outer race.
- Find the average of the measurements (M1).

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

	Reverse gear shim thickness (T1) **(T1) = 29.1 + F/100 – M1**



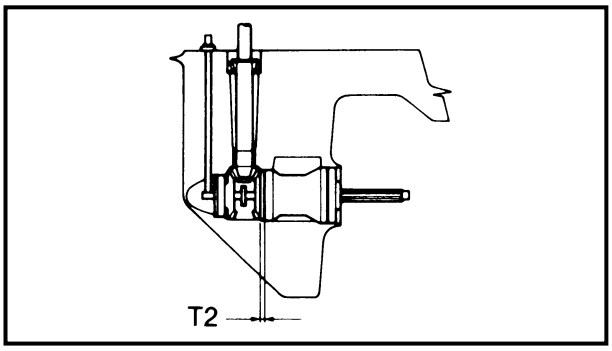
NOTE:
- "F" is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01-mm units. If the "F" mark is missing or unreadable, assume an "F" value of "0", and check the backlash when the unit is assembled.
- If the "F" mark is negative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

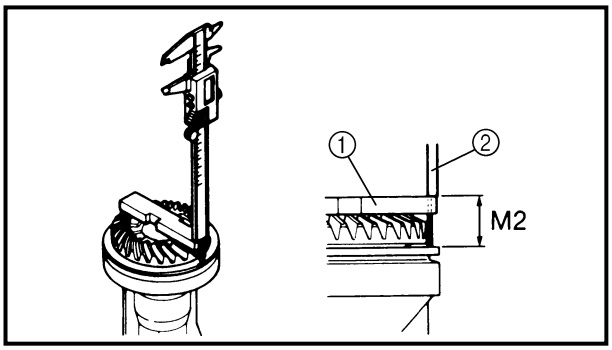
Example:
If M1 is "28.10 mm" and F is "+5", then
T1 = 29.1 + (+5)/100 – 28.10 mm
= 29.1 + 0.05 – 28.10 mm
= 1.05 mm

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

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

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





SELECTING THE FORWARD GEAR SHIMS

NOTE:
Select the shim thickness (T2) by using the specified measurement(s) and the calculation formula.

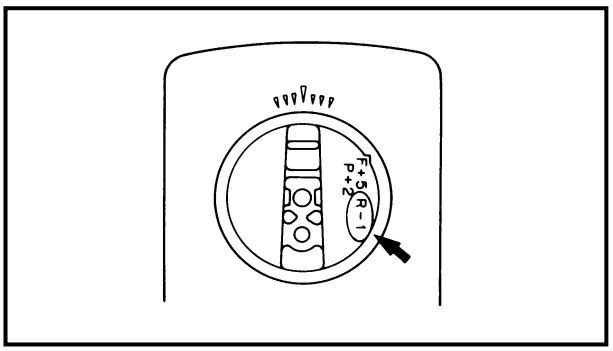
Select:
- Shim thickness (T2)

Selecting steps
(1) Measure (M2).

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

NOTE:
- Measure the height of the gear as shown.
- Perform the same measurement at three points on the gear.
- Find the average of the measurements (M2).

SHIMMING (COUNTER ROTATION MODELS) (EXCEPT FOR USA AND CANADA)



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

Forward gear shim thickness
(T2) = M2 – 29.5 – R/100

NOTE:

- "R" 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 "R" mark is missing or unreadable, assume a "R" value of "0", and check the backlash when the unit is assembled.
- If the "R" mark is negative (–), then subtract the "R" value from the measurement.

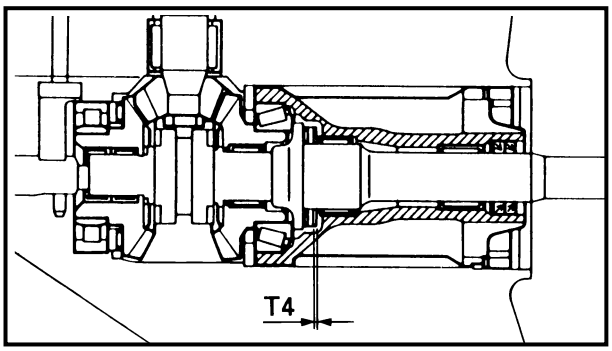
Example:
If M2 is "30.50 mm", R is "+2", then
T2 = 30.50 – 29.5 – (+2)/100 mm
= 30.50 – 29.5 – 0.02 mm
= 0.98 mm

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

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

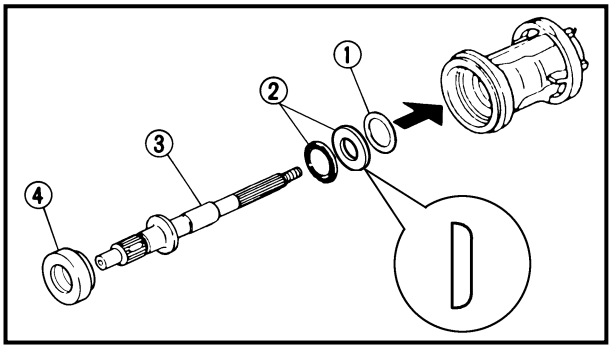
SHIMMING (COUNTER ROTATION MODELS) (EXCEPT FOR USA AND CANADA)



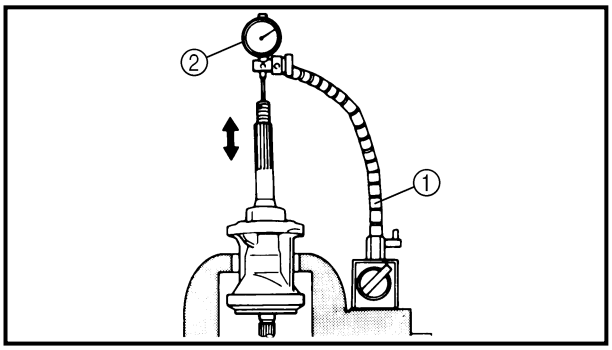
SELECTING THE PROPELLER SHAFT SHIMS

NOTE:

Find the shim thickness (T4) by selecting shims until the specified measurement is obtained with the special tool.



1. Install:
   - Shim(s) ①
   - Thrust bearing ②
   - Propeller shaft ③
   - Tapered roller bearing ④



2. Measure:
   - Propeller shaft free play
     Out of specification → Adjust.

Propeller shaft free play
0.30 ± 0.05 mm

Magnetic base..... ①
90890-06705
Dial gauge set ..... ②
90890-01252

3. Adjust:
   - Propeller shaft free play
     Remove or add shim(s).

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

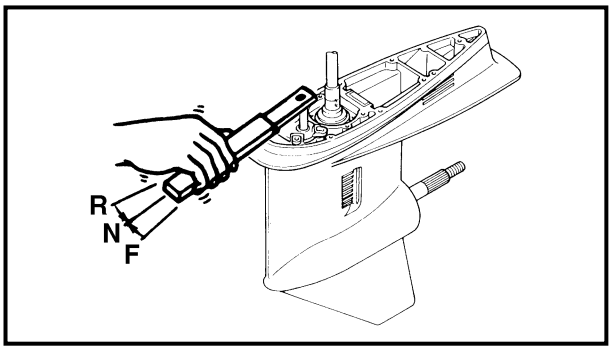
BACKLASH (COUNTER ROTATION MODELS)

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

MEASURING THE FORWARD GEAR BACKLASH

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

	Forward gear backlash **0.21 - 0.43 mm (0.008 - 0.017 in)**

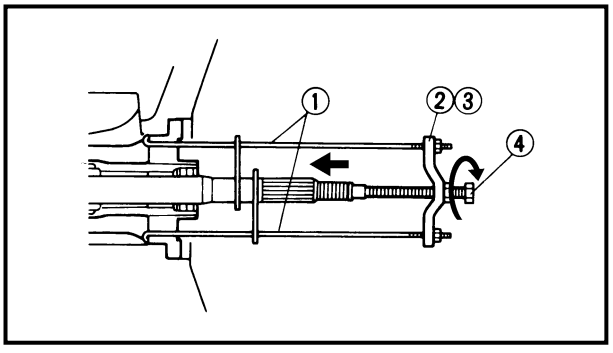


Measuring steps

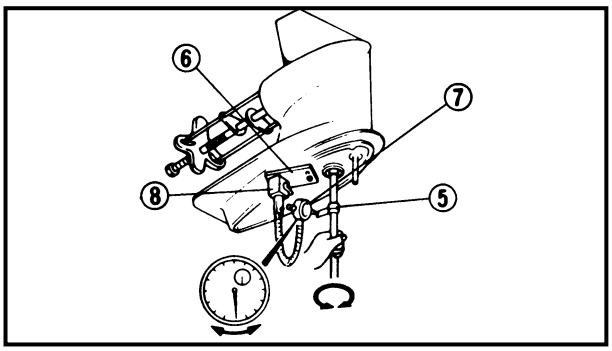
(1) Set the shift rod into the neutral position.

	Shift rod wrench **YB-06052 / 90890-06052**

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



	Propeller shaft housing puller . ① **YB-06207 / 90890-06502** **Universal puller**..... ② **YB-06117** **Guide plate**..... ③ **90890-06501** **Center bolt** ..... ④ **90890-06504**
	Center bolt **10 Nm (1.0 m • kgf, 7.2 ft • lb)**



(3) Install the backlash indicator onto the drive shaft (on the 22.4 mm (0.88 in) diameter portion of the drive shaft).

	Backlash indicator ..... ⑤ **YB-06265 / 90890-06706**

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

	Magnetic-base plate..... ⑥ **YB-07003 / 90890-07003** **Dial gauge set ..... ⑦** **YU-03097 / 90890-01252** **Magnetic base..... ⑧** **YU-34481 / 90890-06705**

(5) Set the lower unit upside down.
(6) Slowly turn the drive shaft clockwise and counterclockwise. When the drive shaft stops in each direction, measure the backlash.

2. Adjust:
   • Forward gear shim
   Remove or add shim(s).

Forward gear backlash	**Shim thickness**
Less than 0.21 mm (0.008 in)	**To be increased by (0.32 – M) × 0.54**
More than 0.43 mm (0.017 in)	**To be decreased by (M – 0.32) × 0.54**

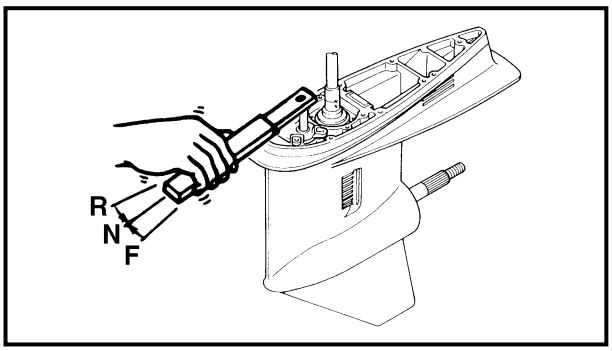
M: Measurement

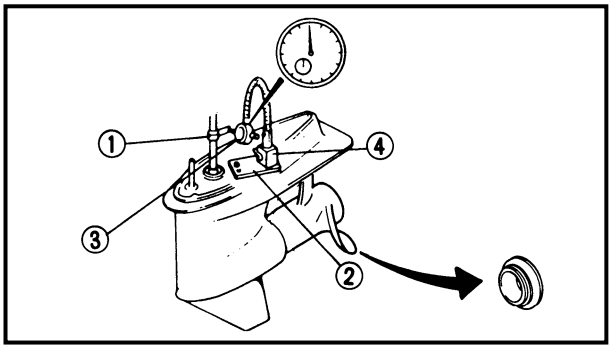
MEASURING THE REVERSE GEAR BACKLASH

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

	Reverse gear backlash **0.97 - 1.29 mm (0.038 - 0.051 in)**

BACKLASH (COUNTER ROTATION MODELS)





Measuring steps

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

	**Shift rod wrench** **YB-06052 / 90890-06052**

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

	**Propeller nut** **5 Nm (0.5 m • kgf, 3.6 ft • lb)**

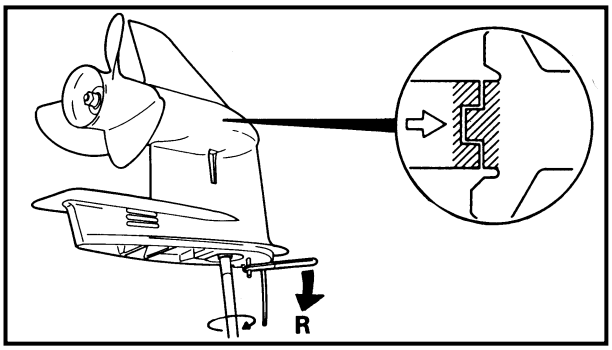
(3) Install the backlash indicator onto the drive shaft (on the 22.4 mm (0.88 in) diameter portion of the drive shaft).

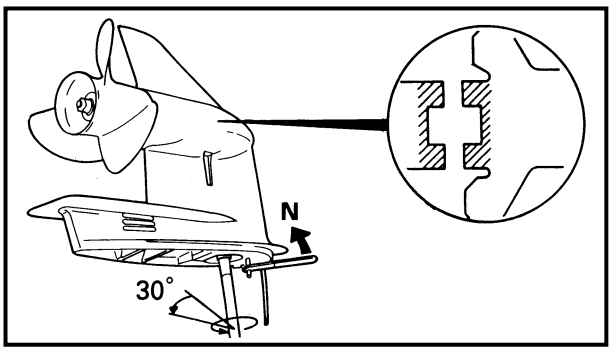
	**Backlash indicator** ..... ① **YB-06265 / 90890-06706**

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

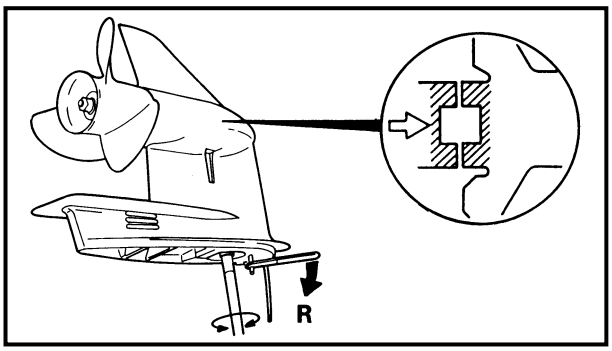
	**Magnetic-base plate**..... ② **YB-07003 / 90890-07003** **Dial gauge set** ..... ③ **YU-03097 / 90890-01252** **Magnetic base**..... ④ **YU-34481 / 90890-06705**

(5) Set the lower unit upside down.
(6) Turn the shift rod into the reverse position with the shift rod wrench.
(7) Turn the drive shaft clockwise until the clutch dog is fully engaged.





(8) Turn the shift rod into the neutral position with the shift rod wrench.
(9) Turn the drive shaft counterclockwise approximately 30° more.



(10) Turn the shift rod into the reverse position with the shift rod wrench.
(11) Slowly turn the drive shaft clockwise and counterclockwise. When the drive shaft stops in each direction, measure the backlash.

NOTE:
When measuring the reverse gear backlash, turn the shift rod wrench slightly towards the reverse position.

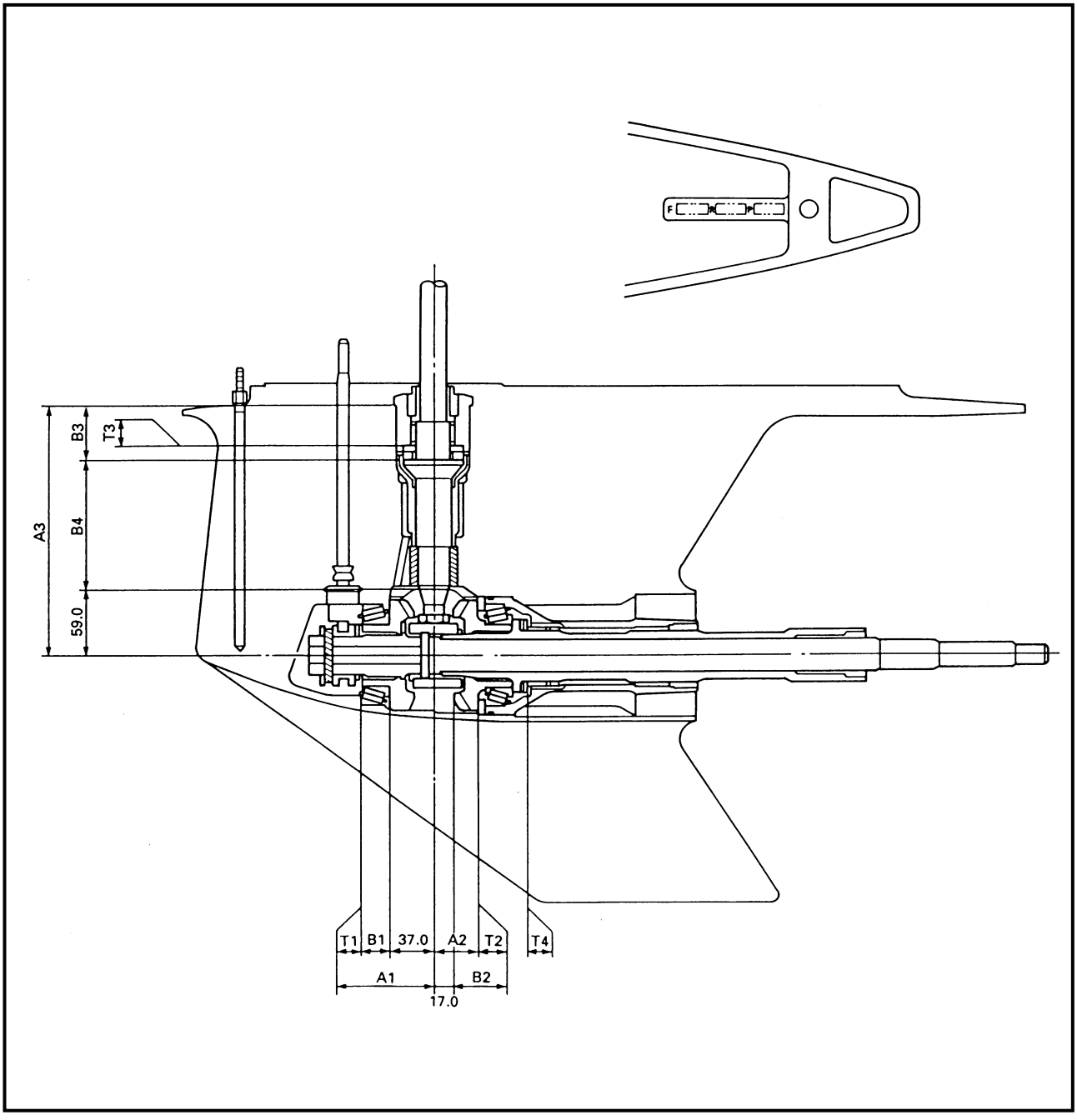
2. Adjust:
   • Reverse gear shim
   Remove or add shim(s).

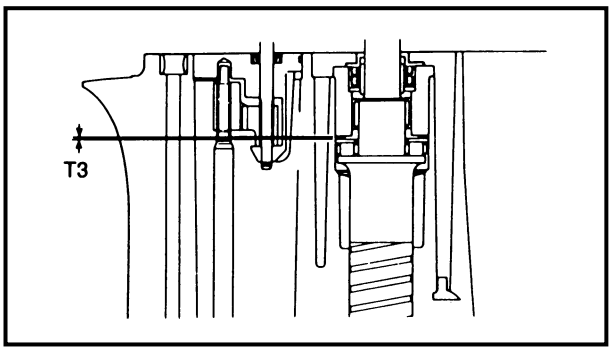
Reverse gear backlash	Shim thickness
Less than 0.97 mm (0.038 in)	To be decreased by (1.13 – M) × 0.54
More than 1.29 mm (0.051 in)	To be increased by (M – 1.13) × 0.54

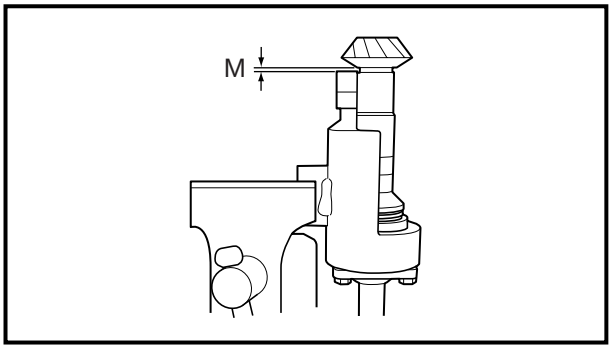
M: Measurement

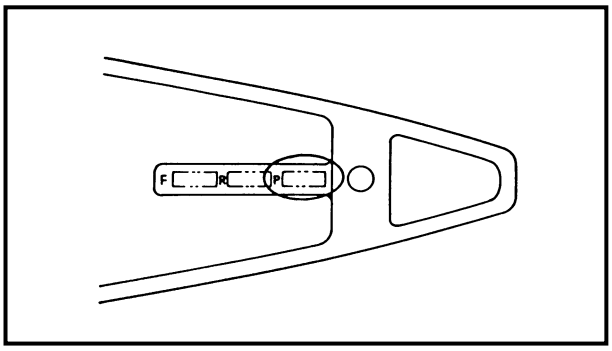
SHIMMING (DUAL PROPELLER MODELS)

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









SELECTING THE PINION SHIMS

NOTE:

Find the shim thickness (T3) by selecting shims until the specified value (M0) is obtained with the special tool.

1. Measure:
   - Specified measurement (M)
     Out of specified value (M0) → Adjust.

Specified value (M0) =
1.00 + P/100 mm

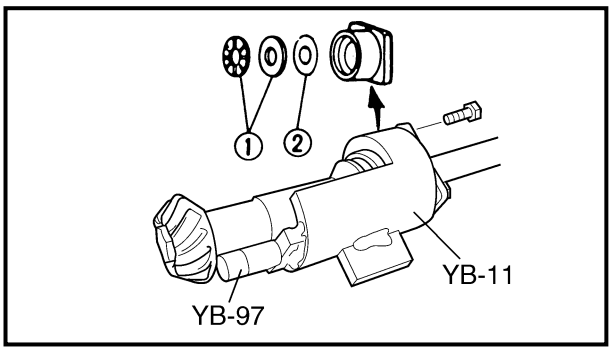
Measuring steps

(1) Calculate the specified value (M0).

NOTE:

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

Example:
If "P" is "+5", then
M0 = 1.00 + (+5)/100 mm
= 1.00 + 0.05 mm
= 1.05 mm
If "P" is "–3", then
M0 = 1.00 + (–3)/100 mm
= 1.00 – 0.03 mm
= 0.97 mm



(2) Install the pinion height gauge, drive shaft, thrust bearing ①, and shim(s) ②.

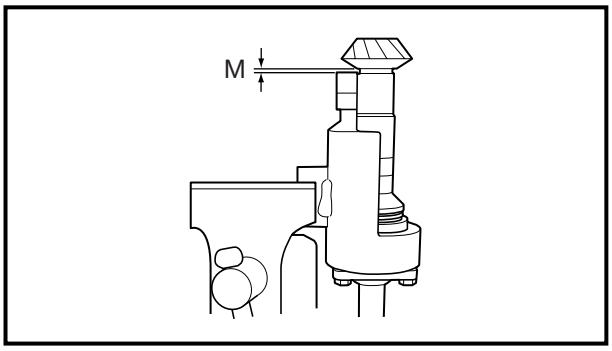
	Pinion height gauge **YB-34432-11, -97**

NOTE:

If the original shim(s) is unavailable, start with a 0.50-mm shim.

(3) Install the pinion and pinion nut.

	Pinion nut **95 Nm (9.5 m • kgf, 68 ft • lb)**



(4) Measure the specified measurement (M).

NOTE:

- Measure the clearance between the pinion height gauge and the lower surface of the pinion as shown.
- Perform the same measurement at three points on the pinion.
- Final the average of the measurements(M).

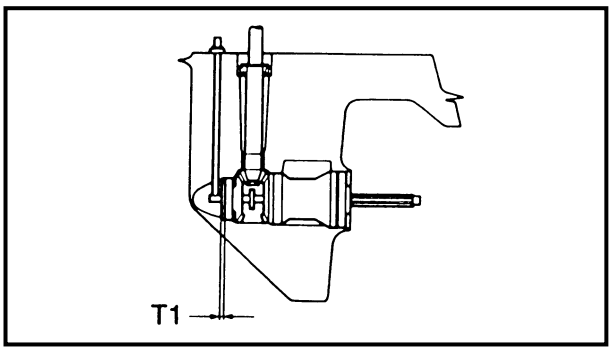
2. Adjust:
   - Shim thickness (T3)

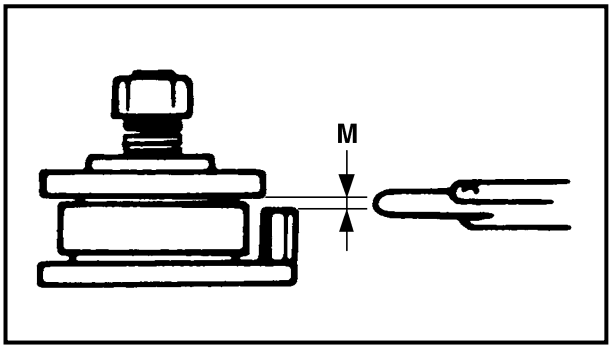
   Remove or add shim(s).

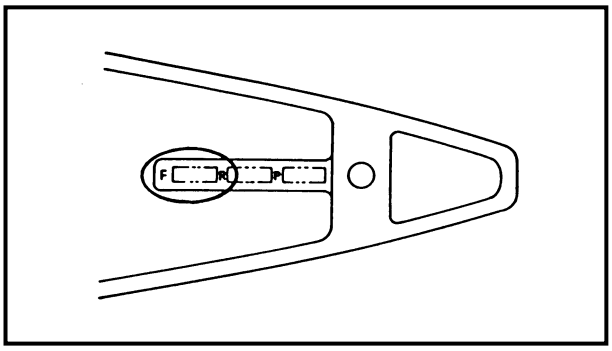
	Available shim thicknesses **0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm**

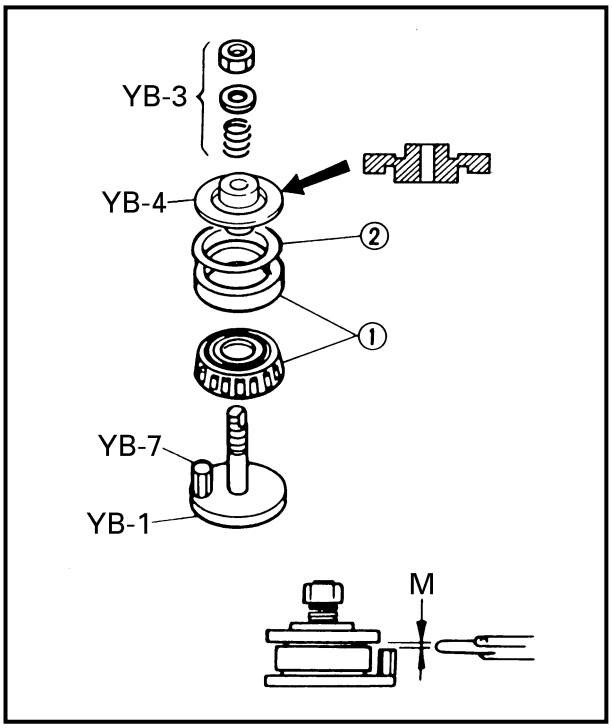
NOTE:

(M0) – (M) should be as close to "0" as possible.









SELECTING THE FRONT GEAR SHIMS

NOTE:

Find the shim thickness (T1) by selecting shims until the specified value (M0) is obtained with the special tool.

1. Measure:
   • Specified measurement (M)
   Out of specified value (M0) → Adjust.

Specified value (M0) =
1.00 + F/100 mm

Measuring steps
(1) Calculate the specified value (M0).

NOTE:

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

Example:
If "F" is "+5", then
M0 = 1.00 + (+5)/100 mm
= 1.00 + 0.05 mm
= 1.05 mm
If "F" is "–3", then
M0 = 1.00 + (–3)/100 mm
= 1.00 – 0.03 mm
= 0.97 mm

(2) Install the shimming gauge, bearing ①, and shim(s) ②.

Shimming gauge
YB-34446-1, -3, -4, -7

NOTE:

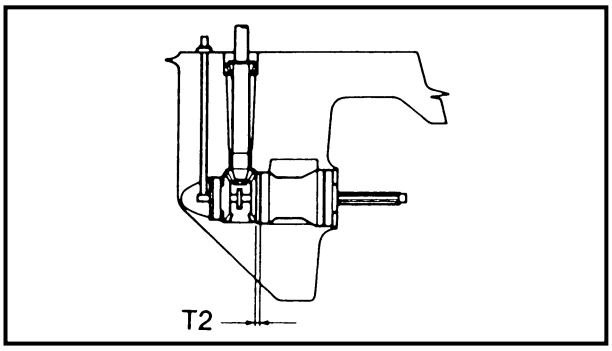
If the original shim(s) is unavailable, start with a 0.50-mm shim.

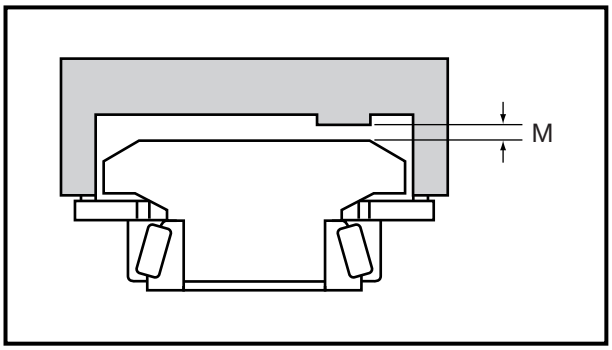
(3) Measure the specified measurement (M).

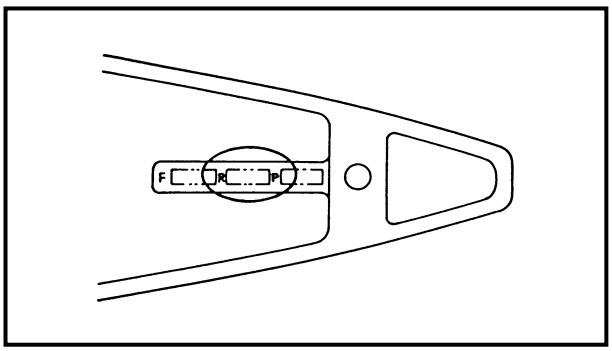
2. Adjust:
   • Shim thickness (T1)
   Remove or add shim(s).

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

NOTE:
(M0) – (M) should be as close to "0" as possible.







SELECTING THE REAR GEAR SHIMS

NOTE:
Find the shim thickness (T2) by selecting shims until the specified value (M0) is obtained with the special tool.

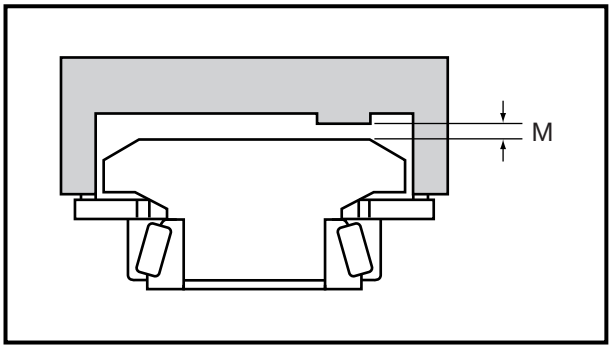
1. Measure:
   • Specified measurement (M)
   Out of specified value (M0) → Adjust.

Specified measurement (M0) =
1.60 – R/100 mm

Measuring steps
(1) Calculate the specified value (M0).

NOTE:
- "R" is the deviation of the lower case dimension from standard. It is stamped on the lower case in 0.01-mm units. If the "R" mark is missing or unreadable, assume an "R" value of "0", and check the backlash when the unit is assembled.
- If the "R" mark is negative (–), then add the "R" value to the measurement.

Example:
If "R" is "+5", then
M0 = 1.60 – (+5)/100 mm
= 1.60 – 0.05 mm
= 1.55 mm
If "R" is "–3", then
M0 = 1.60 – (–3)/100 mm
= 1.60 + 0.03 mm
= 1.63 mm



(2) Install the shimming gauge, bearing, thrust washer, rear gear, and shim(s).

	**Shimming gauge YB-34468-1**

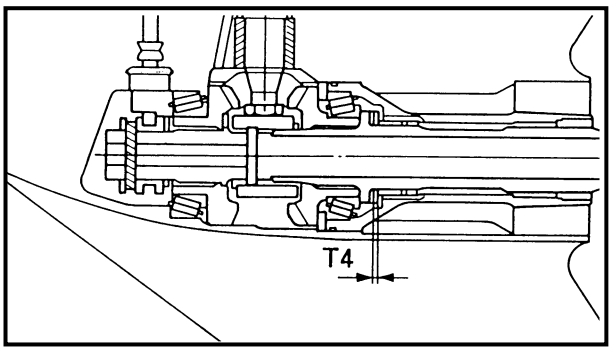
NOTE:
- If the original shim(s) is unavailable, start with a 0.50-mm shim.
- Turn the rear gear assembly a few times until the gear and bearing are horizontal.

(3) Measure the specified measurement (M).

2. Adjust:
- Shim thickness (T2)
Remove or add shim(s).

	**Available shim thicknesses 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm**

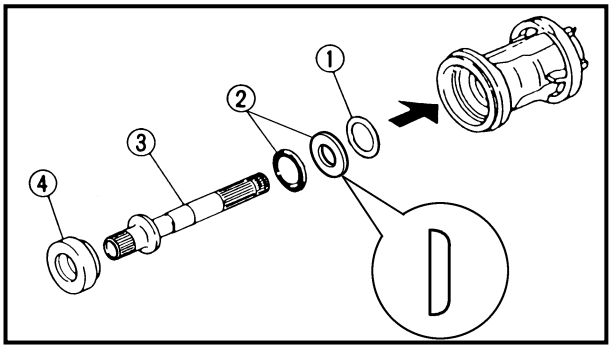
NOTE:
(M0) – (M) should be as close to "0" as possible.



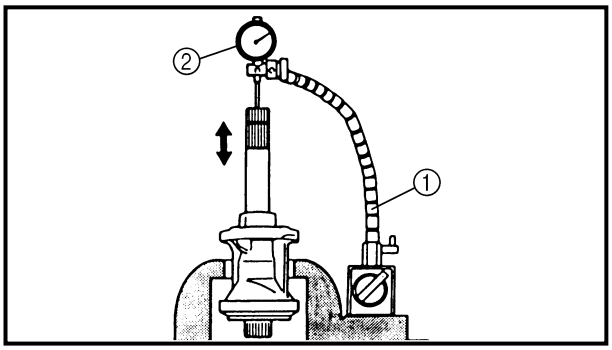
SELECTING THE OUTER PROPELLER SHAFT SHIMS

NOTE:

Find the shim thickness (T4) by selecting shims until the specified measurement is obtained with the special tool.



1. Install:
   - Shim(s) ①
   - Thrust bearing ②
   - Outer propeller shaft ③
   - Tapered roller bearing ④



2. Measure:
   - Outer propeller shaft free play
     Out of specification → Adjust.

Propeller shaft free play
0.30 ± 0.05 mm

Magnetic base..... ①
YU-34481
Dial gauge set ..... ②
YU-03097

3. Adjust:
   - Outer propeller shaft free play
     Remove or add shim(s).

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

BACKLASH (DUAL PROPELLER MODELS)

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

MEASURING THE FRONT GEAR BACKLASH

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

	**Front gear backlash** **0.19 - 0.59 mm (0.007 - 0.023 in)**

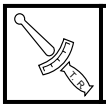
Measuring steps

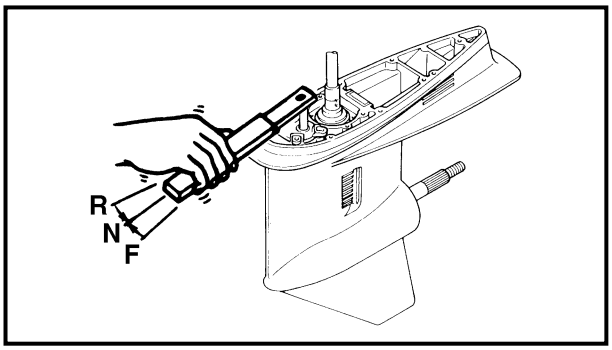
(1) Set the shift rod into the neutral position.

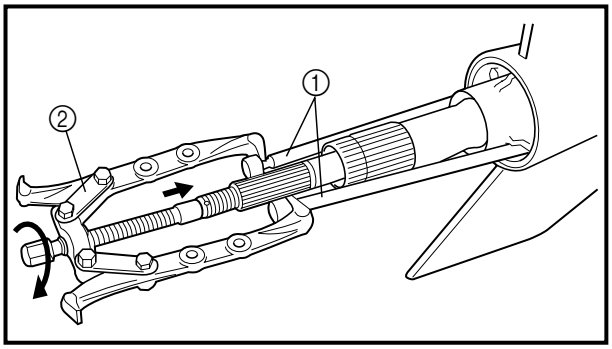
	**Shift rod wrench** **YB-06052 / 90890-06052**

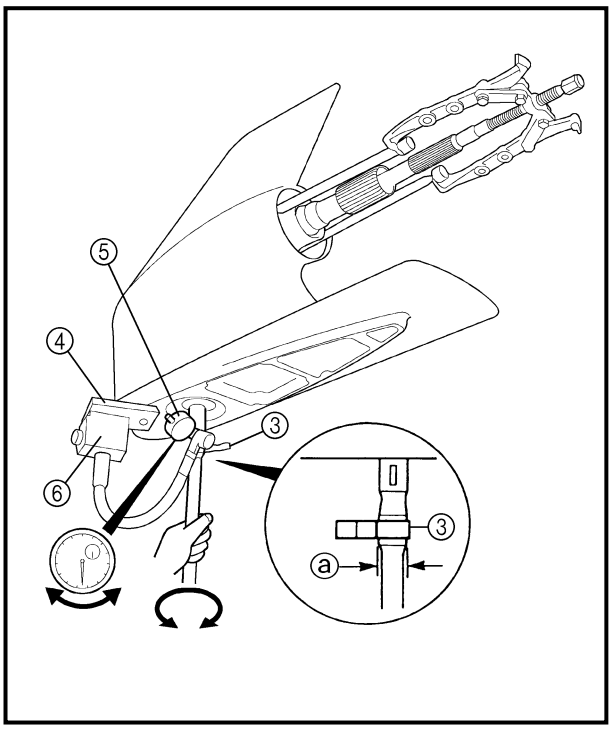
(2) Install the propeller shaft housing puller so it pushes against the inner propeller shaft.

	**Propeller shaft housing puller . ①** **YB-06502 / 90890-06502** **Universal puller..... ②** **YB-06540 / 90890-06540**

	**Universal puller** **10 Nm (1.0 m • kgf, 7.2 ft • lb)**







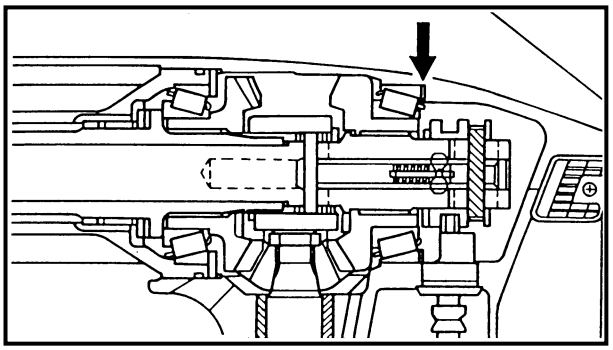
(3) Install the backlash indicator onto the drive shaft (on the 22.4 mm (0.88 in) diameter portion of the drive shaft ⓐ).

Backlash indicator ..... ③ **YB-06265 / 90890-06706**	

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

Magnetic-base plate..... ④ **YB-07003 / 90890-07003** **Dial gauge set ..... ⑤** **YU-03097 / 90890-01252** **Magnetic base..... ⑥** **YU-34481 / 90890-06705**	

(5) Set the lower unit upside down.
(6) Slowly turn the drive shaft clockwise and counterclockwise. When the drive shaft stops in each direction, measure the backlash.



2. Adjust:
• Front gear shim
Remove or add shim(s).

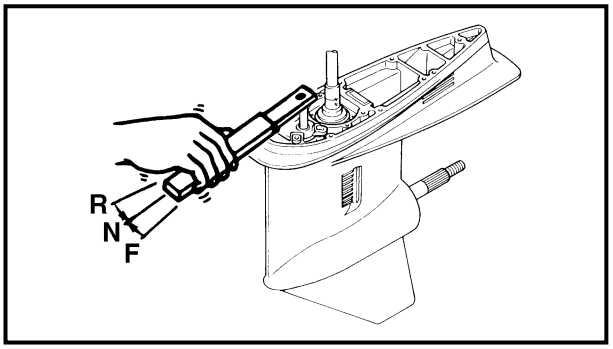
Front gear backlash	**Shim thickness**
Less than 0.19 mm (0.007 in)	**To be decreased by (0.39 – M) × 0.50**
More than 0.59 mm (0.023 in)	**To be increased by (M – 0.39) × 0.50**
Available shim thickness **0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm**	

M: Measurement

MEASURING THE REAR GEAR BACKLASH

1. Measure:
   • Rear gear backlash
   Out of specification → Adjust.

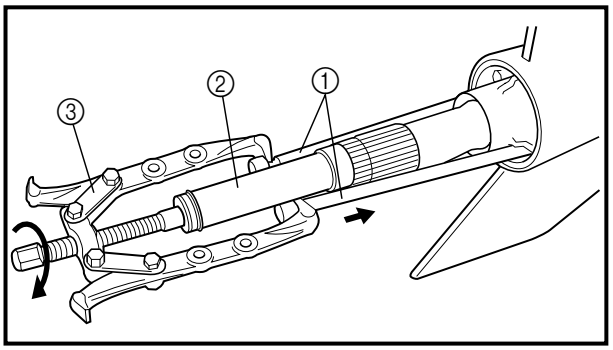
	Rear gear backlash **0.39 - 0.70 mm (0.015 - 0.027 in)**



Measuring steps

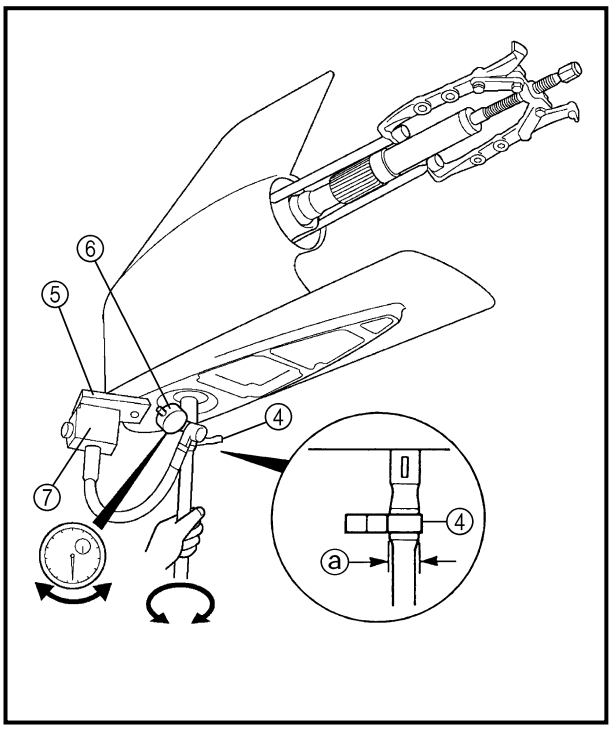
(1) Set the shift rod into the neutral position.

	Shift rod wrench **YB-06052 / 90890-06052**



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

	Propeller shaft housing puller . ① **YB-06502 / 90890-06502** **Propeller shaft housing puller extension..... ②** **YB-06513 / 90890-06513** **Universal puller..... ③** **YB-06540 / 90890-06540**
	Universal puller **10 Nm (1.0 m • kgf, 7.2 ft • lb)**



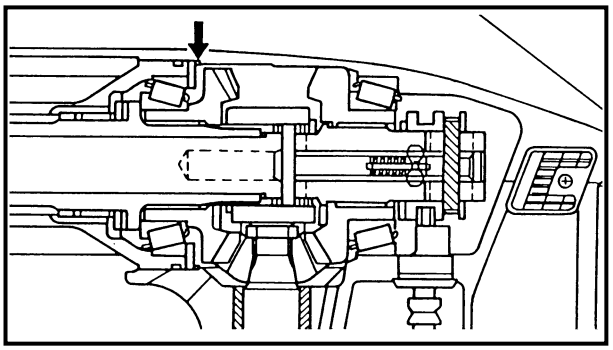
(3) Install the backlash indicator onto the drive shaft (on the 22.4 mm (0.88 in) diameter portion of the drive shaft ⓐ).

Backlash indicator ..... ④ **YB-06265 / 90890-06706**	

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

Magnetic-base plate..... ⑤ **YB-07003 / 90890-07003** **Dial gauge set ..... ⑥** **YU-03097 / 90890-01252** **Magnetic base..... ⑦** **YU-34481 / 90890-06705**	

(5) Set the lower unit upside down.
(6) Slowly turn the drive shaft clockwise and counterclockwise. When the drive shaft stops in each direction, measure the backlash.



2. Adjust:
   • Rear gear backlash
   Remove or add shim(s).

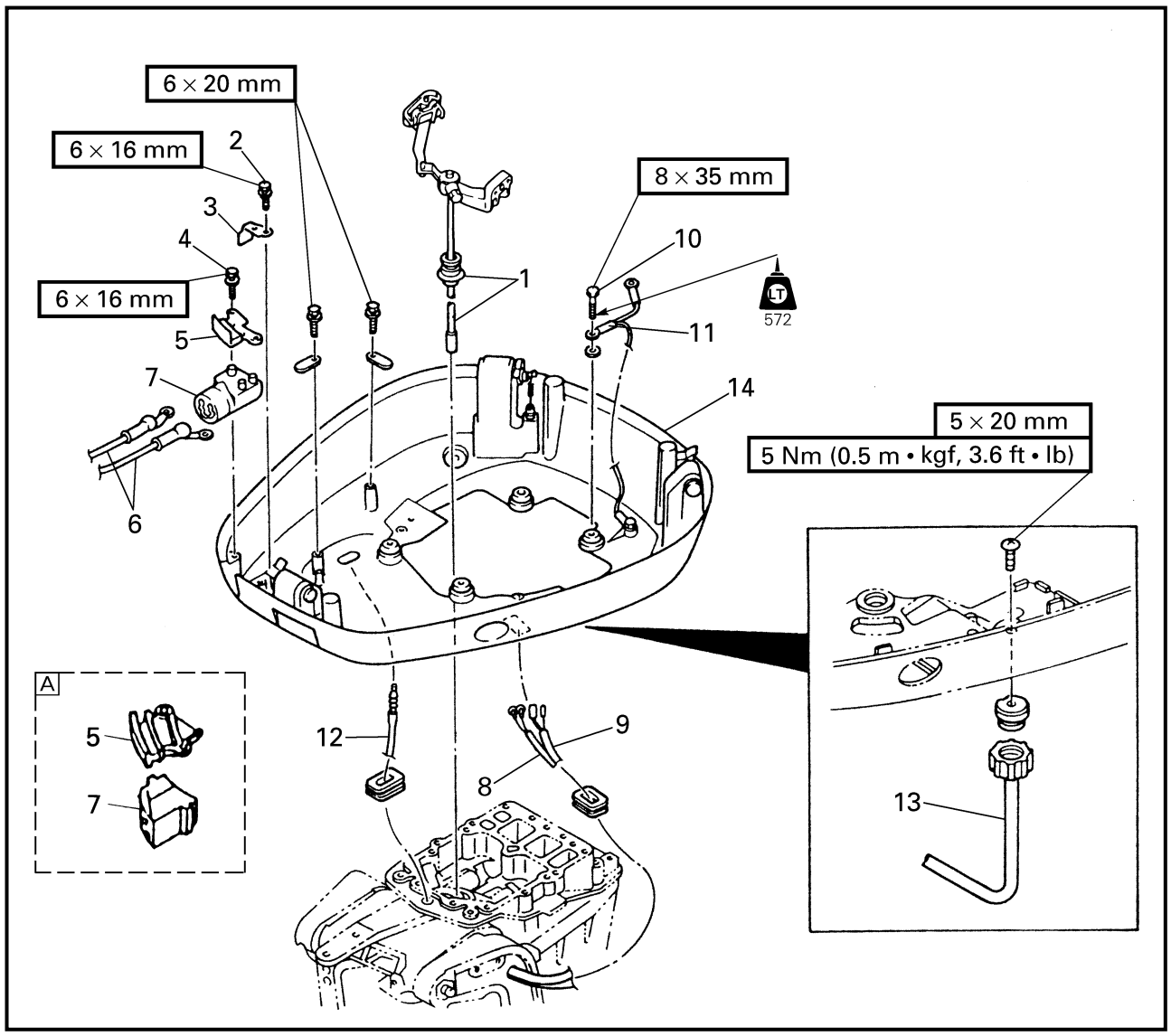
Rear gear backlash	**Shim thickness**
Less than 0.39 mm (0.015 in)	**To be increased by (0.55 – M) × 0.50**
More than 0.70 mm (0.027 in)	**To be decreased by (M – 0.55) × 0.50**
Available shim thickness 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm	

M: Measurement

CHAPTER 7
BRACKET UNIT

BOTTOM COWLING

REMOVING/INSTALLING THE BOTTOM COWLING



Order	Job/Part	Q'ty	Remarks
	Power unit		Refer to "POWER UNIT" on page 5-4.
1	Shift rod assembly	1	
2	Bolt	1	
3	Holder	1	
4	Bolt	2	
5	Bracket	1	
6	Battery lead	2	
7	Hose guide	1	

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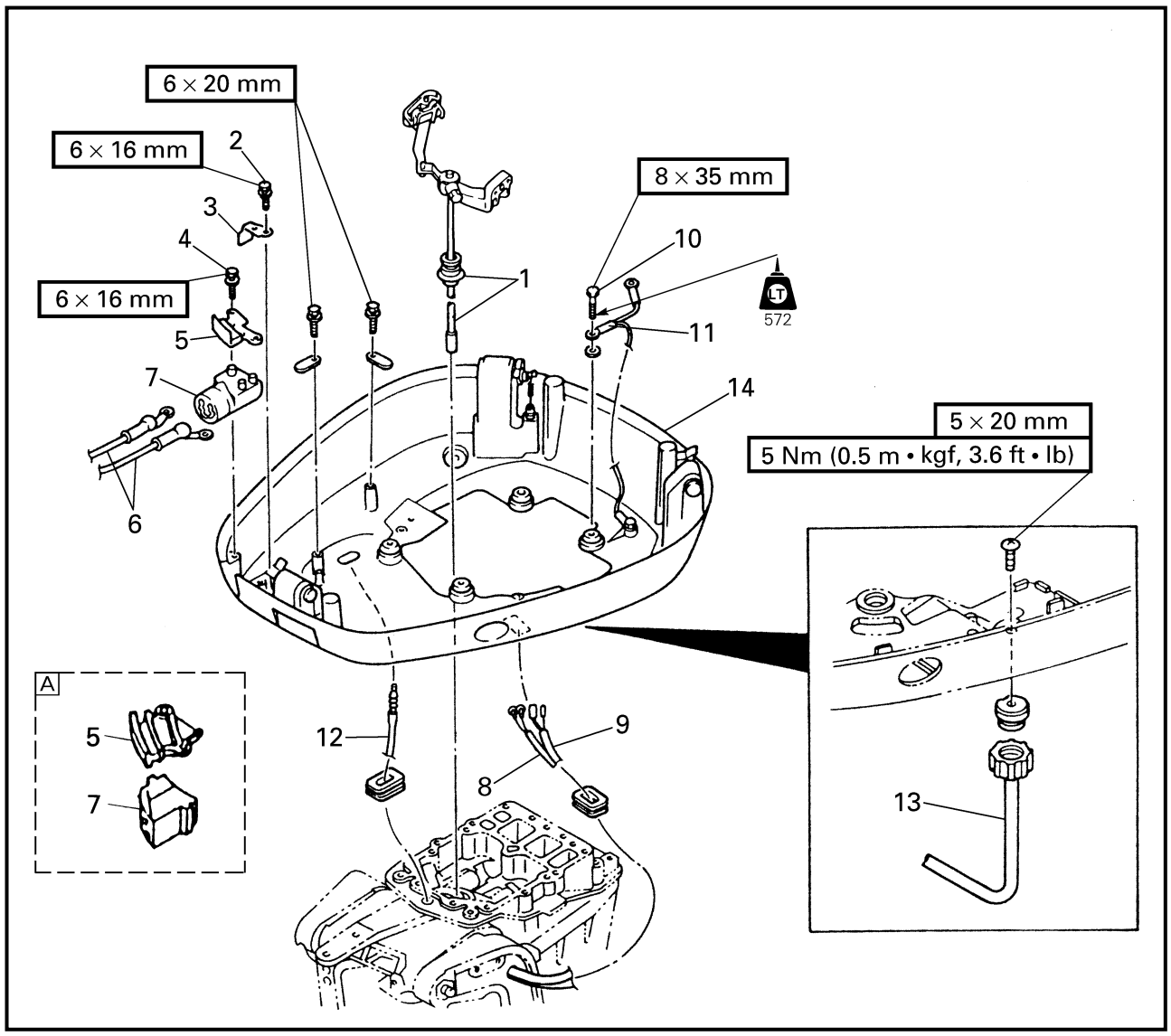
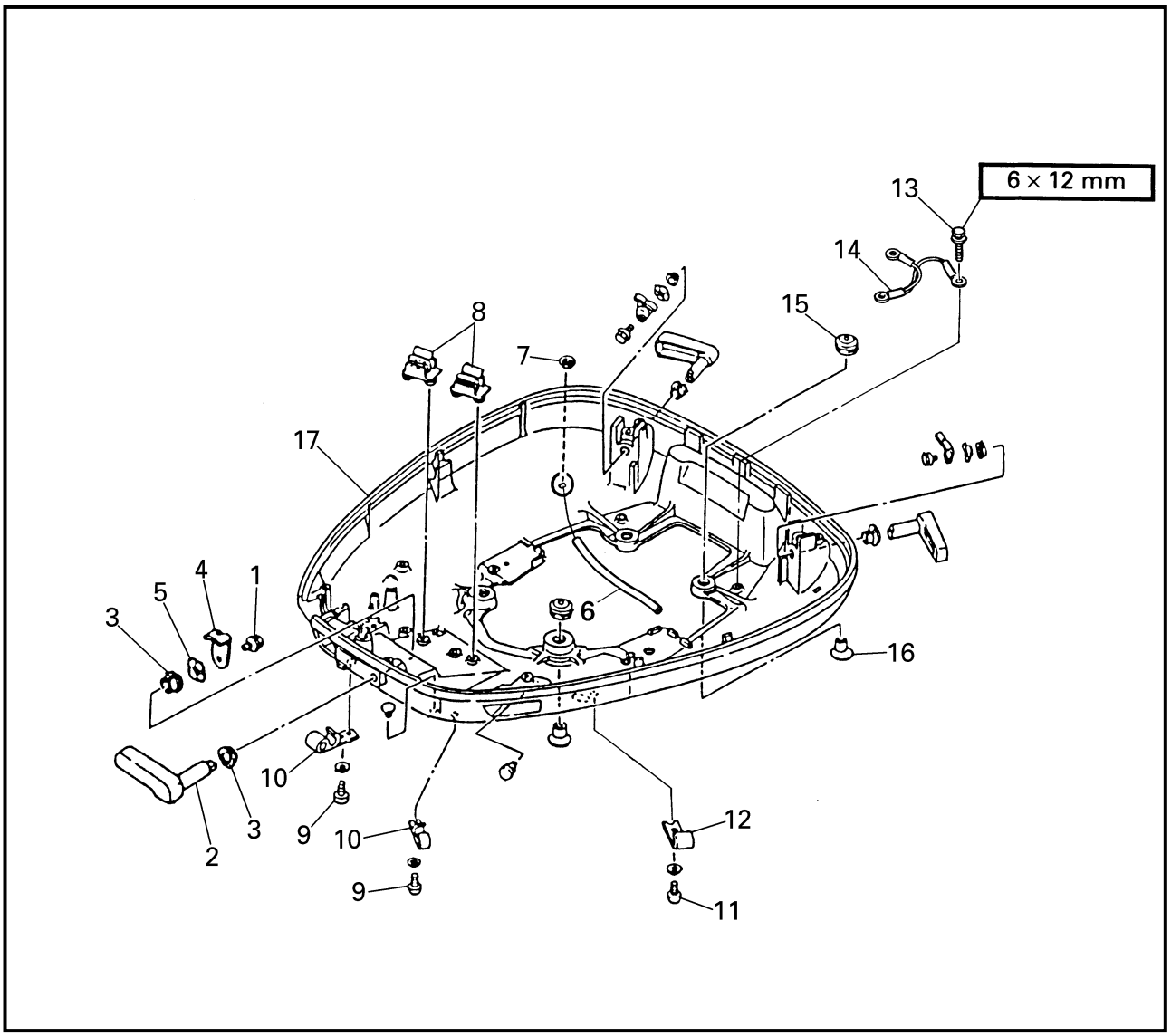


Order	Job/Part	Q'ty	Remarks
8	Power trim and tilt lead	1	
9	Trim sensor lead	1	
10	Bolt	4	
11	Ground lead	1	
12	Speedometer hose	1	
13	Flushing hose	1	Salt water models
14	Bottom cowling	1	
			For installation, reverse the removal procedure.

A Pre-mix models, except for 225DET

DISASSEMBLING/ASSEMBLING THE BOTTOM COWLING (FOR PRE-MIX MODELS, EXCEPT FOR 225DET)



Order	Job/Part	Q'ty	Remarks
1	Bolt	3	
2	Clamp lever	3	
3	Bushing	6	
4	Hook	3	
5	Wave washer	3	
6	Pilot water hose	1	
7	Pilot water outlet	1	
8	Cable holder	2	
9	Bolt	2	

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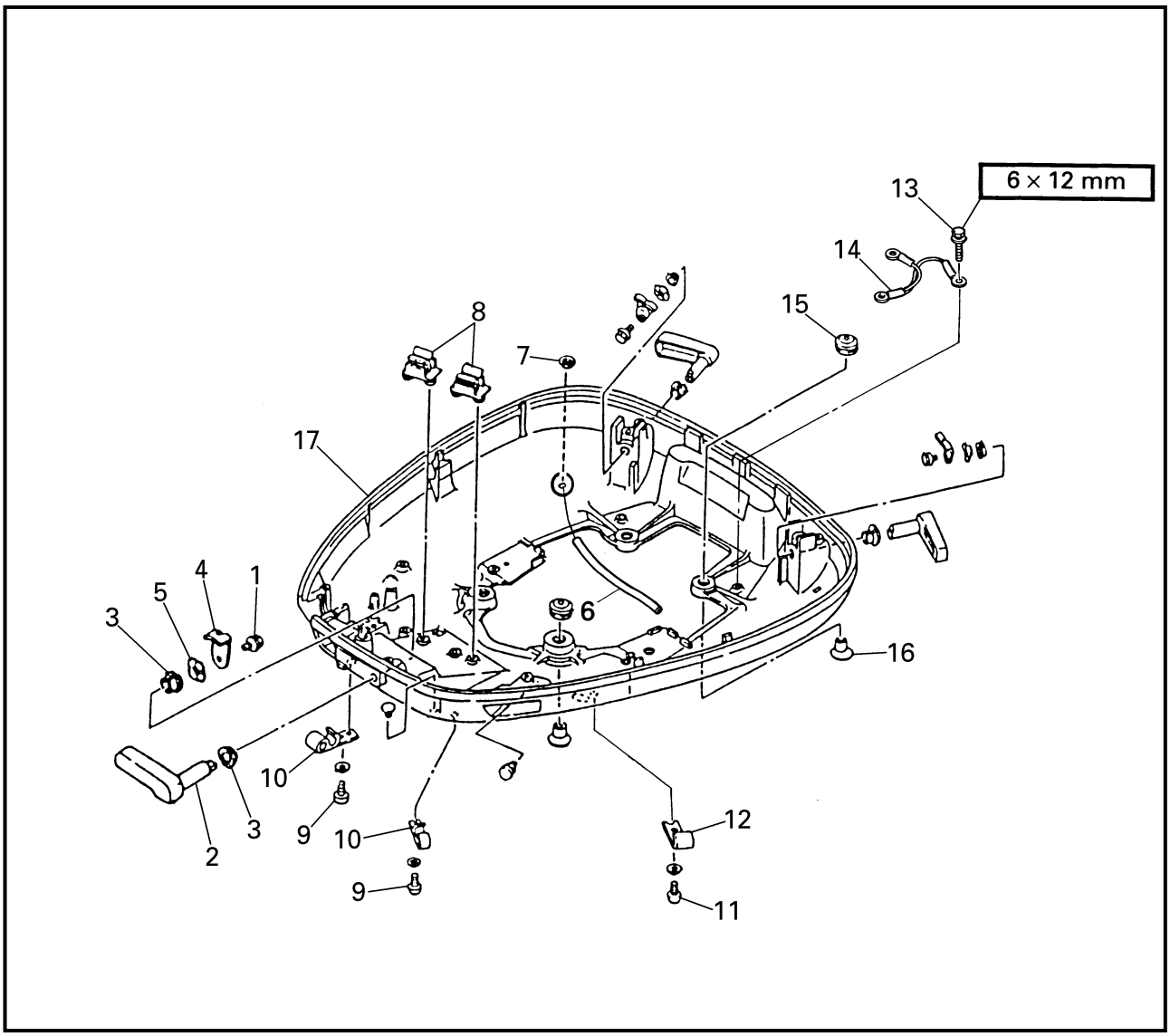
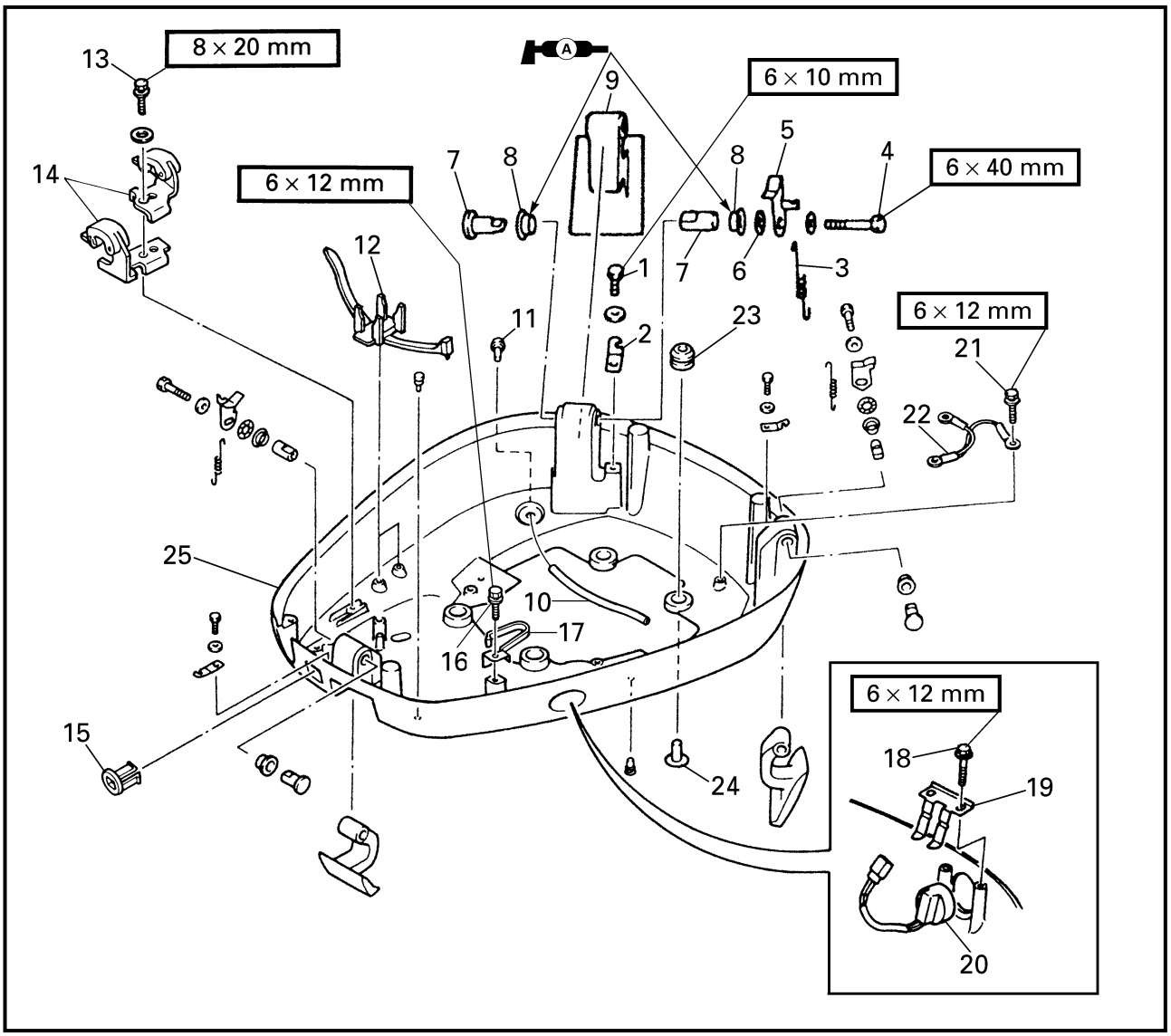


Order	Job/Part	Q'ty	Remarks
10	Fuel hose holder	2	
11	Bolt	1	
12	Fuel hose holder	1	
13	Bolt	1	
14	Ground lead	1	
15	Grommet	4	
16	Collar	4	
17	Bottom cowling	1	
			For assembly, reverse the disassembly procedure.

DISASSEMBLING/ASSEMBLING THE BOTTOM COWLING (FOR OIL INJECTION MODELS, AND 225DET)



Order	Job/Part	Q'ty	Remarks
1	Bolt	3	
2	Lower spring holder	3	
3	Spring	3	
4	Bolt	3	
5	Upper spring holder	3	
6	Wave washer	3	
7	Set pin	3	
8	Bushing	6	
9	Clamp lever	3	

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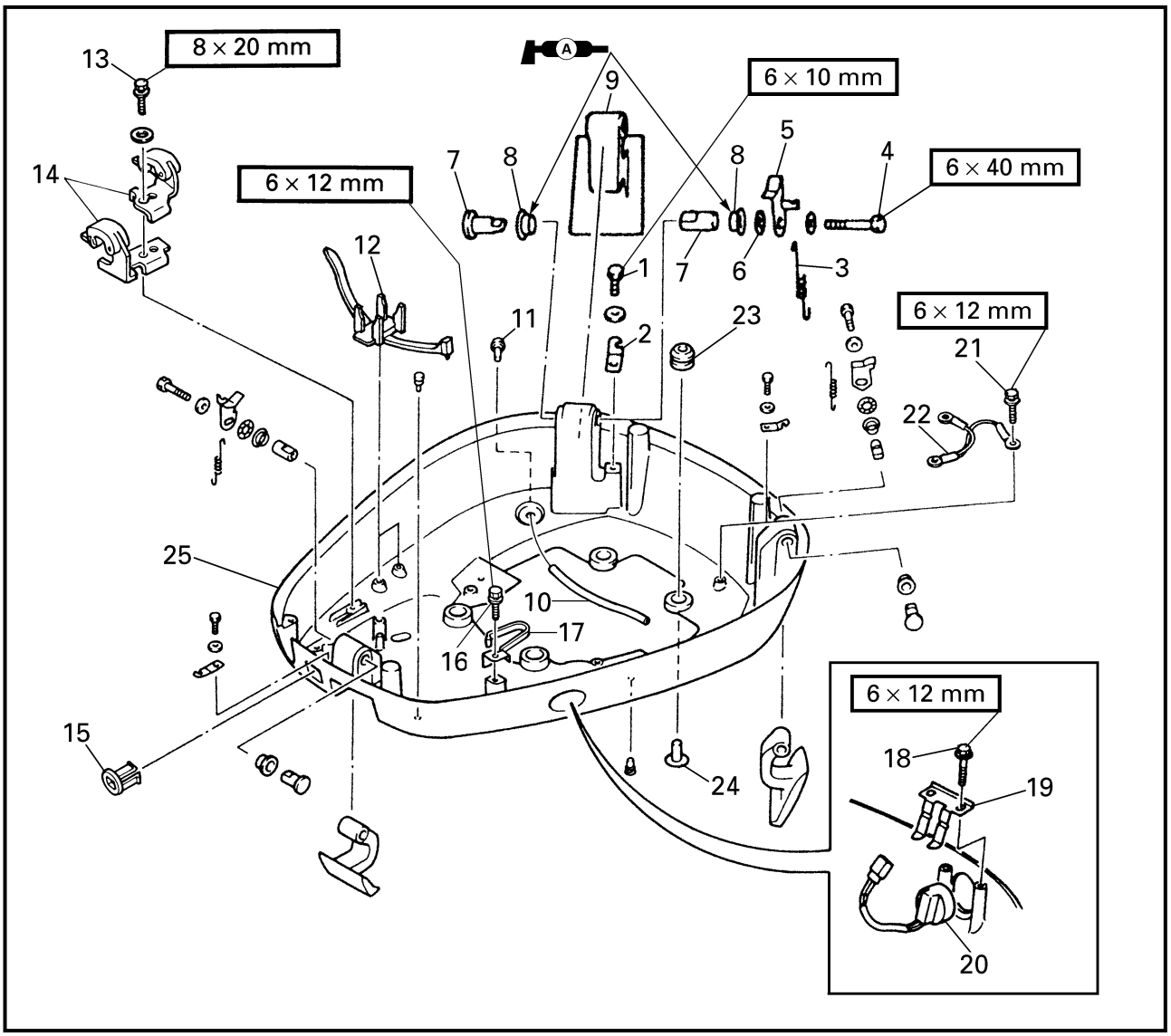

Order	Job/Part	Q'ty	Remarks
10	Pilot water hose	1	
11	Pilot water outlet	1	
12	Wire harness clamp	1	
13	Bolt	1	
14	Cable holder	1	
15	Choke link guide	1	
16	Bolt	1	
17	Cable guide	1	
18	Bolt	2	

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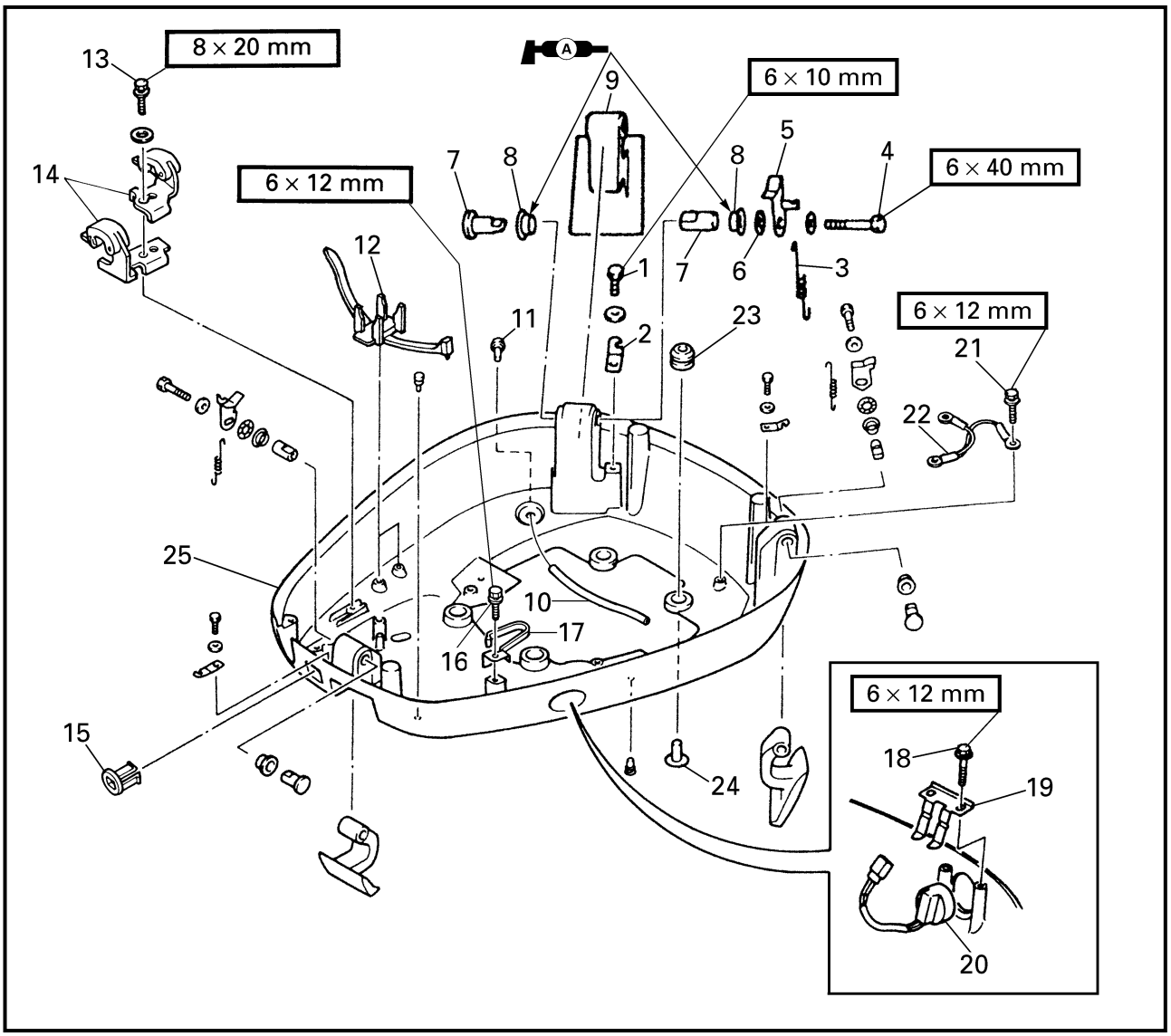
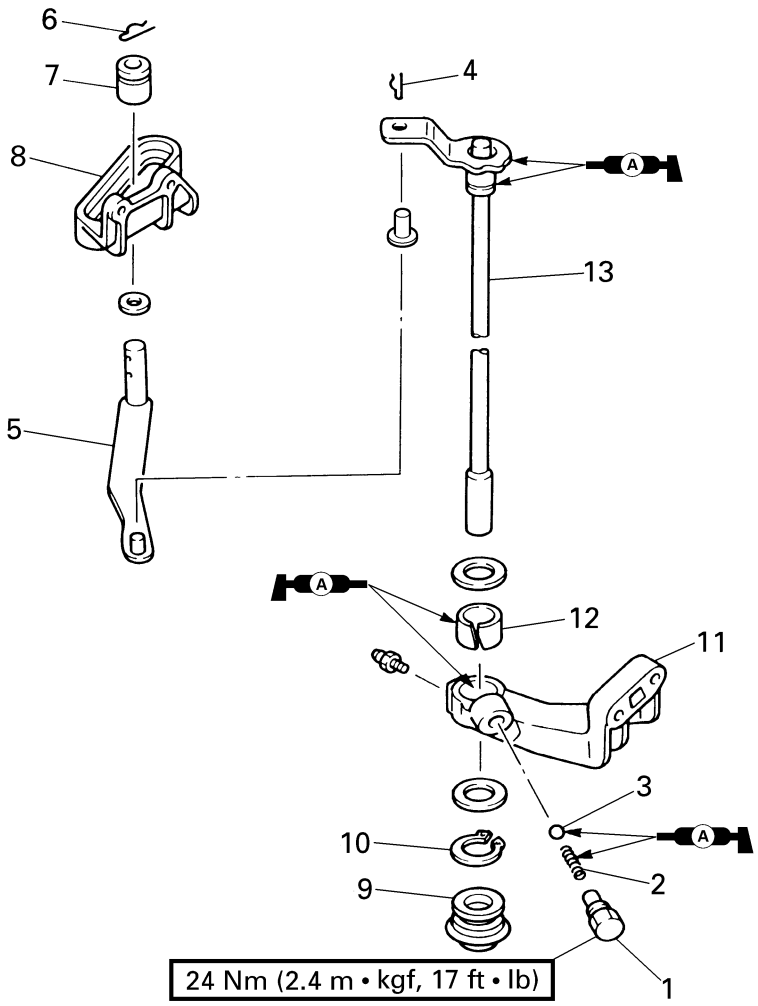


Order	Job/Part	Q'ty	Remarks
19	Trailer switch holder	1	
20	Trailer switch	1	
21	Bolt	1	
22	Ground lead	1	
23	Grommet	4	
24	Collar	4	
25	Bottom cowling	1	
			For assembly, reverse the disassembly procedure.

SHIFT ROD ASSEMBLY

DISASSEMBLING/ASSEMBLING THE SHIFT ROD ASSEMBLY



Order	Job/Part	Q'ty	Remarks
1	Screw	1	
2	Spring	1	
3	Ball	1	
4	Clip	1	
5	Shift rod lever	1	
6	Clip	1	
7	Bushing	1	

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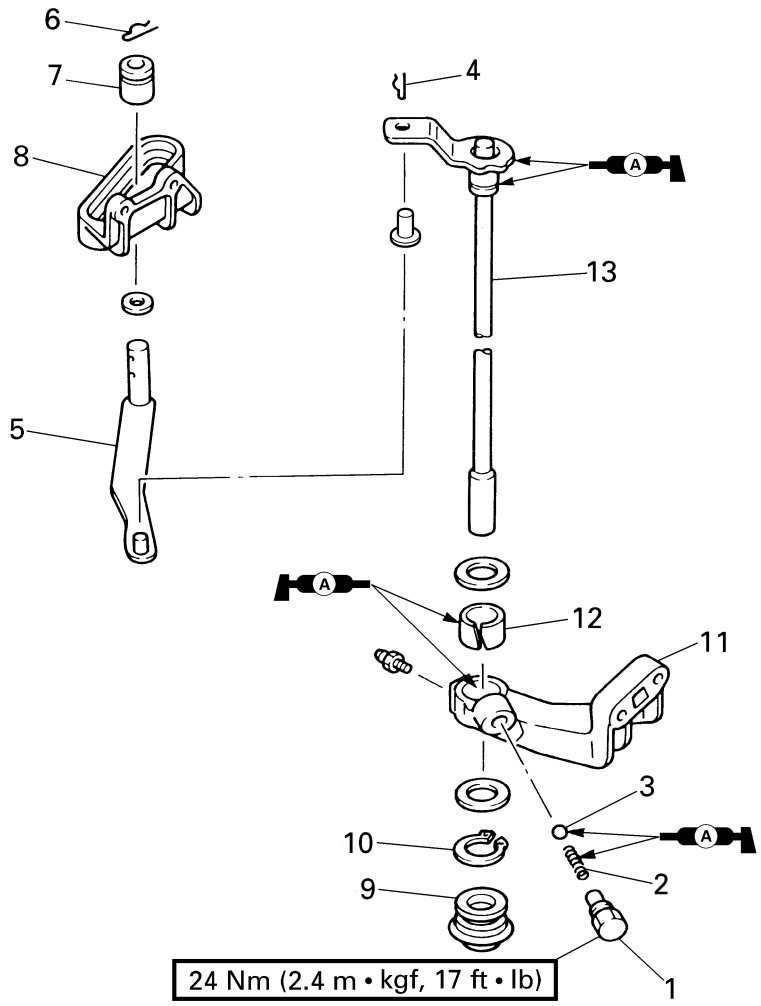
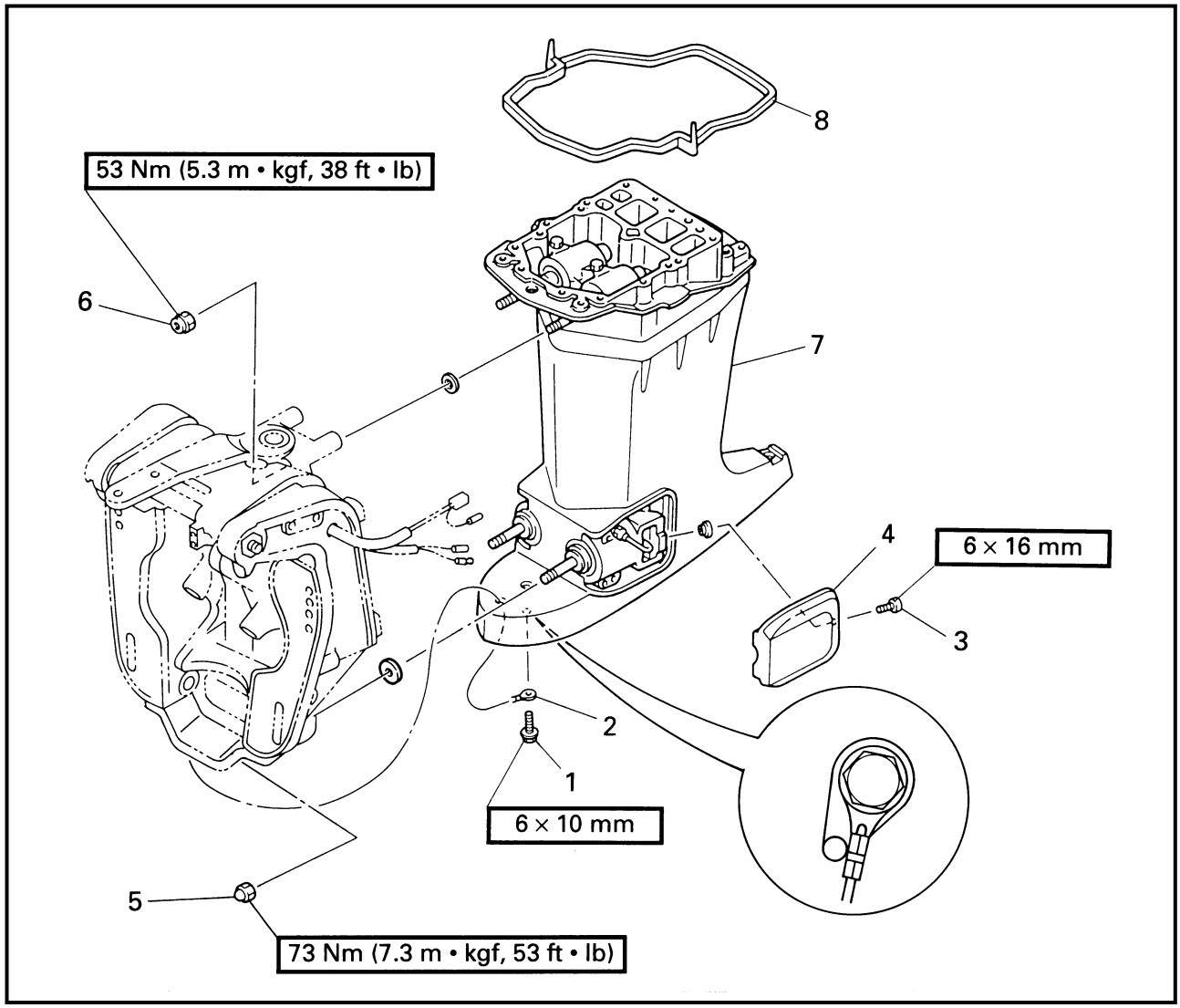


Order	Job/Part	Q'ty	Remarks
8	Shift rod lever bracket	1	
9	Rubber seal	1	
10	Circlip	1	
11	Shift rod bracket	1	
12	Bushing	1	
13	Shift rod	1	
			For assembly, reverse the disassembly procedure.

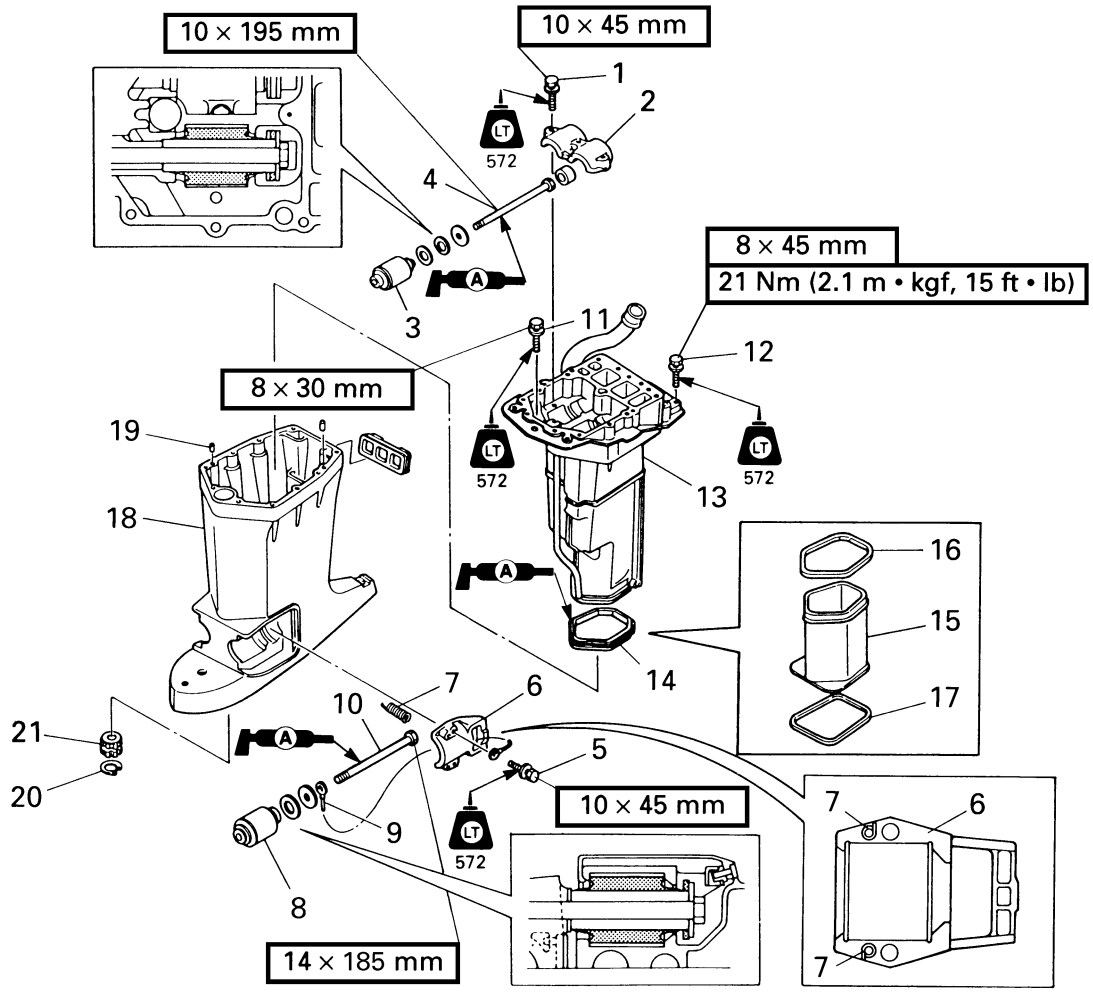
UPPER CASE ASSEMBLY

REMOVING/INSTALLING THE UPPER CASE ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Lower unit		Refer to "LOWER UNIT (REGULAR ROTATION MODELS)" on page 6-1.
	Bottom cowling		Refer to "BOTTOM COWLING" on page 7-1.
1	Bolt	1	
2	Ground lead	1	(upper case-to-swivel bracket)
3	Screw	2	
4	Lower mount cover	2	
5	Cap nut	2	
6	Self-locking nut	2	
7	Upper case assembly	1	
8	Rubber seal	1	
			For installation, reverse the removal procedure.

DISASSEMBLING/ASSEMBLING THE UPPER CASE ASSEMBLY



Order	Job/Part	Q'ty	Remarks
1	Bolt	3	
2	Upper mount bracket	1	
3	Upper mount	2	
4	Bolt	2	
5	Bolt	4	
6	Lower mount bracket	2	
7	Spring	2	
8	Lower mount	2	

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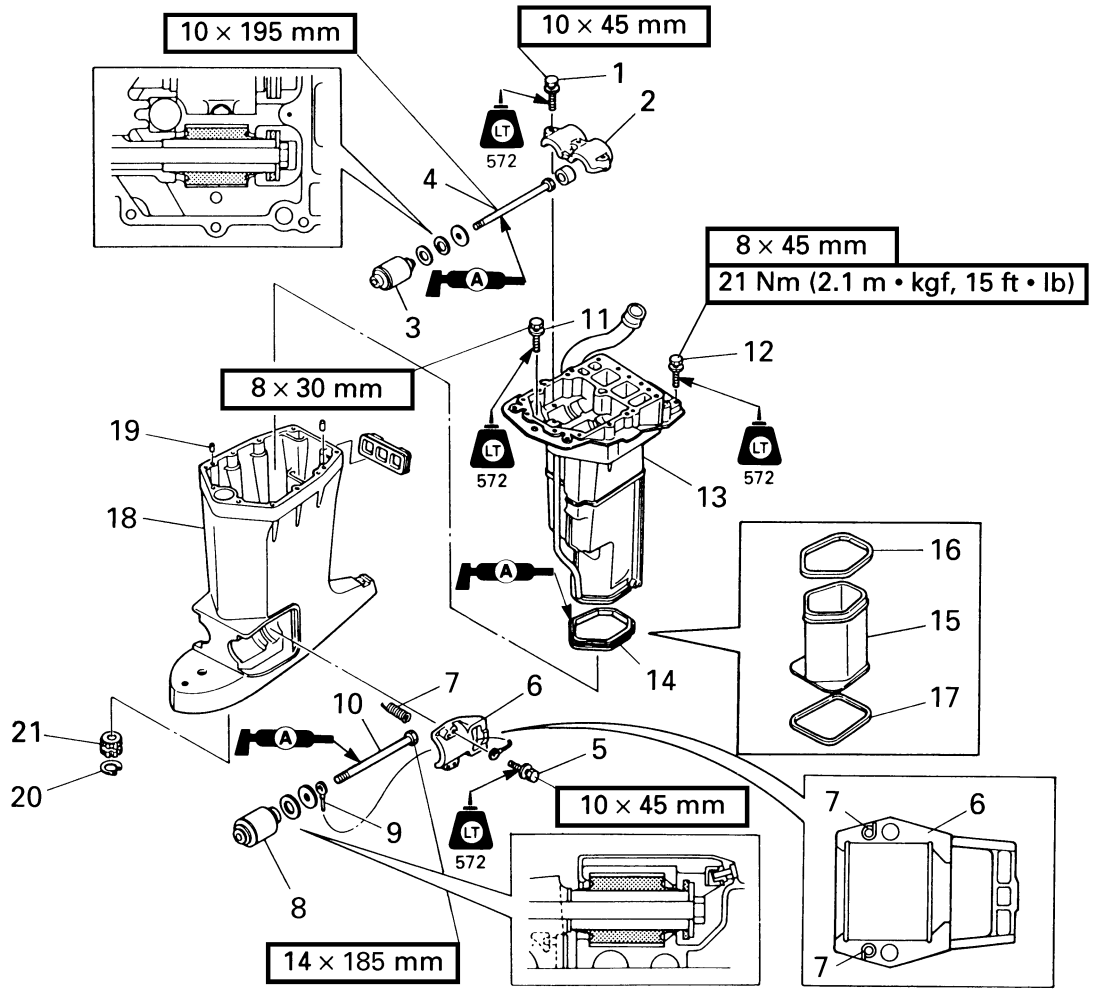

Order	Job/Part	Q'ty	Remarks
9	Ground lead	1	
10	Bolt	2	
11	Bolt	2	
12	Bolt	2	
13	Muffler assembly	1	
14	Rubber seal	1	
15	Muffler	1	X transom models
16	Rubber seal	1	X transom models
17	Rubber seal	1	X transom models

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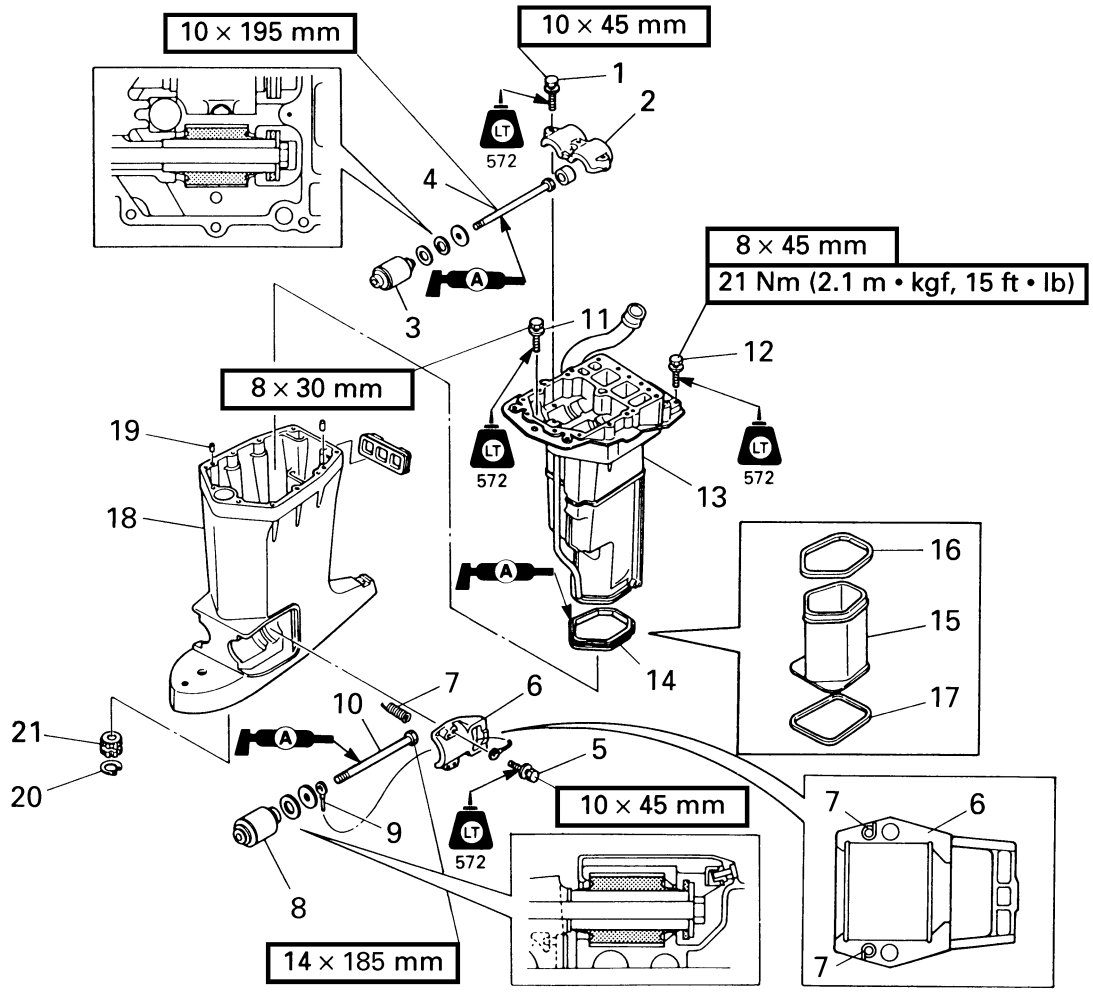
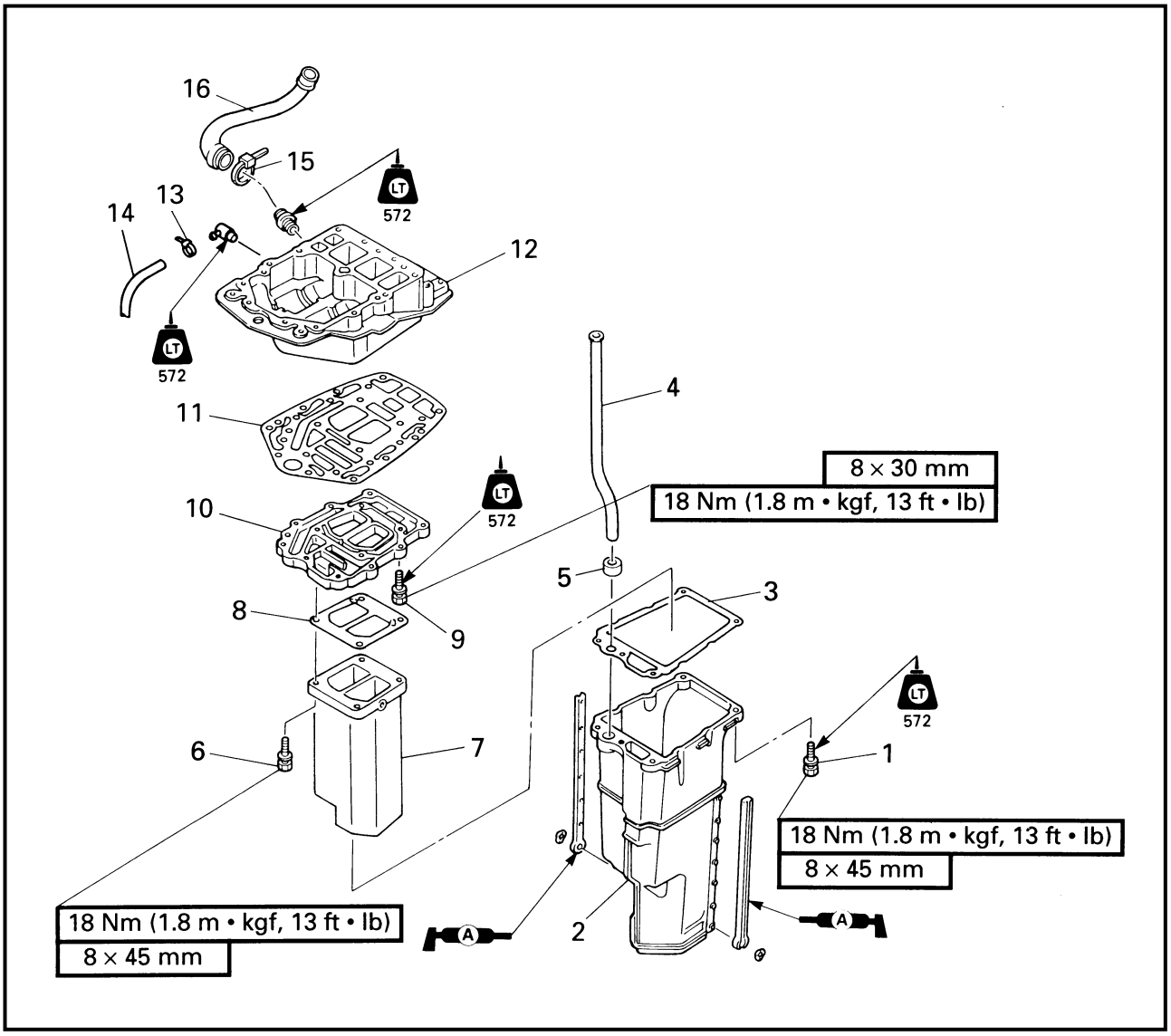


Order	Job/Part	Q'ty	Remarks
18	Upper case	1	
19	Dowel pin	2	
20	Circlip	1	X transom models
21	Bushing	1	X transom models
			For assembly, reverse the disassembly procedure.

EXHAUST MANIFOLD ASSEMBLY

DISASSEMBLING/ASSEMBLING THE EXHAUST MANIFOLD ASSEMBLY



Order	Job/Part	Q'ty	Remarks
1	Bolt	5	
2	Muffler	1	
3	Gasket	1	**Not reusable**
4	Water tube	1	
5	Water seal	1	
6	Bolt	4	
7	Exhaust manifold	1	
8	Gasket	1	**Not reusable**
9	Bolt	4	

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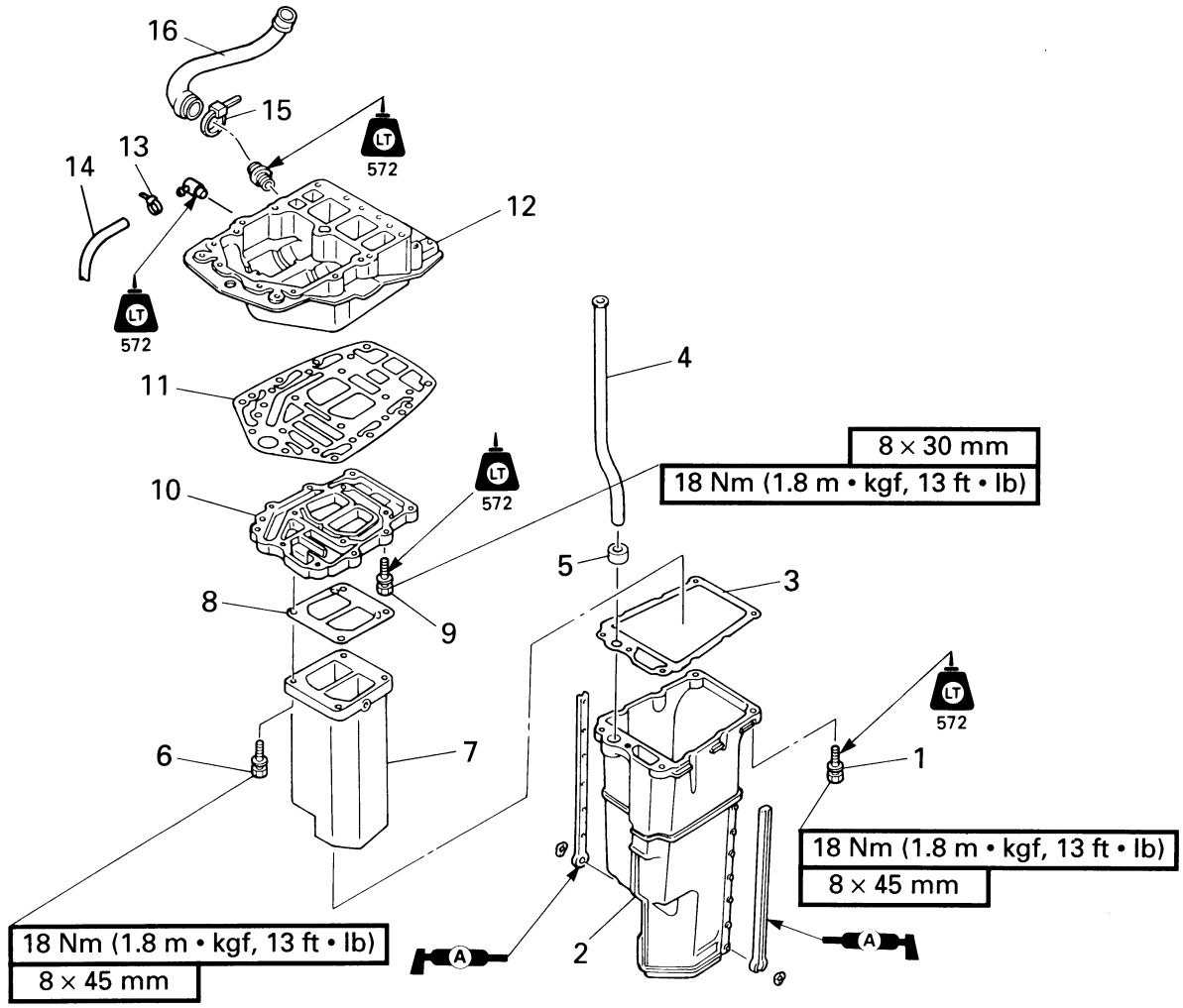
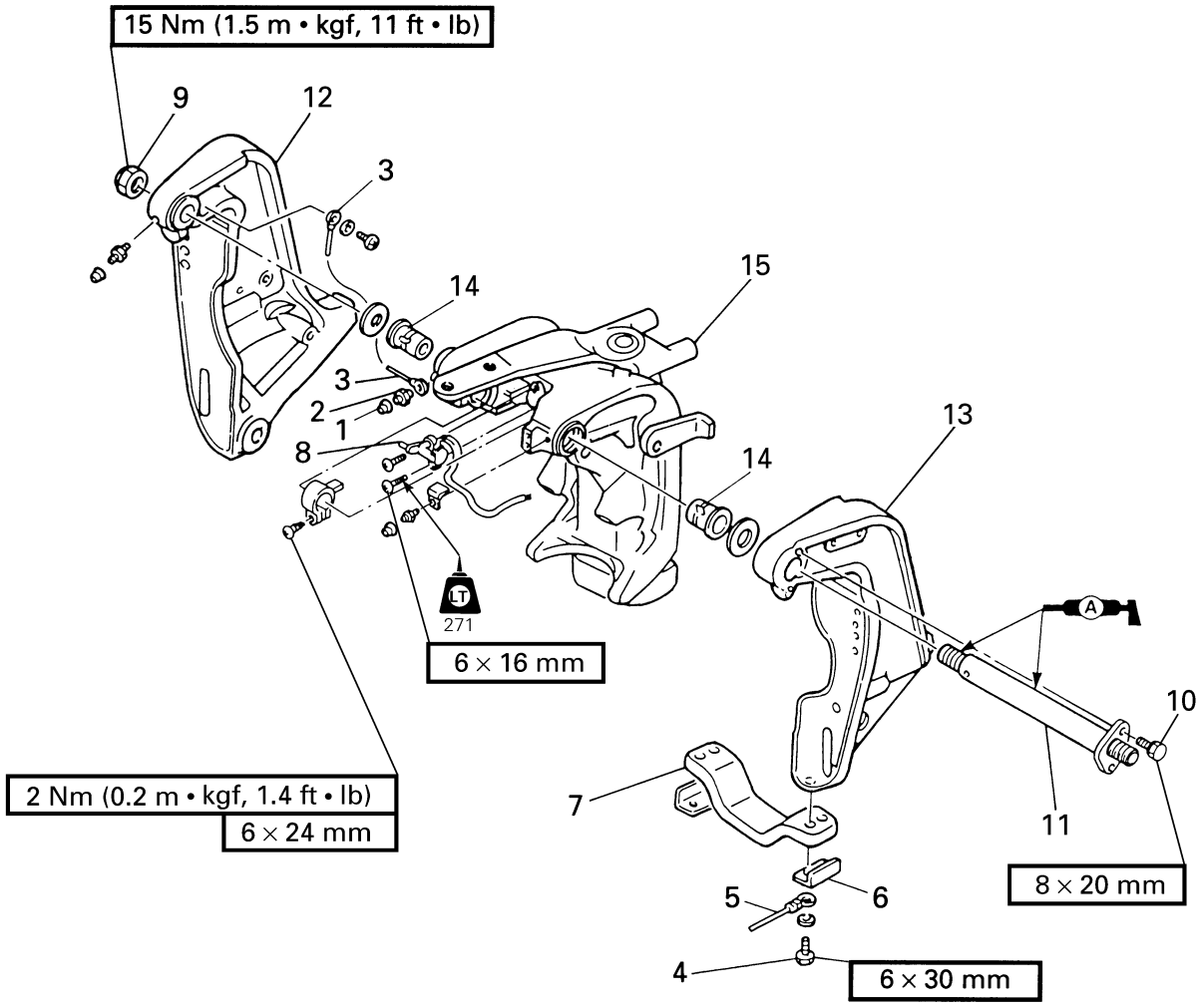


Order	Job/Part	Q'ty	Remarks
10	Lower exhaust manifold guide	1	
11	Gasket	1	**Not reusable**
12	Upper exhaust manifold guide	1	
13	Plastic locking tie	1	**Not reusable** Salt water models
14	Flushing hose	1	Salt water models
15	Plastic locking tie	1	**Not reusable**
16	Cooling water hose	1	
			For assembly, reverse the disassembly procedure.

CLAMP BRACKETS

REMOVING/INSTALLING THE CLAMP BRACKETS



Order	Job/Part	Q'ty	Remarks
	Upper case assembly		Refer to "UPPER CASE ASSEMBLY" on page 7-10.
1	Rubber cap	3	
2	Grease nipple	3	
3	Ground lead	1	
4	Bolt	4	
5	Ground lead	1	
6	Anode bracket	2	
7	Anode	1	
8	Trim sensor	1	

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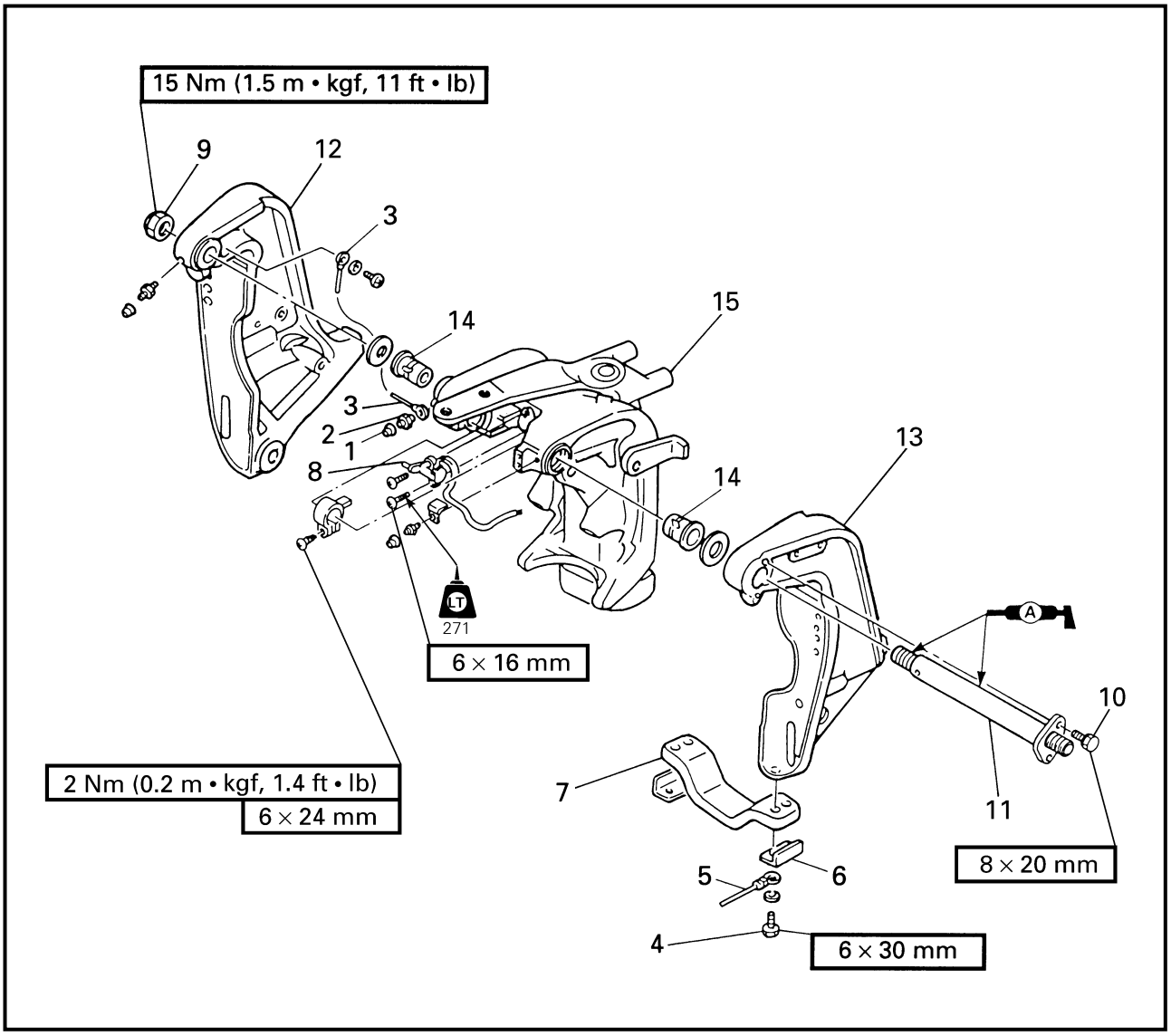
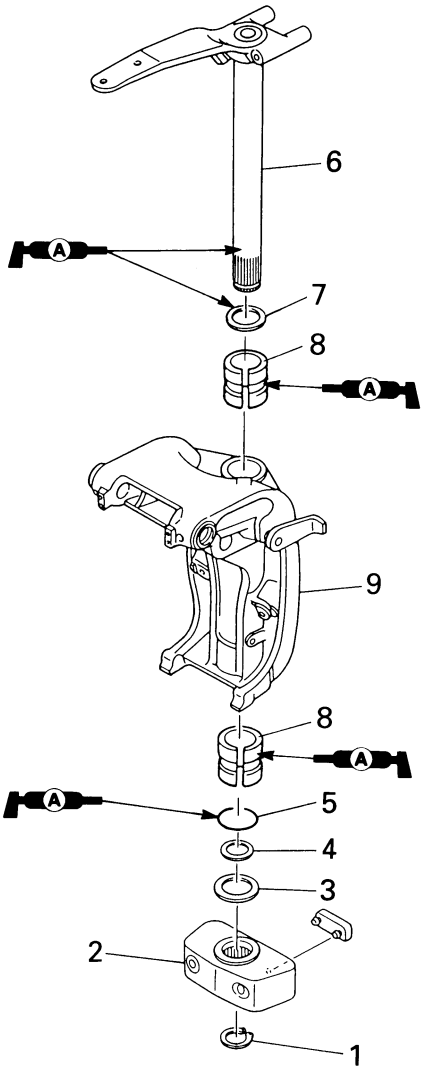


Order	Job/Part	Q'ty	Remarks
9	Self-locking nut	1	
10	Bolt	2	
11	Clamp bracket bolt	1	
12	Starboard clamp bracket	1	
13	Port clamp bracket	1	
14	Bushing	2	
15	Swivel bracket assembly	1	
			For installation, reverse the removal procedure.

STEERING ARM

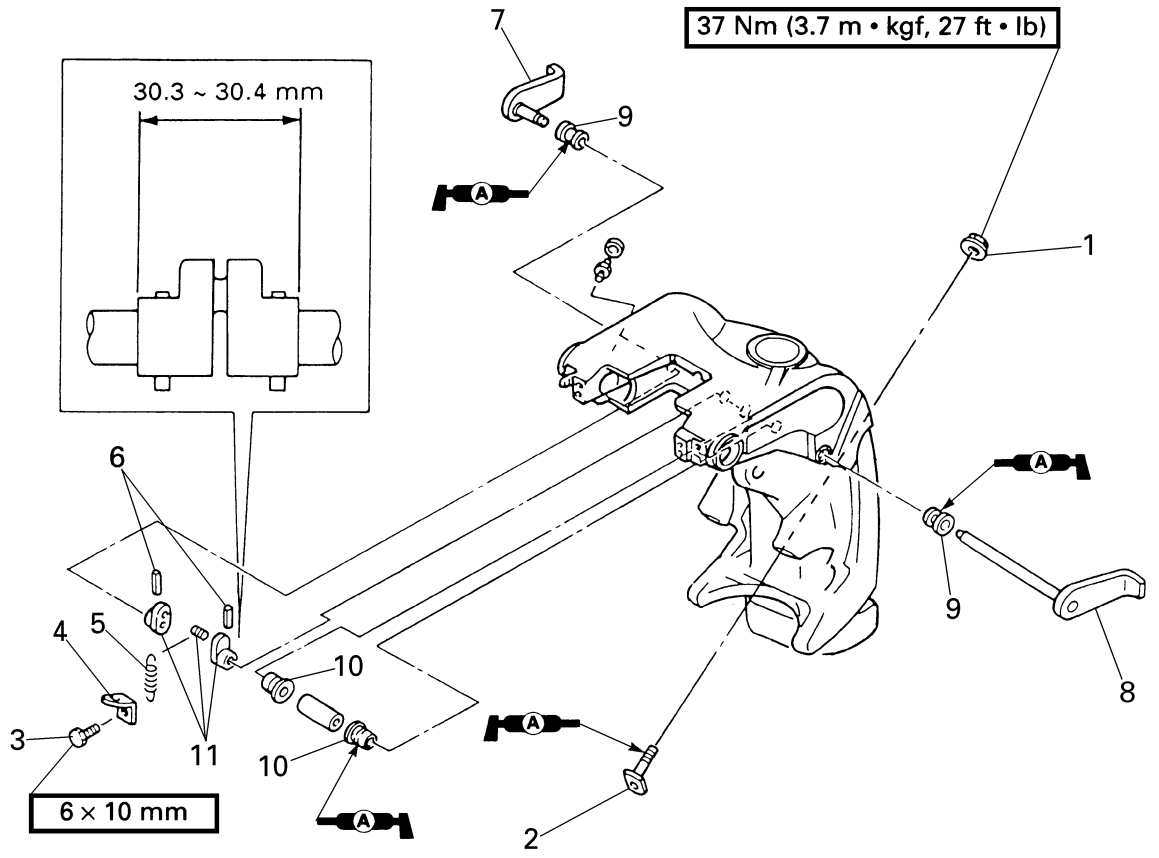
REMOVING/INSTALLING THE STEERING ARM



Order	Job/Part	Q'ty	Remarks
	Upper case assembly		Refer to "UPPER CASE ASSEMBLY" on page 7-10.
1	Circlip	1	
2	Steering arm yoke	1	
3	Washer	1	
4	Washer	1	
5	O-ring	1	
6	Steering arm	1	
7	Washer	1	
8	Bushing	2	
9	Swivel bracket assembly	1	
			For installation, reverse the removal procedure.

SWIVEL BRACKET ASSEMBLY

DISASSEMBLING/ASSEMBLING THE SWIVEL BRACKET ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Steering arm		Refer to "STEERING ARM" on page 7-18.
1	Nut	2	
2	Trim stopper	2	
3	Bolt	1	
4	Spring holder	1	
5	Spring	1	
6	Pin	2	

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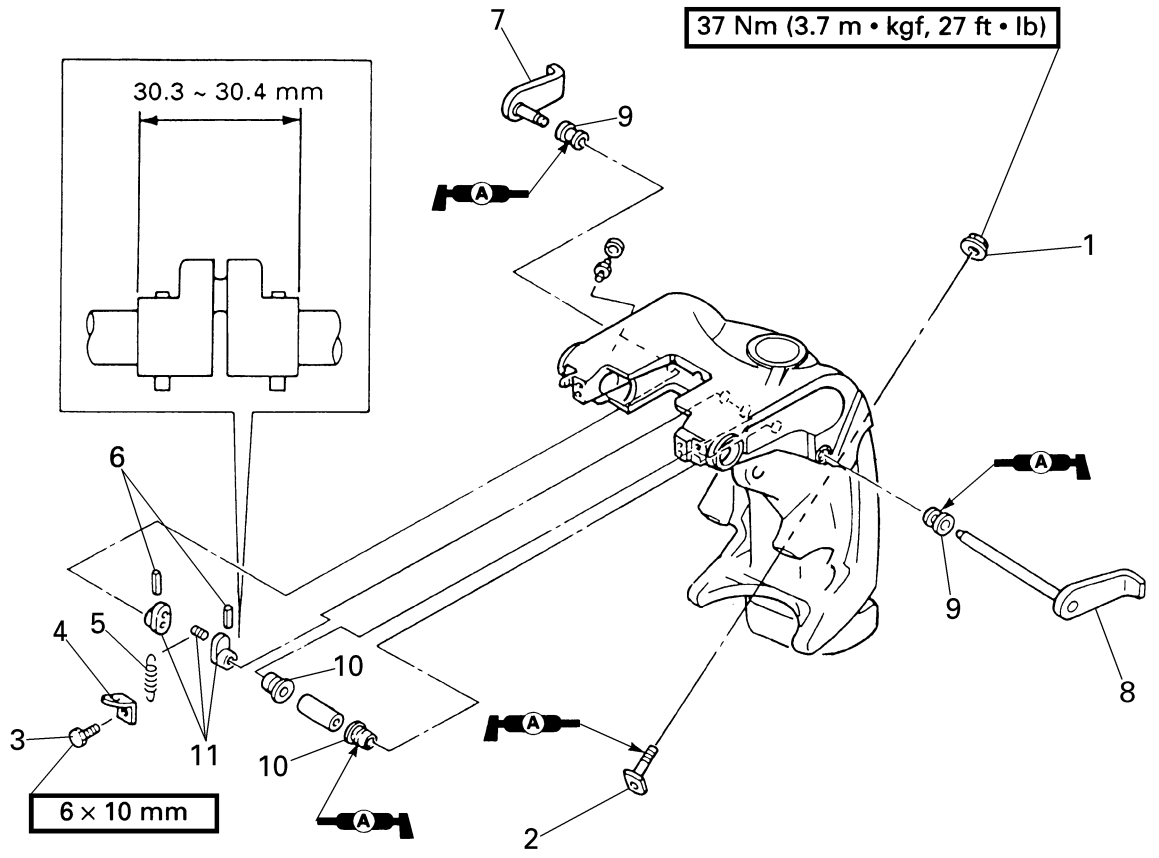
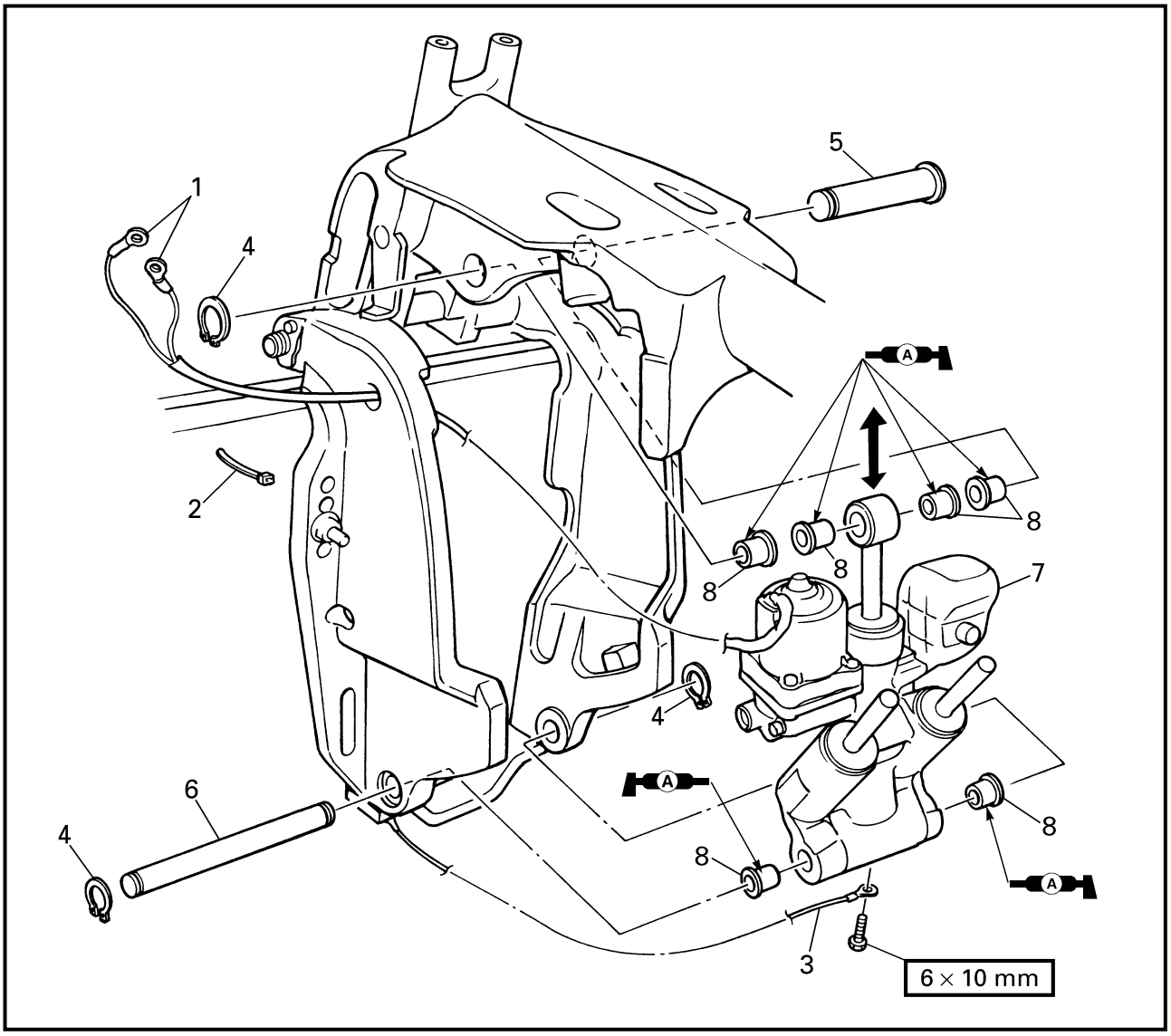


Order	Job/Part	Q'ty	Remarks
7	Starboard tilt stop lever	1	
8	Port tilt stop lever	1	
9	Bushing	2	
10	Bushing	2	
11	Tilt stop lever joint assembly	1	
			For assembly, reverse the disassembly procedure.

POWER TRIM AND TILT UNIT

REMOVING/INSTALLING THE POWER TRIM AND TILT UNIT

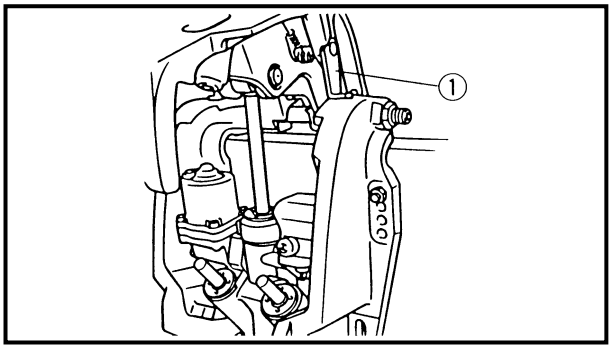


Order	Job/Part	Q'ty	Remarks
	Tilt up the outboard		
1	Power trim and tilt lead	2	
2	Plastic locking tie	3	**Not reusable**
3	Ground lead	1	
4	Circlip	3	
5	Upper mounting pin	1	
6	Lower mounting pin	1	
7	Power trim and tilt unit	1	
8	Collar	6	
			For installation, reverse the removal procedure.

REMOVING THE POWER TRIM AND TILT UNIT

⚠ WARNING

After tilting up the outboard, be sure to support it with the tilt stop levers.
Otherwise, the outboard could suddenly lower if the power trim and tilt unit should lose fluid pressure.



NOTE:
Tilt up the outboard and then turn the tilt stop levers ① to support it.

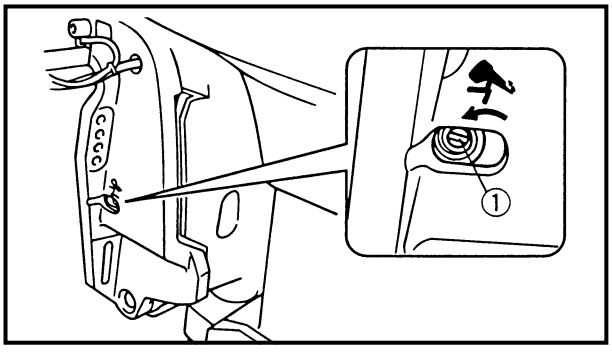
Remove:
- Power trim and tilt unit

NOTE:
Slightly lower the tilt ram assembly and then remove the power trim and tilt unit.

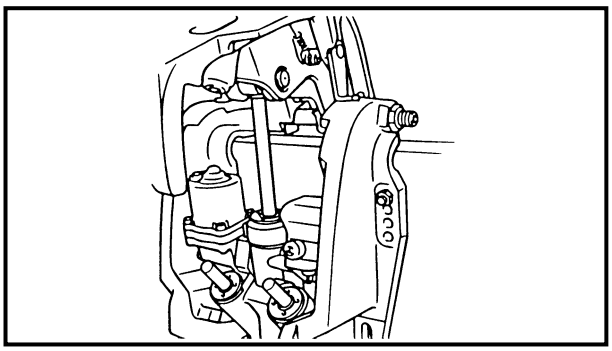
BLEEDING THE POWER TRIM AND TILT UNIT

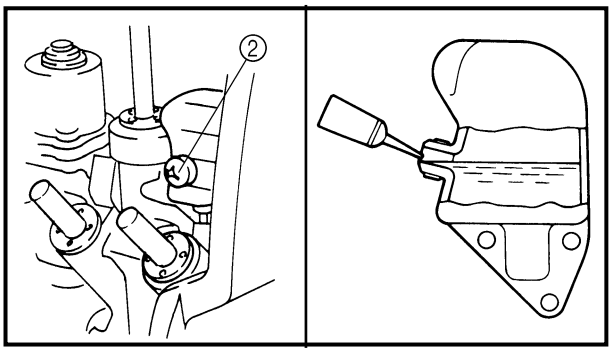
NOTE:
Install the power trim and tilt unit onto the outboard before bleeding.

Bleed:
- Air bubbles
  (from the power trim and tilt unit)



Bleeding steps
(1) Connect the battery leads to the battery.
(2) Loosen the manual valve ① by turning it counterclockwise until it stops.

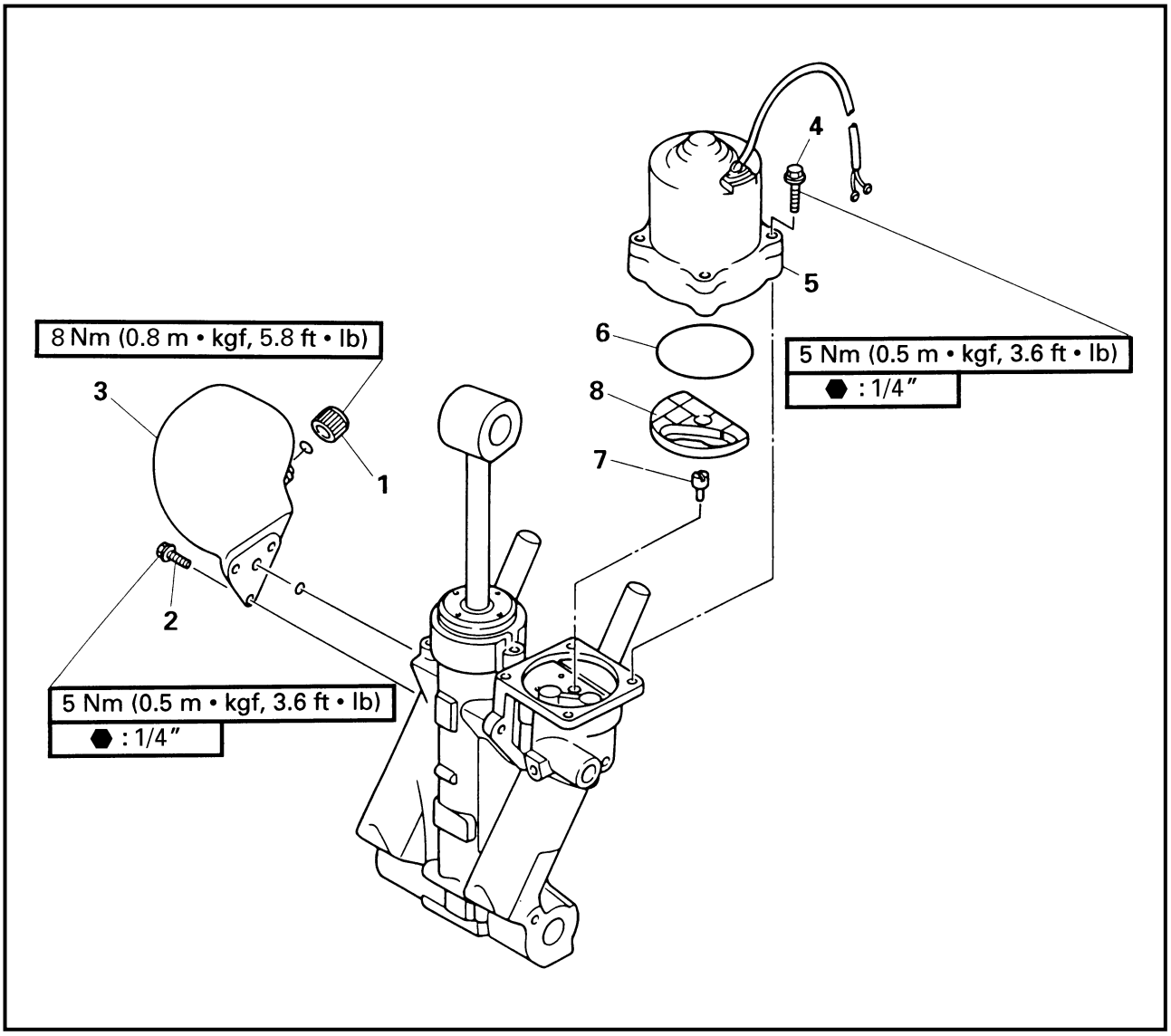




(3) Tilt up the outboard fully, then release it, and let it lower by its own weight.
(4) Tighten the manual valve by turning it clockwise.
(5) Let the power trim and tilt fluid settle for about 5 minutes.
(6) Push and hold the power trim and tilt switch in the up position until the outboard is fully tilted up.
(7) Turn the tilt stop levers to support the outboard. Then, let the power trim and tilt fluid settle for about 5 minutes.
(8) Remove the reservoir cap ② and check that fluid is up to the brim as shown. Add fluid if the level is below the brim.
(9) Install the power trim and tilt reservoir cap.
(10) Repeat the above steps two or three times until the power trim and tilt fluid is at the correct level.

RESERVOIR AND POWER TRIM AND TILT MOTOR

REMOVING/INSTALLING THE RESERVOIR AND POWER TRIM AND TILT MOTOR



Order	Job/Part	Q'ty	Remarks
	Power trim and tilt unit		Refer to "POWER TRIM AND TILT UNIT" on page 7-21.
1	Reservoir cap	1	
2	Bolt	3	
3	Reservoir	1	
4	Bolt	4	
5	Power trim and tilt motor	1	
6	O-ring	1	
7	Drive pin	1	
8	Gear pump housing filter	1	
			For installation, reverse the removal procedure.

⚠ WARNING

- **To prevent the hydraulic fluid from spurting out due to internal pressure, the outboard should be kept fully tilted up (the tilt rod at full length).**
- **After removing the power trim and tilt motor or reservoir, do not push the tilt ram down. This may cause hydraulic fluid to spurt out from the port.**

CAUTION:

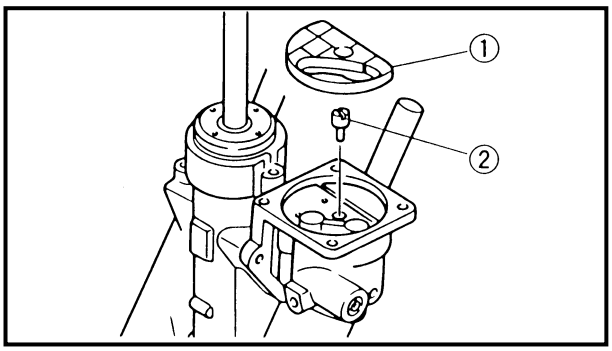
Do not wipe hydraulic system components with rags, paper, tissues, or the like, as fibers from such material will cause malfunctions if they enter the system.

INSPECTING THE RESERVOIR

1. Drain:
   - Power trim and tilt fluid
2. Inspect:
   - Reservoir
     Cracks/damage/leaks → Replace.

INSPECTING THE GEAR PUMP HOUSING FILTER

Inspect:
- Gear pump housing filter
  Damage/tears → Replace.
  Foreign matter → Clean.

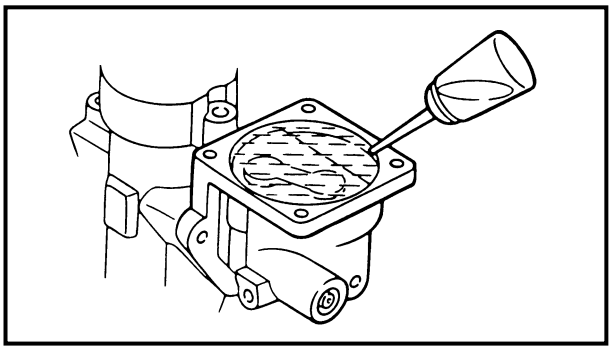


INSTALLING THE POWER TRIM AND TILT MOTOR

1. Install:
   - Gear pump housing filter ①
   - Drive pin ②
2. Fill:
   - Gear pump housing

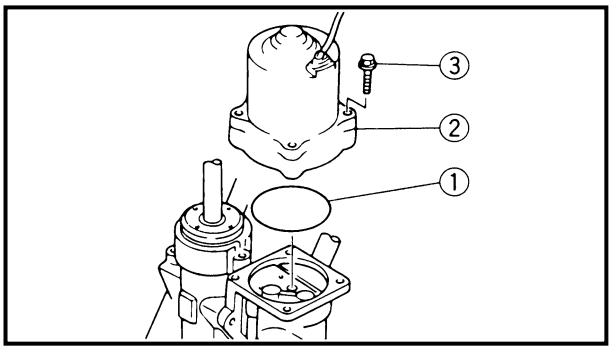
Recommended power trim and tilt fluid
ATF Dexron II

NOTE:
Add power trim and tilt fluid until it reaches the top of the gear pump housing.



3. Bleed:
   - Air bubbles

NOTE:
- Remove all of the air bubbles with a syringe or suitable tool as shown.
- Turn the gear pump gears with a screwdriver and then remove any air between the gear teeth.



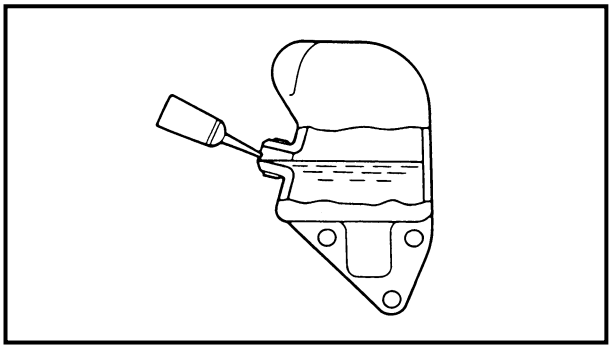
4. Install:
   - O-ring ①
   - Power trim and tilt motor ②
   - Bolt ③

NOTE:
Align the armature shaft with the recess in the drive pin.

FILLING THE RESERVOIR

⚠ WARNING

To prevent the hydraulic fluid from spurting out due to internal pressure, the tilt ram should be kept at full length.



1. Fill:
   • Reservoir

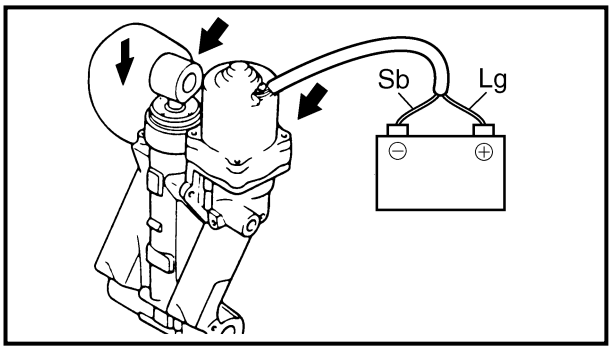
Recommended power trim and tilt fluid
ATF Dexron II

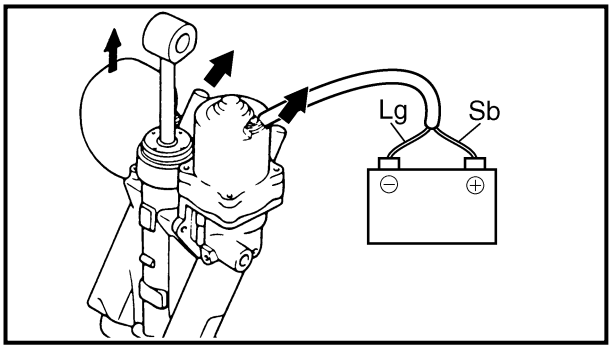
2. Inspect:
   • Power trim and tilt fluid level
   Level is low → Add power trim and tilt fluid to the proper level.

BLEEDING THE POWER TRIM AND TILT UNIT

NOTE:

This bleeding must be done before installing the power trim and tilt unit onto the outboard.





1. Bleed:
   • Air bubbles
   (from the power trim and tilt unit)

Bleeding steps

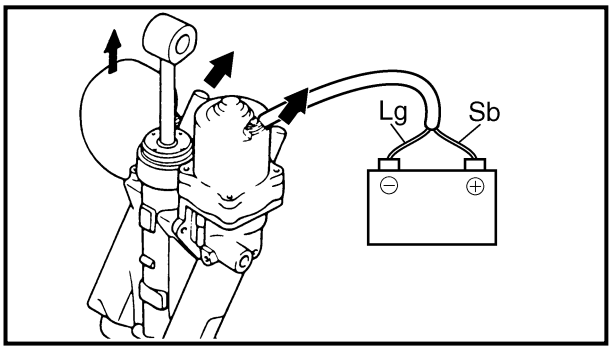
(1) Set the power trim and tilt unit upright.
(2) Connect the leads of the power trim and tilt on the battery terminals until the trim and tilt ram assemblies are fully compressed.

NOTE:

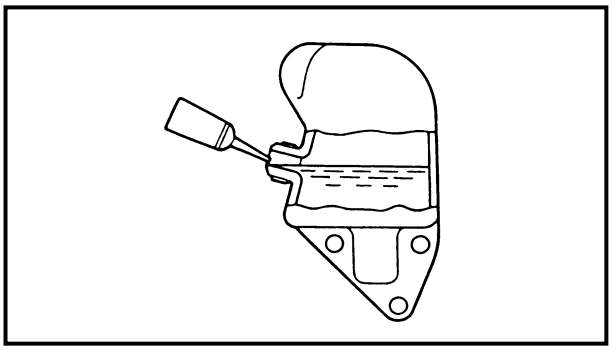
If the rams will not go down, refer to the following.

A. Connect the leads of the power trim and tilt on the battery terminals until the trim and tilt ram assemblies are fully extended. Then, reverse the leads on the battery terminals until the trim and tilt ram assemblies are fully compressed.

B. If step A was unsuccessful, connect the leads on the battery terminals and fully compress the tilt ram assembly by hand.
C. If step B was unsuccessful, loosen the manual valve, compress the trim and tilt ram assemblies fully by hand, and then tighten the manual valve. Then, compress and extend the trim and tilt ram assemblies by connecting the leads on the battery terminals in the up and down positions.
D. If step C was unsuccessful, disassemble, check, and correct any problems with the power trim and tilt unit.



(3) Connect the leads on the battery terminals in the up position until the trim and tilt ram assemblies are fully extended.



(4) Remove the power trim and tilt reservoir cap and inspect that fluid is up to the brim as shown. Add power trim and tilt fluid if the level is below the brim.
(5) Repeat the above steps two or three times until the fluid is at the correct level.

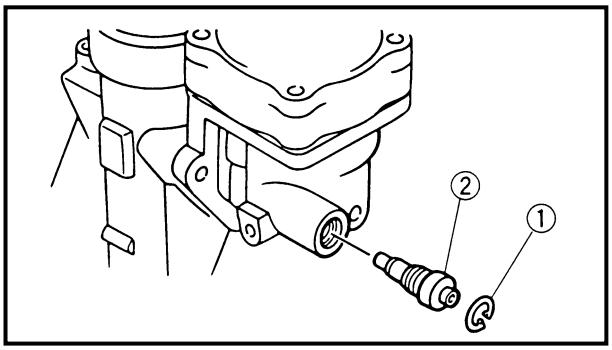
2. Inspect:
• Power trim and tilt unit operation
Unsmooth operation → Bleed the power trim and tilt unit again.

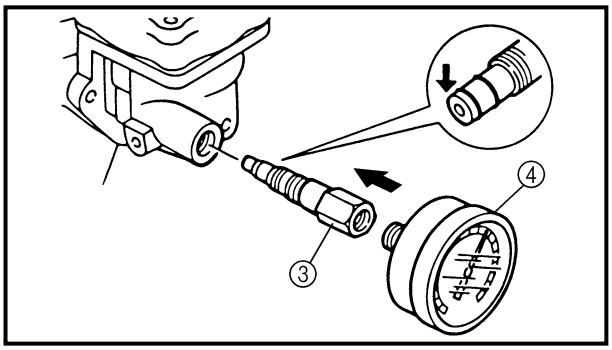
MEASURING THE HYDRAULIC PRESSURE

Inspect:
- Hydraulic pressure
  Out of specification → Repair.

Hydraulic pressure
(with the power trim and tilt ram assemblies fully extended)
9.8 - 11.8 MPa
(100 - 120 kg/cm^2)
(with the power trim and tilt ram assemblies fully compressed)
5.9 - 8.8 MPa (60 - 90 kg/cm^2)

NOTE:
Before measuring the hydraulic pressure, bleed the power trim and tilt unit.



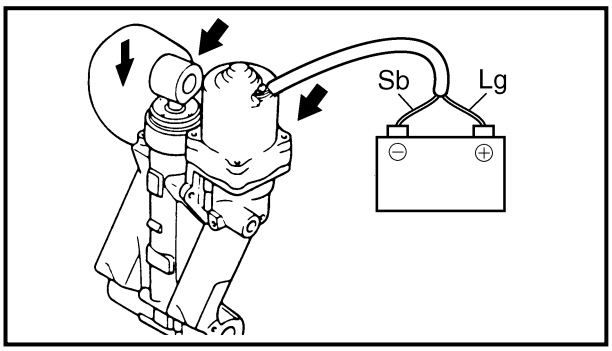


Measuring steps
(1) Fully tilt up the power trim and tilt ram assemblies.
(2) Remove the circlip ①.
(3) Remove the manual valve ② and install the up-relief valve attachment and hydraulic pressure gauge and tighten them to the specified torque.

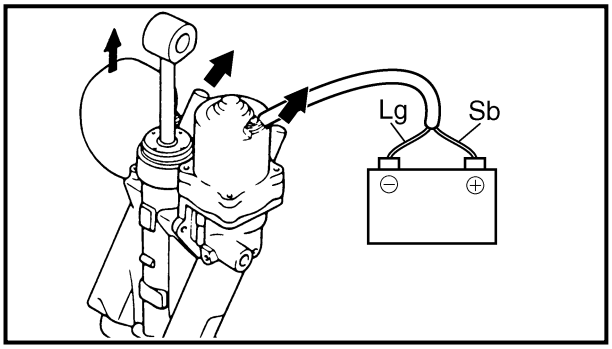
Up-relief valve attachment ..... ③
90890-06773
Hydraulic pressure gauge ..... ④
90890-06776

Hydraulic pressure gauge
9 Nm (0.9 m • kgf, 6.5 ft • lb)
Up-relief valve attachment
4 Nm (0.4 m • kgf, 2.9 ft • lb)

NOTE:
Remove the manual valve and then quickly attach the special tools before any fluid comes out.

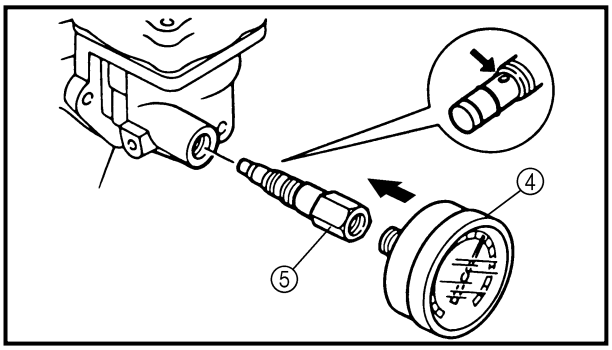


(4) Connect the leads on the battery terminals in the down position until the power trim and tilt ram assemblies are fully compressed.



(5) Connect the leads on the battery terminals in the up position until the power trim and tilt ram assemblies are fully extended. Then, measure the hydraulic pressure.

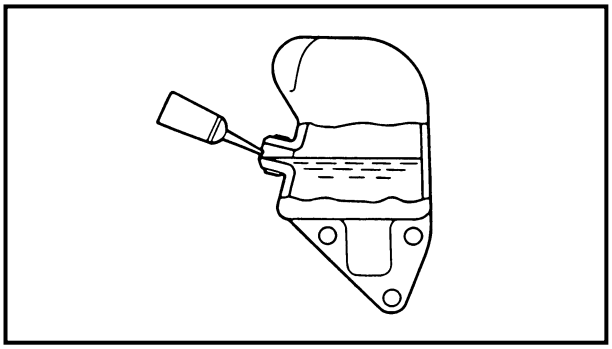
Hydraulic pressure
(with the power trim and tilt ram assemblies fully extended)
9.8 - 11.8 MPa
(100 - 120 kg/cm^2)



(6) After measuring the hydraulic pressure, remove the special tools and quickly attach the down-relief valve attachment.

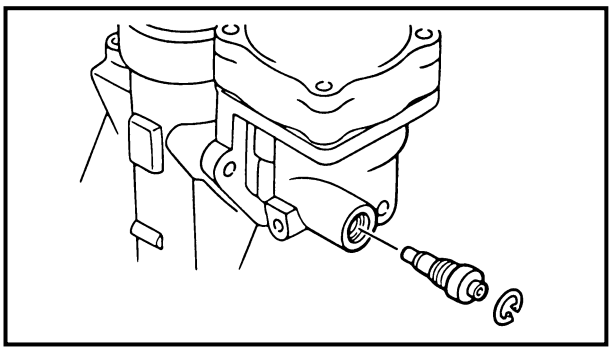
Hydraulic pressure gauge ..... ④
90890-06776
Down-relief valve attachment. ⑤
90890-06774

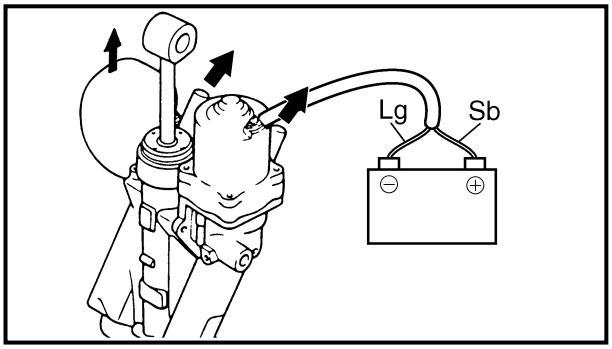
Hydraulic pressure gauge
9 Nm (0.9 m • kgf, 6.5 ft • lb)
Down-relief valve attachment
4 Nm (0.4 m • kgf, 2.9 ft • lb)



(7) Remove the reservoir cap and check that fluid is up to the brim as shown. Add fluid if the level is below the brim.
(8) Install the reservoir cap.
(9) Connect the leads on the battery terminals in the down position until the power trim and tilt ram assemblies are fully compressed. Then, measure the hydraulic pressure.

Hydraulic pressure
(with the power trim and tilt ram assemblies fully compressed)
5.9 - 8.8 MPa (60 - 90 kg/cm^2)



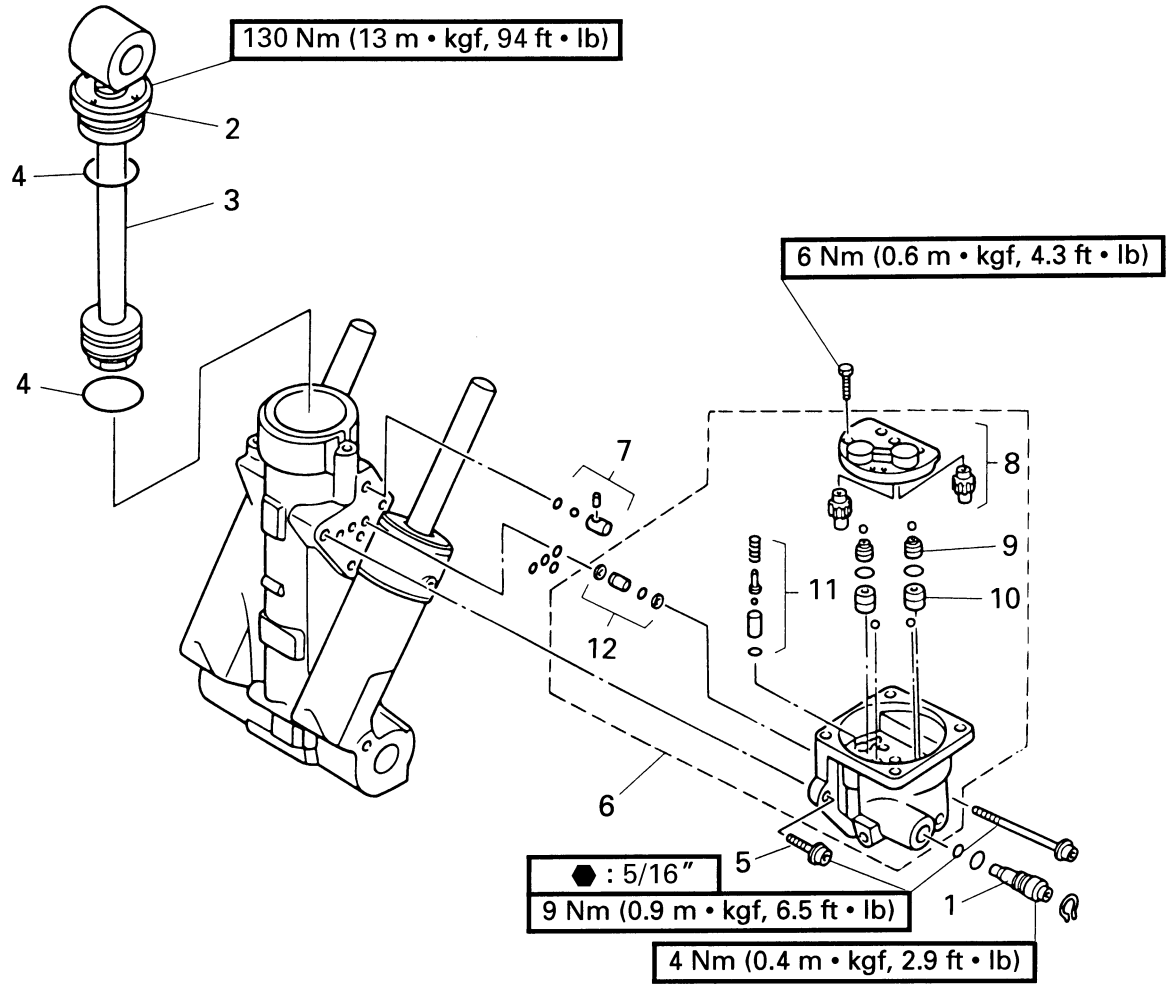


(10) After measuring the hydraulic pressure, connect the leads on the battery terminals in the up position until the power trim and tilt ram assemblies are fully extended.
(11) Remove the special tools.
(12) Install the manual valve and circlip.

NOTE:
After measuring the hydraulic pressure, bleed the power trim and tilt unit.

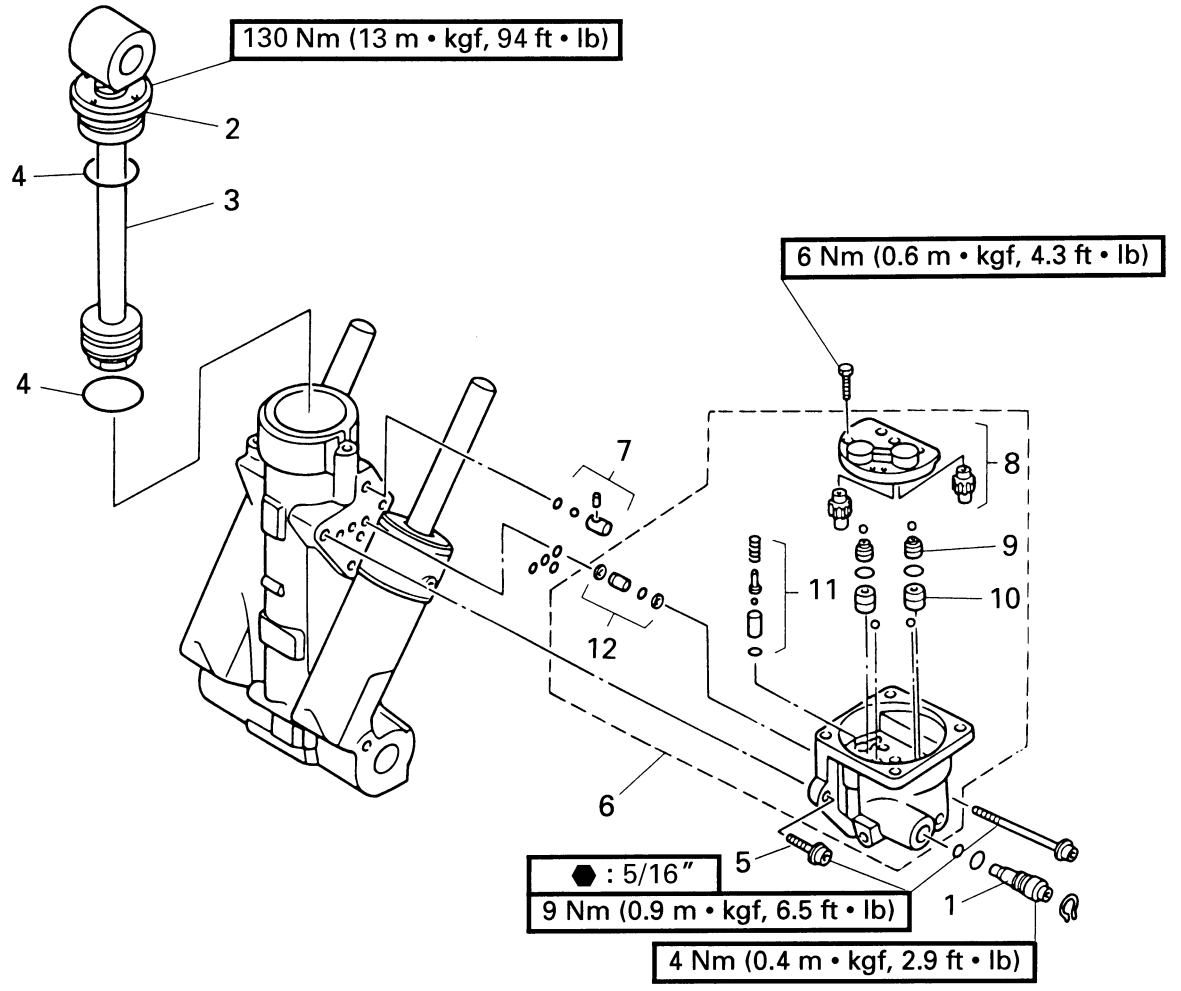
TILT RAM ASSEMBLY AND GEAR PUMP UNIT

REMOVING/INSTALLING THE TILT RAM ASSEMBLY AND GEAR PUMP UNIT

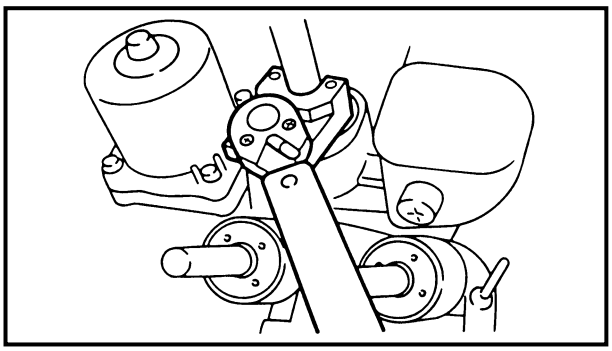


Order	Job/Part	Q'ty	Remarks
	Reservoir and power trim and tilt motor		Refer to "RESERVOIR AND POWER TRIM AND TILT MOTOR" on page 7-24.
1	Manual valve	1	
2	Tilt ram end screw	1	
3	Tilt ram assembly	1	
4	O-ring	2	
5	Bolt	3	
6	Gear pump unit	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
7	Check valve assembly	1	
8	Gear pump	1	
9	Shuttle valve	2	
10	Check valve	2	
11	Up-relief valve assembly	1	
12	Down-relief valve assembly	1	
			For installation, reverse the removal procedure.



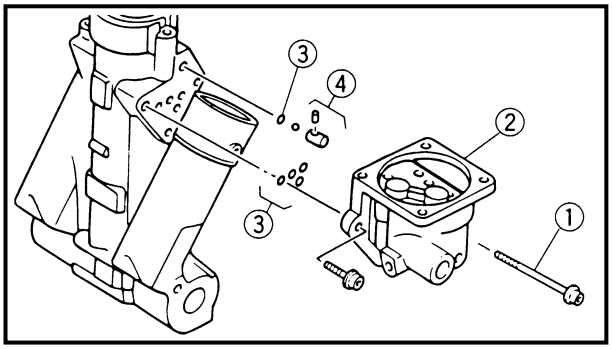
REMOVING THE TILT RAM END SCREW

Loosen:
- Tilt ram end screw

	End screw wrench **YB-06548 / 90890-06548**

NOTE:

Hold the power trim and tilt unit in a vise using aluminum plates on both sides.

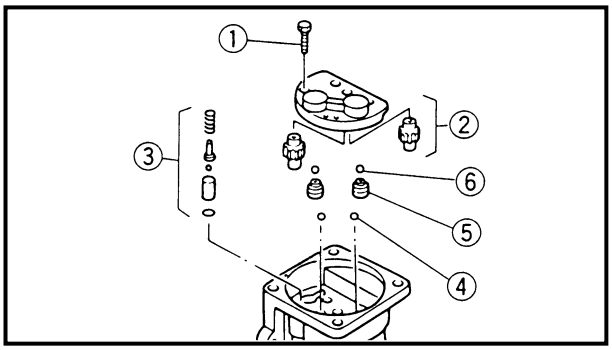


REMOVING THE GEAR PUMP UNIT

Remove:
- Bolt ①
- Gear pump unit ②
- O-ring ③
- Check valve ④

NOTE:

Place a container under the power trim and tilt unit.

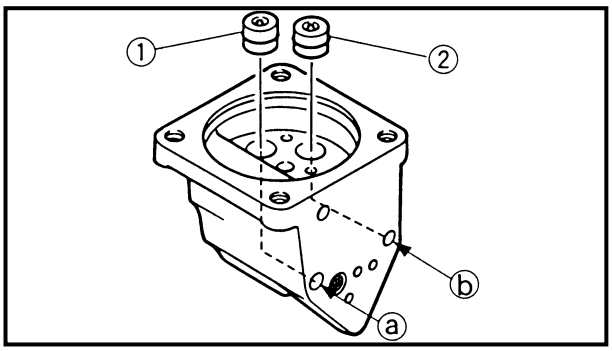


DISASSEMBLING THE GEAR PUMP UNIT

1. Remove:
   - Bolt ①
   - Pump gear ②
   - Up-relief valve assembly ③
   - Ball (4.76 mm/0.187 in) ④
   - Shuttle valve ⑤
   - Ball (3.18 mm/0.125 in) ⑥

NOTE:

When removing the pump gears, note their original direction and position for proper assembly.

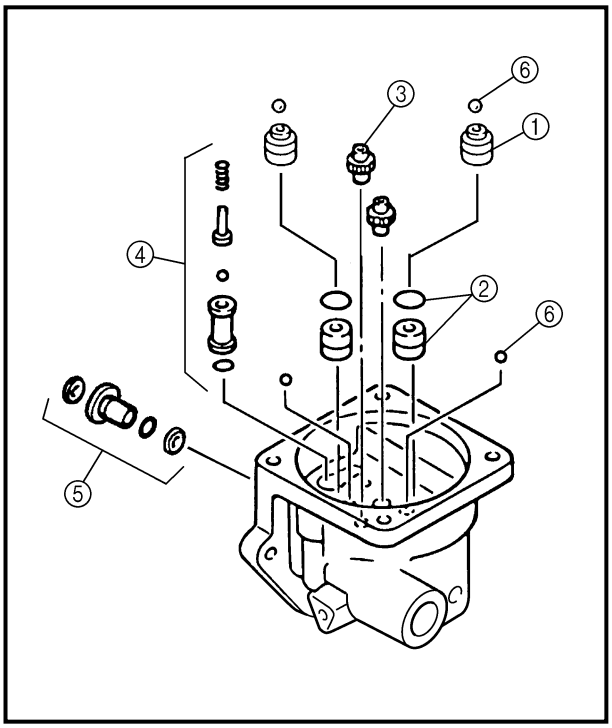


2. Remove:
   • Check valves ① and ②

NOTE:
To remove the check valves, cover the gear pump housing with a clean cloth and then blow compressed air through holes ⓐ and ⓑ.

INSPECTING THE TILT RAM

Inspect:
• Tilt ram
  Excessive scratches → Replace.
  Bends/excessive corrosion → Replace.
  Rust → Polish.
  (with 400 - 600 grit sandpaper)



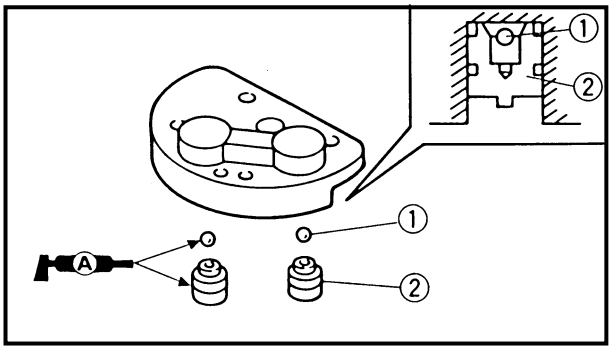
INSPECTING THE GEAR PUMP UNIT

Inspect:
• Shuttle valves ①
• Check valve assemblies ②
  Clogs/damage/wear → Replace.
• Pump gears ③
  Damage/wear → Replace the gear pump unit.
• Up-relief valve assembly ④
• Down-relief valve assembly ⑤
  Damage/wear → Replace the gear pump unit.
• Balls ⑥
  Damage/wear → Replace.

ASSEMBLING THE GEAR PUMP UNIT

CAUTION:

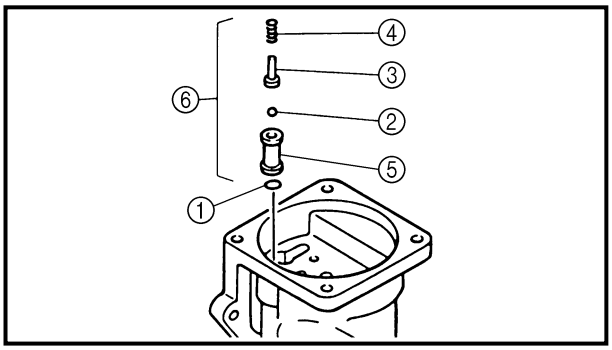
Install all components in their original direction and position for proper assembly and operation.



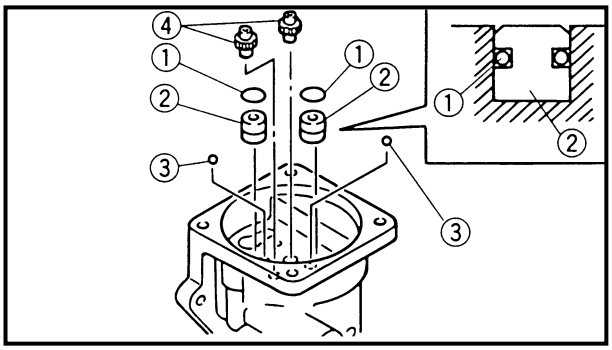
1. Install:
   - Balls (3.18 mm/0.125 in) ①
   - Shuttle valves ②

NOTE:

Apply grease to the balls to prevent them from falling out of the gear pump.



2. Install:
   - O-ring ①
   - Ball (3.18 mm/0.125 in) ②
   - Up-relief valve pin ③
   - Spring ④
   - Up-relief valve ⑤
   - Up-relief valve assembly ⑥

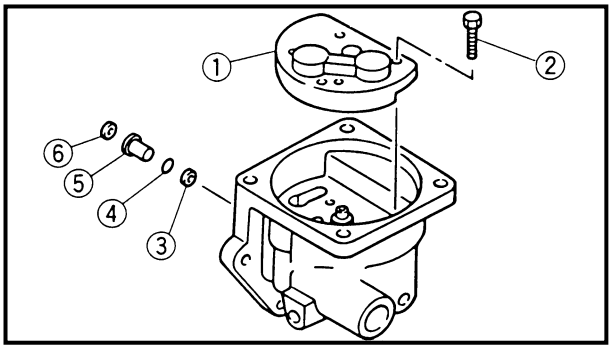


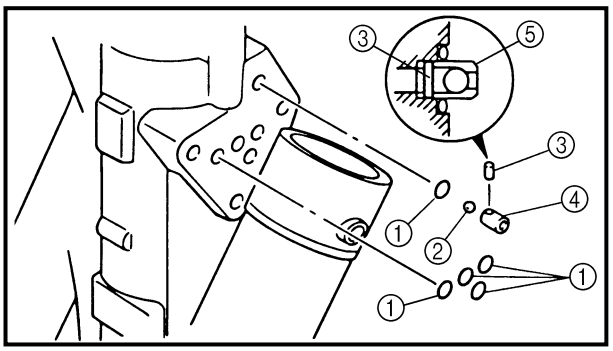
3. Install:
   - O-rings ①
   - Check valves ②
   - Balls (4.76 mm/0.187 in) ③
   - Pump gears ④

4. Install:
   - Gear pump ①
   - Bolt ②
   - Filter ③
   - O-ring ④
   - Down-relief valve ⑤
   - Filter ⑥

NOTE:

Tighten the bolts evenly and make sure the pump gears turn smoothly.



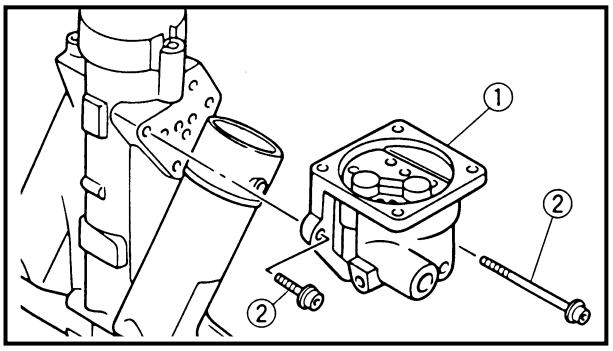


INSTALLING THE GEAR PUMP UNIT

1. Install:
   - O-rings ①
   - Ball ②
   - Pin ③
   - Check valve ④
   - Check valve assembly ⑤

NOTE:

When installing the check valve assembly, make sure the pin is on the tilt ram cylinder side as shown.

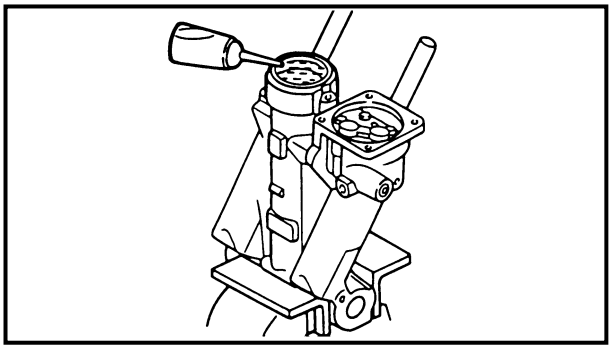


2. Install:
   - Gear pump unit ①
   - Bolt ②

INSTALLING THE TILT RAM ASSEMBLY

⚠ WARNING

To prevent the hydraulic fluid from spurting out due to internal pressure, the tilt ram should be kept at full length.

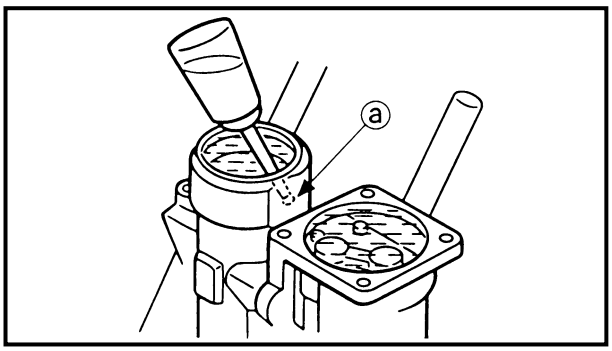


1. Fill:
   - Tilt ram cylinder

Recommended power trim and tilt fluid
ATF Dexron II

NOTE:

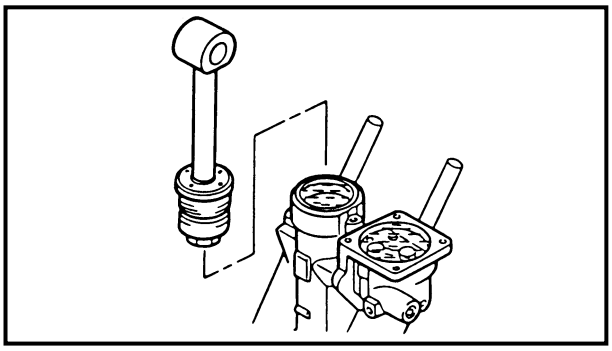
Hold the power trim and tilt unit in a vise using aluminum plates on both sides.



2. Fill:
   • Gear pump housing

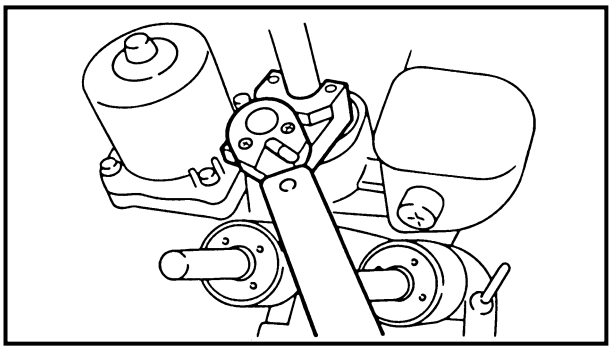
Recommended power trim and tilt fluid
ATF Dexron II

NOTE:
Add power trim and tilt fluid through the hole ⓐ until the fluid level is to the top of the gear pump unit.



3. Install:
   • Tilt ram assembly

NOTE:
Place the tilt ram end screw at the bottom of the tilt ram and install the tilt ram assembly into the tilt ram cylinder.



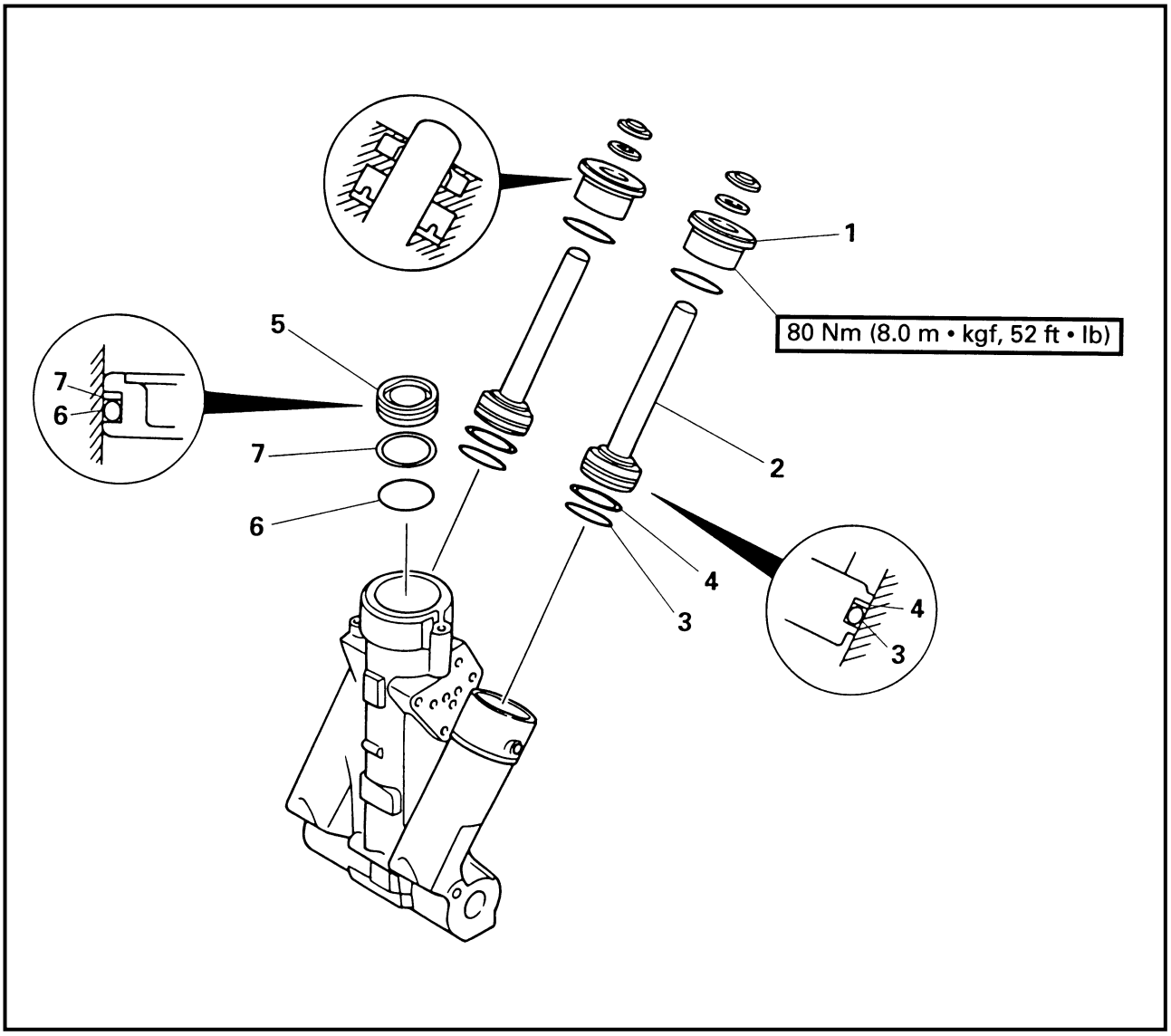
4. Tighten:
   • Tilt ram end screw

End screw wrench
YB-06548 / 90890-06548

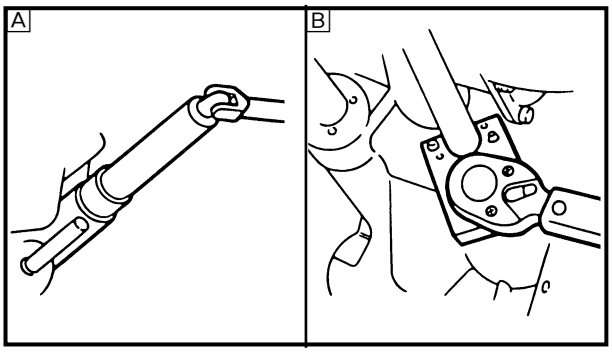
Tilt ram end screw
130 Nm (13 m • kgf, 94 ft • lb)

TRIM RAM ASSEMBLIES AND FREE PISTON

REMOVING/INSTALLING THE TRIM RAM ASSEMBLIES AND FREE PISTON



Order	Job/Part	Q'ty	Remarks
	Tilt ram assembly and gear pump unit		Refer to "TILT RAM ASSEMBLY AND GEAR PUMP UNIT" on page 7-32.
1	Trim ram end screw	2	
2	Trim ram	2	
3	O-ring	2	
4	Seal ring	2	
5	Free piston	1	
6	O-ring	1	
7	Piston ring	1	
			For installation, reverse the removal procedure.



REMOVING THE TRIM RAM END SCREWS

Loosen:
- Trim ram end screw

	End screw wrench **YB-06175-1A / 90890-06548**

A For USA and Canada
B Except for USA and Canada

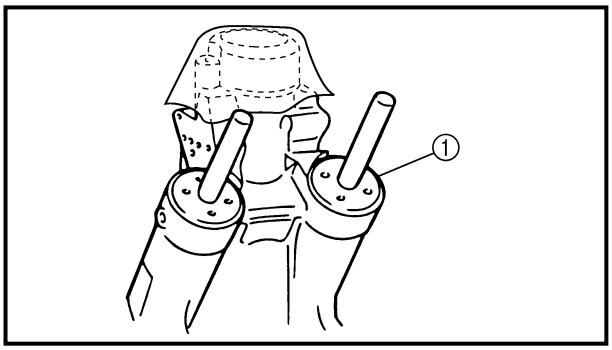
NOTE:
Hold the power trim and tilt unit in a vise using aluminum plates on both sides.

REMOVING THE FREE PISTON

1. Drain:
   - Power trim and tilt fluid

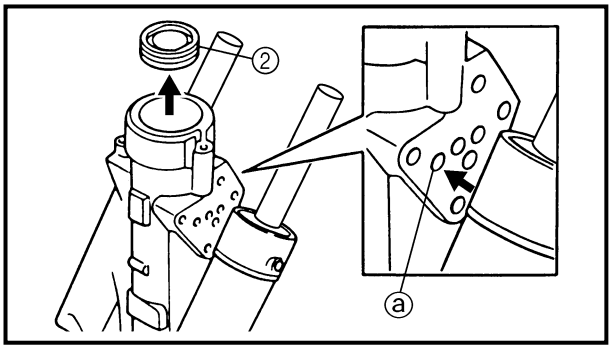
NOTE:
After removing the trim ram assemblies, drain the fluid from the power trim and tilt unit.

2. Install:
   - Trim ram assemblies ①



NOTE:
Finger-tighten the trim ram assemblies and then cover the tilt cylinder openings with a clean cloth.

3. Remove:
   - Free piston ②



⚠ WARNING

Never look into the tilt cylinder opening because the free piston and hydraulic fluid may be expelled out forcefully.

NOTE:
Remove the free piston by blowing compressed air through the hole ⓐ.

INSPECTING THE TRIM RAMS

Inspect:
- Trim ram
  Excessive scratches → Replace.
  Bends/excessive corrosion → Replace.
  Rust → Polish.
  (with 400 - 600 grit sandpaper)

INSPECTING THE FREE PISTON

Inspect:
- Free piston
  Excessive scratches → Replace.

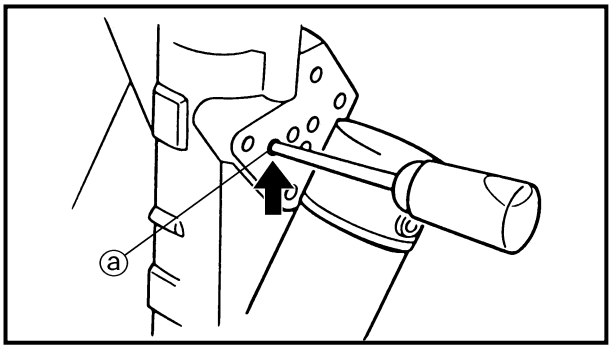
INSPECTING THE TRIM RAM CYLINDERS

Inspect:
- Trim ram cylinder
  Cracks/excessive scratches →
  Replace the power trim and tilt unit.

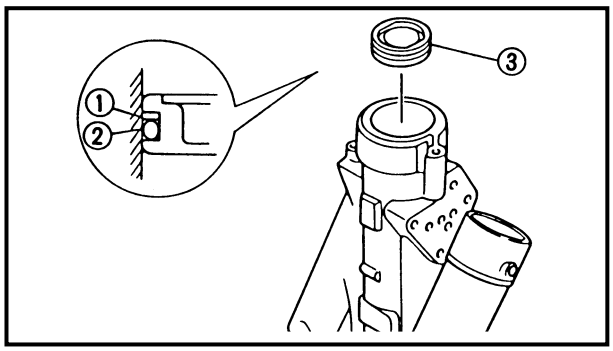
INSTALLING THE FREE PISTON

1. Fill:
   - Fluid passages

Recommended power trim and tilt fluid
ATF Dexron II
Quantity
30 cm³ (1.0 US oz, 1.1 Imp oz)



NOTE:
- Hold the power trim and tilt unit in a vise using aluminum plates on both sides.
- Add power trim and tilt fluid through the hole ⓐ.



2. Install:
   - Piston ring ①
   - O-ring ②
   - Free piston ③

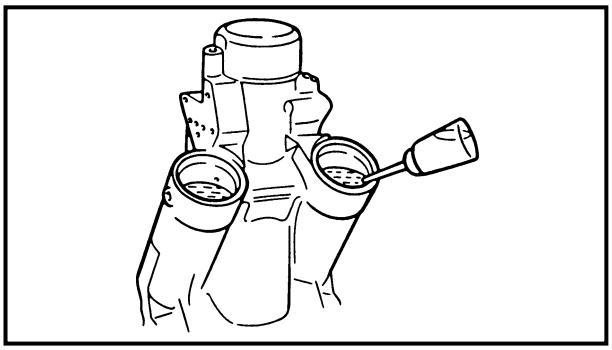
NOTE:
Push the free piston into the tilt ram cylinder until it bottoms out.

INSTALLING THE TRIM RAMS

⚠ WARNING

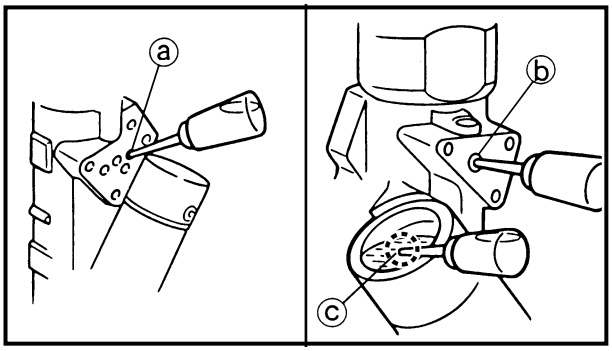
Do not push the trim rams down while installing them into the trim ram cylinders. Otherwise, the hydraulic fluid may spurt out from the unit.

1. Fill:
   - Trim ram cylinders



Recommended power trim and tilt fluid
ATF Dexron II

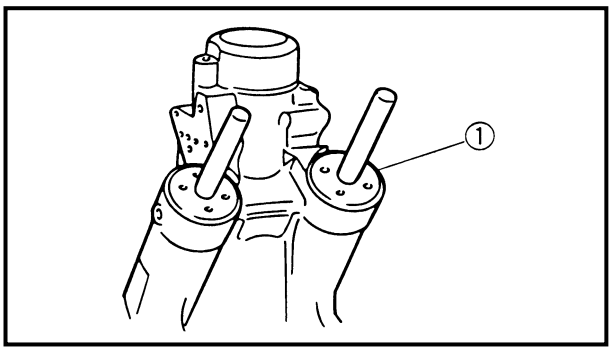
NOTE:
Hold the power trim and tilt unit in a vise using aluminum plates on both sides.



2. Fill:
   - Fluid passages

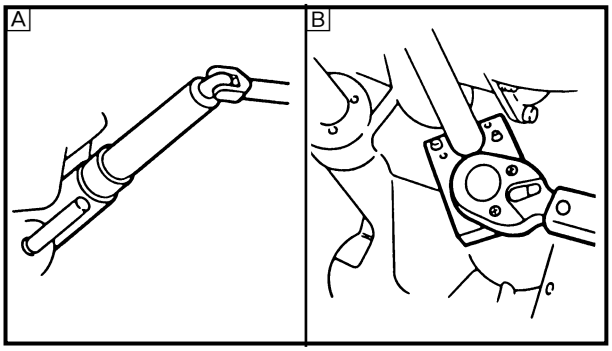
Recommended power trim and tilt fluid
ATF Dexron II

NOTE:
Add power trim and tilt fluid through holes ⓐ, ⓑ and ⓒ until all of the passages are filled.

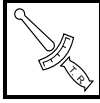


3. Install:
   • Trim ram assemblies ①

NOTE:
Place each trim ram end screw at the bottom of each trim ram and install them into the trim ram cylinders.



4. Tighten:
   • Trim ram end screw

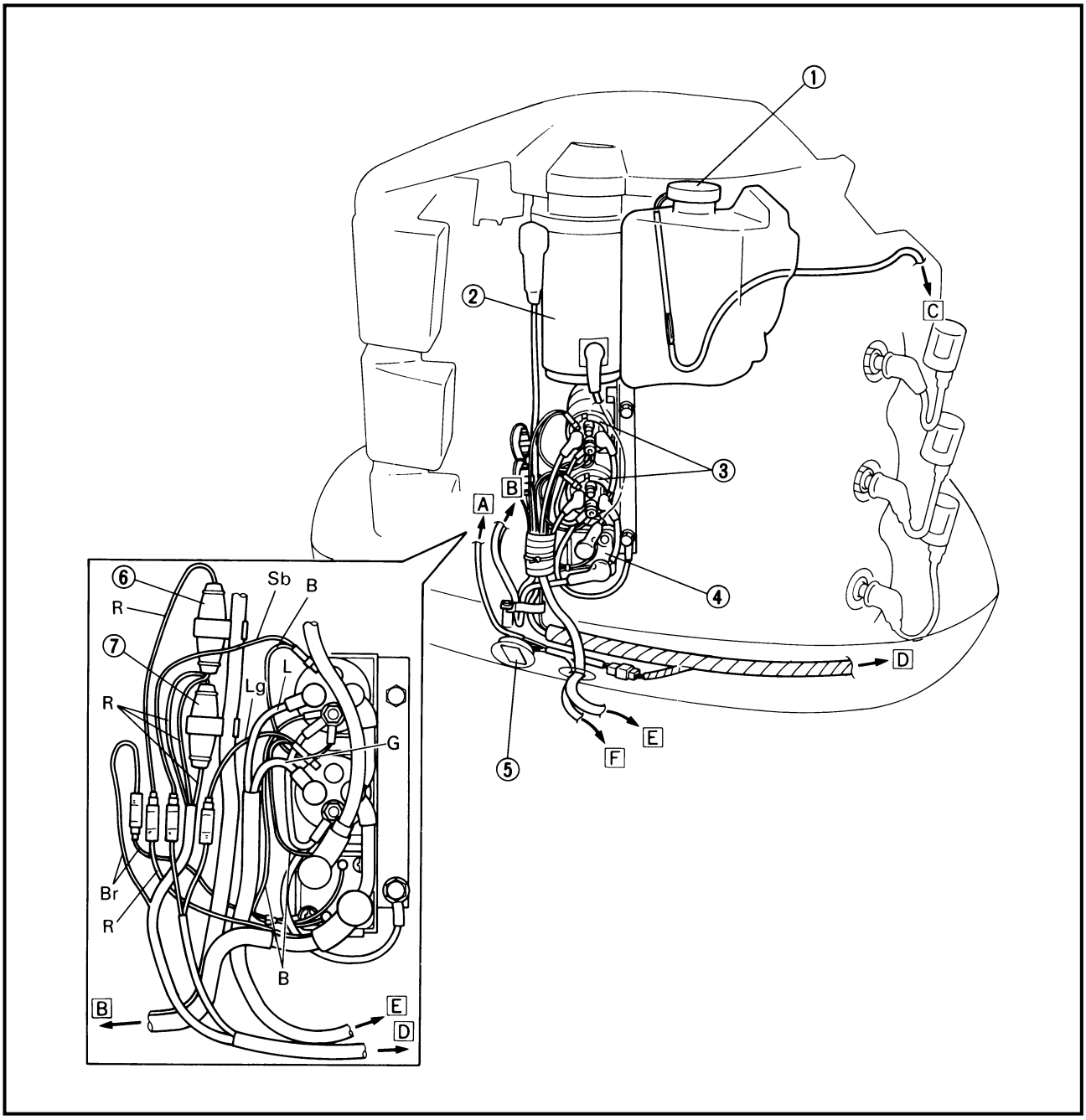
	**End screw wrench** **YB-06175-1A / 90890-06548**
	**Trim ram end screw** **80 Nm (8.0 m • kgf, 58 ft • lb)**

A For USA and Canada
B Except for USA and Canada

CHAPTER 8
ELECTRICAL SYSTEMS

ELECTRICAL COMPONENTS (OIL INJECTION AND 225DET MODELS)

(Port view)

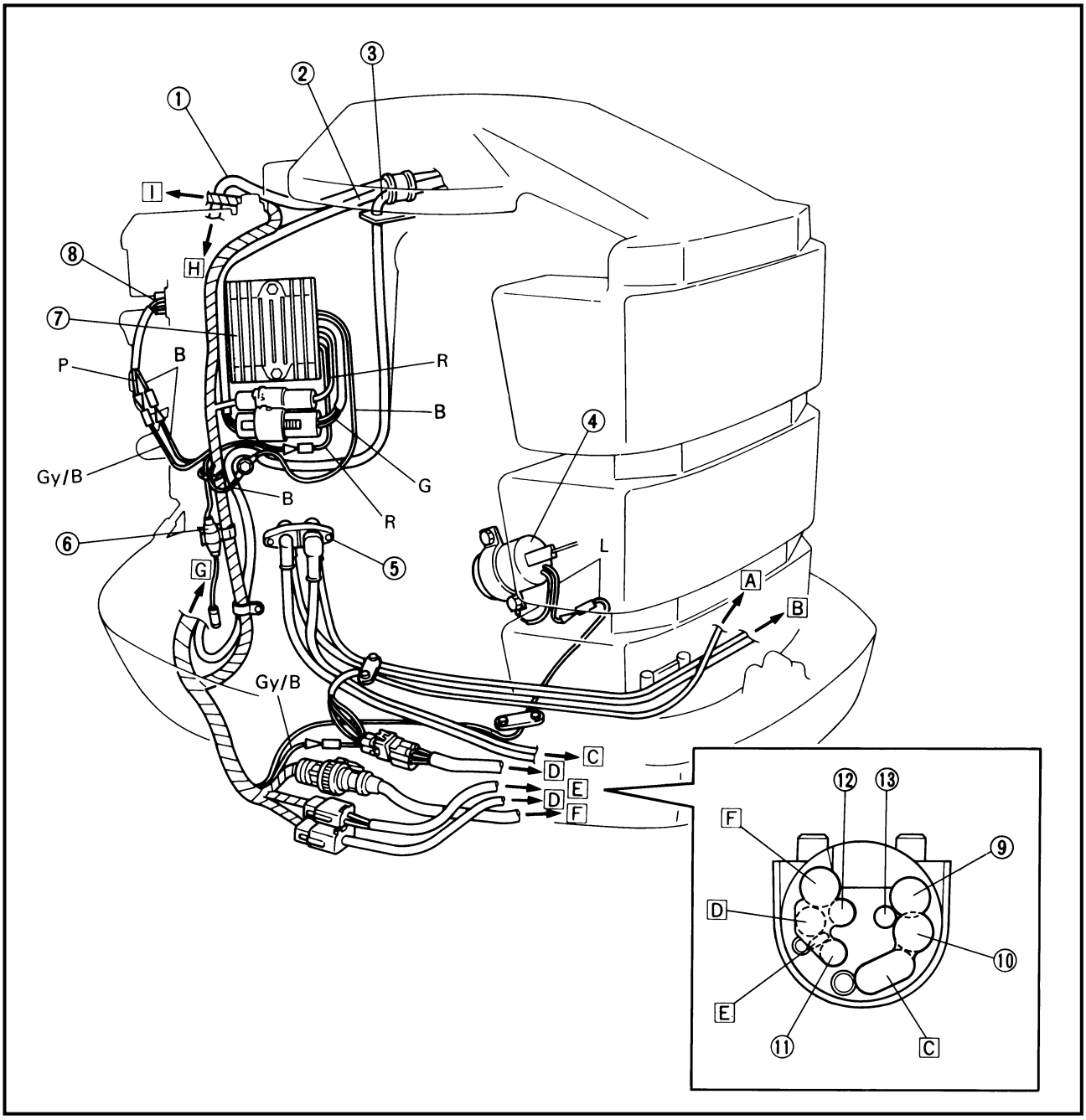


① Oil level sensor
② Starter motor
③ Power trim and tilt relay
④ Starter relay
⑤ Trailer switch
⑥ Fuse (30A)
⑦ Fuse (20A)

A To trim meter
B To battery
C To CDI unit
D To CDI unit and 10P coupler
E To power trim and tilt motor
F To trim sensor

B : Black
Br : Brown
G : Green
L : Blue
Lg : Light green
R : Red
Sb : Sky blue

(Starboard view)

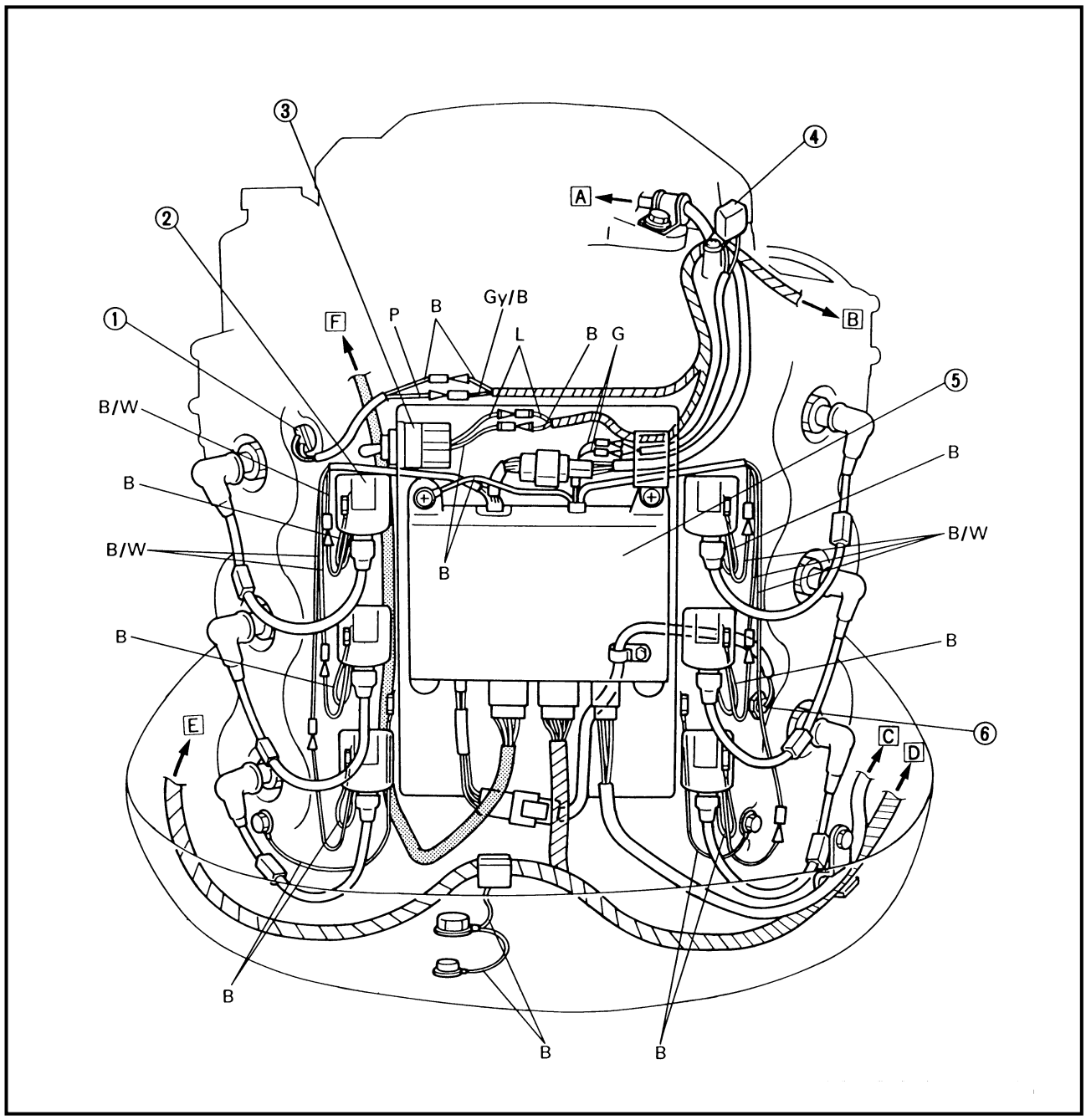


① Charge coil lead
② Lighting coil lead
③ Pulser coil lead
④ Fuel enrichment valve
⑤ Terminal (for USA)
⑥ Fuse (30A)
⑦ Rectifier/regulator
⑧ Thermo switch
⑨ Fuel hose
⑩ Oil hose
⑪ Shift cable
⑫ Throttle cable
⑬ Speedometer hose

A To trim sensor
B To relay assembly
C To battery
D To trim meter and tachometer
E To remote oil tank
F To remote control
G To CDI unit
H To CDI unit
I To thermo switch and emergency switch

B : Black
G : Green
L : Blue
P : Pink
R : Red
Gy/B : Gray/black

(Aft view)



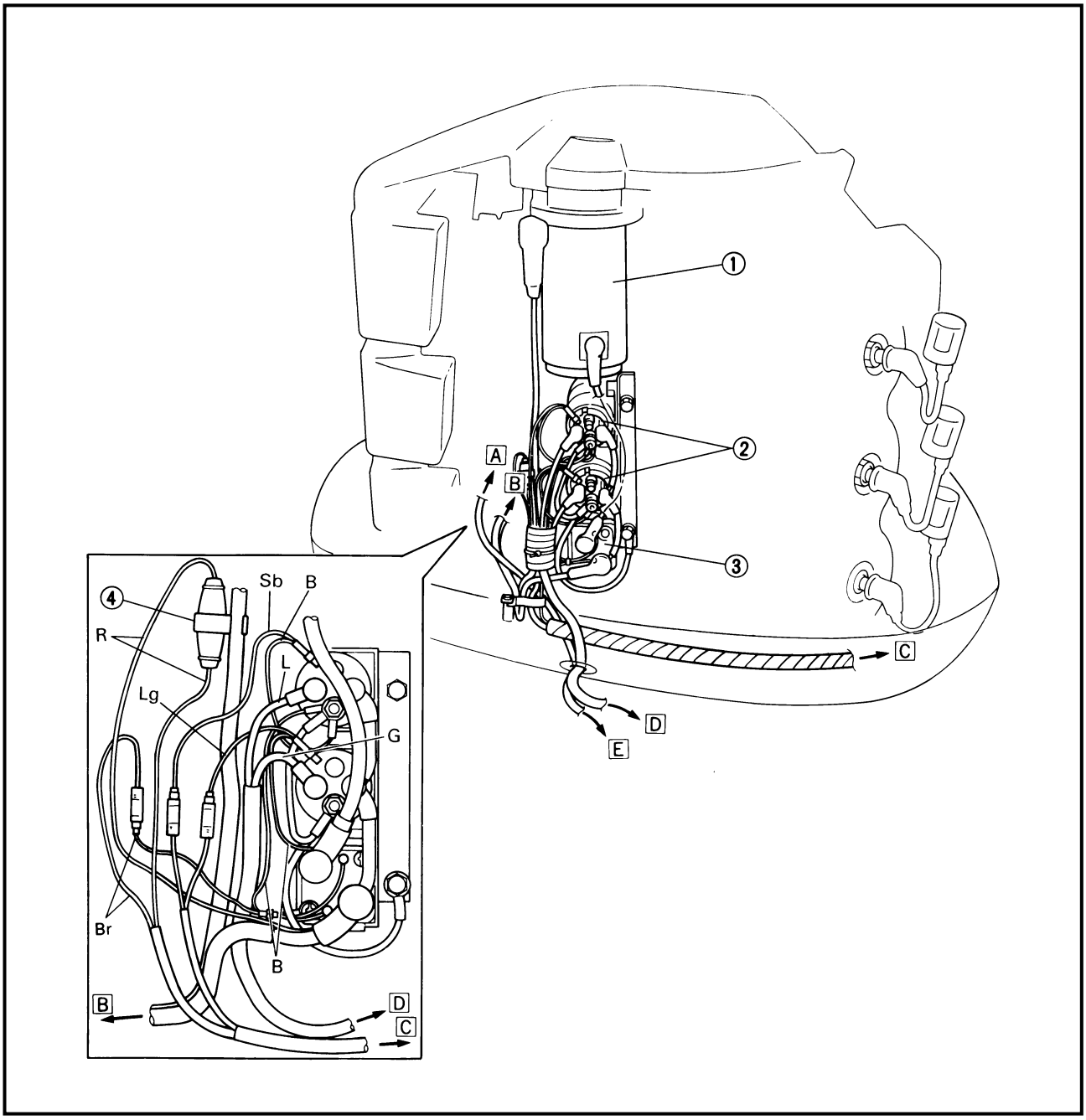
① Thermo switch
② Ignition coil
③ Emergency switch
④ Crank position sensor
⑤ CDI unit
⑥ Engine cooling water temperature sensor

A To charge coil
B To wire harness
C To 10P coupler
D To pulser coil
E To relay assembly
F To oil level sensor

B : Black
G : Green
L : Blue
P : Pink
B/W : Black/white
Gy/B : Gray/black

ELECTRICAL COMPONENTS (PRE-MIX EXCEPT FOR 225DET MODELS)

(Port view)

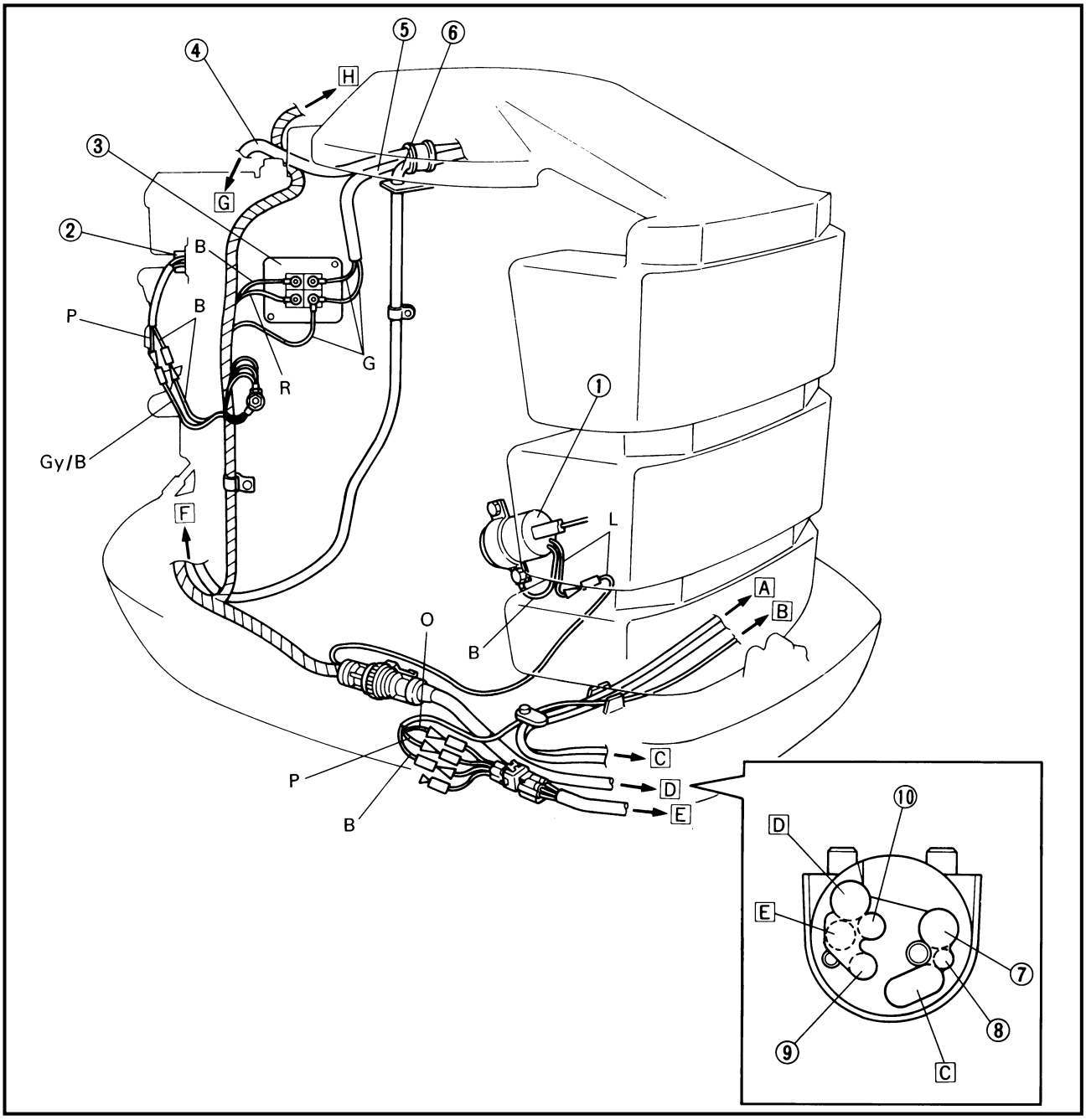


① Starter motor
② Power trim and tilt relay
③ Starter relay
④ Fuse (20A)

A To trim meter
B To battery
C To CDI unit and 10P coupler
D To power trim and tilt motor
E To trim sensor

B : Black
Br : Brown
G : Green
L : Blue
Lg : Light green
R : Red
Sb : Sky blue

(Starboard view)

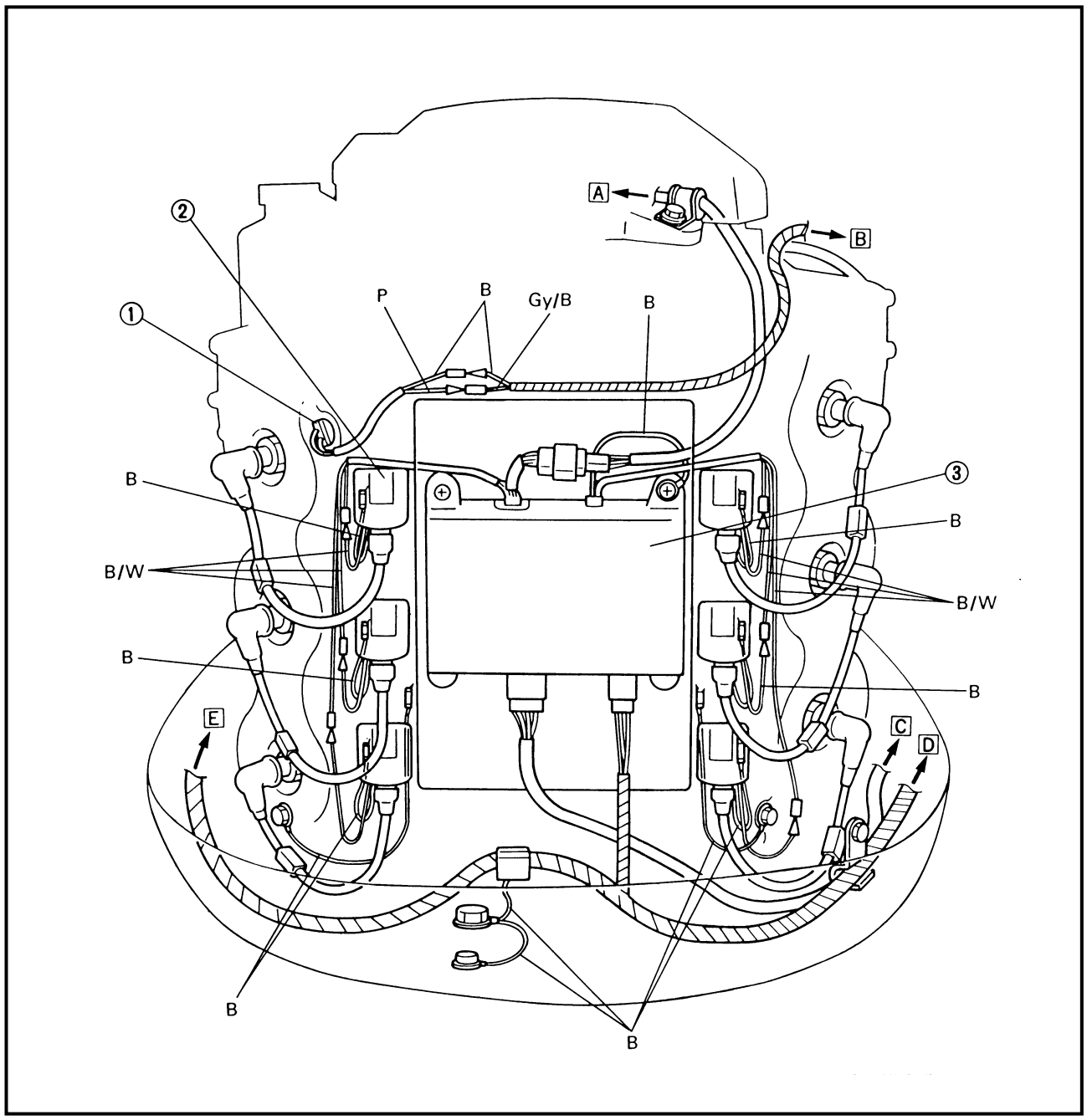


① Fuel enrichment valve
② Thermo switch
③ Rectifier/regulator
④ Charge coil lead
⑤ Lighting coil lead
⑥ Pulser coil lead
⑦ Fuel hose
⑧ Speedometer hose
⑨ Shift cable
⑩ Throttle cable

A To relay assembly
B To trim sensor
C To battery
D To remote control
E To trim meter
F To CDI unit
G To CDI unit
H To thermo switch

B : Black
G : Green
L : Blue
O : Orange
P : Pink
R : Red
Gy/B : Gray/black

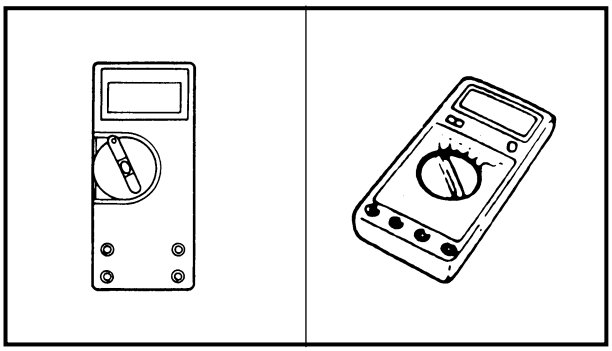
(Aft view)



① Thermo switch
② Ignition coil
③ CDI unit

A To charge coil
B To wire harness
C To pulser coil
D To 10P coupler
E To relay assembly

B : Black
P : Pink
B/W : Black/white
Gy/B : Gray/black



ELECTRICAL COMPONENTS ANALYSIS

DIGITAL CIRCUIT TESTER

	Digital tester **J-39299 / 90890-06752**

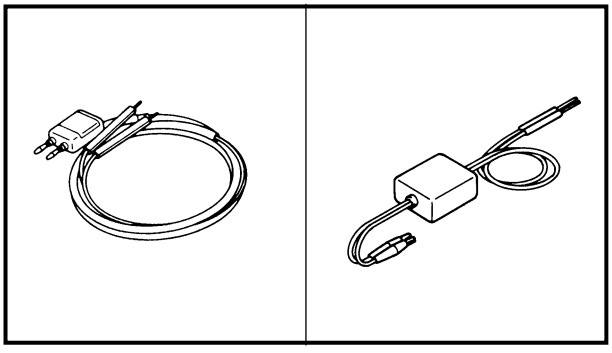
NOTE:

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

MEASURING THE PEAK VOLTAGE

NOTE:

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

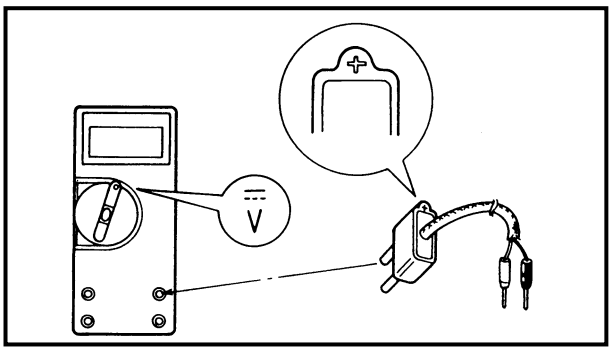


PEAK VOLTAGE ADAPTOR

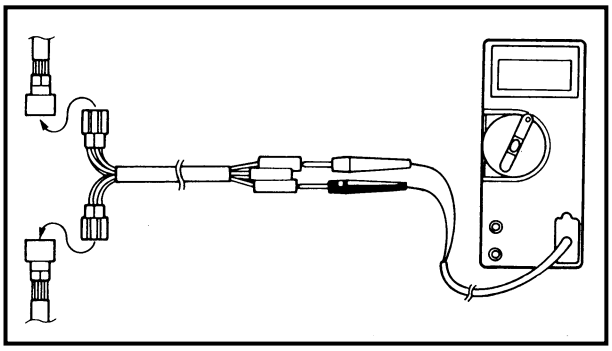
NOTE:

The peak voltage adaptor should be used with the digital circuit tester.

	Peak voltage adaptor **YU-39991 / 90890-03169**



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



Measuring steps
(1) Disconnect the coupler connections.
(2) Connect the test harness between the couplers.
(3) Connect the peak voltage adaptor probes to the connectors which are being checked.
(4) Start or crank the engine and observe the measurement.

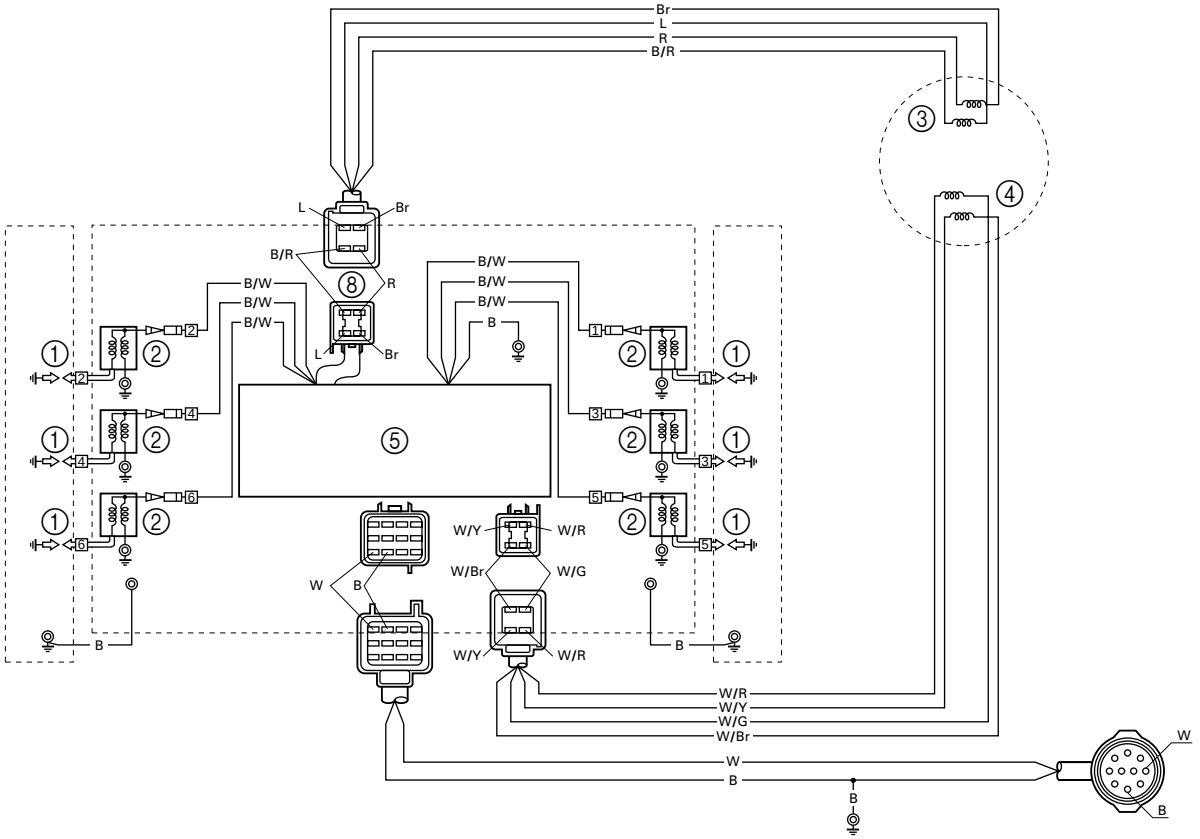
MEASURING A LOW RESISTANCE

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

Correct value
Displayed measurement – internal resistance

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

IGNITION SYSTEM (OIL INJECTION AND 225DET MODELS)

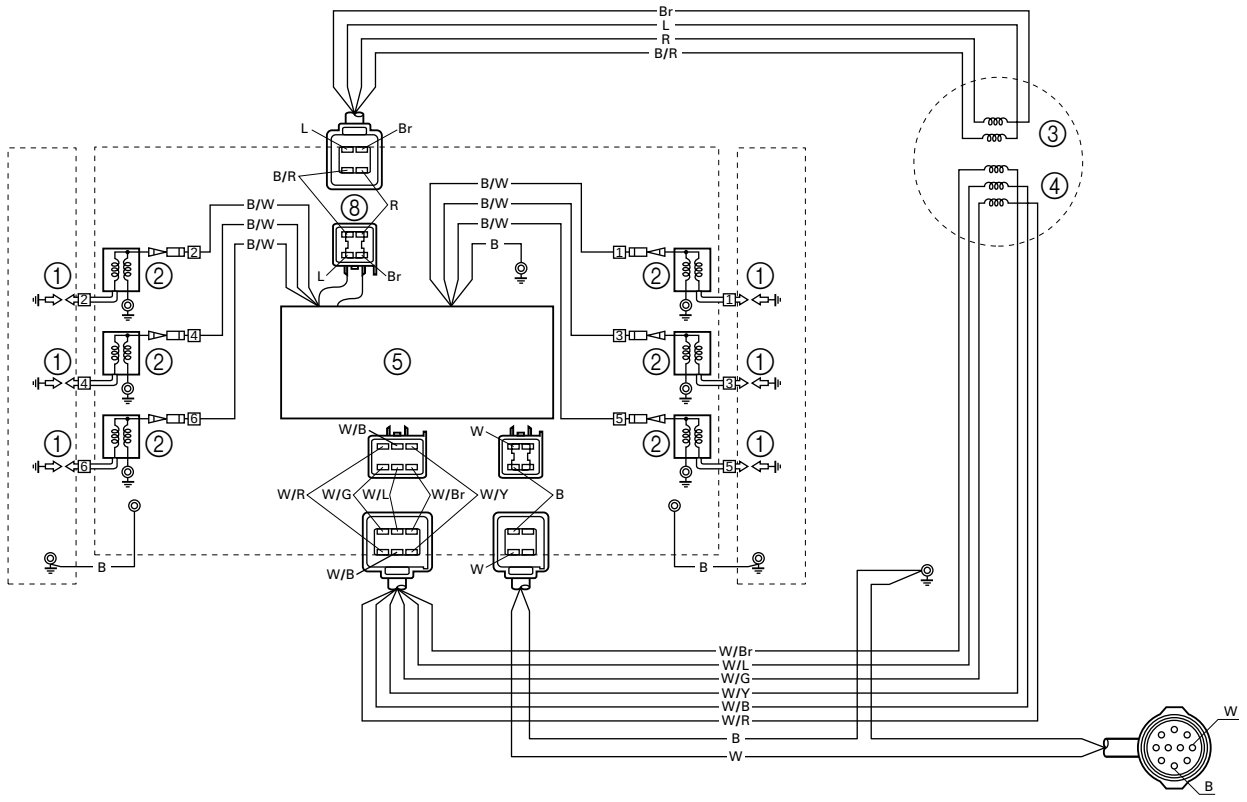


① Spark plugs
② Ignition coils
③ Charge coil
④ Pulser coil
⑤ CDI unit

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

B/R : Black/red
B/W : Black/white
W/Br : White/brown
W/G : White/green
W/R : White/red
W/Y : White/yellow

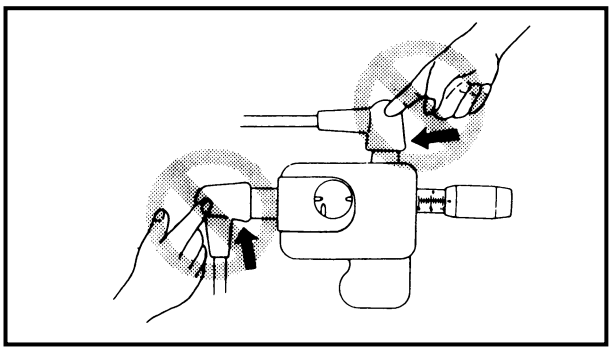
IGNITION SYSTEM (PRE-MIX EXCEPT FOR 225DET MODELS)

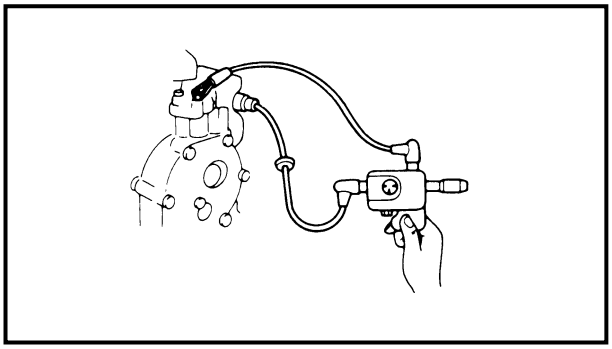


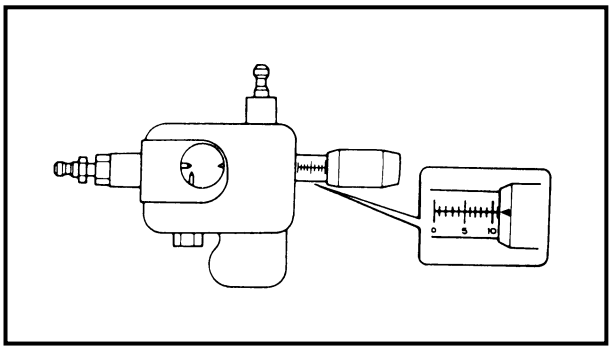
① Spark plugs
② Ignition coils
③ Charge coil
④ Pulser coil
⑤ CDI unit

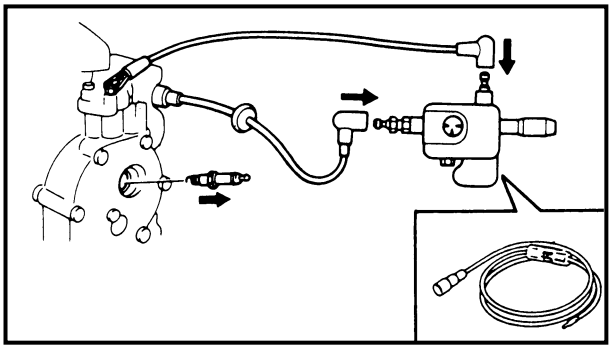
B : Black
Br : Brown
L : Blue
R : Red
W : White
B/R : Black/red
B/W : Black/white

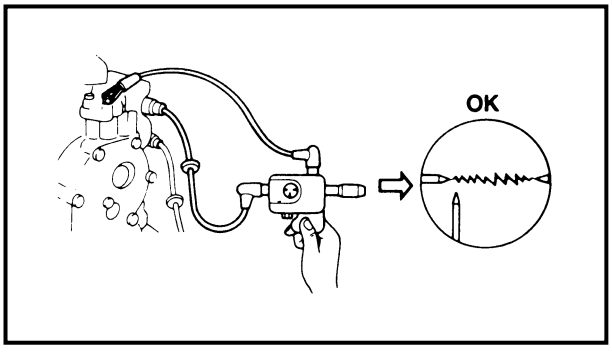
W/B : White/black
W/Br : White/brown
W/G : White/green
W/L : White/blue
W/R : White/red
W/Y : White/yellow











INSPECTING THE IGNITION SPARK GAP

⚠ WARNING

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

Inspect:
- Ignition spark gap
  Above specification → Replace the spark plug.
  Below specification → Inspect the CDI unit output.

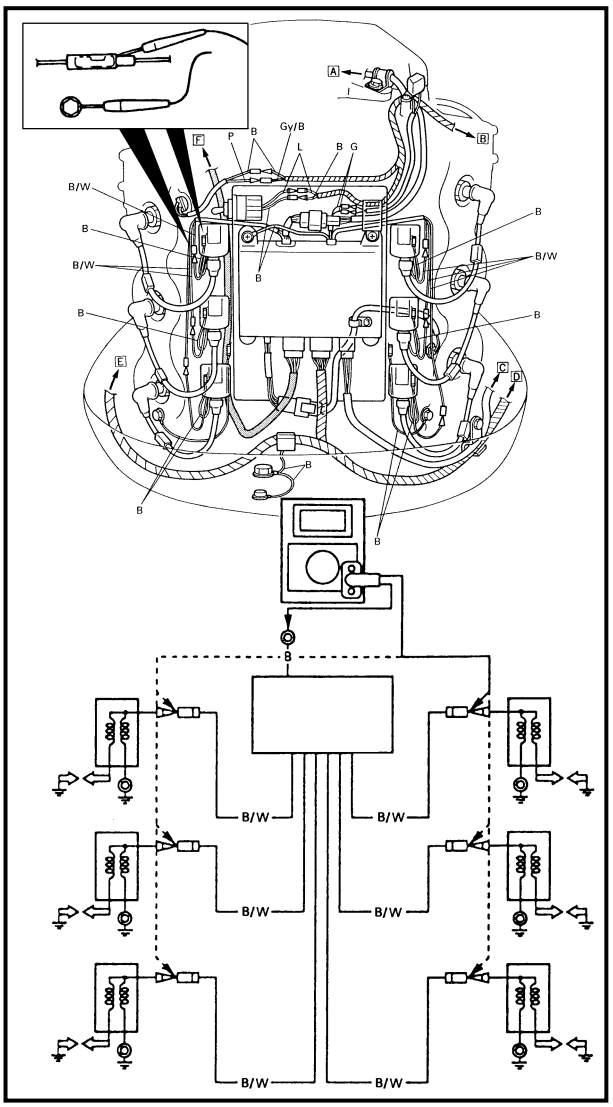
	Ignition spark gap **9 mm (0.4 in)**

Inspecting steps

(1) Remove the spark plugs from the engine.
(2) Connect a spark plug cap to the spark gap tester.
(3) Set the spark gap length on the adjusting knob.

	Spark gap tester **YM-34487 / 90890-06754**

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



MEASURING THE IGNITION SYSTEM PEAK VOLTAGE

⚠ WARNING

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

NOTE:

- If there is no spark or the spark is weak, continue with the ignition system test.
- If a good spark is obtained, the problem is not with the ignition system, but possibly with the spark plug(s) or another component.

1. Measure:
   - CDI unit output peak voltage
     Above specification → Replace the ignition coil.
     Below specification → Measure the charge coil output peak voltage.

CDI unit output peak voltage (oil injection and 225DET models)
Black/white (B/W) – Black (B)

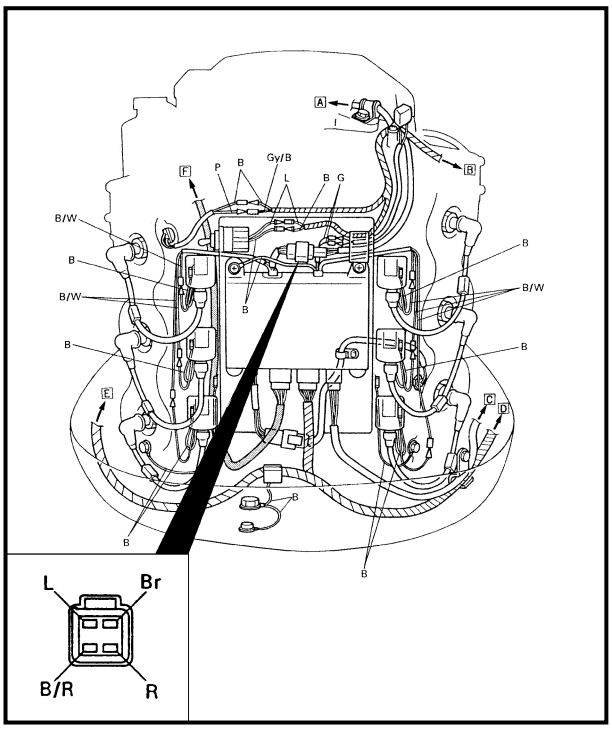
r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	—	130	145	145

NOTE:

With the oil injection and 225DET models, the CDI unit output peak voltage for cylinders #2 and #5 is "0" at either cranking or 1,500 r/min.

CDI unit output peak voltage (pre-mix except for 225DET models)
Black/white (B/W) – Black (B)

r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	—	65	140	135



2. Measure:
   - Charge coil output peak voltage
     Above specification → Measure the pulser coil output peak voltage.
     Below specification → Replace the charge coil.

Charge coil output peak voltage (oil injection and 225DET models)
Red (R) – Brown (Br)

r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	140	160	165	165

Black/red (B/R) – Blue (L)

r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	40	55	165	165

Test harness (4-pin)
YB-38831 / 90890-06771

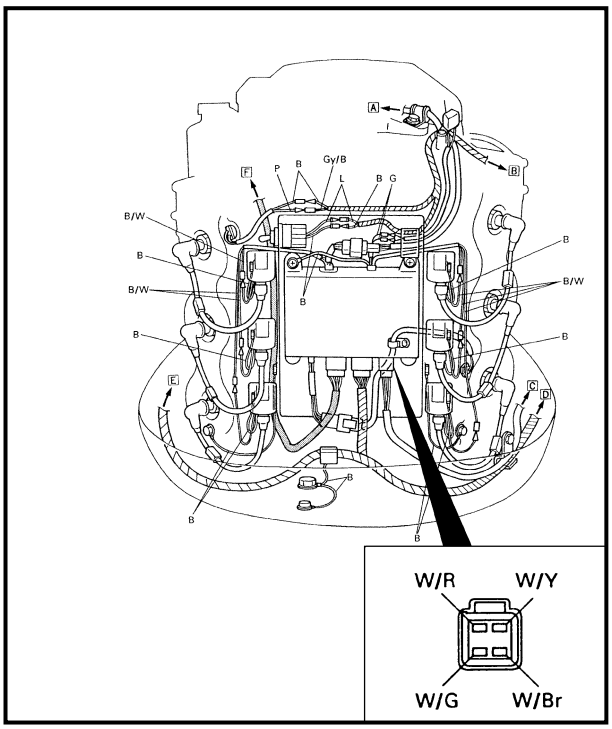
Charge coil output peak voltage (pre-mix except for 225DET models)
Red (R) – Brown (Br)

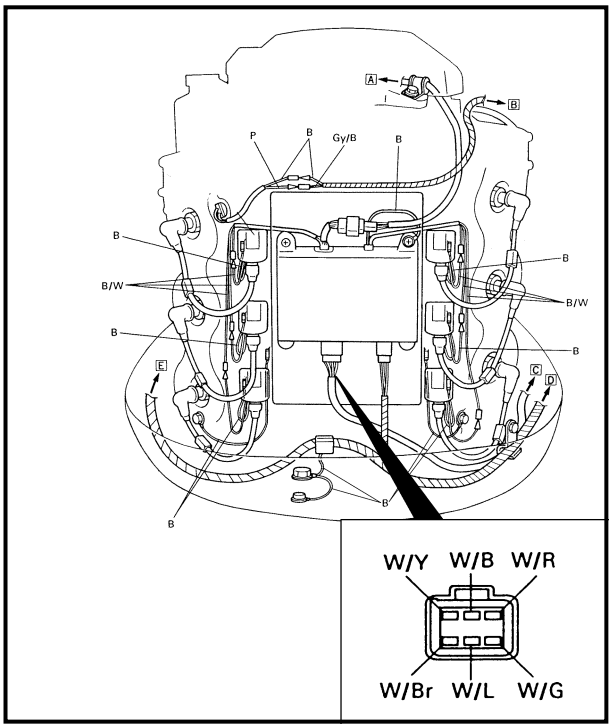
r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	80	90	165	165

Black/red (B/R) – Blue (L)

r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	30	30	160	170

Test harness (4-pin)
YB-38831 / 90890-06771





3. Measure:
   - Pulser coil output peak voltage
     Above specification → Replace the CDI unit.
     Below specification → Replace the pulser coil.

Pulser coil output peak voltage (oil injection and 225DET models)
White/red (W/R) – White/green (W/G)
White/yellow (W/Y) – White/brown (W/Br)

r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	3.0	2.0	8.0	14

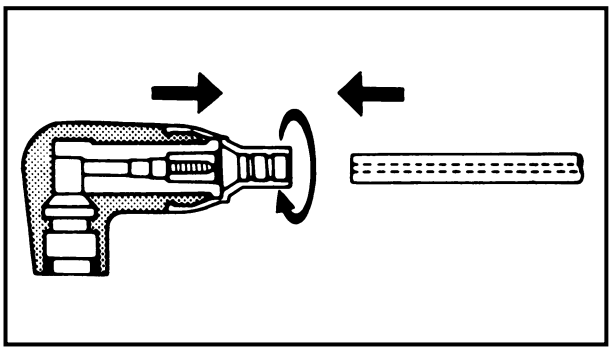
Test harness (4-pin)
YB-38831 / 90890-06771

Pulser coil output peak voltage (pre-mix except for 225DET models)
White/red (W/R) – White/green (W/G)
White/black (W/B) – White/blue (W/L)
White/yellow (W/Y) – White/brown (W/Br)

r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	2.5	2.0	9.5	16

Test harness (6-pin)
YB-38832 / 90890-06772

A Oil injection and 225DET models
B Pre-mix except for 225DET models

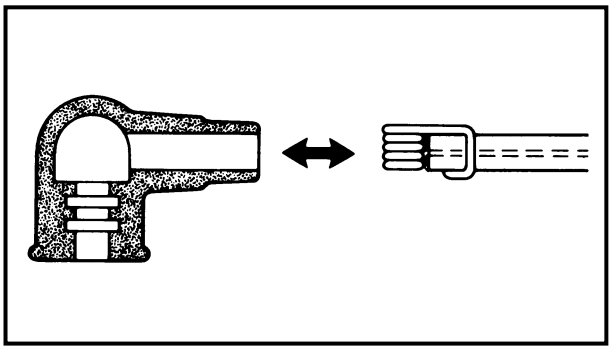


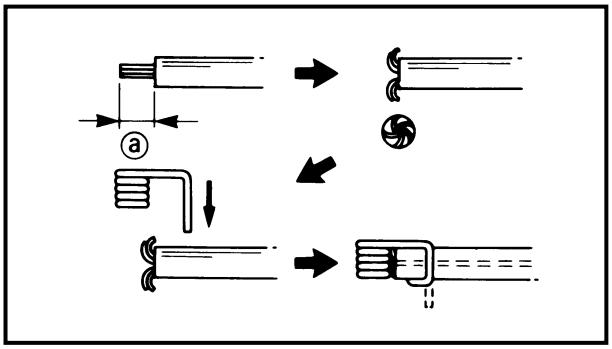
INSPECTING THE SPARK PLUG CAPS

1. Inspect:
   - Spark plug cap
     Loose connection → Tighten.
     Cracks/damage → Replace.

Replacement steps (oil injection and 225DET models)

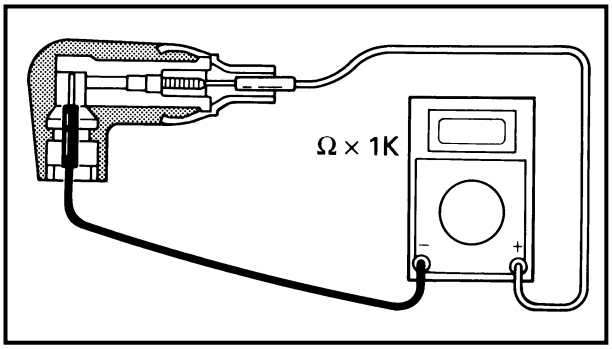
(1) To remove the spark plug cap turn it counterclockwise.
(2) To install the spark plug cap turn it clockwise until it is tight.





Replacement steps (pre-mix except for 225DET models)

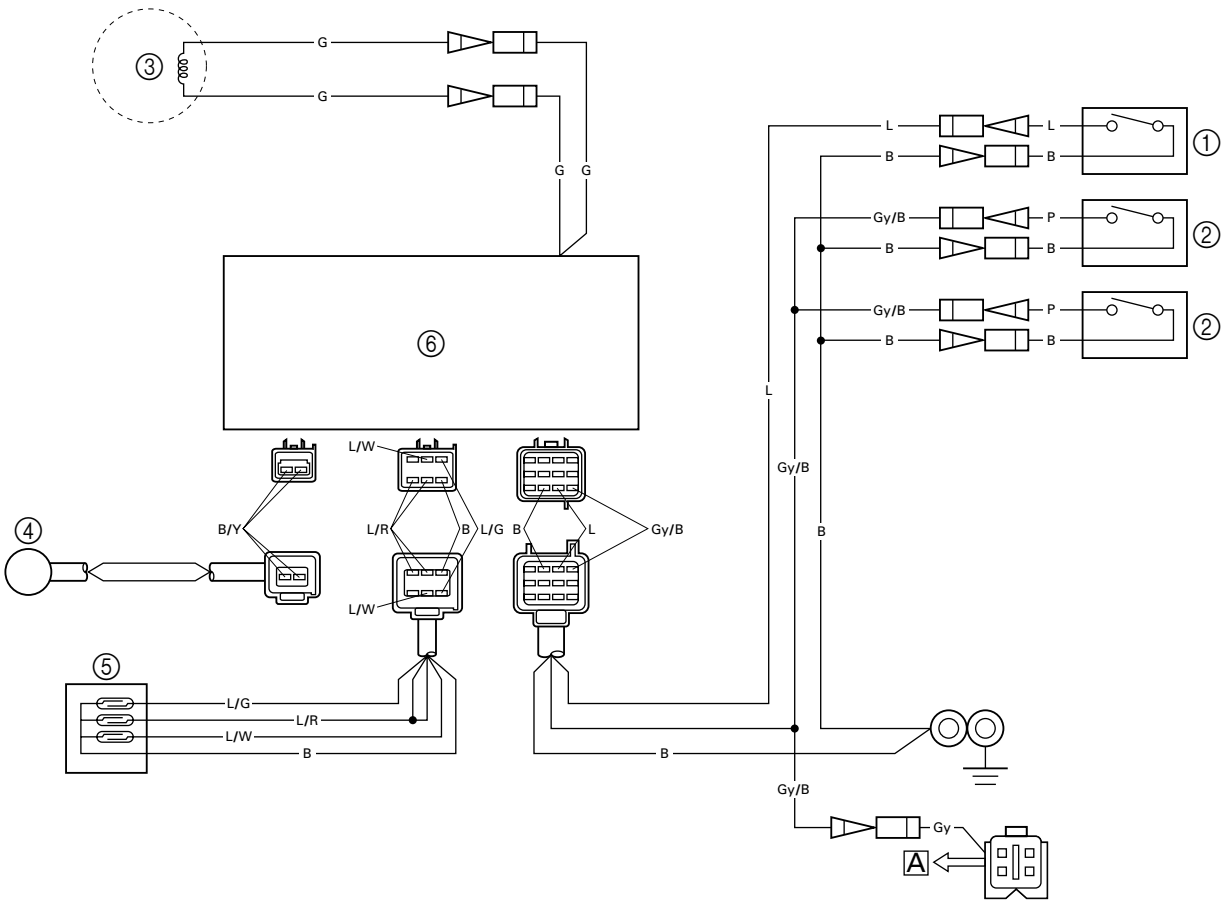
(1) Remove the spark plug cap off of the lead.
(2) Remove the spark plug cap spring.
(3) Strip the insulation cover 5 mm (0.2 in) ⓐ and spread the core wires outward.
(4) Fit the spark plug cap spring close to the spread core wires and bend the end of the spring around the lead.
(5) Install the spark plug cap spring into the spark plug cap.



2. Measure:
   (oil injection and 225DET models)
   - Spark plug cap resistance
     Out of specification → Replace.

	Spark plug cap resistance **4.0 - 6.0 kΩ**

IGNITION CONTROL SYSTEM (OIL INJECTION AND 225DET MODELS)

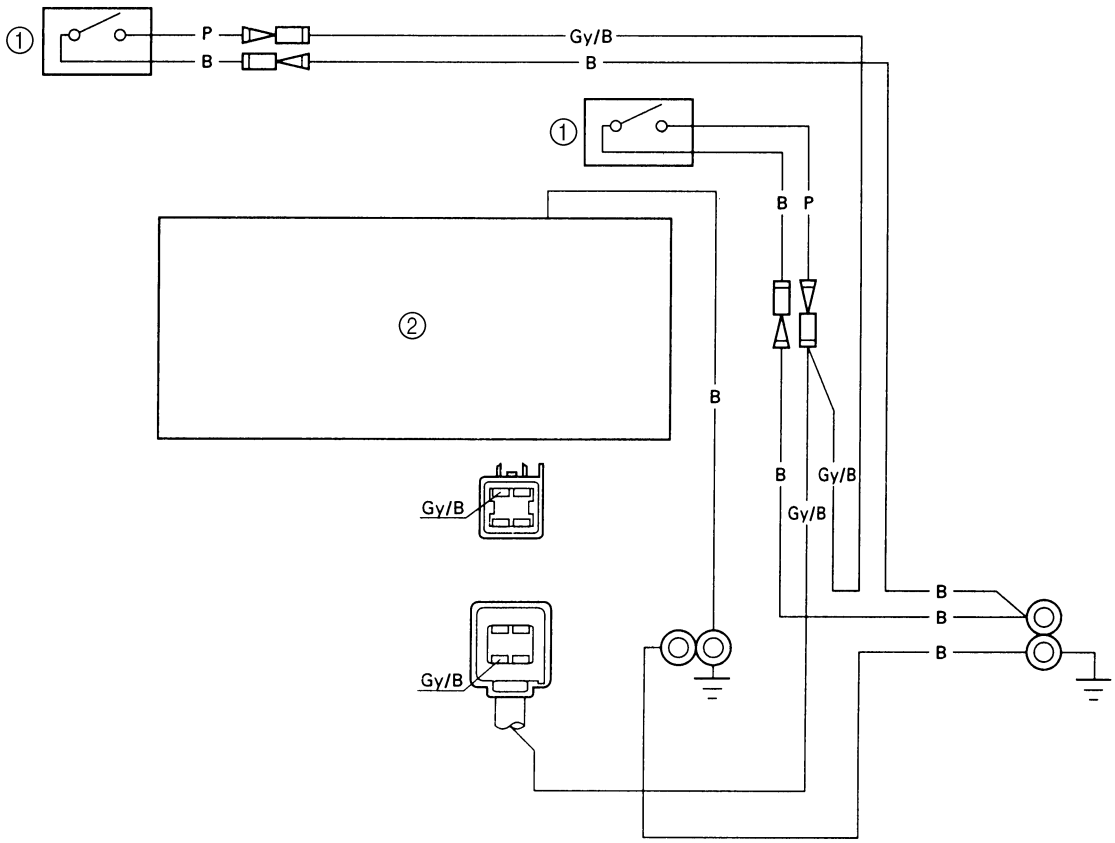


① Emergency switch
② Thermo switch
③ Crank position sensor
④ Engine cooling water temperature sensor
⑤ Oil level sensor (except for 225DET)
⑥ CDI unit

A To the trim sensor

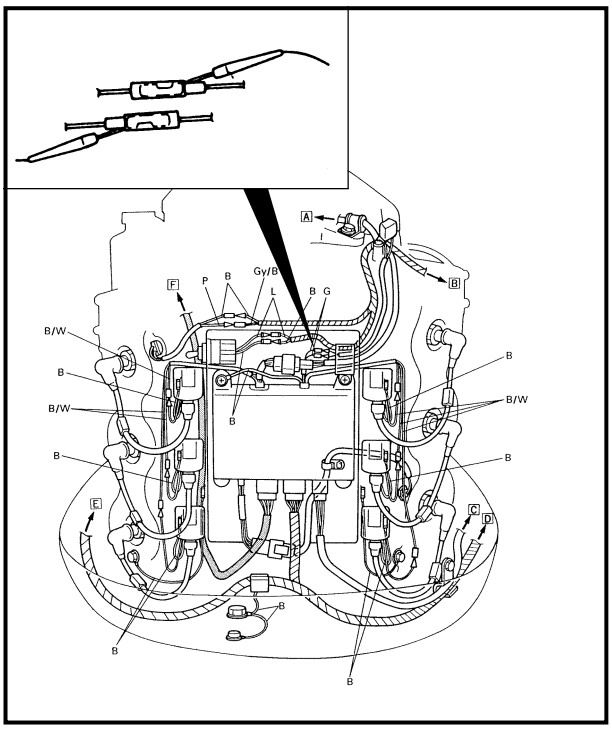
B : Black
L : Blue
P : Pink
B/Y : Black/yellow
Gy/B : Gray/black
L/G : Blue/green
L/R : Blue/red
L/W : Blue/white

IGNITION CONTROL SYSTEM (PRE-MIX EXCEPT FOR 225DET MODELS)



① Thermo switch
② CDI unit

B : Black
P : Pink
Gy/B : Gray/black



MEASURING THE CRANK POSITION SENSOR OUTPUT PEAK VOLTAGE

Measure:

- Crank position sensor output peak voltage

  Below specification → Replace.

Crank position sensor output peak voltage
Green (G) – Green (G)

r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	3.0	2.0	5.5	6.0

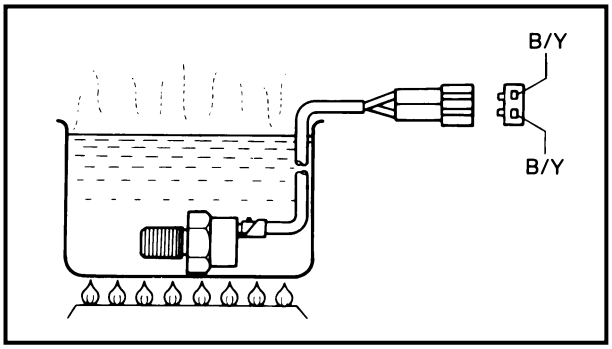
MEASURING THE ENGINE COOLING WATER TEMPERATURE SENSOR RESISTANCE

Measure:

- Engine cooling water temperature sensor resistance

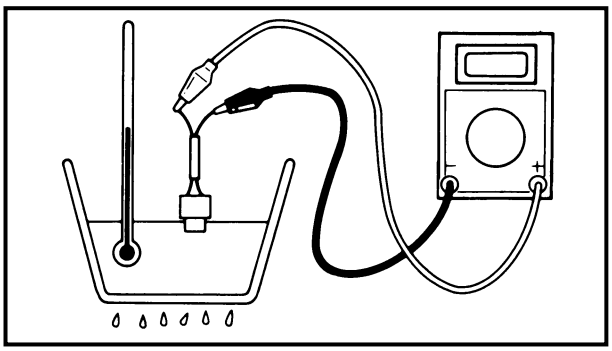
  Out of specification → Replace.

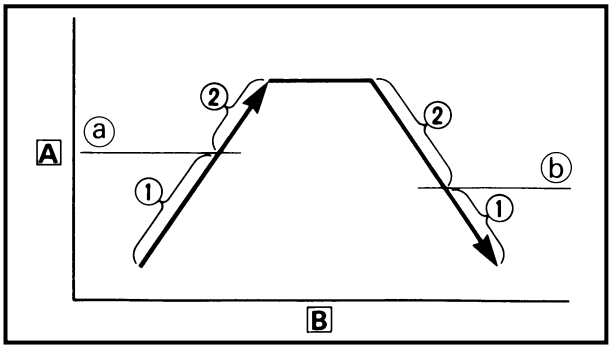
Engine cooling water temperature sensor resistance
Black/yellow (B/Y) – Black/yellow (B/Y)
5 ˚C (41 ˚F): 128 kΩ
20 ˚C (68 ˚F): 54 - 69 kΩ
100 ˚C (212 ˚F): 3.02 - 3.48 kΩ

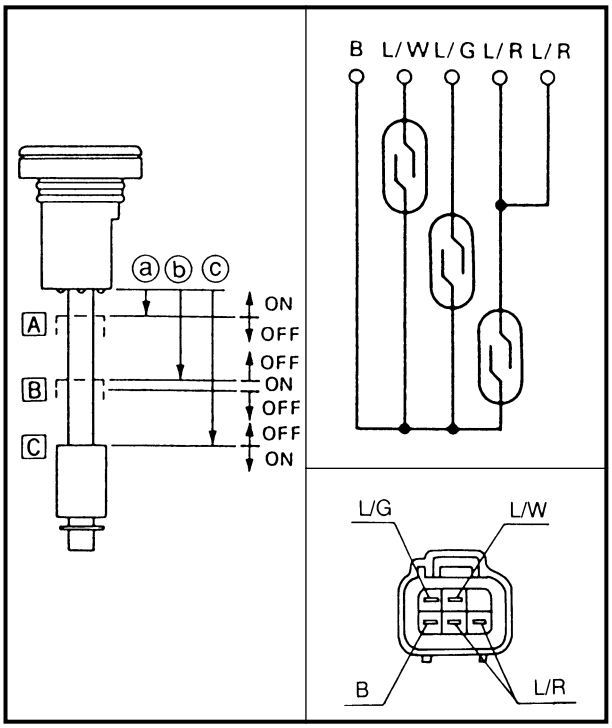


Measuring steps

(1) Place the engine cooling water temperature sensor in a container filled with water.
(2) Place a thermometer in the water.
(3) Slowly heat the water.
(4) Measure the resistance when the specified temperature is reached.







INSPECTING THE THERMO SWITCH CONTINUITY

Inspect:
- Thermo switch continuity
  Out of specification → Replace.

Thermo switch continuity temperature
Pink (P) – Black (B)
ⓐ 84 - 90 °C (183 - 194 °F)
ⓑ 60 - 74 °C (140 - 165 °F)

① No continuity
② Continuity
A Temperature
B Time

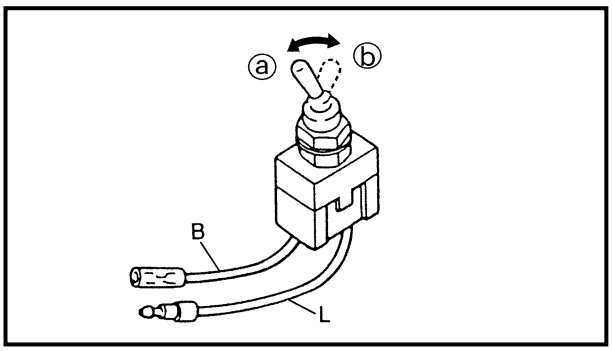
Measuring steps
(1) Place the thermo switch in a container filled with water.
(2) Place a thermometer in the water.
(3) Slowly heat the water.
(4) Measure the continuity when the specified temperature is reached.

INSPECTING THE OIL LEVEL SENSOR CONTINUITY

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

Float position	Lead color			
	Black (B)	Blue/white (L/W)	Blue/green (L/G)	Blue/red (L/R)
A ON	○	○		
A OFF				
B ON	○		○	
B OFF				
C ON	○			○
C OFF				

Float distance
ⓐ: 3 - 6 mm (0.12 - 0.24 in)
ⓑ: 33 - 36 mm (1.30 - 1.42 in)
ⓒ: 53 - 56 mm (2.09 - 2.20 in)



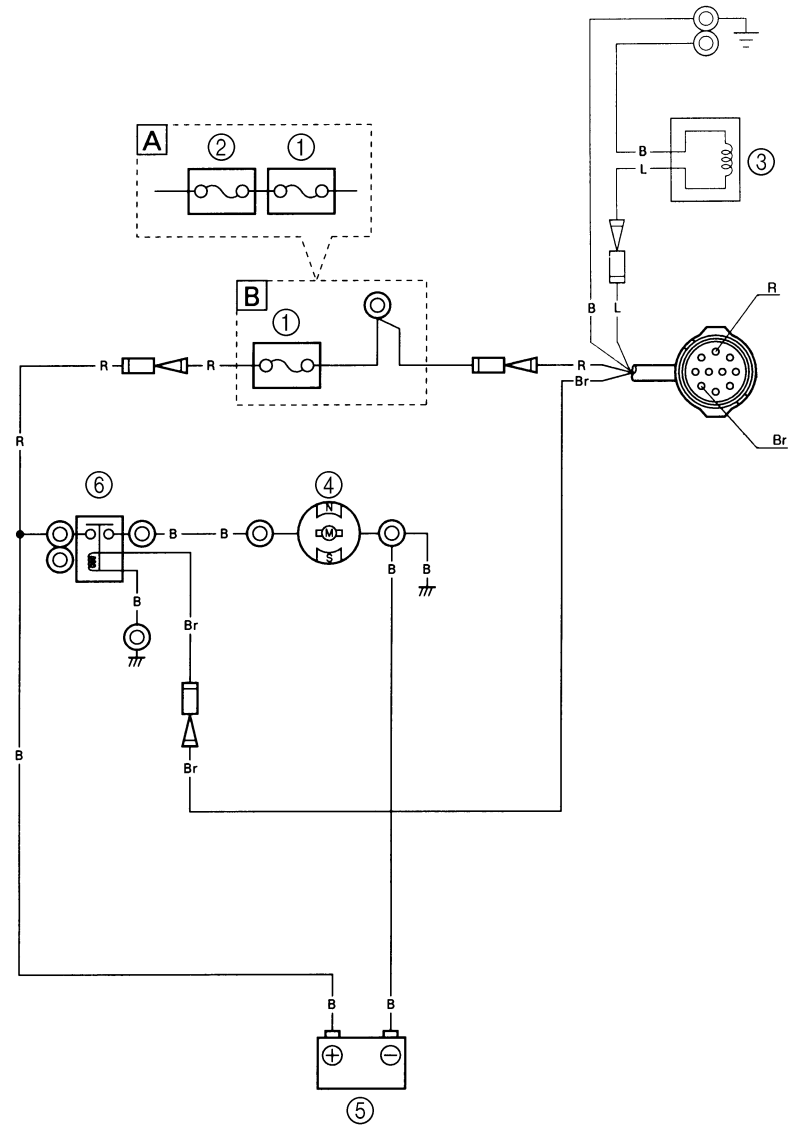
INSPECTING THE EMERGENCY SWITCH

1. Inspect:
   - Emergency switch continuity
     Out of specification → Replace.

Switch position	Lead color
	Blue (L) – Black (B)
Home ⓐ	No continuity
On ⓑ	Continuity

2. Inspect:
   - Emergency switch
     Does not automatically return to the home position → Replace.

STARTING SYSTEM



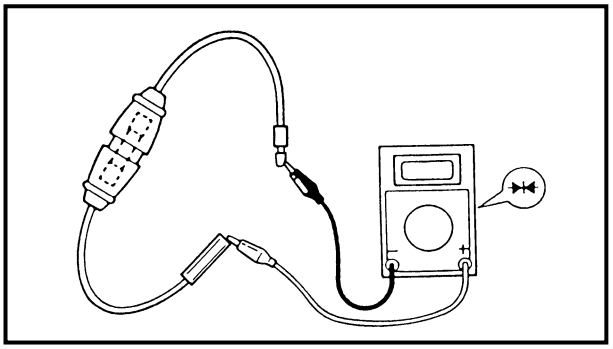
① Fuse (20A)
② Fuse (30A)
③ Fuel enrichment valve
④ Starter motor
⑤ Battery
⑥ Starter relay

A Oil injection and 225DET models
B Pre-mix except for 225DET models

B : Black
Br : Brown
L : Blue
R : Red

INSPECTING THE BATTERY

Refer to "INSPECTING THE BATTERY" on page 3-20.



INSPECTING THE FUSES

1. Inspect:
   - Fuse holder continuity
     No continuity → Check the fuse holder leads.
2. Inspect:
   - Fuse holder lead continuity
     No continuity → Replace the fuse holder.
     Continuity → Inspect the fuse.
3. Inspect:
   - Fuse continuity
     No continuity → Replace.
   - Fuse rating
     Out of specification → Replace.

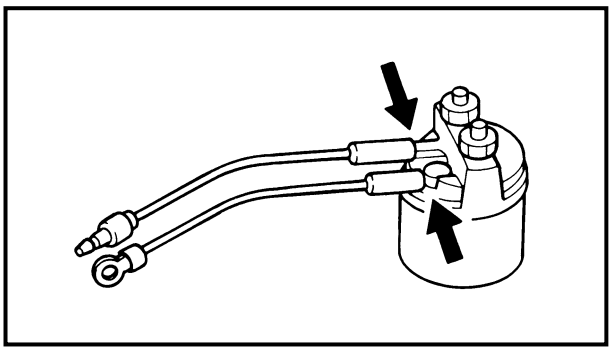
Fuse rating
12 V - 20, 30 A

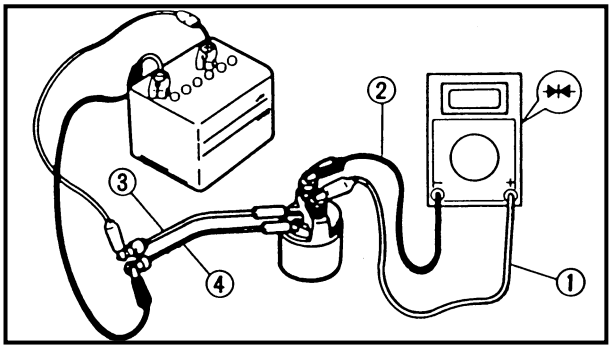
INSPECTING THE WIRE HARNESS CONTINUITY

Inspect:
- Wire harness continuity
  No continuity → Replace.

INSPECTING THE WIRE CONNECTIONS

Inspect:
- Wire connections
  Poor connection → Properly connect.





INSPECTING THE STARTER RELAY

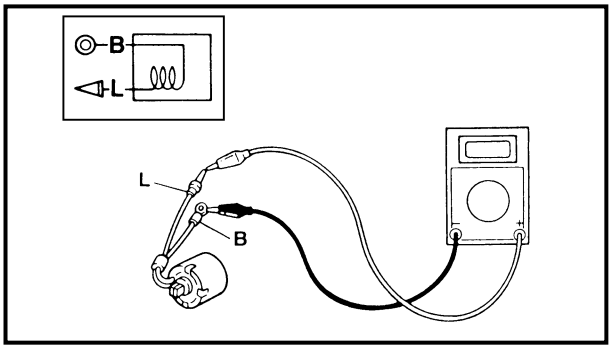
1. Inspect:
   - Brown lead terminal
   - Black lead terminal
   Poor connection → Properly connect.
2. Inspect:
   - Starter relay continuity
   No continuity → Replace.

Inspecting steps

(1) Connect the tester and battery between the starter relay terminals.

Positive digital tester probe ① → Starter relay terminal
Negative digital tester probe ② → Starter relay terminal
Positive battery terminal → Brown lead ③
Negative battery terminal → Black lead ④

(2) Inspect that there is continuity between the starter relay terminals.

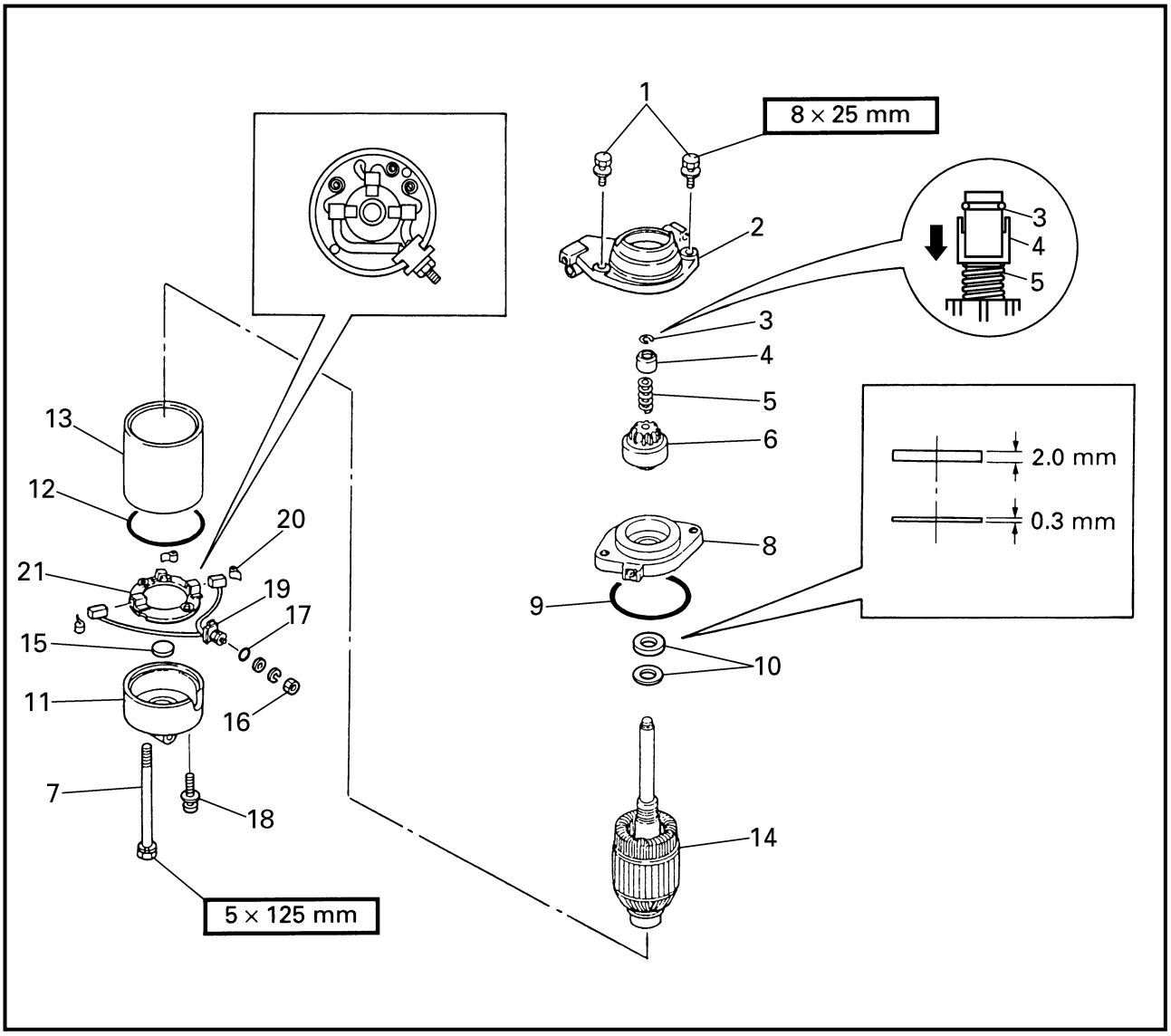


MEASURING THE FUEL ENRICHMENT VALVE

Measure:
- Fuel enrichment valve resistance
Out of specification → Replace.

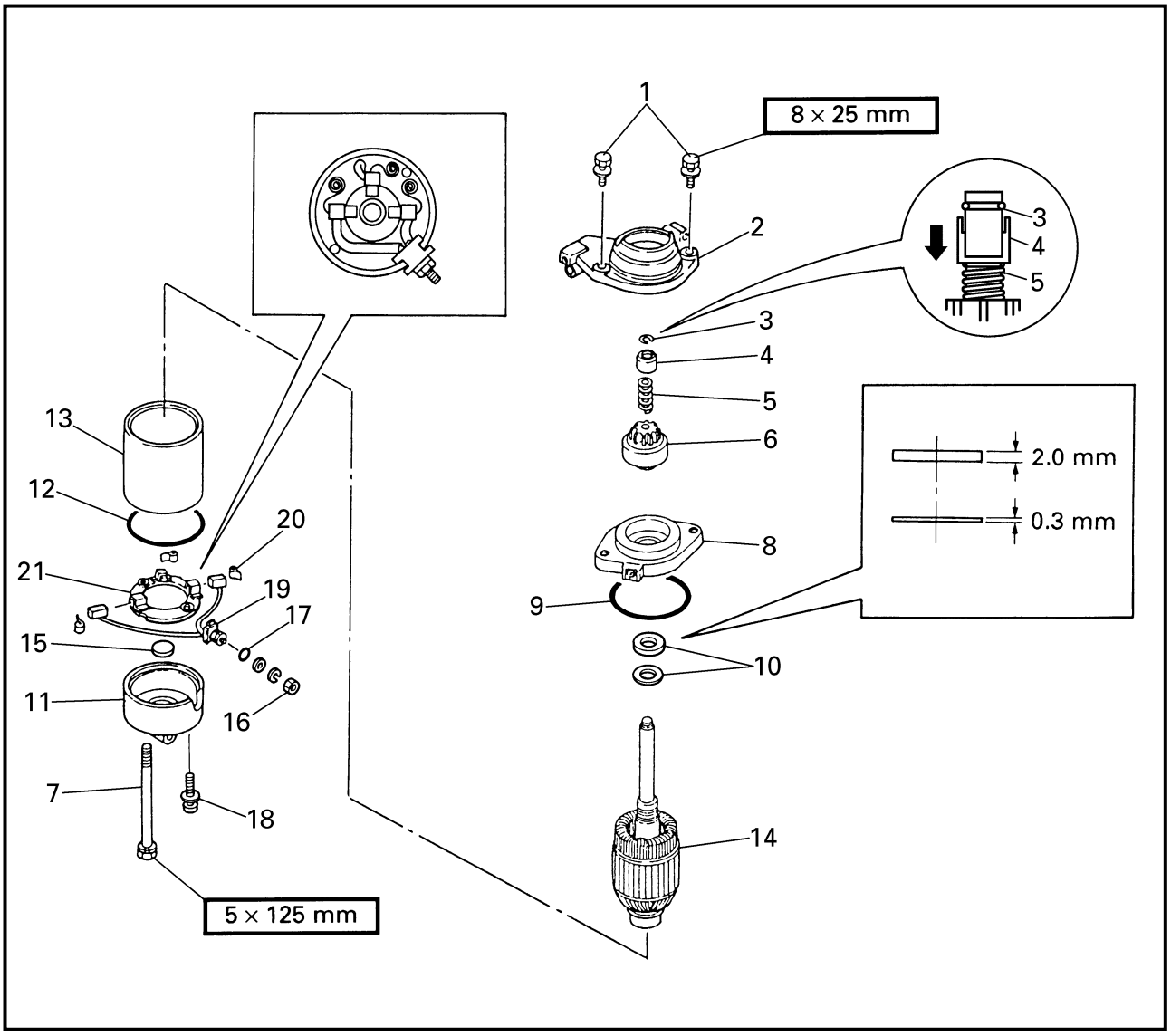
Fuel enrichment valve resistance
Blue (L) – Black (B)
3.4 ~ 4.0 Ω at 20 ˚C (68 ˚F)

STARTER MOTOR
DISASSEMBLING/ASSEMBLING THE STARTER MOTOR



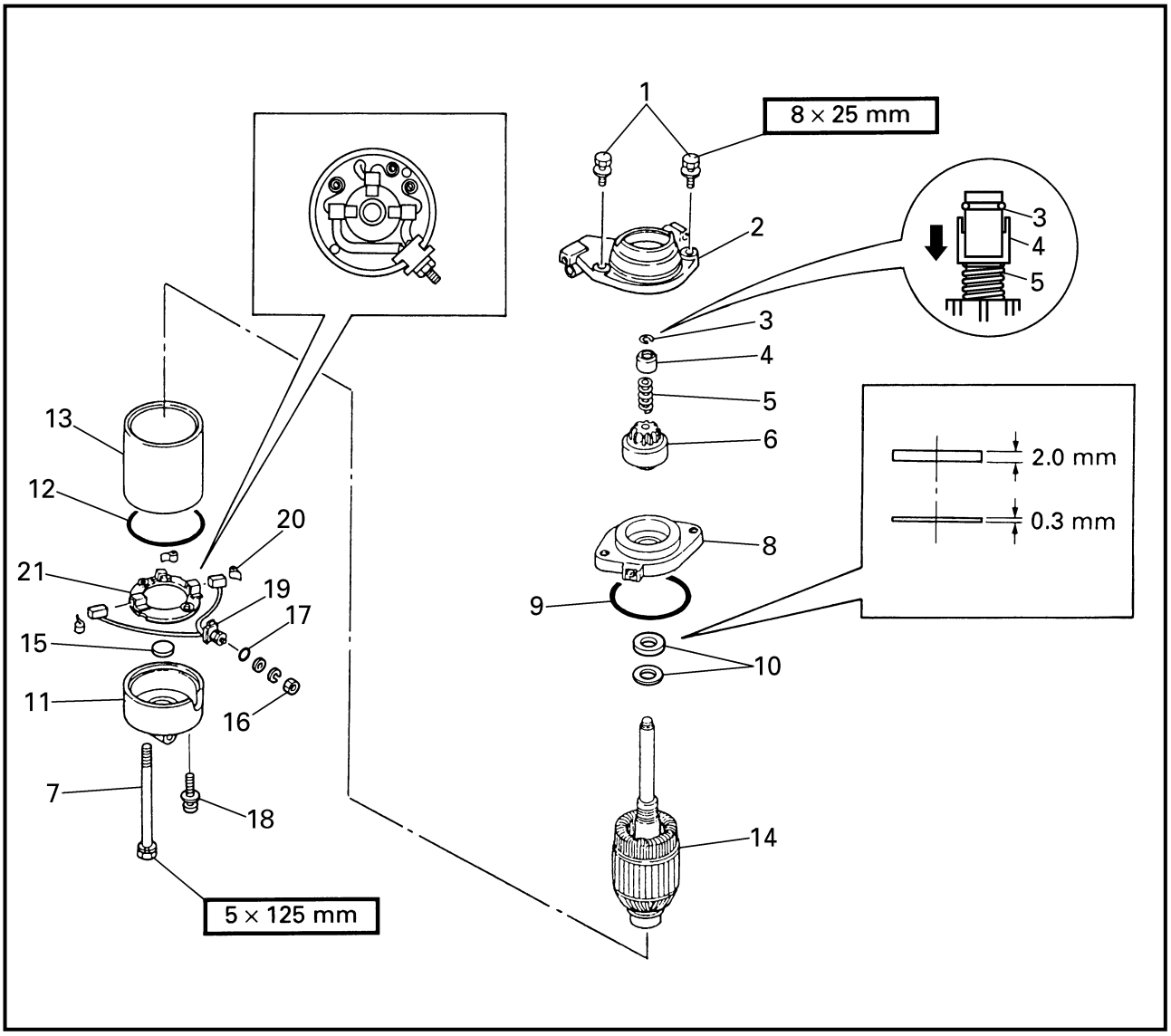
Order	Job/Part	Q'ty	Remarks
	Starter motor		Refer to "RELAY ASSEMBLY AND STARTER MOTOR" on page 5-16.
1	Bolt	2	
2	Starter motor bracket	1	
3	Clip	1	
4	Starter motor pinion stopper	1	
5	Spring	1	
6	Starter motor pinion	1	

Continued on next page.

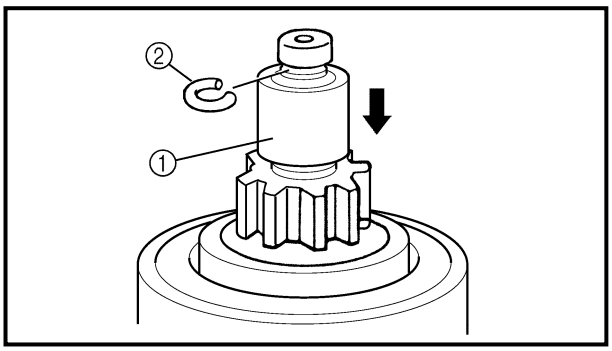


Order	Job/Part	Q'ty	Remarks
7	Bolt	2	
8	Upper cover	1	
9	O-ring	1	
10	Washer	2	
11	Lower bracket	1	
12	O-ring	1	
13	Stator	1	
14	Armature	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
15	Metal plate	1	
16	Nut	1	
17	O-ring	1	
18	Screw	2	
19	Brush assembly	1	
20	Spring	3	
21	Brush holder	1	
			For assembly, reverse the disassembly procedure.

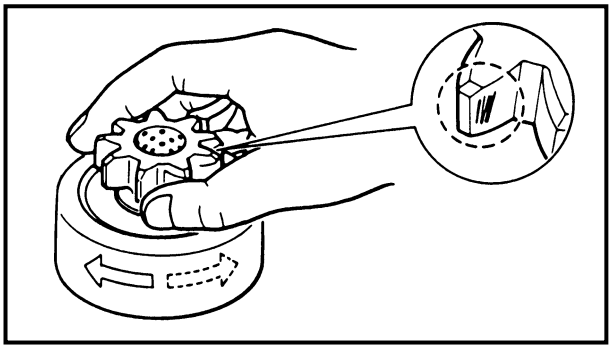


REMOVING THE STARTER MOTOR PINION

Remove:
- Clips ①

NOTE:

Slide the pinion stopper ① down as shown and then remove the clip ②.

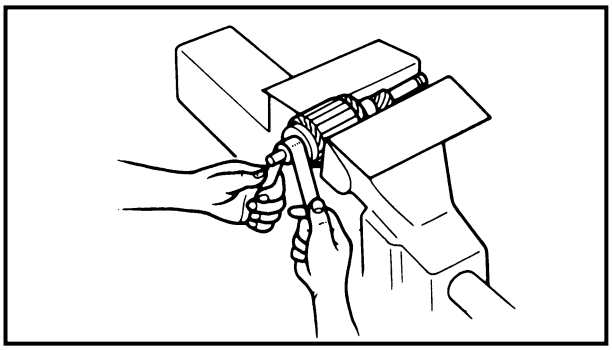


INSPECTING THE STARTER MOTOR PINION

1. Inspect:
   - Starter motor pinion teeth
     Damage/wear → Replace.
2. Inspect:
   - Starter motor pinion movement
     Incorrect → Replace.

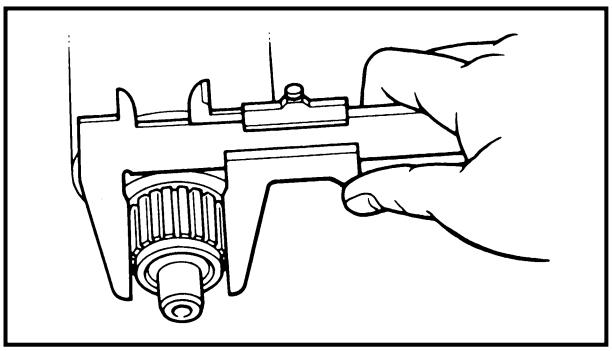
NOTE:

Rotate the starter motor pinion clockwise and make sure it moves smoothly. Also, rotate the starter motor pinion counter-clockwise and make sure it locks.



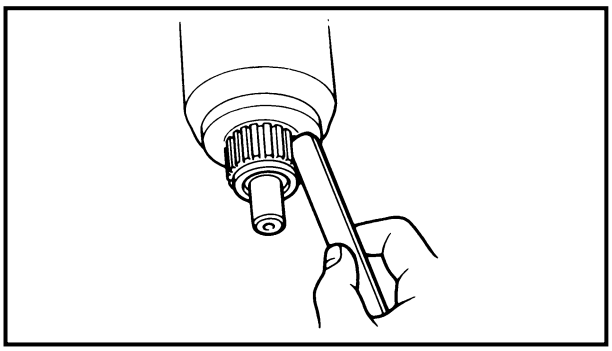
INSPECTING THE ARMATURE

1. Inspect:
   - Commutator
     Foreign matter → Clean.
     (with 600 grit sandpaper)

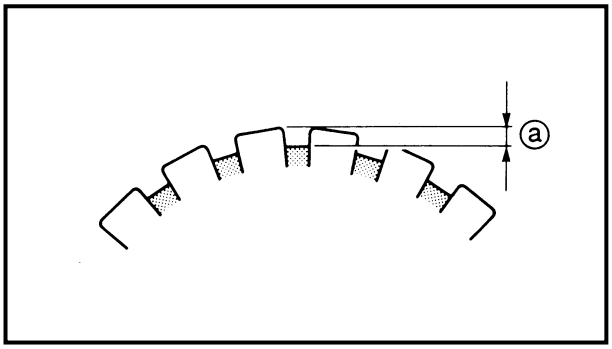


2. Measure:
   - Commutator diameter
     Out of specification → Replace.

	Commutator diameter limit **31.0 mm (1.22 in)**

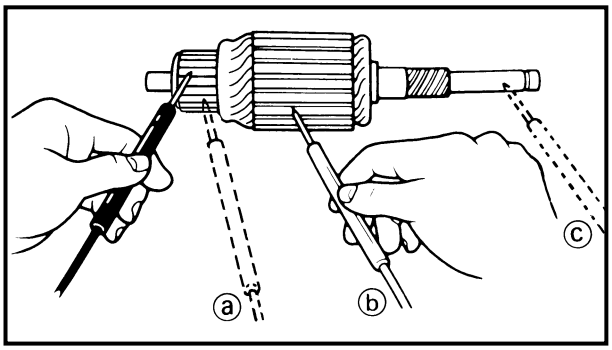


3. Inspect:
   • Commutator undercut
   Dirt/foreign matter → Clean.
   (with compressed air)



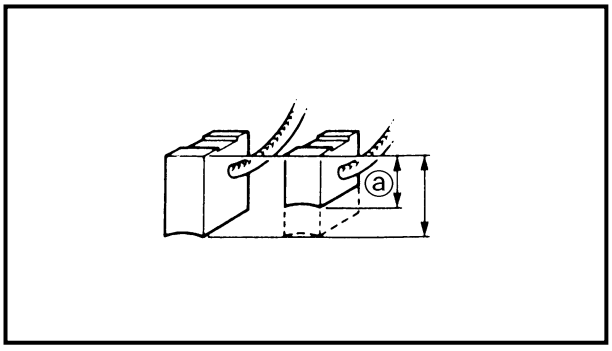
4. Measure:
   • Commutator undercut ⓐ
   Out of specification → Replace the armature.

	Commutator undercut limit 0.2 mm (0.01 in)



5. Inspect:
   • Armature continuity
   Out of specification → Replace.

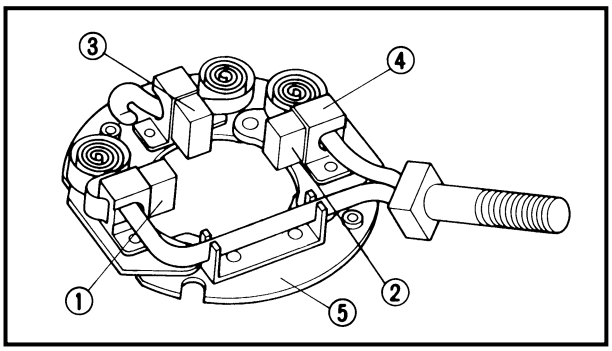
Armature continuity	
Commutator segments ⓐ	**Continuity**
Segment – Armature core ⓑ	**No continuity**
Segment – Armature shaft ⓒ	**No continuity**



MEASURING THE BRUSHES

1. Measure:
   • Brush length ⓐ
   Out of specification → Replace the brush assembly.

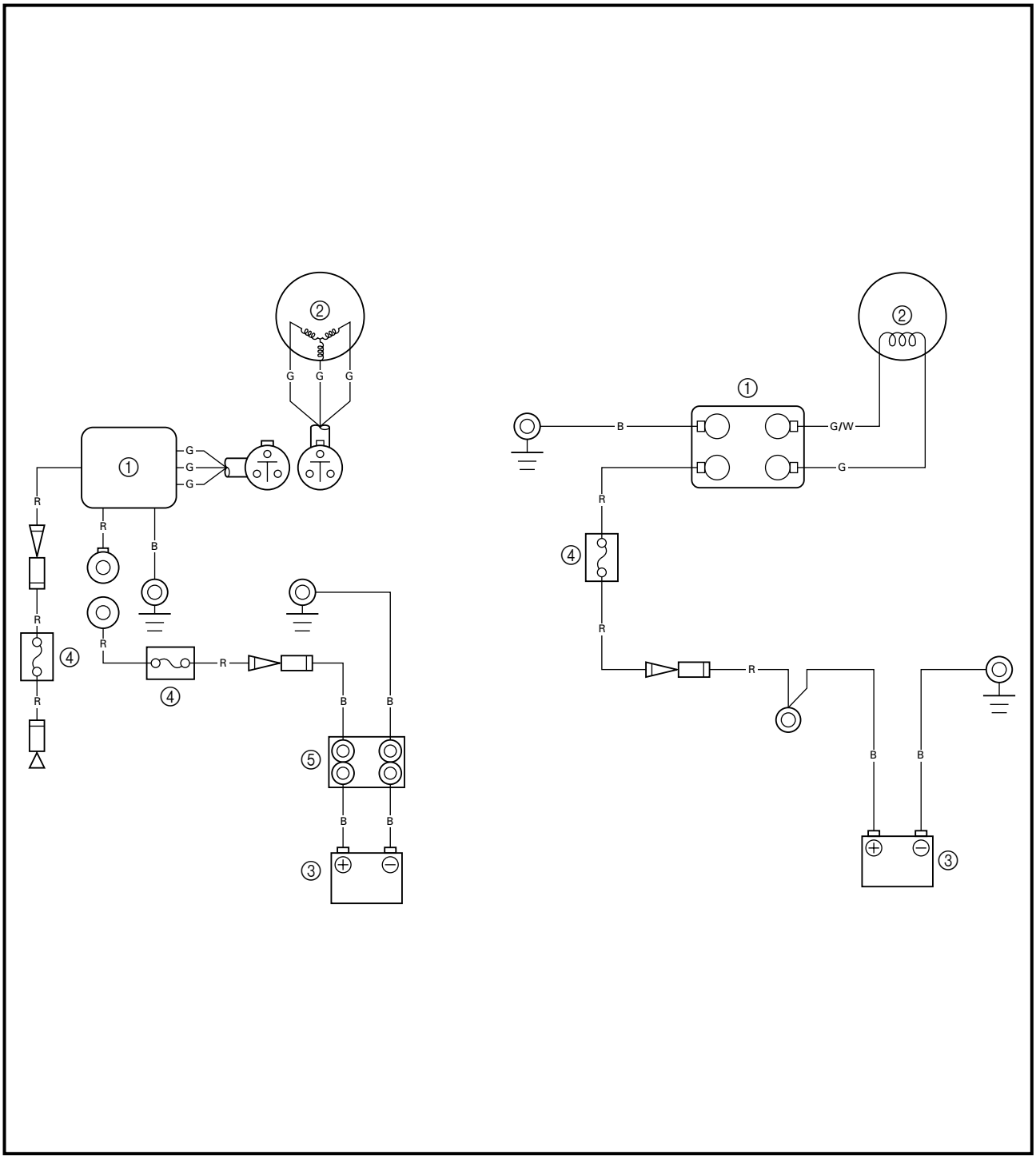
	Brush length limit 12.0 mm (0.47 in)



2. Inspect:
   • Brush assembly continuity
     Out of specification → Replace the brush assembly.

Brush assembly continuity	
Brush ① – Brush ②	**Continuity**
Brush ① – Brush ③ **Brush ② – Brush ③** **Brush holder ④ –** **Brush assembly holder ⑤**	**No continuity**

CHARGING SYSTEM



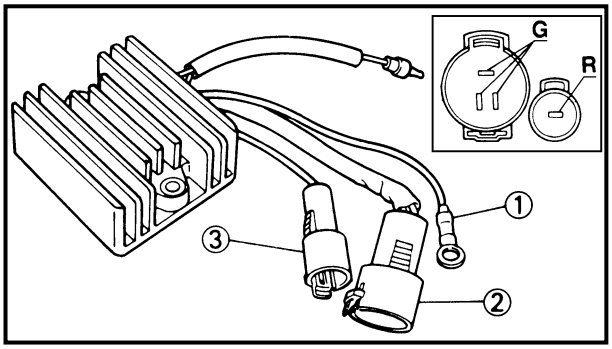
① Rectifier/regulator
② Lighting coil
③ Battery
④ Fuses (20A, 30A)
⑤ Battery lead terminal

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

A Oil injection and 225DET models
B Pre-mix except for 225DET models

INSPECTING THE RECTIFIER/ REGULATOR

1. Inspect:
   (oil injection and 225DET models)
   • Rectifier/regulator continuity
   Out of specification → Replace.



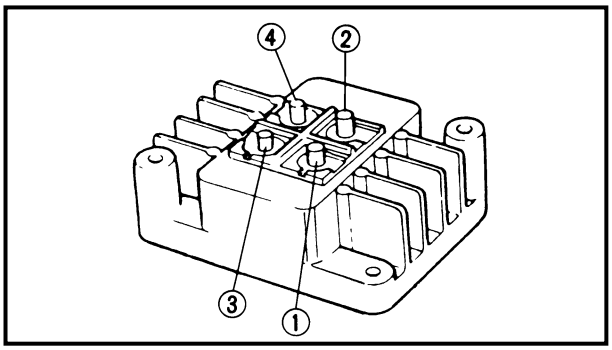
Rectifier/regulator continuity

	① Black (B)	② Green (G)	③ Red (R)
① Black (B)		○	○
② Green (G)	∞		○
③ Red (R)	∞	∞	

○ : Continuity
∞ : No continuity

NOTE:
There are three green and one red terminal. The resistance between black and each of these terminals is the same.

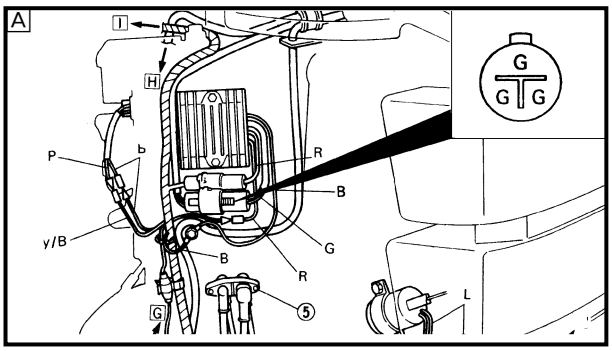
2. Inspect:
   (pre-mix except for 225DET models)
   • Rectifier/regulator continuity

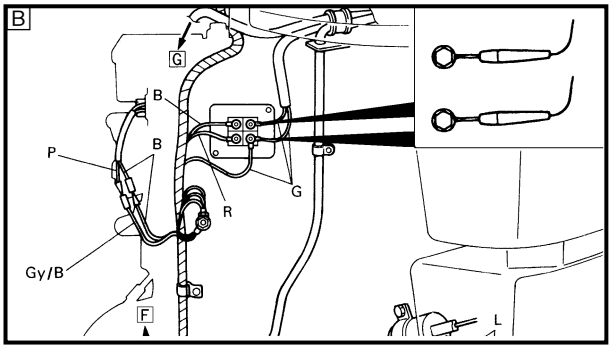


Rectifier/regulator continuity

	① Green (G1)	② Green (G2)	③ Red (R)	④ Black (B)
① Green (G1)		○	○	○
② Green (G2)	∞		○	∞
③ Red (R)	∞	∞		∞
④ Black (B)	○	○	○	

○ : Continuity
∞ : No continuity





MEASURING THE LIGHTING COIL OUTPUT PEAK VOLTAGE

Measure:

- Lighting coil output peak voltage
  Above specification → Replace the rectifier/regulator.
  Below specification → Replace the lighting coil.

Lighting coil output peak voltage (oil injection and 225DET models)
Green (G) – Green (G)

r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	—	—	35	85

Test harness (3-pin)
YB-06770 / 90890-06770

Lighting coil output peak voltage (pre-mix except for 225DET models)
Green/white (G/W) – Green (G)

r/min	Circuit	Loaded		
	Cranking		1,500	3,500
V	—	—	20	50

A Oil injection and 225DET models
B Pre-mix except for 225DET models

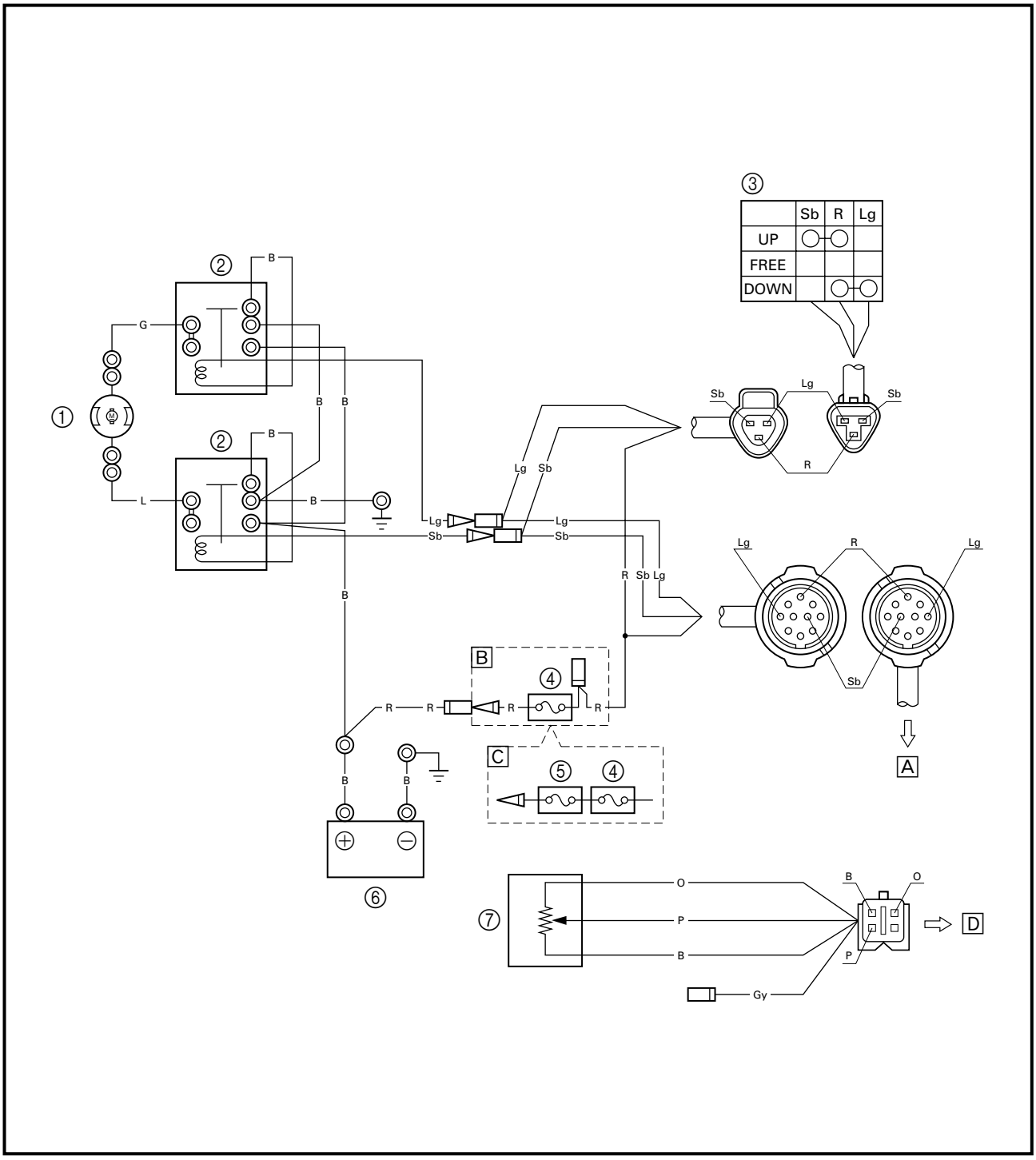
INSPECTING THE FUSES

Refer to "INSPECTING THE FUSES" on page 8-22.

INSPECTING THE BATTERY

Refer to "INSPECTING THE BATTERY" on page 3-20.

POWER TRIM AND TILT SYSTEM



① Power trim and tilt motor
② Power trim and tilt relay
③ Trailer switch
④ Fuse (20A)
⑤ Fuse (30A)
⑥ Battery
⑦ Trim sensor

A To remote control
B Pre-mix except for 225DET models
C Oil injection and 225DET models
D To trim meter

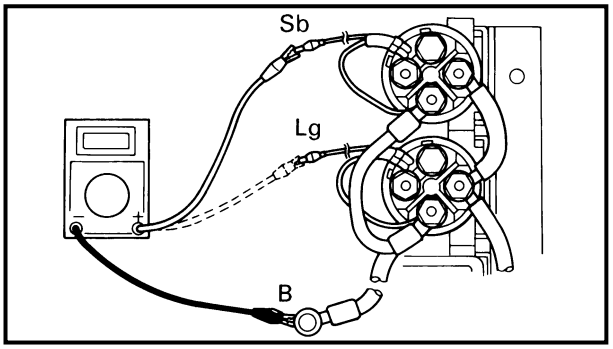
B : Black
G : Green
Gy : Gray
L : Blue
Lg : Light green
O : Orange
P : Pink
R : Red
Sb : Sky blue
Gy/B: Gray/black

INSPECTING THE FUSES

Refer to "INSPECTING THE FUSES" on page 8-22.

INSPECTING THE BATTERY

Refer to "INSPECTING THE BATTERY" on page 3-20.

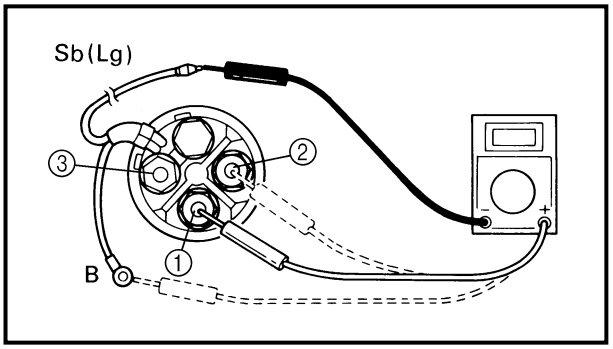


INSPECTING THE POWER TRIM AND TILT RELAY

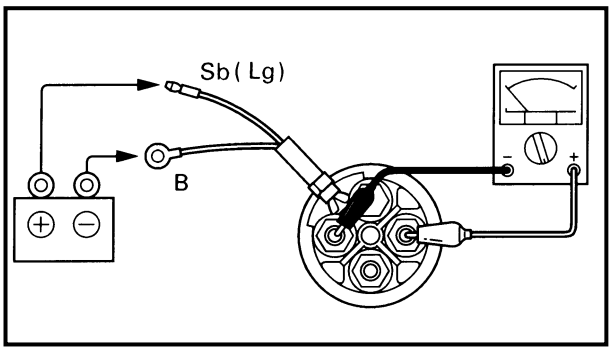
1. Inspect:
   - Power trim and tilt relay assembly continuity
     Out of specification → Inspect the power trim and tilt relay continuity.

	Power trim and tilt relay assembly continuity
Sky blue (Sb) – Black (B) Light green (Lg) – Black (B)	Continuity

2. Inspect:
   - Power trim and tilt relay continuity
     Out of specification → Replace.



	Power trim and tilt relay continuity
Sky blue (Sb) lead – Black (B) lead Light green (Lg) lead – Black (B) lead	Continuity
Sky blue (Sb) lead – Terminal ① Light green (Lg) lead – Terminal ①	Continuity
Sky blue (Sb) lead – Terminal ② Light green (Lg) lead – Terminal ②	No continuity
Terminal ① – Terminal ③	Continuity
Terminal ② – Terminal ③	No continuity



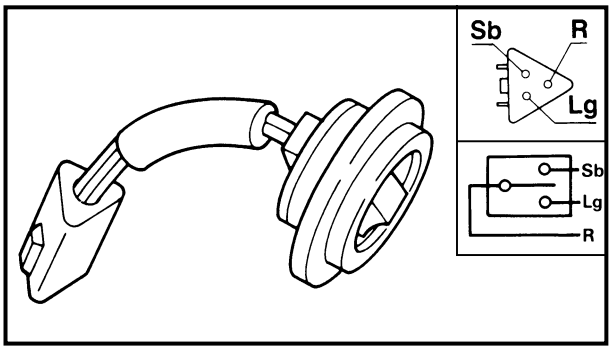
3. Inspect:
   • Power trim and tilt relay operation
   No continuity → Replace.

Inspecting steps

(1) Connect the tester between the power trim and tilt relay terminals.
(2) Connect a 12-V battery as shown.

Sky blue (Sb) lead → Positive terminal **Black (B) lead → Negative terminal**
Light green (Lg) lead → Positive terminal **Black (B) lead → Negative terminal**

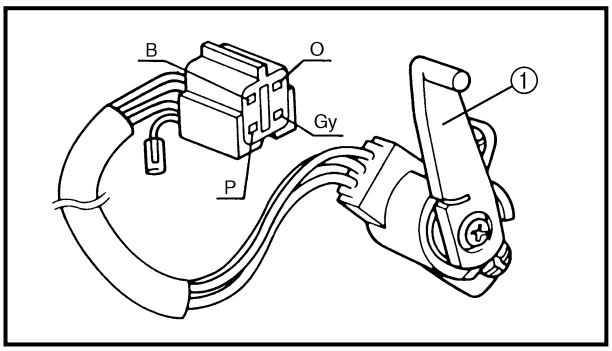
(3) Check that there is continuity between the power trim and tilt relay terminals.



INSPECTING THE TRAILER SWITCH CONTINUITY

Inspect:
• Trailer switch continuity
Out of specification → Replace.

Switch position	Lead color		
	Sky blue (Sb)	Red (R)	Light green (Lg)
Up	○	○	
Free			
Down		○	○



MEASURING THE TRIM SENSOR RESISTANCE

Measure:

- Trim sensor resistance
  Out of specification → Replace.

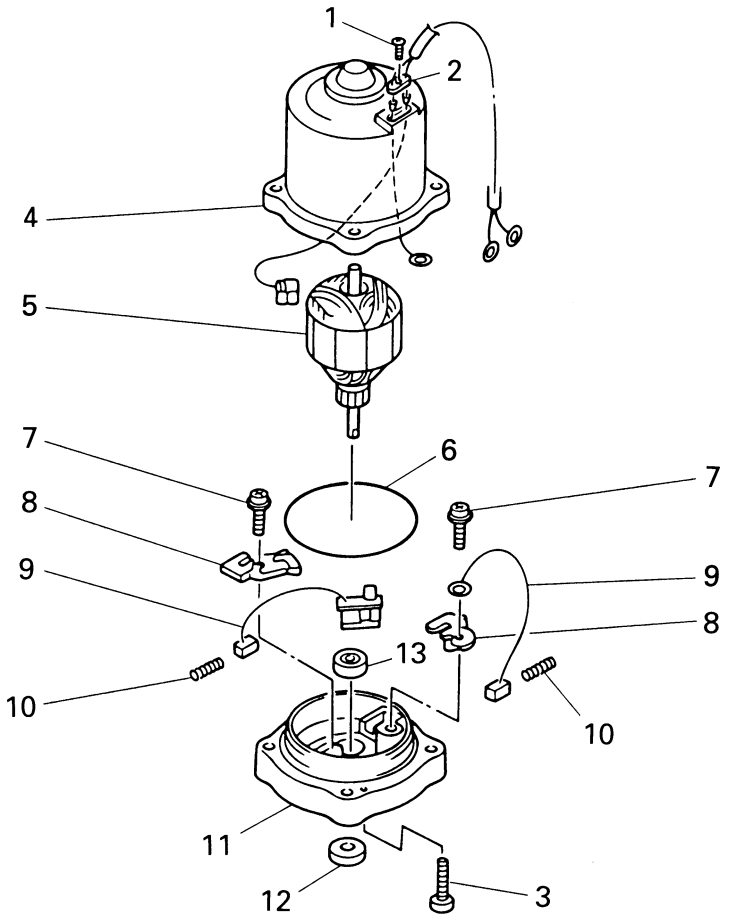
Trim sensor resistance
Pink (P) – Black (B)
582 - 873 Ω at 20 °C (68 °F)
Orange (O) – Black (B)
800 - 1,200 Ω at 20 °C (68 °F)

NOTE:

Turn the lever ① and measure the resistance as it gradually changes.

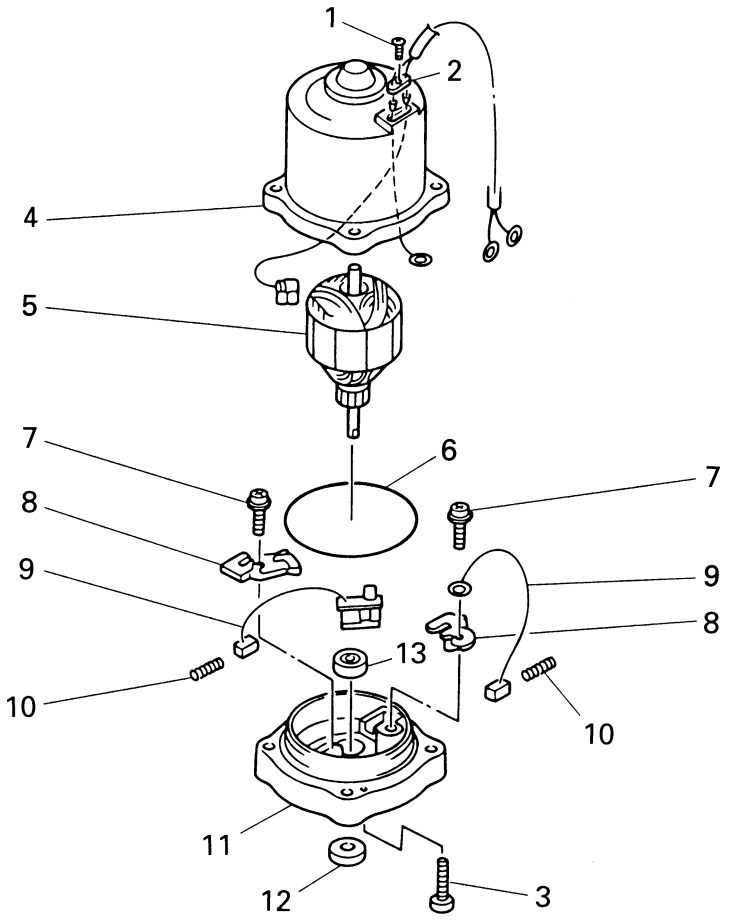
POWER TRIM AND TILT MOTOR

DISASSEMBLING/ASSEMBLING THE POWER TRIM AND TILT MOTOR

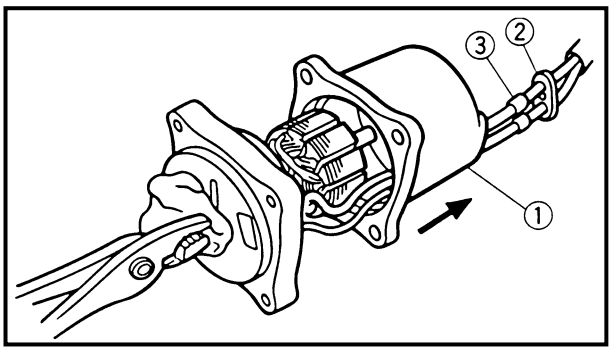


Order	Job/Part	Q'ty	Remarks
	Power trim and tilt motor		Refer to "RESERVOIR AND POWER TRIM AND TILT MOTOR" on page 7-24.
1	Screw	1	
2	Lead holder	1	
3	Screw	2	
4	Stator	1	
5	Armature	1	
6	O-ring	1	
7	Screw	2	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Brush holder	2	
9	Brush	2	
10	Spring	2	
11	Lower cover	1	
12	Oil seal	1	
13	Bearing	1	
			For assembly, reverse the disassembly procedure.



REMOVING THE STATOR

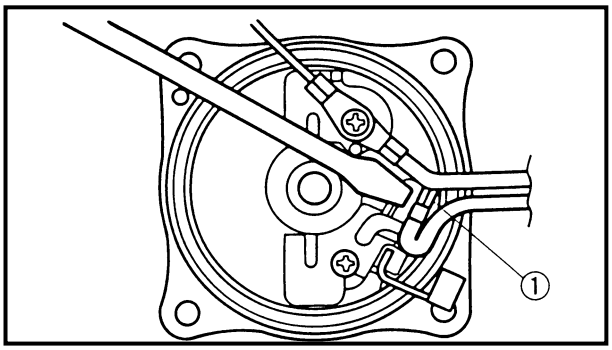
Remove:
- Stator ①

CAUTION:

- **Keep the power trim and tilt motor leads inside the stator.**
- **Do not allow grease or oil to contact the commutator.**

NOTE:

- Remove the lead holder ② and rubber spacer ③ from the stator and slide them towards the leads.
- Hold the end of the armature shaft with a clean cloth and pull off the stator.

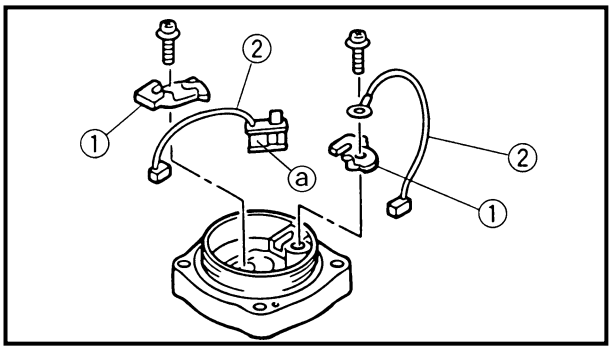


REMOVING THE BRUSH

1. Remove:
   - Sky blue power trim and tilt motor lead ①

NOTE:

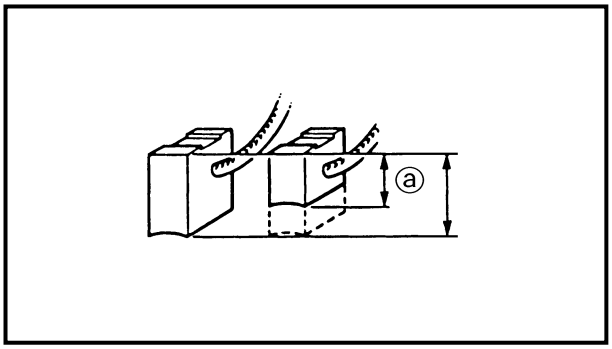
Hold the brush with a screwdriver as shown. Then, disconnect the sky blue lead.



2. Remove:
   - Brush holders ①
   - Brushes ②

CAUTION:

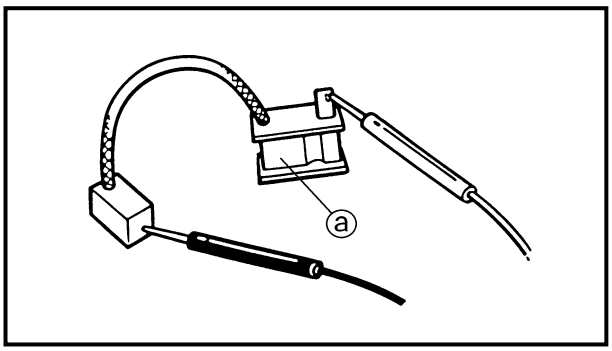
Do not touch the bimetal ⓐ; touching it may affect the operation of the breaker.



INSPECTING THE BRUSH

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

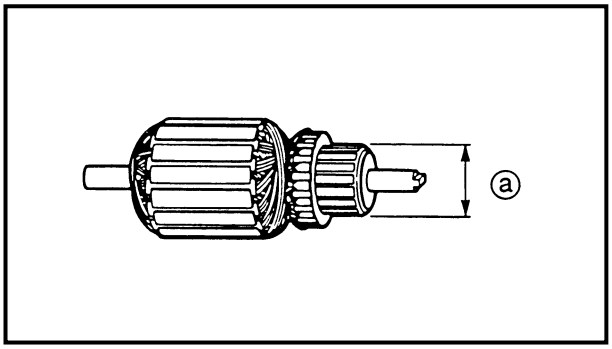
	Brush length **4.8 mm (0.19 in)**



2. Inspect:
   • Brush continuity
   No continuity → Replace.

CAUTION:

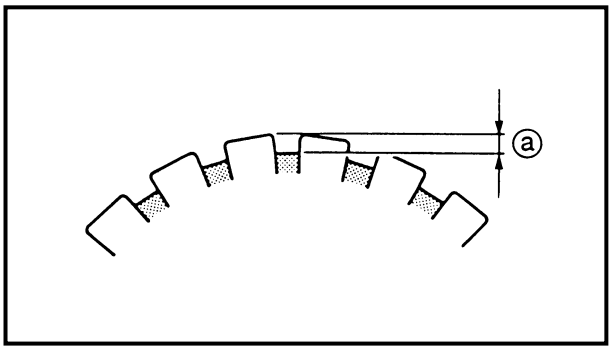
Do not touch the bimetal ⓐ; touching it may affect the operation of the breaker.



INSPECTING THE ARMATURE

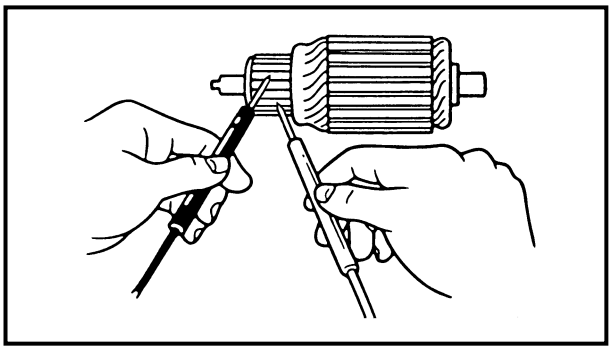
1. Measure:
   • Commutator diameter ⓐ
   Out of specification → Replace.

	Commutator diameter limit 21.0 mm (0.83 in)



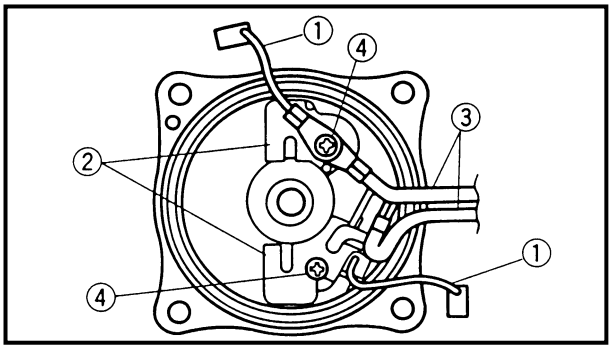
2. Measure:
   • Commutator undercut ⓐ
   Out of specification → Replace the armature.

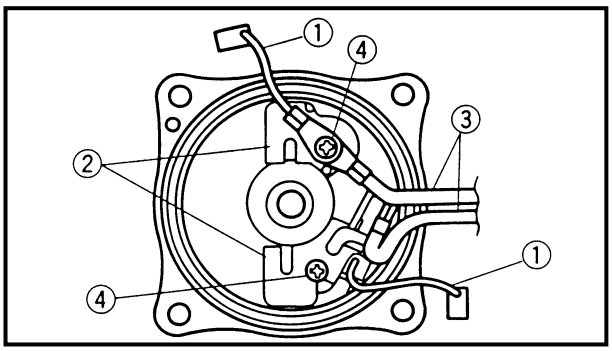
	Commutator undercut limit 0.85 mm (0.03 in)



3. Inspect:
   • Armature continuity
   Out of specification → Replace.

	Armature continuity
Commutator segments	**Continuity**
Segment-laminations	**No continuity**
Segment-shaft	**No continuity**



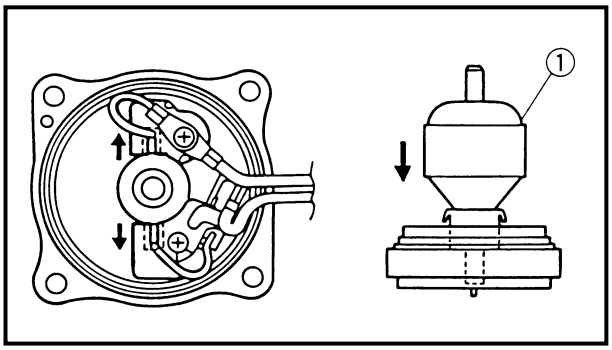


INSTALLING THE BRUSH

Install:
- Brushes ①
- Brush holders ②
- Power trim and tilt motor leads ③
- Screw ④

CAUTION:

Do not touch the bimetal; touching it may affect the operation of the breaker.

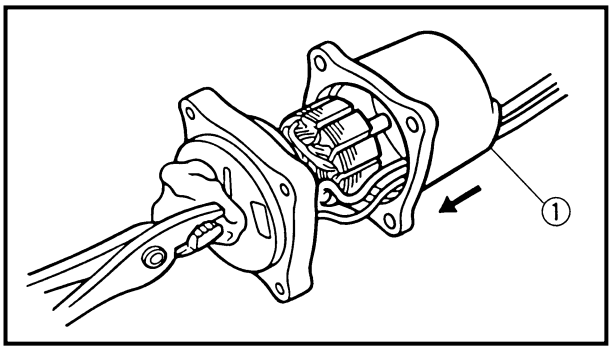


INSTALLING THE ARMATURE

Install:
- Armature ①

NOTE:

Push the brushes into the holder and then install the armature.



INSTALLING THE STATOR

Install:
- Stator ①

NOTE:

Place a clean cloth over the end of the armature shaft and carefully push the armature into the stator with a pair of pliers as shown.

CHAPTER 9
TROUBLE ANALYSIS

TROUBLE ANALYSIS

NOTE:

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

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

TROUBLE ANALYSIS CHART

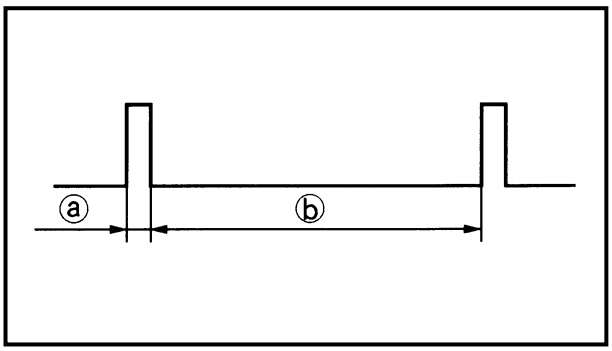
Trouble mode															Check elements	
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOOSE STEERING	LOOSE TILT HOLDING	TILT MOTOR WILL NOT RUN	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference chapter
																FUEL SYSTEM	
○				○			○									Fuel line	3
○	○	○					○									Fuel filter	3
○							○									Fuel joint	4
○							○									Fuel pumps	4
○	○	○			○		○									Carburetors	4
		○	○	○			○									• Idle speed	3
		○	○				○									• Link adjustment	3
				○					○							• Pilot screw setting	4
																POWER UNIT	
○	○	○					○									Compression	3
○	○	○		○												Reed valves	5
○	○	○					○		○							Cylinder head gaskets	5
○	○	○			○											Seal	5
○							○									Cylinder block	5
○							○									Crankcase	5
○							○									Piston rings	5
○							○									Pistons	5
							○									Bearings	5

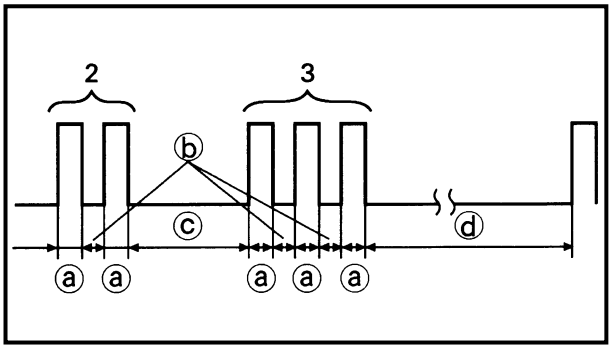
TROUBLE ANALYSIS

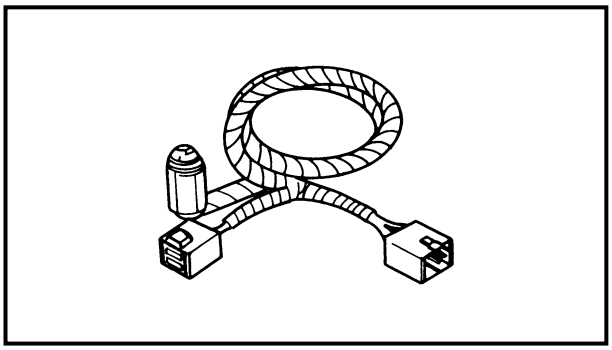
Trouble mode																Check elements	
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOOSE STEERING	LOOSE TILT HOLDING	TILT MOTOR WILL NOT RUN	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference chapter
									○							Thermostat	5
									○							Water passages	5
																LOWER UNIT	
○				○									○			Neutral position	6
○													○			Dog clutch	6
○				○									○			Gears	6
									○							Water inlets	6
									○							Water pump	6
							○									Propeller shaft(s)	6
													○			Shift rod joint/pin	6
													○			Shift cam	6
													○			Shift shaft	6
							○						○			Lower case	6
																BRACKET UNIT	
										○						Bracket	7
										○						Rubber mount	7
													○			Shift rod	7
																POWER TRIM AND TILT UNIT	
											○					Fluid level	3
											○					Relief valve	7
											○					Fluid passages	—
												○				Power trim and tilt motor	7
																ELECTRICAL	
																Ignition system	
○			○					○	○							• Charge coil	8
○	○	○		○	○		○									• Pulser coils	8
○			○			○	○	○								• CDI unit	8
○	○				○		○									• Ignition coils	8
○	○	○	○	○	○	○	○		○							• Spark plugs	3
																Ignition control system	
○						○										• Lanyard switch	—
		○	○		○		○									• Crank position sensor	8
	○	○	○													• Engine cooling water temperature sensor	8

TROUBLE ANALYSIS

Trouble mode															Check elements	
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOOSE STEERING	LOOSE TILT HOLDING	TILT MOTOR WILL NOT RUN	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference chapter
								○	○							• Thermo switch	8
								○						○		• Oil level sensor (engine oil tank)	8
																Starting system	
○	○					○										• Engine start switch	—
○																• Starter relay	8
○																• Starter motor	8
																Charging system	
															○	• Lighting coil	8
															○	• Rectifier/regulator	8
															○	• Fuses	8
○		○		○											○	• Battery leads	—
○													○		○	• Battery	—
																Power trim and tilt system	
												○				• Trailer switch	8
												○				• Power trim and tilt relay	8
														○		• Trim sensor	8







SELF-DIAGNOSIS

DIAGNOSIS CODE INDICATION

1. Normal condition
   (no defective part or irregular processing is found)
2. Single flash is given every 5 seconds.
   ⓐ : Light on, 0.3 second
   ⓑ : Light off, 5 seconds

3. Trouble code indication
   Example: The illustration indicates code number 23.
   ⓐ : Light on, 0.3 second
   ⓑ : Light off, 0.3 second
   ⓒ : Light off, 1.7 seconds
   ⓓ : Light off, 5 seconds

DIAGNOSIS THE ELECTRONIC CONTROL SYSTEM

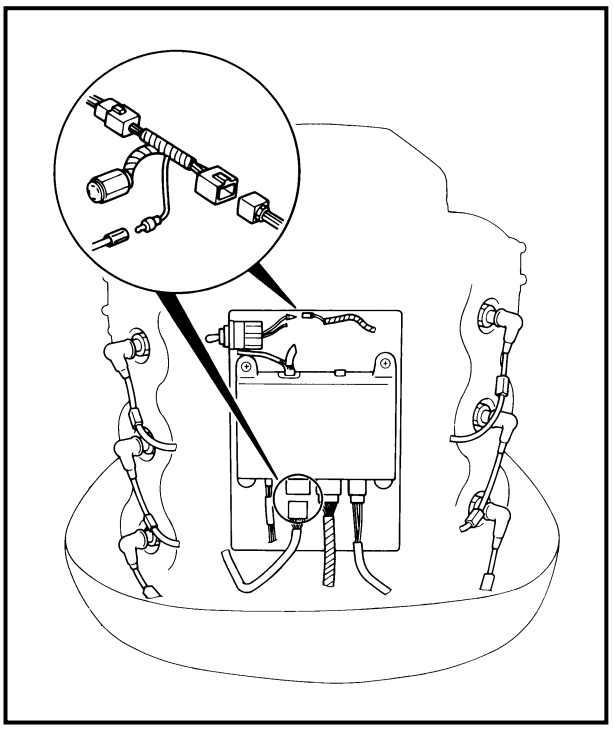
1. Install:
   • Diagnostic indicator

	**Diagnostic indicator** **YB-06765 / 90890-06765**

NOTE:

When performing this diagnosis, all of the electrical wires must be properly connected.

2. Inspect:
   • Diagnosis code
   Code 1 is indicated → Normal.
   Code 12 - 21 indicated → Check the applicable parts.
   Code 33 - 44 indicated → Replace the CDI unit.



Inspecting steps

(1) Start the engine and let it idle.
(2) Check the diagnostic indicator's flash pattern to determine if there are any malfunctions.

NOTE:

When mor e than one problem is detected, the diagnostic tester's light flashes in the pattern of the lowest numbered problem. After that problem is corrected, the light flashes in the pattern of the next lowest numbered problem. This continues until all of the problems are detected and corrected.

Diagnosis code chart

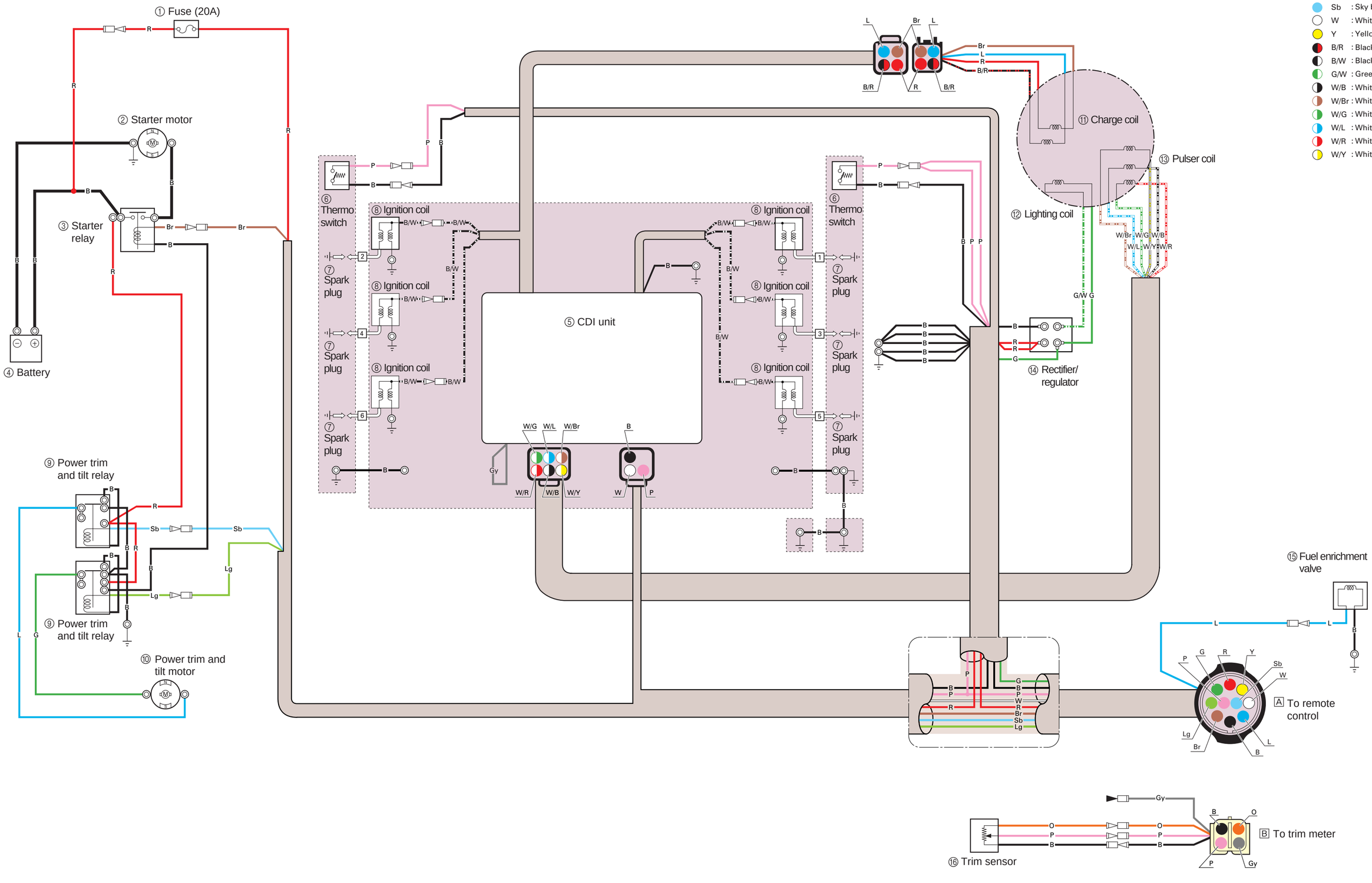
Code	Symptoms
12	Incorrect charge coil input signal
13	Incorrect pulser coil input signal
14	No crank position sensor input signal
15	Incorrect engine cooling water temperature sensor input signal
33 ~ 44	Microcomputer processing information
(33)	Ignition timing is being slightly corrected (when starting a cold engine)
(41)	Overrevolution control (during ignition cutoff operation)
(42)	Overheat control/oil empty control
(43)	Buzzer sounding
(44)	Engine stop switch control operating

WIRING DIAGRAM

150AET, L150AET, 175AET, 200AET, L200AET/C150TR

COLOR CODE

B	: Black	
Br	: Brown	
G	: Green	
Gy	: Gray	
L	: Blue	
Lg	: Light green	
O	: Orange	
P	: Pink	
R	: Red	
Sb	: Sky blue	
W	: White	
Y	: Yellow	
B/R	: Black/red	
B/W	: Black/white	
G/W	: Green/white	
W/B	: White/black	
W/Br	: White/brown	
W/G	: White/green	
W/L	: White/blue	
W/R	: White/red	
W/Y	: White/yellow	



WIRING DIAGRAM

150FETO, S150FETO, L150FETO, LS150FETO, 150GETO, D150HETO, 175DETO, S175DETO, 175FETO, 200FETO, S200FETO, L200FETO, LS200FETO, 200GETO, 225DET, 225DETO/ 150TR, S150TR, L150TR, P150TR, D150TR, S175TR, P175TR, 200TR, S200TR, L200TR, P200TR

COLOR CODE

- B : Black
- Br : Brown
- G : Green
- Gy : Gray
- L : Blue
- Lg : Light green
- O : Orange
- P : Pink
- R : Red
- Sb : Sky blue
- W : White
- Y : Yellow
- B/R : Black/red
- B/W : Black/white
- B/Y : Black/yellow
- G/B : Green/black
- G/R : Green/red
- Gy/B : Gray/black
- L/G : Blue/green
- L/R : Blue/red
- L/W : Blue/white
- W/Br : White/brown
- W/G : White/green
- W/R : White/red
- W/Y : White/yellow

① Fuse (30A)
② Fuse (20A)
③ Starter motor
④ Starter relay
⑤ Terminal
⑥ Battery
⑥ Battery
Ⓐ To accessories
⑦ Emergency switch
⑧ CDI unit
⑨ Thermo switch
⑩ Spark plug
⑪ Ignition coil
⑫ Engine cooling water temperature sensor
⑬ Oil level sensor
⑭ Power trim and tilt relay
⑭ Power trim and tilt relay
⑮ Power trim and tilt motor
⑯ Trailer switch
⑰ Crank position sensor
⑱ Charge coil
⑲ Pulser coil
⑳ Lighting coil
㉑ Rectifier/ regulator
① Fuse (30A)
㉒ Fuel enrichment valve
Ⓓ To remote control
㉓ Trim sensor
Ⓑ To trim meter
Ⓒ To oil level meter
㉔ Oil pump (sub-oil tank)
㉕ Oil level switch (sub-oil tank)

YAMAHA

YAMAHA MOTOR CO., LTD.

Printed in USA

Oct. 1998 – × 1 CR

(150AET, L150AET, 150FETO, L150FETO, 150GETO, D150HETO, 175AET, 175DETO, 175FETO, 200AET, L200AET, 200FETO, L200FETO, 200GETO, 225DET, 225DETO)

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