YAMAHA

55D
75A
85A

SERVICE MANUAL

688-28197-5J-11

NOTICE

This manual has been prepared by Yamaha 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 Yamaha 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.

Important information

Particularly important information is distinguished in this manual by the following notations:

⚠ 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.

55D, 75A, 85A
SERVICE MANUAL

1st Edition, October 2006

Printed in Japan

Contents

General information

How to use this manual

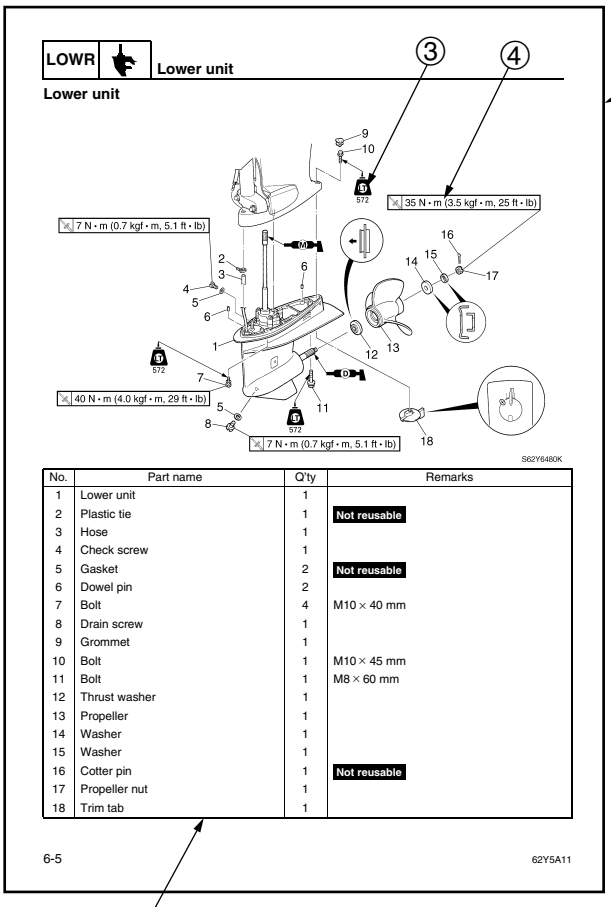
Manual format

The format of this manual has been designed to make service procedures clear and easy to understand. Use the information below as a guide for effective and quality service.

- Parts are shown and detailed in an exploded diagram and are listed in the components list (see ① in the figure below for an example page).
- The component list consists of part names and quantities, as well as bolt and screw dimensions (see ② in the figure below).
- Symbols are used to indicate important aspects of a procedure, such as the grade of lubricant and lubrication point (see ③ in the figure below).
- Tightening torque specifications are provided in the exploded diagrams (see ④ in the figure below for an example), and in the related detailed instructions. Some torque specifications are listed in stages as torque figures or angles in degrees.
- Separate procedures and illustrations are used to explain the details of removal, checking, and installation where necessary (see ⑤ in the figure below for an example page).

NOTE:

For troubleshooting procedures, see Chapter 9, “Troubleshooting.”



No.	Part name	Q'ty	Remarks
1	Lower unit	1	
2	Plastic tie	1	Not reusable
3	Hose	1	
4	Check screw	1	
5	Gasket	2	Not reusable
6	Dowel pin	2	
7	Bolt	4	M10 × 40 mm
8	Drain screw	1	
9	Grommet	1	
10	Bolt	1	M10 × 45 mm
11	Bolt	1	M8 × 60 mm
12	Thrust washer	1	
13	Propeller	1	
14	Washer	1	
15	Washer	1	
16	Cotter pin	1	Not reusable
17	Propeller nut	1	
18	Trim tab	1	

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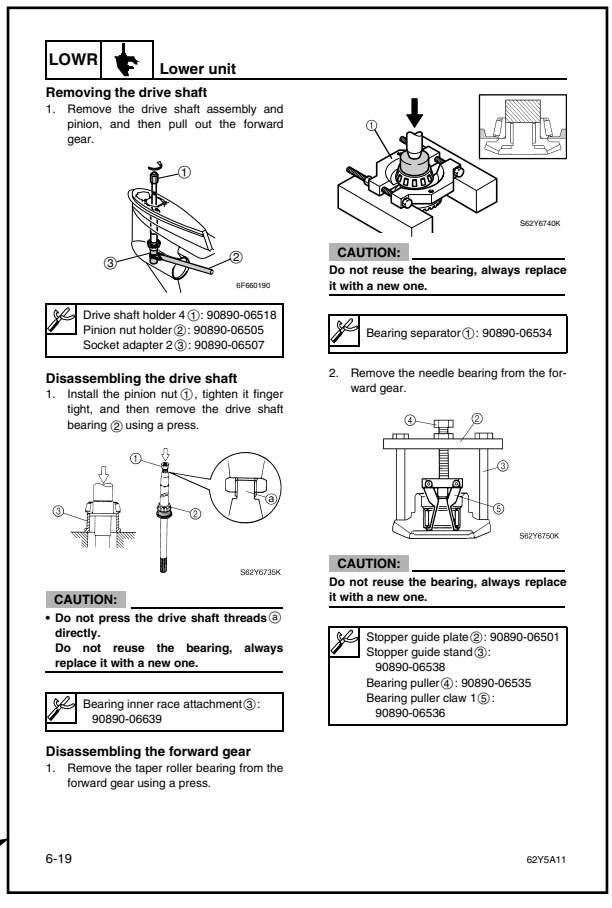
②

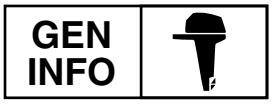


⑤

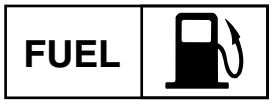
Symbol

The symbols below are designed to indicate the content of a chapter.

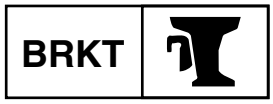
General information



Fuel system



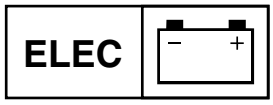
Bracket unit



Specification

Power unit

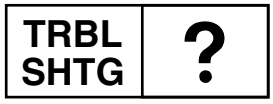
Electrical system



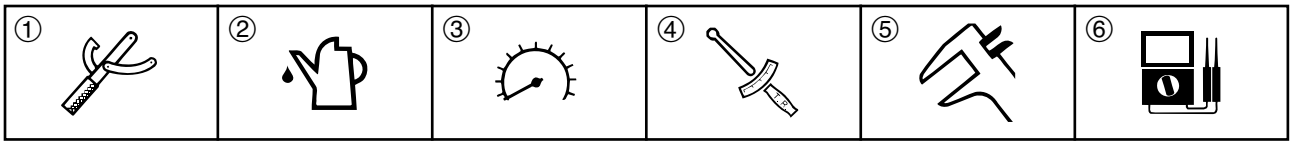
Periodic check and adjustment

Lower unit

Troubleshooting

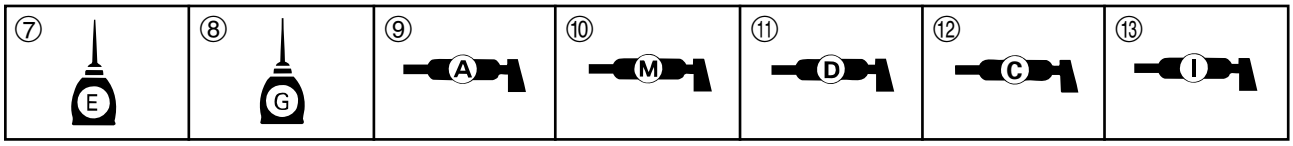


Symbols ① to ⑥ indicate specific data.



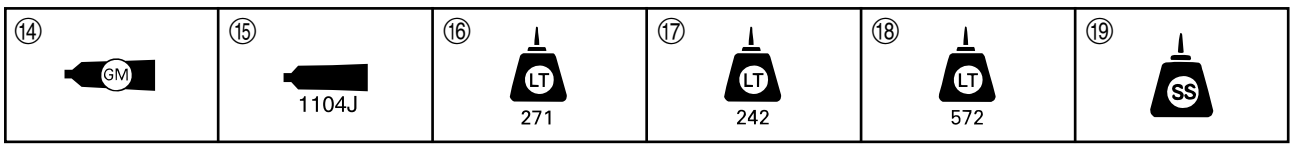
① Special tool
② Specified oil or fluid
③ Specified engine speed
④ Specified tightening torque
⑤ Specified measurement
⑥ Specified electrical value (resistance, voltage, electric current)

Symbols ⑦ to ⑬ in an exploded diagram or illustration indicate the grade of lubricant and the lubrication point.



⑦ Apply Yamaha 2-stroke motor oil
⑧ Apply gear oil
⑨ Apply water resistant grease (Yamaha grease A)
⑩ Apply molybdenum disulfide grease
⑪ Apply corrosion resistant grease (Yamaha grease D)
⑫ Apply low temperature resistant grease (Yamaha grease C)
⑬ Apply injector grease

Symbols ⑭ to ⑲ in an exploded diagram or illustration indicate the type of sealant or locking agent and the application point.



⑭ Apply Gasket Maker
⑮ Apply ThreeBond 1104J
⑯ Apply LOCTITE 271 (red)
⑰ Apply LOCTITE 242 (blue)
⑱ Apply LOCTITE 572
⑲ Apply silicone sealant

Abbreviation

The following abbreviations are used in this service manual.

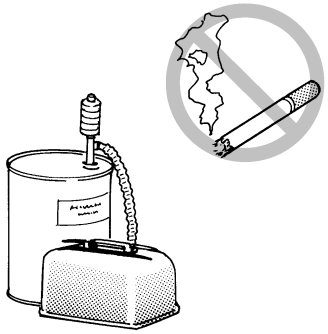
Abbreviation	Description
AFT	Aft end
API	American Petroleum Institute
ATDC	After Top Dead Center
ATF	Automatic Transmission Fluid
BOW	Bow end
BTDC	Before Top Dead Center
CCA	Cold Cranking Ampere
CDI	Capacitor Discharged Ignition system
DN	Downside or downward
EN	European Norm (European standard)
F	Forward
IEC	International Electrotechnical Commission
LED	Light-Emitting Diode
N	Neutral
NMMA	National Marine Manufacturers Association
PCV	Pressure Control Valve
PORT	Port side
PTT	Power Trim and Tilt
R	Reverse
SAE	Society of Automotive Engineers
STBD	Starboard side
TDC	Top Dead Center
UP	Upside or upward
WD	Wiring Diagram
1401	ThreeBond 1401

Safety while working

To prevent an accident or injury and to ensure quality service, follow the safety procedures provided below.

Fire prevention

Gasoline is highly flammable.
Keep gasoline and all flammable products away from heat, sparks, and open flames.



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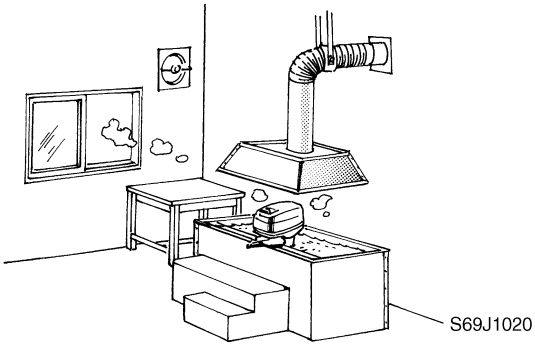
Ventilation

Gasoline vapor and exhaust gas are heavier than air and extremely poisonous. If inhaled in large quantities they may cause loss of consciousness and death within a short time. When test running an engine indoors (e.g., in a water tank) be sure to do so where adequate ventilation can be maintained.



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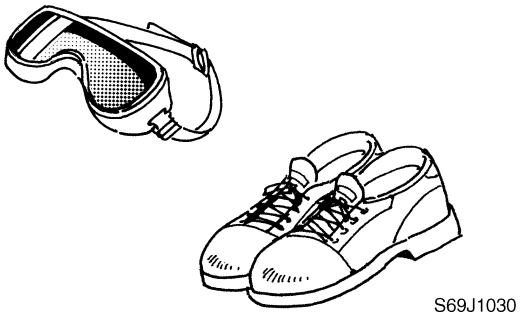
Self-protection

Protect your eyes by wearing safety glasses or safety goggles during all operations involving drilling and grinding, or when using an air compressor.
Protect your hands and feet by wearing protective gloves and safety shoes when necessary.



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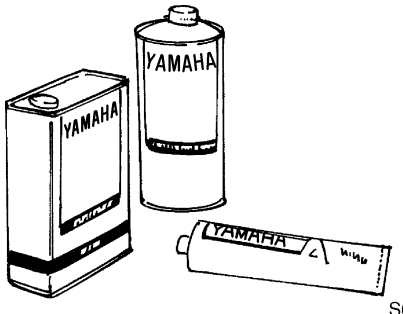
Part, lubricant, and sealant

Use only genuine Yamaha parts, lubricants, and sealants or those recommended by Yamaha, when servicing or repairing the outboard motor.



S69J1040

Under normal conditions, the lubricants mentioned in this manual should not harm or be hazardous to your skin. However, you should follow these precautions to minimize any risk when working with lubricants.

1. Maintain good standards of personal and industrial hygiene.

2. Change and wash clothing as soon as possible if soiled with lubricants.

3. Avoid contact with skin. Do not, for example, place a soiled rag in your pocket.

4. Wash hands and any other part of the body thoroughly with soap and hot water after contact with a lubricant or lubricant soiled clothing has been made.

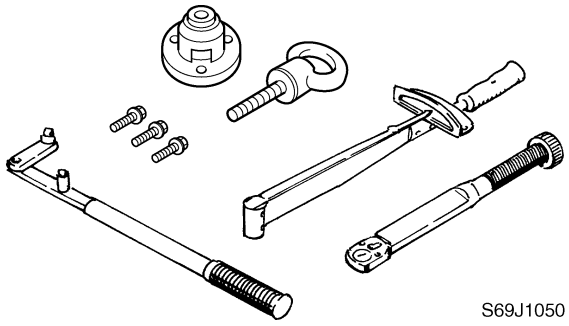
5. To protect your skin, apply a protective cream to your hands before working on the outboard motor.

6. Keep a supply of clean, lint-free cloths for wiping up spills, etc.

Good working practice

Special service tool

Use the recommended special service tools to protect parts from damage. Use the right tool in the right manner–do not improvise.



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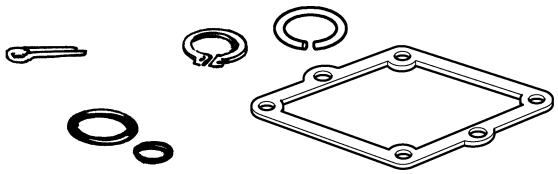
Tightening torque

Follow the tightening torque specifications provided throughout the manual. When tightening nuts, bolts, and screws, tighten the large sizes first, and tighten fasteners starting in the center and moving outward.

Non-reusable part

Always use new gaskets, seals, O-rings, cotter pins, circlips, etc., when installing or assembling parts.



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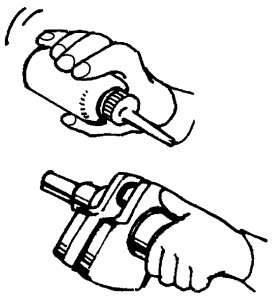
Disassembly and assembly

1. Use compressed air to remove dust and dirt during disassembly.

2. Apply engine oil to the contact surfaces of moving parts before assembly.



S69J1070

3. Install bearings with the manufacture identification mark in the direction indicated in the installation procedure. In addition, be sure to lubricate the bearings liberally.

4. Apply a thin coat of water-resistant grease to the lip and periphery of an oil seal before installation.

5. Check that moving parts operate normally after assembly.

Identification

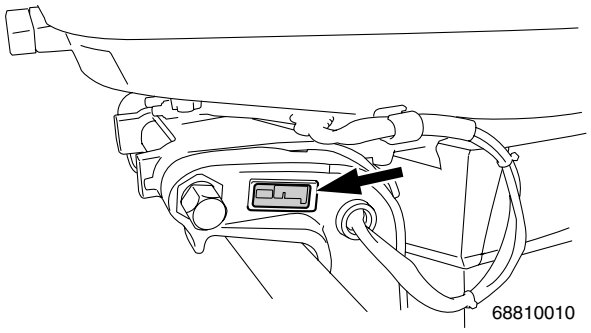
Model

This manual covers the following models.

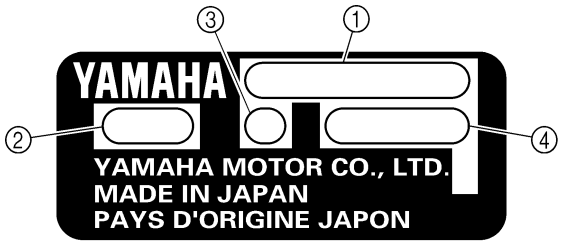
Applicable model
55DEHD, 75AEHD, 75AED, 75AET, 85AEHD, 85AED, 85AET

Serial number

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



68810010

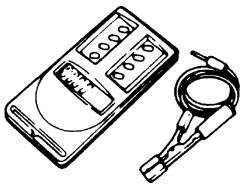


S6AL1D00

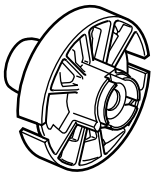
① Model name
② Approved model code
③ Transom height
④ Serial number

Model name	Approved model code	Starting serial No.
55DEHD	63S	1001700–
75AEHD	692	1020817–
75AED		
75AET		
85AEHD	688	1013061–
85AED		
85AET		

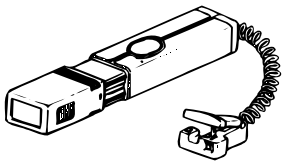
Special service tool



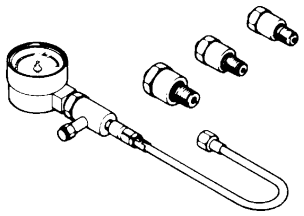
Digital tachometer
90890-06760



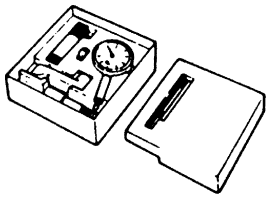
Test propeller
90890-01620



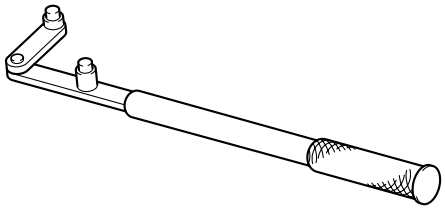
Timing light
90890-03141



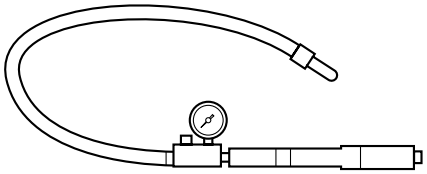
Compression gauge
90890-03160



Dial gauge set
90890-01252



Flywheel holder
90890-06522



Leakage tester
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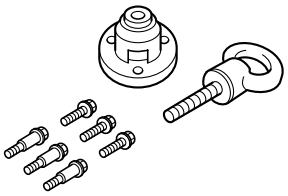
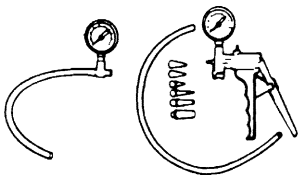
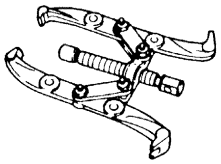


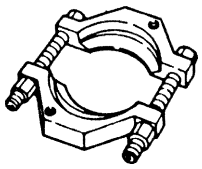
Flywheel puller
90890-06521



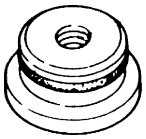
Vacuum/pressure pump gauge set
90890-06756



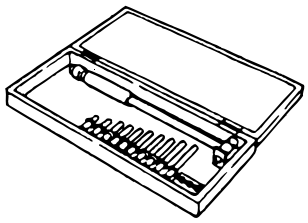
Gear puller
90890-06540



Bearing Separator
90890-06534



Needle bearing attachment
90890-06607, 90890-06608, 90890-06611, 90890-06612, 90890-06615, 90890-06632, 90890-06636, 90890-06655



Cylinder gauge
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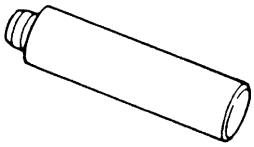
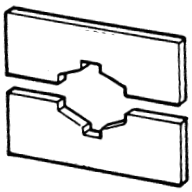


Driver rod LS
90890-06606



Support
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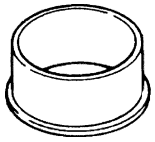
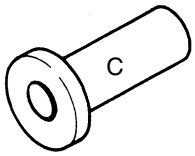
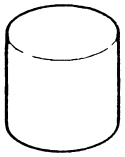


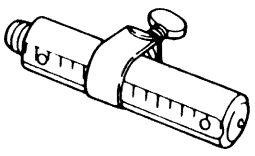
Bearing inner race attachment
90890-06639, 90890-06640, 90890-06643



Bearing pressure C
90890-02393



Small end bearing installer
90890-06527



Driver rod SS
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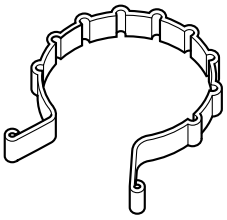
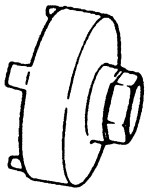
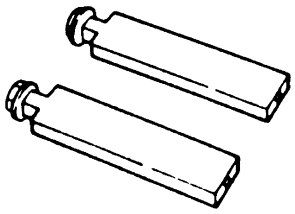


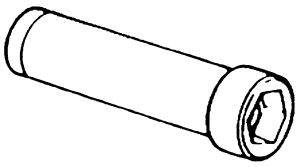
Piston slider
90890-06530



Ring nut wrench 3
90890-06511



Stopper guide stand
90890-06538



Ring nut wrench extension
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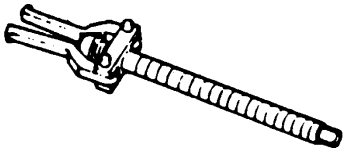
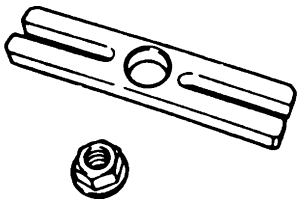
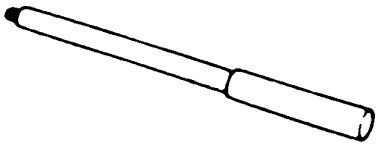


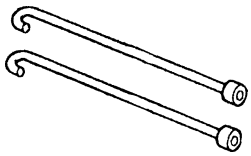
Bearing puller assembly
90890-06535



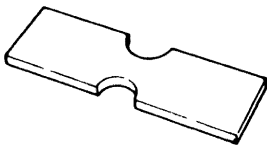
Stopper guide plate
90890-06501



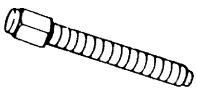
Driver rod L3
90890-06652



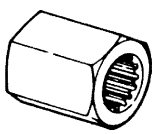
Bearing housing puller claw L
90890-06502



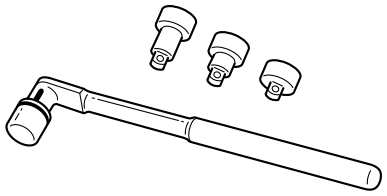
Bearing depth plate
90890-06603



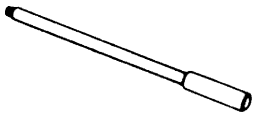
Center bolt
90890-06504



Drive shaft holder 5
90890-06519

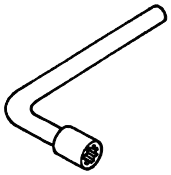


Pinion nut holder
90890-06715

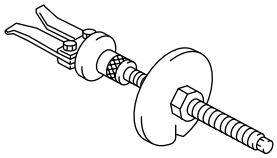


Driver rod LL
90890-06605

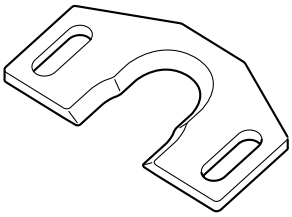
Socket adapter 2
90890-06507



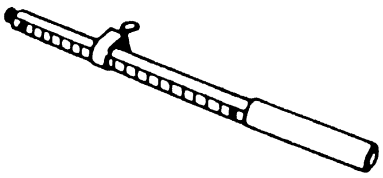
Shift rod push arm
90890-06052



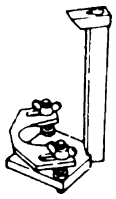
Bearing outer race puller assembly
90890-06523



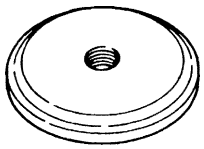
Pinion height gauge plate B
90890-06712



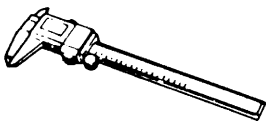
Driver rod SL
90890-06602



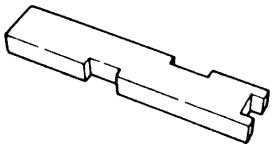
Pinion height gauge
90890-06710



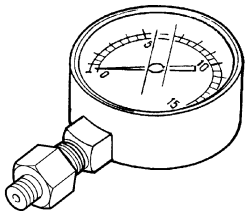
Bearing outer race attachment
90890-06621, 90890-06625, 90890-06626,
90890-06628



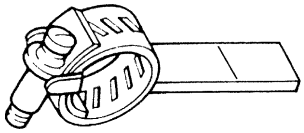
Digital caliper
90890-06704



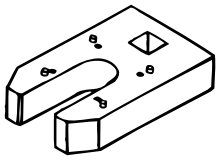
Shimming plate
90890-06701



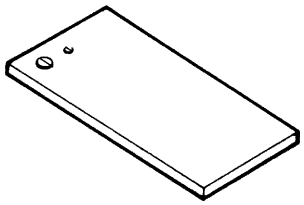
PTT oil pressure gauge assembly
90890-06580



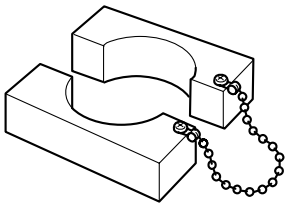
Backlash indicator
90890-06706



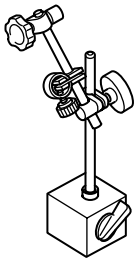
Cylinder-end screw wrench
90890-06568



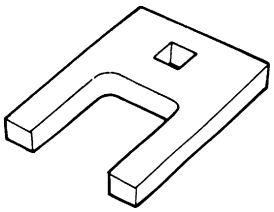
Magnet base plate
90890-07003



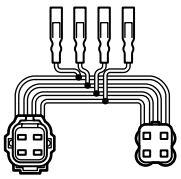
PTT piston vice attachment
90890-06572



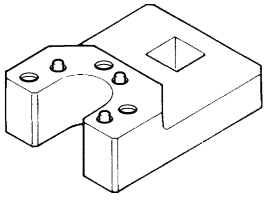
Magnet base B
90890-06844



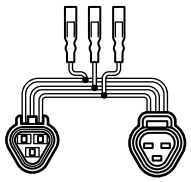
Tilt rod wrench
90890-06569



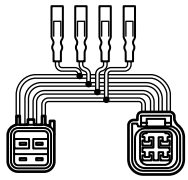
Test harness
90890-06878



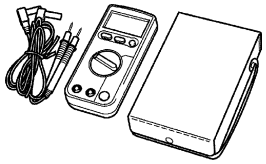
Trim and tilt wrench
90890-06587



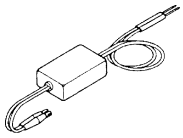
Throttle sensor adjusting lead
90890-06857



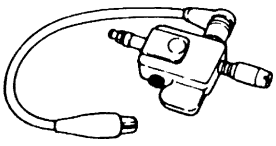
Test harness
90890-06871



Digital circuit tester
90890-03174



Peak voltage adapter B
90890-03172



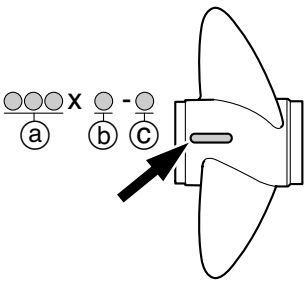
Ignition tester
90890-06754

Propeller selection

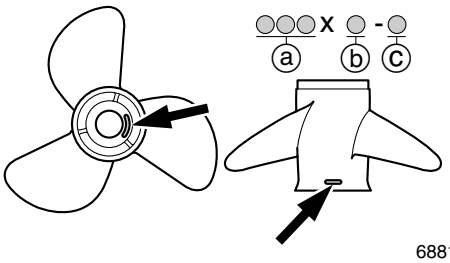
The performance of a boat and outboard motor will be critically affected by the size and type of propeller you choose. Propellers greatly affect boat speed, acceleration, engine life, fuel economy, and even boating and steering capabilities. An incorrect choice could adversely affect performance and could also seriously damage the engine.
Use the following information as a guide for selecting a propeller that meets the operating conditions of the boat and the outboard motor.

Propeller size

The size of the propeller is indicated as shown.



68810020



68810030

ⓐ Propeller diameter (in inches)
ⓑ Propeller pitch (in inches)
ⓒ Propeller type (propeller mark)

Selection

When the engine speed is at the full throttle operating range (4,500–5,500 r/min), the ideal propeller for the boat is one that provides maximum performance in relation to boat speed and fuel consumption.

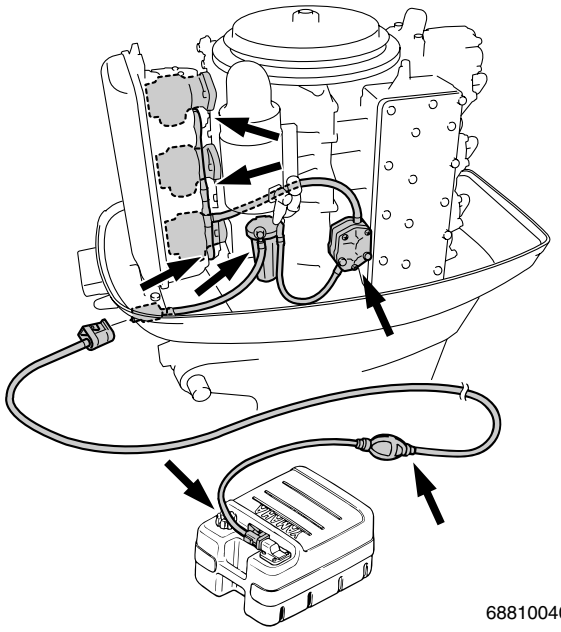
Propeller size (in)	Material
12 5/8 × 21 - K	Aluminum
13 × 19 - K	
13 1/4 × 17 - K	
13 1/2 × 15 - K	
13 5/8 × 13 - K	
13 × 17 - K	Stainless steel
13 × 19 - K	
13 × 21 - K	
13 × 23 - K	
13 × 25 - K	
13 1/2 × 14 - K	
13 1/2 × 16 - K	
14 × 11 - K	

Predelivery check

To make the delivery process smooth and efficient, the predelivery check should be completed as explained below.

Checking the fuel system

1. Check that the fuel hoses is securely connected and that the fuel tank is filled with fuel.

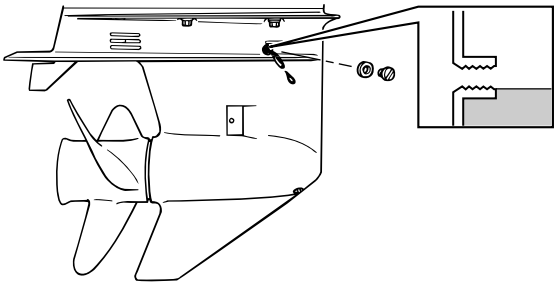

68810040

CAUTION:

Use pre-mixed fuel only.
Fuel and oil mixing ratio is 50:1. For break-in period, 25:1 mixture shall be used.

Checking the gear oil

1. Check the gear oil level.



69D10055

Recommended gear oil:
Hypoid gear oil
API: GL-4
SAE: 90
Oil quantity:
610 cm^3
(20.62 US oz, 21.51 Imp oz)

Checking the battery

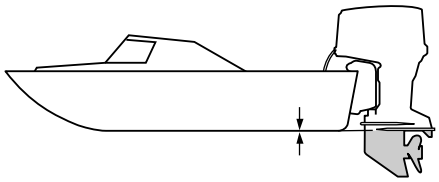
1. Check the capacity, electrolyte level, and specified gravity of the battery.

Recommended battery capacity:
CCA/EN: 430 A
20HR/IEC: 70 Ah
Electrolyte specified gravity:
1.280 at 20°C (68°F)

2. Check that the positive and negative battery cable are securely connected.

Checking the outboard motor mounting height

1. Check that the anti-cavitation plate is aligned with the bottom of the boat. If the mounting height is too high, cavitation will occur and propulsion will be reduced. Also, the engine speed will increase abnormally and cause the engine to overheat. If the mounting height is too low, water resistance will increase and reduce engine efficiency.



69D10080

NOTE:

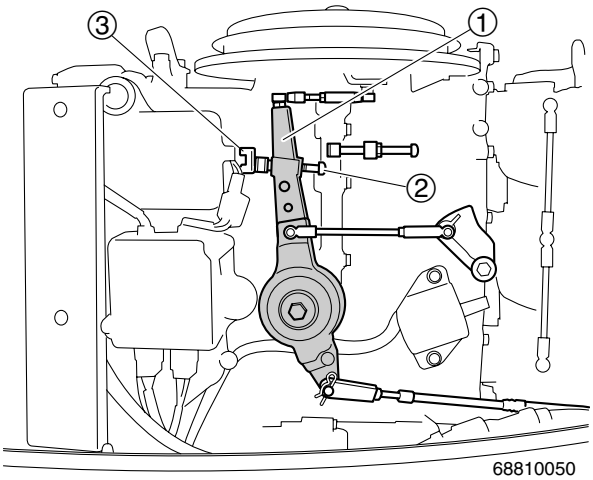
The optimum mounting height is affected by the combination of the boat and the outboard motor. To determine the optimum mounting height, test run the outboard motor at different heights.

2. Check that the clamp brackets are secured with the mounting bolts.

Checking the remote control cable (ED, ET)

1. Set the remote control lever to “N” position and the throttle lever to fully-closed position.

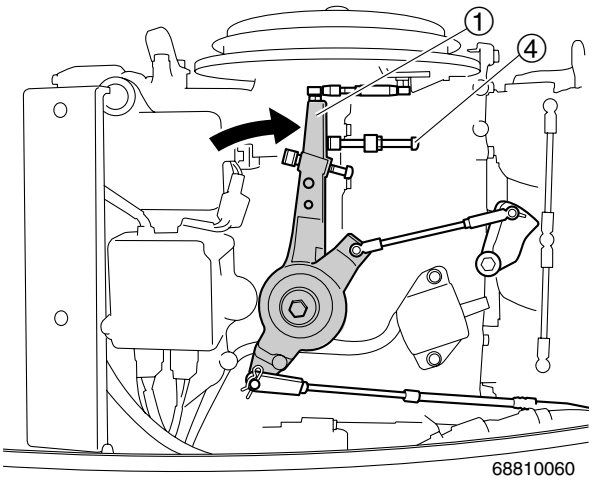
2. Check that the control lever ① is in its fully-closed position and check that the adjusting screw ② is contact the stopper ③.



68810050

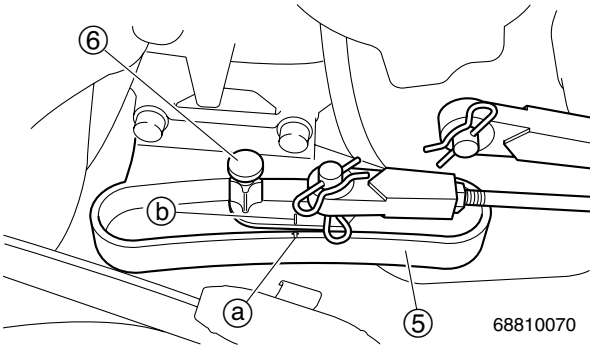
3. Fully open the remote control lever, and then check that the control lever ① is in its fully-opened position.

4. Check that the control lever ① comes in contact with the adjusting screw ④.

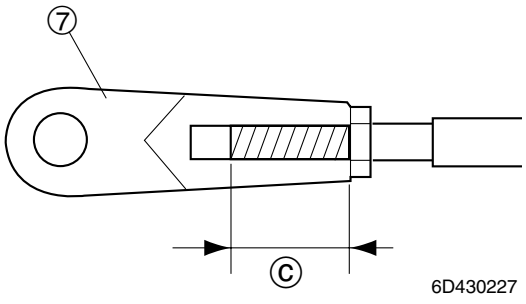


NOTE:
To adjust the throttle cable, refer to page 3-7.

5. Set the remote control lever is in "N" position, and then check that the mark ⓐ on the bracket ⑤ is aligned with the mark ⓑ on the shift lever ⑥.



6. Check that the screwed length of the shift / throttle cable joint ⑦ .

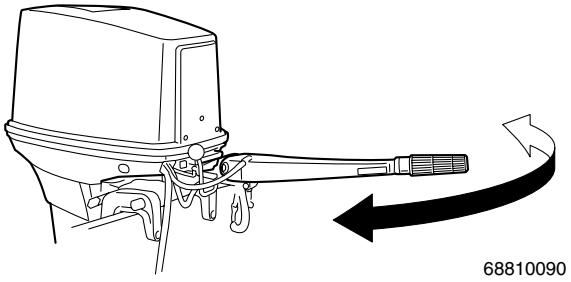


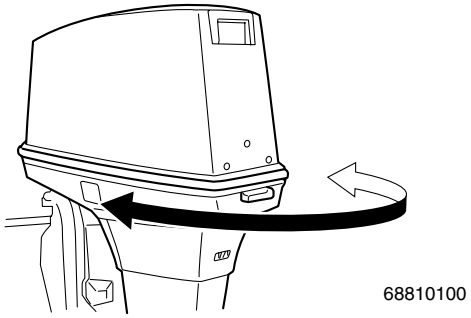
⚠WARNING

The shift / throttle cable joint ⑦ must be screwed in a minimum of 8.0 mm (0.31 in) ⓒ.

Checking the steering system

1. Check that the steering operates smoothly.





2. Check that there is no interference with wires or hoses when the outboard motor is steered.

Checking the PTT system (ET)

1. Check that the outboard motor tilts up and down smoothly when operating the PTT unit.

2. Check that there is no abnormal noise produced when the outboard motor is tilted up or down.

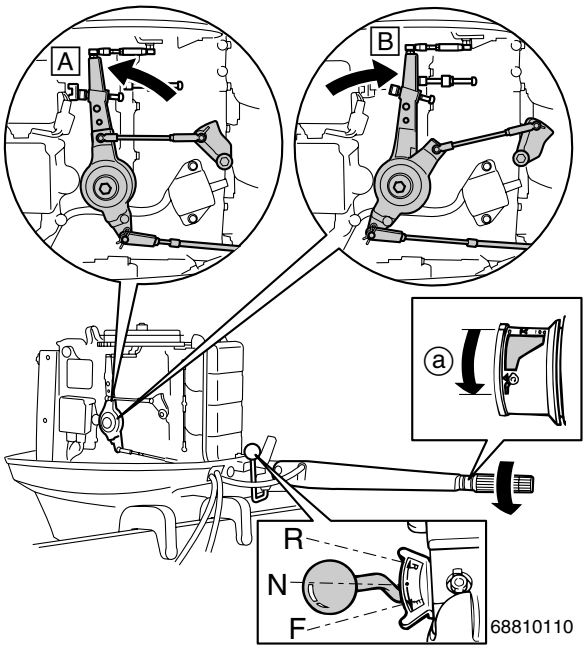
3. Check that there is no interference with wires or hoses when the tilted up outboard motor is steered.

4. Check that the trim meter points down when the outboard motor is tilted all the way down.

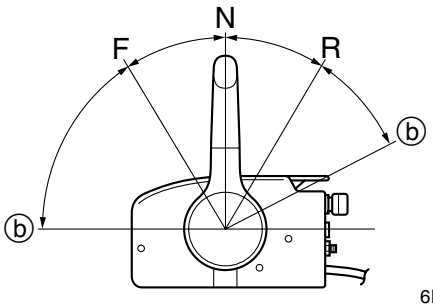
Checking the gear shift and throttle operation

1. Check that the gear shift operates smoothly when the shift lever or remote control lever is shifted from “N” to “F” or “R” position.

2. Check that the throttle operates smoothly when the throttle grip (tiller handle model) is turned from the fully-closed position to the fully-opened position ⓐ.
   Check that the throttle operates smoothly when the remote control lever (remote control model) is shifted from “F” or “R” position to the fully-opened positions ⓑ.



68810110



6F610120

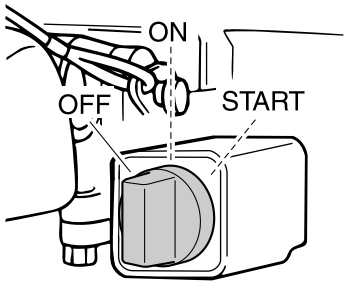
A Fully-closed position
B Fully-opened position

Checking the engine start switch and engine stop lanyard switch

1. Check that the engine starts when the engine start switch is turned to START.

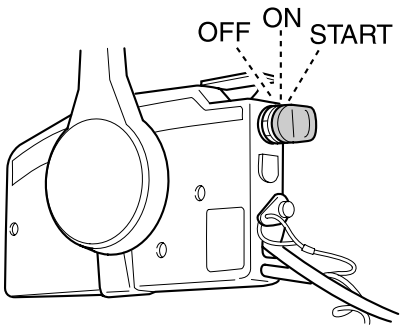
2. Check that the engine turns off when the engine start switch is turned to OFF.

A



68810120

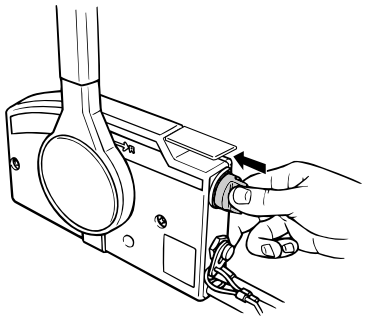
B



69R10200

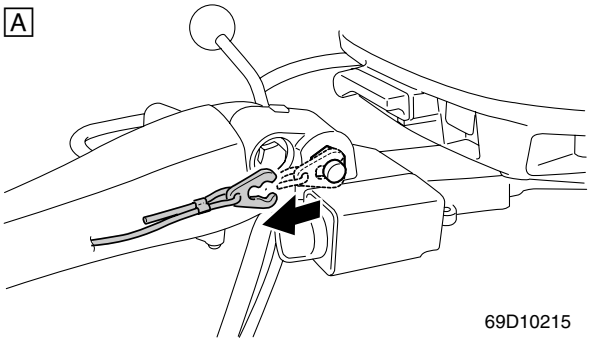
A EHD
B ED, ET

3. Check that the choke solenoid operates when the engine start switch is pushed in. (ED, ET)

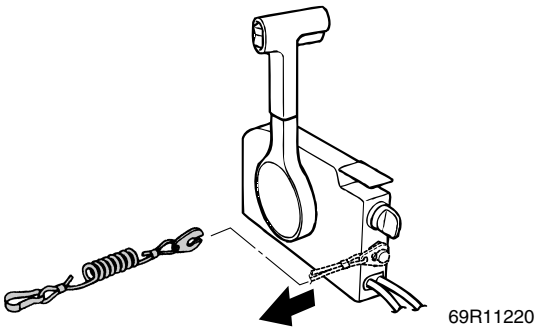

6S310110

4. Check that the engine turns off when the engine stop lanyard is pulled from the engine stop lanyard switch.

A



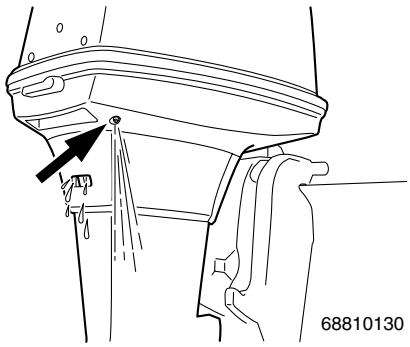
B



A EHD
B ED, ET

Checking the cooling water pilot hole

1. Start the engine, and then check for a water flow from the cooling water pilot hole.



Test run

1. Start the engine, and then check that the gear shift operates smoothly.

2. Check that the engine idle speed after the engine has been warmed up.

3. Operate at trolling speed.

4. Run the outboard motor for 1 hour at 3,000 r/min or at half throttle, then for another hour at 4,000 r/min or at 3/4 throttle.

5. Check that the outboard motor does not tilt up when shifting into reverse and that water does not flow in over the transom.

NOTE:
The test run is part of the break-in operation.

Break-in

During the test run, perform the break-in operation in the following 5 stages.

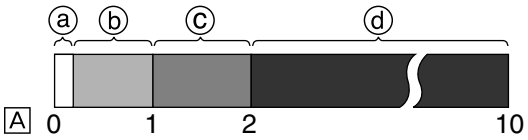
1. 10 minutes ⓐ at the lowest possible speed. A fast idle in neutral is best.

2. 50 minutes ⓑ at 1/2 throttle (approximately 3,000 r/min) or less. Vary engine speed occasionally. On an easy-planing boat, accelerate at full throttle onto plane, then immediately reduce the throttle to 3,000 r/min or less.

3. 1 hour ⓒ at 3/4 throttle (approximately 4,000 r/min). Vary engine speed occasionally. Run at full throttle for 1 minute, then allow about 10 minutes of operation at 3/4 throttle or less to let the engine cool.

4. 8 hours ⓓ at any speed, but avoid operating at full throttle for more than 5 minutes at a time. Let the engine cool between full-throttle runs. Vary engine speed occasionally.

5. After the first 10 hours. Use standard premix ratio of fuel and oil. Refer to page 1-13.



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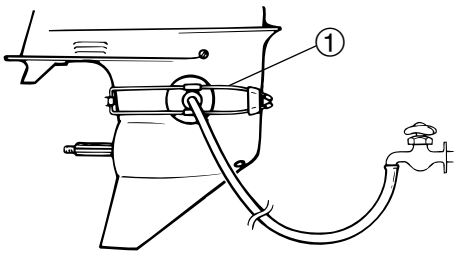
A Hours

After test run

1. Check for water in the gear oil.
2. Check for fuel leakage in the cowling.
3. Install the flushing kit ①.
4. Set the gear shift to “N” position, and then flush the cooling water passage with engine running at idle.



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CAUTION:

Be sure to supply sufficient water when flushing the cooling water passage, otherwise the engine may overheat.

⚠WARNING

- **Be sure to remove the propeller before using the flushing kit.**
- **Keep hands, hair and clothes away from the propeller shaft while the engine is running.**

— MEMO —

Specification

General specification

Item	Unit	Model			
		55DEHD	75AEHD	75AED	75AET
Dimension					
Overall length	mm (in)	1,337 (52.6)		726 (28.6)	
Overall width	mm (in)	398 (15.7)		374 (14.7)	
Overall height					
(L)	mm (in)	1,422 (56.0)			
(X)	mm (in)	—	1,548 (60.9)		—
Boat transom height					
(L)	mm (in)	508 (20.0)			
(X)	mm (in)	—	635 (25.0)		—
Weight					
(with aluminum propeller)					
(L)	kg (lb)	116 (256)		111 (245)	119 (262)
(X)	kg (lb)	—	119 (262)	114 (251)	—
(with stainless propeller)					
(L)	kg (lb)	118 (260)		113 (249)	121 (267)
(X)	kg (lb)	—	121 (267)	116 (256)	—
Performance					
Maximum output	kW (hp)	40.5 (55) at 5,000 r/min	55.2 (75) at 5,000 r/min		
Full throttle operating range	r/min	4,500–5,500			
Maximum fuel consumption	L (US gal, lmp gal)/hr	31 (8.2, 6.8) 5,500 r/min	34 (9.0, 7.5) 5,500 r/min		
Engine idle speed	r/min	750–850			
Power unit					
Engine type		2-stroke, L			
Cylinder quantity		3			
Total displacement	cm^3 (cu. in)	1,140 (69.57)			
Bore x stroke	mm (in)	82.0 × 72.0 (3.23 × 2.83)			
Compression ratio		4.5 :1			
Intake system		Reed valve			
Scavenging system		Loop charge			
Control system		Tiller handle		Remote control	
Starting system		Electric			
Fuel system		Carburetor			
Ignition control system		CDI			
Maximum generator output	V, A	12, 10			
Starting enrichment		Choke valve			
Spark plug		B8HS-10 (NGK) BR8HS-10 (NGK)			

Item	Unit	Model			
		55DEHD	75AEHD	75AED	75AET
Cooling system		Water			
Exhaust system		Propeller boss			
Lubrication system		Pre-mixed fuel and oil			
Fuel and oil					
Fuel type		Regular unleaded gasoline			
Engine oil		2-stroke outboard motor oil			
Engine oil grade		NMMA-certified TC-W3			
Gear oil type		Hypoid gear oil			
Gear oil grade (*1)	API	GL-4			
	SAE	90			
Gear oil quantity	cm^3 (US oz, Imp oz)	610 (20.62, 21.51)			
Bracket unit					
Trim angle (at 12° boat transom)	Degree	-4.0 to 15.0			
Tilt-up angle	Degree	67.0			
Steering angle	Degree	30 + 30			
Drive unit					
Gear shift positions		F-N-R			
Gear ratio		2.00 (26/13)			
Reduction gear type		Spiral bevel gear			
Clutch type		Dog clutch			
Propeller shaft type		Spline			
Propeller direction (rear view)		Clockwise			
Propeller ID mark		K			
Electrical					
Battery minimum capacity (*2)					
CCA/EN	A	430			
20HR/IEC	Ah	70			

(*1) Meeting both API and SAE requirements

(*2) CCA: Cold Cranking Ampere
EN: European Norm (European standard)
IEC: International Electrotechnical Commission

Item	Unit	Model		
		85AEHD	85AED	85AET
Dimension				
Overall length	mm (in)	1,337 (52.6)	726 (28.6)	
Overall width	mm (in)	398 (15.7)	374 (14.7)	
Overall height				
(L)	mm (in)	1,422 (56.0)		
(Y)	mm (in)	1,473 (58.0)	—	
(X)	mm (in)	—	1,548 (60.9)	
Boat transom height				
(L)	mm (in)	508 (20.0)		
(Y)	mm (in)	559 (22.0)	—	
(X)	mm (in)	—	635 (25.0)	
Weight				
(with aluminum propeller)				
(L)	kg (lb)	119 (262)	111 (245)	119 (262)
(Y)	kg (lb)	120 (265)	—	
(X)	kg (lb)	—	114 (251)	122 (269)
(with stainless propeller)				
(L)	kg (lb)	121 (267)	113 (249)	121 (267)
(Y)	kg (lb)	122 (269)	—	
(X)	kg (lb)	—	116 (256)	124 (273)
Performance				
Maximum output	kW (hp)	62.5 (85) at 5,000 r/min		
Full throttle operating range	r/min	4,500–5,500		
Maximum fuel consumption	L (US gal, lmp gal)/hr	35 (9.2, 7.7) at 5,500 r/min		
Engine idle speed	r/min	750–850		
Power unit				
Engine type		2-stroke, L		
Cylinder quantity		3		
Total displacement	cm^3 (cu. in)	1,140 (69.57)		
Bore x stroke	mm (in)	82.0 × 72.0 (3.23 × 2.83)		
Compression ratio		5.1 :1		
Intake system		Reed valve		
Scavenging system		Loop charge		
Control system		Tiller handle	Remote control	
Starting system		Electric		
Fuel system		Carburetor		
Ignition control system		CDI		
Maximum generator output	V, A	12, 10		
Starting enrichment		Choke valve		
Spark plug		B8HS-10 (NGK) BR8HS-10 (NGK)		

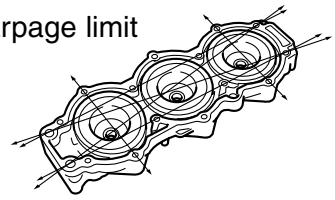
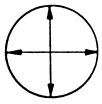
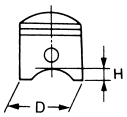
Item	Unit	Model		
		85AEHD	85AED	85AET
Cooling system		Water		
Exhaust system		Propeller boss		
Lubrication system		Pre-mixed fuel and oil		
Fuel and oil				
Fuel type		Regular unleaded gasoline		
Engine oil		2-stroke outboard motor oil		
Engine oil grade		NMMA-certified TC-W3		
Gear oil type		Hypoid gear oil		
Gear oil grade (*1)	API	GL-4		
	SAE	90		
Gear oil quantity	cm^3 (US oz, Imp oz)	610 (20.62, 21.51)		
Bracket unit				
Trim angle (at 12° boat transom)	Degree	-4.0 to 15.0		
Tilt-up angle	Degree	67.0		
Steering angle	Degree	30 + 30		
Drive unit				
Gear shift positions		F-N-R		
Gear ratio		2.00 (26/13)		
Reduction gear type		Spiral bevel gear		
Clutch type		Dog clutch		
Propeller shaft type		Spline		
Propeller direction (rear view)		Clockwise		
Propeller ID mark		K		
Electrical				
Battery minimum capacity (*2)				
CCA/EN	A	430		
20HR/IEC	Ah	70		

(*1) Meeting both API and SAE requirements

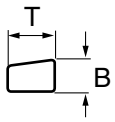
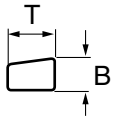
(*2) CCA: Cold Cranking Ampere
EN: European Norm (European standard)
IEC: International Electrotechnical Commission

Maintenance specification

Power unit (55D, 75A models)

Item	Unit	Model			
		55DEHD	75AEHD	75AED	75AET
Power unit					
Minimum compression pressure (*1) at electric starter	kPa (kgf/cm², psi)	340 (3.4, 49)			
Cylinder head					
Warpage limit  (lines indicate straightedge position)	mm (in)	0.1 (0.0039)			
Cylinder					
Bore size 	mm (in)	82.000–82.020 (3.2283–3.2291)			
Piston					
Piston diameter (D) 	mm (in)	81.935–81.955 (3.2258–3.2266)			
Measuring point (H)	mm (in)	20.0 (0.79)			
Piston clearance (reference data)	mm (in)	0.065–0.070 (0.0026–0.0028)			
Piston pin boss bore	mm (in)	19.904–19.915 (0.7836–0.7841)			
Oversize piston					
1st	mm (in)	0.25 (0.010)			
2nd	mm (in)	0.50 (0.020)			
Oversize piston diameter					
1st	mm (in)	82.185–82.205 (3.2356–3.2364)			
2nd	mm (in)	82.435–82.455 (3.2455–3.2463)			
Piston pin					
Outside diameter	mm (in)	19.895–19.900 (0.7833–0.7835)			

(*1) Measuring conditions:
Ambient temperature 20°C (68°F), wide open throttle, with spark plugs removed from all cylinders.
The figures are for reference only.

Item	Unit	Model			
		55DEHD	75AEHD	75AED	75AET
Piston ring					
Top ring 					
Dimension B	mm (in)	1.965–1.980 (0.0774–0.0780)			
Dimension T	mm (in)	3.100–3.300 (0.1220–0.1299)			
End gap (reference data)	mm (in)	0.40–0.60 (0.0157–0.0236)			
Side clearance	mm (in)	0.05–0.08 (0.0020–0.0032)			
Oversize outside diameter					
1st	mm (in)	82.25 (3.24)			
2nd	mm (in)	82.50 (3.25)			
2nd piston ring 					
Dimension B	mm (in)	1.965–1.980 (0.0774–0.0780)			
Dimension T	mm (in)	3.100–3.300 (0.1220–0.1299)			
End gap (reference data)	mm (in)	0.40–0.60 (0.0157–0.0236)			
Side clearance	mm (in)	0.03–0.06 (0.0012–0.0024)			
Oversize outside diameter					
1st	mm (in)	82.25 (3.24)			
2nd	mm (in)	82.50 (3.25)			
Connecting rod					
Small-end inside diameter	mm (in)	24.900–24.912 (0.9803–0.9808)			
Big-end inside diameter	mm (in)	39.010–39.025 (1.5358–1.5364)			
Connecting rod big-end side clearance	mm (in)	0.120–0.260 (0.0047–0.0102)			
Small-end axial play limit	mm (in)	2.0 (0.08)			
Crankshaft					
Crankshaft journal diameter	mm (in)	34.968–34.984 (1.3767–1.3773)			
Crankpin diameter	mm (in)	29.985–30.000 (1.1805–1.1811)			
Runout limit	mm (in)	0.02 (0.0008)			
Thermostat					
Opening temperature	°C (°F)	48–52 (118.4–125.6)			
Fully open temperature	°C (°F)	60 (140)			
Valve open lower limit	mm (in)	3.0 (0.12)			
Reed valve					
Valve stopper height	mm (in)	9.7–10.1 (0.38–0.40)	2.8–3.2 (0.11–0.13)		
Valve bend limit	mm (in)	0.2 (0.0079)			
Carburetor					
ID mark		69245	69225		
Main jet (M.J.)	#	170	175		
Main nozzle (M.N.)	mm (in)	3.2 (0.13)			
Main air jet	#	185	180		
Pilot jet (P.J.)	#	78	80		
Pilot air jet (P.A.J.)	#	85	100		
Pilot screw (P.S.)	turns out	1–1 1/2			
Valve seat size	ø	1.6			
Float height	mm (in)	16.5-22.5 (0.65–0.89)			

Lower unit (55D, 75A models)

Item	Unit	Model			
		55DEHD	75AEHD	75AED	75AET
Gear backlash					
Pinion-to-forward gear	mm (in)	0.08–0.25 (0.0032–0.0098)			
Pinion-to-reverse gear	mm (in)	0.67–1.00 (0.0264–0.0394)			
Pinion gear 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 (55D, 75A models)

Item	Unit	Model			
		55DEHD	75AEHD	75AED	75AET
Ignition and ignition control system					
Spark plug gap	mm (in)	0.9–1.0 (0.035–0.039)			
Spark plug cap resistance	kΩ	4.0–6.0			
Ignition timing (full retarded)	Degree	BTDC 1–3			
Ignition timing (full advanced)	Degree	BTDC 21–23			
Ignition coil resistance					
Primary coil (B/W–B) at 20°C (68°F)	Ω	0.18–0.24			
Secondary coil (B/W–spark plug wire) at 20°C (68°F)	kΩ	3.26–4.88			
CDI unit output peak voltage (B/W–B)					
at Cranking (loaded)	V	130			
at 1,500 r/min (loaded)	V	150			
at 3,500 r/min (loaded)	V	150			
Pulser coil output peak voltage (W/R–W/Y, W/B–W/G)					
at Cranking (unloaded)	V	6.0			
at Cranking (loaded)	V	4.0			
at 1,500 r/min (loaded)	V	8.0			
at 3,500 r/min (loaded)	V	14.0			
Pulser coil resistance at 20°C (68°F) (W/R–W/Y, W/B–W/G)	Ω	256–384			
Thermoswitch					
ON temperature	°C (°F)	84–90 (183–194)			
OFF temperature	°C (°F)	60–74 (140–165)			

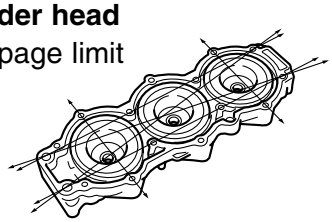
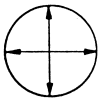
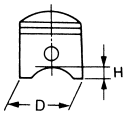
Coil resistance and peak voltage are reference data.
Measuring conditions:
Ambient temperature 20°C (68°F).

Item	Unit	Model			
		55DEHD	75AEHD	75AED	75AET
Charge coil output peak voltage					
(R–Br)					
at Cranking (unloaded)	V	50			
at Cranking (loaded)	V	60			
at 1,500 r/min (loaded)	V	150			
at 3,500 r/min (loaded)	V	160			
(R–L)					
at Cranking (unloaded)	V	150			
at Cranking (loaded)	V	110			
at 1,500 r/min (loaded)	V	150			
at 3,500 r/min (loaded)	V	160			
Charge coil resistance at 20°C (68°F)					
(R–Br)	Ω	48–72			
(R–L)	Ω	428–642			
Starter motor					
Type		Bendix			
Output	kW	1			
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)			
Standard undercut	mm (in)	0.8 (0.03)			
Wear limit	mm (in)	0.2 (0.01)			
Choke solenoid resistance	Ω	—		3.4–4.0	
Charging system					
Fuse	A	20			
Lighting coil output peak voltage (G–G/W)					
at Cranking (unloaded)	V	11.3			
at 1,500 r/min (unloaded)	V	32.3			
at 3,500 r/min (unloaded)	V	72.3			
Lighting coil resistance at 20°C (68°F) (G–G/W)	Ω	0.36–0.54			
Rectifier Regulator output peak voltage (battery)					
at 1,500 r/min (loaded)	V	13			
at 3,500 r/min (loaded)	V	13			

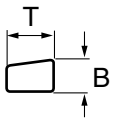
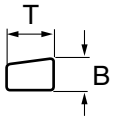
Coil resistance and peak voltage are reference data.
Measuring conditions:
Ambient temperature 20°C (68°F).

Item	Unit	Model			
		55DEHD	75AEHD	75AED	75AET
PTT system					
Trim sensor resistance at 20°C (68°F) (P–B)	Ω		—		168.3–288.3
Trim sensor setting resistance at 20°C (68°F) (P–B)	Ω		—		9–11
Fluid type			—		ATF Dexron Ⅱ
Motor type			—		6H102
Output	kW		—		0.3
Brushes					
Standard length	mm (in)		—		9.75 (0.384)
Wear limit	mm (in)		—		5.5 (0.22)
Commutator					
Standard diameter	mm (in)		—		22.0 (0.87)
Wear limit	mm (in)		—		21.0 (0.83)
Standard undercut	mm (in)		—		1.8 (0.07)
Wear limit	mm (in)		—		1.3 (0.05)
Hydraulic pressure (down)	MPa (kgf/cm²)		—		2.2–3.8 (22-38)
Hydraulic pressure (up)	MPa (kgf/cm²)		—		9–11 (90–110)

Power unit (85A models)

Item	Unit	Model		
		85AEHD	85AED	85AET
Power unit				
Minimum compression pressure (*1) at electric starter	kPa (kgf/cm², psi)	410 (4.1, 59)		
Cylinder head				
Warpage limit  (lines indicate straightedge position)	mm (in)	0.1 (0.0039)		
Cylinder				
Bore size 	mm (in)	82.000–82.020 (3.2283–3.2291)		
Piston				
Piston diameter (D) 	mm (in)	81.935–81.955 (3.2258–3.2266)		
Measuring point (H)	mm (in)	20.0 (0.79)		
Piston clearance (reference data)	mm (in)	0.065–0.070 (0.0026–0.0028)		
Piston pin boss bore	mm (in)	19.904–19.915 (0.7836–0.7841)		
Oversize piston				
1st	mm (in)	0.25 (0.010)		
2nd	mm (in)	0.50 (0.020)		
Oversize piston diameter				
1st	mm (in)	82.185–82.205 (3.2356–3.2364)		
2nd	mm (in)	82.435–82.455 (3.2455–3.2463)		
Piston pin				
Outside diameter	mm (in)	19.895–19.900 (0.7833–0.7835)		

(*1) Measuring conditions:
Ambient temperature 20°C (68°F), wide open throttle, with spark plugs removed from all cylinders.
The figures are for reference only.

Item	Unit	Model		
		85AEHD	85AED	85AET
Piston ring				
Top ring 				
Dimension B	mm (in)	1.965–1.980 (0.0774–0.0780)		
Dimension T	mm (in)	3.100–3.300 (0.1220–0.1299)		
End gap (reference data)	mm (in)	0.40–0.60 (0.0157–0.0236)		
Side clearance	mm (in)	0.05–0.08 (0.0020–0.0032)		
Oversize outside diameter				
1st	mm (in)	82.25 (3.24)		
2nd	mm (in)	82.50 (3.25)		
2nd piston ring 				
Dimension B	mm (in)	1.965–1.980 (0.0774–0.0780)		
Dimension T	mm (in)	3.100–3.300 (0.1220–0.1299)		
End gap (reference data)	mm (in)	0.40–0.60 (0.0157–0.0236)		
Side clearance	mm (in)	0.03–0.06 (0.0012–0.0024)		
Oversize outside diameter				
1st	mm (in)	82.25 (3.24)		
2nd	mm (in)	82.50 (3.25)		
Connecting rod				
Small-end inside diameter	mm (in)	24.900–24.912 (0.9803–0.9808)		
Big-end inside diameter	mm (in)	39.010–39.025 (1.5358–1.5364)		
Connecting rod big-end side clearance	mm (in)	0.120–0.260 (0.0047–0.0102)		
Small-end axial play limit	mm (in)	2.0 (0.08)		
Crankshaft				
Crankshaft journal diameter	mm (in)	34.968–34.984 (1.3767–1.3773)		
Crankpin diameter	mm (in)	29.985–30.000 (1.1805–1.1811)		
Runout limit	mm (in)	0.02 (0.0008)		
Thermostat				
Opening temperature	°C (°F)	48–52 (118.4–125.6)		
Fully open temperature	°C (°F)	60 (140)		
Valve open lower limit	mm (in)	3.0 (0.12)		
Reed valve				
Valve stopper height	mm (in)	9.7–10.1 (0.38–0.40)		
Valve bend limit	mm (in)	0.2 (0.0079)		
Carburetor				
ID mark		68808		
Main jet (M.J.)	#	165		
Main nozzle (M.N.)	mm (in)	3.4 (0.13)		
Main air jet	#	180		
Pilot jet (P.J.)	#	78		
Pilot air jet (P.A.J.)	#	100		
Pilot screw (P.S.)	turns out	7/8–1 3/8		
Valve seat size	ø	1.6		
Float height	mm (in)	16.5-22.5 (0.65–0.89)		

Lower unit (85A models)

Item	Unit	Model		
		85AEHD	85AED	85AET
Gear backlash				
Pinion-to-forward gear	mm (in)	0.08–0.25 (0.0032–0.0098)		
Pinion-to-reverse gear	mm (in)	0.67–1.00 (0.0264–0.0394)		
Pinion gear 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 (85A models)

Item	Unit	Model		
		85AEHD	85AED	85AET
Ignition and ignition control system				
Spark plug gap	mm (in)	0.9–1.0 (0.035–0.039)		
Spark plug cap resistance	kΩ	4.0–6.0		
Ignition timing (full retarded)	Degree	BTDC 1–3		
Ignition timing (full advanced)	Degree	BTDC 23–25		
Ignition coil resistance				
Primary coil (B/W–B) at 20°C (68°F)	Ω	0.18–0.24		
Secondary coil (B/W–spark plug wire) at 20°C (68°F)	kΩ	3.26–4.88		
CDI unit output peak voltage (B/W–B)				
at Cranking (loaded)	V	130		
at 1,500 r/min (loaded)	V	150		
at 3,500 r/min (loaded)	V	150		
Pulser coil output peak voltage (W/R–W/Y, W/B–W/G)				
at Cranking (unloaded)	V	6.0		
at Cranking (loaded)	V	4.0		
at 1,500 r/min (loaded)	V	8.0		
at 3,500 r/min (loaded)	V	14.0		
Pulser coil resistance at 20°C (68°F) (W/R–W/Y, W/B–W/G)	Ω	256–384		
Thermoswitch				
ON temperature	°C (°F)	84–90 (183–194)		
OFF temperature	°C (°F)	60–74 (140–165)		

Coil resistance and peak voltage are reference data.
Measuring conditions:
Ambient temperature 20°C (68°F).

Item	Unit	Model		
		85AEHD	85AED	85AET
Charge coil output peak voltage				
(R–Br)				
at Cranking (unloaded)	V		50	
at Cranking (loaded)	V		60	
at 1,500 r/min (loaded)	V		150	
at 3,500 r/min (loaded)	V		160	
(R–L)				
at Cranking (unloaded)	V		150	
at Cranking (loaded)	V		110	
at 1,500 r/min (loaded)	V		150	
at 3,500 r/min (loaded)	V		160	
Charge coil resistance at 20°C (68°F)				
(R–Br)	Ω		48–72	
(R–L)	Ω		428–642	
Starter motor				
Type			Bendix	
Output	kW		1	
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)	
Standard undercut	mm (in)		0.8 (0.03)	
Wear limit	mm (in)		0.2 (0.01)	
Choke solenoid resistance	Ω	—	3.4–4.0	
Charging system				
Fuse	A		20	
Lighting coil output peak voltage (G–G/W)				
at Cranking (unloaded)	V		11.3	
at 1,500 r/min (unloaded)	V		32.3	
at 3,500 r/min (unloaded)	V		72.3	
Lighting coil resistance at 20°C (68°F) (G–G/W)	Ω		0.36–0.54	
Rectifier Regulator output peak voltage (battery)				
at 1,500 r/min (loaded)	V		13	
at 3,500 r/min (loaded)	V		13	

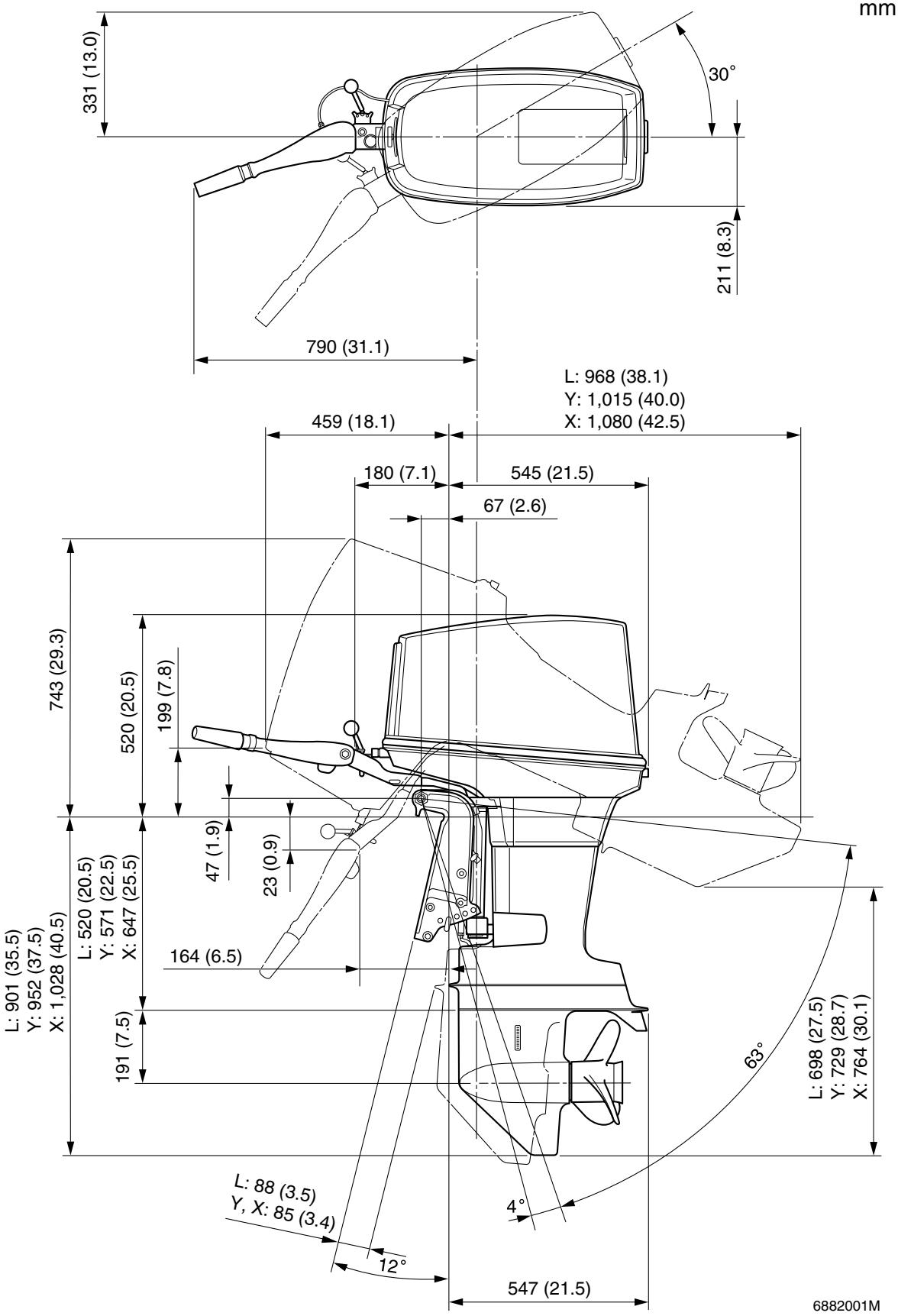
Coil resistance and peak voltage are reference data.
Measuring conditions:
Ambient temperature 20°C (68°F).

Item	Unit	Model		
		85AEHD	85AED	85AET
PTT system				
Trim sensor resistance at 20°C (68°F) (P–B)	Ω	—		168.3–288.3
Trim sensor setting resistance at 20°C (68°F) (P–B)	Ω	—		9–11
Fluid type		—		ATF Dexron Ⅱ
Motor type		—		6H102
Output	kW	—		0.3
Brushes				
Standard length	mm (in)	—		9.75 (0.384)
Wear limit	mm (in)	—		5.5 (0.22)
Commutator				
Standard diameter	mm (in)	—		22.0 (0.87)
Wear limit	mm (in)	—		21.0 (0.83)
Standard undercut	mm (in)	—		1.8 (0.07)
Wear limit	mm (in)	—		1.3 (0.05)
Hydraulic pressure (down)	MPa (kgf/cm²)	—		2.2–3.8 (22-38)
Hydraulic pressure (up)	MPa (kgf/cm²)	—		9–11 (90–110)

Dimension

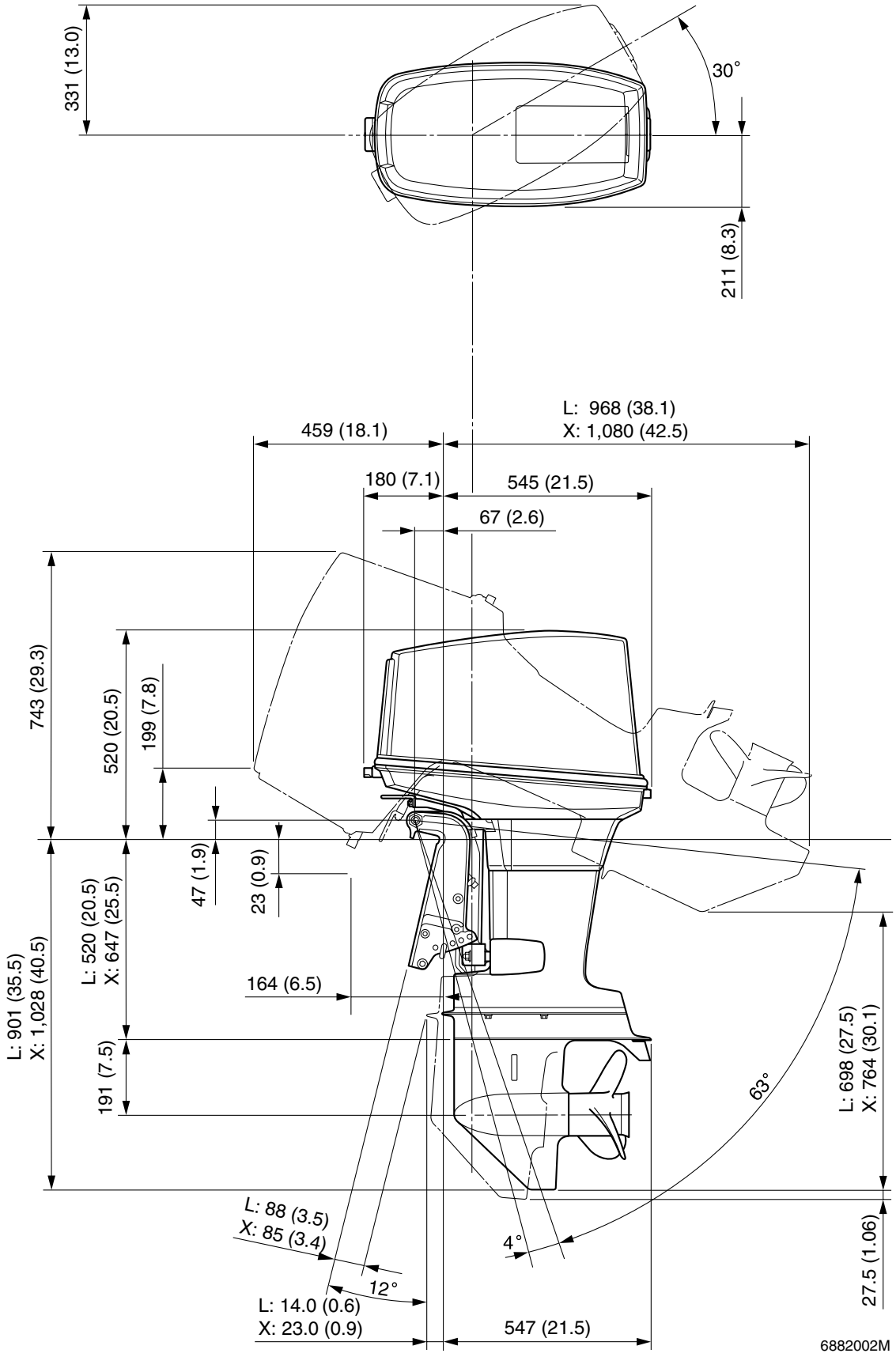
Exterior 55DEHD, 75AEHD, 85AEHD

mm (in)



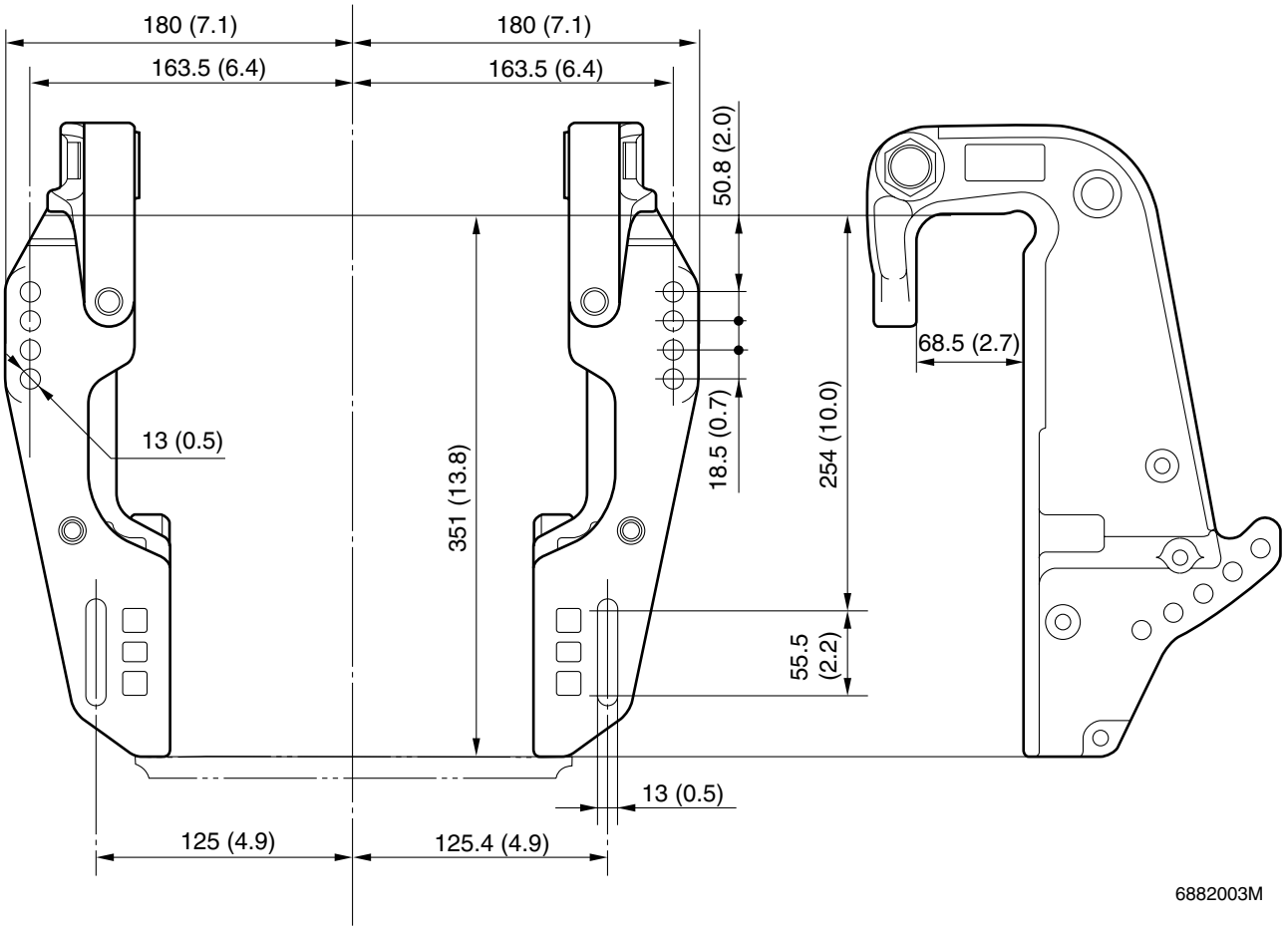
Exterior 75AED, 75AET, 85AED, 85AET

mm (in)



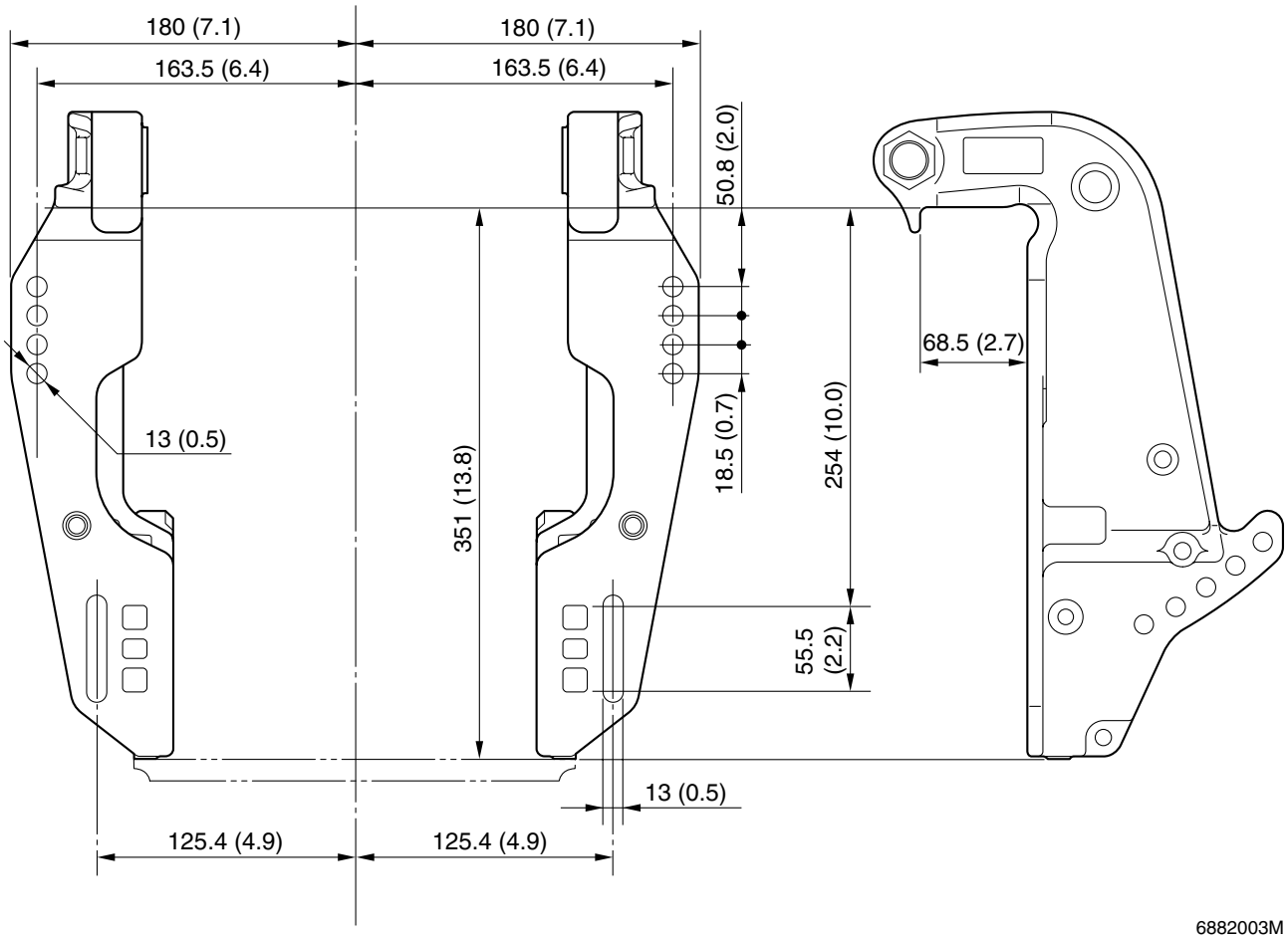
Clamp bracket 55DEHD, 75AEHD, 75AED, 85AEHD, 85AED

mm (in)



Clamp bracket 75AET, 85AET

mm (in)



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Tightening torque

Specified torque

Part to be tightened		Thread size	Tightening torques		
			N·m	kgf·m	ft·lb
Power unit					
Power unit mount bolt		M8	21	2.1	15.5
Flywheel magnet nut		—	160	16.0	118
Ignition coil mount bolt		M6	7	0.7	5.2
Spark plug		M14	25	2.5	18
Intake manifold bolt		M6	12	1.2	8.9
Cylinder head bolt	1st	M8	15	1.5	11.1
	2nd		30	3.0	22.1
Crankcase bolt	1st	M10	20	2.0	14.8
	2nd		40	4.0	29.5
	1st	M6	4	0.4	3.0
	2nd		12	1.2	8.9
Crankcase nut	1st	—	20	2.0	14.8
	2nd		40	4.0	29.5
Connecting rod bolt	1st	M8	12	1.2	8.9
	2nd		35	3.5	25.8
	3rd		Loosen completely		
	4th		12	1.2	8.9
	5th		35	3.5	25.8
Lower unit					
Check screw		—	9	0.9	6.6
Drain screw		—	9	0.9	6.6
Lower case bolt		M10	40	4.0	29.5
Lower case nut (X, Y-transom)		—	40	4.0	29.5
Ring nut		—	105	10.5	77.4
Pinion nut		—	95	9.5	70.1
Propeller nut		—	35	3.5	25.8
Cooling water inlet cover screw		—	4	0.4	3.0
Bracket unit					
Throttle cable lock nut (EHD)		—	11	1.1	8.1
Tiller handle pivot bolt (EHD)		M12	37	3.7	27.3
Steering bracket nut (EHD)		—	37	3.7	27.3
Steering hook nut (ED, ET)		—	20	2.0	14.8
Main switch nut (EHD)		—	5	0.5	3.7
Warning indicator nut (EHD)		—	4	0.4	3.0
Upper case bolt		M8	21	2.1	15.5
Muffler bolt		M8	21	2.1	15.5
Exhaust manifold bolt		M8	21	2.1	15.5
Self-locking nut		—	15	1.5	11.1
Tilt lock lever bolt (EHD, ED)		M6	8	0.8	5.9
Stopper nut (ET)		—	18	1.8	13.3

Part to be tightened	Thread size	Tightening torques		
		N·m	kgf·m	ft·lb
PTT unit (ET)				
PTT motor mount bolt	M6	7	0.7	5.2
Reservoir mount bolt	M6	7	0.7	5.2
Reservoir cap	—	7	0.7	5.2
Main valve	—	11	1.1	8.1
Trim spring screw	—	4	0.4	3.0
Valve lock screw	—	4	0.4	3.0
Manual valve	—	3	0.3	2.2
Pipe joint	—	15	1.5	11.1
Pipe joint	—	20	2.0	14.8
Stator mount screw (PTT motor)	—	3.4	0.34	2.5
Gear pump bolt	M4	4	0.4	3.0
Tilt ram	—	65	6.5	47.9
Tilt cylinder end screw	—	90	9.0	66.4
Tilt piston bolt	M6	13	1.3	9.6
Trim cylinder end screw	—	160	16	118
Electrical				
Negative battery terminal bolt	M8	30	3.0	22.1
Positive battery terminal nut	—	9	0.9	6.6
Positive terminal nut	—	4	0.4	3.0
Starter relay terminal nut	—	4	0.4	3.0
CDI unit bracket mount bolt	M6	7	0.7	5.2
Starter motor mount bolt	M8	30	3.0	22.1

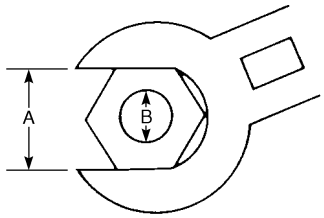
General torque

This chart specifies tightening torques for standard fasteners with a standard ISO thread pitch. Tightening torque specification 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 torque is reached. Unless otherwise specified, torque specification require clean, dry threads.

Components should be at room temperature.

Nut (A)	Bolt (B)	General torque specifications		
		N·m	kgf·m	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	26
17 mm	M12	43	4.3	31



Periodic check and adjustment

Maintenance interval chart

Use the following chart as a guideline for general maintenance.
Adjust the maintenance intervals according to the operating conditions of the outboard motor.

Item	Actions	Initial		Every		Refer to page
		10 hours (1 month)	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	
Anode (s) (external)	Check / replace		○	○		3-19
Anode (s) (internal)	Check / replace				○	3-19
Battery	Check / charge	○				3-19
Cooling water passages	Clean		○	○		3-4
Cowling clamp	Check				○	3-2
Fuel filter (can be disassembled)	Check / clean	○	○	○		3-3
Fuel system	Check	○	○	○		3-2
Fuel tank (Yamaha portable tank)	Check / clean				○	—
Gear oil	Change	○		○		3-17
Lubrication points	Lubricate			○		3-20
Idle speed	Check / adjust	○		○		3-8
PCV	Check				○	5-20
PTT unit	Check / replace				○	3-15
Propeller and cotter pin	Check / replace		○	○		3-19
Shift link / shift cable	Check / adjust				○	3-13
Thermostat	Check / replace				○	3-3
Throttle link / throttle cable / throttle pick-up timing	Check / adjust				○	3-6 3-7
Water pump	Check / replace				○	6-6
Spark plugs	Clean / adjust / replace	○	○	○		3-3

NOTE:

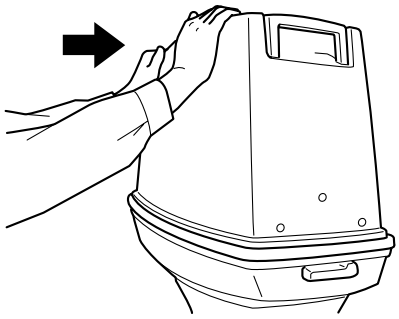
When operating in salt water, turbid or muddy water, the engine should be flushed with clean water after each use.

Top cowling

Checking the top cowling

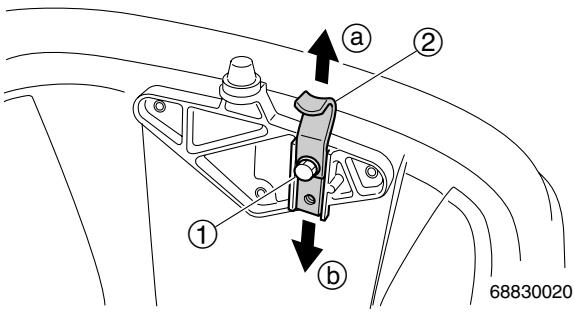
1. Check the top cowling. Replace the top cowling if cracked or other damaged.

2. Check the fitting by pushing the top cowling with both hands. Adjust the fittings of the top cowling following the procedures below if it does not fit improperly.



3. Loosen the bolt ①.

4. Move the hook ② up or down slightly to adjust its position.



NOTE:

- To loosen the fitting, move the hook ② in direction ⓐ.
- To tighten the fitting, move the hook ② in direction ⓑ.

5. Tighten the bolt ①.

6. Check the fitting again. Repeat steps 3–5 if necessary.

7. Check the rubber trim. Replace the rubber trim if worn, deteriorated or damaged.

8. Check the lock lever, bushings and washers. Replace if worn or damaged.

9. Check the hooks and rivets. Replace the hooks and rivets if worn or damaged.

Fuel system

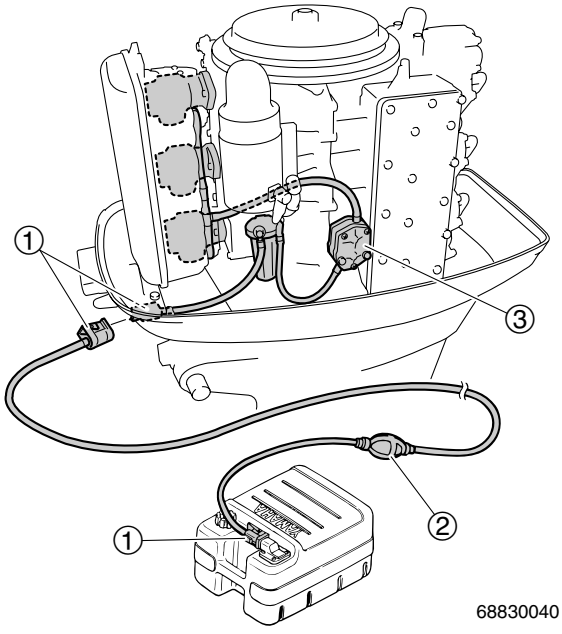
CAUTION:

Checking the fuel system procedures will allow some fuel to spill. Catch fuel in a rag. Wipe up any spilled fuel immediately.

Checking the fuel joint and fuel hose (fuel tank-to-carburetor)

1. Check the fuel joints ①, primer pump ② and fuel hose. Replace them if kinked, leaked or clogged.

2. Check the fuel pump ③. Replace the fuel pump gaskets if leaked.



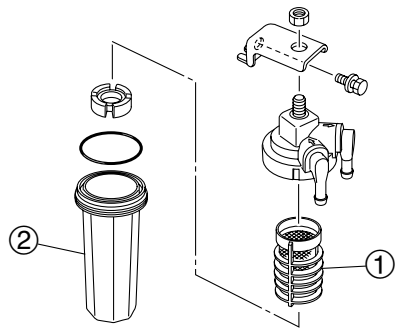
Checking the fuel filter

1. Remove the nut, and then remove the fuel filter assembly.

NOTE:
Be sure not to spill any fuel when removing the fuel cap assembly.

2. Check the fuel filter element ①. Clean if there is dirt or residue.

3. Check the fuel filter cup ②. Clean with the straight gasoline if foreign substance appears or replace if cracked.



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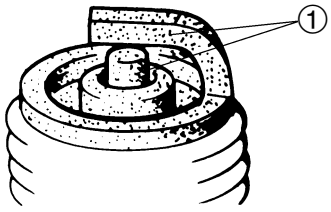
Power unit

Checking the spark plug

1. Disconnect the spark plug caps, and then remove the spark plugs.

2. Clean the electrodes ① with a spark plug cleaner and wire brush.



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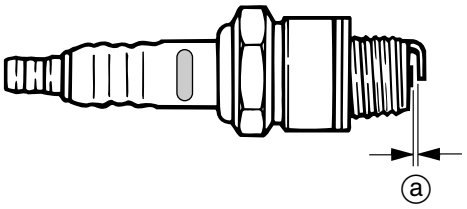
3. Check the electrodes ① and gasket. Replace the spark plug for erosion, excessive carbon, other deposits or damage.

4. Check the spark plug gap ⓐ. Adjust or replace if out of specification.



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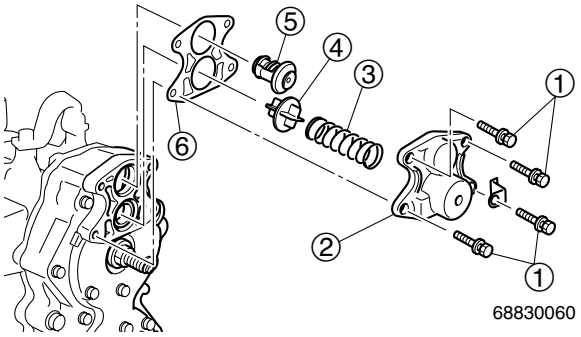
Specified spark plug:
B8HS-10, BR8HS-10 (NGK)
Spark plug gap ⓐ:
0.9–1.0 mm (0.035–0.039 in)

5. Tighten the spark plug temporarily, and then tighten it to the specified torque with a spark plug wrench.

Spark plug:
25 N·m (2.5 kgf·m, 18 ft·lb)

Checking the thermostat

1. Remove the thermostat cover bolts ①, thermostat cover ②, spring ③, PCV ④, thermostat ⑤ and gasket ⑥.



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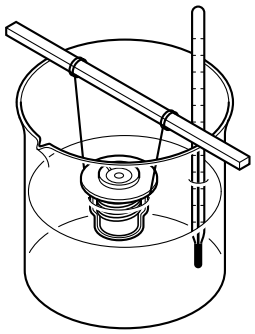
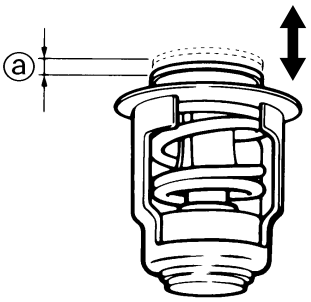
2. Suspend the thermostat ⑤ in a container with water.

3. Place a thermometer in the water and slowly heat the water.

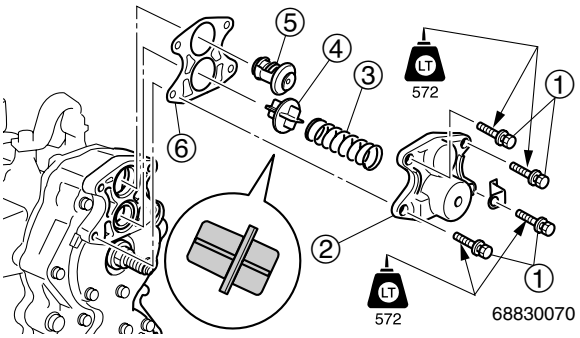


4. Check the thermostat valve opening at the specified water temperatures. Replace if out of specification.



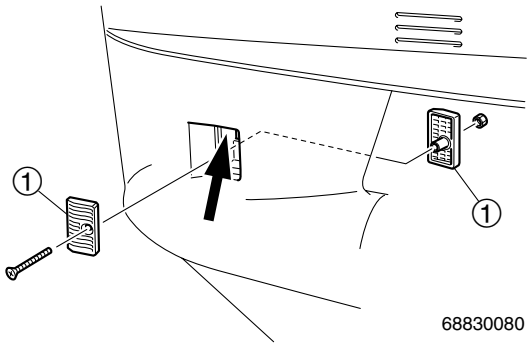
Water temperature	Valve lift ⓐ
48–52°C (118.4–125.6°F)	0.05 mm (0.002 in) (valve begins to lift)
above 60°C (140°F)	more than 3.0 mm (0.12 in)

5. Install the new gasket ⑥ thermostat ⑤, PCV ④, spring ③ and thermostat cover ②, and then tighten the thermostat cover bolts ①.



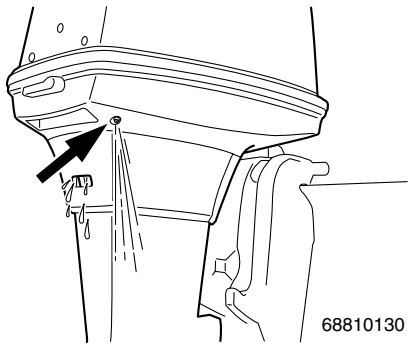
Checking the cooling water passage

1. Check the cooling water inlet covers ① and cooling water inlet. Clean the water inlet cover and cooling water inlet if clogged.



2. Place the lower unit in water, and then start the engine.

3. Check for a water flow from the cooling water pilot hole. Turn the engine off. If there is no water flow, check the water pump and cooling water passage.

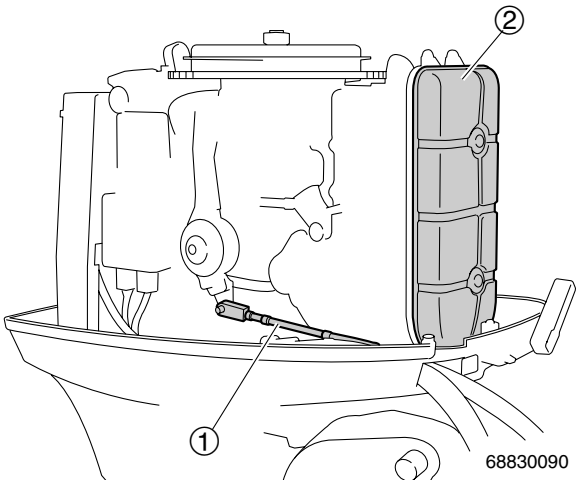


3

Control system
Synchronizing the carburetor

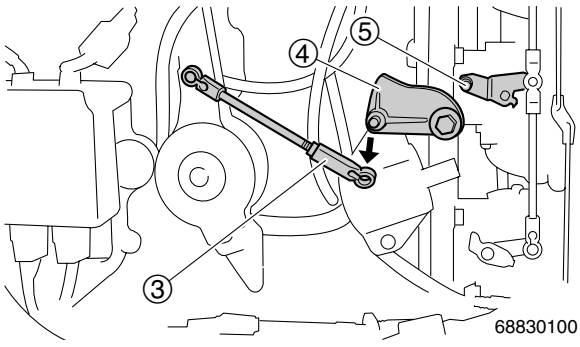
NOTE:
Make sure to synchronizing the carburetor, always disassemble or replace.

1. Disconnect the throttle cable ① and remove the intake silencer cover ②.



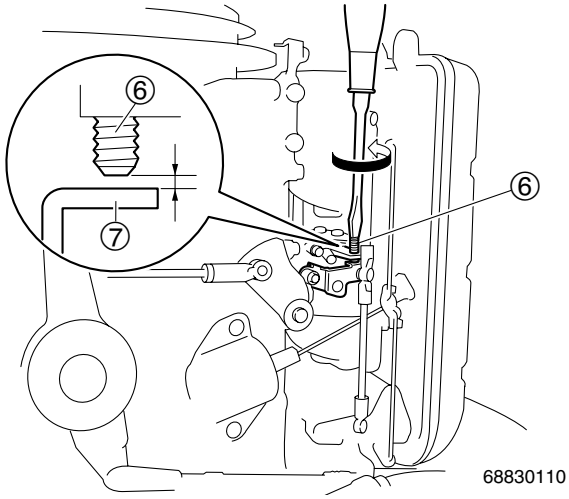
NOTE:
To disconnect and connect the throttle cable, refer to page 3-7.

2. Remove the throttle link rod ③.

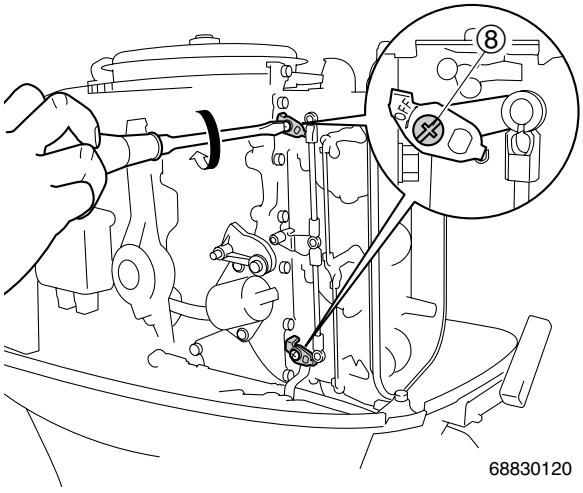


NOTE:
Separate the throttle cam ④ from cam roller ⑤ of the carburetor.

3. Loosen the throttle stop screw ⑥ at the carburetor assembly #2 until it does not contact from the stopper ⑦.



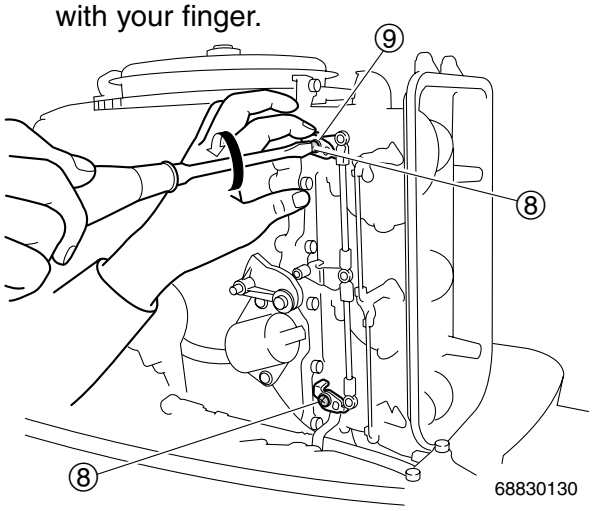
4. Loosen the throttle lever tightening screws ⑧ at the carburetor assembly #1 and #3.



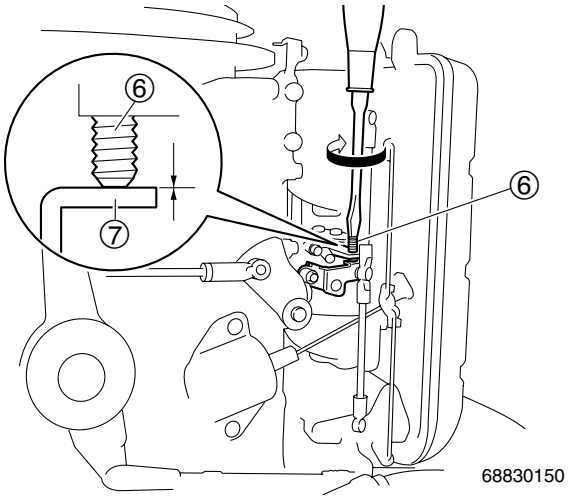
NOTE:
The throttle lever tightening screws are left hand thread.

5. Make sure that the throttle valve is fully closed and check it through the intake silencer.

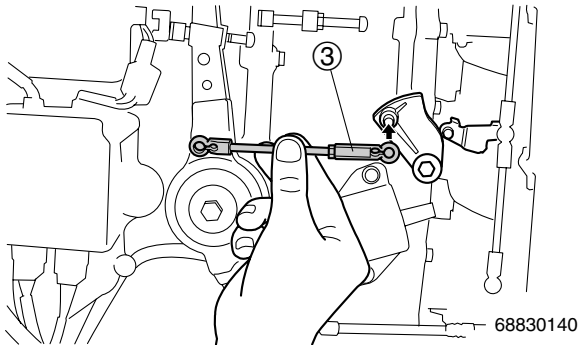
6. Tighten the throttle lever tightening screws ⑧ on the carburetor assembly #1 and #3 by pushing down throttle lever ⑨ with your finger.



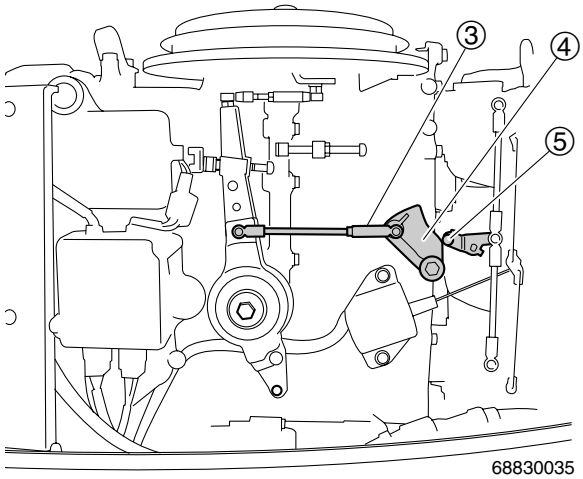
7. Tighten the throttle stop screw ⑥ until contacts the stopper ⑦.



8. Install the throttle link rod ③.



9. Check that the throttle cam ④ slightly contacts to the cam roller ⑤. If it is not in contact, remove the throttle link rod ③ and adjust its length.



10. Install the intake silencer cover and connect the throttle cable.

11. Check the engine idle speed.

NOTE:

After synchronizing the carburetor, make sure to check the engine idle speed, refer to page 3-8.

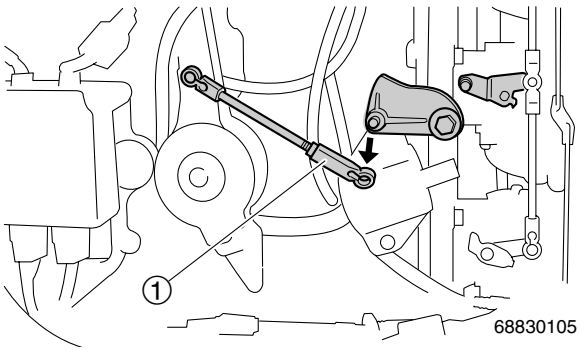
Checking the control link position

1. Disconnect the throttle cable.

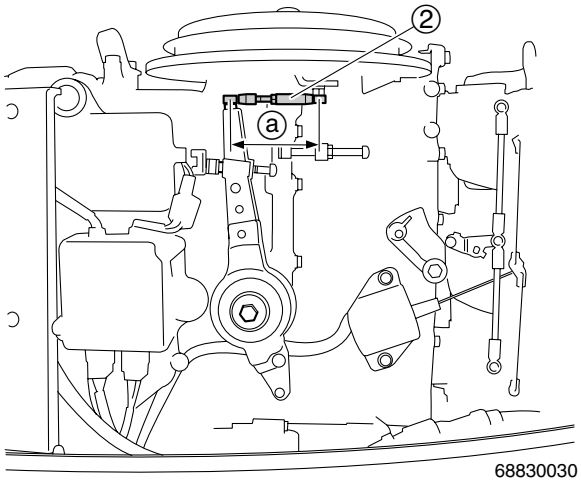
NOTE:

To disconnect and connect the throttle cable, refer to page 3-7.

2. Remove the throttle link rod ①.



3. Remove the control link rod ②, and then measure the length ⓐ of the link.



4. Adjust the length ⓐ if out of specification.

Length ⓐ (reference data):
71 mm (2.79 in)

5. Install the control link rod ②.

6. Check that the ignition timing to the specified position at full retard.

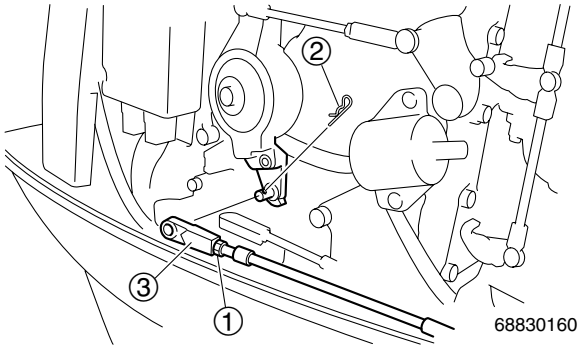
Specified position (full retard):
BTDC 2°

NOTE:
- To check the ignition timing, refer to page 3-9.
- To check the timing stopper, refer to page 3-11.

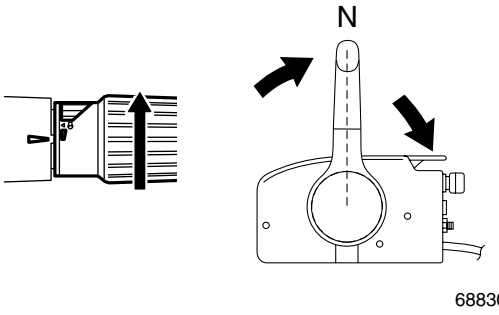
7. Install the throttle link rod and the throttle cable.

Adjusting the throttle cable

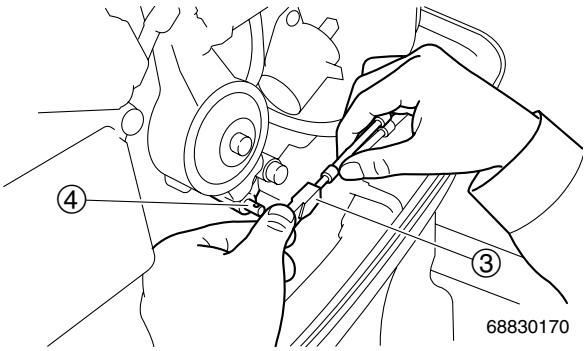
1. Loosen the locknut ①, remove the pin ② and then disconnect the throttle cable joint ③.

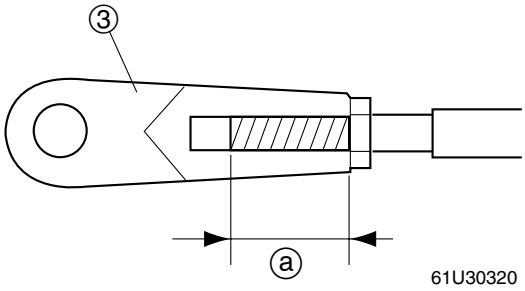


2. Set the throttle grip or remote control lever to the fully closed position.



3. Adjust the position of the throttle cable joint ③ until its hole aligned with the set pin ④ on control lever.





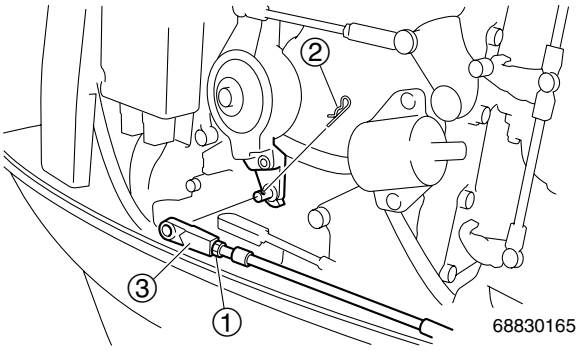
⚠WARNING

The throttle cable joint ③ must be screwed in a minimum of 8.0 mm (0.31 in) ⓐ.

NOTE:

Pull the throttle cable toward the engine to remove any free play in the cable before adjusting the position of the throttle cable joint.

4. Connect the throttle cable joint ③, install the pin ②, and then tighten the lock nut ①.



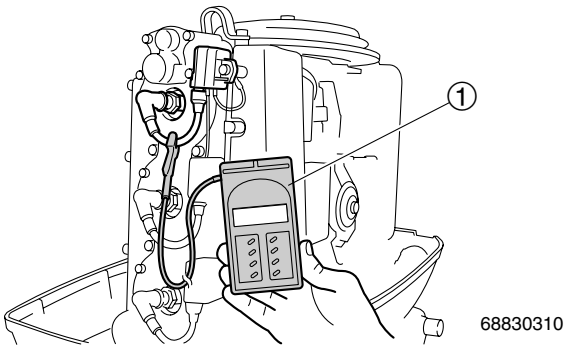
5. Check that the throttle grip or remote control lever fully closed position and adjust the throttle cable length, if necessary, repeat the steps 1–4.

Checking the engine idle speed

1. Start the engine and warm it up for 5 minutes, and then turn off the engine.

2. Attach the special service tool ① to spark plug wire #1, and then start the engine.

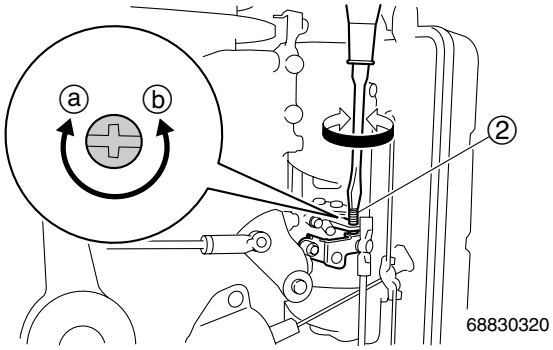
3. Check the engine idle speed. Adjust the engine idle speed if out of specification.



	Digital tachometer ①: 90890-06760

	Engine idle speed: 750–850 r/min

4. Turn the throttle stop screw ② in direction ⓐ or ⓑ until the specified engine idle speed is obtained.



NOTE:

- To increase the idle speed, turn the throttle stop screw in direction ⓐ.
- To decrease the idle speed, turn the throttle stop screw in direction ⓑ.

5. If the specified engine idle speed can not be obtained, adjust the pilot screw or adjust the length of the throttle cable.

NOTE:

- To adjust the pilot screw, refer to page 4-15.
- To adjust the throttle cable, refer to page 3-7.

Checking the ignition timing

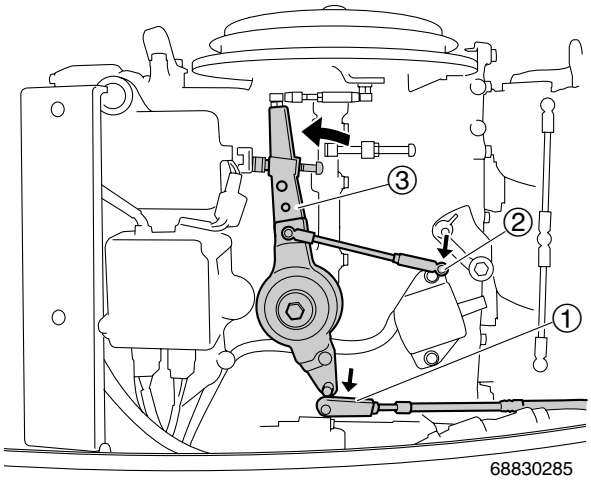
NOTE:
Install the test propeller, when checking the ignition timing.

Test propeller : 90890-01620

1. Place the lower unit in water, and then start the engine and warm it for 5 minutes.

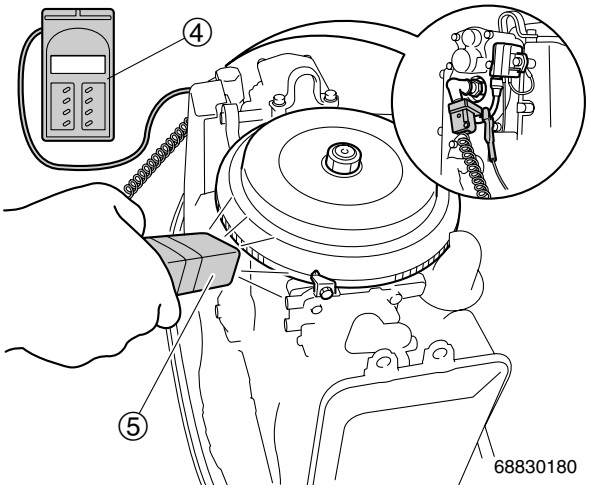
2. Turn off the engine when the engine has been completely warmed up.

3. Disconnect the throttle cable ① and remove the throttle link rod ②, then set the control lever 2 ③ to the full retard position.



NOTE:
To disconnect and connect the throttle cable, refer to page 3-7.

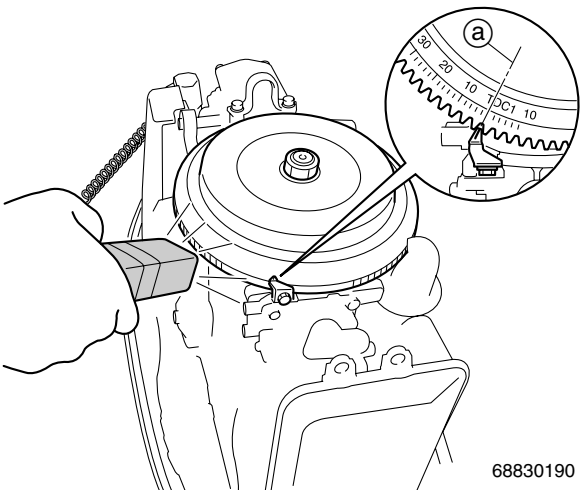
4. Attach the special service tool ④ and ⑤ to the spark plug wire #1, and then start the engine. Check the engine idle speed and ignition timing.



Digital tachometer ④: 90890-06760
Timing light ⑤: 90890-03141

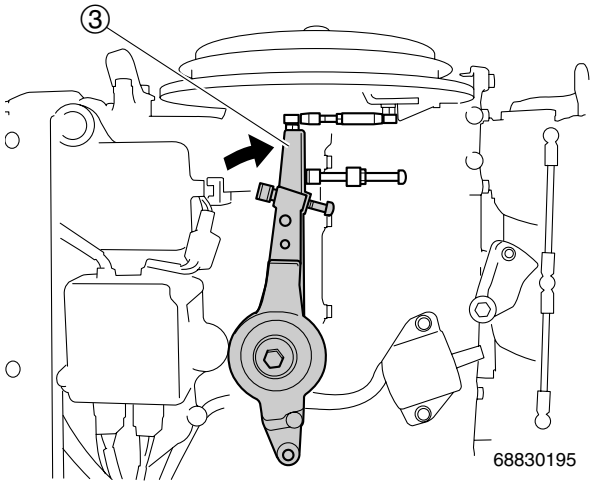
Engine idle speed:
750–850 r/min

5. Check that the ignition timing is specified position ⓐ, when the full retard.

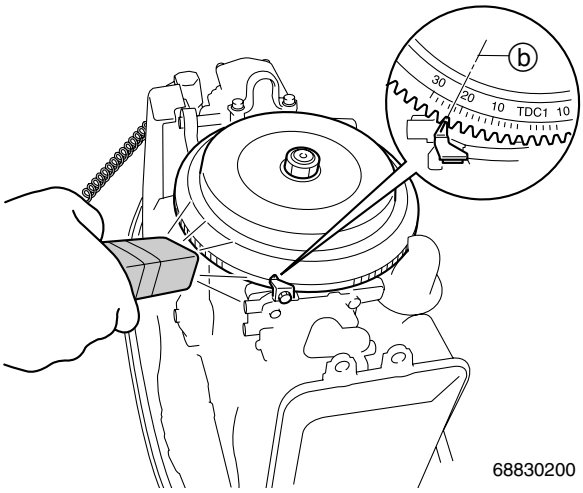


Specified position ⓐ (full retard):
BTDC 1–3°

6. Set the control lever 2 ③ to full advanced position.



7. Check that the ignition timing advances to the specified position ⓑ, when the full advanced.



Specified position ⓑ
(full advanced):
55D, 75A: BTDC 21–23°
85A: BTDC 23–25°

8. If the ignition timing is not specification, check the ignition timing plate position and timing stopper position.

NOTE:
- To check the timing plate, refer to next procedure.
- To check the timing stopper, refer to page 3-11.

9. Turn off the engine, and then remove the special service tools.

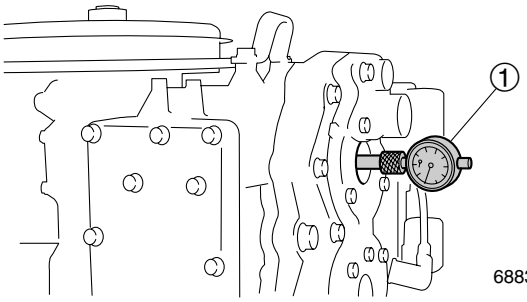
10. Install the throttle link rod and connect the throttle cable.

Checking the timing plate

NOTE:
Remove the all spark plugs and lock plate before adjusting the timing plate.

1. Slowly turn the flywheel magnet clockwise and align it with the piston of the #1 cylinder at the TDC.

2. Install the special service tool ① into the #1 cylinder.

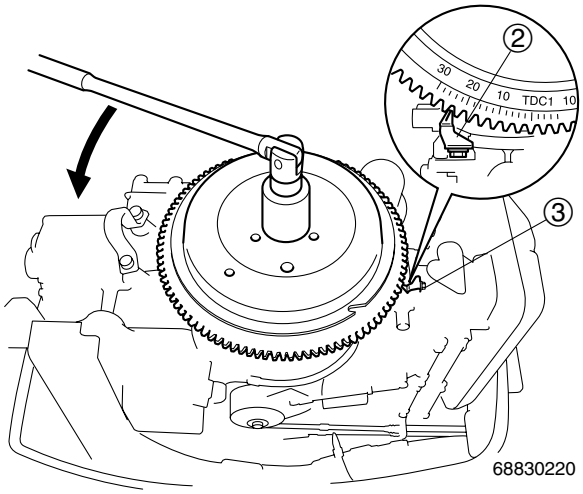


NOTE:
Set the dial gauge to “zero” position which is more than 4 mm from TDC.

Dial gauge set ① : 90890-01252

3

3. While checking the dial gauge, slightly turn the flywheel magnet counterclockwise to the specified position.



Cylinder #1 piston position (BTDC):
55D, 75A: 3.42 mm (0.14 in)
85A: 4.05 mm (0.16 in)

4. Check that the timing plate ② is aligned with the specified position.

5. If it is not aligned, loosen the tightening screw ③ and align the timing plate with the flywheel magnet at specified position, then tighten the screw ③.

NOTE:
After adjusting the timing plate, turn the flywheel magnet clockwise twice.

Timing plate position (full advanced):
55D, 75A: BTDC 22°
85A: BTDC 24°

6. Remove the special service tools.

7. Start the engine, and then check the ignition timing once more. Check the control link, if the ignition timing is out of specification.

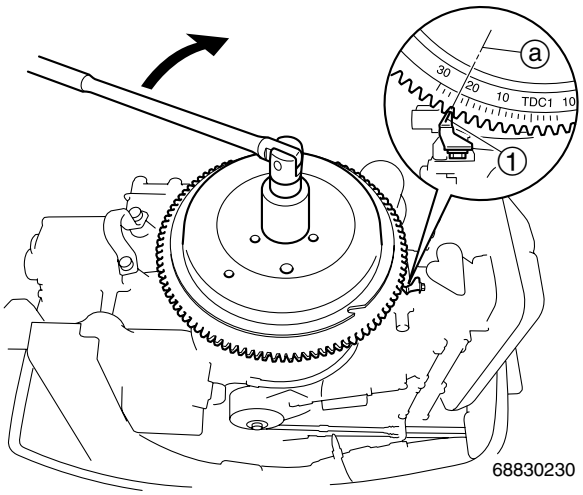
NOTE:
To check the control link, refer to page 3-6.

Checking the ignition timing stopper

1. Disconnect the throttle cable and remove the throttle link rod.

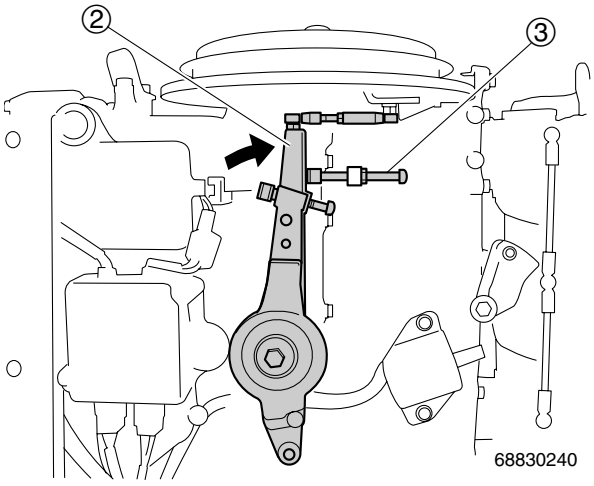
NOTE:
To disconnect and connect the throttle cable, refer to page 3-7.

2. Slowly turn the flywheel magnet clockwise, and check that the timing plate ① is aligned with the scale ⓐ on the flywheel magnet in the specified position.

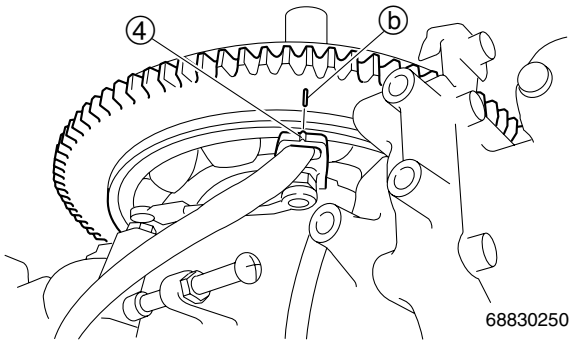


Timing plate position ⓐ
(full advanced):
55D, 75A: BTDC 22°
85A: BTDC 24°

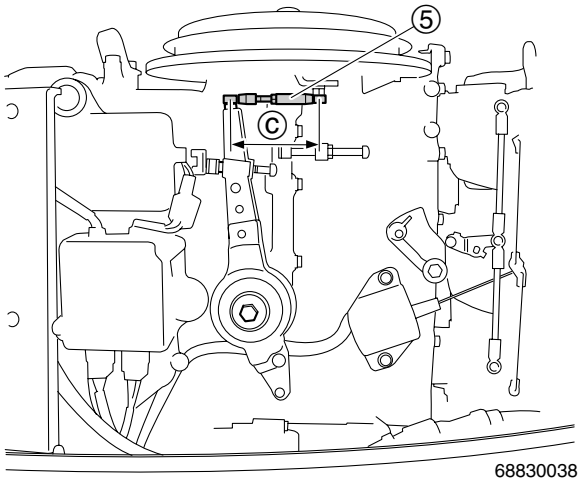
3. Set the control lever 2 ② to the full advanced position, and then check that the adjusting screw ③ comes in contact with the control lever 2.



4. Check that the mark ⓑ on the flywheel magnet is aligned with the pointer ④ on the pulser coil assembly.



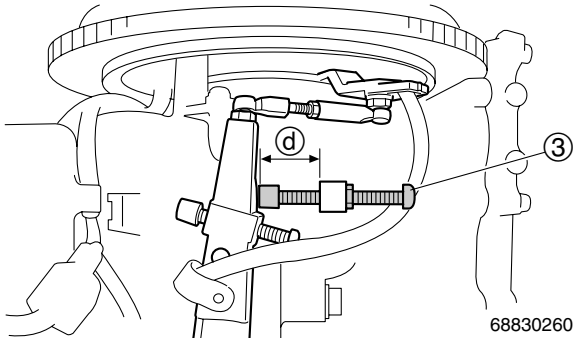
5. If it is not aligned, remove the control link rod ⑤, and then adjust the control link rod length ⓒ.



NOTE:
To adjust the control link rod, refer to page 3-6.

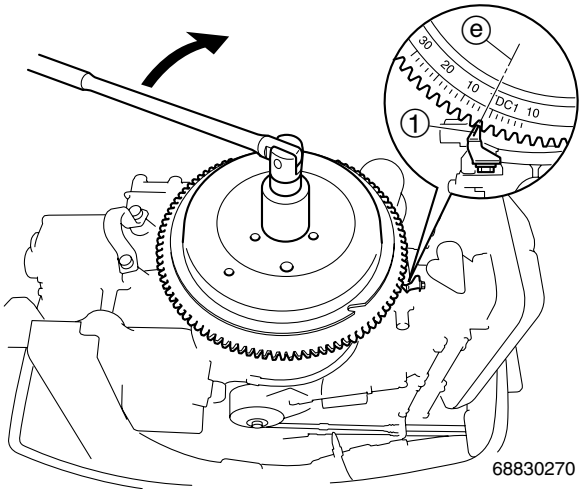
Length ⓒ (reference data):
71 mm (2.79 in)

6. Check the screw out length ⓓ of the adjusting screw ③.



Specified length ⓓ
(full advanced, reference data):
55D, 75A:
32.0–33.0 mm (1.26–1.30 in)
85A: 30.0–31.0 mm (1.18–1.22 in)

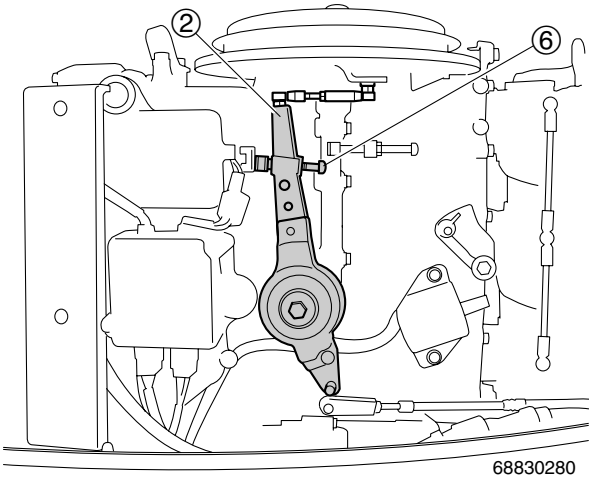
7. Slowly turn the flywheel magnet clockwise, and check that the timing plate ① is aligned with the scale ⓔ on the flywheel magnet in the specified position.



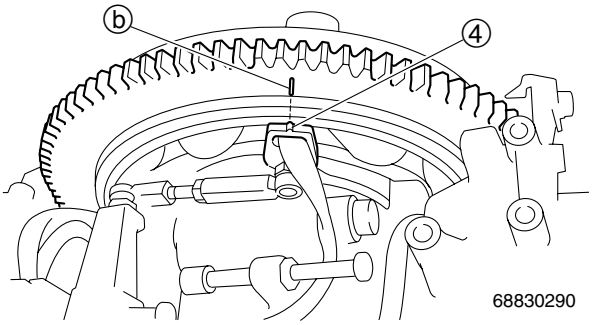
Timing plate position ⓔ (full retard):
BTDC 2°

3

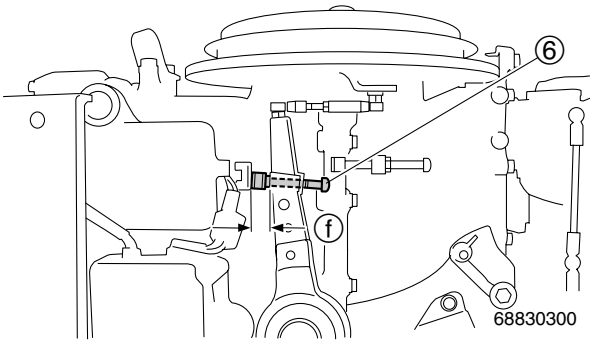
8. Set the control lever 2 ② to the full retard position, and then check that the adjusting screw ⑥ comes in contact with the crankcase.



9. Check that the mark ⓑ on the flywheel magnet is aligned with the pointer ④ on the pulser coil assembly.



10. If it is not aligned, check the screw out length ⓕ of the adjusting screw ⑥.

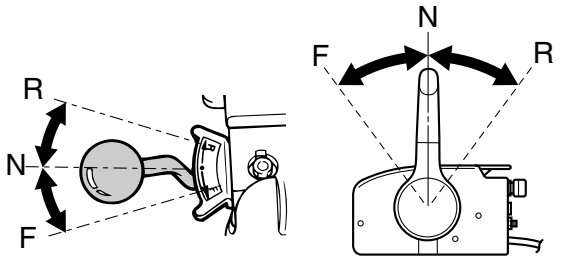


Specified length ⓕ (full retard, reference data):
12.5–13.5 mm (0.49–0.53 in)

11. Install the throttle link rod and connect the throttle cable.

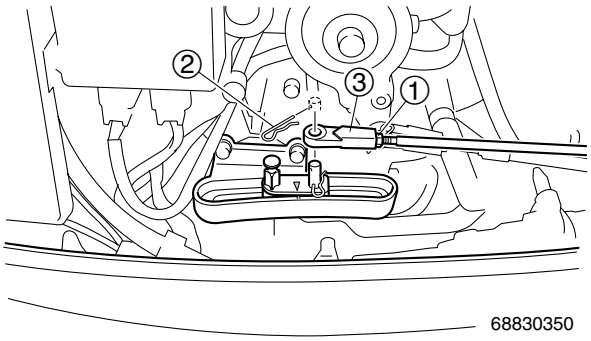
Checking the gear shift operation

1. Check that the gear shift operates smoothly when shifting from “N” to “F” or “R”. Adjust the shift cable if necessary by turning the cable joint.

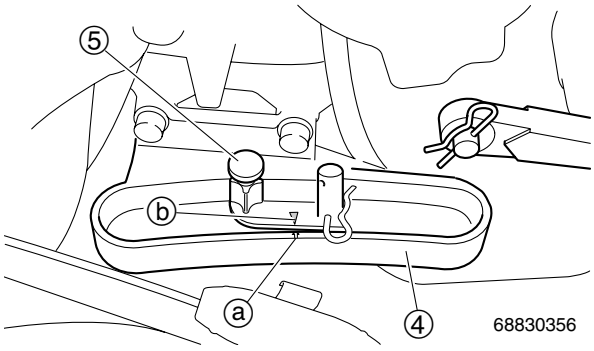


2. Set the gear shift to “N” position.

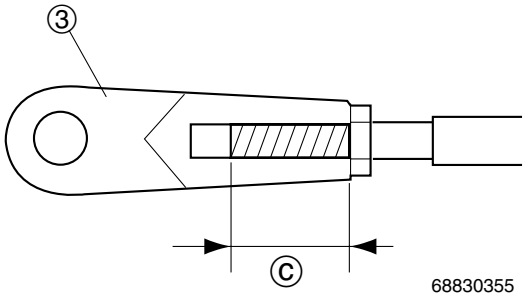
3. Loosen the locknut ①, remove the pin ② and then disconnect the shift cable joint ③.



4. Make sure to align the mark ⓐ on the bracket ④ with mark ⓑ on the shift lever ⑤.



5. Adjust the position of the shift cable joint ③ until its hole is aligned with the set pin ⓒ.



⚠WARNING

The shift cable joint ③ must be screwed in a minimum of 8.0 mm (0.31 in) ⓒ.

NOTE:

Pull the shift cable toward the engine to remove any free play in the shift cable before adjusting the position of the cable joint.

6. Connect the shift cable joint, install the clip.

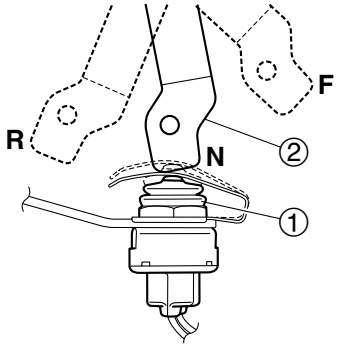
7. Check the gear shift for smooth operation, check the neutral switch operation. If necessary, repeat the steps 3–6.

Checking the neutral switch operation (EHD)

⚠WARNING

Remove the all spark plug caps from all cylinder, while checking the neutral switch.

1. Check that the neutral switch ① is pushed by the shift lever ②, when the gear shift is in the "N" position.



2. Set the gear shift to "F" or "R" position.

3. Check that the starter motor can not operate, when turning the engine start switch to "START".

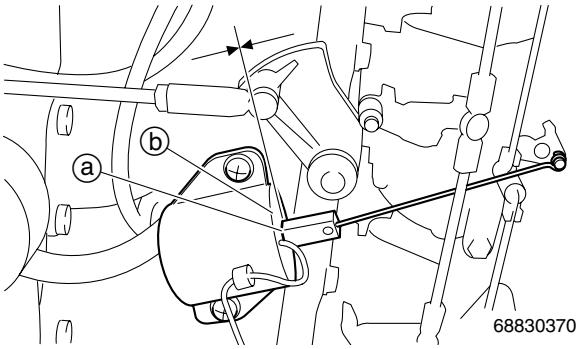
NOTE:

To check the neutral switch continuity, refer to page 8-11.

Checking the choke solenoid position (ED, ET)

1. Set the choke knob to fully closed position.

2. Check the plunger to align the mark ⓐ with the solenoid surface ⓑ.



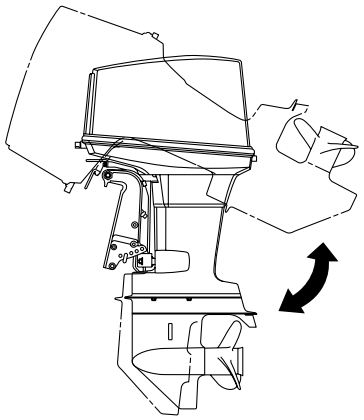
3. Check the choke solenoid.

NOTE:
- To measure the choke solenoid resistance, refer to page 8-11.
- To check the choke solenoid operation, refer to page 1-16.

Bracket

Checking the PTT operation (ET)

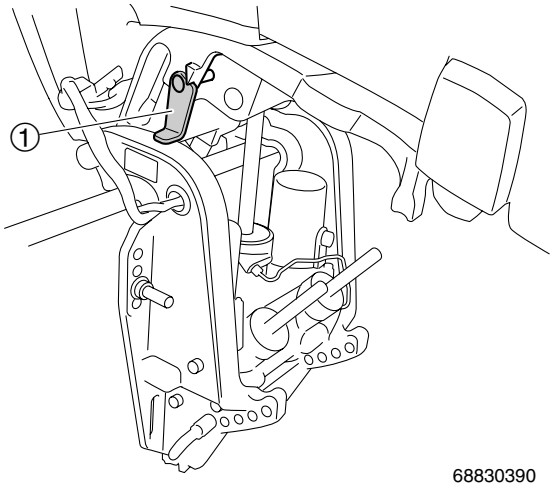
1. Fully tilt the outboard motor up and down 2-3 times and check the entire trim and tilt range for smooth operation. Check the PTT fluid level if necessary.



68830380

NOTE:
Be sure to listen to the winding sound of the PTT motor for smooth operation.

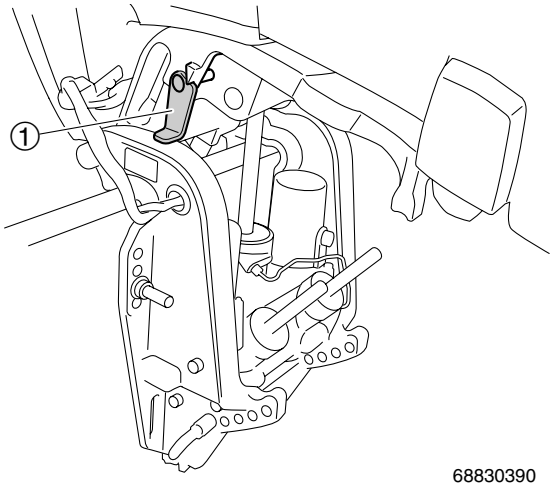
2. Fully tilt the outboard motor up, and then support it with the tilt stop lever ① to check the lock mechanism of the lever.



68830390

Checking the PTT fluid level (ET)

1. Fully tilt the outboard motor up, and then support it with the tilt stop lever ①.

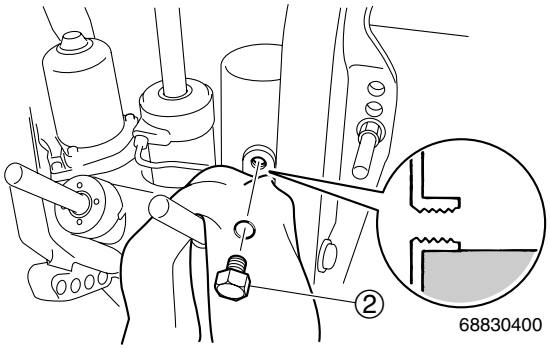


68830390

⚠WARNING

After tilting up the outboard motor, be sure to support it with the tilt stop lever. Otherwise, the outboard motor could suddenly lower if the PTT unit should lose fluid pressure.

2. Remove the reservoir cap ②, and then check the fluid level in the reservoir.



⚠WARNING

Make sure that the trim and tilt rams are fully extended when removing the reservoir cap, otherwise fluid can spurt out from the unit due to internal pressure.

NOTE:

If the fluid is at the correct level, the fluid should overflow out of the filler hole when the reservoir cap ② is removed.

3. If necessary, add sufficient fluid of the recommended type until it overflows out of the filler hole.

Recommended PTT fluid:
ATF Dexron Ⅱ

4. Install the new O-ring, reservoir cap ②, and then tighten it to the specified torque.

Reservoir cap ②:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

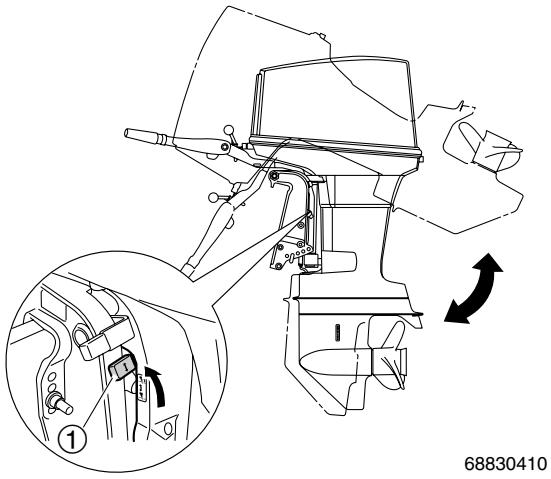
Checking the tilt operation (EHD, ED)

⚠WARNING

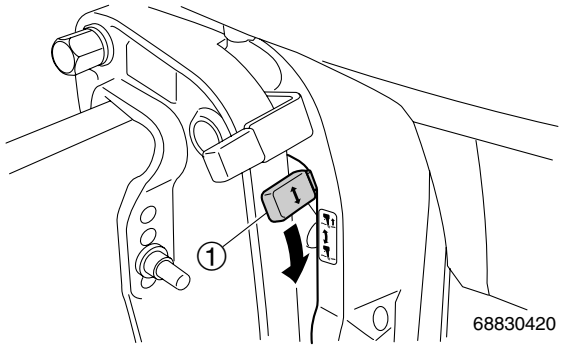
Be sure to tilt the outboard motor fully and support it with the tilt stop lever. It can not be tilted up partially. Otherwise the outboard motor could fall back down suddenly.

1. Set the tilt lock lever ① to tilt position.

2. Check the outboard motor could tilting up. Fully tilt the outboard motor up and down 2-3 times and check the entire tilt range for smooth operation.

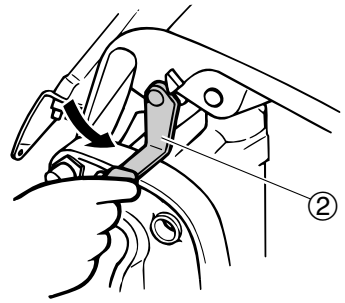


3. Fully tilt the outboard motor down. Check the tilt lock lever ① to lock position automatically, and then check the outboard motor could not tilting up.



3

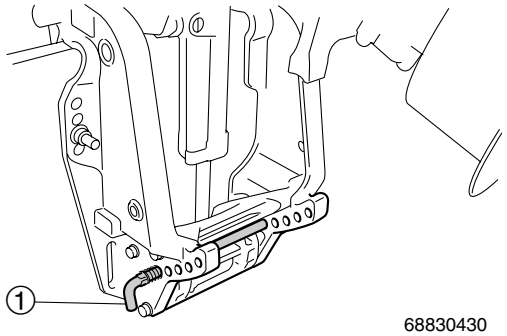
4. Fully tilt the outboard motor up, and then support it with the tilt stop lever ② to check the lock mechanism of the lever.



69D30135

Checking the tilt pin

1. Check the tilt pin ①. Replace the tilt pin if corroded, worn or bent.



68830430

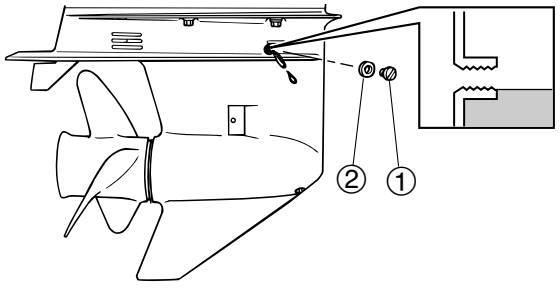
2. Check the standard of the tilt pin ① position. Adjust the standard position by trimming of the boat if necessary.

Lower unit

Checking the gear oil level

1. Fully tilt the outboard motor down.

2. Remove the check screw ①, and then check the gear oil level in the lower case.



69D10055

NOTE:

If the fluid is at the correct level, the fluid should overflow out of the filler hole when the check screw is removed.

3. If necessary, add sufficient gear oil of the recommended type until it overflows out of the check hole.

Recommended gear oil:
Hypoid gear oil
API: GL-4
SAE: 90

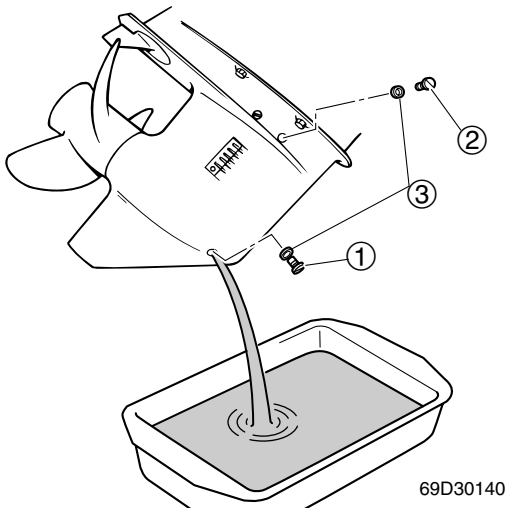
4. Install the new gasket ②, check screw ①, and then tighten it to the specified torque.

Check screw ①:
9 N·m (0.9 kgf·m, 6.6 ft·lb)

Changing the gear oil

1. Tilt the outboard motor so that the gear oil drain hole is at the lowest point possible.

2. Place a drain pan under the drain hole, remove the drain screw ①, and then remove the check screw ② and let the oil drain completely.

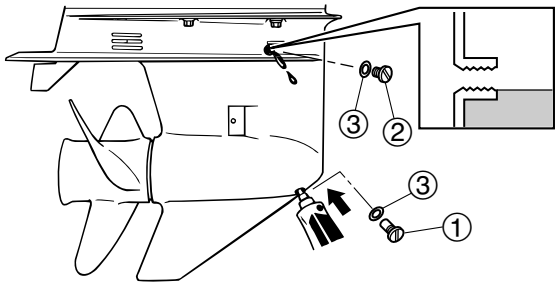


69D30140

3. Check the oil for metal, discoloration and its viscosity. Check the internal parts of the lower case if necessary.

4. Fully tilt the outboard motor down.

5. Insert a 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.



69D10056

Recommended gear oil:
Hypoid gear oil
API: GL-4
SAE: 90
Oil quantity:
610 cm^3
(20.62 US oz, 21.51 Imp oz)

6. Install the new gaskets ③, check screw ②, drain screw ① quickly, and then tighten them to the specified torque.

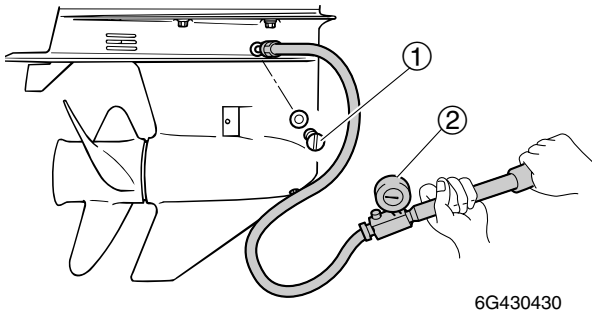
Check screw ② and drain screw ①:
9 N·m (0.9 kgf·m, 6.6 ft·lb)

Checking the lower unit for air leakage

CAUTION:

Do not over pressurize the lower unit, otherwise the oil seals may be damaged.

1. Remove the check screw ①, and then install the special service tool ②.



6G430430

Leakage tester ②: 90890-06840

2. Apply the specified pressure to check that the pressure is maintained in the lower unit for at least 10 seconds.

NOTE:

Cover the check hole with a rag when removing the special service tool from the lower unit.

Lower unit holding pressure:
70 kPa (0.7 kgf/cm^2, 14 psi)

3. If the pressure is not maintained, check the drive shaft, propeller shaft, oil seals, O-rings of propeller shaft housing, shift rod oil seal, and gasket of drain screw. Replace if damaged.

Check screw ①:
9 N·m (0.9 kgf·m, 6.6 ft·lb)

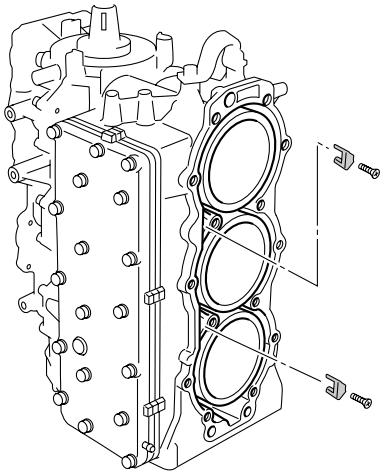
Checking the propeller

1. Check the propeller blades. Replace if cracked. Check the splines. Replace if damaged or worn.

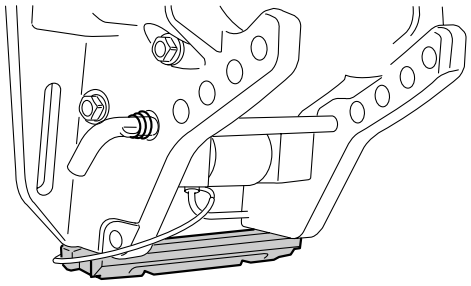
General

Checking the anode

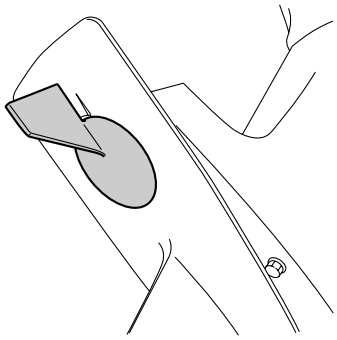
1. Check the anodes. Clean if there are scales, grease, or oil.



68830540



68830560



68830440

CAUTION:

Do not oil, grease, or paint the anodes, otherwise they will be ineffective.

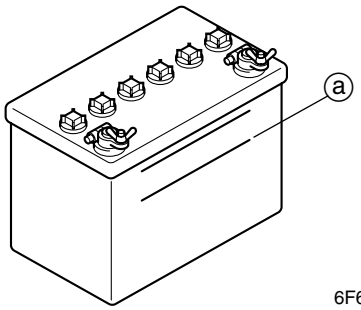
NOTE:

If it is necessary to disassemble the outboard motor to check an anode, refer to Chapter 5 or 6 and 7.

2. Replace the anodes if excessively eroded.

Checking the battery

1. Check the battery electrolyte level. If the level is at or below the minimum level mark ⓐ, add distilled water until the level is between the maximum and minimum level marks.



6F630240

2. Fully charge the battery. Check the specific gravity of the electrolyte. Replace the battery if below specification.

⚠WARNING

Battery electrolyte is dangerous; it contains sulfuric acid which is poisonous and highly caustic.
- **Avoid bodily contact with electrolyte as it can cause severe burns or permanent eye injury.**
- **Wear protective eye gear when handling or working near batteries.**

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

Antidote (INTERNAL):
- **Drink large quantities of water or milk followed with milk of magnesia, beaten egg, or vegetable oil. Get immediate medical attention.**
- **Charge batteries in a well-ventilated area.**
- **Keep batteries away from fire, sparks or open flames (e.g., welding equipment, lighted cigarettes).**
- **DO NOT SMOKE when charging or handling batteries.**

KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.

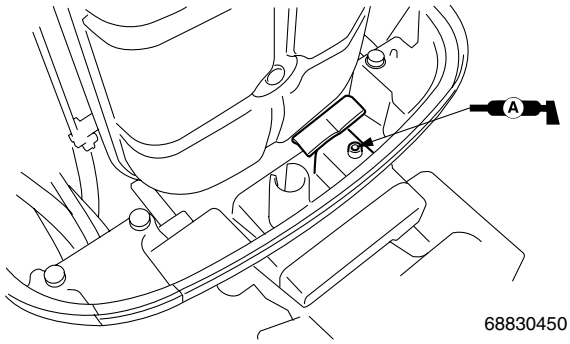
NOTE:
- Batteries vary per manufacturer. The procedures mentioned in this manual may not always apply, therefore, consult the instruction manual of the battery.
- Disconnect the negative battery cable first, then the positive battery cable.

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

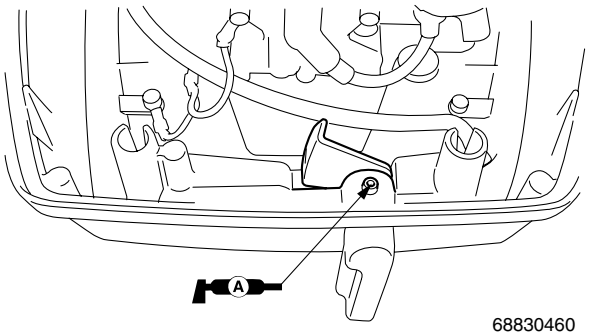
Lubricating the outboard motor

1. Apply Yamaha grease A to the areas shown.

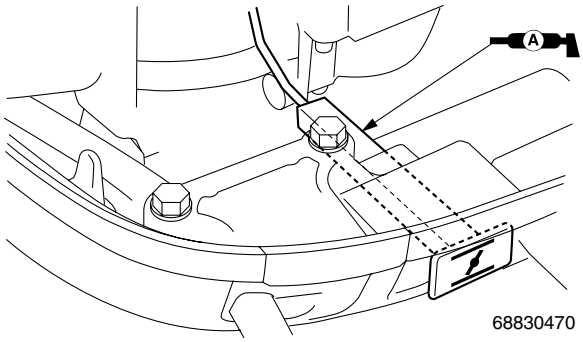
NOTE:
Apply Yamaha grease A to the grease nipple until it flows from the bushings ⓐ.



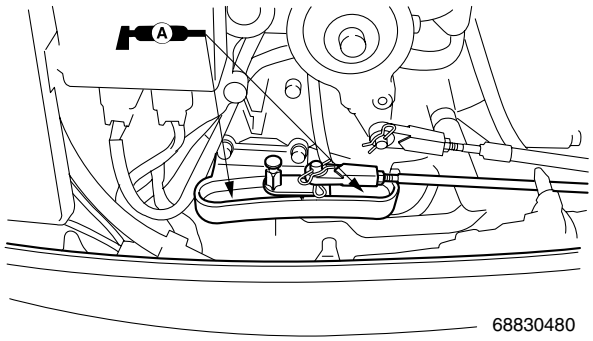
68830450



68830460

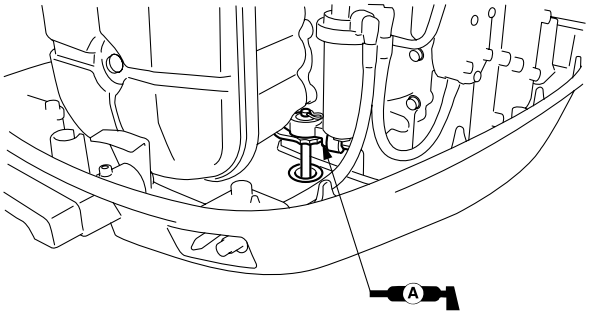


68830470

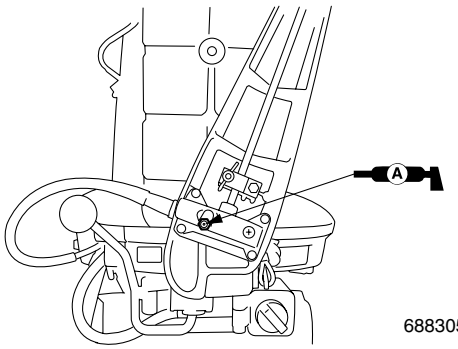


68830480

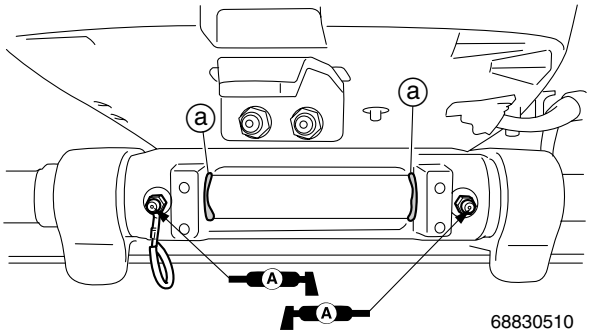
3



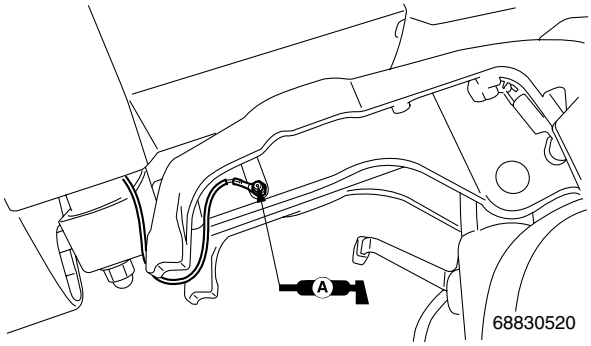
68830490



68830500

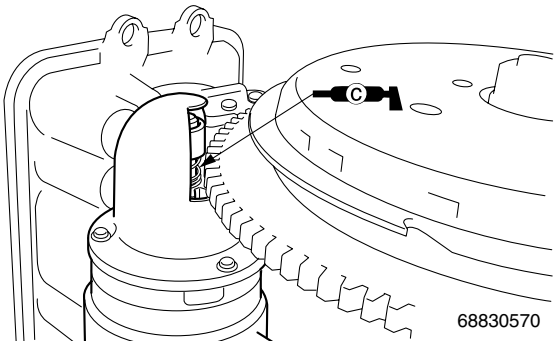


68830510



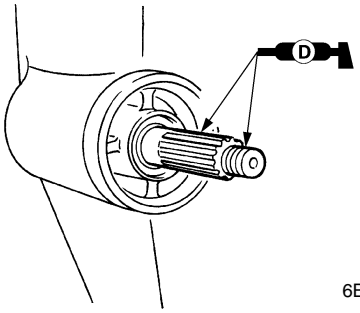
68830520

2. Apply temperature resistant grease to the areas shown.



68830570

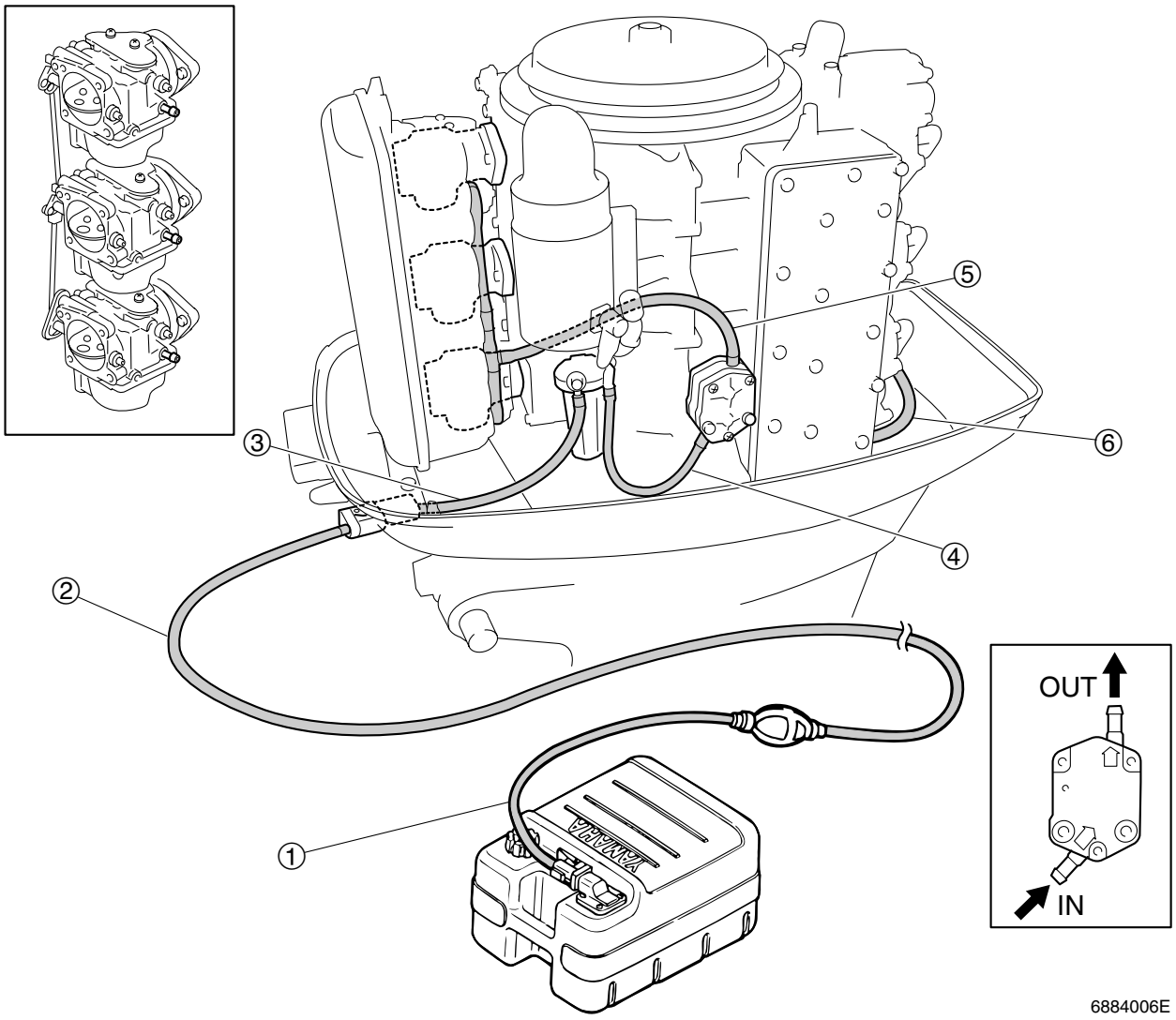
3. Apply corrosion resistant grease to the area shown.



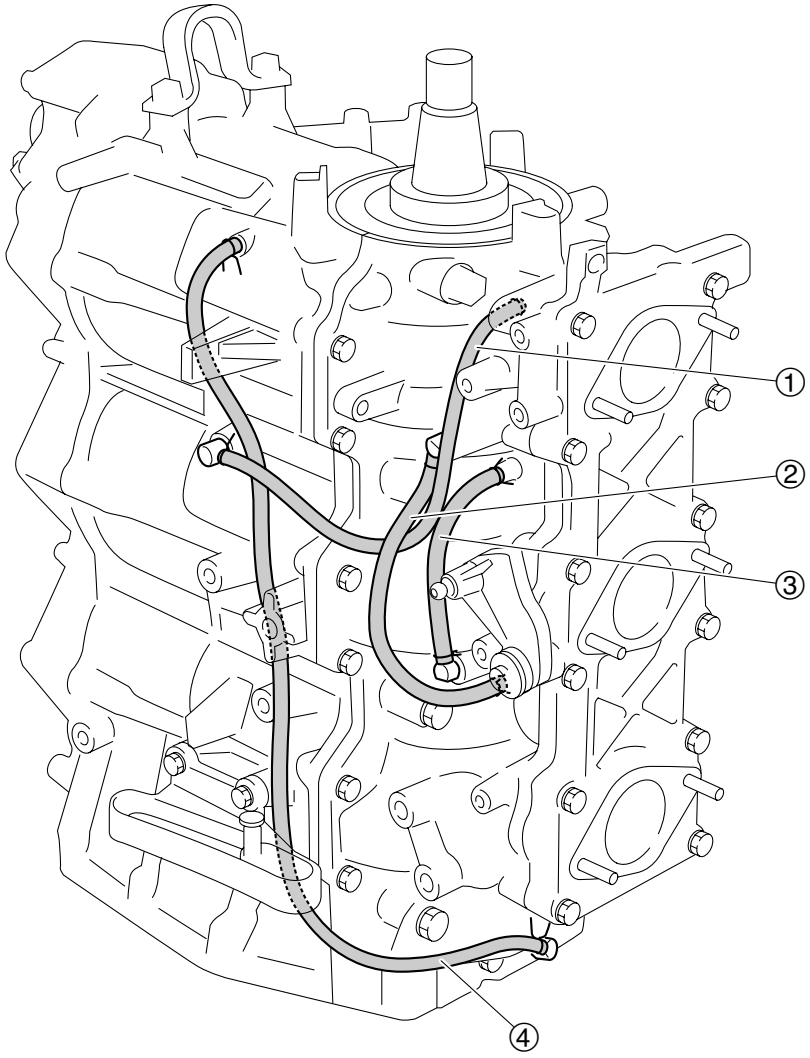
6B430300

Fuel system

Hose routing



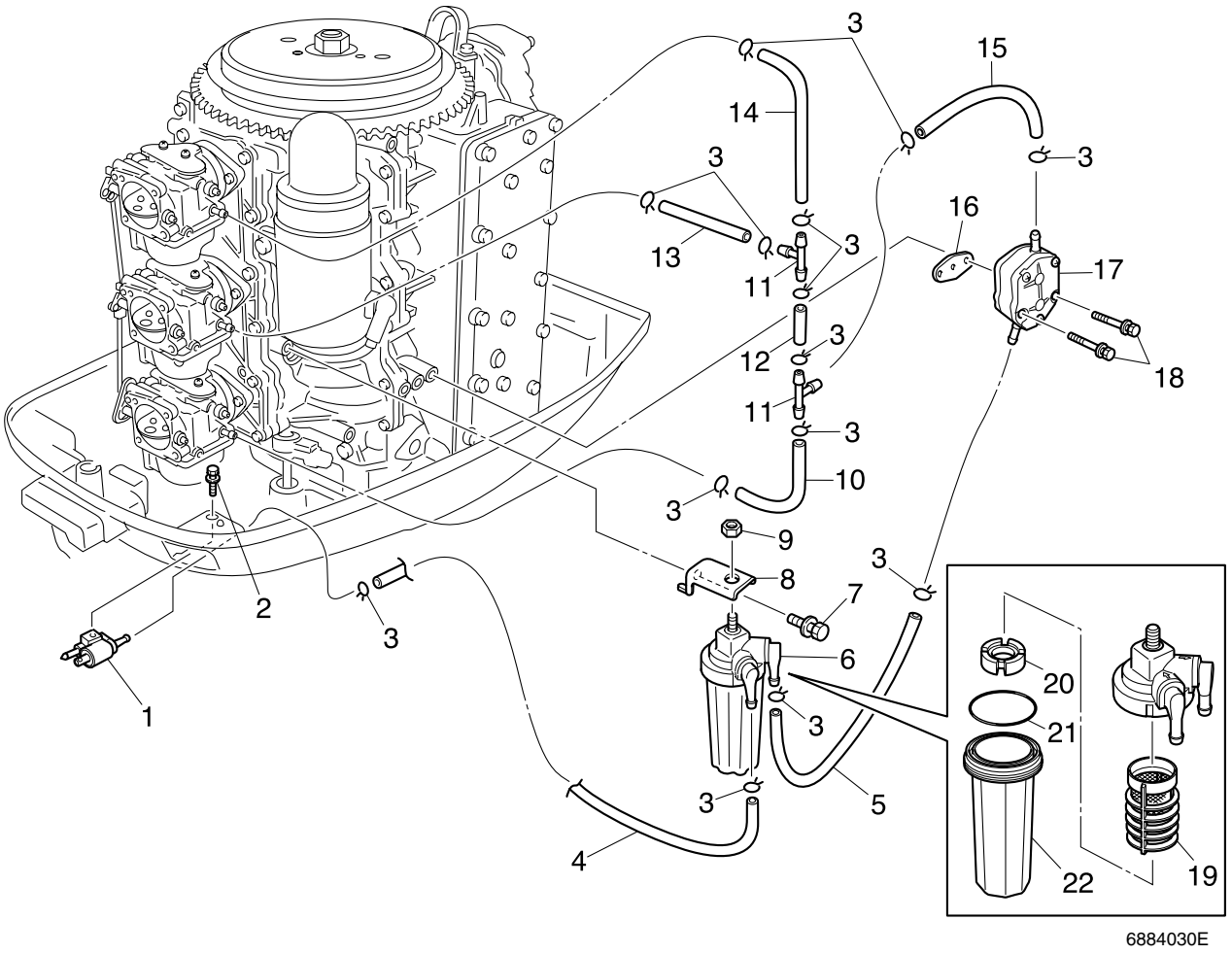
① Fuel hose (Fuel tank-to-primer pump)
② Fuel hose (Primer pump-to-fuel joint)
③ Fuel hose (Fuel joint-to-fuel filter)
④ Fuel hose (Fuel filter-to-fuel pump)
⑤ Fuel hose (Fuel pump-to-carburetor)
⑥ Cooling water hose



6884007E

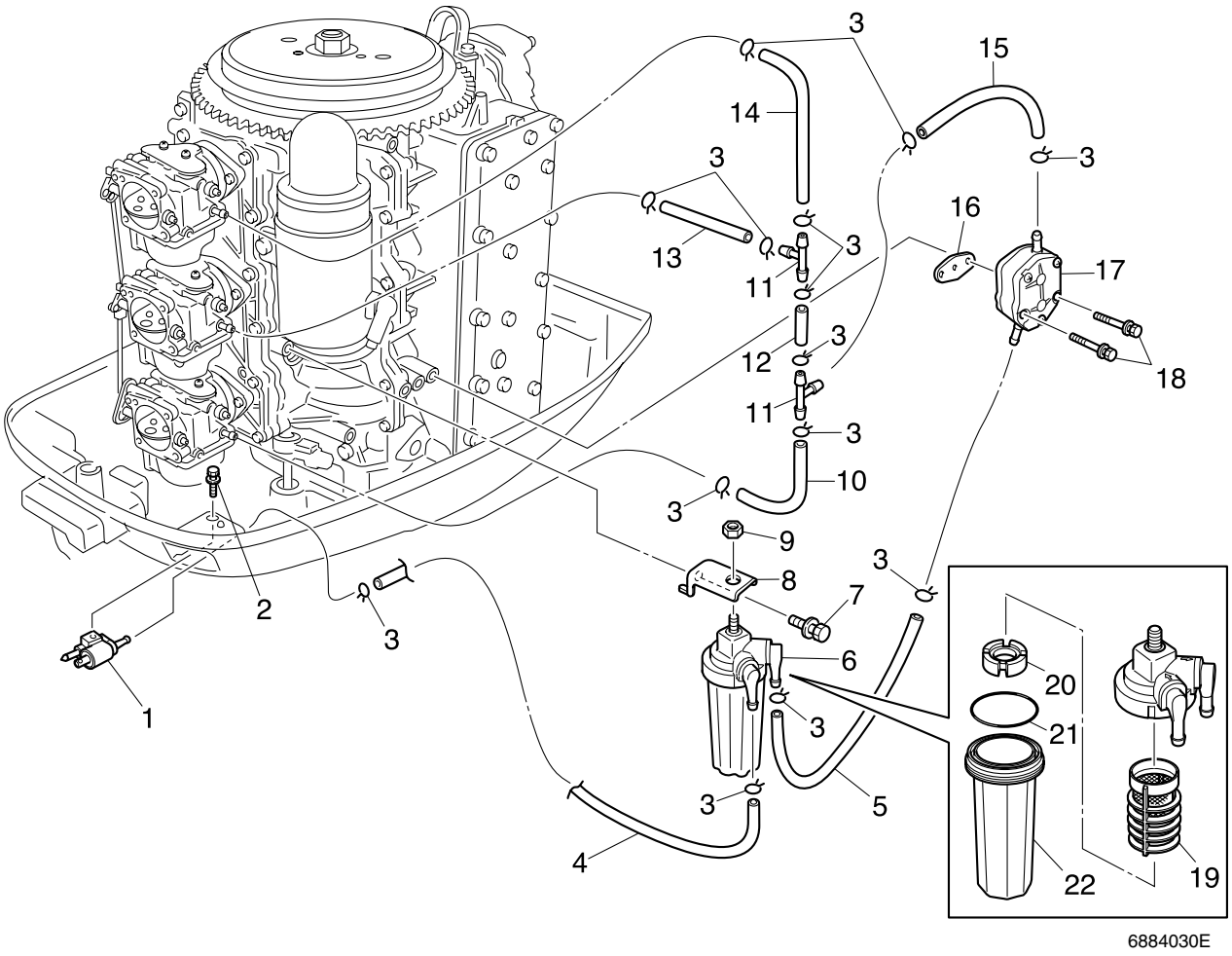
① Breather hose : 275 mm (10.8 in)
② Breather hose : 185 mm (7.3 in)
③ Breather hose : 102 mm (4.0 in)
④ Breather hose : 465 mm (18.3 in)

Fuel line



6884030E

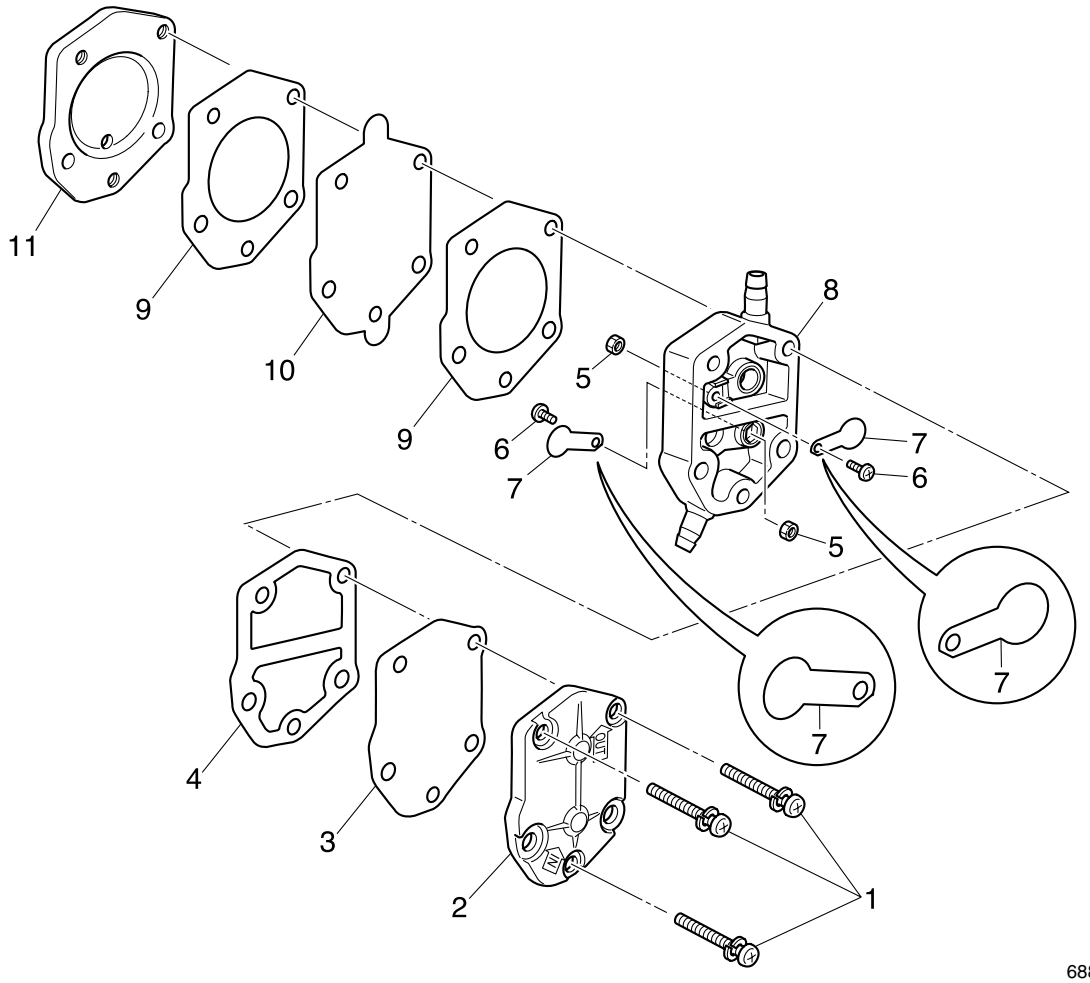
No.	Part name	Q'ty	Remarks
1	Fuel joint	1	
2	Bolt	1	M6 × 20 mm
3	Clip	14	
4	Fuel hose	1	
5	Fuel hose	1	
6	Fuel filter assembly	1	
7	Bolt	1	M6 × 14 mm
8	Bracket	1	
9	Nut	1	
10	Fuel hose	1	
11	Joint	2	M6 × 40 mm
12	Fuel hose	1	
13	Fuel hose	1	
14	Fuel hose	1	
15	Fuel hose	1	
16	Gasket	1	Not reusable
17	Fuel pump assembly	1	



6884030E

No.	Part name	Q'ty	Remarks
18	Bolt	2	M6 × 40 mm
19	Fuel filter element	1	
20	Float	1	
21	O-ring	1	Not reusable
22	Cup	1	

Fuel pump

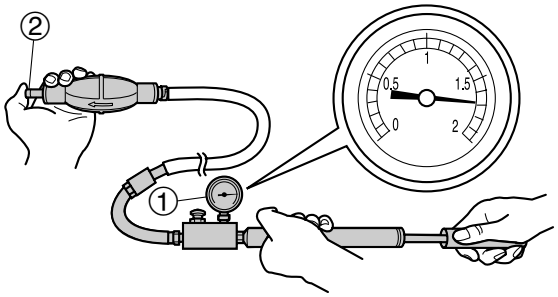


6884050E

No.	Part name	Q'ty	Remarks
1	Screw	3	ø5 × 30 mm
2	Cover	1	
3	Diaphragm	1	
4	Gasket	1	Not reusable
5	Nut	2	
6	Screw	2	ø3 × 5 mm
7	Check valve	2	
8	Fuel pump body	1	
9	Gasket	2	Not reusable
10	Diaphragm	1	
11	Base	1	

Checking the primer pump

1. Place a drain pan under the fuel hose connections, and then disconnect the fuel hose from the primer pump.
2. Connect the special service tool ① to the primer pump inlet hose.
3. Cover the fuel outlet ② with a finger.
4. Apply the specified positive pressure to check that the pressure is maintained for at least 30 seconds.
   Replace the primer pump if it is not maintained.



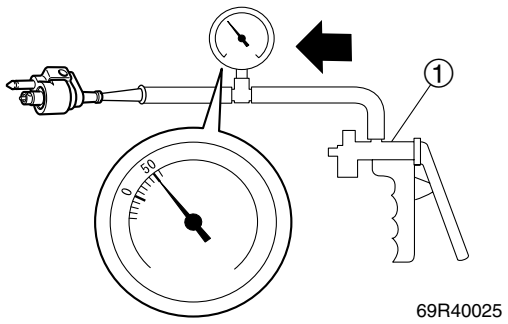
68840120

Leakage tester ①: 90890-06840

Specified positive pressure:
170 kPa (1.7 kgf/cm², 25 psi)

Checking the fuel joint

1. Disconnect the fuel hose, and then remove the fuel joint.
2. Check the fuel joint for cracks or damage.
3. Connect the special service tool ① at the outlet of fuel joint.
4. Apply the specified pressure to check that the positive pressure is maintained for 10 seconds. Replace the fuel joint if it is not maintained.



69R40025

Vacuum/pressure pump gauge set ①:
90890-06756

Specified positive pressure:
50 kPa (0.5 kgf/cm², 7.3 psi)

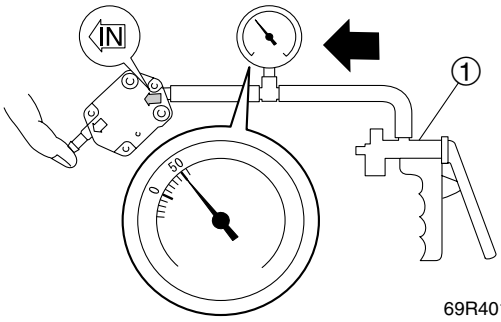
5. Install the fuel joint, and then connect the fuel hose.

Checking the fuel pump

1. Place a rag under the fuel hose connections, and then disconnect the fuel hoses from the fuel pump.

2. Connect the special service tool ① to the fuel pump inlet.

3. Cover the fuel pump outlet with a finger, and then apply the specified positive pressure. Check that there is no air leakage.

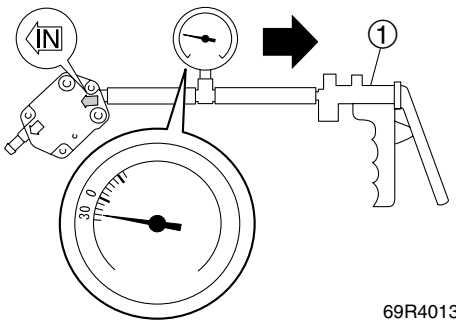


69R40120

Vacuum/pressure pump gauge set ①:
90890-06756

Specified positive pressure:
50 kPa (0.5 kgf/cm², 7.3 psi)

4. Apply the specified negative pressure and check that there is no air leakage.

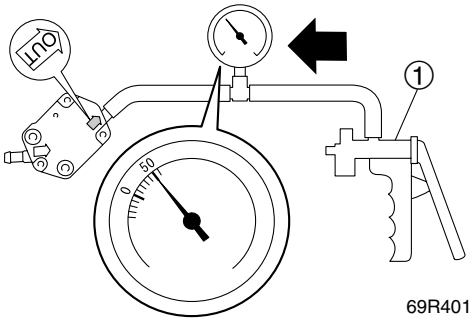


69R40130

Specified negative pressure:
30 kPa (0.3 kgf/cm², 4.4 psi)

5. Connect the special service tool ① to the fuel pump outlet.

6. Apply the specified positive pressure and check that there is no air leakage. Disassemble the fuel pump if air leaked.

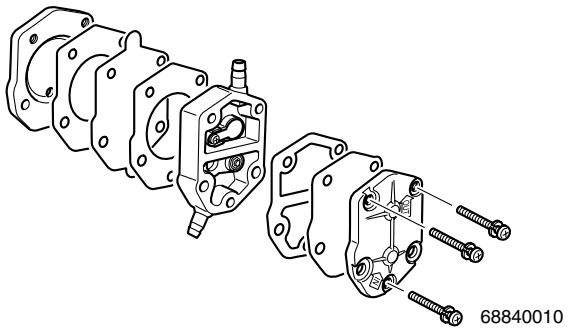


69R40140

Specified positive pressure:
50 kPa (0.5 kgf/cm², 7.3 psi)

Disassembling the fuel pump

1. Remove the 3 screws securing the pump together.


68840010

NOTE:

To disassemble the fuel pump, refer to page 4-5.

2. Check the diaphragms. Replace the diaphragms if deteriorated or tears.

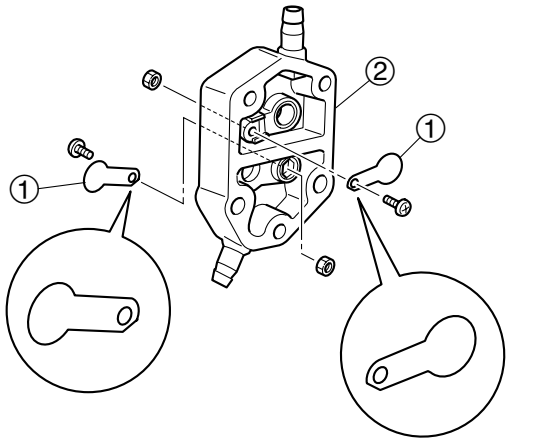
3. Check the check valves. Replace the check valve if bend or damaged. Also, check the fuel pump body. Replace the fuel pump body if damaged.

Assembling the fuel pump

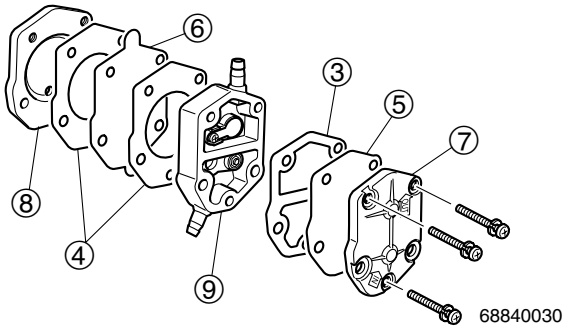
NOTE:

Clean the parts and soak the valves and the diaphragms in gasoline before assembly.

1. Install the check valves ① onto the fuel pump body ②.



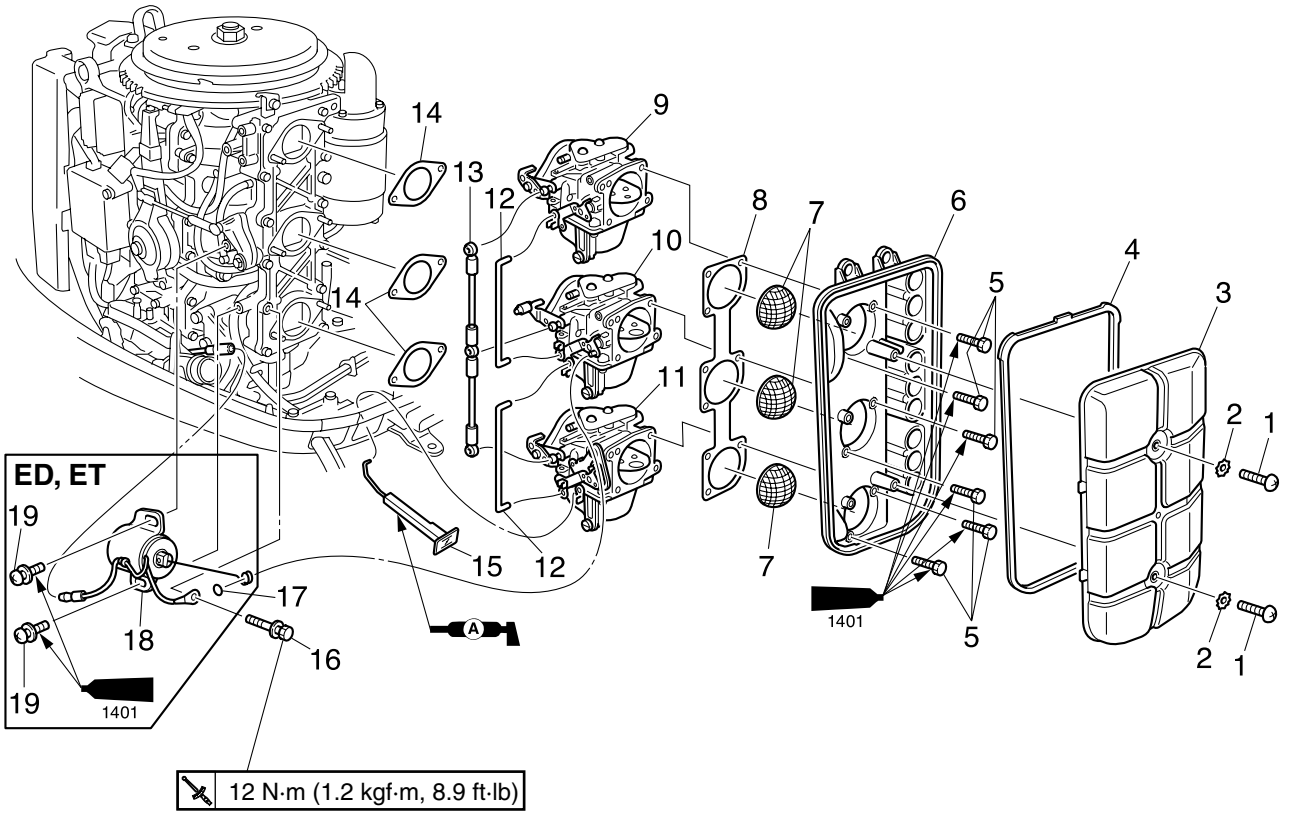
2. Install the new gaskets ③, ④, diaphragms ⑤, ⑥, cover ⑦ and base ⑧ to the fuel pump body ⑨.



NOTE:

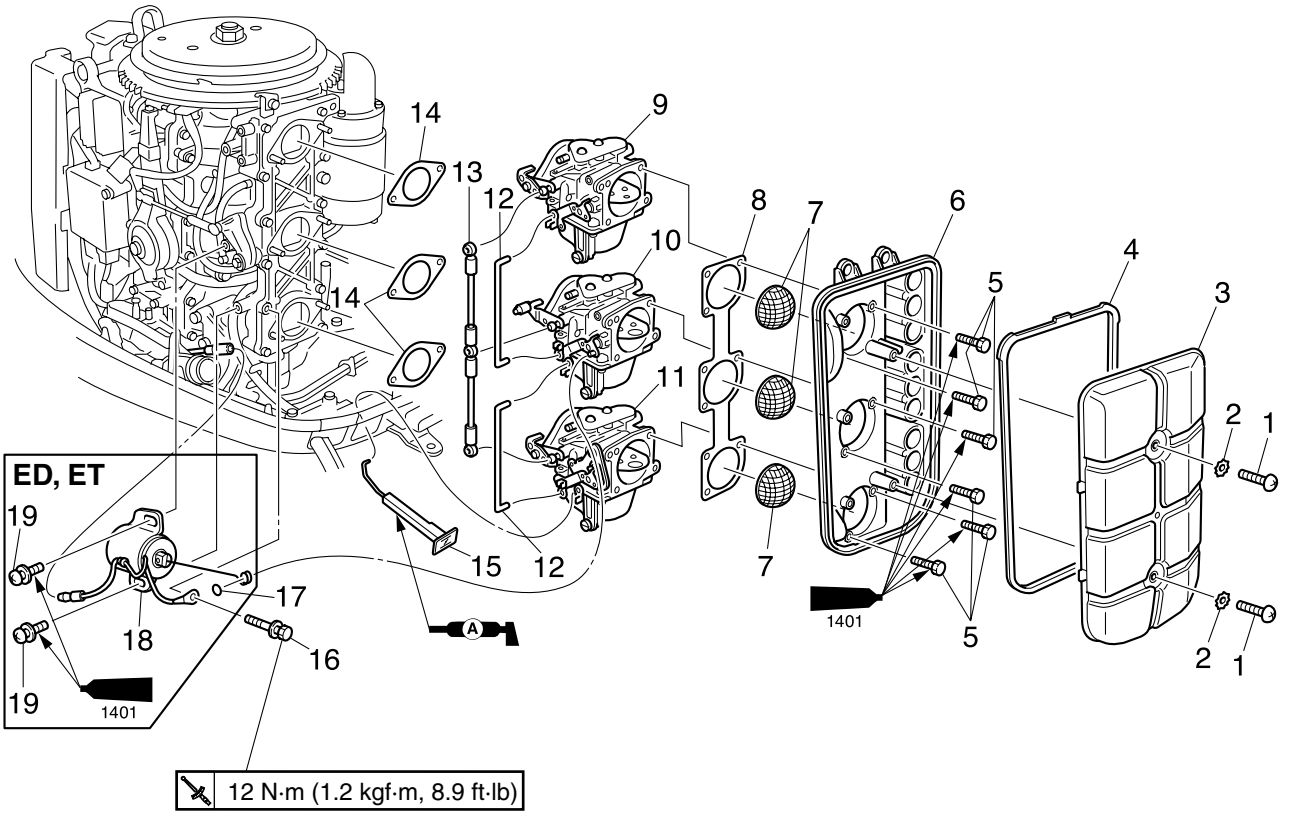
- Make sure that the gaskets ③, ④ and diaphragms ⑤, ⑥ are kept in place through the assembly process.
- After assembling, check the fuel pump air leakage again.

Carburetor



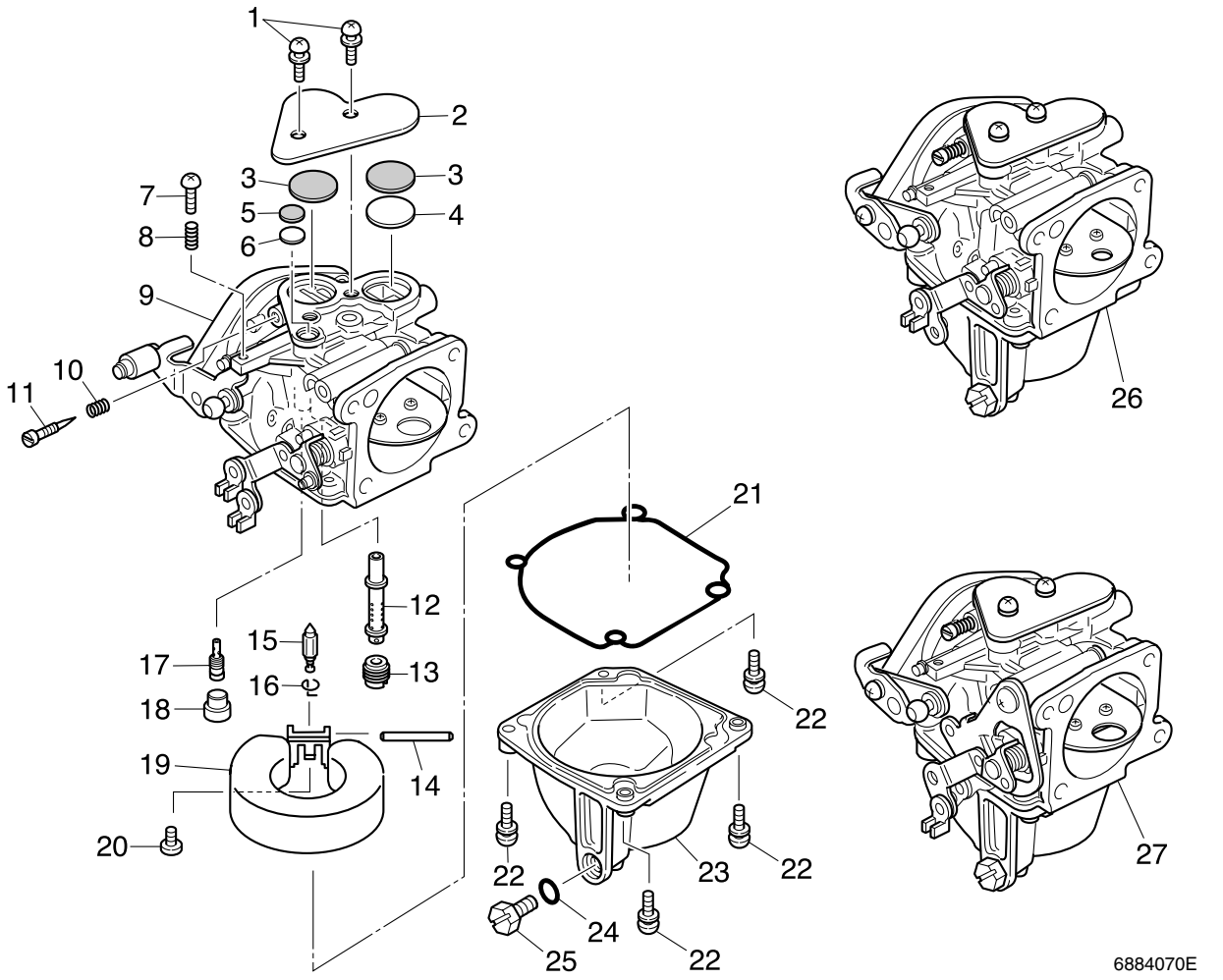
6884060E

No.	Part name	Q'ty	Remarks
1	Screw	2	ø6 × 15 mm
2	Washer	2	
3	Cover	1	
4	Gasket	1	Not reusable
5	Bolt	6	M6 × 18 mm
6	Intake silencer	1	
7	Cap	3	
8	Gasket	1	Not reusable
9	Carburetor assembly #1	1	
10	Carburetor assembly #2	1	
11	Carburetor assembly #3	1	
12	Rod	2	
13	Link rod	1	
14	Gasket	3	Not reusable
15	Choke knob	1	
16	Bolt	1	M6 × 30 mm
17	O-ring	1	ED, ET

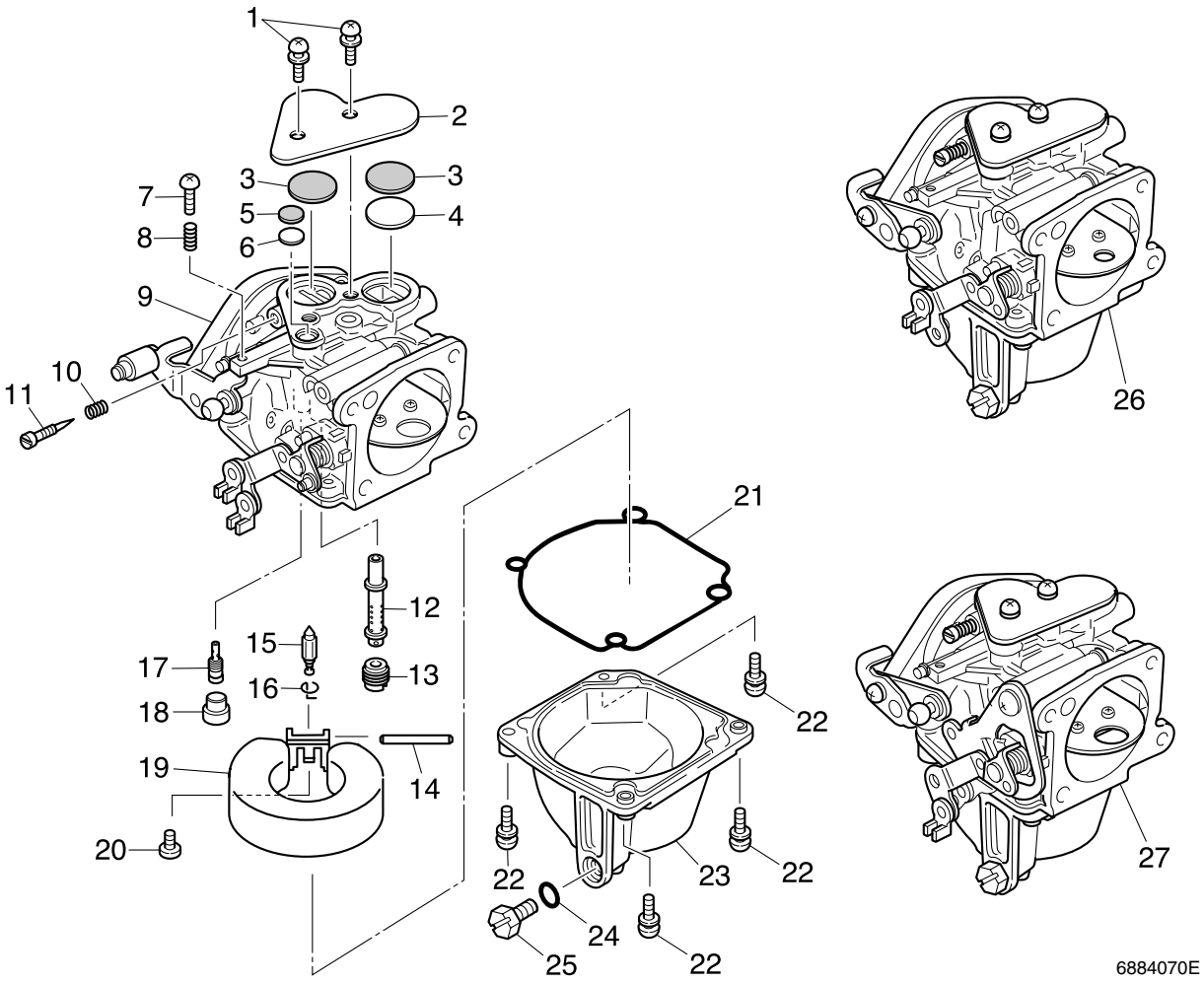


6884060E

No.	Part name	Q'ty	Remarks
18	Choke solenoid	1	ED, ET
19	Screw	2	ø6 × 15 mm : ED, ET



No.	Part name	Q'ty	Remarks
1	Screw	6	ø5 × 10 mm
2	Cover	3	
3	Rubber seal 2	6	
4	Plate 2	3	
5	Rubber seal 1	3	
6	Plate 1	3	
7	Throttle stop screw	1	
8	Spring	1	
9	Carburetor body	3	
10	Spring	3	
11	Pilot screw	3	
12	Main nozzle	3	
13	Main jet	3	
14	Float pin	3	
15	Needle valve	3	
16	Clip	3	
17	Pilot jet	3	



No.	Part name	Q'ty	Remarks
18	Cap	3	
19	Float	3	
20	Screw	3	ø4 × 8 mm
21	Gasket	3	Not reusable
22	Screw	12	ø4 × 14 mm
23	Float chamber	3	
24	O-ring	3	Not reusable
25	Drain bolt	3	
26	Carburetor assembly #1	1	
27	Carburetor assembly #3	1	

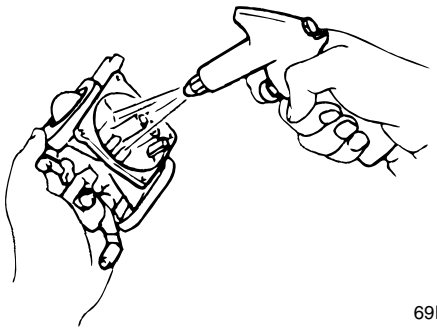
Disassembling the carburetor

NOTE:

Disassembled jets and other components should be sorted out and kept in order, so that they can be re-assembled in their original positions.

Checking the carburetor

1. Check the air and fuel passages and jets. Clean the carburetor body with a petroleum based solvent if dirt and foreign matter.
2. Blow compressed air into all passages and jets.



69R40090

⚠WARNING

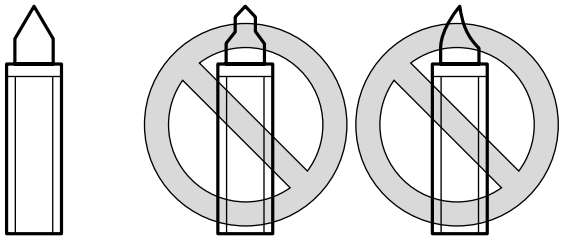
Wear appropriate protective eye gear during the cleaning process to prevent any eye injury by the blown-off debris or liquid.

3. Check the main jet, pilot jet and main nozzle. Clean if dirt or residue appears.

CAUTION:

Do not use steel wire for cleaning the jets, otherwise the jet diameters may be enlarged, which may seriously affect performance.

4. Check the pilot screw and needle valve. Replace the pilot screw and needle valve if bend or worn.



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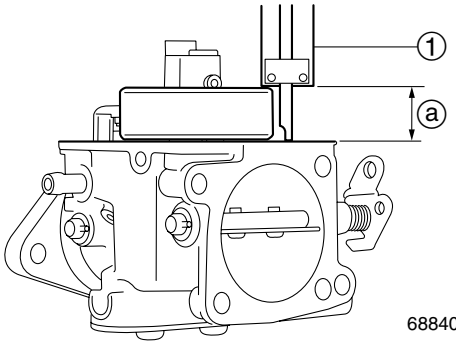
5. Check the float. Replace the float if cracked or damaged.

Checking the float height

1. Measure the float height. Replace the float and needle valve as a set, if out of specification.



68840040

NOTE:

When measure the float height, the float should not be compressing.

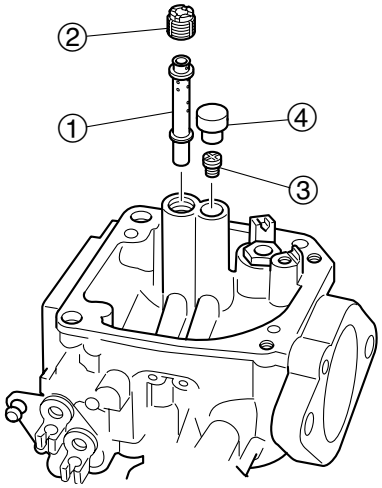
Digital caliper ①: 90890-06704

Float height ⓐ:
16.5–22.5 mm (0.65–0.89 in)

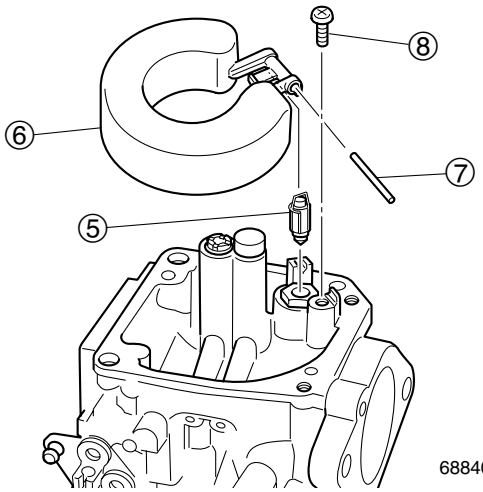
Assembling the carburetor

1. Install the main nozzle ① and main jet ②.

2. Install the pilot jet ③ and cap ④.

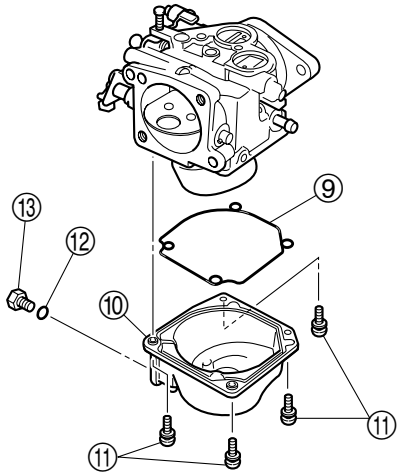


3. Install the needle valve ⑤ to the float ⑥, then install the float pin ⑦ into the float ⑥, and then tighten the float screw ⑧.

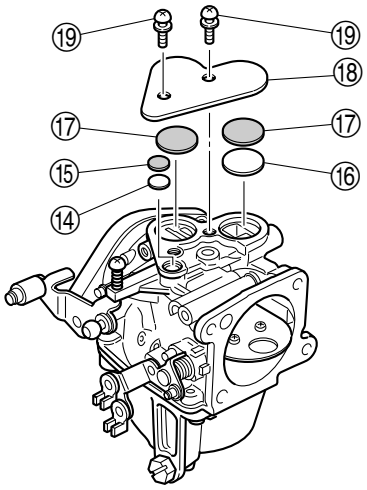


4. Install the new gasket ⑨, float chamber ⑩, and then tighten the float chamber screws ⑪.

5. Install the new O-ring ⑫, and then tighten the drain screw ⑬ to specified torque.

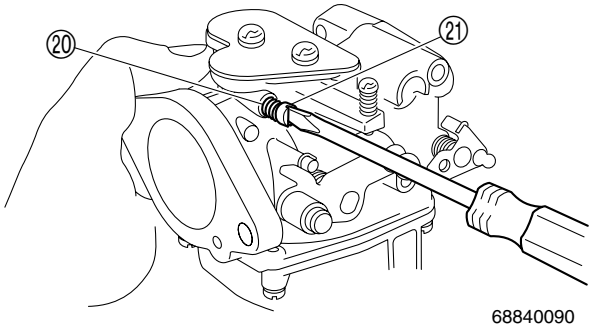


6. Install the plate 1 ⑭, rubber seal 1 ⑮, plate 2 ⑯, rubber seals 2 ⑰, cover ⑱, and then tighten the cover screws ⑲.



4

7. Install the spring ⑳, pilot screw ㉑, then turn it in until it is lightly seated, and then turn it out the specified number of turns.



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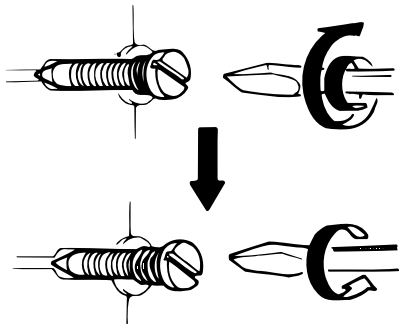
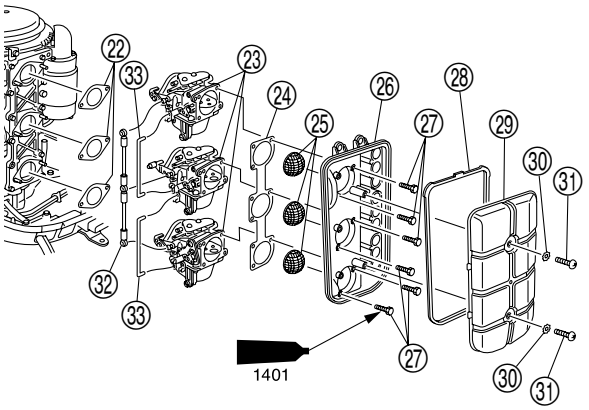

6F640100

Pilot screw setting:
55D, 75A:
1–1 1/2 turns out
85A:
7/8–1 3/8 turns out

8. Install the new gaskets ㉒, carburetor assembly ㉓, new gasket ㉔, carburetor caps ㉕, intake silencer ㉖ and bolts ㉗.

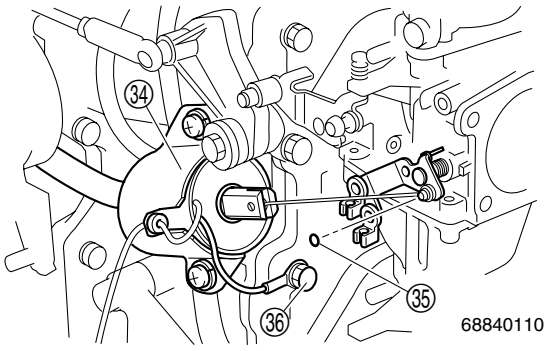
9. Install the new gasket ㉘, cover ㉙, washers ㉚ and screws ㉛, and then install the link rod ㉜ and rods ㉝.



68840100

NOTE:
- Temporarily install the carburetor caps ㉕ to the intake silencer ㉖, and then tighten the bolts ㉗.
- Synchronizing the carburetor, adjust the throttle cable and engine idle speed whenever the carburetor has been disassembled.
- For the adjustment procedures mentioned above, refer to chapter 3.

10. Install the choke solenoid ㉞ and O-ring ㉟. (ED, ET)



68840110

Intake manifold bolt ㊱:
12 N·m (1.2 kgf·m, 8.9 ft·lb)

— MEMO —

Power unit

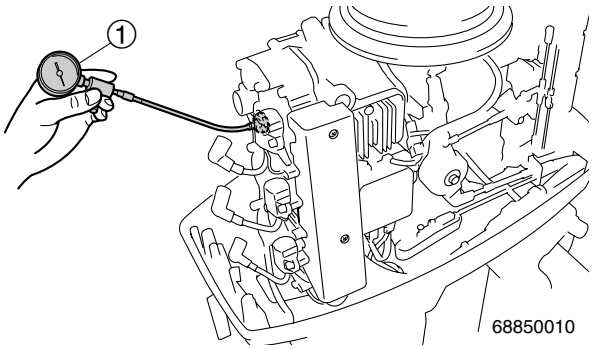
Power unit

Checking the compression pressure

1. Start the engine, warm it up for 5 minutes, and then turn it off.

2. Remove the lock plate from the engine stop lanyard switch.

3. Remove the all spark plug caps and all spark plugs, and then install the special service tool ① into a spark plug hole.



CAUTION:

Before removing the spark plugs, blow compressed air in the spark plug well to clear out any dirt or dust that may fall into the cylinder.

Compression gauge ①:
90890-03160

4. Fully open the throttle, and then crank the engine until the reading on the compression gauge stabilizes.

NOTE:

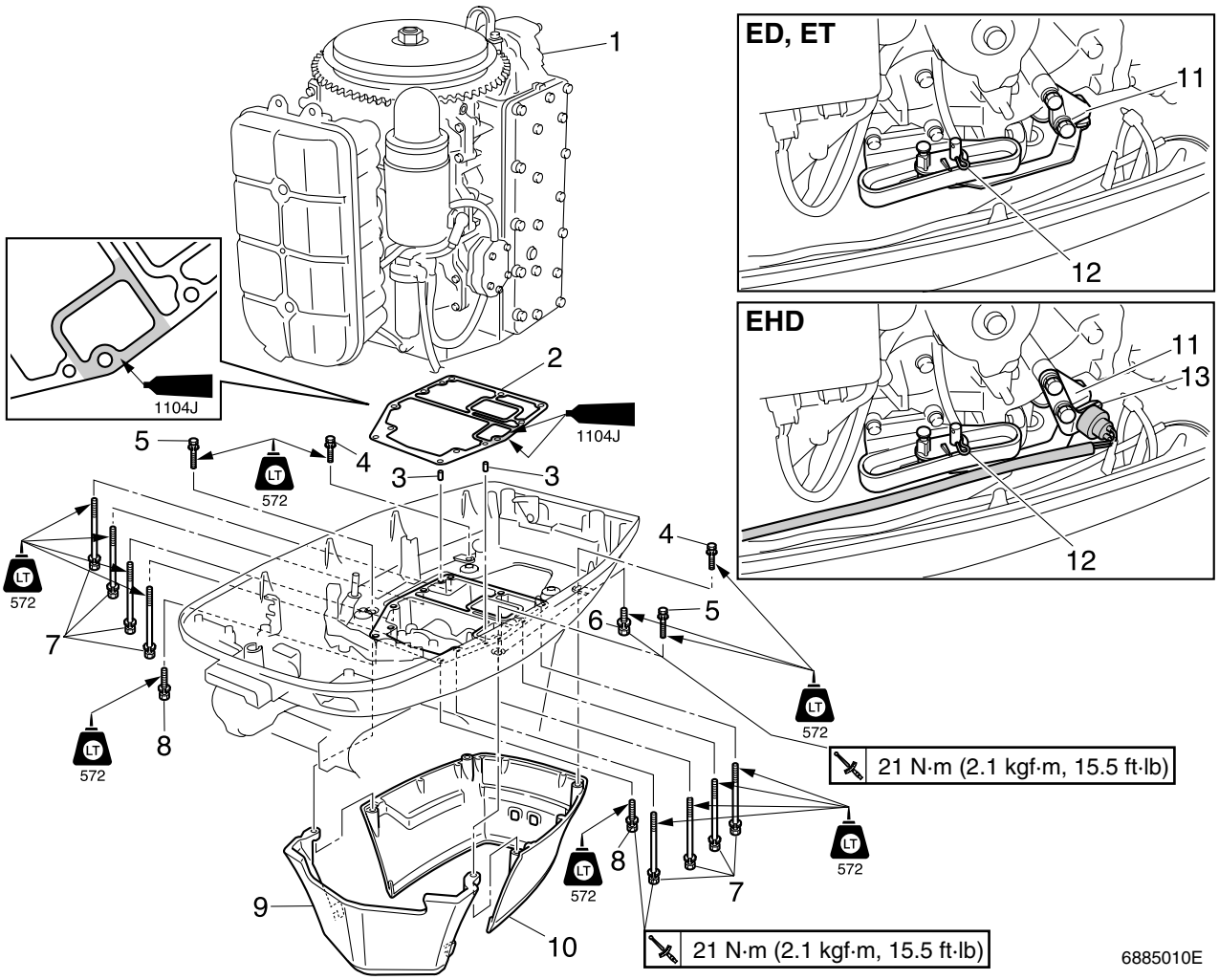
- Disconnect the throttle cable joint from the throttle control lever, and then place hold the lever in the fully-opened position of the throttle (ED, ET).
- Do not pull the choke knob when checking the compression pressure.
- Make a note of each cylinder measurement numeral 3 times to find the compression average.

Minimum compression pressure (reference data):
55D, 75A:
340 kPa (3.4 kgf/cm², 49 psi)
85A:
410 kPa (4.1 kgf/cm², 59 psi)

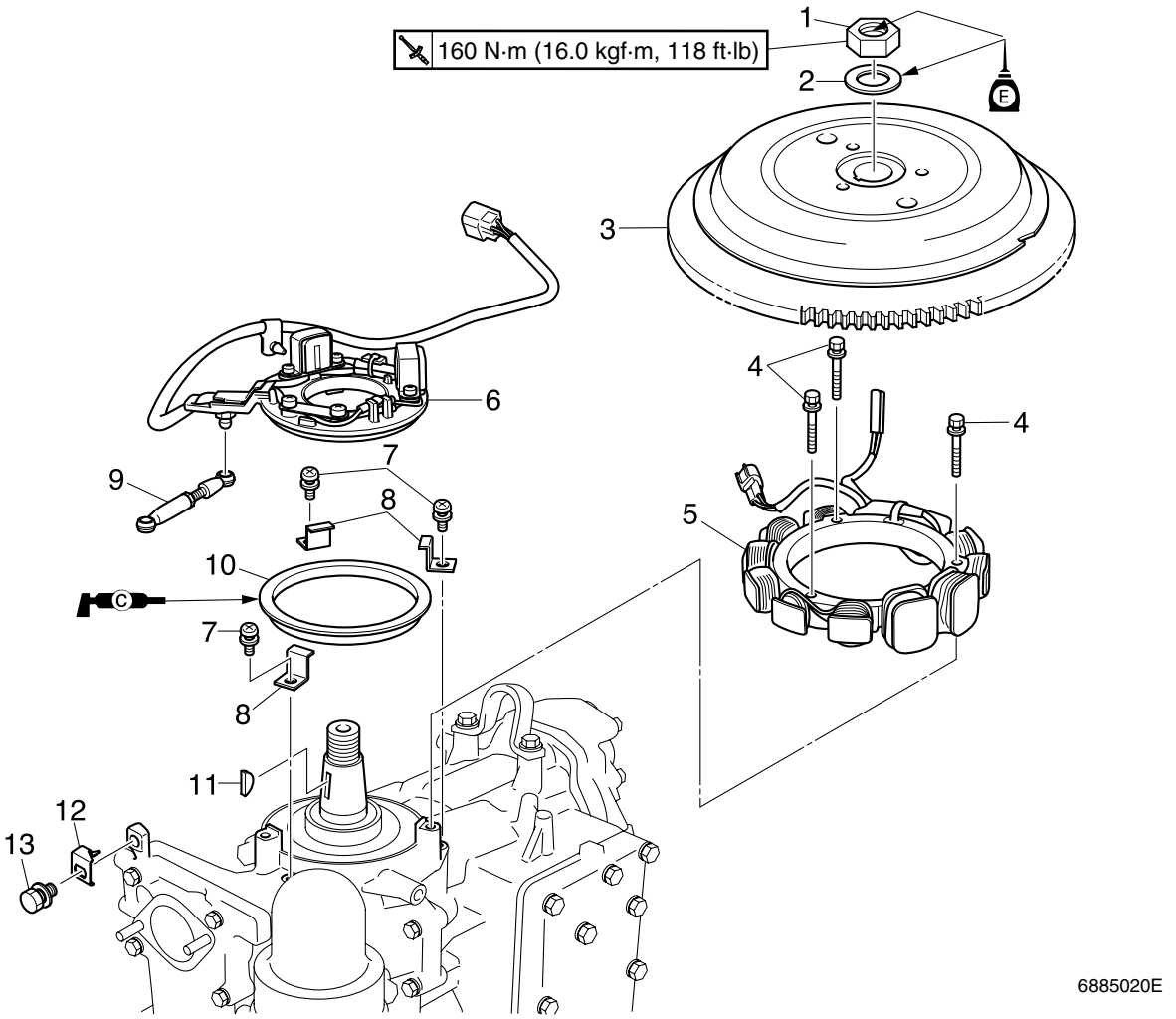
5. If the compression pressure is below specification and the compression pressure for each cylinder is unbalanced, add a small amount of engine oil to the cylinders, and then check the compression pressure again.

NOTE:

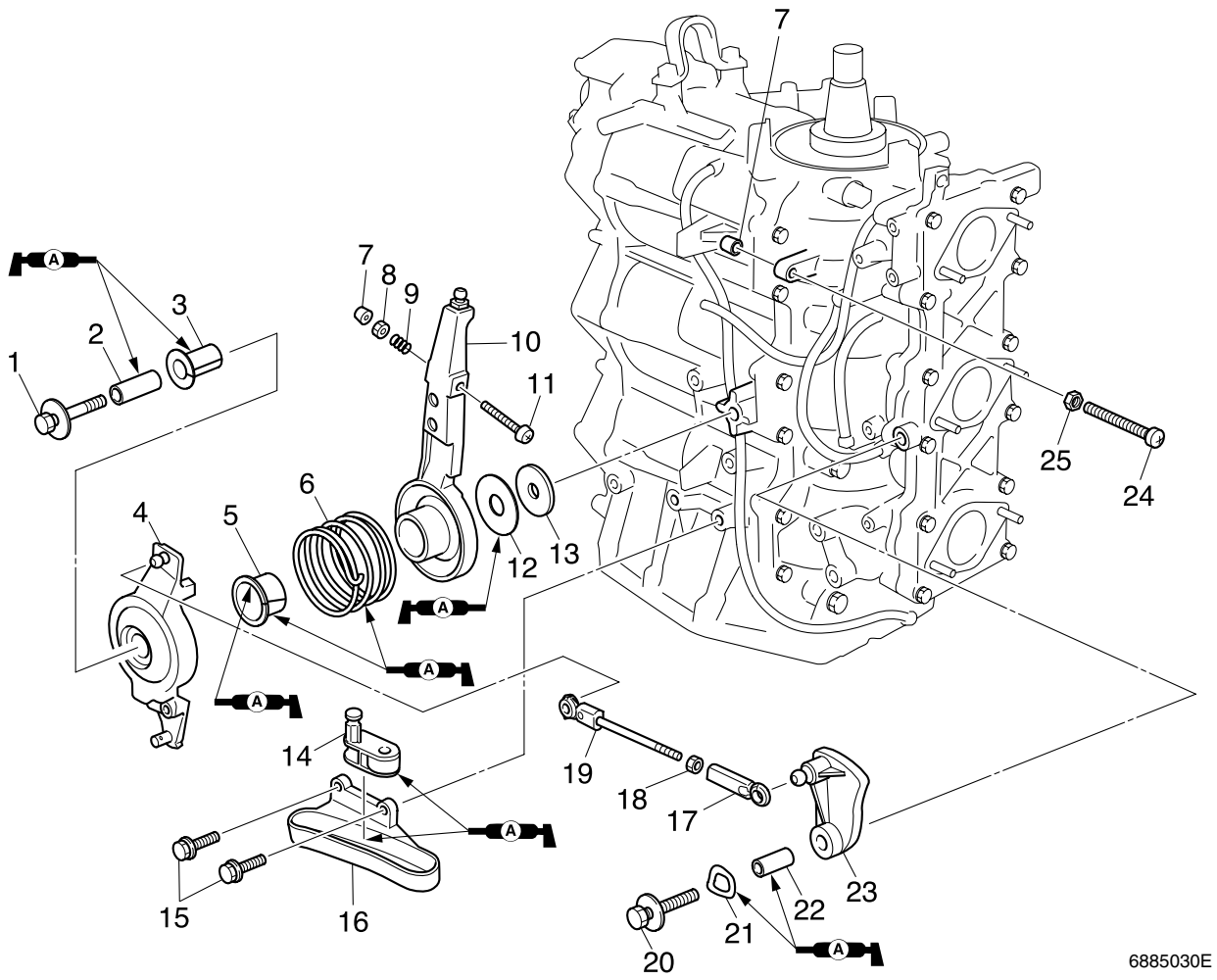
- If the compression pressure increases, check the pistons and piston rings. Replace if worn.
- If the compression pressure does not increase, check the cylinder head gasket and cylinder head. Replace if necessary.



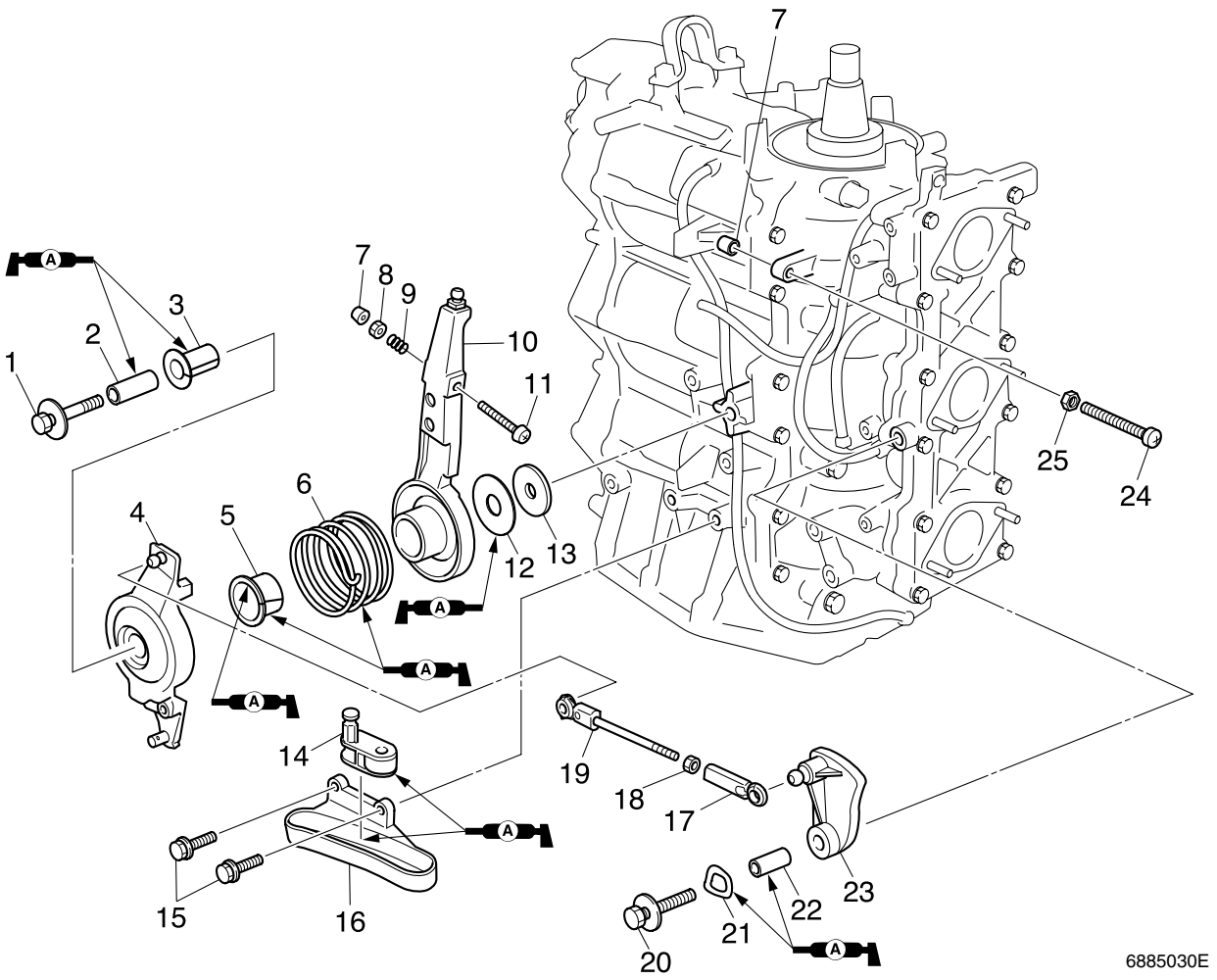
No.	Part name	Q'ty	Remarks
1	Power unit	1	
2	Gasket	1	Not reusable
3	Dowel	2	
4	Bolt	2	M6 × 20 mm
5	Bolt	2	M6 × 30 mm
6	Bolt	1	M8 × 30 mm
7	Bolt	8	M8 × 90 mm
8	Bolt	2	M8 × 35 mm
9	Apron	1	
10	Apron	1	
11	Bracket	1	
12	Clip	1	
13	Neutral switch	1	EHD



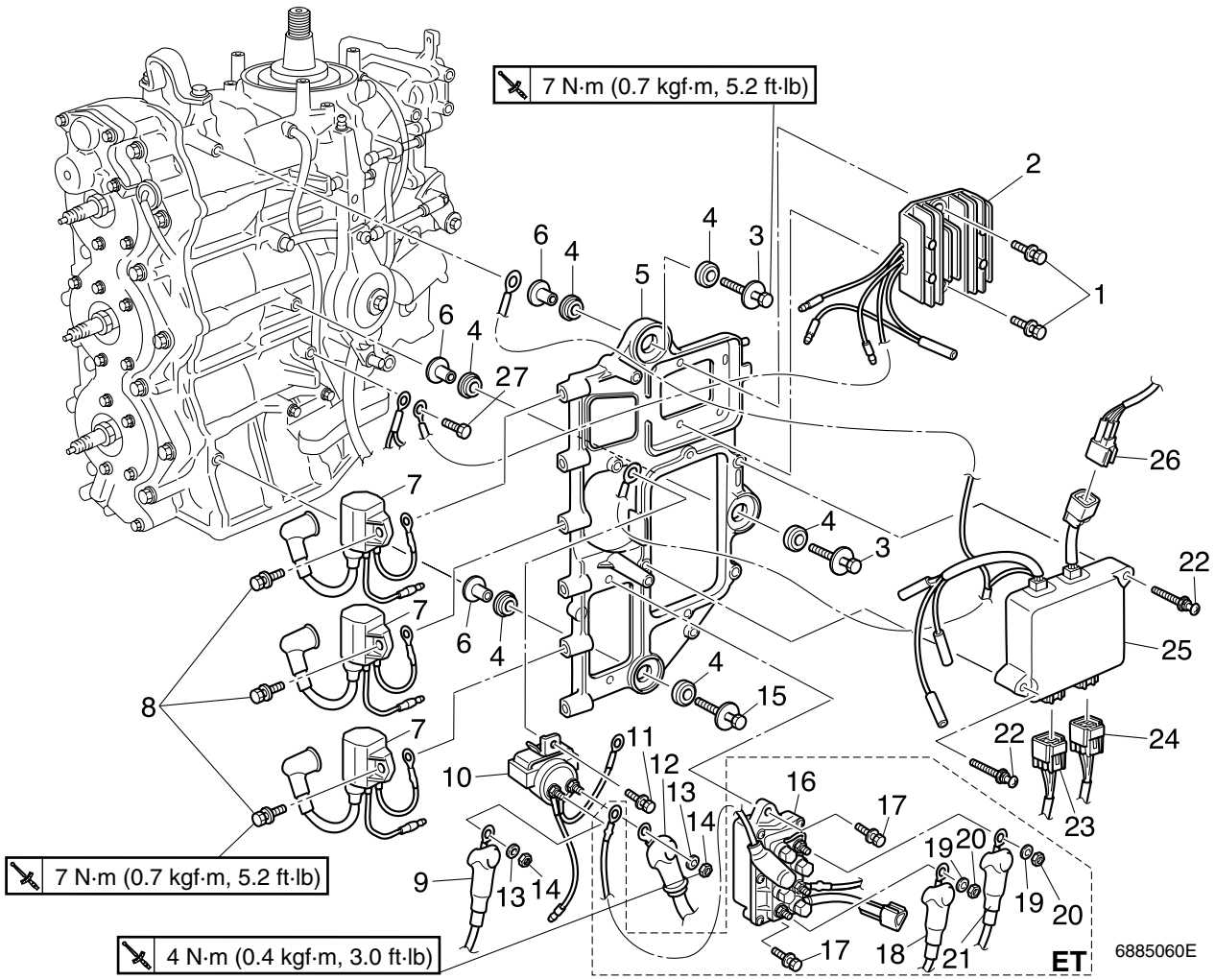
No.	Part name	Q'ty	Remarks
1	Nut	1	
2	Washer	1	
3	Flywheel magnet	1	
4	Bolt	3	M6 × 30 mm
5	Stator assembly	1	
6	Pulser coil assembly	1	
7	Screw	3	ø6 × 12 mm
8	Plate	3	
9	Control link	1	
10	Retainer	1	
11	Woodruff key	1	
12	Timing plate	1	
13	Bolt	1	M6 × 10 mm



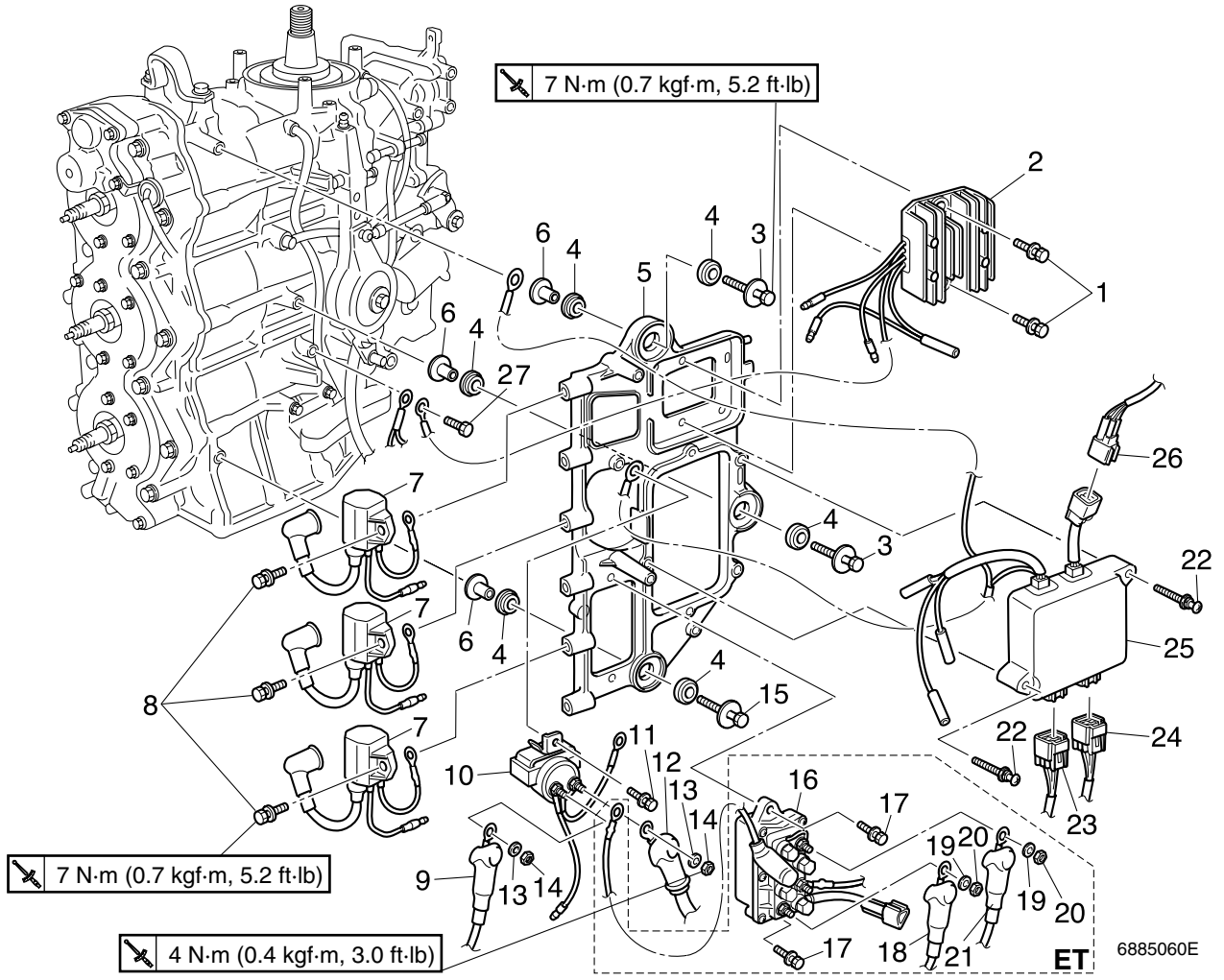
No.	Part name	Q'ty	Remarks
1	Bolt	1	M8 × 45 mm
2	Collar	1	
3	Bushing	1	
4	Control lever 1	1	
5	Bushing	1	
6	Spring	1	
7	Cap	2	
8	Lock nut	1	
9	Spring	1	
10	Control lever 2	1	
11	Screw	1	
12	Plastic washer	1	
13	Washer	1	
14	Shift lever	1	
15	Bolt	2	M8 × 30 mm
16	Bracket	1	
17	Joint	1	



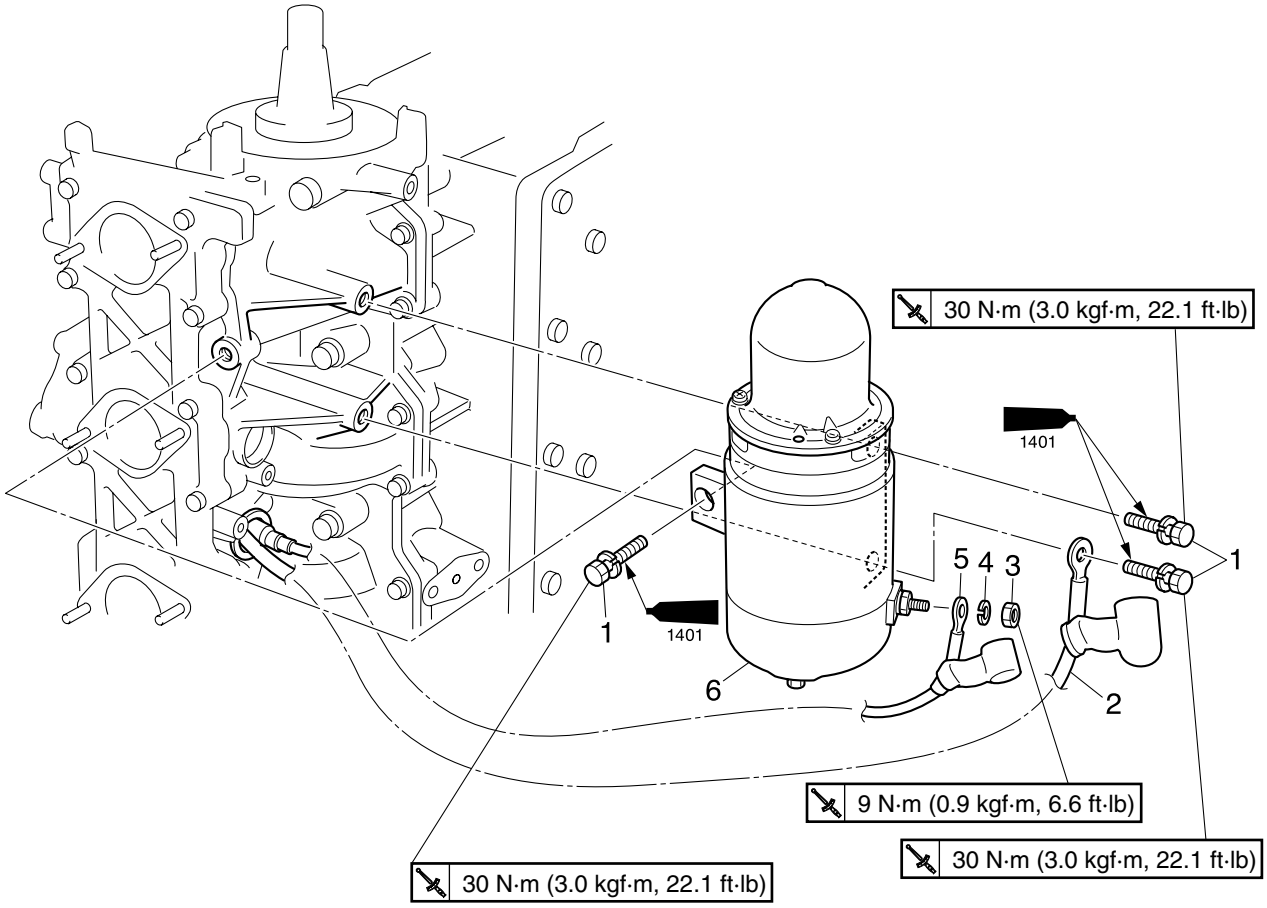
No.	Part name	Q'ty	Remarks
18	Lock nut	1	
19	Throttle link rod	1	
20	Bolt	1	M6 × 35 mm
21	Wave washer	1	
22	Collar	1	
23	Cam	1	
24	Screw	1	
25	Lock nut	1	



No.	Part name	Q'ty	Remarks
1	Bolt	2	M6 × 20 mm
2	Rectifier Regulator	1	
3	Bolt	2	M6 × 30 mm
4	Grommet	6	
5	Bracket	1	
6	Collar	3	
7	Ignition coil	3	
8	Bolt	3	M6 × 20 mm
9	Positive starter relay lead	1	
10	Starter relay	1	
11	Bolt	1	M6 × 16 mm
12	Positive battery cable	1	
13	Spring washer	1	
14	Nut	2	
15	Bolt	1	M6 × 40 mm
16	PTT relay	1	ET
17	Bolt	2	M6 × 25 mm : ET



No.	Part name	Q'ty	Remarks
18	PTT motor lead	1	Green : ET
19	Spring washer	2	ET
20	Nut	2	ET
21	PTT motor lead	1	Blue : ET
22	Screw	2	ø6 × 40 mm
23	Pulser coil coupler	1	
24	Main harness coupler	1	
25	CDI unit	1	
26	Charge coil coupler	1	
27	Bolt	1	M6 × 12 mm



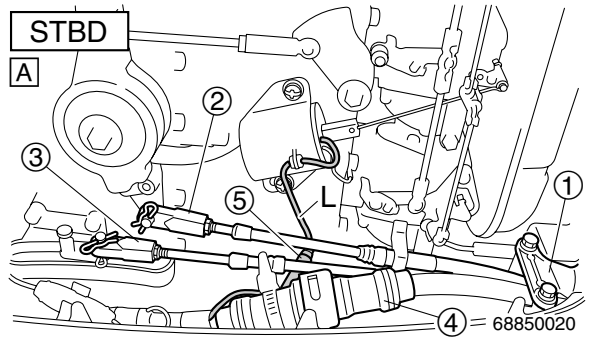
6885050E

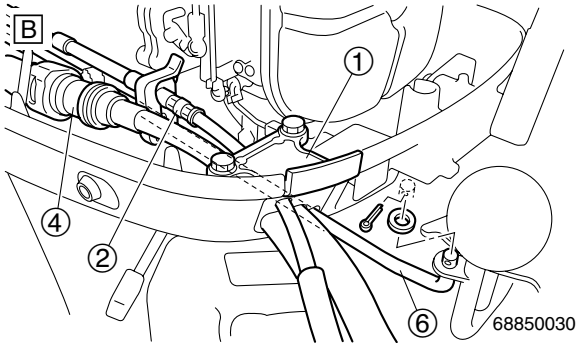
No.	Part name	Q'ty	Remarks
1	Bolt	3	M8 × 30 mm
2	Negative battery cable	1	
3	Nut	1	
4	Spring washer	1	
5	Positive battery lead	1	
6	Starter motor	1	

Removing the power unit

NOTE:
It is recommended to loosen the flywheel magnet nut before removing the power unit to improve working efficiency.

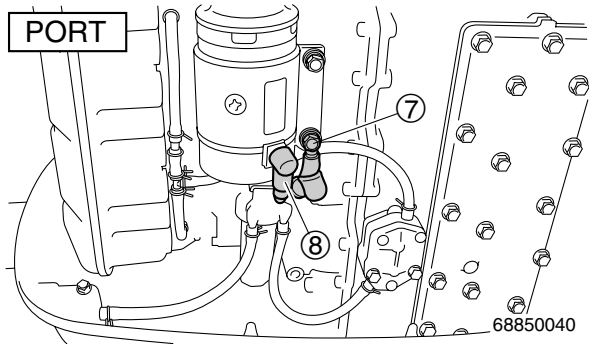
1. Set the gear shift to “N” position, and then remove the retaining plate ①, throttle cable ②, shift cable ③, main harness coupler ④ and choke solenoid lead ⑤ (ED, ET).
   (EHD: throttle cable ② and shift rod ⑥)



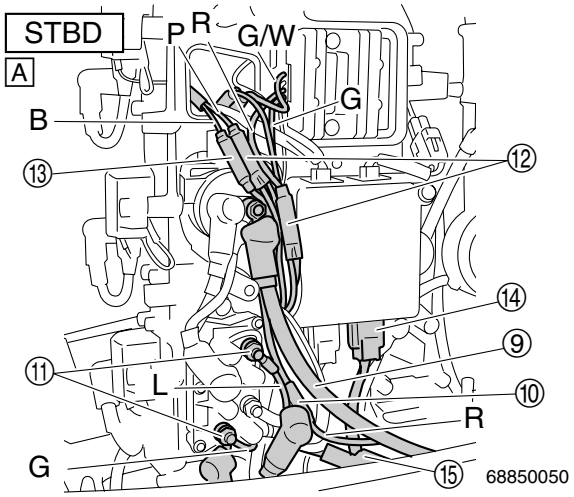


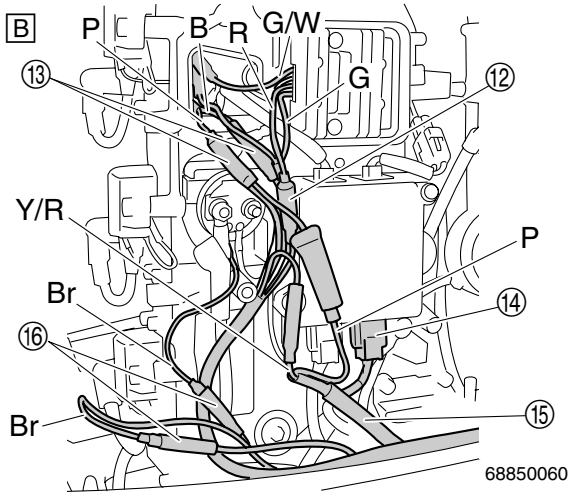
A ED, ET
B EHD

2. Disconnect the negative battery cable ⑦ and positive battery lead ⑧ from starter motor.



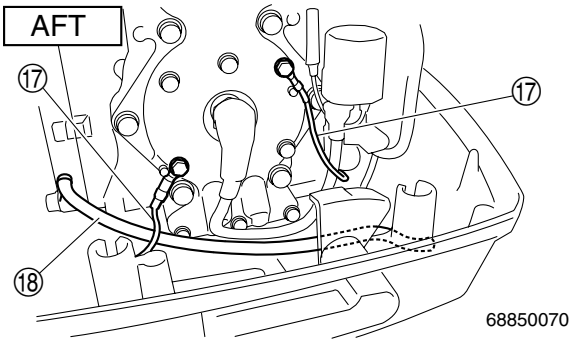
3. Remove the cover, then remove the positive battery cable ⑨, fuse holder lead ⑩, PTT motor leads ⑪ (ET), Rectifier Regulator leads ⑫, thermoswitch leads ⑬ and main harness coupler ⑭.
   (EHD: warning indicator leads ⑮, neutral switch leads ⑯)





A ED, ET
B EHD

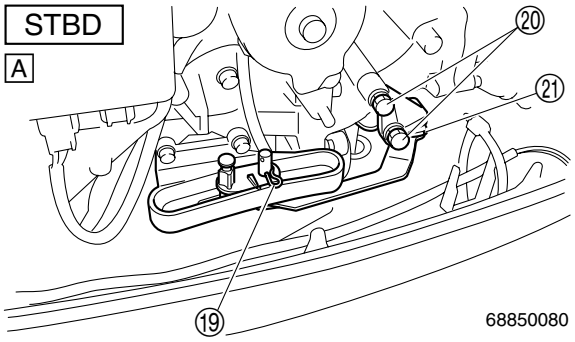
4. Disconnect the ground leads ⑰ and pilot water hose ⑱.

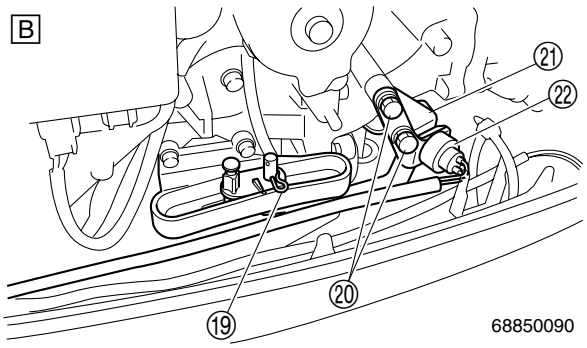


5. Disconnect the fuel hose, and then remove the choke knob.

NOTE:
To disconnect and remove the fuel hose and choke link rod. Refer to page 4-3 and 4-9.

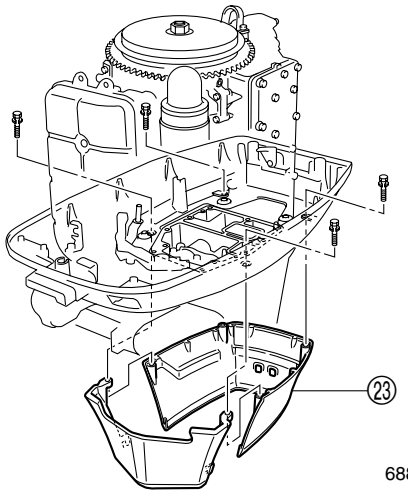
6. Remove the pin ⑲ and bolts ⑳, bracket ㉑.
(EHD: pin ⑲, bolts ⑳, neutral switch ㉒, bracket ㉑)



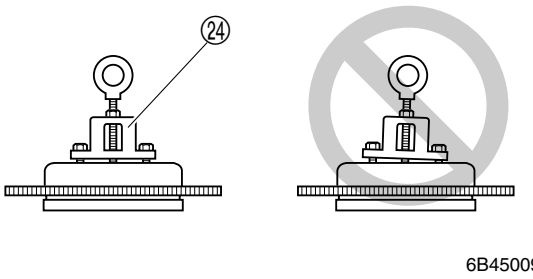


A ED, ET
B EHD

7. Remove the apron ㉓.



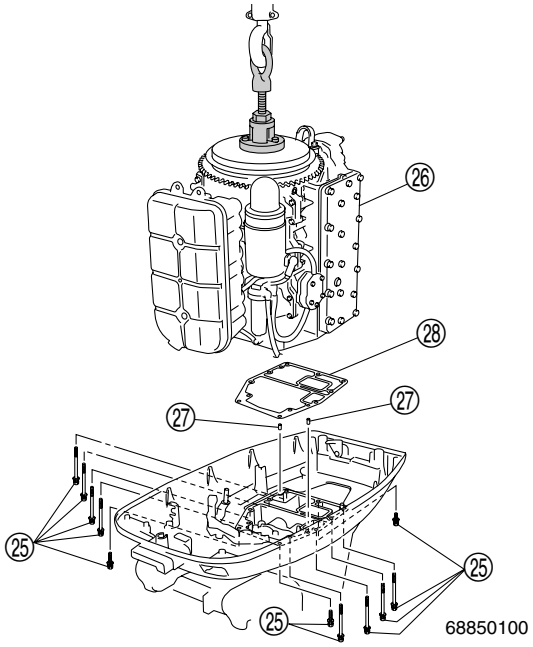
8. Install the special service tool ㉔ as shown.



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

Flywheel puller ㉔: 90890-06521

9. Remove the bolts ㉕ and lift up the power unit ㉖, and then remove the dowels ㉗ and gasket ㉘.



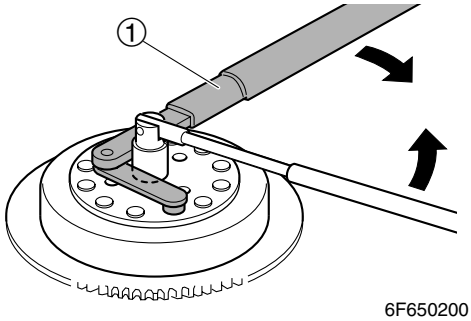
10. Remove the fuel system and carburetors.

NOTE:
To remove the fuel system and carburetors, refer to page 4-3 and 4-9.

5

Removing the flywheel magnet

1. Loosen the flywheel magnet nut.



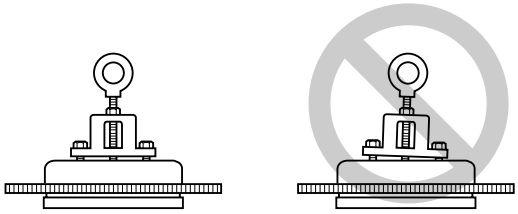
6F650200

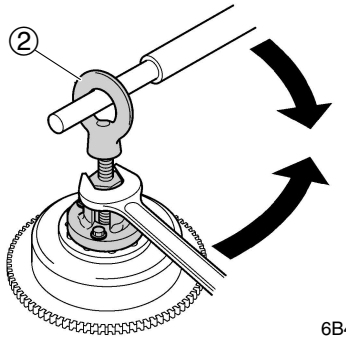
CAUTION:

Apply force in the direction of the arrows shown. While working, do not allow the flywheel holder to slip off the flywheel magnet.

Flywheel holder ① : 90890-06522

2. Install the special service tool, and then remove the flywheel magnet.





6B450090

CAUTION:

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

NOTE:

Apply force to the crankshaft end until the flywheel magnet comes off the tapered portion of the crankshaft.

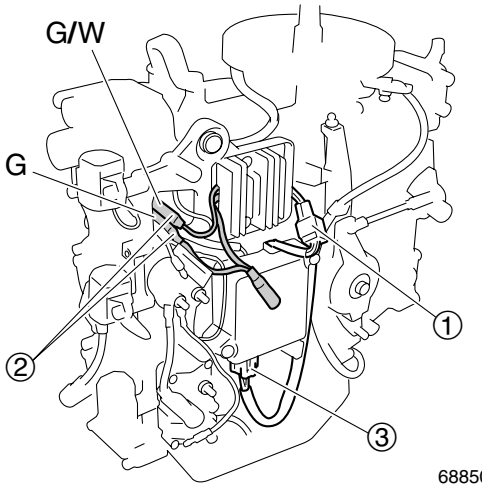
Flywheel puller ② : 90890-06521

3. Remove the Woodruff key.

Removing the electrical component

1. Remove the spark plug caps.

2. Disconnect the charge coil coupler ①, lighting coil leads ②, pulser coil coupler ③, PTT relay ground lead ④ (ET) and Rectifier Regulator ground lead ⑤.



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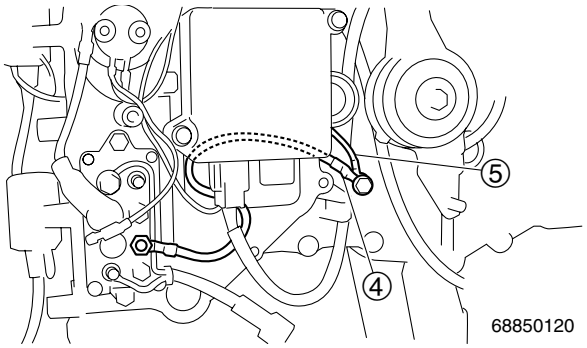

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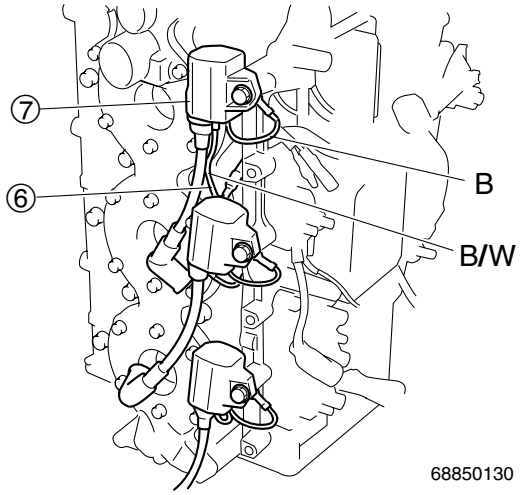
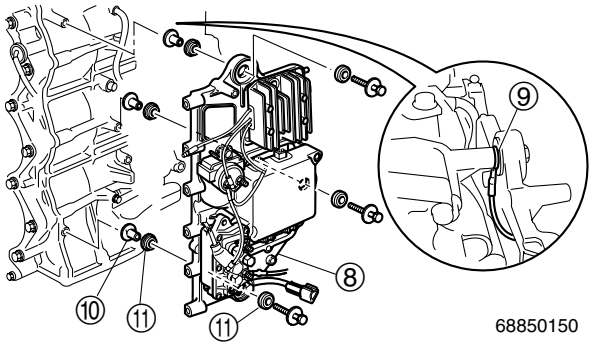
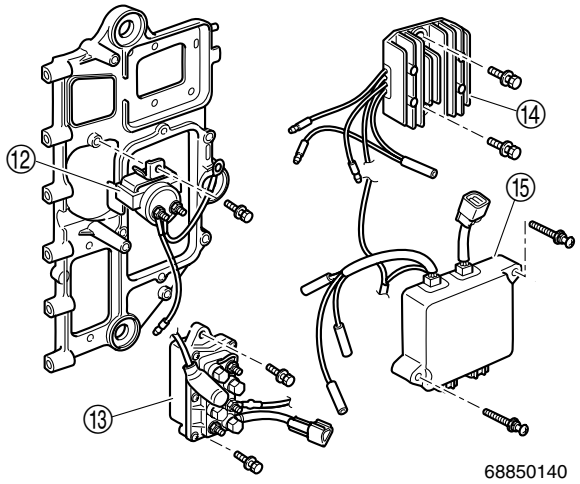
3. Disconnect the Ignition coil leads ⑥, and then remove the ignition coils ⑦.



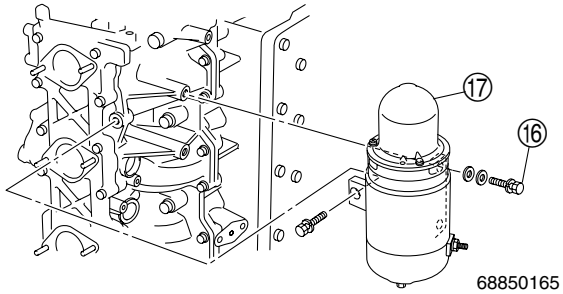
4. Remove the CDI unit bracket ⑧, ground lead ⑨, collars ⑩ and grommets ⑪.



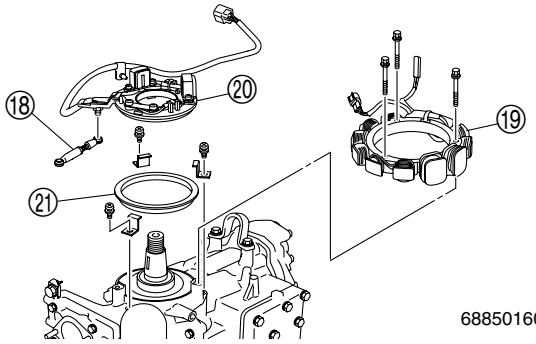
5. Remove the starter relay ⑫, PTT relay ⑬ (ET), Rectifier Regulator ⑭ and CDI unit ⑮ from the CDI unit bracket.



6. Remove the starter motor bolts ⑯, and then remove the starter motor ⑰.

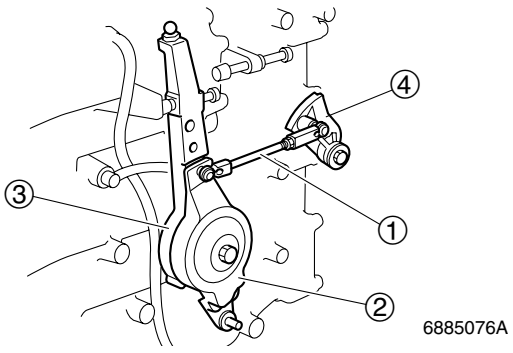


7. Remove the control link ⑱, then remove the stator assembly ⑲, pulser coil assembly ⑳ and retainer ㉑.



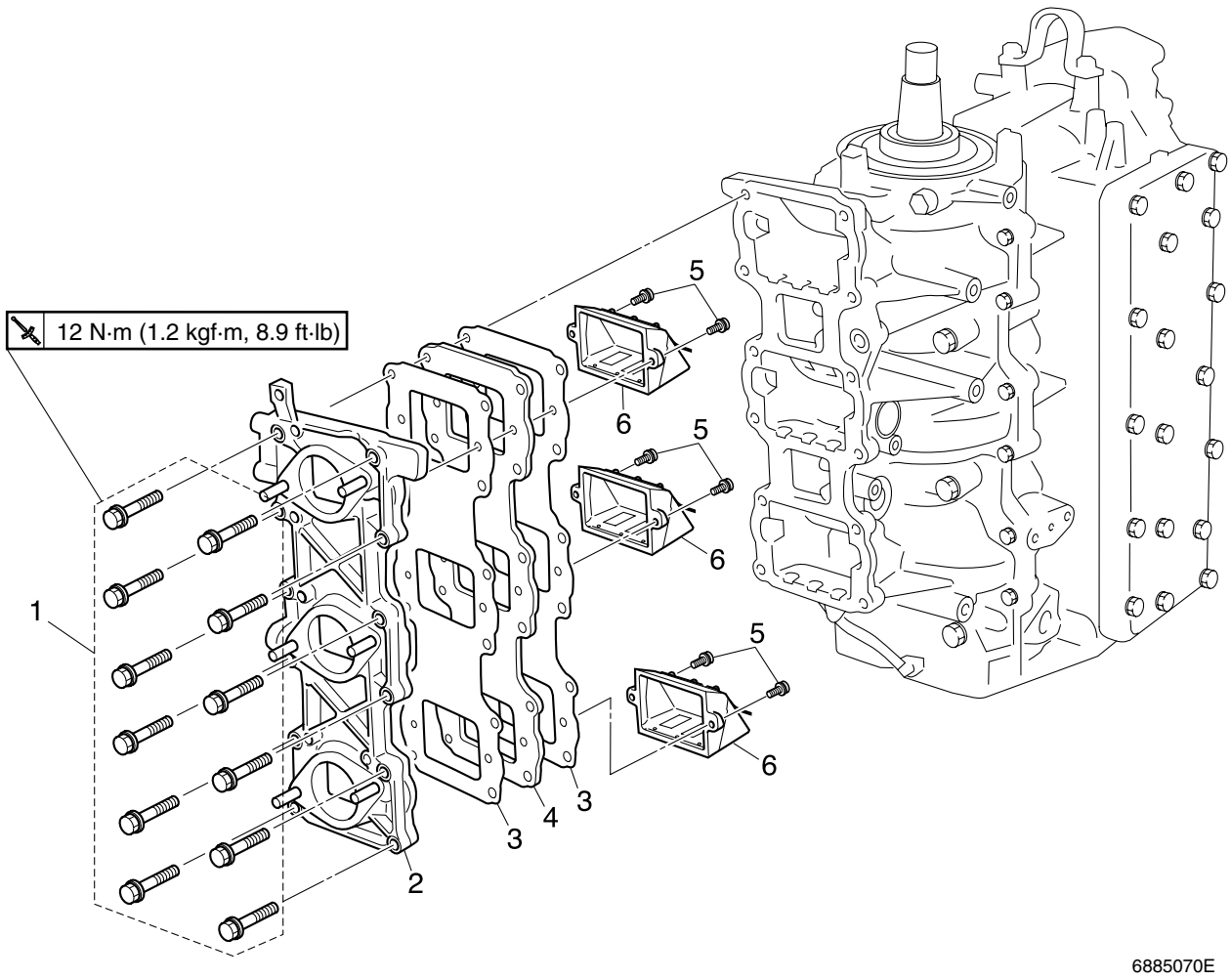
Removing the control lever and throttle cam

1. Remove the throttle link rod ①, control lever 1 ②, control lever 2 ③ and throttle cam ④.



5

Intake manifold

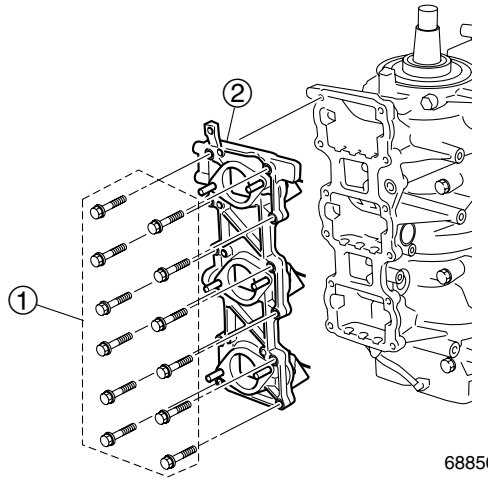


6885070E

No.	Part name	Q'ty	Remarks
1	Bolt	12	M6 × 30 mm
2	Intake manifold	1	
3	Gasket	2	Not reusable
4	Plate	1	
5	Screw	6	ø5 × 20 mm
6	Reed valve assembly	3	

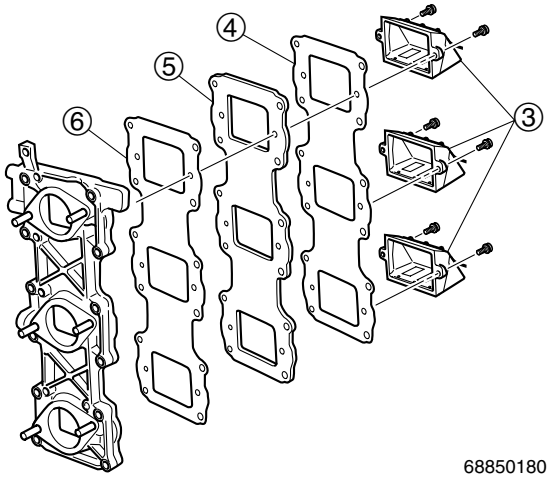
Removing the reed valve assembly

1. Remove the intake manifold bolts ①, and then remove the intake manifold ②.



68850170

2. Remove the reed valve assembly ③, gasket ④, plate ⑤ and gasket ⑥.

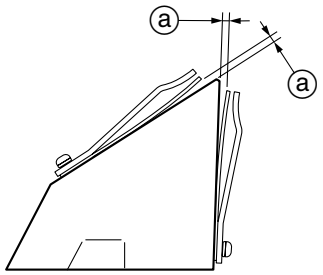


68850180

Checking the reed valve

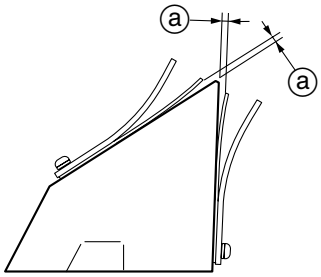
1. Check the reed valves for bends ⓐ. Replace the reed valve assembly if above specification.

A



68850190

B



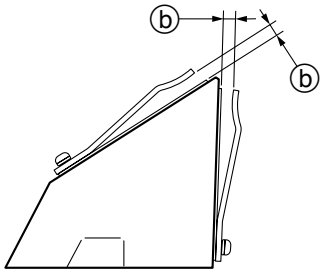
68850200

A 75A
B 55D, 85A

Valve bend limit ⓐ:
0.2 mm (0.0079 in)

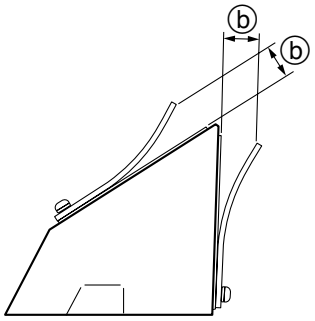
2. Measure the reed valve stopper height ⓑ. Replace the reed valve assembly if out of specification.

A



68850210

B



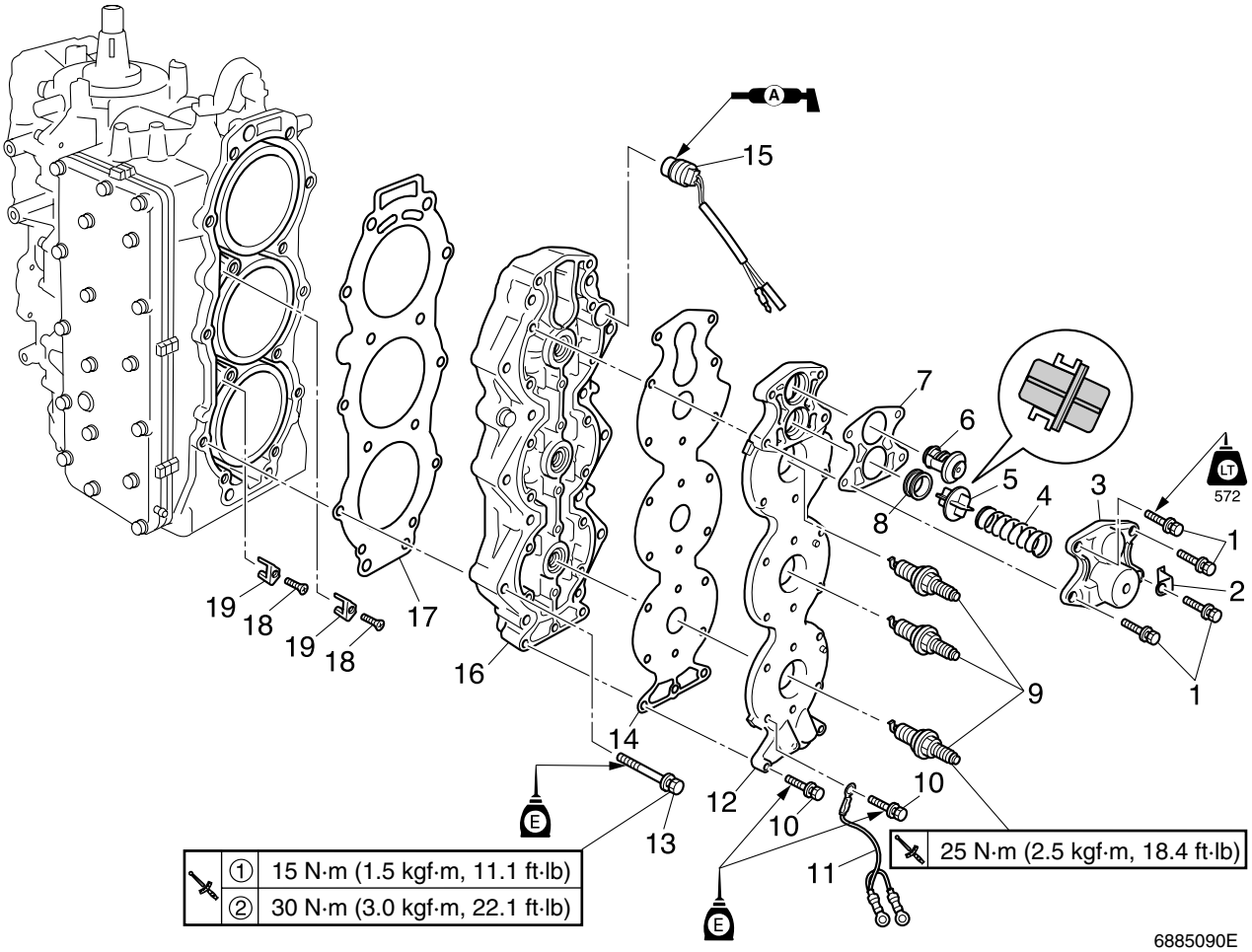
68850220

Valve stopper height ⓑ:
75A: 2.8–3.2 mm
(0.11–0.13 in)
55D, 85A: 9.7–10.1 mm
(0.38–0.40 in)

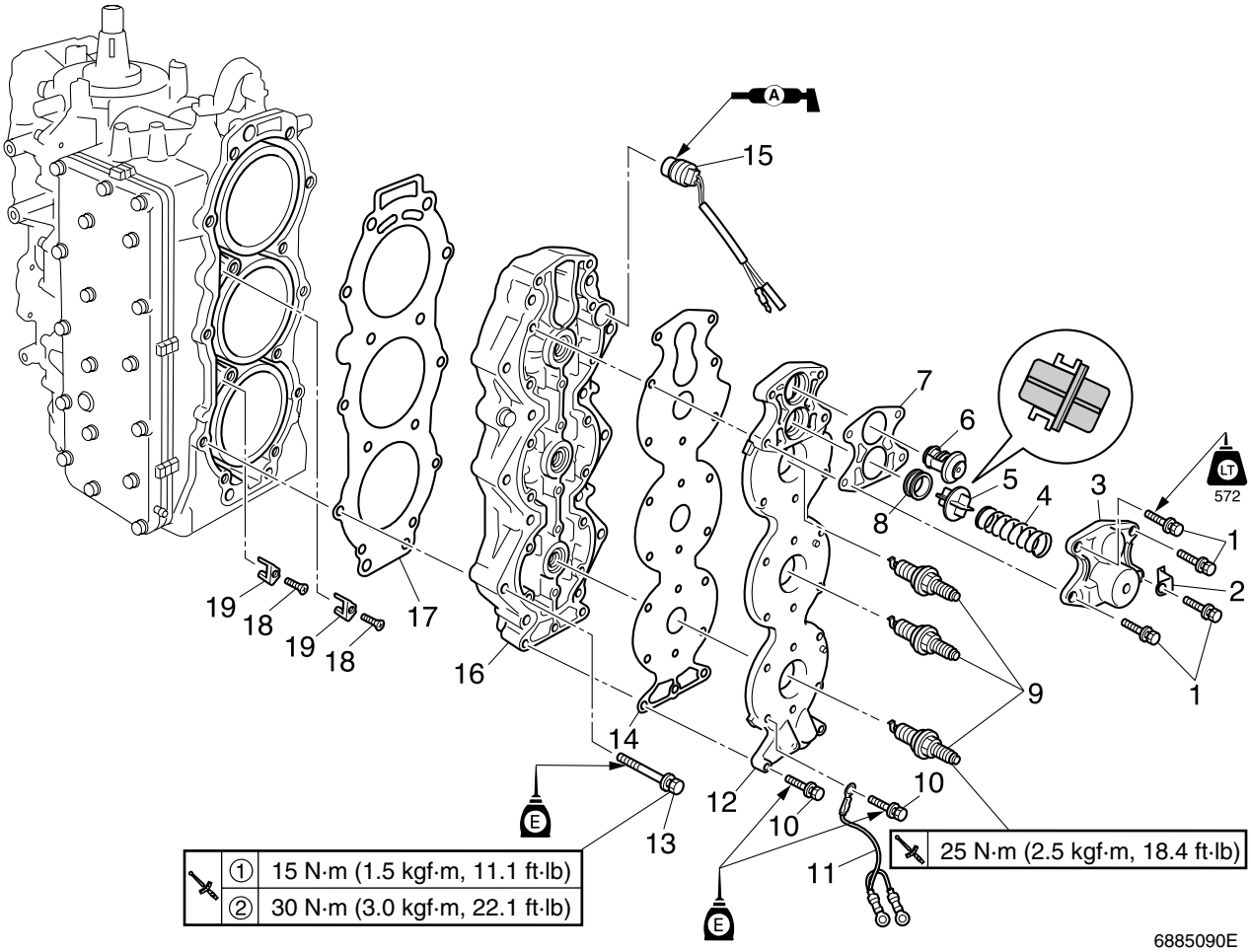
A 75A
B 55D, 85A

5

Cylinder head, exhaust cover

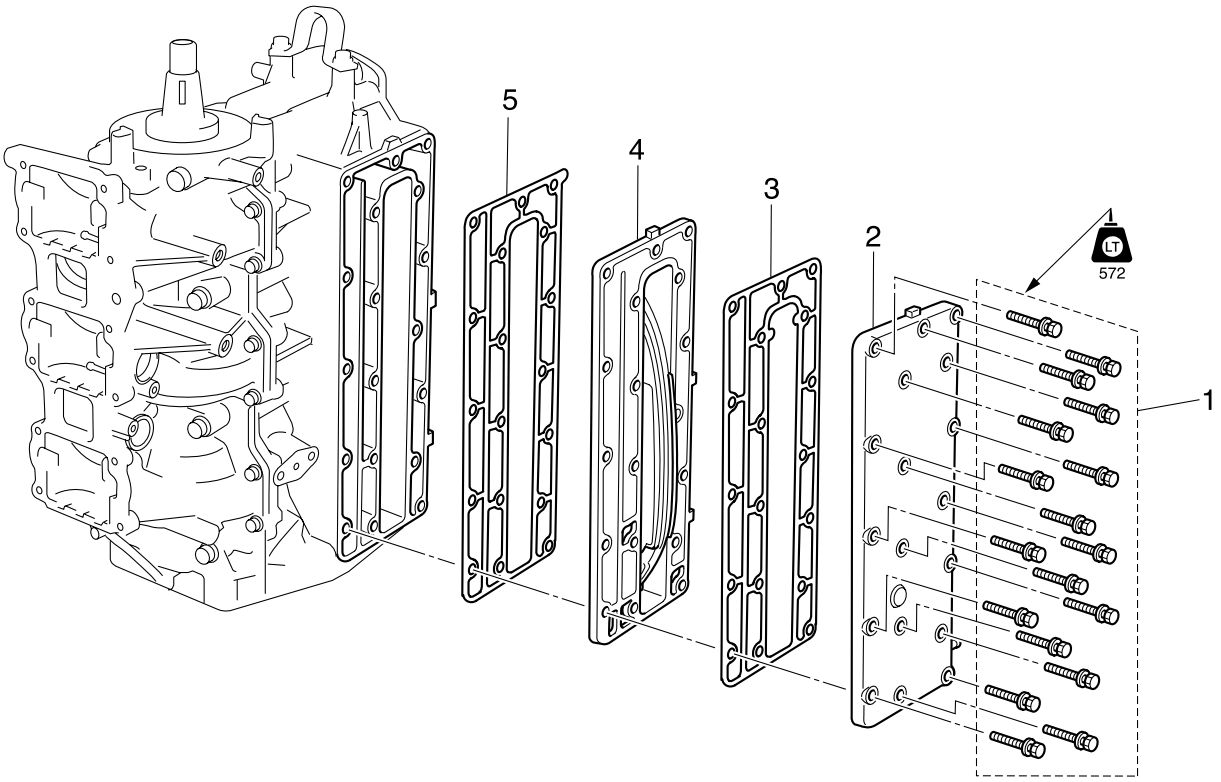


No.	Part name	Q'ty	Remarks
1	Bolt	4	M6 × 35 mm
2	Holder	1	
3	Thermostat cover	1	
4	Spring	1	
5	PCV	1	
6	Thermostat	1	
7	Gasket	1	Not reusable
8	Grommet	1	
9	Spark plug	3	
10	Bolt	18	M6 × 25 mm
11	Ground lead	1	
12	Cylinder head cover	1	
13	Bolt	14	M8 × 60 mm
14	Gasket	1	Not reusable
15	Thermoswitch	1	
16	Cylinder head	1	
17	Gasket	1	Not reusable



No.	Part name	Q'ty	Remarks
18	Screw	2	ø4 × 15 mm
19	Anode	2	

5



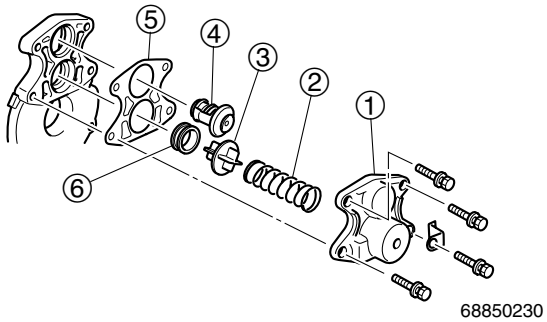
6885080E

No.	Part name	Q'ty	Remarks
1	Bolt	18	M8 × 40 mm
2	Exhaust outer cover	1	
3	Gasket	1	Not reusable
4	Exhaust inner cover	1	
5	Gasket	1	Not reusable

Removing the cylinder head

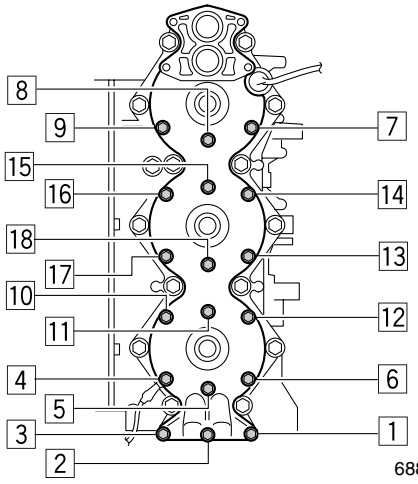
1. Remove the spark plugs.

2. Remove the thermostat cover ①, spring ②, PCV ③, thermostat ④, gasket ⑤ and grommet ⑥.



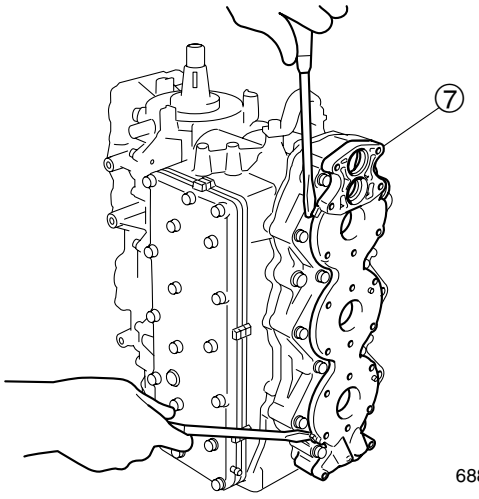
68850230

3. Remove the cylinder head cover bolts in the sequence shown.

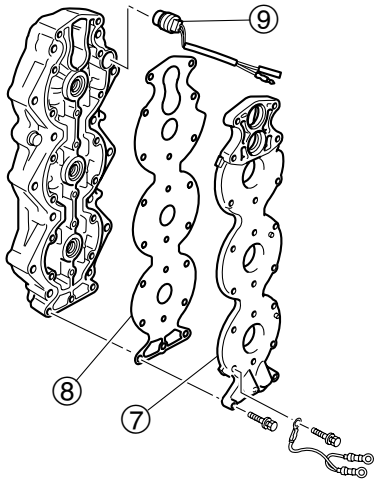


68850240

4. Remove the cylinder head cover ⑦ and gasket ⑧.



68850250

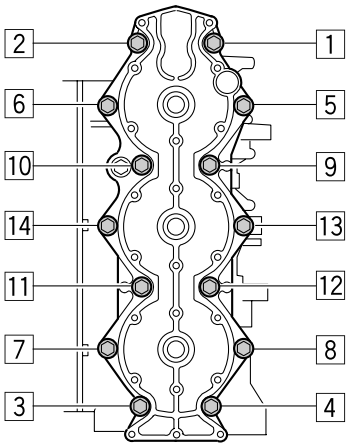


68850260

NOTE:
Insert a flat-head screw driver between the pry tabs to pry off the cylinder head cover.

5. Remove the thermoswitch ⑨.

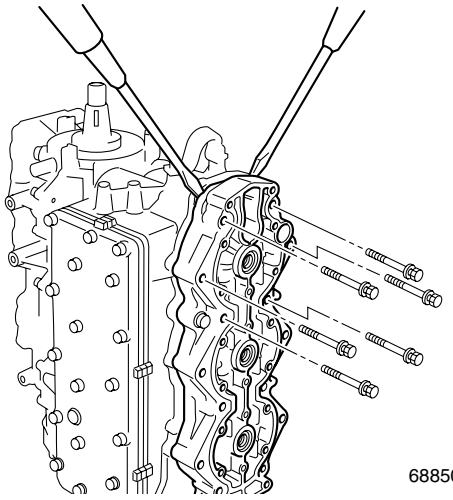
6. Remove the cylinder head bolts in the sequence shown.

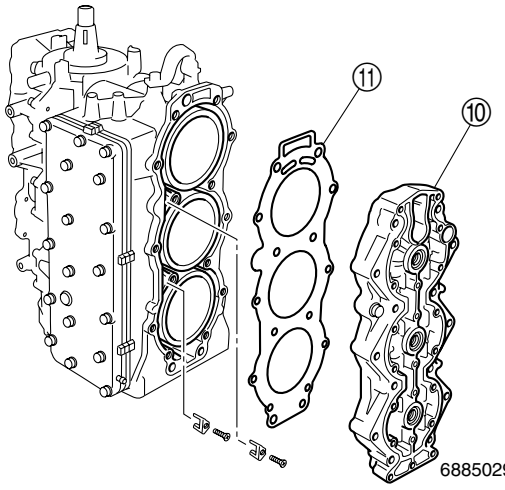


68850270

5

7. Remove the cylinder head ⑩ and gasket ⑪.





NOTE:
Insert a flat-head screw driver between the pry tabs to pry off the cylinder head.

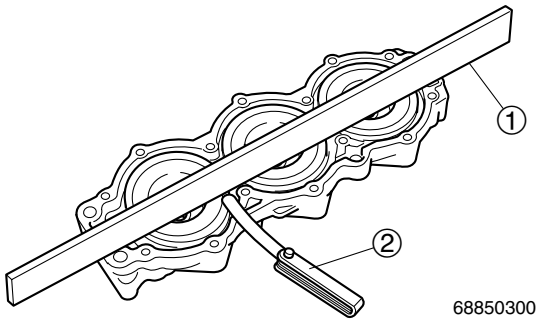
CAUTION:
Do not scratch or damage the mating surfaces of the cylinder head and cylinder block.

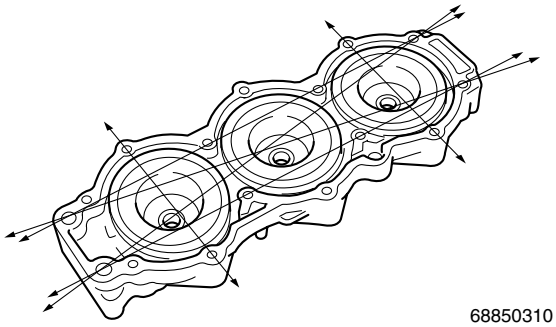
Checking the cylinder head

1. Clean the carbon deposits from the combustion chambers. Check the cylinder head cover and cylinder head. Replace the cylinder head cover or cylinder head if cracked or corroded.

NOTE:
To check the cylinder block anode, refer to page 3-19.

2. Check the cylinder head warpage using a straightedge ① and thickness gauge ② in directions as shown. Replace the cylinder head if above specification.

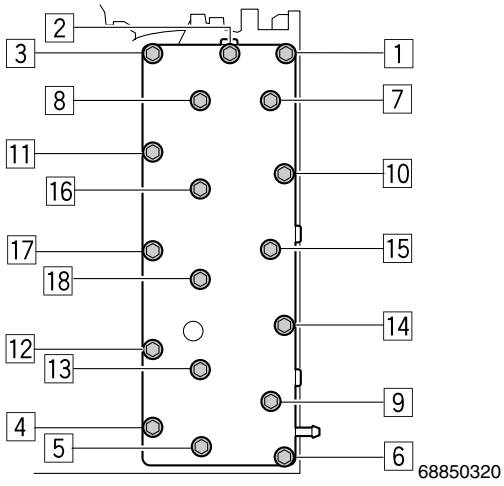




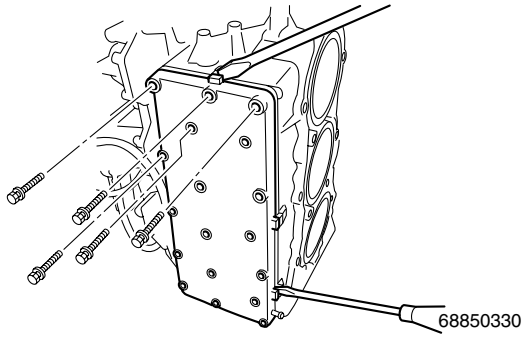
Cylinder head warpage limit:
0.1 mm (0.0039 in)

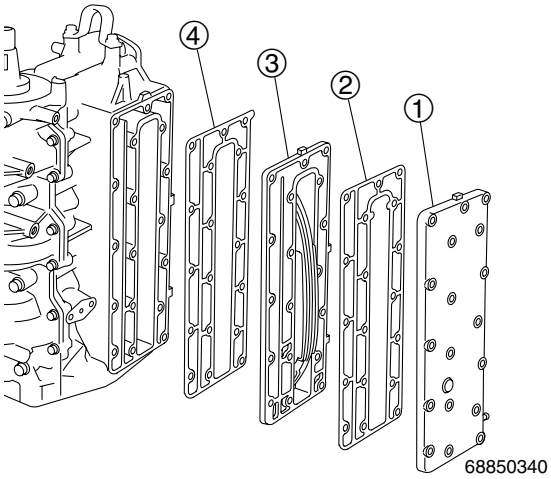
Removing the exhaust cover

1. Remove the exhaust cover bolts in the sequence shown.



2. Remove the exhaust outer cover ①, gasket ②, exhaust inner cover ③ and gasket ④.





NOTE:
Insert a flat-head screw driver between the pry tabs to pry off the exhaust covers.

Checking the exhaust cover

1. Check the exhaust cover. Replace the exhaust cover if cracked or corroded.

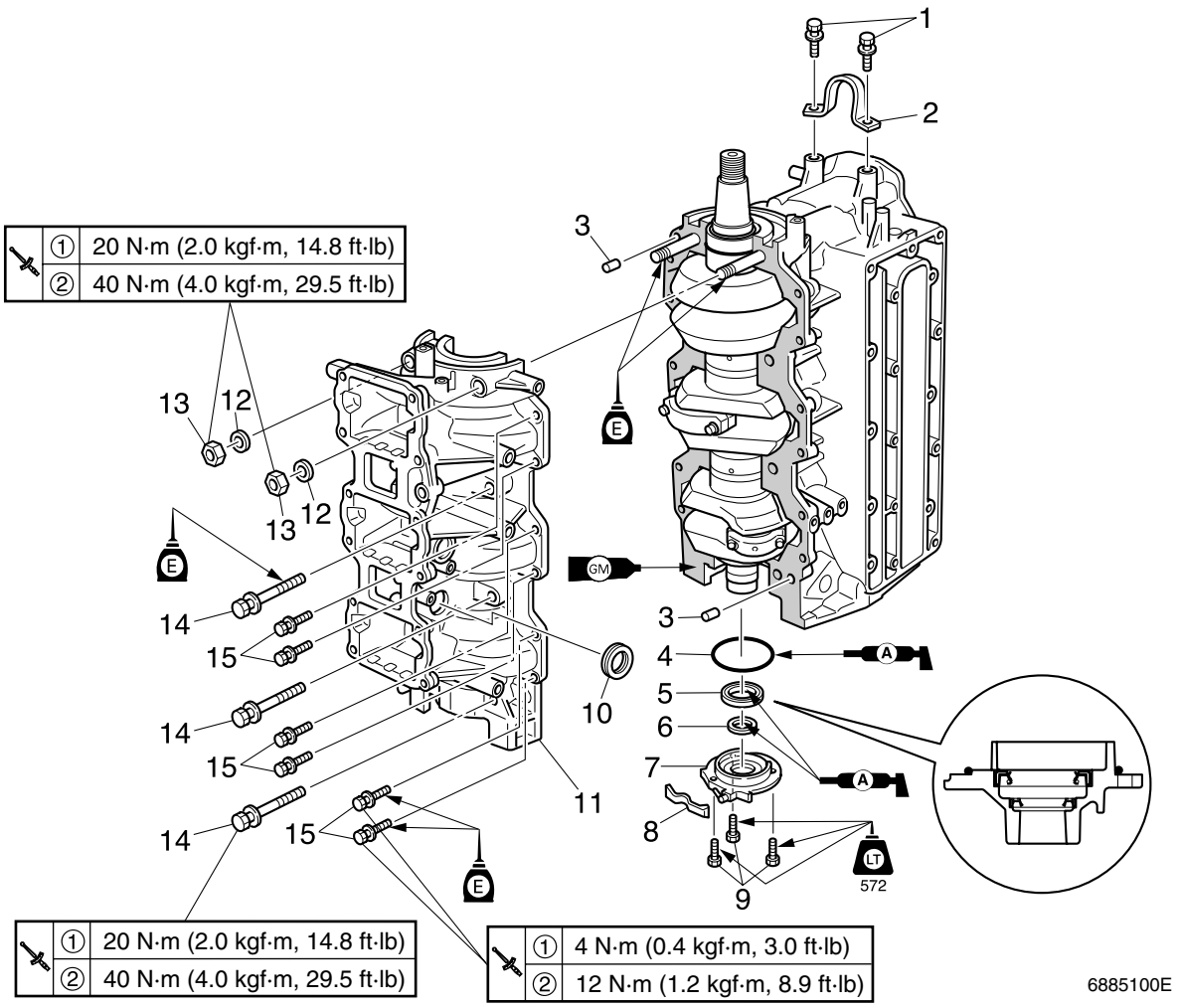
Checking the PCV

1. Check the PCV. Replace the PCV if worn or deformed.

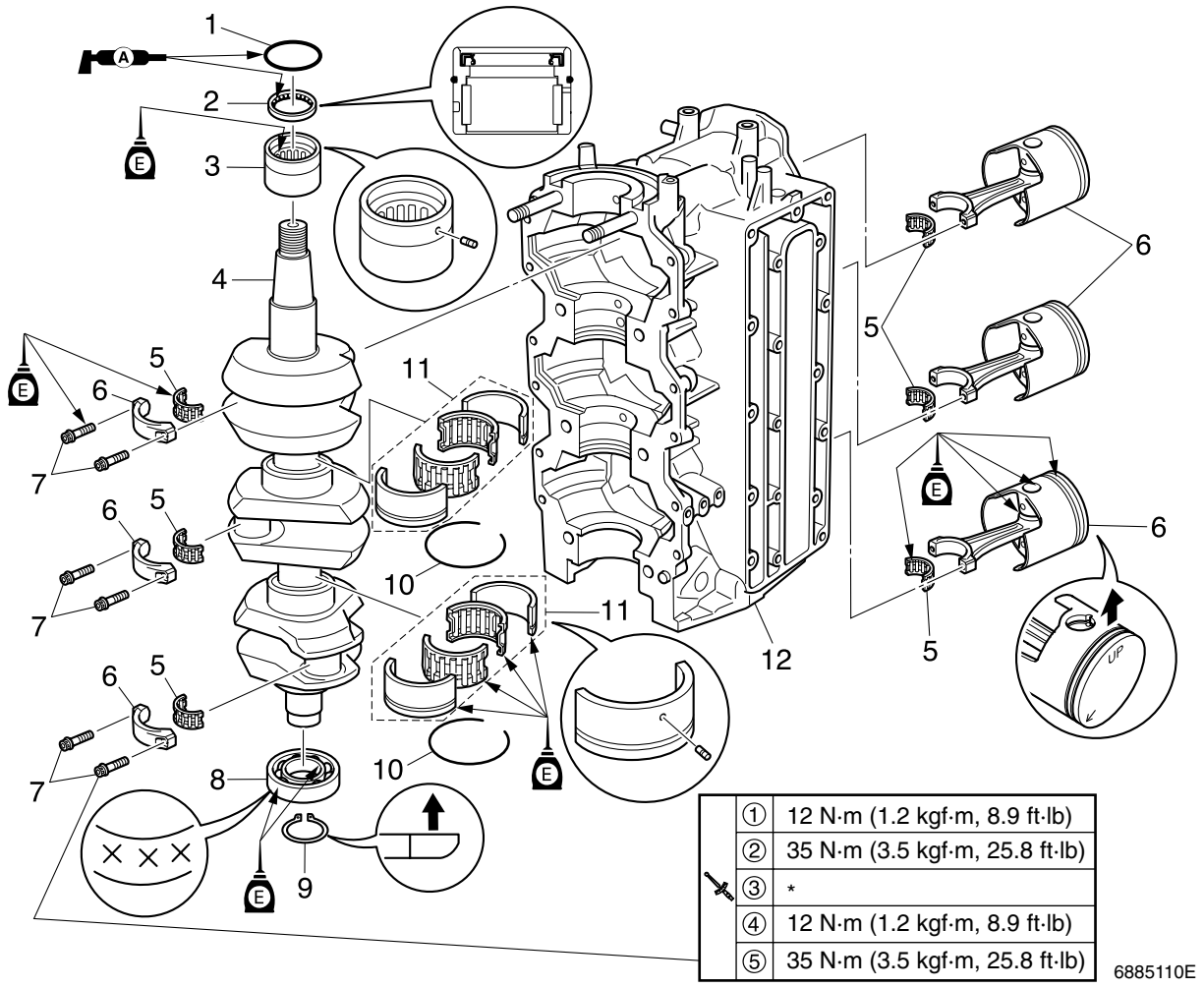
2. Check the grommet. Replace the grommet if deformed.

3. Check the spring. Replace the spring if damaged or deformed.

Crankcase

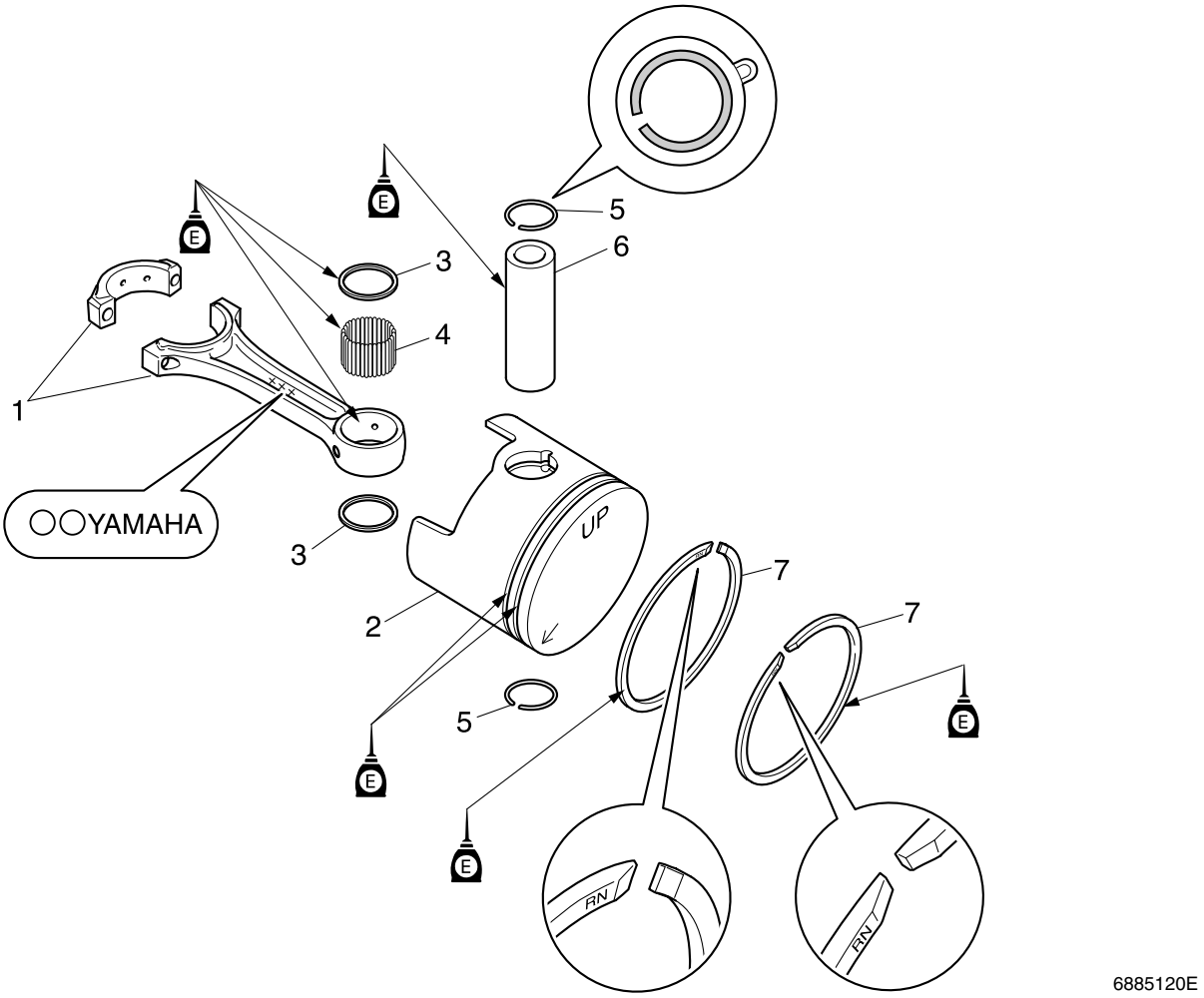


No.	Part name	Q'ty	Remarks
1	Bolt	2	M8 × 20 mm
2	Engine hanger	1	
3	Dowel	2	
4	O-ring	1	Not reusable
5	Oil seal	1	Not reusable
6	Oil seal	1	Not reusable
7	Oil seal housing	1	
8	Rubber seal	1	
9	Bolt	3	M6 × 20 mm
10	Grommet	1	
11	Crankcase	1	
12	Spring washer	2	
13	Nut	2	
14	Bolt	6	M10 × 55 mm
15	Bolt	12	M6 × 25 mm



No.	Part name	Q'ty	Remarks
1	O-ring	1	Not reusable
2	Oil seal	1	Not reusable
3	Needle bearing	1	Not reusable
4	Crankshaft	1	
5	Roller bearing	3 set	Not reusable
6	Piston and connecting rod assembly	3	
7	Bolt	6	M8 × 24 mm
8	Ball bearing	1	Not reusable
9	Circlip	1	
10	Circlip	2	
11	Main bearing	2 set	Not reusable
12	Cylinder block	1	

* Loosen completely



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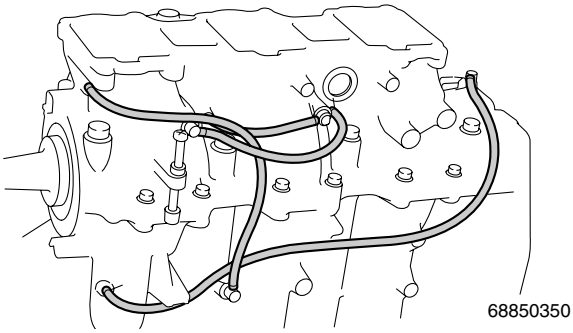
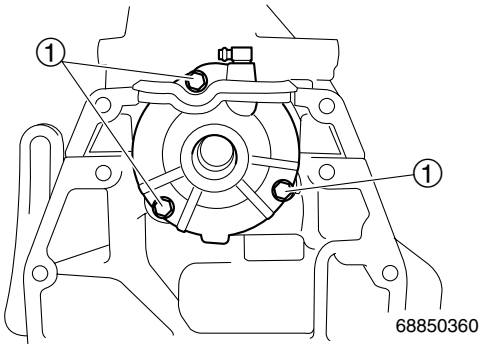
No.	Part name	Q'ty	Remarks
1	Connecting rod	3	
2	Piston	3	
3	Washer	6	
4	Needle bearing	84	
5	Clip	6	Not reusable
6	Piston pin	3	
7	Piston ring	6	

Removing the crankcase

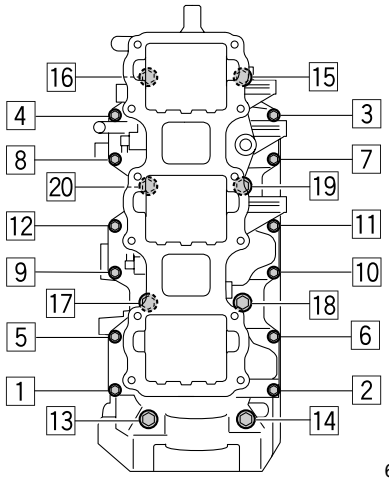
1. Disconnect the breather hoses.

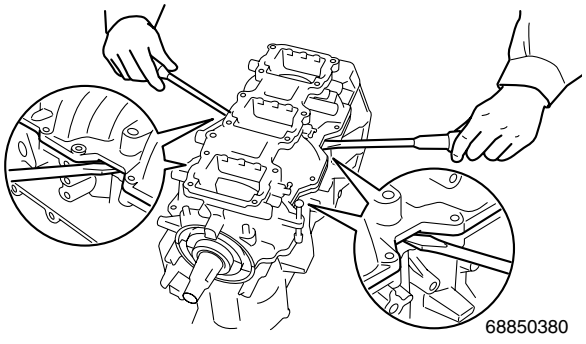


2. Remove the oil seal housing bolts ①.



3. Remove the crankcase bolts and nuts in the sequence shown.





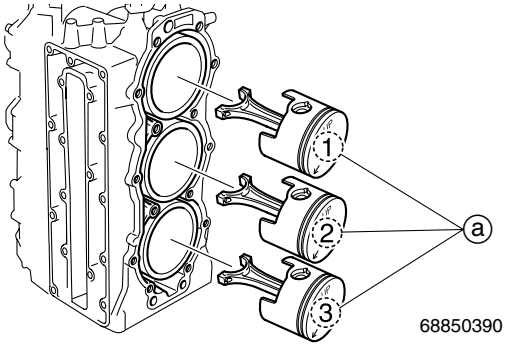
NOTE:

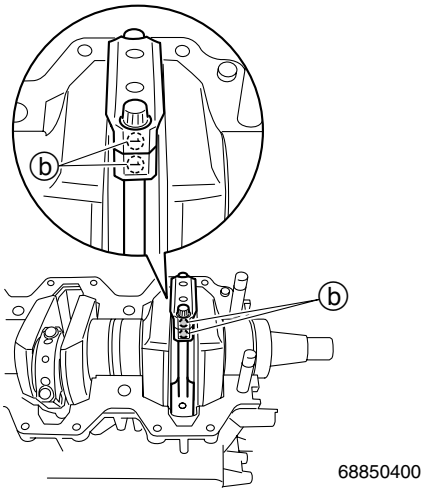
Insert a flat-head screw driver between the pry tabs to pry off the crankcase.

4. Remove the oil seal housing.

Removing the piston, connecting rod assembly and crankshaft assembly

1. Remove the connecting rod bolts and connecting rod caps, bearings.



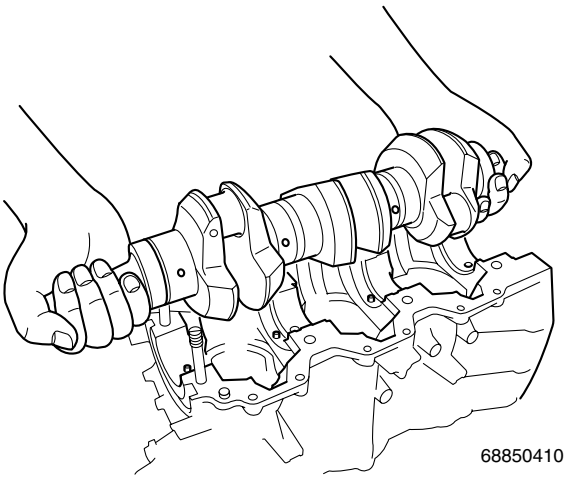


NOTE:

- Mark each piston with the identification number ⓐ of the corresponding cylinder. Also, mark each connecting rod and connecting rod cap with an identification number ⓑ as shown.
- Be sure to keep the bearings in the order as they were removed.
- Do not mix the connecting rods and caps. Keep them organized in their each groups.

5

2. Remove the crankshaft assembly.



3. Remove the piston with connecting rod.

Checking the cylinder block

CAUTION:

Do not scratch the mating surfaces of the cylinder head and cylinder block.

1. Check the cylinder sleeves. Replace the cylinder block if cracked or damaged.

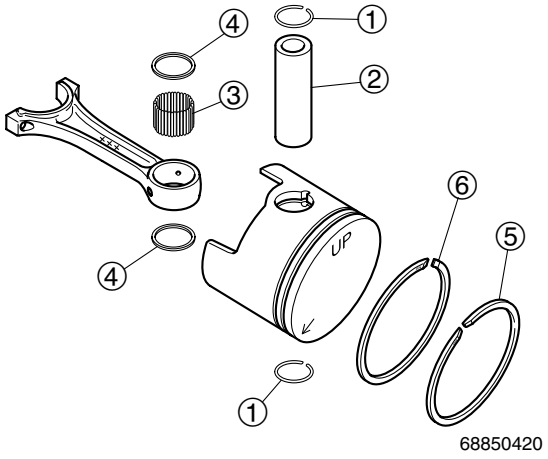
2. Remove any rust or deposits on the cooling water passage walls, and check the cooling water passage walls. Clean or replace the cylinder block for residue.

3. Remove the carbon deposits on the exhaust passage walls, and check the exhaust passage walls. Replace the cylinder block if cracked or damaged.

Disassembling the piston and connecting rod assembly

1. Remove the piston pin clips ① with pliers, and then remove the piston pin ②, needle bearings ③ and washers ④.

2. Remove the top piston ring ⑤ and 2nd piston ring ⑥.

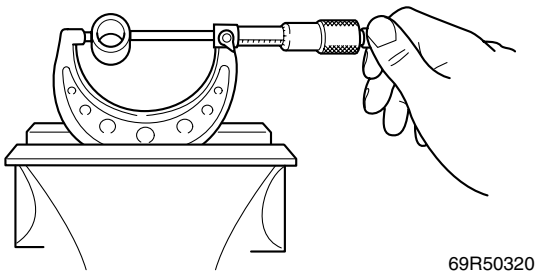


Checking the bearing

1. Check the needle bearings, main bearing and ball bearing for pitting or rumbling.

Checking the piston pin

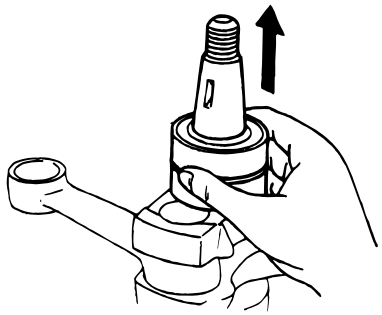
1. Measure the piston pin outside diameter. Replace the piston pin if out of specification.



Piston pin outside diameter:
19.895–19.900 mm
(0.7833–0.7835 in)

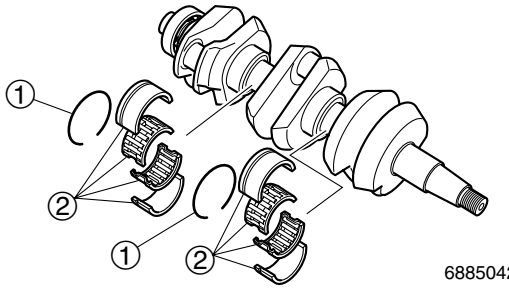
Disassembling the crankshaft

1. Remove the roller bearing.



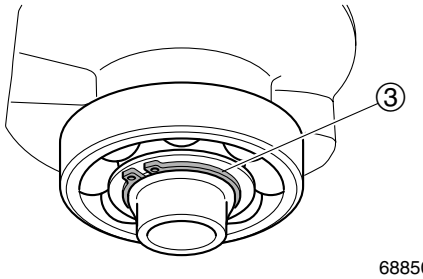
6S650340

2. Remove the circlips ① and main bearings ②.

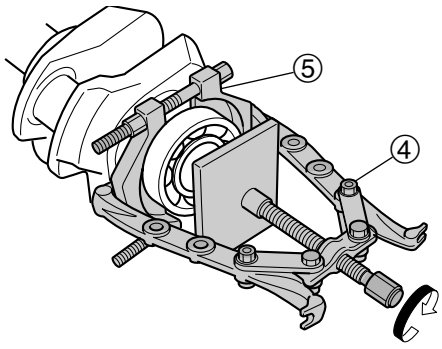


6885042a

3. Remove the circlip ③, and then remove the ball bearing.



6885042d



6885042b

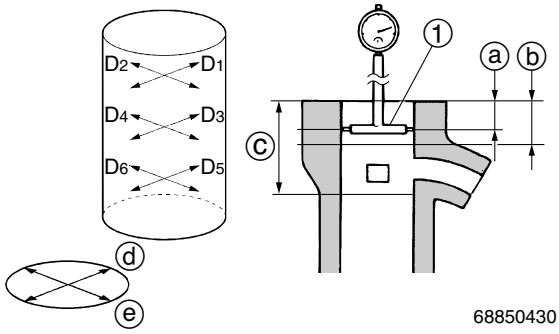
CAUTION:

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

Gear puller ④: 90890-06540
Bearing separator ⑤:
90890-06534
or commercially available tool.

Checking the cylinder bore

1. Measure the cylinder bore (D_1–D_6) at measuring points ⓐ, ⓑ, and ⓒ, and in direction ⓓ (D_1, D_3, D_5), which is parallel to the crankshaft, and direction ⓔ (D_2, D_4, D_6), which is at a right angle to the crankshaft.



68850430

ⓐ:10.0 mm (0.39 in) from the cylinder head top surface
ⓑ:35 mm (1.38 in) from the cylinder head top surface
ⓒ:80 mm (3.15 in) from the cylinder head top surface

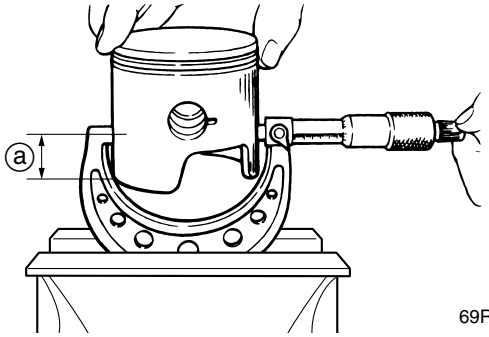
Cylinder bore diameter (D_1–D_6):
82.000–82.020 mm
(3.2283–3.2291 in)

Cylinder gauge ①:
90890-06759

5

Checking the piston diameter

1. Measure the piston outside diameter at the specified measuring point. Replace the piston if out of specification.

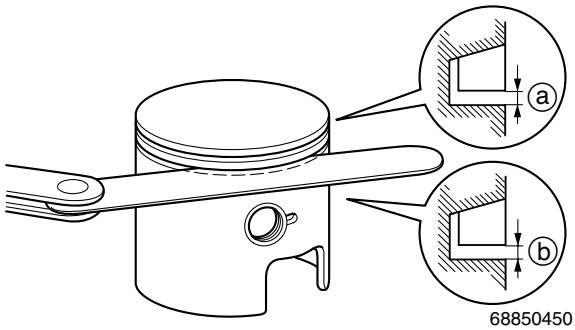


69R50310

Piston outside diameter:
81.935–81.955 mm
(3.2258–3.2266 in)
Measuring point ⓐ:
20.0 mm (0.79 in) up from the bottom of the piston skirt.
Oversize piston diameter:
1st:
82.185–82.205 mm
(3.2356–3.2364 in)
2nd:
82.435–82.455 mm
(3.2455–3.2463 in)

Checking the piston ring side clearance

1. Measure the piston ring side clearance. Replace the piston and piston rings as a set if out of specification.

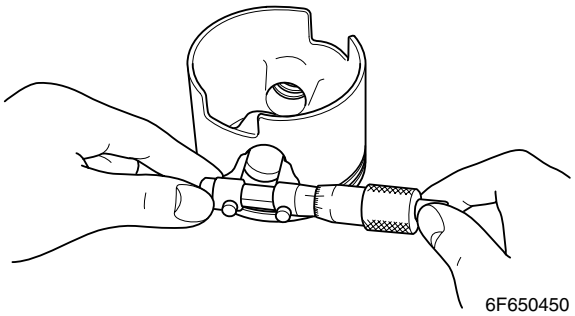


68850450

Piston ring side clearance:
Top piston ring ⓐ:
0.05–0.08 mm
(0.0020–0.0032 in)
2nd piston ring ⓑ:
0.03–0.06 mm
(0.0012–0.0024 in)

Checking the piston pin boss bore

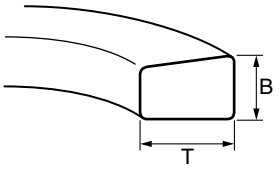
1. Measure the piston pin boss bore. Replace the piston if out of specification.


6F650450

Piston pin boss bore:
19.904–19.915 mm
(0.7836–0.7841 in)

Checking the piston ring

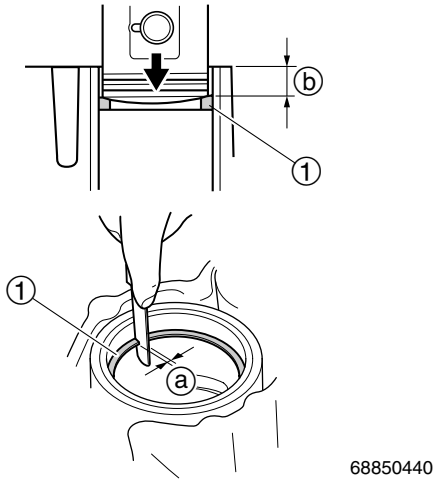
1. Measure the piston ring dimensions. Replace the piston ring if out of specification.



69D50410

Piston ring dimensions
Top and 2nd piston ring:
B: 1.965–1.980 mm
(0.0774–0.0780 in)
T: 3.100–3.300 mm
(0.1220–0.1299 in)

2. Level the piston rings ① in a cylinder with a piston crown.
3. Measure the piston ring end gap ⓐ at the specified measuring point. Replace the piston ring set if out of specification.

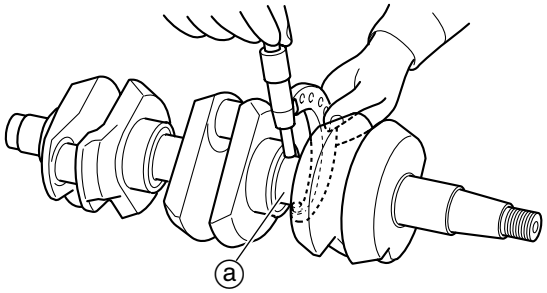


68850440

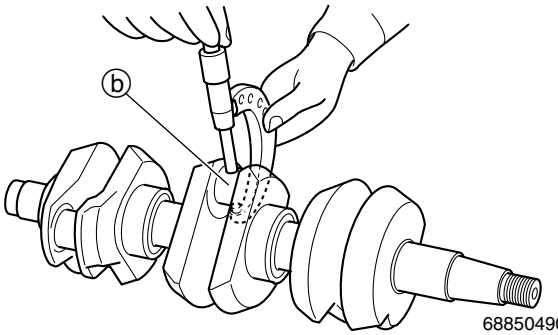
Piston ring end gap ⓐ: (reference data)
Top and 2nd piston ring:
0.40–0.60 mm
(0.0157–0.0236 in)
Measuring point ⓑ:
10.0 mm (0.39 in)

Checking the crankshaft

1. Measure the crankshaft journal diameter ⓐ and crankpin diameter ⓑ. Replace the crankshaft if out of specification.



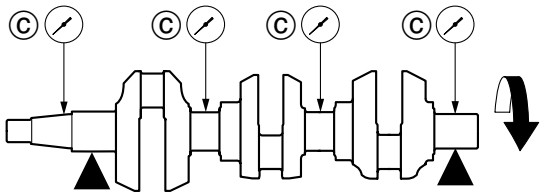
68850480



68850490

Crankshaft journal diameter ⓐ:
34.968–34.984 mm
(1.3767–1.3773 in)
Crankpin diameter ⓑ:
29.985–30.000 mm
(1.1805–1.1811 in)

2. Measure the crankshaft runout. Replace the crankshaft if above specification.



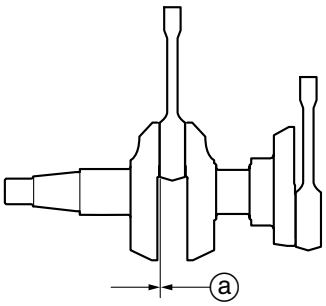
68850500

Crankshaft runout limit ⓒ:
0.02 mm (0.0008 in)

Checking the connecting rod big end side clearance

1. Install the bearing and connecting rod.

2. Measure the connecting rod big end side clearance ⓐ. Replace the connecting rod or crankshaft or both if out of specification.



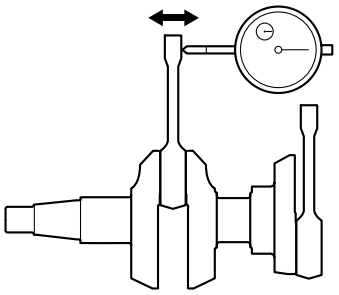
68850470

Connecting rod big end side clearance ⓐ: (reference data)
0.120–0.260 mm
(0.0047–0.0102 in)

5

Checking the connecting rod small end axial play

1. Install the bearing and connecting rod.
2. Measure the connecting rod small end axial play. Replace the bearing and connecting rod if above specification.

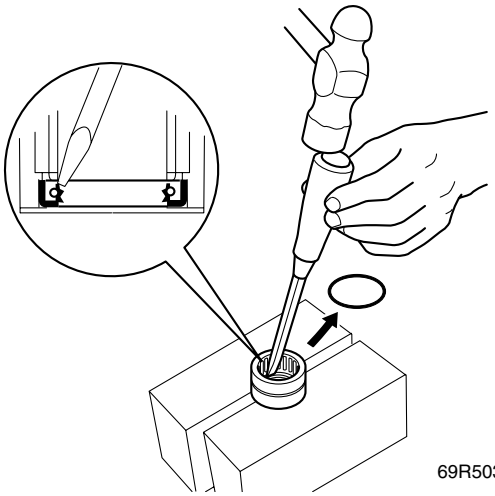

68850460

NOTE:
To measure the axial play, set the dial gauge at the connecting rod small end and parallel to the crankshaft.

Connecting rod small end axial play limit:
2.0 mm (0.08 in)

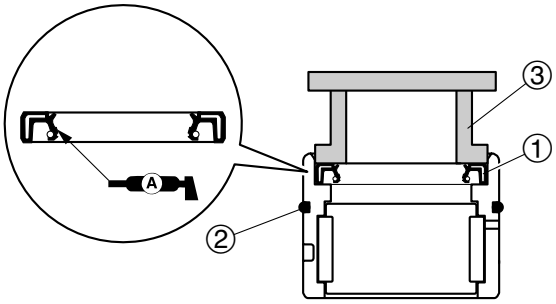
Disassembling the upper bearing

1. Remove the O-ring and oil seal.


69R50340

Assembling the upper bearing

1. Apply grease to the new oil seal ①, new O-ring ②, and then install them onto the upper bearing.

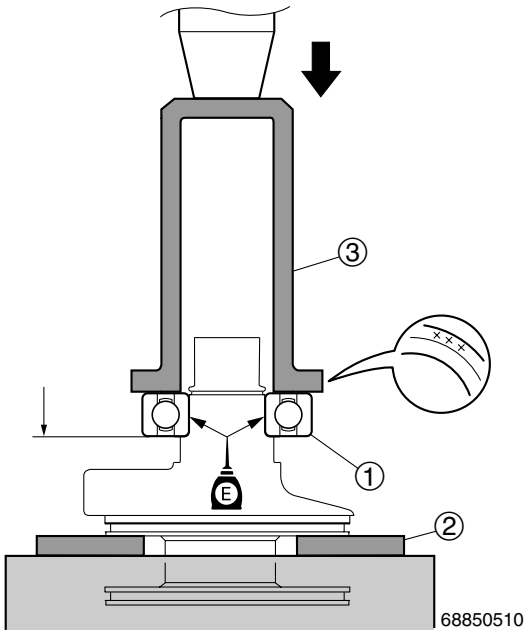


68850580

Bearing inner race attachment ③:
90890-06640

Assembling the crankshaft

1. Install a new ball bearing ① into the crankshaft using a press, then install the circlip.

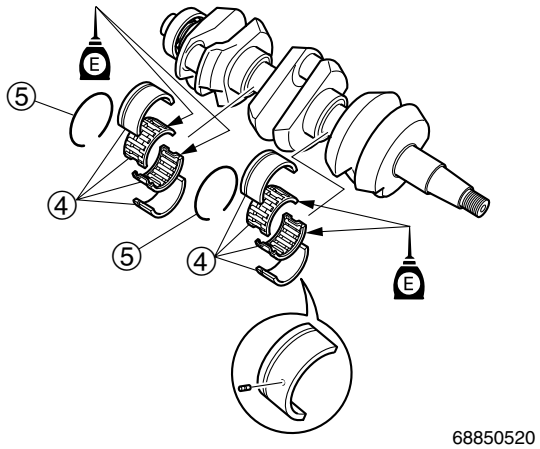


CAUTION:

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

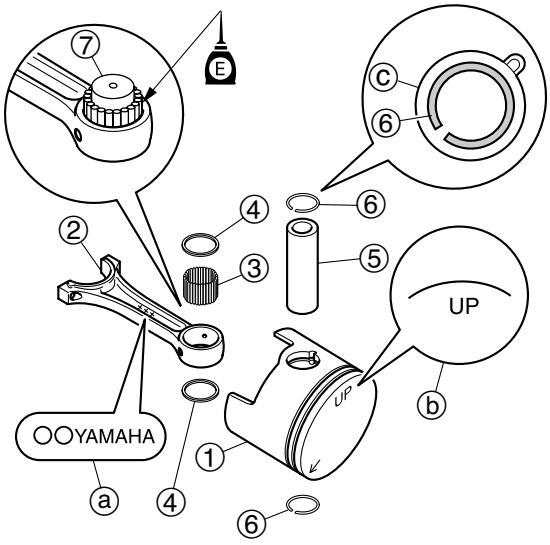
Support ②:
90890-02394
Bearing pressure C ③:
90890-02393

2. Install the main bearings ④ and circlips ⑤ onto the crankshaft journal.



Assembling the piston and connecting rod assembly

1. Assemble the pistons ①, connecting rods ②, needle bearings ③, washers ④, piston pins ⑤, and new piston pin clips ⑥.

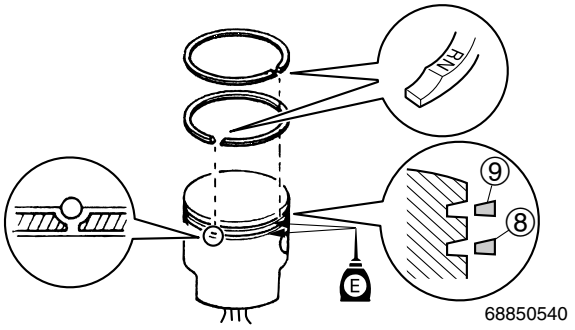


NOTE:

- Face the embossed "YAMAHA" mark ⓐ on the connecting rod in the same direction as the "UP" mark ⓑ on the piston.
- Install the set with the identification mark in the direction indicated in the removal procedure.
- Use the special service tool ⑦ to install the needle bearings.
- Always use new piston pin clips.
- Be sure to align the piston pin clip end with the piston pin slot ⓒ.

Small end bearing installer ⑦:
90890-06527

2. Install the 2nd piston ring ⑧ and top piston ring ⑨ onto the pistons.



5

CAUTION:

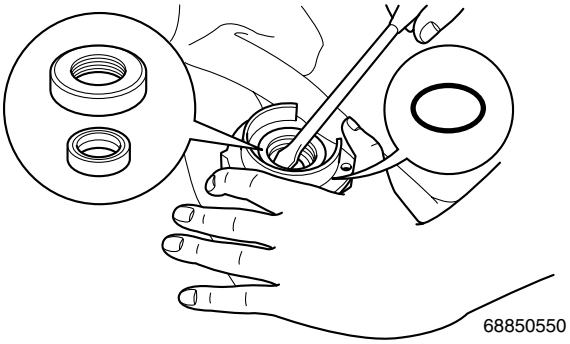
Do not scratch the pistons or break the piston rings.

NOTE:

Install the piston rings with the recess for the locating pin facing up toward the piston crown.

Disassembling the oil seal housing

1. Remove the O-ring and oil seals.

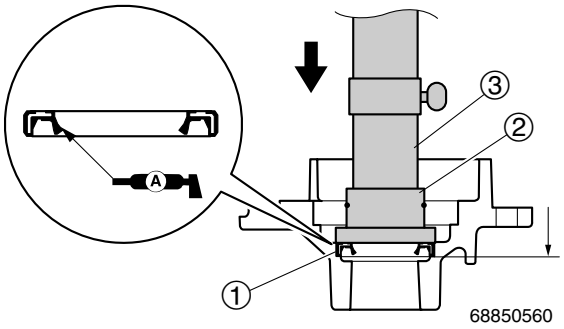


Checking the oil seal housing

1. Check the oil seal housing. Replace the oil seal housing if cracked, damaged, or corrosion.

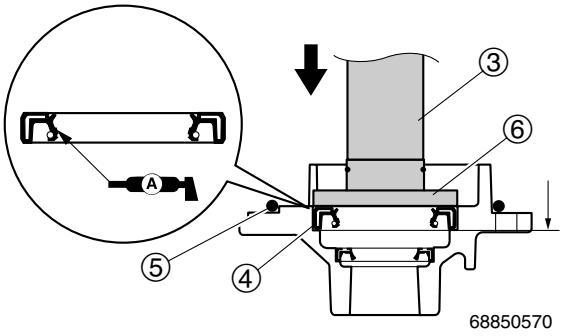
Assembling the oil seal housing

1. Install a new oil seal ① into the oil seal housing.



Needle bearing attachment ②: 90890-06612
Driver rod SS ③: 90890-06604

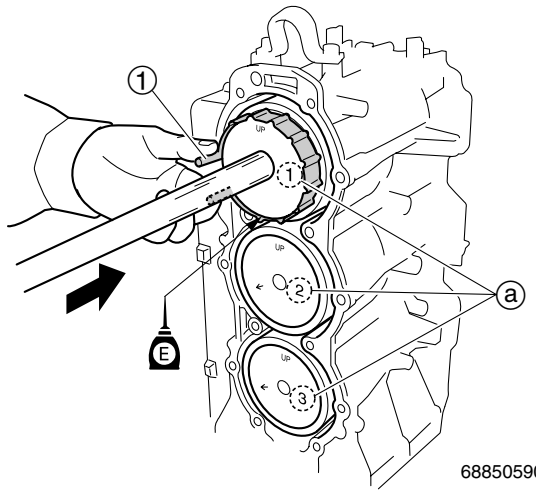
2. Install the new oil seal ④ and new O-ring ⑤ into the oil seal housing.



Needle bearing attachment ⑥: 90890-06632
Driver rod SS ③: 90890-06604

Assembling the power unit

1. Install the pistons into the cylinders with the “UP” mark on the piston crown facing towards the flywheel magnet.

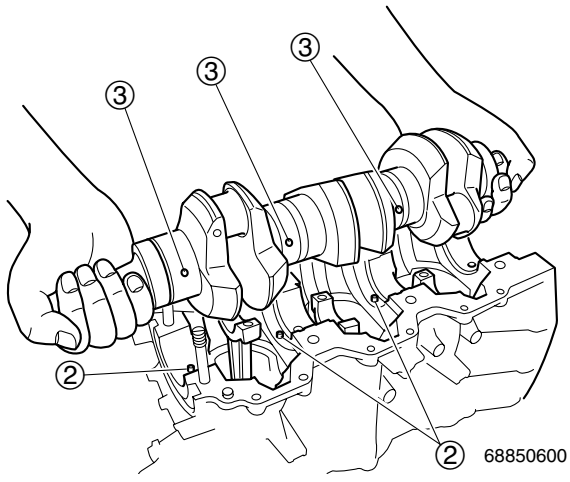


NOTE:

- Apply engine oil to the pistons and piston rings before installation.
- Be sure to install the piston and connecting rod assemblies into the corresponding cylinders according to the marks ⓐ made during disassembly.

	Piston slider ①: 90890-06530

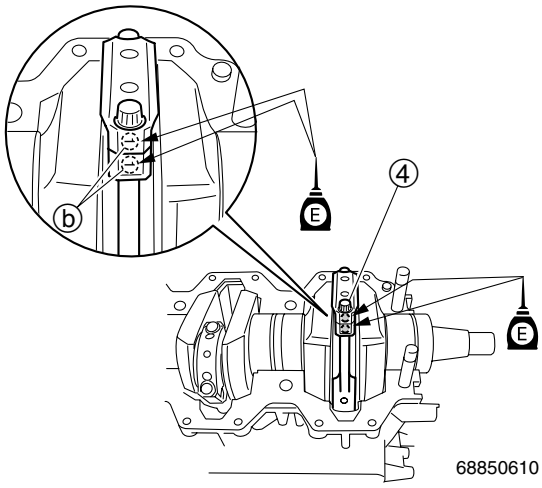
2. Set the crankshaft in the cylinder block.



NOTE:

Fit dowels ② on the cylinder block into the dowel holes ③ in the main bearings.

3. Install the connecting rod bearings and connecting rod caps onto the connecting rods, and then tighten the connecting rod bolts ④ to the specified torques in 5 stages.



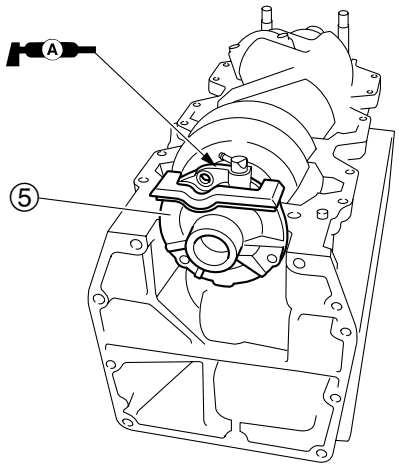
NOTE:

- Align the identification numbers ⓑ, which you made during disassembly, on the connecting rod caps and connecting rods.
- Apply engine oil to the connecting rod bearings, connecting rod caps, and connecting rod bolts before installation.
- Tighten the connecting rod caps one by one and slowly turn the crankshaft, then check the crankshaft for smooth operation.

	Connecting rod bolt ④: 1st: 12 N·m (1.2 kgf·m, 8.9 ft·lb) 2nd: 35 N·m (3.5 kgf·m, 25.8 ft·lb) 3rd: Loosen completely 4th: 12 N·m (1.2 kgf·m, 8.9 ft·lb) 5th: 35 N·m (3.5 kgf·m, 25.8 ft·lb)

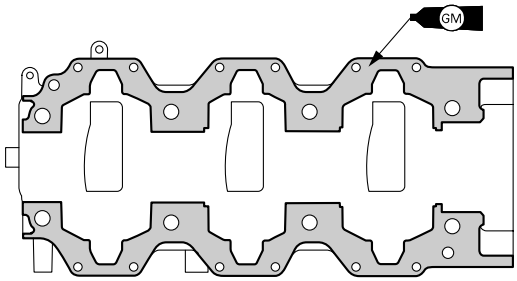
5

4. Install the oil seal housing ⑤ onto the cylinder block.



68850620

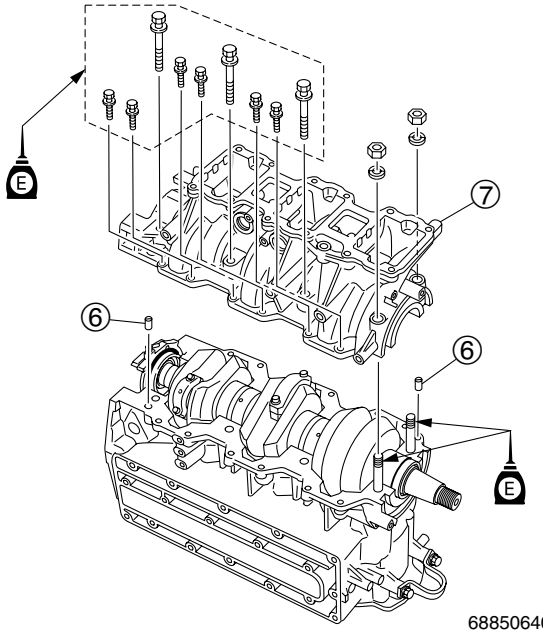
5. Apply sealant to the mating surface of the crankcase.



68850630

NOTE:
Do not get any sealant on the journals.

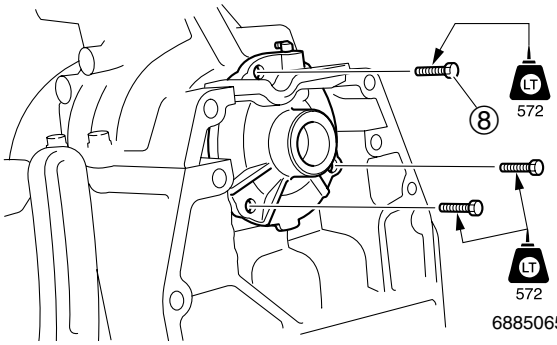
6. Install the dowels ⑥, crankcase ⑦ onto the cylinder block, and then temporarily tighten the crankcase bolts and nuts.



68850640

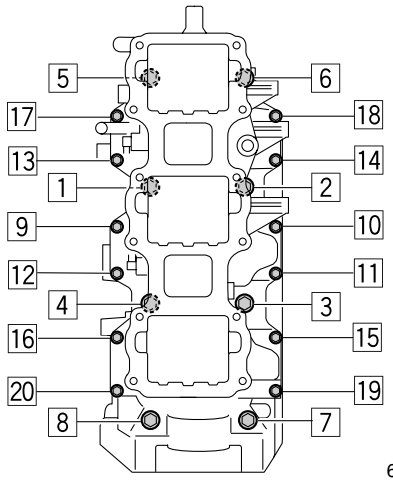
NOTE:
Apply engine oil to the crankcase bolts and stud bolts before installation.

7. Install the oil seal housing bolts ⑧ tighten temporarily.



68850650

8. Tighten the crankcase bolts and nuts to the specified torques in 2 stages and in the sequence as shown.

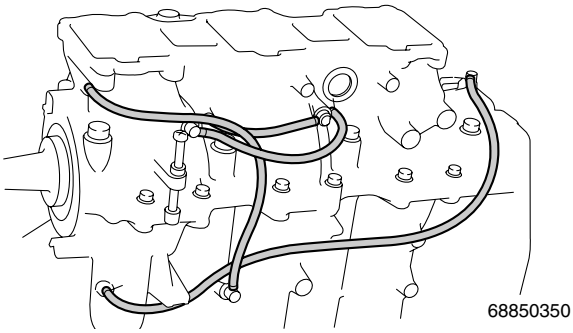


Crankcase bolt and nut
(M10): 1 – 6
1st: 20 N·m (2.0 kgf·m, 14.8 ft·lb)
2nd: 40 N·m (4.0 kgf·m, 29.5 ft·lb)
(M6): 7 – 20
1st: 4 N·m (0.4 kgf·m, 3.0 ft·lb)
2nd: 12 N·m (1.2 kgf·m, 8.9 ft·lb)

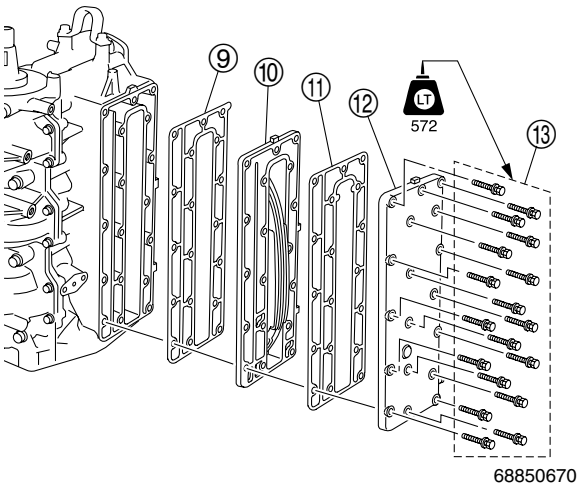
9. Slowly turn the crankshaft. If it does not turn smoothly, remove the connecting rod and replace any parts as necessary.

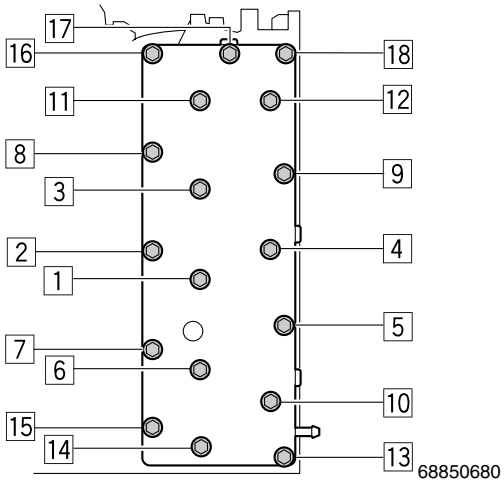
NOTE:
To remove the connecting rod, refer to page 5-24.

10. Connect the breather hoses.



11. Install the new gasket ⑨, exhaust inner cover ⑩, new gasket ⑪, exhaust outer cover ⑫, and then tighten the exhaust cover bolts ⑬ to the specified torques in the sequence as shown.





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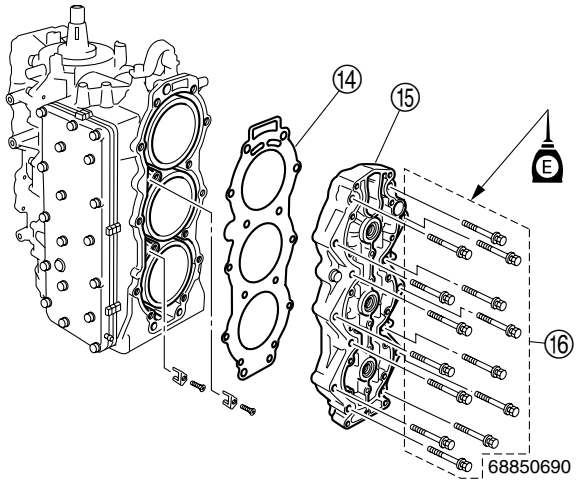
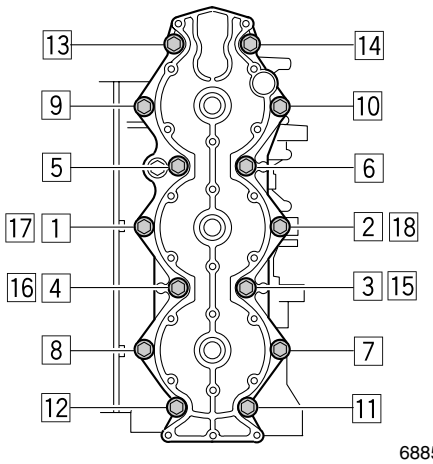
12. Install the new gasket ⑭ and cylinder head ⑮, and then tighten the cylinder head bolts ⑯ to the specified torques in 2 stages and in the sequence as shown.



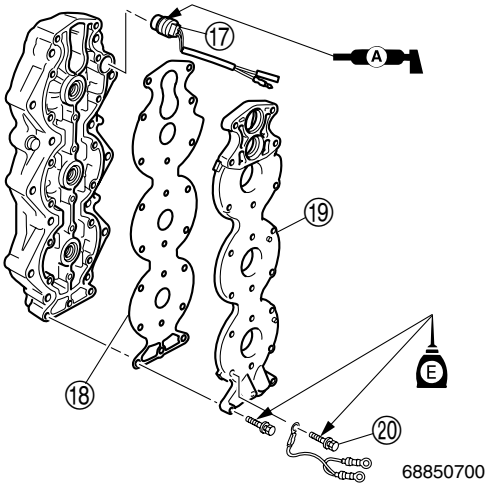


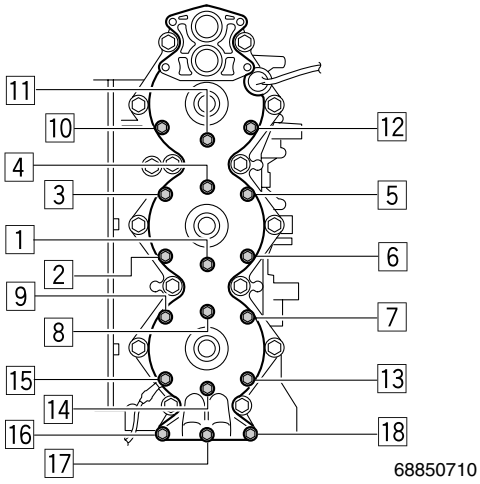
NOTE:

Remove any oil or grease from the cylinder head mating surfaces.

	Cylinder head bolt ⑯: 1st: 15 N·m (1.5 kgf·m, 11.1 ft·lb) 2nd: 30 N·m (3.0 kgf·m, 22.1 ft·lb)

13. Install the thermoswitch ⑰, new gasket ⑱, cylinder head cover ⑲, and then tighten the cylinder head cover bolts ⑳.

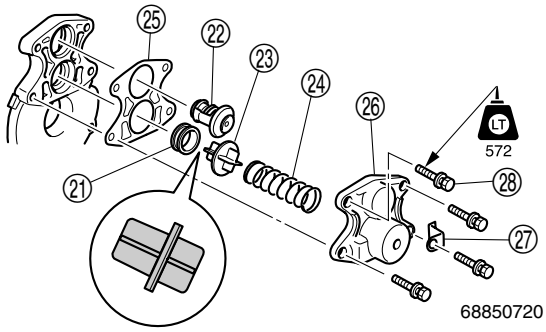




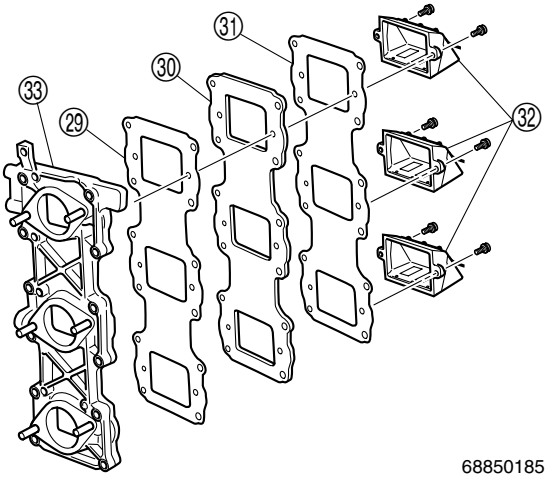
NOTE:

Remove any oil or grease from the cylinder head and cylinder head cover mating surfaces.

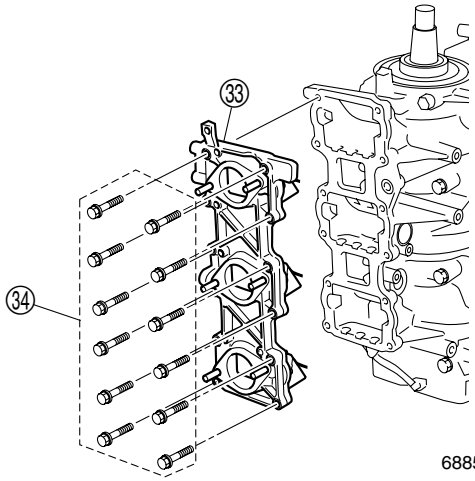
14. Install the grommet ㉑, thermostat ㉒, PCV ㉓, spring ㉔, new gasket ㉕, thermostat cover ㉖, holder ㉗, and then tighten the bolts ㉘.



15. Install the new gasket ㉙, plate ㉚, new gasket ㉛ and reed valve assembly ㉜ onto the intake manifold ㉝.



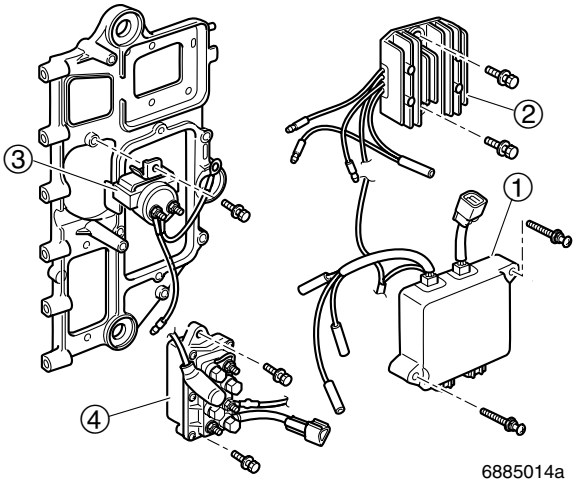
16. Install the intake manifold ㉝, and then tighten the intake manifold bolts ㉞ to the specified torques.



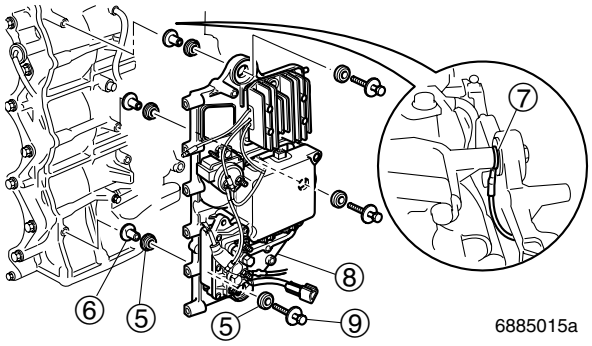
	Intake manifold bolt ㉞: 12 N·m (1.2 kgf·m, 8.9 ft·lb)

Installing the electrical component

1. Install the CDI unit ①, Rectifier Regulator ②, starter relay ③ and PTT relay ④ (ET) onto the CDI unit bracket.



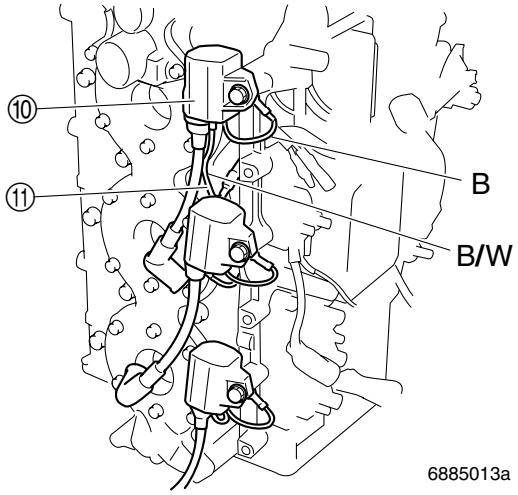
2. Install the grommets ⑤, collars ⑥, CDI unit ground lead ⑦ and CDI unit bracket ⑧, then tighten the bolts ⑨.



	CDI unit bracket mount bolt ⑨: 7 N·m (0.7 kgf·m, 5.2 ft·lb)

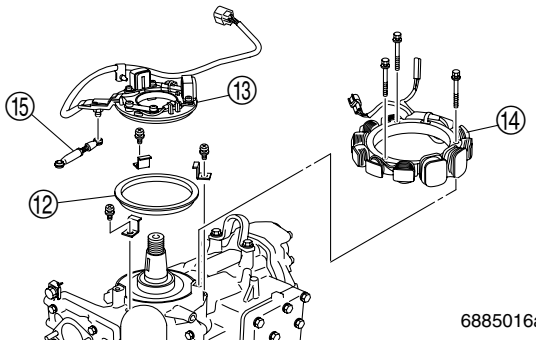
5

3. Install the ignition coils ⑩, and then connect the ignition coil leads ⑪.

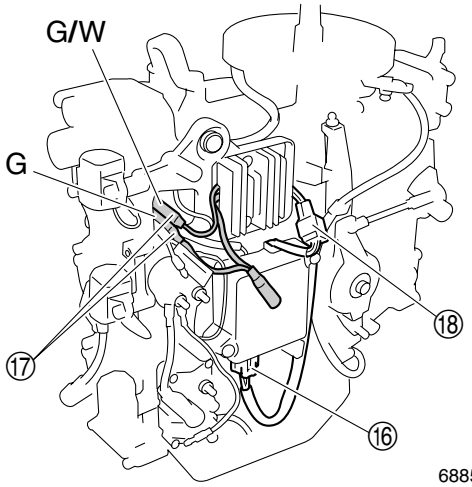


	Ignition coil mount bolt: 7 N·m (0.7 kgf·m, 5.2 ft·lb)

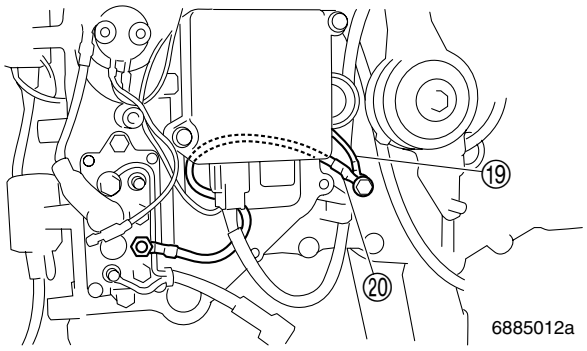
4. Install the retainer ⑫ and pulser coil assembly ⑬, then install the stator assembly ⑭ control link ⑮.



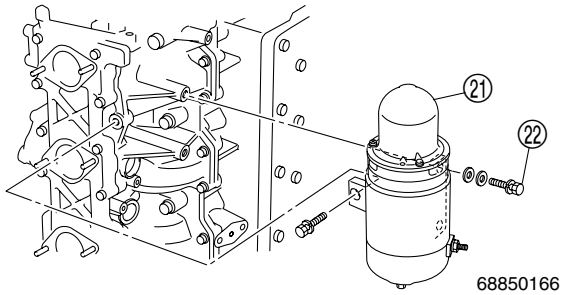
5. Connect the pulser coil coupler ⑯, lighting coil leads ⑰ and charge coil coupler ⑱.



6. Install the Rectifier Regulator ground lead ⑲ and PTT relay ground lead ⑳ (ET).



7. Install the starter motor ㉑, and then tighten the starter motor mount bolts ㉒ to the specified torque.



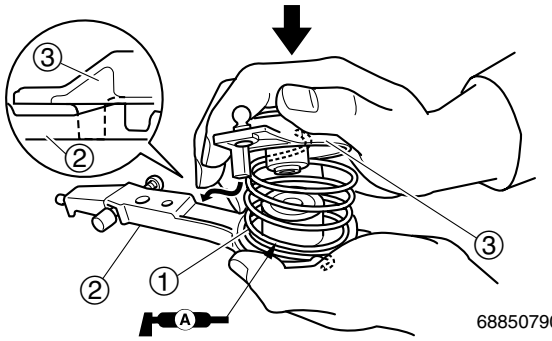
	Starter motor mount bolt ㉒: 30 N·m (3.0 kgf·m, 22.1 ft·lb)

8. Install the spark plugs, tighten them temporary tight, then to the specified torque with a spark plug wrench.

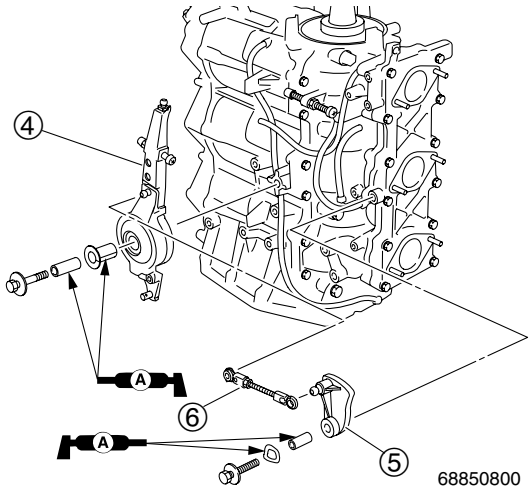
	Spark plug: 25 N·m (2.5 kgf·m, 18 ft·lb)

Install the control lever and throttle cam

1. Install the spring ① onto the control lever 2 ②, and then install the control lever 1 ③.



2. Install the control lever assembly ④, throttle cam ⑤, and then install the throttle link rod ⑥.



Installing the power unit

1. Install the carburetors and fuel system.

NOTE:
To install the fuel system, refer to page 4-3 and 4-9.

2. Install the dowels ① and new gasket ②.

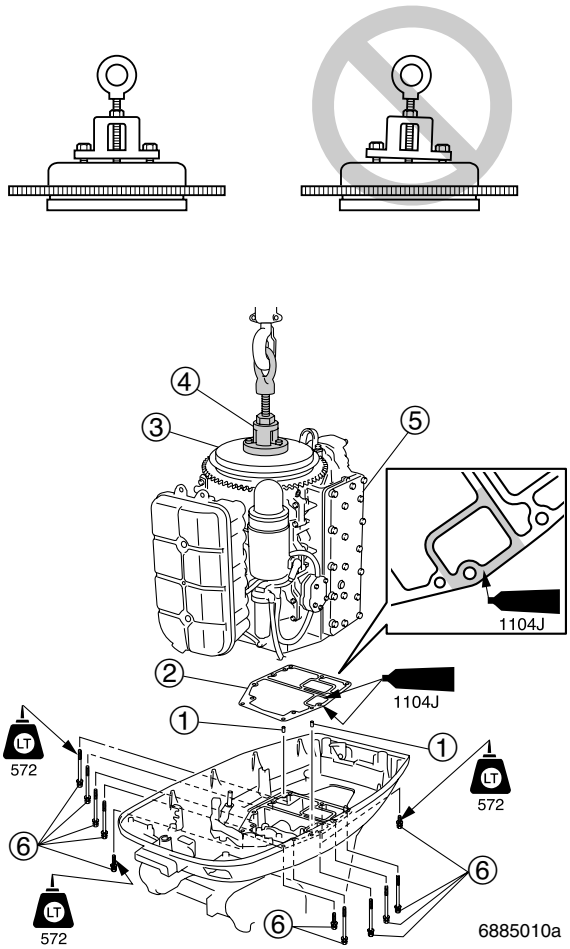
NOTE:
Remove any oil or grease from the power unit mating surfaces.

3. Install the Woodruff key and flywheel magnet ③ temporally tighten, and then install the special service tool ④, lift up the power unit ⑤.

NOTE:
Apply engine oil to the flywheel magnet nut before installation.

	Flywheel puller ④: 90890-06521

4. Install the power unit ⑤, and then tighten the power unit mount bolts ⑥ to the specified torque.



5

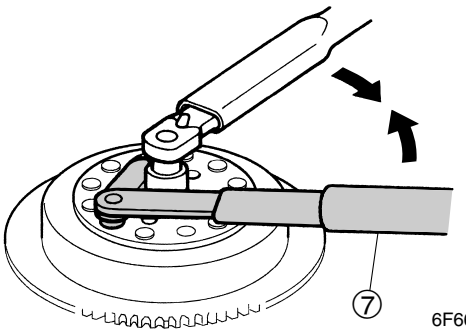
CAUTION:

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

Power unit mount bolt ⑥:
21 N·m (2.1 kgf·m, 15.5 ft·lb)

5. Remove the special service tool from the flywheel magnet.

6. Tighten the flywheel magnet nut to the specified torque.



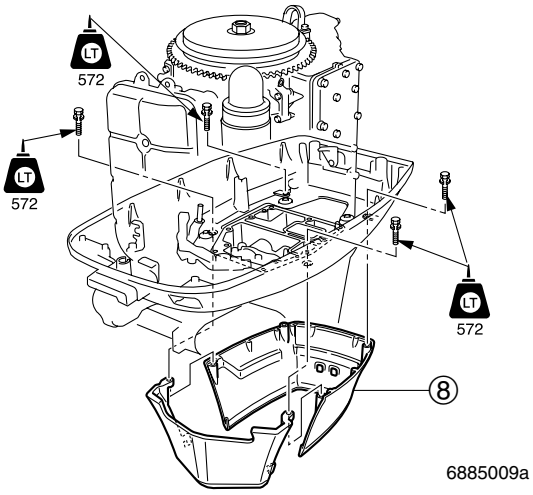
CAUTION:

Apply force in the direction of the arrows shown, to prevent the flywheel holder from slipping off easily.

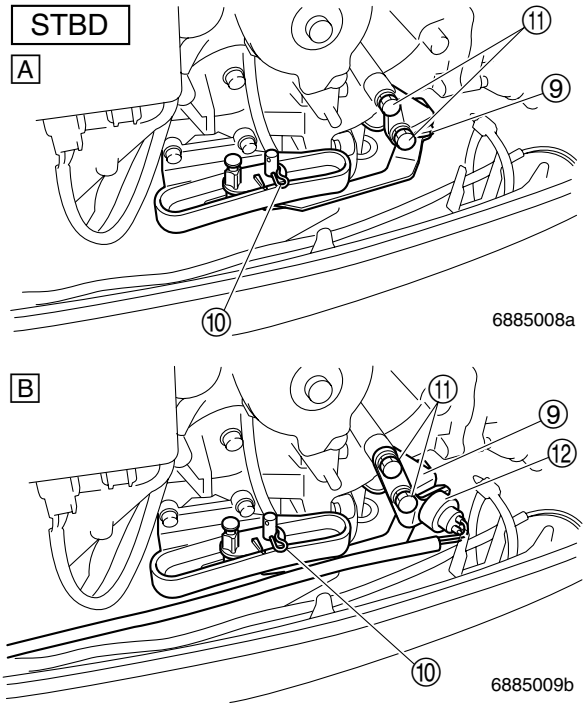
Flywheel holder ⑦: 90890-06522

Flywheel magnet nut:
160 N·m (16.0 kgf·m, 118 ft·lb)

7. Install the apron ⑧ onto the bottom cowling.



8. Install the bracket ⑨ and pin ⑩, then tighten the bolts ⑪.
(EHD: bracket ⑨, neutral switch ⑫ and pin ⑩)

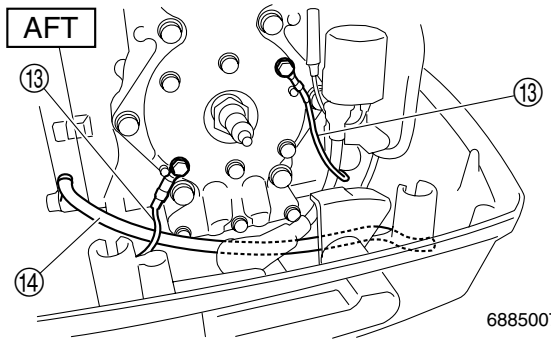


A ED, ET
B EHD

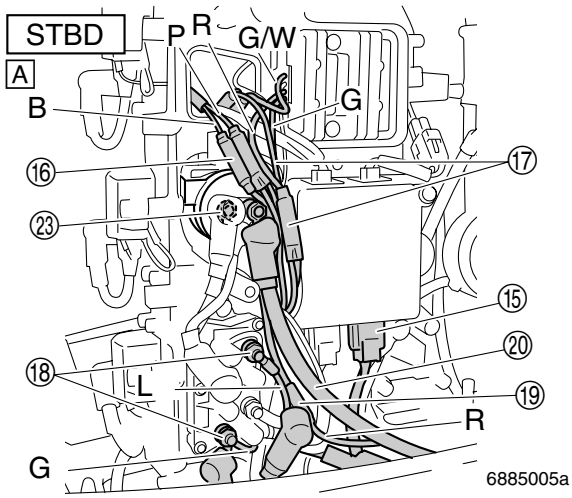
9. Connect the fuel hose.

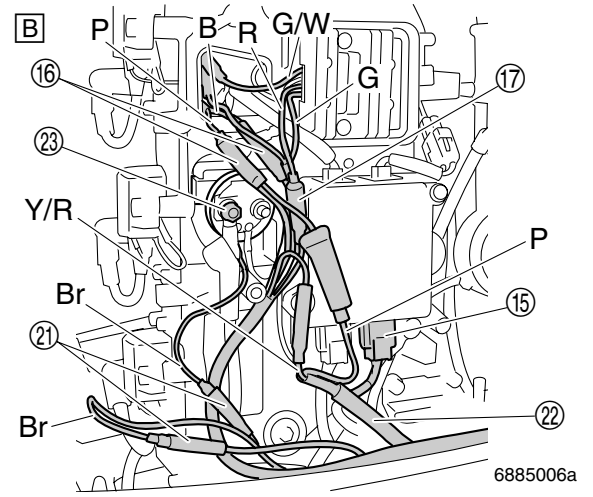
NOTE:
To connect the fuel hose, refer to page 4-3.

10. Connect the ground leads ⑬ and pilot water hose ⑭.



11. Connect the main harness coupler ⑮, thermoswitch leads ⑯, Rectifier Regulator leads ⑰, PTT motor leads ⑱ (ET), fuse holder leads ⑲ and positive battery cable ⑳, then install the cover.
(EHD: neutral switch leads ㉑ and warning indicator leads ㉒)



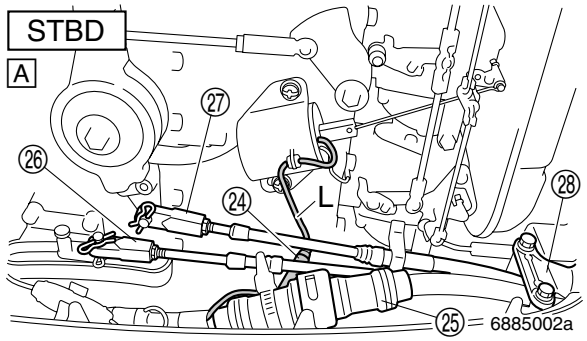


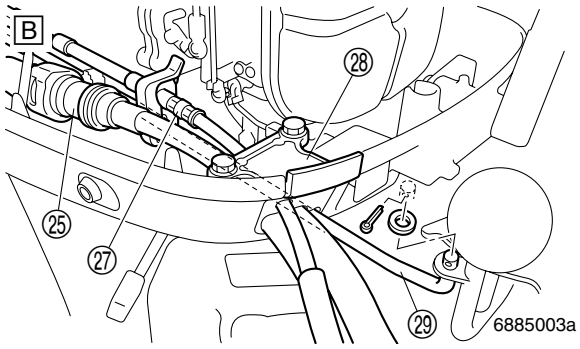
A ED, ET
B EHD

	Starter relay terminal nut ㉓: 4 N·m (0.4 kgf·m, 3.0 ft·lb)

12. Install the cover.

13. Connect the choke solenoid leads ㉔ (ED, ET), main harness coupler ㉕, shift cable ㉖, throttle cable ㉗ and then install the retaining plate ㉘.
(EHD: shift rod ㉙ and throttle cable ㉗)



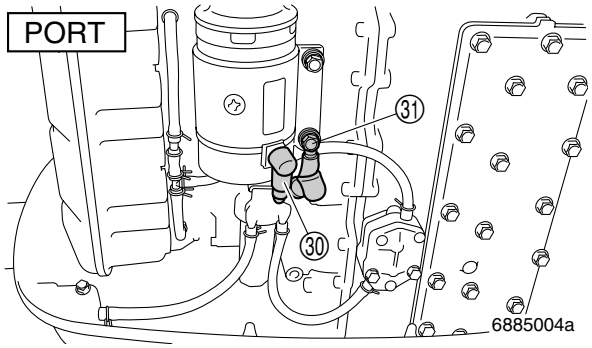


A ED, ET
B EHD

5

14. Install the spark plug caps to the spark plugs.

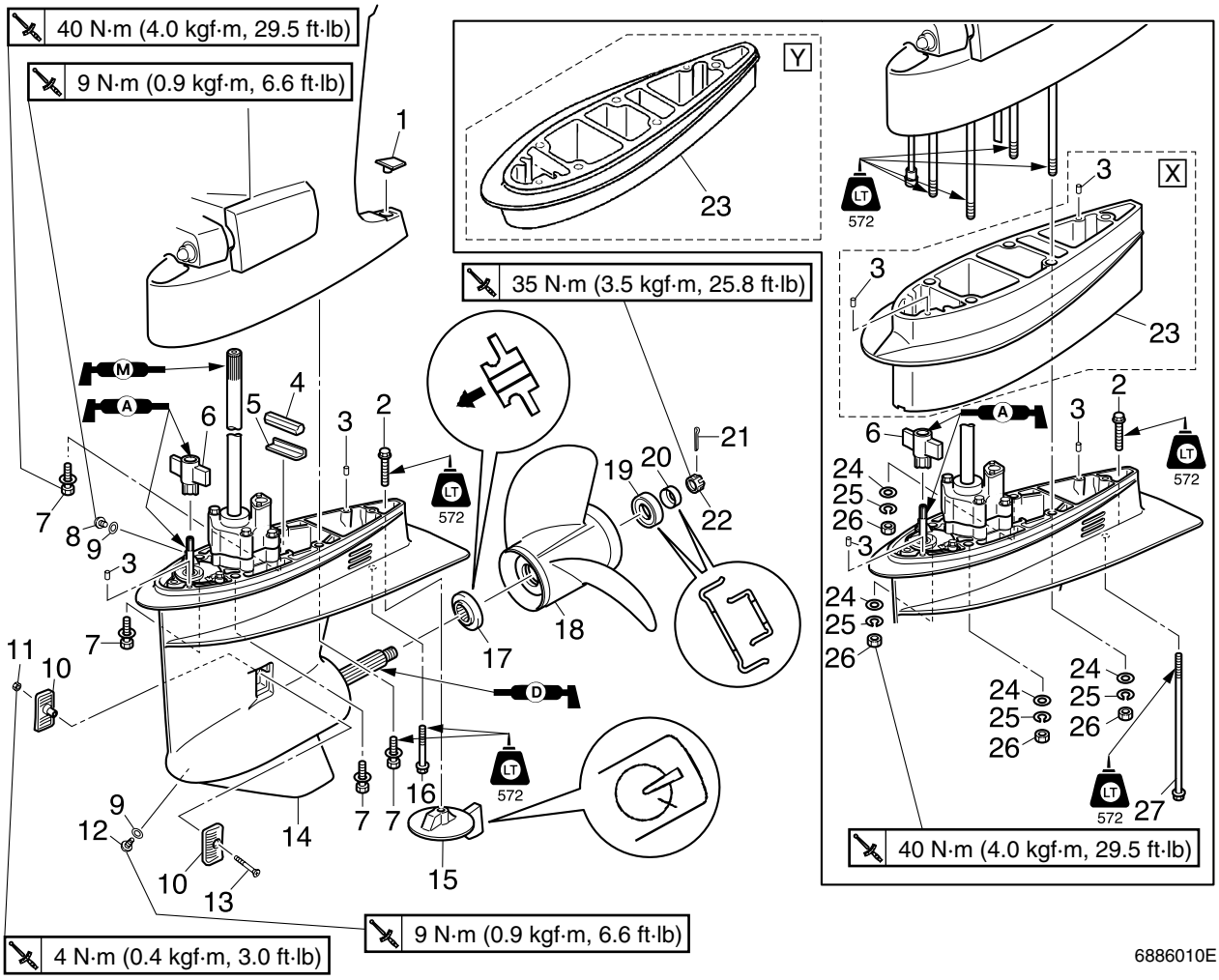
15. Connect the positive battery lead ㉚ and negative battery cable ㉛ to the starter motor.



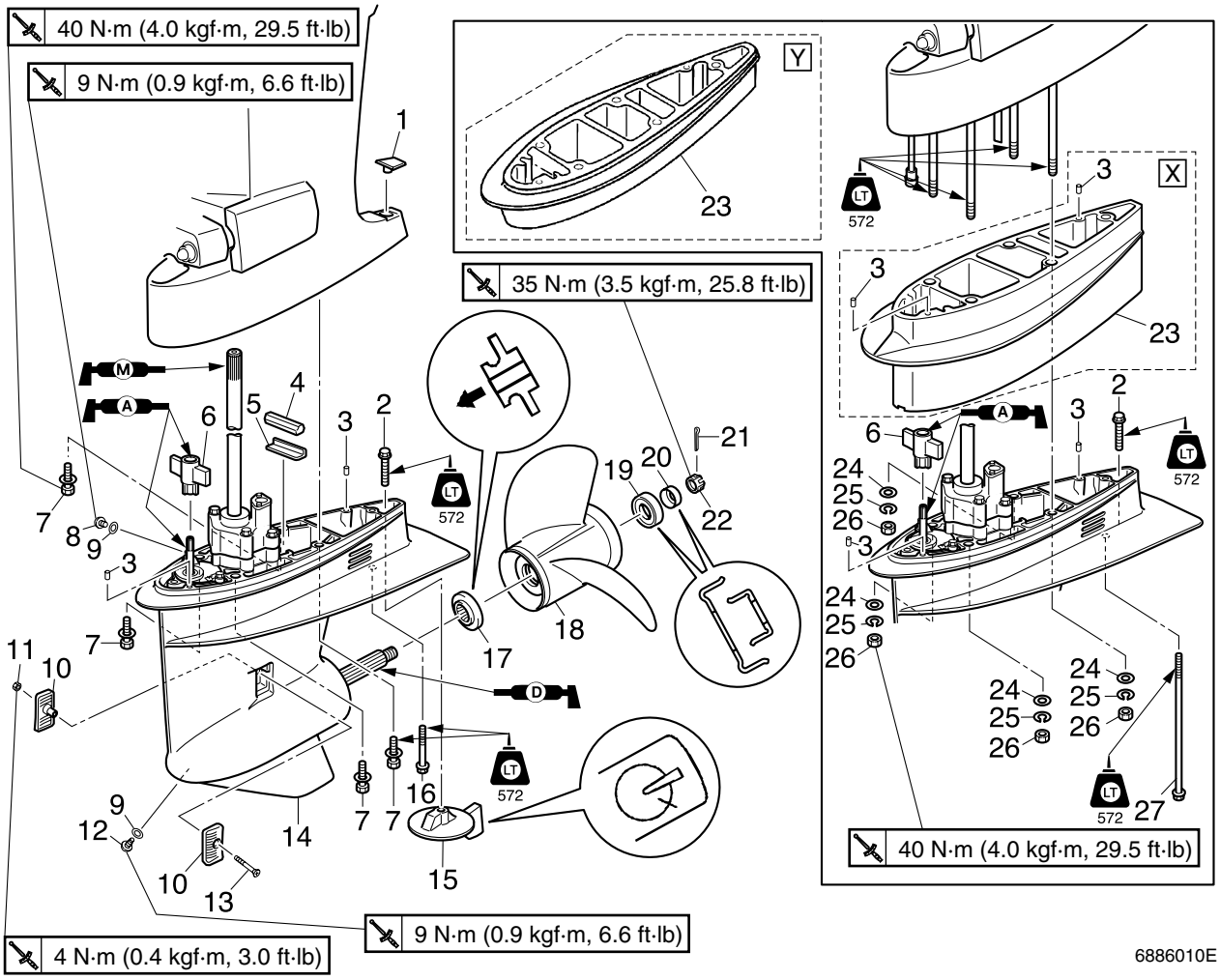
Positive battery terminal nut:
9 N·m (0.9 kgf·m, 6.6 ft·lb)
Negative battery terminal bolt:
30 N·m (3.0 kgf·m, 22.1 ft·lb)

Lower unit

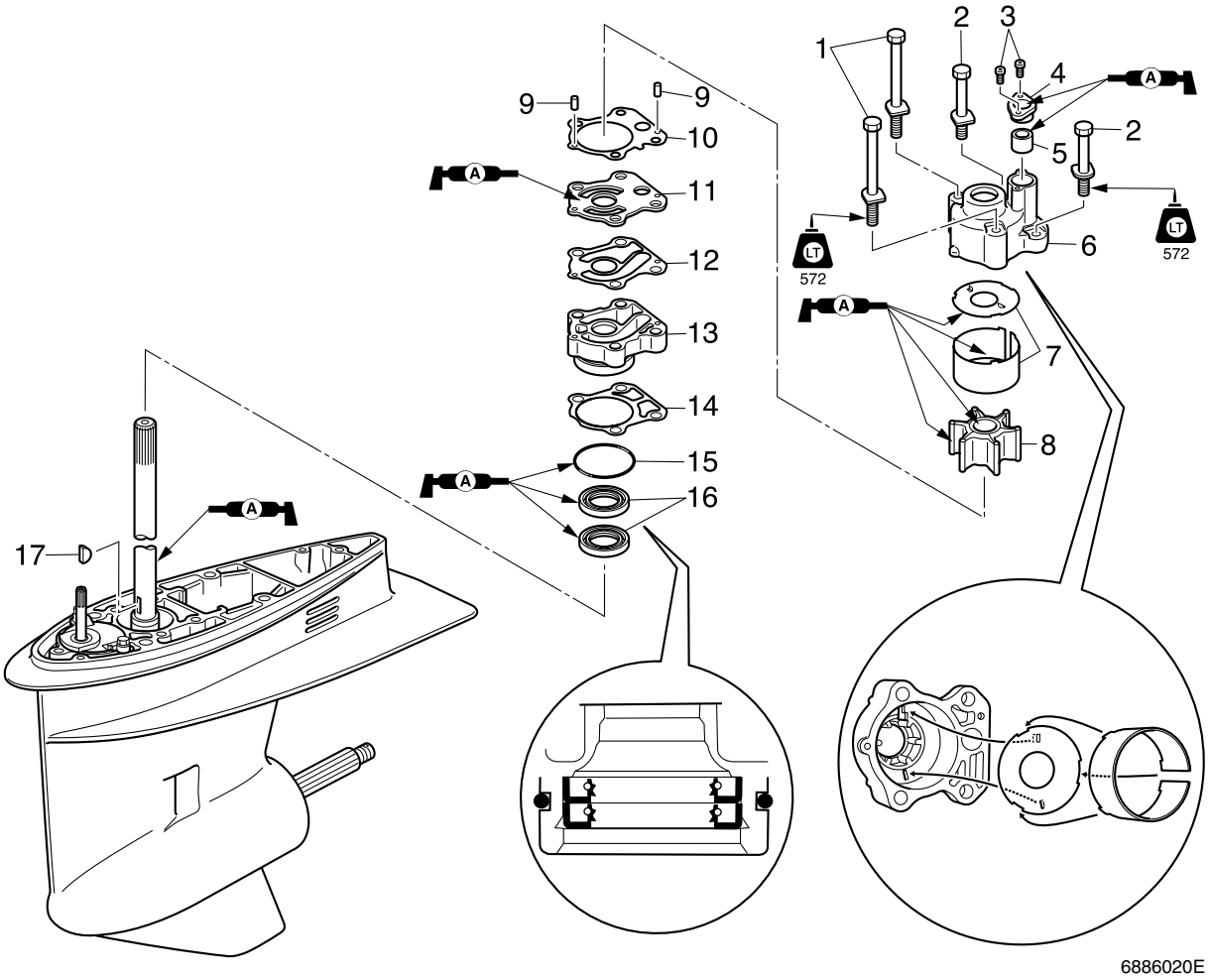
Lower unit



No.	Part name	Q'ty	Remarks
1	Cover	1	
2	Bolt	1	M8 × 40 mm
3	Dowel	2	L-transom
	Dowel	4	X, Y-transom
4	Seal	1	
5	Guide	1	
6	Guide	1	
7	Bolt	4	M10 × 40 mm
8	Check screw	1	
9	Gasket	2	Not reusable
10	Water inlet cover	2	
11	Nut	1	
12	Drain screw	1	
13	Screw	1	ø5 × 45 mm
14	Lower unit	1	
15	Trim tab	1	
16	Bolt	1	M8 × 60 mm



No.	Part name	Q'ty	Remarks
17	Spacer	1	
18	Propeller	1	
19	Spacer	1	
20	Spacer	1	
21	Cotter pin	1	Not reusable
22	Nut	1	
23	Extension	1	Y-transom
	Extension	1	X-transom
24	Washer	4	X, Y-transom
25	Spring washer	4	X, Y-transom
26	Nut	4	X, Y-transom
27	Bolt	1	M8 × 190 mm : X-transom
	Bolt	1	M8 × 112 mm : Y-transom



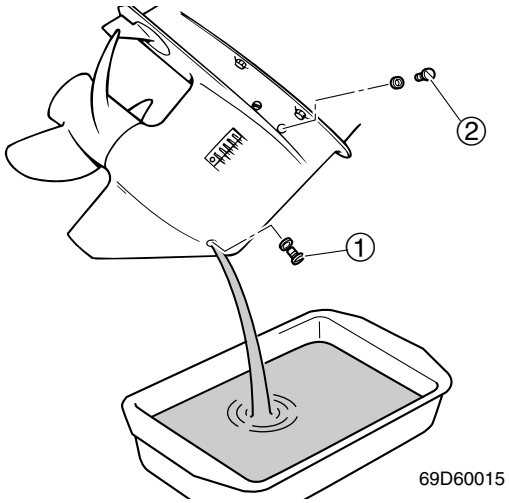
No.	Part name	Q'ty	Remarks
1	Bolt	2	M8 × 70 mm
2	Bolt	2	M8 × 50 mm
3	Screw	2	ø4 × 12 mm
4	Grommet	1	
5	Seal	1	
6	Water pump housing	1	
7	Insert cartridge	1	
8	Impeller	1	
9	Dowel	2	
10	Gasket	1	Not reusable
11	Outer plate cartridge	1	
12	Gasket	1	Not reusable
13	Oil seal housing	1	
14	Gasket	1	Not reusable
15	O-ring	1	Not reusable
16	Oil seal	2	Not reusable
17	Woodruff key	1	

Removing the lower unit

1. Remove the lock plate from the engine stop lanyard switch.

2. Place a drain pan under the drain hole.

3. Remove the drain screw ①, and then remove the check screw ② to drain the gear oil.



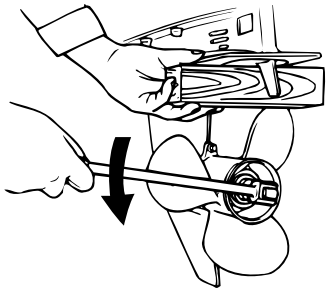
69D60015

4. Fully tilt the outboard motor down.

5. Set the gear shift to “N” position.

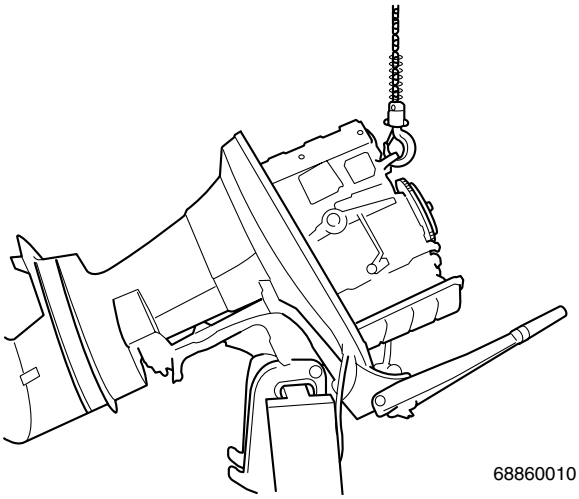
6. Remove the cotter pin.

7. Place a block of wood between the anti-cavitation plate, propeller, and then remove the propeller nut and propeller.


69R60010

⚠WARNING

- **Do not hold the propeller with your hands when loosening or tightening it.**
- **Be sure to disconnect the battery cables from the battery and the lock plate from the engine stop lanyard switch.**
- **Put a block of wood between the anti-cavitation plate and propeller to prevent the propeller from turning.**


68860010

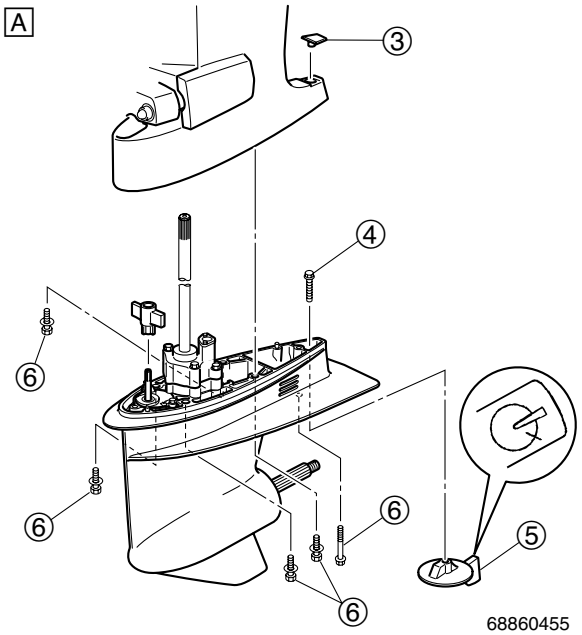
⚠WARNING

- **When removing the lower unit without removing the power unit, be sure to suspend the outboard motor. Otherwise, the outboard motor could suddenly fall and result in injury.**
- **Be sure to tilt the outboard motor fully and support it with the tilt stop lever. It can not be tilted up partially. Otherwise the outboard motor could fall back down suddenly. (EHD, ED)**

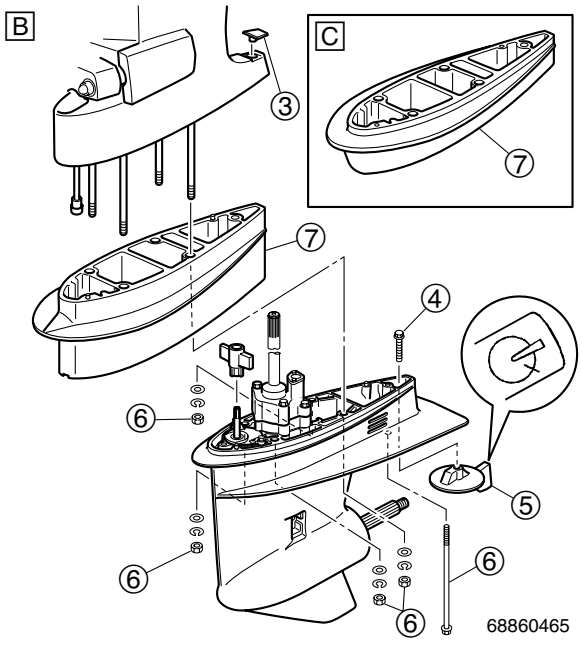
8. Mark the trim tab at the area shown.

9. Remove the cover ③, then remove the trim tab bolt ④ and trim tab ⑤.

10. Loosen the bolts(nuts) ⑥, and then remove the lower unit (X, Y-transom: and extension ⑦) from the upper case.

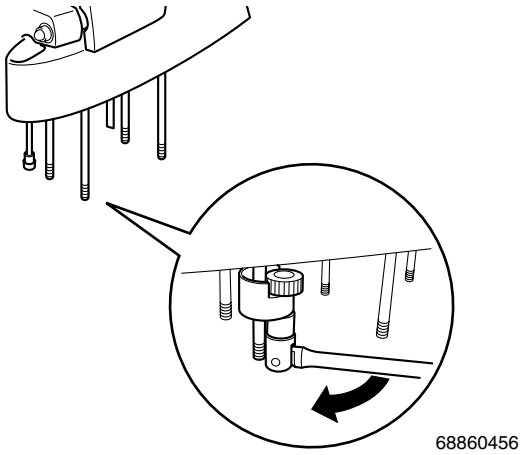


A L-transom



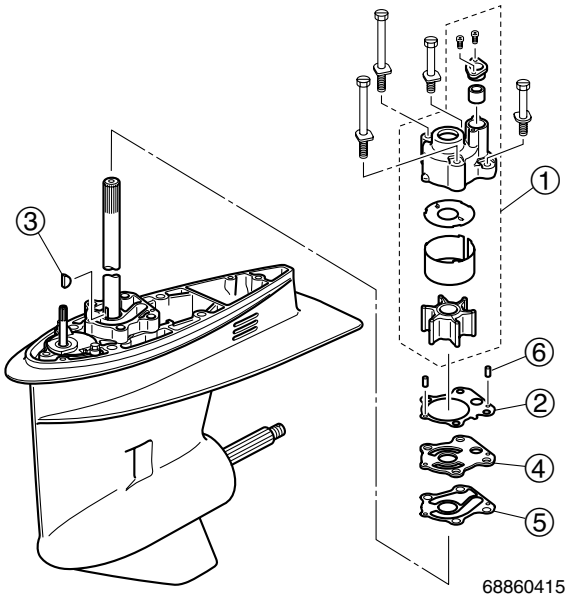
B X-transom
C Y-transom

11. Remove the stud bots. (X, Y-transom)



Removing the water pump

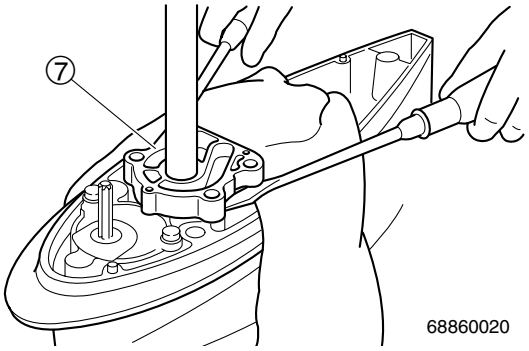
1. Remove the water pump assembly ① and gasket ②.

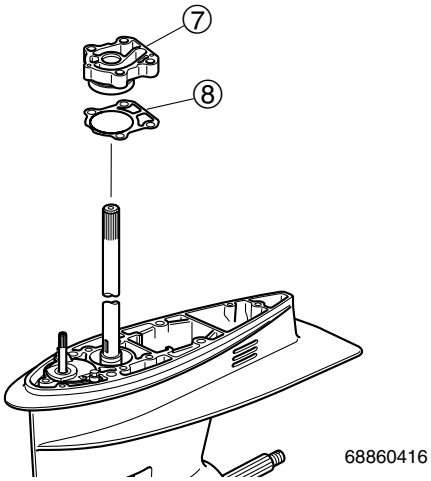


2. Remove the Woodruff key ③ from the drive shaft, then remove the outer plate cartridge ④ and gasket ⑤.

3. Remove the dowels ⑥.

4. Remove the oil seal housing ⑦ and gasket ⑧.

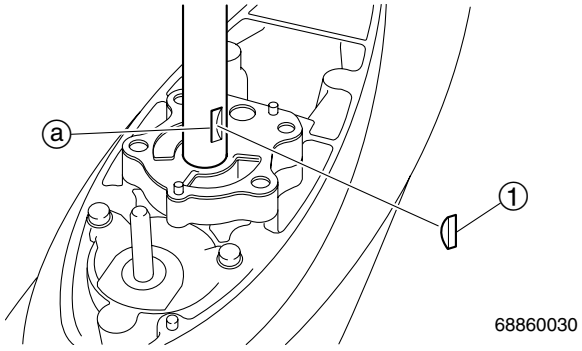




NOTE:
Insert a flat-head screw driver between the pry tabs to pry off the oil seal housing ⑦.

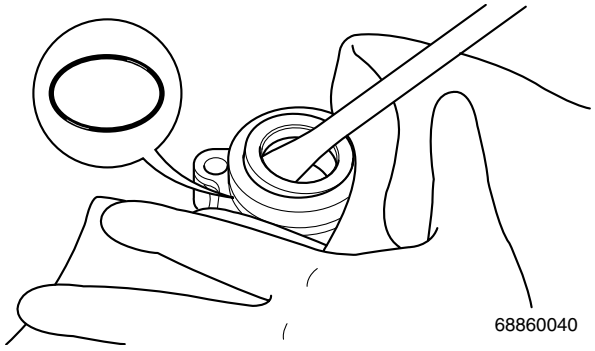
Checking the water pump

1. Check the water pump housing. Replace the water pump housing if deformed.
2. Check the impeller and insert cartridge. Replace the impeller and insert cartridge if cracked or worn.
3. Check the Woodruff key ①. Replace the woodruff key if worn.
4. Check the groove ⓐ on the drive shaft. Replace the drive shaft if worn.



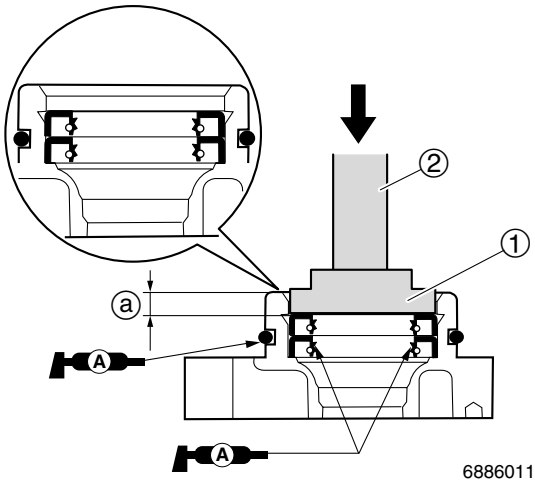
Disassembling the oil seal housing

1. Remove the O-ring and oil seals as shown.



Assembling the oil seal housing

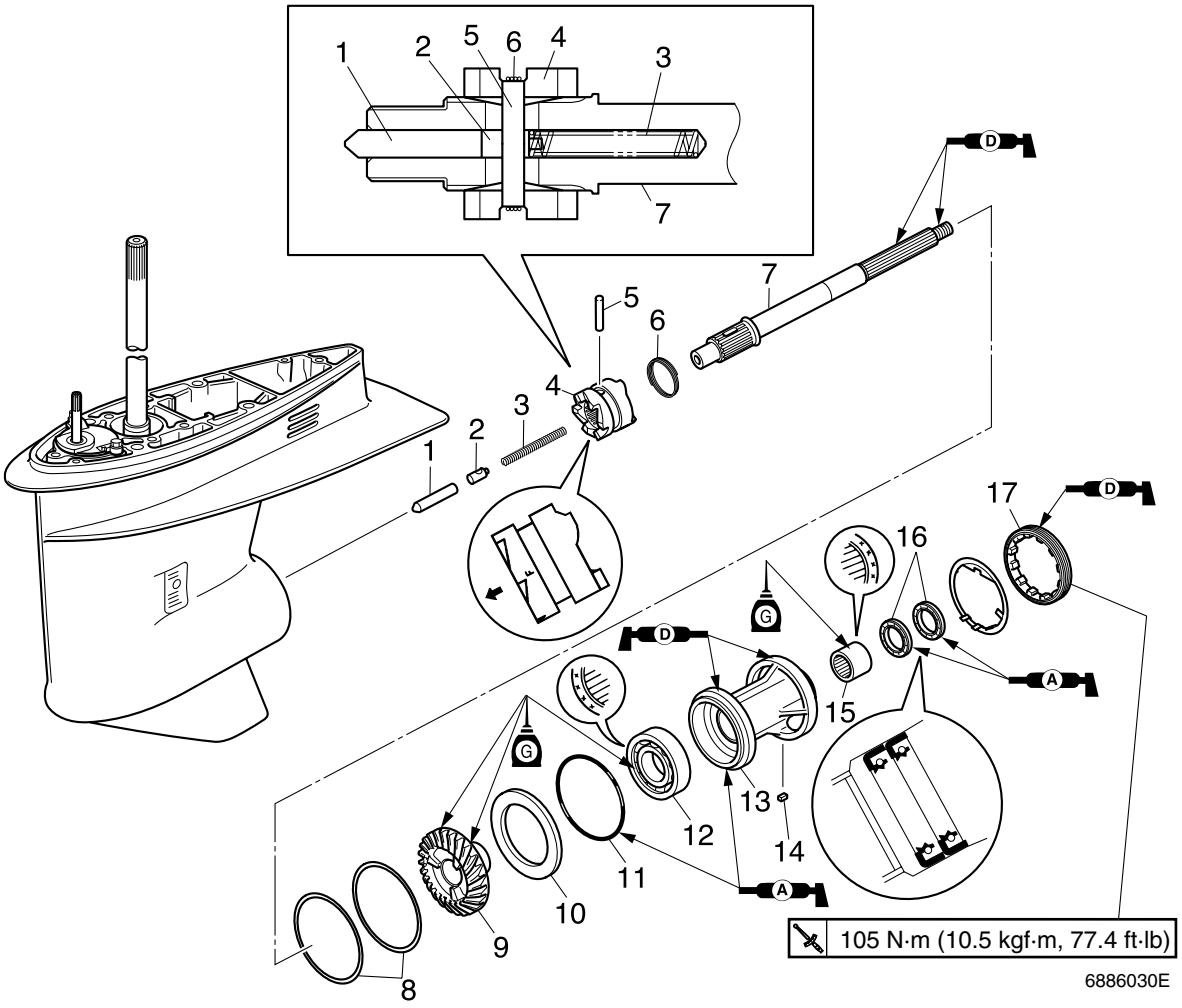
1. Install the new oil seals and new O-ring onto the oil seal housing to the specified depth.



	Needle bearing attachment ①: 90890-06655 Driver rod LS ②: 90890-06606

	Installation depth ⓐ: 3.5–4.5 mm (0.14–0.18 in)

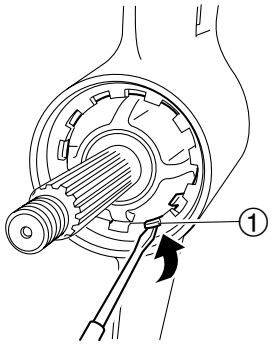
Propeller shaft housing



No.	Part name	Q'ty	Remarks
1	Shift plunger	1	
2	Shift slider	1	
3	Spring	1	
4	Dog clutch	1	
5	Cross pin	1	
6	Spring	1	
7	Propeller shaft	1	
8	Reverse gear shim	—	
9	Reverse gear	1	
10	Washer	1	
11	O-ring	1	Not reusable
12	Ball bearing	1	Not reusable
13	Propeller shaft housing	1	
14	Straight key	1	
15	Needle bearing	1	Not reusable
16	Oil seal	2	Not reusable
17	Ring nut	1	

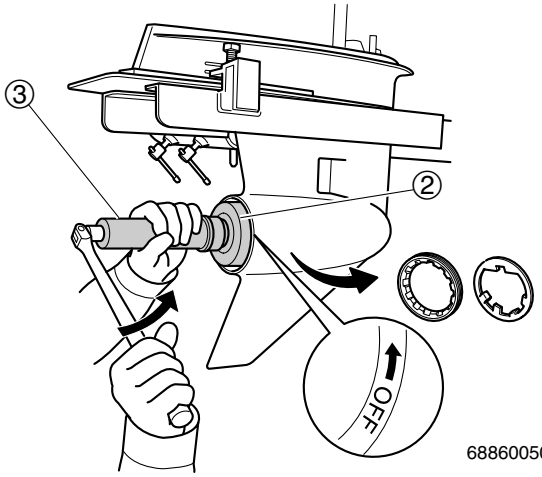
Removing the propeller shaft housing assembly

1. Straighten the one tab ① of the lock washer.



6F660060

2. Remove the ring nut from the propeller shaft housing.

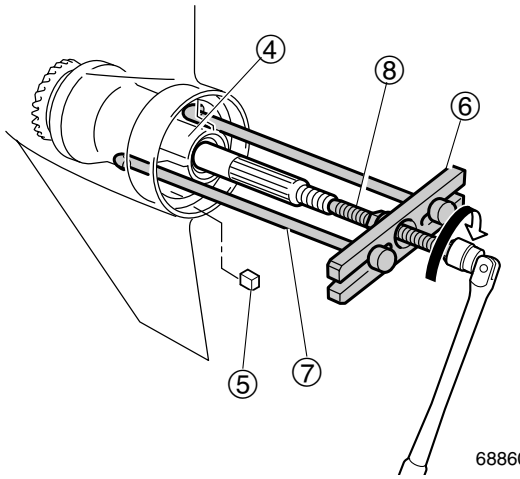


68860050

NOTE:
Turn the ring nut toward to "OFF".

Ring nut wrench 3 ②: 90890-06511
Ring nut wrench extension ③: 90890-06513

3. Remove the propeller shaft housing ④ and straight key ⑤.



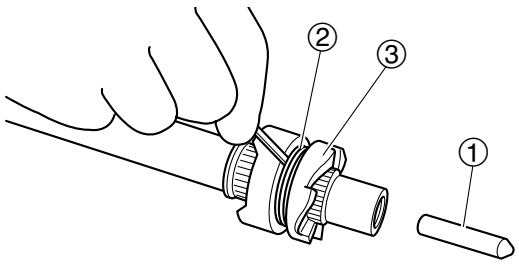
68860076

Stopper guide plate ⑥: 90890-06501
Bearing housing puller claw L ⑦: 90890-06502
Center bolt ⑧: 90890-06504

4. Remove the propeller shaft assembly and shim(s) from propeller shaft housing.

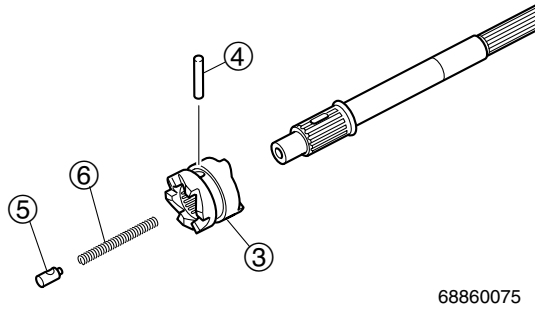
Disassembling the propeller shaft assembly

1. Remove the shift plunger ① and spring ② from dog clutch ③.



68860070

2. Remove the cross pin ④, and then remove the dog clutch ③.

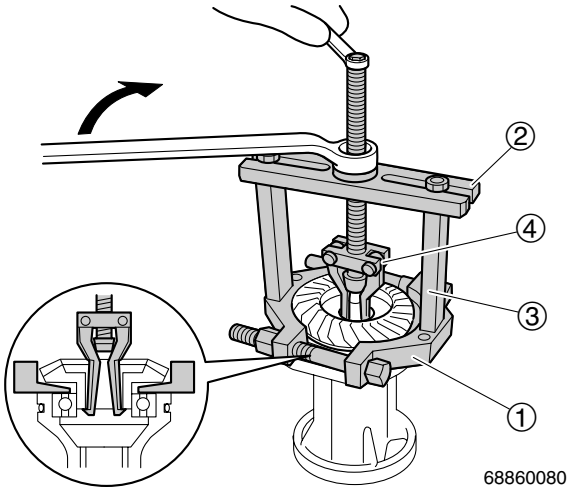


3. Remove the shift slider ⑤ and spring ⑥.

Disassembling the propeller shaft housing

1. Set the special service tools as shown.

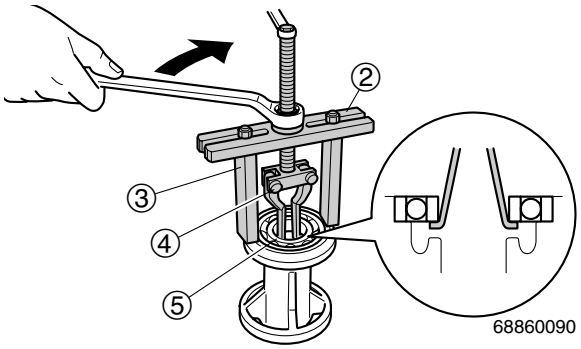
2. Remove the reverse gear and washer.



Bearing separator ①: 90890-06534
Stopper guide plate ②:
90890-06501
Stopper guide stand ③:
90890-06538
Bearing puller assembly ④:
90890-06535

3. Set the special service tools as shown.

4. Remove the ball bearing ⑤ from the propeller shaft housing.

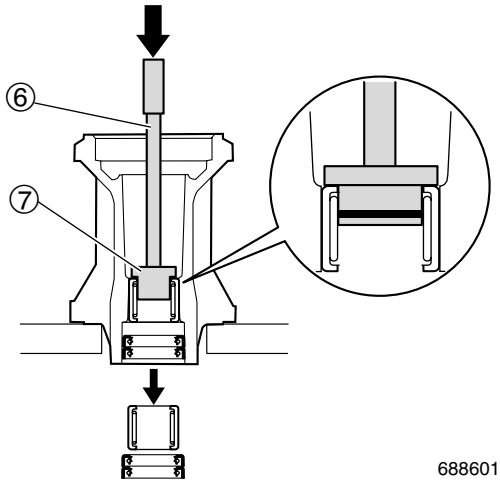


Stopper guide plate ②:
90890-06501
Stopper guide stand ③:
90890-06538
Bearing puller assembly ④:
90890-06535

CAUTION:

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

5. Remove the oil seals with needle bearing.



Driver rod L3 ⑥:
90890-06652
Needle bearing attachment ⑦:
90890-06612

Checking the propeller shaft housing

1. Check the propeller shaft housing. Replace the propeller shaft housing if cracked or corroded.

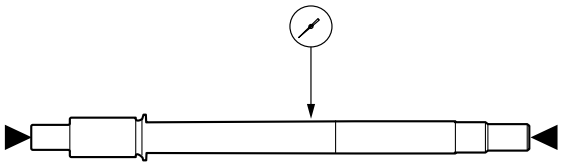
Checking the reverse gear

1. Check the teeth and dogs of the reverse gear. Replace the reverse gear if cracked or worn.

Checking the propeller shaft

1. Check the propeller shaft spline. Replace the propeller shaft if worn.

2. Measure the propeller shaft runout.

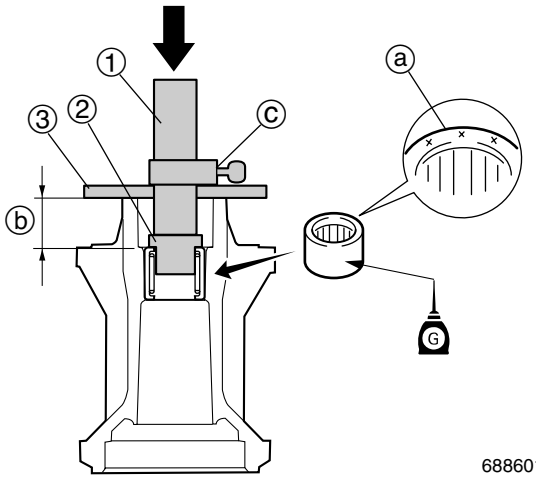


6F660130

Runout limit: 0.02 mm (0.0008 in)

Assembling the propeller shaft housing

1. Install a new needle bearing into the propeller shaft housing to the specified depth.



68860120

NOTE:

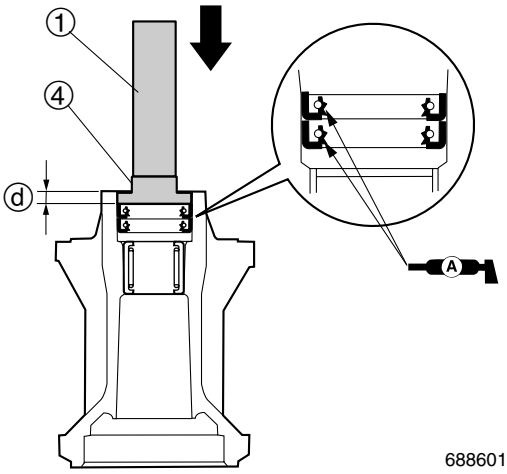
- Install a new needle bearing with the identification mark ⓐ facing toward the propeller side.
- Be careful not to let the stopper ⓒ get out of position when using the driver rod SS ① .

Driver rod SS ①:
90890-06604
Needle bearing attachment ②:
90890-06612
Bearing depth plate ③ :
90890-06603

Installation depth ⓑ :
25.0–25.5 mm (0.98–1.00 in)

6

2. Install the new oil seals into the propeller shaft housing to the specified depth.

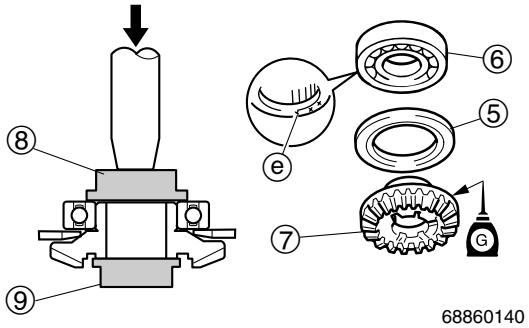


68860130

Driver rod LS ①:
90890-06606
Needle bearing attachment ④:
90890-06636

Installation depth ⓓ:
4.5–5.5 mm (0.18–0.22 in)

3. Install the washer ⑤ and new ball bearing ⑥ onto the reverse gear ⑦ using a press.



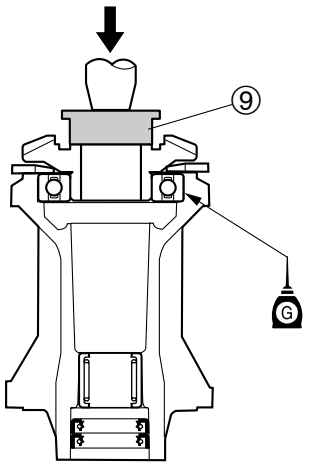
68860140

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

NOTE:
Install a new ball bearing with the identification mark ⓔ facing toward the forward gear side.

Needle bearing attachment:
90890-06608 ⑧
90890-06607 ⑨

4. Install the reverse gear assembly into the propeller shaft housing using a press.



68860150

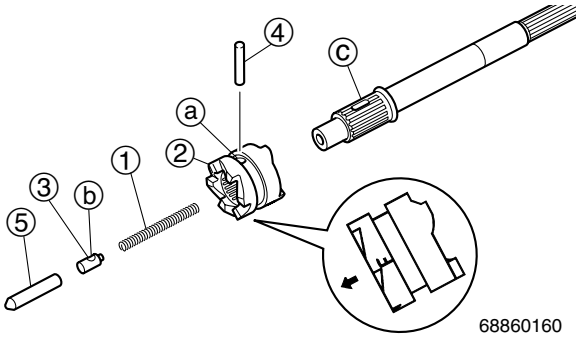
NOTE:
After installing the reverse gear, check that the reverse gear rotates smoothly.

Needle bearing attachment ⑨:
90890-06607

5. Install a new O-ring.

Assembling the propeller shaft assembly

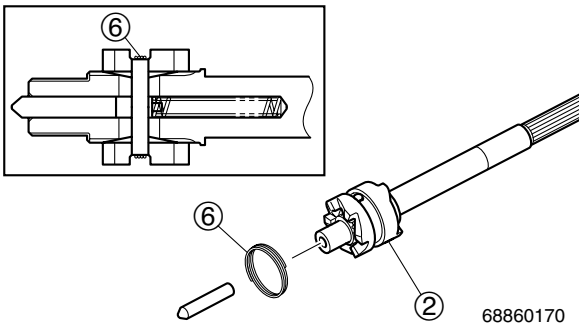
1. Install the spring ①, dog clutch ②, shift slider ③, cross pin ④, and then install the shift plunger ⑤ temporarily.



NOTE:

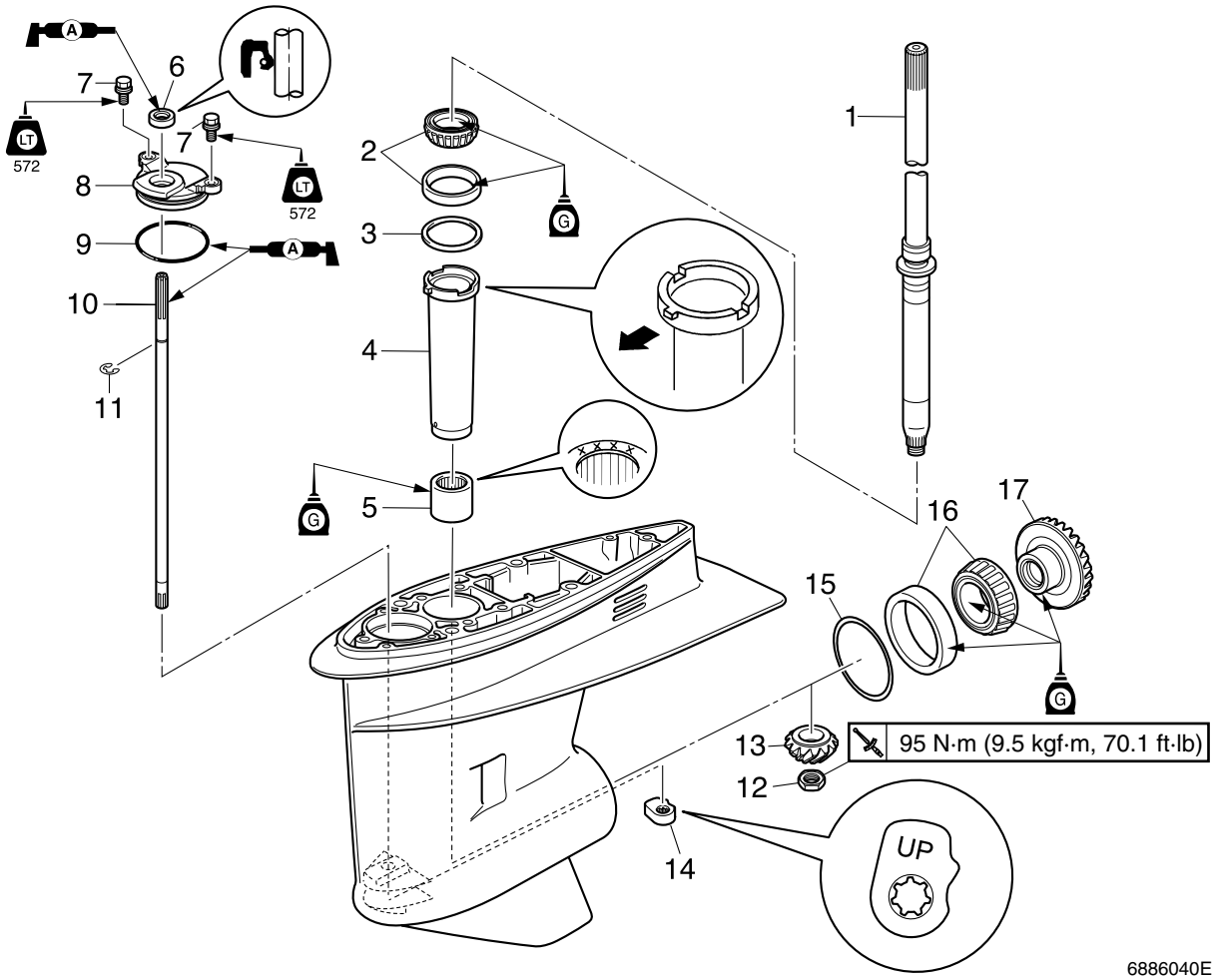
- Align the hole ⓐ of the dog clutch ②, hole ⓑ of shift slider ③ with the slot ⓒ of the propeller shaft and then install the dog clutch ②.
- Install the dog clutch ② with the "F" mark facing toward the forward gear.

2. Install the spring ⑥ onto the dog clutch ②.



6

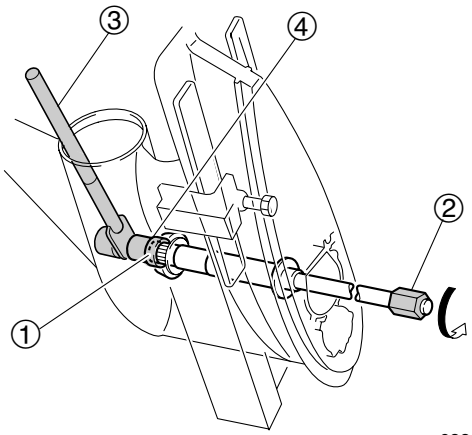
Drive shaft and lower case



No.	Part name	Q'ty	Remarks
1	Drive shaft	1	
2	Taper roller bearing	1	Not reusable
3	Pinion shim	—	
4	Sleeve	1	
5	Needle bearing	1	Not reusable
6	Oil seal	1	Not reusable
7	Bolt	2	M6 × 16 mm
8	Plate	1	
9	O-ring	1	Not reusable
10	Shift rod	1	
11	Circlip	1	
12	Nut	1	
13	Pinion	1	
14	Shift cam	1	
15	Forward gear shim	—	
16	Taper roller bearing	1	Not reusable
17	Forward gear	1	

Removing the drive shaft

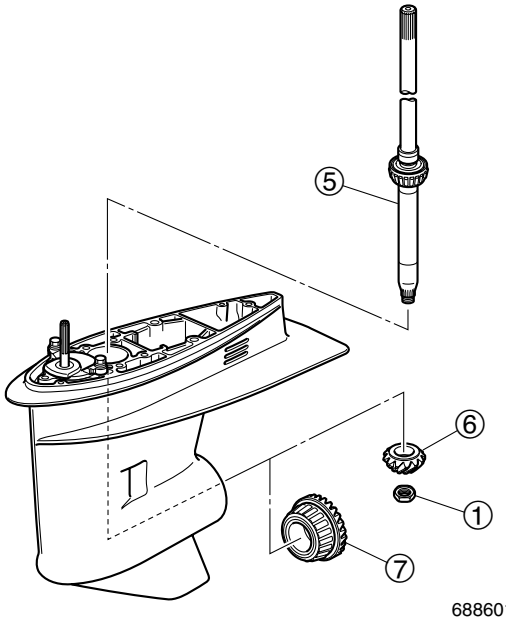
1. Loosen the pinion nut ① as shown.



68860180

	Drive shaft holder 5 ②: 90890-06519 Pinion nut holder ③: 90890-06715 Socket adapter 2 ④: 90890-06507

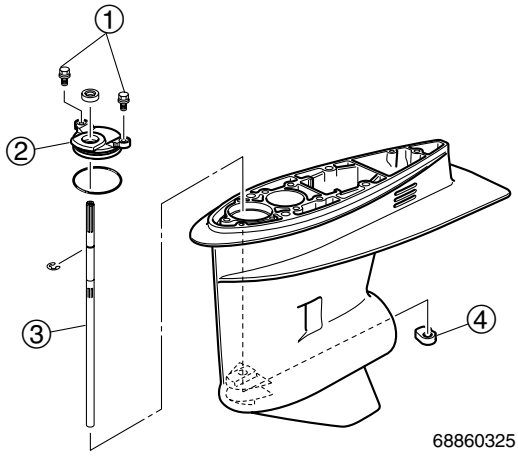
2. Remove the pinion nut ①, drive shaft ⑤, pinion ⑥, and then remove the forward gear ⑦ as shown.



68860190

Removing the shift rod

1. Remove the bolts ①, plate ②, shift rod ③, and then remove the shift cam ④.

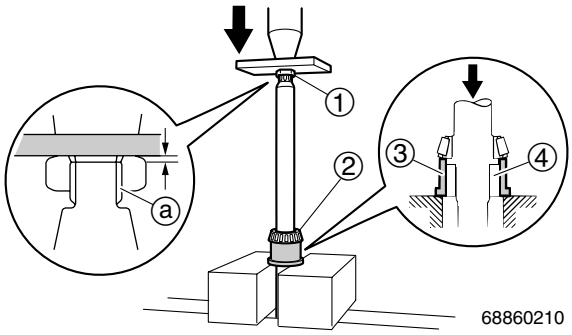


68860325

Disassembling the drive shaft

1. Install the pinion nut ①, and then tighten it temporarily.

2. Remove the taper roller bearing ② using a press.



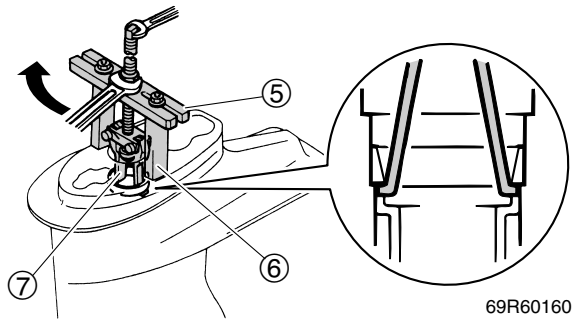
68860210

CAUTION:

- **Do not press the drive shaft threads ⓐ directly.**
- **When removing the taper roller bearing, do not damage the drive shaft collar ④.**

	Bearing inner race attachment ③: 90890-06639

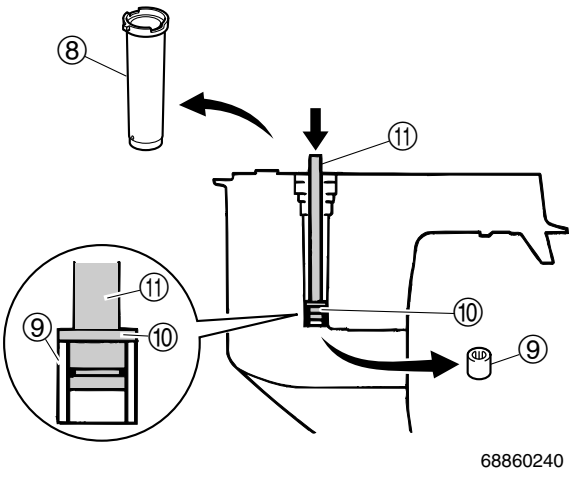
3. Remove the taper roller bearing outer race and shim(s).



69R60160

Stopper guide plate ⑤:
90890-06501
Stopper guide stand ⑥:
90890-06538
Bearing puller assembly ⑦:
90890-06535

4. Remove the sleeve ⑧ and needle bearing ⑨.

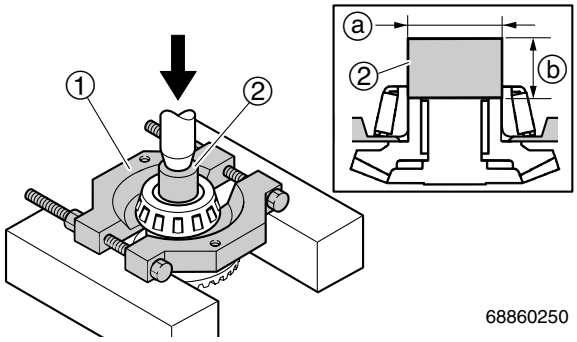


68860240

Needle bearing attachment ⑩:
90890-06611
Driver rod L3 ⑪: 90890-06652

Disassembling the forward gear

1. Remove the taper roller bearing from the forward gear using a press.



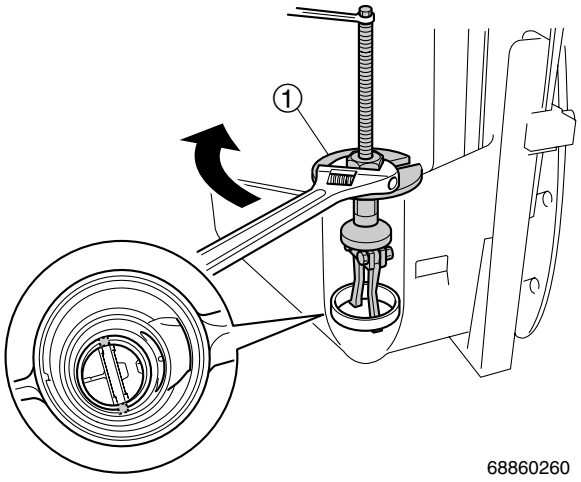
68860250

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

Bearing separator ①: 90890-06534
or commercially available tool
Appropriate rod ②:
ⓐ: 40 mm (1.58 in)
ⓑ: 35 mm (1.38 in)

Disassembling the lower case

1. Remove the taper roller bearing outer race and shim(s).



68860260

Bearing outer puller assembly ①:
90890-06523

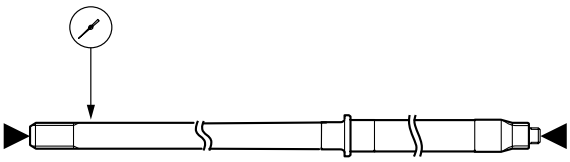
Checking the pinion and forward gear

1. Check the teeth of pinion. Check the teeth and dogs of forward gear. Replace the pinion and forward gear if cracked or worn.

Checking the drive shaft

1. Check the drive shaft spline. Replace the drive shaft if bent or worn.

2. Measure the drive shaft runout.



68860115

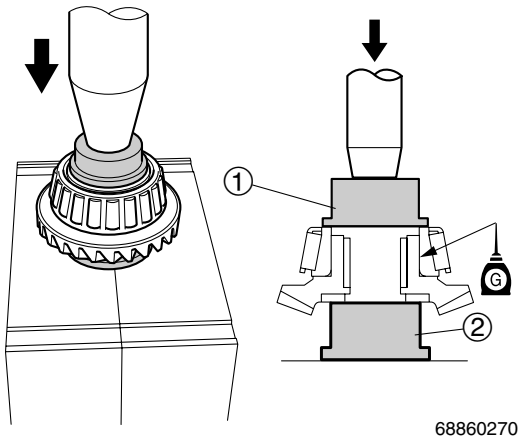
Runout limit: 1.0 mm (0.039 in)

Checking the lower case

1. Check the skeg, cavitation plate and torpedo. Replace the lower case if cracked or damaged.

Assembling the forward gear

1. Install a new taper roller bearing into the forward gear using a press.



68860270

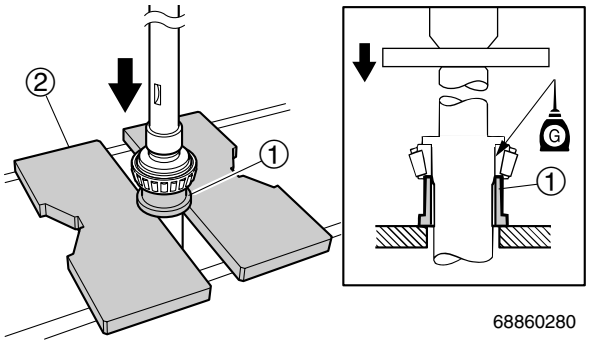
CAUTION:

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

Needle bearing attachment:
90890-06608 ①
90890-06607 ②

Assembling the drive shaft

1. Install a new taper roller bearing onto the drive shaft using a press.



68860280

CAUTION:

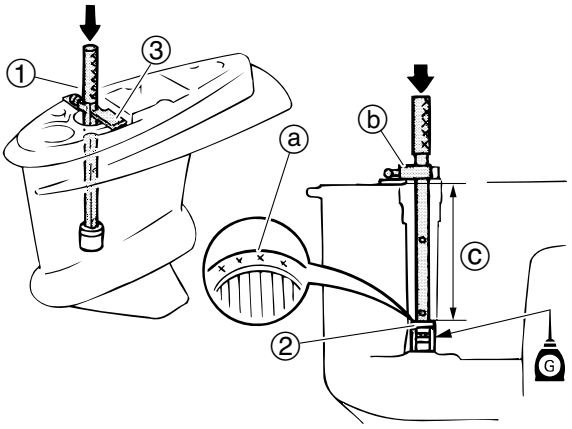
Do not reuse the bearing, always replace it with a new one.

Bearing inner race attachment ①:
90890-06643
Support ②:
90890-02394

6

Assembling the lower case

1. Install a new needle bearing into the lower case to specified depth.



6F660280

CAUTION:

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

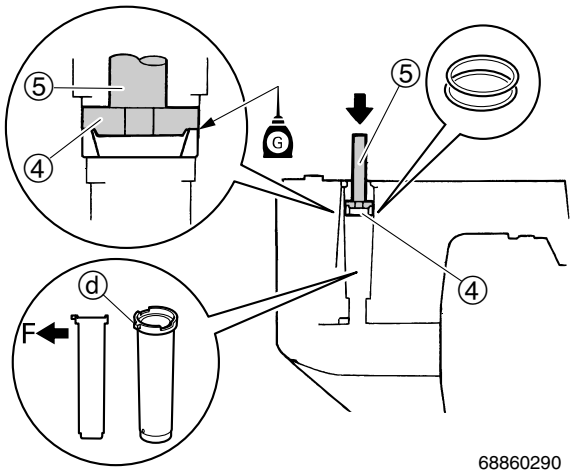
NOTE:

- Install a needle bearing with the identification mark ⓐ facing up.
- Apply gear oil to the needle bearing before installation.
- Be careful not to let the stopper ⓑ get out of position when using the driver rod.

Driver rod SL ①: 90890-06602
Needle bearing attachment ②: 90890-06611
Bearing depth plate ③: 90890-06603

Installation depth ⓒ: 187.6–188.6 mm (7.39–7.43 in)

2. Install the sleeve, shim(s) and new taper roller bearing outer race.



68860290

CAUTION:

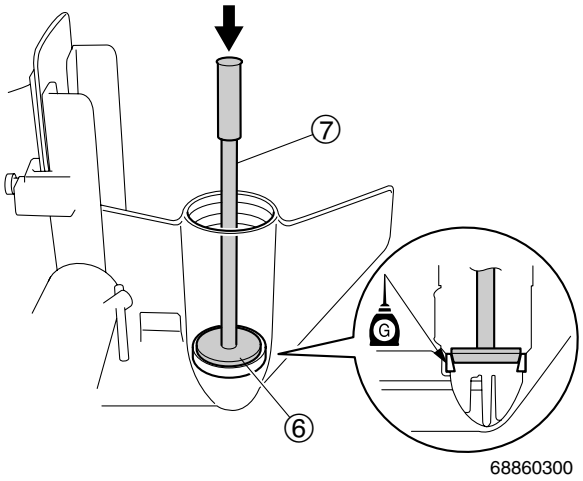
Do not reuse the bearing, always replace it with a new one.

NOTE:

- Be sure to select the pinion shim(s) if the lower case or taper roller bearing is replaced.
- To select the shim(s), refer to page 6-25.
- Install the sleeve with the projection ⓓ facing forward.

Bearing outer race attachment ④: 90890-06626
Driver rod LS ⑤: 90890-06606

3. Install the shim(s) and new taper roller bearing outer race.



CAUTION:

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

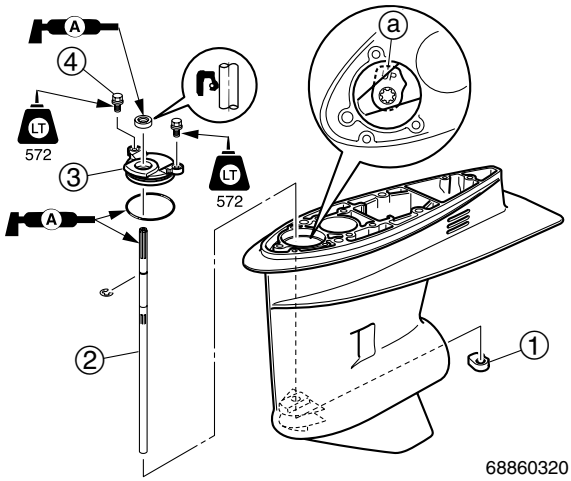
NOTE:

- Be sure to select the forward gear shim(s) if the lower case or taper roller bearing is replaced.
- To select the shim(s), refer to page 6-25.
- Apply gear oil to the inside and outside of the taper roller bearing outer race before installation.

Bearing outer race attachment ⑥: 90890-06621
Driver rod LL ⑦: 90890-06605

Installing the shift rod

1. Install the shift cam ①, shift rod ② and plate ③, then tighten the bolts ④.

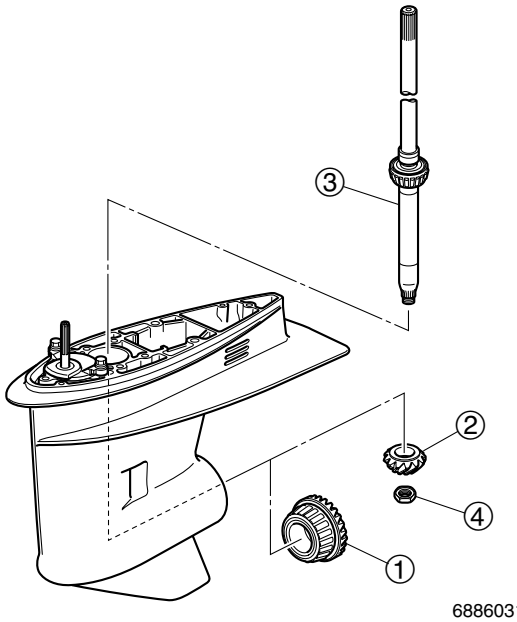


NOTE:

Install the shift cam ① with the "UP" mark ⓐ facing up.

Installing the drive shaft

1. Install the forward gear ①, pinion ②, drive shaft ③ and pinion nut ④.

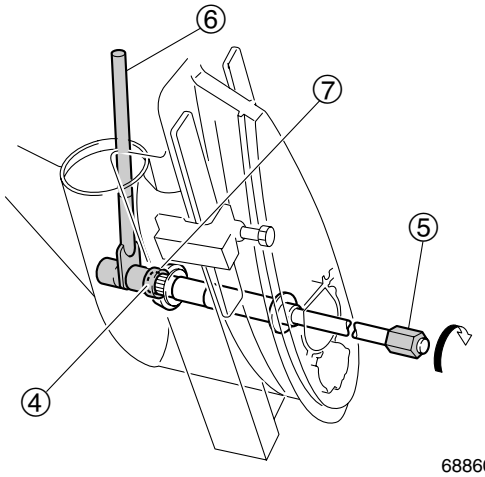


NOTE:

Install the drive shaft ③ lifting it up slightly, and then align its splines with the pinion ②.

6

2. Tighten the pinion nut ④ to the specified torque.



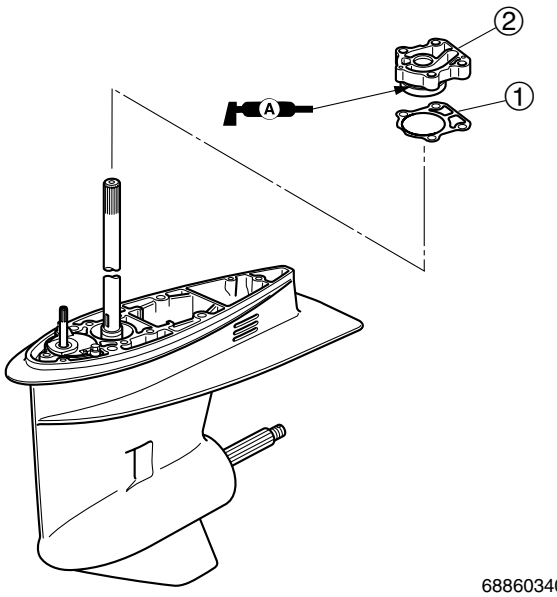
68860330

Drive shaft holder 5 ⑤:
90890-06519
Pinion nut holder ⑥:
90890-06715
Socket adapter 2 ⑦:
90890-06507

Pinion nut ④:
95 N·m (9.5 kgf·m, 70.1 ft·lb)

Installing the oil seal housing

1. Install the new gasket ① and oil seal housing ②.

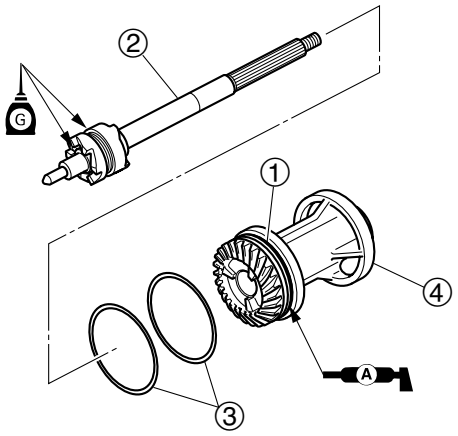


68860340

Installing the propeller shaft housing

1. Install a new O-ring ①.

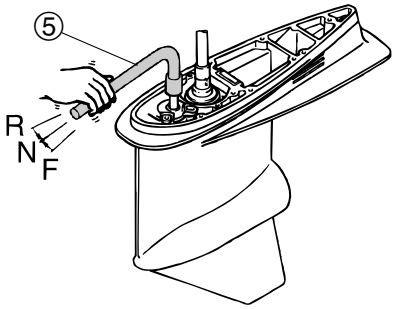
2. Install the propeller shaft assembly ② and shim(s) ③ into the propeller shaft housing assembly ④.



68860350

NOTE:
- Be sure to select the reverse gear shim(s) if the lowercase, propeller shaft housing or ball bearing is replaced.
- To select the shim(s), refer to page 6-26.

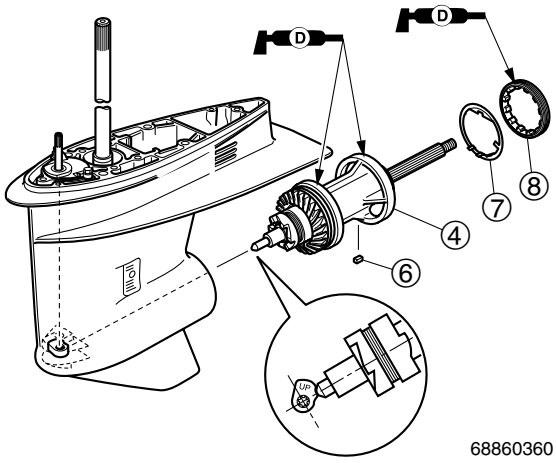
3. Set the gear shift to “N” position.



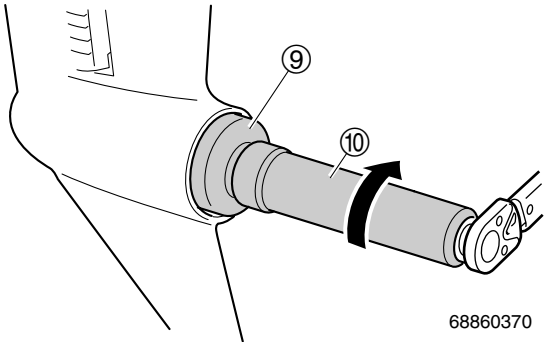
68860355

Shift rod push arm ⑤:
90890-06052

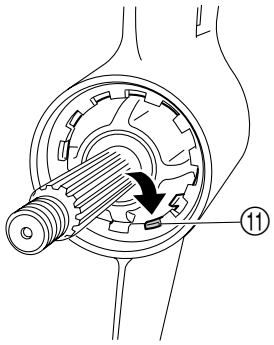
4. Install the propeller shaft housing assembly ④, straight key ⑥ and lock washer ⑦ into the lower case, then tighten the ring nut ⑧ to the specified torque.



68860360



68860370



6F600065

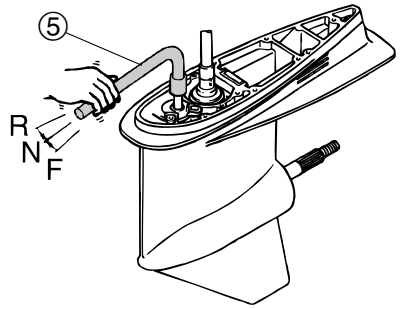
NOTE:

- To secure the ring nut, bend 1 tab ⑪ of the lock washer into a slot in the ring nut.
- Bend all other tabs toward the propeller shaft housing assembly.

	Ring nut wrench 3 ⑨: 90890-06511 Ring nut wrench extension ⑩: 90890-06513

	Ring nut ⑧: 105 N·m (10.5 kgf·m, 77.4 ft·lb)

5. Make sure check the shift operation. Disassemble and assemble the lower case if operated improperly.



69D60045

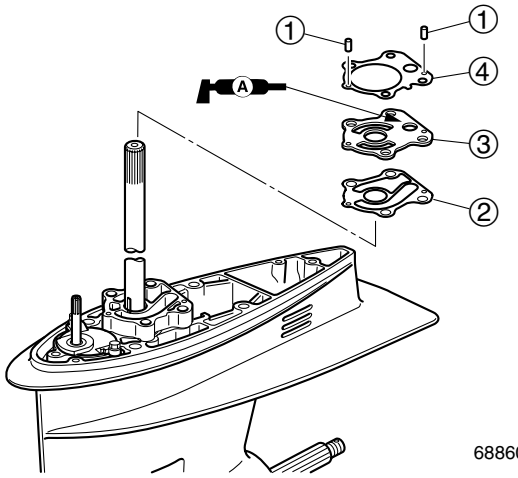
NOTE:

- Change the shift rod position to “F”, “R” and “N” position using a special service tool ⑤.
- Make sure that the propeller shaft rotating direction is correct in “F” and in “R” position.
- Make sure that the position is correct in “N” position.

	Shift rod push arm ⑤: 90890-06052

Installing the water pump

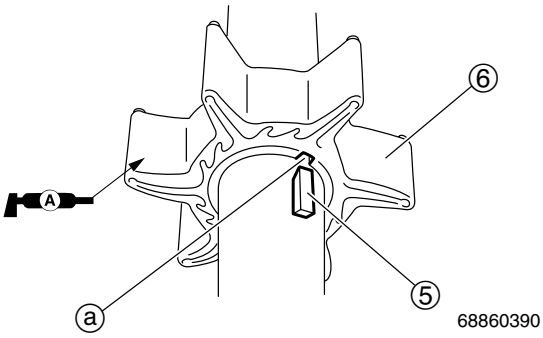
1. Install the dowels ①, new gasket ② the outer plate cartridge ③ new gasket ④.



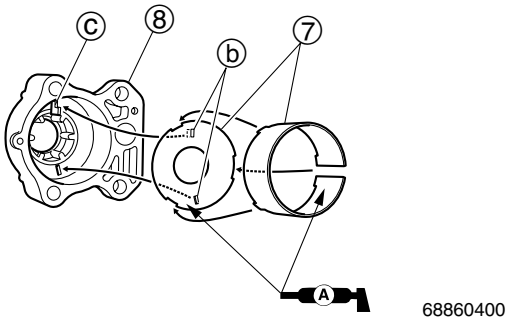
68860380

2. Install the Woodruff key ⑤ onto the drive shaft groove.

3. Align the groove ⓐ in the impeller ⑥ with the Woodruff key ⑤, and then install the impeller.

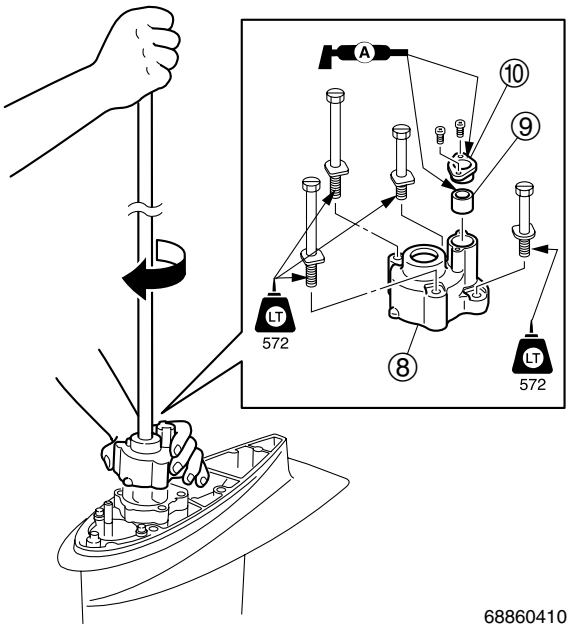


4. Install the insert cartridge ⑦ into the water pump housing ⑧.



NOTE:
Align the insert cartridge projection ⓑ with the hole ⓒ in the water pump housing.

5. Install the water seal rubber ⑨ and grommet ⑩ onto the water pump housing ⑧, then install onto the lower case.



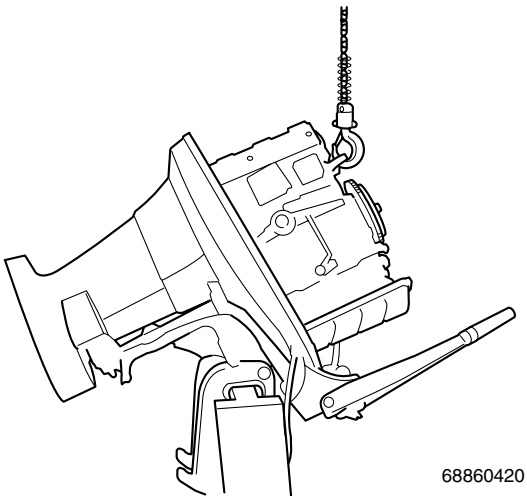
CAUTION:
Do not turn the drive shaft counterclockwise, otherwise the water pump impeller may be damaged.

NOTE:
When installing the water pump housing, turn the drive shaft clockwise while pushing down the pump housing.

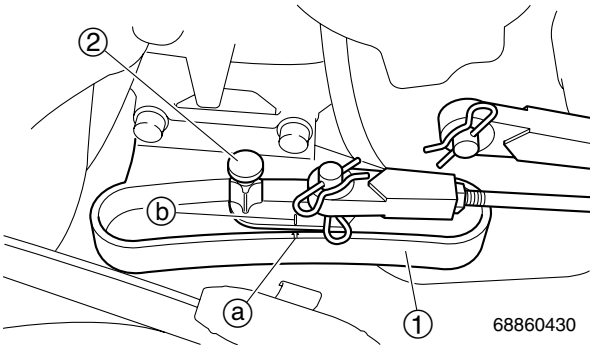
Installing the lower unit

⚠WARNING

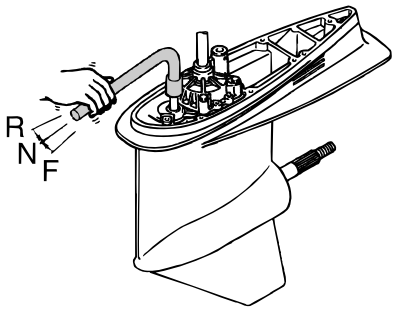
- **When installing the lower unit without removing the power unit, be sure to suspend the outboard motor. Otherwise, the outboard motor could suddenly fall and result in injury.**
- **Be sure to tilt the outboard motor fully and support it with the tilt stop lever. It can not be tilted up partially. Otherwise the outboard motor could fall back down suddenly. (EHD, ED)**



1. Set the gear shift to “N” position, and then check that the mark ⓐ on the bracket ① is aligned with the mark ⓑ on the shift lever ②.



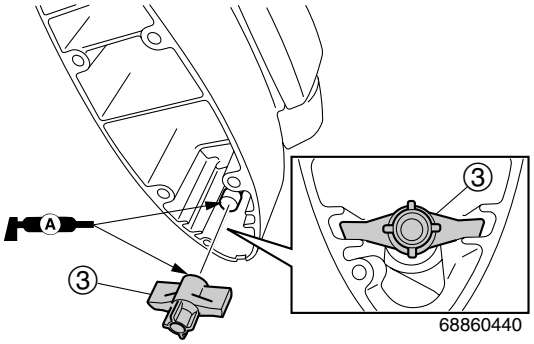
2. Set the gear shift to “N” position at the lower unit. Make sure that the shift rod is in the neutral position.



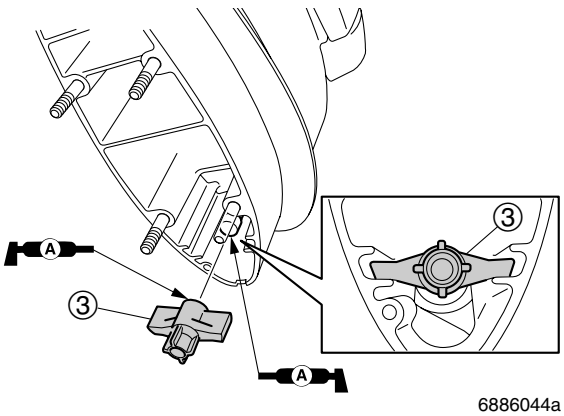
Shift rod push arm:
90890-06052

3. Install the guide ③ into the uppercase (X, Y-transom: extension).

A



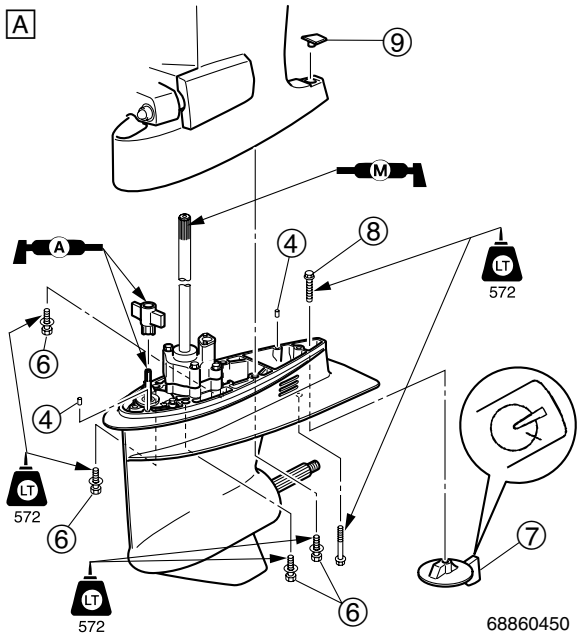
B



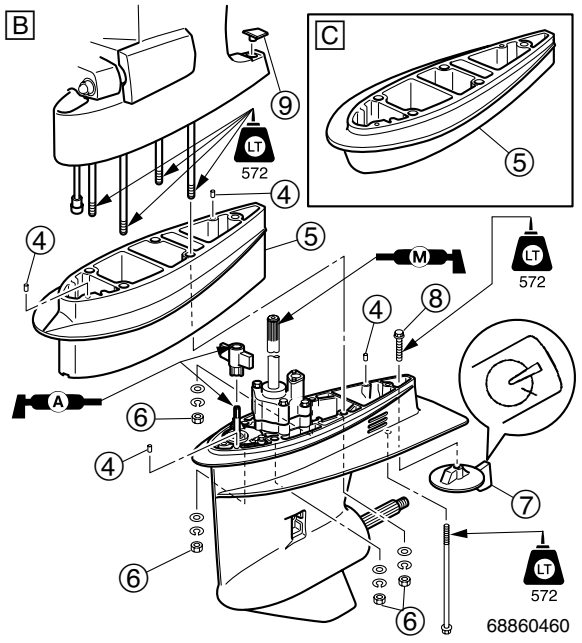
A L-transom
B X, Y-transom

6

4. Install the dowels ④ onto the lower case and extension ⑤ (X, Y-transom).



A L-transom



B X-transom
C Y-transom

5. Install the lower unit to the upper case, and then tighten the lower case bolts (nut) ⑥ to the specified torque.

NOTE:

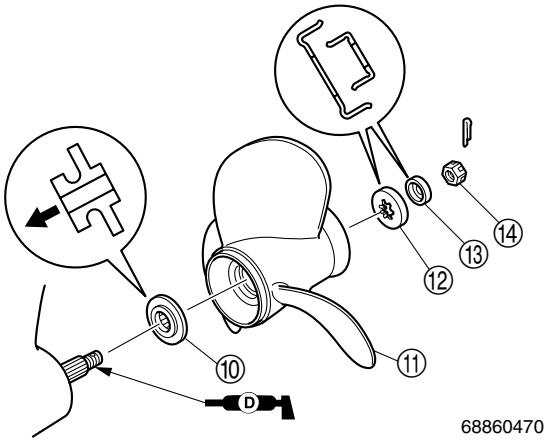
Turn the flywheel magnet slightly clockwise to align the splines, without removing the power unit.

	Lower case bolt (nut) ⑥: 40 N·m (4.0 kgf·m, 29.5 ft·lb)

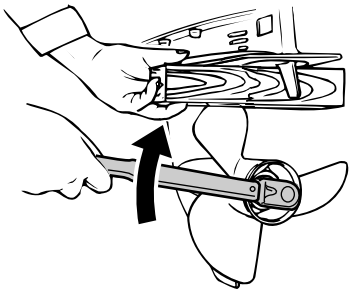
6. Install the trim tab ⑦ on its original position, and then tighten the trim tab bolt ⑧.

7. Install the cover ⑨.

8. Install the spacer ⑩, propeller ⑪, spacer ⑫, spacer ⑬ and the propeller nut ⑭.



9. Place a block of wood between the anti-cavitation plate and the propeller, and then tighten the nut to the specified torque.



69R60285

⚠WARNING

- **Do not hold the propeller with your hands when loosening or tightening it.**
- **Be sure to disconnect the battery cables from the battery and remove the lock plate from the engine stop lanyard switch.**
- **Put a block of wood between the anti-cavitation plate and propeller to prevent the propeller from turning.**

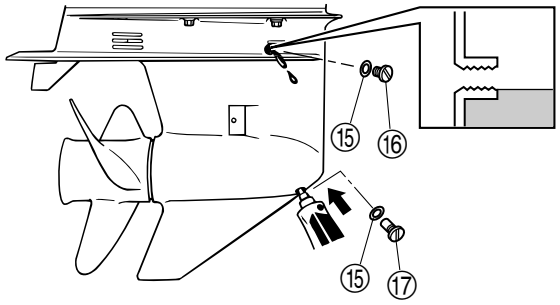
NOTE:

If the grooves in the propeller nut ⑭ do not align with the propeller shaft hole, tighten the nut until they are aligned.

Propeller nut ⑭:
35 N·m (3.5 kgf·m, 25.8 ft·lb)

10. Install a new cotter pin to the propeller shaft.

11. Insert a 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.



69D10050

NOTE:

To check the gear oil, refer to page 3-17.

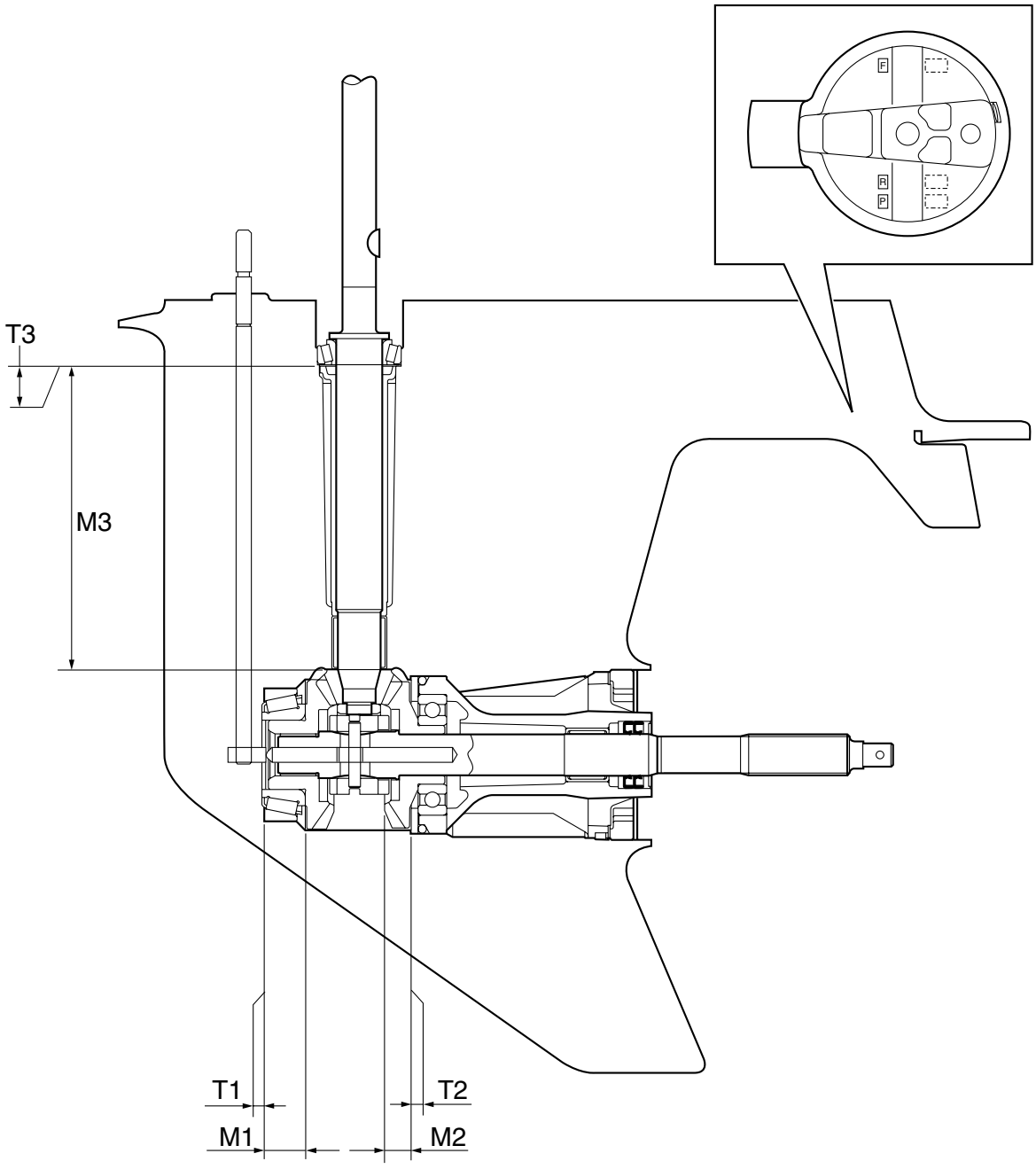
Recommended gear oil:
Hypoid gear oil
API:GL-4
SAE: 90
Oil quantity:
610 cm^3
(20.62 US oz, 21.51 Imp oz)

12. Install the new gaskets ⑮, check screw ⑯, drain screw ⑰ quickly, and then tighten to specified torque.

Check screw ⑯ and drain screw ⑰:
9 N·m (0.9 kgf·m, 6.6 ft·lb)

6

Shimming



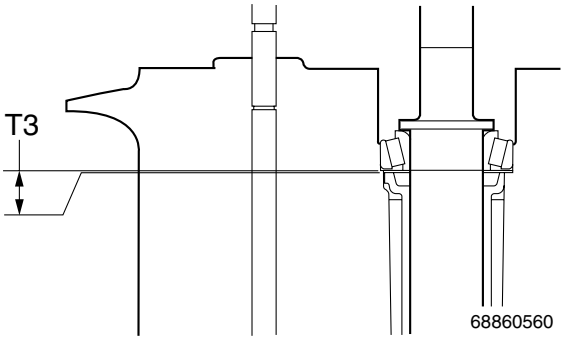
68860480

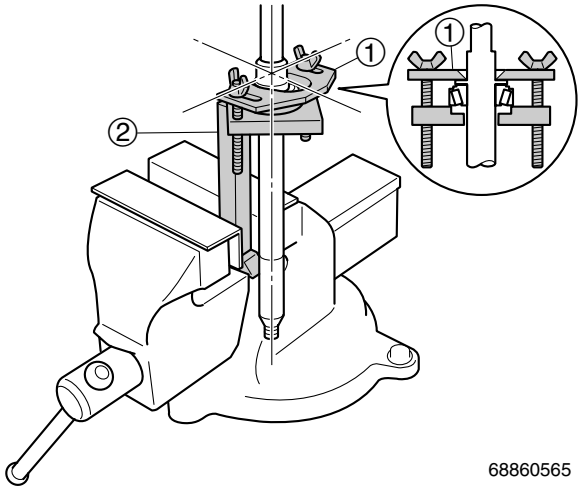
Shimming

NOTE:
- Shimming is not required when assembling the original lower case and inner parts.
- Shimming is required when assembling a new lower case and the original inner parts.
- Shimming is required when replacing the inner part(s).

Selecting the pinion shim

1. Install the special service tools onto the drive shaft.

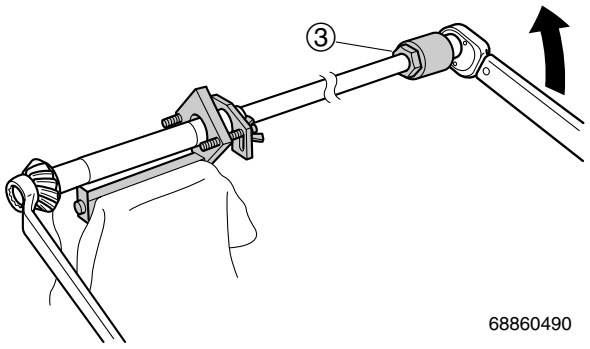




NOTE:
- Select the shim thickness (T3) by using the specified measurement(s) and the calculation formula.
- Install the special service tools onto the drive shaft so that the taper roller bearing outer race is at the center of the hole.
- Tighten the wing nuts another 1/4 of a turn after they contact the pinion height gauge plate.

Pinion height gauge plate B ①: 90890-06712
Pinion height gauge ②: 90890-06710

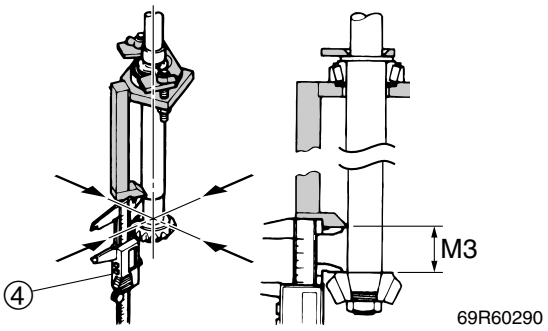
2. Install the pinion and pinion nut, and then tighten the nut to the specified torque.



Drive shaft holder 5 ③: 90890-06519

Pinion nut: 95 N·m (9.5 kgf·m, 70.1 ft·lb)

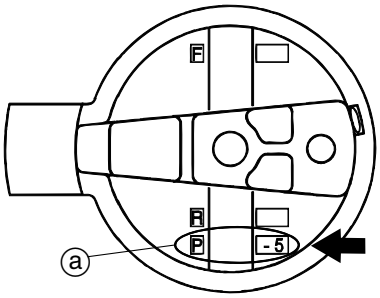
3. Measure the distance (M3) between the special service tool and the pinion as shown.



NOTE:
- Measure the pinion at 4 points to find the distance average.
- Make a note of each measurement numeral.

Digital caliper ④: 90890-06704

4. Calculate the pinion shim thickness (T3) as shown in the examples below.



69D60320

NOTE:

"P" is the deviation of the lower case dimension from standard. The "P" mark ⓐ is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the "P" mark is unreadable, assume that "P" is zero and check the backlash when the unit is assembled.

Calculation formula:
Pinion shim thickness (T3) =
M3 – 31.50 – P/100

Example:
If "M3" is 32.10 mm and "P" is (–5), then
T3 = 32.10 – 31.50 – (–5)/100 mm
= 0.60 + 0.05 mm
= 0.65 mm

5. Select the pinion shim(s) (T3) as follows.

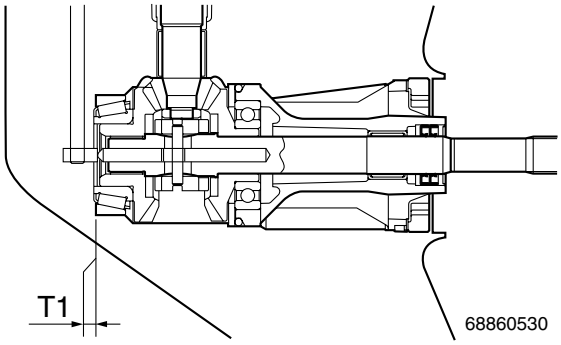
Calculated numeral at 1/100th place	Rounded numeral
1, 2	2
3, 4, 5	5
6, 7, 8	8
9, 10	10

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

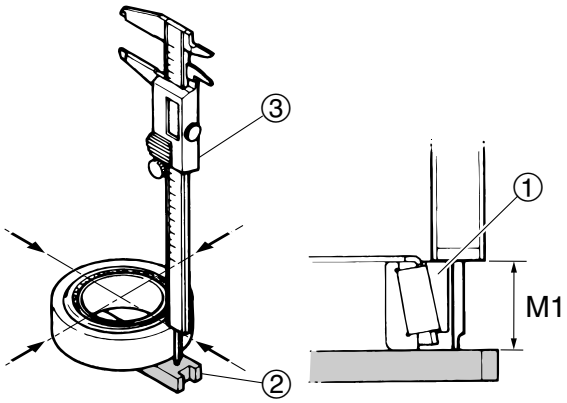
Example:
If "T3" is 0.43 mm, then the pinion shim is 0.45 mm.
If "T3" is 0.38 mm, then the pinion shim is 0.38 mm.

Selecting the forward gear shim

1. Turn the taper roller bearing outer race ① 2 or 3 times to seat the rollers, and then measure the bearing height (M1) as shown.



68860530



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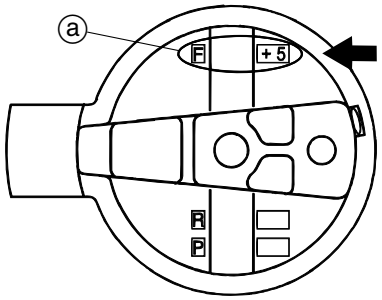
NOTE:

- Select the shim thickness (T1) by using the specified measurement(s) and the calculation formula.
- Measure the bearing outer race at 4 points to find the height average.
- Make a note of each measurement numeral.

Shimming plate ②: 90890-06701
Digital caliper ③: 90890-06704

2. Calculate the forward gear shim thickness (T1) as shown in the examples below.



69D60340

NOTE:
"F" is the deviation of the lower case dimension from standard. The "F" mark ⓐ is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the "F" mark is unreadable, assume that "F" is zero and check the backlash when the unit is assembled.

Calculation formula:
Forward gear shim thickness (T1) = 24.50 + F/100 – M1

Example:
If "M1" is 24.00 mm and "F" is (+5), then
T1 = 24.50 + (+5)/100 – 24.00 mm
= 24.50 + 0.05 – 24.00 mm
= 0.55 mm

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

Calculated numeral at 1/100th place	Rounded numeral
1, 2	0
3, 4, 5	2
6, 7, 8	5
9, 10	8

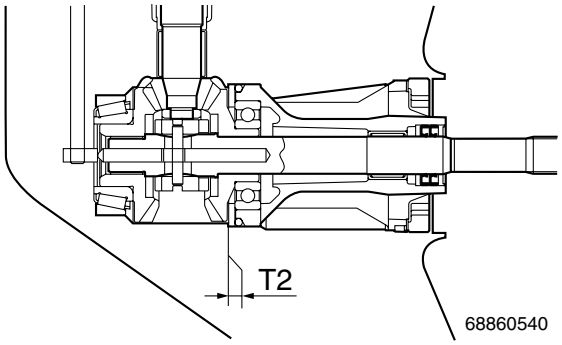
Available shim thicknesses:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

Example:
If "T1" is 0.44 mm, then the forward gear shim is 0.42 mm.
If "T1" is 0.50 mm, then the forward gear shim is 0.48 mm.

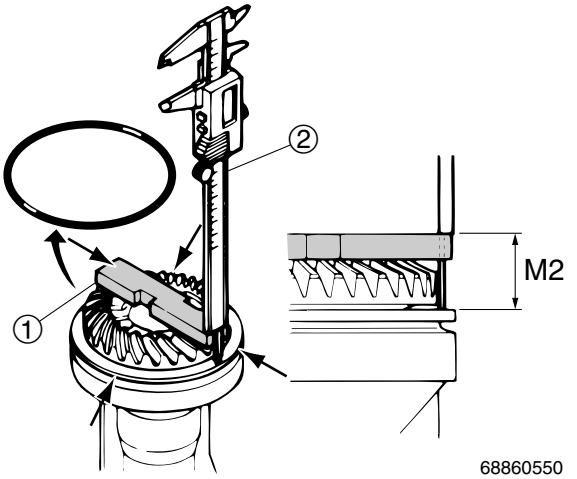
Selecting the reverse gear shim

1. Install the ball bearing to the propeller shaft housing.

2. Measure the propeller shaft housing height (M2) as shown.



68860540

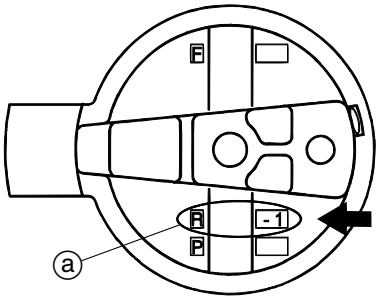


68860550

NOTE:
- Without the O-ring, when measuring the reverse gear height.
- Select the shim thickness (T2) by using the specified measurement(s) and the calculation formula.
- Measure the reverse gear at 4 points to find the height average.
- Make a note of each measurement numeral.

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

3. Calculate the reverse gear shim thickness (T2) as shown in the examples below.



69D60360

NOTE:

"R" is the deviation of the lower case dimension from standard. The "R" mark ⓐ is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the "R" mark is unreadable, assume that "R" is zero and check the backlash when the unit is assembled.

Calculation formula:
Reverse gear shim thickness (T2) =
M2 – 26.00 – R/100

Example:
If "M2" is 26.60 mm and "R" is (–1), then
T2 = 26.60 mm – 26.00 mm – (–1)/100
= 26.60 – 26.00 + 0.01
= 0.61 mm

4. Select the reverse gear shim(s) (T2) as follows.

Calculated numeral at 1/100th place	Rounded numeral
1, 2	2
3, 4, 5	5
6, 7, 8	8
9, 10	10

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

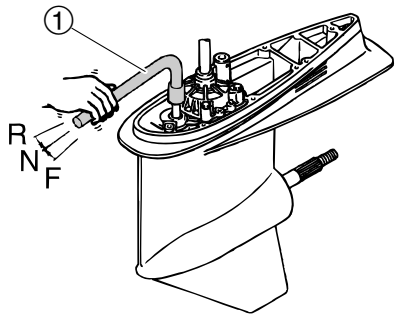
Example:
If "T2" is 0.47 mm, then the reverse gear shim is 0.48 mm.
If "T2" is 0.41 mm, then the reverse gear shim is 0.42 mm.

Backlash

Measuring the forward and reverse gear backlash

1. Remove the water pump assembly and oil seal housing.

2. Set the gear shift to "N" position.



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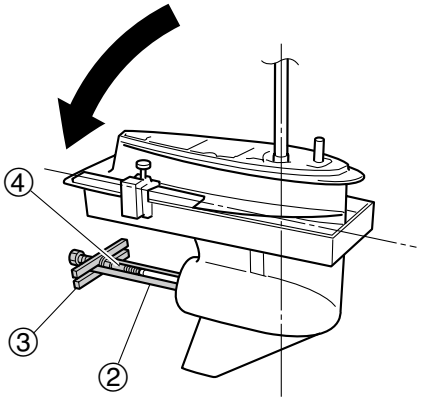
Shift rod push arm ①:
90890-06052

3. Install the special service tools so that it pushes against the propeller shaft, and then turn the lower unit 90° to the upside position.



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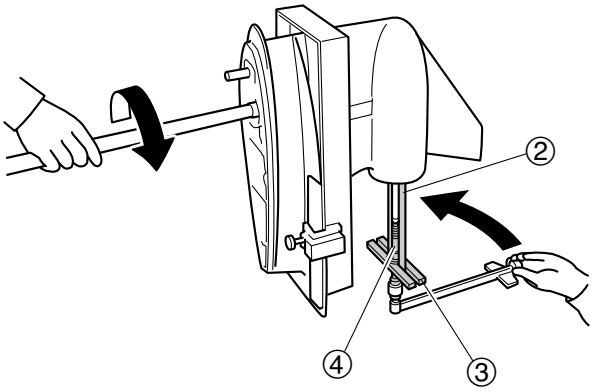

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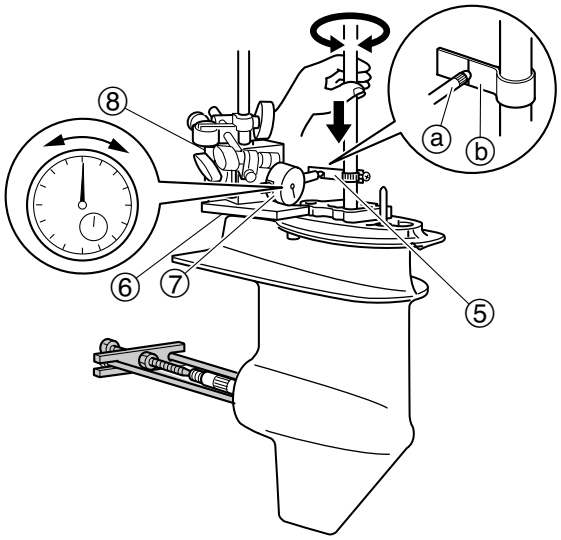
NOTE:
While turning the drive shaft clockwise 5–6 times so that the forward gear taper roller bearing is seated evenly, tighten the center bolt ④ to the specified torque.

Bearing housing puller claw L ②:
90890-06502
Stopper guide plate ③:
90890-06501
Center bolt ④:
90890-06504

Center bolt ④:
5 N·m (0.5 kgf·m, 3.7 ft·lb)

4. Install the backlash indicator onto the drive shaft (20.0 mm [0.79 in] in diameter), then install the dial gauge onto the lower unit as shown.



68860500

NOTE:
Install the dial gauge so that the plunger ⓐ comes in contact with the mark ⓑ on the backlash indicator.

Backlash indicator ⑤: 90890-06706
Magnet base plate ⑥: 90890-07003
Dial gauge set ⑦: 90890-01252
Magnet base B ⑧: 90890-06844

5. While pushing the drive shaft slightly, turn the drive shaft slowly clockwise and counterclockwise, then measure the backlash when the drive shaft stops in each direction.

Forward gear backlash:
0.08–0.25 mm (0.0032–0.0098 in)

6

6. Add or remove shim(s) if out of specification.

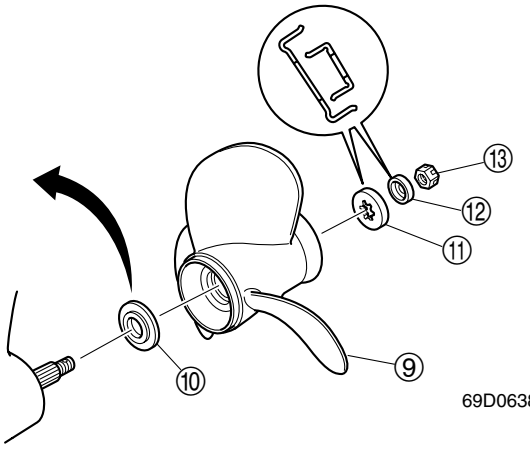
Forward gear backlash	Shim thickness
Less than 0.08 mm (0.0032 in)	To be decreased by (0.17 – M) × 0.60
More than 0.25 mm (0.0098 in)	To be increased by (M – 0.17) × 0.60

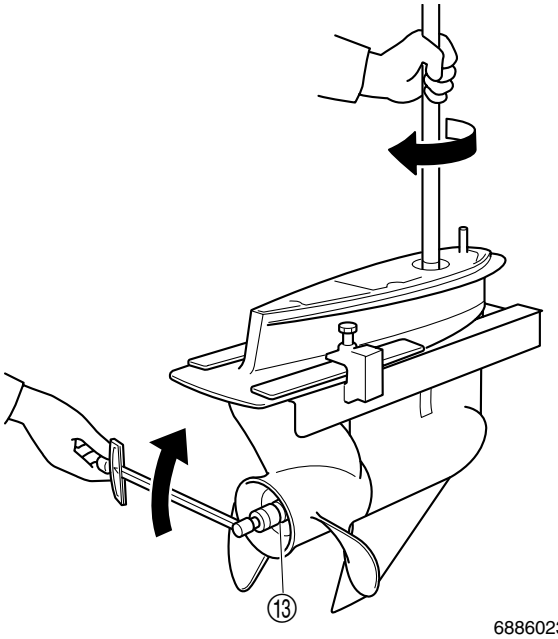
M: Measurement

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

7. Remove the special service tools from the propeller shaft and drive shaft.

8. Apply a load to the reverse gear by installing the propeller ⑨ without the spacer ⑩ , then install the spacer ⑪, spacer ⑫ and propeller nut ⑬ as shown.

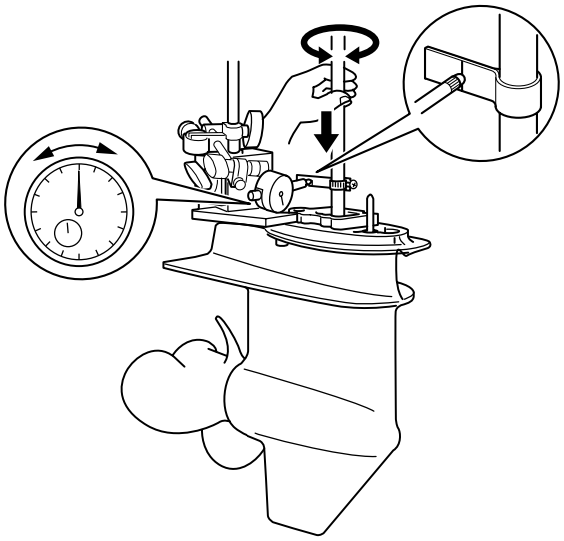




NOTE:
While turning the drive shaft clockwise 5–6 times, tighten the propeller nut ⑬ to the specified torque.

Propeller nut ⑬:
5 N·m (0.5 kgf·m, 3.7 ft·lb)

9. While pushing the drive shaft slightly, turn the drive shaft slowly clockwise and counterclockwise, then measure the backlash when the drive shaft stops in each direction.



68860520

Reverse gear backlash:
0.67–1.00 mm
(0.0264–0.0394 in)

10. Add or remove the shim(s) if out of specification.

Reverse gear backlash	Shim thickness
Less than 0.67 mm (0.0264 in)	To be increased by (0.84 – M) × 0.60
More than 1.00 mm (0.0394 in)	To be decreased by (M – 0.84) × 0.60

M: Measurement

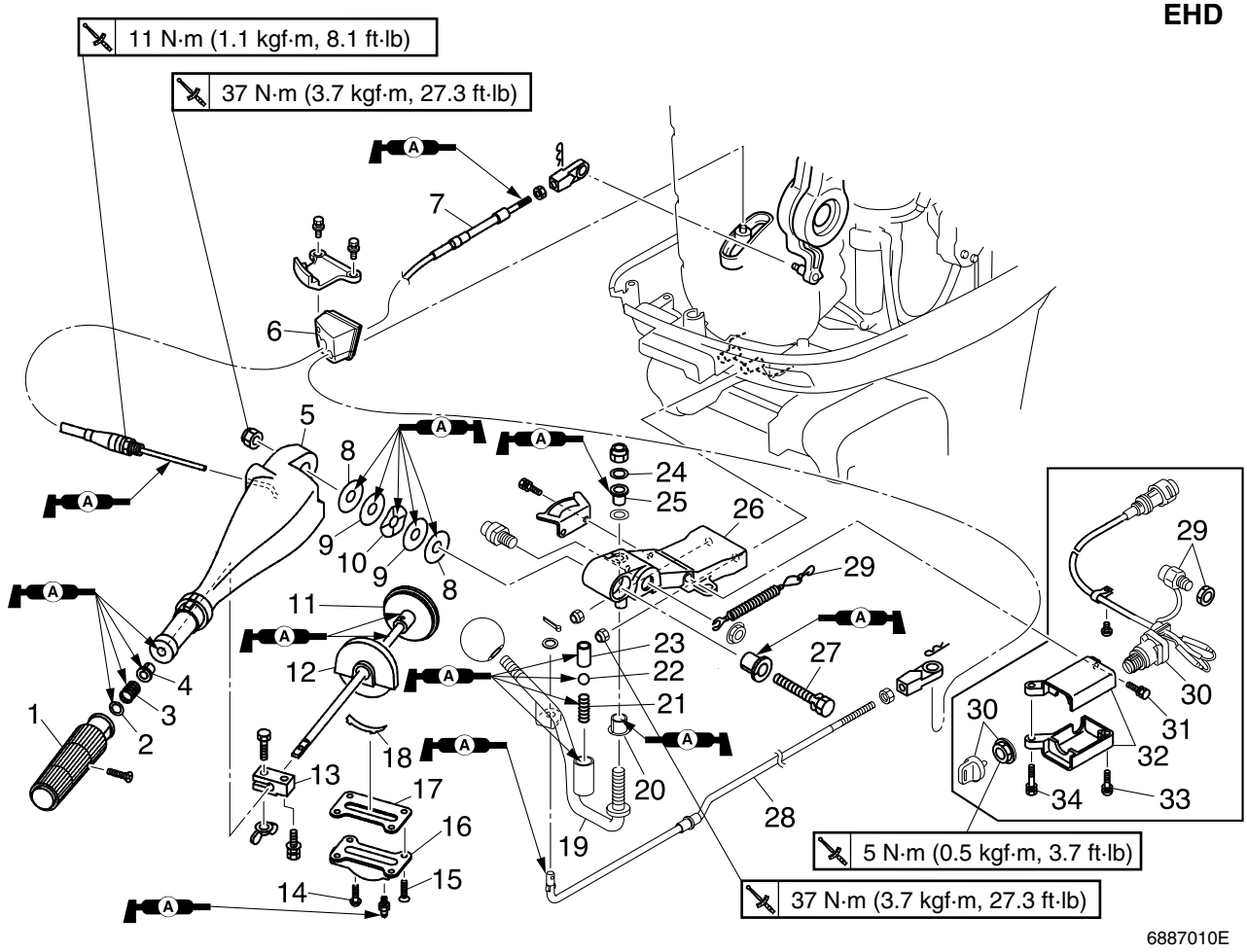
Available shim thicknesses:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

11. Remove the special service tools, and then install the water pump assembly.

Bracket unit

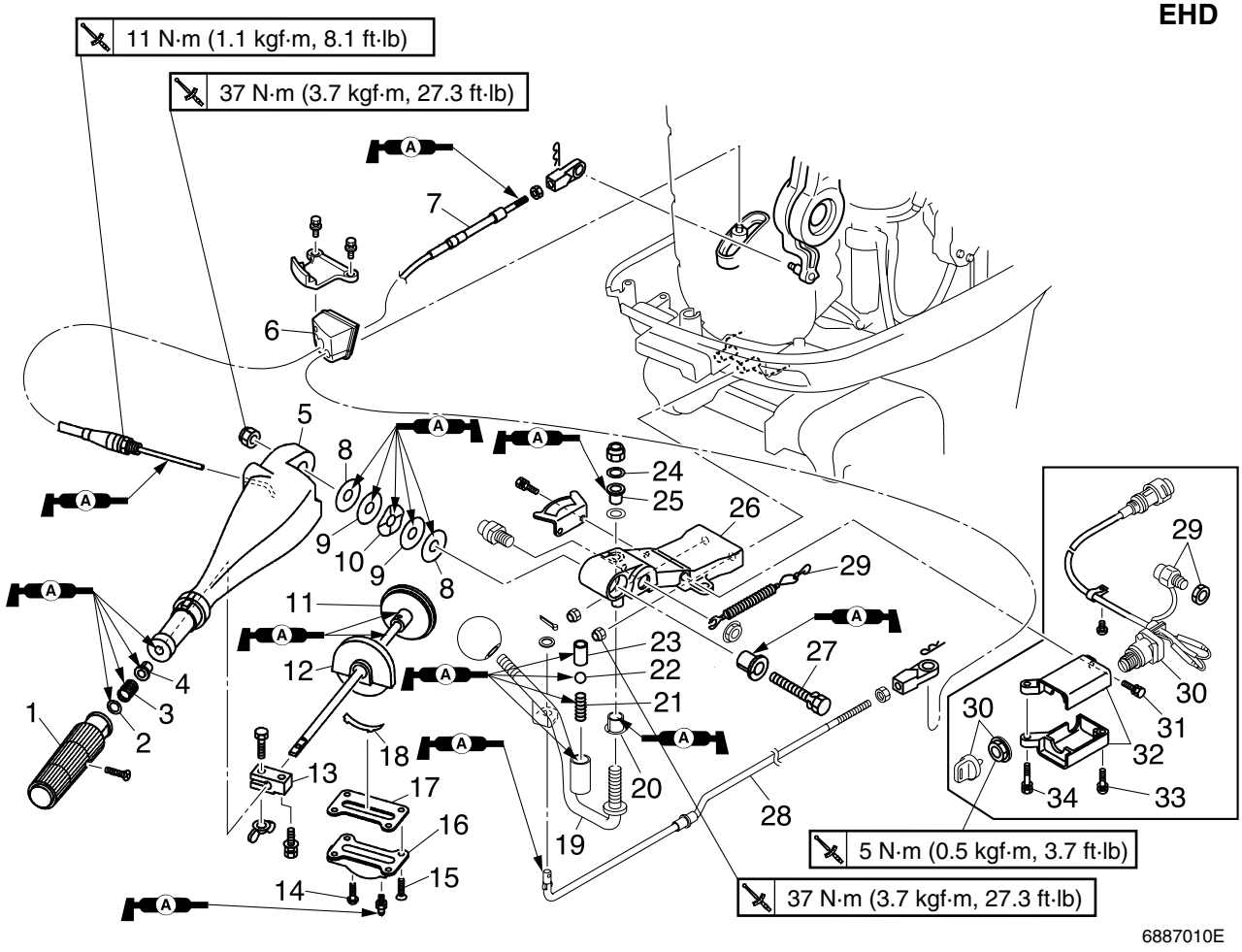
Tiller handle

EHD



No.	Part name	Q'ty	Remarks
1	Throttle grip	1	
2	Washer	1	
3	Spring	1	
4	Bushing	1	
5	Tiller handle	1	
6	Grommet	1	
7	Throttle cable	1	
8	Plastic washer	2	
9	Washer	2	
10	Wave washer	1	
11	Throttle shaft	1	
12	Housing	1	
13	Friction piece	1	
14	Screw	1	ø5 × 12 mm
15	Screw	4	ø5 × 8 mm
16	Cover	1	
17	Gasket	1	Not reusable

EHD



No.	Part name	Q'ty	Remarks
18	Plate	1	
19	Shift lever	1	
20	Bushing	1	
21	Spring	1	
22	Ball	1	
23	Collar	1	
24	Washer	1	
25	Bushing	1	
26	Bracket	1	
27	Bolt	1	M12 × 70 mm
28	Shift cable	1	
29	Engine stop lanyard switch	1	
30	Engine start switch	1	
31	Bolt	1	M6 × 20 mm
32	Switch holder	2	
33	Screw	1	ø6 × 24 mm
34	Bolt	1	M6 × 30 mm

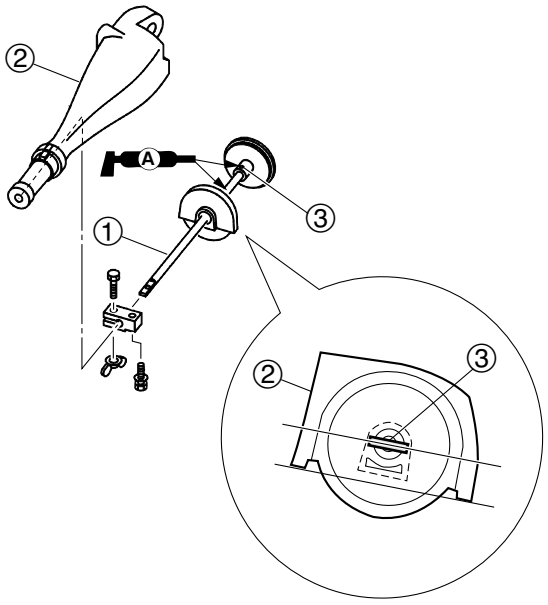
Checking the throttle cable and shift cable (EHD)

1. Check the throttle cable and shift cable for smooth operation.

2. Check the inner wire, outer wire of the throttle cable and shift cable. Replace if the outer wire is bent or damaged or the rubber seals are damaged.

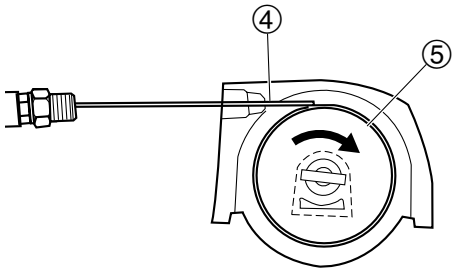
Assembling the tiller handle (EHD)

1. Install the throttle shaft ① into the tiller handle ② so that the pin ③ of the throttle shaft ① aligned with the mating surface of the tiller handle ② in horizontal position.



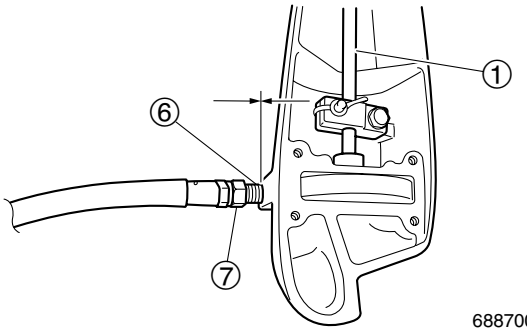
61U70470

2. Insert the throttle cable ④ into the gear ⑤ until the inner cable is winded with the gear.



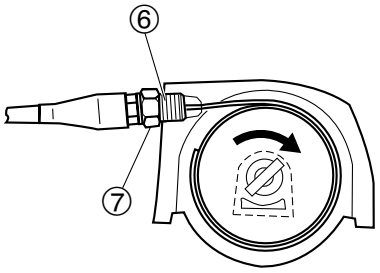
68870025

3. Turn the throttle shaft ① clockwise to wind the inner cable until the bolt ⑥ comes in contact with tiller handle.



68870010

4. Tighten the bolt ⑥ and lock nut ⑦.



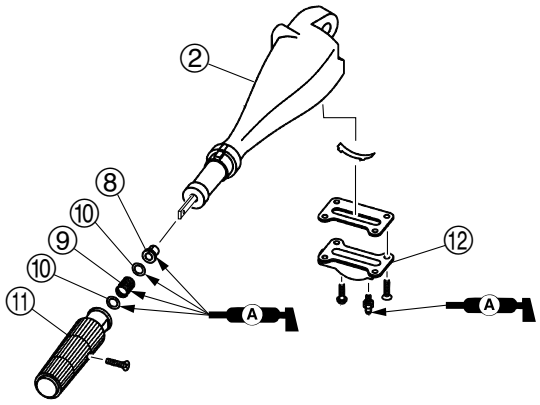
6887002A

NOTE:

Check that the fully closed mark of the indicator is aligned with the mark on the tiller handle.

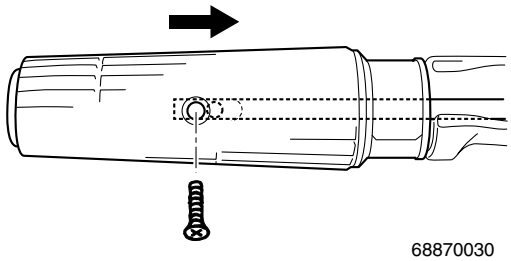
	Lock nut ⑦: 11 N·m (1.1 kgf·m, 8.1 ft·lb)

5. Install the bushing ⑧, spring ⑨, washer ⑩, throttle grip ⑪ and cover ⑫ into the tiller handle ②.



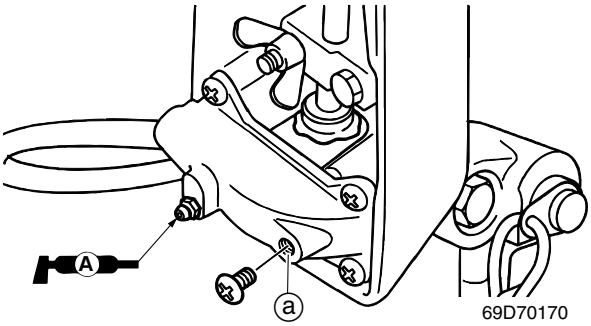
68870040

6. Push the throttle grip so that the throttle grip holes are aligned with the throttle shaft holes.



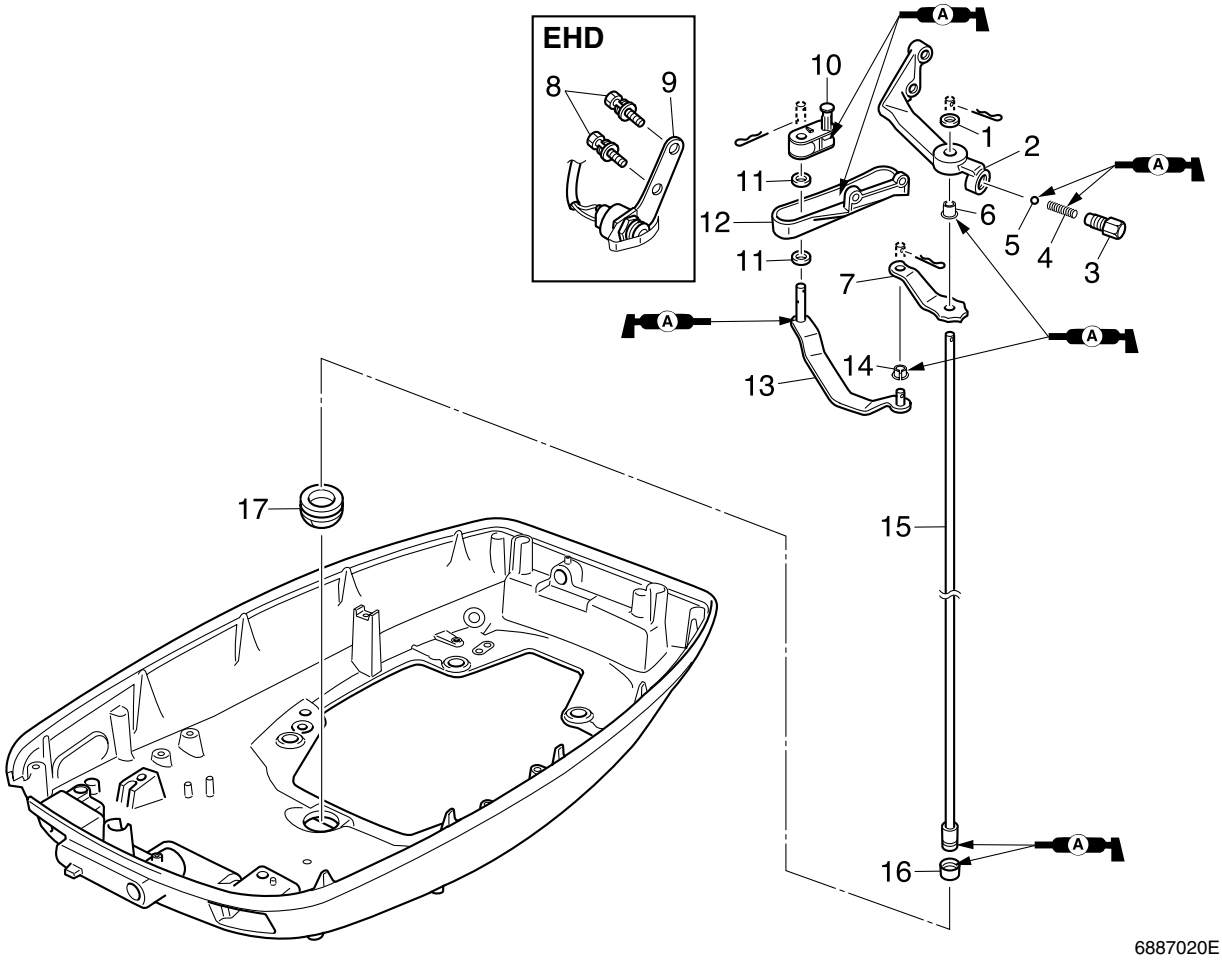
Lubricating the throttle gear (EHD)

1. Inject grease into the grease nipple until grease comes out from the screw hole ⓐ.

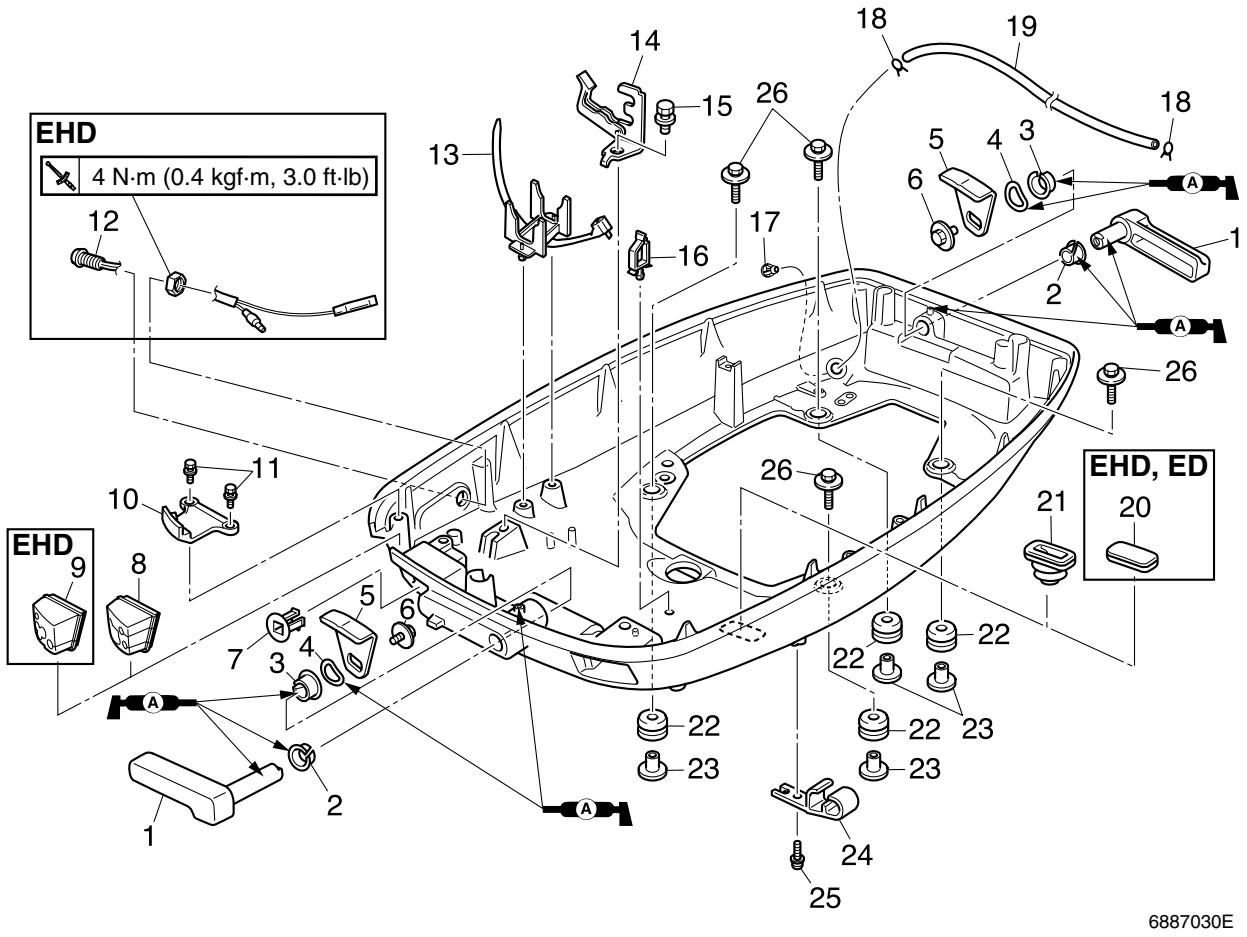


7

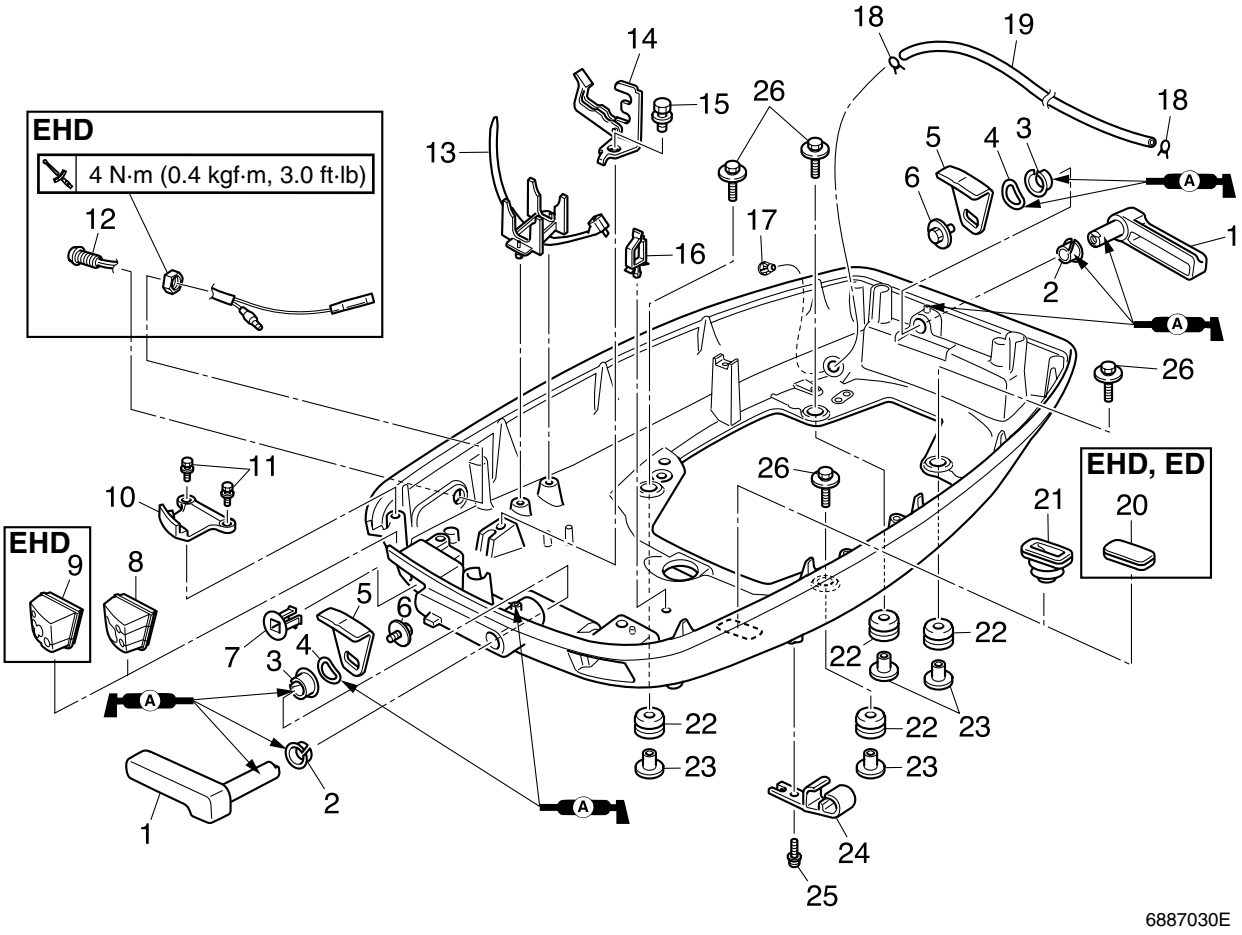
Bottom cowling



No.	Part name	Q'ty	Remarks
1	Washer	1	
2	Bracket	1	
3	Bolt	1	
4	Spring	1	
5	Ball	1	
6	Bushing	1	
7	Arm	1	
8	Bolt	2	M8 × 30 mm : EHD
9	Neutral switch assembly	1	EHD
10	Shift lever	1	
11	Washer	2	
12	Bracket	1	
13	Shift lever	1	
14	Bushing	1	
15	Shift rod	1	
16	Seal	1	
17	Grommet	1	

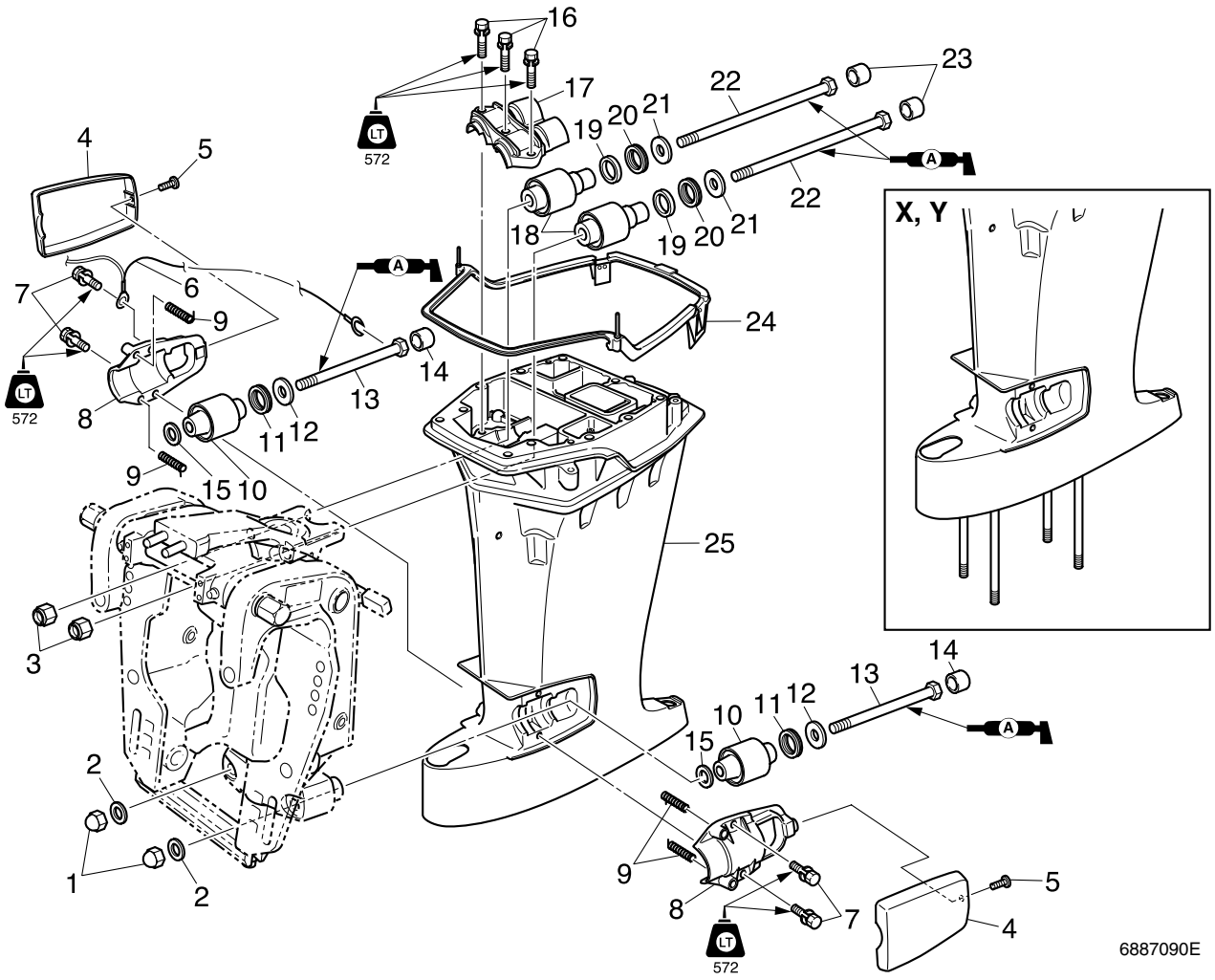


No.	Part name	Q'ty	Remarks
1	Lock lever	2	
2	Bushing	2	
3	Bushing	2	
4	Wave washer	2	
5	Clamp lever	2	
6	Bolt	2	M6 × 12 mm
7	Grommet	1	
8	Grommet	1	ED, ET
9	Grommet	1	EHD
10	Retaining plate	1	
11	Bolt	2	M6 × 16 mm
12	Warning indicator	1	EHD
13	Clamp	1	
14	Bracket	1	
15	Bolt	1	M6 × 16 mm
16	Clamp	1	ET
17	Cooling water pilot hole	1	

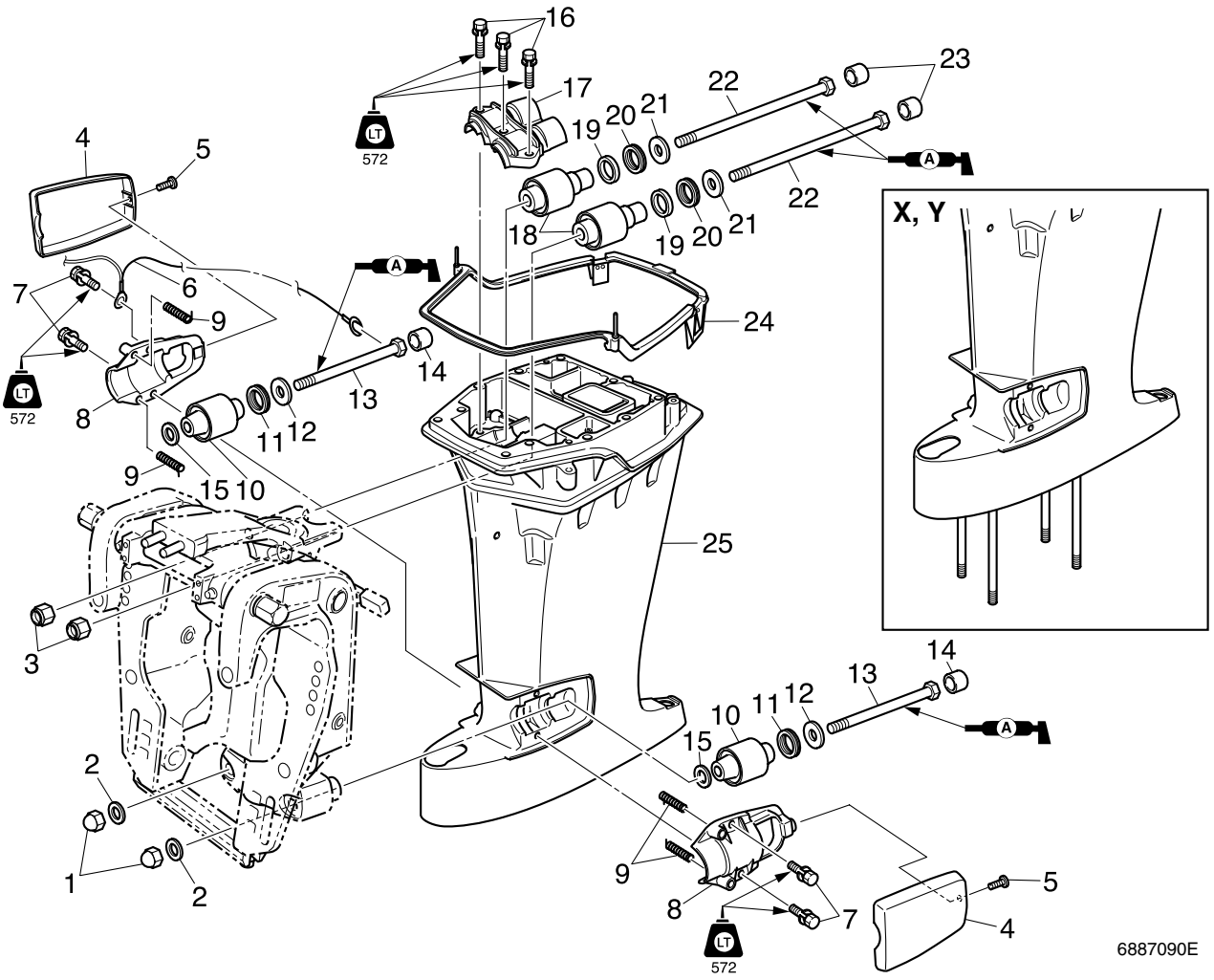


No.	Part name	Q'ty	Remarks
18	Clip	2	
19	Hose	1	
20	Grommet	1	EHD, ED
21	Grommet	1	
22	Grommet	4	
23	Collar	4	
24	Bracket	1	
25	Screw	1	ø6 × 20 mm
26	Bolt	4	M6 × 30 mm

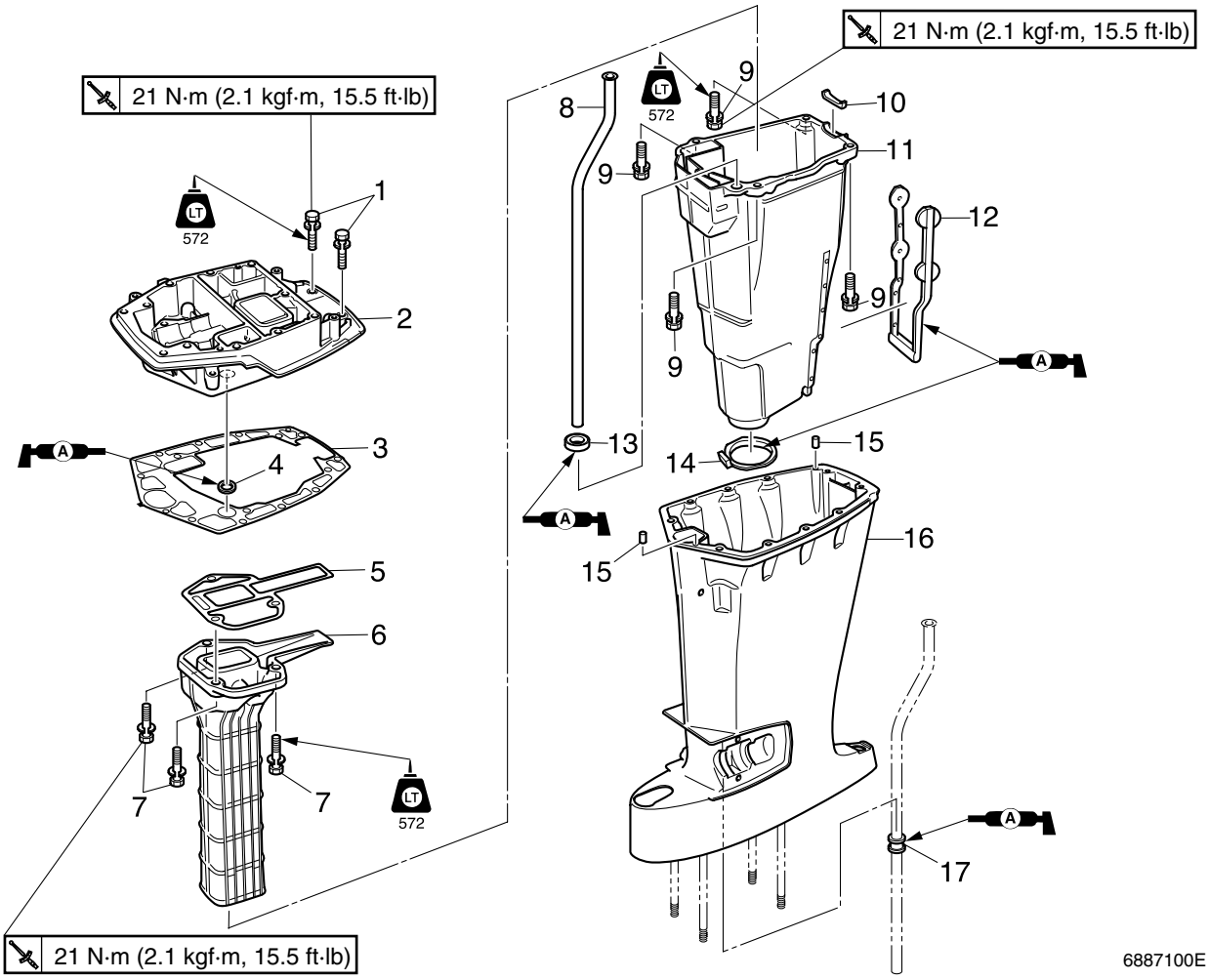
Upper case, steering arm



No.	Part name	Q'ty	Remarks
1	Nut	2	
2	Washer	2	
3	Nut	2	
4	Cover	2	
5	Screw	2	ø6 × 15 mm
6	Ground lead	1	
7	Bolt	4	M8 × 25 mm
8	Mount housing	2	
9	Spring	4	
10	Lower mount	2	
11	Rubber washer	2	
12	Washer	2	
13	Bolt	2	M12 × 160 mm
14	Damper	2	
15	Washer	2	
16	Bolt	3	M8 × 35 mm
17	Bracket	1	



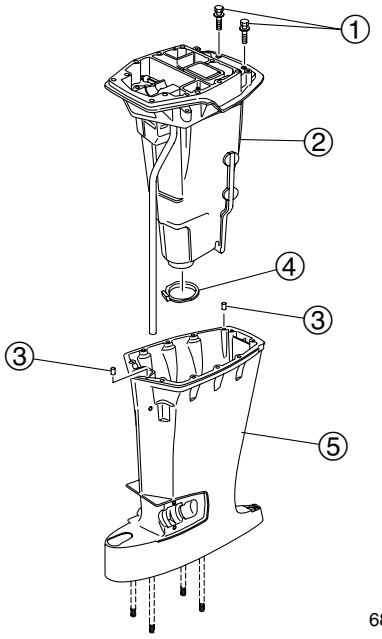
No.	Part name	Q'ty	Remarks
18	Upper mount	2	
19	Washer	2	
20	Rubber washer	2	
21	Washer	2	
22	Bolt	2	M10 × 175 mm
23	Damper	2	
24	Rubber seal	1	Not reusable
25	Upper case assembly	1	



No.	Part name	Q'ty	Remarks
1	Bolt	2	M8 × 30 mm
2	Exhaust guide	1	
3	Gasket	1	Not reusable
4	Collar	1	
5	Gasket	1	Not reusable
6	Exhaust manifold	1	
7	Bolt	3	M8 × 30 mm
8	Cooling water pipe	1	
9	Bolt	4	M8 × 30 mm
10	Rubber damper	1	
11	Muffler	1	
12	Rubber damper	1	
13	Rubber seal	1	
14	Rubber seal	1	Not reusable
15	Dowel	2	
16	Upper case	1	
17	Rubber seal	1	

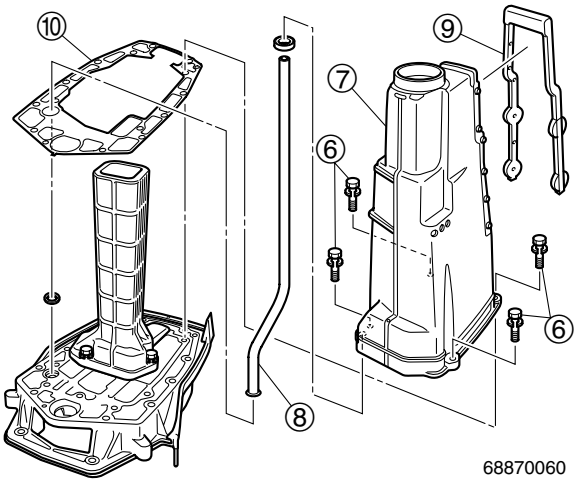
Disassembling the upper case

1. Remove the bolts ①, muffler assembly ②, dowels ③ and rubber seal ④ from the upper case ⑤.



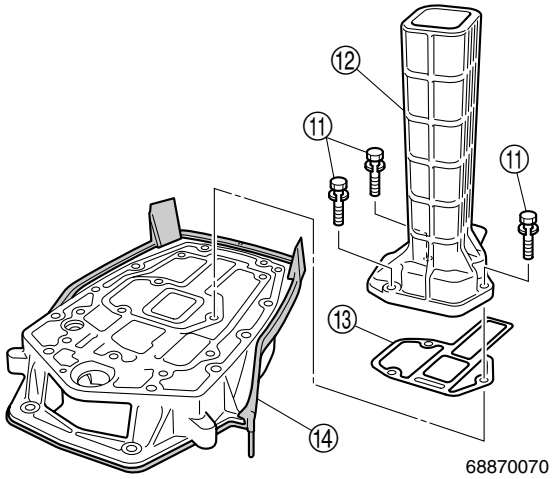
68870050

2. Remove the bolts ⑥, muffler ⑦, cooling water pipe ⑧, rubber damper ⑨ and gasket ⑩.



68870060

3. Remove the bolts ⑪, exhaust manifold ⑫, gasket ⑬ and rubber seal ⑭.



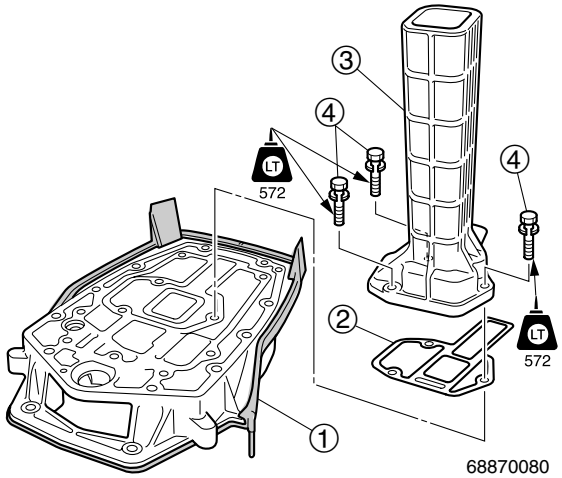
68870070

Checking the upper case

1. Check the rubber dampers. Replace the rubber dampers if deteriorated or cracked.
2. Check the cooling water pipe. Replace the cooling water pipe if deformed or corroded.
3. Check the exhaust guide, exhaust manifold, and muffler. Replace them if deformed or corroded.

Assembling the upper case

1. Install the new rubber seal ① new gasket ②, exhaust manifold ③, and bolts ④, and then tighten the bolts to the specified torque.



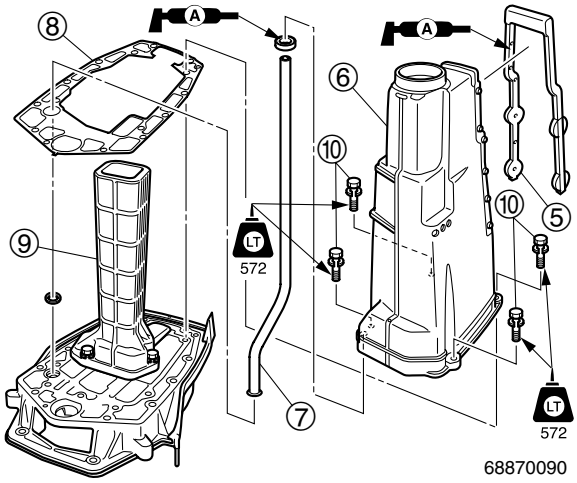
68870080

	Exhaust manifold bolt ④: 21 N·m (2.1 kgf·m, 15.5 ft·lb)

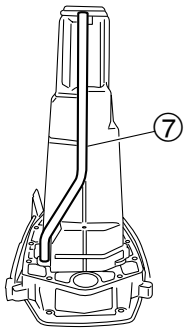
2. Install the rubber damper ⑤ onto the muffler ⑥.

3. Install the cooling water pipe ⑦ onto the muffler ⑥.

4. Install the new gasket ⑧, muffler ⑥ onto the exhaust guide assembly ⑨, and then tighten the bolts ⑩ to the specified torque.



68870090

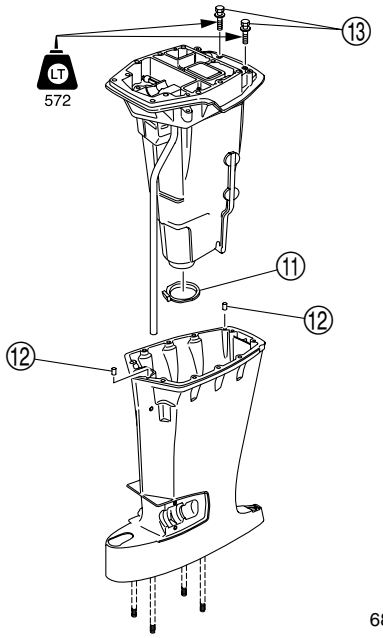


68870100

Muffler bolt ⑩:
21 N·m (2.1 kgf·m, 15.5 ft·lb)

5. Install a new rubber seal ⑪ and dowels ⑫ onto the muffler assembly.

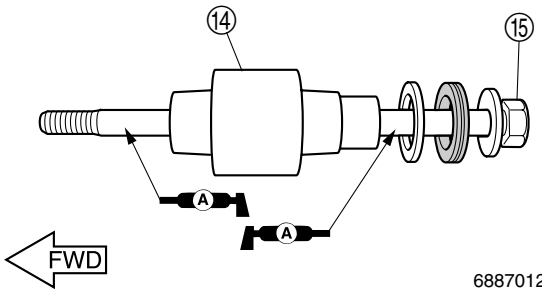
6. Tighten the bolts ⑬ to the specified torque.



68870110

Upper case bolt ⑬:
21 N·m (2.1 kgf·m, 15.5 ft·lb)

7. Install the upper mounts ⑭ and bolts ⑮ as shown below.



68870120

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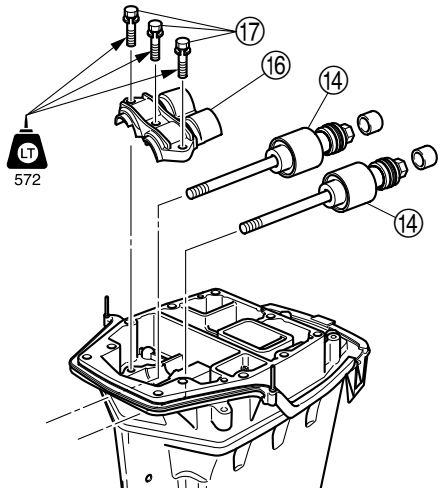
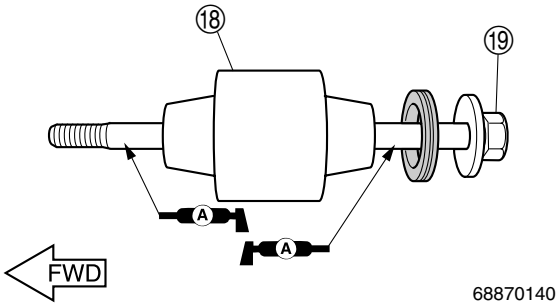
8. Install the upper mounts ⑭ and bracket ⑯ into the upper case assembly, and then tighten it with the bolts ⑰.

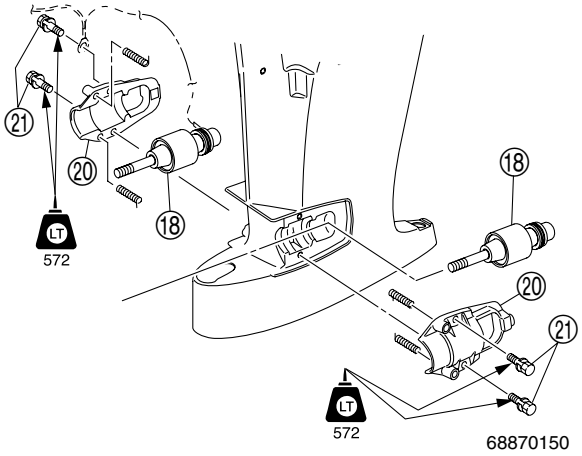


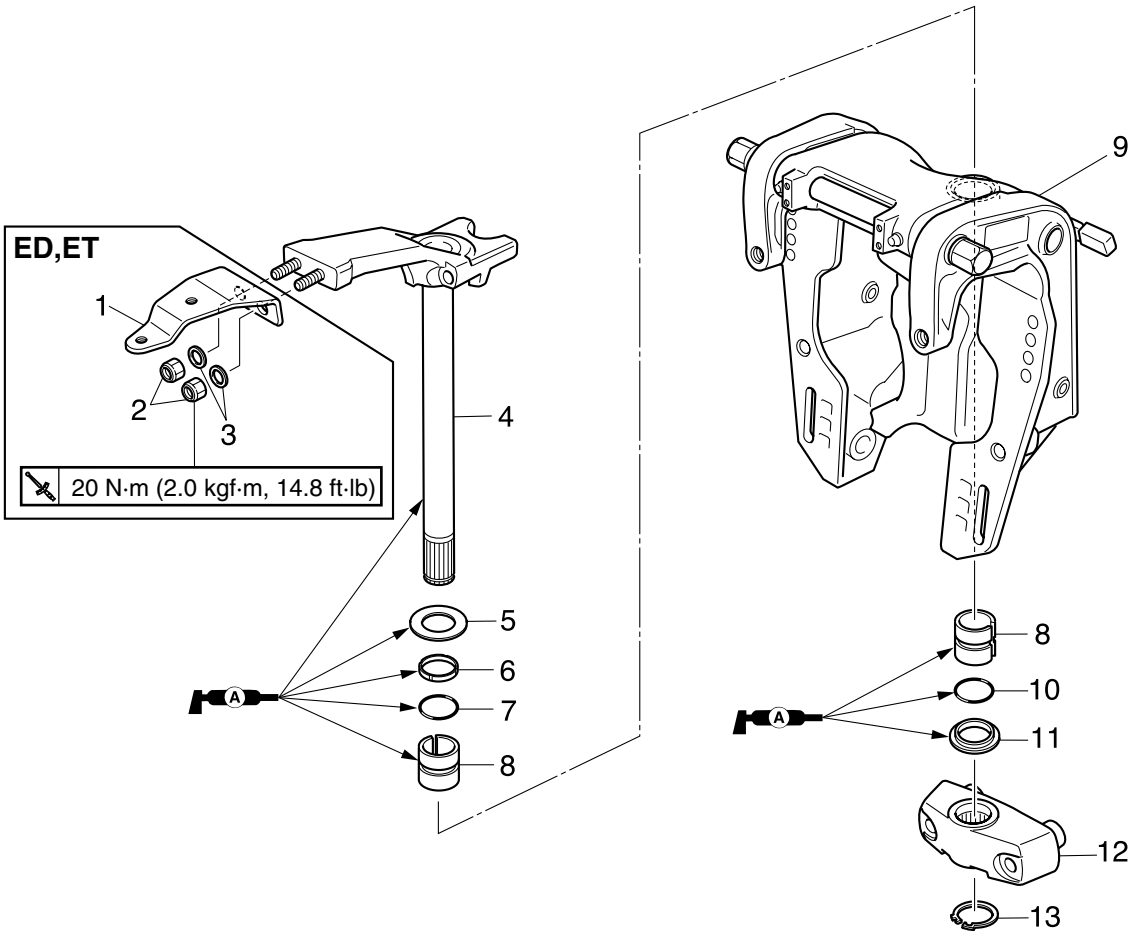
NOTE:
First tighten the center located bolt, when tightening the bolts ⑰.

9. Install the lower mounts ⑱ and bolts ⑲ as shown below.



10. Install the lower mounts ⑱ and mount housings ⑳, and then tighten the bolts ㉑ temporarily.

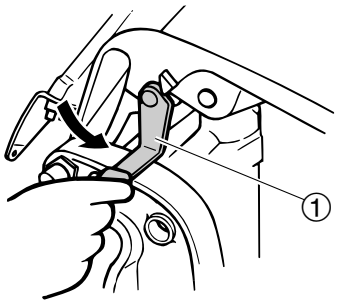




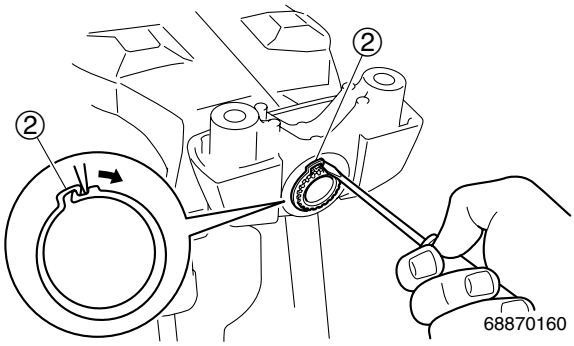
No.	Part name	Q'ty	Remarks
1	Steering hook	1	ED, ET
2	Nut	2	ED, ET
3	Washer	2	ED, ET
4	Steering arm	1	
5	Washer	1	
6	Bushing	1	
7	O-ring	1	Not reusable
8	Bushing	2	
9	Clamp bracket assembly	1	
10	O-ring	1	Not reusable
11	Washer	1	
12	Steering yoke	1	
13	Circlip	1	

Removing the steering arm

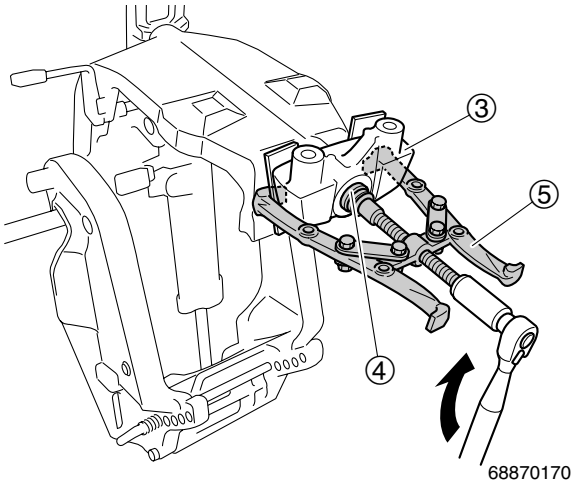
1. Fully tilt the swivel bracket up, and then support it with the tilt stop lever ①.



2. Remove the circlip ②.



3. Remove the steering yoke ③ as shown.



	Needle bearing attachment ④: 90890-06615 Gear puller ⑤: 90890-06540

4. Remove the washer, O-ring, bushing, steering arm, washer, bushing, O-ring, and bushing.

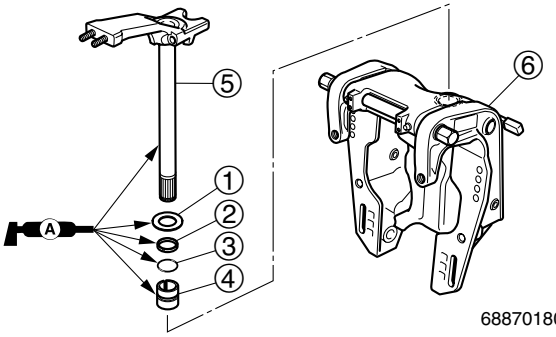
Checking the steering arm

1. Check the steering arm and steering yoke. Replace the steering arm and steering yoke if corroded, deformed or cracked.

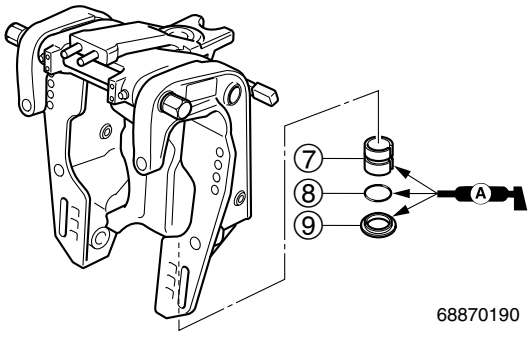
Installing the steering arm

1. Install the washer ①, bushing ②, new O-ring ③ and bushing ④ onto the steering arm ⑤.

2. Place the swivel bracket ⑥ in the upright position, and then install the steering arm ⑤ onto the swivel bracket ⑥.



3. Install the bushing ⑦, new O-ring ⑧ and washer ⑨ onto the bracket assembly.

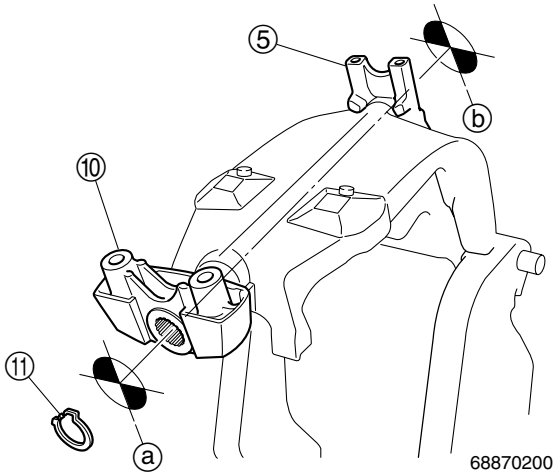


4. Fully tilt the swivel bracket up, and then support it with the tilt stop lever.

5. Install the steering yoke ⑩ to the steering arm ⑤ by aligning the center ⓐ of the steering yoke with the center ⓑ of the steering arm.

NOTE:
Hold the steering arm after tilt up the swivel bracket, and then strike the steering yoke until the circlip installing groove appears.

6. Install the circlip ⑪.



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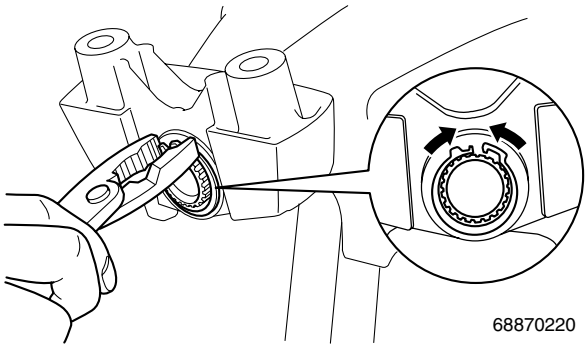
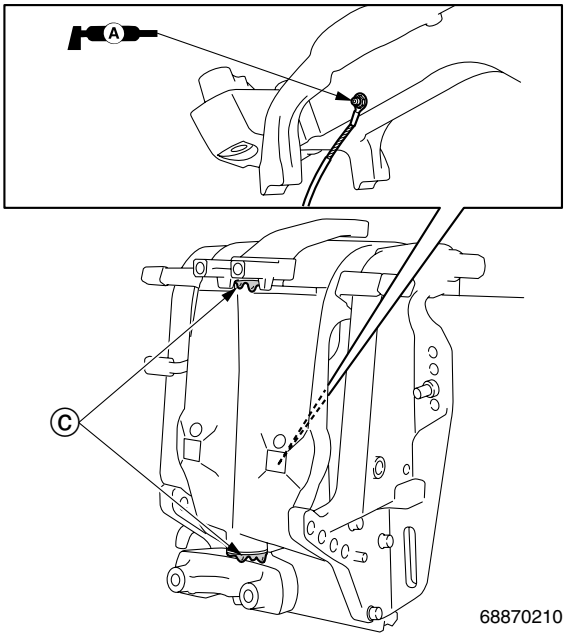

68870220

7. Inject grease into the grease nipple until grease comes out from both the upper and lower bushings ⓒ.



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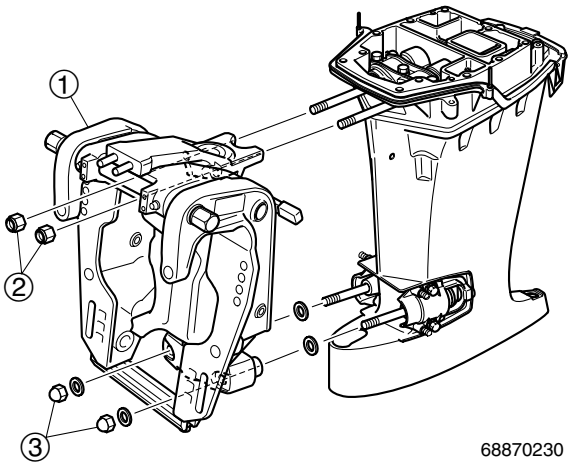
7

Installing the upper case

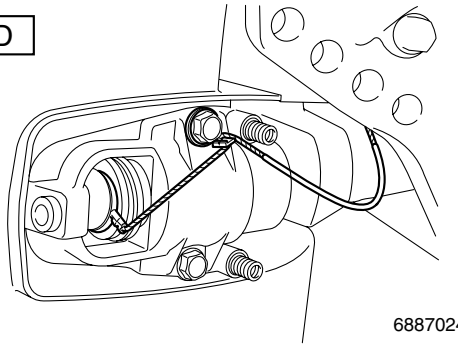
1. Install the upper and lower mount assembly into the bracket assembly ① simultaneously.

2. Install the upper mount nuts ② and lower mount nuts ③, and then tighten them.



68870230

STBD


68870240

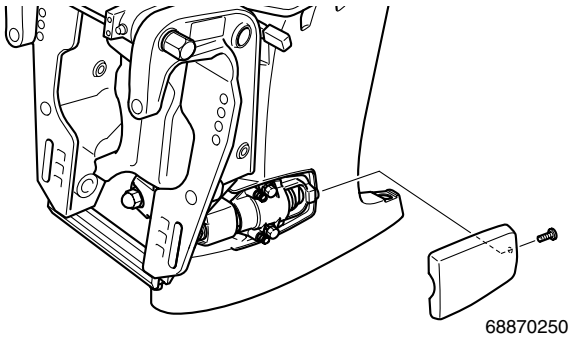
NOTE:

Before tightening the upper case, install the wiring of the ground lead.

CAUTION:

Do not over tighten the ground lead.

3. Install the covers.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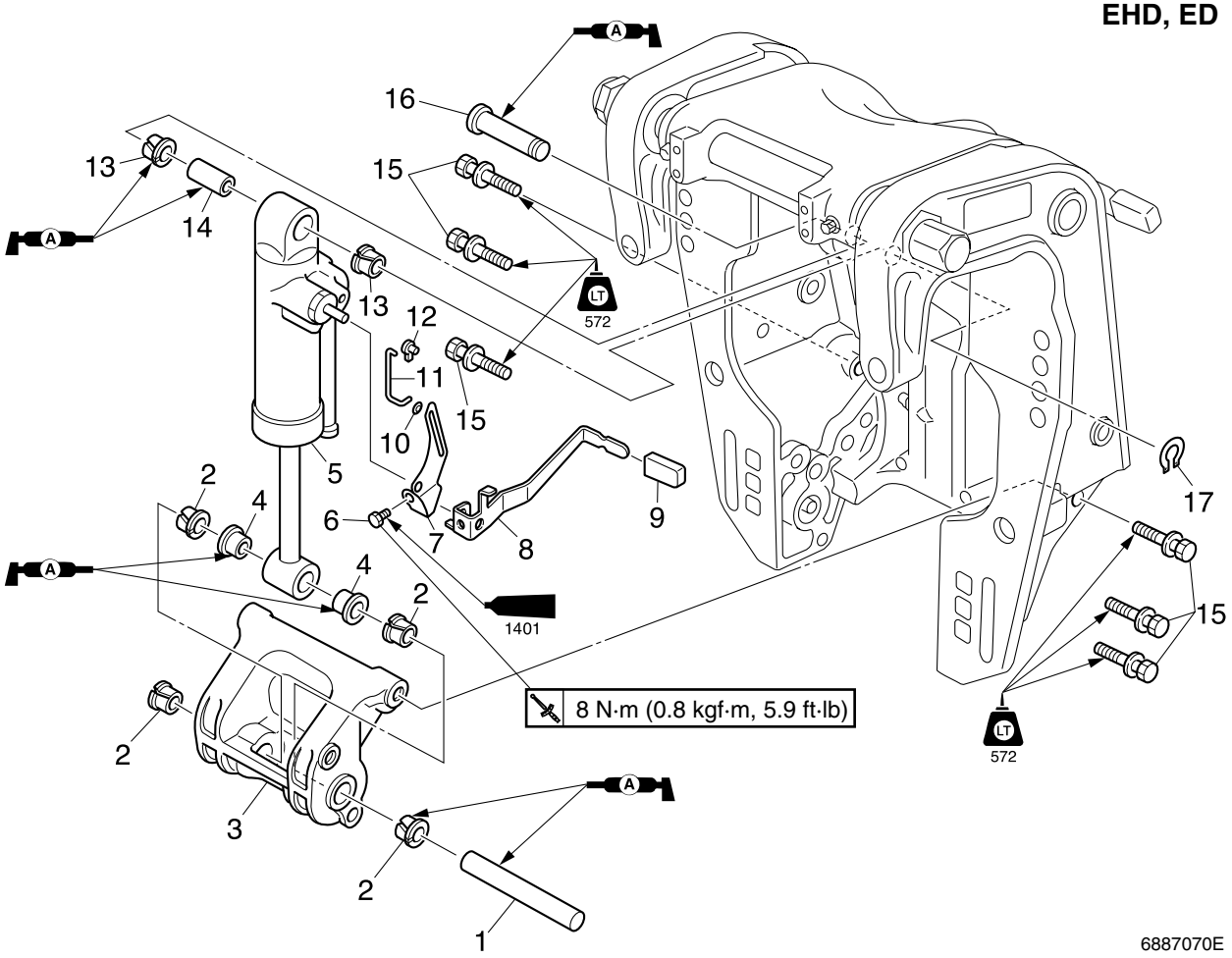
Clamp bracket and swivel bracket

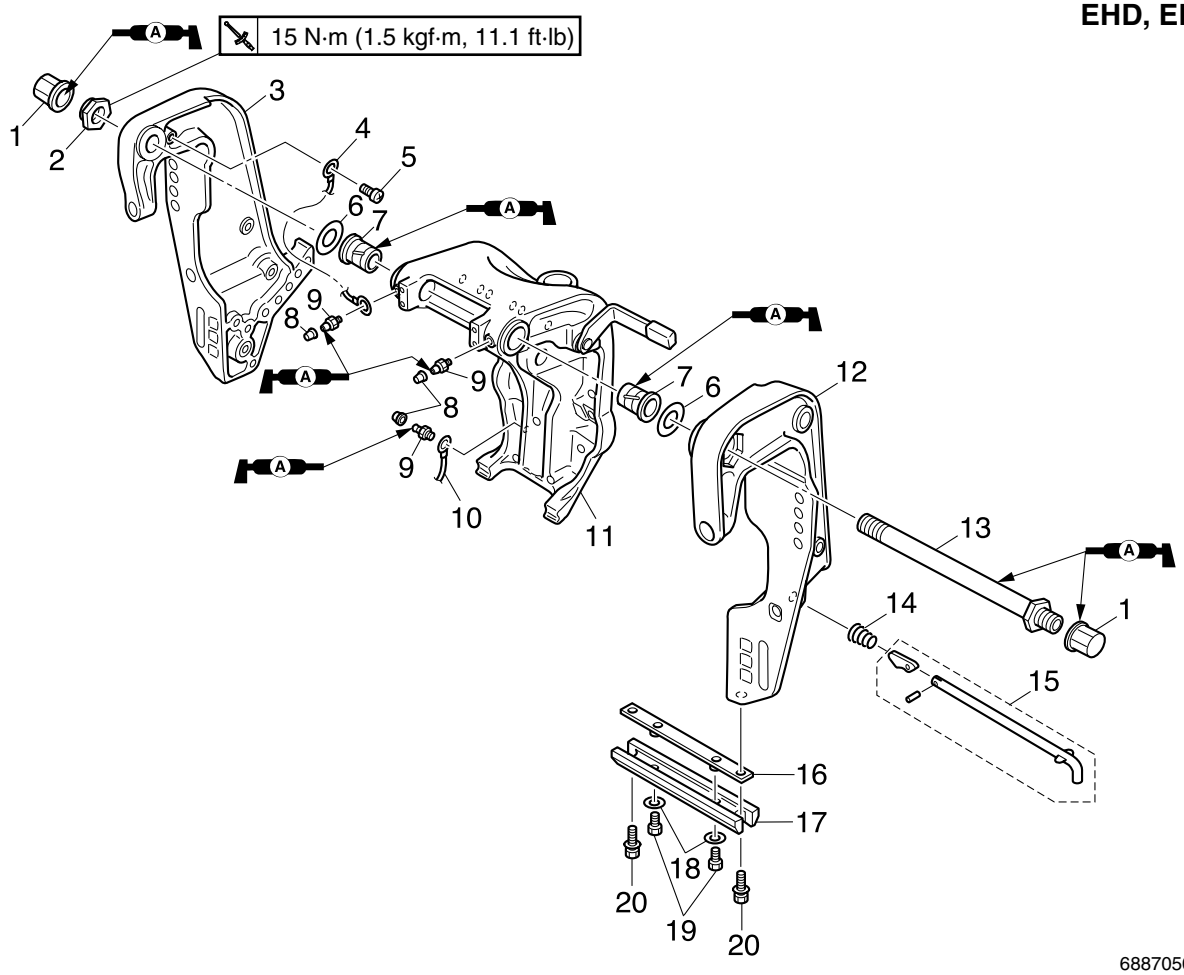
EHD, ED



No.	Part name	Q'ty	Remarks
1	Pin	1	
2	Bushing	4	
3	Bracket	1	
4	Bushing	2	
5	Shock absorber	1	
6	Bolt	1	M6 × 10 mm
7	Reverse lock lever	1	
8	Tilt lock lever	1	
9	Cap	1	
10	Washer	1	
11	Rod	1	
12	Joint	1	
13	Bushing	2	
14	Bushing	1	
15	Bolt	6	M10 × 45 mm
16	Pin	1	
17	Circlip	1	

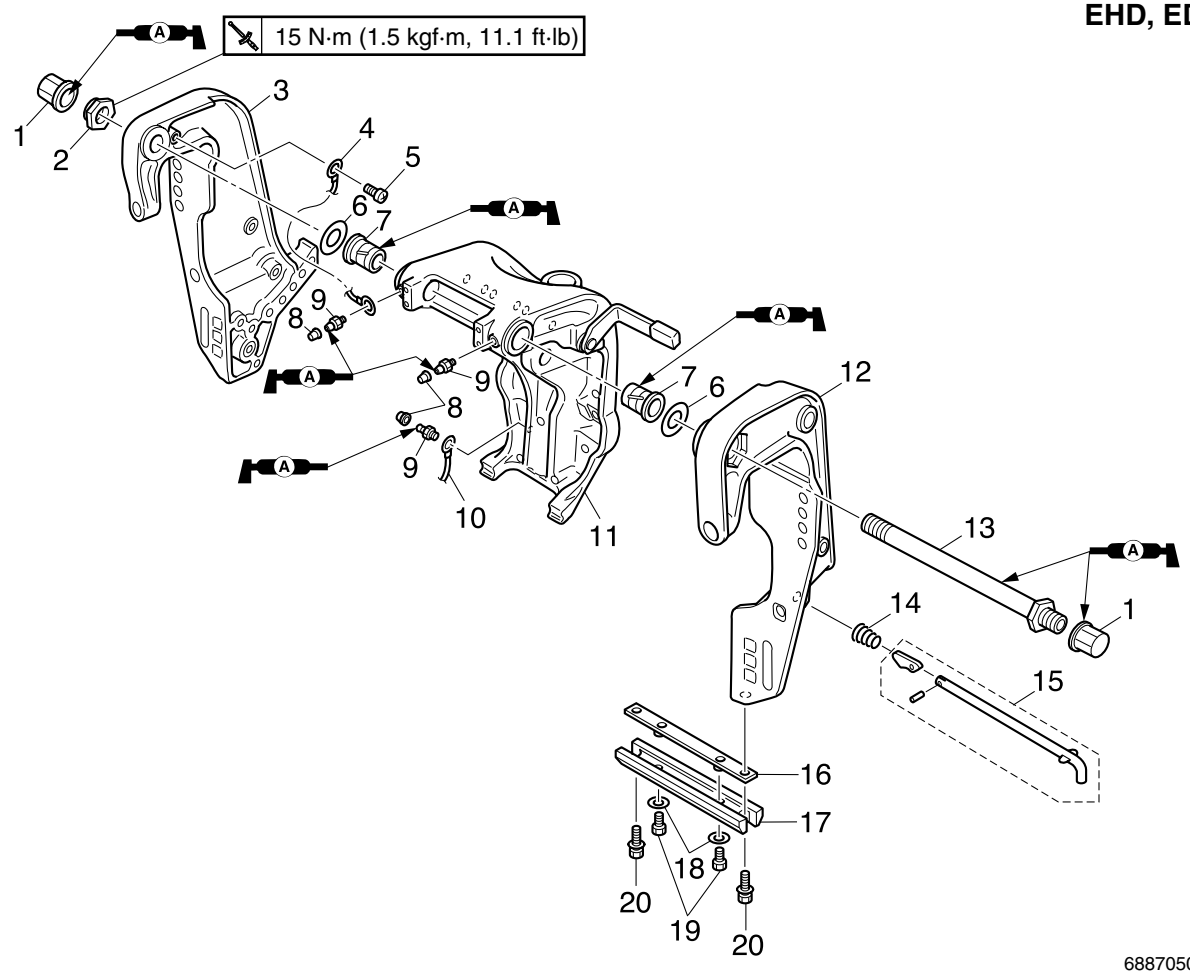
7

EHD, ED



No.	Part name	Q'ty	Remarks
1	Cap	2	
2	Self-locking nut	1	
3	Clamp bracket	1	
4	Ground lead	1	
5	Screw	1	ø6 × 12 mm
6	Washer	2	
7	Bushing	2	
8	Cap	3	
9	Grease nipple	3	
10	Ground lead	1	
11	Swivel bracket assembly	1	
12	Clamp bracket	1	
13	Through tube	1	
14	Spring	1	
15	Tilt pin	1	
16	Plate	1	
17	Anode	1	

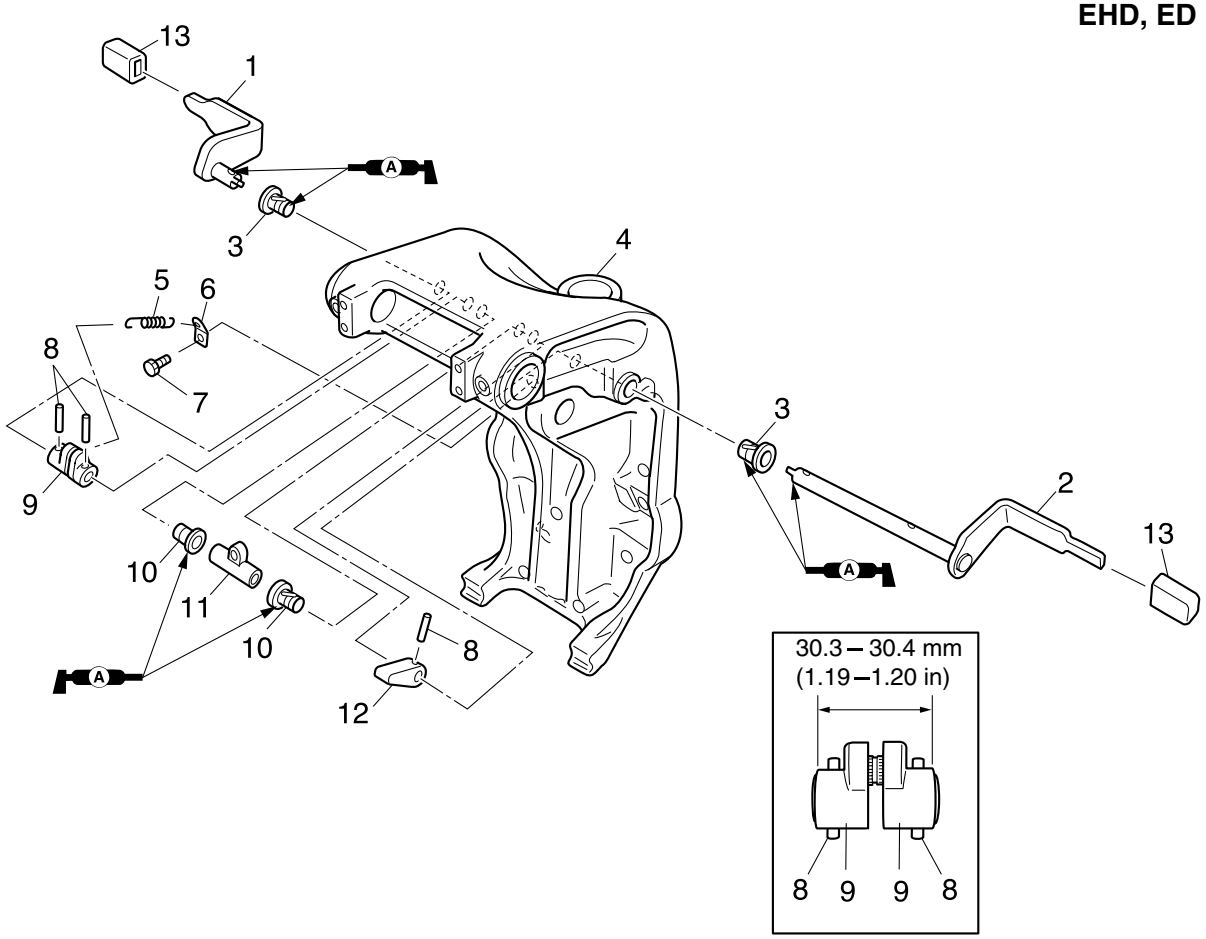
EHD, ED



No.	Part name	Q'ty	Remarks
18	Washer	2	
19	Bolt	2	M6 × 12 mm
20	Bolt	2	M6 × 16 mm

7

EHD, ED



6887040E

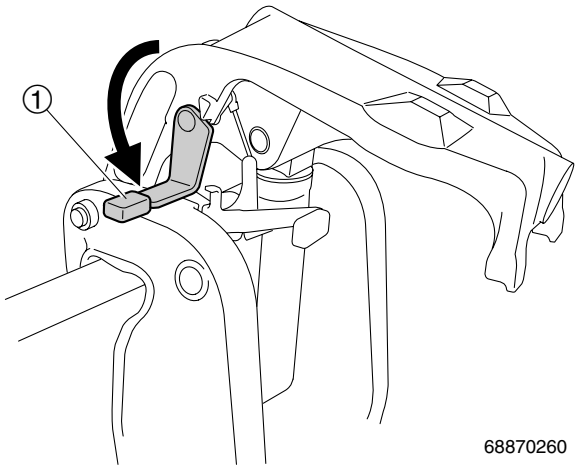
No.	Part name	Q'ty	Remarks
1	Tilt stop lever	1	
2	Tilt stop lever	1	
3	Bushing	2	
4	Swivel bracket	1	
5	Spring	1	
6	Plate	1	
7	Bolt	1	M6 × 10 mm
8	Pin	3	
9	Distance collar	1	
10	Bushing	2	
11	Collar	1	
12	Lever	1	
13	Cap	2	

Removing the clamp bracket (EHD, ED)

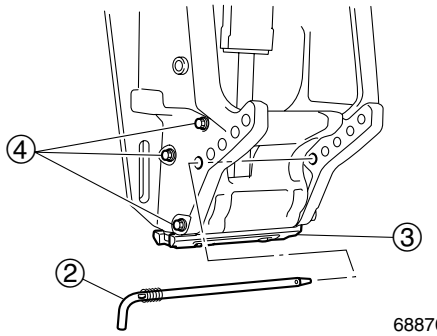
⚠WARNING

- **Be sure to tilt the outboard motor fully and support it with the tilt stop lever. It can not be tilted up partially. Otherwise the outboard motor could fall back down suddenly.**
- **Do not disassemble the shock absorber.**
- **Do not deform or damage the shock absorber. If the shock absorber is damaged, damping performance will suffer.**

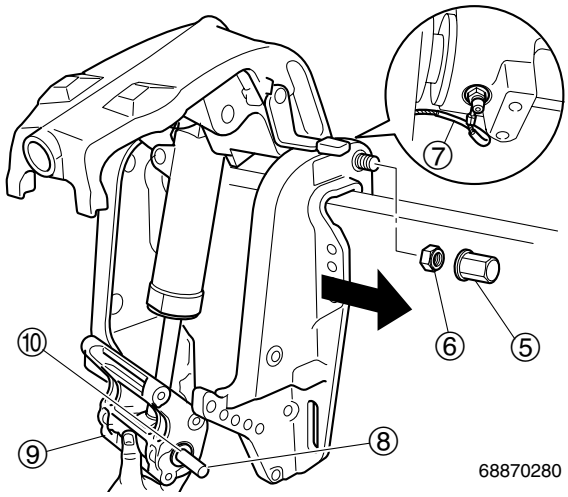
1. Fully tilt the outboard motor up, and then support it with the tilt stop lever ①.



2. Remove the tilt pin ②, anode ③, and shock absorber mount bolts ④.

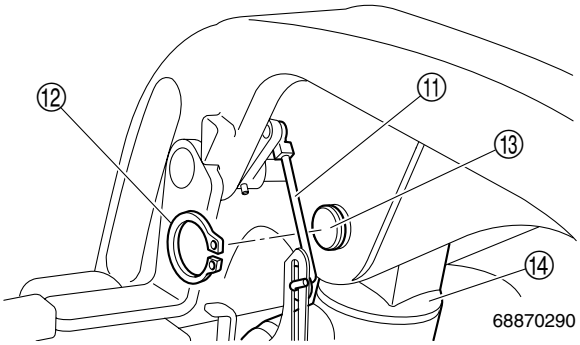


3. Remove the caps ⑤, self-locking nut ⑥ and then ground lead ⑦.



4. Remove the pin ⑧, bracket ⑨ and bushings ⑩.

5. Remove the rod ⑪, circlip ⑫, pin ⑬, and then remove the shock absorber ⑭.

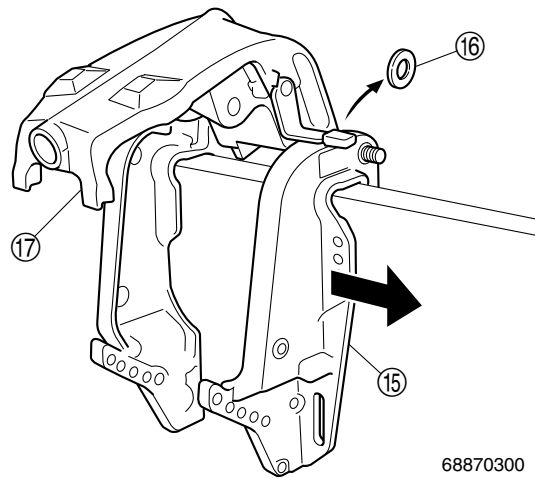


7

6. Remove the starboard clamp bracket ⑮ in the direction of the arrow shown in the illustration.

7. Remove the washer ⑯.

8. Remove the swivel bracket ⑰.

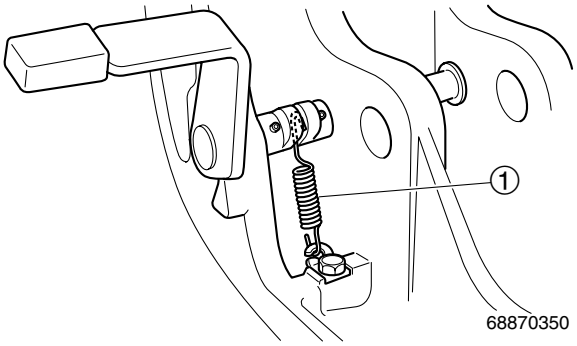


Checking the shock absorber

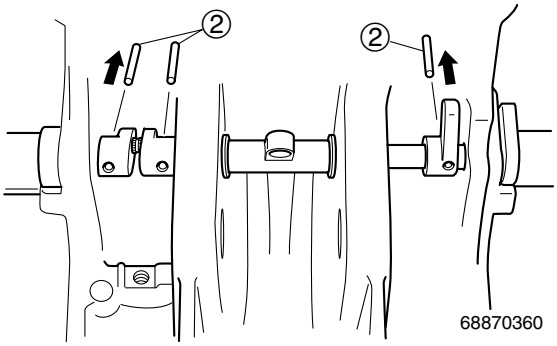
1. Check the shock absorber. Replace the shock absorber if damaged or corroded.

Disassembling the swivel bracket (EHD, ED)

1. Remove the spring ①.



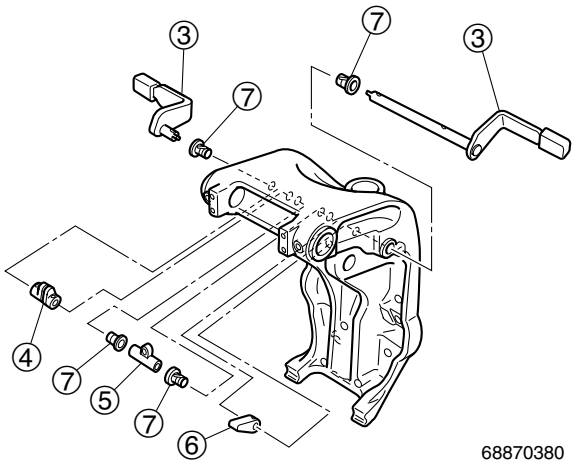
2. Remove the pins ②.



3. Remove the tilt stop levers ③.

4. Remove the distance collar ④, collar ⑤ and lever ⑥.

5. Remove the bushings ⑦.

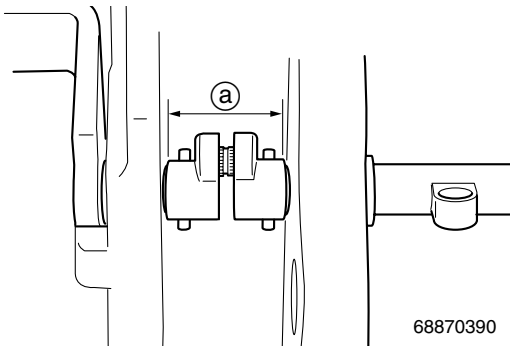


Checking the swivel bracket

1. Check the swivel bracket. Replace the swivel bracket if cracked or damaged.

2. Check the distance collar. Replace the distance collar if cracked or worn.

3. Check the distance collar assembled length. Adjust the distance collar assembled length if out of specification.



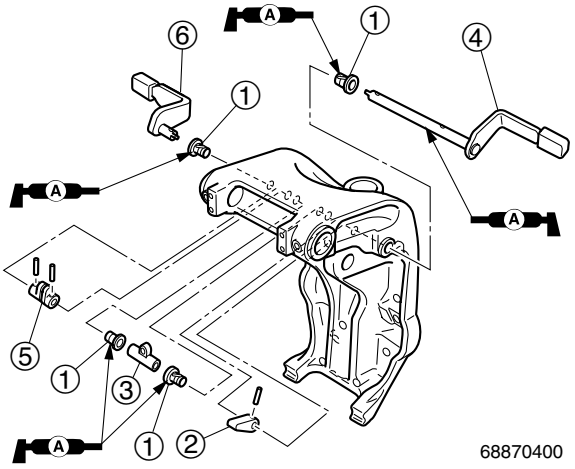
Distance collar assembled length ⓐ:
30.3–30.4 mm (1.19–1.20 in)

Assembling the swivel bracket (EHD, ED)

1. Install the bushings ① into the swivel bracket.

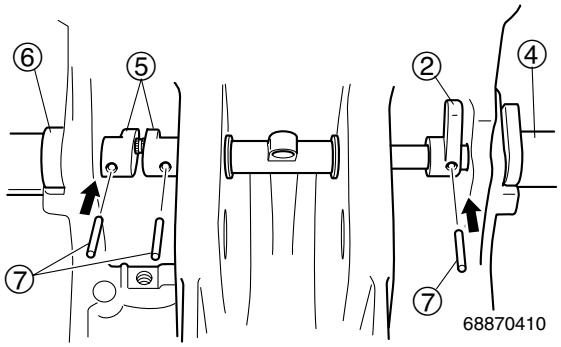
2. Install the lever ②, collar ③, and then install the tilt stop lever ④ as shown.

3. Install the distance collar ⑤ and tilt stop lever ⑥.

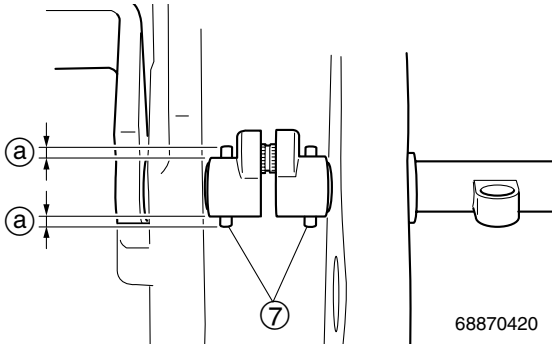


68870400

4. Align the holes of the distance collar ⑤ and lever ② with the holes of the tilt stop lever ④ and ⑥, then install the pin ⑦.



68870410

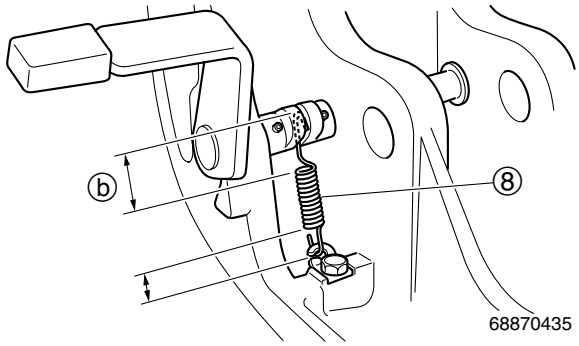


68870420

NOTE:

Install the pins ⑦ so that they extend equal distances ⓐ.

5. Install the spring ⑧ as shown.



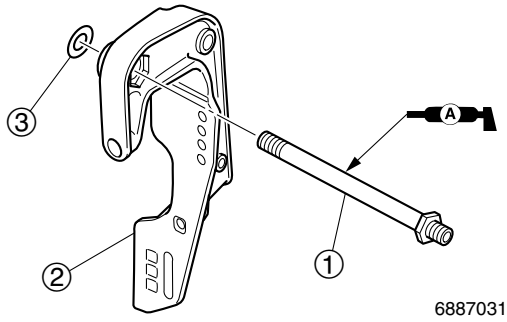
68870435

NOTE:

Install the spring on the longer length side ⓑ with the tilt stop lever side.

Assembling the clamp bracket (EHD, ED)

1. Pass the through tube ① into the clamp bracket ② and washer ③.

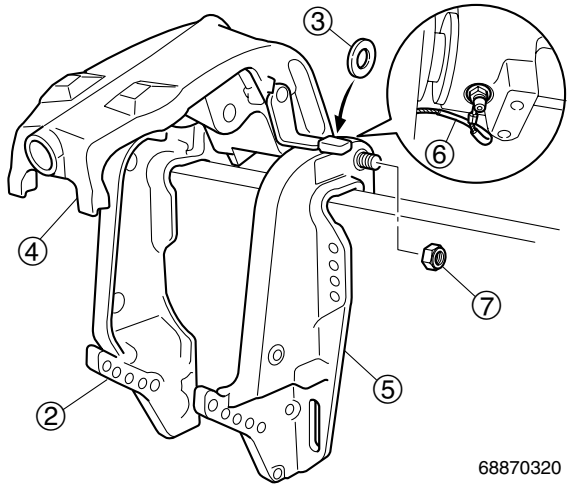


68870310

7

2. Install the swivel bracket ④ to the clamp bracket ②.

3. Install the washer ③, starboard clamp bracket ⑤ and ground lead ⑥.

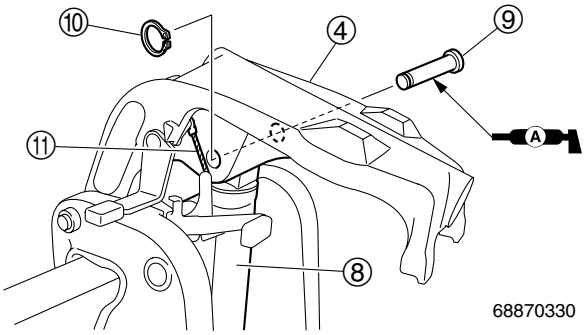


4. Fully tilt the swivel bracket up, and then support it with tilt stop lever.

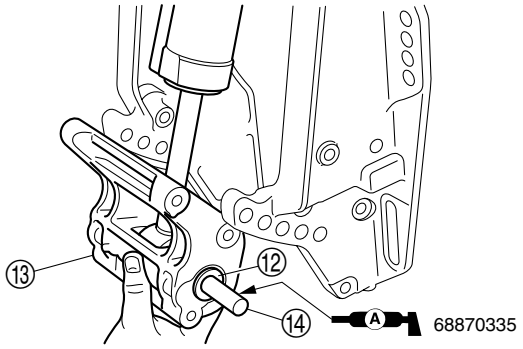
5. Tighten the self-locking nut ⑦ temporarily.

6. Install the shock absorber ⑧ into the swivel bracket ④.

7. Install the pin ⑨, circlip ⑩ and rod ⑪.



8. Install the bushings ⑫, bracket ⑬ and pin ⑭.



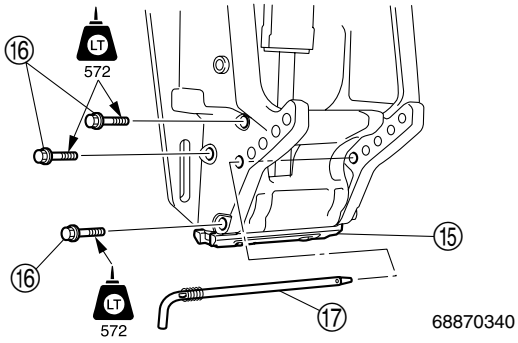
9. Install the anode ⑮ temporarily.

10. Tighten the shock absorber mount bolt ⑯ and anode ⑮.

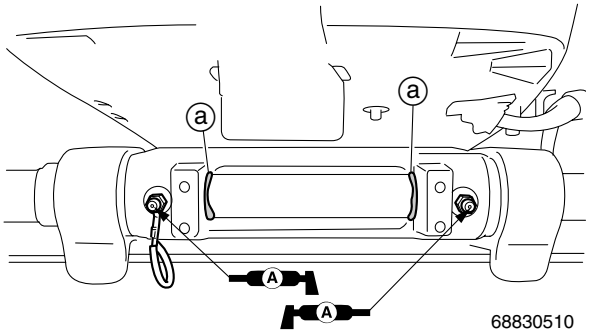
11. Tighten the self-locking nut to the specified torque.

	Self-locking nut ⑦: 15 N·m (1.5 kgf·m, 11.1 ft·lb)

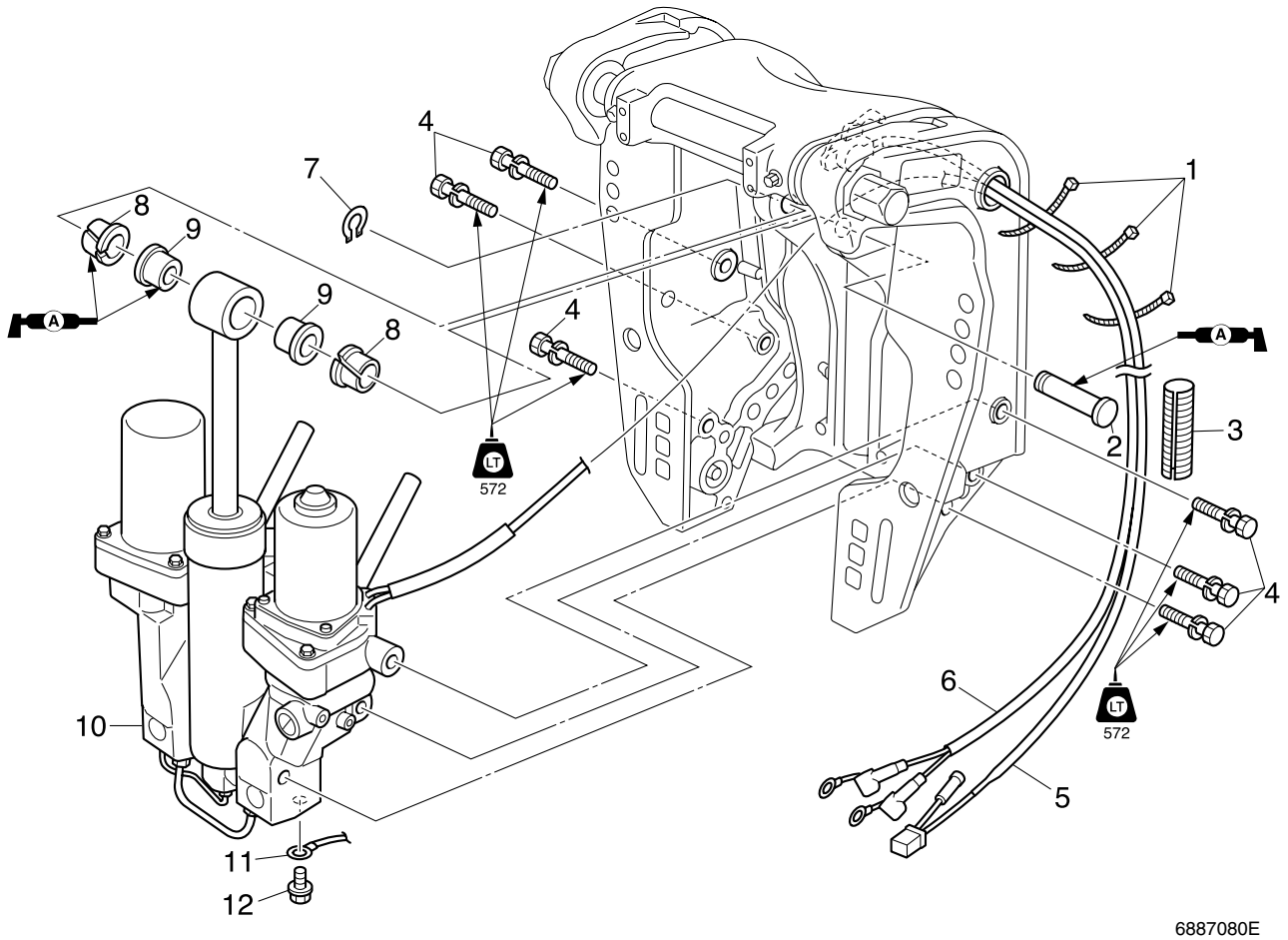
12. Install the tilt pin ⑰.



13. Inject grease into all grease nipples until grease comes out from the bushings ⓐ.



ET

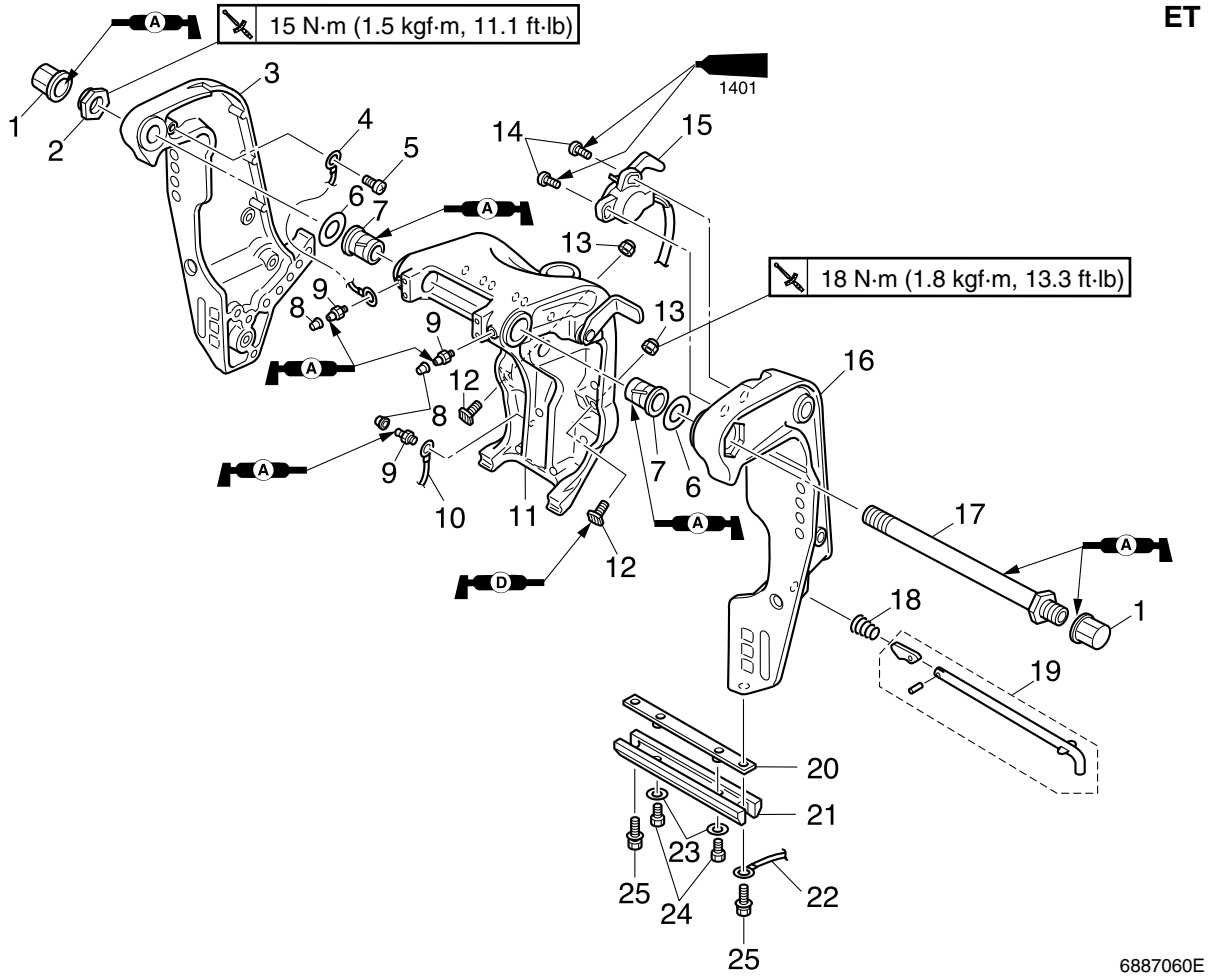


6887080E

No.	Part name	Q'ty	Remarks
1	Lock tie	3	Not reusable
2	Pin	1	
3	Tube	1	
4	Bolt	6	M10 × 45 mm
5	Trim sensor lead	1	
6	PTT motor lead	1	
7	Circlip	1	
8	Bushing	2	
9	Bushing	2	
10	PTT unit	1	
11	Ground lead	1	
12	Bolt	1	M6 × 10 mm

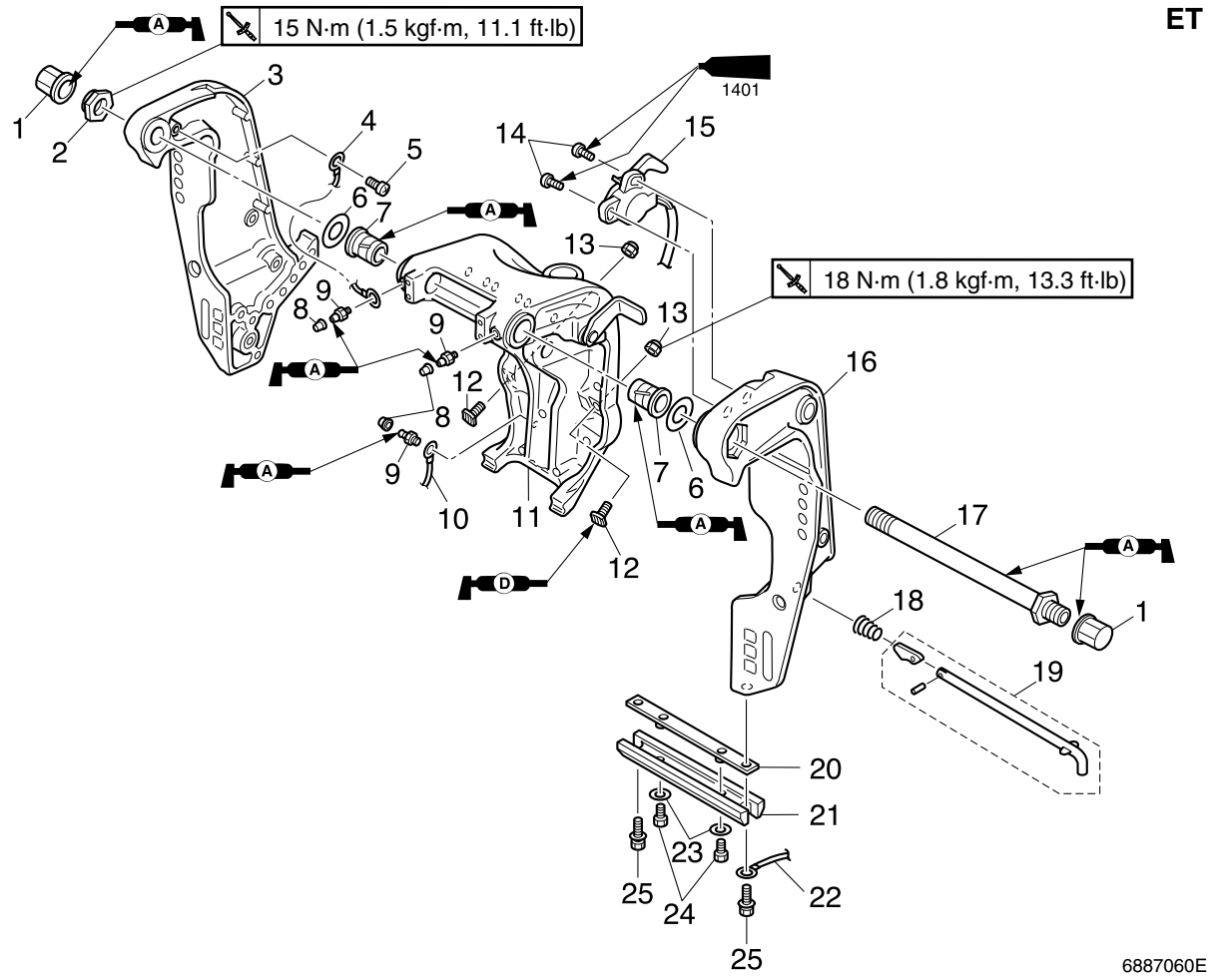
7

ET



No.	Part name	Q'ty	Remarks
1	Cap	2	
2	Self-locking nut	1	
3	Clamp bracket	1	
4	Ground lead	1	
5	Screw	1	ø6 × 12 mm
6	Washer	2	
7	Bushing	2	
8	Cap	3	
9	Grease nipple	3	
10	Ground lead	1	
11	Swivel bracket assembly	1	
12	Trim stopper	2	
13	Nut	2	
14	Screw	2	ø6 × 16 mm
15	Trim sensor	1	
16	Clamp bracket	1	
17	Through tube	1	

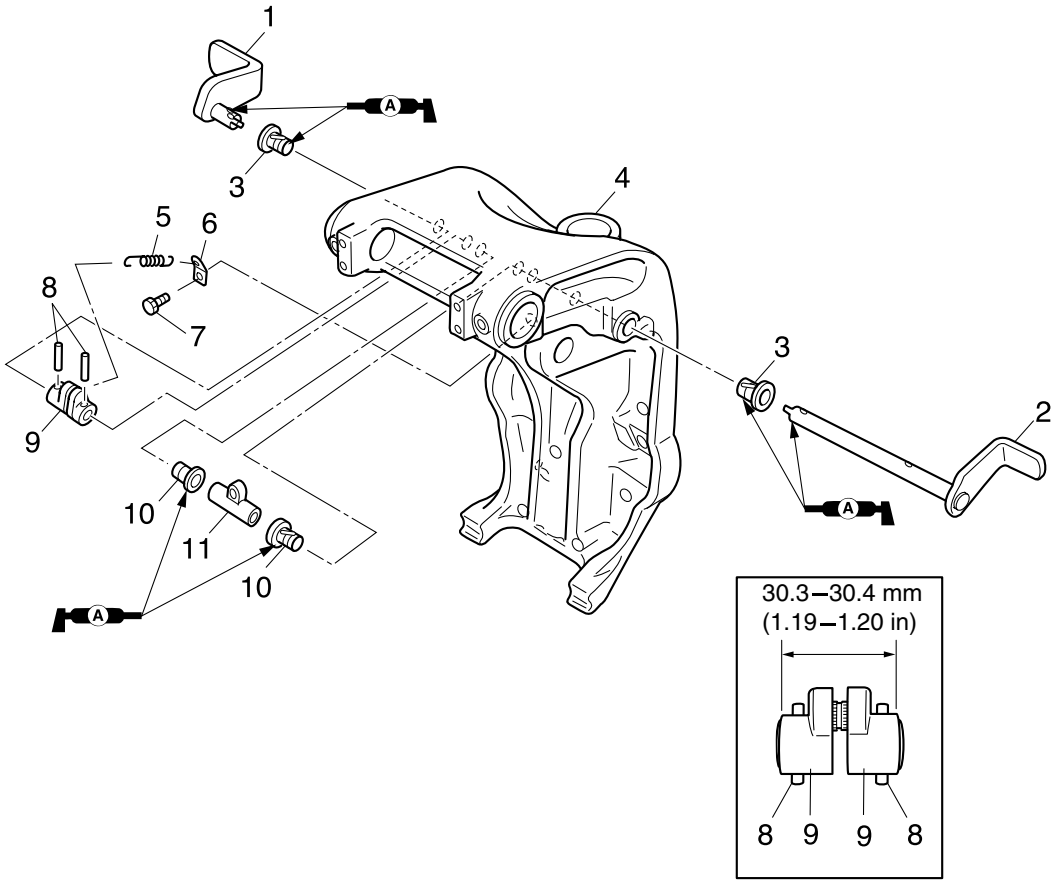
ET



No.	Part name	Q'ty	Remarks
18	Spring	1	
19	Tilt pin	1	
20	Plate	1	
21	Anode	1	
22	Ground lead	1	
23	Washer	2	
24	Bolt	2	M6 × 12 mm
25	Bolt	2	M6 × 16 mm

7

ET

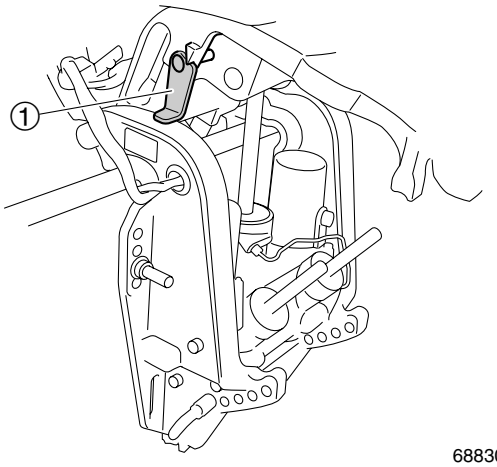


6887045E

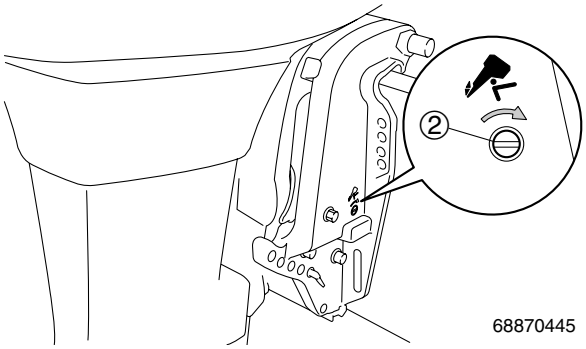
No.	Part name	Q'ty	Remarks
1	Tilt stop lever	1	
2	Tilt stop lever	1	
3	Bushing	2	
4	Swivel bracket	1	
5	Spring	1	
6	Plate	1	
7	Bolt	1	M6 × 10 mm
8	Pin	2	
9	Distance collar	1	
10	Bushing	2	
11	Collar	1	

Removing the PTT unit (ET)

1. Fully tilt the outboard motor up, and then support it with the tilt stop lever ①.



68830390



68870445

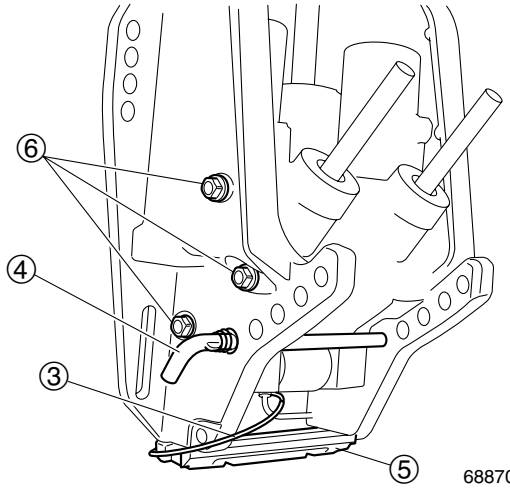
⚠WARNING

- **When removing the PTT unit without removing the power unit, be sure to suspend the outboard motor. Otherwise, the outboard motor could suddenly fall and result in injury.**
- **After tilting up the outboard motor, be sure to support it with the tilt stop lever. Otherwise, the outboard motor could suddenly lower if the PTT unit should lose fluid pressure.**

NOTE:

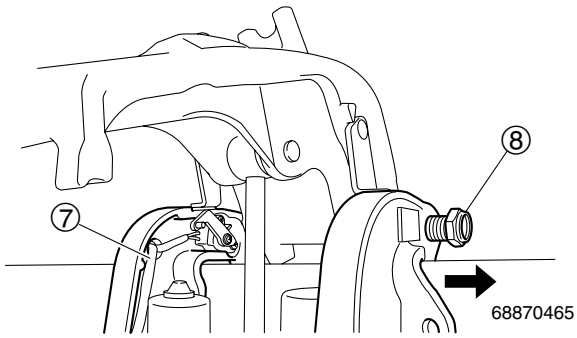
If the PTT does not operate, turn the manual valve ② clockwise and tilt the outboard motor up manually.

2. Disconnect the ground lead ③ at the bottom of the PTT unit.
3. Remove the tilt pin and ④ anode ⑤.
4. Remove the bracket bolts ⑥.



68870455

5. Remove the lock ties, and then pull out the PTT motor lead ⑦.
6. Remove the cap and loosen the self-locking nut ⑧, then move the clamp brackets slightly.



68870465

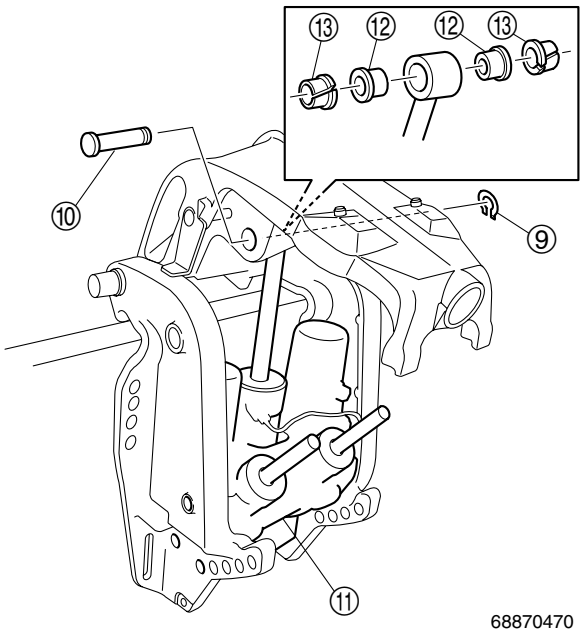
⚠WARNING

Do not remove the tilt stop lever ① from the clamp brackets.

7

7. Remove the circlip ⑨, and then remove the pin ⑩.

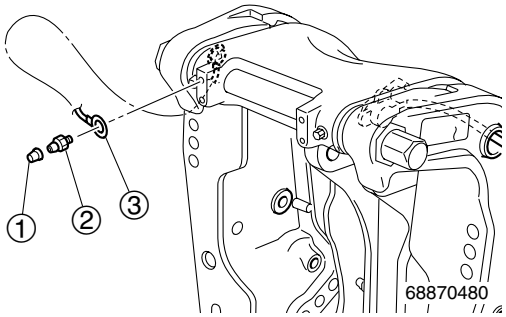
8. Remove the PTT unit ⑪, bushings ⑫ and ⑬.



Removing the clamp bracket (ET)

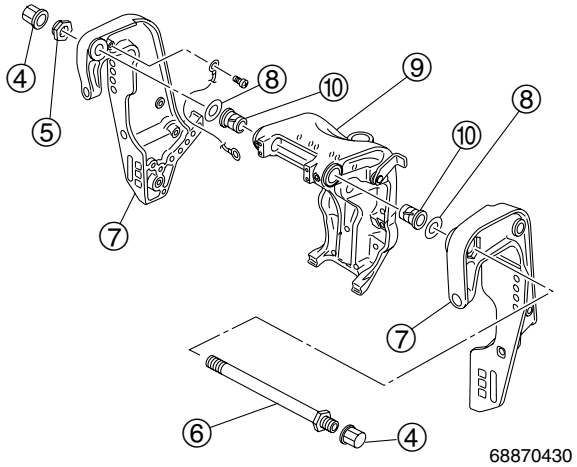
1. Remove the PTT unit.

2. Remove the cap ① and grease nipples ②, and then disconnect the ground leads ③.



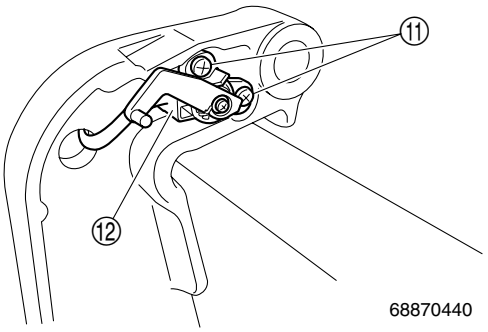
3. Remove the cap ④ and self-locking nut ⑤.

4. Remove the through tube ⑥, clamp brackets ⑦, washers ⑧, swivel bracket ⑨, and then remove the bushings ⑩.



5. Remove the trim sensor cam screw ⑪.

6. Remove the trim sensor ⑫.



Disassembling the swivel bracket (ET)

NOTE:

To disassemble the swivel bracket, refer to page 7-23.

Checking the swivel bracket (ET)

NOTE:

To check the swivel bracket, refer to page 7-23.

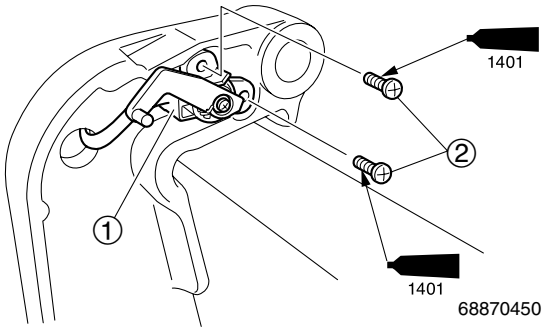
Assembling the swivel bracket (ET)

NOTE:

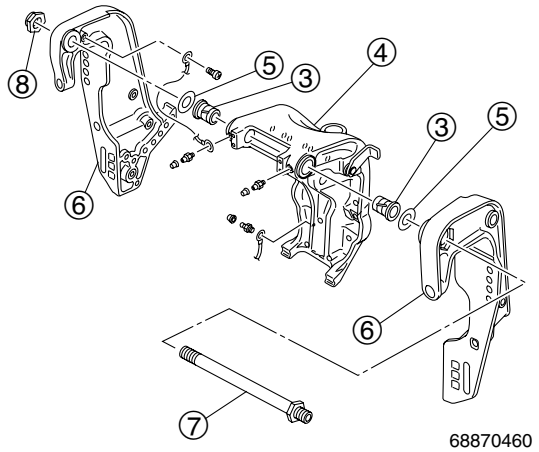
To assemble the swivel bracket, refer to page 7-24.

Installing the clamp bracket (ET)

1. Install the trim sensor ①, and then tighten the screws ②.



2. Install the bushings ③ into the swivel bracket ④, then install the swivel bracket ④, washers ⑤, clamp brackets ⑥, and through tube ⑦.



NOTE:

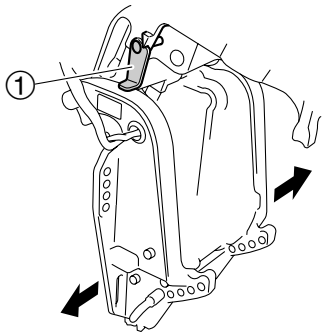
Adjust the trim sensor cam after installing the PTT, refer to page 7-33.

3. Install the self-locking nut ⑧ temporarily.

4. Install the ground lead between the clamp brackets and the swivel bracket.

Installing the PTT unit (ET)

1. Fully tilt the outboard motor up, and then support it with the tilt stop lever ①.



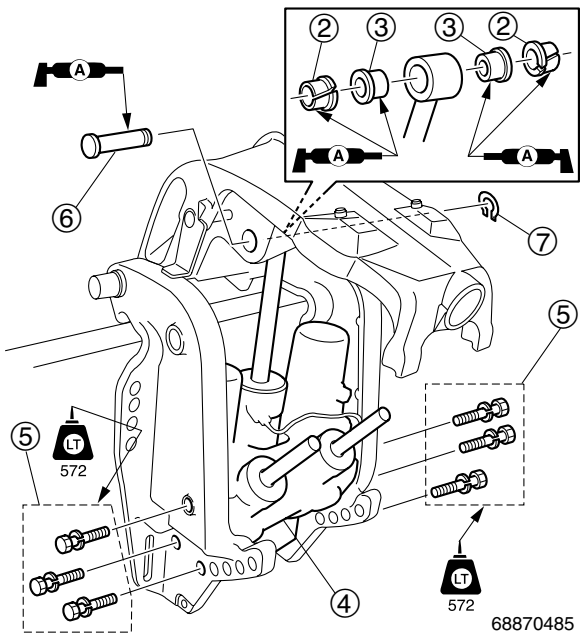
⚠WARNING

- **When installing the PTT unit without removing the power unit, be sure to suspend the outboard motor. Otherwise, the outboard motor could suddenly fall and result in injury.**
- **After tilting the outboard motor up, be sure to support it with the tilt stop lever.**

2. Install the bushing ② and ③.

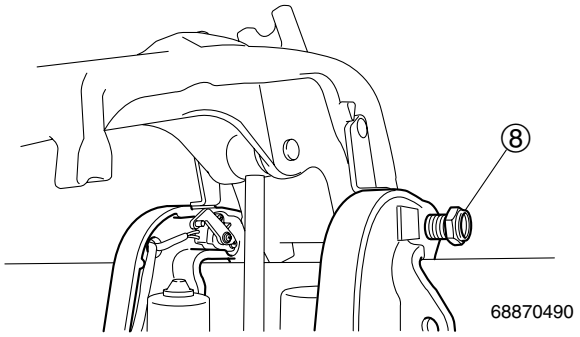
3. Lift the PTT unit ④ up and install the PTT unit mounting bolts ⑤, and then tighten them.

4. Install the tilt ram upper end into the swivel bracket with the pin ⑥ and circlip ⑦.



7

5. Tighten the self-locking nut ⑧ to the specified torque.

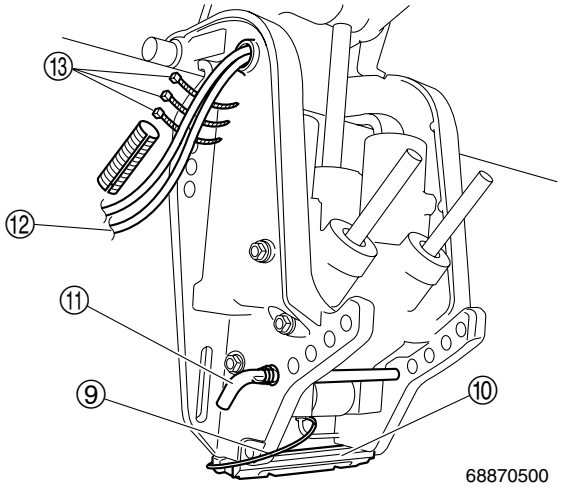


Self-locking nut ⑧:
15 N·m (1.5 kgf·m, 11.1 ft·lb)

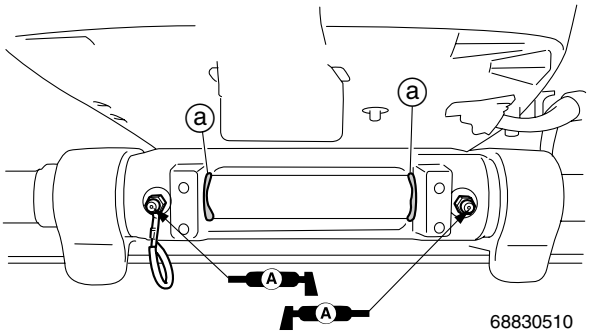
6. Install the ground lead ⑨, anode ⑩ and tilt pin ⑪.

7. Pass the PTT motor lead ⑫ through the hole of the port clamp bracket.

8. Fasten the PTT motor lead and trim sensor lead with the lock ties ⑬.



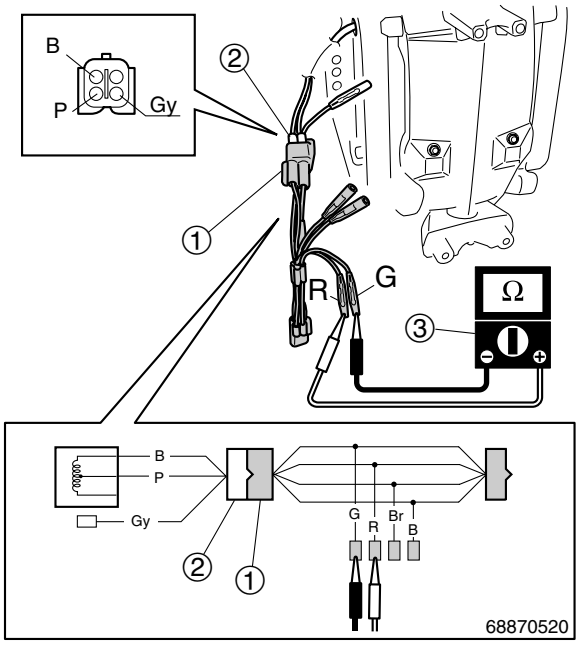
9. Inject grease into all grease nipples until grease comes out from the bushings ⓐ.



Adjusting the trim sensor cam (ET)

1. Fully tilt the outboard motor down.

2. Connect the test harness ① to the trim sensor coupler ②.



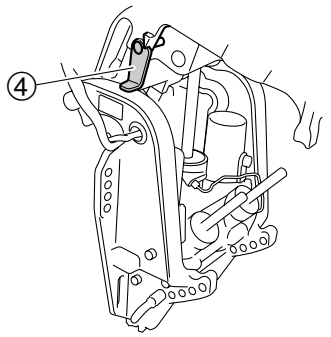
Test harness ①:
90890-06878
Digital circuit tester ③:
90890-03174

3. Measure the trim sensor resistance.

Trim sensor setting resistance:
Pink (P)–Black (B)
9–11 Ω

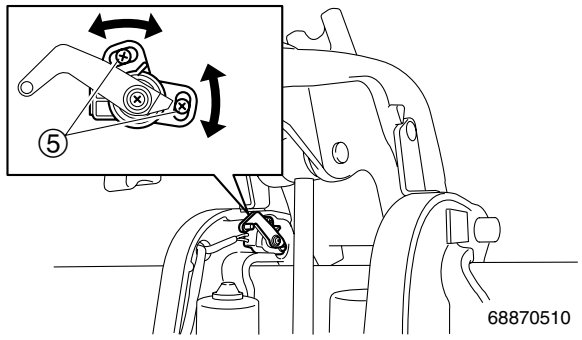
4. If the trim sensor resistance is out of specification, adjust the trim sensor.

5. Fully tilt the outboard motor up, and then support it with the tilt stop lever ④.



6. Loosen the screws ⑤.

7. Adjust the position of the trim sensor, and then tighten the screws ⑤ temporarily.



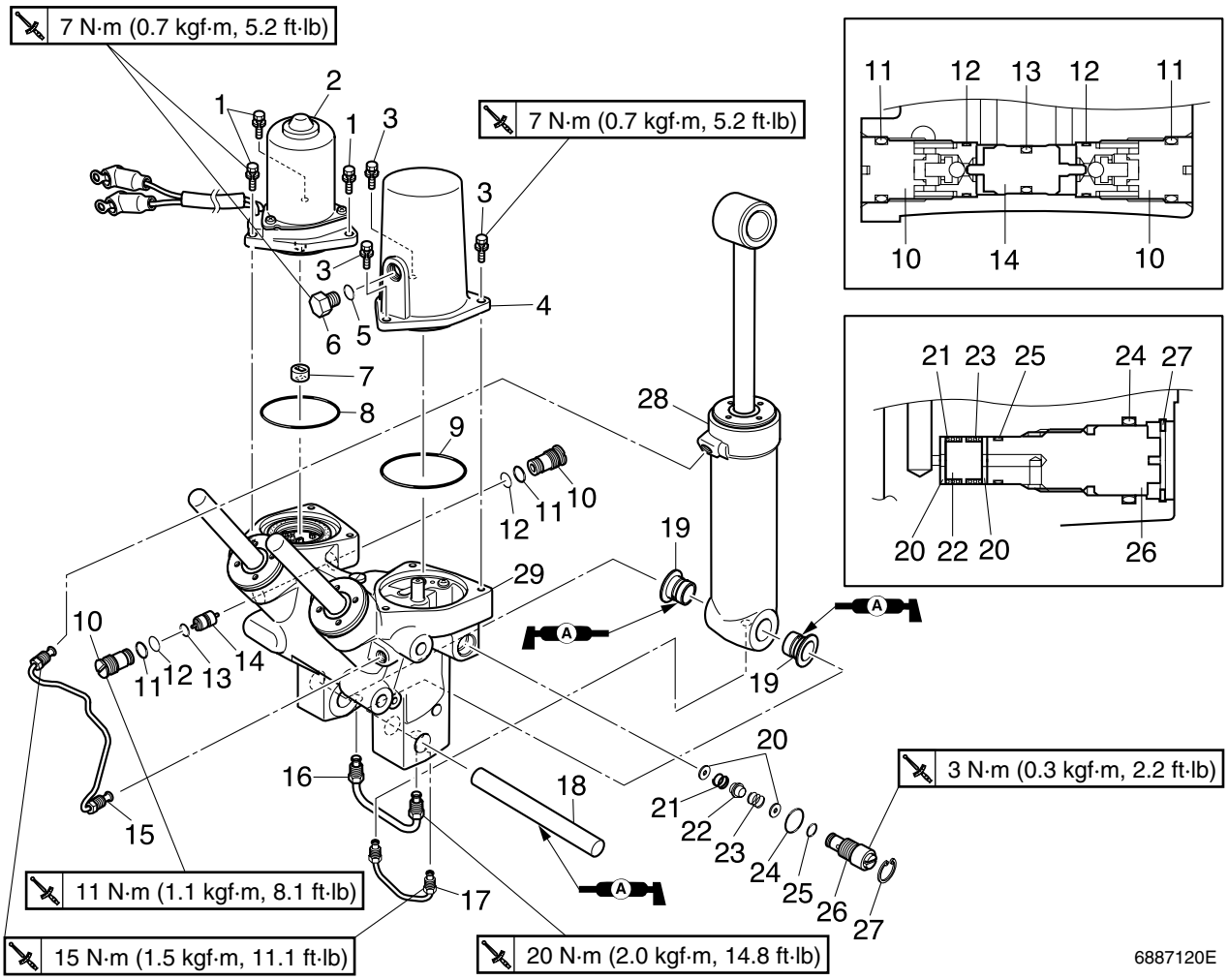
8. Repeat the steps 1–7 if out of specification.

9. Fully tilt the outboard motor up, and then tighten the screws ⑤.

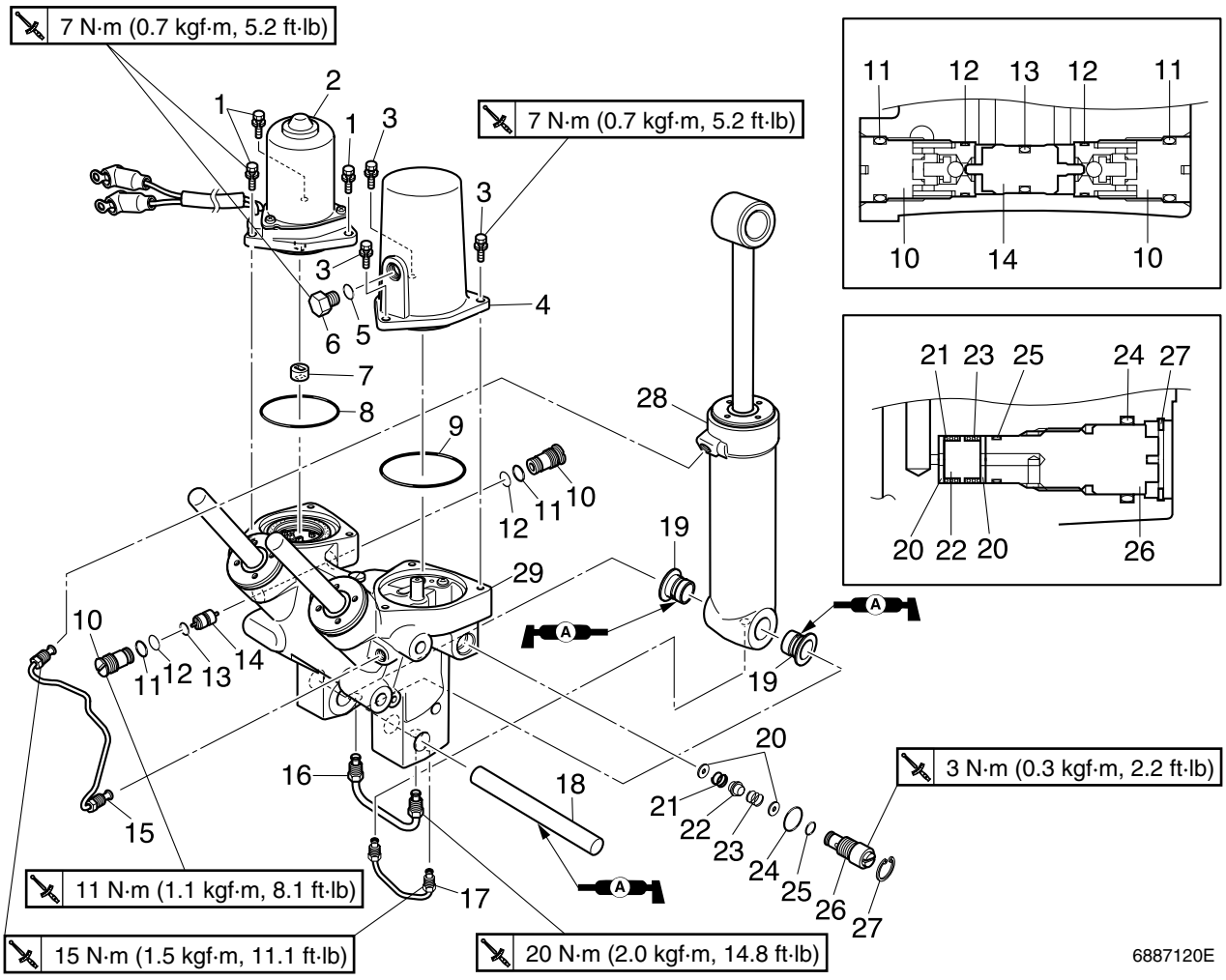
10. Fully tilt the outboard motor down.

NOTE:
Measure the trim sensor resistance after tightening the screws, and fully tilt the outboard motor down.

PTT unit



No.	Part name	Q'ty	Remarks
1	Bolt	3	M6 × 20 mm
2	PTT motor	1	
3	Bolt	3	M6 × 20 mm
4	Reservoir	1	
5	O-ring	1	Not reusable
6	Reservoir cap	1	
7	Joint	1	
8	O-ring	1	Not reusable
9	O-ring	1	Not reusable
10	Main valve	2	
11	O-ring	2	Not reusable
12	O-ring	2	Not reusable
13	O-ring	1	Not reusable
14	Piston	1	
15	Pipe	1	
16	Pipe	1	
17	Pipe	1	

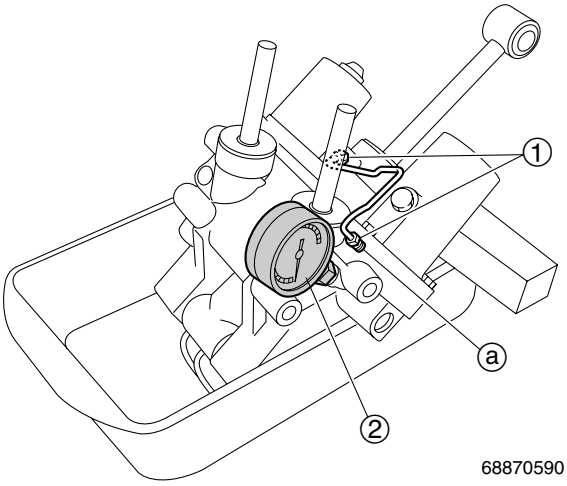


No.	Part name	Q'ty	Remarks
18	Pin	1	
19	Bushing	2	
20	Manual valve seal	2	
21	Spring	1	
22	Adapter	1	
23	Spring	1	
24	O-ring	1	Not reusable
25	O-ring	1	Not reusable
26	Manual valve	1	
27	Circlip	1	
28	Tilt cylinder assembly	1	
29	PTT body	1	

7

Checking the hydraulic pressure

1. Check the hydraulic pressure. Check the internal parts if out of specification.
2. Fully extend the PTT rams.
3. Loosen the pipe joints ①, and then remove the pipe joint ⓐ.
4. Install the special service tool ②.

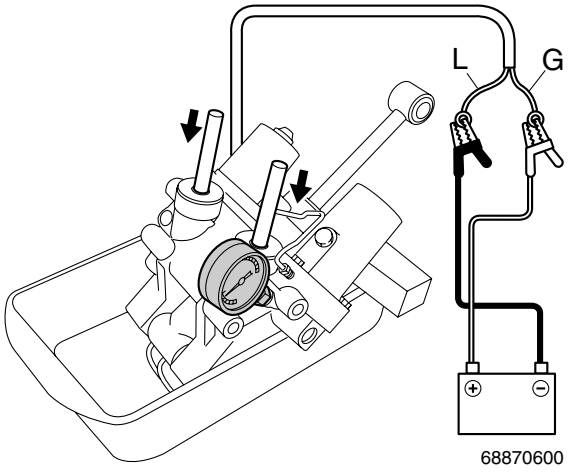


68870590

NOTE:
- Put the PTT unit in the drain pan.
- Tighten the pipe joint of the tilt cylinder temporarily, after remove the pipe joint ⓐ.

PTT oil pressure gauge assembly ②: 90890-06580

5. Connect the PTT motor leads to the battery terminals to retract the trim rams, and then measure the hydraulic pressure.

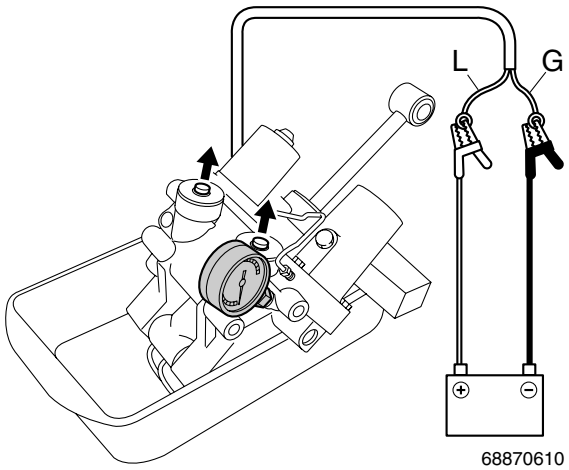


68870600

Rams	PTT motor lead	Battery terminal
Down	Green (G)	⊕
	Blue (L)	⊖

Hydraulic pressure (down): 2.2–3.8 MPa (22–38 kgf/cm²)

6. Reverse the PTT motor leads between the battery terminals to fully extend the rams.



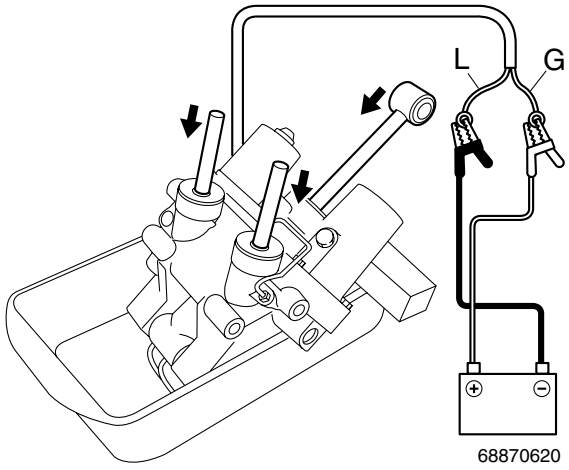
68870610

Rams	PTT motor lead	Battery terminal
Up	Blue (L)	⊕
	Green (G)	⊖

7. Remove the special service tool.
8. Install the pipe joint, and then tighten them to the specified torque.

Pipe joint: 15 N·m (1.5 kgf·m, 11.1 ft·lb)

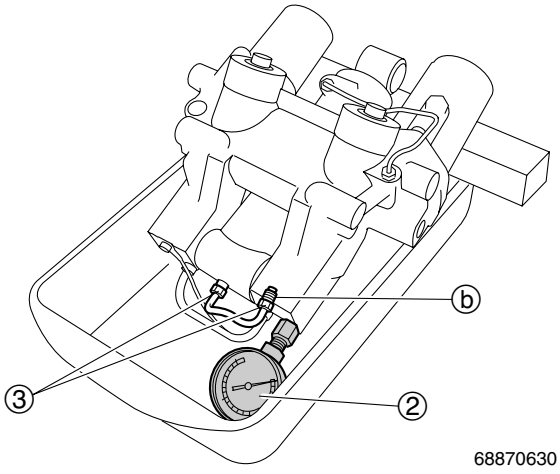
9. Connect the PTT motor leads to the battery terminals to fully retract the trim and tilt rams.



Rams	PTT motor lead	Battery terminal
Down	Green (G)	⊕
	Blue (L)	⊖

10. Loosen the pipe joints ③, and then remove the pipe joint ⓑ.

11. Install the special service tool as shown.

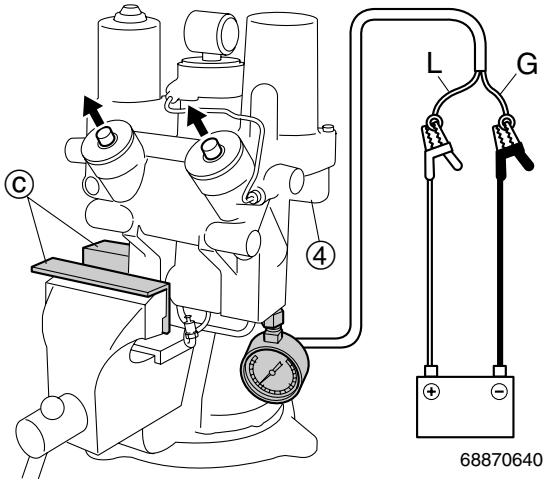


NOTE:
- Put the PTT unit in the drain pan.
- Quickly install the special service tool to the PTT unit, after disconnecting the pipe joint.
- Add the same amount as the spilled fluid.
- Tighten the pipe joint of the tilt cylinder temporarily, after remove the pipe joint ⓑ.

	PTT oil pressure gauge assembly ②: 90890-06580

12. Hold the PTT unit ④ in a vice using aluminum plates ⓒ on both sides.

13. Connect the PTT motor leads to the battery terminals to extend the trim rams, and then measure the hydraulic pressure.

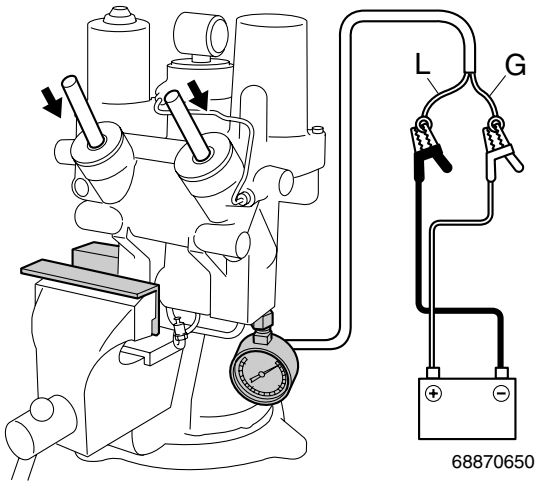


Rams	PTT motor lead	Battery terminal
Up	Blue (L)	⊕
	Green (G)	⊖

	Hydraulic pressure (up): 9–11 MPa (90–110 kgf/cm²)

7

14. Reverse the PTT motor leads between the battery terminals to fully retract the rams.



Rams	PTT motor lead	Battery terminal
Down	Green (G)	⊕
	Blue (L)	⊖

15. Remove the PTT unit from a vice.

16. Remove the special service tool, and then install the pipe joint.

NOTE:
- Put the PTT unit in the drain pan.
- Quickly install the pipe joint, after removing the special service tool.

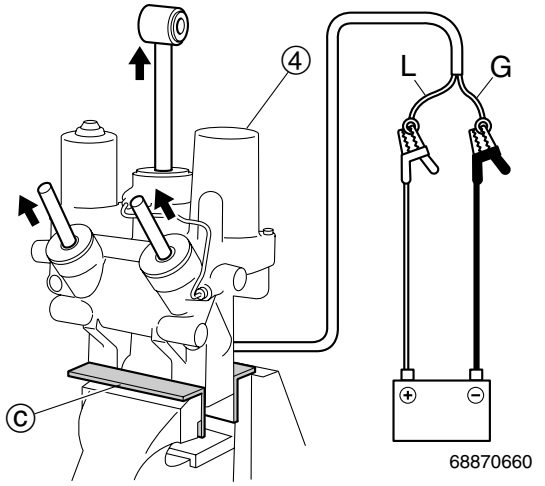
17. Tighten the pipe joints to the specified torque.

	Pipe joint: 15 N·m (1.5 kgf·m, 11.1 ft·lb)

18. Hold the PTT units ④ in a vice using aluminum plates ⓒ on both sides.

NOTE:
Add the same amount as the spilled fluid.

19. Connect the PTT motor leads to the battery terminals to fully extend the trim and tilt rams.



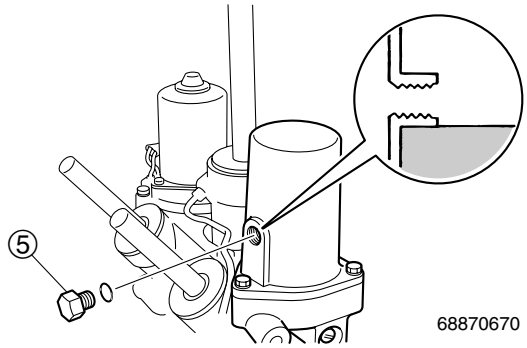
Rams	PTT motor lead	Battery terminal
Up	Blue (L)	⊕
	Green (G)	⊖

20. Remove the reservoir cap ⑤, and then check the fluid level in the reservoir.

⚠WARNING

Make sure that the trim and tilt rams are fully extended when removing the reservoir cap, otherwise fluid can spurt out from the unit due to internal pressure.

NOTE:
If the fluid is at the correct level, the fluid should overflow out of the filler hole when the reservoir cap is removed.



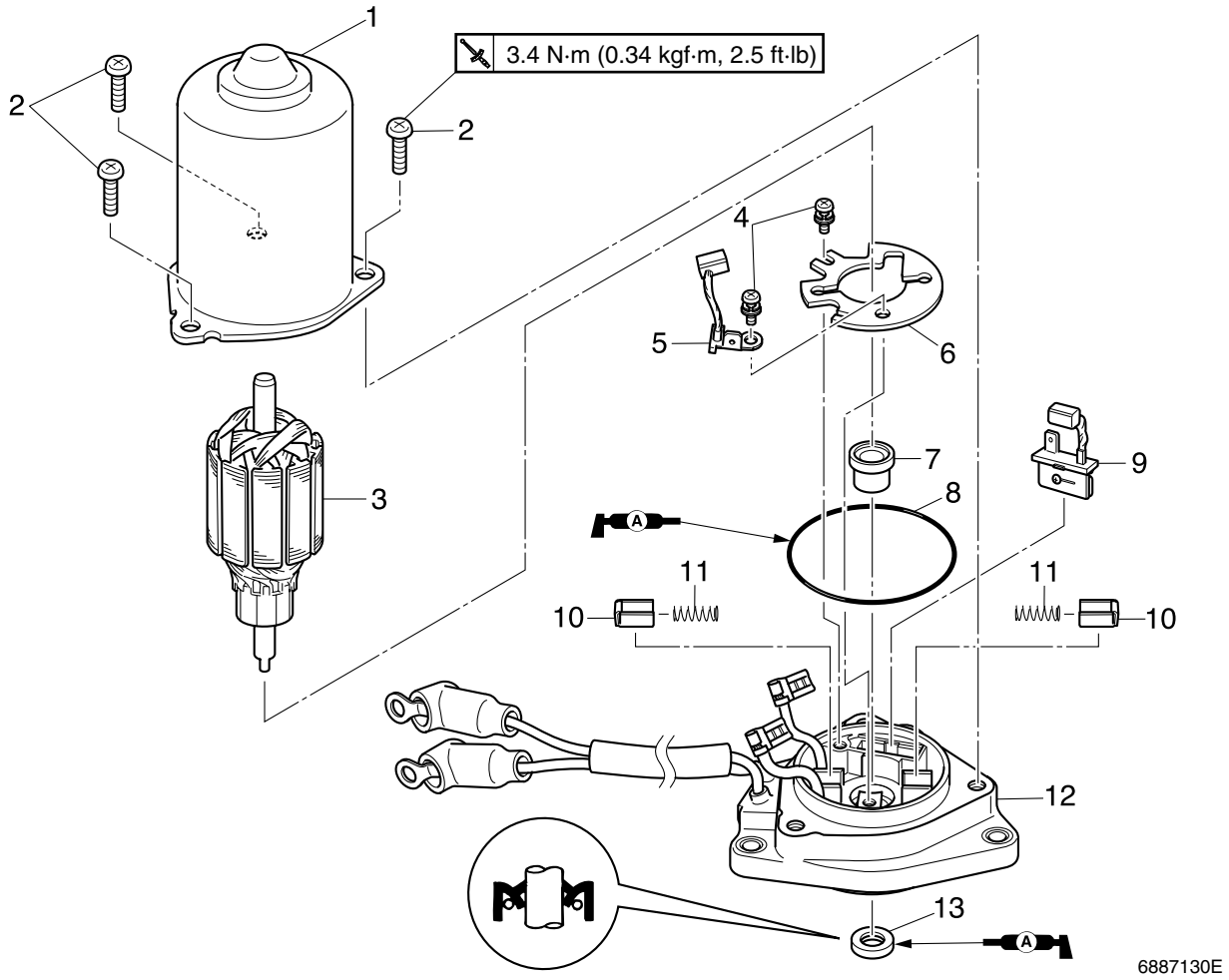
Recommended PTT fluid:
ATF Dexron Ⅱ

21. Install the new O-ring and reservoir cap ⑤, then tighten it to the specified torque.

Reservoir cap ⑤:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

NOTE:
Bleeding the PTT unit 2–3 times, and then check the fluid level. To bleed the PTT unit, refer to page 7-62.

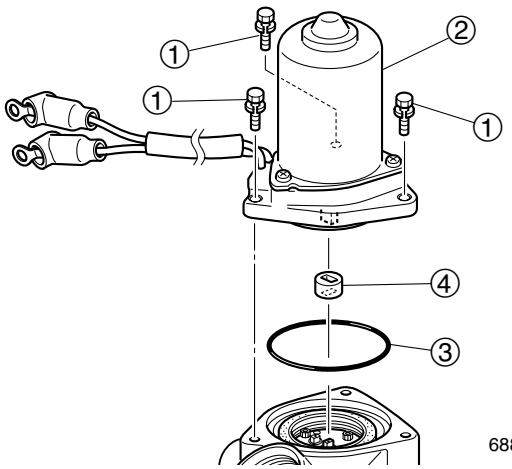
PTT motor



No.	Part name	Q'ty	Remarks
1	Stator	1	
2	Screw	3	ø6 × 16 mm
3	Armature	1	
4	Screw	2	ø4 × 10 mm
5	Brush 1	1	
6	Plate	1	
7	Bushing	1	
8	O-ring	1	Not reusable
9	Brush 2	1	
10	Holder	2	
11	Spring	2	
12	PTT motor base	1	
13	Oil seal	1	Not reusable

Disassembling the PTT motor

1. Remove the bolts ①, then remove the PTT motor ②, O-ring ③, and joint ④ from the PTT unit.

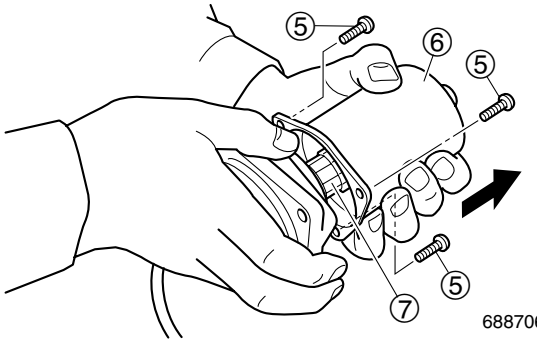


68870680

⚠WARNING

- **Make sure that the trim and tilt rams are fully extended when removing the PTT motor, otherwise fluid can spurt out from the unit due to internal pressure.**
- **Do not push the trim and tilt rams down while the PTT motor is removed from the PTT unit, otherwise fluid can spurt out.**

2. Remove the screws ⑤, stator ⑥ with armature ⑦.



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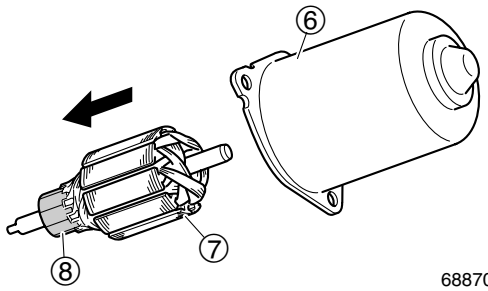
3. Remove the armature ⑦ from the stator ⑥.

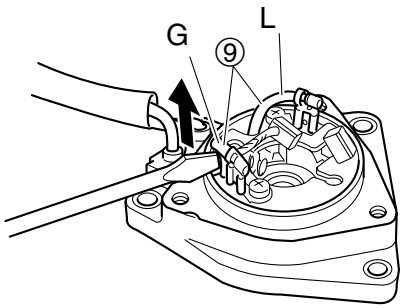


68870700

CAUTION:

Do not allow grease or oil to contact the commutator ⑧.

4. Disconnect the PTT motor lead ⑨.



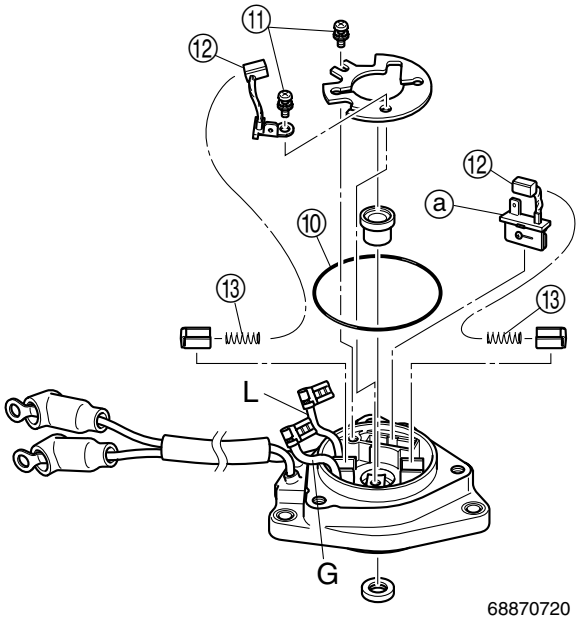
68870710

NOTE:

Hold the brush with a screwdriver as shown, and then disconnect the PTT motor lead ⑨.

7

5. Remove the O-ring ⑩, screws ⑪, then remove the brushes ⑫ and springs ⑬.



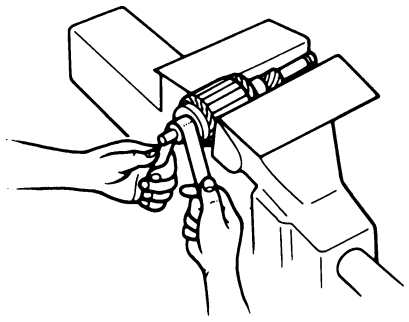
68870720

CAUTION:

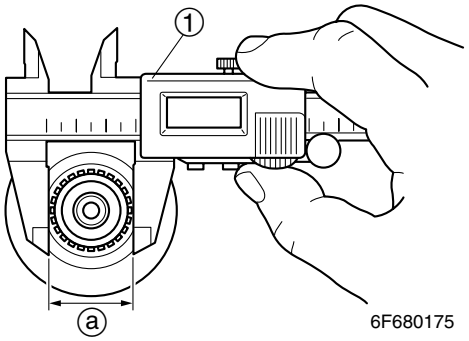
- **Do not pull the PTT motor leads out from the PTT motor base.**
- **Do not deform or damage the bimetal ⓐ, otherwise the operation of the circuit breaker can be affected.**

Checking the PTT motor

1. Check the commutator. Clean with 600–grit sandpaper and compressed air if dirty.


6G480220

2. Measure the commutator diameter. Replace the armature if below specification limit.

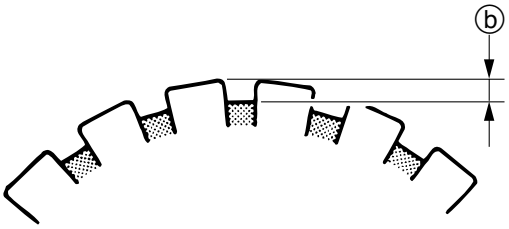


6F680175

Digital caliper ①:
90890-06704

Commutator standard diameter ⓐ:
22.0 mm (0.87 in)
Wear limit:
21.0 mm (0.83 in)

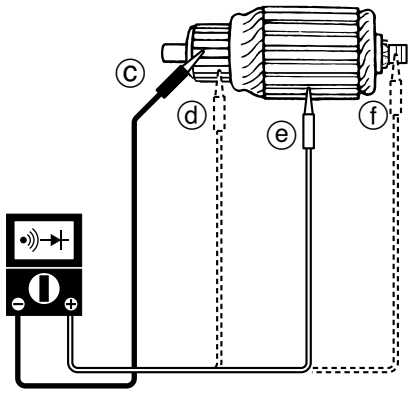
3. Measure the commutator undercut ⓑ. Replace the armature if below specification limit.



6F680180

Standard undercut ⓑ:
1.8 mm (0.07 in)
Wear limit:
1.3 mm (0.05 in)

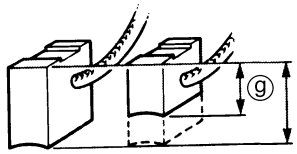
4. Check the armature for continuity. Replace the armature if not shown in the chart below.



69R80320

Armature continuity:				
Tester probe	ⓒ	ⓓ	ⓔ	ⓕ
Segment–Segment	○	○		
Segment–Armature core				
Segment–Armature shaft				

5. Measure the brush length. Replace if below specification limit.



6G470330

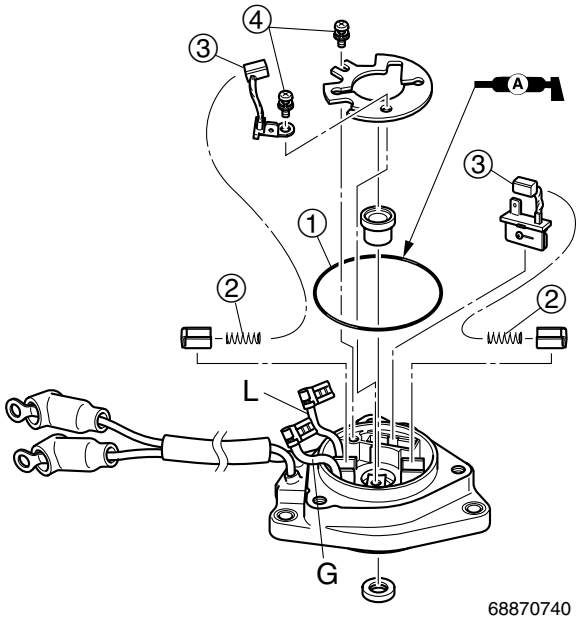
Brush standard length:
9.75 mm (0.384 in)
Wear limit ⓖ:
5.5 mm (0.22 in)

6. Check the PTT motor base. Replace the motor base if cracked or damaged.

7. Check the oil seal. Replace the oil seal if damaged or worn.

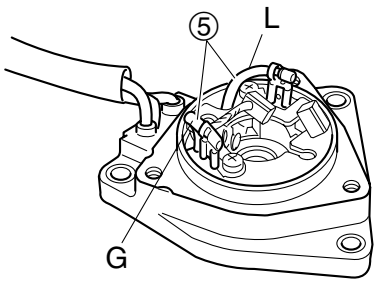
Assembling the PTT motor

1. Install new O-ring ① springs ② and brushes ③, and then tighten the screws ④.



68870740

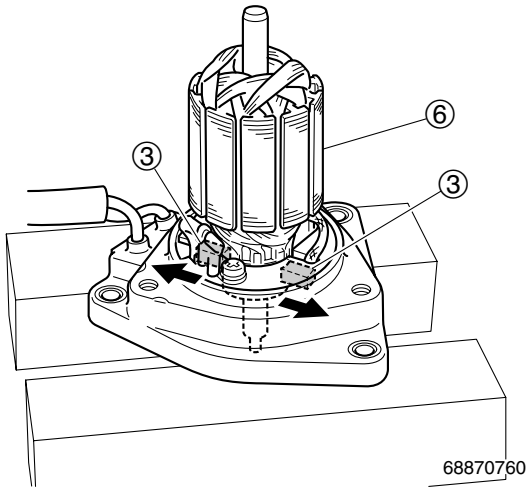
2. Connect the PTT motor leads ⑤.



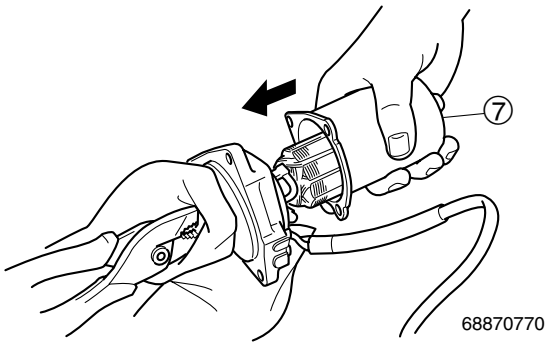
68870750

7

3. Push the brushes ③ into the brush holder, and then install the armature ⑥.



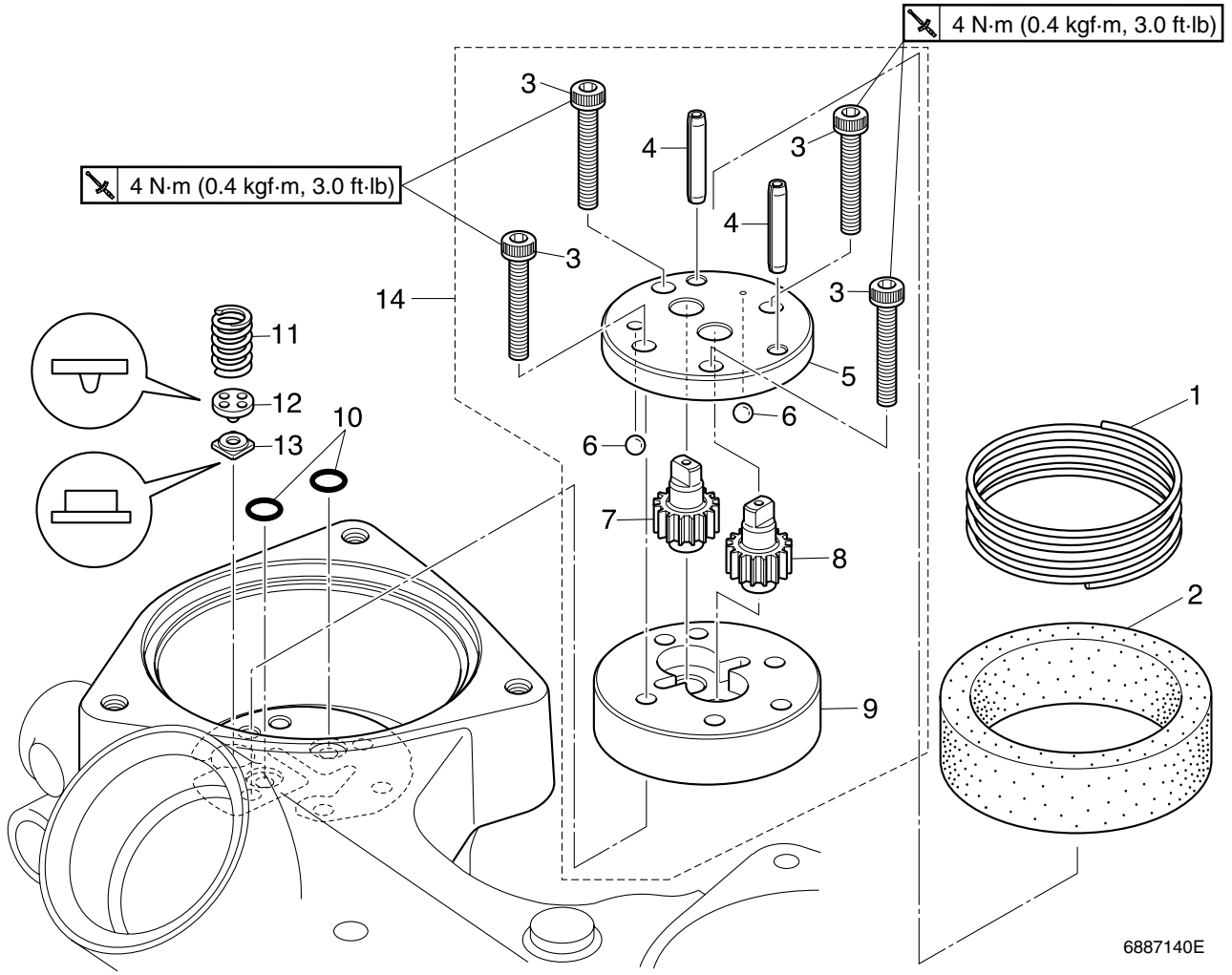
4. Install the stator ⑦ onto the PTT motor base.



NOTE:

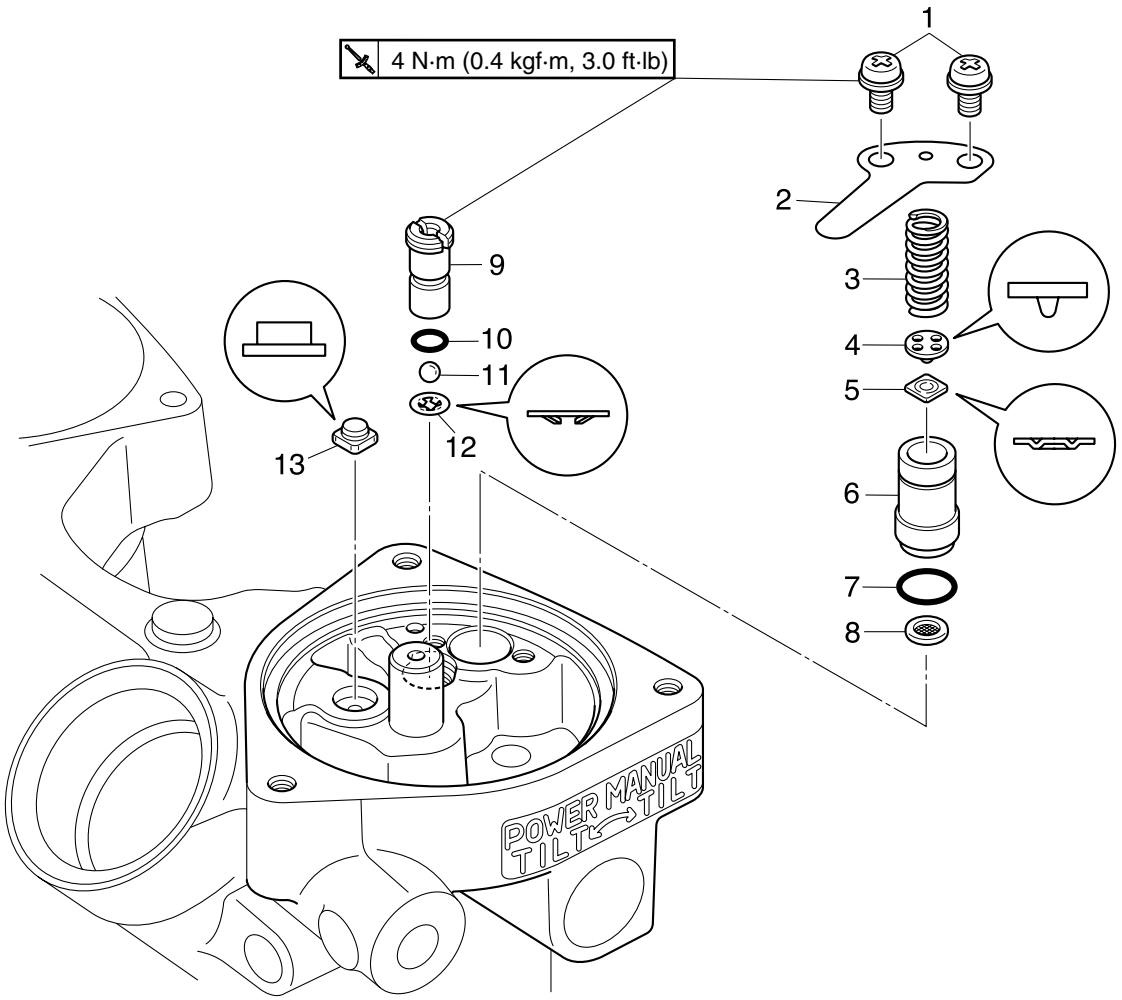
Place a rag over the end of the armature shaft, hold it with a pair of pliers, and then carefully slide the stator over the armature.

Gear pump



No.	Part name	Q'ty	Remarks
1	Spring	1	
2	Filter	1	
3	Bolt	4	M4 × 25 mm
4	Pin	2	
5	Gear housing 1	1	
6	Ball	2	
7	Driven gear	1	
8	Drive gear	1	
9	Gear housing 2	1	
10	O-ring	2	Not reusable
11	Down-relief spring	1	
12	Valve support pin	1	
13	Main valve seal	1	
14	Gear pump assembly	1	

7



6887150E

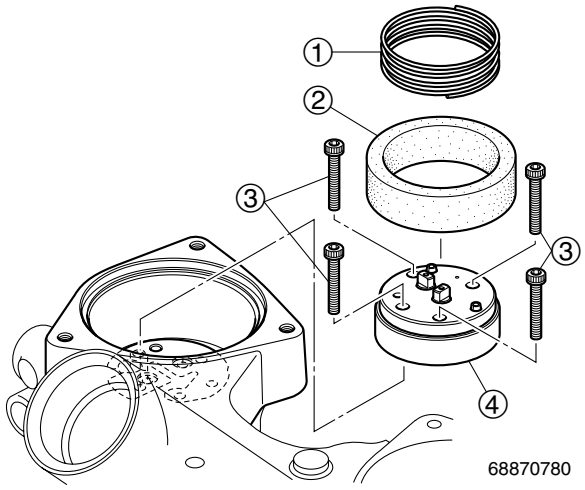
No.	Part name	Q'ty	Remarks
1	Screw	2	ø5 × 10 mm
2	Trim spring	1	
3	Up-relief spring	1	
4	Valve support pin	1	
5	Relief valve seal	1	
6	Relief valve seat	1	
7	O-ring	1	Not reusable
8	Filter	1	
9	Valve lock screw	1	
10	O-ring	1	Not reusable
11	Ball	1	
12	Washer	1	
13	Main valve seal	1	

Disassembling the gear pump, down relief valve and main valve

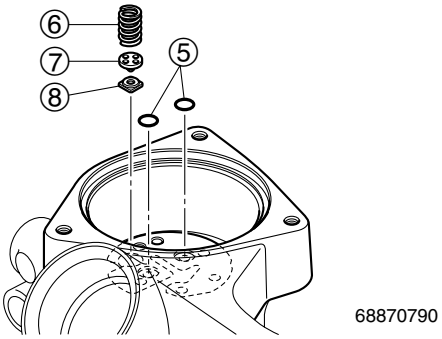
1. Drain the PTT fluid.

2. Remove the spring ① and filter ②.

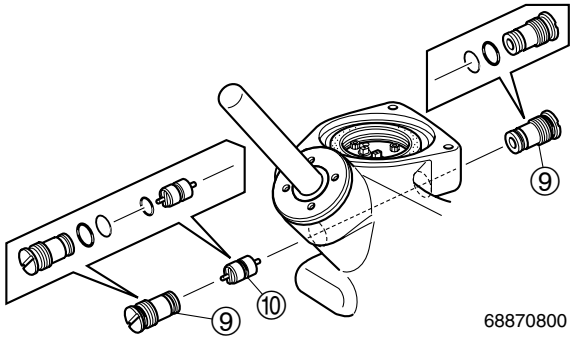
3. Remove the bolts ③, and then remove the gear pump assembly ④.



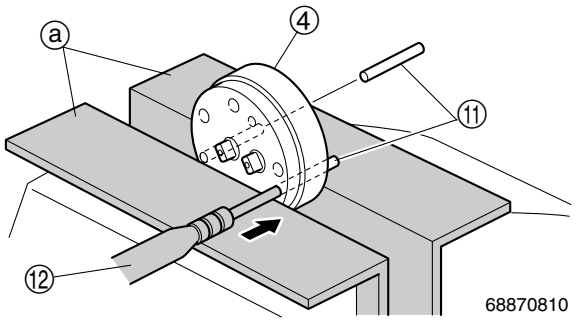
4. Remove the O-rings ⑤, down-relief spring ⑥, valve support pin ⑦ and main valve seal ⑧.



5. Remove the main valves ⑨ and shuttle piston ⑩.

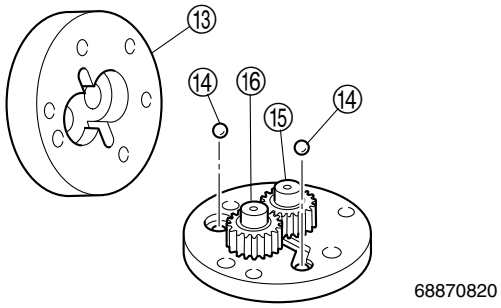


6. Hold the gear pump assembly ④ in a vice using aluminum plates ⓐ on both sides, and then remove the pins ⑪.



NOTE:
Use a 4 mm pin punch ⑫ to remove the pins ⑪.

7. Separate the gear housing 2 ⑬ as shown, then remove the balls ⑭, drive ⑮ and driven gear ⑯.



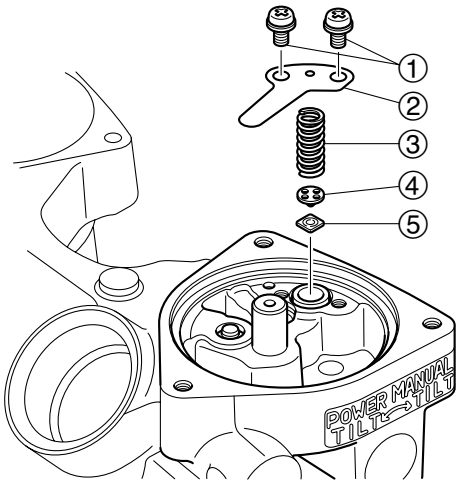
NOTE:
Turn the gear pump assembly upside down, and then separate the gear housing 2 ⑬.

7

Disassembling the relief valve and manual valve

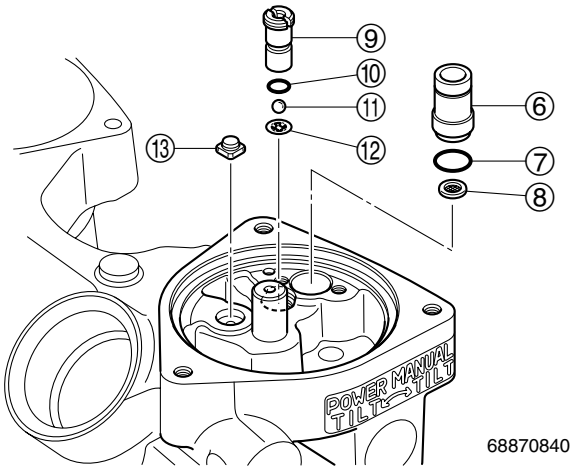
1. Drain the PTT fluid.

2. Remove the screws ①, trim spring ②, up-relief spring ③, and then remove the valve support pin ④, relief valve seal ⑤.



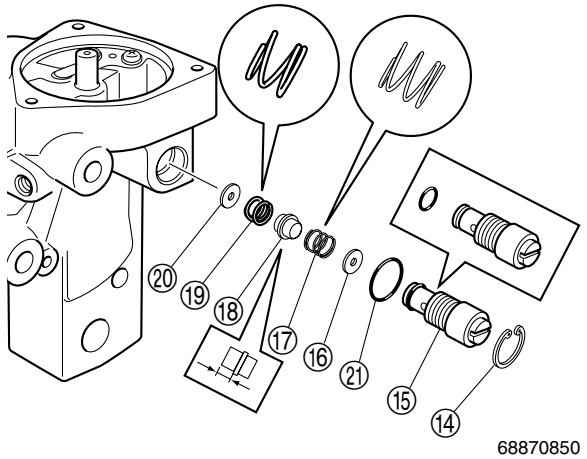
68870830

3. Remove the relief valve seat ⑥, O-ring ⑦, filter ⑧, valve lock screw ⑨, O-ring ⑩, ball ⑪, washer ⑫ and main valve seal ⑬.



68870840

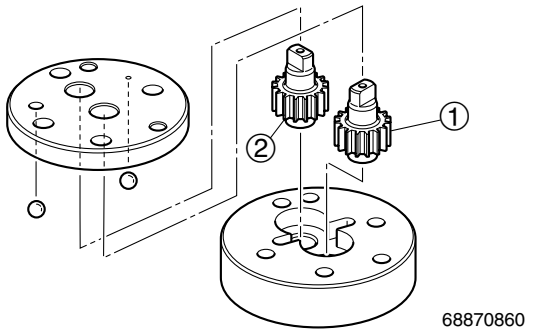
4. Remove the circlip ⑭, then remove the manual valve ⑮, manual valve seal ⑯, spring ⑰, adapter ⑱, spring ⑲, manual valve seal ⑳ and O-ring ㉑.



68870850

Checking the gear pump

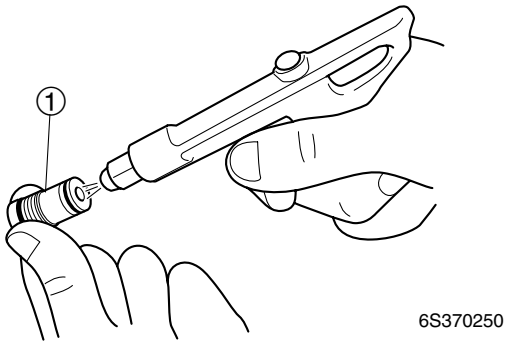
1. Check the drive gear ① and driven gear ②. Replace the drive and driven gear if damaged, scratched or excessive worn.



68870860

Checking the main valve

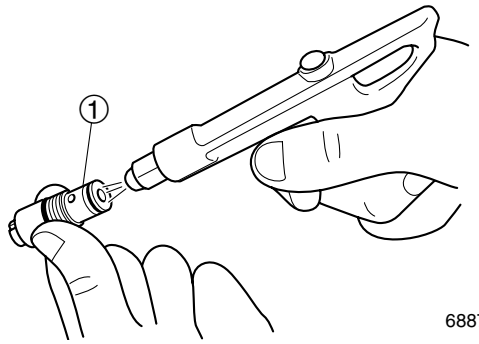
1. Check the main valves ①. Clean the main valves if dirt or residue appears.



6S370250

Checking the manual valve

1. Check the manual valve ①. Clean the manual valve if dirt or residue appears.



68870890

Checking the gear housing

1. Check the inside of the gear housing. Replace the gear housing if scratched or worm.

Checking the reservoir

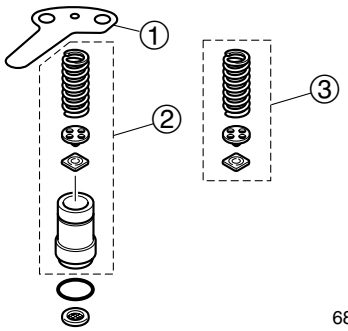
1. Check the reservoir and O-ring. Replace the reservoir and O-ring for deterioration and corrosion.

Checking the filter

1. Check gear pump filter. Clean the filter if dirt or residue appears.

Checking relief valve

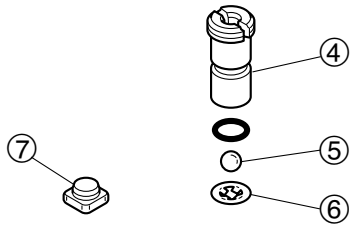
1. Check the trim spring ①, up-relief valve ② and down-relief valve ③. Replace the trim spring if damaged. Clean the up and down relief valve if dirt or residue appears.



68870870

2. Check the valve seal and valve seat. Clean the valve seal and valve seat if dirt or residue appears. Replace them if damaged or worn.

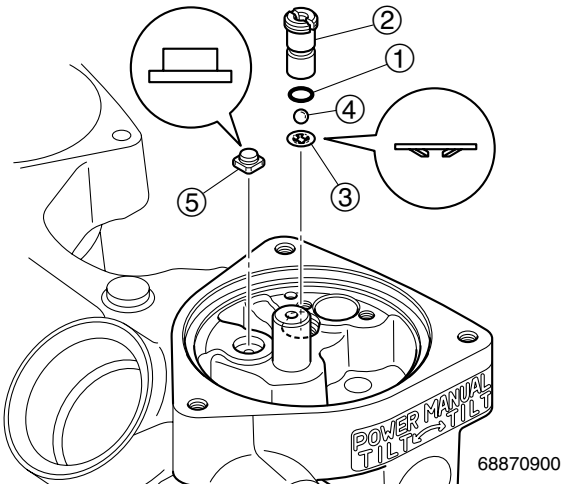
3. Check the valve lock screw ④, ball ⑤, washer ⑥ and main valve seal ⑦.
   Clean the valve lock screw if dirt or residue. Replace them if damaged or worn.



68870880

Assembling the relief valve and manual valve

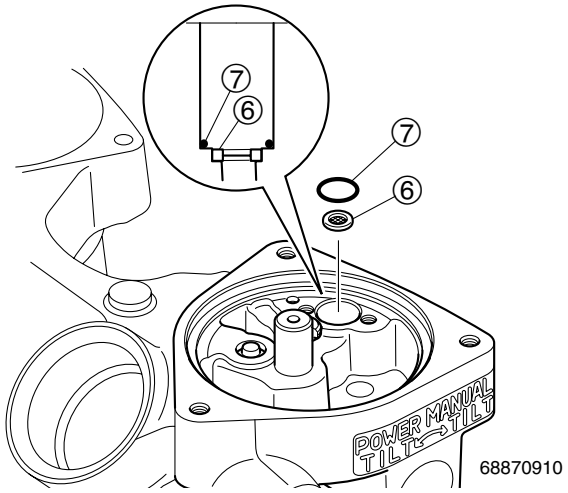
1. Install a new O-ring ① onto the valve lock screw ②, then install the washer ③, ball ④ and main valve seal ⑤ into the PTT body.
   Then tighten the valve lock screw to the specified torque.



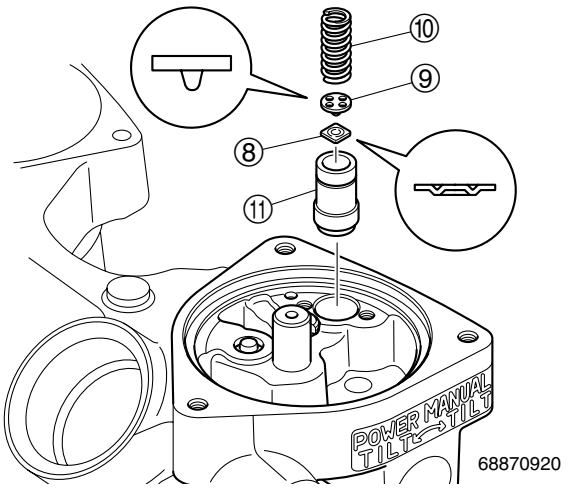
68870900

	Valve lock screw ②: 4 N·m (0.4 kgf·m, 3.0 ft·lb)

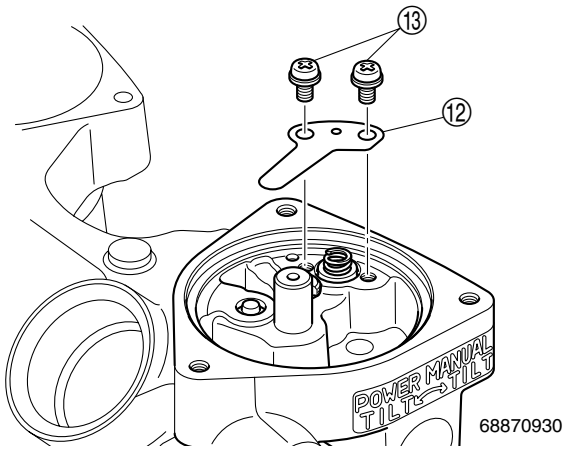
2. Install the filter ⑥ and new O-ring ⑦ into the PTT body.



3. Install the relief valve seal ⑧, valve support pin ⑨ and up-relief spring ⑩ into the relief valve seat ⑪, then install into the PTT body.

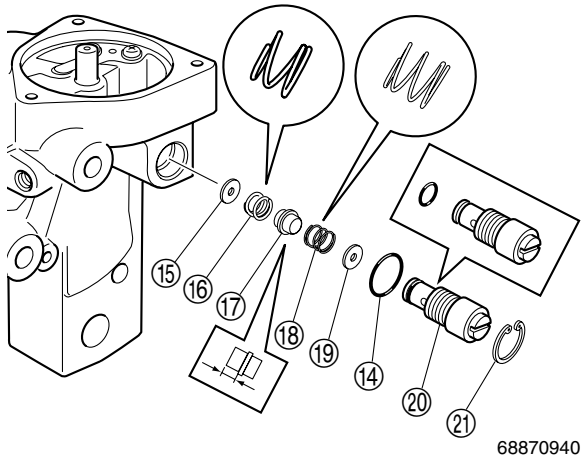


4. Install the trim spring ⑫, and then tighten the screws ⑬ to the specified torque.



Trim spring screw ⑬:
4 N·m (0.4 kgf·m, 3.0 ft·lb)

5. Install the new O-ring ⑭, manual valve seal ⑮, spring ⑯, adapter ⑰, spring ⑱, manual valve seal ⑲ and manual valve ⑳, then install the circlip ㉑.

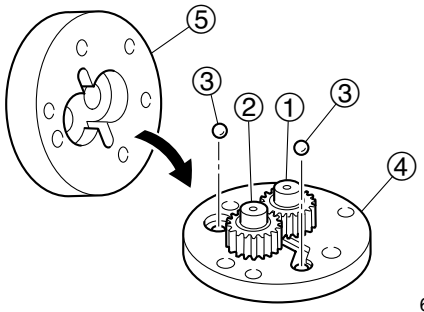


NOTE:
The manual valve is left hand thread.

Manual valve ⑳:
3 N·m (0.3 kgf·m, 2.2 ft·lb)

Assembling the gear pump

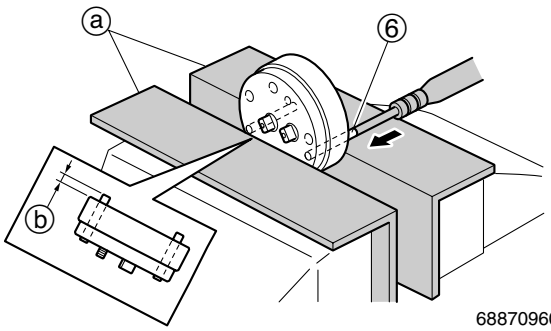
1. Install the drive gear ① and driven gear ② and balls ③ into the gear housing 1 ④, and then install the gear housing 2 ⑤.



68870950

2. Hold the gear pump assembly in a vice using aluminum plates ⓐ on both side.

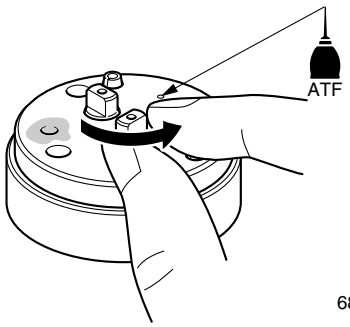
3. Install the pin ⑥ as shown.



68870960

NOTE:
Press the pins ⑥ into gear pump assembly to remains ⓑ. (ⓑ = approximately 3.5 mm (0.14 in)).

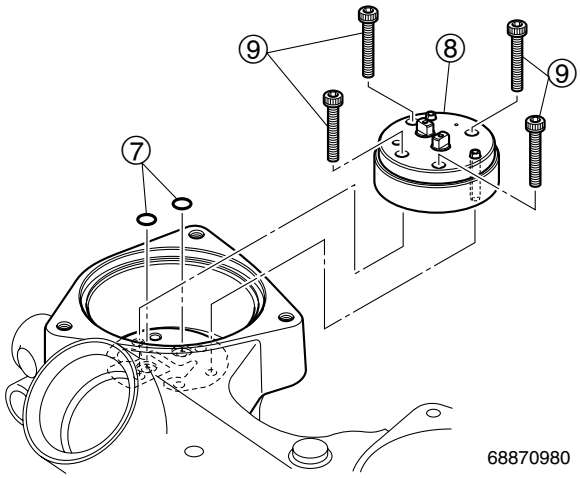
4. Check the gear pump operation.



68870970

NOTE:
Inject a small amount fluid to the gear pump assembly, and then rotate the drive gear in the direction shown.

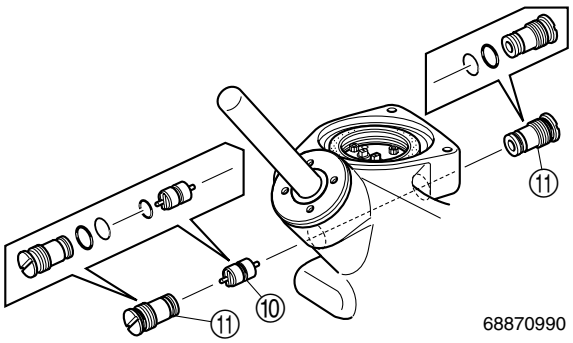
5. Install the new O-rings ⑦, gear pump assembly ⑧ with the bolts ⑨, then tighten them to the specified torque.



68870980

Gear pump bolt ⑨:
4 N·m (0.4 kgf·m, 3.0 ft·lb)

6. Install the new O-rings, piston ⑩, main valves ⑪.

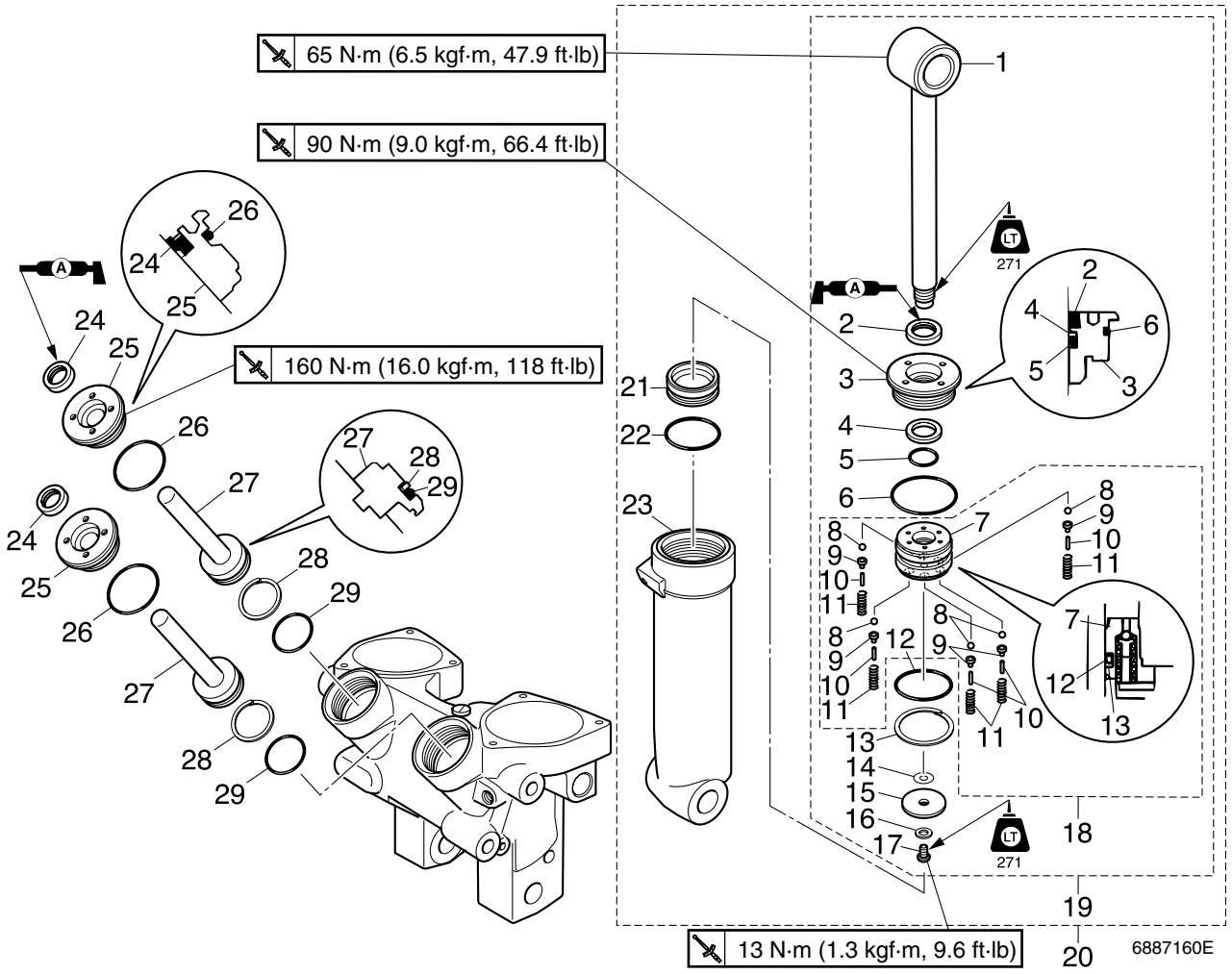


68870990

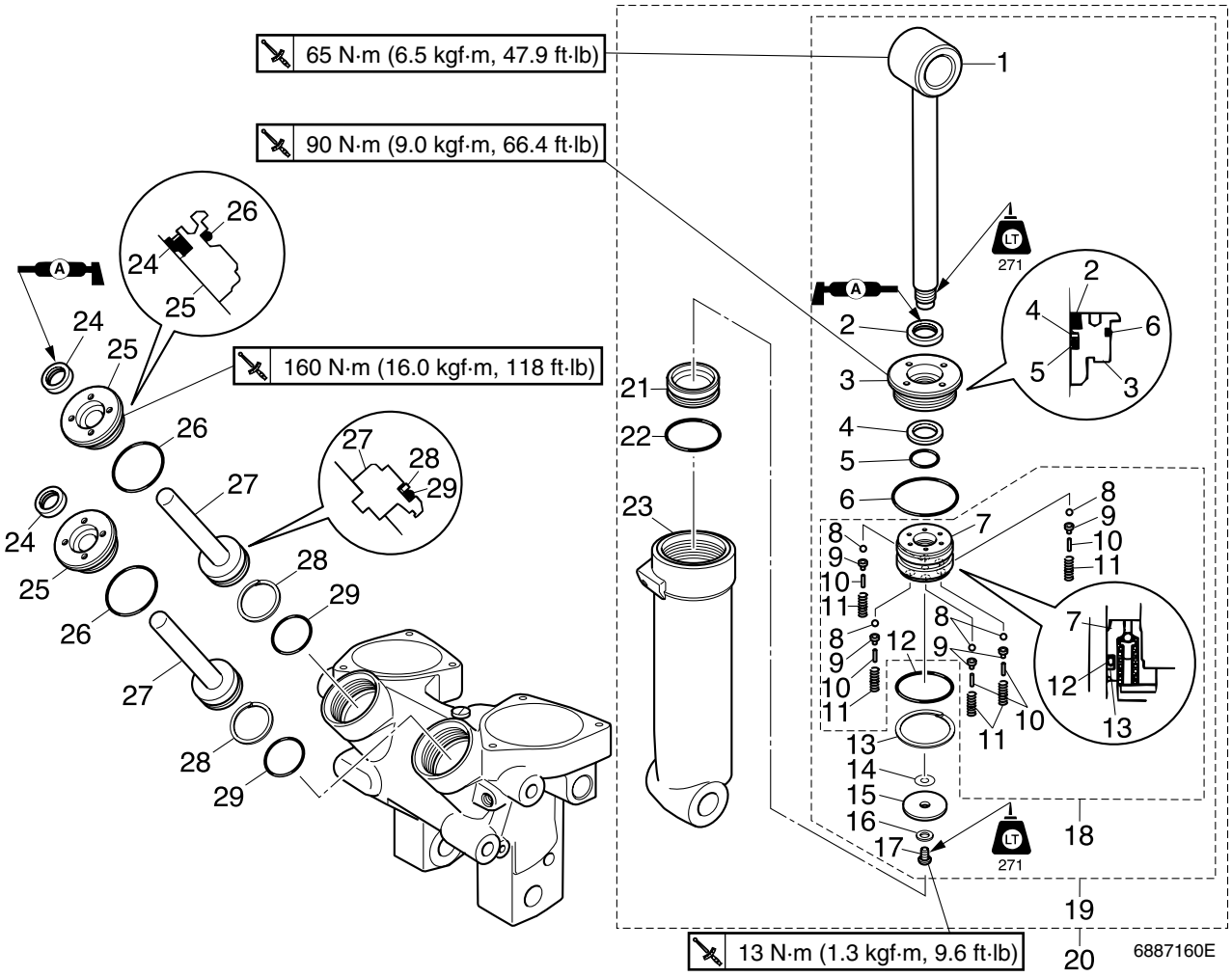
Main valve ⑪:
11 N·m (1.1 kgf·m, 8.1 ft·lb)

7

Tilt cylinder and trim cylinder



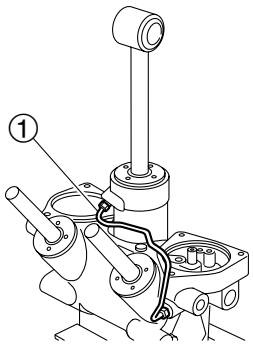
No.	Part name	Q'ty	Remarks
1	Tilt ram	1	
2	Dust seal	1	Not reusable
3	Tilt cylinder end screw	1	
4	Backup ring	1	
5	O-ring	1	Not reusable
6	O-ring	1	Not reusable
7	Tilt piston	1	
8	Ball	5	
9	Absorber valve	5	
10	Pin	5	
11	Spring	5	
12	O-ring	1	Not reusable
13	Backup ring	1	
14	Washer	1	
15	Plate	1	
16	Washer	1	
17	Bolt	1	M6 × 10 mm



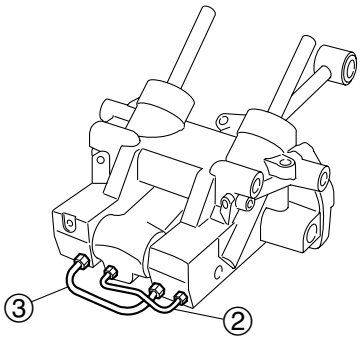
No.	Part name	Q'ty	Remarks
18	Tilt piston assembly	1	
19	Tilt ram assembly	1	
20	Tilt cylinder assembly	1	
21	Free piston	1	
22	O-ring	1	Not reusable
23	Tilt cylinder	1	
24	Dust seal	2	Not reusable
25	Trim cylinder end screw	2	
26	O-ring	2	Not reusable
27	Trim ram assembly	2	
28	Backup ring	2	
29	O-ring	2	Not reusable

Disassembling the tilt cylinder and trim cylinder

1. Loosen the pipe joint, then remove the pipes ①, ② and ③.

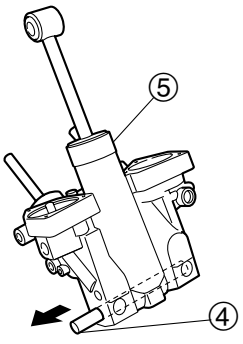


68871000



68871010

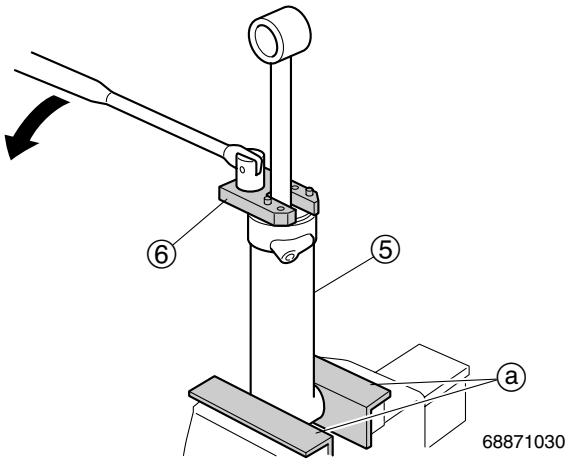
2. Remove the pin ④, and then remove the tilt cylinder ⑤ from PTT unit.



68871020

3. Hold the tilt cylinder ⑤ in a vice using aluminum plates ⓐ on both sides.

4. Loosen the tilt cylinder end screw, and then remove the tilt ram assembly.



68871030

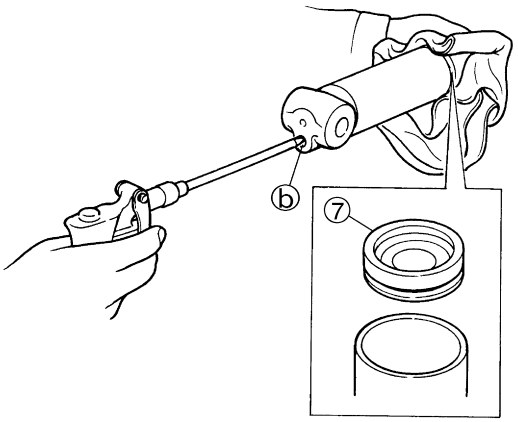
⚠WARNING

Make sure that the ram are fully extended before removing the end screw.

Cylinder-end screw wrench ⑥:
90890-06568

5. Drain the PTT fluid.

6. Blow compressed air through the hole ⓑ to remove the free piston ⑦.



S69J7305

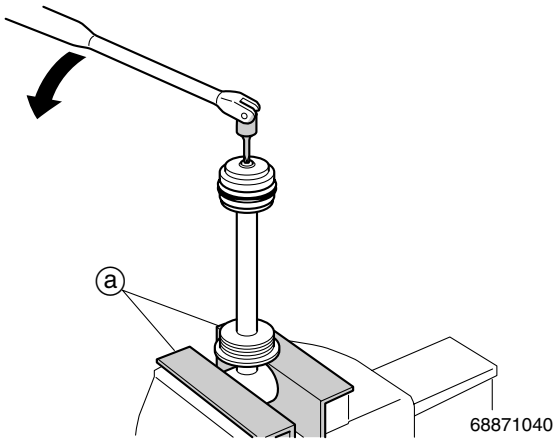
⚠WARNING

Never look into the tilt cylinder opening when removing the free piston. The free piston and PTT fluid can be forcefully expelled out.

NOTE:

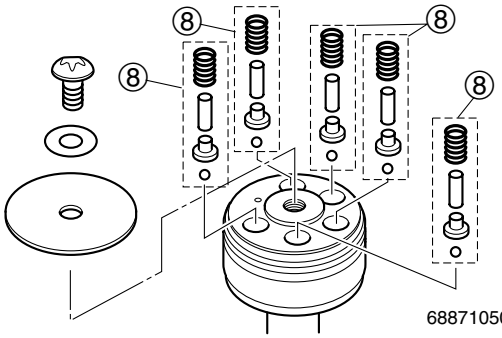
Be sure to cover the opposite end of the tilt cylinder with a rag.

7. Hold the tilt ram end in a vice using aluminum plates ⓐ on both sides, and loosen the bolt.



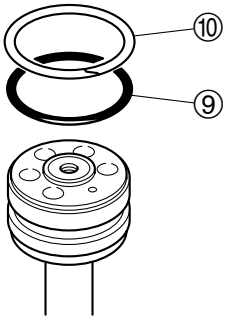
68871040

8. Remove the tilt piston absorber valves ⑧.



68871050

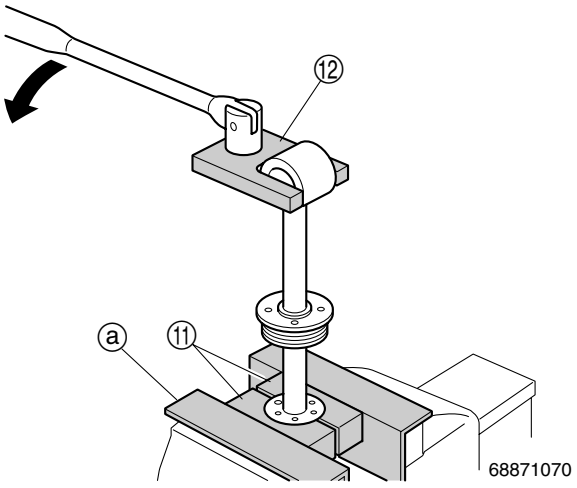
9. Remove the O-ring ⑨ and backup ring ⑩.



68871060

10. Hold the tilt piston in a vice using the aluminum plates ⓐ and special service tool on both sides.

11. Remove the tilt ram.

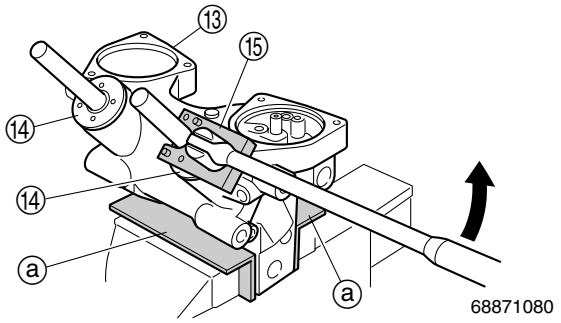


68871070

PTT piston vice attachment ⑪: 90890-06572
Tilt rod wrench ⑫: 90890-06569

12. Hold the PTT body ⑬ in a vice using aluminum plates ⓐ on both sides.

13. Loosen the trim cylinder end screws ⑭, and then remove them.



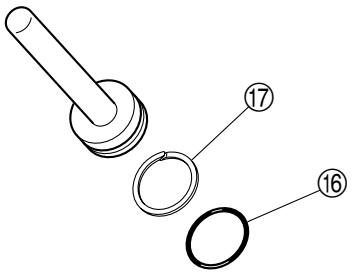
68871080

Trim and tilt wrench ⑮:
90890-06587

14. Remove the trim ram assemblies.

15. Drain the PTT fluid.

16. Remove the O-ring ⑯ and backup ring ⑰.



68871090

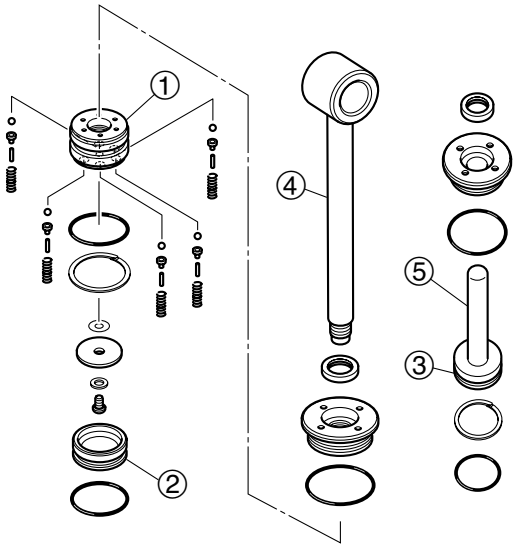
Checking the tilt cylinder and trim cylinder

1. Check the PTT body and tilt cylinder. Replace the PTT body and tilt cylinder if cracked or if corroded.

2. Check the inner walls of the PTT body and tilt cylinder. Replace PTT body and tilt cylinder if scratched.

3. Check the tilt piston ① and free piston ②. Replace the tilt piston and free piston if worn or deteriorated.

4. Check the trim ram assemblies ③. Replace the trim ram assembles if scratched.



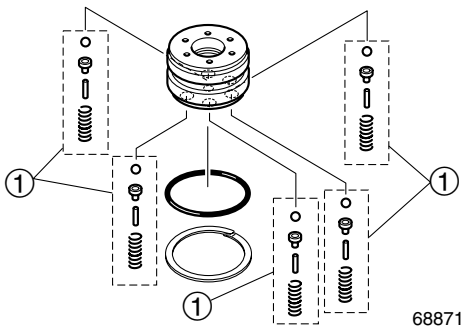
68871100

5. Check the tilt ram ④ and trim rams ⑤. Polish with 400–600 grit sandpaper if there is light rust or replace if bent or if there is excessive corrosion.

6. Check the pipes. Replace the pipes if cracked or if there is corrosion.

Checking the valve

1. Blow the tilt piston absorber valves ① with compressed air to remove any dust or residue. Check the tilt piston absorber valves. Replace the tilt piston absorber valves if worn or deteriorated.



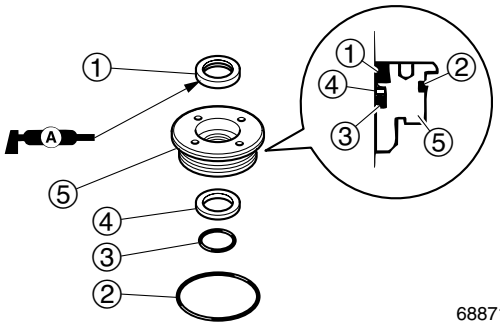
68871110

Assembling the tilt ram

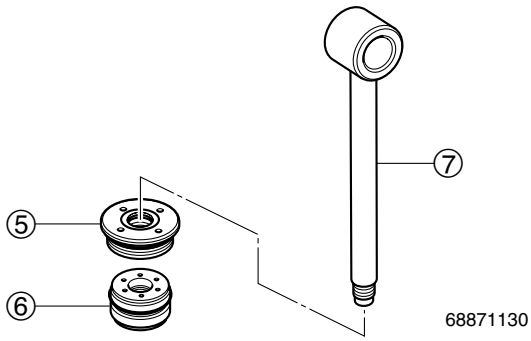
CAUTION:

Do not use a rag when assembling the PTT unit as dust and particles on the PTT unit components can lead to poor performance.

1. Install the new dust seal ①, new O-rings ②, ③, and backup ring ④ into the tilt cylinder end screw ⑤.

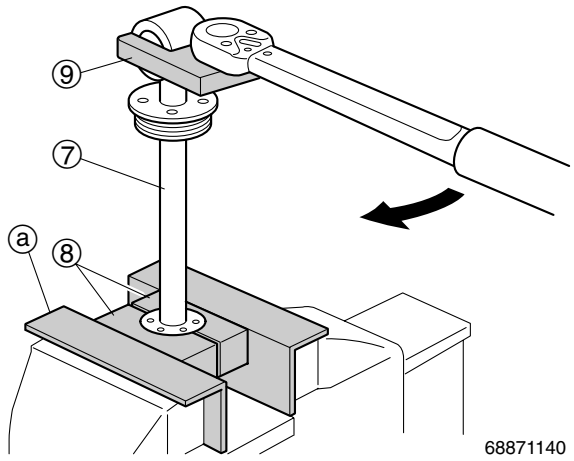


2. Install the tilt cylinder end screw ⑤, and tilt piston ⑥ to the tilt ram ⑦.



3. Hold the tilt piston in a vice using the aluminum plates ⓐ and special service tool ⑧ on both sides.

4. Tighten the tilt ram ⑦ to the specified torque.



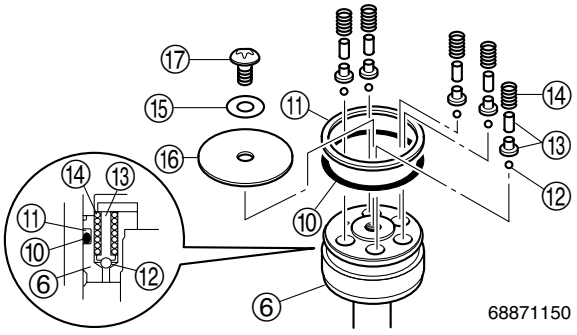
PTT piston vice attachment ⑧: 90890-06572
Tilt rod wrench ⑨: 90890-06569

Tilt ram ⑦: 65 N·m (6.5 kgf·m, 47.9 ft·lb)

5. Install the new O-ring ⑩ and backup ring ⑪ onto the tilt piston ⑥.

6. Install the balls ⑫, absorber valve pins ⑬, and springs ⑭ as shown.

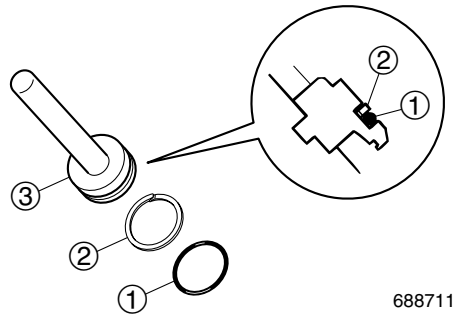
7. Install the washer ⑮, plate ⑯, and bolt ⑰ to the tilt piston ⑥, and then tighten the bolt to the specified torque.



Tilt piston bolt ⑰: 13 N·m (1.3 kgf·m, 9.6 ft·lb)

Assembling the trim ram

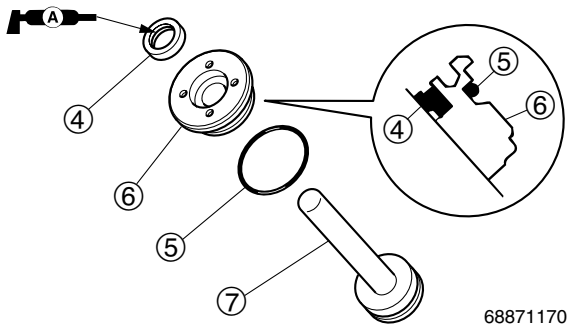
1. Install the new O-ring ①, backup ring ② onto the trim piston ③.



68871160

2. Install the new dust seal ④ and new O-ring ⑤ to the trim cylinder end screw ⑥.

3. Install the trim cylinder end screw ⑥ onto the trim ram ⑦.



68871170

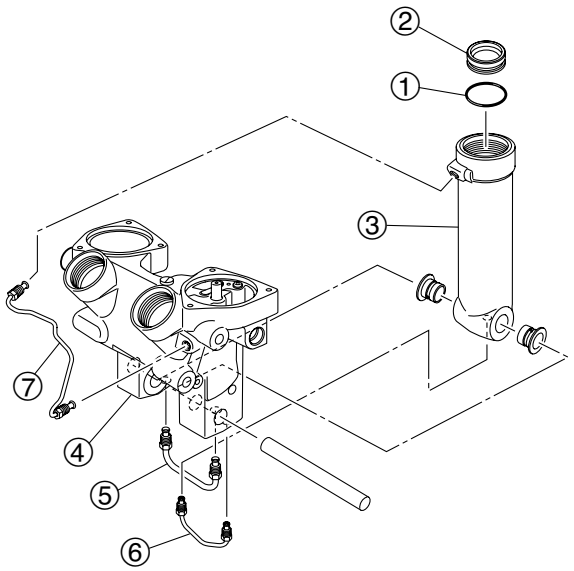
Installing the tilt cylinder

1. Install the new O-ring ① to the free piston ②.

2. Push the free piston ② into the tilt cylinder ③ until it bottoms out.

3. Install the tilt cylinder ③ to the PTT body ④.

4. Install the pipes ⑤, ⑥ and ⑦, onto the PTT body and then tighten the pipe joints to the specified torque.



68871180

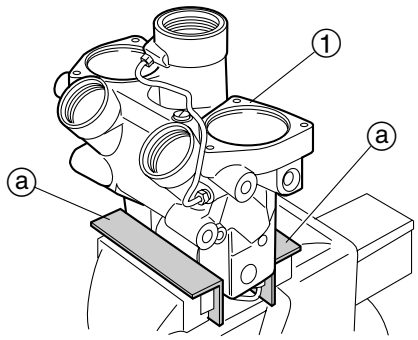
Pipe joints ⑤:
20 N·m (2.0 kgf·m, 14.8 ft·lb)
Pipe joints ⑥, ⑦:
15 N·m (1.5 kgf·m, 11.1 ft·lb)

Installing the trim ram

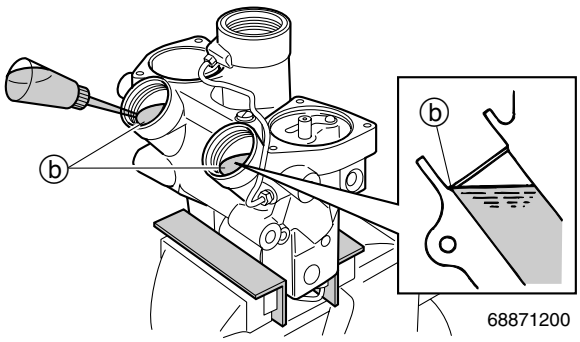
CAUTION:

Do not use a rag when installing the PTT unit as dust and particles on the PTT unit components can lead to poor performance.

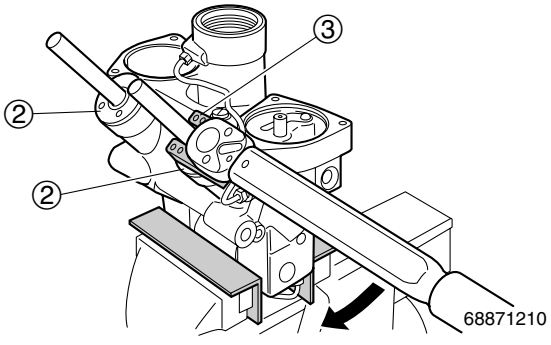
1. Hold the PTT body ① in a vice using aluminum plates ⓐ on both sides.



2. Fill the trim cylinders with the recommended fluid to the correct level ⓑ as shown.



3. Install the trim ram assemblies into the trim cylinder, and then tighten the trim cylinder end screws ② to the specified torque.



⚠WARNING

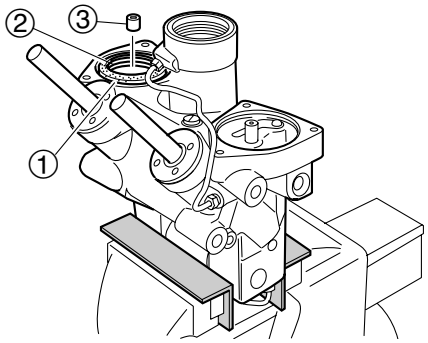
Do not push the trim rams down while installing them into the trim cylinders. Otherwise, the PTT fluid may spurt out from the unit.

Trim and tilt wrench ③:
90890-06587

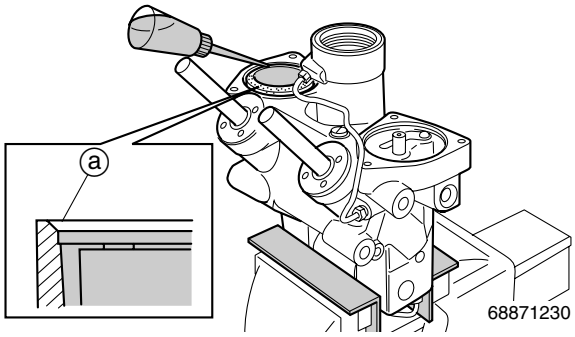
Trim cylinder end screw ②:
160 N·m (16 kgf·m, 118 ft·lb)

Installing the PTT motor

1. Install the filter ①, spring ② and joint ③ into the gear pump.



2. Fill the pump housing with the recommended fluid to the correct level ⓐ as shown.



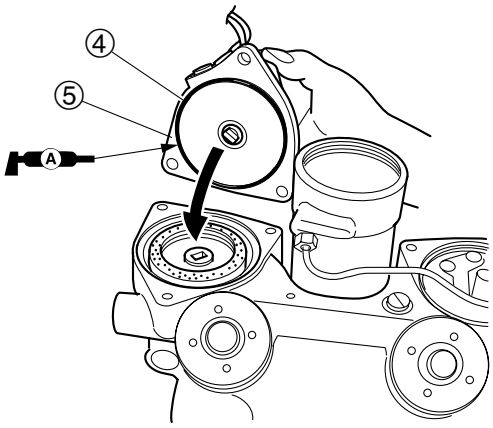
3. Remove all of the air bubbles with a syringe or suitable tool.

NOTE:

Turn the joint with a screwdriver, and then remove any air between the pump gear teeth.

7

4. Install the new O-ring ④ and PTT motor ⑤, and then tighten the bolts to the specified torque.



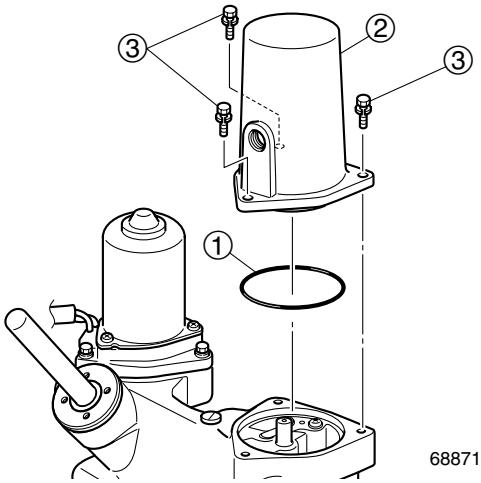
68871235

NOTE:
Align the armature shaft with the recess in the joint.

PTT motor mount bolt:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

Installing the reservoir

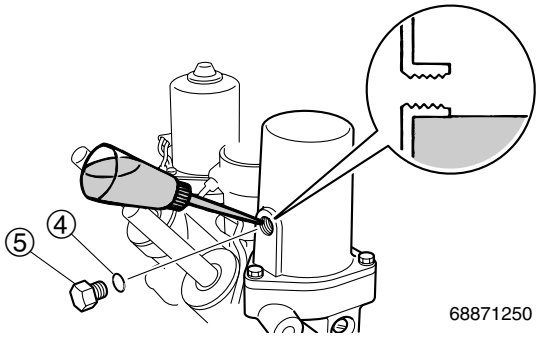
1. Install the new O-ring ① and reservoir ②, and then tighten the bolts ③ to the specified torque.



68871240

Reservoir mount bolt ③:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

2. Fill the PTT fluid into the reservoir, and then install the new O-ring ④ and reservoir cap ⑤, and then tighten it to the specified torque.



68871250

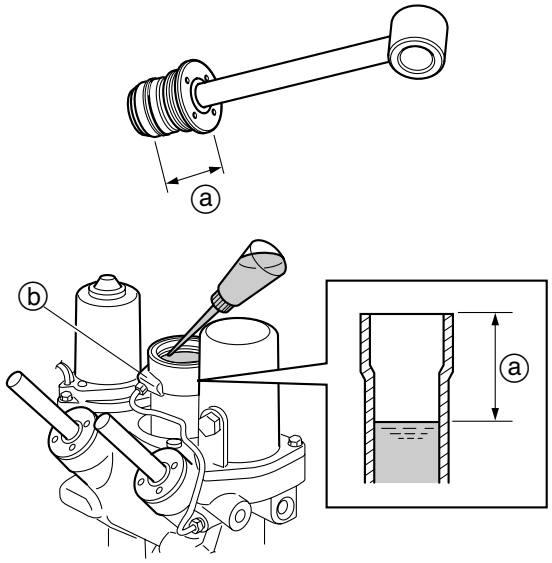
NOTE:
Add sufficient fluid of the recommended type until it overflows out of the filler hole.

Reservoir cap ⑤:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

Installing the tilt ram

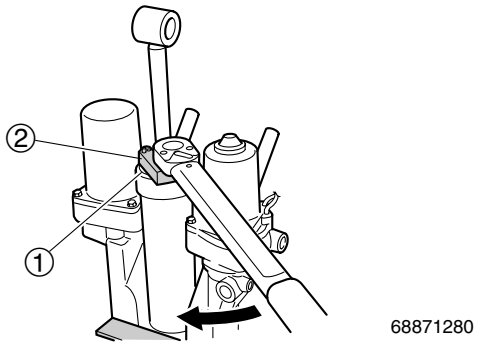
1. Fill the tilt cylinder with the recommended fluid to the correct level ⓐ as shown.

2. Add a small amount of the recommended fluid through the PTT body hole ⓑ as shown.



68871270

3. Install the tilt ram assembly into the tilt cylinder, and then tighten the tilt cylinder end screw ① to the specified torque.



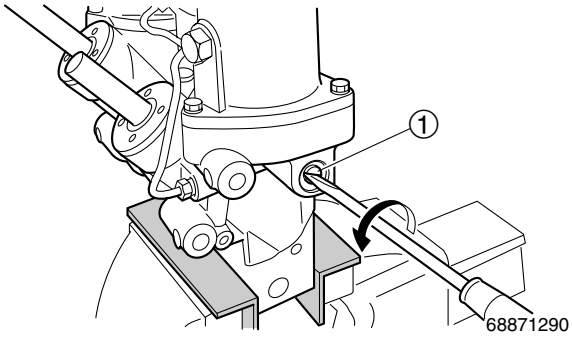
NOTE:
Place the tilt cylinder end screw at the bottom of the tilt ram and install the tilt ram assembly into the tilt cylinder.

	Cylinder-end screw wrench ②: 90890-06568

	Tilt cylinder end screw ①: 90 N·m (9.0 kgf·m, 66.4 ft·lb)

Bleeding the PTT unit

1. Tighten the manual valve ① by turning it counterclockwise.



	Manual valve ①: 3 N·m (0.3 kgf·m, 2.2 ft·lb)

2. Place the PTT unit in an upright position.

3. Remove the reservoir cap, and then check the fluid level in the reservoir.

NOTE:
The fluid level should be at the brim of the filler hole.

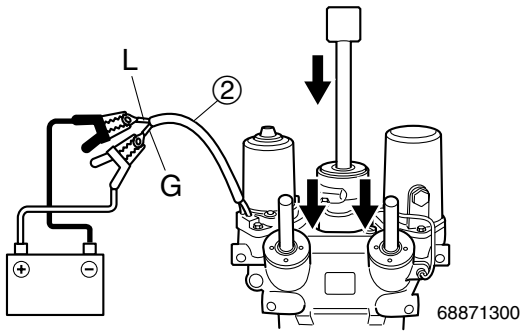
4. If fluid is below the correct level, add fluid of the recommended type.

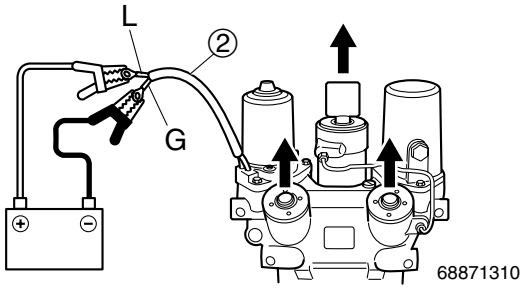
5. Install the reservoir cap, and then tighten it to the specified torque.

	Reservoir cap: 7 N·m (0.7 kgf·m, 5.2 ft·lb)

6. Connect the PTT motor leads ② to the battery terminals to fully retract the rams.

7. Reverse the PTT motor leads between the battery terminals to fully extend the rams.





Ram	PTT motor lead	Battery terminal
Up	Blue (L)	⊕
	Green (G)	⊖
Down	Green (G)	⊕
	Blue (L)	⊖

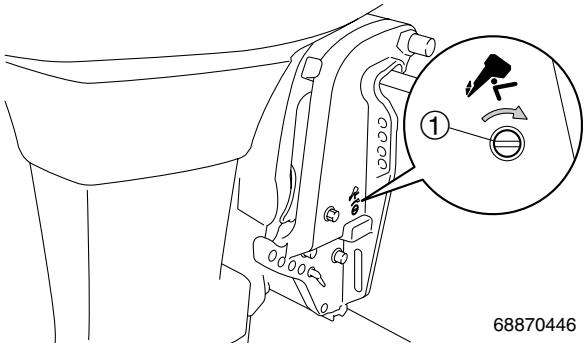
7

NOTE:
- Repeat this procedure so that the rams go up and down 4–5 times (be sure to wait for 2–3 seconds before switching the leads).
- If the rams do not move up and down easily, push and pull on the rams to assist operation.

8. Check the fluid level when the rams are fully extended. If the fluid level is low, add sufficient fluid, and then repeat step 7.

Bleeding the PTT unit (built-in)

1. Check the manual valve fully tightened, and then connect the battery to the battery cables.



NOTE:
If the manual valve is loosened, be sure to tighten it to the specified torque before tilting the outboard motor up.

Manual valve ①:
3 N·m (0.3 kgf·m, 2.2 ft·lb)

2. Fully tilt the outboard motor up and down 4–5 times.

NOTE:
Connect the PTT motor leads to the battery terminals, without installing the power unit. To connect the PTT motor leads, refer to page 7-62.

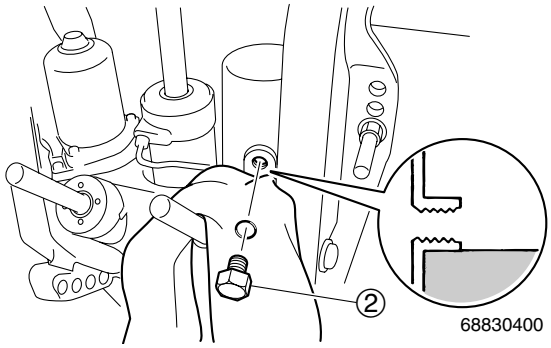
3. Let the fluid settle for 5 minutes.

4. Push and hold the PTT switch in the up position until the outboard motor is fully tilted up.

5. Support the outboard motor with the tilt stop lever, and then let the fluid settle for 5 minutes.

⚠WARNING
After tilting up the outboard motor, be sure to support it with the tilt stop lever. Otherwise, the outboard motor could suddenly lower if the PTT unit should lose fluid pressure.

6. Remove the reservoir cap ②, and then check the fluid level in the reservoir.



NOTE:
If the fluid is at the correct level, the fluid should overflow out of the filler hole when the cap ② is removed.

7. If the fluid is below the correct level, add fluid of the recommended type.

8. Install the new O-ring reservoir cap, and then tighten it to the specified torque.

NOTE:
Repeat this procedure until the fluid remains at the correct level.

Reservoir cap ②:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

PTT electrical system

Checking the fuse

1. Check the fuse (20A) for continuity. Replace if there is no continuity.

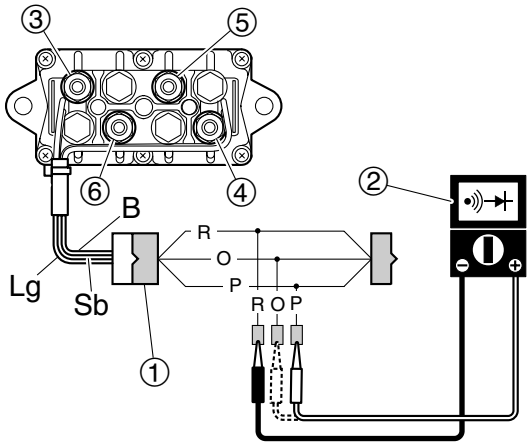
NOTE:

Fuse position, refer to page 8-3.

Checking the PTT relay

1. Remove the PTT relay from CDI unit bracket.

2. Connect the special service tools, and then check the PTT relay for continuity. Replace the PTT relay if not shown in the chart below.



68871320

NOTE:

- Be sure to set the measurement range shown in the illustration when checking for continuity.
- Following [ ] in the continuity chart is indicate color code of the PTT relay.

Throttle sensor adjusting lead ①:
90890-06857
Digital circuit tester ②:
90890-03174

Tester probe	Lead color		
	Orange (O)	Pink (P)	Red (R)
Test harness – Test harness	○		○
		○	○

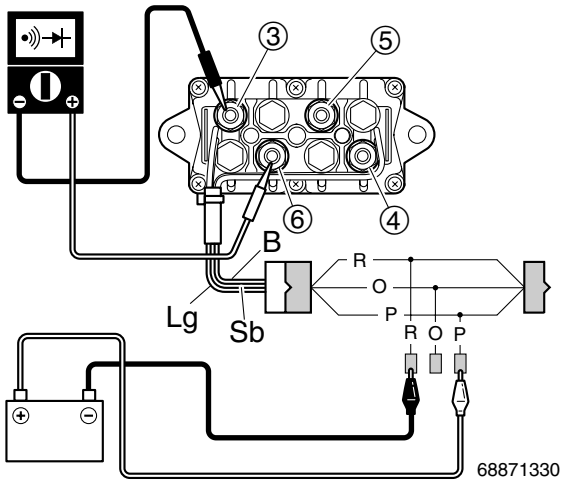
Test harness (O) [Sky blue (Sb)]
Test harness (P) [Light green (Lg)]
Test harness (R) [Black (B)]

Tester probe	Terminal			
	③	④	⑤	⑥
Terminal–Terminal	○			○
		○		○

3. Connect the digital circuit tester between PTT relay terminals ③ and ⑥.

4. Connect the light green (Lg) lead to the positive battery terminal and the black (B) lead to the negative battery terminal as shown.

5. Check for continuity between terminals. Replace the PTT relay if not shown in the chart below.



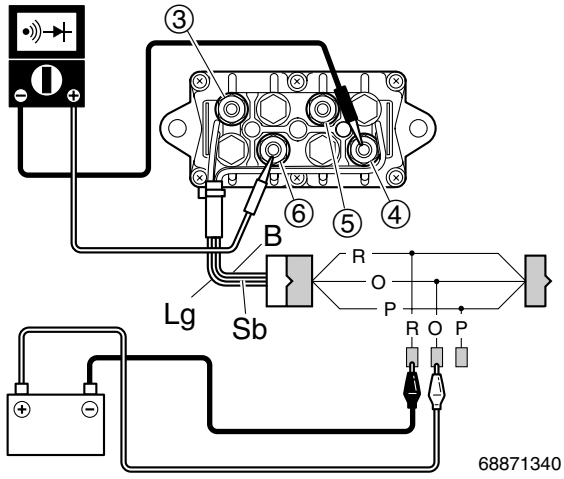
68871330

Tester probe	Terminal			
	③	④	⑤	⑥
Terminal–Terminal	○			○
		○	○	

7

6. Connect the sky blue (Sb) lead to the positive battery terminal and the black (B) lead to the negative battery terminal as shown.

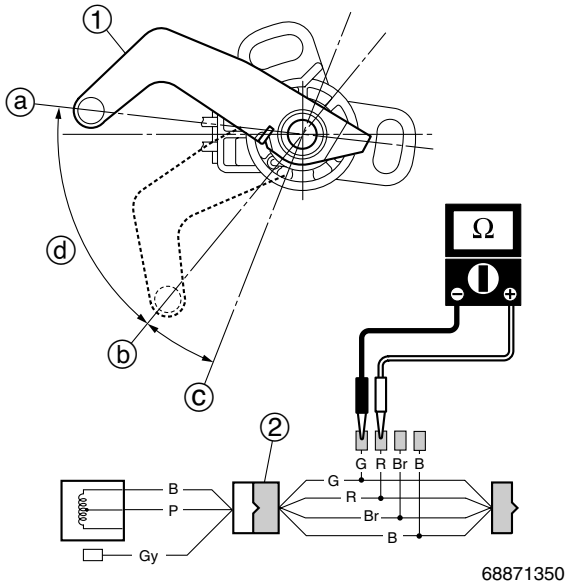
7. Check for continuity between terminals. Replace the PTT relay if not shown in the chart below.



Tester probe	Terminal			
	③	④	⑤	⑥
Terminal–Terminal	○	—	○	
		○		○

Checking the trim sensor

1. Measure the trim sensor resistance. Replace if out of specification.



NOTE:

- Turn the trim sensor lever ① from ⓐ to ⓒ and measure the resistance as it gradually changes.
- The position ⓑ is the trim sensor lever position when the outboard motor is tilted down. To adjust the trim sensor, refer to page 7-33.
- The trim sensor resistance will be lower at the position ⓒ than at the position ⓑ.
- The range ⓓ is the trim and tilt operation range.

Trim sensor resistance:
Pink (P)–Black (B)
168.3–288.3 Ω at ⓐ
9–11 Ω at ⓑ

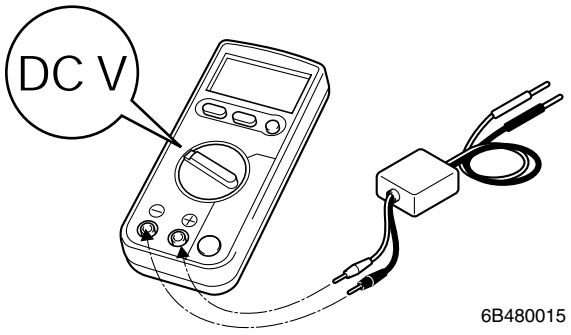
Test harness ②:
90890-06878

Electrical system

Checking the electrical component

Measuring the peak voltage

To check the electrical components or measure the peak voltage, use the special service tools. A faulty electrical component can be easily checked by measuring the peak voltage. The specified engine speed when measuring the peak voltage is effected by many factors such as fouled spark plugs or a weak battery. If one of these factors is present, the peak voltage cannot be measured properly.



⚠WARNING

When checking the peak voltage, do not touch any of the connections of the digital circuit tester leads.

CAUTION:

When testing the voltage between the terminals of an electrical component with the digital tester, do not allow any of the leads to touch any metal parts. If touched, the electrical component can short and be damaged.

NOTE:

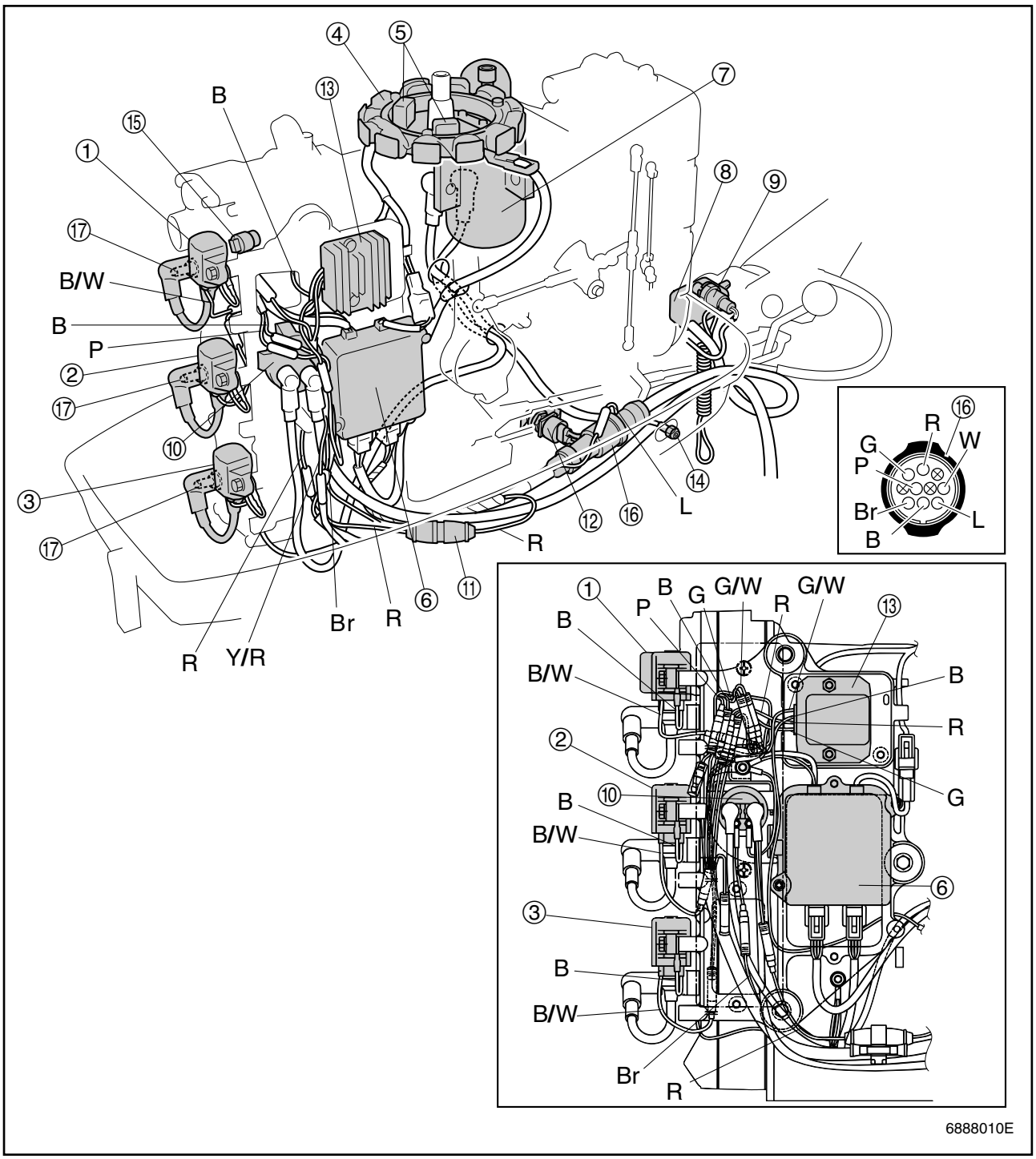
- Before measuring the peak voltage, check all wiring for proper connection and corrosion, and check that the battery is fully charged.
- Use the peak voltage adapter B with the recommended digital circuit tester.
- Connect the positive pin of the peak voltage adapter B to the positive terminal of the digital tester, and the negative pin to the negative terminal.
- When measuring the peak voltage, set the selector on the digital circuit tester to the **DC voltage mode**.

Digital circuit tester: 90890-03174
Peak voltage adapter B:
90890-03172

Electrical component

Starboard view

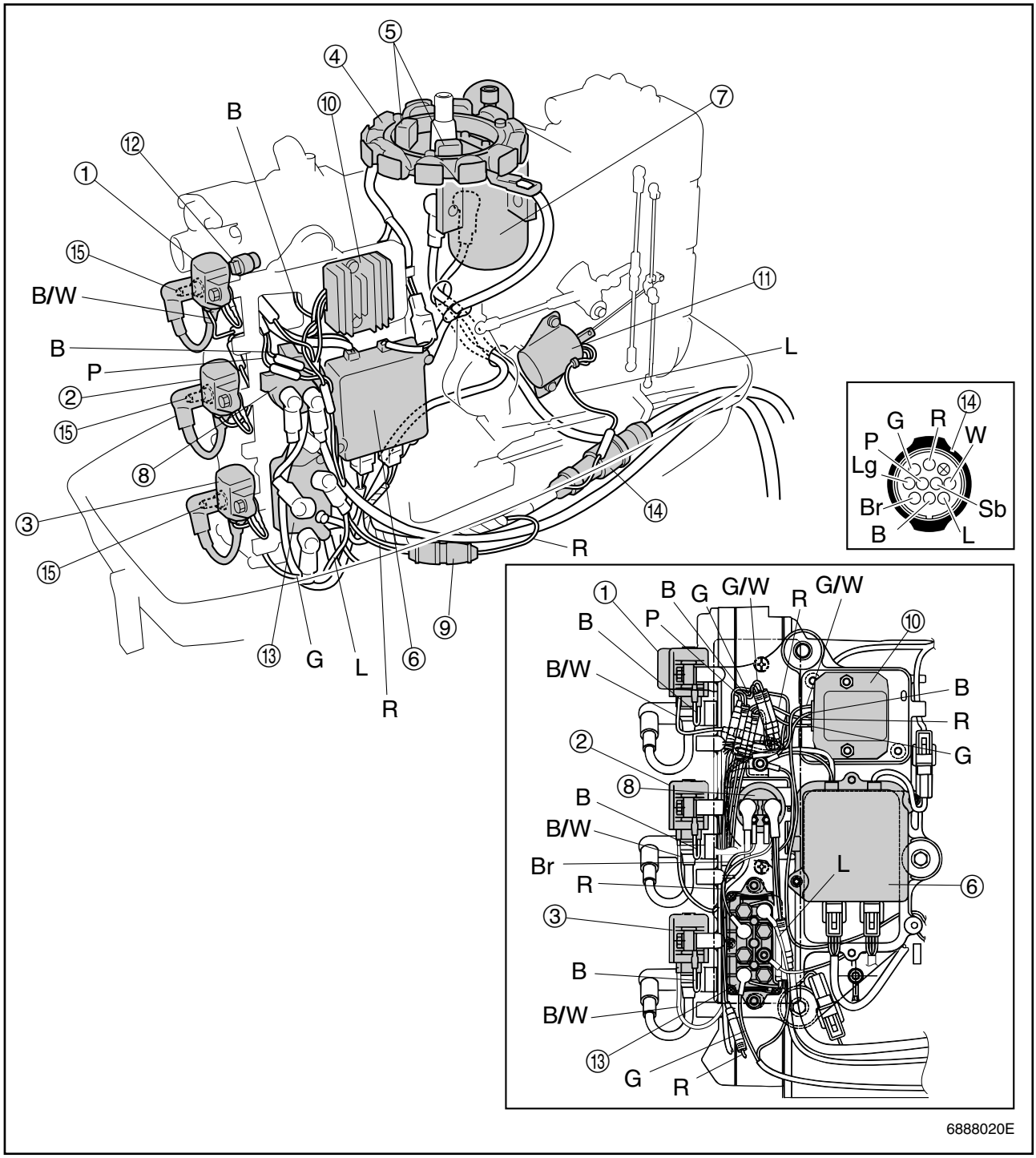
55DEHD, 75AEHD, 85AEHD



① Ignition coil #1	⑧ Engine start switch	⑭ Warning indicator	L : Blue
② Ignition coil #2	⑨ Engine stop lanyard switch	⑮ Thermoswitch	P : Pink
③ Ignition coil #3	⑩ Starter relay	⑯ 10P-coupler	R : Red
④ Stator assembly	⑪ Fuse (20A)	⑰ Spark plug	W : White
⑤ Pulser coil assembly	⑫ Neutral switch	B : Black	B/W : Black/white
⑥ CDI unit	⑬ Rectifier Regulator	Br : Brown	G/W : Green/white
⑦ Starter motor		G : Green	Y/R : Yellow/red

8

75AED, 75AET, 85AED, 85AET



① Ignition coil #1
② Ignition coil #2
③ Ignition coil #3
④ Stator assembly
⑤ Pulser coil assembly
⑥ CDI unit
⑦ Starter motor
⑧ Starter relay
⑨ Fuse (20A)
⑩ Rectifier Regulator
⑪ Choke solenoid
⑫ Thermoswitch
⑬ PTT relay (ET)
⑭ 10P-coupler
⑮ Spark plug

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

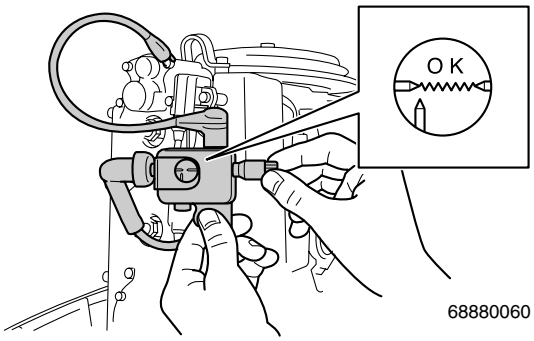
Ignition and ignition control system

Checking the ignition spark gap

1. Disconnect the all spark plug caps from the all spark plugs.
2. Connect a spark plug cap to the special service tool.

Ignition tester: 90890-06754

3. Crank the engine and check for a spark. If there is no spark. Check the ignition system.



68880060

Ignition tester: 90890-06754

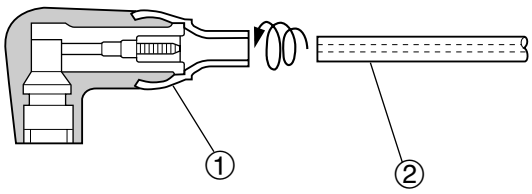
⚠WARNING

- **Do not touch any of the connections of the ignition tester leads.**
- **Keep flammable gas or liquids away, since this test can produce sparks.**

Checking the spark plug cap (with resister type)

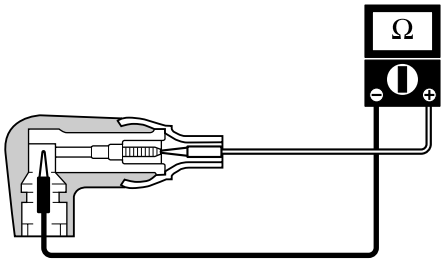
1. Check the spark plug caps. Replace the spark plug caps if cracked or damaged.

2. Remove the spark plug cap ① from the spark plug wire ② by turning the cap counterclockwise.



6B480080

3. Measure the spark plug cap resistance. Replace the spark plug cap if out of specification.



69R80060

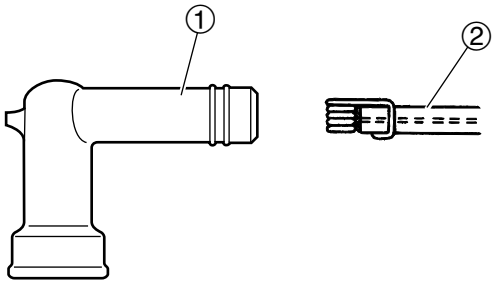
Spark plug cap resistance:
4.0–6.0 kΩ at 20°C (68°F)

8

Checking the spark plug cap

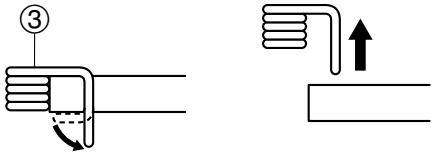
1. Check the spark plug caps. Replace the spark plug caps if cracked or damaged.

2. Remove the spark plug cap ① from the spark plug wire ②.



6S680060

3. Check the spark plug wire terminal ③. Replace the spark plug wire terminal if damaged or corrosion.



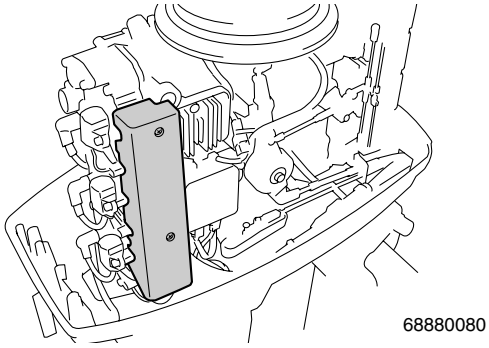
61U80180

4. Install the spark plug wire terminal.

Checking the ignition coil

1. Disconnect the all spark plug caps from the all spark plugs.

2. Remove the cover.



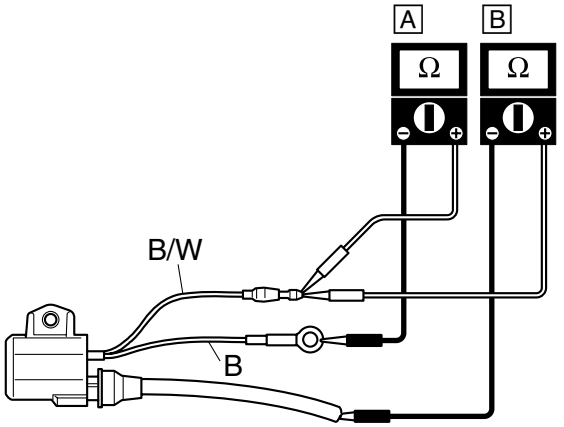
68880080

3. Disconnect the ignition coil connector, and then remove the spark plug cap.

4. Remove the ignition coil from the power unit.

5. Check the spark plug wire. Replace the ignition coil if cracked or corroded.

6. Measure the ignition coil resistance. Replace the ignition coil if out of specification.



68880070

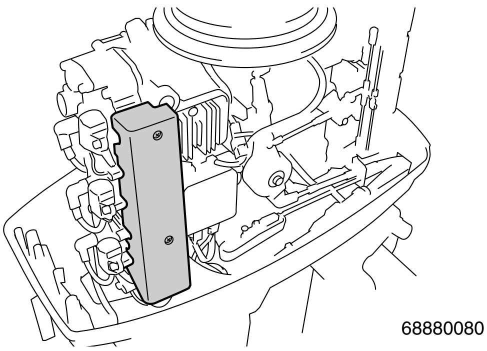
Ignition coil resistance (reference data):
A Primary coil:
Black/white (B/W)–Black (B)
0.18–0.24Ω at 20°C (68°F)
B Secondary coil:
Black/white (B/W)–
Spark plug wire
3.26–4.88 kΩ at 20°C (68°F)

Checking the CDI unit

NOTE:
Be sure to install the test propeller before checking the peak voltage.

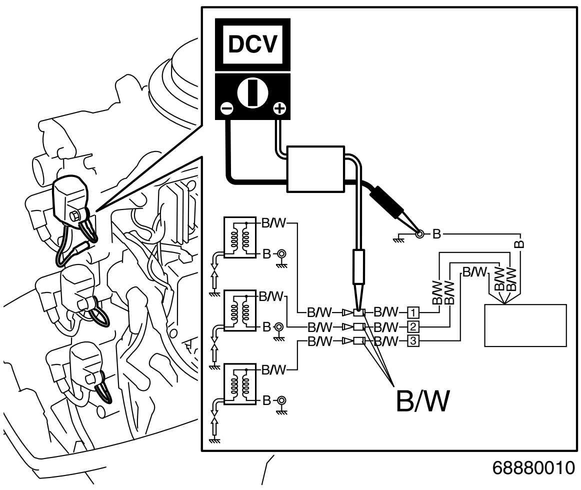
Test propeller: 90890-01620

1. Remove the cover.



2. Connect the digital circuit tester with peak voltage adapter B to the ignition coil lead and the ground.

3. Measure the CDI unit output peak voltage. If less than specification, measure the charge coil output peak voltage. Replace the CDI unit if the output peak voltage of the charge coil is more than specification.



CDI unit output peak voltage:
1 Black/white (B/W)–Ground (B)
2 Black/white (B/W)–Ground (B)
3 Black/white (B/W)–Ground (B)

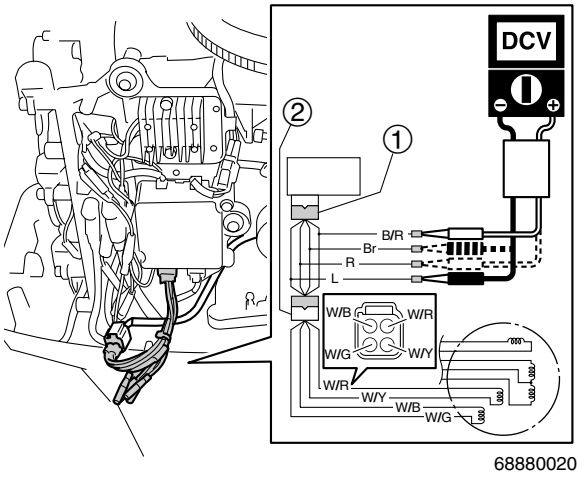
r/min	Loaded		
	Cranking	1,500	3,500
DC V	130	150	150

NOTE:
Remove the all spark plug caps, when measuring the CDI unit peak voltage at loaded engine cranking.

8

Checking the pulser coil

1. Remove the cover.
2. Connect the test harness ① and digital circuit tester with peak voltage adapter B to the pulser coil coupler ②.
3. Measure the pulser coil output peak voltage. If the measurement is less than specification, measure the pulser coil resistance.



68880020

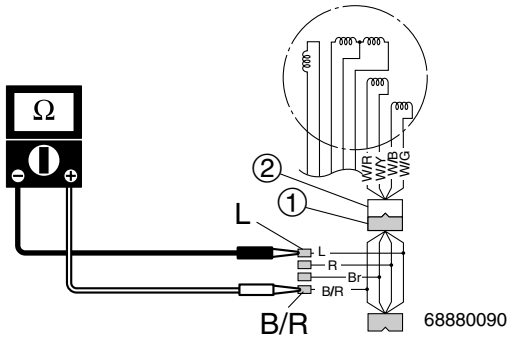
Test harness ①: 90890-06871

Pulser coil output peak voltage:
White/red (W/R)–
White/yellow (W/Y)
White/black (W/B)–
White/green (W/G)

r/min	Unloaded	Loaded		
	Cranking		1,500	3,500
DC V	6.0	4.0	8.0	14.0

NOTE:
Remove the all spark plug caps, when measuring the pluser coil peak voltage at loaded engine cranking.

4. Disconnect the pulser coil coupler.
5. Connect the test harness ① digital circuit tester to the pulser coil coupler ②.
6. Measure the pulser coil resistance. Replace the pulser coil assembly if out of specification.

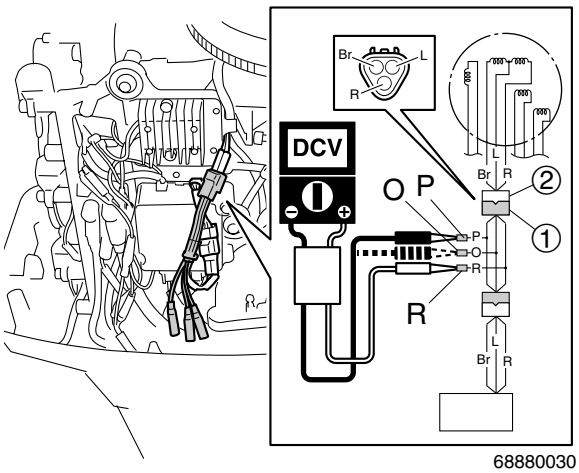


68880090

Pulser coil resistance
(reference data):
White/red (W/R)–
White/yellow (W/Y)
White/black (W/B)–
White/green (W/G)
256–384 Ω at 20°C (68°F)

Checking the charge coil

1. Remove the cover.
2. Connect the special service tool ① and digital circuit tester with peak voltage adapter B to the charge coil coupler ②.
3. Measure the charge coil output peak voltage. If the measurement is less than specification, measure the charge coil resistance.



68880030

Throttle sensor adjusting lead ①:
90890-06857

Charge coil output peak voltage:
Red (R)–Blue (L)

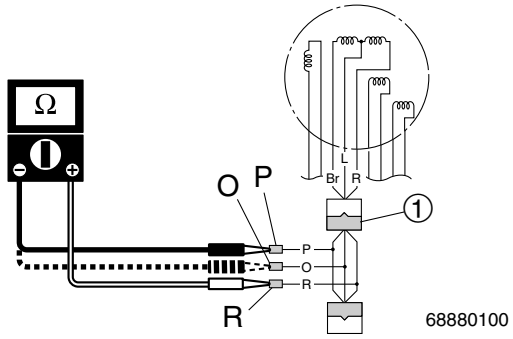
r/min	Unloaded	Loaded		
	Cranking		1,500	3,500
DC V	150	110	150	160

Charge coil output peak voltage:
Red (R)–Brown (Br)

r/min	Unloaded	Loaded		
	Cranking		1,500	3,500
DC V	50	60	150	160

NOTE:
Remove the all spark plug caps, when measuring the charge coil peak voltage at loaded engine cranking.

4. Disconnect the charge coil coupler.
5. Connect the special service tool ① and digital circuit tester to the charge coil coupler.
6. Measure the charge coil resistance. Replace the stator assembly if out of specification.



Charge coil resistance (reference data):
Red (R)–Brown (Br)
48–72 Ω at 20°C (68°F)
Red (R)–Blue (L)
428–642 Ω at 20°C (68°F)

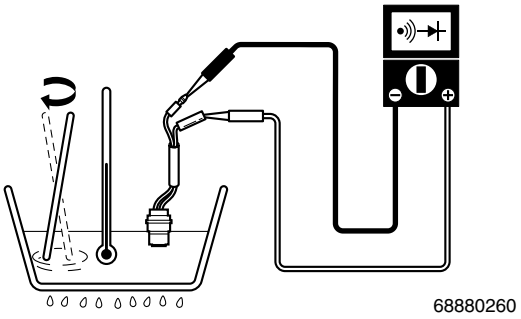
Throttle sensor adjusting lead ①:
90890-06857

Checking the thermoswitch

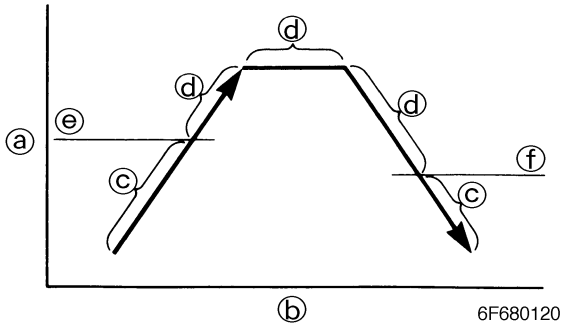
1. Remove the thermoswitch from cylinder head.

NOTE:
To remove the thermoswitch, refer to page 5-18.

2. Place the thermoswitch in a container of water and slowly heat the water.



3. Check the switch for continuity at the specified temperatures. Replace the thermoswitche if out of specification.



ⓐ Temperature
ⓑ Time
ⓒ No continuity
ⓓ Continuity

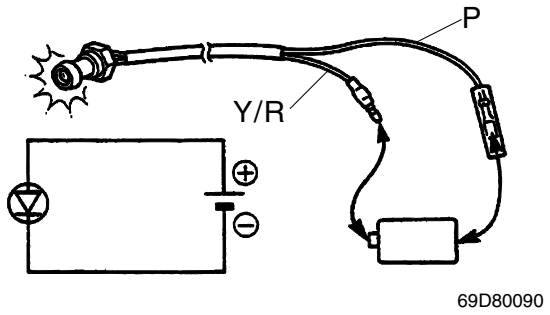
Thermoswitch continuity temperature (reference data):
Pink (P)–Black (B)
ⓔ: 84–90 °C (183–194°F)
ⓕ: 60–74 °C (140–165°F)

8

Checking the warning indicator (EHD)

1. Disconnect the warning indicator connector.

2. Check the warning indicator for continuity.



CAUTION:

- **Be sure to use the 1.5 V dry sell battery, otherwise the higher voltage batteries will damage the diode.**
- **LED has an direction for electrical current. Do not connect them reversely, otherwise they may be damaged.**

Starting system

Checking the fuse

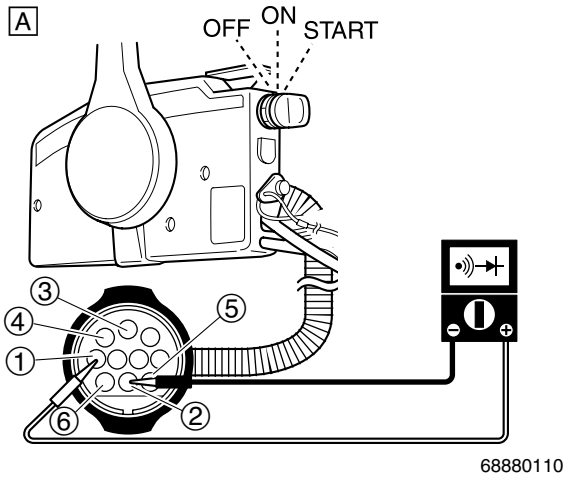
1. Remove the fuse from fuse holder.

2. Check the fuse (20A) for continuity. Replace the fuse if there is no continuity.

Checking the engine start switch

1. Disconnect the main harness coupler.

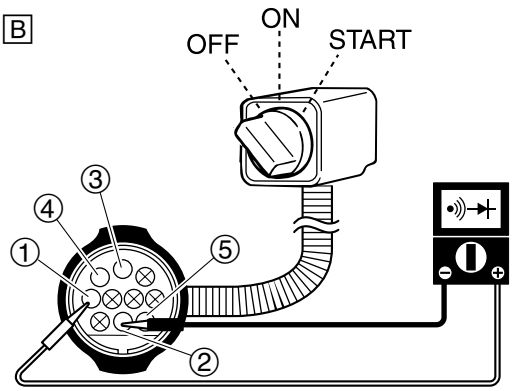
2. Check the engine start switch for continuity at the main harness coupler. Check the wiring harness or replace the engine start switch of the remote control box or tiller handle if it is not shown in the chart below.



Switch position	Lead color					
	White (W) ①	Black (B) ②	Red (R) ③	Yellow (Y) ④	Brown (Br) ⑤	Blue (L) ⑥
OFF	○—○					
ON			○—○			
START			○—○—○			
ON (Push)			○—○			○
START (Push)			○—○—○			○

A ED, ET

B

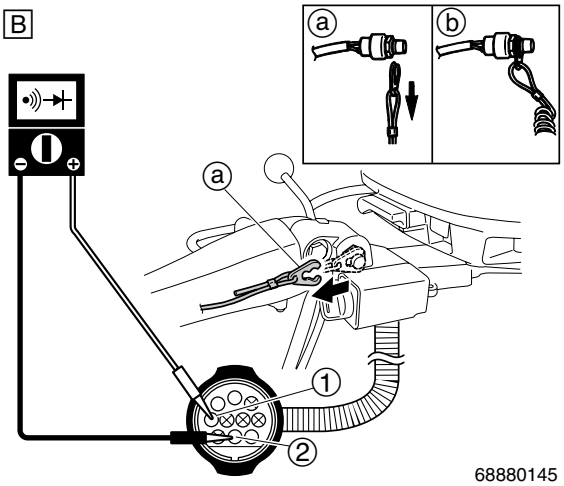


68880115

Switch position	Lead color				
	White (W) ①	Black (B) ②	Red (R) ③	Pink (P) ④	Brown (Br) ⑤
OFF	○——	——○			
ON			○——	——○	
START			○——	○——	——○

B EHD

B



68880145

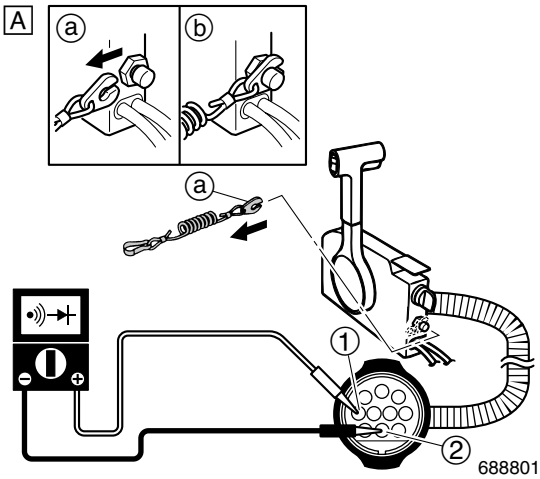
Switch position	Lead color	
	White (W) ①	Black (B) ②
Lock plate removed ⓐ	○——	——○
Lock plate installed ⓑ		

A ED, ET
B EHD

Checking the engine stop lanyard switch

1. Check the engine stop lanyard switch for continuity. Replace the engine stop lanyard switch if it is not shown in the chart below.

A

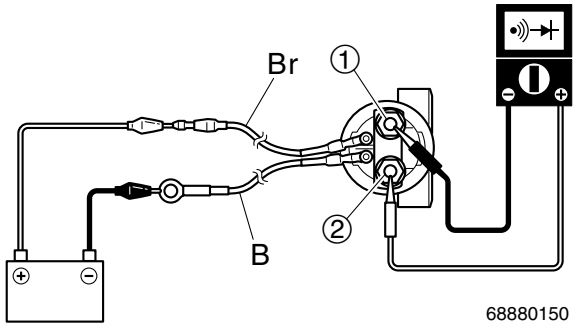


68880140

8

Checking the starter relay

1. Remove the cover and starter relay.
2. Connect the digital circuit tester to the starter relay terminals.
3. Check the starter relay for continuity. Replace the starter relay if it is not shown in the chart below.

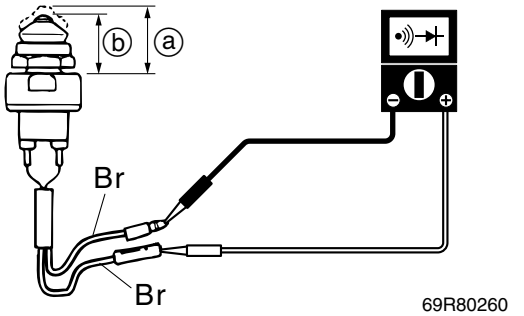


68880150

Battery lead position	Terminal	
	①	②
Battery connected	○	○
Battery disconnected		

Checking the neutral switch continuity (EHD)

1. Disconnect the neutral switch connector.
2. Connect the digital circuit tester to the neutral switch connector.
3. Set the gear shift to “F” or “R” position.
4. Check the neutral switch for continuity. Replace the neutral switch if it is not shown in the chart below.

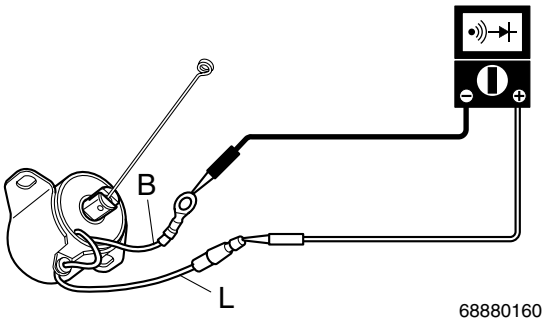


69R80260

Switch position	Lead color	
	Brown (Br)	Brown (Br)
Free ⓐ (“F” or “R” position)		
Push ⓑ (“N” position)	○	○

Measuring the choke solenoid resistance (ED, ET)

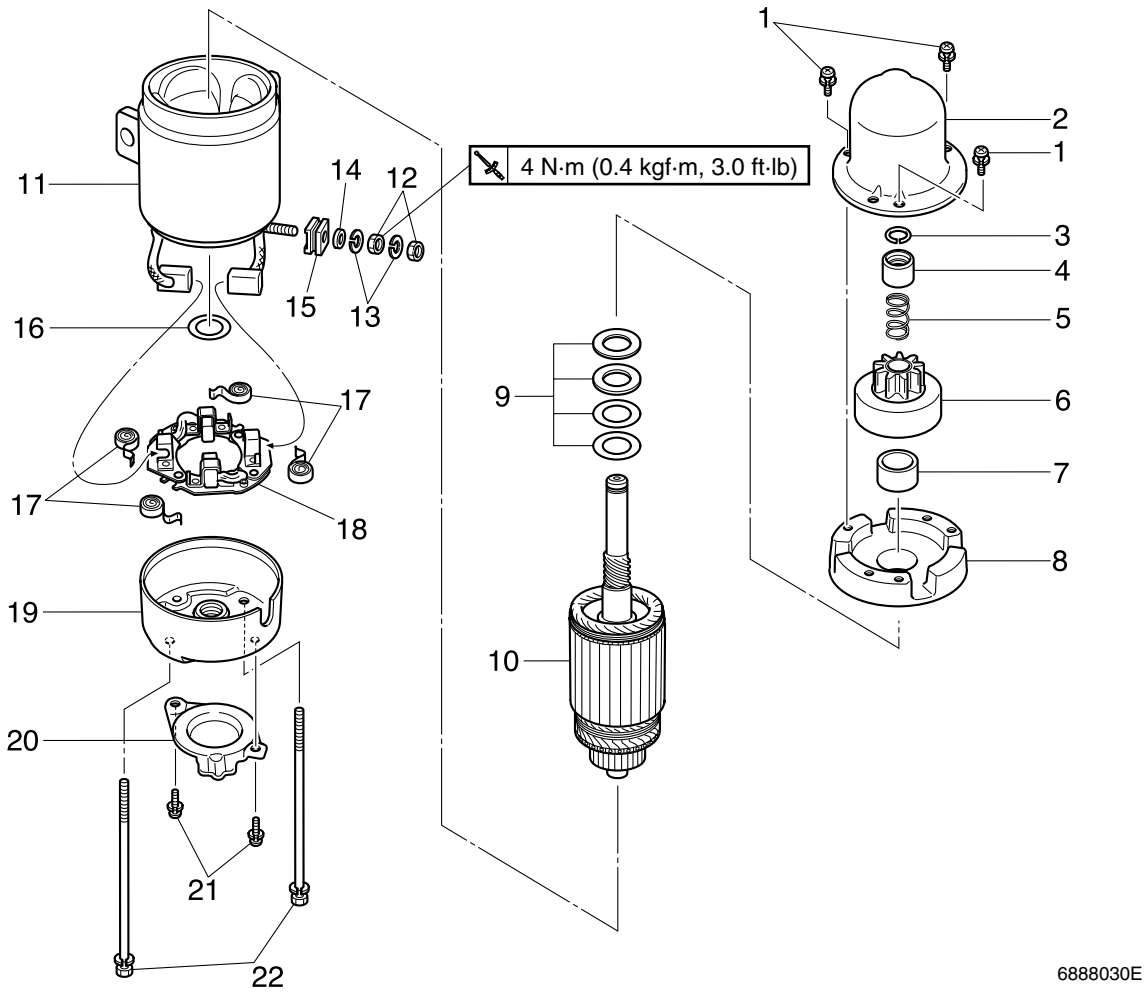
1. Disconnect the choke solenoid connector.
2. Connect the digital circuit tester to the choke solenoid connector.
3. Measure the resistance of the choke solenoid. Replace the choke solenoid if out of specification.



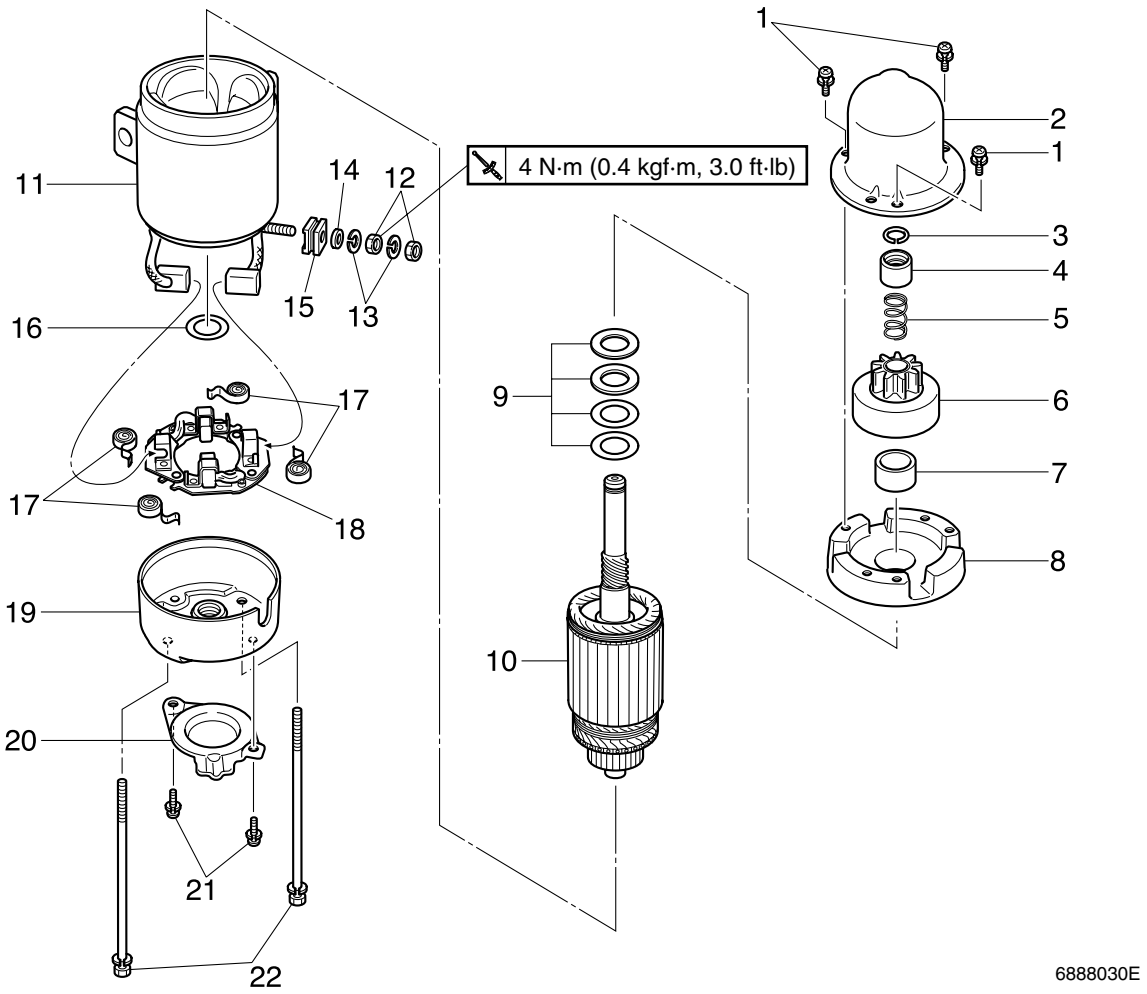
68880160

Choke solenoid resistance:
3.4–4.0 Ω at 20°C (68°F)

Starter motor



No.	Part name	Q'ty	Remarks
1	Screw	3	ø4 × 10 mm
2	Cover	1	
3	Clip	1	Not reusable
4	Pinion stopper	1	
5	Spring	1	Not reusable
6	Pinion	1	
7	Bushing	1	
8	Front bracket	1	
9	Washer	—	
10	Armature	1	
11	Stator assembly	1	
12	Nut	2	
13	Spring washer	2	
14	Washer	1	
15	Holder	1	
16	Washer	2	
17	Spring	4	



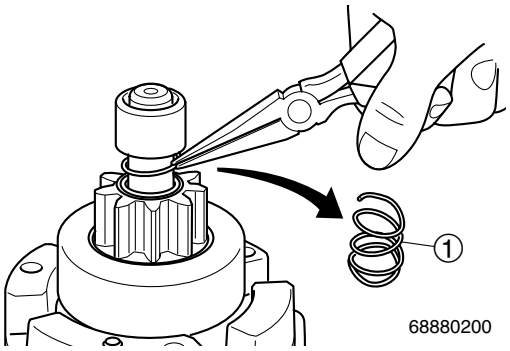
No.	Part name	Q'ty	Remarks
18	Brush holder	1	
19	Rear bracket	1	
20	Cover	1	
21	Screw	2	ø4 × 12 mm
22	Bolt	2	M5 × 130 mm

Removing the starter motor pinion

1. Remove the starter motor from the power unit.

NOTE:
To remove the starter motor, refer to page 5-12.

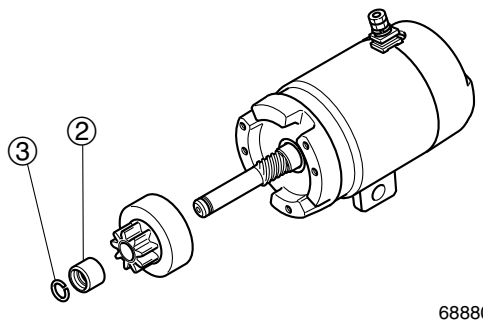
2. Remove the cover, and then remove the spring ① from the starter motor.



68880200

NOTE:
Do not reuse the spring ①.

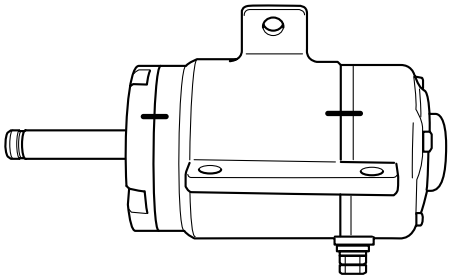
3. Slide the pinion stopper ②, and then remove the clip ③ and starter motor pinion.



68880210

NOTE:
Do not reuse the clip ③.

4. Mark the alignment line on the starter motor before disassembly.


68880220

Checking the starter motor pinion

1. Check the teeth of the pinion. Replace the pinion if cracked or worn.

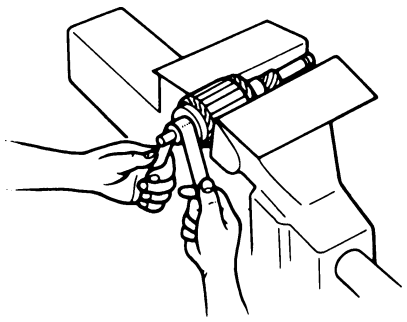
2. Check the pinion. Replace the pinion if it does not operate smoothly.


6F680170

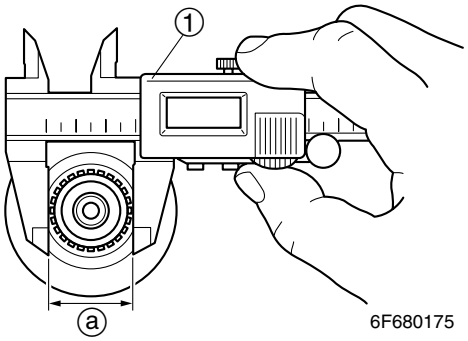
NOTE:
Turn the pinion counterclockwise to check for smooth operation and turn it clockwise to check that it locks in place.

Checking the armature

1. Check the commutator. Clean with 600–grit sandpaper and compressed air if dirt.


6G480220

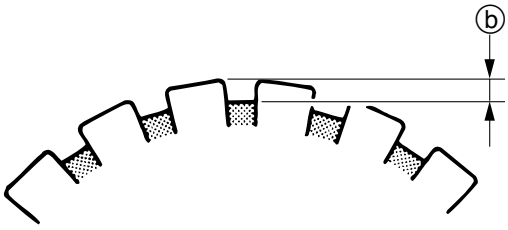
2. Measure the commutator diameter ⓐ. Replace the armature if below specification limit.



Digital caliper ①:
90890-06704

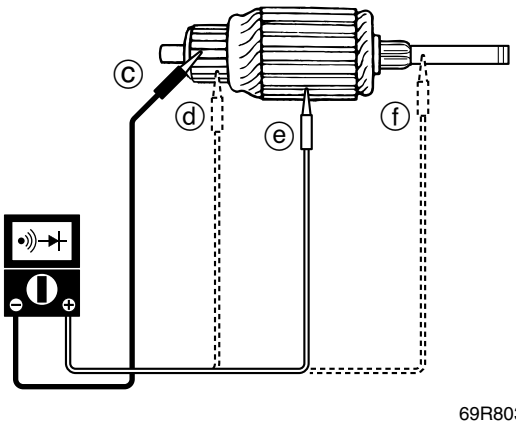
Standard diameter ⓐ:
33.0 mm (1.30 in)
Wear limit:
31.0 mm (1.22 in)

3. Measure the commutator undercut ⓑ. Replace the armature if below specification limit.



Standard undercut ⓑ:
0.8 mm (0.03 in)
Wear limit:
0.2 mm (0.01 in)

4. Check the armature for continuity. Replace the armature if it is not shown in the chart below.

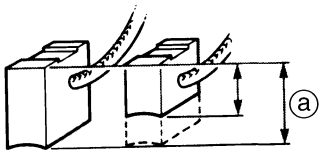


Armature continuity:

Tester probe	ⓒ	ⓓ	ⓔ	ⓕ
Segment–Segment	○—○			
Segment–Armature core				
Segment–Armature shaft				

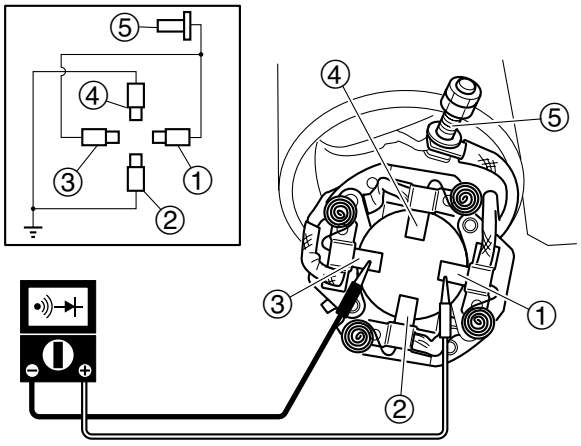
Checking the brush

1. Measure the brush length ⓐ. Replace the brush assembly if below specification limit.



Standard length ⓐ:
16.0 mm (0.63 in)
Wear limit:
12.0 mm (0.47 in)

2. Check the brush holder assembly for continuity. Replace the brush holder if it is not shown in the chart below.

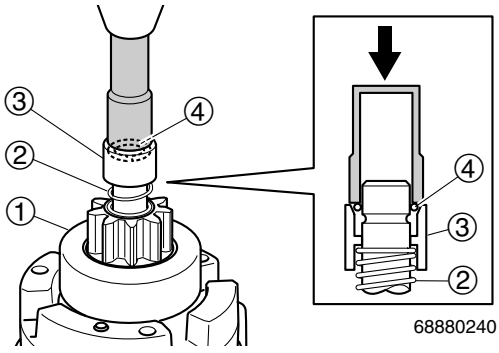


Brush continuity:

Tester probe	Brush and terminal				
	①	②	③	④	⑤
Brush–Brush	○		○		
		○		○	
Terminal–Brush	○				○
			○		○

Installing the starter motor pinion

1. Install the starter motor pinion ①, new spring ②, pinion stopper ③ and then press fit the new clip ④.



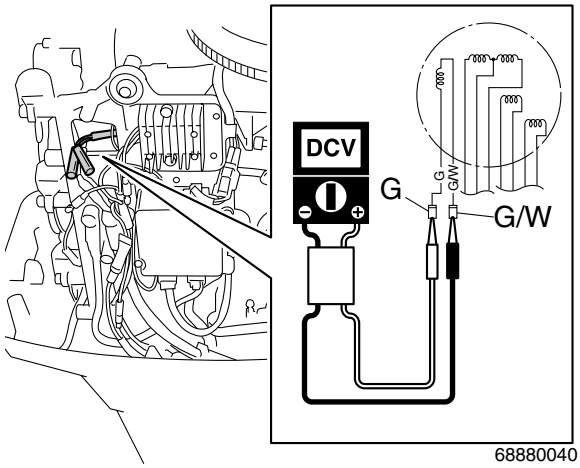
Checking the starter motor operation

1. Connect the battery cable, and then check the operation of the starter motor.

Charging system

Checking the lighting coil

1. Remove the cover.
2. Disconnect the lighting coil connector.
3. Connect the digital circuit tester with peak voltage adapter B to the lighting coil.
4. Measure the lighting coil output peak voltage. If the measurement is less tan specification, measure the lighting coil resistance.



Lighting coil output peak voltage:
Green (G)–Green/white (G/W)

r/min	Unloaded		
	Cranking	1,500	3,500
DC V	11.3	32.3	72.3

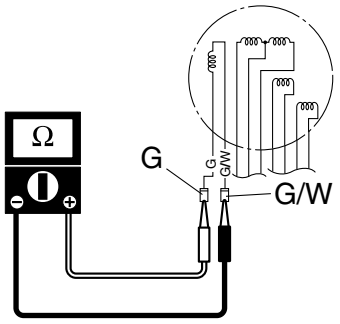
NOTE:

Remove the all spark plug caps, when measuring the lighting coil peak voltage at engine cranking.

5. Connect the digital circuit tester to the lighting coil connector.

8

6. Measure the lighting coil resistance. Replace the stator assembly if out of specification.



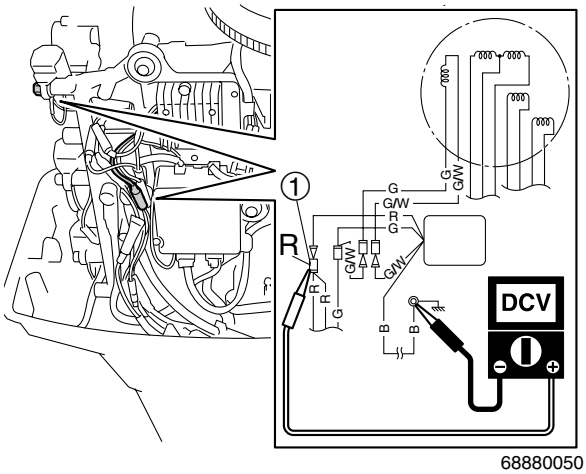
Lighting coil resistance (reference data):
Green(G)–Green/white (G/W)
0.36–0.54 Ω at 20°C (68°F)

Checking the Rectifier Regulator

NOTE:
Do not use the peak voltage adapter when measuring the output peak voltage of the Rectifier Regulator.

1. Remove the cover.

2. Connect the digital circuit tester positive probe to the Rectifier Regulator connector ① and connect the negative probe to the ground.



3. Measure the Rectifier Regulator output peak voltage. If less than specification, measure the lighting coil output peak voltage. Replace the Rectifier Regulator if the output peak voltage of the lighting coil is more than specification.

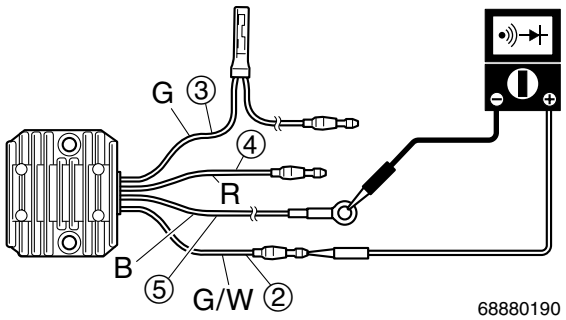
Rectifier Regulator output peak voltage:
Red (R)–Ground (B)

r/min	Loaded	
	1,500	3,500
DC V	13	13

4. Remove the Rectifier Regulator from the power unit.

5. Connect the digital circuit tester to the Rectifier Regulator.

6. Check the Rectifier Regulator for continuity. Replace the Rectifier Regulator if it is not shown in the chart below.



Rectifier Regulator continuity:

Tester lead ⊕	Tester lead ⊖	
G/W ②	R ④	0.38–1.155V (reference data)
G/W ②	G ③	
G/W ②	B ⑤	
G ③	R ④	
B ⑤	R ④	
B ⑤	G/W ②	
B ⑤	G ③	
R ④	G/W ②	OL (over load)
R ④	G ③	
R ④	B ⑤	
G ③	G/W ②	
G ③	B ⑤	

Measuring condition: Ambient temperature 20°C (68°F).

TRBL SHTG ?

Troubleshooting

9

Troubleshooting the power unit
Troubleshooting the power unit

Symptom 1: Specific trouble conditions.
Symptom 2: Trouble conditions of an area or individual part.
Cause 1: The content considered as the trouble factors of symptom 2.
Cause 2: The content considered as the trouble causes of cause 1 (described if necessary).

Symptom 1: Engine does not crank

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Starter motor does not operate	Gear shift not in the “N” position	—	Set the gear shift to “N” position	3-13
	Loose connection of battery terminal	—	Check the battery terminal connection.	—
	Discharged battery	—	Check the battery for electrolyte level, gravity and voltage.	3-19
	Blown fuse (20A)	—	Check the fuse (20A).	8-9
	Engine start switch malfunction	—	Check the engine start switch.	8-9
	Starter relay malfunction	—	Check the starter relay.	8-11
	Neutral switch malfunction	—	Check for continuity.	8-11 (EHD)
	Short or open connection in starter motor circuit	—	Check the wiring harness for continuity.	WD
	Starter motor malfunction	—	Disassemble and check the starter motor.	8-12

WD: See the wiring diagram

Symptom 1: Engine dose not crank

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
—	Broken woodruffkey	—	Disassemble and check the power unit.	5-9
	Stuck piston and crank shaft			
	Piston lock due to water in the combustion chamber			
	Salt buildup on the drive shaft	—	Disassemble and check the oil seal housing.	5-31

Symptom 1: Engine will not start (engine cranks)

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
—	Deterioration or dirty fuel	—	Replace new fuel.	—
Fuel not supplied	Fuel supplied to the carburetor improperly	Kinked fuel hose	Check the fuel hose kinked. Repair the fuel hose.	3-2
		Fuel joint malfunction	Check the fuel joint pressure.	4-6
		Fuel filter element malfunction	Check the fuel filter for clog.	3-3
		Fuel pump malfunction	Check the fuel pump.	4-7
	Carburetor malfunction	—	Adjust and check the carburetor.	4-13
Spark plug does not spark	Engine stop lanyard switch malfunction	—	Check for continuity.	8-10
	Spark plug malfunction	Spark plug gap improperly	Check the spark plug gap and condition.	3-3
	Short, open or loose connection in ignition coil circuit and ground circuit	—	Check the wiring harness for continuity.	WD
	Ignition coil malfunction	Ignition coil resistance out of specifications	Change the ignition coil and check the ignition spark.	5-6 8-5

WD: See the wiring diagram

9

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Spark plug does not spark	CDI unit malfunction	CDI unit output peak voltage less than specifications	Measure the charge coil output peak voltage and resistance.	8-6
	Pulser coil malfunction	Pulser coil output peak voltage less than specifications	Measure the pulser coil resistance.	8-7
			Change the pulser coil and check the ignition spark.	5-3 8-7
	Charge coil malfunction	Charge coil output peak voltage less than specifications	Measure the charge coil resistance.	8-7
			Change the stator assembly and check the ignition spark.	5-3 8-4
Low compression pressure	Cylinder head gasket malfunction	—	Check the compression pressure and disassembling the cylinder head.	5-1 5-18
	Reed valves malfunction	—	Disassemble and check the reed valves.	5-14
	Scratched piston or wear the piston rings	—	Check the compression pressure and disassembling the power unit.	5-1 5-9
	Scratched cylinder			

Symptom 1: Unstable engine idle speed, poor acceleration

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
—	Throttle stop screw adjusting improperly	—	Check and adjust the throttle stop screw.	3-8
	Pilot screw adjusting improperly	—	Check and adjust the pilot screw.	4-14
	Throttle cable adjusting improperly	—	Check and adjust the throttle cable.	3-7
	Throttle link length improperly	—	Check and adjust the throttle link length.	3-6
Fuel not supplied properly	Fuel supplied to the carburetor improperly	Kinked fuel hose	Check the fuel hose kinked. Repair the fuel hose.	3-2
		Fuel joint malfunction	Check the fuel joint pressure.	4-6
		Fuel filter element malfunction	Check the fuel filter for clog.	3-3
		Fuel pump malfunction	Check the fuel pump.	4-7
	Carburetor malfunction	Pilot screw settings improperly	Check and adjust the pilot screw settings.	4-15
		Throttle valve stuck or damage	Disassemble and check the carburetor.	—
		Jet or nozzle clogged and or float damaged		4-13
		Float height improperly		
—	Deterioration or dirty fuel	—	Replace new fuel	—

9

Symptom 1: Limited engine speed (below 2,000 r/min)

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
• Buzzer comes on (ED, ET) • Overheat warning indicator comes on (EHD) • Cooling water does not discharge from the cooling water pilot hole	Clogged cooling water inlet	—	Check the cooling water inlet.	3-4
	Water pump malfunction	Water pump impeller malfunction	Check the impeller.	6-6
			Check the Woodruff key.	6-6
		Water leakage from water pump housing	Check the water pump housing.	6-6
			Check the insert cartridge.	6-6
			Check the outer plate cartridge.	—
	Clogged cooling water passage	—	Check the cooling water passage (exhaust guide, upper case and cooling water pipe).	7-11
	Thermostat malfunction	—	Check the thermostat.	3-3
	Thermoswitch malfunction	—	Check the thermoswitch for continuity.	8-8
	Short connection in thermoswitch circuit and ground circuit	—	Check the wiring harness for continuity.	WD

Symptom 1: Poor performance

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Spark plug sparks improperly	Spark plug malfunction	Spark plug gap improperly	Check the spark plug gap and condition.	3-3
	Short or open connection in ignition coil circuit and ground circuit	—	Check the wiring harness continuity.	WD
	Ignition coil malfunction	Ignition coil resistance out of specifications	Change the ignition coil and check the ignition spark.	5-6 8-4
	CDI unit malfunction	CDI unit output peak voltage less than specifications	Measure the charge coil output peak voltage and resistance.	8-7
Ignition timing improperly	Does not advance	Ignition control link broken	Check and adjust the link rod.	—
	—	Control lever stop screw loosened or setting length improperly	Check the stop screw locknut tightenings and setting length.	3-8
Low compression pressure	Cylinder head gasket malfunction	—	Check the compression pressure and disassembling the cylinder head.	5-1 5-18
	Reed valves malfunction	—	Disassemble and check the reed valves.	5-14
	Scratched piston or wear the piston rings	—	Check the compression pressure and disassembling the power unit.	5-1 5-9
	Scratched cylinder			
—	Propeller selection improperly	—	Check the propeller matching.	1-13
—	Outboard motor mounting height improperly	—	Check the outboard motor mounting height.	1-14
—	Gear damaged (pinion, forward, reverse)	—	Disassemble the lower case and check the pinion, forward, reverse gear.	6-10 6-16 6-16

WD: See the wiring diagram

9

Troubleshooting the PTT unit

Symptom 1: PTT unit does not operate

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
PTT relay does not operate	Short, open, or loose connection of the wiring harness	—	Check the wiring harness for continuity.	WD
	PTT relay malfunction	—	Check the PTT relay.	7-64
PTT motor does not operate	Loose connection of the battery terminal	—	Check the battery terminal.	—
	Discharged battery	—	Check the battery.	3-19
	Blown fuse (20A)	—	Check the fuse (20A).	7-64
	Short, open, or loose connection of the PTT motor lead	—	Check the PTT motor lead and ground circuit.	WD
	PTT motor malfunction	—	Disassemble and check the PTT motor.	7-42
Oil pressure does not increase	Manual valve opened	Manual valve malfunction	Check the manual valve for open.	—
	Insufficient PTT fluid	—	Add sufficient fluid.	3-15 7-40
	PTT fluid leakage	—	Check the PTT unit for leakage.	7-37
	Clogged filter	—	Disassemble and check the PTT unit.	7-35 7-50
	Clogged fluid passage			

WD: See the wiring diagram

Symptom 1: PTT unit does not hold the outboard motor up

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
—	Manual valve opened	Manual valve malfunction	Check the manual valve for open.	—
	Insufficient PTT fluid	—	Add sufficient fluid.	3-15
	PTT fluid leakage	—	Check the PTT unit for leakage.	7-37
	Clogged fluid passage	Main valves does not operate	Disassemble and check the PTT unit.	7-57

Troubleshooting the lower unit

Symptom 1: Gear shift does not operate properly

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
—	Remote control box malfunction	—	Check and adjust the remote control box.	—
	Shift cable and shift cable end malfunction	—	Check the shift cable and shift cable end.	3-13
			Adjust the shift cable.	3-13
	Shift rod operation malfunction	—	Disassemble the lower case, shift rod, plunger and dog clutch.	6-7 6-13
		Shift rod connection malfunction	Check the shift rod connection.	—
	Shift cam position improperly	—	Disassemble the lower case and check the shift cam.	6-13
	Shift cam worn			
	Plunger spring malfunction	—	Disassemble the lower case and check the plunger spring.	6-7
	Cross pin broken	—	Disassemble the lower case and check the cross pin.	6-7
	Dog clutch worn	—	Disassemble the lower case and check the dog clutch.	—

A.

B.

C.

D.

E.

F.

G.

H.

I.

L.

M.

P.

R.

S.

T.

U.

V.

— MEMO —

— MEMO —

WIRING DIAGRAM
55DEHD, 75AEHD, 85AEHD

① Spark plug
② Ignition coil
③ Thermoswitch
④ Starter relay
⑤ Rectifier Regulator
⑥ CDI unit
⑦ Lighting coil
⑧ Charge coil
⑨ Pulser coil
⑩ Starter motor
⑪ Battery
⑫ Fuse (20A)
⑬ Warning indicator
⑭ Neutral switch

[A] To main switch

Color code

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

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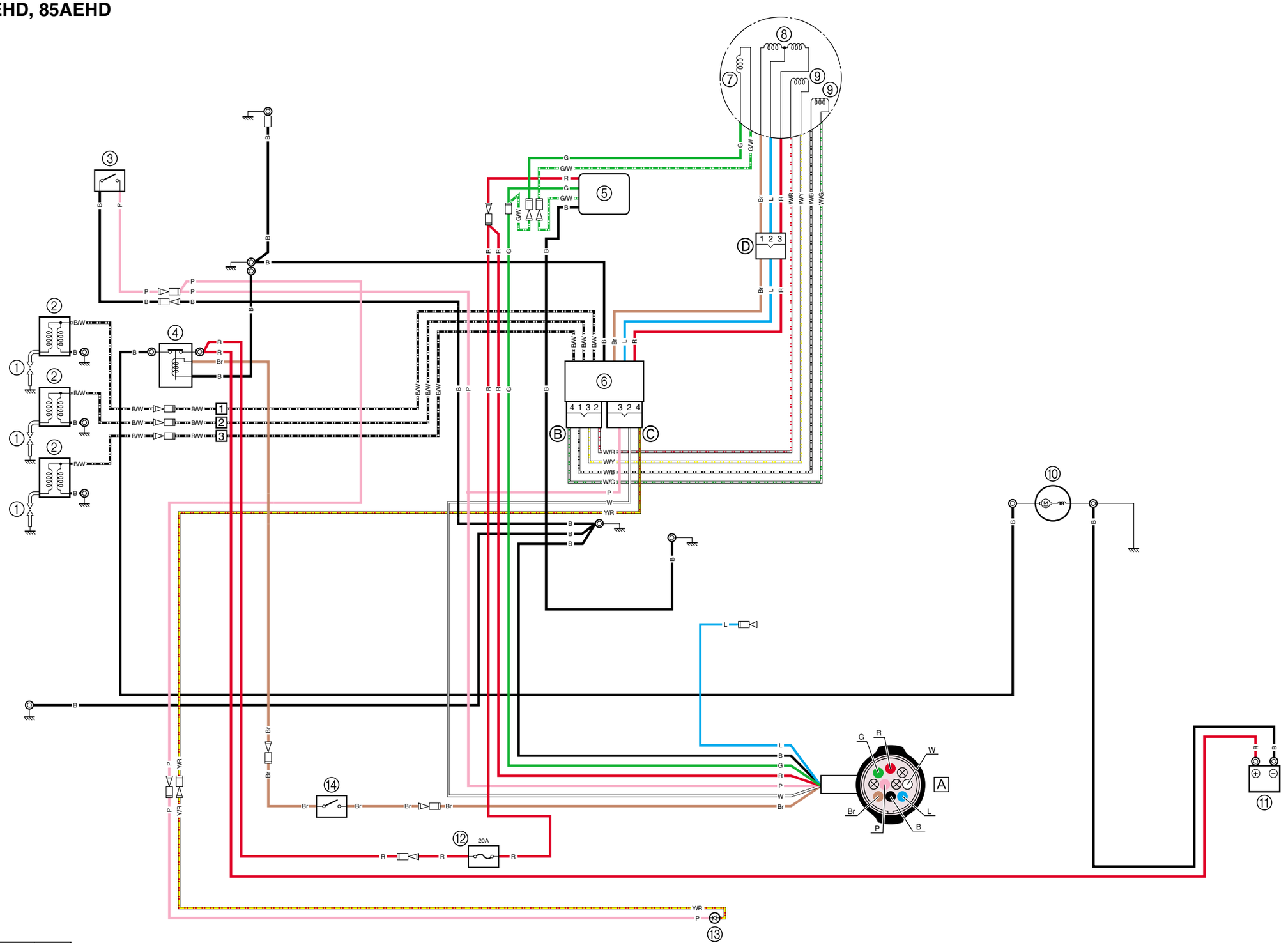
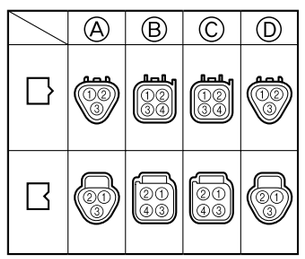
55DEHD, 75AEHD, 85AEHD





688CWD0A

75AED, 85AED

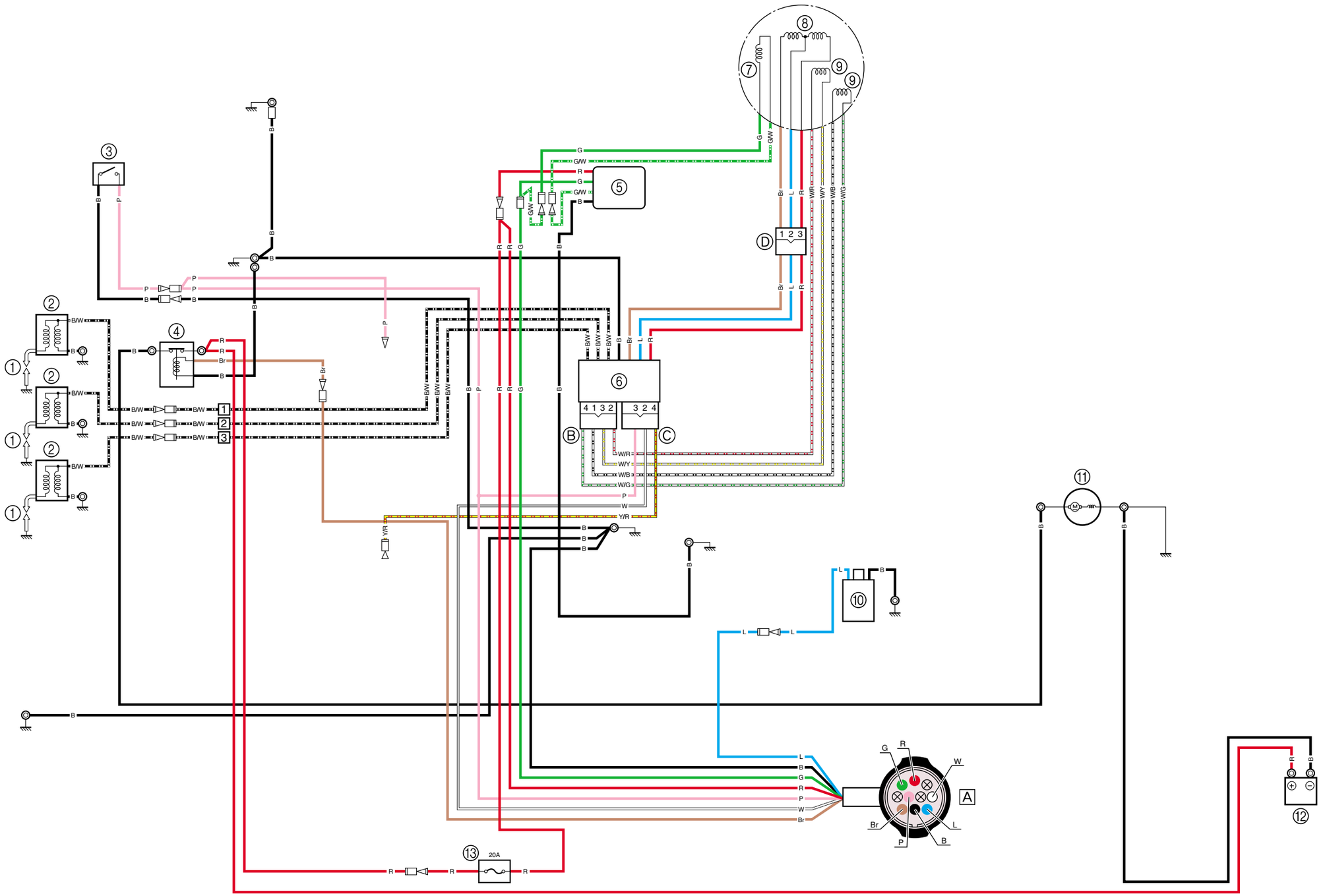
① Spark plug
② Ignition coil
③ Thermoswitch
④ Starter relay
⑤ Rectifier Regulator
⑥ CDI unit
⑦ Lighting coil
⑧ Charge coil
⑨ Pulser coil
⑩ Choke solenoid
⑪ Starter motor
⑫ Battery
⑬ Fuse (20A)

[A] To remote control box

Color code

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

75AED, 85AED



	Ⓐ	Ⓑ	Ⓒ	Ⓓ
☐	①②③	①②③④	①②③④	①② ③
☐	②① ③	②① ④③	②① ④③	②① ③

688CWD01

75AET, 85AET

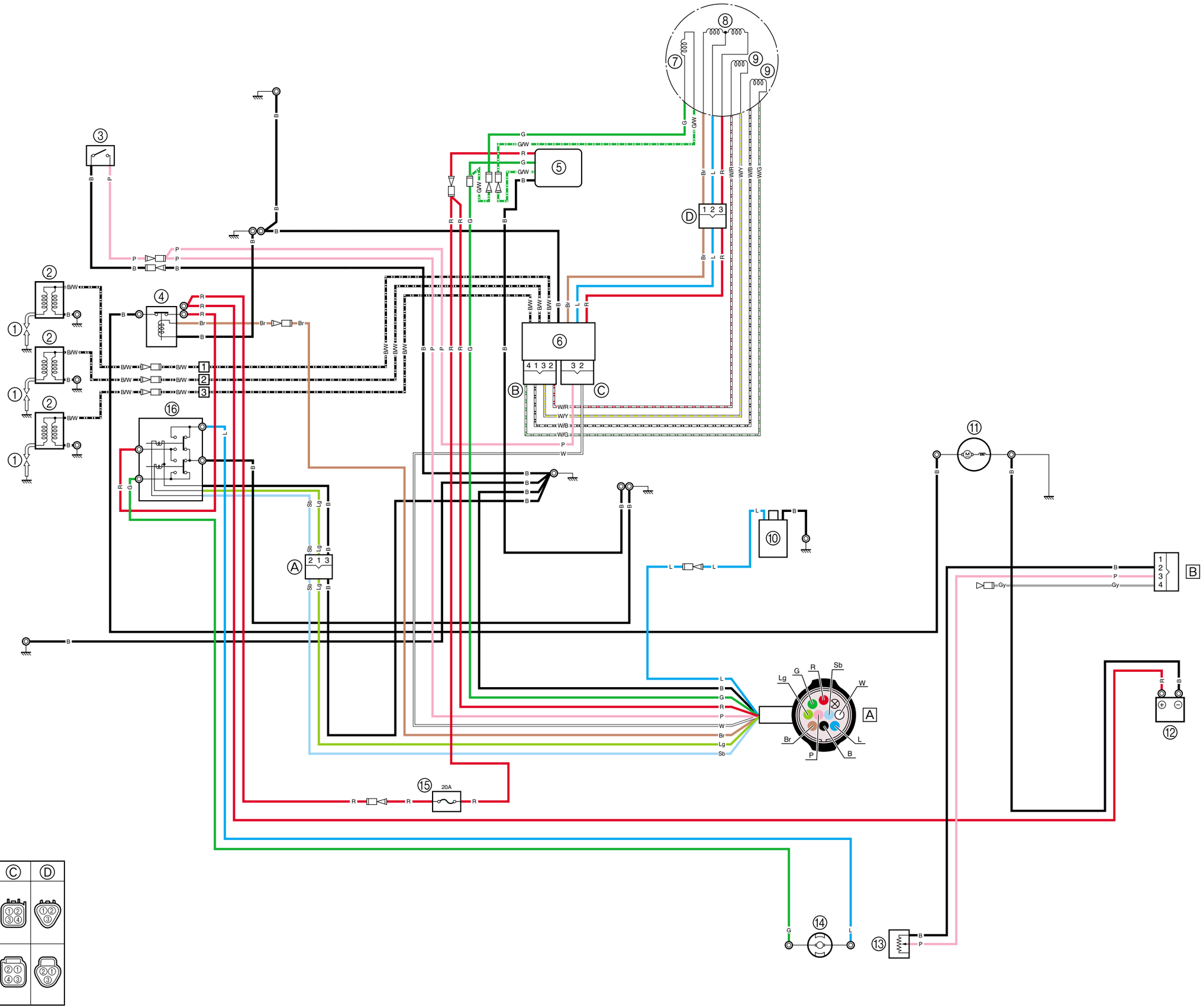
① Spark plug
② Ignition coil
③ Thermoswitch
④ Starter relay
⑤ Rectifier Regulator
⑥ CDI unit
⑦ Lighting coil
⑧ Charge coil
⑨ Pulser coil
⑩ Choke solenoid
⑪ Starter motor
⑫ Battery
⑬ Trim sensor
⑭ PTT motor
⑮ Fuse (20A)
⑯ PTT relay

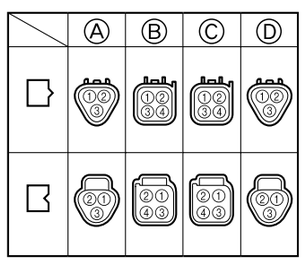
[A] To remote control box
[B] To trim meter

Color code

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

75AET, 85AET





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