

YAMAHA

Outboards

368+1 color fo

**V200X, S225X,
L225X, V225X
S250X, L250X**

SERVICE MANUAL



01/04/1999
V200, S/L/V225, S/L2
50X

1 PC

LIT186160202



Yamaha Motor Corp., USA
Cypress, California

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made in UNITED STATES

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.

**V200X, S225X, L225X,
V225X, S250X, L250X
SERVICE MANUAL**

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LIT-18616-02-02**

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	200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
USA and Canada name	V200TR	S225TR	L225TR	V225TR	S250TR	L250TR
Indication	200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO

ILLUSTRATIONS

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

CROSS REFERENCES

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

IMPORTANT INFORMATION

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

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

WARNING

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

CAUTION:

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

NOTE:

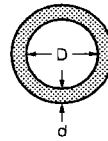
A NOTE provides key information to make procedures easier or clearer.

HOW TO USE THIS MANUAL

- ① The main points regarding removing/installing and disassembling/assembling procedures are shown in the exploded views.
- ② The numbers in the exploded views indicate the required sequence of the procedure and should be observed accordingly.
- ③ Symbols are used in the exploded views to indicate important aspects of the procedure. A list of meanings for these symbols is provided on the following page.
- ④ It is important to refer to the job instruction charts at the same time as the exploded views. These charts list the sequence that the procedures should be carried out in, as well as providing explanations on part names, quantities, dimensions and important points relating to each relevant task.

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.

LOWER UNIT (REGULAR ROTATION MODELS)

LOWER UNIT (REGULAR ROTATION MODELS)
REMOVING/INSTALLING THE LOWER UNIT

40 Nm (4.0 m • kgf, 29 ft • lbf)
10 × 45 mm, Ø 12 mm

55 Nm (5.5 m • kgf, 40 ft • lbf)

40 Nm (4.0 m • kgf, 29 ft • lbf)
10 × 70 mm

40 Nm (4.0 m • kgf, 29 ft • lbf)
10 × 45 mm

Order	Job/Part	Qty	Remarks
1	Speedometer hose	1	
2	Propeller nut	1	
3	Washer	1	
4	Propeller	1	
5	Spacer	1	
6	Bolt	1	
7	Trim tab	1	
8	Bolt	1	(with washer)
9	Bolt	6	(with washer)
10	Lower unit	1	
11	Dowel pin	2	

For installation, reverse the removal procedure.

DRIVE SHAFT (REGULAR ROTATION MODELS)

REMOVING THE DRIVE SHAFT
Loosen
• Pinion nut

Drive shaft holder ①
YB-05201 / 90890-06500
Pinion nut holder ②
90890-06505
Pinion nut holder attachment ③
90890-06507

DISASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY
Remove:
• Needle bearing

Bearing/oil seal attachment ①
YB-05195 / 90890-06610
Driver rod ②
YB-06071 / 90890-06652








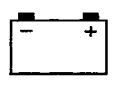




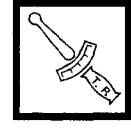

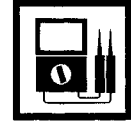









DISASSEMBLING THE FORWARD GEAR ASSEMBLY
1. Remove:
• Tapered roller bearing

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-05096
Guide plate ②
90890-06501
Guide plate stand ③
90890-06528
Bearing puller ④
90890-06535
Small universal claws ⑤
90890-06538

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

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

GENERAL INFORMATION	 GEN INFO	1
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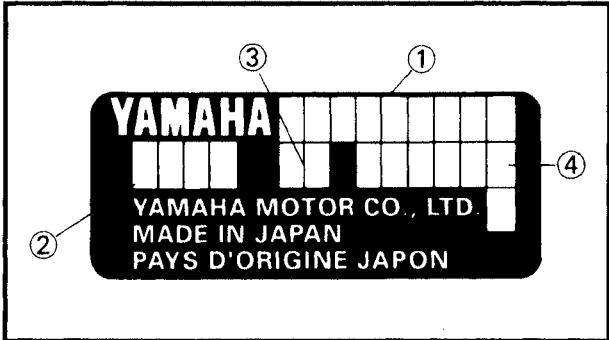
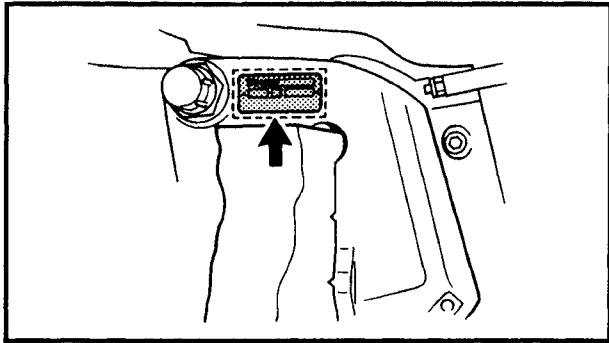
**CHAPTER 1
GENERAL INFORMATION**



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**IDENTIFICATION
SERIAL NUMBER**

The outboard motor's serial number is stamped on a label which is attached to the port 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		
200HETO	V200TR	—	66X	L: 000589 ~
225FETO	S225TR	S225TR	62J	X: 102470 ~
				U: 200423 ~
L225FETO	L225TR	—	62K	X: 100950 ~
				U: 200132 ~
225GETO	V225TR	—	66K	L: 300483 ~
250BETO	S250TR	S250TR	61A	X: 102033 ~
				U: 200711 ~
L250BETO	L250TR	—	61B	X: 101047 ~
				U: 200263 ~



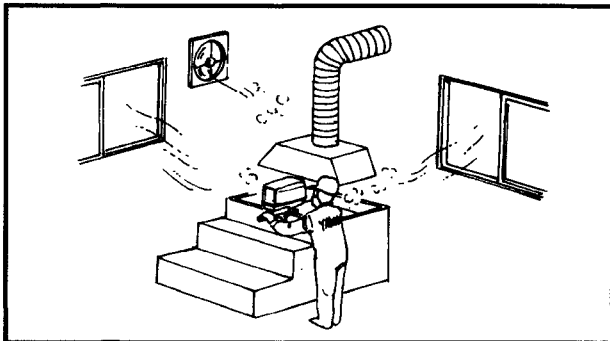
SAFETY WHILE WORKING

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



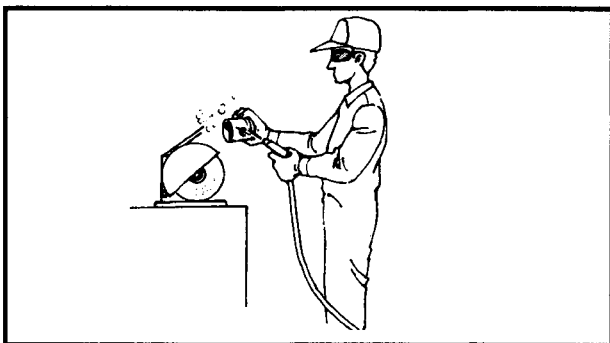
FIRE PREVENTION

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.



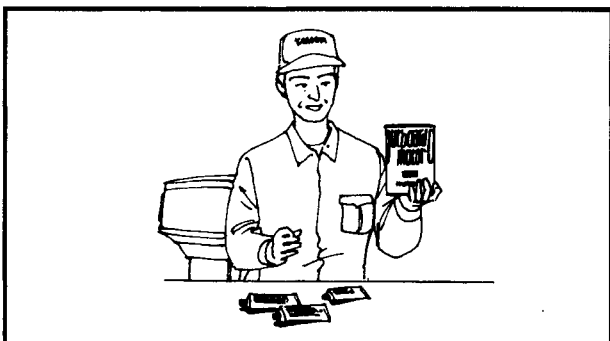
VENTILATION

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.



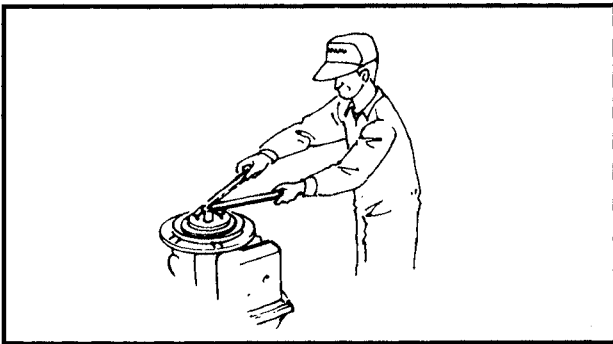
OILS, GREASES AND SEALING FLUIDS

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



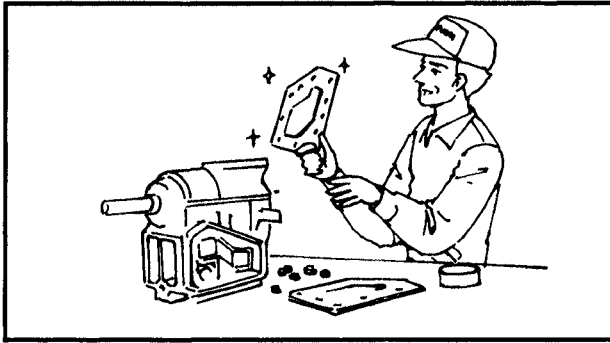
Under normal conditions of use, there should be no hazards from the use of the lubricants mentioned in this manual, but safety is all-important, and by adopting good safety practices, any risk is minimized. A summary of the most important precautions is as follows:

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.

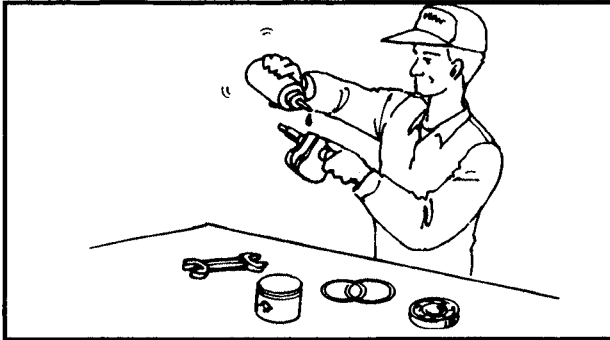


GOOD WORKING PRACTICES

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.

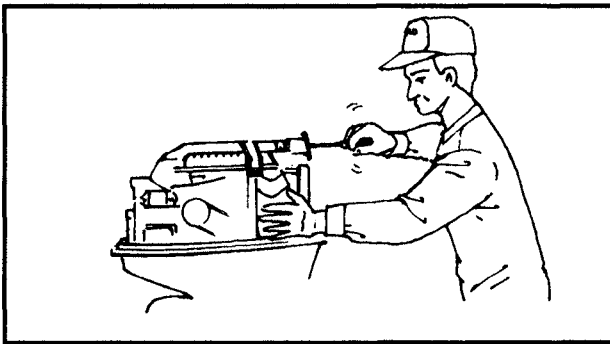


3. Non-reusable items
Always use new gaskets, packings, O-rings, split-pins, circlips, etc., on reassembly.



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.

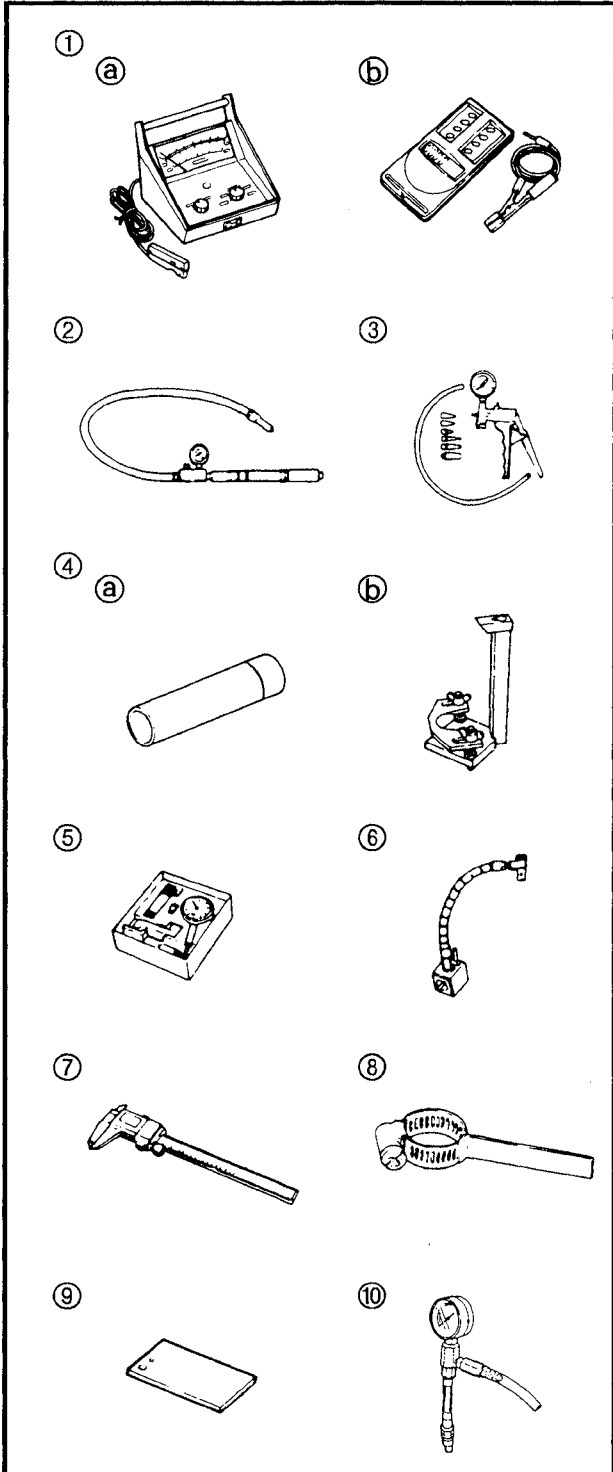
4. Install bearings with the manufacturer's markings on the side exposed to view, and liberally oil the bearings.
5. When installing oil seals, apply a light coating of water-resistant grease to the outside diameter.

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.

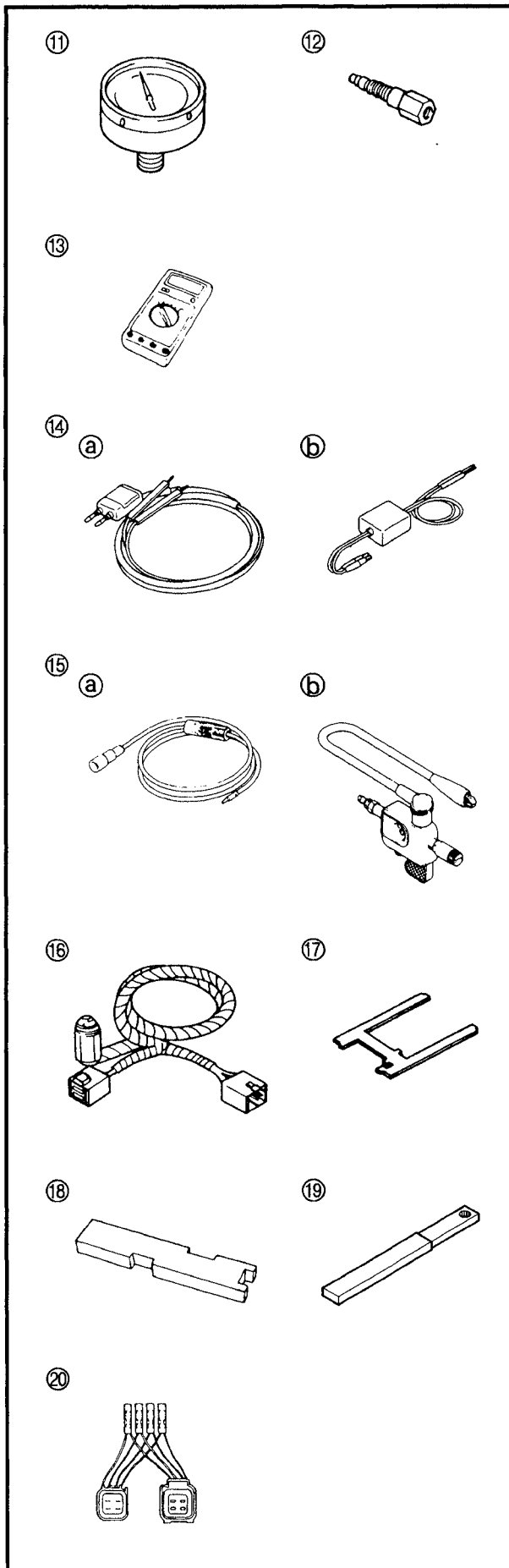
NOTE:

- 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-".

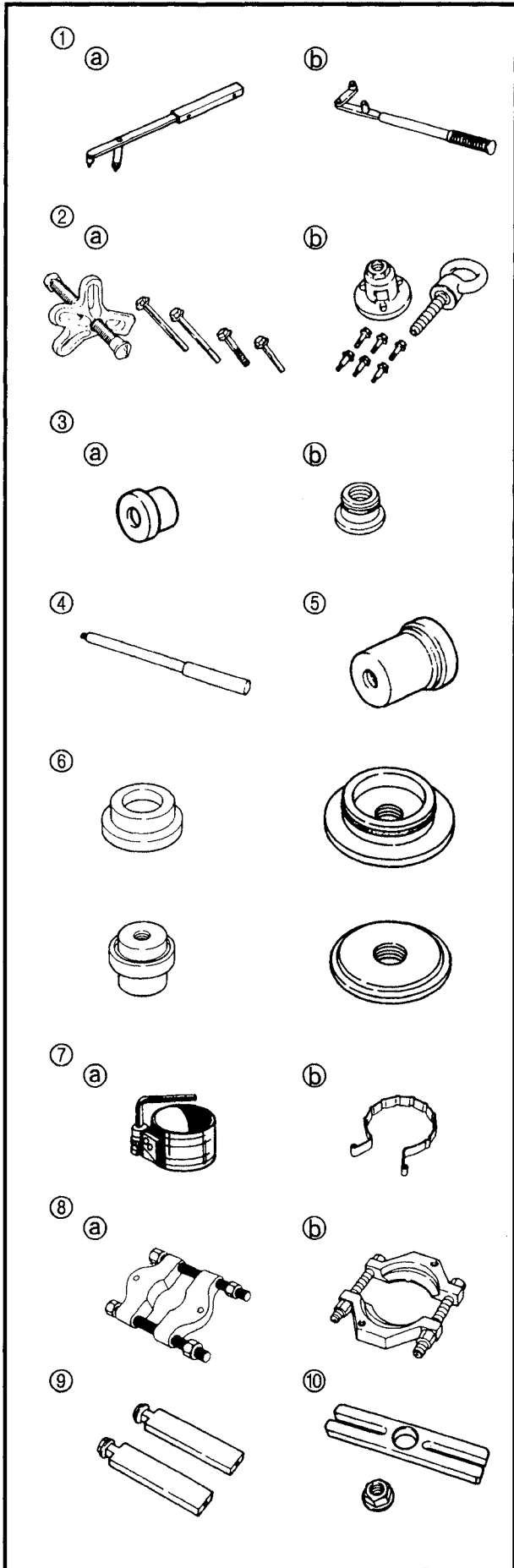


MEASURING

- ① Tachometer
P/N. YU-08036-A ①
90890-06760 ②
- 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-06441 ①
90890-06702 ②
- 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 Fuel pressure gauge
P/N. YB-06766
90890-06766

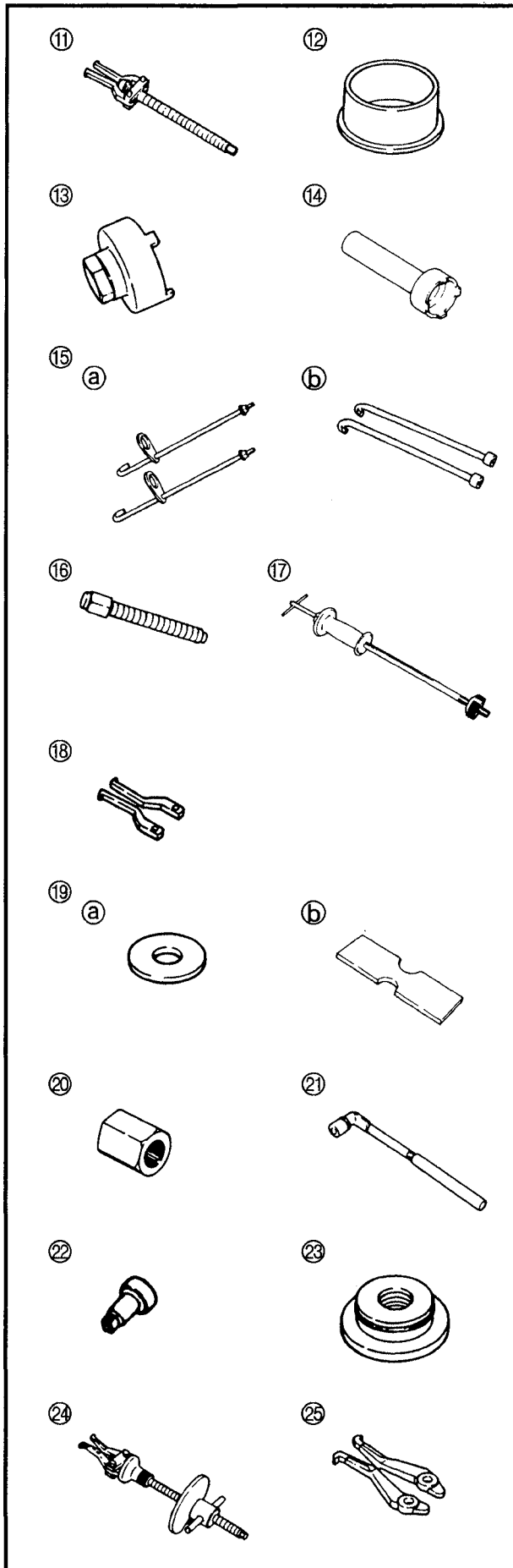


- ⑪ Hydraulic pressure gauge
P/N. 90890-06776
- ⑫ Up-relief valve attachment
P/N. 90890-06773
Down-relief valve attachment
P/N. 90890-06774
- ⑬ Digital tester
P/N. J-39299
90890-06752
- ⑭ Peak voltage adapter
P/N. YU-39991 ①
90890-03169 ②
- ⑮ Spark gap tester
P/N. YM-34487 ①
90890-06754 ②
- ⑯ Diagnostic indicator
P/N. YB-06765
90890-06765
- ⑰ Shimming gauge
P/N. YB-06439, YB-06440
- ⑱ Shimming plate
P/N. 90890-06701
- ⑲ Shift rod wrench
P/N. YB-06052
90890-06052
- ⑳ Test harness
P/N. YB-06443, YB-06767,
YB-06768, YB-06769,
YB-06770, YB-38831,
YB-38832
90890-06757, 90890-06767,
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90890-06770, 90890-06771,
90890-06772

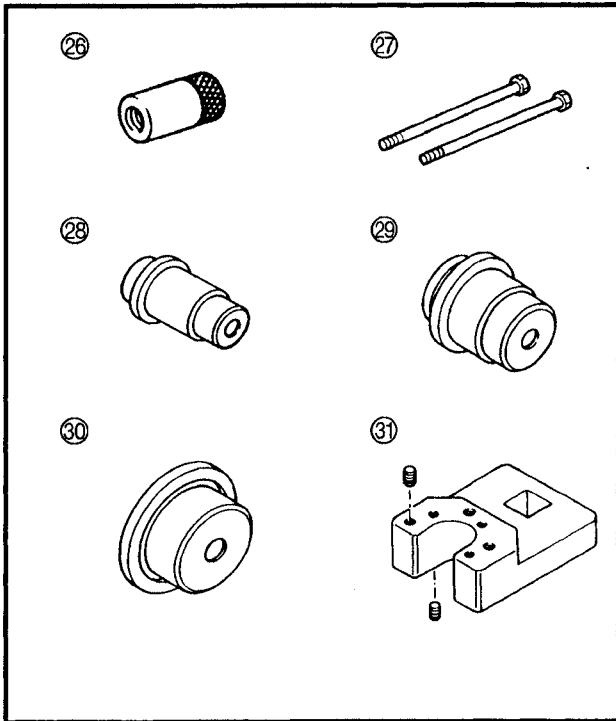


REMOVING AND INSTALLING

- ① Flywheel magnet assembly holder
 P/N. YB-06139 (a)
 90890-06522 (b)
- ② Universal puller
 P/N. YB-06117 (a)
 90890-06521 (b)
- ③ Bearing/oil seal attachment
 P/N. YB-06196 (a)
 90890-06610 (b)
- ④ Driver rod
 P/N. YB-06071
 90890-06604, 90890-06605,
 90890-06606, 90890-06652
- ⑤ Bearing/oil seal attachment
 P/N. YB-06432
- ⑥ Bearing/oil seal attachment
 P/N. YB-06194, YB-06246,
 YB-06276-B, YB-06337,
 YB-06430
 90890-06622, 90890-06656,
 90890-06657, 90890-06658
- ⑦ Piston ring compressor
 P/N. YU-33294 (a)
 90890-06530 (b)
- ⑧ Bearing separator
 P/N. YB-06219 (a)
 90890-06534 (b)
- 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, 90890-06661,
90890-06662
- ⑬ Ring nut wrench
P/N. 90890-06510
- ⑭ Ring nut wrench
P/N. YB-06048
- ⑮ Propeller shaft housing puller
P/N. YB-06207 ①
90890-06502 ②
- 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-06433 ①
90890-06603 ②
- 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. 90890-06507
- ㉓ Bearing/oil seal attachment
P/N. 90890-06636, 90890-06653,
90890-06654, 90890-06655
- ㉔ Bearing puller
P/N. YB-06029
90890-06523
- ㉕ Large universal claws
P/N. 90890-06532



- ②⑥ Slide hammer attachment
P/N. YB-06335
90890-06514
- ②⑦ Puller bolt
P/N. YB-41707
- ②⑧ Bearing/oil seal attachment
P/N. YB-06437
- ②⑨ Bearing/oil seal attachment
P/N. YB-06435
- ③⑩ Bearing/oil seal attachment
P/N. YB-06434
- ③① End screw wrench
P/N. YB-06175-2B, YB-06548
90890-06541, 90890-06544,
90890-06548



CHAPTER 2 SPECIFICATIONS

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GENERAL SPECIFICATIONS

Item	Unit		Model						
			Worldwide	200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
			USA	V200TR	S225TR	L225TR	V225TR	S250TR	L250TR
			Canada	—	S225TR	—	—	S250TR	—
DIMENSION									
Overall length	mm (in)	864 (34.0)	854 (33.6)		864 (34.0)	854 (33.6)			
Overall width	mm (in)	562 (22.1)							
Overall height									
(L)	mm (in)	1,685 (66.3)	—		1,685 (66.3)	—			
(X)	mm (in)	—	1,785 (70.3)		—	1,785 (70.3)			
(U)	mm (in)	—	1,912 (75.3)		—	1,912 (75.3)			
Boat transom height									
(L)	mm (in)	508 (20.0)	—		508 (20.0)	—			
(X)	mm (in)	—	635 (25.0)		—	635 (25.0)			
(U)	mm (in)	—	762 (30.0)		—	762 (30.0)			
WEIGHT									
(with stainless steel propeller)									
(L)	kg (lb)	235.5 (519)	—		235.5 (519)	—			
(X)	kg (lb)	—	237 (523)		239 (538)	237 (523) 239 (538)			
(U)	kg (lb)	—	242 (534)		244 (539)	242 (534) 244 (539)			
PERFORMANCE									
Maximum output	kW (hp) @ 5,000 r/min	147.1 (200)	165.5 (225)		183.9 (250)				
Full throttle operating range	r/min	4,500 - 5,500							
Maximum fuel consumption	L (US gal, Imp gal)/hr @ 5,500 r/min	100 (26.4, 22.0)	94 (24.8, 20.7)		107 (28.3, 23.5)				
POWER UNIT									
Type		2 stroke - V							
Number of cylinders		6							
Displacement	cm ³ (cu. in)	3,130 (191.0)							
Bore x stroke	mm (in)	90.0 x 82.0 (3.54 x 3.23)							
Compression ratio		Cylinders #1 - #4: 5.4 Cylinders #5 - #6: 5.2	Cylinders #1 - #4: 6.0 Cylinders #5 - #6: 5.8		Cylinders #1 - #4: 5.9 Cylinders #5 - #6: 5.7				
Fuel system		Electronic fuel injection							
Fuel injection system		Sequential injection							
Intake system		Reed valve							
Induction system		Loop charge							
Starting system		Electric							
Ignition control system		Microcomputer (CDI)							
Alternator output		12 - 35A							
Spark plugs (NGK)		BR8HS-10	BR9HS-10						



Item	Worldwide USA Canada		Unit	Model					
				200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
				V200TR	S225TR	L225TR	V225TR	S250TR	L250TR
Cooling system				Water					
Exhaust system				Through prop boss					
Lubrication system				Oil injection					
FUEL AND OIL									
Fuel type				Unleaded regular gasoline					
Fuel rating			*PON RON	86 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)	1.2 (1.27, 1.06)					
(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)	1,150 (38.9, 40.5)	1,000 (33.8, 35.2)	1,150 (38.9, 40.5)	1,000 (33.8, 35.2)		
BRACKET									
Trim angle (at 12° boat transom)			Degree	-4 - 16	-3 - 16	-4 - 16	-3 - 16		
Tilt-up angle			Degree	70					
Steering angle			Degree	35 + 35					
DRIVE UNIT									
Gear shift positions				F-N-R					
Gear ratio				1.81 (29/16)					
Reduction gear type				Spiral bevel gear					
Clutch type				Dog clutch					
Propeller shaft type				Spline					
Propeller direction (rear view)				Clockwise	Counter-clockwise	Clockwise	Counter-clockwise		
Propeller mark				M	T/M	TL/ML	M	T/M	TL/ML
ELECTRICAL									
Battery capacity			Ah (kC)	100 (360)					
Minimum cold cranking performance			A	512					



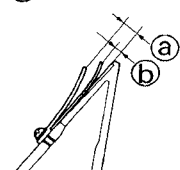
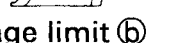
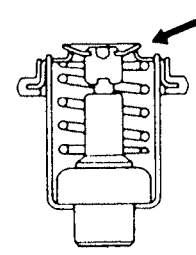
* PON: Pump Octane Number
RON: Research Octane Number



**MAINTENANCE SPECIFICATIONS
POWER UNIT**

Item			Unit	Model					
	Worldwide			200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
	USA			V200TR	S225TR	L225TR	V225TR	S250TR	L250TR
	Canada			—	S225TR	—	—	S250TR	—
CYLINDER HEADS									
Warpage limit			mm (in)	0.1 (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)	89.840 - 89.860 (3.5370 - 3.5378)					
Measuring point (H)			mm (in)	10 (0.4)					
Piston-to-cylinder clearance			mm (in)	0.155 - 0.161 (0.0061 - 0.0063)					
<Limit>			mm (in)	0.201 (0.0079)					
Oversize piston diameter			mm (in)	90.15 (3.549)					
1st			mm (in)	90.40 (3.559)					
2nd			mm (in)						
PISTON RINGS									
Type (B)			mm (in)	Keystone					
(T)			mm (in)	2.0 (0.079)					
End gap (installed)			mm (in)	2.8 (0.110)					
<Limit>			mm (in)	0.30 - 0.40 (0.012 - 0.016)					
Side clearance			mm (in)	0.60 (0.024)					
			mm (in)	0.02 - 0.06 (0.001 - 0.002)					
CRANKSHAFT									
Runout limit			mm (in)	0.05 (0.002)					



Item	Worldwide		Unit	Model					
	USA			200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
	Canada			V200TR	S225TR	L225TR	V225TR	S250TR	L250TR
CONNECTING RODS									
Small-end axial play limit (F)			mm (in)	2.0 (0.08)					
Big-end side clearance (E)			mm (in)	0.12 - 0.26 (0.005 - 0.010)					
OIL INJECTION PUMP									
ID mark				65L00					
Oil discharge (for 3 minutes)			cm ³ (US oz, Imp oz) @ 1,500 r/min	39.6 ± 7.8 (1.339 ± 0.264, 1.397 ± 0.275)					
Bleeding				Screw type					
REED VALVES									
Reed valve stopper height (a)			mm (in)	9.0 ± 0.3 (0.35 ± 0.01)	7.9 ± 0.3 (0.31 ± 0.01)	9.0 ± 0.3 (0.35 ± 0.01)			
Warpage limit (b)			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)					
ENGINE SPEED									
Idling speed			r/min	730 ± 30					



LOWER UNIT

Item	Model		Unit	Model						
	Worldwide	USA		Canada	200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
	USA	Canada		V200TR	S225TR	L225TR	V225TR	S250TR	L250TR	
GEAR BACKLASH										
Pinion - forward gear	mm (in)	0.19 - 0.40 (0.007 - 0.016)	0.32 - 0.52 (0.013 - 0.020)	0.19 - 0.40 (0.007 - 0.016)	0.32 - 0.52 (0.013 - 0.020)					
Pinion - reverse gear	mm (in)	0.64 - 0.93 (0.025 - 0.037)								
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	Model		Unit	Model						
	Worldwide	USA		Canada	200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
	USA	Canada		V200TR	S225TR	L225TR	V225TR	S250TR	L250TR	
IGNITION SYSTEM										
Ignition timing	Degree	ATDC 10 - BTDC 20	ATDC 8 - BTDC 17.8	ATDC 10 - BTDC 18	ATDC 8 - BTDC 17.8					
CDI unit (B/O, B/Y, B/L, B/Br, B/G, B/W - B)										
Output peak voltage lower limit										
@ cranking 1	V	80								
@ cranking 2	V	100								
@ 1,500 r/min	V	150								
@ 3,500 r/min	V	130								
Charge coil (R - Br, B/R - L)										
Output peak voltage lower limit										
@ cranking 1	V	85								
@ cranking 2	V	110								
@ 1,500 r/min	V	150								
@ 3,500 r/min	V	150								
Pulser coil (W/R, W/Y, W/G, W/B, W/L, W/Br - B)										
Output peak voltage lower limit										
@ cranking 1	V	3.0								
@ cranking 2	V	3.0								
@ 1,500 r/min	V	16								
@ 3,500 r/min	V	30								

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

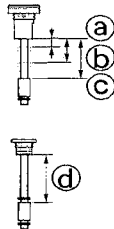


Item	Worldwide USA Canada	Unit	Model					
			200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
			V200TR	S225TR	L225TR	V225TR	S250TR	L250TR
IGNITION CONTROL SYSTEM			—	S225TR	—	—	S250TR	—
Crank position sensor (G/W – G/L)		mm (in)	0.5 - 1.5 (0.02 - 0.06)					
Crank-position-sensor-to-flywheel gap								
Output peak voltage lower limit								
@ cranking 1		V	6.0					
@ cranking 2		V	0.5					
@ 1,500 r/min		V	3.0					
@ 3,500 r/min		V	4.0					
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					
Throttle position sensor								
Input voltage (O – R)		V	4.75 - 5.25					
Output voltage (P – O)		V	0.48 - 0.52					
Thermo switch (P – B)								
OFF → ON		°C (°F)	84 - 90 (183 - 194)					
ON → OFF		°C (°F)	60 - 74 (140 - 165)					
FUEL CONTROL SYSTEM								
Oxygen density sensor								
Heater resistance (W – W)		Ω	100					
Output voltage (Gy – B)		V	0.0 - 1.0					
Atmospheric pressure sensor								
Output voltage (at 101.32 kPa) (P – B)		V	3.2 - 4.6					
Intake air temperature sensor								
Output voltage (at 20 °C (68 °F)) (B/Y – B/Y)		V	3.4 - 5.3					
High-pressure fuel pump resistor resistance		Ω	0.53 - 0.57					
STARTING SYSTEM								
Fuse 1		V-A	14-80					
Fuse 2		V-A	12-30					

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



Item			Unit	Model					
	Worldwide			200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
	USA			V200TR	S225TR	L225TR	V225TR	S250TR	L250TR
	Canada			—	S225TR	—	—	S250TR	—
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									
Rectifier/regulator (R – B)									
Output peak voltage lower limit									
@ cranking 1			V	—					
@ cranking 2			V	—					
@ 1,500 r/min			V	12					
@ 3,500 r/min			V	12					
Lighting coil (G – G)									
Output peak voltage lower limit									
@ cranking 1			V	—					
@ cranking 2			V	—					
@ 1,500 r/min			V	14					
@ 3,500 r/min			V	14					
OIL FEED PUMP CONTROL SYSTEM									
Oil level sensor (engine oil tank)									
Float position ① "OFF"			mm (in)	2.5 - 5.5 (0.10 - 0.22)					
Float position ② "ON"			mm (in)	32.5 - 35.5 (1.28 - 1.40)					
Float position ③ "ON"			mm (in)	76 - 79 (2.99 - 3.11)					
Oil level gauge (sub-oil tank)									
Float position ④ "ON"			mm (in)	150 - 153 (5.91 - 6.02)					



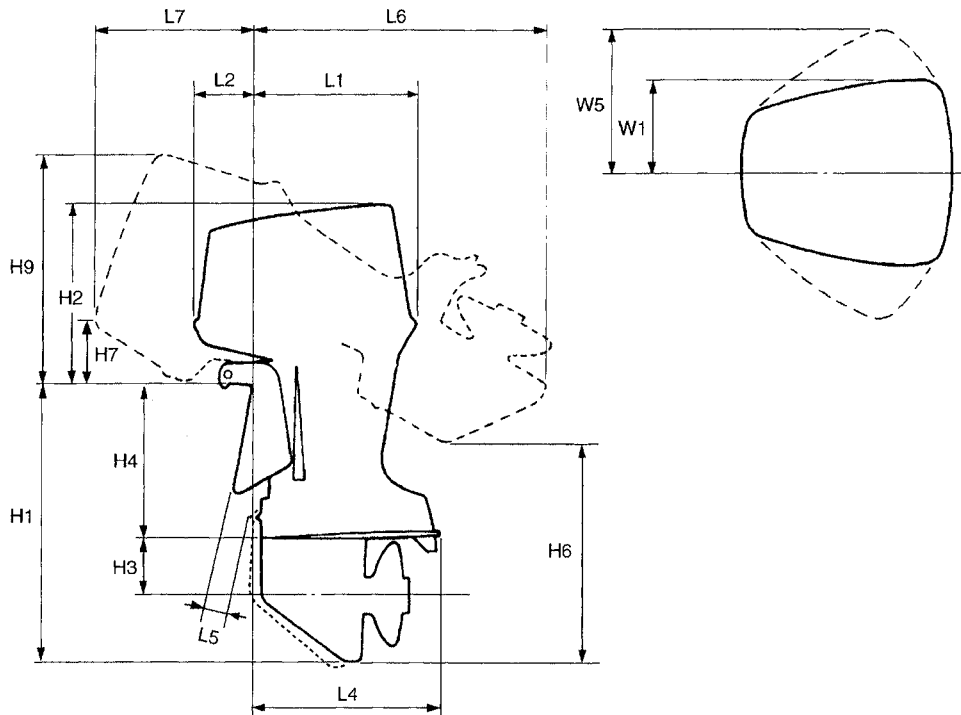
* Cranking 1: Open circuit voltage.
 Cranking 2: Loaded circuit voltage.



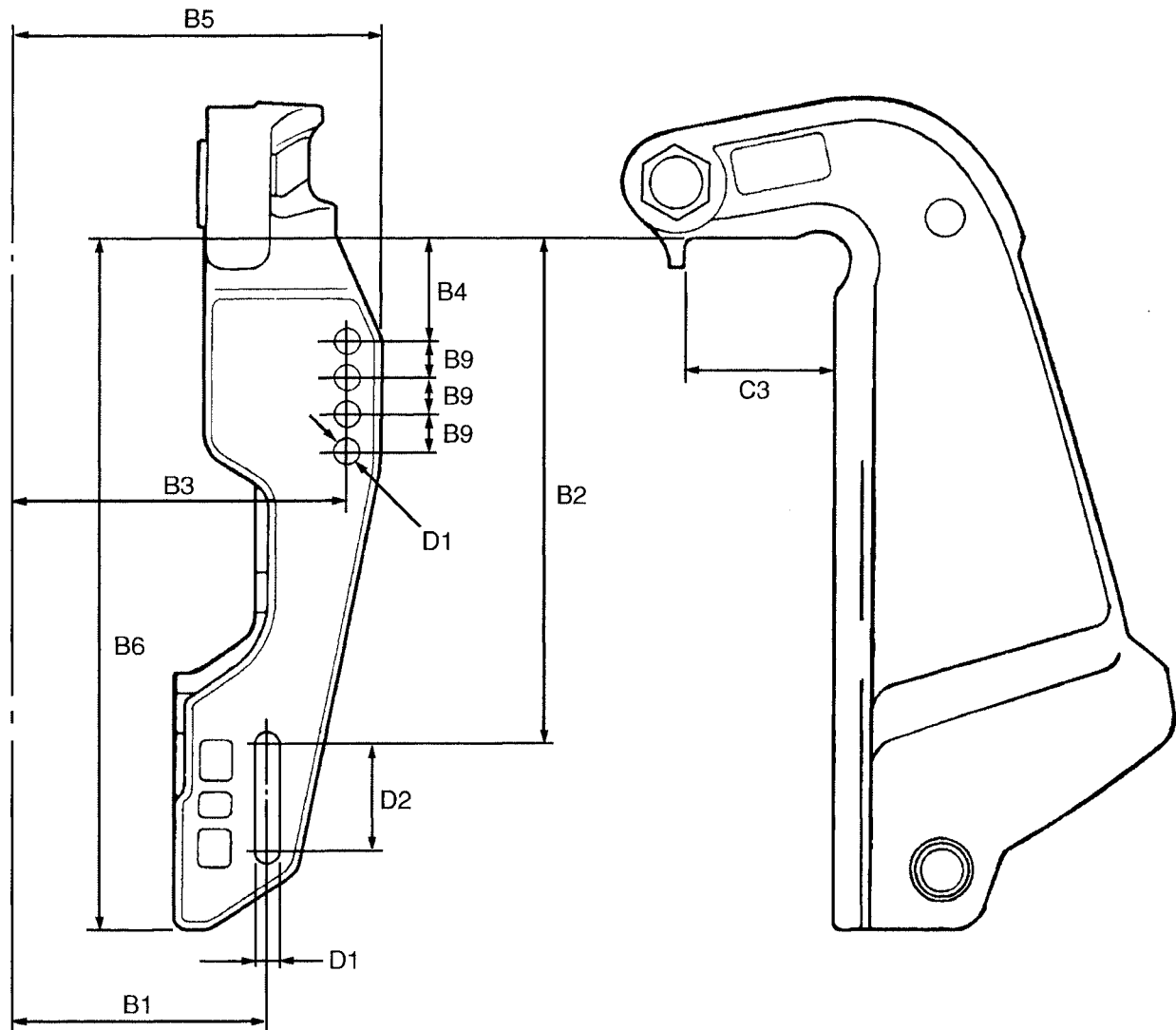
Item	Worldwide USA Canada	Unit	Model					
			200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
			V200TR	S225TR	L225TR	V225TR	S250TR	L250TR
			—	S225TR	—	—	S250TR	—
POWER TRIM AND TILT SYSTEM								
Trim sensor Resistance	(P – B)	Ω	582 - 873	494 - 742	582 - 873	494 - 742		
Resistance	(O – B)	Ω	800 - 1,200					
POWER TRIM AND TILT MOTOR			ATF Dexron II					
Fluid type								
Brushes								
Standard length		mm (in)	9.8 (0.39)	12.0 (0.47)	9.8 (0.39)	12.0 (0.47)		
Wear limit		mm (in)	4.8 (0.19)	4.0 (0.16)	4.8 (0.19)	4.0 (0.16)		
Commutator								
Standard diameter		mm (in)	22.0 (0.87)	25.0 (0.98)	22.0 (0.87)	25.0 (0.98)		
Wear limit		mm (in)	21.0 (0.83)	24.0 (0.94)	21.0 (0.83)	24.0 (0.94)		
Mica								
Standard undercut		mm (in)	1.35 (0.05)	—	1.35 (0.05)	—		
Wear limit		mm (in)	0.85 (0.03)	—	0.85 (0.03)	—		



DIMENSIONS



Symbol		Unit	Models					
Worldwide	200HETO		225FETO	L225FETO	225GETO	250BETO	L250BETO	
USA	V200TR		S225TR	L225TR	V225TR	S250TR	L250TR	
Canada	—		S225TR	—	—	S250TR	—	
L1		mm (in)	591 (23.3)	566 (22.3)		591(23.3)	566 (22.3)	
L2		mm (in)	179 (7.0)	181 (7.1)		179 (7.0)	181 (7.1)	
L4		mm (in)	685 (27.0)	673 (26.5)		685 (27.0)	673 (26.5)	
L5	(L)	mm (in)	61 (2.4)	—		61 (2.4)	—	
	(X)	mm (in)	—	69 (2.7)		—	69 (2.7)	
	(U)	mm (in)	—	89 (3.5)		—	89 (3.5)	
L6	(L)	mm (in)	1,045 (41.2)	—		1,045 (41.2)	—	
	(X)	mm (in)	—	1,155 (45.5)		—	1,155 (45.5)	
	(U)	mm (in)	—	1,271 (50.0)		—	1,271 (50.0)	
L7		mm (in)	624 (24.6)	631 (24.8)		624 (24.6)	631 (24.8)	
H1	(L)	mm (in)	950 (37.4)	—		950 (37.4)	—	
	(X)	mm (in)	—	1,077 (42.4)		—	1,077 (42.4)	
	(U)	mm (in)	—	1,203 (47.4)		—	1,203 (47.4)	
H2		mm (in)	735 (28.9)	710 (28.0)		735 (28.9)	710 (28.0)	
H3		mm (in)	216 (8.5)					
H4	(L)	mm (in)	515 (20.3)	—		515 (20.3)	—	
	(X)	mm (in)	—	642 (25.3)		—	642 (25.3)	
	(U)	mm (in)	—	768 (30.2)		—	768 (30.2)	
H6	(L)	mm (in)	768 (30.2)	—		768 (30.2)	—	
	(X)	mm (in)	—	846 (33.3)		—	846 (33.3)	
	(U)	mm (in)	—	923 (36.3)		—	923 (36.3)	
H7		mm (in)	268 (10.6)	242 (9.5)		268 (10.6)	242 (9.5)	
H9		mm (in)	923 (36.3)	818 (32.2)		923 (36.3)	818 (32.2)	
W1		mm (in)	281 (11.1)					
W5		mm (in)	419 (16.5)	420 (16.5)		419 (16.5)	420 (16.5)	



Symbol	Unit	Models					
		200HETO	225FETO	L225FETO	225GETO	250BETO	L250BETO
		V200TR	S225TR	L225TR	V225TR	S250TR	L250TR
		—	S225TR	—	—	S250TR	—
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)	411 (16.2)	367 (14.4)	411 (16.2)		
B9	mm (in)	18.5 (0.7)					
C3	mm (in)	82 (3.2)	79 (3.1)	82 (3.2)	79 (3.1)		
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					
Intake silencer		M6	3	0.3	2.2
Fuel injection unit		M6	10	1.0	7.2
Fuel filter nut holder		M6	8	0.8	5.8
Oil pump		M6	7	0.7	5.1
Emergency switch		—	4	0.4	2.9
Flywheel magnet assembly		M20	190	19	137
Negative battery lead		M8	18	1.8	13
Junction box cover		M5	3	0.3	2.2
Power unit mount		M8	21	2.1	15
Starter motor lead		M6	9	0.9	6.5
Atmospheric pressure sensor		M6	3	0.3	2.2
Intake air temperature sensor		M12	8	0.8	5.8
Shift cutoff switch		M4	3	0.3	2.2
Starter motor		M8	30	3.0	22
Oxygen density sensor cover		M6	9	0.9	6.5
Oxygen density sensor bracket		M6	14	1.4	10
Oxygen density sensor		M18	49	4.9	35
Knocking sensor		—	28	2.8	20
Engine cooling water temperature sensor		—	15	1.5	11
Reed valve assembly		M6	10	1.0	7.2
Reed valve		M5	3	0.3	2.2
Reed valve stopper		M3	1	0.1	0.7
Pressure control valve cover	1st	M6	4	0.4	2.9
	2nd		8	0.8	5.8
Spark plug		M14	25	2.5	18
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		28	2.8	20
Exhaust cover	1st	M6	4	0.4	2.9
	2nd		8	0.8	5.8
Torsional damper		M32	100	10	72
Crankcase	1st	M6	4	0.4	2.9
	2nd		8	0.8	5.8
	1st	M10	20	2.0	14
	2nd		40	4.0	29
Connecting rod	1st	M8	28	2.8	20
	2nd		45	4.5	33
	3rd		0	0	0
	4th		28	2.8	20
	5th		45	4.5	33



Part to be tightened	Thread size	Tightening torques		
		Nm	m • kgf	ft • lb
LOWER UNIT				
Propeller	M18	55	5.5	40
Trim tab	M10	43	4.3	31
Lower unit	M10	48	4.8	35
Propeller shaft housing assembly	M8	24	2.4	17
Grease nipple	—	6	0.6	4.3
Ring nut (counter rotation models)	—	110	11	80
Pinion nut	M22	145	14.5	105
Gear oil drain screw	—	7	0.7	5.1
Gear oil level check screw	—	7	0.7	5.1
BRACKET UNIT (EXCEPT FOR 200H, 225G/V200, V225)				
Flushing hose	M5	5	0.5	3.6
Upper mount	M12	73	7.3	53
Lower mount	M14	73	7.3	53
Exhaust manifold assembly	M8	21	2.1	15
Extension muffler	M6	8	0.8	5.8
Muffler	M8	21	2.1	15
Exhaust manifold	M8	21	2.1	15
Lower exhaust manifold guide	M8	21	2.1	15
Clamp bracket	M22	15	1.5	11
Trim stopper	—	37	3.7	27
BRACKET UNIT (FOR 200H, 225G/V200, V225)				
Flushing hose	M5	5	0.5	3.6
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 (EXCEPT FOR 200H, 225G/V200, V225)				
Power trim and tilt reservoir cap	—	8	0.8	5.8
Power trim and tilt reservoir	M6	8	0.8	5.8
Power trim and tilt motor	M6	8	0.8	5.8
Gear pump	M4	4	0.4	2.9
Tilt ram end screw	—	90	9.0	65
Trim ram end screw	—	160	16	116
Manual valve seat	—	2	0.2	1.4

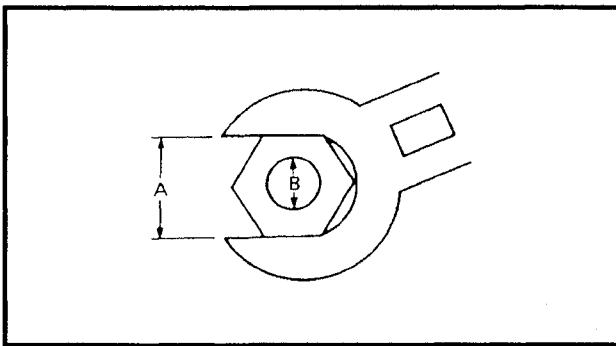


Part to be tightened	Thread size	Tightening torques		
		Nm	m • kgf	ft • lb
POWER TRIM AND TILT UNIT (FOR 200H, 225G/V200, V225)				
Power trim and tilt reservoir cap	—	8	0.8	5.8
Power trim and tilt reservoir	1/4"	5	0.5	3.6
Power trim and tilt motor	1/4"	5	0.5	3.6
Manual valve	—	4	0.4	2.9
Tilt ram end 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

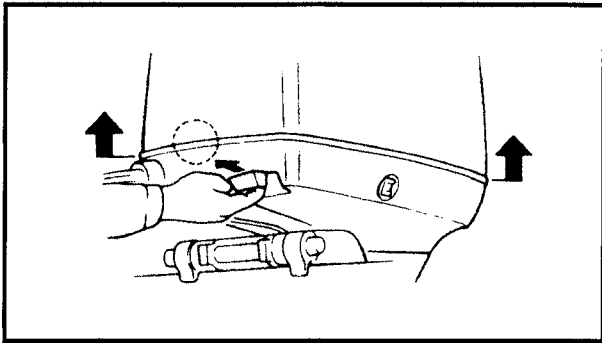
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MAINTENANCE INTERVAL CHART

Use the following chart as a guide to general maintenance intervals.

Dependant on operating conditions, adjust the maintenance intervals accordingly.

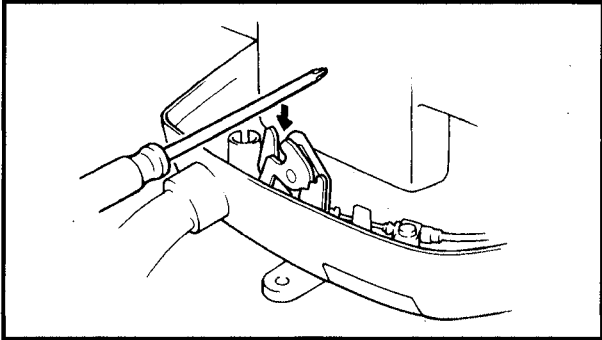
Item	Remarks	Initial		Every		Refer to page
		10 hours (Break-in)	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	
TOP COWLING						
Top cowling fit	Inspect				○	3-2
FUEL SYSTEM						
Fuel line	Inspect	○	○	○		3-3
Fuel filter	Clean/inspect	○	○	○		3-4
POWER UNIT						
Water leakage	Inspect	○	○	○		—
Motor exterior	Inspect	○	○	○		—
Exhaust leakage	Inspect	○	○	○		—
Cooling water passage	Clean/flush		○	○		—
CONTROL SYSTEM						
Engine idling speed	Inspect/adjust	○		○		3-6
Throttle position sensor	Inspect/adjust				○	3-7
Remote control shift cable	Inspect/adjust				○	3-8
Remote control throttle cable	Inspect/adjust				○	3-9
OIL INJECTION SYSTEM						
Oil tank water drain	Clean	○	○	○		—
Oil pump lever	Inspect/adjust	○				3-10
POWER TRIM AND TILT UNIT						
Power trim and tilt fluid	Inspect	○	○	○	○	3-14
LOWER UNIT						
Gear oil	Change	○		○		3-15
Lower unit leakage	Inspect				○	3-16
Propeller	Inspect	○	○	○		6-3, 6-26
GENERAL						
Anodes	Inspect/replace		○	○		3-17
Battery	Inspect/charge	(every month)				3-17
Spark plugs	Clean/adjust/replace	○	○	○		3-18
Wiring and connectors	Adjust/reconnect	○	○	○		—
Bolts and nuts	Tighten	○	○	○		—
Lubrication points	Grease			○		3-19



TOP COWLING
INSPECTING THE LOCK RELEASE

1. Inspect:

- Lock release
Dull release → Adjust the top release wire.

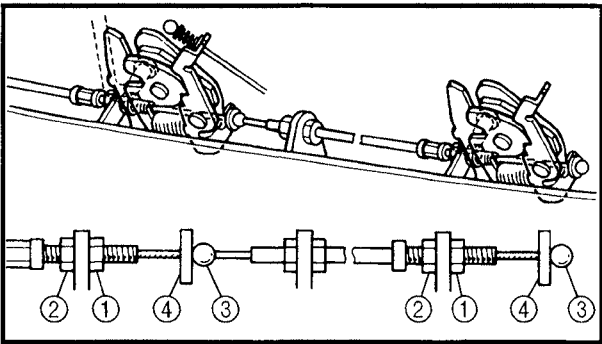


2. Adjust:

- Release wire length

Adjustment steps

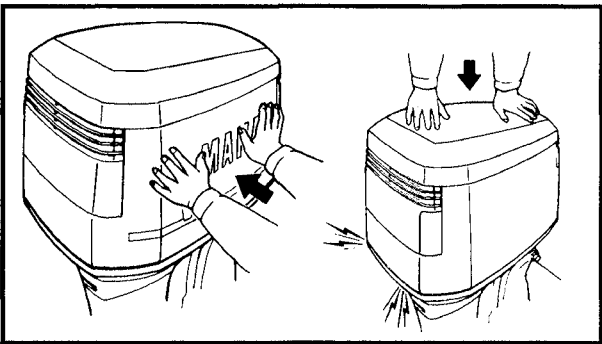
- (1) Push each locking plate down until it locks.
- (2) Loosen the locknuts ①.
- (3) Turn the adjusting nuts ② until the ends of both wires ③ touch the locking plates ④.
- (4) Secure the locknuts ①.

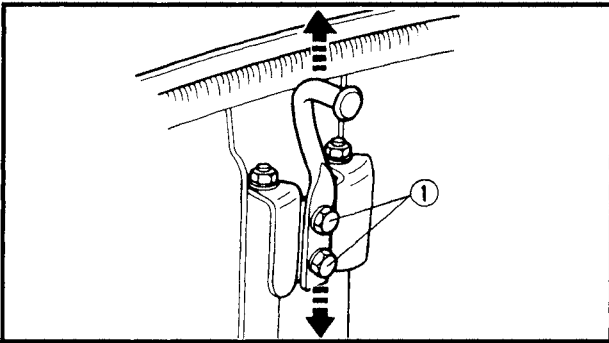


INSPECTING THE TOP COWLING FIT

1. Inspect:

- Top cowling fitting
Loose/unlatched → Adjust the top cowling hook.





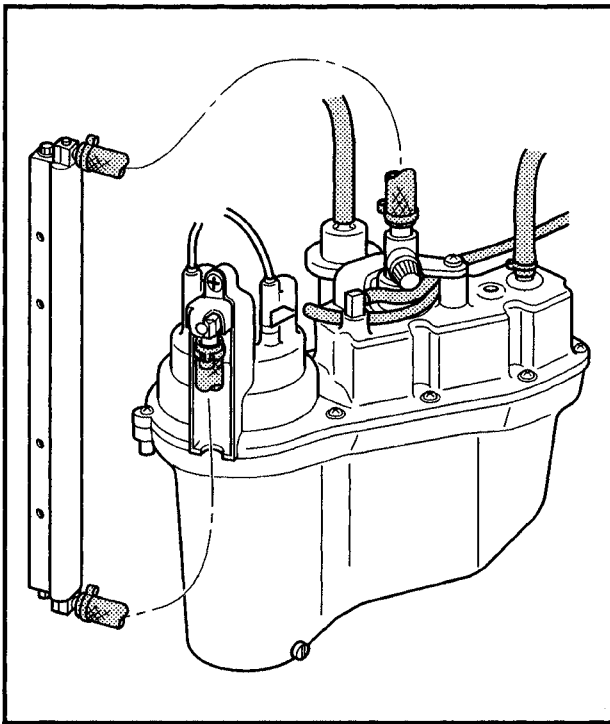
2. Adjust:
 - Top cowling hook position

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.

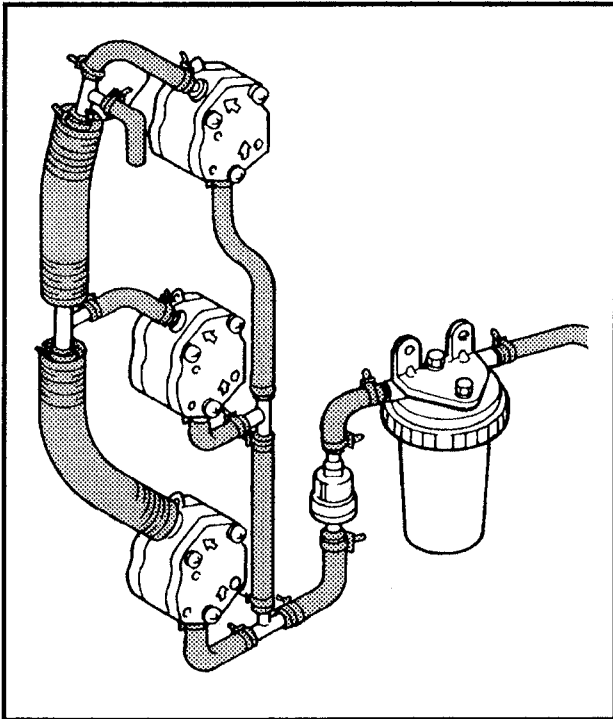
NOTE: _____

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

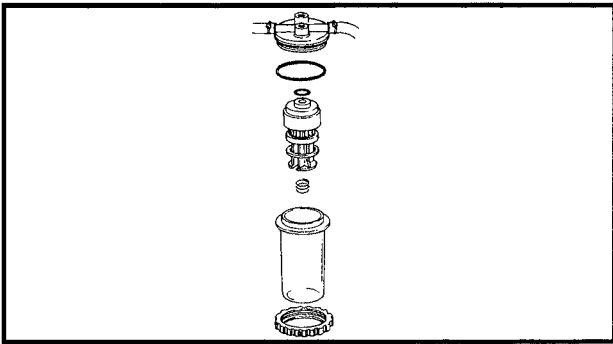


FUEL SYSTEM
INSPECTING THE FUEL LINE

1. Inspect:
 - High-pressure fuel line
Cracks/damage/leaks → Replace.
Refer to "HIGH-PRESSURE FUEL LINE" on page 4-1.

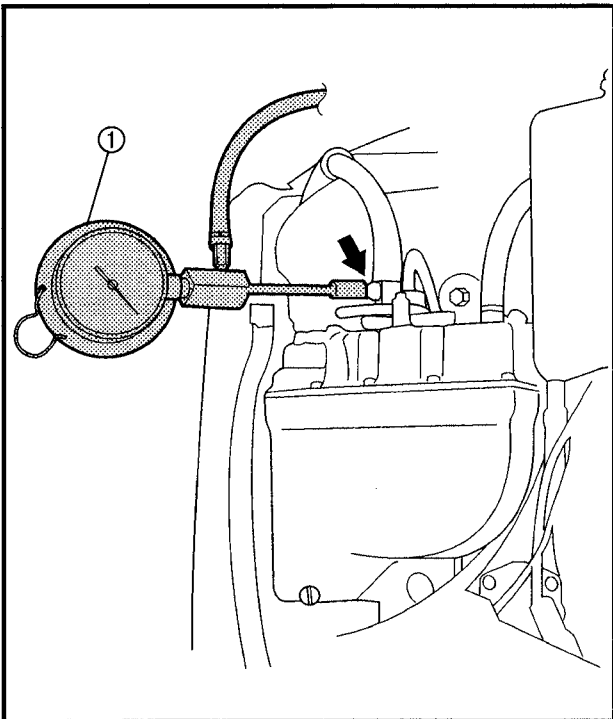


2. Inspect:
 - Plastic locking tie
Loosen → Retighten or replace.
3. Inspect:
 - Low-pressure fuel line
Cracks/damage/leaks → Replace.
Refer to "LOW-PRESSURE FUEL LINE" on page 4-21.



INSPECTING THE FUEL FILTER

- Inspect:
- Fuel filter element
 - Fuel filter cup
Clogs/cracks/leaks → Replace.
Foreign matter → Clean.
Refer to "FUEL FILTER" on page 4-23.



MEASURING THE FUEL PRESSURE (HIGH-PRESSURE FUEL LINE)

- Measure:
- Fuel pressure (high-pressure fuel line)
Out of specification → Inspect the high-pressure fuel line.

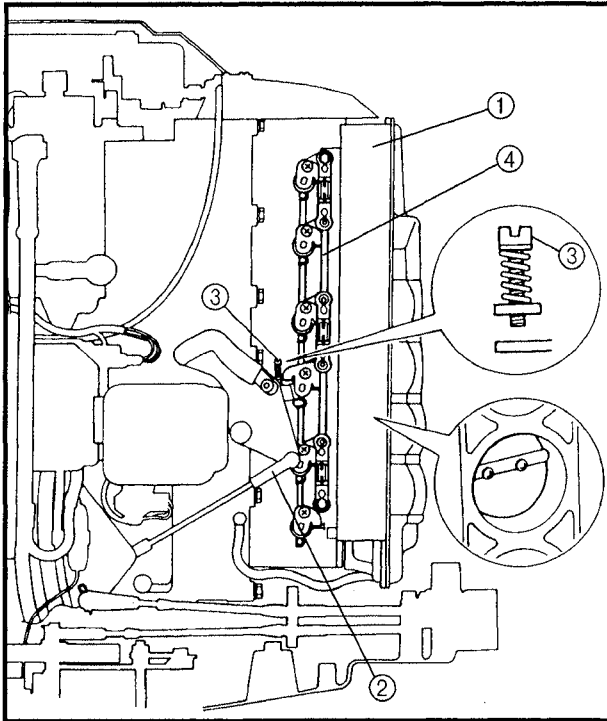
	<p>Fuel pressure (high-pressure fuel line) 250 kPa (2.5 kg/cm², 35.6 psi)</p>
--	---

Measuring steps

- (1) Install the fuel pressure gauge onto the pressure check valve.

	<p>Fuel pressure gauge ① YB-06766 / 90890-06766</p>
--	--

- (2) Start the engine, run it at idle speed for 1 minute, and then measure the fuel pressure.



CONTROL SYSTEM
SYNCHRONIZING THE THROTTLE VALVES

1. Inspect:
- Throttle valve synchronization
 - Uneven opening → Adjust.

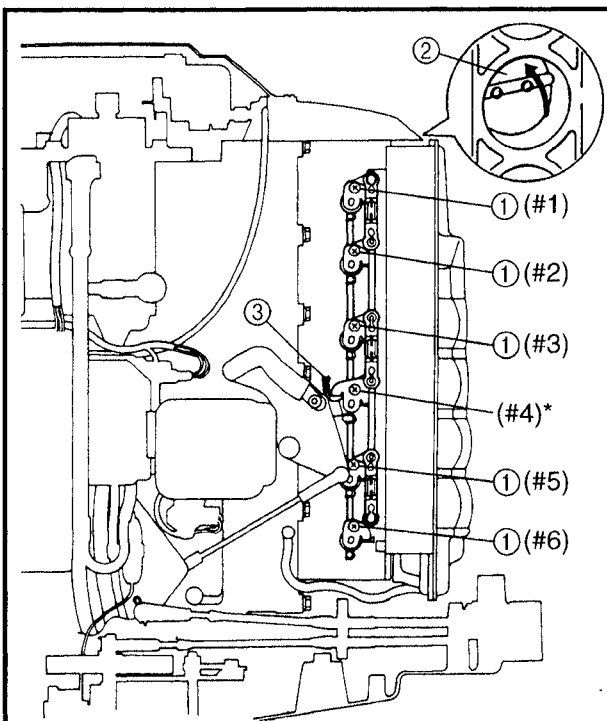
Inspecting steps

- (1) Remove the intake silencer ①.
- (2) Disconnect the throttle lever rod ②.
- (3) Turn the throttle stop screw ③ until it does not touch the stopper.

NOTE:

Record the number of turns so the throttle stop screw can be properly reset when the synchronizing has been achieved.

- (4) Verify that all the throttle valves are fully closed when the throttle link rod ④ is connected.



2. Adjust:
- Throttle valve opening

Adjustment steps

- (1) Turn the screws ① clockwise for all of the cylinders except #4.
- (2) Fully close throttle valve #1 ②.
- (3) Turn screw #1 counterclockwise.
- (4) Close the valves and turn the screws for cylinders #2, #3, #5, and #6 counterclockwise.
- (5) Turn in the throttle stop screw ③ the proper amount of turns.

NOTE:

Cylinder #4's screw does not need to be adjusted.

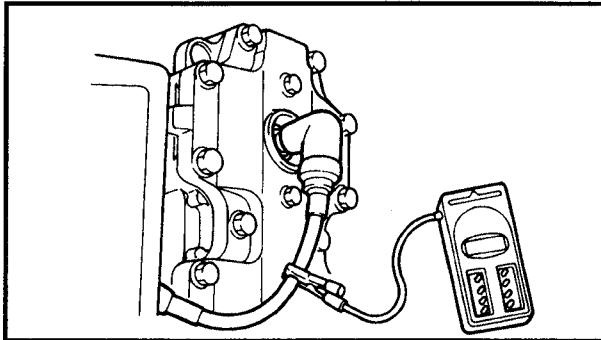


ADJUSTING THE ENGINE IDLING SPEED

1. Measure:


- Engine idling speed
- Out of specification → Adjust.

	Engine idling speed 730 ± 30 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.

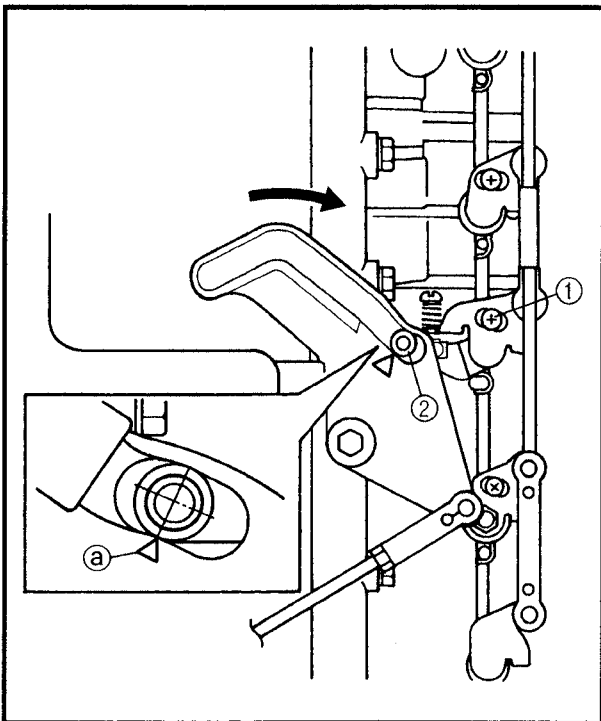
	Tachometer YU-08036-A / 90890-06760
---	--

2. Adjust:

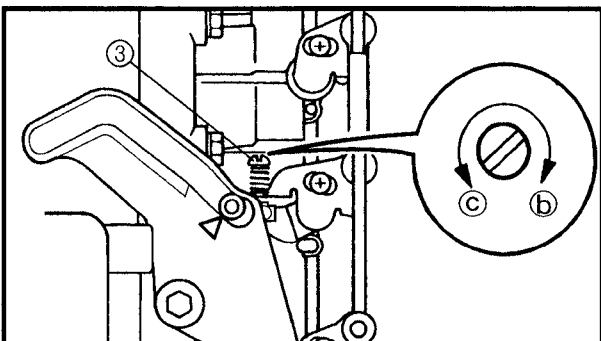
- Engine idling speed

Adjustment steps

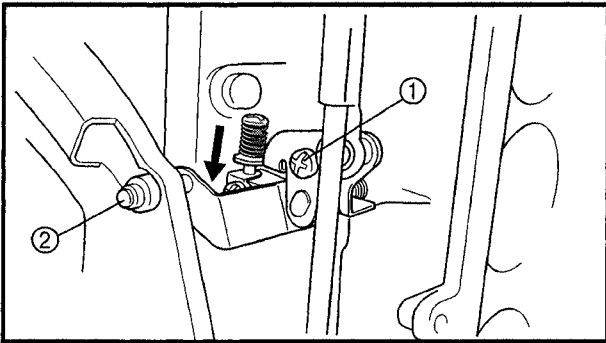
- (1) Loosen the pickup adjustment screw ①.
- (2) Align the center of the throttle control lever cam roller ② with the mark ③.



- (3) Turn the throttle stop screw ③ in direction ④ or ⑤ until the specified engine idling speed is obtained.



Direction ④	Engine idling speed increases.
Direction ⑤	Engine idling speed decreases.



- (4) Tighten the pickup adjustment screw ① while pressing down on the throttle control lever cam roller ②.

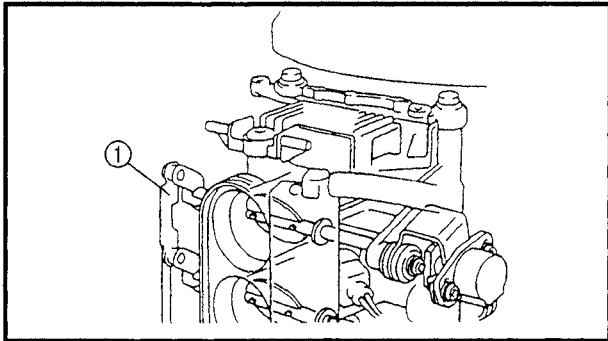
NOTE: _____
Turn the pickup adjustment screw ① counterclockwise to tighten it.

ADJUSTING THE THROTTLE POSITION SENSOR

1. Measure:
- Throttle position sensor output voltage (with the throttle valves fully closed)
Out of specification → Adjust.



Throttle position sensor output voltage (pink (P) – orange (O))
0.50 ± 0.02 V



- NOTE:** _____
- Be sure to adjust the throttle valve's opening before measuring the throttle position sensor output voltage.
 - When measuring the throttle position sensor output voltage, set the digital tester to the manual range.

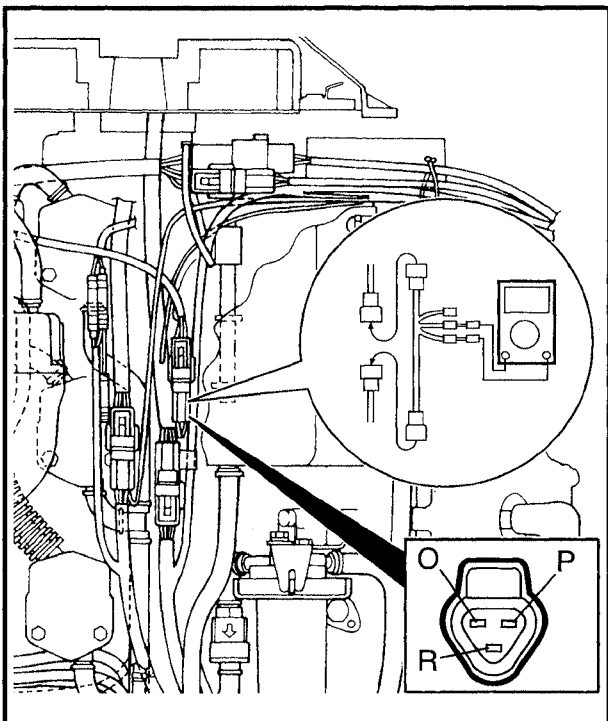
Measuring steps

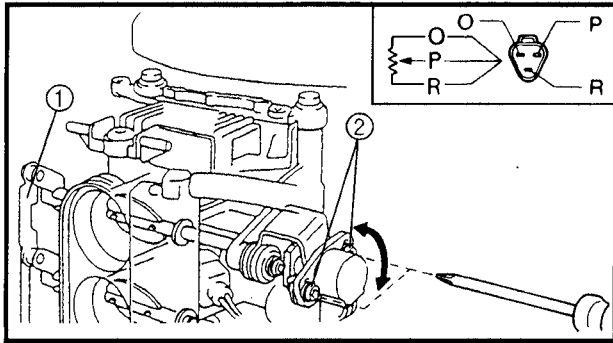
- (1) Disconnect the throttle link rod ① at the #1 throttle valve.
- (2) Connect the test harness (3-pin) as shown.



Test harness (3-pin)
YB-06443 / 90890-06757

- (3) Connect the digital tester probes to the test harness (3-pin) as shown.
- (4) Turn the engine start switch on.
- (5) Measure the output voltage (with the throttle valves fully closed).





2. Adjust:
- Throttle position sensor

Adjustment steps

- (1) Loosen the screws ②.
- (2) Adjust the position of the throttle position sensor until the specified output voltage is obtained.

	<p>Throttle position sensor output voltage (pink (P) – orange (O)) 0.50 ± 0.02 V</p>
--	--

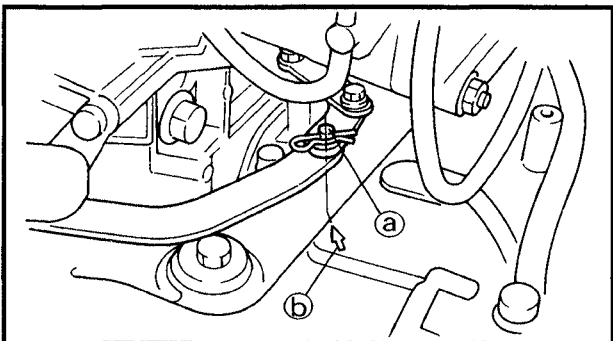
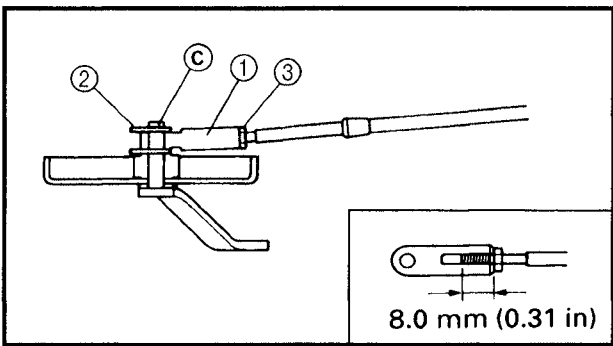
- (3) Tighten the screws.
- (4) Connect the throttle link rod.

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 ③ with the mark ① on the bottom cowling.
- (4) Adjust the position of the shift cable joint until its hole aligns with the set pin ③.
- (5) Install the clip ② and tighten the lock-nut 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 throttle valves' opening and engine idling speed.

1. Inspect:
- Throttle operation
- Incorrect → Adjust.

NOTE: _____

Make sure the throttle valves are fully closed when the remote control lever is fully closed position.

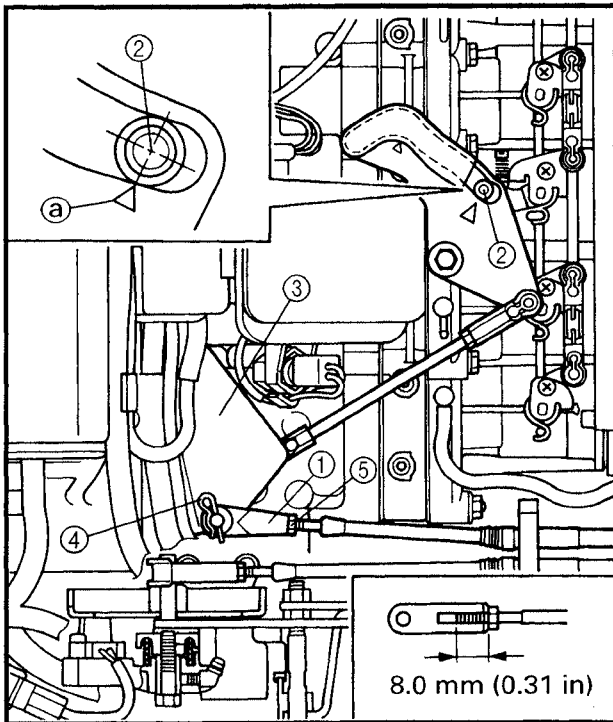
2. Adjust:
- Remote control throttle cable length

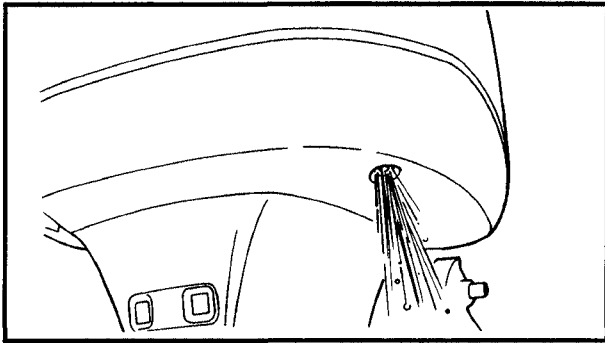
Adjustment steps

- (1) Disconnect the throttle cable joint ①.
- (2) Set the remote control lever to the fully closed position.
- (3) Align the center of the throttle control lever cam roller ② with the mark ③.
- (4) Adjust the position of the throttle cable joint until its hole aligns with the set pin on the throttle control lever ③.
- (5) Install the clip ④ and tighten the lock-nut ⑤.

CAUTION: _____

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





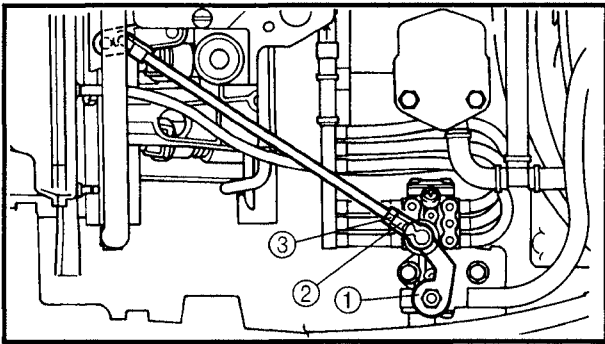
COOLING SYSTEM
INSPECTING THE COOLING WATER
DISCHARGE

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.



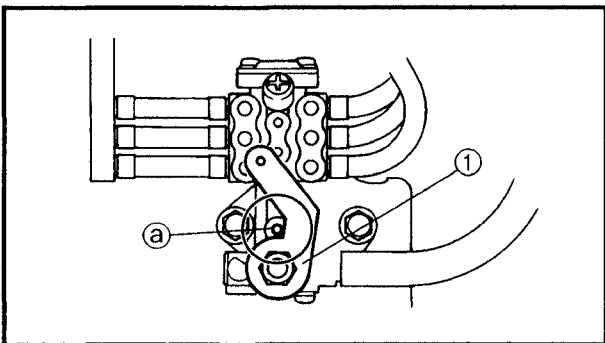
OIL INJECTION SYSTEM
SYNCHRONIZING THE OIL PUMP

1. Inspect:

- Oil pump lever position
Incorrect → Adjust.

NOTE:

Make sure the oil pump lever ① touches the stopper ③ (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 ③ (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

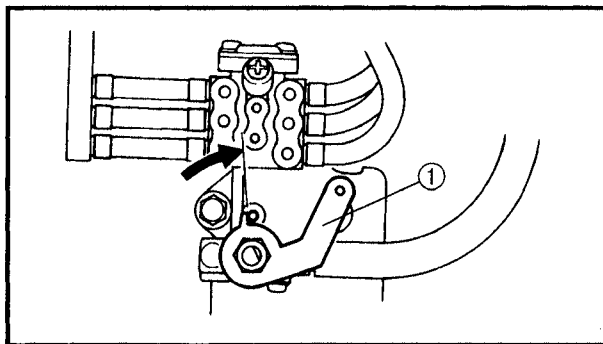
- (1) Fill the fuel tank with the fuel/oil mixture (50:1).

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

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

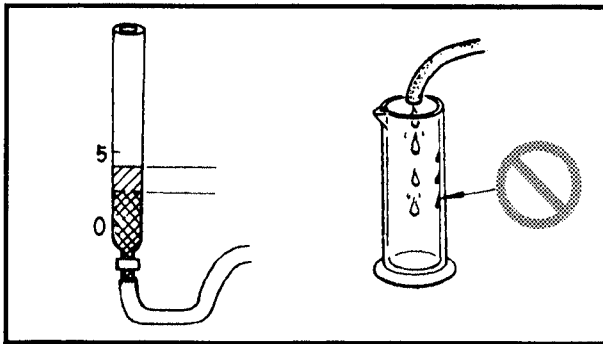
Out of specification → Check all of the oil pump components and replace any defective parts.

	Engine oil discharge (3 minutes)
	$39.6 \pm 7.8 \text{ cm}^3$
	($1.339 \pm 0.264 \text{ US oz}$, $1.397 \pm 0.275 \text{ Imp oz}$)

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

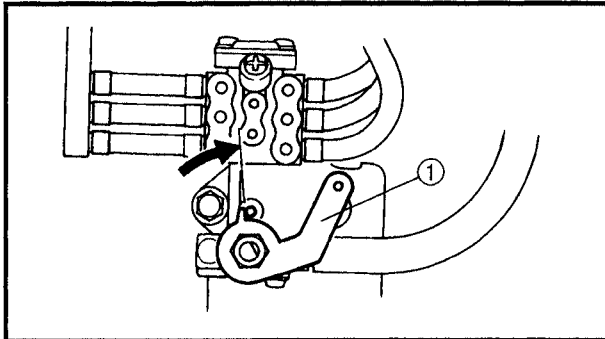
Fuel type
Unleaded regular gasoline
Fuel rating
PON: 86
RON: 91

Recommended engine oil

Engine oil type
2-stroke outboard engine oil
Engine oil grade
TC-W3

CAUTION:

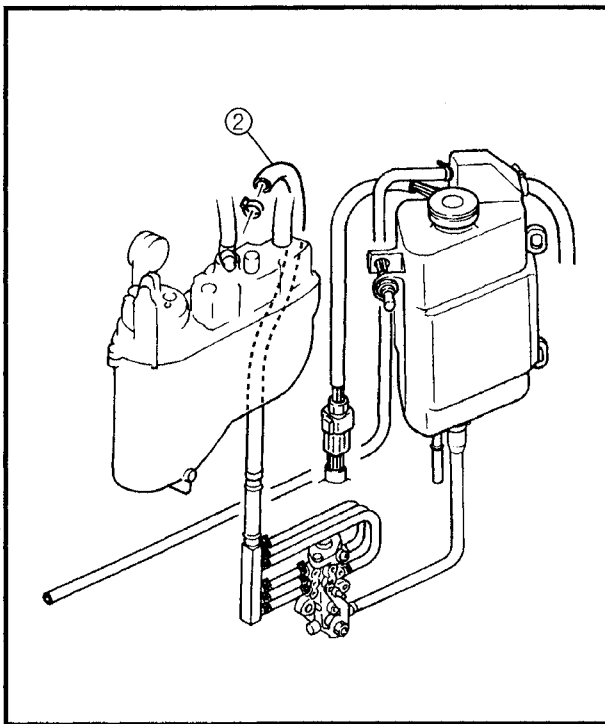
Only use the fuel/oil mixture (50:1) or engine malfunctions or seizure may result.



- (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 3-6.
- (8) Measure the engine oil discharge for 3 minutes.



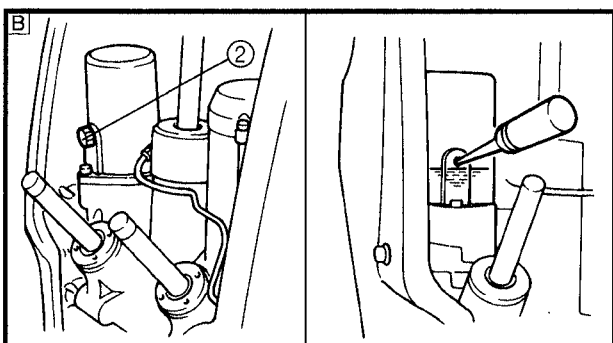
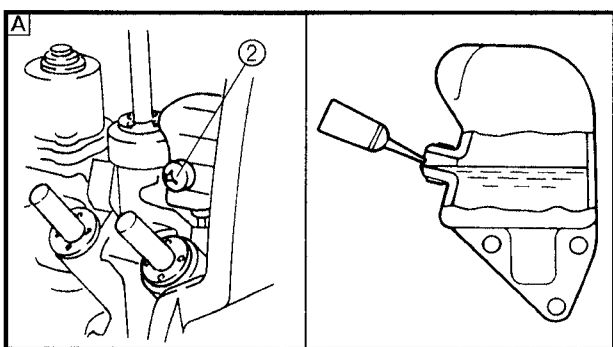
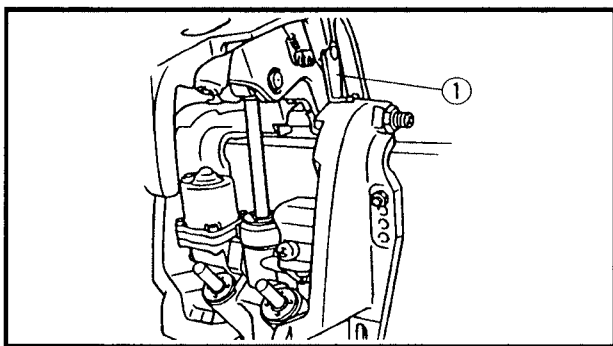
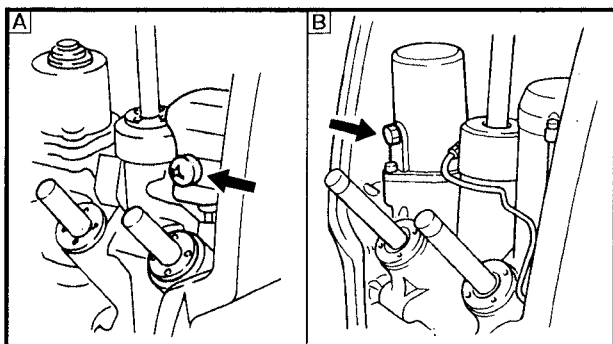
POWER TRIM AND TILT SYSTEM
INSPECTING THE POWER TRIM AND
TILT FLUID LEVEL

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)

- A** 200H, 225G/V200, V225
B 225F, L225F, 250B, L250B/S225, L225, S250, L250



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:

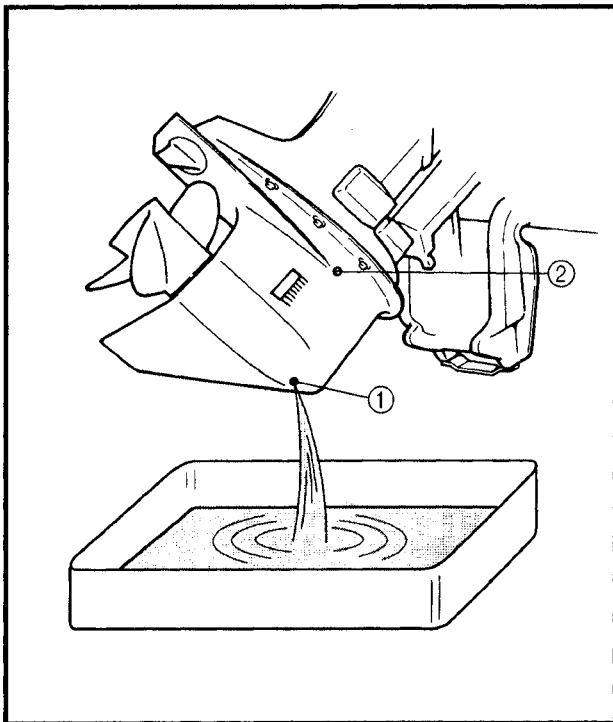
- Gear oil
Milky oil → Replace the oil seal.
Slag oil → Check the gears, bearings, and clutch dog.

Inspecting steps

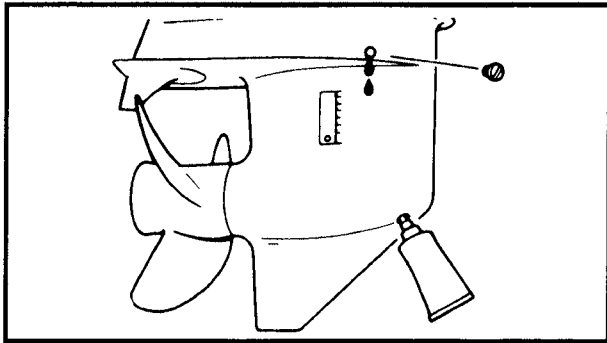
- (1) Tilt up the outboard slightly.
- (2) Place a container under the gear oil drain screw ①.
- (3) Remove the gear oil drain screw and gear oil level check screw ②.

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
1,150 cm³
(38.9 US oz, 40.5 Imp oz)
Counter rotation models
1,000 cm³
(33.8 US oz, 35.2 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)

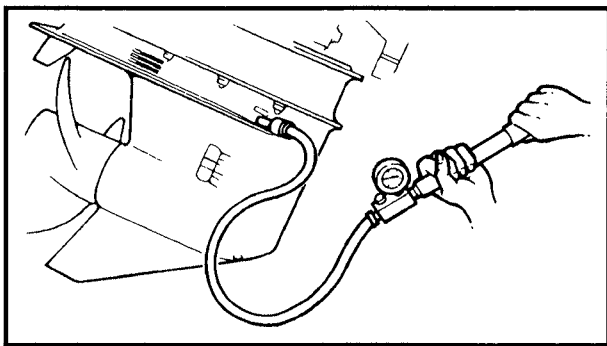
**INSPECTING THE LOWER UNIT
(FOR AIR LEAKS)**

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.

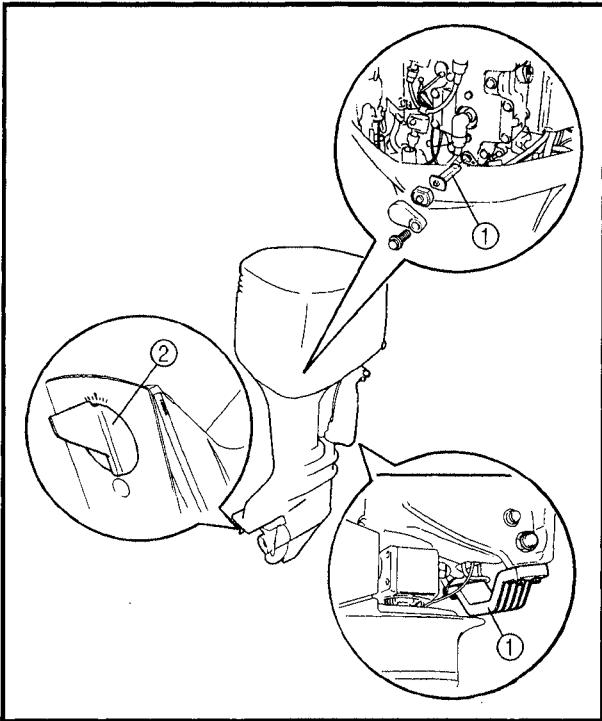


Pressure tester
YB-35956 / 90890-06762

- (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
- 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.



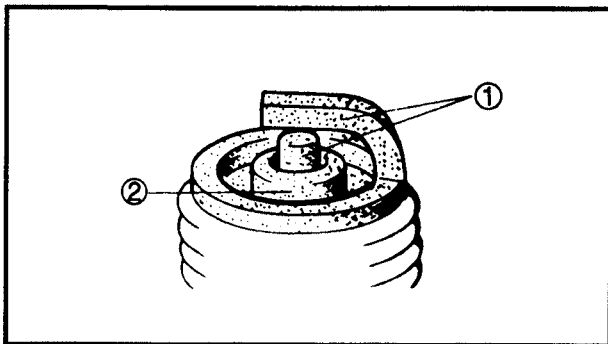
NOTE: _____

- 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

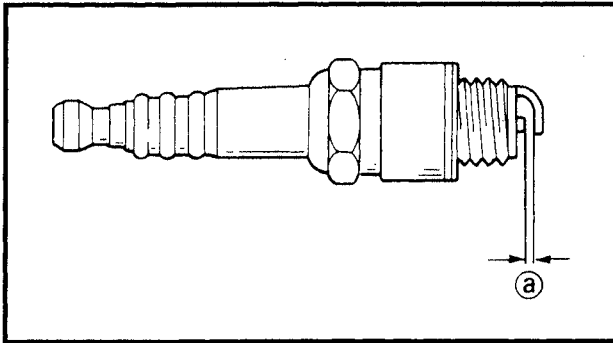
1. Inspect:

- 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 <ul style="list-style-type: none"> • Lean fuel mixture • Plugged jet(-s) • Air leak • Wrong setting Blackish color <ul style="list-style-type: none"> • Rich mixture • Excessive oil usage • Defective ignition system • Defective spark plug
--	---

2. Clean:

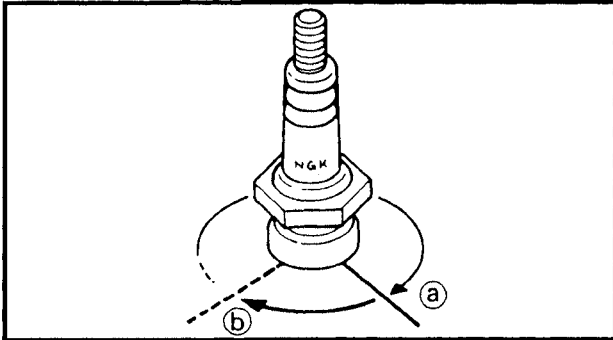
- Spark plug
(with a spark plug cleaner or wire brush.)



3. Measure:
- Spark plug gap **Ⓐ**
Out of specification → Regap.



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



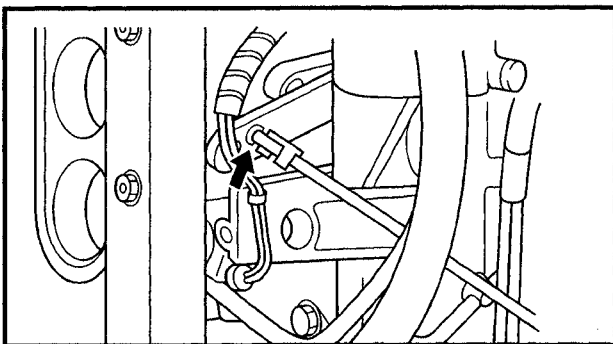
4. Tighten:
- Spark plug



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

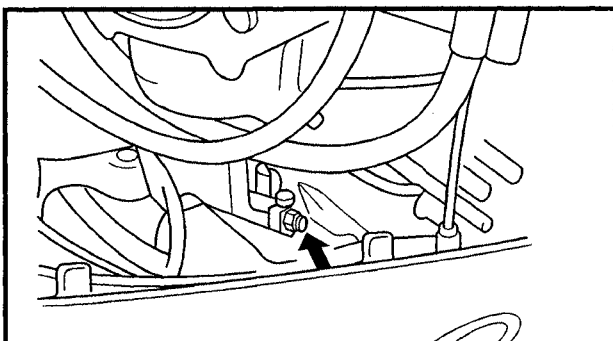
NOTE:

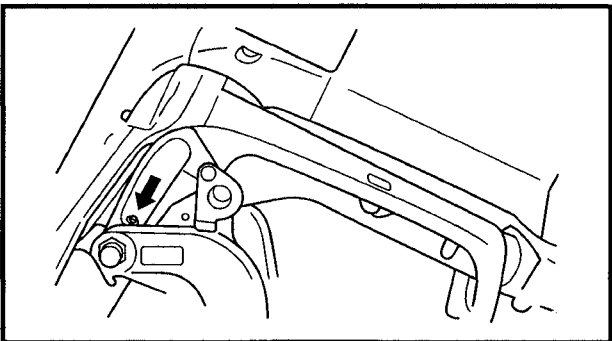
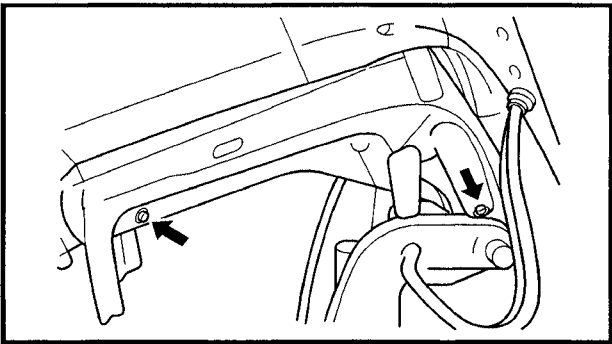
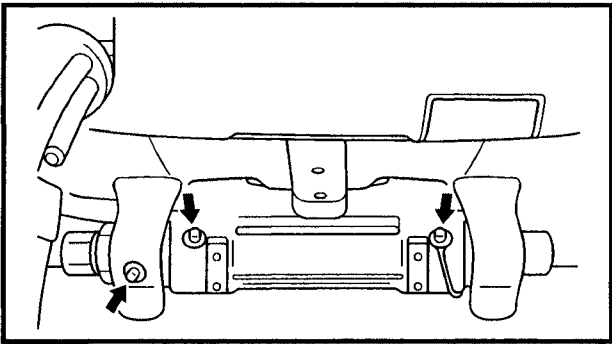
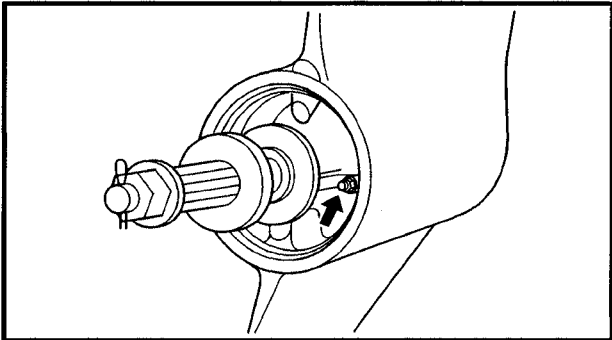
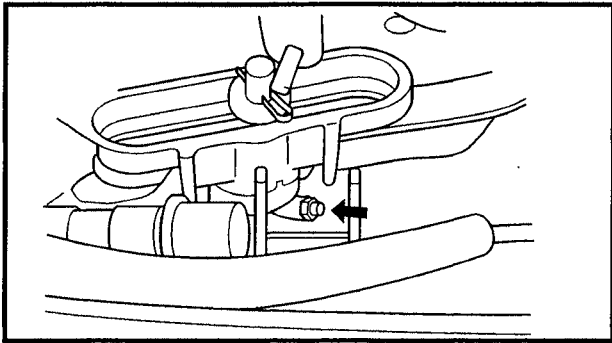
- Before installing the spark plug, clean the gasket surface and spark plug surface. Also, it is suggested to apply a thin film of anti-seize compound to the spark plug threads to prevent thread seizure.
- If a torque wrench is not available, a good estimate of the correct tightening torque is to finger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

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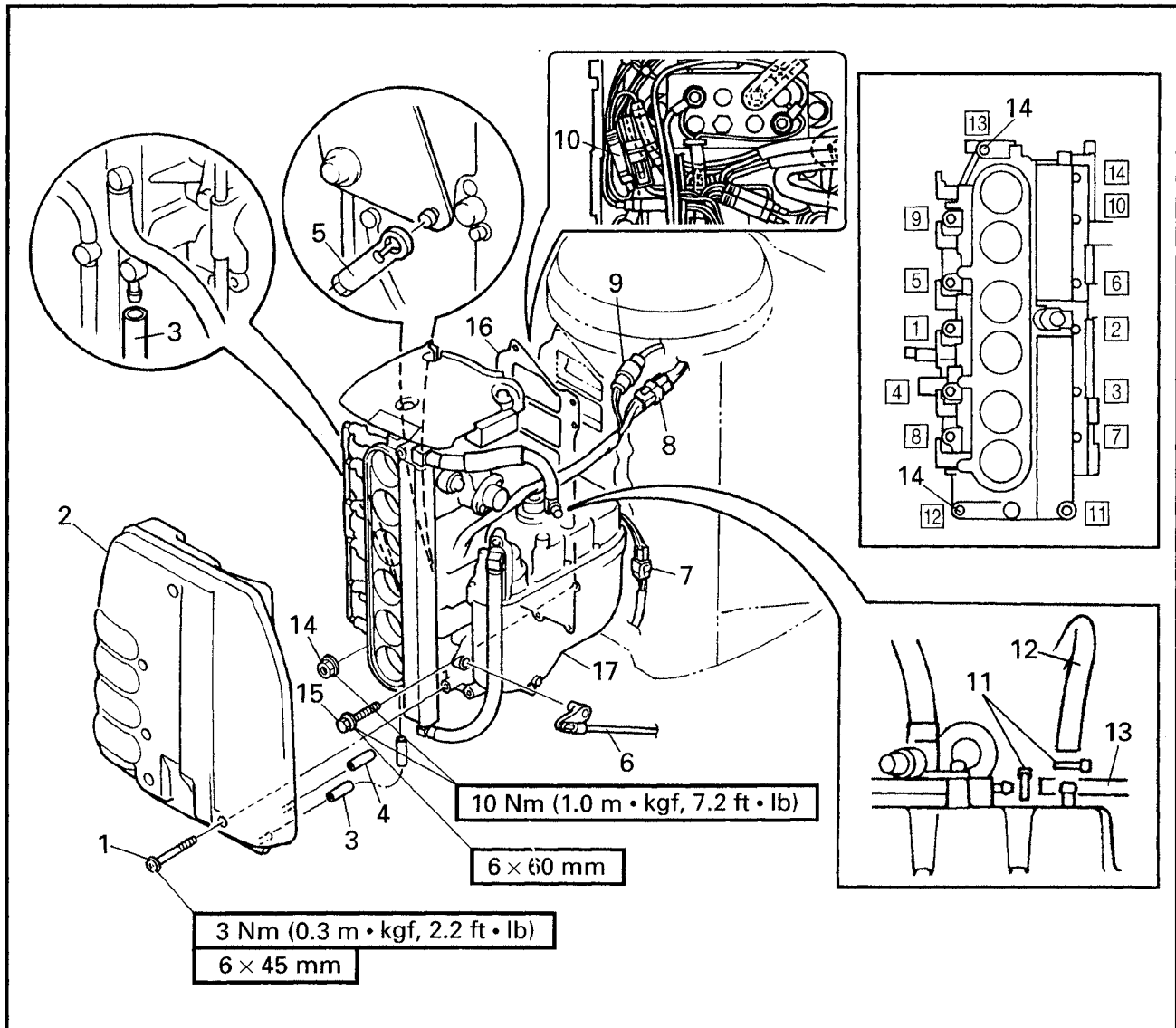
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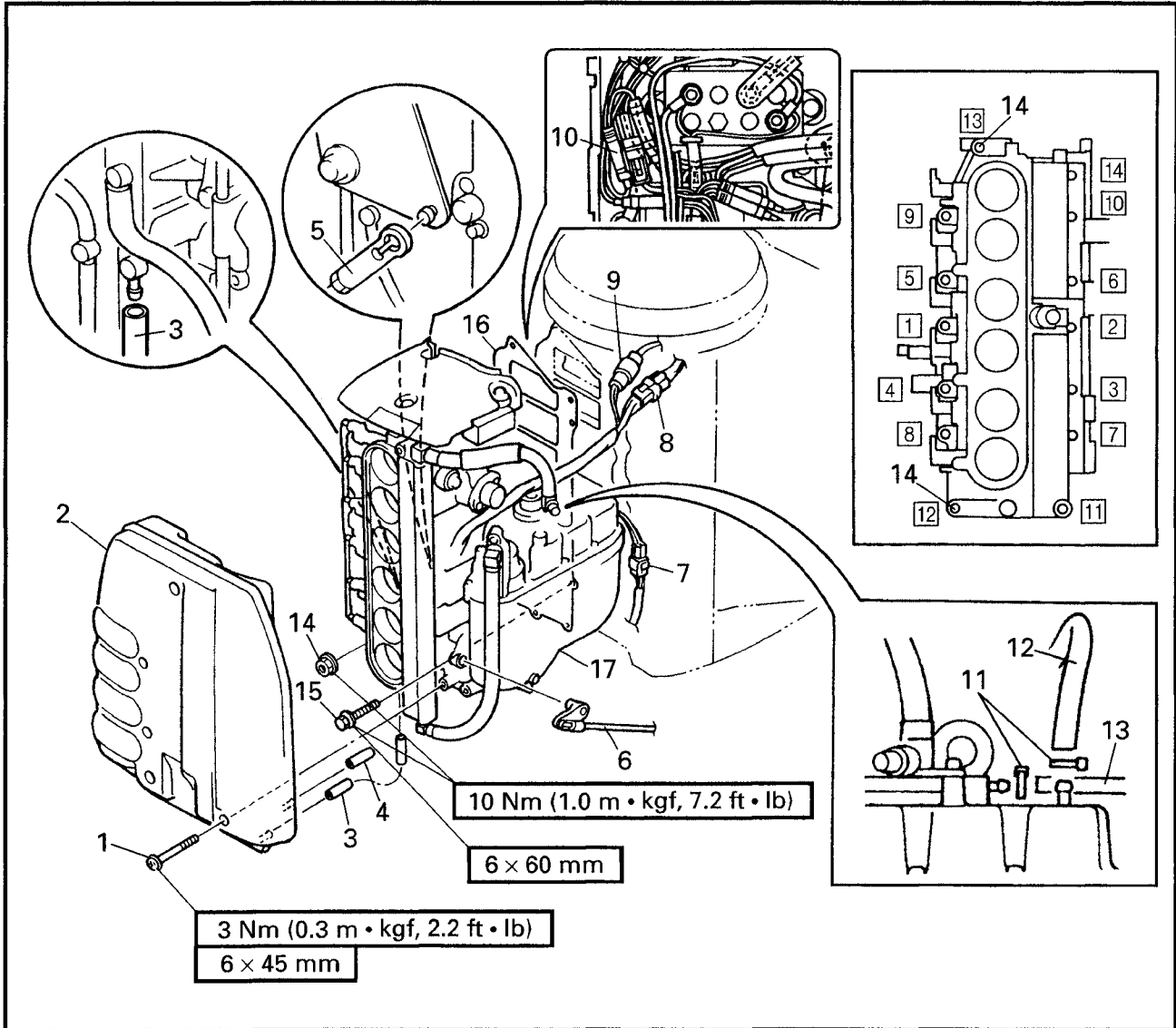
HIGH-PRESSURE FUEL LINE

REMOVING/INSTALLING THE HIGH-PRESSURE FUEL LINE



Order	Job/Part	Q'ty	Remarks
1	Screw	6	
2	Intake silencer	1	
3	Suction hose	1	(intake silencer-to-throttle body)
4	Oil tank air vent hose	1	(intake silencer-to-oil tank)
5	Throttle link rod	1	
6	Oil pump link rod	1	
7	Throttle position sensor coupler	1	
8	Fuel injector coupler	1	
9	High-pressure fuel pump resistor coupler	1	

Continued on next page.



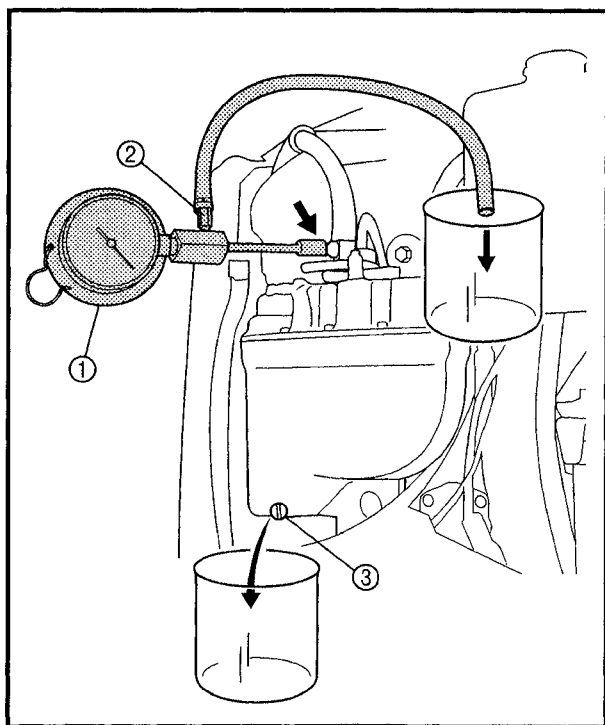
Order	Job/Part	Q'ty	Remarks
10	Main relay connector	1	
11	Plastic locking tie	2	Not reusable
12	Fuel inlet hose	1	(fuel pump-to-vapor separator)
13	Oil inlet hose	1	(oil pump-to-vapor separator)
14	Nut	2	
15	Bolt	12	(with washer)
16	Gasket	1	Not reusable
17	Fuel injection unit	1	
For installation, reverse the removal procedure.			



REDUCING THE FUEL PRESSURE (HIGH-PRESSURE FUEL LINE)

⚠ WARNING

Always reduce the fuel pressure in the high-pressure fuel line before servicing the line or the vapor separator. If the fuel pressure is not released, pressurized fuel may spray out.



1. Reduce:
 - Fuel pressure (high-pressure fuel line)

Reducing steps

- (1) Install the fuel pressure gauge onto the pressure check valve.



Fuel pressure gauge ①
YB-06766 / 90890-06766

- (2) Place the drain hose into a container.
- (3) Open the valve ② and release the pressure.

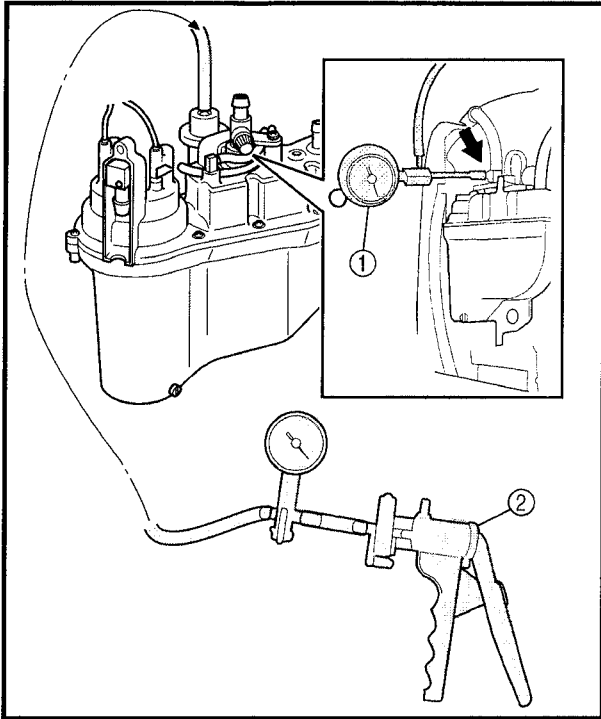
2. Drain:
 - Fuel

⚠ WARNING

Reduce the fuel pressure before removing the vapor separator drain screw, or pressurized fuel will spray out and may result in serious injury.

NOTE:

Remove the drain screw ③ and drain the vapor separator of any fuel.



INSPECTING THE PRESSURE REGULATOR

Inspect:

- Pressure regulator
Faulty → Replace the pressure regulator.

Inspecting steps

- (1) Install the fuel pressure gauge onto the pressure check valve and then install the Mity vac onto the pressure regulator vacuum hose.

	Fuel pressure gauge ① YB-06766 / 90890-06766
	Mity vac ② YB-35956 / 90890-06756

- (2) Start the engine.
- (3) Apply vacuum pressure with the Mity vac.

	Vacuum pressure Approx. 25 kPa (0.25 kg/cm², 3.56 psi)
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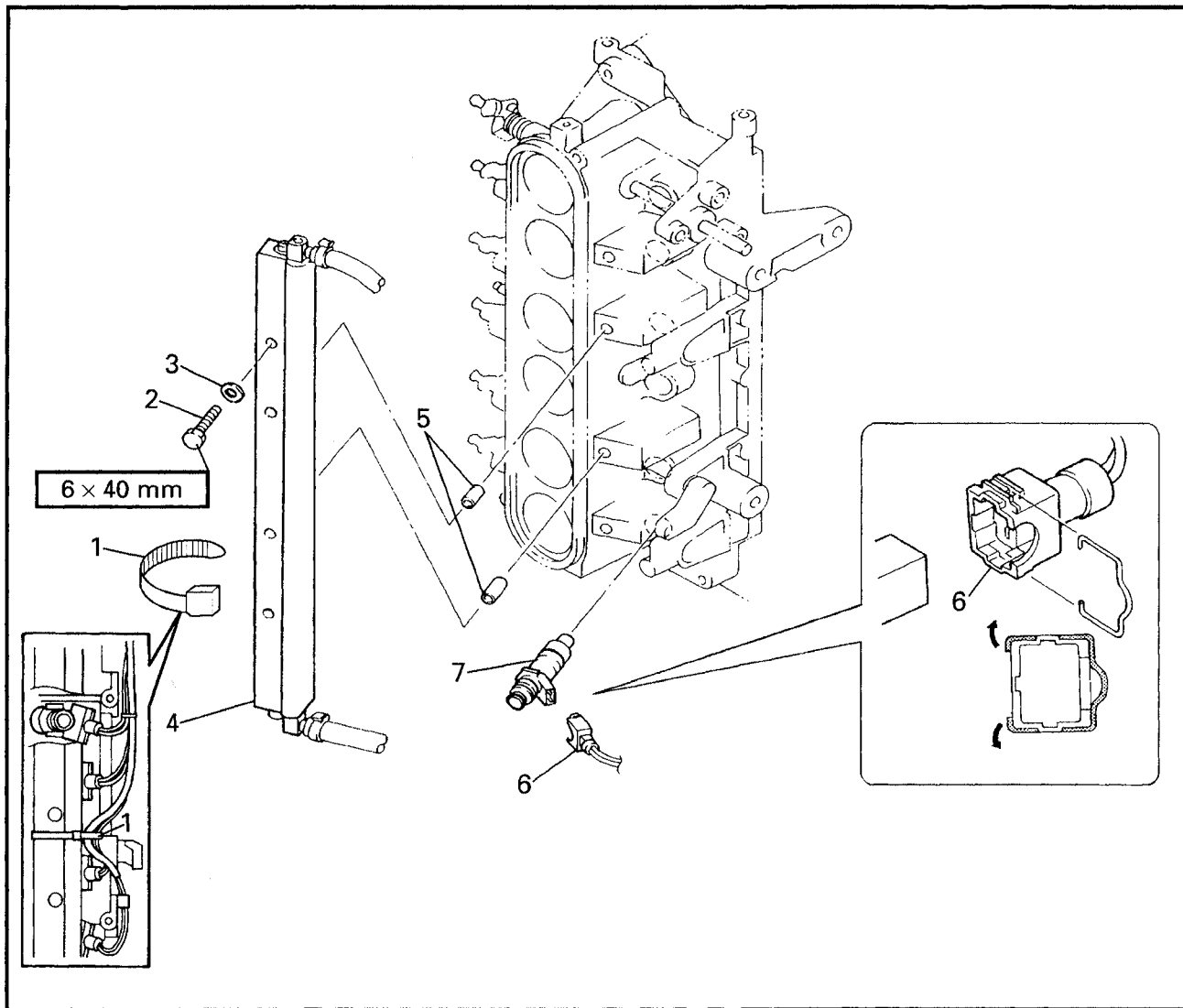
- (4) Inspect the fuel pressure.

NOTE: _____

Make sure the fuel pressure in the high-pressure fuel line lowers conversely in relation to the amount of pressure that is applied to the pressure regulator.



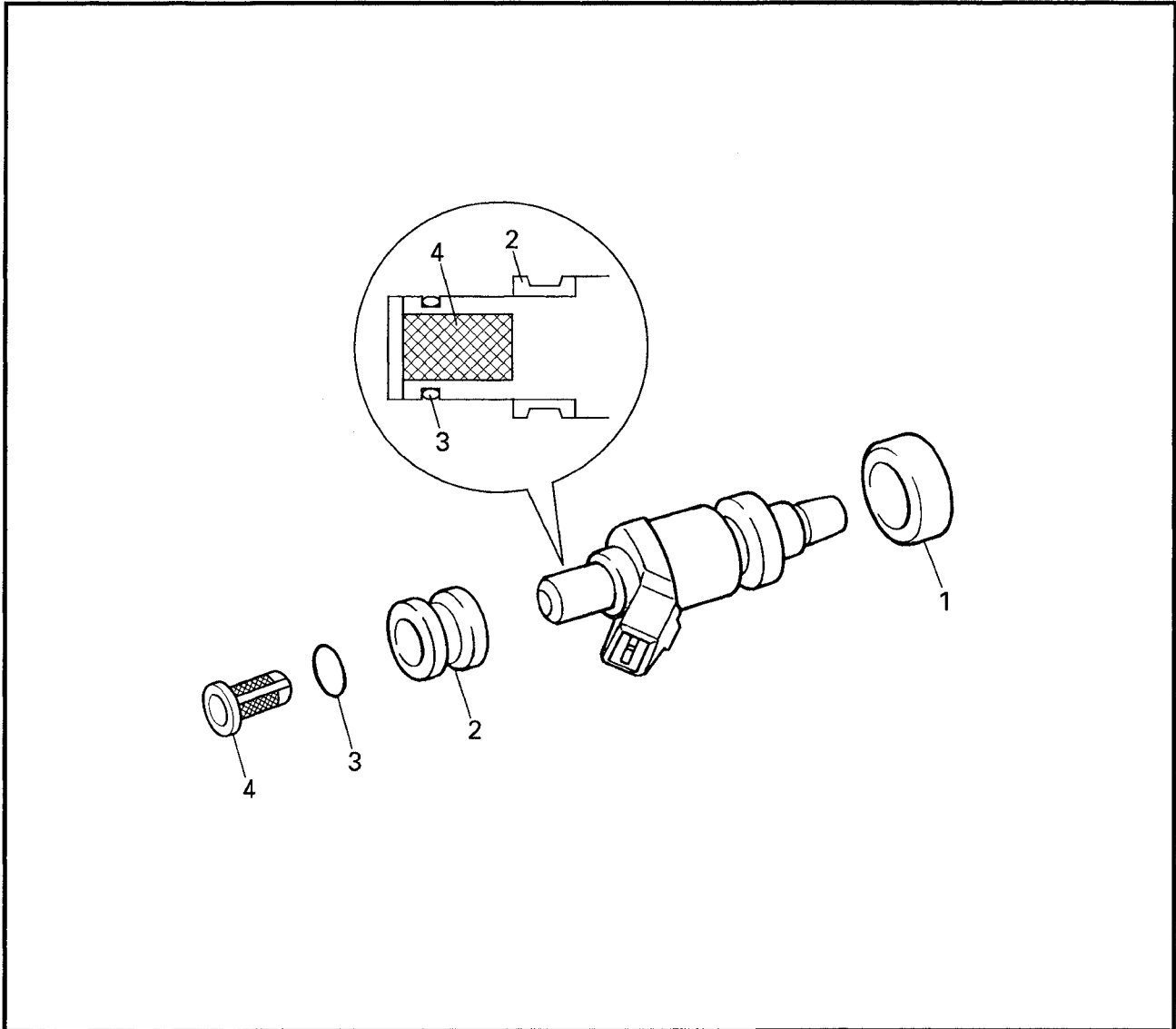
FUEL INJECTORS
REMOVING/INSTALLING THE FUEL INJECTORS



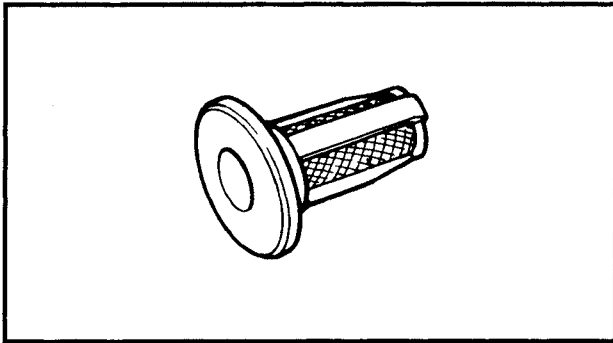
Order	Job/Part	Q'ty	Remarks
	Intake silencer		Refer to "HIGH-PRESSURE FUEL LINE" on page 4-1. Before performing the following procedure, reduce the fuel pressure (high-pressure fuel line).
1	Plastic locking tie	1	Not reusable
2	Bolt	4	
3	Washer	4	
4	Fuel rail	1	
5	Dowel pin	2	
6	Fuel injector coupler	6	
7	Fuel injector	6	
			For installation, reverse the removal procedure.



DISASSEMBLING/ASSEMBLING THE FUEL INJECTORS



Order	Job/Part	Q'ty	Remarks
1	Rubber seal	1	For assembly, reverse the disassembly procedure.
2	Rubber damper	1	
3	O-ring	1	
4	Filter	1	

**INSPECTING THE FILTERS**

Check:

- Filter

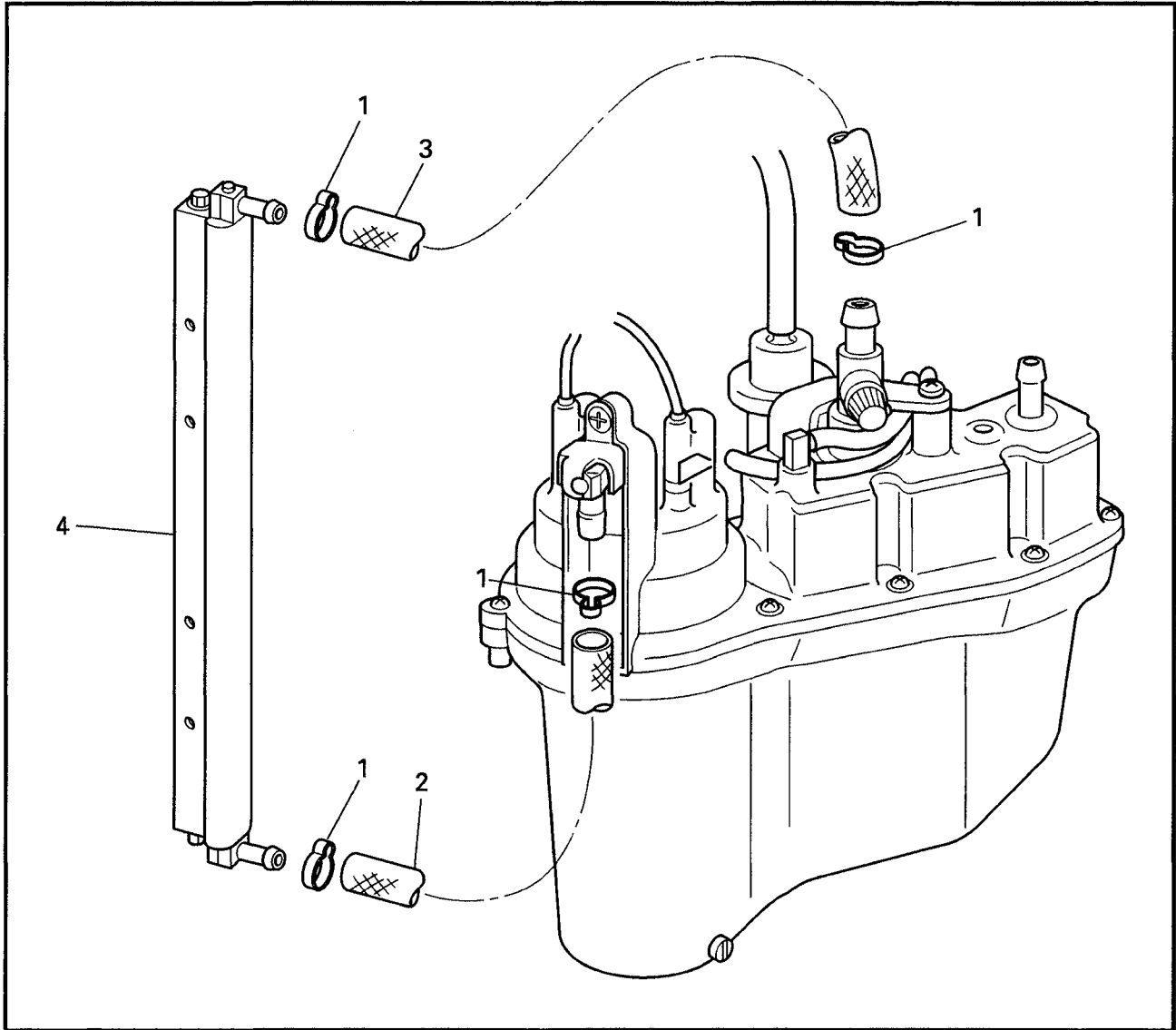
Damage/tears → Replace.

Contaminants → Clean.

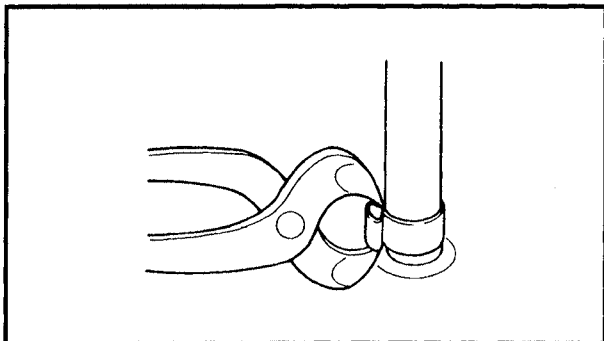


FUEL HOSES

REMOVING/INSTALLING THE FUEL HOSES



Order	Job/Part	Q'ty	Remarks
	Intake silencer		Refer to "HIGH-PRESSURE FUEL LINE" on page 4-1. Before performing the following procedure, reduce the fuel pressure (high-pressure fuel line).
1	Hose clamp	4	Not reusable
2	Fuel hose	1	(fuel pump-to-fuel rail)
3	Fuel hose	1	(fuel rail-to-pressure check valve)
4	Fuel rail	1	For installation, reverse the removal procedure.



REMOVING THE HOSE CLAMPS

Remove:

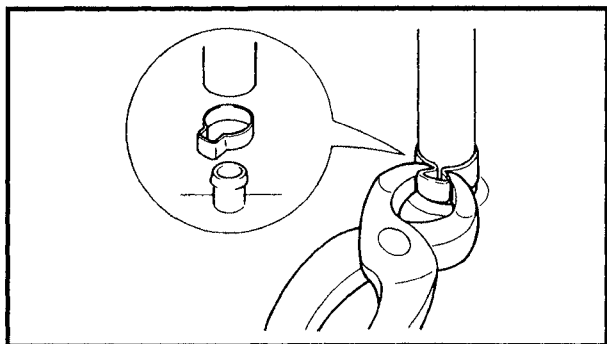
- Hose clamp

NOTE:

Remove the hose clamp by cutting its joint.

CAUTION:

The fuel hose will be damaged if a hose clamp is removed without cutting the joint.



INSTALLING THE HOSE CLAMPS

Install:

- Hose clamp

⚠ WARNING

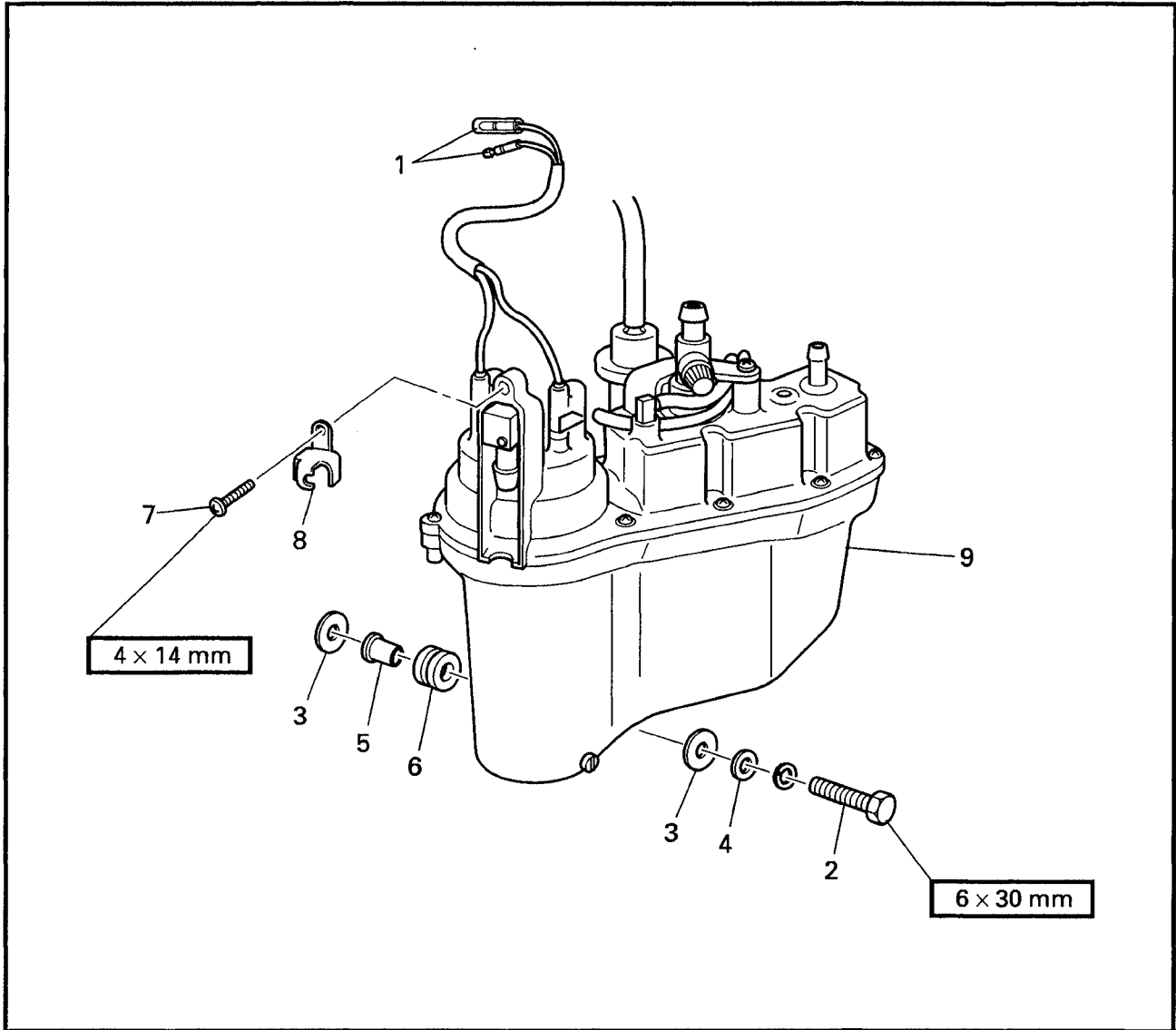
Do not reuse hose clamps, only use new ones.

NOTE:

Properly crimp the hose clamp so it is securely fastened.

VAPOR SEPARATOR

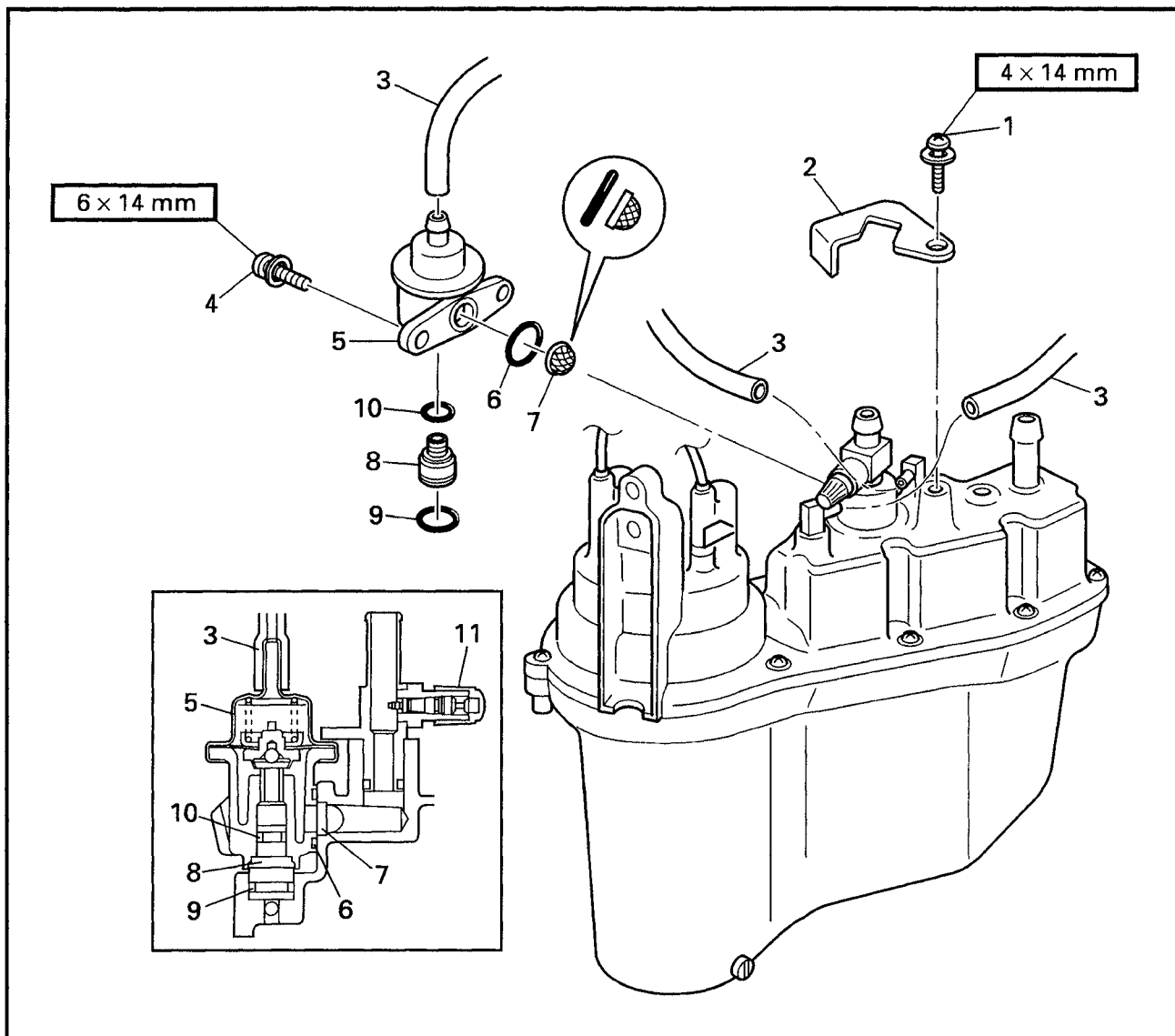
REMOVING/INSTALLING THE VAPOR SEPARATOR



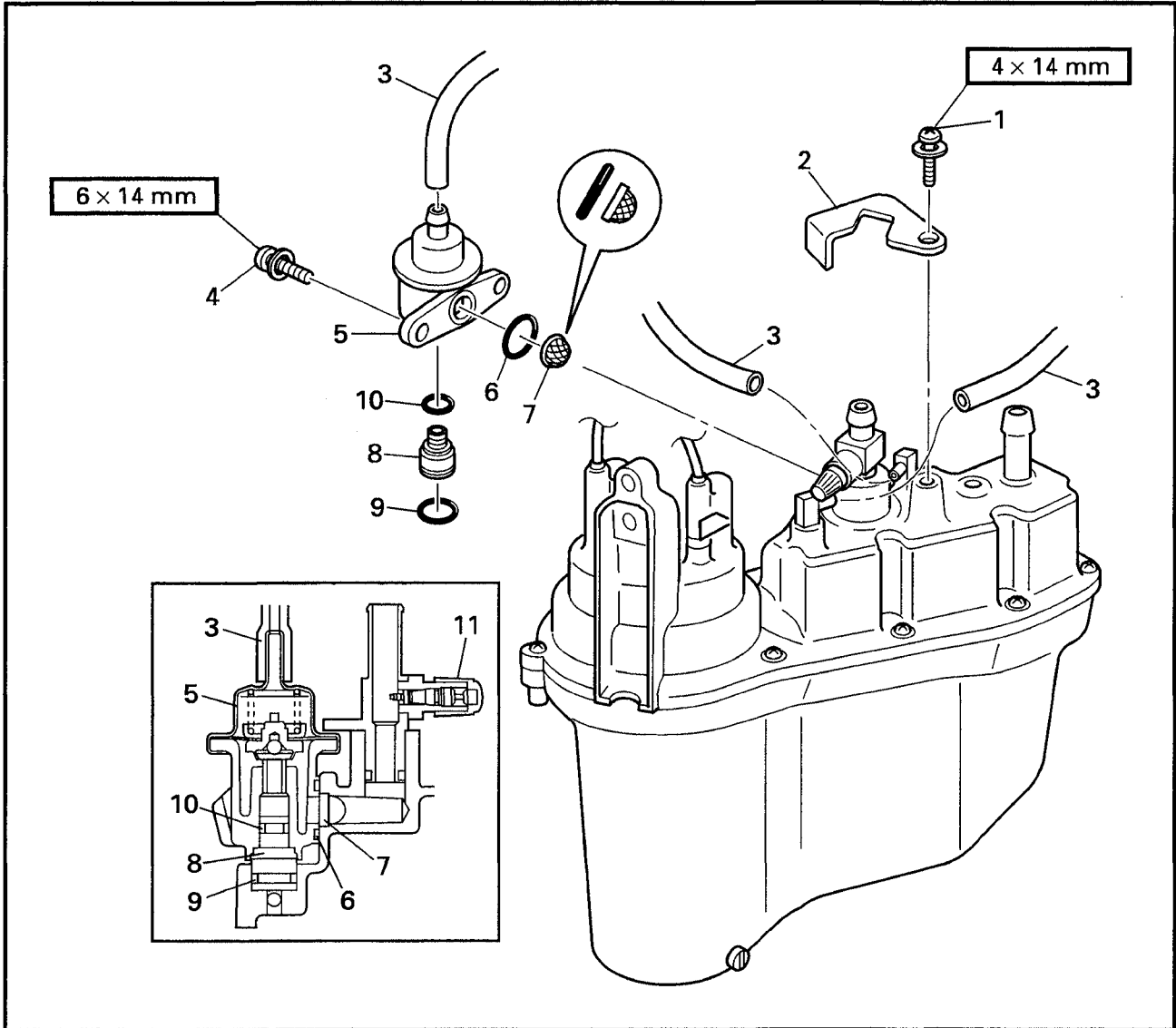
Order	Job/Part	Q'ty	Remarks
	Fuel hoses		Refer to "FUEL HOSES" on page 4-8.
1	High-pressure fuel pump connector	2	
2	Bolt	3	
3	Large washer	6	
4	Small washer	3	
5	Collar	3	
6	Grommet	3	
7	Screw	1	
8	Fuel outlet joint holder	1	
9	Vapor separator	1	
			For installation, reverse the removal procedure.



REMOVING/INSTALLING THE PRESSURE REGULATOR



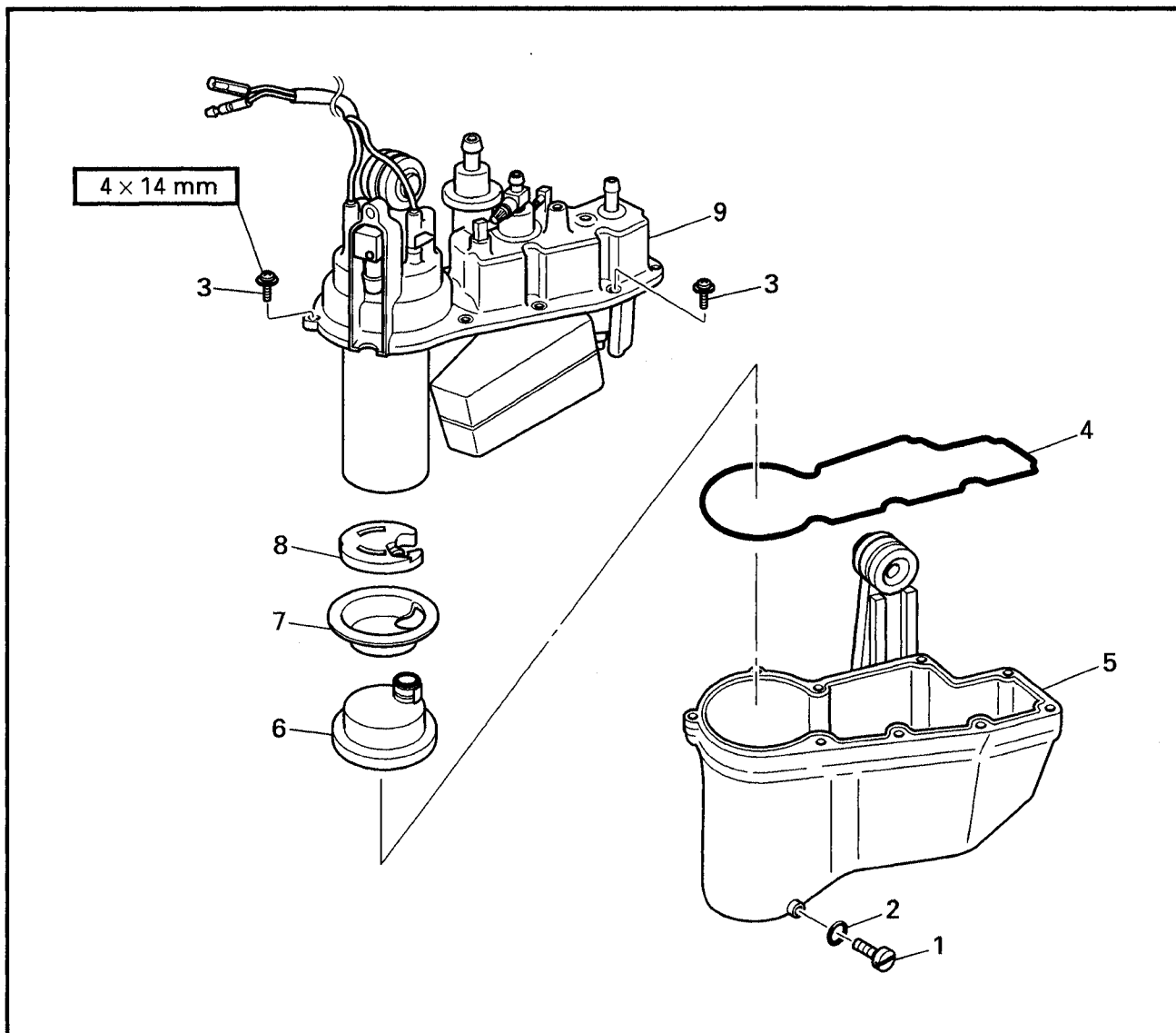
Order	Job/Part	Q'ty	Remarks
1	Screw	1	
2	Pressure check valve holder	1	
3	Hose	3	(vapor separator and pressure regulator-to-throttle body)
4	Screw	2	
5	Pressure regulator	1	
6	O-ring	1	
			Continued on next page.



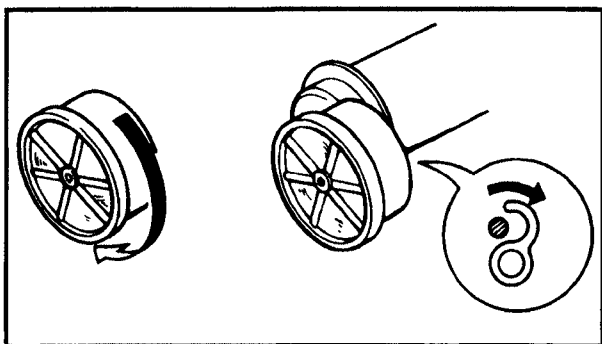
Order	Job/Part	Q'ty	Remarks
7	Filter	1	For installation, reverse the removal procedure.
8	Fuel return joint	1	
9	O-ring	1	
10	O-ring	1	
11	Cap	1	



DISASSEMBLING/ASSEMBLING THE VAPOR SEPARATOR



Order	Job/Part	Q'ty	Remarks
1	Drain screw	1	
2	O-ring	1	4.8 x 1.9 mm
3	Screw	9	
4	O-ring	1	
5	Float chamber	1	
6	High-pressure fuel pump filter	1	
7	Rubber damper holder	1	
8	Rubber damper	1	
9	Vapor separator body	1	
			For assembly, reverse the disassembly procedure.



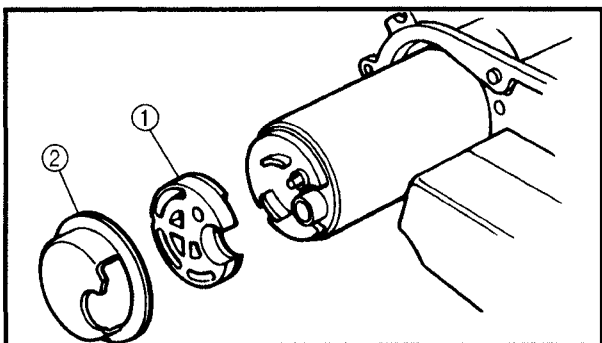
REMOVING THE HIGH-PRESSURE FUEL PUMP FILTER

Remove:

- High-pressure fuel pump filter

NOTE:

To remove the high-pressure fuel pump filter, turn it clockwise.



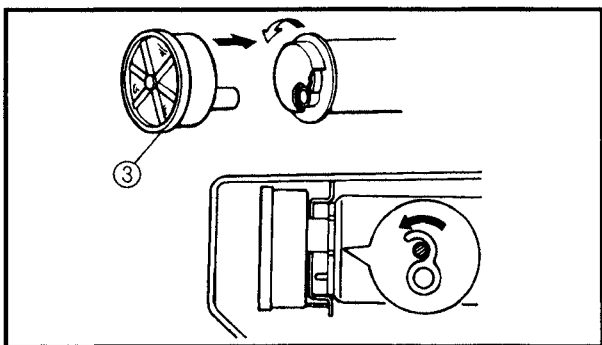
INSTALLING THE HIGH-PRESSURE FUEL PUMP FILTER

Install:

- Rubber damper ①
- Rubber damper holder ②
- High-pressure fuel pump filter ③

NOTE:

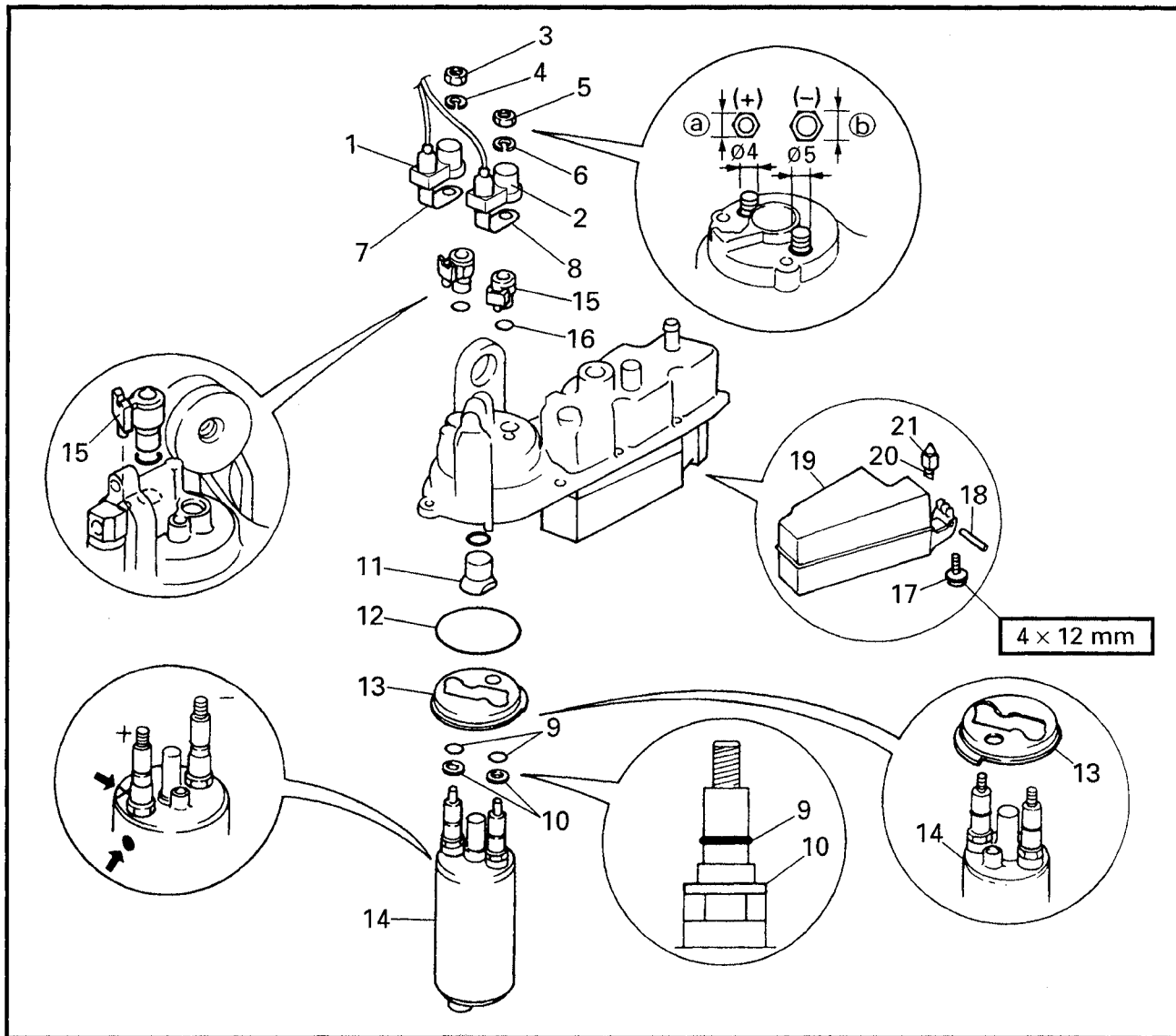
- Make sure the rubber damper is correctly installed in its holder.
- Firmly push the high-pressure fuel pump filter into the bottom of the high-pressure fuel pump and then turn the filter counter-clockwise until it clicks.





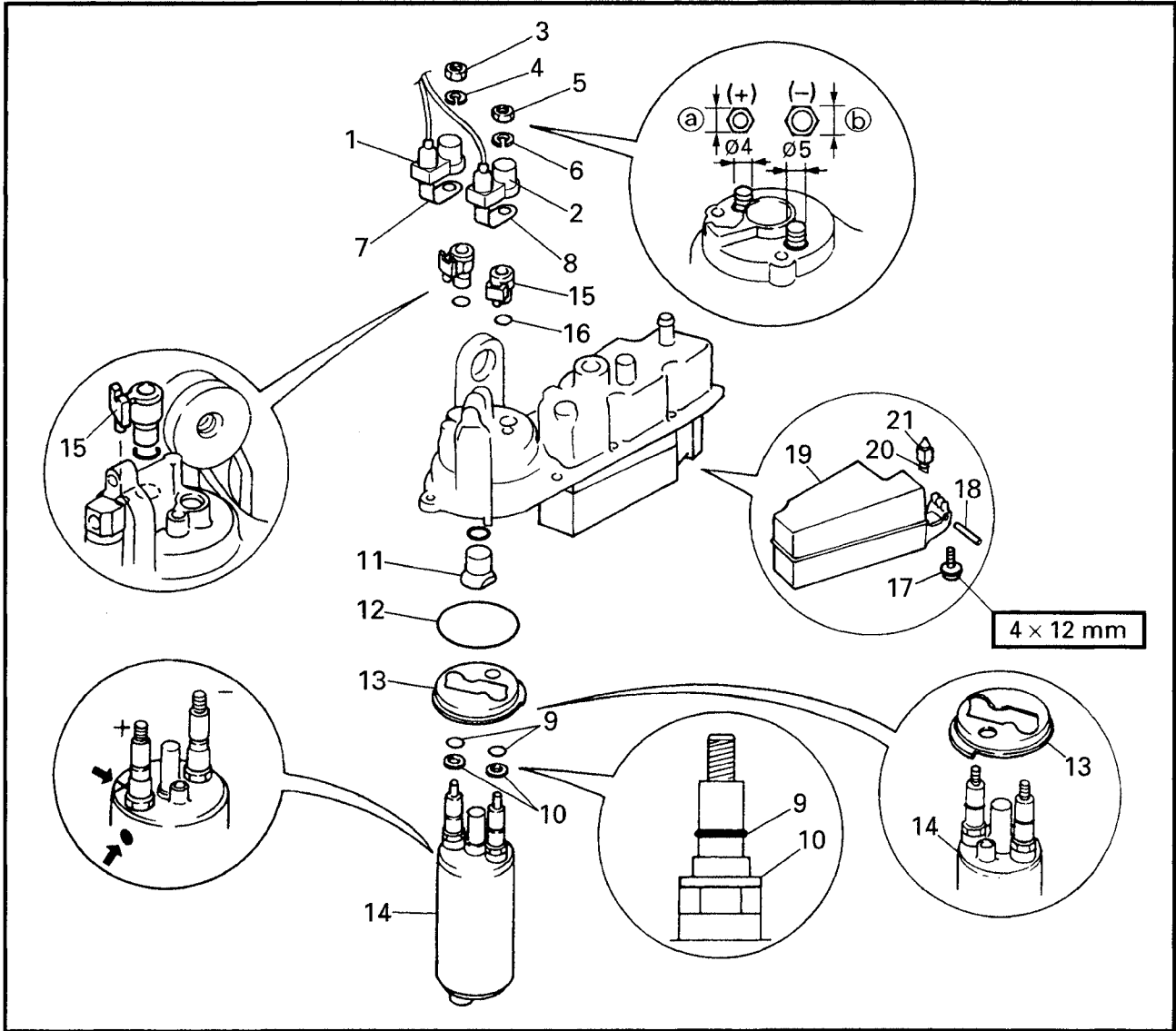
HIGH-PRESSURE FUEL PUMP

DISASSEMBLING/ASSEMBLING THE HIGH-PRESSURE FUEL PUMP



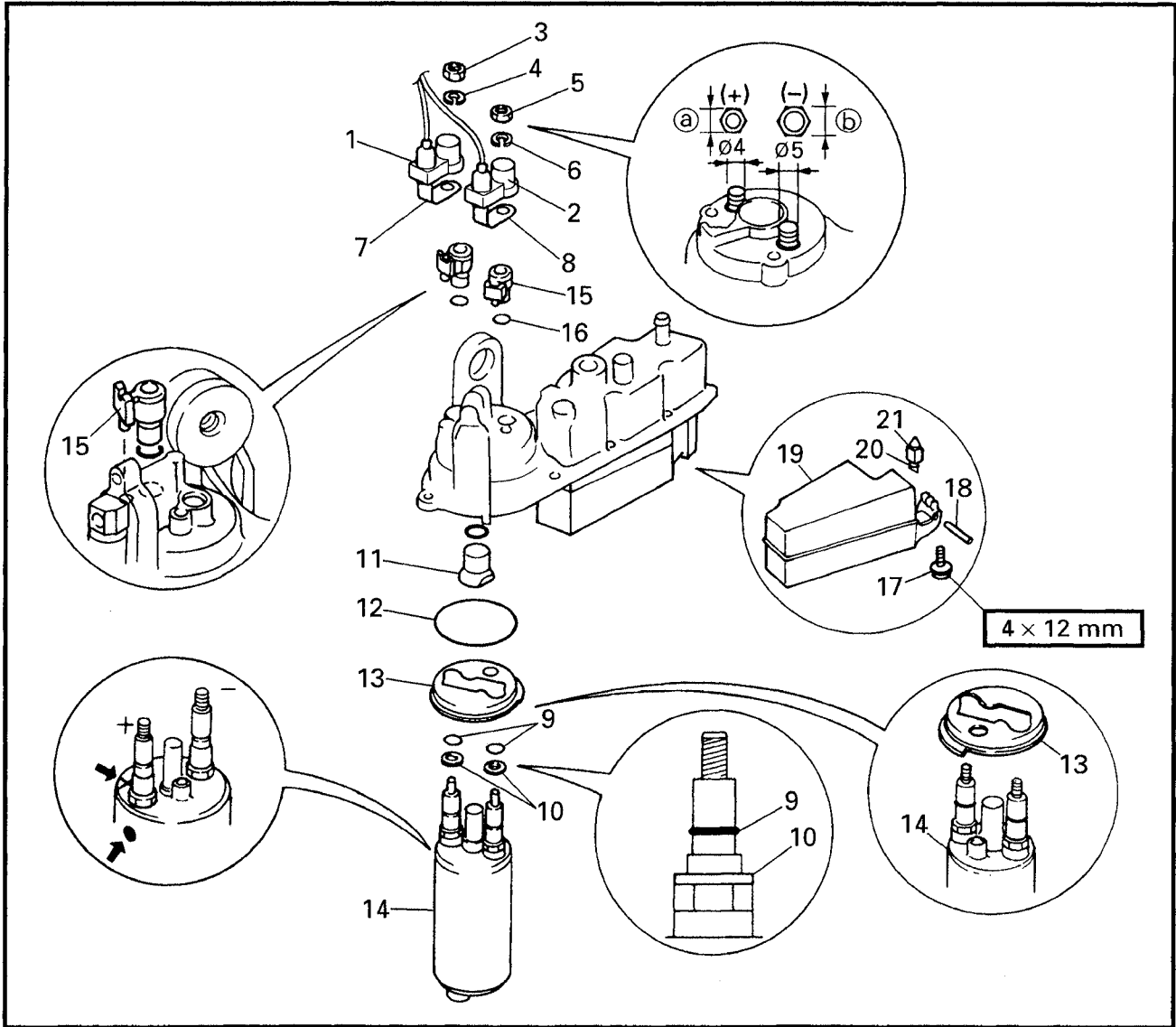
Order	Job/Part	Q'ty	Remarks
1	Positive high-pressure fuel pump terminal cap	1	(red lead)
2	Negative high-pressure fuel pump terminal cap	1	(blue lead)
3	Nut	1	(M4) Ⓐ = 7 mm
4	Spring washer	1	
5	Nut	1	(M5) Ⓑ = 8 mm
6	Spring washer	1	
7	Positive high-pressure fuel pump terminal	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Negative high-pressure fuel pump terminal	1	
9	O-ring	2	4.5 × 1.5 mm
10	Washer	2	(white)
11	Collar	1	
12	O-ring	1	45.7 × 3.5 mm
13	High-pressure fuel pump guide plate	1	
14	High-pressure fuel pump	1	
15	Insulator	2	

Continued on next page.

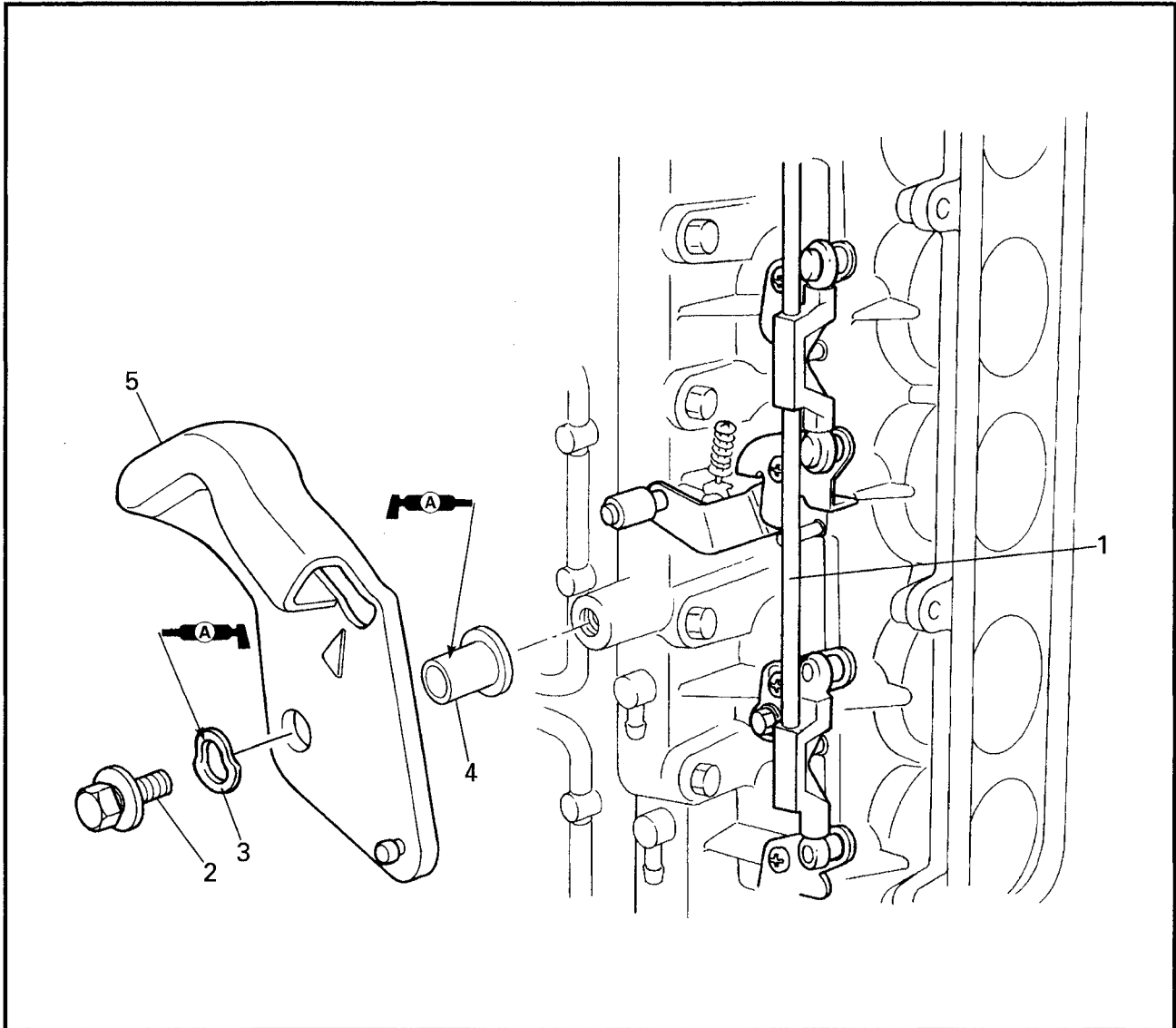


Order	Job/Part	Q'ty	Remarks
16	O-ring	2	8 x 1.3 mm
17	Screw	1	
18	Float pin	1	
19	Float	1	
20	Clip	1	
21	Needle valve	1	
For assembly, reverse the disassembly procedure.			



THROTTLE CONTROL LEVER CAM

REMOVING/INSTALLING THE THROTTLE CONTROL LEVER CAM

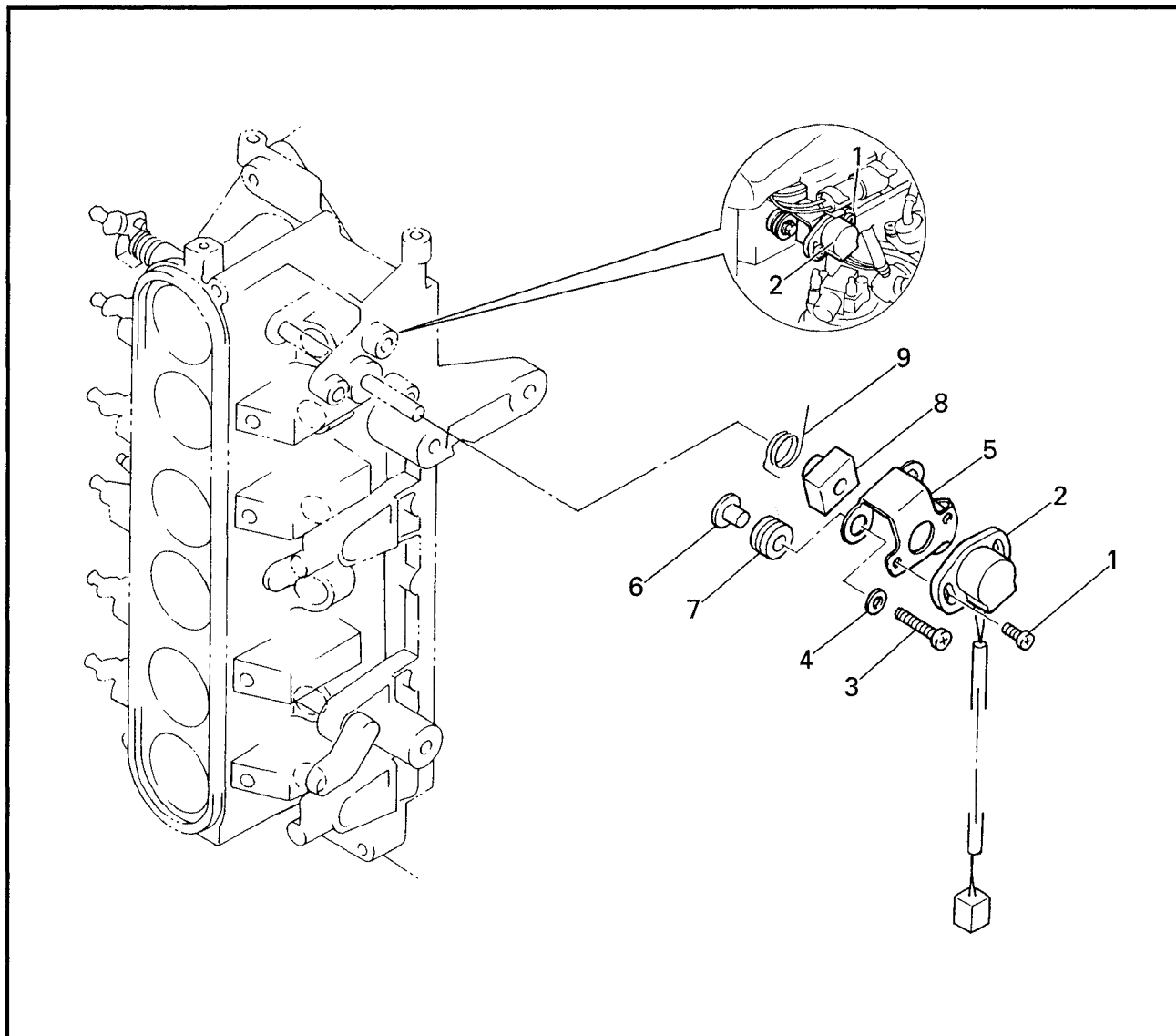


Order	Job/Part	Q'ty	Remarks
1	Throttle link	1	
2	Bolt	1	(with washer)
3	Wave washer	1	
4	Collar	1	
5	Throttle control lever cam	1	
			For installation, reverse the removal procedure.



THROTTLE POSITION SENSOR

REMOVING/INSTALLING THE THROTTLE POSITION SENSOR



Order	Job/Part	Q'ty	Remarks
1	Screw	2	
2	Throttle position sensor	1	
3	Screw	3	
4	Washer	3	
5	Throttle position sensor bracket	1	
6	Collar	3	
7	Grommet	3	
8	Spacer	1	
9	Spring	1	
			For installation, reverse the removal procedure.



INSTALLING THE THROTTLE POSITION SENSOR

NOTE: _____

During installation, make sure the throttle position sensor is properly adjusted.

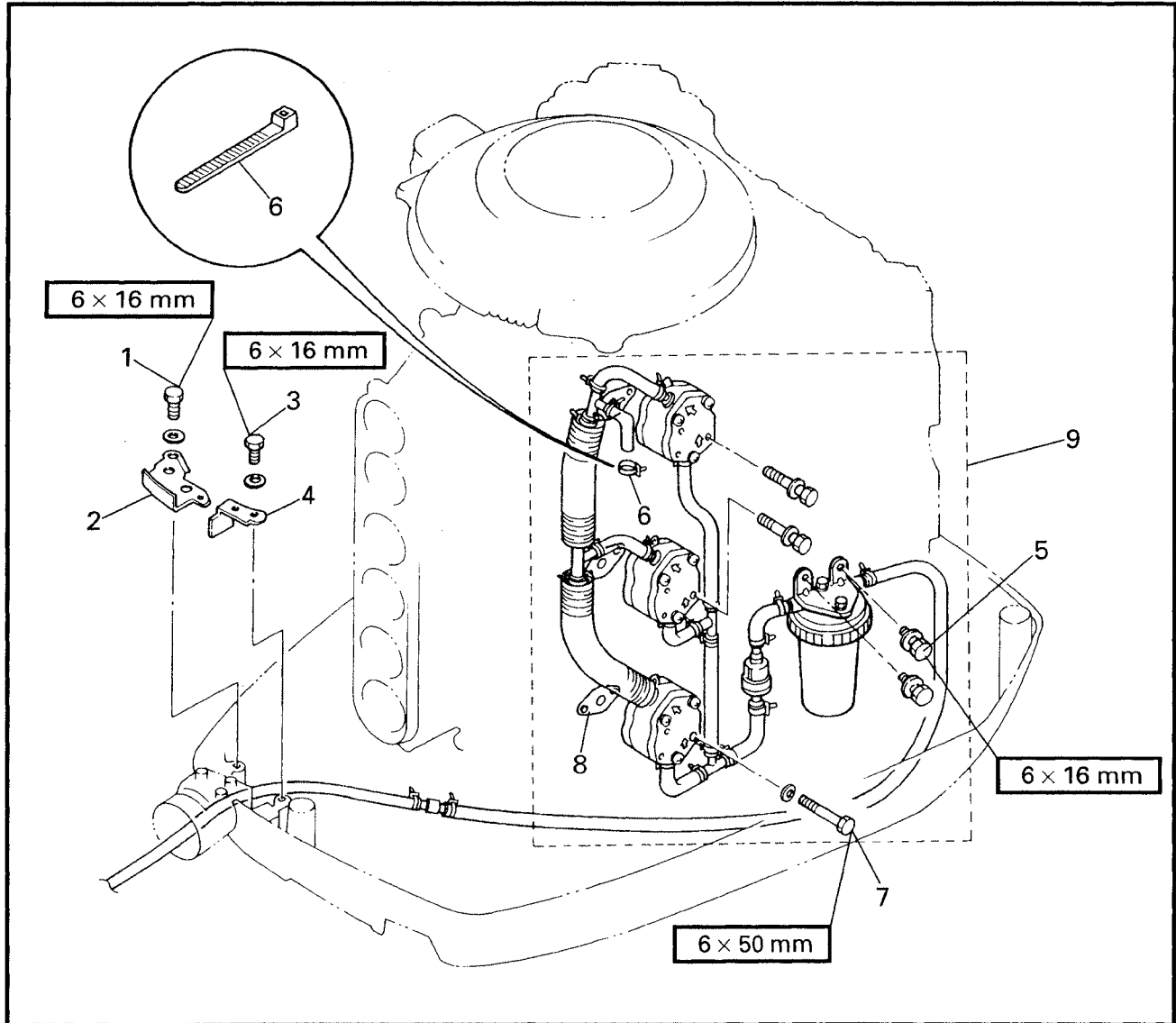
_____**Install:**

- Throttle position sensor

Refer to "ADJUSTING THE THROTTLE POSITION SENSOR" on page 3-7.



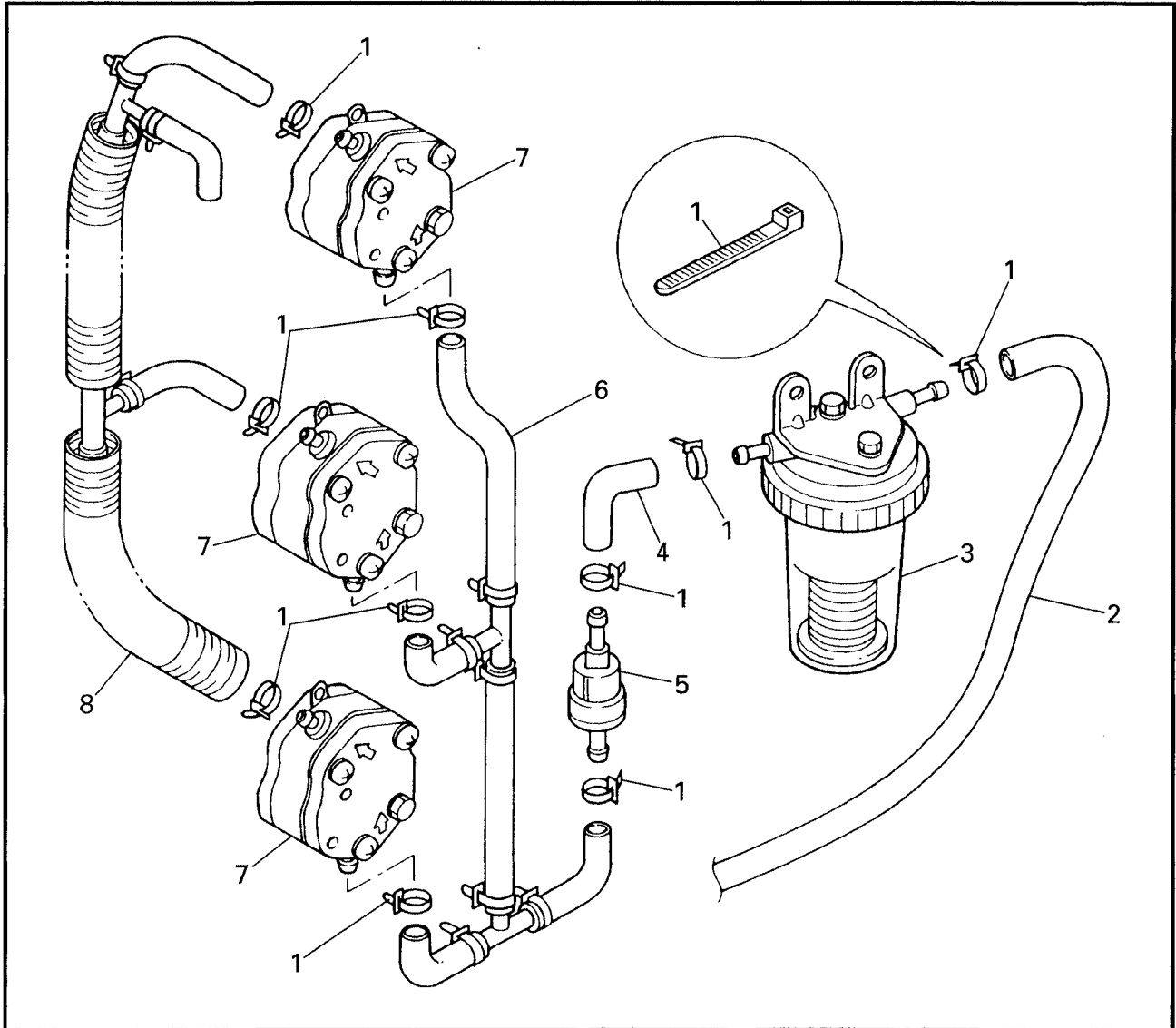
**LOW-PRESSURE FUEL LINE
REMOVING/INSTALLING THE LOW-PRESSURE FUEL LINE**



Order	Job/Part	Q'ty	Remarks
1	Bolt	2	
2	Bracket	1	
3	Bolt	1	
4	Holder	1	
5	Bolt	2	(with washer)
6	Plastic locking tie	1	Not reusable
7	Bolt	6	(with washer)
8	Gasket	3	Not reusable
9	Low-pressure fuel line	1	
			For installation, reverse the removal procedure.



DISASSEMBLING/ASSEMBLING THE LOW-PRESSURE FUEL LINE

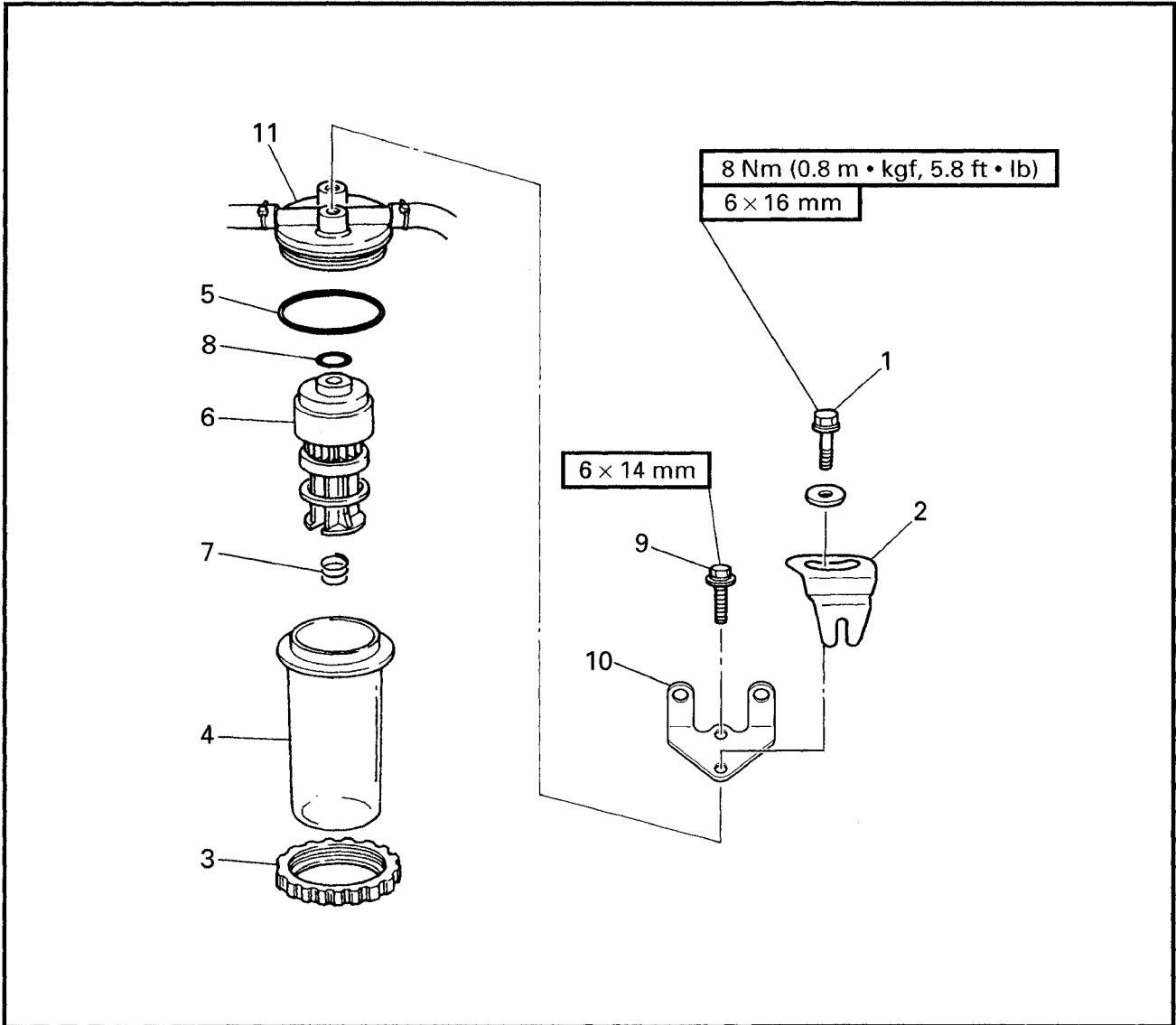


Order	Job/Part	Q'ty	Remarks
1	Plastic locking tie	10	Not reusable
2	Fuel hose	1	(hose joint-to-fuel filter)
3	Fuel filter	1	
4	Fuel hose	1	(check valve-to-fuel filter)
5	Check valve	1	
6	Fuel hose assembly	1	(check valve-to-fuel pump)
7	Fuel pump	3	
8	Fuel hose assembly	1	(fuel pump-to-vapor separator)
For assembly, reverse the disassembly procedure.			



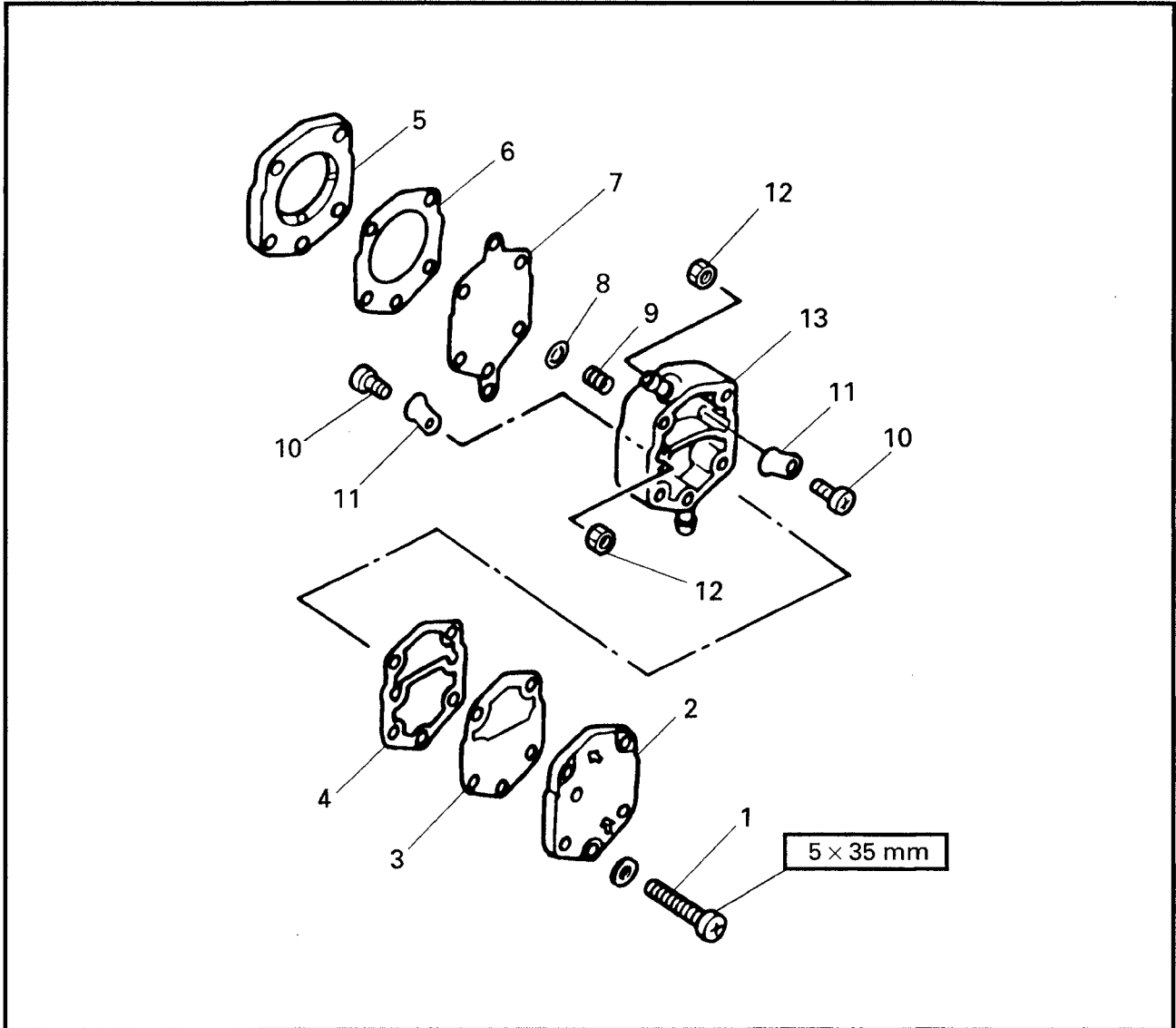
FUEL FILTER

DISASSEMBLING/ASSEMBLING THE FUEL FILTER



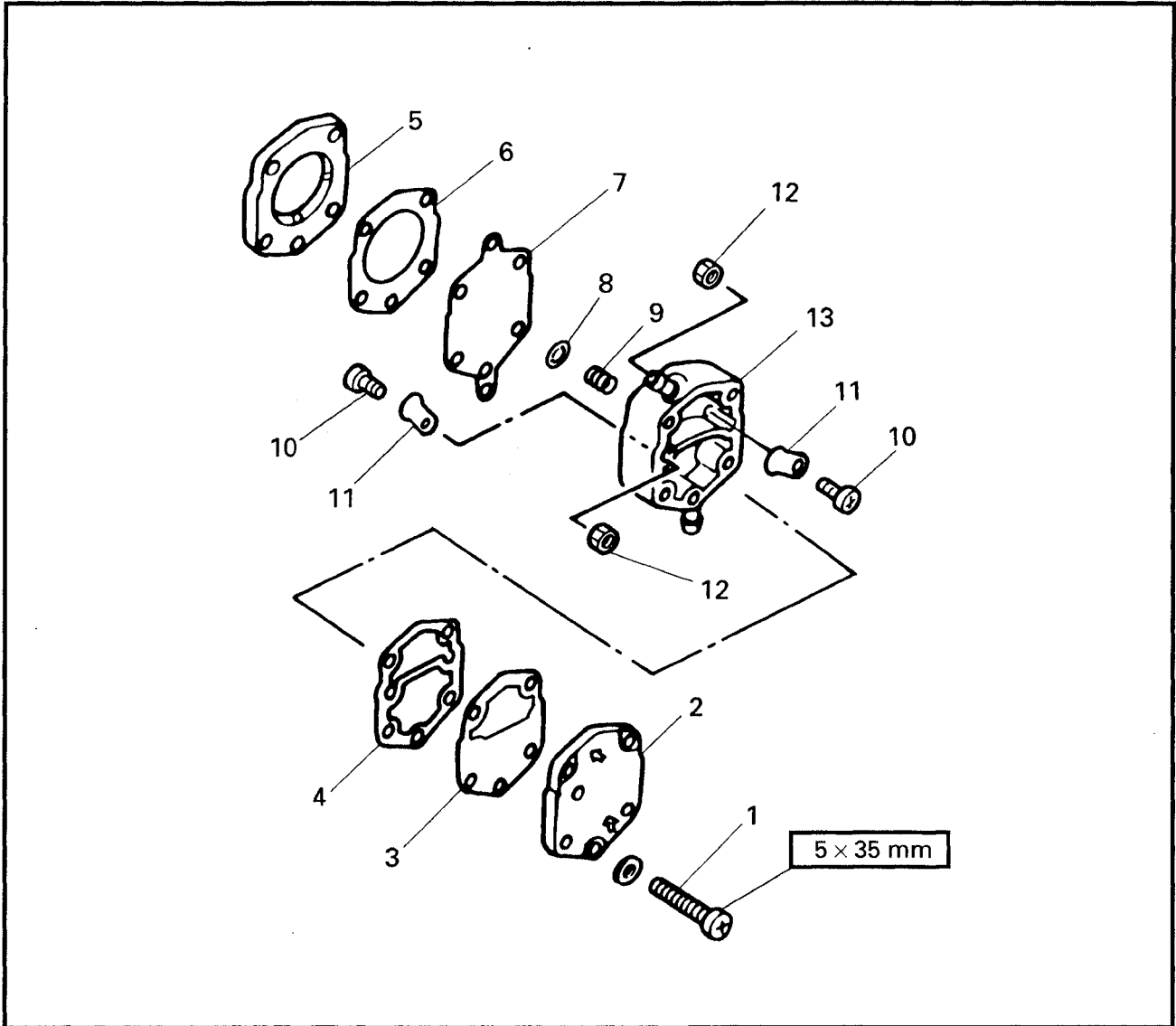
Order	Job/Part	Q'ty	Remarks
1	Bolt	1	
2	Fuel filter nut holder	1	
3	Fuel filter nut	1	
4	Fuel filter cup	1	
5	O-ring	1	
6	Fuel filter element	1	
7	Spring	1	
8	O-ring	1	
9	Bolt	1	
10	Fuel filter bracket	1	
11	Fuel filter cap	1	
			For assembly, reverse the disassembly procedure.

**FUEL PUMP
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	

Continued on next page.



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 CHECK VALVE

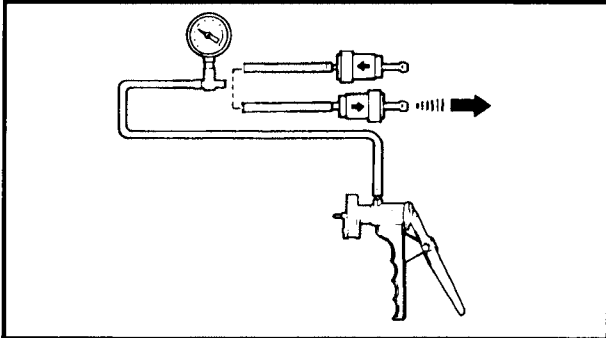
Inspect:

- 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/cm², 11.4 psi)

NOTE: _____

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

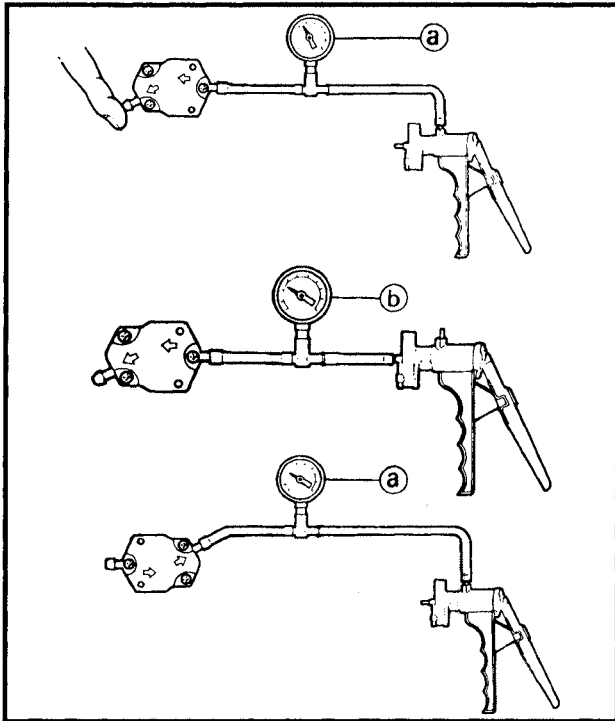
INSPECTING THE FUEL PUMPS

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.

	<p>Mity vac YB-35956 / 90890-06756</p>
--	---

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

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

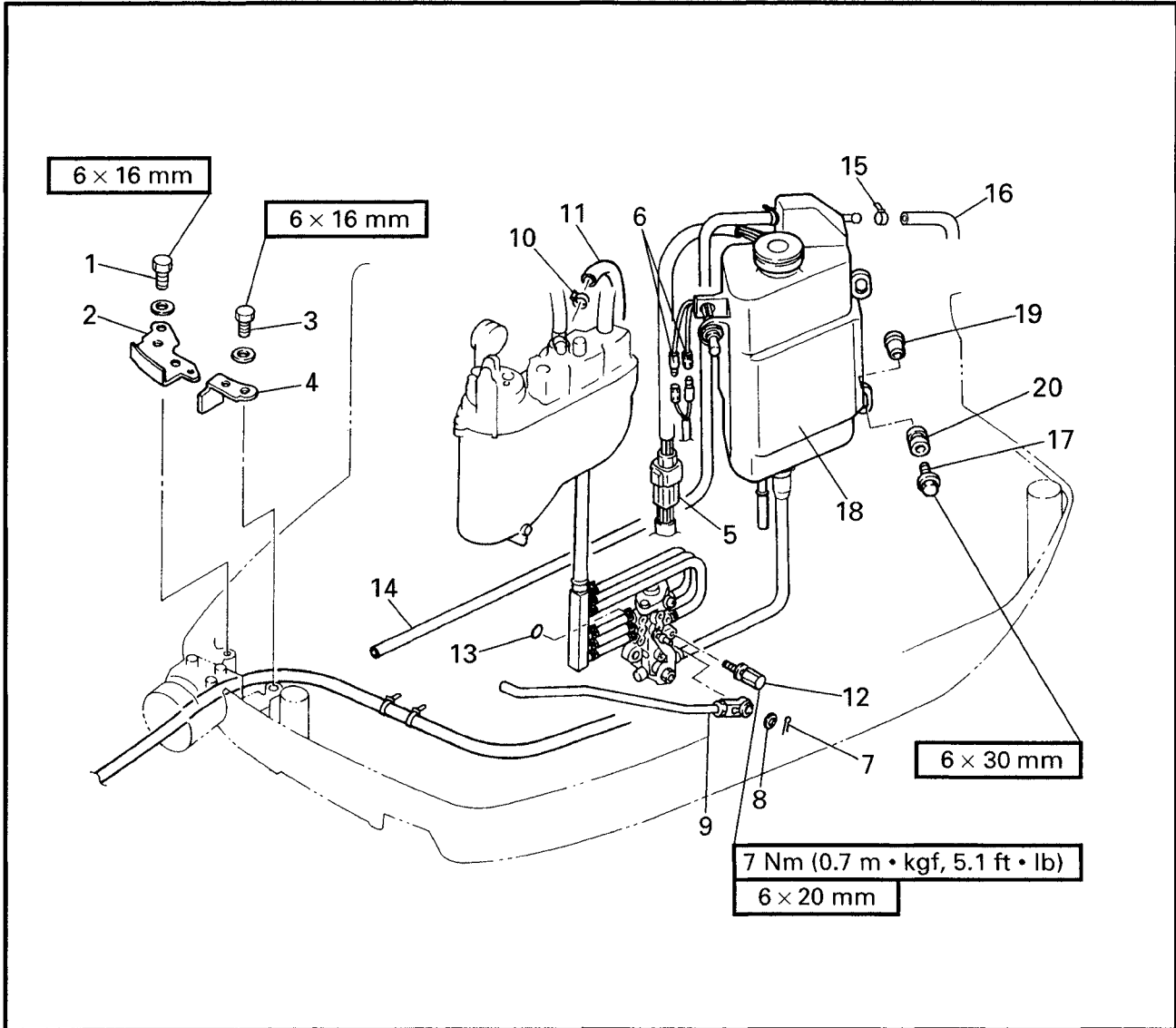
NOTE: _____

- 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).



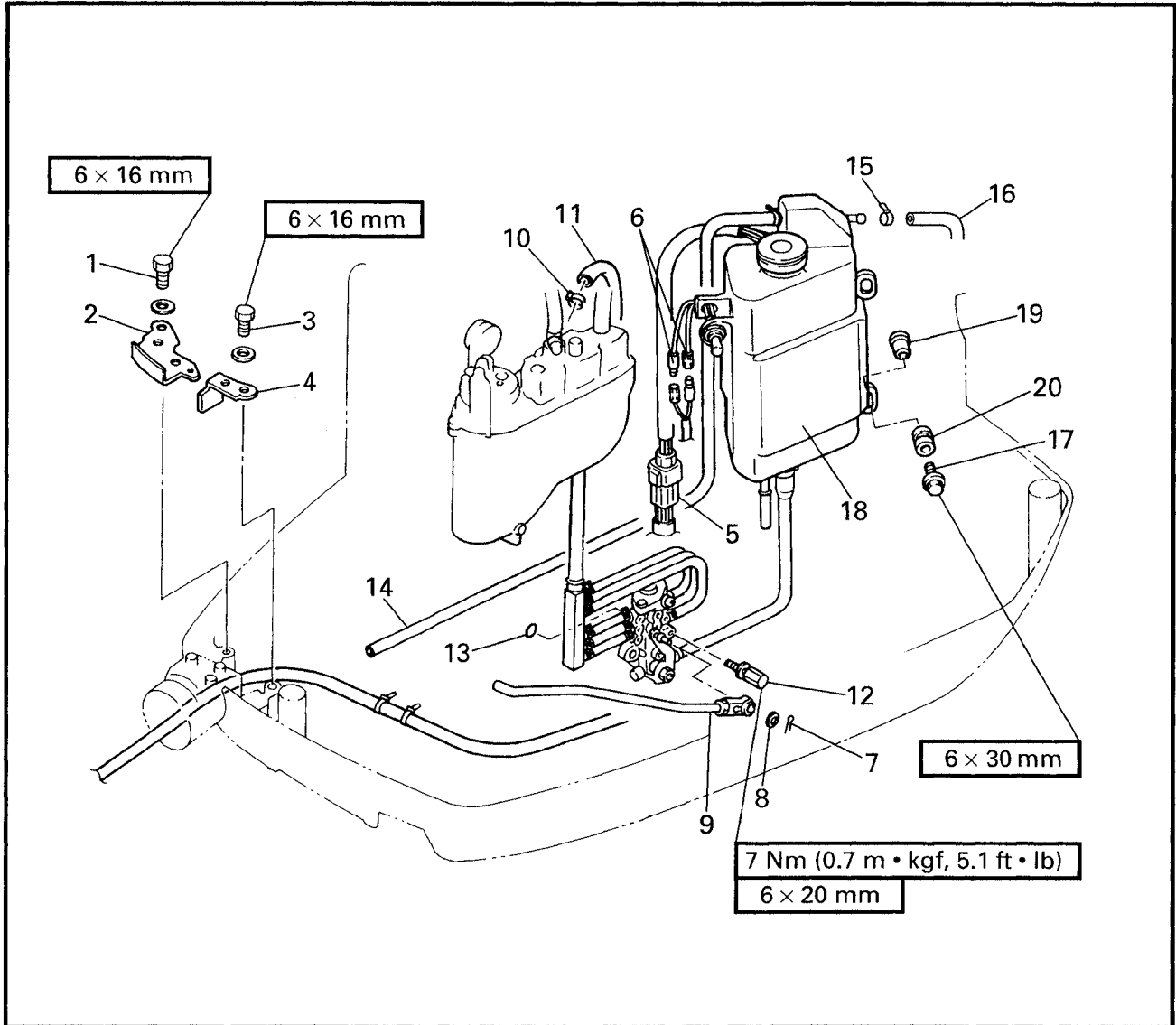
OIL INJECTION SYSTEM

REMOVING/INSTALLING THE OIL INJECTION SYSTEM



Order	Job/Part	Q'ty	Remarks
1	Bolt	2	
2	Bracket	1	
3	Bolt	1	
4	Holder	1	
5	Oil level sensor coupler	1	
6	Emergency switch connector	2	
7	Clip	1	
8	Washer	1	
9	Oil pump link rod	1	
10	Plastic locking tie	1	Not reusable

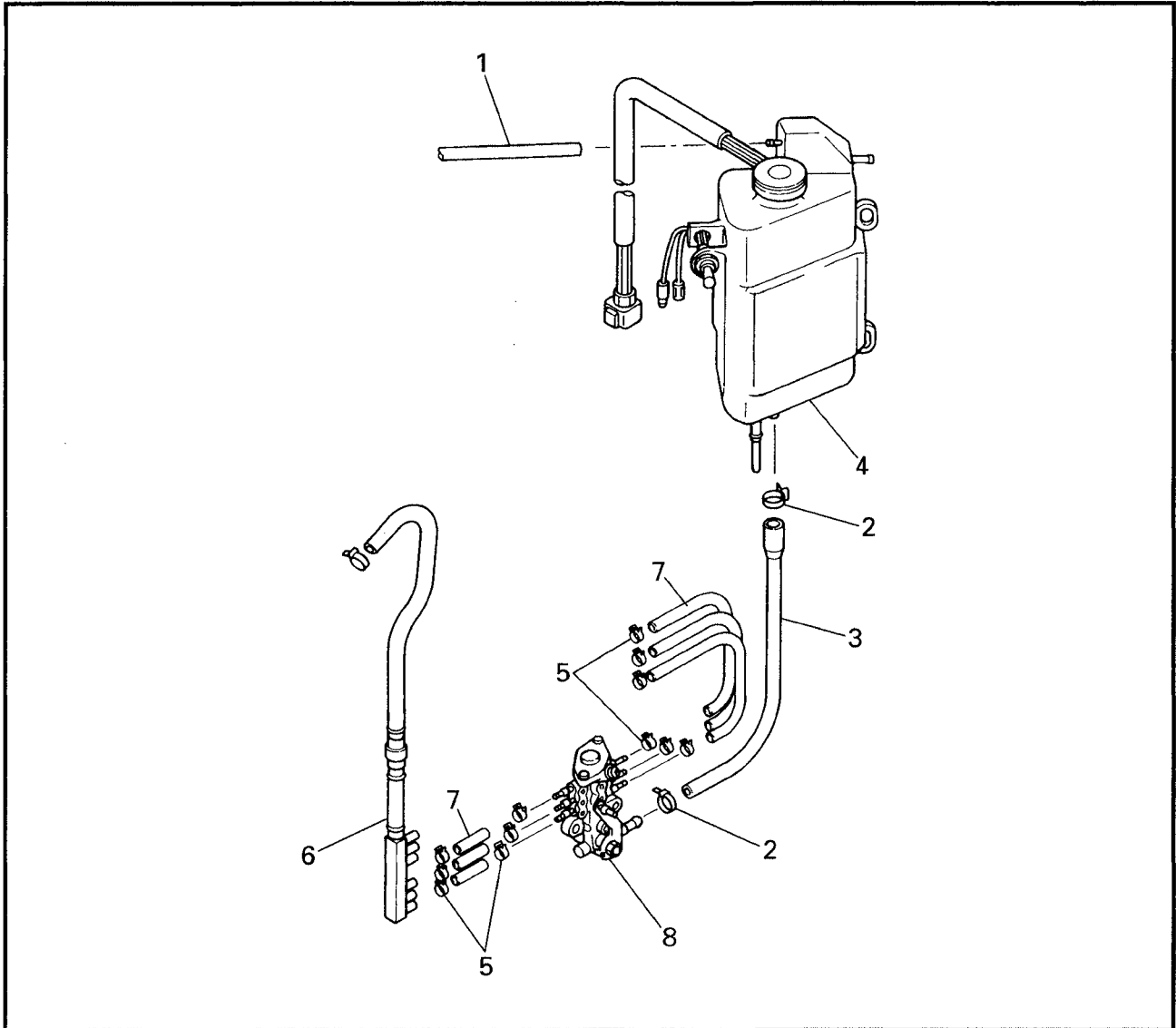
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Order	Job/Part	Q'ty	Remarks
11	Oil hose	1	(oil hose assembly joint-to-vapor separator)
12	Bolt	2	
13	O-ring	1	
14	Oil tank air vent hose	1	(intake silencer-to-oil tank)
15	Plastic locking tie	1	Not reusable
16	Oil hose	1	(sub oil tank-to-oil tank)
17	Bolt	3	
18	Oil tank assembly	1	
19	Collar	3	
20	Grommet	3	
			For installation, reverse the removal procedure.



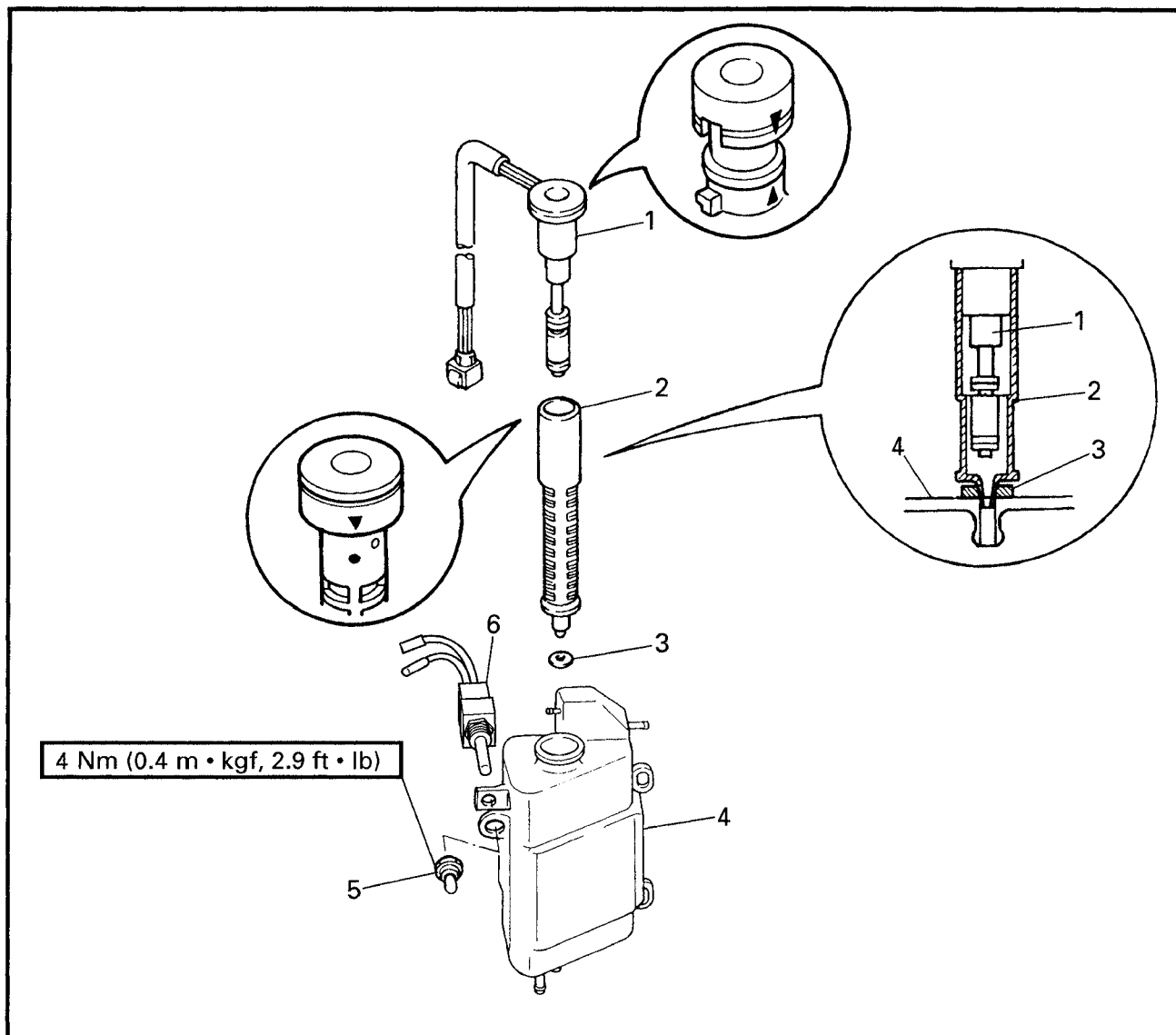
DISASSEMBLING/ASSEMBLING THE OIL INJECTION SYSTEM



Order	Job/Part	Q'ty	Remarks
1	Oil tank air vent hose	1	(oil tank-to-intake silencer)
2	Plastic locking tie	2	Not reusable
3	Oil hose	1	(oil tank-to-oil pump)
4	Oil tank assembly	1	
5	Metal clamp	12	
6	Oil hose assembly	1	(oil pump-to-vapor separator)
7	Oil hose	6	(oil pump-to-oil hose assembly)
8	Oil pump	1	
			For assembly, reverse the disassembly procedure.



OIL TANK
DISASSEMBLING/ASSEMBLING THE OIL TANK



4 Nm (0.4 m • kgf, 2.9 ft • lb)

Order	Job/Part	Q'ty	Remarks
1	Oil level sensor	1	For assembly, reverse the disassembly procedure.
2	Oil strainer	1	
3	Washer	1	
4	Oil tank	1	
5	Emergency switch cap	1	
6	Emergency switch	1	



CHAPTER 5

POWER UNIT

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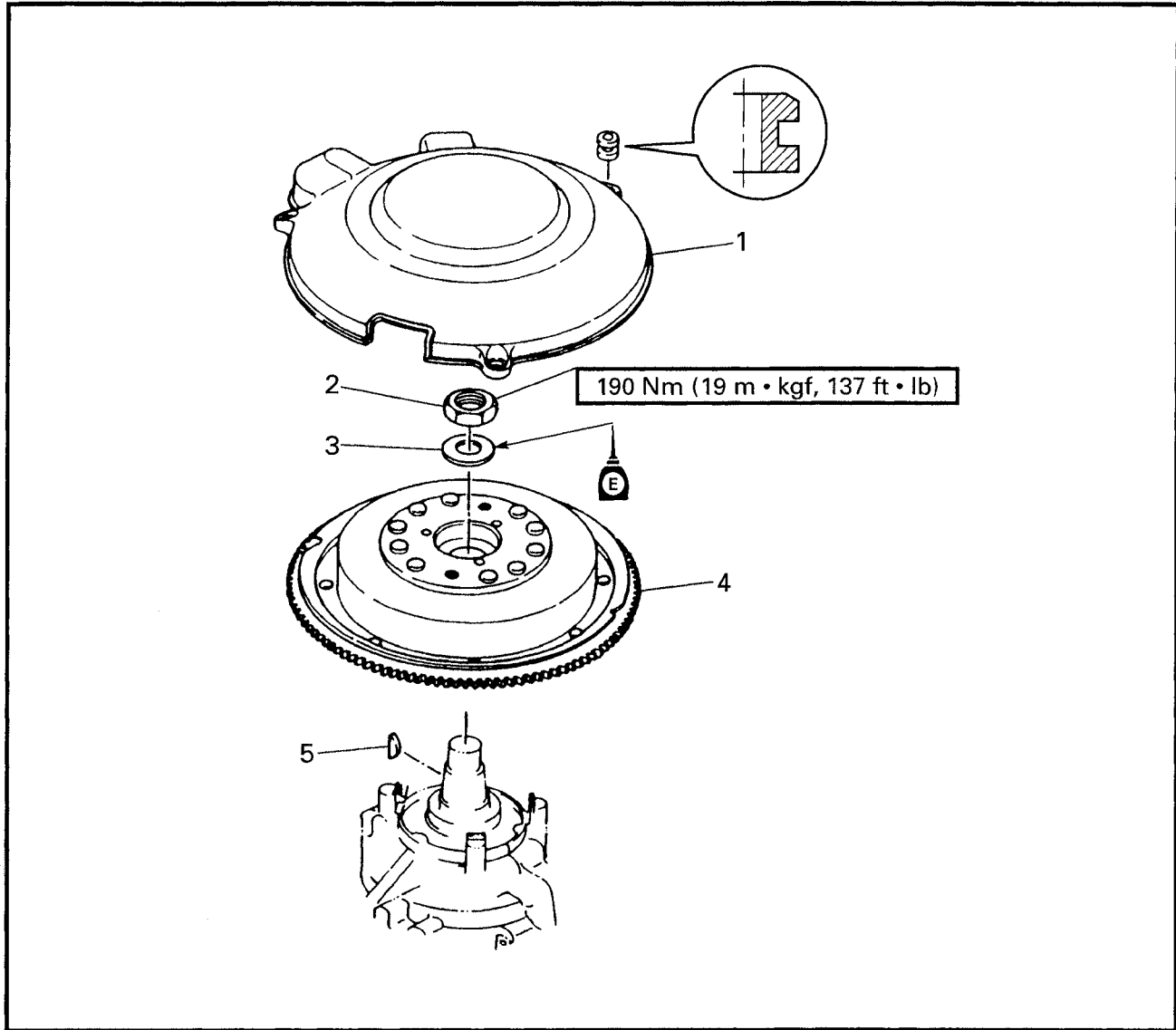
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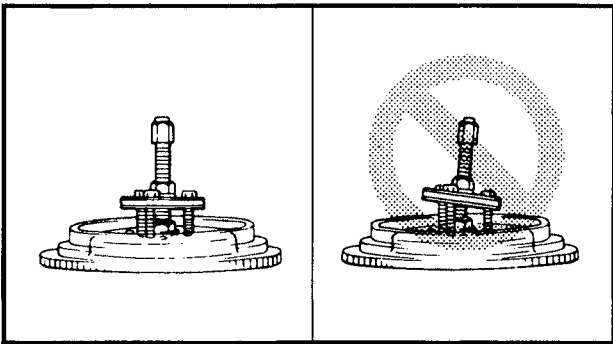
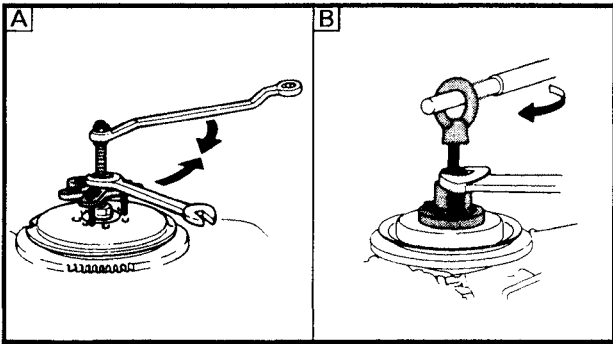
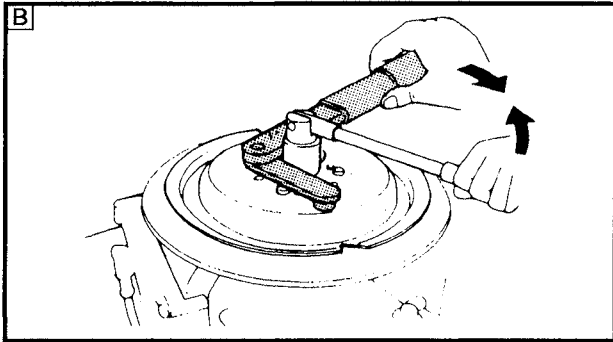
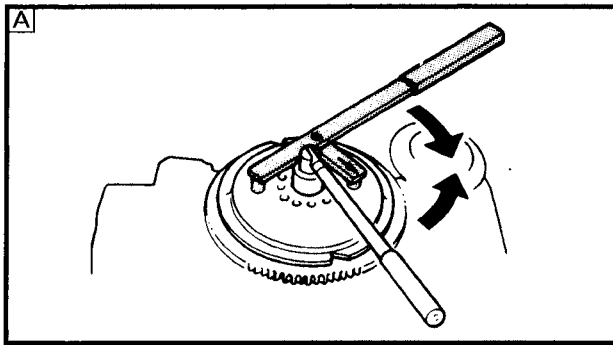


FLYWHEEL MAGNET ASSEMBLY

REMOVING/INSTALLING THE FLYWHEEL MAGNET ASSEMBLY



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



REMOVING THE FLYWHEEL MAGNET ASSEMBLY

Remove:

- Flywheel magnet assembly

Removing steps

(1) Remove the flywheel magnet assembly nut.

	<p>Flywheel magnet assembly holder YB-06139 / 90890-06522</p>
--	--

- 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.

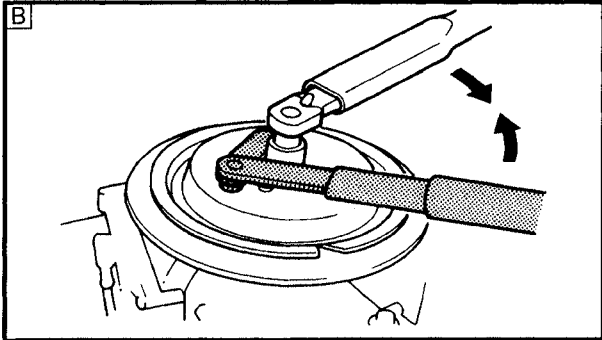
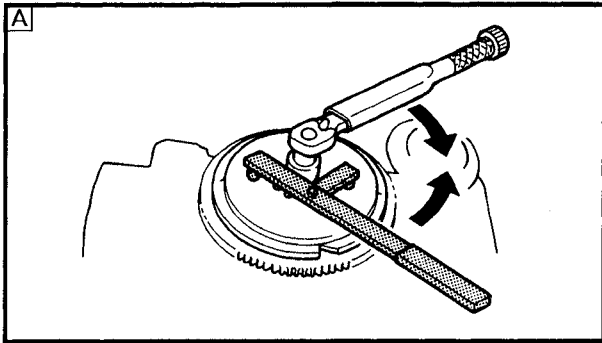
	<p>Universal puller YB-06117 / 90890-06521</p>
--	---

- 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.



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:

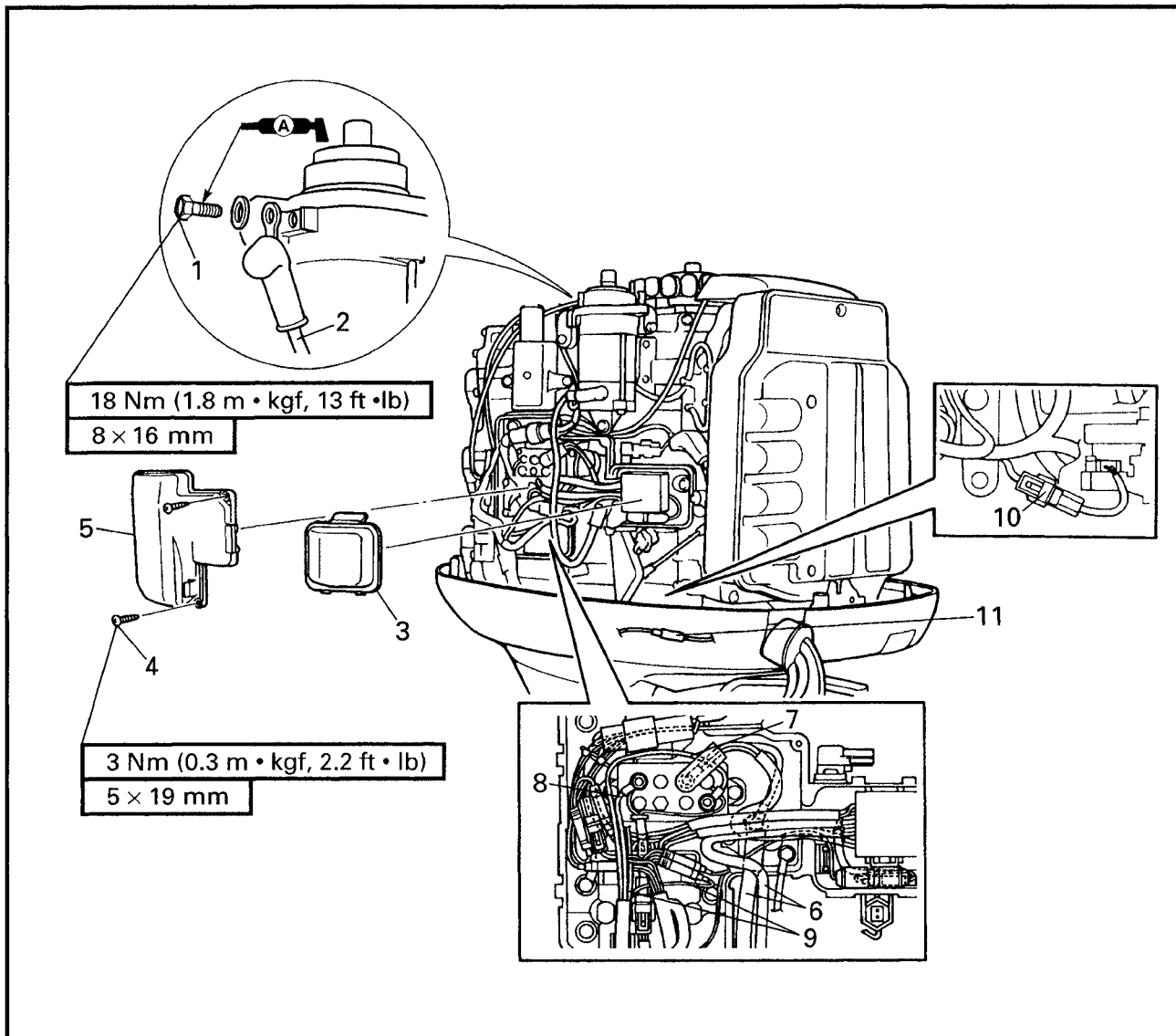
The major load should be applied in the direction of the arrows. If the load is not applied as shown, the flywheel magnet assembly holder may easily slip off of the flywheel magnet assembly.



Flywheel magnet assembly nut
190 Nm (19 m • kgf, 137 ft • lb)

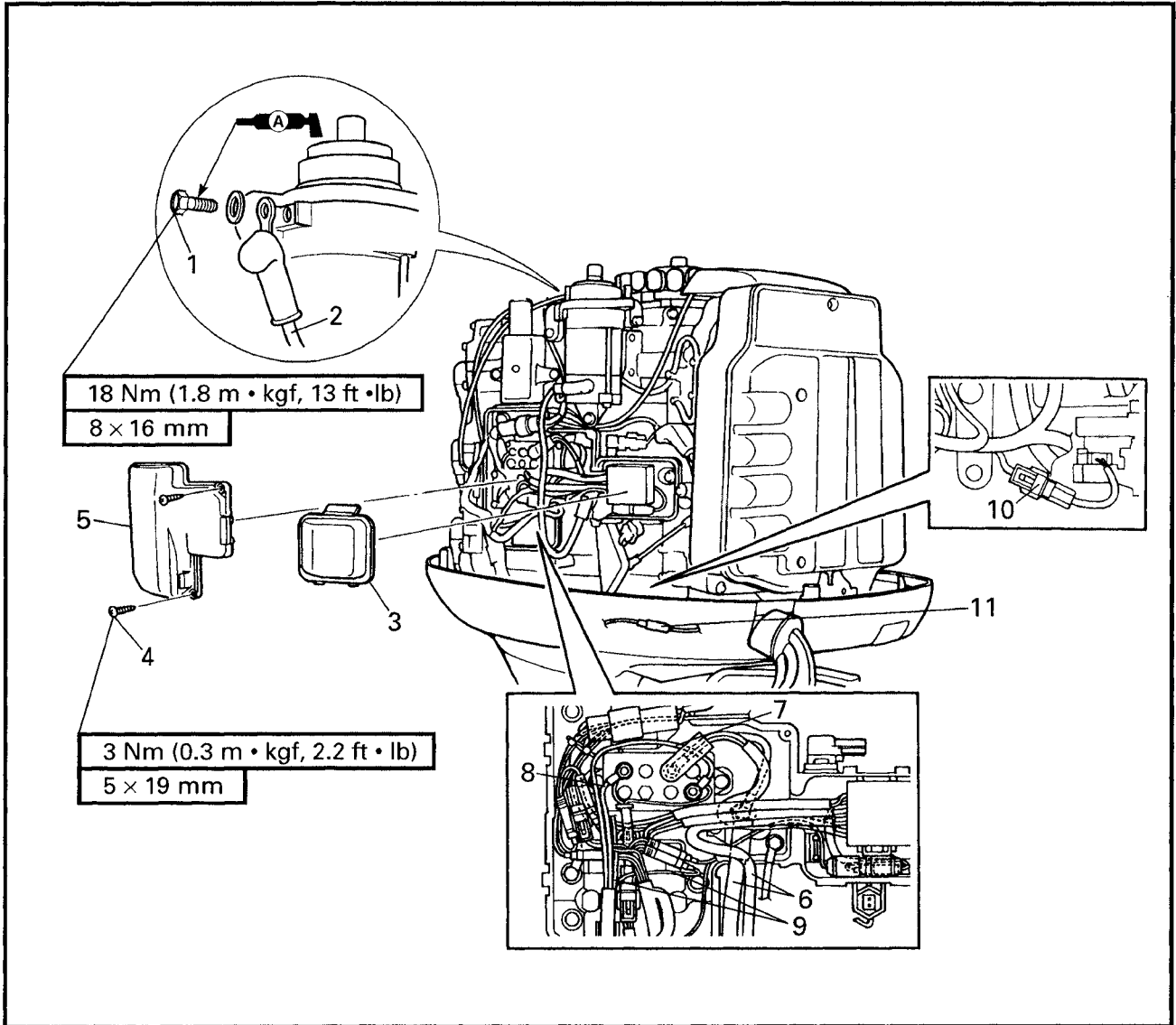


**POWER UNIT
DISCONNECTING/CONNECTING THE LEADS**



Order	Job/Part	Q'ty	Remarks
	Battery leads		(from the battery)
	Remote control shift and throttle rods and cables		
1	Bolt	1	
2	Negative battery lead	1	
3	Fuse cover	1	
4	Screw	2	
5	Junction box cover	1	

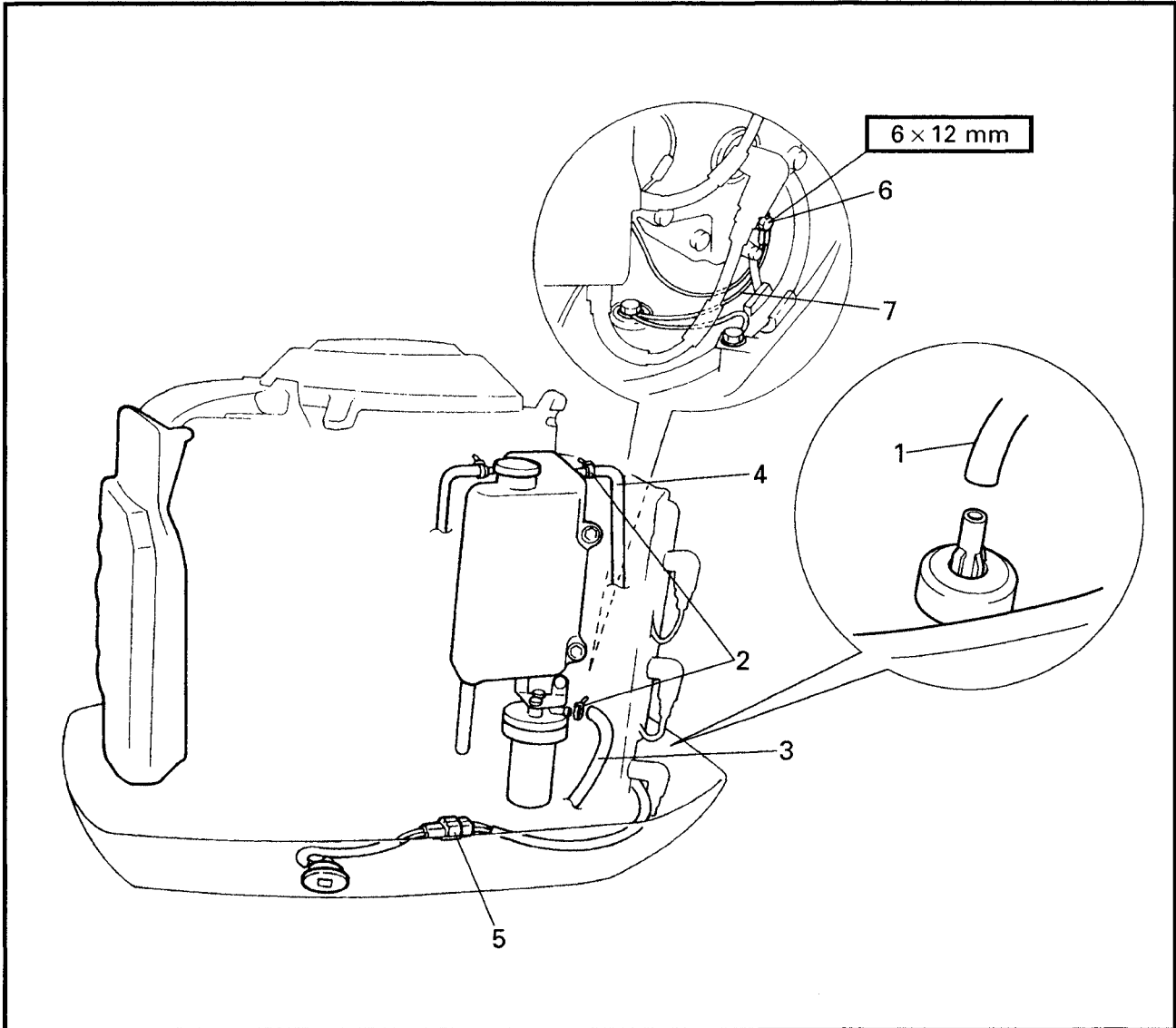
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Order	Job/Part	Q'ty	Remarks
6	Positive battery lead	2	
7	Power trim and tilt lead	1	(sky blue)
8	Power trim and tilt lead	1	(light green)
9	Power trim and tilt lead	2	(black)
10	Shift cutoff switch coupler	1	
11	Trim sensor connector	1	
For installation, reverse the removal procedure.			



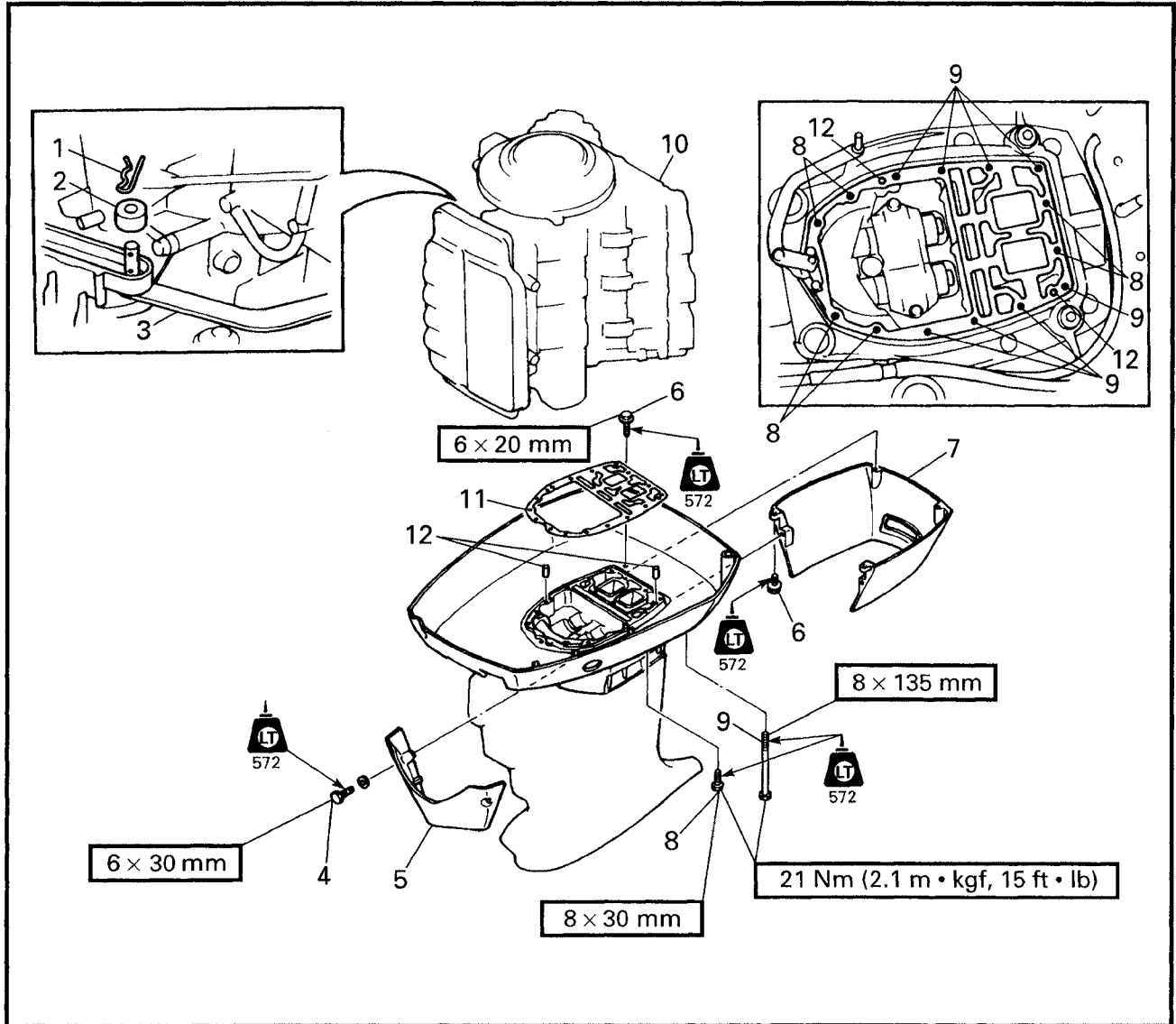
DISCONNECTING/CONNECTING THE HOSES



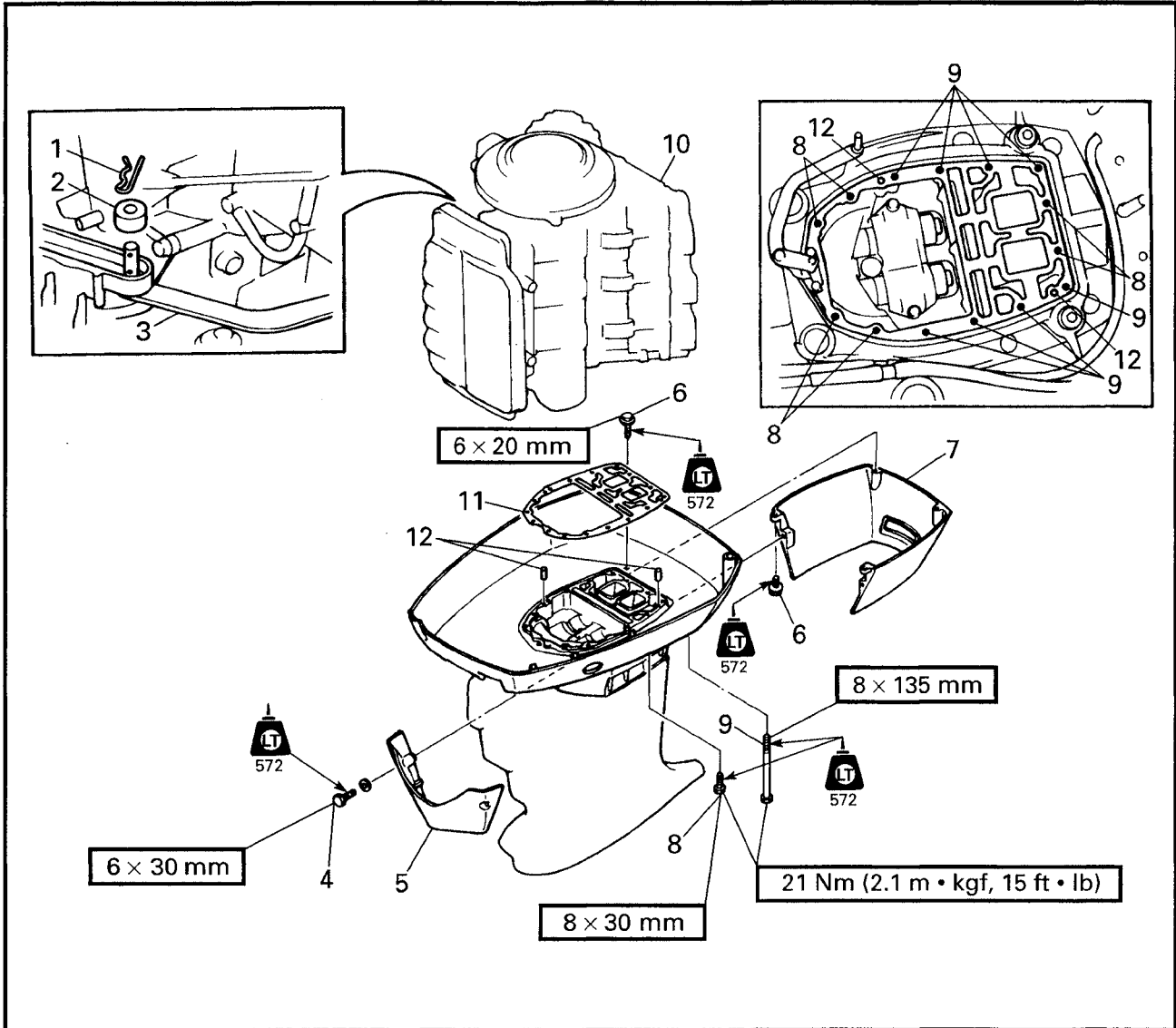
Order	Job/Part	Q'ty	Remarks
1	Pilot water hose	1	
2	Plastic locking tie	2	Not reusable
3	Fuel hose	1	(fuel joint-to-fuel filter)
4	Oil hose	1	(sub oil tank-to-oil tank)
5	Trailer switch coupler	1	
6	Bolt	1	
7	Ground lead	1	
			For installation, reverse the removal procedure.



REMOVING/INSTALLING THE POWER UNIT



Order	Job/Part	Q'ty	Remarks
1	Clip	1	
2	Bushing	1	
3	Shift rod lever	1	
4	Bolt	2	
5	Forward apron	1	
6	Bolt	4	
			Continued on next page.

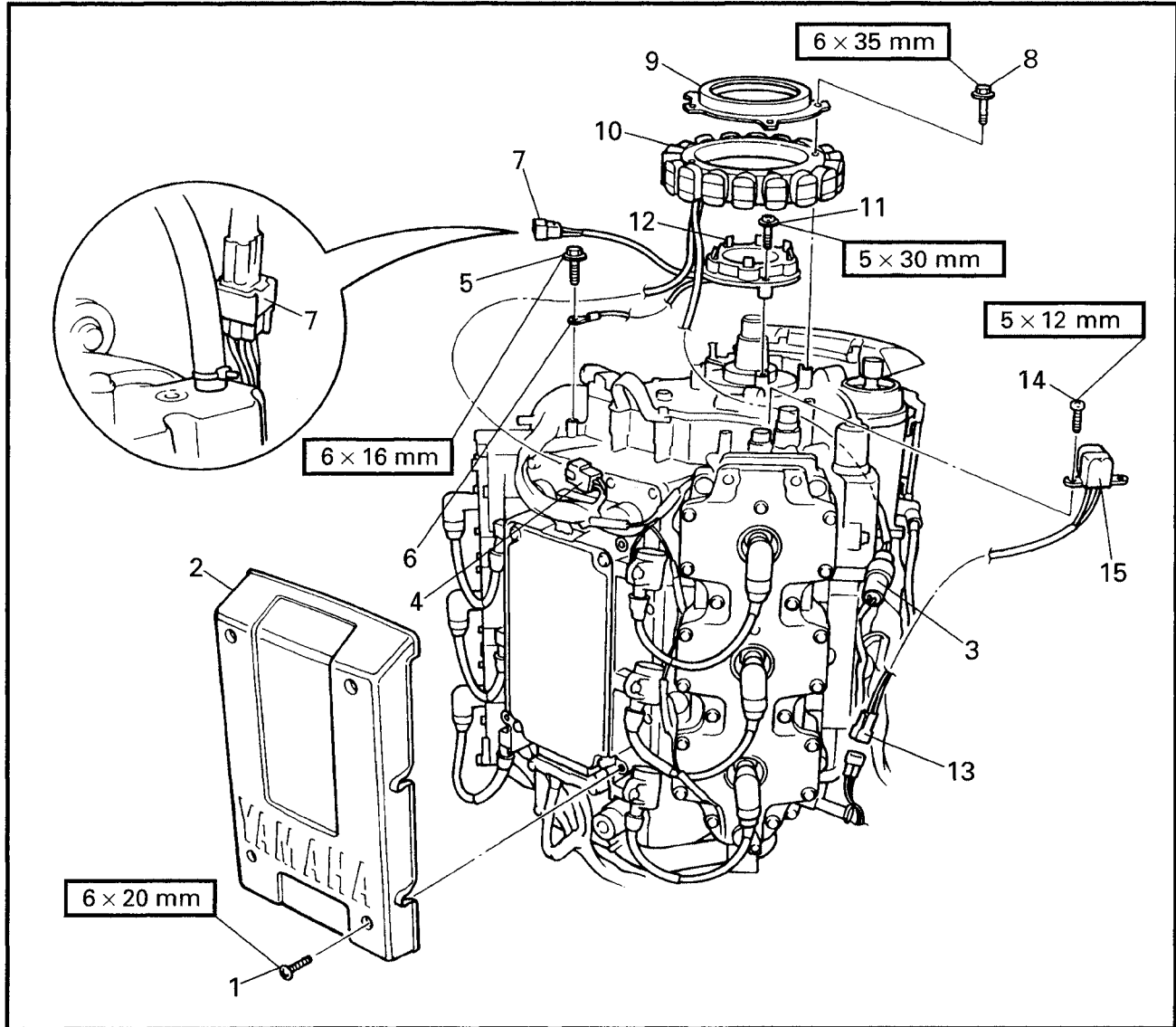


Order	Job/Part	Q'ty	Remarks
7	Rear apron	1	
8	Bolt	6	
9	Bolt	8	
10	Power unit	1	
11	Gasket	1	Not reusable
12	Dowel pin	2	
			For installation, reverse the removal procedure.



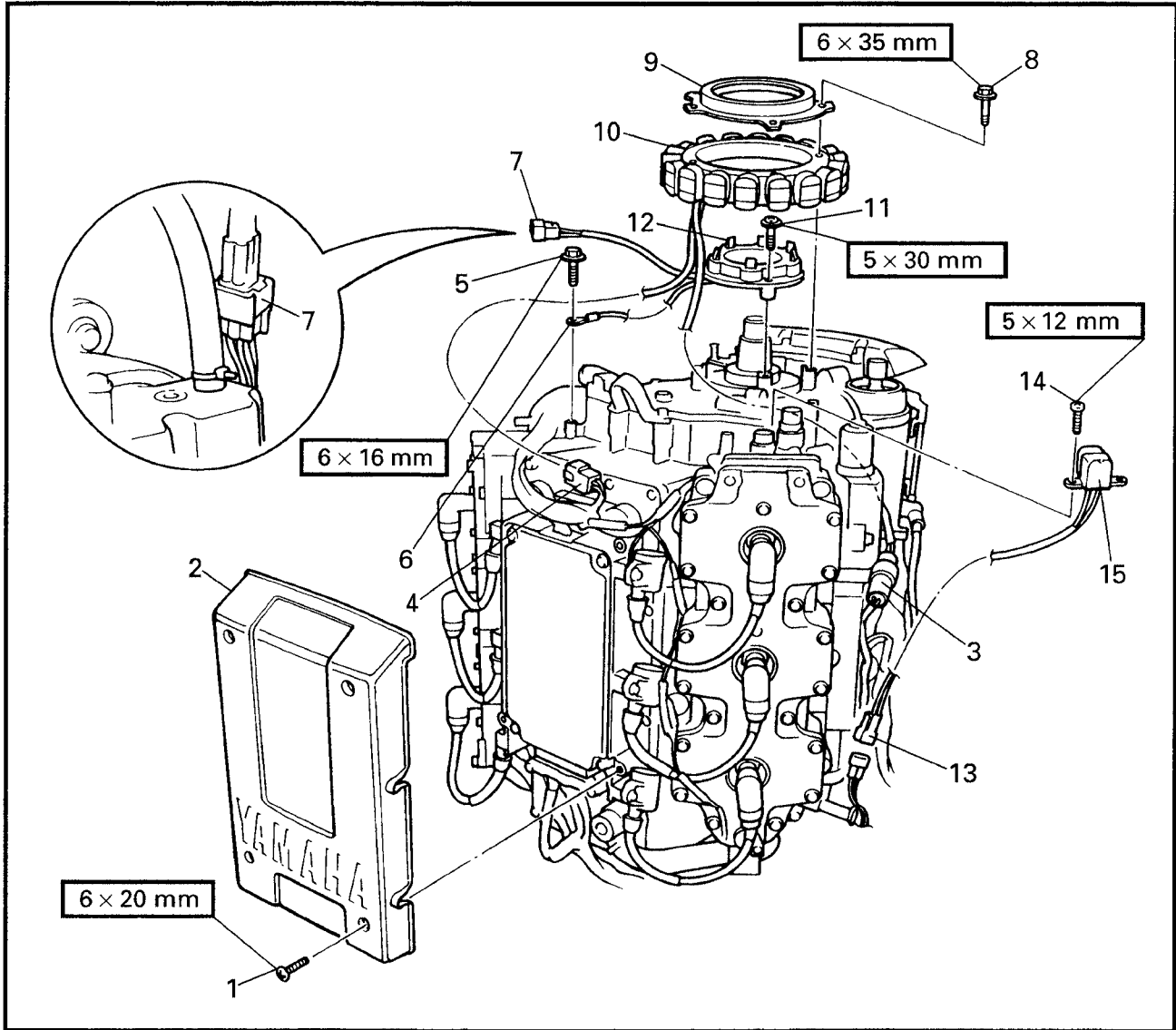
STATOR ASSEMBLY

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	Lighting coil coupler	1	
4	Charge coil coupler	1	
5	Bolt	1	
6	Ground lead	1	
7	Pulser coil coupler	1	

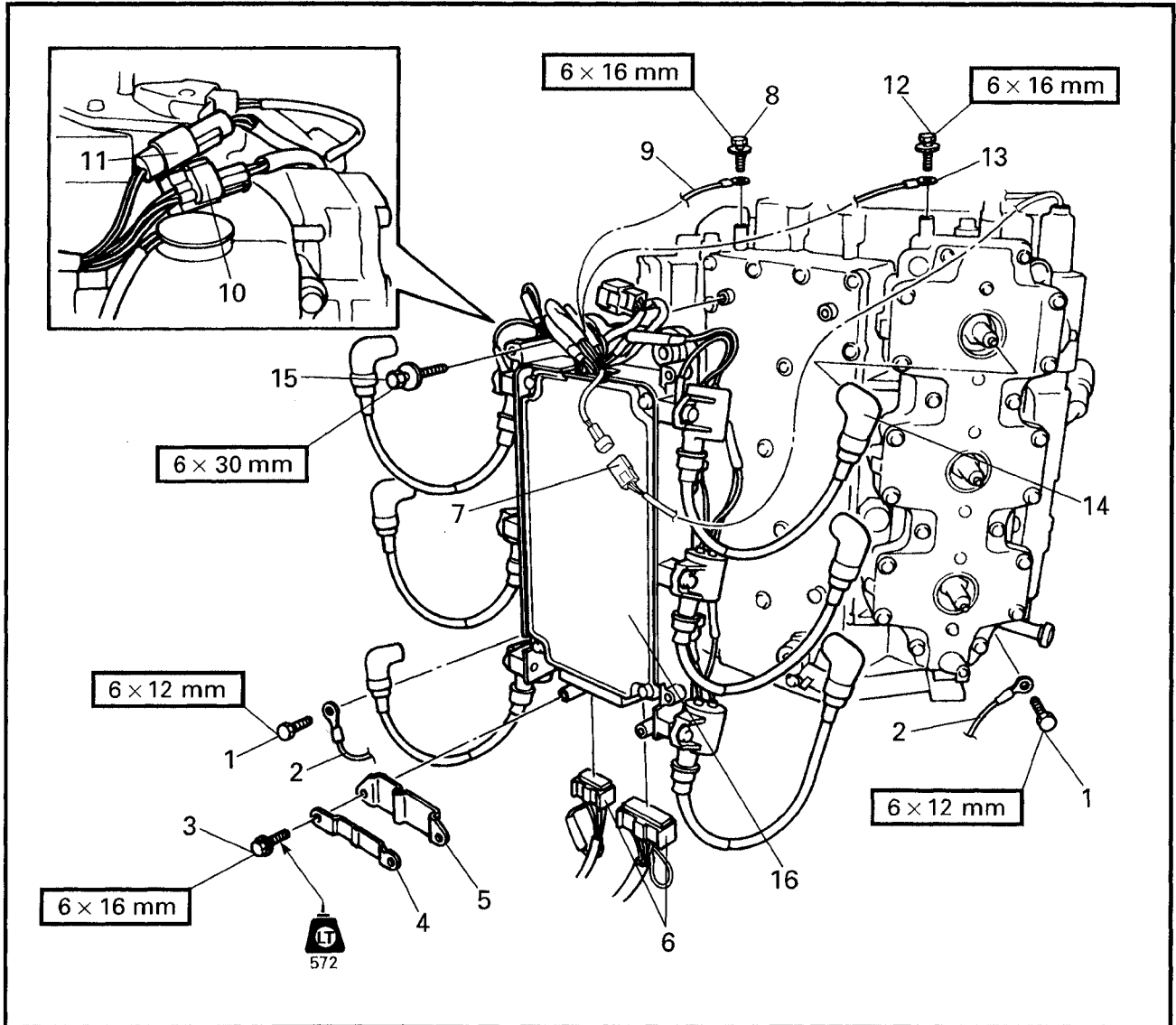
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Order	Job/Part	Q'ty	Remarks
8	Bolt	4	
9	Stator assembly holder	1	
10	Stator assembly	1	
11	Screw	3	
12	Pulser coil assembly	1	
13	Crank position sensor coupler	1	
14	Screw	2	
15	Crank position sensor	1	
			For installation, reverse the removal procedure.

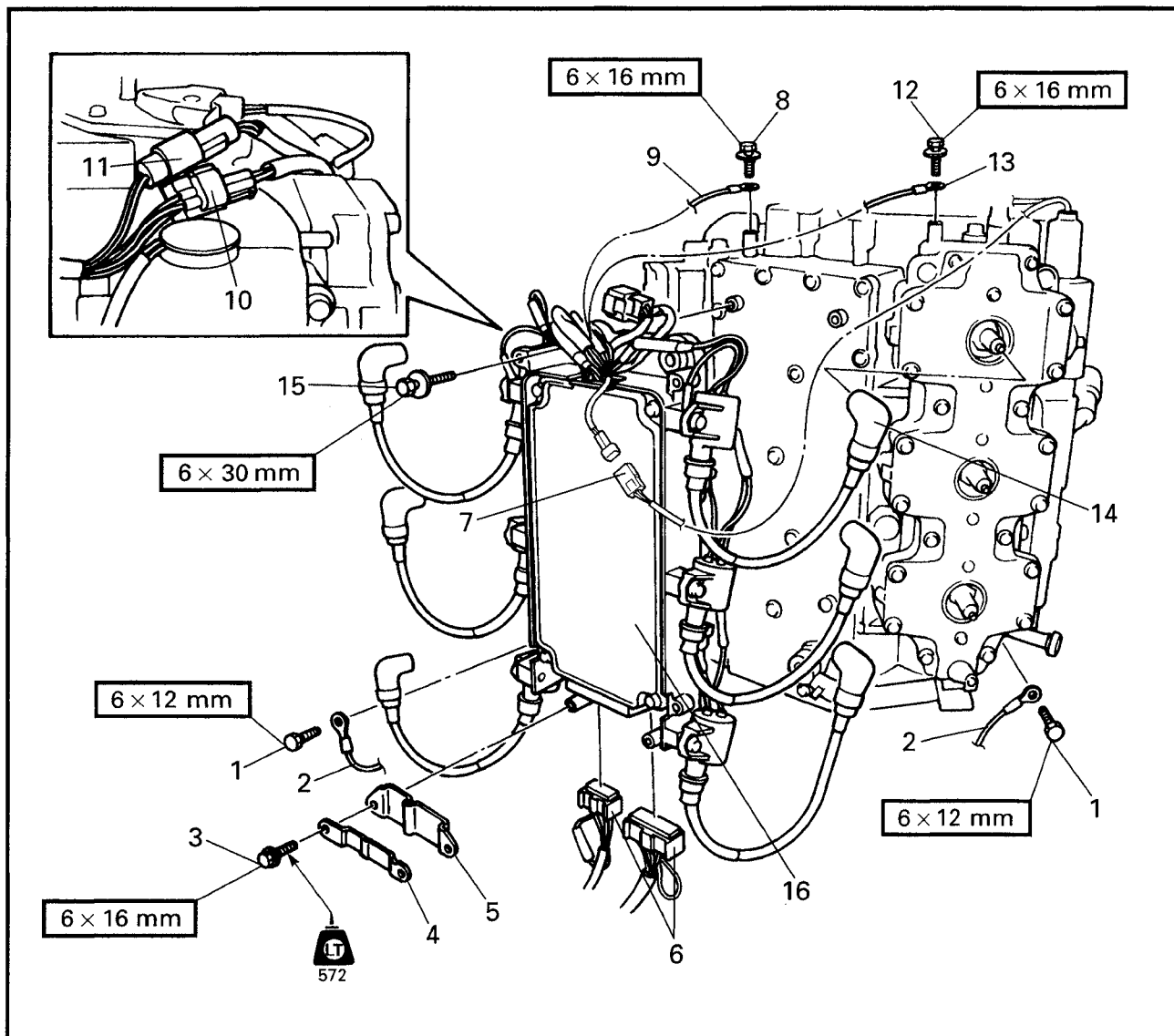


**CDI UNIT
REMOVING/INSTALLING THE CDI UNIT ASSEMBLY**



Order	Job/Part	Q'ty	Remarks
	CDI unit cover		Refer to "STATOR ASSEMBLY" on page 5-9.
1	Bolt	2	
2	Ground lead	2	
3	Bolt	2	
4	CDI unit coupler holder	1	
5	CDI unit coupler guide	1	
6	CDI unit coupler	2	
7	Oxygen density sensor coupler	1	(black coupler)
8	Bolt	1	

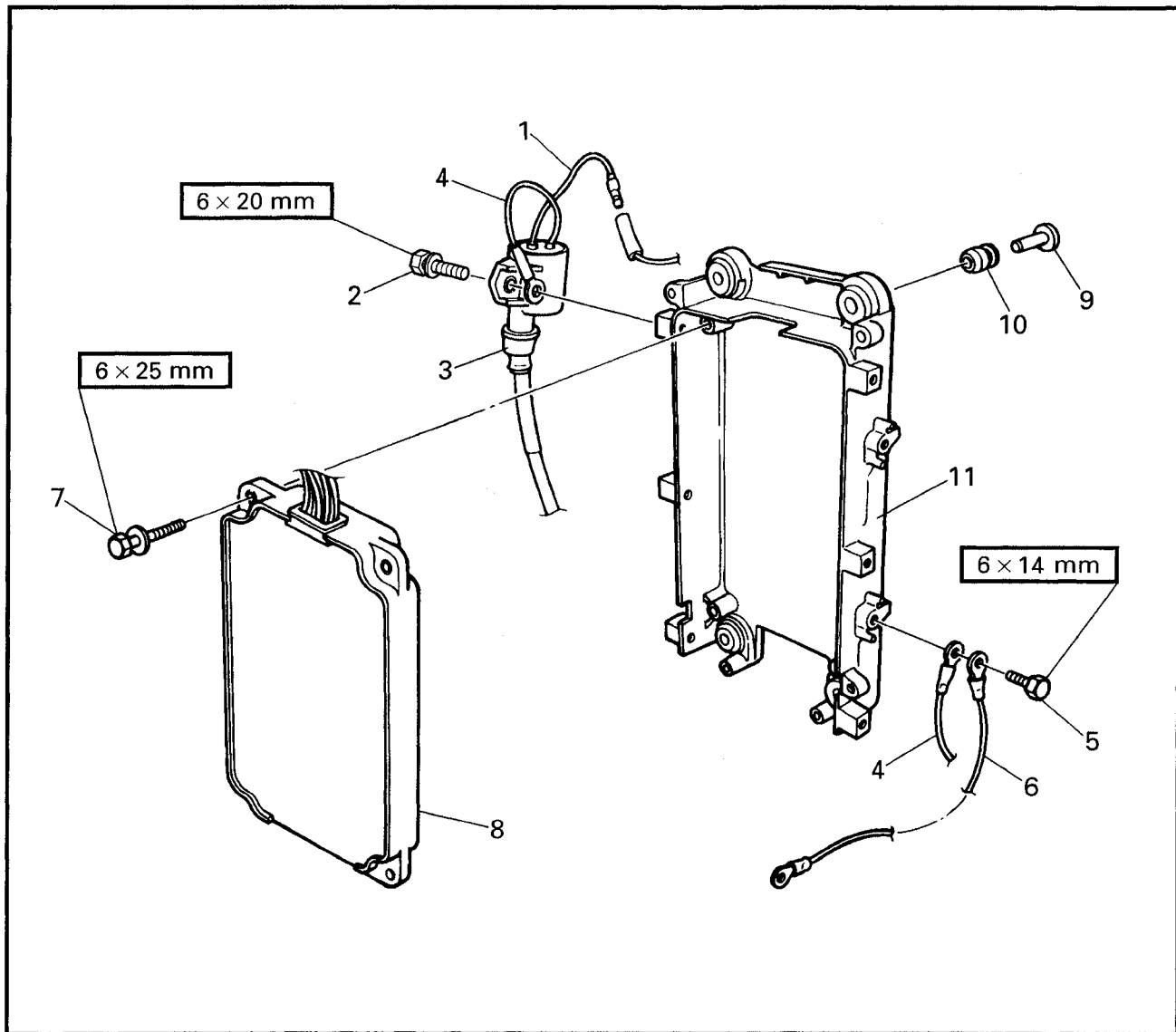
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Order	Job/Part	Q'ty	Remarks
9	Ground lead	1	
10	Fuel injector coupler	1	
11	High-pressure fuel pump resistor coupler	1	
12	Bolt	1	
13	Ground lead	1	
14	Spark plug cap	6	
15	Bolt	4	
16	CDI unit assembly	1	
			For installation, reverse the removal procedure.



REMOVING/INSTALLING THE CDI UNIT

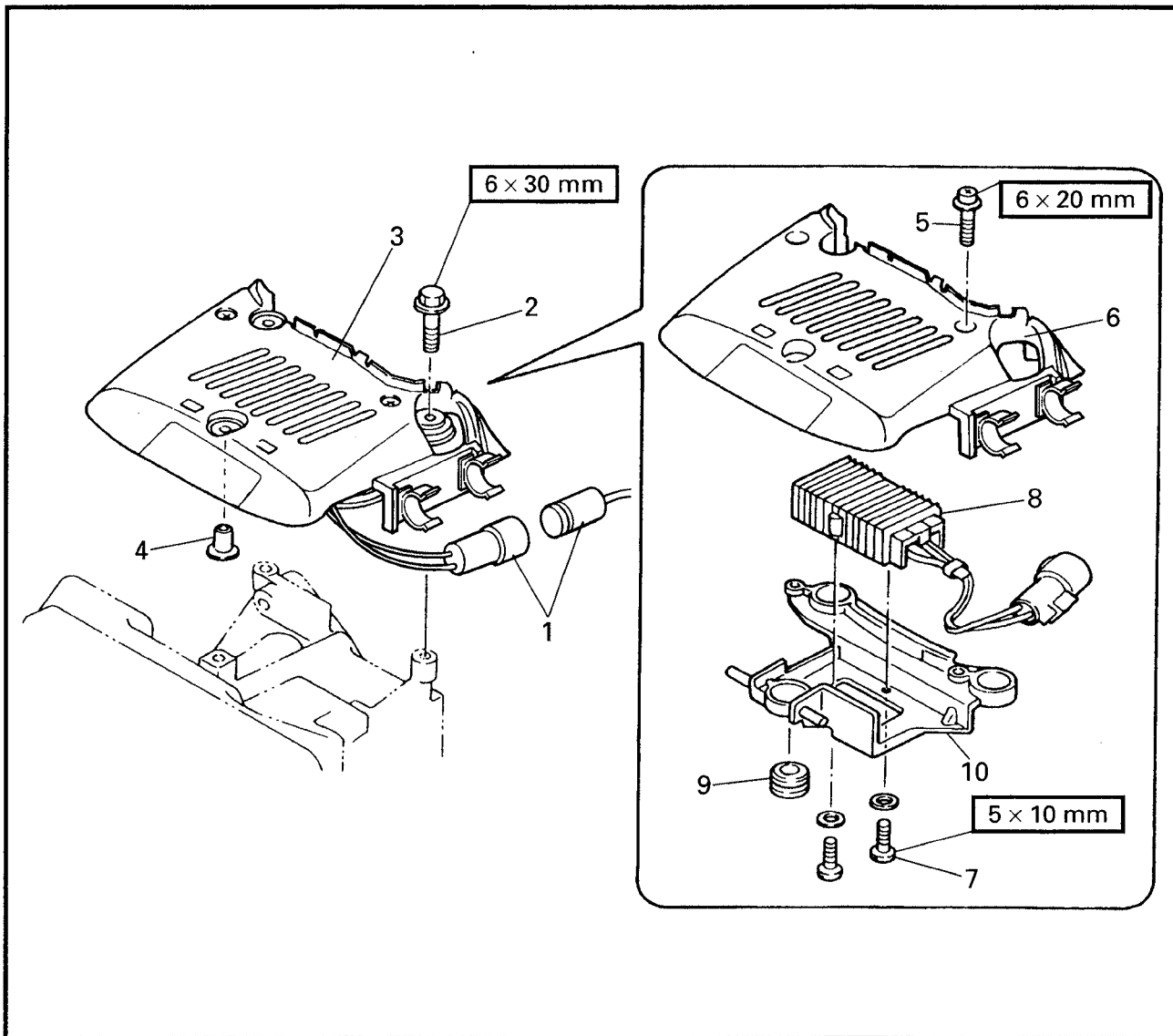


Order	Job/Part	Q'ty	Remarks
1	Ignition coil connector	6	
2	Bolt	6	
3	Ignition coil	6	
4	Ground lead	6	
5	Bolt	4	
6	Ground lead	3	
7	Bolt	4	
8	CDI unit	1	
9	Collar	4	
10	Grommet	4	
11	CDI unit case	1	
			For assembly, reverse the disassembly procedure.



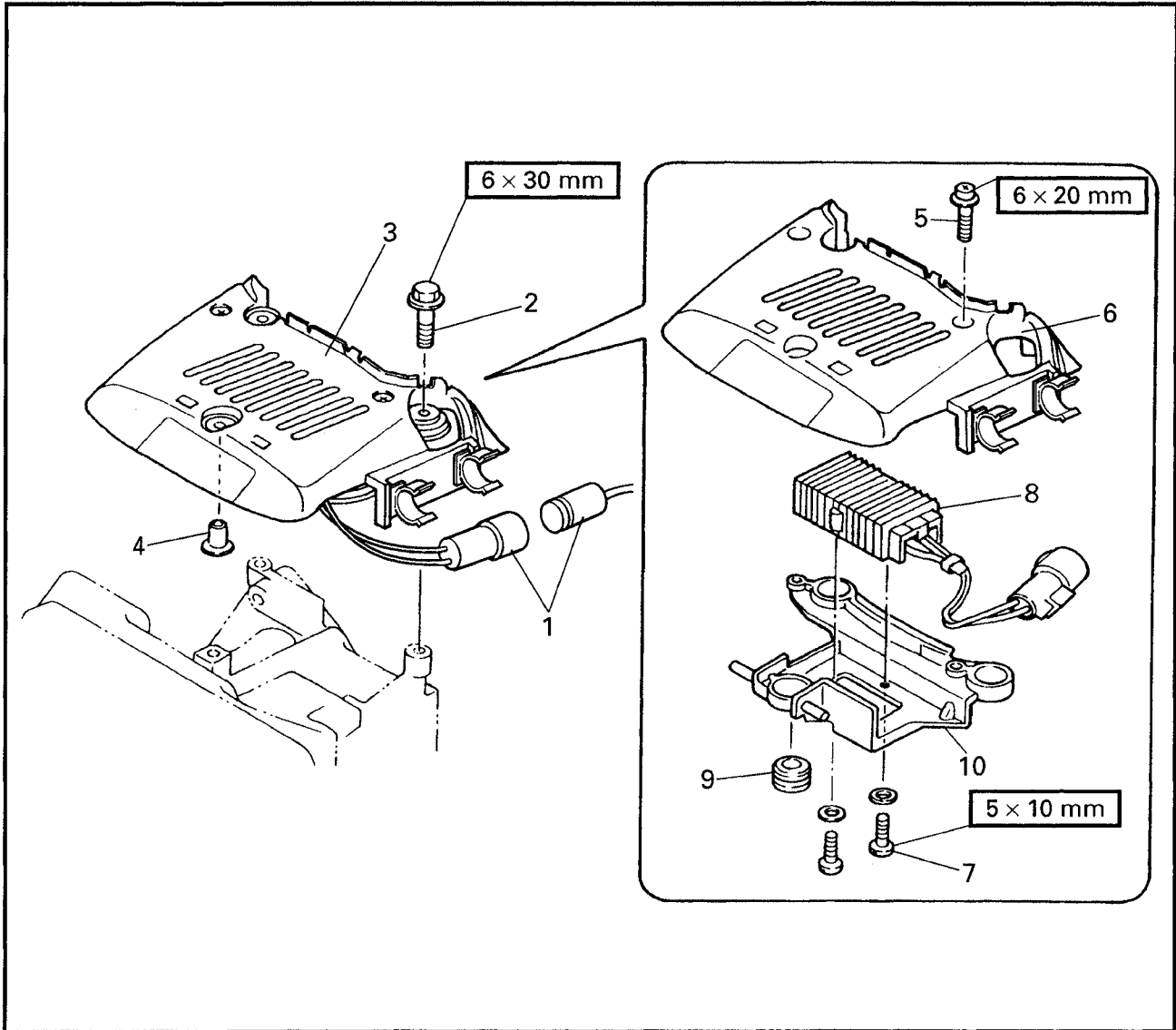
HIGH-PRESSURE FUEL PUMP RESISTOR

REMOVING/INSTALLING THE HIGH-PRESSURE FUEL PUMP RESISTOR



Order	Job/Part	Q'ty	Remarks
1	High-pressure fuel pump resistor coupler	1	
2	Bolt	3	(with washer)
3	High-pressure fuel pump resistor assembly	1	
4	Collar	3	
5	Screw	2	(with washer)

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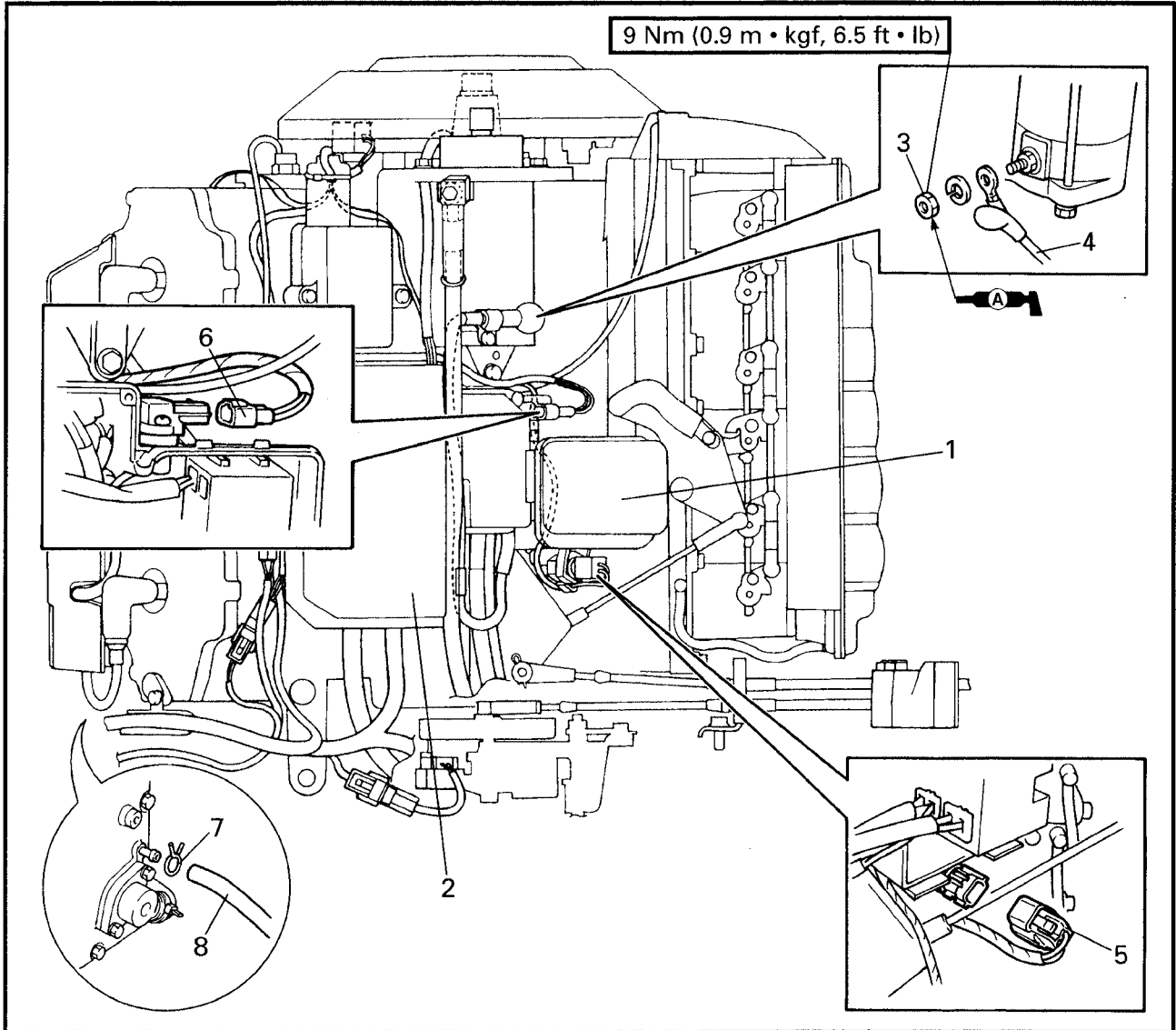


Order	Job/Part	Q'ty	Remarks
6	High-pressure fuel pump resistor cover	1	
7	Screw	2	(with washer)
8	High-pressure fuel pump resistor	1	
9	Grommet	3	
10	High-pressure fuel pump resistor mounting base	1	
			For installation, reverse the removal procedure.



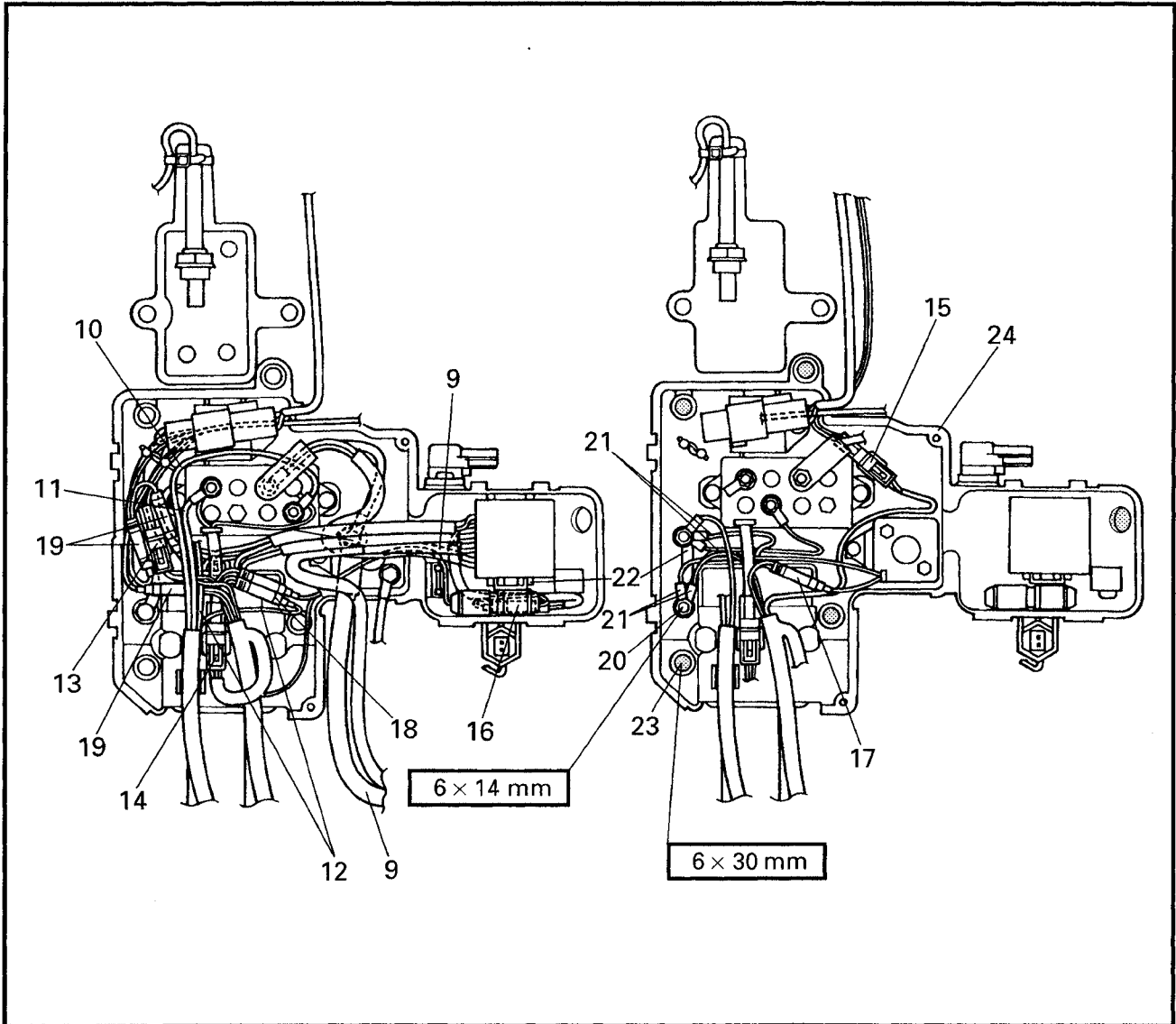
JUNCTION BOX ASSEMBLY

REMOVING/INSTALLING THE JUNCTION BOX ASSEMBLY



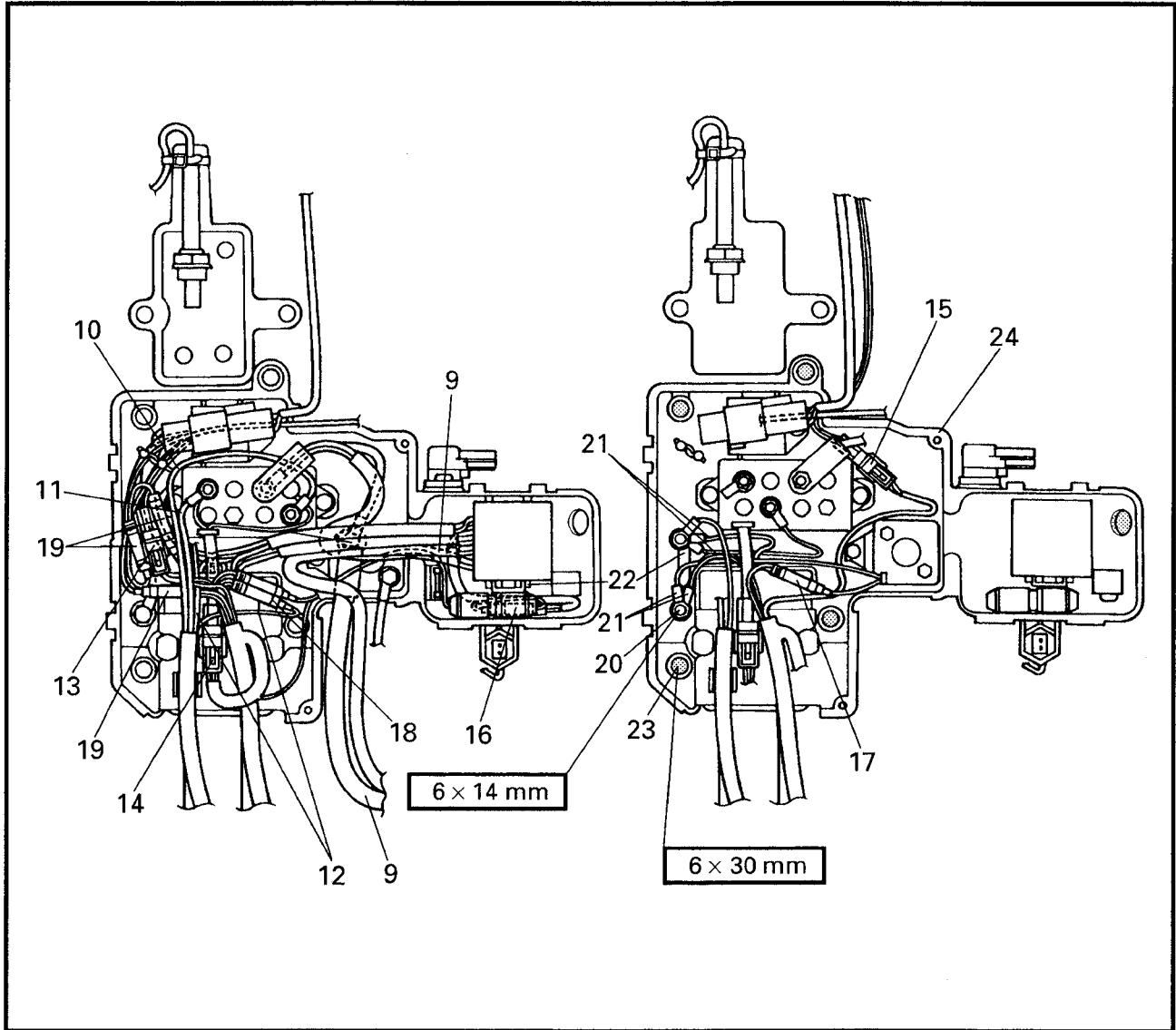
Order	Job/Part	Q'ty	Remarks
1	Fuse cover	1	
2	Junction box cover	1	
3	Nut	1	
4	Starter motor lead	1	
5	Intake air temperature sensor coupler	1	
6	Atmospheric pressure sensor coupler	1	
7	Clip	1	
8	Cooling water hose	1	(exhaust outer cover-to-rectifier/regulator)

Continued on next page.



Order	Job/Part	Q'ty	Remarks
9	Positive battery lead	2	
10	Power trim and tilt lead	1	(sky blue)
11	Power trim and tilt lead	1	(green)
12	Power trim and tilt lead	2	(black)
13	Main relay coupler	1	
14	Power trim and tilt relay coupler	1	
15	Oxygen density sensor coupler	1	(blue coupler)
16	Fuse connector (30A)	1	

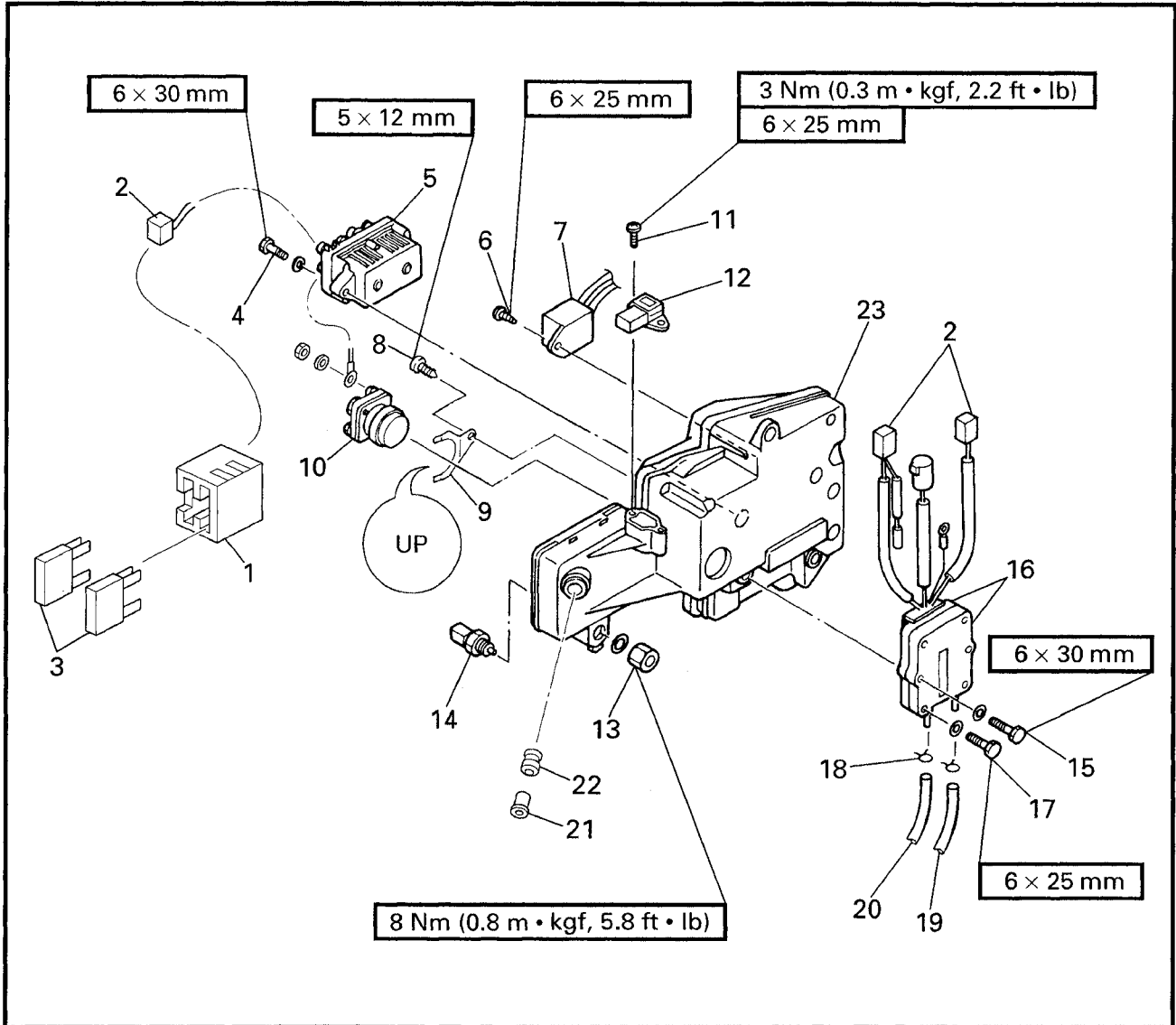
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Order	Job/Part	Q'ty	Remarks
17	Starter relay connector	1	(except for 200H, 225G/V200, V225) For installation, reverse the removal procedure.
18	Thermo switch connector	1	
19	Main relay connector	3	
20	Bolt	2	
21	Ground lead	4	
22	Ground lead plate	1	
23	Bolt	5	
24	Junction box assembly	1	

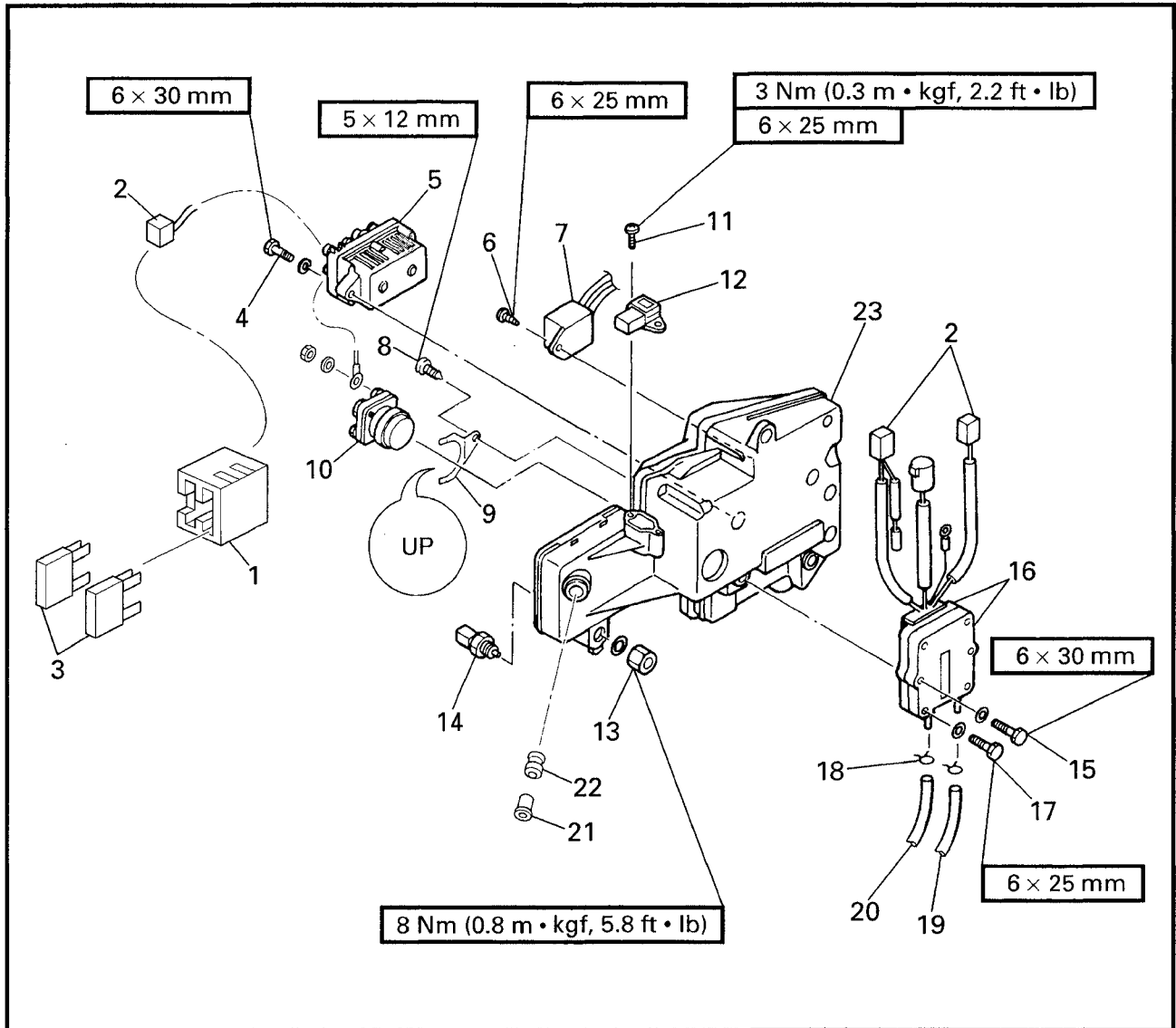


DISASSEMBLING/ASSEMBLING THE JUNCTION BOX ASSEMBLY



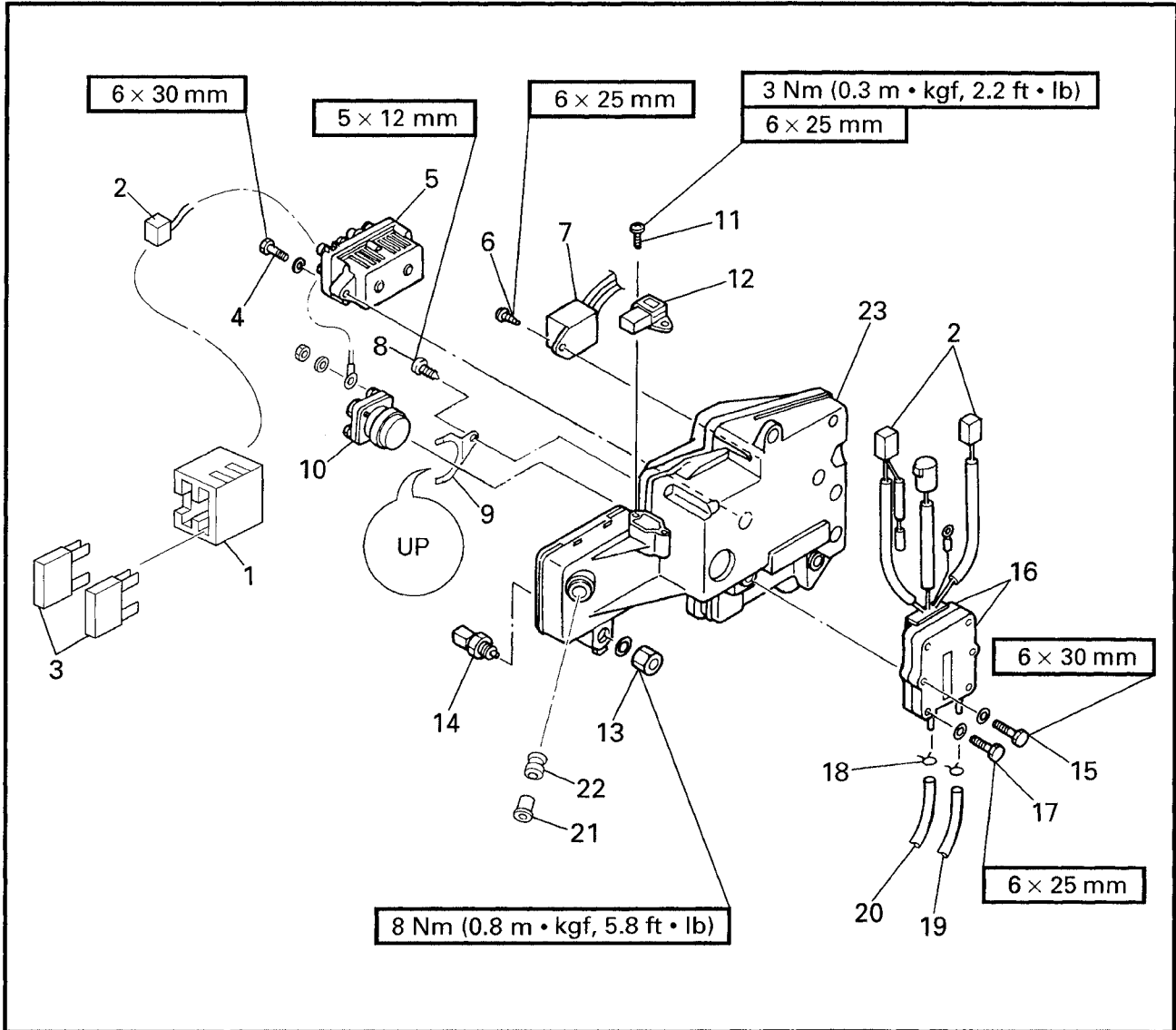
Order	Job/Part	Q'ty	Remarks
1	Fuse holder	1	
2	Fuse coupler	3	
3	Fuse (80A)	2	
4	Bolt	2	
5	Power trim and tilt relay	1	
6	Screw	1	
7	Main relay	1	
8	Screw	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
9	Starter relay holder	1	
10	Starter relay	1	
11	Screw	2	
12	Atmospheric pressure sensor	1	
13	Nut	1	
14	Intake air temperature sensor	1	
15	Bolt	2	
16	Rectifier/regulator	1	

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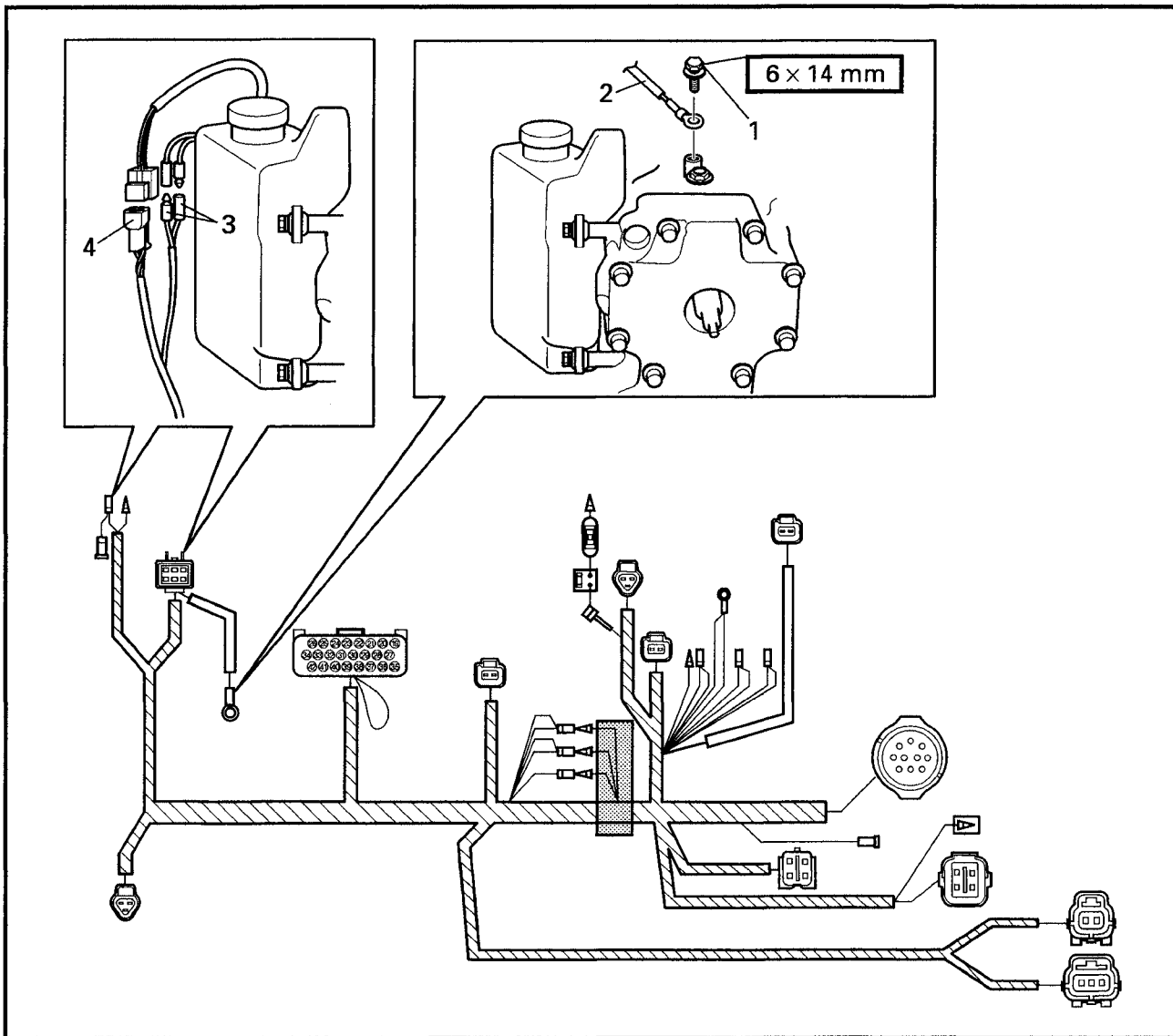


Order	Job/Part	Q'ty	Remarks
17	Bolt	4	
18	Clip	2	
19	Cooling water hose	1	(to exhaust outer cover)
20	Cooling water hose	1	(to pilot water outlet)
21	Collar	5	
22	Grommet	5	
23	Junction box	1	
			For assembly, reverse the disassembly procedure.



WIRE HARNESSSES

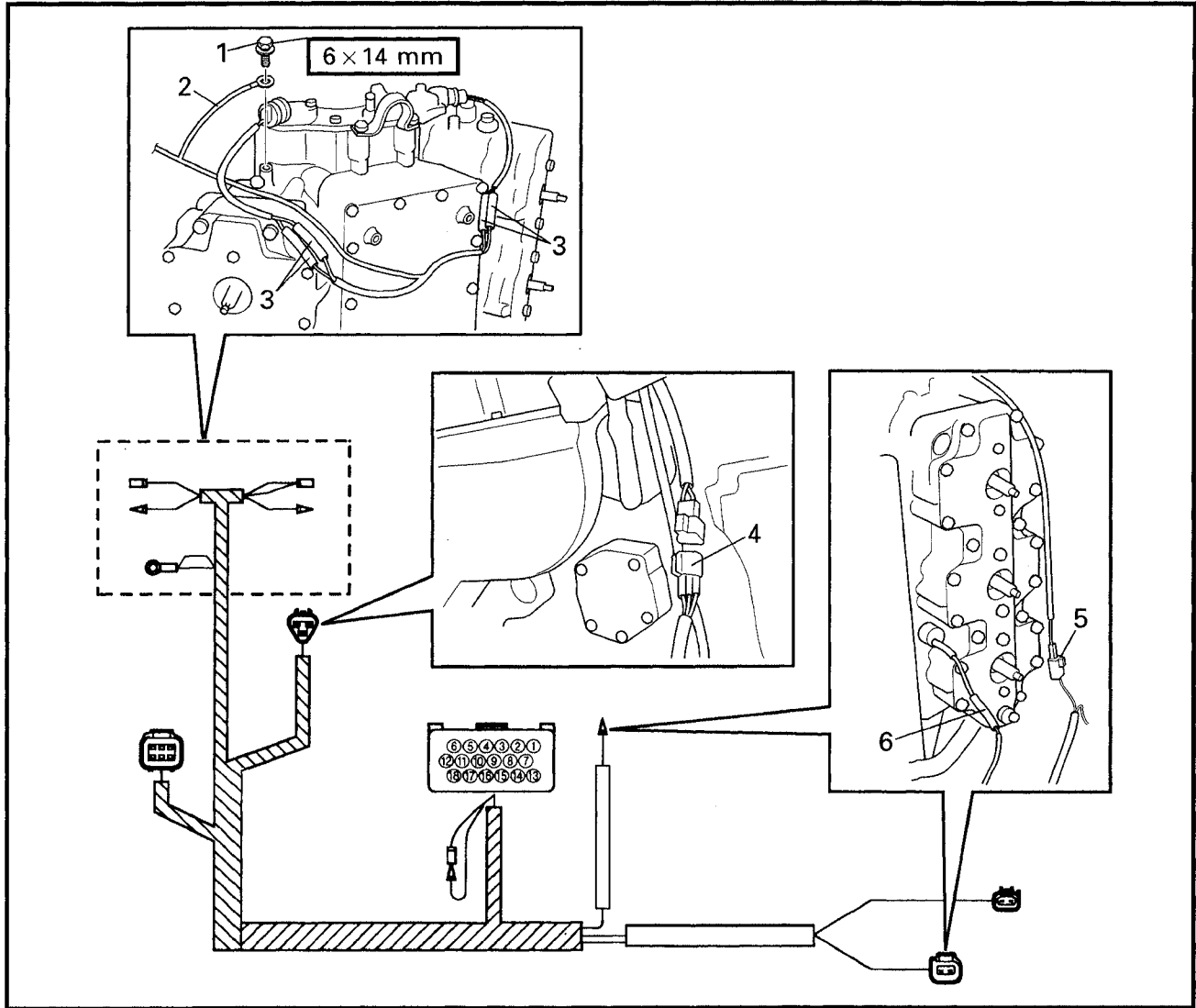
REMOVING/INSTALLING THE MAIN WIRE HARNESS



Order	Job/Part	Q'ty	Remarks
	Trim sensor connector		Refer to "POWER UNIT" on page 5-4.
	Trailer switch coupler		Refer to "POWER UNIT" on page 5-4.
	CDI unit coupler		Refer to "CDI UNIT" on page 5-11.
	Junction box assembly		Refer to "JUNCTION BOX ASSEMBLY" on page 5-16.
1	Bolt	1	
2	Ground lead	1	
3	Emergency switch connector	2	
4	Oil level sensor coupler	1	
			For installation, reverse the removal procedure.



REMOVING/INSTALLING THE SUB WIRE HARNESS

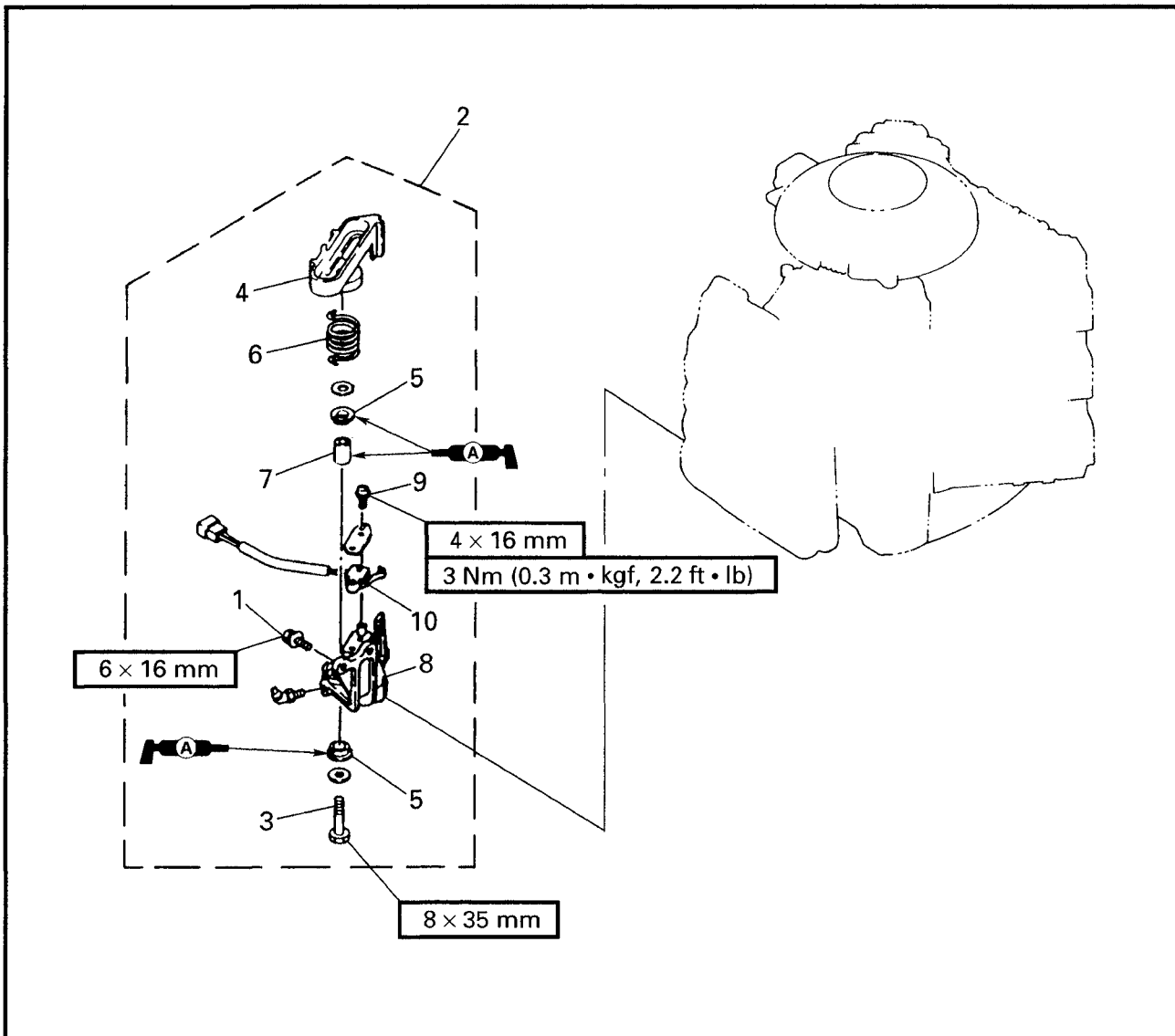


Order	Job/Part	Q'ty	Remarks
	Crank position sensor coupler		Refer to "STATOR ASSEMBLY" on page 5-9.
	Pulser coil coupler		Refer to "STATOR ASSEMBLY" on page 5-9.
	CDI unit coupler		Refer to "CDI UNIT" on page 5-11.
1	Bolt	1	
2	Ground lead	1	
3	Thermo switch connector	4	
4	Throttle position sensor coupler	1	
5	Engine cooling water temperature sensor coupler	1	
6	Knocking sensor connector	1	
			For installation, reverse the removal procedure.



SHIFT CUTOFF SWITCH

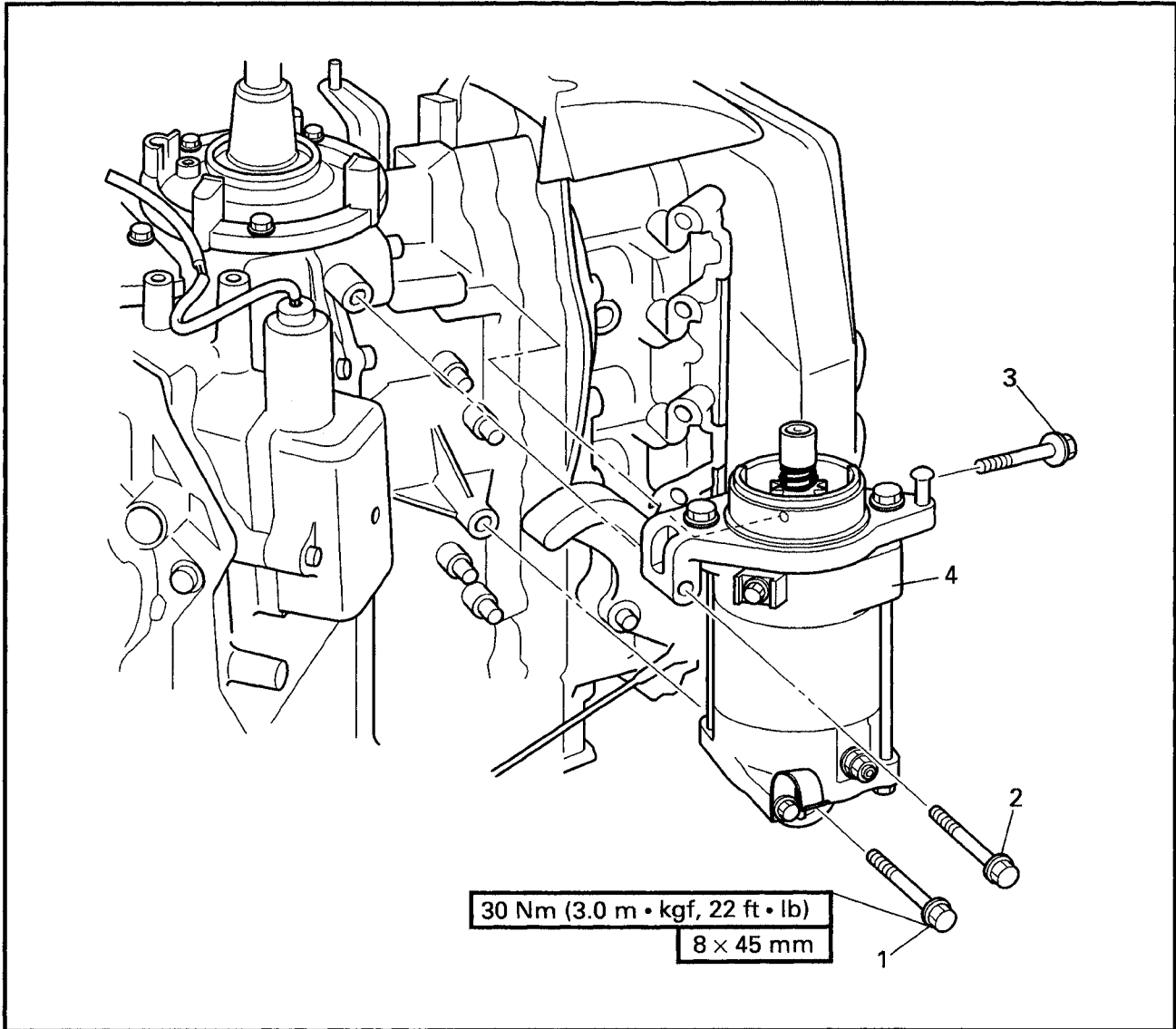
REMOVING/INSTALLING THE SHIFT CUTOFF SWITCH



Order	Job/Part	Q'ty	Remarks
1	Bolts	2	(with washers)
2	Shift cutoff switch assembly	1	
3	Bolt	1	
4	Shift rod lever bracket	1	
5	Bushing	2	
6	Spring	1	
7	Collar	1	
8	Shift cutoff switch bracket	1	
9	Screws	2	
10	Shift cutoff switch	1	
			For installation, reverse the removal procedure.



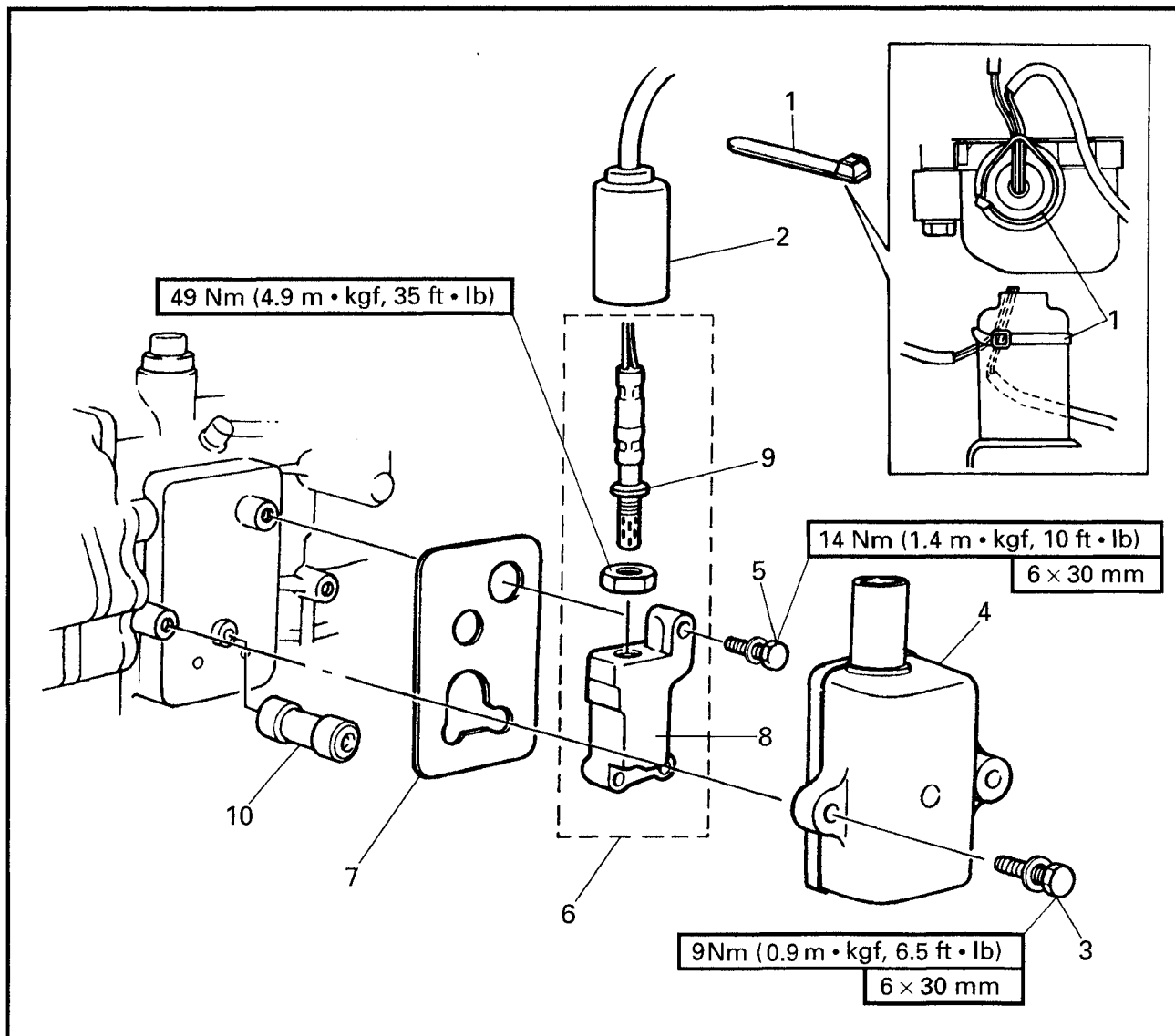
**STARTER MOTOR
REMOVING/INSTALLING THE STARTER MOTOR**



Order	Job/Part	Q'ty	Remarks
	Negative battery lead Starter motor lead		Refer to "POWER UNIT" on page 5-4. Refer to "JUNCTION BOX ASSEMBLY" on page 5-16.
1	Bolt	1	
2	Bolt	1	
3	Bolt	1	
4	Starter motor	1	For installation, reverse the removal procedure.

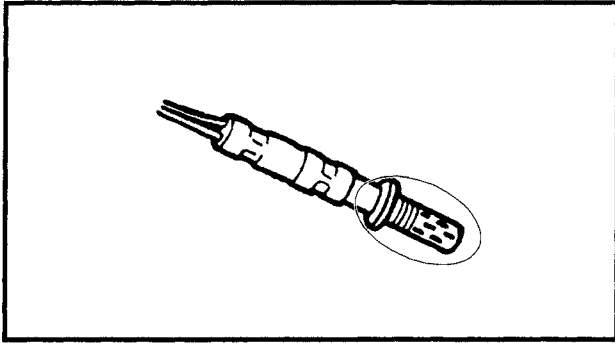


**OXYGEN DENSITY SENSOR
REMOVING/INSTALLING THE OXYGEN DENSITY SENSOR**



Order	Job/Part	Q'ty	Remarks
1	Plastic locking tie	1	
2	Rubber cap	1	
3	Bolt	2	(with washer)
4	Oxygen density sensor cover	1	
5	Bolt	3	(with washer)
6	Oxygen density sensor assembly	1	
7	Gasket	1	Not reusable
8	Oxygen density sensor bracket	1	
9	Oxygen density sensor	1	
10	Oxygen density sensor joint	1	

For installation, reverse the removal procedure.



INSPECTING THE OXYGEN DENSITY SENSOR

Inspect:

- Oxygen density sensor
Any silicon solvent → Clean.

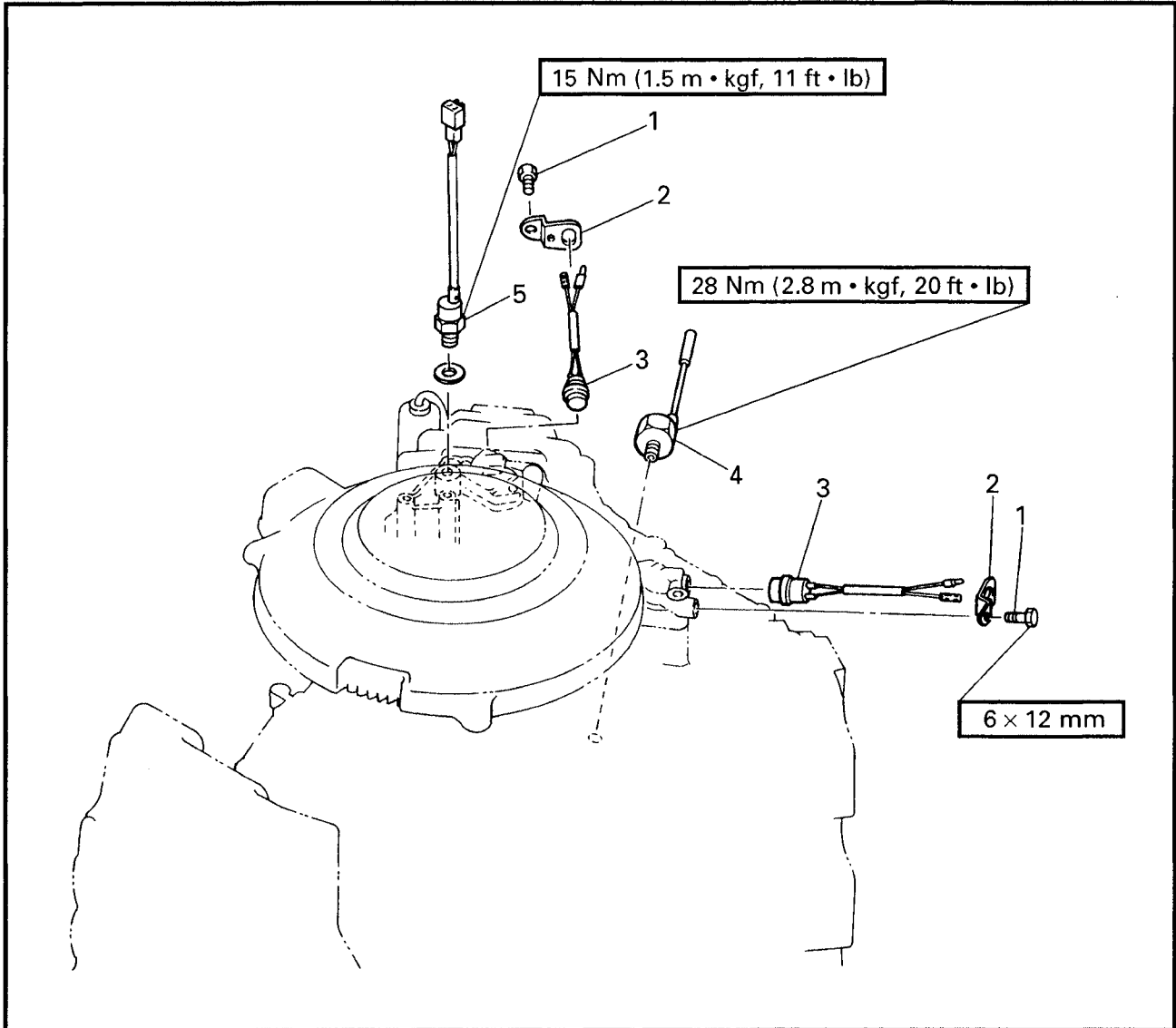
⚠ WARNING

Do not let any silicon anticorrosion solvent touch the oxygen density sensor or its accuracy will be affected.

Refer to "INSPECTING THE OXYGEN DENSITY SENSOR" on page 8-23.



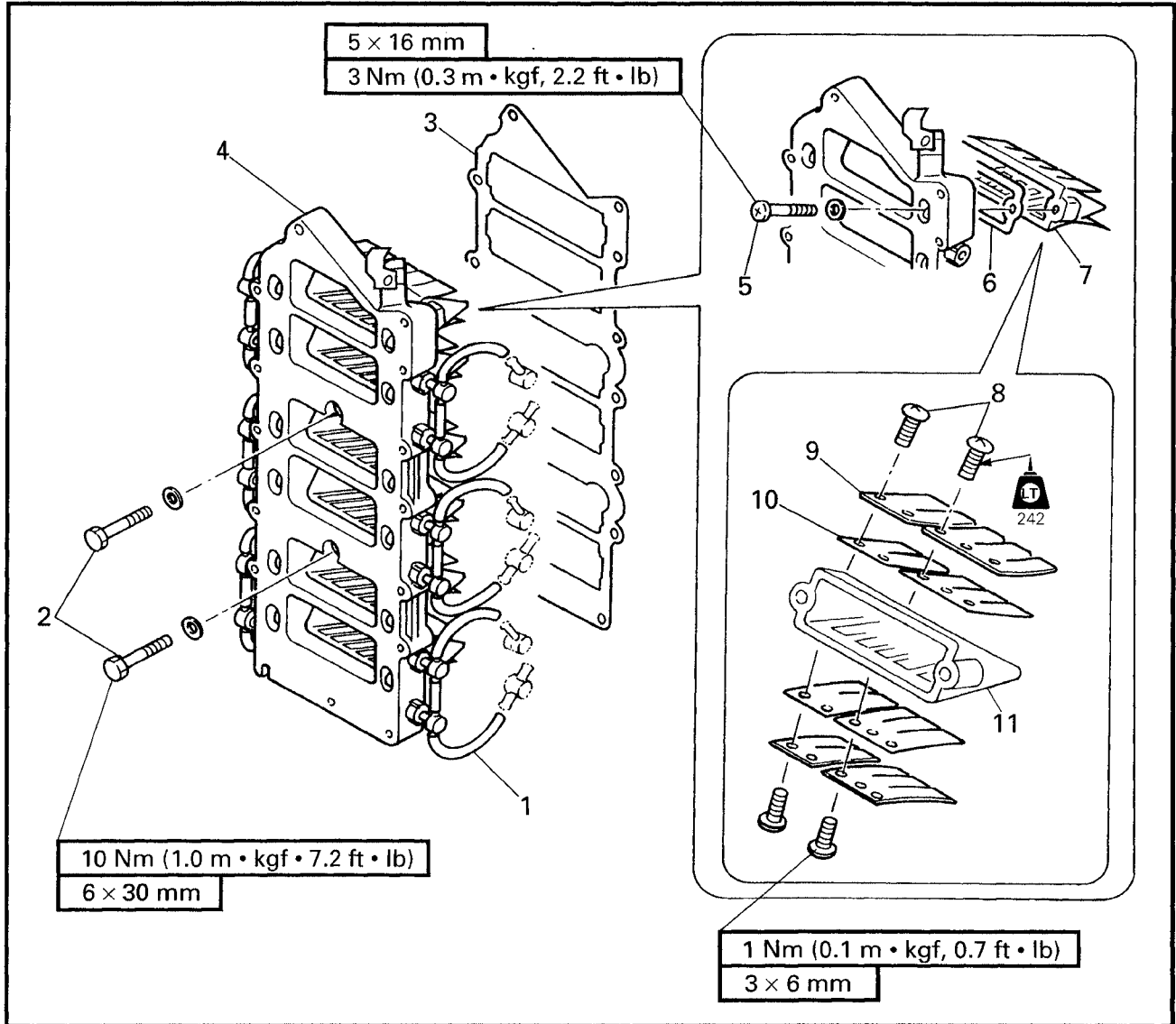
**SENSORS
REMOVING/INSTALLING THE SENSOR**



Order	Job/Part	Q'ty	Remarks
1	Bolt	2	For installation, reverse the removal procedure.
2	Retainer	2	
3	Thermo switch	2	
4	Knocking sensor	1	
5	Engine cooling water temperature sensor	1	

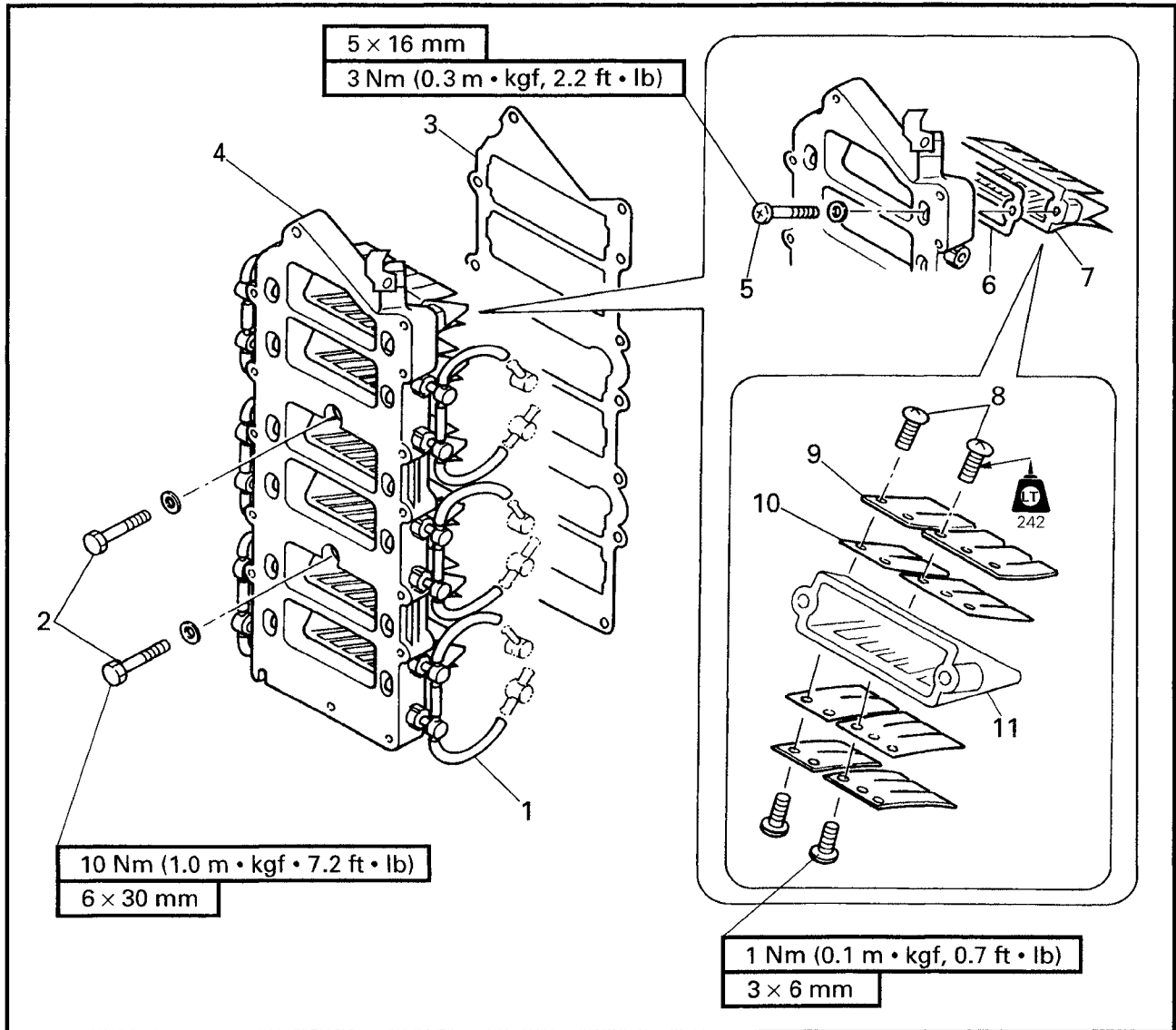


REED VALVES
REMOVING/INSTALLING THE REED VALVES



Order	Job/Part	Q'ty	Remarks
	Fuel injection unit		Refer to "HIGH-PRESSURE FUEL LINE" on page 4-1.
1	Recirculation hose	12	
2	Bolt	2	(with washer)
3	Gasket	1	Not reusable
4	Intake manifold	1	
5	Screw	12	
6	Gasket	6	Not reusable
7	Reed valve assembly	6	

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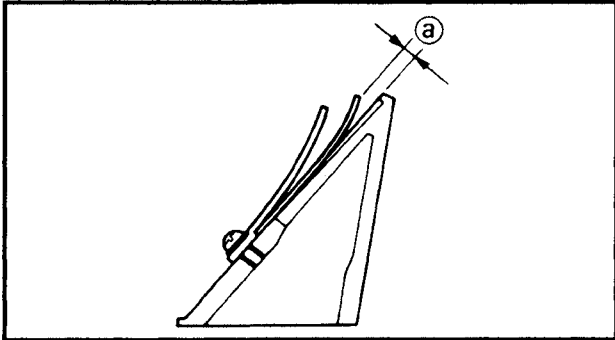
Order	Job/Part	Q'ty	Remarks
8	Screw	10	For installation, reverse the removal procedure.
9	Reed valve stopper	4	
10	Metal reed	4	
11	Reed valve seat	1	



INSPECTING THE REED VALVE ASSEMBLY

1. Inspect:

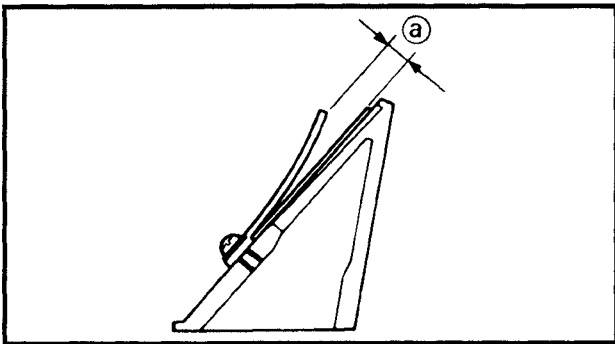
- Reed valve
Cracks/damage → Replace.



2. Measure:

- Warpage limit @
Out of specification → Replace.

	<p>Warpage limit 0.2 mm (0.008 in)</p>
--	---



3. Measure:

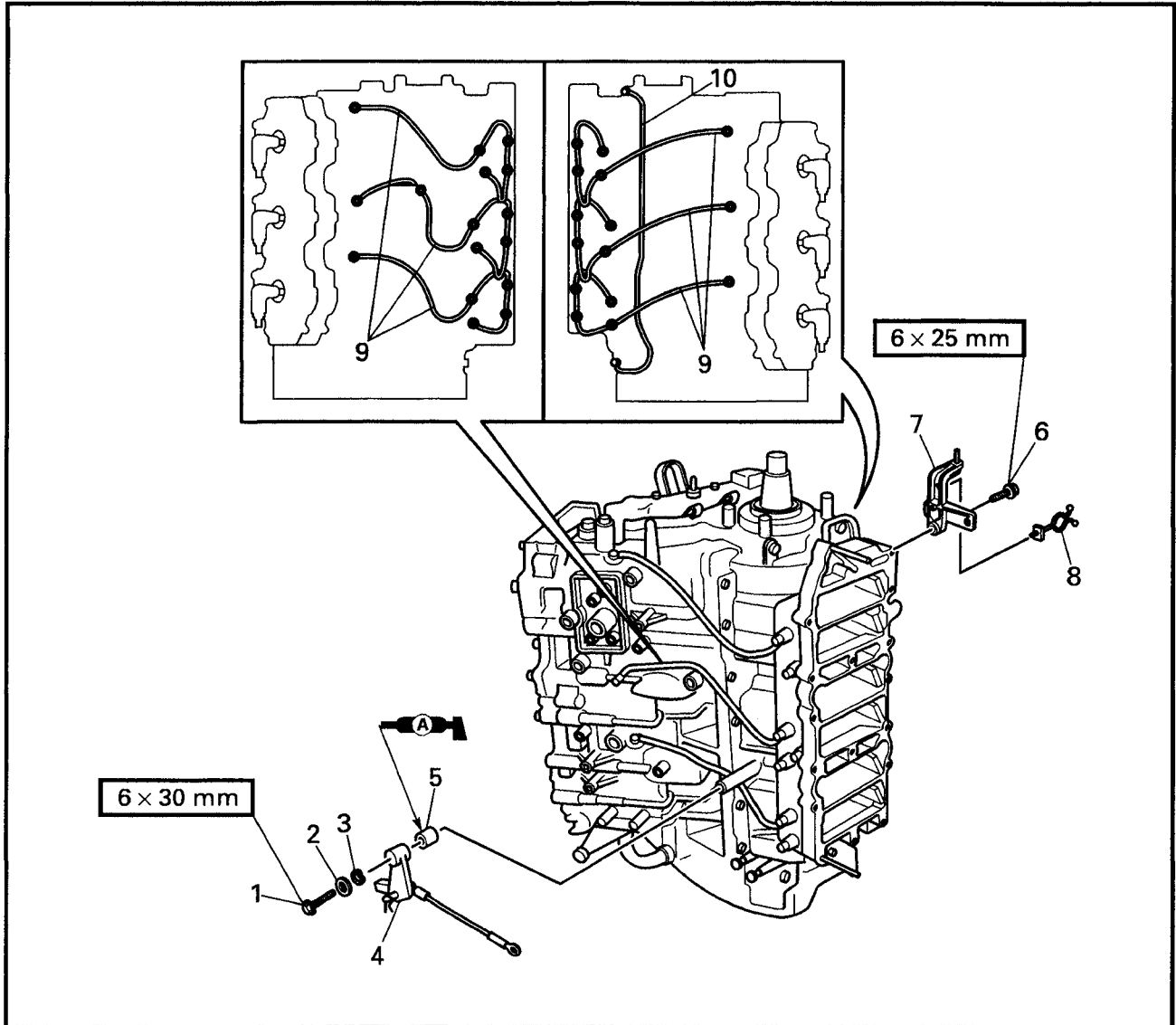
- Reed valve stopper height @
Out of specification → Replace.

	<p>Reed valve stopper height 200H, 225G, 250B, L250B/ V200, V225, S250, L250: 9.0 ± 0.35 mm (0.35 ± 0.01 in) 225F, L225F/S225, L225: 7.9 ± 0.35 mm (0.31 ± 0.01 in)</p>
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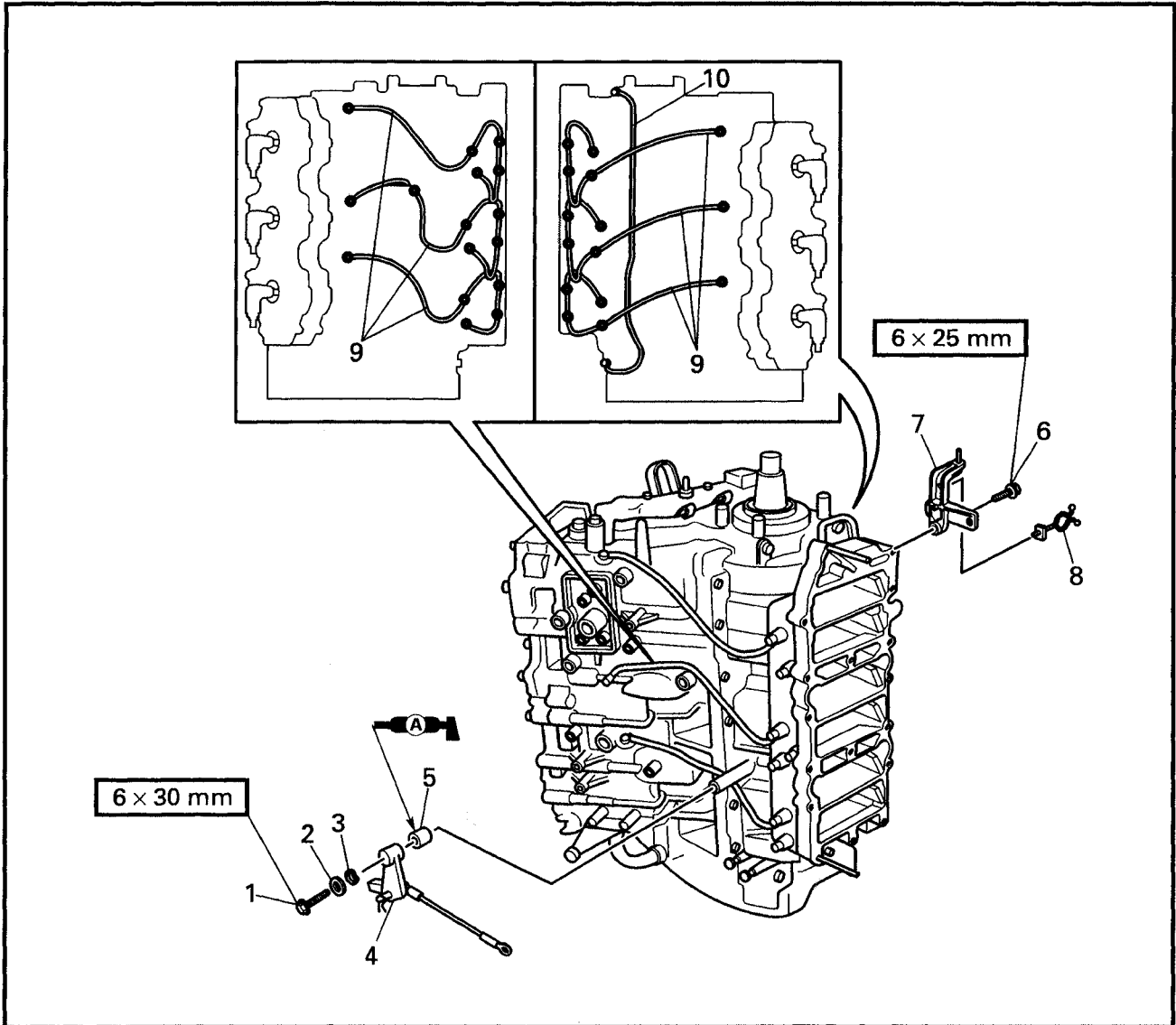
EXTERNAL FITTINGS

REMOVING/INSTALLING THE EXTERNAL FITTINGS



Order	Job/Part	Q'ty	Remarks
	Fuel injection unit		Refer to "HIGH-PRESSURE FUEL LINE" on page 4-1.
	Low-pressure fuel line		Refer to "LOW-PRESSURE FUEL LINE" on page 4-21.
	Oil injection system		Refer to "OIL INJECTION SYSTEM" on page 4-28.
	Junction box		Refer to "JUNCTION BOX ASSEMBLY" on page 5-16.
	Starter motor		Refer to "STARTER MOTOR" on page 5-25.
1	Bolt	1	
2	Washer	1	

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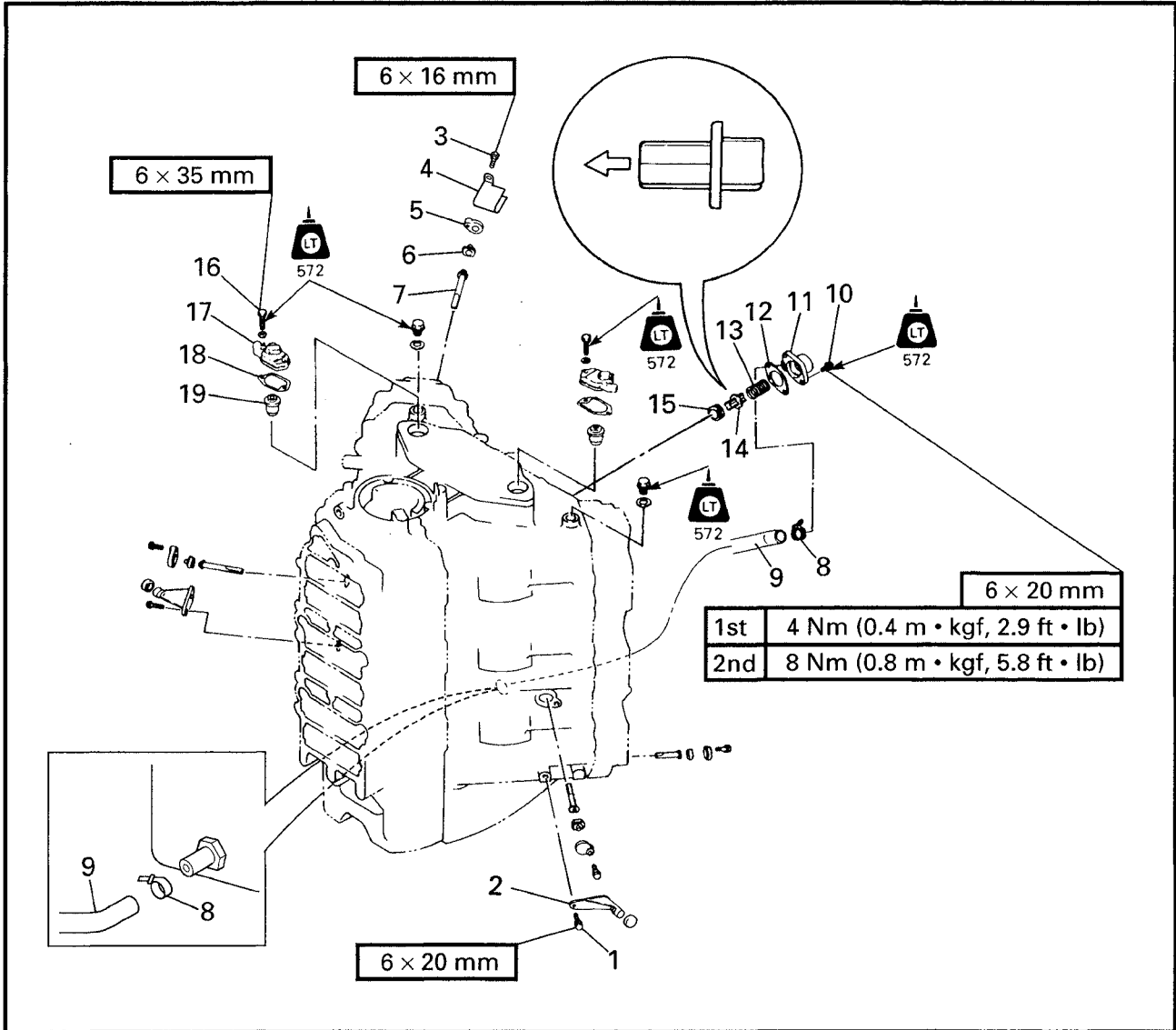


Order	Job/Part	Q'ty	Remarks
3	Wave washer	1	
4	Throttle control lever assembly	1	
5	Collar	1	
6	Bolt	1	
7	Clamp bracket	1	
8	Clamp	2	
9	Recirculation hose	6	
10	Recirculation hose	1	
			For installation, reverse the removal procedure.



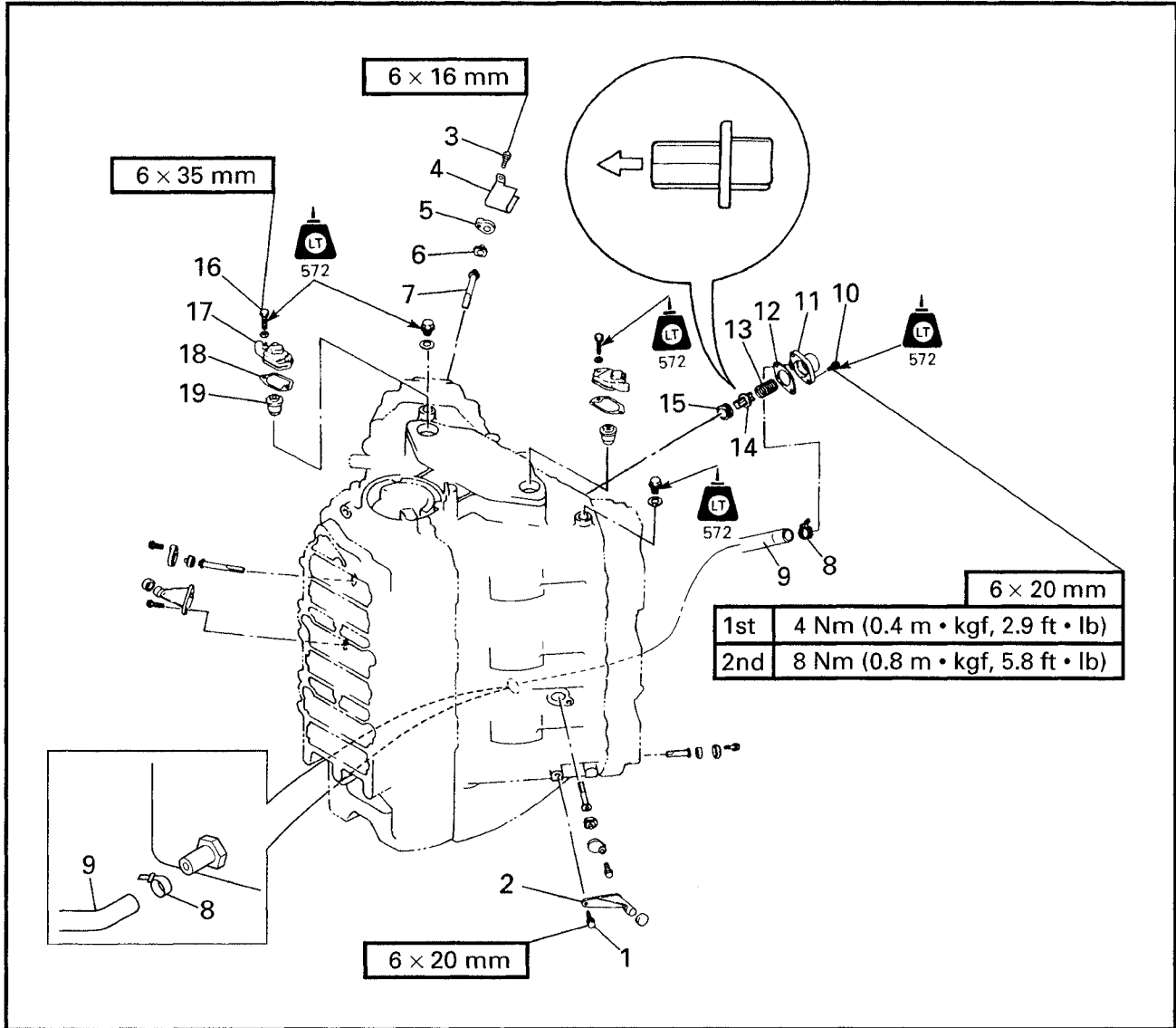
PRESSURE CONTROL VALVE AND THERMOSTAT

REMOVING/INSTALLING THE PRESSURE CONTROL VALVE AND THERMOSTAT

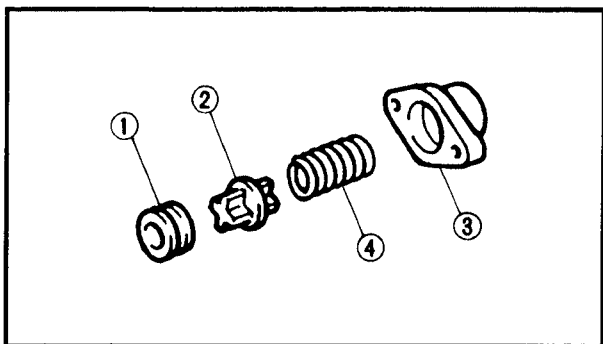


Order	Job/Part	Q'ty	Remarks
1	Bolt	4	
2	Damper bracket	2	
3	Bolt	4	
4	Clamp	1	
5	Anode cover	4	
6	Grommet	4	
7	Anode	4	
8	Plastic locking tie	2	Not reusable
9	Cooling water hose	1	
10	Bolt	2	

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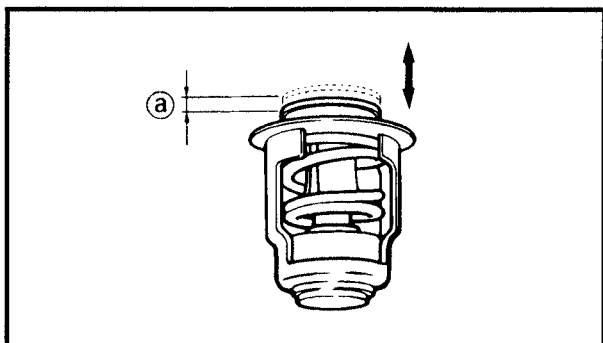
Order	Job/Part	Q'ty	Remarks
11	Pressure control valve cover	1	
12	Gasket	1	Not reusable
13	Spring	1	
14	Pressure control valve	1	
15	Pressure control valve seat	1	
16	Bolt	4	
17	Thermostat cover	2	
18	Gasket	2	Not reusable
19	Thermostat	2	
For installation, reverse the removal procedure.			



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.




INSPECTING THE THERMOSTATS

1. Inspect:

- Thermostat
Damage/valve does not open → Replace.

2. Measure:

- Thermostat opening temperature
- Valve lift ①
Out of specification → Replace.

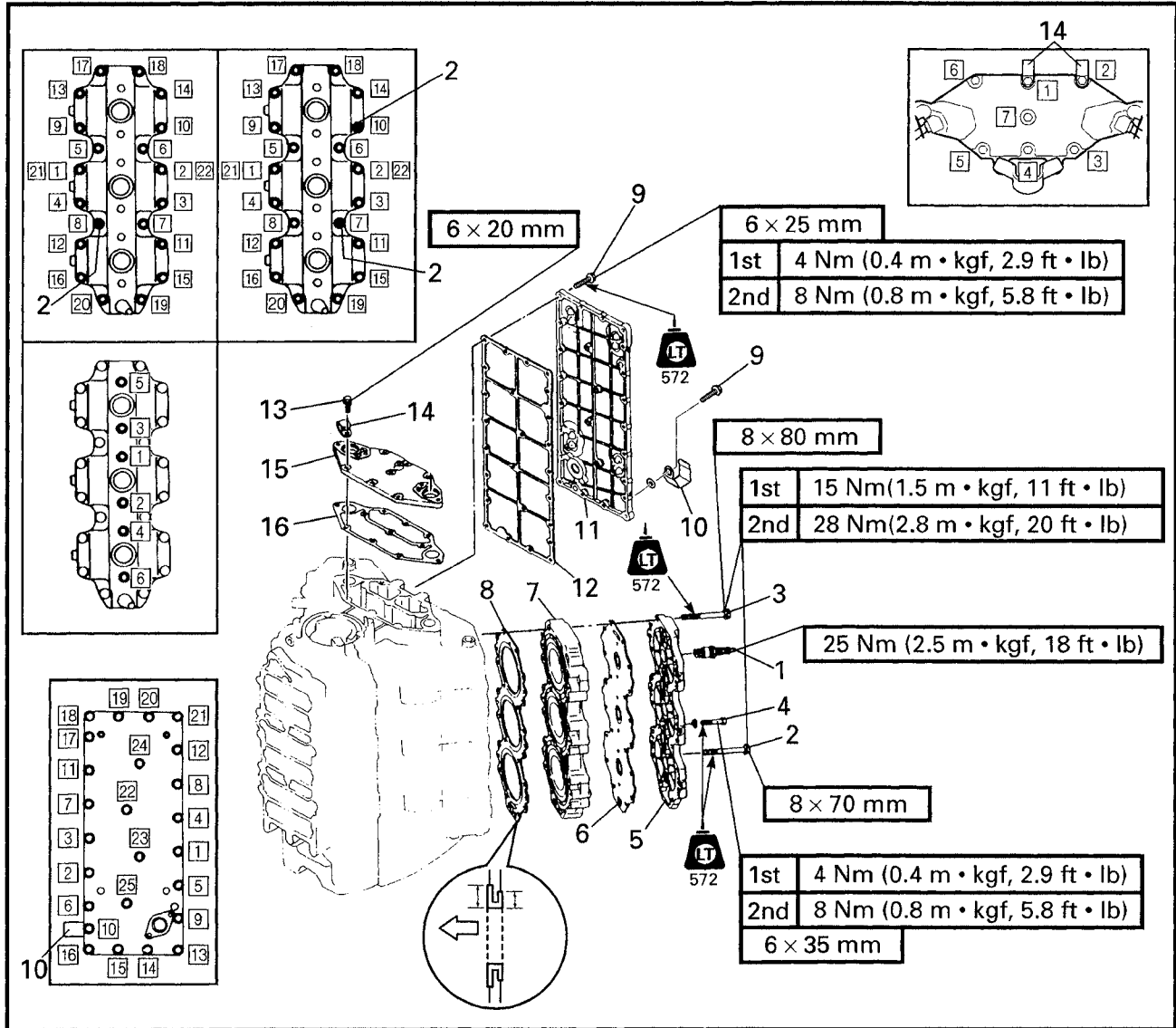
	Water temperature	Valve lift
	Below 48 - 52 °C (118 - 126 °F)	0 mm (0 in)
	Above 60 °C (140 °F)	Min. 3 mm (0.12 in)

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.

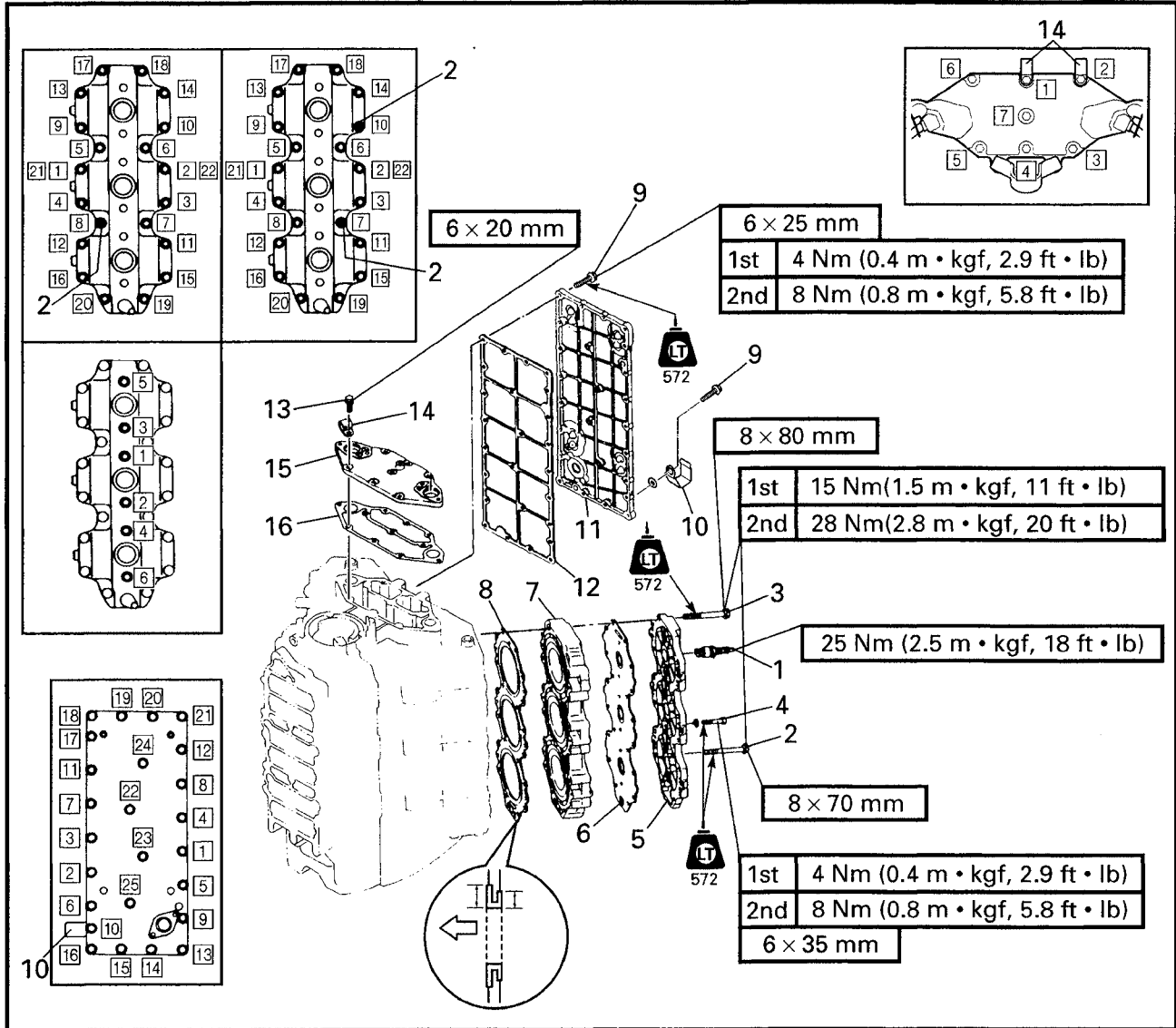


CYLINDER HEADS
REMOVING/INSTALLING THE CYLINDER HEADS



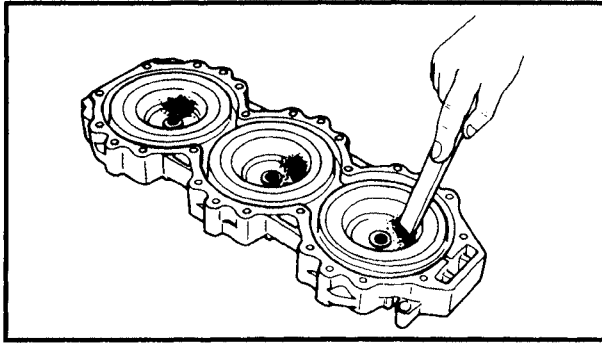
Order	Job/Part	Q'ty	Remarks
	Ground lead		Refer to "CDI UNIT" on page 5-11.
	Spark plug cap		Refer to "CDI UNIT" on page 5-11.
	CDI unit assembly		Refer to "CDI UNIT" on page 5-11.
	Cooling water hose		Refer to "JUNCTION BOX ASSEMBLY" on page 5-16.
1	Spark plug	6	
2	Bolt	3	
3	Bolt	37	
4	Bolt	12	
5	Cylinder head cover	2	
6	Gasket	2	Not reusable

Continued on next page.



Order	Job/Part	Q'ty	Remarks
7	Cylinder head	2	
8	Gasket	2	Not reusable
9	Bolt	25	
10	Clamp	1	
11	Exhaust cover	1	
12	Gasket	1	Not reusable
13	Bolt	7	
14	Clamp	2	
15	Cylinder cover	1	
16	Gasket	1	Not reusable

For installation, reverse the removal procedure.

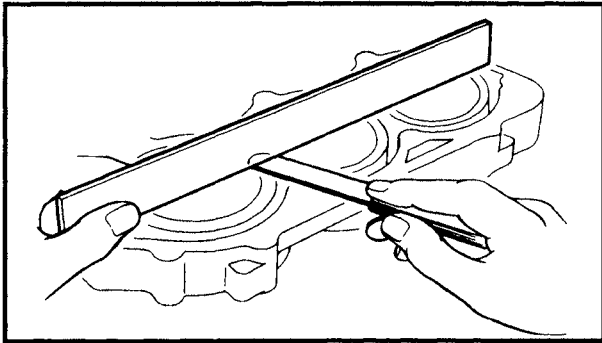


INSPECTING THE CYLINDER HEADS

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

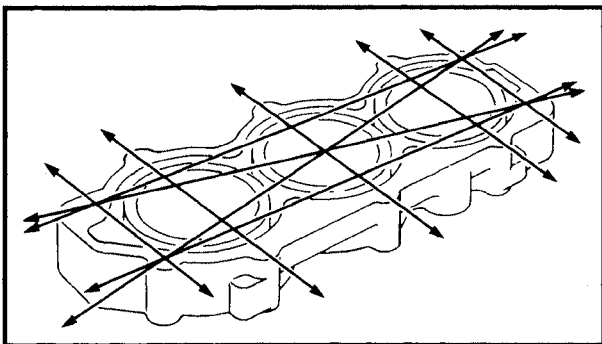
CAUTION:

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.

	<p>Warpage limit 0.1 mm (0.004 in)</p>
--	--

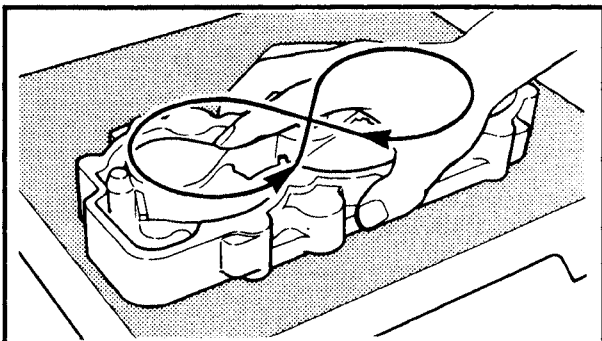


Resurfacing steps

- (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.

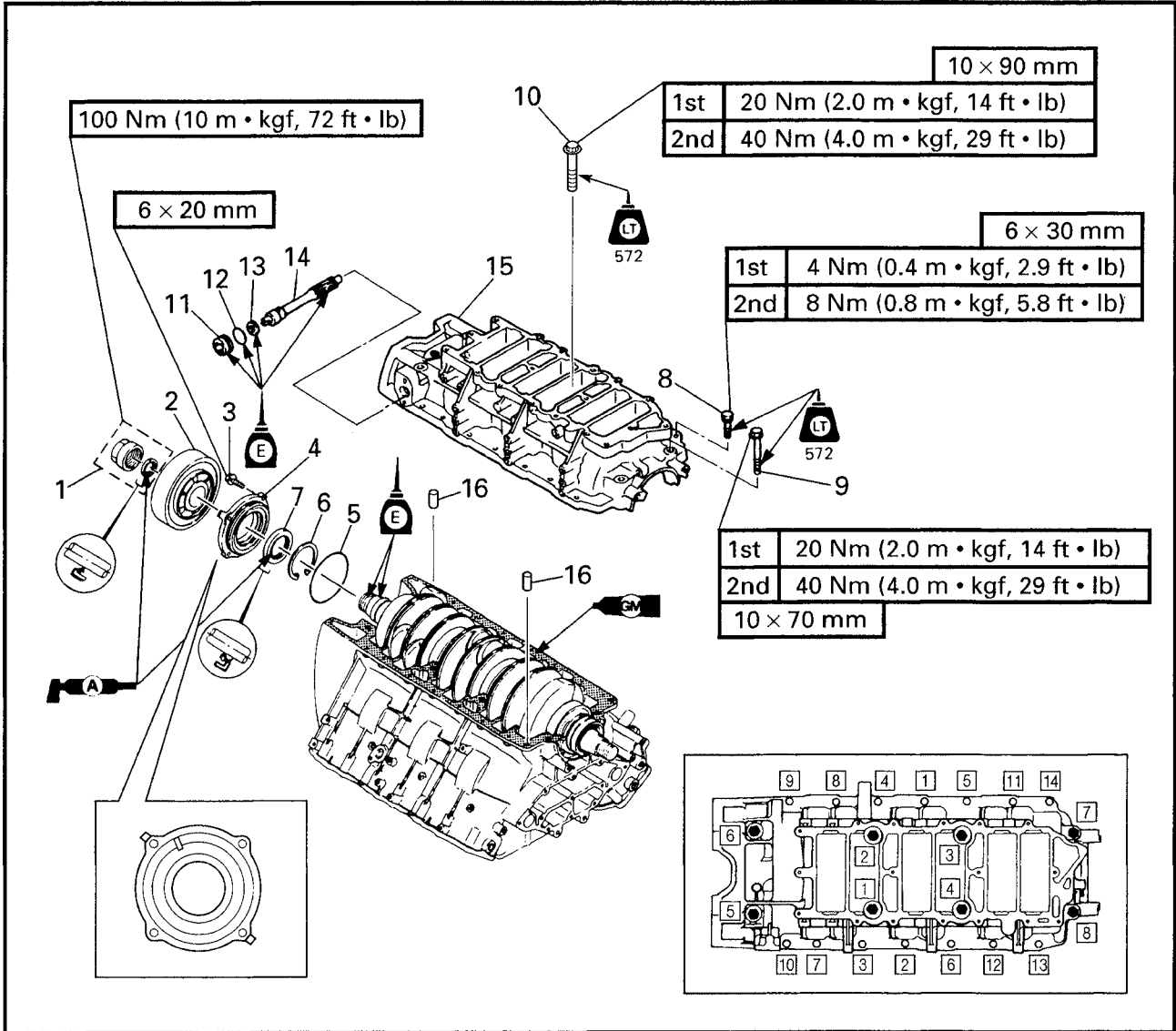
NOTE:

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



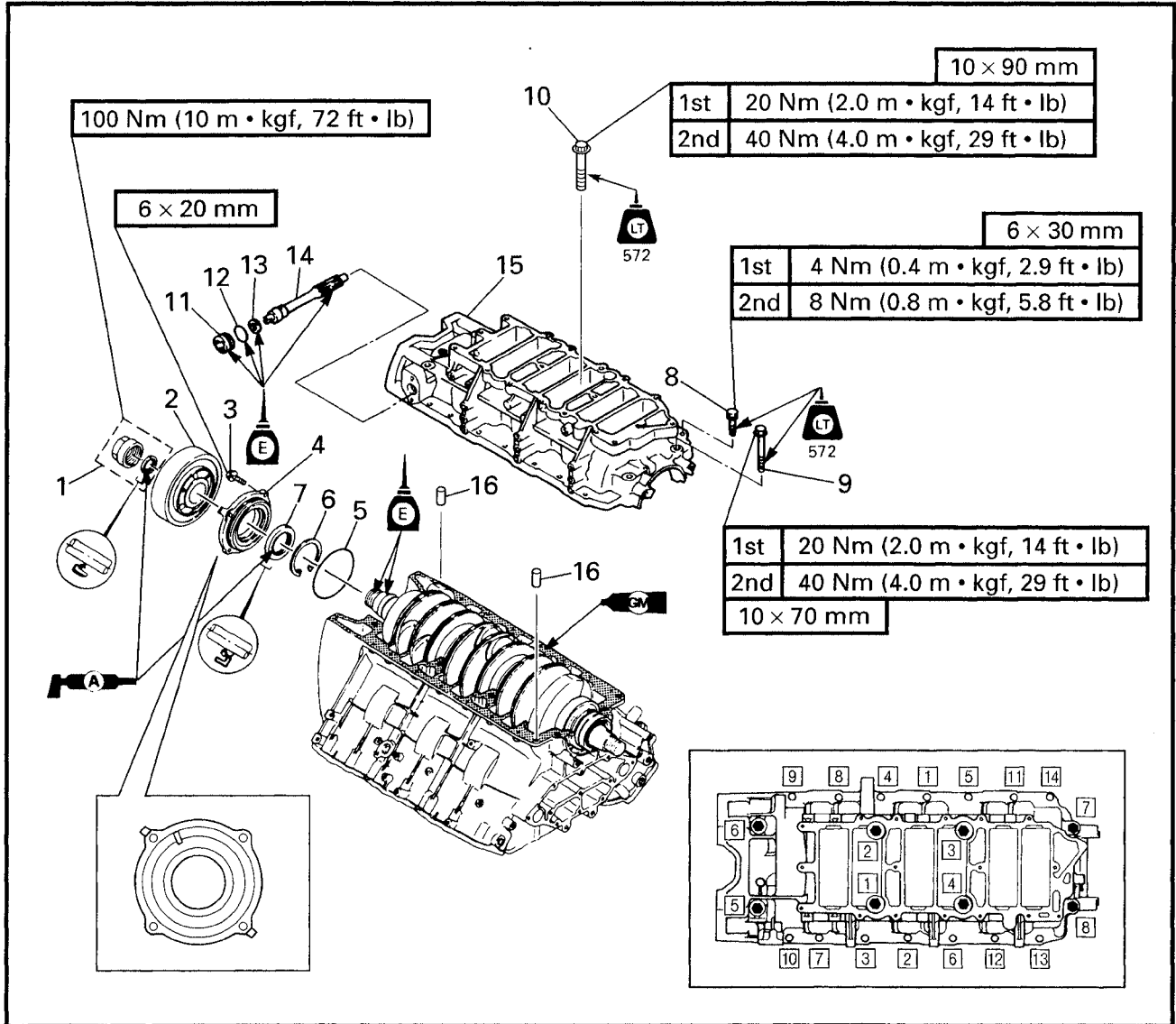


**CRANKCASE
REMOVING/INSTALLING THE CRANKCASE**



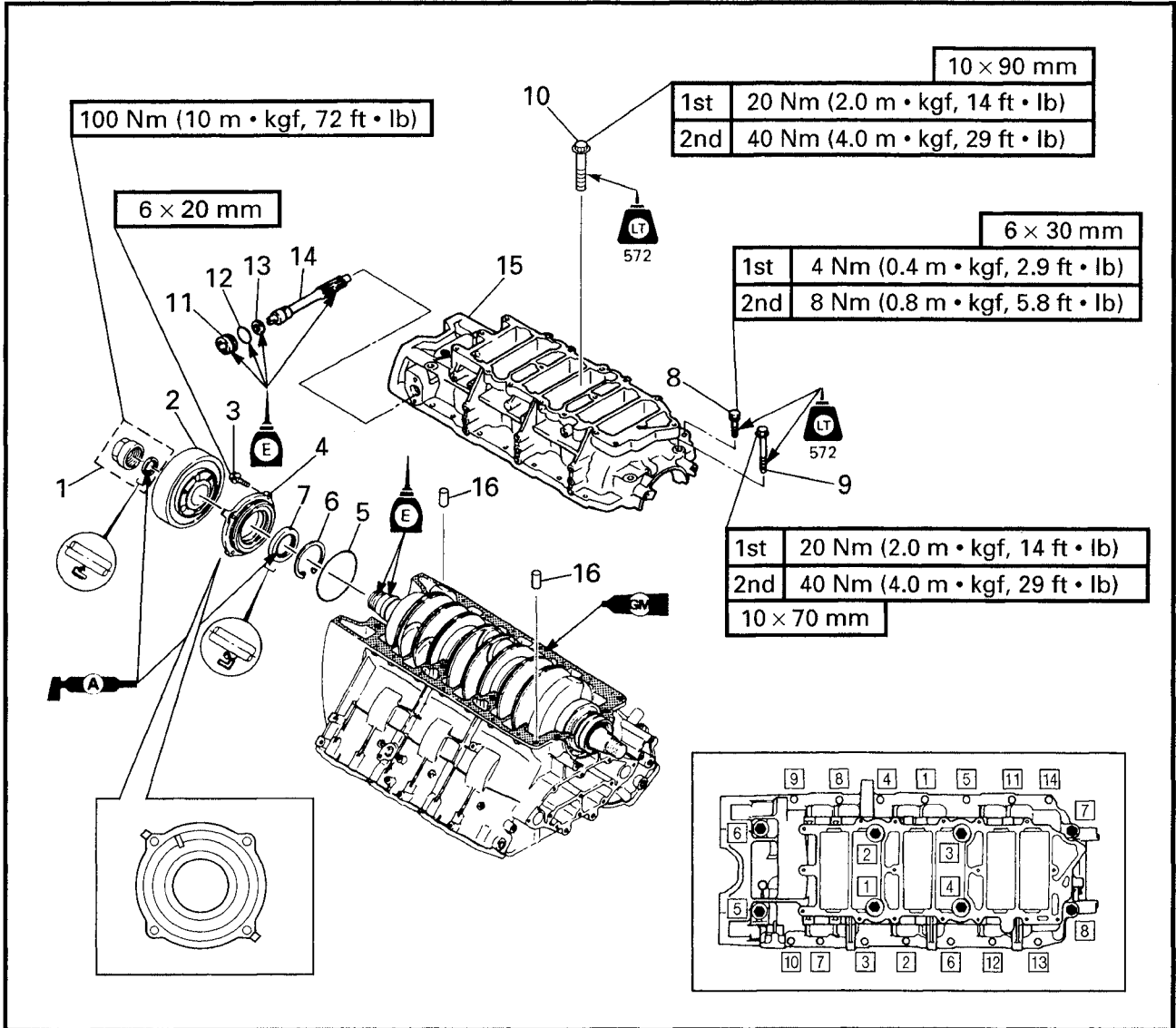
Order	Job/Part	Q'ty	Remarks
	Flywheel magnet assembly		Refer to "FLYWHEEL MAGNET ASSEMBLY" on page 5-1.
	Power unit		Refer to "POWER UNIT" on page 5-4.
	Pulser coil assembly		Refer to "STATOR ASSEMBLY" on page 5-9.
	Intake manifold		Refer to "REED VALVES" on page 5-29.
	External fittings		Refer to "EXTERNAL FITTINGS" on page 5-32.
1	Damper nut	1	
2	Torsional damper	1	

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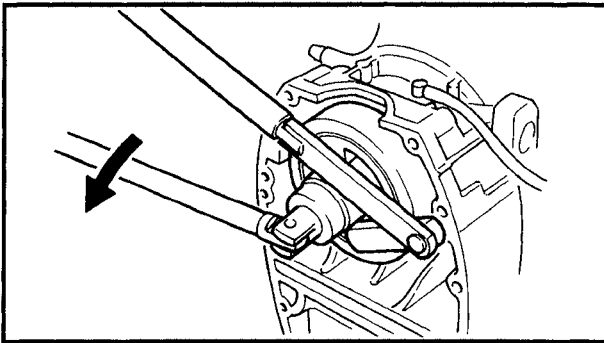


Order	Job/Part	Q'ty	Remarks
3	Bolt	4	
4	Oil seal housing	1	
5	O-ring	1	
6	Circlip	1	
7	Oil seal	1	
8	Bolt	14	
9	Bolt	4	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
10	Bolt	4	
11	Collar	1	
12	O-ring	1	
13	Washer	1	
14	Oil pump driven gear	1	
15	Crankcase	1	
16	Dowel pin	2	
			For installation, reverse the removal procedure.

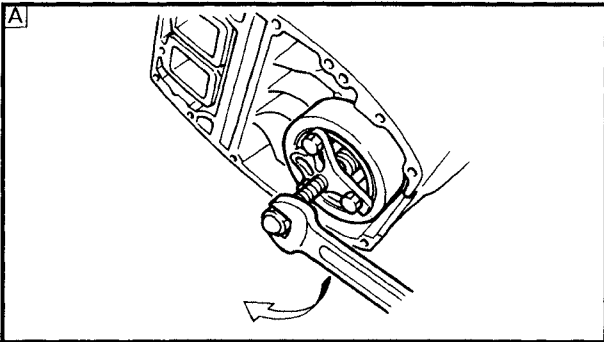


REMOVING THE TORSIONAL DAMPER

1. Remove:
- Damper nut



Flywheel magnet assembly holder
YB-06139 / 90890-06522

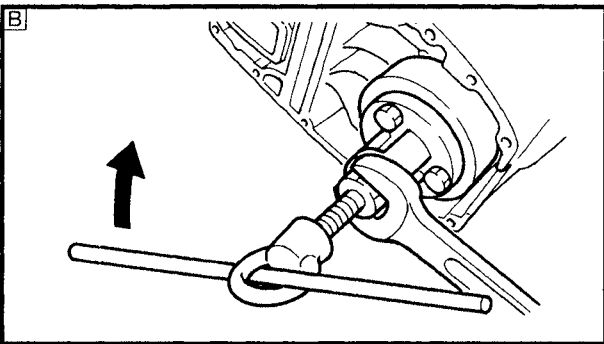


2. Remove:
- Torsional damper



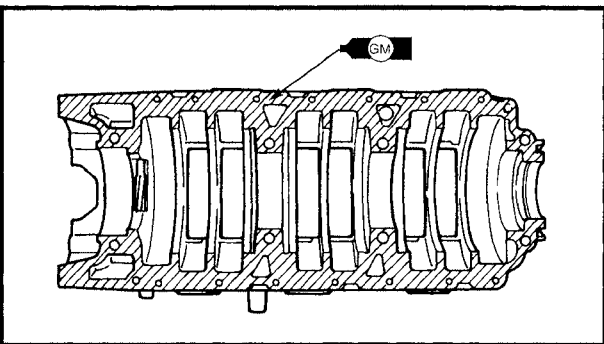
Universal puller
YU-06117 / 90890-06521

- A For USA and Canada
- B Except for USA and Canada

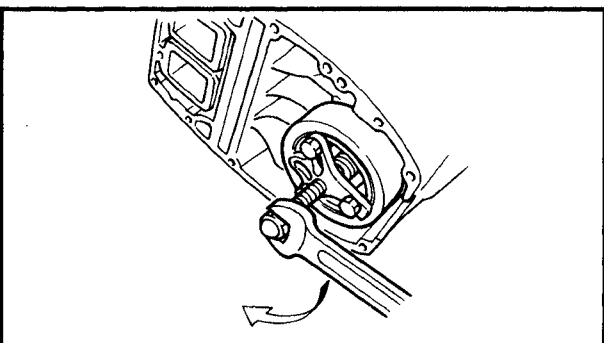


INSTALLING THE CRANKCASE

- 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.



INSTALLING THE TORSIONAL DAMPER

- Install:
- Damper nut

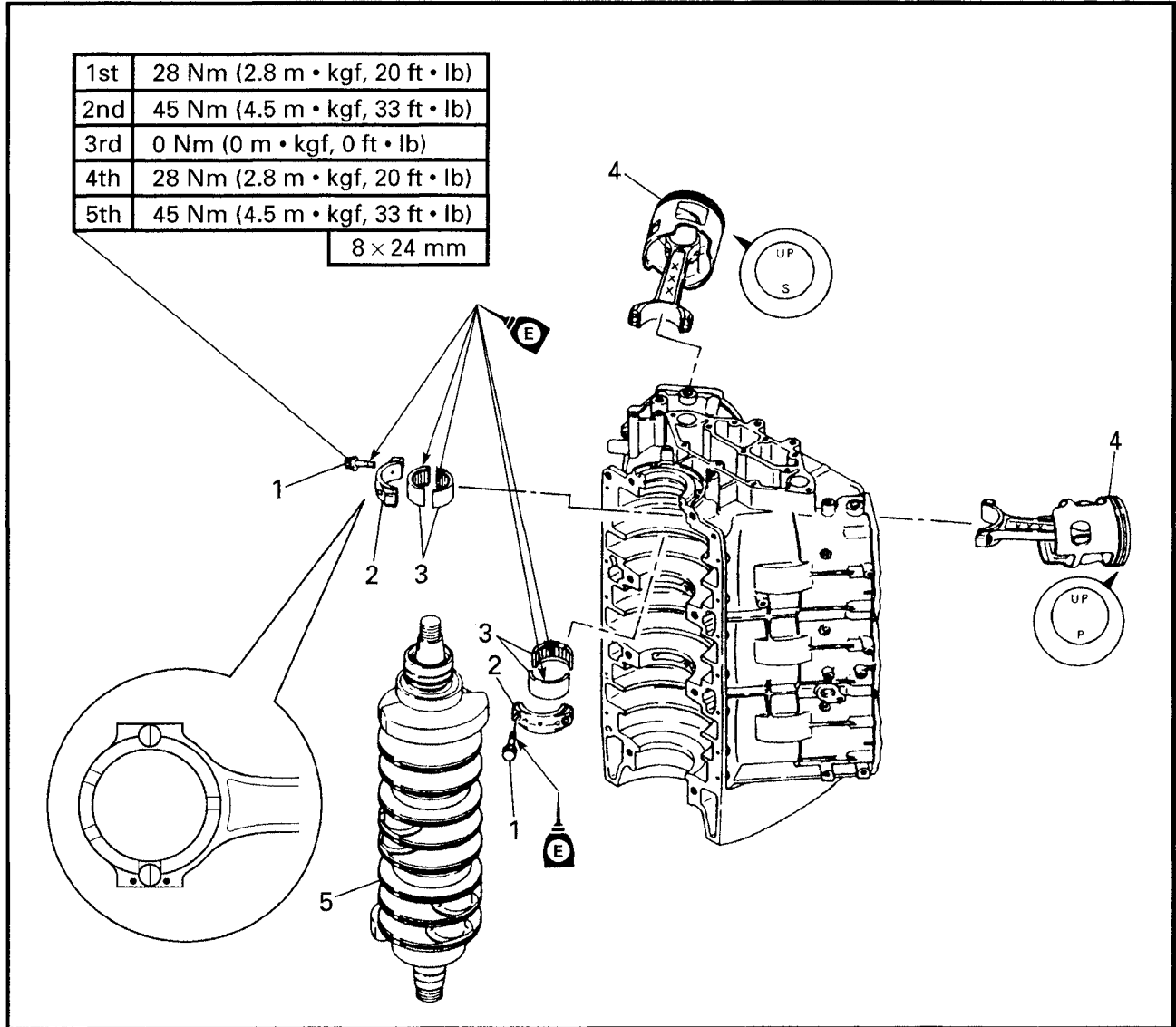


Flywheel magnet assembly holder
YB-06139 / 90890-06522



CYLINDER BODY ASSEMBLY

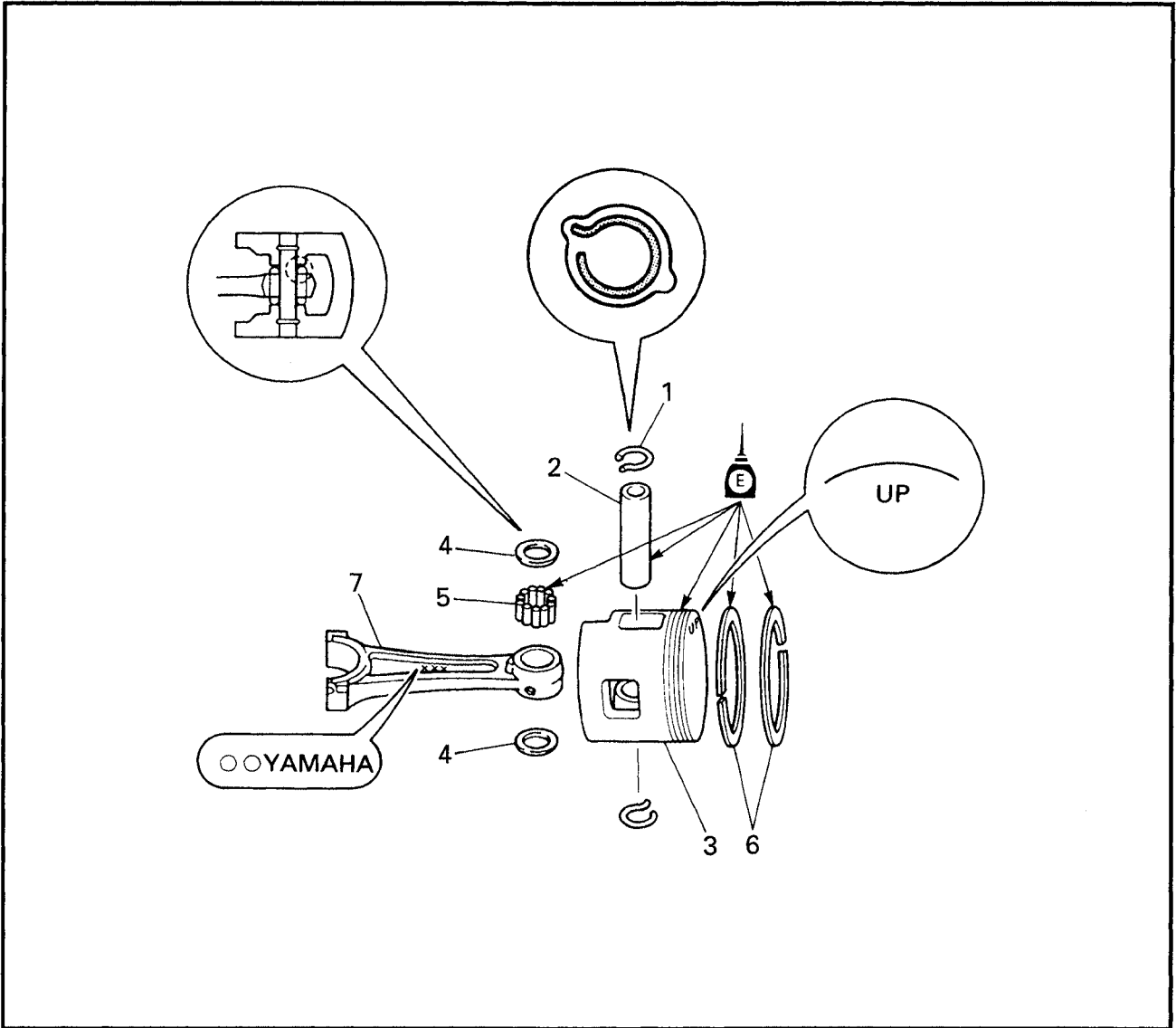
DISASSEMBLING/ASSEMBLING THE CYLINDER BODY ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Cylinder heads		Refer to "CYLINDER HEADS" on page 5-37.
	Crankcase		Refer to "CRANKCASE" on page 5-40.
1	Connecting rod bolt	12	
2	Connecting rod cap	6	
3	Big-end bearing	6	
4	Piston/connecting rod assembly	6	
5	Crankshaft assembly	1	
			For assembly, reverse the disassembly procedure.



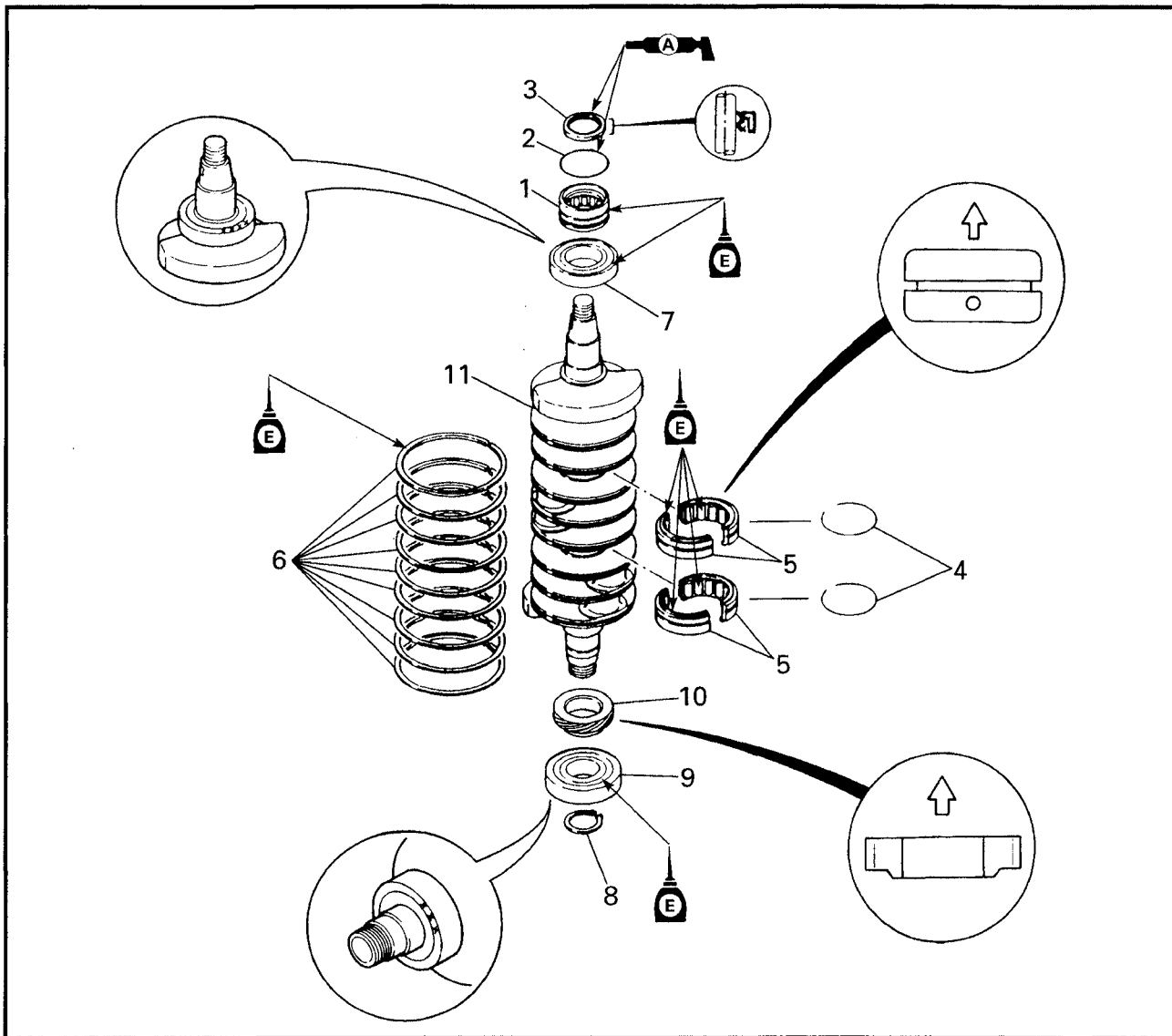
DISASSEMBLING/ASSEMBLING THE PISTON AND CONNECTING ROD ASSEMBLIES



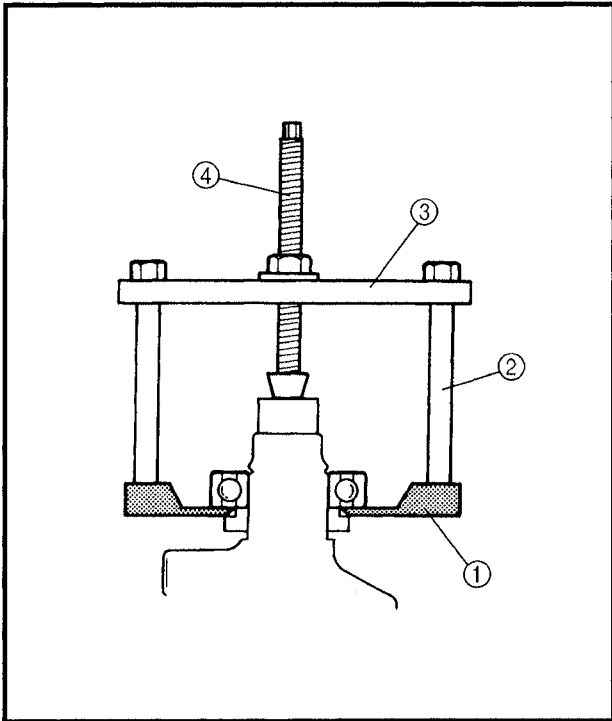
Order	Job/Part	Q'ty	Remarks
1	Piston pin clip	12	Not reusable
2	Piston pin	6	
3	Piston	6	
4	Washer	12	
5	Small-end bearing	6	
6	Piston ring	12	
7	Connecting rod	6	
			For assembly, reverse the disassembly procedure.



DISASSEMBLING/ASSEMBLING THE CRANKSHAFT ASSEMBLY



Order	Job/Part	Q'ty	Remarks
1	Needle bearing	1	
2	O-ring	1	
3	Oil seal	1	
4	Clip	2	
5	Main journal bearing	2	
6	Labyrinth ring	9	
7	Ball bearing	1	
8	Circlip	1	
9	Ball bearing	1	
10	Oil pump drive gear	1	
11	Crankshaft	1	
			For assembly, reverse the disassembly procedure.



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:

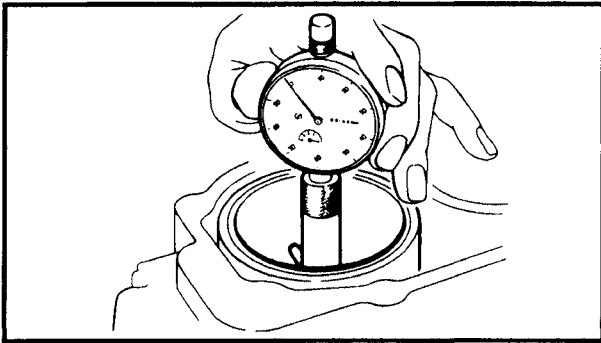
Do not scratch the contacting surfaces of the crankcase and cylinder head.

2. Inspect:

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

CAUTION:

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

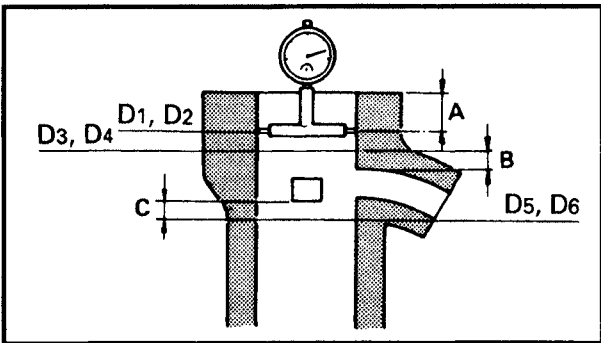
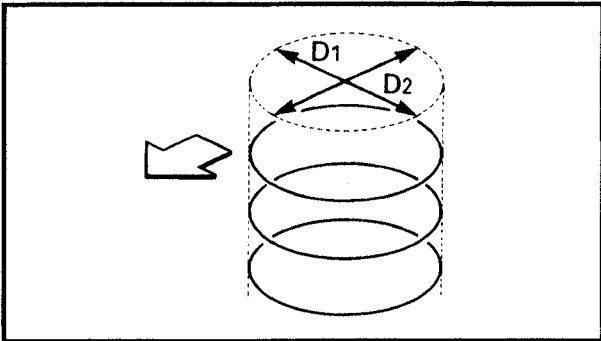



3. Measure:

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

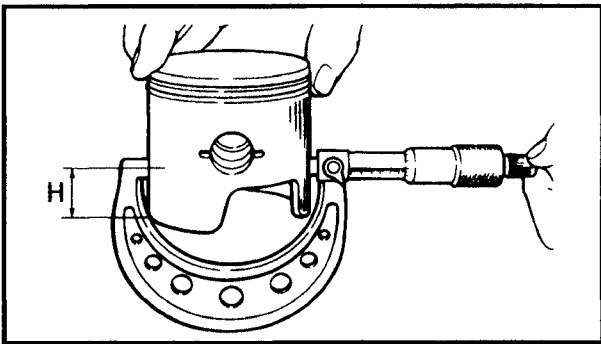
NOTE:

Measure the cylinder bore diameter at three positions for both D₁ and D₂. 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)	89.840 - 89.860 mm (3.5370 - 3.5378 in)

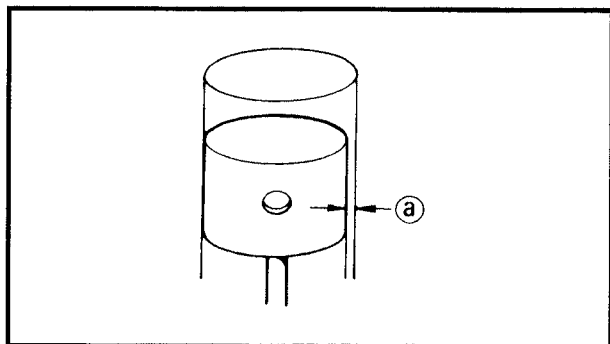


Oversize piston diameter
1st oversize*
 90.15 mm (3.549 in)
2nd oversize
 90.40 mm (3.559 in)

*: 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
------------------------------	---	------------------------	---	-----------------

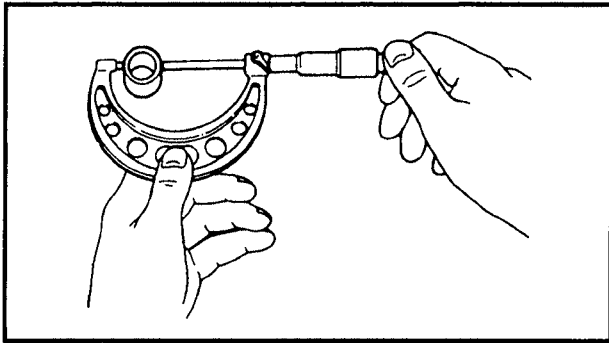


Piston-to-cylinder clearance
 0.155 - 0.161 mm
 (0.0061 - 0.0063 in)

INSPECTING THE PISTON PINS AND SMALL-END BEARINGS

1. Inspect:

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



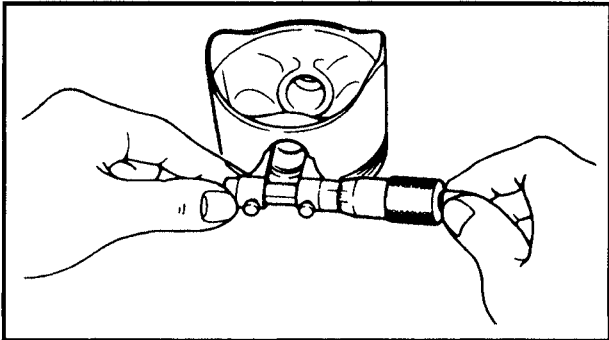
2. Measure:

- Piston pin diameter
(with a micrometer)

Out of specification → Replace.



Piston pin diameter
25.995 - 26.000 mm
(1.0234 - 1.0236 in)



3. Measure:

- Piston pin boss diameter
(with a micrometer)

Out of specification → Replace.

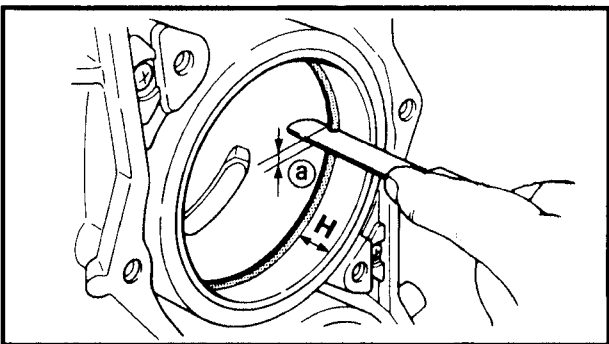


Piston pin boss diameter
26.004 - 26.015 mm
(1.0238 - 1.0242 in)

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).



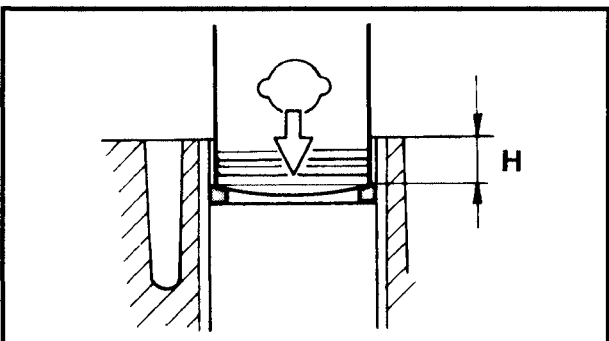
1. Measure:

- Piston ring end gap @
(with a thickness gauge)

Out of specification → Replace.

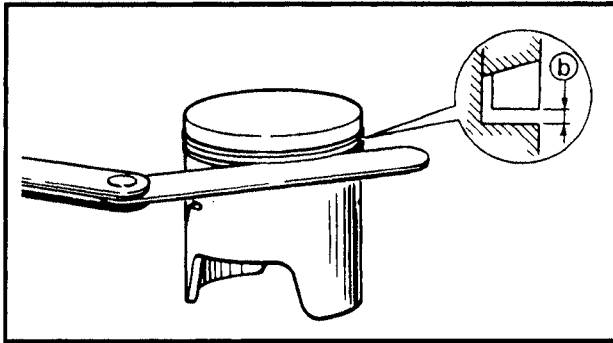


Piston ring end gap
0.30 - 0.40 mm
(0.012 - 0.016 in)
Piston ring end gap limit
0.60 mm (0.024 in)
Measuring point "H"
5 mm (0.2 in)



NOTE:

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



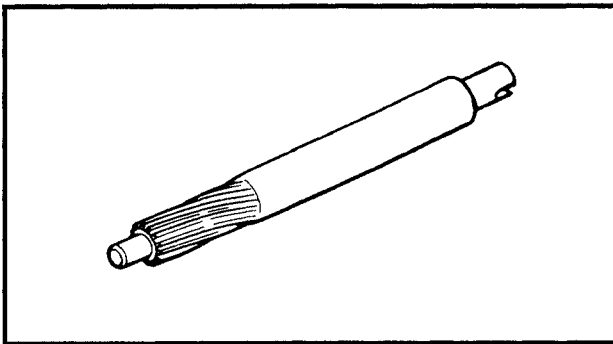
2. Measure:

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

	<p>Piston ring side clearance 0.02 - 0.06 mm (0.001 - 0.002 in)</p>
--	--

NOTE:

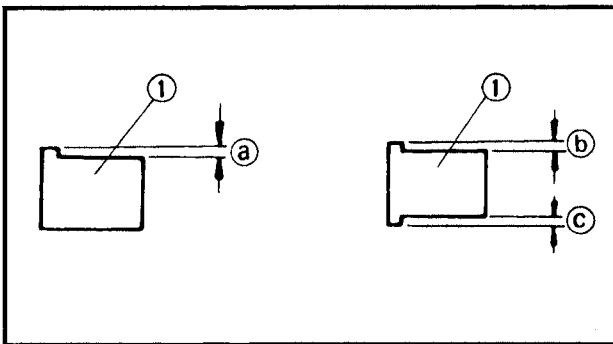
When measuring the piston ring side clearance, the outside of the piston ring should be flush with the piston wall.



INSPECTING THE OIL PUMP DRIVEN GEAR

Inspect:

- Oil pump driven gear
Cracks/pitting/wear → Replace.



INSPECTING THE LABYRINTH RINGS

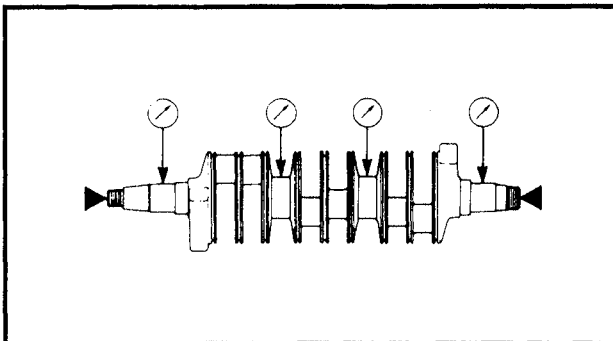
1. Inspect:

- Labyrinth ring (1)
Cracks/damage/wear → Replace.

2. Measure:

- Labyrinth ring wear (a) or (b) + (c)
Out of specification → Replace.

	<p>Labyrinth ring wear limit 0.10 mm (0.004 in)</p>
--	--

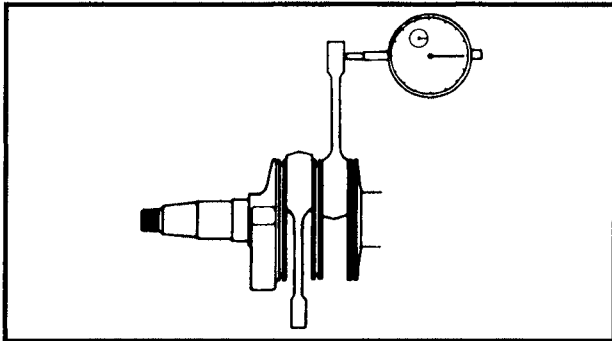


INSPECTING THE CRANKSHAFT

1. Measure:

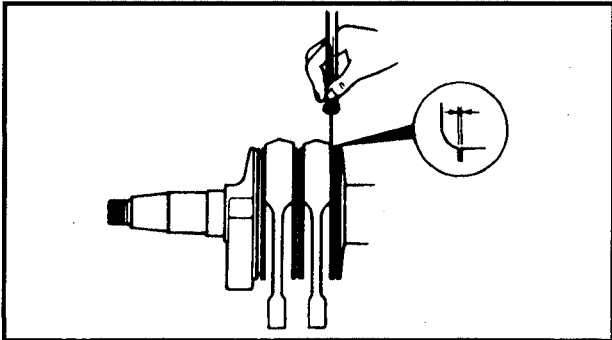
- Crankshaft runout
(with V-blocks and a dial gauge)
Out of specification → Replace.

	<p>Runout limit 0.05 mm (0.002 in)</p>
--	---



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

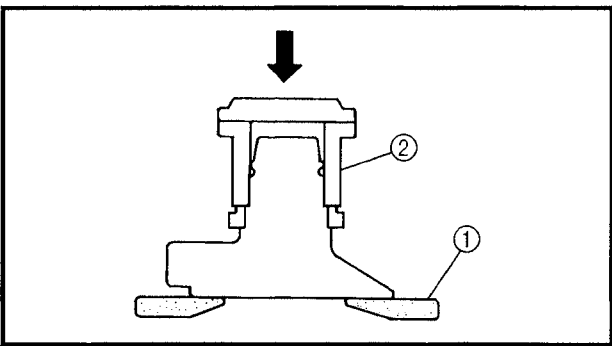
	Small-end axial play limit 2.0 mm (0.08 in)
--	---



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)
--	--

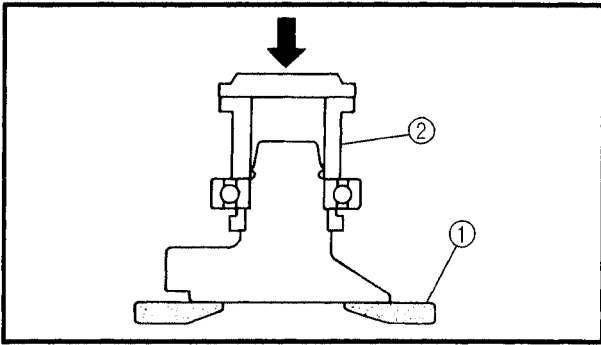
4. Inspect:
- Crankshaft bearing
Pitting/rumbling → Replace.
5. Inspect:
- Oil pump drive gear
Cracks/pitting/wear → Replace.



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

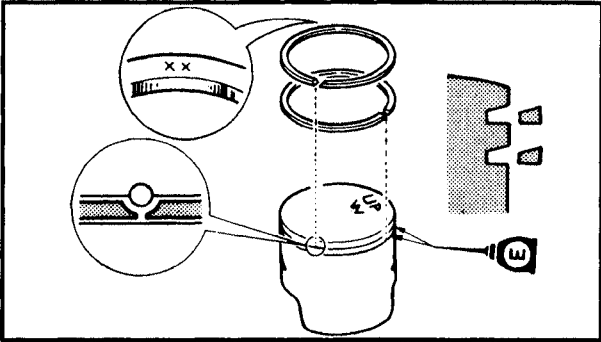


INSTALLING THE BEARING

Install:

- Bearing

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



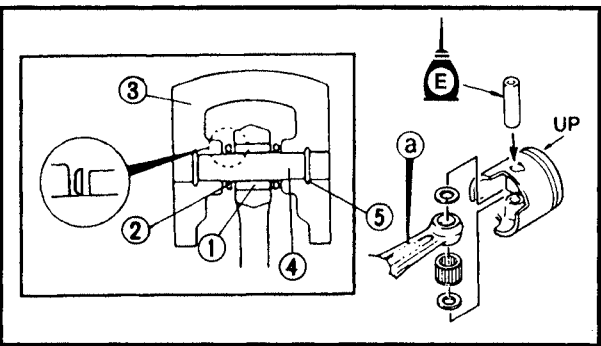
INSTALLING THE PISTON RINGS AND PISTON

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:

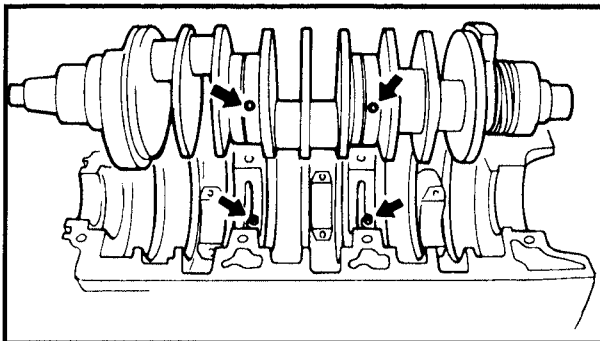
- Small-end bearing ①
- Washers ②
- Piston ③
- Piston pin ④
- Piston pin clips ⑤

CAUTION:

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

NOTE:

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



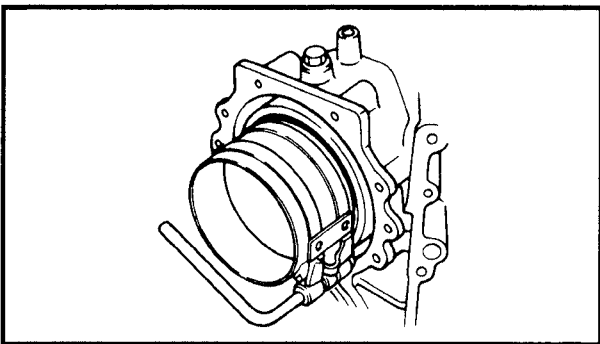
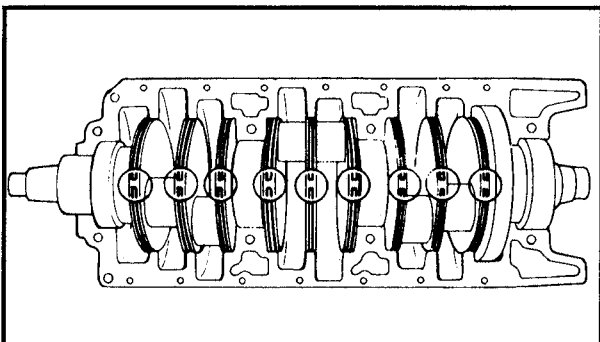
INSTALLING THE CRANKSHAFT ASSEMBLY

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:

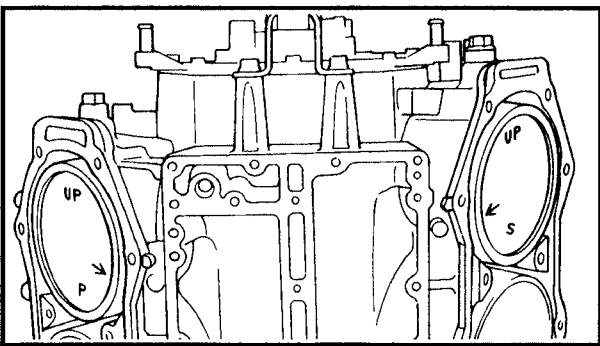
- Piston and connecting rod assembly



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 star-board 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

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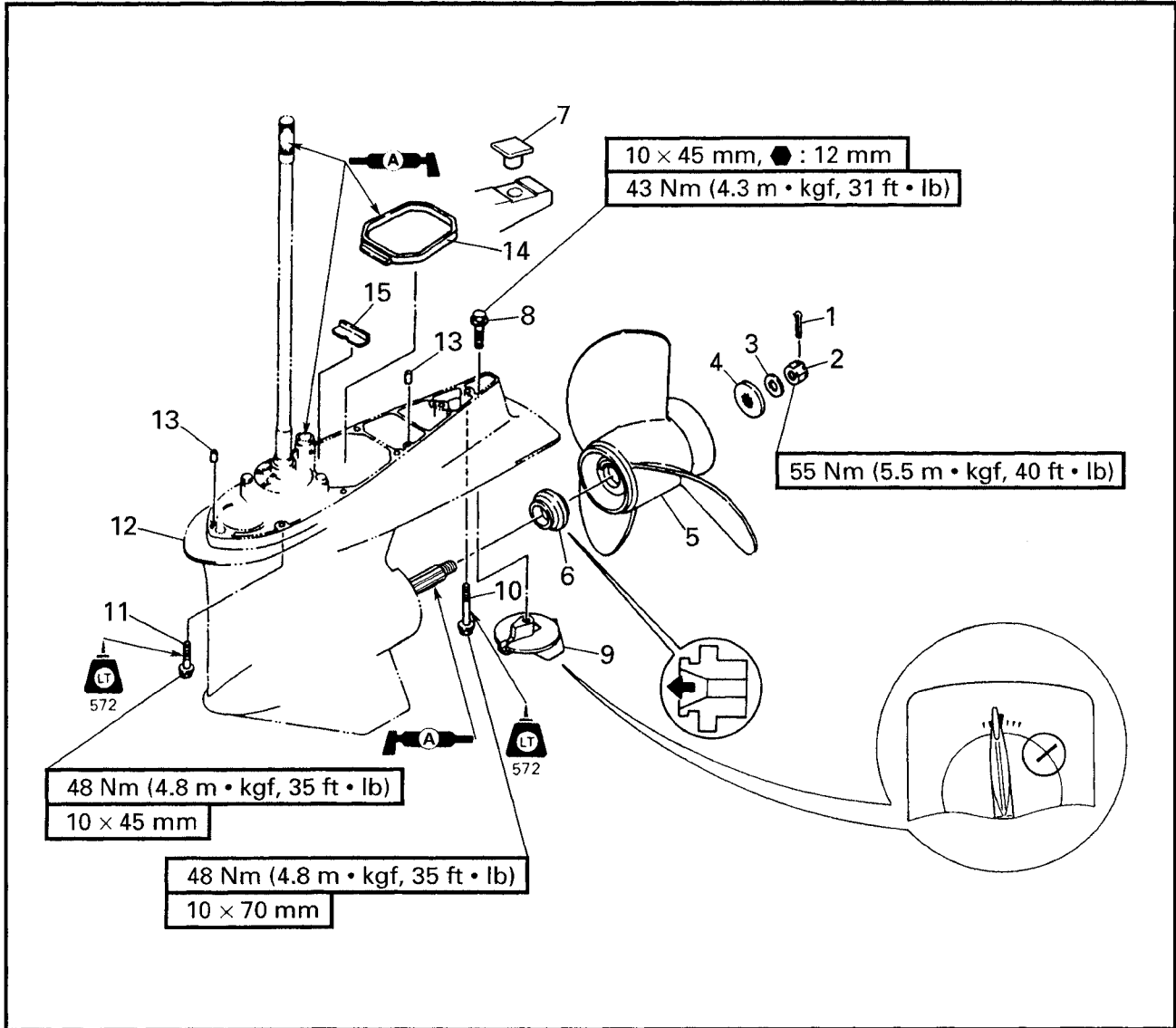
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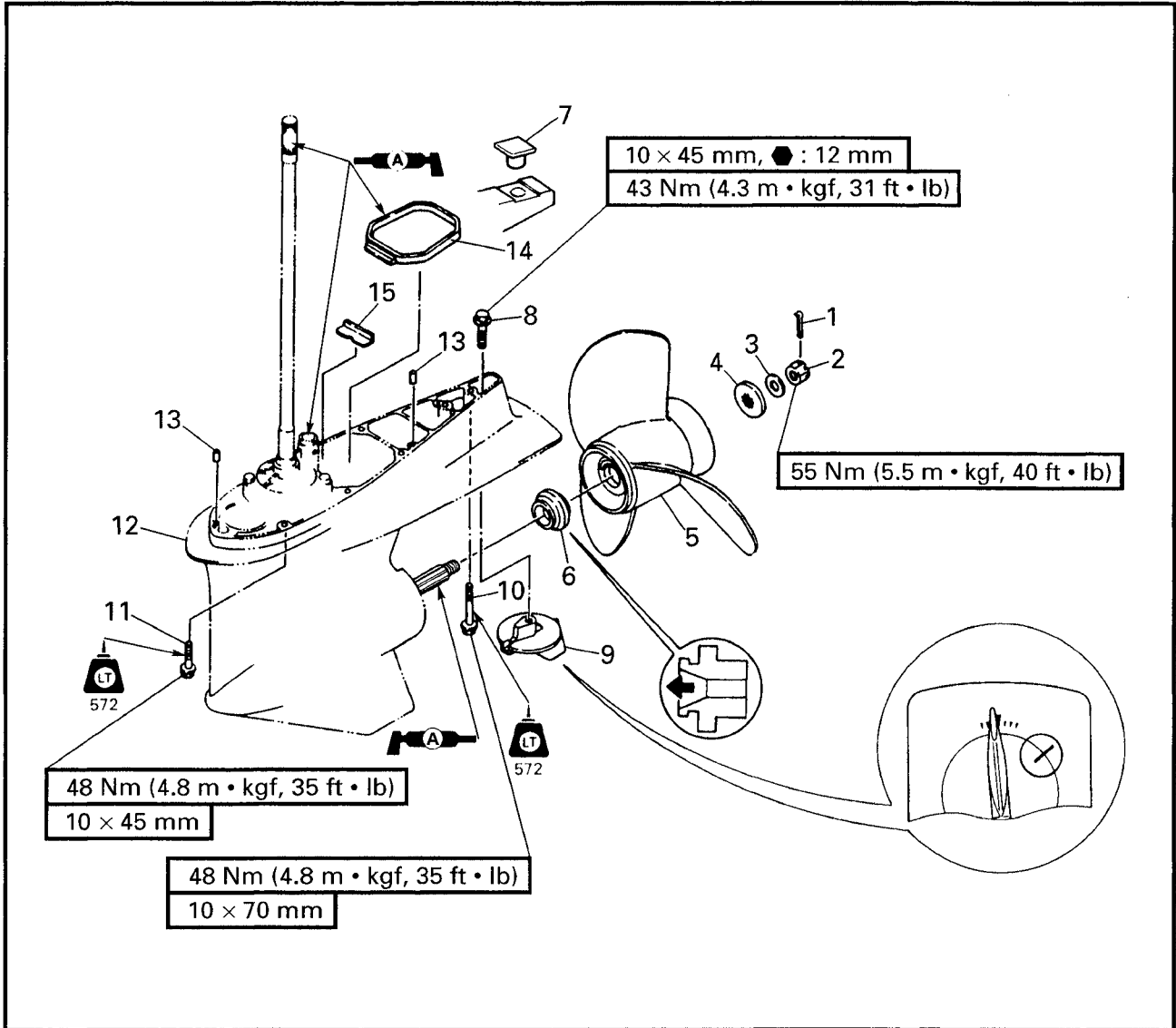


**LOWER UNIT (REGULAR ROTATION MODELS)
REMOVING/INSTALLING THE LOWER UNIT**

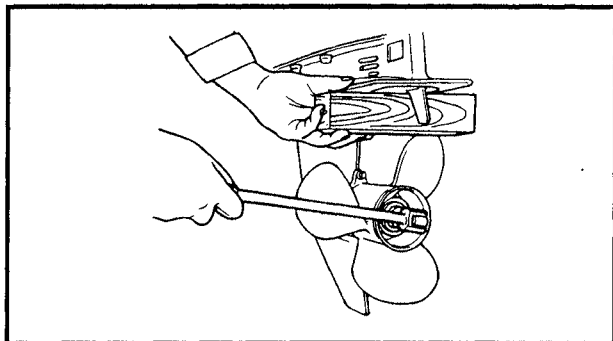


Order	Job/Part	Q'ty	Remarks
1	Cotter pin	1	
2	Propeller nut	1	
3	Washer	1	
4	Washer	1	
5	Propeller	1	
6	Spacer	1	
7	Cap	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Bolt	1	
9	Trim tab	1	
10	Bolt	1	(with washer)
11	Bolt	7	(with washer)
12	Lower unit	1	
13	Dowel pin	2	
14	Rubber seal	1	
15	Plate	1	
			For installation, reverse the removal procedure.



REMOVING THE PROPELLER

Remove:

- Propeller

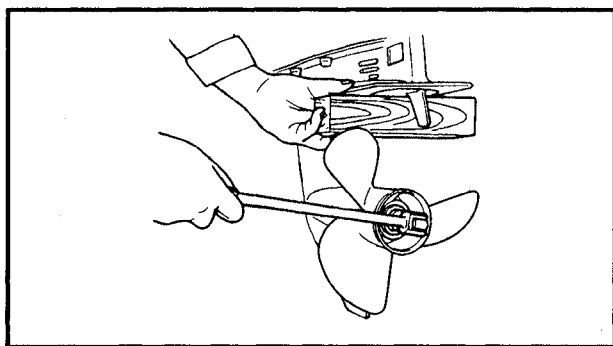
⚠ WARNING

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

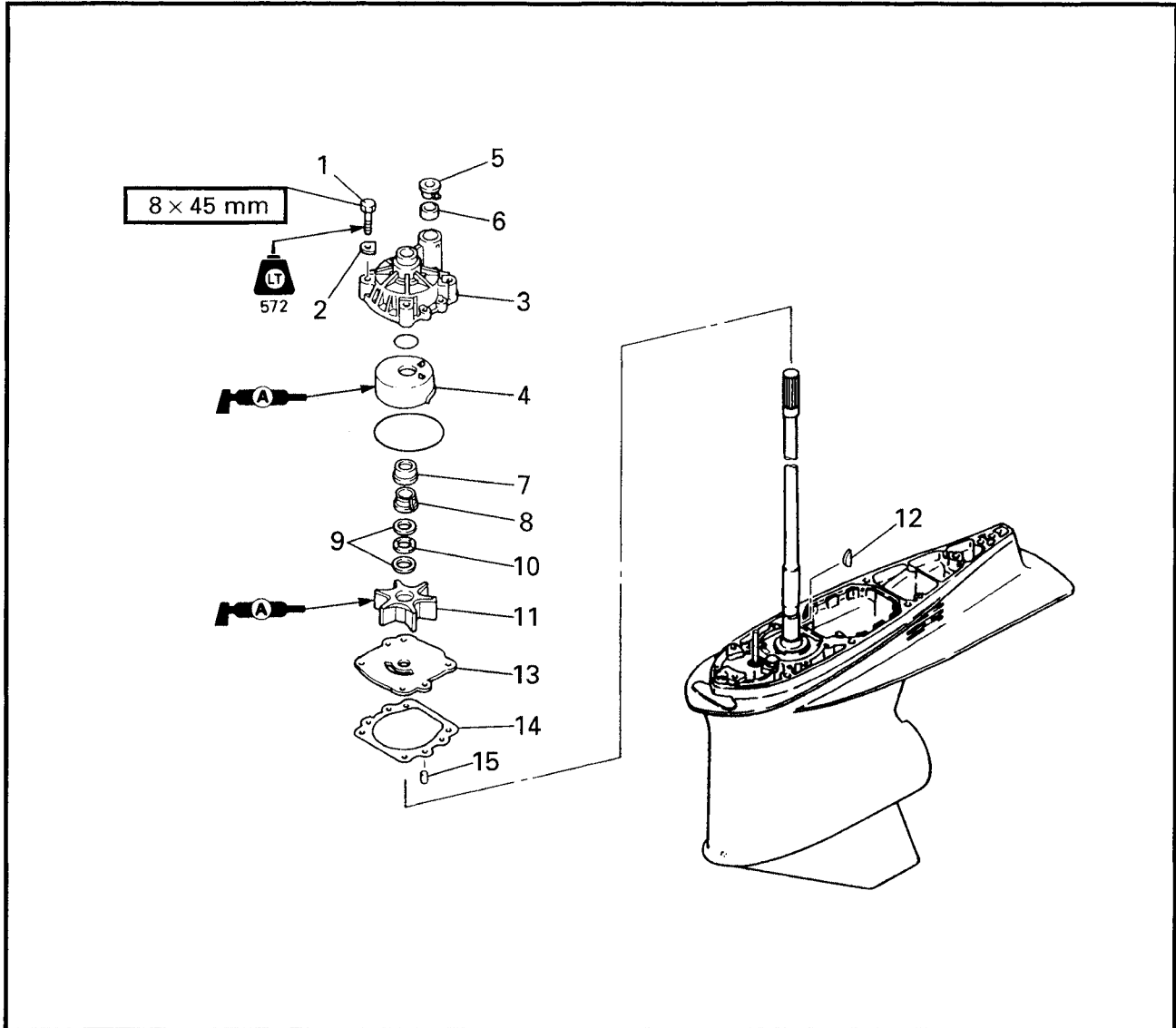
Do not hold the propeller with your hands when removing or installing it. Be sure to remove the battery leads from the batteries and the lanyard engine stop switch. Put a block of wood between the cavitation plate and propeller to keep the propeller from turning.

NOTE:

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

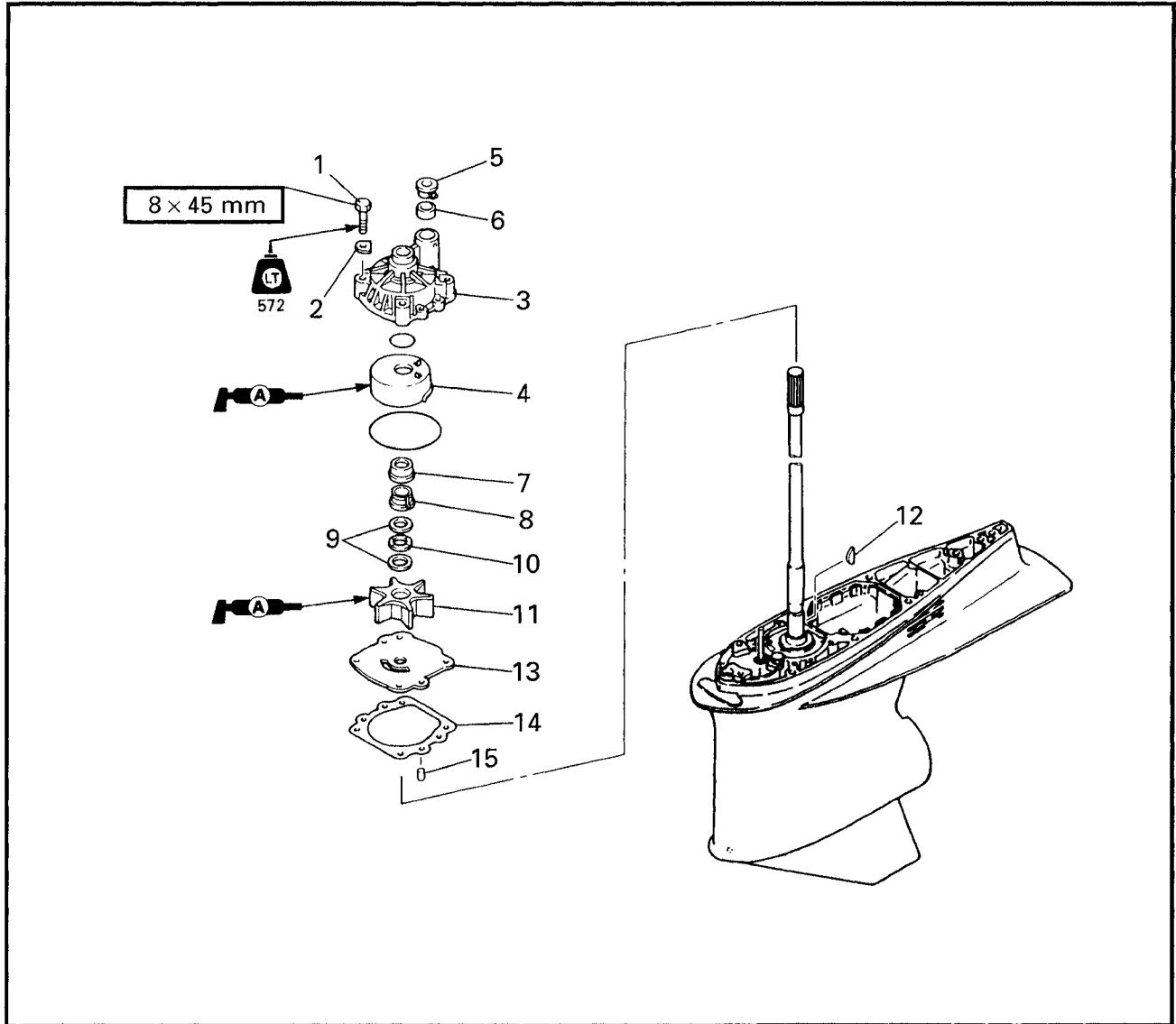


**WATER PUMP (REGULAR ROTATION MODELS)
REMOVING/INSTALLING THE WATER PUMP**



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

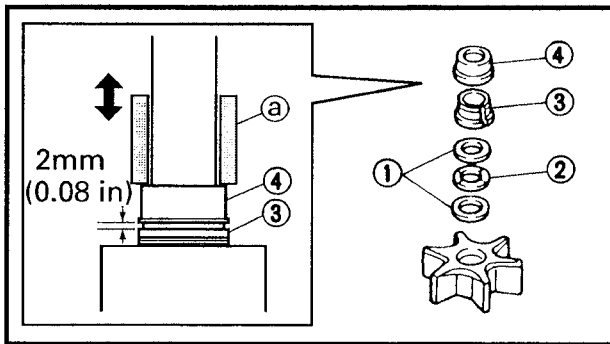
Inspect:

- 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:

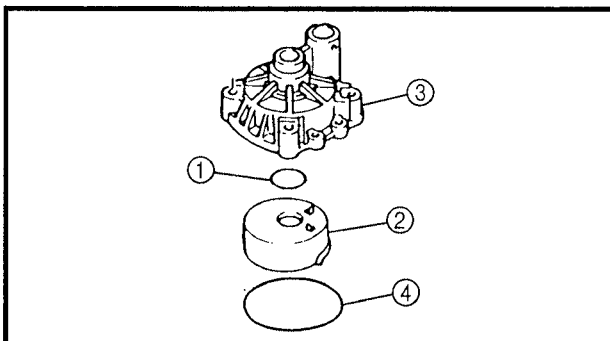
- The collar and spacer should fit together firmly.
- Install the collar with some appropriate tool ⑤ that fits over the drive shaft as shown.

2. Install:

- O-ring ①
- Impeller housing cup ②
- Impeller housing ③
- O-ring ④

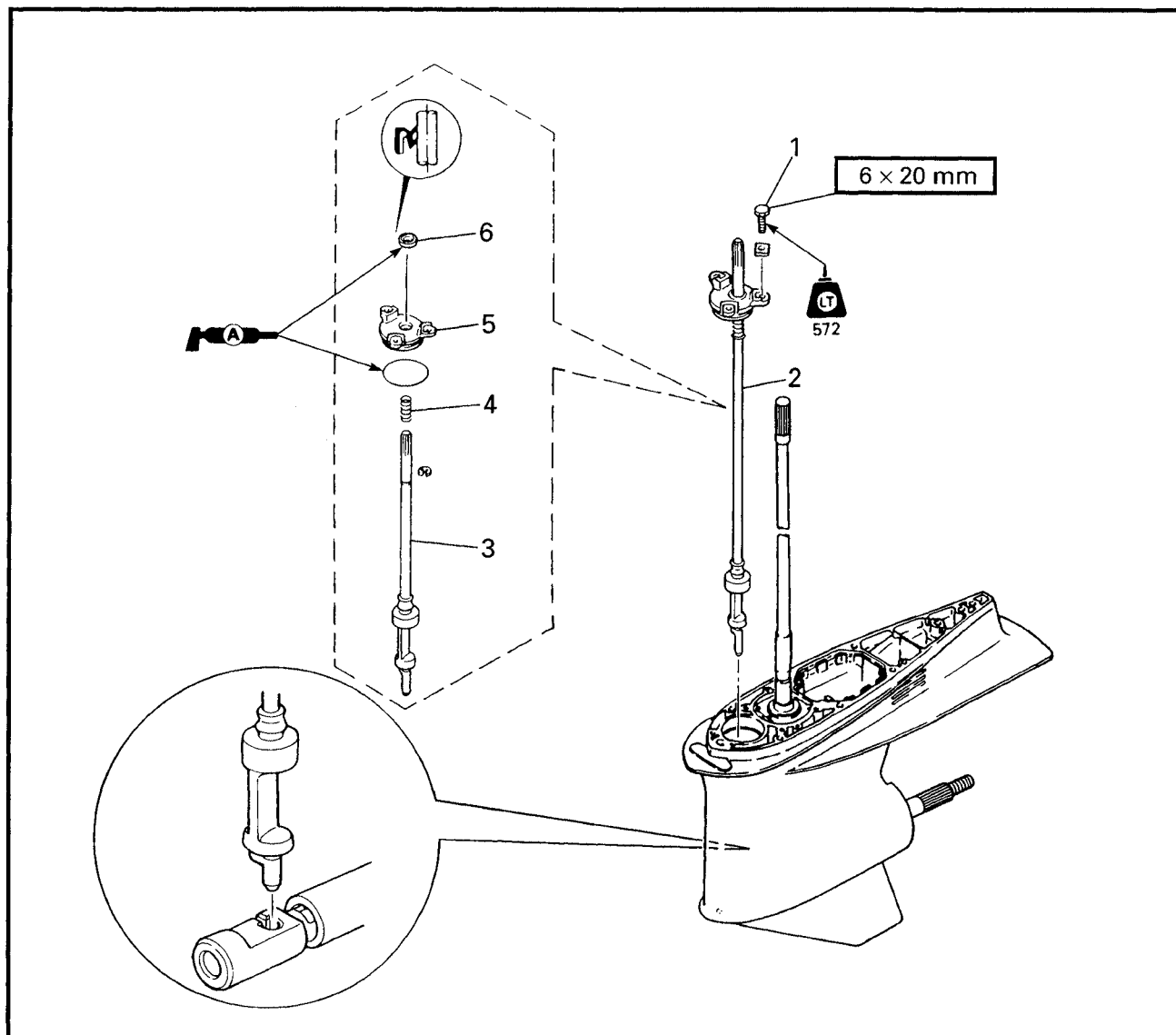
NOTE:

- 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. (with washer)
1	Bolt	3	
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

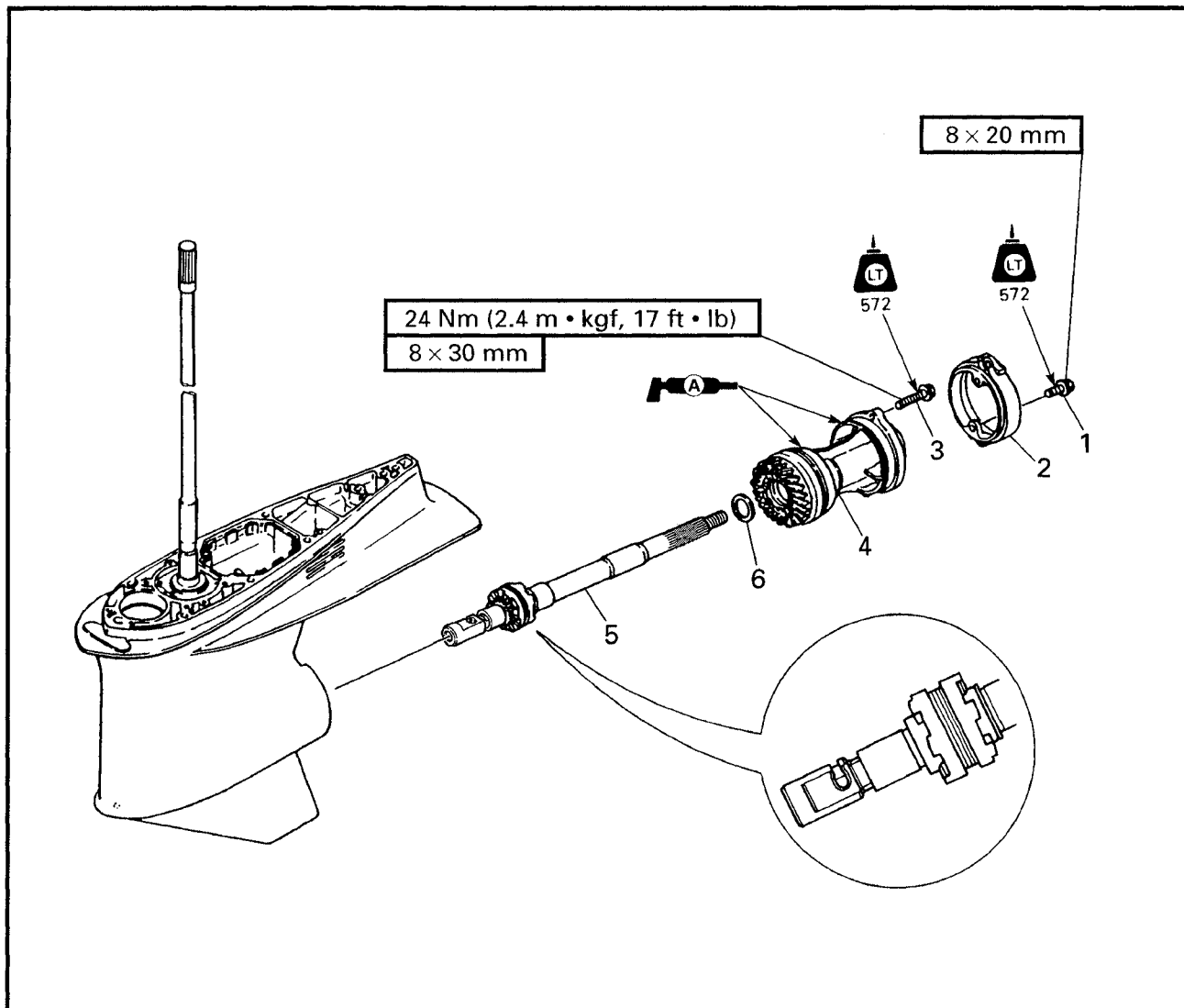
NOTE: _____

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



**PROPELLER SHAFT HOUSING ASSEMBLY
(REGULAR ROTATION MODELS)**

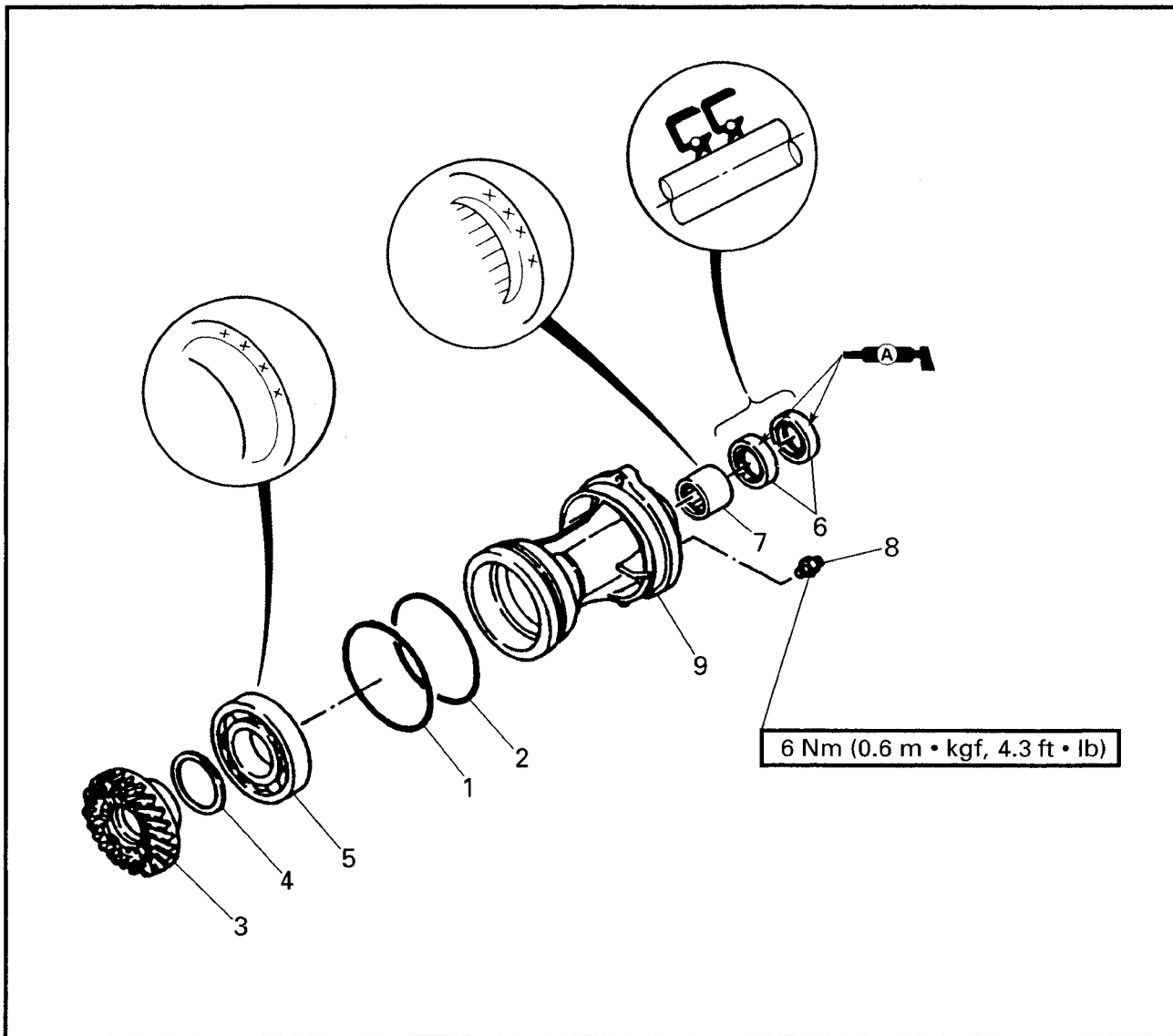
REMOVING/INSTALLING THE PROPELLER SHAFT HOUSING ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Gear oil		Refer to "CHANGING AND INSPECTING THE GEAR OIL" on page 3-15.
	Shift rod assembly		Refer to "SHIFT ROD ASSEMBLY (REGULAR ROTATION MODELS)" on page 6-7.
1	Bolt	2	
2	Ring	1	
3	Bolt	2	
4	Propeller shaft housing assembly	1	
5	Propeller shaft assembly	1	
6	Washer	1	
			For installation, reverse the removal procedure.



DISASSEMBLING/ASSEMBLING THE PROPELLER SHAFT HOUSING

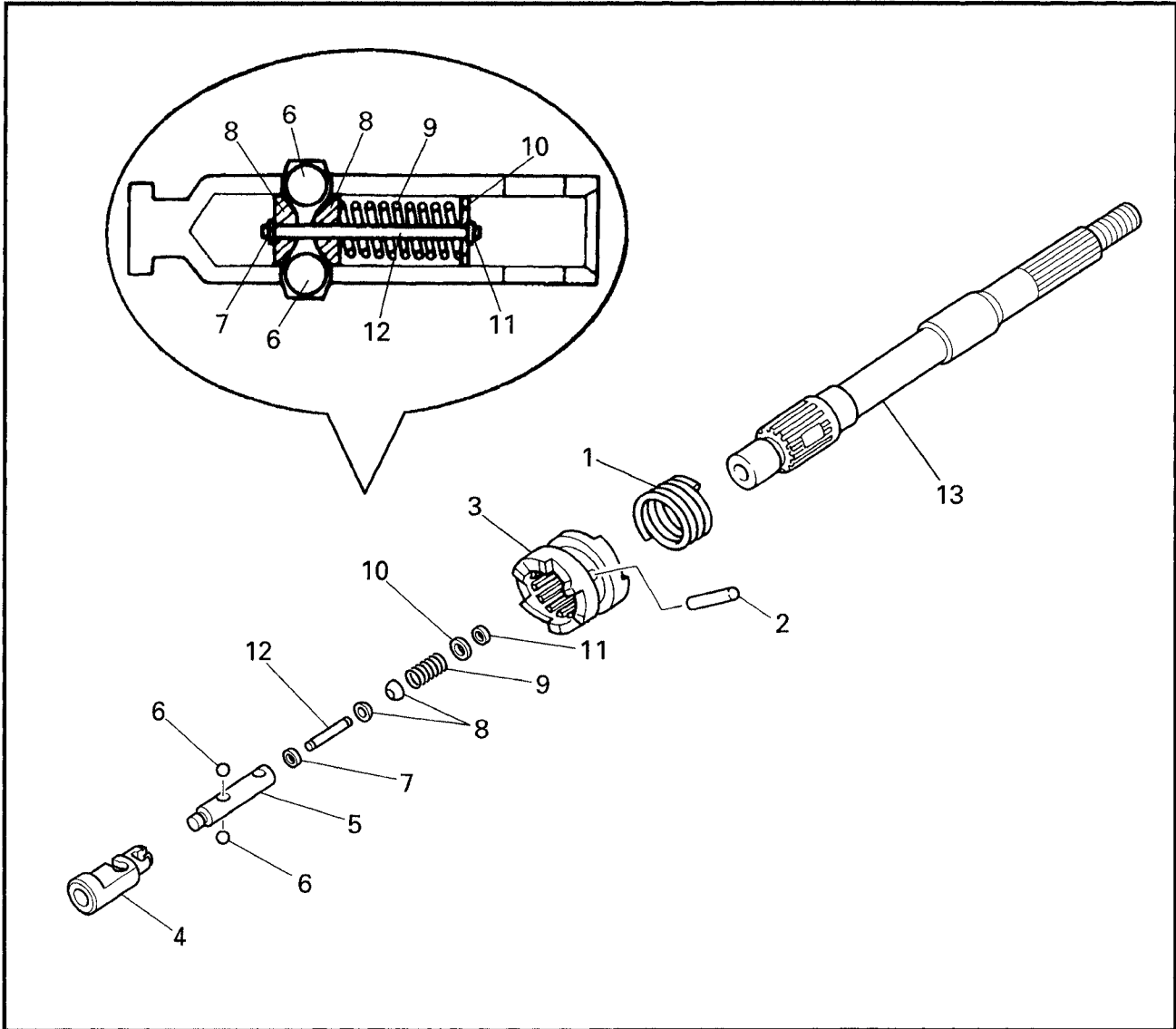


Order	Job/Part	Q'ty	Remarks
1	O-ring	1	
2	O-ring	1	
3	Reverse gear	1	
4	Reverse gear shim	*	
5	Ball bearing	1	
6	Oil seal	2	
7	Needle bearing	1	
8	Grease nipple	1	
9	Propeller shaft housing	1	
			For assembly, reverse the disassembly procedure.

*: As required

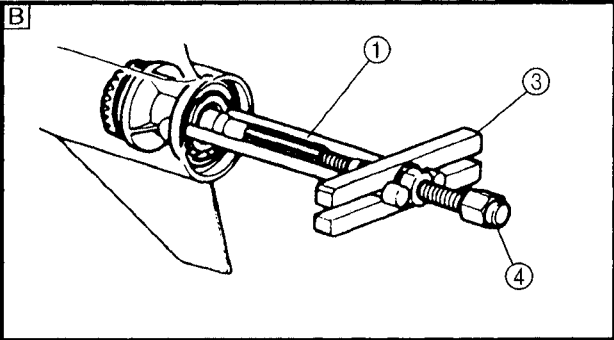
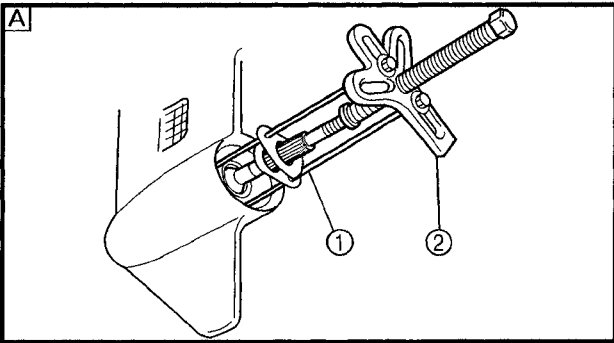


DISASSEMBLING/ASSEMBLING THE PROPELLER SHAFT ASSEMBLY



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	2	
7	Spring nut	1	

Continued on next page.



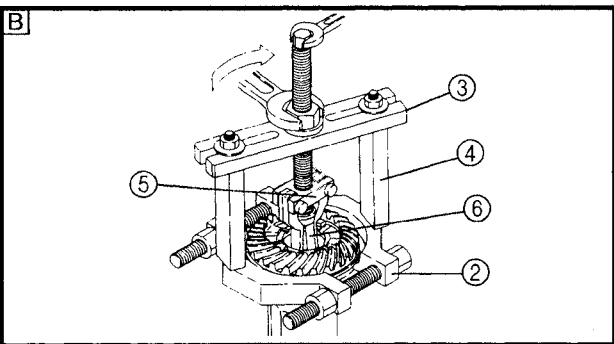
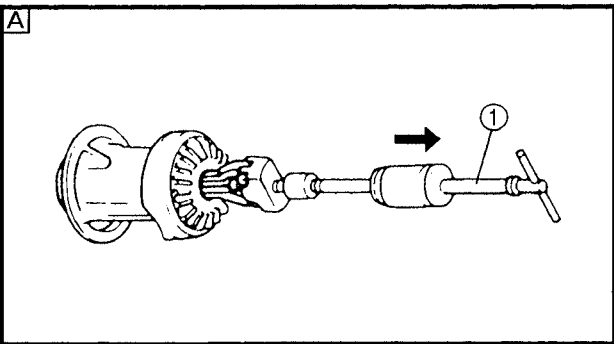
REMOVING THE PROPELLER SHAFT HOUSING ASSEMBLY

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



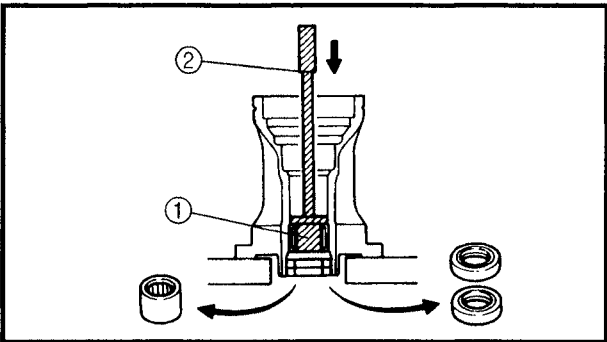
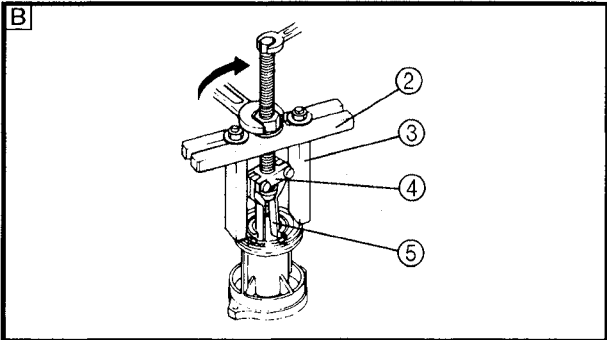
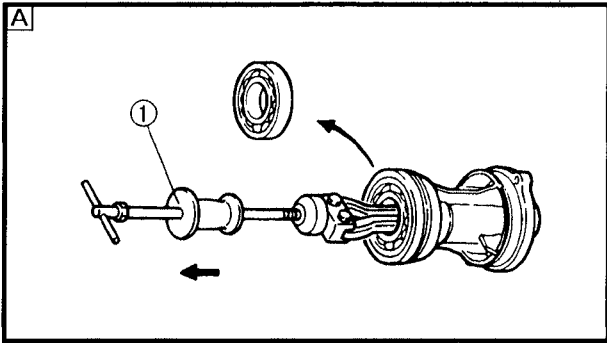
DISASSEMBLING THE PROPELLER SHAFT HOUSING

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



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 / 90890-06653 | |
| 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

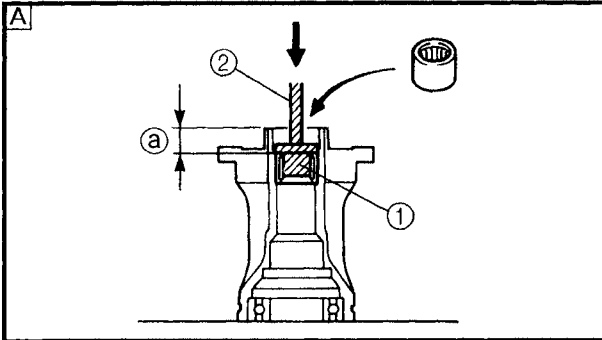
Inspect:

- Propeller shaft
Damage/wear → Replace.

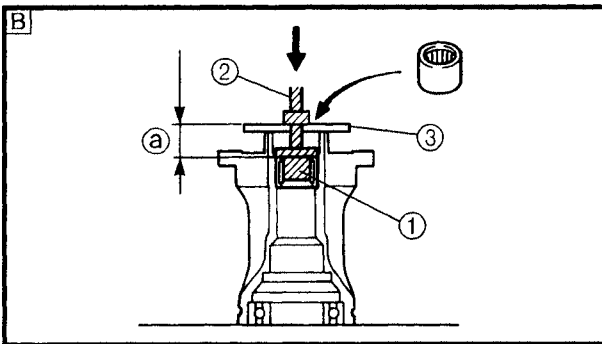
**ASSEMBLING THE PROPELLER
SHAFT HOUSING**

1. Install:

- Needle bearing



	Needle bearing installation position ① 25.05 - 25.55 mm (0.986 - 1.006 in)
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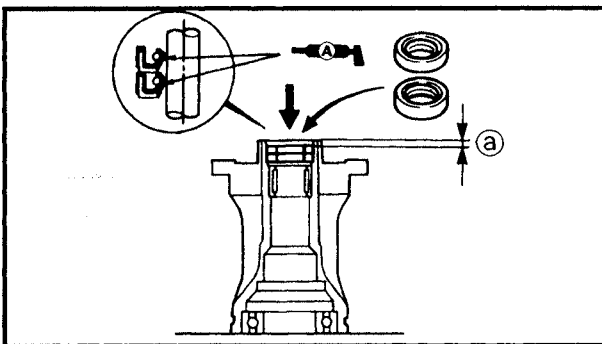


	Bearing/oil seal attachment ① YB-06196 / 90890-06653
	Driver rod ② YB-06071 / 90890-06604
	Bearing/oil seal depth plate ③ 90890-06603

- A** For USA and Canada
- B** Except for USA and Canada

2. Install:

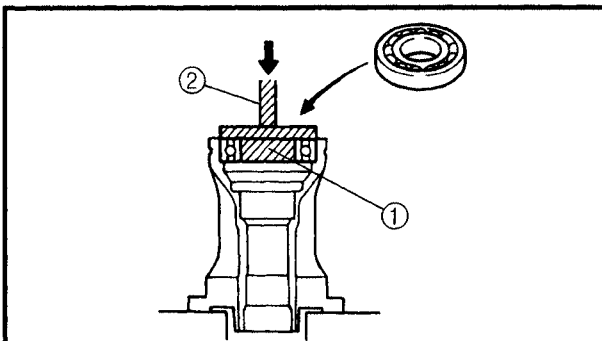
- Oil seal



	Oil seal installation position ① 4.75 - 5.25 mm (0.187 - 0.207 in)
--	--

3. Install:

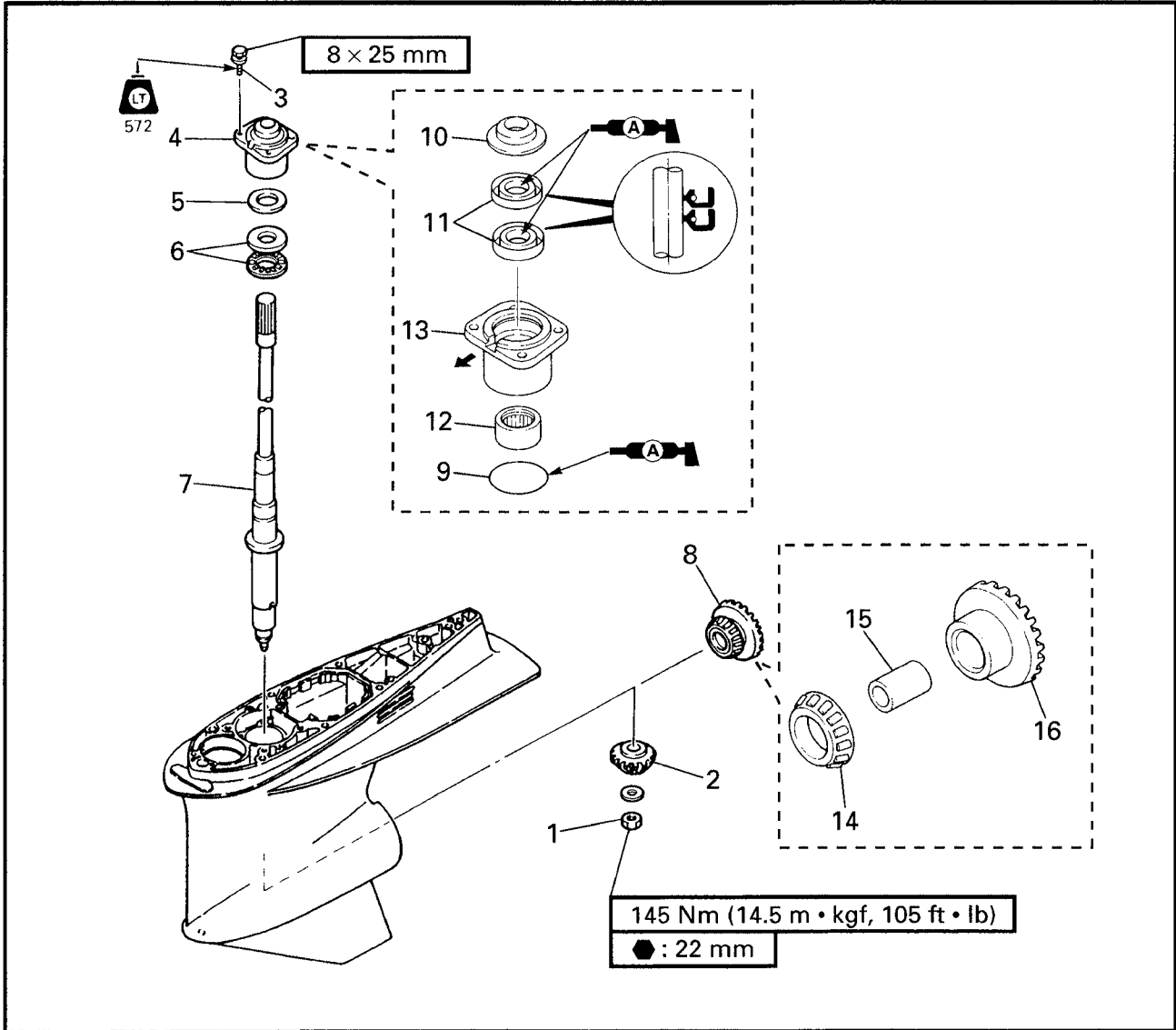
- Ball bearing



	Bearing attachment..... ① YB-06430 / 90890-06656
	Driver rod ② YB-06071 / 90890-06606



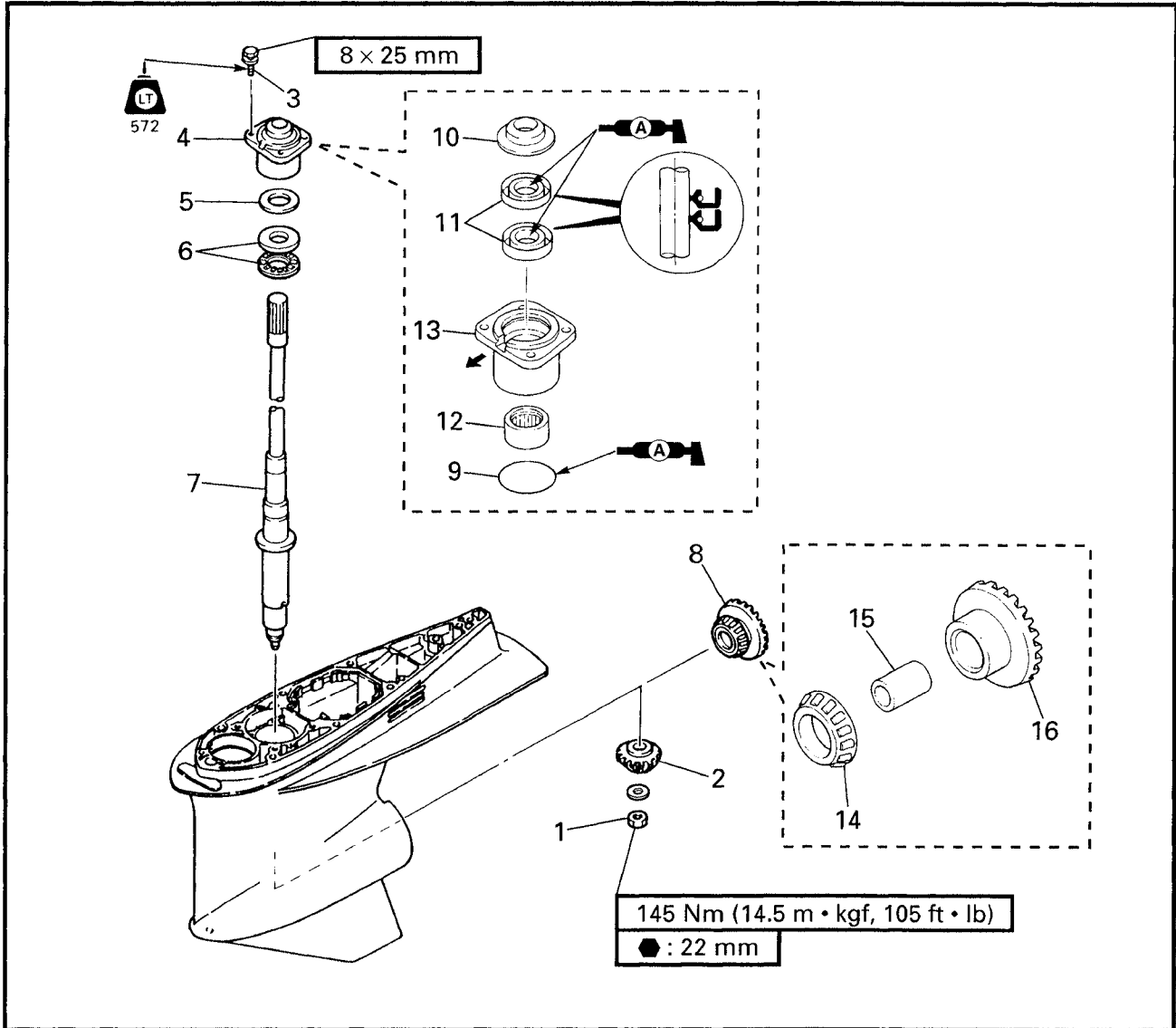
**DRIVE SHAFT (REGULAR ROTATION MODELS)
REMOVING/INSTALLING THE DRIVE SHAFT**



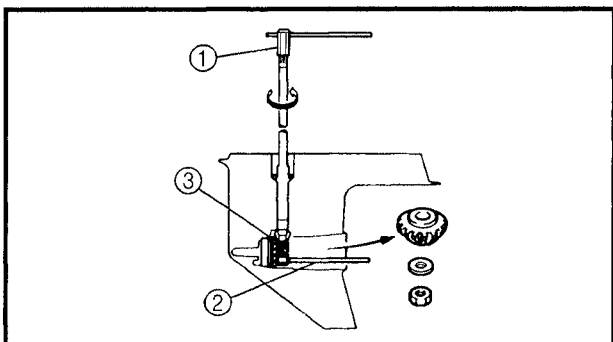
Order	Job/Part	Q'ty	Remarks
	Propeller shaft housing assembly		Refer to "PROPELLER SHAFT HOUSING ASSEMBLY (REGULAR ROTATION MODELS)" on page 6-9.
1	Nut	1	
2	Pinion	1	
3	Bolt	4	(with washer)
4	Drive shaft housing assembly	1	
5	Pinion shim	*	
6	Thrust bearing	1	
7	Drive shaft	1	

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	Bushing	1	
16	Forward gear	1	
			For installation, reverse the removal procedure.

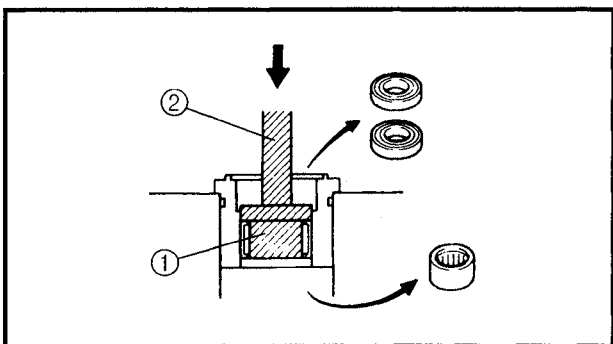


REMOVING THE DRIVE SHAFT

Loosen:

- Pinion nut

	Drive shaft holder ① YB-06201 / 90890-06520
	Pinion nut holder ② 90890-06505
	Pinion nut holder attachment . ③ 90890-06507

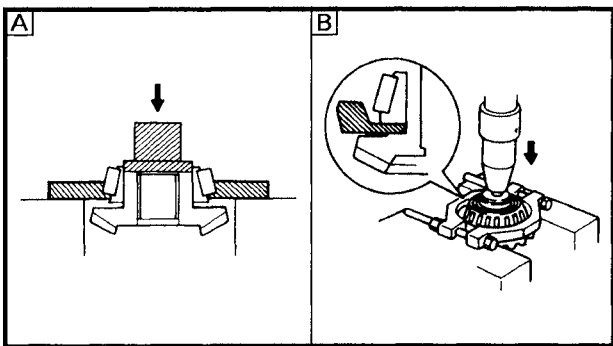


DISASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY

Remove:

- Needle bearing

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



DISASSEMBLING THE FORWARD GEAR ASSEMBLY

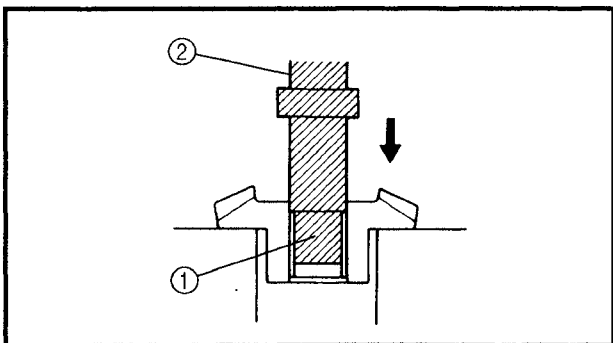
1. Remove:

- Tapered roller bearing

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

- A For USA and Canada
- B Except for USA and Canada

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



2. Remove:

- Bushing

	Bearing/oil seal attachment ① YB-06437
	Driver rod ② YB-06071



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

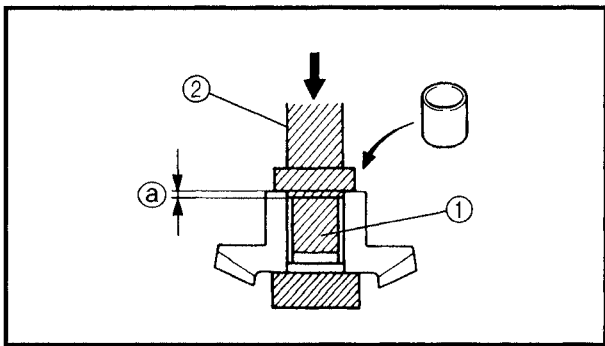
Inspect:

- Bearings
Pitting/rumbling → Replace.

ASSEMBLING THE FORWARD GEAR ASSEMBLY

1. Install:

- Bushing

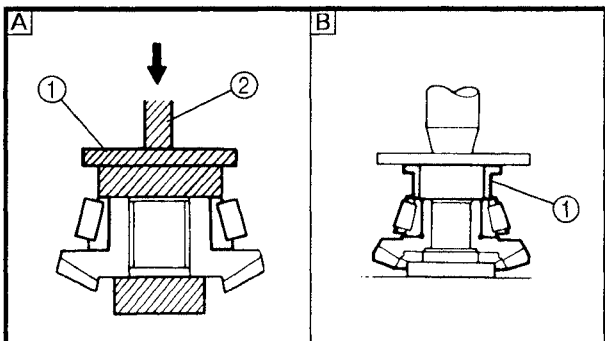


	Bushing installation position [Ⓐ] 2.3 - 2.7 mm (0.09 - 0.10 in)
--	--

	Bearing/oil seal attachment [Ⓐ] YB-06437
	Driver rod [Ⓑ] YB-06071

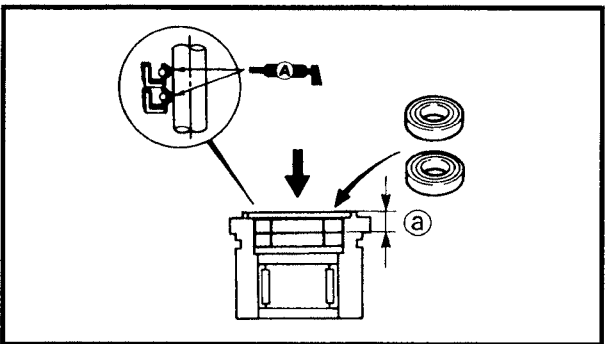
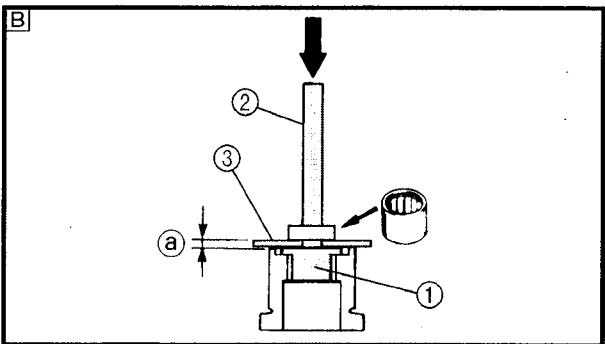
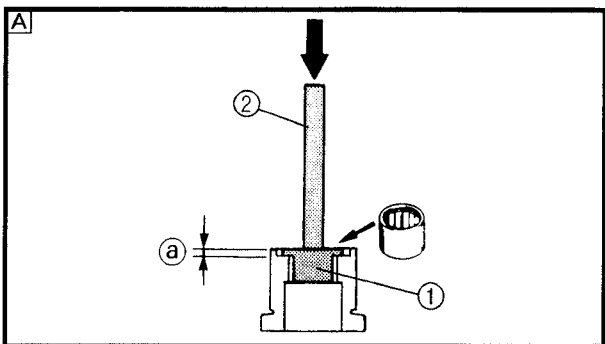
2. Install:

- Tapered roller bearing



	Bearing/oil seal attachment [Ⓐ] YB-06276-B / 90890-06659
	Driver rod [Ⓑ] YB-06071

- A** For USA and Canada
- B** Except for USA and Canada



ASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY

- 1. Install:
 - Needle bearing

	Needle bearing installation position ① 4.25 - 4.75 mm (0.167 - 0.187 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 seals

	Oil seal installation position ① 0.25 - 0.75 mm (0.010 - 0.030 in)
--	--

INSTALLING THE DRIVE SHAFT

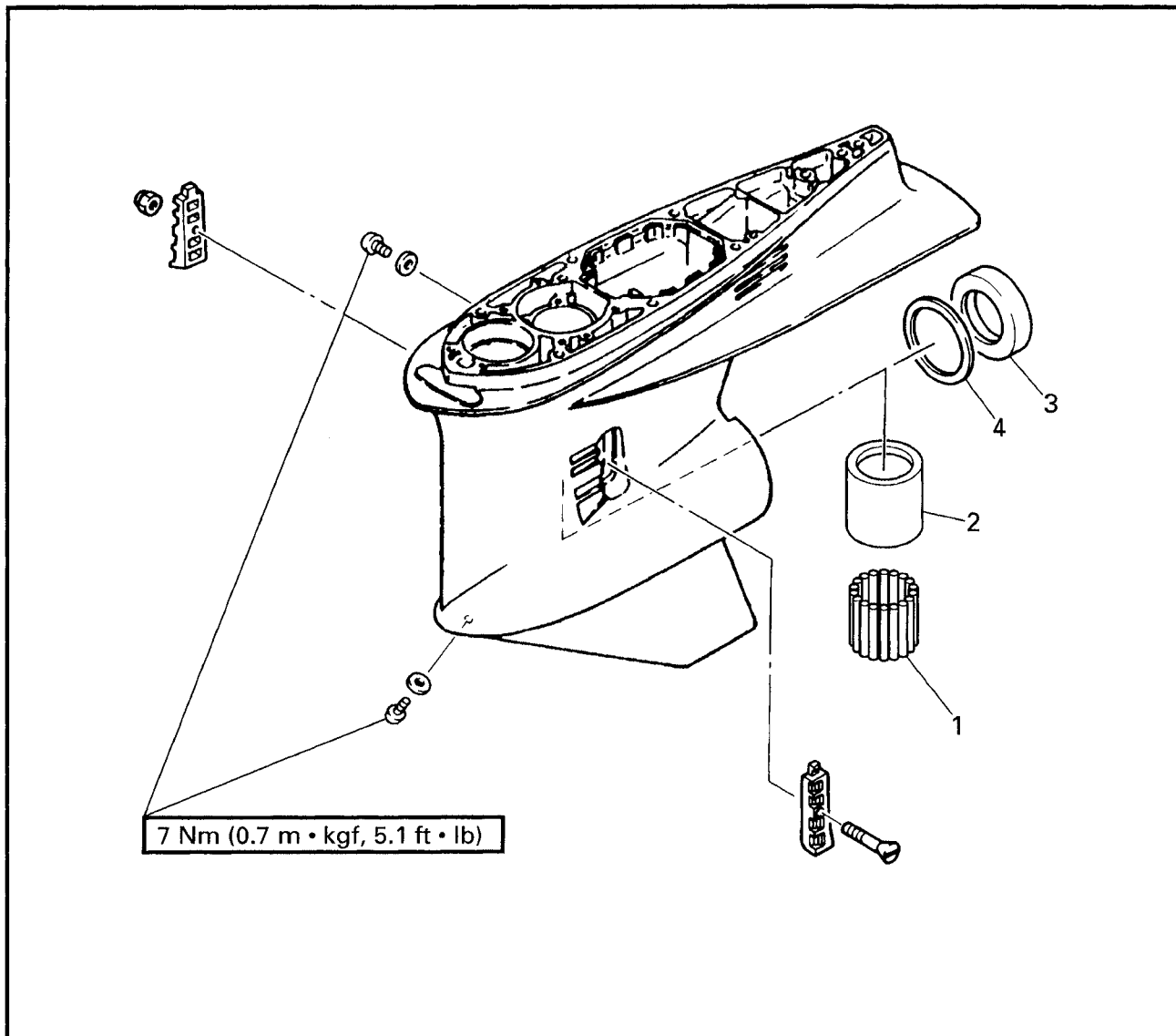
- Tighten:
 - Pinion nut

	Pinion nut 145 Nm (14.5 m • kgf, 105 ft • lb)
--	---

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

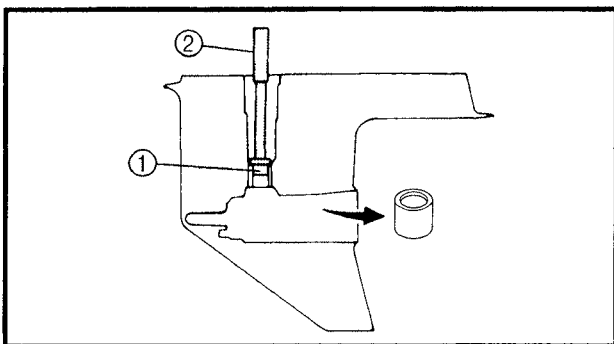


**LOWER CASE ASSEMBLY (REGULAR ROTATION MODELS)
DISASSEMBLING/ASSEMBLING THE LOWER CASE ASSEMBLY**



Order	Job/Part	Q'ty	Remarks
	Forward gear		Refer to "DRIVE SHAFT (REGULAR ROTATION MODELS)" on page 6-16.
1	Needle bearing outer case	1	
2	Needle bearing	24	
3	Tapered roller bearing outer race	1	
4	Forward gear shim	*	
			For assembly, reverse the disassembly procedure.

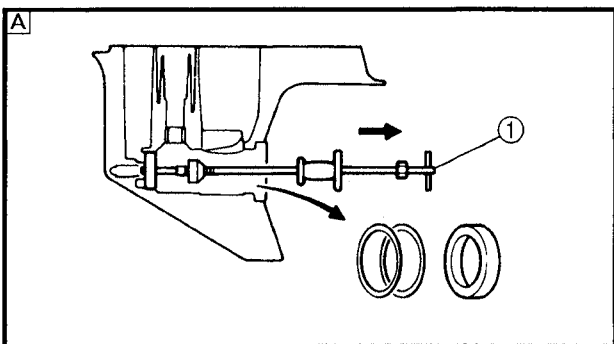
*: As required



DISASSEMBLING THE LOWER CASE ASSEMBLY

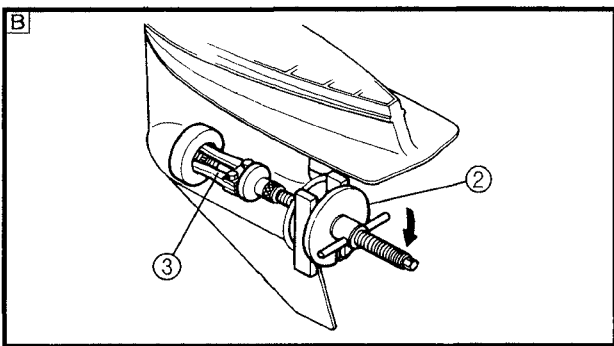
1. Remove:
- Needle bearing outer case

	Bearing/oil seal attachment ①
	YB-06432 / 90890-06655
	Driver rod ②
	YB-06071 / 90890-06605



2. Remove:
- Tapered roller bearing outer race

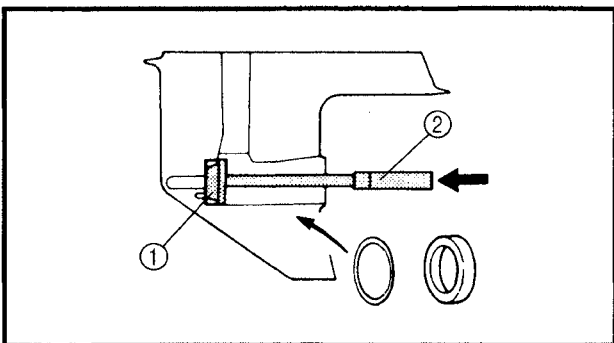
	Slide hammer..... ①
	YB-06096
	Bearing puller..... ②
	90890-06523
	Large universal claws..... ③
	90890-06532



- A** For USA and Canada
- B** Except for USA and Canada

INSPECTING THE NEEDLE BEARING

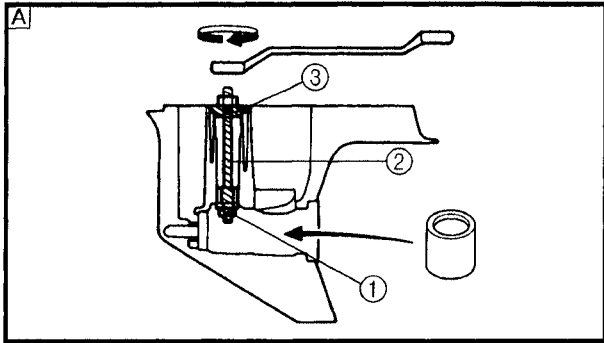
- Inspect:
- Needle bearing
 - Pitting/rumbling → Replace.



ASSEMBLING THE LOWER CASE ASSEMBLY

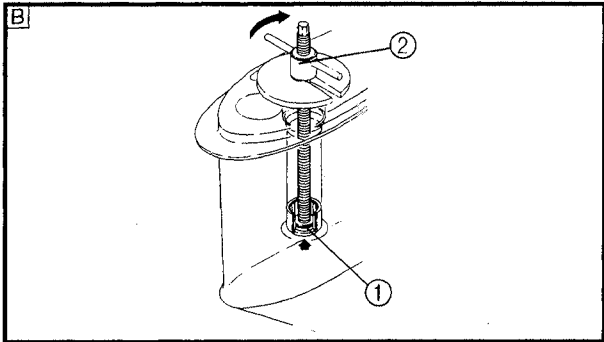
1. Install:
- Tapered roller bearing outer race

	Bearing/oil seal attachment ①
	YB-06432 / 90890-06658
	Driver rod ②
	YB-06071 / 90890-06605



2. Install:
- Needle bearing outer case

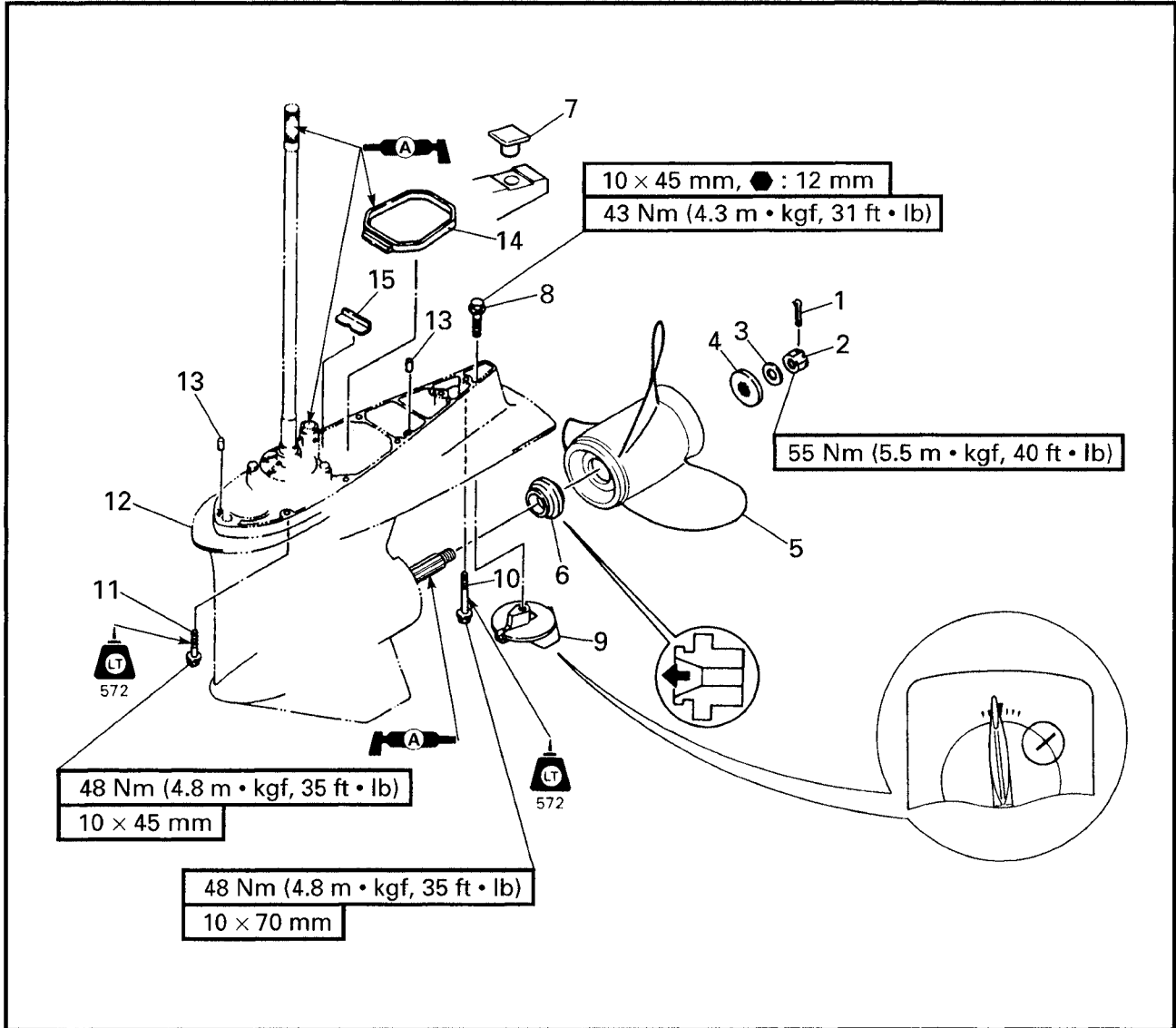
	Bearing/oil seal attachment ① YB-06432 / 90890-06655
	Bearing puller..... ② YB-06029 / 90890-06523
	Needle bearing installation plate..... ③ YB-06213



- A** For USA and Canada
- B** Except for USA and Canada

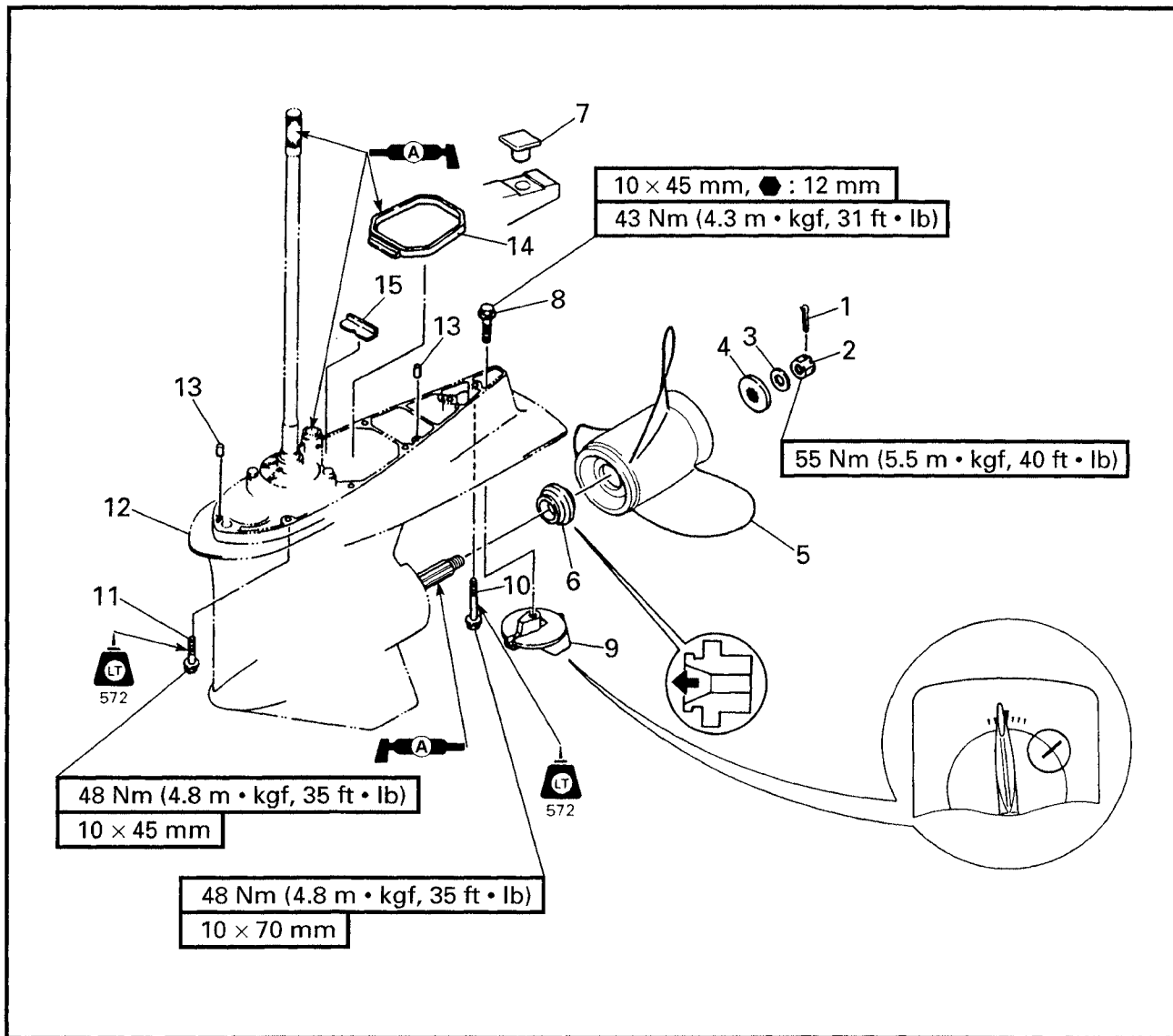


**LOWER UNIT (COUNTER ROTATION MODELS)
REMOVING/INSTALLING THE LOWER UNIT**

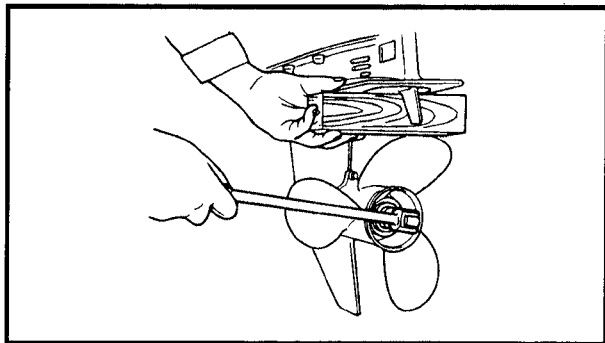


Order	Job/Part	Q'ty	Remarks
1	Cotter pin	1	
2	Propeller nut	1	
3	Washer	1	
4	Washer	1	
5	Propeller	1	
6	Spacer	1	
7	Cap	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Bolt	1	
9	Trim tab	1	
10	Bolt	1	(with washer)
11	Bolt	7	(with washer)
12	Lower unit	1	
13	Dowel pin	2	
14	Rubber seal	1	
15	Plate	1	
For installation, reverse the removal procedure.			



REMOVING THE PROPELLER

Remove:

- Propeller

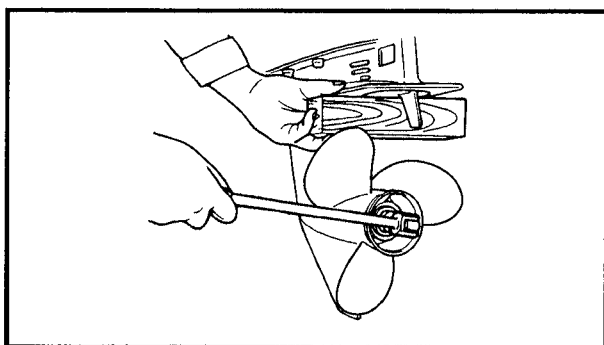
⚠ WARNING

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

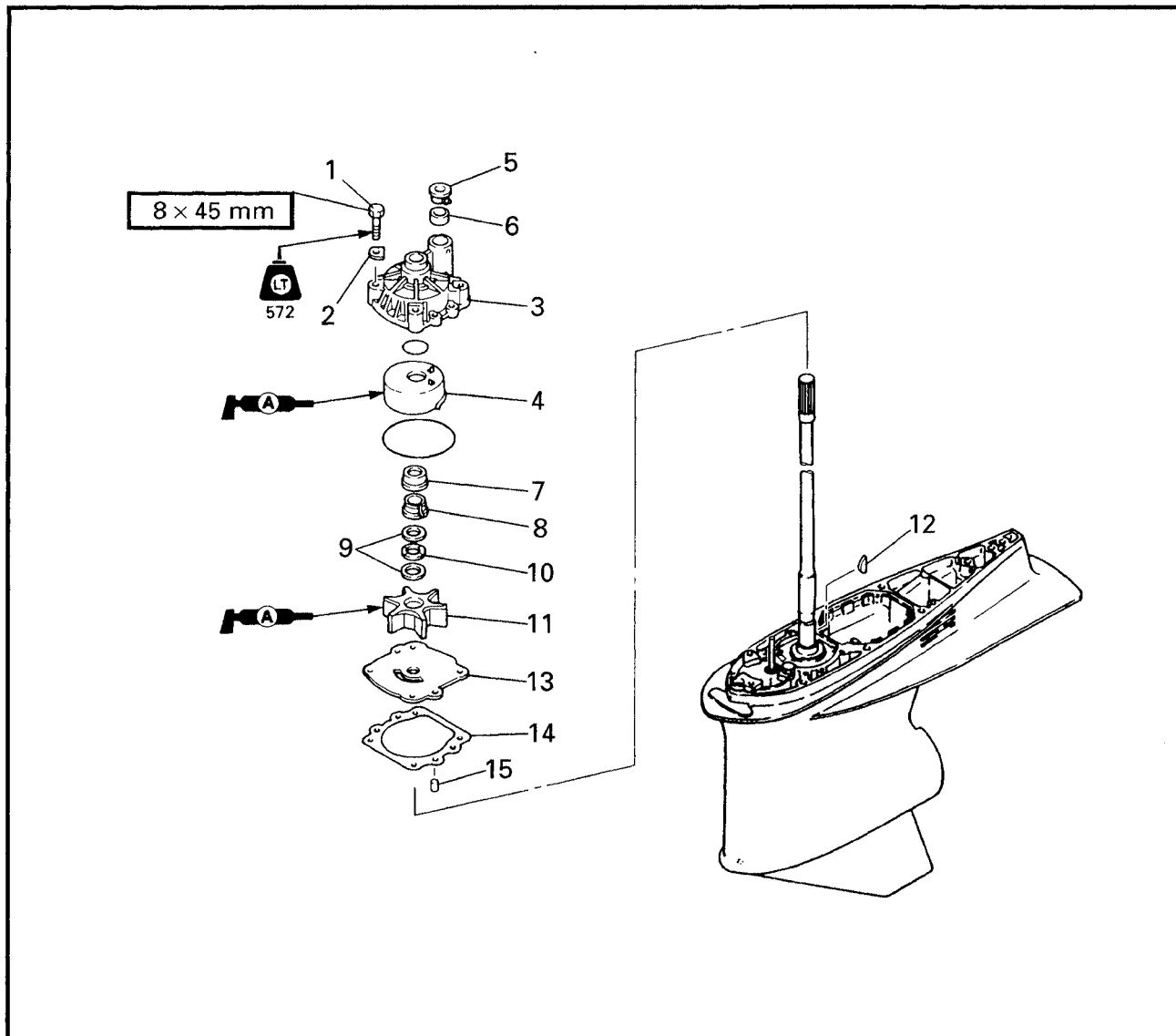
Do not hold the propeller with your hands when removing or installing it. Be sure to remove the battery leads from the batteries and the lanyard engine stop switch. Put a block of wood between the cavitation plate and propeller to keep the propeller from turning.

NOTE:

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

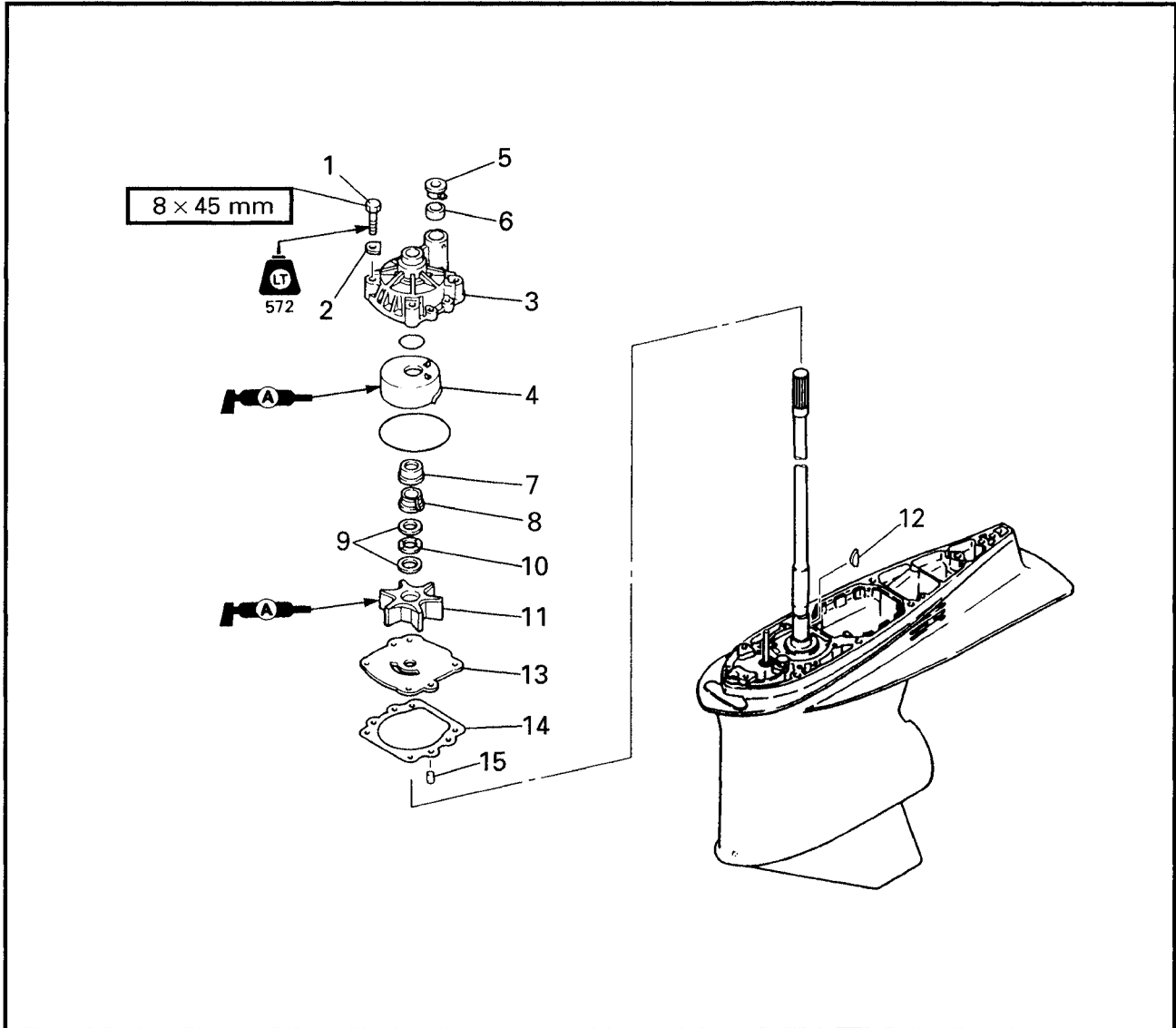


**WATER PUMP (COUNTER ROTATION MODELS)
REMOVING/INSTALLING THE WATER PUMP**



Order	Job/Part	Q'ty	Remarks
	Lower unit		Refer to "LOWER UNIT (COUNTER ROTATION MODELS)" on page 6-24.
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

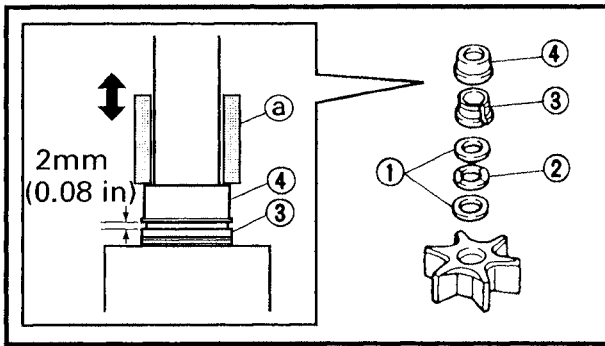
Inspect:

- 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:

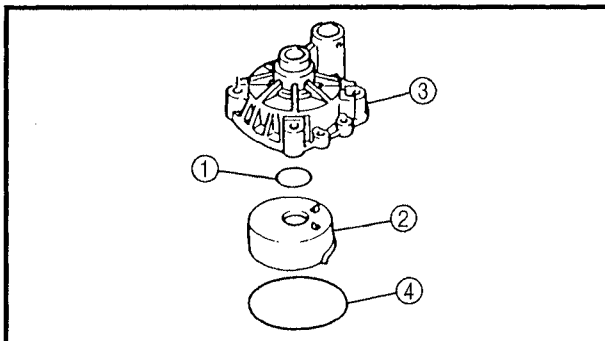
- The collar and spacer should fit together firmly.
- Install the collar with some appropriate tool ② that fits over the drive shaft as shown.

2. Install:

- O-ring ①
- Impeller housing cup ②
- Impeller housing ③
- O-ring ④

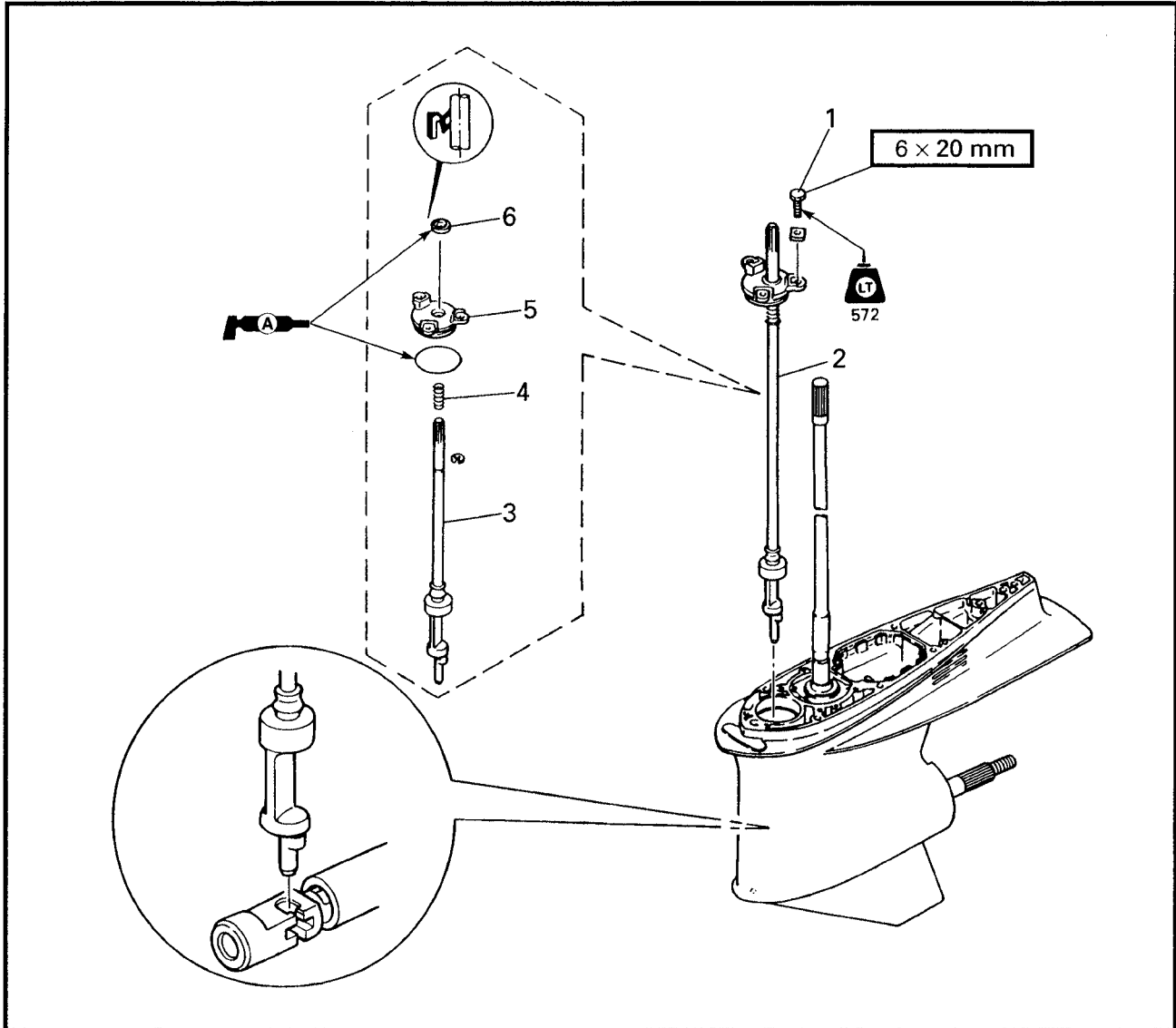
NOTE:

- 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 6-27.
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.

LOWR



SHIFT ROD ASSEMBLY (COUNTER ROTATION MODELS)

E

REMOVING THE SHIFT ROD ASSEMBLY

Remove:

- Shift rod assembly

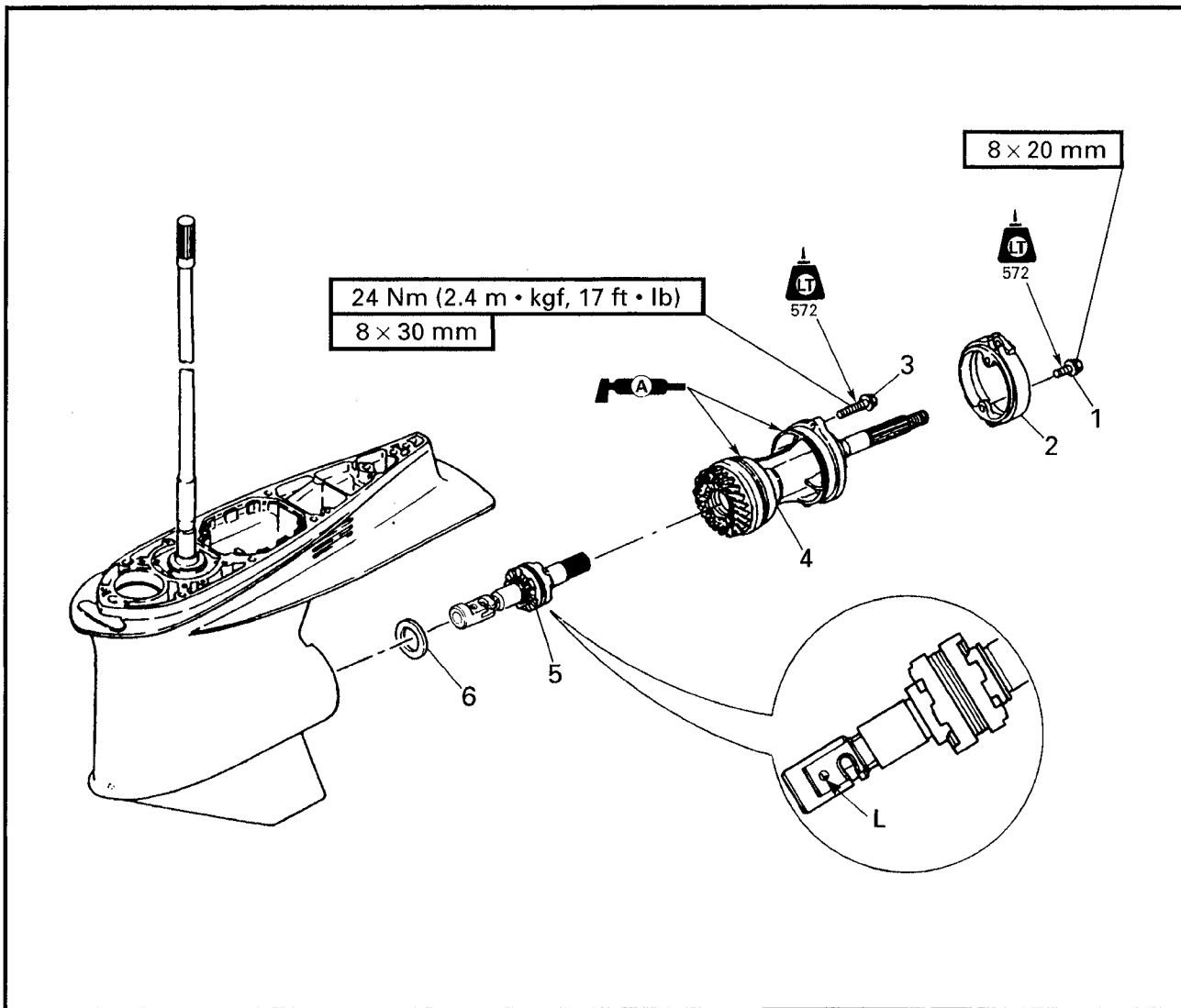
NOTE: _____

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



**PROPELLER SHAFT HOUSING ASSEMBLY
(COUNTER ROTATION MODELS)**

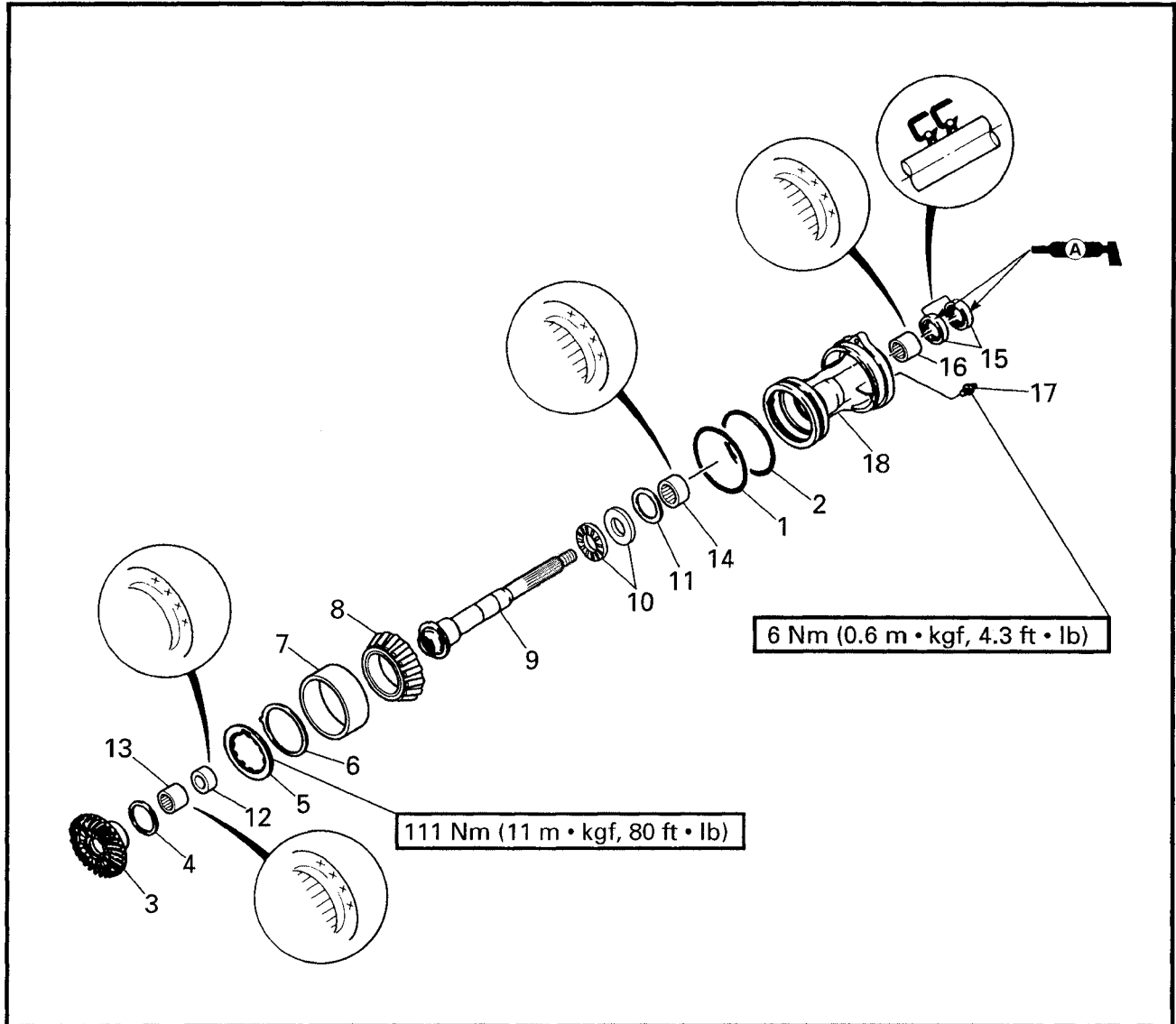
REMOVING/INSTALLING THE PROPELLER SHAFT HOUSING ASSEMBLY



Order	Job/Part	Q'ty	Remarks
	Gear oil		Refer to "CHANGING AND INSPECTING THE GEAR OIL" on page 3-15.
	Shift rod assembly		Refer to "SHIFT ROD ASSEMBLY (COUNTER ROTATION MODELS)" on page 6-30.
1	Bolt	2	
2	Ring	1	
3	Bolt	2	
4	Propeller shaft housing assembly	1	
5	Front propeller shaft assembly	1	
6	Thrust washer	1	
			For installation, reverse the removal procedure.



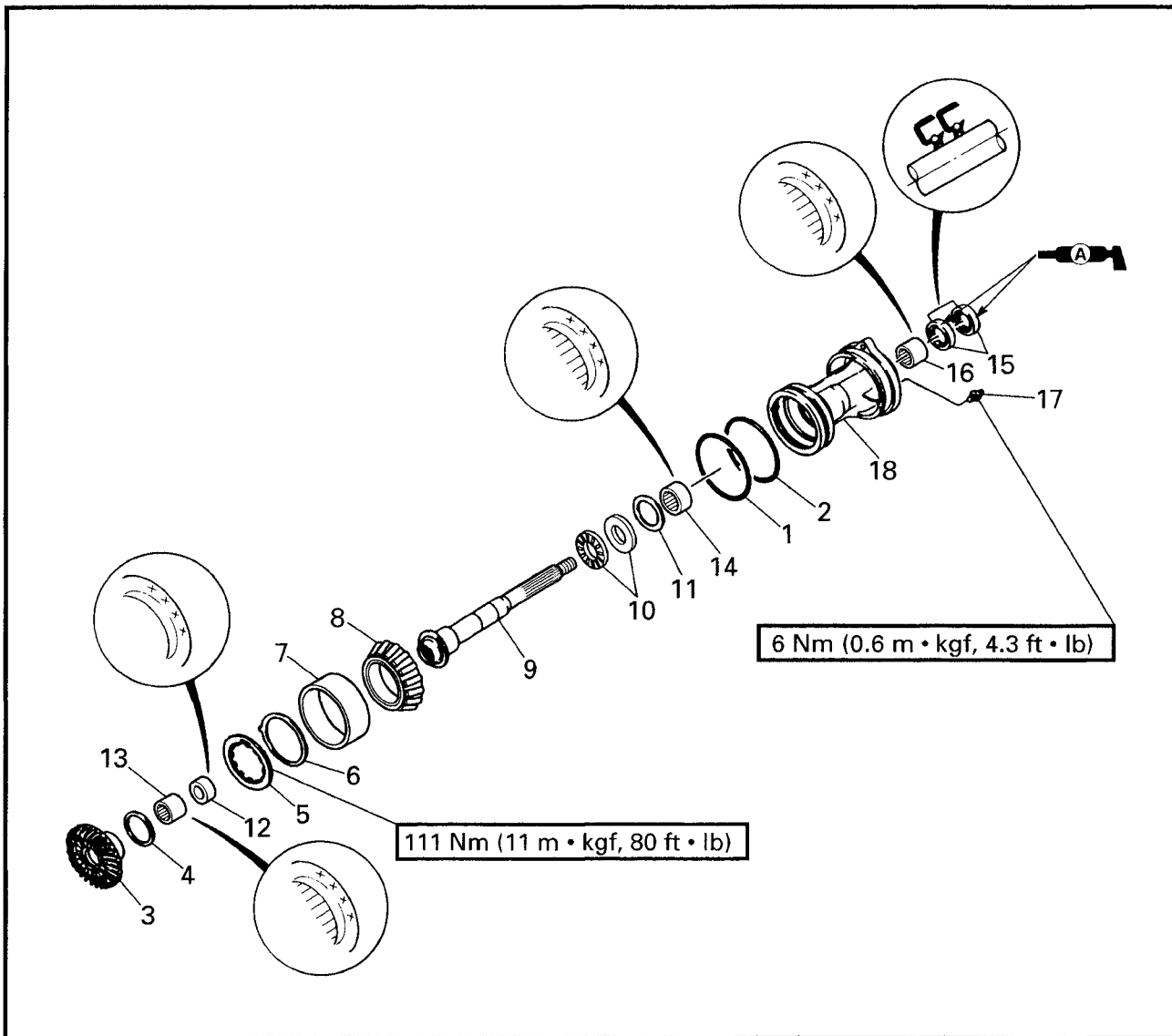
DISASSEMBLING/ASSEMBLING THE PROPELLER SHAFT HOUSING ASSEMBLY



Order	Job/Part	Q'ty	Remarks
1	O-ring	1	
2	O-ring	1	
3	Forward gear	1	
4	Forward gear shim	*	
5	Ring nut	1	
6	Claw washer	1	
7	Tapered roller bearing outer race	1	
8	Tapered roller bearing	1	
9	Rear propeller shaft	1	
10	Thrust bearing	1	

Continued on next page.

*: As required

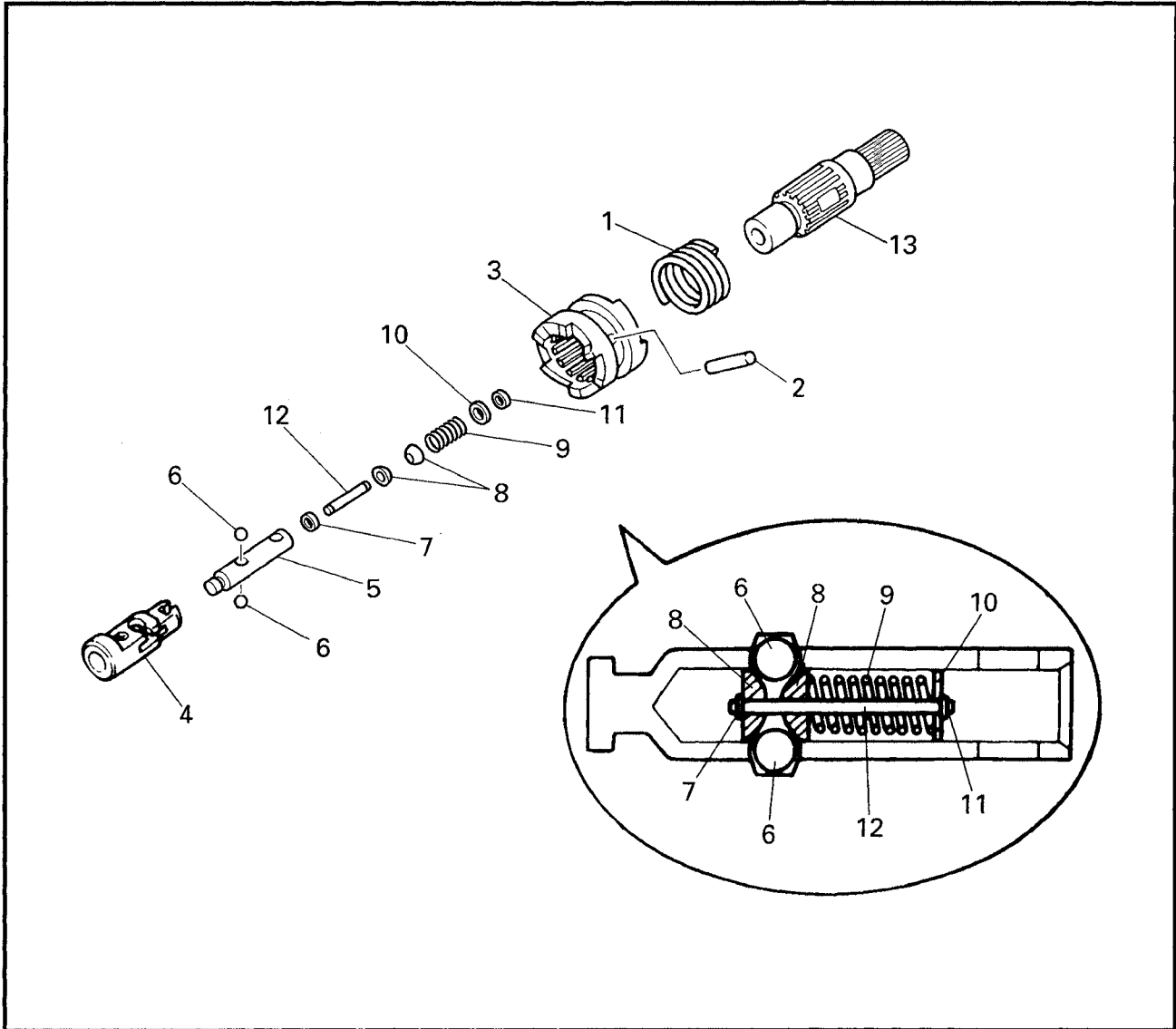


Order	Job/Part	Q'ty	Remarks
11	Propeller shaft shim	*	
12	Bushing	1	
13	Needle bearing	1	
14	Needle bearing	1	
15	Oil seal	2	
16	Needle bearing	1	
17	Grease nipple	1	
18	Propeller shaft housing	1	
			For assembly, reverse the disassembly procedure.

*: As required

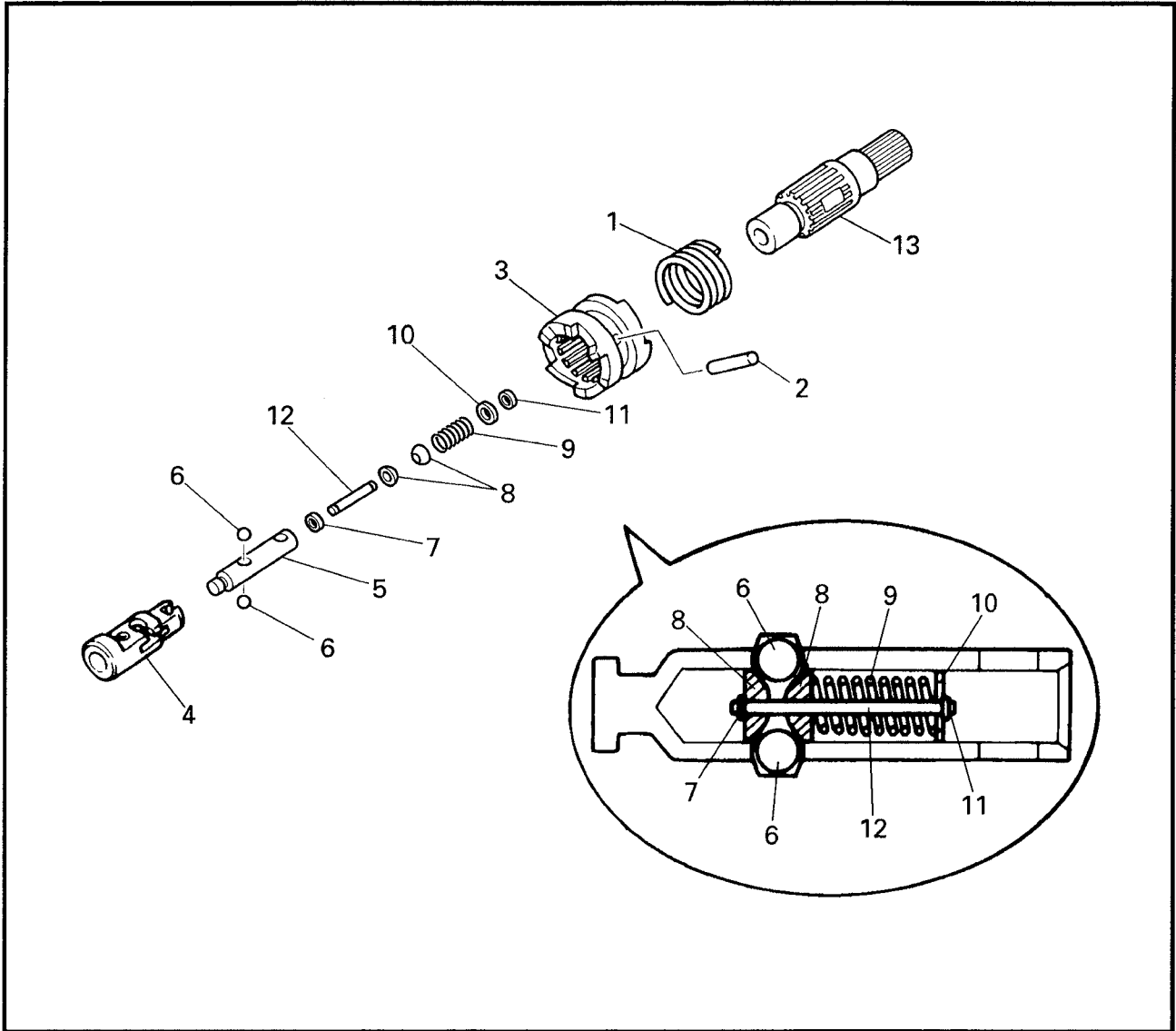


DISASSEMBLING/ASSEMBLING THE FRONT PROPELLER SHAFT ASSEMBLY

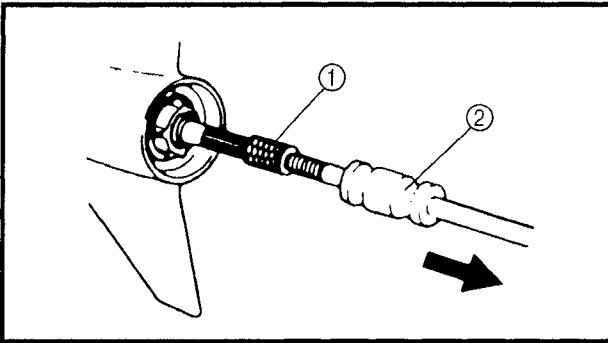


Order	Job/Part	Q'ty	Remarks
1	Spring	1	
2	Pin	1	
3	Dog clutch	1	
4	Shift rod joint	1	
5	Shift rod joint slider	1	
6	Ball	2	
7	Spring nut	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Shift plunger	2	
9	Spring	1	
10	Washer	1	
11	Spring nut	1	
12	Pin	1	
13	Front propeller shaft	1	
			For assembly, reverse the disassembly procedure.



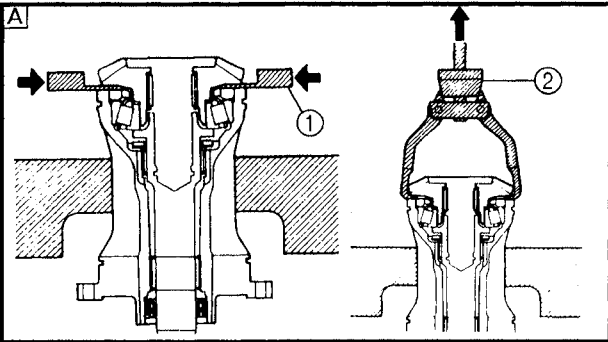
REMOVING THE PROPELLER SHAFT HOUSING ASSEMBLY

Remove:

- Propeller shaft housing assembly



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



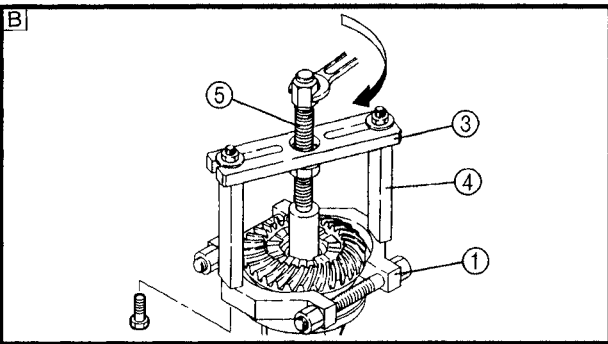
REMOVING THE REAR PROPELLER SHAFT

1. Remove:

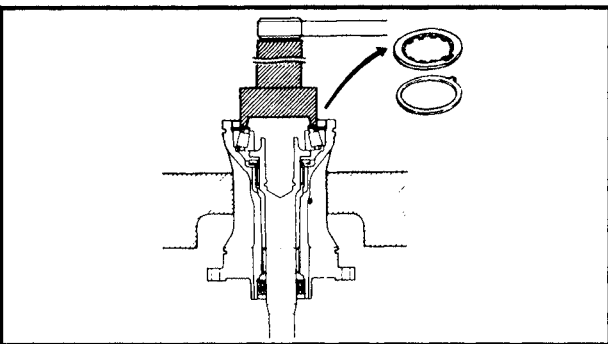
- Forward gear



- Bearing separator ①**
YB-06219 / 90890-06534
- Slide hammer..... ②**
YB-06096
- Guide plate..... ③**
90890-06501
- Guide plate stand ④**
90890-06538
- Center bolt ⑤**
90890-06504



- A** For USA and Canada
- B** Except for USA and Canada



2. Remove:

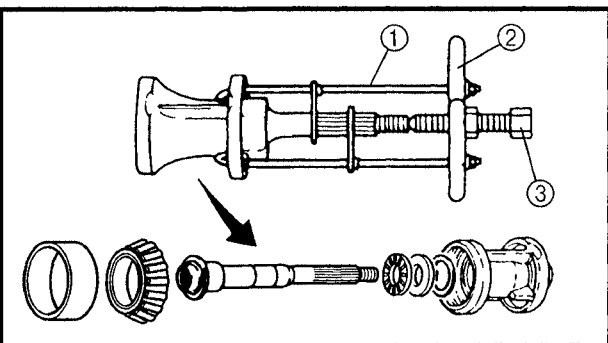
- Ring nut
- Claw washer



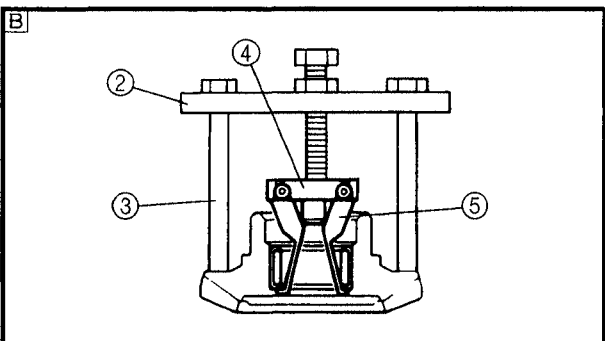
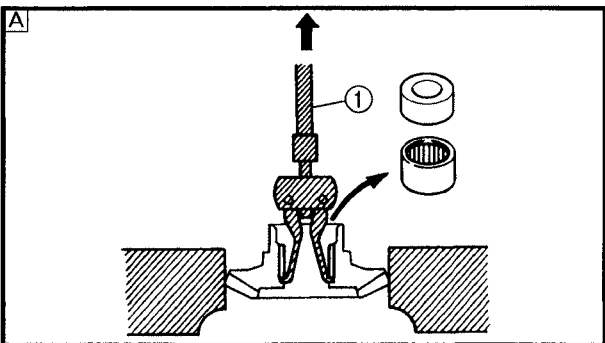
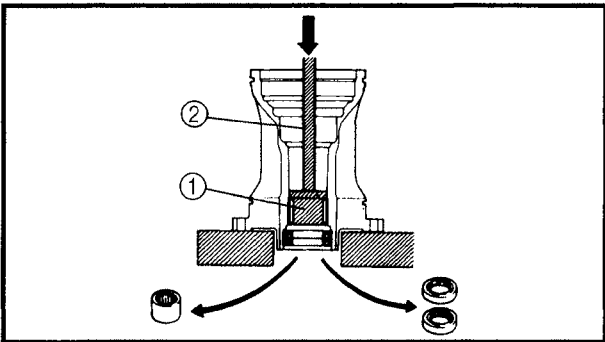
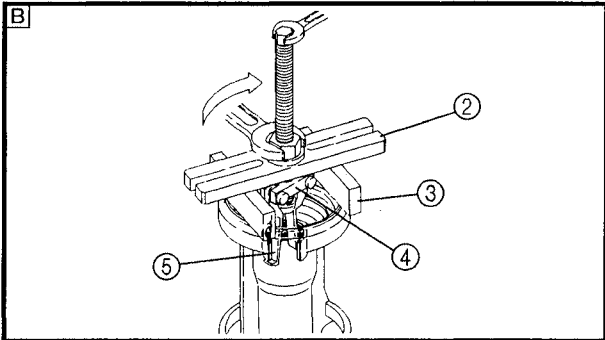
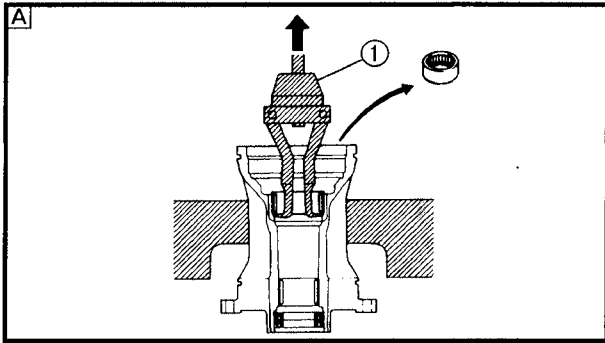
- Ring nut wrench**
YB-06048 / 90890-06510

3. Remove:

- Tapered roller bearing
- Rear propeller shaft



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



**DISASSEMBLING THE PROPELLER
SHAFT HOUSING ASSEMBLY**

1. 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

- A** For USA and Canada
B Except for USA and Canada

2. Remove:
- Oil seal
 - Needle bearing

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

**DISASSEMBLING THE FORWARD
GEAR**

- Remove:
- Bushing
 - 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

- A** For USA and Canada
B Except for USA and Canada



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 SHAFTS

Inspect:

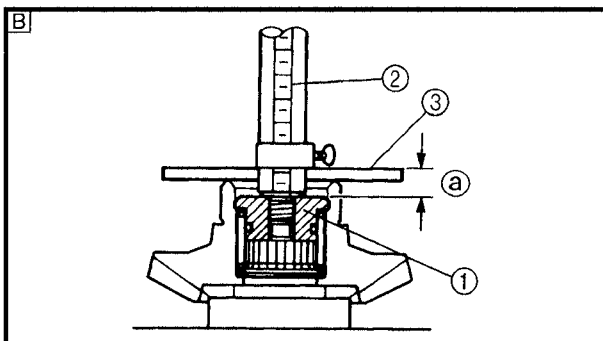
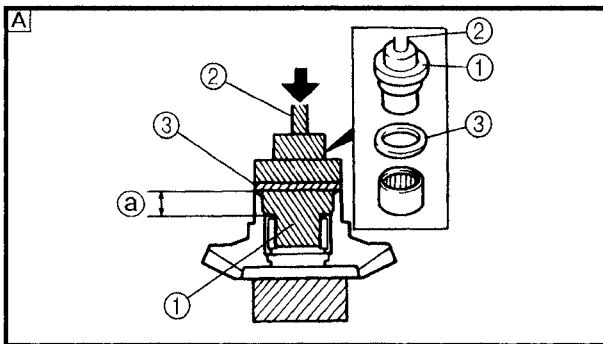
- Propeller shafts

Damage/wear → Replace.

ASSEMBLING THE FORWARD GEAR

Install:

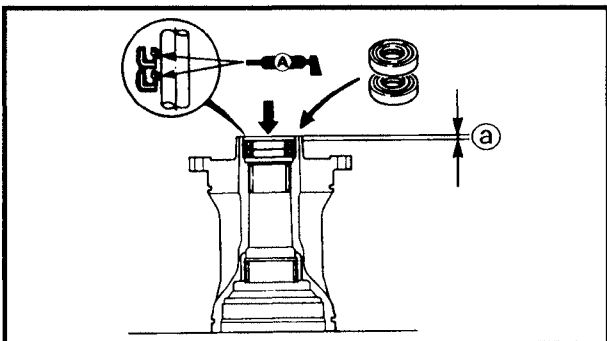
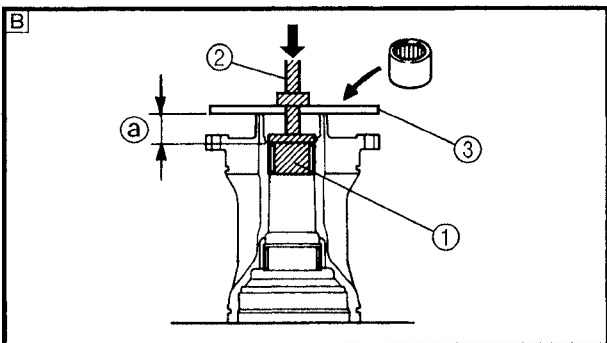
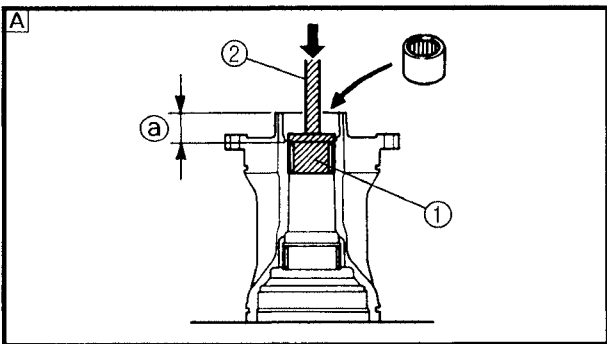
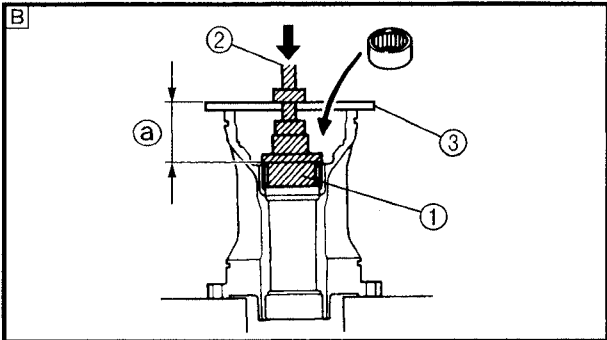
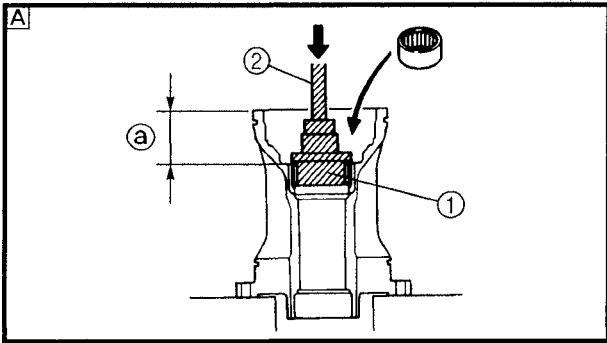
- Needle bearing
- Bushing



	Needle bearing installation position ① 11.8 - 12.2 mm (0.46 - 0.48 in)
--	--

	Bearing/oil seal attachment ① YB-06337 / 90890-06610
	Driver rod ② YB-06071 / 90890-06604
	Bearing/oil seal depth plate ③ YB-06433 / 90890-06603

- A** For USA and Canada
- B** Except for USA and Canada



**ASSEMBLING THE PROPELLER
SHAFT HOUSING ASSEMBLY**

1. Install:

- Needle bearing



**Needle bearing installation
position ①**
44.75 - 45.25 mm
(1.762 - 1.781 in)



Bearing/oil seal attachment ①
YB-06337 / 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:

- Needle bearing



**Needle bearing installation
position ①**
25.05 - 25.55 mm
(0.986 - 1.006 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

3. Install:

- Oil seal



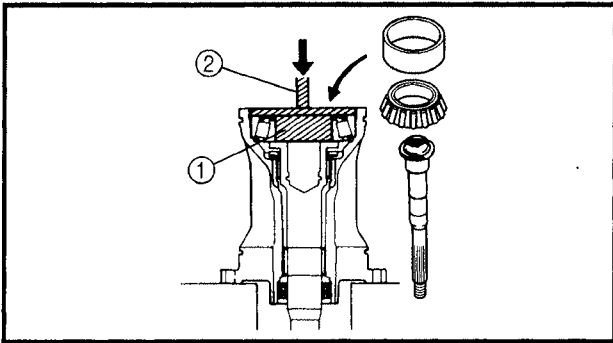
Oil seal installation position ①
4.75 - 5.25 mm (0.187 - 0.207 in)

LOWR



PROPELLER SHAFT HOUSING ASSEMBLY (COUNTER ROTATION MODELS)

E

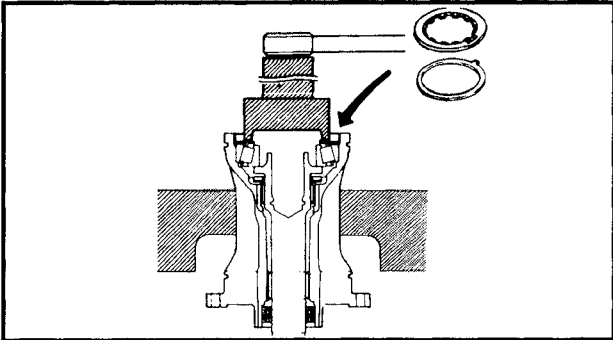


INSTALLING THE REAR PROPELLER SHAFT

1. Install:
- Rear propeller shaft
 - Tapered roller bearing



Bearing/oil seal attachment ①
YB-06430 / 90890-06656
Driver rod ②
YB-06071 / 90890-06606



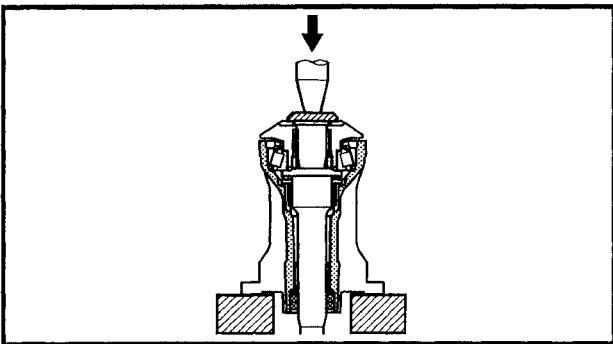
2. Install:
- Claw washer
 - Ring nut



Ring nut wrench
YB-06048 / 90890-06510



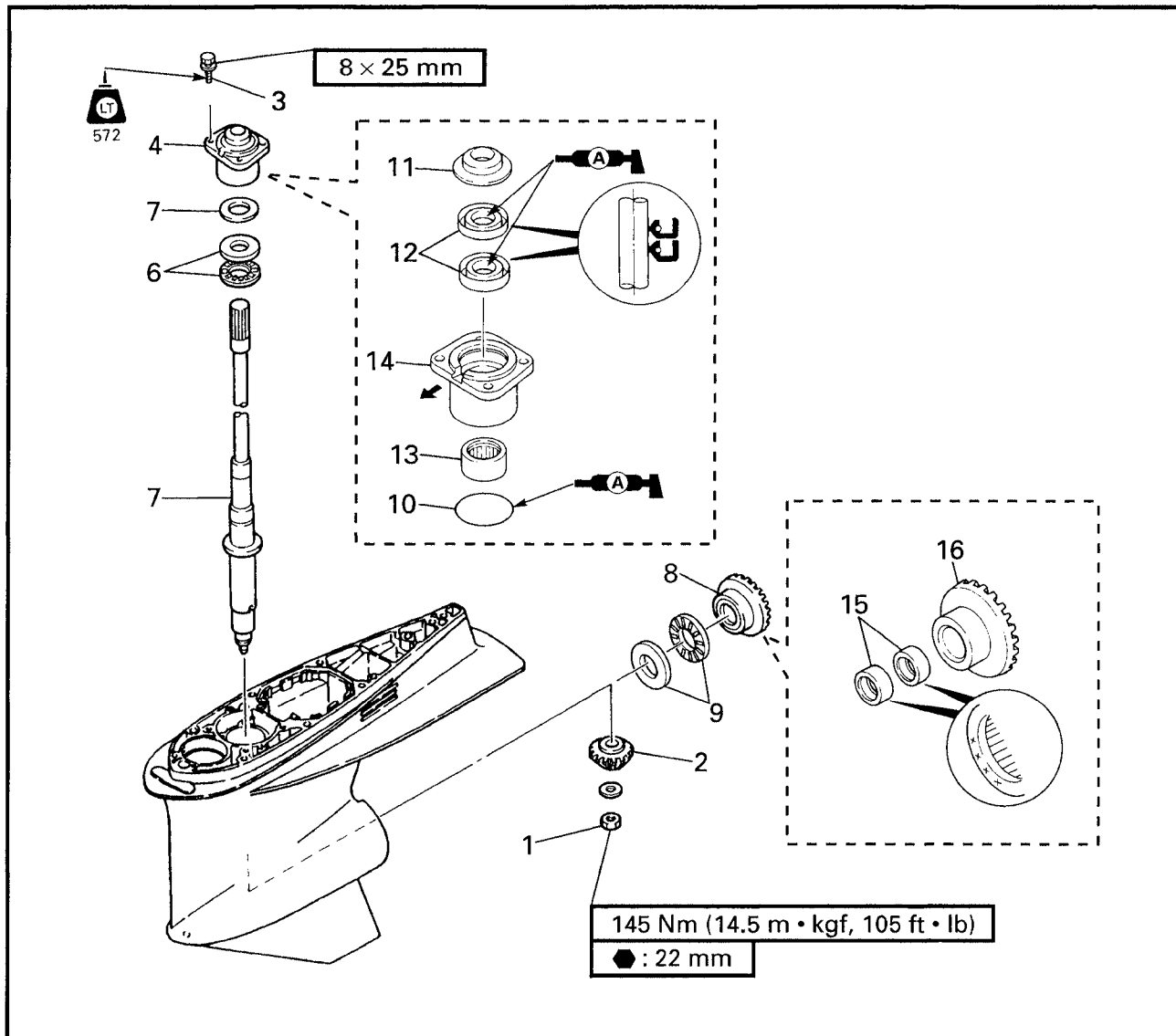
Ring nut
110 Nm (11 m • kgf, 80 ft • lb)



3. Install:
- Forward gear



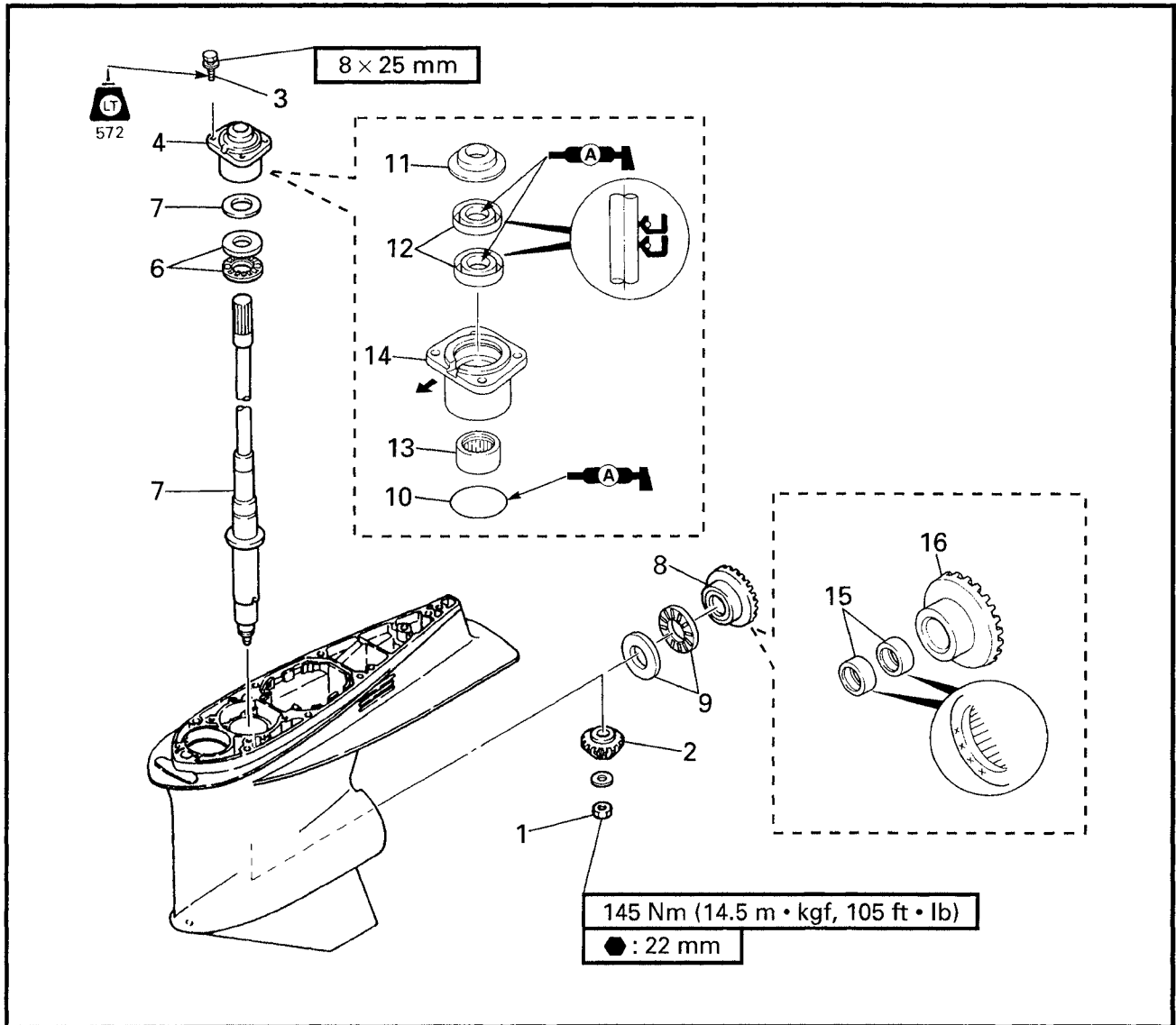
**DRIVE SHAFT (COUNTER ROTATION MODELS)
REMOVING/INSTALLING THE DRIVE SHAFT**



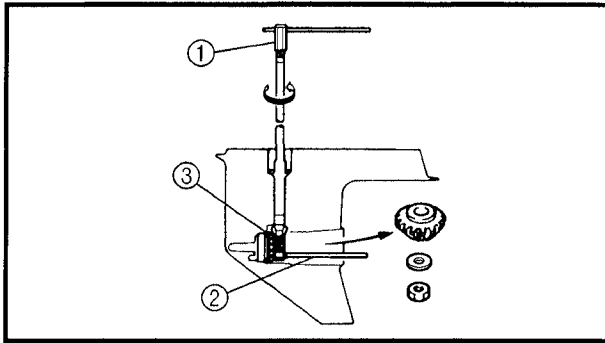
Order	Job/Part	Q'ty	Remarks
	Propeller shaft housing assembly		Refer to "PROPELLER SHAFT HOUSING ASSEMBLY (COUNTER ROTATION MODELS)" on page 6-32.
1	Nut	1	
2	Pinion	1	
3	Bolt	4	(with washer)
4	Drive shaft housing assembly	1	
5	Pinion shim	*	
6	Thrust bearing	1	
7	Drive shaft	1	

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	Needle bearing	2	For installation, reverse the removal procedure.
16	Reverse gear	1	

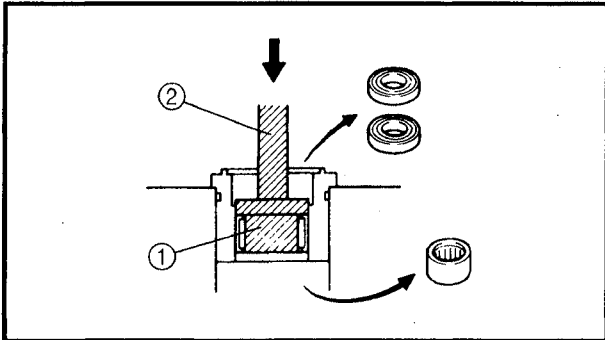


REMOVING THE DRIVE SHAFT

Loosen:

- Pinion nut

	Drive shaft holder ① YB-06201 / 90890-06520
	Pinion nut holder ② 90890-06505
	Pinion nut holder attachment . ③ 90890-06507

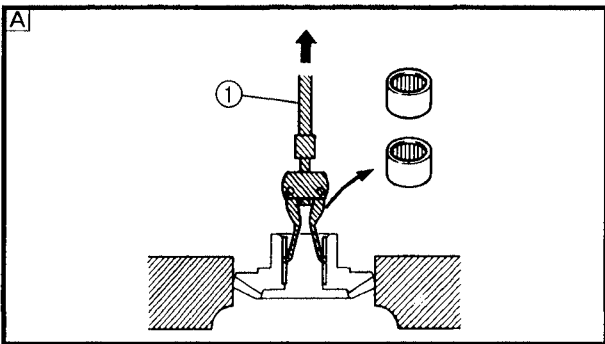


DISASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY

Remove:

- Needle bearing

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

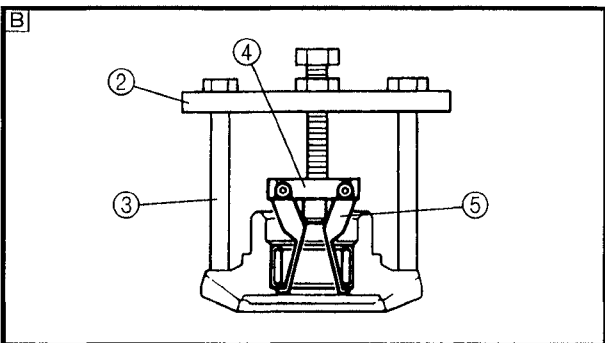


DISASSEMBLING THE REVERSE GEAR

1. Remove:

- Needle bearings

	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



INSPECTING THE PINION

Inspect:

- Teeth
Damage/wear → Replace.

INSPECTING THE DRIVE SHAFT

Inspect:

- Drive shaft
Damage/wear → Replace.

INSPECTING THE DRIVE SHAFT HOUSING

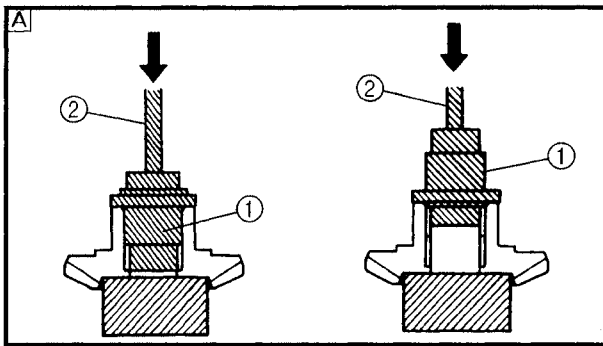
Inspect:

- Drive shaft housing
Cracks/damage → Replace.

INSPECTING THE BEARINGS

Inspect:

- Bearings
Pitting/rumbling → Replace.

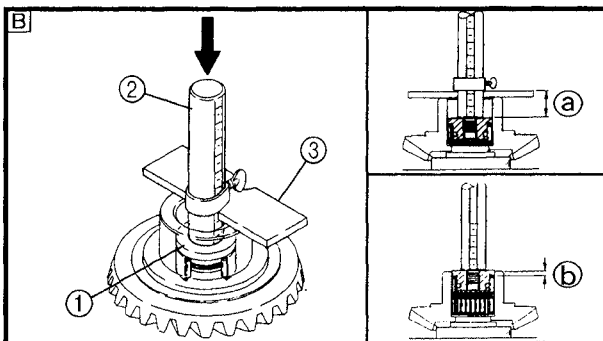


ASSEMBLING THE REVERSE GEAR

Install:

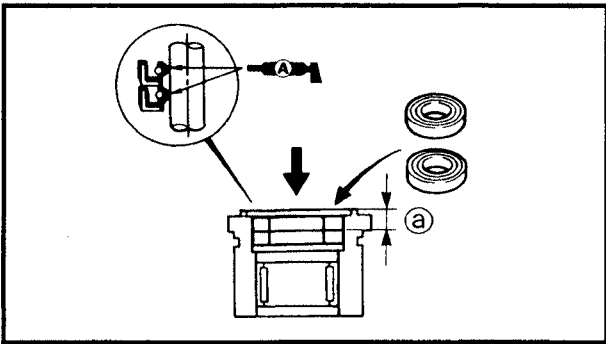
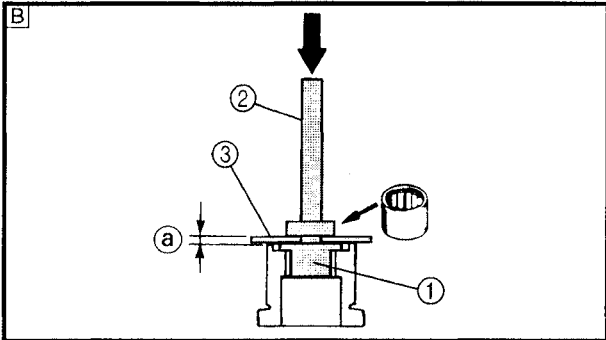
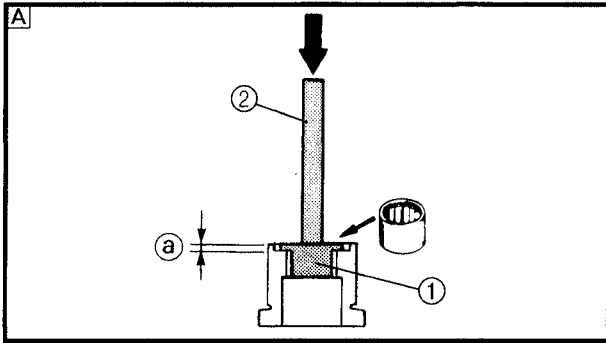
- Needle bearings

	Needle bearing installation position (a)
	20.7 - 21.2 mm (0.82 - 0.83 in)
	Needle bearing installation position (b)
	4.3 - 4.7 mm (0.17 - 0.18 in)



	Bearing/oil seal attachment (1)
	YB-06435 / 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



ASSEMBLING THE DRIVE SHAFT HOUSING ASSEMBLY

1. Install:
- Needle bearing



Needle bearing installation position ①
4.25 - 4.75 mm (0.167 - 0.187 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 seals



Oil seal installation position ①
0.25 - 0.75 mm (0.010 - 0.030 in)

INSTALLING THE DRIVE SHAFT

- Tighten:
- Pinion nut

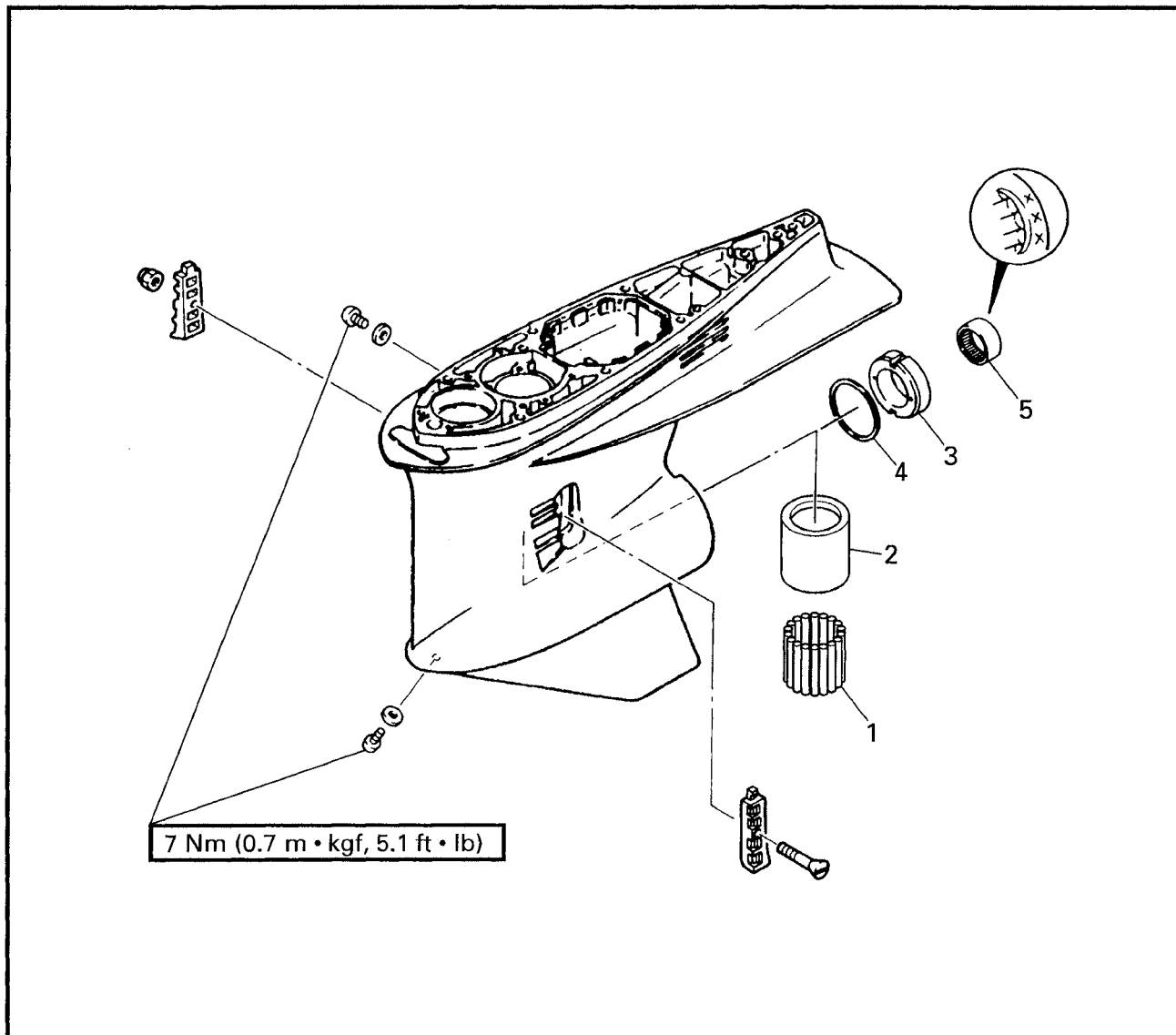


Pinion nut
145 Nm (14.5 m • kgf, 105 ft • lb)

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

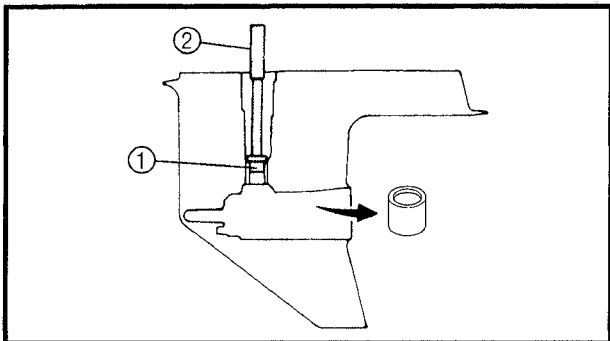


**LOWER CASE ASSEMBLY (COUNTER ROTATION MODELS)
DISASSEMBLING/ASSEMBLING THE LOWER CASE ASSEMBLY**



Order	Job/Part	Q'ty	Remarks
	Reverse gear		Refer to "DRIVE SHAFT (COUNTER ROTATION MODELS)" on page 6-42.
1	Needle bearing	24	
2	Needle bearing outer case	1	
3	Bearing retainer	1	
4	Reverse gear shim	*	
5	Needle bearing	1	
			For assembly, reverse the disassembly procedure.

*: As required

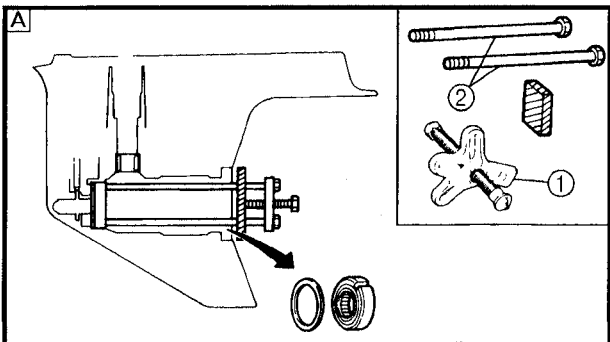


DISASSEMBLING THE LOWER CASE ASSEMBLY

1. Remove:
- Needle bearing outer case



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

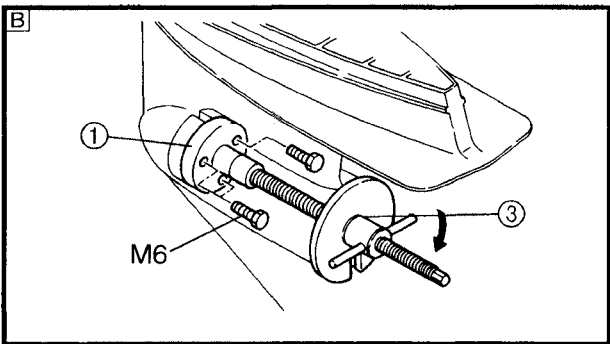


2. Remove:
- Bearing retainer



Universal puller ①
YB-06117 / 90890-06521
Puller bolt ②
YB-41707
Bearing puller ③
90890-06523

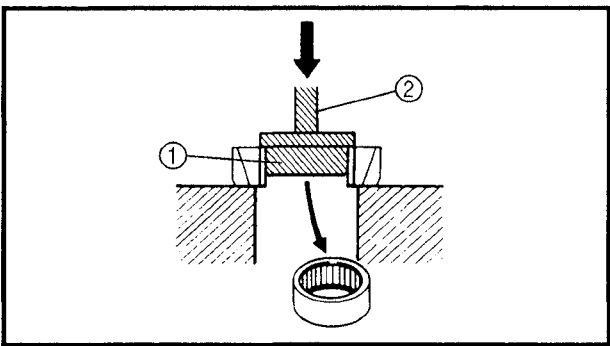
- A** For USA and Canada
B Except for USA and Canada



3. Remove:
- Needle bearing

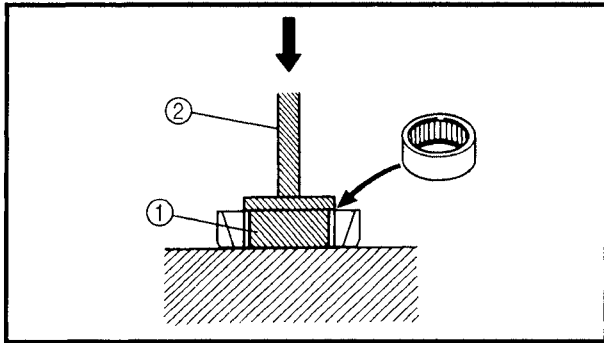


Bearing/oil seal attachment ①
YB-06434 / 90890-06654
Driver rod ②
YB-06071 / 90890-06652



INSPECTING THE NEEDLE BEARINGS

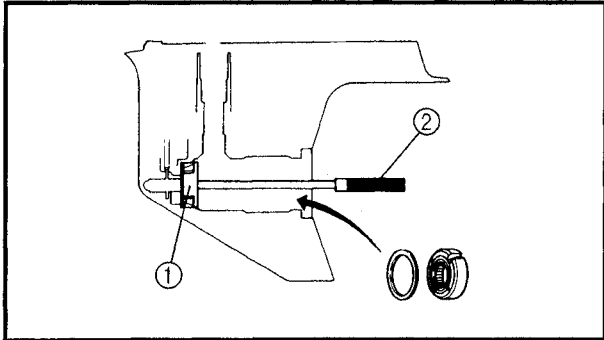
- Inspect:
- Needle bearings
 - Pitting/rumbling → Replace.



ASSEMBLING THE LOWER CASE ASSEMBLY

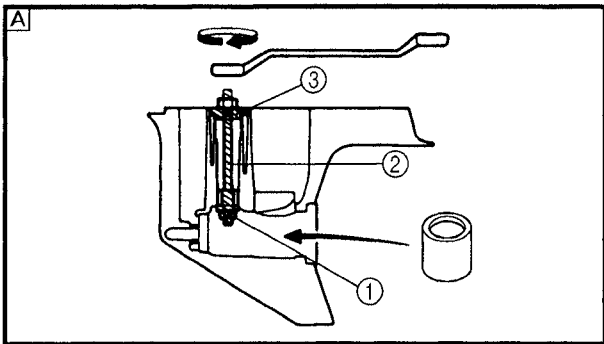
1. Install:
 • Needle bearing

	Bearing/oil seal attachment ①
	YB-06434 / 90890-06654
	Driver rod ②
	YB-06071 / 90890-06652



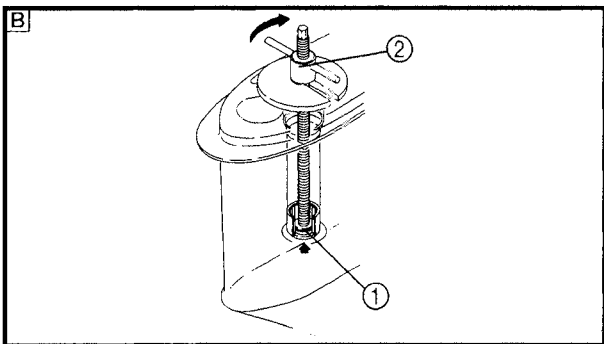
2. Install:
 • Bearing retainer

	Bearing/oil seal attachment ①
	YB-06430 / 90890-06657
	Driver rod ②
	YB-06071 / 90890-06605



3. Install:
 • Needle bearing outer case

	Bearing/oil seal attachment ①
	YB-06246 / 90890-06636
	Bearing puller..... ②
	YB-06029 / 90890-06523
	Needle bearing installation plate ③
	YB-06213

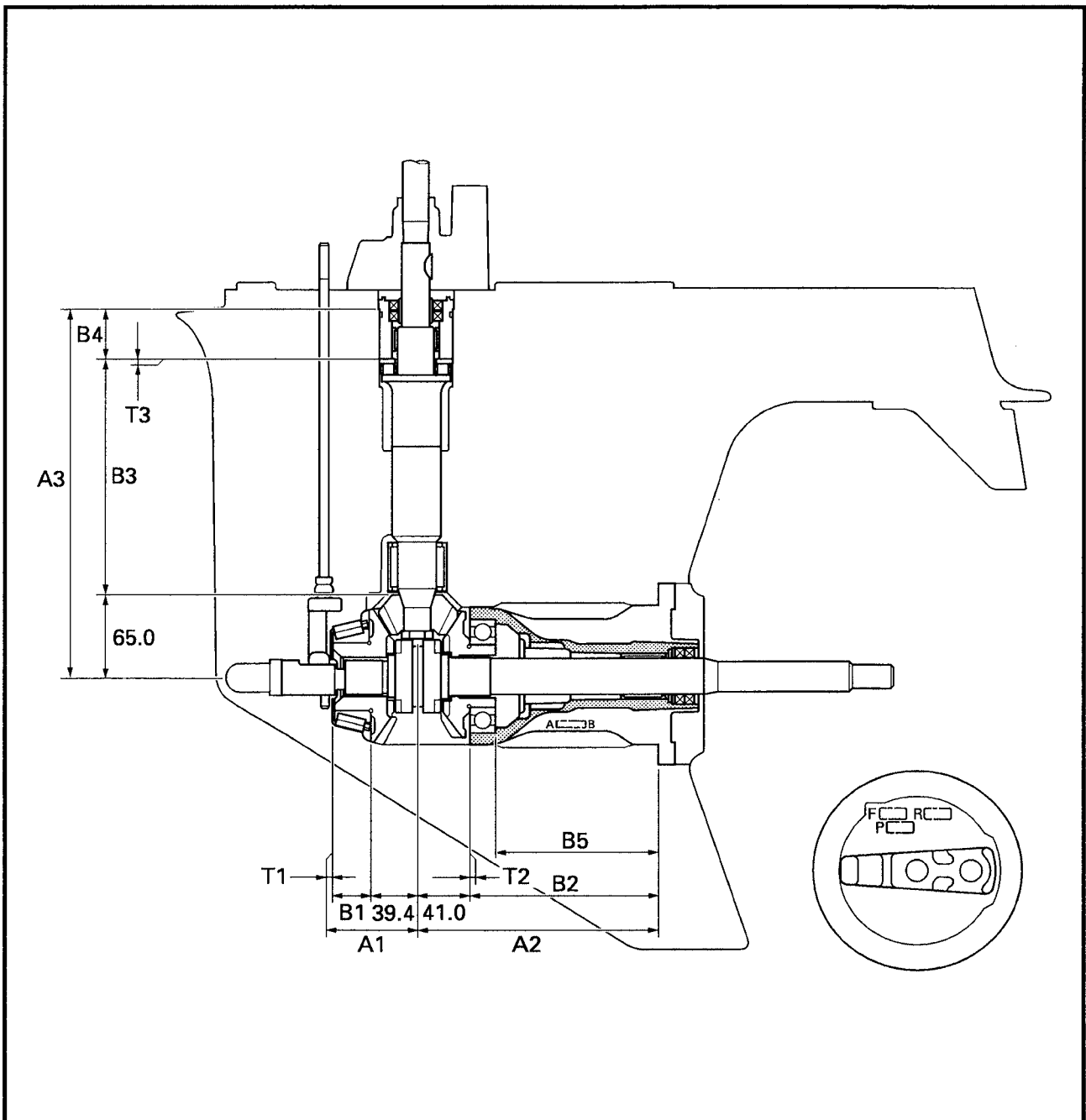


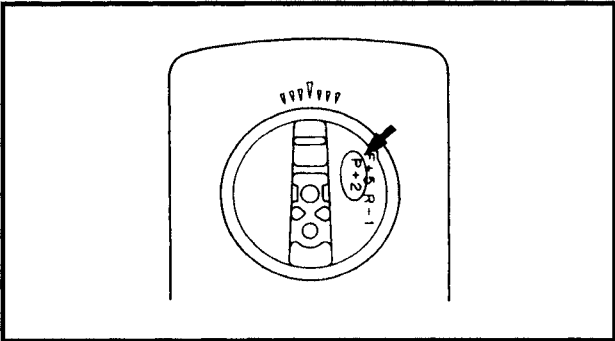
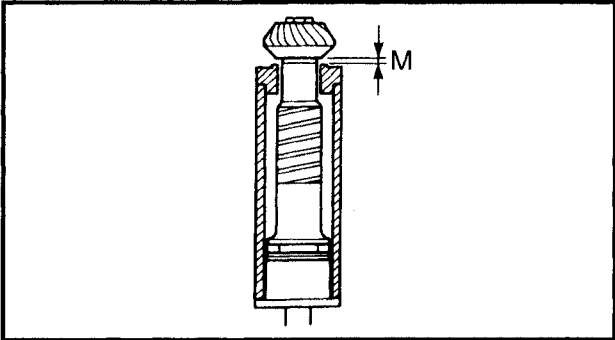
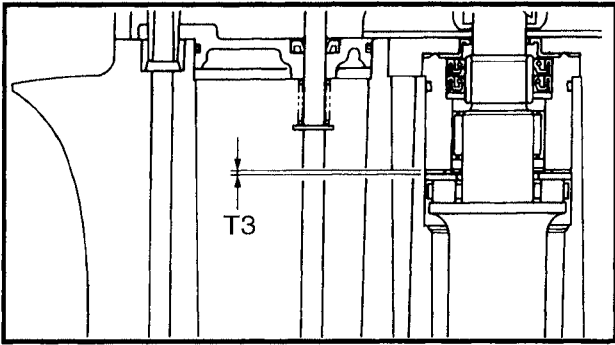
- A** For USA and Canada
B Except for USA and Canada



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).





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

$$M0 = 1.00 + (+5)/100 \text{ mm}$$

$$= 1.00 + 0.05 \text{ mm}$$

$$= 1.05 \text{ mm}$$

If "P" is "-3", then

$$M0 = 1.00 + (-3)/100 \text{ mm}$$

$$= 1.00 - 0.03 \text{ mm}$$

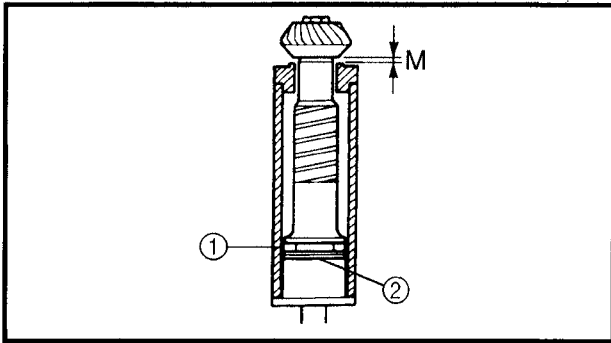
$$= 0.97 \text{ mm}$$

LOWR



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

E



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



Pinion height gauge
YB-06441

NOTE: _____

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

(3) Install the pinion and pinion nut.



Pinion nut
145 Nm (14.5 m • kgf, 105 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:

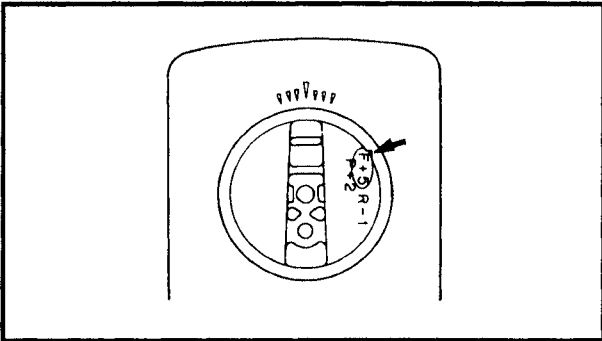
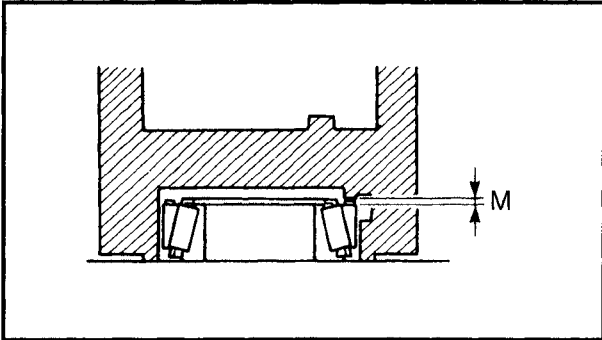
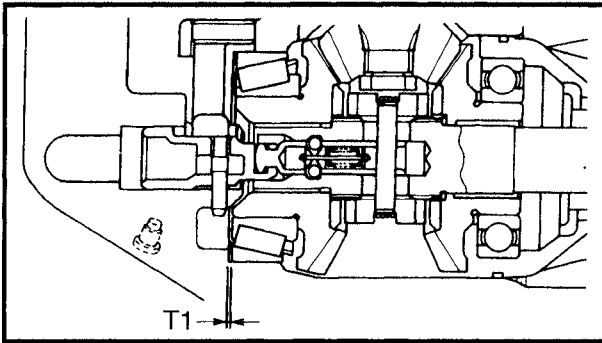
- Shim thickness (T3)
Remove or add shim(s).



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.



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) = 0.60 – 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

$$\begin{aligned}
 M0 &= 0.60 - (+5)/100 \text{ mm} \\
 &= 0.60 - 0.05 \text{ mm} \\
 &= 0.55 \text{ mm}
 \end{aligned}$$

If "F" is "-3", then

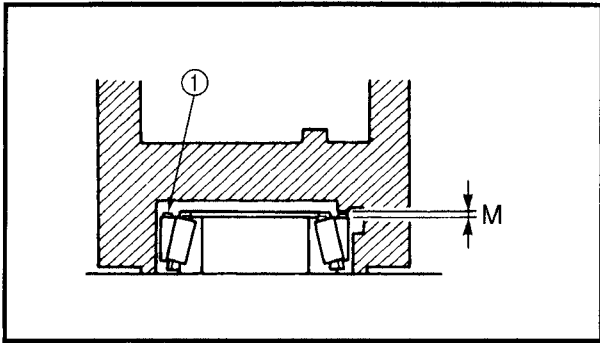
$$\begin{aligned}
 M0 &= 0.60 - (-3)/100 \text{ mm} \\
 &= 0.60 + 0.03 \text{ mm} \\
 &= 0.63 \text{ mm}
 \end{aligned}$$

LOWR



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

E



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



**Shimming gauge
YB-06439**

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

(3) Measure the specified measurement (M).

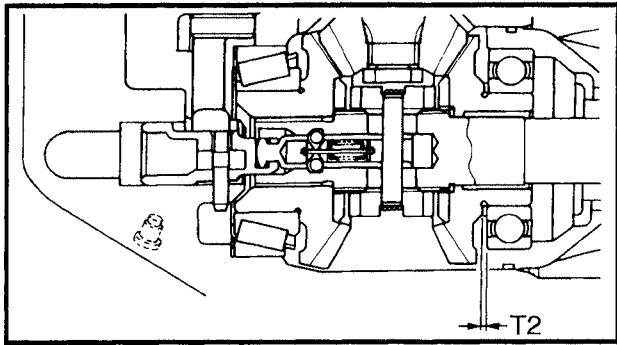
2. Adjust:

- 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**

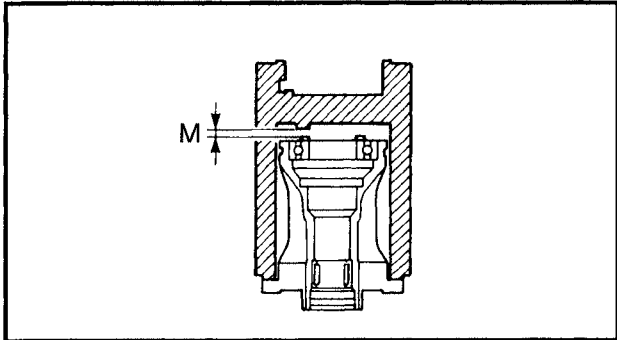
NOTE: _____
(M0) – (M) should be as close to “0” as possible.



SELECTING THE 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:

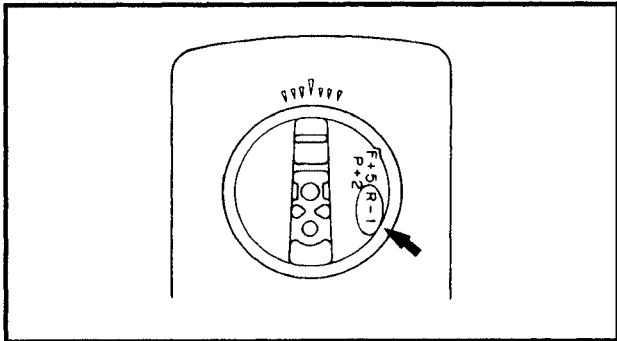
- Specified measurement (M)
- Out of specified value (M0) → Adjust.



Specified value (M0) =
0.50 - 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:

If "R" is "+5", then

$$\begin{aligned} M0 &= 0.50 - (+5)/100 \text{ mm} \\ &= 0.50 - 0.05 \text{ mm} \\ &= 0.45 \text{ mm} \end{aligned}$$

If "R" is "-3", then

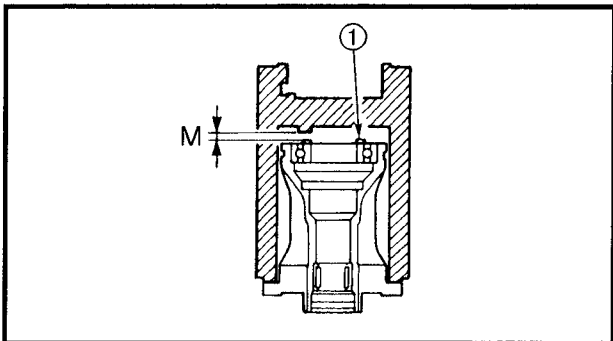
$$\begin{aligned} M0 &= 0.50 - (-3)/100 \text{ mm} \\ &= 0.50 + 0.03 \text{ mm} \\ &= 0.53 \text{ mm} \end{aligned}$$

LOWR



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

E



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



**Shimming gauge
YB-06439**

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 (T2)

Remove or add shim(s).

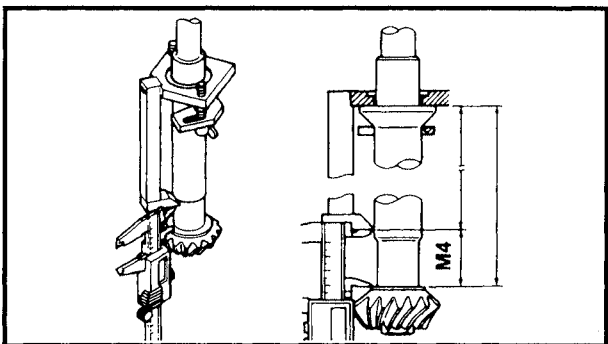
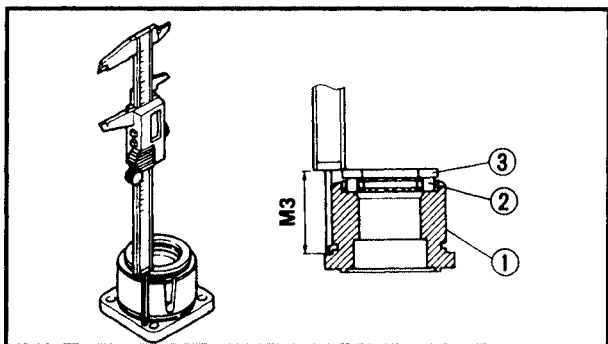
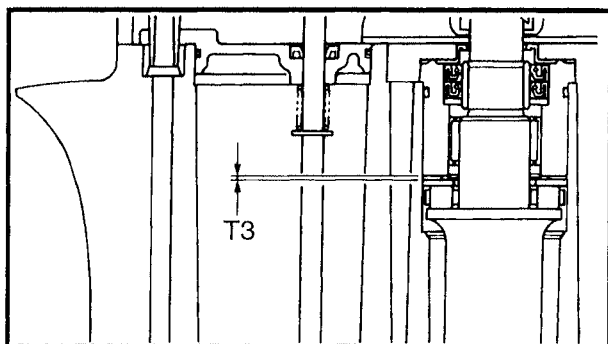


Available shim thickness

**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 145 Nm (14.5 m • kgf, 105 ft • lb)
--	---

(3) Install the pinion height gauge.

	Pinion height gauge 90890-06702
--	---

NOTE: _____

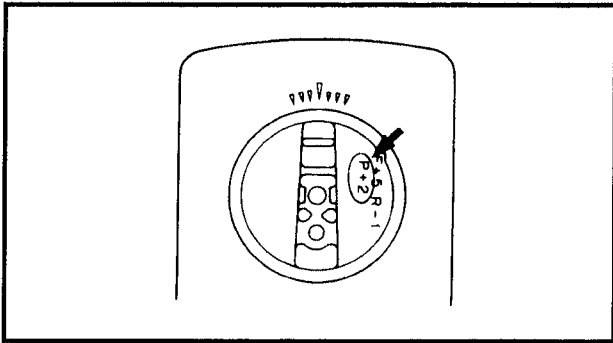
After the wing nuts contact the fixing plate, tighten them another 1/4 of a turn.

(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) =
 $82.0 + P/100 - M3 - M4$

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 "50.75 mm", M4 is "30.52 mm" and P is "-5", then

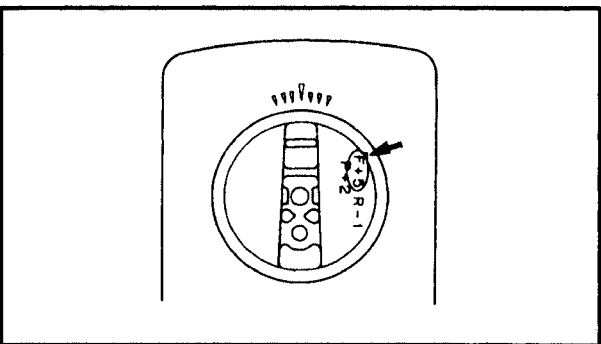
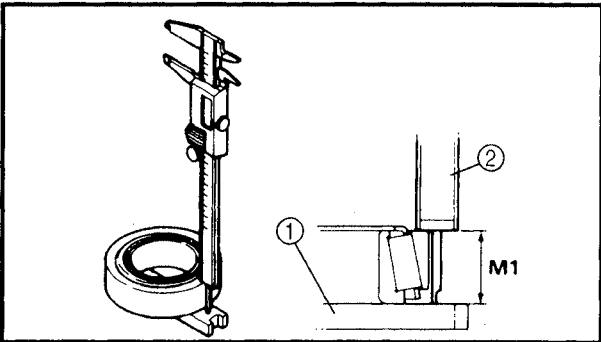
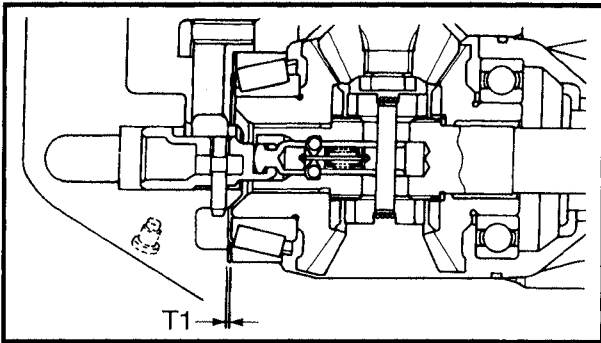
$$\begin{aligned} T3 &= 82.0 + (-5)/100 - 50.75 - 30.52 \text{ mm} \\ &= 82.0 - 0.05 - 50.75 - 30.52 \text{ mm} \\ &= 0.68 \text{ mm} \end{aligned}$$

(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) = 29.5 + 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:

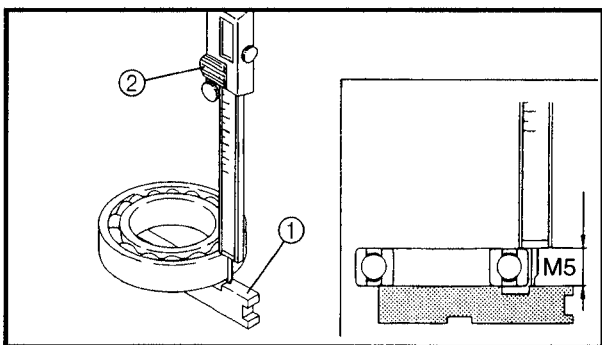
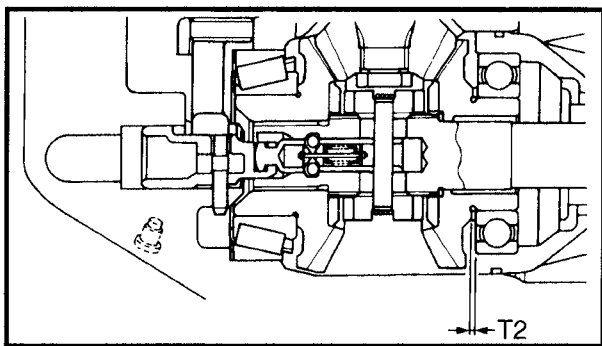
If M1 is "29.10 mm" and F is "+5", then

$$\begin{aligned}
 T1 &= 29.5 + (+5)/100 - 29.10 \text{ mm} \\
 &= 29.5 + 0.05 - 29.10 \text{ mm} \\
 &= 0.45 \text{ mm}
 \end{aligned}$$

(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 (M5).

	Shimming plate ①
	Digital caliper ②

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 (M5).



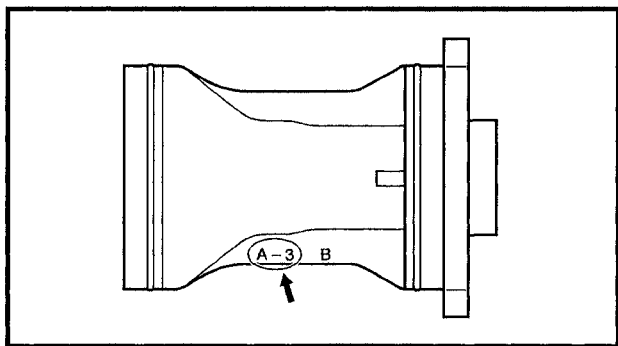
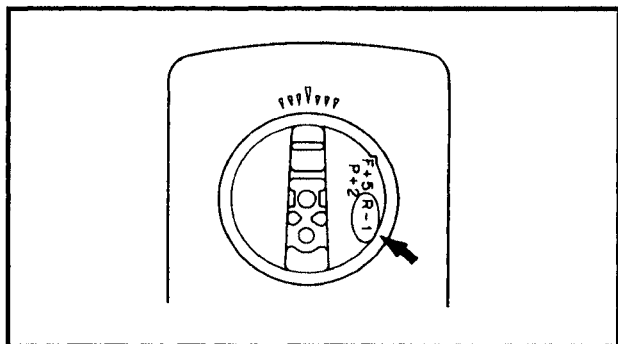
(2) Calculate the reverse gear shim thickness (T2).



Reverse gear shim thickness
(T2) = 21.0 + R/100 - A/100 - M5

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



Example:

If M5 is "19.92 mm", R is "+3" and A is "-5", then

$$\begin{aligned}
 T2 &= 21.0 + (+3)/100 - (-5)/100 - 19.92 \text{ mm} \\
 &= 21.0 + 0.03 + 0.05 - 19.92 \text{ mm} \\
 &= 1.16 \text{ mm}
 \end{aligned}$$

(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 0.19 - 0.40 mm (0.007 - 0.016 in)
--	---

Measuring steps

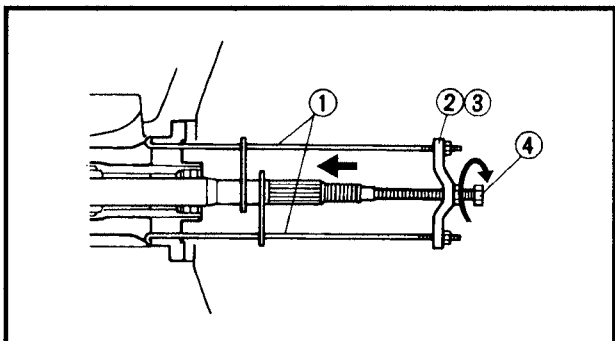
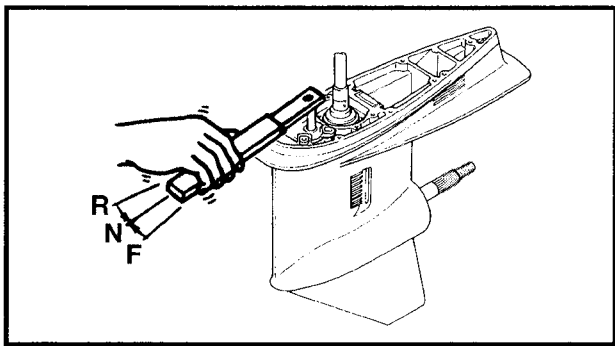
- (1) Set the shift rod into the neutral position.

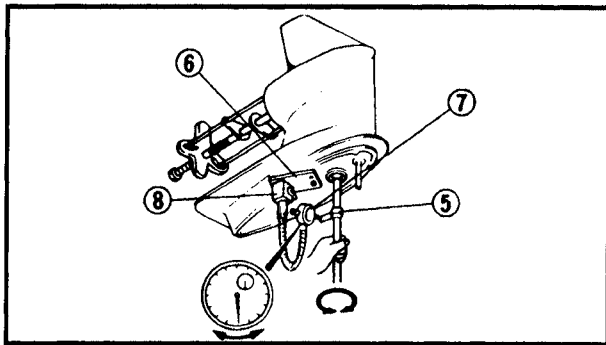
	Shift rod wrench YB-06052 / 90890-06052
--	---

- (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 0.19 mm (0.007 in)	To be decreased by $(0.30 - M) \times 0.78$
	More than 0.40 mm (0.016 in)	To be increased by $(M - 0.30) \times 0.78$

M: Measurement

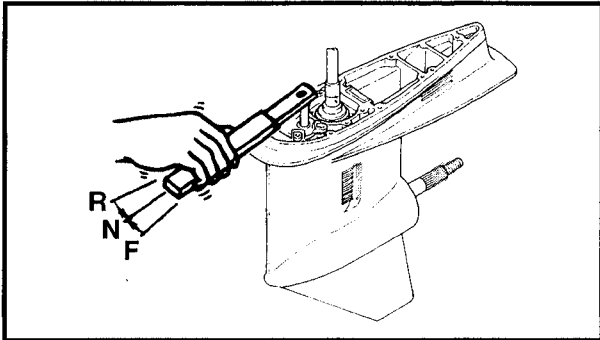


MEASURING THE REVERSE GEAR BACKLASH

1. Measure:

- Reverse gear backlash
- Out of specification → Adjust.

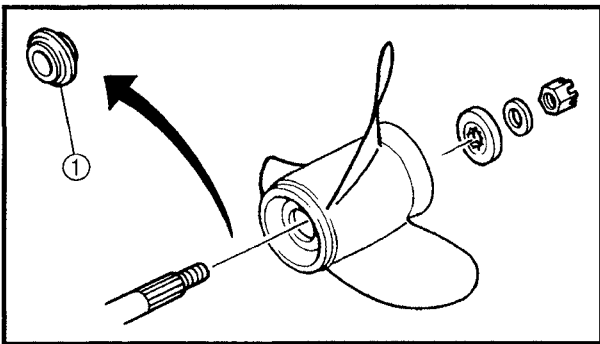
	<p>Reverse gear backlash 0.64 - 0.93 mm (0.025 - 0.037 in)</p>
--	---



Measuring steps

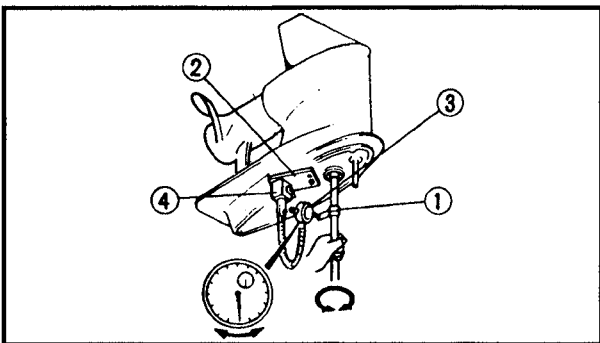
(1) Set the shift rod into the neutral position.

	<p>Shift rod wrench YB-06052 / 90890-06052</p>
--	---



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

	<p>Propeller nut 10 Nm (1.0 m • kgf, 7.2 ft • lb)</p>
--	--



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

	<p>Backlash indicator ① YB-06265 / 90890-06706</p>
--	---

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

	<p>Magnetic-base plate ② YB-07003 / 90890-07003</p>
	<p>Dial gauge set ③ YU-03097 / 90890-01252</p>
	<p>Magnetic base ④ YU-34481 / 90890-06705</p>


(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 0.64 mm (0.025 in)	To be increased by $(0.79 - M) \times 0.78$
	More than 0.93 mm (0.037 in)	To be decreased by $(M - 0.79) \times 0.78$

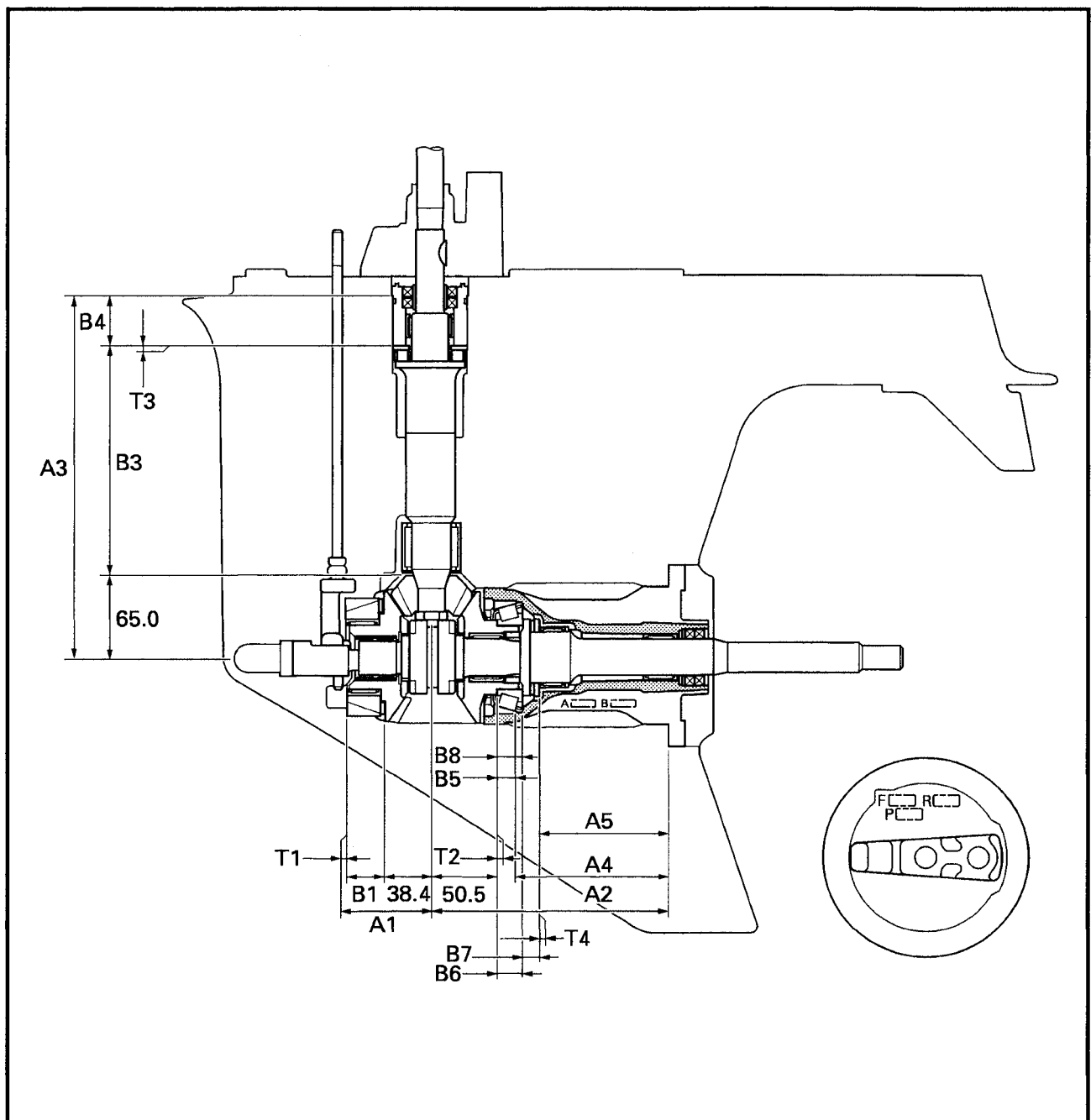
M: Measurement

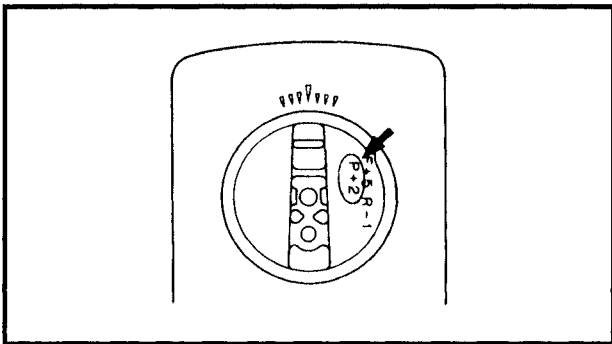
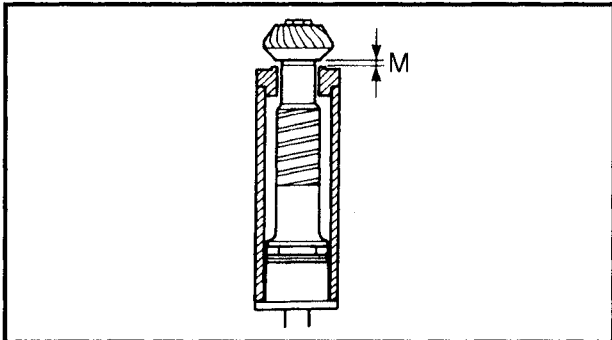
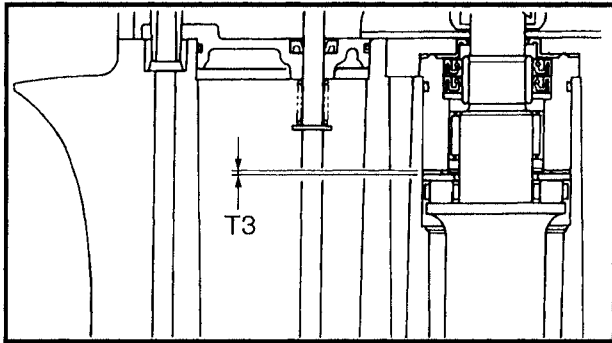


SHIMMING (COUNTER ROTATION MODELS)

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).





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.

	<p>Specified value (M0) = 1.00 + P/100 mm</p>
--	---

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

$$M0 = 1.00 + (+5)/100 \text{ mm}$$

$$= 1.00 + 0.05 \text{ mm}$$

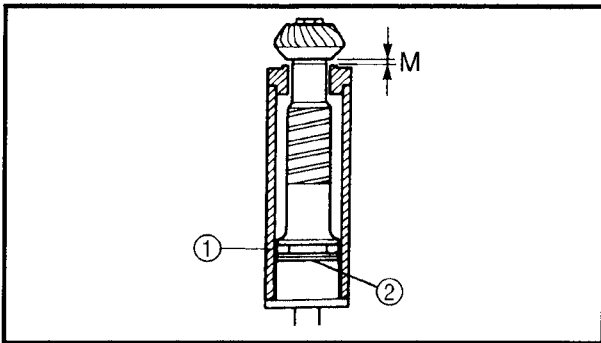
$$= 1.05 \text{ mm}$$

If "P" is "-3", then

$$M0 = 1.00 + (-3)/100 \text{ mm}$$

$$= 1.00 - 0.03 \text{ mm}$$

$$= 0.97 \text{ mm}$$



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



**Pinion height gauge
YB-06441**

NOTE: _____

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

(3) Install the pinion and pinion nut.



**Pinion nut
145 Nm (14.5 m • kgf, 105 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:

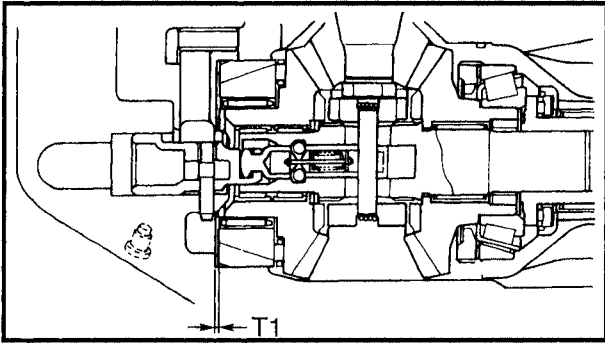
- Shim thickness (T3)
Remove or add shim(s).



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

NOTE: _____

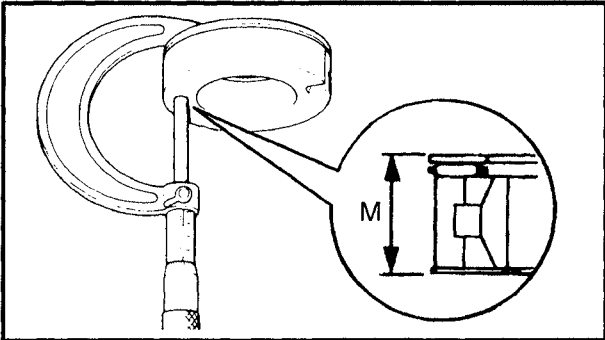
(M0) – (M) should be as close to "0" as possible.



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.



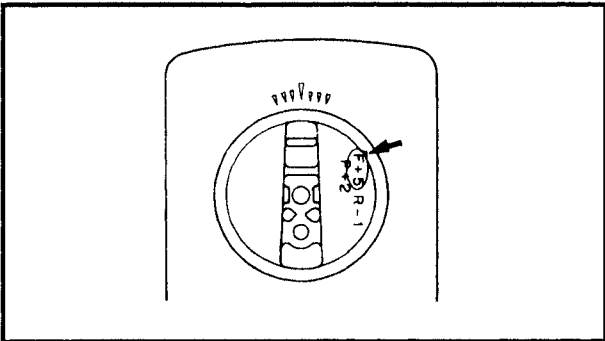
1. Measure:

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

	<p>Specified value (M0) = $30.60 + F/100 \text{ mm}$</p>
--	---

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.

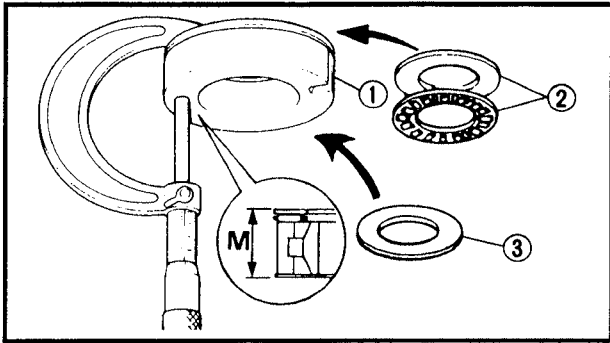
Example:

If "F" is "+5", then

$$\begin{aligned}
 M0 &= 30.60 + (+5)/100 \text{ mm} \\
 &= 30.60 + 0.05 \text{ mm} \\
 &= 30.65 \text{ mm}
 \end{aligned}$$

If "F" is "-3", then

$$\begin{aligned}
 M0 &= 30.60 + (-3)/100 \text{ mm} \\
 &= 30.60 - 0.03 \text{ mm} \\
 &= 30.57 \text{ mm}
 \end{aligned}$$



(2) Install the bearing retainer 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).

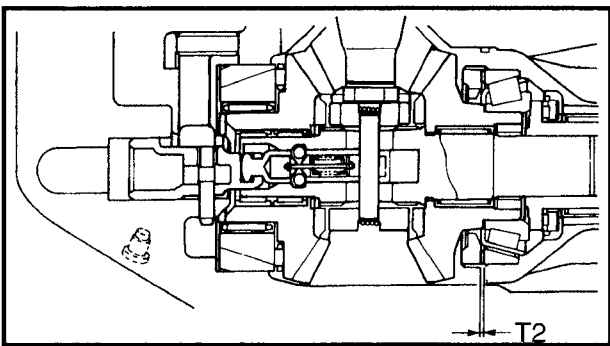
2. Adjust:

- Shim thickness (T1)
Remove or add shim(s).



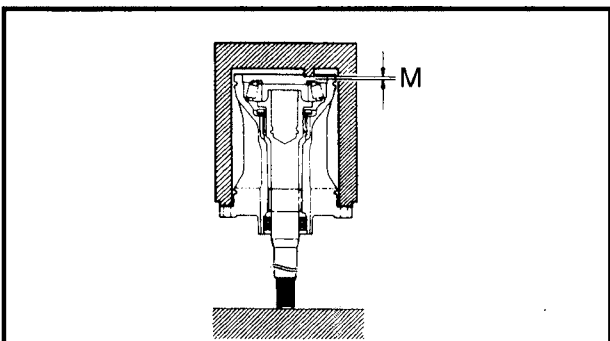
Available shim thickness
0.10, 0.12, 0.15, 0.18, 0.30, 0.40
and 0.50 mm

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.

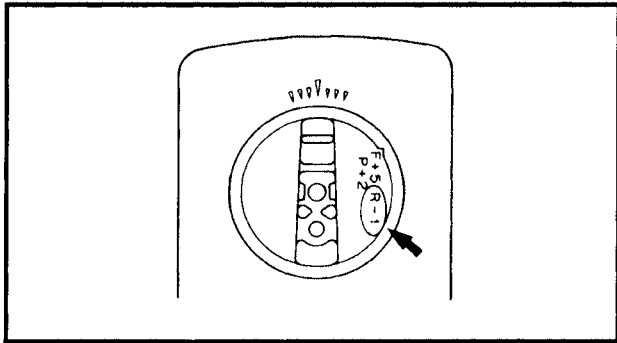


1. Measure:

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



Specified value (M0) =
0.60 – 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 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.

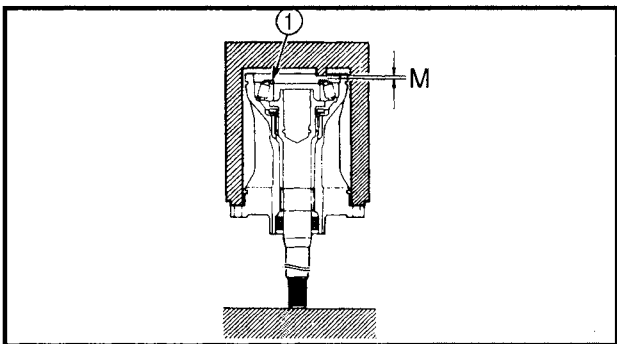
Example:

If "R" is "+5", then

$$\begin{aligned}
 M0 &= 0.60 - (+5)/100 \text{ mm} \\
 &= 0.60 - 0.05 \text{ mm} \\
 &= 0.55 \text{ mm}
 \end{aligned}$$

If "R" is "-3", then

$$\begin{aligned}
 M0 &= 0.60 - (-3)/100 \text{ mm} \\
 &= 0.60 + 0.03 \text{ mm} \\
 &= 0.63 \text{ mm}
 \end{aligned}$$



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

	<p>Shimming gauge YB-06440</p>
--	---

NOTE:

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

(3) Measure the specified measurement (M).

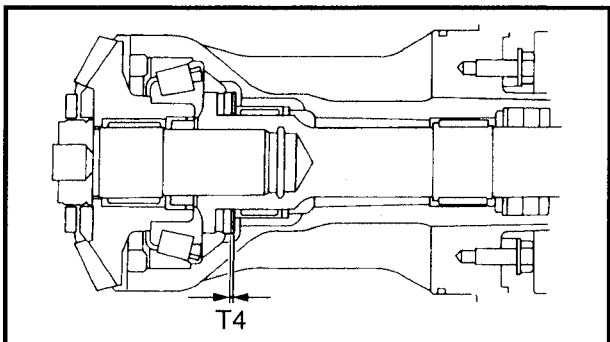


2. Adjust:
- Shim thickness (T2)
- Remove or add shim(s).



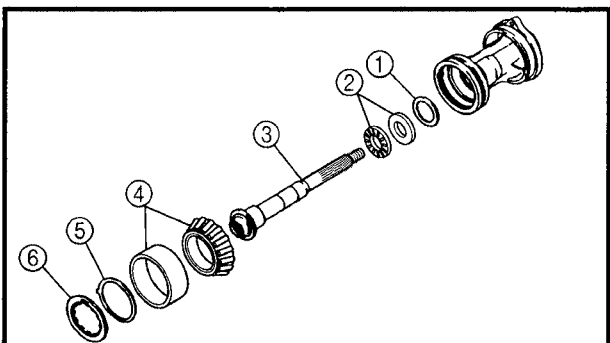
Available shim thickness
0.10, 0.12, 0.15, 0.18, 0.30, 0.40
and 0.50 mm

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

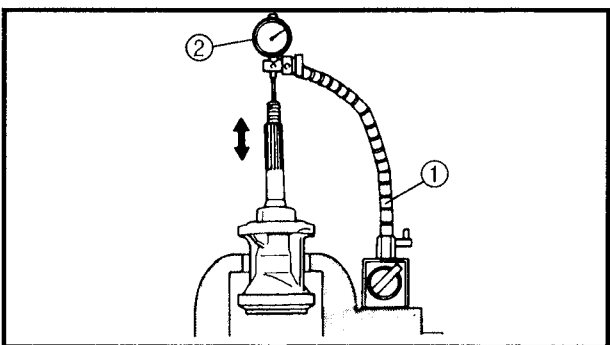


SELECTING THE PROPELLER SHAFT SHIMS

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
 - Rear propeller shaft ③
 - Tapered roller bearing ④
 - Claw washer ⑤
 - Ring nut ⑥



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



Propeller shaft free play
0.30 ± 0.05 mm (0.012 ± 0.002 in)

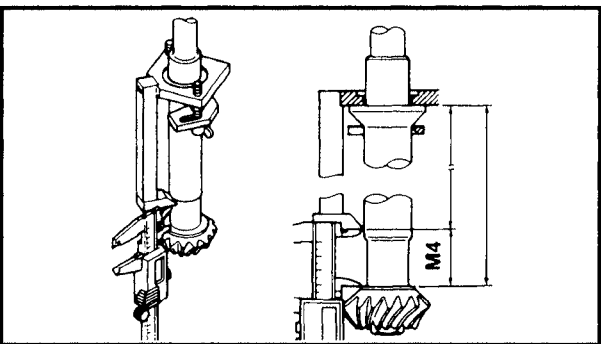
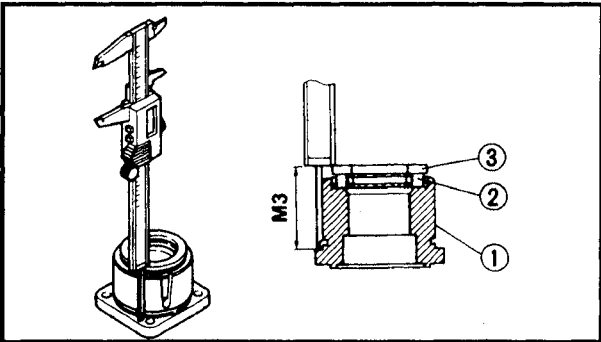
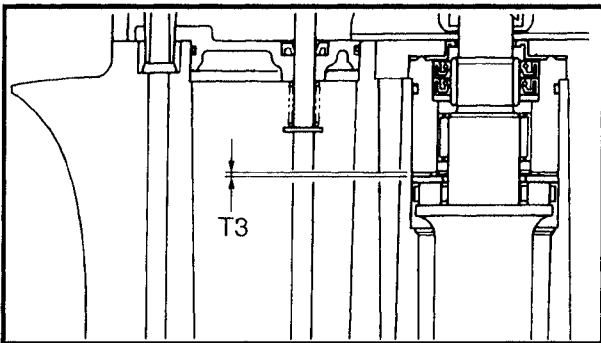


Magnetic base..... ①
YU-34481
Dial gauge set ②
YU-03097

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



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 145 Nm (14.5 m · kgf, 105 ft · lb)
--	---

(3) Install the pinion height gauge.

	Pinion height gauge 90890-06702
--	---

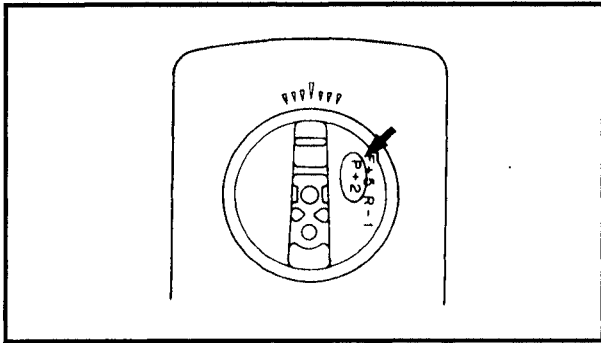
NOTE: _____
After the wing nuts contact the fixing plate, tighten them another 1/4 of a turn.

(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) =
 $82.0 + P/100 - M3 - M4$

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 "50.75 mm", M4 is "30.52 mm" and P is "-5", then

$$T3 = 82.0 + (-5)/100 - 50.75 - 30.52 \text{ mm}$$

$$= 82.0 - 0.05 - 50.75 - 30.52 \text{ mm}$$

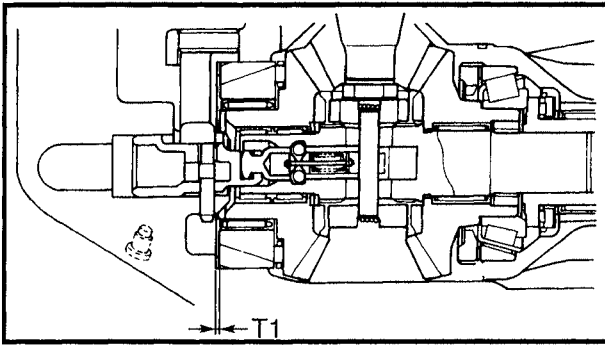
$$= 0.68 \text{ mm}$$

(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)

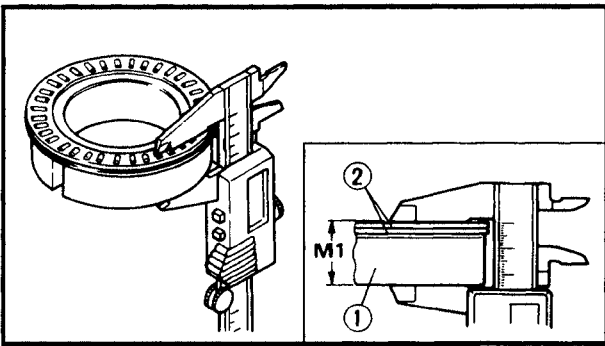
Selecting steps

- (1) Measure (M1).

	Digital caliper 90890-06704
--	---------------------------------------

NOTE: _____

- Measure the combined thickness of the bearing retainer ① and thrust bearing ②.
- Perform the same measurement at three points on the roller bearing outer race.
- Find the average of the measurements (M1).

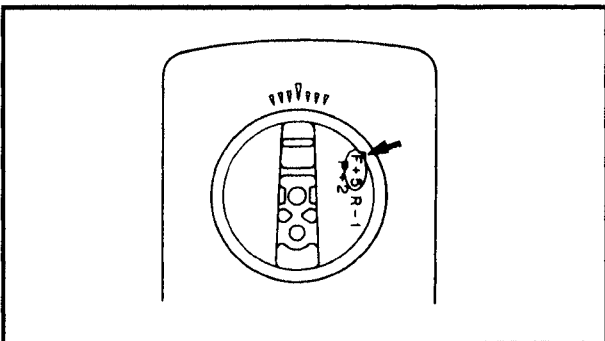


- (2) Calculate the reverse gear shim thickness (T1).

	Reverse gear shim thickness $(T1) = 30.6 + F/100 - M1$
--	--

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:

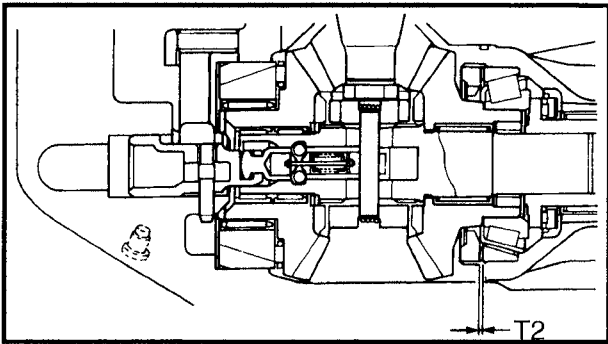
If M1 is "29.90 mm" and F is "+5", then

$$\begin{aligned}
 T1 &= 30.6 + (+5)/100 - 29.90 \text{ mm} \\
 &= 30.6 + 0.05 - 29.90 \text{ mm} \\
 &= 0.75 \text{ mm}
 \end{aligned}$$

(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: _____

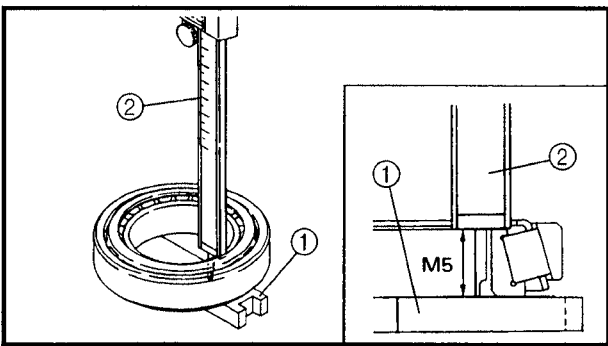
Select the shim thickness (T2) by using the specified measurement(s) and the calculation formula.

Select:

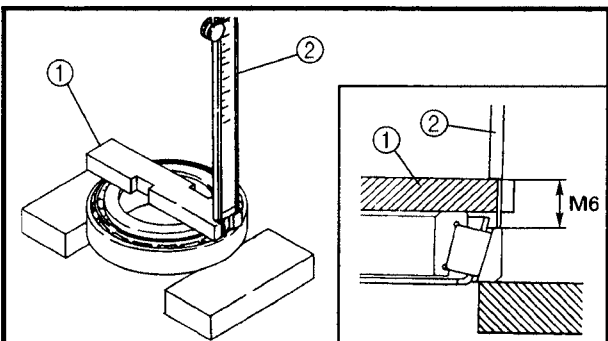
- Shim thickness (T2)

Selecting steps

(1) Measure (M5) and (M6).

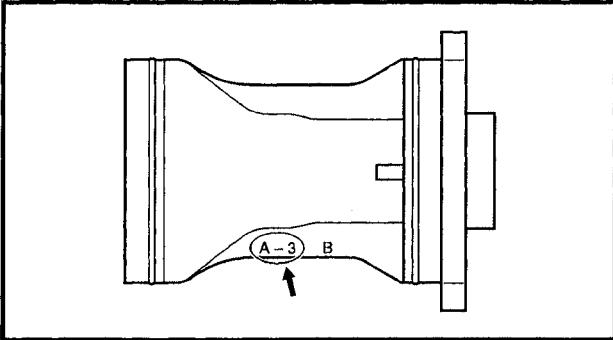
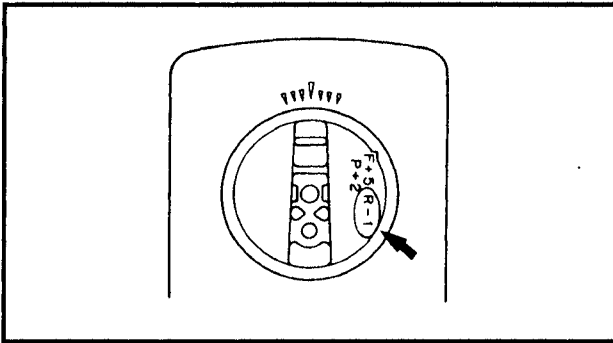


	Shimming plate ①
	90890-06701
	Digital caliper ②
	90890-06704



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 (M5) and (M6).



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



Forward gear shim thickness
 $(T2) = 6.50 + R/100 - A/100 - M5 + M6$

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

Example:

If M5 is "19.90 mm", M6 is "14.80 mm", R is "+7" and A is "-5", then

$$T2 = 6.50 + (+7)/100 - (-5)/100 - 19.90 + 14.80 \text{ mm}$$

$$= 6.50 + 0.07 + 0.05 - 19.90 + 14.80 \text{ mm}$$

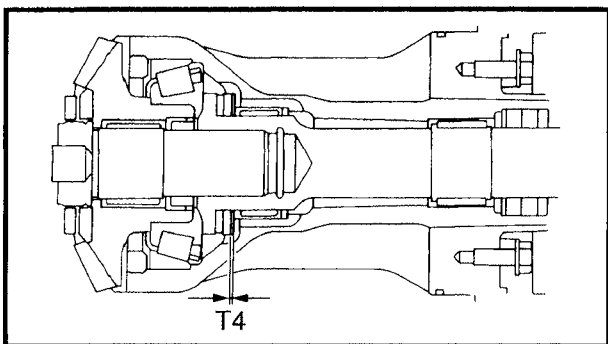
$$= 1.52 \text{ mm}$$

(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



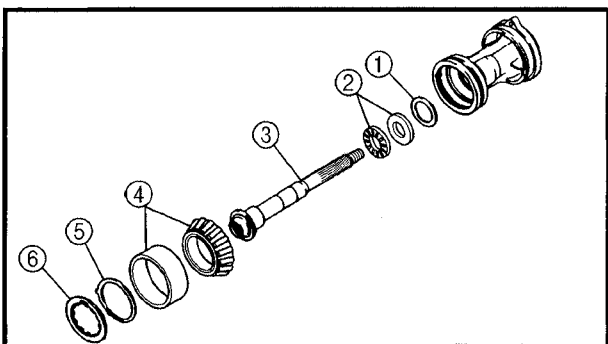
Available shim thickness
 0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm



SELECTING THE PROPELLER SHAFT SHIMS

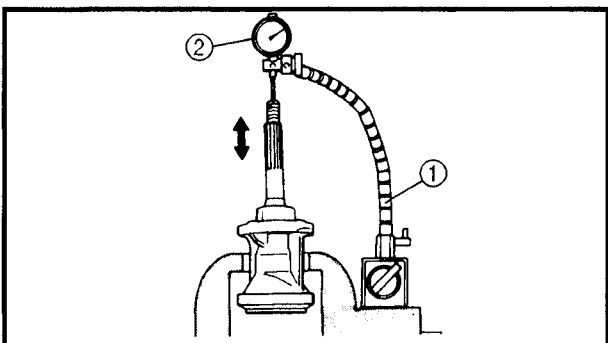
NOTE:

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
- Rear propeller shaft ③
- Tapered roller bearing ④
- Claw washer ⑤
- Ring nut ⑥



2. Measure:


- Propeller shaft free play
Out of specification → Adjust.

 **Propeller shaft free play**
0.30 ± 0.05 mm (0.012 ± 0.002 in)

 **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 0.32 - 0.52 mm (0.013 - 0.020 in)
--	---

Measuring steps

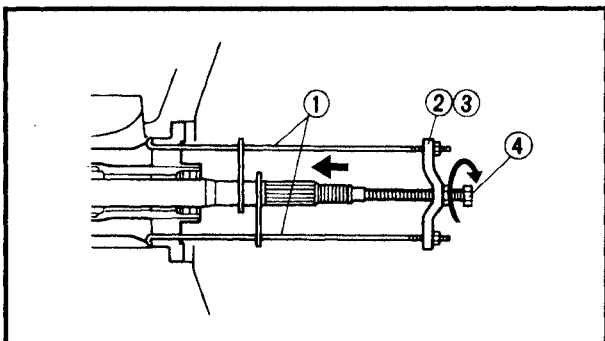
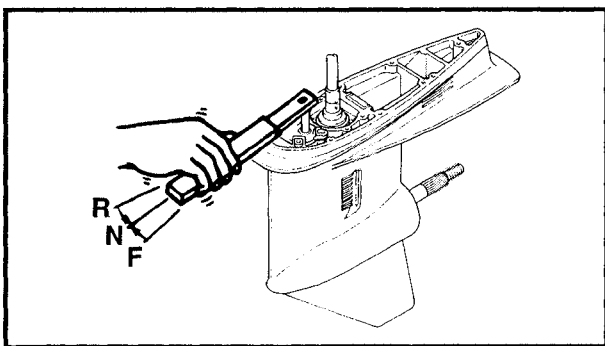
- (1) Set the shift rod into the neutral position.

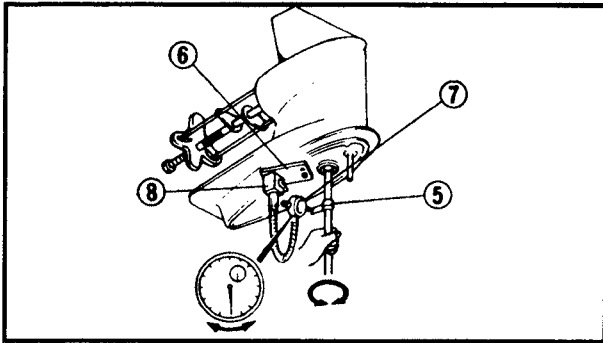
	Shift rod wrench YB-06052 / 90890-06052
--	---

- (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 0.32 mm (0.013 in)		To be increased by (0.42 - M) × 0.78
More than 0.52 mm (0.020 in)		To be decreased by (M - 0.42) × 0.78

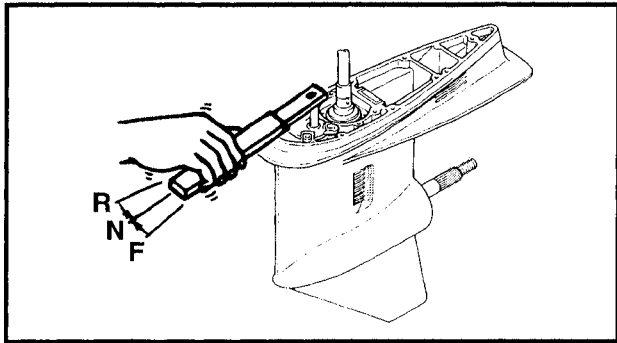
M: Measurement

MEASURING THE REVERSE GEAR BACKLASH

1. Measure:

- Reverse gear backlash
Out of specification → Adjust.

	Reverse gear backlash 0.64 - 0.93 mm (0.025 - 0.037 in)
--	--

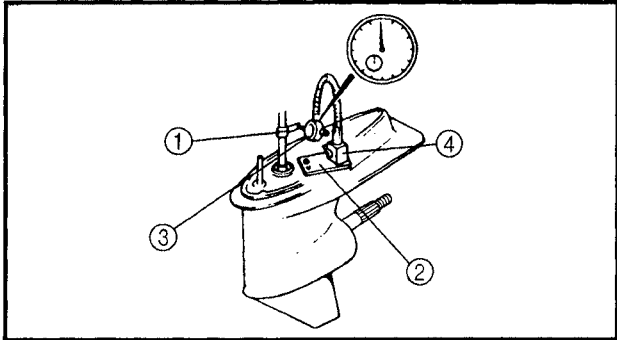


Measuring steps

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



Shift rod wrench
YB-06052 / 90890-06052



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



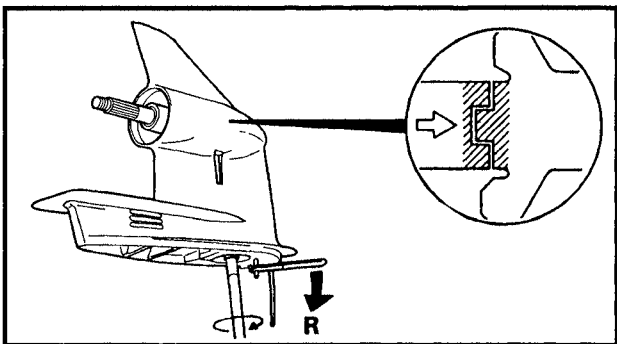
Backlash indicator ①
YB-06265 / 90890-06706

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



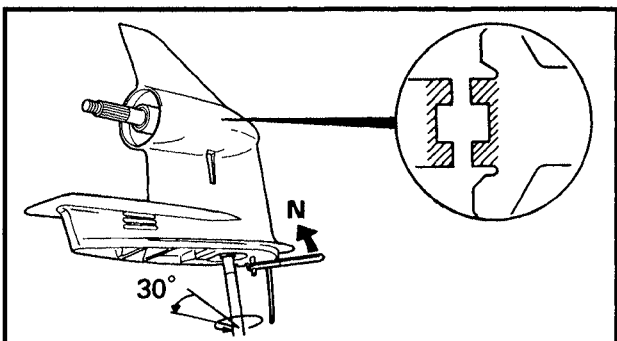
Magnetic-base plate ②
YB-07003 / 90890-07003
Dial gauge set ③
YU-03097 / 90890-01252
Magnetic base..... ④
YU-34481 / 90890-06705

(4) Set the lower unit upside down.



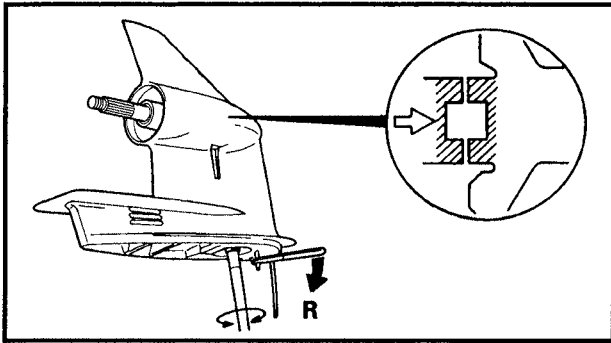
(5) Turn the shift rod into the reverse position with the shift rod wrench.

(6) Turn the drive shaft clockwise until the clutch dog is fully engaged.



(7) Turn the shift rod into the neutral position with the shift rod wrench.


(8) Turn the drive shaft counterclockwise approximately 30° more.



- (9) Turn the shift rod into the reverse position with the shift rod wrench.
- (10) 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 towards the reverse position with force.

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

 Reverse gear backlash	Shim thickness
Less than 0.64 mm (0.025 in)	To be decreased by $(0.79 - M) \times 0.78$
More than 0.93 mm (0.037 in)	To be increased by $(M - 0.79) \times 0.78$

M: Measurement



CHAPTER 7

BRACKET UNIT

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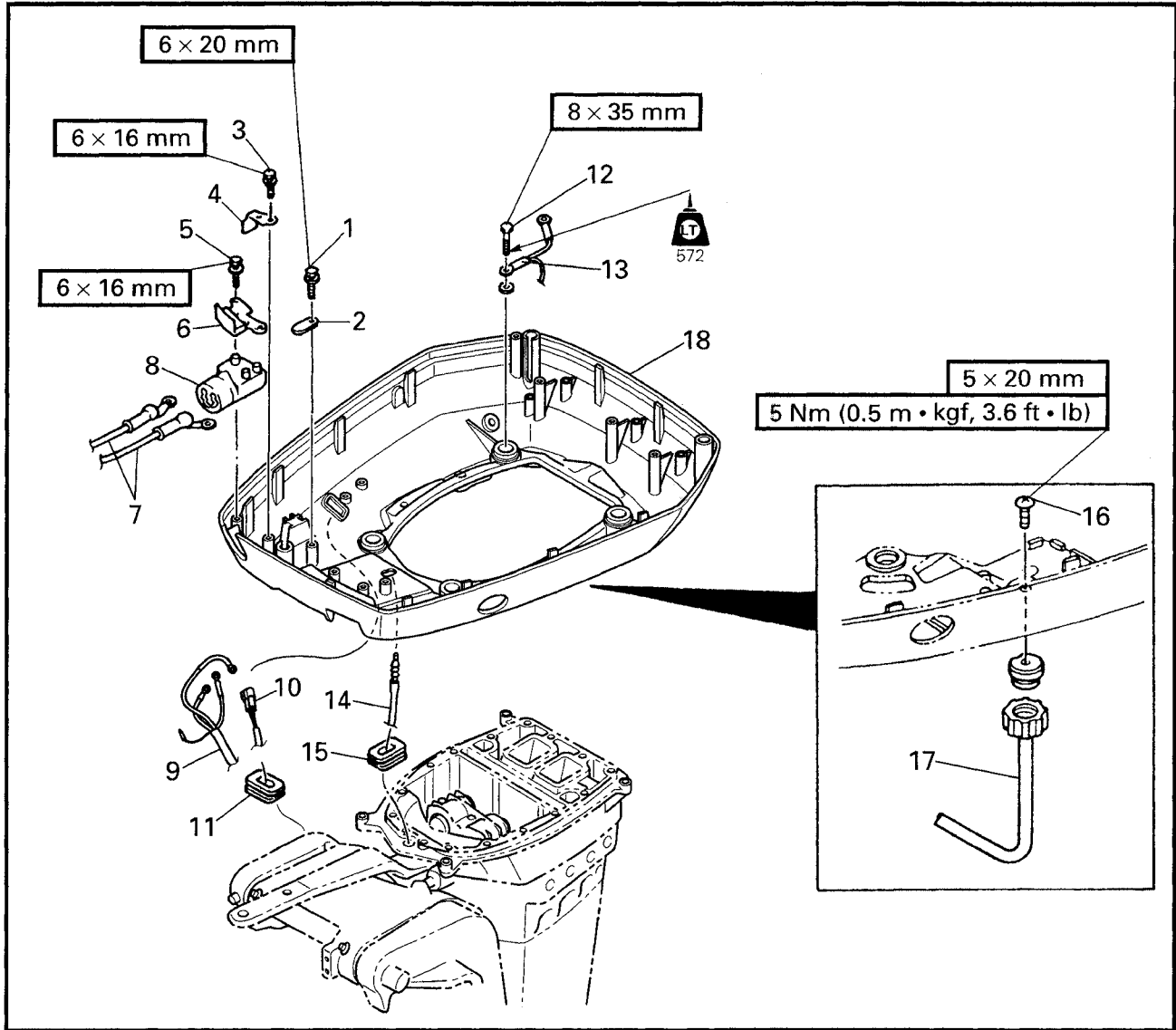
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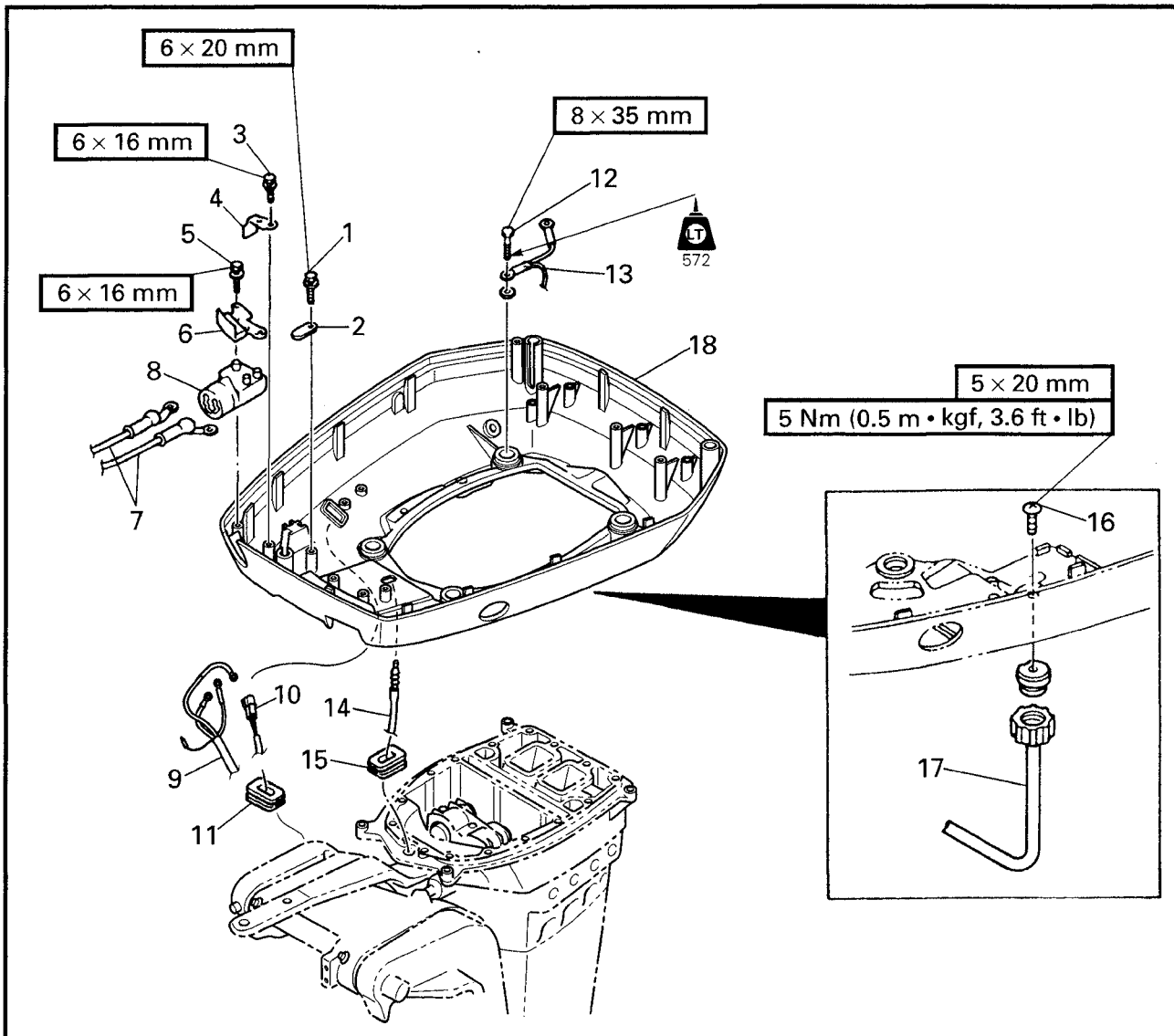


**BOTTOM COWLING
REMOVING/INSTALLING THE BOTTOM COWLING**



Order	Job/Part	Q'ty	Remarks
	Power unit		Refer to "POWER UNIT" on page 5-4.
1	Bolt	1	
2	Holder	1	
3	Bolt	1	
4	Holder	1	
5	Bolt	2	
6	Bracket	1	
7	Battery lead	2	
8	Hose guide	1	
9	Power trim and tilt lead	1	

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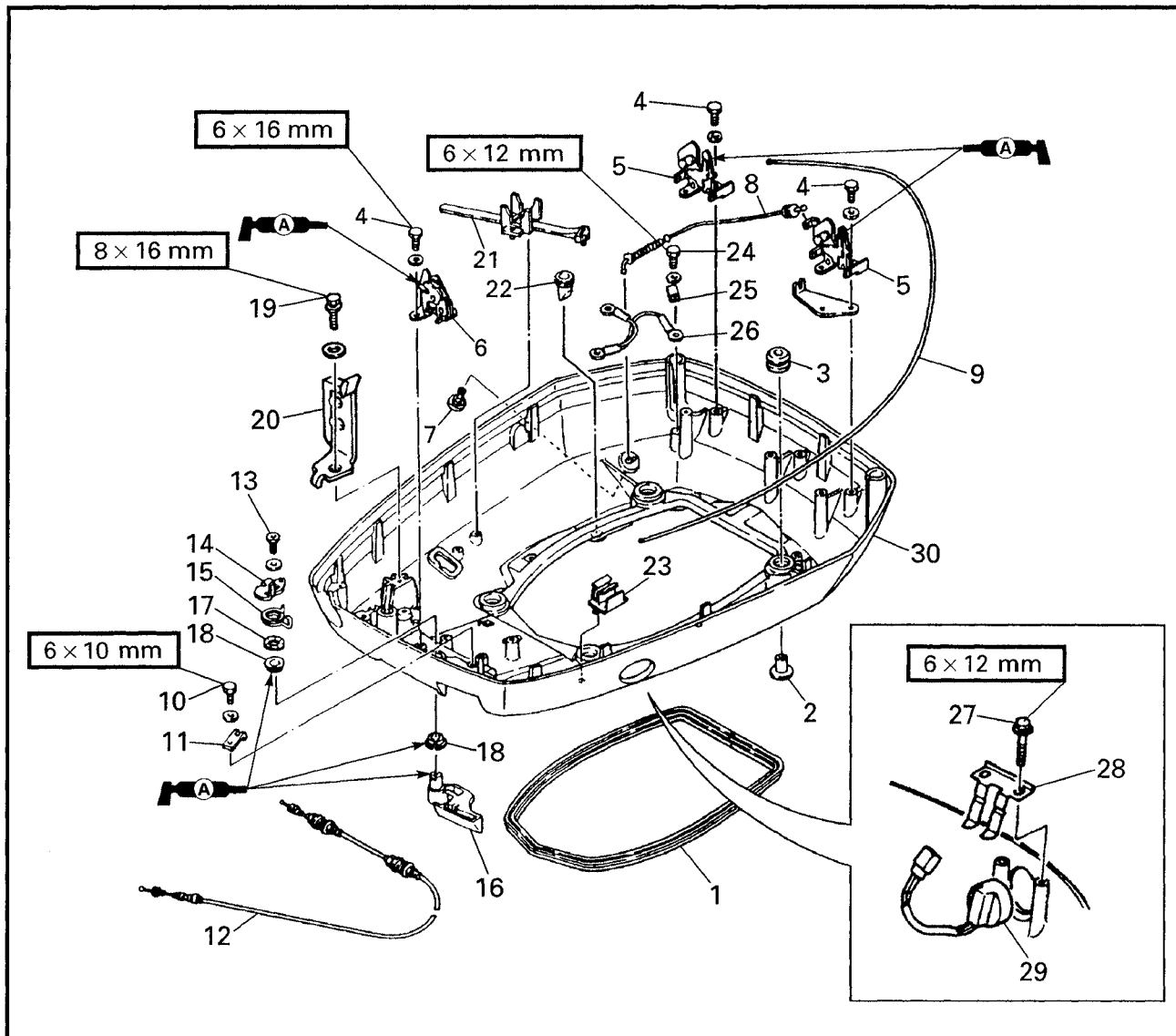


Order	Job/Part	Q'ty	Remarks
10	Trim sensor lead	1	
11	Grommet	1	
12	Bolt	4	
13	Ground lead	1	
14	Speedometer hose	1	
15	Grommet	1	
16	Screw	1	
17	Flushing hose	1	Salt water models
18	Bottom cowling	1	

For installation, reverse the removal procedure.

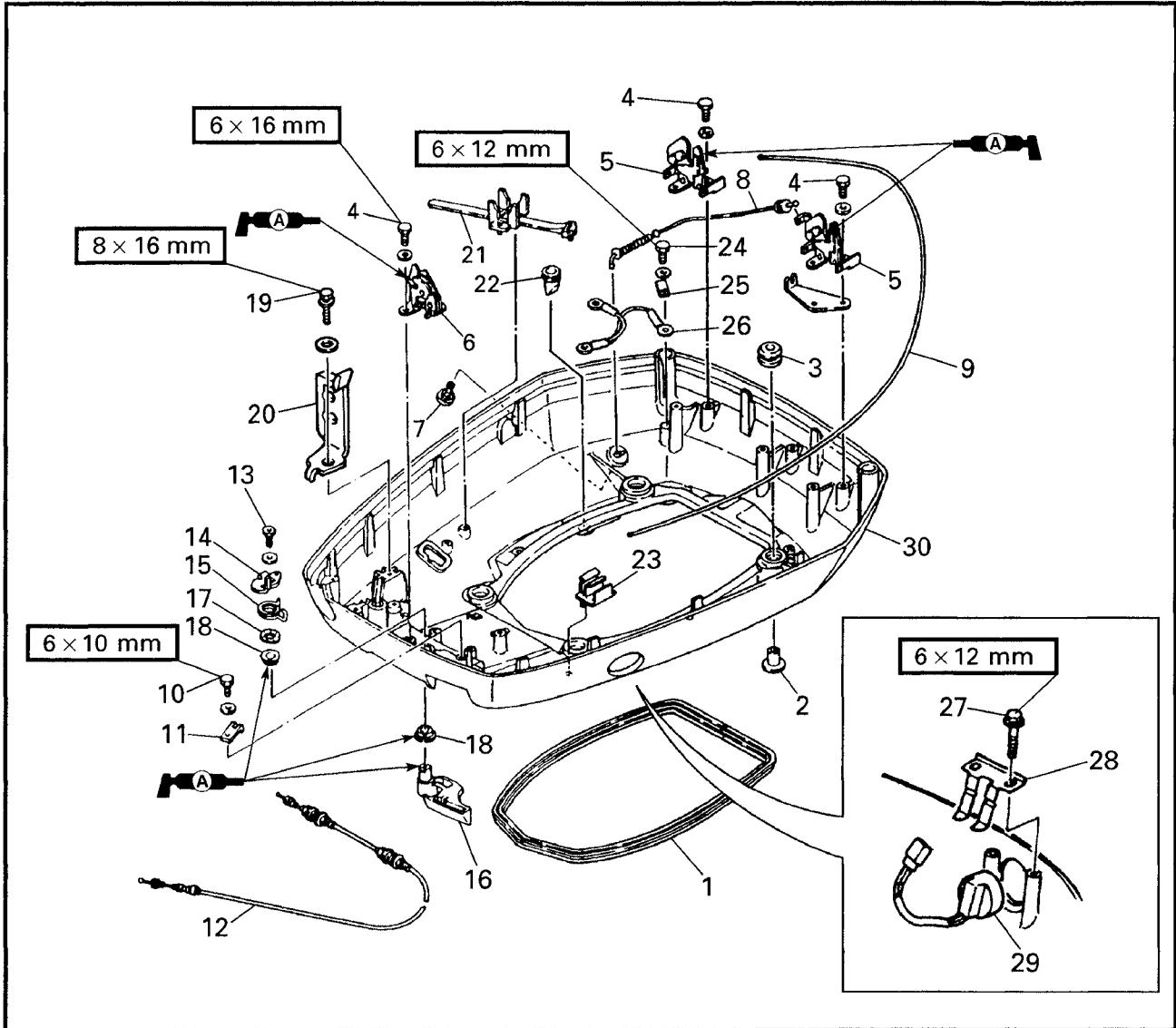


DISASSEMBLING/ASSEMBLING THE BOTTOM COWLING



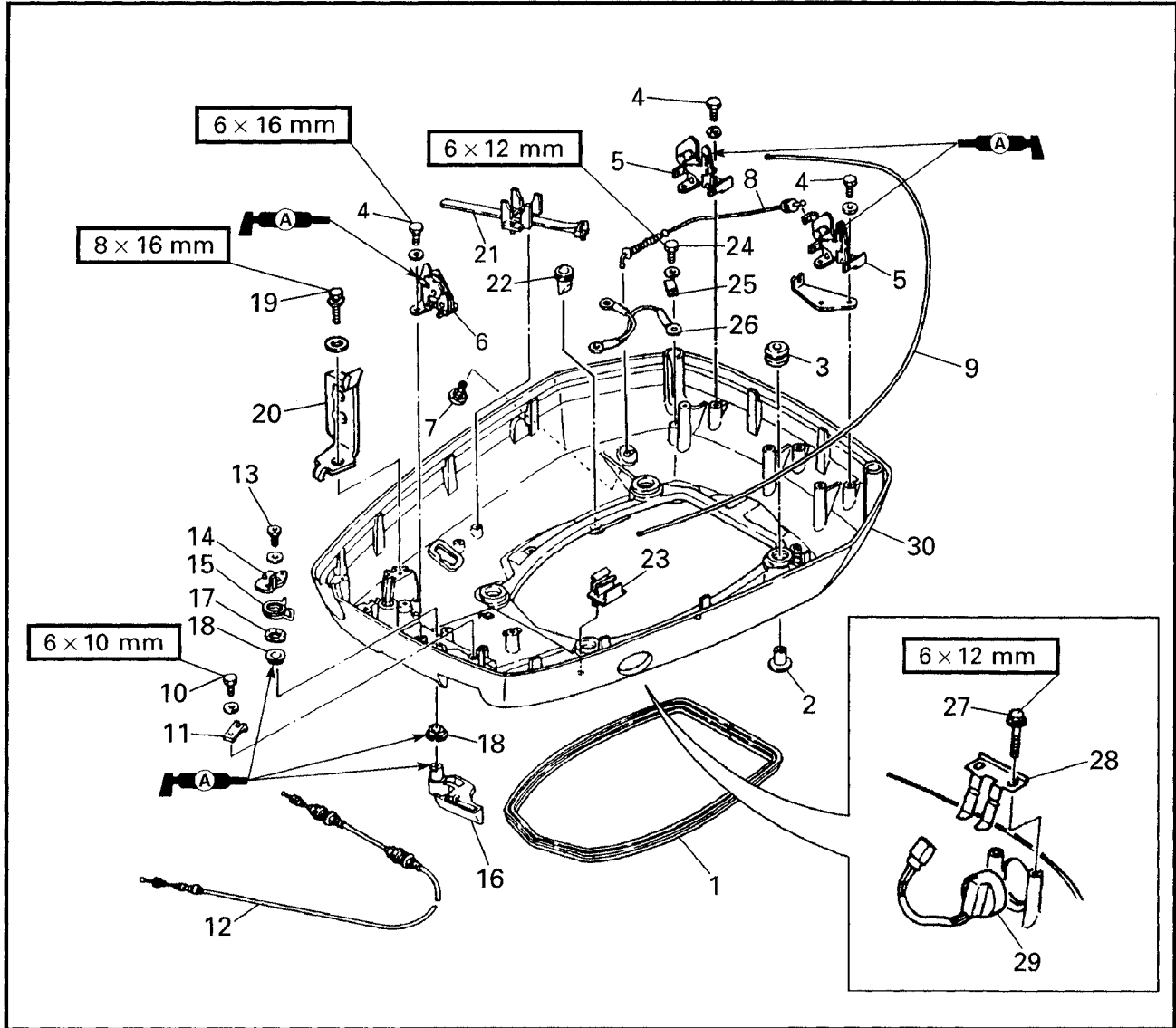
Order	Job/Part	Q'ty	Remarks
1	Rubber seal	1	
2	Collar	4	
3	Grommet	4	
4	Bolt	6	
5	Rear lock	2	
6	Front lock	1	
7	Pilot water outlet	1	
8	Emergency cable	1	(short)
9	Emergency cable	1	(long)
10	Bolt	1	

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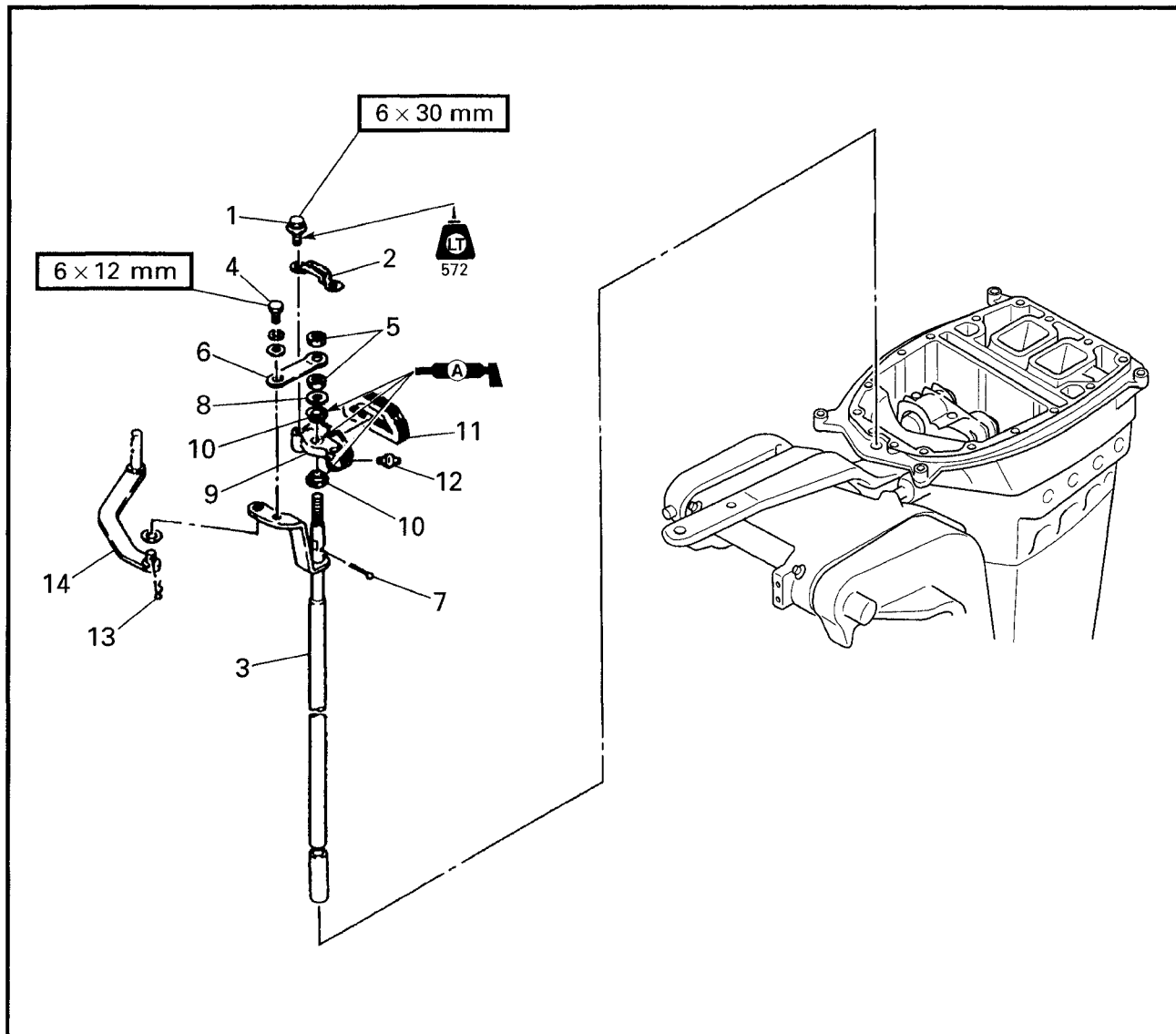
Order	Job/Part	Q'ty	Remarks
11	Cable holder	1	
12	Release cable	1	
13	Bolt	1	
14	Actuating lever	1	
15	Return spring	1	
16	Release lever	1	
17	Wave washer	1	
18	Grommet	2	
19	Bolt	1	
20	Cable holder	1	

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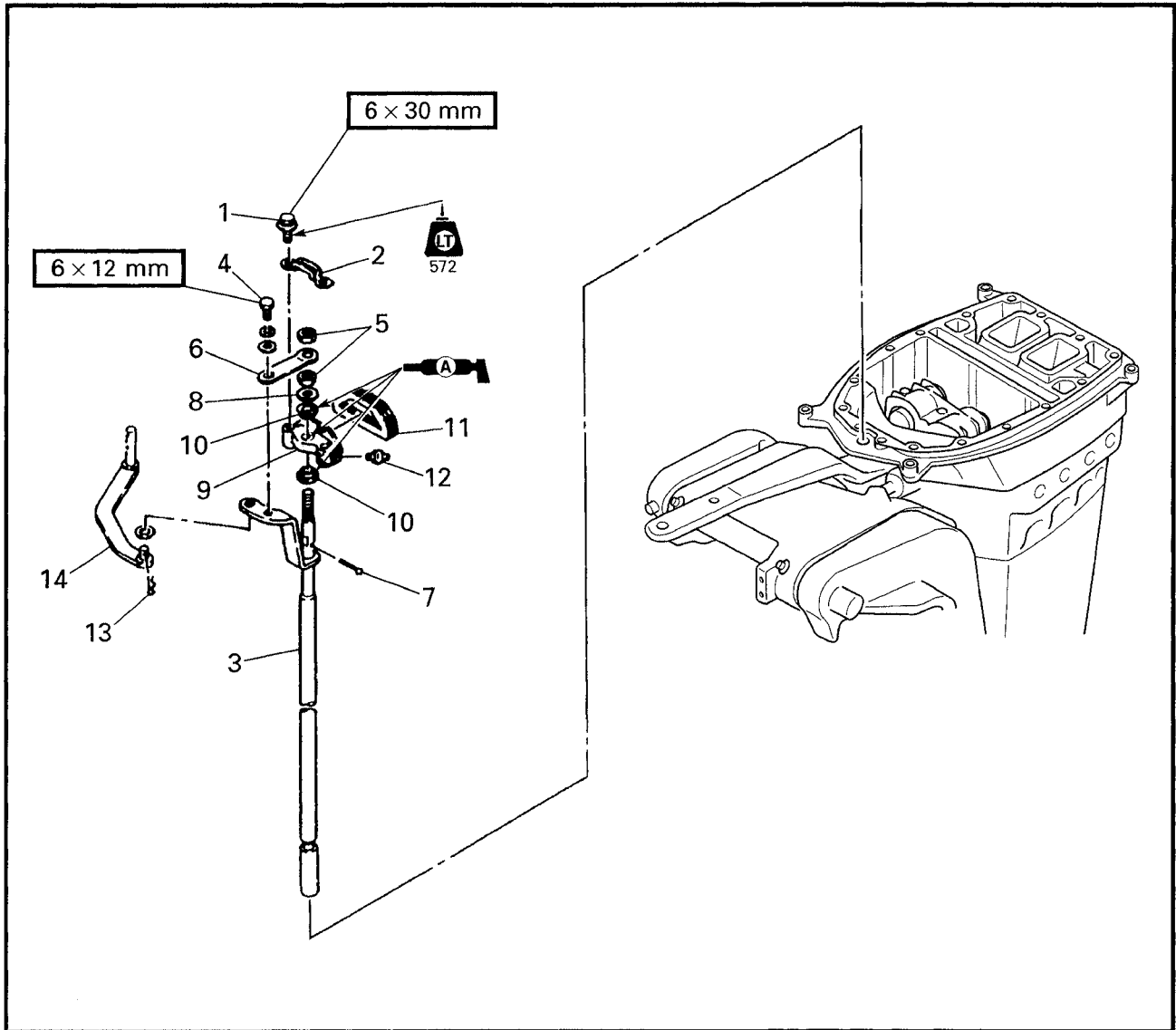
Order	Job/Part	Q'ty	Remarks
21	Wire harness clamp	1	
22	Rubber cap	4	
23	Cable guide	1	
24	Bolt	1	
25	Cable holder	1	
26	Ground lead	1	
27	Bolt	2	
28	Trailer switch holder	1	
29	Trailer switch	1	
30	Bottom cowling	1	

For assembly, reverse the disassembly procedure.

**SHIFT ROD ASSEMBLY****DISASSEMBLING/ASSEMBLING THE SHIFT ROD ASSEMBLY**

Order	Job/Part	Q'ty	Remarks
	Power unit		Refer to "POWER UNIT" on page 5-4.
1	Bolt	2	
2	Spring plate	1	
3	Shift rod	1	
4	Bolt	1	
5	Nut	2	
6	Plate	1	
7	Pin	1	

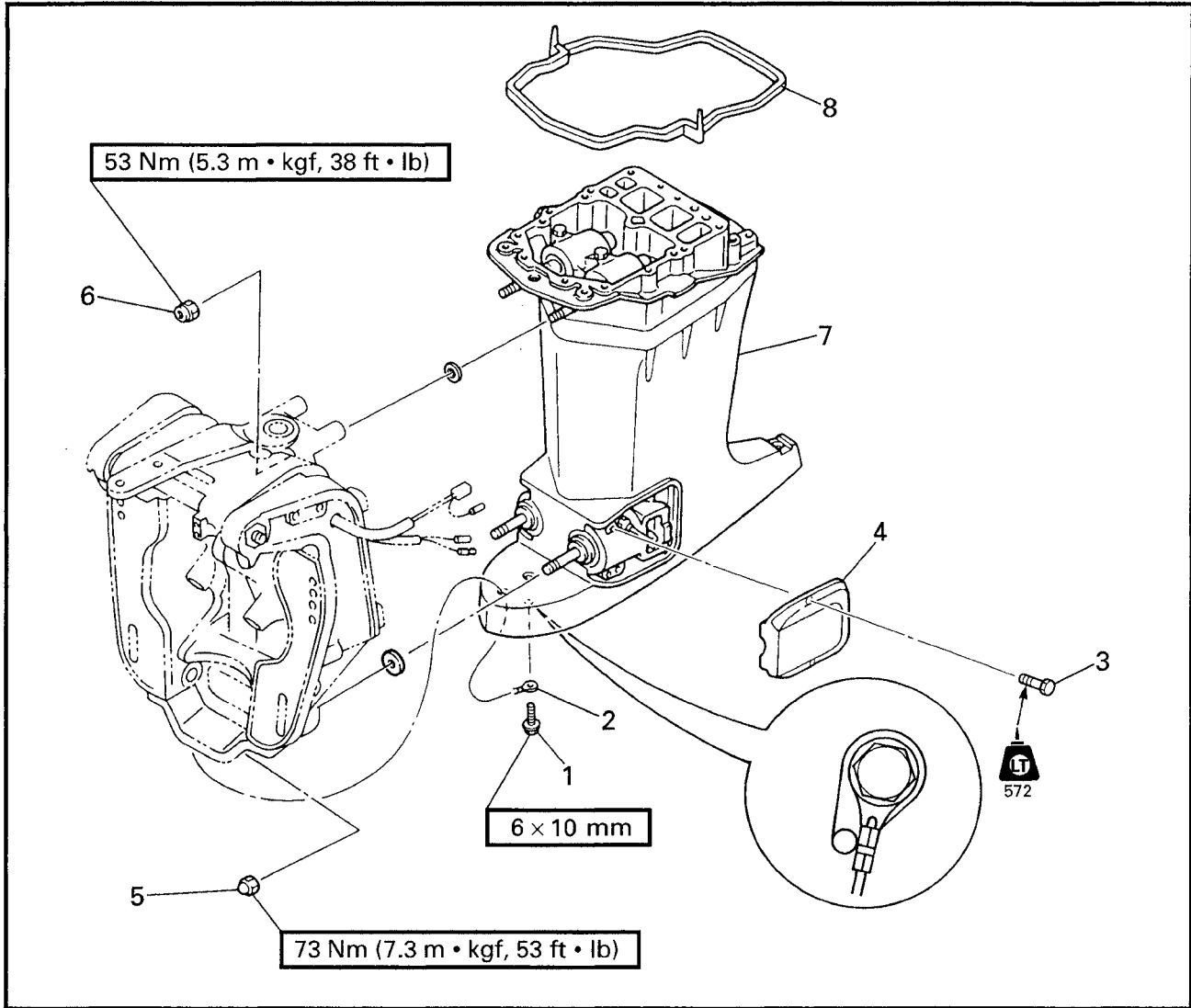
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Order	Job/Part	Q'ty	Remarks
8	Washer	1	
9	Shift rod bracket	1	
10	Collar	2	
11	Grommet	1	
12	Grease nipple	1	
13	Clip	1	
14	Shift rod lever	1	
			For assembly, reverse the disassembly procedure.

UPPER CASE ASSEMBLY

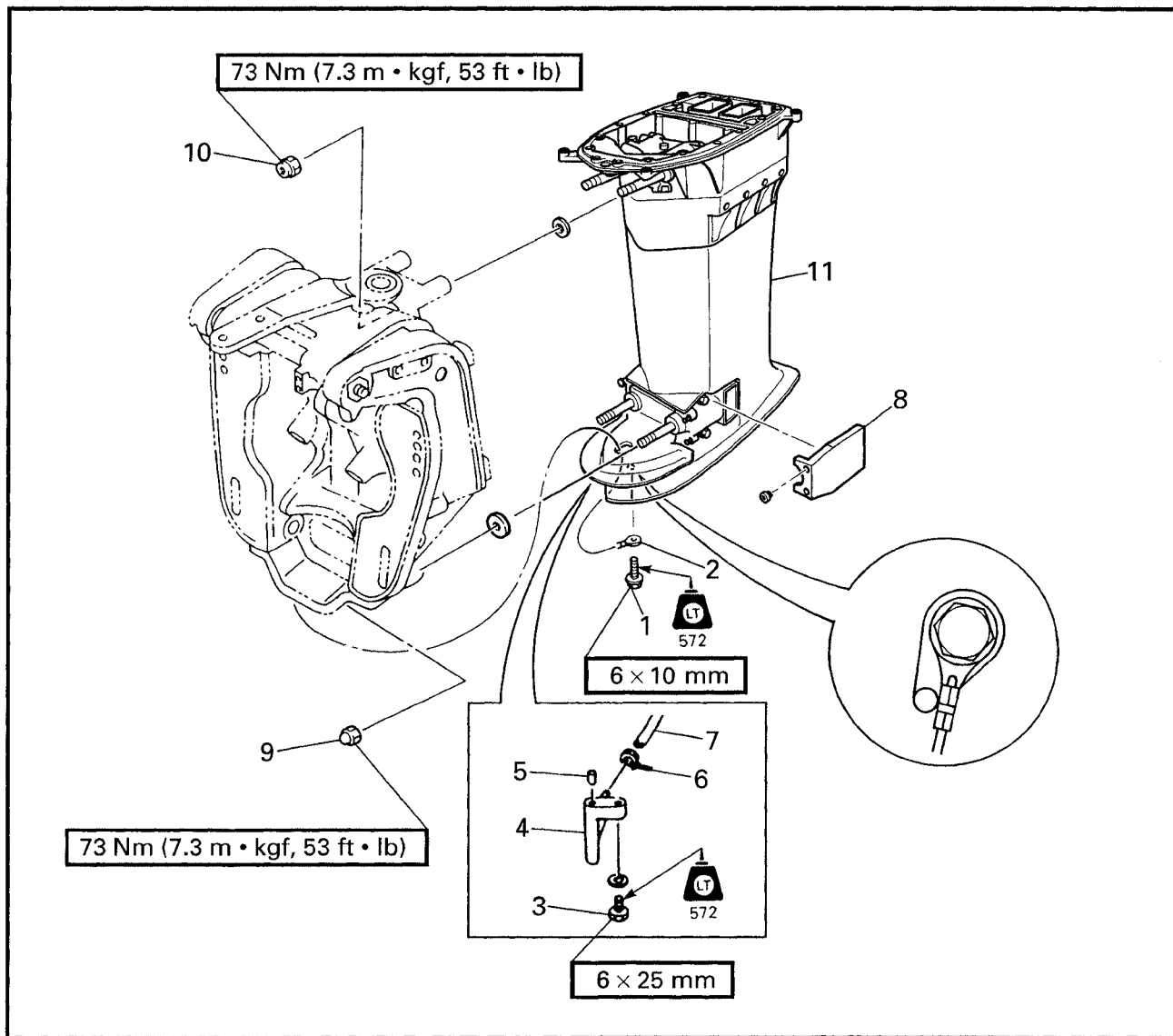
REMOVING/INSTALLING THE UPPER CASE ASSEMBLY (200H, 225G/V200, V225)



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	Bolt	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.

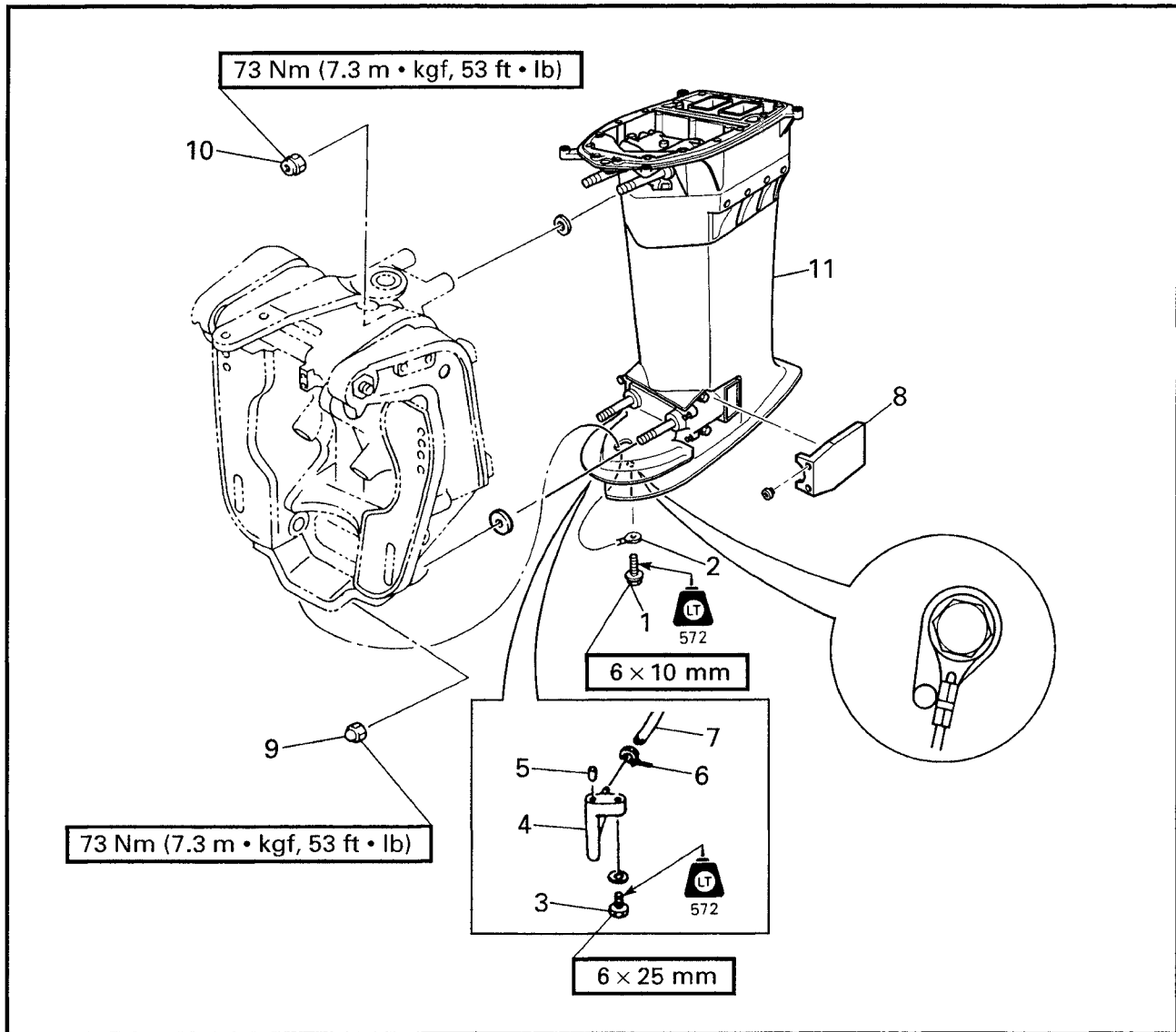


**REMOVING/INSTALLING THE UPPER CASE ASSEMBLY
(225F, L225F, 250B, L250B/S225, L225, S250, L250)**



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	Bolt	1	
4	Speedometer hose unit	1	

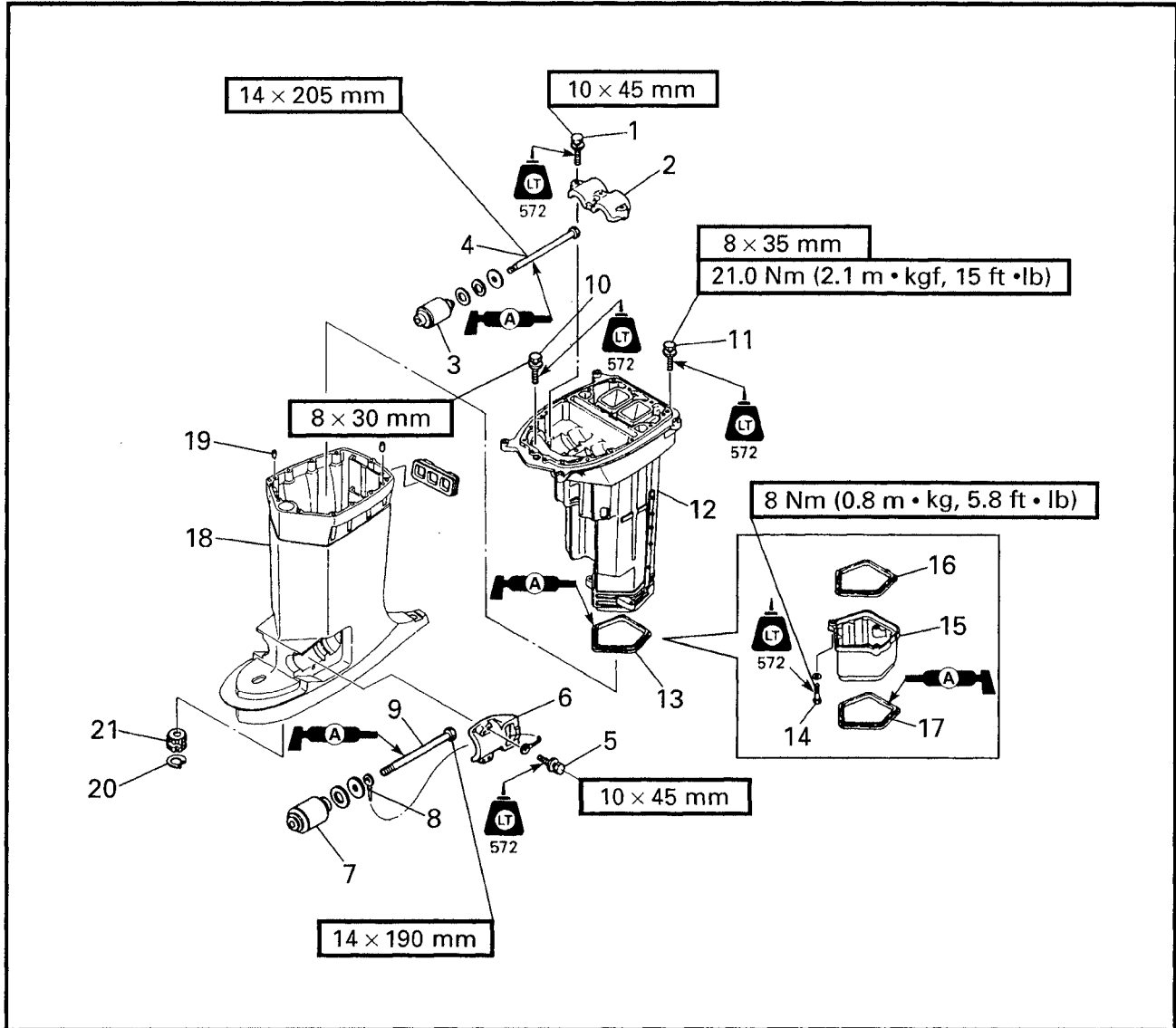
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Order	Job/Part	Q'ty	Remarks
5	Dowel pin	1	
6	Plastic locking tie	1	Not reusable
7	Speedometer hose	1	
8	Lower mount cover	2	
9	Cap nut	2	
10	Self-locking nut	2	
11	Upper case assembly	1	
			For installation, reverse the removal procedure.

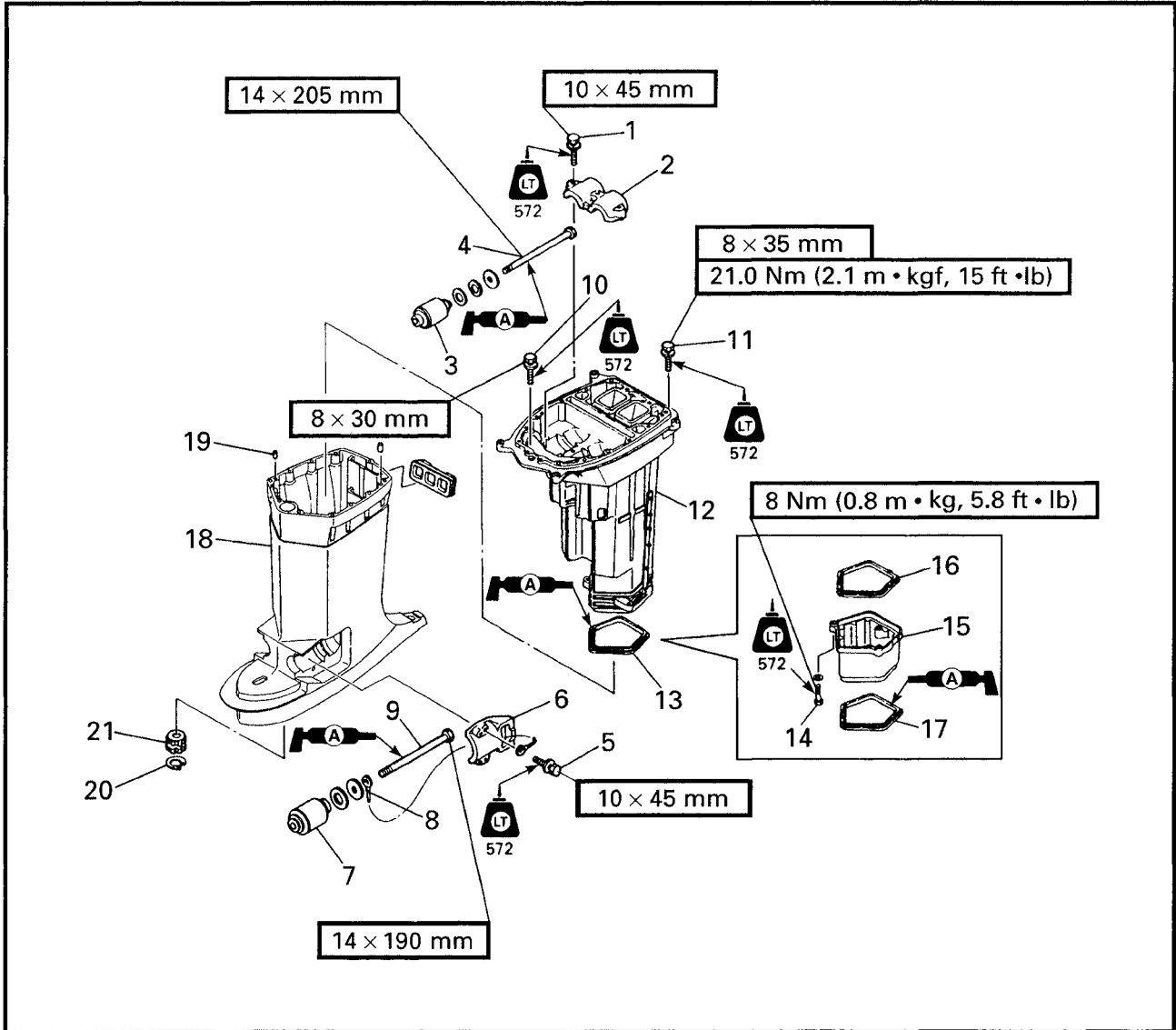


DISASSEMBLING/ASSEMBLING THE UPPER CASE ASSEMBLY



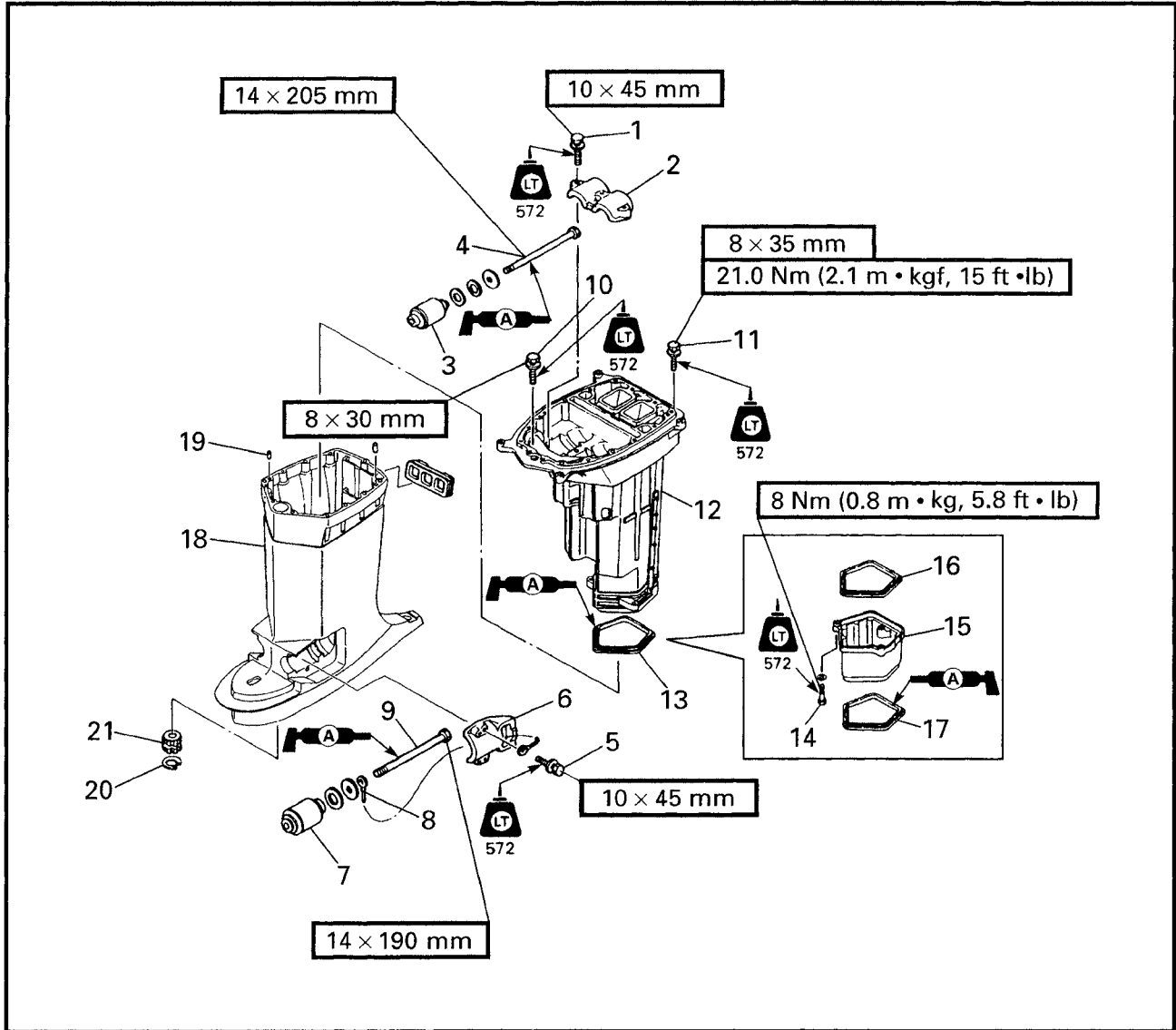
Order	Job/Part	Q'ty	Remarks
1	Bolt	3	
2	Upper mount bracket	1	
3	Upper mount	2	
4	Bolt	2	
5	Bolt	4	
6	Lower mount bracket	2	
7	Lower mount	2	
8	Ground lead	1	

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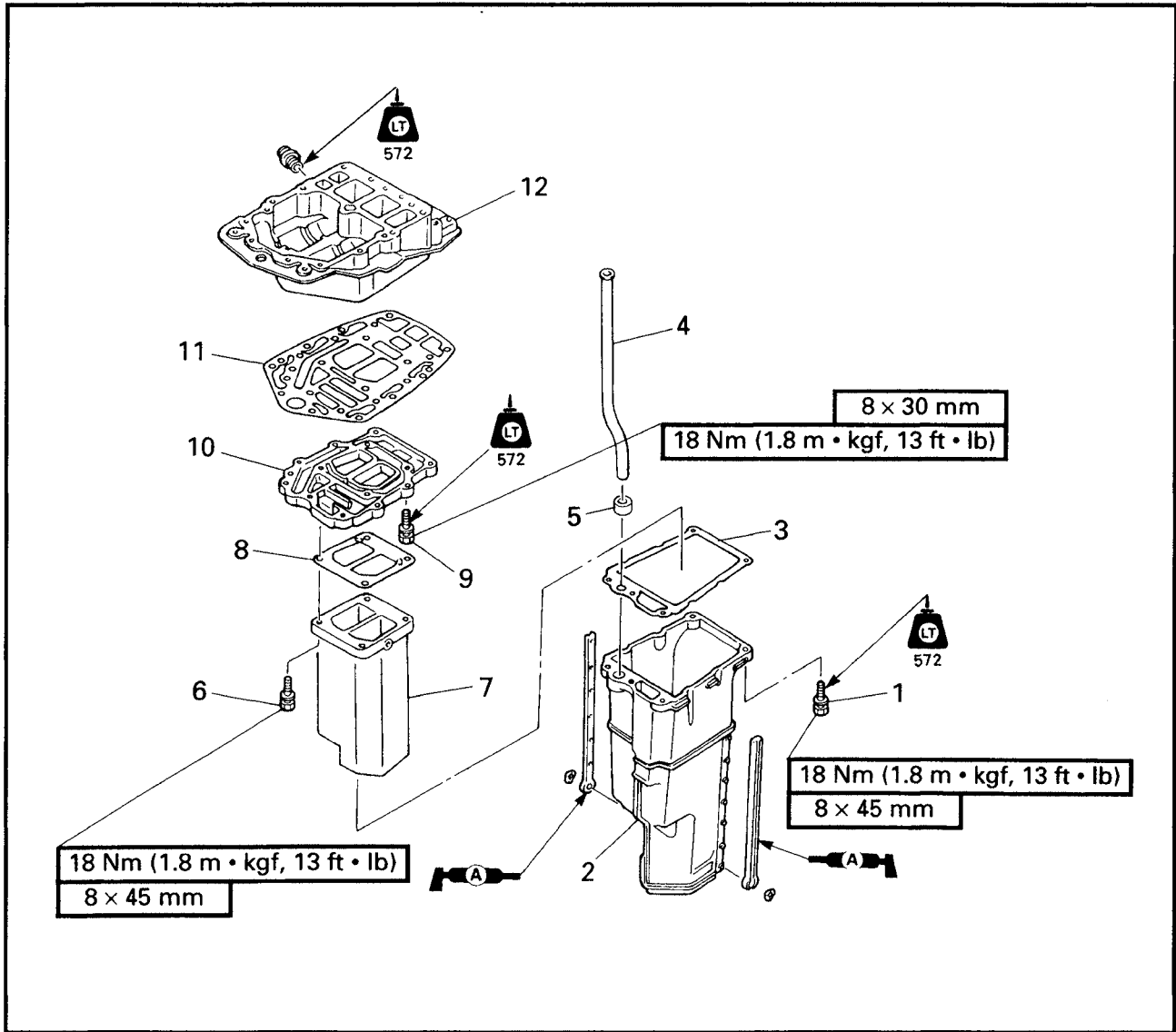
Order	Job/Part	Q'ty	Remarks
9	Bolt	2	
10	Bolt	2	
11	Bolt	1	
12	Muffler assembly	1	
13	Rubber seal	1	
14	Bolt	2	U transom models
15	Muffler	1	U transom models
16	Rubber seal	1	U transom models

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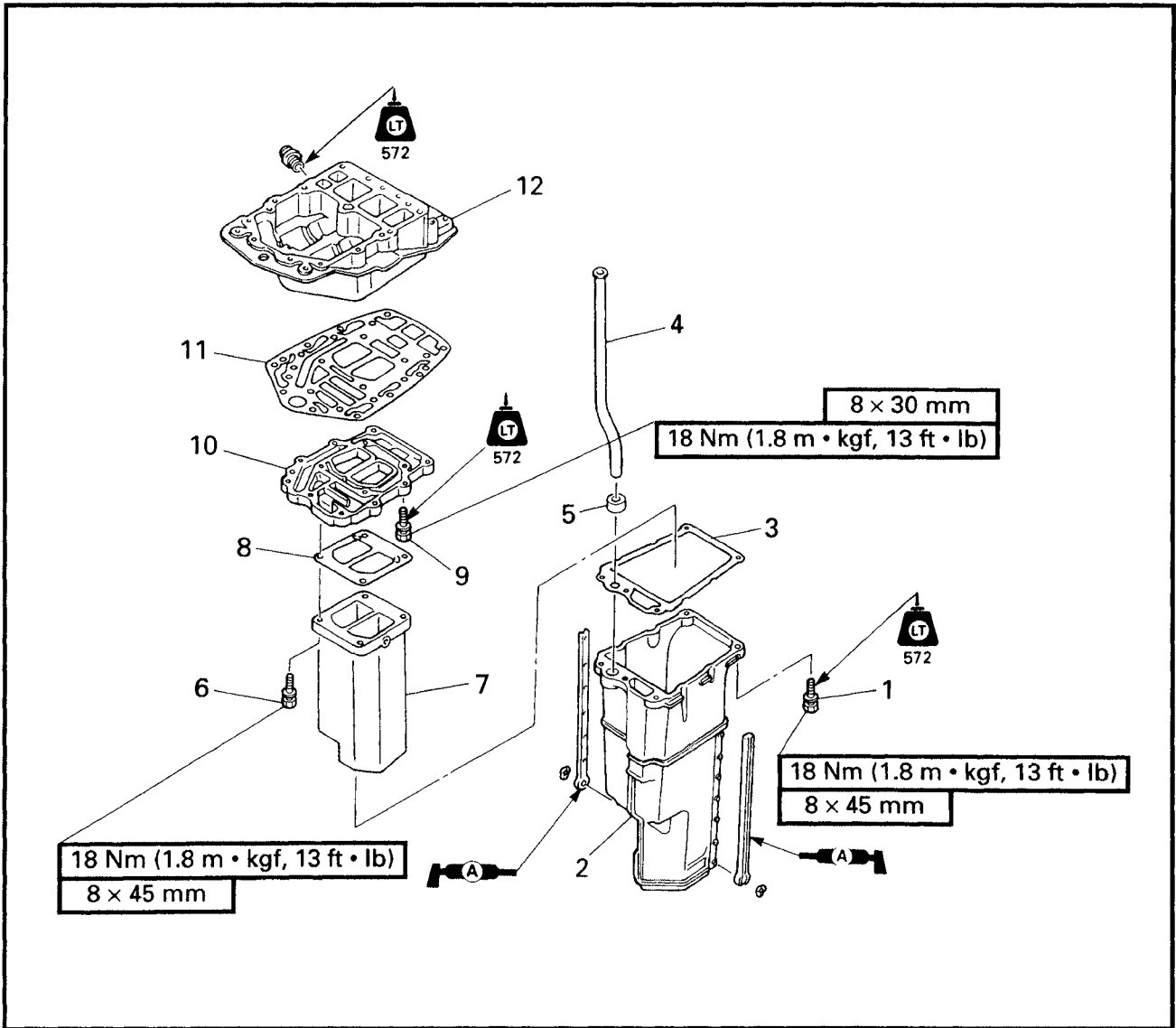
Order	Job/Part	Q'ty	Remarks
17	Rubber seal	1	U transom models
18	Upper case	1	
19	Dowel pin	2	
20	Circlip	1	U transom models
21	Bushing	1	U transom models
			For assembly, reverse the disassembly procedure.

EXHAUST MANIFOLD ASSEMBLY
DISASSEMBLING/ASSEMBLING THE EXHAUST MANIFOLD ASSEMBLY
(200H, 225G/V200, V225)



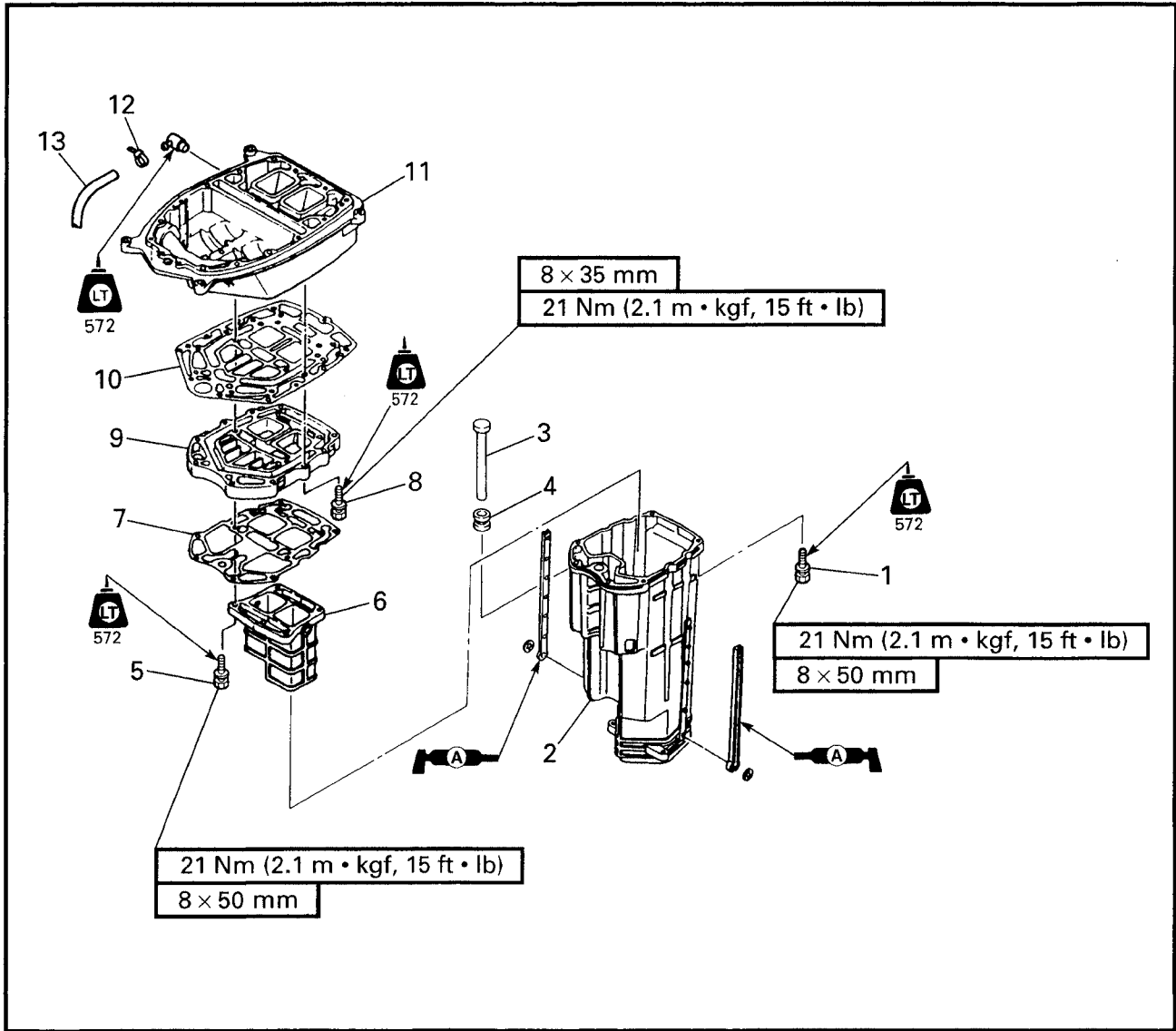
Order	Job/Part	Q'ty	Remarks
1	Bolt	5	
2	Muffler	1	
3	Gasket	1	Not reusable
4	Water tube	1	
5	Water seal	1	
6	Bolt	4	

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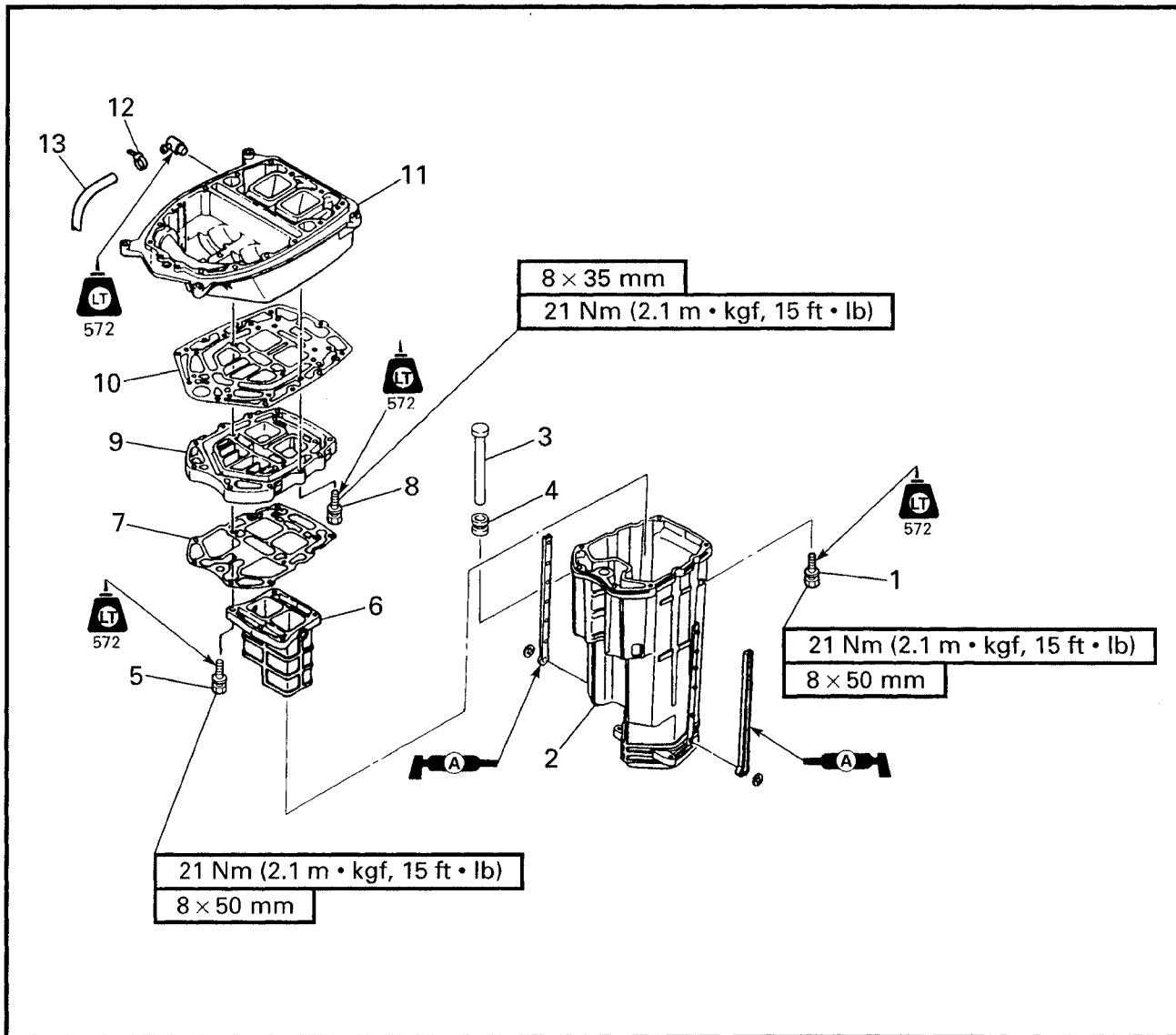
Order	Job/Part	Q'ty	Remarks
7	Exhaust manifold	1	
8	Gasket	1	Not reusable
9	Bolt	4	
10	Lower exhaust manifold guide	1	
11	Gasket	1	Not reusable
12	Upper exhaust manifold guide	1	
			For assembly, reverse the disassembly procedure.

**DISASSEMBLING/ASSEMBLING THE EXHAUST MANIFOLD ASSEMBLY
(225F, L225F, 250B, L250B/S225, L225, S250, L250)**



Order	Job/Part	Q'ty	Remarks
1	Bolt	6	
2	Muffler	1	
3	Water tube	1	
4	Water seal	1	
5	Bolt	4	
6	Exhaust manifold	1	
7	Gasket	1	Not reusable

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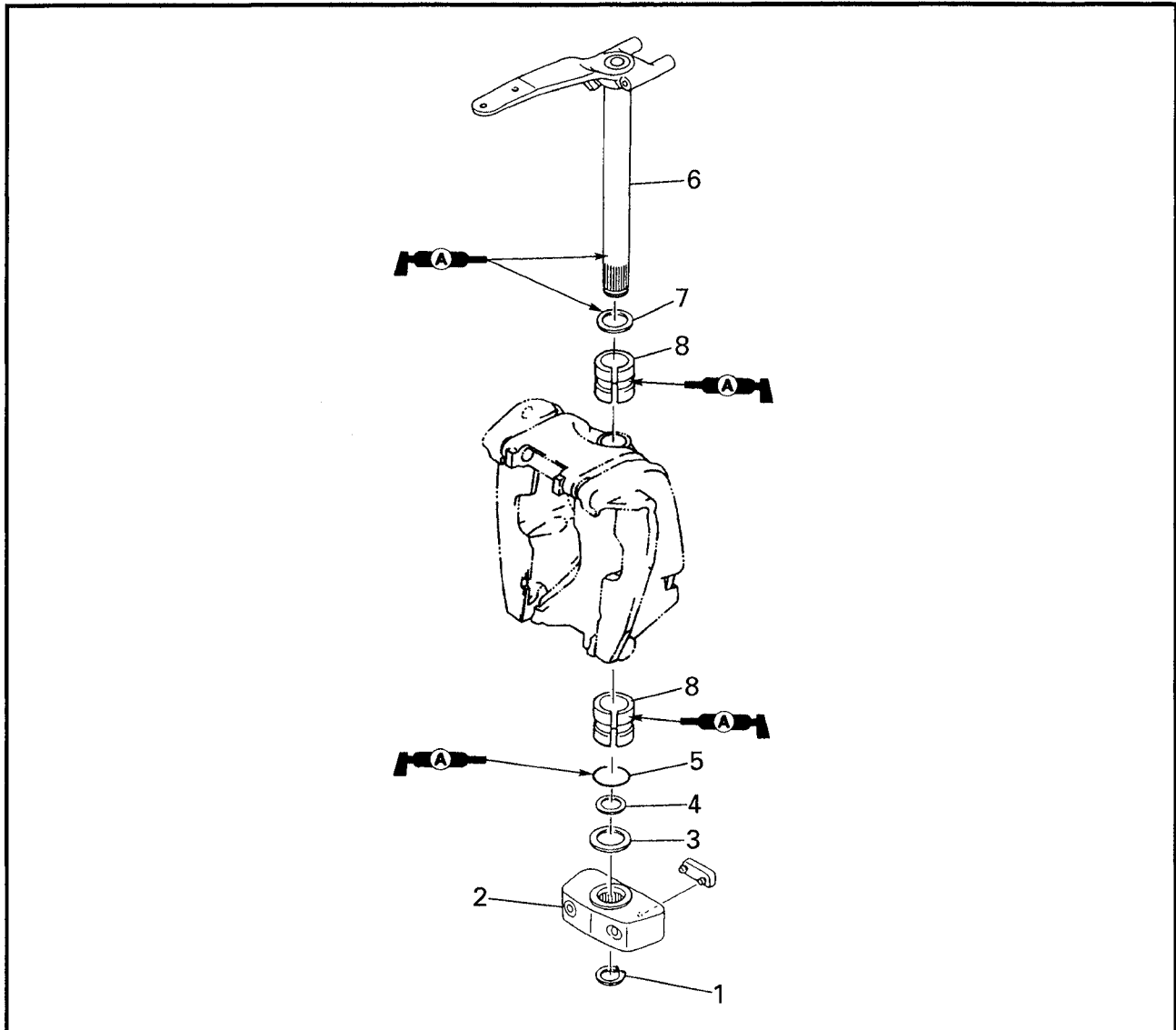


Order	Job/Part	Q'ty	Remarks
8	Bolt	4	
9	Lower exhaust manifold guide	1	
10	Gasket	1	Not reusable
11	Upper exhaust manifold guide	1	
12	Plastic locking tie	1	Not reusable Salt water models
13	Flushing hose	1	Salt water models
			For assembly, reverse the disassembly procedure.



STEERING ARM

REMOVING/INSTALLING THE STEERING ARM



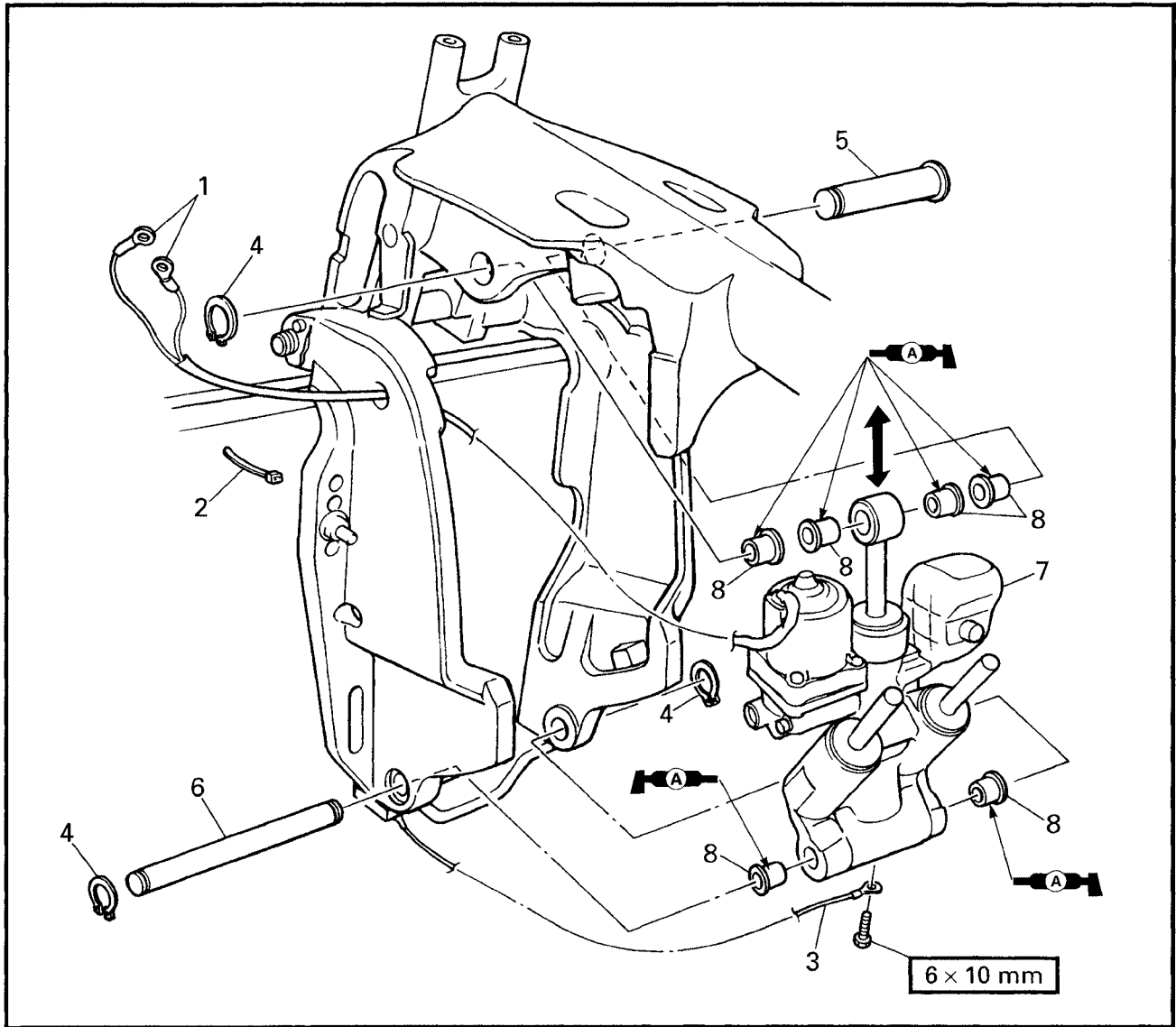
Order	Job/Part	Q'ty	Remarks
	Upper case assembly		Refer to "UPPER CASE ASSEMBLY" on page 7-8.
1	Circlip	1	
2	Steering arm yoke	1	
3	Washer	1	
4	Washer	1	
5	O-ring	1	
6	Steering arm	1	
7	Washer	1	
8	Bushing	2	
			For installation, reverse the removal procedure.



POWER TRIM AND TILT UNIT

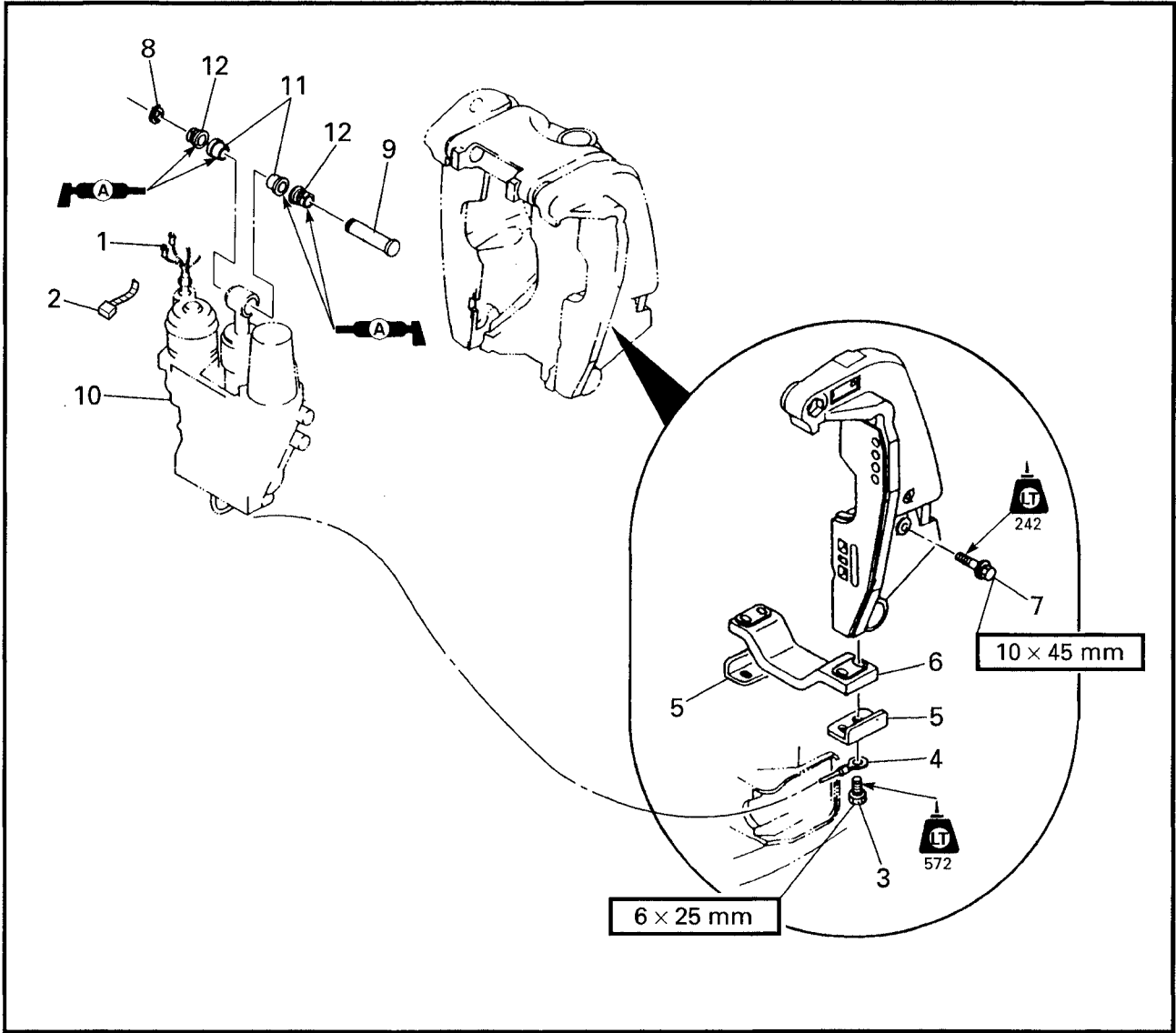
REMOVING/INSTALLING THE POWER TRIM AND TILT UNIT

(200H, 225G/V200, V225)



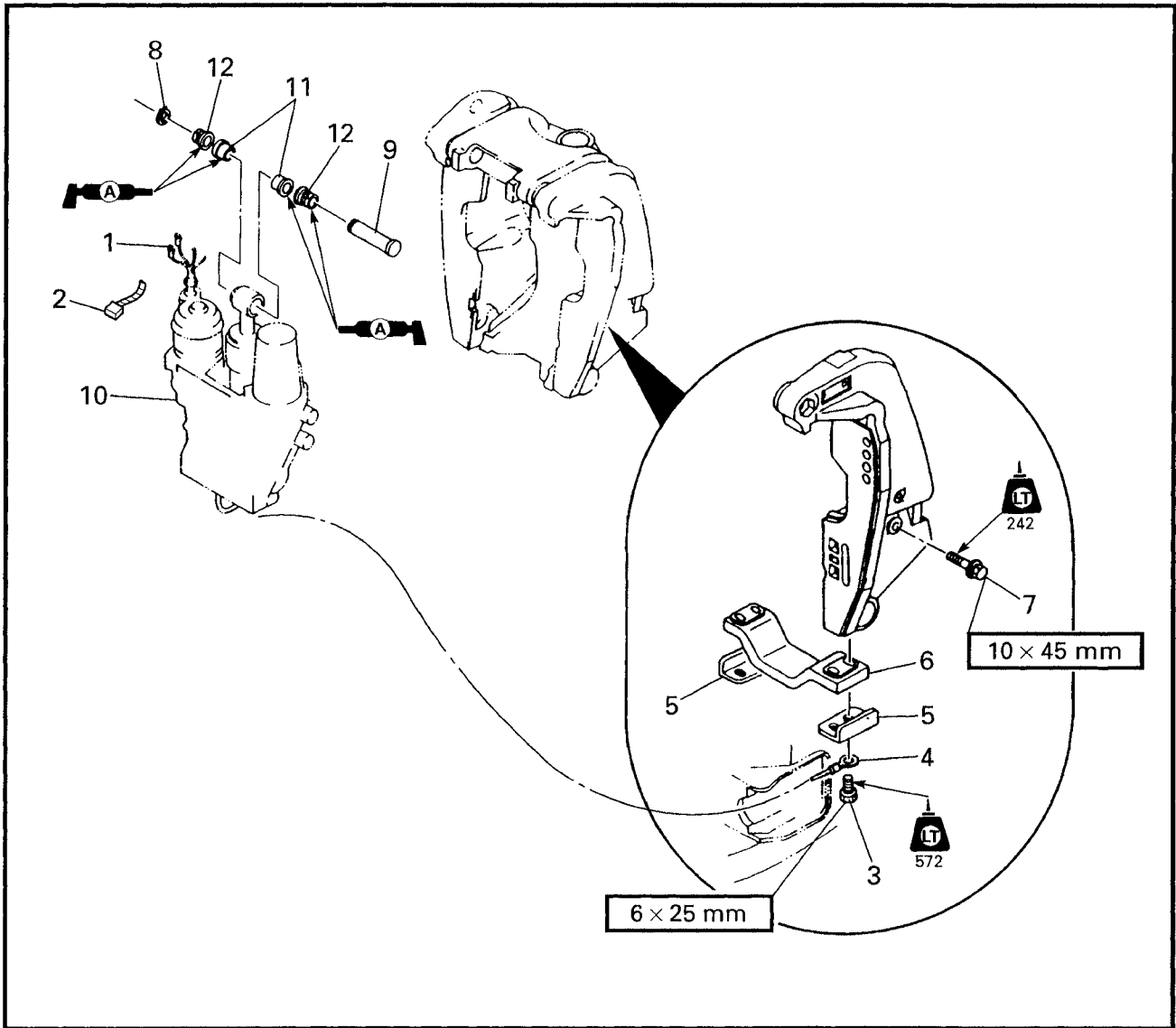
Order	Job/Part	Q'ty	Remarks
	Tilt up the outboard		
1	Power trim and tilt lead	2	
2	Plastic locking tie	3	Not reusable
3	Ground lead	1	
4	Circlip	3	
5	Upper mounting pin	1	
6	Lower mounting pin	1	
7	Power trim and tilt unit	1	
8	Collar	6	
			For installation, reverse the removal procedure.

**REMOVING/INSTALLING THE POWER TRIM AND TILT UNIT
(225F, L225F, 250B, L250B/S225, L225, S250, L250)**



Order	Job/Part	Q'ty	Remarks
	Upper case assembly		Refer to "UPPER CASE ASSEMBLY" on page 7-8.
1	Power trim and tilt lead	4	Not reusable
2	Plastic locking tie	3	
3	Bolt	4	
4	Ground lead	1	
5	Anode bracket	2	

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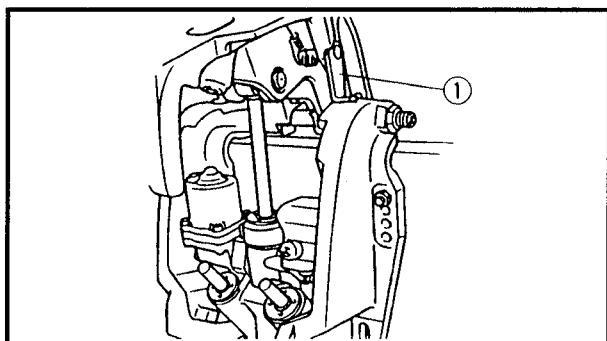
Order	Job/Part	Q'ty	Remarks
6	Anode	1	
7	Bolt	8	
8	Circlip	1	
9	Upper mounting pin	1	
10	Power trim and tilt unit	1	
11	Collar	2	
12	Collar	2	
			For installation, reverse the removal procedure.



REMOVING THE POWER TRIM AND TILT UNIT (200H, 225G/V200, V225)

⚠ 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.

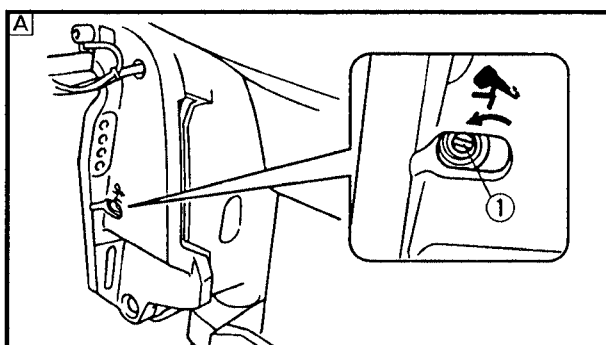


NOTE: Tilt up the outboard and then turn the tilt stop levers ① to support it.

Remove:

- Power trim and tilt unit

NOTE: Slightly lower the tilt ram assembly and then remove the power trim and tilt unit.

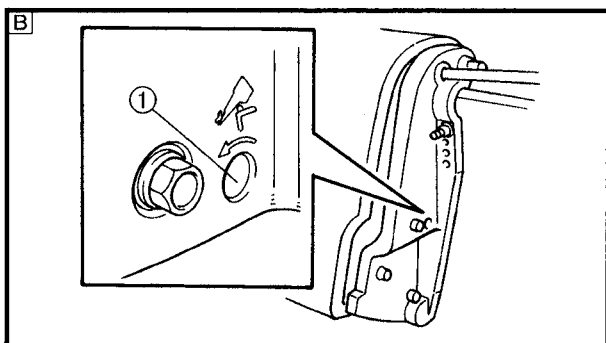


BLEEDING THE POWER TRIM AND TILT UNIT

NOTE: Install the power trim and tilt unit onto the outboard before bleeding.

Bleed:

- Air bubbles
(from the power trim and tilt unit)

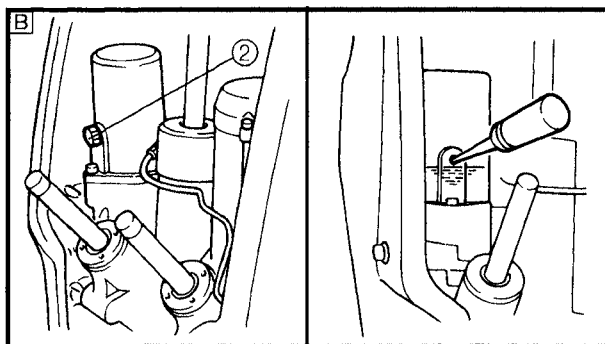
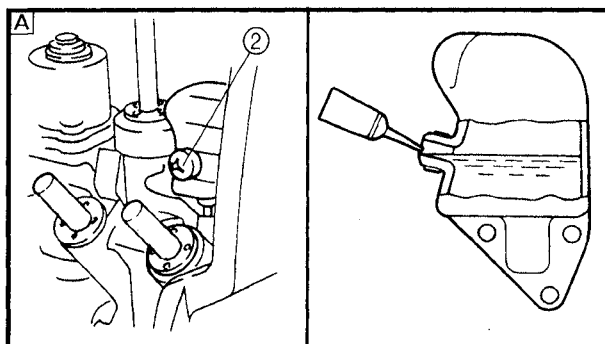
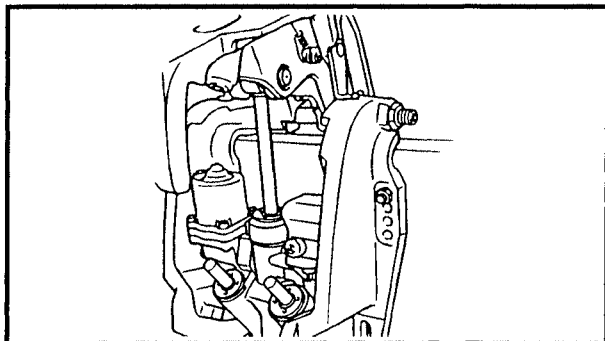


Bleeding steps

- (1) Connect the battery leads to the battery.
- (2) Loosen the manual valve ① by turning it counterclockwise until it stops.

A 200H, 225G/V200, V225

B 225F, L225F, 250B, L250B/S225, L225, S250, L250



- (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 trailer 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.

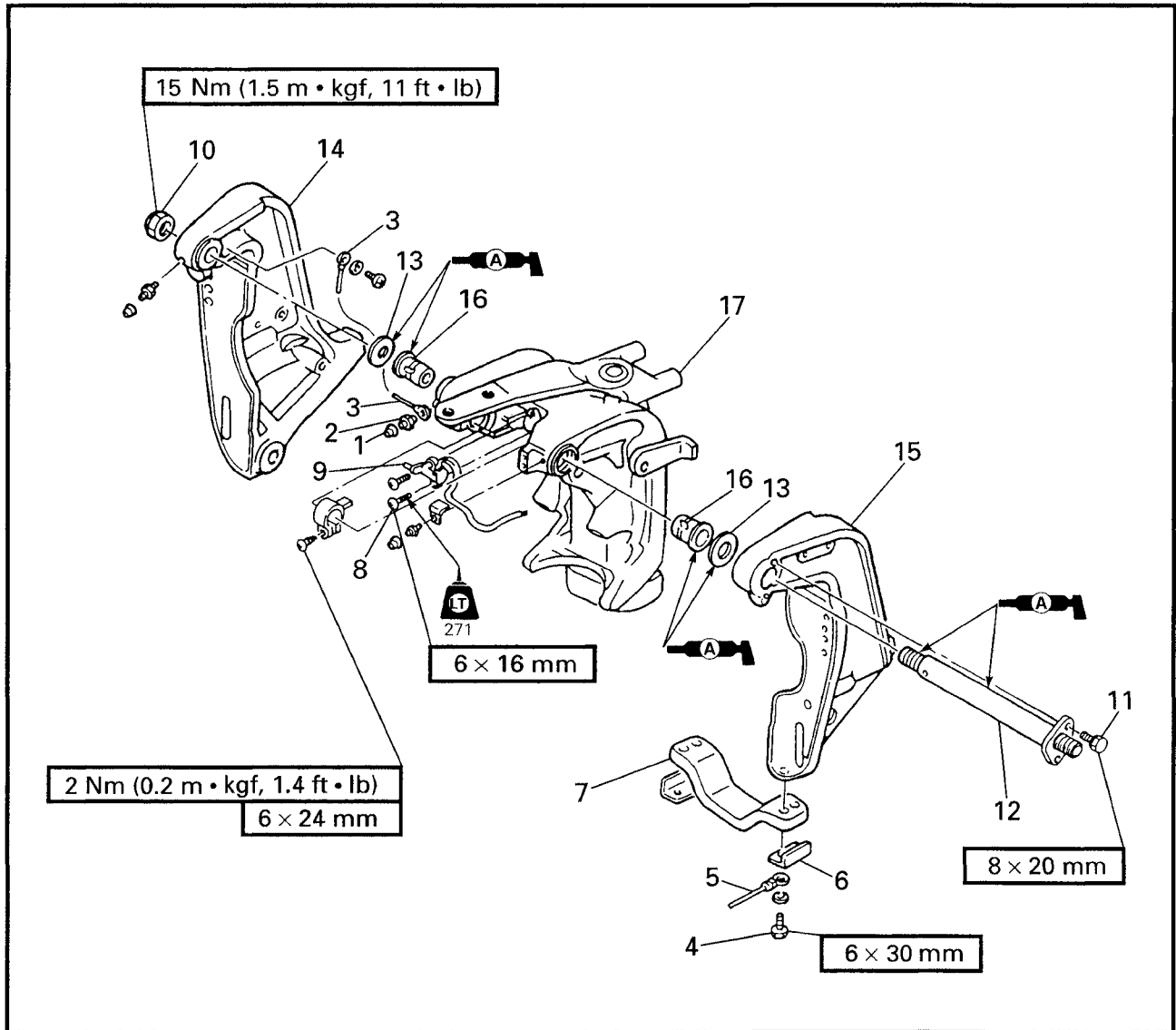
Ⓐ 200H, 225G/V200, V225

Ⓑ 225F, L225F, 250B, L250B/S225, L225, S250, L250



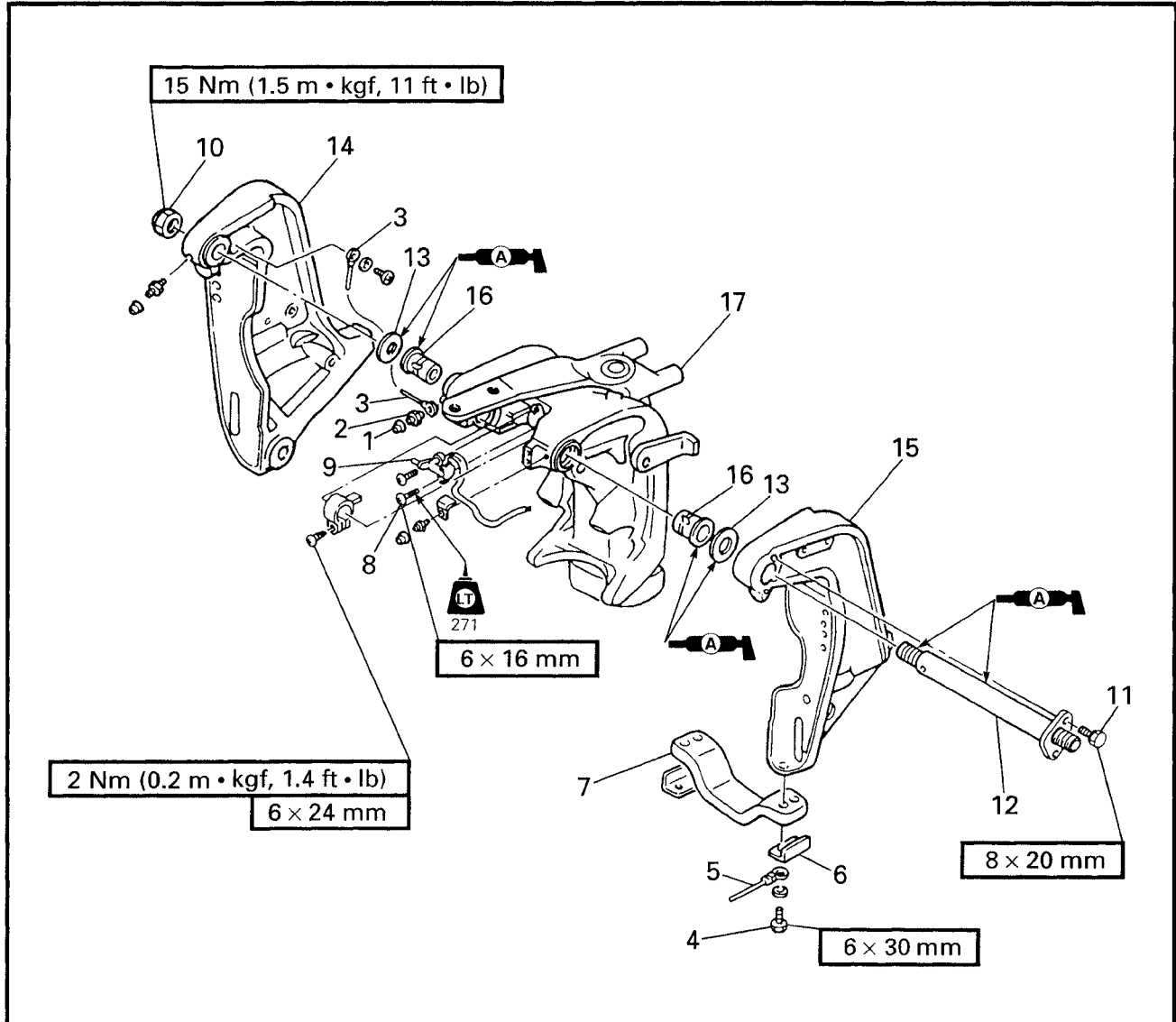
CLAMP BRACKETS

REMOVING/INSTALLING THE CLAMP BRACKETS (200H, 225G/V200, V225)



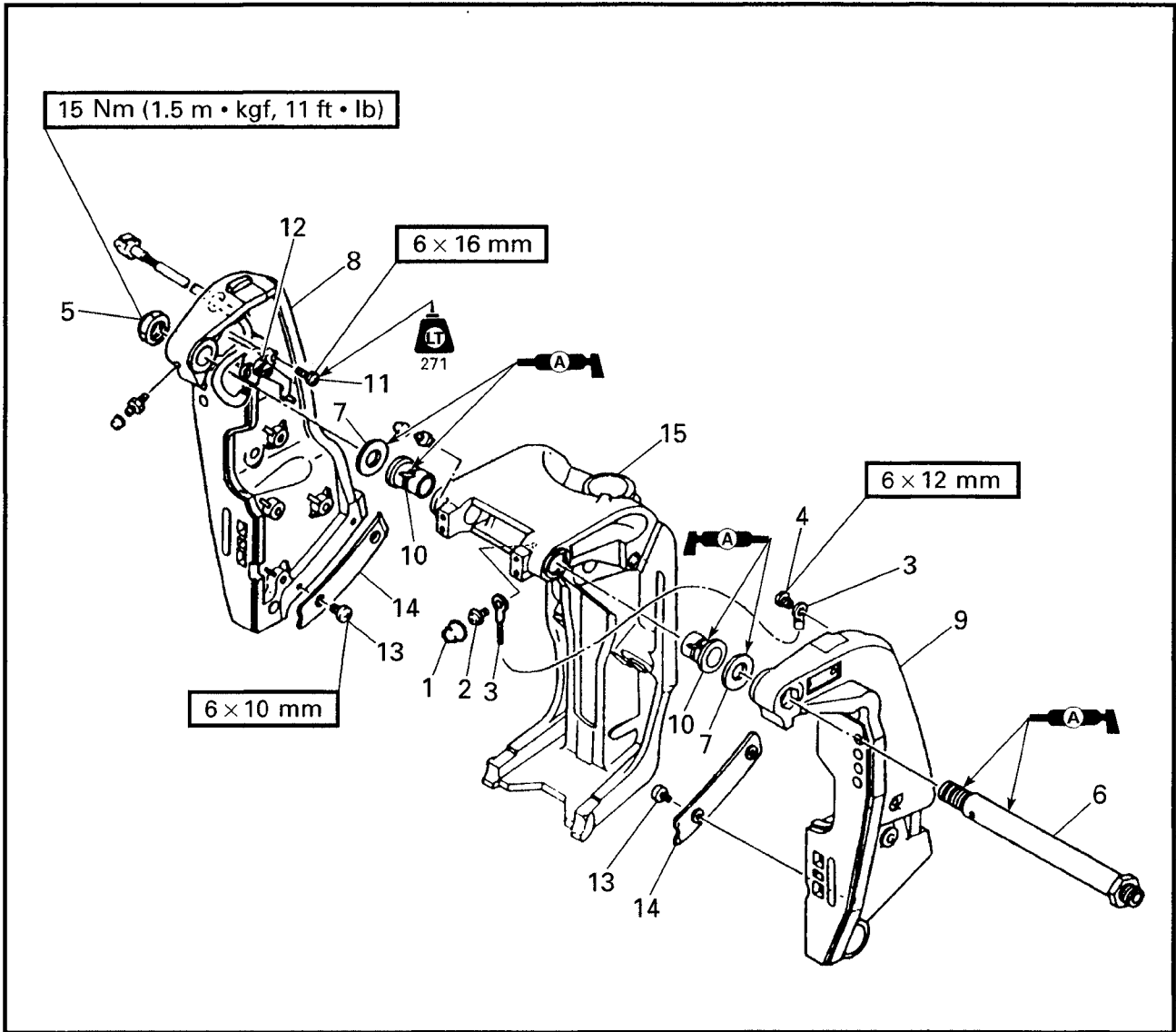
Order	Job/Part	Q'ty	Remarks
	Upper case assembly		Refer to "UPPER CASE ASSEMBLY" on page 7-8.
	Power trim and tilt unit		Refer to "POWER TRIM AND TILT UNIT" on page 7-19.
1	Rubber cap	3	
2	Grease nipple	3	
3	Ground lead	1	
4	Bolt	4	
5	Ground lead	1	
6	Anode bracket	2	
7	Anode	1	

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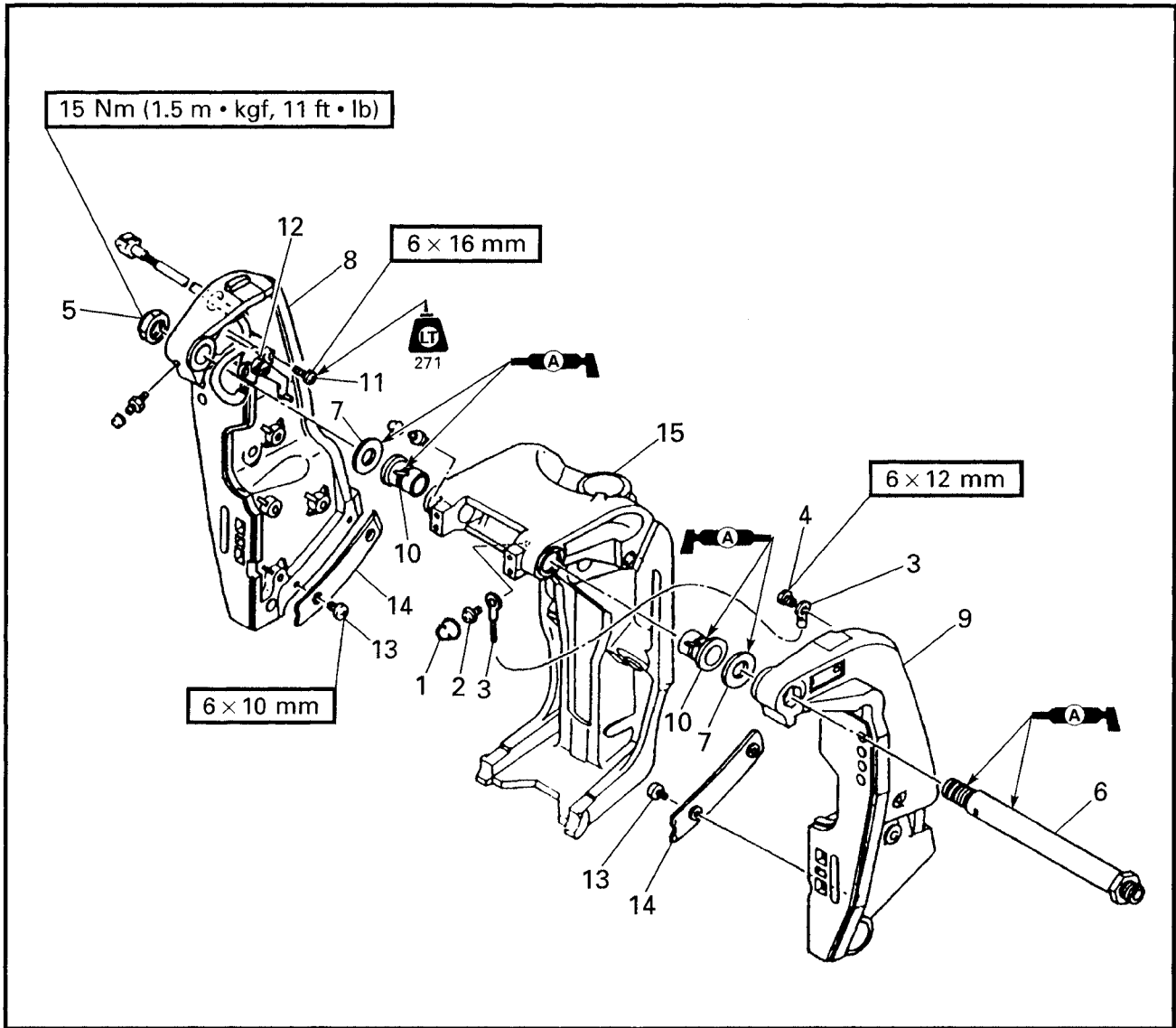
Order	Job/Part	Q'ty	Remarks
8	Screw	2	
9	Trim sensor	1	
10	Self-locking nut	1	
11	Bolt	2	
12	Clamp bracket bolt	1	
13	Washer	2	
14	Starboard clamp bracket	1	
15	Port clamp bracket	1	
16	Bushing	2	
17	Swivel bracket assembly	1	
			For installation, reverse the removal procedure.

**REMOVING/INSTALLING THE CLAMP BRACKETS
(225F, L225F, 250B, L250B/S225, L225, S250, L250)**



Order	Job/Part	Q'ty	Remarks
	Power trim and tilt unit		Refer to "POWER TRIM AND TILT UNIT" on page 7-19.
1	Rubber cap	3	
2	Grease nipple	3	
3	Ground lead	1	
4	Screw	1	
5	Self-locking nut	1	
6	Clamp bracket bolt	1	
7	Washer	2	

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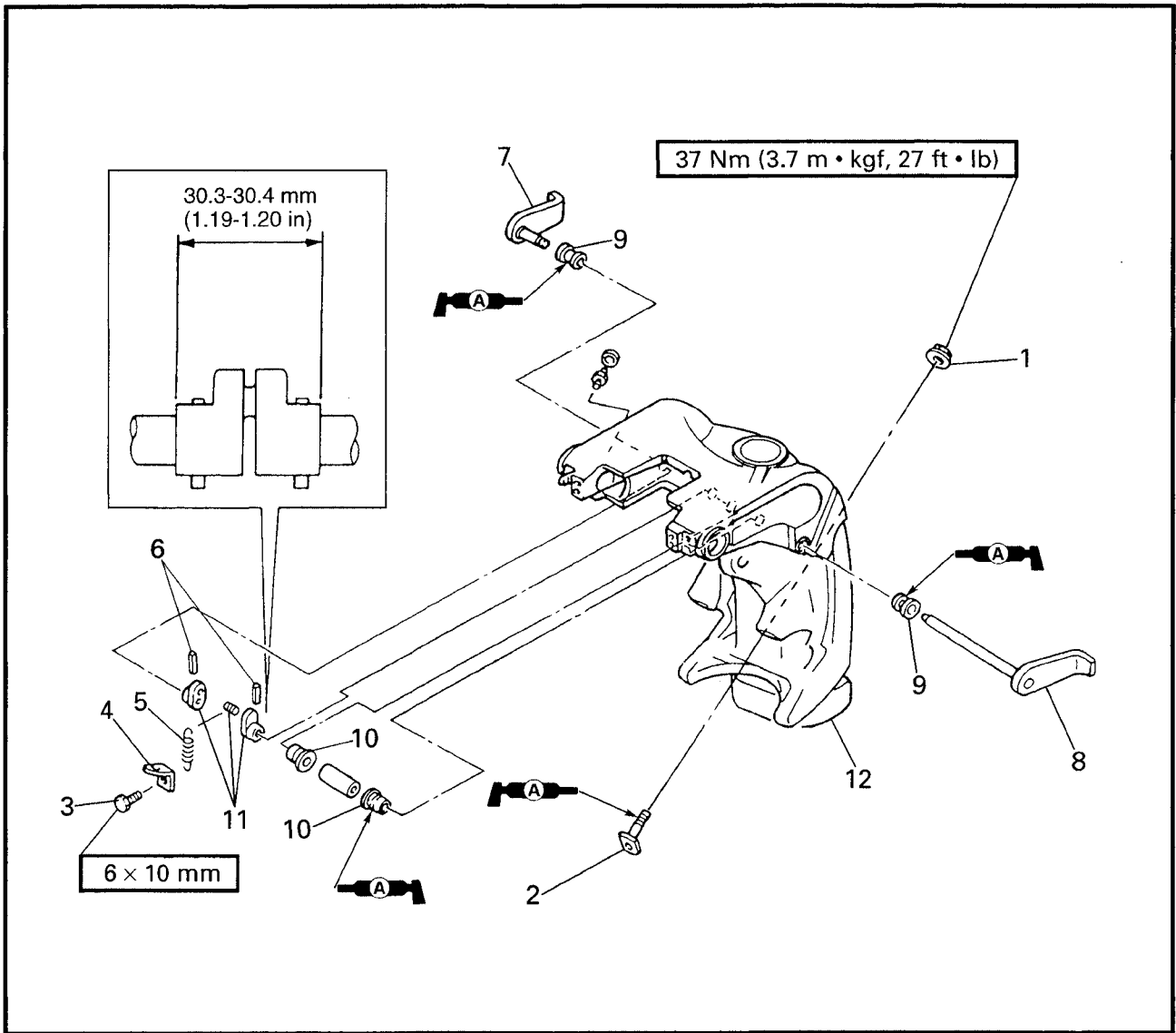
Order	Job/Part	Q'ty	Remarks
8	Starboard clamp bracket	1	For installation, reverse the removal procedure.
9	Port clamp bracket	1	
10	Bushing	2	
11	Screw	2	
12	Trim sensor	1	
13	Screw	4	
14	Slide plate	2	
15	Swivel bracket assembly	1	



SWIVEL BRACKET ASSEMBLY

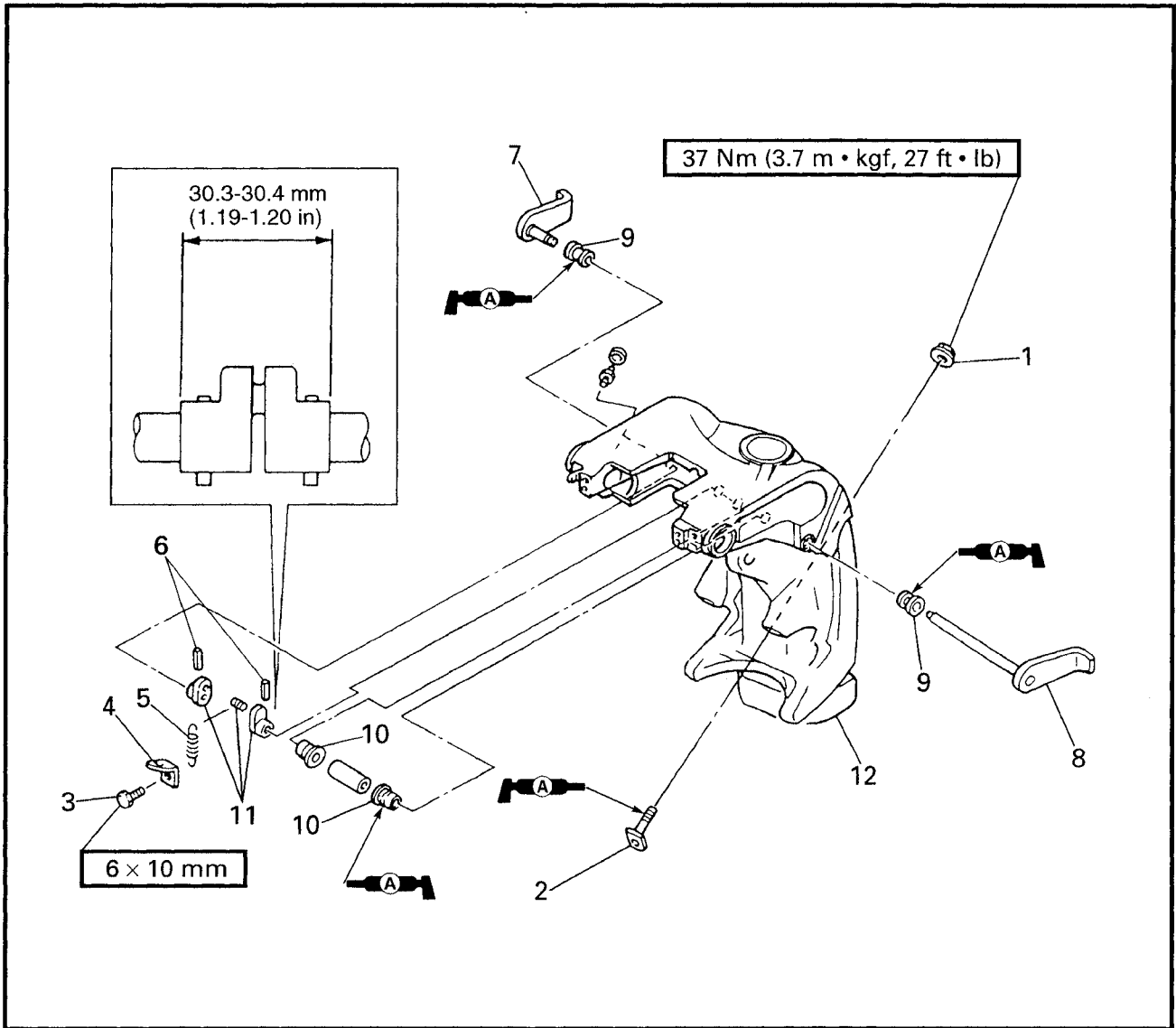
DISASSEMBLING/ASSEMBLING THE SWIVEL BRACKET ASSEMBLY

(200H, 225G/V200, V225)



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	

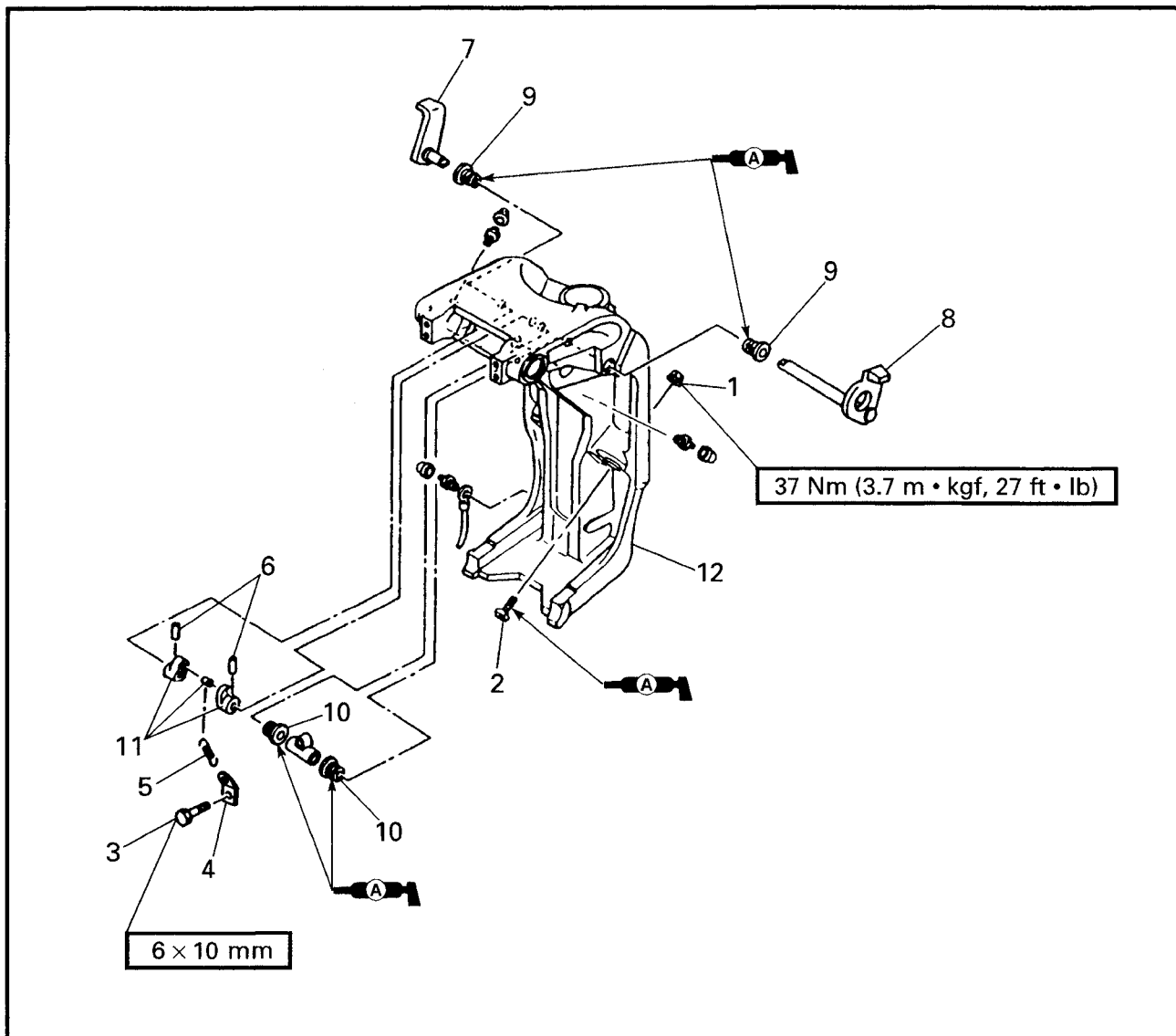
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Order	Job/Part	Q'ty	Remarks
7	Starboard tilt stop lever	1	For assembly, reverse the disassembly procedure.
8	Port tilt stop lever	1	
9	Bushing	2	
10	Bushing	2	
11	Tilt stop lever joint assembly	1	
12	Swivel bracket	1	

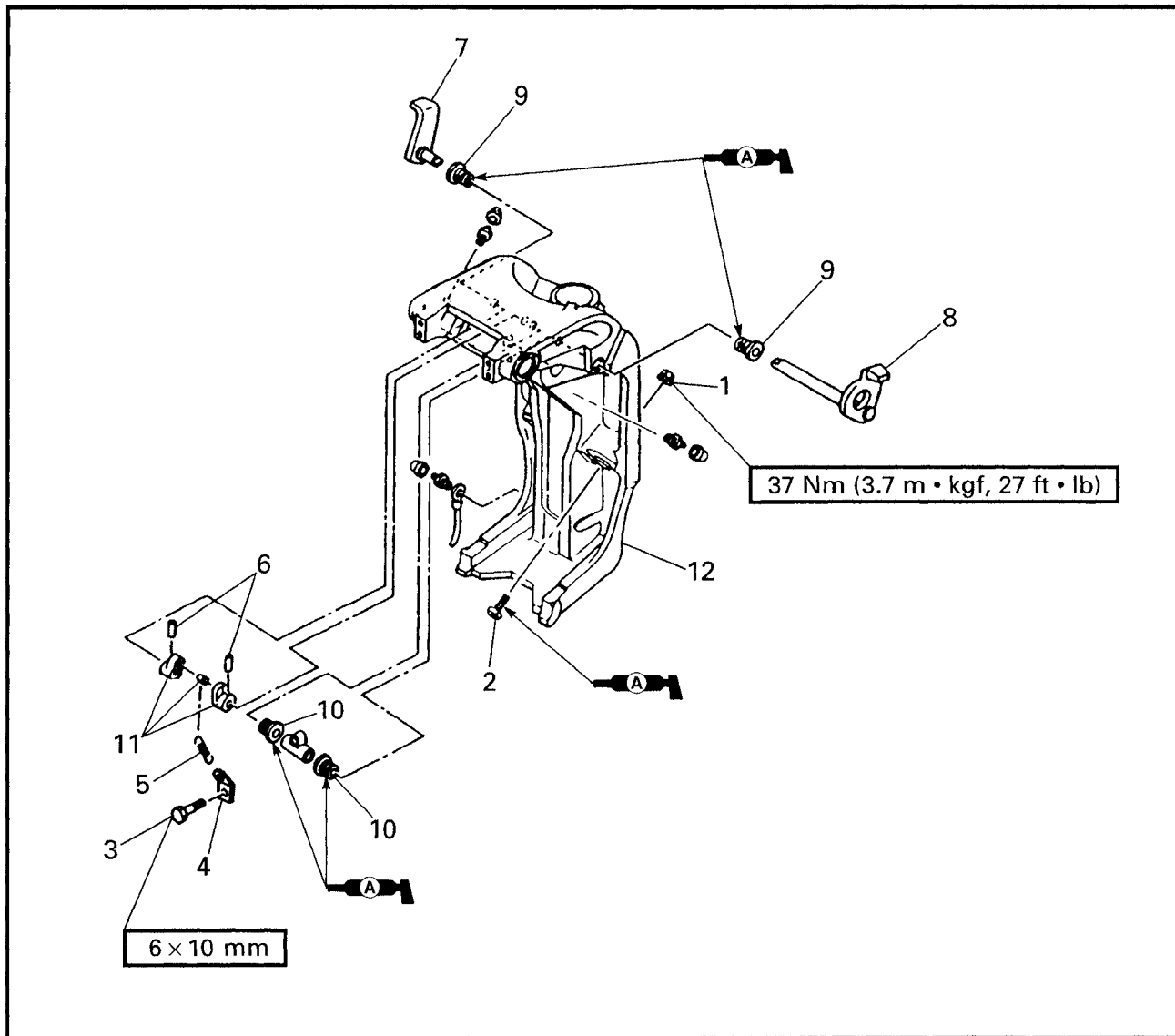


**DISASSEMBLING/ASSEMBLING THE SWIVEL BRACKET ASSEMBLY
(225F, L225F, 250B, L250B/S225, L225, S250, L250)**

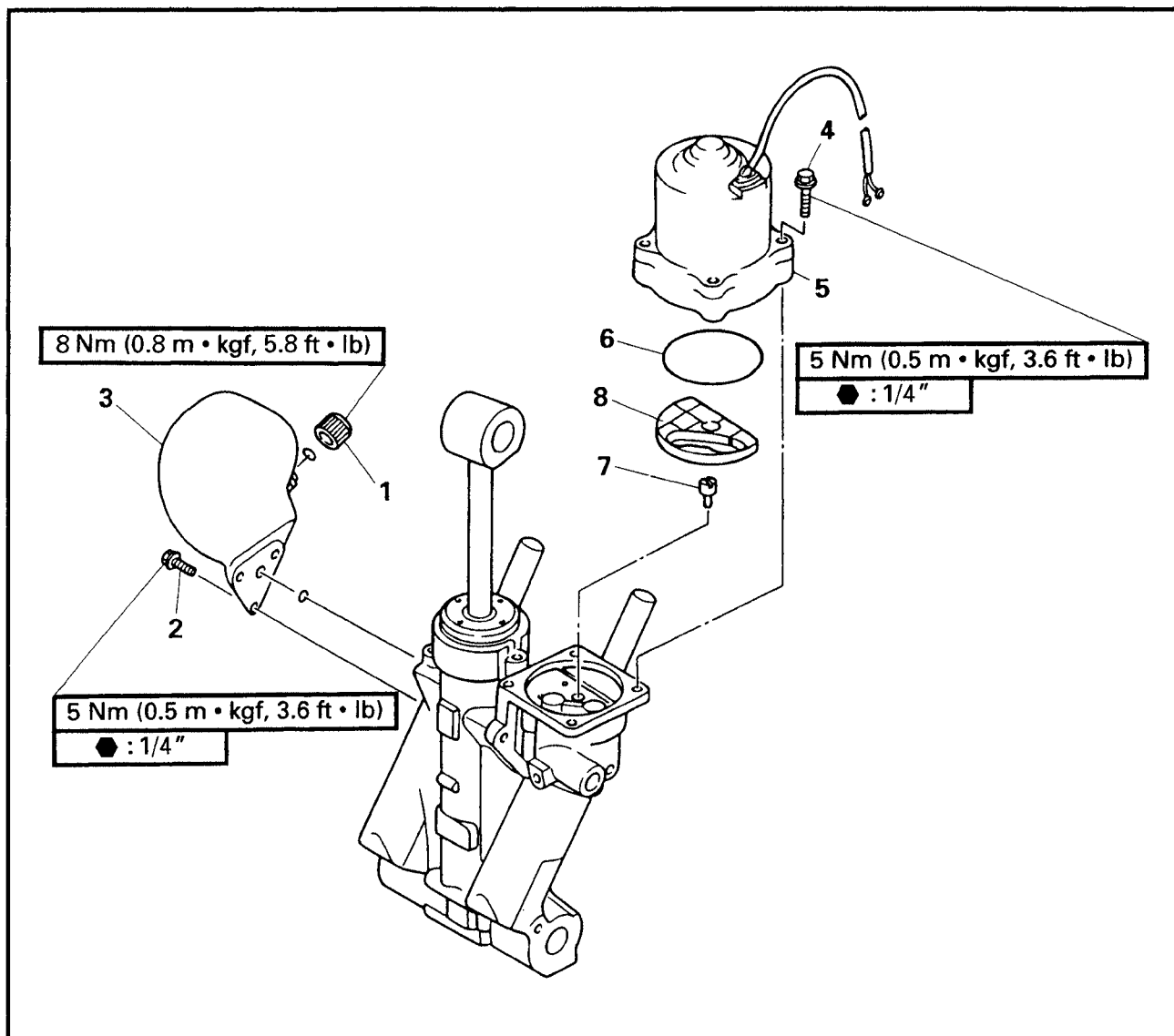


Order	Job/Part	Q'ty	Remarks
	Clamp brackets		Refer to "CLAMP BRACKETS" on page 7-24.
1	Nut	2	
2	Trim stopper	2	
3	Bolt	1	
4	Spring holder	1	
5	Spring	1	
6	Pin	2	

Continued on next page.



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	
12	Swivel bracket	1	
			For assembly, reverse the disassembly procedure.


**RESERVOIR AND POWER TRIM AND TILT MOTOR
(200H, 225G/V200, V225)**
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 7-19.
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 spurt-
ing out due to internal pressure, the out-
board 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:

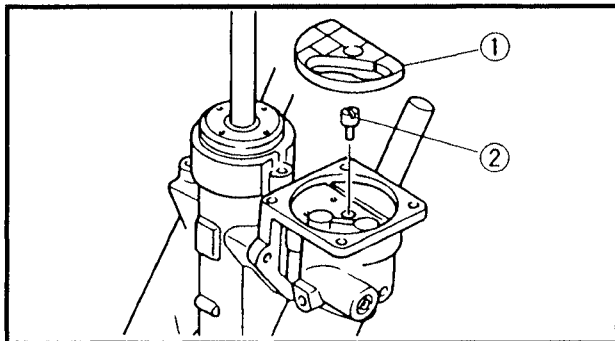
Do not wipe hydraulic system components
with rags, paper, tissues, or the like, as
fibers from such material will cause mal-
functions if they enter the system.

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

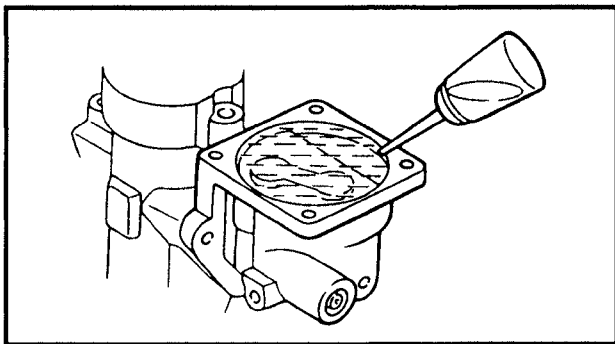
1. Install:
 - Gear pump housing filter ①
 - Drive pin ②
2. Fill:
 - Gear pump housing



Recommended power trim and tilt fluid
ATF Dexron II

NOTE: _____

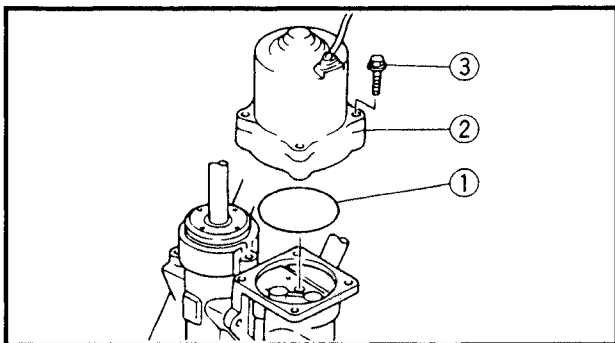
Add power trim and tilt fluid until it reaches the top of the gear pump housing.



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.

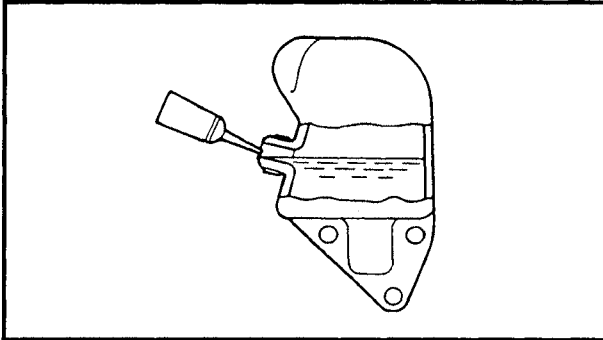


FILLING THE RESERVOIR

⚠ WARNING

To prevent the hydraulic fluid from spurt-
ing 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 install-
ing the power trim and tilt unit onto the out-
board.

1. Bleed:
 - Air bubbles
(from the power trim and tilt unit)

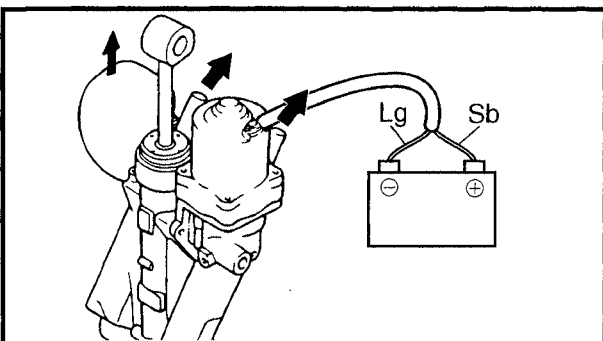
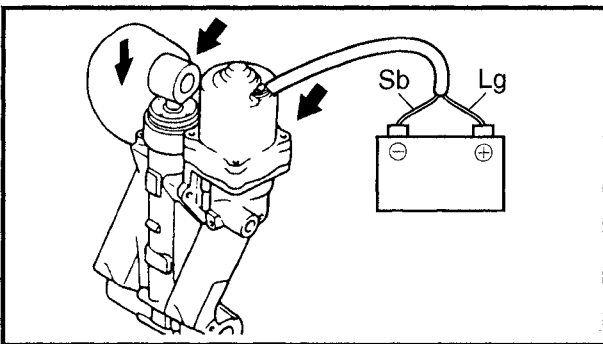
Bleeding steps

- (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:

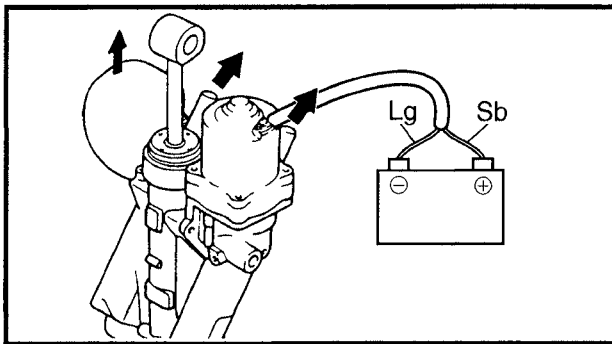
If the rams will not go down, refer to the fol-
lowing.

- 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.

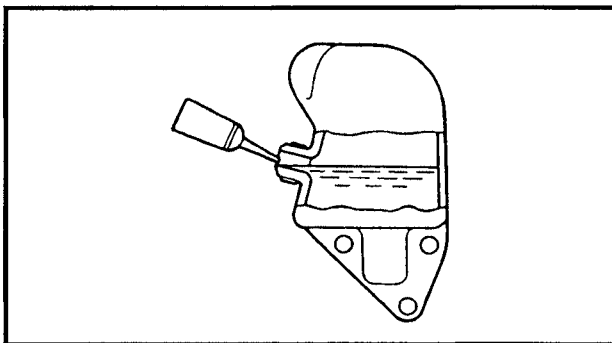




- B. If step A was unsuccessful, connect the leads on the battery terminals and fully compress the tilt ram assembly by hand.
- C. If step B was unsuccessful, loosen the manual valve, compress the trim and tilt ram assemblies fully by hand, and then tighten the manual valve. Then, compress and extend 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

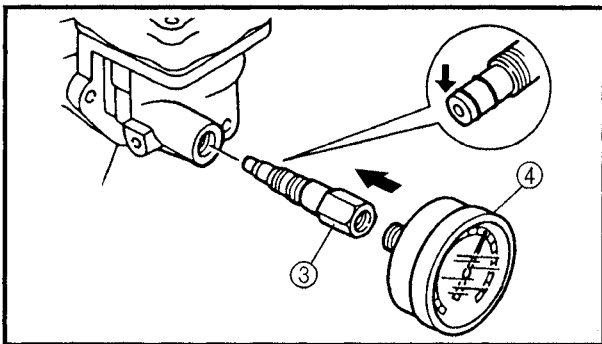
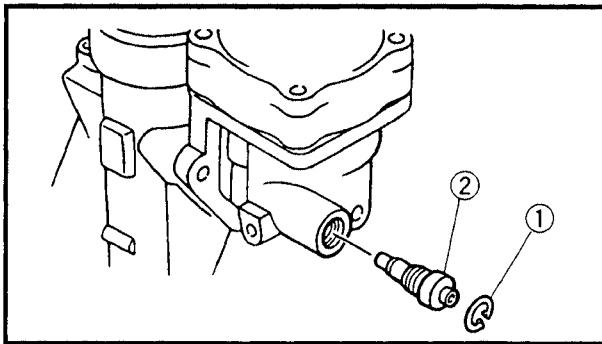
(100 - 120 kg/cm²)

**(with the power trim and tilt ram
assemblies fully compressed)**

5.9 - 8.8 MPa (60 - 90 kg/cm²)

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

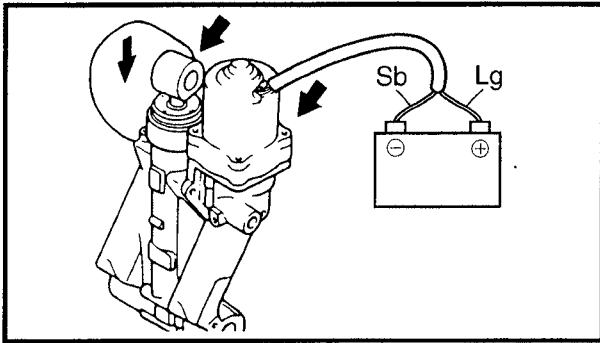
9 Nm (0.9 m · kgf, 6.5 ft · lb)

Up-relief valve attachment

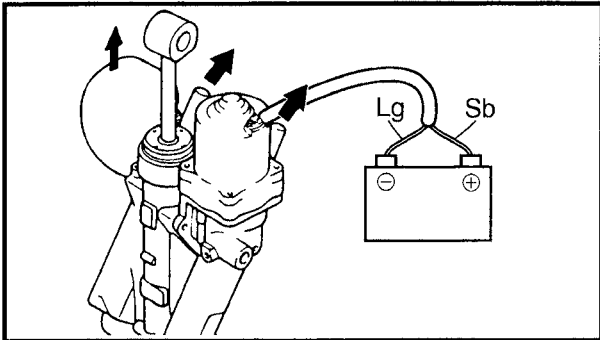
4 Nm (0.4 m · kgf, 2.9 ft · lb)

NOTE:

Remove the manual valve and then quickly attach the special tools before any fluid comes out.



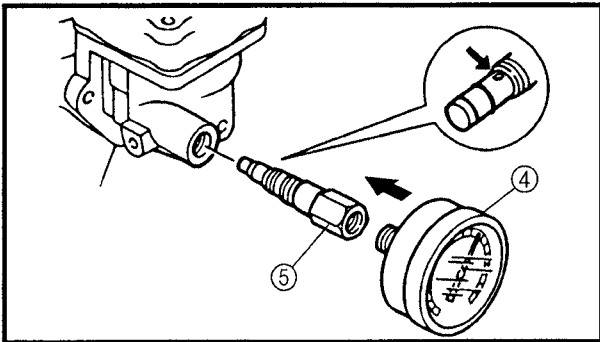
- (4) Connect the leads on the battery terminals in the down position until the power trim and tilt ram assemblies are fully compressed.



- (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/cm²)



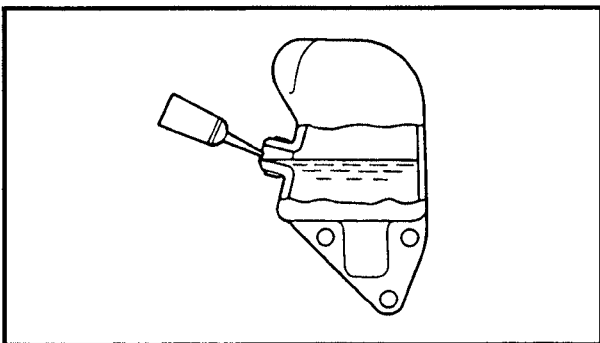
- (6) After measuring the hydraulic pressure, remove the special tools and quickly attach the down-relief valve attachment.



Hydraulic pressure gauge ④
90890-06776
Down-relief valve attachment. ⑤
90890-06774



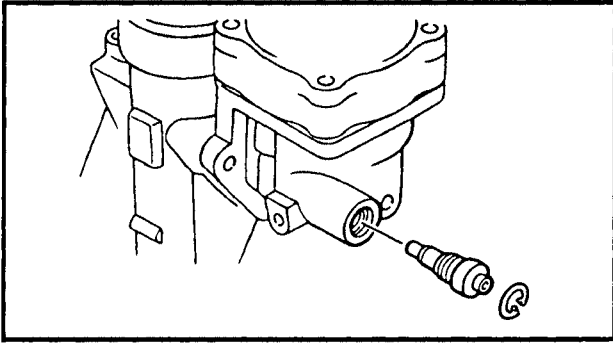
Hydraulic pressure gauge
9 Nm (0.9 m • kgf, 6.5 ft • lb)
Down-relief valve attachment
4 Nm (0.4 m • kgf, 2.9 ft • lb)



- (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/cm²)



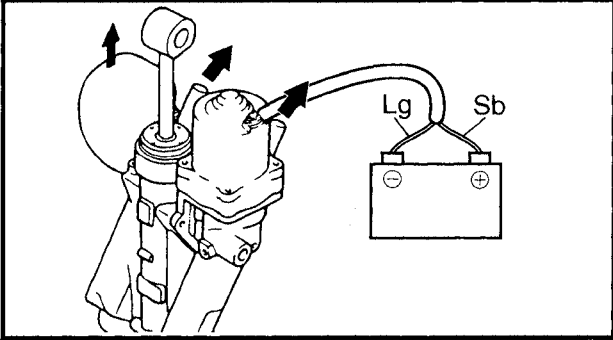
(10) After measuring the hydraulic pressure, connect the leads on the battery terminals in the up position until the power trim and tilt ram assemblies are fully extended.

(11) Remove the special tools.

(12) Install the manual valve and circlip.

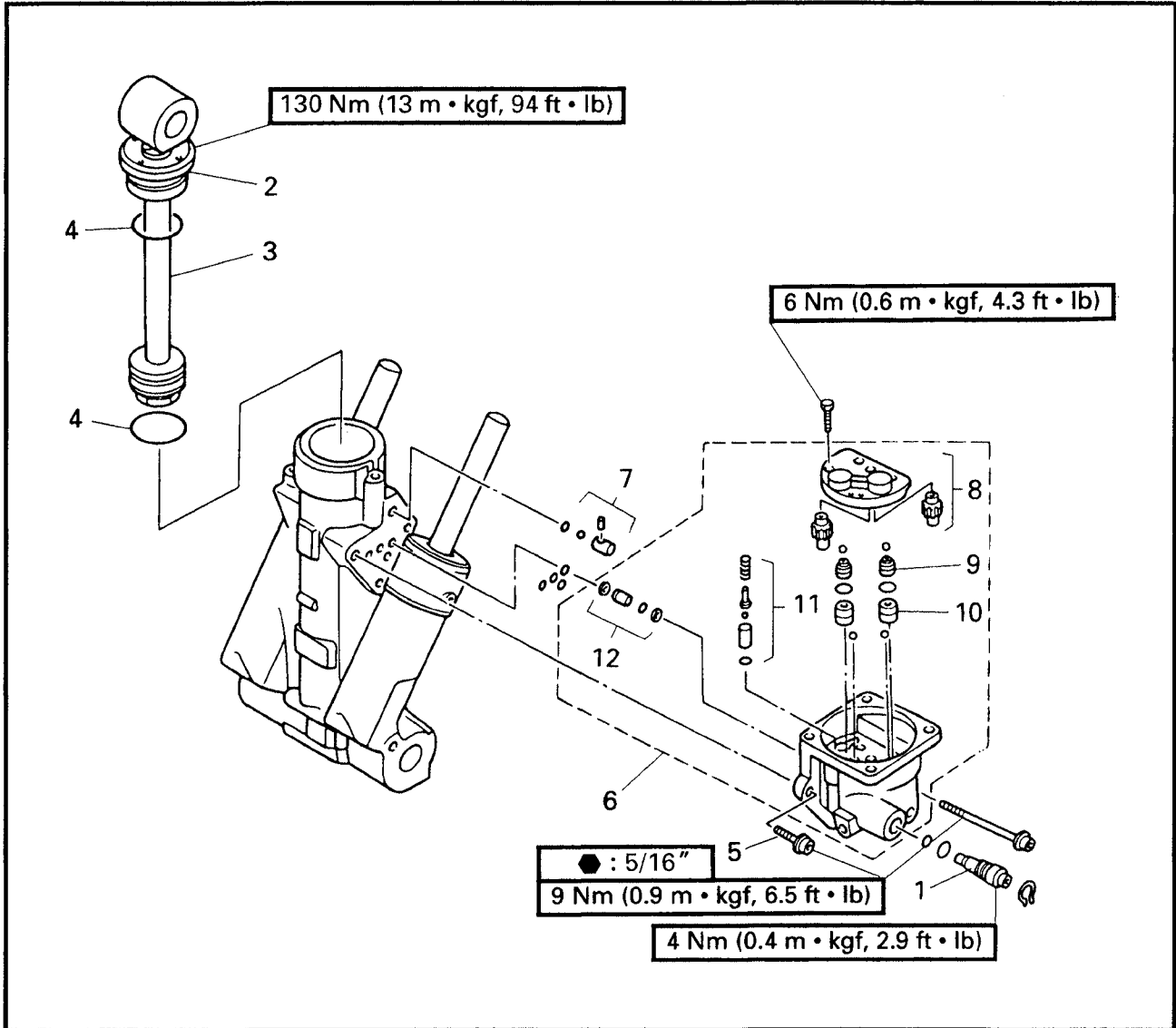
NOTE:

After measuring the hydraulic pressure, bleed the power trim and tilt unit.



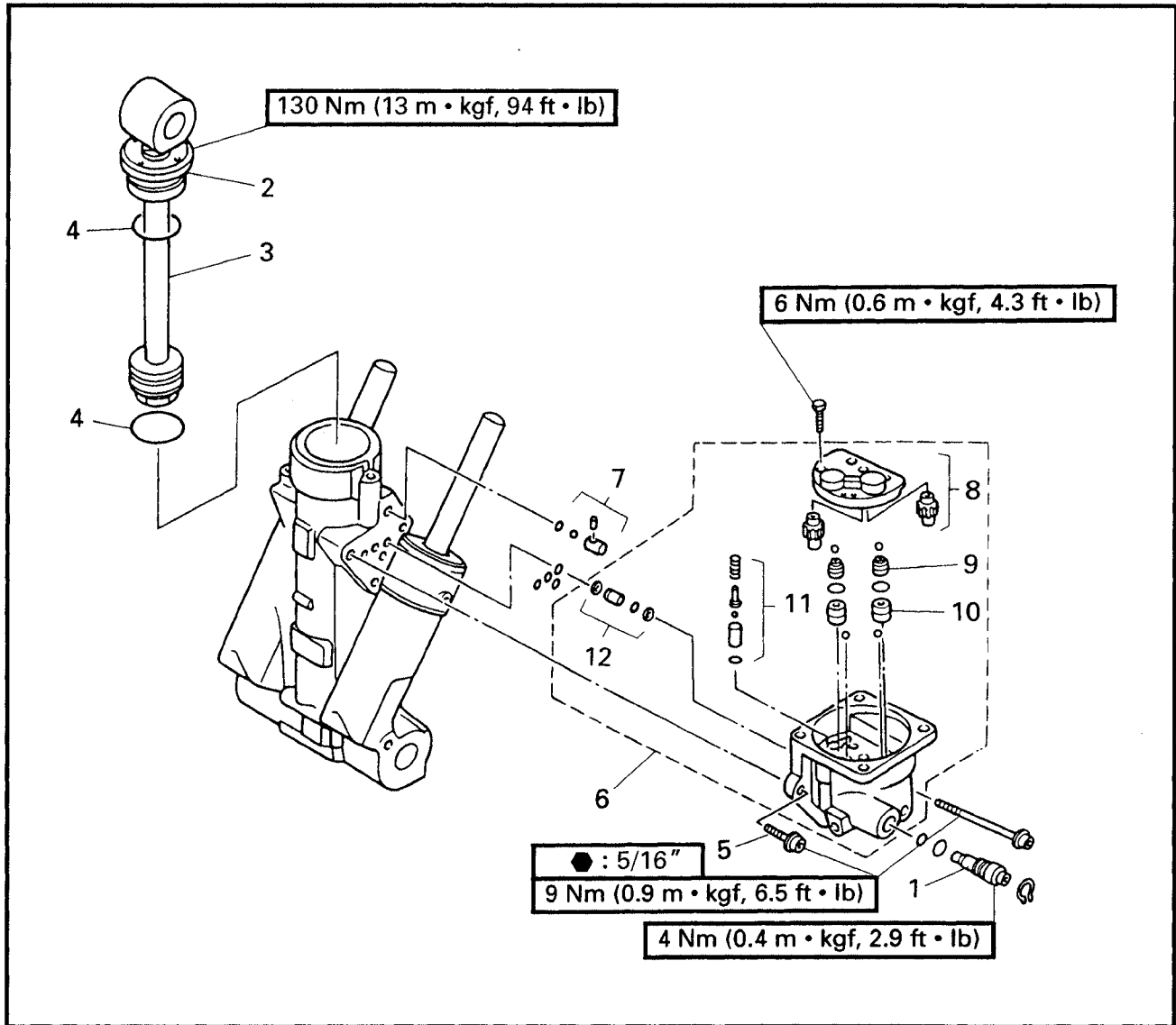


**TILT RAM ASSEMBLY AND GEAR PUMP UNIT (200H, 225G/V200, V225)
REMOVING/INSTALLING THE TILT RAM ASSEMBLY AND GEAR PUMP UNIT**

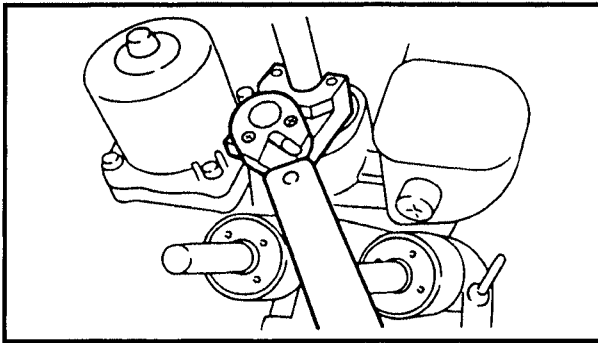


Order	Job/Part	Q'ty	Remarks
	Reservoir and power trim and tilt motor		Refer to "RESERVOIR AND POWER TRIM AND TILT MOTOR (200H, 225G/V200, V225)" on page 7-32.
1	Manual valve	1	
2	Tilt ram end screw	1	
3	Tilt ram assembly	1	
4	O-ring	2	
5	Bolt	3	
6	Gear pump unit	1	

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:

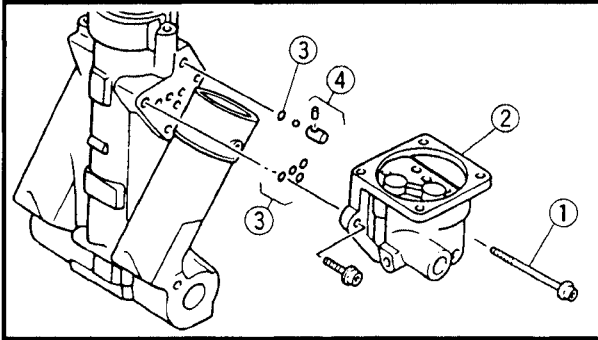
- Tilt ram end screw



End screw wrench
YB-06548 / 90890-06548

NOTE:

Hold the power trim and tilt unit in a vise using aluminum plates on both sides.



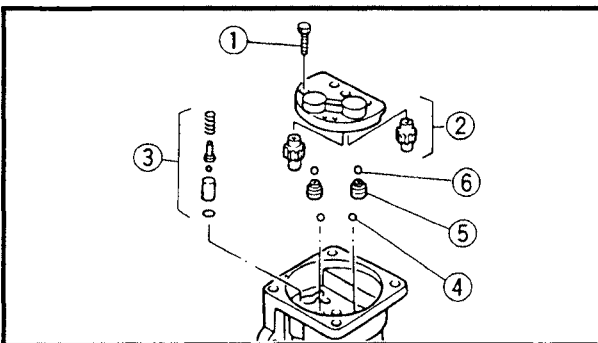
REMOVING THE GEAR PUMP UNIT

Remove:

- Bolt ①
- Gear pump unit ②
- O-ring ③
- Check valve ④

NOTE:

Place a container under the power trim and tilt unit.



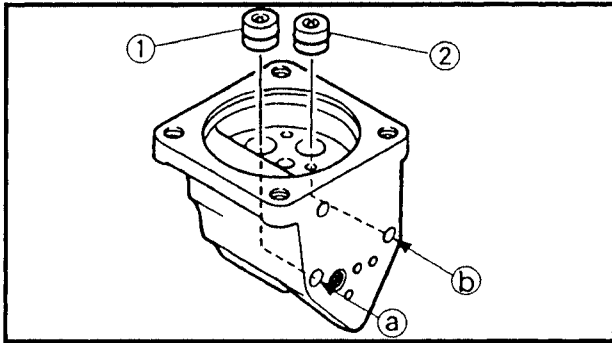
DISASSEMBLING THE GEAR PUMP UNIT

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:

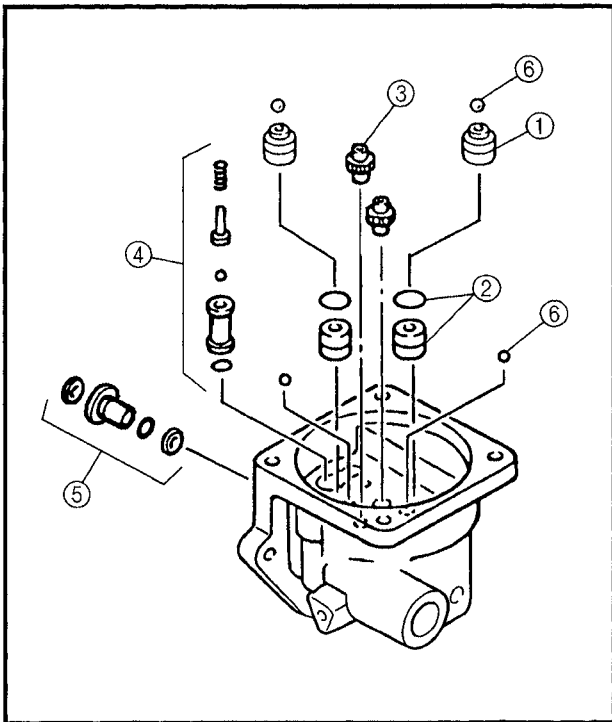
- Check valves ① and ②

NOTE:

To remove the check valves, cover the gear pump housing with a clean cloth and then blow compressed air through holes ① and ②.

INSPECTING THE TILT RAM
Inspect:

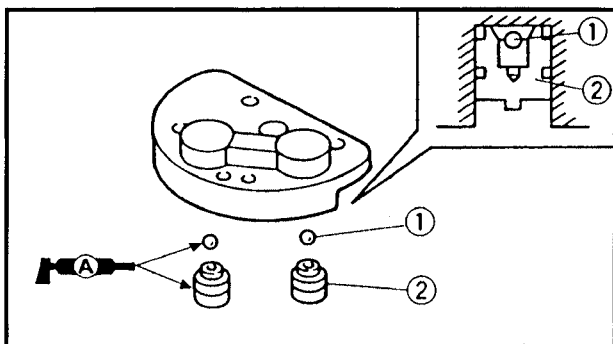
- Tilt ram
 - Excessive scratches → Replace.
 - Bends/excessive corrosion → Replace.
 - Rust → Polish.
 - (with 400 - 600 grit sandpaper)


INSPECTING THE GEAR PUMP UNIT
Inspect:

- Shuttle valves ①
 - Clogs/damage/wear → Replace.
- Check valve assemblies ②
 - Clogs/damage/wear → Replace.
- Pump gears ③
 - Damage/wear → Replace the gear pump unit.
- Up-relief valve assembly ④
 - Damage/wear → Replace the gear pump unit.
- Down-relief valve assembly ⑤
 - Damage/wear → Replace the gear pump unit.
- Balls ⑥
 - Damage/wear → Replace.


ASSEMBLING THE GEAR PUMP UNIT
CAUTION:

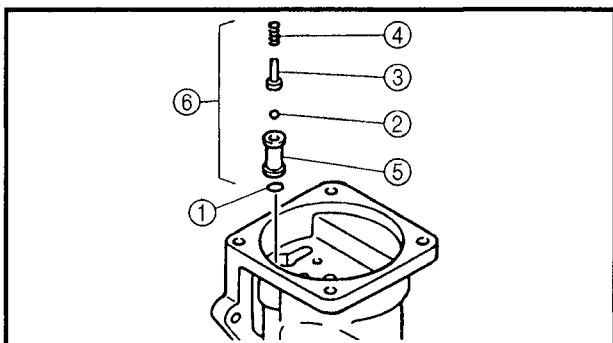
Install all components in their original direction and position for proper assembly and operation.


1. Install:

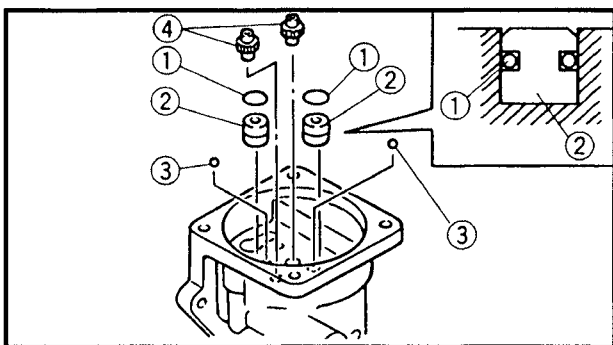
- Balls (3.18 mm/0.125 in) ①
- Shuttle valves ②

NOTE:

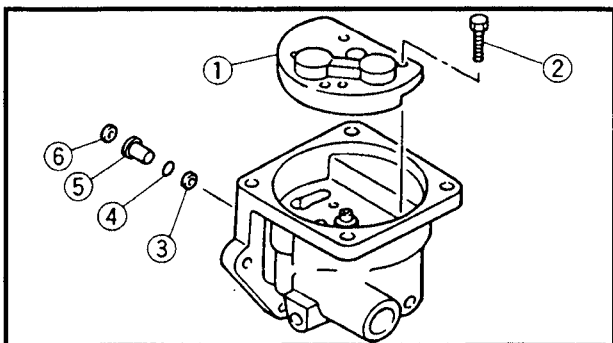
Apply grease to the balls to prevent them from falling out of the gear pump.


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:

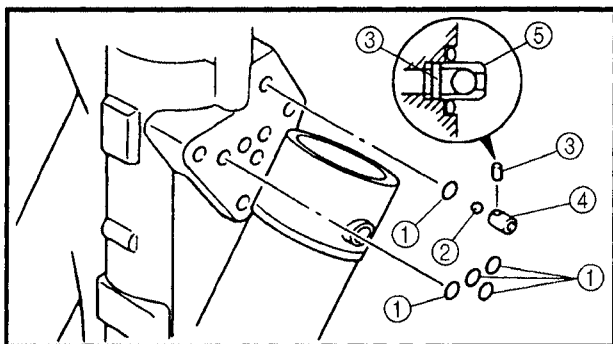
- O-rings ①
- Check valves ②
- Balls (4.76 mm/0.187 in) ③
- Pump gears ④


4. Install:

- Gear pump ①
- Bolt ②
- Filter ③
- O-ring ④
- Down-relief valve ⑤
- Filter ⑥

NOTE:

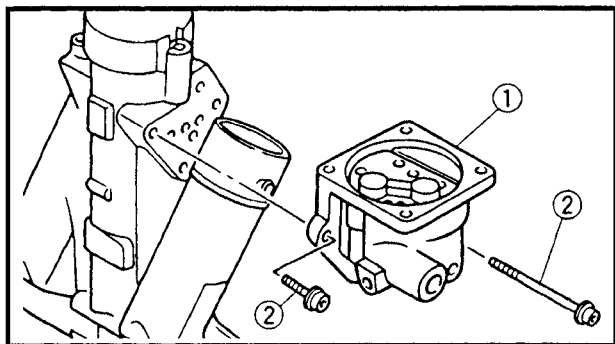
Tighten the bolts evenly and make sure the pump gears turn smoothly.


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 _____

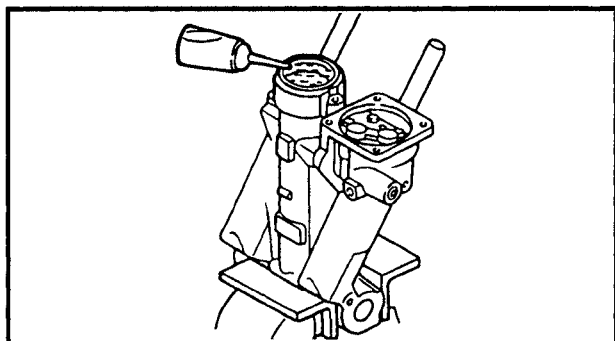
To prevent the hydraulic fluid from spurt-ing out due to internal pressure, the tilt ram should be kept at full length.

1. Fill:

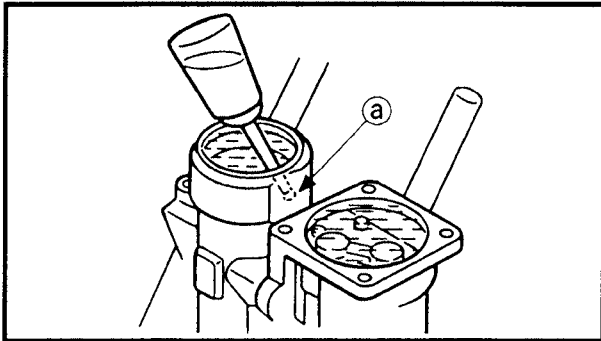
- Tilt ram cylinder



**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:

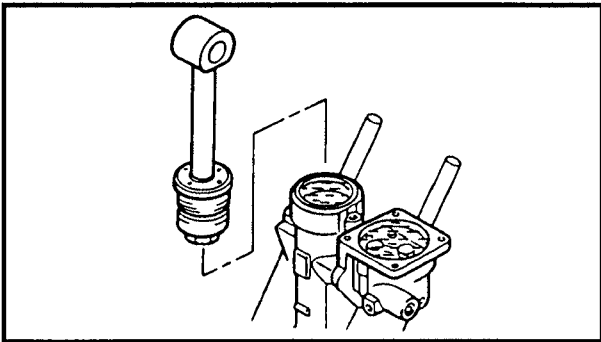
- Gear pump housing



**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.

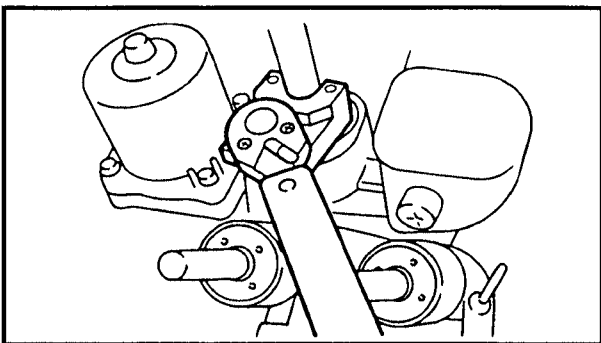


3. Install:

- 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:

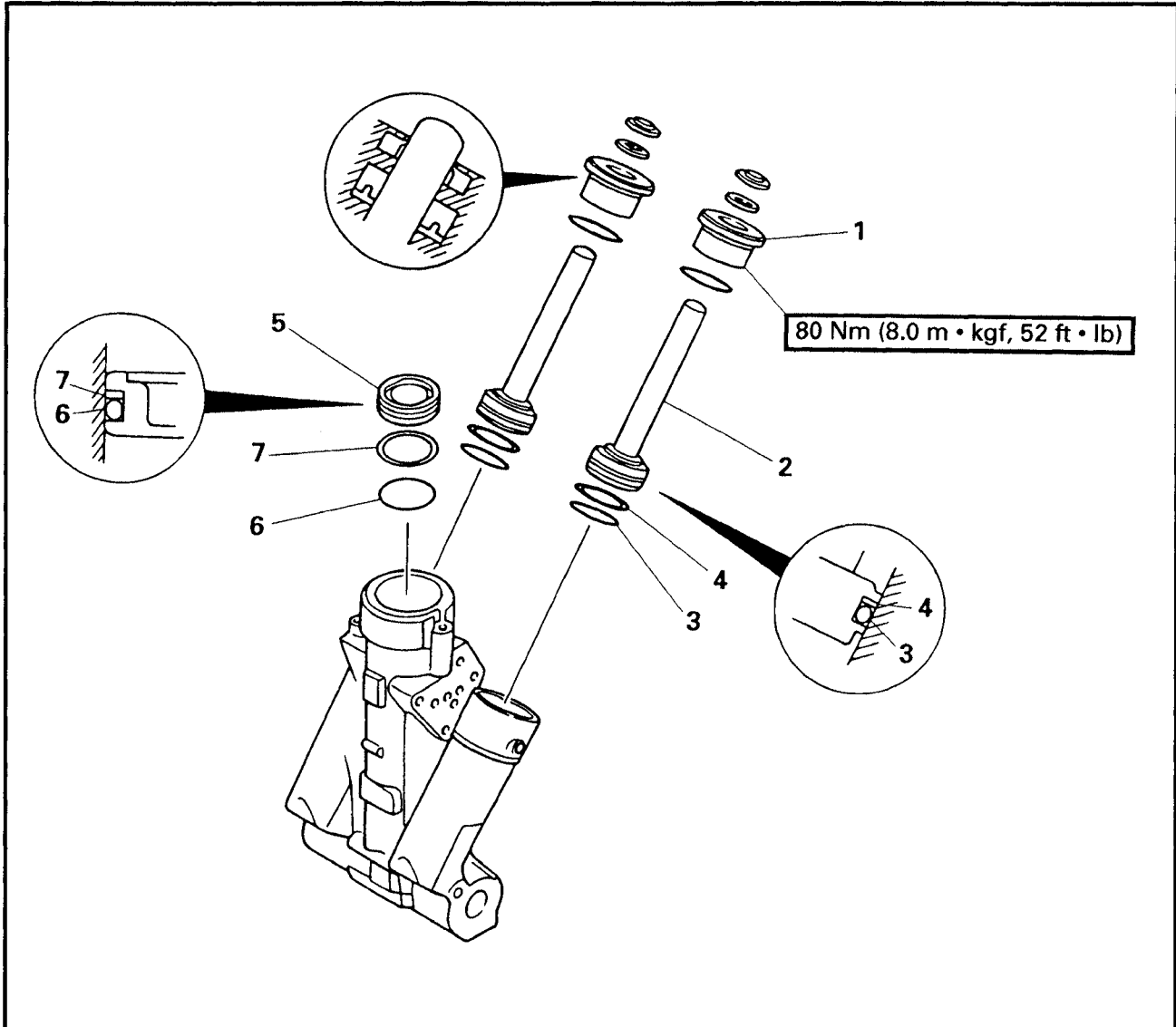
- Tilt ram end screw



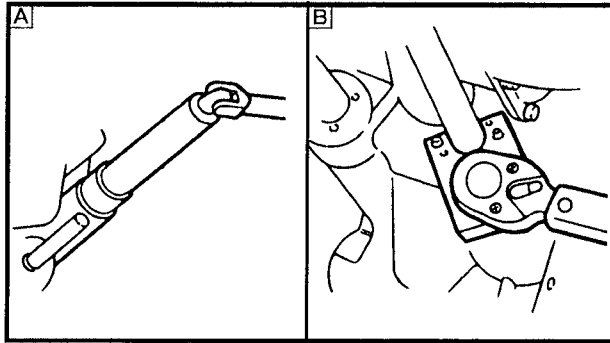
End screw wrench
YB-06548 / 90890-06548



Tilt ram end screw
130 Nm (13 m • kgf, 94 ft • lb)


**TRIM RAM ASSEMBLIES AND FREE PISTON (200H, 225G/V200, V225)
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 (200H, 225G/V200, V225)" on page 7-40.
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.

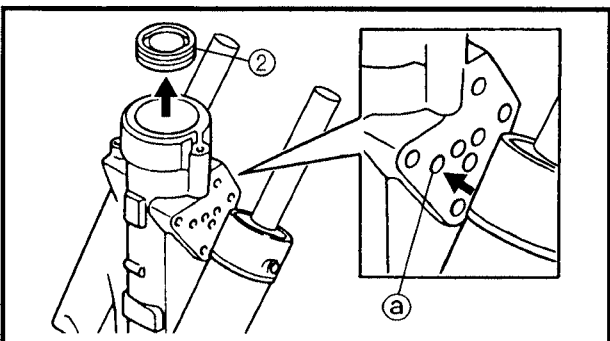
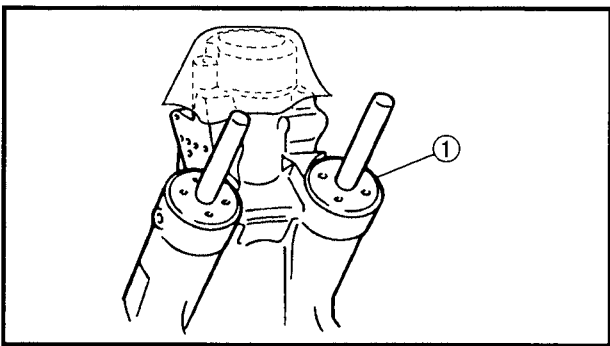
3. Remove:

- 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 ②.





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:

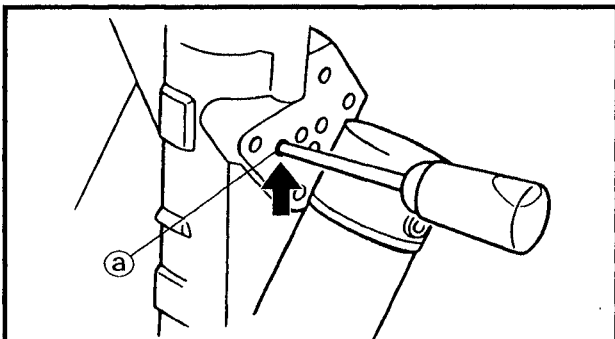
- Trim ram cylinder
Cracks/excessive scratches →
Replace the power trim and tilt unit.

INSTALLING THE FREE PISTON

1. Fill:

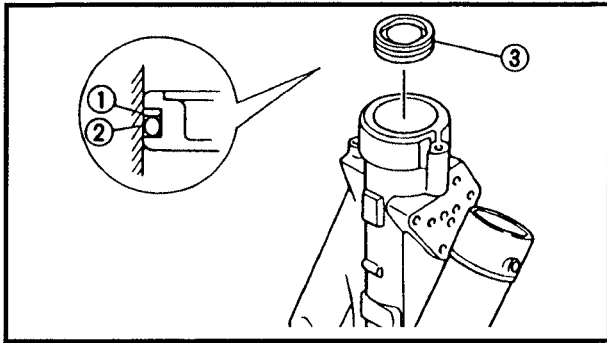
- Fluid passages

	<p>Recommended power trim and tilt fluid ATF Dexron II Quantity 30 cm³ (1.0 US oz, 1.1 Imp oz)</p>
--	--



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 ①.
- _____



2. Install:
- Piston ring ①
 - O-ring ②
 - Free piston ③

NOTE:

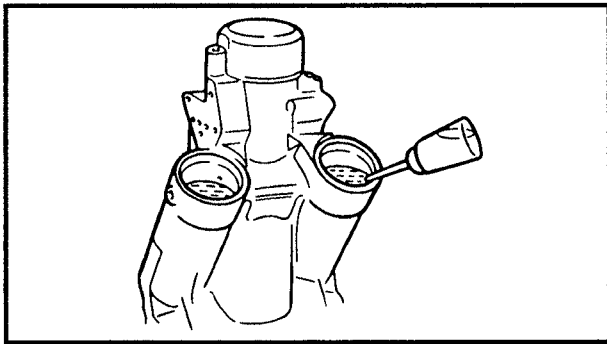
Push the free piston into the trim ram cylinder until it bottoms out.

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

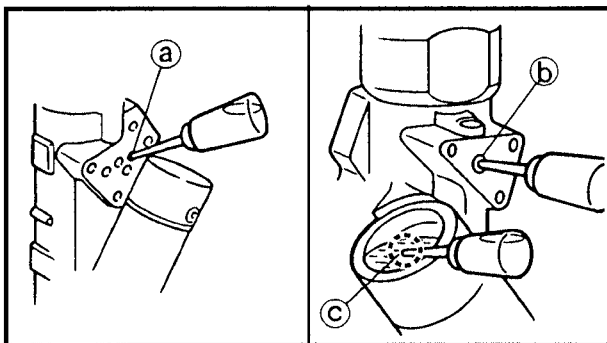


Recommended power trim and tilt fluid
ATF Dexron II

NOTE:

Hold the power trim and tilt unit in a vise using aluminum plates on both sides.

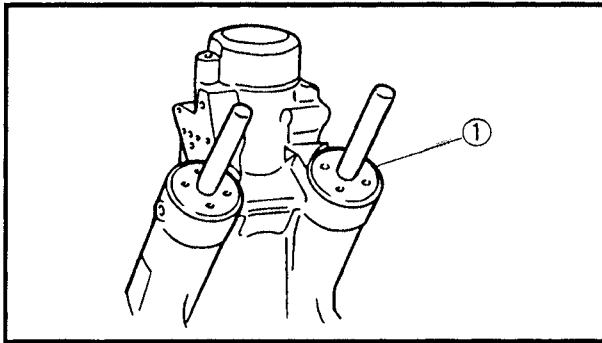
2. Fill:
- Fluid passages



Recommended power trim and tilt fluid
ATF Dexron II

NOTE:

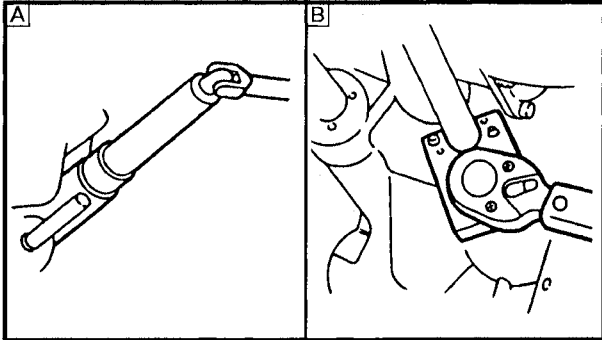
Add power trim and tilt fluid through holes ①, ② and ③ until all of the passages are filled.


3. Install:

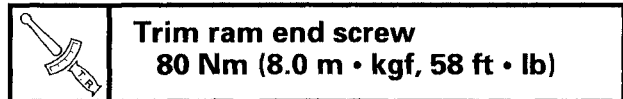
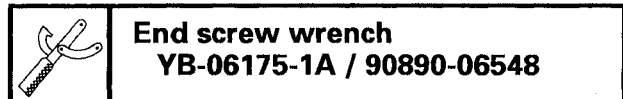
- Trim ram assemblies ①

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

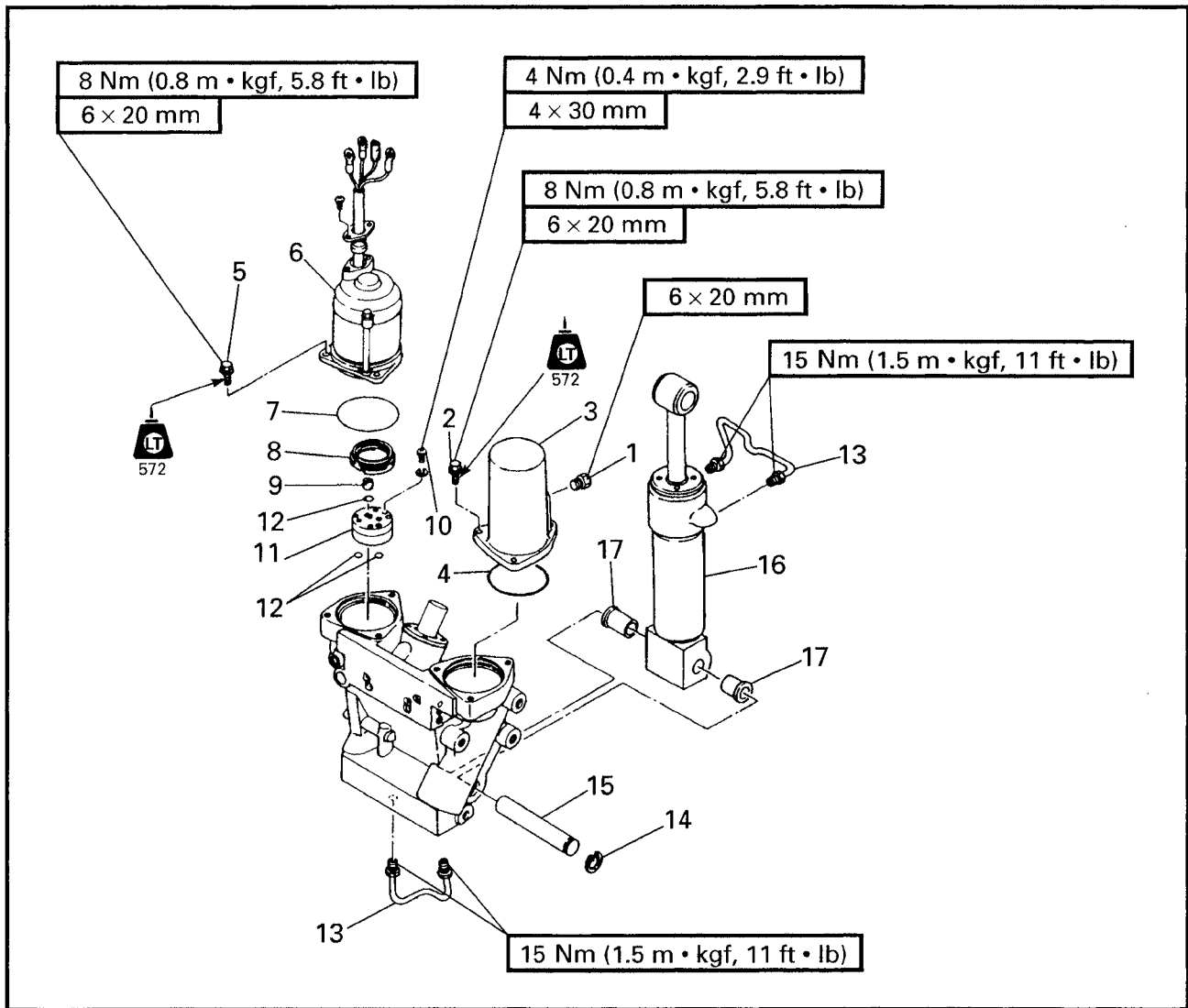


A For USA and Canada

B Except for USA and Canada

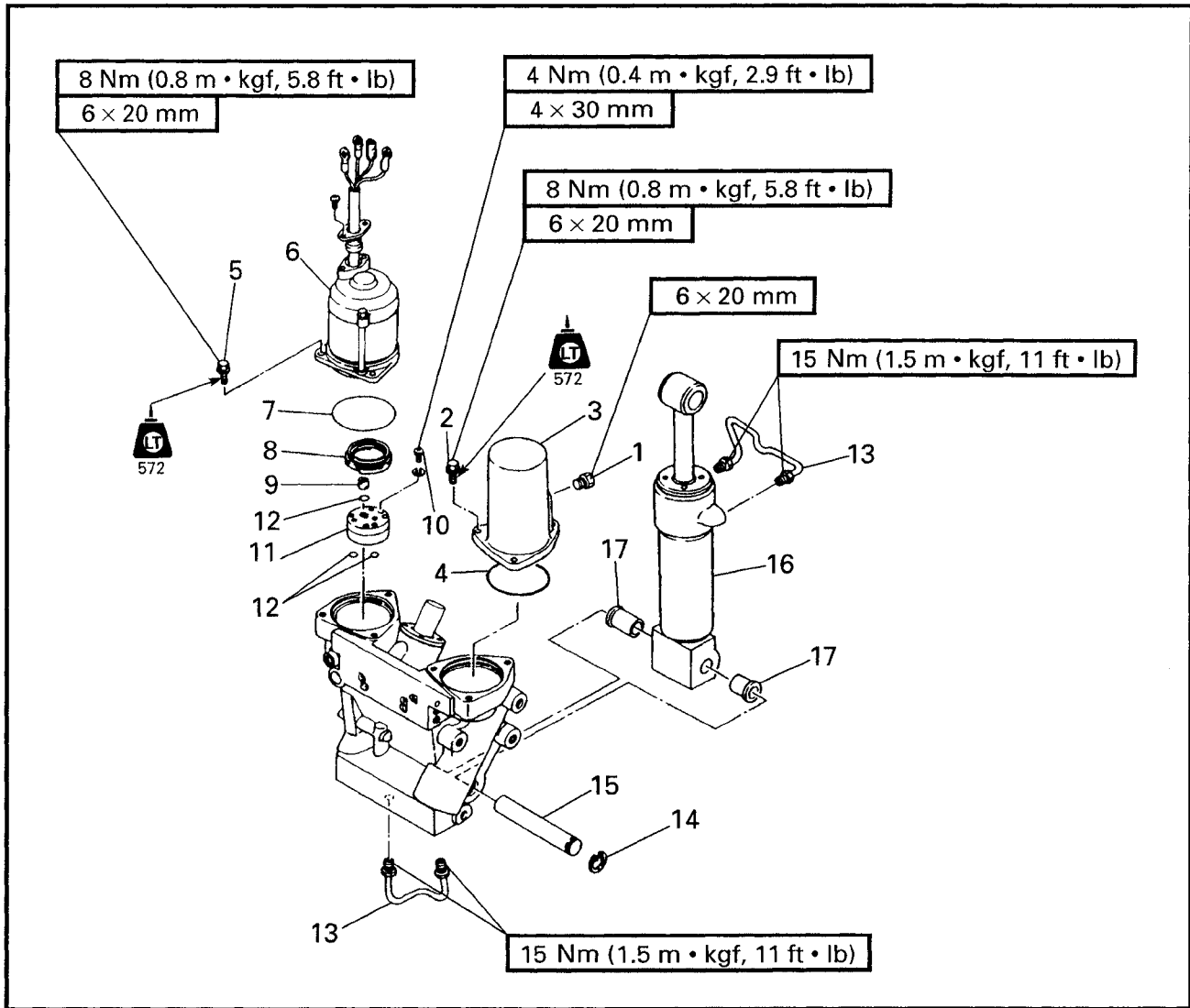


TILT CYLINDER, RESERVOIR AND POWER TRIM AND TILT MOTOR
(225F, L225F, 250B, L250B/S225, L225, S250, L250)
REMOVING/INSTALLING THE TILT CYLINDER, RESERVOIR AND POWER TRIM
AND TILT MOTOR



Order	Job/Part	Q'ty	Remarks
	Power trim and tilt unit		Refer to "POWER TRIM AND TILT UNIT" on page 7-19.
1	Reservoir cap	1	
2	Bolt	3	
3	Reservoir	1	
4	O-ring	1	70.5 × 66.5 mm
5	Bolt	3	
6	Power trim and tilt motor	1	
7	O-ring	1	70.5 × 66.5 mm
8	Gear pump housing filter	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
9	Drive pin	1	
10	Screw	3	
11	Gear pump	1	
12	O-ring	3	8.5 × 5.5 mm
13	Delivery pipe	2	
14	Circlip	1	
15	Mounting pin	1	
16	Tilt cylinder unit	1	
17	Bushing	2	
For installation, reverse the removal procedure.			

**⚠ WARNING**

- To prevent the hydraulic fluid from spurt- ing out due to internal pressure, the out- board 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 mal- functions 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.

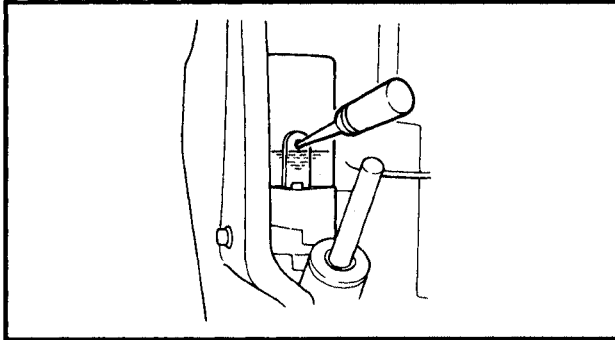


FILLING THE RESERVOIR

⚠ WARNING

To prevent the hydraulic fluid from spurt-
ing 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 install-
ing the power trim and tilt unit onto the out-
board.

1. Bleed:
 - Air bubbles
(from the power trim and tilt unit)

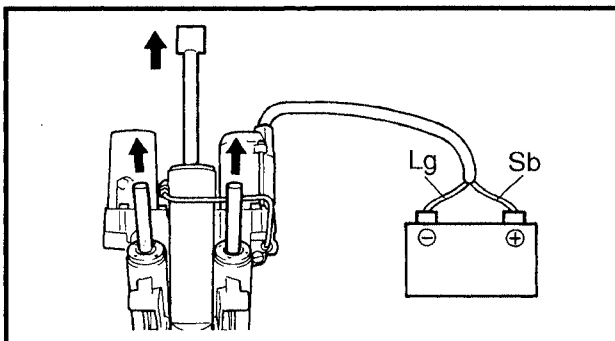
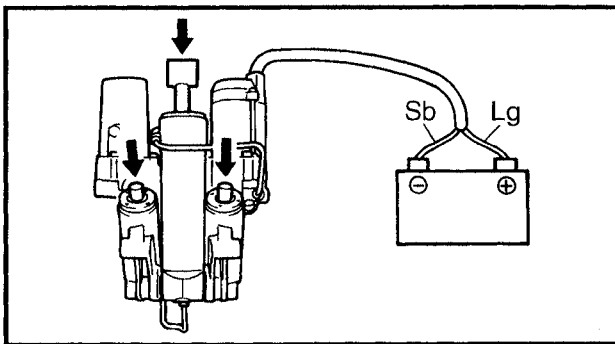
Bleeding steps

- (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:

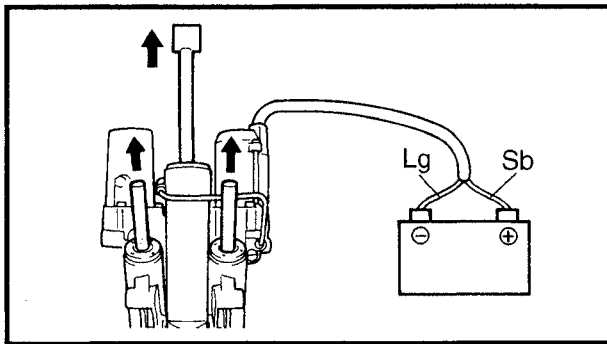
If the rams will not go down, refer to the fol-
lowing.

- 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.

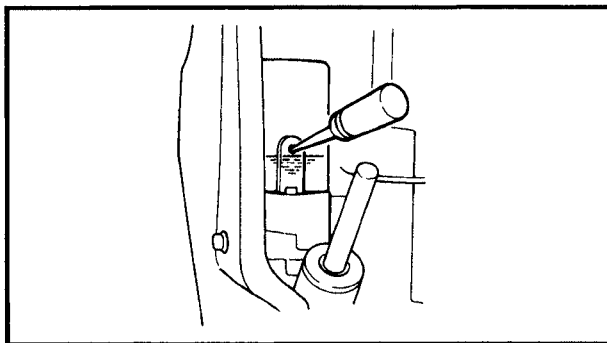




- B. If step A was unsuccessful, connect the leads on the battery terminals and fully compress the tilt ram assembly by hand.
- C. If step B was unsuccessful, loosen the manual valve, compress the trim and tilt ram assemblies fully by hand, and then tighten the manual valve. Then, compress and extend 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.



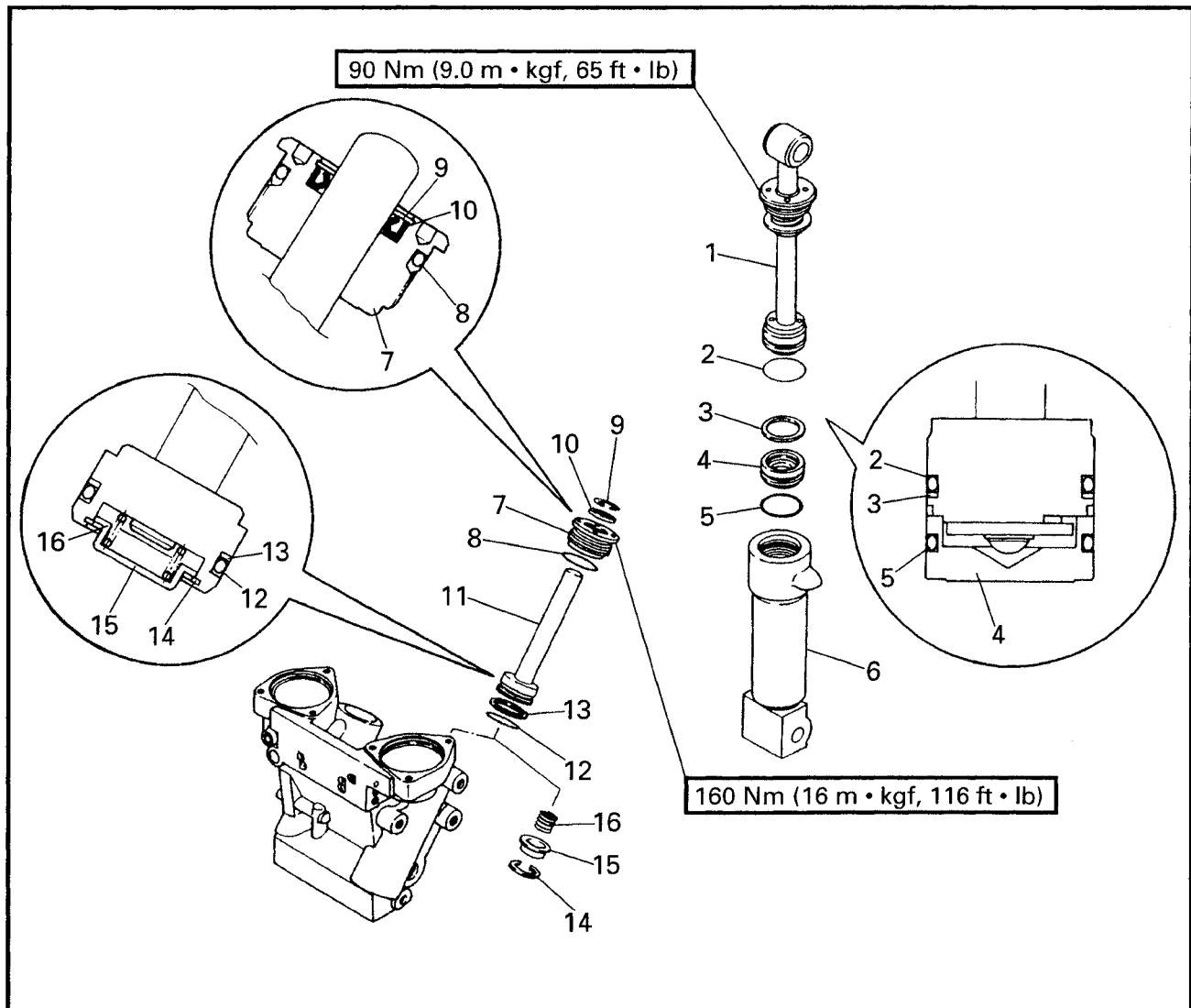
- (3) Connect the leads on the battery terminals in the up position until the trim and tilt ram assemblies are fully extended.



- (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.

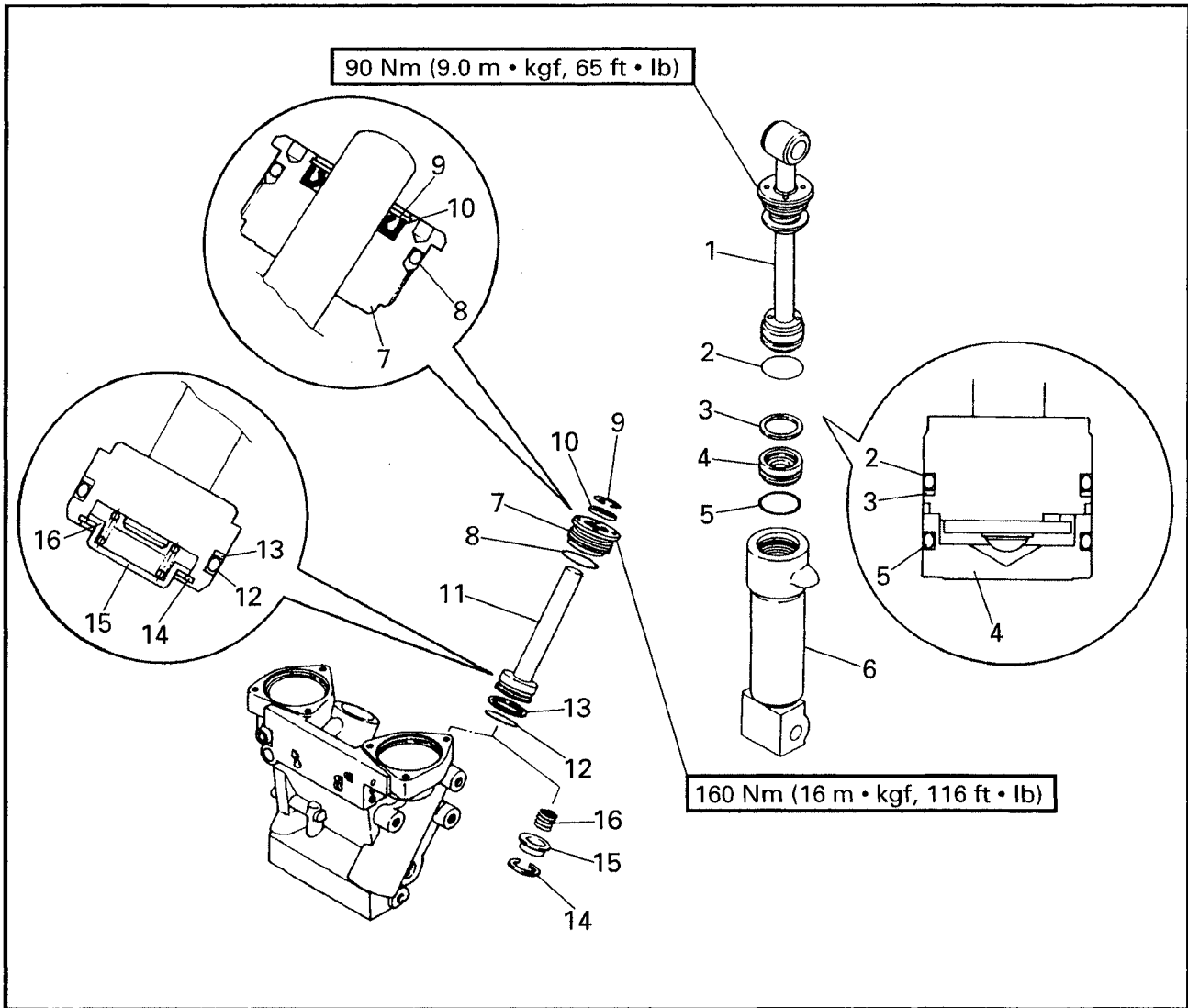
2. Inspect:

- Power trim and tilt unit operation
Unsmooth operation → Bleed the power trim and tilt unit again.

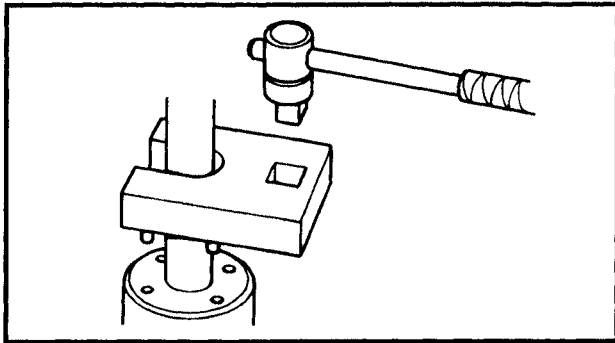

TILT RAM ASSEMBLY AND TRIM RAM ASSEMBLIES
(225F, L225F, 250B, L250B/S225, L225, S250, L250)
REMOVING/INSTALLING THE TILT RAM ASSEMBLY AND TRIM RAM ASSEMBLIES


Order	Job/Part	Q'ty	Remarks
	Power trim and tilt unit		Refer to "POWER TRIM AND TILT UNIT" on page 7-19.
1	Tilt ram assembly	1	
2	O-ring	1	45.7 × 38.7 mm
3	Seal ring	1	
4	Free piston	1	
5	O-ring	1	45.7 × 38.7 mm
6	Tilt cylinder	1	
7	Trim ram end screw	2	
8	O-ring	2	45.7 × 38.7 mm

Continued on next page.



Order	Job/Part	Q'ty	Remarks
9	Circlip	2	
10	Dust seal	2	
11	Trim ram	2	
12	O-ring	2	45.7 × 38.7 mm
13	Seal ring	2	
14	Circlip	2	
15	Damper	2	
16	Spring	2	
			For installation, reverse the removal procedure.


REMOVING THE TILT RAM END SCREW AND TRIM RAM END SCREW

Loosen:

- Tilt ram end screw


End screw wrench
YB-06175-2B / 90890-06544

- Trim ram end screw


End screw wrench
YB-06175-1A / 90890-06541
NOTE:

Hold the power trim and tilt unit in a vise using aluminum plates on both sides.

INSPECTING THE TILT RAM

Inspect:

- Tilt 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 TILT RAM CYLINDER

Inspect:

- Tilt ram cylinder
 - Cracks/excessive scratches → Replace.



INSPECTING THE TRIM RAMS

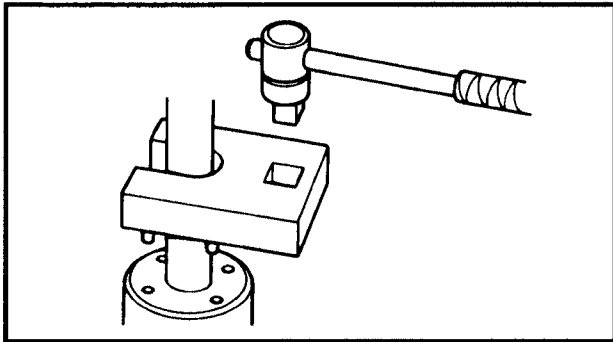
Inspect:

- Trim ram
Excessive scratches → Replace.
Bends/excessive corrosion → Replace.
Rust → Polish.
(with 400 - 600 grit sandpaper)

INSPECTING THE TRIM RAM CYLINDERS

Inspect:

- Trim ram cylinder
Cracks/excessive scratches →
Replace the power trim and tilt unit.



INSTALLING TILT RAM END SCREW AND TRIM RAM END SCREW

Tighten:

- Trim ram end screw



End screw wrench
YB-06175-1A / 90890-06541



Trim ram end screw
160 Nm (16 m • kgf, 116 ft • lb)

- Tilt ram end screw



End screw wrench
YB-06175-2B / 90890-06544



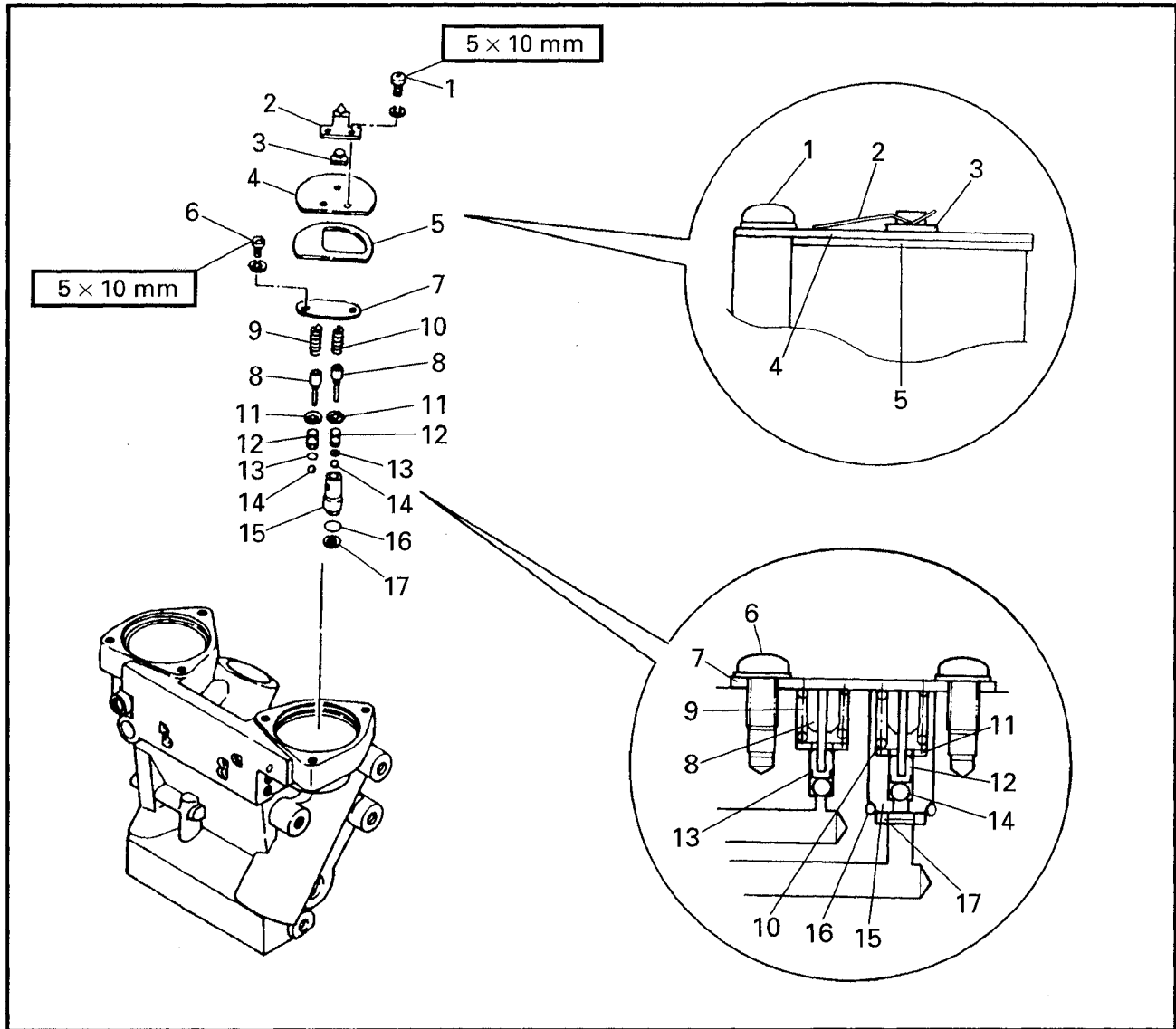
Tilt ram end screw
90 Nm (9.0 m • kgf, 65 ft • lb)

NOTE:

Hold the power trim and tilt unit in a vise using aluminum plates on both sides.

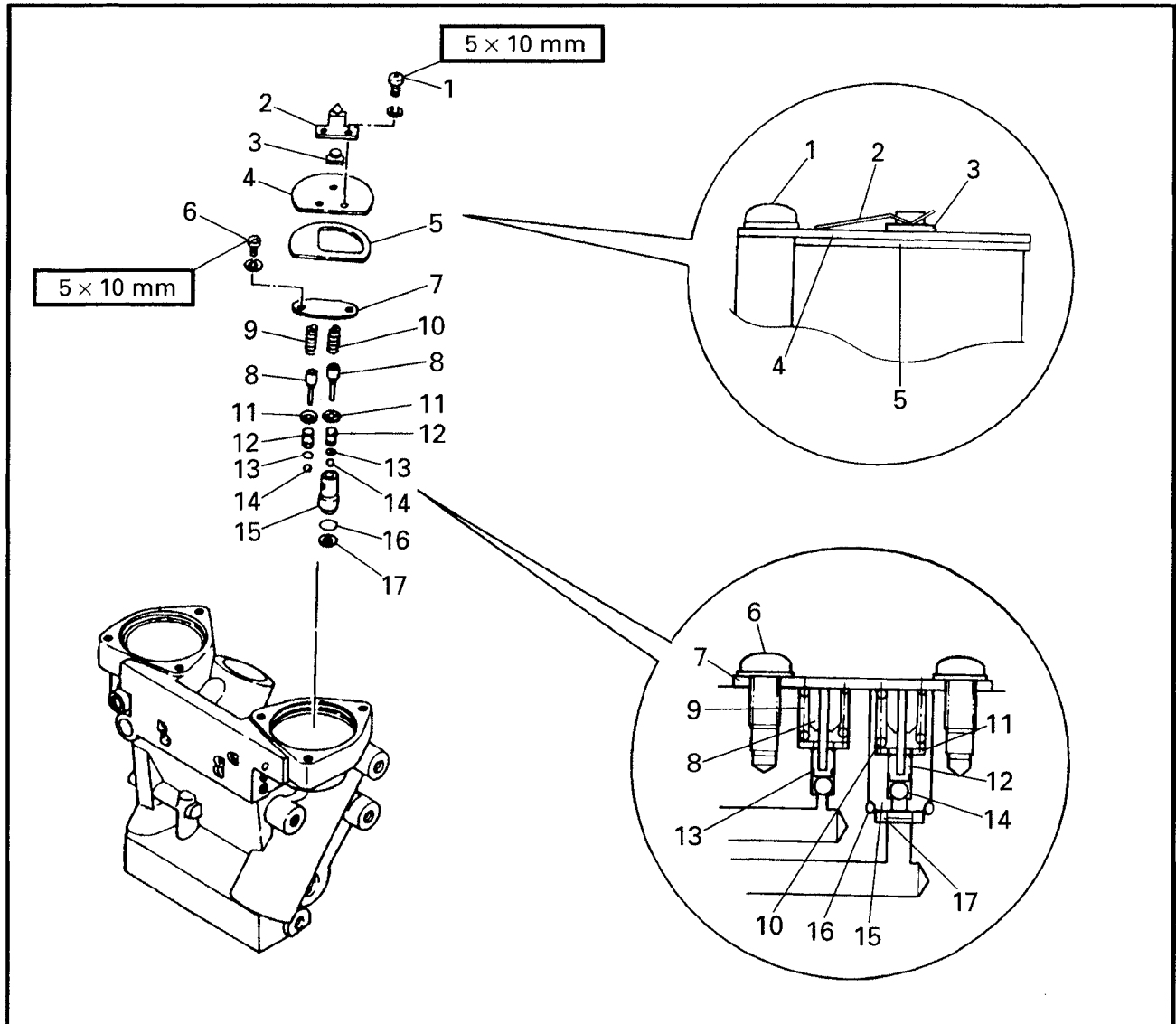


RELIEF VALVE (225F, L225F, 250B, L250B/S225, L225, S250, L250)
REMOVING/INSTALLING THE RELIEF VALVE

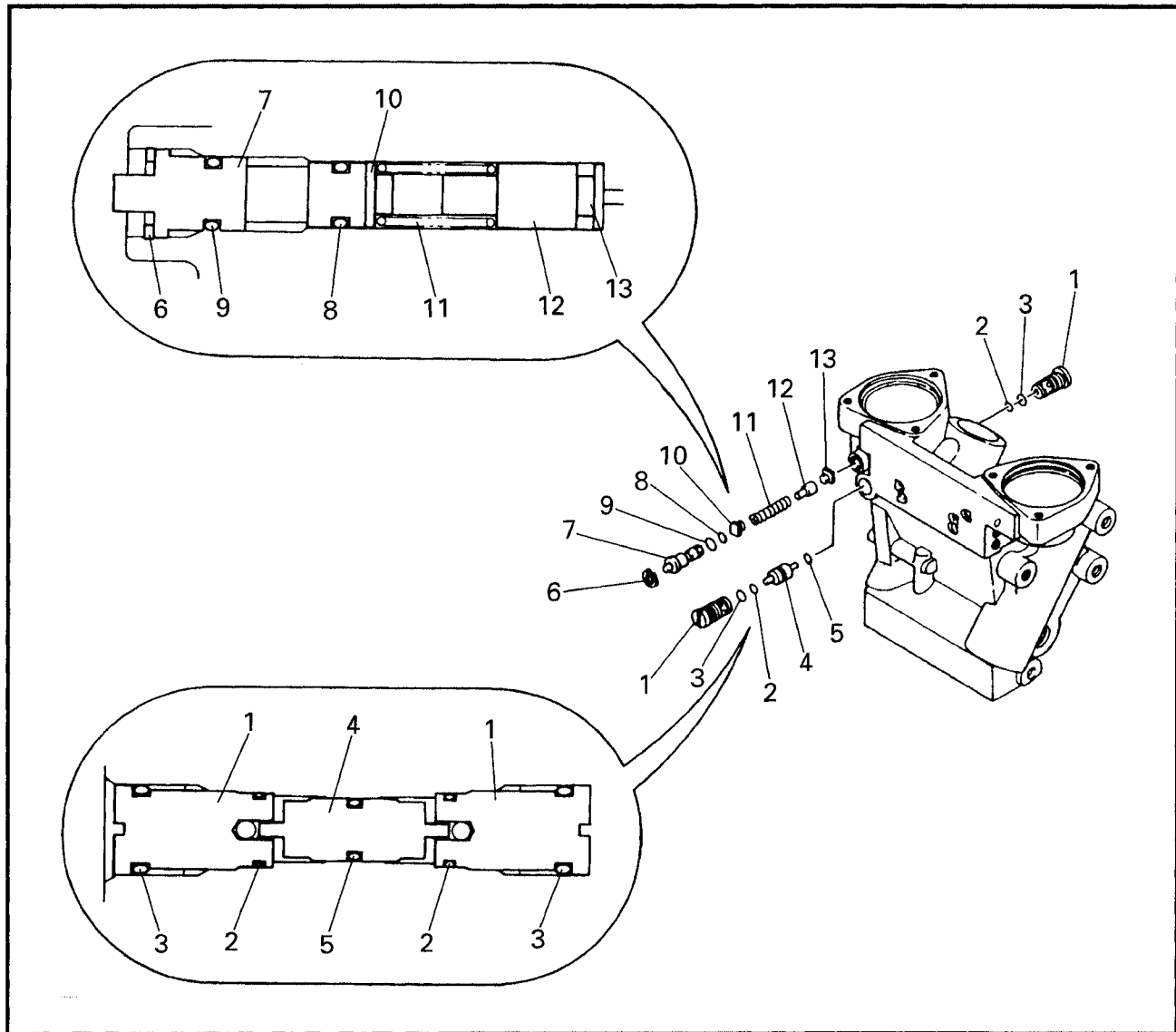


Order	Job/Part	Q'ty	Remarks
	Reservoir		Refer to "TILT CYLINDER, RESERVOIR AND POWER TRIM AND TILT MOTOR (225F, L225F, 250B, L250B/S225, L225, S250, L250)" on page 7-52.
1	Screw	2	
2	Trim down spring	1	
3	Valve seal	1	
4	Trim down plate	1	
5	Trim down seat	1	
6	Screw	2	
7	Relief valve	1	
8	Valve support pin	2	

Continued on next page.

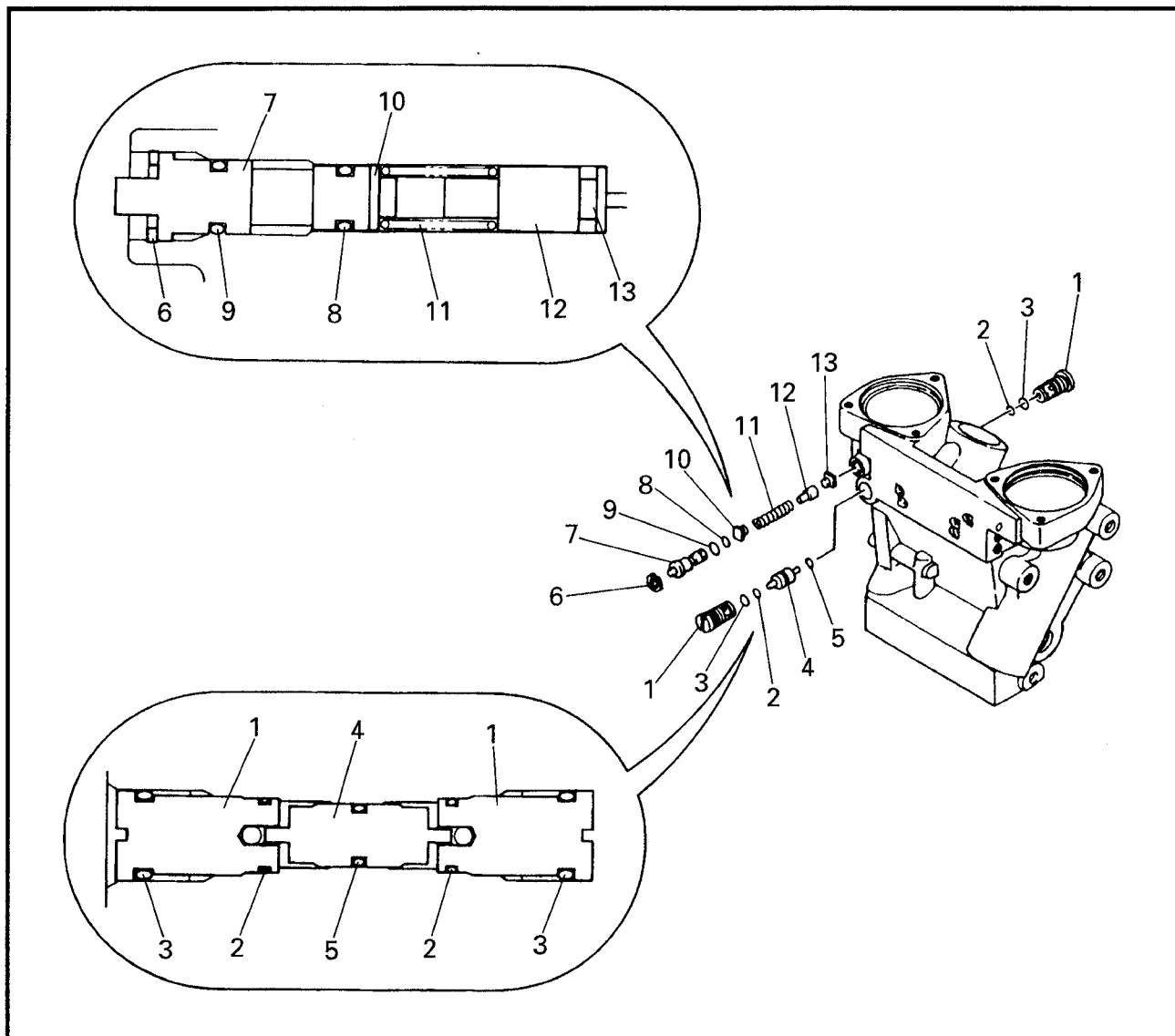


Order	Job/Part	Q'ty	Remarks
9	Down relief spring	1	8.8 × 14.5 mm
10	Up relief spring	1	8.8 × 15.8 mm
11	Washer	2	
12	Valve seat	2	
13	Valve seat	2	
14	Check ball	2	3.2 mm
15	Relief valve	1	
16	O-ring	1	12.5 × 9.5 mm
17	Filter	1	
			For installation, reverse the removal procedure.

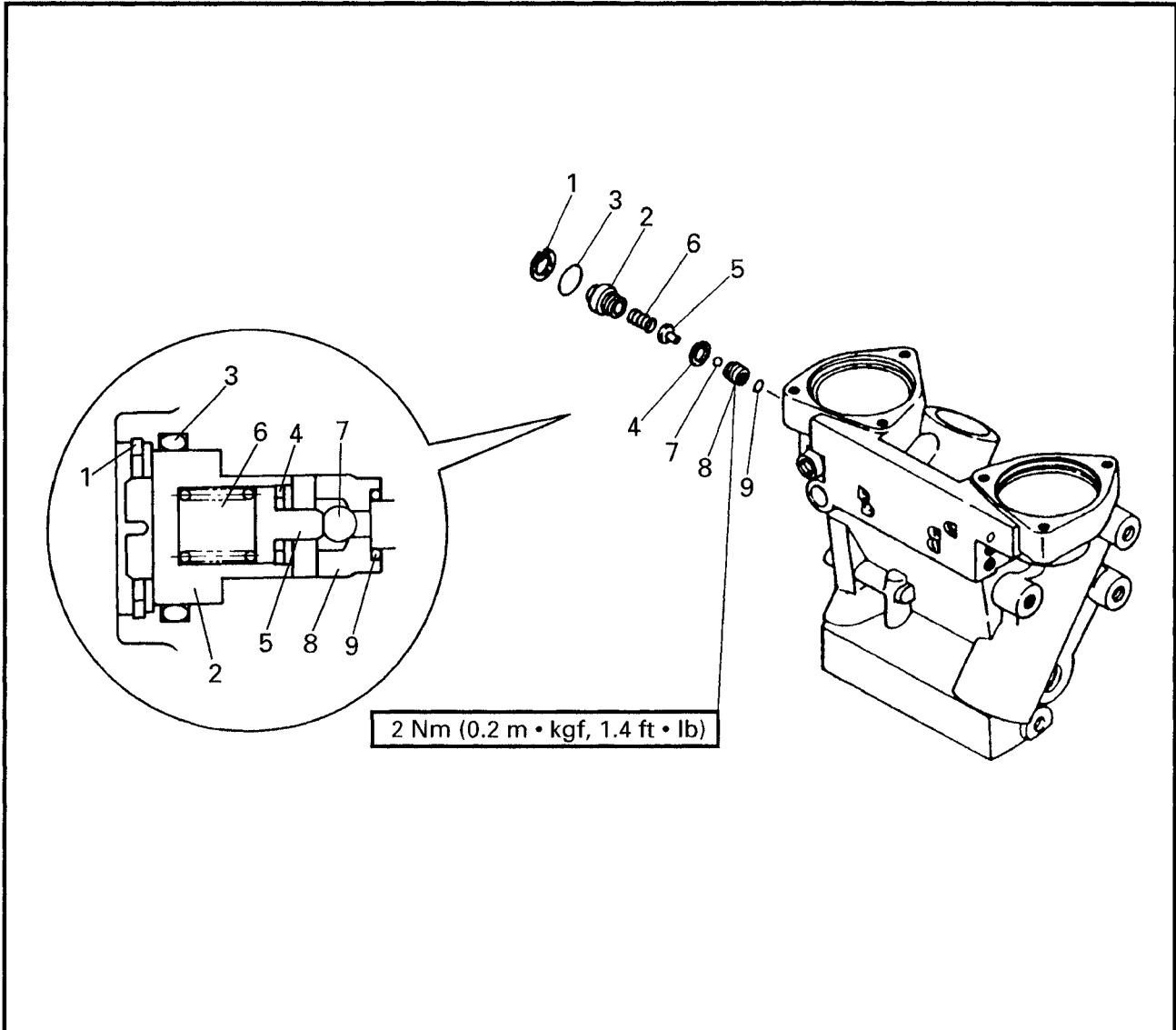

MAIN VALVE AND VALVE RETAINER
(225F, L225F, 250B, L250B/S225, L225, S250, L250)
REMOVING/INSTALLING THE MAIN VALVE AND VALVE RETAINER


Order	Job/Part	Q'ty	Remarks
	Power trim and tilt unit		Refer to "POWER TRIM AND TILT UNIT" on page 7-19.
1	Main valve	2	
2	O-ring	2	14.5 × 11.5 mm
3	O-ring	2	17.1 × 12.3 mm
4	Shuttle piston	1	
5	O-ring	1	12.6 × 8.8 mm
6	Circlip	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
7	Valve retainer	1	
8	O-ring	1	9.6 × 5.8 mm
9	O-ring	1	10.6 × 6.8 mm
10	Valve seal	1	
11	Spring	1	6.2 × 27 mm
12	Spring seat	1	
13	Valve seal	1	
			For installation, reverse the removal procedure.


**MANUAL VALVE (225F, L225F, 250B, L250B/S225, L225, S250, L250)
REMOVING/INSTALLING THE MANUAL VALVE**


Order	Job/Part	Q'ty	Remarks
	Power trim and tilt unit		Refer to "POWER TRIM AND TILT UNIT" on page 7-19.
1	Circlip	1	
2	Manual valve	1	
3	O-ring	1	22.6 × 17.8 mm
4	Circlip	1	
5	Actuator pin	1	
6	Spring	1	8.8 × 13 mm
7	Check ball	1	4.0 mm
8	Valve seat	1	
9	O-ring	1	8.5 × 5.5 mm
			For installation, reverse the removal procedure.

CHAPTER 8

ELECTRICAL SYSTEMS

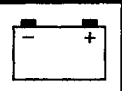
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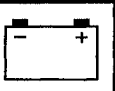
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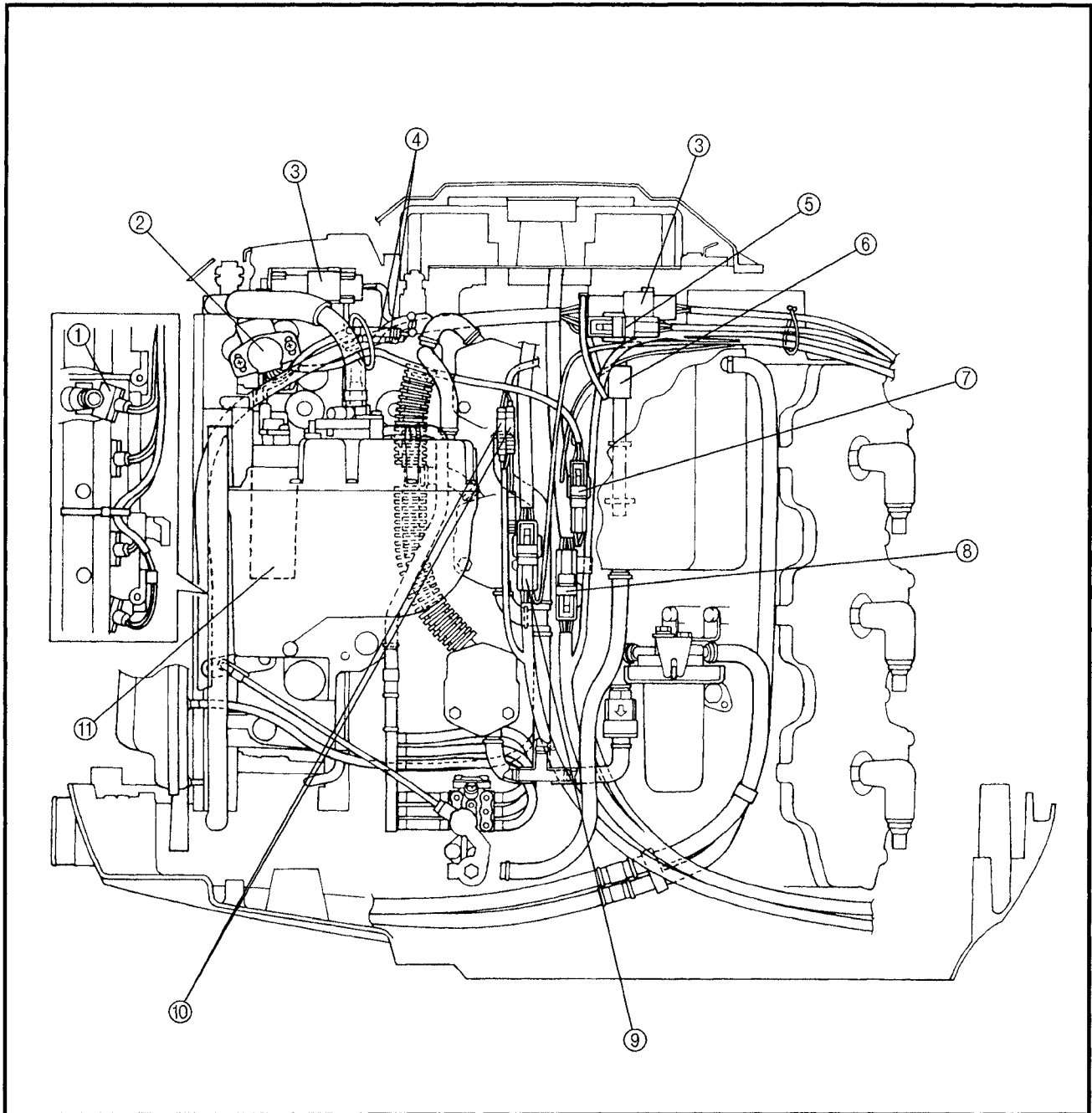


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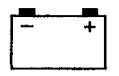


ELECTRICAL COMPONENTS

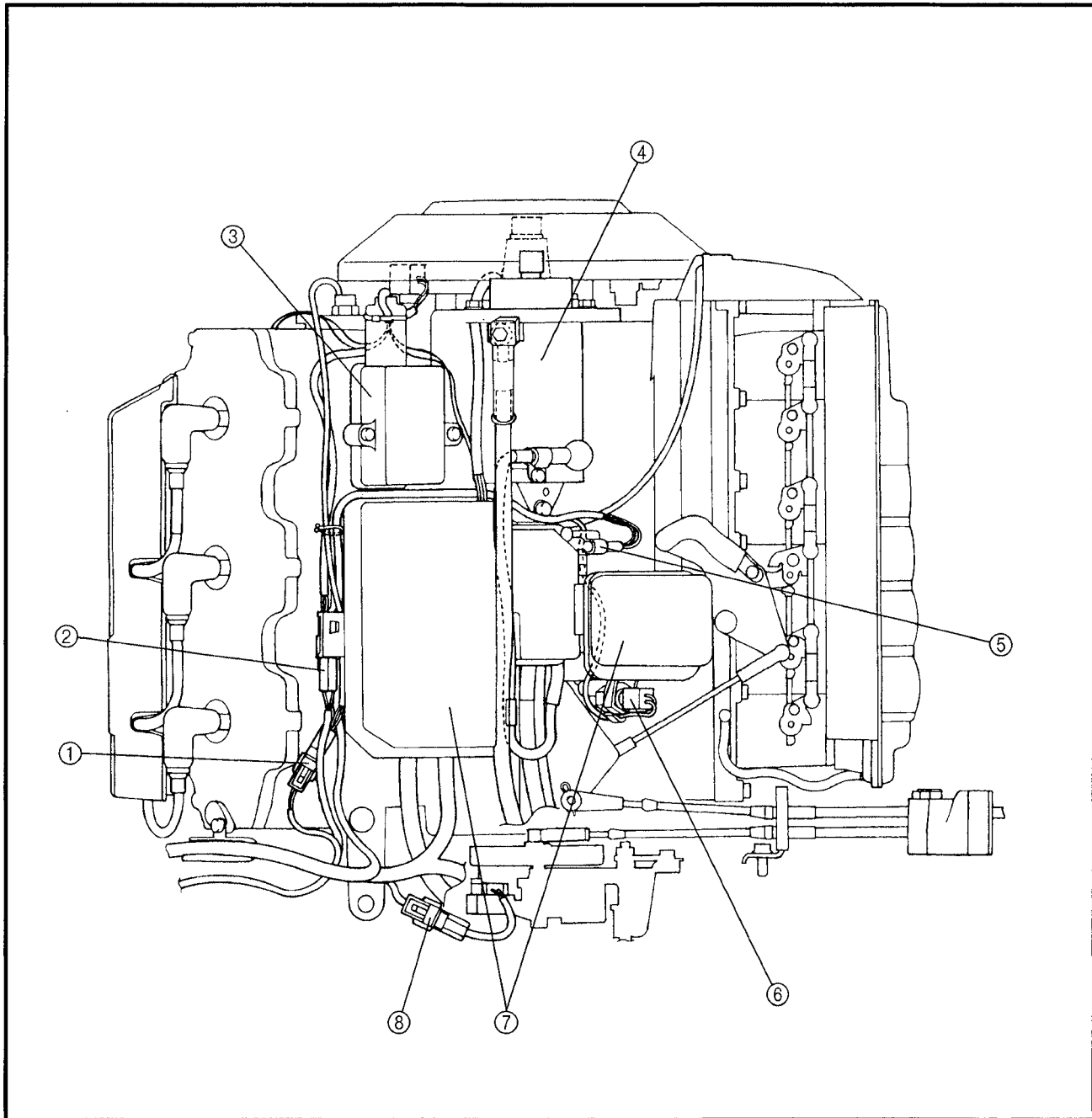
(Port view)



- | | |
|--|---|
| ① Fuel injector | ⑦ Throttle position sensor coupler (3P) |
| ② Throttle position sensor | ⑧ Pulser coil coupler (6P) |
| ③ High-pressure fuel pump resistor couplers (2P) | ⑨ Oil level sensor coupler (6P) |
| ④ High-pressure fuel pump connectors | ⑩ Emergency switch connectors |
| ⑤ Fuel injector coupler (6P) | ⑪ High-pressure fuel pump |
| ⑥ Oil level sensor | |



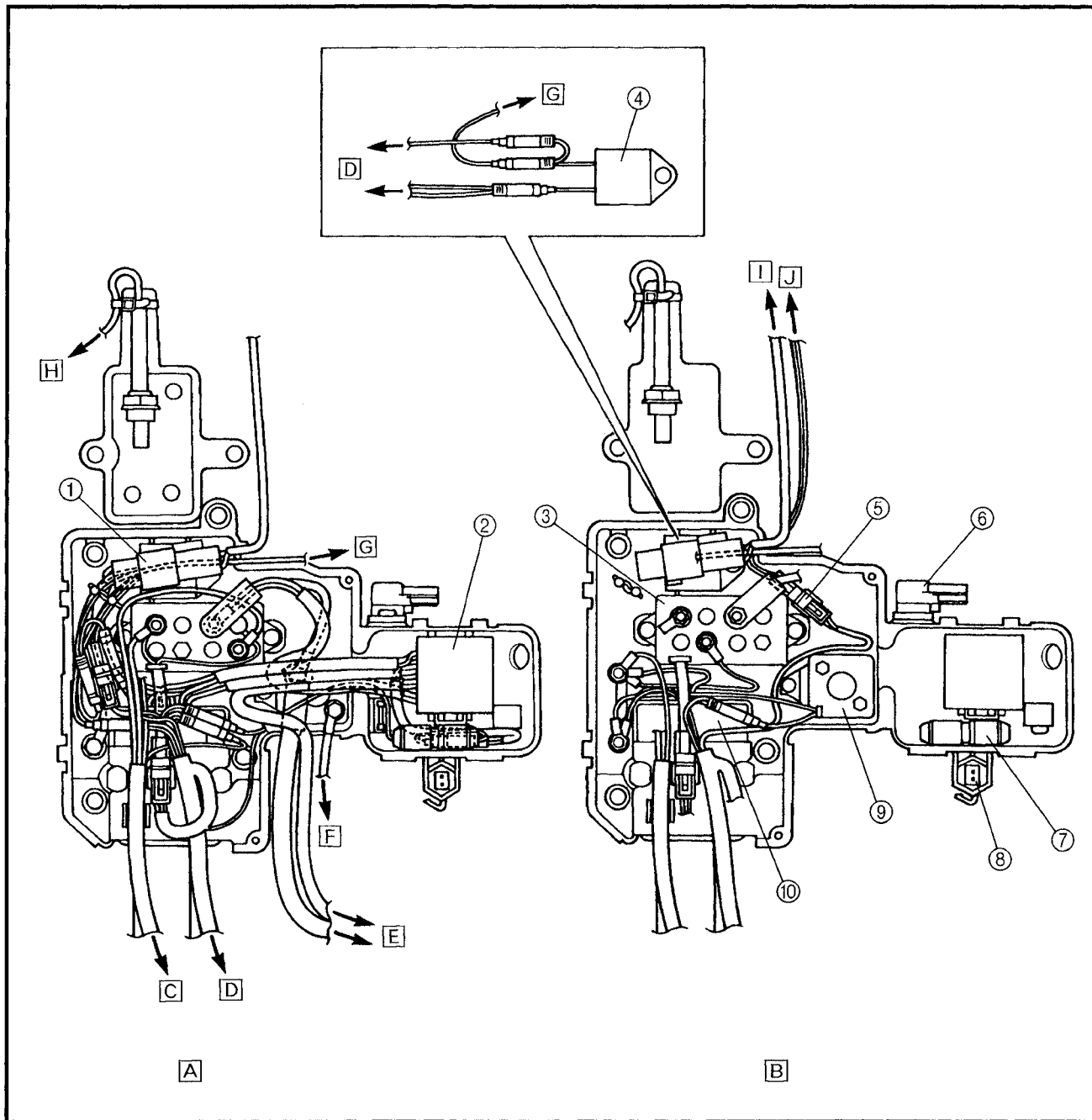
(Starboard view)



- ① Engine cooling water temperature sensor coupler (2P)
- ② Crank position sensor coupler (2P)
- ③ Oxygen density sensor
- ④ Starter motor
- ⑤ Atmospheric pressure sensor
- ⑥ Intake air temperature sensor
- ⑦ Junction box assembly
- ⑧ Shift cutoff switch coupler (2P)



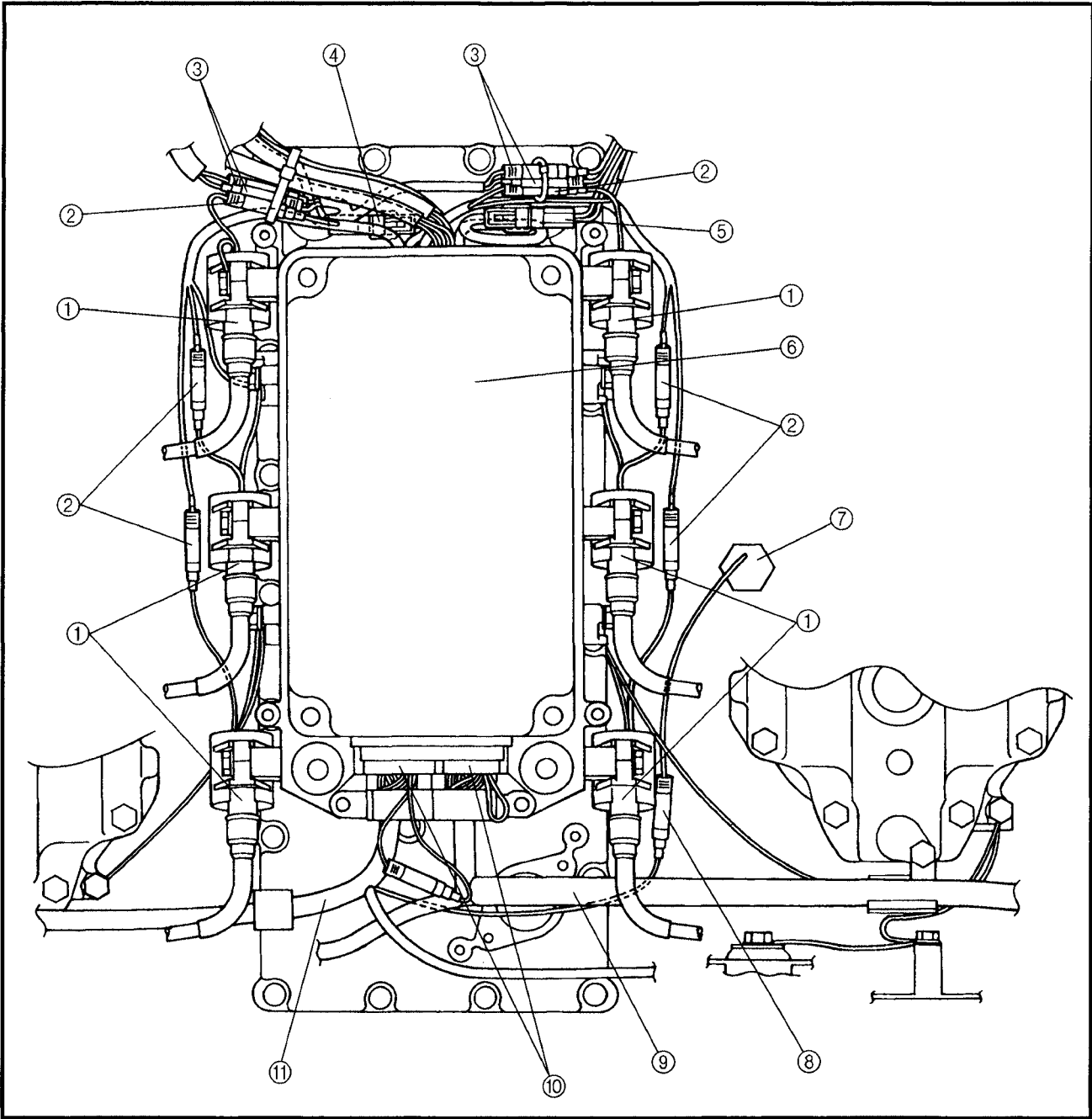
(Junction box assembly)



- ① Lighting coil coupler (3P)
- ② Fuse (80A)
- ③ Power trim and tilt relay
- ④ Main relay
- ⑤ Oxygen density sensor coupler (2P)
- ⑥ Atmospheric pressure sensor
- ⑦ Fuse (30A)
- ⑧ Intake air temperature sensor
- ⑨ Starter relay
- ⑩ Rectifier/regulator

- A** Complete assembly
- B** Sub-assembly
- C** To power trim and tilt motor
- D** To wire harness
- E** To battery
- F** To starter motor
- G** To fuel injector unit
- H** To CDI unit
- I** To lighting coil
- J** To oxygen density sensor

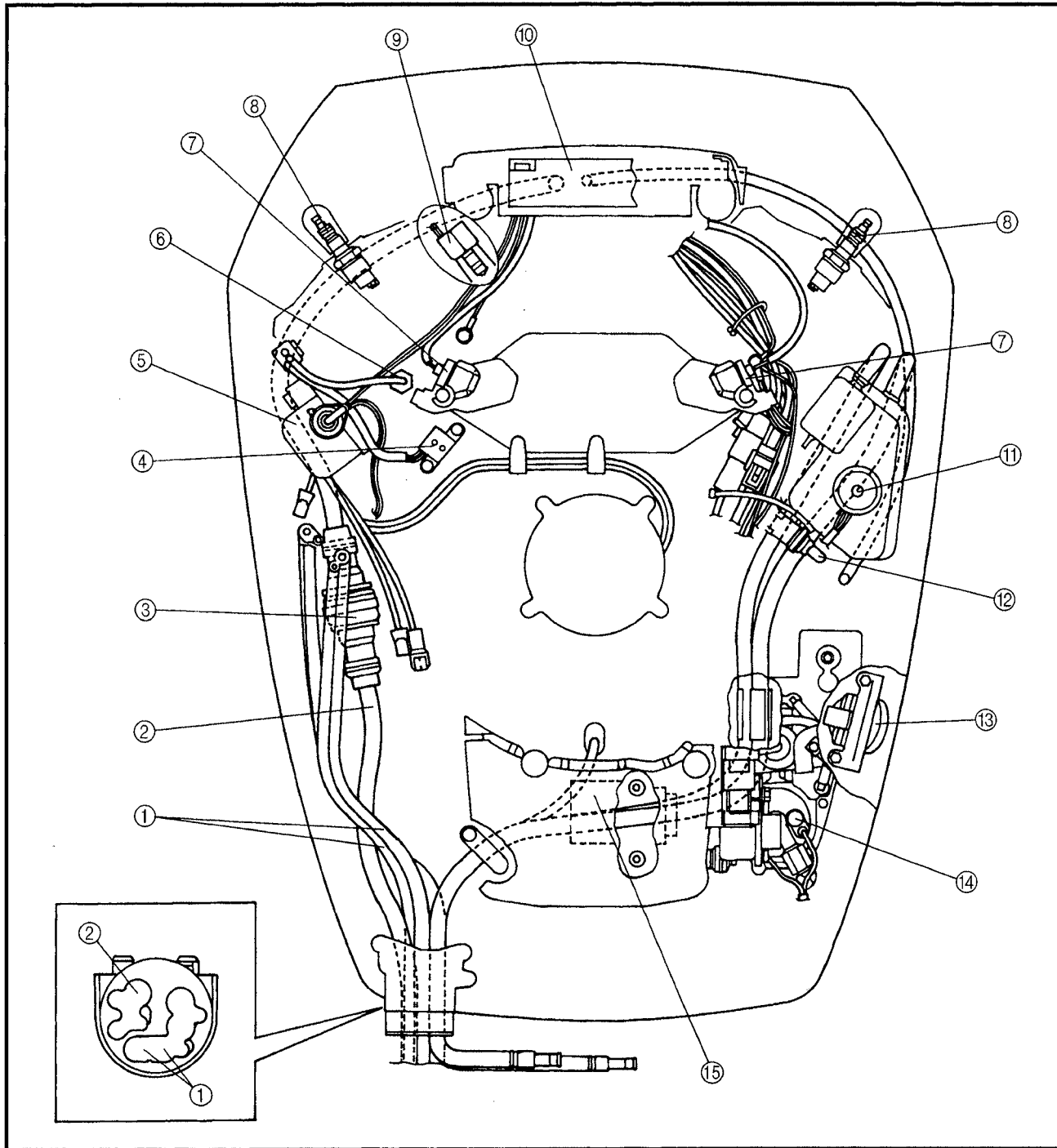
(Aft view)



- | | |
|--------------------------------------|--------------------------------|
| ① Ignition coils | ⑦ Knocking sensor |
| ② Ignition coil connectors | ⑧ Knocking sensor connector |
| ③ Thermo switch connectors | ⑨ Wire harness |
| ④ Charge coil coupler (4P) | ⑩ CDI unit couplers (24P, 18P) |
| ⑤ Oxygen density sensor coupler (2P) | ⑪ Sub-wire harness |
| ⑥ CDI unit | |



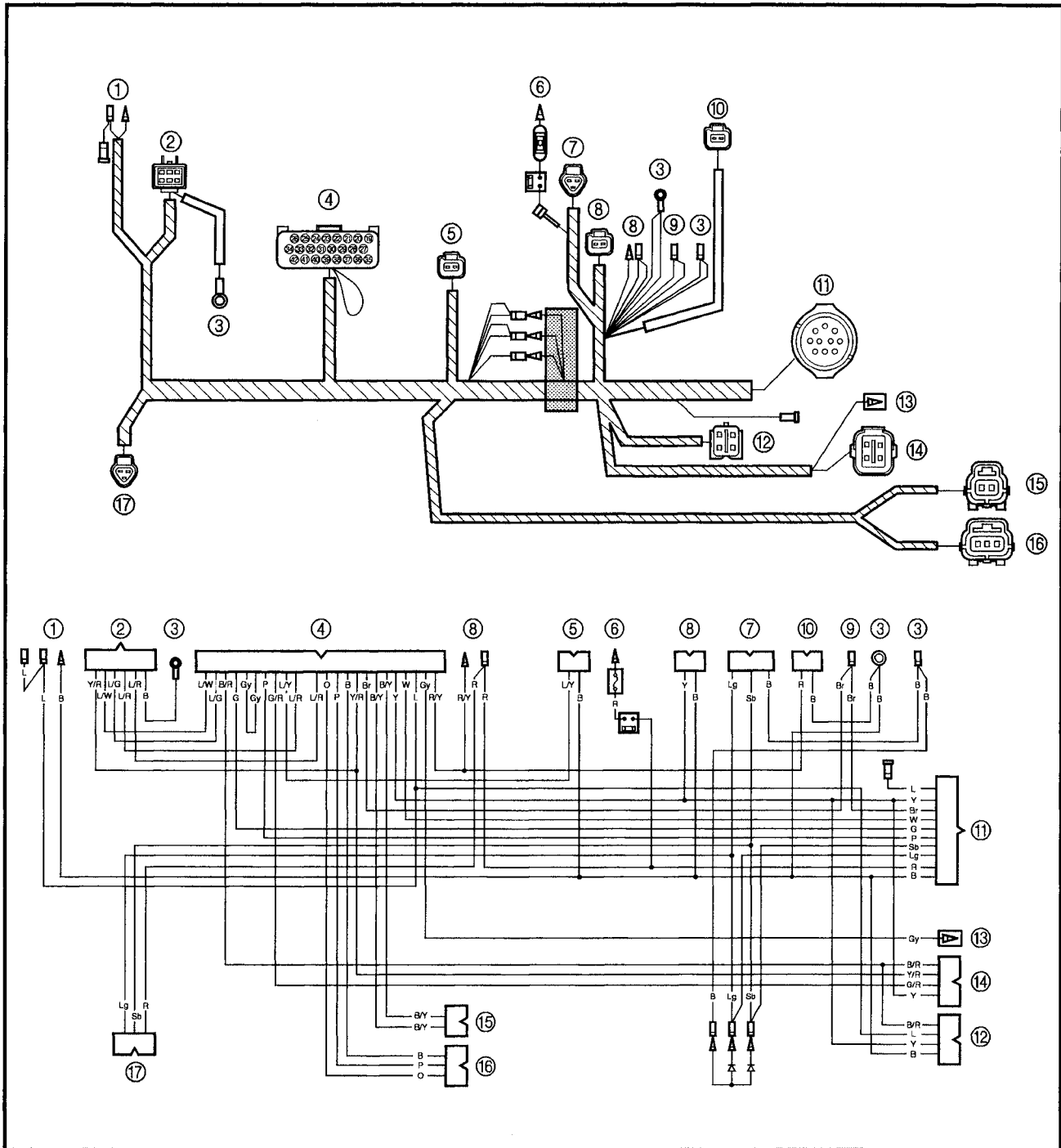
(Top view)



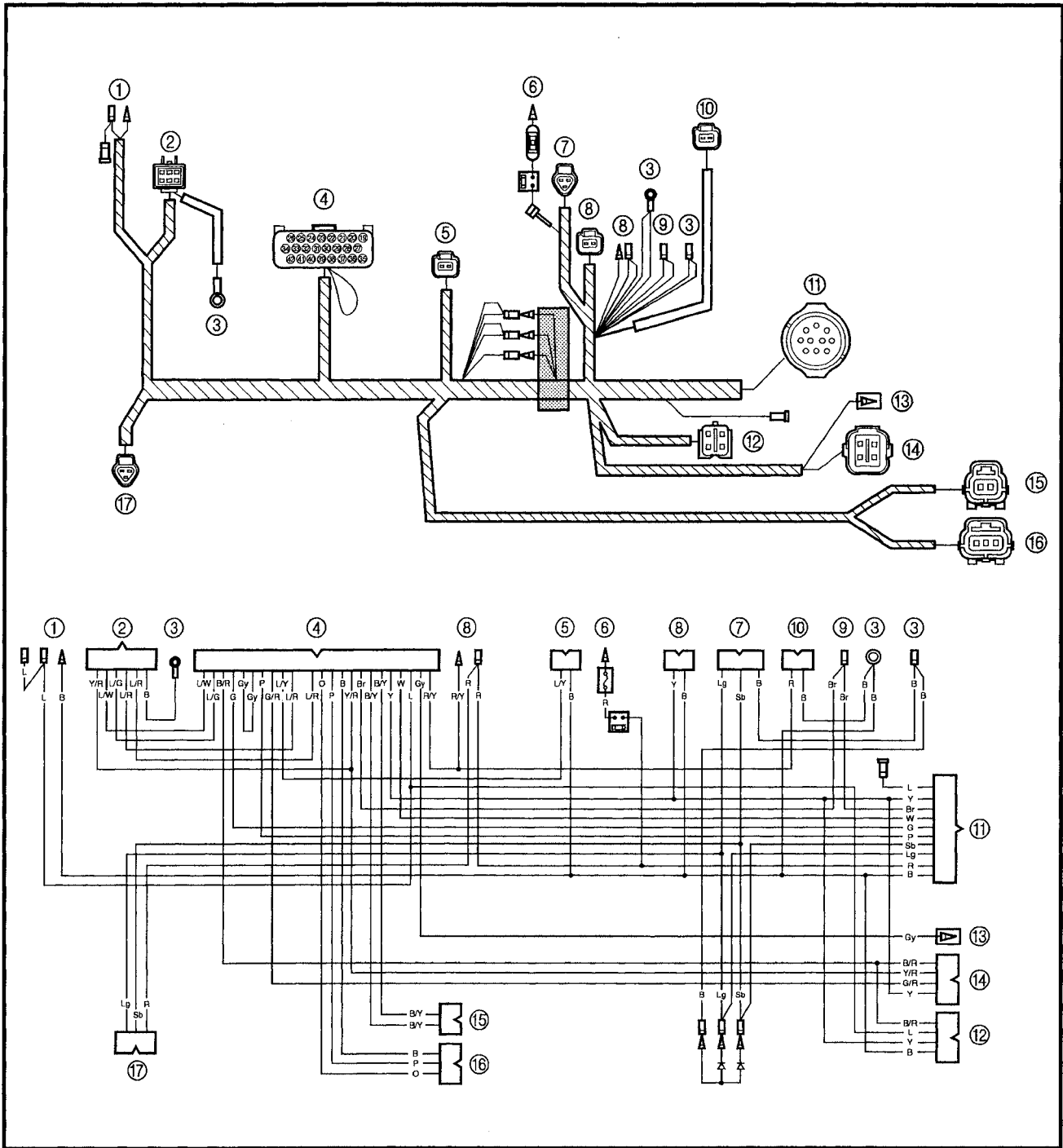
- ① Battery leads
- ② Remote control wire harness
- ③ Remote control coupler (10P)
- ④ Crank position sensor
- ⑤ Oxygen density sensor
- ⑥ Engine cooling water temperature sensor
- ⑦ Thermo switches
- ⑧ Spark plugs

- ⑨ Knocking sensor
- ⑩ CDI unit
- ⑪ Oil level sensor
- ⑫ Emergency switch
- ⑬ Trailer switch
- ⑭ High-pressure fuel pump
- ⑮ High-pressure fuel pump resistor

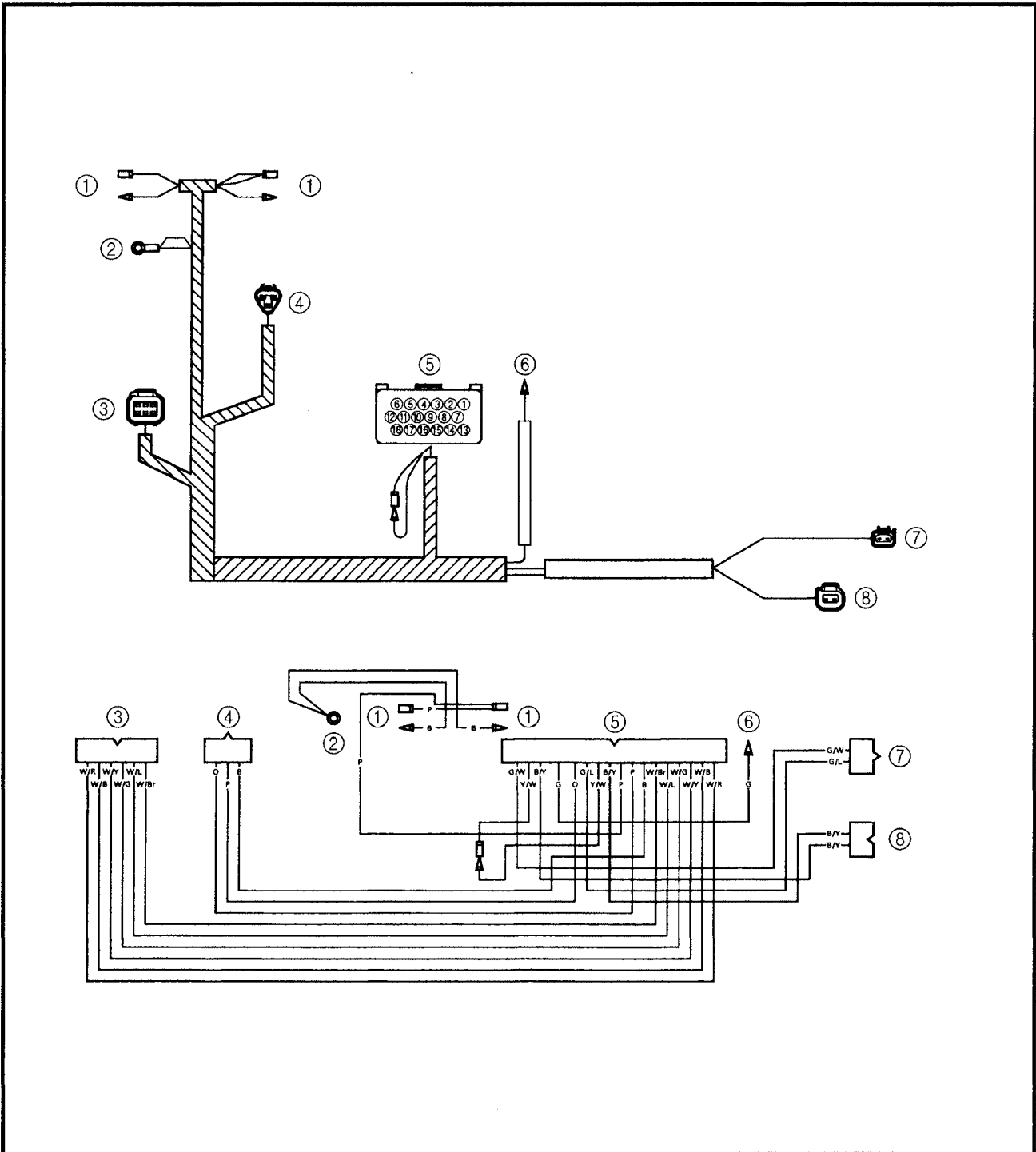
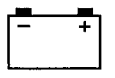
WIRE HARNESS



- | | | | |
|-----------------------------|------------------|--------------------|------------------|
| Connect to: | B : Black | W : White | R/Y : Red/yellow |
| ① Emergency switch | Br : Brown | Y : Yellow | Y/R : Yellow/red |
| ② Oil level sensor | G : Green | B/R : Black/red | |
| ③ Ground | Gy : Gray | B/Y : Black/yellow | |
| ④ CDI unit | L : Blue | G/R : Green/red | |
| ⑤ Shift cutoff switch | Lg : Light green | L/G : Blue/green | |
| ⑥ Fuse (80A) | O : Orange | L/R : Blue/red | |
| ⑦ Power trim and tilt relay | P : Pink | L/W : Blue/white | |
| ⑧ Main relay | R : Red | L/Y : Blue/yellow | |
| ⑨ Starter relay | Sb : Sky blue | P/B : Pink/black | |



- | | | | |
|-----------------------------------|------------------|--------------------|-------------------|
| ⑩ Oxygen density sensor | B : Black | Sb : Sky blue | L/Y : Blue/yellow |
| ⑪ Remote control | Br : Brown | W : White | R/Y : Red/yellow |
| ⑫ Oil level switch (sub-oil tank) | G : Green | Y : Yellow | Y/R : Yellow/red |
| ⑬ Trim sensor | Gy : Gray | B/R : Black/red | |
| ⑭ Oil level meter | L : Blue | B/Y : Black/yellow | |
| ⑮ Intake air temperature sensor | Lg : Light green | G/R : Green/red | |
| ⑯ Atmospheric pressure sensor | O : Orange | L/G : Blue/green | |
| ⑰ Trailer switch | P : Pink | L/R : Blue/red | |
| | R : Red | L/W : Blue/white | |

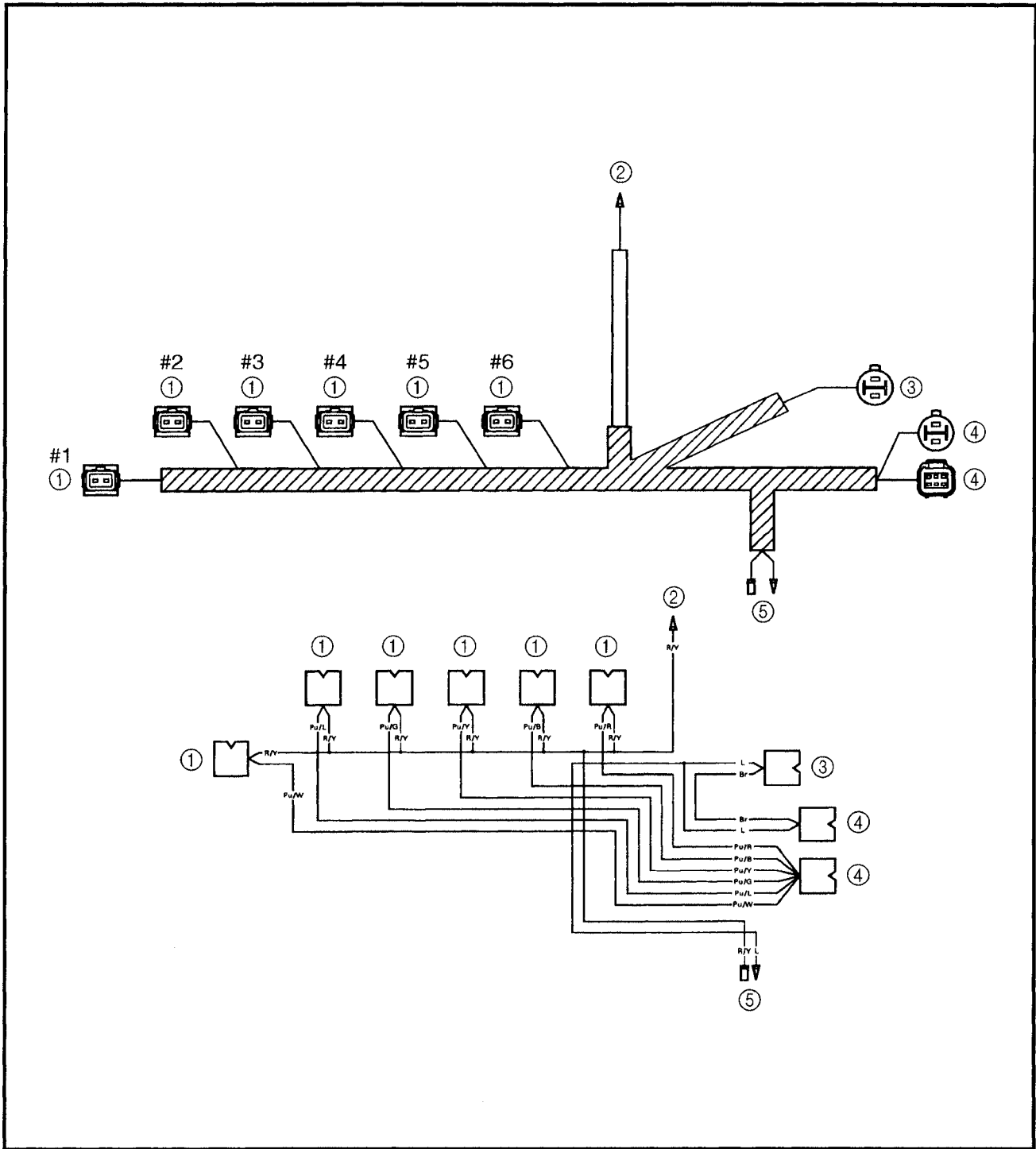
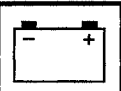


Connect to:

- ① Thermo switches
- ② Ground lead
- ③ Pulser coil
- ④ Throttle position sensor
- ⑤ CDI unit
- ⑥ Knocking sensor
- ⑦ Crank position sensor
- ⑧ Engine cooling water temperature sensor

- B : Black
- G : Green
- O : Orange
- P : Pink
- B/Y : Black/yellow
- G/L : Green/blue
- G/W : Green/white
- W/B : White/black
- W/Br : White/brown

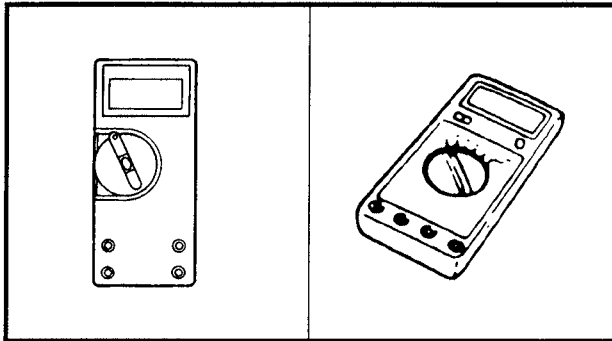
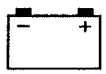
- W/G : White/green
- W/L : White/blue
- W/R : White/red
- W/Y : White/yellow
- Y/W : Yellow/white



Connect to:

- ① Fuel injectors
- ② Main relay
- ③ High-pressure fuel pump resistor
- ④ CDI unit
- ⑤ High-pressure fuel pump

- Br : Brown
- L : Blue
- Pu/B : Purple/black
- Pu/G : Purple/green
- Pu/L : Purple/blue
- Pu/R : Purple/red
- Pu/W : Purple/white
- Pu/Y : Purple/yellow



ELECTRICAL COMPONENTS ANALYSIS

DIGITAL CIRCUIT TESTER



Digital tester
J-39299 / 90890-06752

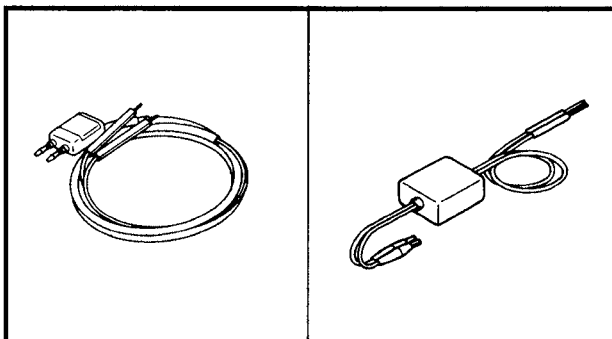
NOTE:

"○—○" 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.



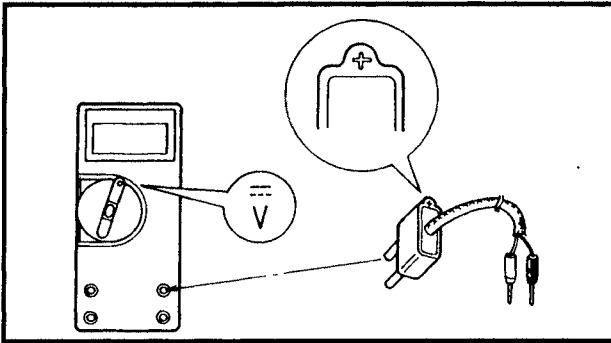
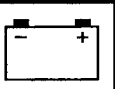
PEAK VOLTAGE ADAPTOR

NOTE:

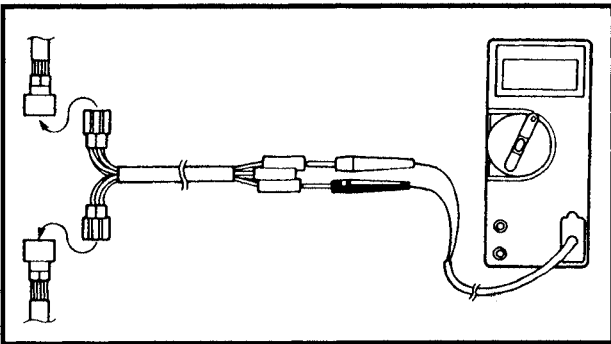
The peak voltage adaptor should be used with the digital circuit tester.



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 10Ω or less with the digital tester, the correct measurement cannot be obtained because of the tester's internal resistance.

To obtain the correct value, subtract the internal resistance from the displayed measurement.

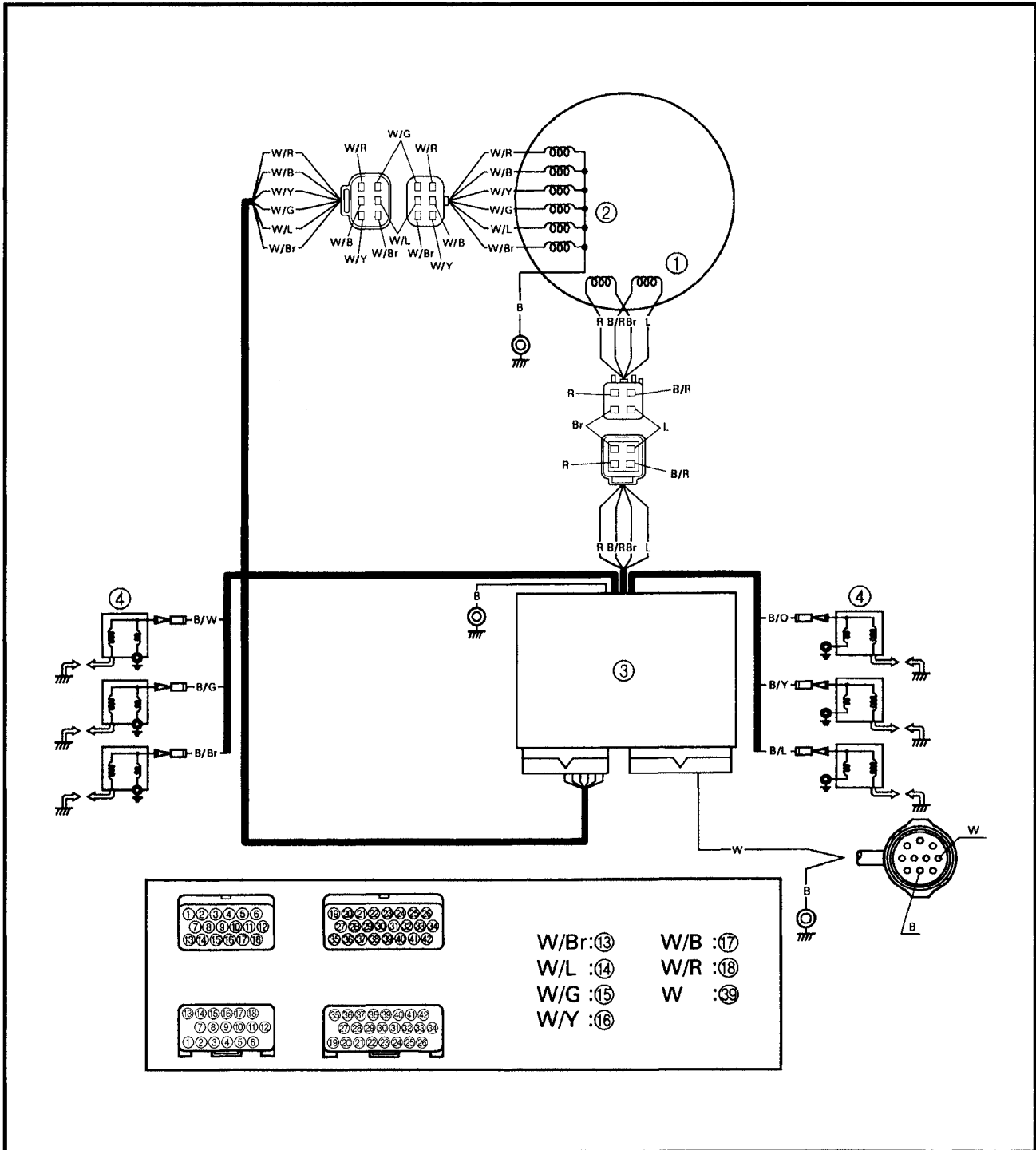


Correct value
Displayed measurement –
internal resistance

NOTE:

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

IGNITION SYSTEM

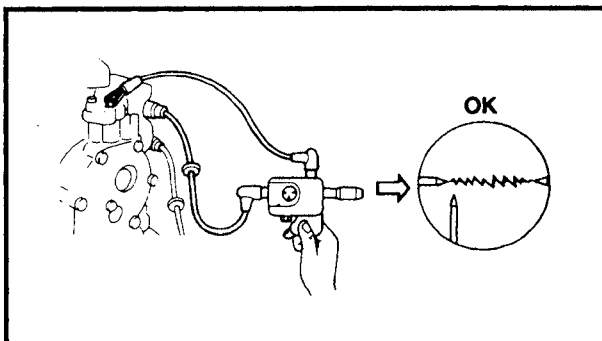
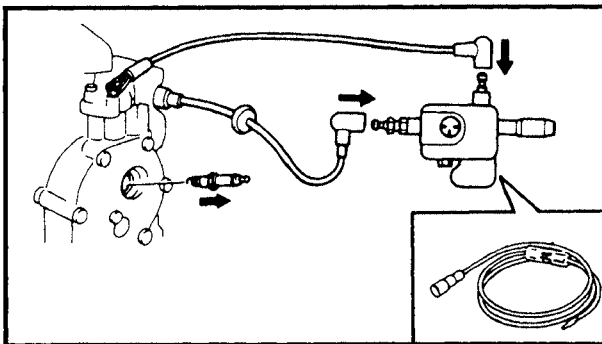
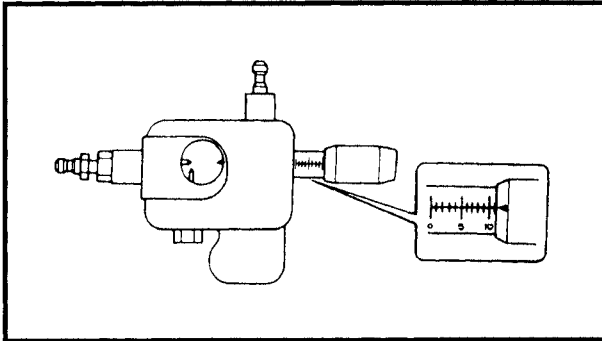
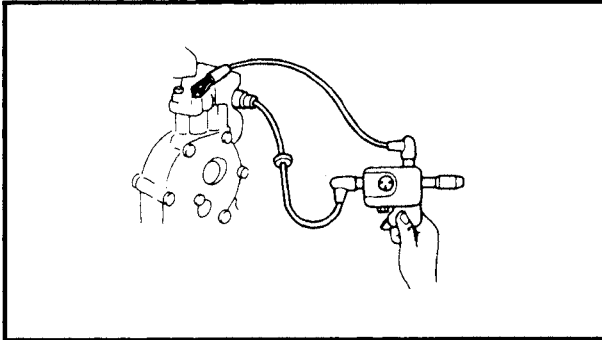
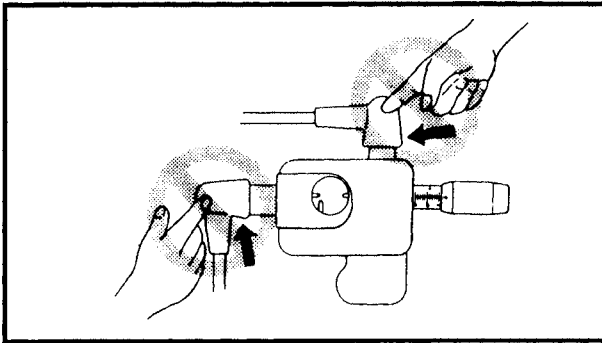
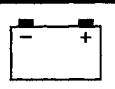


- ① Charge coil
- ② Pulser coil
- ③ CDI unit
- ④ Ignition coils

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

B/L : Black/blue
 B/O : Black/orange
 B/R : Black/red
 B/W : Black/white
 B/Y : Black/yellow
 G/L : Green/blue
 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



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)

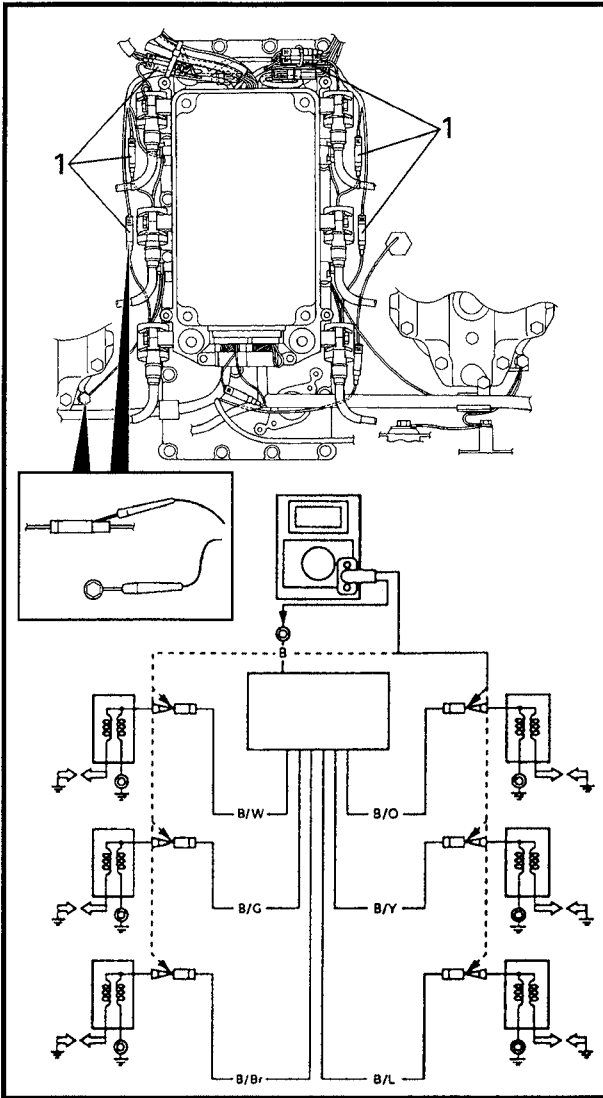
Inspecting steps

- (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:

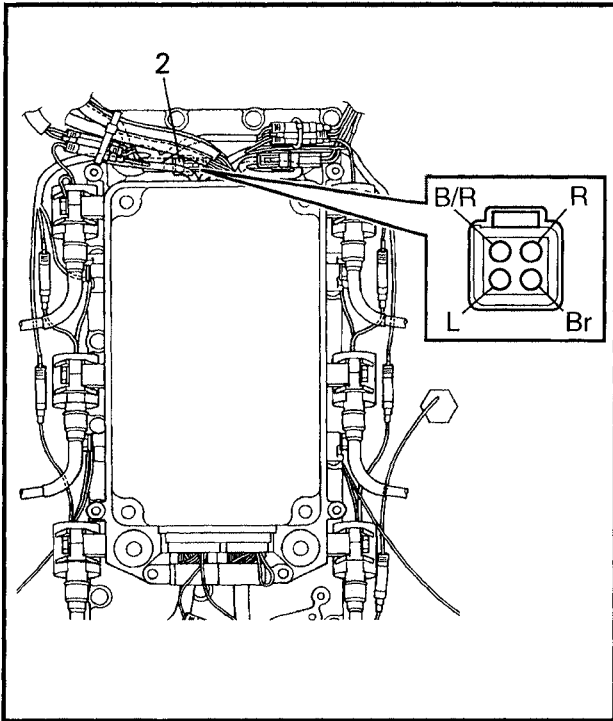
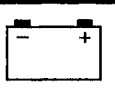
- CDI unit output peak voltage
Above specification → Replace the ignition coil.
Below specification → Measure the charge coil output peak voltage.



CDI unit output peak voltage

- Black/white (B/W) – Black (B)
- Black/green (B/G) – Black (B)
- Black/brown (B/Br) – Black (B)
- Black/orange (B/O) – Black (B)
- Black/yellow (B/Y) – Black (B)
- Black/blue (B/L) – Black (B)

r/min	Circuit	Loaded	
		1,500	3,500
V	80	100	130

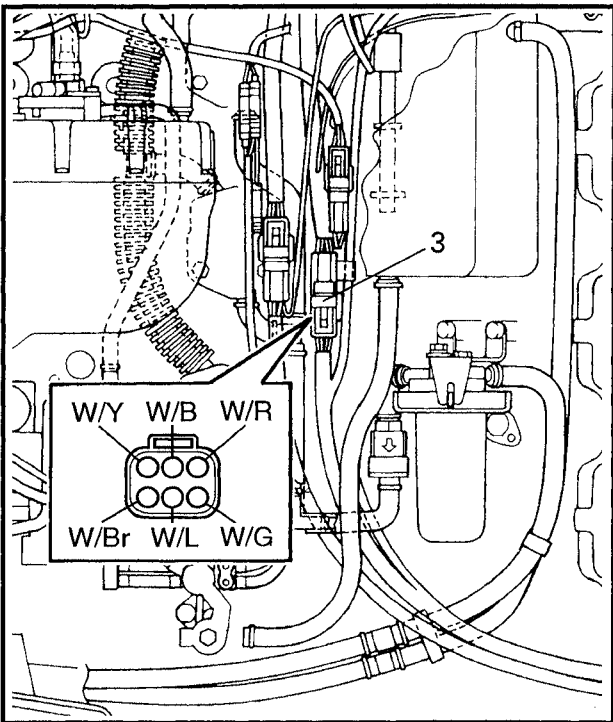


2. Measure:

- 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			
	Red (R) – Brown (Br) Black/red (B/R) – Blue (L)			
r/min	Circuit	Loaded		
	Cranking	1,500	3,500	
V	85	110	150	

	Test harness (4-pin)
	YB-38831 / 90890-06771

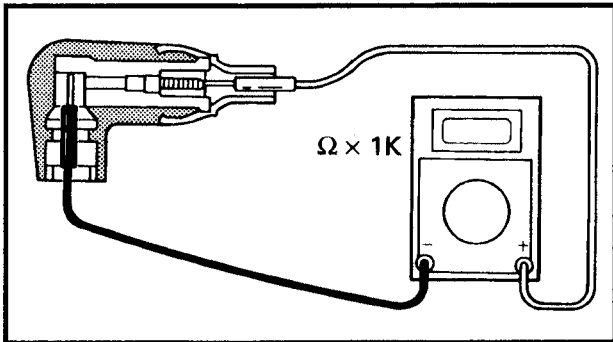
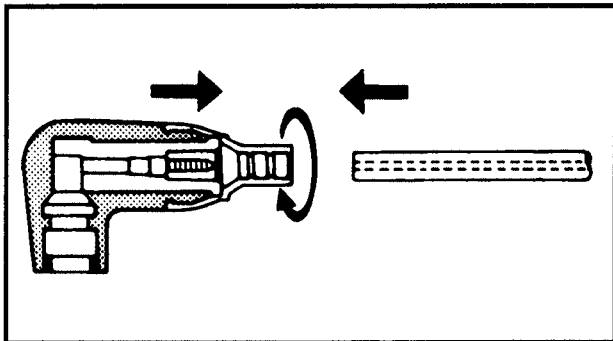


3. Measure:

- Pulser coil output peak voltage
Above specification → Replace the CDI unit.
Below specification → Replace the pulser coil.

	Pulser coil output peak voltage			
	White/red (W/R) – Black (B) White/black (W/B) – Black (B) White/yellow (W/Y) – Black (B) White/green (W/G) – Black (B) White/blue (W/L) – Black (B) White/brown (W/Br) – Black (B)			
r/min	Circuit	Loaded		
	Cranking	1,500	3,500	
V	3.0	3.0	16	

	Test harness (6-pin)
	YB-38832 / 90890-06772



INSPECTING THE SPARK PLUG CAPS

1. Inspect:

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

Replacement steps

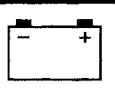
- (1) To remove the spark plug cap turn it counterclockwise.
- (2) To install the spark plug cap turn it clockwise until it is tight.

2. Measure:

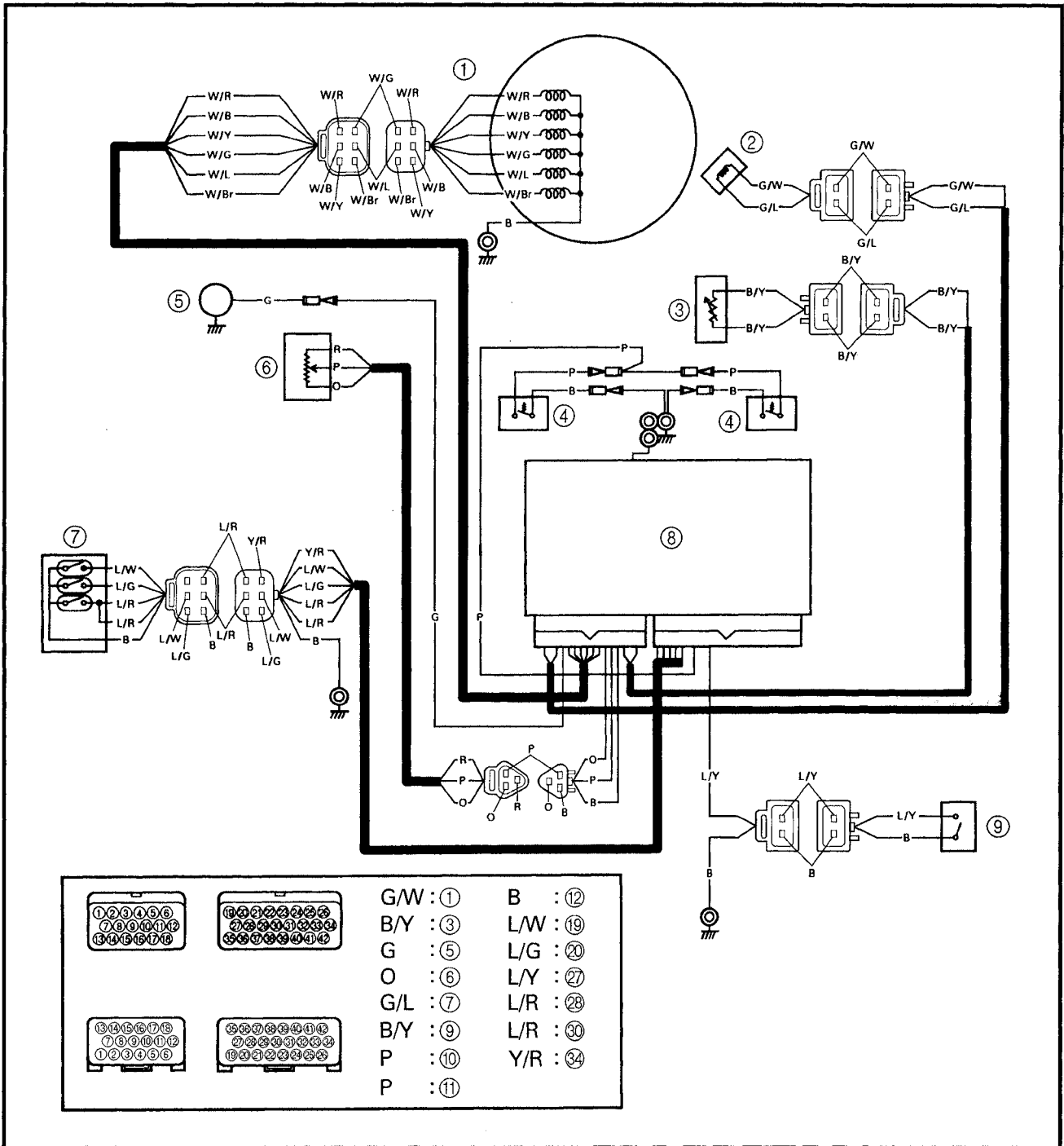
- Spark plug cap resistance
Out of specification → Replace.



Spark plug cap resistance
4.0 - 6.0 k Ω

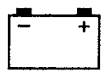


IGNITION CONTROL SYSTEM



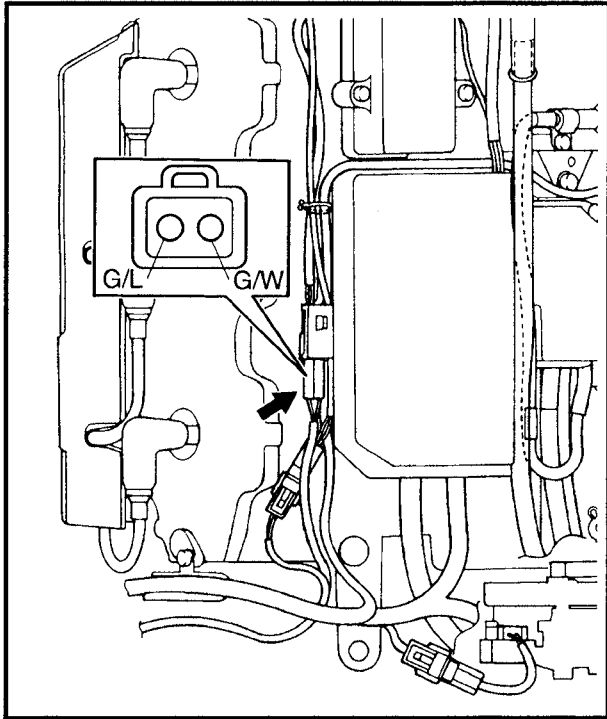
- ① Pulser coil
- ② Crank position sensor
- ③ Engine cooling water temperature sensor
- ④ Thermo switches
- ⑤ Knocking sensor
- ⑥ Throttle position sensor
- ⑦ Oil level sensor
- ⑧ CDI unit
- ⑨ Shift cutoff switch

- B : Black
- G : Green
- O : Orange
- P : Pink
- R : Red
- B/Y : Black/yellow
- G/L : Green/blue
- G/W : Green/white
- L/G : Blue/green
- L/R : Blue/red
- L/W : Blue/white
- L/Y : Blue/yellow
- R/B : Red/black
- W/B : White/black
- W/Br : White/brown
- W/G : White/green
- W/L : White/blue
- W/R : White/red
- W/Y : White/yellow
- Y/R : Yellow/red



**MEASURING THE PULSER COIL
OUTPUT PEAK VOLTAGE**

Refer to "MEASURING THE IGNITION SYSTEM PEAK VOLTAGE" on page 8-14.





**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/white (G/W) – Green/blue (G/L)				
r/min	Circuit	Loaded		
	Cranking	1,500	3,500	
V	6.0	0.5	3.0	4.0
 Test harness (2-pin) YB-06767 / 90890-06767				

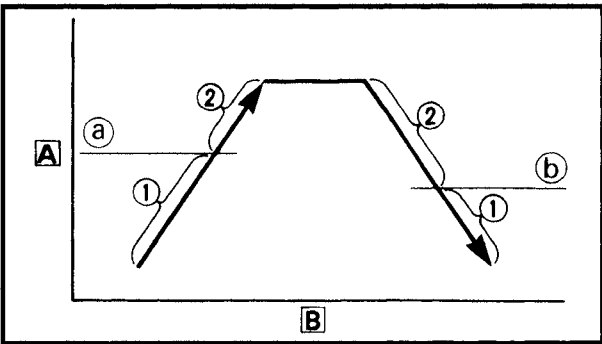
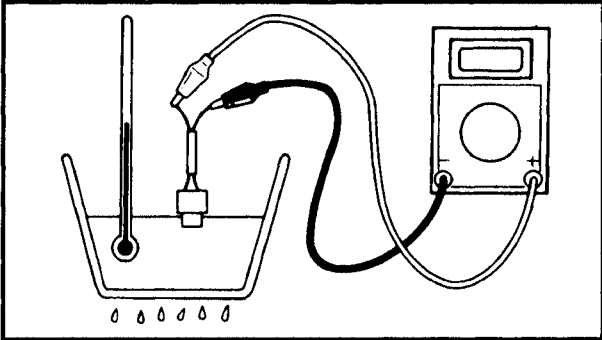
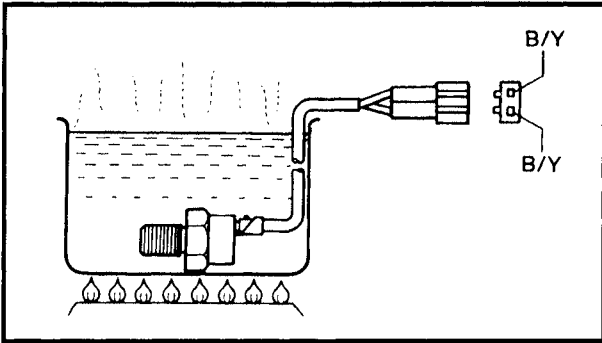
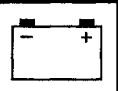
**MEASURING THE ENGINE COOLING
WATER TEMPERATURE SENSOR
RESISTANCE**

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

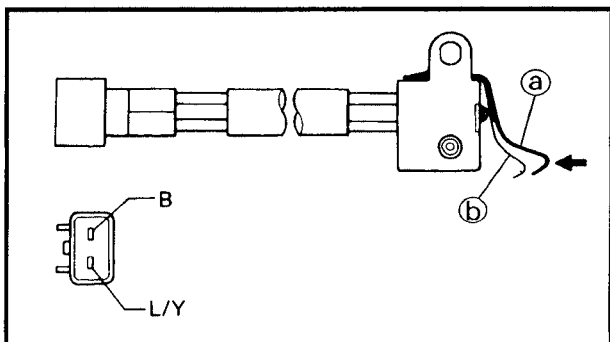
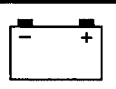
Ⓐ Temperature

② Continuity

Ⓑ 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.

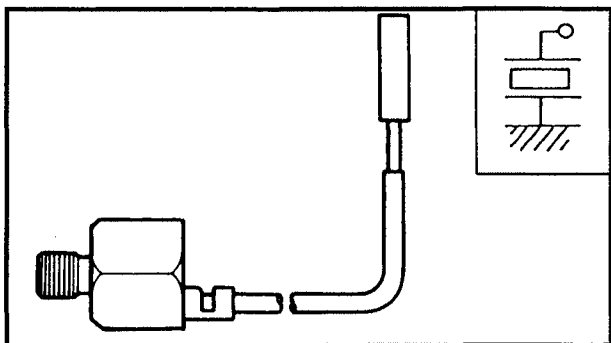


INSPECTING THE SHIFT CUTOFF SWITCH

- Inspect:
 - Shift cutoff switch continuity
 Out of specification → Replace.

 Switch position	Lead color
Home (a)	No continuity
On (b)	Continuity

- Inspect:
 - Shift cutoff switch
 Does not return to the home position
→ Replace.



INSPECTING THE KNOCKING SENSOR

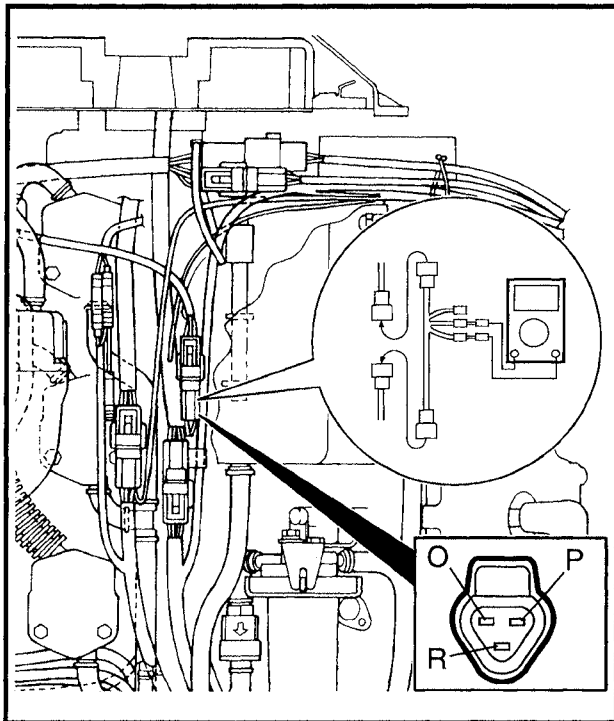
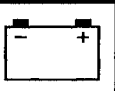
- Inspect:
- Knocking sensor output pulse
- No pulse output → Replace.

Inspecting steps

- Set the digital tester to the AC voltage mode.
- Connect the tester leads to the knocking sensor leads and the sensor body.
- Lightly tap the sensor and check that several millivolts are generated.

INSPECTING THE OIL LEVEL SENSOR CONTINUITY

Refer to “INSPECTING THE OIL LEVEL SENSOR/SWITCH CONTINUITY” on page 8-41.



MEASURING THE THROTTLE POSITION SENSOR OUTPUT VOLTAGE

Measure:

- Throttle position sensor output voltage

Out of specification → Check the CDI unit.



Throttle position sensor output voltage

Orange (O) – Pink (P)
0.48 - 5.25 V

Measuring steps

- (1) Connect the test harness (3-pin) as shown.



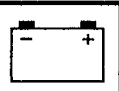
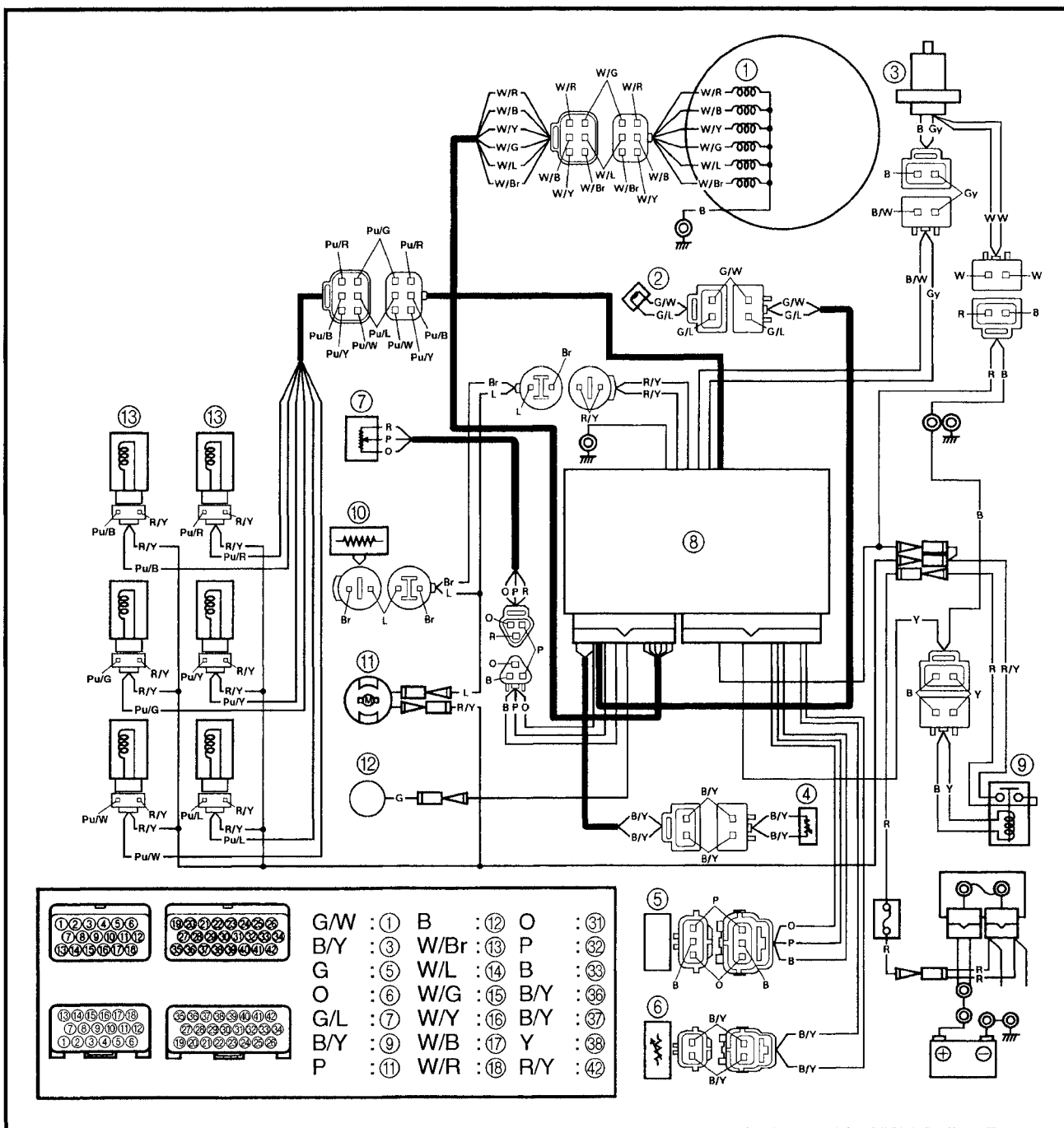
Test harness (3-pin)

YB-06443 / 90890-06757

- (2) Connect the battery leads to a 12-V battery.
- (3) Turn the engine switch to the on position.
- (4) Measure the throttle position sensor output voltage.

NOTE:

Make sure the throttle position sensor output voltage is within specification when the throttle is fully closed and fully opened.

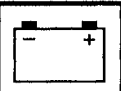
**FUEL CONTROL SYSTEM**

- ① Pulser coil
- ② Crank position sensor
- ③ Oxygen density sensor
- ④ Engine cooling water temperature sensor
- ⑤ Atmospheric pressure sensor
- ⑥ Intake air temperature sensor
- ⑦ Throttle position sensor
- ⑧ CDI unit

- ⑨ Main relay
 - ⑩ High-pressure fuel pump resistor
 - ⑪ High-pressure fuel pump
 - ⑫ Knocking sensor
 - ⑬ Fuel injectors
- B : Black
 Br : Brown
 Gy : Gray

- L : Blue
 O : Orange
 G : Green
 P : Pink
 R : Red
 Y : Yellow
 B/Y : Black/yellow
 B/W : Black/white
 G/L : Green/blue
 G/W : Green/white
 L/Y : Blue/yellow
 Pu/B : Purple/black

- Pu/G : Purple/green
 Pu/L : Purple/blue
 Pu/R : Purple/red
 Pu/W : Purple/white
 Pu/Y : Purple/yellow
 R/Y : Red/yellow
 W/B : White/black
 W/Br : White/brown
 W/G : White/green
 W/L : White/blue
 W/R : White/red
 W/Y : White/yellow

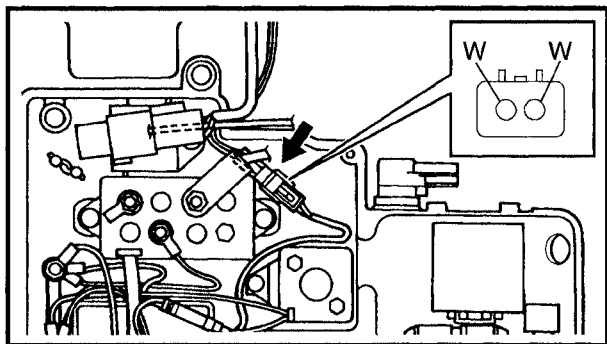


MEASURING THE PULSER COIL OUTPUT PEAK VOLTAGE

Refer to "MEASURING THE IGNITION
SYSTEM PEAK VOLTAGE" on
page 8-14.

MEASURING THE CRANK POSITION SENSOR OUTPUT PEAK VOLTAGE

Refer to "MEASURING THE CRANK
POSITION SENSOR OUTPUT PEAK
VOLTAGE" on page 8-18.



INSPECTING THE OXYGEN DENSITY SENSOR

1. Measure:

- Oxygen density sensor heater resistance
Out of specification → Replace.



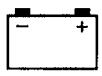
**Oxygen density sensor heater
resistance**
White (W) – White (W)
100 Ω

2. Measure:

- Oxygen density sensor output voltage
Out of specification → Replace.



**Oxygen density sensor output
voltage**
Gray (Gy) – Black (B)
0.0 - 1.0 V

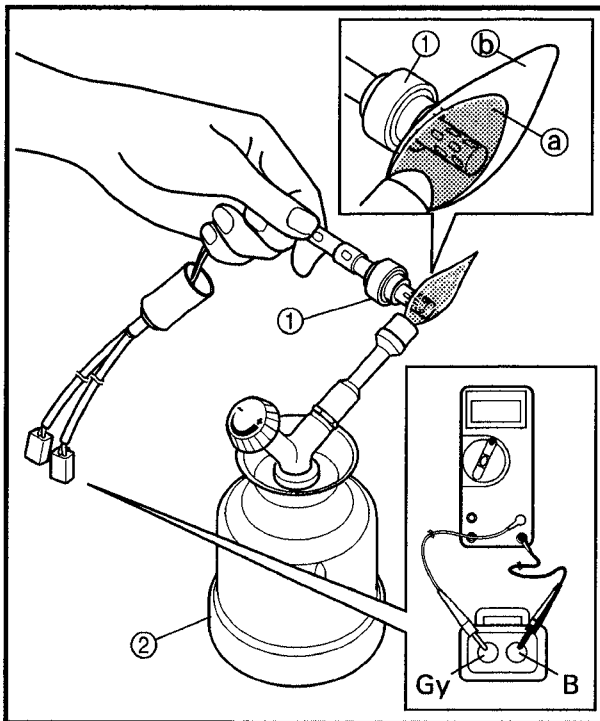


Measuring steps

⚠ WARNING

To prevent an explosion when performing this procedure, keep all flammable products (e.g., gasoline) away from the testing area and make sure there is proper ventilation.

- (1) Remove the oxygen density sensor. Refer to "OXYGEN DENSITY SENSOR" on page 5-26.
- (2) Remove any oil from the oxygen density sensor with acetone or a similar solvent and allow the sensor to thoroughly dry.
- (3) Heat the front end of the oxygen density sensor ① with a gas torch ② (in the center of its blue flame ③) for 10 - 15 seconds. Then, remove the oxygen density sensor from the flame and check the voltage change and time.

**CAUTION:**

- Do not heat the oxygen density sensor above 800 °C (1,472 °F) or continuously for more than 1 minute at a time or the sensor will be damaged.
 - Do not use a burner with an oxygen tank. The sensor may be damaged by a flame of high temperature.
- ③ Inner cone
④ Outer cone

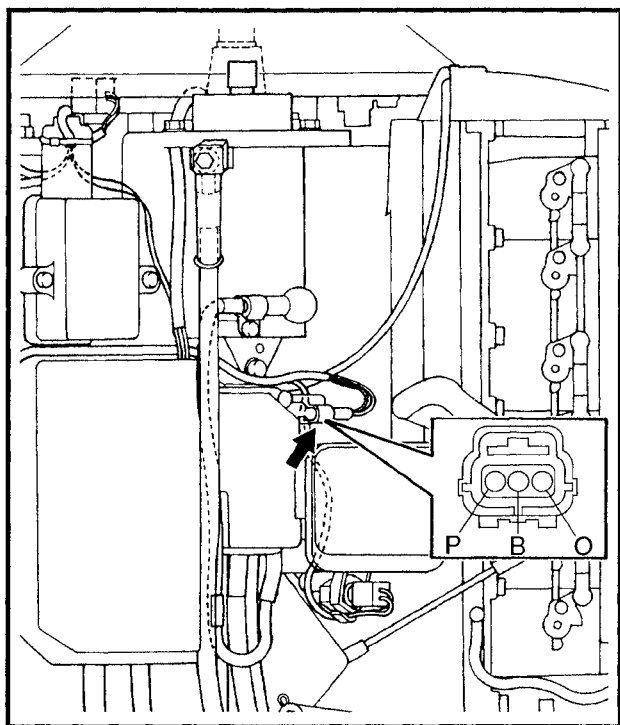
NOTE:

If the instantaneous change in the output voltage is 0.6 V or greater the oxygen density sensor is OK.



MEASURING THE ENGINE COOLING WATER TEMPERATURE SENSOR RESISTANCE

Refer to "MEASURING THE ENGINE COOLING WATER TEMPERATURE SENSOR RESISTANCE" on page 8-18.



INSPECTING THE ATMOSPHERIC PRESSURE SENSOR

Measure:

- Atmospheric pressure sensor output voltage

Out of specification → Replace.



Atmospheric pressure sensor output voltage
Pink (P) – Black (B)
3.2 - 4.6 V

Measuring steps

- (1) Connect the test harness between the atmospheric pressure sensor and the wire harness as shown.



Test harness (3-pin)
YB-06769 / 90890-06769

- (2) Turn the engine start switch to the on position.
- (3) Measure the atmospheric pressure sensor output voltage.

INSPECTING THE INTAKE AIR TEMPERATURE SENSOR

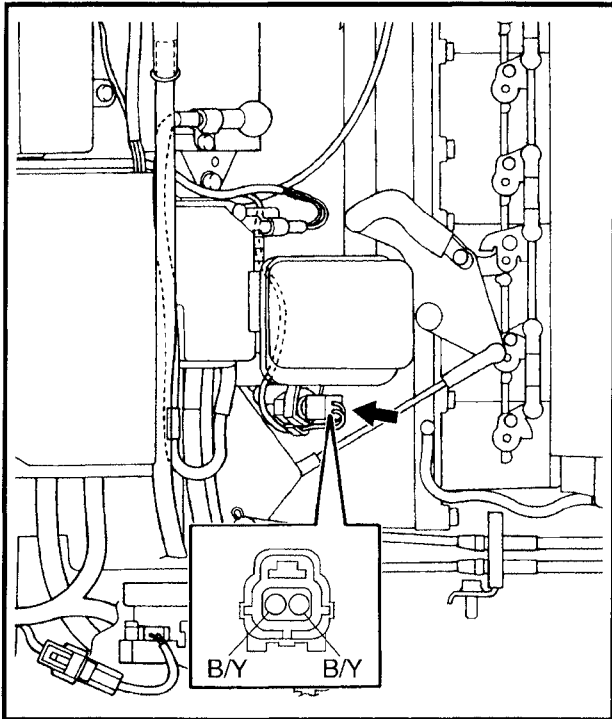
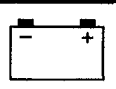
Measure:

- Intake air temperature sensor output voltage

Out of specification → Replace.



Intake air temperature sensor output voltage
Black/yellow (B/Y) –
Black/yellow (B/Y)
3.4 - 5.3 V at 20°C (68°F)

**Measuring steps**

(1) Connect the test harness (2-pin) as shown.



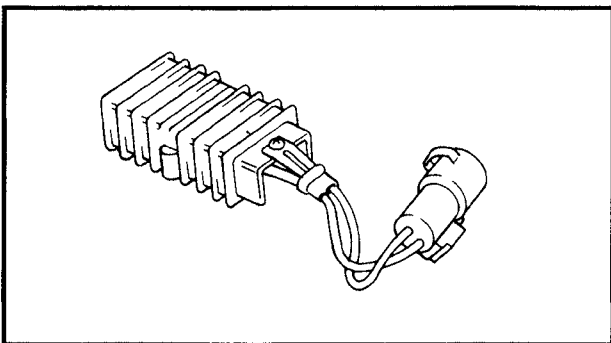
Test harness (2-pin)
YB-06768 / 90890-06768

(2) Turn the engine start switch to the on position.

(3) Measure the intake air temperature sensor output voltage.

MEASURING THE THROTTLE POSITION SENSOR OUTPUT VOLTAGE

Refer to "MEASURING THE THROTTLE POSITION SENSOR OUTPUT VOLTAGE" on page 8-21.



MEASURING THE HIGH-PRESSURE FUEL PUMP RESISTOR RESISTANCE

Inspect:

- High-pressure fuel pump resistor resistance

Out of specification → Replace.



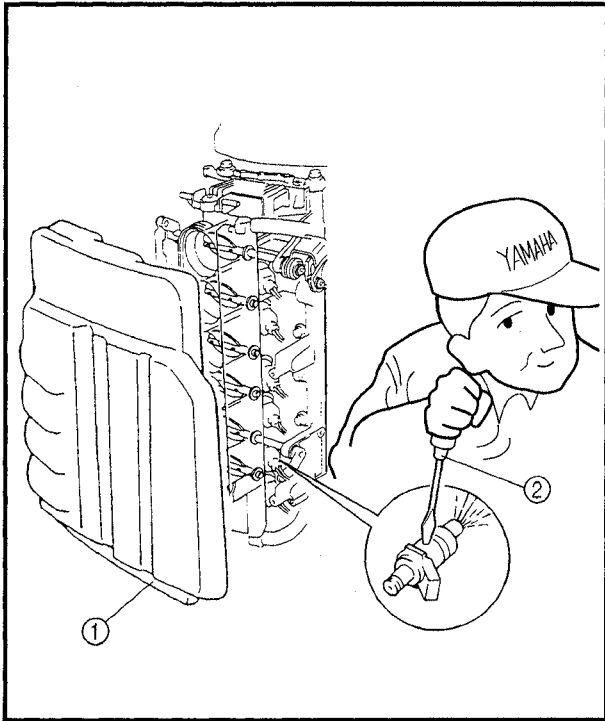
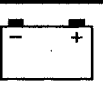
High-pressure fuel pump resistor resistance

Brown (Br) – Blue (L)

0.53 - 0.57 Ω

INSPECTING THE KNOCKING SENSOR

Refer to "INSPECTING THE KNOCKING SENSOR" on page 8-20.



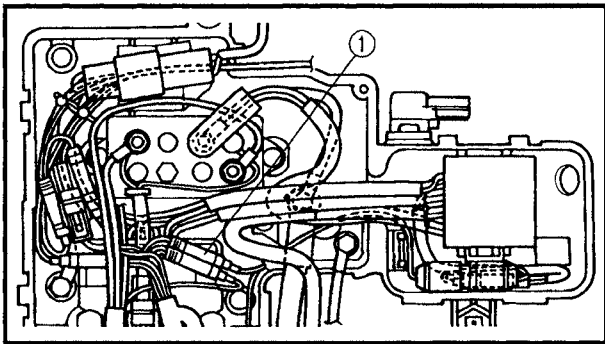
INSPECTING THE FUEL INJECTORS

1. Inspect:

- Fuel injector operating sound
No sound (no fuel is being sprayed) → Inspect the high-pressure fuel pump.

Inspecting steps

- (1) Remove the intake silencer ①.
- (2) Start the engine.
- (3) Fully close the throttle valves.
- (4) Attach the screwdriver ② onto the fuel injector body and check if all of the fuel injectors have a solenoid valve operating sound.

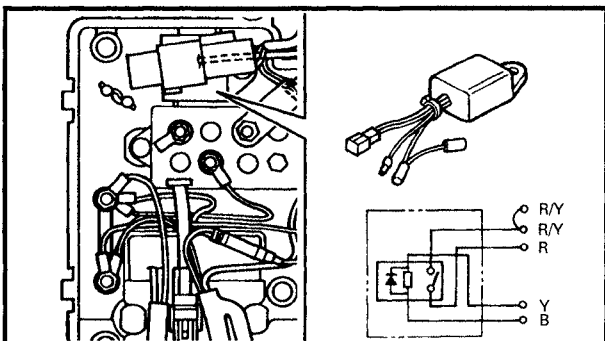


2. Inspect:

- High-pressure fuel pump operating sound
Correct → Replace the fuel injector (no sound).
No sound → Inspect the main relay.

NOTE:

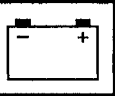
- The high-pressure fuel pump should sound when the engine start switch is turned on.
- Disconnect the Brown (Br) starter relay lead ① to prevent the engine from starting.



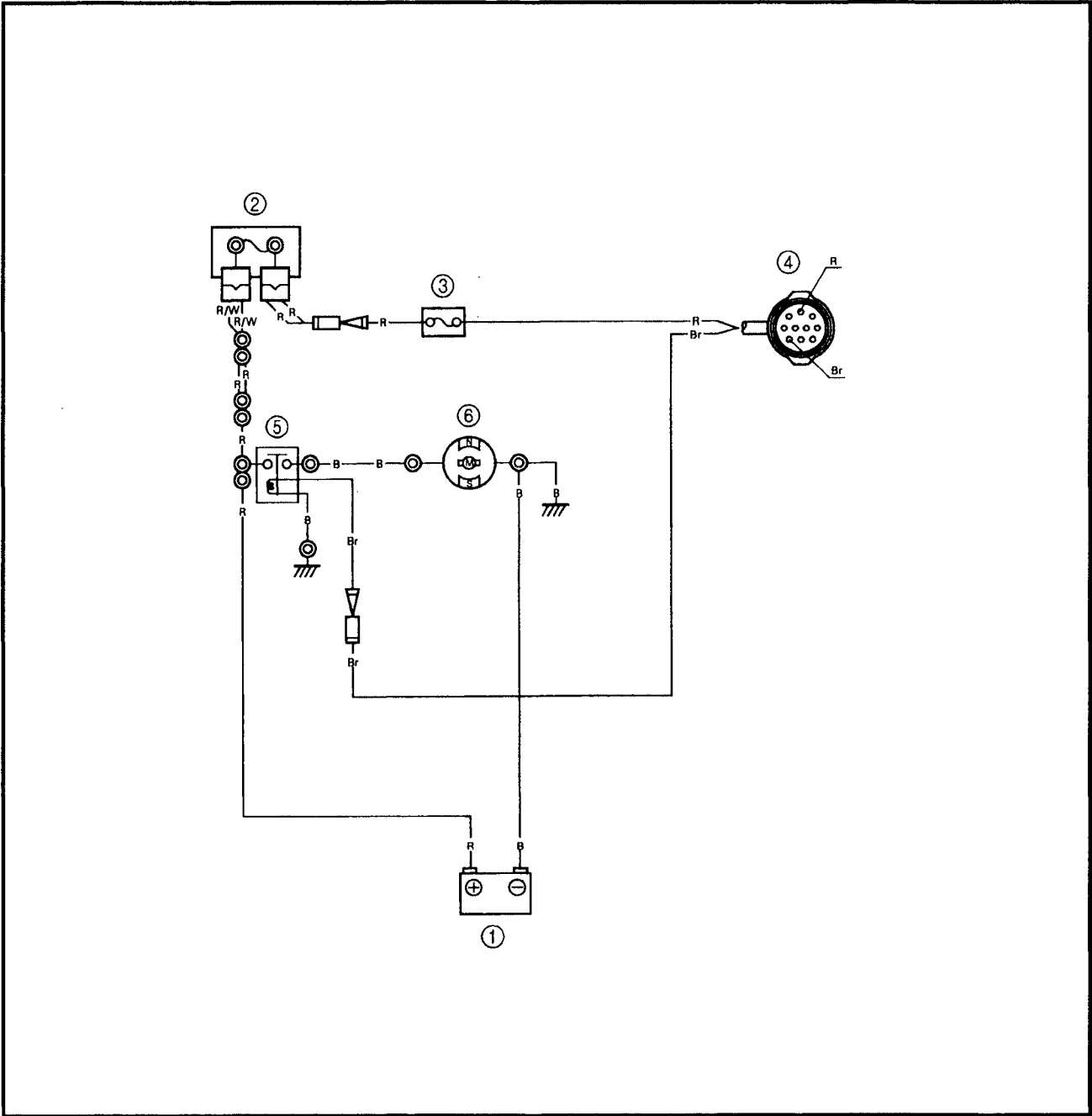
3. Inspect:

- Main relay continuity
Correct → Replace the high-pressure fuel pump.
Out of specification → Replace the main relay.

Engine start switch	Lead color	
	Red (R)	Red/yellow (R/Y)
OFF		
ON	○	○

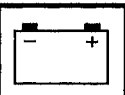


STARTING SYSTEM



- ① Battery
- ② Fuse (80A)
- ③ Fuse (30A)
- ④ 10P connector
- ⑤ Starter relay
- ⑥ Starter motor

- B : Black
- Br : Brown
- R : Red
- R/W : Red/white



INSPECTING THE BATTERY

Refer to "INSPECTING THE BATTERY" on page 3-17.

INSPECTING THE FUSES

1. Inspect:

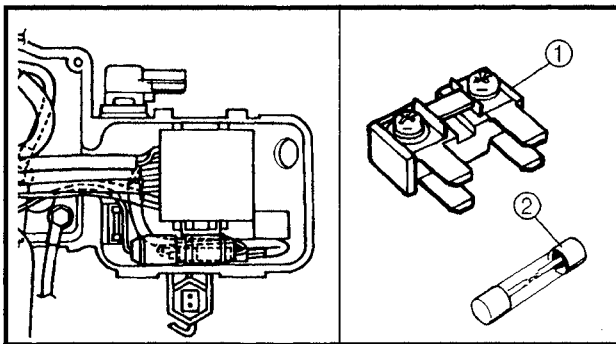
- Fuse holder continuity
No continuity → Check the fuse holder leads.

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
	①: 12 V - 80 A
	②: 12 V - 30 A

INSPECTING THE WIRE HARNESS CONTINUITY

Inspect:

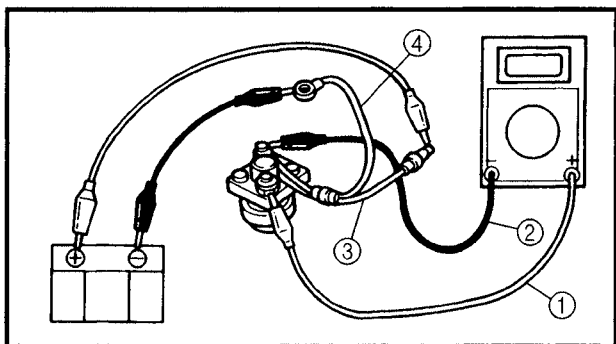
- Wire harness continuity
No continuity → Replace.



INSPECTING THE WIRE CONNECTIONS

Inspect:

- Wire connections
- Poor connection → Properly connect.



INSPECTING THE STARTER RELAY

Inspect:

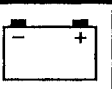
- Starter relay continuity
- No continuity → Replace.

Inspecting steps

- (1) Connect the tester and battery between the starter relay terminals.

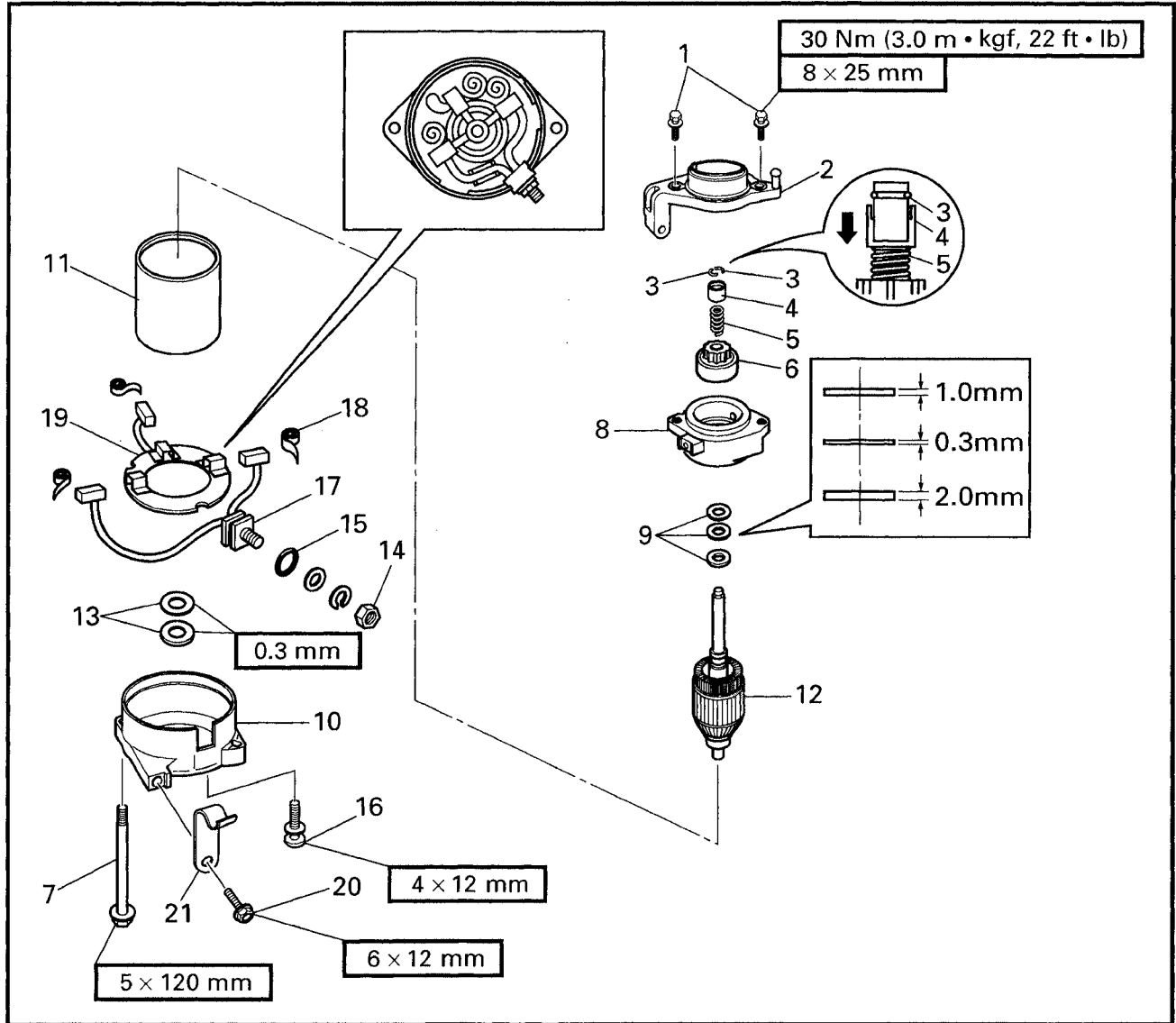
**Positive digital tester probe ① →
Starter relay terminal**
**Negative digital tester probe ② →
Starter relay terminal**
**Positive battery terminal →
Brown lead ③**
**Negative battery terminal →
Black lead ④**

- (2) Inspect that there is continuity between the starter relay terminals.



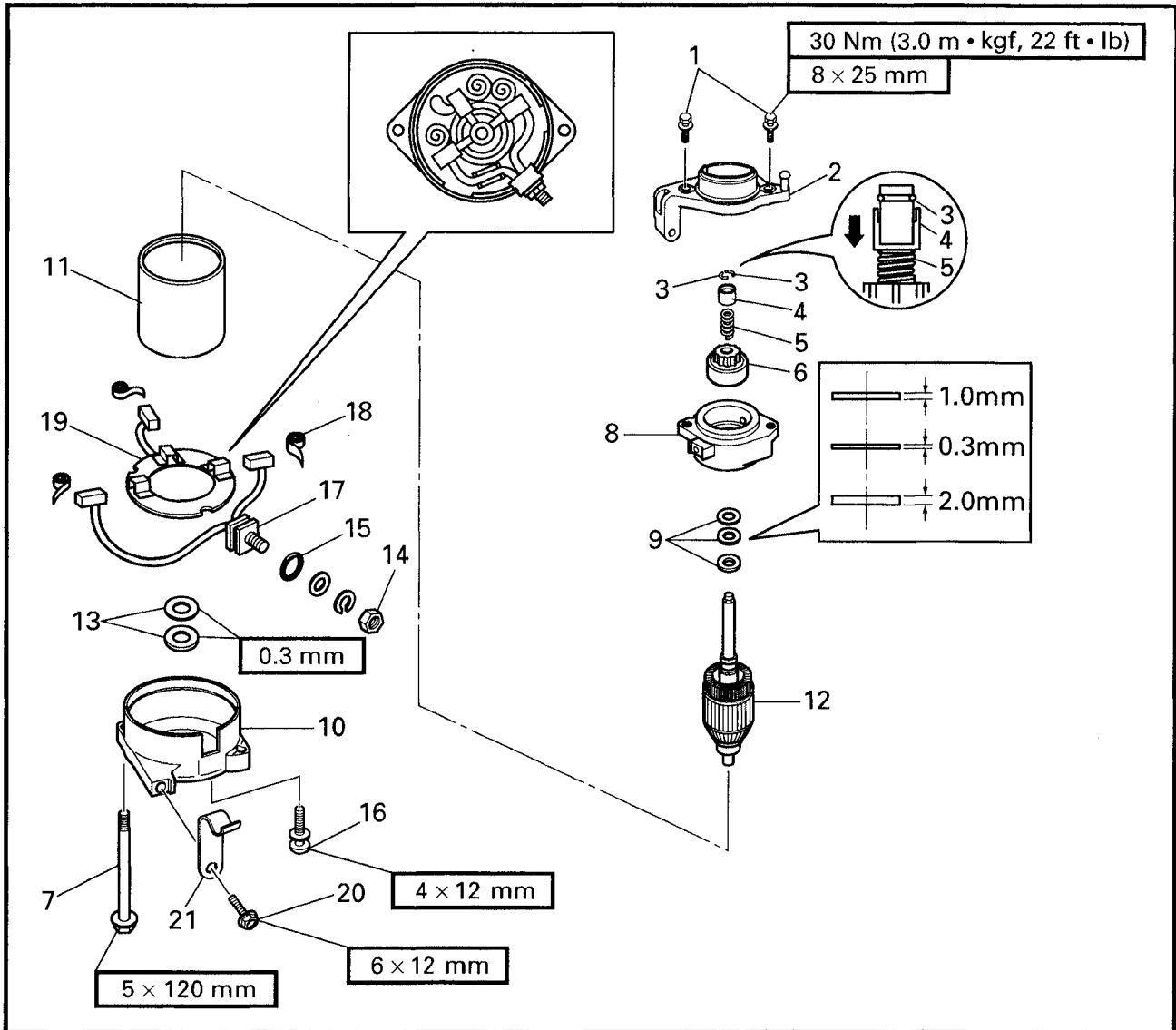
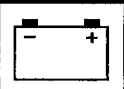
STARTER MOTOR

DISASSEMBLING/ASSEMBLING THE STARTER MOTOR



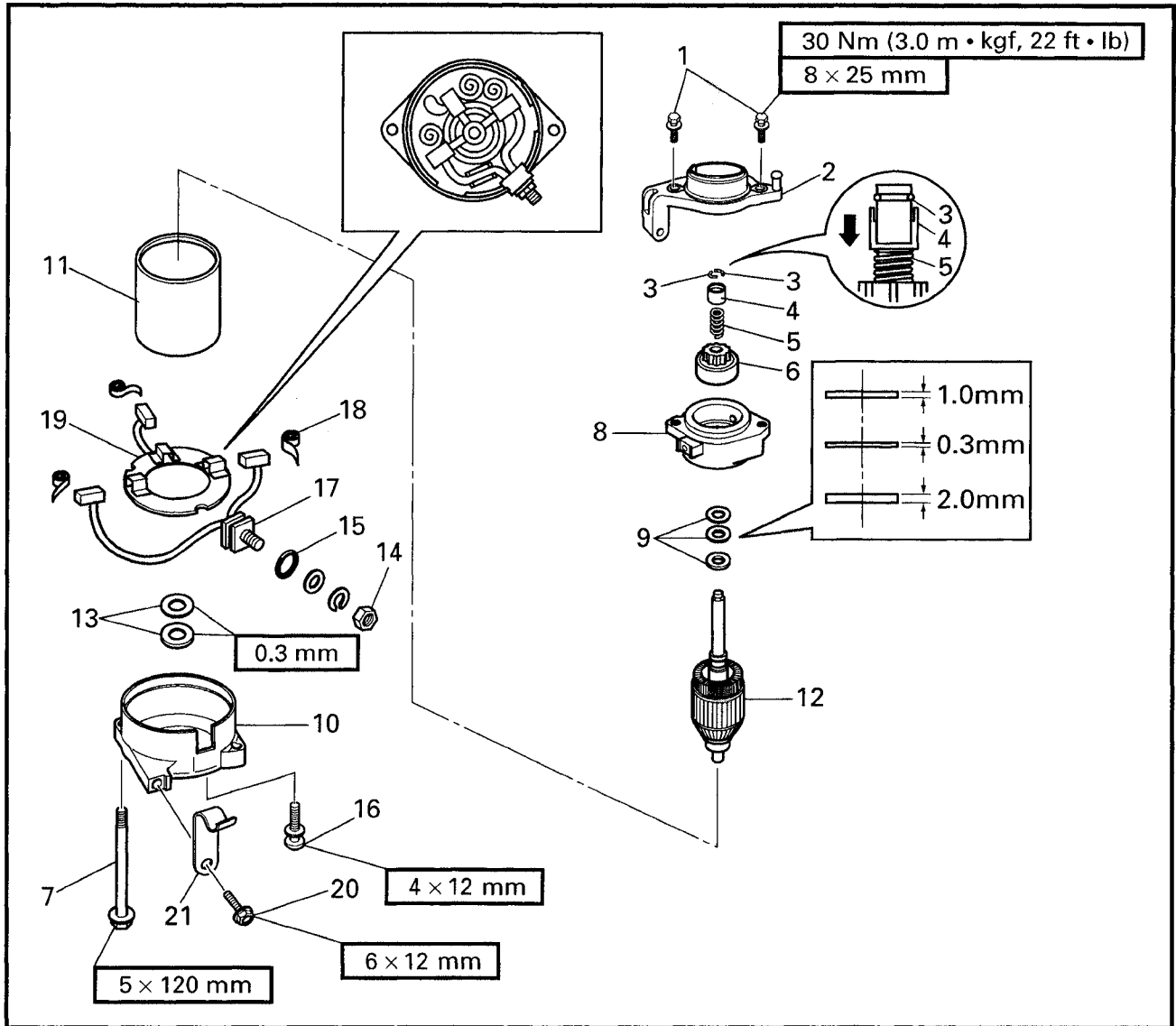
Order	Job/Part	Q'ty	Remarks
	Starter motor		Refer to "STARTER MOTOR" on page 5-25.
1	Bolt	2	
2	Starter motor bracket	1	
3	Clip	2	
4	Starter motor pinion stopper	1	
5	Spring	1	
6	Starter motor pinion	1	

Continued on next page.

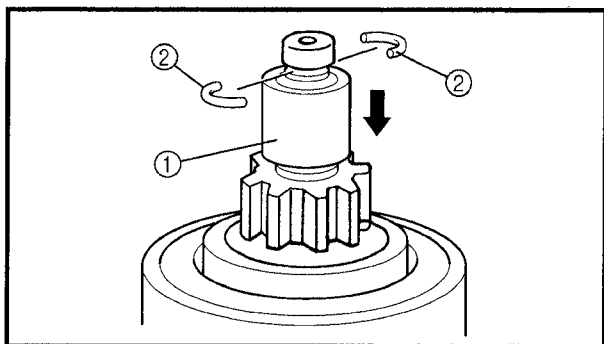
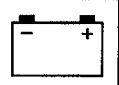


Order	Job/Part	Q'ty	Remarks
7	Bolt	2	
8	Upper cover	1	
9	Washer	3	
10	Lower bracket	1	
11	Stator	1	
12	Armature	1	
13	Washer	2	
14	Nut	1	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
15	O-ring	1	
16	Screw	2	
17	Brush assembly	1	
18	Spring	3	
19	Brush holder	1	
20	Bolt	1	
21	Clamp	1	
			For assembly, reverse the disassembly procedure.



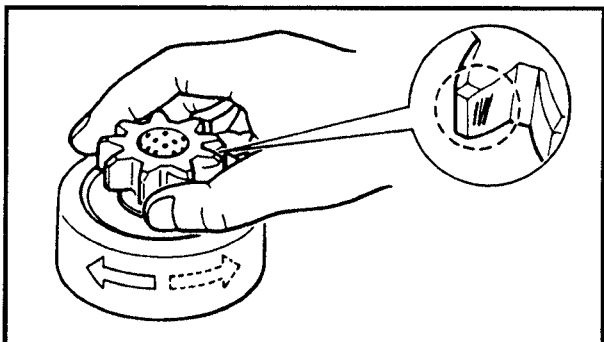
REMOVING THE STARTER MOTOR PINION

Remove:

- Clips ②

NOTE:

Slide the pinion stopper ① down as shown and then remove the clips ②.



INSPECTING THE STARTER MOTOR PINION

1. Inspect:

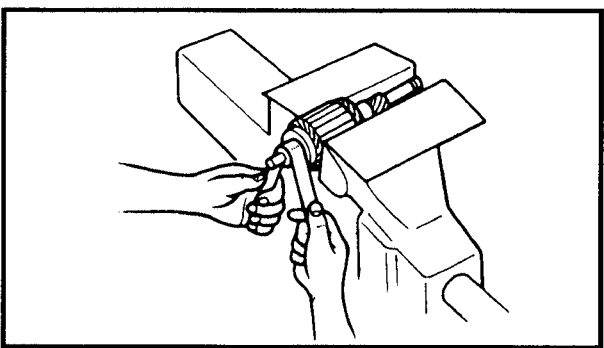
- Starter motor pinion teeth
Damage/wear → Replace.

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.



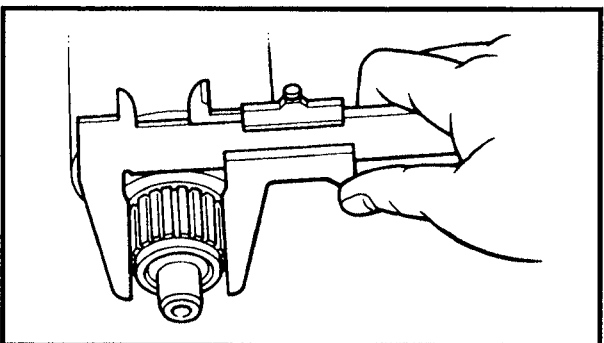
INSPECTING THE ARMATURE

1. Inspect:

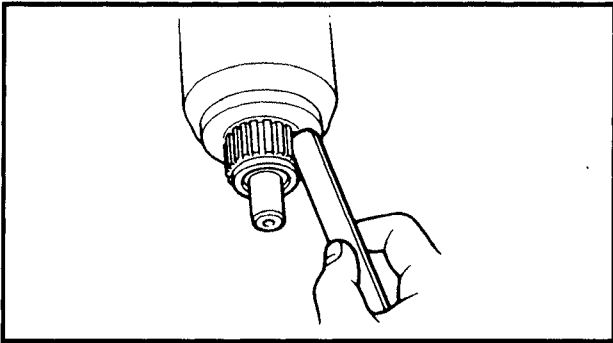
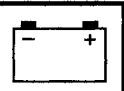
- Commutator
Foreign matter → Clean.
(with 600 grit sandpaper)

2. Measure:

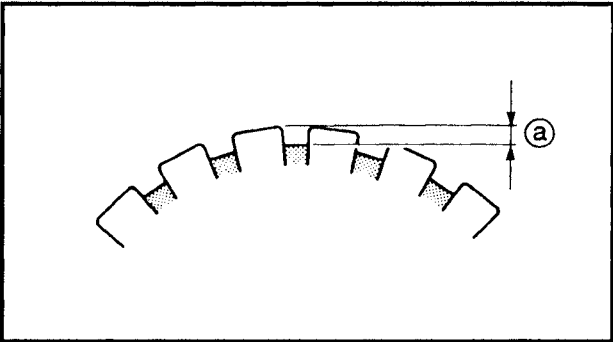
- Commutator diameter
Out of specification → Replace.



**Commutator diameter limit
31.0 mm (1.22 in)**

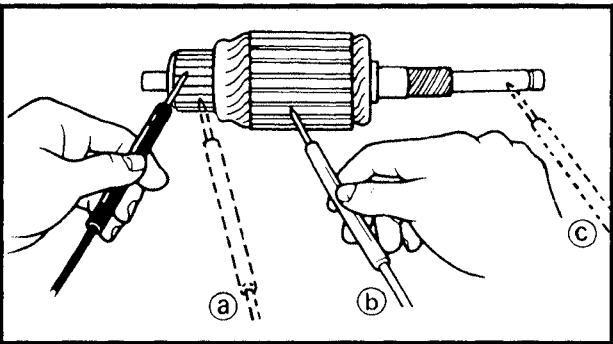


3. Inspect:
- Commutator undercut
Dirt/foreign matter → Clean.
(with compressed air)



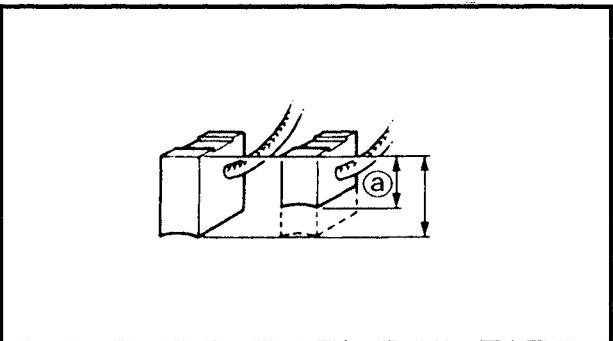
4. Measure:
- Commutator undercut (a)
Out of specification → Replace the armature.

	Commutator undercut limit 0.2 mm (0.01 in)
--	--



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

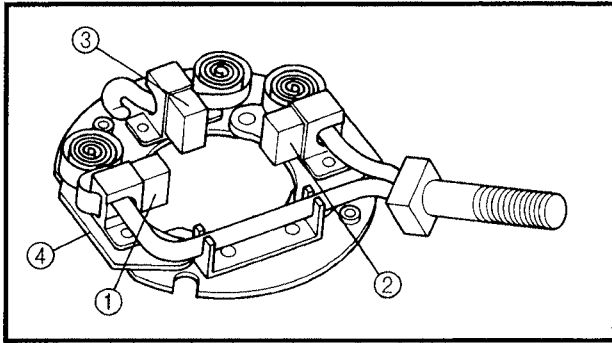
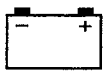
Armature continuity	
Commutator segments (a)	Continuity
Segment – Armature core (b)	No continuity
Segment – Armature shaft (c)	No continuity



MEASURING THE BRUSHES

1. Measure:
- Brush length (a)
Out of specification → Replace the brush assembly.


	Brush length limit 12.0 mm (0.47 in)
--	--

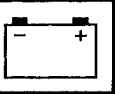


2. Inspect:

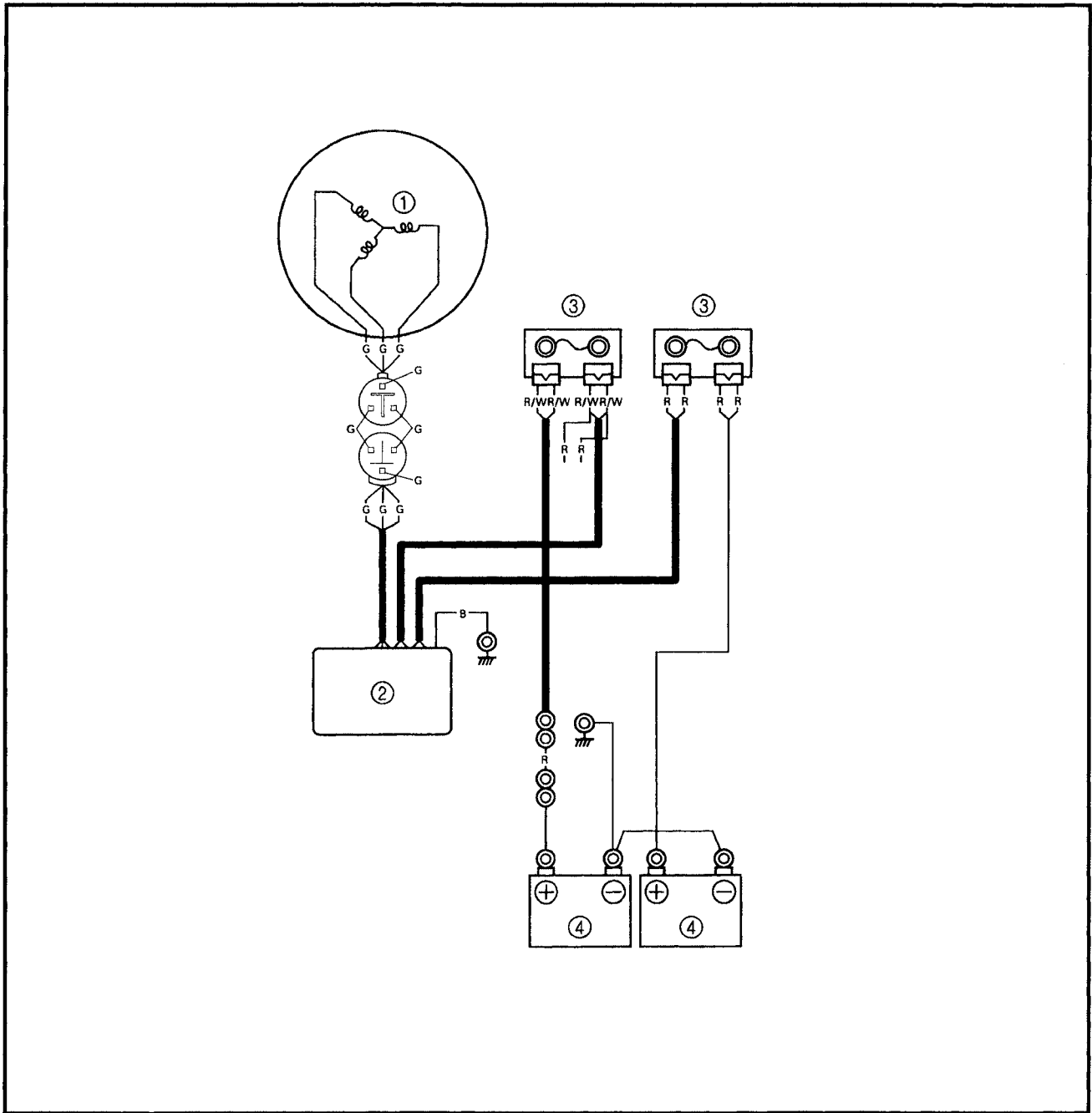
- Brush assembly continuity

Out of specification → Replace the brush assembly.

 Brush assembly continuity	
Brush ① – Brush ②	Continuity
Brush ① – Brush ③	No continuity
Brush ② – Brush ③	
Brush ①, ②, ③) – Brush assembly holder ④	

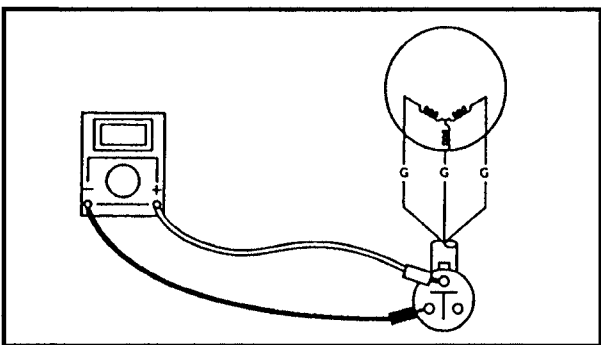
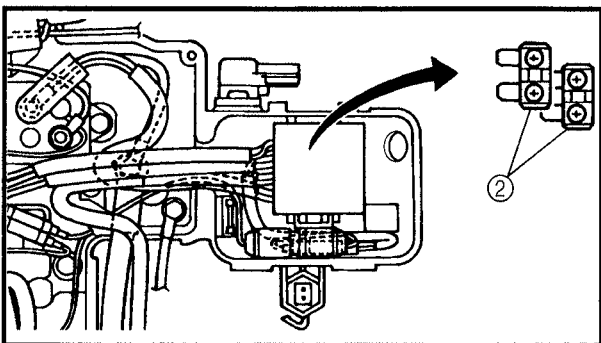
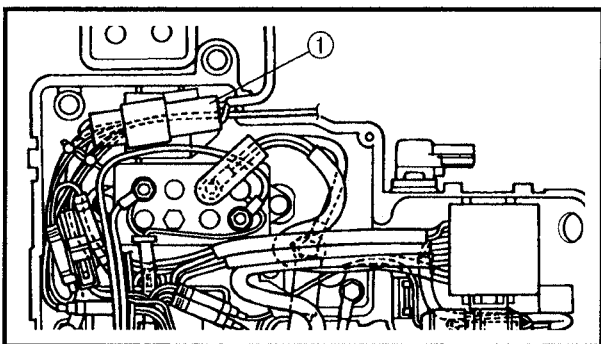
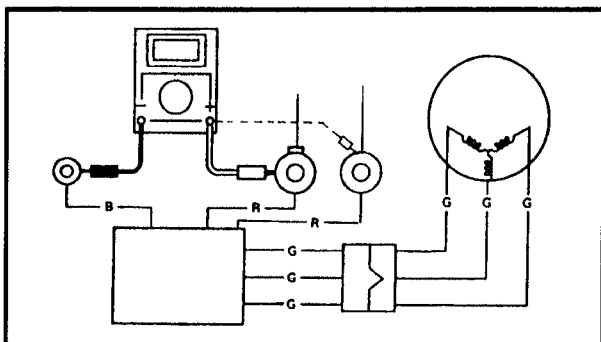


CHARGING SYSTEM



- ① Lighting coil
- ② Rectifier/regulator
- ③ Fuses (80A)
- ④ Battery



- B : Black
- G : Green
- R : Red
- R/W : Red/white



**MEASURING THE RECTIFIER/
REGULATOR OUTPUT PEAK
VOLTAGE**

Measure:

- Rectifier/regulator output peak voltage
Below specification → Check the lighting coil.

 Rectifier/regulator output peak voltage Red (R) – Black (B)				
r/min	Circuit	Loaded		
	Cranking	1,500	3,500	
V	—	12	12	
 Test harness (3-pin) YB-06770 / 90890-06770				



NOTE:

Before measuring the rectifier/regulator output peak voltage, disconnect the lighting coil coupler ① and remove the fuses ②.

**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.

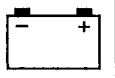
 Lighting coil output peak voltage Green (G) – Green (G)				
r/min	Circuit	Loaded		
	Cranking	1,500	3,500	
V	—	14	14	
 Test harness (3-pin) YB-06770 / 90890-06770				

**INSPECTING THE FUSES**

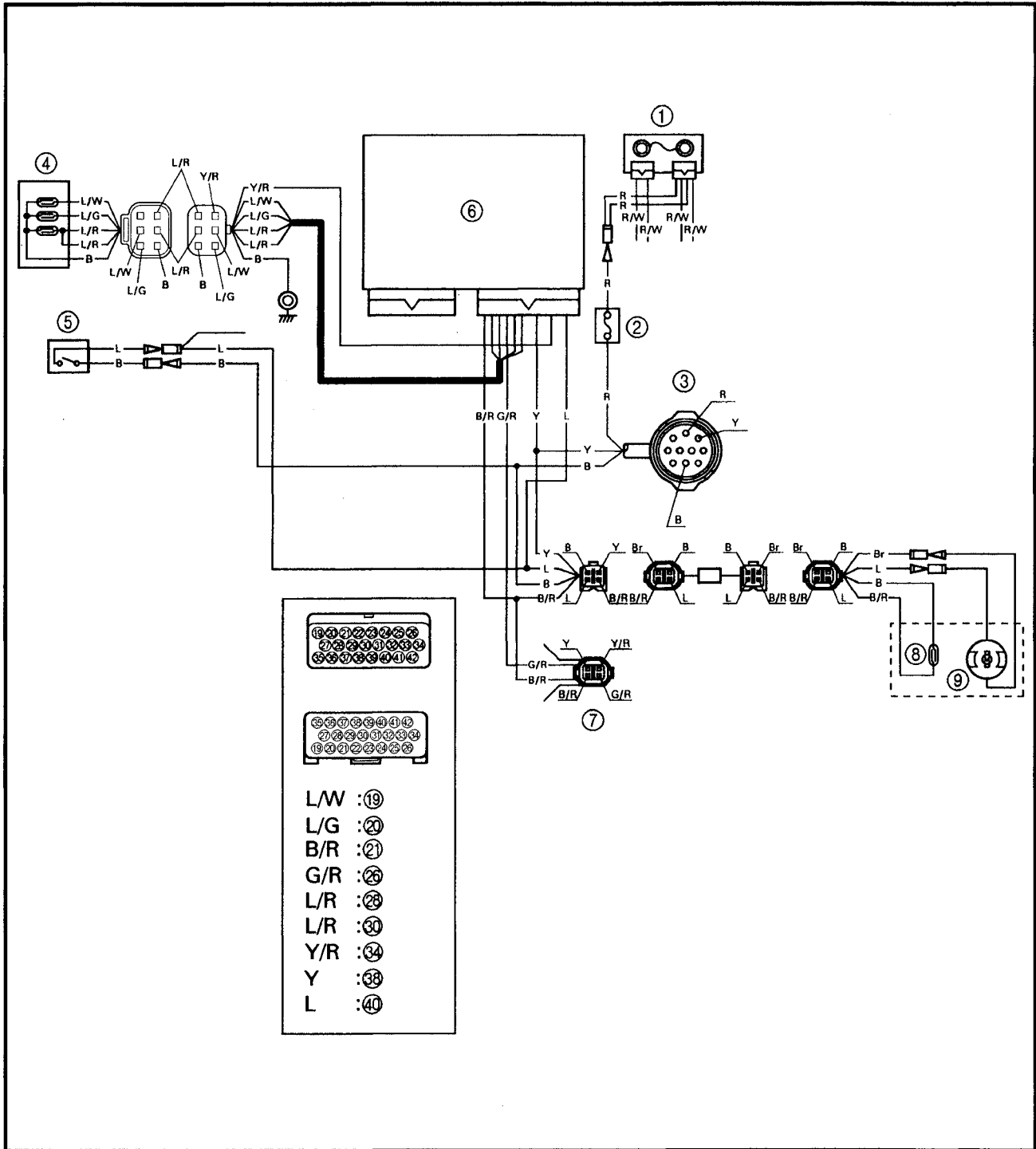
Refer to "INSPECTING THE FUSES" on page 8-29.

INSPECTING THE BATTERY

Refer to "INSPECTING THE BATTERY" on page 3-17.



OIL FEED PUMP CONTROL SYSTEM

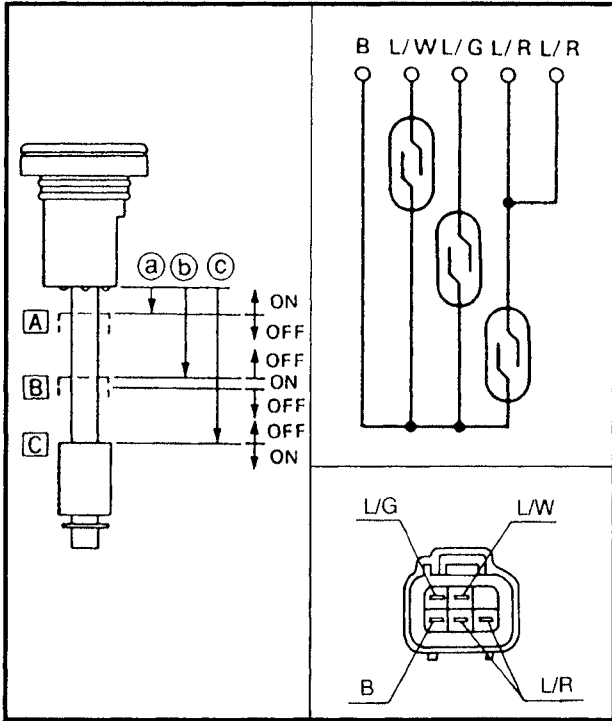


- | | | |
|-----------------------------------|------------------|------------------|
| ① Fuse (80A) | B : Black | L/W : Blue/white |
| ② Fuse (30A) | Br : Brown | R/W : Red/white |
| ③ 10P connector | L : Blue | Y/R : Yellow/red |
| ④ Oil level sensor | R : Red | |
| ⑤ Emergency switch | Y : Yellow | |
| ⑥ CDI unit | B/R : Black/red | |
| ⑦ 4P coupler | G/R : Green/red | |
| ⑧ Oil level switch (sub-oil tank) | L/G : Blue/green | |
| ⑨ Oil pump (sub-oil tank) | L/R : Blue/red | |



INSPECTING THE FUSES

Refer to "INSPECTING THE FUSES" on page 8-29.



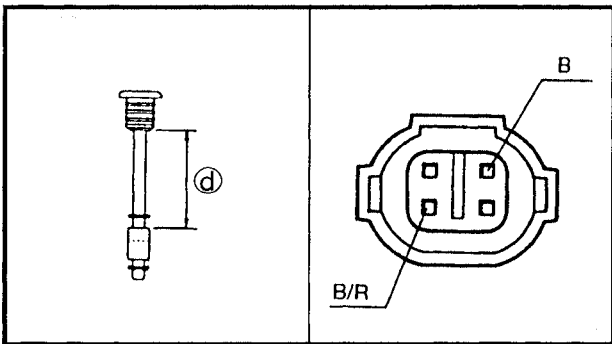
INSPECTING THE OIL LEVEL SENSOR/SWITCH CONTINUITY

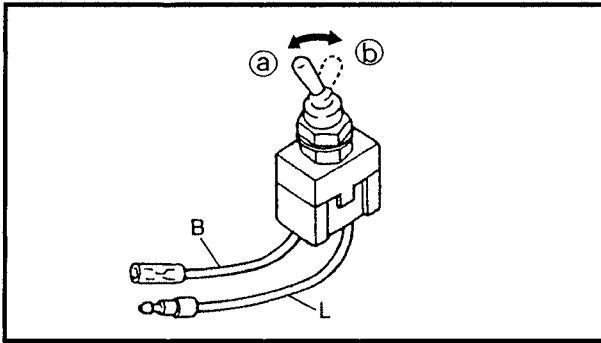
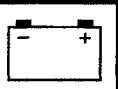
Inspect:

- Oil level sensor/switch 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
a: 2.5 - 5.5 mm (0.10 - 0.22 in)
b: 32.5 - 35.5 mm (1.28 - 1.40 in)
c: 76 - 79 mm (2.99 - 3.11 in)
d: 150 - 153 mm (5.91 - 6.02 in)



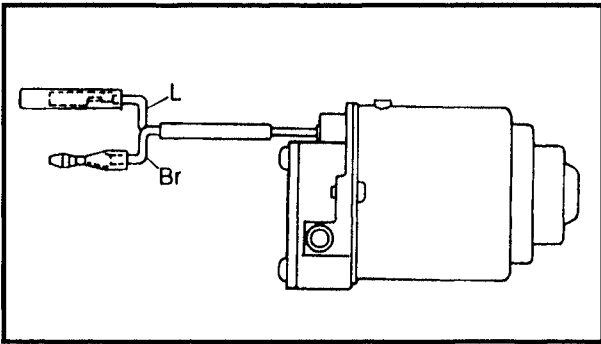


INSPECTING THE EMERGENCY SWITCH

1. Inspect:
- Emergency switch continuity
- Out of specification → Replace.

	Switch position	Lead color
		Blue (L) – Black (B)
	Home (a)	No continuity
	On (b)	Continuity

2. Inspect:
- Emergency switch
- Does not automatically return to the home position → Replace.

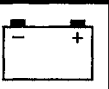


INSPECTING THE OIL PUMP (SUB-OIL TANK)

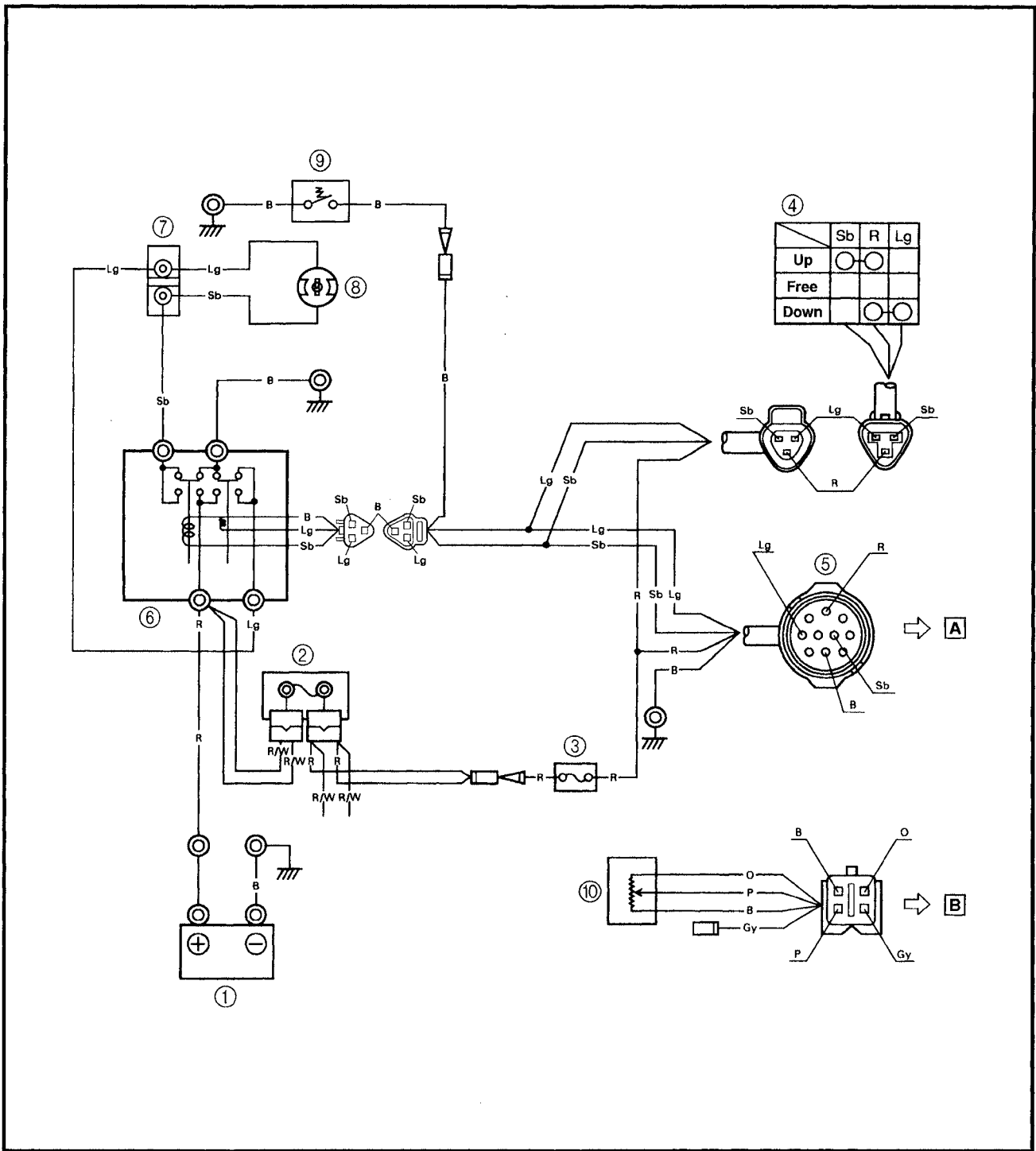
- Inspect:
- Oil pump (sub-oil tank)
- Incorrect operation → Replace.

NOTE: _____
 Connect the oil pump leads to a 12-V battery and make sure the oil pump operates properly.

Blue (L) lead → Positive battery terminal
Brown (Br) lead → Negative battery terminal



POWER TRIM AND TILT SYSTEM



	Sb	R	Lg
Up	○	○	
Free			
Down	○	○	

- ① Battery
- ② Fuse (80A)
- ③ Fuse (30A)
- ④ Trailer switch
- ⑤ 10P connector
- ⑥ Power trim and tilt relay
- ⑦ Terminal
(for 200H, 225G/V200, V225)
- ⑧ Power trim and tilt motor

- ⑨ Thermo switch
(except for 200H, 225G/V200, V225)
- ⑩ Trim sensor
- [A] To remote control
- [B] To trim meter

- B : Black
- Gy : Gray
- Lg : Light green
- O : Orange
- P : Pink
- R : Red
- Sb : Sky blue
- R/W : Red/white
- P/B : Pink/black

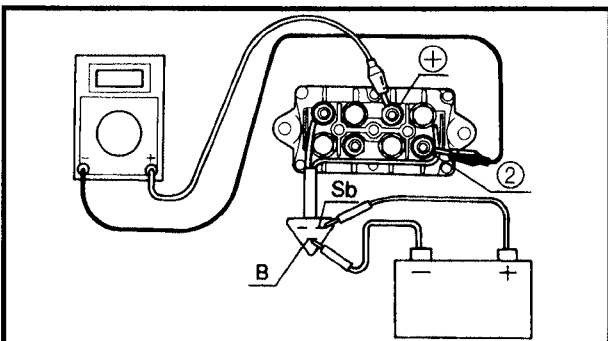
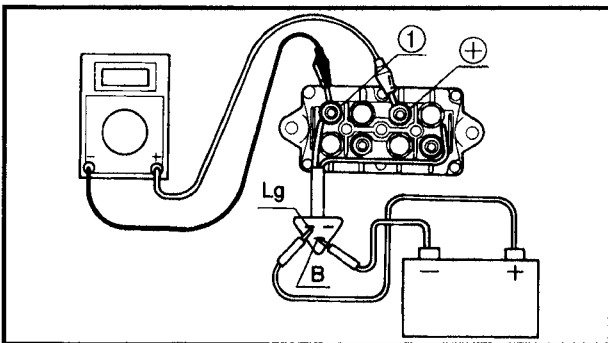
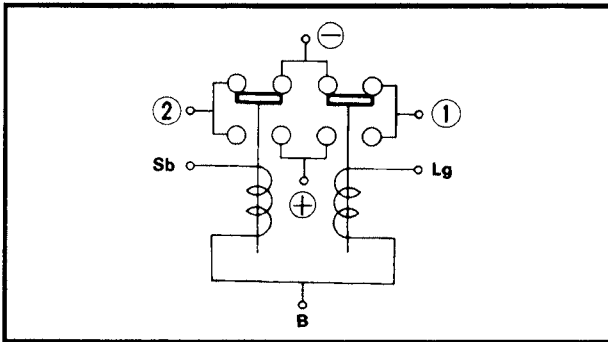
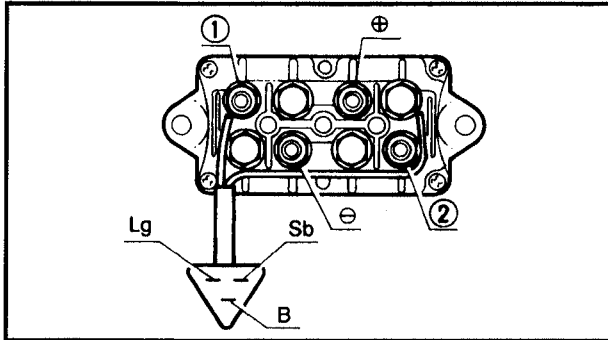


INSPECTING THE FUSES

Refer to "INSPECTING THE FUSES" on page 8-29.

INSPECTING THE BATTERY

Refer to "INSPECTING THE BATTERY" on page 3-17.



INSPECTING THE POWER TRIM AND TILT RELAY

1. Inspect:

- Power trim and tilt relay continuity
- Out of specification → Replace.

Power trim and tilt relay continuity	
Sky blue (Sb) – Black (B)	Continuity
Light green (Lg) – Black (B)	
Terminal ① – Terminal ⊖	Continuity
Terminal ② – Terminal ⊖	
Terminal ① – Terminal ⊕	No continuity
Terminal ② – Terminal ⊕	

2. Inspect:

- Power trim and tilt relay operation
- No continuity → Replace.

Inspecting steps

(1) Connect the digital tester between power trim and tilt relay terminals ① and ⊕.

(2) Connect a 12-V battery as shown.

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

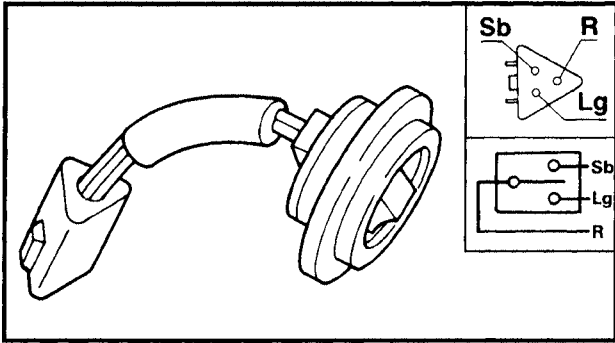
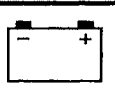
(3) Check that there is continuity between the power trim and tilt relay terminals.

(4) Connect the digital tester between power trim and tilt relay terminals ⊕ and ②.

(5) Connect a 12-V battery as shown.

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

(6) Check that there is continuity between the power trim and tilt relay terminals.




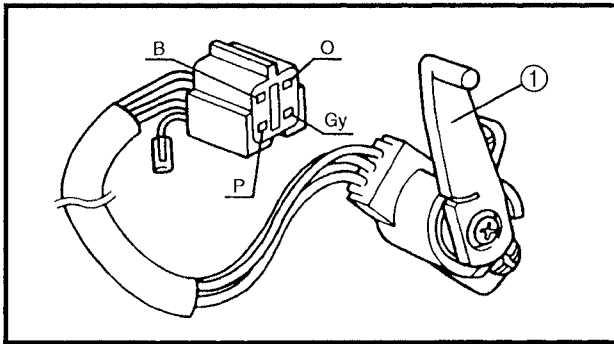
INSPECTING THE TRAILER SWITCH CONTINUITY

Inspect:

- Trailer switch continuity

Out of specification → Replace.

 Switch position	Lead color		
	Skyblue (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)
 225F, L225F, 250B, L250B/
 S225, L225, S250, L250:
 494 - 742 Ω at 20 °C (68 °F)

200H, 225G/V200, V225:
 582 - 873 Ω at 20 °C (68 °F)

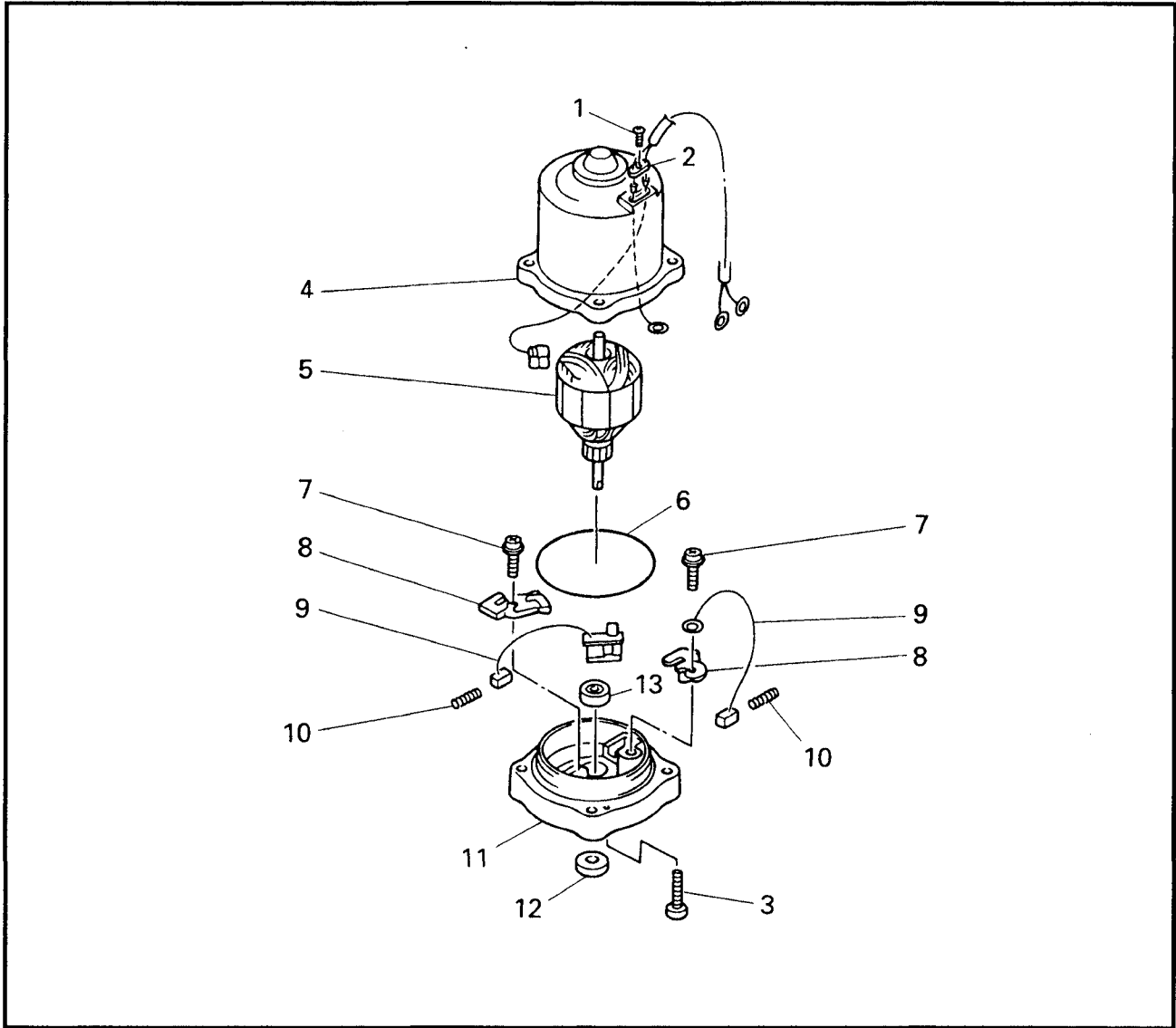
Orange (O) – Black (B)
 800 - 1,200 Ω at 20 °C (68 °F)

NOTE: _____
 Turn the lever ① and measure the resistance as it gradually changes.

INSPECTING THE THERMO SWITCH CONTINUITY (EXCEPT FOR 200H, 225G/V200, V225)

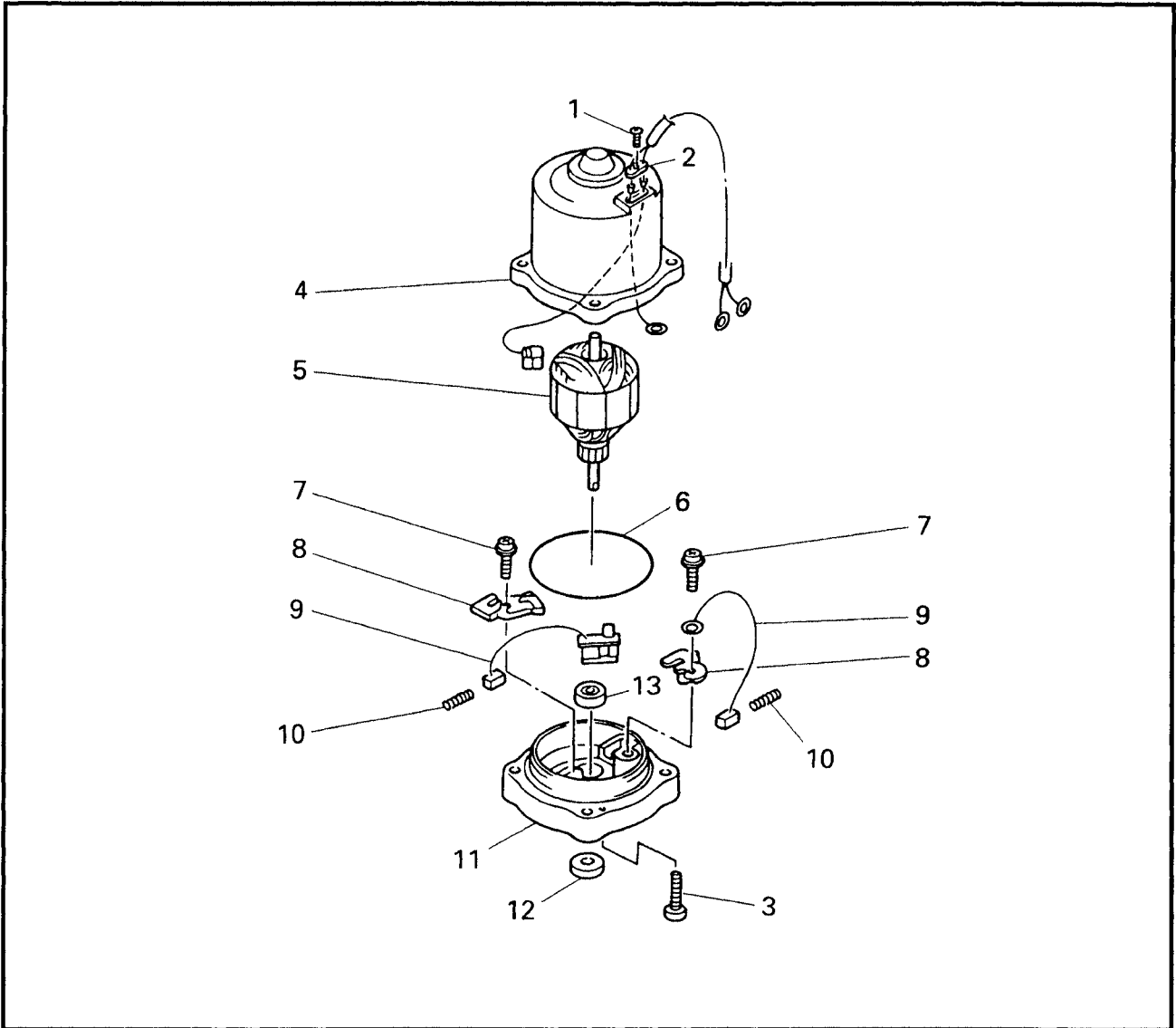
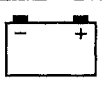
Refer to "INSPECTING THE THERMO SWITCH CONTINUITY" on page 8-19.

**POWER TRIM AND TILT MOTOR (200H, 225G/V200, V225)
DISASSEMBLING/ASSEMBLING THE POWER TRIM AND TILT MOTOR**

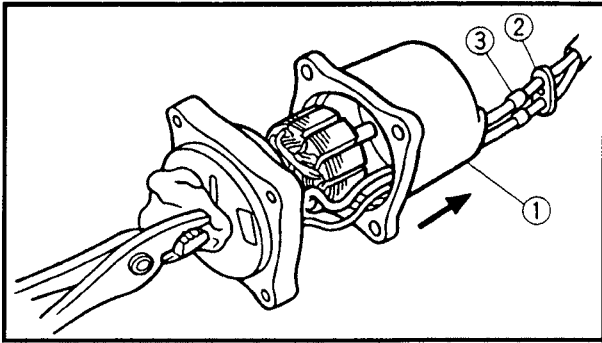
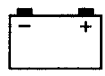


Order	Job/Part	Q'ty	Remarks
	Power trim and tilt motor		Refer to "RESERVOIR AND POWER TRIM AND TILT MOTOR (200H, 225G/V200, V225)" on page 7-32.
1	Screw	1	
2	Lead holder	1	
3	Screw	2	
4	Stator	1	
5	Armature	1	
6	O-ring	1	
7	Screw	2	

Continued on next page.



Order	Job/Part	Q'ty	Remarks
8	Brush holder	2	For assembly, reverse the disassembly procedure.
9	Brush	2	
10	Spring	2	
11	Lower cover	1	
12	Oil seal	1	
13	Bearing	1	



REMOVING THE STATOR

Remove:

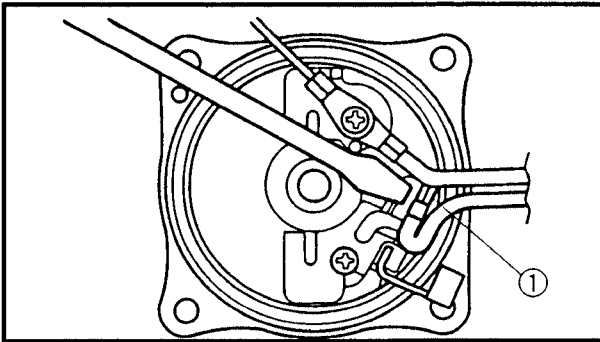
- Stator ①

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.



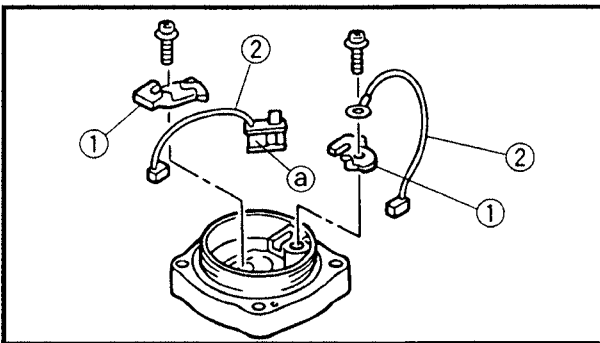
REMOVING THE BRUSH

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.

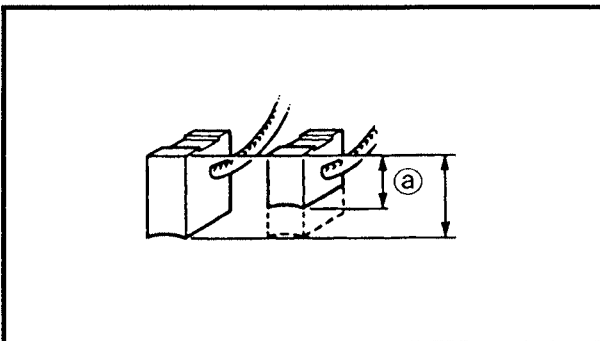


2. Remove:

- Brush holders ①
- Brushes ②

CAUTION:

Do not touch the bimetal ②; touching it may affect the operation of the breaker.



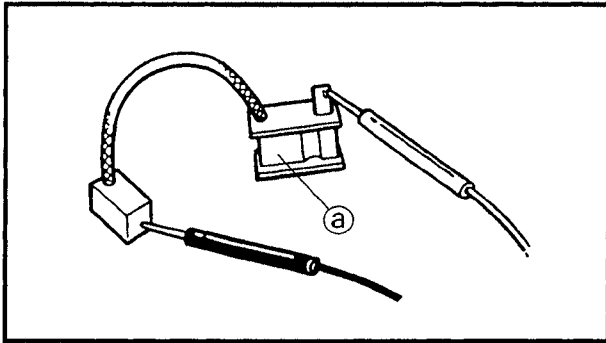
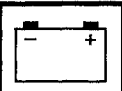
INSPECTING THE BRUSH

1. Measure:

- Brush length ②
- Out of specification → Replace.



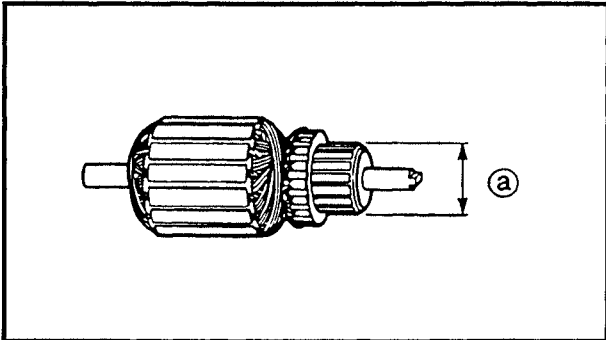
**Brush length
4.8 mm (0.19 in)**



2. Inspect:
- Brush continuity
No continuity → Replace.

CAUTION:

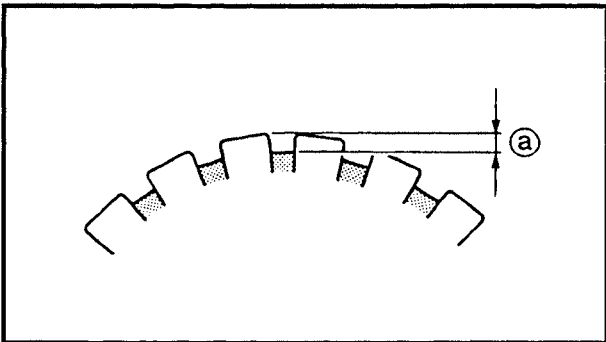
Do not touch the bimetal (a); touching it may affect the operation of the breaker.



INSPECTING THE ARMATURE

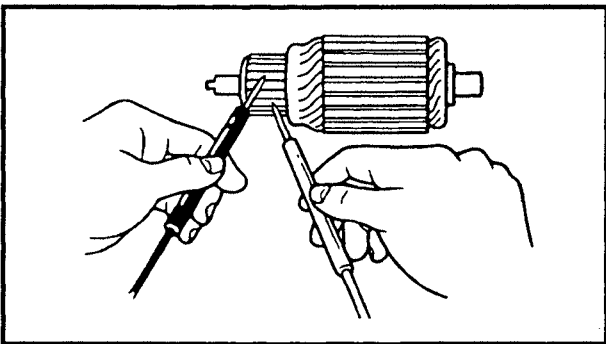
1. Measure:
- Commutator diameter (a)
Out of specification → Replace.

	Commutator diameter limit 21.0 mm (0.83 in)
--	---



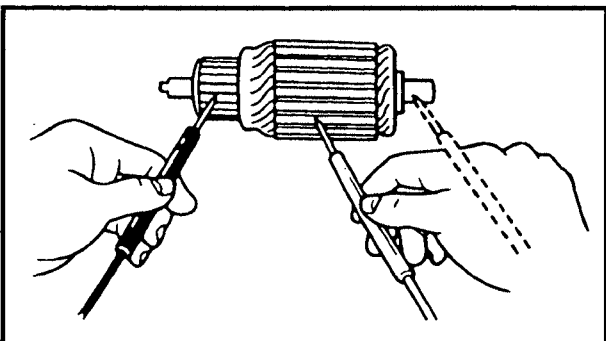
2. Measure:
- Commutator undercut (a)
Out of specification → Replace the armature.

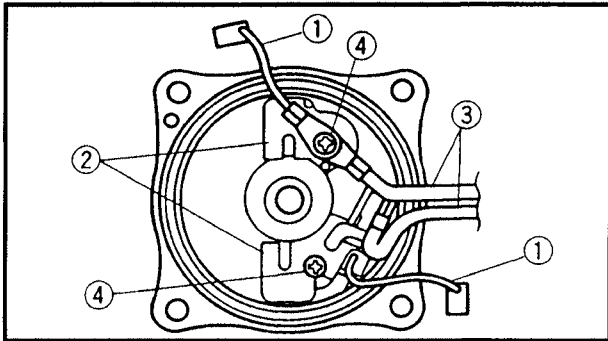
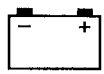
	Commutator undercut limit 0.85 mm (0.03 in)
--	---



3. Inspect:
- Armature continuity
Out of specification → Replace.

	Armature continuity	
	Commutator segments	Continuity
	Segment-laminations	No continuity
	Segment-shaft	No continuity





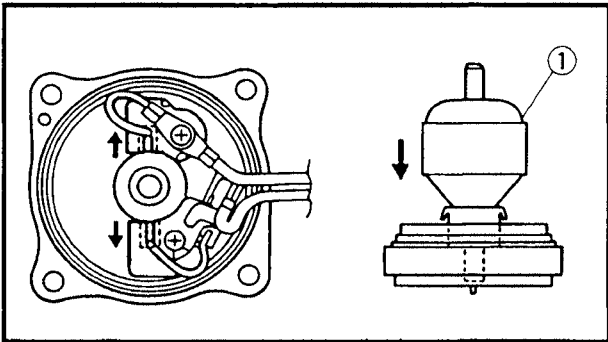
INSTALLING THE BRUSH

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.



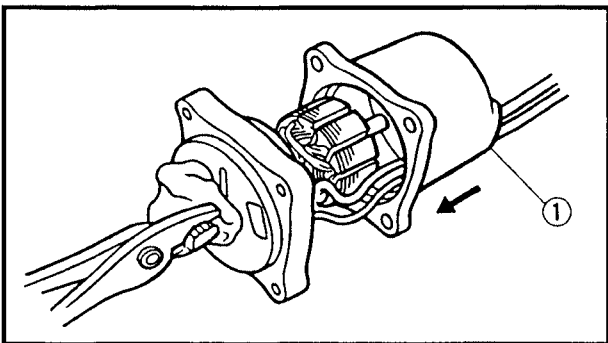
INSTALLING THE ARMATURE

Install:

- Armature ①

NOTE:

Push the brushes into the holder and then install the armature.



INSTALLING THE STATOR

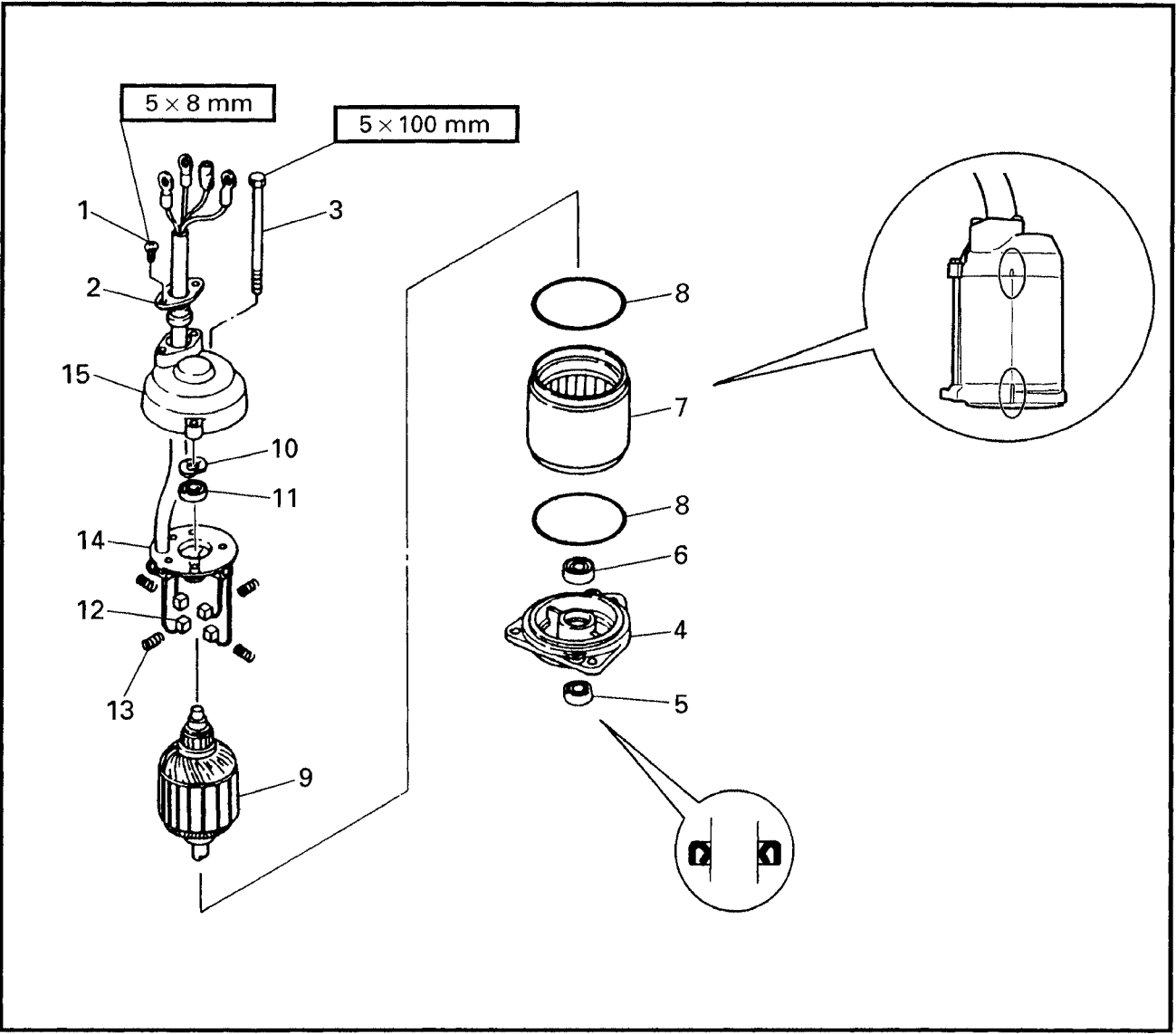
Install:

- Stator ①

NOTE:

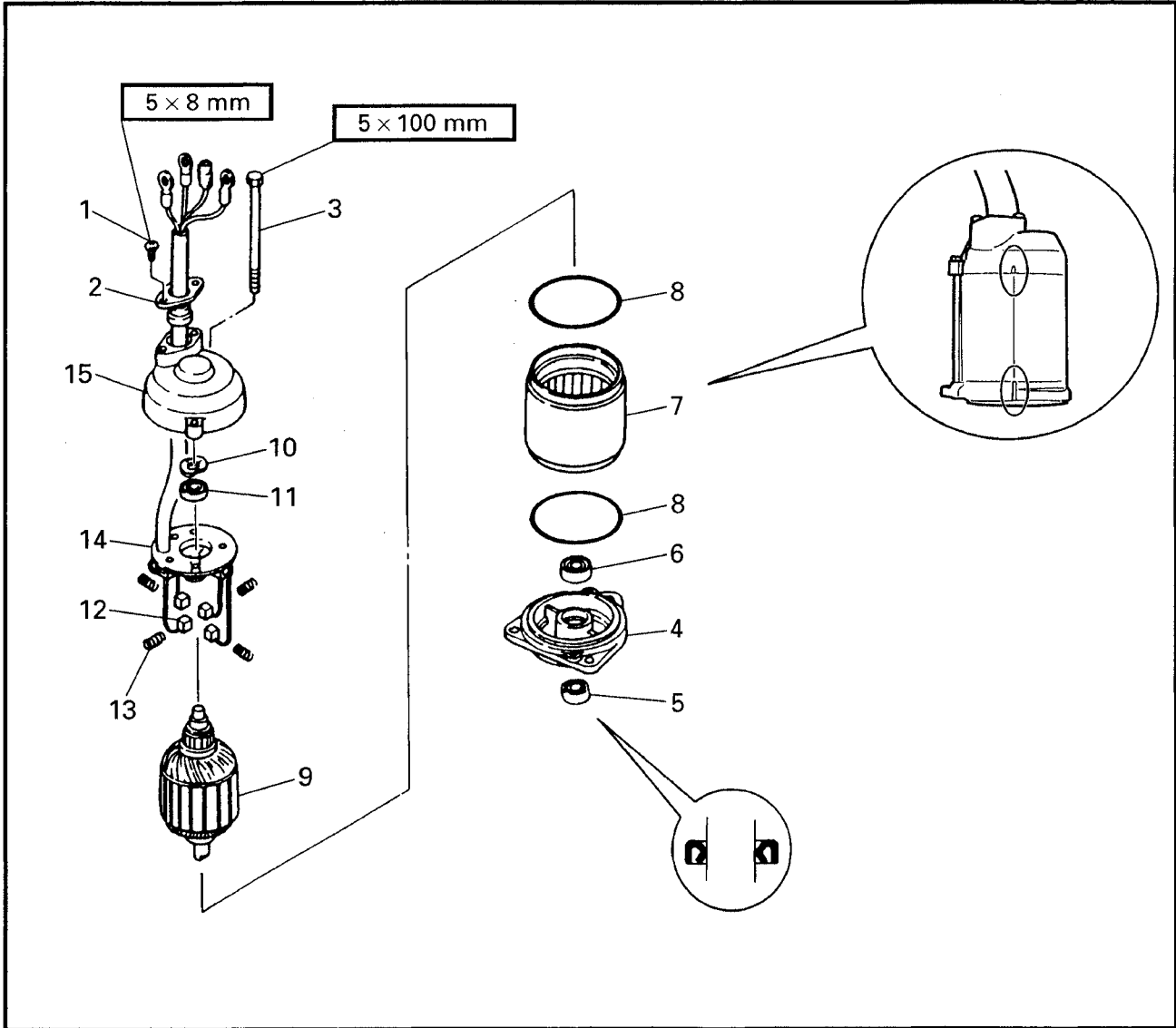
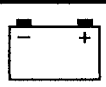
Place a clean cloth over the end of the armature shaft and carefully push the armature into the stator with a pair of pliers as shown.

POWER TRIM AND TILT MOTOR
(225F, L225F, 250B, L250B/S225, L225, S250, L250)
DISASSEMBLING/ASSEMBLING THE POWER TRIM AND TILT MOTOR

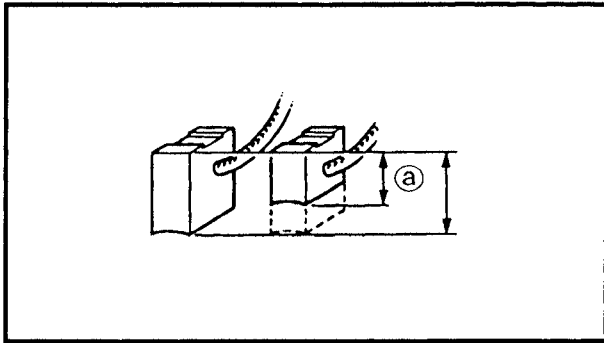
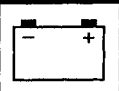


Order	Job/Part	Q'ty	Remarks
	Power trim and tilt motor		Refer to "TILT CYLINDER, RESERVOIR AND POWER TRIM AND TILT MOTOR (225F, L225F, 250B, L250B/S225, L225, S250, L250)" on page 7-52.
1	Screw	2	
2	Lead holder	1	
3	Bolt	2	
4	Lower cover	1	
5	Oil seal	1	
6	Bearing	1	

Continued on next page.



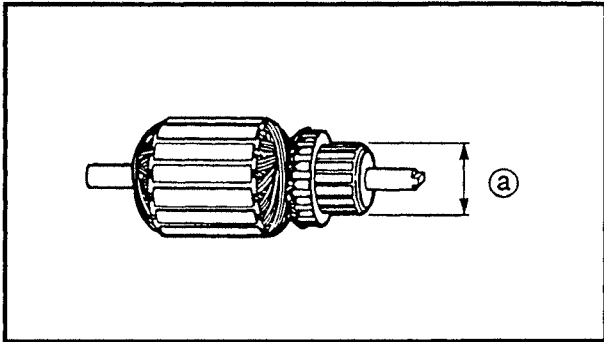
Order	Job/Part	Q'ty	Remarks
7	Stator	1	
8	O-ring	2	
9	Armature	1	
10	Wave washer	1	
11	Bearing	1	
12	Brush	4	
13	Spring	4	
14	Brush holder	1	
15	Upper cover	1	
			For assembly, reverse the disassembly procedure.



INSPECTING THE BRUSH

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

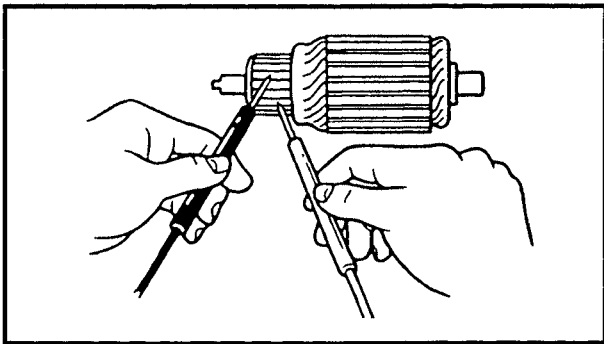
	Brush length 4.0 mm (0.16 in)
--	---



INSPECTING THE ARMATURE

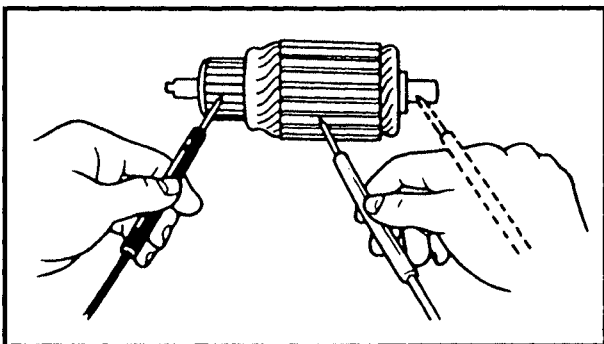
1. Measure:
- Commutator diameter **(a)**
 Out of specification → Replace.

	Commutator diameter limit 24.0 mm (0.95 in)
--	---



2. Inspect:
- Armature continuity
 Out of specification → Replace.

	Armature continuity	
	Commutator segments	Continuity
	Segment-laminations	No continuity
	Segment-shaft	No continuity



CHAPTER 9 TROUBLE ANALYSIS

TROUBLE ANALYSIS	9-1
TROUBLE ANALYSIS CHART	9-1
SELF-DIAGNOSIS	9-4
DIAGNOSIS CODE INDICATION	9-4
DIAGNOSIS THE ELECTRONIC CONTROL SYSTEM	9-4
TROUBLE SHOOTING FOR ELECTRIC FUEL INJECTION	9-6

TROUBLE ANALYSIS

NOTE:

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

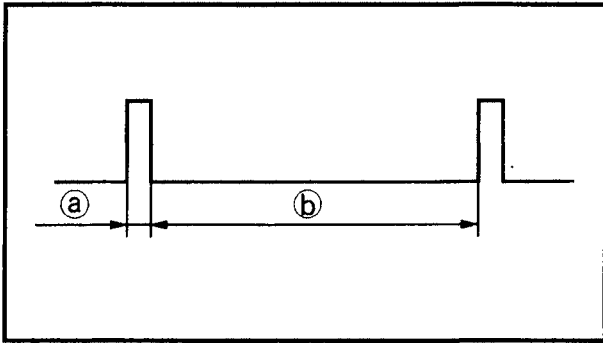
1. The battery is charged and its specified gravity is within specification.
2. There are no incorrect wiring connections.
3. Wiring connections are properly secured and are not rusty.
4. The lanyard is installed onto the engine stop switch.
5. The shift position is in neutral.
6. Fuel is reaching the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

TROUBLE ANALYSIS CHART

Trouble mode														Check elements			
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOOSE STEERING	LOOSE TILT HOLDING	TILT MOTOR WILL NOT RUN	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference chapter
														FUEL SYSTEM			
														Low-pressure fuel line			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	• Fuel line	3
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	• Fuel filter	3
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	• Fuel pump	4
														High-pressure fuel line			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	• Vapor separator	4
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	• High-pressure fuel pump	4
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	• High-pressure fuel line	3
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	• Fuel injectors	4
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Link adjustment	3
														POWER UNIT			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Compression	3
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Reed valves	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Cylinder head gaskets	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Seal	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Cylinder block	5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Crankcase	5

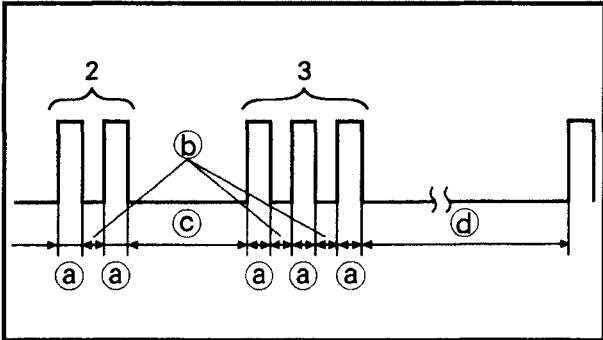
Trouble mode													Check elements				
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOOSE STEERING	LOOSE TILT HOLDING	TILT MOTOR WILL NOT RUN	HARD SHIFTING	IRREGULAR WARNING INDICATION	POOR BATTERY CHARGING	Relative part	Reference chapter
<input type="checkbox"/>							<input type="checkbox"/>									Piston rings	5
<input type="checkbox"/>							<input type="checkbox"/>									Pistons	5
							<input type="checkbox"/>									Bearings	5
									<input type="checkbox"/>							Thermostat	5
									<input type="checkbox"/>							Water passages	5
LOWER UNIT																	
<input type="checkbox"/>				<input type="checkbox"/>									<input type="checkbox"/>			Neutral position	6
<input type="checkbox"/>													<input type="checkbox"/>			Dog clutch	6
<input type="checkbox"/>				<input type="checkbox"/>									<input type="checkbox"/>			Gears	6
									<input type="checkbox"/>							Water inlets	6
									<input type="checkbox"/>							Water pump	6
						<input type="checkbox"/>										Propeller shaft(s)	6
													<input type="checkbox"/>			Shift rod joint/pin	6
													<input type="checkbox"/>			Shift cam	6
													<input type="checkbox"/>			Shift shaft	6
						<input type="checkbox"/>							<input type="checkbox"/>			Lower case	6
BRACKET UNIT																	
										<input type="checkbox"/>						Bracket	7
										<input type="checkbox"/>						Rubber mount	7
													<input type="checkbox"/>			Shift rod	7
POWER TRIM AND TILT UNIT																	
											<input type="checkbox"/>					Fluid level	3
											<input type="checkbox"/>					Relief valve	7
											<input type="checkbox"/>					Fluid passages	—
												<input type="checkbox"/>				Power trim and tilt motor	7
ELECTRICAL																	
Ignition system																	
<input type="checkbox"/>			<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>							• Charge coil	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>									• Pulser coils	8
<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								• CDI unit	8
<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>		<input type="checkbox"/>									• Ignition coils	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>							• Spark plugs	3
Ignition/fuel control system																	
<input type="checkbox"/>						<input type="checkbox"/>										• Lanyard switch	—

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
<input type="checkbox"/>																• Main relay	8
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>											• High-pressure fuel pump resistor	8
		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>									• Crank position sensor	8
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>													• Atmospheric pressure sensor	8
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>													• Intake air temperature sensor	8
		<input type="checkbox"/>	<input type="checkbox"/>													• Oxygen density sensor	8
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>													• Engine cooling water temperature sensor	8
		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>									• Throttle position sensor	8
								<input type="checkbox"/>	<input type="checkbox"/>							• Thermo switch	8
		<input type="checkbox"/>		<input type="checkbox"/>									<input type="checkbox"/>			• Shift cutoff switch	8
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>											• Knocking sensor	8
Starting system																	
<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>											• Engine start switch	—
<input type="checkbox"/>																• Neutral switch	8
<input type="checkbox"/>																• Starter relay	8
<input type="checkbox"/>																• Starter motor	8
Charging system																	
															<input type="checkbox"/>	• Lighting coil	8
															<input type="checkbox"/>	• Rectifier/regulator	8
															<input type="checkbox"/>	• Fuses	8
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>											<input type="checkbox"/>	• Battery leads	—
<input type="checkbox"/>													<input type="checkbox"/>	<input type="checkbox"/>	• Battery	—	
Oil feed pump control system																	
								<input type="checkbox"/>						<input type="checkbox"/>		• Oil level sensor (engine oil tank)	8
								<input type="checkbox"/>								• Oil level switch (sub-oil tank)	8
Power trim and tilt system																	
												<input type="checkbox"/>				• Trailer switch	8
											<input type="checkbox"/>					• Power trim and tilt relay	8
													<input type="checkbox"/>			• Trim sensor	8

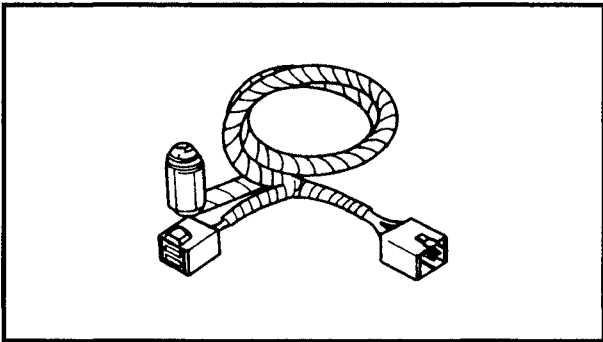


**SELF-DIAGNOSIS
DIAGNOSIS CODE INDICATION**

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**

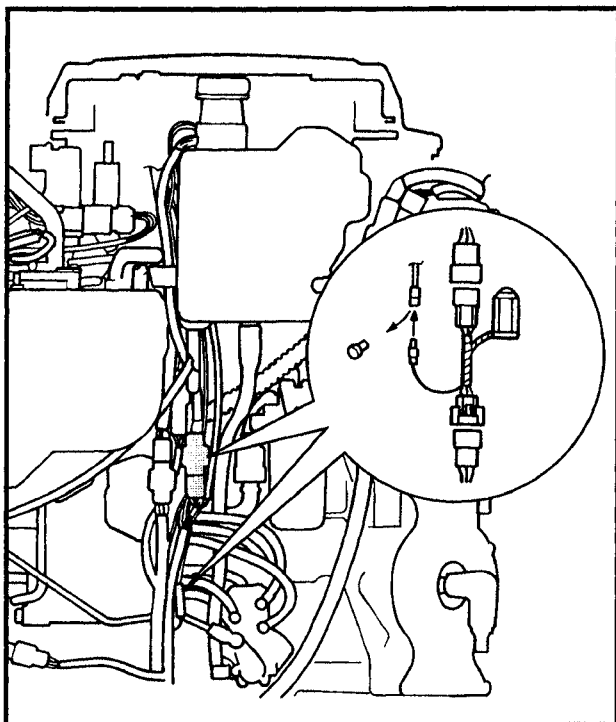
1. Install:
 - Diagnostic indicator

	<p>Diagnostic indicator YB-06765 / 90890-06765</p>
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NOTE: _____

When performing this diagnosis, all of the electrical wires must be properly connected.

2. Inspect:
 - Diagnosis code
Code 1 is indicated → Normal.
Code 13 - 31 indicated → Check the applicable parts.
Code 32 - 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 more 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
13	Incorrect pulser coil input signal
14	No crank position sensor input signal
15	Incorrect engine cooling water temperature sensor input signal
17	Incorrect knocking sensor input signal
18	Incorrect throttle position sensor input signal
22	Incorrect atmospheric pressure sensor input signal (out of normal operating range)
23	Incorrect intake air temperature sensor input signal
31	No tachometer pulse being output
32 ~ 44	Microcomputer processing information
(32)	Shift cutoff control (during ignition cutoff operation)
(33)	Ignition timing is being slightly corrected (when starting a cold engine)
(35)	Fuel injection period is being slightly corrected (when knocking control)
(36)	Ignition timing is being slightly corrected (when knocking control)
(41)	Overrevolution control (during ignition cutoff operation)
(42)	Overheat control/oil empty control
(43)	Buzzer sounding
(44)	Engine stop switch control operating

TROUBLE SHOOTING FOR ELECTRIC FUEL INJECTION

Items	Symptoms
<p>1. Poor starting/ Engine will not start</p>	<p>1. No firing. The starter motor cranks the engine, but no firing is generated in the cylinder. 2. The firing is generated in the cylinder, but the engine soon stops. 3. Start-up time is too long. The engine will not start-up easily.</p>
	<p>1. Inspect the high-pressure fuel lines.</p> <p>1) Inspect for fuel line leaks ↓ 2) Inspect the fuel pressure → Fuel pressure is out of specification ↓ 3) Inspect the operation of the fuel injector ↓ 4) Inspect the diagnosis cord</p> <p>① Inspect the 30-A fuse ② Inspect the high-pressure fuel pump operation ③ Inspect the main relay ④ Inspect the main relay drive's ECU output ⑤ Inspect the pressure regulator</p> <p>2. Inspect the ignition system.</p> <p>1) Inspect the wire harness ↓ 2) Inspect the ignition spark ↓ 3) Inspect the ignition coil ↓ 4) Inspect the CDI unit output peak voltage ↓ 5) Inspect the charge coil output peak voltage ↓ 6) Inspect the pulser coil output peak voltage</p>

Items	Symptoms
<p>2. Erratic idling speed</p>	<p>1. The engine speed is not constant when idling. 2. The engine stalls when the throttle lever is pulled back. 3. The engine stalls when the throttle lever is opened or during outboard operation.</p>
	<p>1. Inspect the high-pressure fuel lines.</p> <p>1) Inspect for fuel line leaks ↓ 2) Inspect the fuel pressure → Fuel pressure is out of specification ↓ 3) Inspect the operation of the fuel injector ↓ 4) Inspect the diagnosis cord ↓ 5) Inspect the oxygen density sensor</p> <p>① Inspect the 30-A fuse ② Inspect the high-pressure fuel pump operation ③ Inspect the main relay ④ Inspect the main relay drive's ECU output ⑤ Inspect the pressure regulator</p> <p>2. Inspect the ignition system.</p> <p>1) Inspect the wire harness ↓ 2) Inspect the ignition spark ↓ 3) Inspect the ignition coil ↓ 4) Inspect the CDI unit output peak voltage ↓ 5) Inspect the charge coil output peak voltage ↓ 6) Inspect the pulser coil output peak voltage</p> <p>3. Inspect the ignition timing.</p> <p>1) Inspect the diagnosis cords → ① Inspect the pulser coil diagnosis cord ↓ ② Inspect the crank position sensor diagnosis cord ↓ ③ Inspect the engine cooling water temperature sensor diagnosis cord</p>

Items	Symptoms
<p>3. Erratic engine speed</p>	<p>1. The engine is started, but will not run smoothly. The engine speed drops during acceleration.</p>
	<p>1. Inspect the high-pressure fuel lines.</p> <p>1) Inspect for fuel line leaks ↓ 2) Inspect the fuel pressure → Fuel pressure is out of specification →</p> <ul style="list-style-type: none"> ① Inspect the 30-A fuse ② Inspect the high-pressure fuel pump operation ③ Inspect the main relay ④ Inspect the main relay drive's ECU output ⑤ Inspect the pressure regulator <p>3) Inspect the operation of the fuel injector ↓ 4) Inspect the diagnosis cord ↓ 5) Inspect the oxygen density sensor</p> <p>2. Inspect the ignition system.</p> <p>1) Inspect the wire harness ↓ 2) Inspect the ignition spark ↓ 3) Inspect the ignition coil ↓ 4) Inspect the CDI unit output peak voltage ↓ 5) Inspect the charge coil output peak voltage ↓ 6) Inspect the pulser coil output peak voltage</p> <p>3. Inspect the ignition timing.</p> <p>1) Inspect the diagnosis cords →</p> <ul style="list-style-type: none"> ① Inspect the pulser coil diagnosis cord ② Inspect the crank position sensor diagnosis cord ③ Inspect the engine cooling water temperature sensor diagnosis cord

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LIT-18616-02-02



**V200,S/L/V225,S/L250X 1999
Service Manual**

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