YAMAHA

F30A
F40B

SERVICE MANUAL

67C-28197-3K-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.

F30A, F40B
SERVICE MANUAL

1st Edition, August 2007

Printed in China

Contents

General information

How to use this manual

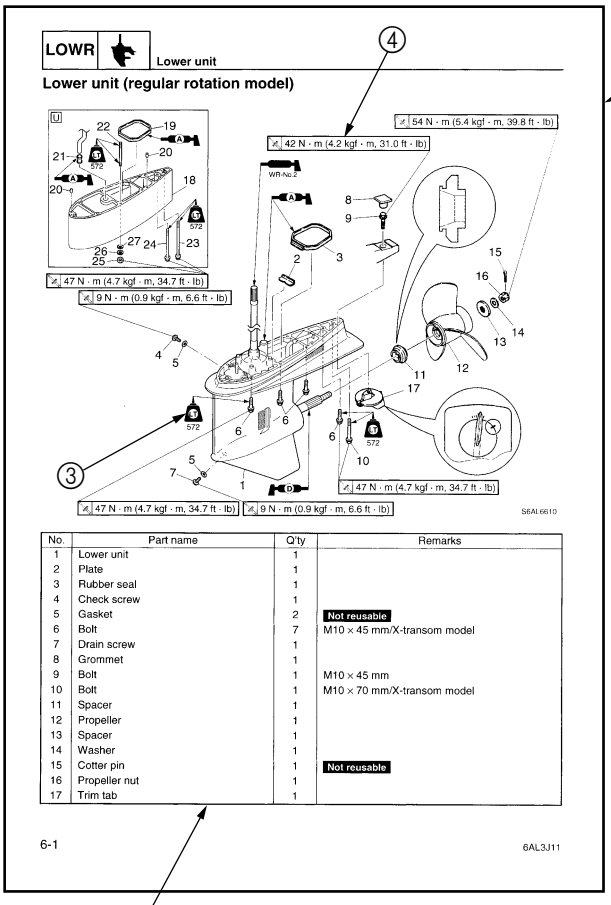
Manual format

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.

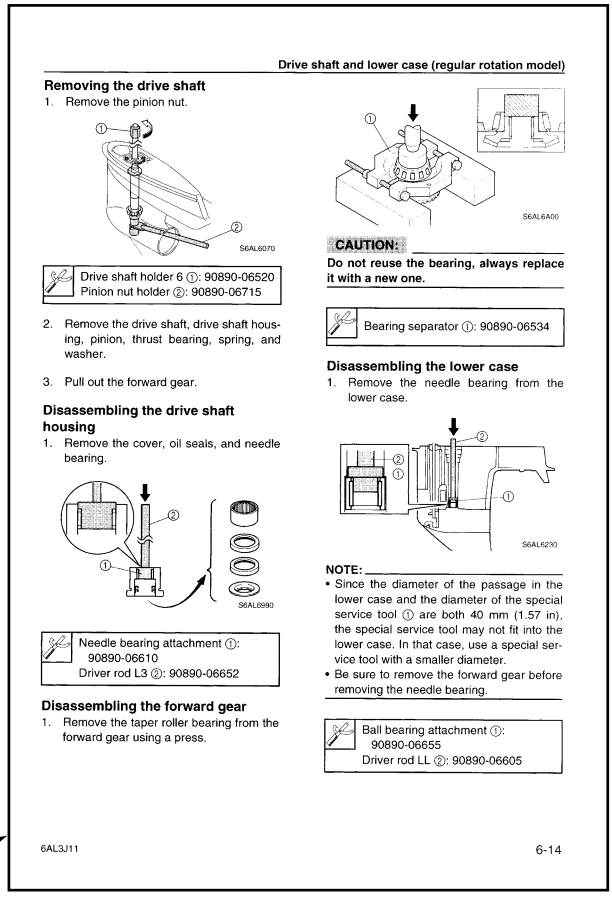
- Parts are shown and detailed in an exploded diagram and are listed in the component list (see ① in the figure below for an example page).
- The component list consists of part names and quantities, as well as bolt and screw dimensions (see ② in the figure below).
- Symbols are used to indicate important 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.”



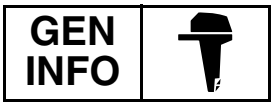
No.	Part name	Q'ty	Remarks
1	Lower unit	1	
2	Plate	1	
3	Rubber seal	1	
4	Check screw	1	
5	Gasket	2	Not reusable
6	Bolt	7	M10 × 45 mm/X-transom model
7	Drain screw	1	
8	Grommet	1	
9	Bolt	1	M10 × 45 mm
10	Bolt	1	M10 × 70 mm/X-transom model
11	Spacer	1	
12	Propeller	1	
13	Spacer	1	
14	Washer	1	
15	Cotter pin	1	Not reusable
16	Propeller nut	1	
17	Trim tab	1	



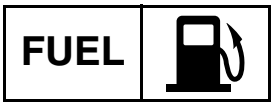
Symbol

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

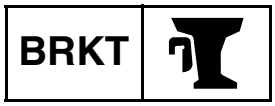
General information



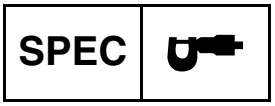
Fuel system



Bracket unit

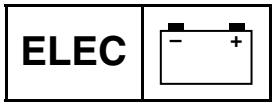


Specification



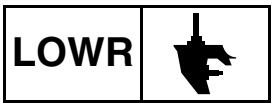
Power unit

Electrical system

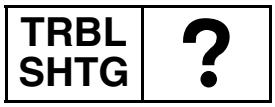


Periodic check and adjustment

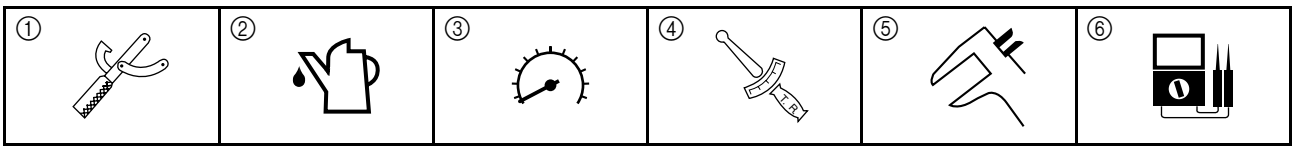
Lower unit



Troubleshooting

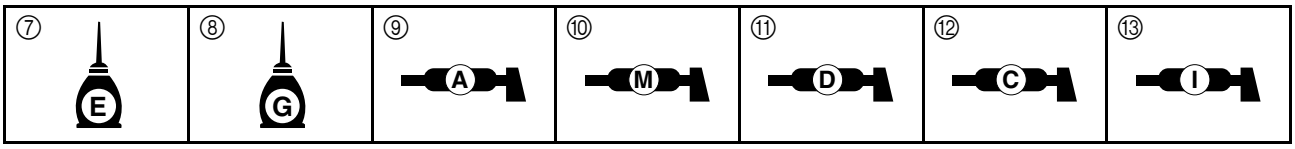


Symbols ① to ⑥ indicate specific data.



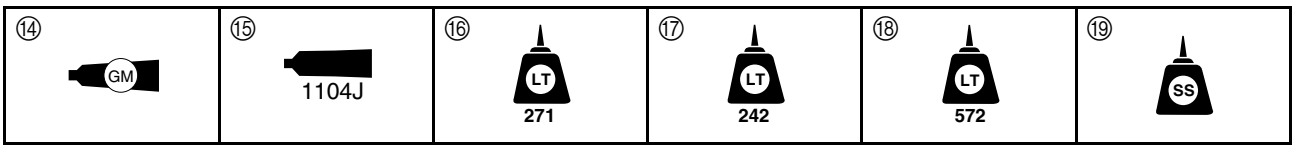
① Special service tool
② Specified oil or fluid
③ Specified engine speed
④ Specified tightening torque
⑤ Specified measurement
⑥ Specified electrical value (resistance, voltage, electric current)

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



⑦ Apply 4-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
API	American Petroleum Institute
ATDC	After Top Dead Center
BOW	Bow end
CCA	Cold Cranking Ampere
CDI	Capacitor Discharge Ignition
D model	Hydraulic tilt model
E model	Electric starter model
EN	European Norm (European standard)
EX	Exhaust
F position	Forward position
H model	Tiller handle model
IEC	International Electrotechnical Commission
IN	Intake
M model	Manual starter model
N position	Neutral position
PORT	Port side
PTT	Power trim and tilt
R model	Remote control model
R position	Reverse position
SAE	Society of Automotive Engineers
STBD	Starboard side
WD	Wiring Diagram
W model	Electrical starter with manual starter model

Sealant and locking agent table

The following table contains sealants, locking agents, and lubricants used in this service manual that are not listed on page 1-2.

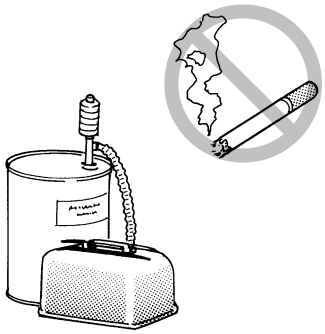
Symbol	Name	Application	Manufacturer
 518	LOCTITE 518	Sealant	Henkel

Safety while working

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

Fire prevention

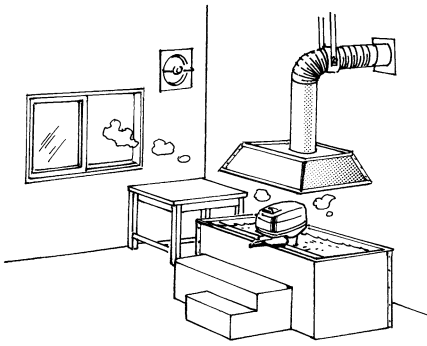
Gasoline is highly flammable.
Keep gasoline and all flammable products away from heat, sparks, and open flames.



S69J1010

Ventilation

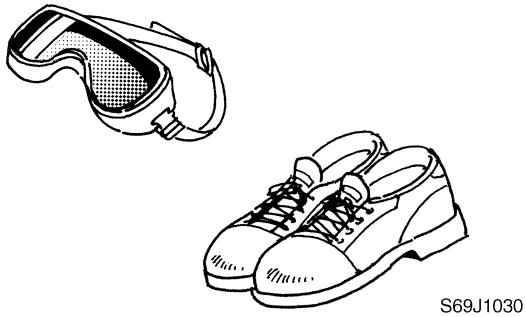
Gasoline vapor and exhaust gas are heavier than air and extremely poisonous. If inhaled in large quantities, they may cause loss of consciousness and death within a short time. When test running an engine indoors (e.g., in a water tank), be sure to do so where adequate ventilation can be maintained.



S69J1020

Self-protection

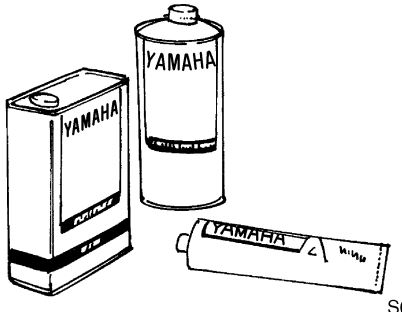
Protect your eyes by wearing safety glasses or safety goggles during all operations involving drilling and grinding, or when using an air compressor.
Protect your hands and feet by wearing protective gloves and safety shoes when necessary.



S69J1030

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.

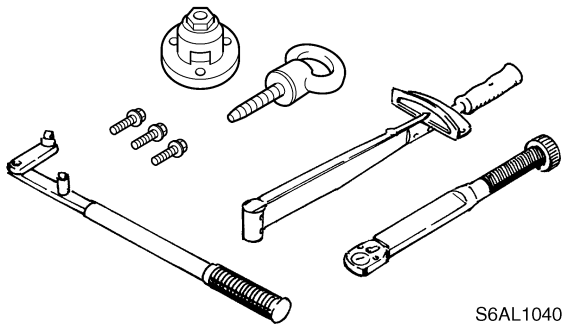
1. Avoid contact with skin. Do not, for example, place a soiled rag in your pocket.
2. Wash hands and any other part of the body thoroughly with soap and hot water after contact with a lubricant or lubricant soiled clothing has been made.
3. Change and wash clothing as soon as possible if soiled with lubricants.
4. To protect your skin, apply a protective cream to your hands before working on the outboard motor.
5. Keep a supply of clean, lint-free cloths for wiping up spills, etc.

6. Maintain good standards of personal and industrial hygiene.

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.



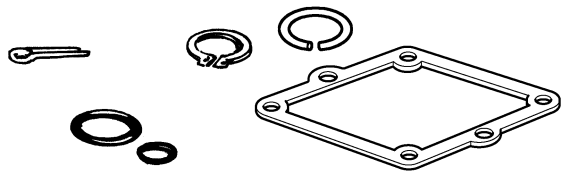
S6AL1040

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.

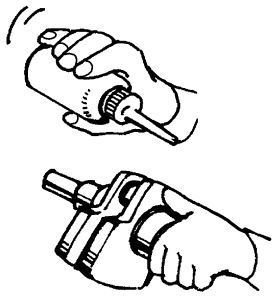


S69J1060

Disassembling and assembling

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

2. Apply oil or fluid 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

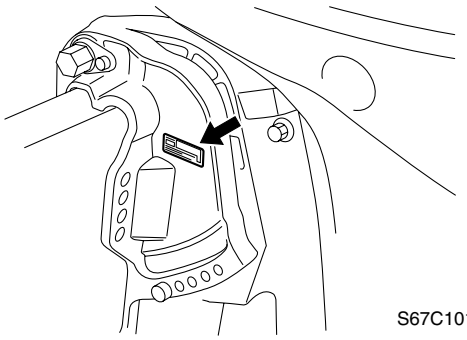
Model

This manual covers the following models.

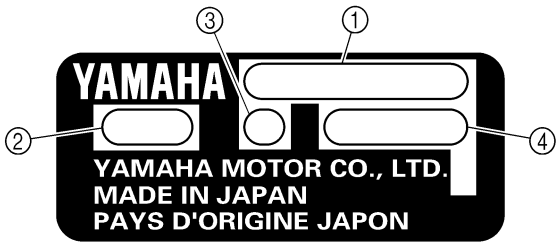
Applicable model
F30AMHD, F30AEHT, F30AET, F40BMHD, F40BWHD, F40BWHT, F40BED, F40BET

Serial number

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



S67C1010

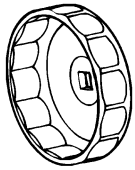


S6AL1D00

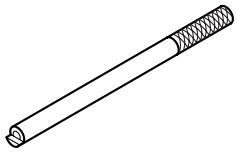
① Model name
② Approved model code
③ Transom height
④ Serial number

Model name	Approved model code	Starting serial No.
F30A	69H	1008205–
F40B	67C	1035037–

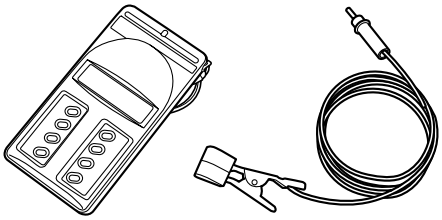
Special service tool



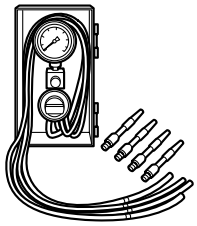
Oil filter wrench
90890-01426



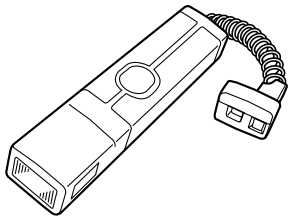
Pilot screw adjusting tool
90890-03154



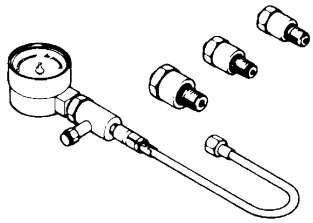
Digital tachometer
90890-06760



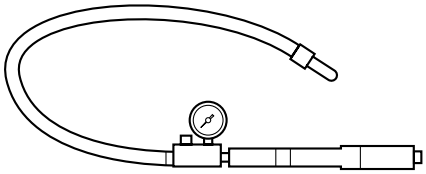
Vacuum gauge
90890-03094



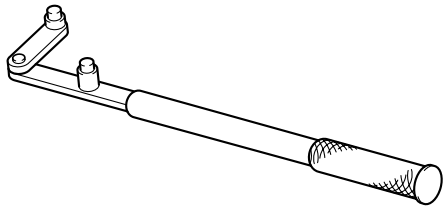
Timing light
90890-03141



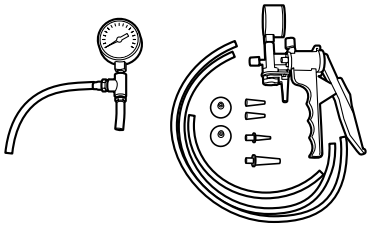
Compression gauge
90890-03160



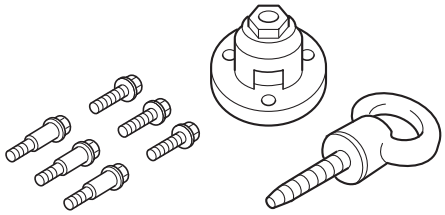
Leakage tester
90890-06840



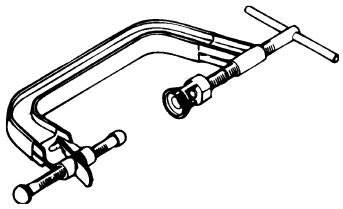
Flywheel holder
90890-06522



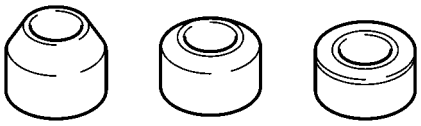
Vacuum/pressure pump gauge set
90890-06756



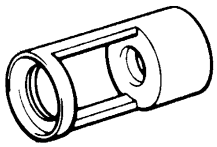
Flywheel puller
90890-06521



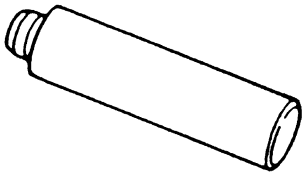
Valve spring compressor
90890-04019



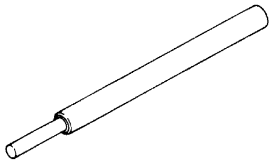
Valve seat cutter
90890-06312, 90890-06323, 90890-06325, 90890-06327, 90890-06328



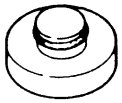
Valve spring compressor attachment
90890-06320



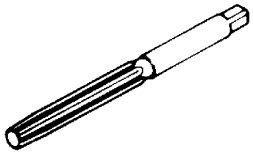
Driver rod LS
90890-06606



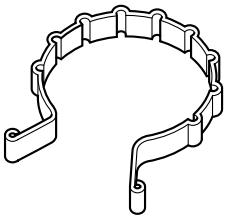
Valve guide remover/installer
90890-06801



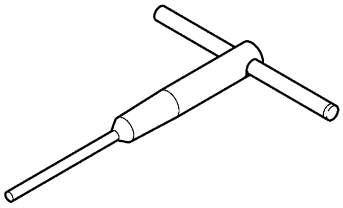
Ball bearing attachment
90890-06631



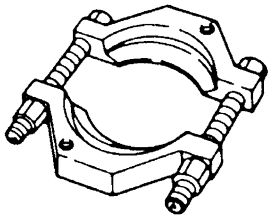
Valve guide reamer
90890-06804



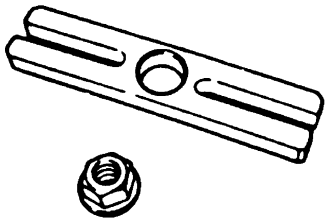
Piston slider
90890-06529



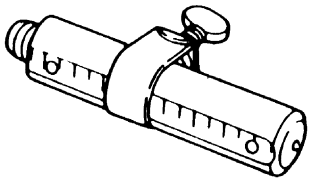
Valve seat cutter holder
90890-06316



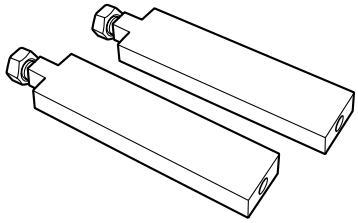
Bearing separator
90890-06534



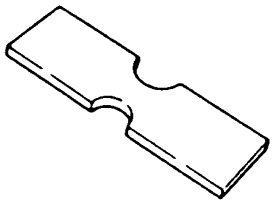
Stopper guide plate
90890-06501



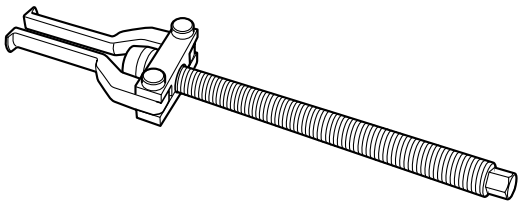
Driver rod SS
90890-06604



Stopper guide stand
90890-06538

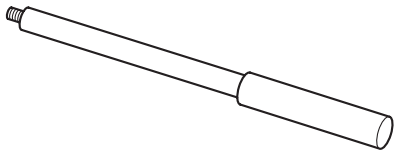


Bearing depth plate
90890-06603

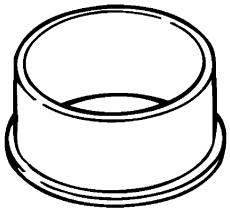


Bearing puller assembly
90890-06535

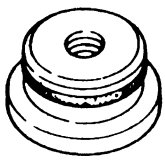
Ball bearing attachment
90890-06637



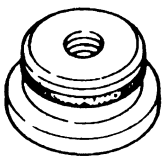
Driver rod L3
90890-06652



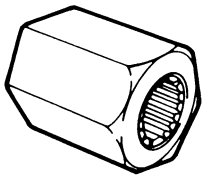
Bearing inner race attachment
90890-06639, 90890-06640, 90890-06641



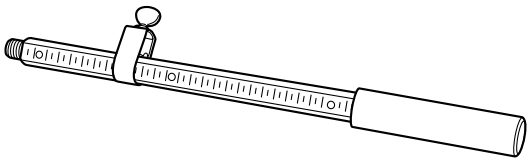
Needle bearing attachment
90890-06612, 90890-06614



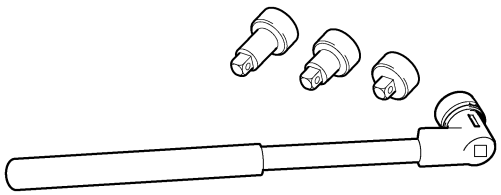
Ball bearing attachment
90890-06633



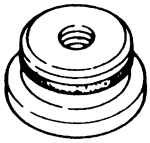
Drive shaft holder 3
90890-06517



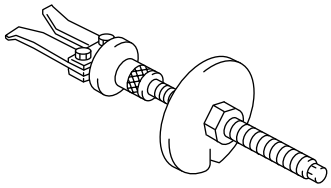
Driver rod SL
90890-06602



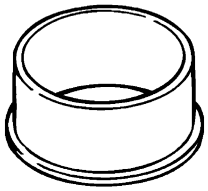
Pinion nut holder
90890-06715



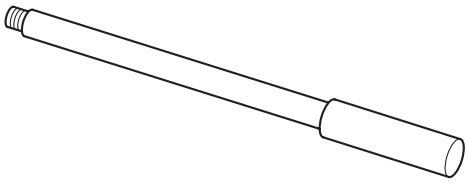
Ball bearing attachment
90890-06634



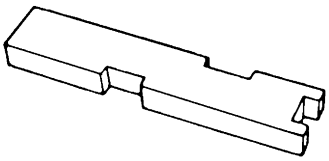
Bearing outer race puller assembly
90890-06523



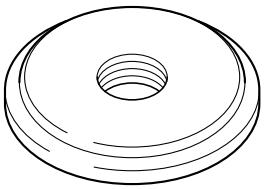
Bearing inner race attachment
90890-06644



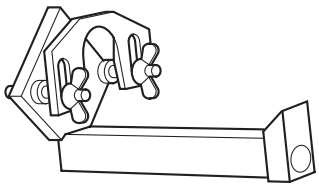
Driver rod LL
90890-06605



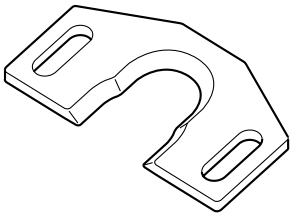
Shimming plate
90890-06701



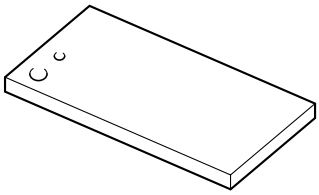
Bearing outer race attachment
90890-06622, 90890-06627



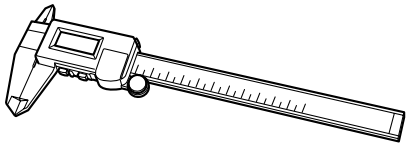
Pinion height gauge
90890-06710



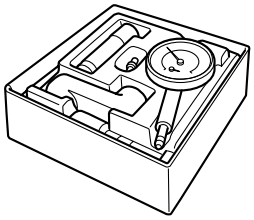
Pinion height gauge plate B
90890-06712



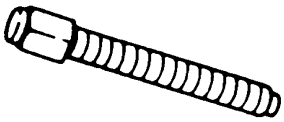
Magnet base plate
90890-07003



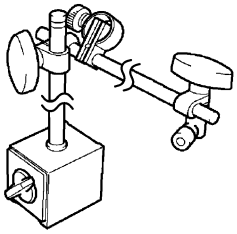
Digital caliper
90890-06704



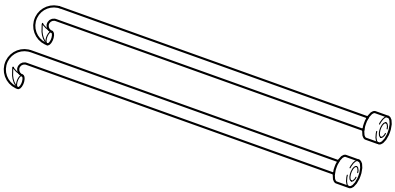
Dial gauge set
90890-01252



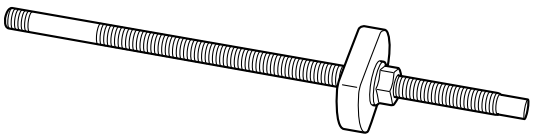
Center bolt
90890-06504



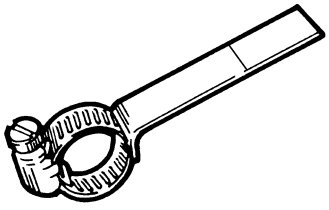
Magnet base B
90890-06844



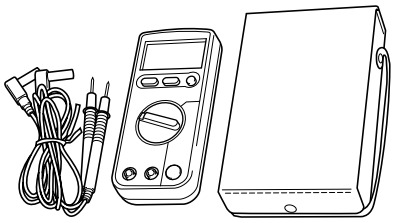
Bearing housing puller claw S
90890-06564



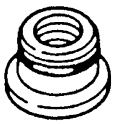
Bushing installer center bolt
90890-06601



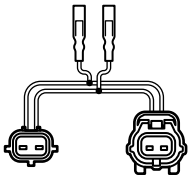
Backlash indicator
90890-06706



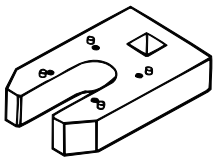
Digital circuit tester
90890-03174



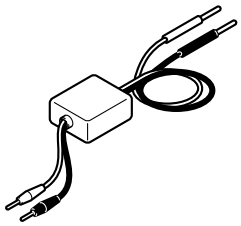
Needle bearing attachment
90890-06615



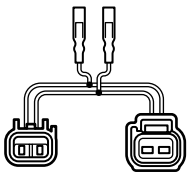
Test harness (2 pins)
90890-06868



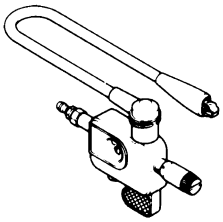
Cylinder-end screw wrench
90890-06568



Peak voltage adapter B
90890-03172



Test harness (2 pins)
90890-06867



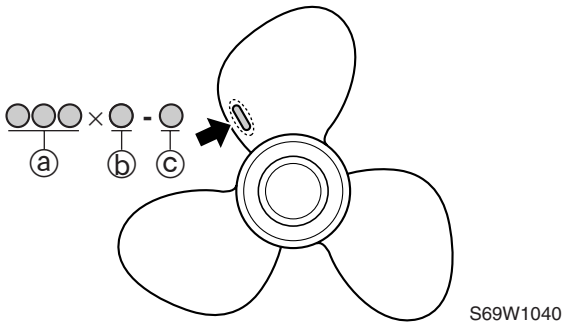
Ignition tester
90890-06754

Propeller selection

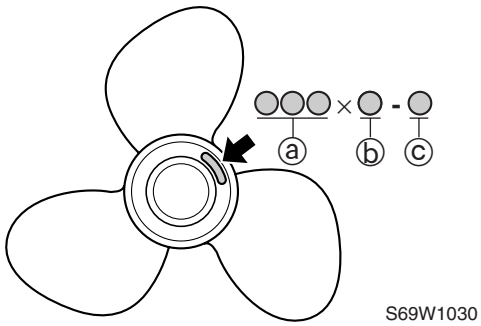
The performance of a boat and outboard motor will be critically affected by the size and type of propeller you choose. Propellers greatly affect boat speed, acceleration, engine life, fuel economy, and even boating and steering capabilities. An incorrect choice could adversely affect performance and 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

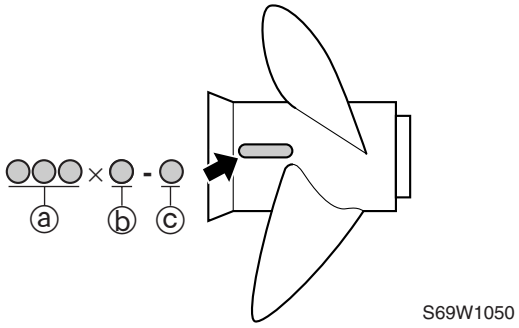
The size of the propeller is indicated on a propeller blade, on the propeller boss end, and on the side of the propeller boss.



S69W1040



S69W1030



S69W1050

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

Selection

When the engine speed is in the full throttle operating range (4,500–5,500 r/min [F30A] or 5,000–6,000 r/min [F40B]), the ideal propeller for the boat is one that provides maximum performance in relation to boat speed and fuel consumption.

Propeller size (in)	Material
10 × 15 - G	Aluminum
10 1/4 × 14 - G*	
10 1/4 × 15 - G	
10 1/4 × 16 - G	
10 3/8 × 13 - G	
10 5/8 × 12 - G	
10 5/8 × 13 - G	
10 3/4 × 16 - G	
10 3/4 × 17 - G	
11 1/8 × 13 - G	
11 1/4 × 14 - G*	
11 3/8 × 12 - G*	
11 1/2 × 13 - G	
11 5/8 × 11 - G	
11 3/4 × 12 - G	
12 × 11 - G	
12 1/4 × 9 - G	

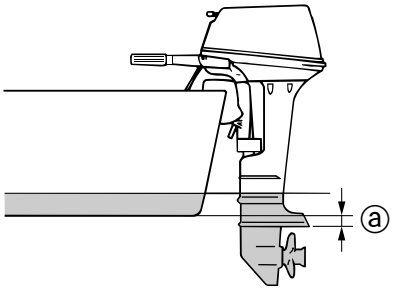
*: This propeller is available in 2 types.

Predelivery check

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

Checking the outboard motor mounting height

1. Check that the anti-cavitation plate is between the bottom of the boat and a maximum of 25 mm (1 in) ⓐ below it. 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.



S6D51030

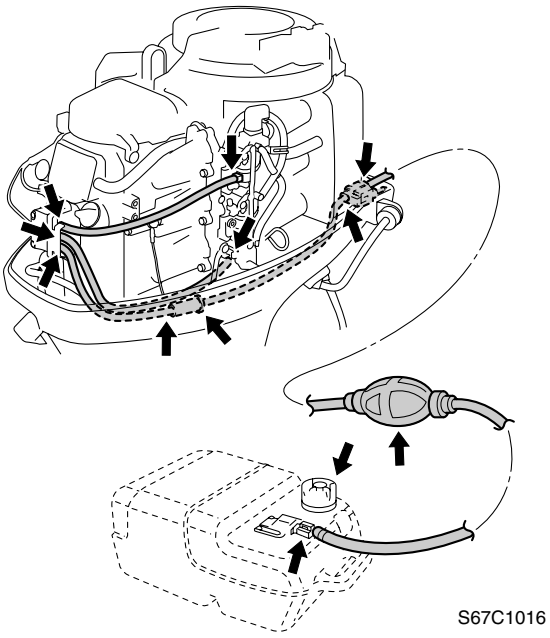
NOTE:

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 clamp bolts.

Checking the fuel system

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

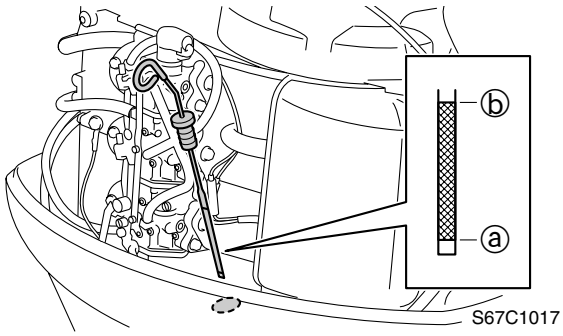

S67C1016

CAUTION:

This is a 4-stroke engine. Never use premixed fuel or 2-stroke outboard motor oil.

Checking the engine oil level

1. Check the engine oil level.



S67C1017

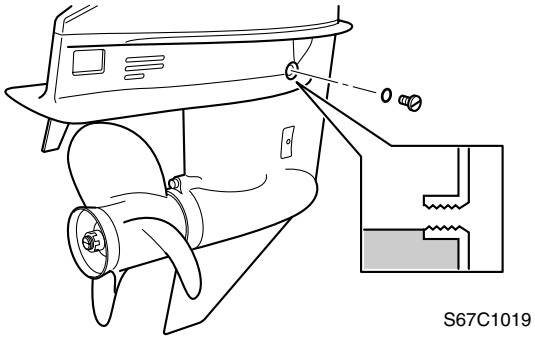
NOTE:

If the engine oil is below the minimum level mark ⓐ, add sufficient oil until the level is between ⓐ and ⓑ.

Recommended engine oil:
4-stroke motor oil
API: SE, SF, SG, SH, SJ, or SL
SAE: 5W-30, 10W-30, or 10W-40
Engine oil quantity:
Without oil filter replacement:
2.0 L (2.11 US qt, 1.76 Imp qt)

Checking the gear oil level

1. Check the gear oil level.


S67C1019

NOTE:
If the oil is at the correct level, a small amount of oil should overflow out of the check hole when the gear oil check screw is removed.

Checking the battery (E and W model)

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

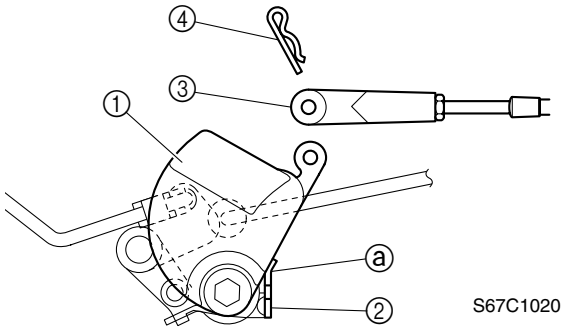
Recommended battery capacity:
CCA/EN: 430 A
20HR/IEC: 70 Ah
Electrolyte specific gravity:
1.280 at 20 °C (68 °F)

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

Connecting the throttle cable and shift cable

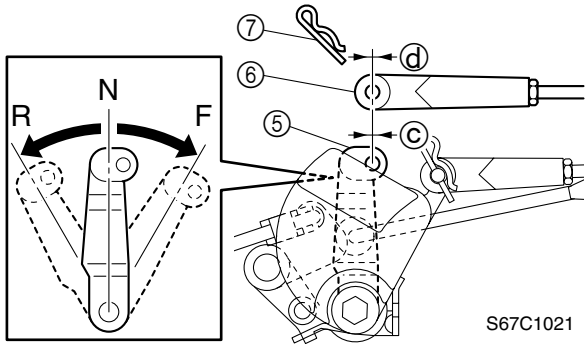
NOTE:
To adjust the throttle cable and shift cable, see "Adjusting the throttle cable" (3-8) or "Checking the gear shift operation" (3-9).

1. Set the shift lever or remote control lever to the N position and the throttle grip or throttle lever to the fully closed position.
2. Turn the throttle cam ① clockwise until the cam contacts the fully closed stopper ⓐ on the throttle cam bracket ② and hold it in that position. Connect the throttle cable ③ to the throttle cam, and then install the clip ④.

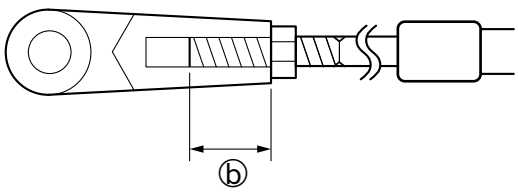


S67C1020

3. Check that the shift arm ⑤ is in the N position as shown. Connect the shift cable ⑥ to the shift arm, and then install the clip ⑦.



S67C1021



S67C1047

⚠ WARNING

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

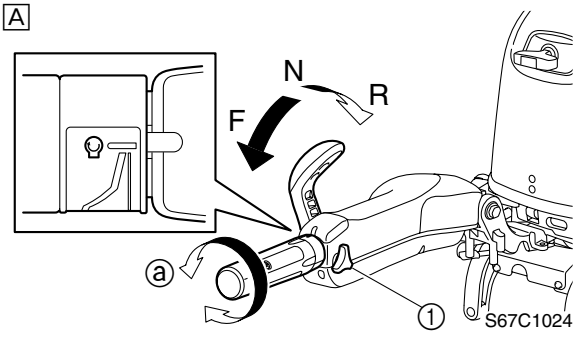
NOTE:
Center the shift arm ⑤ in its free play ⓒ and the shift cable ⑥ in its free play ⓓ, and then connect the shift cable.

Checking the gear shift and throttle operation

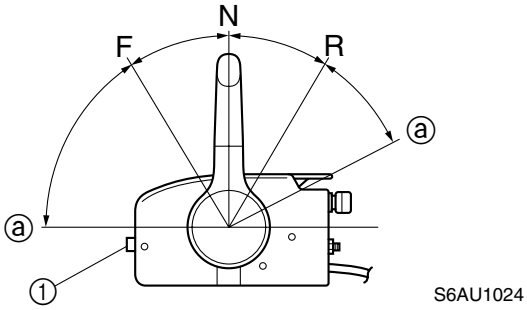
1. Check that the throttle operates smoothly when the throttle grip is turned from the fully closed position to the fully open position ⓐ. (H model)
   Check that the throttle operates smoothly when the remote control lever is shifted from the F position or R position to the fully open position ⓐ. (R model)

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

A



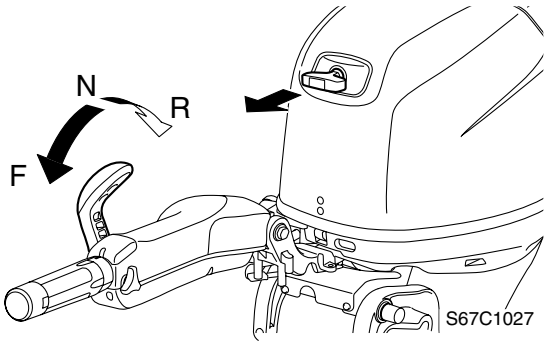
B



A H model
B R model

NOTE:
- The shift lever cannot be operated unless the throttle grip is in the fully closed position. (H model)
- The resistance of the throttle grip (H model) or remote control lever (R model) can be adjusted using the throttle friction adjuster ①.

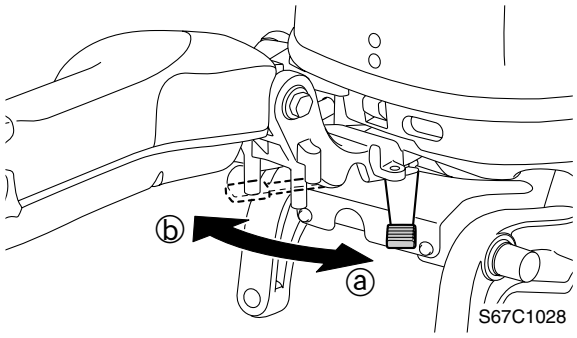
3. Set the shift lever to the F position or R position, and then check that the starter handle cannot be pulled. If the starter rope can be pulled out normally, adjust the start-in-gear protection cable. (M and W model)



NOTE:
To adjust the start-in-gear protection cable, see “Checking the start-in-gear protection (M and W model)” (3-10).

Checking the steering system

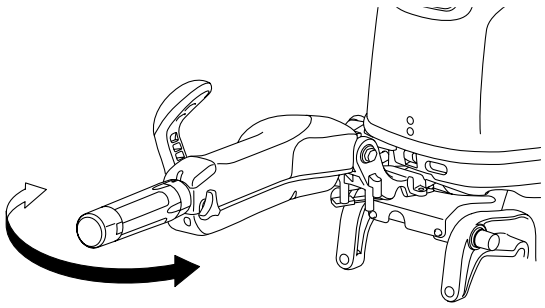
1. Check the steering friction for proper adjustment. (H model)



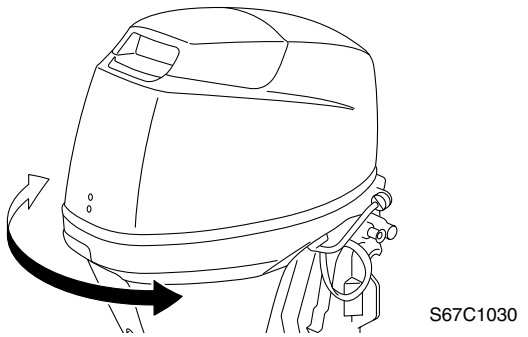
NOTE:
- To increase the friction, move the steering lock lever in direction ⓐ.
- To decrease the friction, move the steering lock lever in direction ⓑ.

2. Check that the steering operates smoothly.

A



B

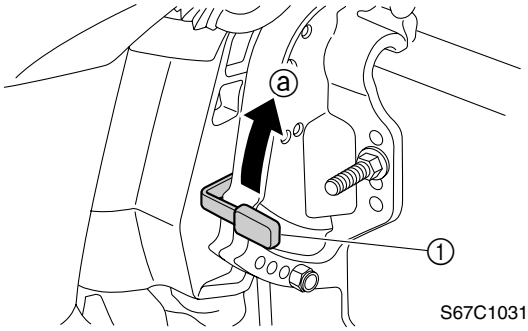


A H model
B R model

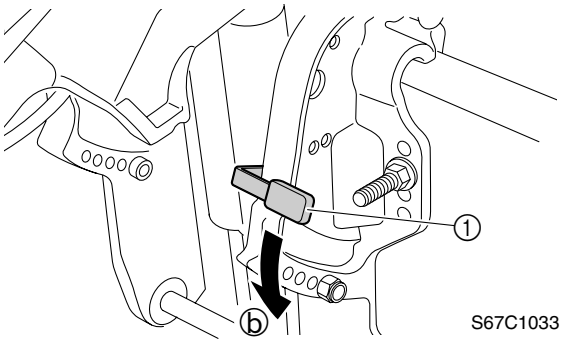
3. Check that there is no interference with leads, cables, or hoses when the outboard motor is steered.

Checking the tilt system (D model)

1. Set the tilt lock lever ① to the release position ⓐ and tilt the outboard motor to the fully up position. Check that the outboard motor tilts up smoothly.



2. Set the tilt lock lever ① to the lock position ⓑ and check that the outboard motor is locked in the tilted-up position.



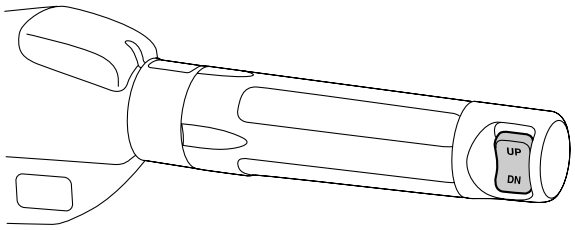
3. Check that there is no interference with leads, cables, or hoses when steering the motor in its fully up position.

4. Set the tilt lock lever ① to the release position ⓐ and tilt the outboard motor to the fully down position. Check that the outboard motor tilts down smoothly.

Checking the PTT system (PTT model)

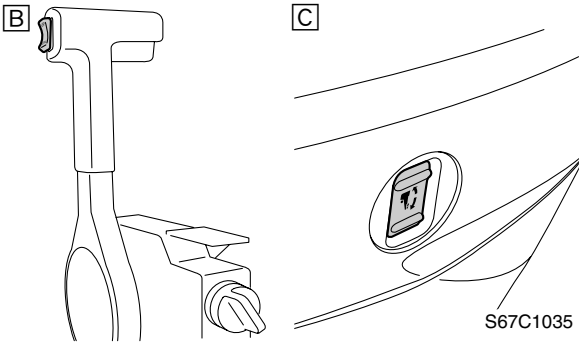
1. Check that the outboard motor tilts up and down smoothly when operating the PTT switch.

A



S67C1034

B C



S67C1035

A H model
B R model (remote control lever)
C R model (bottom cowling)

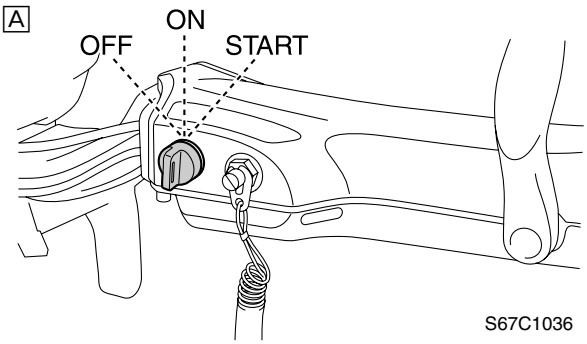
2. Check that there is no abnormal noise produced when the outboard motor is tilted up or down.

3. Check that there is no interference with leads, cables, or hoses when steering the motor in its fully up position.

Checking the engine start switch and engine shut-off switch

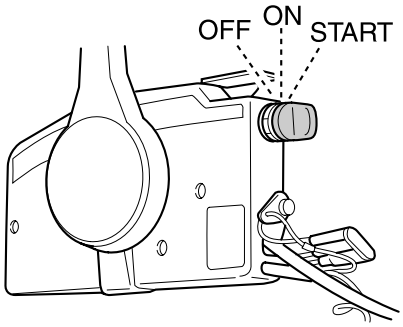
1. Check that the engine starts when the engine start switch is turned to “START.”

A



S67C1036

B

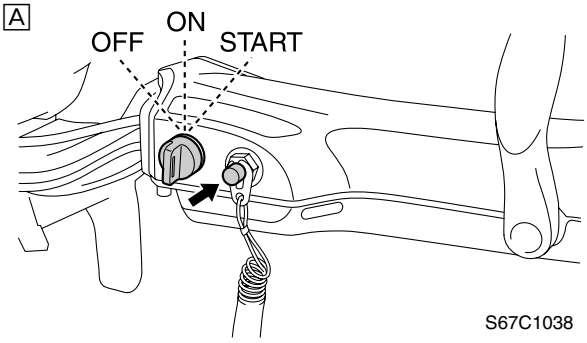


S6AU1035

A H model
B R model

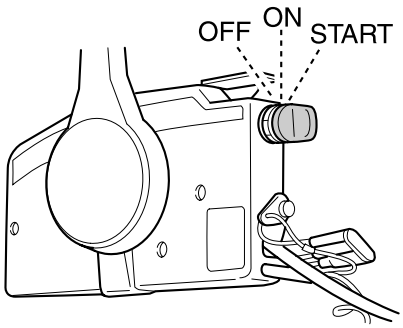
2. Check that the engine turns off when the engine shut-off switch is pushed. (H model)
   Check that the engine turns off when the engine start switch is turned to “OFF.” (H model with electric starter and R model)

A



S67C1038

B

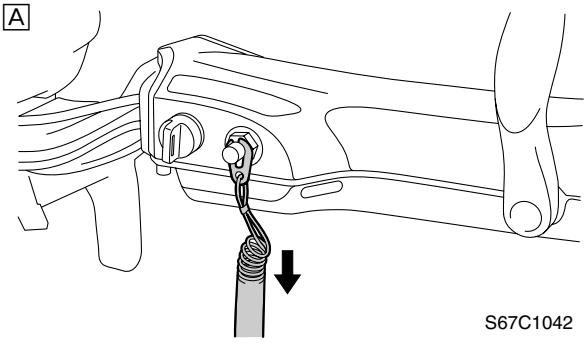


S6AU1035

A H model
B R model

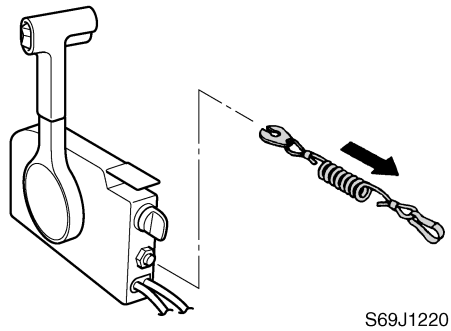
3. Check that the engine turns off when the clip is pulled from the engine shut-off switch.

A



S67C1042

B



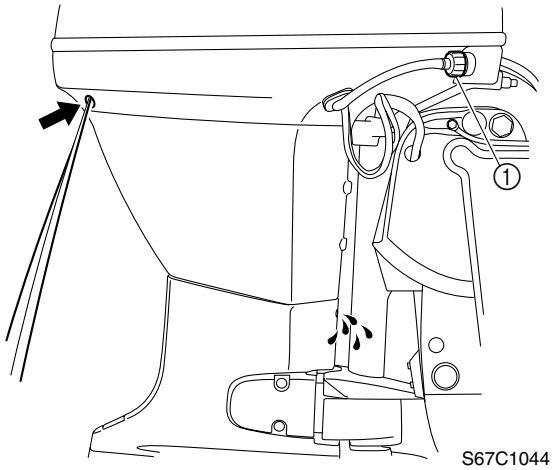
S69J1220

A H model
B R model

Checking the cooling water pilot hole

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

2. Check for water flow at the cooling water pilot hole.



S67C1044

NOTE:
Make sure that the cooling water hoses are securely connected and that the flushing hose joint adapter ① is not loose or damaged.

Test run

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

2. Check 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 varying speeds up to 2,000 r/min or approximately half throttle, then, for another hour, increase engine speed as much as necessary to put the boat on plane (but avoid full-throttle operation).

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

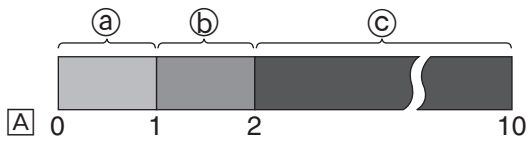
Run the engine under load (in gear with a propeller installed) for 10 hours as follows.

1. For the 1st hour ⓐ of operation:
   Run the engine at varying speeds up to 2,000 r/min or approximately half throttle.

2. For the 2nd hour ⓑ of operation:
   Increase engine speed as much as necessary to put the boat on plane (but avoid full-throttle operation), then back off on the throttle while keeping the boat at a planing speed.

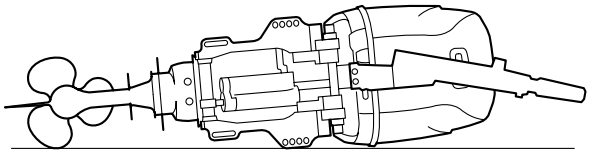
3. For the remaining 8 hours ⓒ of operation:
   Run the engine at any speed. However, avoid operating at full throttle for more than 5 minutes at a time.

4. After the 1st 10 hours of operation:
   Operate the engine normally.



S69J1240

A Hour



S67C1048

After the test run

1. Check for water in the gear oil.

2. Check for fuel leakage in the cowling.

3. Flush the cooling water passages with fresh water using the flushing kit and with the engine running at idle.

CAUTION:

Be sure to supply sufficient water and water pressure when flushing the cooling water passages. If sufficient water and sufficient water pressure are not supplied, the engine can overheat.

NOTE:

When using the flushing device (flushing hose joint adapter), flush the cooling water passages without starting the engine.

Precaution when transporting or storing the outboard motor

1. When transporting or storing the outboard motor while removed from a boat, keep the outboard motor in the attitude shown or use an outboard motor stand.

— MEMO —

Specification

General specification

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Dimension					
Overall length	mm (in)	1,332 (52.4)			700 (27.6)
Overall width	mm (in)	378 (14.9)			
Overall height					
(S)	mm (in)	1,246 (49.1)		—	
(L)	mm (in)	1,369 (53.9)			1,340 (52.8)
Transom height					
(S)	mm (in)	410 (16.1)		—	
(L)	mm (in)	533 (21.0)			
Boat transom height					
(S)	mm (in)	381 (15.0)		—	
(L)	mm (in)	508 (20.0)			
Weight					
(with aluminum propeller)					
(S)	kg (lb)	83.8 (185)		—	
(L)	kg (lb)	88.1 (194)		94.2 (208)	87.7 (193)
Performance					
Maximum output	kW (HP)	22.1 (30) at 5,000 r/min	29.4 (40) at 5,500 r/min		
Full throttle operating range	r/min	4,500–5,500	5,000–6,000		
Maximum fuel consumption	L (US gal, Imp gal)/hr	11.1 (2.9, 2.4) at 6,000 r/min	15.0 (4.0, 3.3) at 6,000 r/min		
Engine idle speed	r/min	850 ± 50			
Power unit					
Type		4-stroke L			
Cylinder quantity		3			
Total displacement	cm^3 (cu. in)	747 (45.6)			
Bore × stroke	mm (in)	65.0 × 75.0 (2.56 × 2.95)			
Compression ratio		9.87			
Control system		Tiller handle			Remote control
Starting system		Manual		Manual and electric	Electric
Fuel system		Carburetor			
Enrichment system		Prime Start			

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Ignition control system		CDI (micro computer)			
Advanced type		Micro computer			
Ignition timing					
at 850 r/min	Degree	ATDC 5 ± 2			
Maximum generator output	W, A	85, 6.0		—	
	V, A	—		12, 15.0	
Spark plug		DPR6EA-9 (NGK)			
Cooling system		Water			
Exhaust system		Propeller boss			
Lubrication system		Wet sump			
Fuel and oil					
Fuel type		Regular unleaded gasoline			
Engine oil type		4-stroke motor oil			
Engine oil grade(*1)	API	SE, SF, SG, SH, SJ, or SL			
	SAE	5W-30, 10W-30, or 10W-40			
Engine oil quantity					
(without oil filter replacement)	L (US qt, Imp qt)	2.0 (2.11, 1.76)			
(with oil filter replacement)	L (US qt, Imp qt)	2.2 (2.33, 1.94)			
Gear oil type		Hypoid gear oil			
Gear oil grade(*2)	API	GL-4			
	SAE	90			
Gear oil quantity	cm^3 (US oz, Imp oz)	430 (14.54, 15.17)			
Bracket unit					
Trim angle (at 12° boat transom)	Degree	–4 to 20			
Tilt-up angle	Degree	66			
Steering angle	Degree	40 + 40			
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 mark		G			

(*1) If the recommended engine oil grades are not available, use engine oil with an API classification of SH, SJ, or SL and an SAE classification of 15W-40, 20W-40, or 20W-50.
(*2) Meeting both API and SAE requirements

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Electrical					
Battery minimum capacity					
CCA/EN	A	—		430	
20HR/IEC	Ah	—		70	
Electrolyte specific gravity					
at 20 °C (68 °F)		—		1.280	

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Dimension					
Overall length	mm (in)	1,332 (52.4)	700 (27.6)	1,332 (52.4)	700 (27.6)
Overall width	mm (in)	378 (14.9)			
Overall height					
(S)	mm (in)	—	1,217 (47.9)	—	1,217 (47.9)
(L)	mm (in)	1,340 (52.8)	1,340 (52.8)	1,369 (53.9)	1,340 (52.8)
Transom height					
(S)	mm (in)	—	410 (16.1)	—	410 (16.1)
(L)	mm (in)	533 (21.0)			
Boat transom height					
(S)	mm (in)	—	381 (15.0)	—	381 (15.0)
(L)	mm (in)	508 (20.0)			
Weight					
(with aluminum propeller)					
(S)	kg (lb)	—	86.1 (190)	—	86.1 (190)
(L)	kg (lb)	92.0 (203)	90.4 (199)	96.9 (214)	90.4 (199)
Performance					
Maximum output	kW (HP)	22.1 (30) at 5,000 r/min		29.4 (40) at 5,500 r/min	
Full throttle operating range	r/min	4,500–5,500		5,000–6,000	
Maximum fuel consumption	L (US gal, Imp gal)/hr	11.1 (2.9, 2.4) at 6,000 r/min		15.0 (4.0, 3.3) at 6,000 r/min	
Engine idle speed	r/min	850 ± 50			
Power unit					
Type		4-stroke L			
Cylinder quantity		3			
Total displacement	cm^3 (cu. in)	747 (45.6)			
Bore × stroke	mm (in)	65.0 × 75.0 (2.56 × 2.95)			
Compression ratio		9.87			
Control system		Tiller handle	Remote control	Tiller handle	Remote control
Starting system		Electric		Manual and electric	Electric
Fuel system		Carburetor			
Enrichment system		Prime Start			

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Ignition control system		CDI (micro computer)			
Advanced type		Micro computer			
Ignition timing					
at 850 r/min	Degree	ATDC 5 ± 2			
Maximum generator output	V, A	12, 15.0			
Spark plug		DPR6EA-9 (NGK)			
Cooling system		Water			
Exhaust system		Propeller boss			
Lubrication system		Wet sump			
Fuel and oil					
Fuel type		Regular unleaded gasoline			
Engine oil type		4-stroke motor oil			
Engine oil grade(*1)	API	SE, SF, SG, SH, SJ, or SL			
	SAE	5W-30, 10W-30, or 10W-40			
Engine oil quantity					
(without oil filter replacement)	L (US qt, Imp qt)	2.0 (2.11, 1.76)			
(with oil filter replacement)	L (US qt, Imp qt)	2.2 (2.33, 1.94)			
Gear oil type		Hypoid gear oil			
Gear oil grade(*2)	API	GL-4			
	SAE	90			
Gear oil quantity	cm^3 (US oz, Imp oz)	430 (14.54, 15.17)			
Bracket unit					
Trim angle (at 12° boat transom)	Degree	–4 to 20			
Tilt-up angle	Degree	66			
Steering angle	Degree	40 + 40			
PTT system					
Fluid type		ATF Dexron II			
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 mark		G			

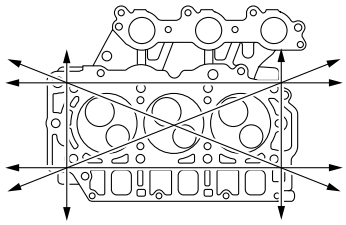
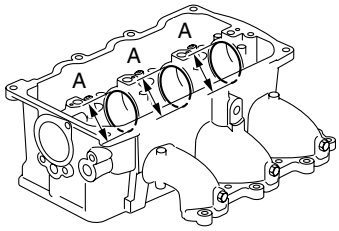
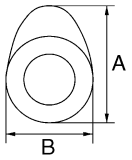
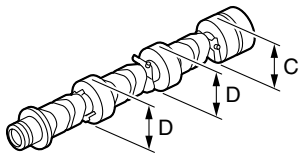
(*1) If the recommended engine oil grades are not available, use engine oil with an API classification of SH, SJ, or SL and an SAE classification of 15W-40, 20W-40, or 20W-50.

(*2) Meeting both API and SAE requirements

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Electrical					
Battery minimum capacity					
CCA/EN	A	430			
20HR/IEC	Ah	70			
Electrolyte specific gravity					
at 20 °C (68 °F)		1.280			

Maintenance specification

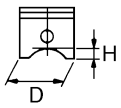
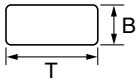
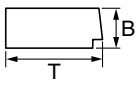
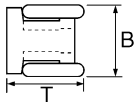
Power unit

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Power unit					
Minimum compression pressure(*1)	kPa (kgf/cm², psi)	600 (6.0, 87.0)		380 (8.3, 120.4)	
Oil pressure(*2)	kPa (kgf/cm², psi)	210 (2.1, 30.5) at 52 °C (126 °F) with SL 10W-30 engine oil and at engine idle speed			
Cylinder head					
Warpage limit	mm (in)	0.10 (0.0039)			
 (lines indicate straightedge position)					
Cylinder head journal inside diameter (A)	mm (in)	37.000–37.025 (1.4567–1.4577)			
					
Camshaft					
Intake and exhaust (A) 	mm (in)	30.834–31.034 (1.2139–1.2218)			
Intake and exhaust (B)	mm (in)	25.900–26.100 (1.0197–1.0276)			
Camshaft journal diameter (C)	mm (in)	36.925–36.945 (1.4537–1.4545)			
Camshaft journal diameter (D)	mm (in)	36.935–36.955 (1.4541–1.4549)			
					
Camshaft runout limit	mm (in)	0.03 (0.0012)			

(*1) Measuring conditions:
Ambient temperature 20 °C (68 °F), wide open throttle, with spark plugs removed from all cylinders. Since this outboard motor is equipped with an automatic decompression mechanism, the compression pressure may vary depending on the speed at which the starter handle is pulled when using the manual starter to crank the engine. (M and W model)
The figures are for reference only.

(*2) For details of the checking method, see “Checking the oil pressure” (5-1).
The figures are for reference only.

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Rocker arm shaft					
Outside diameter	mm (in)	15.971–15.991 (0.6288–0.6296)			
Rocker arm					
Inside diameter	mm (in)	16.000–16.018 (0.6299–0.6306)			
Valve					
Valve clearance (cold)					
Intake	mm (in)	0.20 ± 0.05 (0.008 ± 0.002)			
Exhaust	mm (in)	0.30 ± 0.05 (0.012 ± 0.002)			
Head diameter (A)					
Intake	mm (in)	31.9–32.1 (1.256–1.264)			
Exhaust	mm (in)	25.9–26.1 (1.020–1.028)			
Face width (B)					
Intake	mm (in)	1.84–2.97 (0.0724–0.1169)			
Exhaust	mm (in)	1.98–3.11 (0.0780–0.1224)			
Seat contact width (C)					
Intake and exhaust	mm (in)	0.9–1.1 (0.035–0.043)			
Margin thickness (D)					
Intake	mm (in)	0.6–1.0 (0.024–0.039)			
Exhaust	mm (in)	0.7–1.1 (0.028–0.043)			
Stem diameter					
Intake	mm (in)	5.475–5.490 (0.2156–0.2161)			
Exhaust	mm (in)	5.460–5.475 (0.2150–0.2156)			
Stem runout limit					
Intake	mm (in)	0.030 (0.0012)			
Exhaust	mm (in)	0.016 (0.0006)			
Guide inside diameter					
Intake and exhaust	mm (in)	5.500–5.512 (0.2165–0.2170)			
Stem-to-guide clearance					
Intake	mm (in)	0.010–0.037 (0.0004–0.0015)			
Exhaust	mm (in)	0.025–0.052 (0.0010–0.0020)			
Valve spring					
Free length	mm (in)	39.85 (1.5689)			
Tilt limit	mm (in)	1.7 (0.067)			
Cylinder					
Bore size	mm (in)	64.985–65.015 (2.5585–2.5596)			

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Piston					
Piston diameter (D) 	mm (in)	64.950–64.965 (2.5571–2.5577)			
Measuring point (H)	mm (in)	2.0 (0.08)			
Piston clearance(*1)	mm (in)	0.035–0.065 (0.0014–0.0026)			
Piston pin boss bore	mm (in)	15.974–15.985 (0.6289–0.6293)			
Oversize piston diameter					
1st	mm (in)	65.200–65.215 (2.5669–2.5675)			
2nd	mm (in)	65.450–65.465 (2.5768–2.5774)			
Piston ring groove					
Top ring	mm (in)	1.21–1.23 (0.0476–0.0484)			
2nd ring	mm (in)	1.51–1.53 (0.0594–0.0602)			
Oil ring	mm (in)	2.52–2.54 (0.0992–0.1000)			
Piston pin					
Outside diameter	mm (in)	15.965–15.970 (0.6285–0.6287)			
Piston ring					
Top ring		Barrel			
Dimension B 	mm (in)	1.17–1.19 (0.0461–0.0469)			
Dimension T	mm (in)	2.30–2.50 (0.0906–0.0984)			
End gap(*1)	mm (in)	0.15–0.30 (0.0059–0.0118)			
Side clearance	mm (in)	0.02–0.06 (0.0008–0.0024)			
2nd ring		Taper			
Dimension B 	mm (in)	1.47–1.49 (0.0579–0.0587)			
Dimension T	mm (in)	2.60–2.80 (0.1024–0.1102)			
End gap(*1)	mm (in)	0.30–0.50 (0.0118–0.0197)			
Side clearance	mm (in)	0.02–0.06 (0.0008–0.0024)			
Oil ring					
Dimension B 	mm (in)	2.36–2.48 (0.0929–0.0976)			
Dimension T	mm (in)	2.75 (0.1083)			
End gap(*1)	mm (in)	0.20–0.70 (0.0079–0.0276)			
Side clearance	mm (in)	0.04–0.18 (0.0016–0.0071)			
Connecting rod					
Small end inside diameter	mm (in)	15.985–15.998 (0.6293–0.6298)			
Big end inside diameter	mm (in)	36.000–36.024 (1.4173–1.4183)			
Big end side clearance(*1)	mm (in)	0.12–0.15 (0.0047–0.0059)			
Crankpin oil clearance(*1)	mm (in)	0.020–0.052 (0.0008–0.0020)			
Big end bearing thickness					
Blue	mm (in)	1.494–1.498 (0.0588–0.0590)			
Black	mm (in)	1.490–1.494 (0.0587–0.0588)			
Brown	mm (in)	1.486–1.490 (0.0585–0.0587)			

(*1) The figures are for reference only.

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Crankshaft					
Crankshaft journal diameter	mm (in)	42.984–43.000 (1.6923–1.6929)			
Crankpin diameter	mm (in)	32.984–33.000 (1.2986–1.2992)			
Crankpin width	mm (in)	21.000–21.070 (0.8268–0.8295)			
Crankshaft runout limit	mm (in)	0.05 (0.0020)			
Crankcase					
Crankshaft journal oil clearance(*1)	mm (in)	0.012–0.044 (0.0005–0.0017)			
Upper and lower crankcase main journal bearing thickness					
A - (Blue)	mm (in)	1.498–1.502 (0.0590–0.0591)			
B - (Black)	mm (in)	1.494–1.498 (0.0588–0.0590)			
C - (Brown)	mm (in)	1.490–1.494 (0.0587–0.0588)			
Oil pump					
Type		Trochoid			
Relief valve opening pressure	kPa (kgf/cm^2, psi)	389–451 (3.89–4.51, 56.4–65.4)			
Thermostat					
Opening temperature					
at 0.05 mm (0.0020 in)	°C (°F)	58–62 (136–144)			
Fully open temperature	°C (°F)	70 (158)			
Valve open lower limit	mm (in)	3.0 (0.12)			
Manual starter					
Starter rope length	mm (in)	1,750 (68.9)			—
Starter rope extended length	mm (in)	1,400–1,600 (55.12–62.99)			—

(*1) The figures are for reference only.

Fuel system

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Carburetor					
ID mark					
(For Europe)		69H22	67C23	—	67C23
(For Oceania)		—		67C03	—
Float height	mm (in)	12.0–16.0 (0.47–0.63)			
Valve seat size	mm (in)	1.4 (0.06)			
Main jet (M.J.)		#88	#95		
Main nozzle (M.N.)	mm (in)	2.4 (0.09)	2.8 (0.11)		
Pilot jet (P.J.)					
(For Europe)		#40		—	#40
(For Oceania)		—		#38	—
Pilot screw (P.S.)	turns out	1 7/8 ± 1/2	2 ± 1/2		
Engine idle speed	r/min	850 ± 50			

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Fuel pump					
Fuel pump holding pressure					
Fuel inlet positive pressure	kPa (kgf/cm^2, psi)	50 (0.5, 7.3)			
Fuel inlet negative pressure	kPa (kgf/cm^2, psi)	30 (0.3, 4.4)			
Fuel outlet positive pressure	kPa (kgf/cm^2, psi)	50 (0.5, 7.3)			
Fuel joint holding pressure					
Positive pressure	kPa (kgf/cm^2, psi)	50 (0.5, 7.3)			
Fuel filter assembly holding pressure					
Positive pressure	kPa (kgf/cm^2, psi)	1,035 (10.35, 150.1)			

Lower unit

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Lower unit					
Holding pressure	kPa (kgf/cm^2, psi)	100 (1.0, 14.5)			
Gear backlash					
Pinion-to-forward gear(*1)	mm (in)	0.18–0.57 (0.0071–0.0224)			
Pinion-to-reverse gear(*1)	mm (in)	0.75–1.13 (0.0295–0.0445)			
Pinion shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			
Forward gear shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			
Reverse gear shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			
Propeller shaft					
Runout limit	mm (in)	0.02 (0.0008)			
Drive shaft					
Runout limit	mm (in)	0.5 (0.0197)			

(*1) Figures obtained using the special service tools.

Electrical

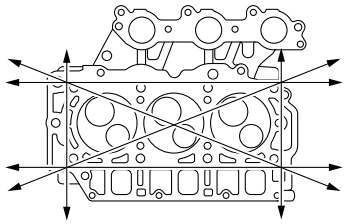
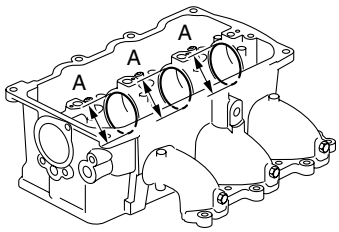
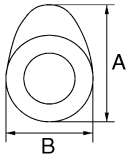
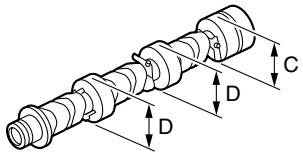
Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Ignition and ignition control system					
Spark plug gap	mm (in)	0.8–0.9 (0.031–0.035)			
Spark plug cap resistance(*1)	kΩ	4.0–6.0			
Ignition coil resistance(*1)					
Primary coil (O – B/W)					
at 20 °C (68 °F)	Ω	0.18–0.24			
Secondary coil (B/W – spark plug wire)					
at 20 °C (68 °F)	kΩ	2.72–3.68			
Pulser coil output peak voltage (R – B)					
at cranking (unloaded)	V	8.1			
at cranking (loaded)	V	6.9			
at 1,500 r/min (loaded)	V	16.8			
at 3,500 r/min (loaded)	V	25.8			
Pulser coil resistance(*1) (R – B)					
at 20 °C (68 °F)	Ω	300–350			
Charge coil output peak voltage (W/G – G/W)					
at cranking (unloaded)	V	200			
at cranking (loaded)	V	190			
at 1,500 r/min (loaded)	V	200			
at 3,500 r/min (loaded)	V	200			
Charge coil resistance(*1) (W/G – G/W)					
at 20 °C (68 °F)	Ω	660–710			
CDI unit output peak voltage (O – B)					
at cranking (loaded)	V	120			
at 1,500 r/min (loaded)	V	170			
at 3,500 r/min (loaded)	V	170			
Thermo sensor resistance(*1) (Br/B – B)					
at 20 °C (68 °F)	kΩ	12.49			
at 50 °C (122 °F)	kΩ	3.60			
at 70 °C (158 °F)	kΩ	1.75			
Oil pressure switch					
Specified oil pressure(*2)	kPa (kgf/cm^2, psi)	15.5 (0.155, 2.25)			

(*1) The figures are for reference only.
(*2) For details of the checking method, see “Checking the oil pressure switch” (8-21).

Item	Unit	Model			
		F30AMHD	F40BMHD	F40BWHD	F40BED
Fuel control system					
Prime Start resistance(*1) (Y – Y)					
at 20 °C (68 °F)	Ω	20.0–23.0			
Prime Start plunger length(*1)	mm (in)	10.7 (0.42)			
Starting system					
Power bobbin output peak voltage (Y/B – Y/B)					
at cranking (loaded)	V	7.0			
at 1,500 r/min (loaded)	V	28.0			
at 3,500 r/min (loaded)	V	77.7			
Power bobbin resistance(*2) (Y/B – Y/B)					
at 20 °C (68 °F)	Ω	6.5–7.2			
Starter motor					
Type		—		Bendix	
Output	kW	—		1.20	
Cranking time limit	Second	—		30	
Brushes					
Wear limit	mm (in)	—		6.4 (0.25)	
Commutator					
Undercut wear limit	mm (in)	—		0.8 (0.03)	
Charging system					
Fuse	A	—		20	
Lighting coil output peak voltage (Y – Y)					
at cranking (unloaded)	V	14.1		8.4	
at 1,500 r/min (unloaded)	V	39.7		28.5	
at 3,500 r/min (unloaded)	V	95.2		66.6	
Lighting coil resistance(*2) (Y – Y)					
at 20 °C (68 °F)	Ω	0.90–1.10		0.26–0.28	
Rectifier Regulator output peak voltage (R – Ground)					
at 1,500 r/min (loaded)	V	—		13	
at 3,500 r/min (loaded)	V	—		13	

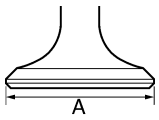
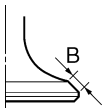
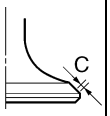
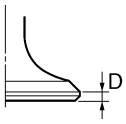
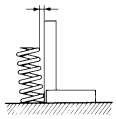
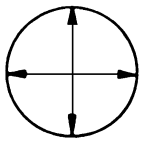
(*1) The following resistance is when the ambient temperature is 20 °C (68 °F) and there is no power supplied. The figures are for reference only.
(*2) The figures are for reference only.

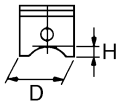
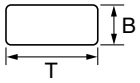
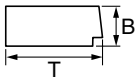
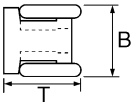
Power unit

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Power unit					
Minimum compression pressure(*1)	kPa (kgf/cm², psi)	830 (8.3, 120.4)			
Oil pressure(*2)	kPa (kgf/cm², psi)	210 (2.1, 30.5) at 52 °C (126 °F) with SL 10W-30 engine oil and at engine idle speed			
Cylinder head					
Warpage limit	mm (in)	0.10 (0.0039)			
 (lines indicate straightedge position)					
Cylinder head journal inside diameter (A)	mm (in)	37.000–37.025 (1.4567–1.4577)			
					
Camshaft					
Intake and exhaust (A) 	mm (in)	30.834–31.034 (1.2139–1.2218)			
Intake and exhaust (B)	mm (in)	25.900–26.100 (1.0197–1.0276)			
Camshaft journal diameter (C)	mm (in)	36.925–36.945 (1.4537–1.4545)			
Camshaft journal diameter (D)	mm (in)	36.935–36.955 (1.4541–1.4549)			
					
Camshaft runout limit	mm (in)	0.03 (0.0012)			
Rocker arm shaft					
Outside diameter	mm (in)	15.971–15.991 (0.6288–0.6296)			

(*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.

(*2) For details of the checking method, see “Checking the oil pressure” (5-1).
The figures are for reference only.

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Rocker arm					
Inside diameter	mm (in)	16.000–16.018 (0.6299–0.6306)			
Valve					
Valve clearance (cold)					
Intake	mm (in)	0.20 ± 0.05 (0.008 ± 0.002)			
Exhaust	mm (in)	0.30 ± 0.05 (0.012 ± 0.002)			
Head diameter (A) 					
Intake	mm (in)	31.9–32.1 (1.256–1.264)			
Exhaust	mm (in)	25.9–26.1 (1.020–1.028)			
Face width (B) 					
Intake	mm (in)	1.84–2.97 (0.0724–0.1169)			
Exhaust	mm (in)	1.98–3.11 (0.0780–0.1224)			
Seat contact width (C) 					
Intake and exhaust	mm (in)	0.9–1.1 (0.035–0.043)			
Margin thickness (D) 					
Intake	mm (in)	0.6–1.0 (0.024–0.039)			
Exhaust	mm (in)	0.7–1.1 (0.028–0.043)			
Stem diameter					
Intake	mm (in)	5.475–5.490 (0.2156–0.2161)			
Exhaust	mm (in)	5.460–5.475 (0.2150–0.2156)			
Stem runout limit					
Intake	mm (in)	0.030 (0.0012)			
Exhaust	mm (in)	0.016 (0.0006)			
Guide inside diameter					
Intake and exhaust	mm (in)	5.500–5.512 (0.2165–0.2170)			
Stem-to-guide clearance					
Intake	mm (in)	0.010–0.037 (0.0004–0.0015)			
Exhaust	mm (in)	0.025–0.052 (0.0010–0.0020)			
Valve spring					
Free length 	mm (in)	39.85 (1.5689)			
Tilt limit	mm (in)	1.7 (0.067)			
Cylinder					
Bore size 	mm (in)	64.985–65.015 (2.5585–2.5596)			

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Piston					
Piston diameter (D) 	mm (in)	64.950–64.965 (2.5571–2.5577)			
Measuring point (H)	mm (in)	2.0 (0.08)			
Piston clearance(*1)	mm (in)	0.035–0.065 (0.0014–0.0026)			
Piston pin boss bore	mm (in)	15.974–15.985 (0.6289–0.6293)			
Oversize piston diameter					
1st	mm (in)	65.200–65.215 (2.5669–2.5675)			
2nd	mm (in)	65.450–65.465 (2.5768–2.5774)			
Piston ring groove					
Top ring	mm (in)	1.21–1.23 (0.0476–0.0484)			
2nd ring	mm (in)	1.51–1.53 (0.0594–0.0602)			
Oil ring	mm (in)	2.52–2.54 (0.0992–0.1000)			
Piston pin					
Outside diameter	mm (in)	15.965–15.970 (0.6285–0.6287)			
Piston ring					
Top ring		Barrel			
Dimension B 	mm (in)	1.17–1.19 (0.0461–0.0469)			
Dimension T	mm (in)	2.30–2.50 (0.0906–0.0984)			
End gap(*1)	mm (in)	0.15–0.30 (0.0059–0.0118)			
Side clearance	mm (in)	0.02–0.06 (0.0008–0.0024)			
2nd ring		Taper			
Dimension B 	mm (in)	1.47–1.49 (0.0579–0.0587)			
Dimension T	mm (in)	2.60–2.80 (0.1024–0.1102)			
End gap(*1)	mm (in)	0.30–0.50 (0.0118–0.0197)			
Side clearance	mm (in)	0.02–0.06 (0.0008–0.0024)			
Oil ring					
Dimension B 	mm (in)	2.36–2.48 (0.0929–0.0976)			
Dimension T	mm (in)	2.75 (0.1083)			
End gap(*1)	mm (in)	0.20–0.70 (0.0079–0.0276)			
Side clearance	mm (in)	0.04–0.18 (0.0016–0.0071)			
Connecting rod					
Small end inside diameter	mm (in)	15.985–15.998 (0.6293–0.6298)			
Big end inside diameter	mm (in)	36.000–36.024 (1.4173–1.4183)			
Big end side clearance(*1)	mm (in)	0.12–0.15 (0.0047–0.0059)			
Crankpin oil clearance(*1)	mm (in)	0.020–0.052 (0.0008–0.0020)			
Big end bearing thickness					
Blue	mm (in)	1.494–1.498 (0.0588–0.0590)			
Black	mm (in)	1.490–1.494 (0.0587–0.0588)			
Brown	mm (in)	1.486–1.490 (0.0585–0.0587)			

(*1) The figures are for reference only.

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Crankshaft					
Crankshaft journal diameter	mm (in)	42.984–43.000 (1.6923–1.6929)			
Crankpin diameter	mm (in)	32.984–33.000 (1.2986–1.2992)			
Crankpin width	mm (in)	21.000–21.070 (0.8268–0.8295)			
Crankshaft runout limit	mm (in)	0.05 (0.0020)			
Crankcase					
Crankshaft journal oil clearance(*1)	mm (in)	0.012–0.044 (0.0005–0.0017)			
Upper and lower crankcase main journal bearing thickness					
A - (Blue)	mm (in)	1.498–1.502 (0.0590–0.0591)			
B - (Black)	mm (in)	1.494–1.498 (0.0588–0.0590)			
C - (Brown)	mm (in)	1.490–1.494 (0.0587–0.0588)			
Oil pump					
Type		Trochoid			
Relief valve opening pressure	kPa (kgf/cm^2, psi)	389–451 (3.89–4.51, 56.4–65.4)			
Thermostat					
Opening temperature					
at 0.05 mm (0.0020 in)	°C (°F)	58–62 (136–144)			
Fully open temperature	°C (°F)	70 (158)			
Valve open lower limit	mm (in)	3.0 (0.12)			
Manual starter					
Starter rope length	mm (in)	—		1,750 (68.9)	—
Starter rope extended length	mm (in)	—		1,400–1,600 (55.12–62.99)	—

(*1) The figures are for reference only.

Fuel system

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Carburetor					
ID mark					
(For Europe)		—	69H22	—	67C23
(For Oceania)		69H02		67C03	
Float height	mm (in)	12.0–16.0 (0.47–0.63)			
Valve seat size	mm (in)	1.4 (0.06)			
Main jet (M.J.)		#88		#95	
Main nozzle (M.N.)	mm (in)	2.4 (0.09)		2.8 (0.11)	

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Pilot jet (P.J.)					
(For Europe)		—	#40	—	#40
(For Oceania)		#40		#38	
Pilot screw (P.S.)	turns out	1 7/8 ± 1/2		2 ± 1/2	
Engine idle speed	r/min	850 ± 50			
Fuel pump					
Fuel pump holding pressure					
Fuel inlet positive pressure	kPa (kgf/cm^2, psi)	50 (0.5, 7.3)			
Fuel inlet negative pressure	kPa (kgf/cm^2, psi)	30 (0.3, 4.4)			
Fuel outlet positive pressure	kPa (kgf/cm^2, psi)	50 (0.5, 7.3)			
Fuel joint holding pressure					
Positive pressure	kPa (kgf/cm^2, psi)	50 (0.5, 7.3)			
Fuel filter assembly holding pressure					
Positive pressure	kPa (kgf/cm^2, psi)	1,035 (10.35, 150.1)			

Lower unit

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Lower unit					
Holding pressure	kPa (kgf/cm^2, psi)	100 (1.0, 14.5)			
Gear backlash					
Pinion-to-forward gear(*1)	mm (in)	0.18–0.57 (0.0071–0.0224)			
Pinion-to-reverse gear(*1)	mm (in)	0.75–1.13 (0.0295–0.0445)			
Pinion shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			
Forward gear shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			
Reverse gear shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			
Propeller shaft					
Runout limit	mm (in)	0.02 (0.0008)			
Drive shaft					
Runout limit	mm (in)	0.5 (0.0197)			

(*1) Figures obtained using the special service tools.

Electrical

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Ignition and ignition control system					
Spark plug gap	mm (in)	0.8–0.9 (0.031–0.035)			
Spark plug cap resistance(*1)	kΩ	4.0–6.0			
Ignition coil resistance(*1)					
Primary coil (O – B/W)					
at 20 °C (68 °F)	Ω	0.18–0.24			
Secondary coil (B/W – spark plug wire)					
at 20 °C (68 °F)	kΩ	2.72–3.68			
Pulser coil output peak voltage (R – B)					
at cranking (unloaded)	V	8.1			
at cranking (loaded)	V	6.9			
at 1,500 r/min (loaded)	V	16.8			
at 3,500 r/min (loaded)	V	25.8			
Pulser coil resistance(*1) (R – B)					
at 20 °C (68 °F)	Ω	300–350			
Charge coil output peak voltage (W/G – G/W)					
at cranking (unloaded)	V	200			
at cranking (loaded)	V	190			
at 1,500 r/min (loaded)	V	200			
at 3,500 r/min (loaded)	V	200			
Charge coil resistance(*1) (W/G – G/W)					
at 20 °C (68 °F)	Ω	660–710			
CDI unit output peak voltage (O – B)					
at cranking (loaded)	V	120			
at 1,500 r/min (loaded)	V	170			
at 3,500 r/min (loaded)	V	170			
Thermo sensor resistance(*1) (Br/B – B)					
at 20 °C (68 °F)	kΩ	12.49			
at 50 °C (122 °F)	kΩ	3.60			
at 70 °C (158 °F)	kΩ	1.75			
Oil pressure switch					
Specified oil pressure(*2)	kPa (kgf/cm^2, psi)	15.5 (0.155, 2.25)			

(*1) The figures are for reference only.
(*2) For details of the checking method, see “Checking the oil pressure switch” (8-21).

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
Fuel control system					
Prime Start resistance(*1) (Y – Y)					
at 20 °C (68 °F)	Ω	20.0–23.0			
Prime Start plunger length(*1)	mm (in)	10.7 (0.42)			
Starting system					
Power bobbin output peak voltage (Y/B – Y/B)					
at cranking (loaded)	V	7.0			
at 1,500 r/min (loaded)	V	28.0			
at 3,500 r/min (loaded)	V	77.7			
Power bobbin resistance(*2) (Y/B – Y/B)					
at 20 °C (68 °F)	Ω	6.5–7.2			
Starter motor					
Type		Bendix			
Output	kW	1.20			
Cranking time limit	Second	30			
Brushes					
Wear limit	mm (in)	6.4 (0.25)			
Commutator					
Undercut wear limit	mm (in)	0.8 (0.03)			
Charging system					
Fuse	A	20			
Lighting coil output peak voltage (Y – Y)					
at cranking (unloaded)	V	8.4			
at 1,500 r/min (unloaded)	V	28.5			
at 3,500 r/min (unloaded)	V	66.6			
Lighting coil resistance(*2) (Y – Y)					
at 20 °C (68 °F)	Ω	0.26–0.28			
Rectifier Regulator output peak voltage (R – Ground)					
at 1,500 r/min (loaded)	V	13			
at 3,500 r/min (loaded)	V	13			

(*1) The following resistance is when the ambient temperature is 20 °C (68 °F) and there is no power supplied. The figures are for reference only.
(*2) The figures are for reference only.

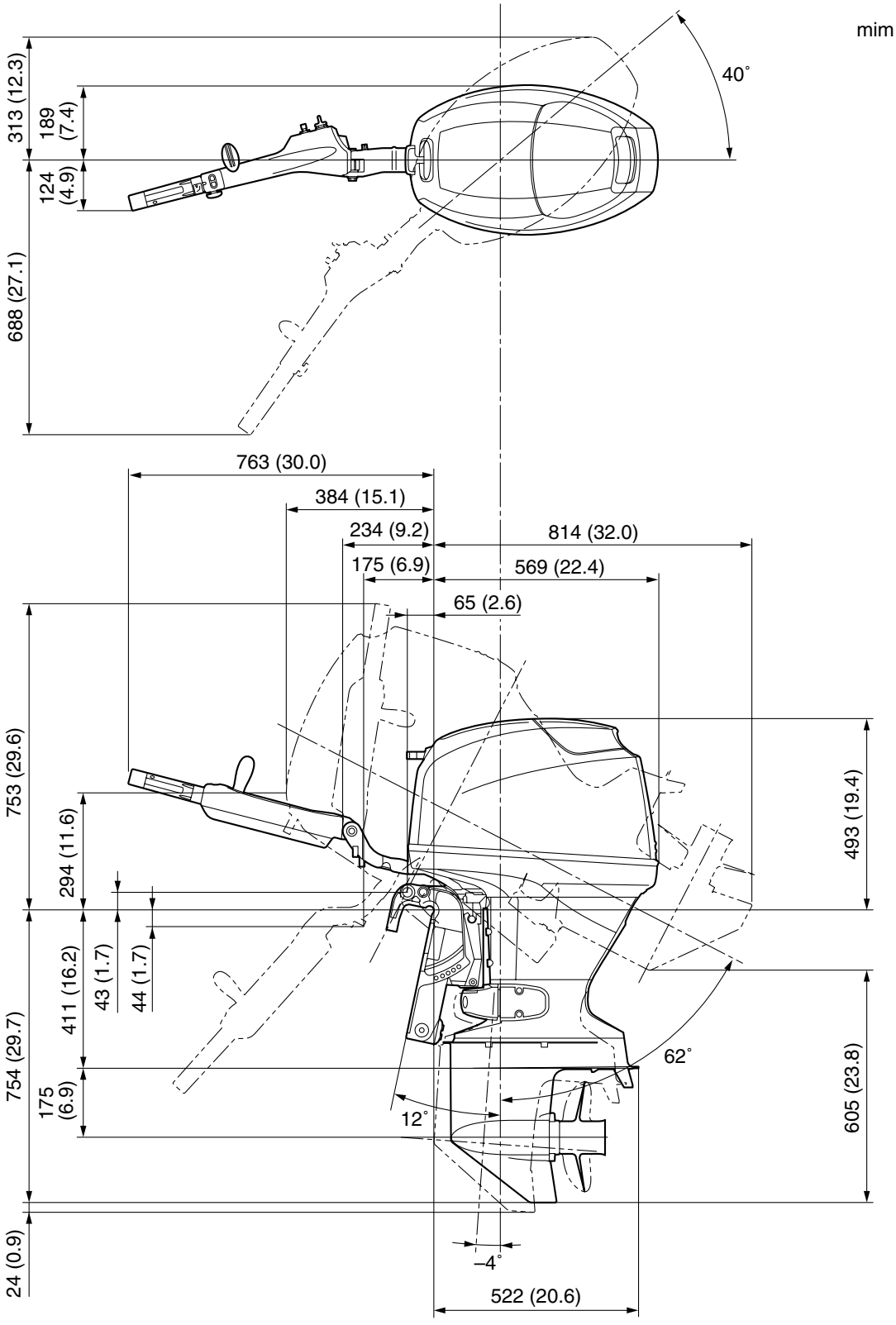
Specification

Item	Unit	Model			
		F30AEHT	F30AET	F40BWHT	F40BET
PTT system					
Trim sensor setting resistance(*1) (P – B)					
at 20 °C (68 °F)	Ω	9–11			
Trim sensor resistance(*1) (P – B)					
at 20 °C (68 °F)	Ω	238.8–378.8			
PTT motor					
Output	kW	0.18			
Brushes					
Standard length	mm (in)	6.0 (0.24)			
Wear limit	mm (in)	3.0 (0.12)			
Commutator					
Standard diameter	mm (in)	16.5 (0.65)			
Wear limit	mm (in)	15.5 (0.61)			
Standard undercut	mm (in)	1.00 (0.039)			
Wear limit	mm (in)	0.50 (0.020)			

(*1) The figures are for reference only.

Dimension

Exterior F30AMHD, F40BMHD (For Europe) (S-transom model)



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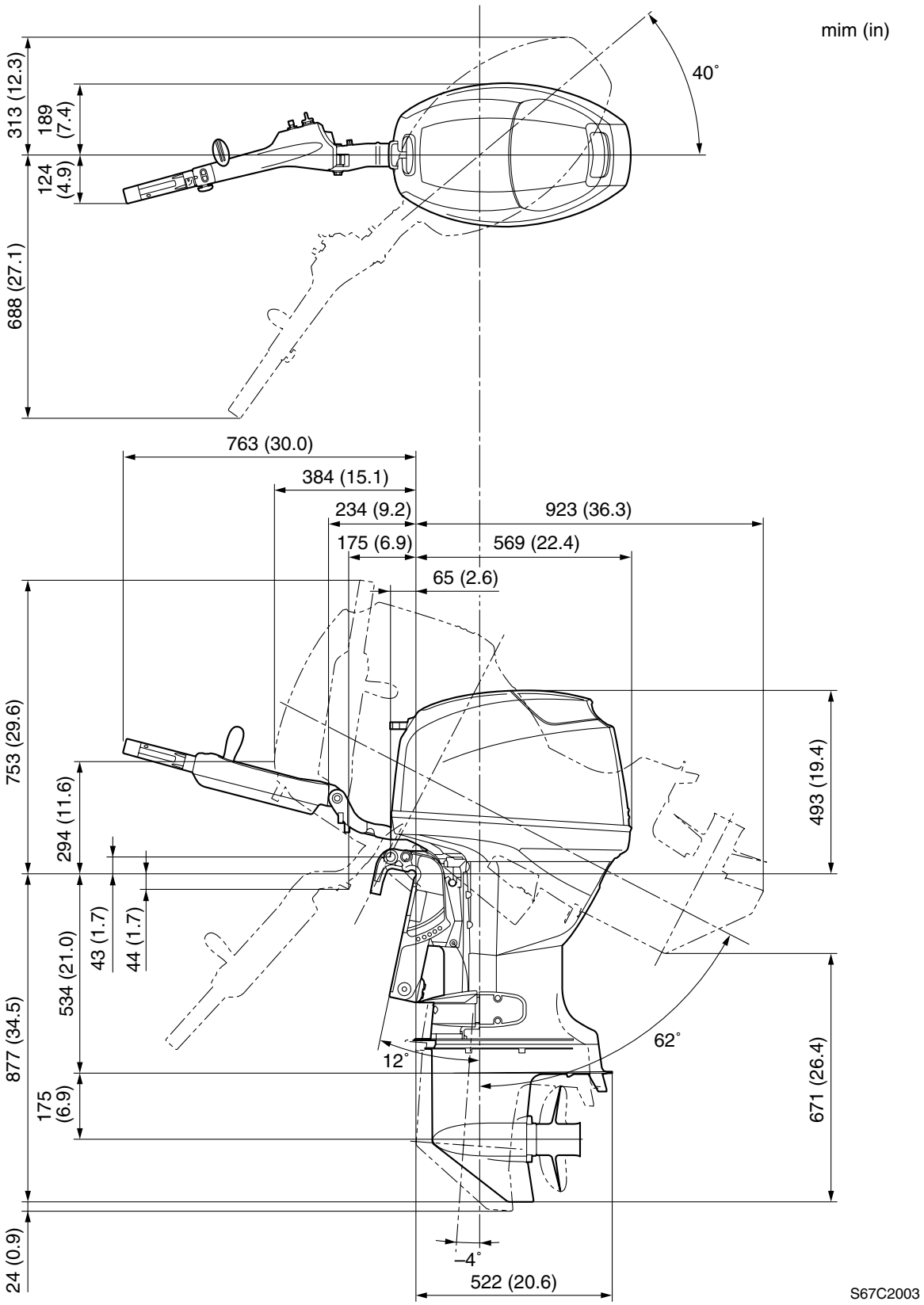
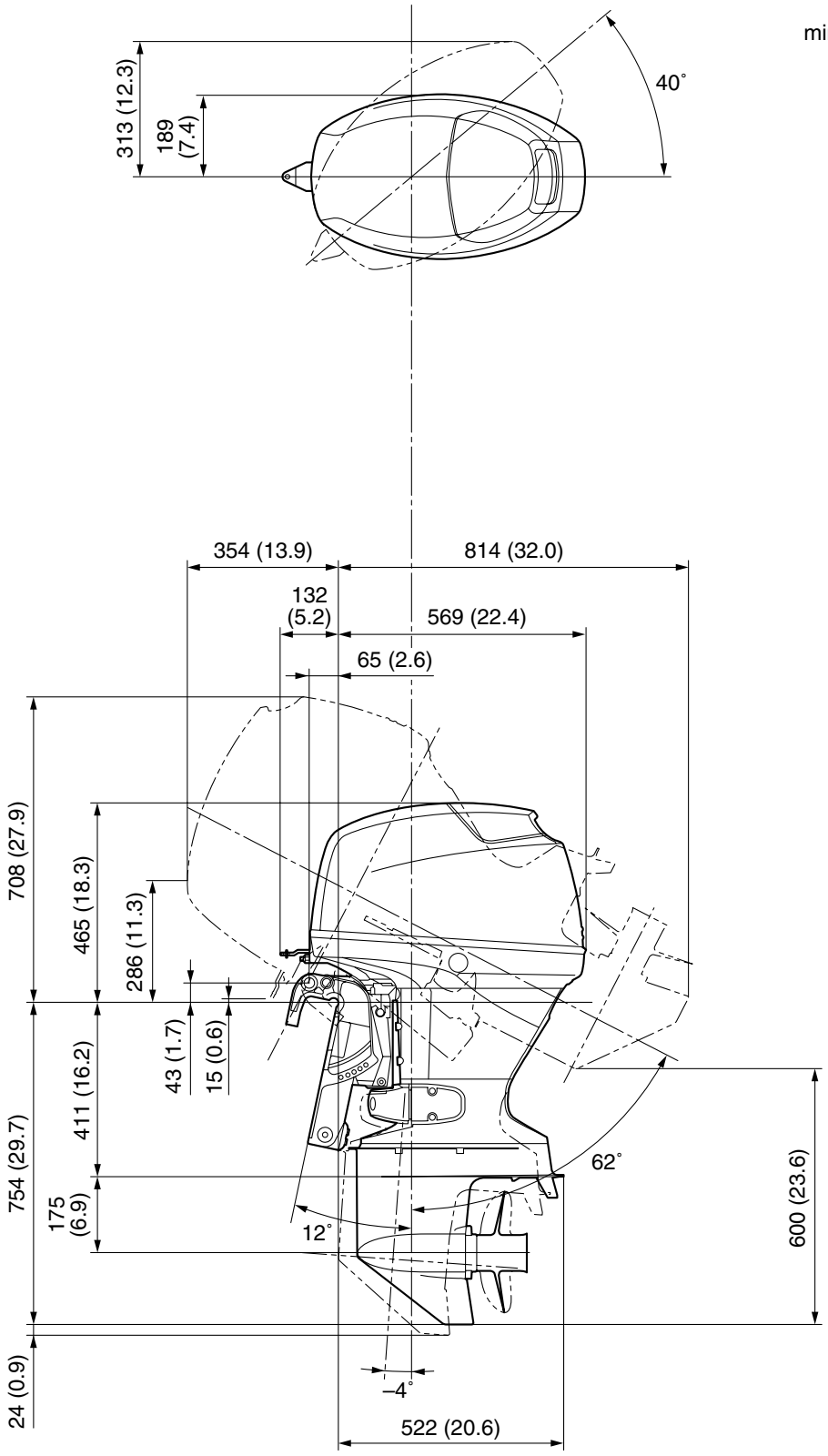
Exterior F30AMHD, F40BMHD (For Europe), F30AEHT, F40BWHD, F40BWHT (For Oceania) (L-transom model)



Exterior F30AET, F40BET (For Europe) (S-transom model)



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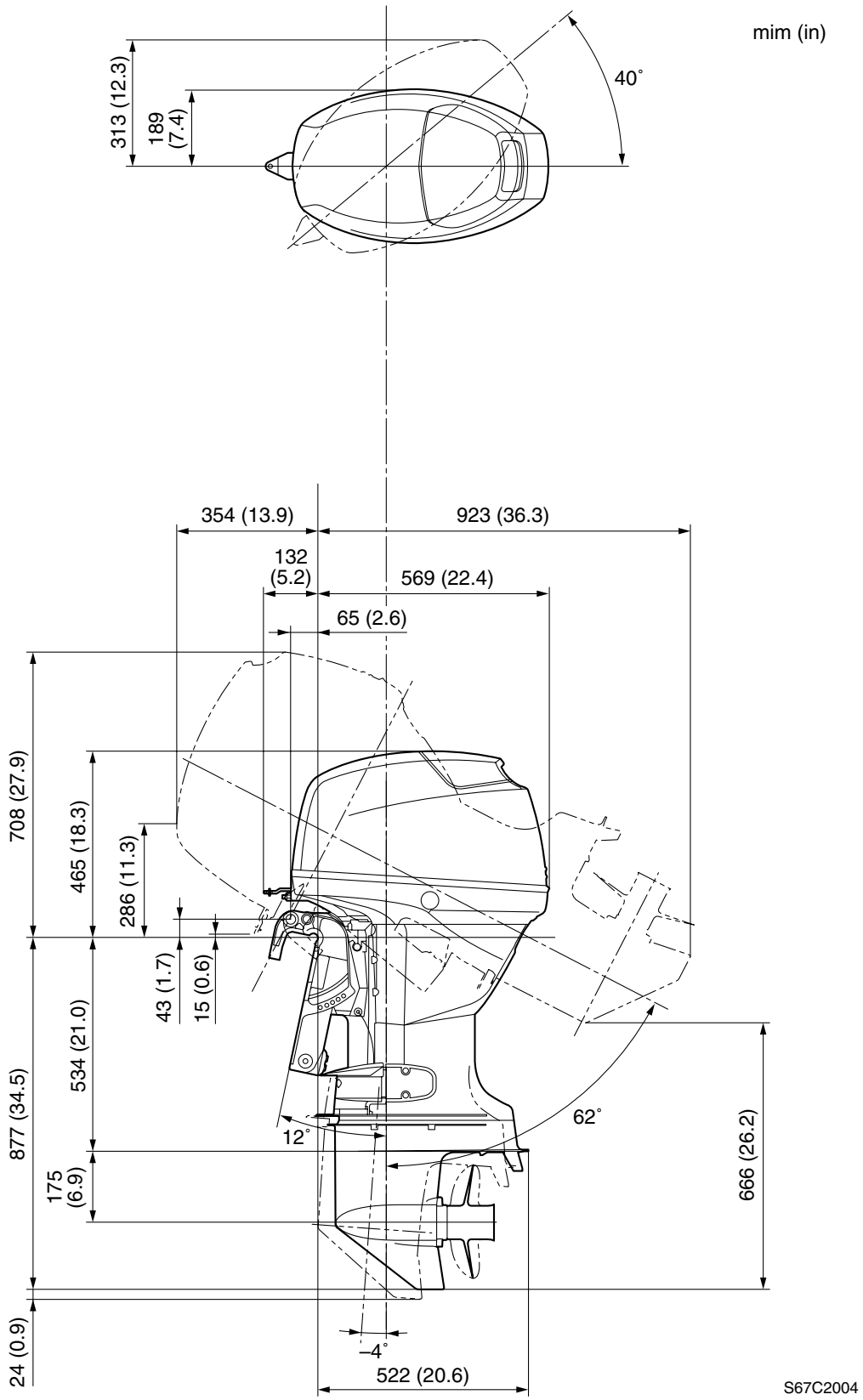
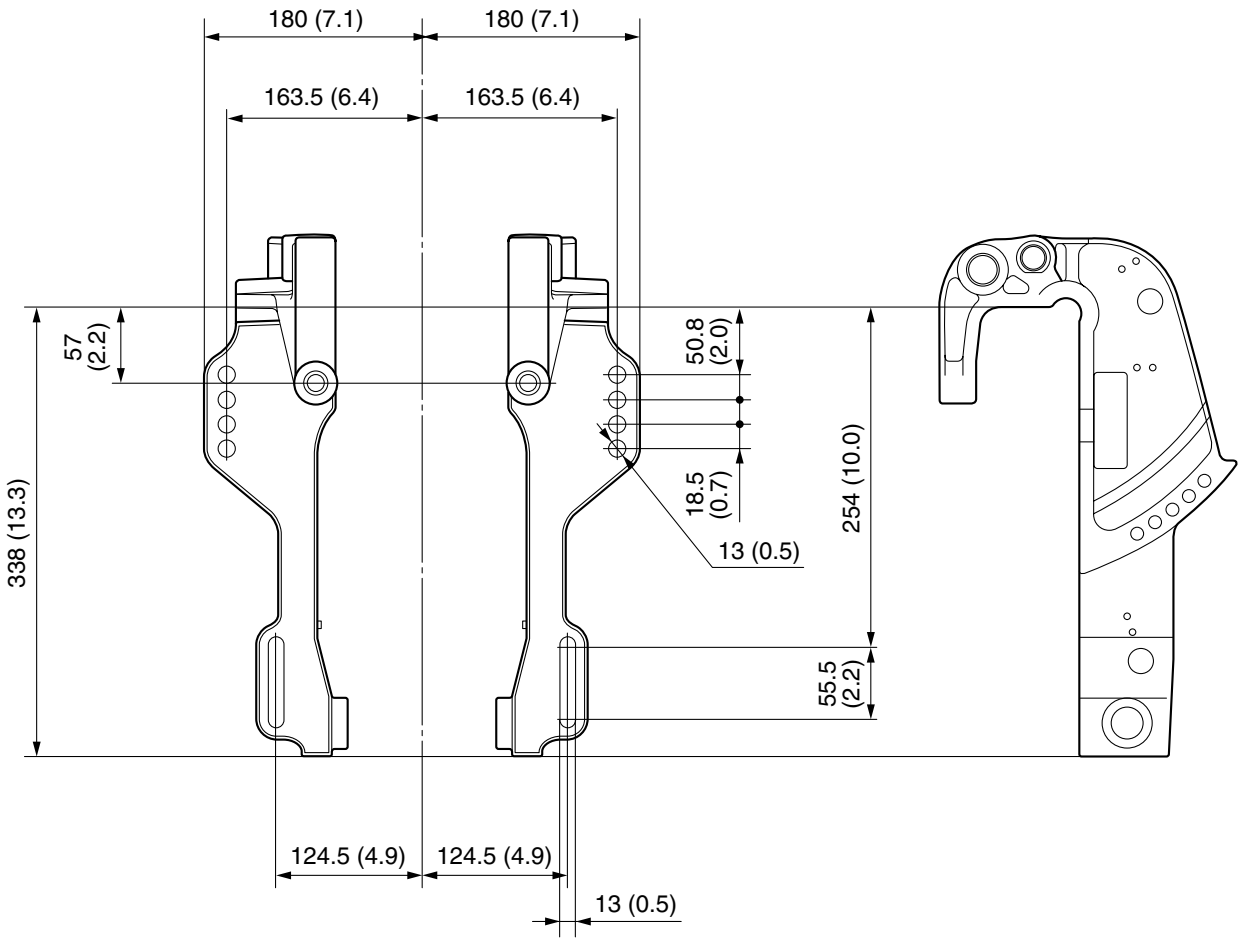
Exterior F30AET, F40BED, F40BET (For Europe), F30AET, F40BET (For Oceania) (L-transom model)



Clamp bracket

mim (in)



S67C2005

Tightening torque

Specified torque

Part to be tightened		Thread size	Tightening torques		
			N·m	kgf·m	ft·lb
Fuel system					
Fuel joint bolt		M6	8	0.8	5.9
Fuel pump screw		M5	3	0.3	2.2
Fuel pump valve screw		M3	0.5	0.05	0.37
Carburetor assembly bolt		M6	8	0.8	5.9
Carburetor unit bolt		M6	8	0.8	5.9
Intake silencer bolt		M6	8	0.8	5.9
Dashpot screw		M6	5	0.5	3.7
Power unit					
Power unit mounting bolt		M8	21	2.1	15.5
Apron bolt		M6	8	0.8	5.9
Ignition coil bolt		M6	8	0.8	5.9
Rectifier Regulator bolt		M6	8	0.8	5.9
Spark plug		—	17	1.7	12.5
Pulser coil bolt		M5	5	0.5	3.7
CDI unit bracket bolt		M6	8	0.8	5.9
Starter motor bolt (E and W model)		M8	29	2.9	21.4
Terminal bolt (PTT model)		M6	8	0.8	5.9
Starter relay bolt (E and W model)		M6	8	0.8	5.9
Starter motor cover bolt (E and W model)		M6	8	0.8	5.9
Pinion stopper nut (E and W model)		—	30	3.0	22.1
PTT relay bolt (PTT model)		M6	8	0.8	5.9
Oil pressure switch		—	6	0.6	4.4
Thermo sensor		—	4	0.4	3.0
Throttle cam bolt		M6	8	0.8	5.9
Throttle cam bracket bolt		M6	8	0.8	5.9
Accelerator lever bolt		M6	8	0.8	5.9
Stator assembly bolt		M5	6	0.6	4.4
Flywheel magnet nut		—	157	15.7	115.8
Driven sprocket bolt		M10	38	3.8	28.0
Cylinder head cover bolt		M6	8	0.8	5.9
Blowby plate screw		M4	2	0.2	1.5
Cylinder head bolt	1st	M9	23	2.3	17.0
	2nd		46	4.6	33.9
	1st	M6	6	0.6	4.4
	2nd		12	1.2	8.9
Anode cover bolt		M6	8	0.8	5.9
Rocker arm locknut		—	14	1.4	10.3
Rocker arm shaft bolt		M8	18	1.8	13.3
Camshaft retaining bolt		—	8	0.8	5.9
Oil filter		—	18	1.8	13.3

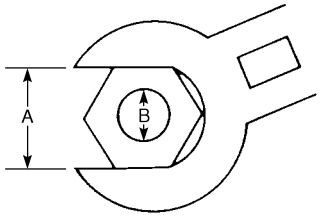
Part to be tightened		Thread size	Tightening torques		
			N·m	kgf·m	ft·lb
Union bolt		—	40	4.0	29.5
Oil pump assembly bolt		M6	8	0.8	5.9
Thermostat cover bolt		M6	7	0.7	5.2
Exhaust cover bolt	1st	M6	6	0.6	4.4
	2nd		12	1.2	8.9
Crankcase bolt	1st	M8	15	1.5	11.1
	2nd		30	3.0	22.1
	1st	M6	6	0.6	4.4
	2nd		12	1.2	8.9
Connecting rod cap bolt	1st	M6	6	0.6	4.4
	2nd		17	1.7	12.5
Ground lead bolt		M8	19	1.9	14.0
		M6	8	0.8	5.9
Lower unit					
Gear oil drain screw		—	9	0.9	6.6
Gear oil check screw		—	9	0.9	6.6
Trim tab bolt		M8	18	1.8	13.3
Lower case mounting bolt		M10	39	3.9	28.8
		M8	18	1.8	13.3
Propeller nut		—	39	3.9	28.8
Cooling water inlet cover screw		M5	4	0.4	3.0
Water pump housing bolt		M8	18	1.8	13.3
Propeller shaft housing bolt		M8	16	1.6	11.8
Pinion nut		—	74	7.4	54.6
Bracket unit					
Shift lever bolt		M8	18	1.8	13.3
Tiller handle nut (H model)		—	37	3.7	27.3
Tiller handle bracket nut (H model)		—	32	3.2	23.6
Tiller handle bracket bolt		M12	32	3.2	23.6
PTT switch screw (H model with PTT)		M6	2	0.2	1.5
PTT switch bracket bolt (R model with PTT)		M6	10	1.0	7.4
Warning indicator assembly screw (H model with electric starter)		M6	2	0.2	1.5
Engine start switch nut (H model with electric starter)		—	4	0.4	3.0
Engine shut-off switch nut (H model)		—	2	0.2	1.5
Friction plate bolt (H model)		M6	8	0.8	5.9
Friction plate assembly nut (H model)		—	18	1.8	13.3
Friction plate self-locking nut (H model)		—	4	0.4	3.0
Retaining plate bolt		M6	10	1.0	7.4
Flushing hose adapter bracket bolt		M6	8	0.8	5.9
Shift lod lever bolt		M6	10	1.0	7.4
Shift lod lever spring bolt		M6	10	1.0	7.4

Part to be tightened	Thread size	Tightening torques		
		N·m	kgf·m	ft·lb
Bottom cowling PTT motor lead holder bolt (H model with PTT)	M6	10	1.0	7.4
Upper mounting nut	—	24	2.4	17.7
Steering arm stud bolt	—	20	2.0	14.8
Upper case plug (L-transom model)	M14	17	1.7	12.5
Baffle plate screw	M5	3	0.3	2.2
Steering arm lock bolt	M6	4	0.4	3.0
Engine oil drain bolt	—	17	1.7	12.5
Exhaust manifold bolt	M6	10	1.0	7.4
Upper case bolt	M8	21	2.1	15.5
Self-locking nut	—	22	2.2	16.2
Trim sensor cam screw	M6	2	0.2	1.5
Anode bolt	M6	8	0.8	5.9
Grease nipple	—	3	0.3	2.2
PTT unit (PTT model)				
PTT motor assembly bolt	M6	7	0.7	5.2
Reservoir cap	—	7	0.7	5.2
Gear pump bolt	M4	4	0.4	3.0
Gear pump housing bolt	M6	9	0.9	6.6
Valve lock screw	—	6	0.6	4.4
Main valve	—	7	0.7	5.2
Manual valve	—	3	0.3	2.2
Tilt piston bolt	M10	61	6.1	45.0
PTT cylinder end screw	—	90	9.0	66.4

General torque

This chart specifies tightening torques for standard fasteners with a standard ISO thread pitch. Tightening torque specifications for special components or assemblies are provided in applicable sections of this manual. To avoid warpage, tighten multi-fastener assemblies in a crisscross fashion and progressive stages until the specified torque is reached. Unless otherwise specified, torque specifications 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	3.7
10 mm	M6	8	0.8	5.9
12 mm	M8	18	1.8	13.3
14 mm	M10	36	3.6	26.6
17 mm	M12	43	4.3	31.7



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Periodic check and adjustment

3

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	Remarks	Initial	Every			Refer to page
		20 hours (3 months)	100 hours (1 year)	300 hours (3 years)	500 hours (5 years)	
Anode(s) (external)	Check/replace		○			3-15
Anode(s) (cylinder head, thermostat cover)	Check/replace		○			3-15
Anodes (exhaust cover, cooling water passage cover, Rectifier Regulator cover)	Replace				○	3-15
Anode(s) (exhaust cover, cover joint)	Replace				○	3-15
Battery	Check/charge/ replace	○	○			3-16
Cooling water leakage	Check/replace	○	○			3-7
Cowling clamp	Check		○			3-3
Engine starting condition/ noise	Check	○	○			—
Engine idle speed/noise	Check	○	○			3-11
Engine oil	Replace	○	○			3-4
Engine oil filter (cartridge)	Replace		○			3-5
Fuel filter	Replace		○			3-3
Fuel pump	Check/replace			○		4-4
Fuel/oil leakage	Check	○	○			3-3
Fuel pipe	Check/replace	○	○			3-3
Fuel pipe	Replace			○		4-1
Gear oil	Replace	○	○			3-13
Greasing points	Lubricate	○	○			3-17
Impeller/water pump housing	Check/replace		○			6-5
Impeller/water pump housing	Replace			○		6-5
PTT unit	Check	○	○			3-13
Propeller/propeller nut/cotter pin	Check/replace	○	○			6-1
Shift link/shift cable	Check/adjust/ replace	○	○			3-9
Spark plugs	Check/adjust/ replace		○			3-6
Spark plug caps/spark plug wires	Check/replace	○	○			8-16
Pilot water	Check	○	○			3-7

Item	Remarks	Initial	Every			Refer to page
		20 hours (3 months)	100 hours (1 year)	300 hours (3 years)	500 hours (5 years)	
Throttle link/throttle cable/ throttle pick-up timing	Check/adjust/ replace	○	○			3-8, 3-8
Thermostat	Check/replace		○			3-7
Timing belt	Check/replace		○			3-6
Valve clearance	Check/adjust				○	5-2
Water inlet	Check	○	○			3-7
Engine start switch/engine shut-off switch/choke switch	Check/replace	○	○			8-13, 8-18, 8-19
Wiring harness connections/ lead coupler connections	Check/replace	○	○			8-1
(Yamaha) Meter/gauge	Check	○	○			—
(Yamaha) Fuel tank	Check/clean		○			—

NOTE:

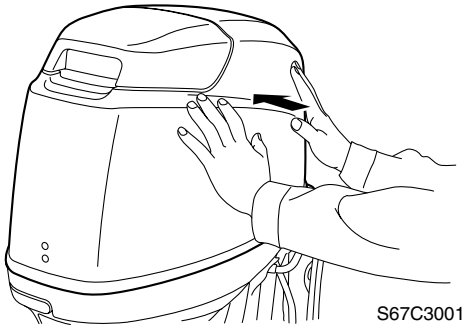
- When operating in muddy, turbid, or salt water, the engine should be flushed with clean water after each use.
- When using leaded or high-sulfur gasoline, checking the valve clearances may be required more frequently than every 500 hours.

Item	Remarks	Every	Refer to page
		1,000 hours	
Exhaust guide/exhaust manifold	Check/replace	○	7-20
Timing belt	Replace	○	5-3

Top cowling

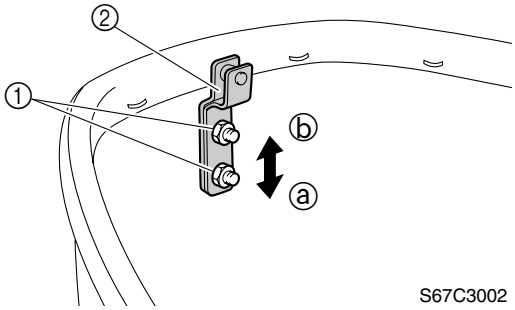
Checking the top cowling

1. Check the fitting by pushing the cowling with both hands. Adjust if necessary.


S67C3001

2. Loosen the nuts ①.

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



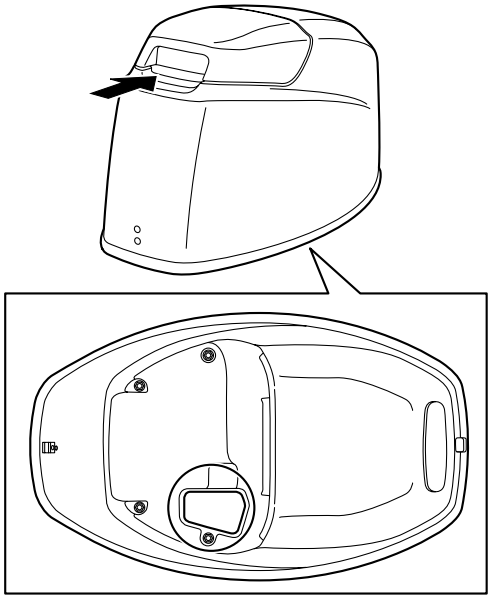
S67C3002

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

4. Tighten the nuts ①.

5. Check the fitting again and, if necessary, repeat steps 2–4.

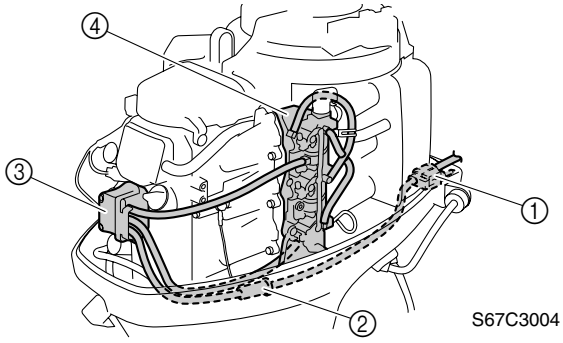
6. Check the air intake duct. Clean if there are obstructions.


S67C3003

Fuel system

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

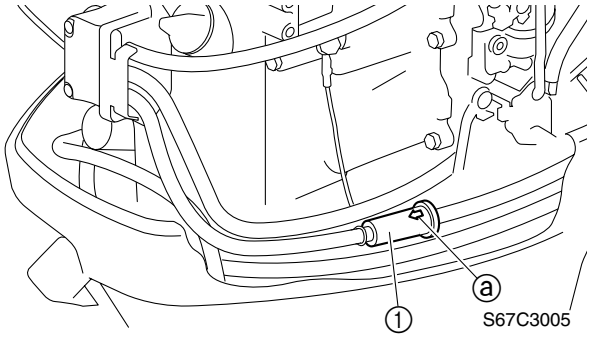
1. Check the fuel hose connections for leaks. Also, check the fuel joint ①, fuel hoses, fuel filter ②, fuel pump ③, and carburetors ④. Replace if there is leakage or deterioration.



S67C3004

Checking the fuel filter

1. Check the fuel filter ①. Replace if there is residue or if it is cracked or damaged.



CAUTION:

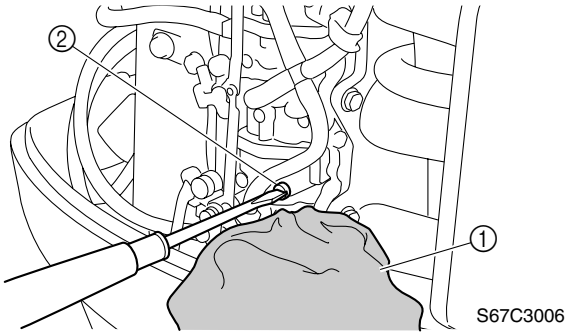
When replacing the fuel filter ①, the arrow mark ⓐ must point toward the fuel pump.

NOTE:

Be sure not to spill any fuel when removing the fuel filter ①.

Draining the fuel

1. Place a rag ① or container under the carburetor fuel drain hole, and then remove the fuel drain screw ② and let the fuel drain completely.



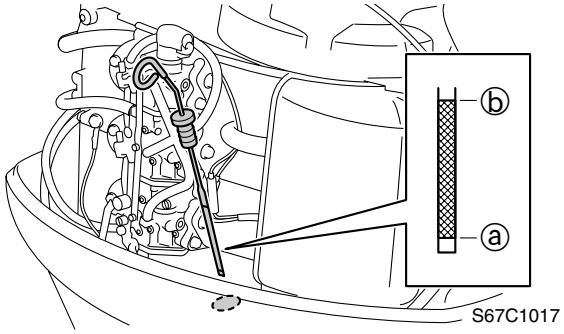
Power unit

Checking the engine oil

1. Place the outboard motor in an upright position.

2. Remove the oil dipstick, wipe it clean, and then insert it back into the oil dipstick hole.

3. Remove the oil dipstick again to check the oil level and to check the oil for discoloration and its viscosity.



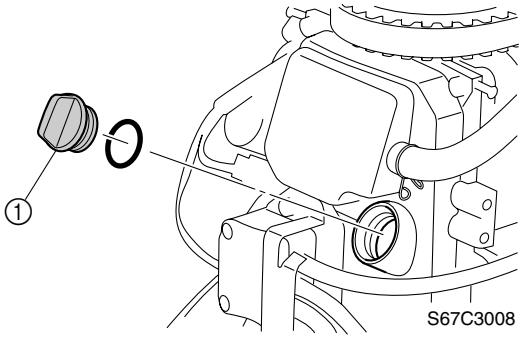
NOTE:

- If the oil appears milky or dirty, check for and repair the cause, and then change the oil.
- If the engine oil is below the minimum level mark ⓐ, add sufficient oil until the level is between ⓐ and ⓑ.

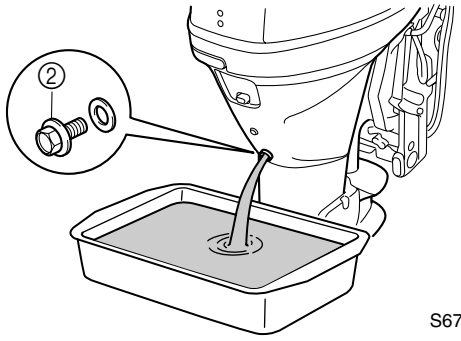
Changing the engine oil

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

2. Remove the oil dipstick and oil filler cap ①.



3. Place a drain pan under the drain hole, and then remove the engine oil drain bolt ② and let the oil drain completely.



NOTE:
- Be sure to clean up any oil spills.
- When using an oil changer to change the engine oil, insert the oil changer hose into the oil dipstick hole.

4. Install the engine oil drain bolt ②, and then tighten it to the specified torque.

Engine oil drain bolt ②:
17 N·m (1.7 kgf·m, 12.5 ft·lb)

5. Pour the specified amount of the recommended engine oil into the oil filler hole.

Recommended engine oil:
4-stroke motor oil
API: SE, SF, SG, SH, SJ, or SL
SAE: 5W-30, 10W-30, or 10W-40
Engine oil quantity:
Without oil filter replacement:
2.0 L (2.11 US qt, 1.76 Imp qt)

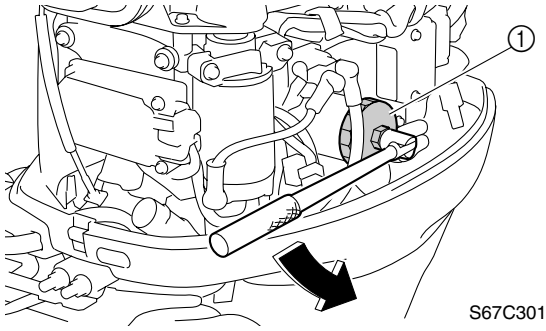
6. Install the oil filler cap and oil dipstick, and then start the engine and warm it up.

7. Turn the engine off, and then check the oil level and that there is no oil leakage. If the oil level is low, add engine oil to the correct level.

Replacing the oil filter

1. Drain the engine oil or use an oil changer to extract it.

2. Place a rag under the oil filter, and then remove the oil filter using a 64 mm (2.5 in) oil filter wrench ①.

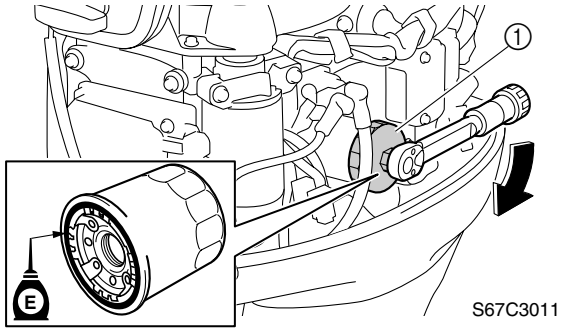


NOTE:
- Wait more than 5 minutes after turning the engine off to replace the oil filter.
- Be sure to clean up any oil spills.

Oil filter wrench ①: 90890-01426

3. Apply a thin coat of engine oil to the O-ring of the new oil filter.

4. Install the oil filter, and then tighten it to the specified torque using a 64 mm (2.5 in) oil filter wrench ①.



Oil filter:
18 N·m (1.8 kgf·m, 13.3 ft·lb)

5. Pour the specified amount of the recommended engine oil into the oil filler hole.

Recommended engine oil:
4-stroke motor oil
API: SE, SF, SG, SH, SJ, or SL
SAE: 5W-30, 10W-30, or 10W-40
Engine oil quantity:
With oil filter replacement:
2.2 L (2.33 US qt, 1.94 Imp qt)

6. Install the oil filler cap and oil dipstick, and then start the engine and warm it up.

7. Turn the engine off, and then check the oil level and that there is no oil leakage. If the oil level is low, add engine oil to the correct level.

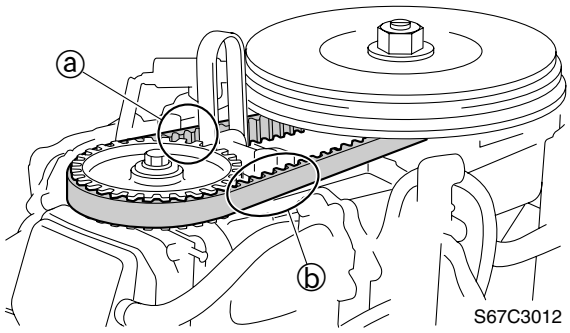
Checking the timing belt

CAUTION:

Do not turn the flywheel magnet counterclockwise, otherwise the water pump impeller may be damaged.

1. Remove the manual starter and driven sprocket cover. (M and W model)
   Remove the flywheel magnet cover. (E model)

2. While turning the flywheel magnet clockwise, check the interior ⓐ and the exterior ⓑ of the timing belt. Replace the timing belt if cracked, damaged, or worn.



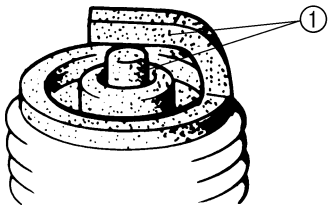
S67C3012

NOTE:
To replace the timing belt, see "Replacing the timing belt" (5-3).

Checking the spark plug

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

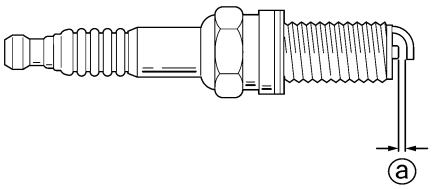
2. Clean the electrodes ① with a spark plug cleaner or wire brush.



S69J3190

3. Check the spark plug. Replace if the electrodes are eroded, there is excessive carbon or other deposits, or the gasket is damaged.

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



S69J3200

NOTE:
Perform steps 2–4 for each spark plug.

Specified spark plug:
DPR6EA-9 (NGK)
Spark plug gap ⓐ:
0.8–0.9 mm (0.031–0.035 in)

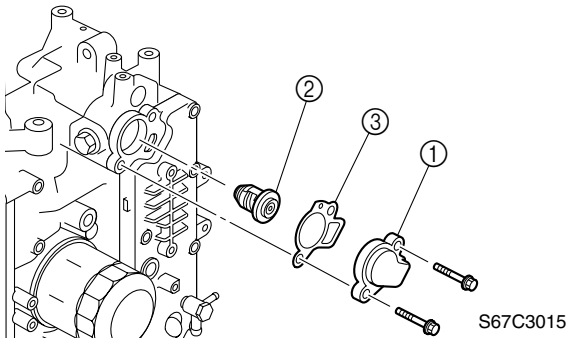
5. Install the spark plugs, tighten them temporarily, and then tighten them to the specified torque using a spark plug wrench.

Spark plug:
17 N·m (1.7 kgf·m, 12.5 ft·lb)

6. Connect the spark plug caps.

Checking the thermostat

1. Remove the thermostat cover ① and thermostat ②.

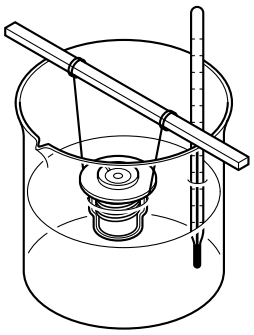


CAUTION:

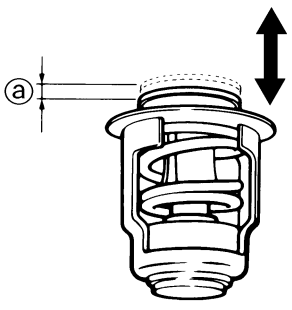
Do not reuse the gasket ③, always replace it with a new one.

2. Suspend the thermostat in a container of water.

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



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



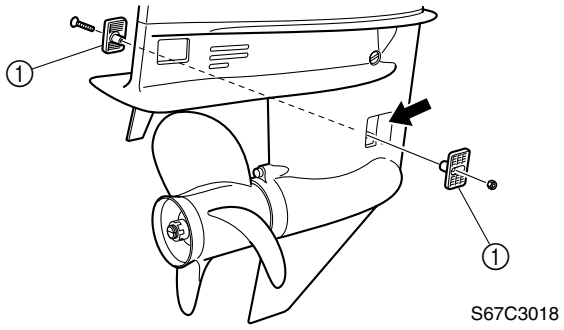
Water temperature	Valve opening ⓐ
58–62 °C (136–144 °F)	0.05 mm (0.0020 in) (valve begins to open)
Above 70 °C (158 °F)	More than 3.0 mm (0.12 in)

5. Install a new gasket, the thermostat ②, and the thermostat cover ①, and then tighten the bolts to the specified torque.

Thermostat cover bolt: 7 N·m (0.7 kgf·m, 5.2 ft·lb)	

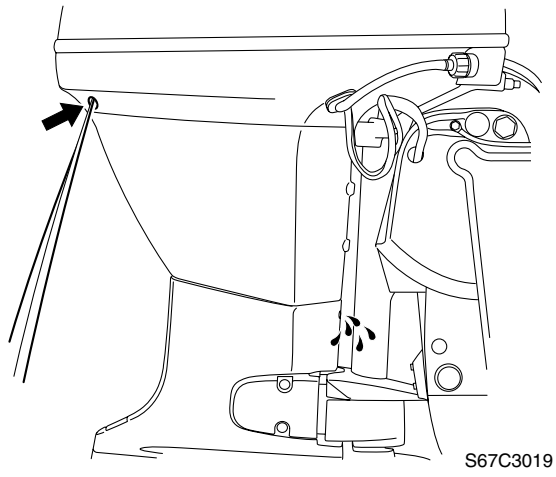
Checking the cooling water passage

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



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

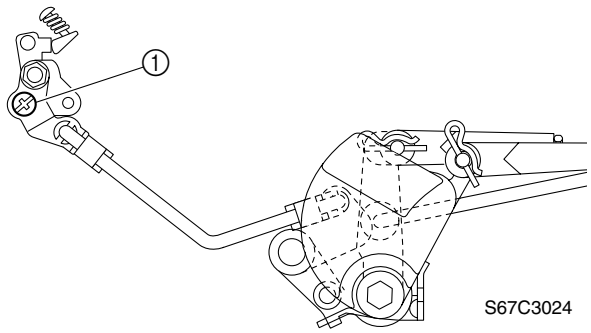
3. Check for water flow at the cooling water pilot hole. If there is no water flow, check the cooling water passages inside the outboard motor.


S67C3019

Control system

Adjusting the throttle link

1. Loosen the throttle link adjusting screw ①.



S67C3024

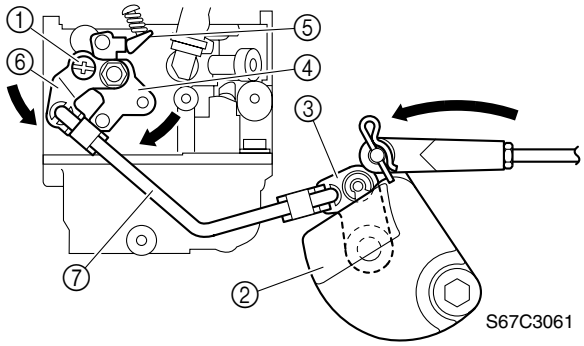
NOTE:
The throttle link adjusting screw ① has left-hand threads, therefore, turn it clockwise to loosen it.

2. Turn the throttle cam ② to the fully open position and contact it to the accelerator lever ③, and then hold it in place.

3. Turn the carburetor #3 throttle lever ④ clockwise so that it contacts the carburetor body ⑤ as shown.

4. Turn the throttle link lever ⑥ counterclockwise until there is no free play in the throttle link rod ⑦.

5. Tighten the throttle link adjusting screw ①.



S67C3061

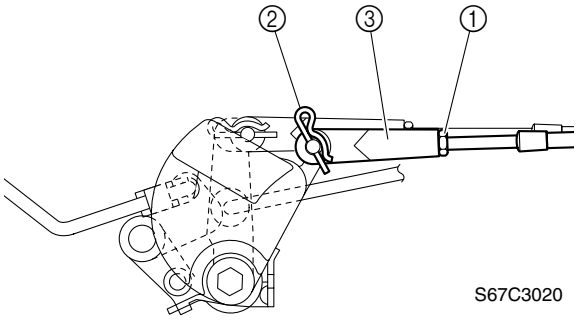
6. Turn the throttle grip (H model) or move the remote control lever (R model) to the fully open and fully closed positions and check that the throttle cam operates smoothly.

NOTE:
After adjusting the throttle link, adjust the throttle cable. See “Adjusting the throttle cable” (3-8).

Adjusting the throttle cable

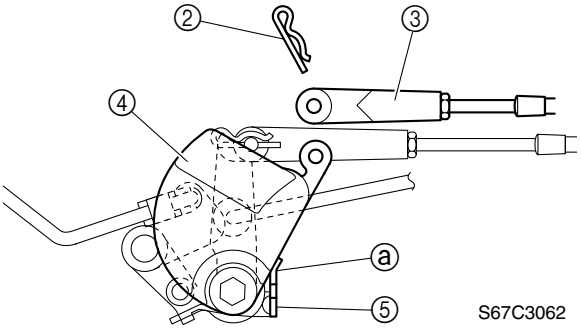
NOTE:
Adjust the throttle link before adjusting the throttle cable.

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

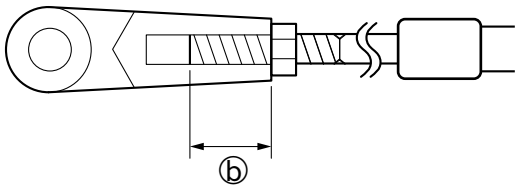


S67C3020

2. Check that the throttle cam ④ contacts the fully closed stopper ⓐ on the throttle cam bracket ⑤.



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



⚠ WARNING

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

NOTE:
Pull the throttle cable toward the engine when adjusting the position of the throttle cable joint ③.

4. Connect the throttle cable joint ③, install the clip ②, and then tighten the locknut ①.

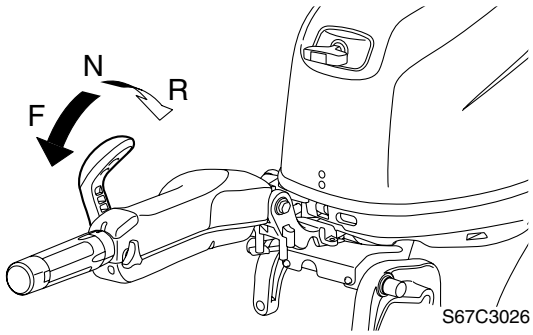
5. Turn the throttle grip (H model) or move the remote control lever (R model) to the fully open and fully closed positions and check that the carburetors fully open and fully close.

Checking the gear shift operation

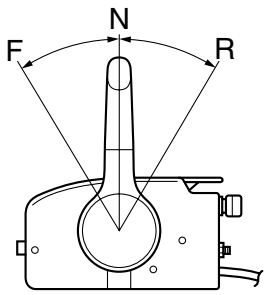
1. Check that the gear shift operates smoothly when the shift lever (H model) or remote control lever (R model) is shifted from the N position to the F position or R position. Adjust the shift cable and shift rod if necessary.

2. Set the shift lever (H model) or remote control lever (R model) to the N position.

A



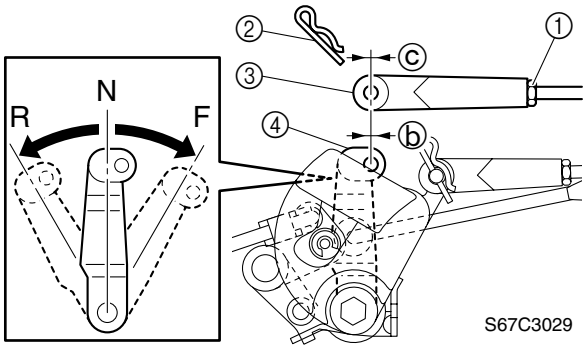
B



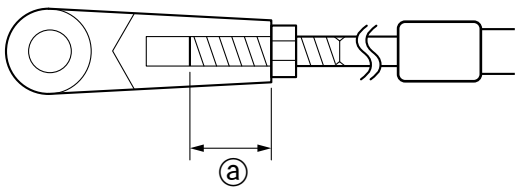
A H model
B R model

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

4. Check that the shift arm ④ is in the N position as shown.



5. Adjust the position of the shift cable joint ③ until its hole is aligned with the set pin on the shift arm ④.



S6AG3130

⚠ WARNING

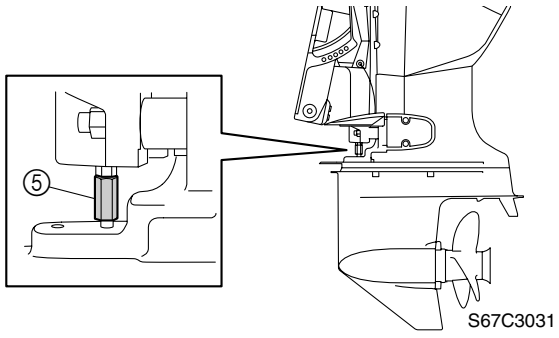
The shift cable joint must be screwed in a minimum depth of 8.0 mm (0.31 in) ⓐ.

NOTE:

Center the shift arm ④ in its free play ⓑ and the shift cable in its free play ⓒ, and then connect the shift cable.

6. Connect the shift cable joint ③, install the clip ②, and then tighten the locknut ①.

7. Adjust the shift rod adjusting nut ⑤.



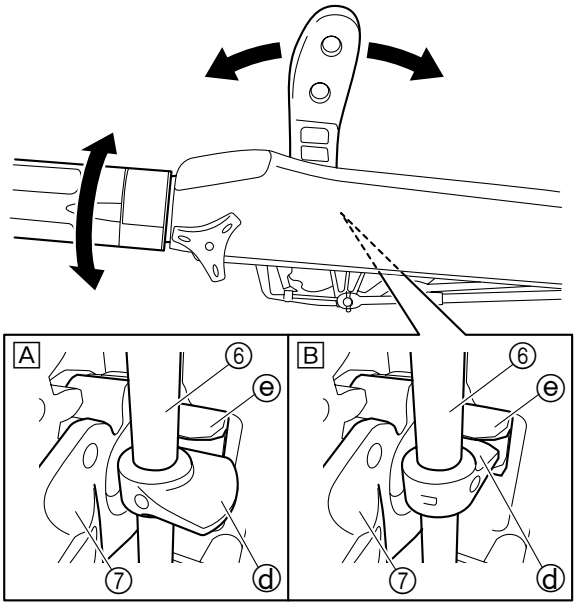
S67C3031

NOTE:

To adjust the shift rod adjusting nut ⑤, see "Installing the lower unit" (6-19).

8. Check the gear shift for smooth operation.

9. Turn the throttle grip to the fully closed position, and then check that the shift-lock cam ⓓ on the throttle shaft ⑥ is not in the slot ⓔ in the shift lever cam ⑦ and that the shift lever can be operated. Next, turn the throttle grip to the fully open position, and then check that the shift-lock cam ⓓ on the throttle shaft ⑥ is fitted into the slot ⓔ in the shift lever cam ⑦ and that the shift lever cannot be operated. (H model)



S67C3028

A Fully closed position
B Fully open position

Checking the start-in-gear protection (M and W model)

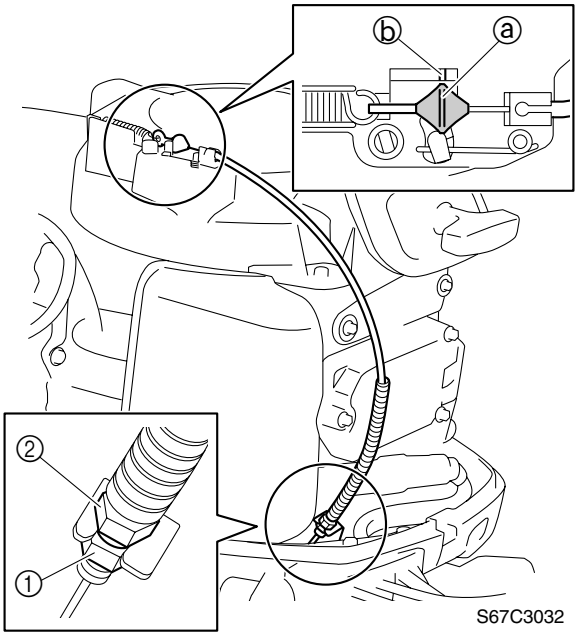
CAUTION:

Be sure to remove the clip from the engine shut-off switch before checking the start-in-gear protection.

1. Set the shift lever to the F position or R position, and then check that the starter handle cannot be pulled. If the starter rope can be pulled out normally, adjust the start-in-gear protection cable.

2. Set the shift lever to the N position and loosen the locknut ①. Align the cable end ⓐ with the mark ⓑ on the manual starter cover by turning the adjusting nut ②.

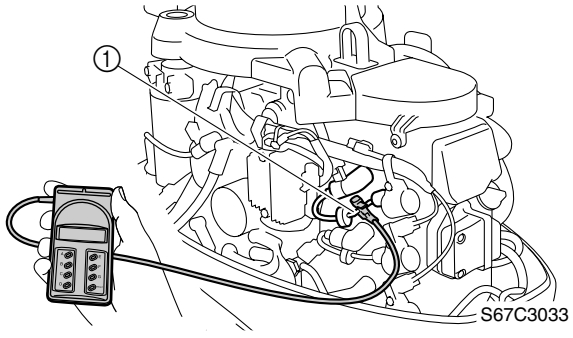
3. Tighten the locknut ①.



Checking the engine idle speed

1. Start the engine and warm it up.

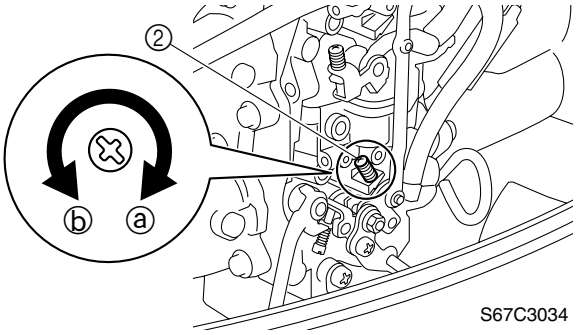
2. Attach the special service tool to spark plug wire #1 ①, and then check the engine idle speed. Adjust if out of specification.



	Digital tachometer: 90890-06760

	Engine idle speed: 850 ± 50 r/min

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



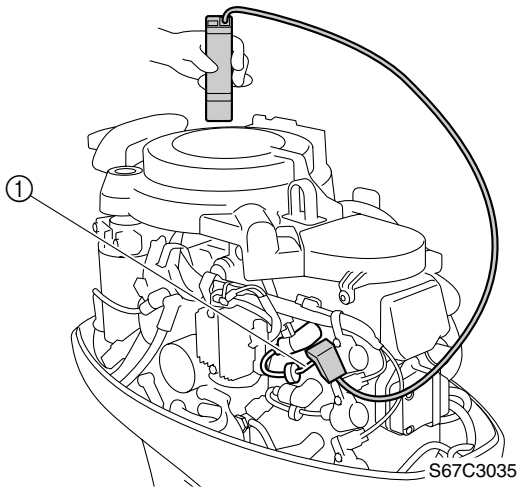
NOTE:
- To increase the engine idle speed, turn the throttle stop screw ② in direction ⓐ.
- To decrease the engine idle speed, turn the throttle stop screw ② in direction ⓑ.

4. After adjusting the engine idle speed, rev the engine a few times and let it idle to check the stability of the engine.

Checking the ignition timing

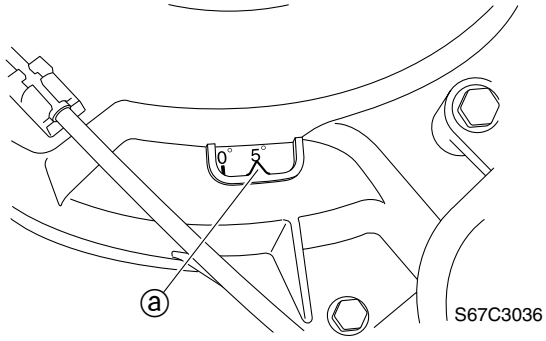
1. Start the engine and warm it up.

2. Attach the special service tool to spark plug wire #1 ①.



	Timing light: 90890-03141

3. Check that the pointer ⓐ is aligned with the "5°" mark on the flywheel magnet as shown.



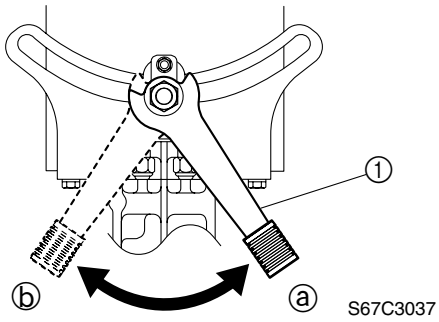
Ignition timing at 850 r/min:
ATDC 5 ± 2°

Bracket unit

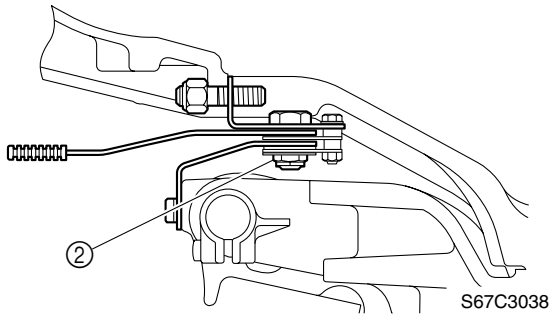
Checking the steering operation (H model)

NOTE:
Lubricate the swivel bracket before checking the steering operation.

1. Move the steering lock lever ① to position ⓐ and check that the steering is locked.
   Move the steering lock lever ① to position ⓑ and check that the steering operates smoothly.



2. Adjust the self-locking nut ② until the steering operation is proper.

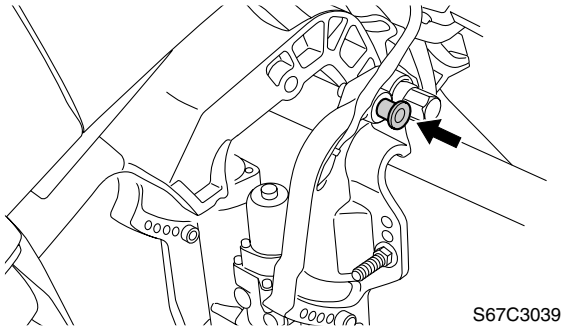


Checking the tilt operation

1. Tilt the outboard motor to the fully up and fully down positions a few times and check the entire tilt range for smooth operation. Check the tilt mechanism (D model) or PTT fluid level (PTT model) if necessary.

NOTE:
- To check the tilt operation, see “Checking the tilt system (D model)” (1-17).
- To check the PTT fluid level, see “Checking the PTT fluid level” (3-13).
- Be sure to listen to the winding sound of the PTT motor for smooth operation.

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



3

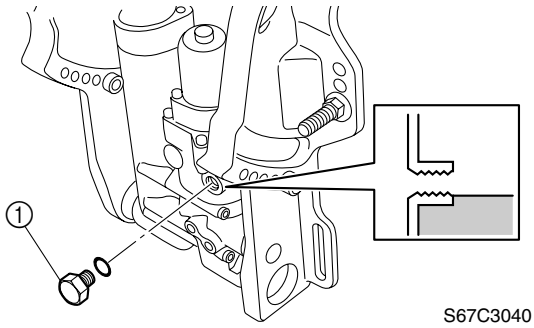
Checking the PTT fluid level

1. Tilt the outboard motor to the fully up position, and then support it with the tilt stop lever.

⚠ 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 ①, and then check the fluid level in the reservoir.



S67C3040

NOTE:

If the fluid is at the correct level, a small amount of fluid should overflow out of the filler hole when the cap 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 a new O-ring and the reservoir cap ①, and then tighten the cap to the specified torque.

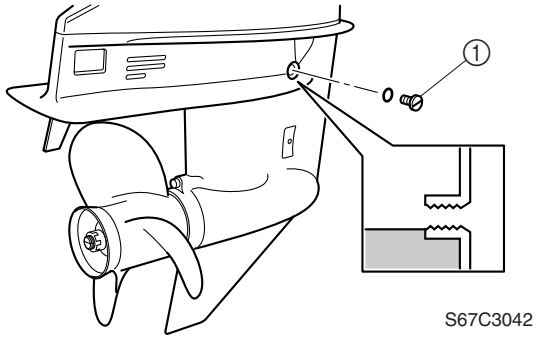
Reservoir cap ①:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

Lower unit

Checking the gear oil

1. Tilt the outboard motor to the fully down position.

2. Remove the gear oil check screw ①, and then check the gear oil level in the lower case. Also, check the oil for discoloration and its viscosity.



S67C3042

NOTE:

- If the oil is at the correct level, a small amount of oil should overflow out of the check hole when the gear oil check screw ① is removed.
- If the oil appears milky or dirty, check for and repair the cause, and then change the oil.

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

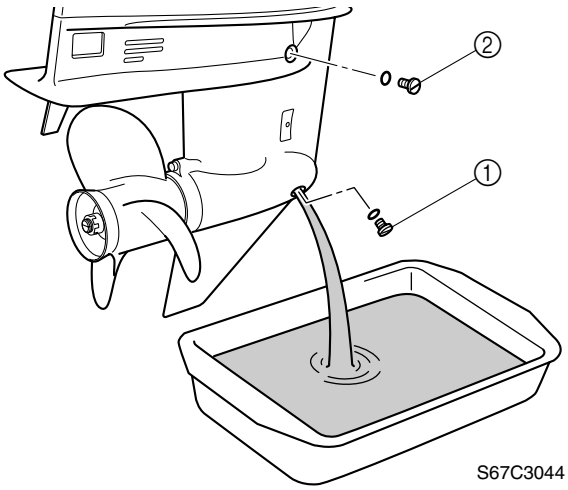
4. Install a new gasket and the gear oil check screw ①, and then tighten the screw to the specified torque.

Gear oil check screw ①:
9 N·m (0.9 kgf·m, 6.6 ft·lb)

Changing the gear oil

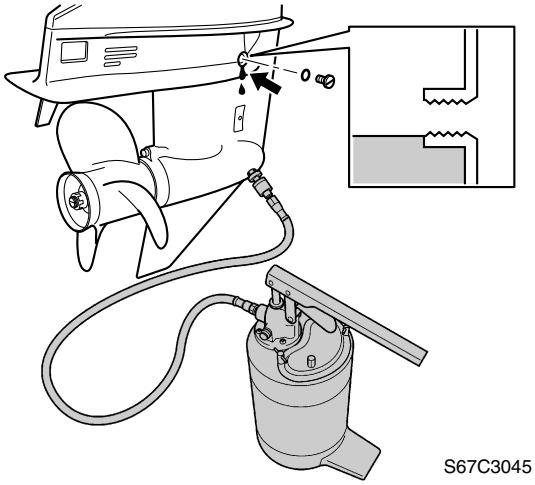
1. Tilt the outboard motor to the fully down position.

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



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

4. Insert a gear oil tube or gear oil pump into the drain hole and slowly fill with gear oil until oil flows out of the check hole and no air bubbles are visible.



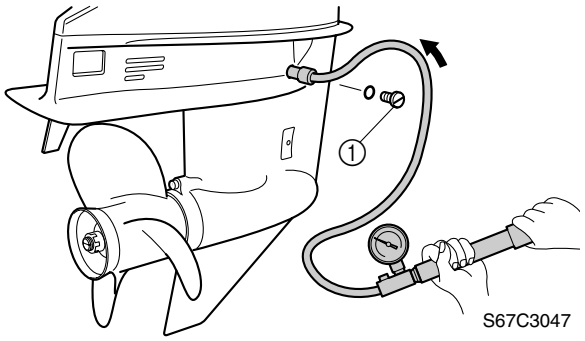
Recommended gear oil:
Hypoid gear oil
API: GL-4
SAE: 90
Gear oil quantity:
430 cm^3
(14.54 US oz, 15.17 Imp oz)

5. Install new gaskets and the gear oil check screw ②, quickly install the gear oil drain screw ①, and then tighten them to the specified torque.

Gear oil 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

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



Leakage tester: 90890-06840

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

CAUTION:

Do not overpressurize the lower unit, otherwise the oil seals can be damaged.

NOTE:

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

Lower unit holding pressure:
100 kPa (1.0 kgf/cm^2, 14.5 psi)

3. If the specified pressure cannot be maintained, check the propeller shaft, drive shaft, shift rod, O-rings, and oil seals for damage. If necessary, check each shaft for bends.

Checking the propeller

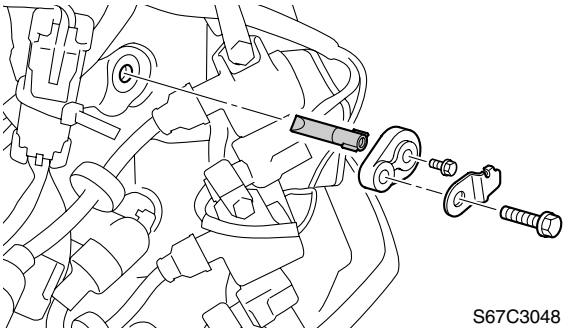
1. Check the propeller blades and splines. Replace the propeller if cracked, damaged, or worn.

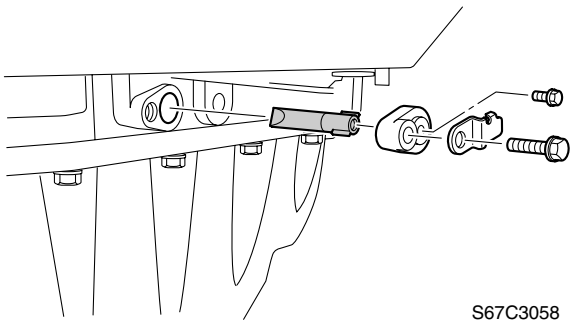
NOTE:
When replacing the propeller, see "Propeller selection" (1-13) and select a propeller of the same size as originally installed.

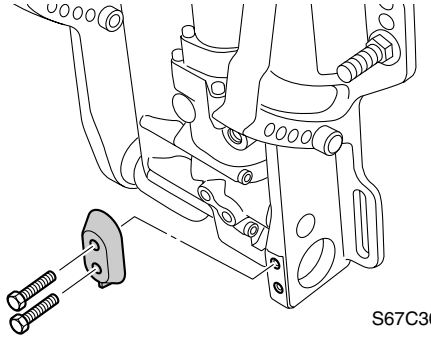
General

Checking the anode

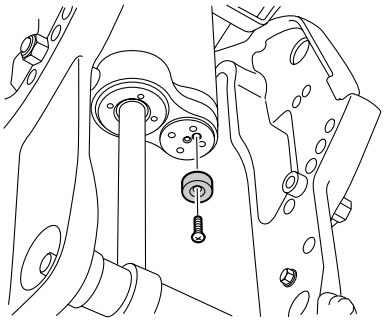
1. Check the anodes. Clean the anodes if there are scales, grease, or oil.


S67C3048

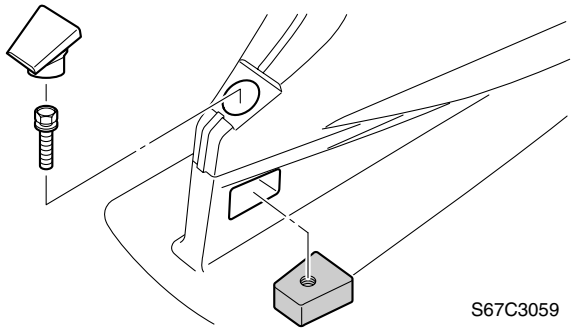

S67C3058

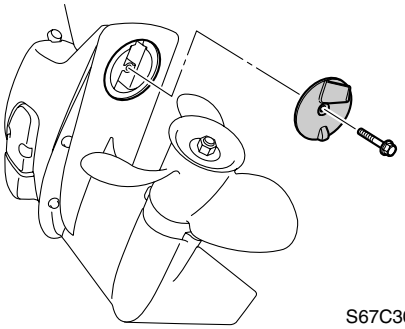

S67C3049

A


S67C3050

A D model


S67C3059

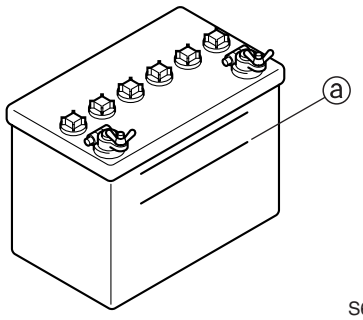

S67C3051

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

NOTE:
- Replace the anodes if excessively eroded. In addition, check the ground lead.
- If it is necessary to disassemble the outboard motor to check an anode, refer to the applicable disassembly procedure in this manual.

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.



S69J3620

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

⚠ WARNING

Battery electrolyte is dangerous; it contains sulfuric acid which is poisonous and highly caustic.
Always follow these preventive measures:
- **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.**

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

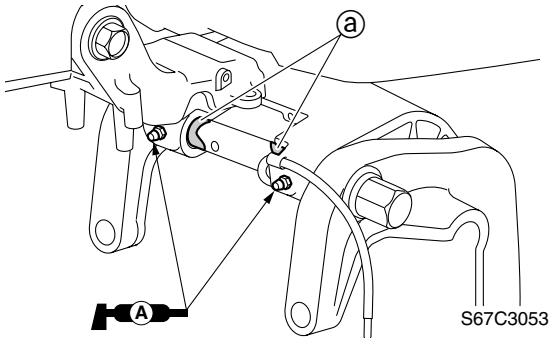
KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.

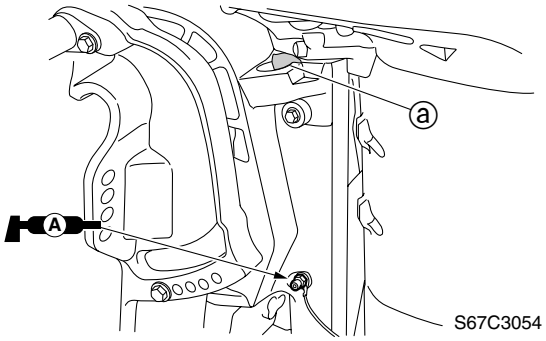
NOTE:
- Batteries vary per manufacturer. The procedures mentioned in this manual may not always apply, therefore, consult the instruction manual of the battery.
- Disconnect the negative battery cable first, then the positive battery cable.

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

Lubricating the outboard motor

1. Apply water resistant grease to the areas shown.





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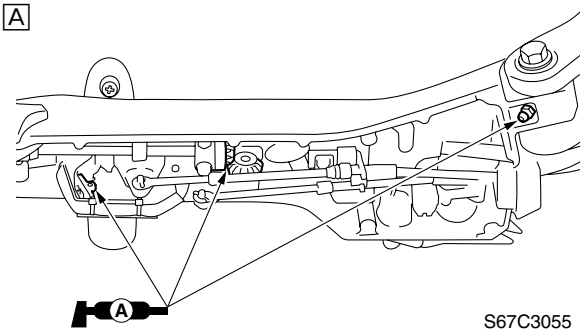
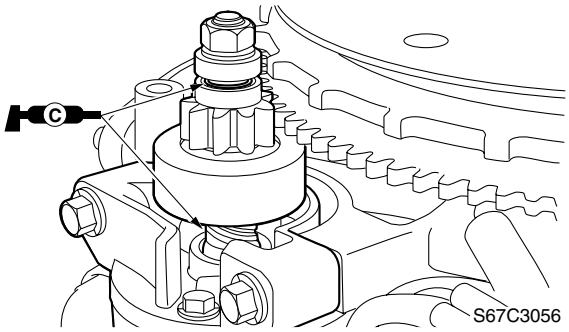


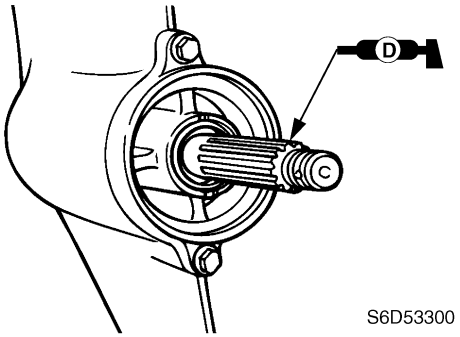
A H model

NOTE:
Apply grease until it flows from the bushings ⓐ.

2. Apply low temperature resistant grease to the areas shown. (E and W model)



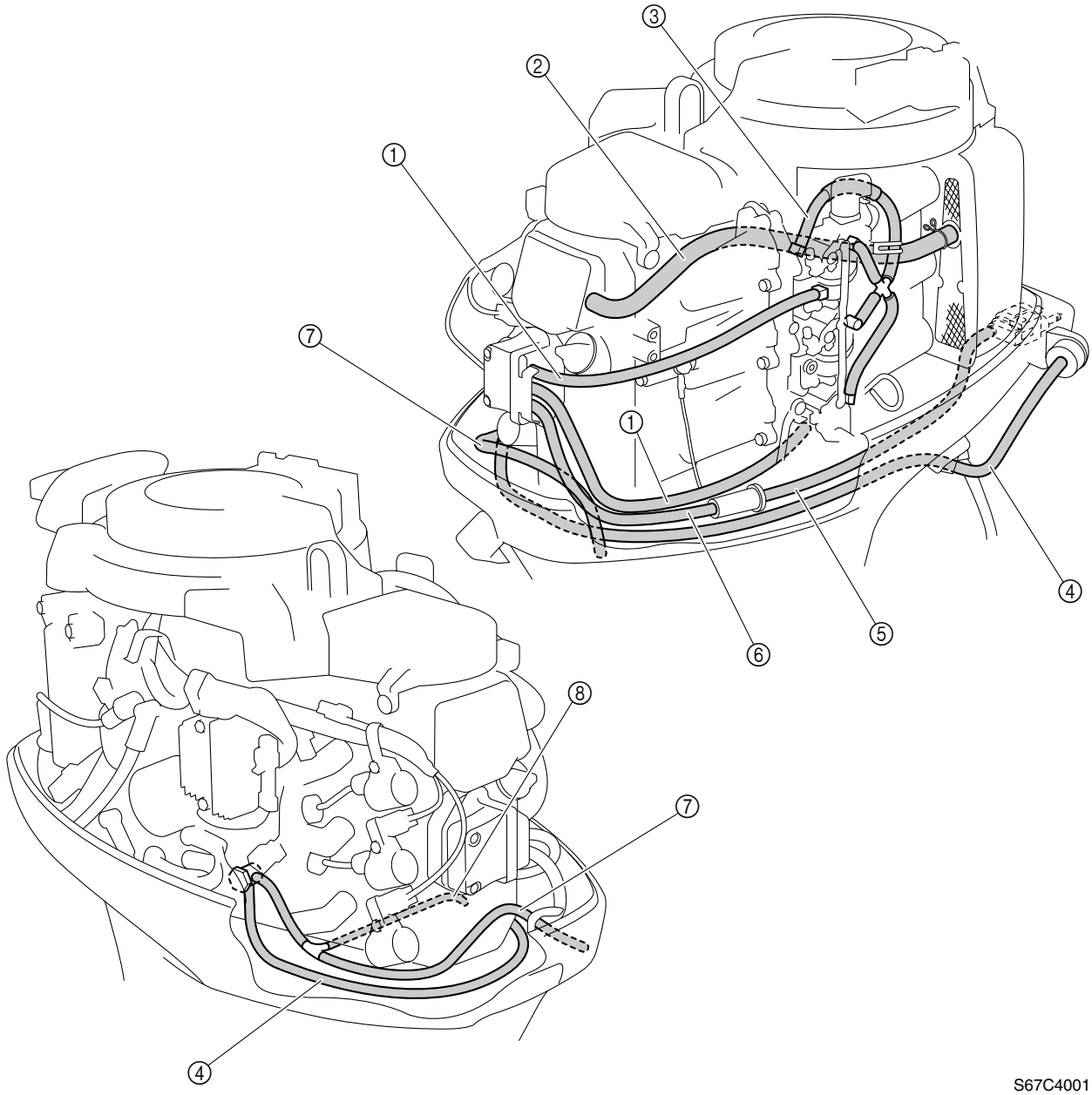
3. Apply corrosion resistant grease to the area shown.



Fuel system

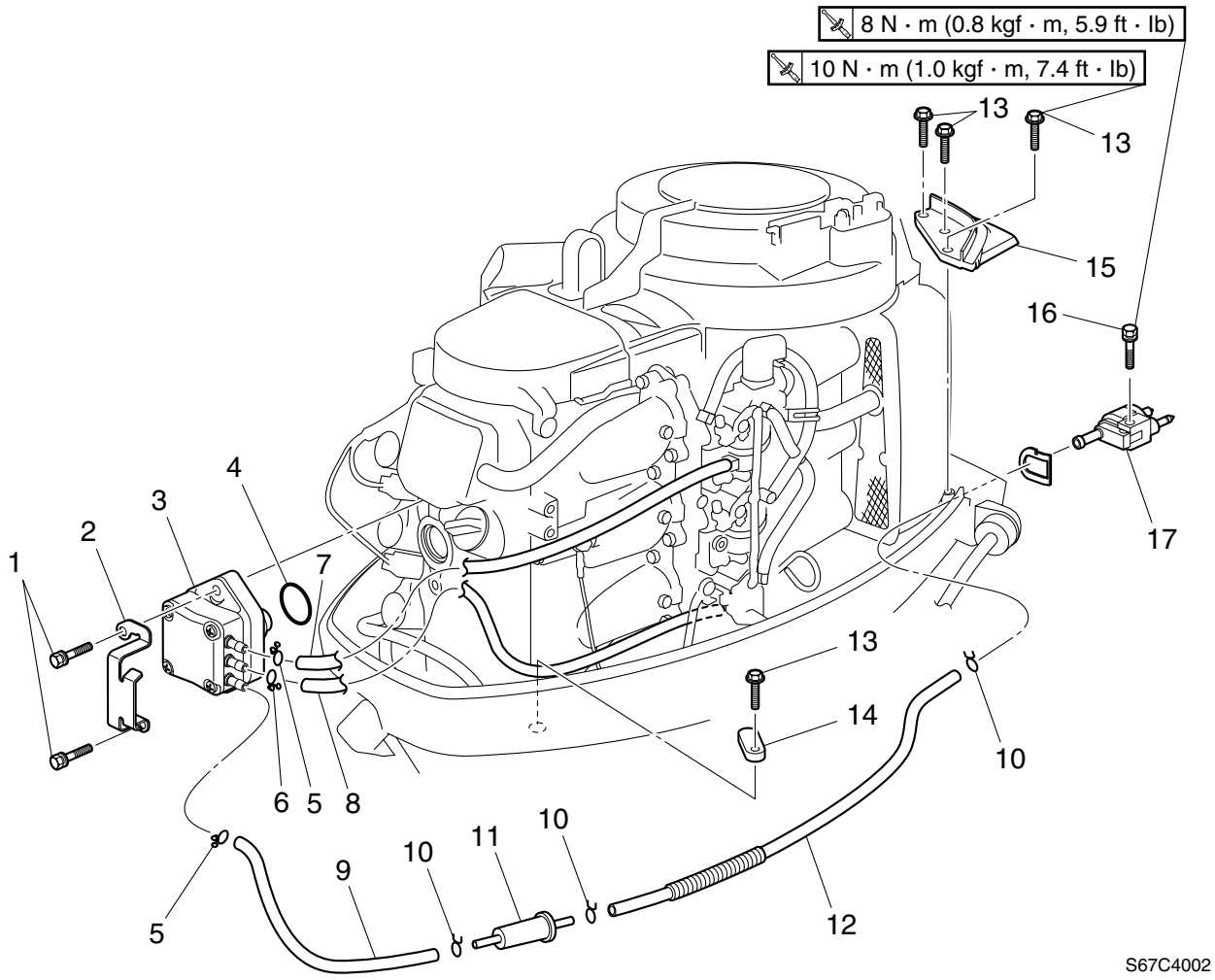
Hose routing

Fuel hose, blowby hose, and cooling water hose

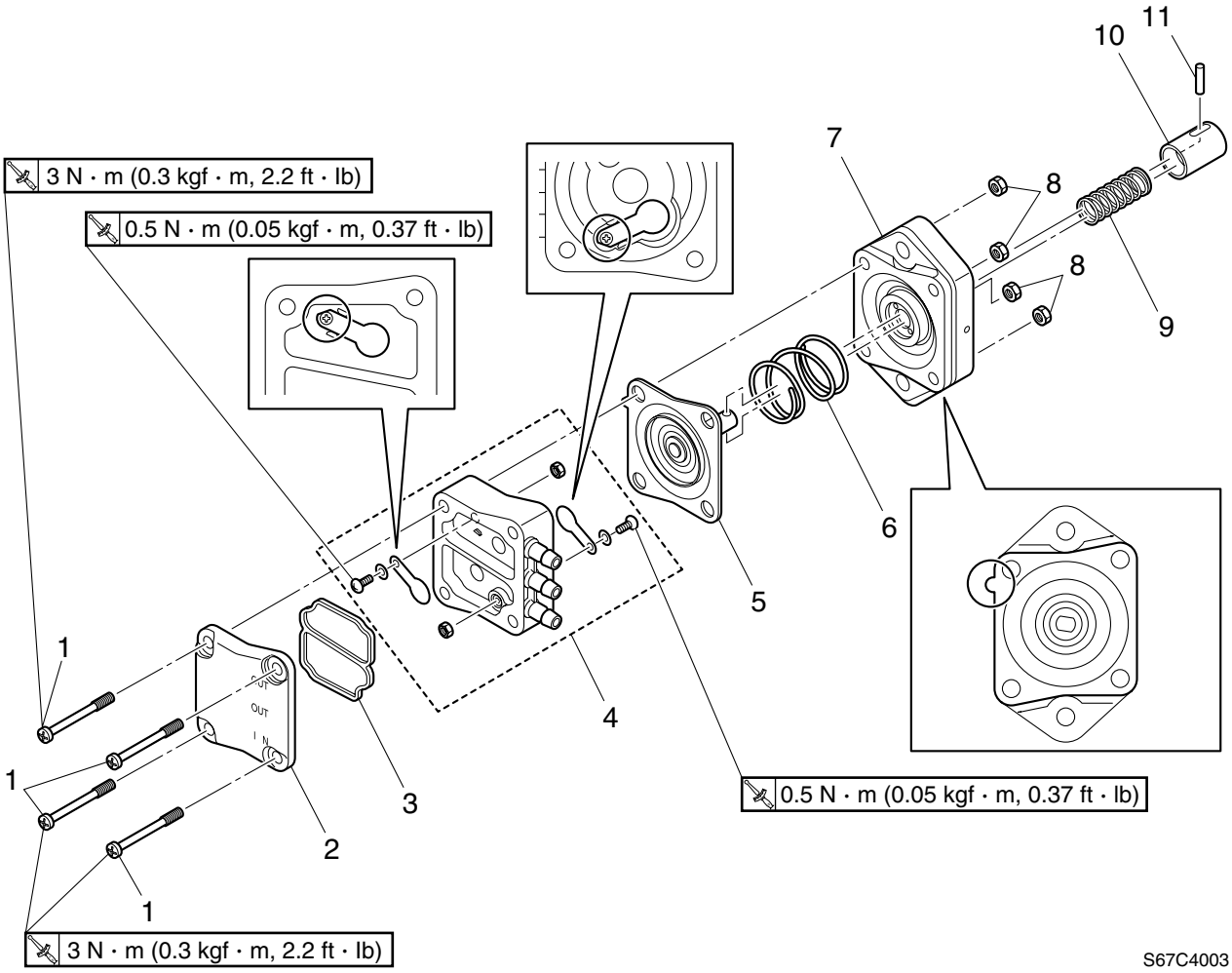


① Fuel hoses (fuel pump to carburetor assembly)
② Blowby hose
(cylinder head cover to intake silencer)
③ Breather hoses (carburetor to carburetor joint)
④ Flushing hose
(flushing hose adapter to exhaust cover)
⑤ Fuel hose (fuel joint to fuel filter assembly)
⑥ Fuel hose (fuel filter assembly to fuel pump)
⑦ Cooling water hose
(exhaust cover to cooling water pilot hole)
⑧ Cooling water hose
(exhaust cover to exhaust guide)

Fuel pump, fuel filter, and fuel joint



No.	Part name	Q'ty	Remarks
1	Bolt	2	M6 × 30 mm
2	Cover	1	
3	Fuel pump	1	
4	O-ring	1	**Not reusable**
5	Clamp	2	
6	Clamp	1	
7	Fuel hose	1	
8	Fuel hose	1	
9	Fuel hose	1	
10	Clamp	3	
11	Fuel filter	1	
12	Fuel hose	1	
13	Bolt	4	M6 × 25 mm
14	Plate	1	
15	Retaining plate	1	
16	Bolt	1	M6 × 25 mm
17	Fuel joint	1	



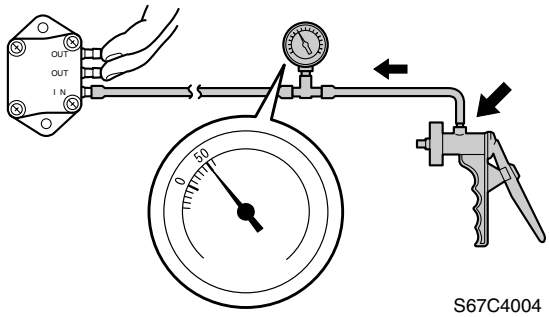
S67C4003

No.	Part name	Q'ty	Remarks
1	Screw	4	ø5 × 43 mm
2	Cover	1	
3	Diaphragm	1	**Not reusable**
4	Fuel pump body 2 assembly	1	
5	Diaphragm	1	
6	Spring	1	
7	Fuel pump body 1	1	
8	Nut	4	
9	Spring	1	
10	Plunger	1	
11	Pin	1	

Checking the fuel pump

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

2. Cover the fuel pump outlets with your fingers, and then apply the specified positive pressure. Check that there is no air leakage.

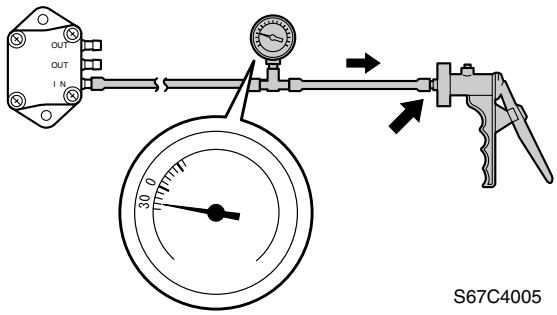


S67C4004

Vacuum/pressure pump gauge set:
90890-06756

Specified positive pressure:
50 kPa (0.5 kgf/cm^2, 7.3 psi)

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

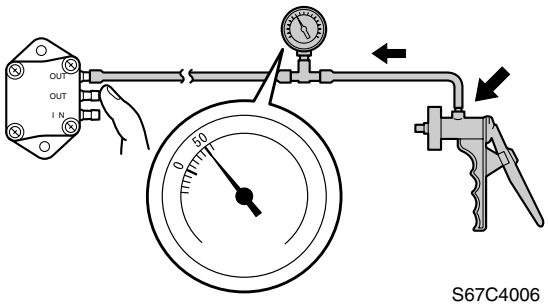


S67C4005

Specified negative pressure:
30 kPa (0.3 kgf/cm^2, 4.4 psi)

4. Connect the special service tool to 1 fuel pump outlet and cover the other fuel pump outlet with your finger.

5. Apply the specified positive pressure and check that there is no air leakage.



S67C4006

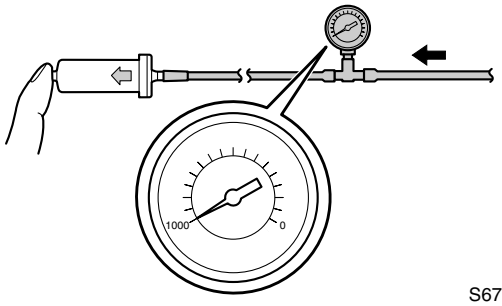
Specified positive pressure:
50 kPa (0.5 kgf/cm^2, 7.3 psi)

Checking the fuel filter

NOTE:
To check the fuel filter, see “Checking the fuel filter” (3-3).

1. Connect a meter to the fuel inlet.

2. Cover the fuel outlet with your finger, and then apply the specified positive pressure. Replace the fuel filter if the specified pressure cannot be maintained for at least 10 seconds.



S67C4007

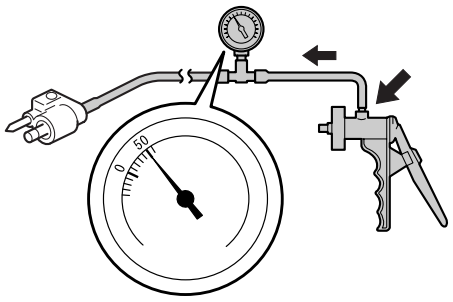
NOTE:
Use a commercially available compressor and meter that can be pressurized up to 1,035 kPa (10.35 kgf/cm^2, 150.1 psi).

Specified positive pressure:
1,035 kPa
(10.35 kgf/cm^2, 150.1 psi)

4

Checking the fuel joint

1. Check the fuel joint. Replace if cracked or damaged.
2. Connect the special service tool to the fuel joint outlet.
3. Apply the specified positive pressure. Replace the fuel joint if the specified pressure cannot be maintained for at least 10 seconds.



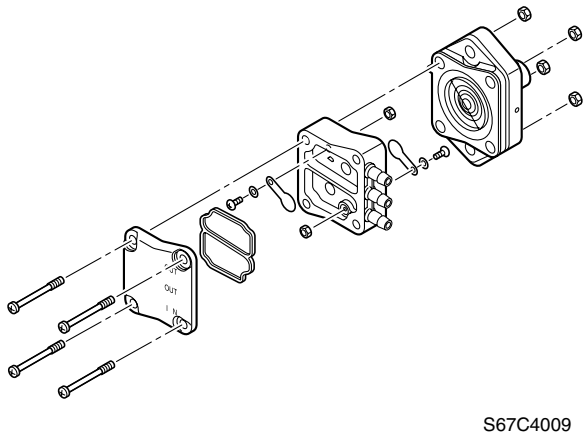
S6AU4004

Vacuum/pressure pump gauge set:
90890-06756

Specified positive pressure:
50 kPa (0.5 kgf/cm^2, 7.3 psi)

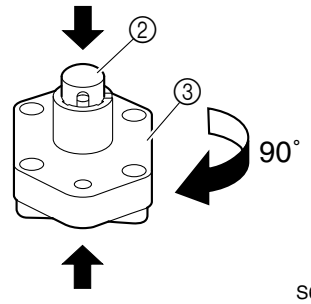
Disassembling the fuel pump

1. Disassemble the fuel pump as shown.

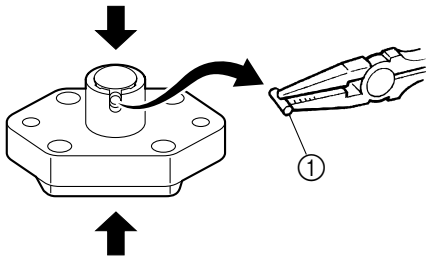


S67C4009

2. Remove the pin ① from the plunger ②, and then disassemble fuel pump body 1 ③.



S67C4010



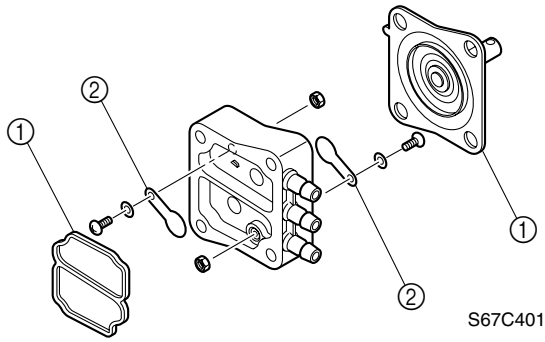
S67C4011

NOTE:

- Push the plunger ② and the diaphragm completely inward, and then turn fuel pump body 1 ③ approximately 90° to a position where the pin ① can be removed easily.
- Slowly release on the plunger ② and diaphragm, and then remove them.

Checking the diaphragm and valve

1. Check the diaphragms ① and valves ②. Replace the diaphragms if torn or replace the fuel pump body 2 assembly if the valves are cracked.

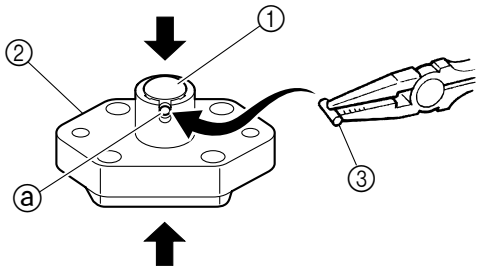


S67C4012

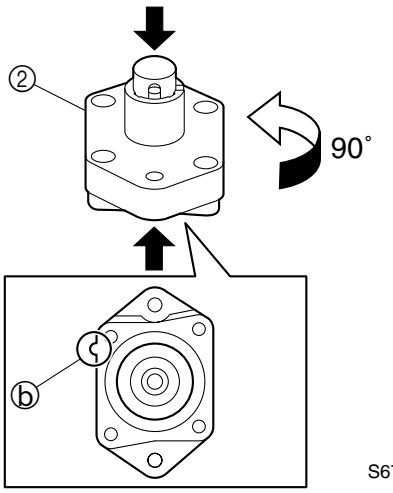
Assembling the fuel pump

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

1. Install the plunger ① and diaphragm into fuel pump body 1 ②, and then install the pin ③ to the plunger.



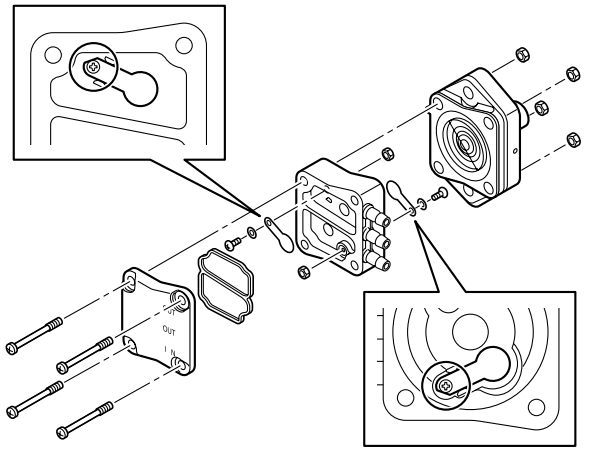
S67C4013



S67C4014

NOTE:
- Align the pin installation holes ⓐ with the slot in fuel pump body 1 ②, and then install the pin ③ while pushing the plunger ① and diaphragm completely inward.
- Turn fuel pump body 1 ② until the pin ③ is 90° from the slot in the body.
- Make sure that the projection ⓑ on the diaphragm is toward the port side.

2. Assemble the fuel pump as shown.

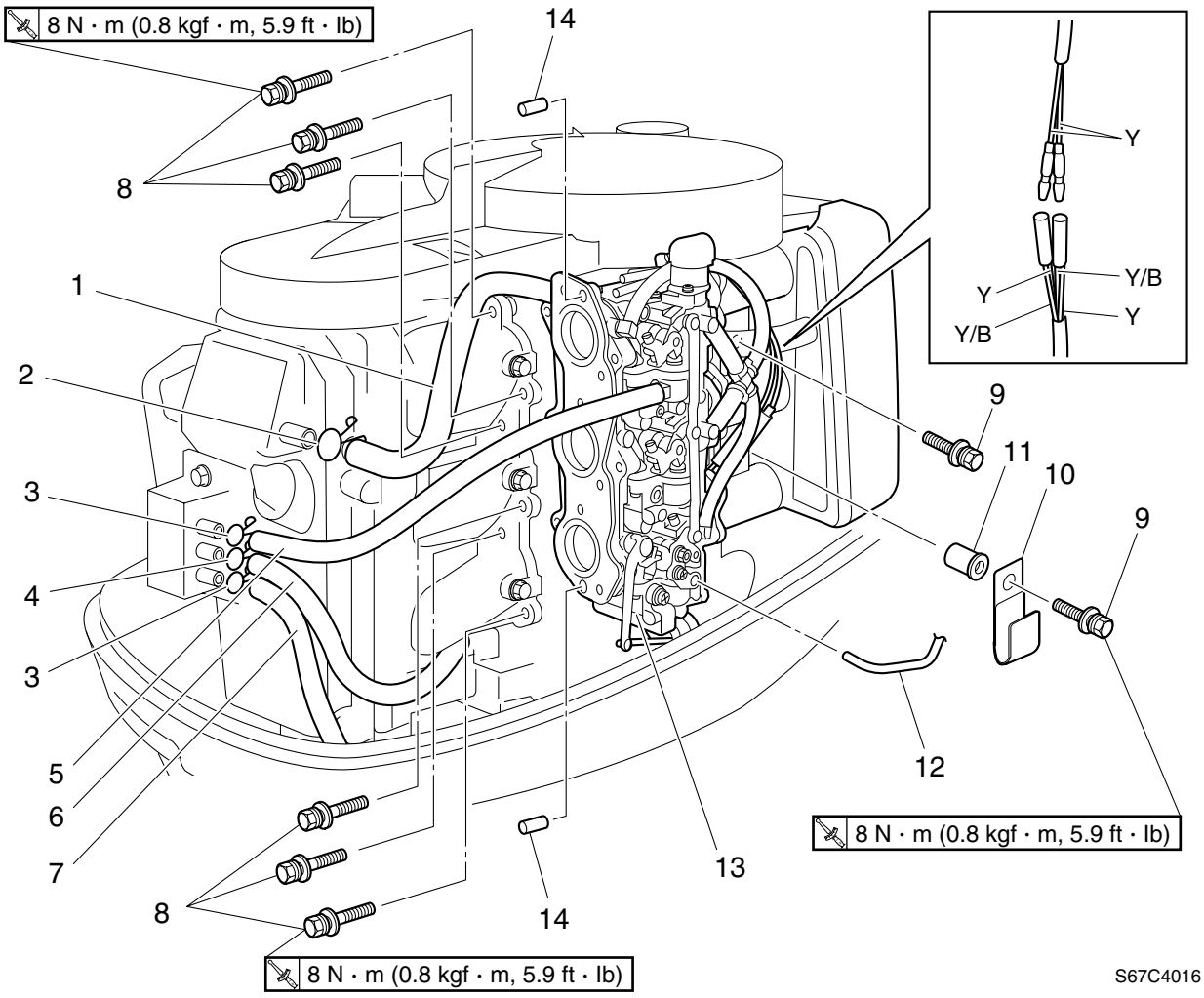


S67C4015

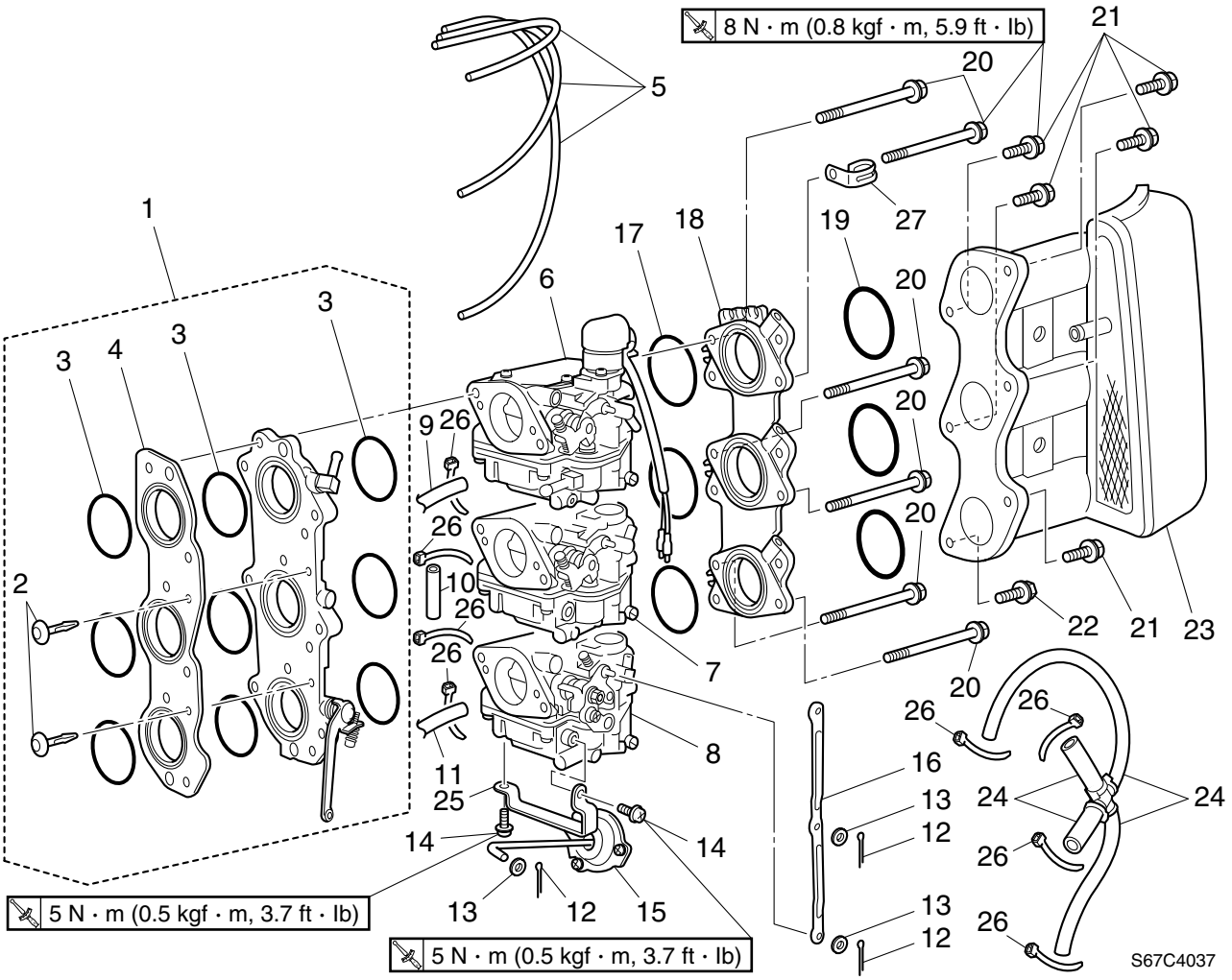
NOTE:
- Moisten the inside of the fuel pump with gasoline to ensure a good seal.
- Make sure that the diaphragms are kept in place through the assembly process.
- After disassembling and assembling the fuel pump, check it for air leaks. See “Checking the fuel pump” (4-4).

4

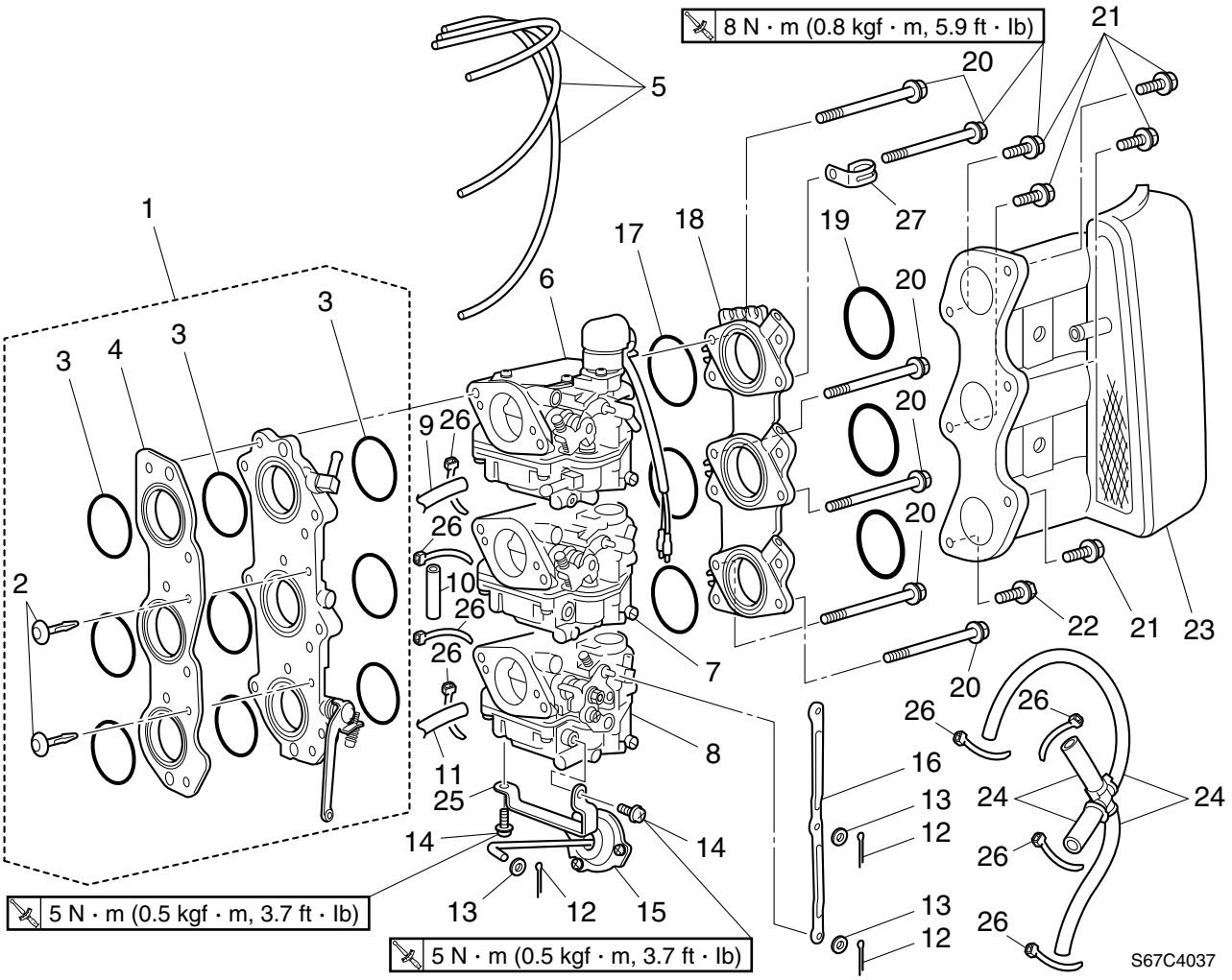
Carburetor unit



No.	Part name	Q'ty	Remarks
1	Blowby hose	1	
2	Clamp	1	
3	Clamp	2	
4	Clamp	1	
5	Fuel hose	1	
6	Fuel hose	1	
7	Fuel hose	1	
8	Bolt	6	M6 × 25 mm
9	Bolt	2	M6 × 20 mm
10	Holder	1	
11	Collar	1	
12	Throttle link rod	1	
13	Carburetor unit	1	
14	Dowel	2	

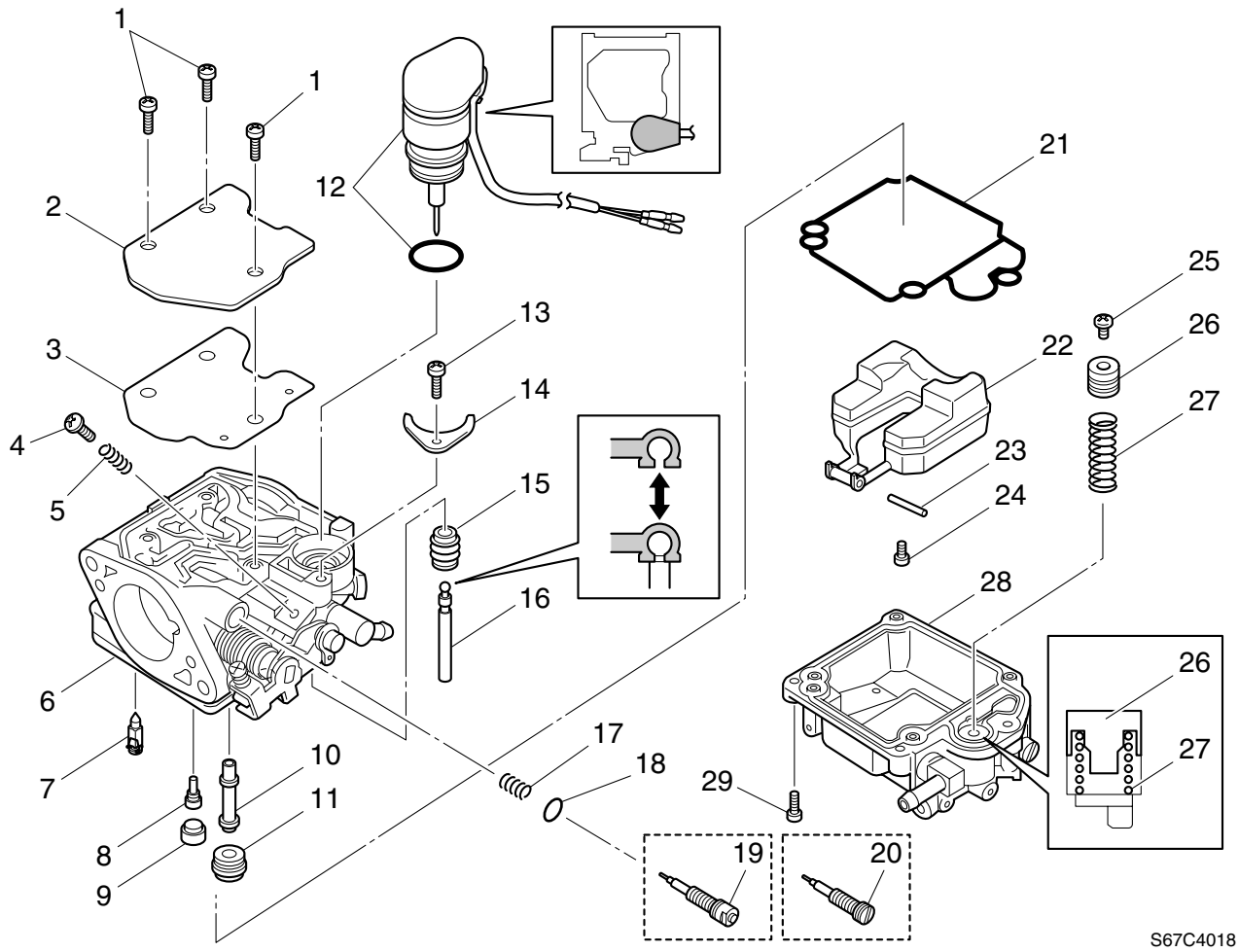


No.	Part name	Q'ty	Remarks
1	Carburetor joint assembly	1	
2	Plug	2	
3	O-ring	9	**Not reusable**
4	Insulator	1	
5	Hose	3	
6	Carburetor #1	1	
7	Carburetor #2	1	
8	Carburetor #3	1	
9	Fuel hose	1	
10	Fuel hose	1	
11	Fuel hose	1	
12	Cotter pin	3	
13	Washer	3	
14	Screw	2	ø6 × 10 mm
15	Dashpot	1	
16	Throttle link plate	1	
17	O-ring	3	**Not reusable**

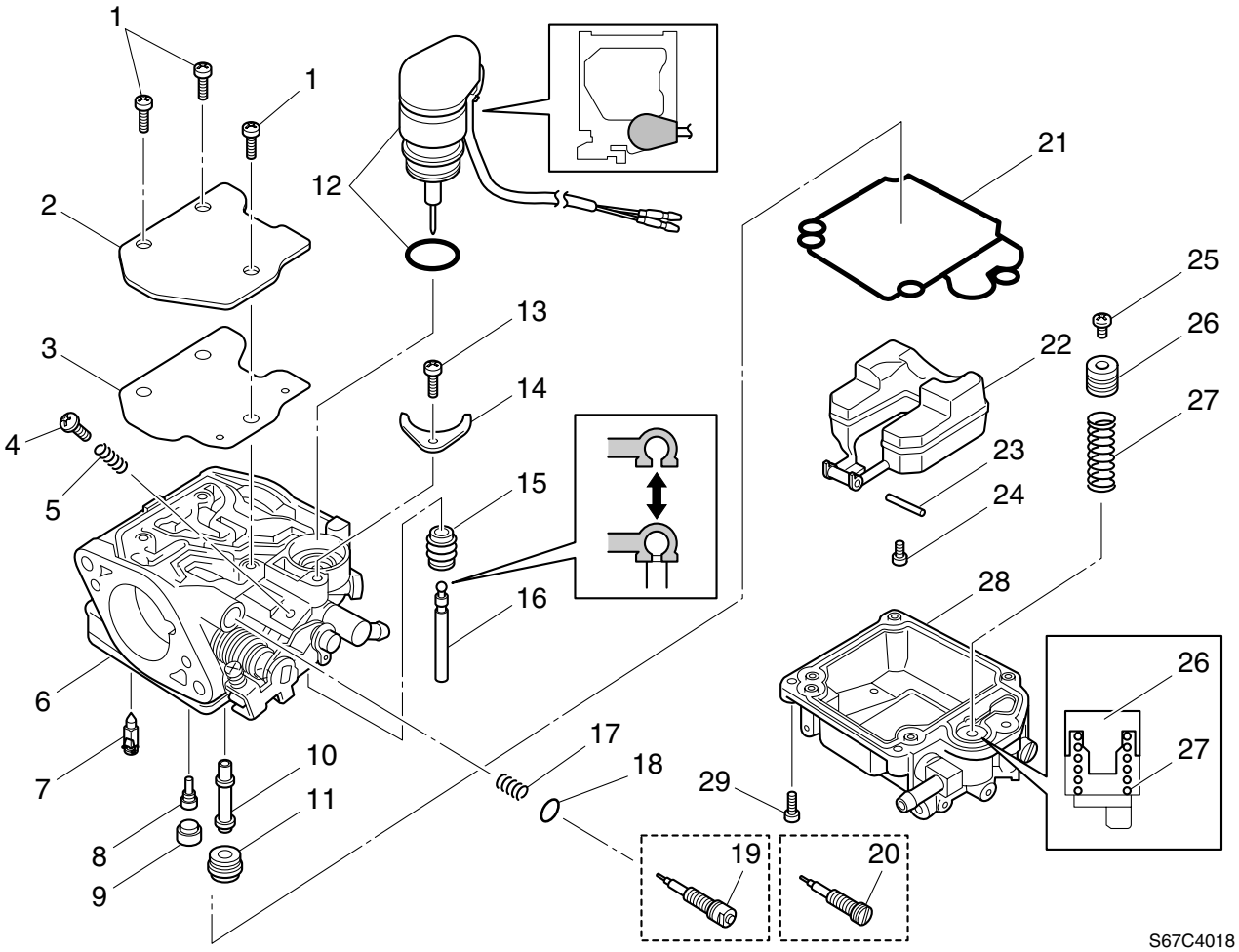


No.	Part name	Q'ty	Remarks
18	Plate	1	
19	O-ring	3	**Not reusable**
20	Bolt	6	M6 × 90 mm
21	Bolt	5	M6 × 20 mm
22	Bolt	1	M6 × 20 mm
23	Intake silencer	1	
24	Hose	4	
25	Bracket	1	
26	Plastic tie	8	
27	Holder	1	

Carburetor



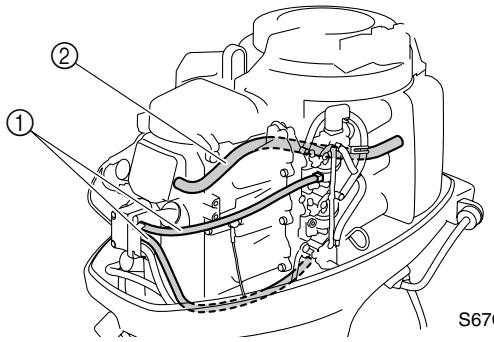
No.	Part name	Q'ty	Remarks
1	Screw	3	ø4 × 9 mm
2	Cover	1	
3	Gasket	1	**Not reusable**
4	Throttle stop screw	1	
5	Spring	1	
6	Carburetor body	1	
7	Needle valve	1	
8	Pilot jet	1	
9	Plug	1	
10	Main nozzle	1	
11	Main jet	1	
12	Prime Start	1	
13	Screw	1	ø4 × 9 mm
14	Retainer	1	
15	Boot	1	
16	Plunger rod	1	
17	Spring	1	



No.	Part name	Q'ty	Remarks
18	O-ring	1	**Not reusable**
19	Pilot screw	1	For Europe
20	Pilot screw	1	For Oceania
21	Gasket	1	**Not reusable**
22	Float	1	
23	Float pin	1	
24	Screw	1	ø4 × 8 mm
25	Screw	1	ø3 × 6 mm
26	Plunger	1	
27	Spring	1	
28	Float chamber	1	
29	Screw	4	ø4 × 14 mm

Removing the carburetor

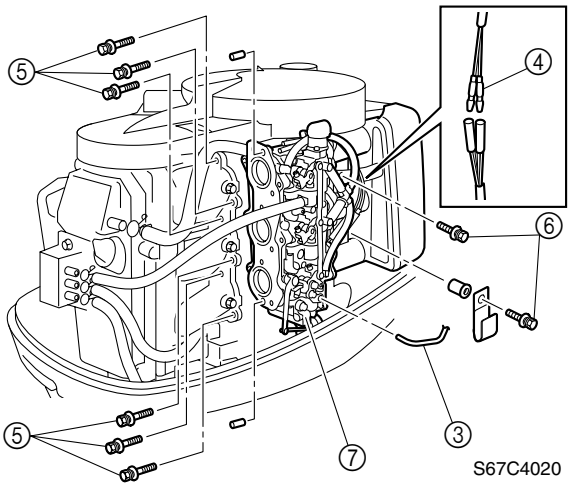
1. Disconnect the fuel hoses ① and blowby hose ②.



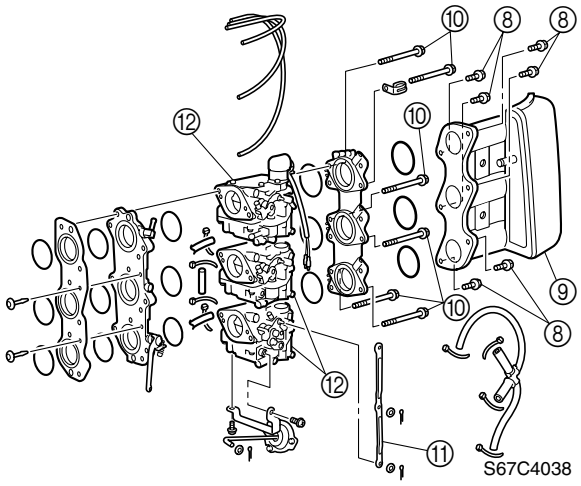
2. Disconnect the throttle link rod ③.

3. Disconnect the Prime Start leads ④.

4. Remove the bolts ⑤ and ⑥, and then remove the carburetor unit ⑦.



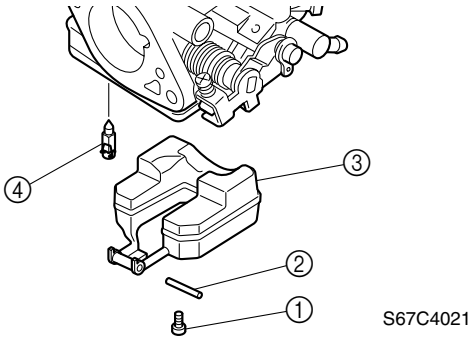
5. Remove the bolts ⑧, intake silencer ⑨, bolts ⑩, and throttle link plate ⑪, and then remove the carburetor assemblies ⑫.



Disassembling the carburetor

NOTE:
See the exploded diagram for disassembly (4-10).

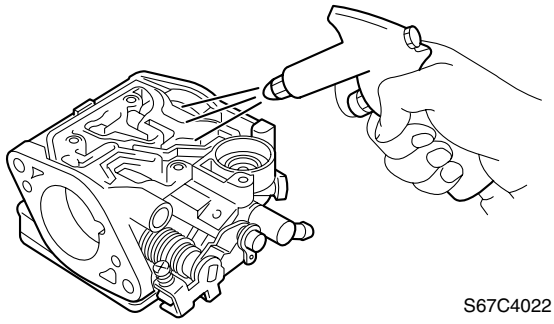
1. Remove the screw ①, float pin ②, float ③, and needle valve ④.



Checking the carburetor

1. Check the air and fuel passages and jets. Clean the carburetor body if there is dirt or foreign material.

2. Blow compressed air into all passages and jets.



S67C4022

⚠ WARNING

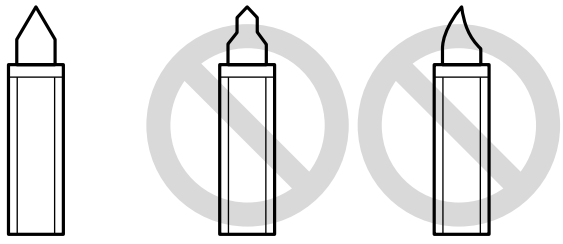
Wear appropriate protective eye gear during the cleaning process to prevent any eye injury by the blown-off debris or liquid.

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

CAUTION:

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

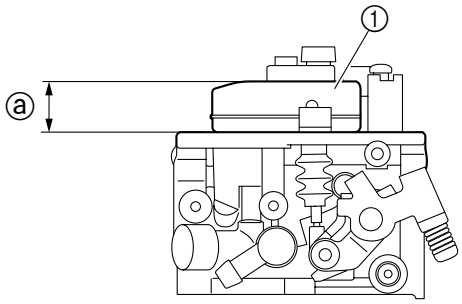
4. Check the pilot screw and needle valve. Replace if worn or deformed.



S6AG4200

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

6. Measure the float height ⓐ. Replace the float ① or needle valve if out of specification.



S67C4024

NOTE:
Take measurements at the float position shown opposite its pivoting side.

Float height ⓐ:
12.0–16.0 mm (0.47–0.63 in)

Checking the Prime Start

1. Measure the Prime Start resistance when the Prime Start is cold.

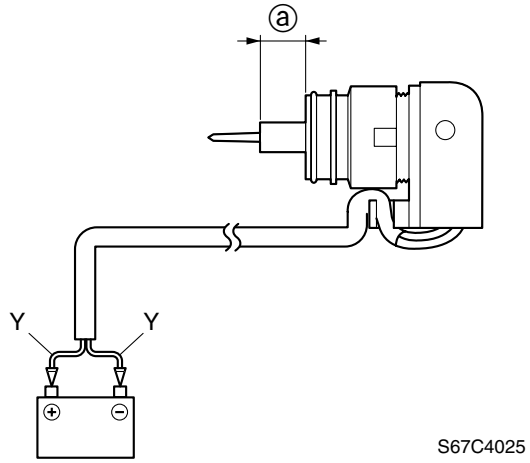
NOTE:
The following resistance is when the ambient temperature is 20 °C (68 °F) and there is no power supplied.

Prime Start resistance (reference data):
Yellow (Y) – Yellow (Y)
20.0–23.0 Ω at 20 °C (68 °F)

2. Measure the length of the Prime Start plunger before supplying power.

Prime Start plunger length before supplying power (reference data):
10.7 mm (0.42 in) at 20 °C (68 °F)

3. Connect the Prime Start blue (L) leads to a 12 V battery as shown. Measure the plunger length ⓐ after supplying power.



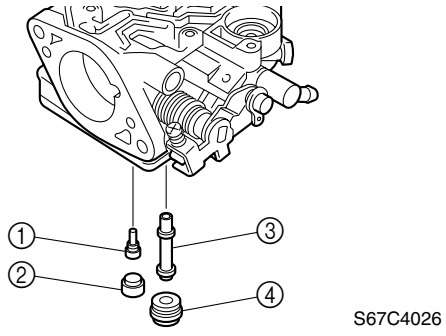
S67C4025

Prime Start plunger length ⓐ after supplying power (reference data):
5 minutes: 14.2 mm (0.56 in)
10 minutes: 14.9 mm (0.59 in) at 23 °C (73 °F)

Assembling the carburetor

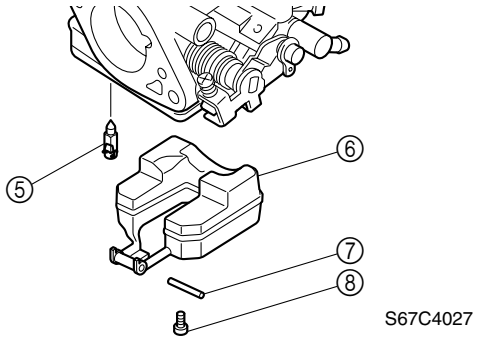
NOTE:
See the exploded diagram for assembly (4-10).

1. Install the pilot jet ①, plug ②, main nozzle ③, and main jet ④ to the carburetor body as shown.



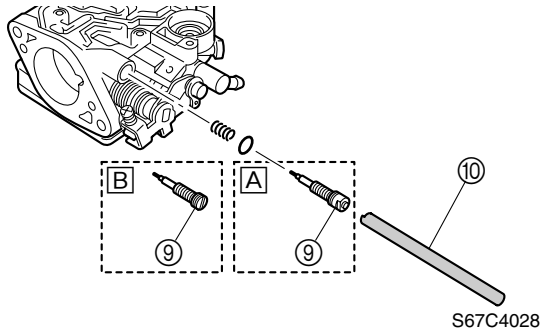
S67C4026

2. Install the needle valve ⑤, float ⑥, float pin ⑦, and screw ⑧ as shown, and then check the float for smooth operation.



S67C4027

3. Install the pilot screw ⑨, turn it in until it is lightly seated, and then turn it out the specified number of turns.



S67C4028

A For Europe
B For Oceania

Pilot screw adjusting tool ⑩ (for Europe): 90890-03154

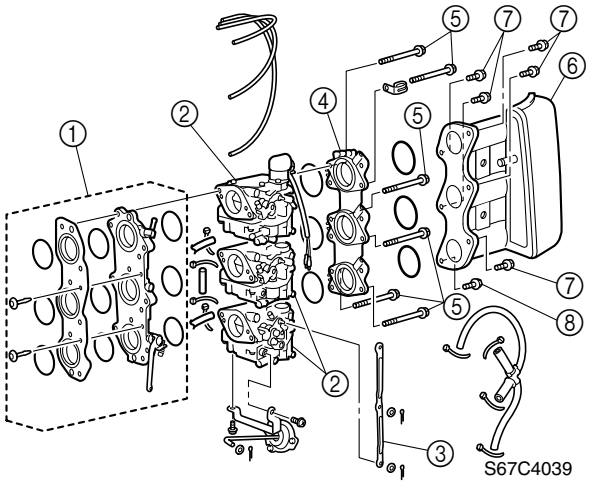
Pilot screw setting:
F30A: 1 7/8 ± 1/2 turns out
F40B: 2 ± 1/2 turns out

4

Installing the carburetor

1. Install the carburetor joint assembly ①, carburetor assemblies ②, throttle link plate ③, and plate ④, and then tighten the bolts ⑤ to the specified torque.

2. Install the intake silencer ⑥, and then tighten the bolts ⑦ and ⑧ to the specified torque.



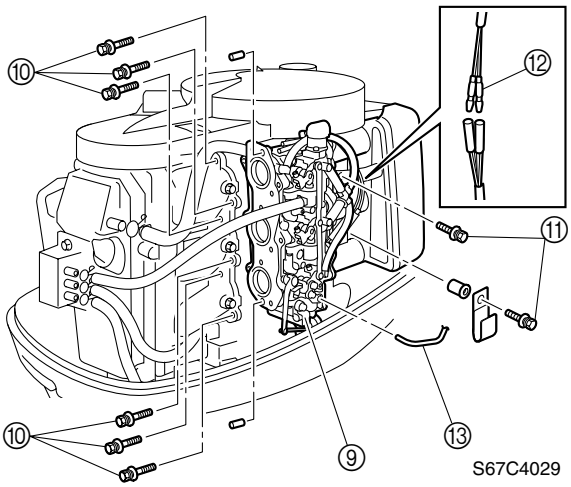
NOTE:
The intake silencer bolt ⑧ is different from the bolts ⑦ and has a flat head.

Carburetor assembly bolt ⑤:
8 N·m (0.8 kgf·m, 5.9 ft·lb)
Intake silencer bolt ⑦ and ⑧:
8 N·m (0.8 kgf·m, 5.9 ft·lb)

3. Install the carburetor unit ⑨, and then tighten the bolts ⑩ and ⑪ to the specified torque.

4. Connect the Prime Start leads ⑫.

5. Connect the throttle link rod ⑬ to the carburetor throttle lever.



NOTE:
To adjust the throttle link rod, see “Adjusting the throttle link” (3-8).

Carburetor unit bolt ⑩:
8 N·m (0.8 kgf·m, 5.9 ft·lb)
Intake silencer bolt ⑪:
8 N·m (0.8 kgf·m, 5.9 ft·lb)

6. Adjust the engine idle speed.

NOTE:
If the carburetor has been disassembled and assembled, adjust the pilot screw, and then adjust the engine idle speed. See “Adjusting the pilot screw” (4-15).

Adjusting the pilot screw

1. Adjust the throttle stop screw.

NOTE:
If the carburetor was disassembled, turn the throttle stop screw in until it contacts the carburetor throttle lever, and then turn it in about 1/4–1/2 turn to tighten it temporarily.

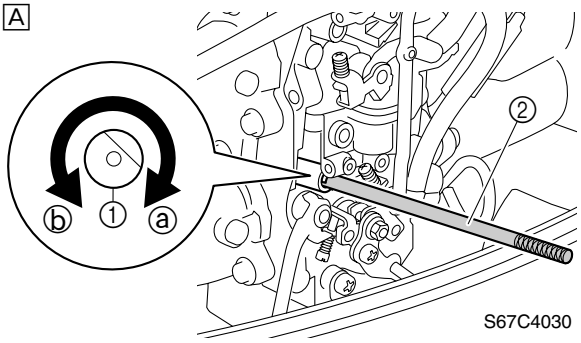
2. Start the engine and warm it up.

3. Attach the special service tool to spark plug wire #1.

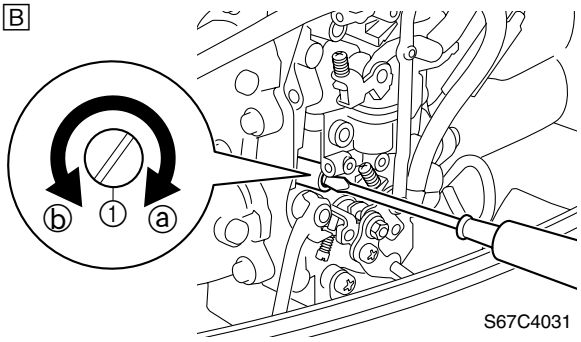
Digital tachometer: 90890-06760

4. Turn the pilot screw ① in direction ⓐ until it is lightly seated, and then turn it in direction ⓑ the specified number of turns.

A



B



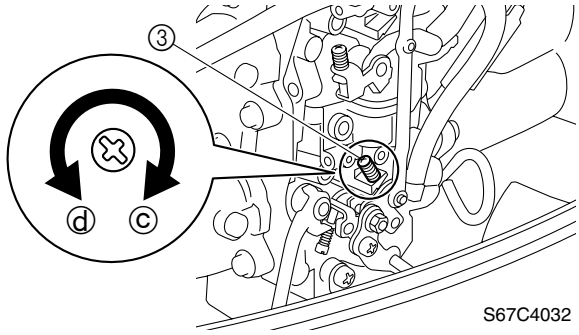
A For Europe
B For Oceania

NOTE:
Adjust the pilot screw setting within the specified number of turns out so that the engine idle speed is stable.

Pilot screw adjusting tool ② (for Europe): 90890-03154

Pilot screw setting:
F30A: 1 7/8 ± 1/2 turns out
F40B: 2 ± 1/2 turns out

5. Turn the throttle stop screw ③ in direction ⓒ or ⓓ until the specified engine idle speed is obtained.



NOTE:
- To increase the engine idle speed, turn the throttle stop screw ③ in direction ⓒ.
- To decrease the engine idle speed, turn the throttle stop screw ③ in direction ⓓ.

Engine idle speed: 850 ± 50 r/min

6. After adjusting the engine idle speed, rev the engine a few times and let it idle to check the stability of the engine.

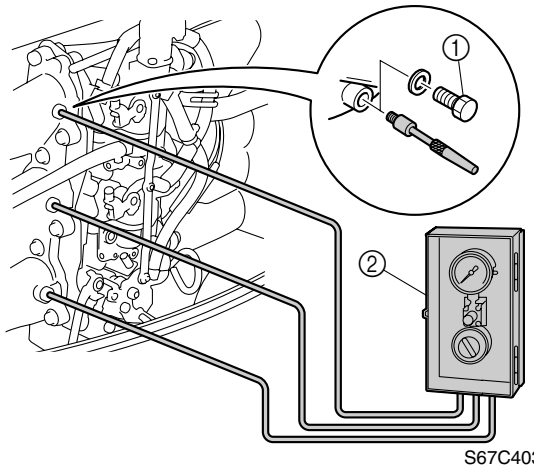
4

Synchronizing the carburetor

CAUTION:

Do not adjust the carburetors when they are operating properly. Excessive adjustment may cause poor engine performance.

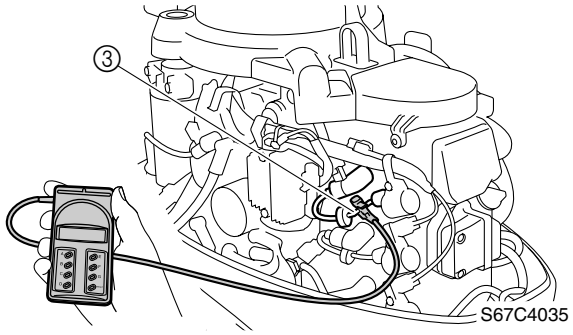
1. Remove the plugs ①, and then attach the special service tool to the intake manifold as shown.



Vacuum gauge ②: 90890-03094

2. Start the engine and warm it up for 10 minutes.

3. Attach the special service tool to spark plug wire #1 ③, and then check the engine idle speed.

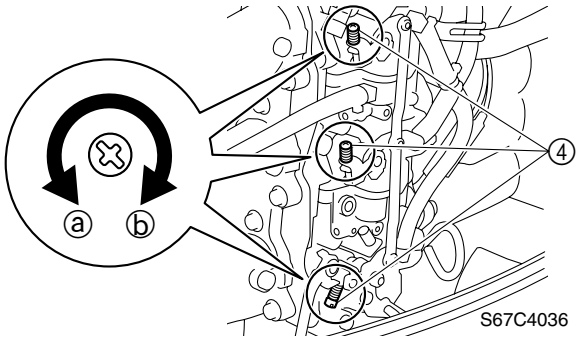


Digital tachometer: 90890-06760

Engine idle speed: 850 ± 50 r/min

4. Check the vacuum pressure of all cylinders.

5. Turn the synchronizing screws ④ in direction ⓐ or ⓑ until the specified vacuum pressure is obtained.



NOTE:

- To increase the vacuum pressure, turn the synchronizing screw in direction ⓐ.
- To decrease the vacuum pressure, turn the synchronizing screw in direction ⓑ.

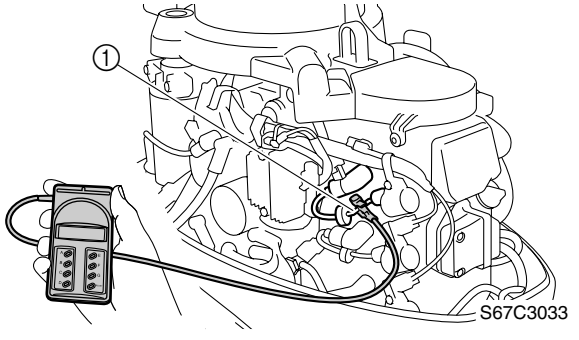
Vacuum pressure:
42.6 kPa (319.5 mmHg, 12.6 inHg)

6. Check the engine idle speed. Repeat steps 3–5 if out of specification.

Adjusting the dashpot

1. Start the engine and warm it up.

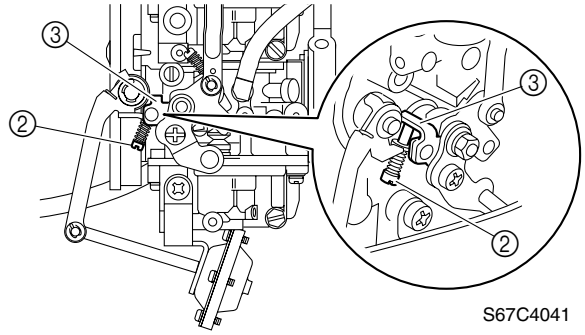
2. Attach the special service tool to spark plug wire #1 ①.



Digital tachometer: 90890-06760

3. Turn the throttle grip (H model) or move the remote control lever (R model) until the engine speed is 3,750 ± 50 r/min.

4. Turn the adjusting screw ② until it is just touching the stopper ③.



5. Rev the engine a few times and check the dashpot operation. Repeat steps 3–4 if the dashpot does not operate properly.

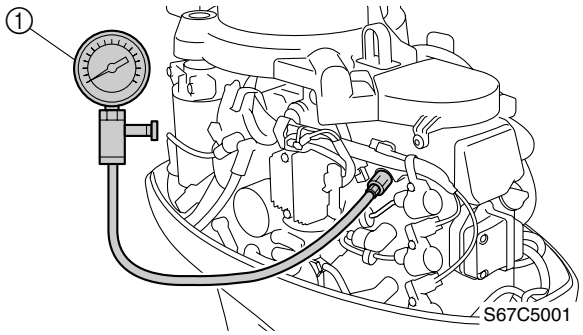
Power unit

5

Power unit (check and adjustment)

Checking the compression pressure

1. Start the engine, warm it up, and then turn it off.
2. Remove the clip from the engine shut-off switch.
3. Disconnect the spark plug caps, remove the spark plugs, and then install the special service tool ① into a spark plug hole.



CAUTION:

Before removing the spark plugs, remove any dirt or dust in the spark plug wells that may fall into the cylinders.

Compression gauge ①:
90890-03160

4. Turn the throttle grip or move the remote control lever to the fully open position.
5. Crank the engine until the reading on the compression gauge stabilizes, and then measure the compression pressure.

NOTE:

Since this outboard motor is equipped with an automatic decompression mechanism, the compression pressure may vary depending on the speed at which the starter handle is pulled when using the manual starter to crank the engine. (M and W model)

Minimum compression pressure (reference data):
600 kPa (6.0 kgf/cm^2, 87.0 psi) (M and W model)
830 kPa (8.3 kgf/cm^2, 120.4 psi) (E model)

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

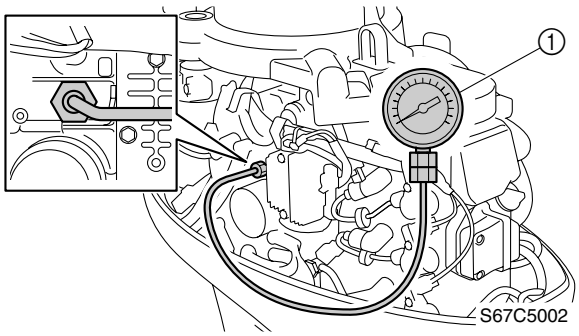
NOTE:

- If the compression pressure increases, check the pistons and piston rings. Replace if worn.
- If the compression pressure does not increase, check the valve clearances, valves, valve seats, cylinder sleeves, cylinder head gasket, and cylinder head. Adjust or replace if necessary.

7. Repeat steps 4–6 for each cylinder.

Checking the oil pressure

1. Remove the oil pressure switch, and then install an oil pressure gauge ① to the oil pressure switch installation hole.



NOTE:

Use a commercially available oil pressure gauge ①.

2. Start the engine and warm it up for 10 minutes.

NOTE:
Because the Prime Start operates when the engine is started, the engine idle speed will be above specification. Therefore, measure the oil pressure after the engine has been warmed up.

3. Measure the oil pressure. If out of specification, check the oil pump and oil strainer, and for oil leakage.

NOTE:
The actual oil pressure may vary depending the temperature and viscosity of the engine oil being used.

Oil pressure (reference data):
210 kPa (2.1 kgf/cm^2, 30.5 psi) at 52 °C (126 °F) with SL 10W-30 engine oil and at engine idle speed

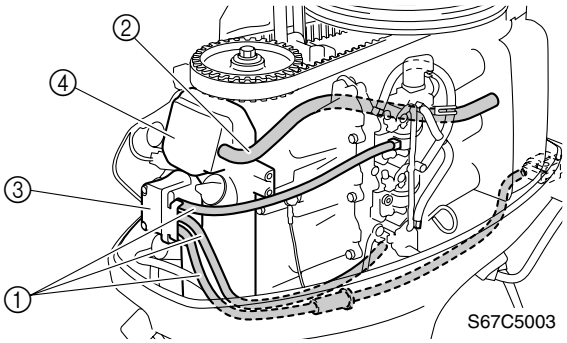
Checking the valve clearance

NOTE:
Measure the valve clearances when the engine is cold.

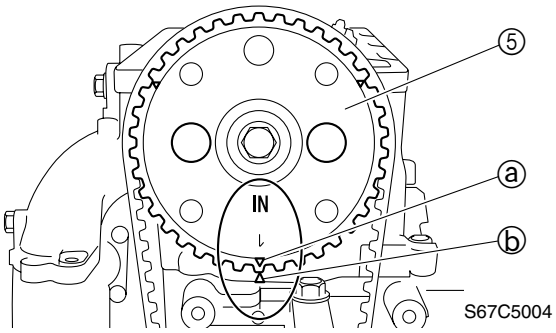
1. Remove the manual starter and driven sprocket cover. (M and W model)
   Remove the flywheel magnet cover. (E model)

2. Disconnect the ignition coil couplers and spark plug caps, and then remove the spark plugs.

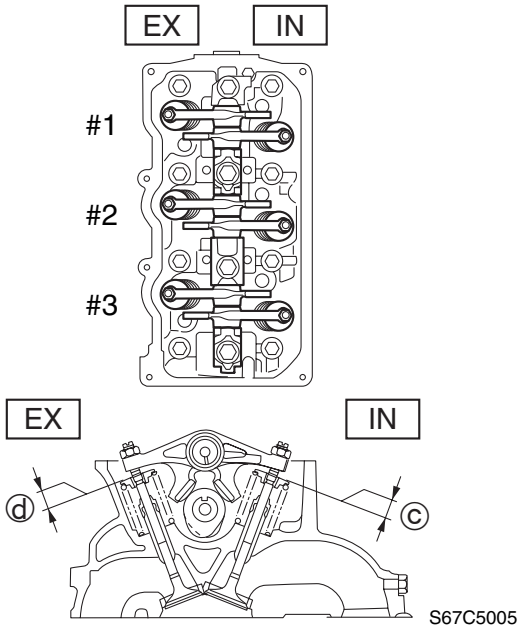
3. Disconnect the fuel hoses ① and blowby hose ②, and then remove the fuel pump ③ and cylinder head cover ④.



4. Turn the flywheel magnet clockwise and align the "1 ▲" mark ⓐ on the driven sprocket ⑤ with the "▲" mark ⓑ on the cylinder head.



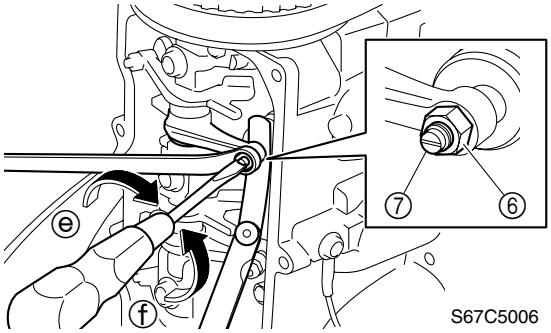
5. Measure the intake and exhaust valve clearances for cylinder #1. Adjust if out of specification.



Valve clearance:
Intake ⓒ:
0.20 ± 0.05 mm (0.008 ± 0.002 in)
Exhaust ⓓ:
0.30 ± 0.05 mm (0.012 ± 0.002 in)

5

6. Loosen the rocker arm locknut ⑥, and then turn the adjusting screw ⑦ until the specified valve clearance is obtained.



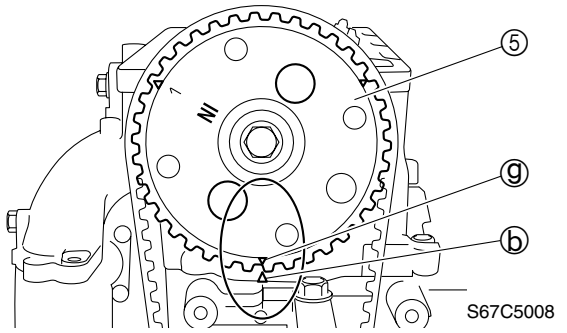
S67C5006

NOTE:
- To decrease the valve clearance, turn the adjusting screw ⑦ in direction ⓔ.
- To increase the valve clearance, turn the adjusting screw ⑦ in direction ⓕ.

7. Tighten the rocker arm locknut ⑥ to the specified torque.

	Rocker arm locknut ⑥: 14 N·m (1.4 kgf·m, 10.3 ft·lb)

8. Turn the flywheel magnet an additional 240° clockwise and align the "▲" mark ⓖ on the driven sprocket ⑤ with the "▲" mark ⓑ on the cylinder head.



S67C5008

9. Repeat steps 5–7 for cylinder #2.

10. Repeat steps 8–9 for cylinder #3.

11. Install all parts removed during removal.

Replacing the timing belt

CAUTION:

Do not turn the flywheel magnet counterclockwise, otherwise the water pump impeller may be damaged.

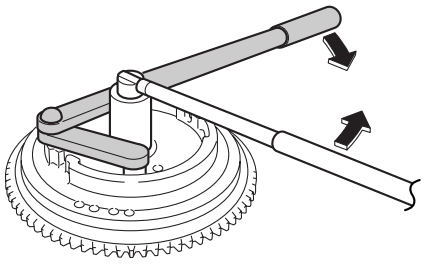
NOTE:

To remove and install the timing belt, drive sprocket, and driven sprocket, see "Removing the timing belt and sprocket" (5-23) and "Installing the sprocket and timing belt" (5-24).

1. Remove the manual starter, starter hub, and driven spocket cover. (M and W model)
   Remove the flywheel magnet cover. (E model)

2. Disconnect the spark plug caps and remove the spark plugs.

3. Remove the flywheel magnet nut.


S6AG5G30

⚠ WARNING

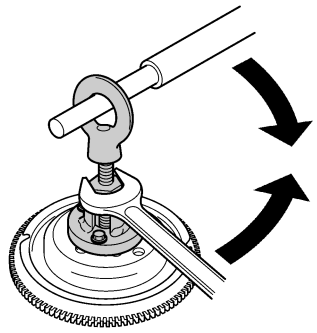
Apply force in the direction of the arrows shown to prevent the flywheel holder from slipping off easily.

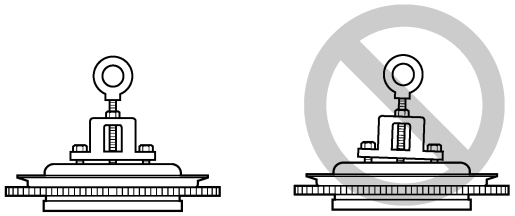
NOTE:

Use a 30 mm socket to loosen the flywheel magnet nut.

	Flywheel holder: 90890-06522

4. Remove the flywheel magnet, Woodruff key and spring washer.


S63P5280


S63P5290

CAUTION:

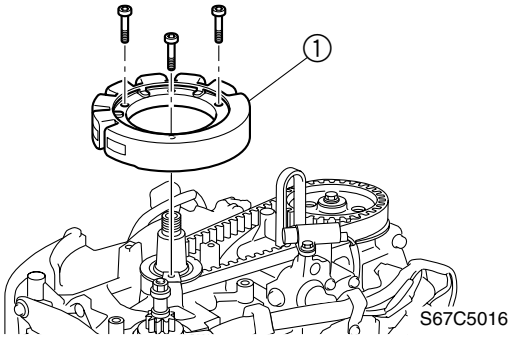
To prevent damage to the engine or tools, screw in the puller set bolts evenly and completely so that the flywheel puller is parallel to the flywheel magnet.

NOTE:

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

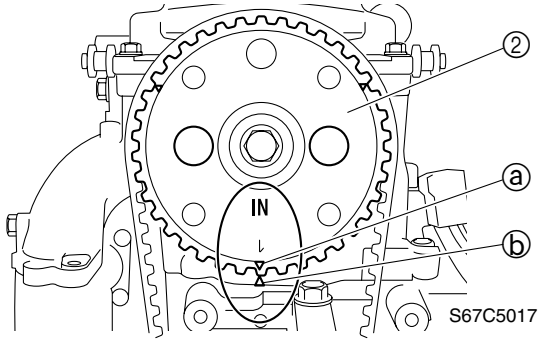
	Flywheel puller: 90890-06521

5. Remove the stator assembly ①.

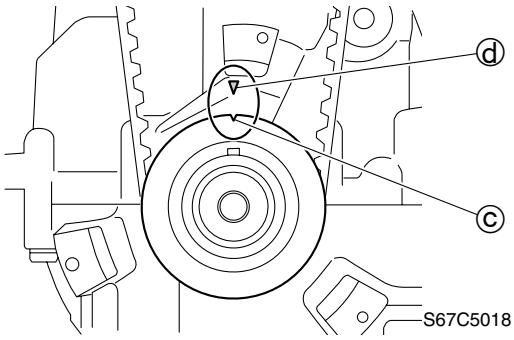


S67C5016

6. Align the "1 ▲" mark ⓐ on the driven sprocket ② with the "▲" mark ⓑ on the cylinder head.



S67C5017



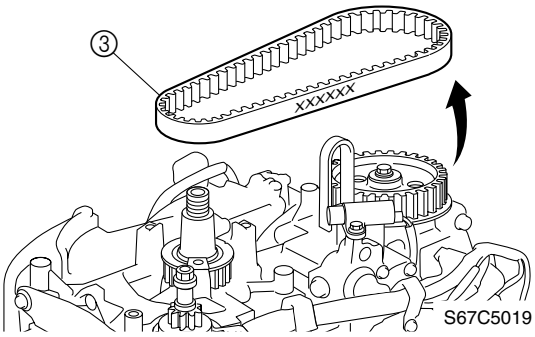
S67C5018

NOTE:

Check that the notch ⓒ in the drive sprocket and the "▲" mark ⓓ on the cylinder block are aligned.

5

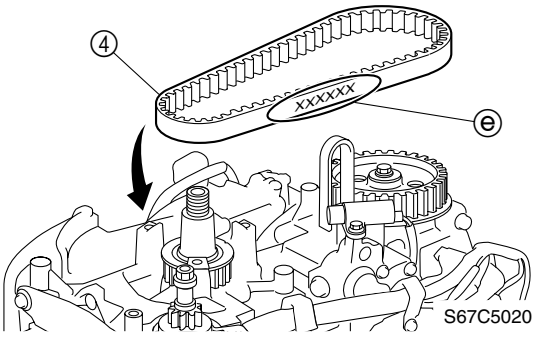
7. Remove the timing belt ③ from the driven sprocket, and then remove it from the drive sprocket.



CAUTION:

Unless directed to do so in the following instructions, do not turn the drive sprocket or driven sprocket when the timing belt is not installed. Otherwise the pistons and valves will collide with each other and be damaged.

8. Install a new timing belt ④ onto the drive sprocket, and then install it onto the driven sprocket so that the part number ⓔ on the belt is in the upright position.



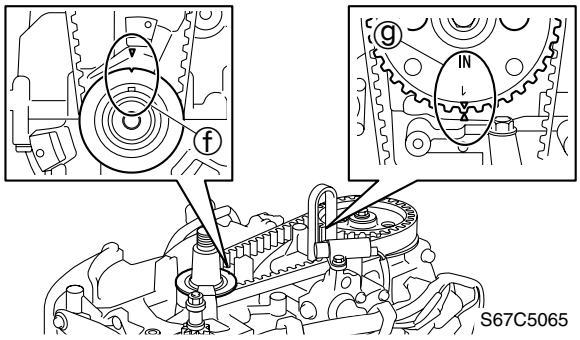
CAUTION:

- **Do not twist, turn inside out, or bend the timing belt beyond the maximum limit of 25 mm (1.0 in), otherwise it can be damaged.**
- **Do not get oil or grease on the timing belt.**

NOTE:

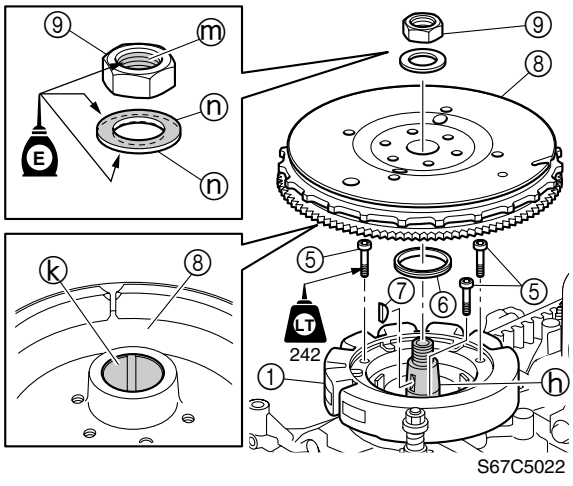
Before installing the timing belt, make sure that the notch on the drive sprocket and the mark on the driven sprocket are aligned with the marks on the cylinder block and cylinder head respectively.

9. Turn the drive sprocket clockwise 2 turns, and then check that the parts are aligned at the areas ⓕ and ⓖ as shown.



10. Install the stator assembly ① and tighten the bolts ⑤ to the specified torque.

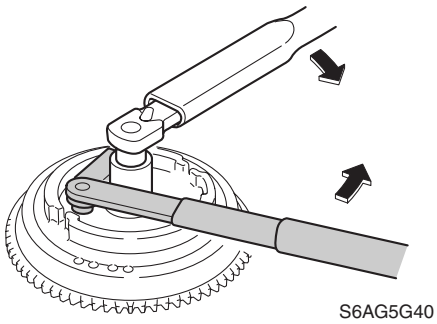
11. Install the spring washer ⑥ and Woodruff key ⑦, and then install the flywheel magnet ⑧.



NOTE:
- Be sure to remove any grease from the tapered portion ⓗ of the crankshaft and the inner surface ⓚ of the flywheel magnet ⑧.
- Apply engine oil to the threads ⓜ of the flywheel magnet nut ⑨ and upper and lower surfaces ⓝ of the washer before installation.

Stator assembly bolt ⑤:
6 N·m (0.6 kgf·m, 4.4 ft·lb)

12. Tighten the flywheel magnet nut ⑨ to the specified torque.


S6AG5G40

⚠ WARNING

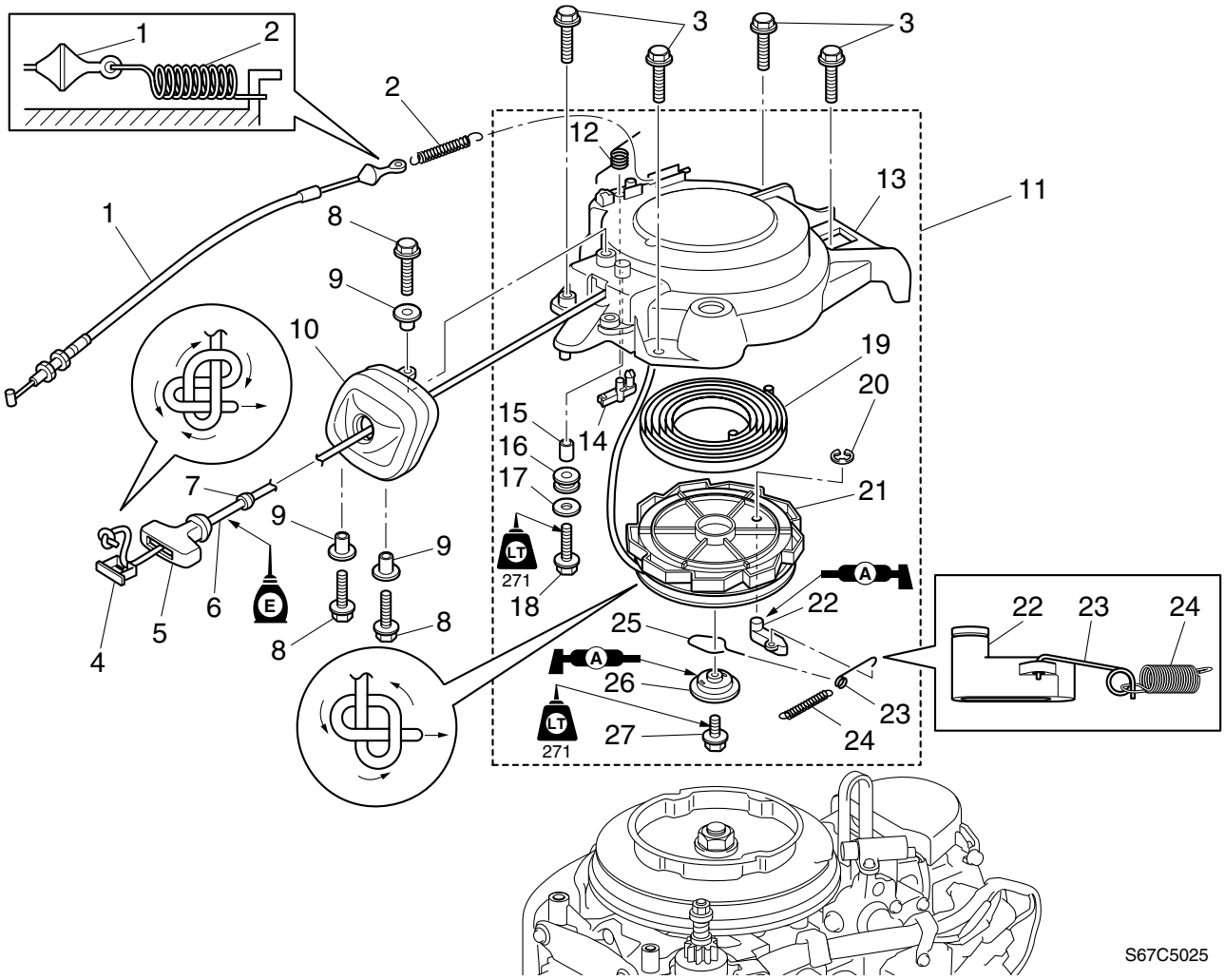
Apply force in the direction of the arrows shown to prevent the flywheel holder from slipping off easily.

Flywheel holder: 90890-06522

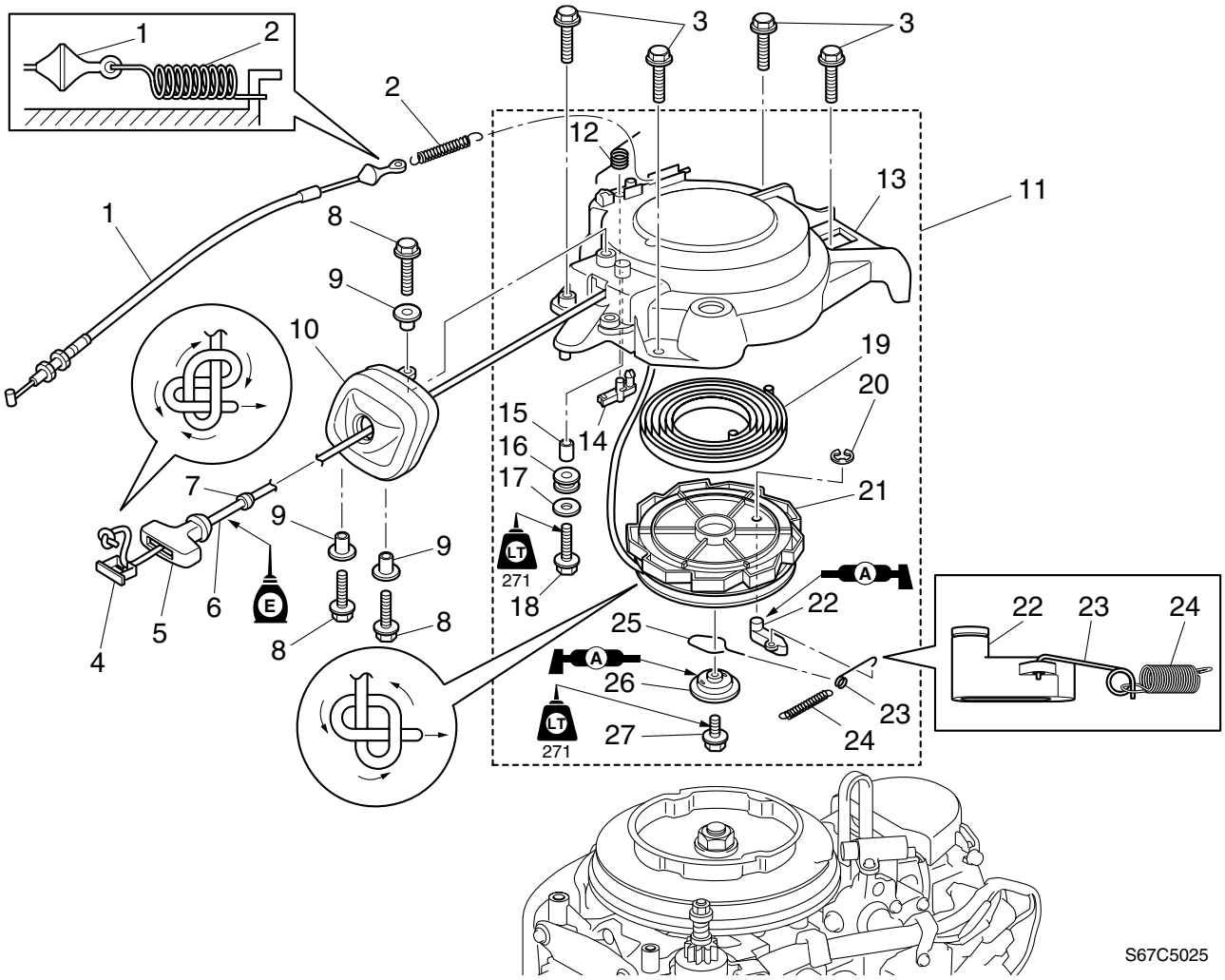
Flywheel magnet nut ⑨:
157 N·m (15.7 kgf·m, 115.8 ft·lb)

13. Install all parts removed during removal.

Manual starter (M and W model)



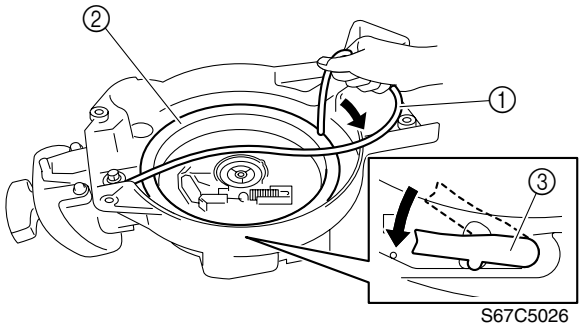
No.	Part name	Q'ty	Remarks
1	Start-in-gear protection cable	1	
2	Spring	1	
3	Bolt	4	M6 × 25 mm
4	Cap	1	
5	Starter handle	1	
6	Starter rope	1	1,750 mm (68.9 in) (reference data)
7	Damper	1	
8	Bolt	3	M6 × 25 mm
9	Collar	3	
10	Starter rope guide	1	
11	Manual starter assembly	1	
12	Spring	1	
13	Cover	1	
14	Starter plunger	1	
15	Collar	1	
16	Roller	1	
17	Washer	1	



No.	Part name	Q'ty	Remarks
18	Bolt	1	M6 × 25 mm
19	Spiral spring	1	
20	E-clip	1	
21	Sheave drum	1	
22	Drive pawl	1	
23	Drive pawl spring 2	1	
24	Spring	1	
25	Drive pawl spring 1	1	
26	Drive plate	1	
27	Bolt	1	M6 × 15 mm

Disassembling the manual starter

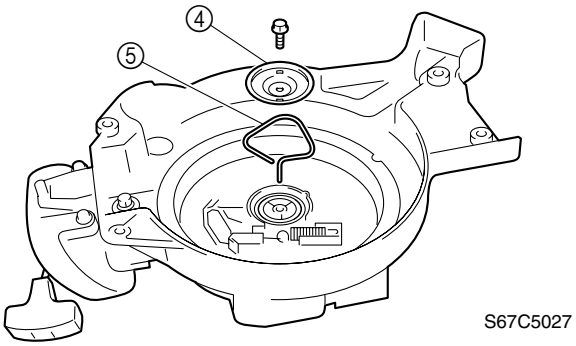
1. While holding the starter rope ①, turn the sheave drum ② in the direction of the arrow shown until there is no tension in the spiral spring.



S67C5026

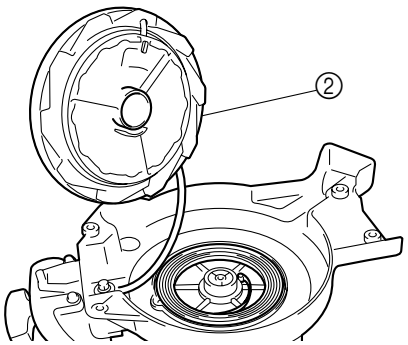
NOTE:
Push the starter plunger ③ in the direction of the arrow shown while turning the sheave drum ② as shown.

2. Remove the drive plate ④ and drive pawl spring 1 ⑤.



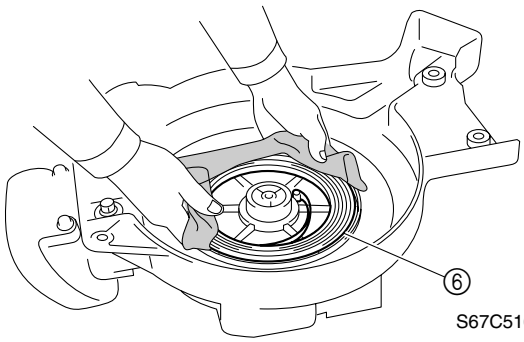
S67C5027

3. Remove the sheave drum ②.



S67C5028

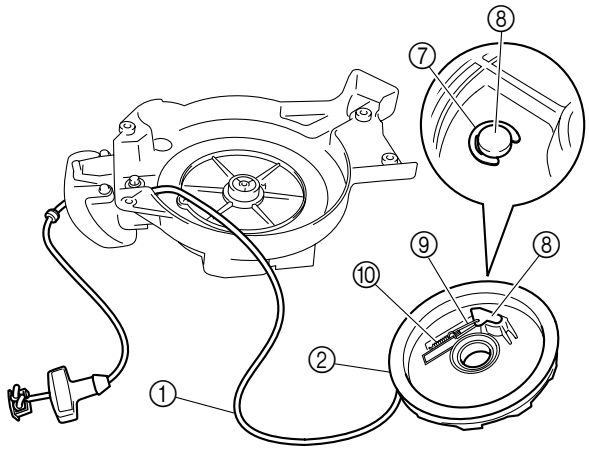
4. Remove the spiral spring ⑥ from the manual starter cover.



S67C5161

⚠ WARNING
The spiral spring ⑥ can pop out. Cover the spiral spring with rags when removing it.

5. Remove the starter rope ① and E-clip ⑦, and then remove the drive pawl ⑧, drive pawl spring 2 ⑨, and spring ⑩ from the sheave drum ②.

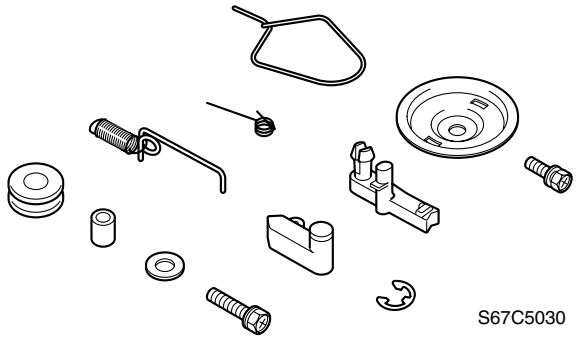


S67C5029

Checking the manual starter

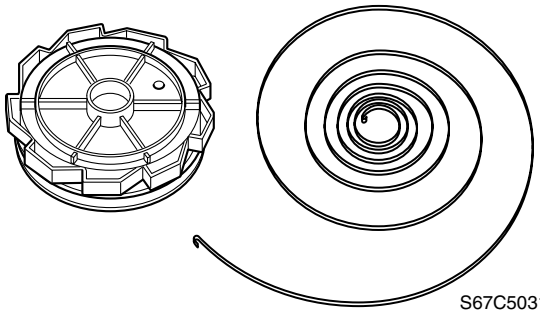
1. Check the roller, collar, drive pawl, E-clip, starter plunger, and drive plate. Replace if cracked or damaged.

2. Check the springs. Replace if bent, cracked, or damaged.


S67C5030

3. Check the sheave drum. Replace if cracked or damaged.

4. Check the spiral spring. Replace if bent, cracked, or damaged.


S67C5031

5. Check the starter handle. Replace if cracked or damaged.

6. Check the starter rope. Replace if damaged.

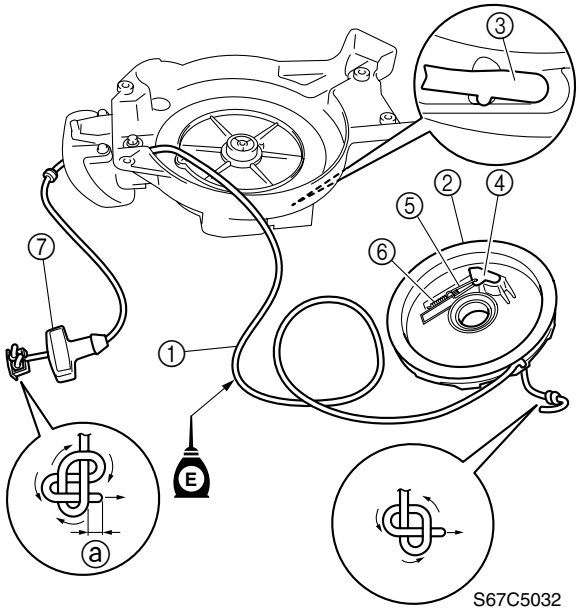
NOTE:
- When replacing the starter rope with a new one, make sure that the length is approximately 1,750 mm (68.9 in).
- Be sure to use a genuine Yamaha starter rope.

Assembling the manual starter

1. Install the starter rope ① into the sheave drum ②.

2. Install the starter plunger ③, drive pawl ④, drive pawl spring 2 ⑤, spring ⑥, and E-clip.

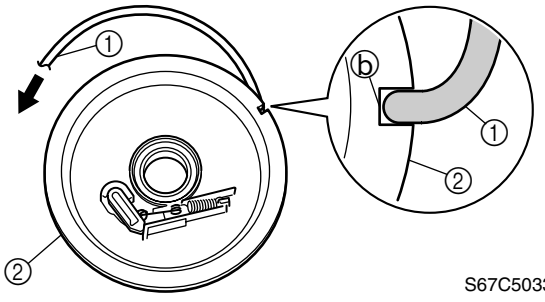
3. Install the starter handle ⑦.



S67C5032

NOTE:
- Apply engine oil to the starter rope ① before installation.
- Tie a knot at the end of the starter rope ① as shown in the illustration.
- Be sure to leave 7–12 mm (0.28–0.47 in) ⓐ at the end of the starter rope.

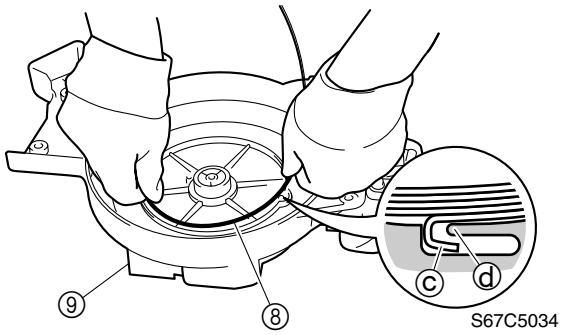
4. Wind the starter rope ① twice around the sheave drum ② in the direction of the arrow shown.



S67C5033

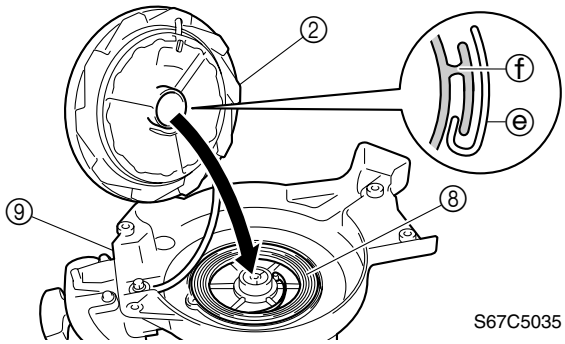
NOTE:
After winding the starter rope ① around the sheave drum ②, fit the rope into the notch ⓑ.

5. Install the spiral spring ⑧ into the manual starter cover ⑨.



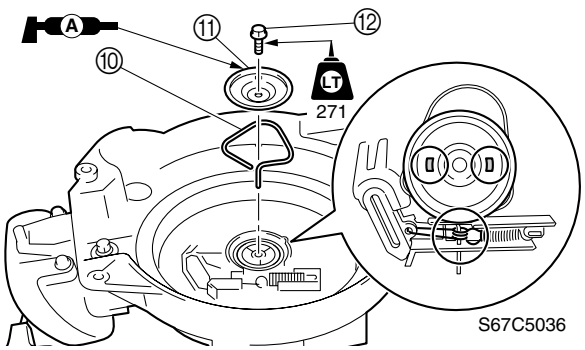
NOTE:
Hook the end ⓒ of the spiral spring ⑧ onto the cut-out ⓓ in the manual starter cover ⑨.

6. Install the sheave drum ② into the manual starter cover ⑨.

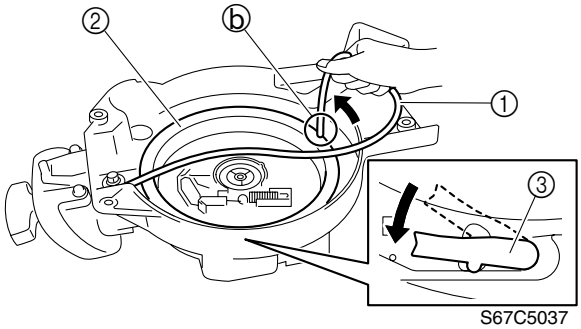


NOTE:
- When installing the sheave drum ②, set the spiral spring ⑧ by turning the drum.
- Hook the end ⓔ of the spiral spring ⑧ onto the cut-out ⓕ in the sheave drum ②.

7. Install drive pawl spring 1 ⑩, the drive plate ⑪, and the bolt ⑫.



8. While holding the starter rope ①, turn the sheave drum ② 3 turns in the direction of the arrow shown.

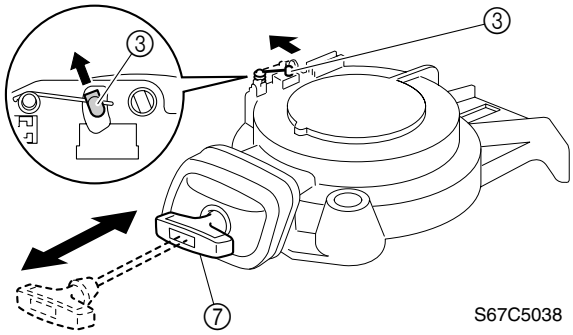


NOTE:
Push the starter plunger ③ in the direction of the arrow shown while turning the sheave drum ② as shown.

9. Remove the starter rope ① from the notch ⓑ, and then fit it into the groove in the sheave drum ②.

NOTE:
- Be sure to hold the sheave drum ② with your hand so that it turns slowly.
- Allow the spring force to slowly turn the drum as the starter rope winds around the drum.

10. Pull the starter handle ⑦ several times to check that the sheave drum turns smoothly and to check the starter rope for slack. Repeat steps 4–9 if necessary.

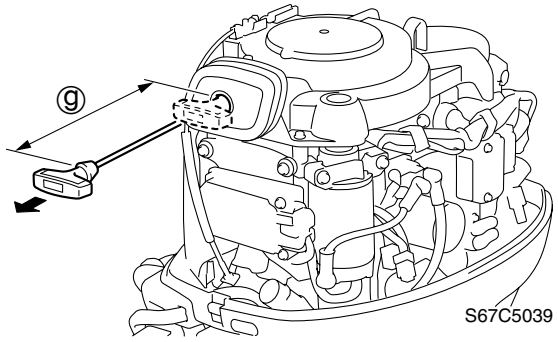


NOTE:
Push the starter plunger ③ in the direction of the arrow shown while pulling the starter handle ⑦.

11. Install the manual starter onto the power unit, and then connect the start-in-gear protection cable.

NOTE:
- Place the start-in-gear protection cable in its original position, making sure to route it correctly.
- To adjust the start-in-gear protection cable, see “Checking the start-in-gear protection (M and W model)” (3-10).

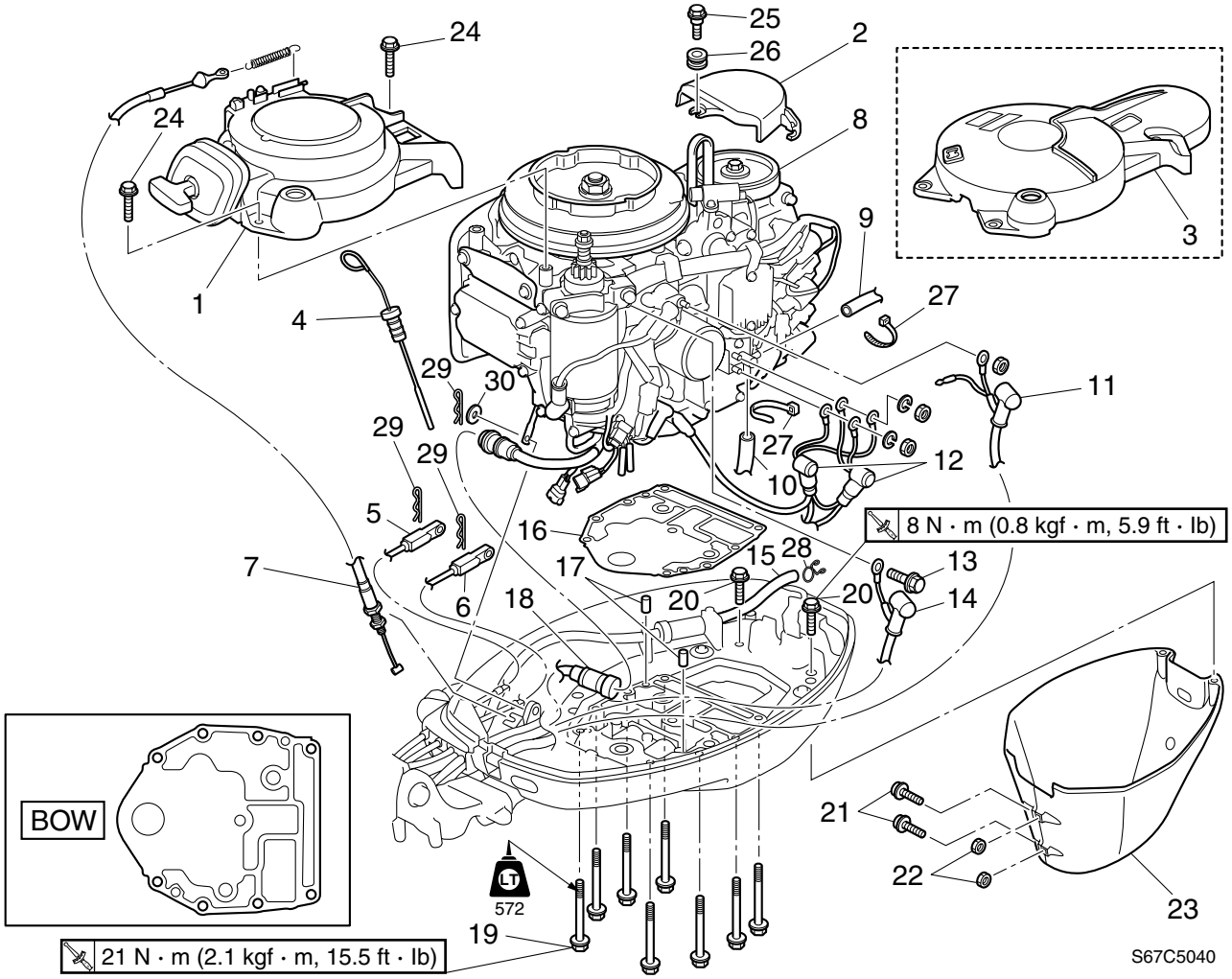
12. Pull the starter handle to extend the starter rope completely, and then measure the starter rope extended length ⓖ.



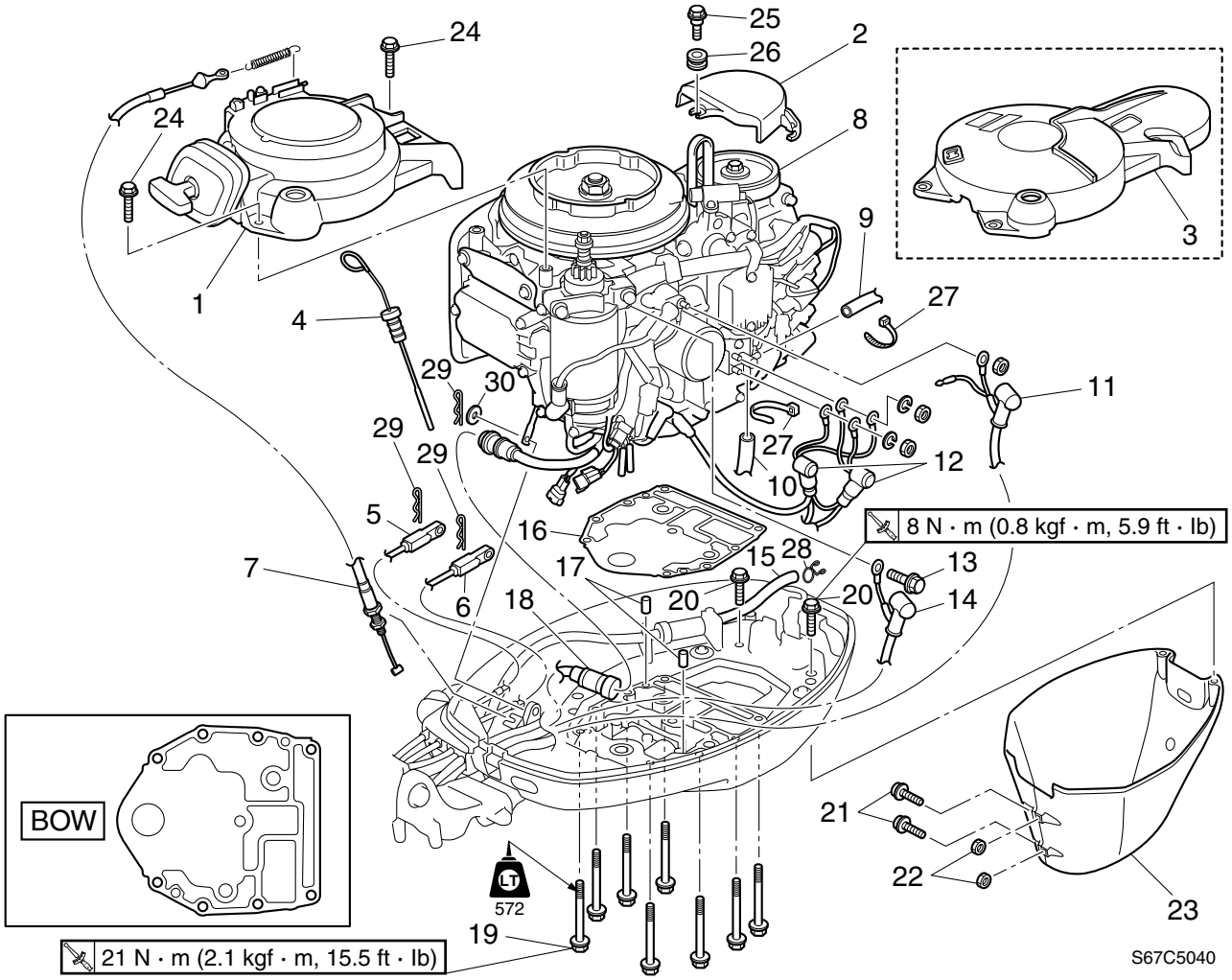
Starter rope extended length ⓖ:
1,400–1,600 mm (55.12–62.99 in)

Power unit

Power unit assembly

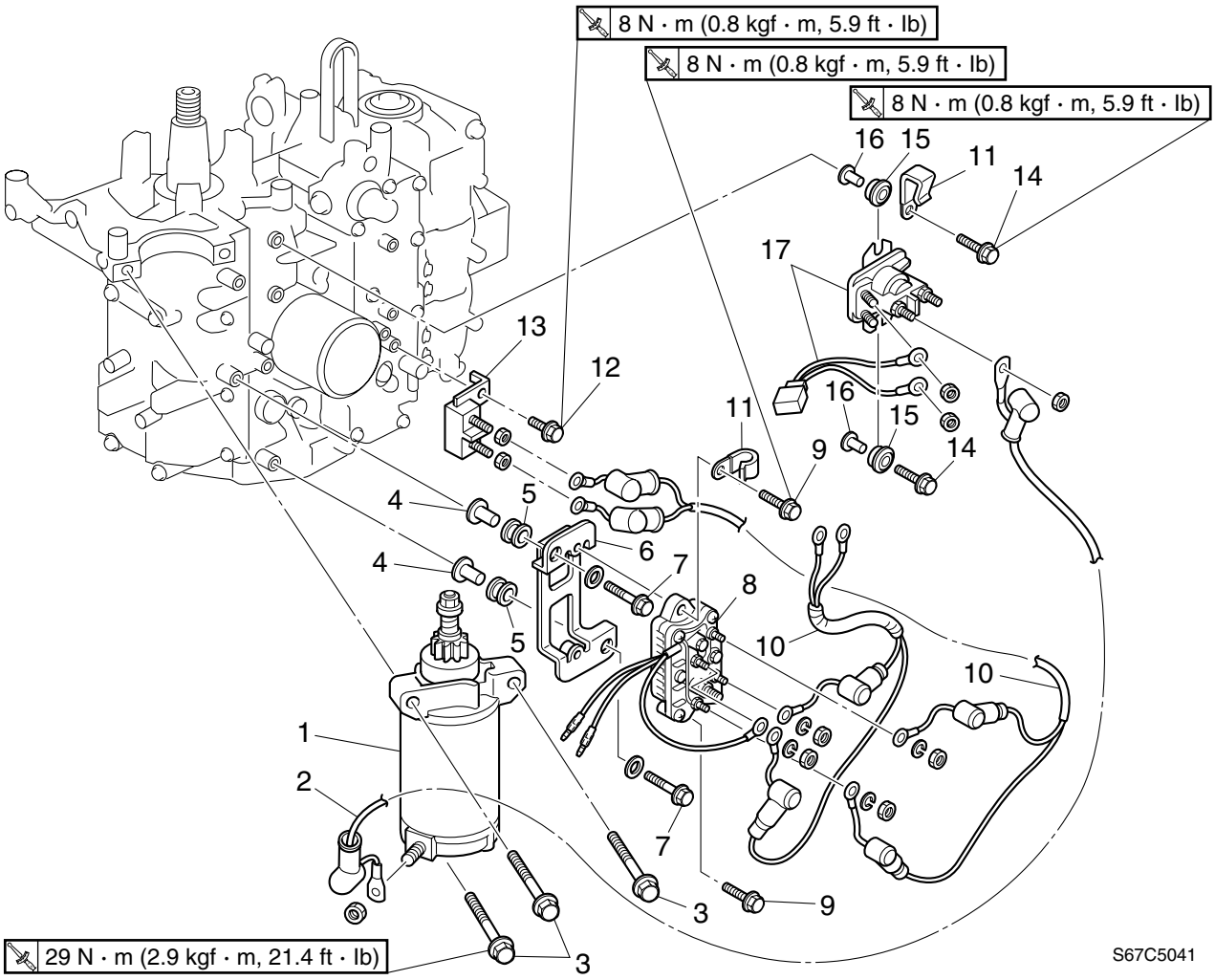


No.	Part name	Q'ty	Remarks
1	Manual starter	1	M and W model
2	Driven sprocket cover	1	M and W model
3	Flywheel magnet cover	1	E model
4	Oil dipstick	1	
5	Throttle cable	1	
6	Shift cable	1	
7	Start-in-gear protection cable	1	M and W model
8	Power unit	1	
9	Cooling water hose	1	
10	Cooling water hose	1	
11	Positive battery cable	1	E and W model
12	PTT relay lead	2	PTT model
13	Bolt	1	M6 × 12 mm/E and W model
14	Negative battery cable	1	E and W model
15	Fuel hose	1	
16	Gasket	1	**Not reusable**
17	Dowel	2	



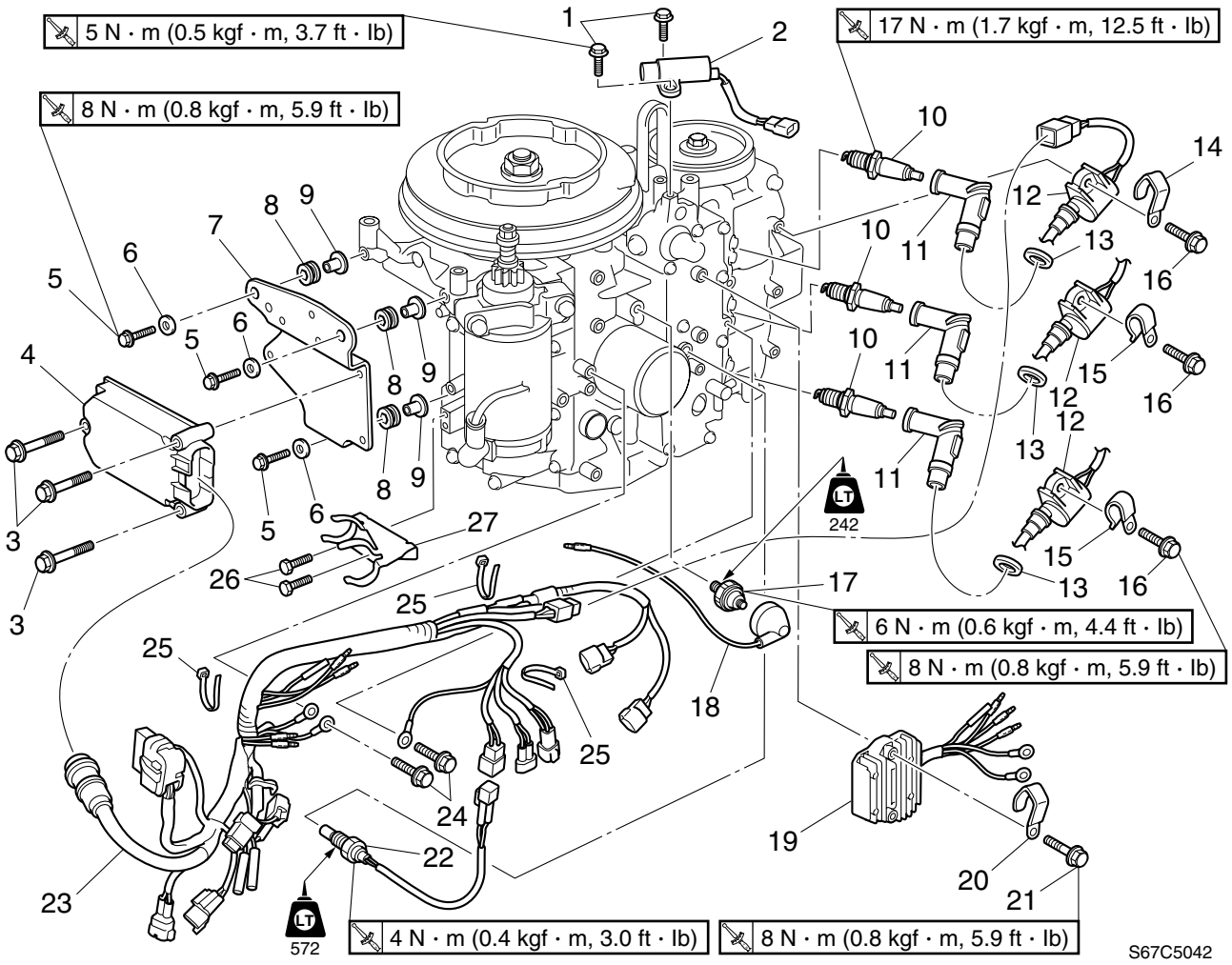
No.	Part name	Q'ty	Remarks
18	10-pin main harness	1	E and W model
19	Bolt	8	M8 × 80 mm
20	Bolt	2	M6 × 16 mm
21	Screw	2	ø6 × 25 mm
22	Nut	2	
23	Apron	1	
24	Bolt	4	M6 × 25 mm/M and W model
25	Bolt	1	M6 × 18 mm/M and W model
26	Grommet	1	M and W model
27	Plastic tie	2	
28	Clamp	1	
29	Clip	3	
30	Washer	1	

Starter motor, starter relay, and PTT relay (E and W model)

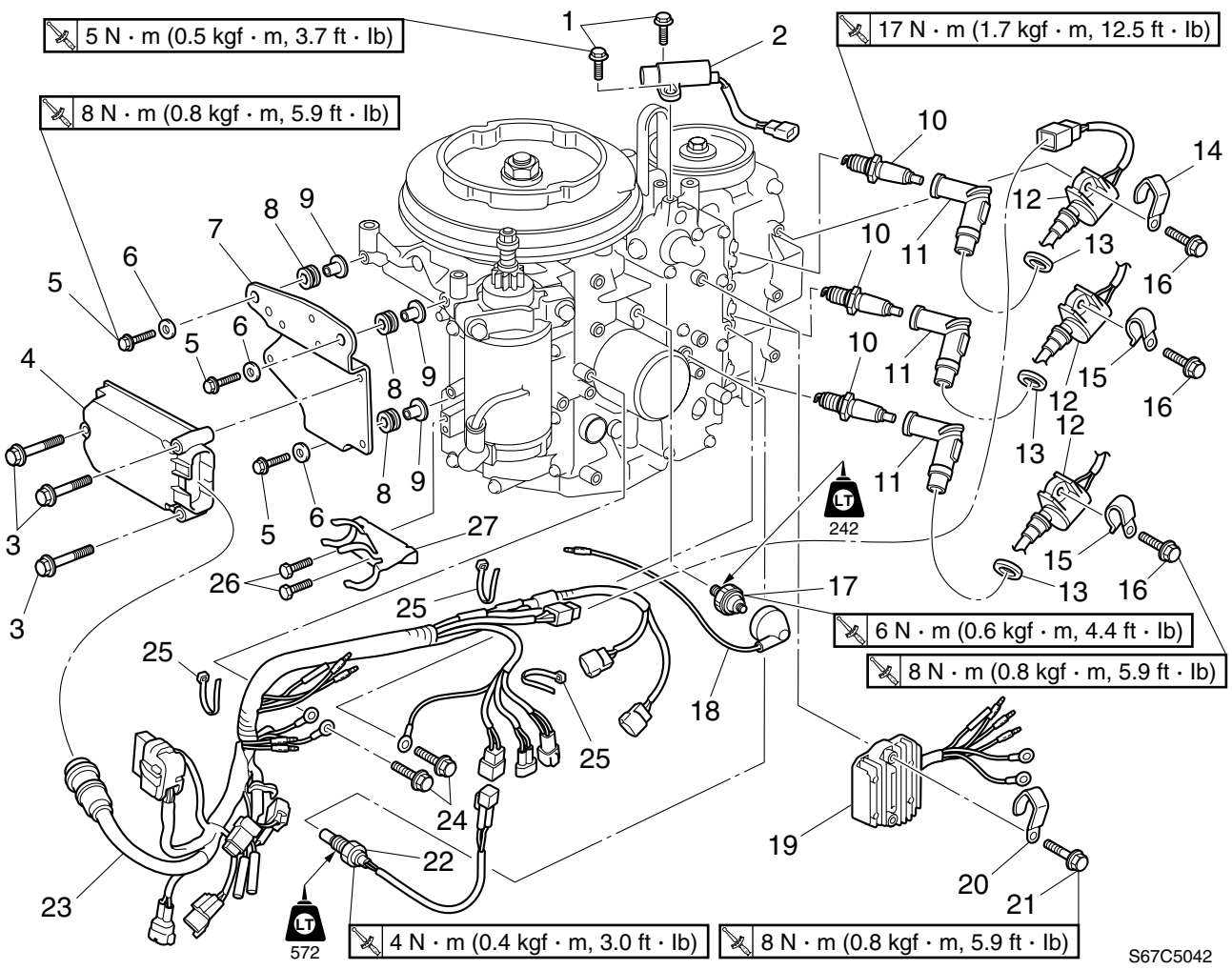


No.	Part name	Q'ty	Remarks
1	Starter motor	1	
2	Starter motor lead	1	
3	Bolt	3	M8 × 50 mm
4	Collar	2	PTT model
5	Grommet	2	PTT model
6	PTT relay bracket	1	PTT model
7	Bolt	2	M6 × 30 mm/PTT model
8	PTT relay	1	PTT model
9	Bolt	2	M6 × 20 mm/PTT model
10	PTT relay lead	2	PTT model
11	Holder	2	
12	Bolt	1	M6 × 12 mm/PTT model
13	Terminal	1	PTT model
14	Bolt	2	M6 × 30 mm
15	Grommet	2	
16	Collar	2	
17	Starter relay	1	

Ignition coil, CDI unit, and Rectifier Regulator

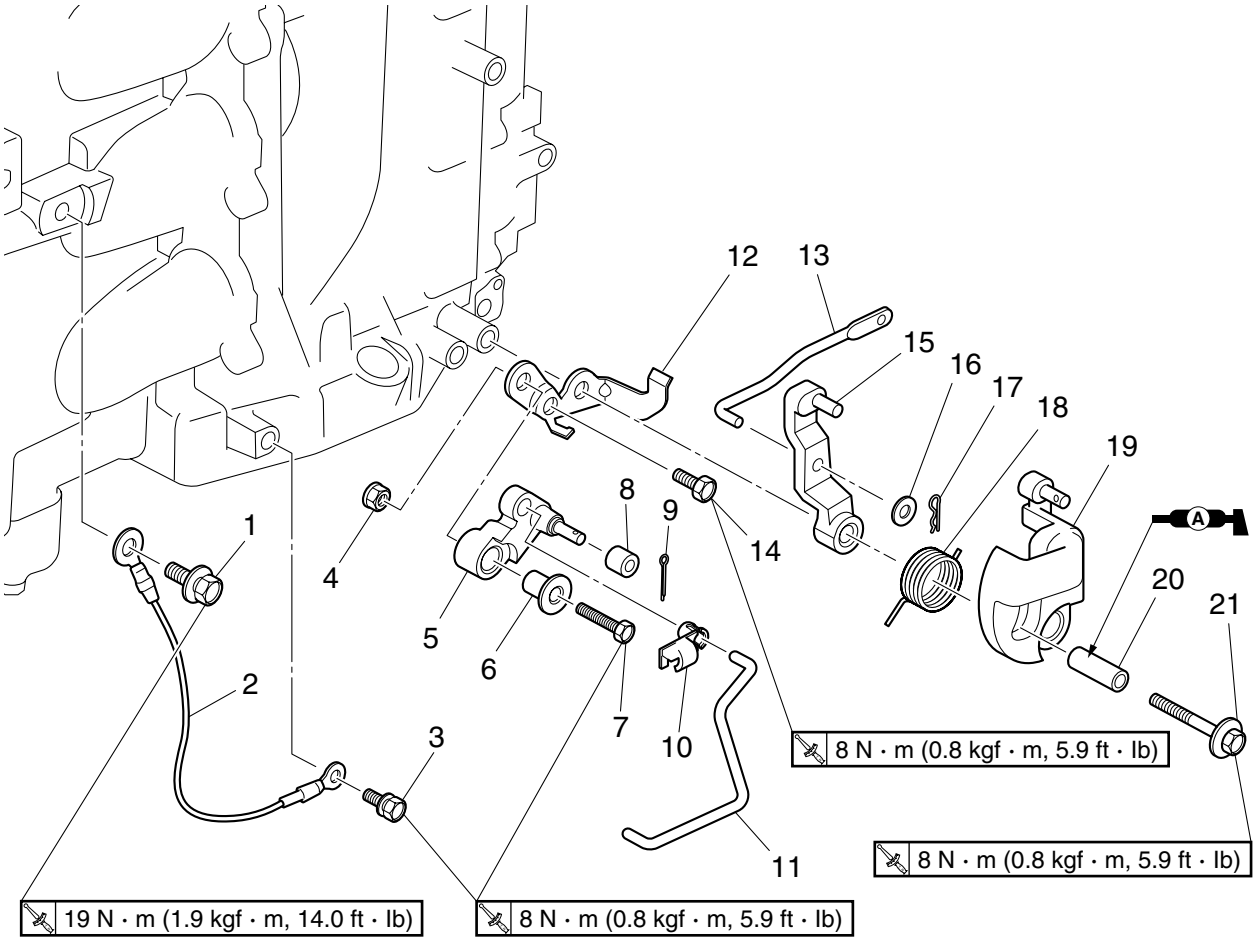


No.	Part name	Q'ty	Remarks
1	Bolt	2	M5 × 16 mm
2	Pulser coil	1	
3	Bolt	3	M6 × 45 mm
4	CDI unit	1	
5	Bolt	3	M6 × 25 mm
6	Washer	3	
7	Bracket	1	
8	Grommet	3	
9	Collar	3	
10	Spark plug	3	
11	Spark plug cap	3	
12	Ignition coil	3	
13	Grommet	3	
14	Holder	1	
15	Holder	2	
16	Bolt	3	M6 × 20 mm
17	Oil pressure switch	1	



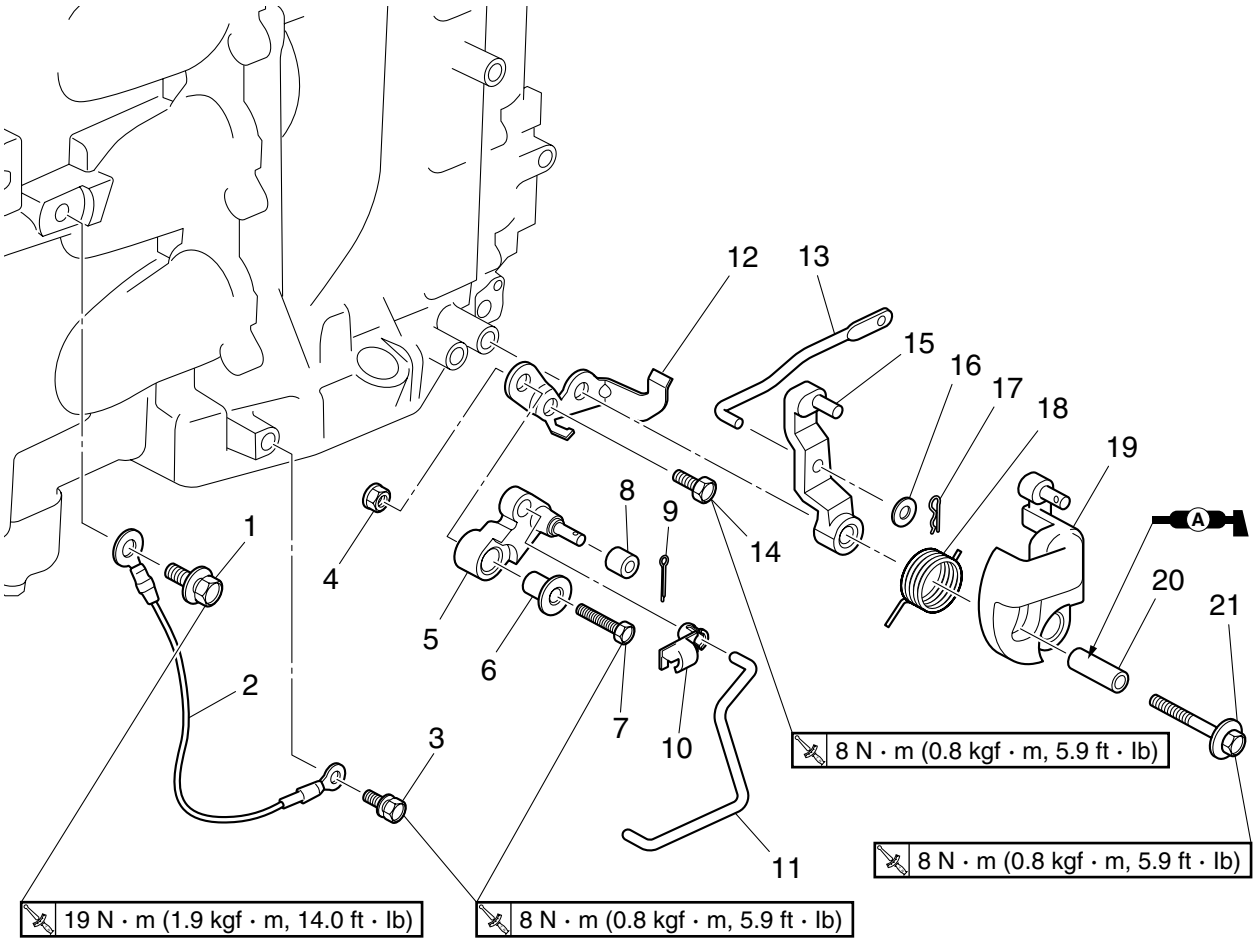
No.	Part name	Q'ty	Remarks
18	Oil pressure switch lead	1	
19	Rectifier Regulator	1	E and W model
20	Holder	1	
21	Bolt	2	M6 × 40 mm
22	Thermo sensor	1	
23	Wiring harness	1	
24	Bolt	2	M6 × 12 mm
25	Plastic tie	3	
26	Bolt	2	M5 × 12 mm
27	Bracket	1	E and W model

Throttle cam



S67C5043

No.	Part name	Q'ty	Remarks
1	Bolt	1	M8 × 12 mm
2	Ground lead	1	
3	Bolt	1	M6 × 12 mm
4	Nut	1	
5	Accelerator lever	1	
6	Collar	1	
7	Bolt	1	M6 × 25 mm
8	Bushing	1	
9	Cotter pin	1	
10	Clip	1	
11	Throttle link rod	1	
12	Bracket	1	
13	Shift link rod	1	
14	Bolt	1	M6 × 14 mm
15	Shift arm	1	
16	Washer	1	
17	Clip	1	

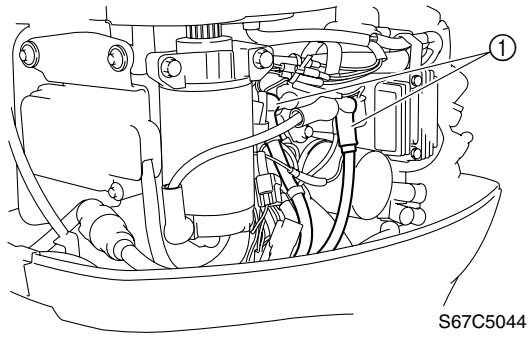


S67C5043

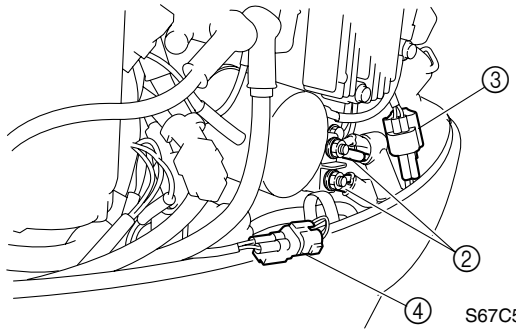
No.	Part name	Q'ty	Remarks
18	Spring	1	
19	Throttle cam	1	
20	Collar	1	
21	Bolt	1	M6 × 45 mm

Removing the power unit

1. Disconnect the start-in-gear protection cable. (M and W model)
   Disconnect the battery cables ①. (E and W model)

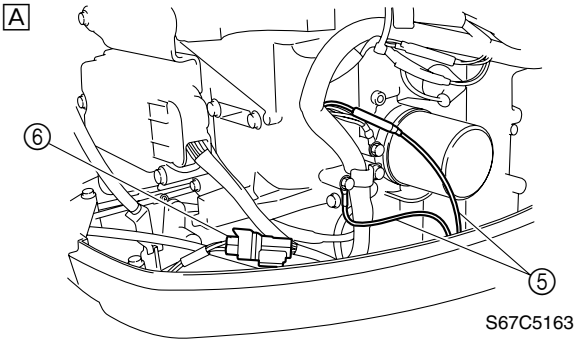


2. Disconnect the PTT motor leads ②. (PTT model)
   Disconnect the PTT switch coupler ③ and trim sensor coupler ④. (R model with PTT)

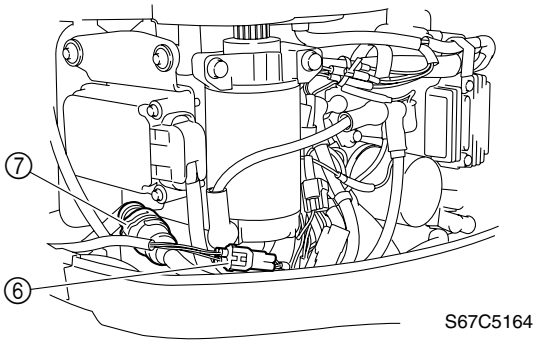


3. Disconnect the engine shut-off switch leads ⑤ and warning indicator assembly coupler ⑥. (M model)
   Disconnect the warning indicator assembly coupler ⑥ and 10-pin main harness ⑦ from the power unit. (E and W model)

A

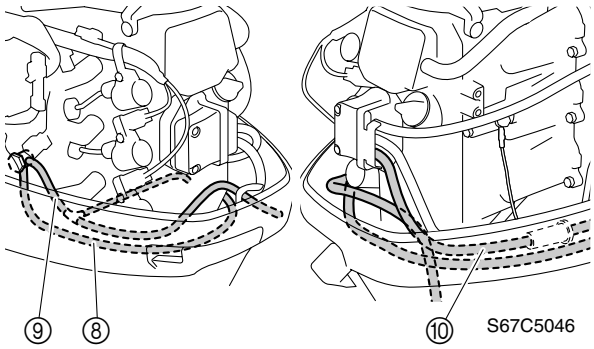


B



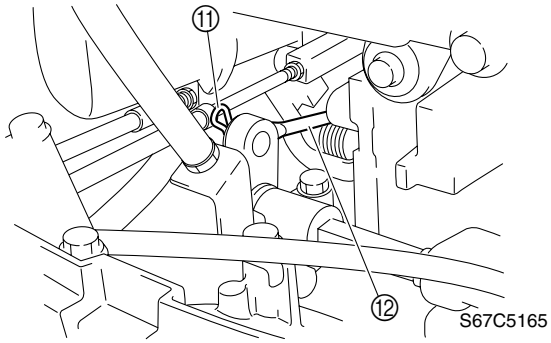
A M model
B E and W model

4. Disconnect the flushing hose ⑧, cooling water hose ⑨, and fuel hose ⑩.



5. Disconnect the throttle cable and shift cable.

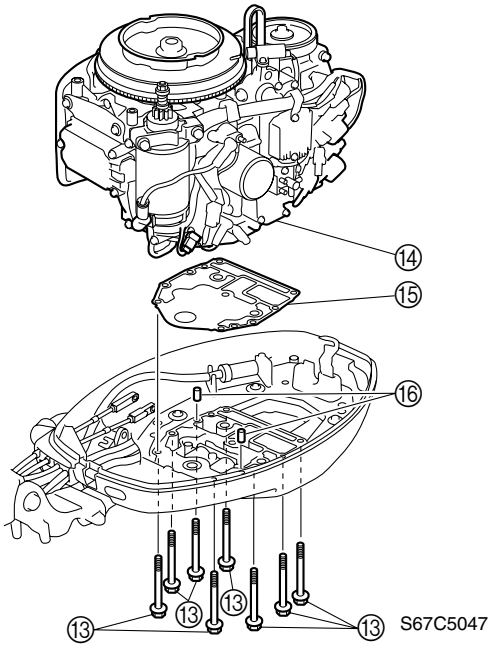
6. Remove the clip ⑪, and then disconnect the shift link rod ⑫.



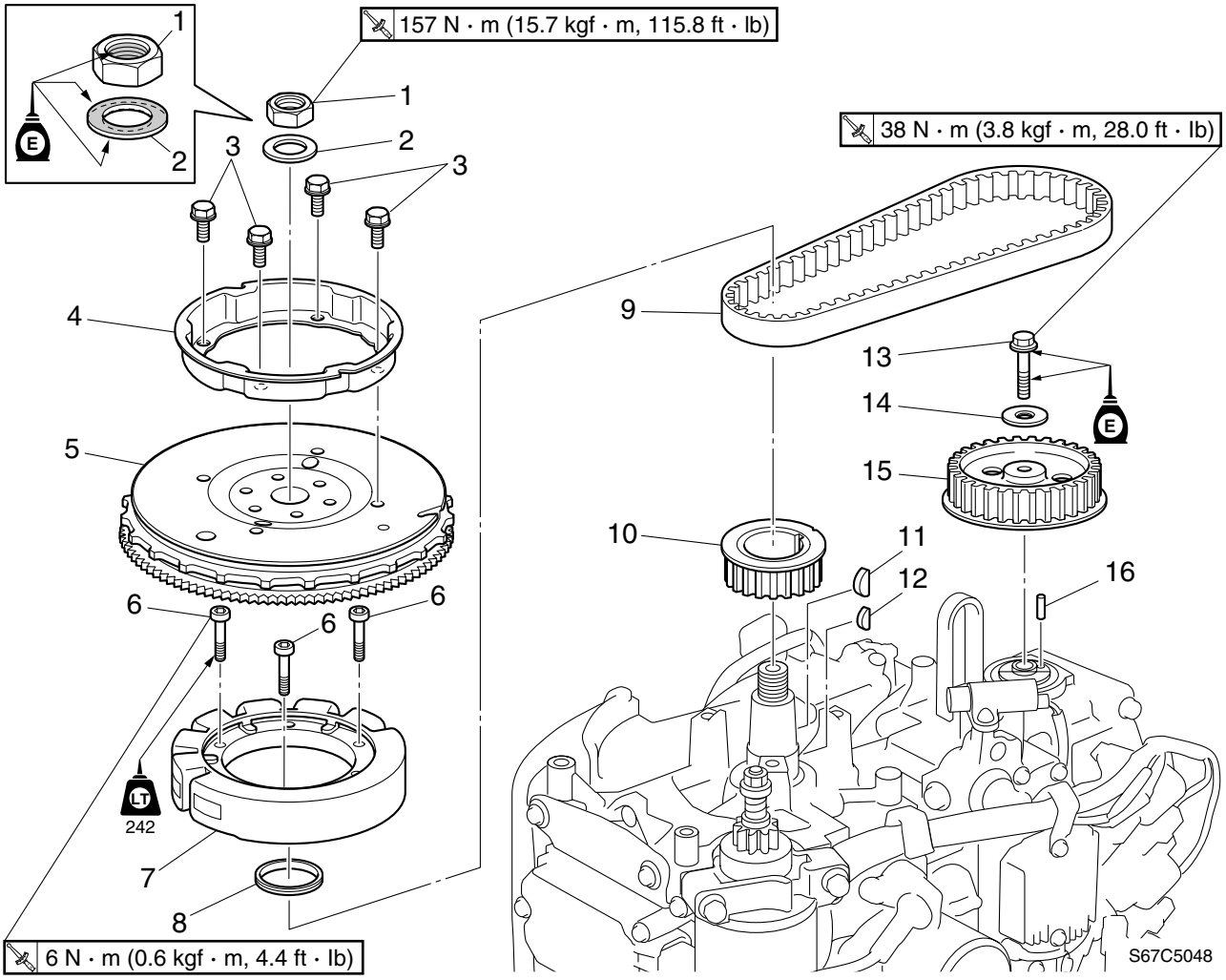
5

7. Remove the oil dipstick and apron, and then remove the mounting bolts ⑬.

8. Remove the power unit ⑭, gasket ⑮, and dowels ⑯.



Timing belt and sprocket

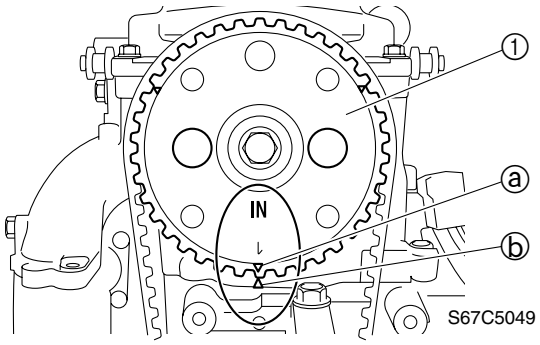


No.	Part name	Q'ty	Remarks
1	Nut	1	Width across flats: 30 mm
2	Washer	1	
3	Bolt	4	M6 × 10 mm/M and W model
4	Starter hub	1	M and W model
5	Flywheel magnet	1	
6	Bolt	3	M5 × 25 mm/M model/M5 × 30 mm/E and W model
7	Stator assembly	1	
8	Spring washer	1	
9	Timing belt	1	
10	Drive sprocket	1	
11	Woodruff key	1	
12	Woodruff key	1	
13	Bolt	1	M10 × 40 mm
14	Washer	1	
15	Driven sprocket	1	
16	Dowel	1	

Removing the timing belt and sprocket

1. Remove the manual starter and driven sprocket cover. (M and W model)
   Remove the flywheel magnet cover. (E model)

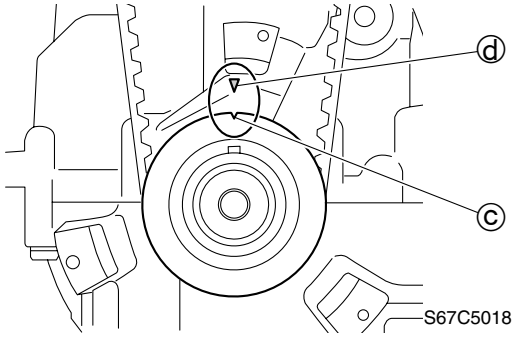
2. Align the "1 ▲" mark ⓐ on the driven sprocket ① with the "▲" mark ⓑ on the cylinder head.



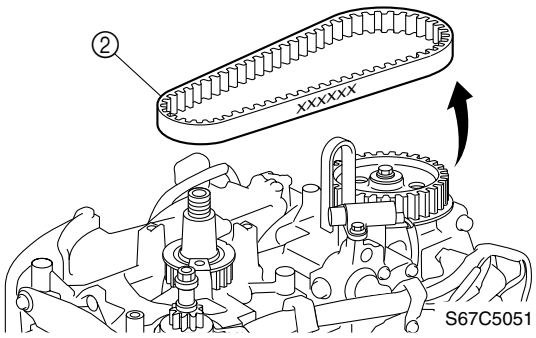
3. Remove the flywheel magnet, spring washer, and stator assembly.

NOTE:
See "Replacing the timing belt" (5-3).

4. Check that the notch ⓒ in the drive sprocket and the "▲" mark ⓓ on the cylinder block are aligned.

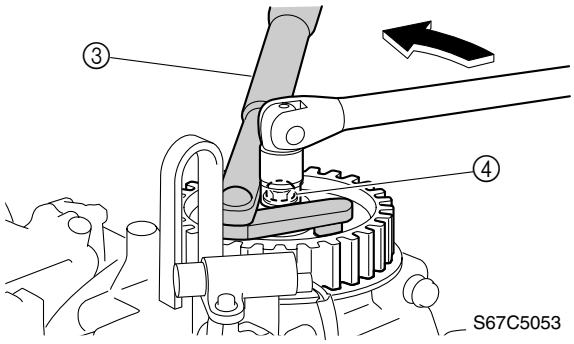


5. Remove the timing belt ② from the driven sprocket, and then remove it from the drive sprocket.



CAUTION:
Unless directed to do so in the following instructions, do not turn the drive sprocket or driven sprocket when the timing belt is not installed. Otherwise the pistons and valves will collide with each other and be damaged.

6. Hold the driven sprocket using the special service tool ③, and then remove the bolt ④.



NOTE:
Make sure that the driven sprocket does not turn when loosening the bolt.

	Flywheel holder ③: 90890-06522

7. Remove the driven sprocket and dowel.

8. Remove the drive sprocket and Woodruff key.

Checking the timing belt and sprocket

1. Check the interior and exterior of the timing belt. Replace if cracked, damaged, or worn.

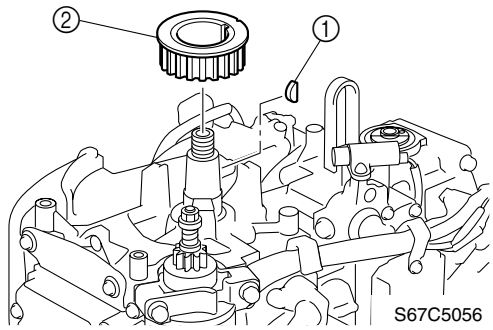
2. Check the drive sprocket and driven sprocket. Replace if cracked, damaged, or worn.

Installing the sprocket and timing belt

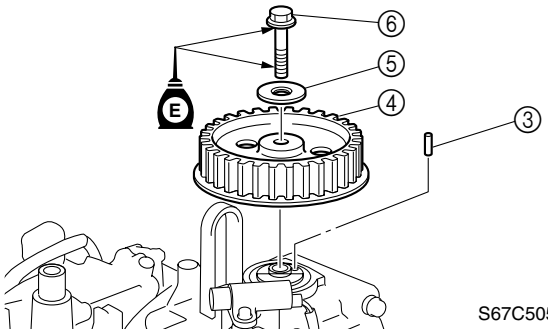
CAUTION:

Unless directed to do so in the following instructions, do not turn the crankshaft or camshaft when the timing belt is not installed. Otherwise the pistons and valves will collide with each other and be damaged.

1. Install the Woodruff key ① and drive sprocket ②.



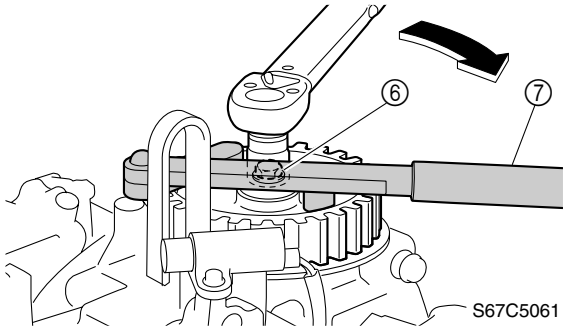
2. Install the dowel ③, driven sprocket ④, and washer ⑤, and then install the bolt ⑥ temporarily.



NOTE:

Apply engine oil to the driven sprocket bolt ⑥ before installation.

3. Hold the driven sprocket using the special service tool ⑦, and then tighten the bolt ⑥ to the specified torque.



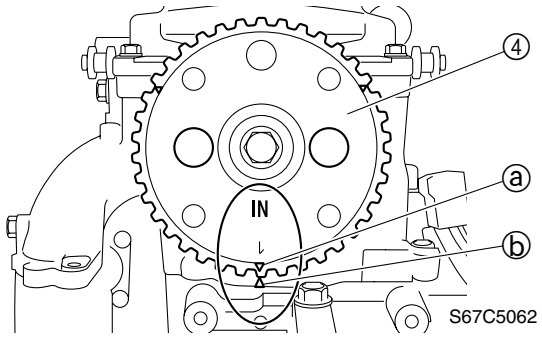
NOTE:

Make sure that the driven sprocket does not turn when tightening the bolt ⑥.

	Flywheel holder ⑦: 90890-06522

	Driven sprocket bolt ⑥: 38 N·m (3.8 kgf·m, 28.0 ft·lb)

4. Align the "1 ▲" mark ⓐ on the driven sprocket ④ with the "▲" mark ⓑ on the cylinder head.



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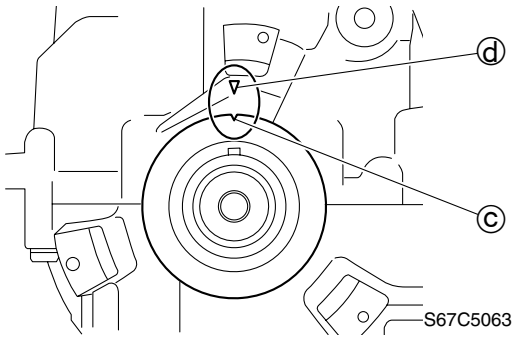
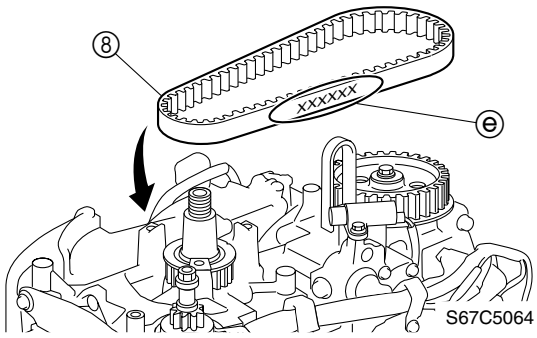
5. Align the notch ⓒ in the drive sprocket with the "▲" mark ⓓ on the cylinder block.



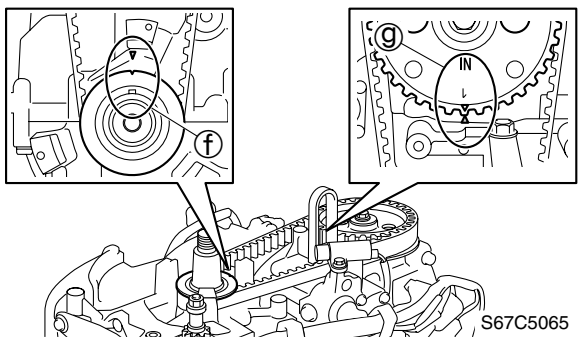
6. Install the timing belt ⑧ onto the drive sprocket, and then install it onto the driven sprocket so that the part number ⓔ on the belt is in the upright position.



CAUTION:

- **Do not twist, turn inside out, or bend the timing belt beyond the maximum limit of 25 mm (1.0 in), otherwise it can be damaged.**
- **Do not get oil or grease on the timing belt.**

7. Turn the drive sprocket clockwise 2 turns, and then check that the parts are aligned at the areas ⓕ and ⓖ as shown.



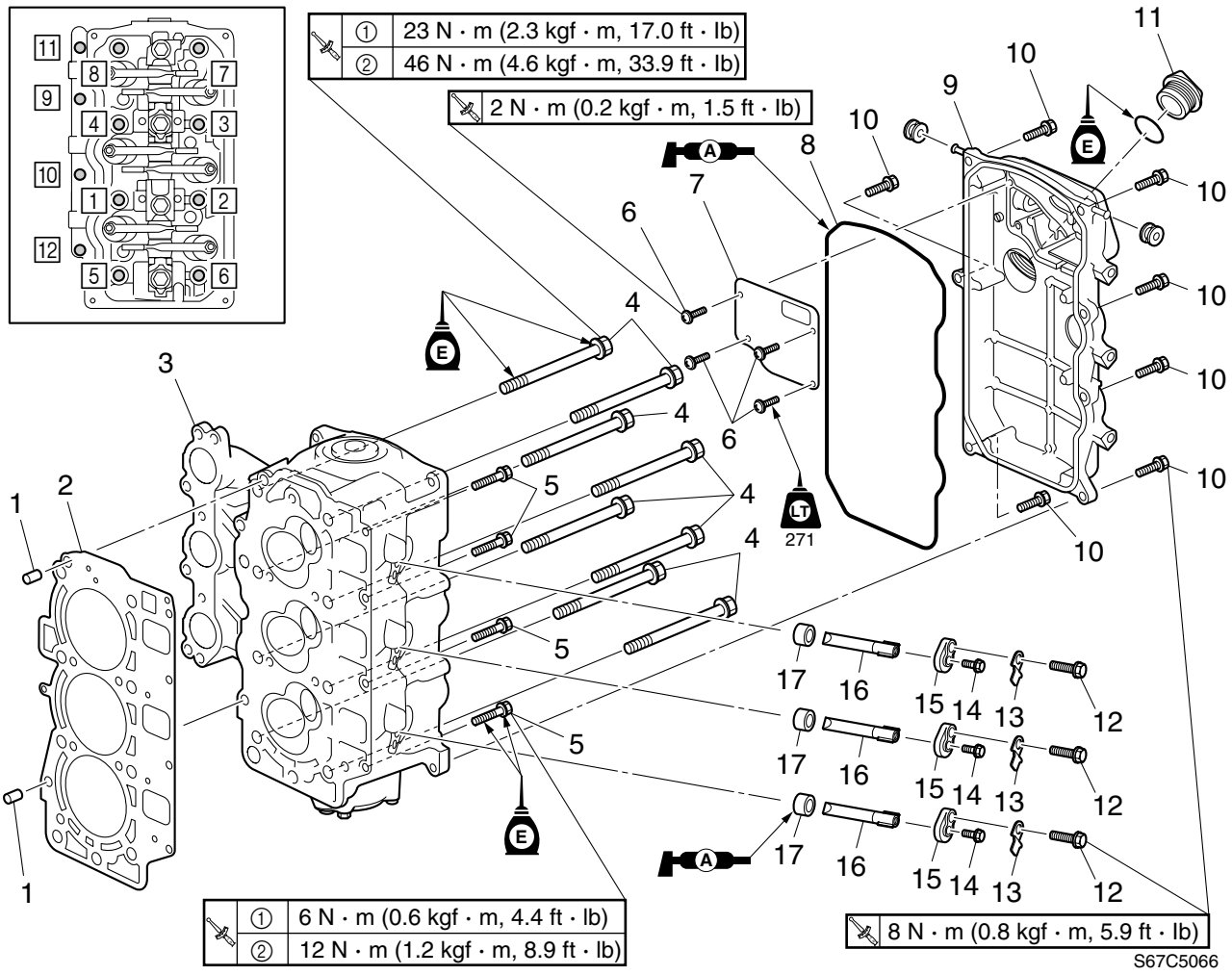
8. Install the stator assembly, spring washer, and flywheel magnet.

NOTE:

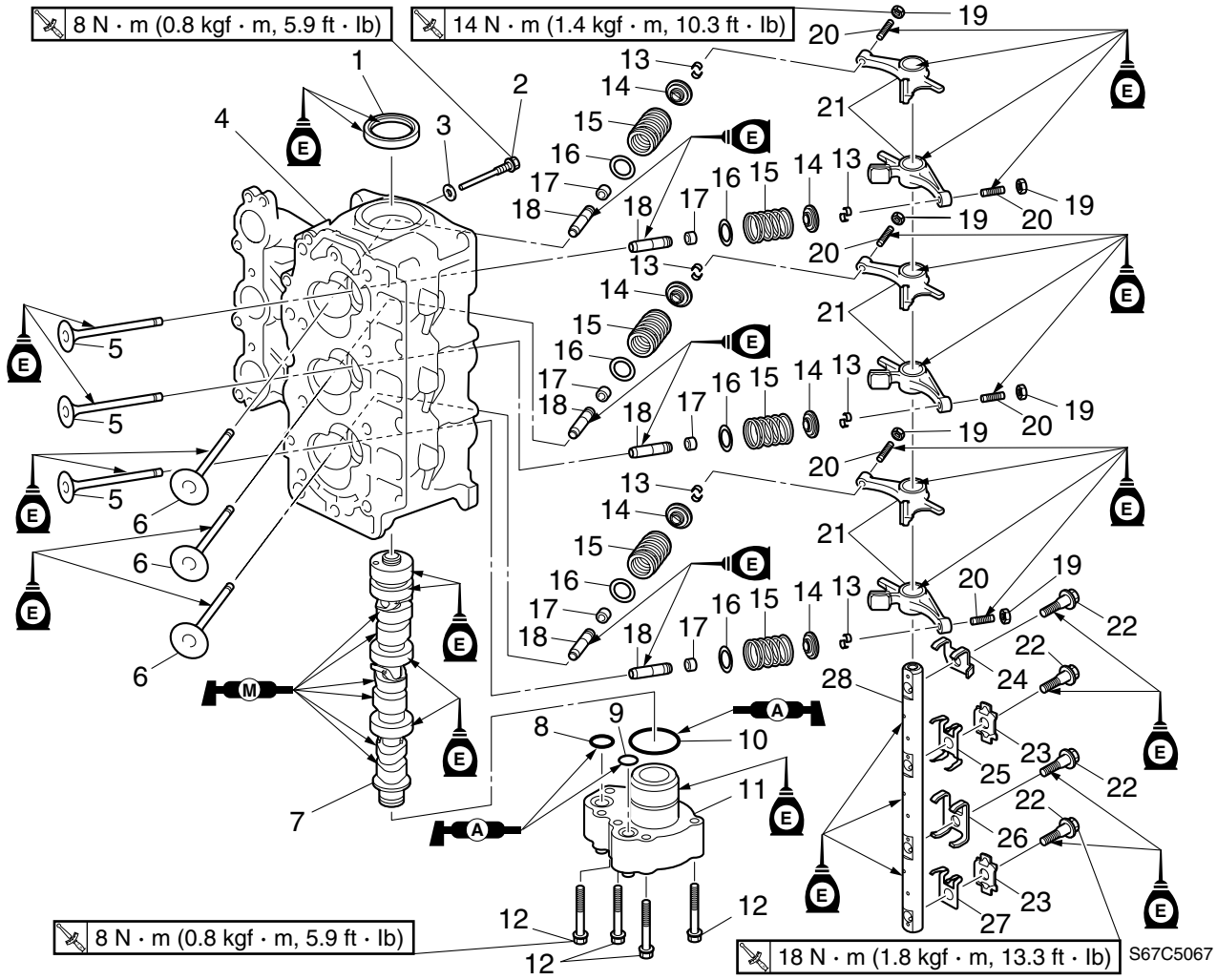
See "Replacing the timing belt" (5-3).

	Flywheel magnet nut: 157 N·m (15.7 kgf·m, 115.8 ft·lb)

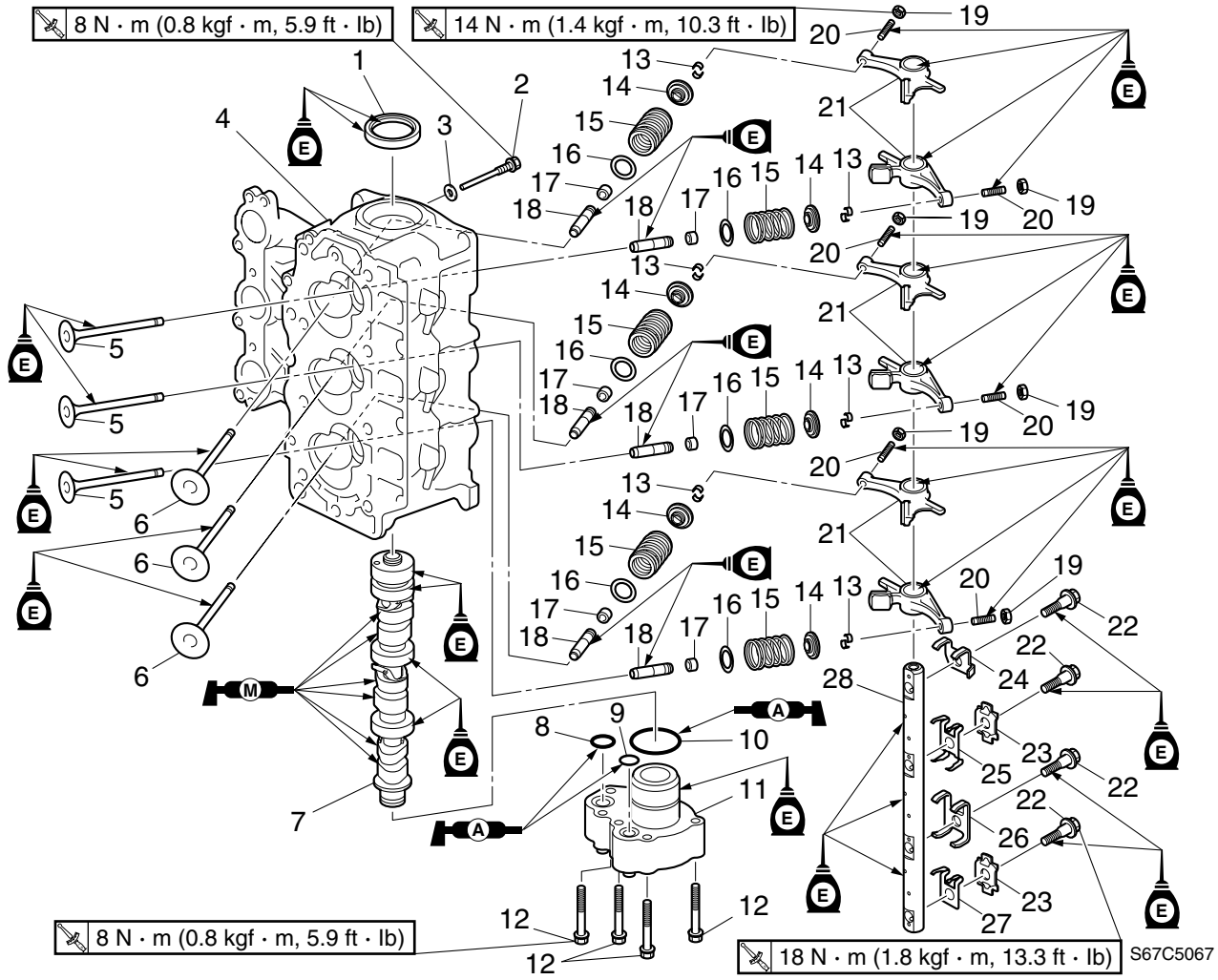
Cylinder head



No.	Part name	Q'ty	Remarks
1	Dowel	2	
2	Gasket	1	**Not reusable**
3	Cylinder head assembly	1	
4	Bolt	8	M9 × 95 mm
5	Bolt	4	M6 × 25 mm
6	Screw	4	ø4 × 10 mm
7	Plate	1	
8	Gasket	1	**Not reusable**
9	Cylinder head cover	1	
10	Bolt	7	M6 × 20 mm
11	Oil filler cap	1	
12	Bolt	3	M6 × 20 mm
13	Plate	3	
14	Bolt	3	M5 × 12 mm
15	Anode cover	3	
16	Anode	3	
17	Grommet	3	



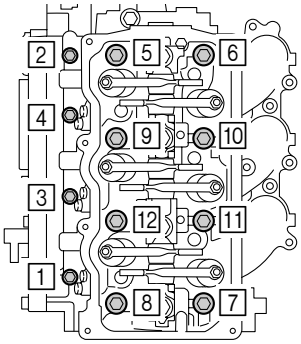
No.	Part name	Q'ty	Remarks
1	Oil seal	1	**Not reusable**
2	Bolt	1	
3	Gasket	1	**Not reusable**
4	Cylinder head	1	
5	Exhaust valve	3	
6	Intake valve	3	
7	Camshaft	1	
8	O-ring	1	**Not reusable**
9	O-ring	1	**Not reusable**
10	O-ring	1	**Not reusable**
11	Oil pump assembly	1	
12	Bolt	4	M6 × 45 mm
13	Valve cotter	12	
14	Valve spring retainer	6	
15	Valve spring	6	
16	Valve spring seat	6	
17	Valve seal	6	**Not reusable**



No.	Part name	Q'ty	Remarks
18	Valve guide	6	**Not reusable**
19	Locknut	6	
20	Adjusting screw	6	
21	Rocker arm	6	
22	Bolt	4	M8 × 30 mm
23	Retainer	2	
24	Retainer	1	
25	Spring	1	
26	Retainer	1	
27	Spring	1	
28	Rocker arm shaft	1	

Removing the cylinder head

1. Remove the cylinder head cover.
2. Remove the cylinder head bolts in the sequence shown.



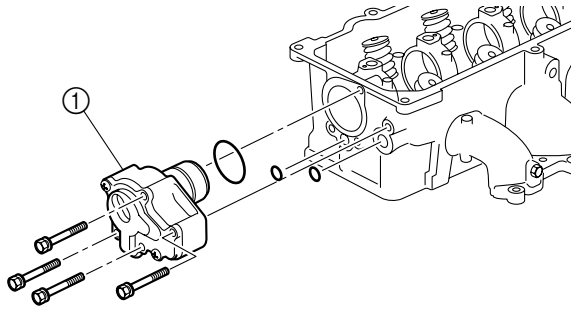
S67C5068

CAUTION:

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

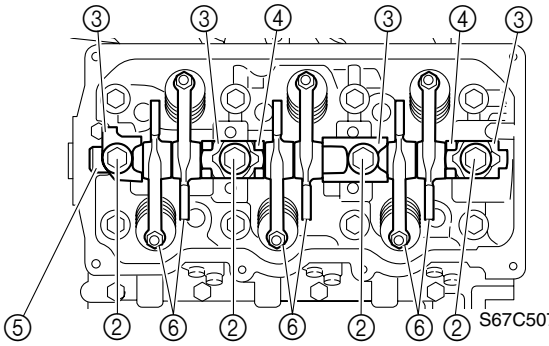
Disassembling the cylinder head

1. Remove the oil pump assembly ①.



S67C5069

2. Remove the bolts ②, retainers ③, springs ④, rocker arm shaft ⑤, and rocker arms ⑥.

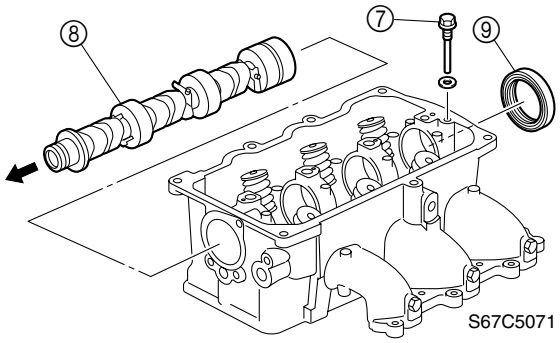


S67C5070

NOTE:

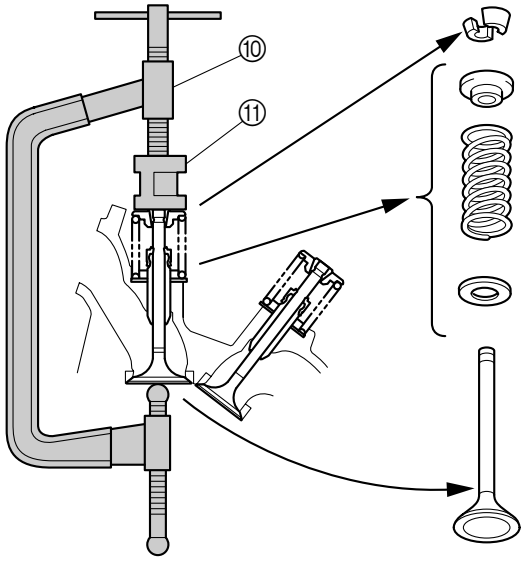
- Loosen the locknuts and adjusting screws to ease the tension on the rocker arm shaft ⑤ before removing it.
- Be sure to keep the parts in the order as they were removed.

3. Remove the bolt ⑦, camshaft ⑧, and oil seal ⑨.



S67C5071

4. Remove the intake and exhaust valves.



S67C5174

NOTE:

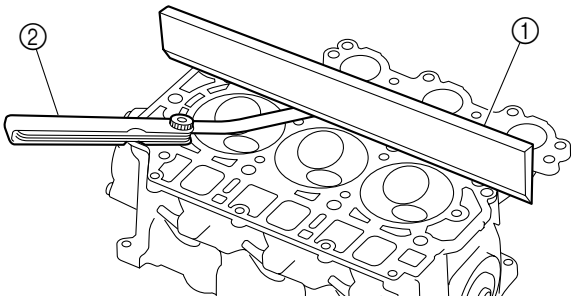
Be sure to keep the valves, springs, and other parts in the same order as removed.

	Valve spring compressor ⑩: 90890-04019 Valve spring compressor attachment ⑪: 90890-06320

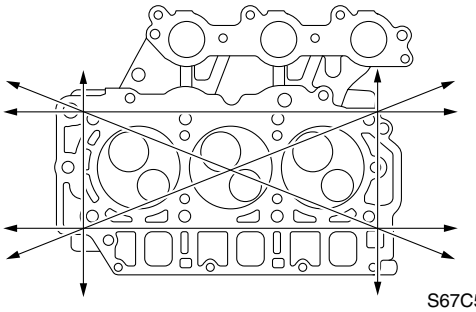
Checking the cylinder head

1. Eliminate carbon deposits from the combustion chambers and check the cylinder head for damage or scratches.

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



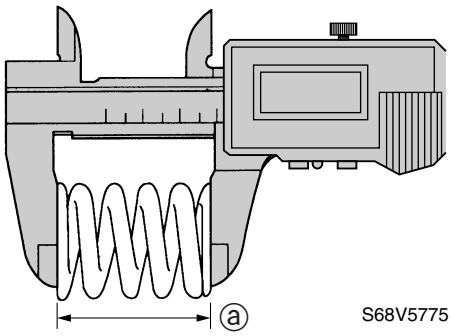
S67C5073


S67C5074

Cylinder head warpage limit:
0.10 mm (0.0039 in)

Checking the valve spring

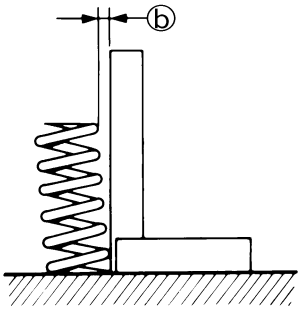
1. Measure the valve spring free length ⓐ. Replace if below specification.



S68V5775

Valve spring free length ⓐ:
39.85 mm (1.5689 in)

2. Measure the valve spring tilt ⓑ. Replace if above specification.



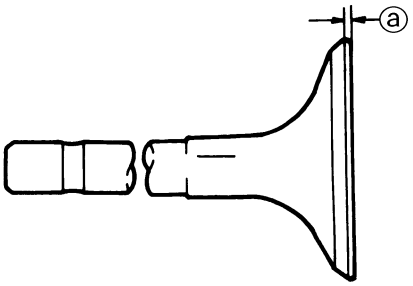
S69J5730

Valve spring tilt limit ⓑ:
1.7 mm (0.067 in)

Checking the valve

1. Check the valve face. Replace the valve if pitted or worn.

2. Measure the valve margin thickness ⓐ. Replace the valve if out of specification.

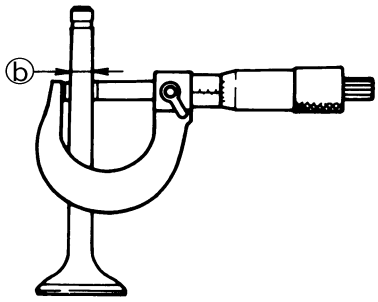


S69J5740

Valve margin thickness ⓐ:
Intake:
0.6–1.0 mm (0.024–0.039 in)
Exhaust:
0.7–1.1 mm (0.028–0.043 in)

5

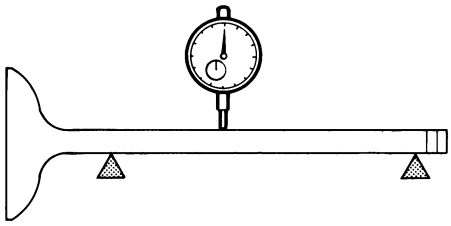
3. Measure the valve stem diameter ⓑ. Replace the valve if out of specification.



S69J5750

Valve stem diameter ⓑ:
Intake:
5.475–5.490 mm
(0.2156–0.2161 in)
Exhaust:
5.460–5.475 mm
(0.2150–0.2156 in)

4. Measure the valve stem runout. Replace the valve if above specification.



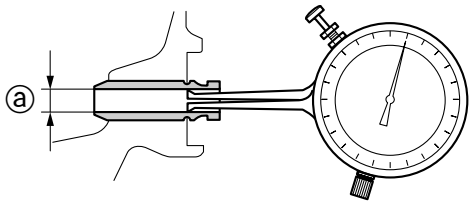
S69J5760

Valve stem runout limit:
Intake: 0.030 mm (0.0012 in)
Exhaust: 0.016 mm (0.0006 in)

Checking the valve guide

NOTE:
Before checking a valve guide, make sure that the valve stem diameter is within specification.

1. Measure the valve guide inside diameter ⓐ.



S6AU5085

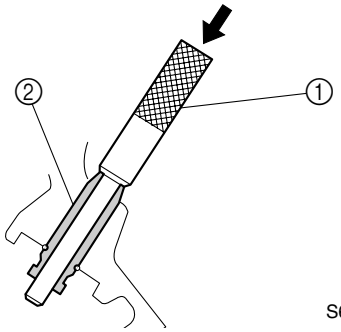
Valve guide inside diameter ⓐ:
Intake and exhaust:
5.500–5.512 mm
(0.2165–0.2170 in)

2. Calculate the valve-stem-to-valve-guide clearance as follows. Replace the valve guide if out of specification.

Valve-stem-to-valve-guide clearance = valve guide inside diameter – valve stem diameter:
Intake:
0.010–0.037 mm
(0.0004–0.0015 in)
Exhaust:
0.025–0.052 mm
(0.0010–0.0020 in)

Replacing the valve guide

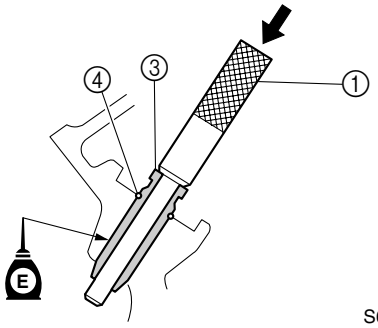
1. Remove the valve seal.
2. Insert the special service tool ① into the combustion chamber end of the valve guide ②, and then strike the tool to drive the guide out of the cylinder head.



S67C5081

Valve guide remover/installer ①:
90890-06801

3. Insert the special service tool ① into the camshaft end of a new valve guide ③, and then strike the tool to drive the guide into the cylinder head.

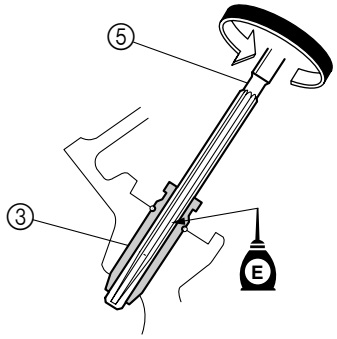


S67C5082

NOTE:
- Apply engine oil to the surface of a new valve guide ③ before installation.
- Make sure that the circlip ④ contacts the cylinder head.

Valve guide remover/installer ①: 90890-06801

4. Insert the special service tool ⑤ into the valve guide ③, and then ream the guide.



S67C5083

NOTE:
- Apply engine oil to the inner surface of the valve guide before reaming it.
- Turn the valve guide reamer clockwise to ream the valve guide.
- Do not turn the reamer counterclockwise when removing it.
- Be sure to clean the valve guide after reaming it.

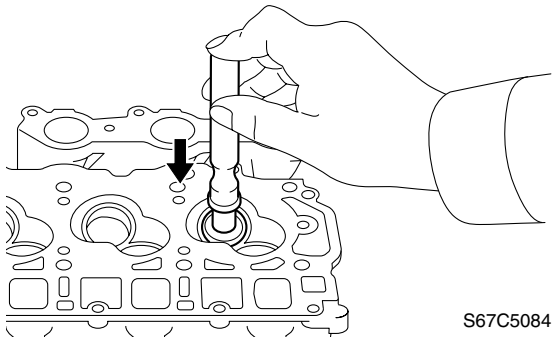
Valve guide reamer ⑤: 90890-06804

5. Measure the valve guide inside diameter.

Valve guide inside diameter:
Intake and exhaust:
5.500–5.512 mm
(0.2165–0.2170 in)

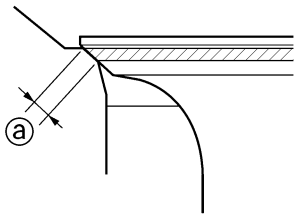
Checking the valve seat

1. Eliminate carbon deposits from the valve.
2. Apply a thin, even layer of Mechanic's blueing dye (Dykem) onto the valve seat.
3. Press the valve lightly against the valve seat with a valve lapper as shown.

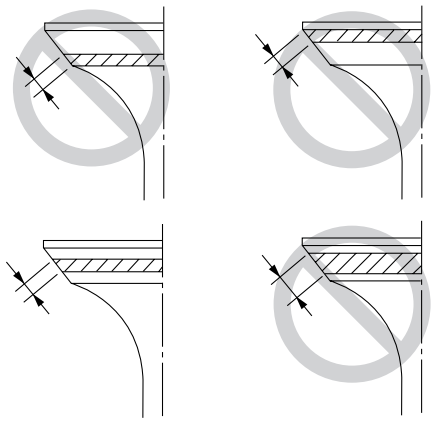

S67C5084

5

4. Determine the valve seat contact width ⓐ by measuring the blueing dye marking on the valve face. Reface the valve seat if the valve is not seated properly or if the valve seat contact width is out of specification. Check the valve guide if the valve seat contact width is uneven.



S69J5830

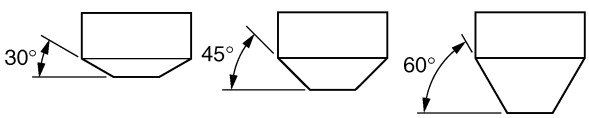


S68V5720

Valve seat contact width ⓐ:
Intake and exhaust:
0.9–1.1 mm (0.035–0.043 in)

Refacing the valve seat

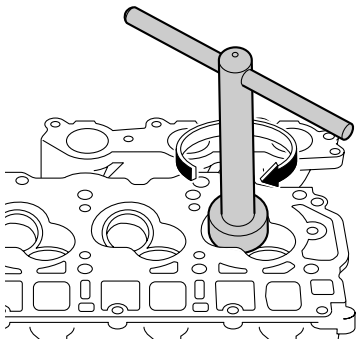
1. Reface the valve seat with valve seat cutters.



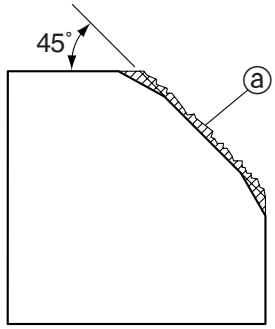
S69J5850

Valve seat cutter holder:
90890-06316
Valve seat cutter:
30° (intake): 90890-06327
30° (exhaust): 90890-06328
45° (intake): 90890-06325
45° (exhaust): 90890-06312
60° (intake and exhaust):
90890-06323

2. Cut the surface of the valve seat with a 45° cutter by turning the cutter clockwise until the valve seat face has become smooth.



S67C5090



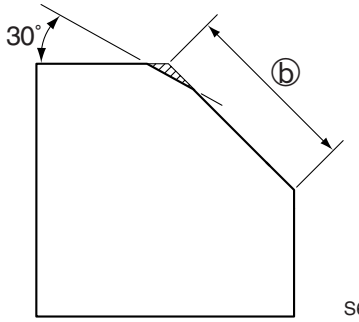
S6AG5J20J

ⓐ Slag or rough surface

CAUTION:

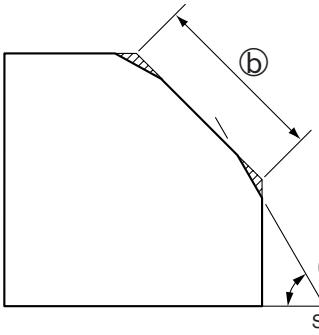
Do not over cut the valve seat. Be sure to turn the cutter evenly downward at a pressure of 40–50 N (4–5 kgf, 8.8–11 lbf) to prevent chatter marks.

3. Use a 30° cutter to adjust the contact width of the top edge of the valve seat.



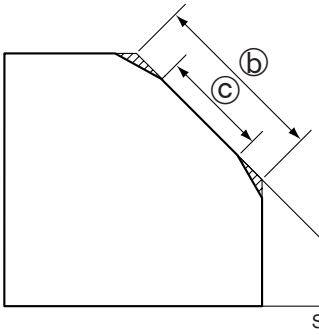
ⓑ Previous contact width

4. Use a 60° cutter to adjust the contact width of the bottom edge of the valve seat.



ⓑ Previous contact width

5. Use a 45° cutter to adjust the contact width of the valve seat to specification.

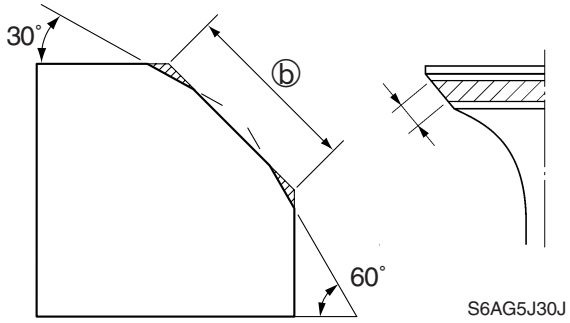


ⓑ Previous contact width
ⓒ Specified contact width

6. Check the valve seat contact area of the valve.

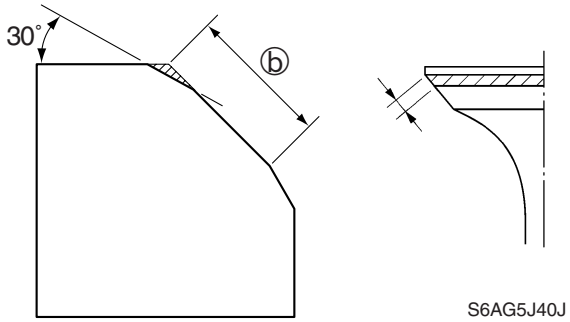
NOTE:
To check the valve seat contact area, see "Checking the valve seat" (5-32).

7. If the valve seat contact area is too wide and situated in the center of the valve face, use a 30° cutter to cut the top edge of the valve seat, and then use a 60° cutter to cut the bottom edge to center the area and set its width.



ⓑ Previous contact width

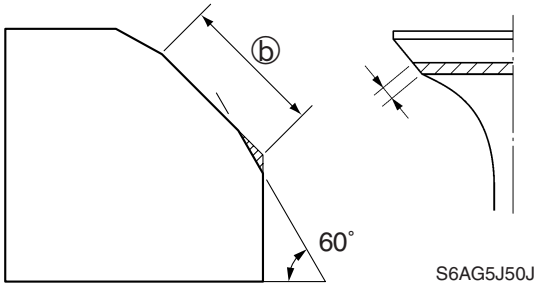
8. If the valve seat contact area is too narrow and situated near the top edge of the valve face, use a 30° cutter to cut the top edge of the valve seat and center the area, and then use a 45° cutter to set its width.



ⓑ Previous contact width

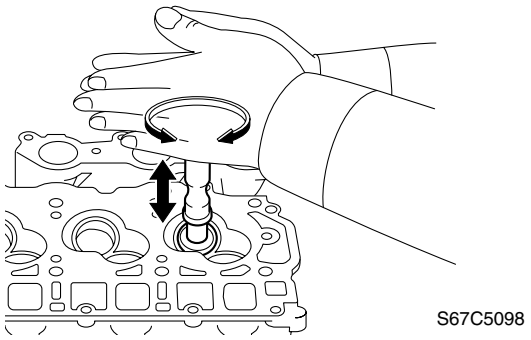
5

9. If the valve seat contact area is too narrow and situated near the bottom edge of the valve face, use a 60° cutter to cut the bottom edge of the valve seat, and then use a 45° cutter to center the area and set its width.



ⓑ Previous contact width

10. After refacing the valve seat to the specified contact width, apply a thin, even layer of lapping compound onto the valve seat, and then lap the valve using a valve lapper.



CAUTION:

Do not get the lapping compound on the valve stem and valve guide.

11. After every lapping procedure, be sure to clean off any remaining lapping compound from the cylinder head and the valve.

12. Check the valve seat contact area of the valve again.

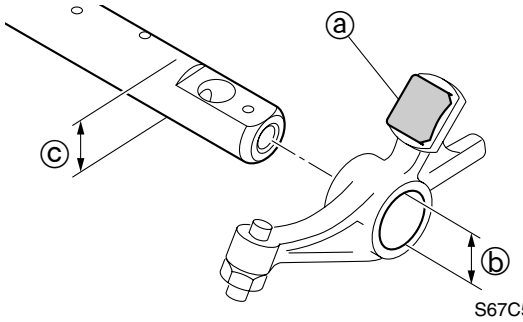
NOTE:

To check the valve seat contact area, see "Checking the valve seat" (5-32).

Checking the rocker arm and rocker arm shaft

1. Check the rocker arms, rocker arm shaft, and contact surface ⓐ of each rocker arm. Replace if worn.

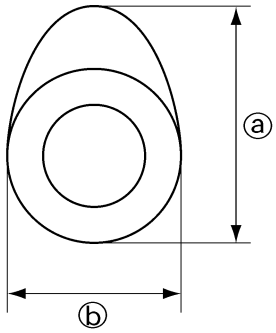
2. Measure the rocker arm inside diameter ⓑ and rocker arm shaft outside diameter ⓒ. Replace if out of specification.



Rocker arm inside diameter ⓑ:
16.000–16.018 mm
(0.6299–0.6306 in)
Rocker arm shaft outside diameter ⓒ:
15.971–15.991 mm
(0.6288–0.6296 in)

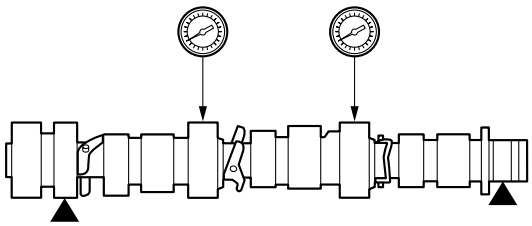
Checking the camshaft

1. Measure the cam lobe height ⓐ and width ⓑ. Replace if out of specification.



Cam lobe height ⓐ:
Intake and exhaust:
30.834–31.034 mm
(1.2139–1.2218 in)
Cam lobe width ⓑ:
Intake and exhaust:
25.900–26.100 mm
(1.0197–1.0276 in)

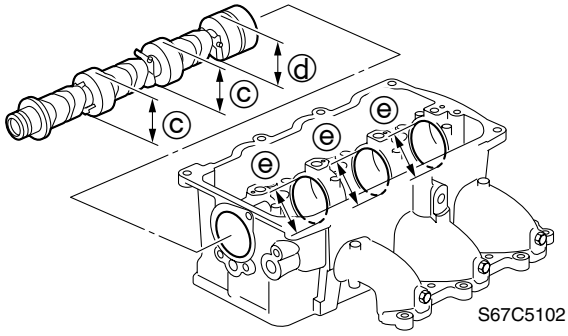
2. Measure the camshaft runout. Replace if above specification.



S67C5101

Camshaft runout limit:
0.03 mm (0.0012 in)

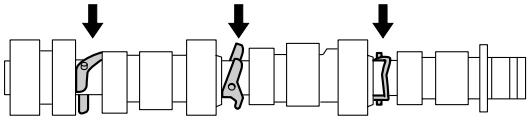
3. Measure the camshaft journal diameters ⓒ and ⓓ, and the cylinder head journal inside diameters ⓔ. Replace the camshaft, cylinder head, or both if out of specification.



S67C5102

Camshaft journal diameter ⓒ:
36.935–36.955 mm
(1.4541–1.4549 in)
Camshaft journal diameter ⓓ:
36.925–36.945 mm
(1.4537–1.4545 in)
Cylinder head journal inside diameter ⓔ:
37.000–37.025 mm
(1.4567–1.4577 in)

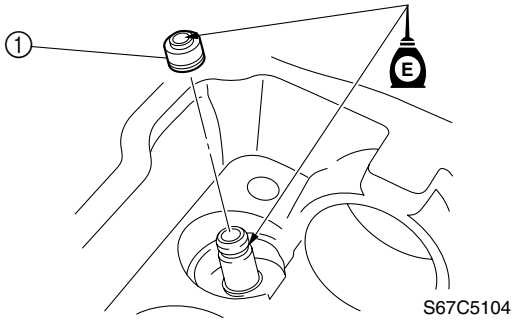
4. Check the automatic decompression actuators. Replace the camshaft if damaged or worn. (M and W model)



S67C5103

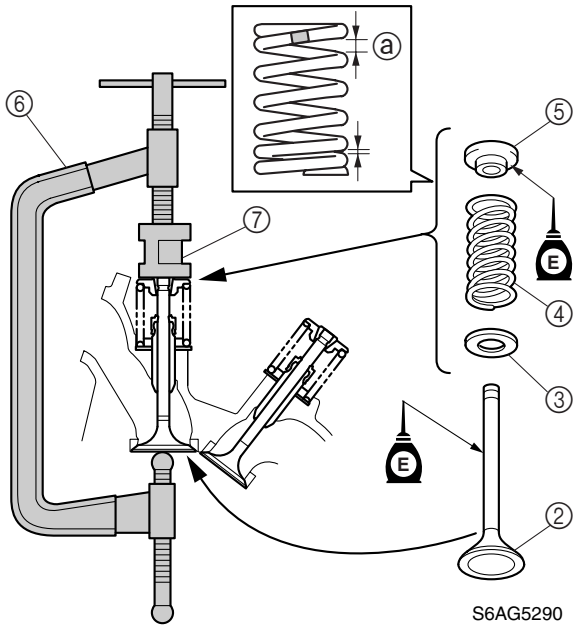
Assembling the cylinder head

1. Install a new valve seal ① onto the valve guide.



S67C5104

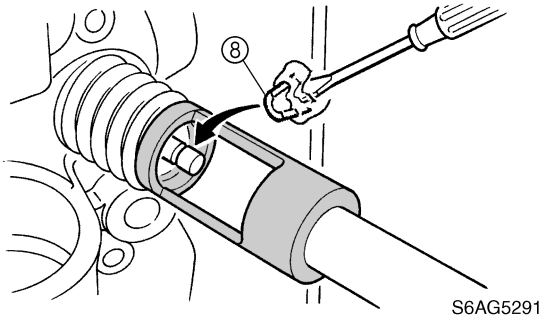
2. Install the valve ②, valve spring seat ③, valve spring ④, and valve spring retainer ⑤ in the sequence shown, and then attach the special service tools.



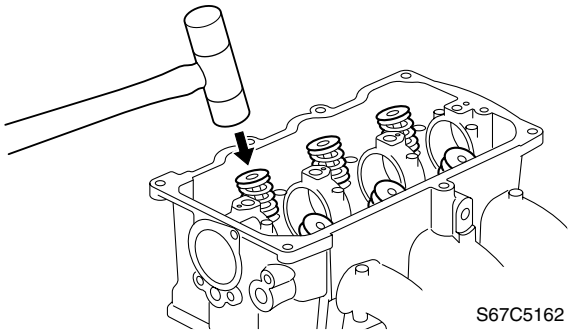
NOTE:
Face the wide-pitched spring end ⓐ, identified by the paint mark, toward the valve spring retainer ⑤.

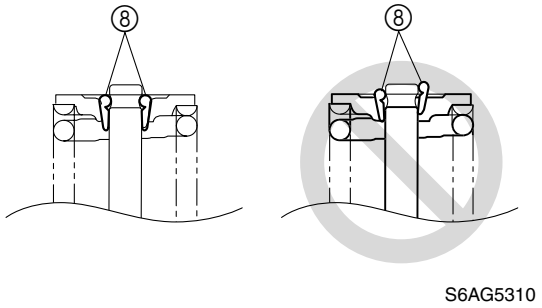
Valve spring compressor ⑥: 90890-04019
Valve spring compressor attachment ⑦: 90890-06320

3. Compress the valve spring, and then install the valve cotters ⑧.

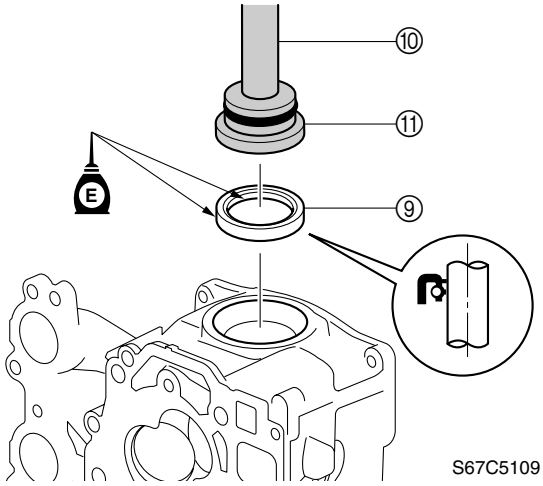


4. Lightly tap the valve spring retainer with a plastic hammer to set the valve cotters ⑧ securely.



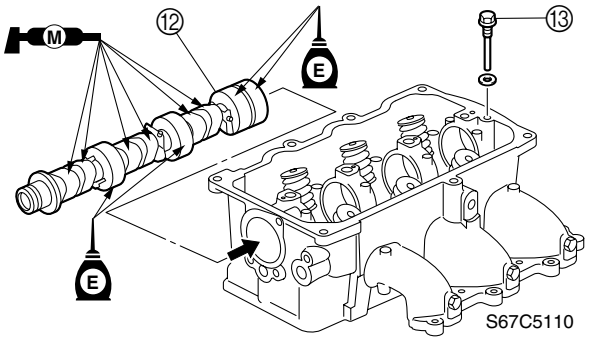


5. Install a new oil seal ⑨.

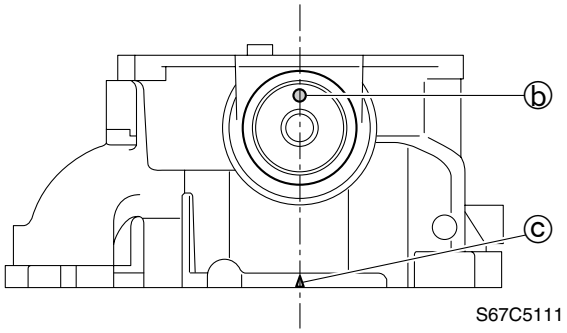


Driver rod LS ⑩: 90890-06606
Ball bearing attachment ⑪: 90890-06631

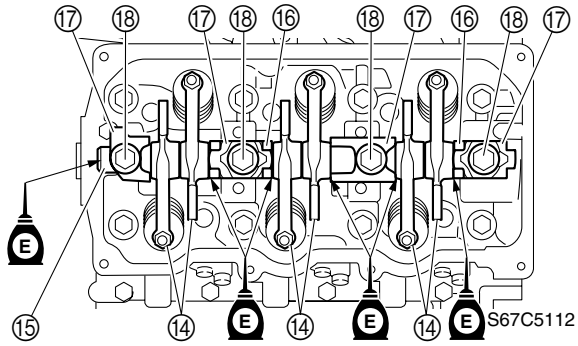
6. Install the camshaft ⑫ in the direction of the arrow shown, and then tighten the bolt ⑬.



7. Align the dowel hole ⓑ in the camshaft with the "▲" mark ⓒ on the cylinder head as shown.

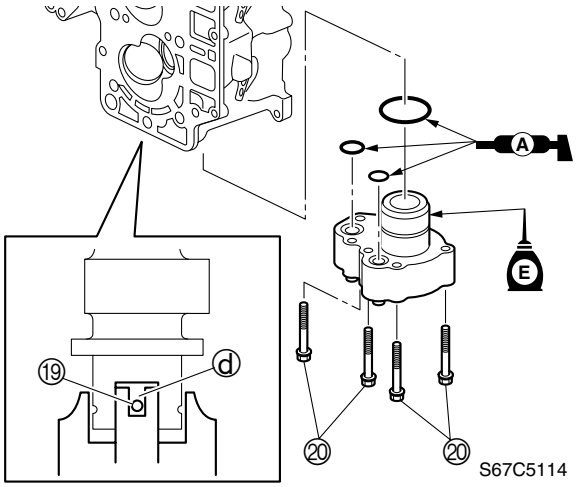


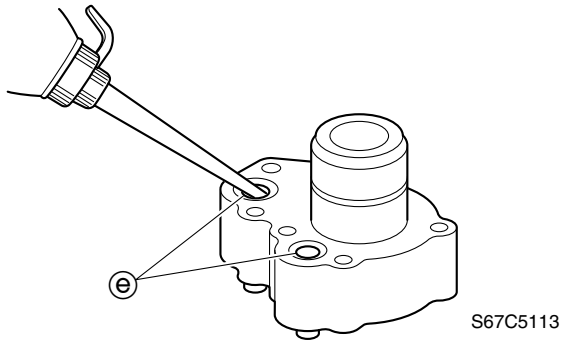
8. Install the rocker arms ⑭, rocker arm shaft ⑮, springs ⑯, and retainers ⑰ into the cylinder head, and then tighten the bolts ⑱ to the specified torque.



	Rocker arm shaft bolt ⑱: 18 N·m (1.8 kgf·m, 13.3 ft·lb)

9. Install the oil pump assembly by aligning the slot ⓓ in the oil pump drive shaft with the camshaft pin ⑲, and then tighten the bolts ⑳ to the specified torque.





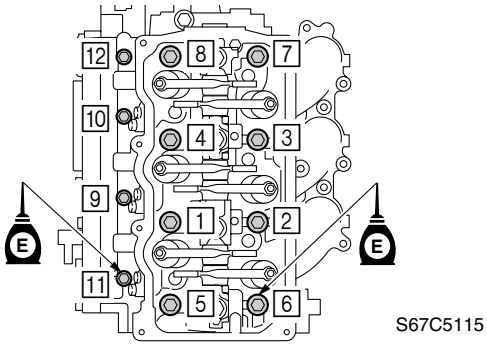
NOTE:
Before installing the oil pump assembly, be sure to fill it with a small amount of engine oil through the oil passages ⓔ.

	Oil pump assembly bolt ⑳: 8 N·m (0.8 kgf·m, 5.9 ft·lb)

5

Installing the cylinder head

1. Install a new gasket, the dowels, and the cylinder head, and then tighten the bolts to the specified torques in the sequence shown.



CAUTION:

Do not reuse the cylinder head gasket, always replace it with a new one.

NOTE:

- Apply engine oil to the cylinder head bolts before installation.
- Tighten the bolts to the specified torques in 2 stages.

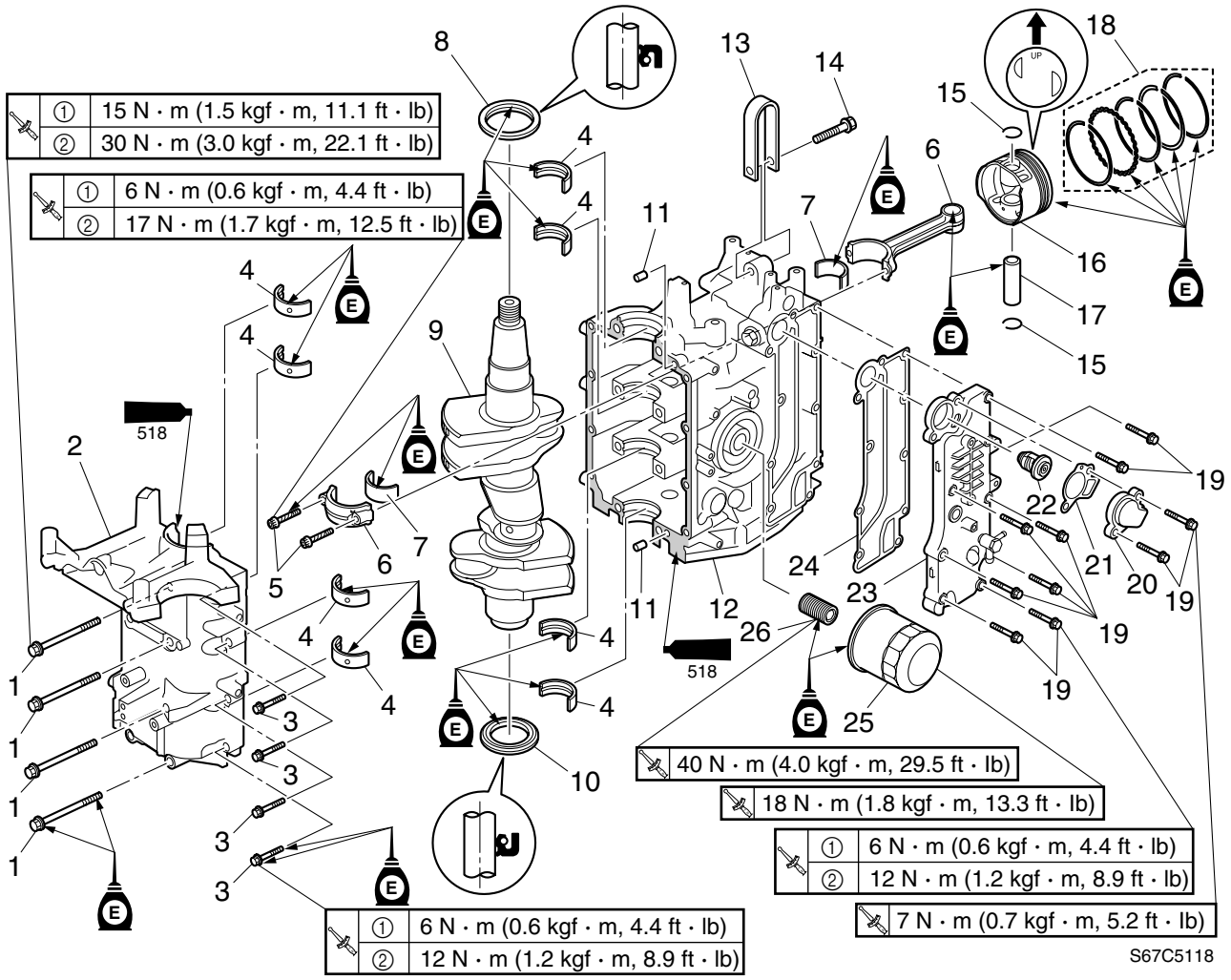
Cylinder head bolt (M9):
1st: 23 N·m (2.3 kgf·m, 17.0 ft·lb)
2nd: 46 N·m (4.6 kgf·m, 33.9 ft·lb)
Cylinder head bolt (M6):
1st: 6 N·m (0.6 kgf·m, 4.4 ft·lb)
2nd: 12 N·m (1.2 kgf·m, 8.9 ft·lb)

2. Adjust the valve clearances.

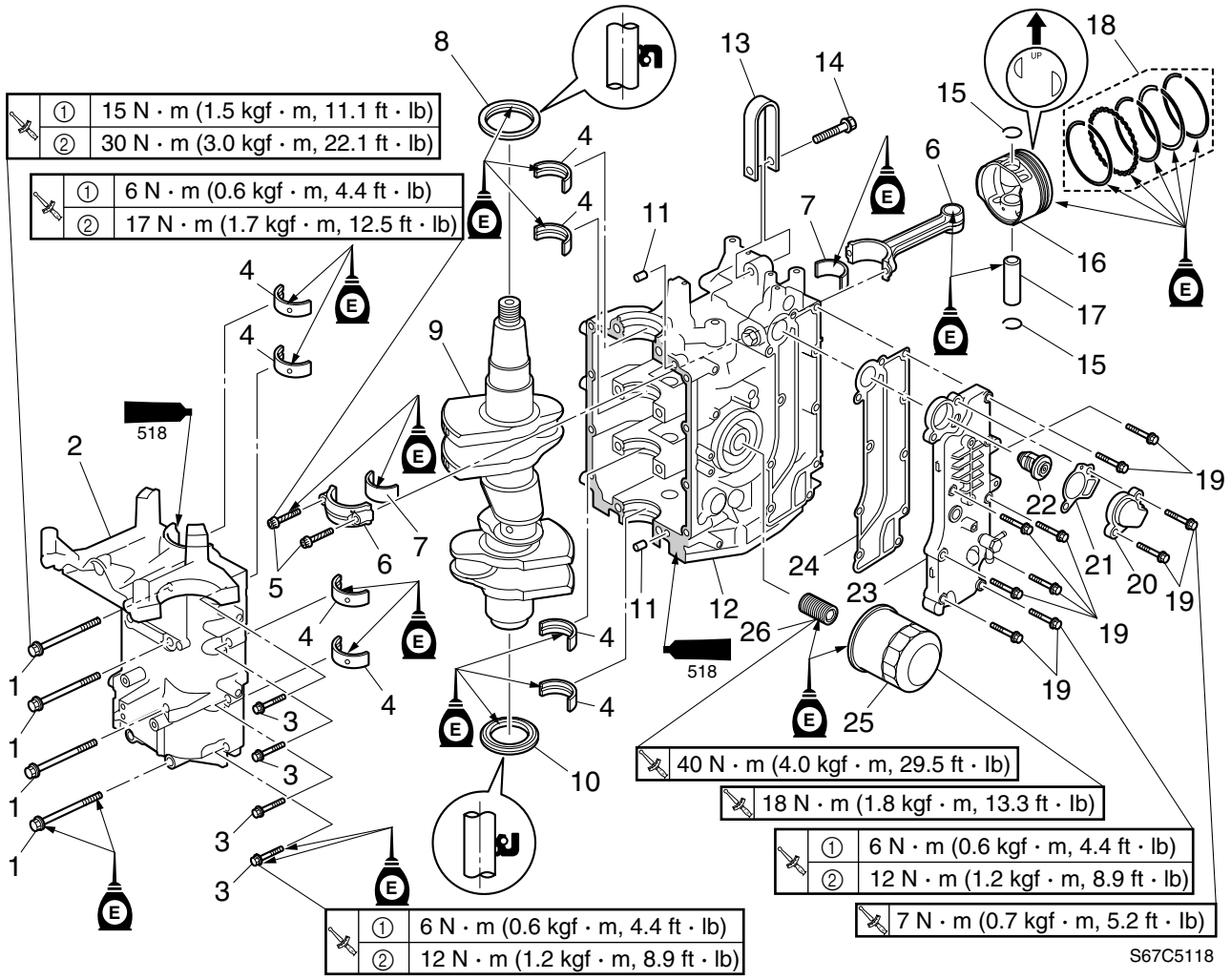
NOTE:

- Be sure to install the timing belt before adjusting the valve clearances.
- To adjust the valve clearances, see “Checking the valve clearance” (5-2).

Cylinder block



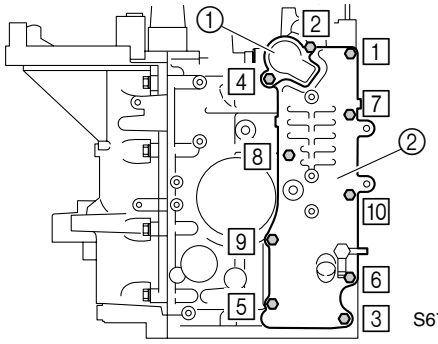
No.	Part name	Q'ty	Remarks
1	Bolt	8	M8 × 82 mm
2	Crankcase	1	
3	Bolt	8	M6 × 35 mm
4	Main bearing	8	
5	Bolt	6	M6 × 30 mm
6	Connecting rod	3	
7	Connecting rod bearing	6	
8	Oil seal	1	**Not reusable**
9	Crankshaft	1	
10	Oil seal	1	**Not reusable**
11	Dowel	2	
12	Cylinder block	1	
13	Hanger	1	
14	Bolt	1	M8 × 35 mm
15	Clip	6	**Not reusable**
16	Piston	3	
17	Piston pin	3	



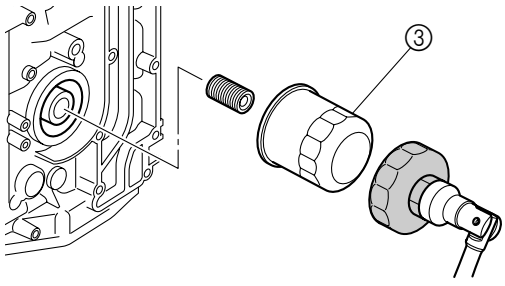
No.	Part name	Q'ty	Remarks
18	Piston ring set	3	
19	Bolt	10	M6 × 35 mm
20	Thermostat cover	1	
21	Gasket	1	**Not reusable**
22	Thermostat	1	
23	Exhaust cover	1	
24	Gasket	1	**Not reusable**
25	Oil filter	1	
26	Union bolt	1	

Disassembling the cylinder block

1. Remove the thermostat cover bolts and exhaust cover bolts in the sequence shown, and then remove the thermostat cover ①, thermostat, and exhaust cover ②.

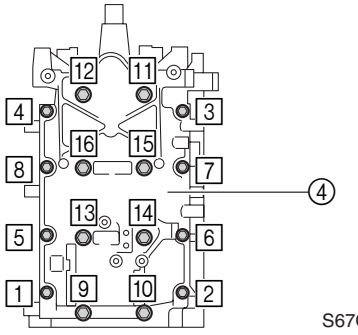


2. Remove the oil filter ③ using a 64 mm (2.5 in) oil filter wrench.

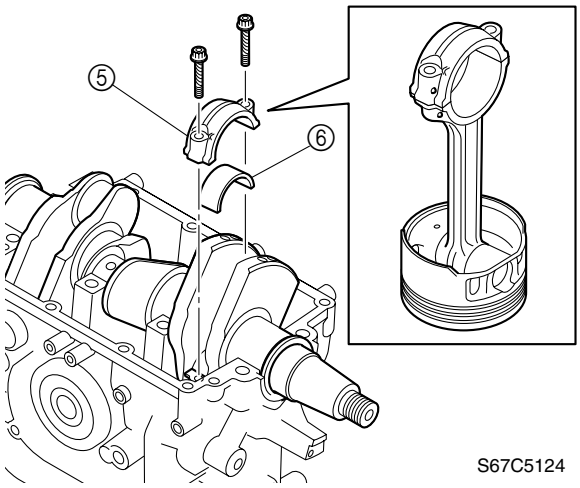


	Oil filter wrench: 90890-01426

3. Remove the crankcase bolts in the sequence shown, and then remove the crankcase ④.



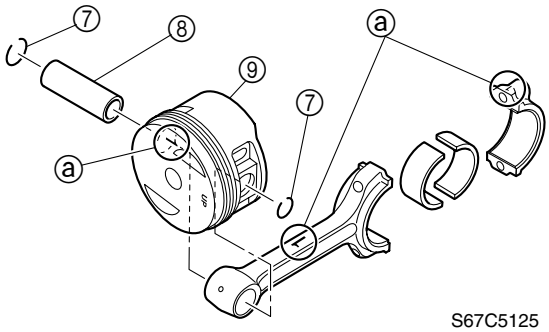
4. Remove the connecting rod caps ⑤ and bearings ⑥, and then remove the connecting rods, bearings, and piston assemblies.



5. Remove the crankshaft, main bearings, and oil seals.

NOTE:
Be sure to keep the main bearings in the order as they were removed.

6. Remove the piston pin clips ⑦ and piston pin ⑧, and then remove the piston ⑨.

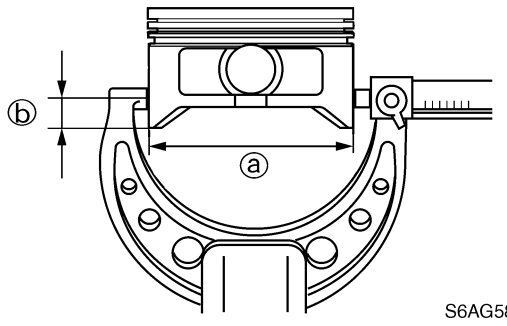


NOTE:
To avoid interchanging the pistons, connecting rods, and connecting rod caps, mark each with an identification number ⓐ of the corresponding cylinder and be sure to keep them in the order as they were removed.

7. Remove the piston rings.

Checking the piston diameter

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

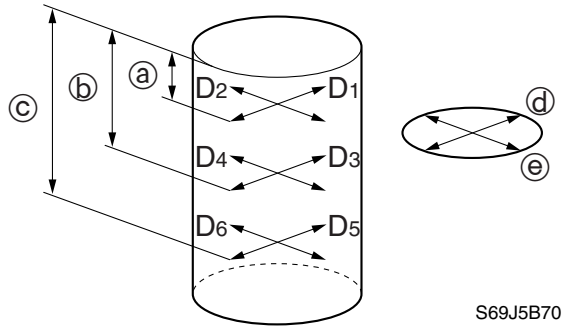


S6AG5850

Piston diameter ⓐ:
64.950–64.965 mm
(2.5571–2.5577 in)
Measuring point ⓑ:
2.0 mm (0.08 in) up from the bottom of the piston skirt
Oversize piston diameter:
Oversize 1st:
65.200–65.215 mm
(2.5669–2.5675 in)
Oversize 2nd:
65.450–65.465 mm
(2.5768–2.5774 in)

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 in direction ⓔ (D_2, D_4, D_6), which is at a right angle to the crankshaft.



S69J5B70

ⓐ 20 mm (0.8 in)
ⓑ 40 mm (1.6 in)
ⓒ 60 mm (2.4 in)

Cylinder bore (D_1–D_6):
64.985–65.015 mm
(2.5585–2.5596 in)

Checking the piston clearance

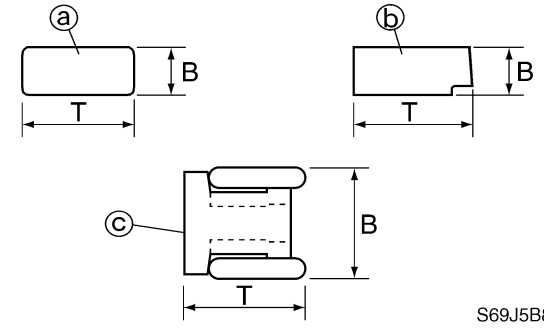
1. Check the piston clearances if replacing the pistons, piston ring sets, cylinder block, or all parts.

NOTE:
The figures are for reference only. Depending on how the parts are assembled, the actual measurements may not be within the specified ranges.

Piston clearance (reference data):
0.035–0.065 mm
(0.0014–0.0026 in)

Checking the piston ring

1. Measure the piston ring dimensions B and T. Replace the piston ring set if out of specification.

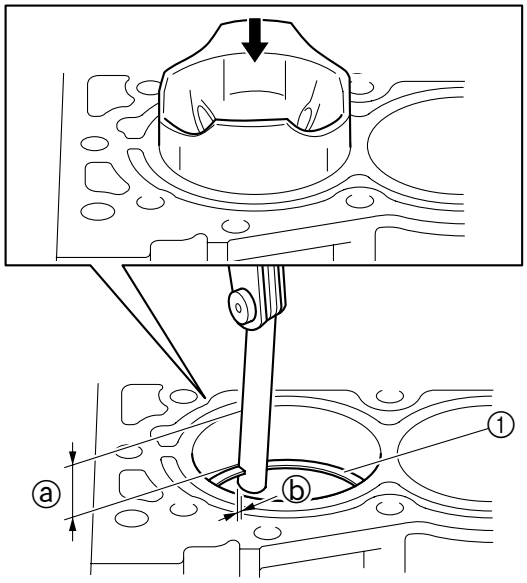


S69J5B80

Piston ring dimensions:
Top ring ⓐ:
B: 1.17–1.19 mm
(0.0461–0.0469 in)
T: 2.30–2.50 mm
(0.0906–0.0984 in)
2nd ring ⓑ:
B: 1.47–1.49 mm
(0.0579–0.0587 in)
T: 2.60–2.80 mm
(0.1024–0.1102 in)
Oil ring ⓒ:
B: 2.36–2.48 mm
(0.0929–0.0976 in)
T: 2.75 mm (0.1083 in)
(reference data)

Checking the piston ring end gap

1. Level the piston ring ① in the cylinder with a piston crown at the specified measuring point ⓐ.
2. Measure the piston ring end gap ⓑ.



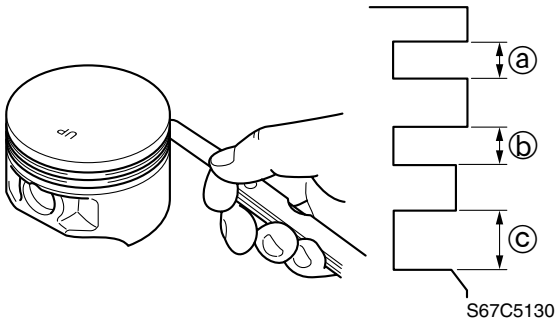
S67C5129

NOTE:
The figures are for reference only. Depending on how the parts are assembled, the actual measurements may not be within the specified ranges.

Piston ring end gap ⓑ (reference data):
Top ring:
0.15–0.30 mm
(0.0059–0.0118 in)
2nd ring:
0.30–0.50 mm
(0.0118–0.0197 in)
Oil ring:
0.20–0.70 mm
(0.0079–0.0276 in)
Measuring point ⓐ (reference data):
20 mm (0.8 in)

Checking the piston ring groove

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



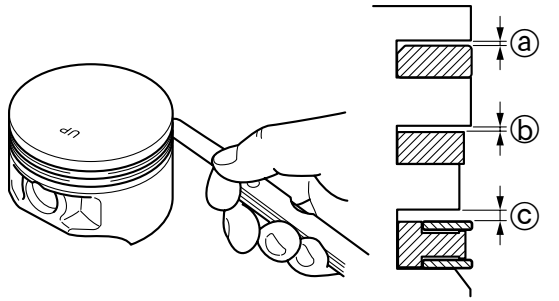
S67C5130

Piston ring groove:
Top ring ⓐ:
1.21–1.23 mm
(0.0476–0.0484 in)
2nd ring ⓑ:
1.51–1.53 mm
(0.0594–0.0602 in)
Oil ring ⓒ:
2.52–2.54 mm
(0.0992–0.1000 in)

5

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.

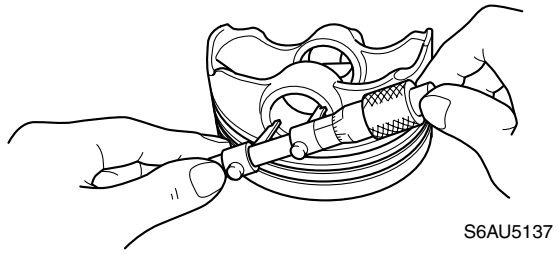


S67C5131

Piston ring side clearance:
Top ring ⓐ:
0.02–0.06 mm
(0.0008–0.0024 in)
2nd ring ⓑ:
0.02–0.06 mm
(0.0008–0.0024 in)
Oil ring ⓒ:
0.04–0.18 mm
(0.0016–0.0071 in)

Checking the piston pin boss bore

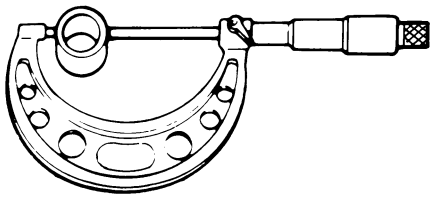
1. Measure the piston pin boss bore. Replace the piston if out of specification.


S6AU5137

Piston pin boss bore:
15.974–15.985 mm
(0.6289–0.6293 in)

Checking the piston pin diameter

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


S69J5C30

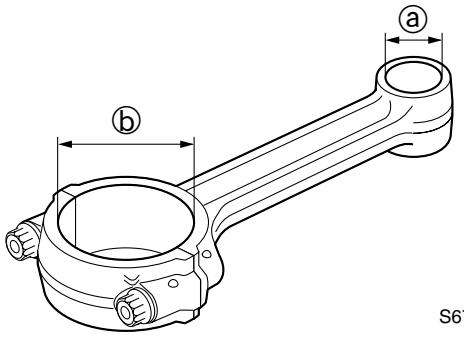
Piston pin diameter:
15.965–15.970 mm
(0.6285–0.6287 in)

Checking the connecting rod small end inside diameter and big end inside diameter

1. Tighten the connecting rod cap bolts to the specified torques in 2 stages.

Connecting rod cap bolt:
1st: 6 N·m (0.6 kgf·m, 4.4 ft·lb)
2nd: 17 N·m (1.7 kgf·m, 12.5 ft·lb)

2. Measure the connecting rod small end inside diameter ⓐ and big end inside diameter ⓑ. Replace the connecting rod if out of specification.

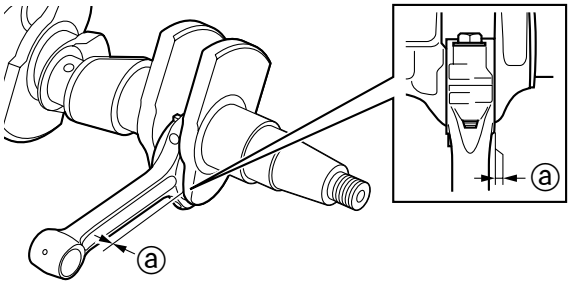


S67C5134

Connecting rod small end inside diameter ⓐ:
15.985–15.998 mm
(0.6293–0.6298 in)
Connecting rod big end inside diameter ⓑ:
36.000–36.024 mm
(1.4173–1.4183 in)

Checking the connecting rod big end side clearance

1. Measure the connecting rod big end side clearance ⓐ.

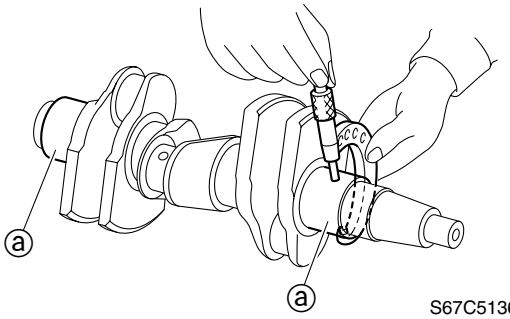


S67C5135

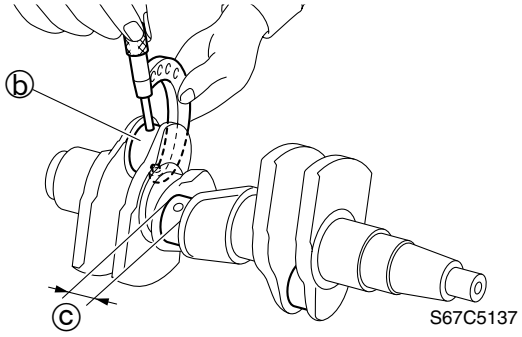
Connecting rod big end side clearance ⓐ (reference data):
0.12–0.15 mm (0.0047–0.0059 in)

Checking the crankshaft

1. Measure the crankshaft journal diameters ⓐ, crankpin diameters ⓑ, and crankpin widths ⓒ. Replace the crankshaft if out of specification.



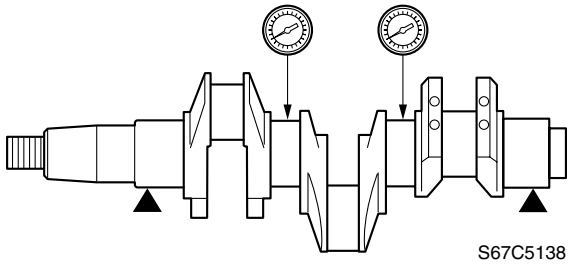
S67C5136



S67C5137

Crankshaft journal diameter ⓐ:
42.984–43.000 mm
(1.6923–1.6929 in)
Crankpin diameter ⓑ:
32.984–33.000 mm
(1.2986–1.2992 in)
Crankpin width ⓒ:
21.000–21.070 mm
(0.8268–0.8295 in)

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



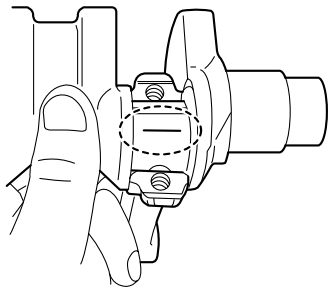
S67C5138

Crankshaft runout limit:
0.05 mm (0.0020 in)

Checking the crankpin oil clearance

1. Clean the bearings, connecting rods and, crankpin.

2. Put a piece of Plastigauge (PG-1) onto the crankpin, parallel to the crankshaft.

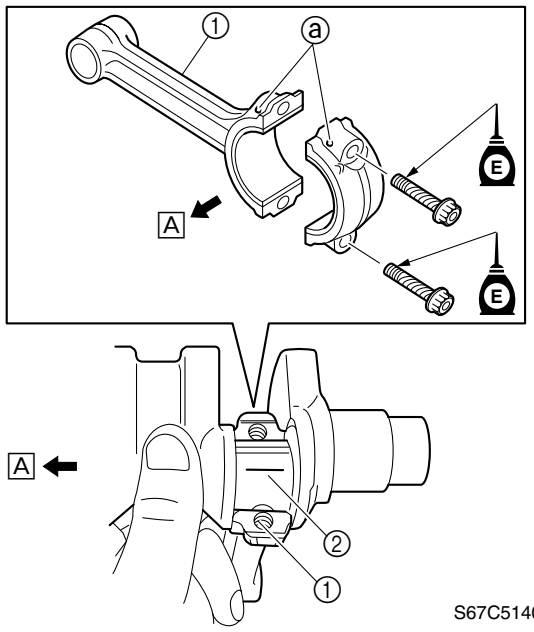


S6AU5144

NOTE:
Be sure not to put the Plastigauge (PG-1) over the oil hole in the crankpin of the crankshaft.

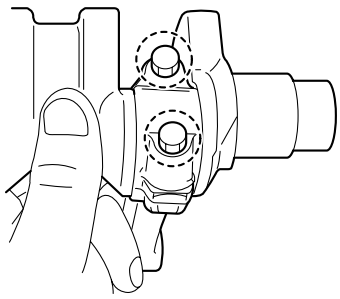
5

3. Install the connecting rod ① and bearings to the crankpin ②.



NOTE:
Make sure that the projections ⓐ on the connecting rod and connecting rod cap face towards the flywheel magnet end A of the crankshaft.

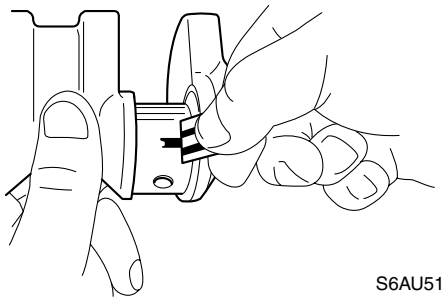
4. Tighten the connecting rod cap bolts to the specified torques in 2 stages.



NOTE:
Do not turn the connecting rod until the crankpin oil clearance measurement has been completed.

Connecting rod cap bolt:
1st: 6 N·m (0.6 kgf·m, 4.4 ft·lb)
2nd: 17 N·m (1.7 kgf·m, 12.5 ft·lb)

5. Remove the connecting rod cap and measure the width of the compressed Plastigauge (PG-1) on the crankpin. Check the connecting rods, bearings, and crankshaft if out of specification and replace the defective parts.

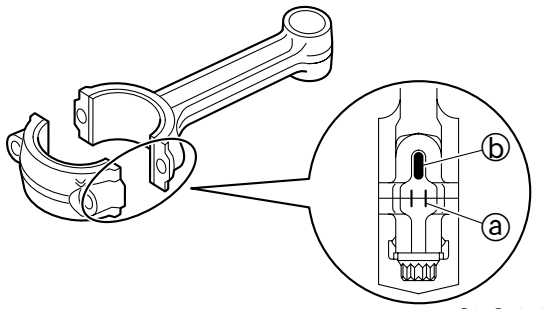


Crankpin oil clearance (reference data):
0.020–0.052 mm
(0.0008–0.0020 in)

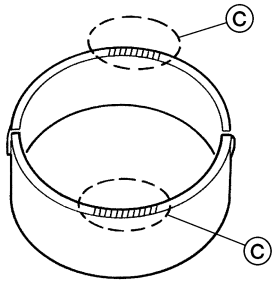
Selecting the connecting rod bearing

1. When replacing the connecting rod bearing, select the suitable bearing as follows.

2. Check the connecting rod mark ⓐ or painted color ⓑ on the connecting rod.



3. Select the suitable bearing color ⓒ for the connecting rod bearing from the table.



S67C5172

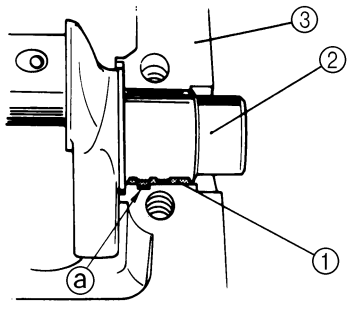
Connecting rod mark ⓐ/color ⓑ	Bearing color ⓒ
I/Red	Blue
II/Blue	Black
III/Yellow	Brown

Checking the crankshaft journal oil clearance

1. Clean the main bearings, crankshaft journals, and bearing portions of the crankcase and cylinder block.

2. Place the cylinder block upside down on a bench.

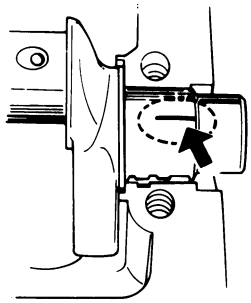
3. Install half of the main bearings ① and the crankshaft ② into the cylinder block ③.



S6D55860

NOTE:
- Install the main bearings ① in their original positions.
- Insert the projection ⓐ of each bearing into the slots in the cylinder block ③.

4. Put a piece of Plastigauge (PG-1) on each crankshaft journal parallel to the crankshaft.



S6D55870

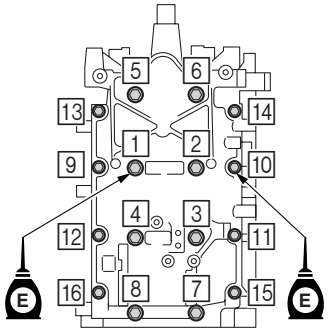
NOTE:
Be sure not to put the Plastigauge (PG-1) over the oil hole in each crankshaft journal.

5. Install the remaining half of the main bearings into the crankcase.

NOTE:
- Install the main bearings in their original positions.
- Insert the projection of each bearing into the slots in the crankcase.

5

6. Install the crankcase onto the cylinder block, and then tighten the crankcase bolts to the specified torques in 2 stages and in the sequence shown.

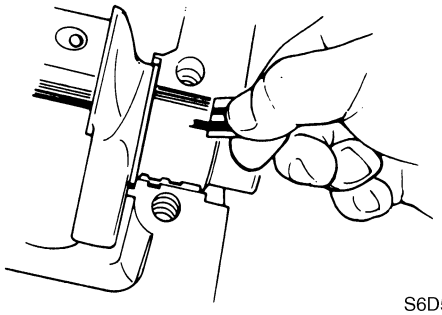


S67C5145

NOTE:
- Apply engine oil to the threads of the crankcase bolts.
- Do not turn the crankshaft until the crankshaft journal oil clearance measurement has been completed.

Crankcase bolt 1–8 (M8):
1st: 15 N·m (1.5 kgf·m, 11.1 ft·lb)
2nd: 30 N·m (3.0 kgf·m, 22.1 ft·lb)
Crankcase bolt 9–16 (M6):
1st: 6 N·m (0.6 kgf·m, 4.4 ft·lb)
2nd: 12 N·m (1.2 kgf·m, 8.9 ft·lb)

7. Gently remove the crankcase, and then measure the width of the compressed Plastigauge (PG-1) on each crankshaft journal. Replace the main bearings if out of specification.

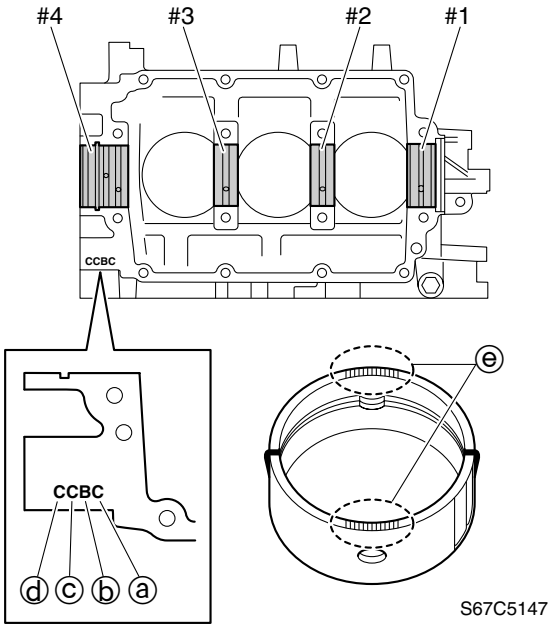

S6D55880

NOTE:
When loosening the crankcase bolts, loosen them in the opposite order used for tightening.

Crankshaft journal oil clearance (reference data):
0.012–0.044 mm
(0.0005–0.0017 in)

Selecting the crankshaft main bearing

1. Check the stamped marks ⓐ, ⓑ, ⓒ, and ⓓ on the cylinder block.



S67C5147

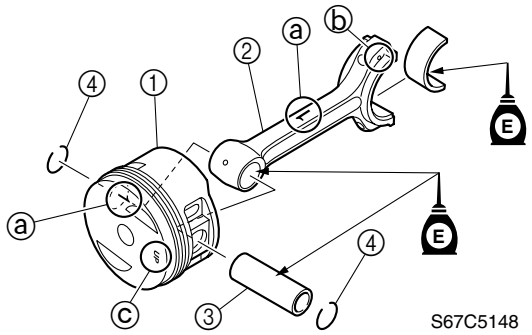
NOTE:
The stamped marks ⓐ, ⓑ, ⓒ, and ⓓ indicate crankshaft main bearings #1, #2, #3, and #4 respectively.

2. Select the suitable bearing color ⓔ for the main bearings from the table.

Stamped marks ⓐ, ⓑ, ⓒ, and ⓓ	Bearing color ⓔ
A	Blue
B	Black
C	Brown

Assembling the cylinder block

1. Assemble the piston ①, connecting rod ②, piston pin ③, and piston pin clips ④.



CAUTION:

Do not reuse the piston pin clips ④, always replace them with new ones.

NOTE:

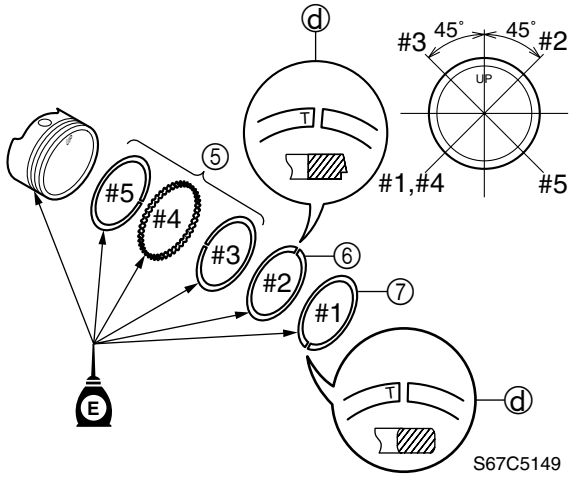
- Before assembly, make sure that the identification numbers ⓐ made on the piston and connecting rod ② during removal are the same.
- Face the projection ⓑ on the connecting rod ② in the same direction as the "UP" mark ⓒ on the piston crown.

2. Install the oil ring ⑤, 2nd ring ⑥, and top ring ⑦ onto each piston.

NOTE:

Make sure that the "T" marks ⓓ of the 2nd ring ⑥ and the top ring ⑦ are facing upward.

3. Offset the piston ring end gaps as shown.



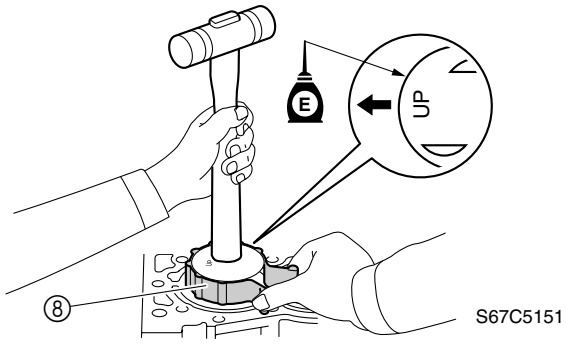
CAUTION:

Do not scratch the pistons or break the piston rings.

NOTE:

After installing the piston rings, check that they move smoothly.

4. Install the piston with the "UP" mark on the piston crown facing towards the flywheel magnet.

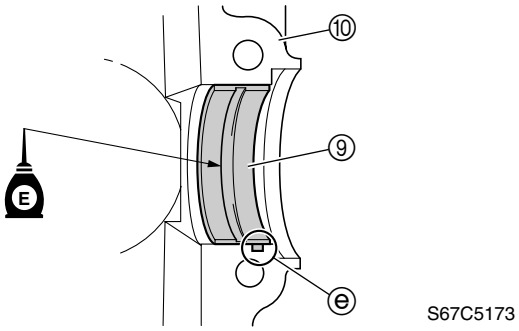


NOTE:

Apply engine oil to the side of each piston and the piston rings before installation.

	Piston slider ⑧: 90890-06529

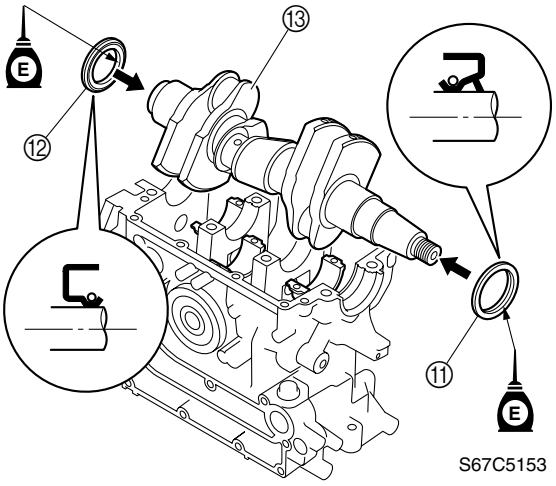
5. Install half of the main bearings ⑨ into the cylinder block ⑩.



NOTE:

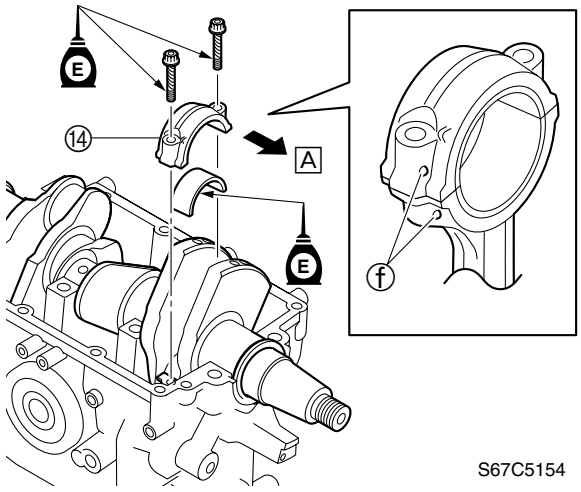
- Install the main bearings ⑨ in their original positions.
- Insert the projection ⓔ of each bearing into the slots in the cylinder block ⑩.

6. Install the oil seals ⑪ and ⑫ onto the crankshaft ⑬ as shown, and then install the crankshaft into the cylinder block.



NOTE:
Apply engine oil to the inside of each oil seal before installation.

7. Install the connecting rod caps ⑭ to the connecting rods, and then tighten the bolts to the specified torques in 2 stages.



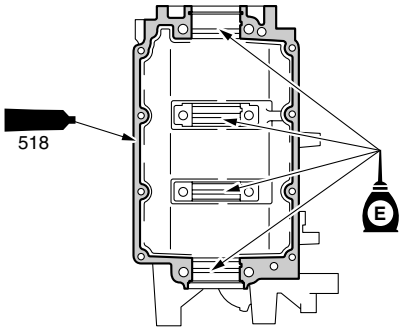
NOTE:
- Make sure that the projections ⓕ on the connecting rod cap ⑭ face towards the flywheel magnet end A of the crankshaft.
- Apply engine oil to the connecting rod cap bolts before installation.
- After tightening the connecting rod cap bolts, check that the crankshaft rotates smoothly.

	Connecting rod cap bolt: 1st: 6 N·m (0.6 kgf·m, 4.4 ft·lb) 2nd: 17 N·m (1.7 kgf·m, 12.5 ft·lb)

8. Install the remaining half of the main bearings into the crankcase.

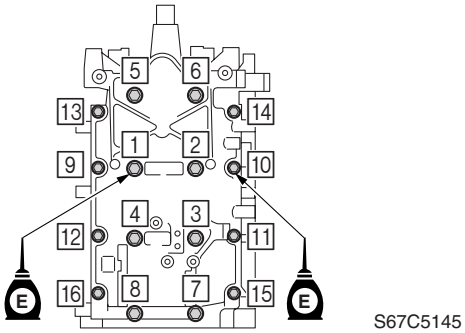
NOTE:
- Install the main bearings in their original positions.
- Insert the projection of each bearing into the slots in the crankcase.

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



NOTE:
Do not get any sealant on the main bearings.

10. Install the crankcase onto the cylinder block, and then tighten the crankcase bolts to the specified torques in 2 stages and in the sequence shown.

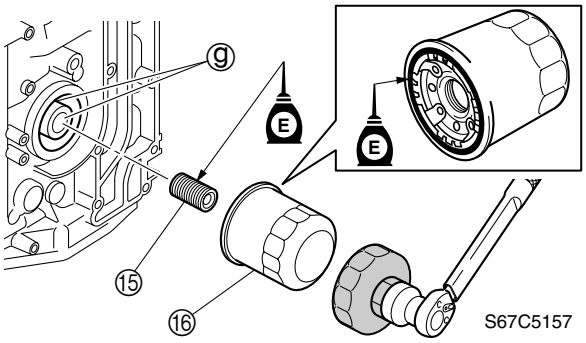


NOTE:
Apply engine oil to the threads of the crankcase bolts before installation.

Crankcase bolt 1–8 (M8):
1st: 15 N·m (1.5 kgf·m, 11.1 ft·lb)
2nd: 30 N·m (3.0 kgf·m, 22.1 ft·lb)
Crankcase bolt 9–16 (M6):
1st: 6 N·m (0.6 kgf·m, 4.4 ft·lb)
2nd: 12 N·m (1.2 kgf·m, 8.9 ft·lb)

11. Install the union bolt ⑮ and tighten it to the specified torque.

12. Install the oil filter ⑯, and then tighten it to the specified torque using a 64 mm (2.5 in) oil filter wrench.

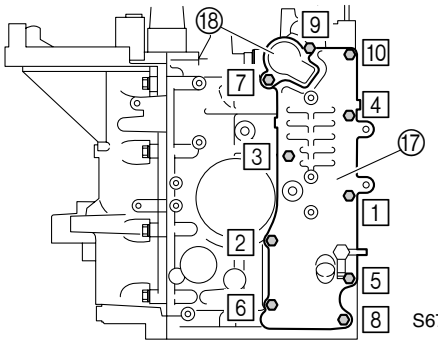


NOTE:
- Before installing the oil filter ⑯, be sure to supply engine oil to the oil passages ⓖ.
- Apply a thin coat of engine oil to the O-ring of the oil filter ⑯ before installation.

Oil filter wrench: 90890-01426

Union bolt ⑮:
40 N·m (4.0 kgf·m, 29.5 ft·lb)
Oil filter ⑯:
18 N·m (1.8 kgf·m, 13.3 ft·lb)

13. Install new gaskets, the exhaust cover ⑰, the thermostat, and the thermostat cover ⑱, and then tighten the bolts to the specified torques in 2 stages and in the sequence shown.

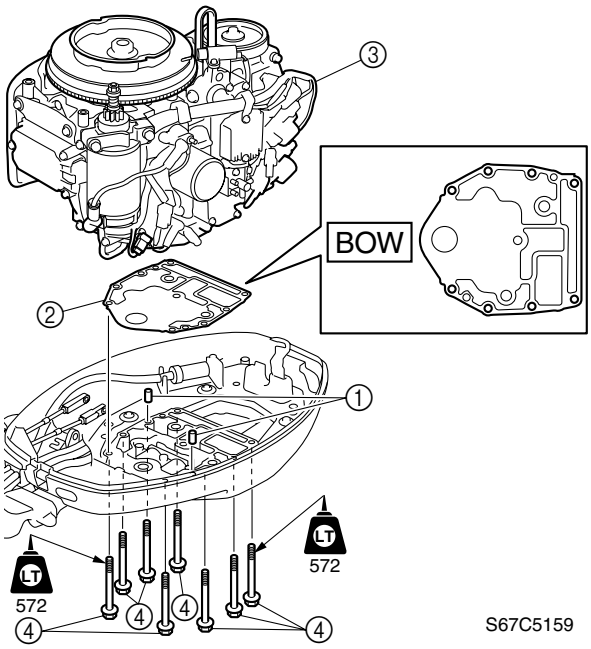


Exhaust cover bolt 1–6, 8, 10:
1st: 6 N·m (0.6 kgf·m, 4.4 ft·lb)
2nd: 12 N·m (1.2 kgf·m, 8.9 ft·lb)
Thermostat cover bolt 7, 9:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

Installing the power unit

1. Clean the power unit mating surface.

2. Install the dowels ①, a new gasket ②, and the power unit ③, and then tighten the mounting bolts ④ to the specified torque.



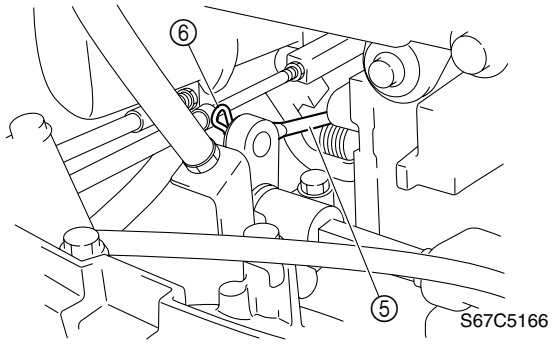
CAUTION:
Do not reuse the gasket, always replace it with a new one.

Power unit mounting bolt ④:
21 N·m (2.1 kgf·m, 15.5 ft·lb)

5

3. Install the apron and oil dipstick.

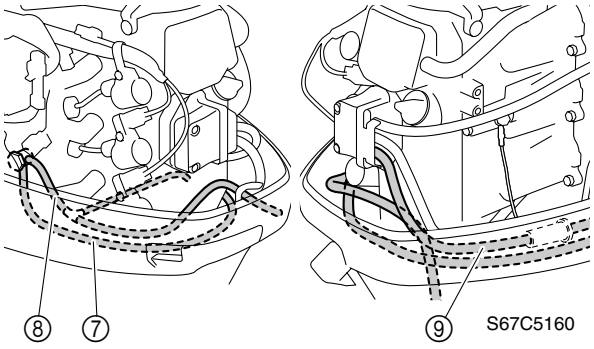
4. Connect the shift link rod ⑤, and then install the clip ⑥.



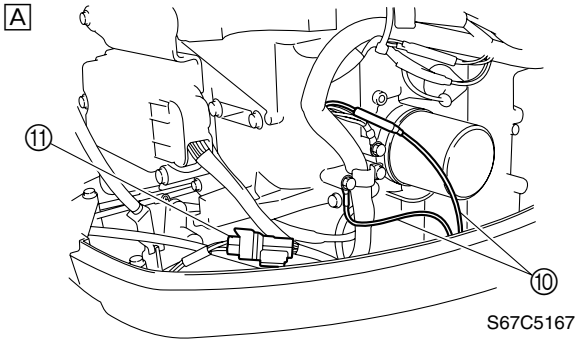
5. Connect the throttle cable and shift cable, and then adjust them.

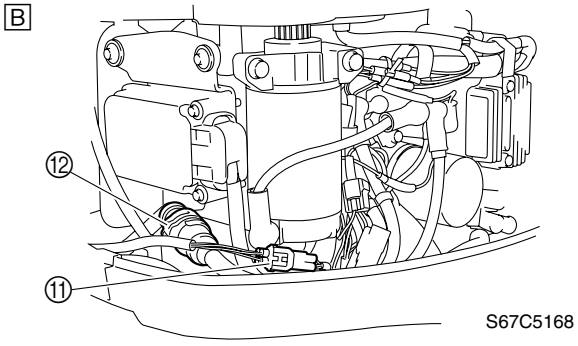
NOTE:
To adjust the throttle cable and shift cable, see “Adjusting the throttle cable” (3-8) and “Checking the gear shift operation” (3-9).

6. Connect the flushing hose ⑦, cooling water hose ⑧, and fuel hose ⑨.



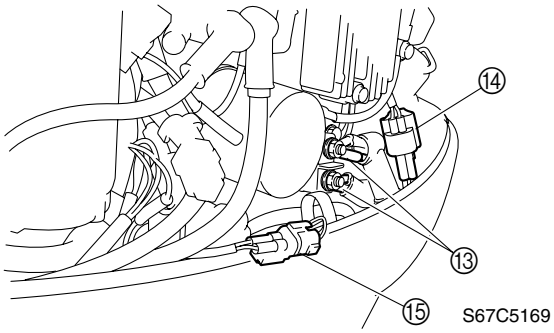
7. Connect the engine shut-off switch leads ⑩ and the warning indicator assembly coupler ⑪. (M model)
   Connect the warning indicator assembly coupler ⑪ and 10-pin main harness ⑫ to the power unit. (E and W model)



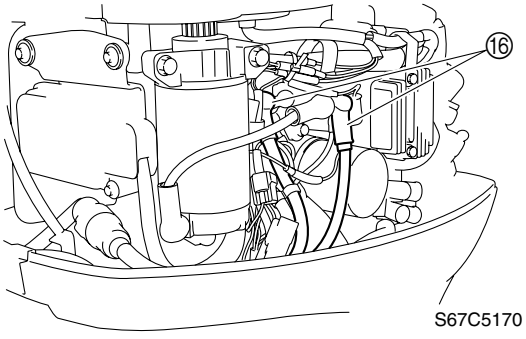


A M model
B E and W model

8. Connect the PTT motor leads ⑬. (PTT model)
   Connect the PTT switch coupler ⑭ and trim sensor coupler ⑮. (R model with PTT)



9. Connect the battery cables ⑯. (E and W model)



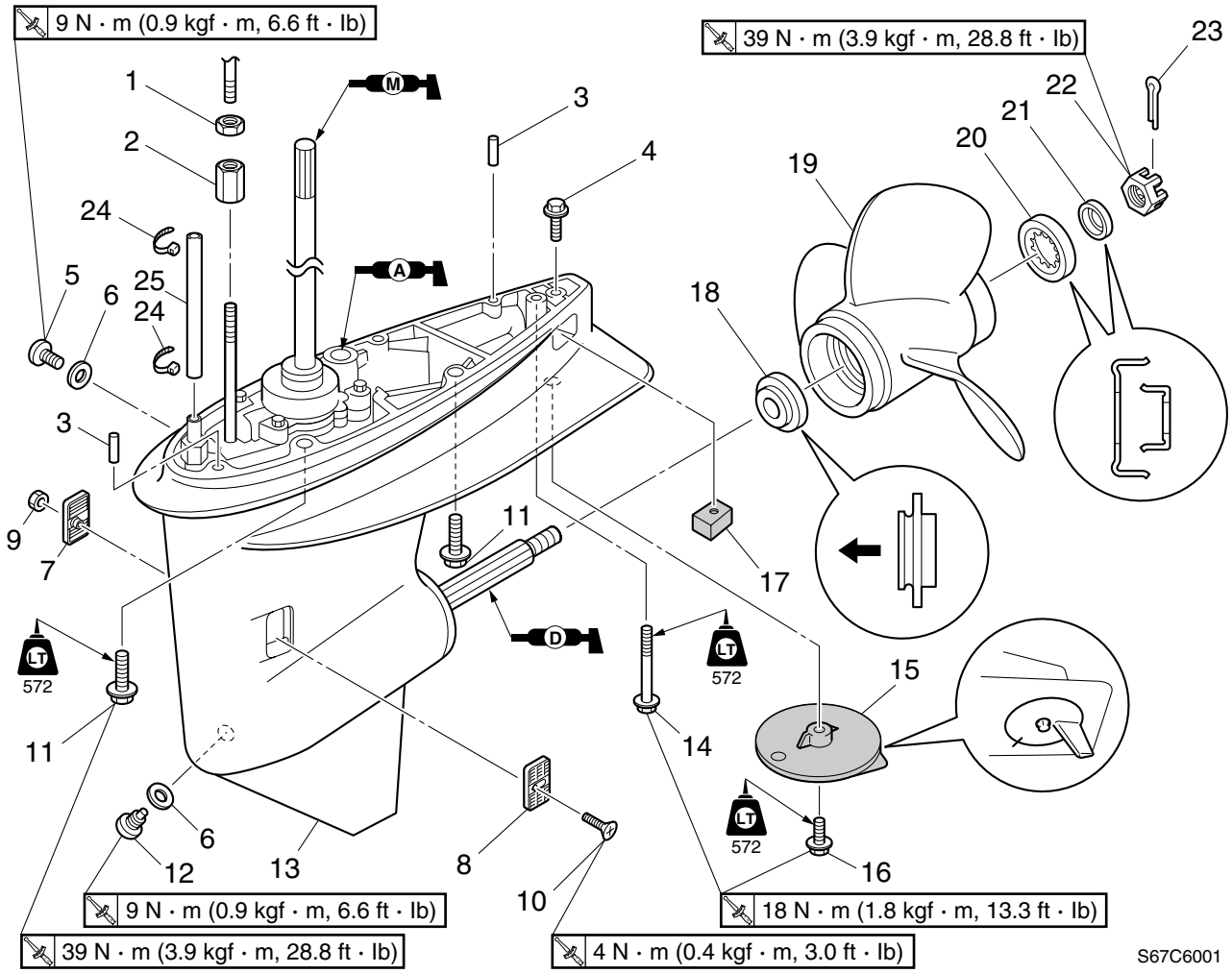
10. Connect the start-in-gear protection cable. (M and W model)

NOTE:
To connect the start-in-gear protection cable, see “Checking the start-in-gear protection (M and W model)” (3-10).

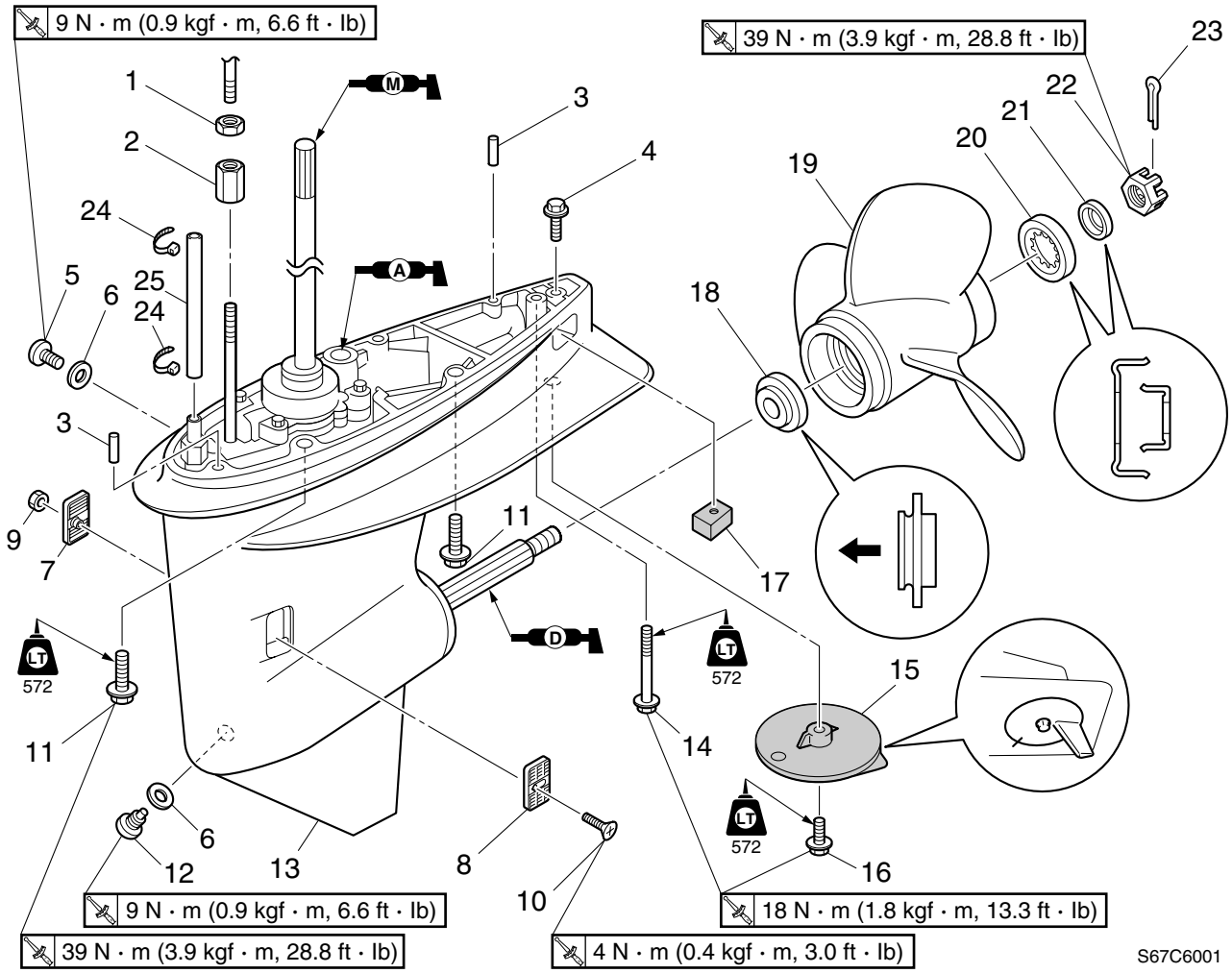
— MEMO —

Lower unit

Lower unit

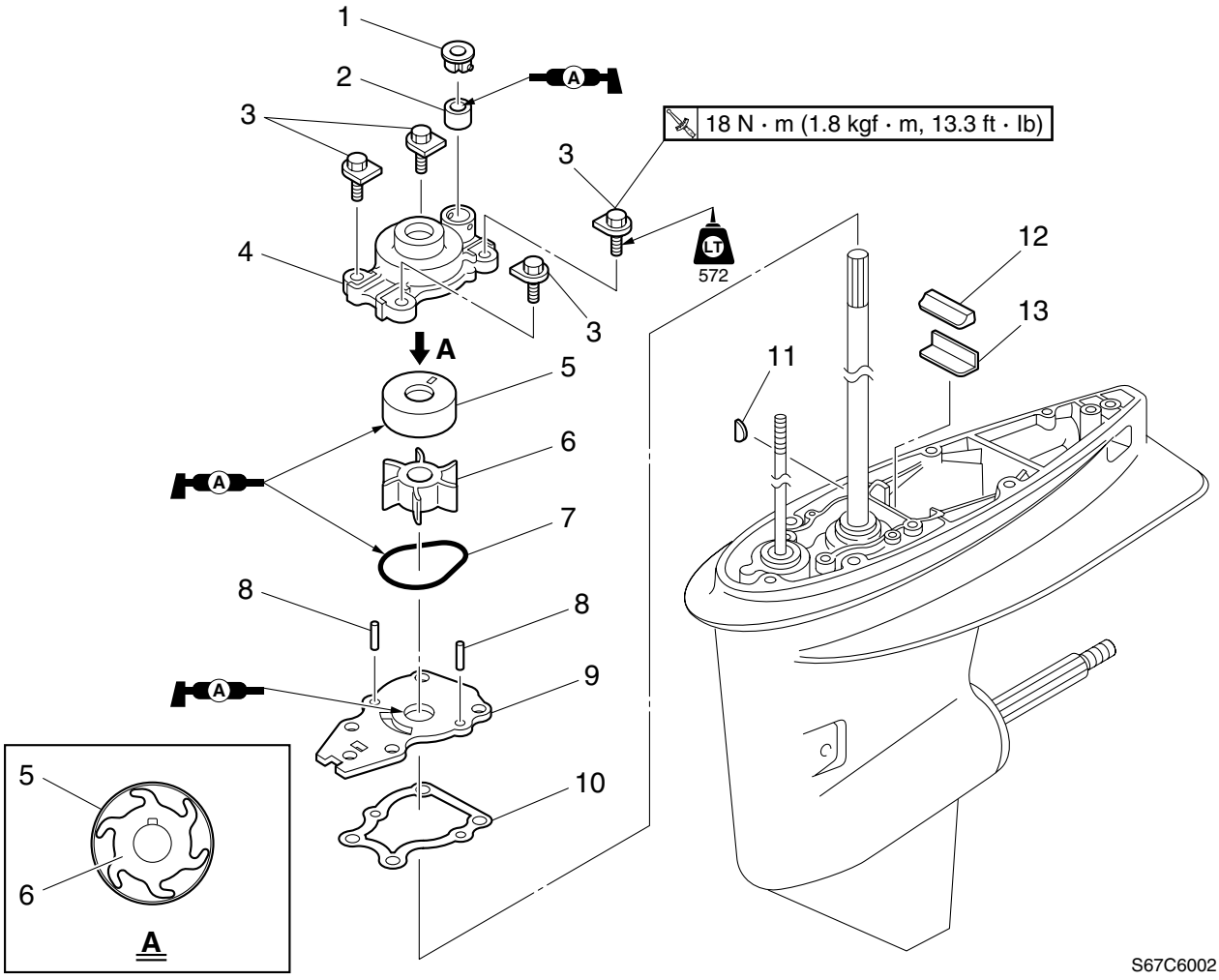


No.	Part name	Q'ty	Remarks
1	Locknut	1	
2	Adjusting nut	1	
3	Dowel	2	
4	Bolt	1	M8 × 35 mm
5	Check screw	1	
6	Gasket	2	**Not reusable**
7	Cooling water inlet cover	1	
8	Cooling water inlet cover	1	
9	Nut	1	
10	Screw	1	ø5 × 25 mm
11	Bolt	4	M10 × 40 mm
12	Drain screw	1	
13	Lower case	1	
14	Bolt	1	M8 × 65 mm
15	Trim tab	1	
16	Bolt	1	M8 × 25 mm
17	Anode	1	



No.	Part name	Q'ty	Remarks
18	Spacer	1	
19	Propeller	1	
20	Spacer	1	
21	Bushing	1	
22	Propeller nut	1	
23	Cotter pin	1	**Not reusable**
24	Plastic tie	2	
25	Speedometer hose	1	

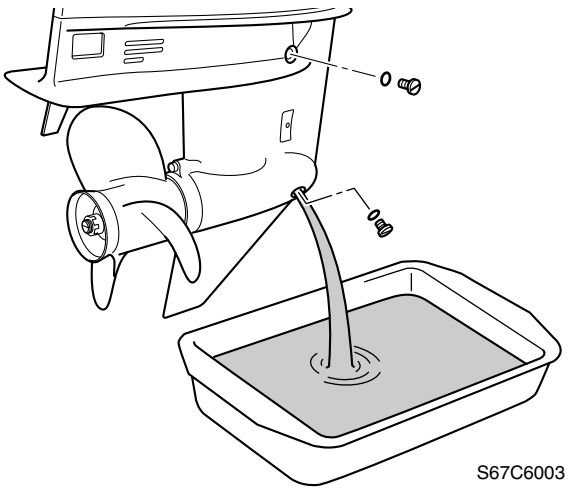
6



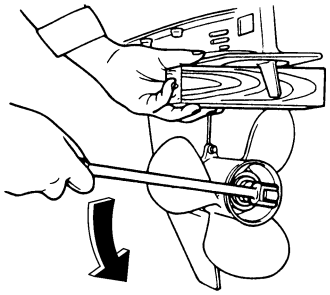
No.	Part name	Q'ty	Remarks
1	Collar	1	
2	Rubber spacer	1	
3	Bolt	4	M8 × 30 mm
4	Water pump housing	1	
5	Insert cartridge	1	
6	Impeller	1	
7	O-ring	1	**Not reusable**
8	Dowel	2	
9	Outer plate cartridge	1	
10	Gasket	1	**Not reusable**
11	Woodruff key	1	
12	Rubber seal	1	
13	Plate	1	

Removing the lower unit

1. Drain the gear oil.


S67C6003

2. Set the gear shift to the N position, place a block of wood between the anti-cavitation plate and propeller to keep the propeller from turning, and then remove the propeller nut and propeller.

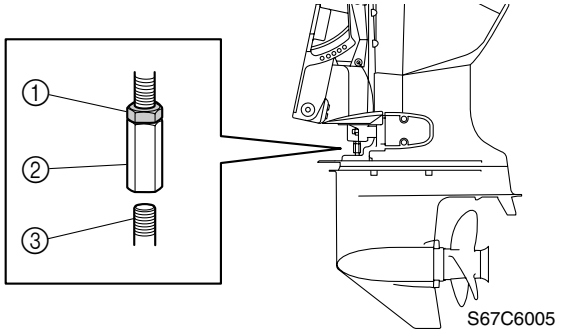

S67C6107

⚠ WARNING

- **Do not hold the propeller with your hands when loosening or tightening the propeller nut.**
- **Be sure to disconnect the battery cables from the battery and remove the clip from the engine shut-off switch. (E and W model)**

3. Remove the lower mount cover. (L-transom model)

4. Loosen the locknut ① while holding the adjusting nut ②, and then turn the adjusting nut to disconnect the shift rod ③.

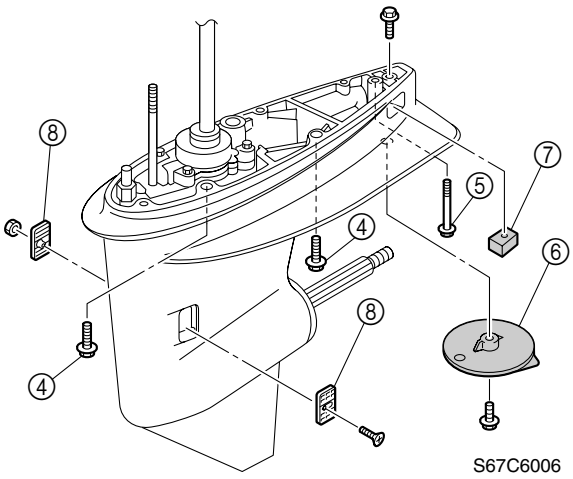


S67C6005

NOTE:
Set the gear shift to the N position before disconnecting the shift rod ③.

5. Remove the lower case mounting bolts ④ and ⑤, and then remove the lower unit.

6. Remove the trim tab ⑥, anode ⑦, and cooling water inlet covers ⑧.



S67C6006

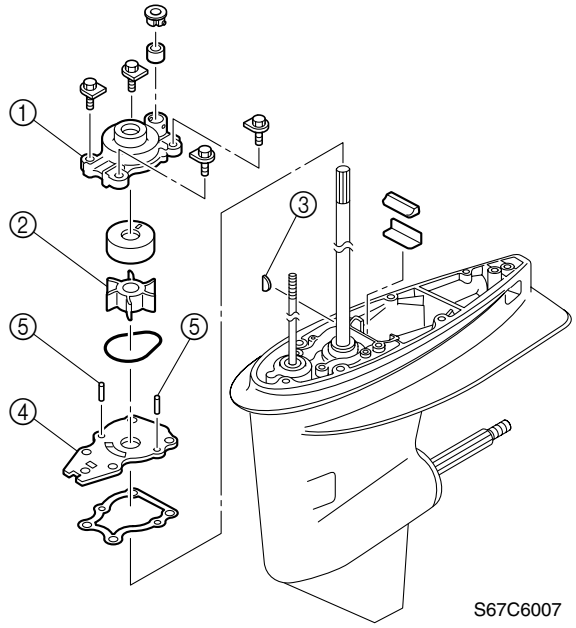
6

Removing the water pump

1. Remove the water pump housing ① and impeller ②.

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

3. Remove the dowels ⑤ from the lower case.



Checking the water pump

1. Check the water pump housing. Replace if deformed.

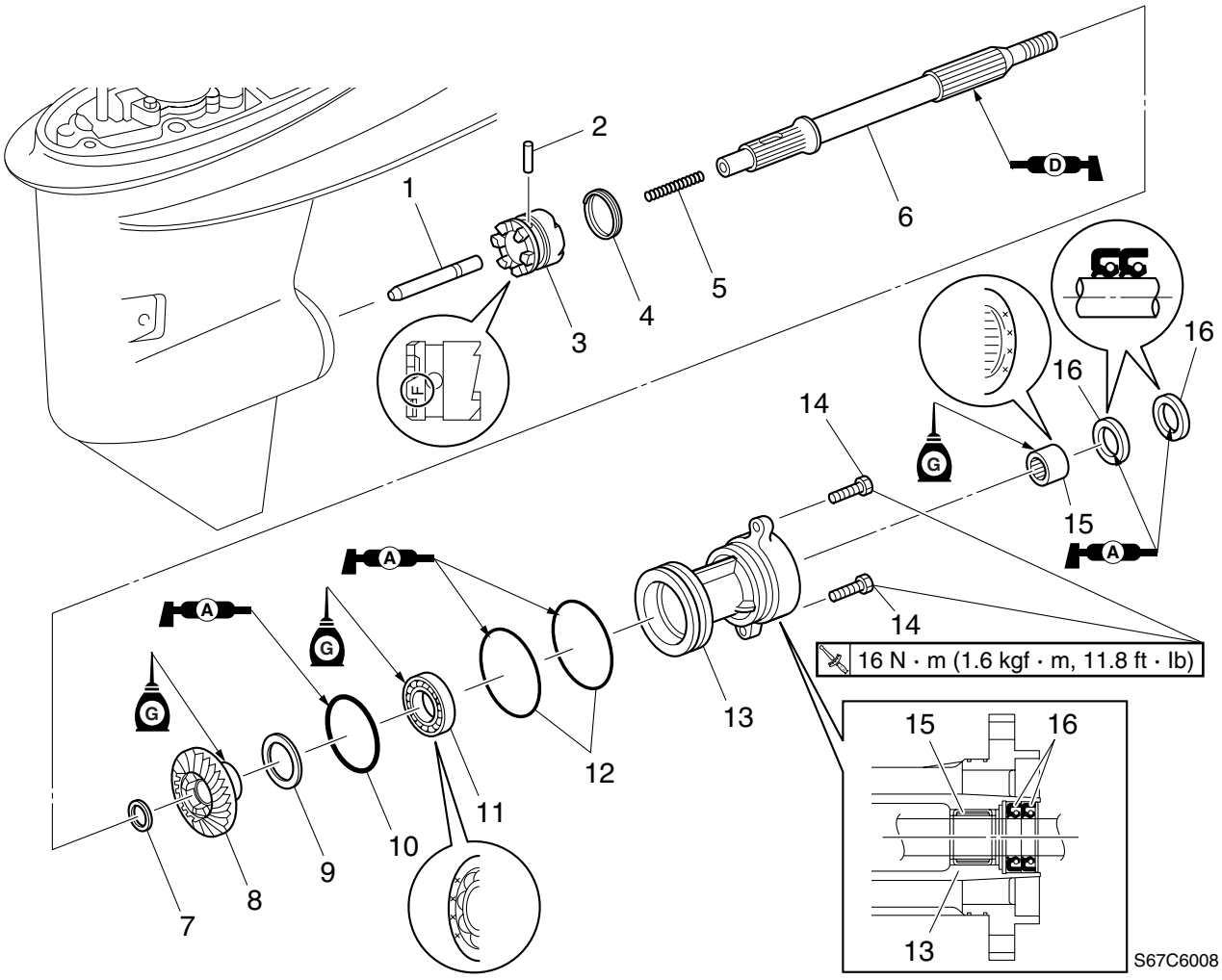
NOTE:

If the engine overheated, the inside of the water pump housing may be deformed, therefore be sure to remove the insert cartridge when checking the housing.

2. Check the impeller, insert cartridge, and outer plate cartridge. Replace if cracked or worn.

3. Check the Woodruff key and the keyway in the drive shaft. Replace if worn or deformed.

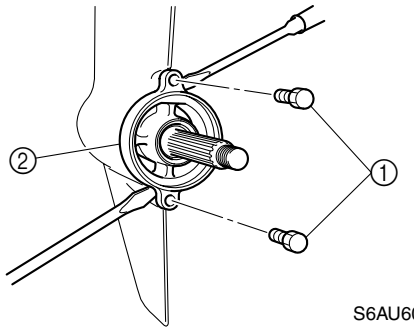
Propeller shaft housing



No.	Part name	Q'ty	Remarks
1	Shift plunger	1	
2	Cross pin	1	
3	Dog clutch	1	
4	Spring	1	
5	Spring	1	
6	Propeller shaft	1	
7	Washer	1	
8	Reverse gear	1	
9	Reverse gear shim	—	
10	O-ring	1	**Not reusable**
11	Ball bearing	1	**Not reusable**
12	O-ring	2	**Not reusable**
13	Propeller shaft housing	1	
14	Bolt	2	M8 × 25 mm
15	Needle bearing	1	**Not reusable**
16	Oil seal	2	**Not reusable**

Removing the propeller shaft housing assembly

1. Remove the bolts ① from the propeller shaft housing.
2. Remove the propeller shaft housing assembly ②.

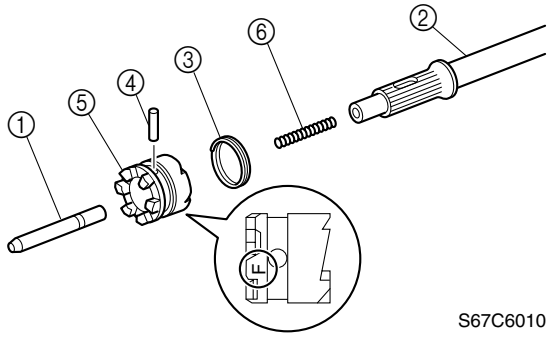


S6AU6009

NOTE:
- Insert flat-head screwdrivers between the propeller shaft housing assembly ② and the lower case to pry the assembly loose.
- If the propeller shaft housing assembly ② is stuck to the lower case, use the special service tools. See “Backlash” (6-26).

Disassembling the propeller shaft assembly

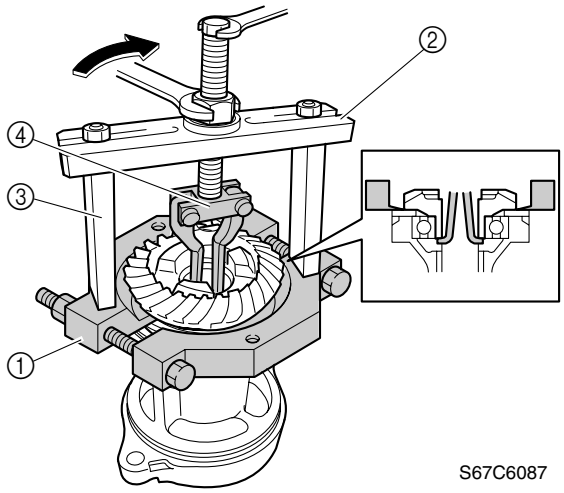
1. Remove the shift plunger ① from the propeller shaft ②.
2. Remove the spring ③, and then remove the cross pin ④ and dog clutch ⑤.
3. Pull out the spring ⑥ from the propeller shaft ②.



S67C6010

Disassembling the propeller shaft housing assembly

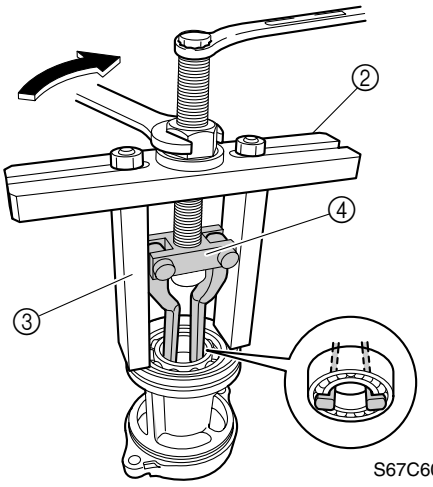
1. Remove the reverse gear and shim(s).



S67C6087

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

2. Remove the ball bearing.

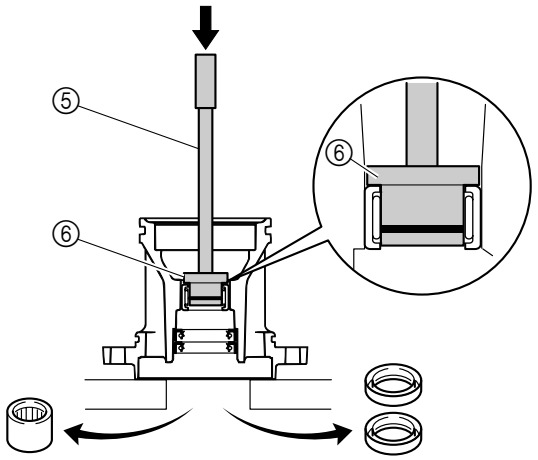


S67C6013

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

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

3. Remove the oil seals and needle bearing.



S67C6015

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

Driver rod L3 ⑤: 90890-06652
Needle bearing attachment ⑥:
90890-06614

Checking the propeller shaft housing

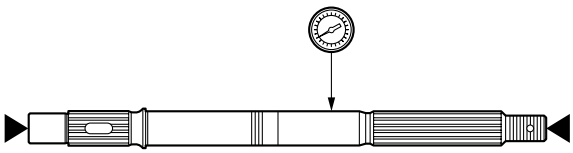
1. Clean the propeller shaft housing, and then check it. Replace if cracked or damaged.

2. 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. Replace if damaged or worn.

2. Measure the propeller shaft runout. Replace if above specification.


S67C6016

Propeller shaft runout limit:
0.02 mm (0.0008 in)

3. Check the dog clutch, shift plunger, and cross pin. Replace if cracked or worn.

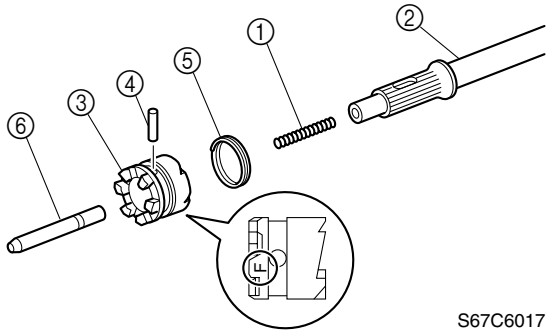
Assembling the propeller shaft assembly

1. Insert the spring ① into the propeller shaft ②.

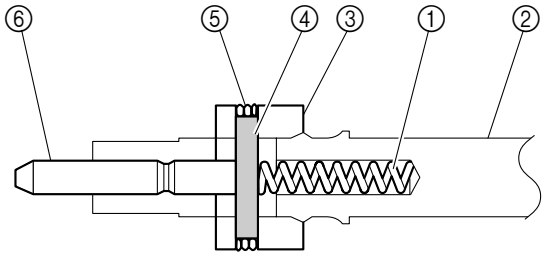
2. Install the dog clutch ③, cross pin ④, and spring ⑤.

NOTE:
Install the dog clutch ③ with the "F" mark facing toward the forward gear.

3. Install the shift plunger ⑥.



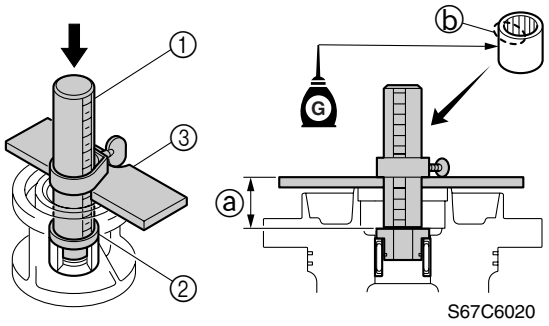
S67C6017



S67C6018

Assembling the propeller shaft housing assembly

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



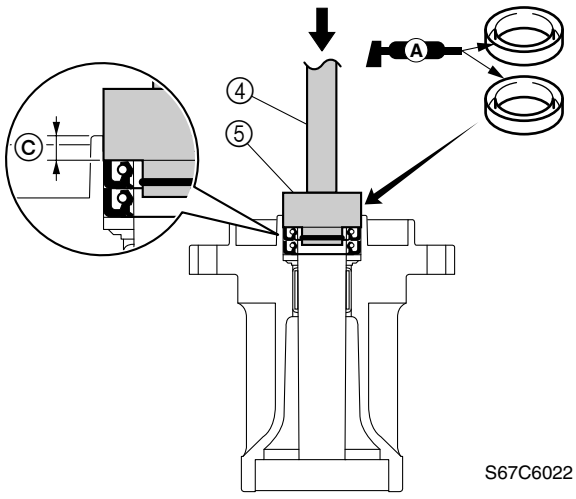
S67C6020

NOTE:
Install the needle bearing with the manufacture identification mark ⓑ facing toward the oil seal (propeller side).

Driver rod SS ①: 90890-06604
Needle bearing attachment ②: 90890-06614
Bearing depth plate ③: 90890-06603

Installation depth ⓐ: 23.5–24.0 mm (0.93–0.94 in)

2. Apply grease to new oil seals, and then install them into the propeller shaft housing to the specified depth ⓒ.



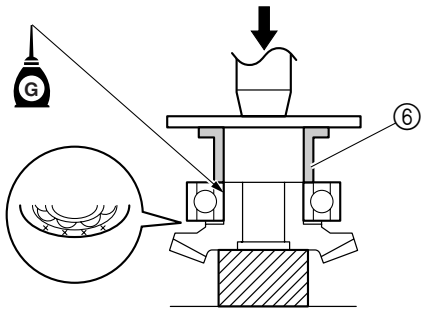
S67C6022

NOTE:
Install an oil seal halfway into the propeller shaft housing, and then install the other oil seal.

Driver rod LS ④: 90890-06606
Ball bearing attachment ⑤: 90890-06637

Installation depth ⓒ: 4.0–4.5 mm (0.16–0.18 in)

3. Install a new ball bearing and original shim(s) onto the reverse gear.

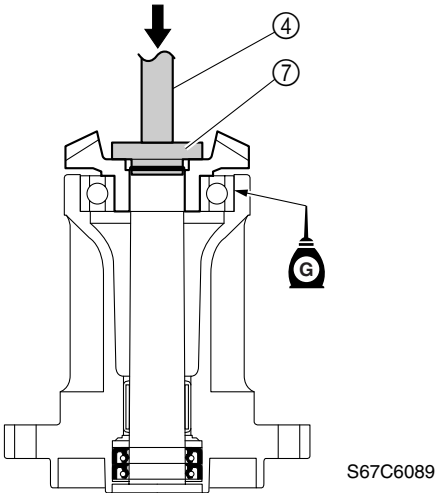


S67C6024

NOTE:
Install the ball bearing with the manufacture identification mark facing toward the reverse gear.

Bearing inner race attachment ⑥: 90890-06639

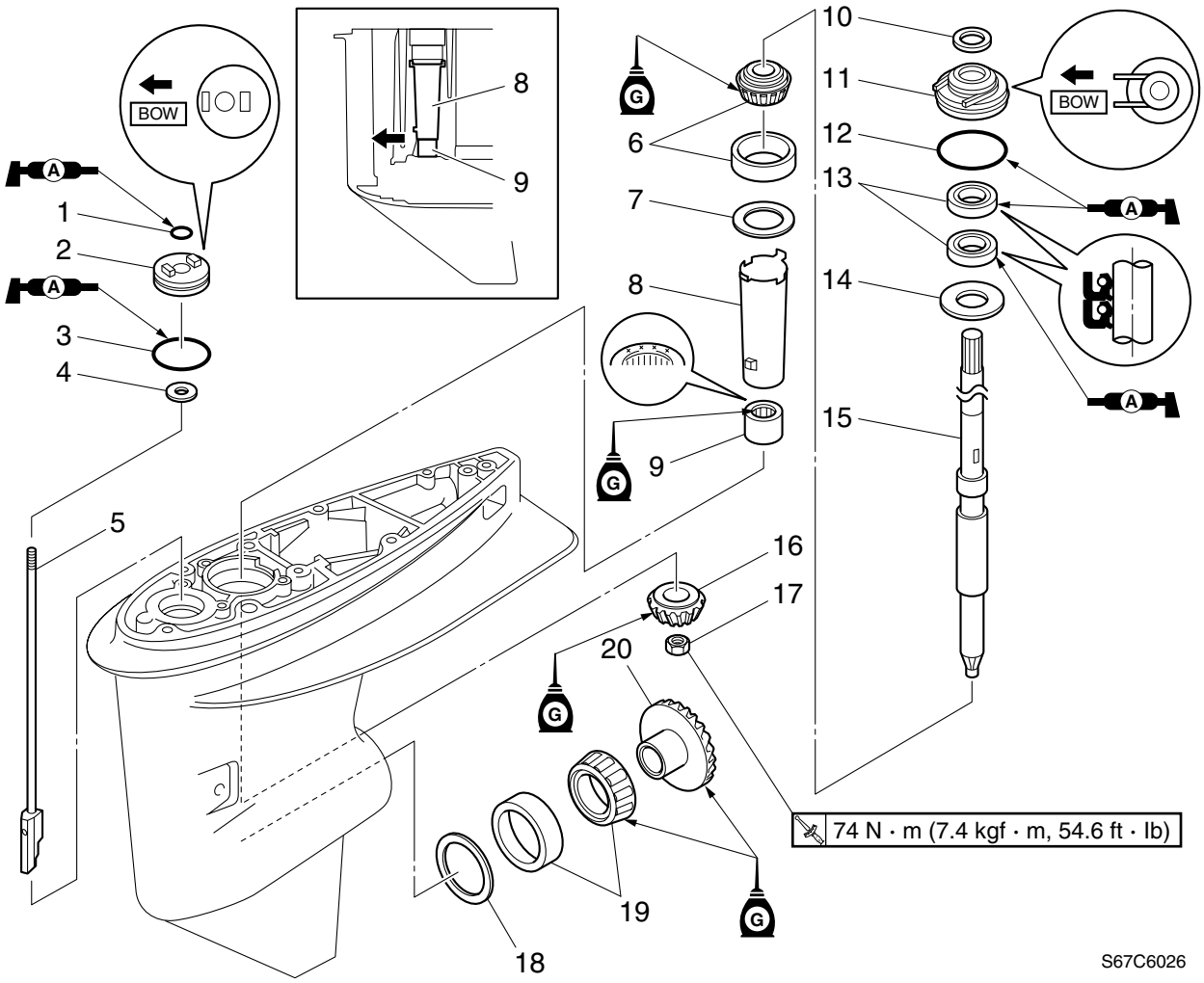
4. Install the reverse gear assembly into the propeller shaft housing.



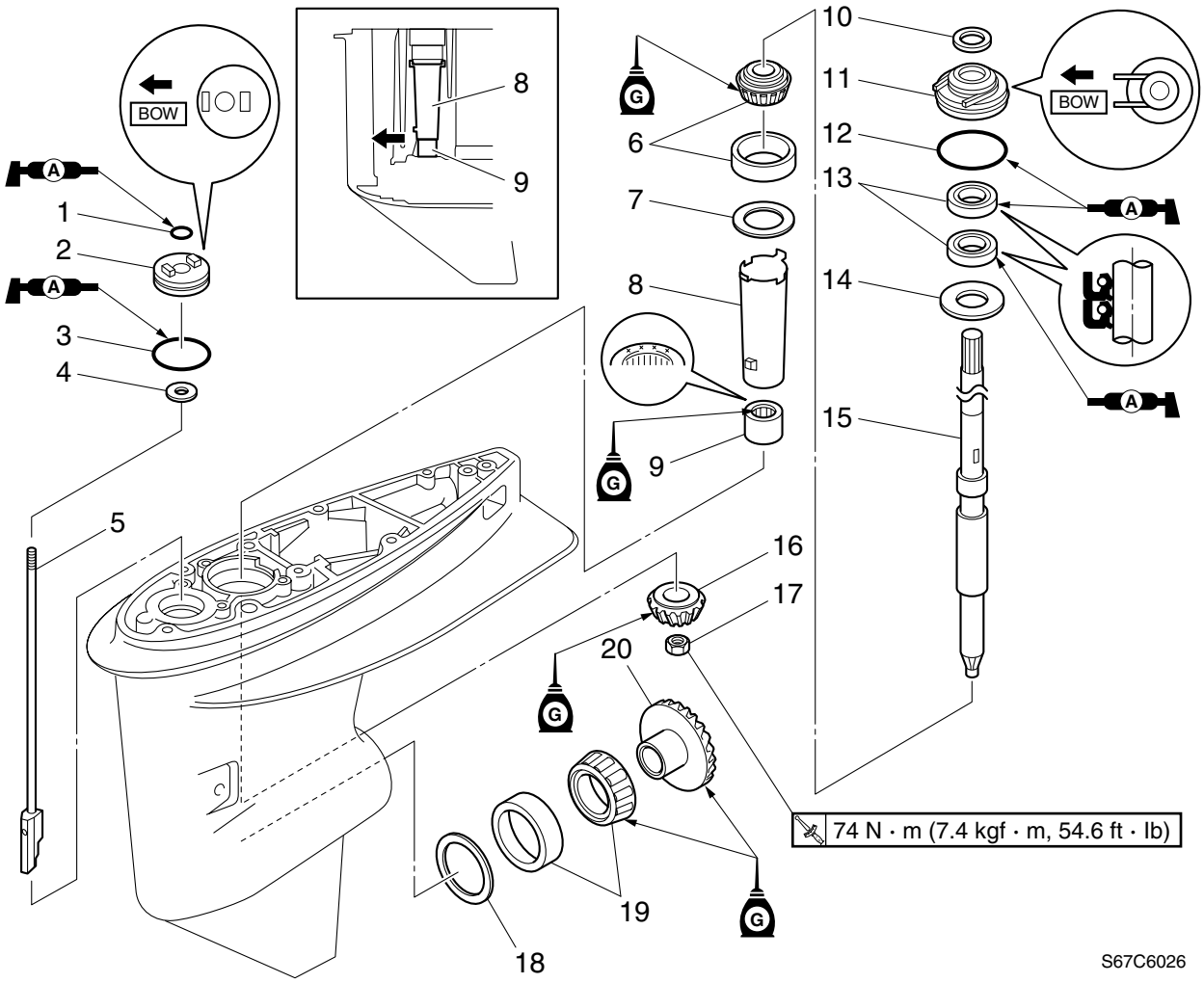
NOTE:
After installing the reverse gear and shim(s), check that the gear rotates smoothly.

	Driver rod LS ④: 90890-06606 Ball bearing attachment ⑦: 90890-06633

Drive shaft and lower case



No.	Part name	Q'ty	Remarks
1	O-ring	1	**Not reusable**
2	Shift rod housing	1	
3	O-ring	1	**Not reusable**
4	Washer	1	
5	Shift rod	1	L-transom model/S-transom model
6	Taper roller bearing	1	**Not reusable**
7	Pinion shim	—	
8	Drive shaft sleeve	1	
9	Needle bearing	1	**Not reusable**
10	Oil seal cover	1	
11	Oil seal housing	1	
12	O-ring	1	**Not reusable**
13	Oil seal	2	**Not reusable**
14	Washer	1	
15	Drive shaft	1	L-transom model/S-transom model
16	Pinion	1	
17	Nut	1	

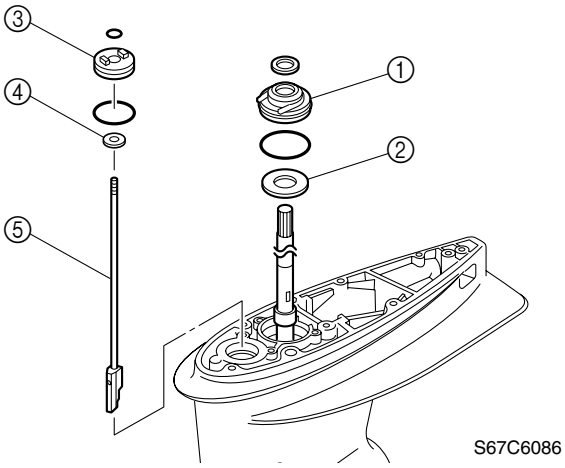


No.	Part name	Q'ty	Remarks
18	Forward gear shim	—	
19	Taper roller bearing	1	**Not reusable**
20	Forward gear	1	

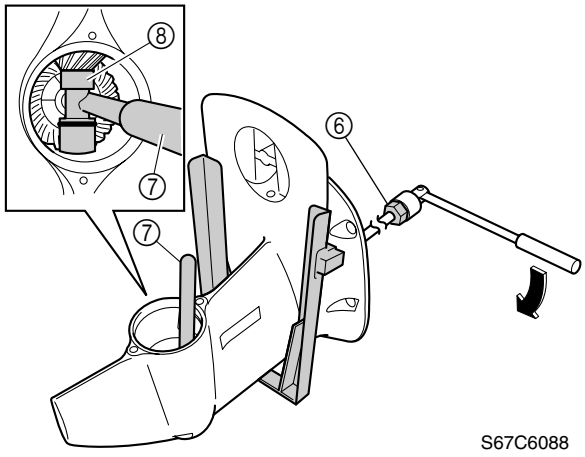
6

Removing the drive shaft, oil seal housing, and shift rod

1. Remove the oil seal housing ①, washer ②, shift rod housing ③, washer ④, and shift rod ⑤.

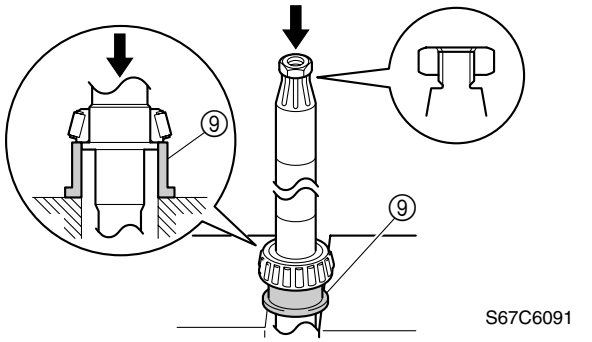


2. Remove the pinion nut.



Drive shaft holder 3 ⑥: 90890-06517
Pinion nut holder ⑦: 90890-06505
Socket adapter 1 ⑧: 90890-06506

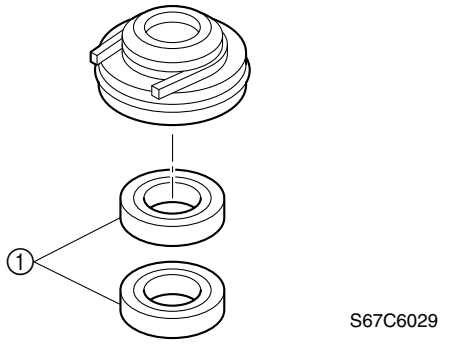
3. Remove the drive shaft and pinion.
4. Pull out the forward gear.
5. Remove the taper roller bearing from the drive shaft.



Bearing inner race attachment ⑨: 90890-06641

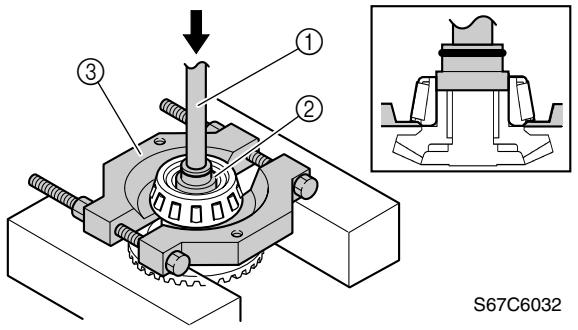
Disassembling the oil seal housing

1. Remove the oil seals ①.



Disassembling the forward gear

1. Remove the taper roller bearing from the forward gear.



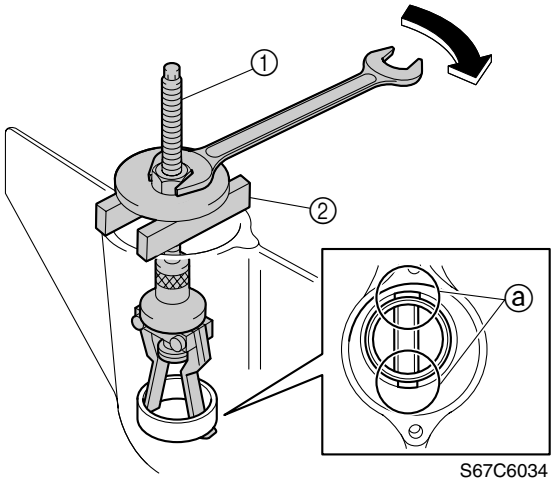
CAUTION:

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

Driver rod L3 ①: 90890-06652
Needle bearing attachment ②: 90890-06612
Bearing separator ③: 90890-06534

Disassembling the lower case

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



CAUTION:

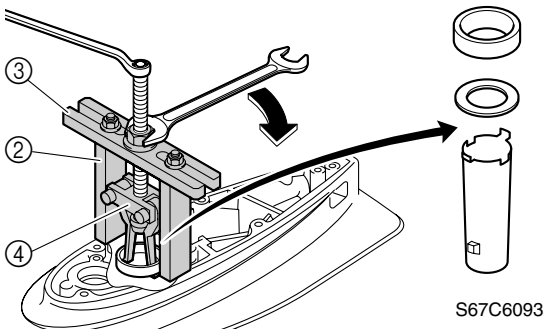
Do not reuse the bearing, always replace it with a new one.

NOTE:

Fit the hooks of the puller claw into the slots ⓐ in the lower case.

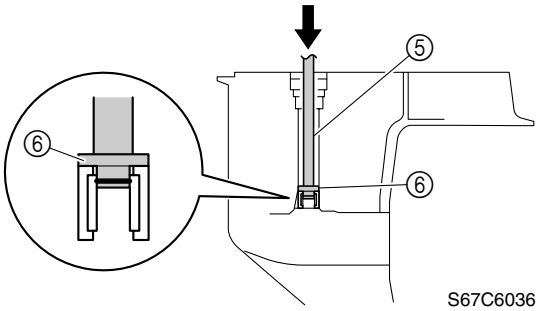
Bearing outer race puller assembly ①: 90890-06523
Stopper guide stand ②: 90890-06538

2. Remove the taper roller bearing outer race, pinion shim(s), and drive shaft sleeve.



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

3. Remove the needle bearing from the lower case.



CAUTION:

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

Driver rod L3 ⑤: 90890-06652
Needle bearing attachment ⑥: 90890-06614

Checking the pinion and forward gear

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

Checking the bearing

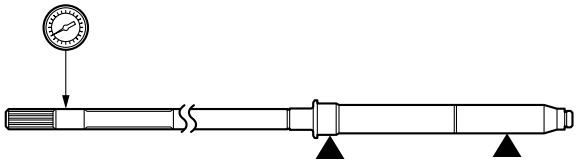
1. Check the bearings. Replace if pitted or if there is rumbling.

Checking the drive shaft

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

6

2. Measure the drive shaft runout. Replace if above specification.



S67C6037

Drive shaft runout limit:
0.5 mm (0.0197 in)

Checking the shift rod

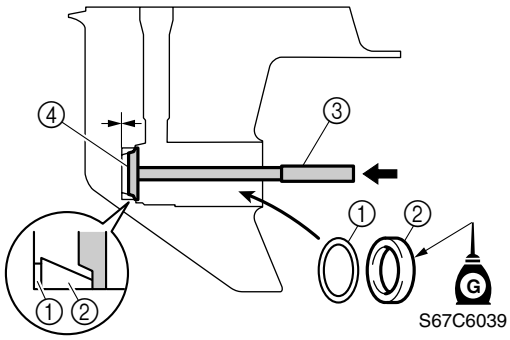
1. Check the shift rod. Replace if bent or worn.

Checking the lower case

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

Assembling the lower case

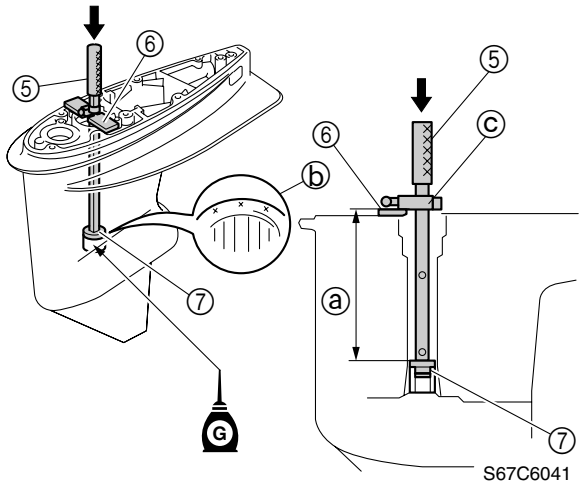
1. Install the original forward gear shim(s) ① and a new taper roller bearing outer race ②.



S67C6039

Driver rod LL ③: 90890-06605
Bearing outer race attachment ④:
90890-06622

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



S67C6041

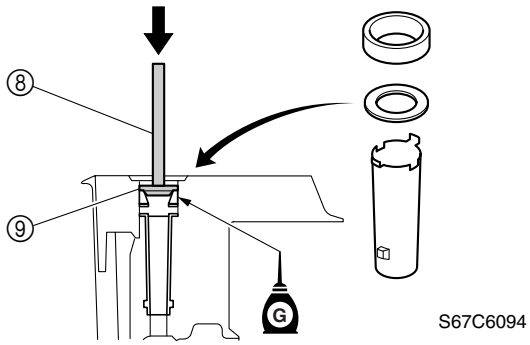
NOTE:

- Install the needle bearing with the manufacture identification mark ⓑ facing upward.
- Install the stopper ⓒ onto the driver rod SL ⑤ at the installation depth ⓐ as shown. Install the needle bearing until the stopper ⓒ contacts the special service tool ⑥.

Driver rod SL ⑤: 90890-06602
Bearing depth plate ⑥: 90890-06603
Needle bearing attachment ⑦:
90890-06614

Installation depth ⓐ:
182.5–183.0 mm (7.19–7.20 in)

3. Install the drive shaft sleeve, pinion shim(s), and a new taper roller bearing outer race.



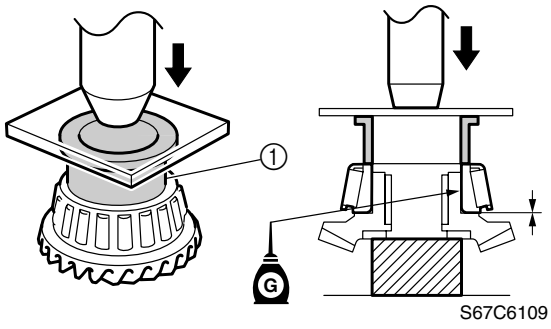
S67C6094

NOTE:
Be sure to select the pinion shim(s) if replacing the pinion, taper roller bearing, or lower case. To select the shims, see “Shimming” (6-21).

Driver rod LS ⑧: 90890-06606
Bearing outer race attachment ⑨: 90890-06627

Assembling the forward gear

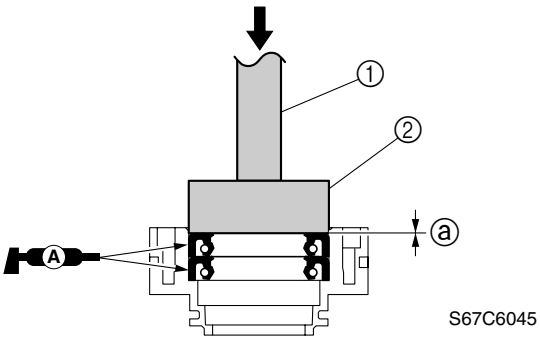
1. Install a new taper roller bearing onto the forward gear.



Bearing inner race attachment ①: 90890-06640

Assembling the oil seal housing

1. Apply grease to a new oil seal, and then install it into the oil seal housing to the specified depth ⓐ.



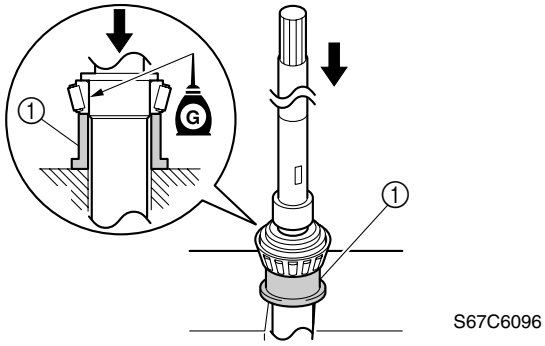
NOTE:
Install an oil seal halfway into the oil seal housing, and then install the other oil seal.

Driver rod LS ①: 90890-06606
Ball bearing attachment ②: 90890-06634

Installation depth ⓐ: 0–0.5 mm (0–0.02 in)

Assembling the drive shaft

1. Install the taper roller bearing onto the drive shaft.



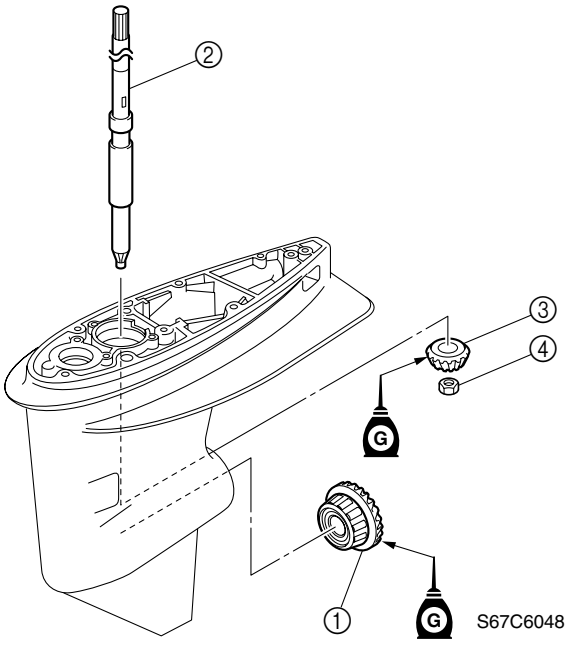
Bearing inner race attachment ①: 90890-06644

6

Installing the shift rod, oil seal housing, and drive shaft

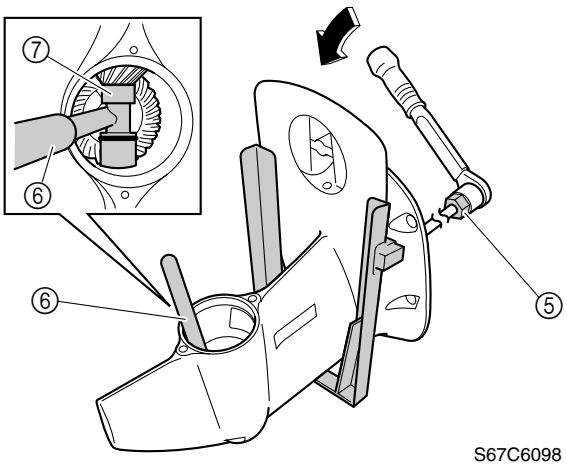
1. Install the forward gear assembly ① into the lower case.

2. Install the drive shaft ②, and then install the pinion ③ and pinion nut ④ to the shaft.



NOTE:
When installing the pinion ③, lift up the drive shaft ② slightly and align the gear and shaft splines.

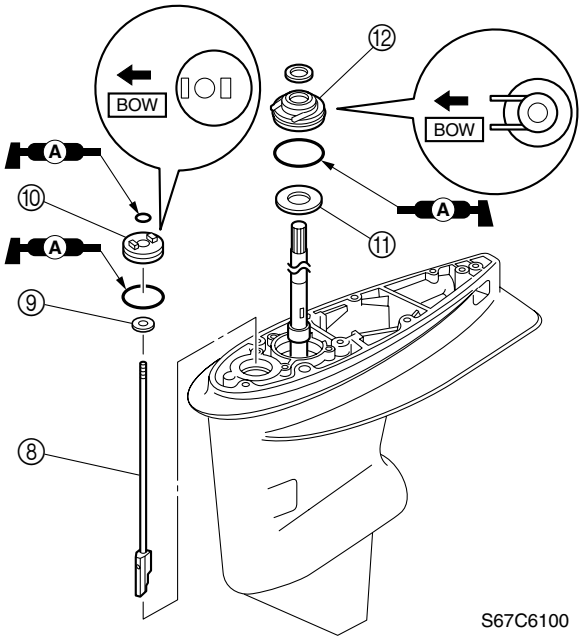
3. Tighten the pinion nut ④ to the specified torque.



Drive shaft holder 3 ⑤: 90890-06517
Pinion nut holder ⑥: 90890-06505
Socket adapter 1 ⑦: 90890-06506

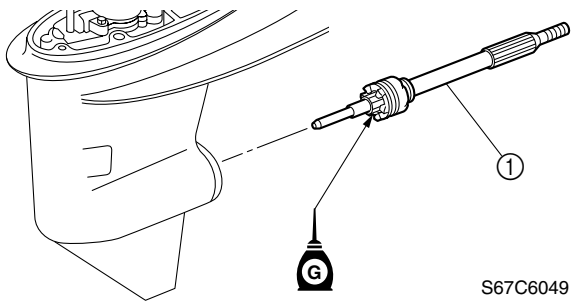
Pinion nut ④:
74 N·m (7.4 kgf·m, 54.6 ft·lb)

4. Install the shift rod ⑧, washer ⑨, shift rod housing ⑩, washer ⑪, and oil seal housing ⑫.

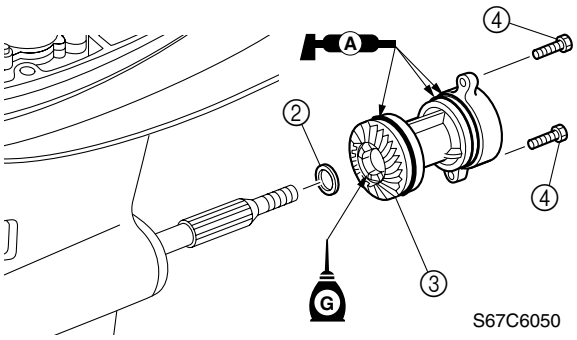


Installing the propeller shaft housing assembly

1. Install the propeller shaft assembly ① into the lower case.

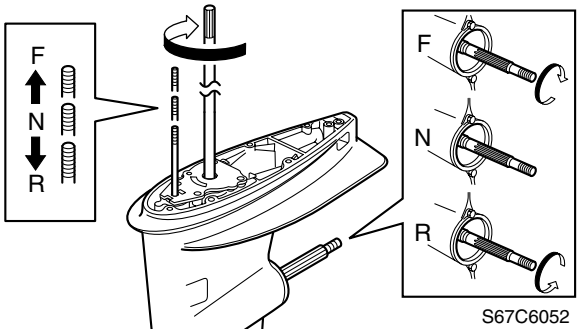


2. Install the washer ② and propeller shaft housing assembly ③ into the lower case, and then tighten the bolts ④ to the specified torque.



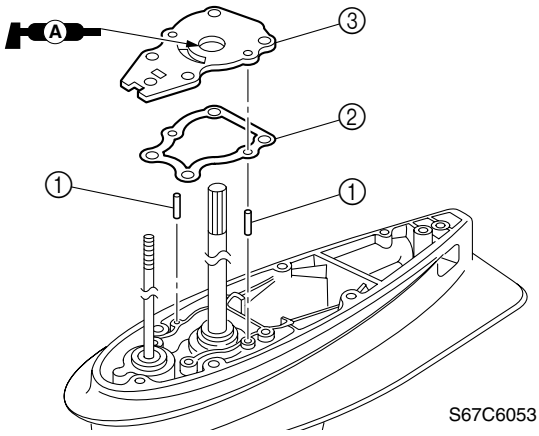
Propeller shaft housing bolt ④:
16 N·m (1.6 kgf·m, 11.8 ft·lb)

3. Check that the shifting mechanism works properly and smoothly.

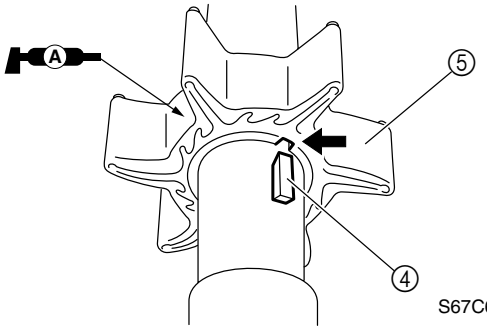


Installing the water pump

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

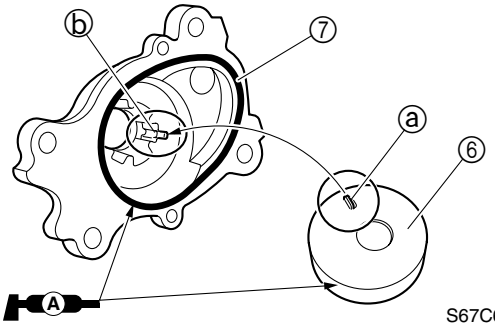


2. Install the Woodruff key ④ and impeller ⑤ to the drive shaft.



NOTE:
When installing the impeller ⑤ onto the drive shaft, align the groove in the impeller with the Woodruff key ④.

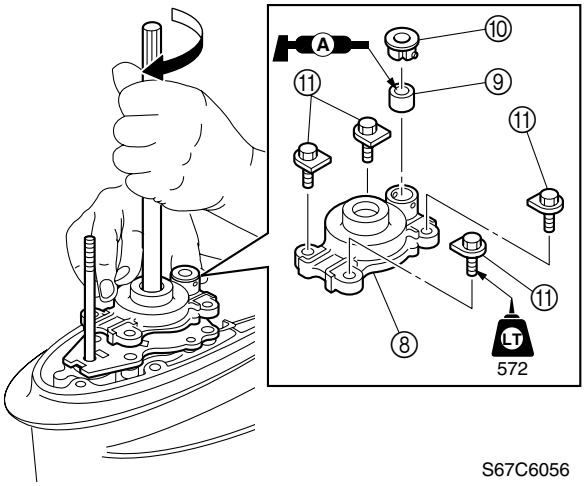
3. Install the insert cartridge ⑥ and a new O-ring ⑦ into the water pump housing.



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

6

4. Install the water pump housing ⑧ onto the lower case, and then install the rubber spacer ⑨ and collar ⑩.



S67C6056

CAUTION:

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

NOTE:

- Apply grease to the inside of the water pump housing ⑧.
- While turning the drive shaft clockwise, push down on the water pump housing ⑧ and install it.

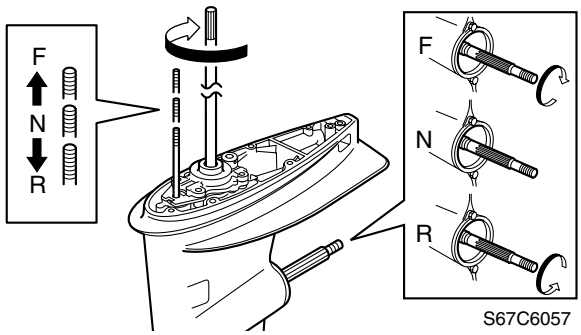
5. Tighten the water pump housing bolts ⑪ to the specified torque.

Water pump housing bolt ⑪:
18 N·m (1.8 kgf·m, 13.3 ft·lb)

Installing the lower unit

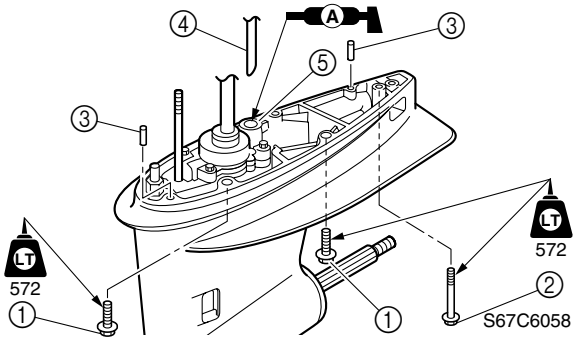
1. Set the shift lever to the N position. (H model)
   Set the remote control lever to the N position. (R model)

2. Set the shift rod to the N position.



S67C6057

3. Install the lower unit to the upper case, and then tighten the lower case mounting bolts ① and ② to the specified torque.



S67C6058

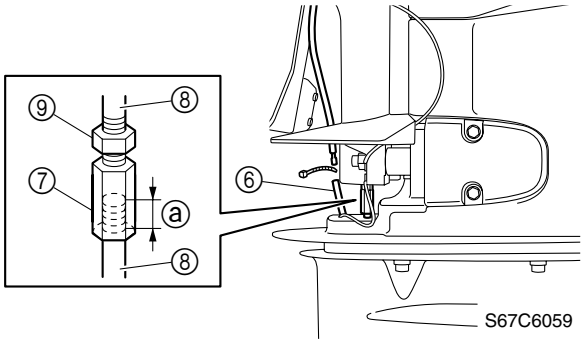
NOTE:

- Before installing the lower unit to the upper case, install the dowels ③ into the lower case.
- When installing the lower unit, make sure that the water pipe ④ is inserted securely into the collar ⑤.

Lower case mounting bolt (M10) ①:
39 N·m (3.9 kgf·m, 28.8 ft·lb)
Lower case mounting bolt (M8) ②:
18 N·m (1.8 kgf·m, 13.3 ft·lb)

4. Connect the speedometer hose ⑥.

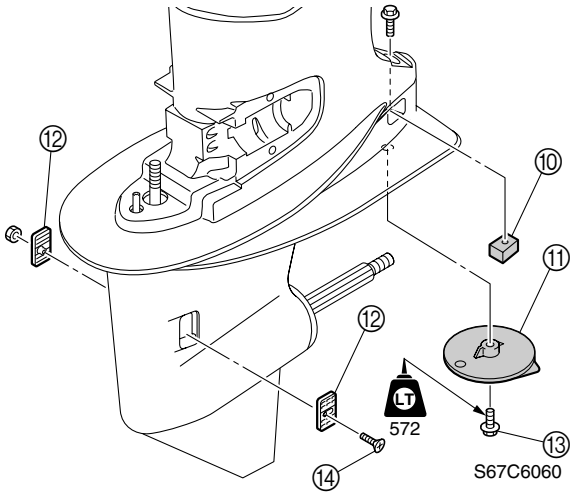
5. Turn the adjusting nut ⑦ to connect the shift rods ⑧, and then tighten the locknut ⑨.



NOTE:
After connecting the shift rod ⑧, check that the gear shift operates properly.

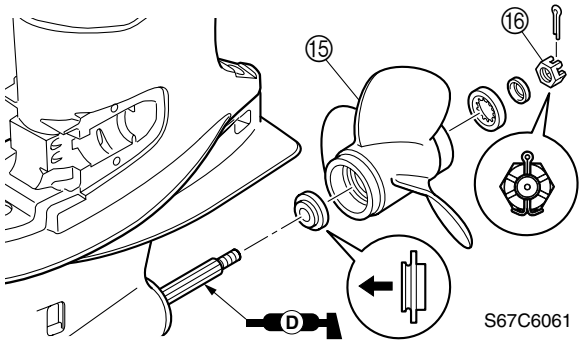
Screwed in length ⓐ:
8.0–9.0 mm (0.31–0.35 in)

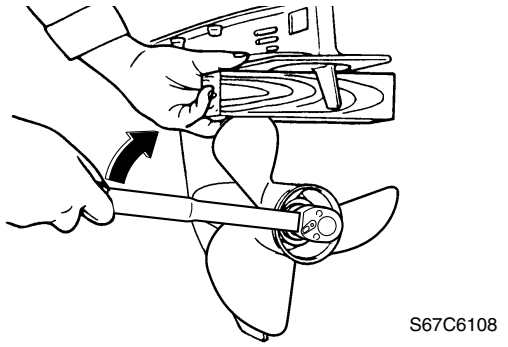
6. Install the anode ⑩, trim tab ⑪, and cooling water inlet covers ⑫, and then tighten the trim tab bolt ⑬ and cooling water inlet cover screw ⑭ to the specified torques.



Trim tab bolt ⑬:
18 N·m (1.8 kgf·m, 13.3 ft·lb)
Cooling water inlet cover screw ⑭:
4 N·m (0.4 kgf·m, 3.0 ft·lb)

7. Install the propeller ⑮ and propeller nut ⑯. Place a block of wood between the anti-cavitation plate and propeller to keep the propeller from turning, and then tighten the nut to the specified torque.





⚠ WARNING

- **Do not hold the propeller with your hands when loosening or tightening the propeller nut.**
- **Be sure to disconnect the battery cables from the battery and remove the clip from the engine shut-off switch. (E and W model)**

NOTE:
If the grooves in the propeller nut ⑯ do not align with the cotter pin hole, tighten the nut until they are aligned.

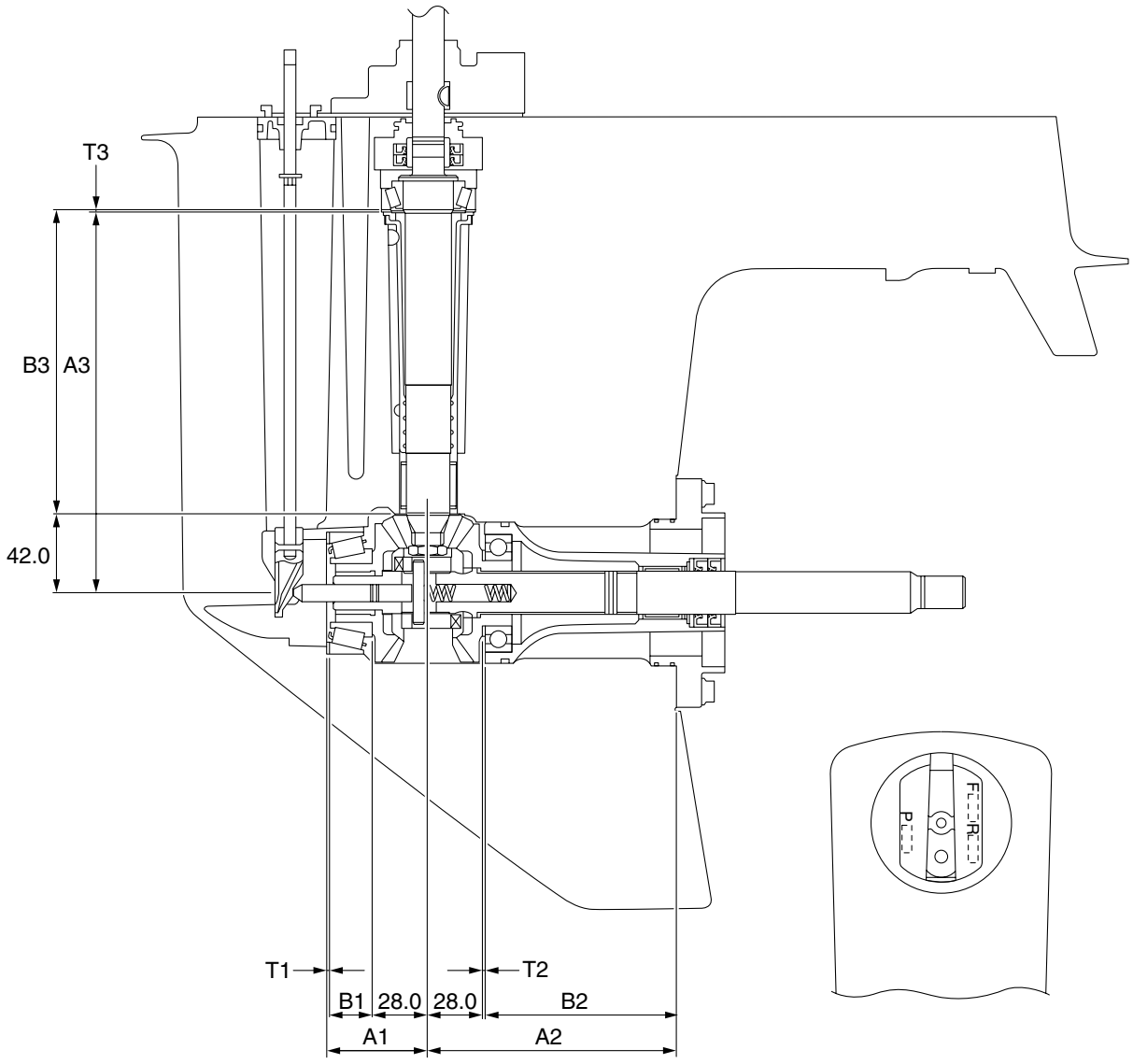
Propeller nut ⑯:
39 N·m (3.9 kgf·m, 28.8 ft·lb)

8. Fill the lower unit with gear oil to the correct level.

Recommended gear oil:
Hypoid gear oil
API: GL-4
SAE: 90
Gear oil quantity:
430 cm^3
(14.54 US oz, 15.17 Imp oz)

6

Shimming



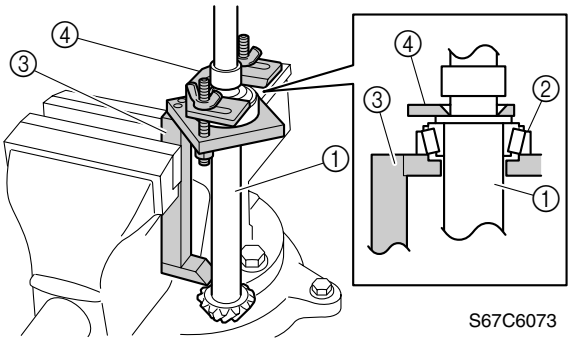
S67C6063

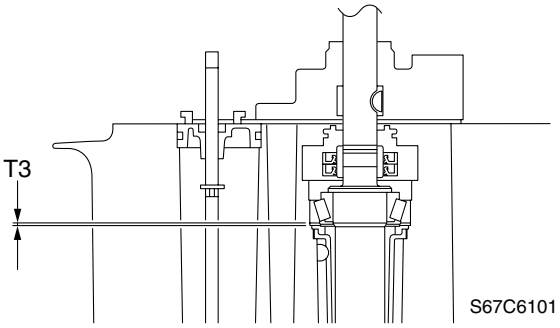
Shimming

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

Selecting the pinion shim

1. Install the drive shaft ① and taper roller bearing ② onto the special service tools.





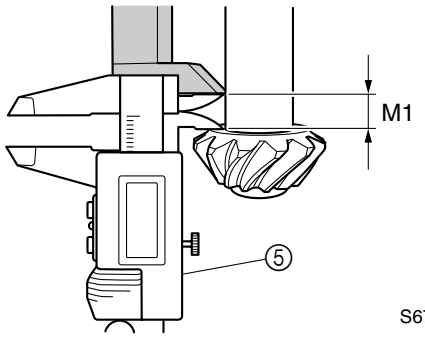
NOTE:
- Select the shim thickness (T3) by using the specified measurement(s) and the calculation formula.
- Hold the special service tool ③ in a vise, and then install the drive shaft ① onto the tool so that the shaft is centered in the hole.
- Tighten the wing nuts another 1/4 of a turn after they contact the special service tool ④.
- Make sure that the special service tool ③ and drive shaft ① are parallel.

Pinion height gauge ③:
90890-06710
Pinion height gauge plate B ④:
90890-06712

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

Pinion nut:
74 N·m (7.4 kgf·m, 54.6 ft·lb)

3. Measure the distance (M1) between the special service tool and the pinion as shown.

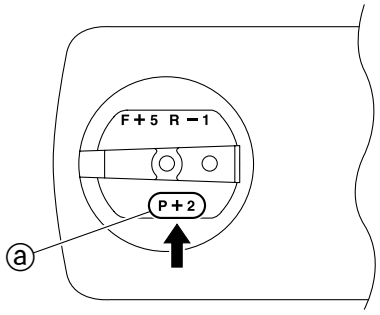


NOTE:
Measure the pinion at 4 points to find the distance average.

Digital caliper ⑤: 90890-06704

6

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



S67C6064

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 measure the backlash when the unit is assembled.

Calculation formula:
Pinion shim thickness (T3) =
M1 – 11.30 – P/100

Example:
If "M1" is 11.70 mm and "P" is (+5), then
T3 = 11.70 – 11.30 – (+5)/100 mm
= 11.70 – 11.30 – 0.05 mm
= 0.35 mm
If "M1" is 11.70 mm and "P" is (–3), then
T3 = 11.70 – 11.30 – (–3)/100 mm
= 11.70 – 11.30 + 0.03 mm
= 0.43 mm

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

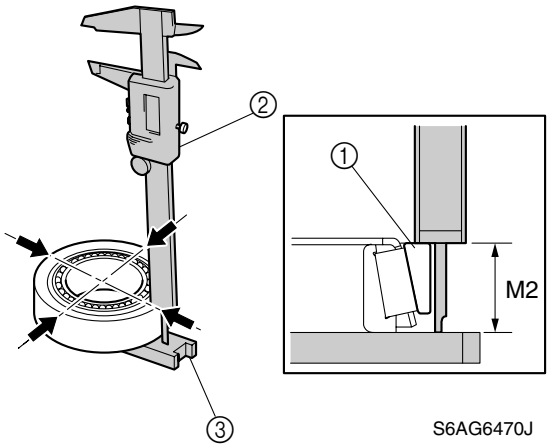
Calculated number	Rounded number
0.01–0.02	0.02
0.03–0.05	0.05
0.06–0.08	0.08
0.09–0.10	0.10

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

Example:
If "T3" is 0.35 mm, then the pinion shim thickness is 0.35 mm.
If "T3" is 0.43 mm, then the pinion shim thickness is 0.45 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 (M2) as shown.



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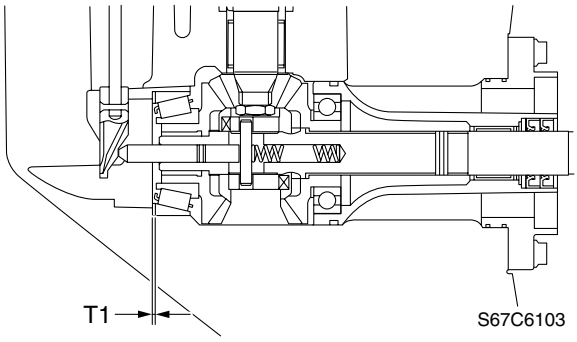
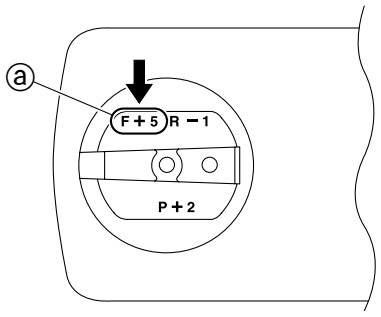


S67C6103

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.

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

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



S67C6067

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) =
22.75 + F/100 – M2

Example:
If "M2" is 22.30 mm and "F" is (+5), then
T1 = 22.75 + (+5)/100 – 22.30 mm
= 22.75 + 0.05 – 22.30 mm
= 0.50 mm
If "M2" is 22.30 mm and "F" is (–3), then
T1 = 22.75 + (–3)/100 – 22.30 mm
= 22.75 – 0.03 – 22.30 mm
= 0.42 mm

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

Calculated number	Rounded number
0.01–0.02	0.00
0.03–0.05	0.02
0.06–0.08	0.05
0.09–0.10	0.08

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

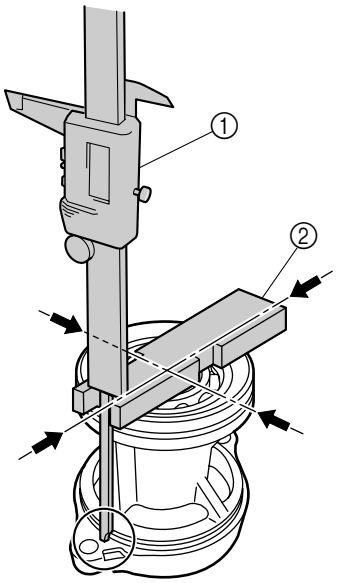
Example:
If "T1" is 0.50 mm, then the forward gear shim thickness is 0.48 mm.
If "T1" is 0.42 mm, then the forward gear shim thickness is 0.40 mm.

Selecting the reverse gear shim

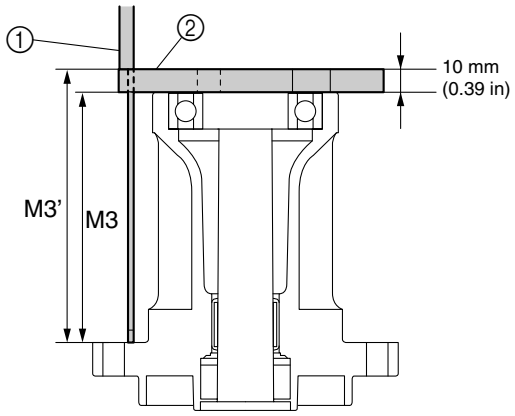
1. Remove the reverse gear and reverse gear shim(s) from the propeller shaft housing.

6

2. Measure the propeller shaft housing height (M3) as shown.



S67C6075



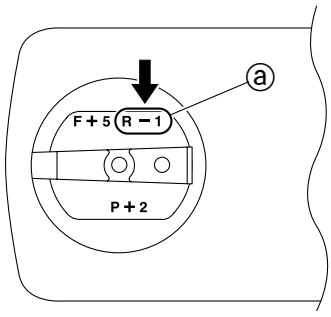
S67C6076

M3 = M3' – 10 mm

NOTE:
Measure the propeller shaft housing at 4 points to find the height average.

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

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



S67C6078

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) = 98.00 – M3 + R/100

Example:
If "M3" is 96.79 mm and "R" is (–1), then
T2 = 98.00 – 96.79 + (–1)/100 mm
= 98.00 – 96.79 – 0.01 mm
= 1.20 mm
If "M3" is 96.79 mm and "R" is (+3), then
T2 = 98.00 – 96.79 + (+3)/100 mm
= 98.00 – 96.79 + 0.03 mm
= 1.24 mm

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

Calculated number	Rounded number
0.01–0.02	0.00
0.03–0.05	0.02
0.06–0.08	0.05
0.09–0.10	0.08

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

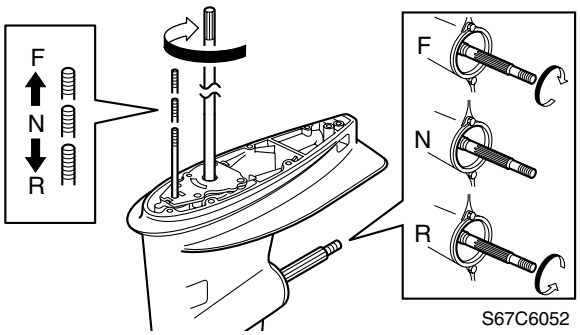
Example:
If “T2” is 1.20 mm, then the reverse gear shim thickness is 1.18 mm.
If “T2” is 1.24 mm, then the reverse gear shim thickness is 1.22 mm.

Backlash

Measuring the forward and reverse gear backlash

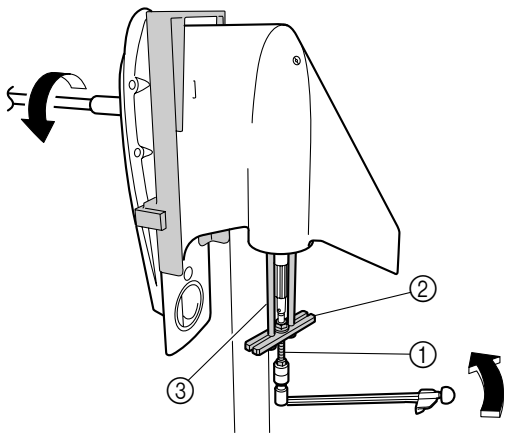
NOTE:
Remove the water pump assembly before measuring the backlash.

1. Install the lower unit onto a repair stand.
2. Set the shift rod to the N position at the lower unit.



S67C6052

3. Turn the lower unit so that the propeller shaft is facing down.
4. Install the special service tools onto the propeller shaft.
5. Tighten the center bolt ① to the specified torque while turning the drive shaft.

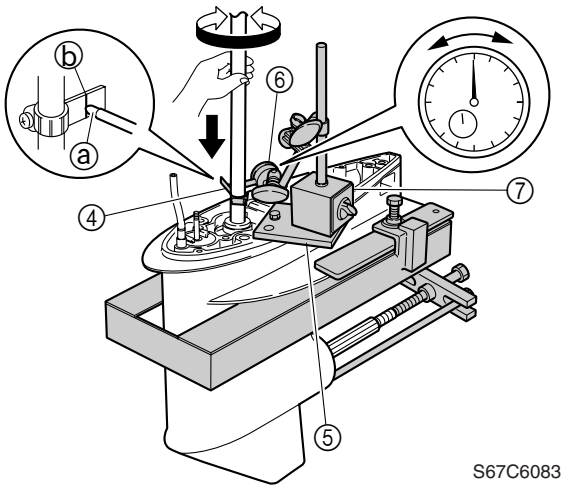


S67C6081

Center bolt ①: 90890-06504
Stopper guide plate ②: 90890-06501
Bearing housing puller claw S ③: 90890-06564

Center bolt ①:
5 N·m (0.5 kgf·m, 3.7 ft·lb)

6. Turn the lower unit upright.
7. Install the backlash indicator ④ onto the drive shaft where the shaft diameter is 16.0 mm (0.63 in), and then set up the dial gauge as shown.



S67C6083

NOTE:
Position the dial gauge so that the plunger tip ⓐ is aligned with the mark ⓑ on the backlash indicator.

Backlash indicator ④: 90890-06706
Magnet base plate ⑤: 90890-07003
Dial gauge set ⑥: 90890-01252
Magnet base B ⑦: 90890-06844

6

8. Slowly turn the drive shaft clockwise and counterclockwise and measure the backlash between where the drive shaft stops in each direction.

NOTE:
- Push the drive shaft downward, and then turn it.
- Measure the backlash at 4 points to find the average.

Forward gear backlash:
0.18–0.57 mm (0.0071–0.0224 in)

9. Adjust the current forward gear shim thickness if the forward gear backlash is out of specification.

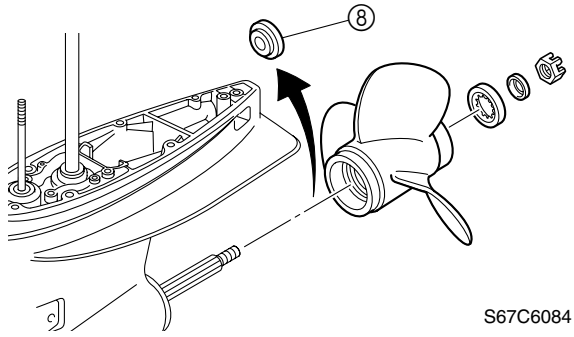
Forward gear backlash	Forward gear shim thickness
Less than 0.18 mm (0.0071 in)	To be decreased by (0.38 – M) × 0.53
More than 0.57 mm (0.0224 in)	To be increased by (M – 0.38) × 0.53

M: Measurement

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

10. Remove the special service tools from the propeller shaft.

11. Install the propeller, spacer, bushing, and nut, without installing the spacer ⑧.

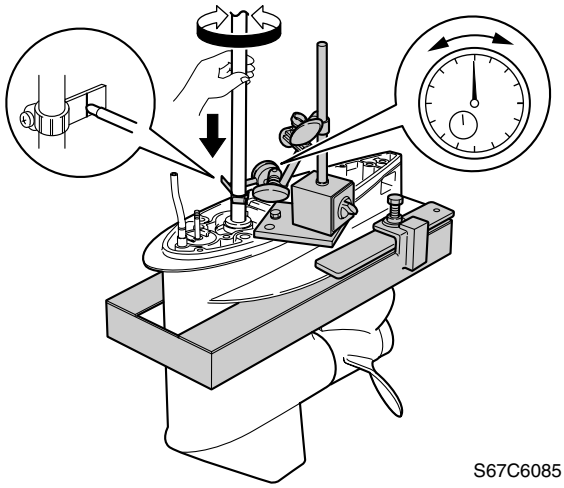


S67C6084

12. Tighten the propeller nut to the specified torque.

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

13. Slowly turn the drive shaft clockwise and counterclockwise and measure the backlash between where the drive shaft stops in each direction.


S67C6085

NOTE:
- Push the drive shaft downward, and then turn it.
- Measure the backlash at 4 points to find the average.

Reverse gear backlash:
0.75–1.13 mm (0.0295–0.0445 in)

14. Adjust the current reverse gear shim thickness if the reverse gear backlash is out of specification.

Reverse gear backlash	Reverse gear shim thickness
Less than 0.75 mm (0.0295 in)	To be decreased by (0.94 – M) × 0.53
More than 1.13 mm (0.0445 in)	To be increased by (M – 0.94) × 0.53

M: Measurement

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

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

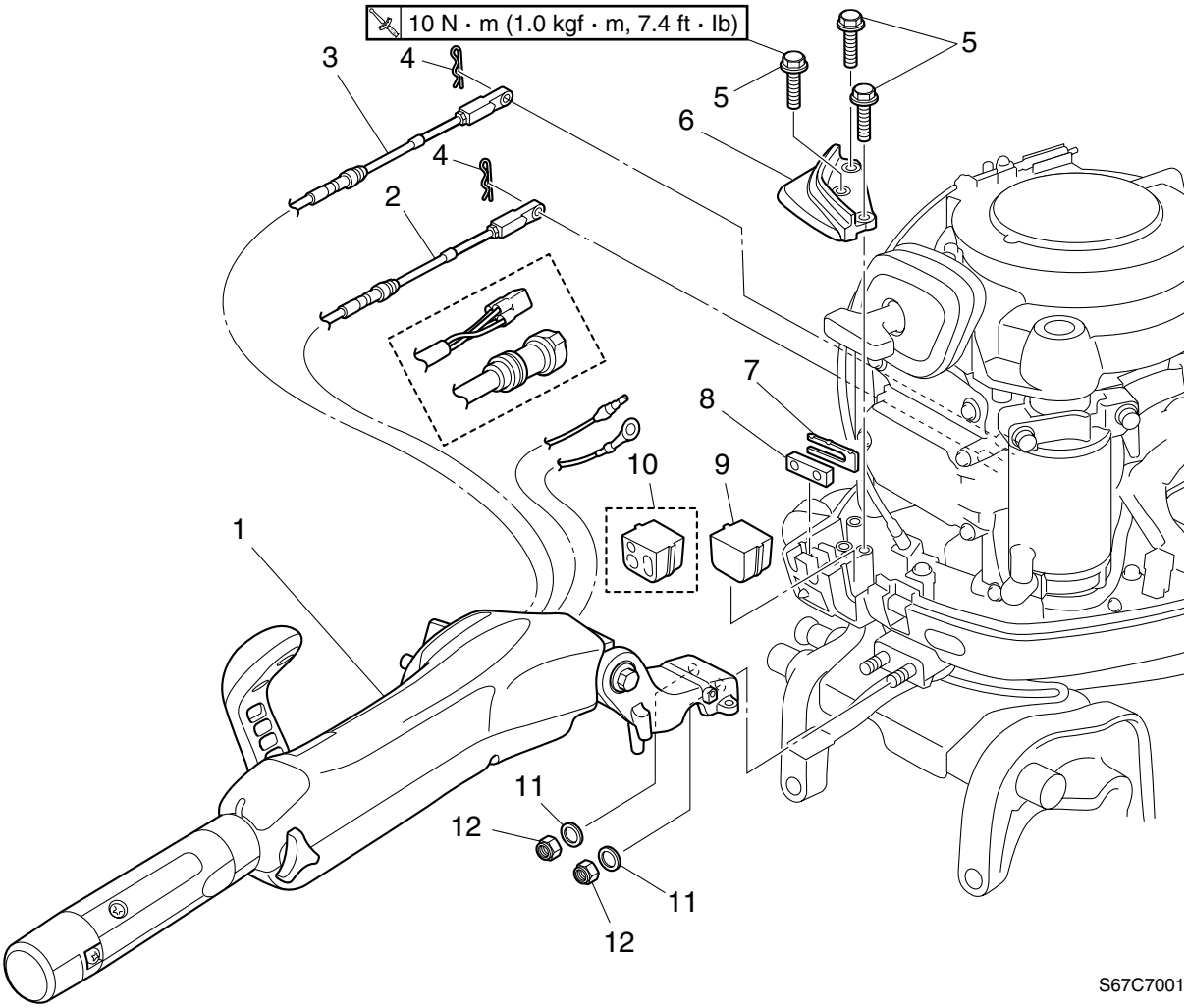
NOTE:
To install the water pump assembly, see “Installing the water pump” (6-18).

16. Fill the lower unit with gear oil to the correct level.

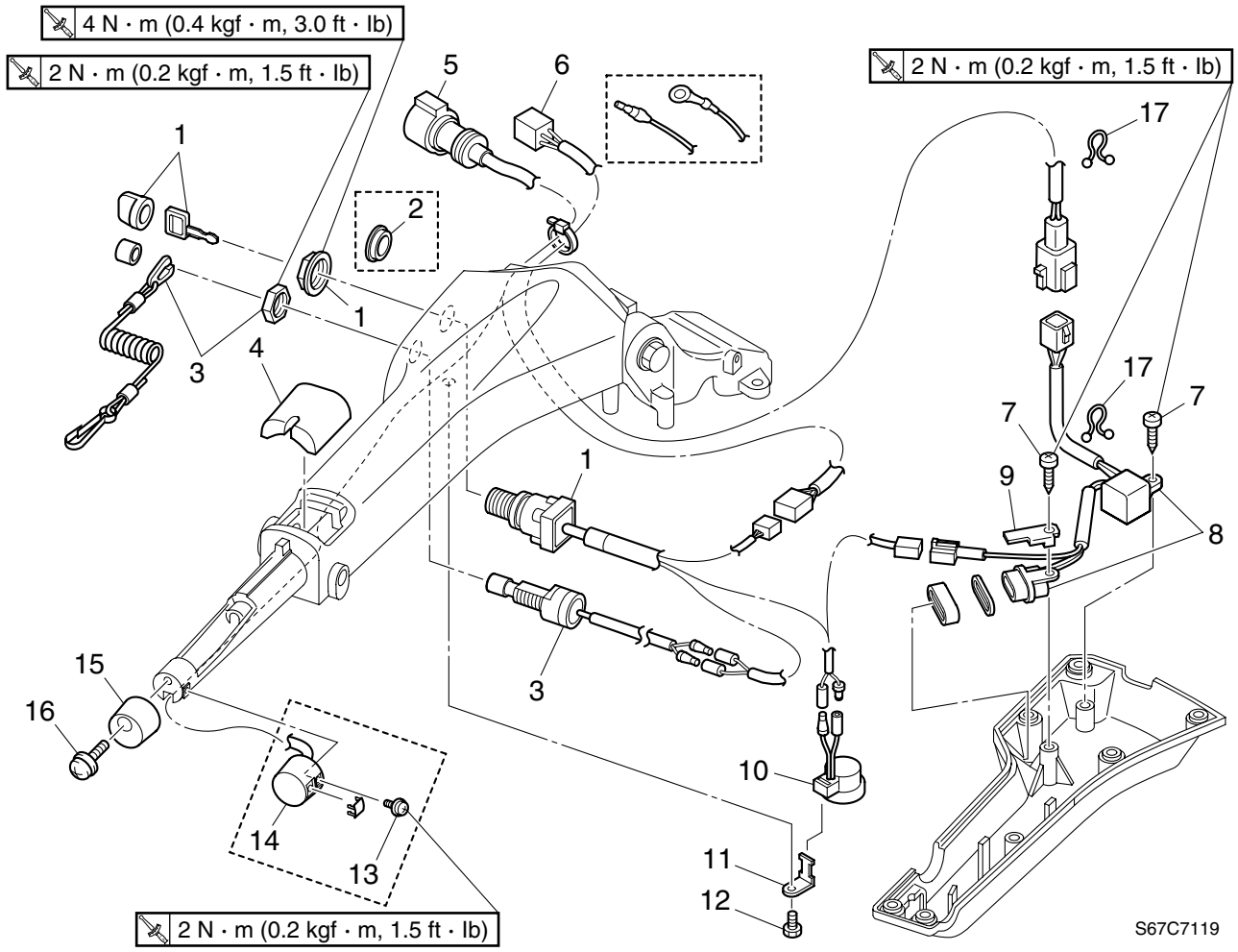
Bracket unit

7

Tiller handle (H model)

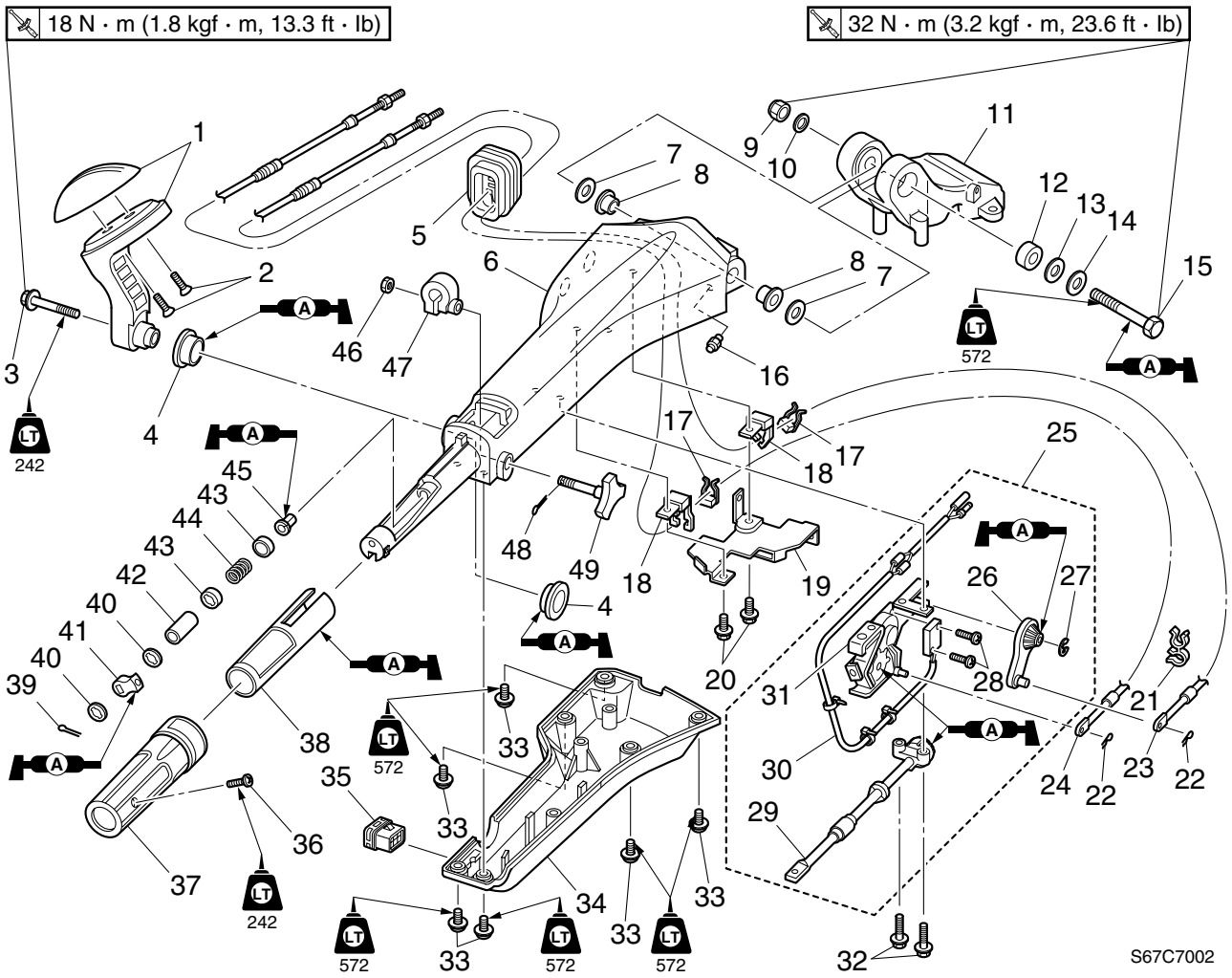


No.	Part name	Q'ty	Remarks
1	Tiller handle assembly	1	
2	Shift cable	1	
3	Throttle cable	1	
4	Clip	2	
5	Bolt	3	M6 × 25 mm
6	Retaining plate	1	
7	Cable holder	1	
8	Grommet	1	
9	Grommet	1	M model
10	Grommet	1	E and W model
11	Washer	2	
12	Self-locking nut	2	

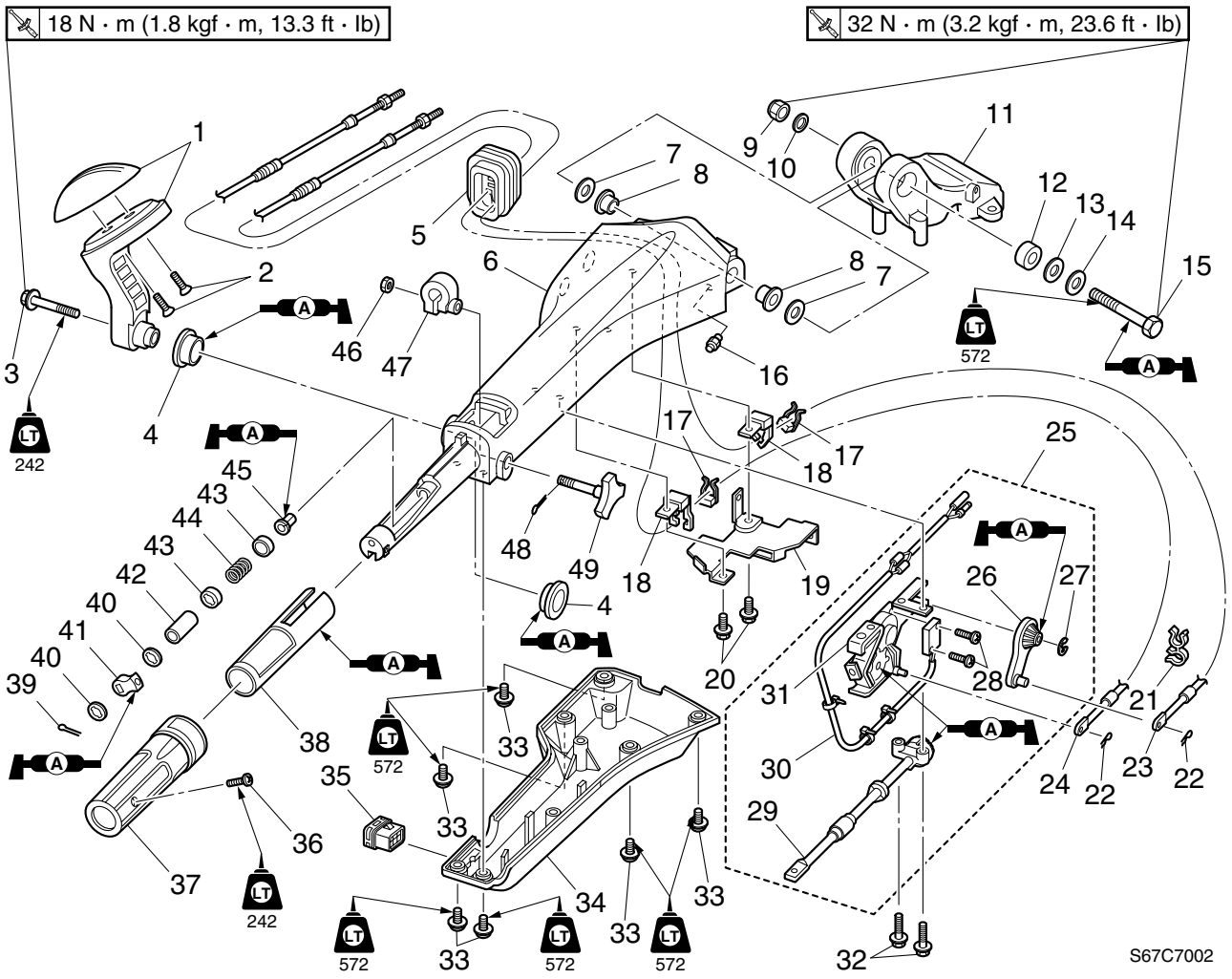


No.	Part name	Q'ty	Remarks
1	Engine start switch	1	E and W model
2	Plug	1	M model
3	Engine shut-off switch	1	
4	Cover	1	
5	10-pin main harness	1	E and W model
6	Warning indicator harness	1	E and W model
7	Screw	2	ø6 × 19 mm/E and W model
8	Warning indicator assembly	1	E and W model
9	Plate	1	E and W model
10	Warning buzzer	1	E and W model
11	Bracket	1	E and W model
12	Bolt	1	M6 × 14 mm/E and W model
13	Screw	1	ø6 × 16 mm/PTT model
14	PTT switch	1	PTT model
15	Grip end	1	
16	Screw	1	ø6 × 16 mm
17	Clamp	2	E and W model

7

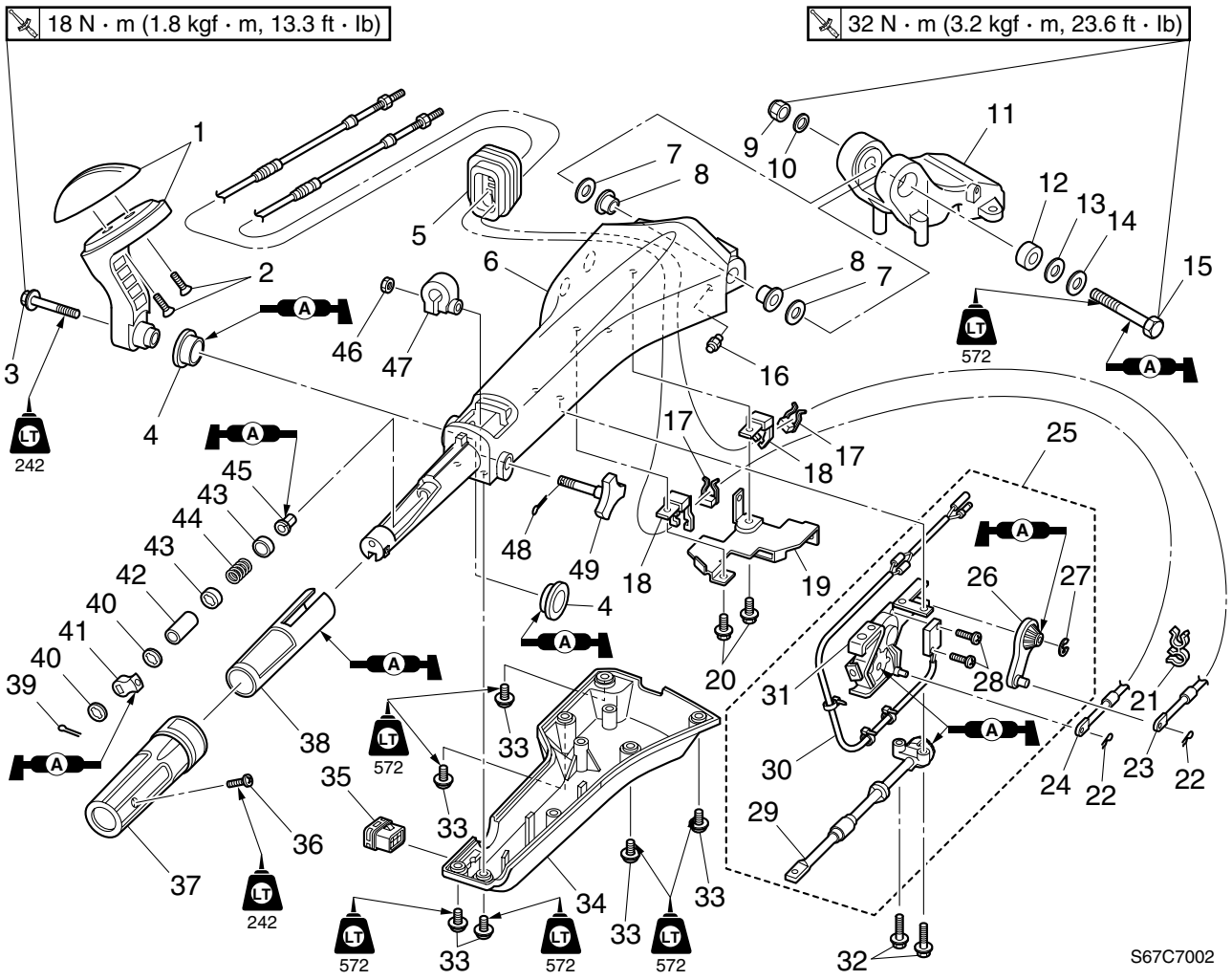


No.	Part name	Q'ty	Remarks
1	Shift lever	1	
2	Screw	2	ø6 × 15 mm
3	Bolt	1	M8 × 40 mm
4	Bushing	2	
5	Grommet	1	
6	Tiller handle	1	
7	Washer	2	
8	Collar	2	
9	Self-locking nut	1	
10	Washer	1	
11	Tiller handle bracket	1	
12	Collar	1	
13	Wave washer	1	
14	Washer	1	
15	Bolt	1	M12 × 80 mm
16	Grease nipple	1	
17	Holder	2	



No.	Part name	Q'ty	Remarks
18	Holder	2	
19	Cable bracket	1	
20	Bolt	2	M6 × 14 mm
21	Holder	1	
22	Clip	2	
23	Throttle cable	1	
24	Shift cable	1	
25	Shift link assembly	1	
26	Throttle lever	1	
27	E-clip	1	
28	Screw	2	ø3 × 15 mm
29	Throttle rod	1	
30	Neutral switch	1	E and W model
31	Shift link	1	
32	Bolt	2	M6 × 30 mm
33	Screw	6	ø6 × 16 mm
34	Tiller handle cover	1	

7



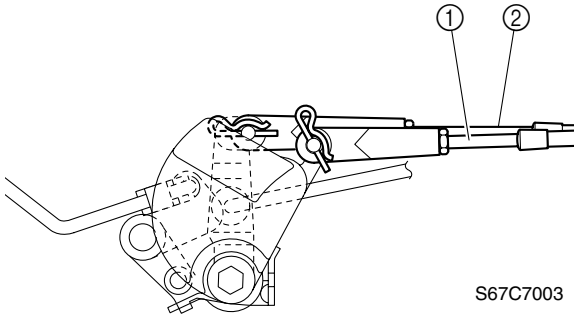
No.	Part name	Q'ty	Remarks
35	Cap	1	
36	Screw	1	ø5 × 22 mm
37	Grip	1	
38	Bushing	1	
39	Cotter pin	1	
40	Washer	2	
41	Throttle rod cam	1	
42	Collar	1	
43	Spring seat	2	
44	Spring	1	
45	Bushing	1	
46	Nut	1	
47	Friction piece	1	
48	Cotter pin	1	**Not reusable**
49	Throttle friction adjuster	1	

Removing the tiller handle

1. Disconnect the engine shut-off switch leads (M model), or 10-pin main harness and warning indicator assembly coupler (E and W model).

NOTE:
To disconnect the leads or wiring harness, see "Electrical component and wiring harness routing" (8-1).

2. Disconnect the throttle cable ① and shift cable ②.



3. Remove the tiller handle and disassemble it.

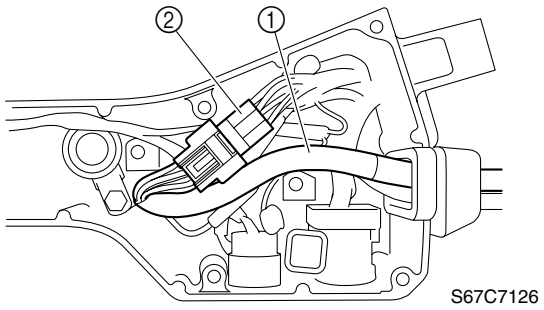
NOTE:
See the exploded diagram for disassembly (7-1).

Installing the tiller handle

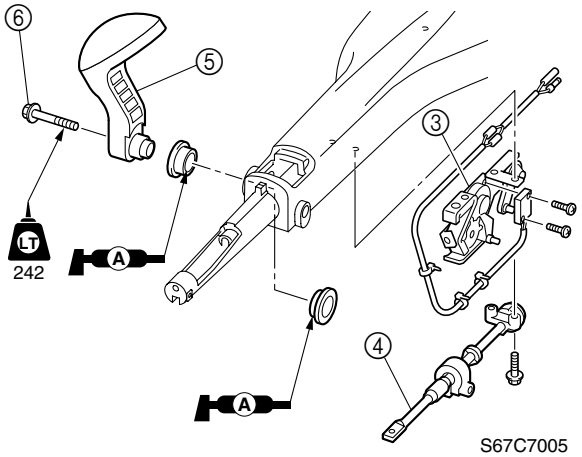
1. Assemble the tiller handle.

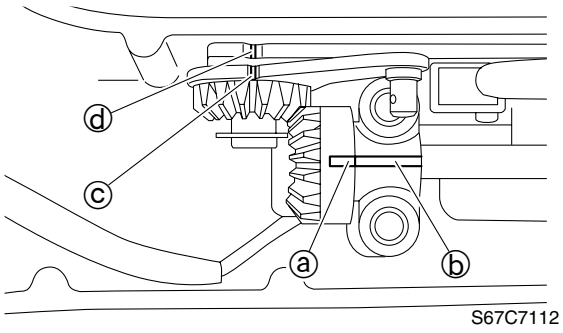
NOTE:
See the exploded diagram for assembly (7-1).

2. Connect the 10-pin main harness ① to the engine start switch coupler ② as shown. (E and W model)



3. Install the shift link assembly ③, throttle rod ④, and shift lever ⑤, and then tighten the bolt ⑥ to the specified torque.



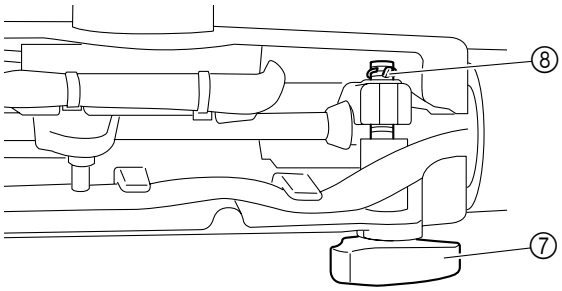


NOTE:
When installing the throttle rod ④, be sure to align the mark ⓐ on the throttle rod gear with the mark ⓑ on the rod guide and align the mark ⓒ on the throttle lever gear with the mark ⓓ on the shift bracket.

	Shift lever bolt ⑥: 18 N·m (1.8 kgf·m, 13.3 ft·lb)

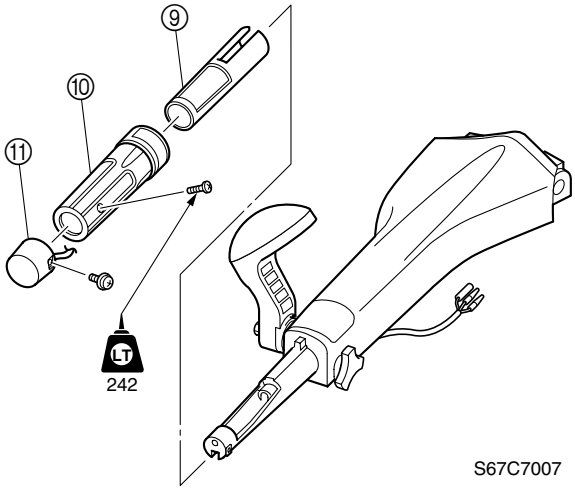
7

4. Install the throttle friction adjuster ⑦, and then install a new cotter pin ⑧.

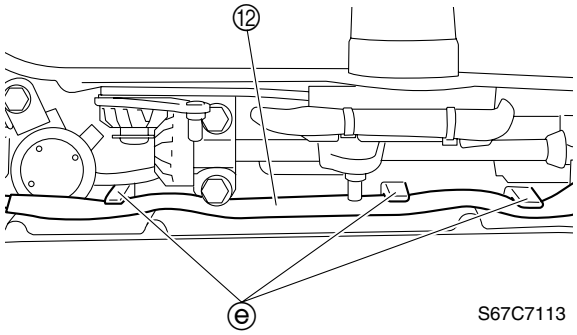


S67C7006

5. Install the bushing ⑨, throttle grip ⑩, and PTT switch ⑪ (PTT model).



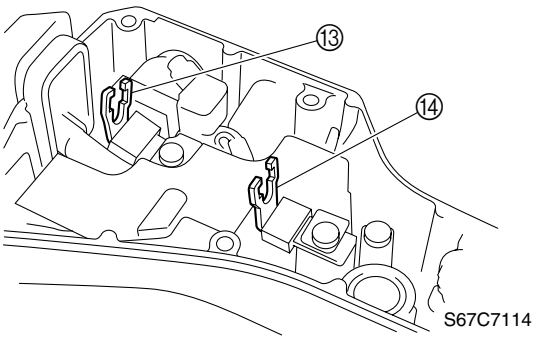
S67C7007



S67C7113

NOTE:
Fasten the PTT switch lead ⑫ with the holders ⓔ. (PTT model)

6. Install the throttle cable holder ⑬ and shift cable holder ⑭ as shown.



S67C7114

7. Install the tiller handle assembly to the steering arm, and then tighten the nuts to the specified torque.

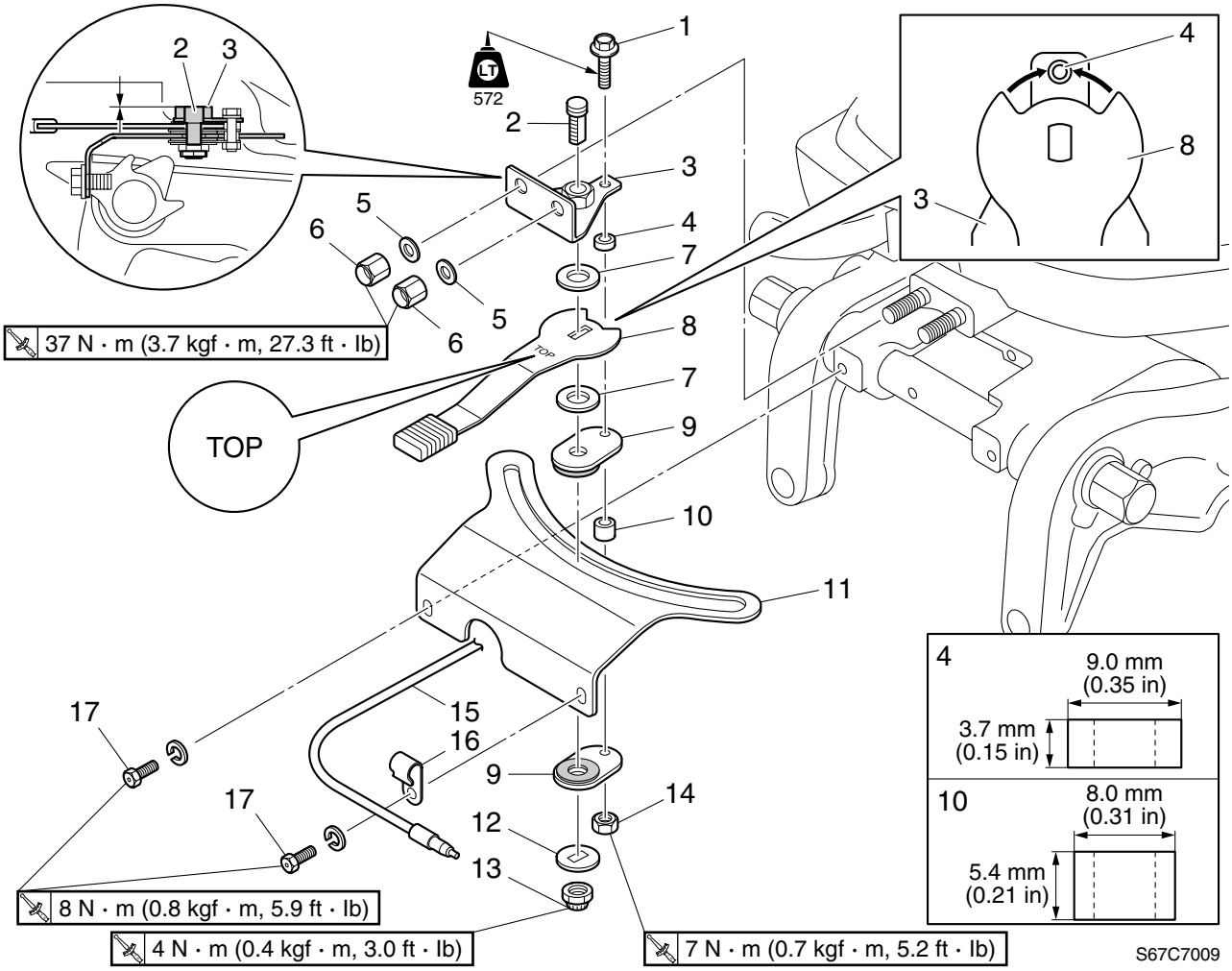
	Tiller handle nut: 37 N·m (3.7 kgf·m, 27.3 ft·lb)

8. Connect the throttle cable and shift cable.

NOTE:
To adjust the throttle cable and shift cable, see “Adjusting the throttle cable” (3-8) and “Checking the gear shift operation” (3-9).

9. Connect the engine shut-off switch leads (M model), or 10-pin main harness and warning indicator assembly coupler (E and W model).

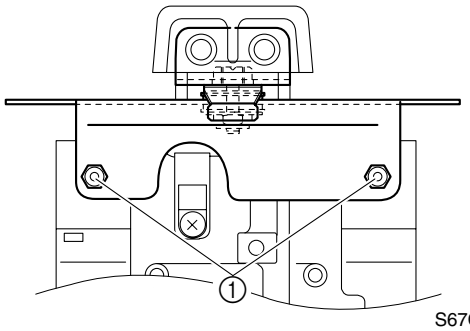
Friction plate (H model)



No.	Part name	Q'ty	Remarks
1	Bolt	1	M5 × 20 mm
2	Steering lock shaft	1	
3	Bracket	1	
4	Collar	1	Short
5	Washer	2	
6	Self-locking nut	2	
7	Washer	2	
8	Steering lock lever	1	
9	Friction piece	2	
10	Collar	1	Long
11	Friction plate	1	
12	Steering lock washer	1	
13	Self-locking nut	1	
14	Nut	1	
15	Speedometer hose	1	
16	Holder	1	
17	Bolt	2	M6 × 12 mm

Disassembling the friction plate

1. Remove the tiller handle and friction plate bolts ①, and then remove the friction plate assembly from the swivel bracket.



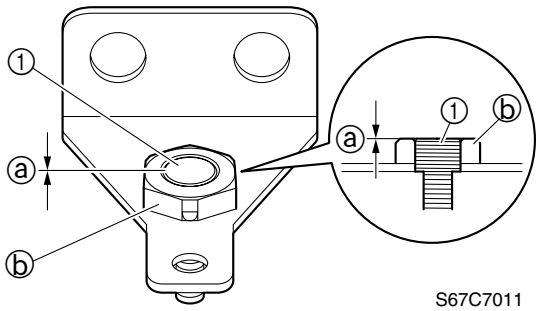
S67C7010

2. Disassemble the friction plate assembly.

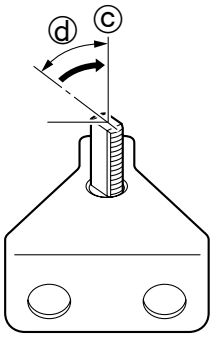
NOTE:
See the exploded diagram for disassembly (7-8).

Assembling the friction plate

1. Turn the steering lock shaft ① until it is flush with the end ⓐ of the nut ⓑ on the bracket.



S67C7011



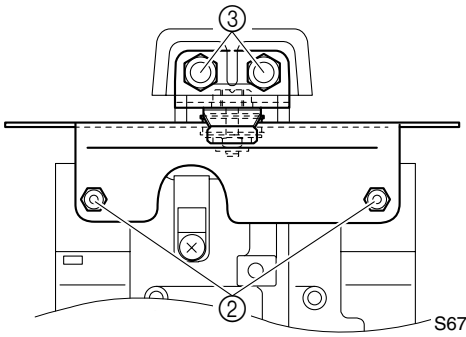
S67C7012

NOTE:
If the steering lock shaft ① is not aligned with position ⓒ, turn it whichever direction requires less than 90° ⓓ for proper alignment.

2. Assemble the friction plate assembly.

NOTE:
- See the exploded diagram for assembly (7-8).
- Face the "TOP" mark on the steering lock lever up.
- Be sure to install the collars in the correct positions; the collar lengths are different.

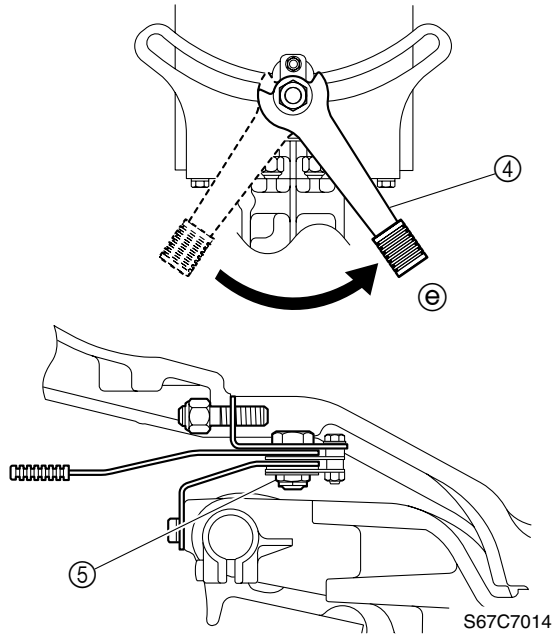
3. Install the friction plate assembly and tiller handle, and then tighten the friction plate bolts ② and tiller handle nuts ③ to the specified torque.



S67C7013

Friction plate bolt (M6) ②:
8 N·m (0.8 kgf·m, 5.9 ft·lb)
Tiller handle nut ③:
37 N·m (3.7 kgf·m, 27.3 ft·lb)

4. Move the steering lock lever ④ to position ⓔ, and then tighten the friction plate self-locking nut ⑤ to the specified torque.

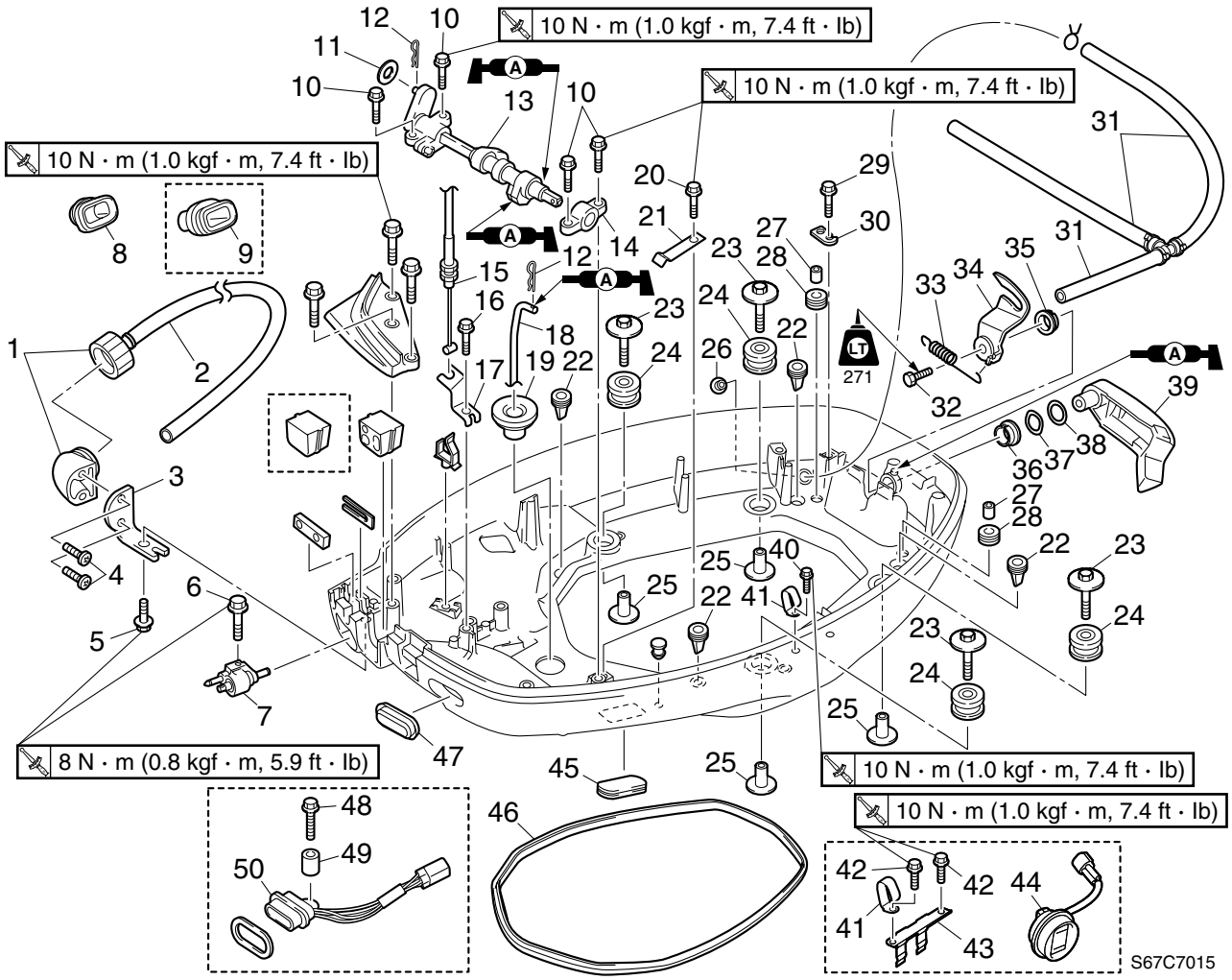


NOTE:
To check and adjust the friction plate, see "Checking the steering operation (H model)" (3-12).

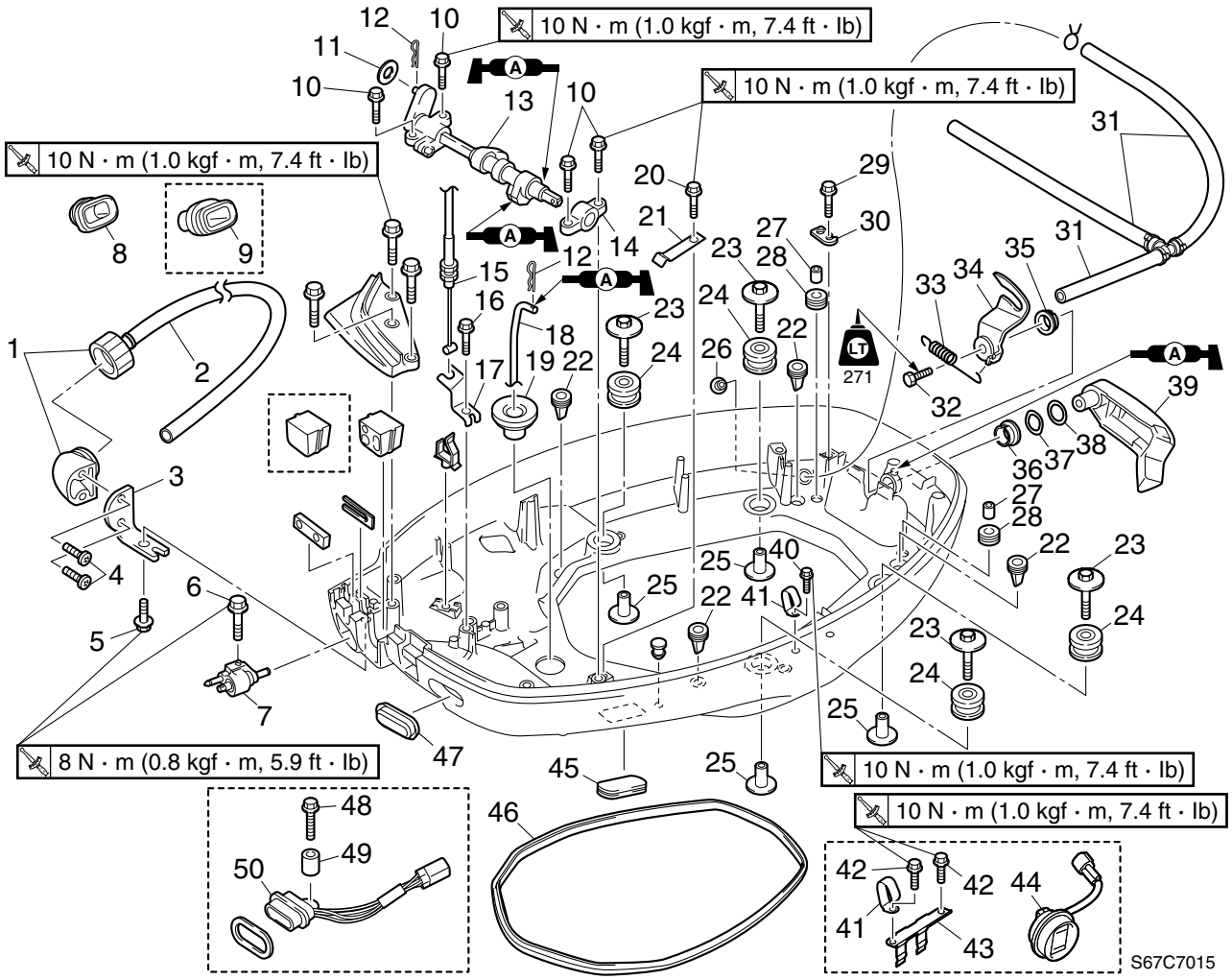
	Friction plate self-locking nut ⑤: 4 N·m (0.4 kgf·m, 3.0 ft·lb)

7

Bottom cowling

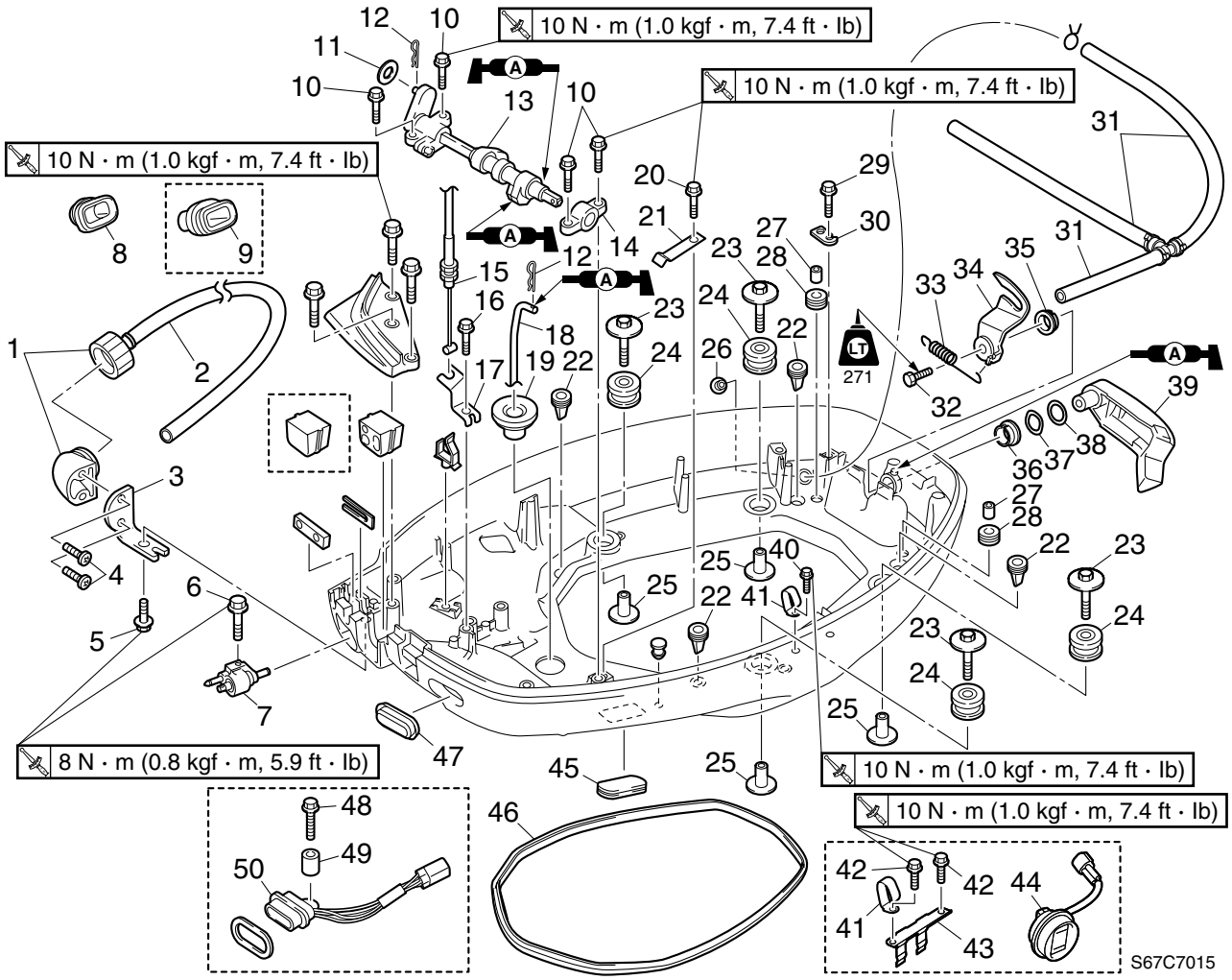


No.	Part name	Q'ty	Remarks
1	Adapter	1	
2	Flushing hose	1	
3	Bracket	1	
4	Screw	2	ø6 × 19 mm
5	Bolt	1	M6 × 16 mm
6	Bolt	1	M6 × 25 mm
7	Fuel joint	1	
8	Grommet	1	D model
9	Grommet	1	PTT model
10	Bolt	4	M6 × 25 mm
11	Washer	1	
12	Clip	2	
13	Shift rod lever	1	
14	Bracket	1	
15	Start-in-gear protection cable	1	M and W model
16	Bolt	1	M6 × 20 mm
17	Bracket	1	



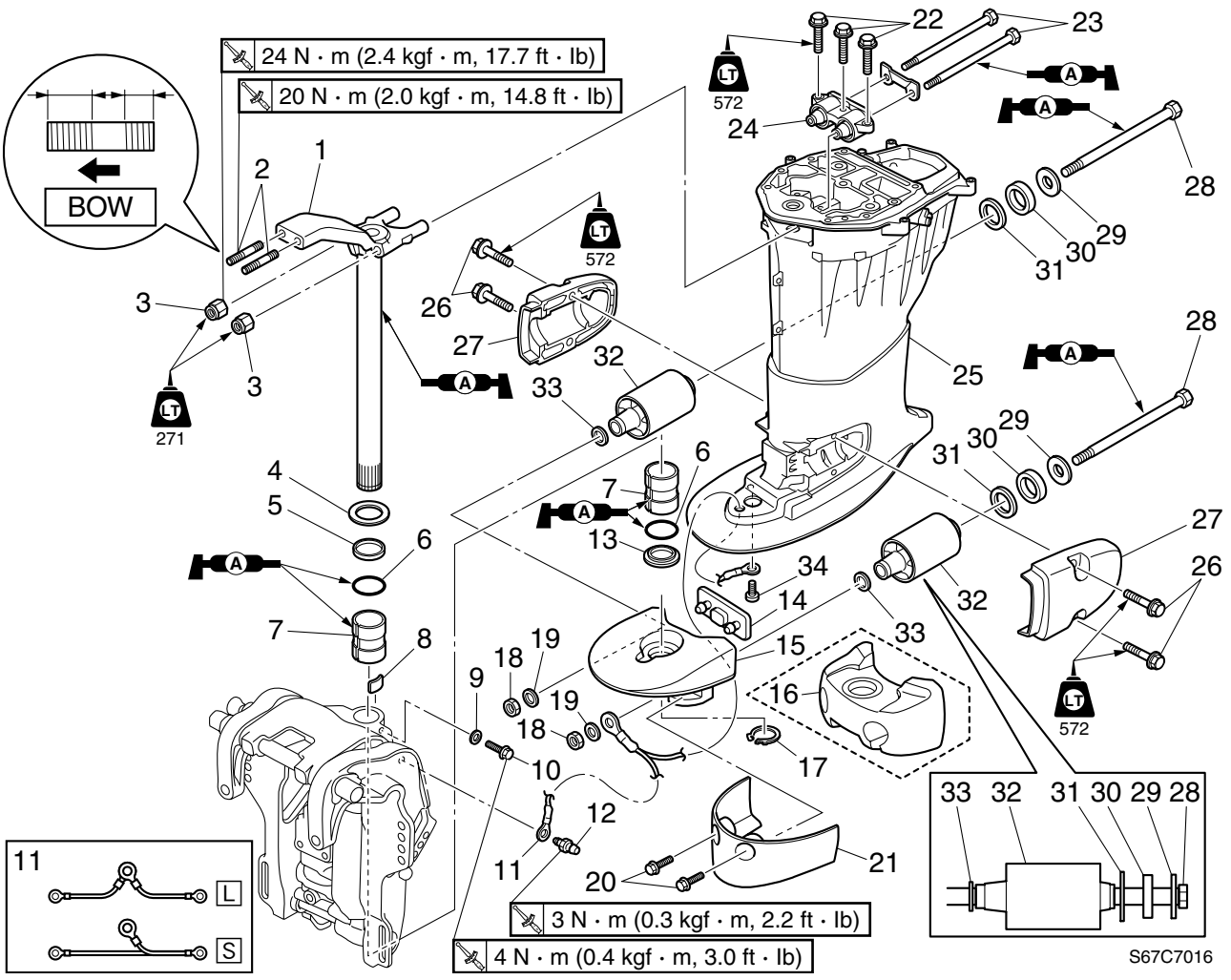
No.	Part name	Q'ty	Remarks
18	Shift rod	1	
19	Grommet	1	
20	Bolt	1	M6 × 20 mm
21	Spring	1	
22	Grommet	4	
23	Bolt	4	M6 × 30 mm
24	Grommet	4	
25	Collar	4	
26	Water outlet	1	
27	Collar	2	
28	Grommet	2	
29	Bolt	1	M6 × 25 mm
30	Plate	1	
31	Cooling water hose	3	
32	Bolt	1	M6 × 14 mm
33	Spring	1	
34	Clamp lever	1	

7

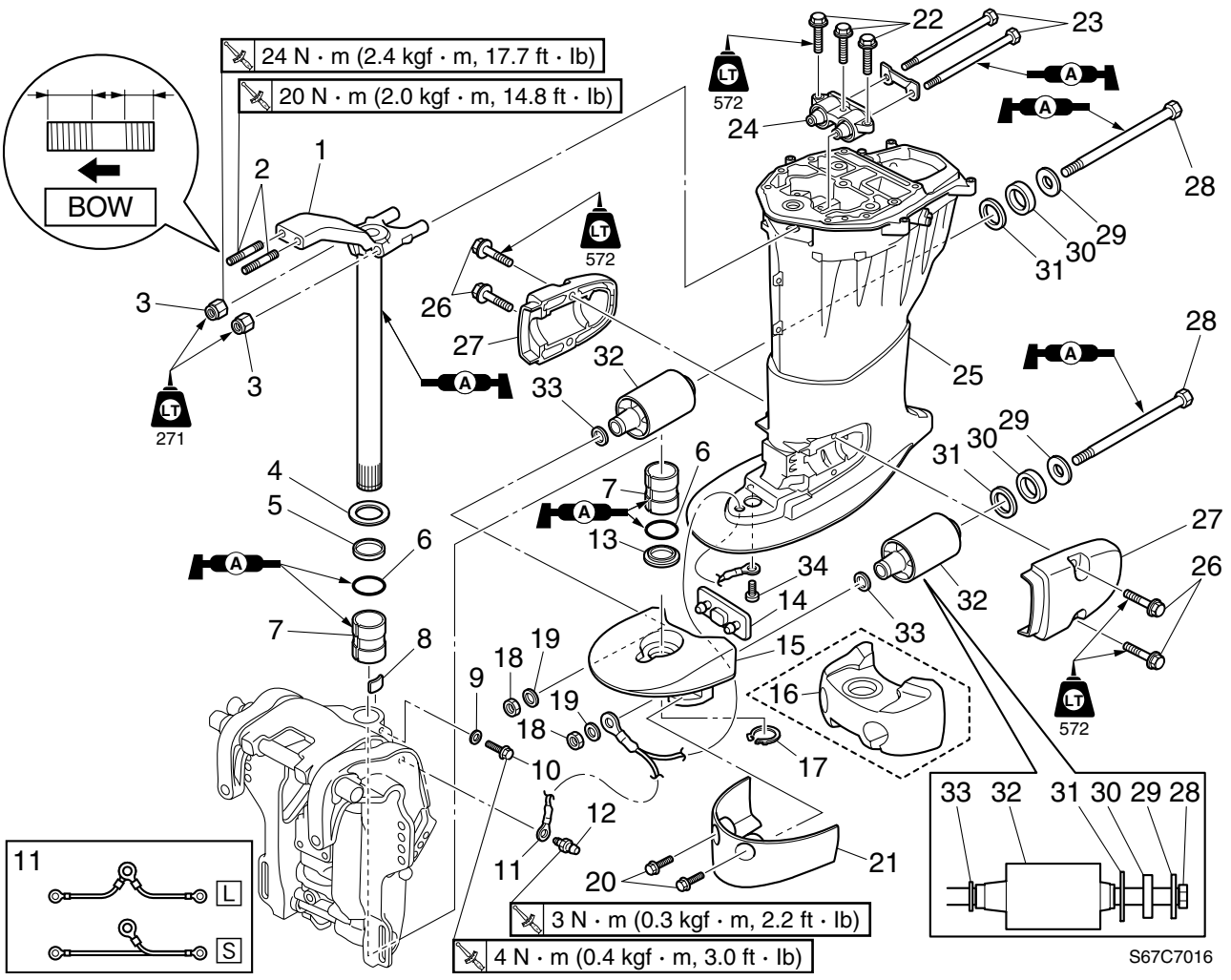


No.	Part name	Q'ty	Remarks
35	Bushing	1	
36	Bushing	1	
37	Wave washer	1	
38	Washer	1	
39	Cowling lock lever	1	
40	Bolt	1	M6 × 20 mm/H model with PTT
41	Holder	1	PTT model
42	Bolt	2	M6 × 20 mm/R model with PTT
43	Bracket	1	R model with PTT
44	PTT switch	1	R model with PTT
45	Plug	1	
46	Rubber seal	1	
47	Plug	1	E and W model
48	Bolt	1	M6 × 35 mm/M model
49	Collar	1	M model
50	Warning indicator assembly	1	M model

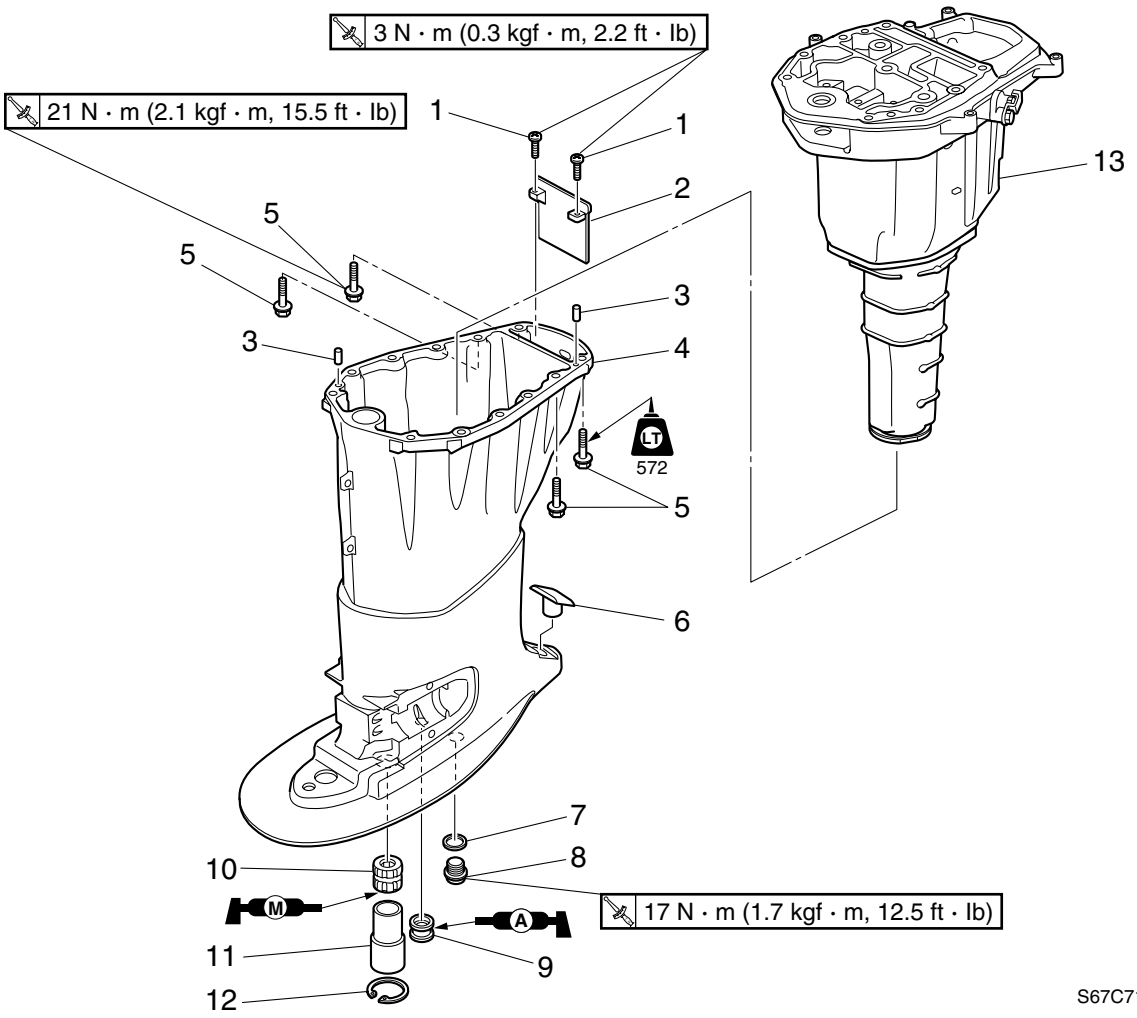
Upper case and steering arm



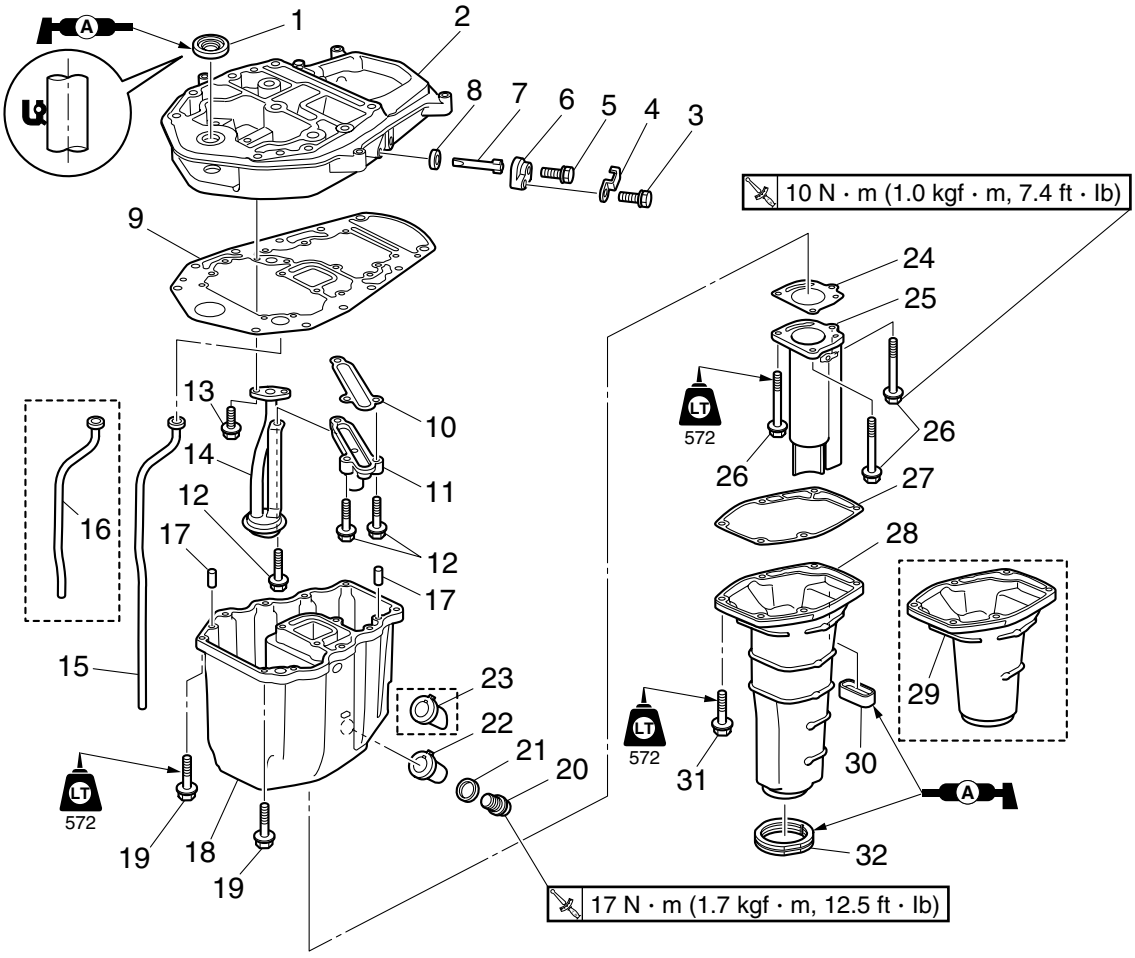
No.	Part name	Q'ty	Remarks
1	Steering arm	1	
2	Stud bolt	2	
3	Nut	2	
4	Washer	1	
5	Bushing 1	1	
6	O-ring	2	**Not reusable**
7	Bushing 2	2	
8	Plate	1	
9	Gasket	1	**Not reusable**
10	Bolt	1	M6 × 20 mm
11	Ground lead	1	L: L-transom model/S: S-transom model
12	Grease nipple	1	
13	Plate	1	
14	Rubber damper	1	
15	Steering yoke	1	L-transom model
16	Steering yoke	1	S-transom model
17	Circlip	1	



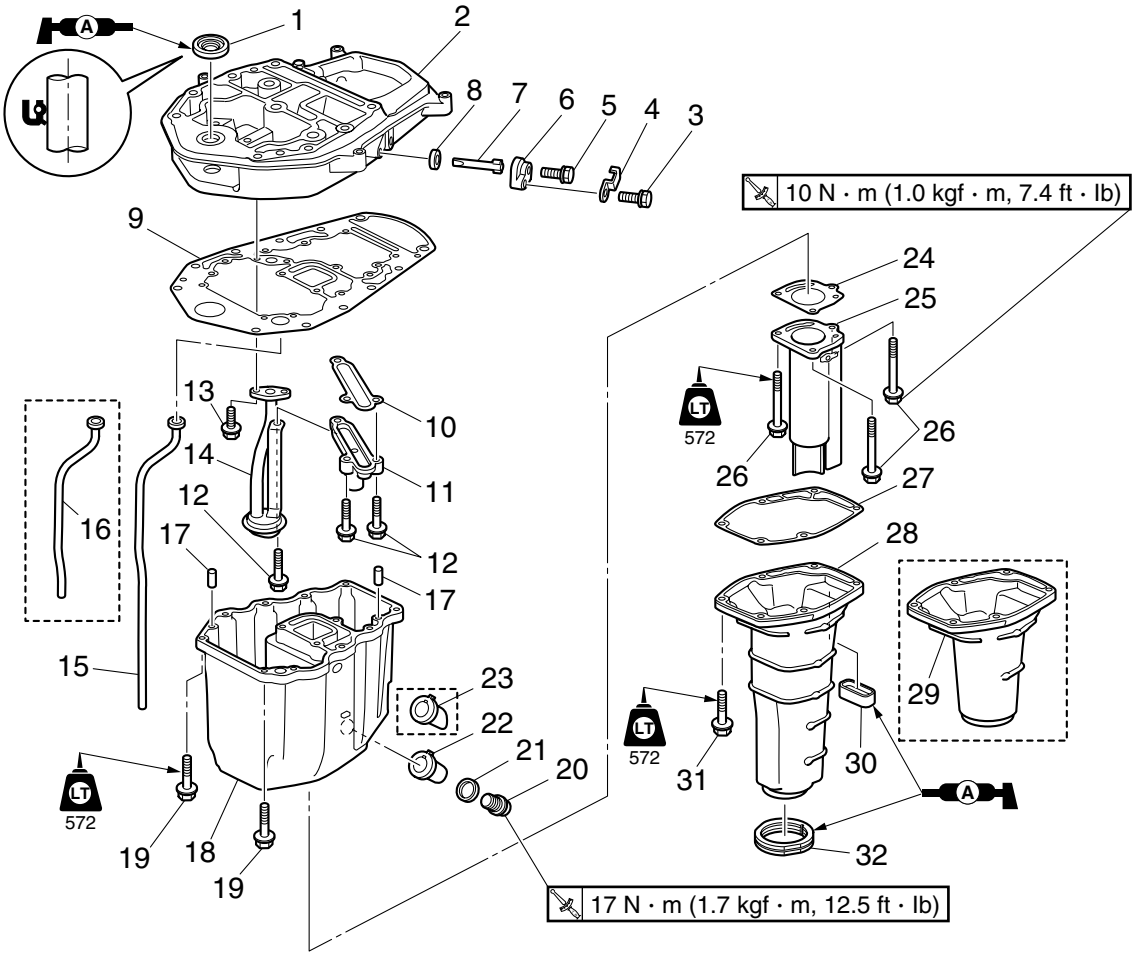
No.	Part name	Q'ty	Remarks
18	Nut	2	
19	Washer	2	
20	Bolt	2	M8 × 20 mm/L-transom model
21	Lower mount cover	1	L-transom model
22	Bolt	3	M8 × 30 mm
23	Bolt	2	M8 × 175 mm
24	Upper mount	1	
25	Upper case assembly	1	
26	Bolt	4	M8 × 30 mm
27	Lower mount housing	2	
28	Bolt	2	M12 × 170 mm
29	Washer	2	
30	Washer	2	
31	Washer	2	
32	Lower mount	2	
33	Washer	2	
34	Screw	1	ø6 × 7 mm



No.	Part name	Q'ty	Remarks
1	Screw	2	ø5 × 16 mm
2	Baffle plate	1	
3	Dowel	2	
4	Upper case	1	
5	Bolt	4	M8 × 30 mm
6	Grommet	1	
7	Gasket	1	**Not reusable** L-transom model
8	Plug	1	M14 × 12 mm/L-transom model
9	Grommet	1	L-transom model
10	Drive shaft bushing	1	L-transom model
11	Collar	1	L-transom model
12	Circlip	1	L-transom model
13	Oil pan assembly	1	



No.	Part name	Q'ty	Remarks
1	Oil seal	1	**Not reusable**
2	Exhaust guide	1	
3	Bolt	1	M6 × 20 mm
4	Plate	1	
5	Bolt	1	M5 × 12 mm
6	Cover	1	
7	Anode	1	
8	Grommet	1	
9	Gasket	1	**Not reusable**
10	Gasket	1	**Not reusable**
11	Relief valve assembly	1	
12	Bolt	3	M6 × 25 mm
13	Bolt	2	M6 × 16 mm
14	Oil strainer	1	
15	Cooling water pipe	1	L-transom model
16	Cooling water pipe	1	S-transom model
17	Dowel	2	

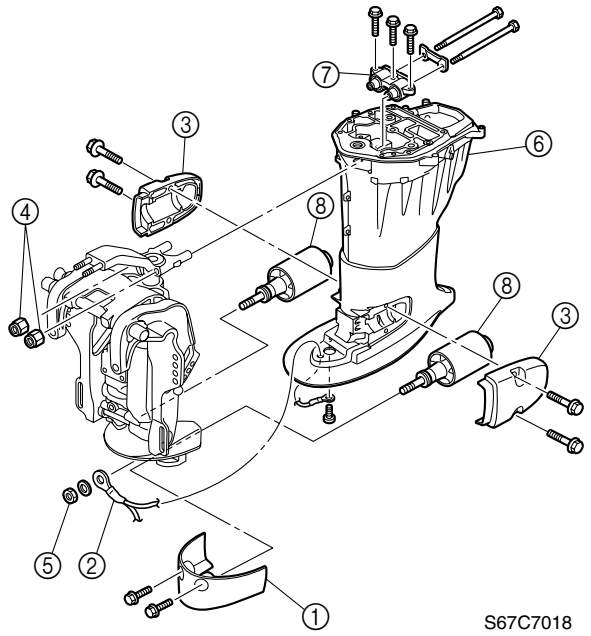


No.	Part name	Q'ty	Remarks
18	Oil pan	1	
19	Bolt	10	M6 × 25 mm
20	Drain bolt	1	
21	Gasket	1	**Not reusable**
22	Damper	1	L-transom model
23	Damper	1	S-transom model
24	Gasket	1	**Not reusable**
25	Exhaust manifold	1	
26	Bolt	3	M6 × 50 mm
27	Gasket	1	**Not reusable**
28	Muffler	1	L-transom model
29	Muffler	1	S-transom model
30	Rubber seal	1	
31	Bolt	6	M6 × 25 mm
32	Rubber seal	1	

Removing the upper case

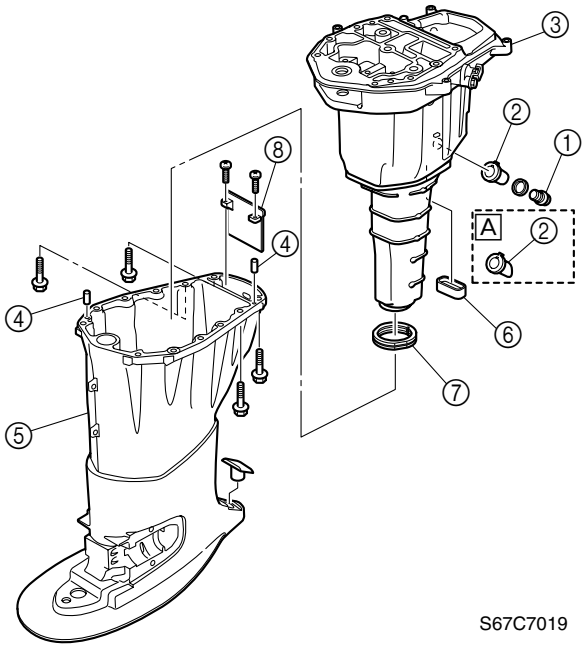
NOTE:
Drain the engine oil before removing the upper case assembly.

1. Remove the lower mount cover ①. (L-transom model)
2. Remove the ground lead ② and speedometer hose.
3. Remove the lower mount housings ③, and then remove the upper and lower mounting nuts ④ and ⑤.
4. Remove the upper case assembly ⑥.
5. Remove the upper mount ⑦ and lower mount assemblies ⑧.



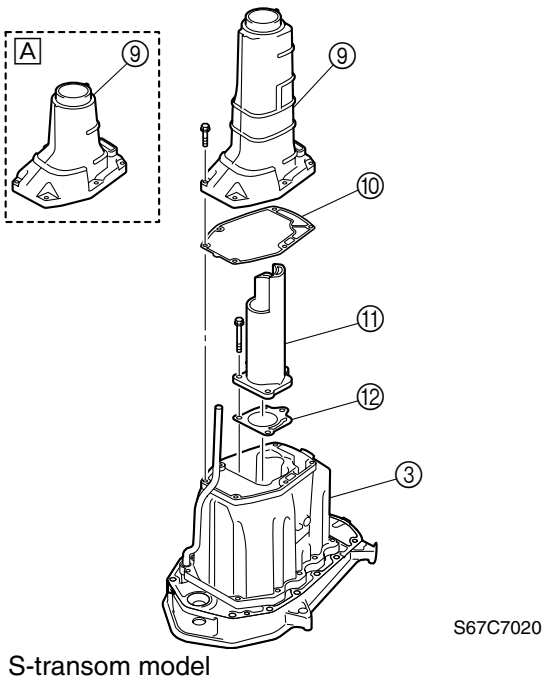
Disassembling the upper case

1. Remove the engine oil drain bolt ① and damper ②.
2. Remove the oil pan assembly ③ and dowels ④ from the upper case ⑤.
3. Remove the rubber seals ⑥ and ⑦.
4. Remove the baffle plate ⑧.



A S-transom model

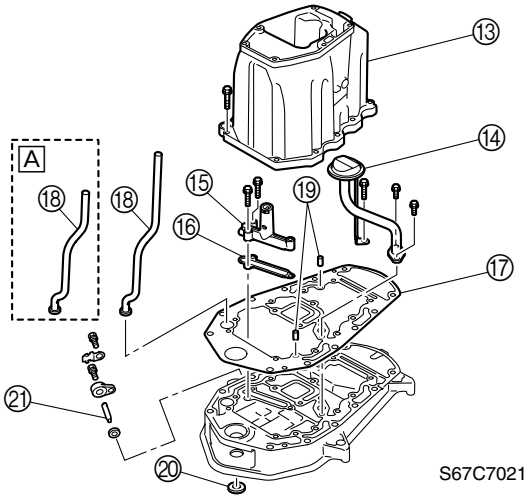
5. Remove the muffler ⑨ and gasket ⑩ from the oil pan assembly ③.
6. Remove the exhaust manifold ⑪ and gasket ⑫.



A S-transom model

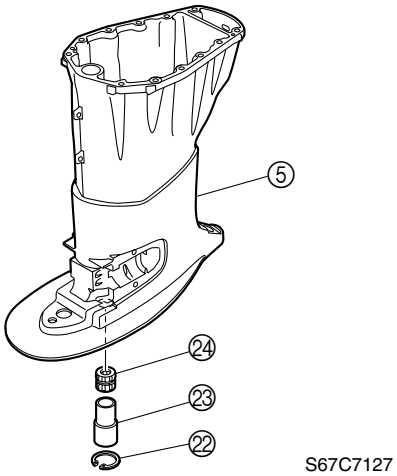
7. Remove the oil pan ⑬, oil strainer ⑭, relief valve assembly ⑮, gaskets ⑯ and ⑰, cooling water pipe ⑱, and dowels ⑲.

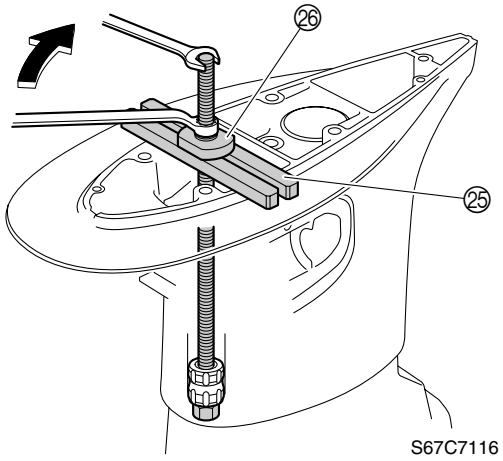
8. Remove the oil seal ⑳ and anode ㉑ from the exhaust guide.



A S-transom model

9. Remove the circlip ㉒, collar ㉓, and drive shaft bushing ㉔ from the upper case ⑤. (L-transom model)





Stopper guide plate ㉕:
90890-06501
Bushing installer center bolt ㉖:
90890-06601

Checking the muffler, exhaust manifold, oil pan, and exhaust guide

1. Check the muffler, exhaust manifold, oil pan, and exhaust guide. Replace if cracked or corroded.

NOTE:
Clean the removed parts before checking them.

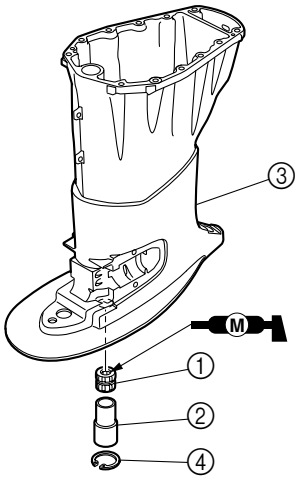
Checking the oil strainer

1. Check the oil strainer. Clean if there is dirt or residue.

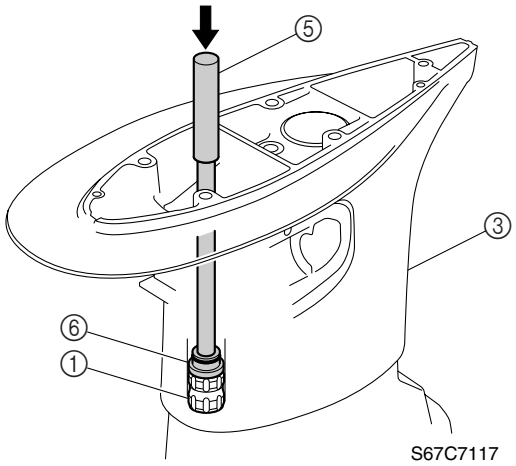
7

Assembling the upper case

1. Install the drive shaft bushing ① and collar ② into the upper case ③, and then install the circlip ④. (L-transom model)



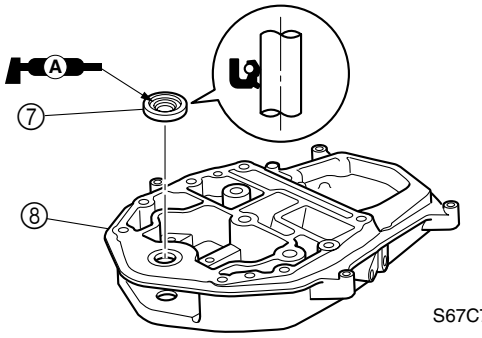
S67C7128



S67C7117

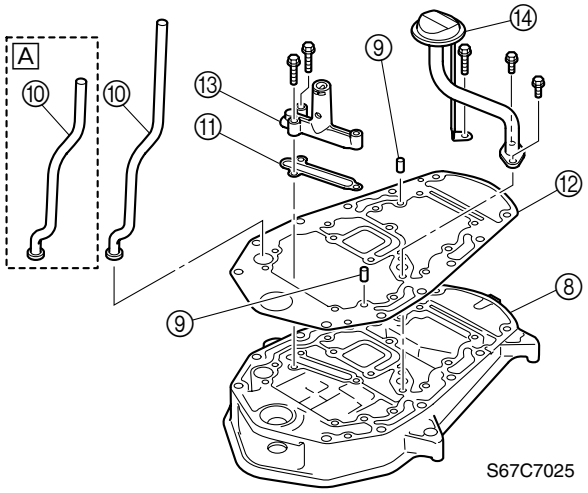
Driver rod L3 ⑤: 90890-06652
Needle bearing attachment ⑥: 90890-06614

2. Install a new oil seal ⑦ into the exhaust guide ⑧.



S67C7023

3. Install the dowels ⑨, the cooling water pipe ⑩, new gaskets ⑪ and ⑫, the relief valve assembly ⑬, and the oil strainer ⑭ onto the exhaust guide ⑧.



S67C7025

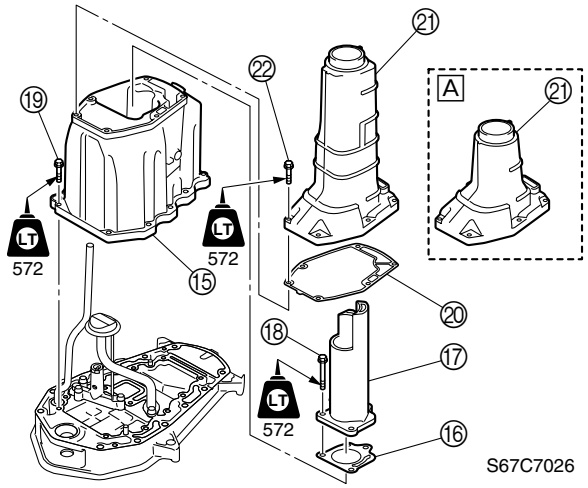
A S-transom model

4. Install the oil pan ⑮.

5. Install a new gasket ⑯ and the exhaust manifold ⑰, and then tighten the bolts ⑱ to the specified torque.

6. Tighten the bolts ⑲.

7. Install a new gasket ⑳ and the muffler ㉑, and then tighten the bolts ㉒.



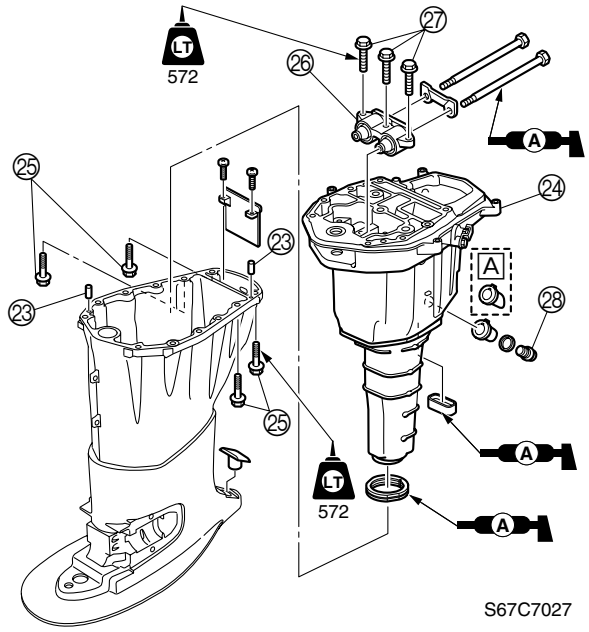
S67C7026

A S-transom model

Exhaust manifold bolt ⑱:
10 N·m (1.0 kgf·m, 7.4 ft·lb)

8. Install the dowels ㉓ and oil pan assembly ㉔, and then tighten the upper case bolts ㉕ to the specified torque.

9. Install the upper mount ㉖, and then tighten the bolts ㉗.



S67C7027

A S-transom model

	Upper case bolt ㉕: 21 N·m (2.1 kgf·m, 15.5 ft·lb)

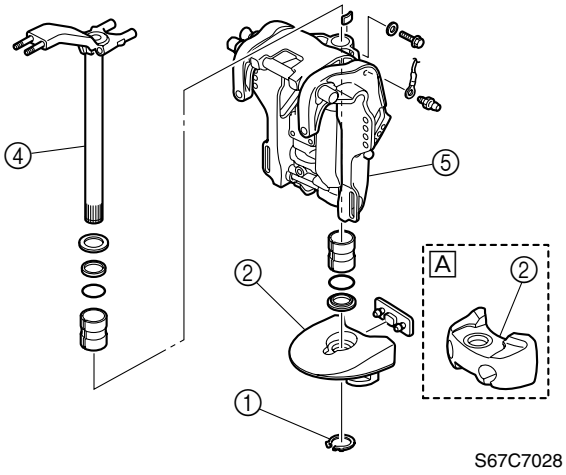
10. Install the damper and engine oil drain bolt ㉘, and then tighten the drain bolt to the specified torque.

	Engine oil drain bolt ㉘: 17 N·m (1.7 kgf·m, 12.5 ft·lb)

Removing the steering arm

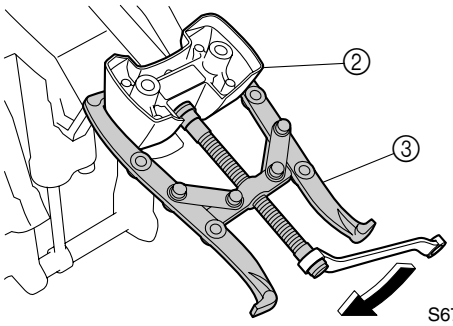
1. Remove the circlip ①, and then remove the steering yoke ② using a general puller ③.

2. Remove the steering arm ④ from the swivel bracket ⑤ by pulling the arm off the bracket.



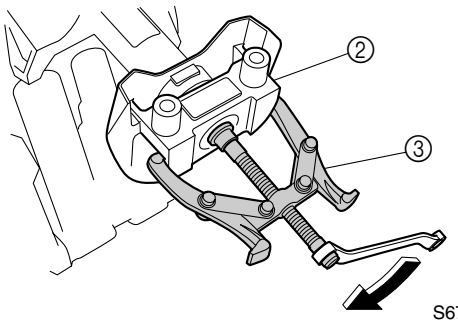
S67C7028

A



S67C7130

B



S67C7129

A S-transom model
B L-transom model

NOTE:
To disassemble the clamp brackets, see "Removing the clamp bracket" (7-29).

	General puller ③: (commercially available)

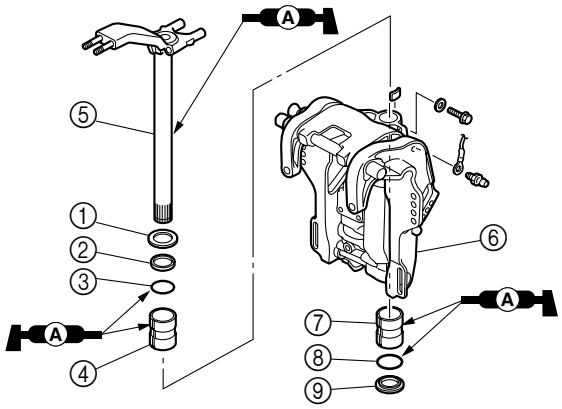
7

Installing the steering arm

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

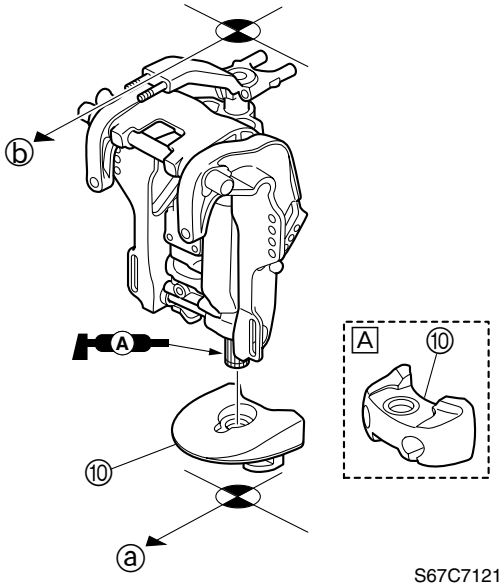
2. Place the swivel bracket ⑥ in an upright position, and then install the steering arm onto the bracket.

3. Install bushing 2 ⑦, a new O-ring ⑧, and the plate ⑨ onto the steering arm.



S67C7029

4. Install the steering yoke ⑩ onto the steering arm, making sure that they are both facing in the same direction (ⓐ and ⓑ are aligned).



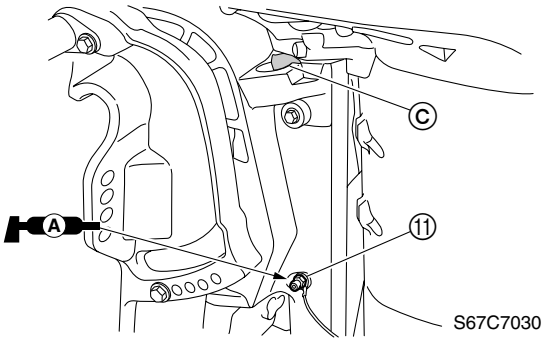
S67C7121

A S-transom model

NOTE:

Hold the steering arm, and then strike the steering yoke ⑩ with a copper hammer to install it.

5. Apply grease to the grease nipple ⑪ on the swivel bracket until it comes out from the upper bushing Ⓒ.



S67C7030

NOTE:

To assemble the clamp brackets, see “Installing the clamp bracket” (7-29).

Installing the upper case

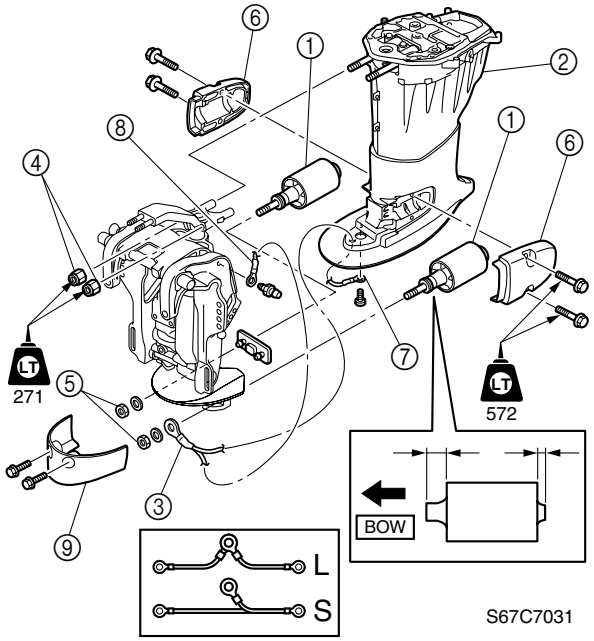
1. Install the lower mount assemblies ① to the upper case assembly ②.

2. Install the upper case assembly ② to the steering arm, install the ground lead terminal ③, and then tighten the nuts ④ to the specified torque. Also, tighten the nuts ⑤.

3. Install the lower mount housings ⑥.

4. Install the ground lead terminals ⑦ and ⑧.

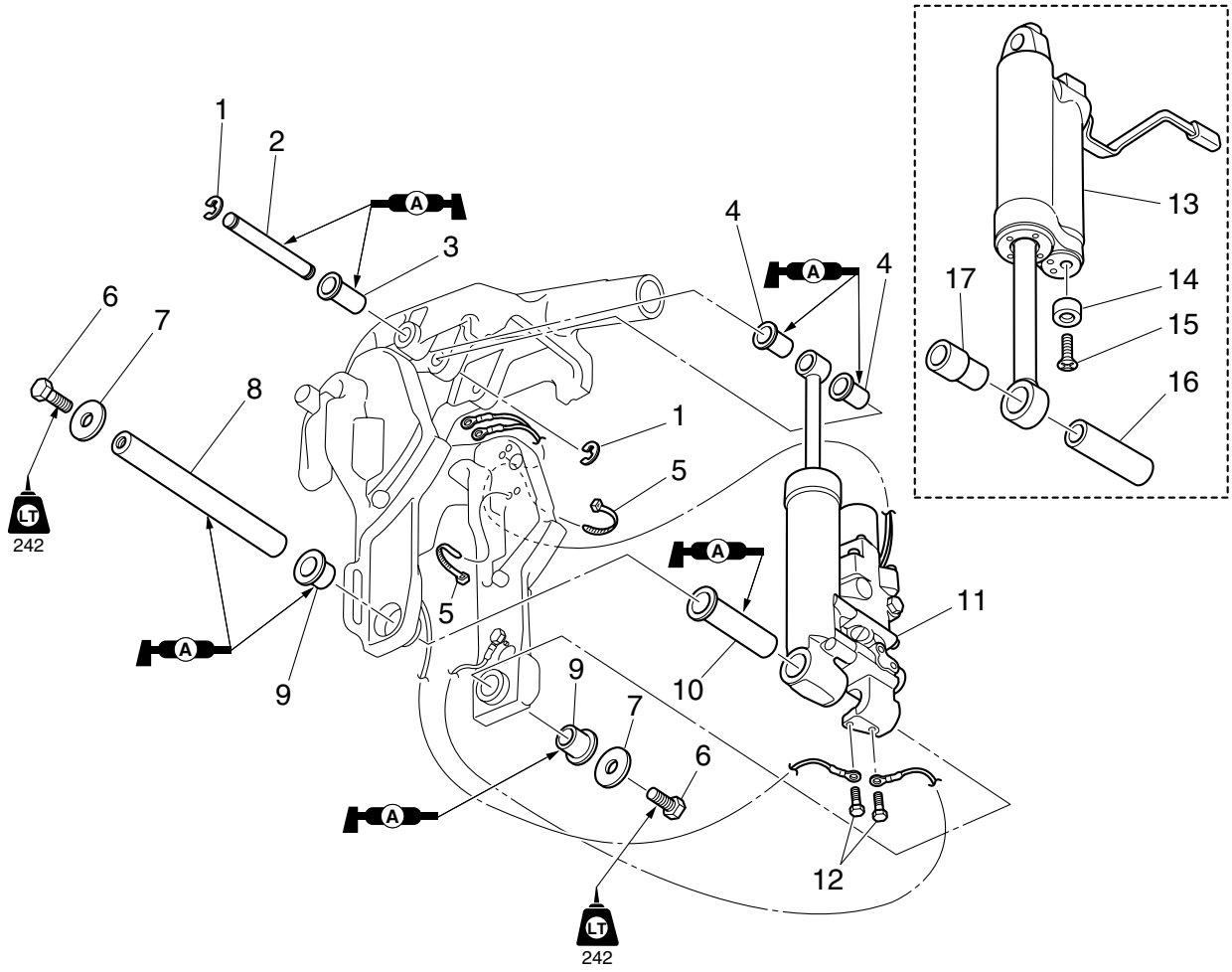
5. Install the lower mount cover ⑨. (L-transom model)



	Upper mounting nut ④: 24 N·m (2.4 kgf·m, 17.7 ft·lb) Grease nipple: 3 N·m (0.3 kgf·m, 2.2 ft·lb)

7

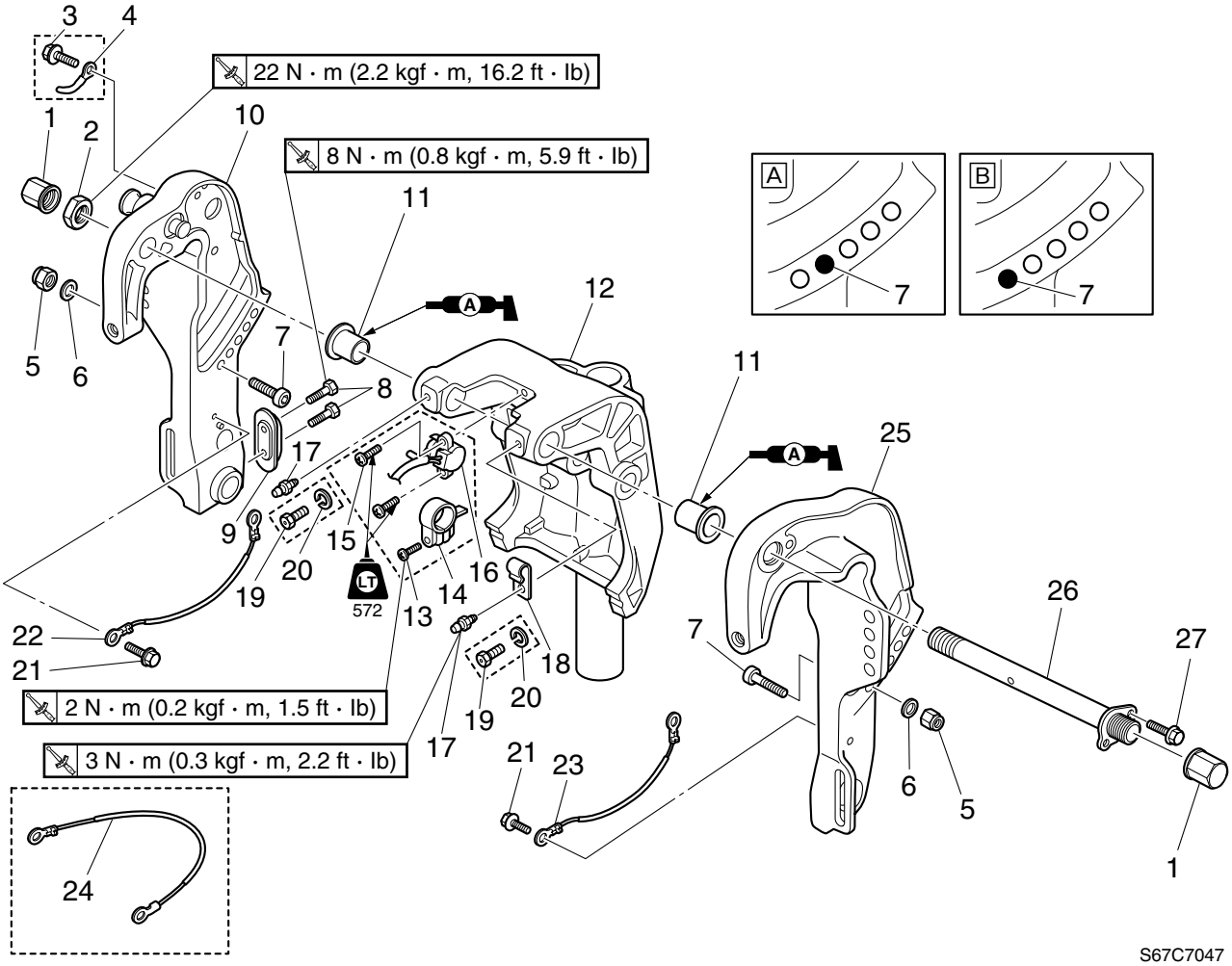
Hydraulic tilt unit and PTT unit



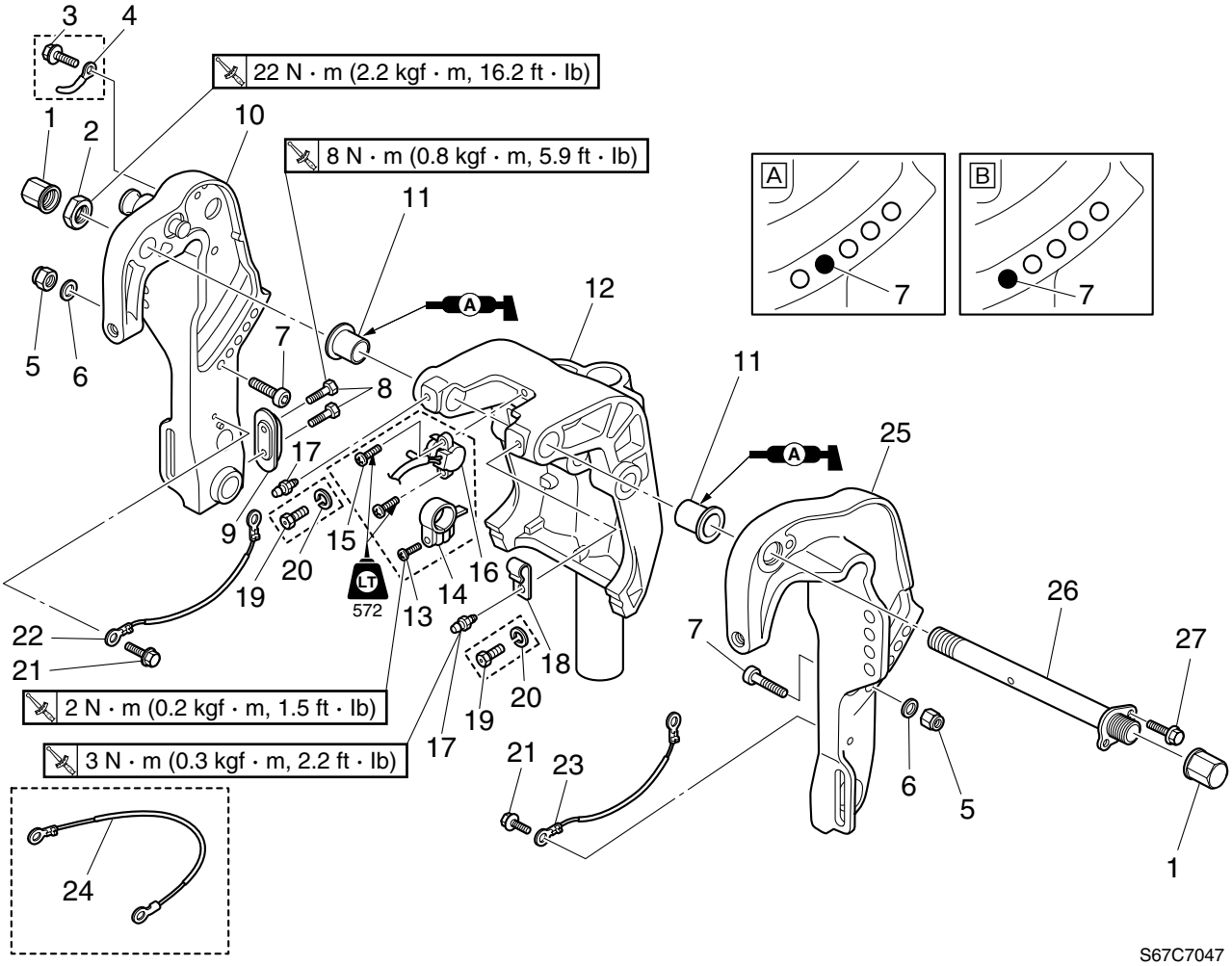
S67C7120

No.	Part name	Q'ty	Remarks
1	E-clip	2	
2	Shaft	1	
3	Bushing	1	
4	Bushing	2	
5	Plastic tie	2	PTT model
6	Bolt	2	M8 × 15 mm
7	Washer	2	
8	Shaft	1	
9	Bushing	2	
10	Bushing	1	PTT model
11	PTT unit	1	PTT model
12	Bolt	2	M6 × 10 mm/PTT model
13	Hydraulic tilt unit	1	D model
14	Anode	1	D model
15	Screw	1	ø6 × 20 mm/D model
16	Collar	1	D model
17	Collar	1	D model

Clamp bracket and swivel bracket



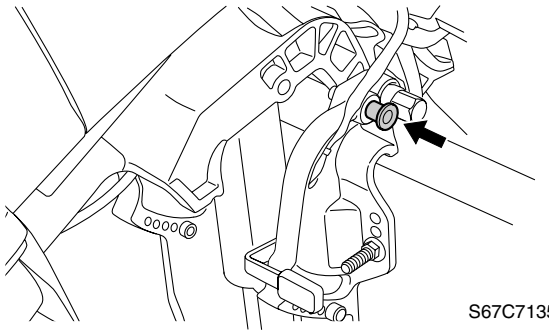
No.	Part name	Q'ty	Remarks
1	Cap	2	
2	Self-locking nut	1	
3	Bolt	1	M6 × 14 mm/R model with PTT
4	Holder	1	R model with PTT
5	Nut	2	
6	Washer	2	
7	Stopper	2	M10 × 45 mm/[A] D model/[B] PTT model
8	Bolt	2	M6 × 25 mm
9	Anode	1	
10	Clamp bracket	1	STBD
11	Collar	2	
12	Swivel bracket	1	
13	Screw	1	ø6 × 24 mm/R model with PTT
14	Trim sensor cam	1	R model with PTT
15	Screw	2	ø6 × 15 mm/R model with PTT
16	Trim sensor	1	R model with PTT
17	Grease nipple	2	Without friction plate



No.	Part name	Q'ty	Remarks
18	Holder	1	
19	Bolt	2	M6 × 12 mm/With friction plate
20	Spring washer	2	With friction plate
21	Bolt	2	M6 × 14 mm/PTT model
22	Ground lead	1	Short/PTT model
23	Ground lead	1	Long/PTT model
24	Ground lead	1	D model
25	Clamp bracket	1	PORT
26	Through tube	1	
27	Bolt	1	M8 × 20 mm

Removing the hydraulic tilt unit

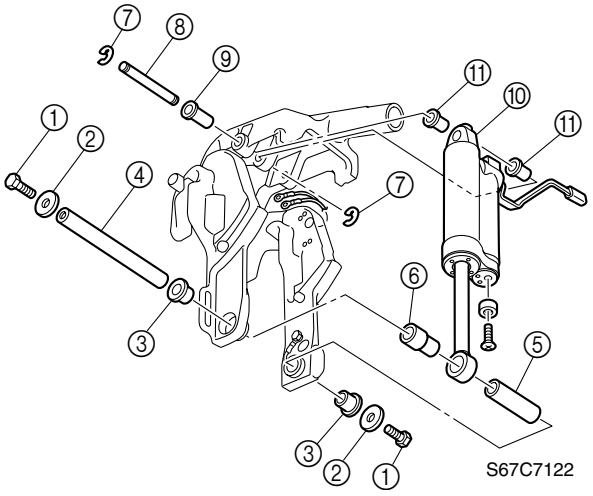
1. Tilt the outboard motor to the fully up position, and then support it with the tilt stop lever.


S67C7135

⚠ WARNING

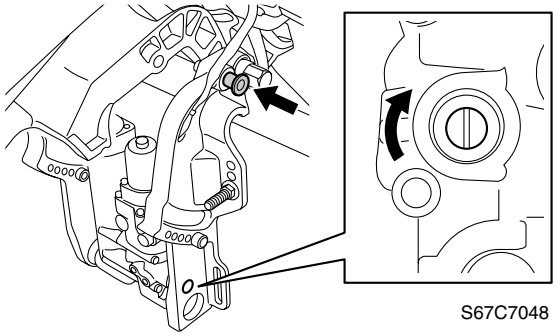
After tilting up the outboard motor, be sure to support it with the tilt stop lever. Otherwise, the outboard motor could suddenly lower if the hydraulic tilt unit should lose air pressure.

2. Remove the bolts ①, washers ②, bushings ③, shaft ④, and collars ⑤ and ⑥.
3. Remove the E-clips ⑦, shaft ⑧, and bushing ⑨.
4. Remove the hydraulic tilt unit ⑩, and then remove the bushings ⑪.


S67C7122

Removing the PTT unit

1. Tilt the outboard motor to the fully up position, and then support it with the tilt stop lever.


S67C7048

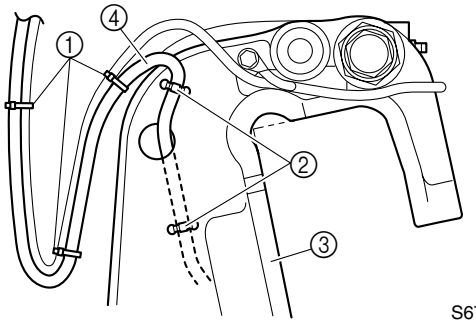
⚠ WARNING

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.

NOTE:

If the PTT unit does not operate, open the manual valve by turning it clockwise, and then tilt the outboard motor up manually.

2. Remove the plastic ties ①. (R model)
3. Remove the plastic ties ② from the clamp bracket (STBD) ③, and then pull out the PTT motor lead ④.

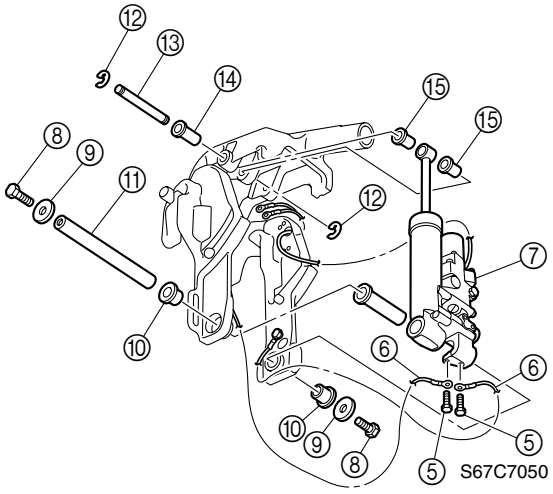

S67C7049

4. Remove the bolts ⑤ and disconnect the ground leads ⑥ from the PTT unit ⑦.

5. Remove the bolts ⑧, washers ⑨, bushings ⑩, and shaft ⑪.

6. Remove the E-clips ⑫, shaft ⑬, and bushing ⑭.

7. Remove the PTT unit ⑦, and then remove the bushings ⑮.

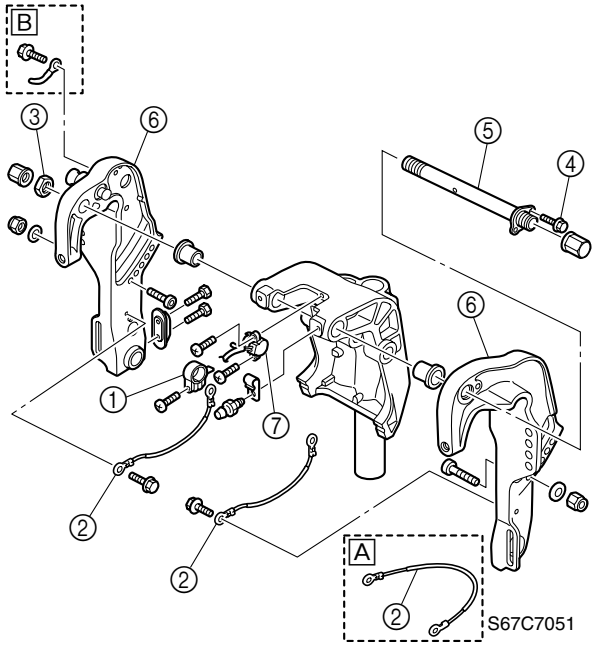


Removing the clamp bracket

1. Remove the trim sensor cam ①. (R model with PTT)

2. Remove the ground lead(s) ②, self-locking nut ③, bolt ④, and through tube ⑤, and then remove the clamp brackets ⑥.

3. Remove the trim sensor ⑦. (R model with PTT)

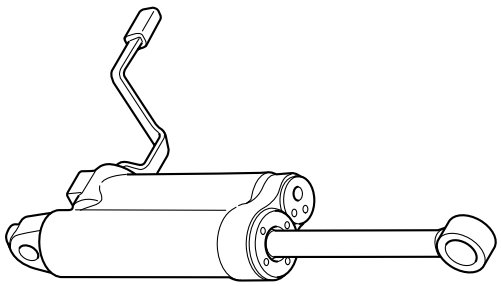


A D model
B R model with PTT

NOTE:
Be sure to remove the ground lead(s) ② before removing the self-locking nut ③.

Checking the hydraulic tilt unit

1. Check the hydraulic tilt unit. Replace if there is oil leakage, gas leakage, or damage, or if the rod is bent.

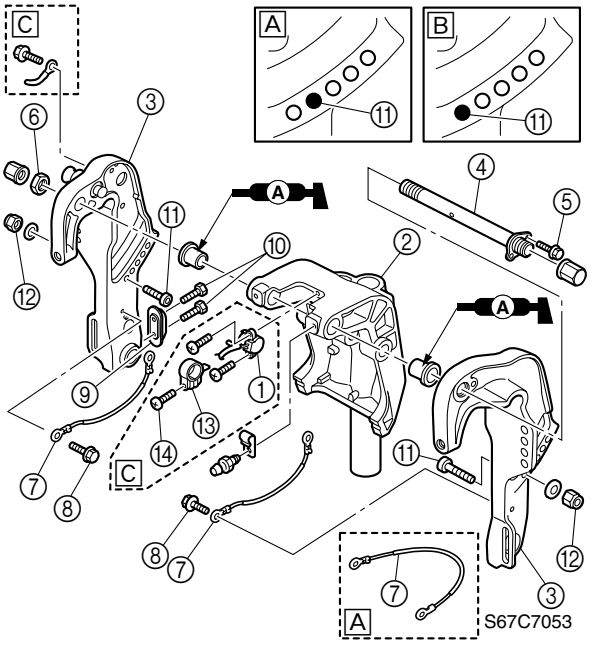


Installing the clamp bracket

1. Install the trim sensor ① to the swivel bracket ②. (R model with PTT)

2. Assemble the clamp brackets ③ and swivel bracket ②, and then install the through tube ④ from the port side.

3. Install the bolt ⑤, and then tighten it.
4. Install the self-locking nut ⑥ onto the through tube ④, and then tighten it to the specified torque.
5. Install the ground lead(s) ⑦ and bolts ⑧ to the brackets.
6. Install the anode ⑨ and then tighten the bolts ⑩ to the specified torque.
7. Install the stoppers ⑪ and nuts ⑫.
8. Install the trim sensor cam ⑬, and then tighten the screw ⑭ to the specified torque. (R model with PTT)



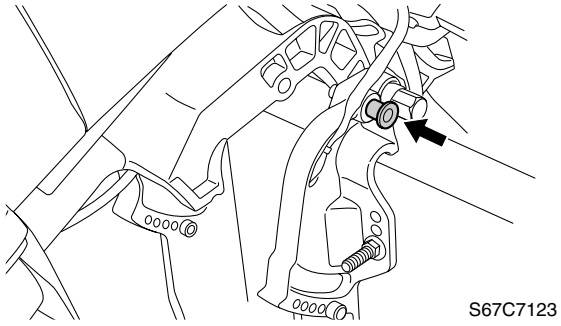
A D model
B PTT model
C R model with PTT

NOTE:
Adjust the trim sensor cam after installing the PTT unit. To adjust the trim sensor cam, see "Adjusting the trim sensor cam (R model)" (7-32).

Self-locking nut ⑥:
22 N·m (2.2 kgf·m, 16.2 ft·lb)
Anode bolt ⑩:
8 N·m (0.8 kgf·m, 5.9 ft·lb)
Trim sensor cam screw ⑭:
2 N·m (0.2 kgf·m, 1.5 ft·lb)
Grease nipple:
3 N·m (0.3 kgf·m, 2.2 ft·lb)

Installing the hydraulic tilt unit

1. Tilt the outboard motor to the fully up position, and then support it with the tilt stop lever.



⚠ WARNING
After tilting the outboard motor up, be sure to support it with the tilt stop lever.

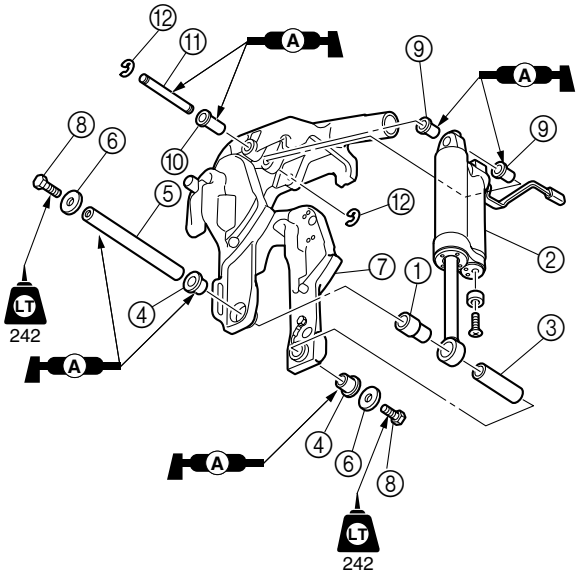
7

2. Install the collar ① onto the hydraulic tilt unit ②.

3. Install the hydraulic tilt unit ②, collar ③, bushings ④, shaft ⑤, and washers ⑥ onto the clamp brackets ⑦, and then tighten the bolts ⑧.

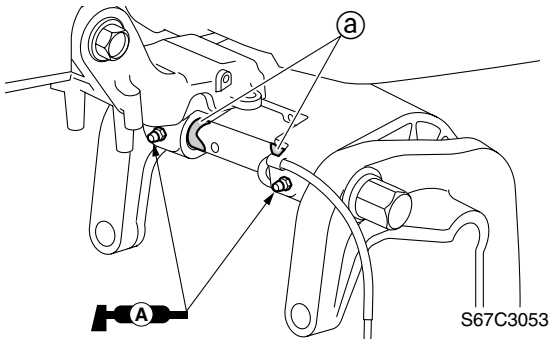
4. Install a bushing ⑨ to the hydraulic tilt unit ② and install a bushing ⑨ and the bushing ⑩ to the swivel bracket.

5. Install the hydraulic tilt unit ②, shaft ⑪, and E-clips ⑫ to the swivel bracket.



S67C7124

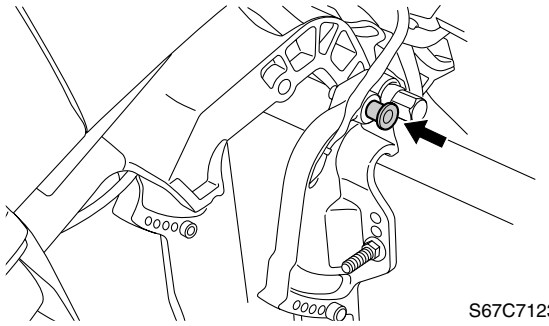
6. Apply grease to all grease nipples until it comes out from the areas ⓐ.



S67C3053

Installing the PTT unit

1. Tilt the outboard motor to the fully up position, and then support it with the tilt stop lever.


S67C7123

⚠ WARNING

After tilting the outboard motor up, be sure to support it with the tilt stop lever.

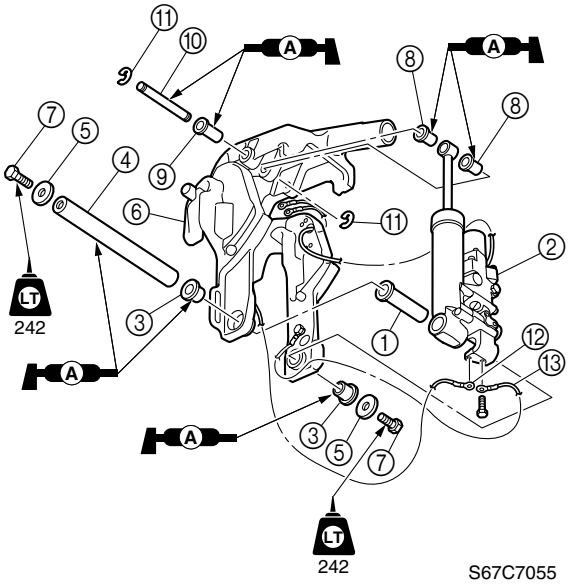
2. Install the bushing ① onto the PTT unit ②.

3. Install the PTT unit ②, bushings ③, shaft ④, and washers ⑤ onto the clamp brackets ⑥, and then tighten the bolts ⑦.

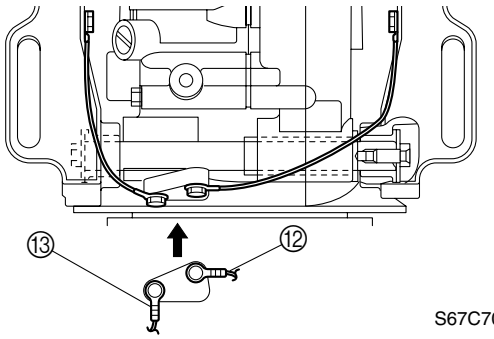
4. Install a bushing ⑧ to the PTT unit ② and install a bushing and the bushing ⑨ to the swivel bracket.

5. Install the PTT unit ②, shaft ⑩, and E-clips ⑪ to the swivel bracket.

6. Install the ground lead terminals ⑫ and ⑬ to the PTT unit ②.

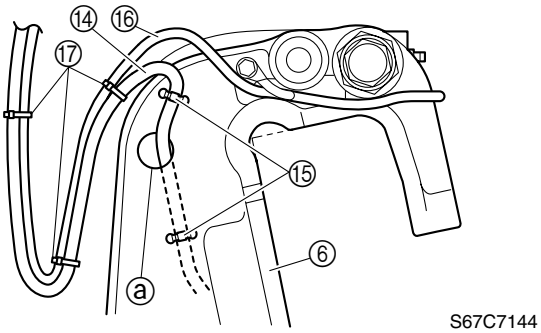


S67C7055

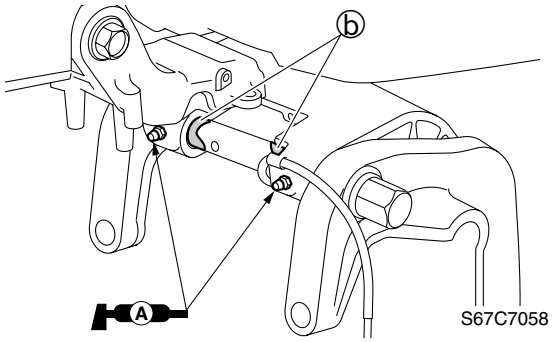


NOTE:
Install the ground lead terminals ⑫ and ⑬ as shown.

7. Pass the PTT motor lead ⑭ through the hole ⓐ in the clamp bracket ⑥ (STBD).
8. Fasten the PTT motor lead ⑭ to the clamp bracket ⑥ with a plastic ties ⑮.
9. Fasten the PTT motor lead ⑭ and trim sensor lead ⑯ with the plastic ties ⑰. (R model)

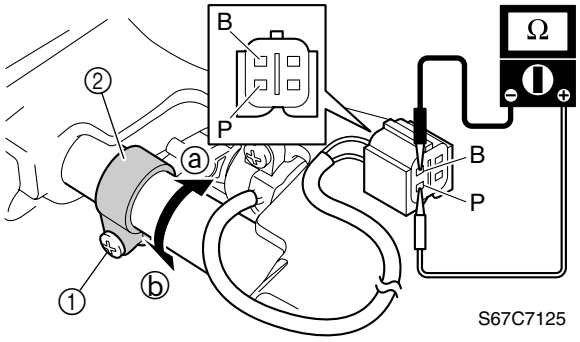


10. Apply grease to the grease nipples until it comes out from the areas ⓑ.



Adjusting the trim sensor cam (R model)

1. Tilt the outboard motor to the fully down position.
2. Loosen the trim sensor cam screw ①.
3. Adjust the trim sensor cam ② so that the trim sensor setting resistance is within specification.



NOTE:
- To decrease the resistance, turn the trim sensor cam in direction ⓐ.
- To increase the resistance, turn the trim sensor cam in direction ⓑ.

	Digital circuit tester: 90890-03174

	Trim sensor setting resistance: Pink (P) – Black (B) 9–11 Ω at 20 °C (68 °F)

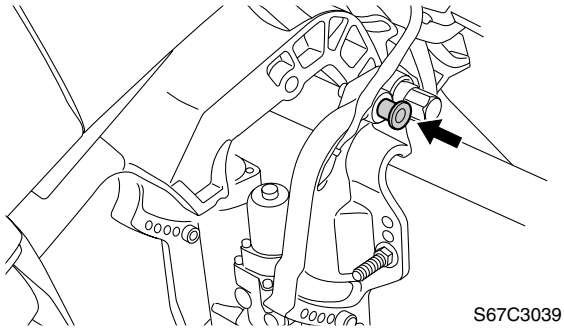
4. Tighten the trim sensor cam screw ① to the specified torque.

NOTE:
Check the trim sensor setting resistance again after tightening the trim sensor cam screw ①.

	Trim sensor cam screw ①: 2 N·m (0.2 kgf·m, 1.5 ft·lb)

7

5. Tilt the outboard motor to the fully up position, and then support it with the tilt stop lever.



⚠ 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.

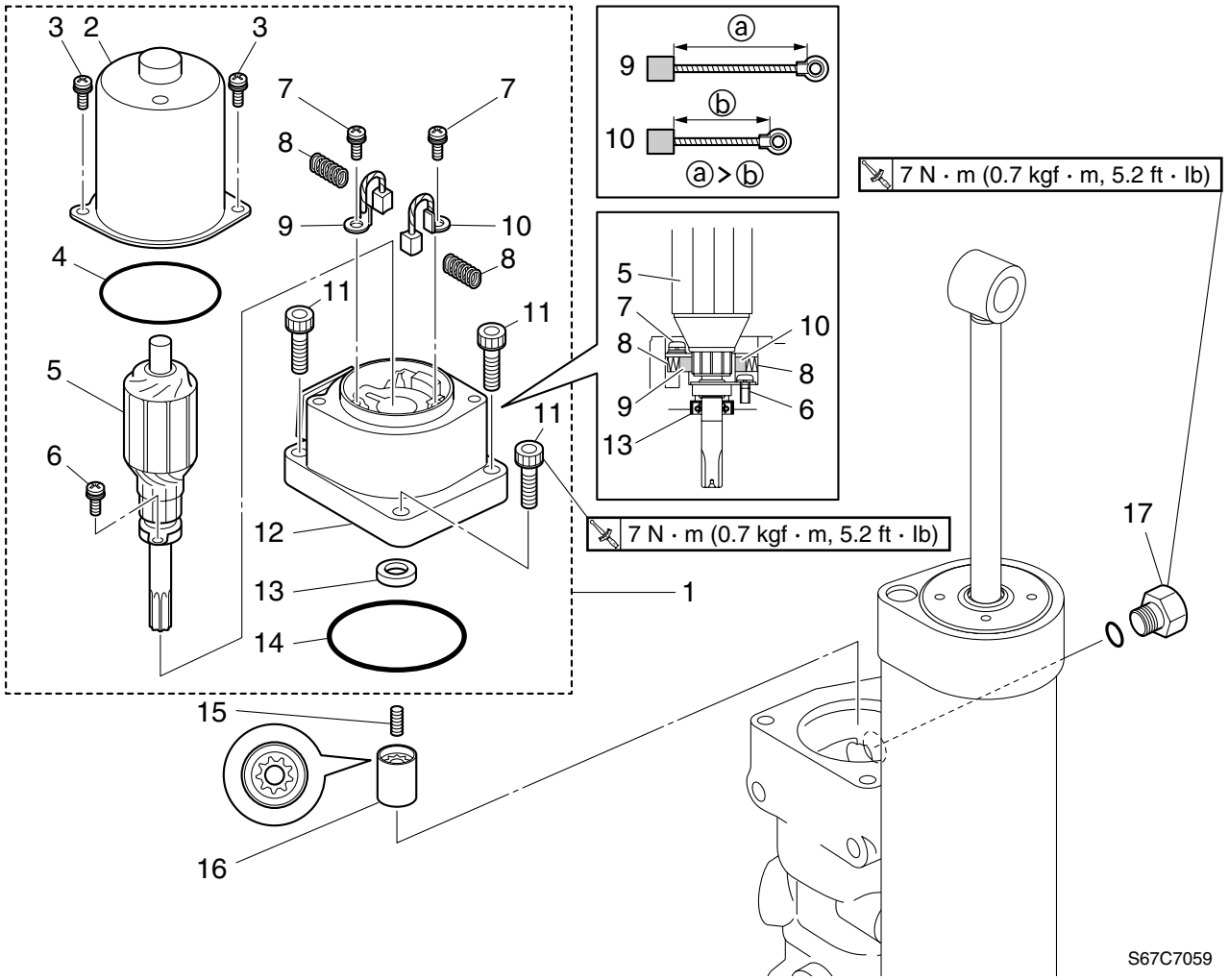
6. Check the trim sensor resistance. If the resistance is out of specification, adjust the trim sensor cam position and check the trim sensor.

NOTE:

To check the trim sensor, see “Checking the trim sensor” (7-54).

Trim sensor resistance:
Pink (P) – Black (B)
238.8–378.8 Ω at 20 °C (68 °F)

PTT motor



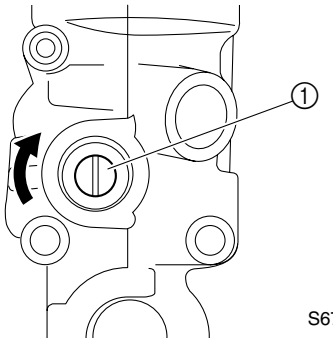
No.	Part name	Q'ty	Remarks
1	PTT motor assembly	1	
2	Stator	1	
3	Screw	2	ø4 × 10 mm
4	O-ring	1	**Not reusable**
5	Armature	1	
6	Screw	1	ø4 × 8 mm
7	Screw	2	ø4 × 10 mm
8	Spring	2	
9	Brush	1	Long lead
10	Brush	1	Short lead
11	Bolt	4	M6 × 20 mm
12	PTT motor base	1	
13	Oil seal	1	**Not reusable**
14	O-ring	1	**Not reusable**
15	Spring	1	
16	Shaft connector	1	
17	Reservoir cap	1	

Disassembling the PTT motor

1. Remove the PTT unit from the bracket.

NOTE:
To remove the PTT unit, see "Removing the PTT unit" (7-28).

2. Fully extend the tilt ram, and then open the manual valve ① by turning it clockwise.

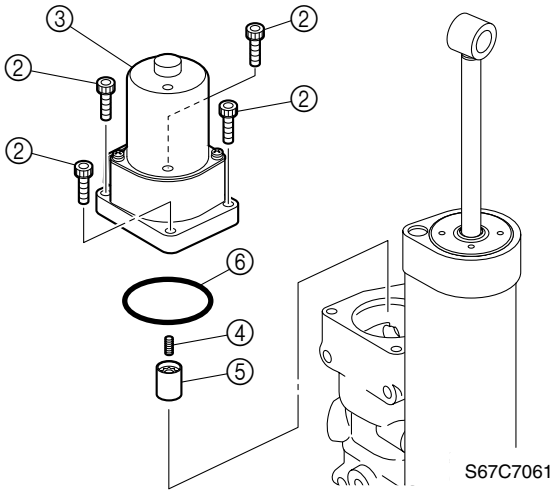


⚠ WARNING

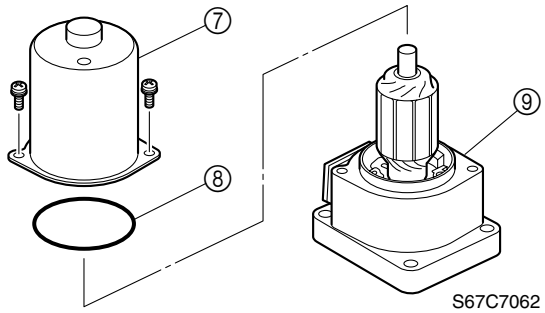
Make sure that the tilt ram is fully extended before removing the PTT motor, otherwise fluid can spurt out from the unit due to internal pressure.

NOTE:
To prevent the internal PTT unit parts from falling out, place the PTT unit in an upright position before disassembling it.

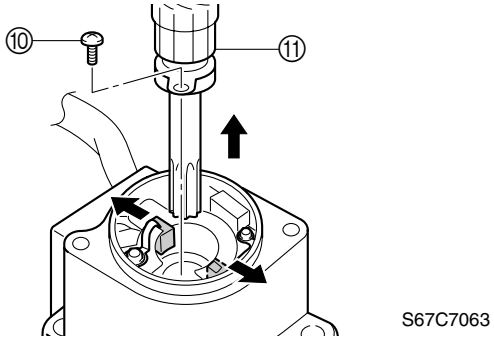
3. Remove the PTT motor base bolts ②, and then remove the PTT motor assembly ③, spring ④, shaft connector ⑤, and O-ring ⑥ from the gear pump housing.



4. Remove the stator ⑦ and O-ring ⑧ from the PTT motor base ⑨.

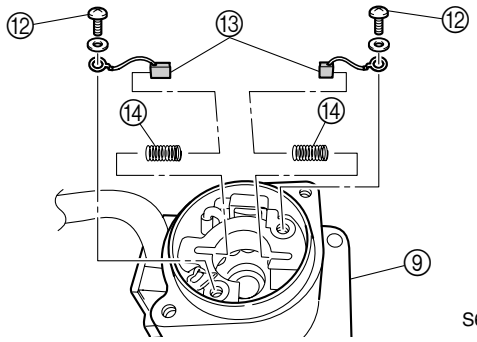


5. Remove the armature plate screw ⑩, and then remove the armature assembly ⑪.



NOTE:
- Push the brushes apart, and then remove the armature assembly ⑪.
- Do not remove the bearing from the armature assembly ⑪.

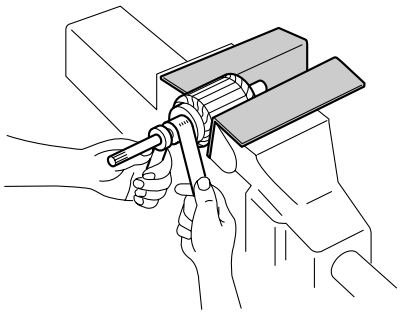
6. Remove the brush holder screws ⑫, brushes ⑬, brush springs ⑭, and oil seal from the PTT motor base ⑨.



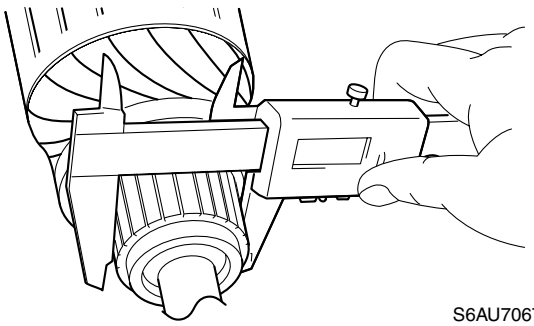
S67C7064

Checking the PTT motor

1. Check the commutator. Clean with 600-grit sandpaper and compressed air if dirty.

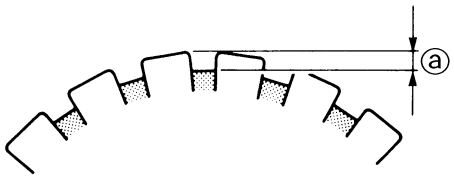

S6AU7066

2. Measure the commutator diameter. Replace the armature if below specification.


S6AU7067

PTT motor commutator standard diameter: 16.5 mm (0.65 in)
Wear limit: 15.5 mm (0.61 in)

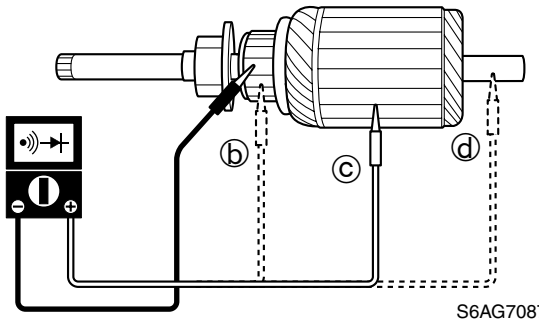
3. Measure the commutator undercut ⓐ. Replace the armature if below specification.



S69J8410

PTT motor commutator standard undercut ⓐ: 1.00 mm (0.039 in)
Wear limit: 0.50 mm (0.020 in)

4. Check the armature for continuity. Replace the armature if out of specification.



S6AG7087

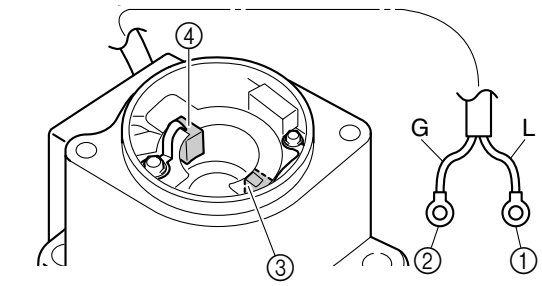
Armature continuity

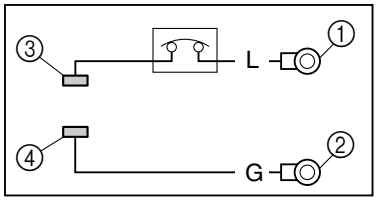
Checking point	Continuity
Commutator segments ⓑ	Yes
Segment – Armature core ⓒ	No
Segment – Armature shaft ⓓ	No

5. Check the bearing. Replace the armature if damaged.

Checking the brush holder and brush

1. Check the brush holder assembly for continuity. Replace the PTT motor base if out of specification.





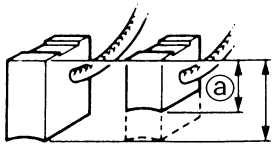
S67C7069

NOTE:
The brush holder and circuit breaker cannot be removed from the PTT motor base; if either part is damaged, replace the PTT motor base.

PTT motor base continuity

Checking point	Continuity
Terminal ① – ③ (L) Terminal ② – ④ (G)	Yes
For all terminal combinations not listed above.	No

2. Measure the length of each brush. Replace the brushes if below specification.



S69J8430

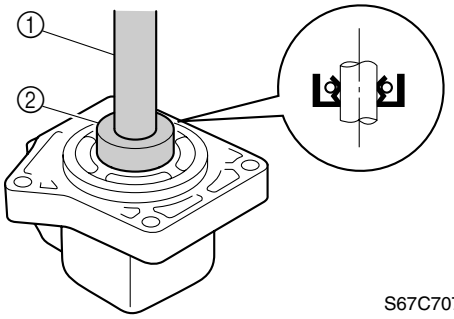
Motor brush standard length:
6.0 mm (0.24 in)
Wear limit ⓐ: 3.0 mm (0.12 in)

Assembling the PTT motor

CAUTION:

- **Do not reuse the oil seal and O-rings, always replace them with new ones.**
- **Do not allow grease or oil to contact the commutator of the armature.**

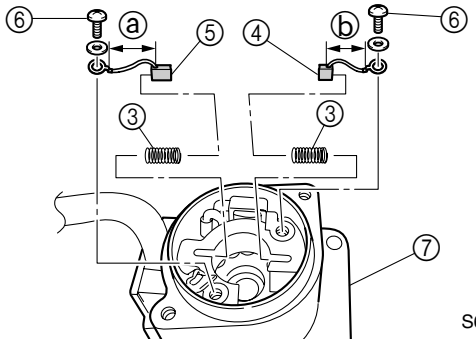
1. Install a new oil seal into the PTT motor base as shown.



S67C7071

Driver rod L3 ①: 90890-06652
Needle bearing attachment ②: 90890-06615

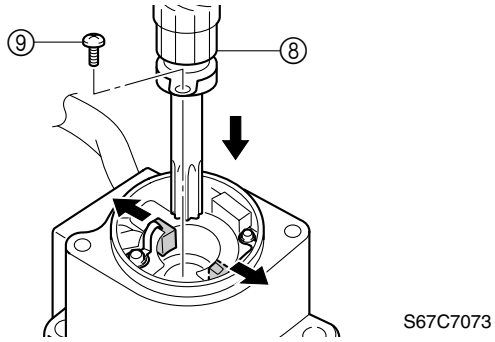
2. Install the brush springs ③, brush (short lead) ④, brush (long lead) ⑤, and brush holder screws ⑥ to the PTT motor base ⑦ as shown.



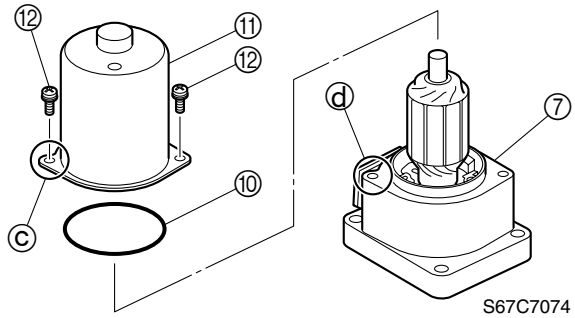
S67C7072

Brush lead length: ⓐ > ⓑ

3. Push the brushes into the holders, and then install the armature assembly ⑧ and tighten the armature plate screw ⑨.

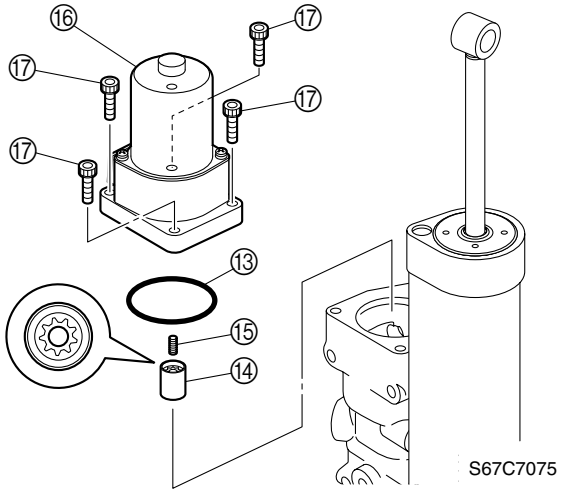


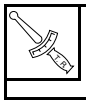
4. Install a new O-ring ⑩ and the stator ⑪ to the PTT motor base ⑦, and then tighten the screws ⑫.



NOTE:
Align the rounded section ⓒ of the stator ⑪ with the rounded section ⓓ of the PTT motor base ⑦.

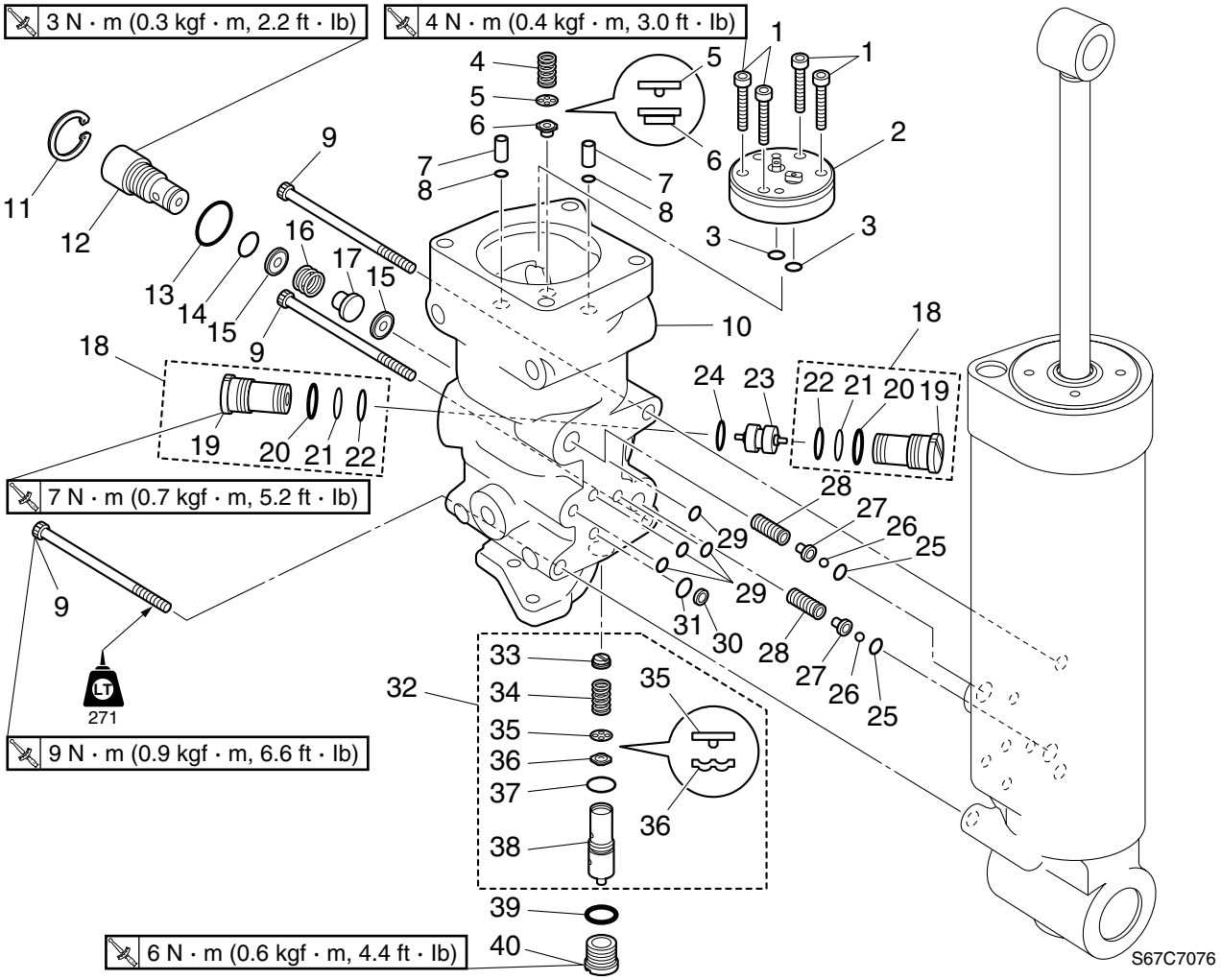
5. Install a new O-ring ⑬, the shaft connector ⑭, the spring ⑮, and the PTT motor assembly ⑯ to the gear pump housing, and then tighten the PTT motor assembly bolts ⑰ to the specified torque.



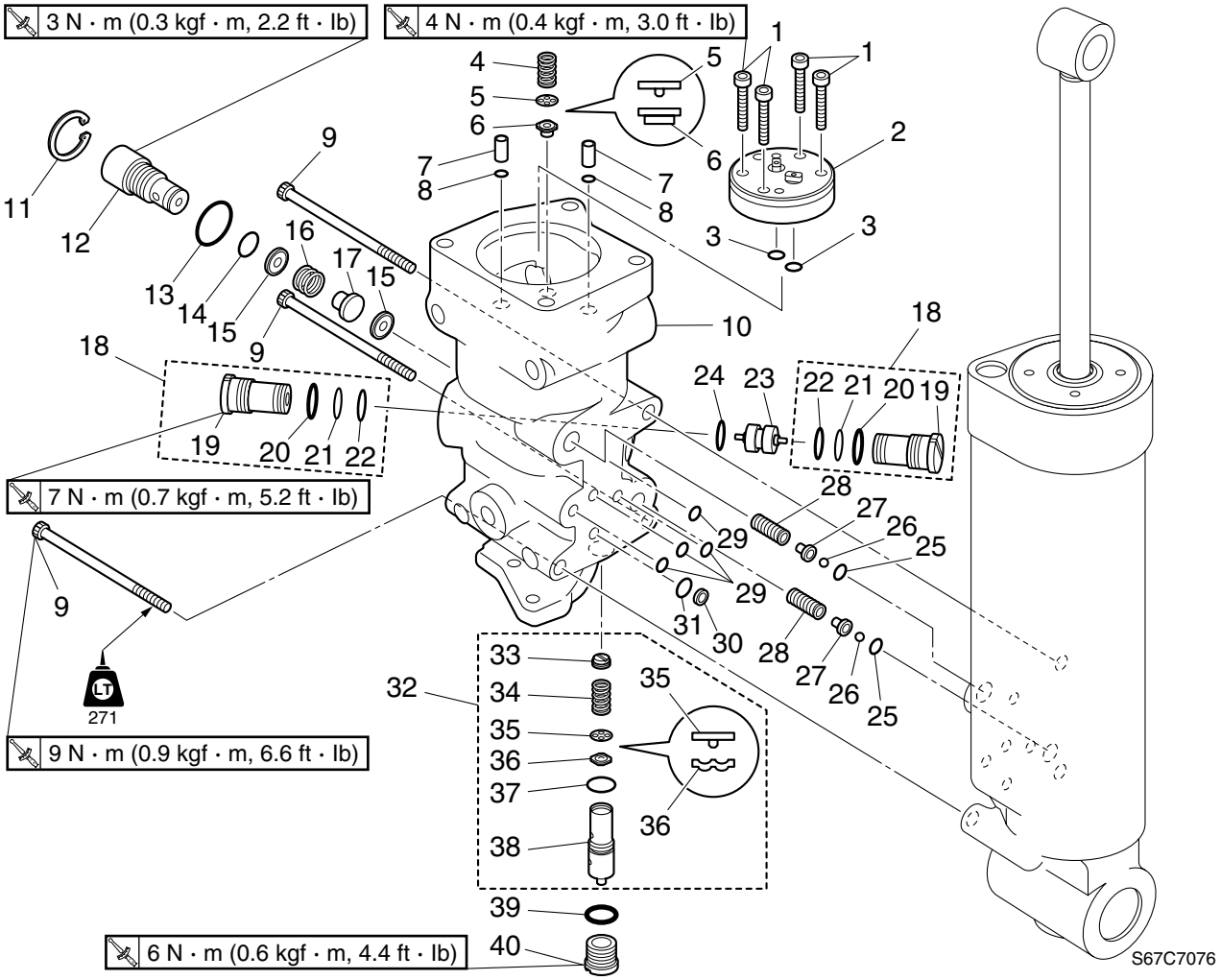
	PTT motor assembly bolt ⑰: 7 N·m (0.7 kgf·m, 5.2 ft·lb)

7

PTT gear pump

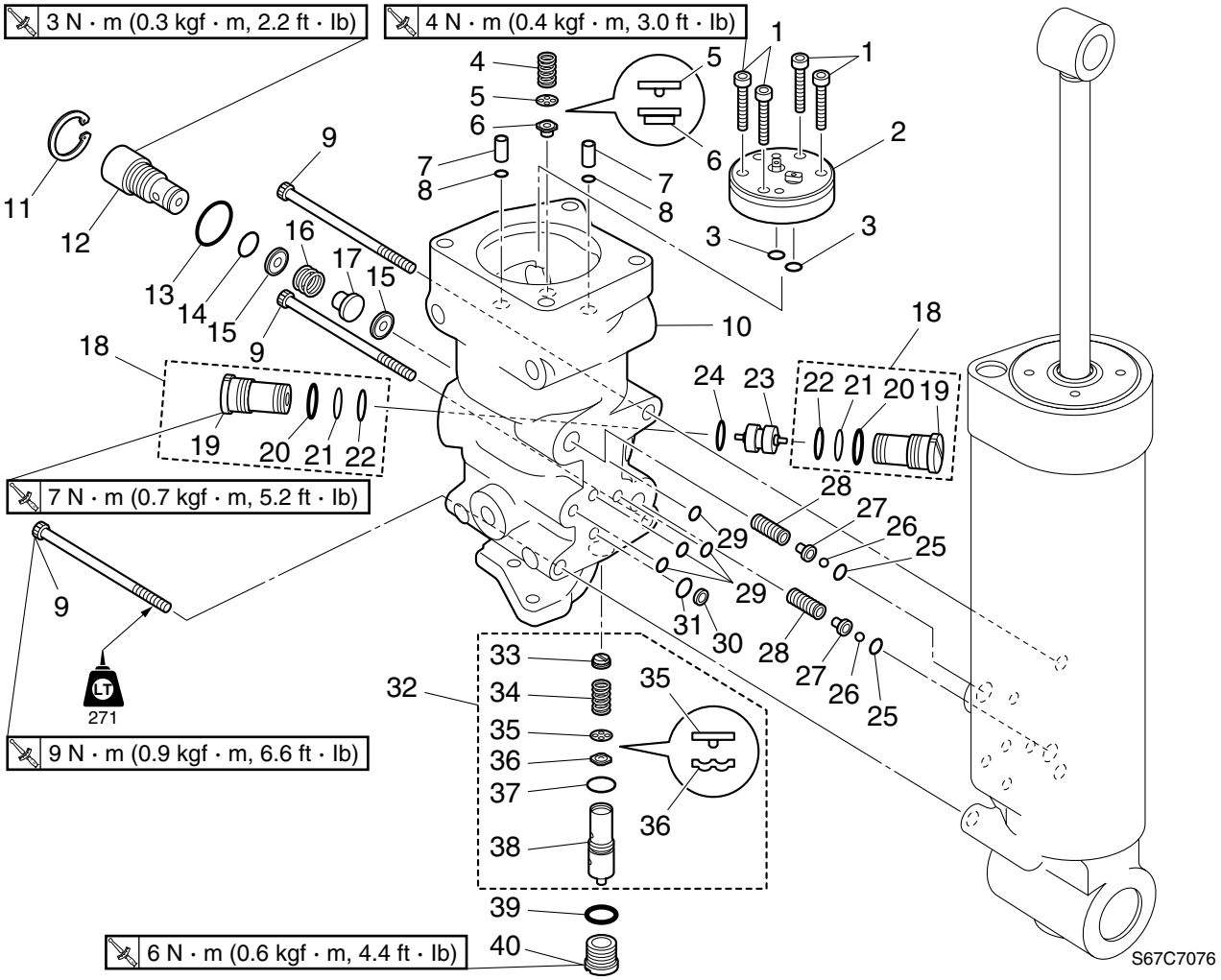


No.	Part name	Q'ty	Remarks
1	Bolt	4	M4 × 25 mm
2	Gear pump assembly	1	
3	O-ring	2	**Not reusable**
4	Spring	1	
5	Valve pin	1	
6	Main valve seal	1	
7	Filter	2	
8	O-ring	2	**Not reusable**
9	Bolt	3	M6 × 75 mm
10	Gear pump housing	1	
11	Circlip	1	
12	Manual valve	1	
13	O-ring	1	**Not reusable**
14	O-ring	1	**Not reusable**
15	Manual valve seat	2	
16	Spring	1	
17	Adapter	1	



No.	Part name	Q'ty	Remarks
18	Main valve assembly	2	
19	Main valve	2	
20	O-ring	2	Not reusable
21	O-ring	2	Not reusable
22	O-ring	2	Not reusable
23	Shuttle piston	1	
24	O-ring	1	Not reusable
25	O-ring	2	Not reusable
26	Ball	2	
27	Absorber valve pin	2	
28	Spring	2	
29	O-ring	4	Not reusable
30	Filter	1	
31	O-ring	1	Not reusable
32	Relief valve assembly	1	
33	Valve lock screw	1	
34	Spring	1	

7

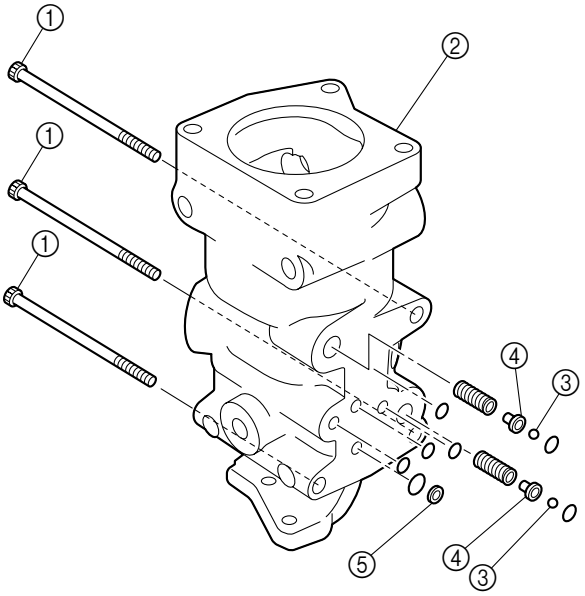


No.	Part name	Q'ty	Remarks
35	Valve pin	1	
36	Valve pin seal	1	
37	O-ring	1	**Not reusable**
38	Relief valve	1	
39	O-ring	1	**Not reusable**
40	Valve lock screw	1	

Disassembling the gear pump

1. Remove the bolts ①, and then remove the gear pump housing ②.

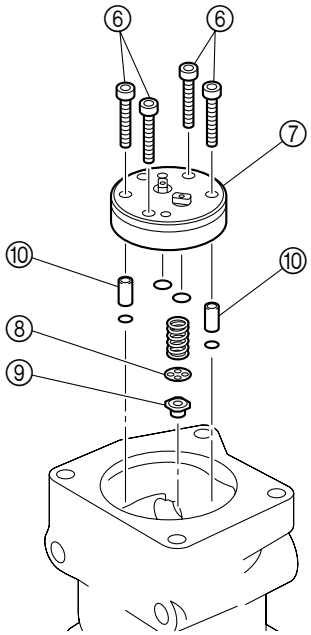
2. Remove the balls ③, absorber valve pins ④, and filter ⑤.



S67C7077

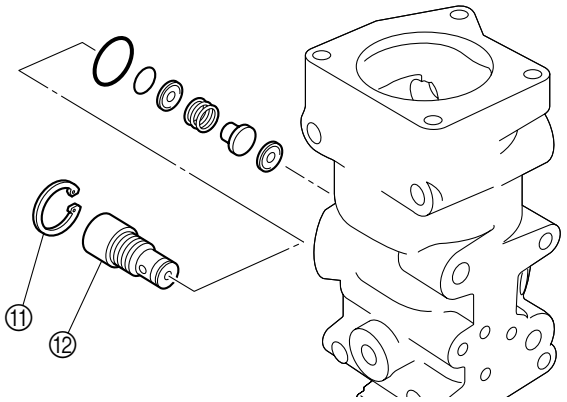
3. Remove the bolts ⑥, and then remove the gear pump assembly ⑦.

4. Remove the valve pin ⑧, main valve seal ⑨, and filters ⑩.



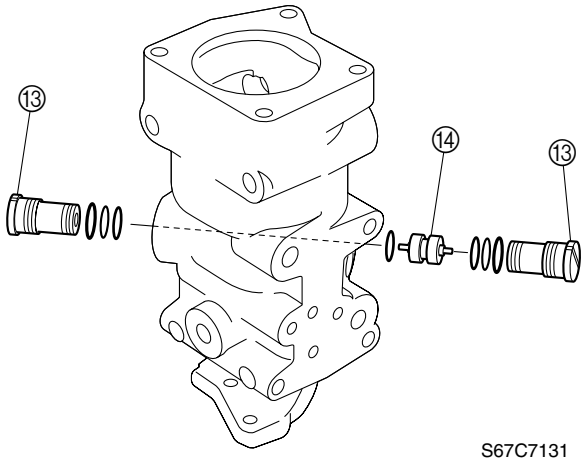
S67C7078

5. Remove the circlip ⑪, and then remove the manual valve ⑫.



S67C7079

6. Remove the main valves ⑬ and shuttle piston ⑭.

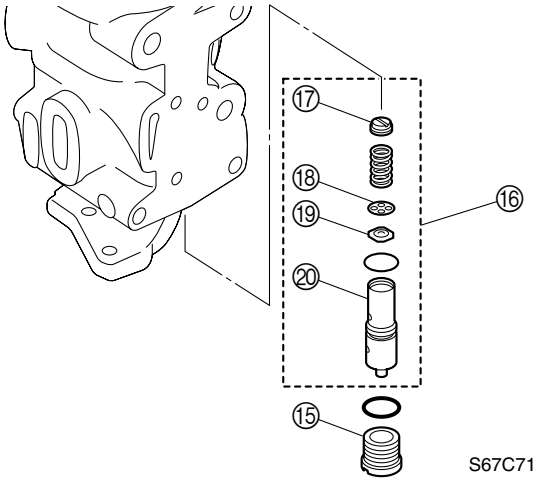


S67C7131

7

7. Remove the valve lock screw ⑮ and relief valve assembly ⑯.

8. Remove the valve lock screw ⑰, valve pin ⑱, and valve pin seal ⑲ from the relief valve ⑳.

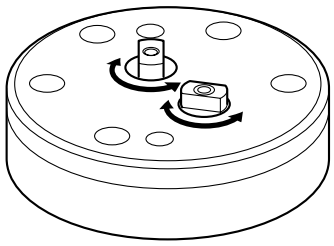


S67C7132

NOTE:
When disassembling the relief valve assembly ⑯, be sure to note the number of times the valve lock screw ⑰ is turned out from its set position.

Checking the gear pump

1. Check the operation of the gear pump shafts. Replace the gear pump assembly if the shafts do not rotate smoothly.

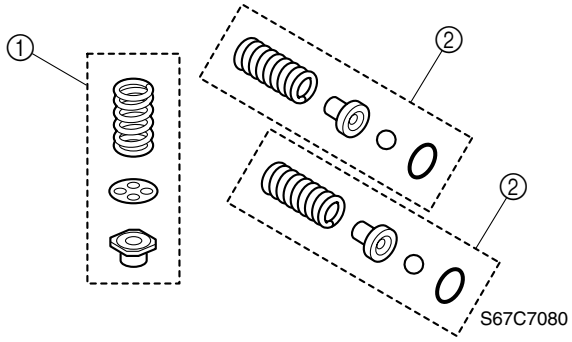

S67C7133

Checking the gear pump housing

1. Check the gear pump housing. Replace the gear pump housing if corroded or cracked.

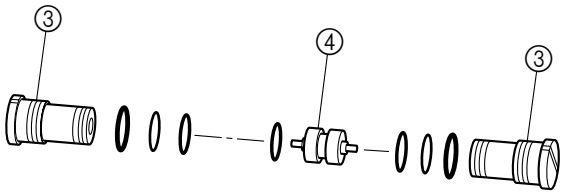
Checking the valve seal

1. Check the main valve seal assembly ① and absorber valve pin assemblies ②. Replace if damaged.



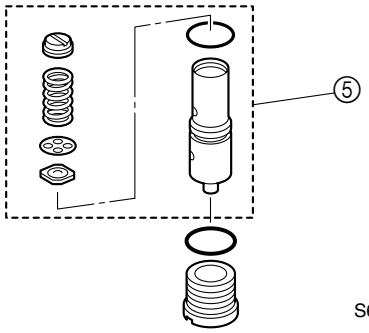
S67C7080

2. Check the main valves ③ and shuttle piston ④. Replace if damaged.



S67C7081

3. Check the relief valve assembly ⑤. Replace if damaged.



S67C7134

4. Check the manual valve and spring. Replace if damaged.

Checking the filter

1. Check the filters. Clean if there is dirt or residue.

NOTE:
See the exploded diagram for the filter installation positions (7-39).

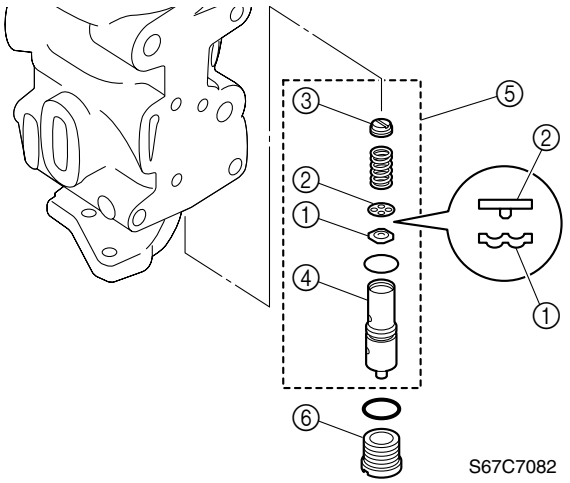
Assembling the gear pump

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.**
- **Do not reuse the O-rings, always replace them with new ones.**

NOTE:
Lubricate the parts with ATF Dexron II during assembly.

1. Install the valve pin seal ①, valve pin ②, and valve lock screw ③ into the relief valve ④.

2. Install the relief valve assembly ⑤, and then tighten the valve lock screw ⑥ to the specified torque.

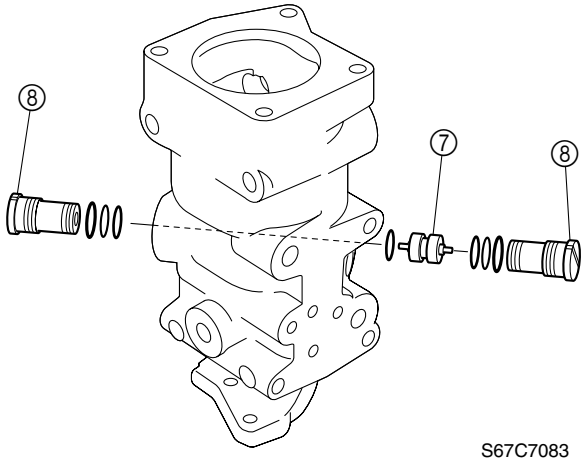


S67C7082

NOTE:
Turn in the valve lock screw ③ the same number of turns it was turned out when it was removed.

Valve lock screw ⑥:
6 N·m (0.6 kgf·m, 4.4 ft·lb)

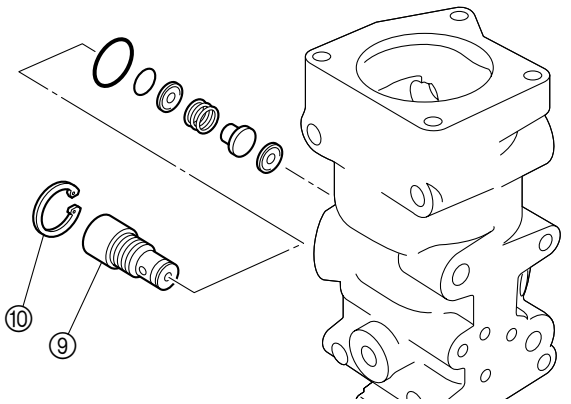
3. Install the shuttle piston ⑦, and then tighten the main valves ⑧ to the specified torque.



S67C7083

Main valve ⑧:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

4. Install the manual valve ⑨ and circlip ⑩, and then tighten the valve to the specified torque.

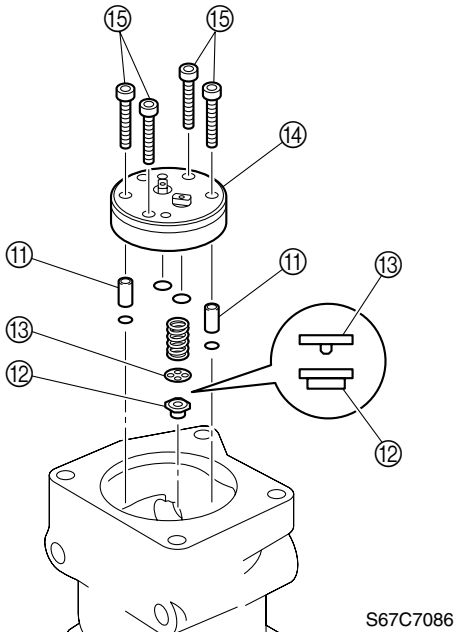


S67C7085

Manual valve ⑨:
3 N·m (0.3 kgf·m, 2.2 ft·lb)

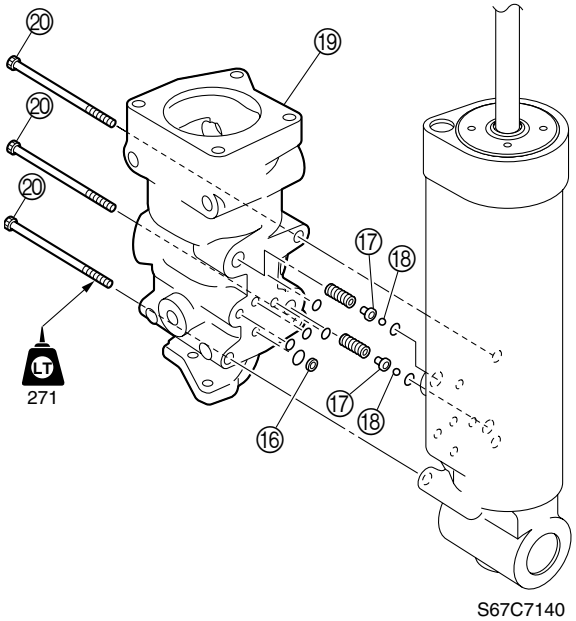
5. Install the filters ⑪, main valve seal ⑫, and valve pin ⑬.

6. Install the gear pump assembly ⑭, and then tighten the bolts ⑮ to the specified torque.



	Gear pump bolt ⑮: 4 N·m (0.4 kgf·m, 3.0 ft·lb)

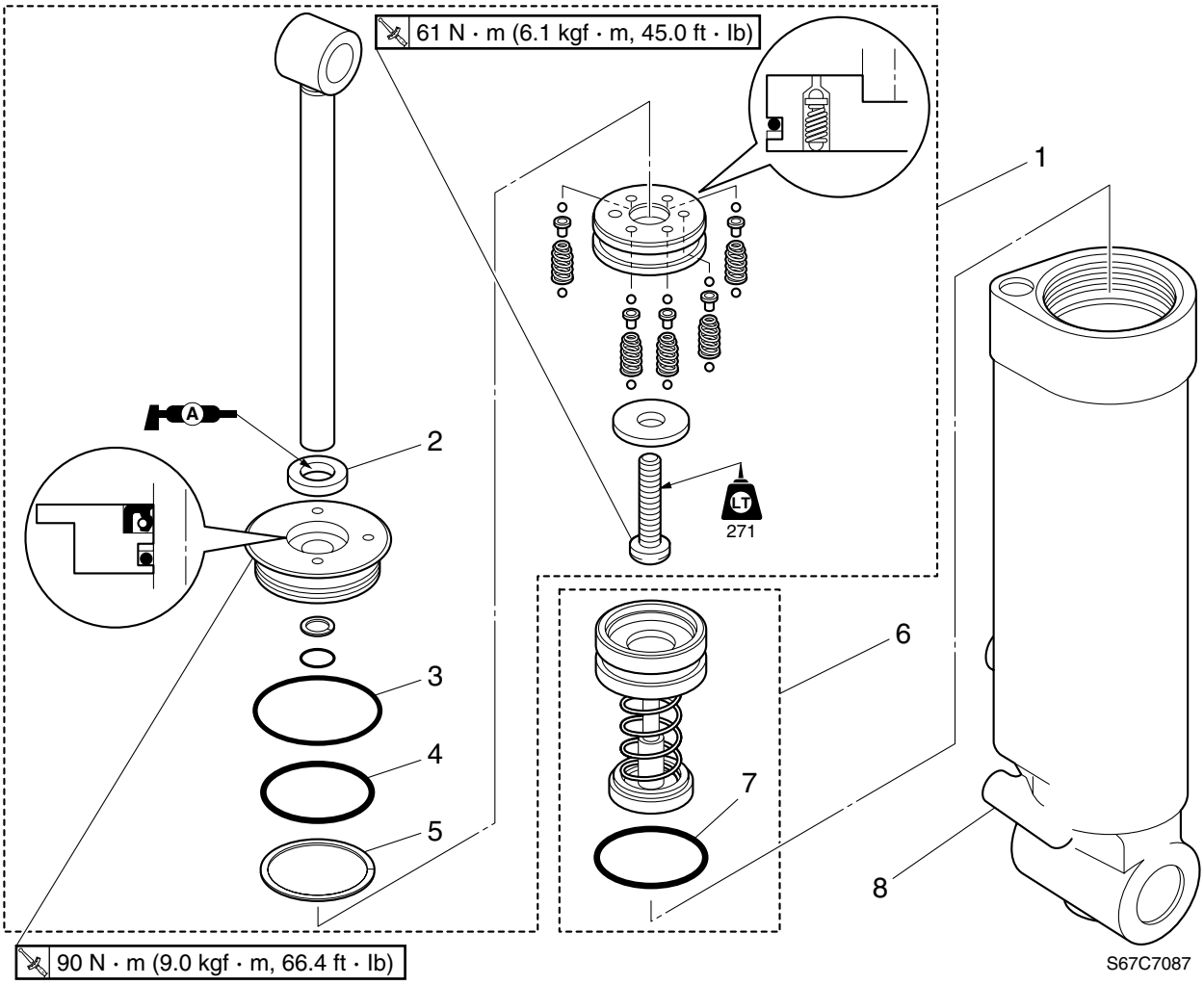
7. Install the filter ⑯, absorber valve pins ⑰, balls ⑱, and gear pump housing ⑲, and then tighten the bolts ⑳ to the specified torque.



NOTE:
When installing the gear pump housing ⑲, apply grease to the O-rings and balls ⑱ to prevent them from falling out.

	Gear pump housing bolt ⑳: 9 N·m (0.9 kgf·m, 6.6 ft·lb)

PTT cylinder



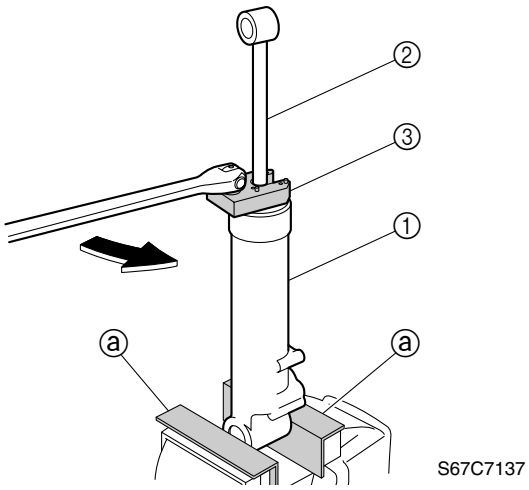
No.	Part name	Q'ty	Remarks
1	Tilt ram assembly	1	
2	Dust seal	1	**Not reusable**
3	O-ring	1	**Not reusable**
4	O-ring	1	**Not reusable**
5	Backup ring	1	
6	Free piston assembly	1	
7	O-ring	1	**Not reusable**
8	Cylinder	1	

7

Disassembling the PTT cylinder

1. Hold the cylinder ① in a vise using aluminum plates ⓐ on both sides.

2. Loosen the tilt cylinder end screw, and then remove the tilt ram assembly ②.



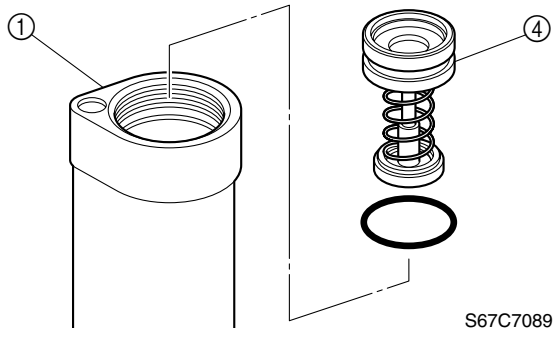
⚠ WARNING

Make sure that the ram is fully extended before removing the end screw.

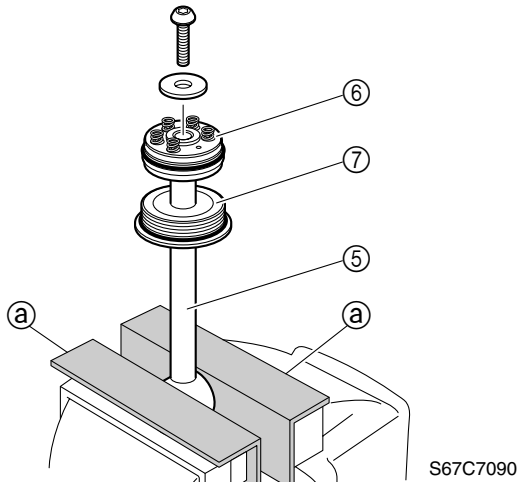
	Cylinder-end screw wrench ③: 90890-06568

3. Drain the PTT fluid.

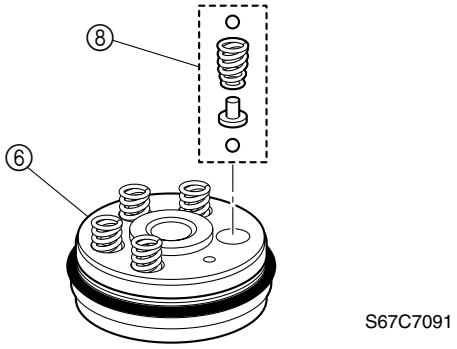
4. Remove the free piston ④ from the cylinder ①.



5. Hold the tilt ram ⑤ in a vise using aluminum plates ⓐ on both sides, and then remove the tilt piston ⑥ and tilt cylinder end screw ⑦ from the ram.



6. Remove the absorber valves ⑧ from the tilt piston ⑥.

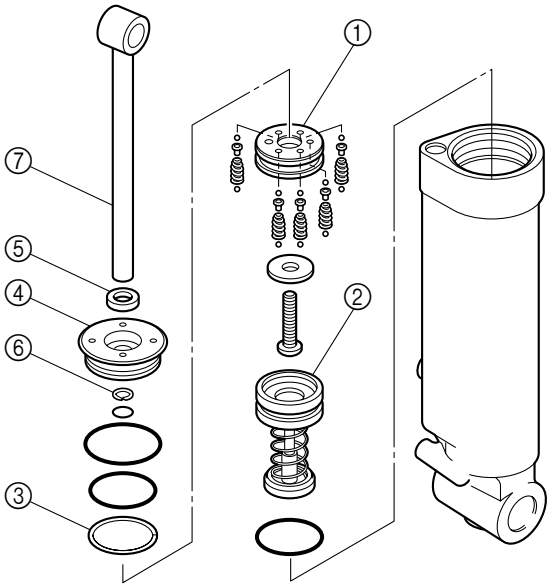


Checking the tilt cylinder and piston

1. Check the tilt piston ①, free piston ②, and backup ring ③. Replace if cracked or scratched.

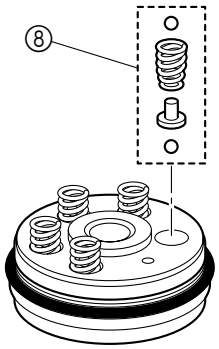
2. Check the tilt cylinder end screw ④, dust seal ⑤, and backup ring ⑥. Replace if cracked or scratched.

3. Check the tilt ram ⑦. Polish with 400–600-grit sandpaper if there is light rust, or replace if bent or excessively corroded.



S67C7092

4. Check the absorber valves ⑧. Clean if there is dirt or residue.



S67C7093

Assembling the tilt cylinder

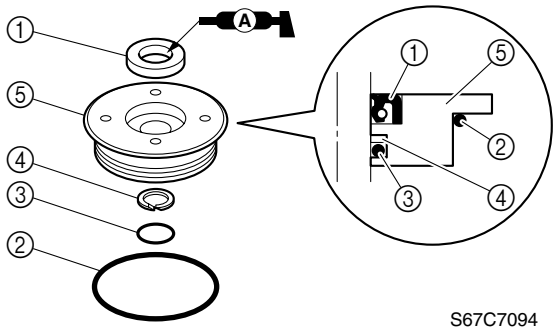
CAUTION:

- **Do not use a rag when assembling the PTT unit as dust and particles on the PTT unit components can lead to poor performance.**
- **Do not reuse the dust seal and O-rings, always replace them with new ones.**

NOTE:

Lubricate the parts with ATF Dexron II during assembly.

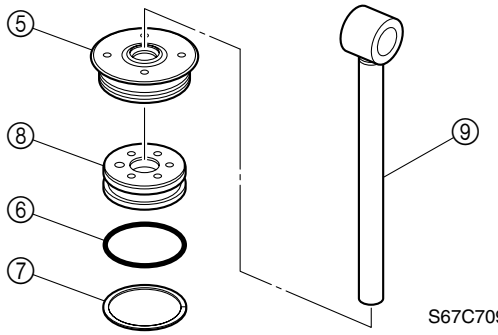
1. Install a new dust seal ①, new O-rings ② and ③, and the backup ring ④ into the tilt cylinder end screw ⑤.



S67C7094

2. Install a new O-ring ⑥ and the backup ring ⑦ to the tilt piston ⑧.

3. Install the tilt cylinder end screw ⑤ and tilt piston ⑧ to the tilt ram ⑨.



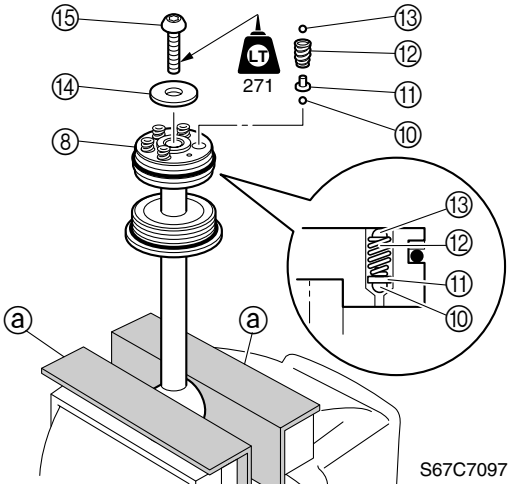
S67C7095

7

4. Hold the tilt ram in a vise using aluminum plates ⓐ on both sides.

5. Install the balls ⑩, absorber valve pins ⑪, springs ⑫, and balls ⑬ as shown.

6. Install the washer ⑭ and bolt ⑮ to the tilt piston ⑧, and then tighten the bolt to the specified torque.



Tilt piston bolt ⑮:
61 N·m (6.1 kgf·m, 45.0 ft·lb)

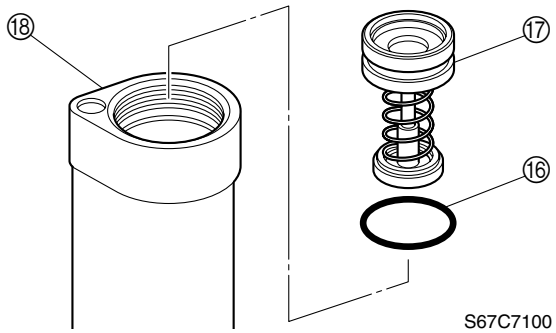
7. Install the PTT gear pump housing to the tilt cylinder.

NOTE:
To install the PTT gear pump housing, see "Assembling the gear pump" (7-44).

8. Fill the cylinder with the recommended PTT fluid to about 60%.

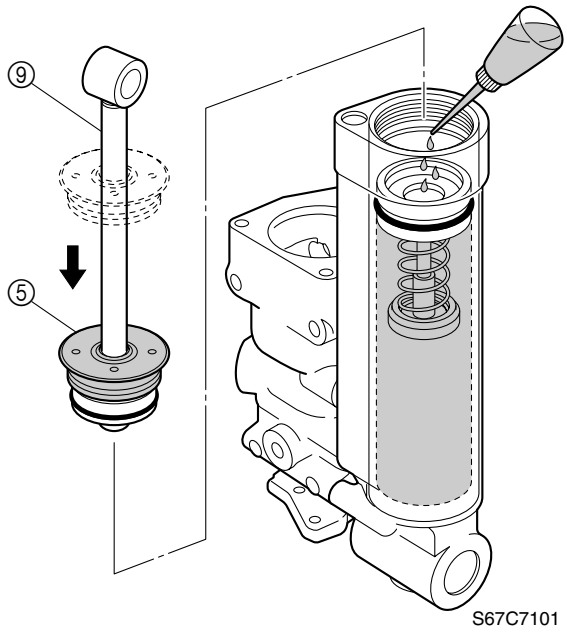
Recommended PTT fluid:
ATF Dexron II

9. Install a new O-ring ⑯ to the free piston ⑰, and then install the piston into the cylinder ⑱.

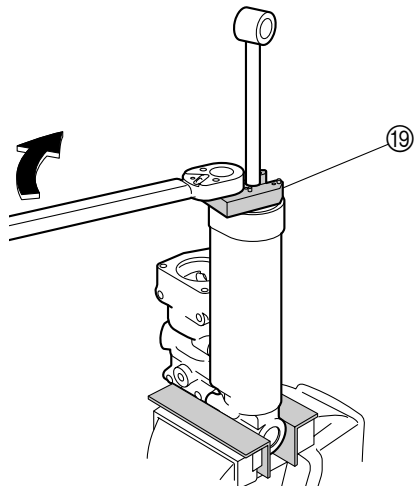


10. Place the tilt cylinder end screw ⑤ at the bottom of the tilt ram ⑨.

11. Install the tilt ram assembly into the cylinder.



12. Tighten the tilt cylinder end screw ⑤ to the specified torque.



Cylinder-end screw wrench ⑲:
90890-06568

Tilt cylinder end screw ⑤:
90 N·m (9.0 kgf·m, 66.4 ft·lb)

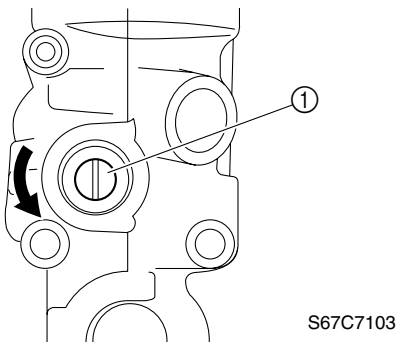
13. Install the PTT motor to the PTT gear pump housing.

NOTE:
To install the PTT motor, see "Assembling the PTT motor" (7-37).

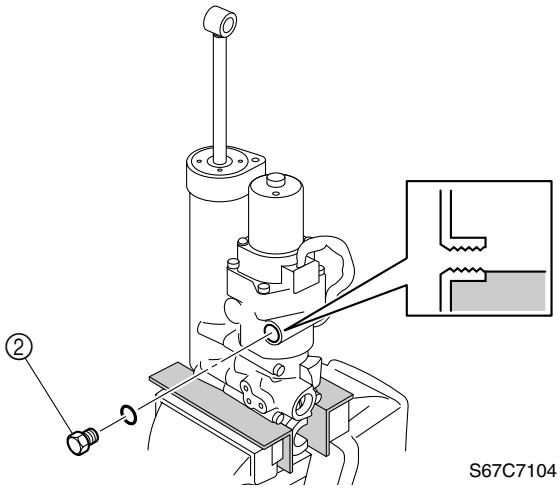
Bleeding the PTT unit

NOTE:
Make sure that the tilt ram is fully extended.

1. Place the PTT unit in an upright position.
2. Turn the manual valve ① counterclockwise to close it.



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



NOTE:
- If the fluid is at the correct level, a small amount of fluid should overflow out of the filler hole.
- If fluid is below the correct level, add the recommended PTT fluid.

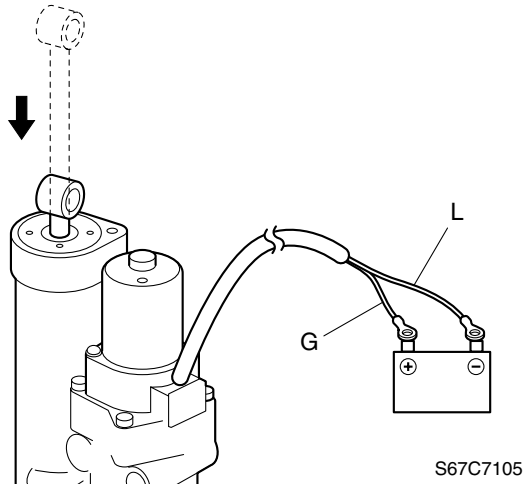
Recommended PTT fluid:
ATF Dexron II

4. Install the 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)

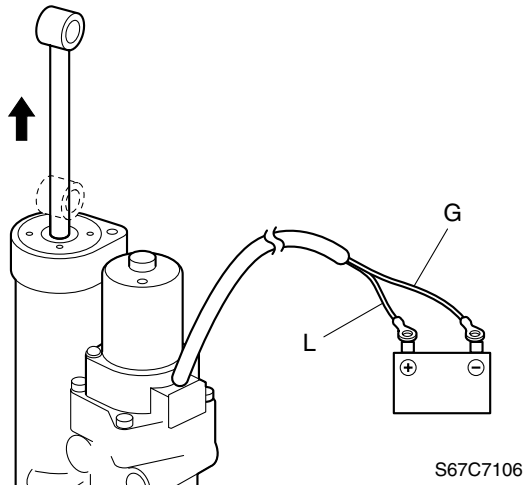
7

5. Connect the PTT motor leads to the battery terminals to fully retract the tilt ram.



Ram	PTT motor lead	Battery terminal
Down	Green (G)	⊕
	Blue (L)	⊖

6. Reverse the PTT motor leads between the battery terminals to fully extend the tilt ram.



Ram	PTT motor lead	Battery terminal
Up	Blue (L)	⊕
	Green (G)	⊖

NOTE:
- Repeat steps 5–6 to fully extend and retract the tilt ram 4 to 5 times.
- If the tilt ram does not move up and down easily, push and pull on the ram to assist the operation.

7. Fully extend the tilt ram.

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

⚠ WARNING

Make sure that the tilt ram is 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, a small amount of fluid should overflow out of the filler hole when the cap is removed.
- If the fluid is below the correct level, add the recommended PTT fluid.

Recommended PTT fluid:
ATF Dexron II

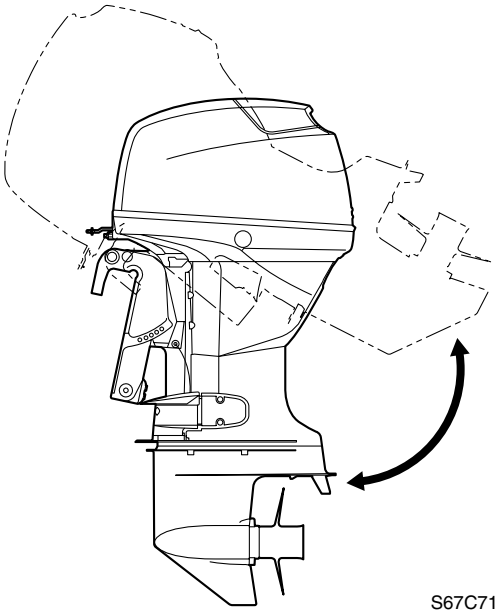
9. Install a new O-ring and the reservoir cap, and then tighten the cap to the specified torque.

NOTE:
If the fluid is below the correct level in step 8, repeat steps 5–9 until the fluid remains at the correct level.

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

Bleeding the PTT unit (installed)

1. Push the PTT switch to tilt the outboard motor to the fully up and down positions 4 to 5 times.

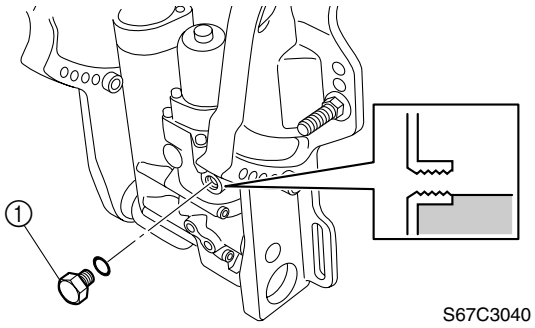

S67C7139

NOTE:
Connect the PTT motor leads directly to the battery terminals when the power unit is not installed. To connect the PTT motor leads, see “Bleeding the PTT unit” (7-50).

2. Let the fluid settle for 5 minutes with the outboard motor tilted down.
3. Push the PTT switch to tilt the outboard motor to the fully up position.
4. 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.

5. Remove the reservoir cap ①, and then check the fluid level in the reservoir.



S67C3040

NOTE:
- If the fluid is at the correct level, a small amount of fluid should overflow out of the filler hole when the cap is removed.
- If the fluid is below the correct level, add the recommended PTT fluid.

Recommended PTT fluid:
ATF Dexron II

6. Install a new O-ring and the reservoir cap ①, and then tighten the cap to the specified torque.

NOTE:
If the fluid is below the correct level in step 5, repeat steps 1–6 until the fluid remains at the correct level.

Reservoir cap ①:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

PTT electrical system

Checking the fuse

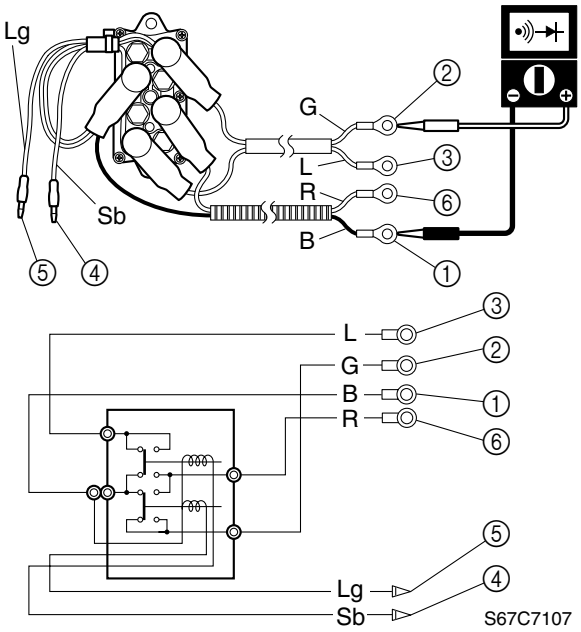
1. Check the fuse for continuity. Replace if there is no continuity.

NOTE:
- For the location of the fuse, see “Electrical component and wiring harness routing” (8-1).
- To check the fuse, see “Checking the fuse (E and W model)” (8-13).

7

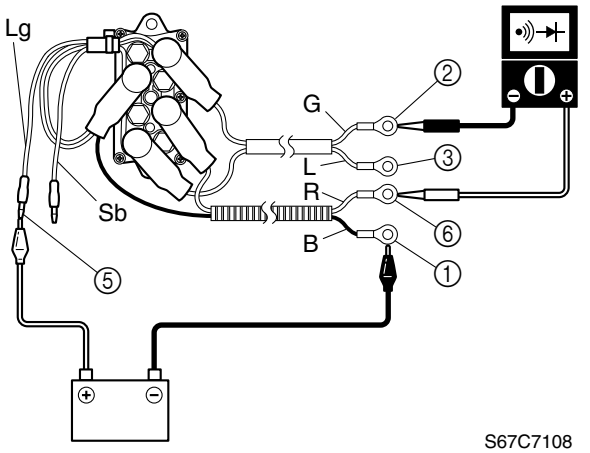
Checking the PTT relay

1. Check the PTT relay for continuity. Replace if out of specification.



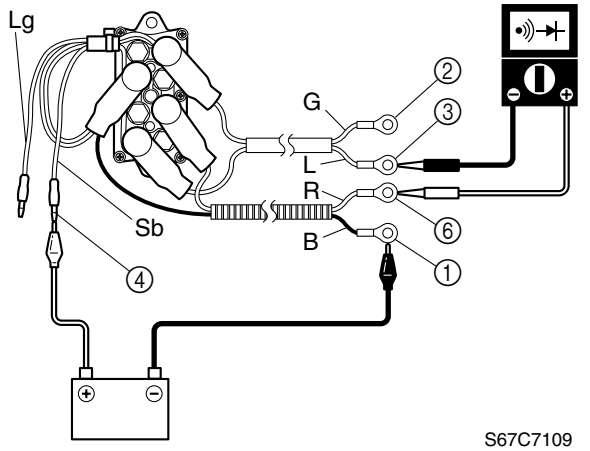
PTT relay continuity	
Black (B) ① – Green (G) ② Black (B) ① – Blue (L) ③ Black (B) ① – Sky blue (Sb) ④ Black (B) ① – Light green (Lg) ⑤	Continuity
Red (R) ⑥ – Green (G) ② Red (R) ⑥ – Blue (L) ③	No continuity

2. Connect the positive battery lead to the light green (Lg) lead ⑤, and the negative battery lead to the black (B) lead ① as shown, and then check the PTT relay for continuity. Replace the PTT relay if out of specification.



PTT relay continuity	
Red (R) ⑥ – Green (G) ②	Continuity
Red (R) ⑥ – Blue (L) ③ Green (G) ② – Blue (L) ③	No continuity

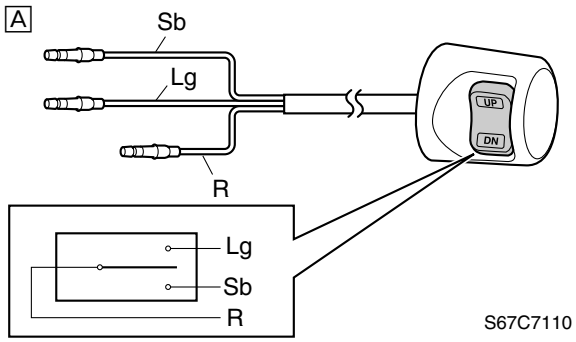
3. Connect the positive battery lead to the sky blue (Sb) lead ④, and the negative battery lead to the black (B) lead ① as shown, and then check the PTT relay for continuity. Replace the PTT relay if out of specification.

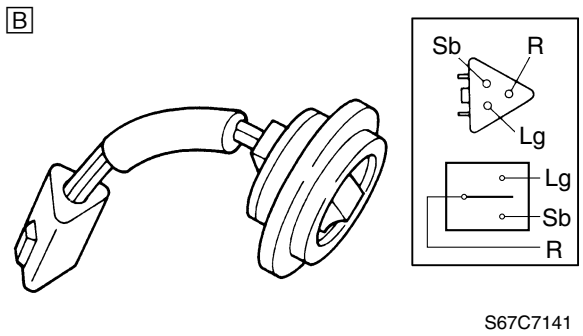


PTT relay continuity	
Red (R) ⑥ – Blue (L) ③	Continuity
Red (R) ⑥ – Green (G) ② Green (G) ② – Blue (L) ③	No continuity

Checking the PTT switch

1. Check the PTT switch for continuity. Replace if out of specification.



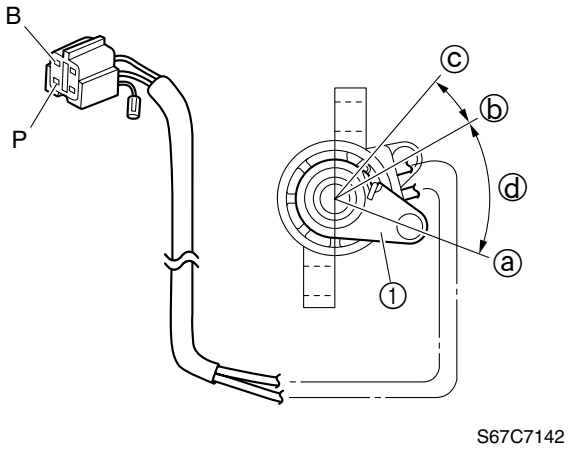


A H model
B R model

Switch position	Lead color		
	Sky blue (Sb)	Red (R)	Light green (Lg)
Free			
Up	○	○	
Down		○	○

Checking the trim sensor

1. Measure the trim sensor resistance. Adjust the trim sensor if out of specification.



NOTE:

- Turn the trim sensor lever ① from ⓐ to ⓒ and measure the resistance as it gradually changes.
- Position ⓑ is the trim sensor lever position when the outboard motor is tilted down. To adjust the trim sensor cam, see "Adjusting the trim sensor cam (R model)" (7-32).
- The trim sensor resistance will be lower at position ⓒ than at position ⓑ.
- Range ⓓ is the trim and tilt operation range.

Trim sensor resistance:
Pink (P) – Black (B)
238.8–378.8 Ω at ⓐ
9–11 Ω at ⓑ (setting resistance)

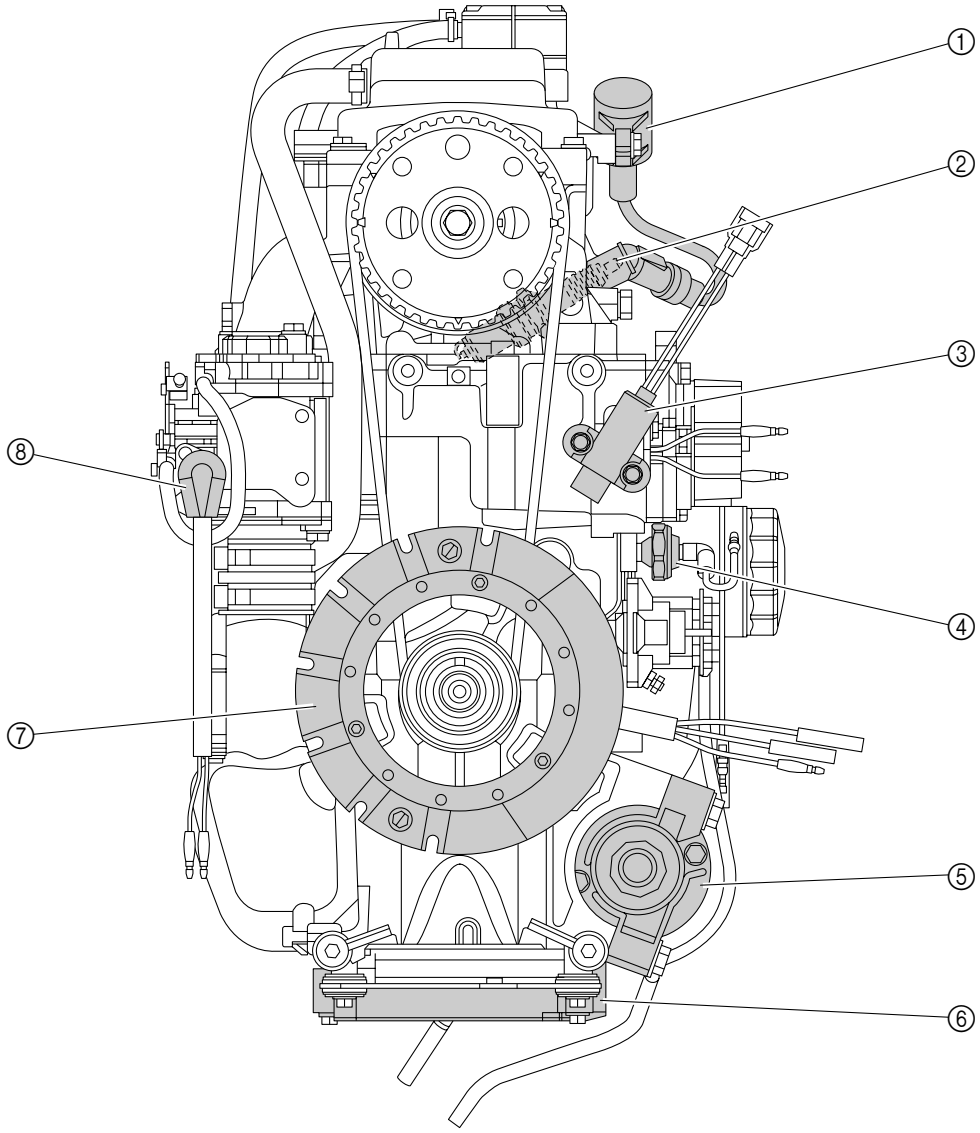
7

— MEMO —

Electrical system

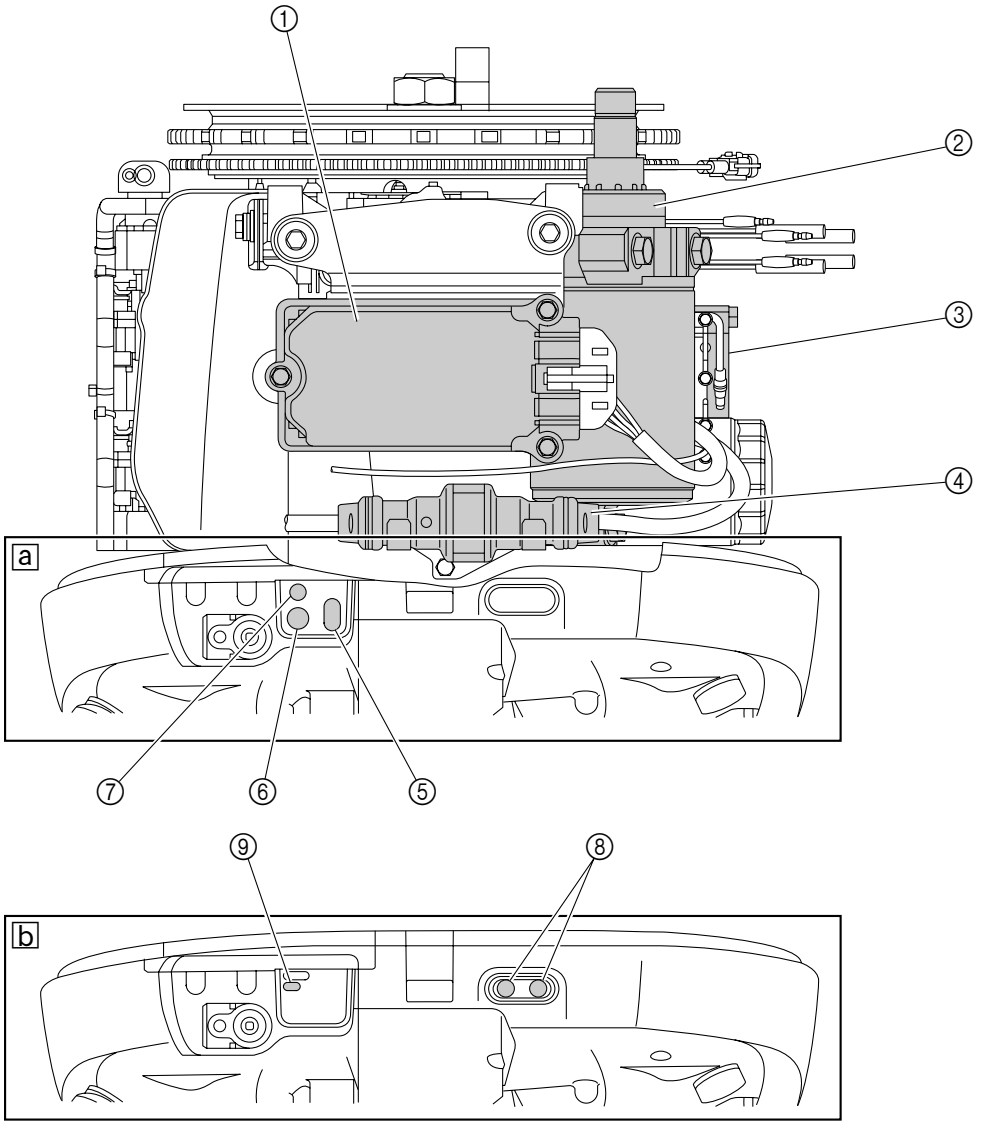
Electrical component and wiring harness routing

Top view



① Ignition coil
② Spark plug
③ Pulser coil
④ Oil pressure switch
⑤ Starter motor (E and W model)
⑥ CDI unit
⑦ Stator assembly
⑧ Prime Start

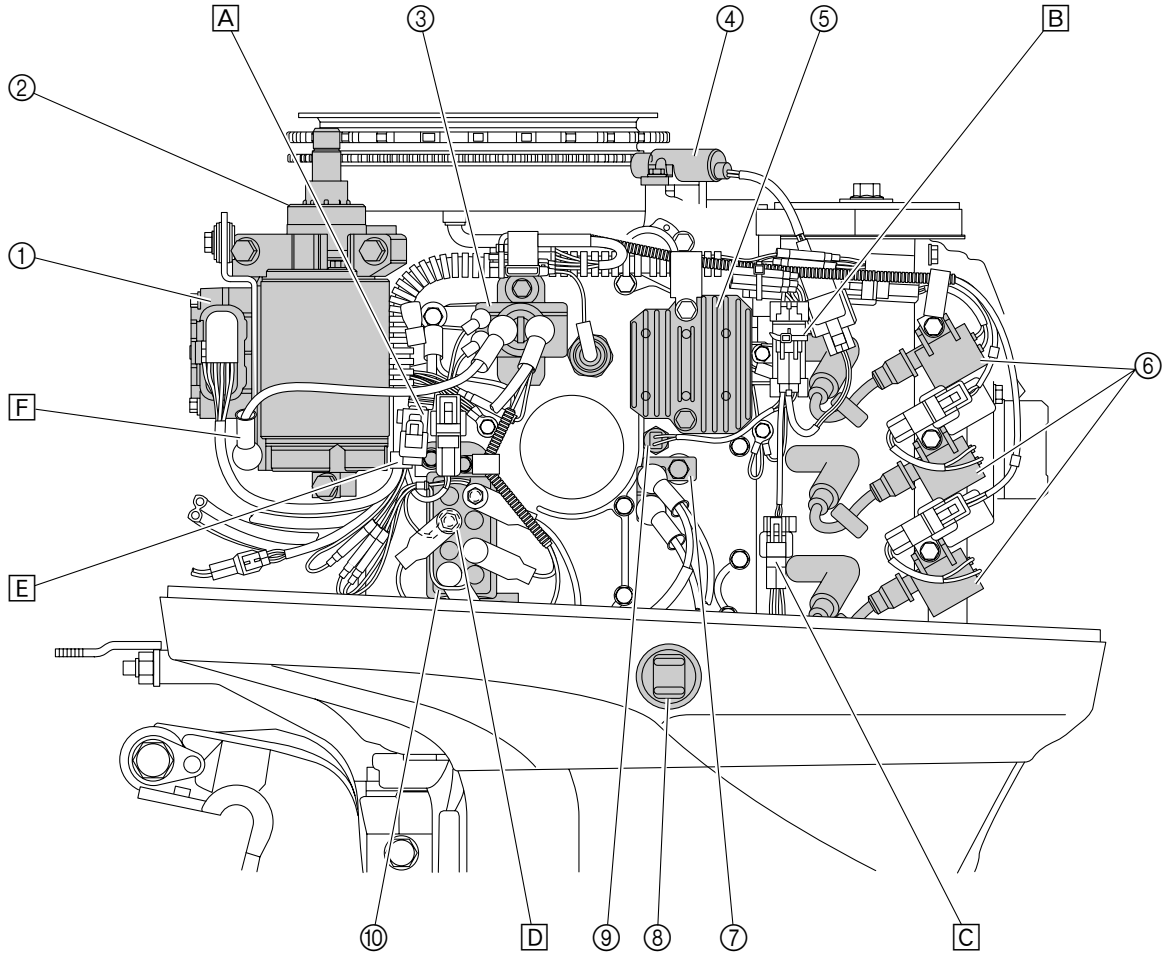
Bow view



a E and W model
b M model

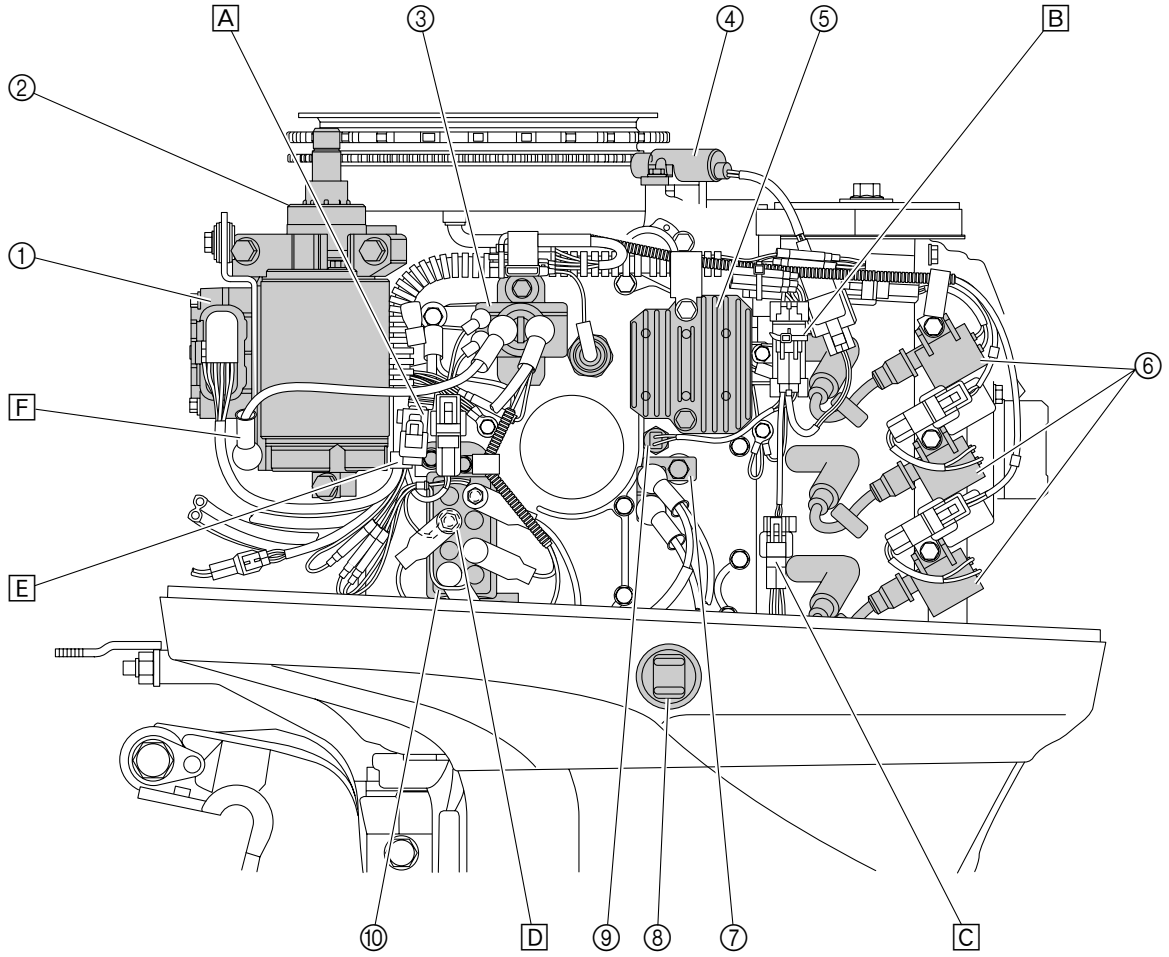
① CDI unit
② Starter motor (E and W model)
③ Rectifier Regulator (E and W model)
④ 10-pin main harness coupler (E and W model)
⑤ Battery cable (E and W model)
⑥ 10-pin main harness (E and W model)
⑦ Warning indicator assembly lead (H model with electric starter)
⑧ Warning indicator assembly (M model)
⑨ Engine shut-off switch lead (M model)

Port view



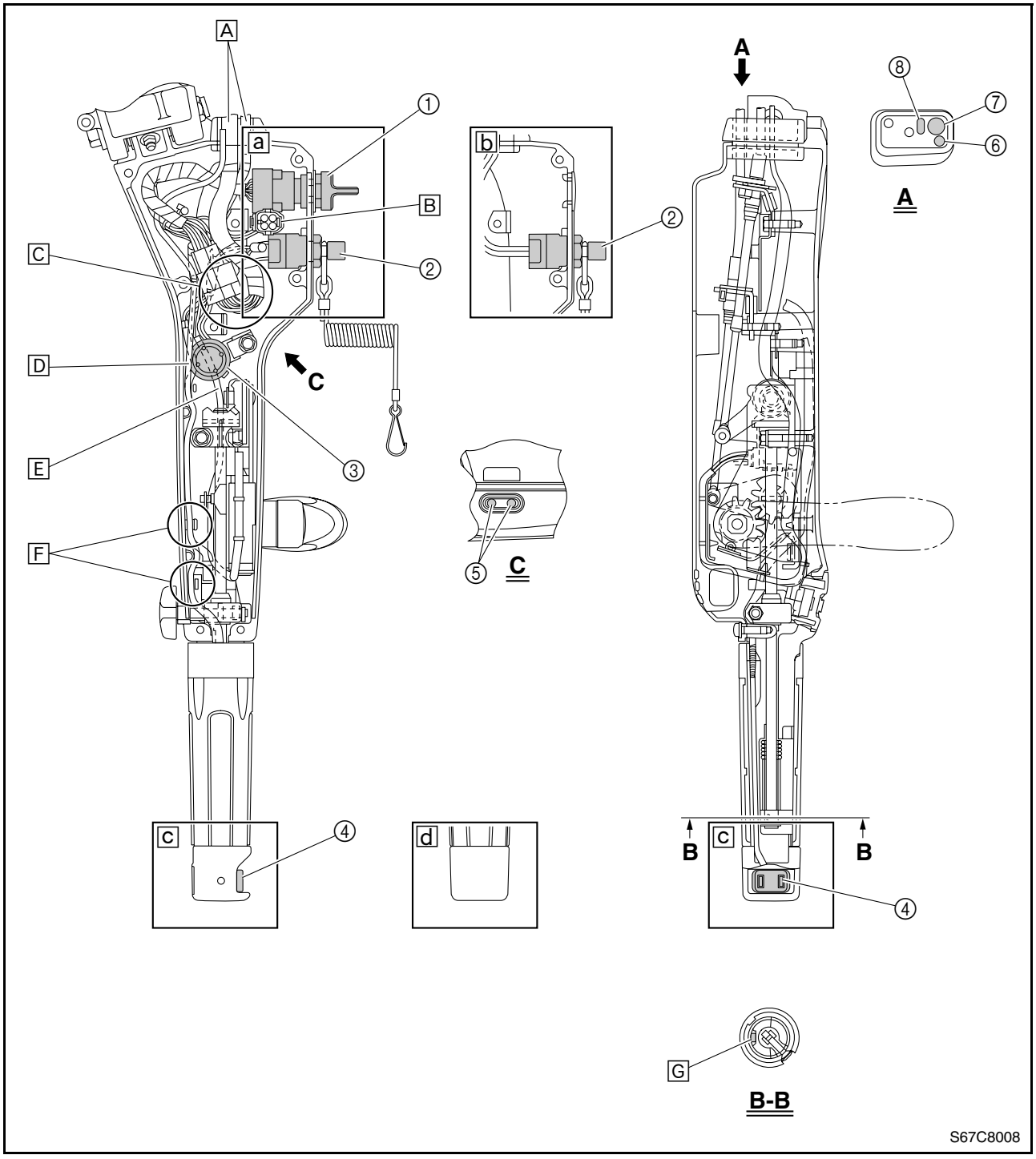
① CDI unit
② Starter motor (E and W model)
③ Starter relay (E and W model)
④ Pulser coil
⑤ Rectifier Regulator (E and W model)
⑥ Ignition coils
⑦ PTT terminal (PTT model)
⑧ PTT switch (R model with PTT)
⑨ Thermo sensor
⑩ PTT relay (PTT model)

A Fasten the negative battery cable and fuse holder with the holder.
B Fasten the pulser coil lead, Rectifier Regulator lead, and thermo sensor connector with the plastic tie, making sure to align the tie with the holder.
C Connect the PTT switch coupler. (R model with PTT)
D Install the ground lead terminals using the same nut.



E Align the positioning tape on the wiring harness with the bottom of the starter motor.
F Install the terminal so that it is facing upward, within ± 15° of vertical.

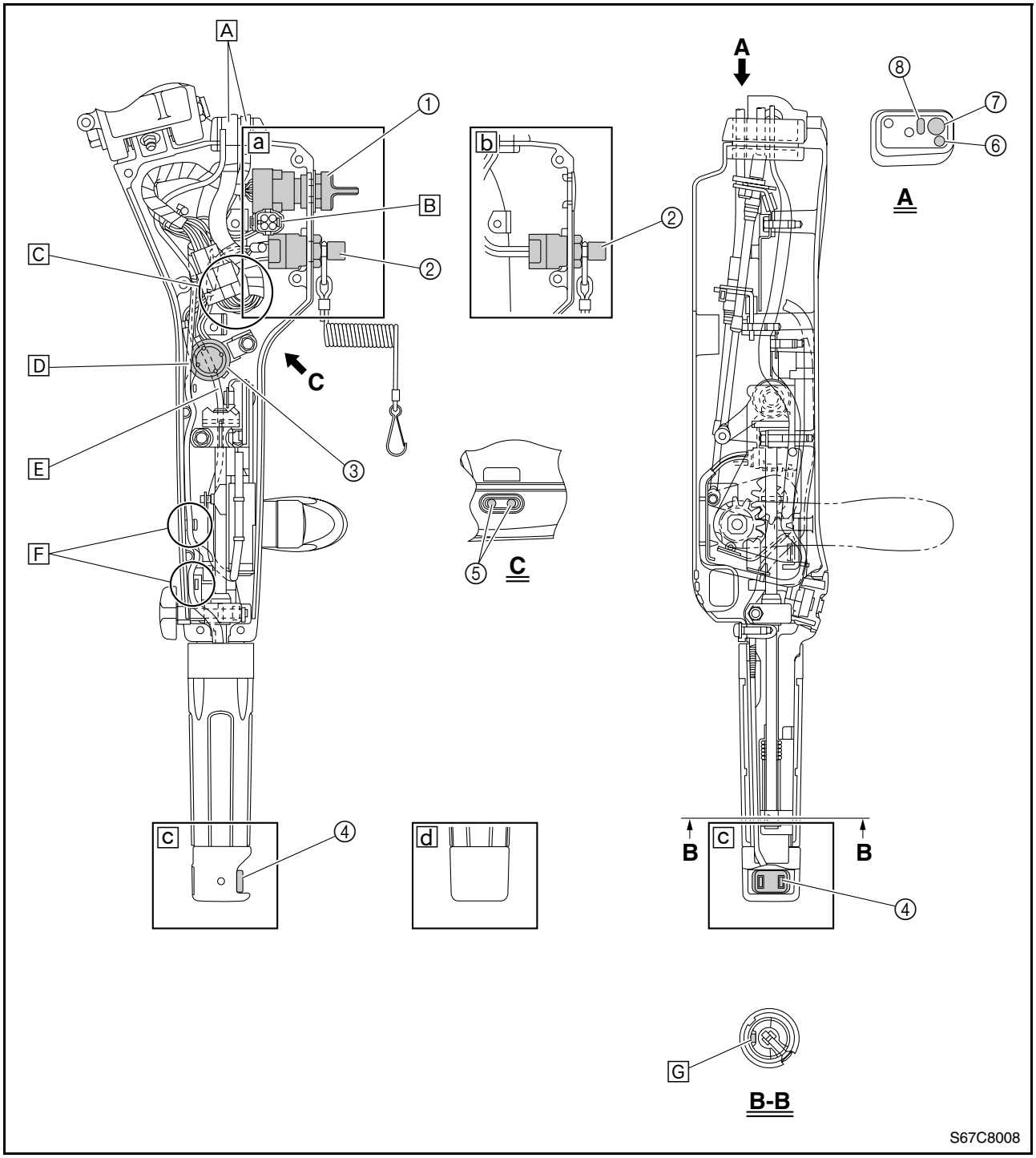
Tiller handle



a E and W model
b M model
c PTT model
d Except for PTT model

① Engine start switch (E and W model)
② Engine shut-off switch
③ Warning buzzer (E and W model)
④ PTT switch (PTT model)
⑤ Warning indicator assembly (E and W model)
⑥ Warning indicator assembly lead (E and W model)
⑦ 10-pin main harness (E and W model)
⑧ Engine shut-off switch lead (M model)

A Position the tape on the wiring harness to the inside of the grommet, making sure to align the edge of the tape with the end of the grommet.



B Position the warning indicator coupler between the engine start switch and the engine shut-off switch, making sure that it is vertical. (E and W model)

C Bend the 10-pin main harness as shown in the illustration, and then connect the harness coupler. The bend should be 10 mm (0.39 in) or more from the coupler and have a bend radius of 10 mm (0.39 in) or more. (E and W model)

D Route the PTT switch lead above the warning buzzer as shown. (PTT model)

E Route the neutral switch lead below the warning buzzer as shown. (E and W model)

F Fasten the PTT switch lead with the holder. (PTT model)

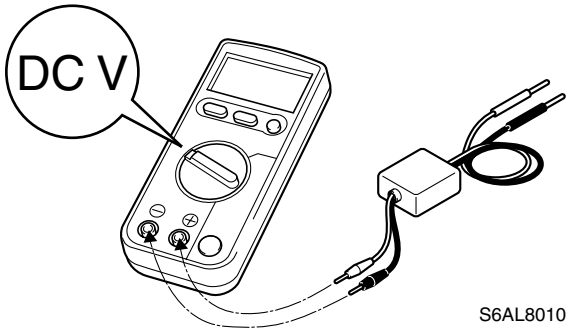
G Be careful not to pinch the PTT switch lead between the steering handle and the bushing. (PTT model)

8

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 affected 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 tester leads.

CAUTION:

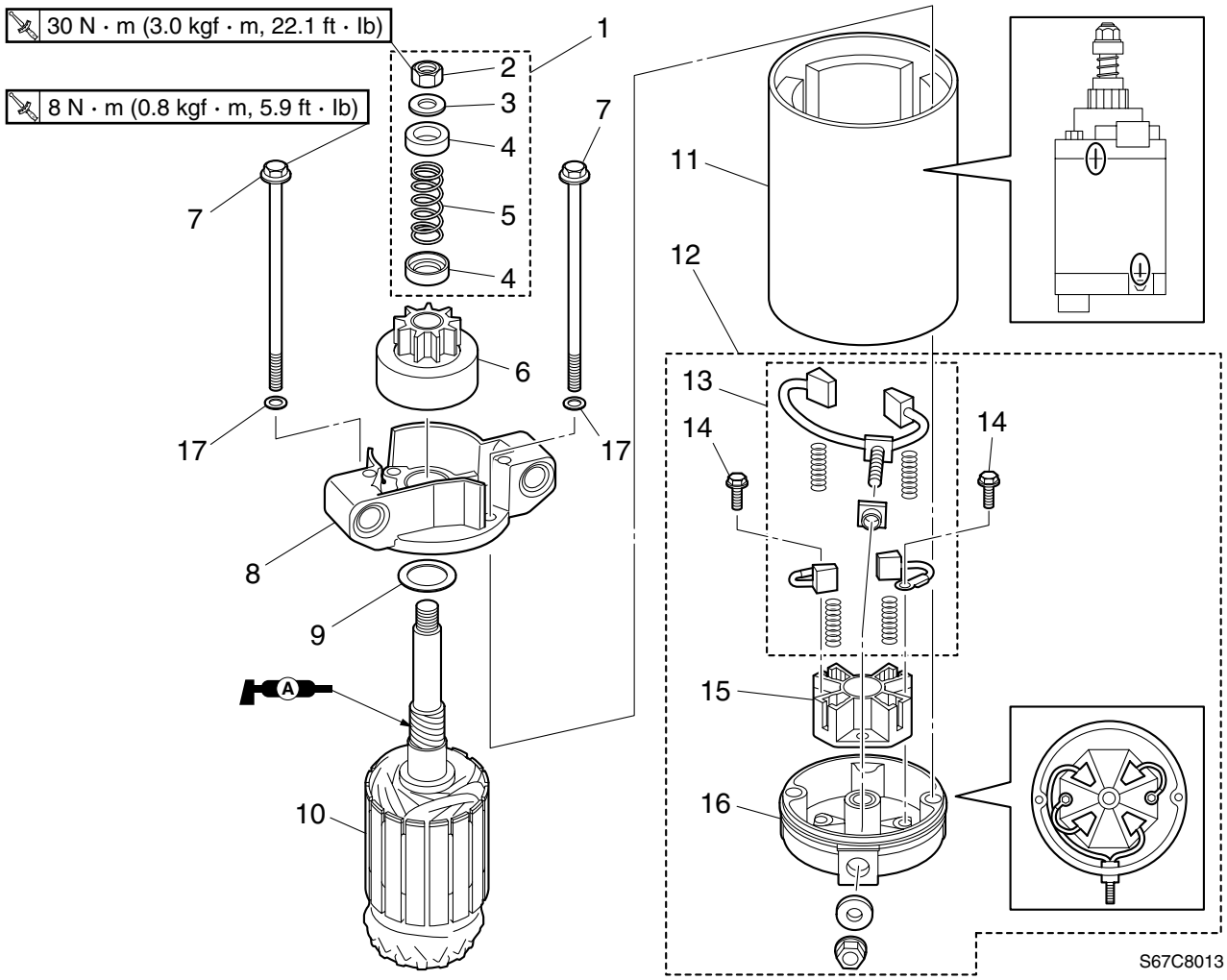
When testing the voltage between the terminals of an electrical component with the digital tester, do not allow any of the leads to touch any metal parts. If touched, the electrical component can short and be damaged.

NOTE:

- Before measuring the peak voltage, check all wiring for corrosion and proper connection, and check that the battery is fully charged.
- Use peak voltage adapter B with the recommended digital circuit tester.
- Connect the positive pin of 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

Starter motor (E and W model)



No.	Part name	Q'ty	Remarks
1	Pinion stopper set	1	
2	Nut	1	Width across flats: 14.2 mm (9/16 in)
3	Washer	1	
4	Pinion stopper	2	
5	Spring	1	
6	Pinion	1	
7	Bolt	2	M6 × 125 mm/Width across flats: 9.5 mm (3/8 in)
8	Cover	1	
9	Washer	1	
10	Armature	1	
11	Stator	1	
12	Bracket assembly	1	
13	Brush set	1	
14	Bolt	2	M5 × 14 mm
15	Brush holder	1	
16	Bracket	1	
17	Washer	2	

Removing the starter motor

1. Remove the starter motor from the power unit.

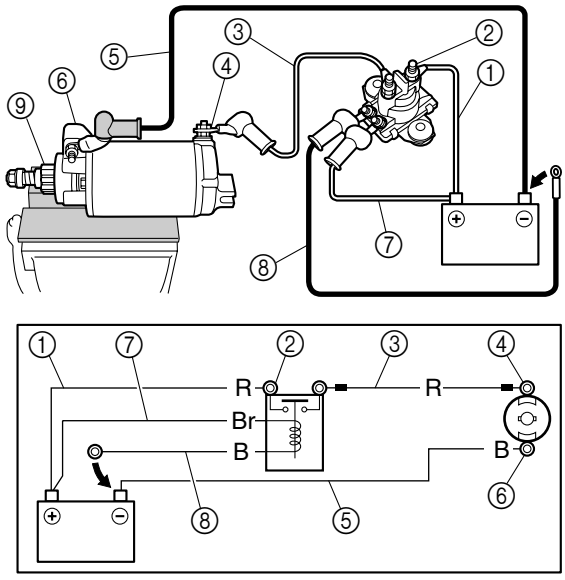
NOTE:
- Check the engine start switch, neutral switch, starter relay, and fuse before removing the starter motor.
- To remove the starter motor, see "Starter motor, starter relay, and PTT relay (E and W model)" (5-15).

Checking the starter motor operation

1. Hold the starter motor in a vise using aluminum plates on both sides.

2. Connect the positive battery cable ① to the starter relay terminal ②, connect the starter motor lead ③ to the starter motor positive terminal ④, and connect the negative battery cable ⑤ to the starter motor body ⑥.

3. Connect the starter relay lead (brown) ⑦ to the positive battery terminal. Connect the starter relay lead (black) ⑧ to the negative battery terminal to check the starter motor operation.



S67C8014

⚠ WARNING

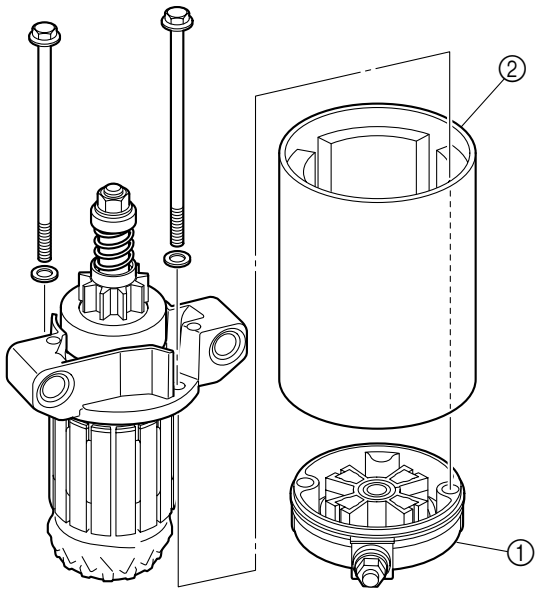
Do not place any objects near the pinion or touch it. The pinion ⑨ moves slightly away from the starter motor body and rotates at high speed.

NOTE:
- Check the starter motor operation for a few seconds.
- If the starter motor is disassembled for maintenance, be sure to check the operation again after assembling it.

4. Disconnect the negative battery cable and positive battery cable from the battery terminals.

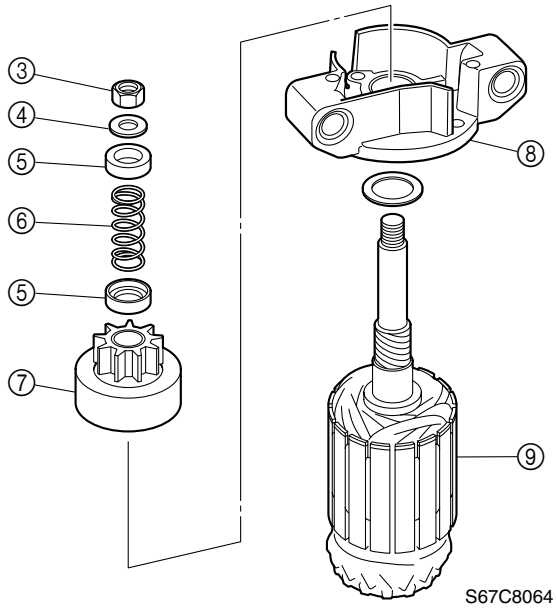
Disassembling the starter motor

1. Remove the bracket ① and stator ②.

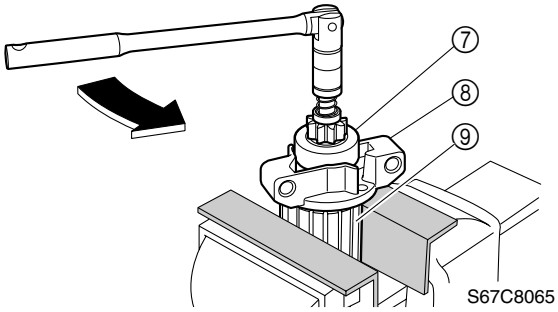


S67C8017

2. Remove the nut ③, washer ④, pinion stoppers ⑤, and spring ⑥, and then remove the pinion ⑦ and cover ⑧ from the armature ⑨.

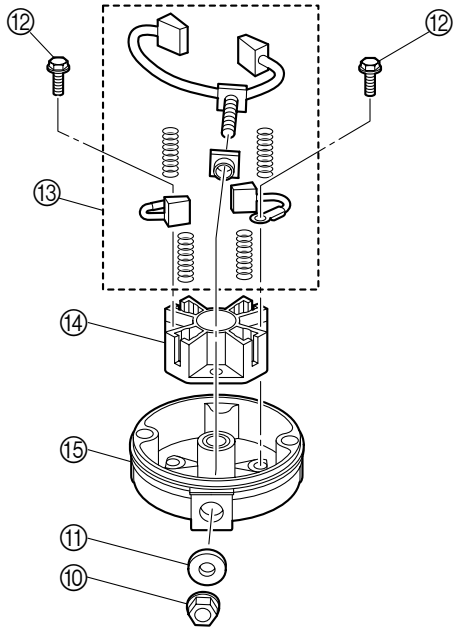


S67C8064



S67C8065

3. Remove the nut ⑩, spacer ⑪, and bolts ⑫, and then remove the brush set ⑬ and brush holder ⑭ from the bracket ⑮.

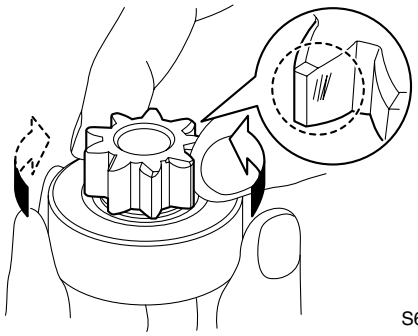


S67C8018

Checking the starter motor pinion

1. Check the pinion teeth. Replace the pinion if cracked or worn.

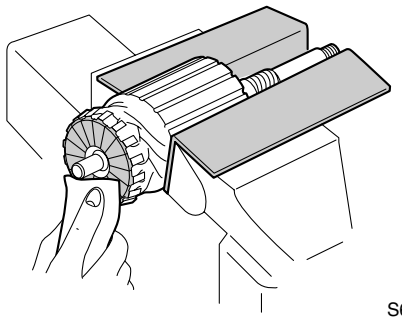
2. Check the pinion for smooth operation.


S67C8063

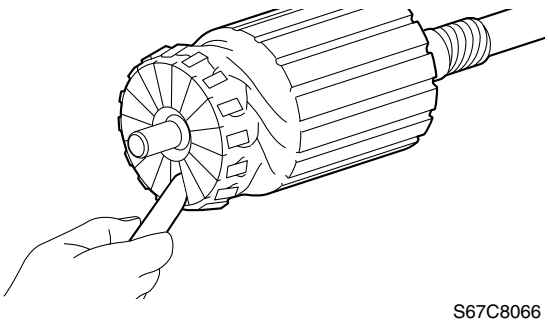
NOTE:
Turn the pinion counterclockwise to check that it operates smoothly and turn it clockwise to check that it locks in place.

Checking the starter motor

1. Check the commutator. Clean with 600-grit sandpaper and compressed air if dirty.

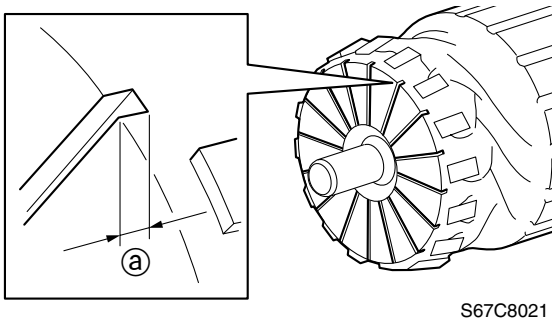

S67C8019

2. Clean the grooves between the commutator segments.


S67C8066

8

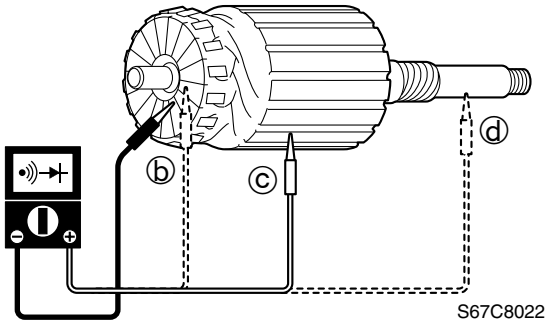
3. Measure the commutator undercut ⓐ. Replace the armature if below specification.



S67C8021

Starter motor commutator undercut wear limit ⓐ: 0.8 mm (0.03 in)

4. Check the armature for continuity. Replace the armature if out of specification.



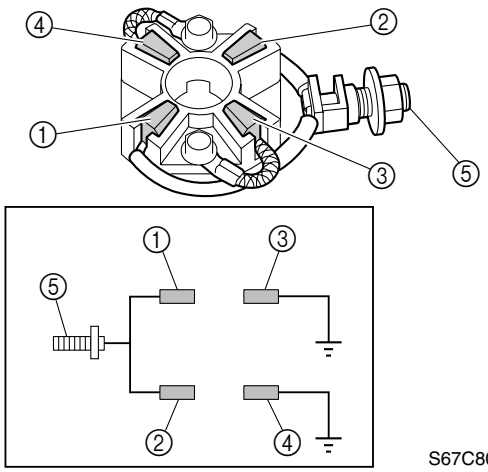
S67C8022

Armature continuity

Checking points	Continuity
Commutator segments ⓑ	Yes
Segment – Armature core ⓒ	No
Segment – Armature shaft ⓓ	No

Checking the brush holder and brush

1. Check the brush holder assembly for continuity. Replace if out of specification.

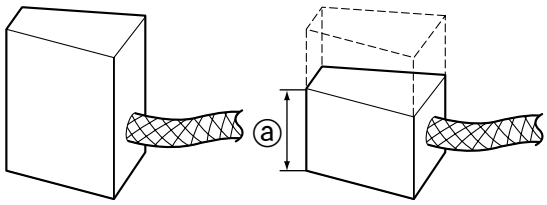


S67C8023

Brush holder assembly continuity

Checking points	Continuity
Brush ① – Brush ② Brush ① – Terminal ⑤ Brush ② – Terminal ⑤	Yes
Brush ③ – Brush ④ Brush ③ – Terminal ⑤ Brush ④ – Terminal ⑤	No

2. Measure the length of each brush. Replace if below specification.



S67C8024

Brush length wear limit ⓐ: 6.4 mm (0.25 in)

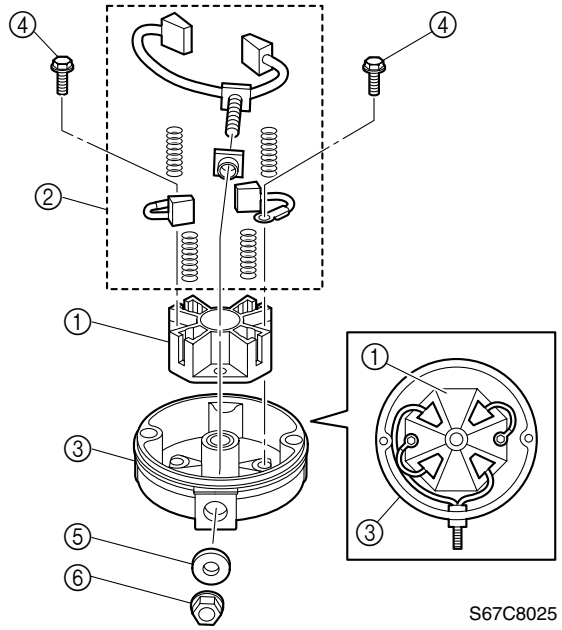
Assembling the starter motor

CAUTION:

Do not allow grease or oil to contact the commutator of the armature.

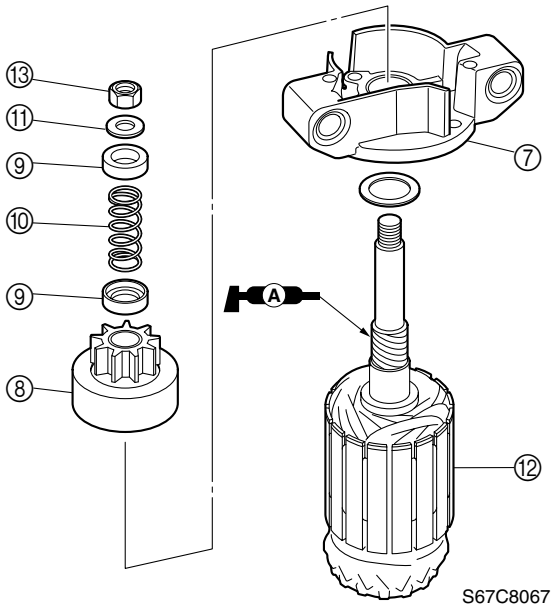
1. Install the brush holder ① and brush set ② into the bracket ③, and then tighten the bolts ④.

2. Install the spacer ⑤ and nut ⑥.

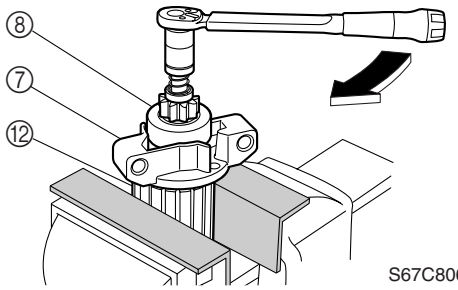


S67C8025

3. Install the cover ⑦, pinion ⑧, pinion stoppers ⑨, spring ⑩, and washer ⑪ to the armature ⑫, and then tighten the nut ⑬ to the specified torque.



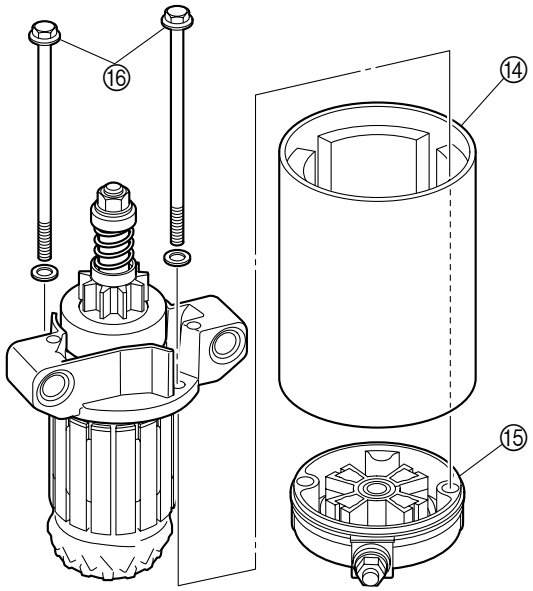
S67C8067



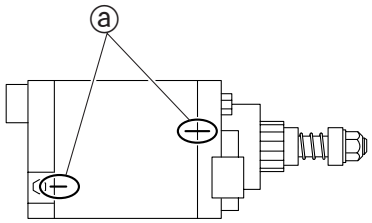
S67C8068

	Pinion stopper nut ⑬: 30 N·m (3.0 kgf·m, 22.1 ft·lb)

4. Install the stator ⑭ and bracket ⑮, and then tighten the bolts ⑯.



S67C8026



S67C8027

NOTE:
- Align the line marks ⓐ as shown.
- Check the starter motor operation again after assembling it.

8

Installing the starter motor

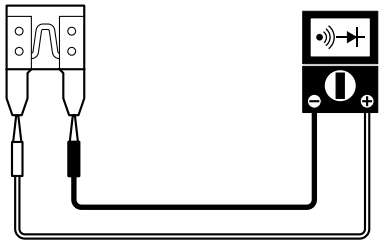
1. Install the starter motor to the power unit.
2. Connect the wiring harness to the starter motor, and then fasten the wiring harness.

NOTE:
To connect the wiring harness to the starter motor, see "Electrical component and wiring harness routing" (8-1).

Starting system

Checking the fuse (E and W model)

1. Check the fuse for continuity. Replace if there is no continuity.

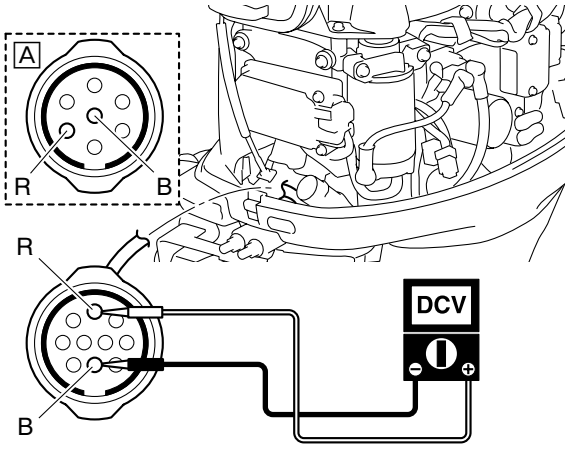


S6AU8024

NOTE:
For the location of the fuse, see "Electrical component and wiring harness routing" (8-1).

Checking the engine start switch

1. Disconnect the 10-pin (7-pin) main harness coupler.
2. Measure the input voltage at the 10-pin (7-pin) main harness coupler (outboard motor end). Check the fuse and wiring harness if below specification.



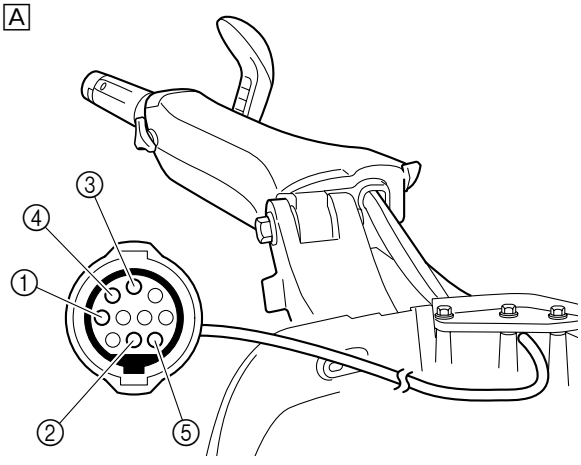
S67C8032

A 7-pin main harness model

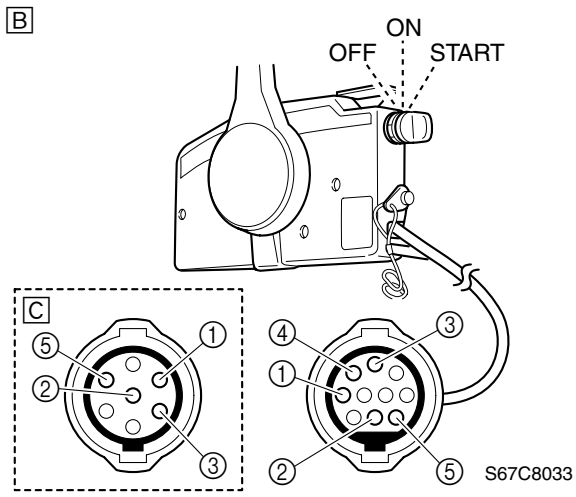
Engine start switch input voltage (reference data):
Red (R) – Black (B)
12 V (battery voltage)

3. Set the shift lever or remote control lever to the N position.
4. Check the engine start switch for continuity at the 10-pin (7-pin) main harness coupler (tiller handle end or remote control box end). Check the wiring harness and neutral switch, or replace the engine start switch if out of specification.

A



S67C8069



A H model
B R model
C 7-pin main harness model

Switch position	Lead color				
	White (W) ①	Black (B) ②	Red (R) ③	Yellow (Y) ④	Brown (Br) ⑤
OFF	○	○			
ON			○	○	
START			○	○	○

5. Connect the 10-pin (7-pin) main harness coupler.

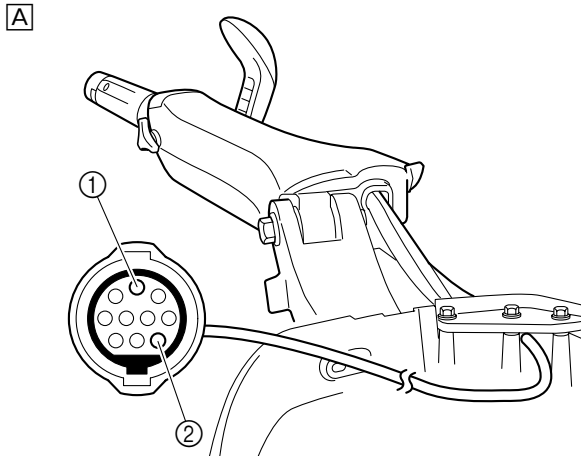
Checking the neutral switch (E and W model)

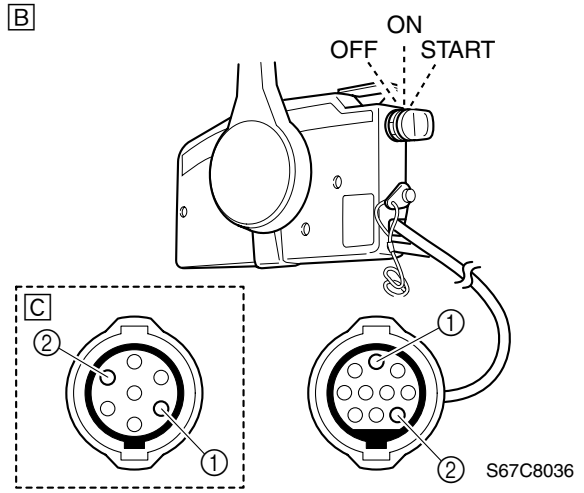
NOTE:
Be sure to check the engine start switch for continuity before checking the neutral switch.

1. Set the shift lever or remote control lever to the N position.

2. Turn the engine start switch to “START,” and then check the neutral switch for continuity at the 10-pin (7-pin) main harness coupler (tiller handle end or remote control box end).

3. Set the shift lever or remote control lever to the F position or R position, and then check the neutral switch for continuity. Check the wiring harness or replace the neutral switch if out of specification.





A H model
B R model
C 7-pin main harness model

Shift lever or remote control lever position	Lead color	
	Red (R) ①	Brown (Br) ②
N position	○	○
F position or R position		

4. Turn the engine start switch to “OFF.”

5. Connect the 10-pin (7-pin) main harness coupler.

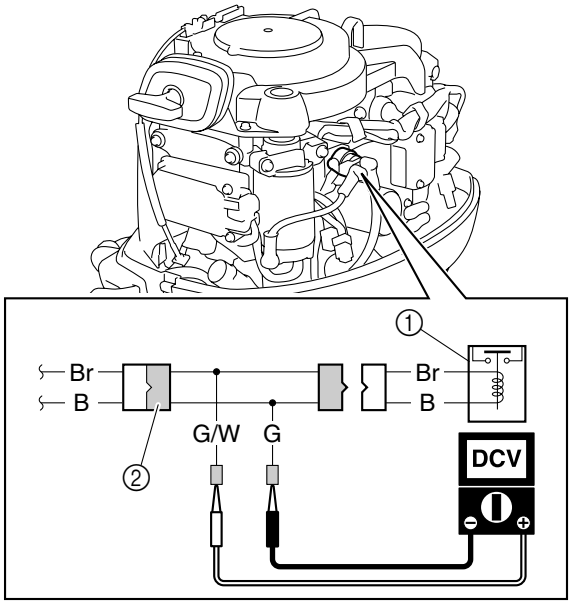
8

Checking the starter relay (E and W model)

1. Disconnect the starter relay ① coupler.
2. Connect the special service tool ② to the starter relay coupler (wiring harness end).

Test harness (2 pins) ②:
90890-06867

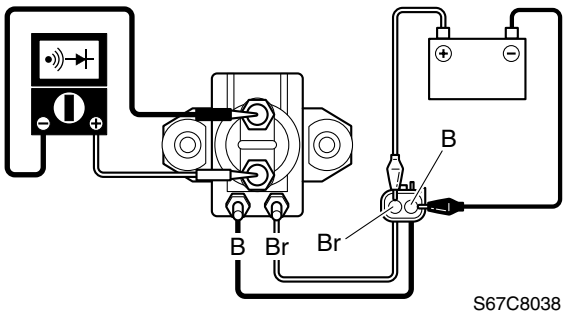
3. Set the shift lever or remote control lever to the N position.
4. Turn the engine start switch to "START," and then measure the input voltage at the starter relay coupler (wiring harness end). Check the engine start switch, neutral switch (in the tiller handle or remote control box), wiring harness, and ground lead if below specification.



S67C8037

Starter relay input voltage (reference data):
Brown (Br) – Black (B)
12 V (battery voltage)

5. Disconnect the special service tool ② and battery cables, and then remove the starter relay.
6. Connect the digital circuit tester leads to the starter relay terminals.
7. Connect the brown (Br) lead of the starter relay to the positive battery terminal and connect the black (B) lead to the negative battery terminal. Check for continuity between the starter relay terminals. Replace if there is no continuity.
8. Disconnect the brown (Br) or black (B) lead of the starter relay from a battery terminal. Check that there is no continuity between the starter relay terminals. Replace if there is continuity.



S67C8038

9. Install the starter relay, and then connect the battery cables, starter relay coupler, and starter relay leads.

Ignition and ignition control system

Checking the ignition spark

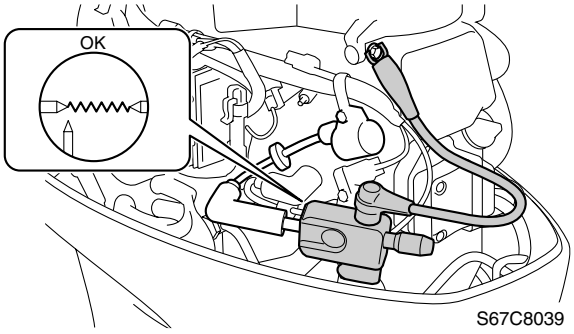
1. Disconnect the spark plug caps from the spark plugs.

NOTE:
To prevent the engine from starting when cranking it, be sure to disconnect all spark plug caps.

2. Connect the 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.



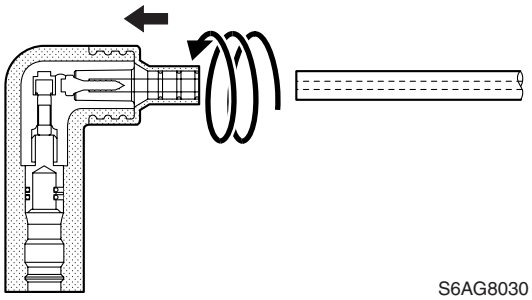
⚠ WARNING

- **Do not touch any of the connections of the special service tool.**
- **Be sure to install the special service tool to the spark plug cap so that sparks do not leak out.**
- **Keep flammable gas or liquids away, since this test can produce sparks.**

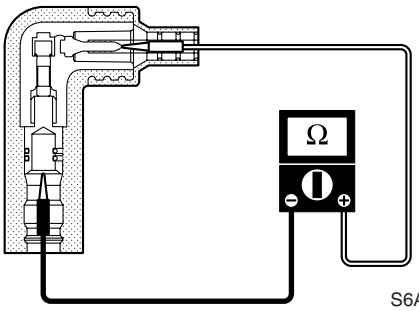
NOTE:
Repeat steps 2–3 for each spark plug cap.

Checking the spark plug cap

1. Remove the spark plug caps from the spark plug wires by turning the caps counterclockwise.



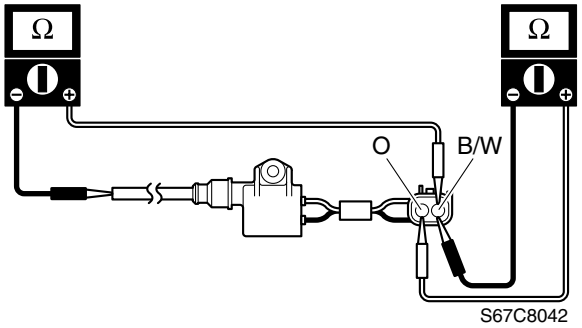
2. Measure the spark plug cap resistance. Replace if out of specification.



Spark plug cap resistance (reference data): 4.0–6.0 kΩ

Checking the ignition coil

1. Disconnect the ignition coil coupler.
2. Remove the spark plug caps from the spark plug wires by turning the caps counterclockwise.
3. Measure the ignition coil resistance. Replace if out of specification.



Ignition coil resistance (reference data):
Primary coil:
Orange (O) – Black/white (B/W)
0.18–0.24 Ω at 20 °C (68 °F)
Secondary coil:
Black/white (B/W) – Spark plug wire
2.72–3.68 kΩ at 20 °C (68 °F)

4. Install the spark plug caps to the spark plug wires by turning the caps clockwise, and then connect the ignition coil coupler.

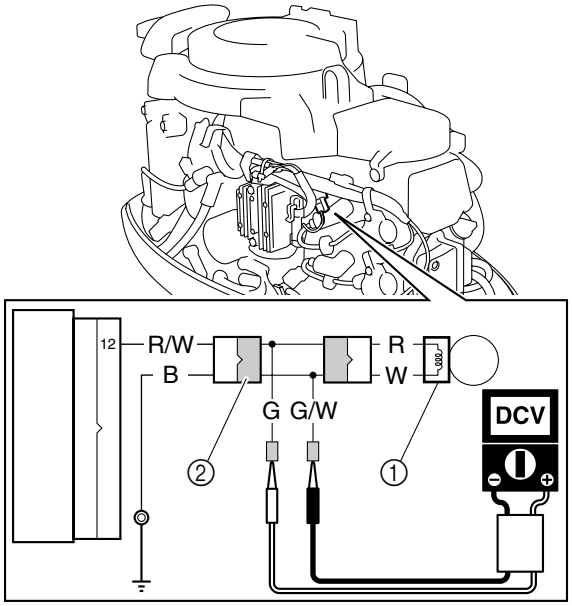
8

Checking the pulser coil

1. Disconnect the pulser coil ① coupler.
2. Connect the special service tool ② to the pulser coil coupler.

Test harness (2 pins) ②:
90890-06868

3. Measure the pulser coil ① output peak voltage. Replace if below specification.



S67C8043

NOTE:

- To prevent the engine from starting when cranking it, be sure to disconnect all spark plug caps.
- Do not remove the clip from the engine shut-off switch.
- If measuring the output peak voltage under the unloaded conditions, disconnect the pulser coil coupler.
- When using the manual starter to crank the engine, the voltage values may vary depending on the speed at which the starter handle is pulled.

Pulser coil output peak voltage:
Red (R) – White (W)

r/min	Unloaded	Loaded		
	Cranking		1,500	3,500
DC V	8.1	6.9	16.8	25.8

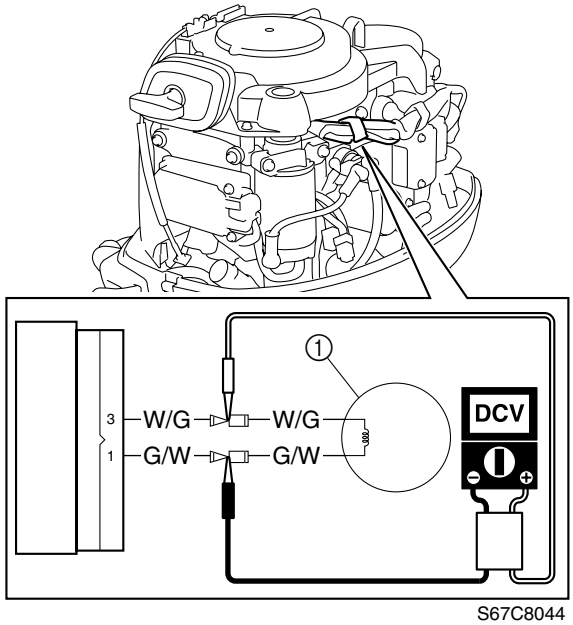
4. Disconnect the special service tool ②.
5. Measure the pulser coil resistance. Replace if out of specification.

Pulser coil resistance
(reference data):
Red (R) – White (W)
300–350 Ω at 20 °C (68 °F)

6. Connect the pulser coil coupler.

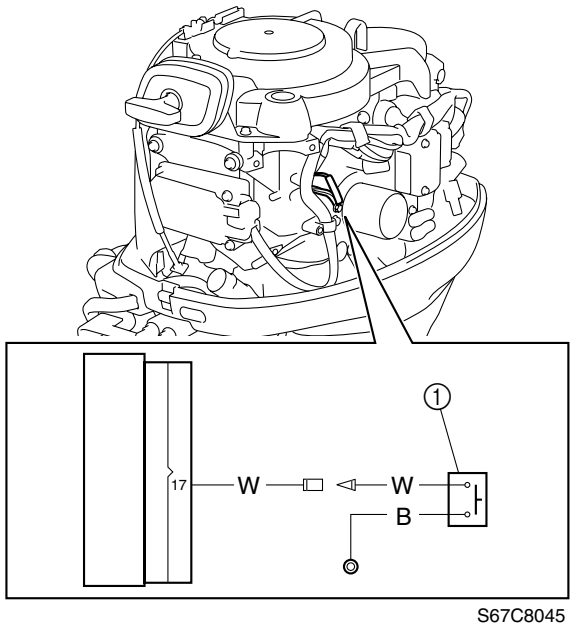
Checking the charge coil

1. Measure the charge coil ① output peak voltage. Replace the stator assembly if below specification.



S67C8044

NOTE:
- To prevent the engine from starting when cranking it, be sure to disconnect all spark plug caps.
- Do not remove the clip from the engine shut-off switch.
- If measuring the output peak voltage under the unloaded conditions, disconnect the charge coil connectors.
- When using the manual starter to crank the engine to measure the output peak voltage under the loaded conditions, turn the engine start switch to “ON” (W model).
- When using the manual starter to crank the engine, the voltage values may vary depending on the speed at which the starter handle is pulled.



S67C8045

Charge coil output peak voltage:
White/green (W/G) –
Green/white (G/W)

r/min	Unloaded	Loaded		
	Cranking		1,500	3,500
DC V	200	190	200	200

2. Disconnect the charge coil connectors.

3. Measure the charge coil resistance. Replace if out of specification.

Charge coil resistance (reference data):
White/green (W/G) –
Green/white (G/W)
660–710 Ω at 20 °C (68 °F)

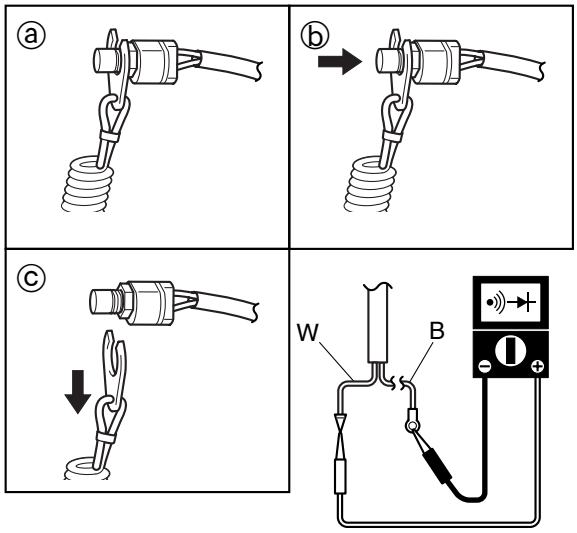
4. Connect the charge coil connectors.

Checking the engine shut-off switch (M model)

1. Disconnect the engine shut-off switch ① connector and ground terminal.

8

2. Check the engine shut-off switch ① for continuity between the engine shut-off switch connector and ground terminal (engine shut-off switch end). Replace if out of specification.



S6AG8150

Engine shut-off switch continuity:
White (W) – Black (B)

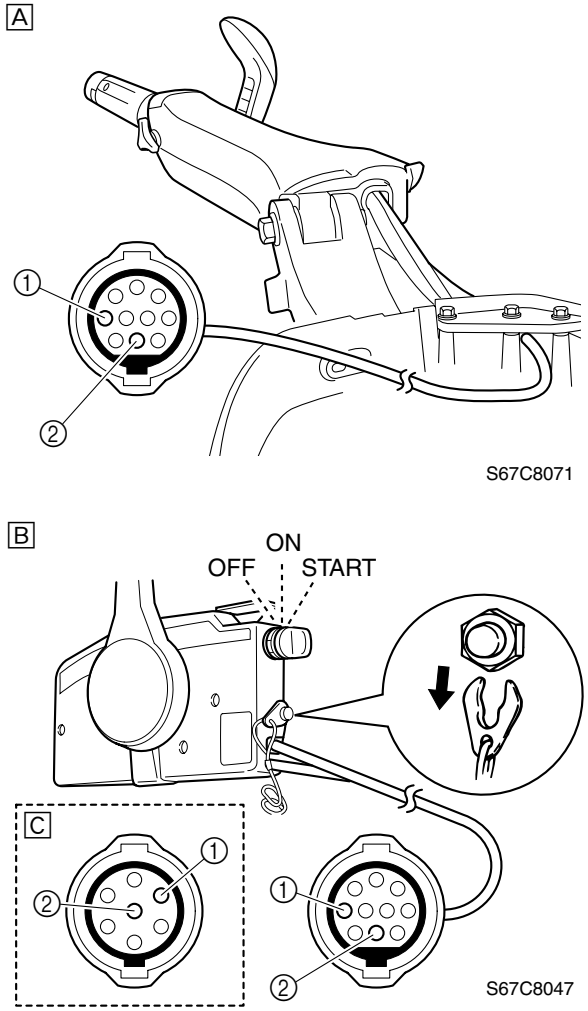
Switch position	Continuity
Clip installed ⓐ	No
Engine stop button pushed ⓑ	Yes
Clip removed ⓒ	Yes

3. Connect the engine shut-off switch connector and ground terminal.

Checking the engine shut-off switch (E and W model)

1. Disconnect the 10-pin (7-pin) main harness coupler.

2. Turn the engine start switch to “ON,” and then check the engine shut-off switch for continuity at the 10-pin (7-pin) main harness coupler (tiller handle end or remote control box end). Check the wiring harness or replace the engine shut-off switch if out of specification.



A H model
B R model
C 7-pin main harness model

Engine shut-off switch continuity:
White (W) ① – Black (B) ②

Switch position	Continuity
Clip installed	No
Clip removed	Yes

3. Turn the engine start switch to “OFF.”

4. Connect the 10-pin (7-pin) main harness coupler.

Engine electric control system

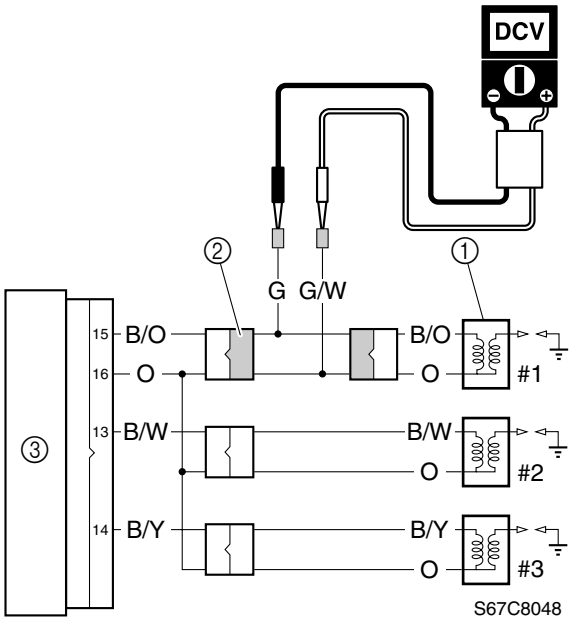
Checking the CDI unit

1. Disconnect the ignition coil ① coupler.

2. Connect the special service tool ② to the ignition coil coupler.

Test harness (2 pins) ②:
90890-06867

3. Measure the CDI unit ③ output peak voltage. Replace if below specification.



NOTE:
- To prevent the engine from starting when cranking it, be sure to disconnect all spark plug caps.
- Do not remove the clip from the engine shut-off switch.
- When using the manual starter to crank the engine to measure the output peak voltage, turn the engine start switch to "ON" (W model).
- When using the manual starter to crank the engine, the voltage values may vary depending on the speed at which the starter handle is pulled.
- Be sure to check the charge coil and pulser coil before measuring the CDI unit output peak voltage.

CDI unit output peak voltage (reference data):
#1: Orange (O) – Black/orange (B/O)
#2: Orange (O) – Black/white (B/W)
#3: Orange (O) – Black/yellow (B/Y)

r/min	Loaded		
	Cranking	1,500	3,500
DC V	120	170	170

4. Disconnect the special service tool ② and connect the ignition coil coupler.

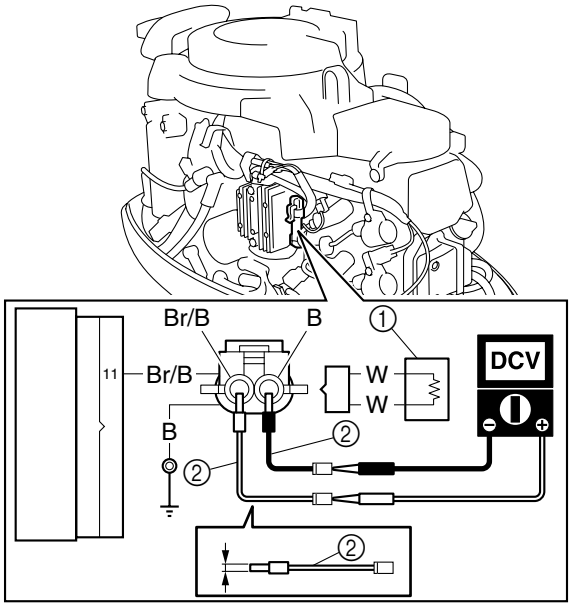
8

Checking the thermo sensor

1. Disconnect the thermo sensor ① coupler.

2. Connect jumper leads (thin terminals) ② (commercially available) to the thermo sensor coupler (wiring harness end) as shown.

3. Start the engine, and then measure the input voltage at the thermo sensor coupler (wiring harness end). Check the wiring harness if out of specification.



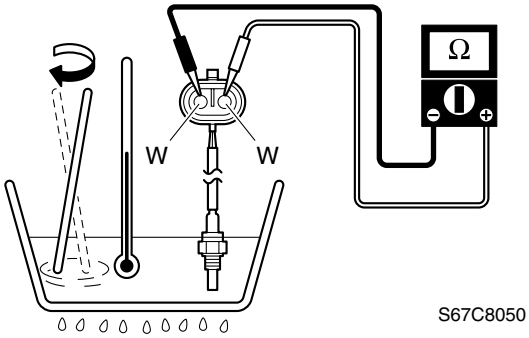
S67C8049

Thermo sensor input voltage (reference data):
Brown/black (Br/B) – Black (B)
4.93–4.99 V at engine idle speed

4. Push the engine stop button. (M model) Turn the engine start switch to "OFF." (E and W model)

5. Disconnect the jumper leads ② and remove the thermo sensor ①.

6. Place the thermo sensor in a container of water and slowly heat the water.



S67C8050

7. Measure the thermo sensor resistance at the specified water temperatures. Replace if out of specification.

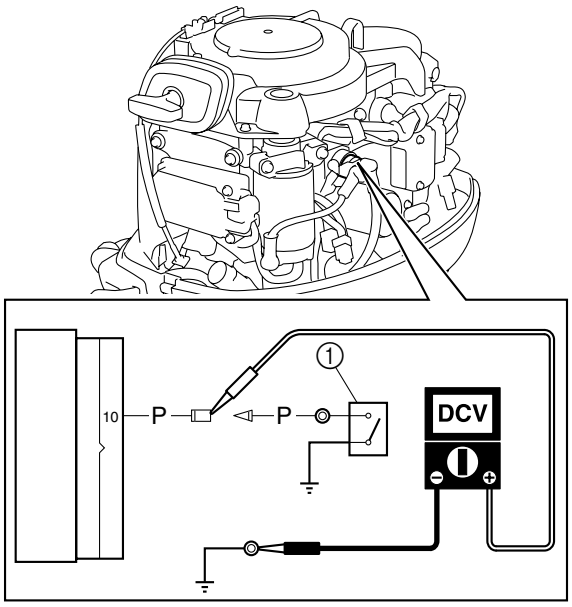
Thermo sensor resistance (reference data):
20 °C (68 °F): 12.49 kΩ
50 °C (122 °F): 3.60 kΩ
70 °C (158 °F): 1.75 kΩ

8. Install the thermo sensor, and then connect the thermo sensor coupler.

Checking the oil pressure switch

1. Disconnect the oil pressure switch ① connector.

2. Start the engine, and then measure the input voltage between the oil pressure switch connector (wiring harness end) and the ground. Check the wiring harness if below specification.

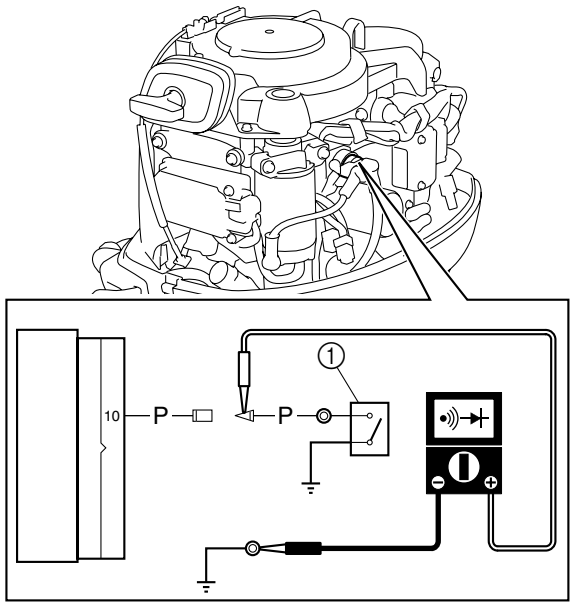


S67C8052

Oil pressure switch input voltage (reference data):
Pink (P) – Ground
10.44–11.35 V at engine idle speed

3. Push the engine stop button. (M model) Turn the engine start switch to “OFF.” (E and W model)

4. Check the oil pressure switch ① for continuity when the engine is stopped and when it is running. Check the oil pressure and oil pressure switch if out of specification.



S67C8053

Oil pressure switch continuity:
Oil pressure switch – Ground

Engine condition	Continuity
Stopped	Yes
Running	No

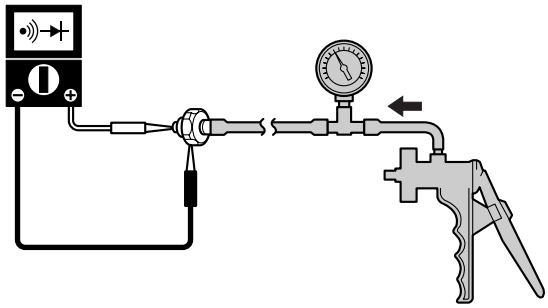
5. Remove the oil pressure switch.

6. Connect the special service tool to the oil pressure switch.

Vacuum/pressure pump gauge set:
90890-06756

8

7. Check the oil pressure switch for continuity at the specified pressures. Replace if out of specification.


S6AG8130

NOTE:
Slowly operate the special service tool.

Oil pressure switch continuity:
Oil pressure switch – Ground

Pressure	Continuity
More than 15.5 kPa (0.155 kgf/cm^2, 2.248 psi)	No
Less than 15.5 kPa (0.155 kgf/cm^2, 2.248 psi)	Yes

NOTE:
Apply pressure to the oil pressure switch gradually. The oil pressure switch is operating correctly if the digital tester indication changes from continuity to no continuity in the range of 15.5 ± 5.2 kPa (0.155 ± 0.052 kgf/cm^2, 2.248 ± 0.754 psi).

8. Install the oil pressure switch, and then connect the oil pressure switch connector.

Checking the warning indicator assembly

1. Disconnect the thermo sensor coupler, and then ground the brown/black (Br/B) terminal (wiring harness end).

2. Start the engine, and then check that the overheat warning indicator comes on after about 60 seconds.

3. Push the engine stop button. (M model) Turn the engine start switch to “OFF.” (E and W model)

4. Disconnect the oil pressure switch connector, and then ground the pink (P) lead (wiring harness end).

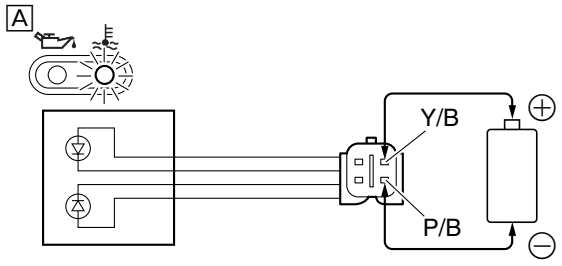
5. Start the engine, and then check that the oil pressure warning indicator comes on after about 10 seconds.

6. Push the engine stop button. (M model) Turn the engine start switch to “OFF.” (E and W model)

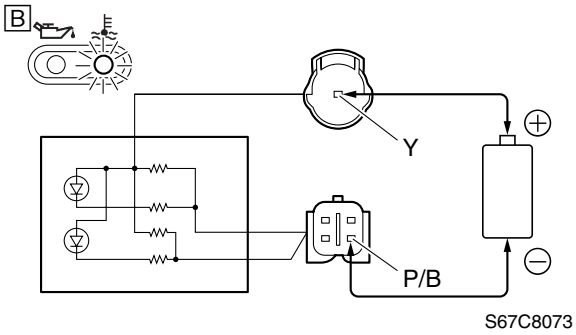
7. Connect the thermo sensor coupler and oil pressure switch connector.

8. Disconnect the warning indicator assembly coupler.

9. Connect the yellow/black (Y/B) lead (M model) or yellow (Y) lead (E and W model) to the positive penlight battery terminal (1.5 V) and connect the pink/black (P/B) lead to the negative terminal, and then check that the overheat warning indicator comes on. Replace the warning indicator assembly if it does not come on.

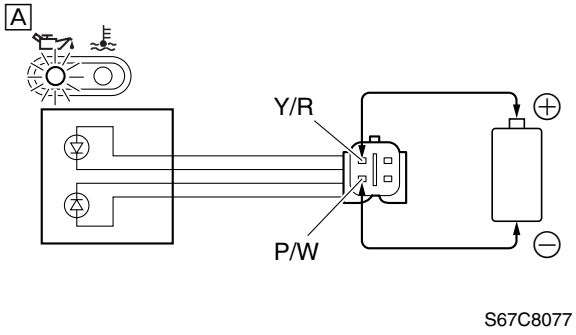


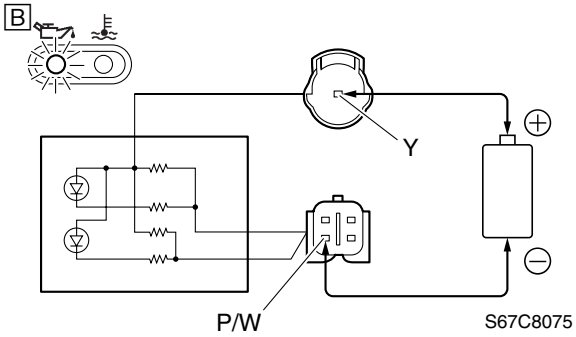
S67C8076



A M model
B E and W model

10. Connect the yellow/red (Y/R) lead (M model) or yellow (Y) lead (E and W model) to the positive penlight battery terminal (1.5 V) and connect the pink/white (P/W) lead to the negative terminal, and then check that the oil pressure warning indicator comes on. Replace the warning indicator assembly if it does not come on.





A M model
B E and W model

CAUTION:

- **Only use a penlight battery (1.5 V) when checking the LEDs. Other batteries (e.g., alkaline batteries or high-voltage batteries) will damage the diodes.**
- **Do not apply more than 1.7 V to the leads when checking the LEDs.**

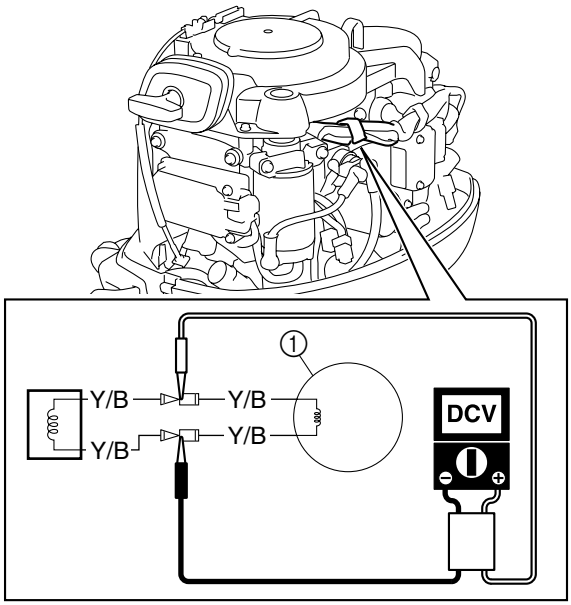
NOTE:

A feature of LEDs is that they only allow current to flow in one direction.

8

Checking the power bobbin (for Prime Start)

1. Measure the power bobbin ① output peak voltage. Replace the stator assembly if below specification.



S67C8056

NOTE:

- To prevent the engine from starting when cranking it, be sure to disconnect all spark plug caps.
- Do not remove the clip from the engine shut-off switch.
- When using the manual starter to crank the engine, the voltage values may vary depending on the speed at which the starter handle is pulled.

Power bobbin output peak voltage:
Yellow/black (Y/B) –
Yellow/black (Y/B)

r/min	Loaded		
	Cranking	1,500	3,500
DC V	7.0	28.0	77.7

2. Disconnect the power bobbin connectors.

3. Measure the power bobbin resistance. Replace the stator assembly if out of specification.

Power bobbin resistance
(reference data):
Yellow/black (Y/B) –
Yellow/black (Y/B)
6.5–7.2 Ω at 20 °C (68 °F)

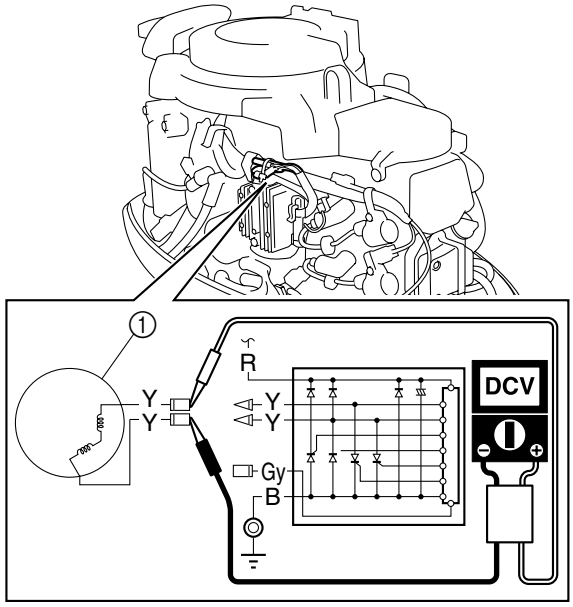
4. Connect the power bobbin connectors.

Charging system

Checking the lighting coil

1. Disconnect the lighting coil connectors.

2. Measure the lighting coil ① output peak voltage. Replace if below specification.



S67C8058

NOTE:

- To prevent the engine from starting when cranking it, be sure to disconnect all spark plug caps.
- Do not remove the clip from the engine shut-off switch.
- When using the manual starter to crank the engine, the voltage values may vary depending on the speed at which the starter handle is pulled.

Lighting coil output peak voltage (6 A model):
Yellow (Y) – Yellow (Y)

r/min	Unloaded		
	Cranking	1,500	3,500
DC V	14.1	39.7	95.2

Lighting coil output peak voltage (15 A model):
Yellow (Y) – Yellow (Y)

r/min	Unloaded		
	Cranking	1,500	3,500
DC V	8.4	28.5	66.6

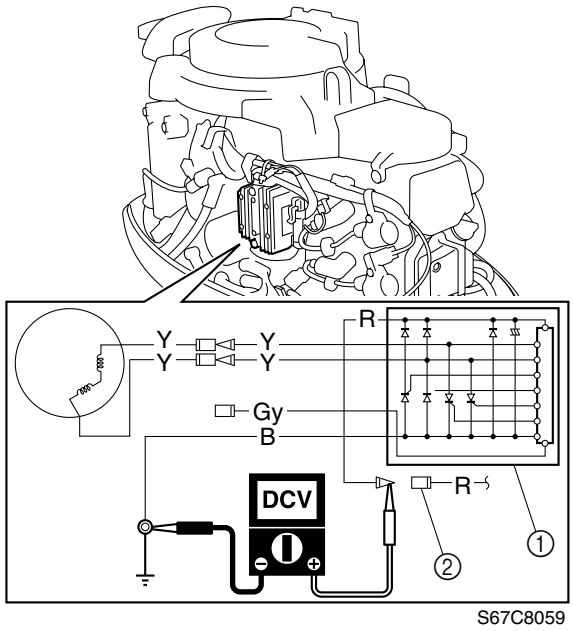
3. Measure the lighting coil resistance. Replace if out of specification.

Lighting coil resistance (6 A model) (reference data):
Yellow (Y) – Yellow (Y)
0.9–1.1 Ω at 20 °C (68 °F)
Lighting coil resistance (15 A model) (reference data):
Yellow (Y) – Yellow (Y)
0.26–0.28 Ω at 20 °C (68 °F)

4. Connect the lighting coil connectors.

Checking the Rectifier Regulator (E and W model)

1. Measure the Rectifier Regulator ① output peak voltage. Check the Rectifier Regulator for continuity if the output peak voltage is below specification.



S67C8059

NOTE:
- Measure the Rectifier Regulator output peak voltage with the connector (R) ② disconnected.
- Do not use peak voltage adapter B when measuring the Rectifier Regulator output peak voltage.
- Be sure to check the lighting coil before measuring the Rectifier Regulator output peak voltage.

Rectifier Regulator output peak voltage:
Red (R) – Ground

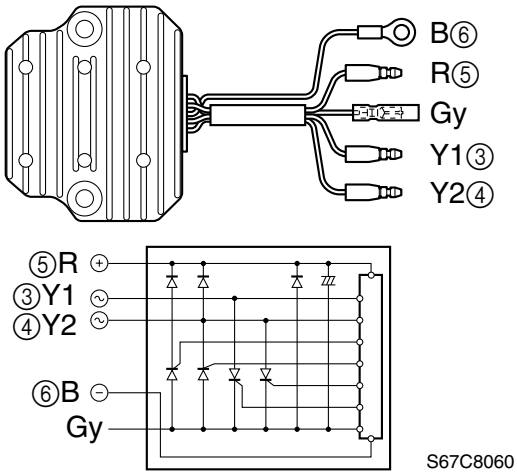
r/min	Unloaded	
	1,500	3,500
DC V	13	13

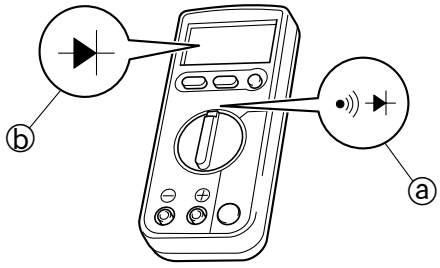
2. Disconnect the Rectifier Regulator connectors and terminal.

8

3. Check the Rectifier Regulator for continuity. Replace if out of specification.

NOTE:
The voltage values given in the table are for reference only. If voltage is produced, there is continuity, and, if there is an overload, there is no continuity. Refer to the table to determine if there should or should not be continuity and replace the Rectifier Regulator if out of specification.





NOTE:
Be sure to set the measurement range ⓐ, and display the mark ⓑ by pushing the "SHIFT" switch when checking the Rectifier Regulator continuity.

Rectifier Regulator continuity (testing diode)

Tester lead ⊕	Tester lead ⊖	Display value (V) (reference data)	Continuity
Y1 ③	R ⑤	0.447	Yes
Y1 ③	B ⑥	1.503	Yes
Y1 ③	Y2 ④	OL	No
Y2 ④	R ⑤	0.439	Yes
Y2 ④	B ⑥	1.502	Yes
Y2 ④	Y1 ③	OL	No
B ⑥	R ⑤	0.416	Yes
B ⑥	Y1 ③	OL	No
B ⑥	Y2 ④	OL	No
R ⑤	B ⑥	OL	No
R ⑤	Y1 ③	OL	No
R ⑤	Y2 ④	OL	No

OL: Indicates an overload

TRBL SHTG ?

Troubleshooting

9

Troubleshooting the outboard motor

NOTE:

Before troubleshooting the outboard motor:

- Make sure that fresh fuel of the specified type has been used.
- Make sure that the battery is fully charged.
- Be sure to check that the couplers, connectors, and battery terminals are securely connected.
- When checking the input voltage of a part, the coupler or connector must be disconnected. However, be careful not to short-circuit the wiring harness.
- Perform the troubleshooting as described in the following tables.

Troubleshooting table format

Troubleshooting consists of the following 4 items.
Symptom 1: Specific trouble conditions
Symptom 2: Trouble conditions of an area or individual part
Cause 1: Content considered as the trouble causes of symptom 2
Cause 2: Content considered as the trouble causes of cause 1

Troubleshooting the power unit

Symptom 1: Engine does not crank (M and W model)

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Starter rope does not operate	Shift lever not in the N position	—	Set the shift lever to the N position.	3-9
	Start-in-gear protection cable not adjusted correctly	—	Adjust the start-in-gear protection cable.	3-10
	Manual starter malfunction	—	Disassemble and check the manual starter.	5-9
	Stuck piston	Seizure or rust	Disassemble and check the power unit.	5-1
	Piston lock due to water in the combustion chamber	—		
	Stuck drive shaft	Buildup of foreign material on the drive shaft splines and bushing	Disassemble and check the lower unit.	6-13
		Malfunction of the lower unit internal parts		

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Starter rope operates, but the engine does not crank	Manual starter malfunction	—	Disassemble and check the manual starter.	5-9
	Damaged flywheel magnet Woodruff key	—	Check the flywheel magnet Woodruff key.	5-22

Symptom 1: Engine does not crank (E and W model)

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Starter motor does not operate	Shift lever or remote control lever not in the N position	—	Set the shift lever or remote control lever to the N position.	3-9
	Blown fuse	—	Check the fuse.	8-13
	Engine start switch malfunction	—	Check the engine start switch.	8-13
	Neutral switch malfunction	—	Check the neutral switch.	8-14
	Starter relay malfunction	—	Check the starter relay.	8-15
	Short or open connection in starter motor circuit	—	Check the wiring harness continuity.	WD
	Starter motor malfunction	—	Disassemble and check the starter motor.	8-9

WD: See the wiring diagram.

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Starter motor operates, but the engine does not crank	Stuck piston	Seizure or rust	Disassemble and check the power unit.	5-1
	Piston lock due to water in the combustion chamber	—		
	Stuck drive shaft	Buildup of foreign material on the drive shaft splines and bushing	Disassemble and check the lower unit.	6-13
		Malfunction of the lower unit internal parts		
	Starter motor malfunction	—	Disassemble and check the starter motor.	8-9
	Damaged flywheel magnet Woodruff key	—	Check the flywheel magnet Woodruff key.	5-22

Symptom 1: Engine does not start (engine cranks)

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Spark plug does not spark	Spark plug malfunction	—	Check the spark plug.	3-6
	Spark plug cap malfunction	—	Check the spark plug cap.	8-16
	Ignition coil malfunction	—	Check the ignition coil.	8-16
	Engine shut-off switch malfunction	—	Check the engine shut-off switch.	8-18 8-19
	Charge coil malfunction	—	Check the charge coil.	8-17
	Pulser coil malfunction	—	Check the pulser coil.	8-17
	Short or open connection in ignition circuit	—	Check the wiring harness continuity.	WD
	CDI unit malfunction	—	Check the CDI unit.	8-19

WD: See the wiring diagram.

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Fuel not supplied	Pinched or kinked fuel hose	—	Check the fuel hoses and fuel hose joint.	3-3
	Clogged fuel filter	—	Replace the fuel filter.	3-3
	Fuel pump malfunction	—	Disassemble and check the fuel pump.	4-4
	Carburetor malfunction	Malfunction of the carburetor internal parts	Disassemble and check the carburetor.	4-12
Low compression pressure	Valve clearance not adjusted correctly	—	Adjust the valve clearance.	5-2
	Damaged cylinder head gasket	—	Disassemble and check the cylinder head and power unit.	5-29 5-42
	Damaged valve			
	Valve stuck to valve guide			
	Scratched piston or cylinder			
	Damaged or worn piston ring			

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Symptom 1: Unstable engine idle speed, poor acceleration, poor performance, limited engine speed, or engine stalls

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Intermittent spark	Spark plug malfunction	—	Check the spark plug.	3-6
	Spark plug cap malfunction	—	Check the spark plug cap.	8-16
	Ignition coil malfunction	—	Check the ignition coil.	8-16
	Engine shut-off switch malfunction	—	Check the engine shut-off switch.	8-18 8-19
	Charge coil malfunction	—	Check the charge coil.	8-17
	Pulser coil malfunction	—	Check the pulser coil.	8-17
	Short or open connection in ignition circuit	—	Check the wiring harness continuity.	WD
	CDI unit malfunction	—	Check the CDI unit.	8-19
Incorrect fuel and air amount supplied	Pinched or kinked fuel hose	—	Check the fuel hoses and fuel hose joint.	3-3
	Clogged fuel filter	—	Replace the fuel filter.	3-3
	Fuel pump malfunction	—	Disassemble and check the fuel pump.	4-4
	Carburetor malfunction	Carburetors not synchronized	Synchronize the carburetors.	4-17
		Throttle stop screw not adjusted correctly	Adjust the throttle stop screw.	3-11
		Pilot screw not adjusted correctly	Adjust the pilot screw.	4-15
		Malfunction of the carburetor internal parts	Disassemble and check the carburetor.	4-12
		Prime Start system malfunction	Check the Prime Start system	4-13

WD: See the wiring diagram.

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Low compression pressure	Valve clearance not adjusted correctly	—	Adjust the valve clearance.	5-2
	Damaged cylinder head gasket	—	Disassemble and check the cylinder head and power unit.	5-29 5-42
	Damaged valve			
	Scratched piston or cylinder			
	Damaged or worn piston ring			
Throttle valve does not fully open	Throttle control system malfunction	Throttle cable not adjusted correctly	Check and adjust the throttle cable.	3-8
		Throttle link rod not adjusted correctly	Check and adjust the throttle link rod.	3-8
—	Air leakage into intake manifold (carburetor to cylinder head)	Damaged gaskets, spacer, and intake manifold (carburetor to cylinder head)	Check the gaskets, spacer, and intake manifold (carburetor to cylinder head).	4-12

Symptom 1: High engine idle speed

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
Engine speed does not decrease when throttle control lever is in fully closed position	Carburetor malfunction	Carburetors not synchronized	Synchronize the carburetors.	4-17
		Throttle stop screw not adjusted correctly	Adjust the throttle stop screw.	3-11
		Pilot screw not adjusted correctly	Adjust the pilot screw.	4-15
		Malfunction of the carburetor internal parts	Disassemble and check the carburetor.	4-12
Throttle control lever does not return to fully closed position	Throttle control system malfunction	Throttle cable not adjusted correctly	Check and adjust the throttle cable.	3-8
		Throttle link rod not adjusted correctly	Check and adjust the throttle link rod.	3-8
		Throttle cam not installed correctly	Check the throttle cam.	5-18

Symptom 1: Limited engine speed

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
• Buzzer comes on (E and W model) • Overheat warning indicator comes on • Cooling water does not discharge from the cooling water pilot hole	Clogged cooling water inlet	—	Check the cooling water inlets.	3-7
	Clogged cooling water passages	—	Check the cooling water passages.	3-7
	Cooling water leakage			
	Damaged water pipe or incorrect installation	—	Check the water pipe and its installation.	7-19
	Water pump malfunction	Damaged water pump impeller	Check the impeller.	6-5
			Check the Woodruff key.	6-5
		Water leakage from water pump housing	Check the water pump housing.	6-5
			Check the insert cartridge.	6-5
			Check the outer plate cartridge.	6-5
	Thermostat malfunction	—	Check the thermostat.	3-7
	Thermo sensor malfunction	—	Check the thermo sensor.	8-21
• Buzzer comes on (E and W model) • Oil pressure-warning indicator comes on	Insufficient engine oil	—	Add sufficient oil.	3-4
	Engine oil pressure decrease	—	Check the oil pressure.	5-1
		Oil pump malfunction	Check the oil pump.	5-29
		Clogged oil strainer	Check the oil strainer.	7-20
		Clogged engine oil passages	Check the engine oil passages (power unit and oil pump).	5-29
		Clogged oil filter	Replace the oil filter.	3-5
	Oil pressure switch malfunction	—	Check the oil pressure switch.	8-21

Troubleshooting the PTT unit (PTT model)

Symptom 1: PTT unit does not operate

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
PTT motor does not operate	Blown fuse	—	Check the fuse.	8-13
	PTT switch malfunction	—	Check the PTT switch.	7-54
	PTT relay malfunction	—	Check the PTT relay.	7-53
	Short or open connection in PTT motor circuit	—	Check the wiring harness continuity.	WD
	PTT motor malfunction	—	Disassemble and check the PTT motor.	7-35
PTT motor operates, but the tilt ram does not extend	Manual valve left open	Manual valve malfunction	Check the manual valve.	7-43
	Insufficient PTT fluid	—	Add sufficient fluid.	3-13
	PTT fluid leakage	—	Check the PTT unit for leakage.	7-47
	Clogged filter	—	Disassemble and check the PTT unit.	7-42
	Clogged fluid passages			
	Malfunction of the PTT unit internal parts			

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 left open	Manual valve malfunction	Check the manual valve.	7-43
	Insufficient PTT fluid	—	Add sufficient fluid.	3-13
	PTT fluid leakage	—	Check the PTT unit for leakage.	7-47
	Air in PTT fluid	—	Bleed the PTT unit.	7-50 7-51
	Clogged fluid passages	—	Disassemble and check the PTT unit.	7-42
	Malfunction of the PTT unit internal parts			

Troubleshooting the lower unit

Symptom 1: Shift mechanism of the forward gear and reverse gear does not operate properly

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
—	Throttle open	—	Turn the throttle grip or move the throttle lever to the fully closed position.	3-9
	Shift cable and shift cable joint malfunction	—	Check and adjust the shift cable and shift cable joint.	3-9
	Remote control box malfunction (R model)	—	Check the remote control box. (R model)	3-9
	Shift arm malfunction	—	Check the shift link rod.	3-9
		Detent malfunction	Check the shift arm.	5-18
	Shift rod operation malfunction	Shift rod not connected correctly	Check the connection of the shift rod.	6-19
		Shift rod not adjusted correctly	Adjust the shift rod.	6-19
	Shift mechanism malfunction (in lower unit)	—	Disassemble and check the lower unit.	6-7

Symptom 1: Cooling water does not discharge from the cooling water pilot hole

Symptom 2	Cause 1	Cause 2	Checking step	Refer to page
—	Clogged cooling water inlet	—	Check the cooling water inlets.	3-7
	Clogged cooling water passages	—	Check the cooling water passages.	3-7
	Incorrectly connected cooling water hose			
	Damaged water pipe or incorrect installation	—	Check the water pipe and its installation.	7-19
	Water pump malfunction	Damaged water pump impeller	Check the impeller.	6-5
			Check the Woodruff key.	6-5
		Water leakage from water pump housing	Check the water pump housing.	6-5
			Check the insert cartridge.	6-5
			Check the outer plate cartridge.	6-5

A.

B.

C.

D.

E.

F.

G.

H.

I.

L.

M.

P.

R.

S.

T.

U.

V.

Wiring diagram
F30AMHD, F40BMHD

① CDI unit
② Stator assembly
③ Pulser coil
④ Thermo sensor
⑤ Ignition coil
⑥ Spark plug
⑦ Oil pressure switch
⑧ Warning indicator assembly
⑨ Engine shut-off switch
⑩ Prime Start

Color code

B : Black
O : Orange
P : Pink
R : Red
W : White
Y : Yellow
B/O : Black/orange
B/W : Black/white
B/Y : Black/yellow
Br/B : Brown/black
G/W : Green/white
P/B : Pink/black
P/W : Pink/white
R/W : Red/white
W/G : White/green
Y/B : Yellow/black
Y/R : Yellow/red

Wiring diagram
F30AEHT, F30AET, F40BWHD, F40BWHT, F40BED, F40BET

① CDI unit
② Stator assembly
③ Pulser coil
④ Thermo sensor
⑤ Ignition coil
⑥ Spark plug
⑦ PTT switch (bottom cowling) (R model with PTT)
⑧ Rectifier Regulator
⑨ Oil pressure switch
⑩ Fuse (20 A)
⑪ Starter relay
⑫ Starter motor
⑬ PTT motor (PTT model)
⑭ PTT relay (PTT model)
⑮ Trim sensor (R model with PTT)
⑯ Warning indicator assembly (H model with electric starter)
⑰ Battery
⑱ Prime Start
⑲ Engine start switch (H model)
⑳ Engine shut-off switch (H model)
㉑ Neutral switch (H model)
㉒ Buzzer (H model)
㉓ PTT switch (H model with PTT)

Ⓐ 10-pin main harness
Ⓑ 7-pin main harness
Ⓒ R model with PTT
Ⓓ PTT model
Ⓔ H model with electric starter
Ⓕ H model with PTT

Color code

B	: Black
Br	: Brown
G	: Green
Gy	: Gray
L	: Blue
Lg	: Light green
O	: Orange
P	: Pink
R	: Red
Sb	: Sky blue
W	: White
Y	: Yellow
B/O	: Black/orange
B/W	: Black/white
B/Y	: Black/yellow
Br/B	: Brown/black
G/R	: Green/red
G/W	: Green/white
P/B	: Pink/black
P/W	: Pink/white
R/W	: Red/white
W/G	: White/green
Y/B	: Yellow/black
Y/R	: Yellow/red

YAMAHA MOTOR CO., LTD.

Printed in China
Aug. 2007 – 1.2 × 1 CR
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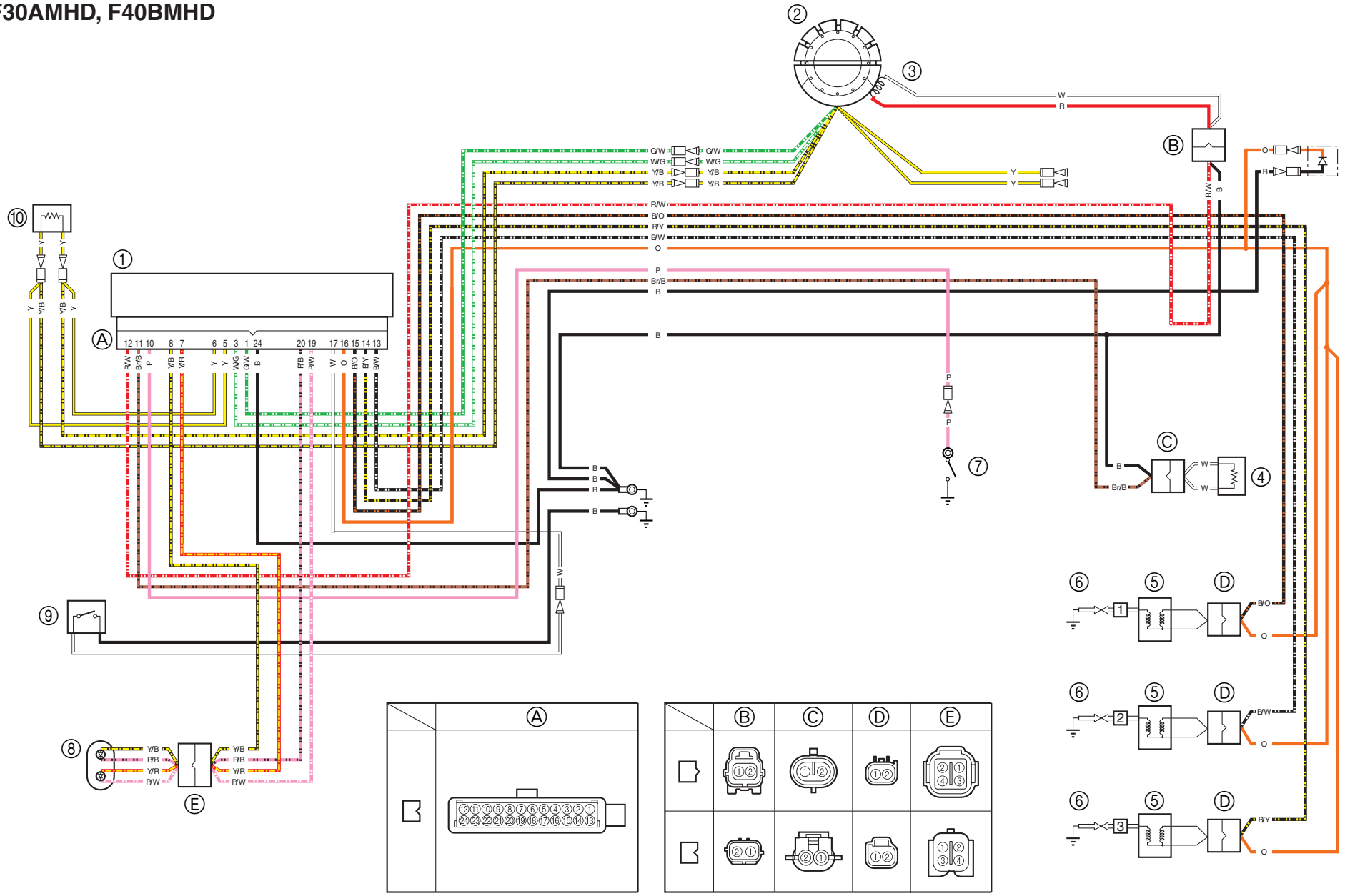
F30AMHD, F40BMHD



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