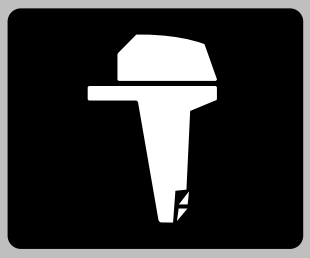
YAMAHA



F100B
F100C

SERVICE MANUAL

290429

60C-28197-5D-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.

F100B, F100C
SERVICE MANUAL

Printed in the Netherlands

Contents

General information

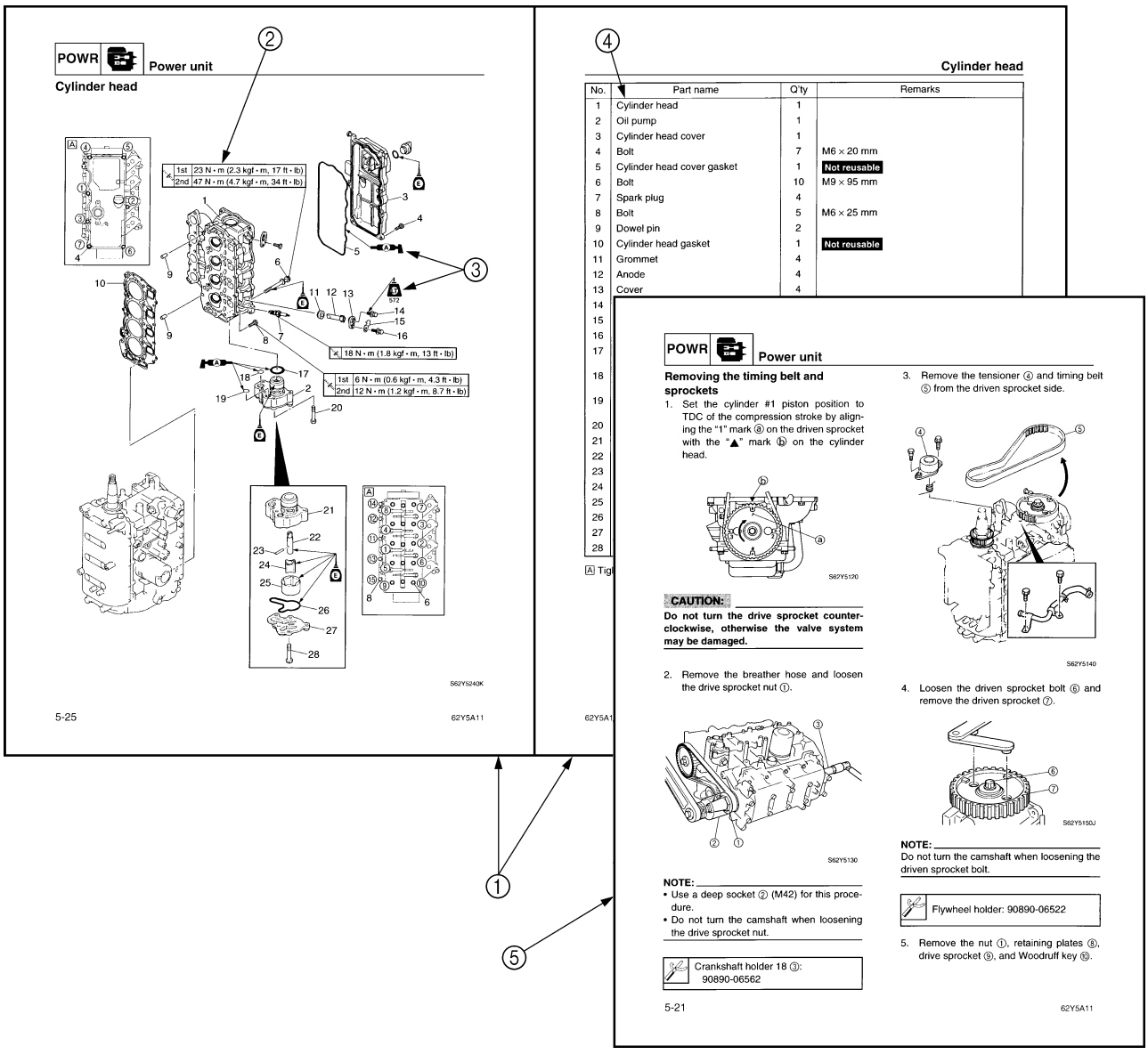
How to use this manual

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.

① Parts are shown and detailed in an exploded diagram and are listed in the components list.
② Tightening torque specifications are provided in the exploded diagrams and after a numbered step with tightening instructions.
③ Symbols are used to indicate important aspects of a procedure, such as the grade of lubricant and lubrication point.
④ The components list consist of parts and part quantities, as well as bolt, screw, O-ring, and hose dimensions.
⑤ Service points regarding removal, checking, and installation are shown in individual illustrations to explain the relevant procedure.

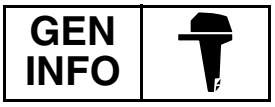
NOTE:
For troubleshooting procedures, see Chapter 9, “Troubleshooting.”



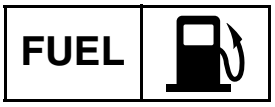
Symbols

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

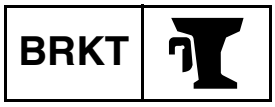
General information



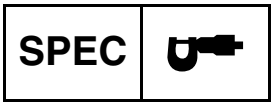
Fuel system



Bracket unit

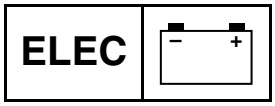


Specifications



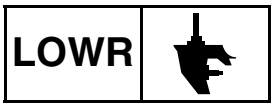
Power unit

Electrical systems

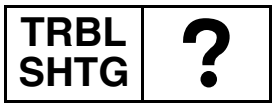


Periodic checks and adjustments

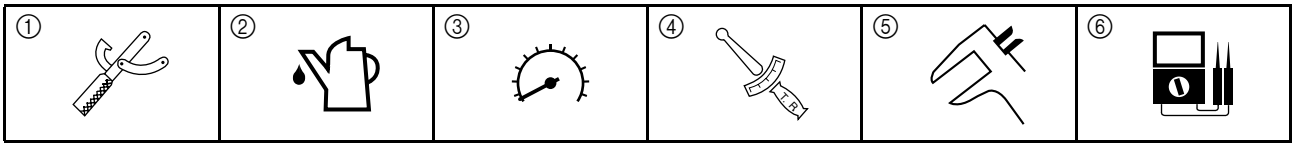
Lower unit



Troubleshooting

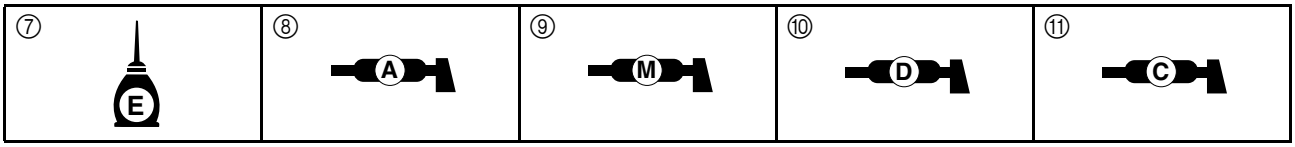


Symbols ① to ⑥ indicate specific data.



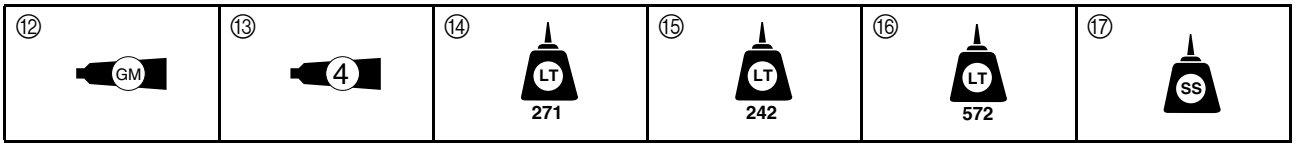
① Special tool
② Specified oil or fluid
③ Specified engine speed
④ Specified tightening torque
⑤ Specified measurement
⑥ Specified electrical value (Resistance, Voltage, Electric current)

Symbols ⑦ to ⑪ in an exploded diagram indicate the grade of lubricant and the lubrication point.



⑦ Apply Yamaha 4-stroke motor oil
⑧ Apply water resistant grease (Yamaha grease A)
⑨ Apply molybdenum disulfide grease
⑩ Apply corrosion resistant grease (Yamaha grease D)
⑪ Apply low temperature resistant grease (Yamaha grease C)

Symbols ⑫ to ⑰ in an exploded diagram indicate the type of sealant or locking agent and the application point.



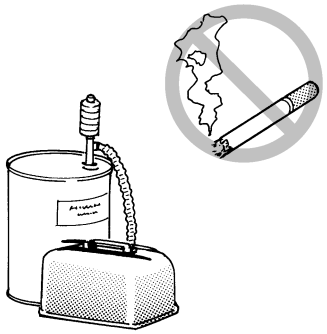
⑫ Apply Gasket Maker®
⑬ Apply Yamabond No. 4
⑭ Apply LOCTITE® No. 271 (Red)
⑮ Apply LOCTITE® No. 242 (Blue)
⑯ Apply LOCTITE® No. 572
⑰ Apply silicon sealant

Safety while working

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

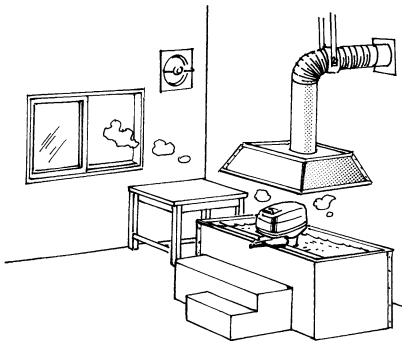
Fire prevention

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


S60C1010

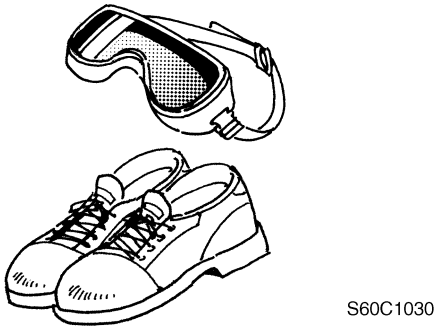
Ventilation

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.


S60C1020

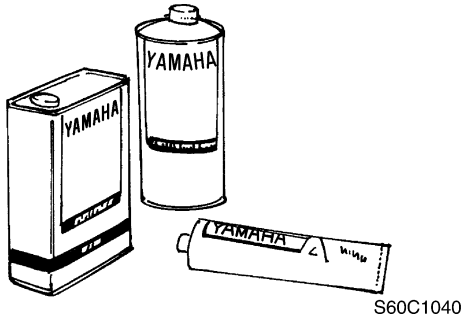
Self-protection

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.


S60C1030

Parts, lubricants, and sealants

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



S60C1040

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

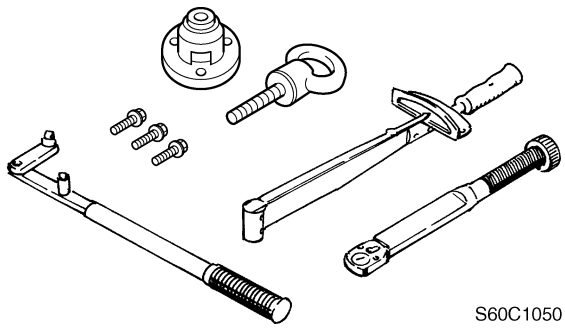
1. Maintain good standards of personal and industrial hygiene.
2. Change and wash clothing as soon as possible if soiled with lubricants.
3. Avoid contact with skin. Do not, for example, place a soiled rag in your pocket.
4. Wash hands and any other part of the body thoroughly with soap and hot water after contact with a lubricant or lubricant soiled clothing has been made.
5. To protect your skin, apply a protective cream to your hands before working on the outboard motor.

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

Good working practices

Special tools

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



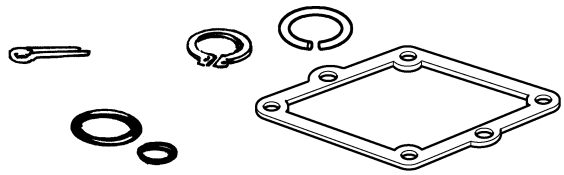
S60C1050

Tightening torques

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 parts

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

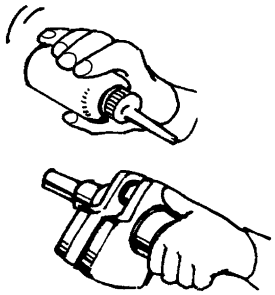


S60C1060

Disassembly and assembly

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

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



S60C1070

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

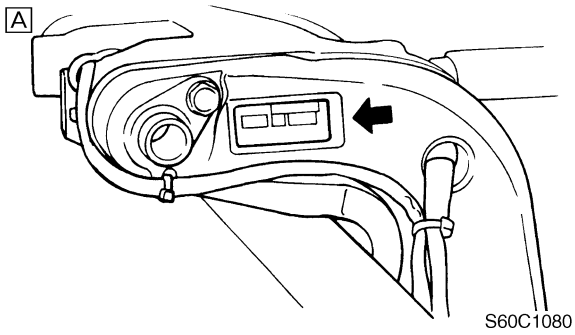
Applicable models

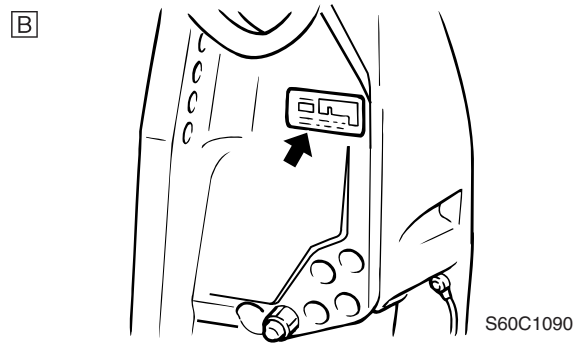
This manual covers the following models.

Applicable models
F100BET, F100CET

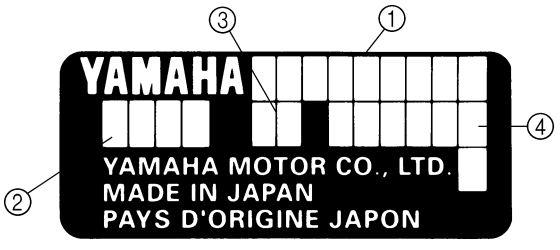
Serial number

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





A F100B
B F100C



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

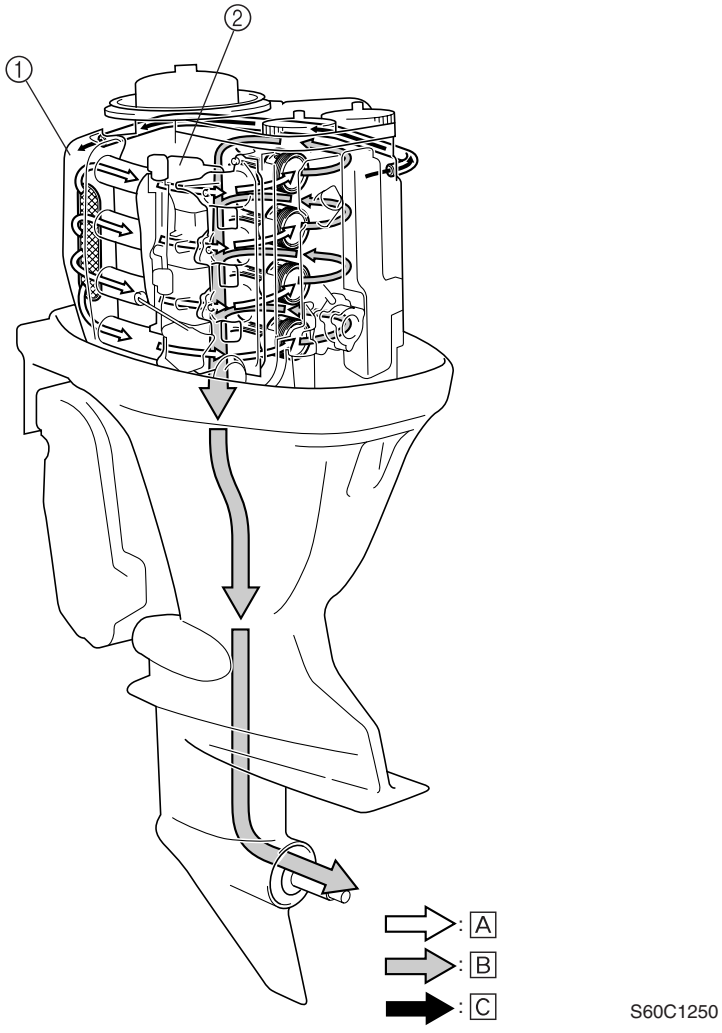
NOTE:
If the serial number label is removed, VOID marks will appear on the label.

Model name	Approved model code	Starting serial No.
F100BET	60C	L: 000101–
		X: 200101–
F100CET	60D	L: 000101–
		X: 200101–

Features and benefits

Power unit

The F100B and F100C have been developed on the bases of the F100A, which has been recognized as being environmentally friendly, with established emission control, and which has received high marks as an efficiently superior model with a high fuel economy.
Blowby gas, which is discharged from the engine, is returned to the intake silencer and reburned to purify the exhaust gas.
The intake passage and exhaust passage have been arranged around the engine to make the entire engine compact. When compared to a small, 2-stroke, V4 engine it is compact like an in-line, three cylinder engine.



S60C1250

① Silencer
② Carburetor

A Intake
B Exhaust gas
C Blowby gas

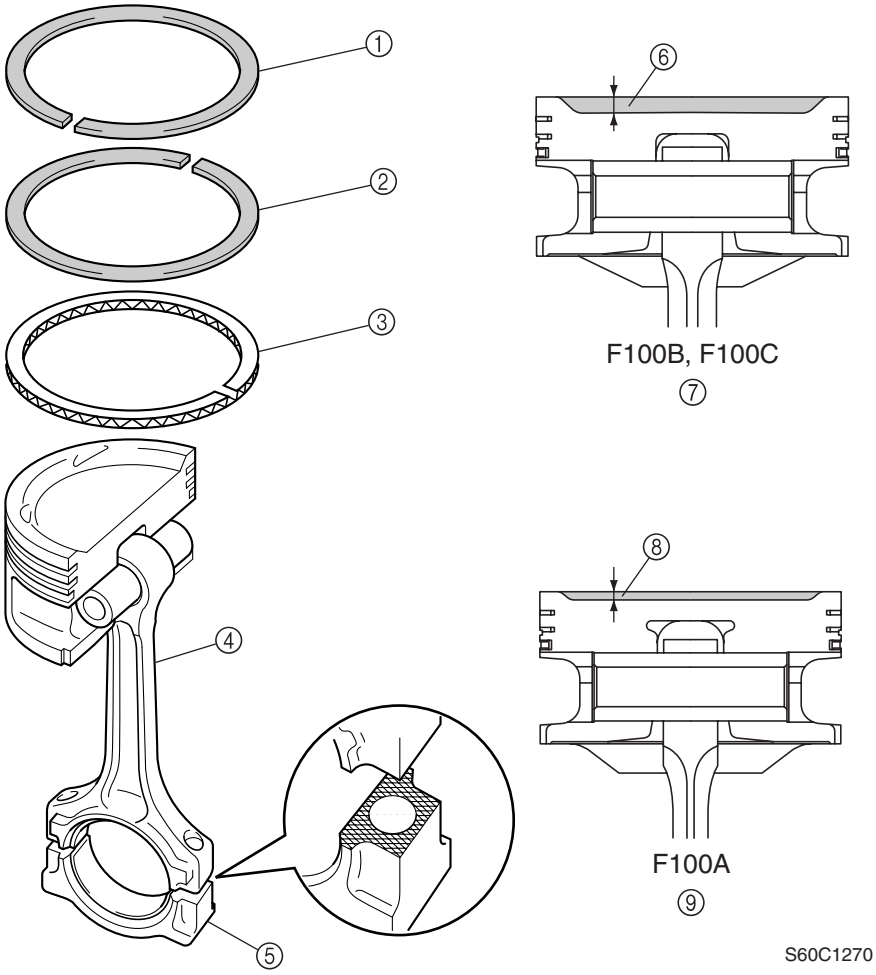
Piston and connecting rod

The piston pin has been installed by shrink fitting it to the small end of the connecting rod, as a result, a circlip is not used to install the piston pin.

The top ring has been nitrided and the second ring has been chrome plated for use with leaded gasoline.

The connecting rod and end cap are processed as a single unit. After being heat treated, the single unit is struck and the connecting rod and end cap are split apart as shown in the illustration. To increase accuracy during installation, the connecting rod and end cap that were processed together are always installed as a set.

The hollow volume at the top of the pistons has been made larger and the compression ration has been lowered to increase reliability and durability.

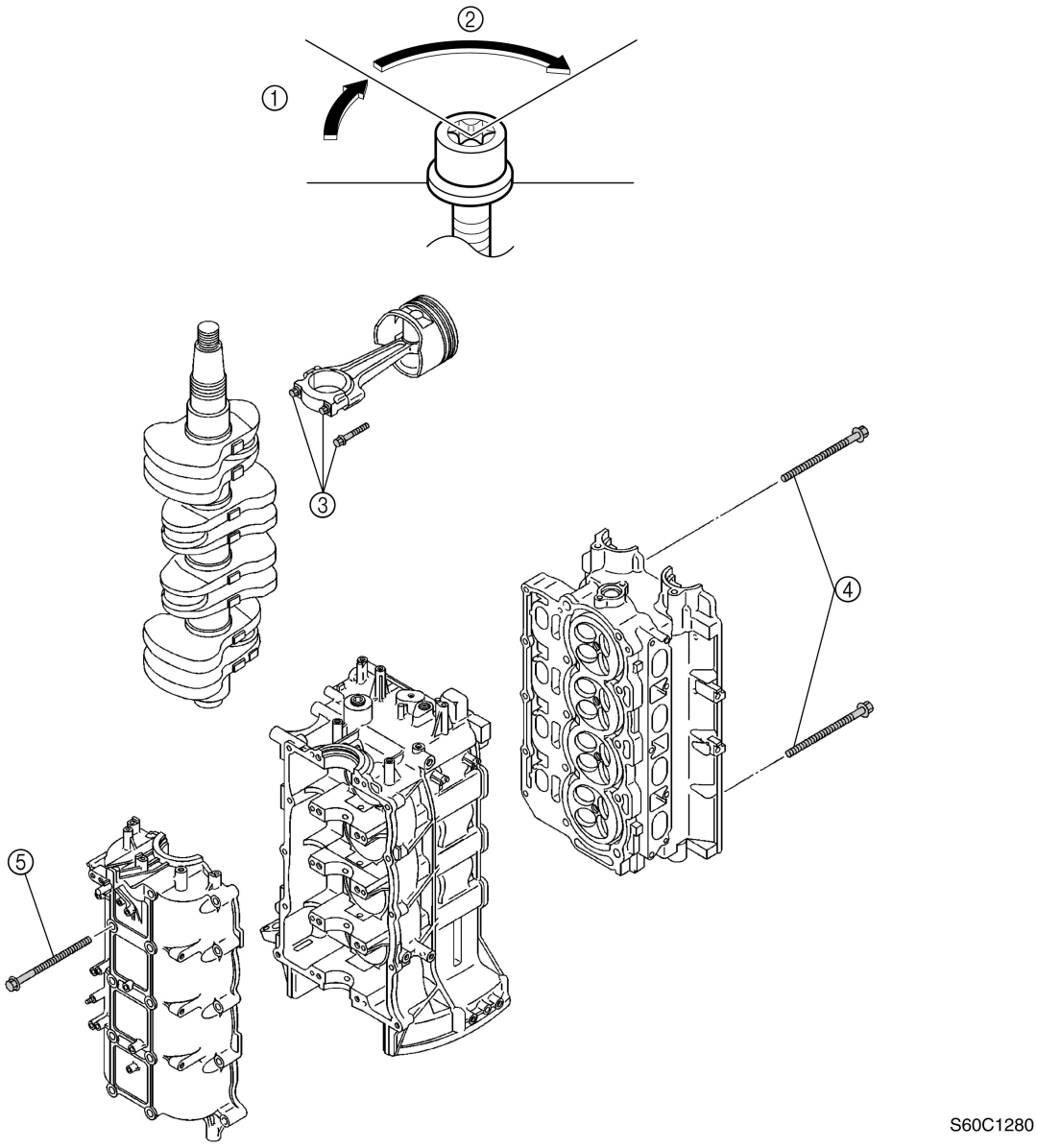


① Top ring
② Second ring
③ Oil ring
④ Connecting rod
⑤ Connecting rod end cap
⑥ Large hollow volume
⑦ Compression ratio (8.9)
⑧ Small hollow volume
⑨ Compression ratio (9.6)

New plastic-region tightening bolts

To tighten the plastic-region tightening bolts, tighten them to the specified torque, and then tighten them to the specified angle. By tightening the bolts to the specified angle, they are contracted to a more accurate torque, making periodic maintenance checks and adjustments to, as well as additional tightening of the bolt unnecessary.

The cylinder head bolts, connecting rod bolts, and crankcase bolts have adopted this method to help better control torque accuracy.



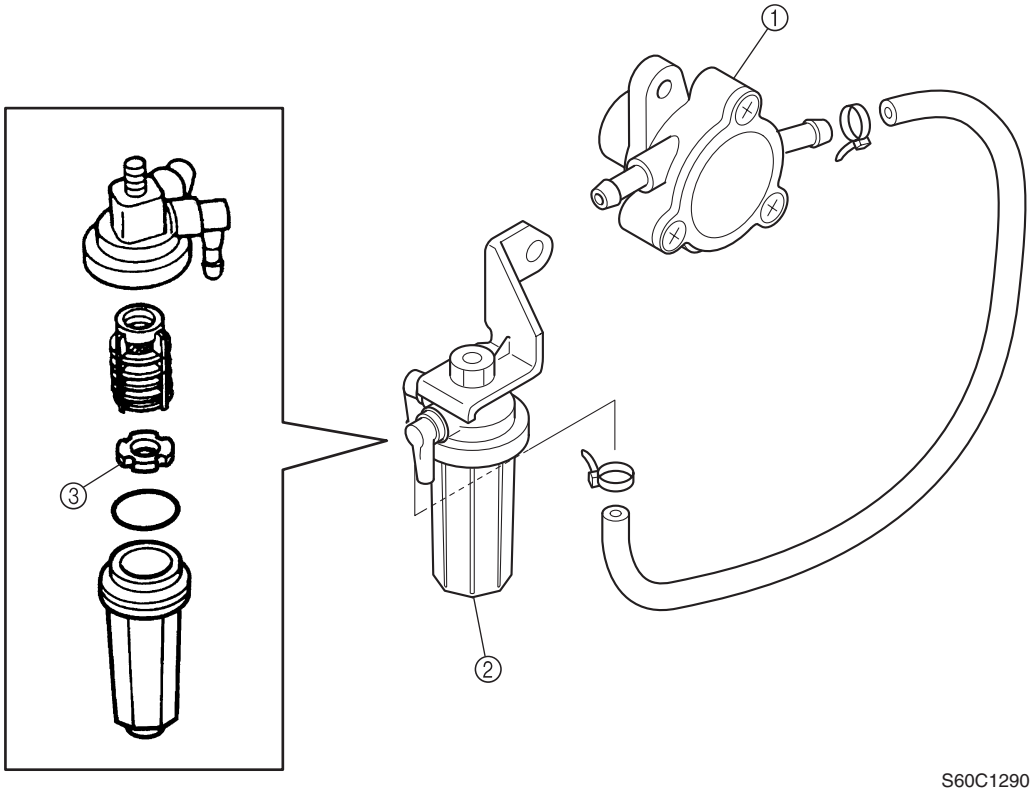
S60C1280

① Specified torque
② Specified angle
③ Connecting rod bolt
④ Cylinder head bolt
⑤ Crankcase journal bolt

Fuel pump and fuel filter

The fuel pump found in the F115A has been adopted. Although the quantity of parts has been reduced and the necessary servicing time has been decreased as well, the ability of the fuel pump to supply sufficient fuel has been retained.

A water separation fuel filter has been adopted. When water is mixed with fuel, it is separated and precipitated at the bottom of the filter to prevent it from flowing to the carburetors. As water gathers in the fuel cup, the red float inside the cup begins to rise, indicating that the accumulation of water is taking place. After water has gathered in the fuel cup, the fuel filter can be disassembled to dispose of the water.



S60C1290

① Fuel pump
② Fuel filter
③ Red float

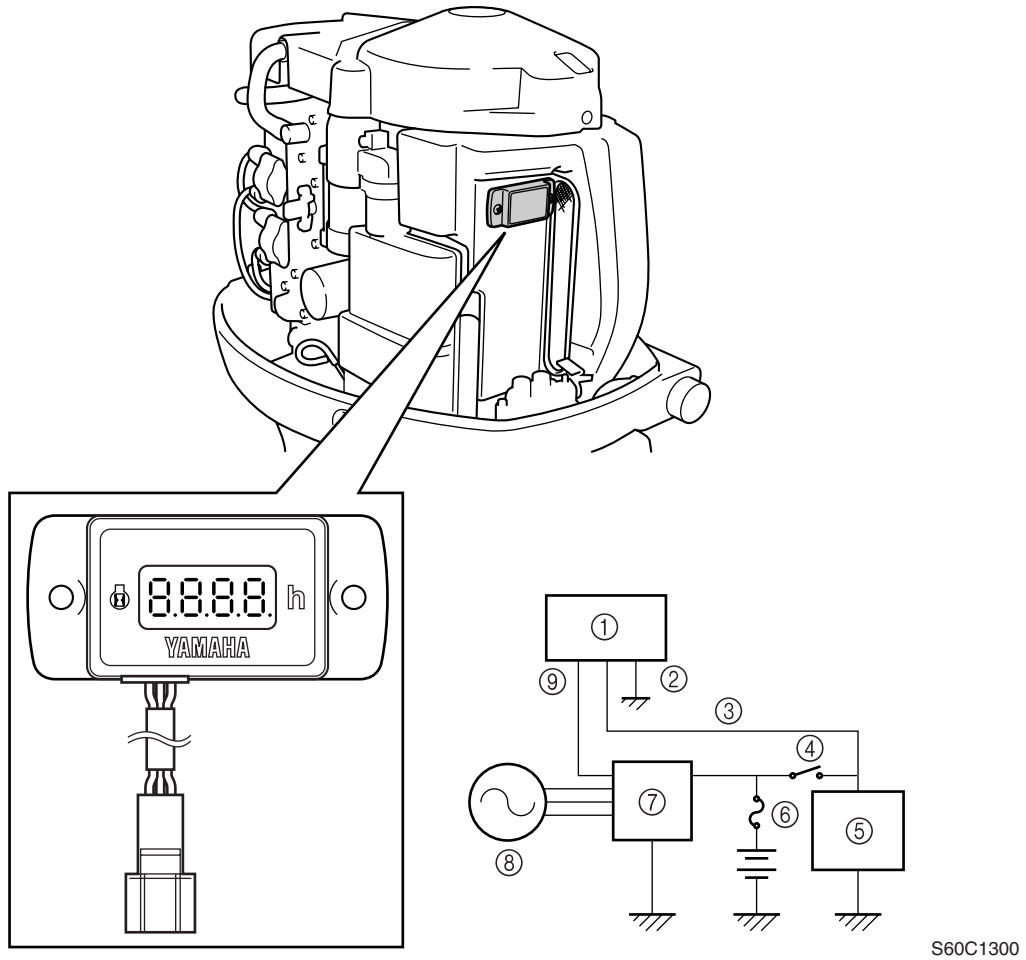
Hour meter

A newly developed hour meter is incorporated on the F100B and F100C. The hour meter makes it possible to check the hours of operation of the outboard motor, which can be used to keep track of periodic checks and adjustments.

When the engine switch is turned to ON, all LED on the display will illuminate for two seconds, and then the hours of operation will be displayed.

A signal from the Rectifier Regulator, via the green and white (G/W) lead, is sent to the hour meter as the hours of operation accumulation.

The hours of operation cannot be deleted.



S60C1300

① Hour meter
② Grand (B)
③ Battery (Y)
④ Engine start switch
⑤ Starter motor
⑥ Fuse
⑦ Rectifier Regulator
⑧ Flywheel magnet
⑨ Signal (G/W)

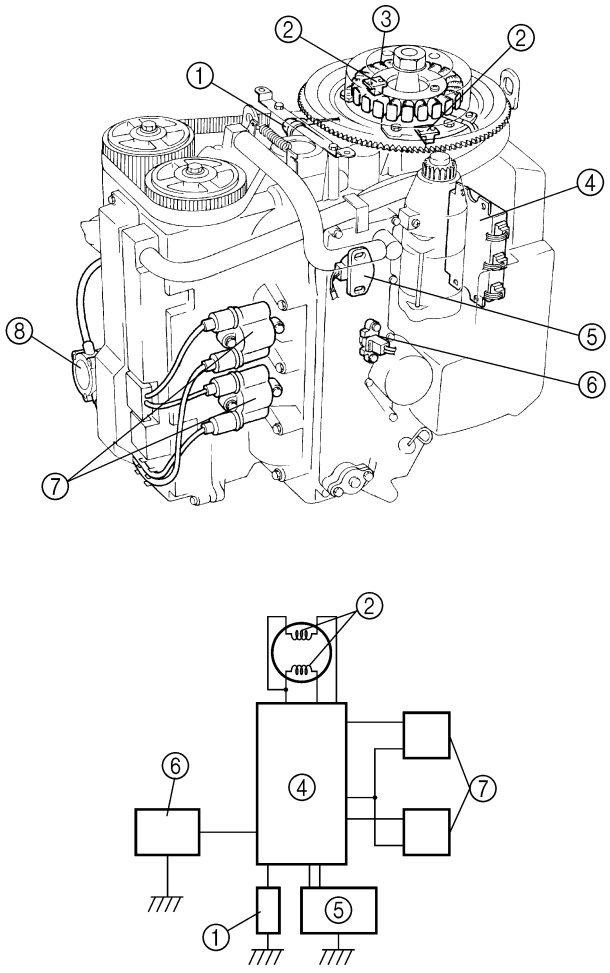
Ignition system

A CDI system has been incorporated. The CDI unit uses three signals (i.e., crankshaft position, engine revolution, and throttle position) to determine the optimum ignition timing.

Engine speed is controlled by the CDI unit to prevent damage to the engine when the engine temperature sensor detects that the engine temperature (i.e., water temperature) is too high, or when the oil pressure switch detects that the oil pressure is too low, or when the engine idle speed is too high.

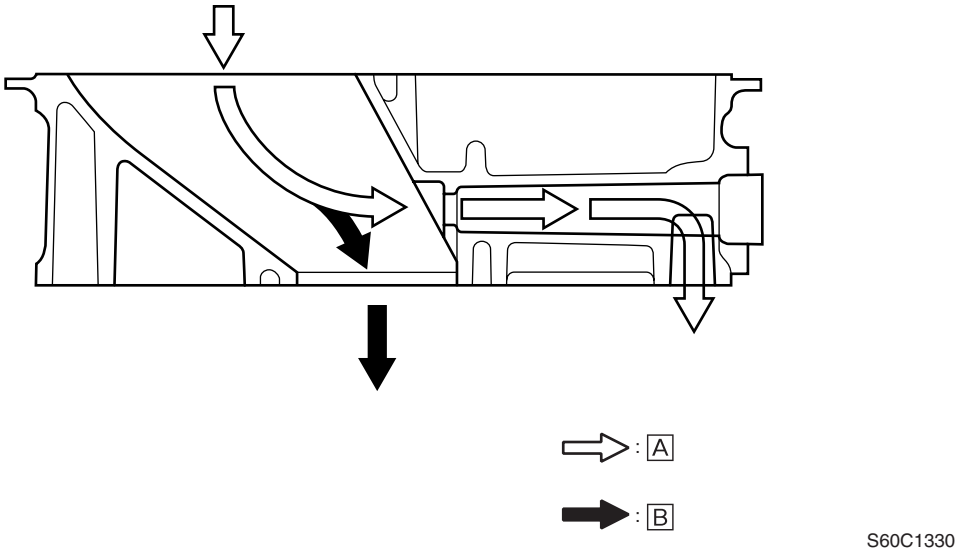
In addition, when the engine overheats or when there is low oil pressure, the warning lamp flashes and the buzzer sounds.

If the throttle position sensor and engine temperature sensor malfunction, the engine ignition timing is set by the CDI unit to prevent damage to the engine.



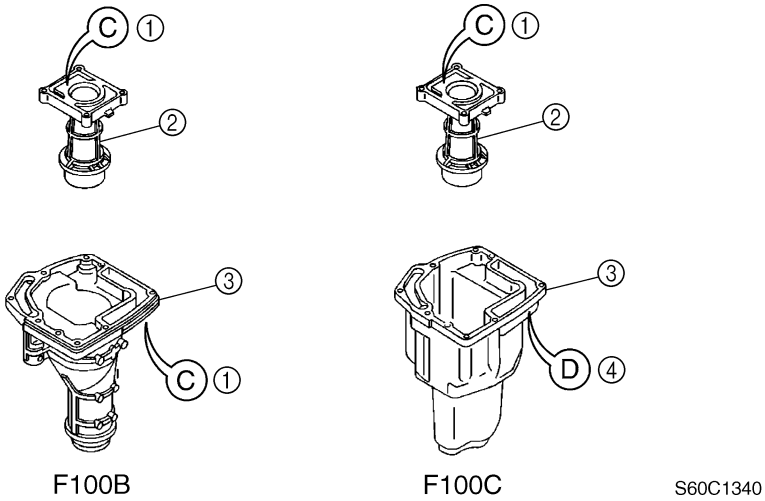
① Oil pressure switch
② Puler coil
③ Lighting coil
④ CDI unit
⑤ Throttle position sensor
⑥ Engine temperature sensor
⑦ Ignition coils
⑧ Fuel pump

At low speeds, the exhaust gas flows into the water wall through a hole on the side of the exhaust guide.



A Exhaust gas flow at low speeds
B Exhaust gas flow at high speeds

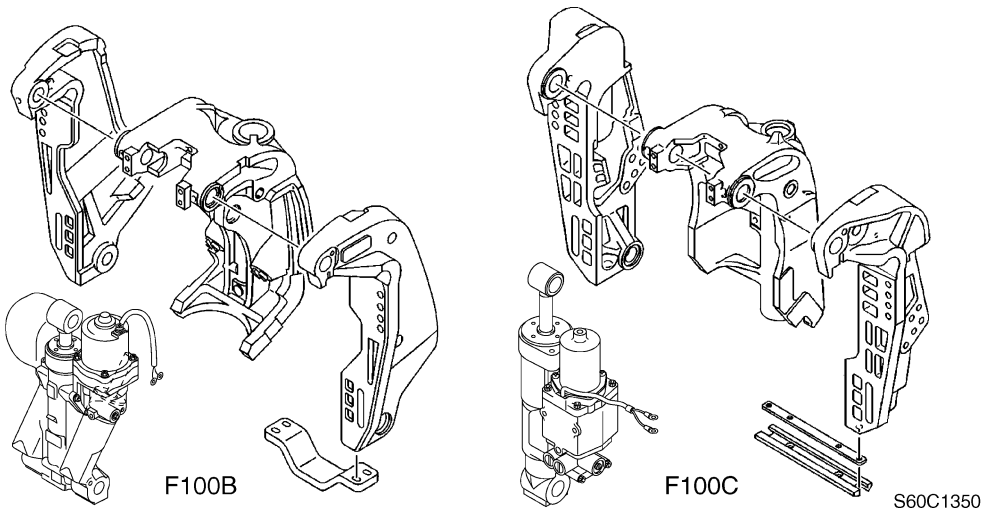
An identification mark has been stamped on the exhaust manifold and exhaust chamber.



① Identification mark “C”
② Exhaust manifold
③ Exhaust chamber
④ Identification mark “D”

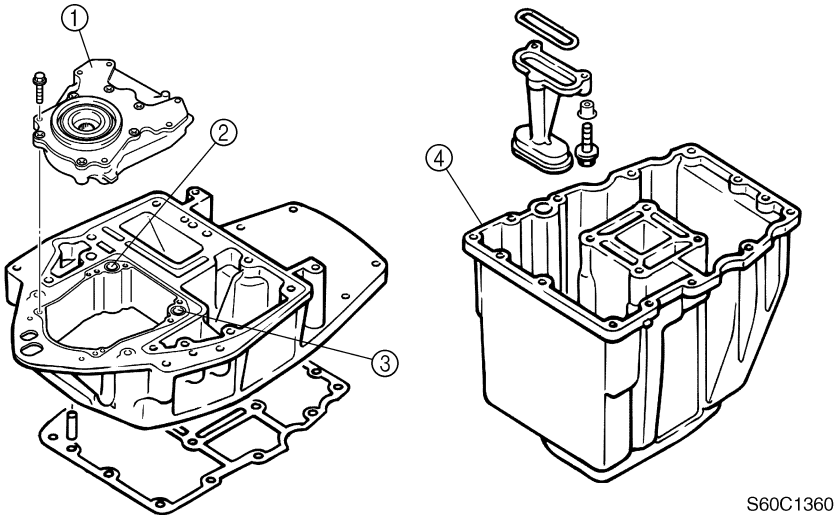
Bracket unit and the PTT unit

F100B uses the bracket unit of 2-stroke, V4 outboard motor and F100C uses that of F100A.
In addition, the PTT unit has been adopted from the F100A as well.
The F100B uses the one found on the proven 2-stroke, V4, and V6 outboard motors. This PTT unit has been constructed to feature a single tilt cylinder and two trim cylinders.
The PTT unit of the F100C has been adopted from the proven F100A. This PTT unit consists of a single cylinder for both tilt and trim functions, making the unit compact and lightweight.



Oil pump

The oil pump has been installed directly above the oil pan and to the exhaust guide.
In addition, the oil pump is operated directly by the drive shaft, therefore proper oil delivery can be achieved.



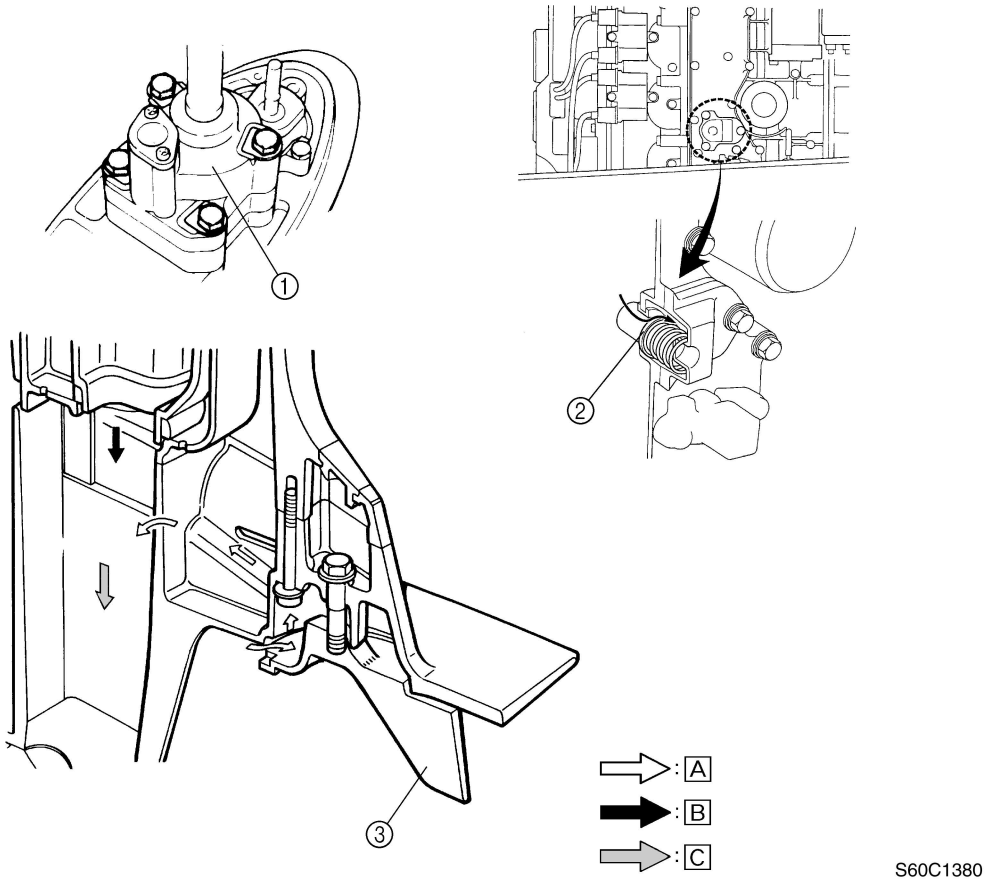
① Oil pump
② OUT
③ IN
④ Oil pan

Cooling system

A high capacity water pump and a large cylinder head water jacket have been incorporated to enable better cooling.

A pressure control valve (PCV) has also been incorporated to control the cooling water pressure, which in turn helps prevent water leakage from the power unit. When the cooling water pressure becomes too high, the PCV opens and the cooling water flows through a bypass passage to the upper case.

An additional water inlet, located in front of the trim tab, allows cooling water to flow into the exhaust passage in the lower unit during high-speed operation. This extra cooling water properly cools the high-temperature exhaust gas before it exits through the propeller boss, helping to prevent the rubber parts in the propeller boss from being damaged by high gas temperatures.



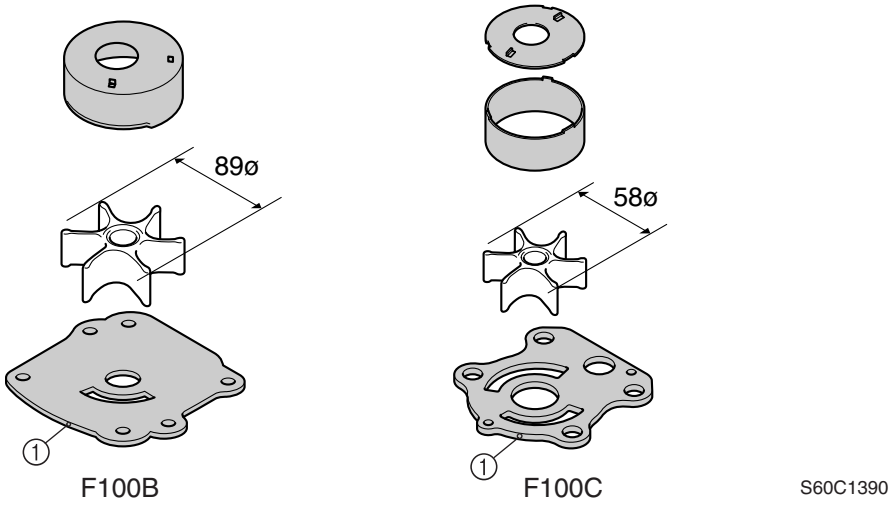
S60C1380

① Water pump
② Pressure control valve (PCV)
③ Trim tab

A Cooling water
B Exhaust gas
C Exhaust gas/Cooling water mixture

Water pump

The water pump has been hard chrome plated to prevent wear from muddy water. By hard chrome plating the water pump, wear resistance has been enhanced, and as a result, the time necessary between part changes or maintenance has been extended.



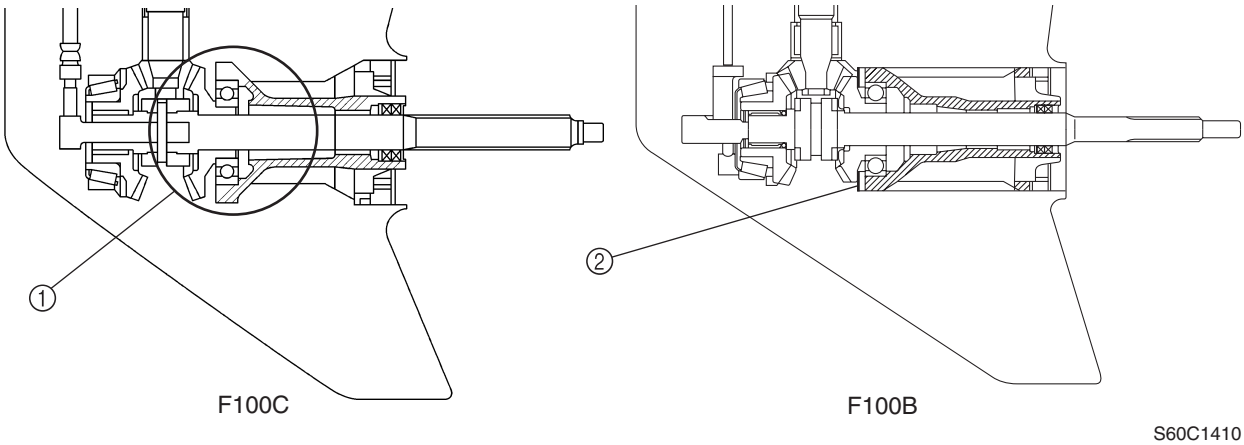
① Blue identification paint

Lower unit

The lower unit of the F100C does not contain a reverse gear shim. Therefore, it is not necessary to set the position of a shim for the reverse gear.

Gear ratio

F100A	2.31 (30/13)
F100B	2.15 (28/13)
F100C	2.31 (30/13)



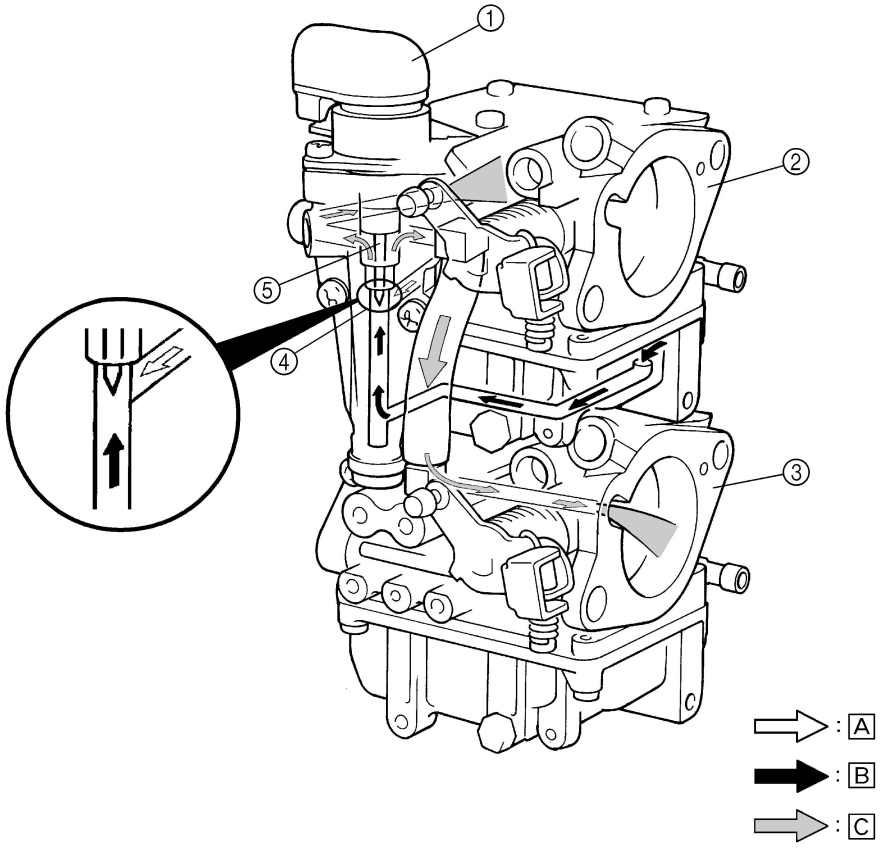
① No reverse gear shim
② Reverse gear shim

Technical tips

Carburetor

Prime start

To facilitate the starting of a cold engine, an air-fuel mixture that is richer than normal is required. For this reason, the Prime Start system has been adopted in the F100B and F100C. In the Prime Start system, the thermo heater plunger is in a position that fully opens the fuel enrichment valve while the engine is being started. Thus, fuel enrichment is achieved during the starting of the engine, and continues while the engine is being warmed up. Once the engine is started, a signal is sent from the pulser coil to the CDI, and from the CDI to the Prime Start to allow the wax to expand. The expanded wax moves the thermo heater plunger in the direction to close the enrichment valve. As a result, the volume of fuel that passes through the fuel enrichment valve decreases. A few minutes after the engine has started, the thermo heater plunger completely closes the fuel enrichment valve, thus ending the fuel enrichment by the Prime Start system.



S60C1420

① Prime Start
② Carburetor #1/#3
③ Carburetor #2/#4
④ Fuel enrichment valve
⑤ Thermo heater plunger

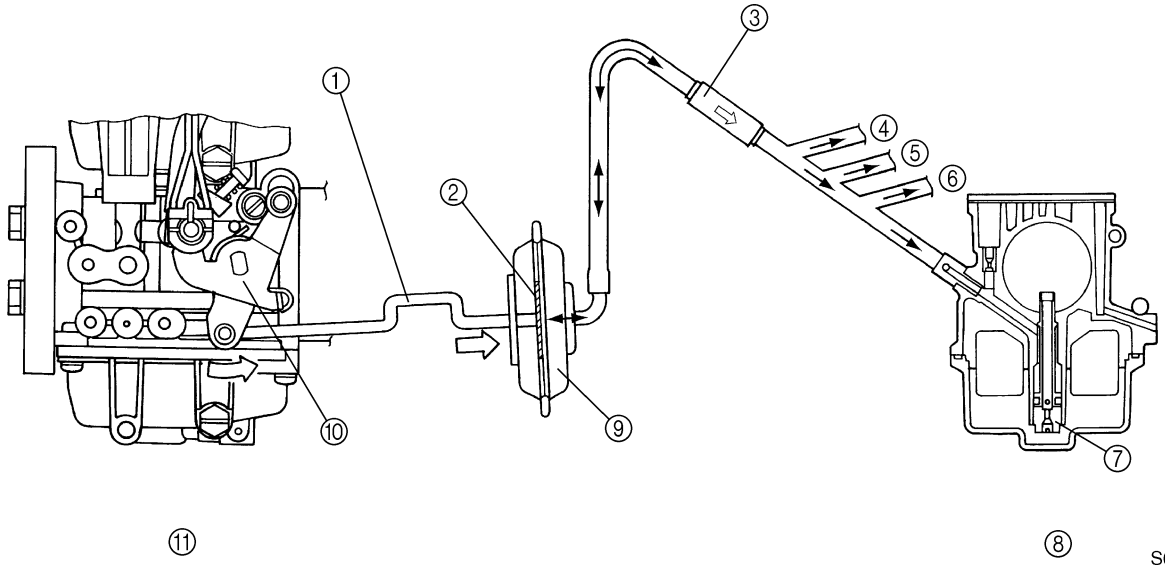
A Air
B Fuel
C Air-fuel mixture

Acceleration pump

The function of the acceleration pump is to ensure a smooth acceleration by preventing the air-fuel mixture from becoming temporarily lean in case the throttle valve is opened suddenly. When the throttle valve is opened suddenly, a large volume of air is introduced into the engine. However, because fuel is heavier than air, it is not possible to supply the volume of fuel that is necessary for the large volume of air that has been introduced. Thus, because it is not possible to achieve the air-fuel mixture that is required by the engine, bucking or hesitation results. For this reason, the acceleration pump temporarily increases the fuel volume in order to adjust the air-fuel mixture to a ratio that is necessary for the engine in case the throttle valve is opened suddenly.

Operation

When the throttle is opened suddenly, diaphragm (via the link that is connected to the throttle lever) operates to pressurize the air in the dashpot. The pressurized air distributed to the carburetors by passing through the in-line, one-way valve that is connected to the carburetors. The pressurized and distributed air then utilizes the passage of the main air jet to flow into the main nozzle. The pressure of the air helps suck fuel from the main jet, which increases the fuel in the main nozzle, and thus achieves fuel enrichment.



① Throttle lever link rod
② Diaphragm
③ In-line, one-way valve
④ To carburetor #1
⑤ To carburetor #2
⑥ To carburetor #3
⑦ Main jet
⑧ Carburetor #4 (cutaway view)
⑨ Dashpot
⑩ Throttle lever
⑪ Carburetor #4 (side view)

Ignition system

The computer controlled CDI system has three basic modes of operation: starting, warm-up, and normal operation.

Ignition timing control

Starting mode

Ignition timing is fixed at 10° BTDC. The starting mode cuts off when the engine has been started and the engine speed is over 600 r/min.

Warm-up mode

The engine speed is kept at approximately 1,100 r/min by the computer. The four main situations, based on the cooling water temperature, that this mode operates in are as follows:

1. Below 0 °C (32 °F), this mode lasts approximately 300 seconds.
2. From 0 °C (32 °F)–20 °C (68 °F), this mode lasts approximately 180 seconds.
3. From 20 °C (68 °F)–40 °C (104 °F), this mode lasts approximately 120 seconds.
4. Over 40 °C (104 °F), this mode does not operate.

The warm-up mode will cut off if the engine speed exceeds 4,000 r/min.

Normal operation

This mode operates between 5° ATDC and 35° BTDC. The ignition timing is automatically adjusted by the computer. The computer receives three signals (i.e, crankshaft position, engine revolution, and throttle position) every five microseconds, and then adjusts the ignition timing accordingly.
Two pulser coils send signals to the computer which then determines the crankshaft position and engine revolution.
The throttle position sensor also sends signals to the computer which then determines the throttle position. The microcomputer uses these three signals to determine the proper ignition timing.

Fail-safe controls

When the engine start switch is turned on, both low oil pressure and overheat warning lights will turn on. After the engine is started and the engine operates normally, the warning lights will turn off.
This ignition system incorporates three Fail-safe controls that are described below.

- Over-revolution control
  Over 6,150 r/min, the ignition to either cylinder #1 or #4 is cut. At 6,175 r/min, the ignition to both cylinders #1 and #4 is cut. Over 6,200 r/min, the ignition to both cylinders #1 and #4, and either #2 or #3 is cut. Over 6,225 r/min, the ignition to cylinders #1, #2, #3, and #4 is cut.
- Overheating control
  From 0–2,000 r/min (after starting the engine), this mode will not operate for 60 seconds. From 2,000 r/min, it will not operate for 21 seconds.
  When the cooling water temperature is 95 °C (203 °F) or above, this mode starts. The buzzer will sound and the warning light will turn on. Ignition to cylinders #1 and #4 will cut off and the engine speed will gradually lower to approximately 2,000 r/min.
  This mode will stop when the cooling water temperature is 79 °C (174 °F) and the throttle is fully closed. The buzzer will then stop and the warning light will turn off.

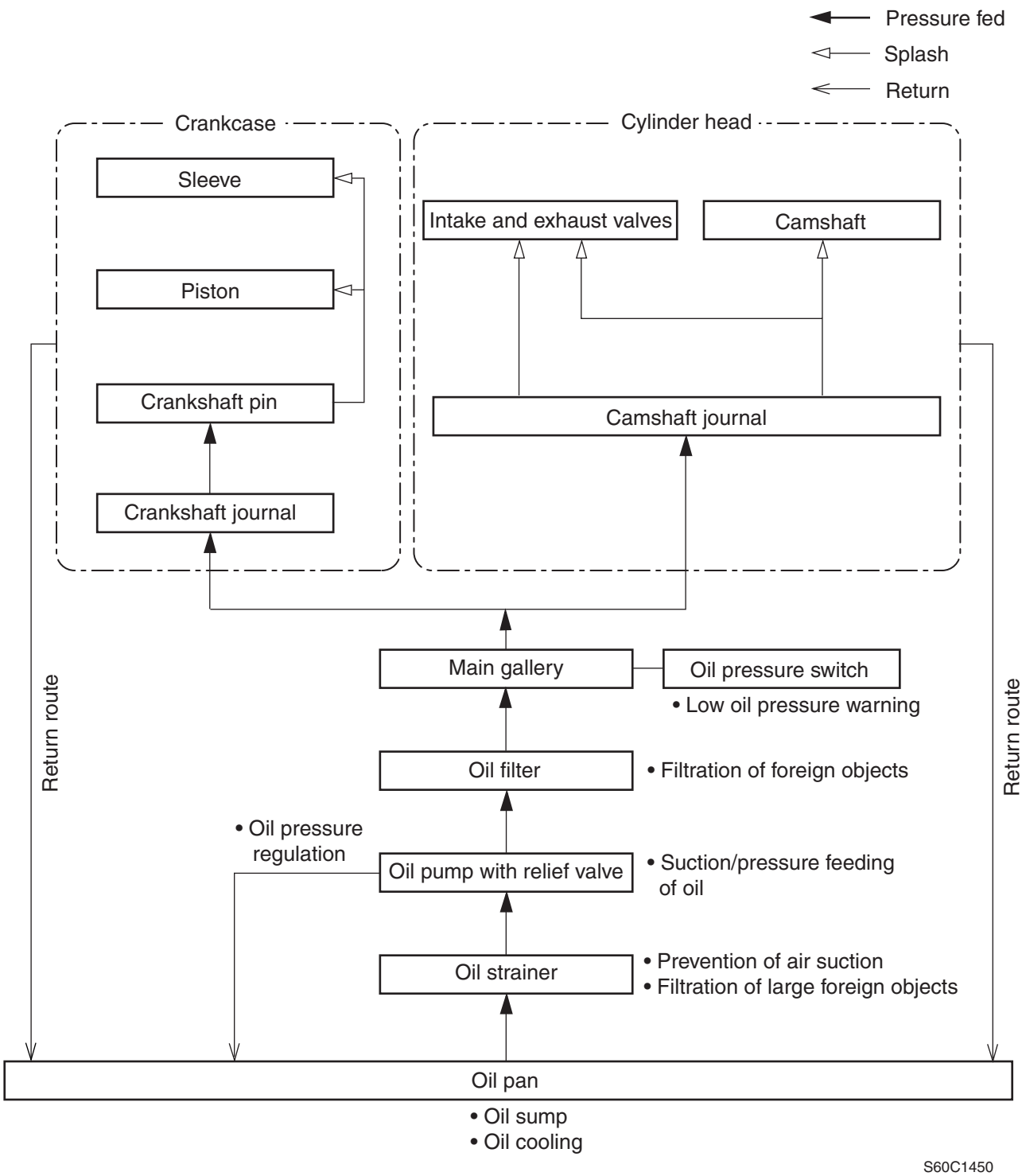
- Low oil pressure control
  Three seconds after starting the engine this mode does not operate.
  When the oil pressure switch turns on oil pressure is 150 kPa (1.5 kg/cm^2, 21.3 psi) or below, this mode starts. The buzzer will sound and the warning light will turn on. Ignition to cylinders #1 and #4 will cut off and the engine speed will gradually lower to approximately 2,000 r/min.
  This mode will stop when the oil pressure is 150 kPa (1.5 kg/cm^2, 21.3 psi) or above and the throttle is fully closed. The buzzer will then stop and the warning light will turn off.

Throttle position sensor
If the throttle position sensor is faulty, the ignition timing will automatically be fixed at 10° BTDC.

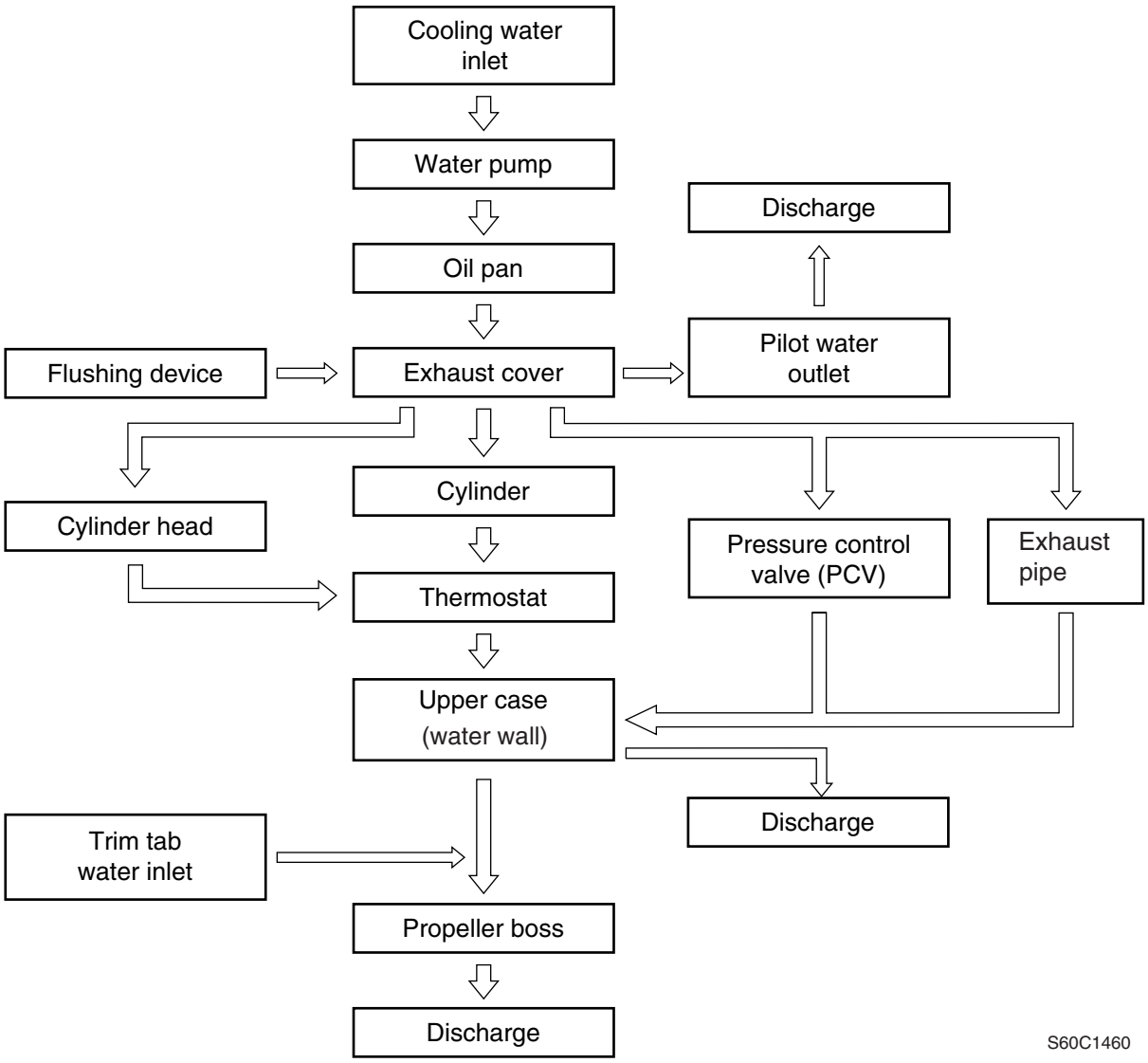
Engine temperature sensor
If the engine temperature sensor is faulty, the ignition timing will automatically be fixed at 10° BTDC.

Dual engine control system
This control system is used when two outboard motors are installed, along with a dual switch panel. If the overheating or low oil pressure protection control modes on one of the two outboard motors is activated, the same protection control mode on the other engine will be activated as well. However, on the other engine, the warning light will not light and the buzzer will not sound.

Lubrication system

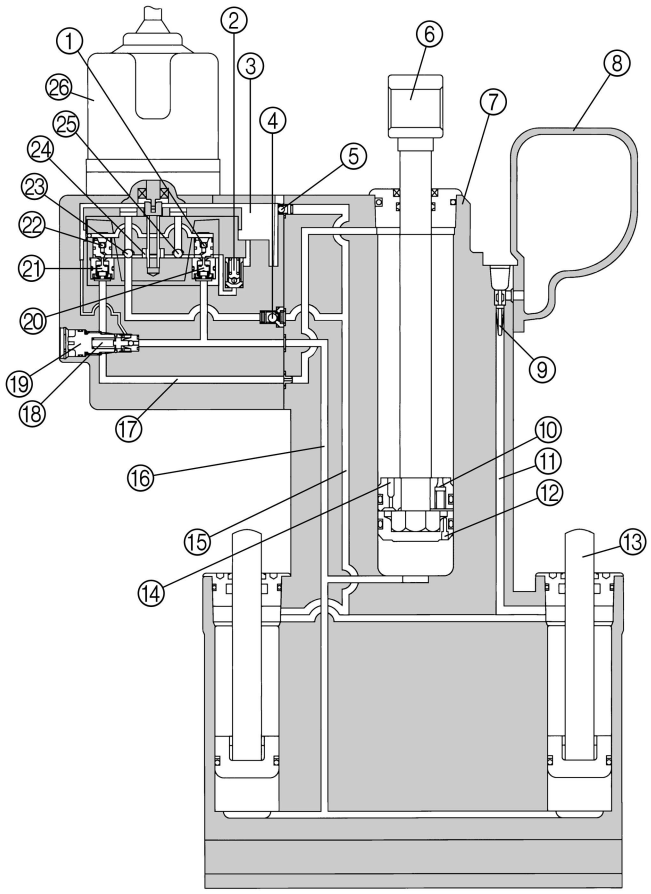


Cooling system



PTT (power trim and tilt) unit (F100B)

The circuit of the PTT unit and the location of its major components are shown in the illustration below.



S60C1470

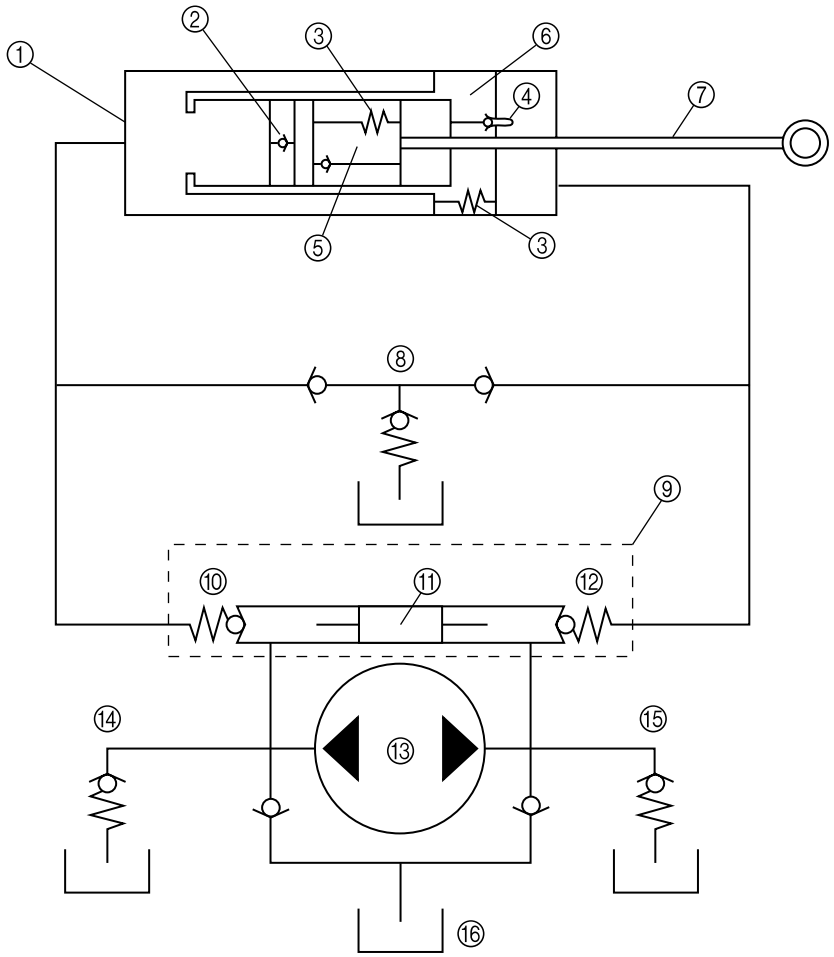
① Lower chamber shuttle valve
② Up-relief valve
③ Pump chamber
④ Down-check valve
⑤ Check valve
⑥ Tilt ram
⑦ Trim and tilt housing
⑧ Reservoir
⑨ Filter screen
⑩ Shock valve
⑪ Passage to reservoir
⑫ Free piston check valve
⑬ Trim ram
⑭ Shock return valve
⑮ Passage to upper chamber of trim cylinders
⑯ Passage to lower chambers of tilt cylinder and trim cylinders
⑰ Passage to upper chamber of tilt cylinder
⑱ Thermal valve
⑲ Manual valve
⑳ Lower chamber check valve
㉑ Upper chamber check valve
㉒ Upper chamber shuttle valve
㉓ Up-intake valve
㉔ Pump
㉕ Down-intake valve
㉖ Motor

Component identification

Description	Notes
Up-relief valve	PTT fluid flows upward above 10.8 MPa (110 kg/cm^2, 1,500 psi).
Down-check valve	PTT fluid flows easily to the left while some fluid flows to the right through a small restriction.
Lower chamber check valve	PTT fluid flows easily downward.
Lower chamber shuttle valve	PTT fluid flows easily upward, pressure on top causes valve to move down.
Upper chamber check valve	PTT fluid flows easily downward.
Upper chamber shuttle valve	PTT fluid flows easily upward, pressure on top causes valve to move down.
Manual valve	Port side, clockwise to release
Free piston check valve	PTT fluid flows easily downward.
Shock valve	PTT fluid flows downward above 16.7 MPa (170 kg/cm^2, 2,420 psi).
Shock return valve	PTT fluid flows easily upward.
Check valve	PTT fluid flows easily to the right while a restriction allows some flow to the left.
Thermal valve	PTT fluid flows to the left above 18.6 MPa (190 kg/cm^2, 2,700 psi).
Down-intake valve	PTT fluid flows easily downward.
Up-intake valve	PTT fluid flows easily downward.

PTT (power trim and tilt) unit (F100C)

The circuit of the PTT unit and the location of its major components are shown in the illustration below.



S60C1480

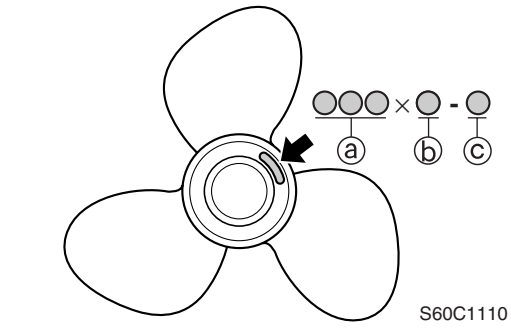
① PTT cylinder
② Free piston
③ Pressure-release valves
④ Check valve
⑤ Tilt piston
⑥ Trim piston
⑦ Ram
⑧ Manual valve
⑨ Main valve
⑩ Up-flow side
⑪ Shuttle piston
⑫ Down-flow side
⑬ Gear pump
⑭ Up-relief valve
⑮ Down-relief valve
⑯ Reservoir

Propeller selection

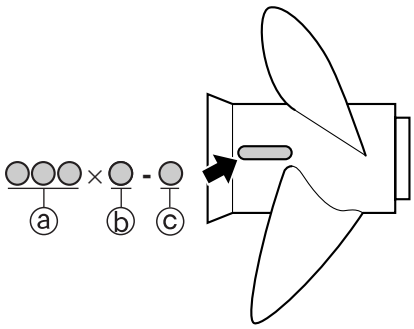
The performance of a boat and outboard motor will be critically affected by the size and type of propeller you choose. Propellers greatly affect boat speed, acceleration, engine life, fuel economy, and even boating and steering capabilities. An incorrect choice could adversely affect performance and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

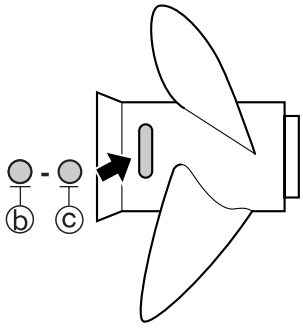
The size of the propeller is indicated on the propeller blade or outside of the propeller boss.



S60C1110



S60C1120



S60C1125

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

Selection

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

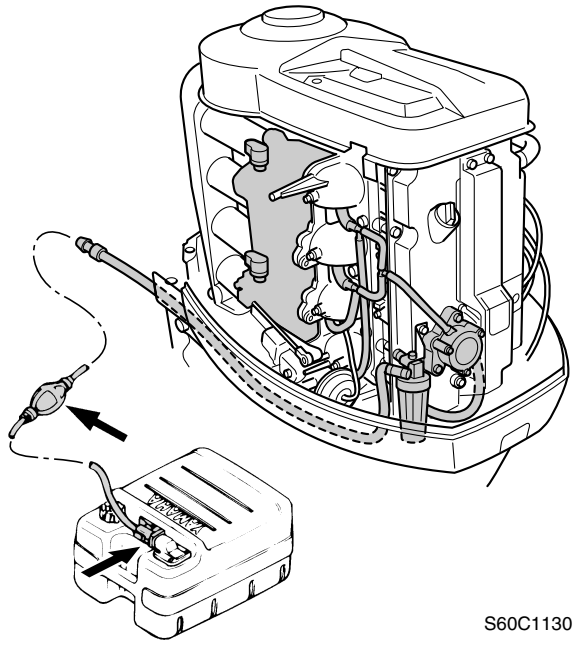
Propeller size (in)	Material
12 5/8 × 21 - K	Aluminum
13 × 19 - K	
13 × 23 - K	
13 × 25 - K	
13 1/4 × 17 - K	
13 1/2 × 15 - K	
13 5/8 × 13 - K	
14 × 11 - K	
13 × 17 - K	Stainless
13 × 19 - K	
13 × 21 - K	
13 × 23 - K	
13 × 25 - K	
13 1/2 × 14 - K	
13 1/2 × 16 - K	

Predelivery checks

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

Checking the fuel system

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



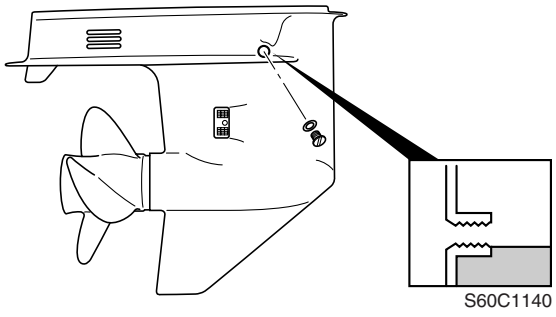
S60C1130

CAUTION:

This is a 4-stroke engine. Never use premixed fuel.

Checking the gear oil

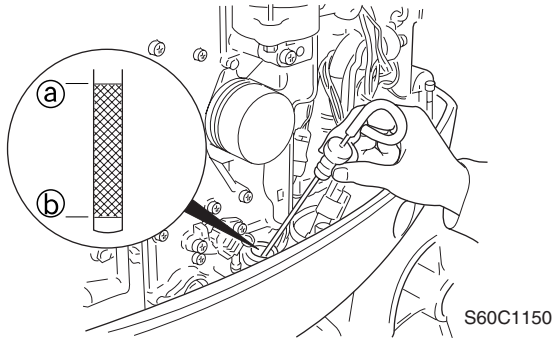
1. Check the gear oil level.



S60C1140

Checking the engine oil

1. Check the oil level.



S60C1150

NOTE:

- If the engine oil is above the maximum level mark ⓐ, drain sufficient oil until the level is between ⓐ and ⓑ.
- 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, or SH
SAE: 10W-30, 10W-40, or 20W-40
Oil capacity:
Without oil filter replacement:
4.5 L (4.8 US qt, 4.0 Imp qt)

Checking the battery

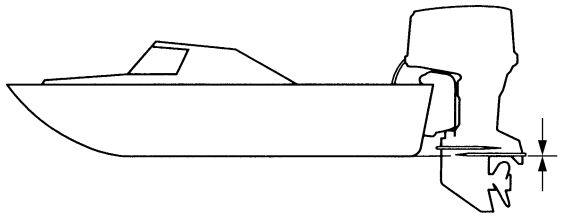
1. Check the capacity, electrolyte level, and specified gravity of the battery.

Battery capacity: 70–100 Ah
Minimum cold cranking performance:
380 A
Electrolyte specific gravity:
1.28 at 20 °C (68 °F)

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

Checking the outboard motor mounting position

1. Check the position of the anti-cavitation plate.



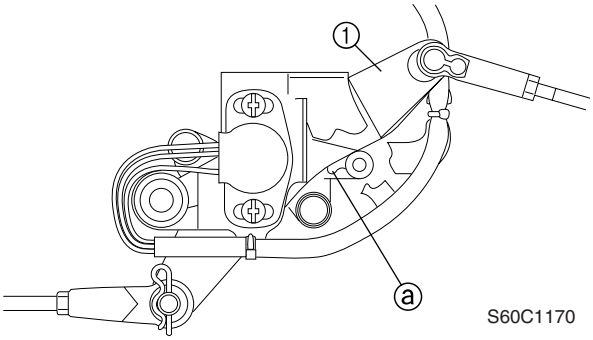
S60C1160

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

Checking the remote control cables

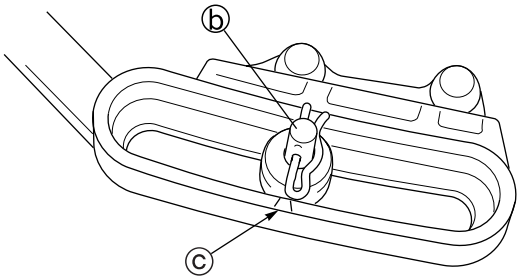
1. Set the remote control lever to the neutral position and fully close the throttle lever/throttle grip.

2. Check that the throttle control lever ① touches the fully closed stopper ⓐ.

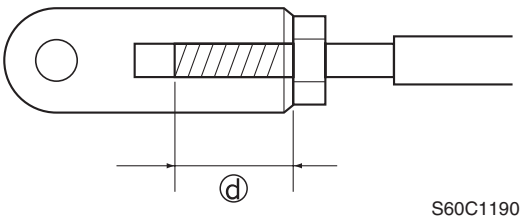


S60C1170

3. Check that the set pin ⓑ is in the center of the shift bracket and aligned with the alignment mark ⓒ on the bracket.



S60C1180



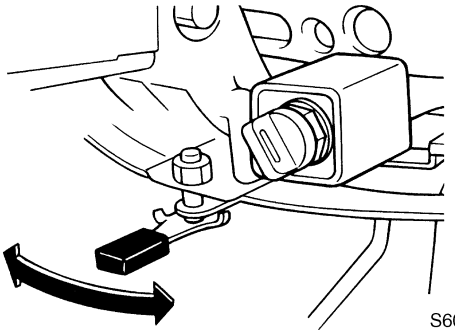
S60C1190

CAUTION:

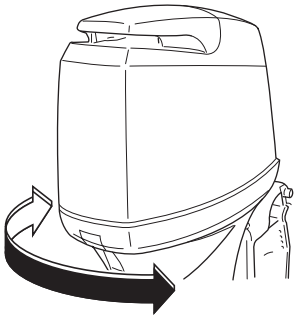
The shift/throttle cable joint must be screwed in a minimum of 8.0 mm (0.31 in) ⓓ.

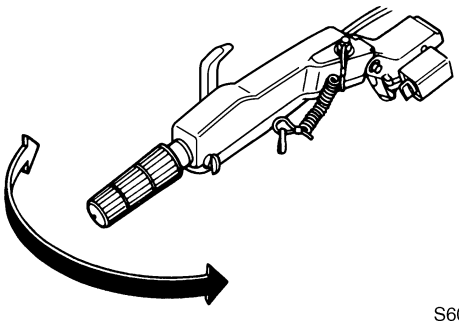
Checking the steering system

1. Check the steering friction for proper adjustment.


S60C1195

2. Check that the steering operates smoothly.


S60C1200

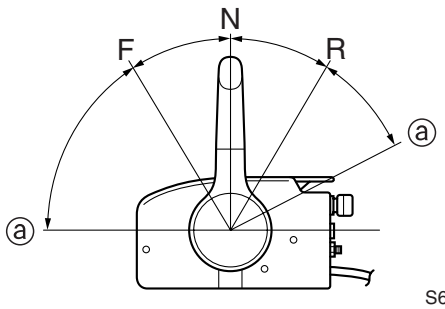

S60C1205

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

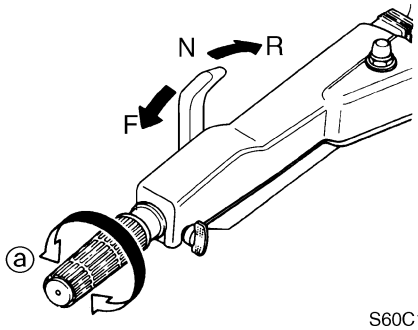
Checking the gearshift and throttle operation

1. Check that the gearshift operates smoothly when the remote control lever or shift lever is shifted from neutral into forward or reverse.

2. Check that the throttle operates smoothly when the remote control lever or throttle grip is shifted from the fully closed position to the fully open position ⓐ.



S60C1210



S60C1215

Checking the tilt system

1. Check that the outboard motor tilts up and down smoothly when operating the power trim and tilt unit.

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

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

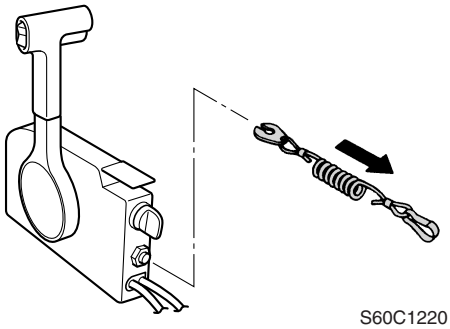
4. Check that the trim meter points down when the outboard motor is tilted all the way down.

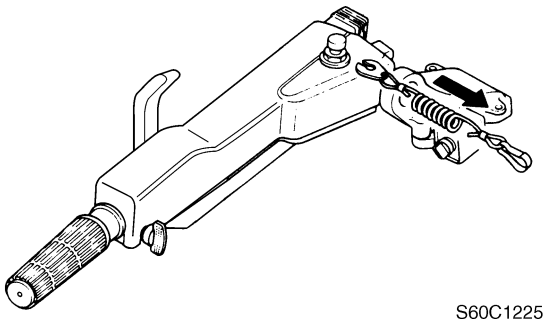
Checking the engine start switch and engine stop switch/engine shut-off switch

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

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

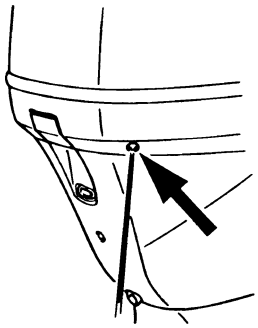
3. Check that the engine turns off when the engine stop switch is pushed or the engine shut-off cord is pulled from the engine shut-off switch.


S60C1220


S60C1225

Checking the pilot water outlet

1. Start the engine, and then check that cooling water is discharged from the pilot water outlet.


S60C1230

Test run

1. Start the engine, and then check that the gearshift 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 one hour at 2,000 r/min or at half throttle, then for another hour at 3,000 r/min or at 3/4 throttle.

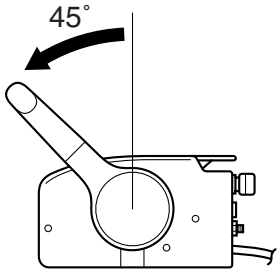
5. Check that the outboard motor does not tilt up when shifting into reverse and that water does not flow in over the transom.

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

Break-in

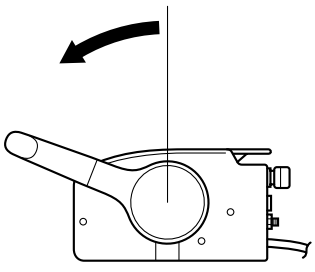
During the test run, perform the break-in operation in the following three stages.

1. One hour ⓐ at 2,000 r/min or at approximately half throttle.

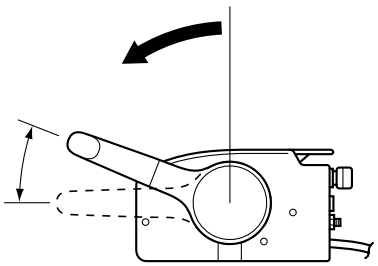


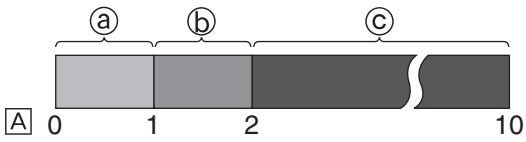
S60C1232

2. One hour ⓑ at 3,000 r/min or 3/4 throttle and one minute out of every ten at full throttle.


S60C1233

3. Eight hours ⓒ at any speed, however, avoid running at full speed for more than five minutes.


S60C1234



S60C1240

A Hour

After test run

1. Check for water in the gear oil.

2. Check for fuel leakage in the cowling.

3. After a test run and while the engine is at idle, flush the cooling water passage with fresh water using the flushing kit.

Specifications

General specifications

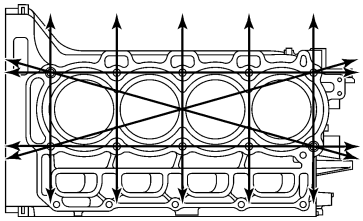
Item	Unit	Model	
		F100BET	F100CET
Dimension			
Overall length	mm (in)	825 (32.5)	
Overall width	mm (in)	486 (19.1)	
Overall height			
(L)	mm (in)	1,595 (62.8)	1,582 (62.3)
(X)	mm (in)	1,722 (67.8)	1,710 (67.3)
Boat transom height			
(L)	mm (in)	508 (20.0)	
(X)	mm (in)	635 (25.0)	
Weight			
(with aluminum propeller)			
(L)	kg (lb)	182.5 (402.4)	172.0 (379.3)
(X)	kg (lb)	187.2 (412.8)	176.0 (388.1)
Performance			
Maximum output	kW (hp) at 5,500 r/min	73.6 (100.0)	
Full throttle operating range	r/min	5,000–6,000	
Maximum fuel consumption	L (US gal, lmp gal)/hr at 6,000 r/min	31.0 (8.19, 6.82)	
Power unit			
Type		In-line, 4-stroke, DOHC, 16 valves	
Cylinder quantity		4	
Displacement	cm^3 (cu. in)	1,596 (97.4)	
Bore × stroke	mm (in)	79.0 × 81.4 (3.11 × 3.20)	
Compression ratio		8.90	
Carburetor quantity		4	
Control system		Remote control (Tiller handle)	
Starting system		Electric	
Ignition control system		Microcomputer (CDI)	
Ignition timing	Degree	ATDC 5–BTDC 20	
Alternator output	V, A	12, 10	
Enrichment system		Prime Start	
Choke valve control		—	
Spark plugs		LFR5A-11 (NGK)	
Cooling system		Water	
Exhaust system		Through propeller boss	
Lubrication system		Wet sump	

Item	Unit	Model	
		F100BET	F100CET
Fuel and oil			
Fuel type		Unleaded gasoline/leaded gasoline	
Fuel rating	RON*	84	
Engine oil type		4-stroke motor oil	
Engine oil grade	API	SE, SF, SG, or SH	
	SAE	10W-30 or 10W-40	
Engine oil quantity			
(with oil filter replacement)	L	4.7 (5.0, 4.1)	
	(US qt, lmp qt)		
(without oil filter replacement)	L	4.5 (4.8, 4.0)	
	(US qt, lmp qt)		
Gear oil type		Hypoid gear oil	
Gear oil grade	API	GL-4	
	SAE	90	
Gear oil quantity	L	0.785 (0.83, 0.69)	0.670 (0.71, 0.59)
	(US qt, lmp qt)		
Bracket			
Trim angle (at 12 degree boat transom)	Degree	–4–16	
Tilt-up angle	Degree	70	
Steering angle	Degree	30 + 30	35 + 35
Drive unit			
Gearshift positions		F-N-R	
Gear ratio		2.15 (28/13)	2.31 (30/13)
Reduction gear type		Spiral bevel gear	
Clutch type		Dog clutch	
Propeller shaft type		Spline	
Propeller direction (rear view)		Clockwise	
Propeller identification mark		K	
Electrical			
Battery capacity	Ah	70–100	
Minimum cold cranking performance	A	380	

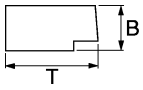
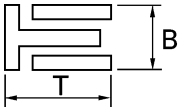
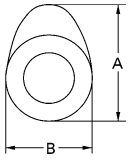
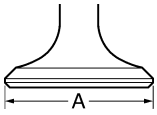
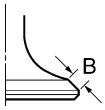
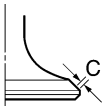
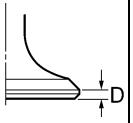
* RON: Research Octane Number

Maintenance specifications

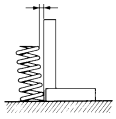
Power unit

Item	Unit	Model	
		F100BET	F100CET
Power unit			
Minimum compression pressure*	kPa (kgf/cm², psi)	670 (6.7, 95)	
Lubrication oil pressure (reference data)	kPa (kgf/cm², psi) at 850 r/min	520 (5.2, 74)	
Cylinder heads			
Warpage limit	mm (in)	0.1 (0.04)	
 (lines indicate straightedge position)			
Cylinder head journal inside diameter	mm (in)	25.00–25.02 (0.9843–0.9850)	
Cylinders			
Bore size	mm (in)	79.00–79.02 (3.1103–3.1110)	
Taper limit	mm (in)	0.08 (0.0031)	
Out-of-round limit	mm (in)	0.08 (0.0031)	
Pistons			
Piston diameter (D)	mm (in)	78.93–78.94 (3.1075–3.1078)	
Measuring point (H)	mm (in)	13 (0.5)	
Piston-to-cylinder clearance	mm (in)	0.07–0.08 (0.0028–0.0031)	
Oversize piston			
1st	mm (in)	+ 0.25 (0.0098)	
Oversize piston diameter	mm (in)	79.18–79.19 (3.1173–3.1177)	
Piston pins			
Outside diameter	mm (in)	17.997–18.000 (0.7085–0.7087)	
Piston rings			
Top ring			
Dimension B	mm (in)	1.17–1.19 (0.0461–0.0468)	
Dimension T	mm (in)	2.80–3.00 (0.1103–0.1181)	
End gap	mm (in)	0.15–0.35 (0.0060–0.0137)	
Side clearance	mm (in)	0.04–0.08 (0.0016–0.0031)	

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

Item	Unit	Model	
		F100BET	F100CET
2nd ring			
Dimension B 	mm (in)	1.47–1.49 (0.0579–0.0586)	
Dimension T	mm (in)	3.00–3.20 (0.1182–0.1259)	
End gap	mm (in)	0.70–0.90 (0.0276–0.0354)	
Side clearance	mm (in)	0.03–0.07 (0.0012–0.0027)	
Oil ring			
Dimension B 	mm (in)	2.38–2.48 (0.0938–0.0976)	
Dimension T	mm (in)	2.40 (0.0945)	
End gap	mm (in)	0.20–0.70 (0.0079–0.0275)	
Side clearance	mm (in)	0.03–0.15 (0.0012–0.0059)	
Camshafts			
Intake (A) 	mm (in)	37.22–37.38 (1.4654–1.4716)	
Exhaust (A)	mm (in)	36.90–37.06 (1.4528–1.4590)	
Intake and exhaust (B)	mm (in)	29.92–30.08 (1.1780–1.1842)	
Camshaft journal diameter	mm (in)	24.96–24.98 (0.9827–0.9834)	
Camshaft journal oil clearance	mm (in)	0.02–0.06 (0.0008–0.0023)	
Maximum camshaft runout	mm (in)	0.1 (0.004)	
Valves			
Valve clearance (cold)			
Intake	mm (in)	0.20 ± 0.03 (0.008 ± 0.001)	
Exhaust	mm (in)	0.34 ± 0.03 (0.013 ± 0.001)	
Head diameter (A)			
Intake 	mm (in)	29.0–29.2 (1.142–1.150)	
Exhaust	mm (in)	24.0–24.2 (0.945–0.953)	
Face width (B)			
Intake 	mm (in)	2.00–2.43 (0.0787–0.0957)	
Exhaust	mm (in)	2.28–2.71 (0.0898–0.1067)	
Seat contact width (C)			
Intake 	mm (in)	1.2–1.6 (0.047–0.063)	
Exhaust	mm (in)	1.2–1.6 (0.047–0.063)	
Margin thickness (D)			
Intake 	mm (in)	0.8–1.2 (0.031–0.047)	
Exhaust	mm (in)	1.0–1.4 (0.039–0.055)	
Stem diameter			
Intake	mm (in)	5.97–5.99 (0.2350–0.2358)	
Exhaust	mm (in)	5.96–5.97 (0.2347–0.2350)	
Guide inside diameter			
Intake and exhaust	mm (in)	6.01–6.02 (0.2367–0.2370)	
Stem-to-guide clearance			
Intake	mm (in)	0.02–0.05 (0.0008–0.0019)	
Exhaust	mm (in)	0.04–0.06 (0.0016–0.0023)	
Stem runout limit	mm (in)	0.01 (0.0004)	

Specifications

Item	Unit	Model	
		F100BET	F100CET
Valve springs			
Free length 	mm (in)	53.20 (2.0945)	
Minimum free length	mm (in)	52.25 (2.0570)	
Tilt limit	mm (in)	2.6 (0.10)	
Connecting rods			
Small-end inside diameter	mm (in)	17.97–17.98 (0.7075–0.7078)	
Big-end inside diameter	mm (in)	47.03–47.04 (1.8514–1.8518)	
Crank pin oil clearance	mm (in)	0.023–0.035 (0.0010–0.0013)	
Big-end bearing thickness			
Yellow	mm (in)	1.499–1.506 (0.0590–0.0593)	
Green	mm (in)	1.506–1.513 (0.0593–0.0596)	
Blue	mm (in)	1.513–1.520 (0.0596–0.0598)	
Red	mm (in)	1.520–1.527 (0.0598–0.0601)	
Crankshaft			
Crankshaft journal			
Diameter	mm (in)	47.984–48.000 (1.8892–1.8897)	
Crank pin			
Diameter	mm (in)	43.982–44.000 (1.7315–1.7322)	
Runout limit	mm (in)	0.03 (0.0012)	
Crankcase			
Crankshaft main journal oil clearance	mm (in)	0.024–0.044 (0.0010–0.0017)	
Upper crankcase main journal bearing thickness			
Green	mm (in)	2.992–2.999 (0.1178–0.1181)	
Blue	mm (in)	2.999–3.006 (0.1181–0.1183)	
Red	mm (in)	3.006–3.013 (0.1183–0.1186)	
Lower crankcase main journal bearing thickness			
Yellow	mm (in)	3.010–3.017 (0.1185–0.1188)	
Green	mm (in)	3.017–3.024 (0.1188–0.1191)	
Blue	mm (in)	3.024–3.031 (0.1191–0.1193)	
Red	mm (in)	3.031–3.038 (0.1193–0.1196)	
#3 main journal bearing thickness (upper)			
Green	mm (in)	2.992–2.999 (0.1178–0.1181)	
Blue	mm (in)	2.999–3.006 (0.1181–0.1183)	
Red	mm (in)	3.006–3.013 (0.1183–0.1186)	

Item	Unit	Model	
		F100BET	F100CET
Oil pump			
Discharge at 100 °C (212 °F) with 10W-30 engine oil	L (US gal, Imp gal)/min at 1,000 r/min	5.9 (1.56, 1.30)	
Thermostats			
Opening temperature	°C (°F)	50 (122)	
Fully open temperature	°C (°F)	60 (140)	
Valve open lower limit	mm (in)	4.3 (0.17)	
Fuel pump			
Discharge	L (US gal, Imp gal)/hr at 6,000 r/min	100 (26.4, 22)	
Pressure	kPa (kgf/cm^2, psi)	26–98 (0.26–0.98, 3.7–13.9)	
Carburetor			
ID mark		60C00	
Main jet	#	128	
Main air jet	#	75	
Pilot jet	#	42	
Pilot air jet	#	85	
Midrange jet	#	40	
Pilot screw	turns out	1 1/2–2 1/2	
Float height	mm (in)	12.5–15.5 (0.49–0.61)	
Engine idle speed	r/min	800–900	

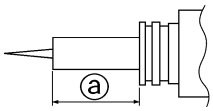
Lower unit

Item	Unit	Model	
		F100BET	F100CET
Gear backlash			
Pinion-to-forward gear	mm (in)	0.19–0.53 (0.007–0.021)	0.13–0.47 (0.005–0.019)
Pinion-to-reverse gear	mm (in)	0.86–1.26 (0.034–0.050)	—
Pinion shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50	
Forward gear shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50	
Reverse gear shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50	—

Electrical

Item	Unit	Model	
		F100BET	F100CET
Ignition system			
Ignition timing (engine idle speed)	Degree	ATDC ± 5	
Pulser coil output peak voltage (W/R – B)			
at cranking 1(*1)	V	3.5	
at cranking 2(*1)	V	2.5	
at 1,500 r/min	V	9.0	
at 3,500 r/min	V	14.0	
Pulser coil resistance(*2) (W/R – B)	Ω	445–545	
CDI unit output peak voltage (B/O – B, B/W – B)			
at cranking (loaded)	V	124	
at 1,500 r/min	V	125	
at 3,500 r/min	V	126	
Spark plug gap	mm (in)	11 (0.4)	
Ignition control system			
Oil pressure switch	kPa (kgf/cm², psi)	150 (1.5, 21.3)	
Thermo sensor resistance			
at 20 °C (68 °F)	kΩ	2.54	
at 40 °C (104 °F)	kΩ	1.15	
at 60 °C (140 °F)	kΩ	0.59	
at 80 °C (176 °F)	kΩ	0.32	
Starter motor			
Type		Sliding gear	
Output	kW	1.4	
Cranking time limit	Second	30	
Brushes			
Standard length	mm (in)	15.5 (0.61)	
Wear limit	mm (in)	9.5 (0.37)	
Commutator			
Standard diameter	mm (in)	29.0 (1.14)	
Wear limit	mm (in)	28.0 (1.10)	
Mica			
Standard undercut	mm (in)	0.5 (0.02)	
Wear limit	mm (in)	0.2 (0.01)	

(*1) Cranking 1: unloaded
Cranking 2: loaded
(*2) The figures are for reference only.

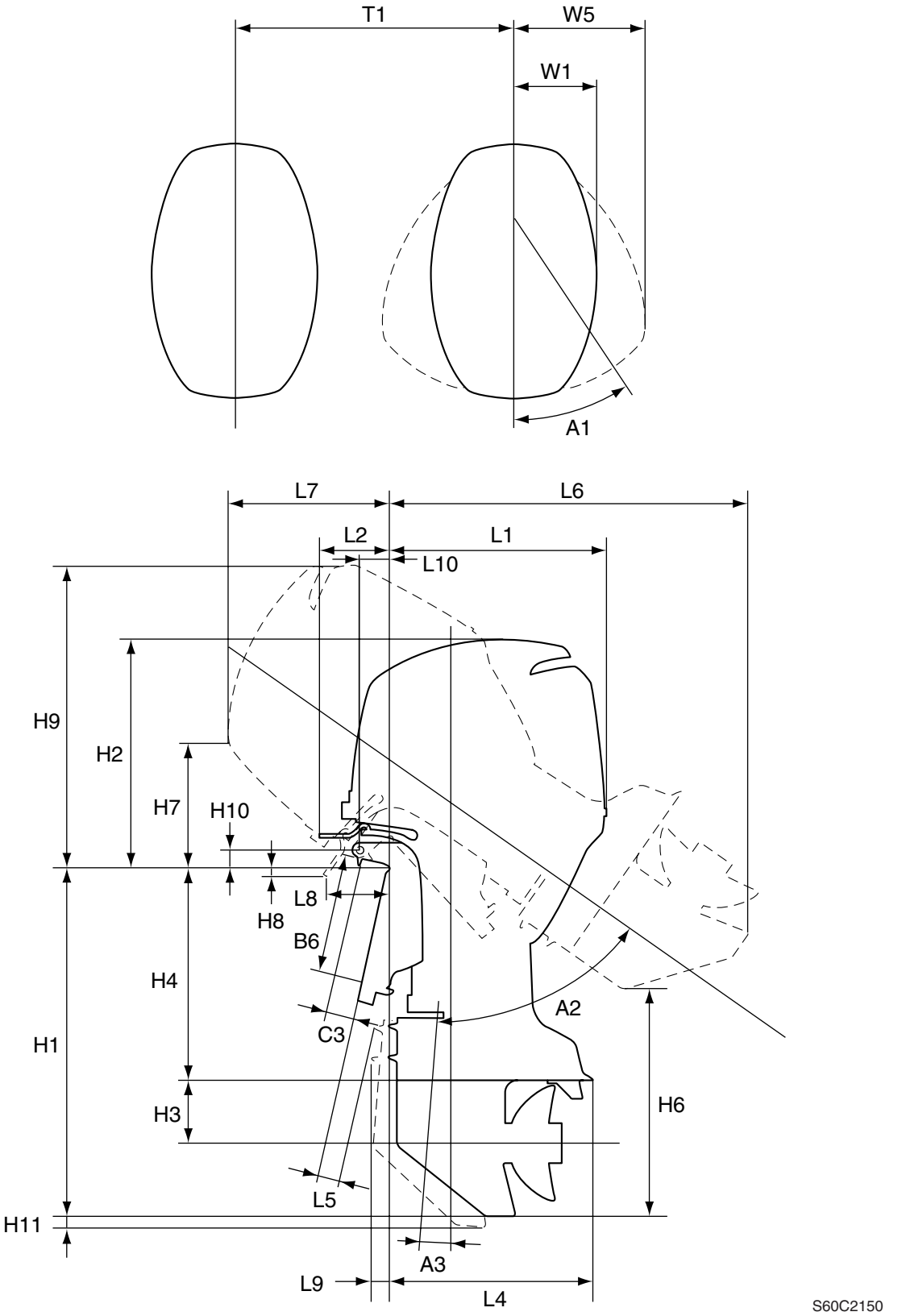
Item	Unit	Model	
		F100BET	F100CET
Charging system			
Fuse	A	20, 30	
Lighting coil output peak voltage (W – W)			
at cranking(*1)	V	7.0	
at 1,500 r/min(*1)	V	38	
at 3,500 r/min(*1)	V	91	
Lighting coil resistance(*2) (W – W)	Ω	0.32–0.48	
Rectifier Regulator output peak voltage (R – B)			
at 1,500 r/min(*1)	V	17.5	
at 3,500 r/min(*1)	V	19.0	
Charging current	V, A at 6,000 r/min	12, 20	
Enrichment control system			
Prime Start 			
Plunger minimum length ⓐ	mm (in)	15.0 (0.59)	
Power trim and tilt system			
Trim sensor			
Setting resistance	Ω	9–11	
Resistance (P – B)	Ω	9–378.8	
Fluid type		ATF Dexron II	
Brushes			
Standard length	mm (in)	9.8 (0.39)	—
Wear limit	mm (in)	4.8 (0.19)	—
Commutator			
Standard diameter	mm (in)	22 (0.87)	—
Wear limit	mm (in)	21 (0.83)	—
Mica			
Standard undercut	mm (in)	1.35 (0.05)	—

(*1) Unloaded

(*2) The figures are for reference only.

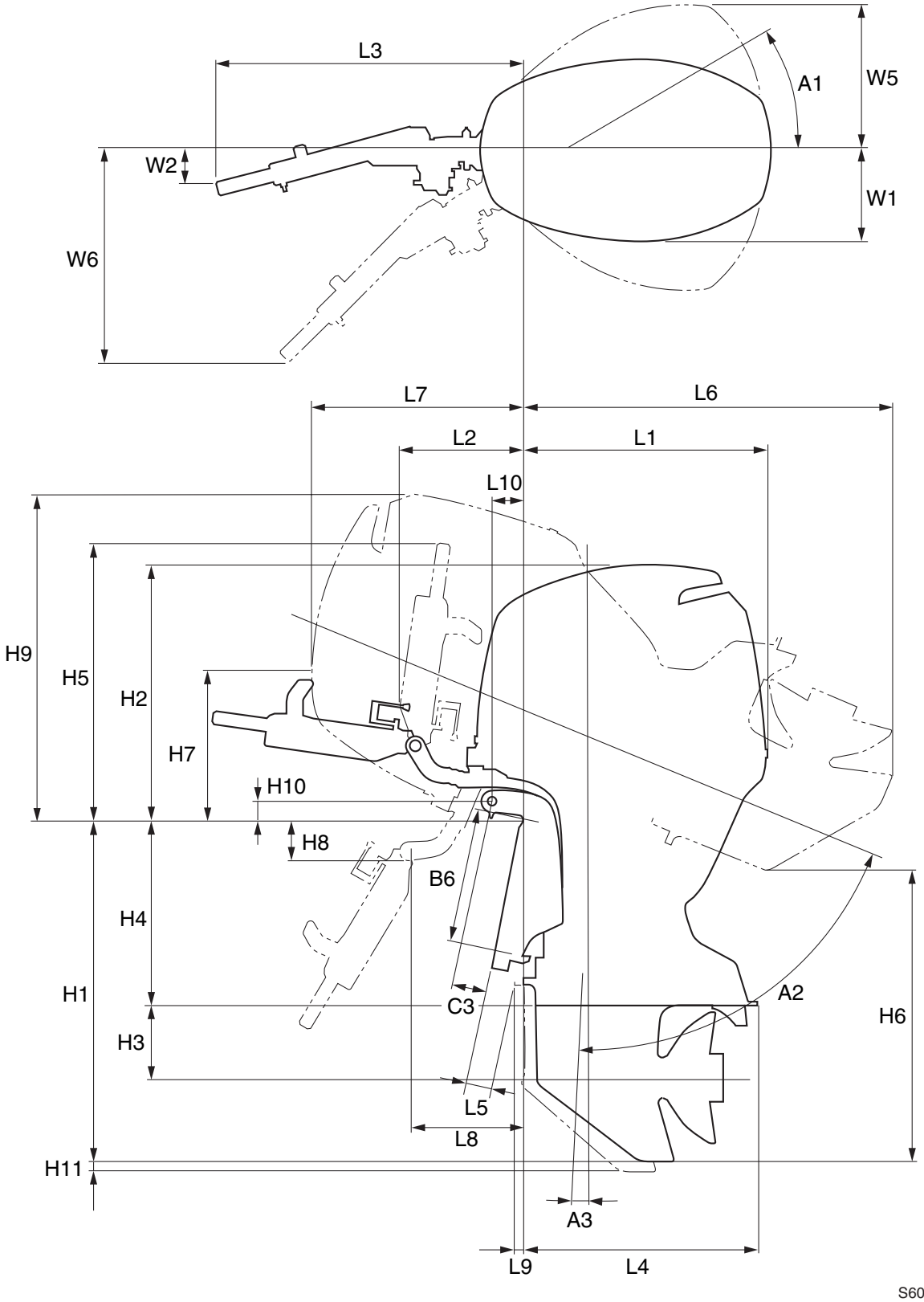
Dimensions

Exterior



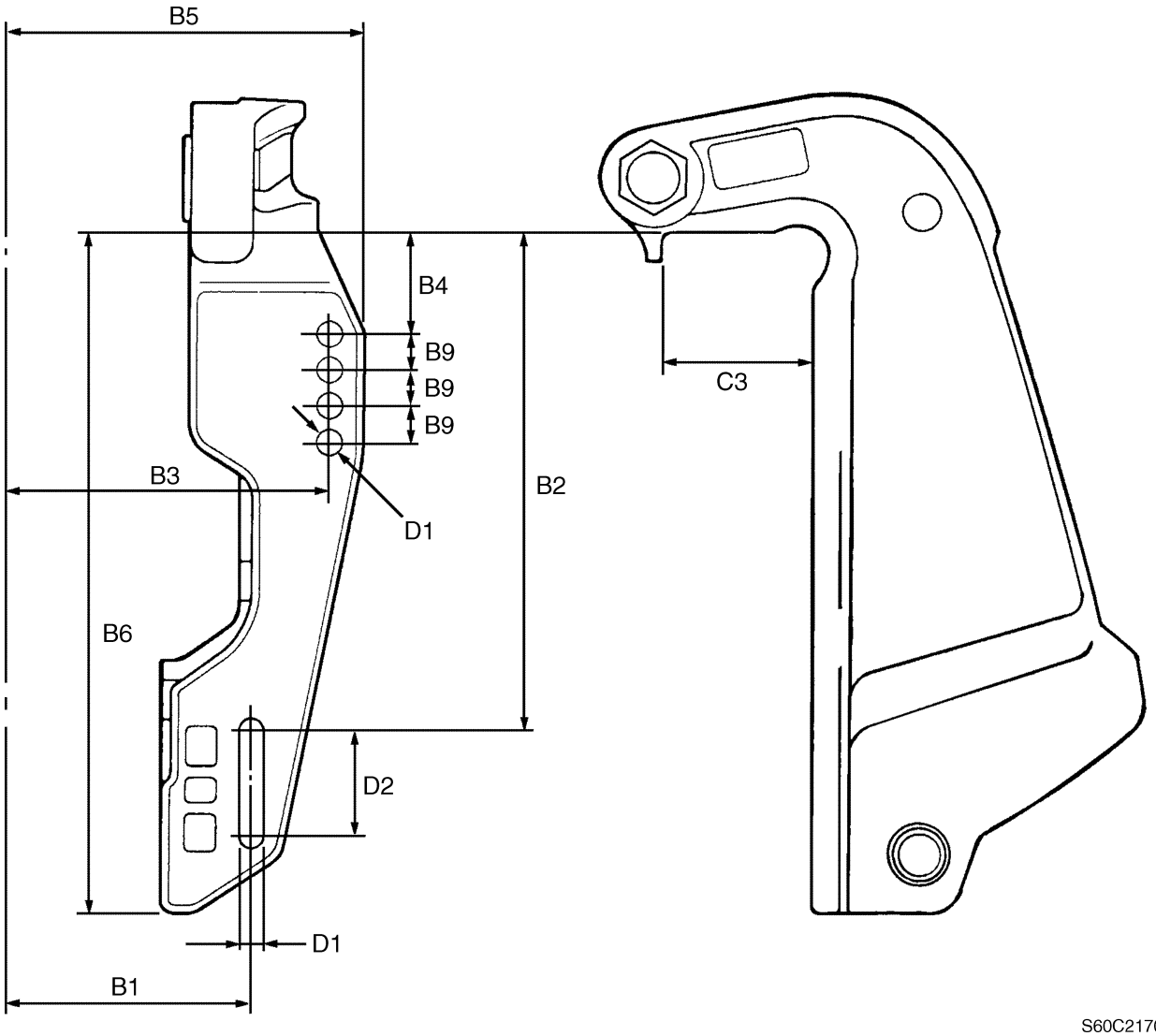
Symbol		Unit	Model	
			F100BET	F100CET
L1		mm (in)	664 (26.1)	647 (25.5)
L2		mm (in)	161 (6.3)	171 (6.7)
L3		mm (in)	—	
L4		mm (in)	631 (24.8)	574 (22.6)
L5	(L)	mm (in)	69 (2.7)	65 (2.6)
	(X)	mm (in)	76 (3.0)	
L6	(L)	mm (in)	1,005 (39.6)	998 (39.3)
	(X)	mm (in)	1,122 (44.2)	1,115 (43.9)
L7		mm (in)	536 (21.1)	528 (20.8)
L8		mm (in)	158 (6.2)	164 (6.5)
L9	(L)	mm (in)	25 (1.0)	27 (1.1)
	(X)	mm (in)	25 (1.0)	27 (1.1)
L10		mm (in)	75 (3.0)	62 (2.4)
H1	(L)	mm (in)	929 (36.6)	917 (36.1)
	(X)	mm (in)	1,056 (41.6)	1,040 (40.9)
H2		mm (in)	667 (26.3)	666 (26.2)
H3		mm (in)	191 (7.5)	
H4	(L)	mm (in)	516 (20.3)	537 (21.1)
	(X)	mm (in)	643 (25.3)	664 (26.1)
H5		mm (in)	—	
H6	(L)	mm (in)	776 (30.6)	767 (30.2)
	(X)	mm (in)	854 (33.6)	844 (33.2)
H7		mm (in)	388 (15.3)	366 (14.4)
H8		mm (in)	14 (0.6)	27 (1.1)
H9		mm (in)	877 (34.5)	856 (33.7)
H10		mm (in)	44 (1.7)	48 (1.9)
H11		mm (in)	25 (1.0)	24 (0.9)
W1		mm (in)	243 (9.6)	240 (9.4)
W2		mm (in)	—	
W3		mm (in)	—	
W4		mm (in)	—	
W5		mm (in)	384 (15.1)	405 (15.9)
W6		mm (in)	—	
A1		Degree	30	35
A2		Degree	70	
A3		Degree	4	
T1		mm (in)	660 (26.0)	

Exterior (Tiller handle model)



Symbol		Unit	Model	
			F100BET	F100CET
L1		mm (in)	664 (26.1)	651 (25.6)
L2		mm (in)	316 (12.4)	268.3 (10.5)
L3		mm (in)	832 (32.8)	792.7 (31.2)
L4		mm (in)	631 (24.8)	574 (22.6)
L5	(L)	mm (in)	69 (2.7)	65 (2.6)
	(X)	mm (in)	76 (3.0)	
L6	(L)	mm (in)	1,005 (39.6)	998 (39.3)
	(X)	mm (in)	1,122 (44.2)	1,115 (43.9)
L7		mm (in)	536 (21.1)	528 (20.8)
L8		mm (in)	294 (11.6)	270.5 (10.6)
L9	(L)	mm (in)	25 (1.0)	27 (1.1)
	(X)	mm (in)	25 (1.0)	27 (1.1)
L10		mm (in)	75 (3.0)	62 (2.4)
H1	(L)	mm (in)	929 (36.6)	917 (36.1)
	(X)	mm (in)	1,056 (41.6)	1,040 (40.9)
H2		mm (in)	667 (26.3)	666 (26.2)
H3		mm (in)	191 (7.5)	
H4	(L)	mm (in)	516 (20.3)	537 (21.1)
	(X)	mm (in)	643 (25.3)	664 (26.1)
H5		mm (in)	748 (29.4)	743.2 (29.3)
H6	(L)	mm (in)	776 (30.6)	767 (30.2)
	(X)	mm (in)	854 (33.6)	844 (33.2)
H7		mm (in)	388 (15.3)	366 (14.4)
H8		mm (in)	105 (4.1)	76.3 (3.0)
H9		mm (in)	877 (34.5)	856 (33.7)
H10		mm (in)	44 (1.7)	48 (1.9)
H11		mm (in)	25 (1.0)	24 (0.9)
W1		mm (in)	243 (9.6)	240 (9.4)
W2		mm (in)	93 (3.7)	
W3		mm (in)	—	
W4		mm (in)	—	
W5		mm (in)	384 (15.1)	405 (15.9)
W6		mm (in)	574 (22.6)	610.1 (24.0)
A1		Degree	30	35
A2		Degree	70	
A3		Degree	4	
T1		mm (in)	—	

Clamp bracket



S60C2170

Symbol	Unit	Model	
		F100BET	F100CET
B1	mm (in)	125.4 (4.9)	
B2	mm (in)	254 (10.0)	
B3	mm (in)	163.5 (6.4)	
B4	mm (in)	50.8 (2.0)	
B5	mm (in)	180 (7.1)	
B6	mm (in)	367 (14.4)	347 (13.7)
B7	mm (in)	—	
B8	mm (in)	—	
B9	mm (in)	18.5 (0.7)	
C2	mm (in)	—	
C3	mm (in)	82 (3.2)	80 (3.1)
D1	mm (in)	13 (0.5)	
D2	mm (in)	55.5 (2.2)	

Tightening torques

Specified torques

Part to be tightened		Thread size	Tightening torques		
			N·m	kgf·m	ft·lb
Power unit					
Flywheel magnet nut		—	186	18.6	135
Negative battery lead bolt		M8	9	0.9	6.5
Positive battery lead nut		—	9	0.9	6.5
Power unit bolt		M10	42	4.2	30
Apron bolt		M6	4	0.4	2.9
Drive sprocket nut		—	265	26.5	192
Tensioner bolt		M10	39	3.9	28
Driven sprocket bolt		M10	60	6.0	43
Cover screw		M6	4	0.4	2.9
Hour meter screw		—	2	0.2	1.4
Ignition coil bolt		M6	8	0.8	5.8
Ground lead bolt		M6	8	0.8	5.8
Oil pressure switch		—	8	0.8	5.8
Oil pressure switch lead bolt		M4	2	0.2	1.4
Cylinder head cover bolt		M6	8	0.8	5.8
Breather cover screw		M4	2	0.2	1.4
Fuel pump bracket bolt		M7	17	1.7	12
Camshaft cap bolt	1st	M7	8	0.8	5.8
	2nd		17	1.7	12
Spark plug		—	25	2.5	18
Cylinder head bolt	1st	M8	14	1.4	10
	2nd		28	2.8	20
	1st	M10	15	1.5	11
	2nd		30	3.0	22
	3rd		Turn 90°		
Exhaust cover bolt	1st	M6	6	0.6	4.3
	2nd		12	1.2	8.7
Oil filter		—	18	1.8	13
Plug		M14	23	2.3	17
Crankcase bolt	1st	M8	14	1.4	10
	2nd		28	2.8	20
	1st	M10	19	1.9	14
	2nd		Turn 60°		
Connecting rod cap bolt	1st	M8	18	1.8	13
	2nd		Turn 90°		

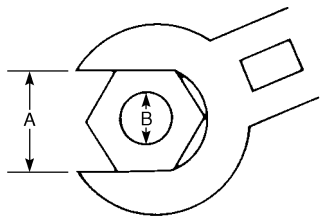
Specifications

Part to be tightened		Thread size	Tightening torques		
			N·m	kgf·m	ft·lb
Lower unit (F100B)					
Check screw		—	7	0.7	5.1
Lower unit bolt		M10	39	3.9	28
Drain screw		—	7	0.7	5.1
Propeller nut		—	55	5.5	40
Trim tab bolt		M10	42	4.2	30
Ring nut		—	103	10.3	74
Pinion nut		—	93	9.3	67
Water inlet cover screw		—	4	0.4	2.9
Lower unit (F100C)					
Check screw		—	7	0.7	5.1
Lower unit bolt		M10	39	3.9	28
Drain screw		—	7	0.7	5.1
Propeller nut		—	34	3.4	25
Ring nut		—	103	10.3	74
Pinion nut		—	93	9.3	67
Water inlet cover screw		—	5	0.5	3.6
Bracket unit					
Tiller handle assembly nut		—	37	3.7	27
Engine shut-off switch nut		—	4	0.4	2.9
Engine start switch nut		—	4	0.4	2.9
Tiller handle bracket bolt		M10	37	3.7	27
Oil pump assembly bolt		M6	11	1.1	8.0
Oil pump cover screw		M6	4	0.4	2.9
Upper mount nut		—	53	5.3	38
Lower mount nut	F100B	—	73	7.3	53
	F100C	—	53	5.3	38
Upper mount bolt		M8	26	2.6	19
Muffler assembly bolt		M8	20	2.0	14
Baffle plate screw		M6	4	0.4	2.9
Oil strainer bolt		M6	11	1.1	8.0
Oil pan bolt		M6	11	1.1	8.0
Exhaust manifold bolt		M6	11	1.1	8.0
Clamp bracket self-locking nut		—	15	1.5	11
Trim sensor screw		M6	2	0.2	1.4

Part to be tightened	Thread size	Tightening torques		
		N·m	kgf·m	ft·lb
Power trim and tilt unit (F100B)				
Reservoir bolt	M6	5	0.5	3.6
Reservoir cap	—	7	0.7	5.1
PTT motor bolt	M6	5	0.5	3.6
Manual valve	—	3	0.3	2.2
Gear pump assembly bolt	M8	9	0.9	6.5
Gear pump bolt	M5	6	0.6	4.3
Tilt cylinder end screw	—	130	13	94
Tilt piston nut	—	100	10	72
Trim cylinder end screw	—	80	8.0	58
Power trim and tilt unit (F100C)				
Tilt cylinder end screw	—	90	9.0	65
Reservoir cap	—	7	0.7	5.1
Pump housing assembly	—	9	0.9	6.5
Trim cylinder end screw	—	80	8.0	58
Tilt piston bolt	M12	85	8.5	61
Gear pump bolt	M6	8	0.8	5.8
Main valve	—	11	1.1	8.0
Manual valve	—	2	0.2	1.4
Manual valve seat	—	4	0.4	2.9
Electrical unit				
Throttle position sensor screw	—	4	0.4	2.9

General torques

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



S60C2190

Nut (A)	Bolt (B)	General torque specifications		
		N·m	kgf·m	ft·lb
8 mm	M5	5	0.5	3.6
10 mm	M6	8	0.8	5.8
12 mm	M8	18	1.8	13
14 mm	M10	36	3.6	25
17 mm	M12	43	4.3	31

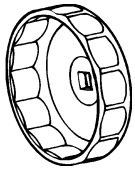
— MEMO —

CHK
ADJ

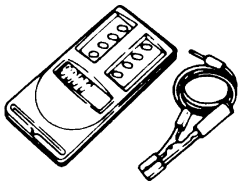
Periodic checks and adjustments

3

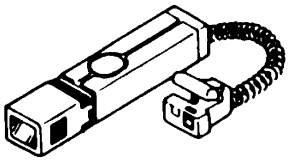
Special service tools



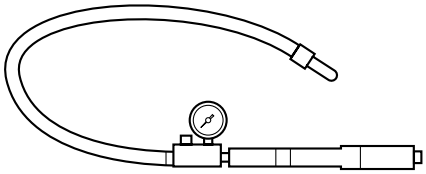
Oil filter wrench
90890-01426



Digital tachometer
90890-06760



Timing light
90890-03141



Leakage tester
90890-06762

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
		10 hours (Break-in)	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	500 hours (every 30 months)	1000 hours (every 5 years)	
Top cowling								
Top cowling fit	Check/adjust	○			○			3-4
Fuel system								
Fuel joint and fuel hoses	Check	○			○			3-4
Fuel filter	Check/replace	○		○				3-4
Fuel tank(*1)	Clean				○			—
Power unit								
Ignition timing	Check	○						3-11
Engine oil	Check/change	○		○				3-5
Oil filter	Change				○			3-5
Oil pump	Check					○		7-17, 7-59
Timing belt(*2)	Check/replace				○		○	3-7
Valve clearance	Check/adjust					○		5-6
Spark plugs	Clean/adjust/replace	○			○	○		3-7
Piston rings	Check/replace						○	5-41
Thermostat	Check				○			3-8
Pressure control valve	Check					○		—
Oil leakage	Check/replace	○	○	○				—
Flywheel magnet nut	Check	○						—
Carburetor(*3)	Check				○			—
Motor exterior	Check			○				—
Cooling water passage(*4)	Clean			○				—
Control system								
Carburetor link	Check/adjust				○			4-17
Throttle cable	Check/adjust				○			3-9
Shift cable	Check/adjust				○			3-10
Engine idle speed	Check/adjust	○			○			3-10
Power trim and tilt unit								
Power trim and tilt unit	Check				○			3-12

Periodic checks and adjustments

Item	Remarks	Initial		Every				Refer to page
		10 hours (Break-in)	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	500 hours (every 30 months)	1000 hours (every 5 years)	
Lower unit								
Gear oil	Change	○		○				3-13
Impeller/Woodruff key	Check/replace					○		6-8, 6-36
Oil seals	Check/replace			○				—
Drive shaft	Check/replace					○		6-18, 6-46
Propeller	Check			○				3-14
General								
Anodes/Trim tab	Check/replace	○	○	○	○			3-14
Battery	Check/charge				○			3-15
Wiring and connectors	Adjust/reconnect	○			○			—
Nuts and bolts(*5)	Tighten	○			○			—
Lubrication points	Lubricate			○				3-16
Rubber seals	Replace						○	—
Bearings	Check/replace						○	—
Exhaust system deterioration	Check/replace						○	—

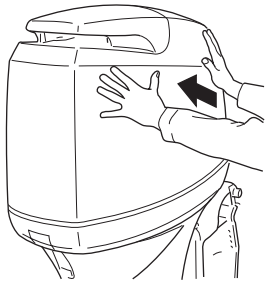
NOTE:

(*1) If equipped with a portable fuel tank.
(*2) Be sure to replace the timing belt every 1,000 hours of operation or every five years.
(*3) Do not adjust the carburetor if it is operating correctly.
(*4) The engine should be flushed with fresh water after operating in salt, turbid, or muddy water.
(*5) Do not retighten the cylinder head and crankcase bolts.

Top cowling

Checking the top cowling

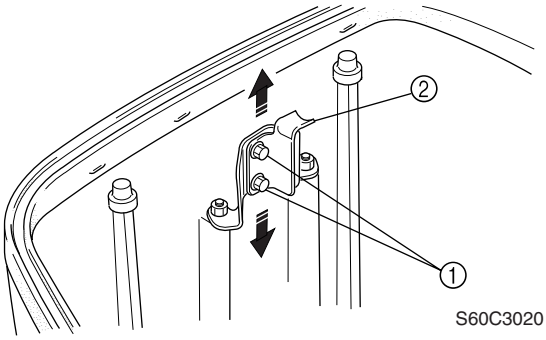
1. Check the fitting by pushing the cowling with both hands. Adjust if necessary.



S60C3010

2. Loosen the bolts ①.

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



S60C3020

NOTE:

- To loosen the fitting, move the hook toward the seal.
- To tighten the fitting, move the hook away from the seal.

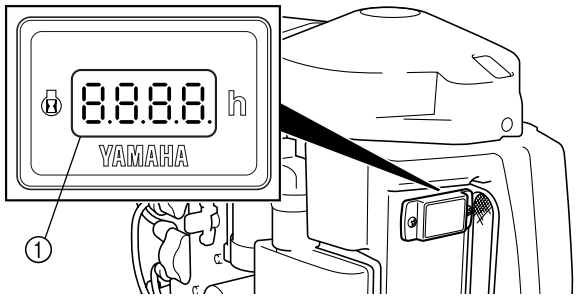
4. Tighten the bolts.

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

Checking the hour meter

1. Turn the engine start switch to ON.

2. Check that the total hours of operation are displayed after the entire LED ① has been illuminated for two seconds. Replace if LED does not illuminate.

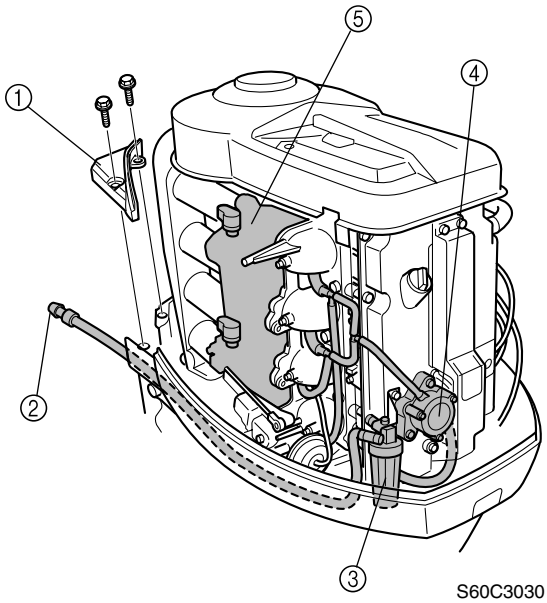


S60C3730

Fuel system

Checking the fuel joint and fuel hoses (fuel joint-to-carburetor)

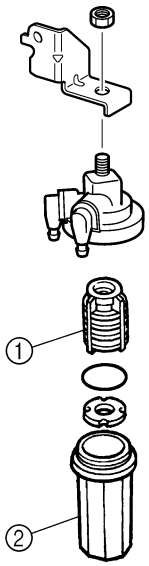
1. Remove the plate ①, and then check the fuel hose connections and fuel joint ② for leaks. Replace if necessary. Also, check the fuel filter ③, fuel pump ④, and carburetor ⑤ for leaks, and the fuel hoses for leaks and deterioration. Replace if necessary.



S60C3030

Checking the fuel filter

1. Check the fuel filter element ① for dirt and residue and check the fuel filter cup ② for foreign substances and cracks. Clean with straight gasoline and replace the cup if necessary.



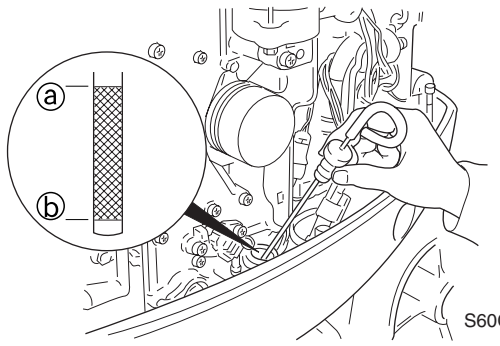
S60C3040

NOTE:
Be sure not to spill any fuel when removing the fuel filter cup.

Power unit

Checking the engine oil

1. Place the outboard motor in an upright position.
2. Remove the engine oil dipstick, wipe it clean, and then insert it back into the oil filler hole.
3. Remove the dipstick again to check the oil level, and the oil for discoloration and its viscosity.

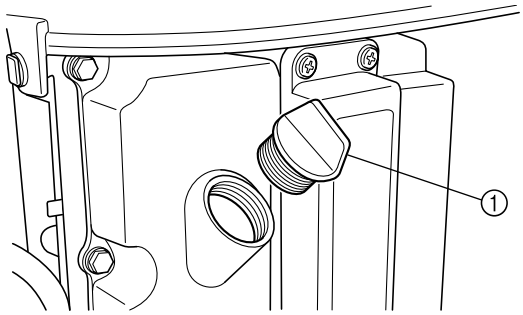


S60C3050

NOTE:
- Change the oil if it appears milky or black.
- If the engine oil is above the maximum level mark ⓐ, drain sufficient oil until the level is between ⓐ and ⓑ.
- If the engine oil is below the minimum level mark ⓑ, add sufficient oil until the level is between ⓐ and ⓑ.

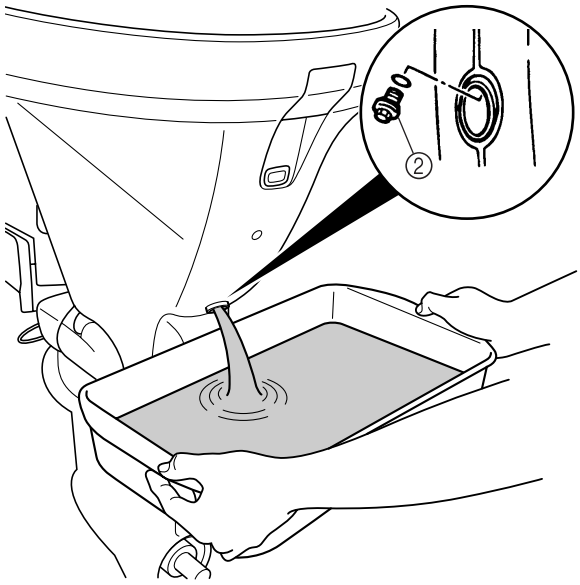
Changing the engine oil

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

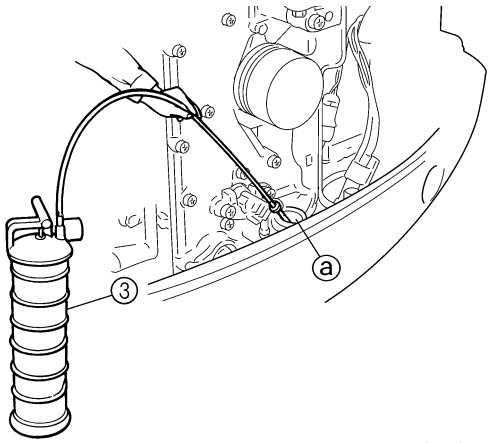


S60C3060

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



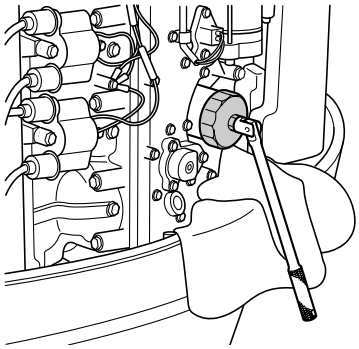
S60C3070



S60C3075

NOTE:
To extract and change the oil through the dipstick hole ⓐ, you can use an oil changer ③ like the one shown in the illustration.

3. Place a rag under the oil filter, and then remove the filter.



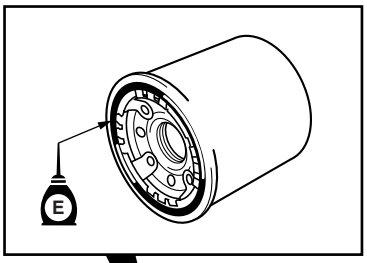
S60C3080

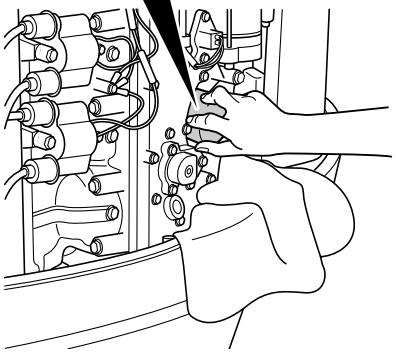
	Oil filter wrench: 90890-01426

NOTE:
Be sure to clean up any oil spills.

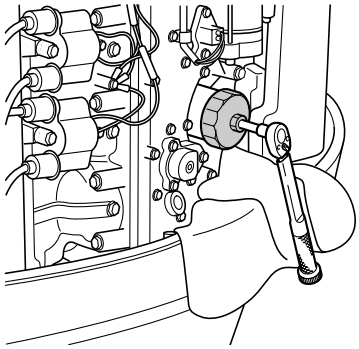
4. Apply a thin coat of engine oil to the O-ring of the new oil filter.

5. Install the oil filter, and then tighten it to the specified torque.





S60C3090



S60C3100

	Oil filter wrench: 90890-01426

	Oil filter: 18 N·m (1.8 kgf·m, 13 ft·lb)

6. Install the drain bolt, and then tighten it to the specified torque.

	Drain bolt: 28 N·m (2.8 kgf·m, 20 ft·lb)

3

7. 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, or SH
SAE: 10W-30, 10W-40, or 20W-40
Oil quantity:
With oil filter replacement:
4.7 L (5.0 US qt, 4.1 Imp qt)
Without oil filter replacement:
4.5 L (4.8 US qt, 4.0 Imp qt)

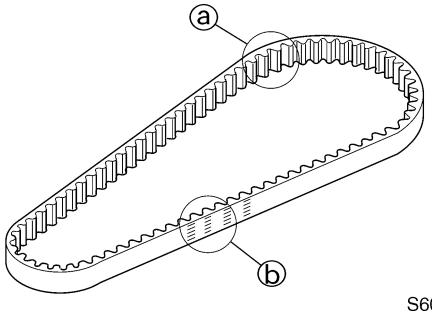
8. Install the oil filler cap and dipstick, and then start the engine and warm it up for 5 minutes.

9. Turn the engine off, and then check the oil level and correct it if necessary.

Checking the timing belt

1. Remove the flywheel magnet cover.

2. While turning the flywheel magnet clockwise, check the interior ⓐ and the exterior ⓑ of the timing belt for cracks, damage, or wear. Replace if necessary.



S60C3110

CAUTION:

Do not turn the flywheel magnet counterclockwise, otherwise the valve system may be damaged.

Replacing the timing belt

NOTE:

For replacement procedures, see Chapter 5, “Removing the timing belt and sprockets”.

Checking the valve clearance

NOTE:

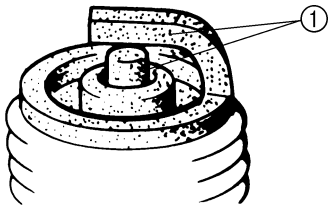
For checking procedures, see Chapter 5, “Checking the valve clearance”.

Checking the spark plugs

1. Remove the cover.

2. Disconnect the high-tension cords, and then remove the spark plugs.

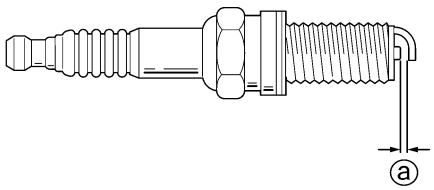
3. Clean the electrodes ① with a spark plug cleaner or wire brush. Replace the spark plug if necessary.



S60C3290

4. Check the electrodes for erosion and excessive carbon or other deposits, and the gasket for damage. Replace the spark plug if necessary.

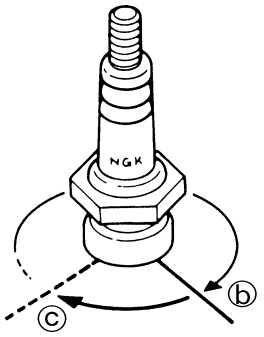
5. Check the spark plug gap ⓐ. Adjust if out of specification.



S60C3300

Specified spark plug:
LFR5A-11 (NGK)
Spark plug gap ⓐ:
1.0–1.1 mm (0.039–0.043 in)

6. Install the spark plug, tighten it finger tight ⓑ, then to the specified torque with a spark plug wrench ⓒ.

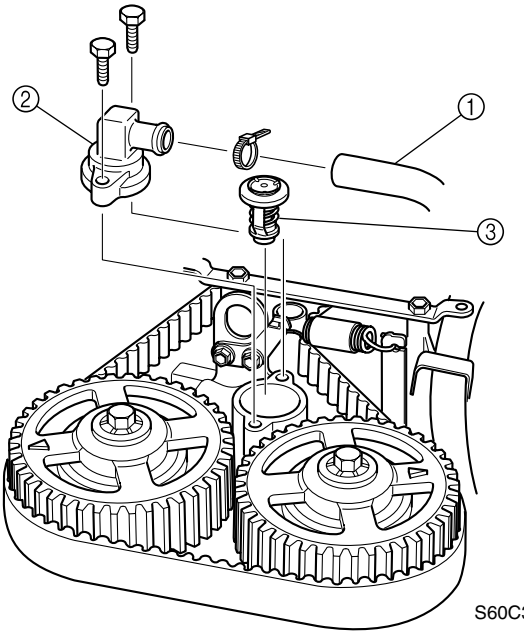


S60C3310

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

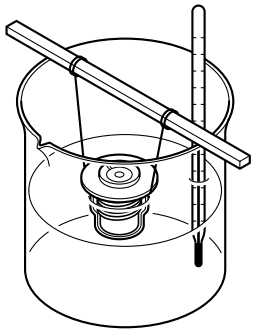
Checking the thermostat

1. Remove the flywheel magnet cover.
2. Disconnect the cooling water hose ①, and then remove the thermostat cover ② and thermostat ③.

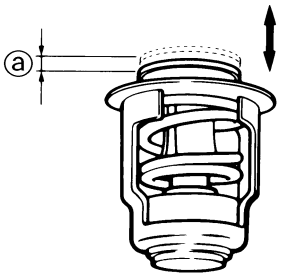


S60C3320

3. Suspend the thermostat in a container of water.
4. Place a thermometer in the water and slowly heat the water.


S60C3330

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



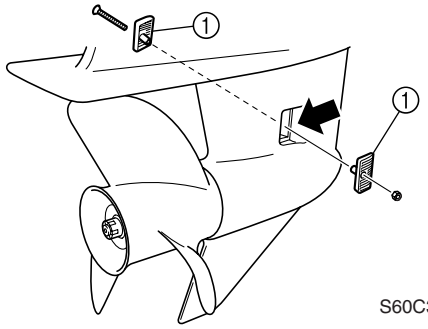
S60C3340

Water temperature	Valve lift ⓐ
50 °C (122 °F)	0 mm (0 in)– (When the valve begins to open.)
above 60 °C (140 °F)	more than 4.3 mm (0.17 in)

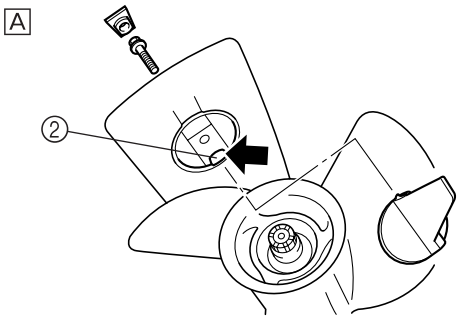
6. Install the thermostat, new gasket, thermostat cover, and then connect the cooling water hose.
7. Install the flywheel magnet cover.

Checking the cooling water passage

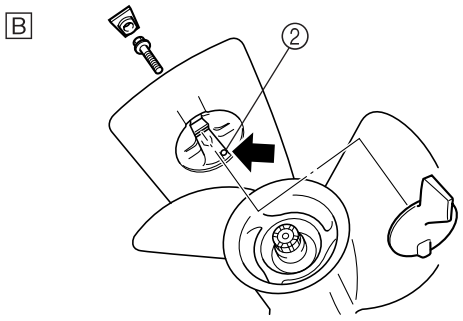
1. Check the cooling water inlet cover ① and cooling water inlet ② for clogs. Clean if necessary.



S60C3370



S60C3350

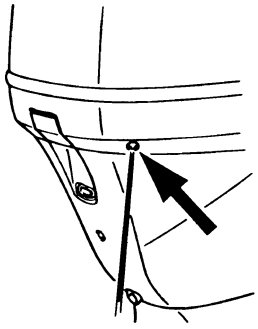


S60C3360

A F100B
B F100C

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

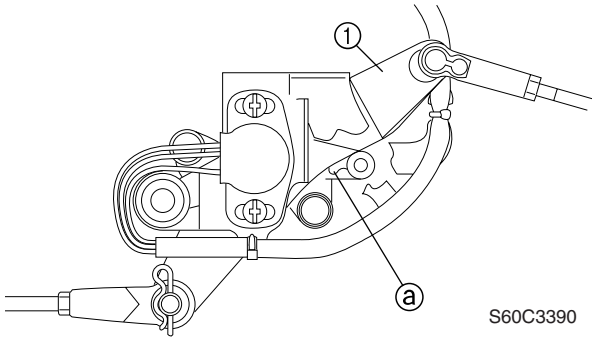
3. Check for water flow at the cooling water outlet. If there is no water flow, check the cooling water passage inside the outboard motor.


S60C3380

Control system

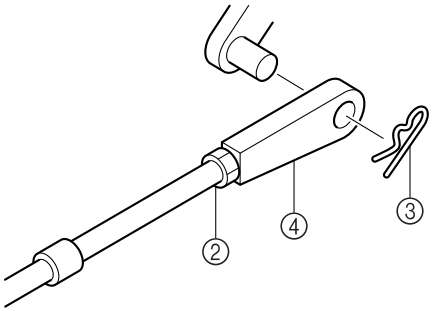
Checking the throttle cable operation

1. Check that the throttle control lever ① touches the fully closed stopper ⓐ when the remote control lever is in neutral or the throttle grip is fully closed. Adjust the throttle cable length, if necessary, as follows.



S60C3390

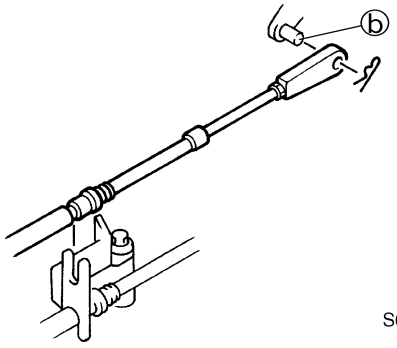
2. Loosen the locknut ②, remove the clip ③, and then disconnect the throttle cable joint ④.



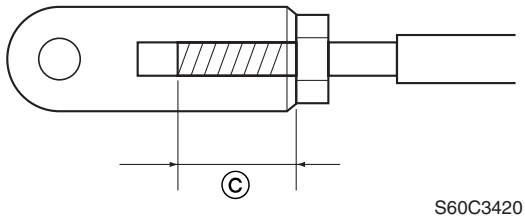
S60C3400

3. Contact the throttle control lever ① with the fully closed stopper ⓐ.

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



S60C3410



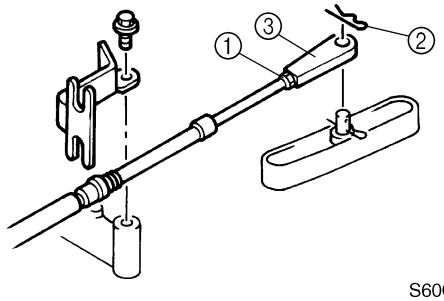
S60C3420

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

5. Connect the cable joint, install the clip, and then tighten the locknut.
6. Check the throttle cable for smooth operation and adjust the cable length, if necessary, repeating steps 2–6.

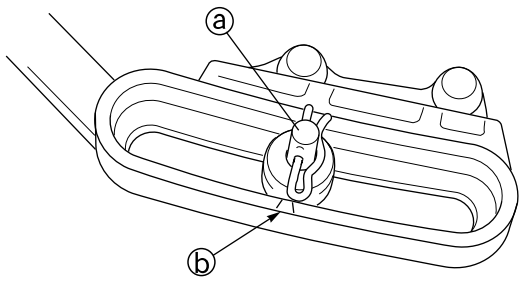
Checking the gearshift operation

1. Check that the gearshift operates smoothly when shifting from neutral into forward or reverse. Adjust the shift cable length if necessary.
2. Set the gearshift to the neutral position.
3. Loosen the locknut ①, remove the clip ②, and then disconnect the shift cable joint ③.



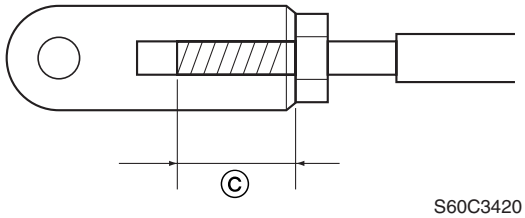
S60C3430

4. Align the set pin ⓐ in the center of the shift bracket and with the alignment mark ⓑ on the bracket.



S60C3440

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



S60C3420

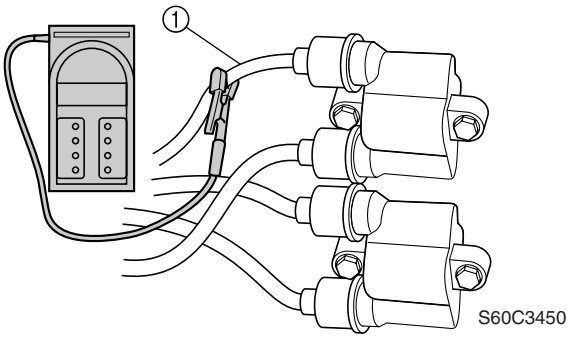
CAUTION:
The shift cable joint must be screwed in a minimum of 8.0 mm (0.31 in) ⓒ.

6. Connect the cable joint, install the clip, and then tighten the locknut.
7. Check the gearshift for smooth operation and adjust the shift cable length, if necessary, repeating steps 3–6.

Checking the engine idle speed

NOTE:
Be sure to check the engine idle speed before adjusting the pilot screw.

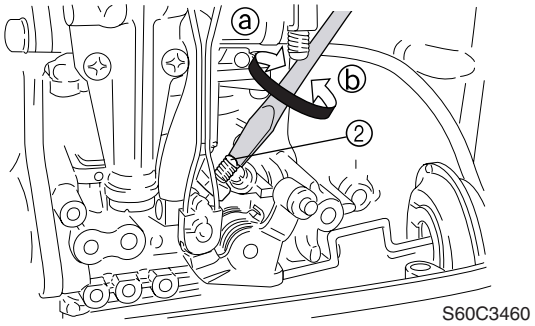
1. Start the engine and warm it up for 5 minutes.
2. Attach the special service tool to high-tension cord #1 ①, and then check the engine idle speed. Adjust if out of specification.



Digital tachometer: 90890-06760

Engine idle speed: 800–900 r/min

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



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

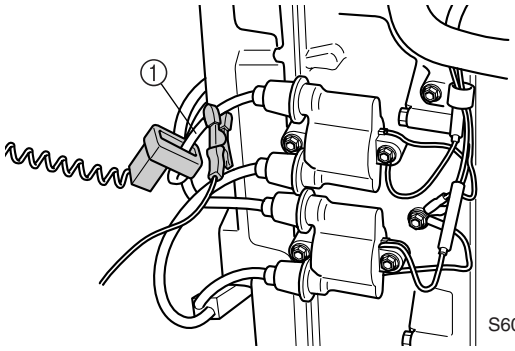
4. After adjusting the idle speed, rev the engine a few times and let it idle for at least 15 seconds to check the stability of the engine.

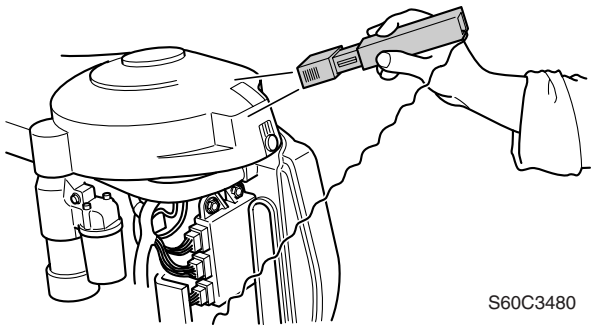
Checking the ignition timing

1. Start the engine and warm it up for 5 minutes.

2. Attach the special service tool to high-tension cord #1, and then check the engine idle speed.

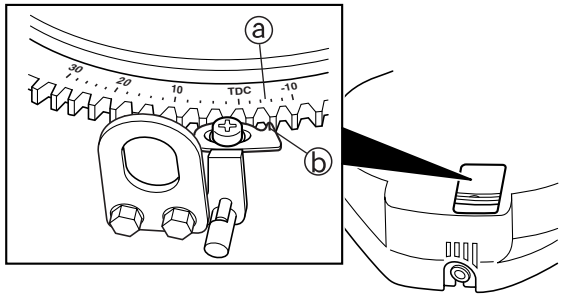
3. Attach the special service tool to high-tension cord #1 ①.





Timing light: 90890-03141

4. Check that the ignition timing mark (–5°) ⓐ on the flywheel magnet is aligned with the pointer ⓑ. Check the ignition system and ignition control system if necessary.



Ignition timing: ATDC 5°

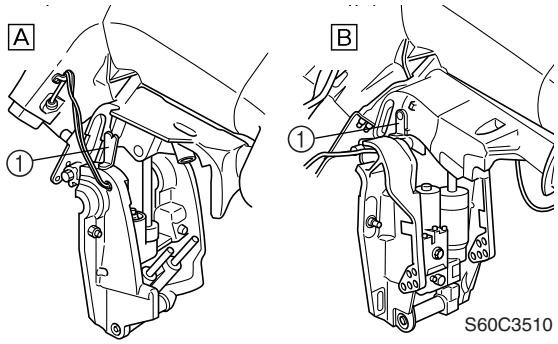
Power trim and tilt unit

Checking the power trim and tilt operation

1. Fully tilt the outboard motor up and down a few times and check the entire trim and tilt range for smooth operation. Check the power trim and tilt fluid level if necessary.

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

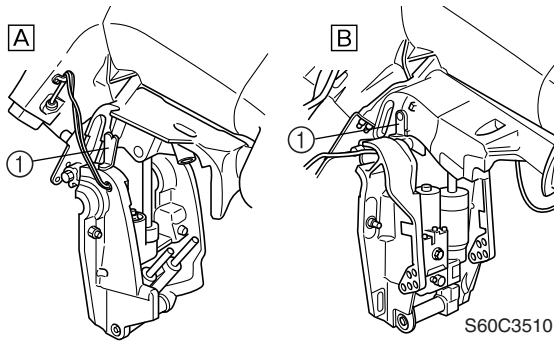
2. Fully tilt the outboard motor up, and then support it with the tilt stop lever ① to check the lock mechanism of the lever.



A F100B
B F100C

Checking the power trim and tilt fluid level

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

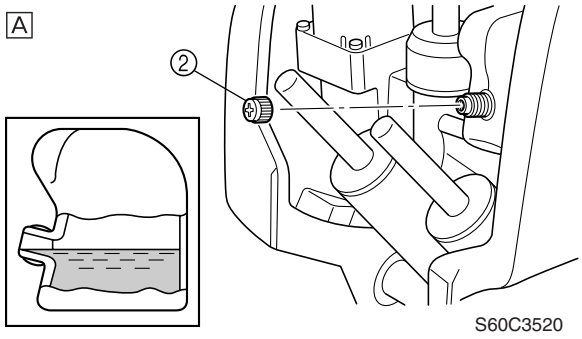


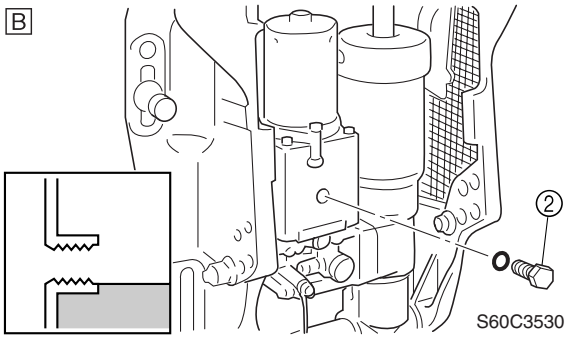
A F100B
B F100C

⚠ 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 power trim and tilt unit should lose fluid pressure.

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





A F100B
B F100C

NOTE:
If the fluid is at the correct level, the 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 power trim and tilt fluid:
ATF Dexron II

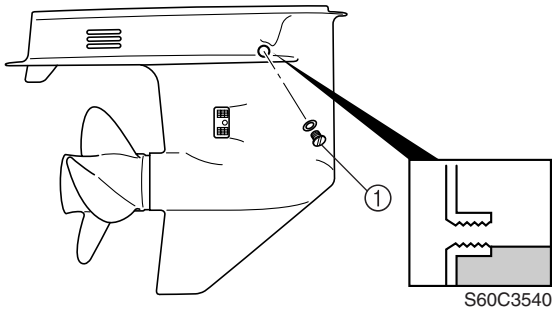
4. Install the reservoir cap, and then tighten it to the specified torque.

Reservoir cap:
7 N·m (0.7 kgf·m, 5.1 ft·lb)

Lower unit

Checking the gear oil level

1. Fully tilt the outboard motor down.
2. Remove the check screw ①, and then check the gear oil level in the lower case.



S60C3540

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

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

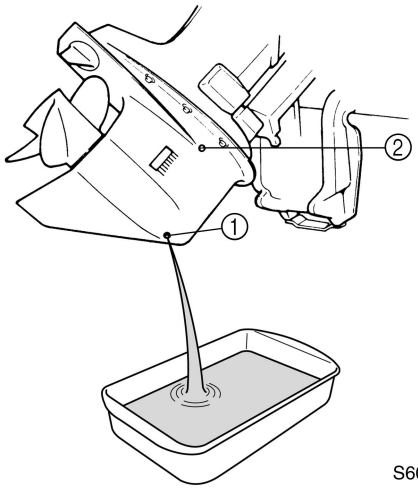
Recommended gear oil:
Hypoid gear oil
SAE: 90

4. Install the check screw, and then tighten it to the specified torque.

Check screw:
7 N·m (0.7 kgf·m, 5.1 ft·lb)

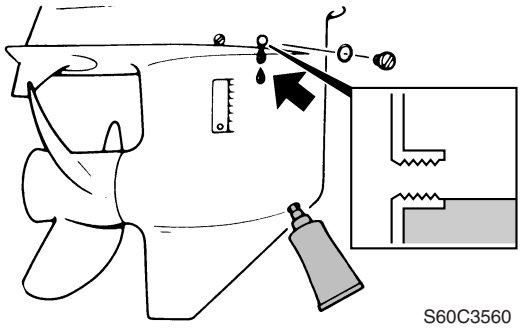
Changing the gear oil

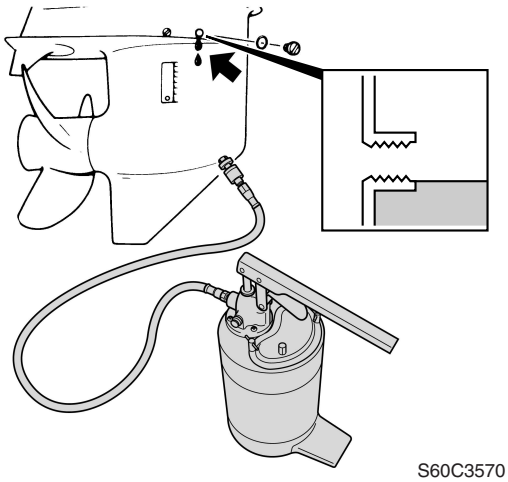
1. Tilt the outboard motor up slightly.
2. Place a drain pan under the drain screw ①, remove the drain screw, then the check screw ② to drain the oil.



S60C3550

3. Check the oil for metal, discoloration, and its viscosity. Check the internal parts of the lower case if necessary.
4. Insert the gear oil tube or gear oil pump into the drain hole and slowly fill the gear oil until oil flows out of the check hole and no air bubbles are visible.


S60C3560


S60C3570

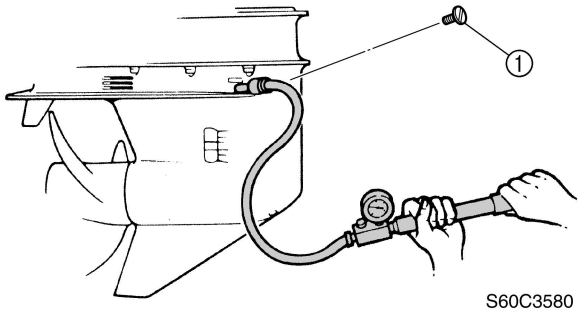
Recommended gear oil:
Hypoid gear oil
SAE: 90
Oil quantity:
F100B:
0.785 L (0.83 US qt, 0.69 Imp qt)
F100C:
0.670 L (0.71 US qt, 0.59 Imp qt)

5. Install the check screw, quickly install the drain screw, and then tighten them to the specified torque.

Check and drain screw:
7 N·m (0.7 kgf·m, 5.1 ft·lb)

Checking the lower unit (for air leakage)

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



S60C3580

Leakage tester: 90890-06762

2. Apply the specified pressure to check whether the lower unit can hold it for at least 10 seconds.

CAUTION:

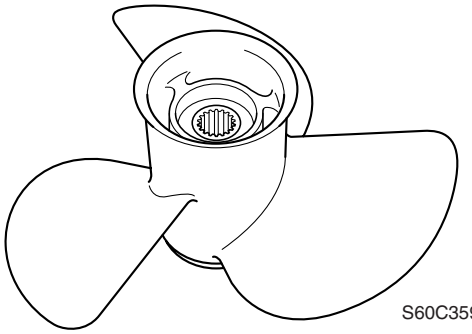
Do not over pressurize the lower unit, otherwise the oil seals may be damaged.

Lower unit holding pressure:
100 kPa (1.0 kgf/cm^2, 14 psi)

3. If pressure drops below specification, check the drive shaft and propeller shaft oil seals for damage.

Checking the propeller

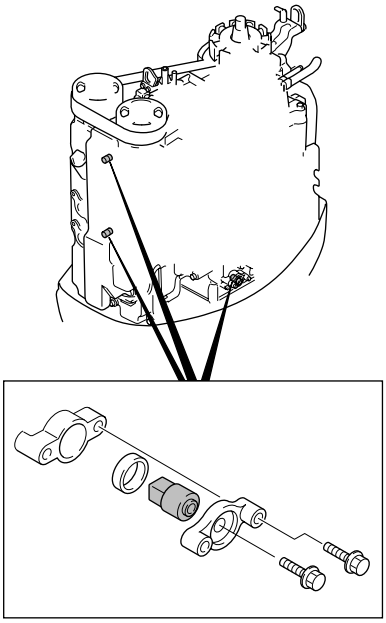
1. Check the propeller blades and splines for cracks, damage, or wear. Replace if necessary.


S60C3590

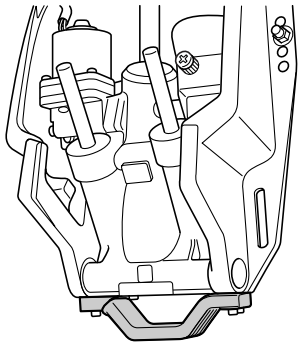
General

Checking the anodes

1. Check the anodes and trim tab for scales, grease, or oil. Clean if necessary.

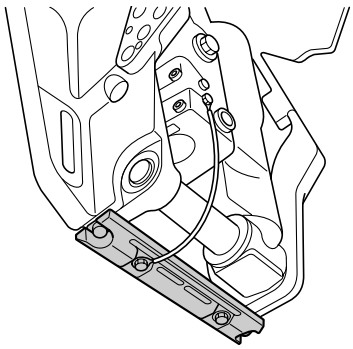

S60C3600

A



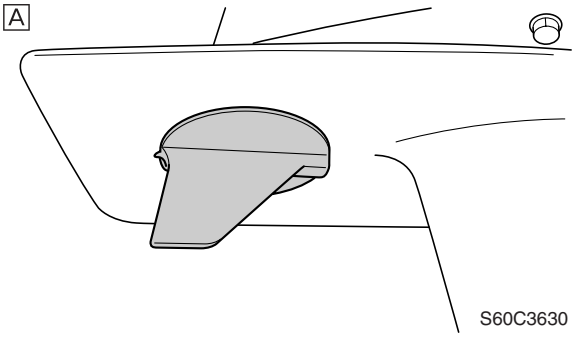
S60C3610

B



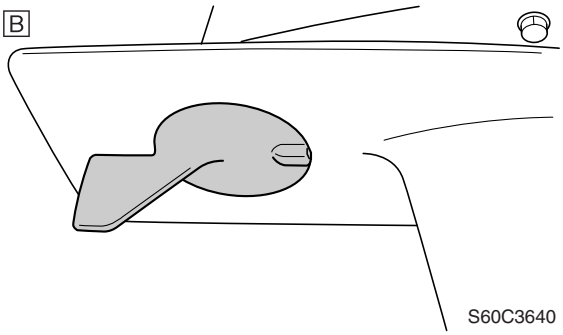
S60C3620

A



S60C3630

B



S60C3640

A F100B
B F100C

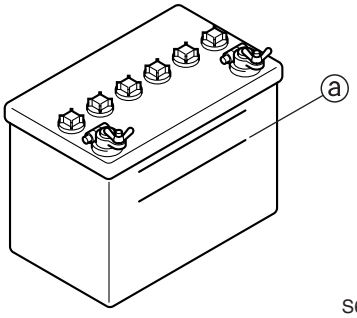
CAUTION:

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

2. Replace the anodes and trim tab if excessively eroded.

Checking the battery

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



S60C3650

2. Check the specific gravity of the electrolyte. Fully charge the battery if out of 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.**

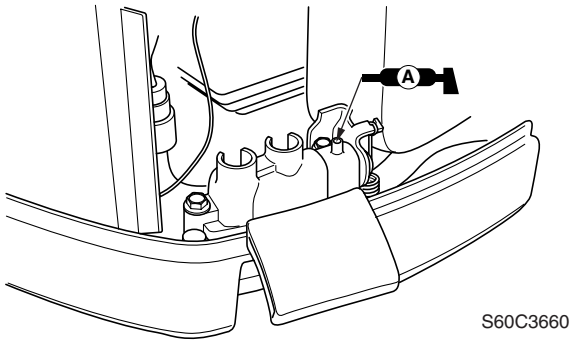
KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.

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 lead first, then the positive lead.

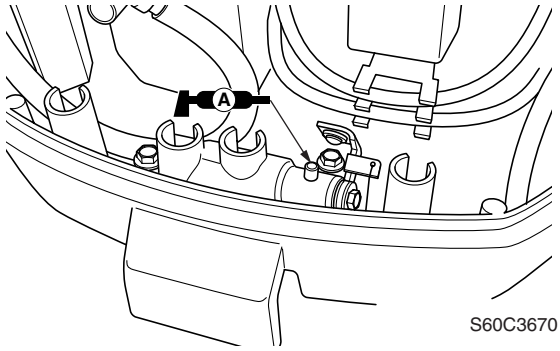
Electrolyte specific gravity:
1.280 at 20 °C (68 °F)

Lubrication

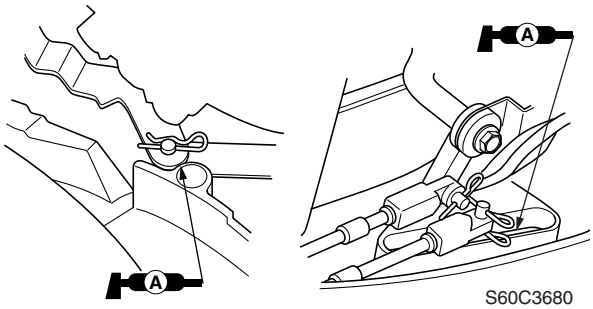
1. Apply water resistant grease to the areas shown.



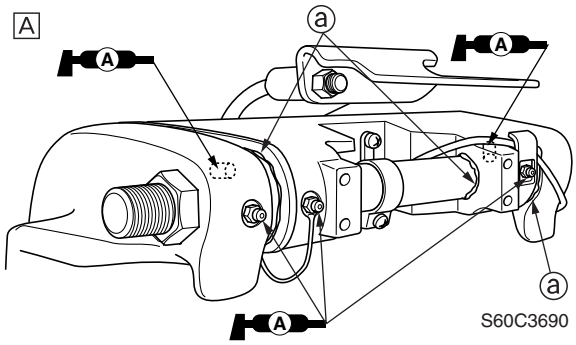
S60C3660



S60C3670

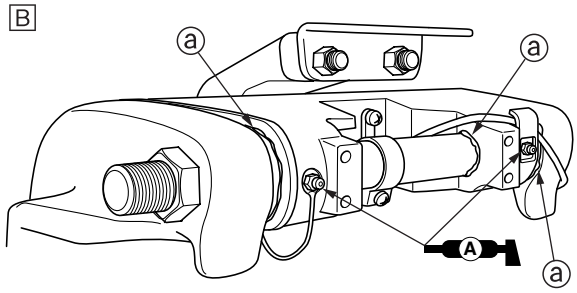


S60C3680



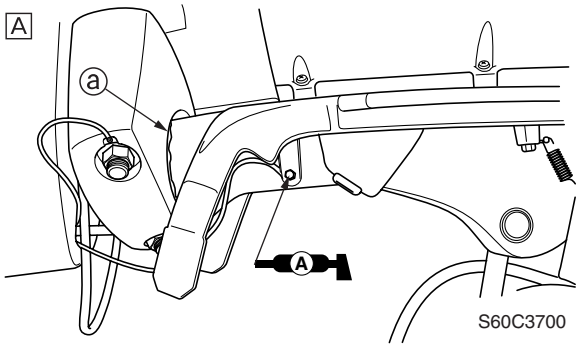
S60C3690

B



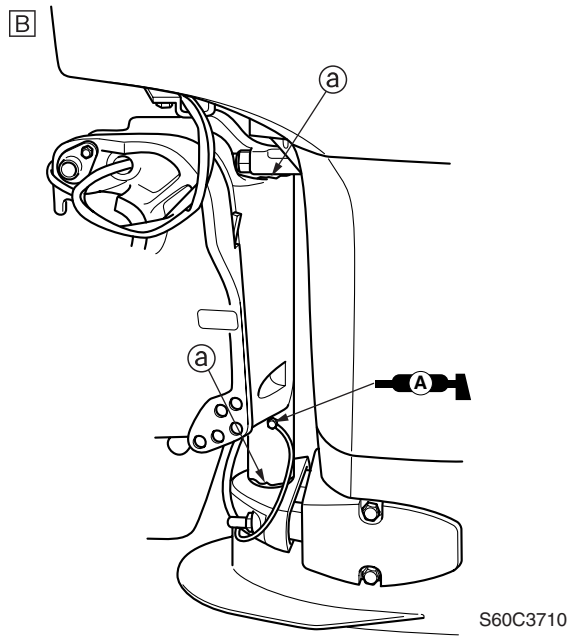
S60C3695

A



S60C3700

B

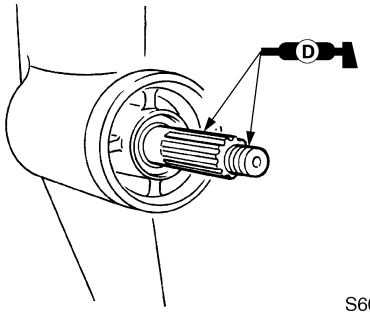


S60C3710

A F100B
B F100C

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

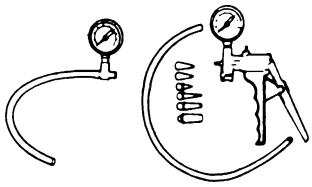
2. Apply corrosion resistant grease to the areas shown.



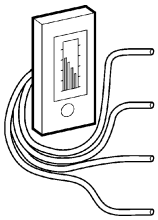
S60C3720

Fuel system

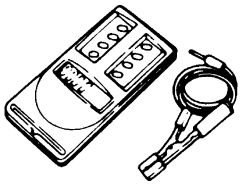
Special service tools



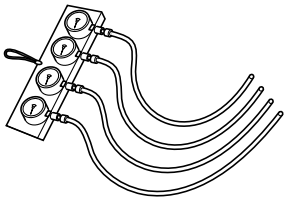
Vacuum/pressure pump gauge set
90890-06756



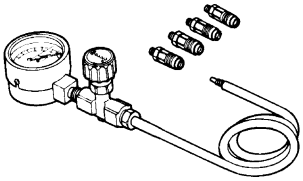
Vacuum gauge (digital)
(commercially obtainable)



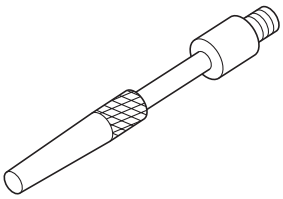
Digital tachometer
90890-06760



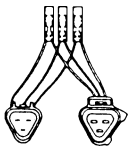
Vacuum gauge (4 analog meters)
(commercially obtainable)



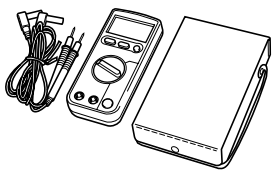
Vacuum gauge
90890-03159



Vacuum gauge adaptor
(commercially obtainable)



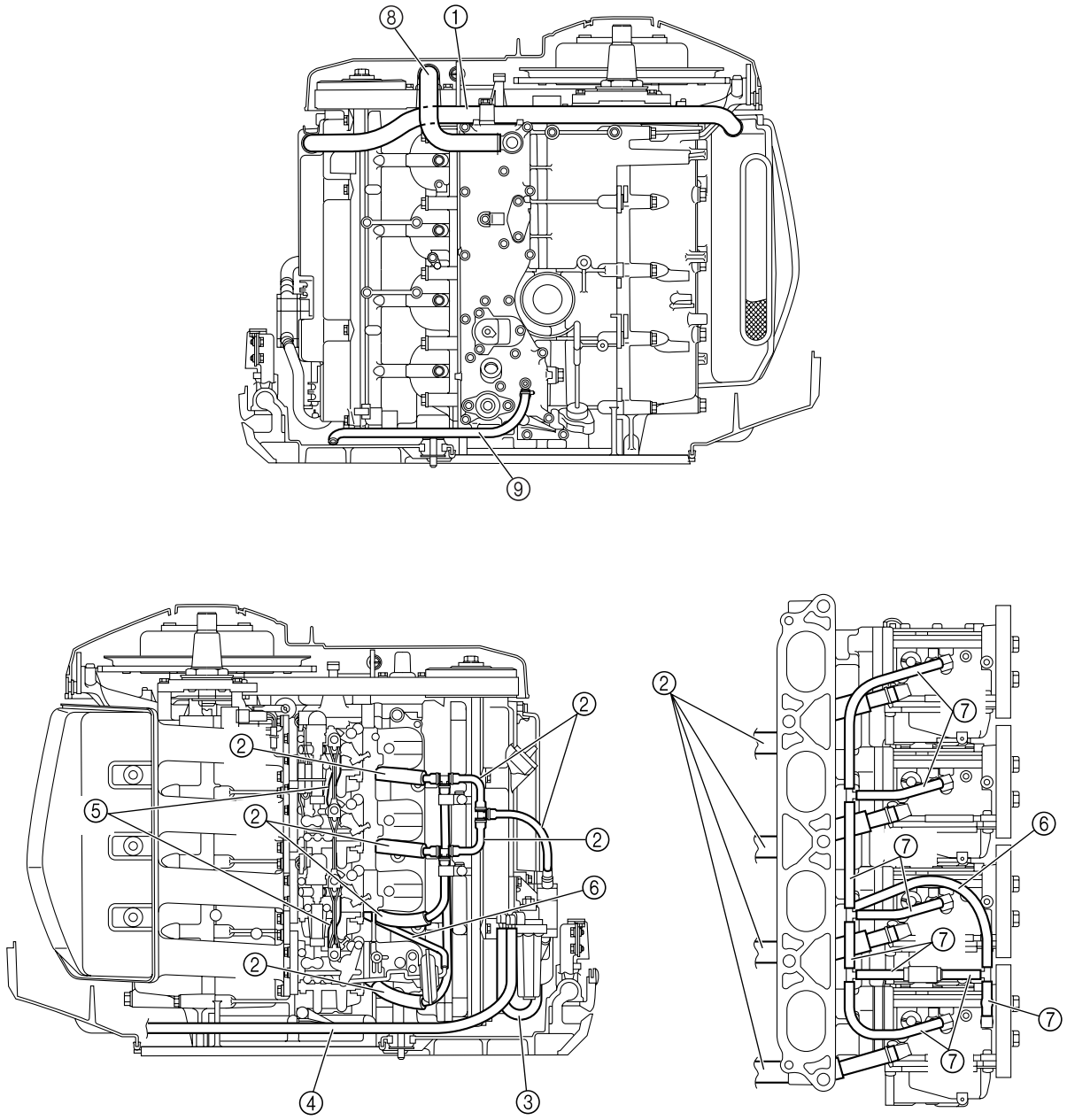
Test harness (3 pins)
90890-06757



Digital circuit tester
90890-03174

Hose routing

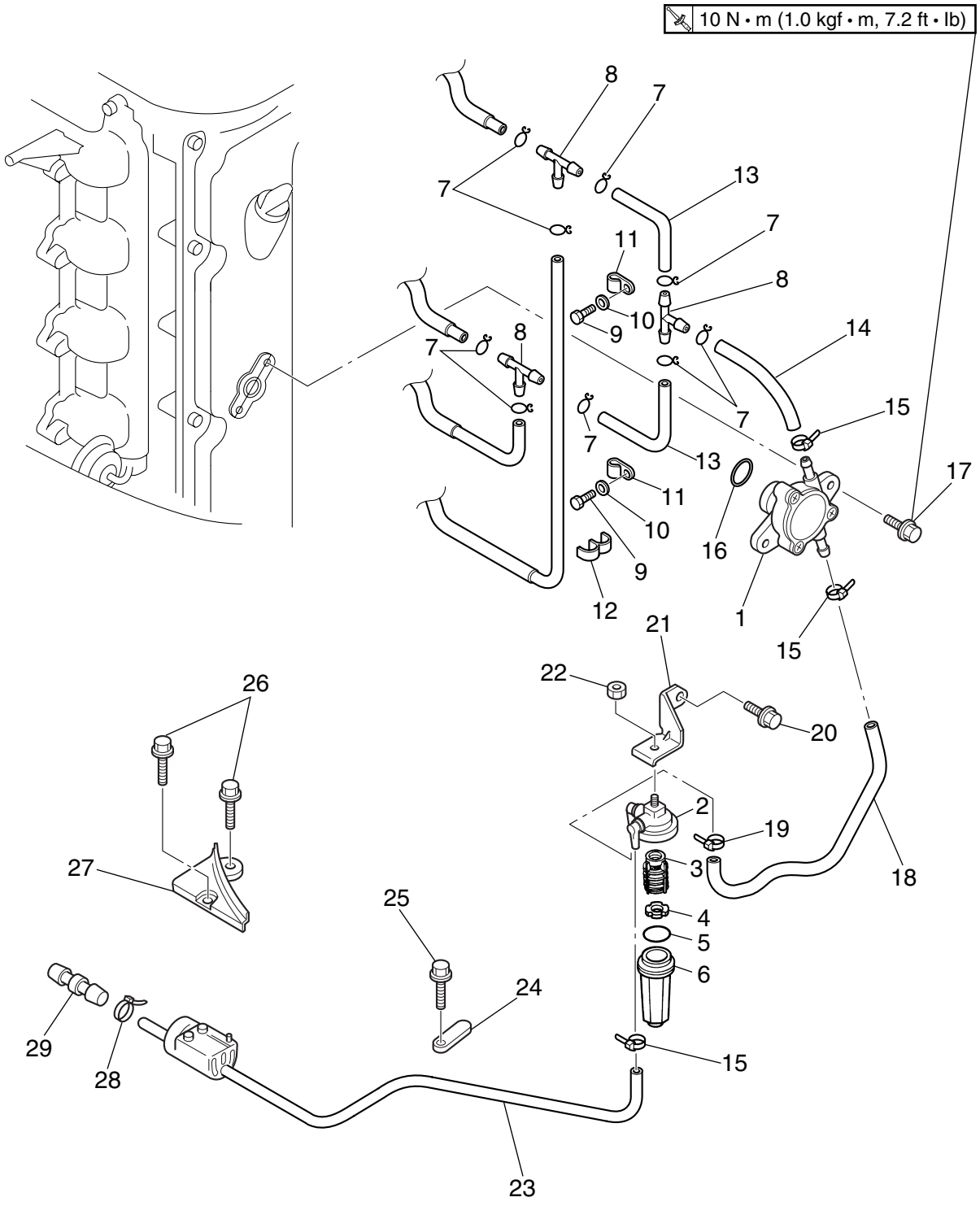
Fuel, blowby, and cooling water hoses



S60C4010

① Blowby hose
② Fuel hose (fuel pump-to-carburetor)
③ Fuel hose (fuel filter-to-fuel pump)
④ Fuel hose (fuel joint-to-fuel filter)
⑤ Fuel hose (carburetor-to-carburetor)
⑥ Hose (acceleration pump-to-carburetor)
⑦ Hose (carburetor-to-carburetor)
⑧ Cooling water hose
⑨ Pilot water hose

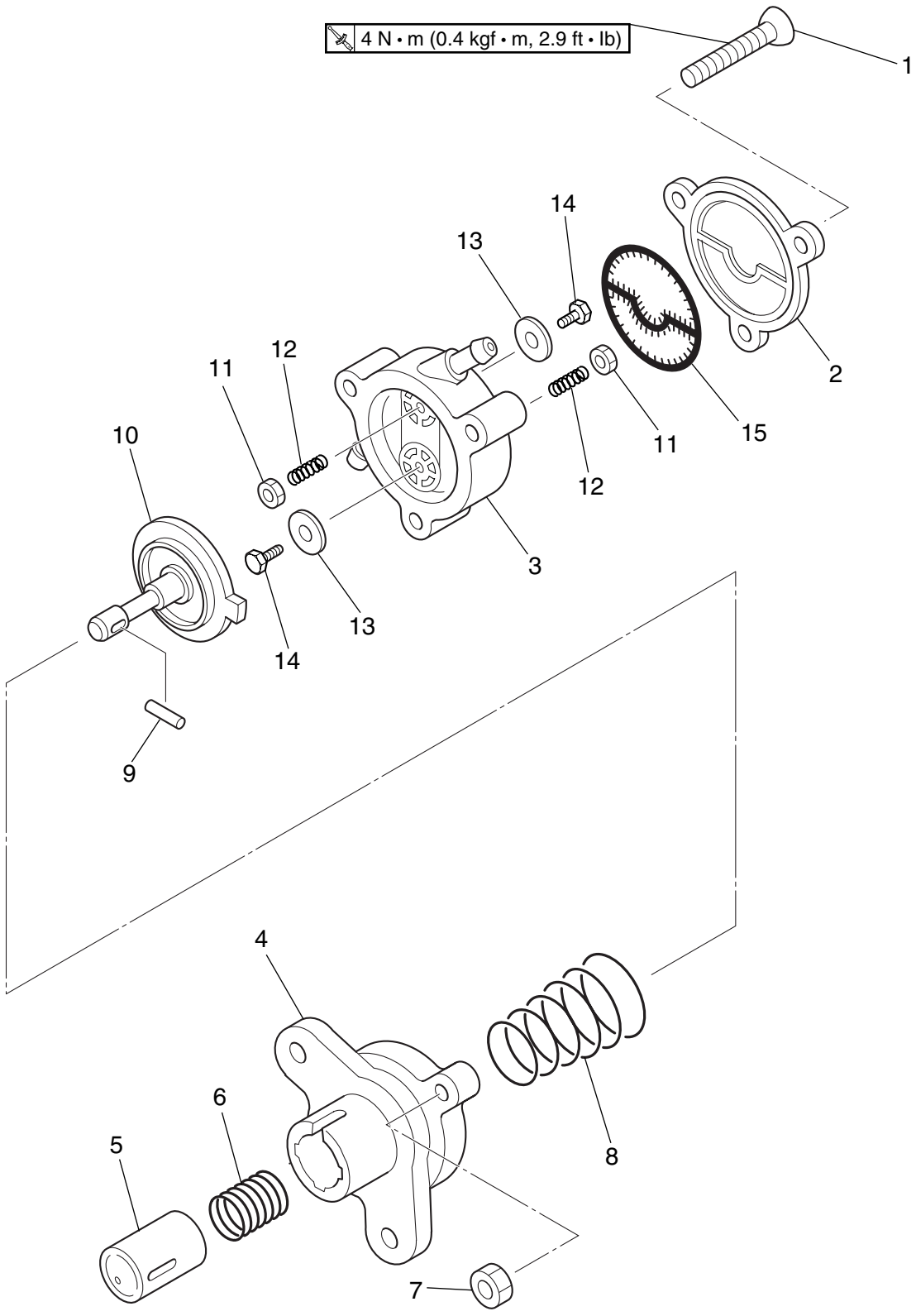
Fuel line and fuel filter



S60C4030

No.	Part name	Q'ty	Remarks
1	Fuel pump	1	
2	Body	1	
3	Fuel filter element	1	
4	Float	1	
5	O-ring	1	**Not reusable** 2 × 36.2 mm
6	Fuel filter cup	1	
7	Clip	9	
8	Fuel joint	3	
9	Bolt	2	M6 × 12 mm
10	Washer	2	
11	Clamp	2	
12	Clamp	1	
13	Fuel hose	2	Fuel joint-to-fuel joint
14	Fuel hose	1	Fuel pump-to-fuel joint
15	Plastic tie	2	**Not reusable**
16	O-ring	1	**Not reusable**
17	Bolt	2	M6 × 30 mm
18	Fuel hose	1	Fuel pump-to-fuel filter 12.5 × 300 mm
19	Plastic tie	2	**Not reusable**
20	Bolt	1	M6 × 16 mm
21	Bracket	1	
22	Nut	1	
23	Fuel hose	1	Fuel filter-to-fuel joint 12.5 × 950 mm
24	Plate	1	
25	Bolt	1	M6 × 25 mm
26	Bolt	2	M6 × 25 mm
27	Grommet retaining plate	1	
28	Plastic tie	1	**Not reusable**
29	Fuel joint	1	

Fuel pump

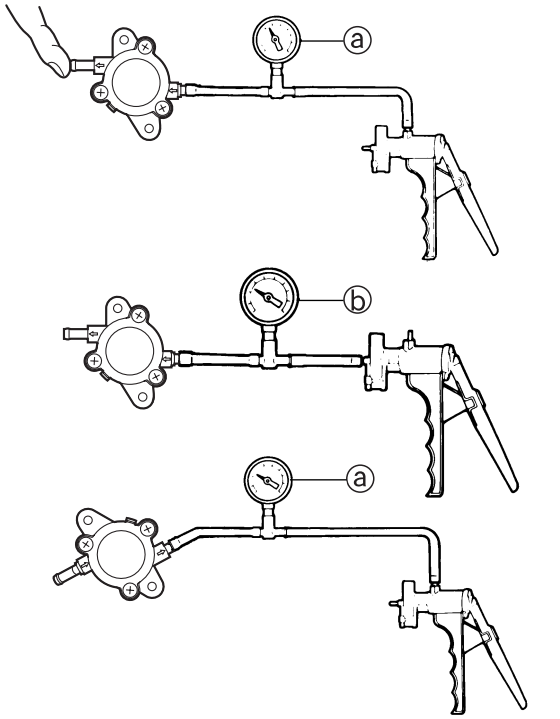


S60C4040

No.	Part name	Q'ty	Remarks
1	Screw	3	M6 × 35 mm
2	Cover	1	
3	Fuel pump body 2	1	
4	Fuel pump body 1	1	
5	Plunger	1	
6	Spring	1	
7	Nut	3	
8	Spring	1	
9	Pin	1	
10	Diaphragm	1	
11	Nut	2	
12	Spring	2	
13	Valve	2	
14	Screw	2	
15	Gasket	1	**Not reusable**

Checking the fuel pump

1. Install the special service tool onto the fuel pump as shown.



S60C4050

Vacuum/pressure pump gauge set:
90890-06756

2. Apply the specified pressure to each fuel pump port.

3. If air flow is reversed, check the diaphragm for tears and the valves for cracks. Replace if necessary.

CAUTION:

Do not over pressurize the fuel pump, otherwise excessive pressure may cause air leakage.

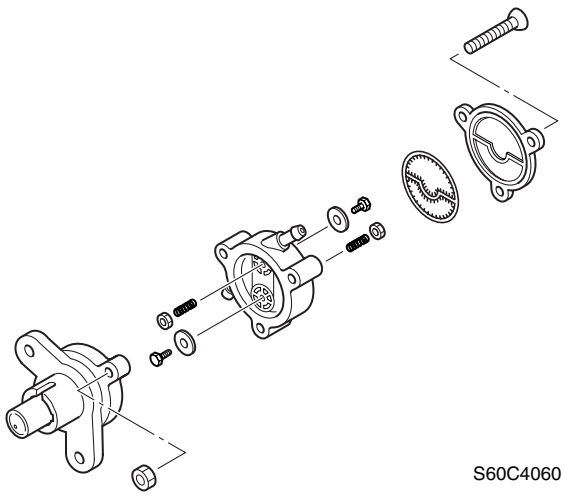
NOTE:

- Make sure that air does not escape from the opposite side of the fuel pump.
- To eliminate any gaps between the fuel pump valves and the fuel pump body 2, and to ensure a better seal, make sure that the inside of the fuel pump is moist with gasoline.

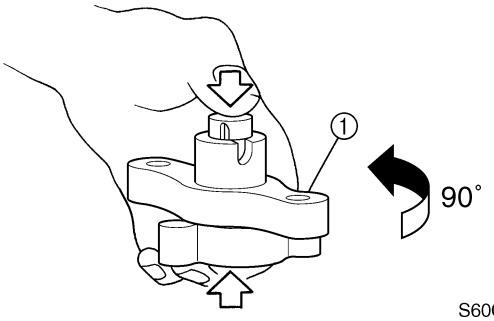
Fuel pump pressure ⓐ:
50 kPa (0.5 kgf/cm^2, 7.1 psi)
Fuel pump negative pressure ⓑ:
30 kPa (0.3 kgf/cm^2, 4.3 psi)

Disassembling the fuel pump

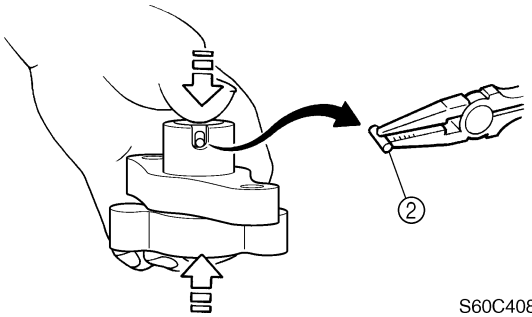
1. Disassemble the fuel pump as shown.


S60C4060

2. Push down on the plunger and the diaphragm, turn the fuel pump body 1 ① approximately 90° to a position where the pin ② can be removed easily, and then remove the pin.



S60C4070

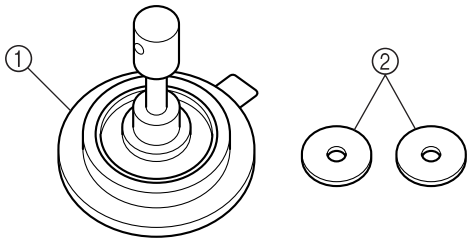


S60C4080

3. Slowly let up on the plunger and diaphragm, and then remove them.

Checking the diaphragm and valves

1. Check the diaphragm ① for tears and the valves ② for cracks. Replace if necessary.

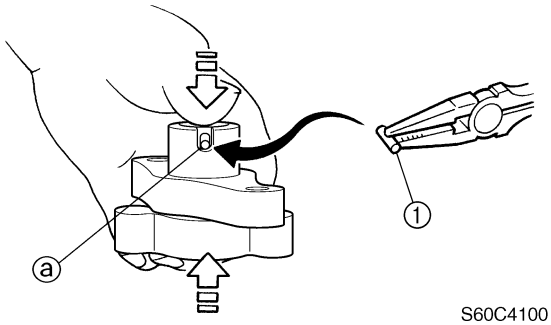


S60C4090

Assembling the fuel pump

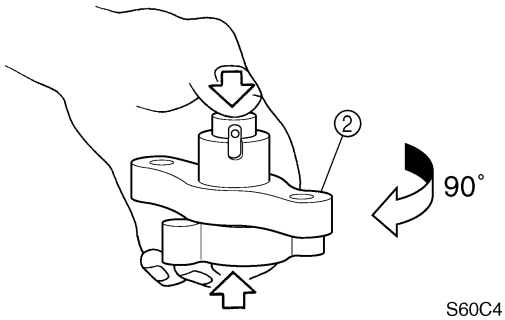
1. Align the plunger and diaphragm installation holes ⓐ, and then install the plunger into the diaphragm.

2. Push down on the plunger and the diaphragm, and then install the pin ①.



S60C4100

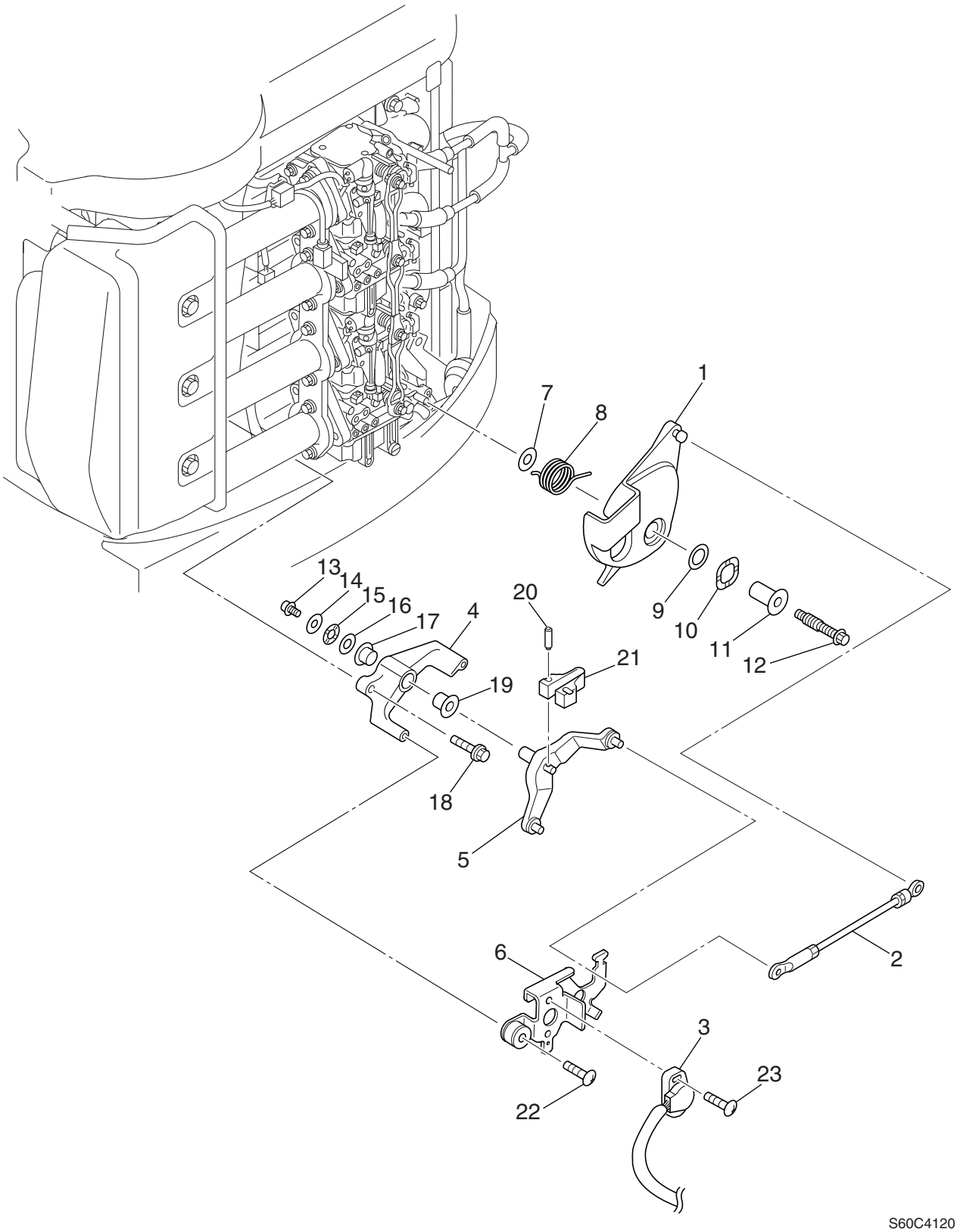
3. Turn the fuel pump body 1 ② approximately 90°, and then push down on the plunger several times to make sure that the pin does not come out.



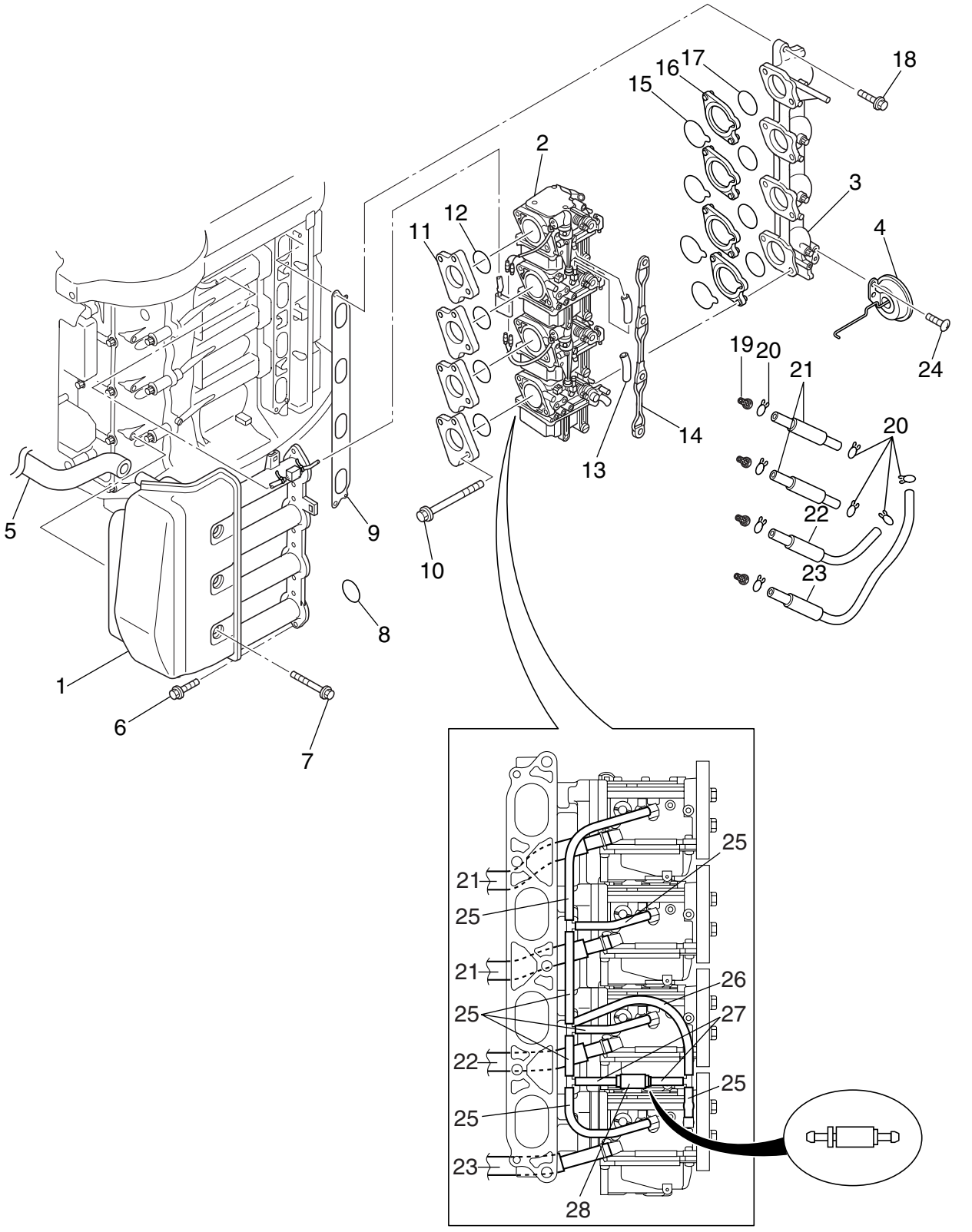
S60C4110

4

Throttle control

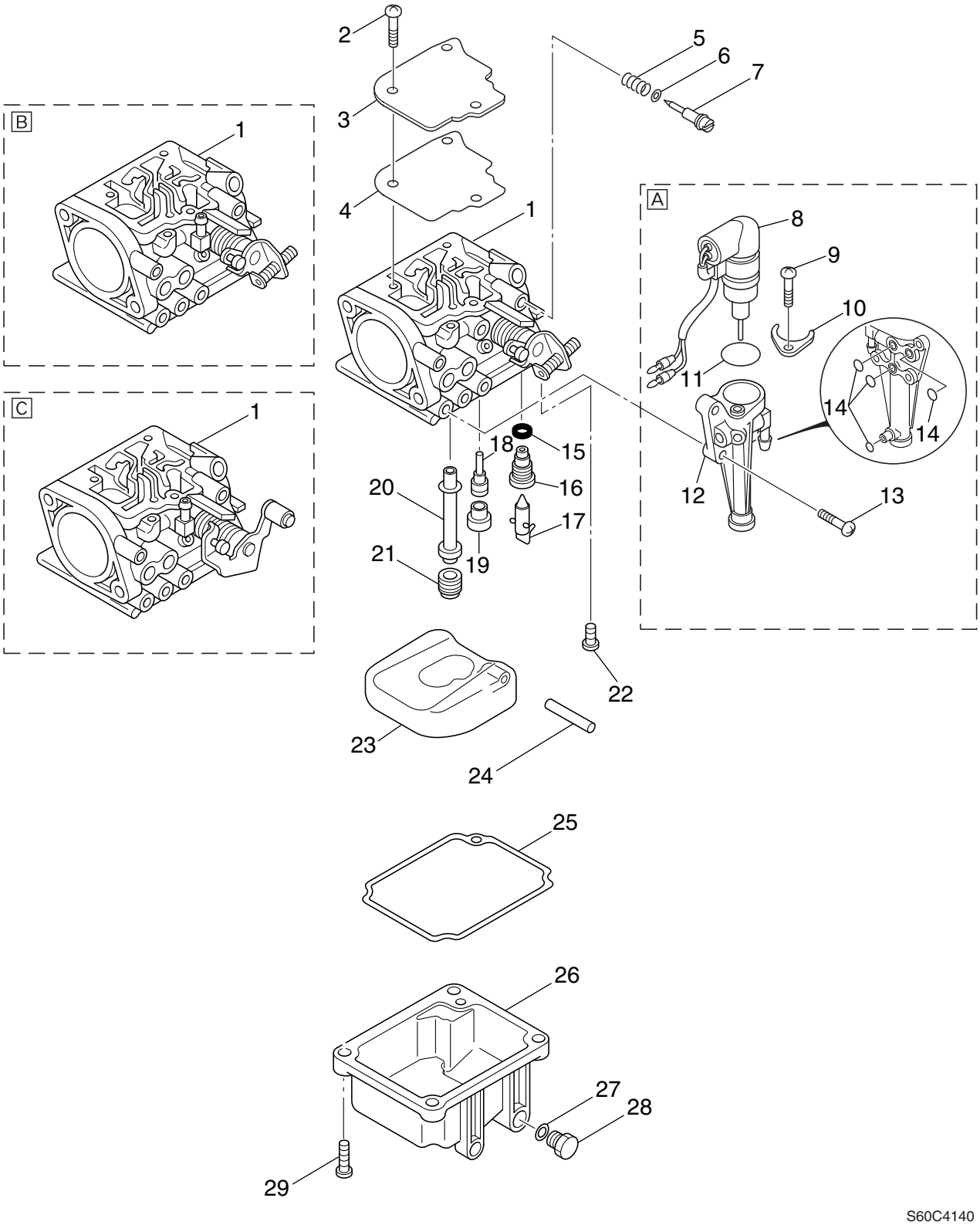


No.	Part name	Q'ty	Remarks
1	Throttle cam	1	
2	Throttle link rod	1	
3	Throttle position sensor	1	
4	Bracket	1	
5	Throttle control lever	1	
6	Bracket	1	
7	Washer	1	
8	Spring	1	
9	Washer	1	
10	Wave washer	1	
11	Collar	1	
12	Bolt	1	M6 × 35 mm
13	Bolt	1	M6 × 12 mm
14	Washer	1	
15	Wave washer	1	
16	Washer	1	
17	Collar	1	
18	Bolt	2	M6 × 25 mm
19	Collar	1	
20	Pin	1	
21	Spacer	1	
22	Screw	2	M5 × 25 mm
23	Screw	2	M5 × 10 mm


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
S60C4130

No.	Part name	Q'ty	Remarks
1	Silencer	1	
2	Carburetor assembly	1	
3	Intake manifold	1	
4	Acceleration pump	1	
5	Blowby hose	1	
6	Bolt	8	M6 × 20 mm
7	Bolt	3	M8 × 60 mm
8	O-ring	4	**Not reusable** 3.5 × 47.7 mm
9	Gasket	1	
10	Bolt	8	M6 × 120 mm
11	Spacer	4	
12	O-ring	4	**Not reusable**
13	Fuel hose	2	Carburetor-to-carburetor
14	Link lever	1	
15	O-ring	4	**Not reusable**
16	Spacer	4	
17	O-ring	4	**Not reusable** 2.4 × 44.5 mm
18	Bolt	5	M8 × 35 mm
19	Fuel filter	4	
20	Clip	8	
21	Fuel hose	2	Carburetor-to-fuel pump 10 × 120 mm
22	Fuel hose	1	Carburetor-to-fuel pump 10 × 180 mm
23	Fuel hose	1	Carburetor-to-fuel pump 10 × 350 mm
24	Screw	2	M6 × 15 mm
25	Hose	7	Carburetor-to-carburetor
26	Hose	1	Carburetor-to-acceleration pump
27	Hose	2	Check valve-to-carburetor
28	Check valve	1	

Carburetor



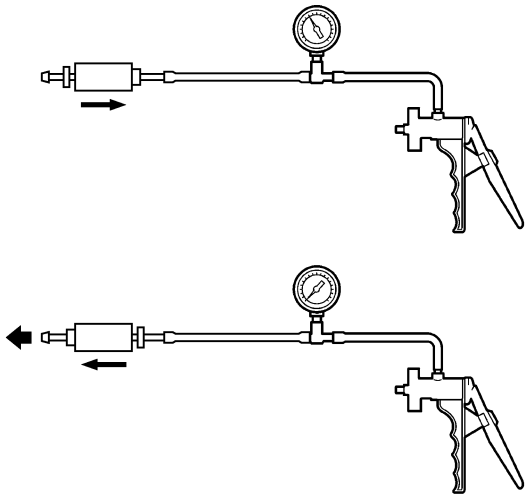
S60C4140

No.	Part name	Q'ty	Remarks
1	Carburetor body	1	
2	Screw	3	M4 × 10 mm
3	Cover	1	
4	Gasket	1	**Not reusable**
5	Spring	1	
6	O-ring	1	**Not reusable**
7	Pilot screw	1	
8	Prime Start	1	
9	Screw	1	M4 × 10 mm
10	Bracket	1	
11	O-ring	1	**Not reusable**
12	Body	1	
13	Screw	3	M5 × 16 mm
14	O-ring	4	**Not reusable**
15	O-ring	1	**Not reusable**
16	Valve seat	1	
17	Needle valve	1	
18	Pilot jet	1	
19	Plug	1	
20	Main nozzle	1	
21	Main jet	1	
22	Screw	1	M4 × 8 mm
23	Float	1	
24	Float pin	1	
25	Gasket	1	**Not reusable**
26	Float chamber	1	
27	O-ring	1	**Not reusable**
28	Drain screw	1	
29	Screw	4	M4 × 14 mm

[A] Carburetors #1 and #3
[B] Carburetor #2
[C] Carburetor #4

Checking the check valve

1. Install the special service tool onto the check valve.



S60C4150

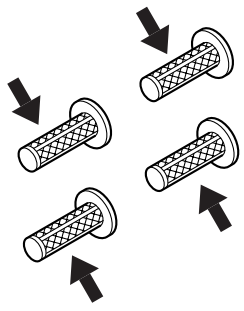
	Vacuum/pressure pump gauge set: 90890-06756

2. Apply pressure to each check valve port. Replace if necessary.

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

Checking the fuel filters

1. Check the fuel filters for dirt or residue. Clean if necessary.

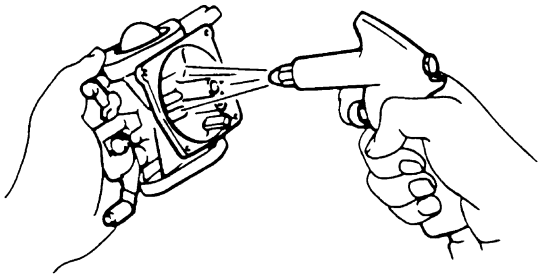


S60C4160

Checking the carburetor

1. Check the air and fuel passages, and jets for dirt and foreign matter. Clean the carburetor body with a petroleum based solvent if necessary.

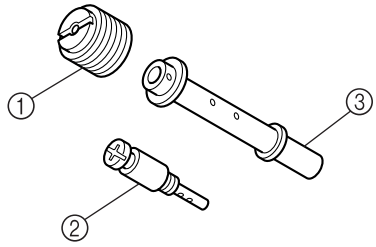
2. Blow compressed air into all passages and jets.



S60C4170

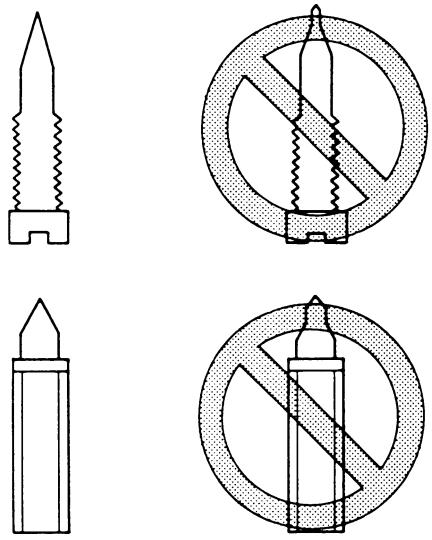
CAUTION:
- **Direct the compressed air downward, otherwise cleaning solvent may be blown into your eyes or small parts of the carburetor may be blown off.**
- **Do not use steel wire for cleaning the jets, otherwise the jet diameters may be enlarged, which may seriously affect performance.**

3. Check the main jet ①, pilot jet ②, and main nozzle ③ for dirt or residue. Clean if necessary.



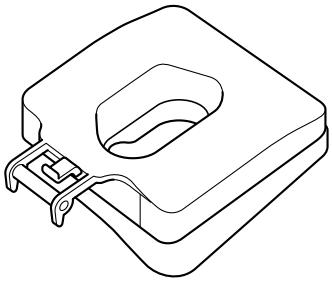
S60C4180

4. Check the pilot screw and needle valve for bends or wear. Replace if necessary.



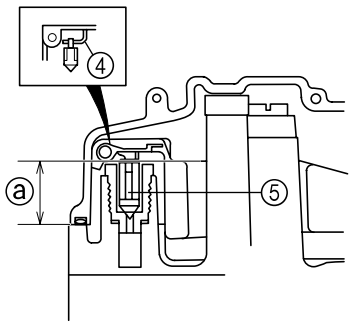
S60C4185

5. Check the float for deterioration. Replace it necessary.



S60C4190

6. Measure the float height ⓐ. Adjust the float height by bending the tab ④ if out of specification.



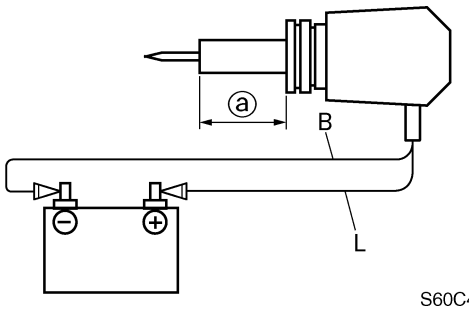
S60C4200

NOTE:
- The float should be resting on the needle valve ⑤, but not compressing it.
- Take measurements at the end of the float opposite its pivoted side.

Float height ⓐ:
12.5–15.5 mm (0.49–0.61 in)

Checking the Prime Start

1. Measure the length of the Prime Start plunger.
2. Connect the positive Prime Start blue (L) lead and the negative Prime Start black (B) lead to a battery as shown.
3. Measure the plunger length ⓐ after applying power for 5 minutes. Replace if out of specification.

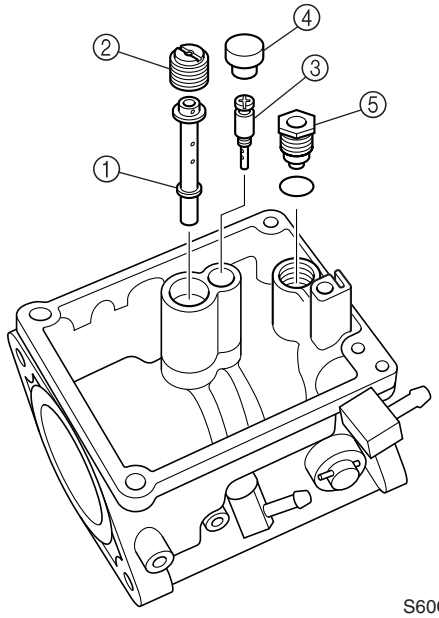


S60C4210

Prime Start plunger minimum length ⓐ:
15.0 mm (0.59 in)

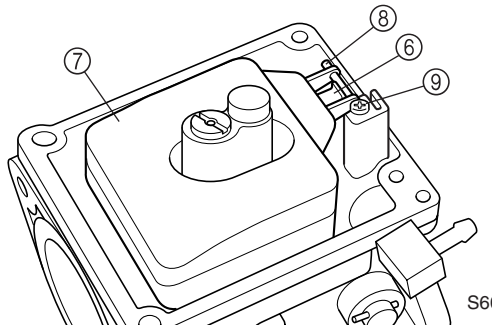
Assembling the carburetor

1. Install the main nozzle ①, main jet ②, pilot jet ③, plug ④, and valve seat ⑤ to the carburetor body as shown.



S60C4220

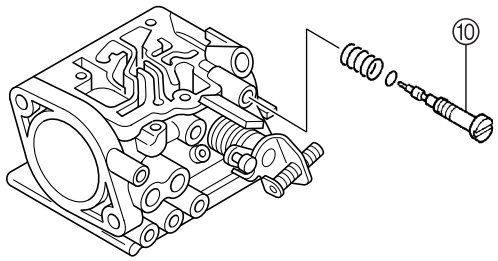
2. Install the needle valve ⑥, float ⑦, float pin ⑧, and screw ⑨ as shown, and then check the float for smooth operation.



S60C4230

NOTE:
- Place the needle valve in the valve seat when installing the float to the carburetor body.
- Fit the float pin into the slit on the carburetor body and lock it with the screw.

3. Install the pilot screw ⑩, turn it in until it is lightly seated, then out the specified number of turns.



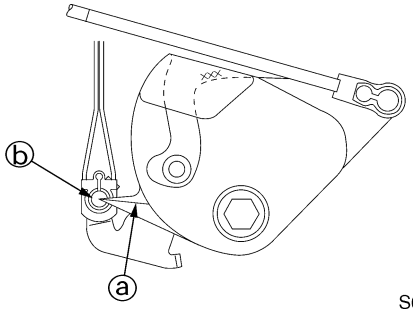
S60C4240

Pilot screw setting:
1 1/2–2 1/2 turns out

Adjusting the throttle link rod

1. Set the throttle control lever to the fully closed position.

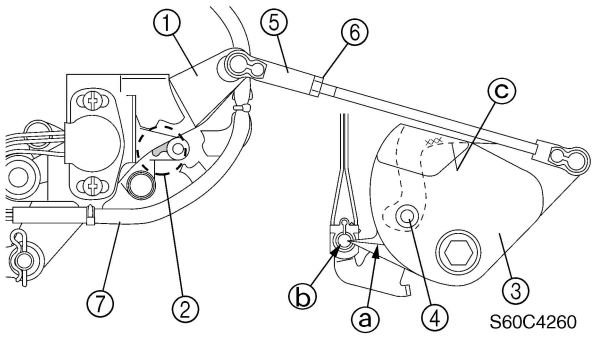
2. Check that the mark ⓐ on the throttle cam aligns with the center of the link lever ⓑ as shown.



S60C4250

3. Contact the throttle control lever ① with the fully closed stopper ②.

4. Check that the throttle is fully closed, and that the fully closed mark ⓐ on the throttle cam ③ is aligned with the center of the link lever ⓑ.



S60C4260

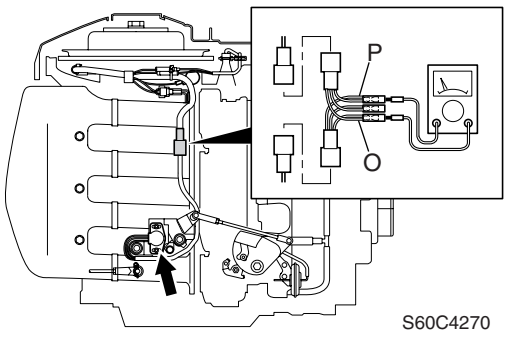
NOTE:
Make sure that there is complete clearance between the throttle cam roller ④ and the cam surface.

5. Adjust the length of the throttle link rod ⑤, and then tighten the nut ⑥ securely.
6. Move the throttle control lever ① to check that the throttle valve opens and closes smoothly. Also, check that the throttle cam roller ④ moves freely to the fully open position ⓒ on the throttle cam ③.
7. Set the throttle to the fully closed position and check that the fully closed mark ⓐ aligns with the center of the link lever ⓑ.

NOTE:
Make sure that there is no interference between the throttle control lever ① and the throttle position sensor lead ⑦.

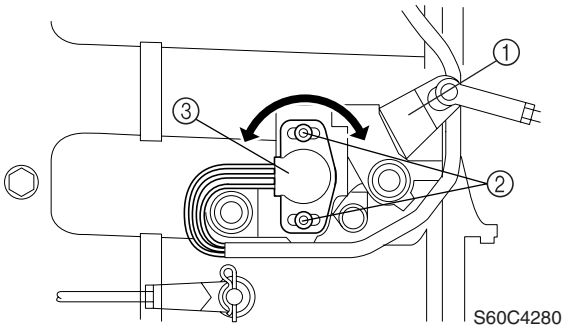
Adjusting the throttle position sensor

1. Connect the test harness (3 pins) and digital circuit tester.



Digital circuit tester: 90890-03174
Test harness (3 pins): 90890-06757

2. Start the engine and warm it up for 5 minutes to check the stability of the engine.
3. Contact the throttle control lever ① with the fully closed stopper.
4. Loosen the screws ②.



5. Adjust the position of the throttle position sensor ③ until the specified voltage is obtained.

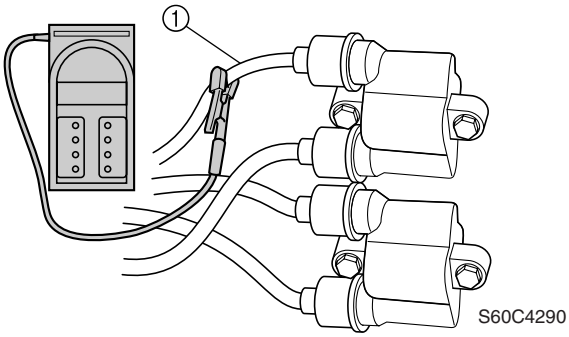
Throttle position sensor output voltage:
Pink (P) – Orange (O)
0.68–0.72 V

6. Tighten the screws ②.

Adjusting the pilot screw

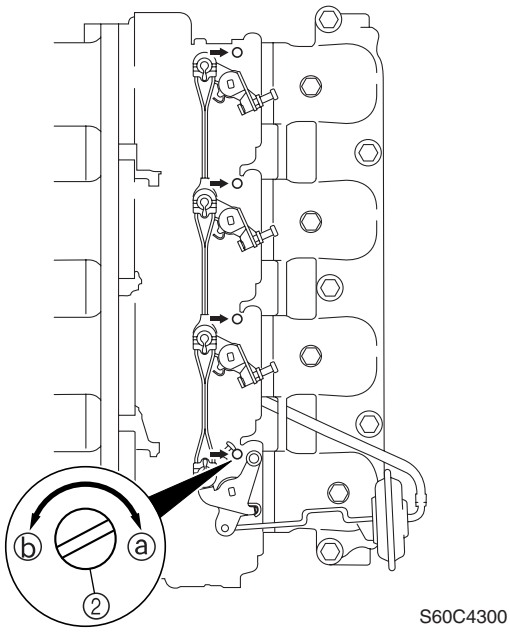
1. Start the engine and warm it up for 5 minutes to check the stability of the engine. Adjust the pilot screw if necessary.

2. Attach the special service tool to high-tension cord #1 ①.



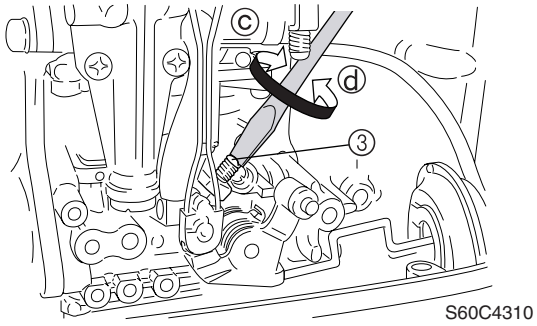
Digital tachometer: 90890-06760

3. Turn the pilot screws ② in direction ⓐ until the engine idle speed has decreased to approximately 40 r/min, then in direction ⓑ 3/4 turn.



Engine idle speed: 800–900 r/min

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



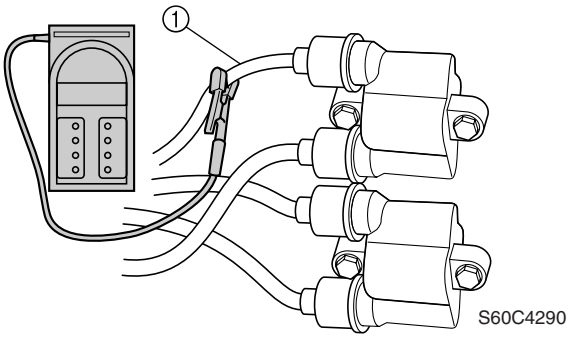
NOTE:
- To increase the idle speed, turn the throttle stop screw in direction ⓒ.
- To decrease the idle speed, turn the throttle stop screw in direction ⓓ.

5. After adjusting the idle speed, rev the engine a few times and let it idle for at least 15 seconds to check the stability of the engine. Adjust the carburetor synchronization if necessary.

Synchronizing the carburetors

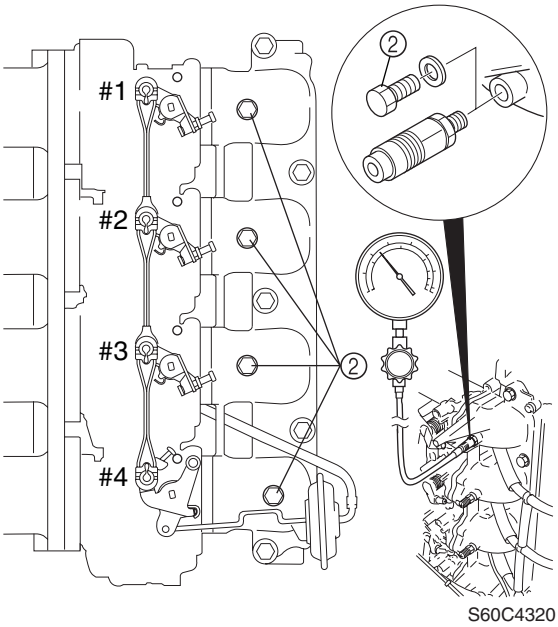
1. Start the engine and warm it up for 5 minutes to check the stability of the engine.

2. Attach the special service tool to high-tension cord #1 ①.

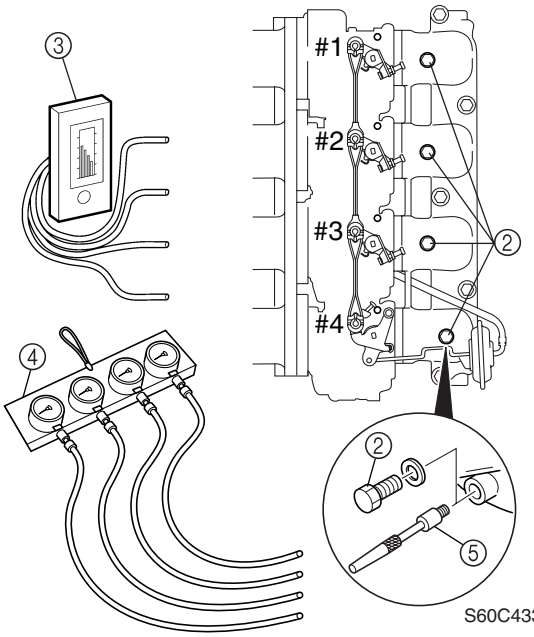


Digital tachometer: 90890-06760

3. Remove all of the plugs ② and attach the special service tool and adapters to the carburetor assembly as shown.

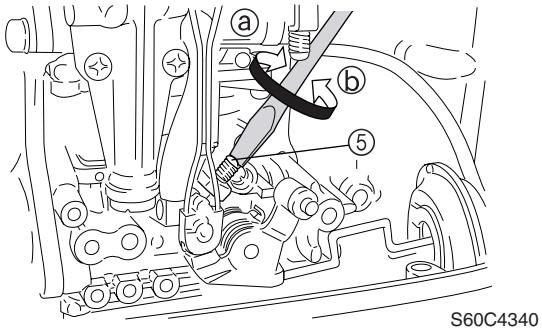


Vacuum gauge: 90890-03159



Vacuum gauge (digital) (commercially obtainable) ③:
Vacuum gauge (4 analog meters) (commercially obtainable) ④:
Vacuum gauge adaptor (commercially obtainable) ⑤:

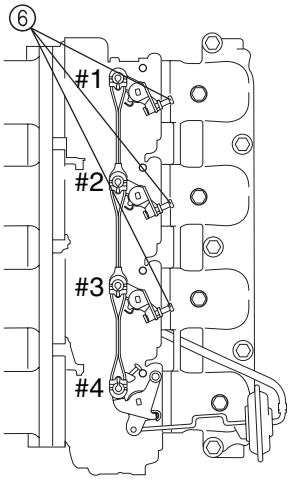
4. Adjust the idle speed to 1,000 r/min by turning the throttle stop screw ⑤ on carburetor #4 in direction ⓐ or ⓑ.



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

5. Measure the vacuum pressure of carburetor #4.

6. Turn the throttle valve adjusting screws ⑥ to adjust the vacuum pressure of carburetors #1, #2, and #3 to the same vacuum variation as carburetor #4.



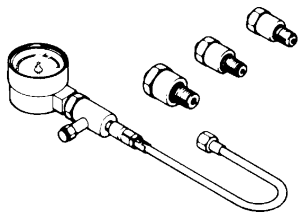
7. Adjust the engine idle speed to specification.

	Engine idle speed: 800–900 r/min

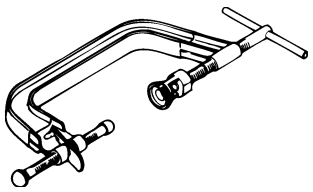
8. After adjusting the idle speed, rev the engine a few times and let it idle for at least 15 seconds to check that the vacuum pressure of carburetors #1, #2, and #3 stays within 50 mmHg (67 mbar, 1.97 inHg) of carburetor #4, and to check the stability of the engine.

Power unit

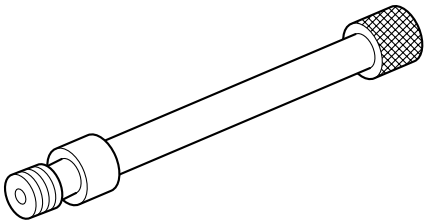
Special service tools



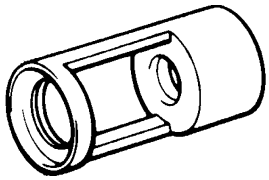
Compression gauge
90890-03160



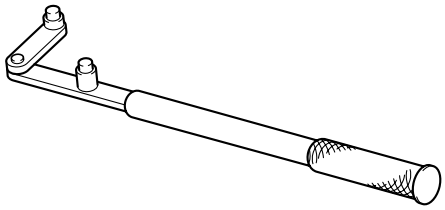
Valve spring compressor
90890-04019



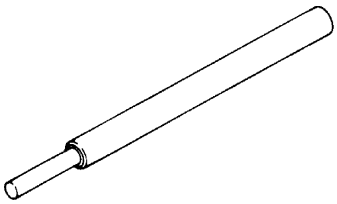
Compression gauge adaptor
90890-06563



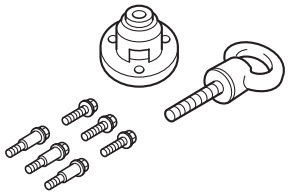
Valve spring compressor attachment
90890-06320



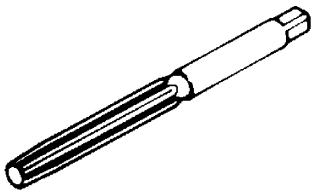
Flywheel holder
90890-06522



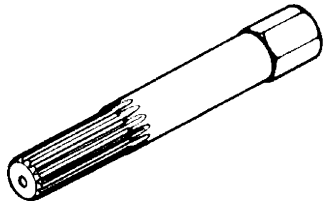
Valve guide remover/installer
90890-04064



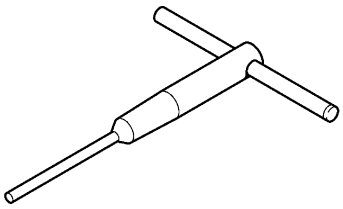
Flywheel puller
90890-06521



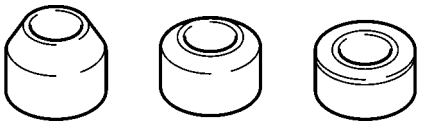
Valve guide reamer
90890-04066



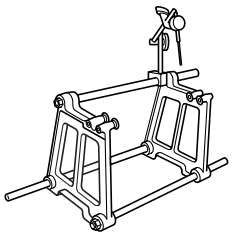
Crankshaft holder 20
90890-06552



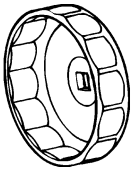
Valve seat cutter holder
90890-06553



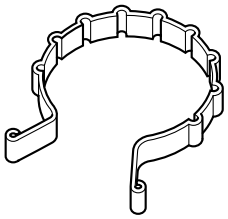
Valve seat cutter
90890-06315, 90890-06324, 90890-06326,
90890-06328, 90890-06555



Crank stand alignment
90890-03107

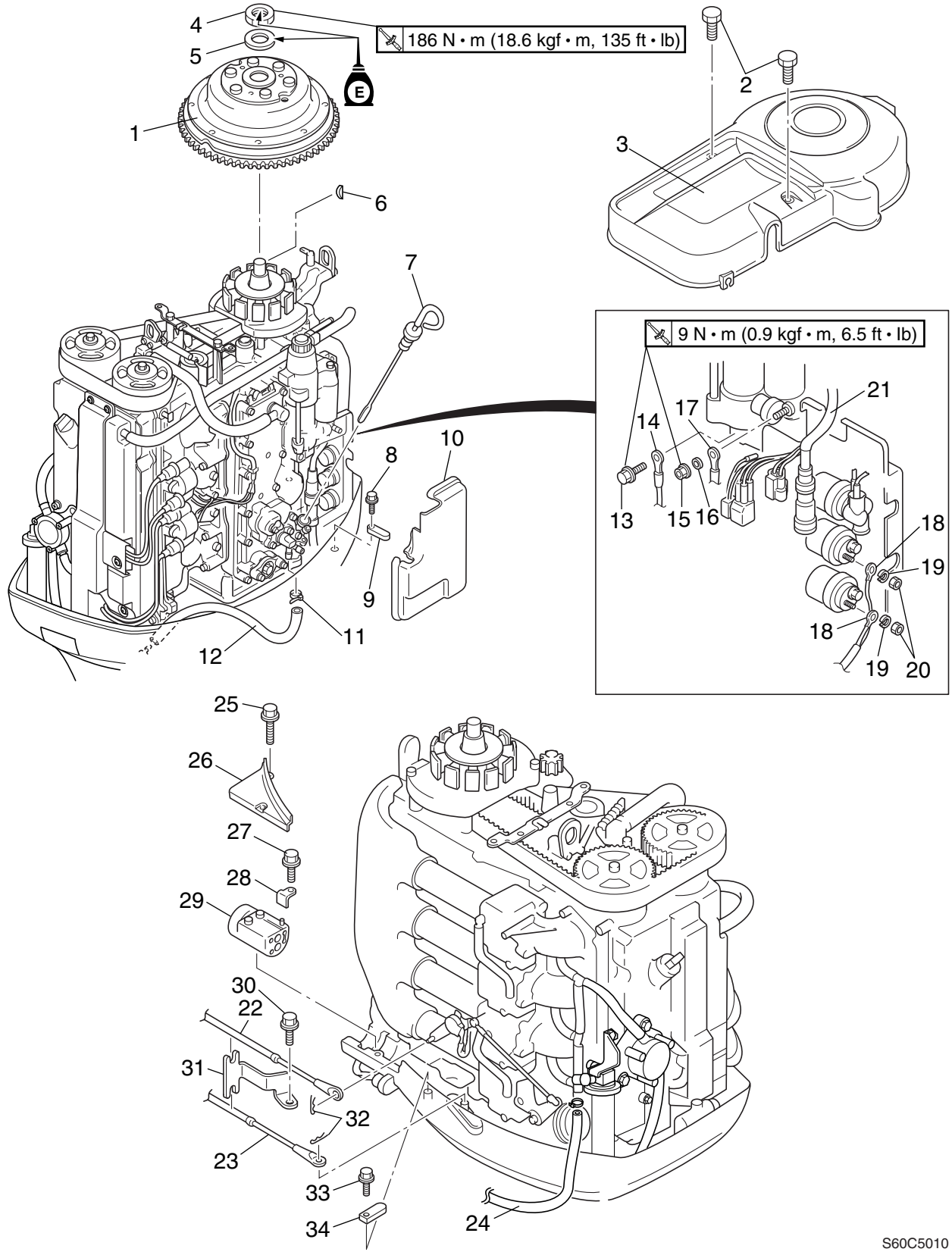


Oil filter wrench
90890-01426

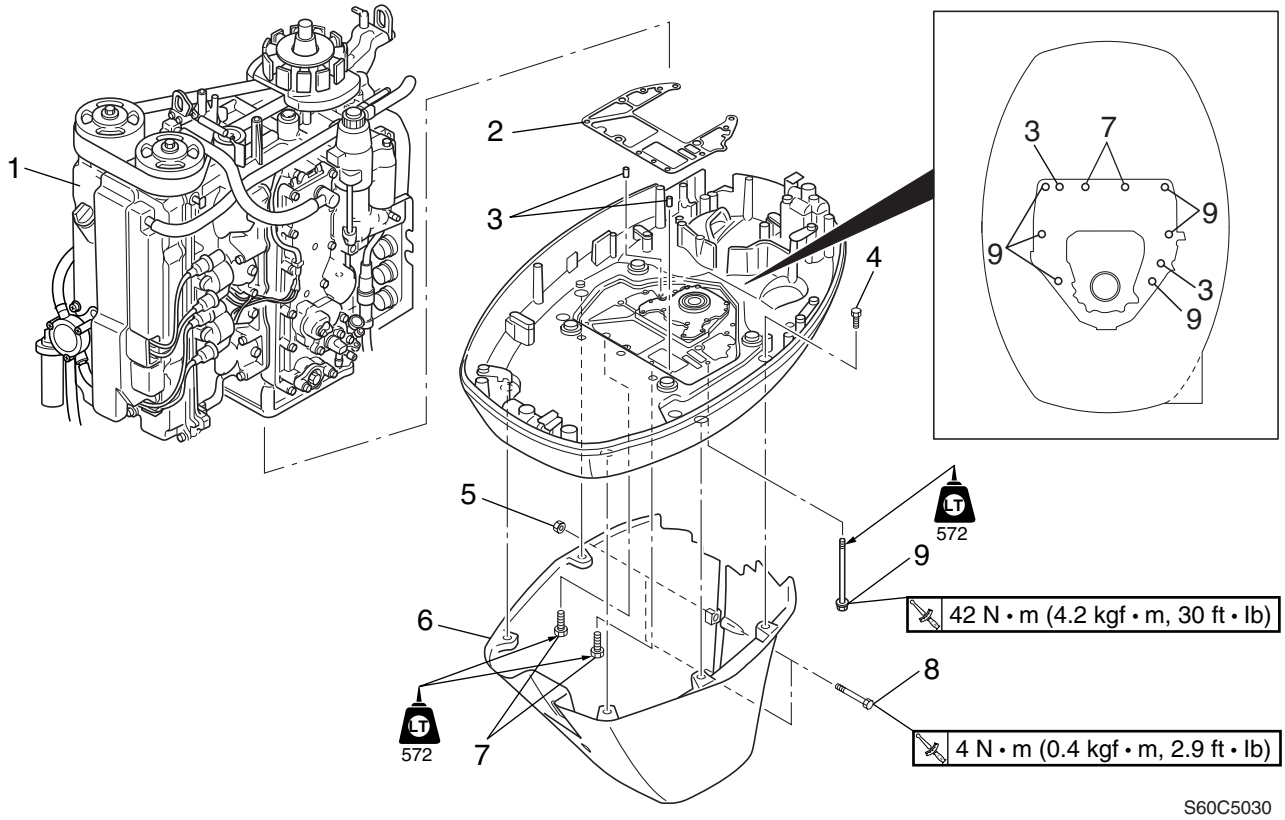


Piston slider
90890-06530

Power unit



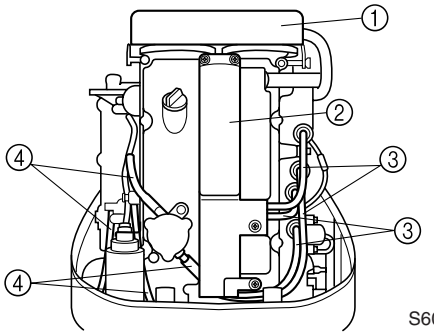
No.	Part name	Q'ty	Remarks
1	Flywheel magnet	1	
2	Bolt	2	M8 × 20 mm
3	Cover	1	
4	Nut	1	
5	Washer	1	
6	Woodruff key	1	
7	Engine oil dipstick	1	
8	Bolt	1	M6 × 25 mm
9	Plate	1	
10	Cover	1	
11	Plastic tie	1	**Not reusable**
12	Pilot water hose	1	10 × 330 mm
13	Bolt	1	M8 × 16 mm
14	Negative battery lead	1	
15	Nut	1	
16	Washer	1	
17	Positive battery lead	1	
18	PTT motor lead	2	
19	Washer	2	
20	Nut	2	
21	Wiring harness	1	
22	Throttle cable	1	
23	Shift cable	1	
24	Fuel hose	1	Fuel filter-to-fuel joint 12.5 × 950 mm
25	Bolt	2	M6 × 25 mm
26	Retaining plate	1	
27	Bolt	1	M6 × 20 mm
28	Plate	1	
29	Grommet	1	
30	Bolt	1	M6 × 20 mm
31	Clamp	1	
32	Clip	2	
33	Bolt	1	M6 × 25 mm
34	Plate	1	



No.	Part name	Q'ty	Remarks
1	Power unit	1	
2	Gasket	1	
3	Dowel pin	2	
4	Bolt	5	M6 × 16 mm
5	Nut	2	
6	Apron	1	
7	Bolt	2	M8 × 35 mm
8	Bolt	2	M6 × 40 mm
9	Bolt	6	M10 × 130 mm

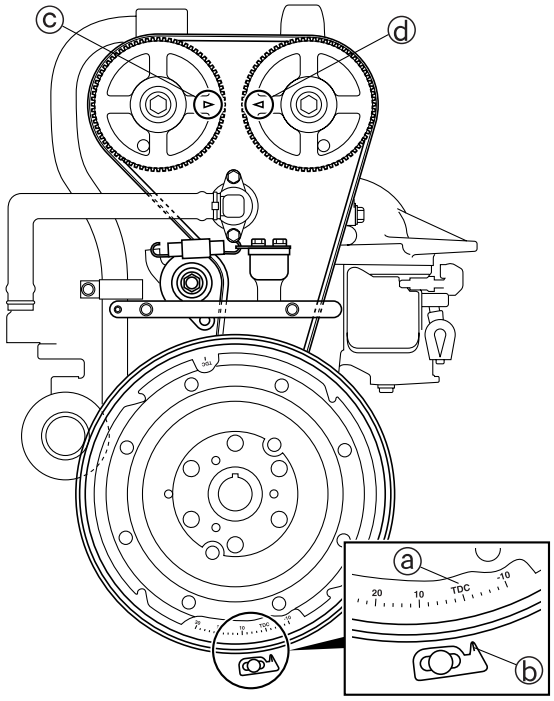
Checking the valve clearance

1. Remove the flywheel magnet cover ①, cover ②, disconnect the high-tension cords ③ and fuel hoses ④, and then remove the spark plugs.



S60C3220

2. Turn the flywheel magnet clockwise and align the TDC mark ⓐ on the flywheel magnet with the pointer ⓑ, and check that "▲" marks ⓒ and ⓓ on the driven sprockets are aligned.

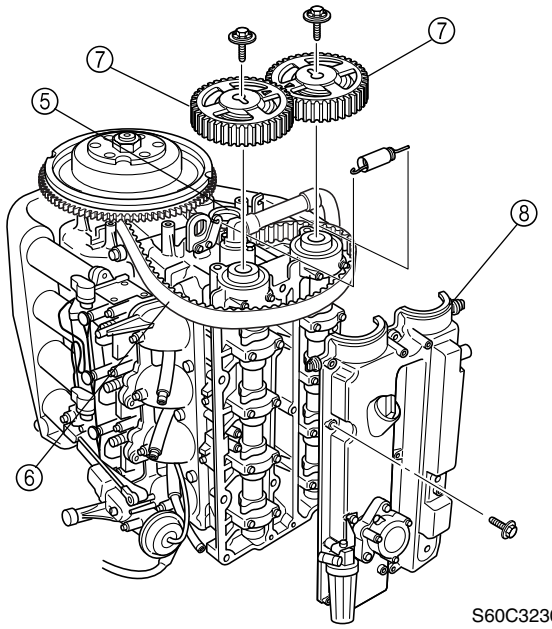


S60C3120

CAUTION:

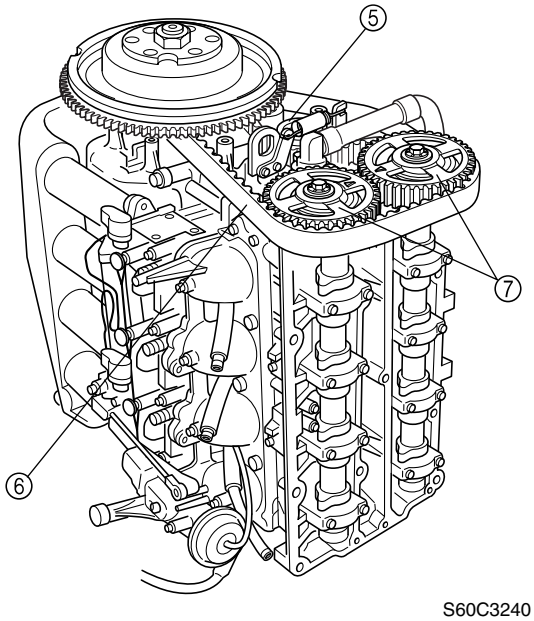
Do not turn the flywheel magnet counterclockwise, otherwise the valve system may be damaged.

3. Loosen the tensioner bolt ⑤, and then remove the timing belt ⑥, driven sprockets ⑦, and cylinder head cover ⑧.



S60C3230

4. Install the driven sprockets ⑦ and timing belt ⑥, and then tighten the tensioner bolt ⑤.



S60C3240

5. Check the intake valve clearance for cylinders #1 and #2, and the exhaust valve clearance for cylinders #1 and #3. Adjust if out of specification.

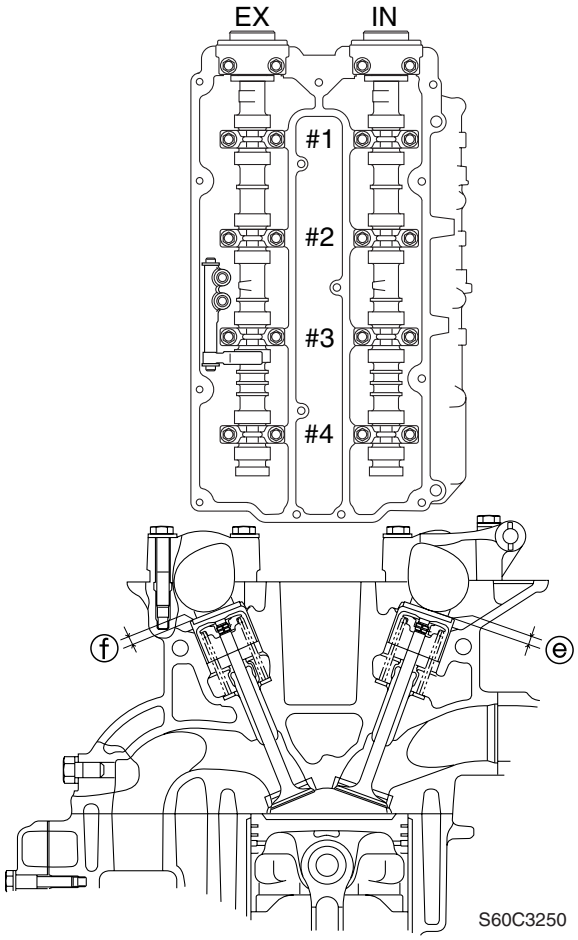
5

6. Turn the flywheel magnet 360° clockwise.

CAUTION:

Do not turn the flywheel magnet counterclockwise, otherwise the valve system may be damaged.

7. Check the intake valve clearance for cylinders #3 and #4, and the exhaust valve clearance for cylinders #2 and #4. Adjust if out of specification.

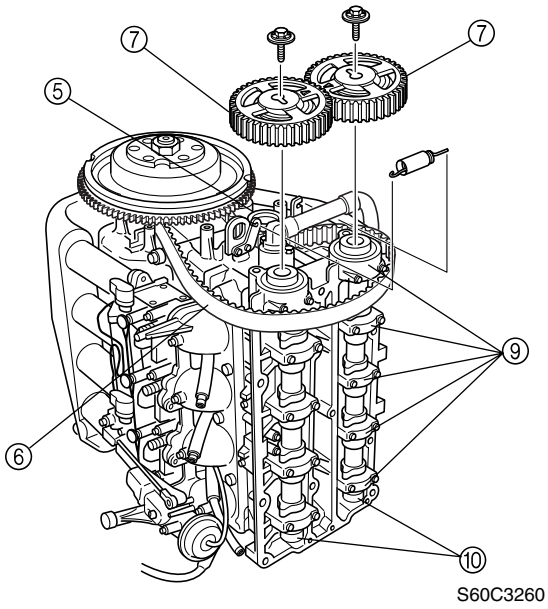


NOTE:

- Check the valve clearance when the engine is cold.
- Note the measurement.

Valve clearance:
Intake ⓔ:
0.20 ± 0.03 mm (0.008 ± 0.001 in)
Exhaust ⓕ:
0.34 ± 0.03 mm (0.013 ± 0.001 in)

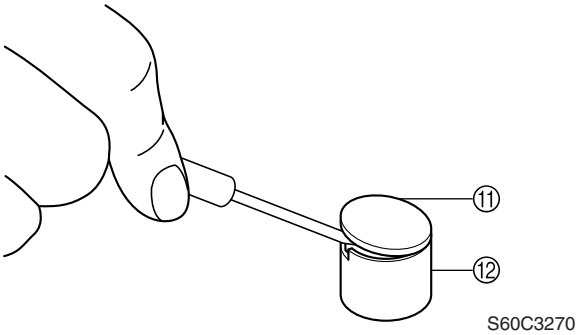
8. Adjust the valve clearance if out of specification. Loosen the tensioner bolt ⑤, and then remove the timing belt ⑥, driven sprockets ⑦, camshaft caps ⑨, and camshafts ⑩.



NOTE:

Do not mix the valve train parts. Keep them organized in their proper groups.

9. Remove the valve pad ⑪ from the valve lifter ⑫ using a thin screwdriver.



10. Measure the valve pad thickness with a micrometer.
    Select the necessary valve pad by calculating its thickness with the following formula.

Necessary valve pad thickness = Removed valve pad thickness + Measured valve clearance – Specified valve clearance

Example:
If the “Removed valve pad thickness” is 2.10 mm, the “Checked valve clearance” is 0.30 mm and the “Specified valve clearance” is 0.20 mm, then the necessary valve pad thickness = 2.10 + 0.30 – 0.20 = 2.20 mm

11. Install the necessary valve pad into the valve lifter.

12. Install the camshafts, camshaft caps, driven sprockets, and timing belt, and then tighten the tensioner bolt.

Camshaft cap bolt: 1st: 8 N·m (0.8 kgf·m, 5.8 ft·lb) 2nd: 17 N·m (1.7 kgf·m, 12 ft·lb)

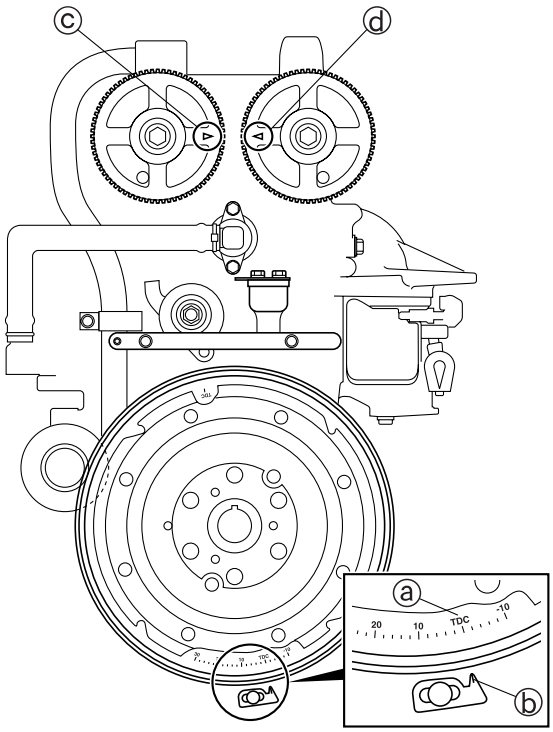
13. Check the valve clearance. Adjust if necessary.

14. Loosen the tensioner bolt, and then remove the timing belt and driven sprockets.

15. Install the cylinder head cover and driven sprockets.

Cylinder head cover: 8 N·m (0.8 kgf·m, 5.8 ft·lb) Driven sprocket: 60 N·m (6.0 kgf·m, 43 ft·lb)

16. Check that the TDC mark ⓐ on the flywheel magnet is aligned with the pointer ⓑ, and that “▲” marks ⓒ and ⓓ on the driven sprockets are aligned. Adjust if necessary.



S60C3280

CAUTION:
- **Do not turn the flywheel magnet counterclockwise, otherwise the valve system may be damaged.**
- **Do not remove the ignition timing pointer.**

17. Install the timing belt, and then tighten the tensioner bolt finger tight.

18. Turn the flywheel magnet clockwise two turns, and then check that the alignment marks are aligned.

19. Tighten the tensioner bolt to the specified torque.

Tensioner bolt: 39 N·m (3.9 kgf·m, 28 ft·lb)

20. Install the spark plugs, and then connect the high-tension cords and fuel hoses.

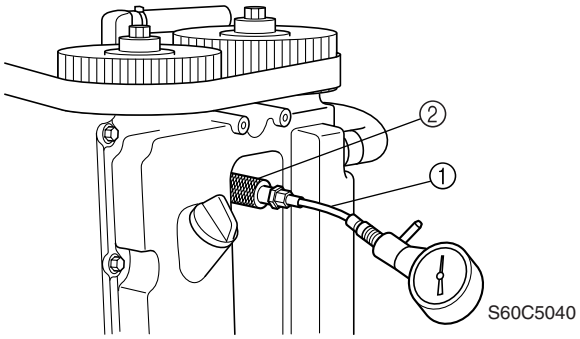
Spark plug: 25 N·m (2.5 kgf·m, 18 ft·lb)

5

21. Install the cover and flywheel magnet cover.

Checking the compression pressure

1. Start the engine, warm it up for 5 minutes, and then turn it off.
2. Remove the clip from the engine shut-off switch on the remote control box or tiller handle.
3. Remove the cover and all spark plugs, and then install the special service tools to each spark plug hole.



CAUTION:

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

Compression gauge ①:
90890-03160
Compression gauge adapter ②:
90890-06563

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

Minimum compression pressure:
670 kPa (6.7 kgf/cm^2, 95.3 psi)

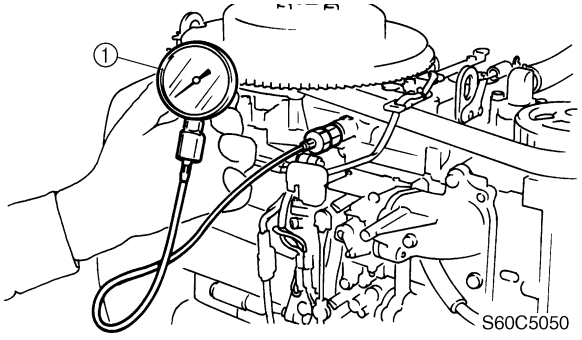
5. If the compression pressure is below specification and the compression pressure for each cylinder is unbalanced, add a small amount of engine oil to the cylinder, and then check the pressure again.

NOTE:

- If the compression pressure increases, check the piston and piston rings for wear. Replace if necessary.
- If the compression pressure does not increase, check the valve clearance, valve, valve seat, cylinder sleeve, cylinder head gasket, and cylinder head. Adjust or replace if necessary.

Checking the oil pressure

1. Start the engine, warm it up for 5 minutes, and then turn it off.
2. Remove the flywheel magnet cover and oil pressure switch, and then install an oil pressure gauge ① to the oil pressure switch installation hole.



NOTE:

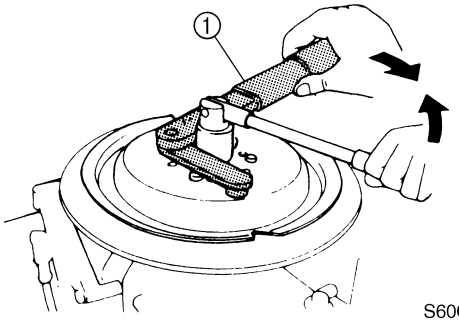
Use a pressure gauge with an adapter that has a 1/8 pitch thread.

3. Check the oil pressure. Check the oil pump, oil suction pipe, and oil strainer if out of specification.

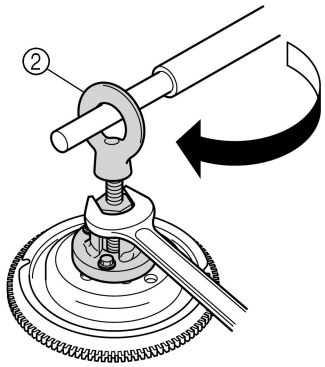
Oil pressure:
520 kPa (5.2 kgf/cm^2, 74 psi) at idle speed (850 r/min)

Removing the power unit

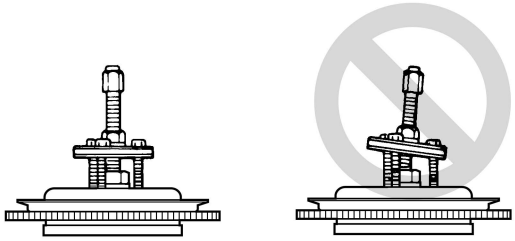
1. Remove the flywheel magnet cover and flywheel magnet.



S60C5060



S60C5070



S60C5080

CAUTION:

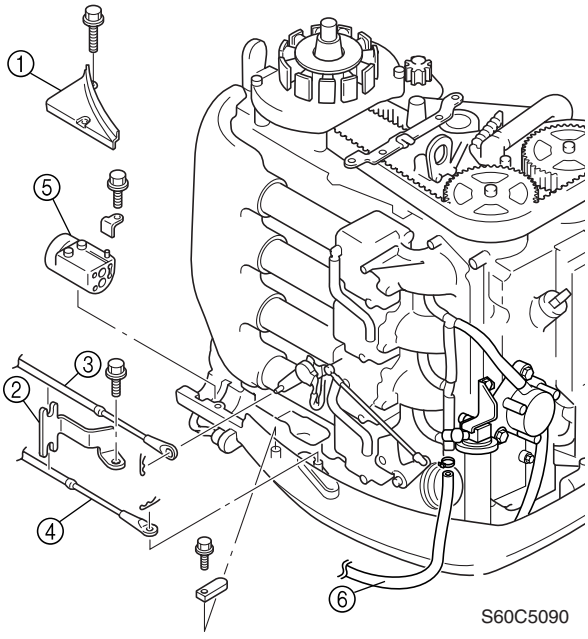
- **Before removing the power unit, disconnect the battery terminals.**
- **Apply force in the direction of the arrows shown, to prevent the flywheel holder from slipping off easily.**
- **To prevent damage to the engine or tools, screw in the flywheel puller set bolts evenly and completely so that the flywheel puller plate 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 holder ①: 90890-06522
Flywheel puller ②: 90890-06521

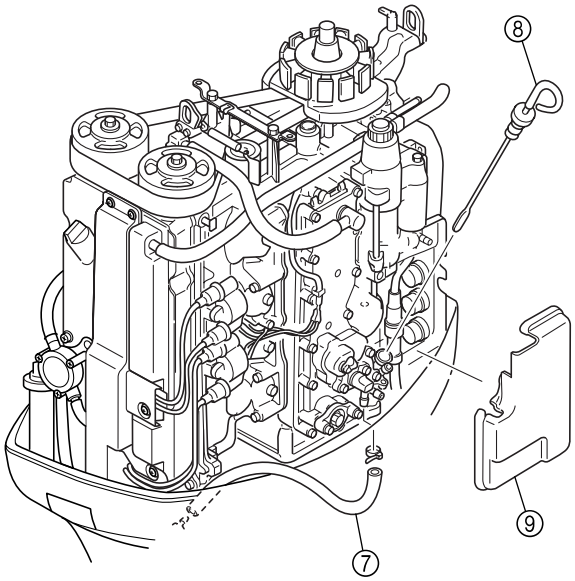
2. Remove the retaining plate ① and clamp ②, and then disconnect the throttle cable ③ and shift cable ④. Remove the grommet ⑤ and disconnect the fuel hose ⑥.



S60C5090

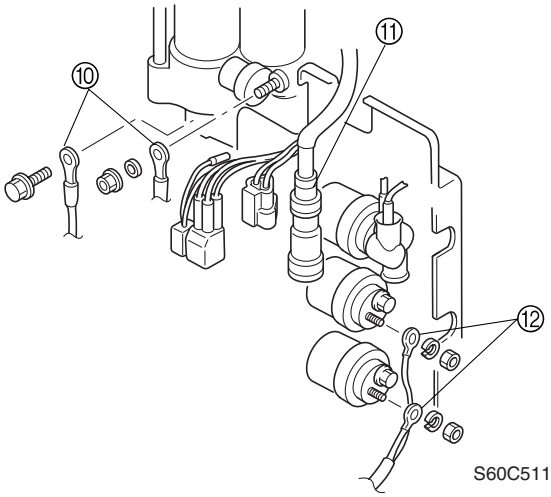
5

3. Disconnect the pilot water hose ⑦ and remove the engine oil dipstick ⑧ and cover ⑨.



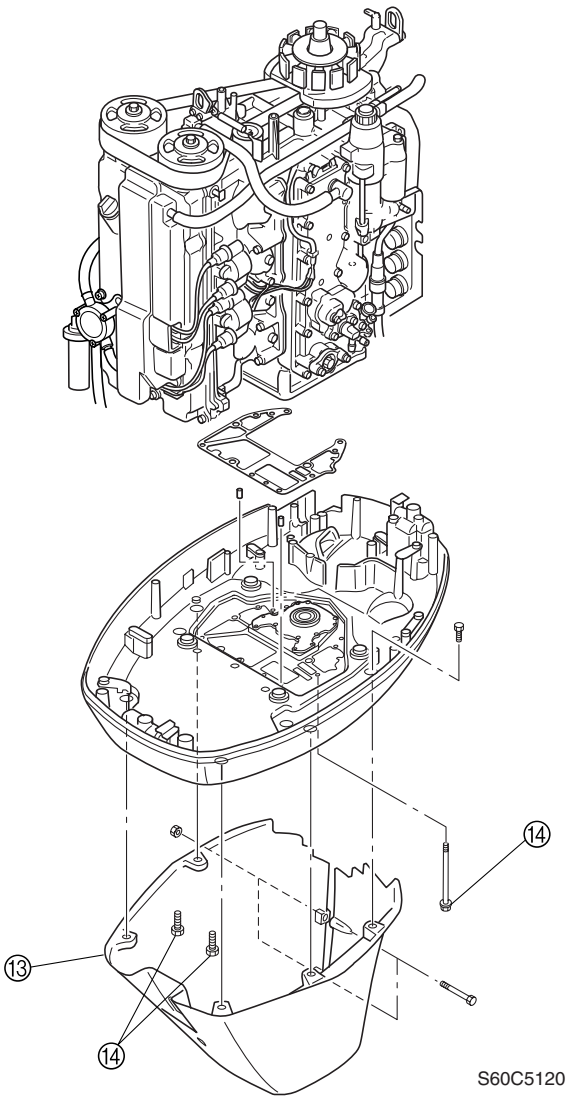
S60C5100

4. Disconnect the battery leads ⑩, wiring harness ⑪, and PTT motor leads ⑫.



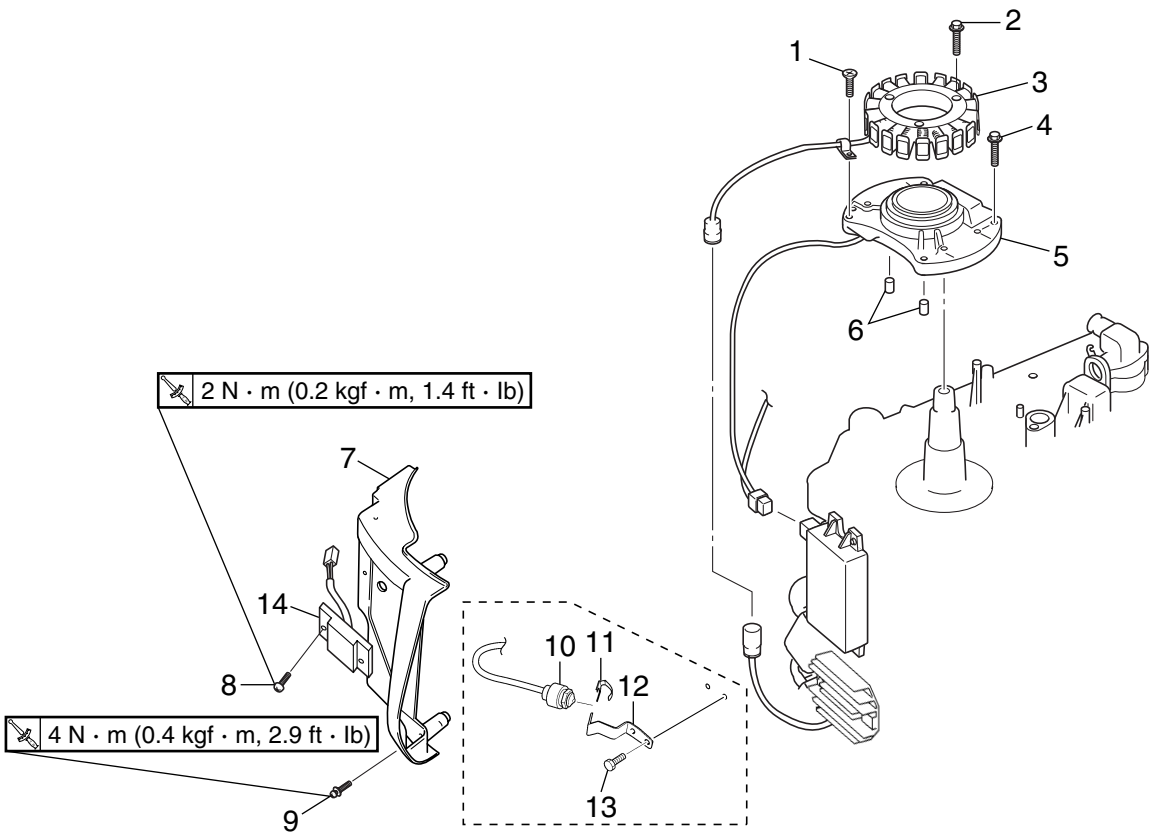
S60C5110

5. Remove the apron ⑬ and power unit by removing the bolts ⑭.

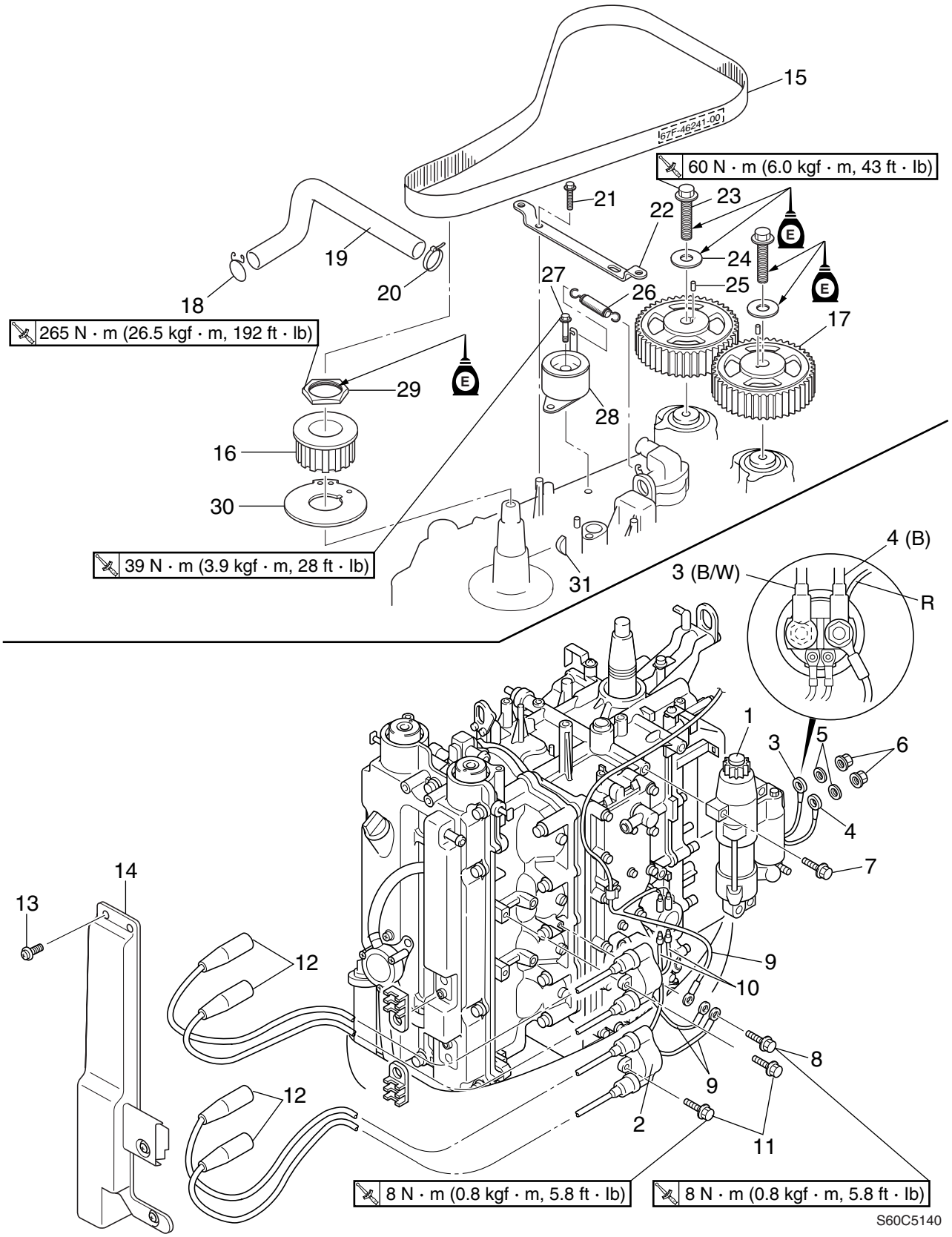


S60C5120

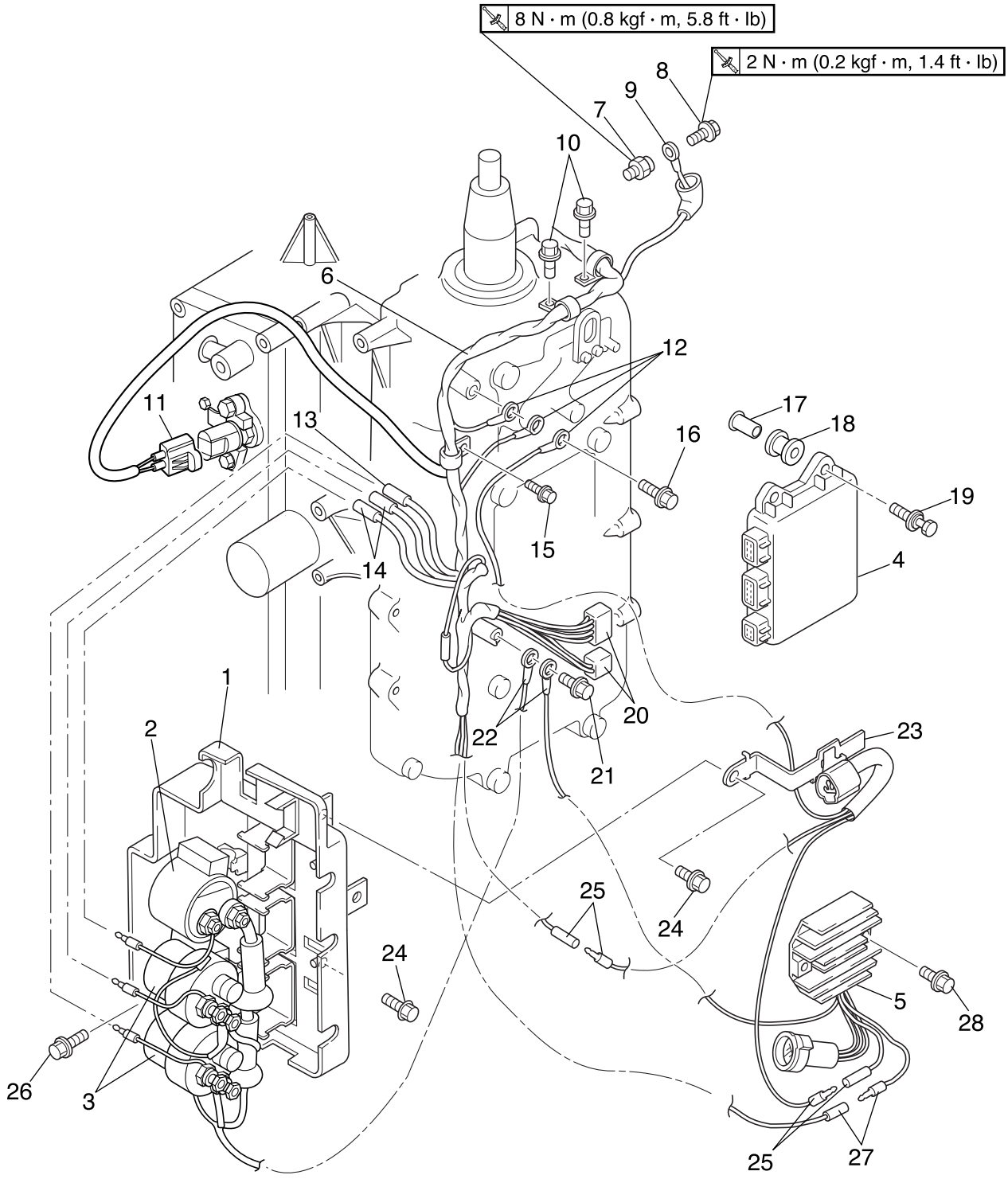
Timing belt and sprockets



No.	Part name	Q'ty	Remarks
1	Screw	1	M4 × 10 mm
2	Bolt	3	M6 × 30 mm
3	Lighting coil	1	
4	Bolt	4	M6 × 30 mm
5	Lighting coil base	1	
6	Dowel pin	1	
7	Cover	1	
8	Screw	2	
9	Screw	3	M6 × 20 mm
10	Neutral switch	1	Tiller handle model
11	Plate	1	Tiller handle model
12	Bracket	1	Tiller handle model
13	Bolt	2	M6 × 14 mm Tiller handle model
14	Hour meter	1	


15
67F-46241-00
60 N · m (6.0 kgf · m, 43 ft · lb)
21
22
23
24
25
26
27
17
19
20
18
265 N · m (26.5 kgf · m, 192 ft · lb)
29
28
16
30
39 N · m (3.9 kgf · m, 28 ft · lb)
31
4 (B)
3 (B/W)
R
1
3
5
6
4
7
14
13
12
9
10
8
12
9
2
11
8 N · m (0.8 kgf · m, 5.8 ft · lb)
8 N · m (0.8 kgf · m, 5.8 ft · lb)
S60C5140

No.	Part name	Q'ty	Remarks
1	Starter motor	1	
2	Ignition coil	2	
3	Starter motor lead	1	Black/white
4	Starter motor lead	1	Black
5	Washer	2	
6	Nut	2	
7	Bolt	3	M8 × 45 mm
8	Bolt	1	M6 × 20 mm
9	Ground lead	3	
10	Ignition coil lead	2	
11	Bolt	4	M6 × 30 mm
12	Spark plug cap	4	
13	Screw	5	
14	Cover	1	
15	Timing belt	1	
16	Drive sprocket	1	
17	Driven sprocket	2	
18	Clip	1	
19	Cooling water hose	1	
20	Plastic tie	1	**Not reusable**
21	Bolt	2	M6 × 16 mm
22	Bracket	1	
23	Bolt	2	M10 × 35 mm
24	Washer	2	
25	Pin	2	
26	Spring	1	
27	Bolt	1	M10 × 45 mm
28	Tensioner	1	
29	Nut	1	
30	Retaining plate	1	
31	Woodruff key	1	

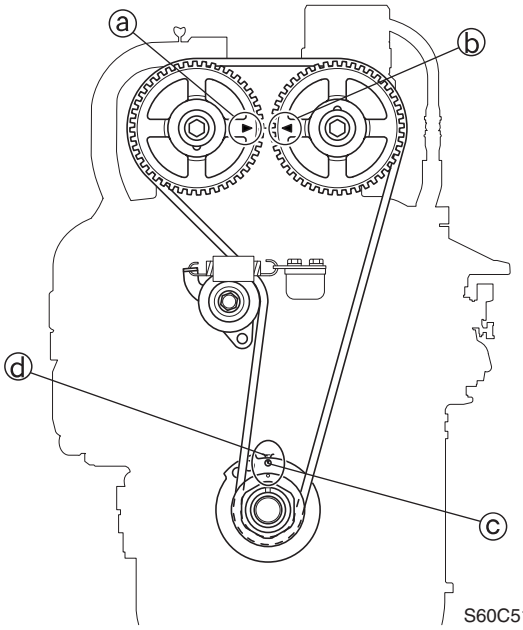

8 N · m (0.8 kgf · m, 5.8 ft · lb)
2 N · m (0.2 kgf · m, 1.4 ft · lb)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

S60C5150

No.	Part name	Q'ty	Remarks
1	Cover	1	
2	Starter relay	1	
3	Power trim and tilt relay	2	
4	CDI unit	1	
5	Rectifier Regulator	1	
6	Wiring harness	1	
7	Oil pressure switch	1	
8	Bolt	1	M4 × 8 mm
9	Oil pressure switch lead	1	
10	Bolt	2	M6 × 12 mm
11	Thermo sensor coupler	1	
12	Ground lead	3	
13	Starter relay lead	1	
14	PTT relay lead	2	
15	Bolt	1	M6 × 12 mm
16	Bolt	1	M6 × 20 mm
17	Collar	4	
18	Grommet	4	
19	Bolt	4	M6 × 28 mm
20	CDI unit coupler	2	
21	Bolt	1	M6 × 20 mm
22	Ground lead	2	
23	Hour meter coupler	1	
24	Bolt	2	M6 × 12 mm
25	Hour meter lead	2	
26	Bolt	3	M6 × 16 mm
27	Rectifier Regulator lead	1	
28	Bolt	2	M6 × 25 mm

Removing the timing belt and sprockets

1. Set the cylinder #1 piston position to TDC of the compression stroke by aligning "▲" marks ⓐ and ⓑ on the driven sprockets, and the hole ⓒ on the retaining plate with the notch ⓓ on the cylinder block.

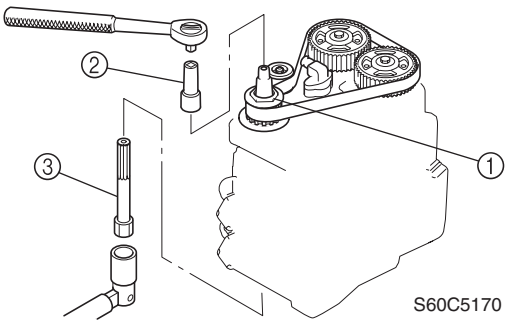


S60C5160

CAUTION:

Do not turn the drive sprocket counterclockwise, otherwise the valve system may be damaged.

2. Loosen the drive sprocket nut ①.



S60C5170

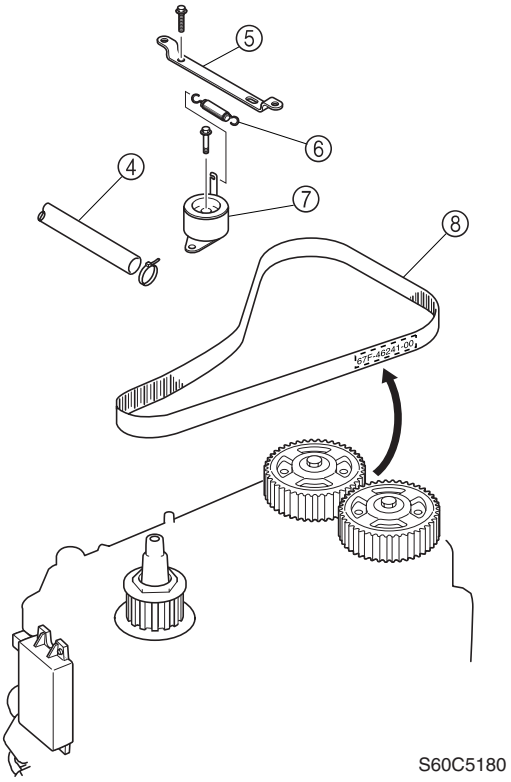
NOTE:

- Use a deep socket ② (M46) for this procedure.
- Do not turn the camshaft when loosening the drive sprocket nut.

Crankshaft holder 20 ③:
90890-06552

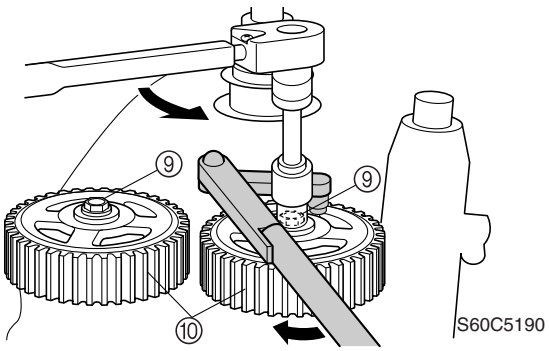
3. Disconnect the cooling water hose ④.

4. Remove the bracket ⑤, spring ⑥, tensioner ⑦, and timing belt ⑧ from the driven sprocket side.



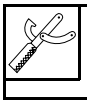
S60C5180

5. Loosen the driven sprocket bolts ⑨ and remove the driven sprockets ⑩.

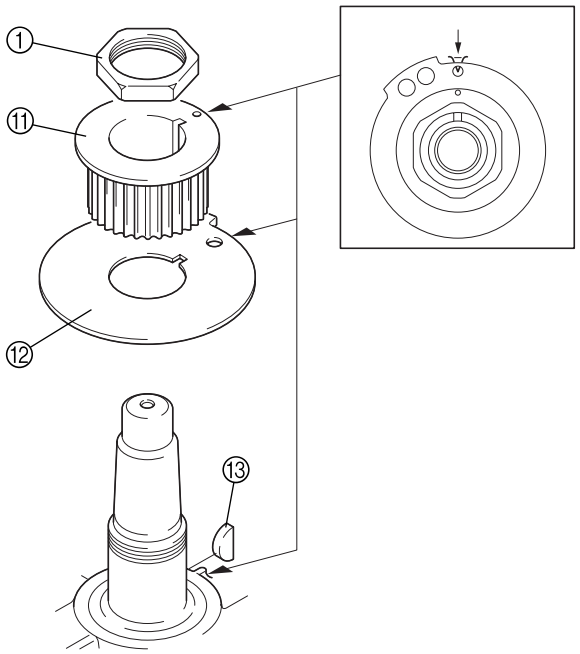


S60C5190

NOTE:
Do not turn the camshaft when loosening the driven sprocket bolt.

	Flywheel holder: 90890-06522

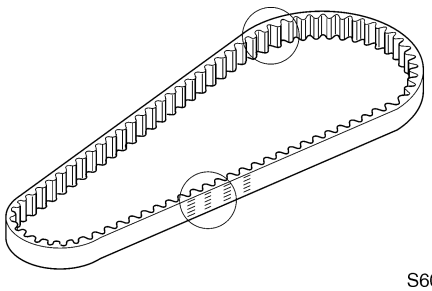
6. Remove the nut ①, drive sprocket ⑪, retaining plate ⑫, and Woodruff key ⑬.



S60C5200

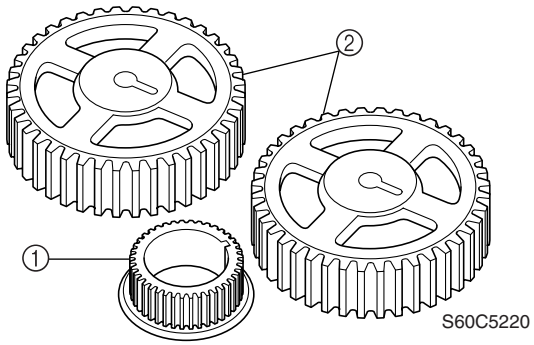
Checking the timing belt and sprockets

1. Check the interior and exterior of the timing belt for cracks, damage, or wear. Replace if necessary.



S60C5210

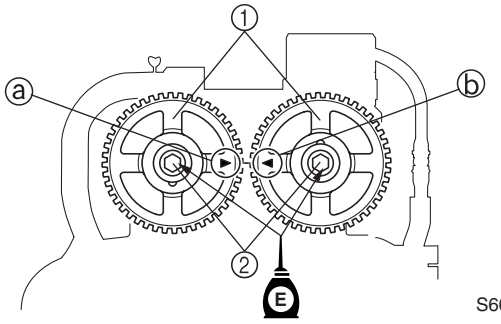
2. Check the drive sprocket ① and driven sprockets ② for cracks, damage, or wear. Replace if necessary.



S60C5220

Installing the sprockets and timing belt

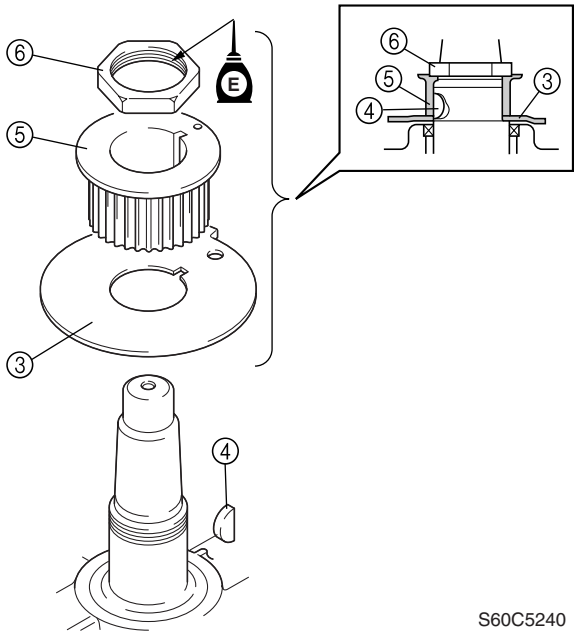
1. Check that "▲" marks ⓐ and ⓑ on the driven sprockets ① are aligned, and then tighten the bolts ②.



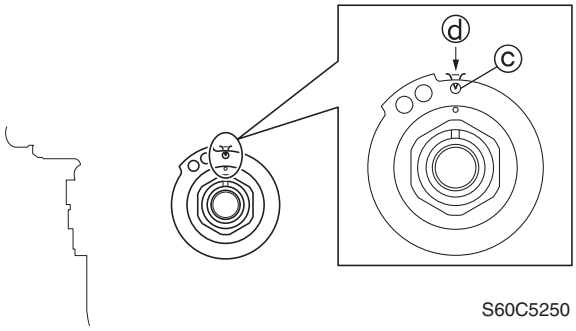
S60C5230

2. Install the retaining plate ③, Woodruff key ④, drive sprocket ⑤, and nut ⑥, and then tighten the nut.

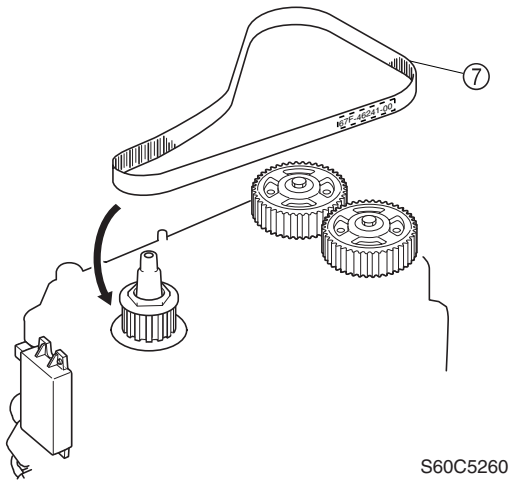
5

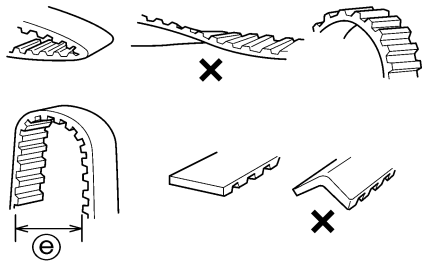


3. Check that the hole ⓒ on the retaining plate is aligned with the notch ⓓ on the cylinder block.



4. Install the timing belt ⑦ from the drive sprocket side with its part number in the upright position.

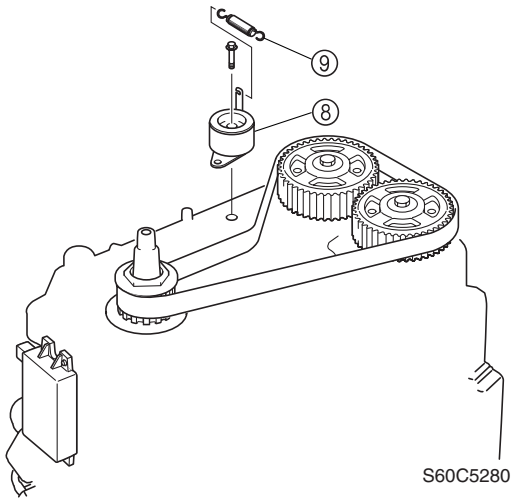




CAUTION:

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

5. Install the tensioner ⑧, spring ⑨, and bolts, and then tighten the bolts finger tight.

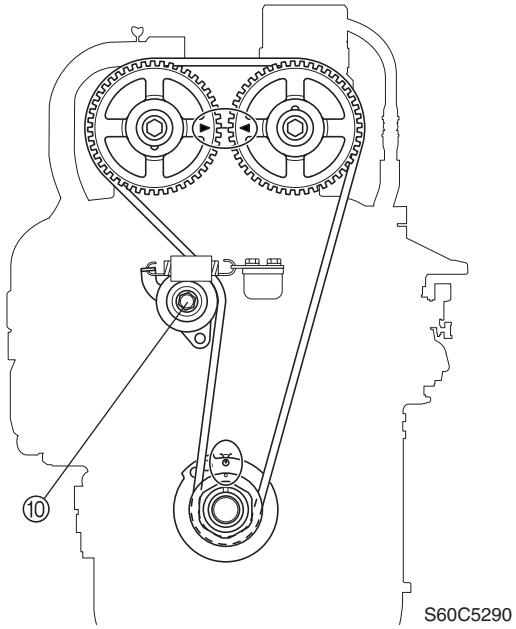


6. Take up the timing belt slack by turning the drive sprocket clockwise at least two full turns.

CAUTION:

Do not turn the sprockets counterclockwise, otherwise the valve system may be damaged.

7. Tighten the tensioner bolts to the specified torque.



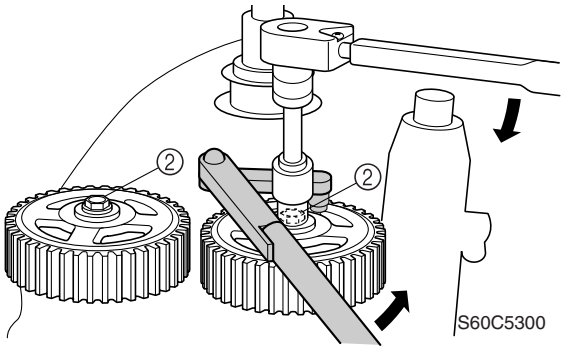
Tensioner bolt ⑩:
39 N·m (3.9 kgf·m, 28 ft·lb)

8. Turn the drive sprocket two turns, and then check that the alignment marks are aligned.

CAUTION:

Do not turn the sprockets counterclockwise, otherwise the valve system may be damaged.

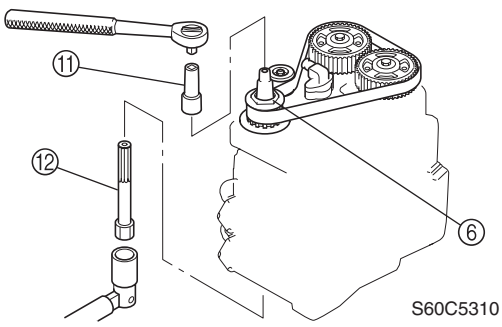
9. Tighten the driven sprocket bolt ② to the specified torque.



Flywheel holder: 90890-06522

Driven sprocket bolt ②:
60 N·m (6.0 kgf·m, 43 ft·lb)

10. Tighten the drive sprocket nut ⑥ to the specified torque, and then install the breather hose.



NOTE:

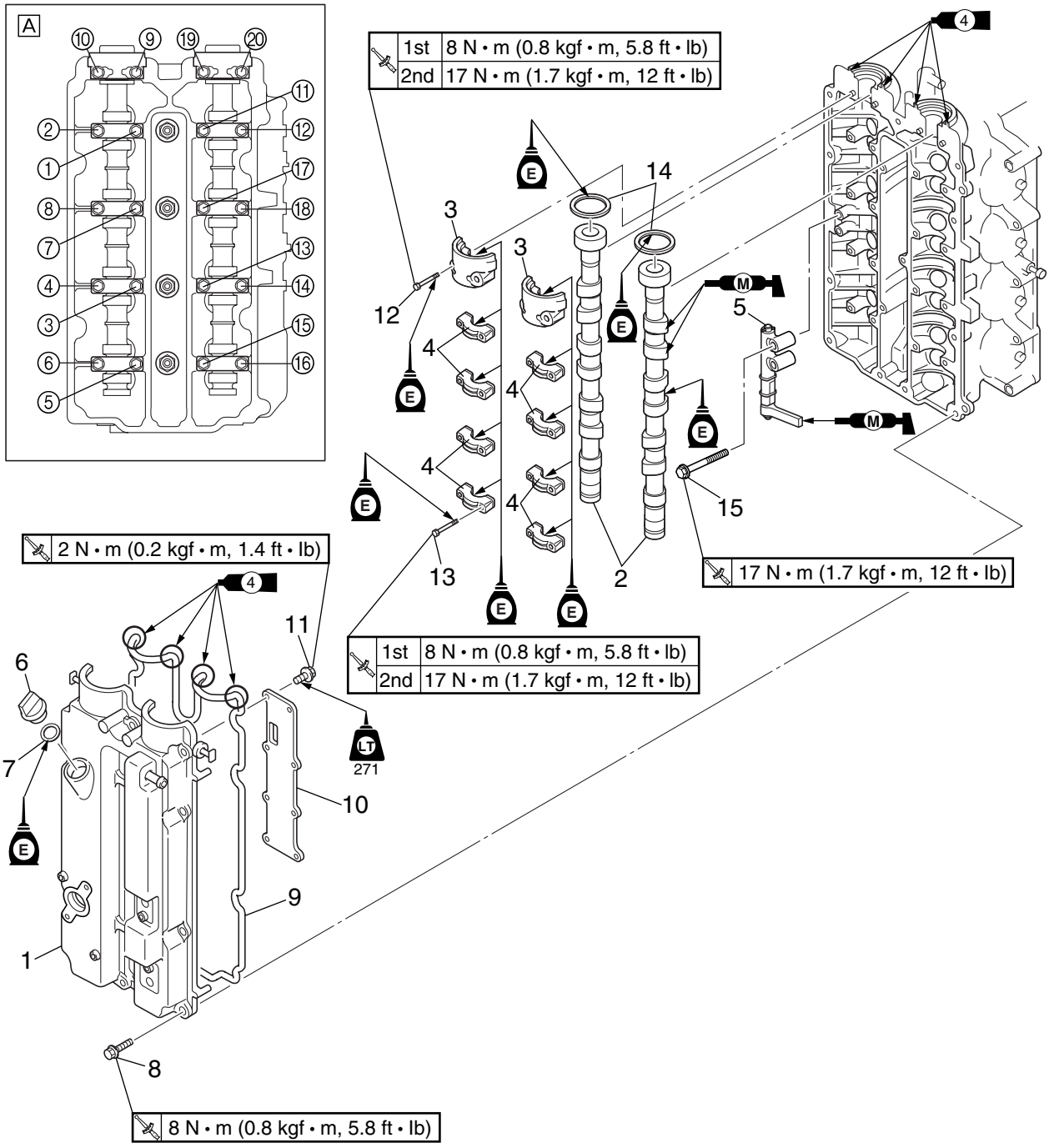
- Use a deep socket ⑪ (M46) for this procedure.
- Install the timing belt, and then tighten the drive sprocket nut ⑥ so that the drive sprocket and the driven sprocket do not move out of the TDC position.

Crankshaft holder 20 ⑫:
90890-06552

Drive sprocket nut ⑥:
265 N·m (26.5 kgf·m, 192 ft·lb)

5

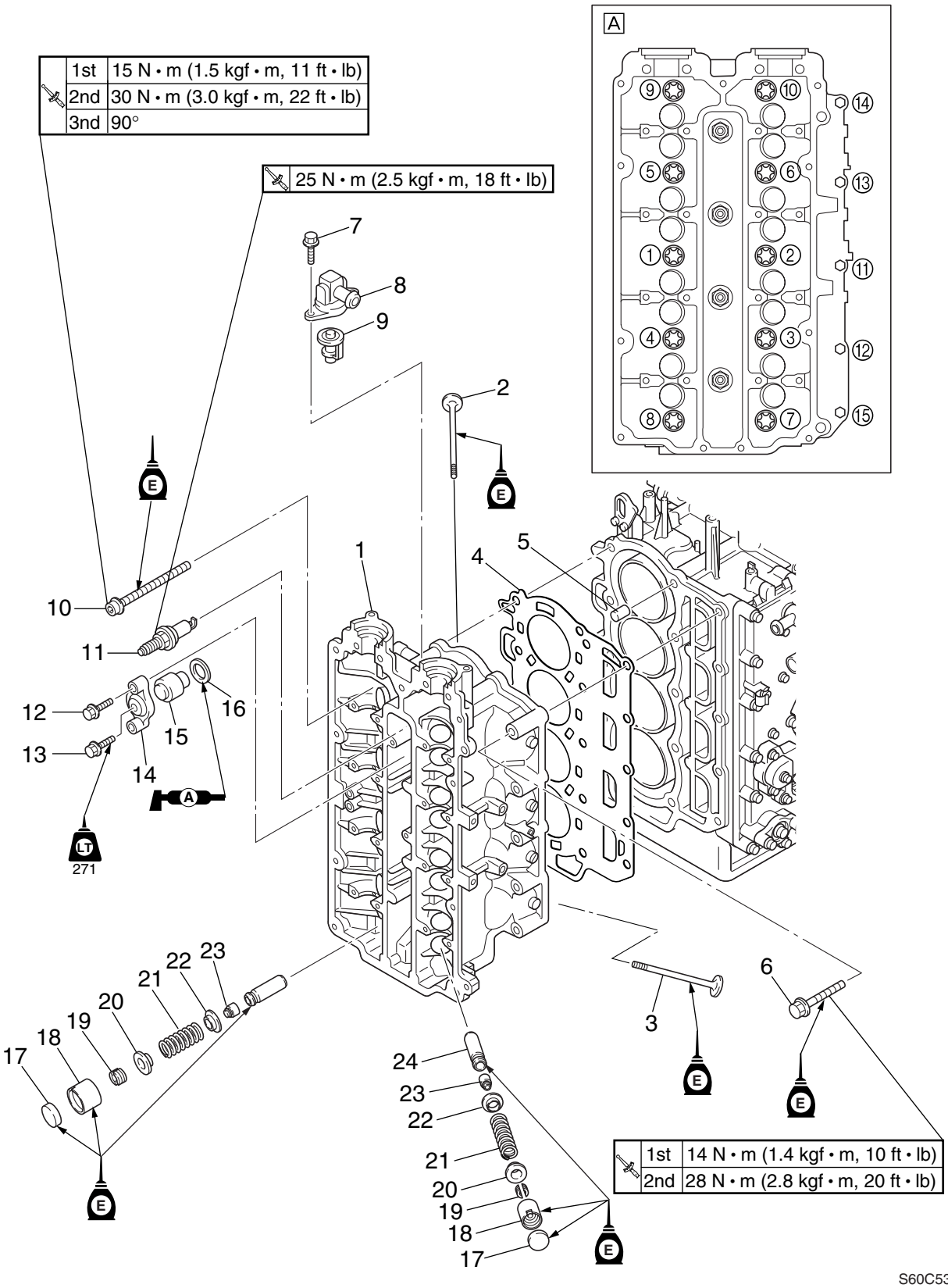
Cylinder head



S60C5320

No.	Part name	Q'ty	Remarks
1	Cylinder head cover	1	
2	Camshaft	2	
3	Camshaft cap	2	
4	Camshaft cap	8	
5	Fuel pump bracket	1	
6	Oil filler cap	1	
7	O-ring	1	3.1 × 30.6 mm
8	Bolt	14	M6 × 30 mm
9	Gasket	1	**Not reusable**
10	Breather cover	1	
11	Screw	8	M4 × 8 mm
12	Bolt	4	M7 × 48 mm
13	Bolt	16	M7 × 37 mm
14	Oil seal	2	**Not reusable**
15	Bolt	2	M7 × 48 mm

[A] Tightening sequence

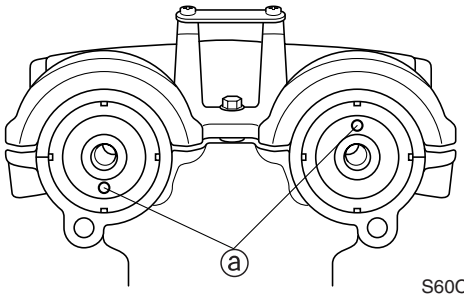

1st 15 N • m (1.5 kgf • m, 11 ft • lb)
2nd 30 N • m (3.0 kgf • m, 22 ft • lb)
3nd 90°
25 N • m (2.5 kgf • m, 18 ft • lb)
A
1st 14 N • m (1.4 kgf • m, 10 ft • lb)
2nd 28 N • m (2.8 kgf • m, 20 ft • lb)
271
S60C5330

No.	Part name	Q'ty	Remarks
1	Cylinder head	1	
2	Exhaust valve	8	
3	Intake valve	8	
4	Cylinder head gasket	1	**Not reusable**
5	Dowel pin	2	
6	Bolt	5	M8 × 55 mm
7	Bolt	2	M6 × 25 mm
8	Cover	1	
9	Thermostat	1	
10	Bolt	10	M10 × 143 mm
11	Spark plug	4	
12	Bolt	4	M8 × 25 mm
13	Bolt	2	M6 × 20 mm
14	Cover	2	
15	Anode	2	
16	Grommet	2	
17	Valve pad	16	
18	Valve lifter	16	
19	Valve cotter	32	
20	Spring retainer	16	
21	Valve spring	16	
22	Spring seat	16	
23	Stem seal	16	**Not reusable**
24	Valve guide	16	**Not reusable**

[A] Tightening sequence

Removing the cylinder head

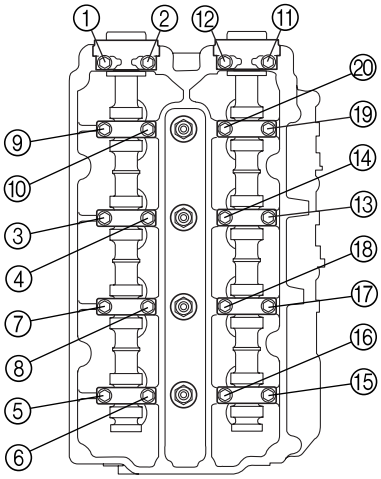
1. Check that the camshaft dowel pin holes ⓐ are in the position shown in the illustration. Adjust if necessary.



S60C5340

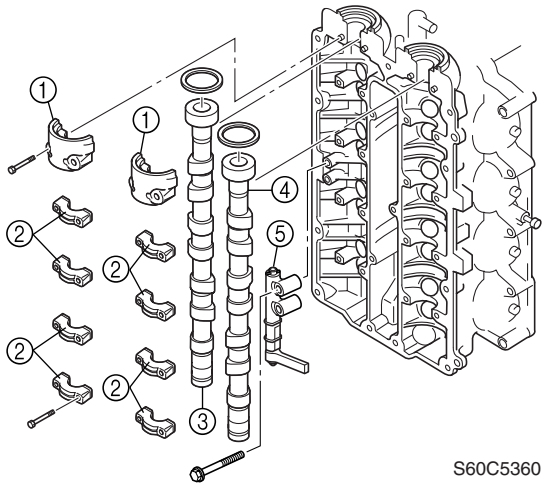
2. Remove the cylinder head cover.

3. Remove the camshaft cap bolts in the sequence shown.



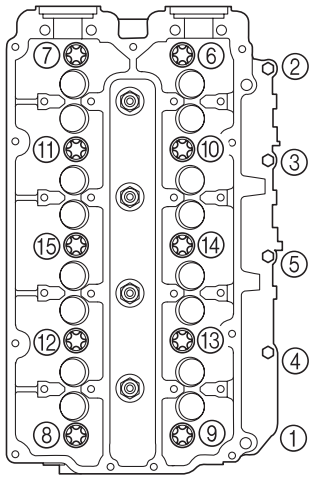
S60C5350

4. Remove camshaft caps ① and ②, camshaft (intake) ③, camshaft (exhaust) ④, and fuel pump bracket ⑤.



S60C5360

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



S60C5370

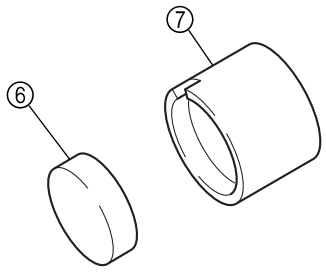
CAUTION:

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

NOTE:

Use a T-type TORX socket (T55) to remove the cylinder head bolts (M10).

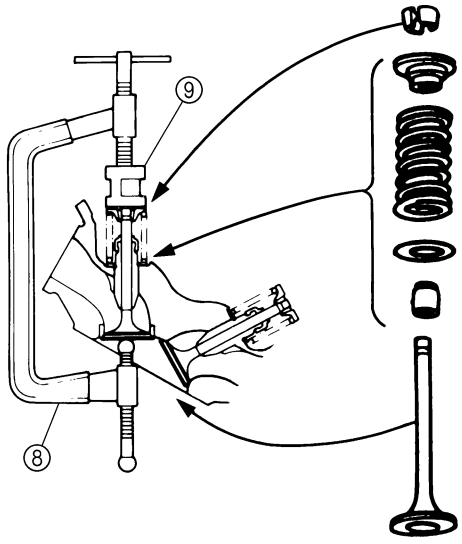
6. Remove the valve pads ⑥ and valve lifters ⑦.



S60C5380

NOTE:
Do not mix the valve train parts. Keep them organized in their proper groups.

7. Remove the intake valve and exhaust valves.



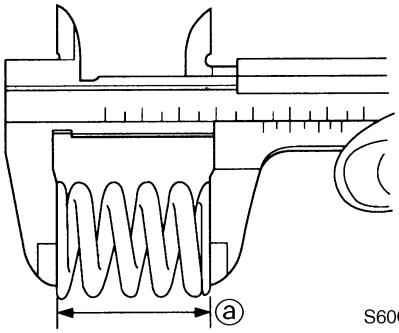
S60C5390

NOTE:
- Be sure to keep the valves, springs, and other parts in the order as they were removed.
- When replacing the valve, also replace the valve guide and stem seal.

Valve spring compressor ⑧:
90890-04019
Valve spring compressor attachment ⑨:
90890-06320

Checking the valve springs

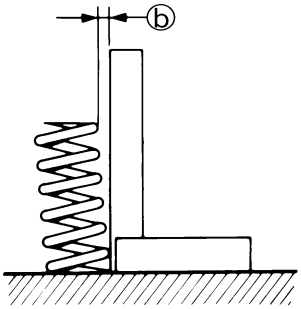
1. Measure the valve spring free length ⓐ. Replace if out of specification.



S60C5400

Valve spring free length limit ⓐ:
52.25 mm (2.057 in)

2. Measure the valve spring tilt ⓑ. Replace if out of specification.



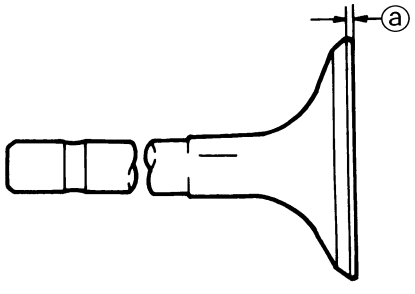
S60C5410

Valve spring tilt limit ⓑ:
2.6 mm (0.1 in)

Checking the valves

1. Check the valve face for pitting or wear. Replace if necessary.

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

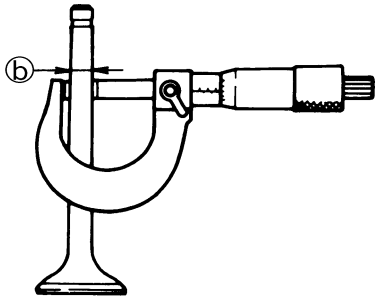


S60C5420

5

Valve margin thickness ⓐ:
Intake:
0.8–1.2 mm (0.031–0.047 in)
Exhaust:
1.0–1.4 mm (0.039–0.055 in)

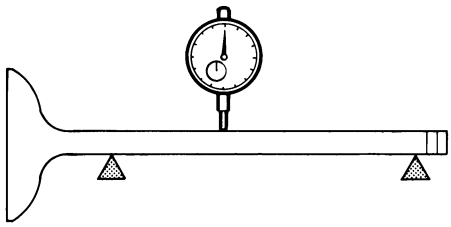
3. Measure the valve stem diameter ⓑ. Replace if out of specification.



S60C5430

Valve stem diameter ⓑ:
Intake:
5.97–5.99 mm
(0.2350–0.2358 in)
Exhaust:
5.96–5.97 mm
(0.2347–0.2350 in)

4. Measure the valve stem runout. Replace if out of specification.

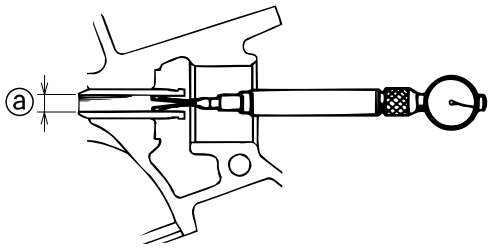

S60C5440

Valve stem runout:
Intake: 0.01 mm (0.0004 in)
Exhaust: 0.01 mm (0.0004 in)

Checking the valve guides

NOTE:
- Use the valve guide clearance calculation method or the valve runout measurement method to check the valve guides.
- Before checking the valve guide make sure that the valve stem diameter is within specification.

1. Measure the valve guide inside diameter ⓐ.



S60C5450

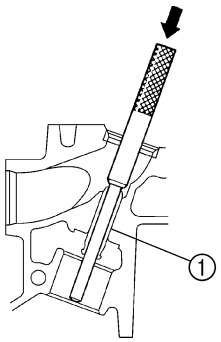
Valve guide inside diameter limit ⓐ:
6.01–6.02 mm (0.2367–0.2370 in)

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:
0.02–0.05 mm
(0.0008–0.0019 in)
Exhaust:
0.04–0.06 mm
(0.0016–0.0023 in)

Replacing the valve guides

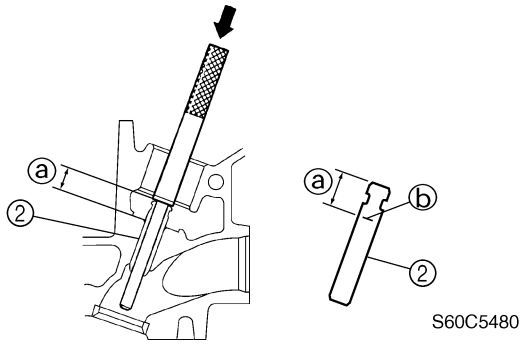
1. Remove the valve guide ① by striking the special service tool from the combustion chamber side.



S60C5470

Valve guide remover/installer: 90890-04064

2. Install the new valve guide ② by striking the special tool from the camshaft side to the specified position ⓐ.



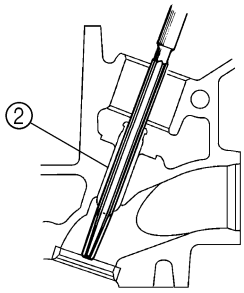
S60C5480

NOTE:
- Before installing the valve guide, mark its installation position ⓑ as shown.
- Apply engine oil to the surface of the new valve guide.

Valve guide position ⓐ: 11.5 mm (0.45 in)

Valve guide remover/installer: 90890-04064

3. Insert the special service tool into the valve guide ②, and then ream the valve guide.



S60C5490

NOTE:
- Turn the valve guide reamer clockwise to ream the valve guide.
- Do not turn the reamer counterclockwise when removing the reamer.

Valve guide reamer: 90890-04066

4. Measure the valve guide inside diameter. Replace the valve guide if out of specification.

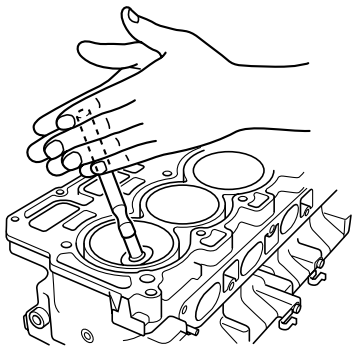
Valve guide inside diameter: 6.01–6.02 mm (0.2367–0.2370 in)

Checking the valve seat

1. Eliminate carbon deposits from the valve with a scraper.

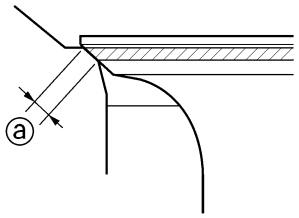
2. Apply a thin, even layer of Mechanic's blueing dye (Dykem) onto the valve seat.

3. Lap the valve slowly on the valve seat with a valve lapper (commercially obtainable) as shown.

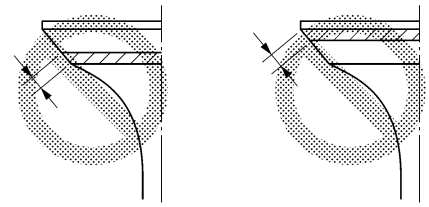

S60C5500

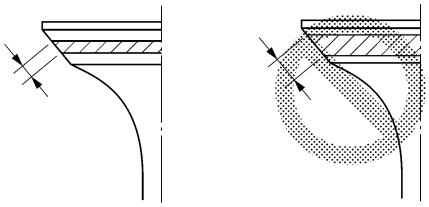
5

4. Measure the valve seat contact width ⓐ where the blueing dye is adhered to 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. Replace the valve guide if the valve seat contact is uneven.



S60C5510



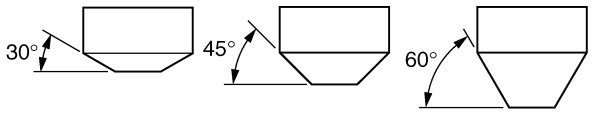


S60C5520

Valve seat contact width ⓐ:
Intake:
1.2–1.6 mm (0.047–0.063 in)
Exhaust:
1.2–1.6 mm (0.047–0.063 in)

Refacing the valve seat

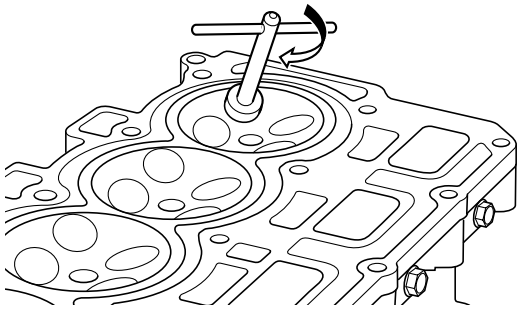
1. Reface the valve seat with the valve seat cutter.



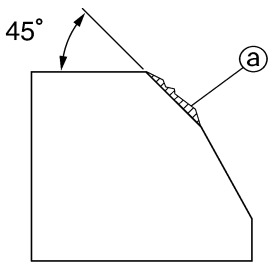
S60C5530

Valve seat cutter holder:
90890-06553
Valve seat cutter:
30° (intake): 90890-06326
30° (exhaust): 90890-06328
45° (intake and exhaust):
90890-06555
60° (intake): 90890-06324
60° (exhaust): 90890-06315

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.



S60C5540



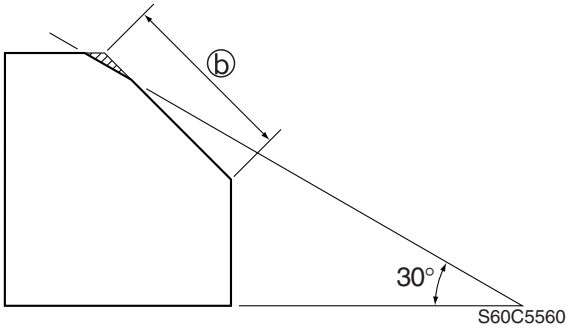
S60C5550

ⓐ Slag or rough surface

CAUTION:

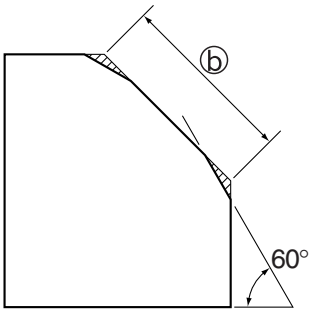
Do not over cut the valve seat. Be sure to turn the cutter evenly downward at a pressure of 40–50 N (4–5 kgf, 8.8–11 lbf) to prevent chatter marks.

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



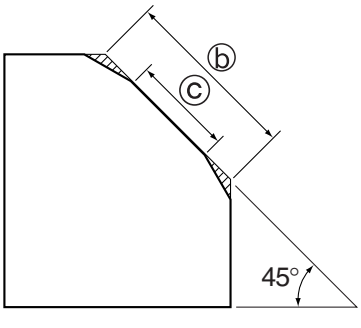
ⓑ Previous contact width

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



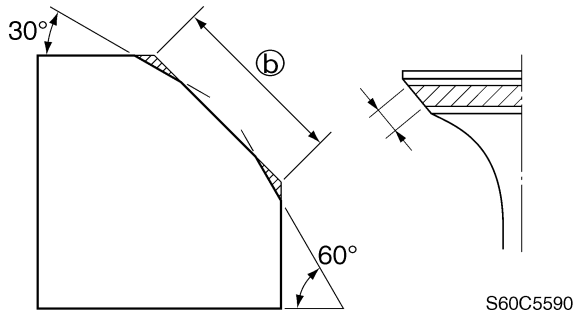
ⓑ Previous contact width

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



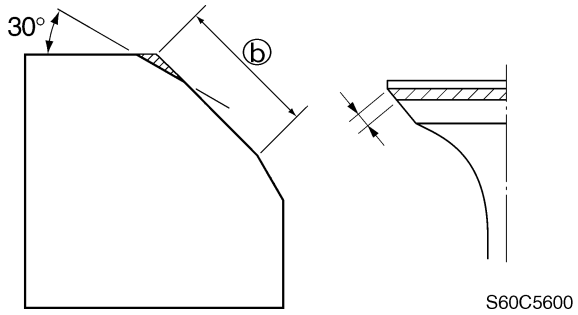
ⓑ Previous contact width
ⓒ Specified contact width

6. 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, a 60° cutter to cut the bottom edge to center the area and set its width.



ⓑ Previous contact width

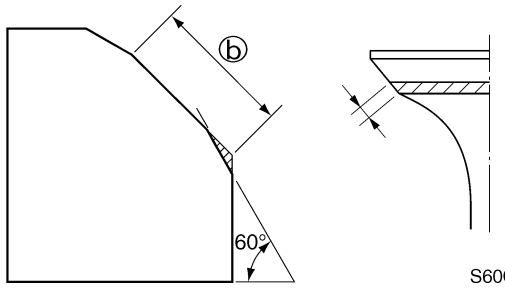
7. If the valve seat contact area is too narrow and situated near the top edge of the valve face, use a 30° cutter to cut the top edge of the valve seat. If necessary, use a 45° cutter to center the area and set its width.



ⓑ Previous contact width

5

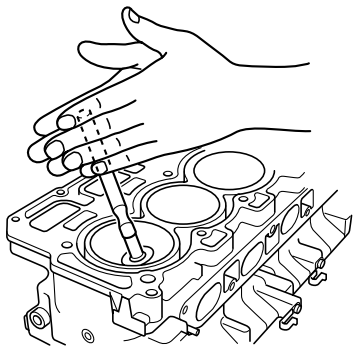
8. If the valve seat contact area is too narrow and situated near the bottom edge of the valve face, use a 60° cutter to cut the bottom edge of the valve seat. If necessary, use a 45° cutter to center the area and set its width.



S60C5610

ⓑ Previous contact width

9. Apply a thin, even layer of lapping compound onto the valve seat, and then lap the valve using a valve lapper (commercially obtainable).


S60C5500

CAUTION:

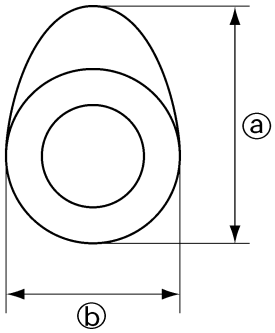
Do not get the lapping compound on the valve stem and valve guide.

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

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

Checking the camshaft

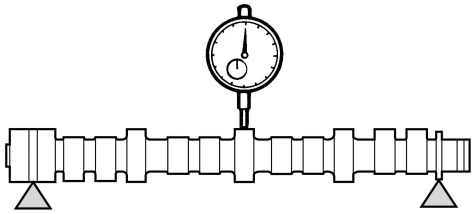
1. Measure the cam lobe. Replace if out of specification.



S60C5620

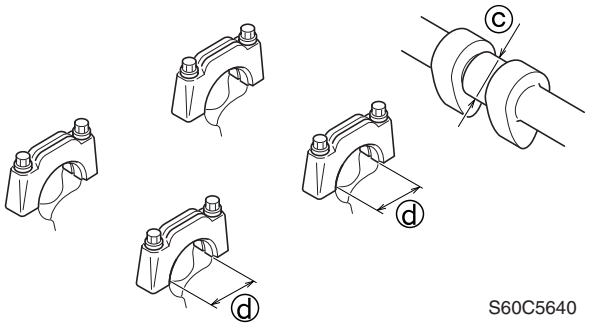
Cam lobe ⓐ:
Intake:
37.22–37.38 mm
(1.4654–1.4716 in)
Exhaust:
36.90–37.06 mm
(1.4528–1.4590 in)
Cam lobe ⓑ:
Intake:
29.92–30.08 mm
(1.1780–1.1842 in)
Exhaust:
29.92–30.08 mm
(1.1780–1.1842 in)

2. Measure the camshaft runout. Replace if out of specification.


S60C5630

Camshaft runout limit:
0.1 mm (0.004 in)

3. Measure the camshaft journal diameter ⓒ and cylinder head journal inside diameter ⓓ. Replace the camshaft and cylinder head if out of specification.



Camshaft journal diameter ⓒ:
24.96–24.98 mm
(0.9827–0.9834 in)
Camshaft cap inside diameter ⓓ:
25.00–25.02 mm
(0.9843–0.9850 in)

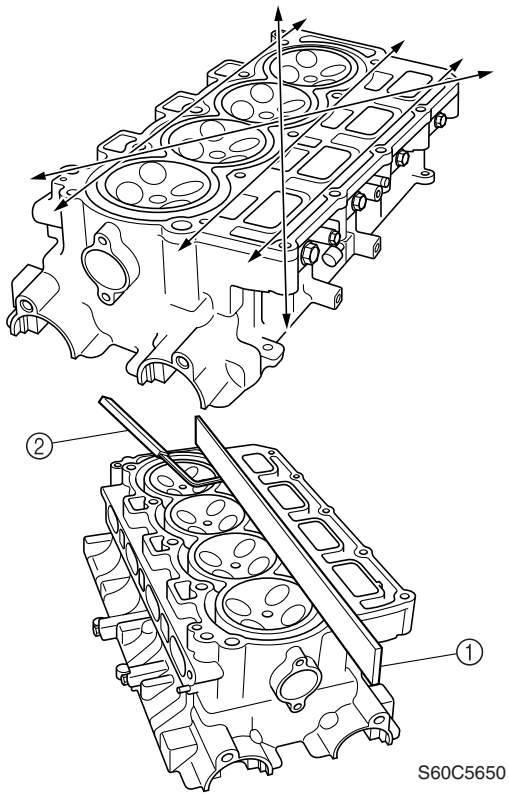
4. Calculate the camshaft oil clearance ⓔ as follows. Replace the camshaft and cylinder head as a set if out of specification.

ⓔ = ⓓ – ⓒ:
0.02–0.06 mm (0.0008–0.0023 in)

Checking the cylinder head

1. Eliminate carbon deposits from the combustion chambers and check for deterioration.

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

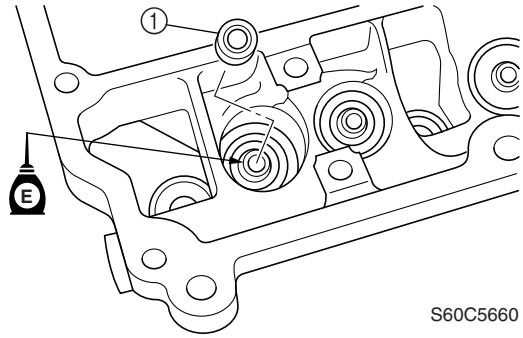


Cylinder head warpage limit:
0.1 mm (0.004 in)

5

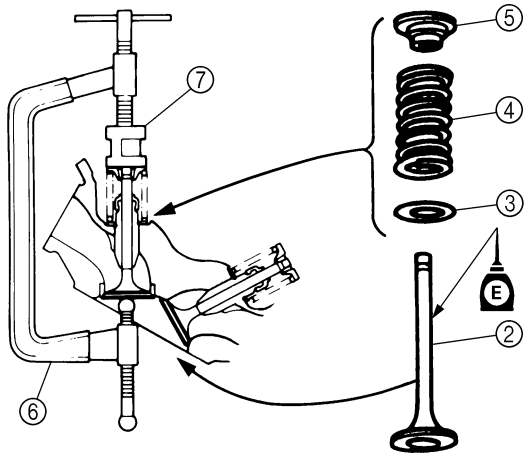
Installing the valves

1. Install the new valve stem seal ① to the valve guide.



S60C5660

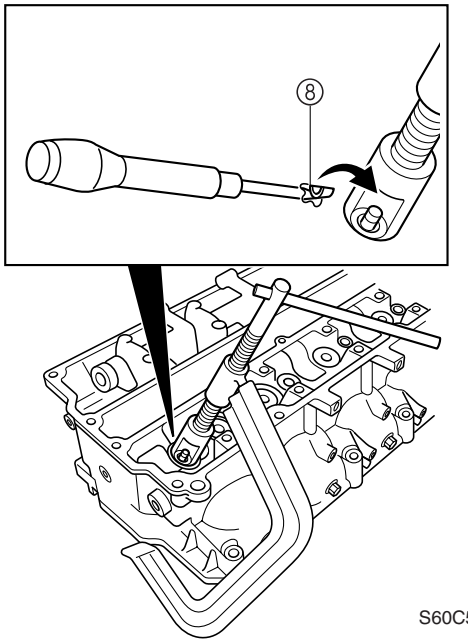
2. Install the valve ②, spring seat ③, valve spring ④, and spring retainer ⑤ in the sequence shown, and then attach the special service tool.



S60C5670

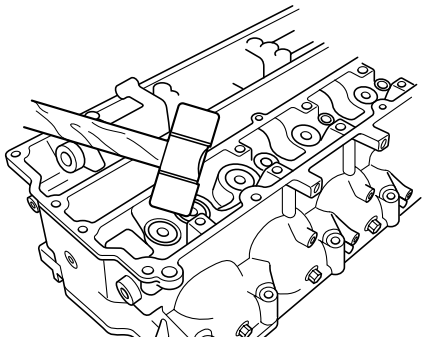
	Valve spring compressor ⑥: 90890-04019 Valve spring compressor attachment ⑦: 90890-06320

3. Compress the valve spring, and then install the valve cotter ⑧ using a thin screwdriver with a small amount of grease applied to it.



S60C5680

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

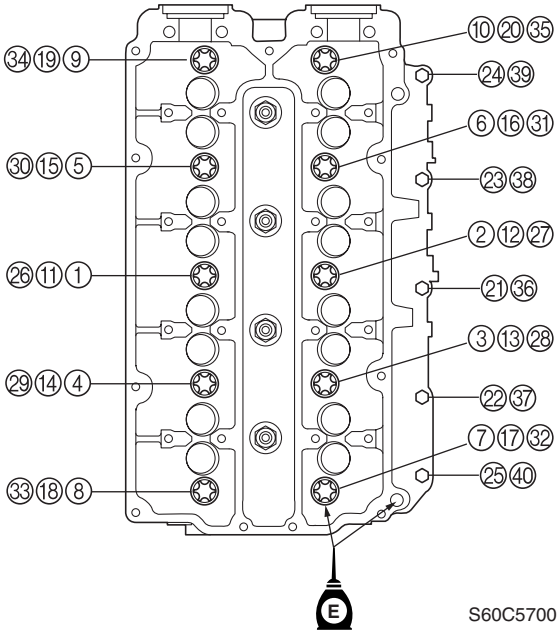


S60C5690

5. Install the valve pads and valve lifters.

Installing the cylinder head

1. Tighten the cylinder head bolts to the specified torques, in the specified stages, and in the sequence detailed in the specification box.



S60C5700

CAUTION:

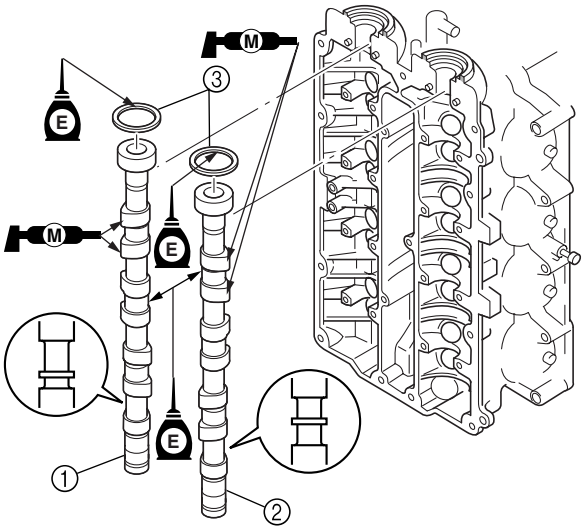
Do not reuse the cylinder head gasket, always replace it with a new one.

NOTE:

- Apply engine oil to the cylinder head bolts before installation.
- Use a T-type TORX socket (T55) to install the cylinder head bolts (M10).

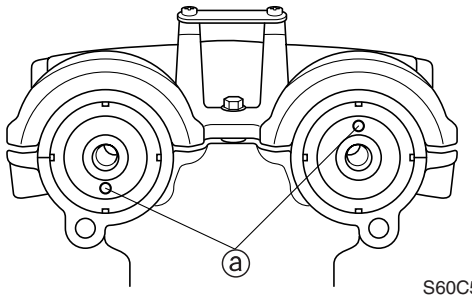
Cylinder head bolt (M10):
1st ①–⑩:
15 N·m (1.5 kgf·m, 11 ft·lb)
2nd ⑪–⑳:
30 N·m (3.0 kgf·m, 22 ft·lb)
3rd ㉖–㉟: 90°
Cylinder head bolt (M8):
1st ㉑–㉕:
14 N·m (1.4 kgf·m, 10 ft·lb)
2nd ㊱–㊵:
28 N·m (2.8 kgf·m, 20 ft·lb)

2. Install the camshaft (intake) ① and camshaft (exhaust) ② with the new oil seals ③.



S60C5710

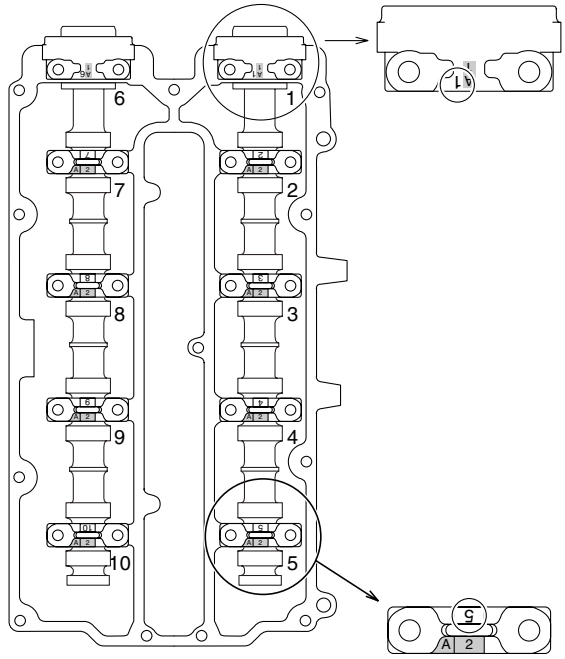
3. Check that the camshaft dowel pin holes ⓐ are in the position shown in the illustration. Adjust if necessary.



S60C5340

5

4. Install the camshaft caps in the proper position as shown and with the stamped numbers facing upside down.



S60C5730

5. Tighten the camshaft cap bolts to the specified torques in two stages and in the sequence shown.

NOTE:
Apply engine oil to the camshaft cap bolts before installation.

	Camshaft cap bolt: 1st: 8 N·m (0.8 kgf·m, 5.8 ft·lb) 2nd: 17 N·m (1.7 kgf·m, 12 ft·lb)

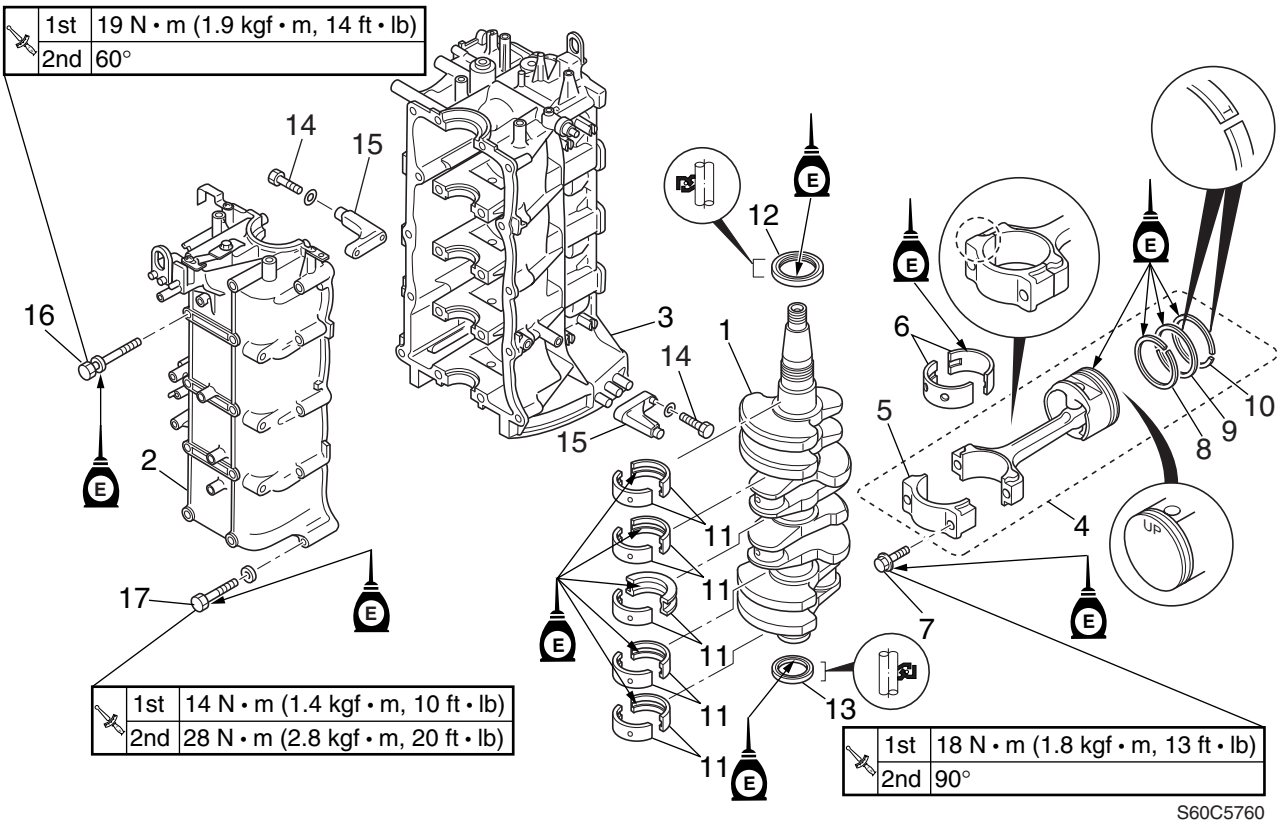
6. Install the fuel pump bracket.

	Fuel pump bracket: 17 N·m (1.7 kgf·m, 12 ft·lb)

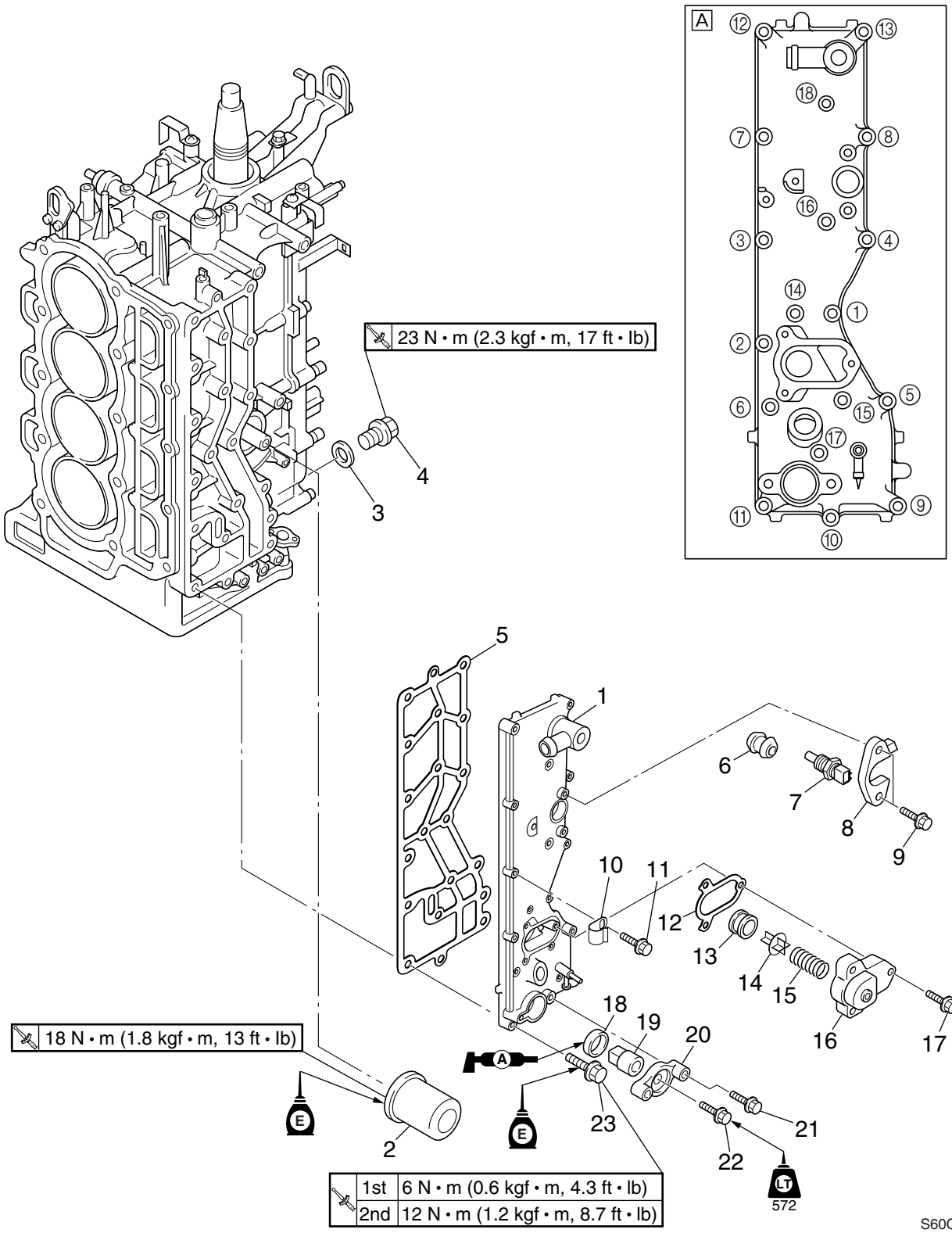
7. Install the cylinder head cover.

	Cylinder head cover: 8 N·m (0.8 kgf·m, 5.8 ft·lb)

Cylinder body



No.	Part name	Q'ty	Remarks
1	Crankshaft	1	
2	Crankcase	1	
3	Cylinder body	1	
4	Piston and connecting rod	4	
5	Connecting rod cap	4	
6	Connecting rod bearing	8	
7	Bolt	8	**Not reusable** M8 × 38 mm
8	Oil ring	4	
9	Second ring	4	
10	Top ring	4	
11	Main bearing	10	
12	Oil seal	1	**Not reusable**
13	Oil seal	1	**Not reusable**
14	Bolt	4	M6 × 25 mm
15	Bracket	2	
16	Bolt	10	M10 × 135 mm
17	Bolt	10	M8 × 55 mm

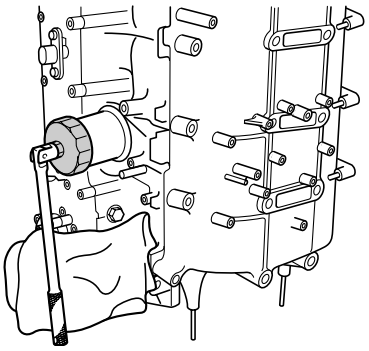

A
23 N • m (2.3 kgf • m, 17 ft • lb)
18 N • m (1.8 kgf • m, 13 ft • lb)
1st 6 N • m (0.6 kgf • m, 4.3 ft • lb)
2nd 12 N • m (1.2 kgf • m, 8.7 ft • lb)
572
S60C5750

No.	Part name	Q'ty	Remarks
1	Exhaust cover	1	
2	Oil filter	1	
3	Gasket	1	**Not reusable**
4	Bolt	1	
5	Gasket	1	**Not reusable**
6	Gasket	1	**Not reusable**
7	Thermo sensor	1	
8	Retainer	1	
9	Bolt	2	M6 × 16 mm
10	Clamp	1	
11	Bolt	1	M6 × 10 mm
12	Gasket	1	**Not reusable**
13	Grommet	1	
14	Pressure control valve	1	
15	Spring	1	
16	Cover	1	
17	Bolt	3	
18	Grommet	1	
19	Anode	1	
20	Cover	1	
21	Bolt	2	M8 × 25 mm
22	Bolt	1	M6 × 20 mm
23	Bolt	18	M6 × 30 mm

Ⓐ Tightening sequence

Removing and installing the oil filter

1. Place a rag under the oil filter, and then remove the filter.

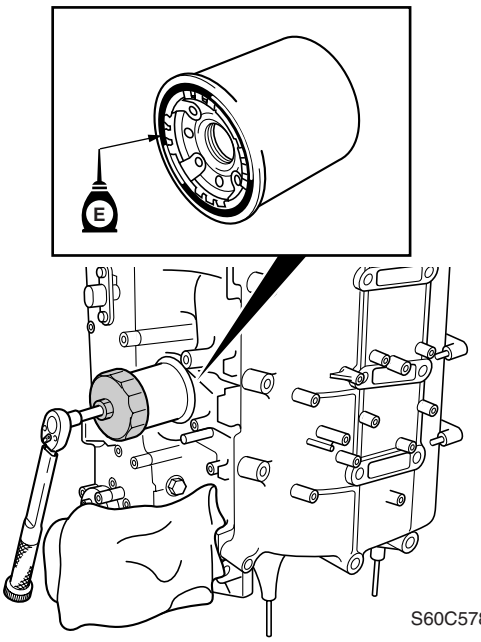

S60C5770

Oil filter wrench: 90890-01426

NOTE:
Be sure to clean up any oil spills.

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

3. Install the oil filter, and then tighten it to the specified torque.



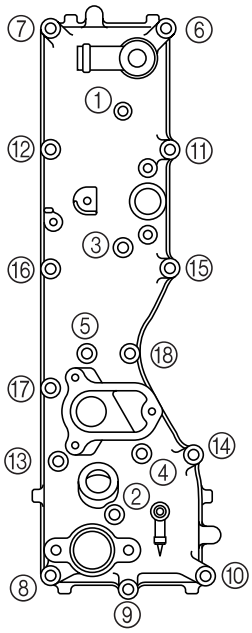
S60C5780

Oil filter wrench: 90890-01426

Oil filter: 18 N·m (1.8 kgf·m, 13 ft·lb)

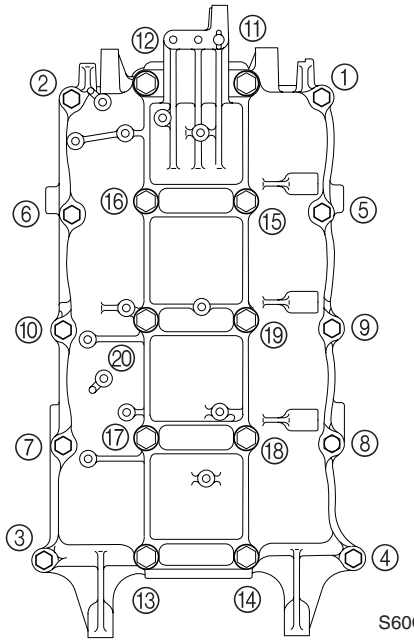
Disassembling the cylinder body

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



S60C5800

2. Remove the crankcase bolts in the sequence shown.



S60C5810

NOTE:
Do not remove the ignition timing pointer from the crankcase.

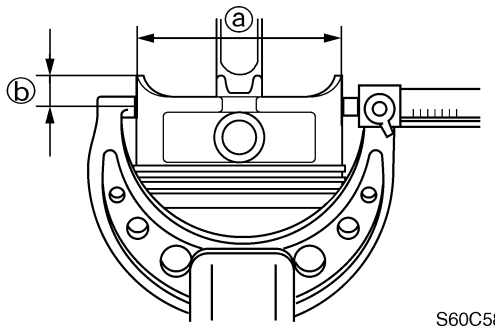
3. Remove the connecting rod bolts and the connecting rod caps.

NOTE:
- Be sure to keep the bearings in the order as they were removed, and to note the bearing color of the bearing.
- After removing the connecting rods, mark each cylinder for identification.

4. Remove the crankshaft, oil seals, and the piston assemblies.

Checking the piston diameter

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

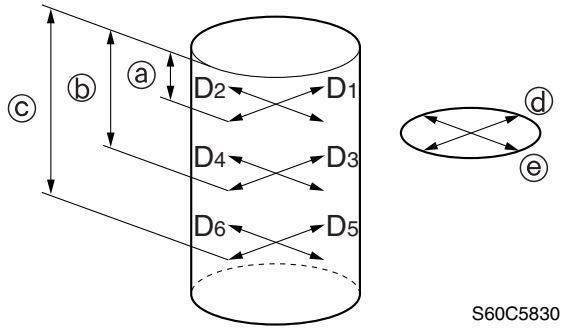


S60C5820

Piston diameter ⓐ:
78.93–78.94 mm
(3.1075–3.1078 in)
Measuring point ⓑ:
13 mm (0.5 in) up from the bottom of the piston skirt
Oversize piston diameter:
79.18–79.19 mm
(3.1174–3.1177 in)
Oversize 1: +0.25 mm (0.0098 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 direction ⓔ (D_2, D_4, D_6), which is at a right angle to the crankshaft.



S60C5830

ⓐ 20 mm (0.8 in)
ⓑ 70 mm (2.8 in)
ⓒ 120 mm (4.7 in)

Cylinder bore (D_1–D_6):
79.00–79.02 mm
(3.1103–3.1110 in)

2. Calculate the taper limit. Replace or rebore the cylinder body if out of specification.

Taper limit:
D_1–D_5 (direction ⓓ)
D_2–D_6 (direction ⓔ)
0.08 mm (0.0031 in)

3. Calculate the out-of-round limit. Replace or rebore the cylinder body if out of specification.

Out-of-round limit:
D_2–D_1 (measuring point ⓐ)
D_6–D_5 (measuring point ⓒ)
0.08 mm (0.0031 in)

5

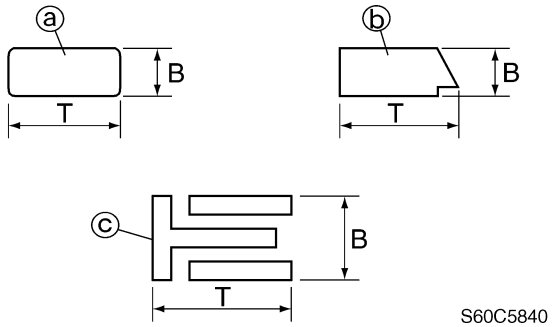
Checking the piston clearance

1. Rebore the cylinder or replace the piston and piston rings as a set, or the cylinder body, or all parts if out of specification.

Piston clearance:
0.07–0.08 mm (0.0028–0.0031 in)

Checking the piston rings

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

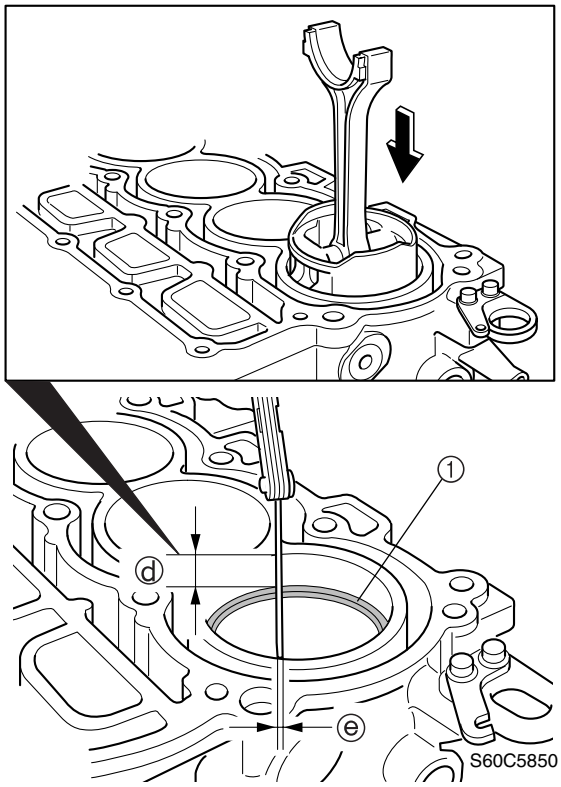


Piston ring dimensions:
Top ring ⓐ:
B: 1.17–1.19 mm
(0.0461–0.0468 in)
T: 2.8–3.0 mm (0.111–0.118 in)
Second ring ⓑ:
B: 1.47–1.49 mm
(0.0579–0.0586 in)
T: 3.00–3.20 mm
(0.1182–0.1259 in)
Oil ring ⓒ:
B: 2.38–2.48 mm
(0.0938–0.0976 in)
T: 2.40 mm (0.0945 in)

2. Level the piston ring ① in the cylinder with the piston crown.

Measuring point ⓓ: 20 mm (0.8 in)

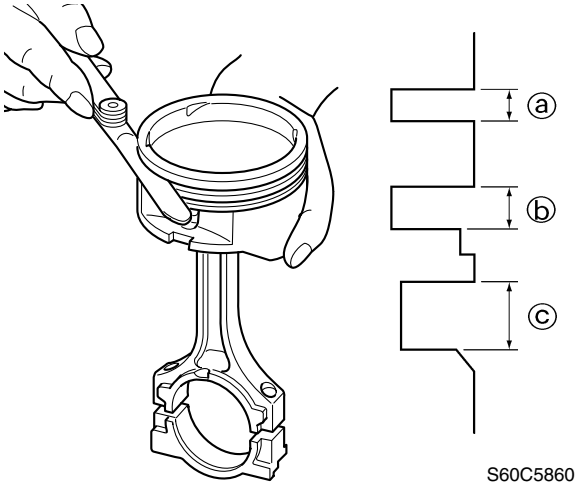
3. Check the piston ring end gap ⓔ at the specified measuring point. Replace if out of specification.



Piston ring end gap ⓔ:
Top ring:
0.15–0.35 mm
(0.0060–0.0137 in)
Second ring:
0.70–0.90 mm
(0.0276–0.0354 in)
Oil ring:
0.20–0.70 mm
(0.0079–0.0275 in)

Checking the piston ring grooves

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

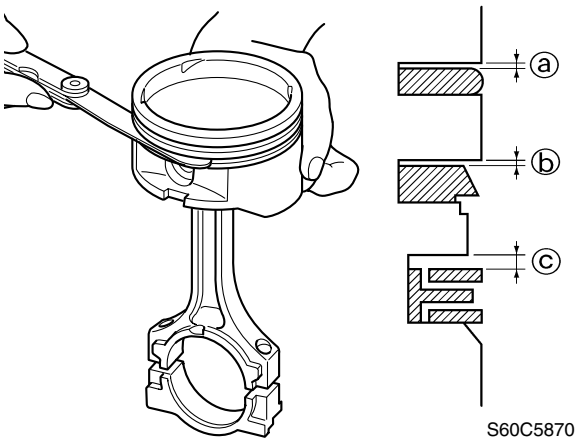


S60C5860

Piston ring groove:
Top ring ⓐ:
1.23–1.25 mm
(0.0485–0.0492 in)
Second ring ⓑ:
1.52–1.54 mm
(0.0599–0.0606 in)
Oil ring ⓒ:
2.51–2.53 mm
(0.0989–0.0996 in)

Checking the piston ring side clearance

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

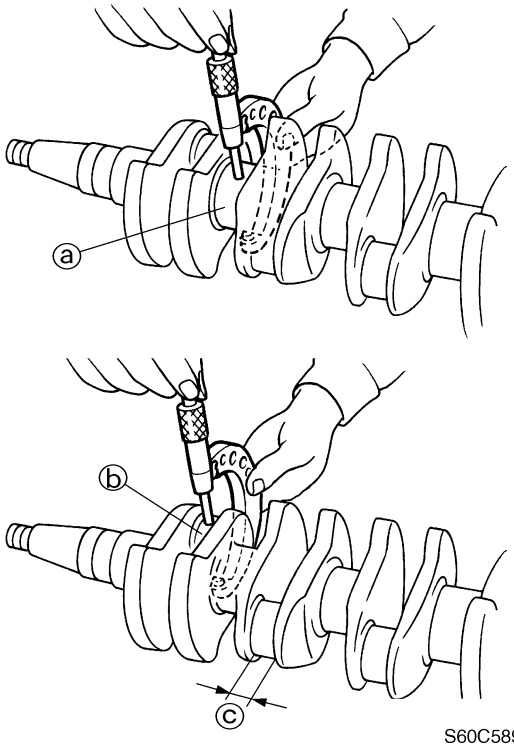


S60C5870

Piston ring side clearance:
Top ring ⓐ:
0.04–0.08 mm
(0.0016–0.0031 in)
Second ring ⓑ:
0.03–0.07 mm
(0.0012–0.0027 in)
Oil ring ⓒ:
0.03–0.15 mm
(0.0012–0.0059 in)

Checking the crankshaft

1. Measure the crankshaft journal diameter ⓐ, crank pin diameter ⓑ, and crank pin width ⓒ. Replace the crankshaft if out of specification.

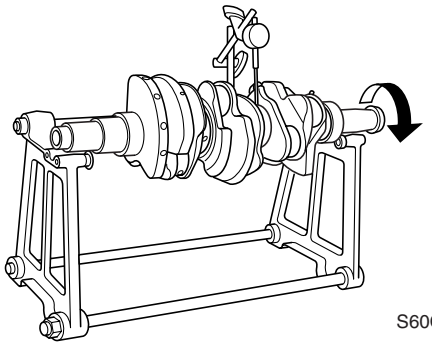


S60C5890

Crankshaft journal diameter ⓐ:
47.984–48.000 mm
(1.8892–1.8897 in)
Crank pin diameter ⓑ:
43.982–44.000 mm
(1.7315–1.7322 in)
Crank pin width ⓒ:
21.00–21.07 mm
(0.8268–0.8295 in)

5

2. Measure the crankshaft runout. Replace the crankshaft if out of specification.


S60C5900

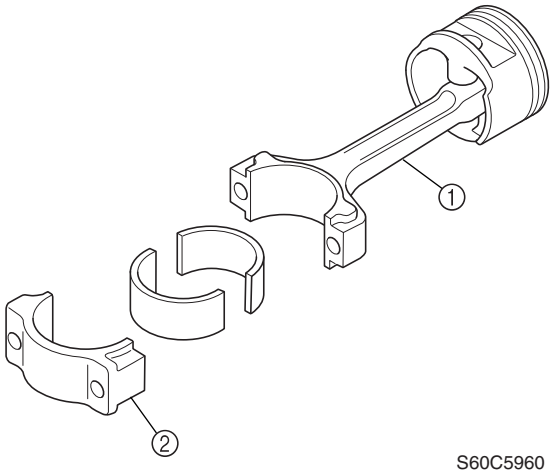
Crank stand alignment:
90890-03107

Crankshaft runout limit:
0.03 mm (0.0012 in)

Checking the crankshaft pin oil clearance

1. Clean the bearings and the connecting rod.

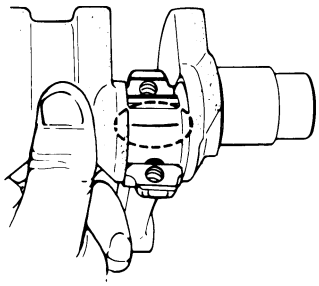
2. Install the upper half of the bearing into the connecting rod ① and the lower half into the connecting rod cap ②.



S60C5960

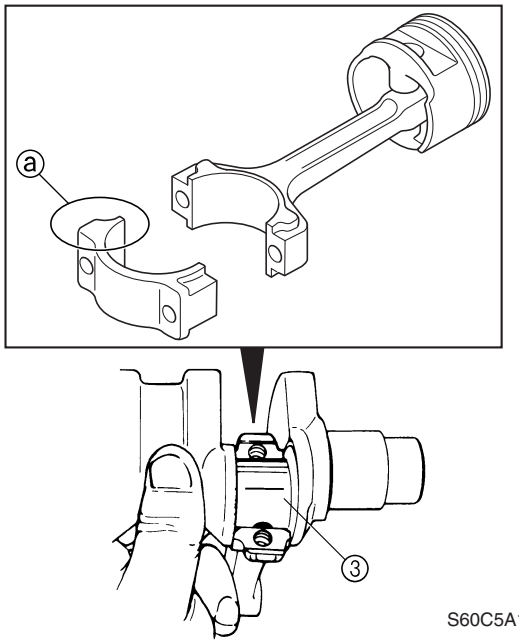
CAUTION:
Install the bearings in their original positions.

3. Put a piece of Plastigauge® (PG-1) onto the crank pin, parallel to the crankshaft.


S60C5990

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

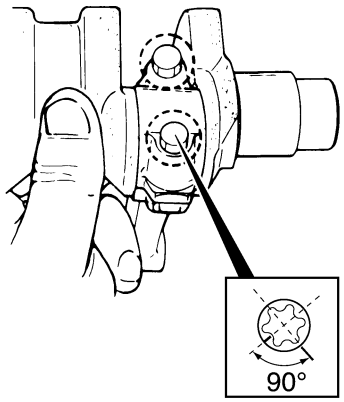
4. Install the connecting rod to the crank pin ③.



S60C5A10

NOTE:
Make sure that the large, flat side ⓐ on the connecting rod faces towards the flywheel side of the crankshaft.

5. Tighten the connecting rod bolts to the specified torques in two stages.

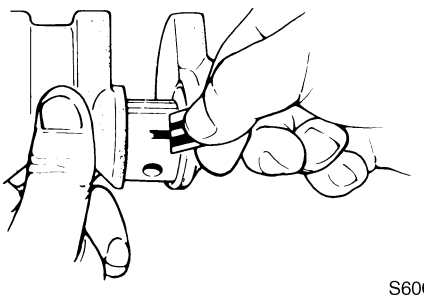


S60C5A20

NOTE:
- Reuse the connecting rod bolts.
- Do not turn the connecting rod until the crank pin oil clearance measurement has been completed.
- Make a mark on the connecting rod bolts and connecting rod caps, and then tighten the bolts 90° from the mark.
- Use a E-type TORX socket (E10) to install the connecting rod bolts.

Connecting rod bolt:
1st: 18 N·m (1.8 kgf·m, 13 ft·lb)
2nd: 90°

6. Remove the connecting rod cap and measure the width of the compressed Plastigauge (PG-1) on each crank pin. Replace the connecting rod bearing if out of specification.



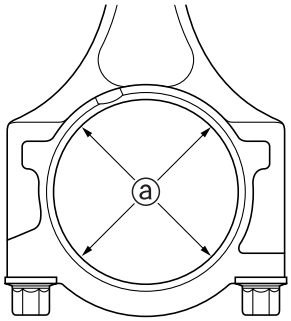
S60C5A30

Crank pin oil clearance:
0.023–0.035 mm
(0.0010–0.0013 in)

Selecting the connecting rod big end bearing

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

2. Measure the connecting rod big end inside diameter ⓐ.



S60C5980

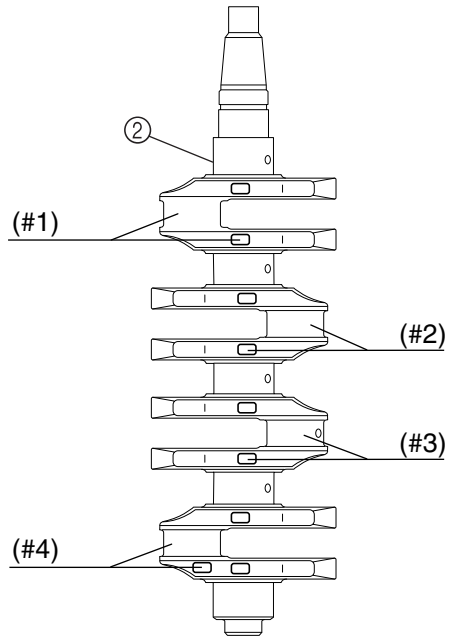
NOTE:
Reuse the connecting rod bolts.

Connecting rod big end inside diameter ⓐ:
47.03–47.04 mm
(1.8514–1.8518 in)

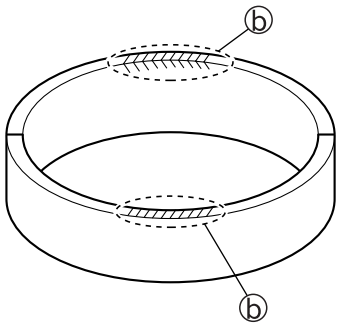
5

3. Check the crank pin mark on the crankshaft ②.

4. Select the suitable color ⓑ for the connecting rod bearing from the table.



S60C5A45



S60C5A65

5. Subtract the crank pin diameters (#1–#4) from the connecting rod big end diameters (#1–#4).

NOTE:
The crank pin diameters (#1–#4) can be determined by the stamped value as described below.
Crank pin diameter = 43.900 + (stamped value/1,000)
Example: #1 = 92 → 43.992

6. Select the suitable bearing from the table below according to the calculated values.

Connecting rod bearing selection table (20 °C [68 °F])		
Connecting rod big end diameters – crank pin diameters (mm)	Upper bearing	Lower bearing
3.025–3.027	Yellow	Yellow
3.028–3.034	Yellow	Green*
3.035–3.041	Green	Green
3.042–3.049	Green	Blue*
3.050–3.057	Blue	Blue
3.058–3.063	Blue	Red*

CAUTION:
The (*) mark indicates that the color of the upper and lower bearings are different.

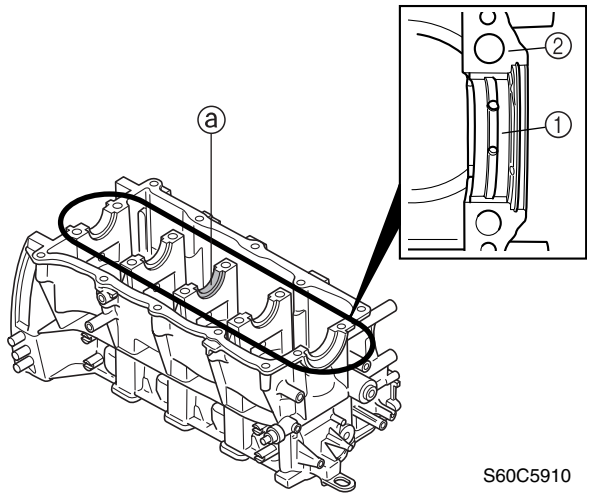
7. If the measurement value is more than the maximum value (3.063 mm), replace the crankshaft, connecting rod, or both.

Checking the crankshaft main journal oil clearance

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

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

3. Install half of the bearings (grooved bearings) ① and the crankshaft into the cylinder body ②.



S60C5910

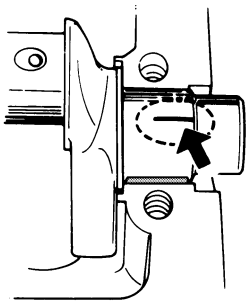
CAUTION:

Install the bearings in their original positions.

NOTE:

Install the unified thrust bearing at the position ⓐ shown.

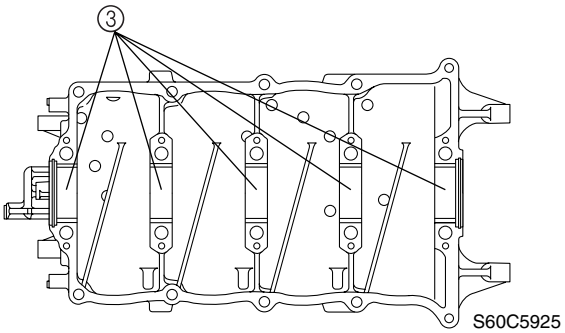
4. Put a piece of Plastigauge (PG-1) on each main journal parallel to the crankshaft.


S60C5920

NOTE:

Do not put the Plastigauge (PG-1) over the oil hole in the main journals of the crankshaft.

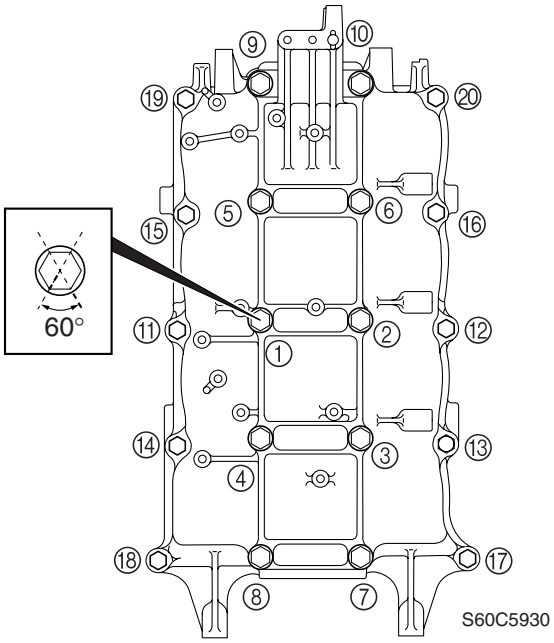
5. Install the remaining half of the bearings (plain bearings) ③ into the crankcase.



S60C5925

6. Install the crankcase onto the cylinder body and apply engine oil onto the threads of the crankcase bolts.

7. Tighten the crankcase bolts to the specified torques in two stages and in the sequence shown.



S60C5930

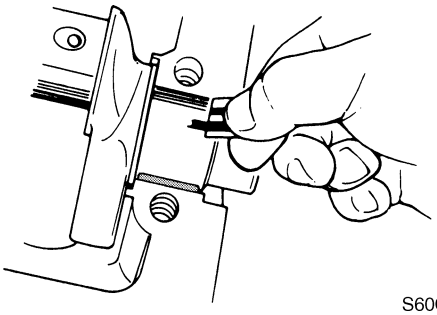
NOTE:

- Do not move the crankshaft until the main journal oil clearance measurement has been completed.
- Make a mark on the crankcase and crankcase bolts, and then tighten the M10 bolts 60° from the mark.

5

Crankcase bolt (M10):
1st: 19 N·m (1.9 kgf·m, 14 ft·lb)
2nd: 60°
Crankcase bolt (M8):
1st: 14 N·m (1.4 kgf·m, 10 ft·lb)
2nd: 28 N·m (2.8 kgf·m, 20 ft·lb)

8. Remove the crankcase and measure the width of the compressed Plastigauge (PG-1) on each main journal. Replace the main bearing if out of specification.


S60C5950

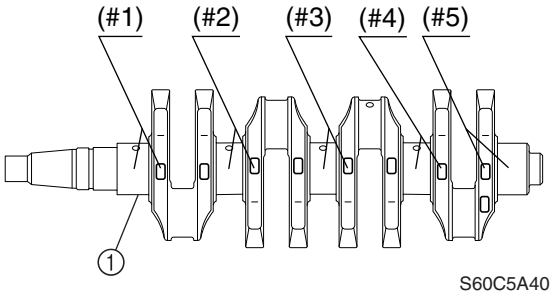
Crankshaft main journal oil clearance:
0.024–0.044 mm
(0.0010–0.0017 in)

Selecting the crankshaft main journal bearing

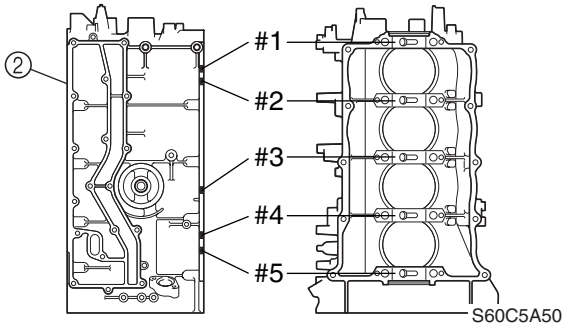
1. When replacing the main bearing, select the suitable bearing as follows.

2. Check the crankshaft journal mark on the crankshaft ① and the cylinder body mark on the cylinder body ②.

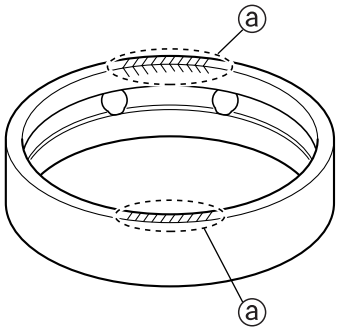
3. Select the suitable color ⓐ for the main bearing from the table.



S60C5A40



S60C5A50



S60C5A60

4. Subtract crankshaft journal diameters #1–#5 from cylinder body journal diameters #1–#5.

NOTE:
Cylinder body journal diameters (#1–#5) and crankshaft journal diameters (#1–#5) can be determined by the stamped value as described below.
Crankshaft journal diameter = 47.900 + (stamped value/1,000)
Example: #1 = 92 → 47.992
Cylinder body journal diameter = 54.000 + (stamped value/1,000)
Example: #1 = 32 → 54.032

5. Select the suitable bearing from the table below according to the calculated values.

Crankshaft bearing selection table (20 °C [68 °F])		
Cylinder body journal diameters – crankshaft journal diameters (mm)	Bearing (cylinder side)/thrust bearing	Bearing (crankcase side)
6.023–6.026	Green	Yellow*
6.027–6.034	Blue	Green*
6.035–6.042	Blue	Blue
6.043–6.049	Red	Blue*
6.050–6.058	Red	Red

CAUTION:

- **The (*) mark indicates that the color of the upper and lower bearings are different.**
- **Be sure to install the main bearings in the middle of the cylinder body and crankcase journal so they do not block the oil holes.**

NOTE:

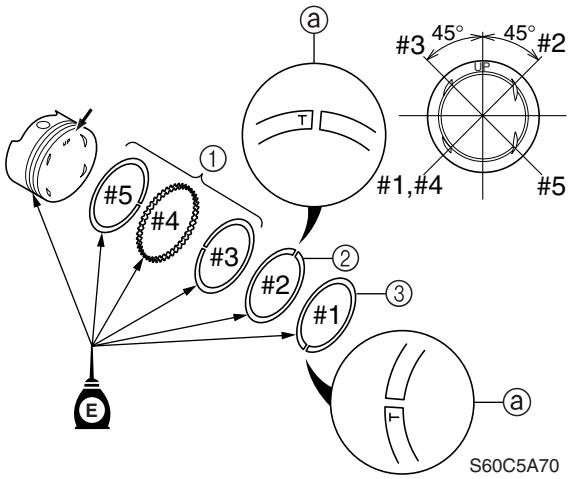
Crankshaft bearing #3 is a thrust bearing.

6. If the difference between the cylinder body journal diameter and crankshaft journal diameter is more than the maximum value (6.058 mm), replace the crankshaft.

Assembling the cylinder body

1. Install the oil ring ①, second ring ②, and top ring ③ to the piston with the "T" mark ⓐ on the piston rings facing upward.

2. Offset the piston ring end gaps as shown.



S60C5A70

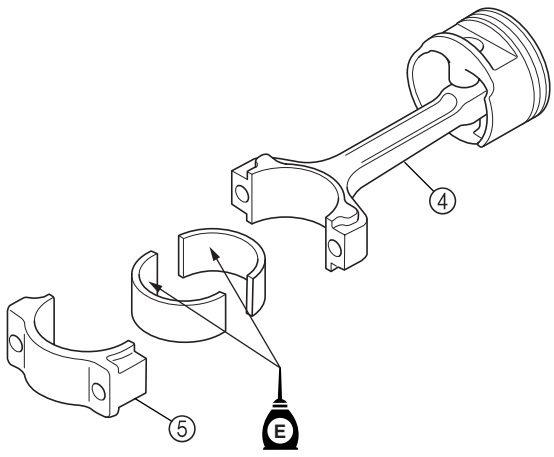
CAUTION:

Do not scratch the piston or break the piston rings.

NOTE:

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

3. Install the upper half of the bearing into the connecting rod ④ and the lower half into the connecting rod cap ⑤.



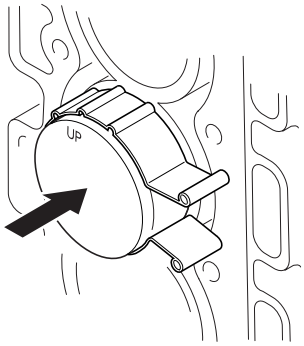
S60C5A80

5

CAUTION:

Install the bearings in their original position.

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



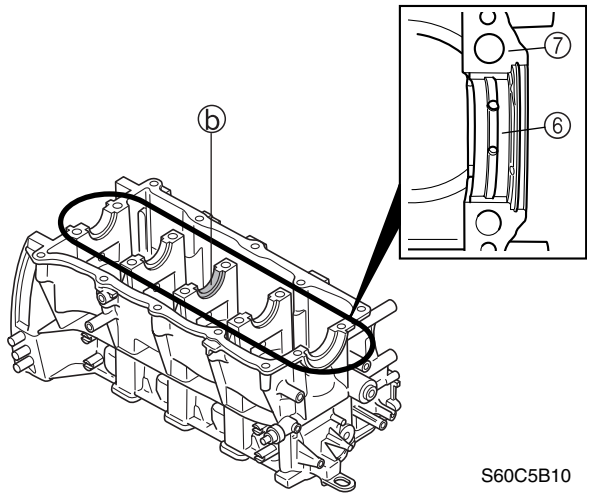
S60C5A90

NOTE:

Apply engine oil to the sides of the piston assembly.

Piston slider: 90890-06530

5. Install half of the bearings (grooved bearings) ⑥ into the cylinder body ⑦.

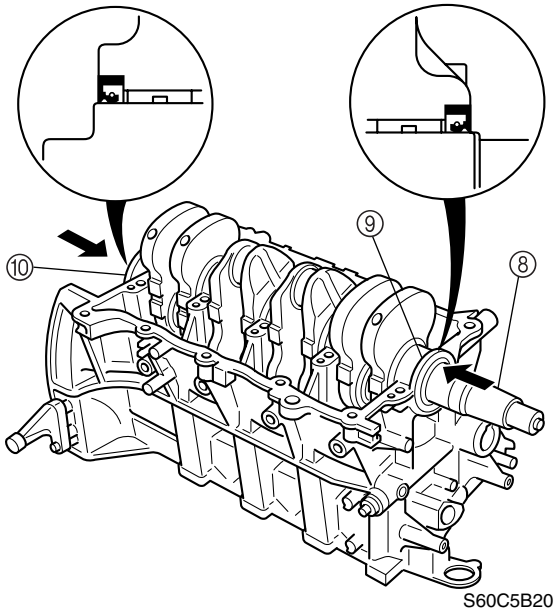


S60C5B10

NOTE:

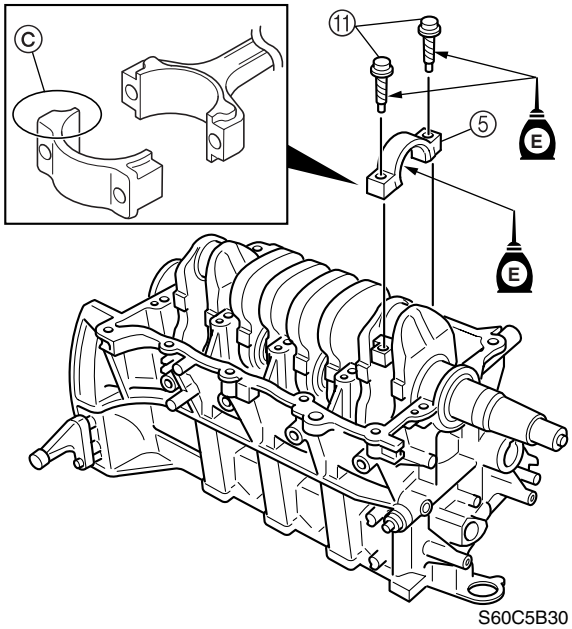
Install the unified thrust bearing at the position ⓑ shown.

6. Set the crankshaft ⑧, and oil seals ⑨ and ⑩ into the cylinder body as shown.



S60C5B20

7. Install the connecting rod cap ⑤ to the connecting rod, and then tighten the new connecting rod bolts ⑪ to the specified torques in two stages.



S60C5B30

CAUTION:

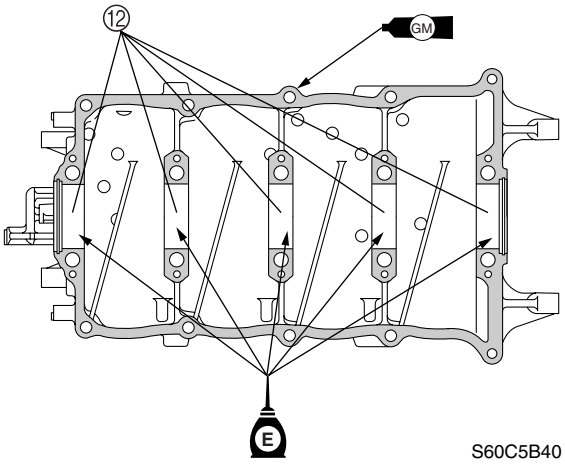
Do not reuse the connecting rod bolts, always replace them with new ones.

NOTE:
- Make sure that the large, flat side Ⓒ of the connecting rod faces towards the flywheel magnet side of the crankshaft.
- Apply engine oil to the connecting rod cap and connecting rod bolt.

Connecting rod bolt ⑪:
1st: 18 N·m (1.8 kgf·m, 13 ft·lb)
2nd: 90°

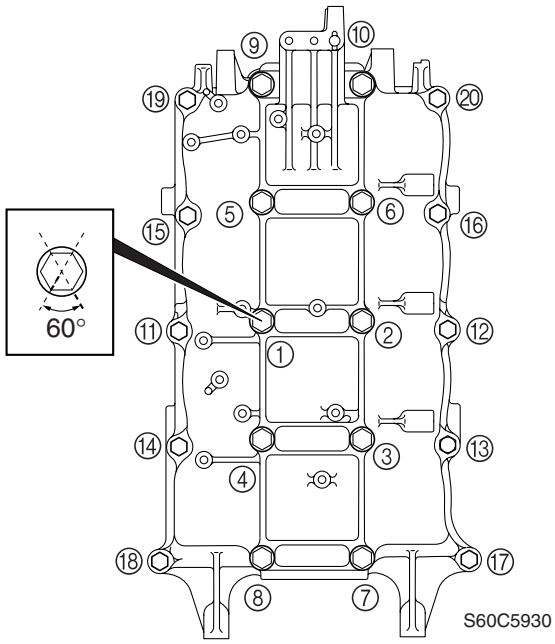
8. Install half of the bearings (plain bearings) ⑫ into the crankcase.

9. Apply Gasket Maker® to the mating surface of the crankcase.



NOTE:
Do not get any Gasket Maker on the journal bearings.

10. Install the crankcase bolts, and then tighten them to the specified torques in two stages and in the sequence shown.



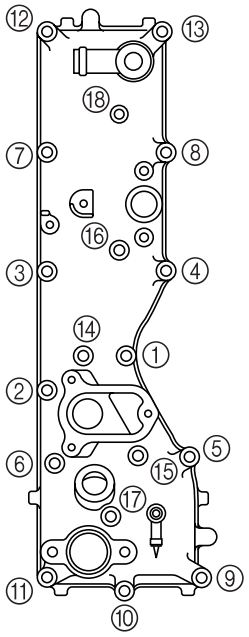
CAUTION:
The oil seals must be installed before tightening the crankcase bolts.

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

Crankcase bolt (M10):
1st: 19 N·m (1.9 kgf·m, 14 ft·lb)
2nd: 60°
Crankcase bolt (M8):
1st: 14 N·m (1.4 kgf·m, 10 ft·lb)
2nd: 28 N·m (2.8 kgf·m, 20 ft·lb)

5

11. Install the new gasket and exhaust cover, and then tighten the bolts to the specified torques in two stages and in the sequence shown.

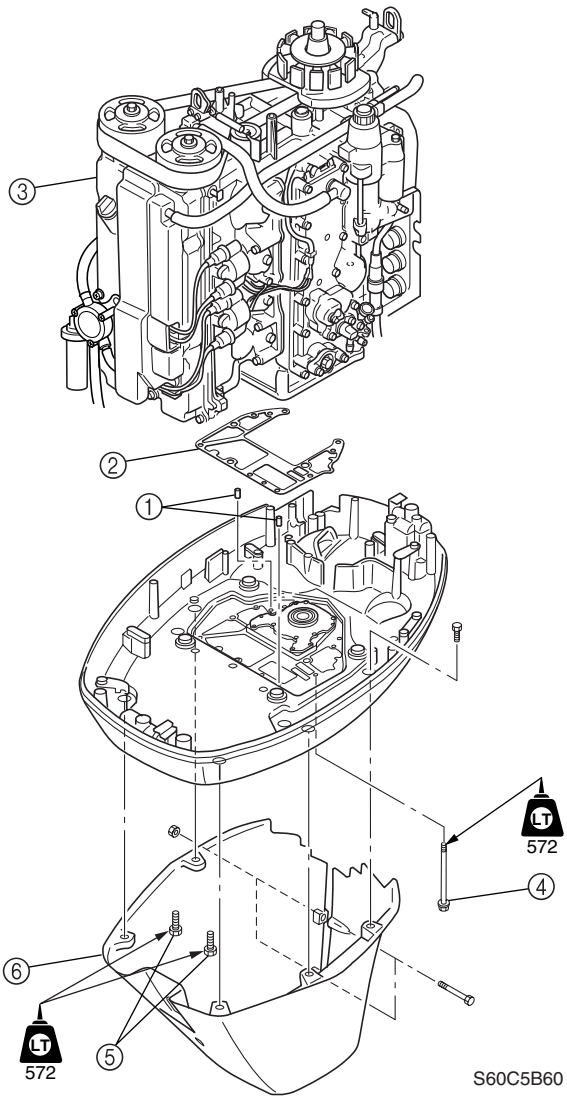


S60C5B50

Exhaust cover bolt:
1st: 6 N·m (0.6 kgf·m, 4.3 ft·lb)
2nd: 12 N·m (1.2 kgf·m, 8.7 ft·lb)

Installing the power unit

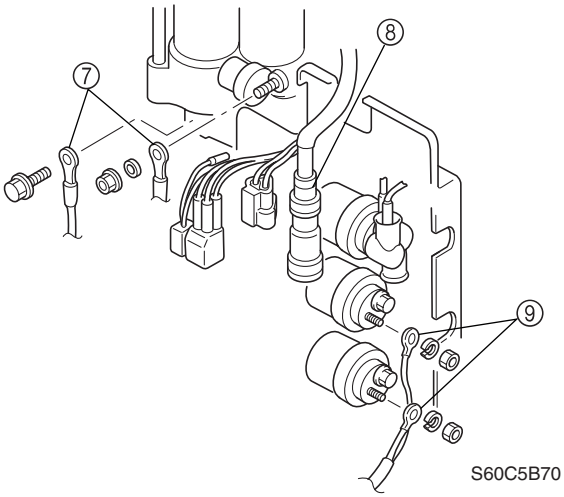
1. Install the dowel pins ① and gasket ②.
2. Install the power unit ③ by installing bolts ④ and ⑤, then tightening them to the specified torque.
3. Install the apron ⑥.



S60C5B60

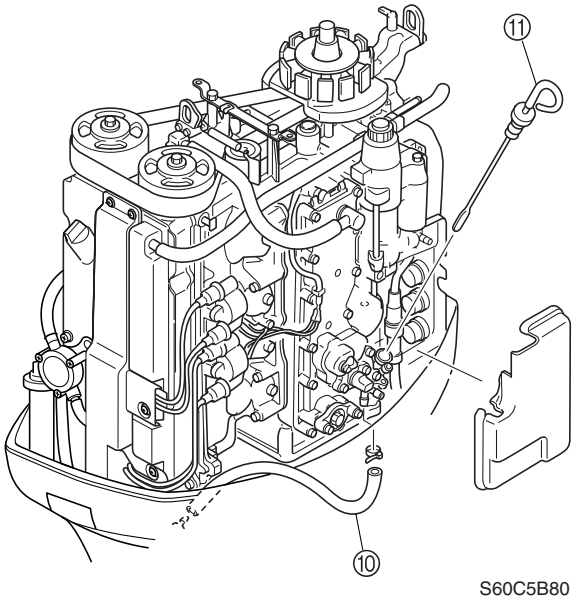
Mounting bolt ④ ⑤:
42 N·m (4.2 kgf·m, 30 ft·lb)

4. Connect the battery leads ⑦, wiring harness ⑧, and PTT motor leads ⑨.



S60C5B70

5. Connect the pilot water hose ⑩ and install the engine oil dipstick ⑪.

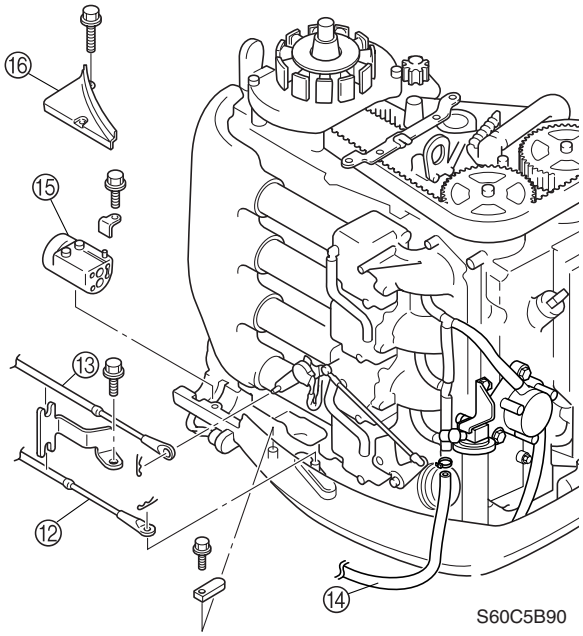


S60C5B80

6. Connect the shift cable ⑫ and throttle cable ⑬, and then adjust their lengths. For adjustment procedures, see Chapter 3, “Checking the throttle cable operation,” and “Checking the gearshift operation.”

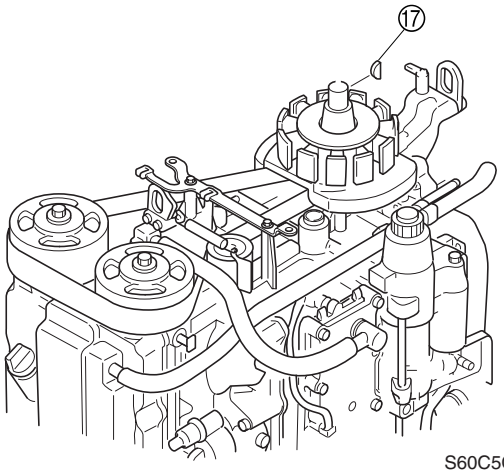
7. Connect the fuel hose ⑭.

8. Install the grommet ⑮ and retaining plate ⑯.



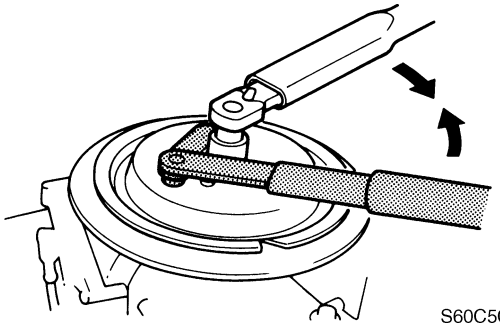
S60C5B90

9. Install the Woodruff key ⑰.



S60C5C10

10. Install the flywheel magnet and flywheel magnet cover.



S60C5C20

CAUTION:

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

NOTE:

Apply engine oil to the flywheel magnet nut before installation.

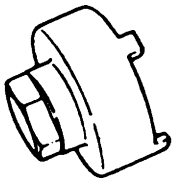
	Flywheel holder: 90890-06522

	Flywheel magnet nut: 186 N·m (18.6 kgf·m, 135 ft·lb)

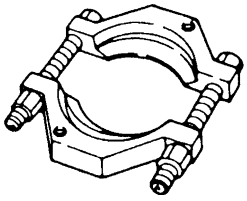
5

Lower unit

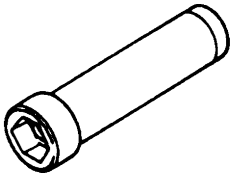
Special service tools



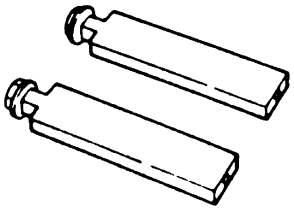
Ring nut wrench 3
90890-06511



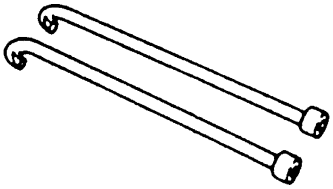
Bearing separator
90890-06534



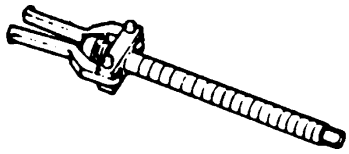
Ring nut wrench extension
90890-06513



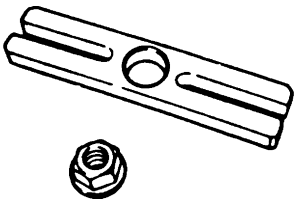
Stopper guide stand
90890-06538



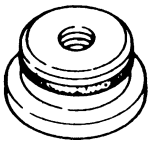
Bearing housing puller claw L
90890-06502



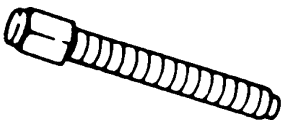
Bearing puller
90890-06535
Bearing puller claw 1
90890-06536
Bearing puller claw 2
90890-06537



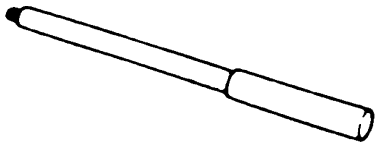
Stopper guide plate
90890-06501



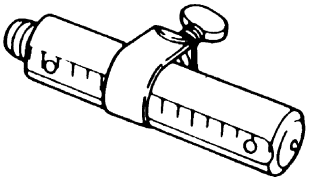
Needle bearing attachment
90890-06609, 90890-06610, 90890-06611,
90890-06612, 90890-06653
Ball bearing attachment
90890-06631, 90890-06633, 90890-06636



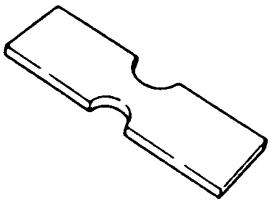
Center bolt
90890-06504



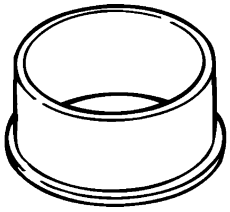
Driver rod LL
90890-06605
Driver rod L3
90890-06652



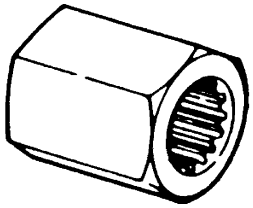
Driver rod SS
90890-06604



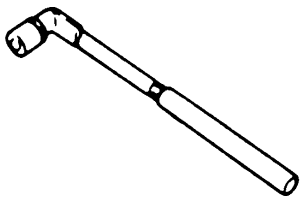
Bearing depth plate
90890-06603



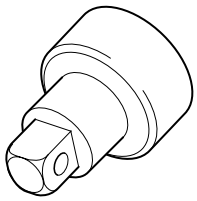
Bearing inner race attachment
90890-06639, 90890-06641, 90890-06643,
90890-06661, 90890-06662



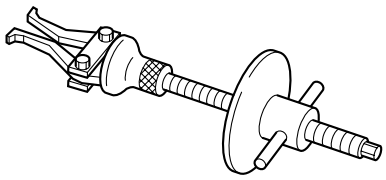
Drive shaft holder 5
90890-06519



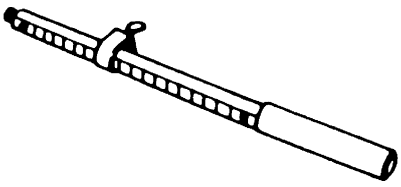
Pinion nut holder
90890-06505



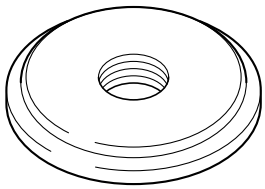
Socket adapter 2
90890-06507



Bearing outer race puller
90890-06523

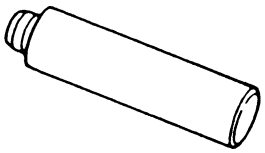


Driver rod SL
90890-06602

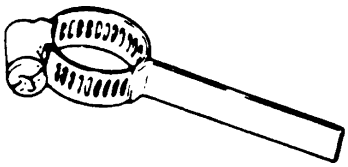


Bearing outer race attachment
90890-06620, 90890-06621, 90890-06623,
90890-06626, 90890-06628

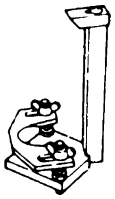
6



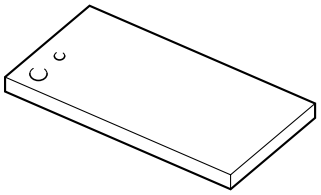
Driver rod LS
90890-06606



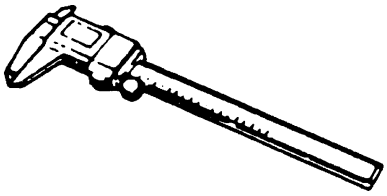
Backlash indicator
90890-06706



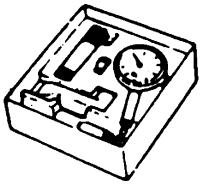
Pinion height gauge
90890-06702



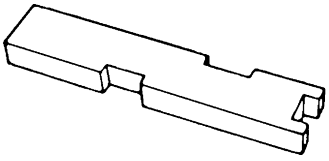
Magnet base plate
90890-07003



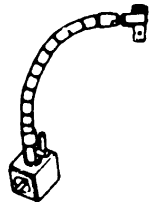
Digital caliper
90890-06704



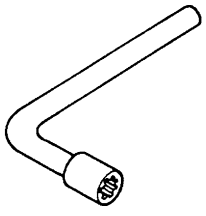
Dial gauge set
90890-01252



Shimming plate
90890-06701

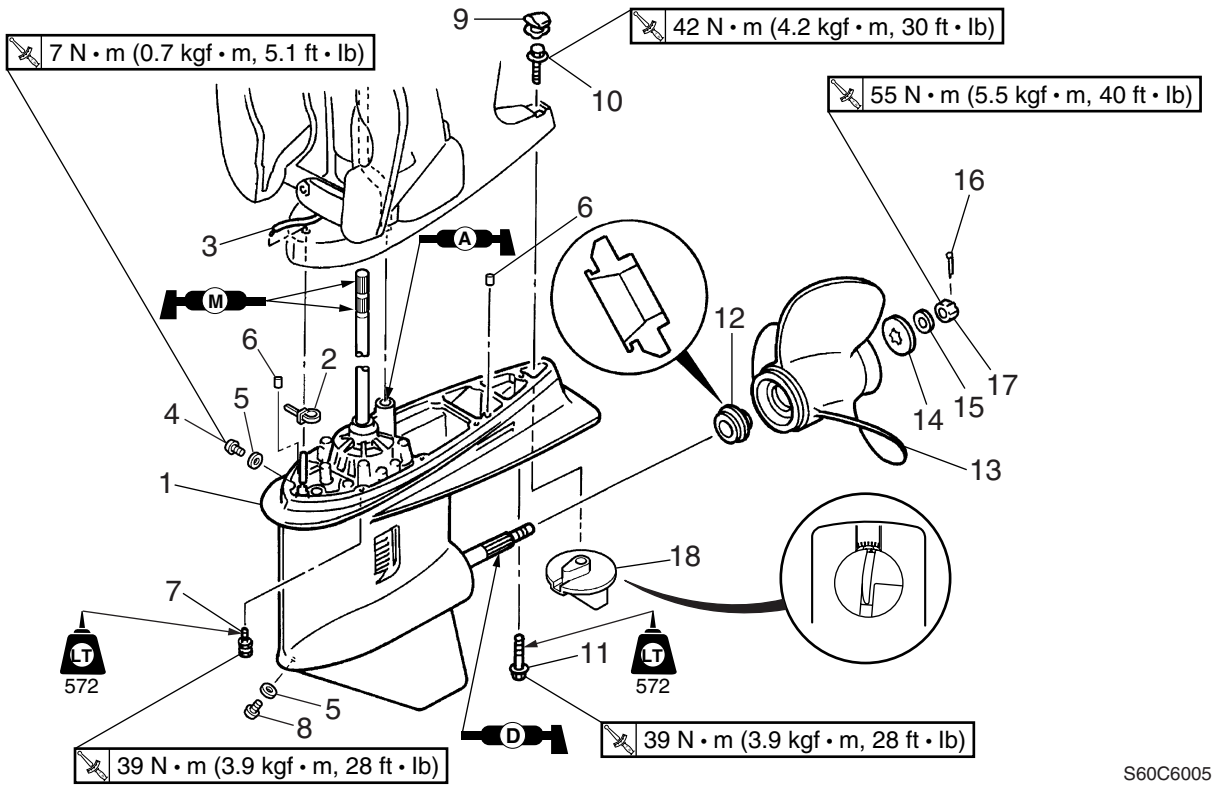


Magnet base
90890-06705



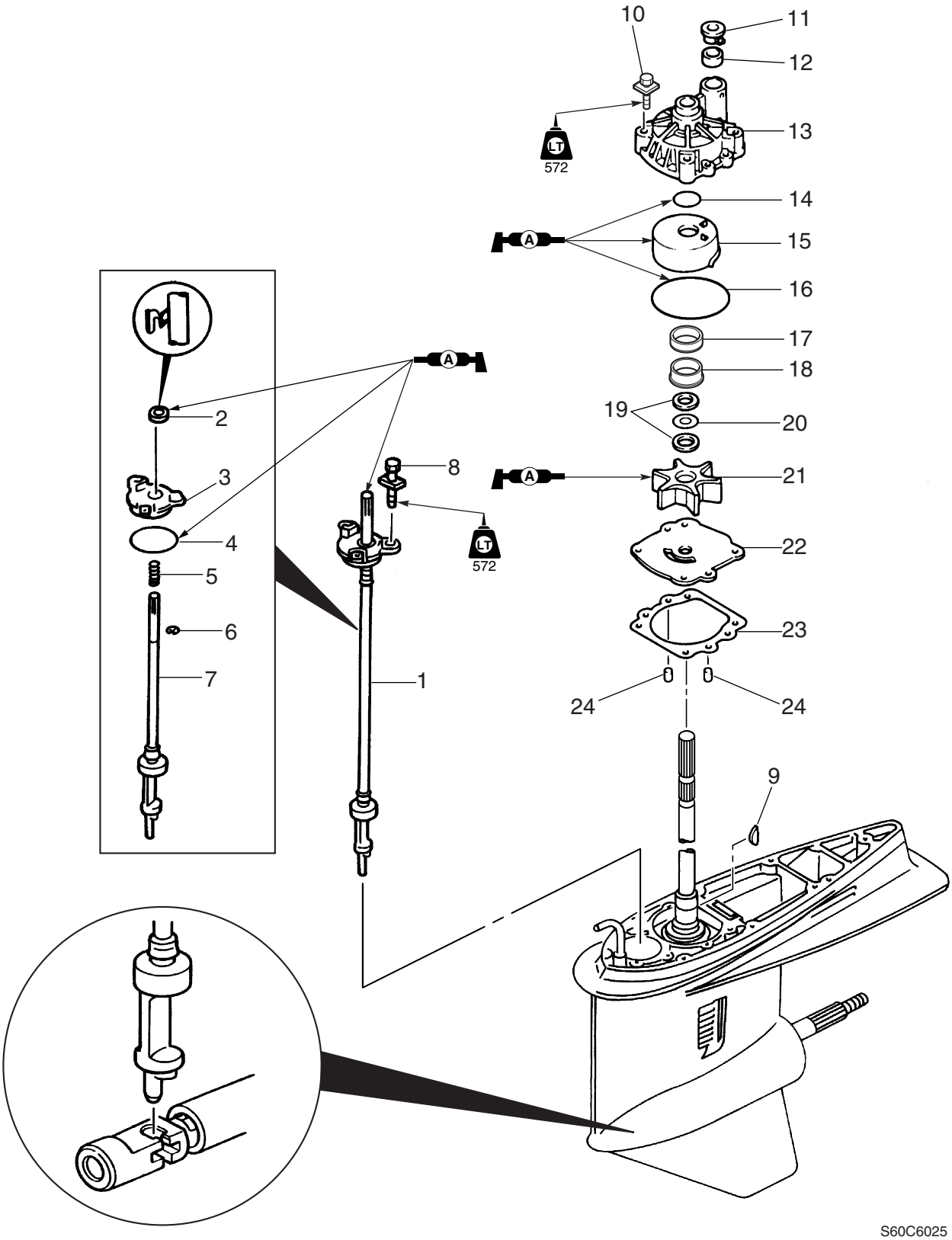
Shift rod push arm
90890-06052

Lower unit (F100B)



No.	Part name	Q'ty	Remarks
1	Lower unit	1	
2	Plastic tie	1	**Not reusable**
3	Hose	1	7 × 145 mm
4	Check screw	1	
5	Gasket	2	**Not reusable**
6	Dowel pin	2	
7	Bolt	6	M10 × 45 mm
8	Drain screw	1	
9	Grommet	1	
10	Bolt	1	M10 × 45 mm
11	Bolt	1	M10 × 70 mm
12	Spacer	1	
13	Propeller	1	
14	Washer	1	
15	Washer	1	
16	Cotter pin	1	**Not reusable**
17	Propeller nut	1	
18	Trim tab	1	

6

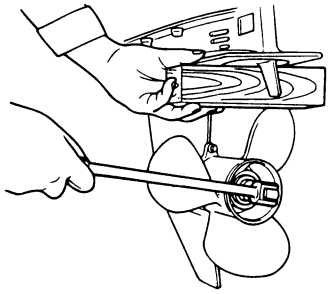

10
11
12
13
572
14
A
15
16
17
18
19
20
21
22
23
24
24
2
3
4
5
6
7
8
572
1
9
S60C6025

No.	Part name	Q'ty	Remarks
1	Shift rod assembly	1	
2	Oil seal	1	**Not reusable**
3	Oil seal housing	1	
4	O-ring	1	**Not reusable** 3.1 × 64.6 mm
5	Spring	1	
6	Circlip	1	
7	Shift rod	1	
8	Bolt	3	M6 × 20 mm
9	Woodruff key	1	
10	Bolt	4	M8 × 45 mm
11	Cover	1	
12	Seal	1	
13	Water pump housing	1	
14	O-ring	1	**Not reusable** 2.5 × 42 mm
15	Insert cartridge	1	
16	O-ring	1	**Not reusable** 2.5 × 91.5 mm
17	Collar	1	
18	Spacer	1	
19	Washer	2	
20	Wave washer	1	
21	Impeller	1	
22	Outer plate cartridge	1	
23	Gasket	1	**Not reusable**
24	Dowel pin	2	

Removing the lower unit

1. Drain the gear oil. For draining procedures, see Chapter 3, “Changing the gear oil.”

2. Set the gearshift to the neutral position, and 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.



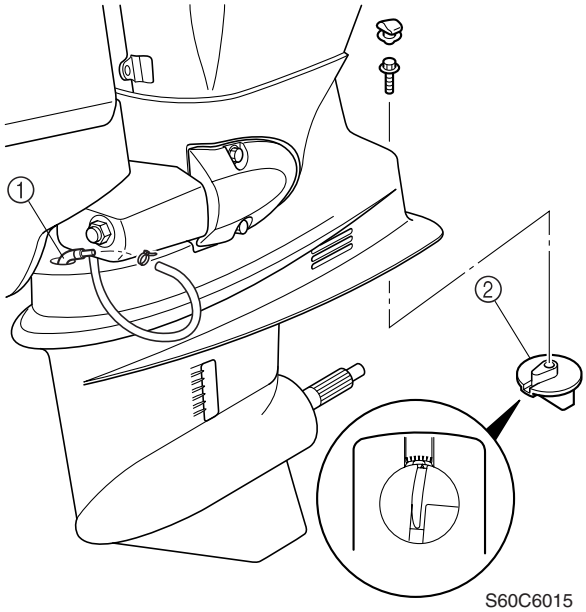
S60C6010

⚠ WARNING

Do not hold the propeller with your hands when loosening or tightening it. Be sure to remove the battery leads from the batteries and the engine shut-off switch. Put a block of wood between the anti-cavitation plate and propeller to keep the propeller from turning.

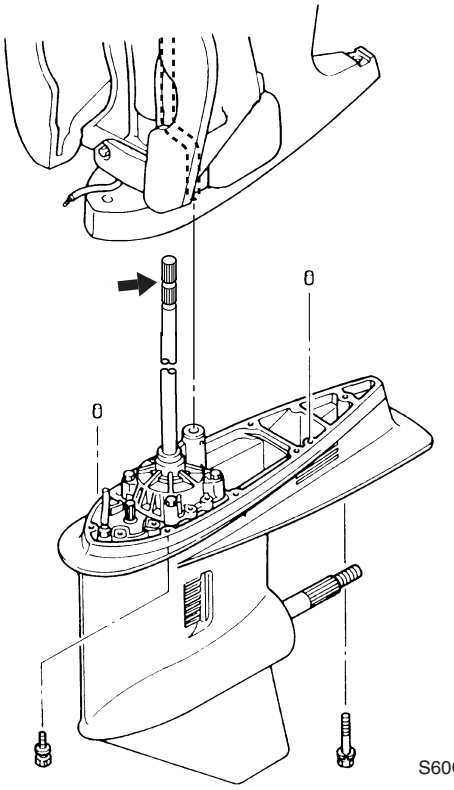
3. Disconnect the speedometer hose ①.

4. Mark the trim tab ② at the area shown, and then remove it.



S60C6015

5. Loosen the bolts, and then remove the lower unit from the upper case.



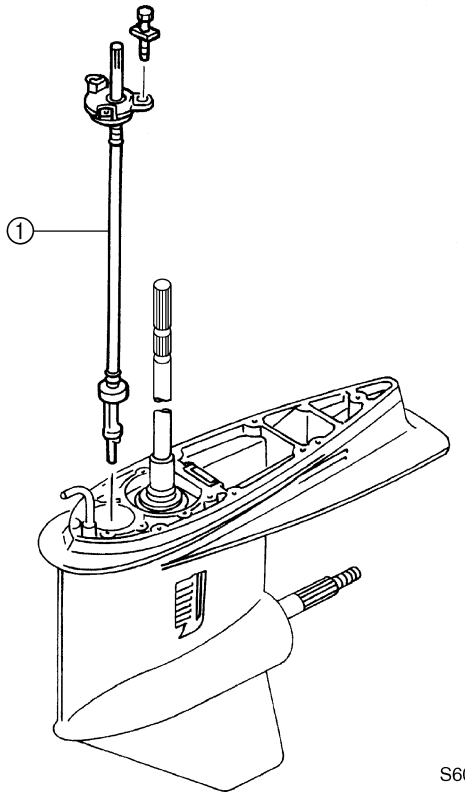
S60C6020

NOTE:

Check that there is no oil on the spline and check it for rust or wear. Check the oil pump if necessary.

Removing the water pump and shift rod

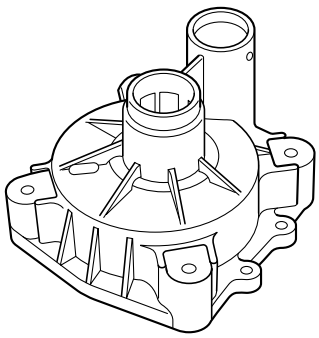
1. Remove the water pump assembly and shift rod assembly ①.



S60C6030

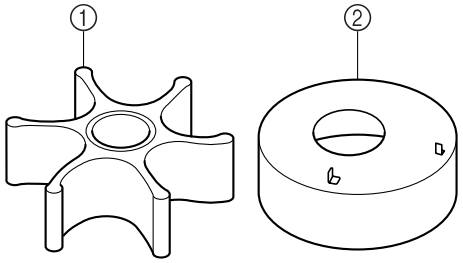
Checking the water pump and shift rod

1. Check the pump housing for deformation. Replace if necessary.



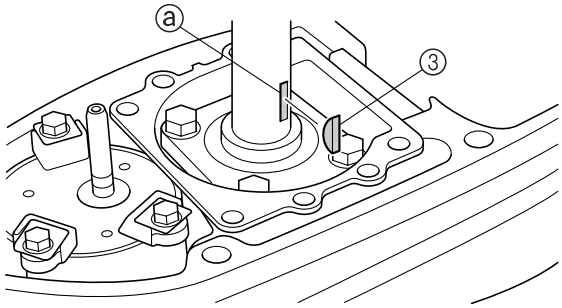
S60C6035

2. Check the impeller ① and insert cartridge ② for cracks or wear. Replace if necessary.



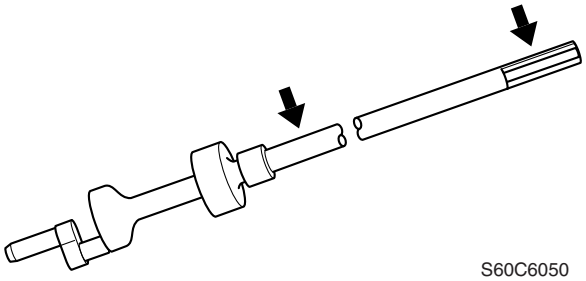
S60C6040

3. Check the Woodruff key ③ and the groove ⓐ on the drive shaft for wear. Replace if necessary.



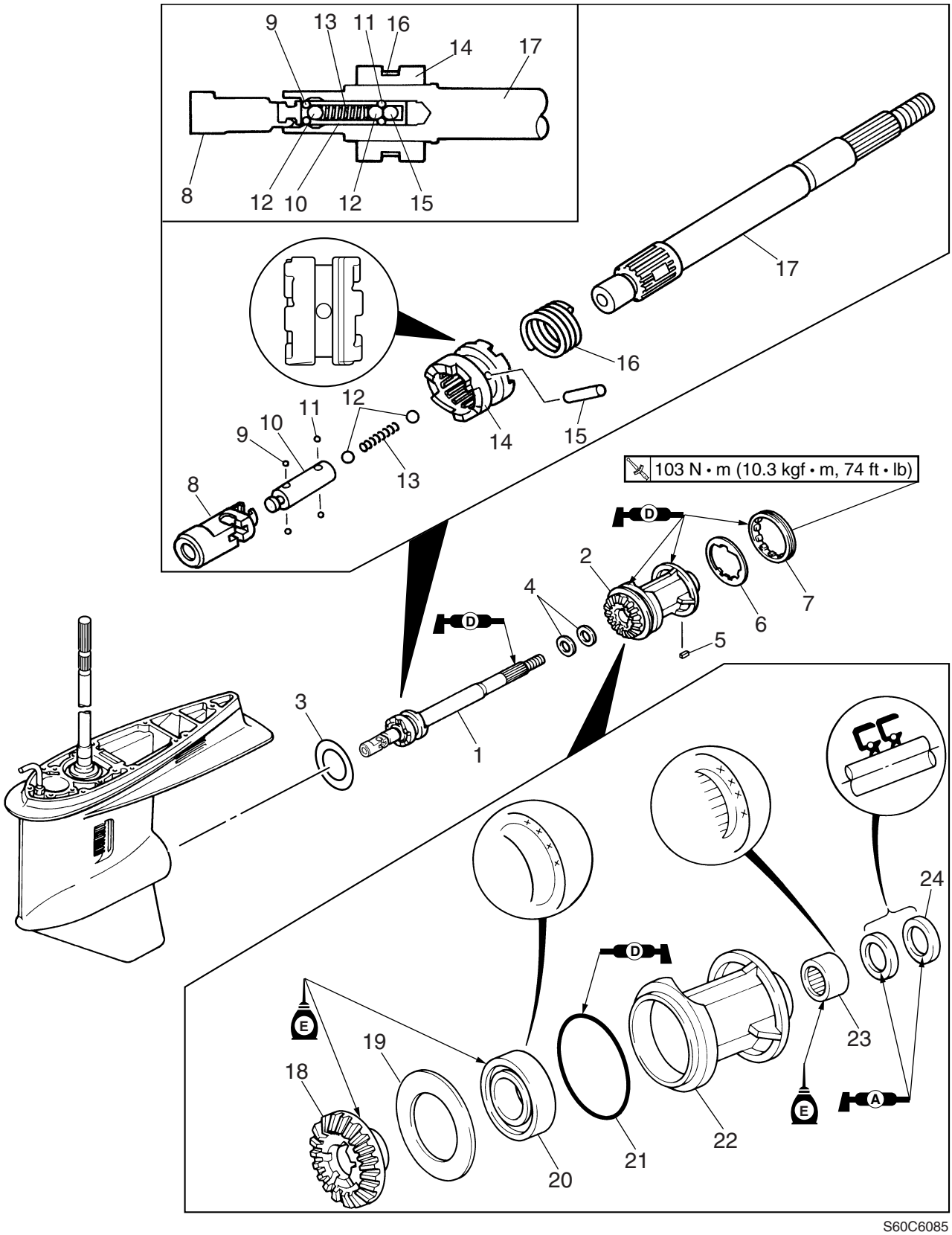
S60C6045

4. Check the shift rod for cracks or wear. Replace if necessary.



S60C6050

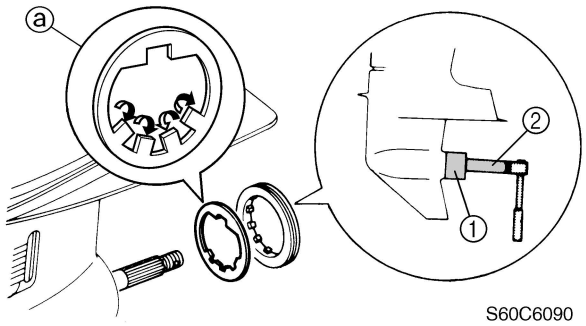
Propeller shaft housing (F100B)



No.	Part name	Q'ty	Remarks
1	Propeller shaft assembly	1	
2	Propeller shaft housing assembly	1	
3	Reverse gear shim	—	As required
4	Washer	2	
5	Straight key	1	
6	Claw washer	1	
7	Ring nut	1	
8	Shift rod joint	1	
9	Ball	2	
10	Slider	1	
11	Ball	2	
12	Ball	2	
13	Spring	1	
14	Dog clutch	1	
15	Cross pin	1	
16	Spring	1	
17	Propeller shaft	1	
18	Reverse gear	1	
19	Thrust washer	1	
20	Ball bearing	1	
21	O-ring	1	**Not reusable** 5.5 × 97.8 mm
22	Propeller shaft housing	1	
23	Needle bearing	1	
24	Oil seal	2	**Not reusable**

Removing the propeller shaft housing assembly

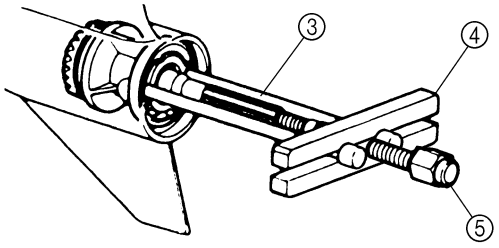
1. Straighten the claw washer tabs ⓐ, and then remove the ring nut and claw washer.



S60C6090

Ring nut wrench 3 ①: 90890-06511
Ring nut wrench extension ②: 90890-06513

2. Pull out the propeller shaft housing assembly.

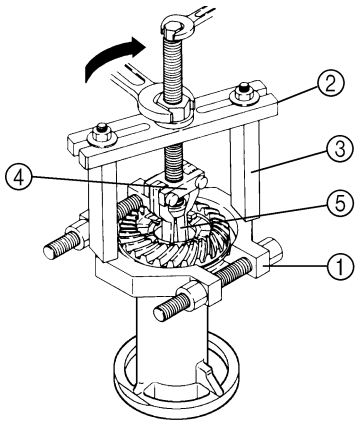


S60C6095

Bearing housing puller claw L ③: 90890-06502
Stopper guide plate ④: 90890-06501
Center bolt ⑤: 90890-06504

Disassembling the propeller shaft housing

1. Remove the reverse gear and thrust washer.

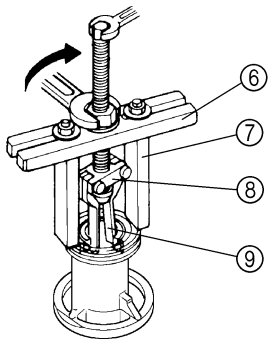


S60C6100

Bearing separator ①: 90890-06534
Stopper guide plate ②: 90890-06501
Stopper guide stand ③: 90890-06538
Bearing puller ④: 90890-06535
Bearing puller claw 1 ⑤: 90890-06536

NOTE:
Install the bearing separator ① between the reverse gear and thrust washer completely.

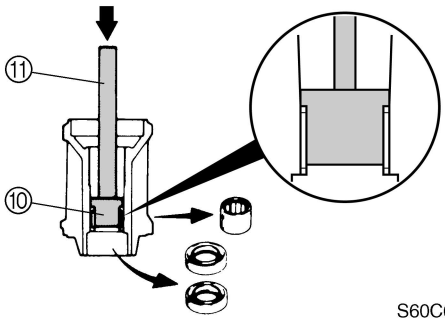
2. Remove the ball bearing.



S60C6105

Stopper guide plate ⑥: 90890-06501
Stopper guide stand ⑦: 90890-06538
Bearing puller ⑧: 90890-06535
Bearing puller claw 1 ⑨: 90890-06536

3. Remove the oil seals and needle bearing.

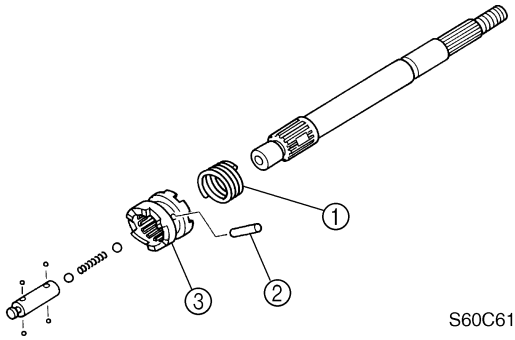


S60C6110

Needle bearing attachment ⑩: 90890-06653
Driver rod L3 ⑪: 90890-06652

Disassembling the propeller shaft assembly

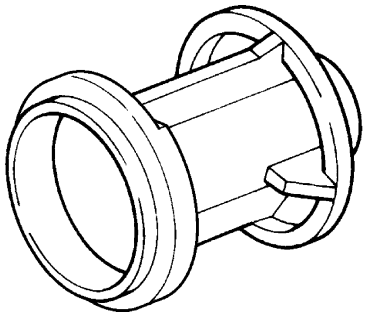
1. Remove the spring ①, and then remove the cross pin ②, dog clutch ③, slider, and spring.



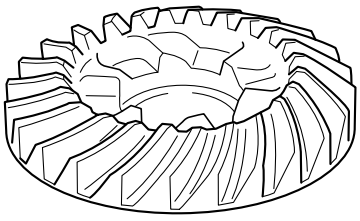
S60C6115

Checking the propeller shaft housing

1. Clean the propeller shaft housing using a soft brush and cleaning solvent, and then check it for cracks. Replace if necessary.

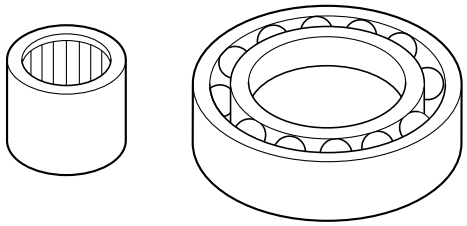

S60C6120

2. Check the teeth and dogs of the reverse gear for cracks or wear. Replace the gear if necessary.


S60C6125

6

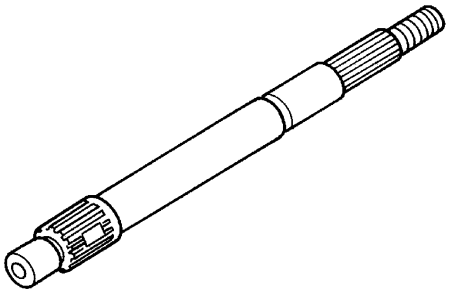
3. Check the bearings for pitting or rumbling. Replace if necessary.



S60C6130

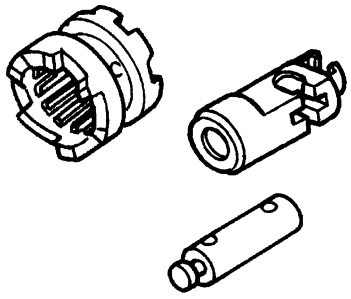
Checking the propeller shaft

1. Check the propeller shaft for bends or wear. Replace if necessary.



S60C6135

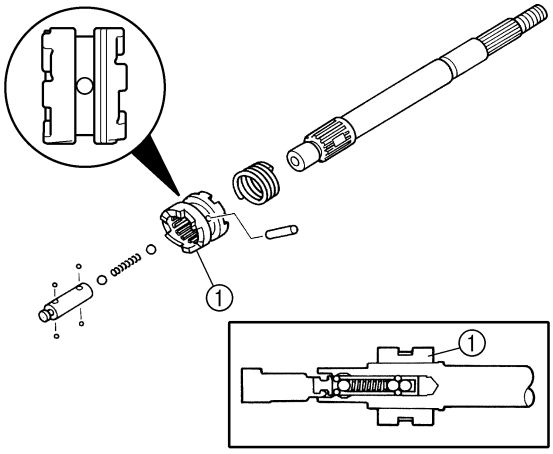
2. Check the dog clutch, shift rod joint, and shift slider for cracks or wear. Replace if necessary.



S60C6140

Assembling the propeller shaft assembly

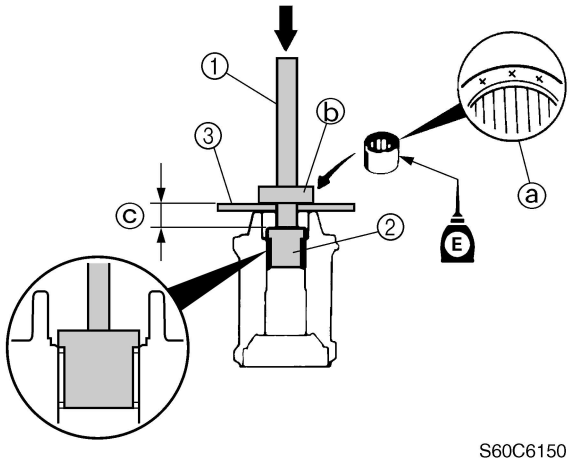
1. Install the dog clutch ① as shown.



S60C6145

Assembling the propeller shaft housing

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



S60C6150

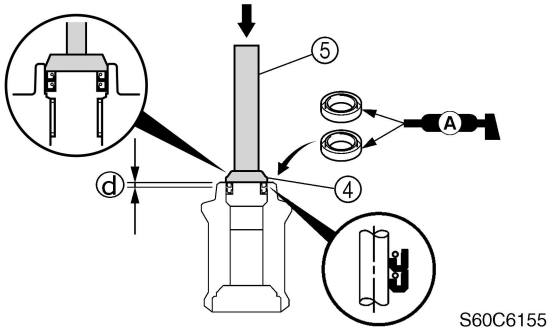
NOTE:

- Install the needle bearing with the manufacture identification mark ⓐ facing toward the oil seal (propeller side).
- When using the driver rod, do not strike the special tool in a manner that will force the stopper ⓑ out of place.

Driver rod SS ①: 90890-06604
Needle bearing attachment ②: 90890-06610
Bearing depth plate ③: 90890-06603

Depth ⓒ:
24.75–25.25 mm (0.97–0.99 in)

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



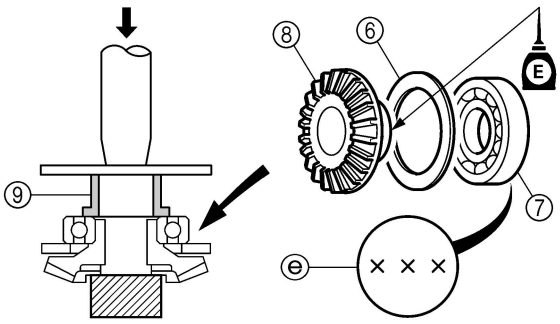
S60C6155

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

Bearing outer race attachment ④:
90890-06628
Driver rod LS ⑤: 90890-06606

Depth ⓓ:
4.75–5.25 mm (0.19–0.21 in)

3. Install the thrust washer ⑥ and ball bearing ⑦ to the reverse gear ⑧ using a press.

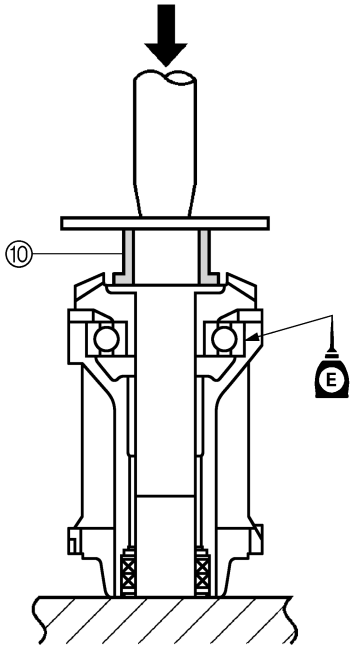


S60C6160

NOTE:
Install the ball bearing with the manufacture identification mark ⓔ facing outward (propeller side).

Bearing inner race attachment ⑨:
90890-06661

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

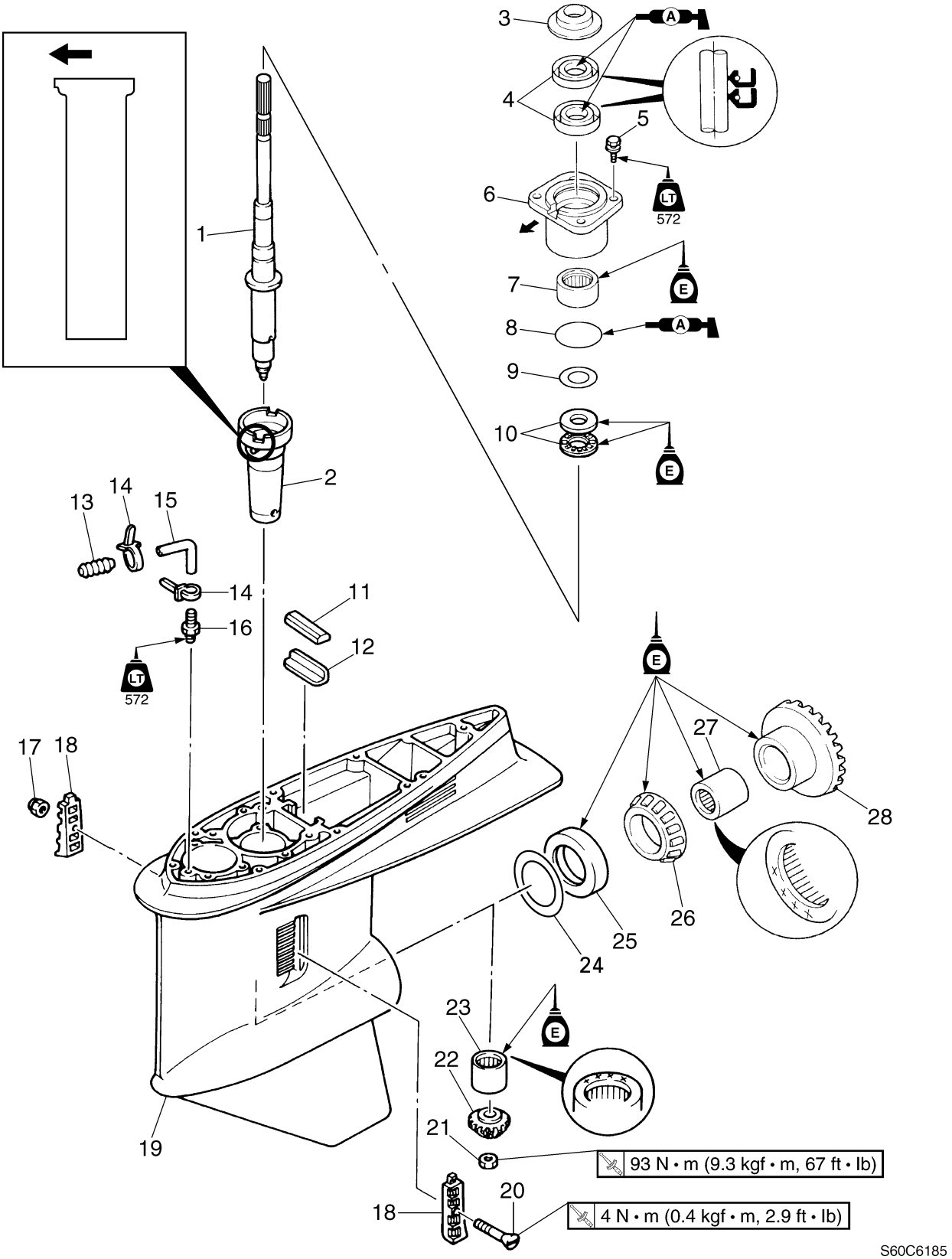


S60C6165

Bearing inner race attachment ⑩:
90890-06661

6

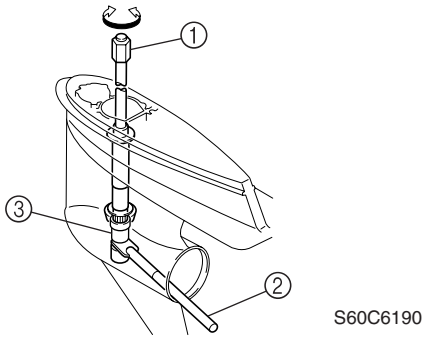
Drive shaft and lower case (F100B)



No.	Part name	Q'ty	Remarks
1	Drive shaft	1	
2	Sleeve	1	
3	Cover	1	
4	Oil seal	2	**Not reusable**
5	Bolt	4	M8 × 25 mm
6	Drive shaft housing	1	
7	Needle bearing	1	
8	O-ring	1	**Not reusable** 3 × 60.5 mm
9	Pinion shim	—	As required
10	Thrust bearing	1	
11	Seal	1	
12	Plate	1	
13	Joint	1	
14	Plastic tie	2	**Not reusable** 7 × 80 mm
15	Hose	1	
16	Joint	1	
17	Nut	1	
18	Water inlet cover	2	
19	Lower case	1	
20	Screw	1	
21	Nut	1	
22	Pinion	1	
23	Needle bearing	1	
24	Forward gear shim	—	As required
25	Bearing outer race	1	**Not reusable**
26	Taper roller bearing	1	**Not reusable**
27	Needle bearing	1	
28	Forward gear	1	

Removing the drive shaft

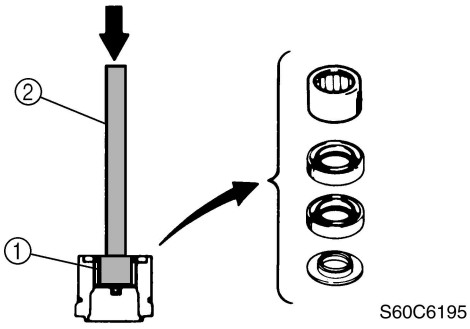
1. Remove the drive shaft assembly and pinion, and then pull out the forward gear.



Drive shaft holder 5 ①: 90890-06519
Pinion nut holder ②: 90890-06505
Socket adapter 2 ③: 90890-06507

Disassembling the drive shaft housing

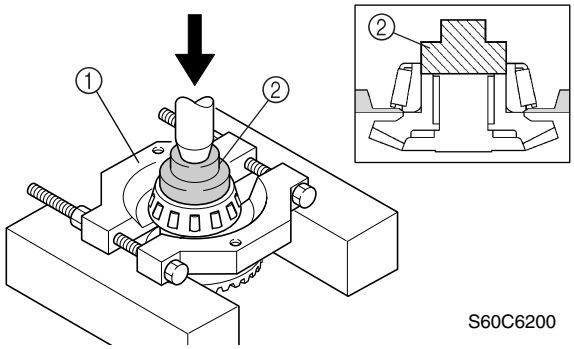
1. Remove the cover, oil seals, and needle bearing.



Needle bearing attachment ①: 90890-06610
Driver rod L3 ②: 90890-06652

Disassembling the forward gear

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

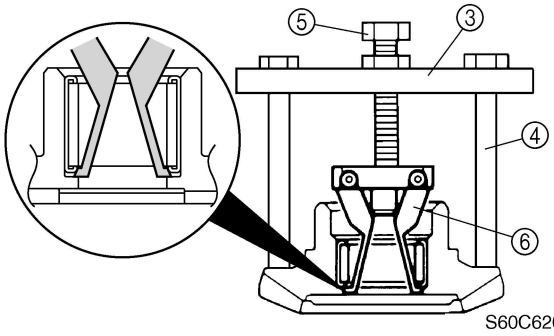


CAUTION:

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

Bearing separator ①: 90890-06534
Bearing inner race attachment ②: 90890-06641

2. Remove the needle bearing from the forward gear.



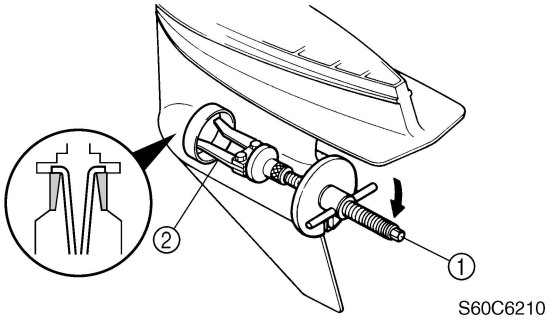
CAUTION:

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

Stopper guide plate ③: 90890-06501
Stopper guide stand ④: 90890-06538
Bearing puller ⑤: 90890-06535
Bearing puller claw 1 ⑥: 90890-06536

Disassembling the lower case

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

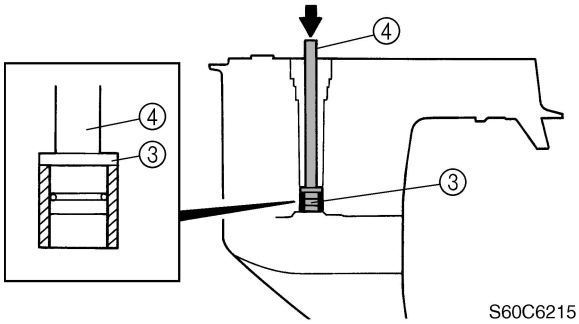


S60C6210

NOTE:
Install the claws as shown.

Bearing outer race puller ①: 90890-06523
Outer race puller claw A ②: 90890-06532

2. Remove the needle bearing.

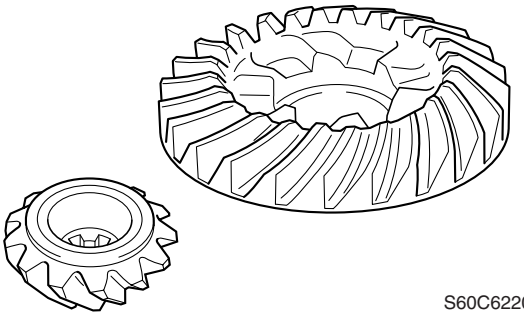


S60C6215

Ball bearing attachment ③: 90890-06636
Driver rod LL ④: 90890-06605

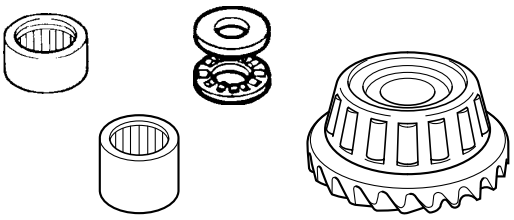
Checking the pinion and forward gear

1. Check the teeth of the pinion, and the teeth and dogs of the forward gear for cracks or wear. Replace if necessary.


S60C6220

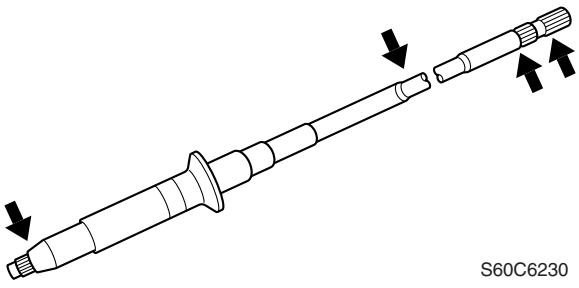
Checking the bearings

1. Check the bearings for pitting or rumbling. Replace if necessary.


S60C6225

Checking the drive shaft

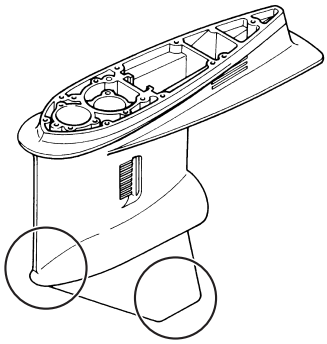
1. Check the drive shaft for bends or wear. Replace if necessary.


S60C6230

6

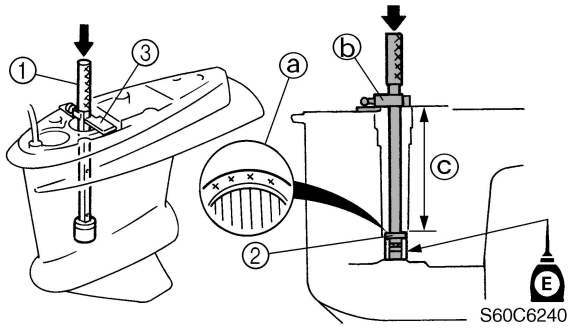
Checking the lower case

1. Check the skeg and torpedo for cracks or damage. Replace if necessary.


S60C6235

Assembling the lower case

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



S60C6240

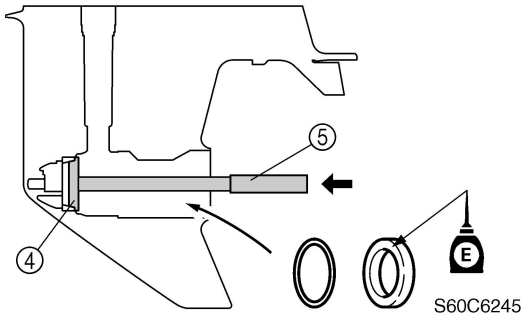
NOTE:

- Install the needle bearing with the manufacture identification mark ⓐ facing upward.
- When using the driver rod, do not strike the special tool in a manner that will force the stopper ⓑ out of place.

Driver rod SL ①: 90890-06602
Needle bearing attachment ②: 90890-06609
Bearing depth plate ③: 90890-06603

Depth ⓒ: 184.0 mm (7.24 in)

2. Install the original shim(s) and taper roller bearing outer race.



S60C6245

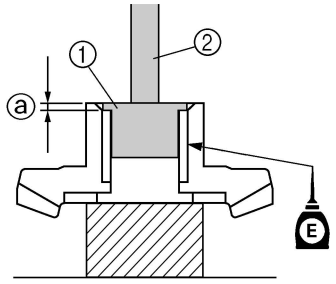
CAUTION:

Add or remove shims, if necessary, when replacing the forward gear or lower case.

Bearing outer race attachment ④: 90890-06620
Driver rod LL ⑤: 90890-06605

Assembling the forward gear

1. Install the new needle bearing into the forward gear to the specified depth.

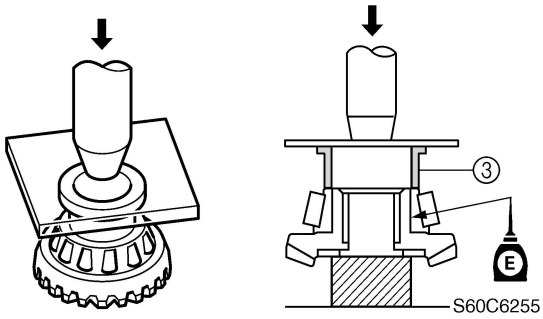


S60C6250

Needle bearing attachment ①: 90890-06612
Driver rod L3 ②: 90890-06652

Depth ⓐ: 2.5–3.5 mm (0.10–0.14 in)

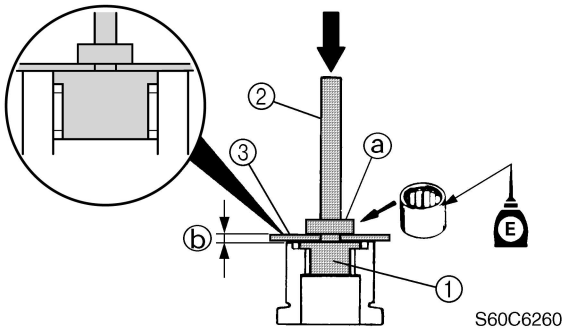
2. Install the new taper roller bearing into the forward gear using a press.



Bearing inner race attachment ③:
90890-06661

Assembling the drive shaft housing

1. Install the needle bearing into the drive shaft housing to the specified depth.

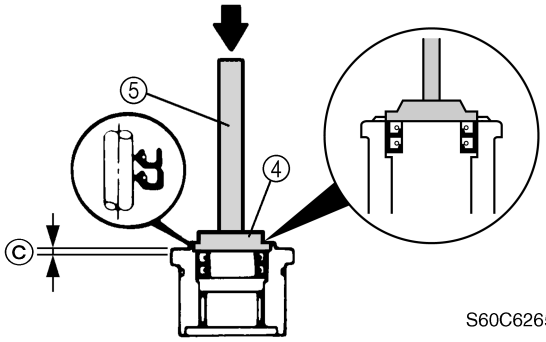


NOTE:
When using the driver rod, do not strike the special tool in a manner that will force the stopper ⓐ out of place.

Needle bearing attachment ①:
90890-06610
Driver rod SS ②: 90890-06604
Bearing depth plate ③: 90890-06603

Depth ⓑ:
5.75–6.25 mm (0.23–0.25 in)

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



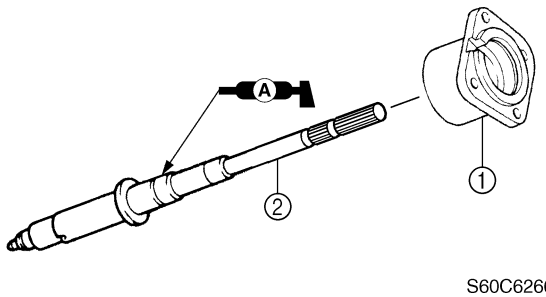
NOTE:
Install an oil seal halfway into the drive shaft housing, then the other oil seal.

Ball bearing attachment ④:
90890-06633
Driver rod LS ⑤: 90890-06606

Depth ⓒ:
0.25–0.75 mm (0.01–0.03 in)

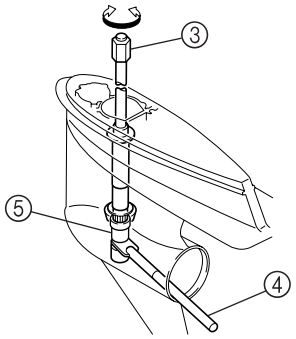
Installing the drive shaft

1. Install the forward gear to the lower case.
2. Install the drive shaft housing ① to the drive shaft ②.



3. Install the drive shaft assembly, pinion, and pinion nut, and then tighten the nut to the specified torque.

6



S60C6270

NOTE:
Install the drive shaft by lifting it up slightly, then aligning it with the pinion and the spline of the drive shaft.

Drive shaft holder 5 ③:
490890-06519
Pinion nut holder ④: 90890-06505
Socket adapter 2 ⑤: 90890-06507

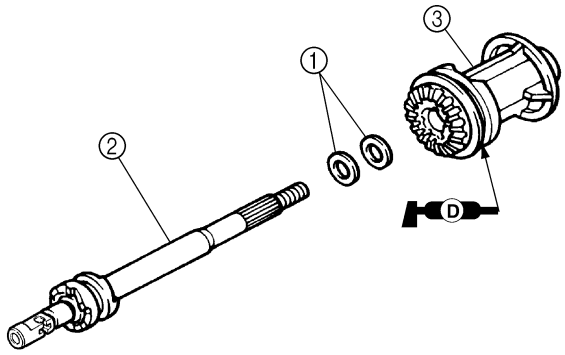
Pinion nut:
93 N·m (9.3 kgf·m, 67 ft·lb)

4. Tighten the housing bolt.

Installing the propeller shaft housing

1. Install the washers ① and propeller shaft assembly ② into the propeller shaft housing assembly ③.

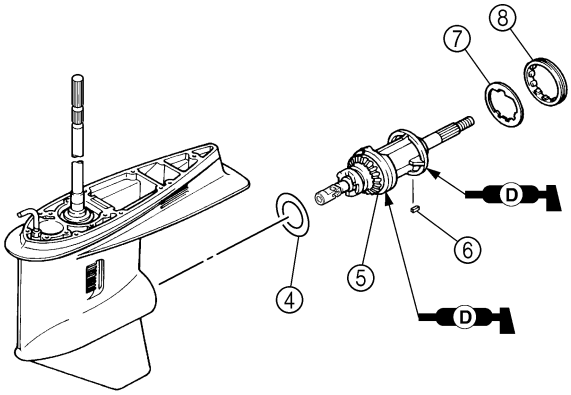
2. Apply grease to the new O-rings.



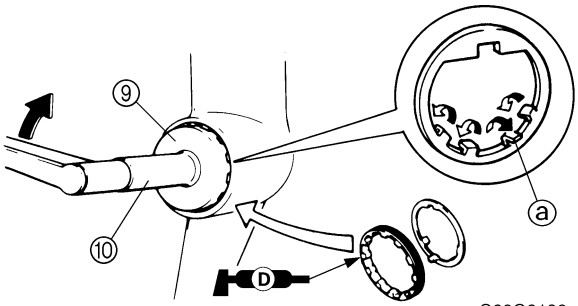
S60C6170

3. Install the original shim(s) ④ and propeller shaft housing assembly ⑤ into the lower case, and then install the straight key ⑥, claw washer ⑦, and ring nut ⑧.

4. Tighten the nut to the specified torque.



S60C6175



S60C6180

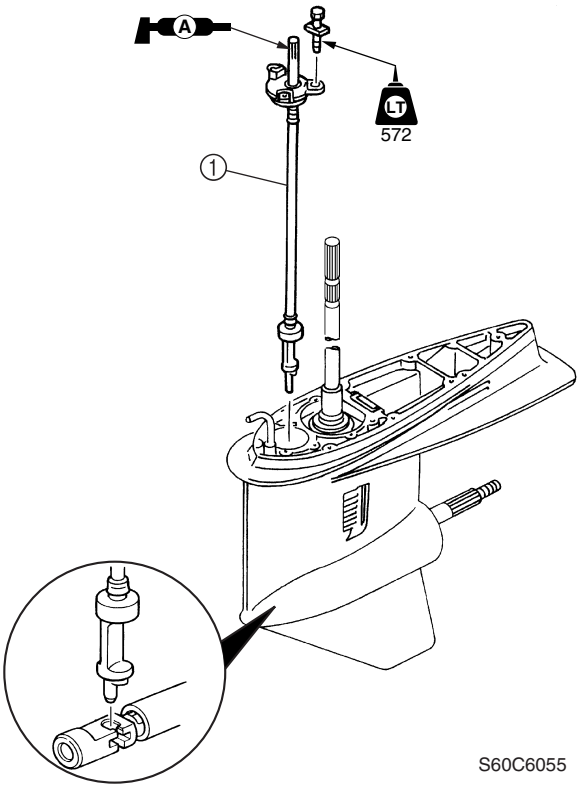
NOTE:
Secure the ring nut by bending one tab ⓐ into the slot in the ring nut and the other tabs toward the propeller shaft housing assembly.

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

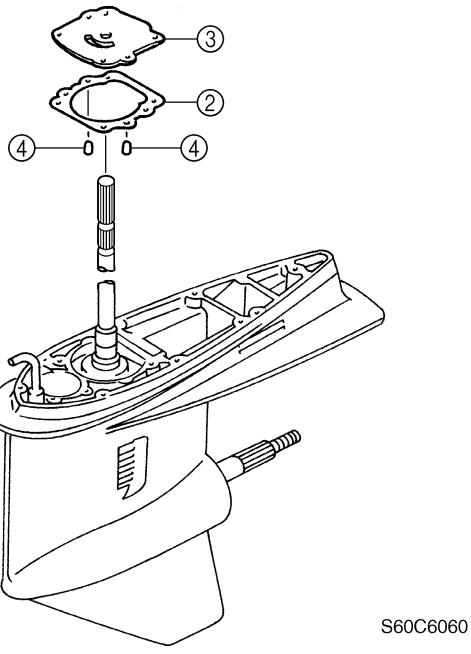
Ring nut ⑧:
103 N·m (10.3 kgf·m, 74 ft·lb)

Installing the water pump and shift rod

1. Install the shift rod assembly ①.

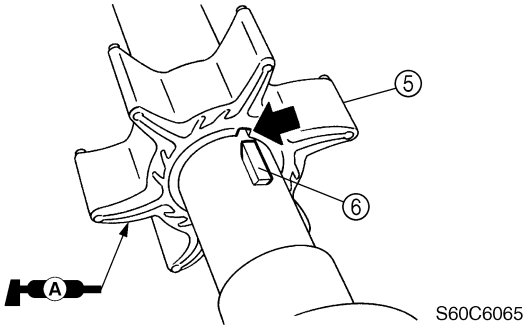


2. Install the new gasket ②, outer plate cartridge ③, and dowel pins ④.

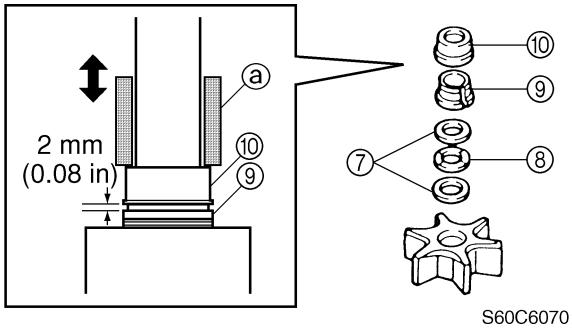


3. Install the Woodruff key into the drive shaft.

4. Align the groove on the impeller ⑤ with the Woodruff key ⑥, and then install it to the drive shaft.



5. Install the washers ⑦, wave washer ⑧, spacer ⑨, and collar ⑩ to the drive shaft.

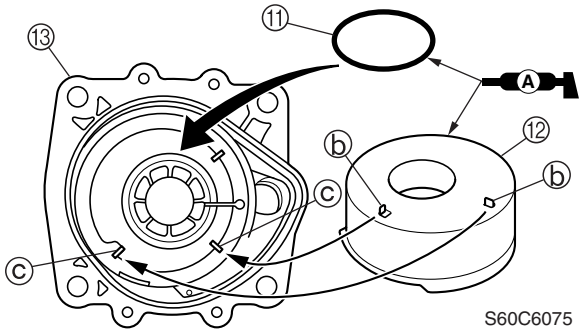


NOTE:

- The collar and spacer should fit together firmly.
- While pulling the drive shaft up, install the collar with some appropriate tool ⓐ that fits over the drive shaft as shown.

6

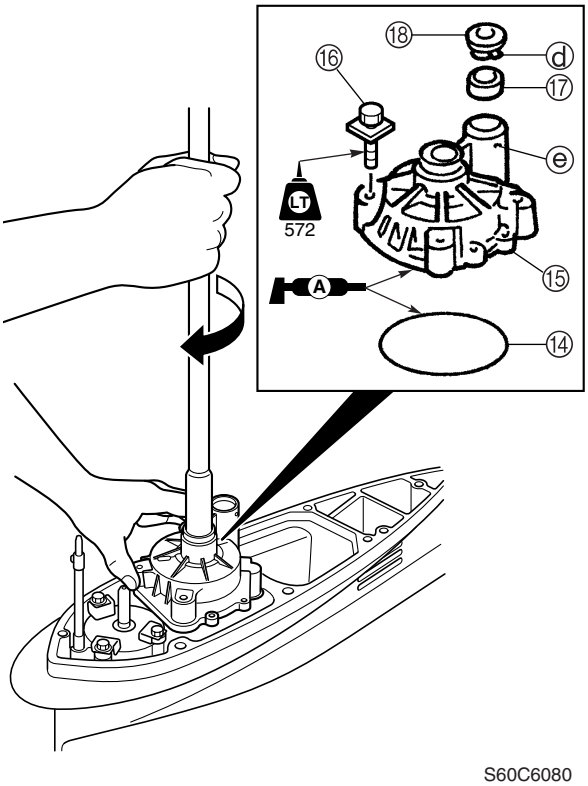
6. Install the O-ring ⑪ and insert cartridge ⑫ into the pump housing ⑬.



S60C6075

NOTE:
Align the insert cartridge projections ⓑ with the holes ⓒ in the pump housing.

7. Install the O-ring ⑭ and pump housing assembly ⑮ into the lower case, tighten the bolts ⑯, and then install the seal ⑰ and cover ⑱.

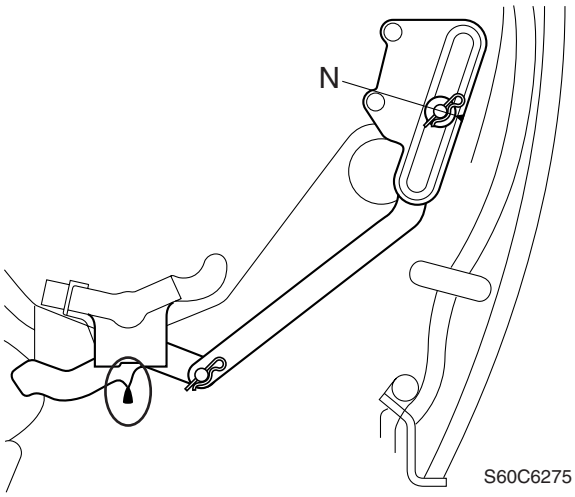


S60C6080

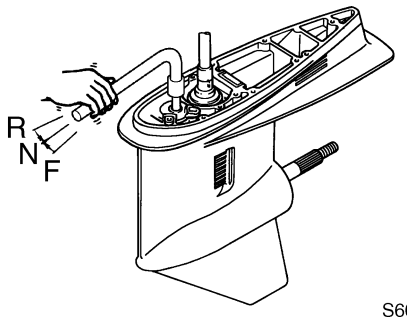
NOTE:
- When installing the pump housing, apply grease to the inside of the housing, and then turn the drive shaft clockwise while pushing down the pump housing.
- Align the cover ⑱ projection ⓓ with the hole ⓔ in the pump housing.

Installing the lower unit

1. Set the gearshift to the neutral position at the lower unit.



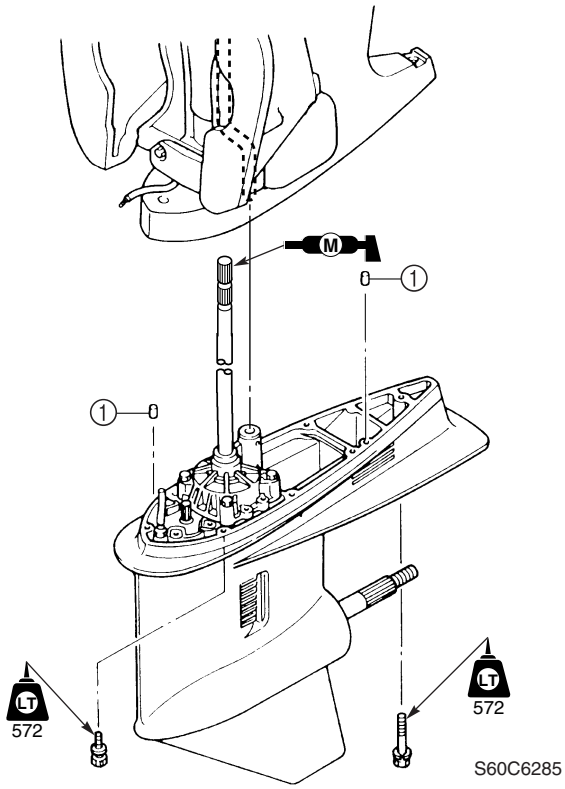
S60C6275



S60C6280

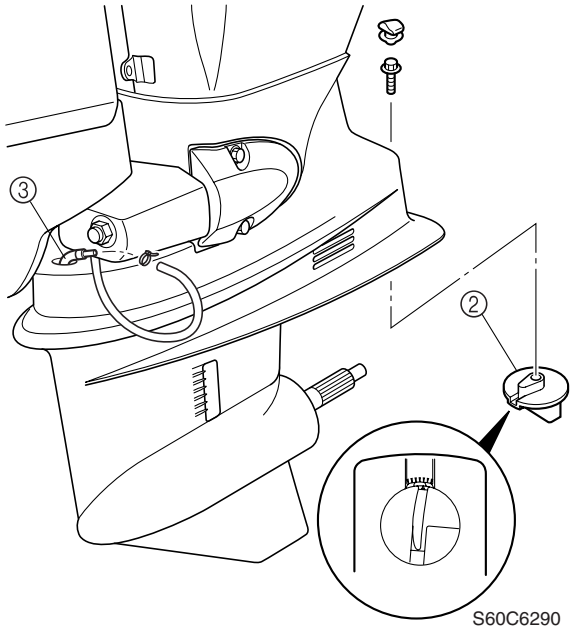
2. Install the two dowel pins ① to the lower unit.

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

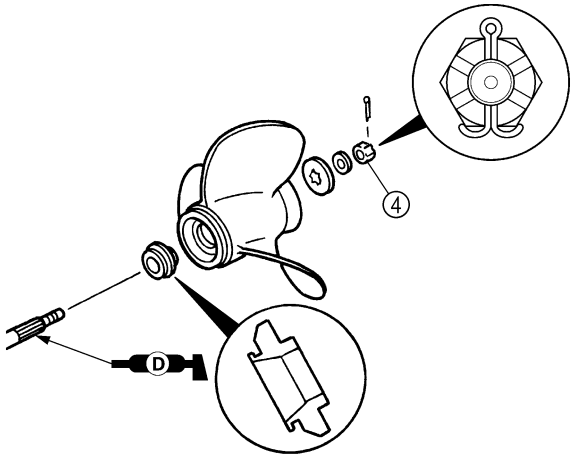


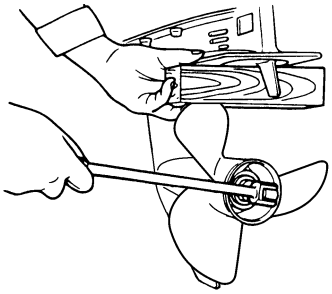
Mounting bolt:
39 N·m (3.9 kgf·m, 28 ft·lb)

4. Install the trim tab ② to its original position, and then connect the speedometer hose ③.



5. Install the propeller and propeller nut, and then tighten the nut finger tight. 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 it. Be sure to remove the battery leads from the batteries and the engine shut-off switch. Put a block of wood between the anti-cavitation plate and propeller to keep the propeller from turning.

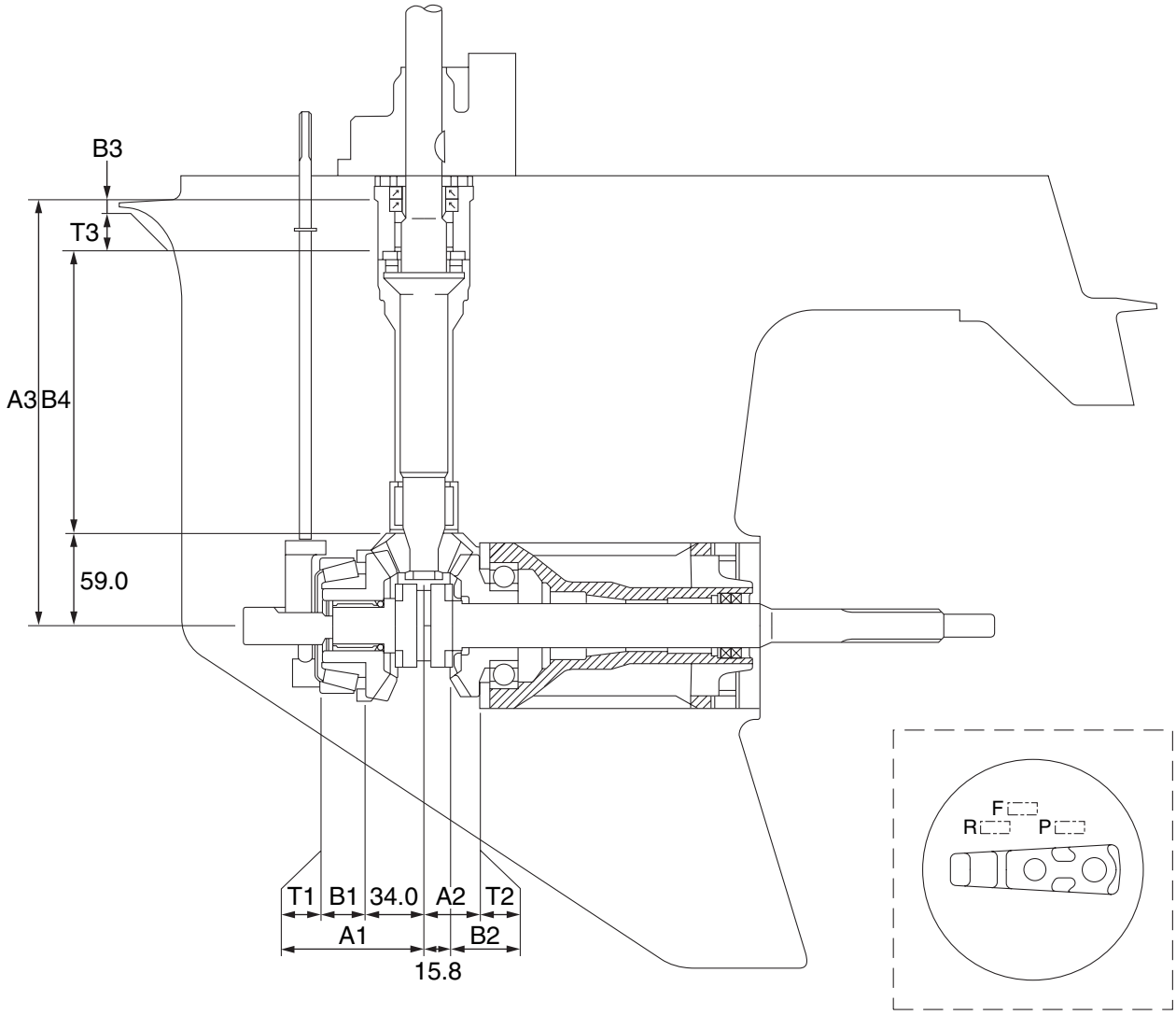
NOTE:

If the grooves in the propeller nut ④ do not align with the cotter pin hole, tighten the nut until they are aligned.

Propeller nut ④:
55 N·m (5.5 kgf·m, 40 ft·lb)

6

Shimming (F100B)



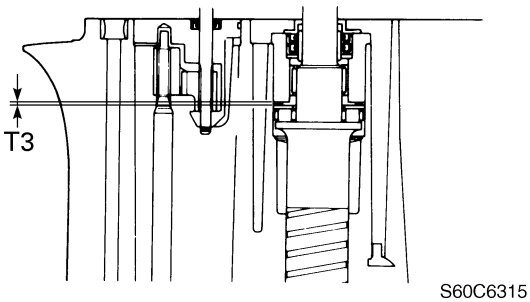
S60C6305

Shimming

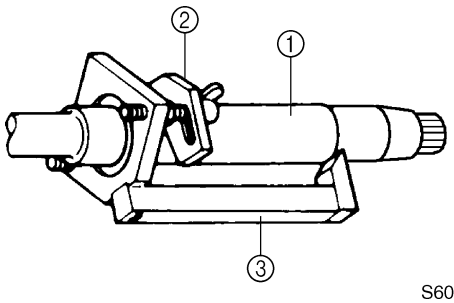
NOTE:
- Shimming is not required when assembling the original lower case and inner parts.
- Shimming is required when assembling the original inner parts and a new lower case.
- Shimming is required when replacing the inner part(s).

Selecting the pinion shims

1. Install the drive shaft ① to the shimming tools.



S60C6315



S60C6320

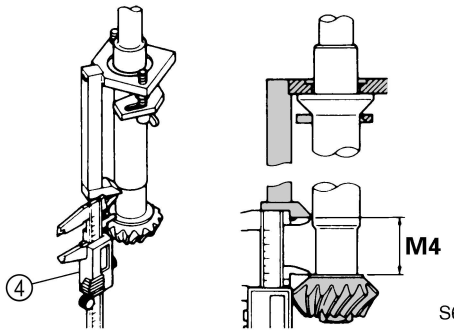
NOTE:
- Select the shim thickness (T3) by using the specified measurement(s) and the calculation formula.
- Install the shimming tool to the drive shaft so that the shaft is at the center of the hole.
- Tighten the wing nuts another 1/4 of a turn after they contact the fixing plate ②.

Pinion height gauge ③:
90890-06702

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

Pinion nut:
93 N·m (9.3 kgf·m, 67 ft·lb)

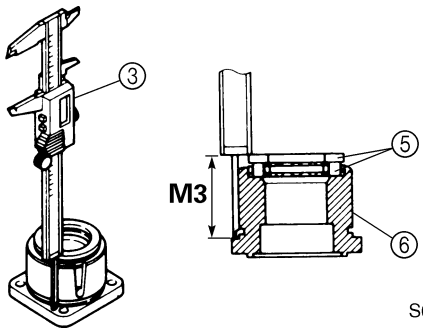
3. Measure the distance (M4) between the shimming tool and the pinion as shown.



S60C6325

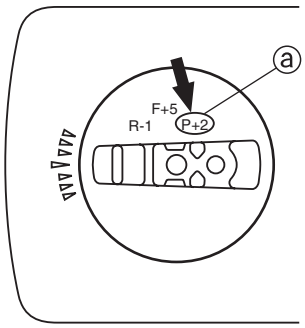
Digital caliper ④: 90890-06704

4. Install the thrust bearing ⑤ to the drive shaft housing ⑥, and then measure the housing height (M3) as shown.



S60C6310

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



S60C6330

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

Calculation formula:
Pinion shim thickness (T3) =
62.50 + P/100 – M3 – M4

Example:
If "M3" is 46.85 mm and "M4" is 15.12 mm and "P" is (–5), then
T3 = 62.50 + (–5)/100 – 46.85 – 15.12 mm
= 62.50 – 0.05 – 46.85 – 15.12 mm
= 0.48 mm

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

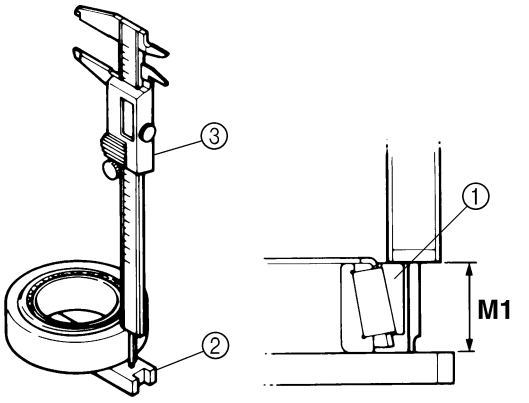
Calculated numeral at 1/100 place	Rounded numeral
1, 2	0
3, 4, 5	2
6, 7, 8	5
9, 10	8

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

Example:
If "T3" is 0.44 mm, then the pinion shim is 0.42 mm.
If "T3" is 0.48 mm, then the pinion shim is 0.45 mm.

Selecting the forward gear shims

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

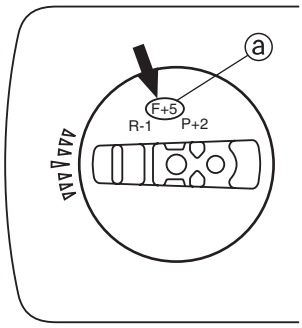


S60C6340

NOTE:
- Select the shim thickness (T1) by using the specified measurement(s) and the calculation formula.
- Measure the bearing outer race at three points to find the height average.

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

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



S60C6345

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 unreadable, assume that "F" is zero and check the backlash when the unit is assembled.

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

Example:
If "M1" is 24.10 mm and "F" is (+5), then
T1 = 24.60 + (+5)/100 – 24.10 mm
= 24.60 + 0.05 – 24.10 mm
= 0.55 mm

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

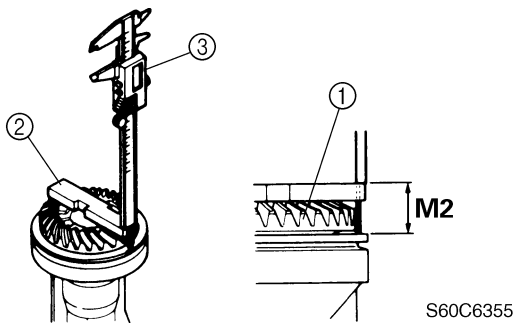
Calculated numeral at 1/100 place	Rounded numeral
1, 2	0
3, 4, 5	2
6, 7, 8	5
9, 10	8

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

Example:
If "T1" is 0.55 mm, then the forward gear shim is 0.52 mm.
If "T1" is 0.60 mm, then the forward gear shim is 0.58 mm.

Selecting the reverse gear shims

1. Turn the reverse gear ① two or three times, and then measure the reverse gear height (M2) as shown.

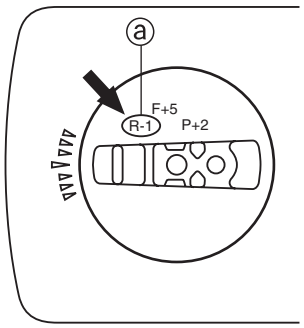


S60C6355

NOTE:
- Select the shim thickness (T2) by using the specified measurement(s) and the calculation formula.
- Measure the reverse gear at three points to find the height average.
- Remove the O-ring when the measurement.

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

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



S60C6360

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 unreadable, assume that "R" is zero and check the backlash when the unit is assembled.

Calculation formula:
Reverse gear shim thickness (T2) =
M2 – 27.40 – R/100

Example:
If "M2" is 27.95 mm and "R" is (+2), then
T2 = 27.95 – 27.40 – (+2)/100 mm
= 27.95 – 27.40 – 0.02 mm
= 0.53 mm

6

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

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

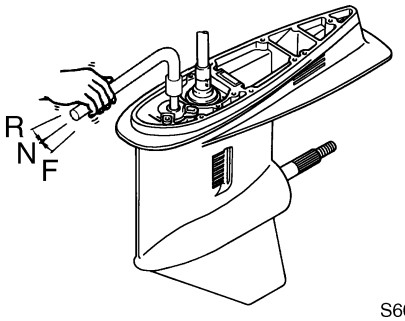
Available shim thicknesses:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, and 0.50 mm

Example:
If "T2" is 0.53 mm, then the reverse gear shim is 0.55 mm.
If "T2" is 0.50 mm, then the reverse gear shim is 0.50 mm.

Backlash (F100B)

Measuring the forward and reverse gear backlash

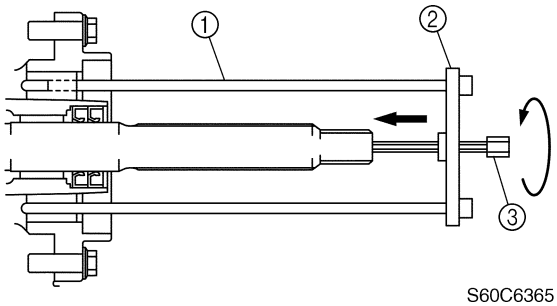
1. Remove the water pump assembly.
2. Set the gearshift to the neutral position.



S60C6280

Shift rod push arm: 90890-06052

3. Install the special service tool so that it pushes against the propeller shaft.

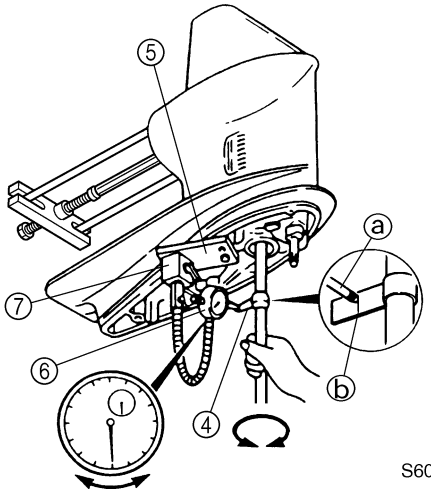


S60C6365

NOTE:
Tighten the center bolt while turning the drive shaft until the drive shaft can no longer be turned.

Bearing housing puller claw L ①: 90890-06502
Stopper guide plate ②: 90890-06501
Center bolt ③: 90890-06504

4. Install the backlash indicator onto the drive shaft (22.4 mm [0.88 in] in diameter), then the dial gauge onto the lower unit.
5. Set the lower unit upside down.



S60C6370

NOTE:
Install the dial gauge so that the plunger ⓐ contacts 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 ⑦: 90890-06705

6. Slowly turn the drive shaft clockwise and counterclockwise and measure the backlash when the drive shaft stops in each direction.

Forward gear backlash:
0.19–0.53 mm (0.007–0.021 in)

7. Add or remove shims if out of specification.

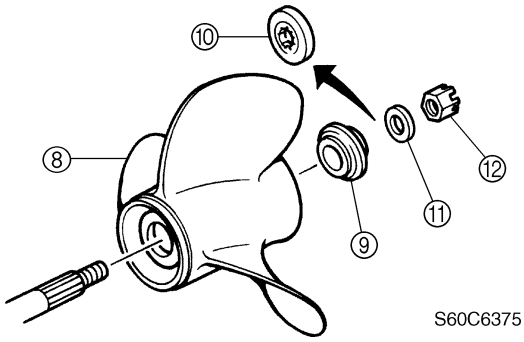
Forward gear backlash	Shim thickness
Less than 0.19 mm (0.007 in)	To be decreased by (0.36 – M) × 0.58
More than 0.53 mm (0.021 in)	To be increased by (M – 0.36) × 0.58

M: Measurement

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

8. Remove the special service tools from the propeller shaft.

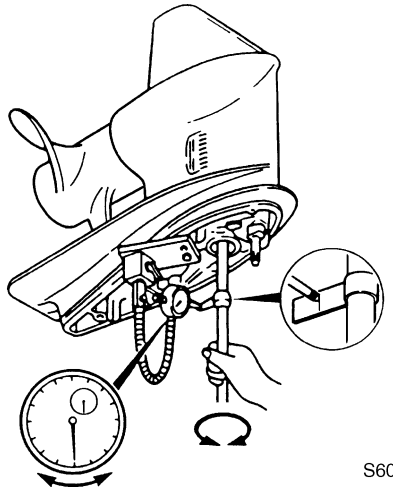
9. Apply a load to the reverse gear by installing the propeller ⑧, the spacer ⑨ (without the washer ⑩), then the washer ⑪ as shown.



S60C6375

NOTE:
Tighten the propeller nut ⑫ while turning the drive shaft until the drive shaft can no longer be turned.

10. Slowly turn the drive shaft clockwise and counterclockwise, and measure the backlash when the drive shaft stops in each direction.


S60C6380

Reverse gear backlash:
0.86–1.26 mm (0.034–0.050 in)

11. Add or remove shims if out of specification.

Reverse gear backlash	Shim thickness
Less than 0.86 mm (0.034 in)	To be increased by (1.06 – M) × 0.58
More than 1.26 mm (0.050 in)	To be decreased by (M – 1.06) × 0.58

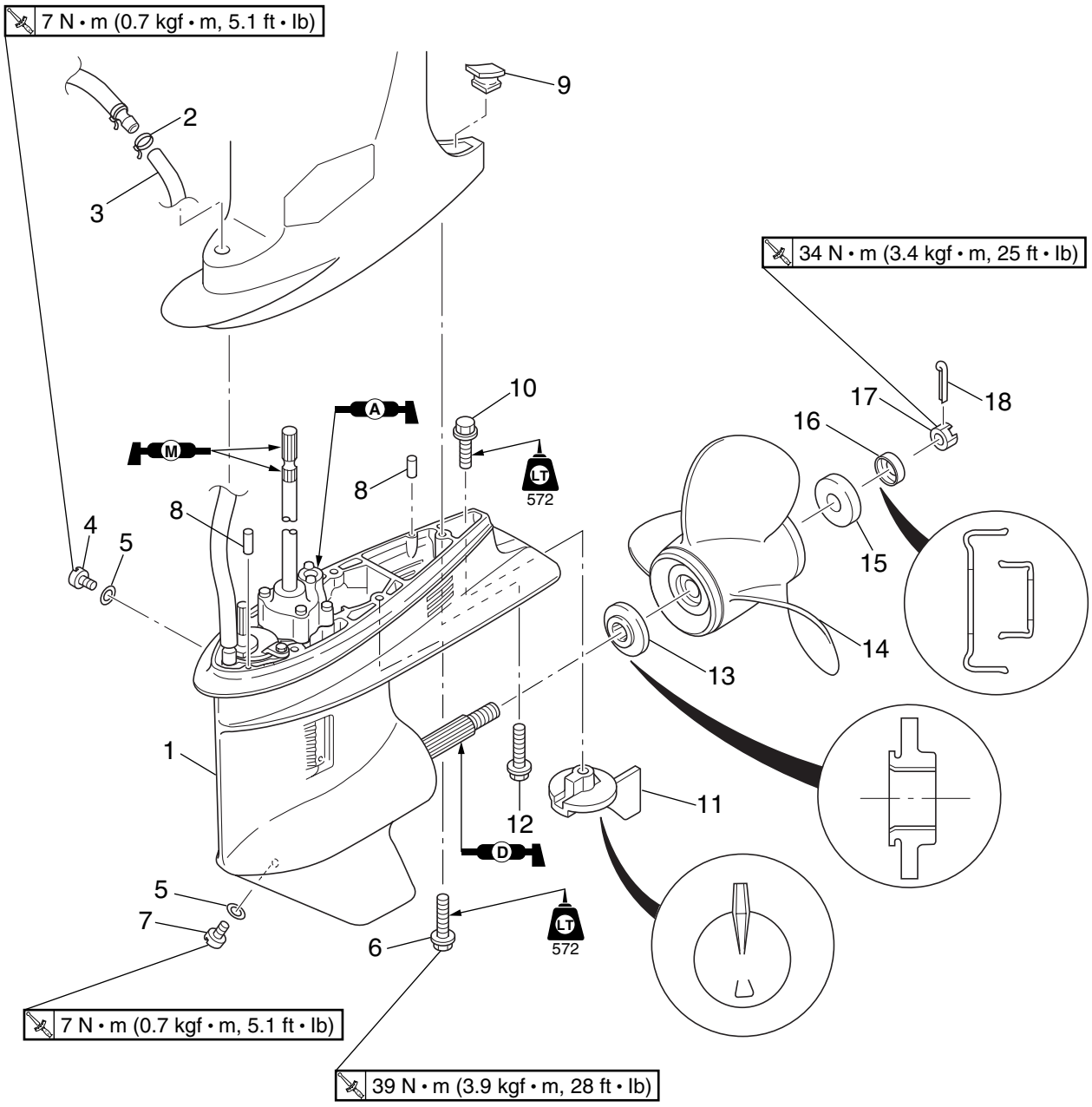
M: Measurement

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

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

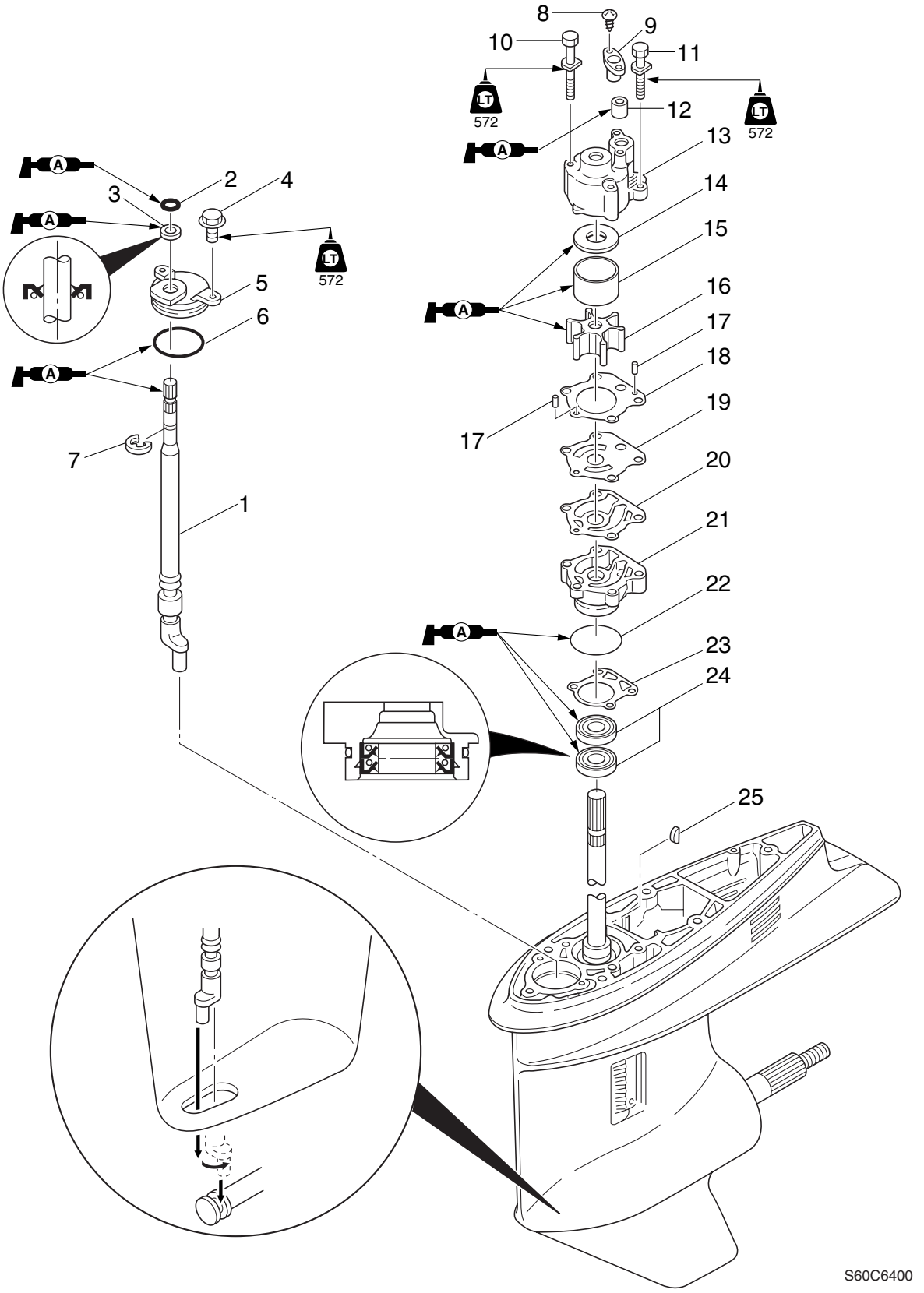
6

Lower unit (F100C)



S60C6385

No.	Part name	Q'ty	Remarks
1	Lower unit	1	
2	Plastic tie	1	**Not reusable**
3	Hose	1	7 × 200 mm
4	Check screw	1	
5	Gasket	2	**Not reusable**
6	Bolt	4	M10 × 40 mm
7	Drain screw	1	
8	Dowel pin	2	
9	Grommet	1	
10	Bolt	1	M8 × 45 mm
11	Trim tab	1	
12	Bolt	1	M8 × 60 mm
13	Spacer	1	
14	Propeller	1	
15	Washer	1	
16	Spacer	1	
17	Propeller nut	1	
18	Cotter pin	1	**Not reusable**

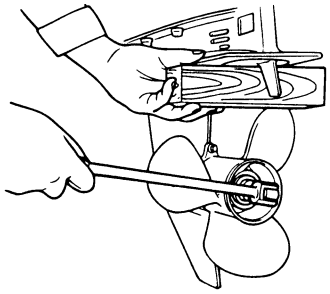

8
9
10
11
572
572
12
13
14
15
16
17
18
19
20
21
22
23
24
25
2
4
3
5
6
7
1
572
17
S60C6400

No.	Part name	Q'ty	Remarks
1	Shift rod	1	
2	O-ring	1	**Not reusable** 1.9 × 10.6 mm
3	Oil seal	1	**Not reusable**
4	Bolt	2	M6 × 16 mm
5	Oil seal housing	1	
6	O-ring	1	**Not reusable** 3.1 × 55.6 mm
7	Circlip	1	
8	Screw	2	
9	Cover	1	
10	Bolt	2	M8 × 75 mm
11	Bolt	2	M8 × 50 mm
12	Seal	1	
13	Water pump housing	1	
14	Inner plate cartridge	1	
15	Insert cartridge	1	
16	Impeller	1	
17	Dowel pin	2	
18	Gasket	1	**Not reusable**
19	Outer plate cartridge	1	
20	Gasket	1	**Not reusable**
21	Oil seal housing	1	
22	O-ring	1	**Not reusable** 3.1 × 52.4 mm
23	Gasket	1	**Not reusable**
24	Oil seal	2	**Not reusable**
25	Woodruff key	1	

Removing the lower unit

1. Drain the gear oil. For draining procedures, see Chapter 3, “Changing the gear oil.”

2. Set the gearshift to the neutral position, and 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.



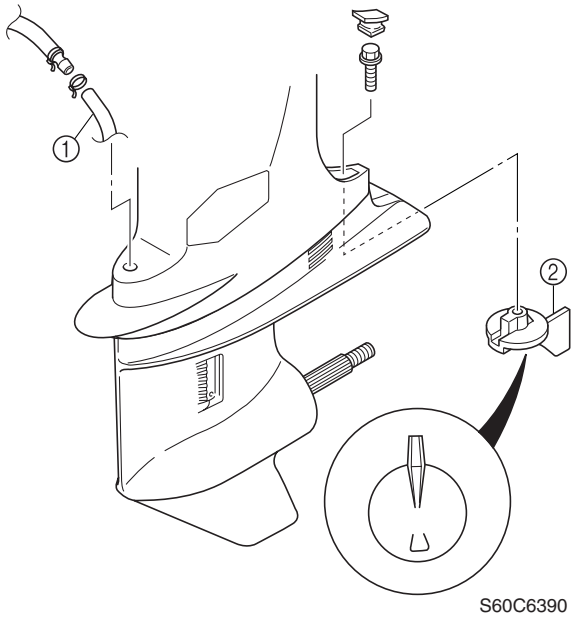
S60C6010

⚠ WARNING

Do not hold the propeller with your hands when loosening or tightening it. Be sure to remove the battery leads from the batteries and the engine shut-off switch. Put a block of wood between the anti-cavitation plate and propeller to keep the propeller from turning.

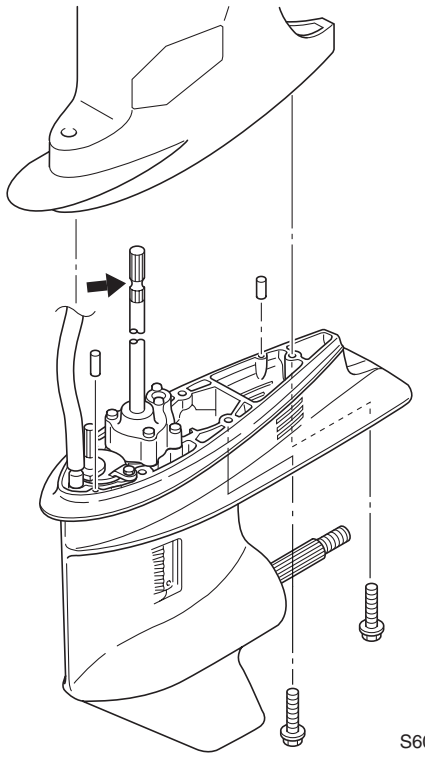
3. Disconnect the speedometer hose ①.

4. Mark the trim tab ② at the area shown, and then remove it.



S60C6390

5. Loosen the bolts, and then remove the lower unit from the upper case.



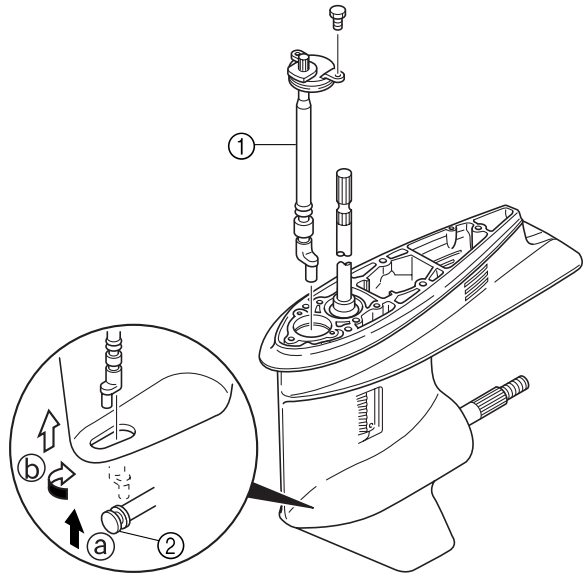
S60C6395

NOTE:

Check that there is no oil on the spline and check it for rust or wear. Check the oil pump if necessary.

Removing the water pump and shift rod

1. Remove the water pump assembly and shift rod assembly ①.

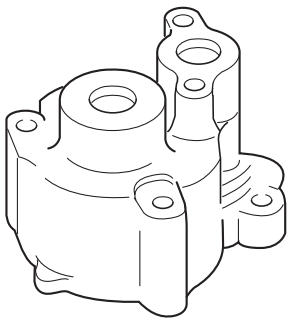


S60C6405

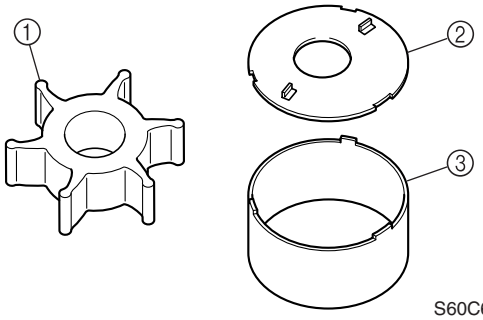
NOTE:
Pull up the shift rod assembly a little ⓐ to disconnect it from the shift slider ②, turn it clockwise 90° ⓑ, and then remove it.

Checking the water pump and shift rod

1. Check the pump housing for deformation. Replace if necessary.

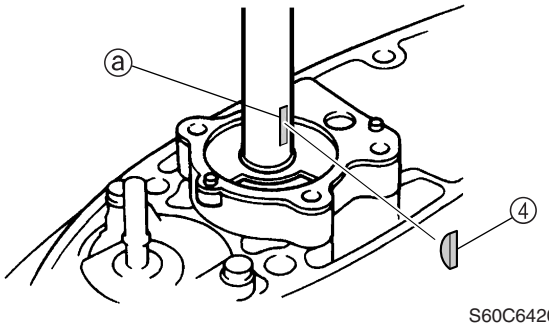

S60C6410

2. Check the impeller ①, inner plate cartridge ② and insert plate cartridge ③ for cracks or wear. Replace if necessary.



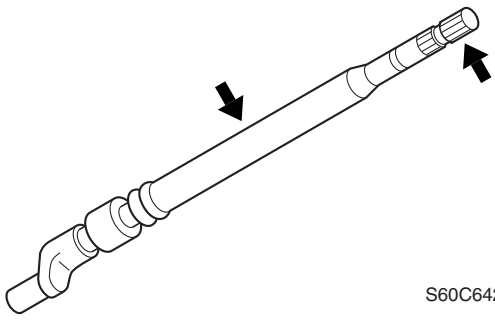
S60C6415

3. Check the Woodruff key ④ and the groove ⓐ on the drive shaft for wear. Replace if necessary.



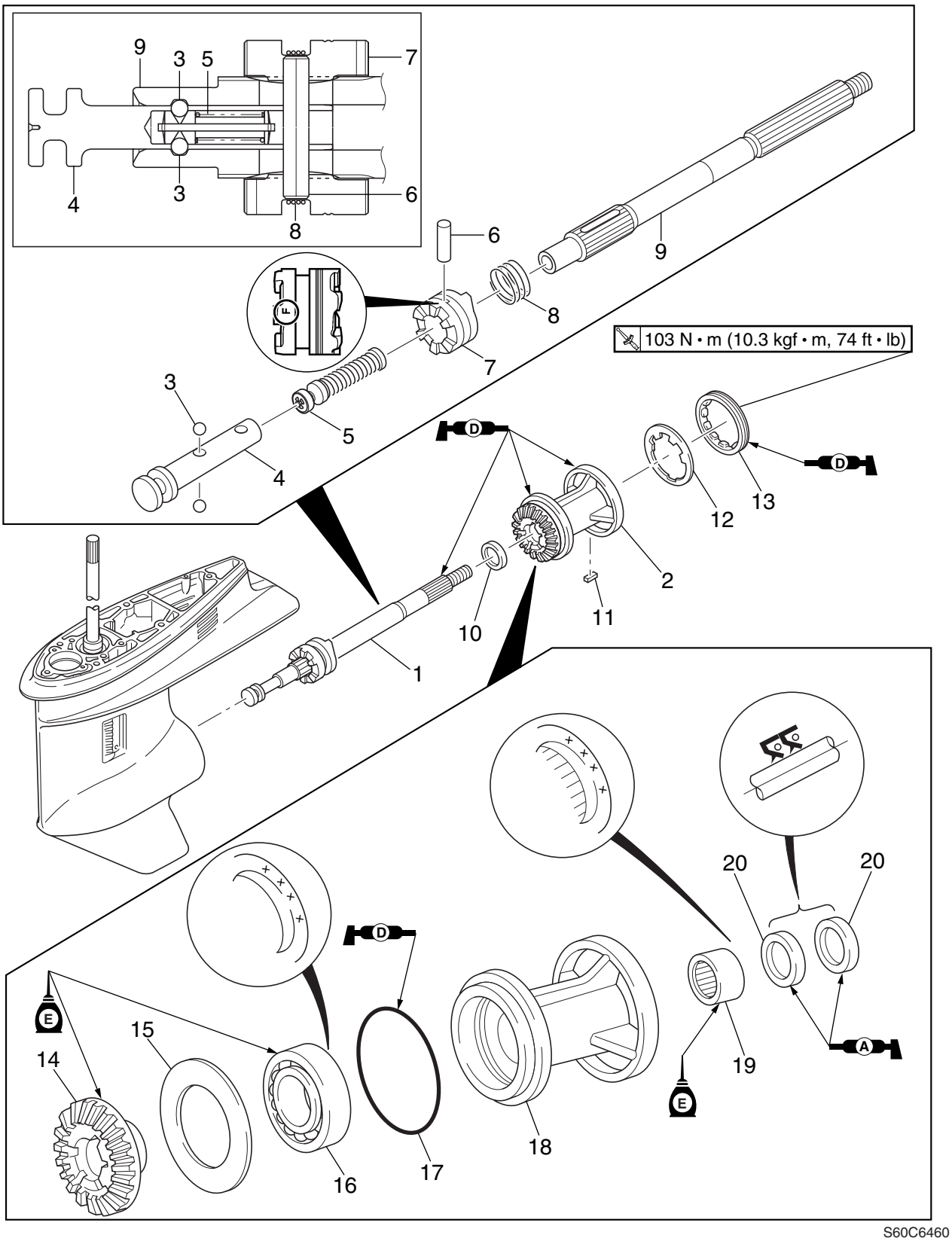
S60C6420

4. Check the shift rod for cracks or wear. Replace if necessary.


S60C6425

6

Propeller shaft housing (F100C)

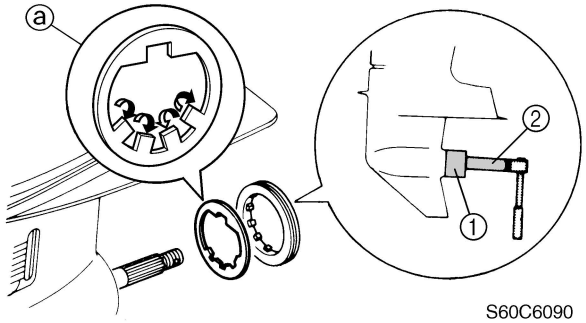


No.	Part name	Q'ty	Remarks
1	Propeller shaft assembly	1	
2	Propeller shaft housing assembly	1	
3	Ball	2	
4	Slider	1	
5	Shift plunger	1	
6	Cross pin	1	
7	Dog clutch	1	
8	Spring	1	
9	Propeller shaft	1	
10	Washer	1	
11	Straight key	1	
12	Claw washer	1	
13	Ring nut	1	
14	Reverse gear	1	
15	Thrust washer	1	
16	Ball bearing	1	
17	O-ring	1	**Not reusable** 5.5 × 97.8 mm
18	Propeller shaft housing	1	
19	Needle bearing	1	
20	Oil seal	2	**Not reusable**

6

Removing the propeller shaft housing assembly

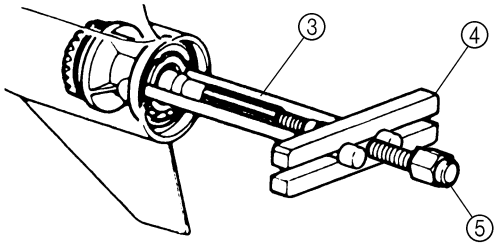
1. Straighten the claw washer tabs ⓐ, and then remove the ring nut and claw washer.



S60C6090

Ring nut wrench 3 ①: 90890-06511
Ring nut wrench extension ②: 90890-06513

2. Pull out the propeller shaft housing assembly.

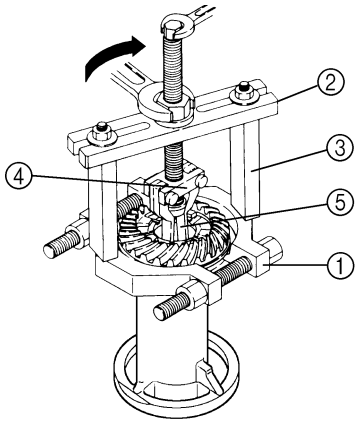


S60C6095

Bearing housing puller claw L ③: 90890-06502
Stopper guide plate ④: 90890-06501
Center bolt ⑤: 90890-06504

Disassembling the propeller shaft housing

1. Remove the reverse gear and thrust washer.

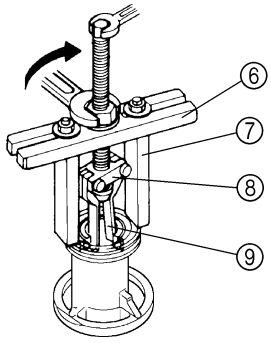


S60C6100

Bearing separator ①: 90890-06534
Stopper guide plate ②: 90890-06501
Stopper guide stand ③: 90890-06538
Bearing puller ④: 90890-06535
Bearing puller claw 1 ⑤: 90890-06536

NOTE:
Install the bearing separator ① between the reverse gear and thrust washer completely.

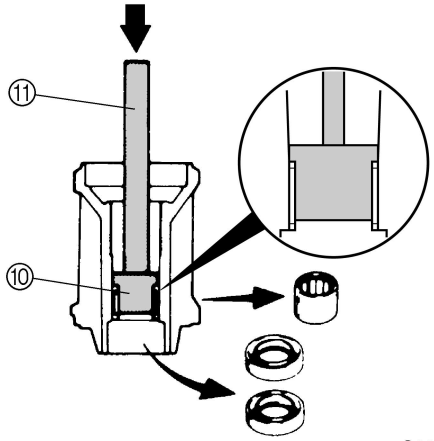
2. Remove the ball bearing.



S60C6105

Stopper guide plate ⑥: 90890-06501
Stopper guide stand ⑦: 90890-06538
Bearing puller ⑧: 90890-06535
Bearing puller claw 1 ⑨: 90890-06536

3. Remove the oil seals and needle bearing.

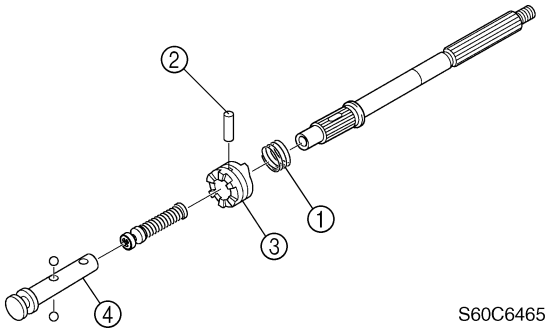


S60C6655

	Needle bearing attachment ⑩: 90890-06612 Driver rod L3 ⑪: 90890-06652

Disassembling the propeller shaft assembly

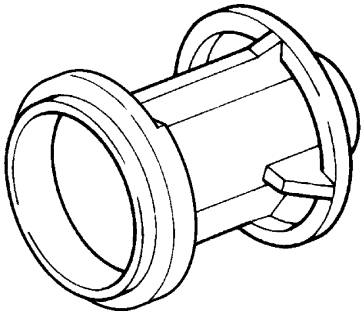
1. Remove the spring ①, and then remove the cross pin ②, dog clutch ③, slider, and shift plunger ④.



S60C6465

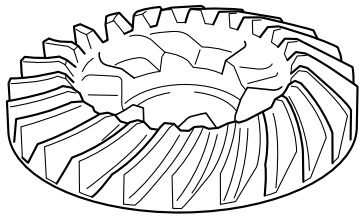
Checking the propeller shaft housing

1. Clean the propeller shaft housing using a soft brush and cleaning solvent, and then check it for cracks. Replace if necessary.



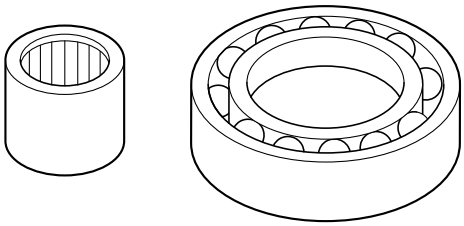
S60C6120

2. Check the teeth and dogs of the reverse gear for cracks or wear. Replace the gear if necessary.



S60C6125

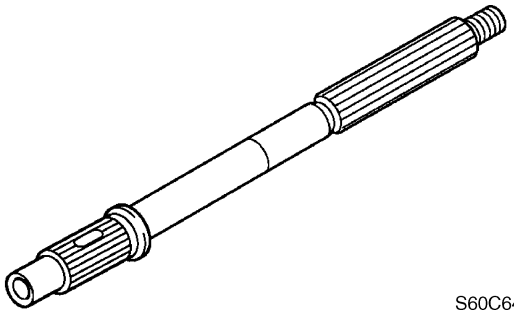
3. Check the bearings for pitting or rumbling. Replace if necessary.



S60C6130

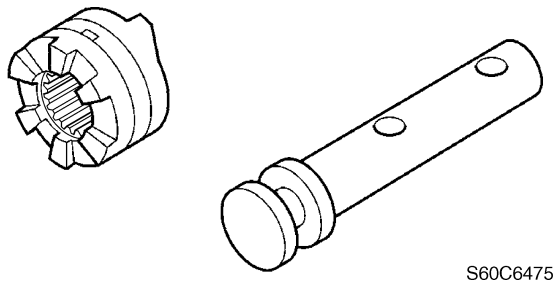
Checking the propeller shaft

1. Check the propeller shaft for bends or wear. Replace if necessary.



S60C6470

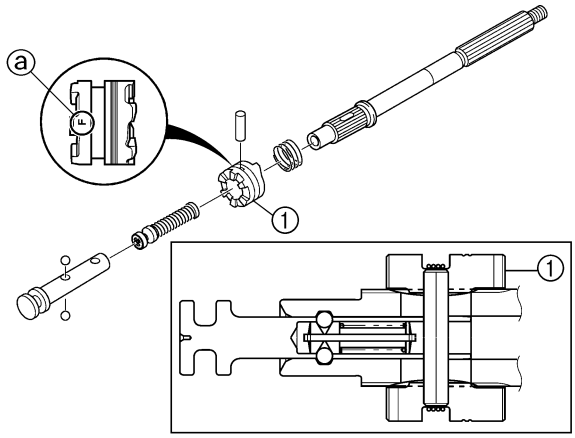
2. Check the dog clutch and shift slider for cracks or wear. Replace if necessary.



S60C6475

Assembling the propeller shaft assembly

1. Install the dog clutch as shown.



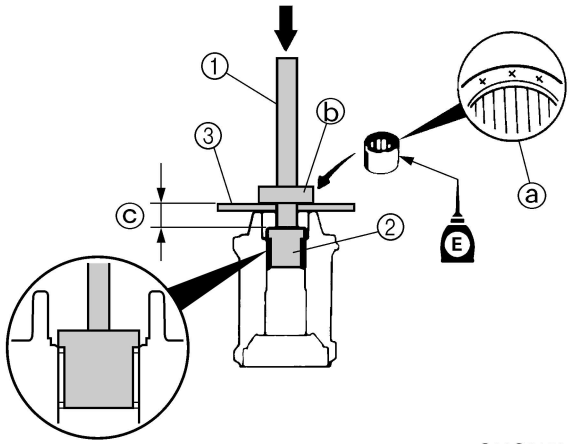
S60C6480

NOTE:

Install the dog clutch ① with the "F" mark ⓐ facing toward the shift slider.

Assembling the propeller shaft housing

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



S60C6150

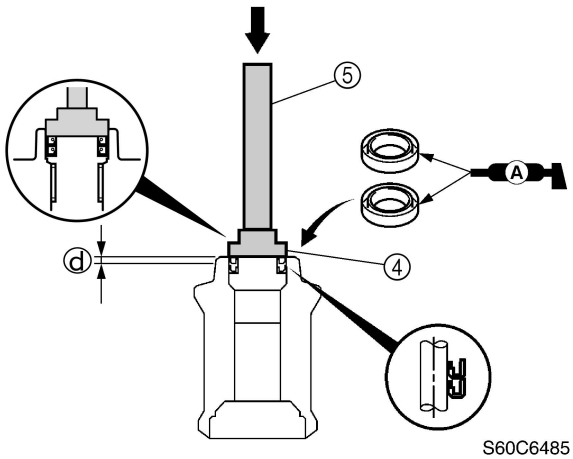
NOTE:

- Install the needle bearing with the manufacture identification mark ⓐ facing toward the oil seal (propeller side).
- When using the driver rod, do not strike the special tool in a manner that will force the stopper ⓑ out of place.

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

Depth ⓒ:
25.0–25.5 mm (0.98–1.00 in)

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



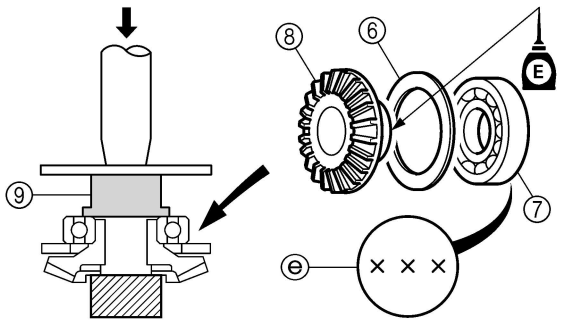
S60C6485

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

Ball bearing attachment ④:
90890-06633
Driver rod LS ⑤: 90890-06606

Depth ⓓ: 4.5–5.5 mm (0.18–0.22 in)

3. Install the thrust washer ⑥ and ball bearing ⑦ to the reverse gear ⑧ using a press.

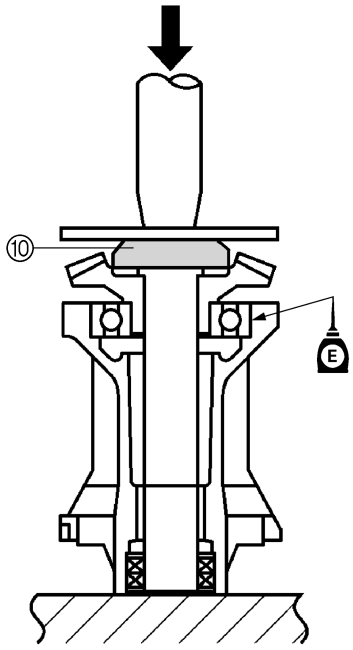


S60C6490

NOTE:
Install the ball bearing with the manufacture identification mark ⓔ facing outward (propeller side).

Ball bearing attachment ⑨:
90890-06631

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

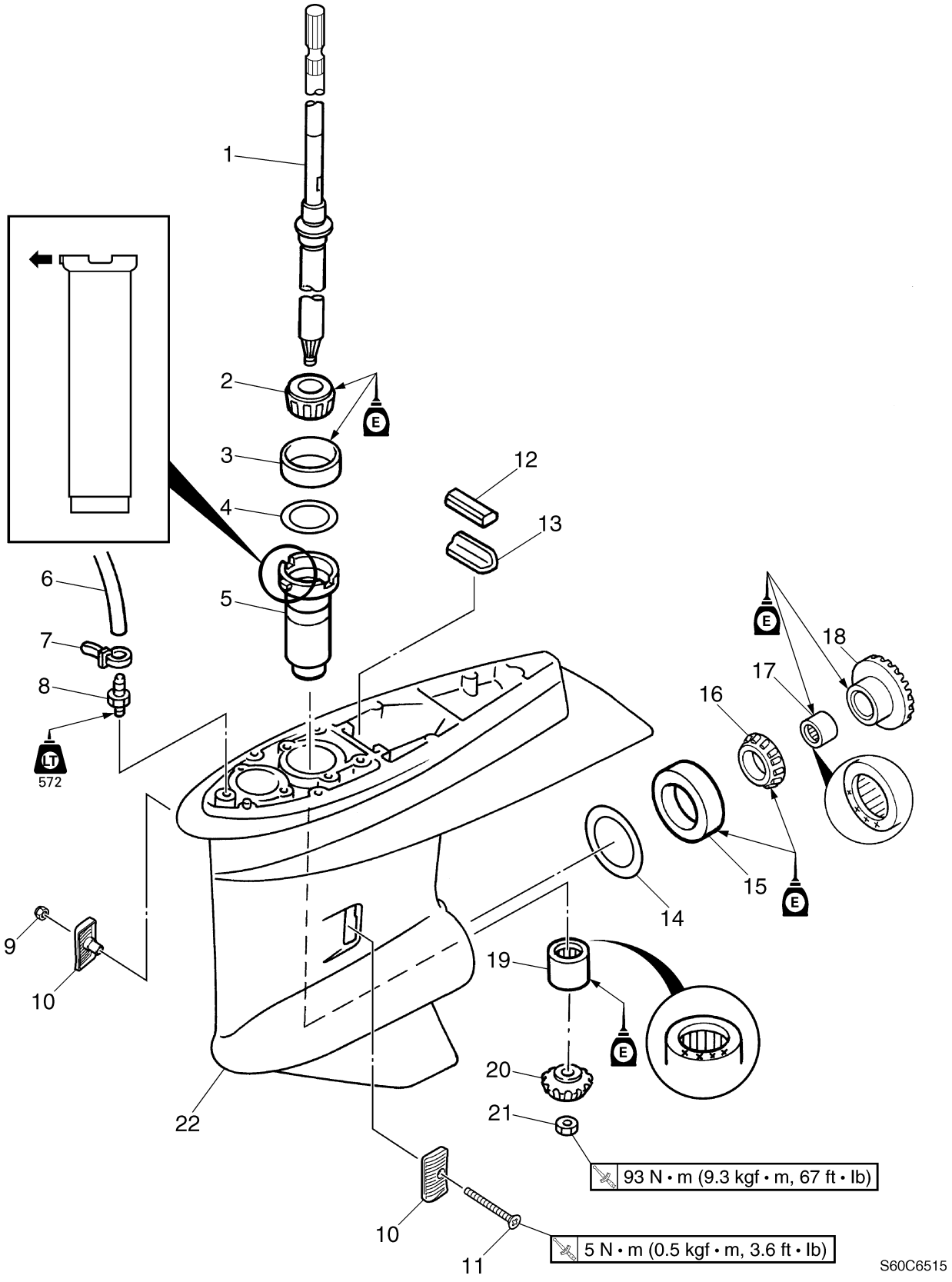


S60C6495

Bearing outer race attachment ⑩:
90890-06623

6

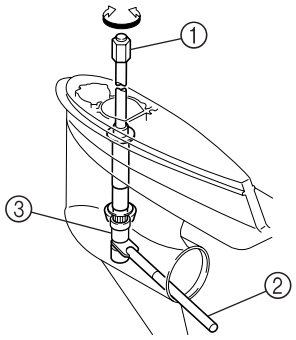
Drive shaft and lower case (F100C)



No.	Part name	Q'ty	Remarks
1	Drive shaft	1	
2	Taper roller bearing	1	**Not reusable**
3	Bearing outer race	1	**Not reusable**
4	Pinion shim	—	As required
5	Sleeve	1	
6	Hose	1	7 × 300 mm
7	Plastic tie	1	**Not reusable**
8	Joint	1	
9	Nut	1	
10	Water inlet cover	2	
11	Screw	1	
12	Seal	1	
13	Plate	1	
14	Forward gear shim	—	As required
15	Bearing outer race	1	**Not reusable**
16	Taper roller bearing	1	**Not reusable**
17	Needle bearing	1	
18	Forward gear	1	
19	Needle bearing	1	
20	Pinion	1	
21	Nut	1	
22	Lower case	1	

Removing the drive shaft

1. Remove the drive shaft assembly and pinion, and then pull out the forward gear.

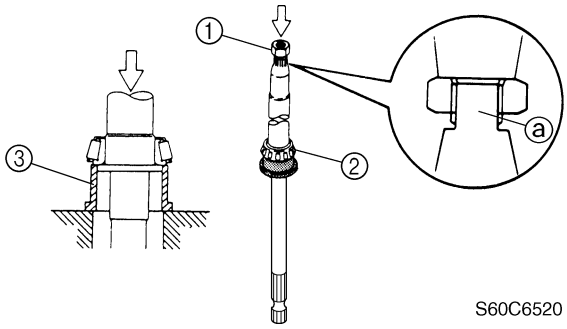


S60C6190

Drive shaft holder 5 ①: 90890-06519
Pinion nut holder ②: 90890-06505
Socket adapter 2 ③: 90890-06507

Disassembling the drive shaft

1. Install the pinion nut ①, tighten it finger tight, and then remove the drive shaft bearing ② using a press.



S60C6520

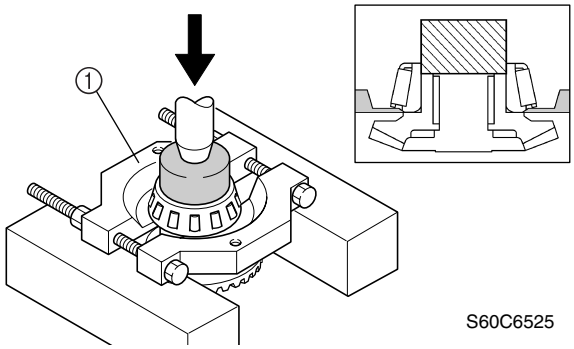
CAUTION:

- **Do not press the drive shaft threads ⓐ directly.**
- **Do not reuse the bearing, always replace it with a new one.**

Bearing inner race attachment ③: 90890-06639

Disassembling the forward gear

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



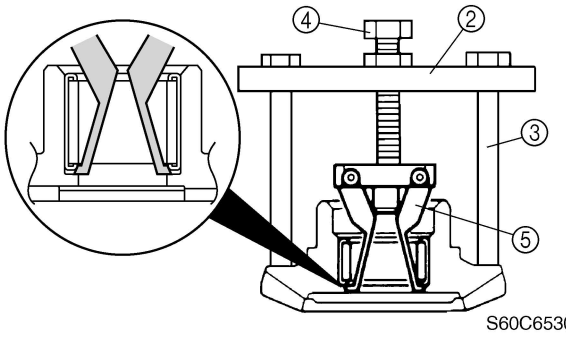
S60C6525

CAUTION:

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

Bearing separator ①: 90890-06534

2. Remove the needle bearing from the forward gear.



S60C6530

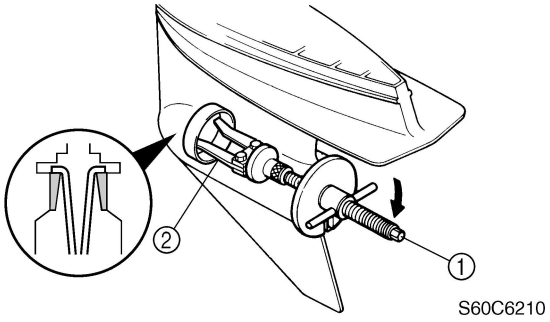
CAUTION:

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 ④: 90890-06535
Bearing puller claw 2 ⑤: 90890-06537

Disassembling the lower case

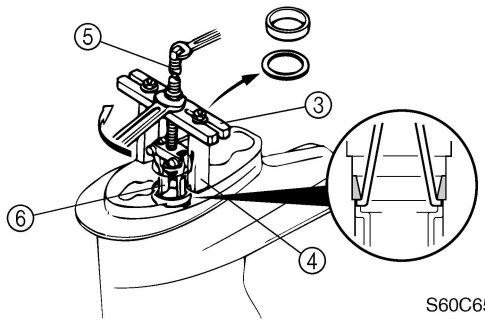
1. Remove the taper roller bearing outer race and shim(s).



NOTE:
Install the claws as shown.

Bearing outer race puller ①: 90890-06523
Outer race puller claw A ②: 90890-06532

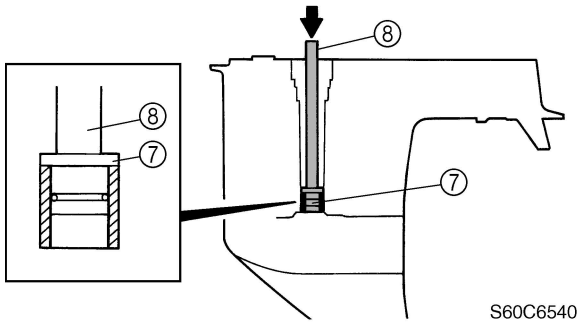
2. Remove the drive shaft bearing outer race, shim(s), and drive shaft sleeve.



NOTE:
Install the claws as shown.

Stopper guide plate ③: 90890-06501
Stopper guide stand ④: 90890-06538
Bearing puller ⑤: 90890-06535
Bearing puller claw 1 ⑥: 90890-06536

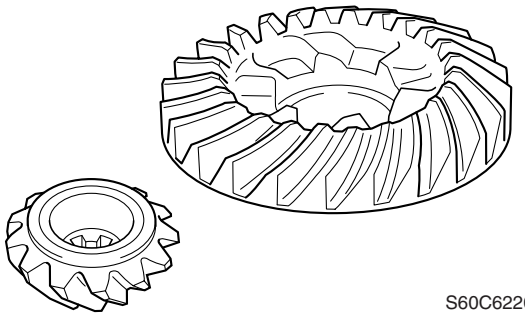
3. Remove the needle bearing.



Needle bearing attachment ⑦: 90890-06611
Driver rod L3 ⑧: 90890-06652

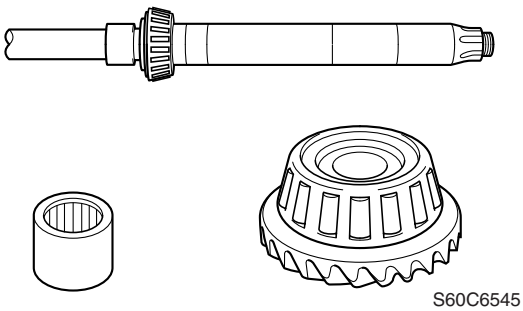
Checking the pinion and forward gear

1. Check the teeth of the pinion, and the teeth and dogs of the forward gear for cracks or wear. Replace if necessary.



Checking the bearings

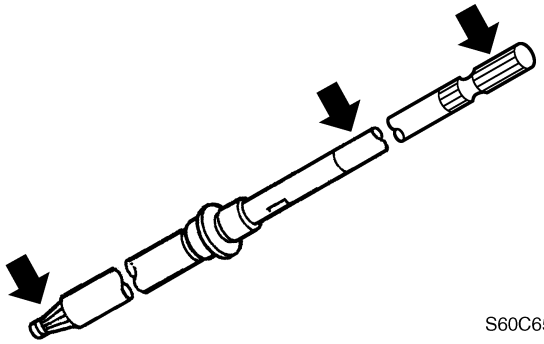
1. Check the bearings for pitting or rumbling. Replace if necessary.



Checking the drive shaft

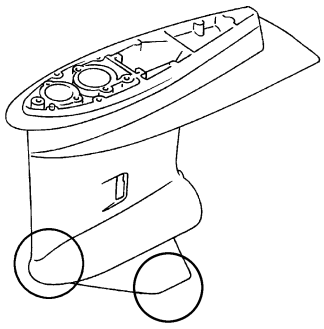
1. Check the drive shaft for bends or wear. Replace if necessary.

6


S60C6550

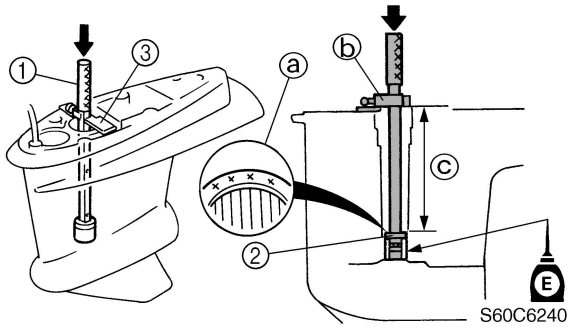
Checking the lower case

1. Check the skeg and torpedo for cracks or damage. Replace if necessary.


S60C6555

Assembling the lower case

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



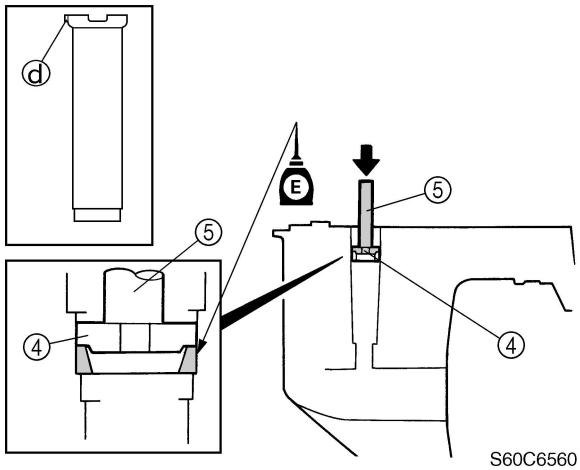
S60C6240

NOTE:
- Install the needle bearing with the manufacture identification mark ⓐ facing upward.
- When using the driver rod, do not strike the special tool in a manner that will force the stopper ⓑ out of place.

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

Depth ⓒ:
187.6–188.6 mm (7.39–7.43 in)

2. Install the sleeve, original shim(s), and drive shaft bearing outer race.



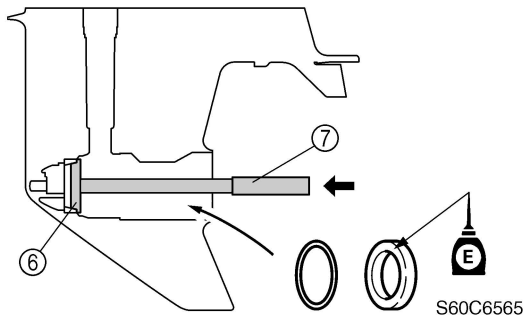
S60C6560

CAUTION:
Add or remove shims, if necessary, when replacing the pinion or lower case.

NOTE:
- Apply the gear oil to the inside and outside of the sleeve.
- Install the sleeve by facing the projection ⓓ forward.

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

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



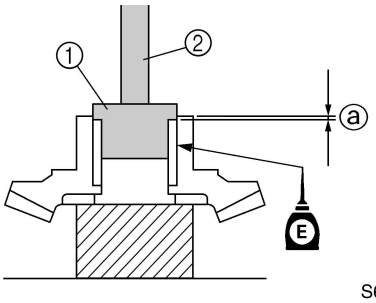
S60C6565

CAUTION:
Add or remove shims, if necessary, when replacing the forward gear or lower case.

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

Assembling the forward gear

1. Install the new needle bearing into the forward gear to the specified depth.

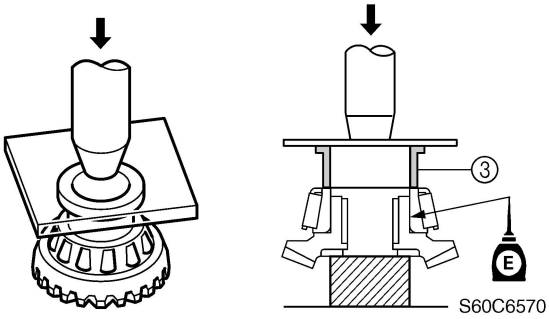


S60C6575

Needle bearing attachment ①: 90890-06609
Driver rod L3 ②: 90890-06652

Depth ⓐ: 1.2 mm (0.05 in)

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

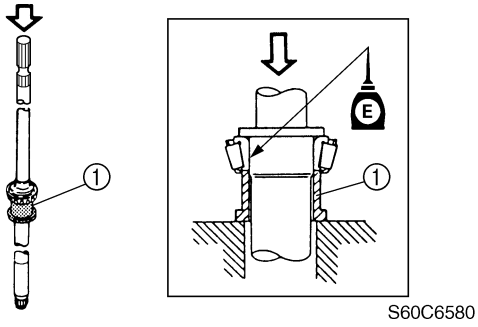


S60C6570

Bearing inner race attachment ③: 90890-06662

Assembling the drive shaft

1. Install the new drive shaft bearing into the drive shaft using a press.

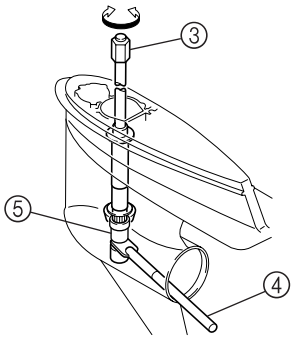


S60C6580

Bearing inner race attachment ①: 90890-06643

Installing the drive shaft

1. Install the forward gear to the lower case.
2. Install the drive shaft assembly, pinion, and pinion nut, and then tighten the nut to the specified torque.



S60C6270

NOTE:
Install the drive shaft by lifting it up slightly, then aligning it with the pinion and the spline of the drive shaft.

Drive shaft holder 5 ①: 90890-06519
Pinion nut holder ②: 90890-06505
Socket adapter 2 ③: 90890-06507

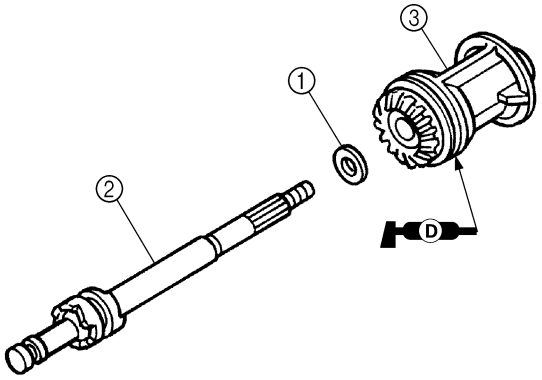
Pinion nut:
93 N·m (9.3 kgf·m, 67 ft·lb)

6

Installing the propeller shaft housing

1. Install the washer ①, propeller shaft assembly ②, into the propeller shaft housing assembly ③.

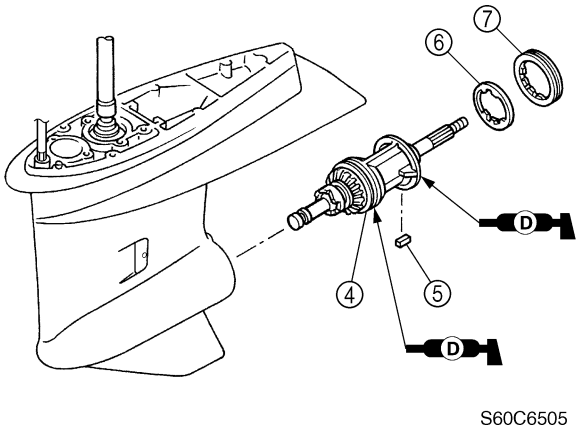
2. Apply grease to the new O-rings.



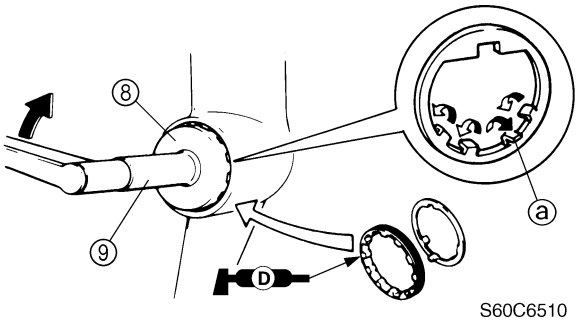
S60C6500

3. Install the propeller shaft housing assembly ④ into the lower case, and then install the straight key ⑤, claw washer ⑥, and ring nut ⑦.

4. Tighten the nut to the specified torque.



S60C6505



S60C6510

NOTE:

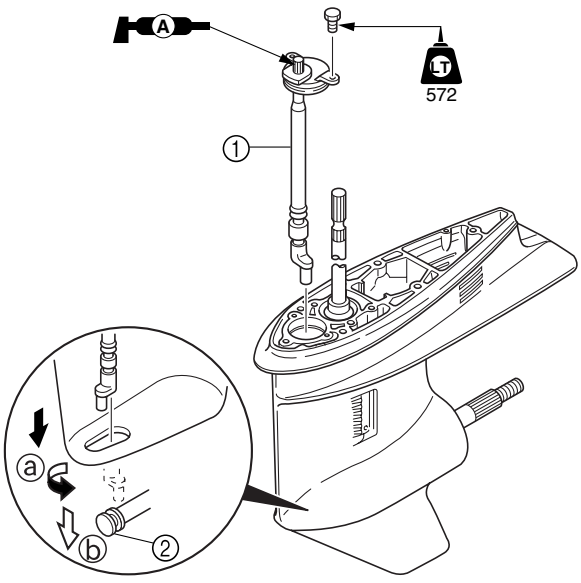
Secure the ring nut by bending one tab ⓐ into the slot in the ring nut and the other tabs toward the propeller shaft housing assembly.

	Ring nut wrench 3 ⑧: 90890-06511 Ring nut wrench extension ⑨: 90890-06513

	Ring nut ⑦: 103 N·m (10.3 kgf·m, 74 ft·lb)

Installing the water pump and shift rod

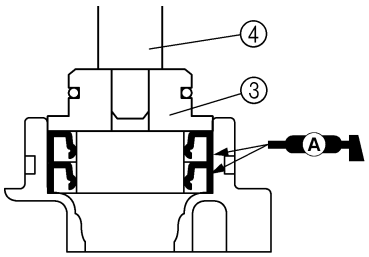
1. Install the shift rod assembly ①.



S60C6430

NOTE:
Install the shift rod assembly into the lower case, turn it counterclockwise 90° ⓐ, and then push it down ⓑ to connect it to the shift slider ②.

2. Install the new oil seals into the oil seal housing as shown.

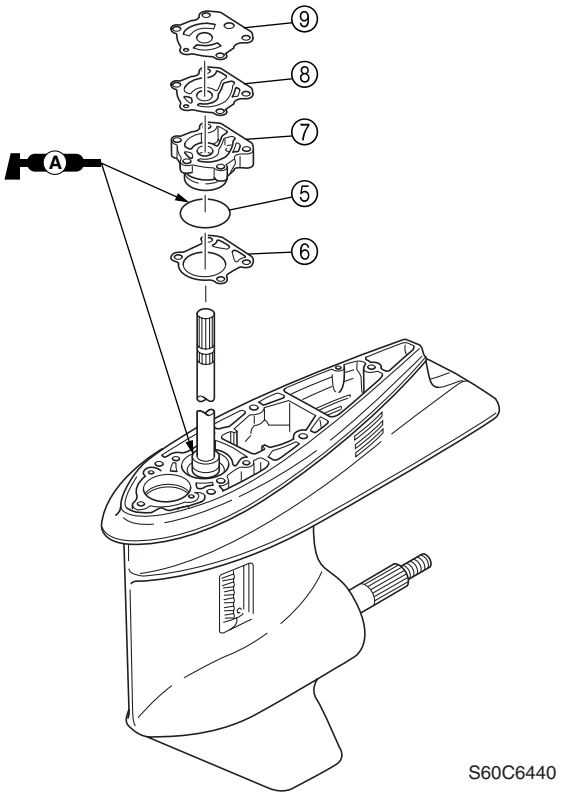


S60C6435

	Ball bearing attachment ③: 90890-06636 Driver rod LS ④: 90890-06606

3. Install the new O-ring ⑤.

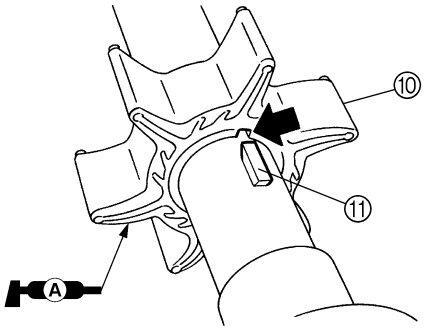
4. Install the new gasket ⑥, oil seal housing ⑦, new gasket ⑧, and outer plate cartridge ⑨.



S60C6440

5. Install the Woodruff key into the drive shaft.

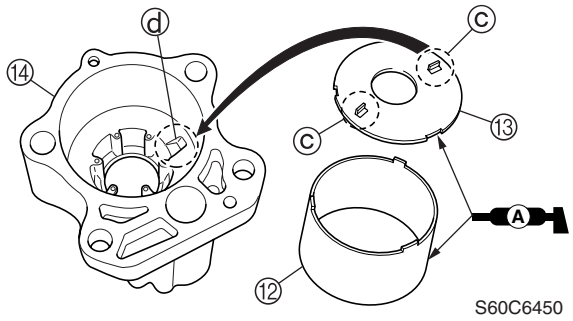
6. Align the groove on the impeller ⑩ with the Woodruff key ⑪, and then install it to the drive shaft.



S60C6445

6

7. Install the insert cartridge ⑫ and inner plate cartridge ⑬ into the pump housing ⑭.

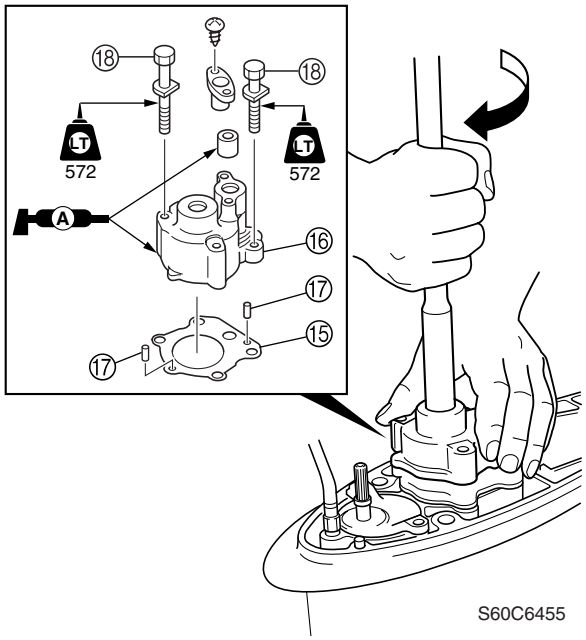


S60C6450

NOTE:
Align the insert cartridge projections ⓒ with the holes ⓓ in the pump housing.

8. Install the new gasket ⑮, pump housing assembly ⑯, and dowel pins ⑰ to the lower case.

9. Install and tighten the bolts ⑱.

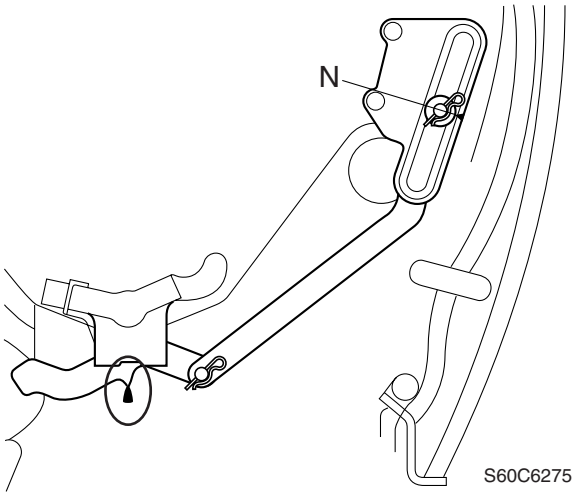


S60C6455

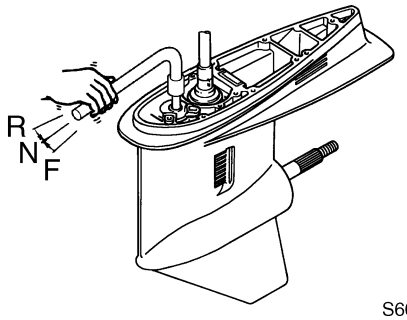
NOTE:
When installing the pump housing, apply grease to the inside of the housing, and then turn the drive shaft clockwise while pushing down the pump housing.

Installing the lower unit

1. Set the gearshift to the neutral position at the power unit and lower unit.



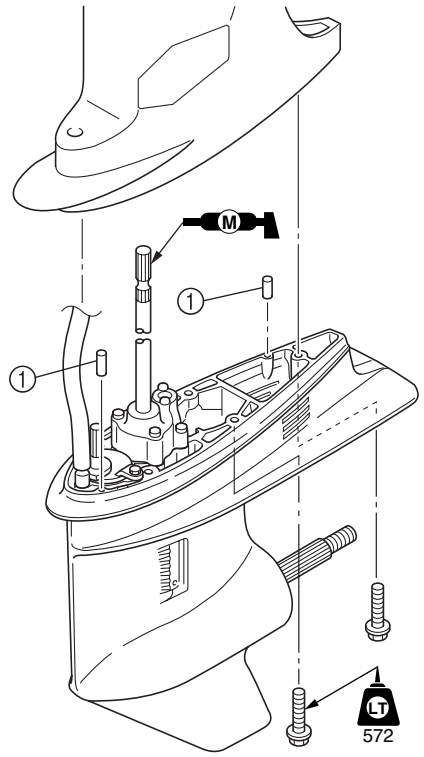
S60C6275



S60C6280

2. Install the two dowel pins ① to the lower unit.

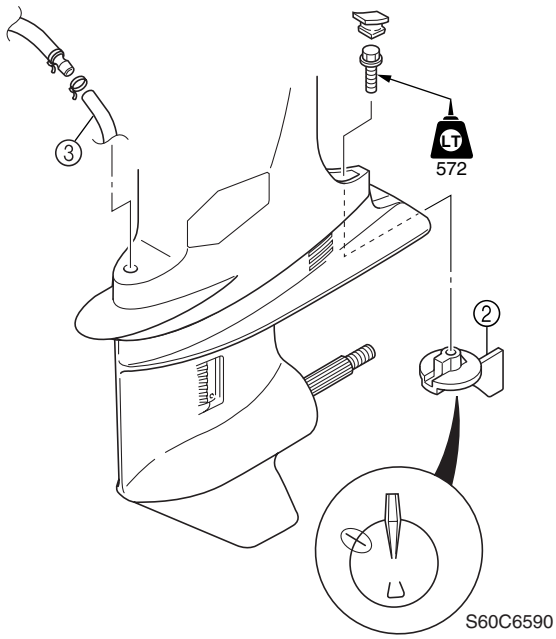
3. Install the lower unit to the upper case, and then tighten the bolts to the specified torque.



S60C6585

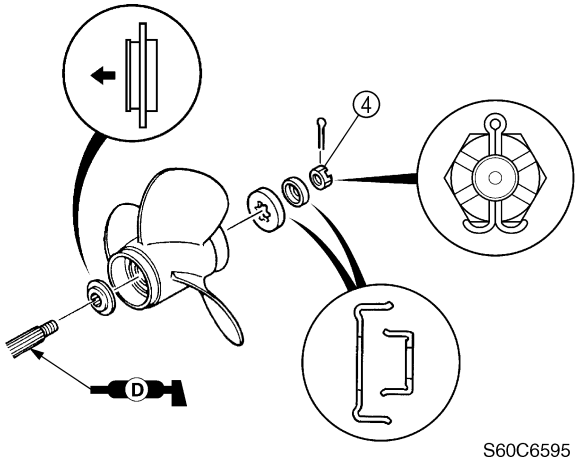
Mounting bolt:
39 N·m (3.9 kgf·m, 28 ft·lb)

4. Install the trim tab ② to its original position, and then connect the speedometer hose ③.

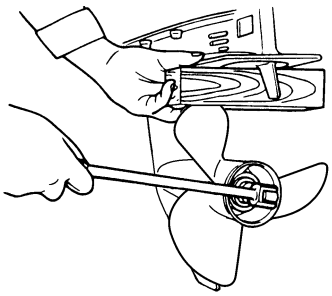


S60C6590

5. Install the propeller and propeller nut, and then tighten the nut finger tight. 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.



S60C6595



S60C6300

⚠ WARNING

Do not hold the propeller with your hands when loosening or tightening it. Be sure to remove the battery leads from the batteries and the engine shut-off switch. Put a block of wood between the anti-cavitation plate and propeller to keep the propeller from turning.

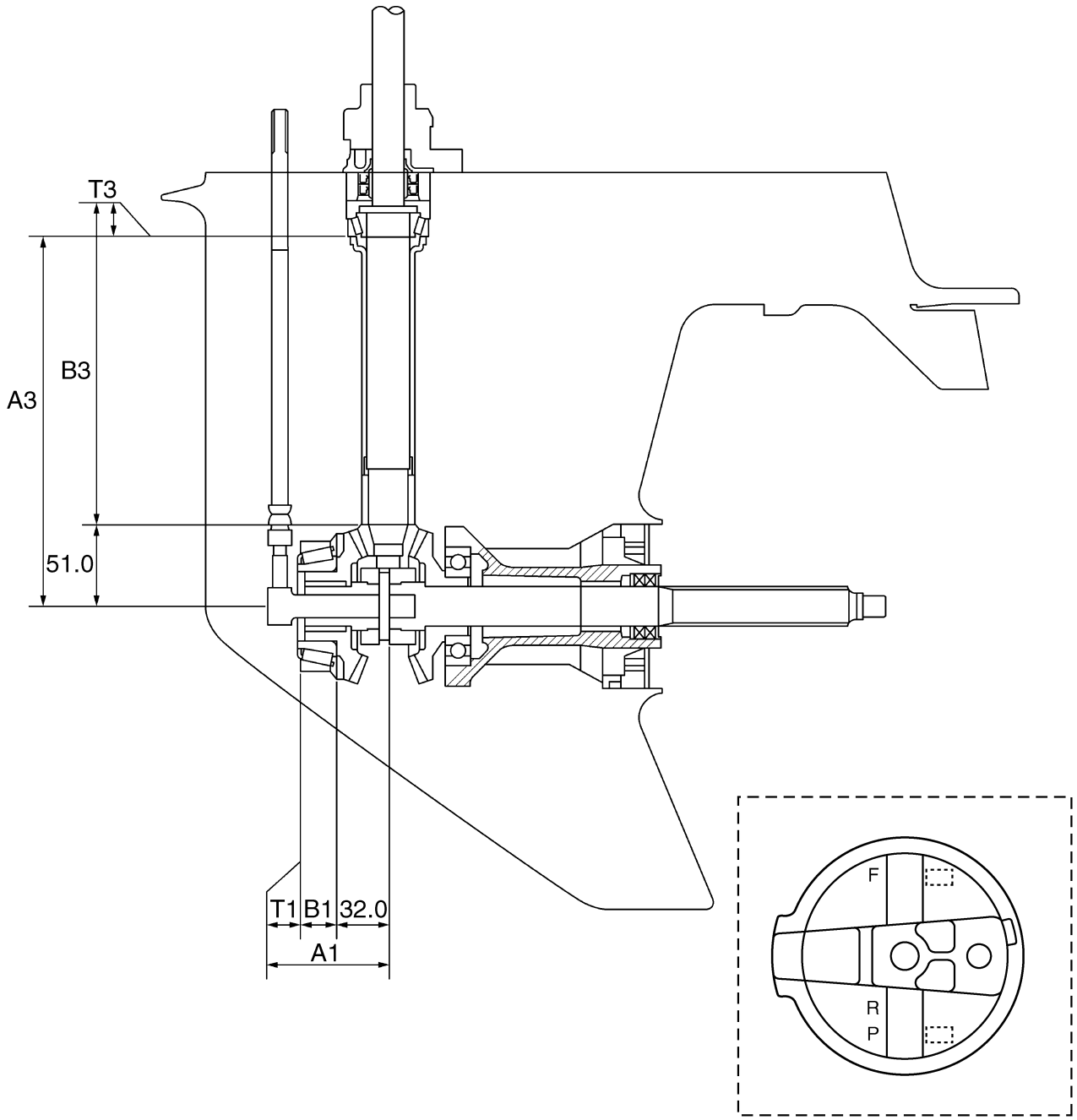
NOTE:

If the grooves in the propeller nut ④ do not align with the cotter pin hole, tighten the nut until they are aligned.

Propeller nut ④:
34 N·m (3.4 kgf·m, 25 ft·lb)

6

Shimming (F100C)



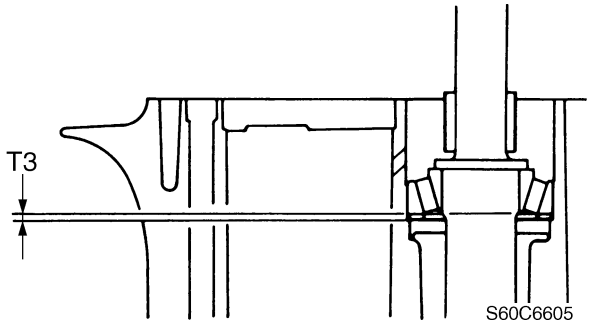
S60C6600

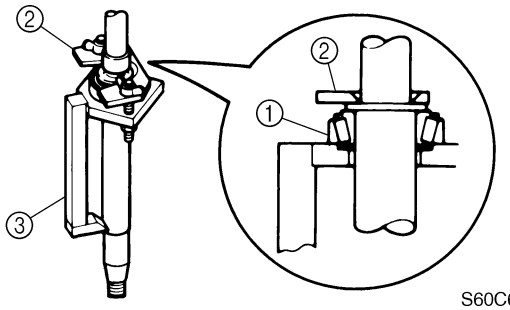
Shimming

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 shims

1. Install the drive shaft and drive shaft bearing ① to the shimming tools.





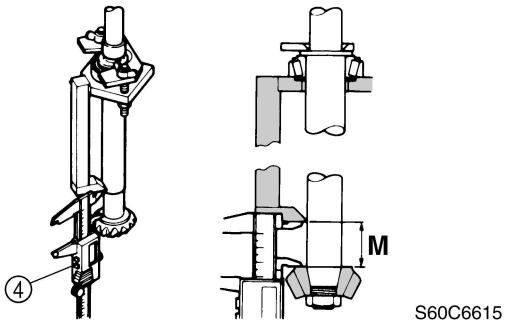
NOTE:
- Select the shim thickness (T3) by using the specified measurement(s) and the calculation formula.
- Install the shimming tool to the drive shaft so that the shaft is at the center of the hole.
- Tighten the wing nuts another 1/4 of a turn after they contact the fixing plate ②.

Pinion height gauge ③:
90890-06702

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

Pinion nut:
93 N·m (9.3 kgf·m, 67 ft·lb)

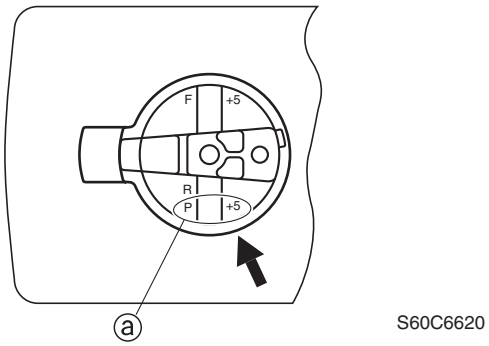
3. Measure the distance (M) between the shimming tool and the pinion as shown.



NOTE:
Measure the pinion at three points to find the clearance average.

Digital caliper ④: 90890-06704

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



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

6

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

Example:
If "M" is 32.10 mm and "P" is (+5), then
T3 = 32.10 – 31.50 – (+5)/100 mm
= 0.60 – 0.05 mm = 0.55 mm
If "M" is 32.10 mm and "P" is (–5), then
T3 = 32.10 – 31.50 – (–5)/100 mm
= 0.60 + 0.05 mm = 0.65 mm

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

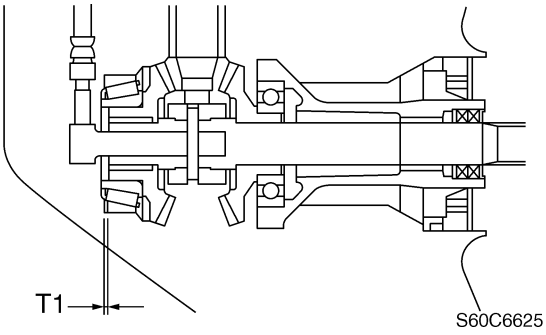
Calculated numeral at 1/100 place	Rounded numeral
0, 1	2
2, 3, 4	5
5, 6, 7	8
8, 9	10

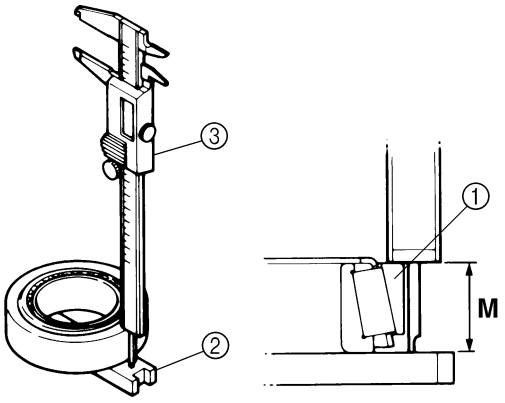
Available shim thicknesses:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, and 0.50 mm

Example:
If "T3" is 0.55 mm, then the pinion shim is 0.58 mm.
If "T3" is 0.65 mm, then the pinion shim is 0.68 mm.

Selecting the forward gear shims

1. Turn the taper roller bearing outer race ① two or three times to seat the rollers, and then measure the bearing height (M) as shown.

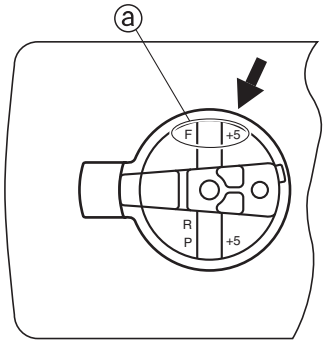




NOTE:
- Select the shim thickness (T1) by using the specified measurement(s) and the calculation formula.
- Measure the bearing outer race at three points to find height average.

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

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



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 unreadable, assume that "F" is zero and check the backlash when the unit is assembled.

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

Example:
If “M” is 24.00 mm and “F” is (+5), then
T1 = 24.50 + (+5)/100 – 24.00 mm
= 0.50 + 0.05 mm = 0.55 mm
If “M” is 24.00 mm and “F” is (–5), then
T1 = 24.50 + (–5)/100 – 24.00 mm
= 0.50 – 0.05 mm = 0.45 mm

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

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

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

Example:
If “T1” is 0.55 mm, then the forward gear shim is 0.52 mm.
If “T1” is 0.45 mm, then the forward gear shim is 0.42 mm.

Selecting the reverse gear shims

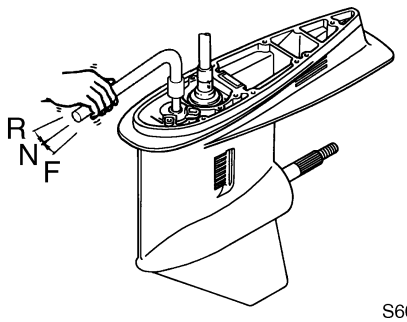
NOTE:
The F100C does not contain reverse gear shims, therefore shimming is not necessary.

Backlash (F100C)

Measuring the forward gear backlash

1. Remove the water pump assembly.

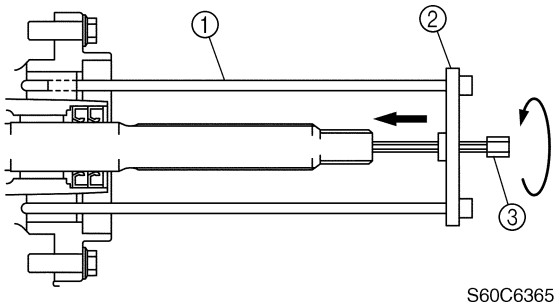
2. Set the gearshift to the neutral position.



S60C6280


Shift rod push arm: 90890-06052

3. Install the special service tool so that it pushes against the propeller shaft.



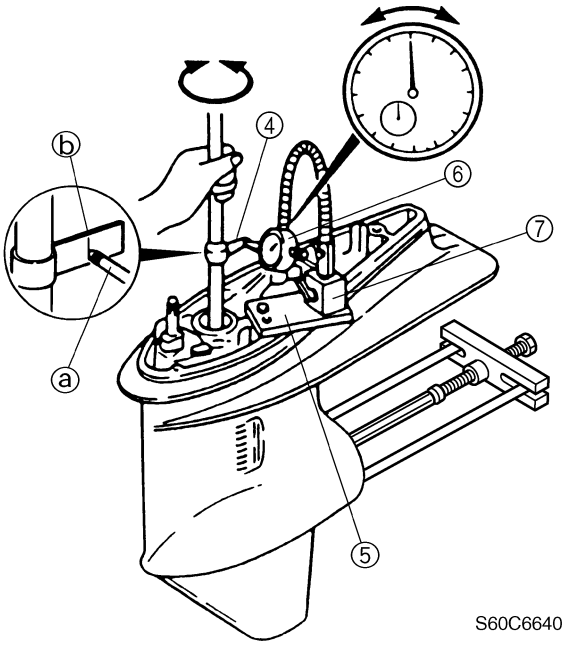
S60C6365

NOTE:
Tighten the universal puller or center bolt while turning the drive shaft until the drive shaft can no longer be turned.


Bearing housing puller claw L ①:
90890-06502
Stopper guide plate ②: 90890-06501
Center bolt ③: 90890-06504

6

4. Install the backlash indicator onto the drive shaft (20 mm [0.79 in] in diameter), then the dial gauge onto the lower unit.



NOTE:
Install the dial gauge so that the plunger ⓐ contacts 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 ⑦: 90890-06705

5. Slowly turn the drive shaft clockwise and counterclockwise and measure the backlash when the drive shaft stops in each direction.

Forward gear backlash:
0.13–0.47 mm (0.005–0.019 in)

6. Add or remove shims if out of specification.

Forward gear backlash	Shim thickness
Less than 0.13 mm (0.005 in)	To be decreased by (0.30 – M) × 0.56
More than 0.47 mm (0.019 in)	To be increased by (M – 0.30) × 0.56

M: Measurement

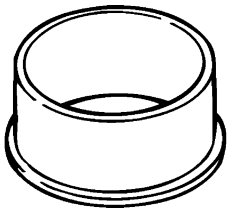
Available shim thicknesses:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, and 0.50 mm

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

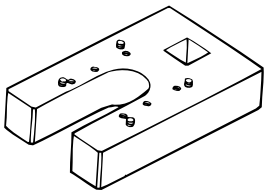
Bracket unit

7

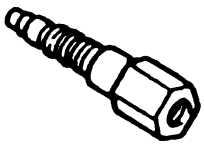
Special service tools



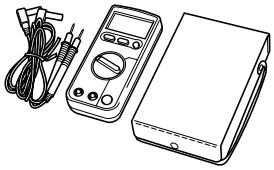
Bearing inner race attachment
90890-06662



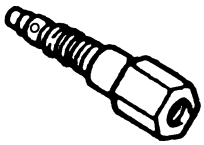
Cylinder-end screw wrench
90890-06544



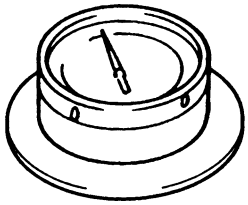
Up relief fitting
90890-06773



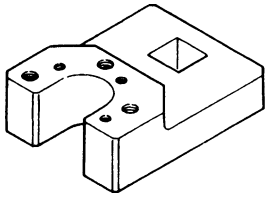
Digital circuit tester
90890-03174



Down relief fitting
90890-06774



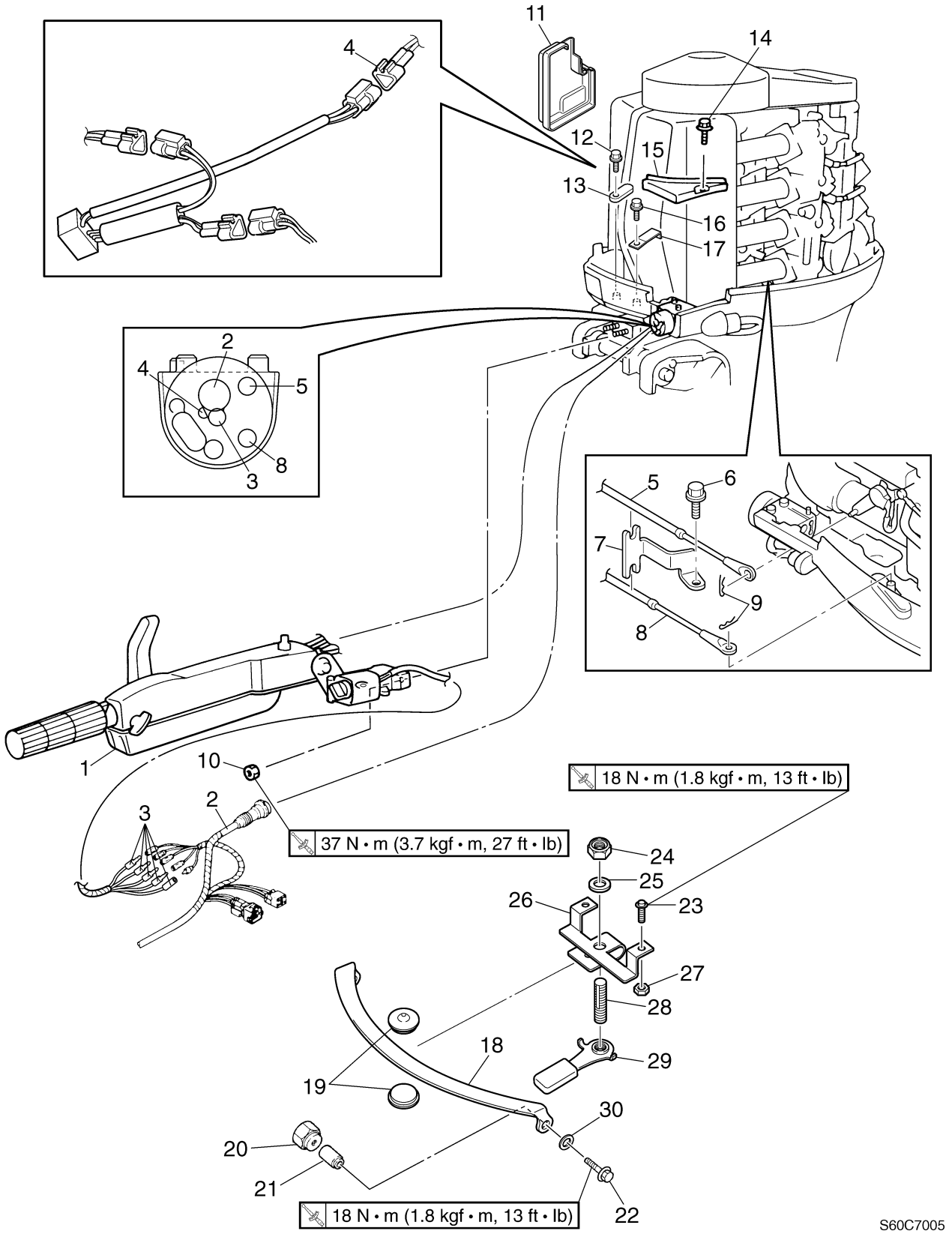
Hydraulic pressure gauge
90890-06776



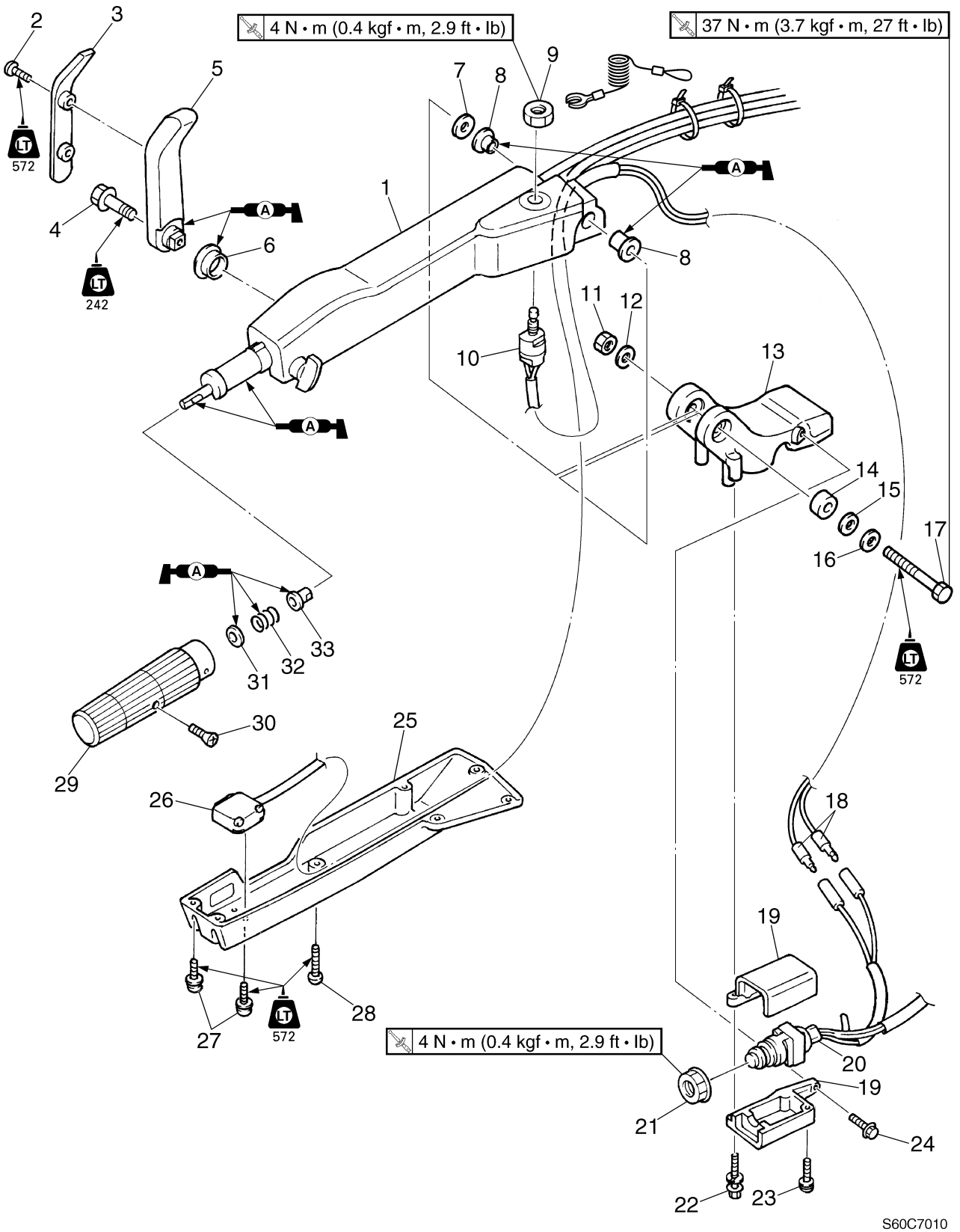
Trim & tilt wrench
90890-06548

— MEMO —

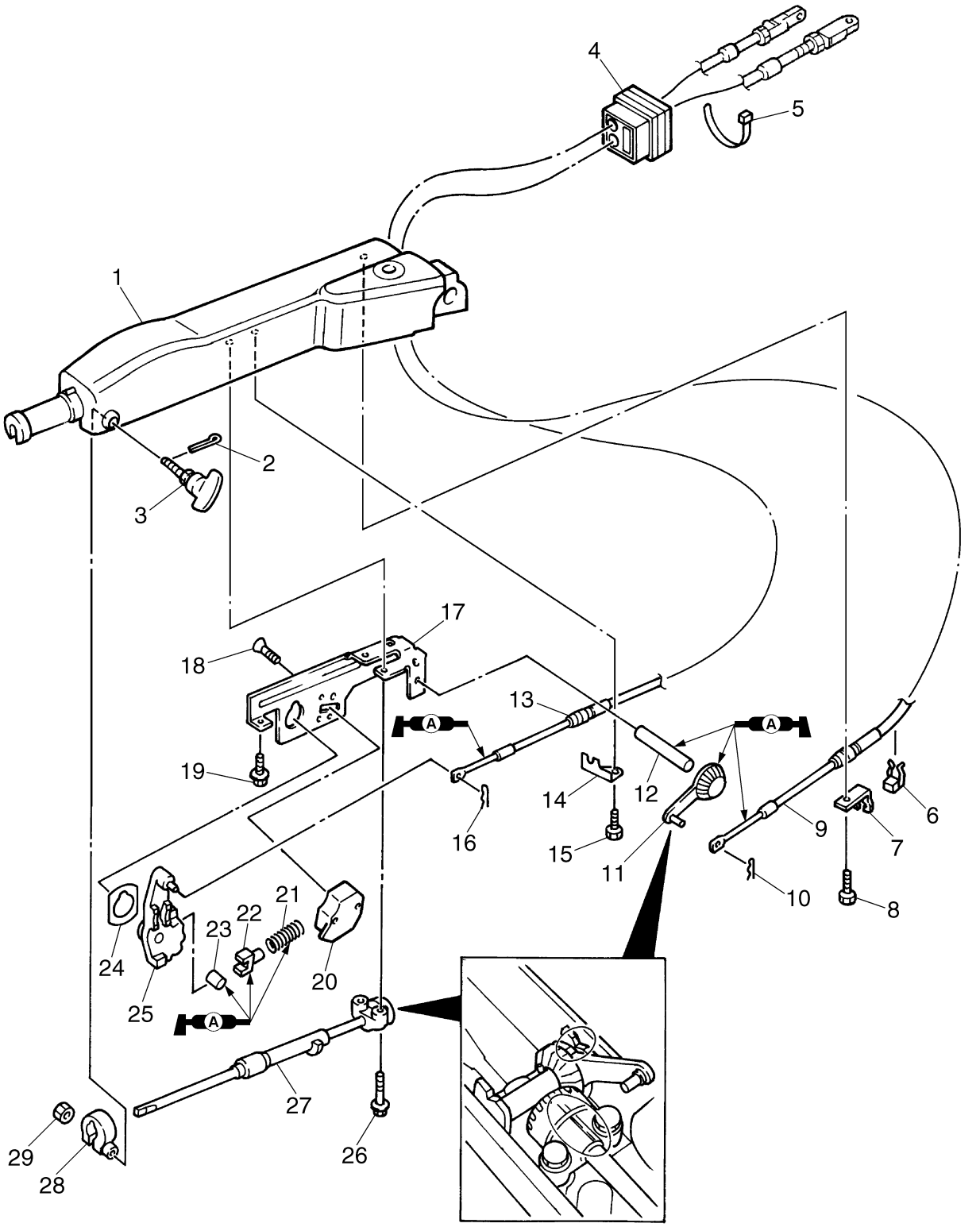
Tiller handle



No.	Part name	Q'ty	Remarks
1	Tiller handle assembly	1	
2	Wiring harness extension	1	
3	Engine start switch lead	1	
4	PTT switch coupler	1	
5	Throttle cable	1	
6	Bolt	1	M6 × 20 mm
7	Clamp	1	
8	Shift cable	1	
9	Clip	1	
10	Nut	2	
11	Cover	1	
12	Bolt	1	M6 × 25 mm
13	Plate	1	
14	Bolt	2	M6 × 25 mm
15	Retaining plate	1	
16	Bolt	1	M6 × 25 mm
17	Plate	1	
18	Friction plate	1	
19	Friction piece	2	
20	Nut	2	
21	Collar	2	
22	Bolt	2	
23	Bolt	2	
24	Nut	1	
25	Washer	1	
26	Bracket	1	
27	Nut	2	
28	Steering lock shaft	1	
29	Steering lock knob	1	
30	Washer	2	


4 N • m (0.4 kgf • m, 2.9 ft • lb)
37 N • m (3.7 kgf • m, 27 ft • lb)
4 N • m (0.4 kgf • m, 2.9 ft • lb)
572
242
572
572
S60C7010

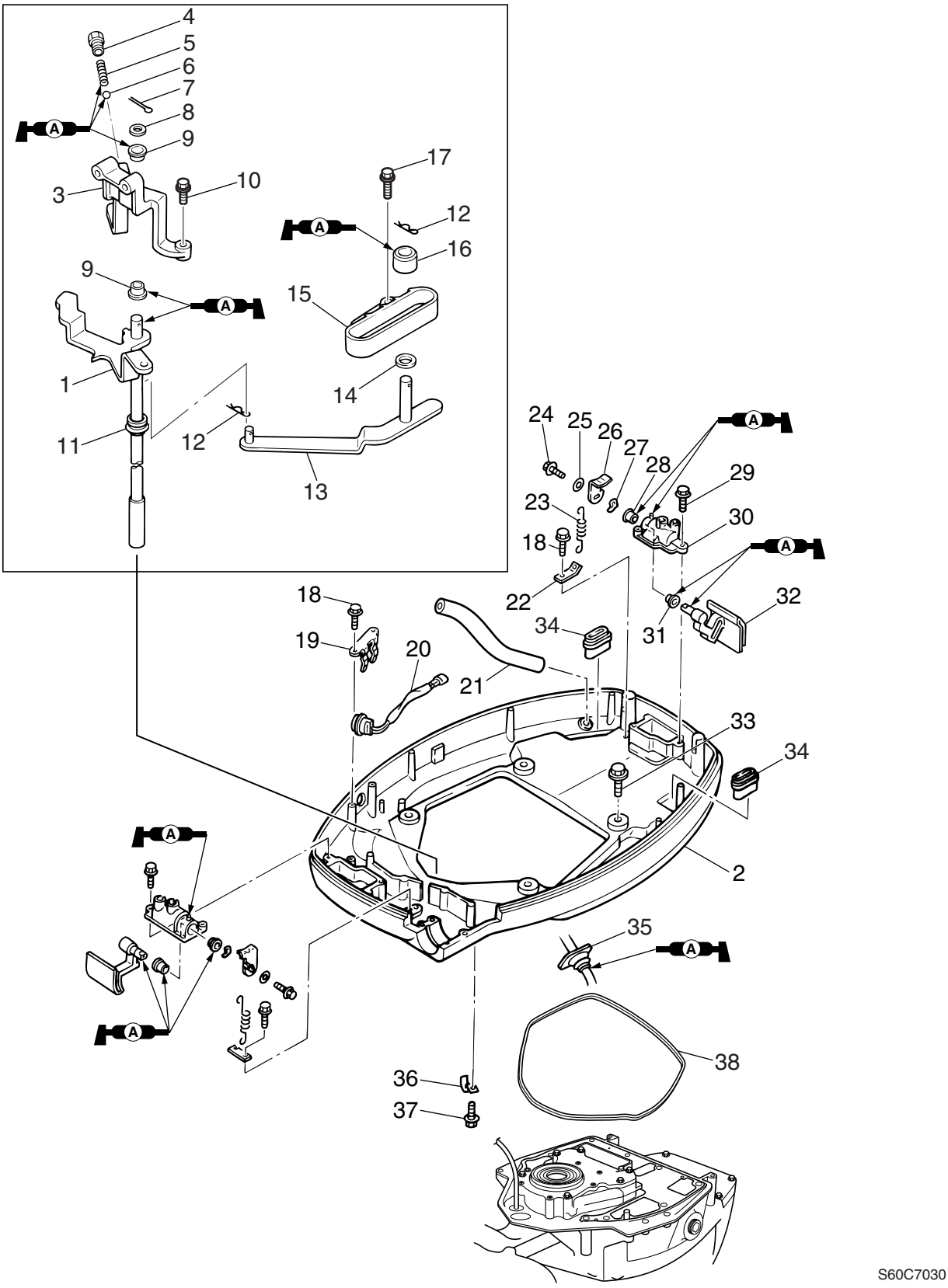
No.	Part name	Q'ty	Remarks
1	Tiller handle sub assembly	1	
2	Screw	2	M6 × 10 mm
3	Shift lever cover	1	
4	Bolt	1	M8 × 40 mm
5	Shift lever	1	
6	Bushing	1	
7	Washer	1	
8	Bushing	2	
9	Nut	1	
10	Engine shut-off switch	1	
11	Nut	1	
12	Washer	1	
13	Bracket	1	
14	Collar	1	
15	Wave washer	1	
16	Washer	1	
17	Bolt	1	M10 × 80 mm
18	Connector	2	
19	Engine start switch housing	1	
20	Engine start switch	1	
21	Nut	1	
22	Bolt	1	M6 × 25 mm
23	Screw	1	
24	Bolt	1	M6 × 20 mm
25	Cover	1	
26	Power trim and tilt switch	1	
27	Screw	7	M6 × 16 mm
28	Screw	2	M6 × 40 mm
29	Throttle grip	1	
30	Screw	1	M5 × 25 mm
31	Washer	1	
32	Spring	1	
33	Bushing	1	



S60C7015

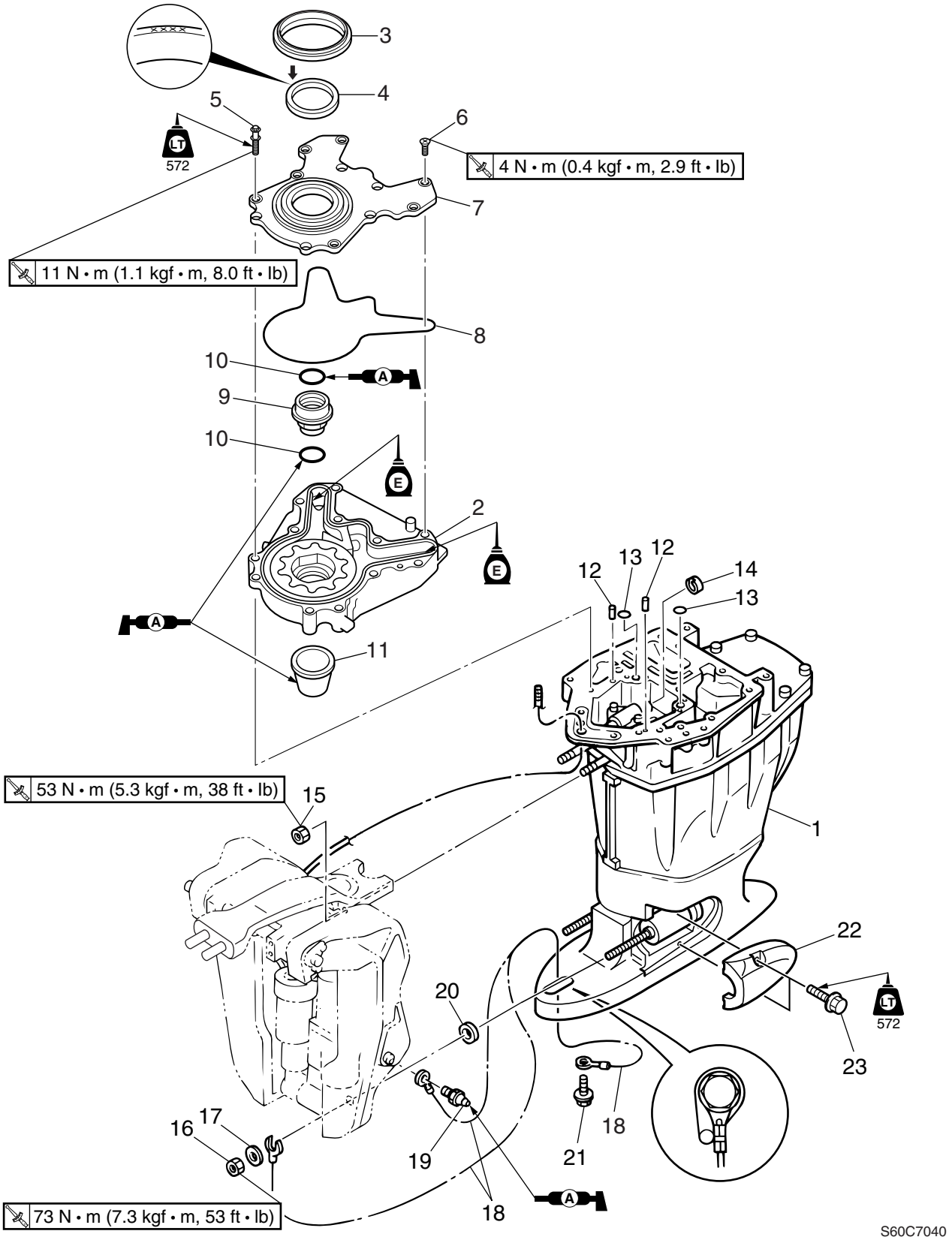
No.	Part name	Q'ty	Remarks
1	Tiller handle	1	
2	Cotter pin	1	**Not reusable**
3	Friction adjusting knob	1	
4	Grommet	1	
5	Plastic tie	2	**Not reusable**
6	Cable clamp	1	
7	Stay	1	
8	Bolt	1	M6 × 14 mm
9	Throttle cable	1	Short
10	Clip	1	
11	Throttle arm	1	
12	Throttle arm shaft	1	
13	Shift cable	1	Long
14	Shift cable bracket	1	
15	Bolt	1	M6 × 20 mm
16	Clip	1	
17	Frame	1	
18	Screw	2	M5 × 14 mm
19	Bolt	1	M6 × 14 mm
20	Spring housing	1	
21	Spring	1	
22	Actuator	1	
23	Roller	1	
24	Bushing	1	
25	Shift arm	1	
26	Bolt	2	M6 × 30 mm
27	Throttle shaft	1	
28	Friction piece	1	
29	Nut	1	

Bottom cowling



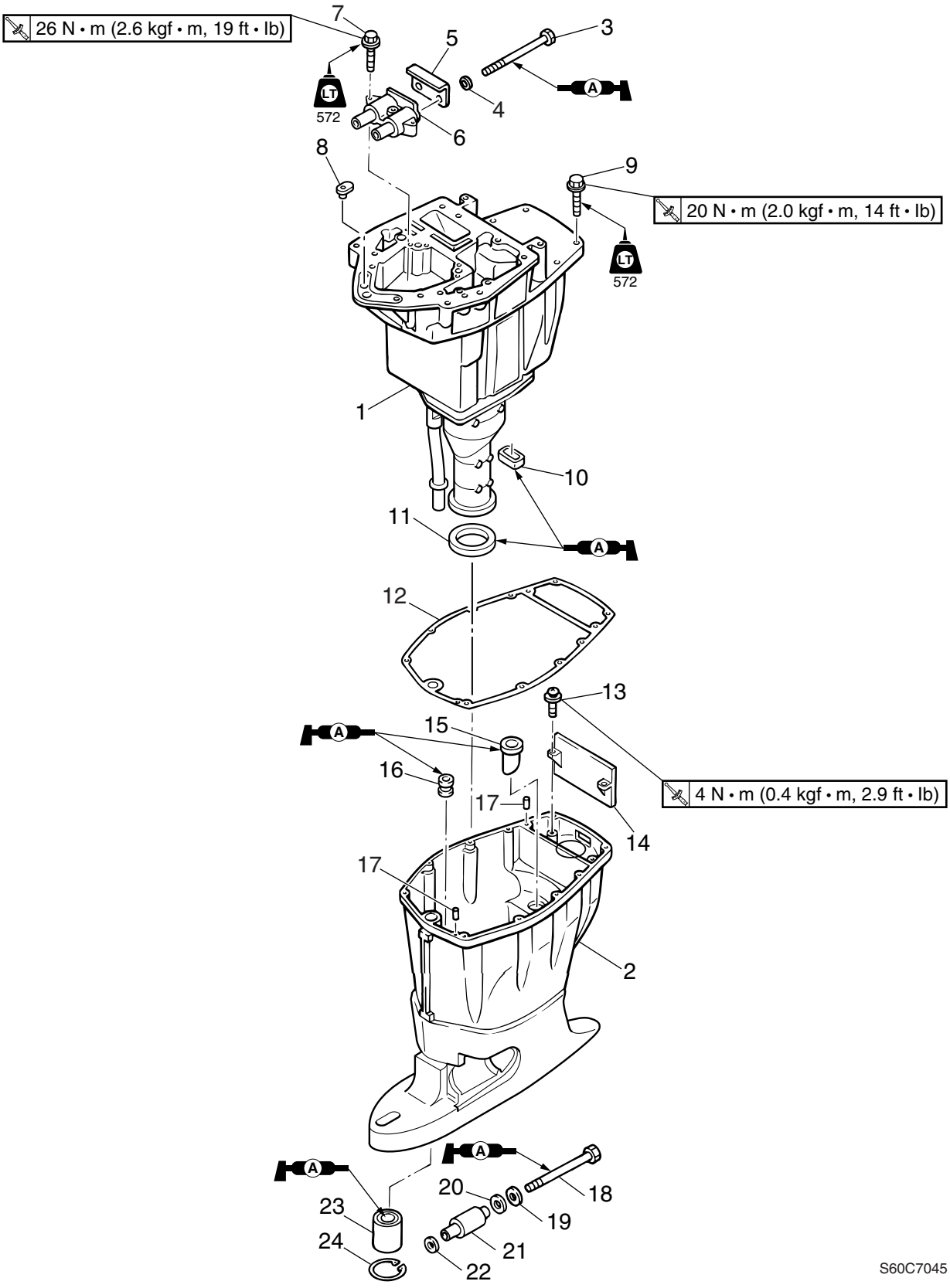
No.	Part name	Q'ty	Remarks
1	Shift rod	1	
2	Bottom cowling	1	
3	Shift rod bracket	1	
4	Bolt	1	
5	Spring	1	
6	Ball	1	
7	Cotter pin	1	**Not reusable**
8	Washer	1	
9	Bushing	2	
10	Bolt	2	M6 × 25 mm
11	Grommet	1	
12	Clip	2	
13	Shift rod lever	1	
14	Washer	1	
15	Shift bracket	1	
16	Bushing	1	
17	Bolt	2	M6 × 40 mm
18	Bolt	4	M6 × 20 mm
19	Bracket	1	
20	Trailer switch	1	
21	Pilot water hose	1	
22	Hook	2	
23	Spring	2	
24	Bolt	2	M6 × 12 mm
25	Washer	2	
26	Lever	2	
27	Wave washer	2	
28	Bushing	2	
29	Bolt	4	M6 × 30 mm
30	Plate	2	
31	Bushing	2	
32	Cowling lock lever	2	
33	Bolt	4	M8 × 35 mm
34	Grommet	2	
35	Grommet	1	
36	Clamp	1	
37	Bolt	1	M6 × 30 mm
38	Rubber seal	1	

Upper case (F100B)

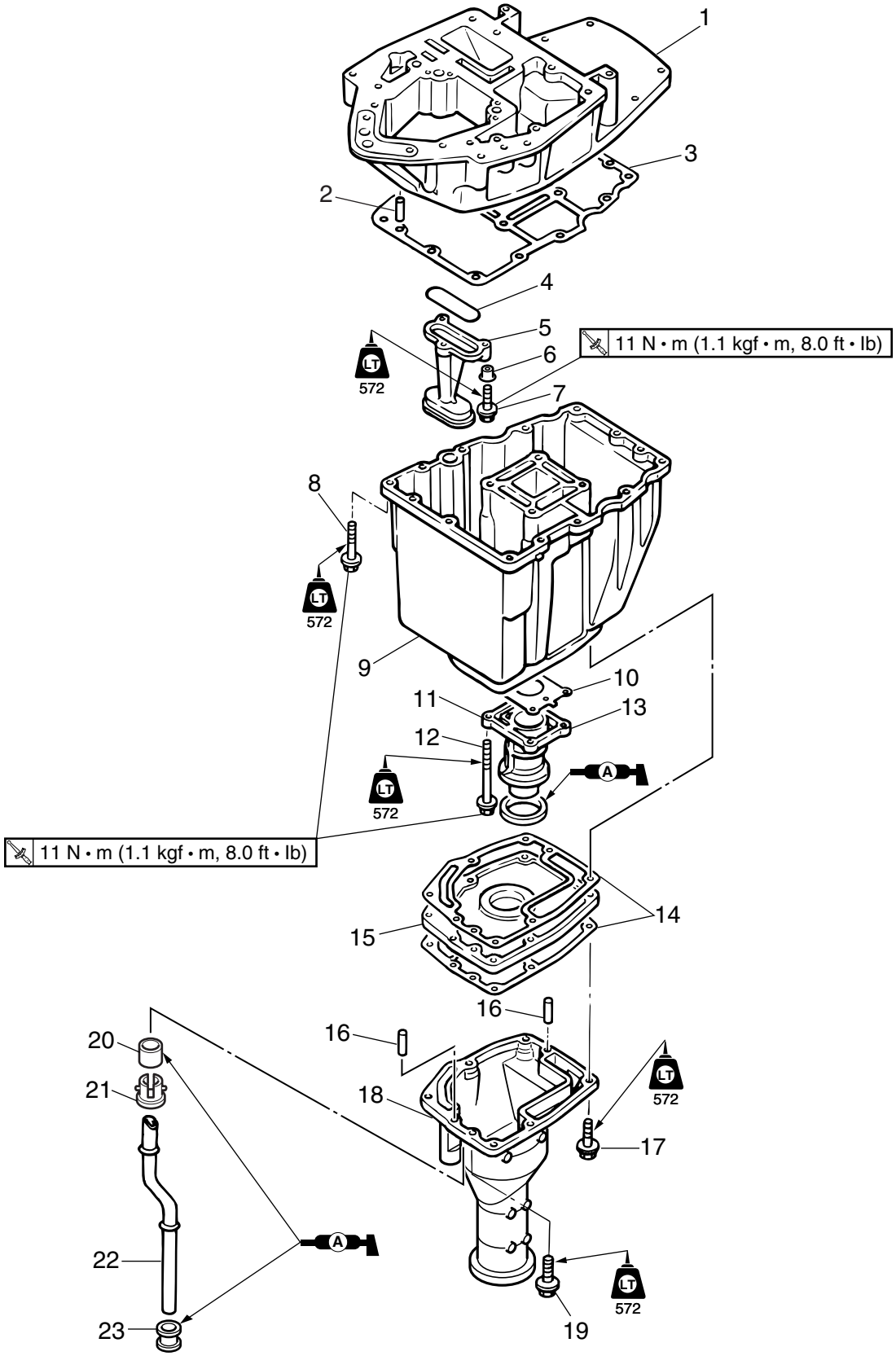


No.	Part name	Q'ty	Remarks
1	Upper case assembly	1	
2	Oil pump body	1	
3	Oil seal	1	**Not reusable**
4	Oil seal	1	**Not reusable**
5	Bolt	6	M6 × 45 mm
6	Screw	6	M6 × 10 mm
7	Cover	1	
8	Gasket	1	**Not reusable**
9	Shaft	1	
10	O-ring	2	**Not reusable**
11	Oil seal	1	**Not reusable**
12	Dowel pin	2	
13	O-ring	2	**Not reusable** 1.9 × 22.9 mm
14	Damper	2	
15	Nut	2	
16	Nut	2	
17	Washer	2	
18	Ground lead	1	
19	Grease nipple	1	
20	Washer	2	
21	Bolt	1	M6 × 10 mm
22	Mount cover	2	
23	Bolt	4	M10 × 40 mm

Bracket unit



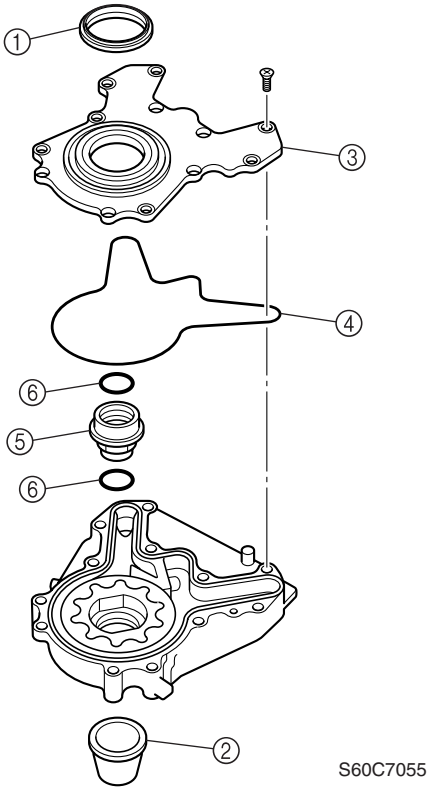
No.	Part name	Q'ty	Remarks
1	Muffler assembly	1	
2	Upper case	1	
3	Bolt	2	M12 × 193 mm
4	Washer	2	
5	Plate	1	
6	Upper mount	1	
7	Bolt	3	M8 × 45 mm
8	Grommet	1	
9	Bolt	4	M8 × 40 mm
10	Muffler seal	1	
11	Rubber seal	1	
12	Gasket	1	**Not reusable**
13	Screw	2	M6 × 15 mm
14	Baffle plate	1	
15	Damper	1	
16	Grommet	1	
17	Dowel pin	2	
18	Bolt	2	M14 × 235 mm
19	Washer	2	
20	Rubber washer	2	
21	Lower mount	2	
22	Washer	2	
23	Drive shaft bushing	1	
24	Circlip	1	


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
16
17
18
19
20
21
22
23
11 N • m (1.1 kgf • m, 8.0 ft • lb)
11 N • m (1.1 kgf • m, 8.0 ft • lb)
LT
572
LT
572
LT
572
LT
572
LT
572
A
A
S60C7050

No.	Part name	Q'ty	Remarks
1	Exhaust guide	1	
2	Dowel pin	2	
3	Gasket	1	**Not reusable**
4	Gasket	1	**Not reusable**
5	Oil strainer	1	
6	Collar	3	
7	Bolt	3	M6 × 25 mm
8	Bolt	12	M6 × 25 mm
9	Oil pan	1	
10	Gasket	1	**Not reusable**
11	Exhaust manifold	1	
12	Bolt	4	M6 × 70 mm
13	Exhaust seal	1	
14	Gasket	2	**Not reusable**
15	Plate	1	
16	Dowel pin	2	
17	Bolt	6	M6 × 30 mm
18	Muffler	1	
19	Bolt	1	M6 × 50 mm
20	Spacer	1	
21	Grommet	1	
22	Pipe	1	
23	Rubber seal	1	

Disassembling the oil pump

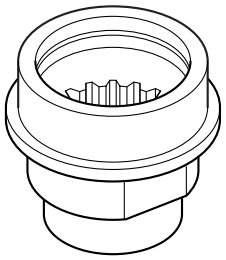
1. Remove oil seals ① and ②, the cover ③, gasket ④, shaft ⑤, and O-rings ⑥.



S60C7055

Checking the oil pump

1. Check the shaft for cracks or wear. Replace if necessary.

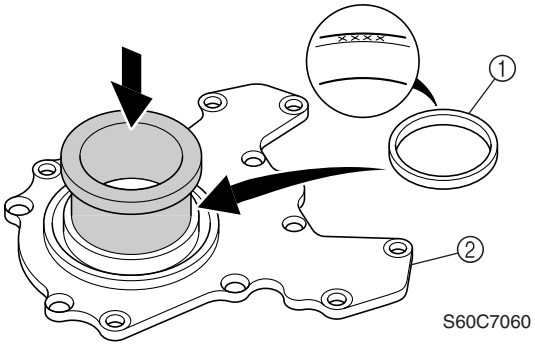

S60C7280

2. Check the oil seal and O-ring for tears. Replace if necessary.

3. Check the oil passage for dirt or residue. Clean if necessary.

Assembling the oil pump

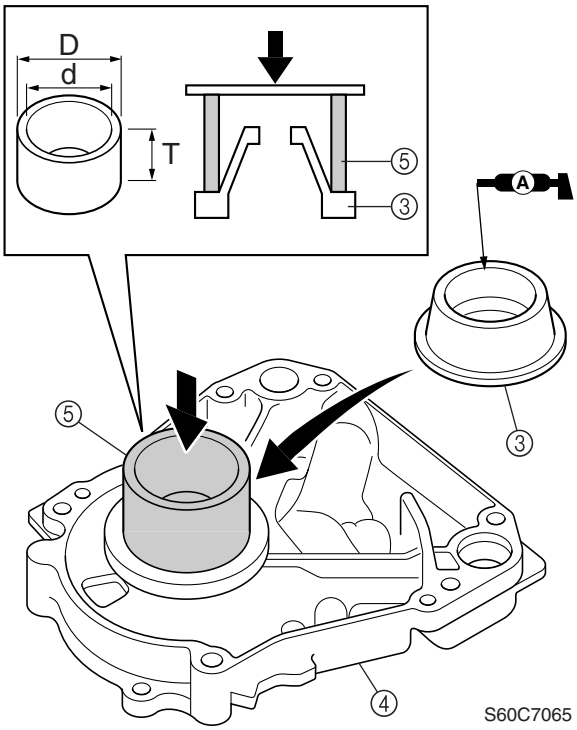
1. Install the new oil seal ① into the cover ②.



S60C7060

Bearing inner race attachment:
90890-06662

2. Install the new oil seal ③ into the oil pump body ④.



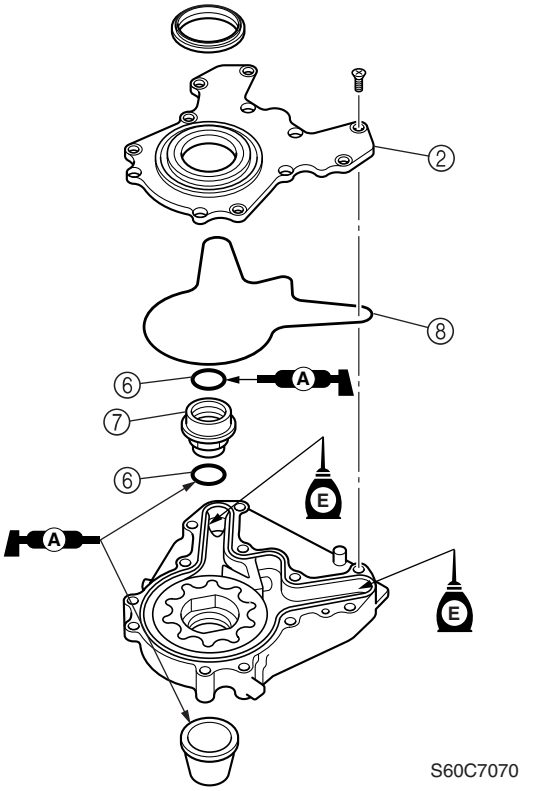
S60C7065

NOTE:
Use a general pipe with the specified measurements.

General pipe ⑤:
D = 43 mm (1.69 in)
d = 40 mm (1.57 in)
T = 30 mm (1.18 in)

3. Install the O-rings ⑥ into the shaft ⑦.

4. Install the gasket ⑧ and the cover ②, and then tighten the screws to the specified torque.



S60C7070

	Oil pump cover screw: 4 N·m (0.4 kgf·m, 2.9 ft·lb)

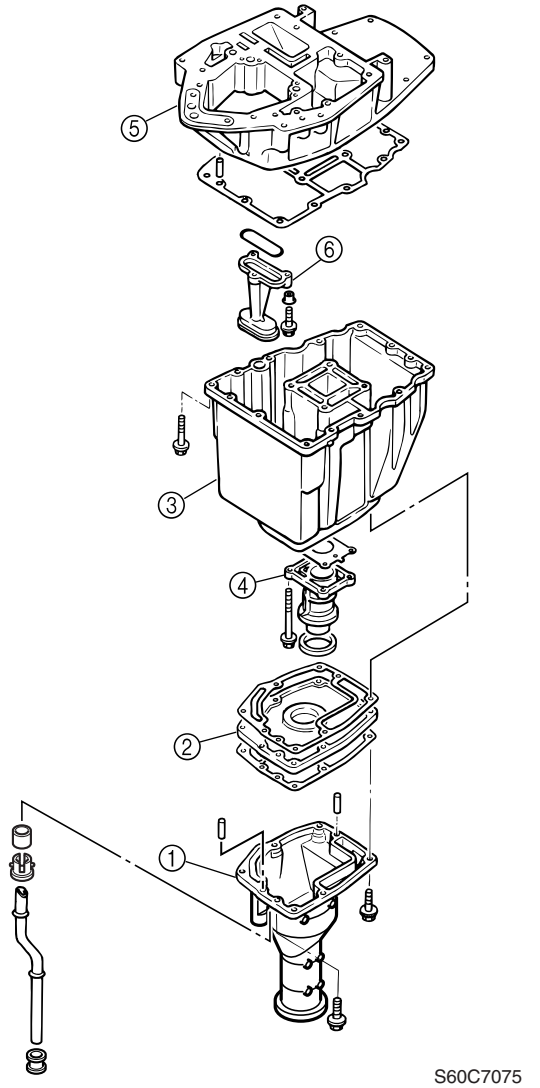
Disassembling the oil pan

1. Remove the muffler ① and plate ② from the oil pan ③.

2. Remove the exhaust manifold ④ from the oil pan ③.

3. Remove the oil pan ③ from the exhaust guide ⑤.

4. Remove the oil strainer ⑥.



S60C7075

Checking the oil strainer

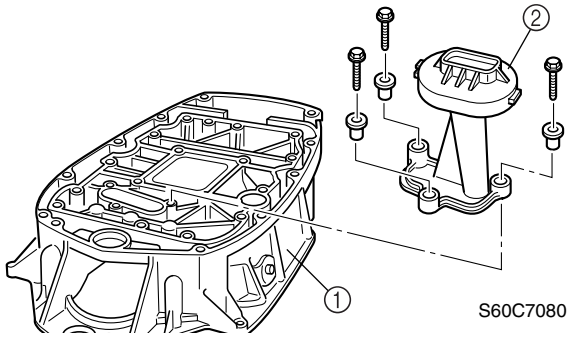
1. Check the oil strainer for dirt and residue. Clean if necessary.

Assembling the oil pan

1. Install the gaskets onto the exhaust guide ①.

2. Install the oil strainer ② and bolts, and then tighten the bolts to the specified torque.

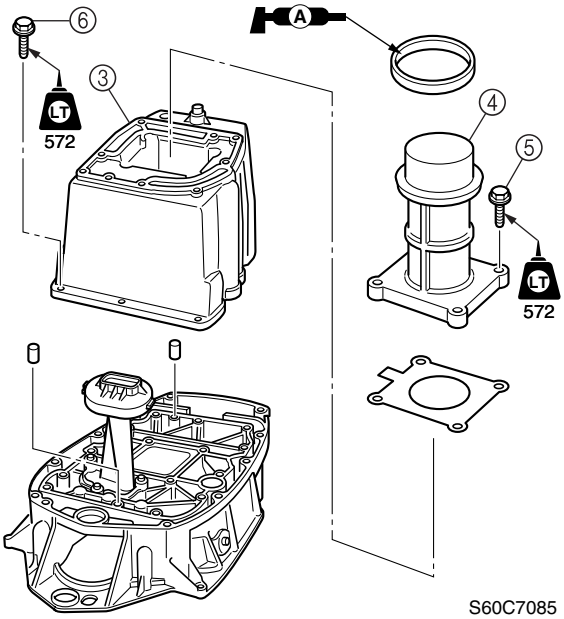
7



Oil strainer bolt:
11 N·m (1.1 kgf·m, 8.0 ft·lb)

3. Install the oil pan ③ and then tighten the bolts finger tight.

4. Install the exhaust manifold ④ and bolts, and then tighten the bolts finger tight.

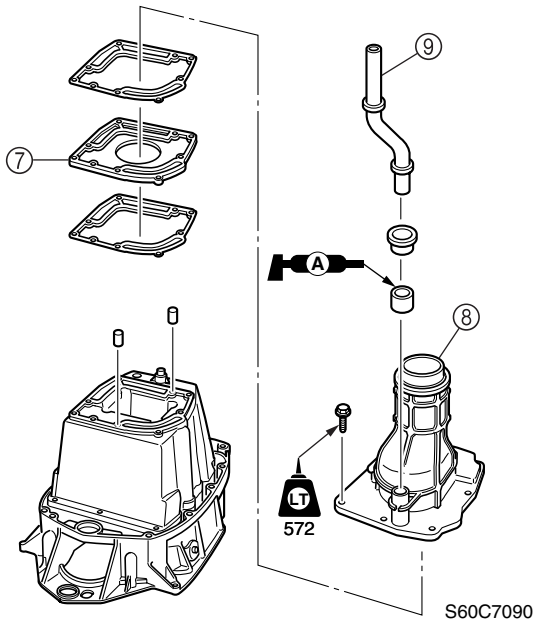


5. Tighten the exhaust manifold bolts ⑤, then the oil pan bolts ⑥, and then tighten them to the specified torques.

Exhaust manifold bolt ⑤:
11 N·m (1.1 kgf·m, 8.0 ft·lb)
Oil pan bolt ⑥:
11 N·m (1.1 kgf·m, 8.0 ft·lb)

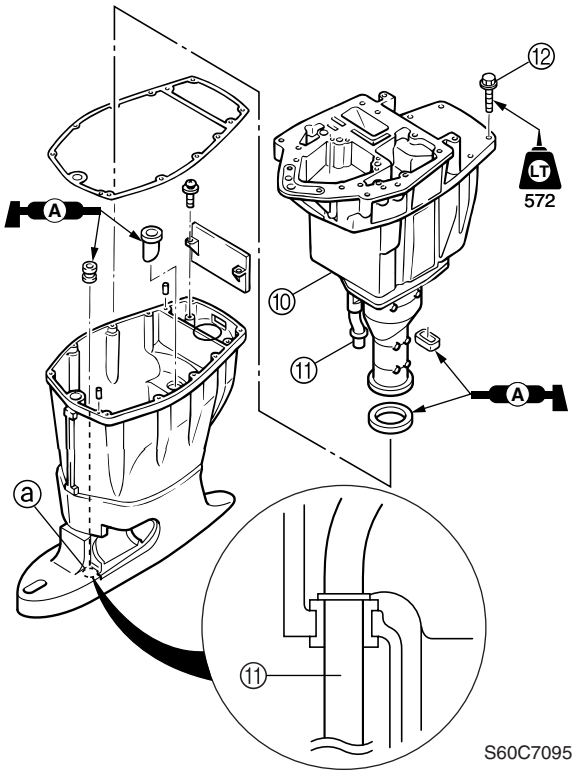
6. Install the plate ⑦ and the muffler ⑧ into the oil pan.

7. Install the water pipe ⑨.



8. Install the muffler assembly ⑩ by inserting the tip of the water pipe ⑪ into the joint hole ⓐ of the upper case.

9. Install the muffler assembly bolts ⑫, and then tighten them to the specified torque.

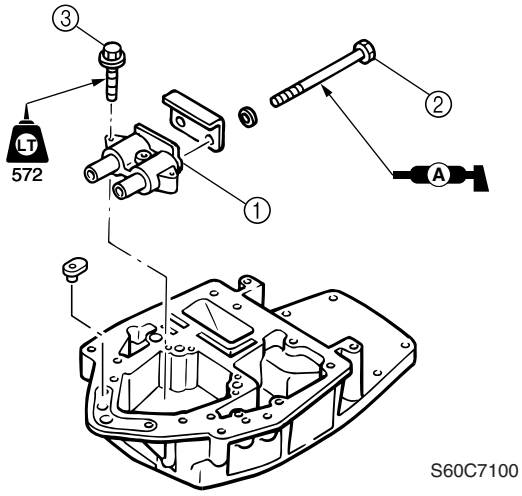


	Muffler assembly bolt ⑫: 20 N·m (2.0 kgf·m, 14 ft·lb)

Installing the upper case

1. Install the upper mount ① and bolts ② into the upper case.

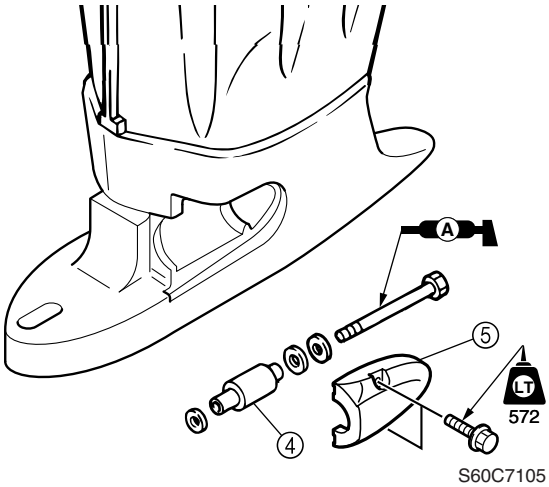
2. Install the bolts ③, and then tighten them to the specified torque.



	Upper mount bolt ③: 26 N·m (2.6 kgf·m, 19 ft·lb)

3. Install the lower mounts ④ to the upper case.

4. Install the mount cover ⑤.

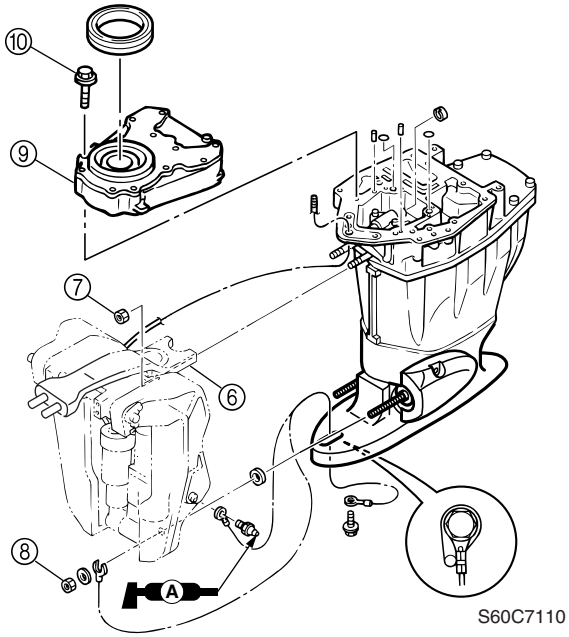


5. Install the upper and lower mounting bolts into the swivel bracket ⑥ simultaneously.

6. Install the upper mounting nut ⑦ and lower mounting nut ⑧, and then tighten them to the specified torques.

NOTE:
Before tightening the lower mounting nut, be sure to connect the ground lead to the lower mounting bolt.

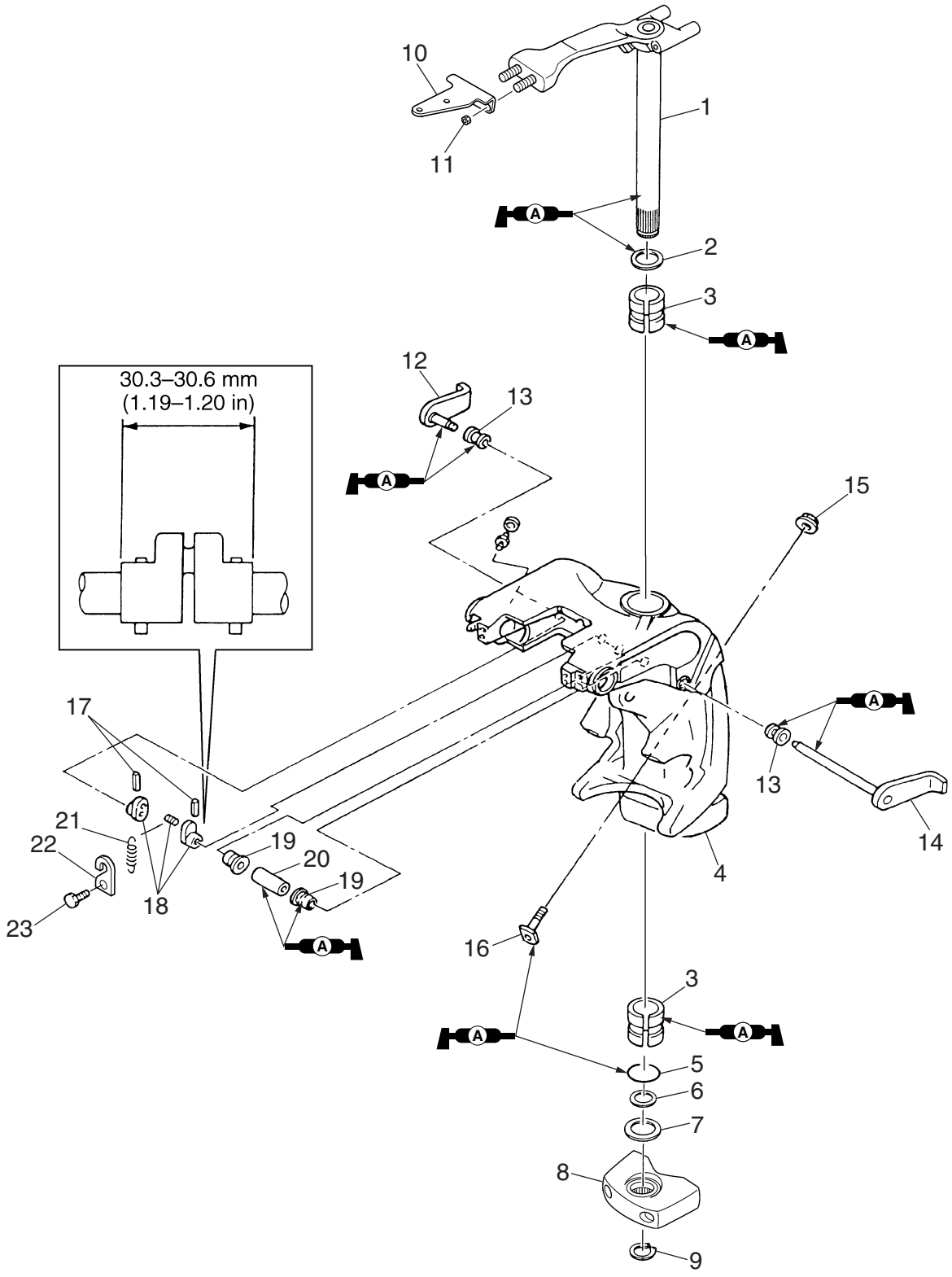
7. Install the oil pump assembly ⑨.



	Upper mounting nut ⑦: 53 N·m (5.3 kgf·m, 38 ft·lb) Lower mounting nut ⑧: 73 N·m (7.3 kgf·m, 53 ft·lb) Oil pump bolt ⑩: 11 N·m (1.1 kgf·m, 8.0 ft·lb)

7

Swivel bracket and steering arm (F100B)

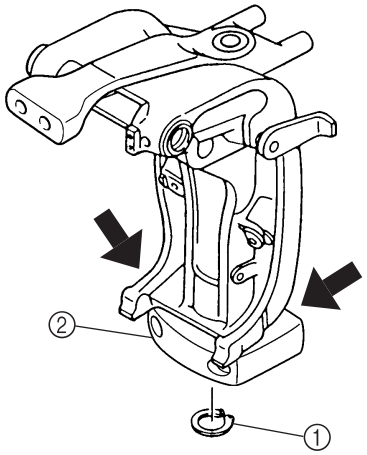


S60C7115

No.	Part name	Q'ty	Remarks
1	Steering arm	1	
2	Washer	1	
3	Bushing	2	
4	Swivel bracket	1	
5	O-ring	1	**Not reusable** 5.6 × 48.2 mm
6	Bushing	1	
7	Washer	1	
8	Steering yoke	1	
9	Circlip	1	
10	Steering hook	1	
11	Nut	2	
12	Starboard tilt stop lever	1	
13	Bushing	2	
14	Port tilt stop lever	1	
15	Nut	2	
16	Trim stopper	2	M10 × 27 mm
17	Pin	2	
18	Tilt stop lever joint	1	
19	Bushing	2	
20	Collar	1	
21	Spring	1	
22	Spring holder	1	
23	Bolt	1	M6 × 10 mm

Removing the steering arm

1. Remove the circlip ①.
2. Remove the steering yoke ② by striking it with a plastic hammer.

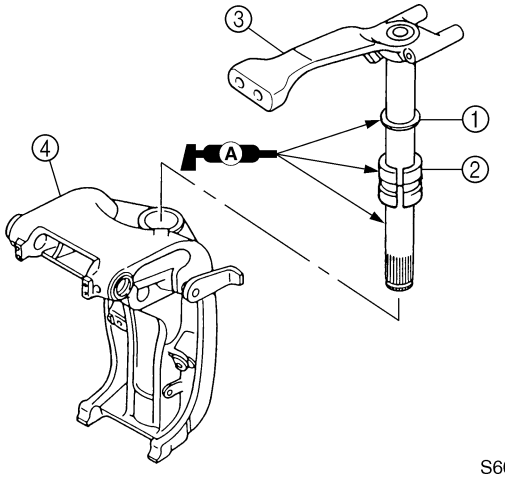


S60C7120

3. Remove the steering arm from the swivel bracket by pulling the arm off the bracket.

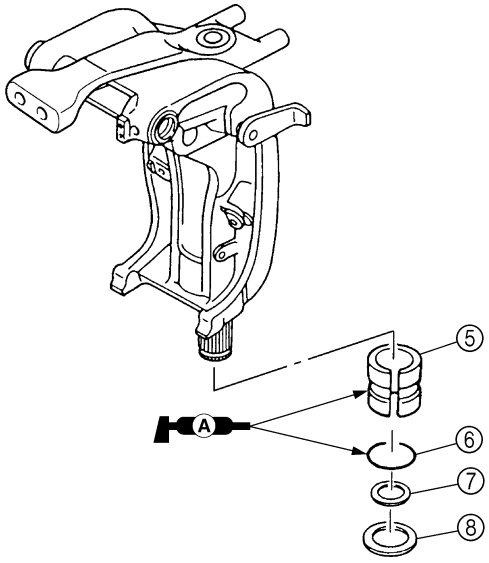
Installing the steering arm

1. Install the washer ① and bushing ② onto the steering arm ③.
2. Place the swivel bracket ④ in an upright position, and then install the steering arm onto the swivel bracket.



S60C7125

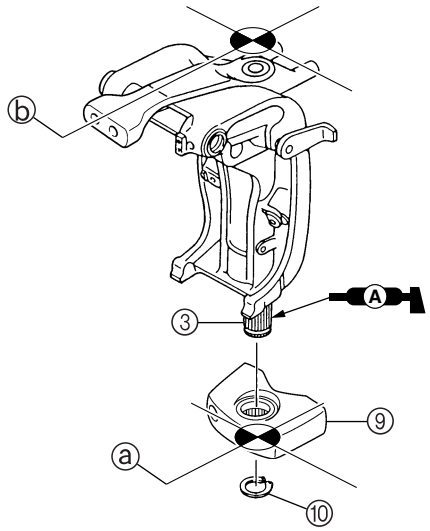
3. Install the bushing ⑤, O-ring ⑥, bushing ⑦, and washer ⑧ onto the swivel bracket.



S60C7130

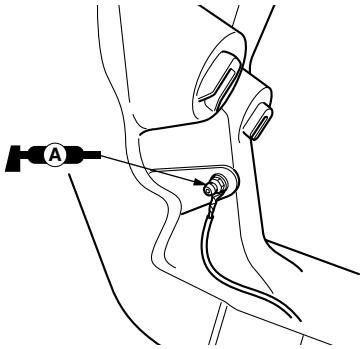
4. Install the steering arm ③ into the steering yoke ⑨ by aligning the center ⓐ of the yoke with the center ⓑ of the steering arm.

5. Install the circlip ⑩.

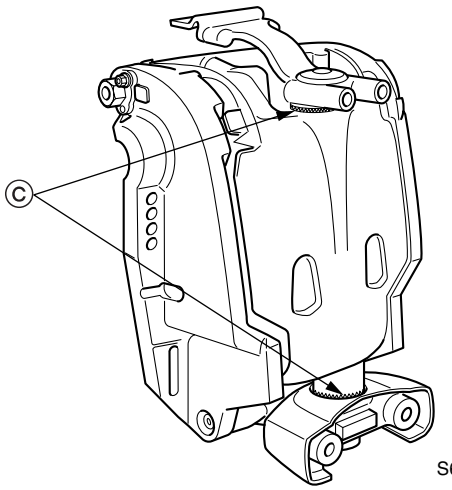


S60C7135

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



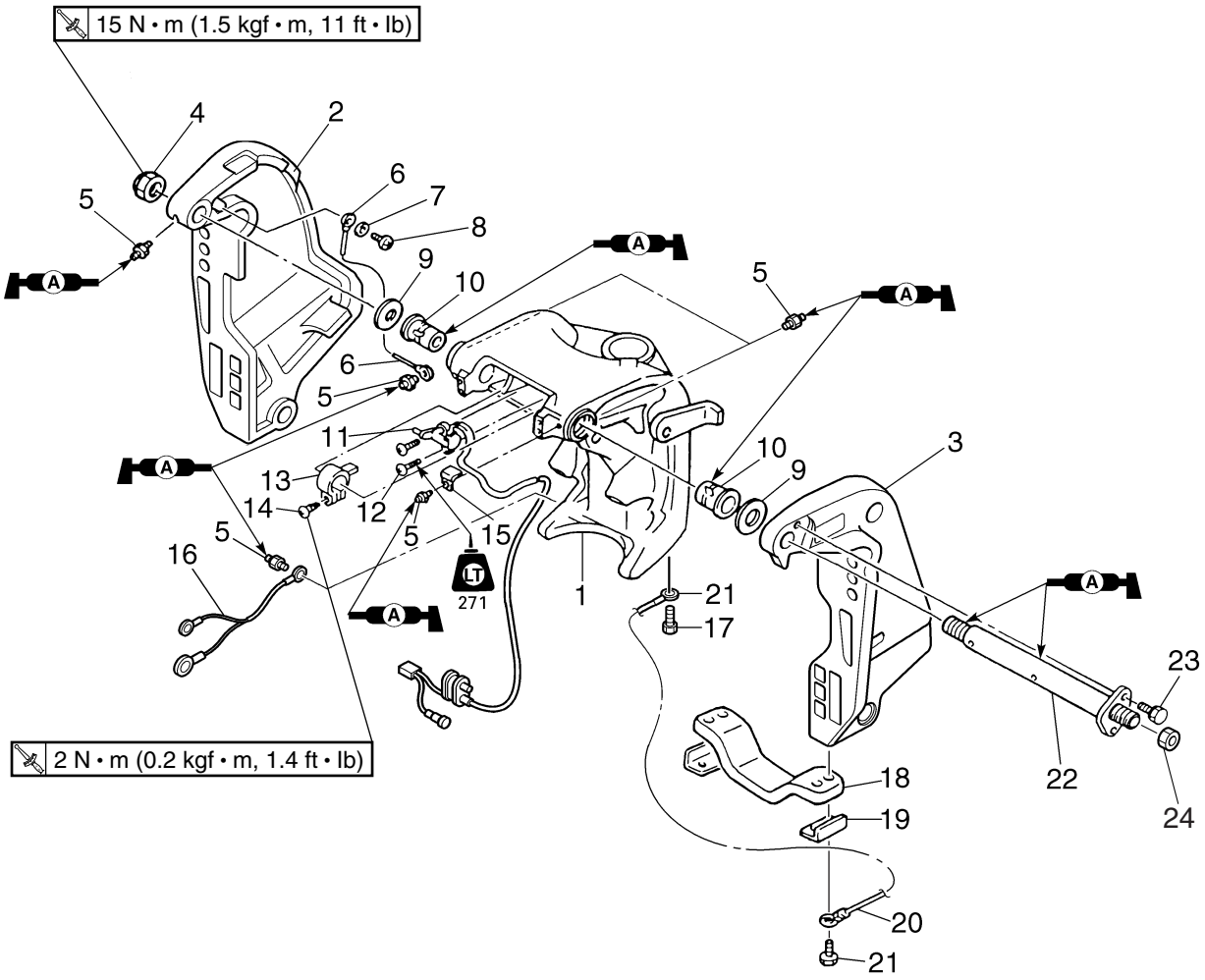
S60C7140



S60C7145

7

Clamp brackets (F100B)

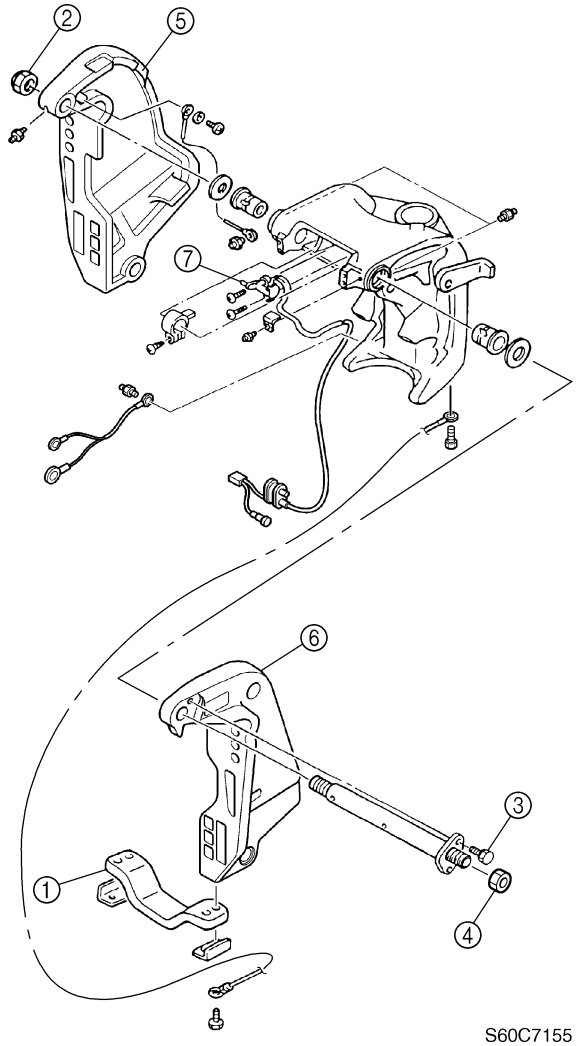


S60C7150

No.	Part name	Q'ty	Remarks
1	Swivel bracket assembly	1	
2	Starboard clamp bracket	1	
3	Port clamp bracket	1	
4	Self-locking nut	1	
5	Grease nipple	6	
6	Ground lead	1	
7	Washer	1	
8	Screw	1	M6 × 11 mm
9	Washer	2	
10	Bushing	2	
11	Trim sensor	1	
12	Screw	2	M6 × 15 mm
13	Trim sensor cam	1	
14	Screw	1	M6 × 24 mm
15	Clamp	1	
16	Ground lead	1	
17	Bolt	1	M6 × 20 mm
18	Anode	1	
19	Bracket	2	
20	Ground lead	1	
21	Bolt	4	M6 × 30 mm
22	Through tube	1	
23	Bolt	1	M8 × 20 mm
24	Cap	1	

Removing the clamp brackets

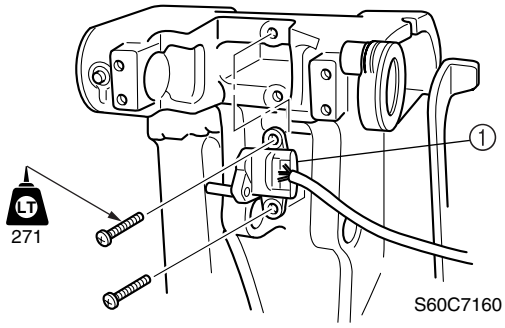
1. Remove the power trim and tilt unit. For removal procedures, see “Removing the power trim and tilt unit” in this chapter.
2. Remove the anode ①.
3. Loosen the self-locking nuts ②, bolt ③, cap ④, and then remove clamp brackets ⑤ and ⑥.
4. Remove the trim sensor ⑦.



S60C7155

Installing the clamp brackets

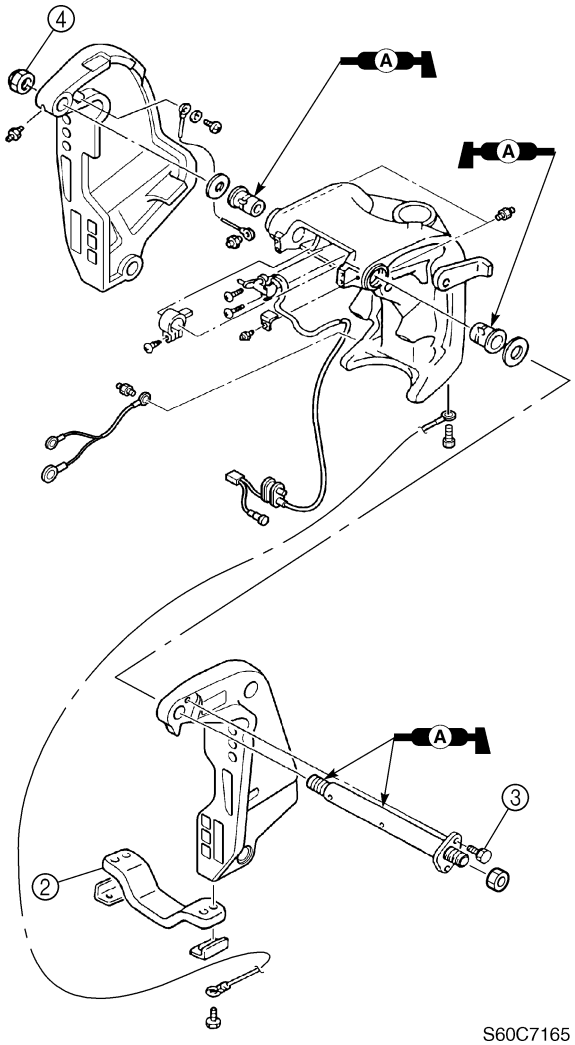
1. Install the trim sensor ① onto the swivel bracket assembly.



S60C7160

NOTE:
Adjust the trim sensor after installing the power trim and tilt unit.

2. Assemble the clamp brackets and the swivel bracket by installing the anode ②, bolt ③, and self-locking nuts ④, then tightening them to the specified torque.

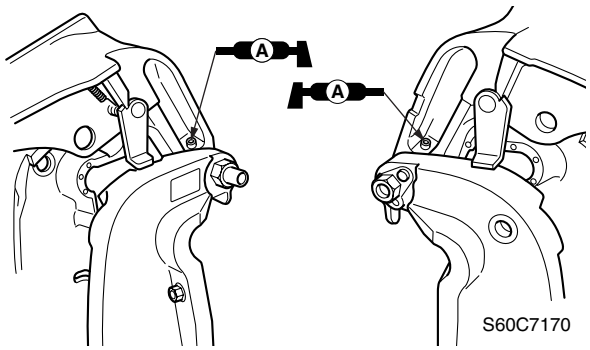


S60C7165

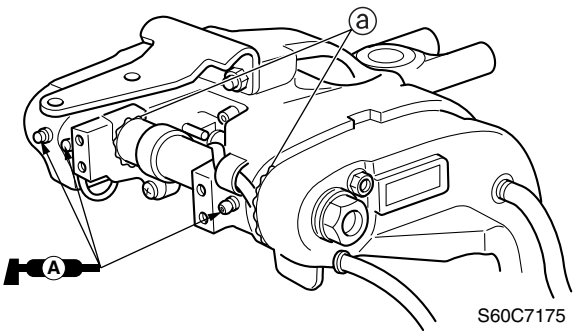
Self-locking nut ④:
15 N·m (1.5 kgf·m, 11 ft·lb)

3. Install the power trim and tilt unit. For installation procedures, see "Installing the power trim and tilt unit" in this chapter.

4. Inject grease into all grease nipples until grease comes out from the bushings ⓐ.



S60C7170



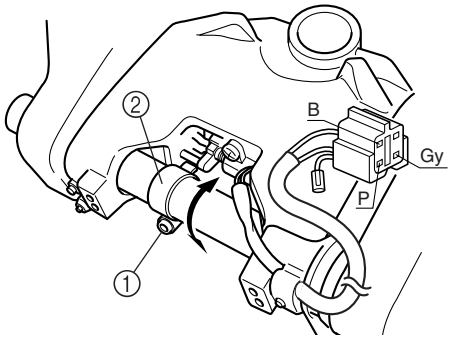
S60C7175

Adjusting the trim sensor cam

1. Fully tilt the outboard motor down.

2. Loosen the screw ①.

3. Adjust the position of the trim sensor cam ② until the specified resistance is obtained.



S60C7185

Trim sensor resistance:
Pink (P) – Black (B)
9–11 Ω at 20 °C (68 °F)

4. Tighten the screw ①.

Trim sensor cam screw ①:
2 N·m (0.2 kgf·m, 1.4 ft·lb)

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

⚠ WARNING

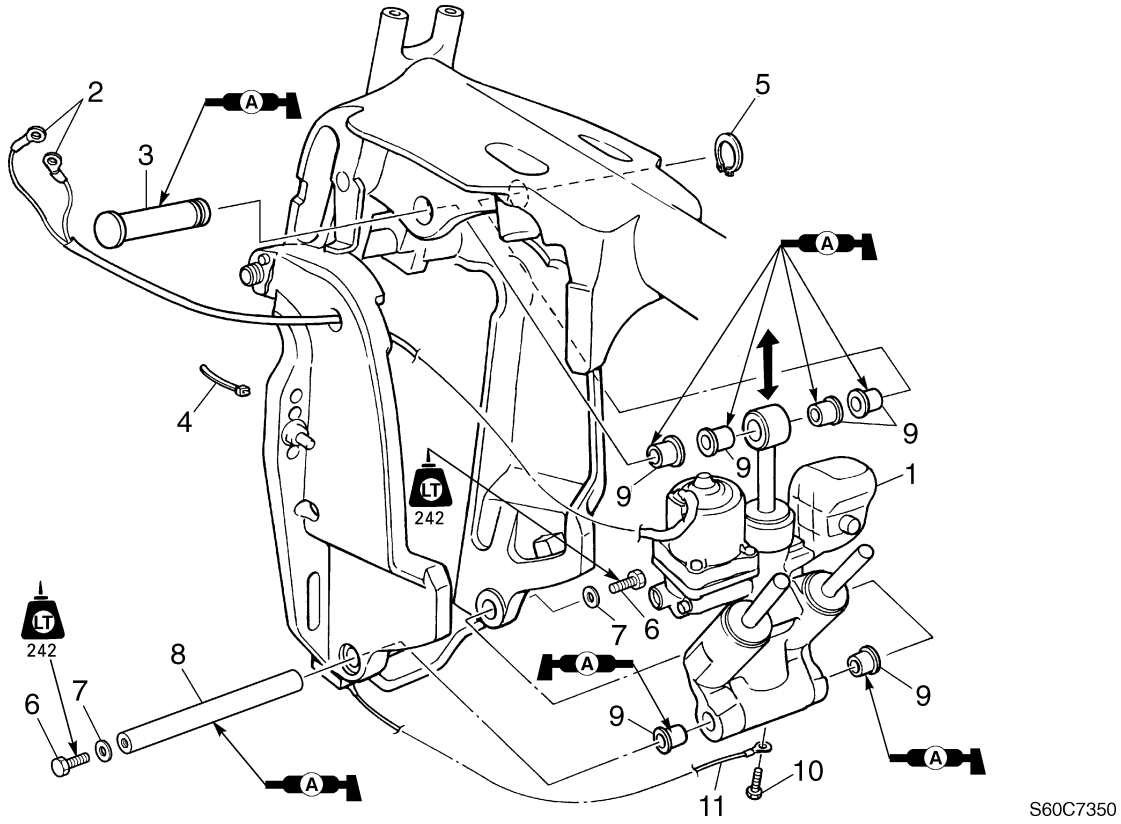
After tilting up the outboard motor, be sure to support it with the tilt stop lever. Otherwise, the outboard motor could suddenly lower if the power trim and tilt unit should lose fluid pressure.

6. Measure the trim sensor resistance. Check the trim sensor if out of specification.

Trim sensor resistance:
Pink (P) – Black (B)
238.8–378.8 Ω at 20 °C (68 °F)

7

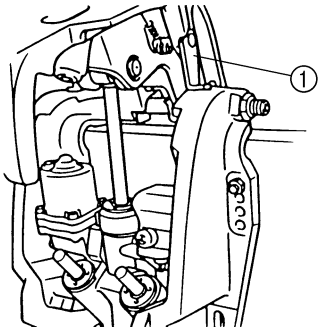
Power trim and tilt unit (F100B)



No.	Part name	Q'ty	Remarks
1	Power trim and tilt unit	1	
2	PTT motor lead	2	
3	Shaft	1	
4	Plastic tie	3	**Not reusable**
5	Circlip	1	
6	Bolt	2	M8 × 16 mm
7	Washer	2	
8	Shaft	1	
9	Bushing	6	
10	Bolt	1	M6 × 10 mm
11	Ground lead	1	

Removing the power trim and tilt unit

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



S60C7410

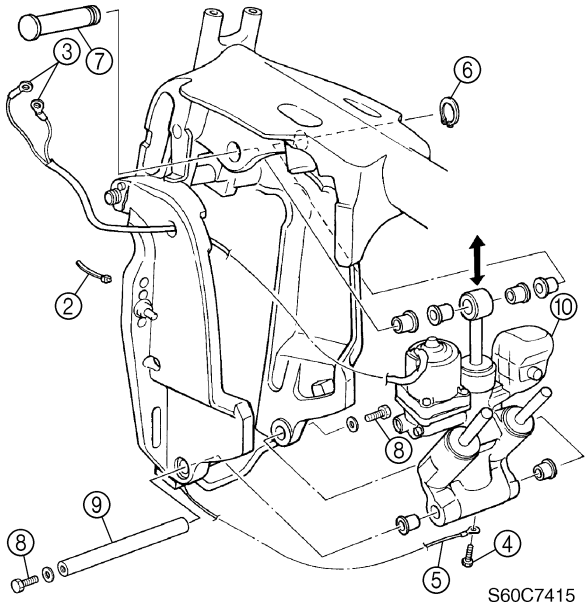
⚠ WARNING

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 power trim and tilt unit should lose fluid pressure.

NOTE:

If the power trim and tilt does not operate, loosen the manual valve and tilt the outboard motor up manually.

2. Loosen the plastic ties ②, and then pull out the PTT motor lead ③.
3. Remove the bolt ④ and disconnect the ground lead ⑤.
4. Remove the circlip ⑥, then the shaft ⑦.
5. Loosen the bolts ⑧, and then remove the shaft ⑨.
6. Remove the power trim and tilt unit ⑩.



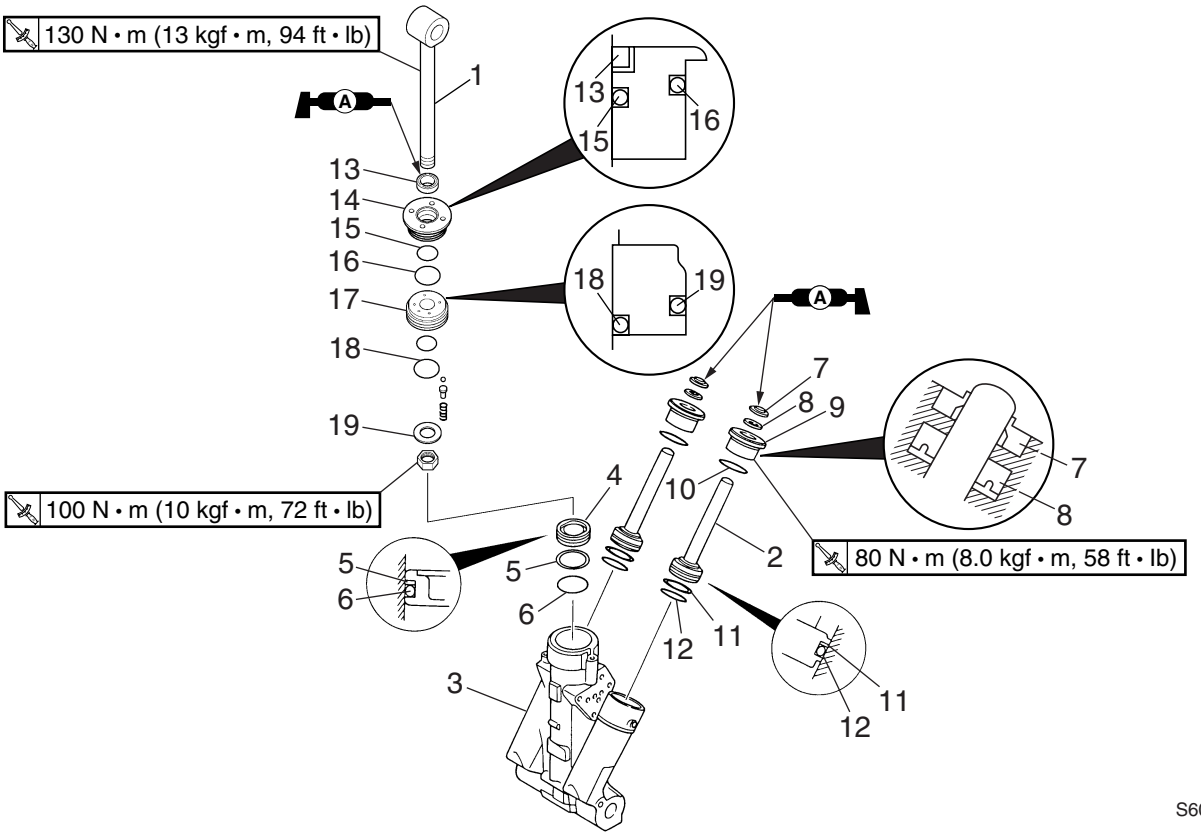
S60C7415

NOTE:

To remove the power trim and tilt unit, lower the tilt ram slightly.

7

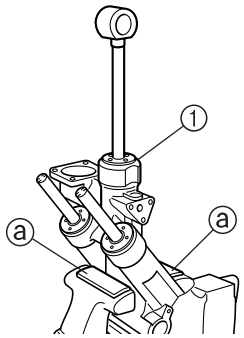
Tilt cylinder and trim cylinder (F100B)



No.	Part name	Q'ty	Remarks
1	Tilt ram	1	
2	Trim piston assembly	2	
3	Cylinder body	1	
4	Free piston	1	
5	Backup ring	1	
6	O-ring	1	**Not reusable**
7	Dust seal	2	**Not reusable**
8	Seal	2	**Not reusable**
9	Trim cylinder end screw	2	
10	O-ring	2	**Not reusable**
11	Backup ring	2	
12	O-ring	2	**Not reusable**
13	Dust seal	1	**Not reusable**
14	Tilt cylinder end screw	1	
15	O-ring	1	**Not reusable**
16	O-ring	1	**Not reusable**
17	Tilt piston	1	
18	O-ring	1	**Not reusable**
19	O-ring	1	**Not reusable**

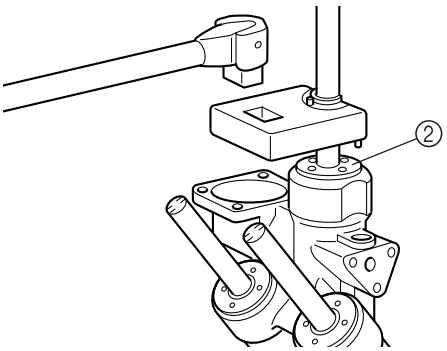
Disassembling the tilt cylinder and trim cylinders

1. Hold the power trim and tilt unit ① in a vise using aluminum plates ⓐ on both sides.



S60C7425

2. Loosen the tilt cylinder end screw ②, and then remove it.



S60C7430

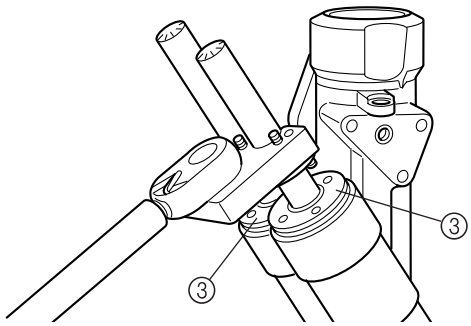
⚠ WARNING

Make sure that the rams are fully extended before removing the end screw.

Trim & tilt wrench: 90890-06548

3. Drain the fluid.

4. Loosen the trim cylinder end screws ③, and then remove them.

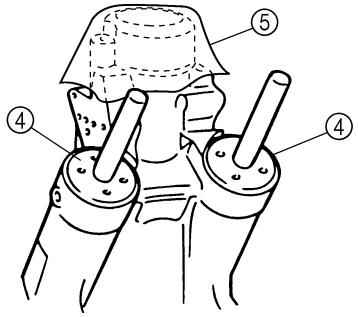


S60C7435

Trim & tilt wrench: 90890-06548

5. Drain the power trim and tilt fluid.

6. Install the trim cylinder end screws ④ and tighten them finger tight.

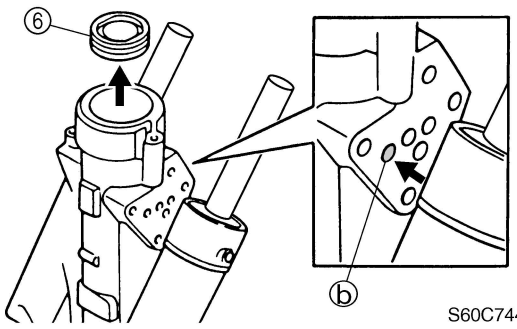


S60C7440

NOTE:

Cover the tilt cylinder with a clean cloth ⑤.

7. Remove the free piston ⑥.



S60C7445

⚠ WARNING

Never look into the tilt cylinder opening because the free piston and power trim and tilt fluid may be expelled out forcefully.

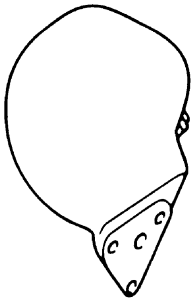
7

NOTE:
To remove the free piston, blow compressed air through the hole ⓐ while holding down the cloth.

8. Remove the trim piston assemblies.

Checking the reservoir

1. Check the reservoir for cracks. Replace if necessary.

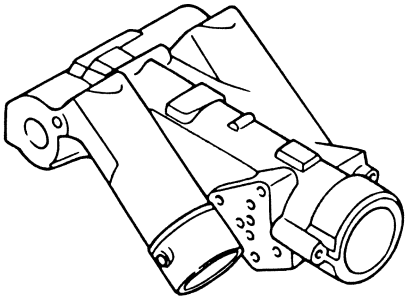


S60C7485

Checking the tilt cylinder and trim cylinder

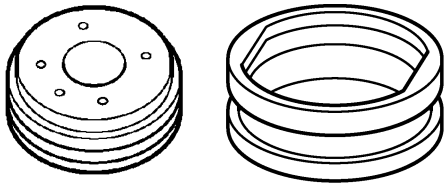
1. Check the power trim and tilt unit for cracks or corrosion. Replace if necessary.

2. Check the inner walls of the cylinder body for scratches. Replace if necessary.



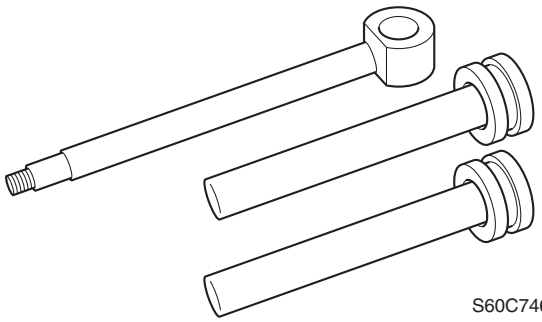
S60C7450

3. Check the outer surface of the tilt piston and free piston for scratches. Replace if necessary.



S60C7455

4. Check the trim and tilt rams for bends or excessive corrosion. Polish with #400–600 grit sandpaper if there is light rust or replace if necessary.



S60C7460

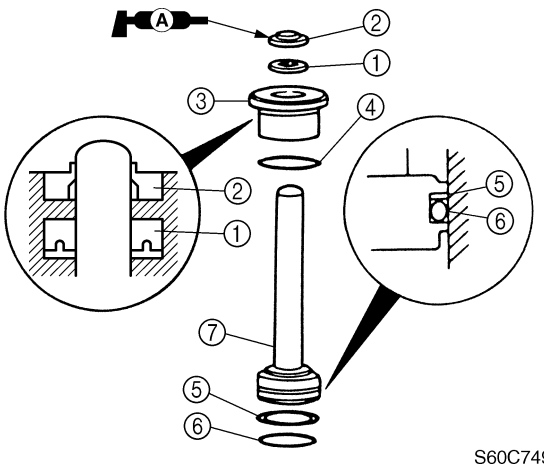
Assembling the trim rams

1. Install the new seal ① and dust seal ② into the trim cylinder end screw ③.

2. Install the new O-ring ④ onto the end screw.

3. Install the backup ring ⑤ and new O-ring ⑥ to the trim ram ⑦.

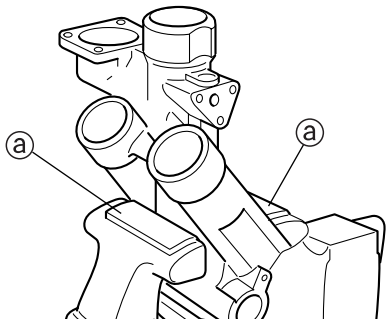
4. Install the trim ram into the end screw.



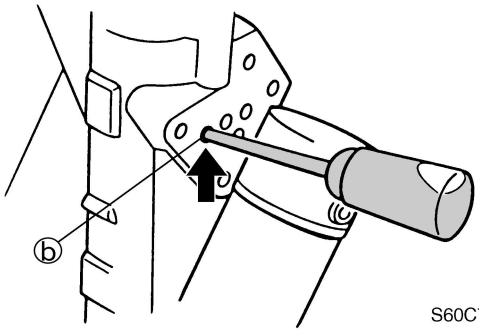
S60C7495

Installing the trim rams

1. Hold the cylinder body ① in a vise using aluminum plates ⓐ on both sides.



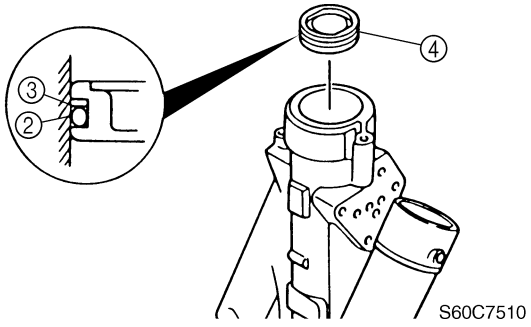
2. Add the specified amount of the recommended fluid through the cylinder body hole ⓑ.



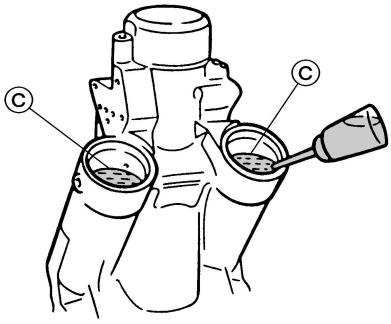
Recommended power trim and tilt fluid:
ATF Dexron II
Fluid quantity:
30 cm^3 (1.0 US oz, 1.1 Imp oz)

3. Install the new O-ring ② and backup ring ③ to the free piston ④.

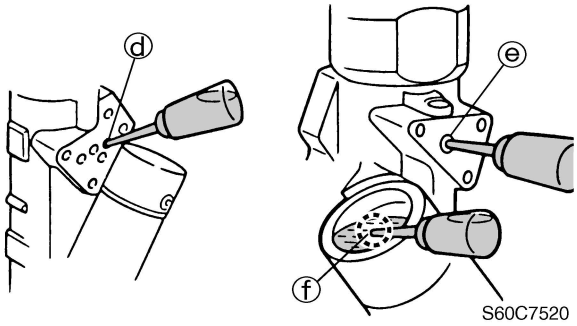
4. Push the free piston ④ into the tilt cylinder until it bottoms out.



5. Fill the trim cylinders ⓒ with the recommended fluid to the correct level as shown.

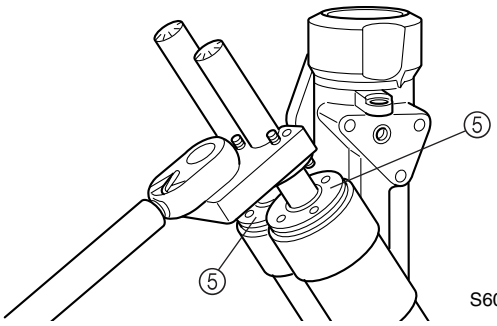


6. Add a small amount of the recommended fluid though cylinder body holes ⓓ, ⓔ, and ⓕ.



Recommended power trim and tilt fluid:
ATF Dexron II

7. Install the trim piston assembly into the trim cylinder, and then tighten the trim cylinder end screw ⑤ to the specified torque.



⚠ WARNING

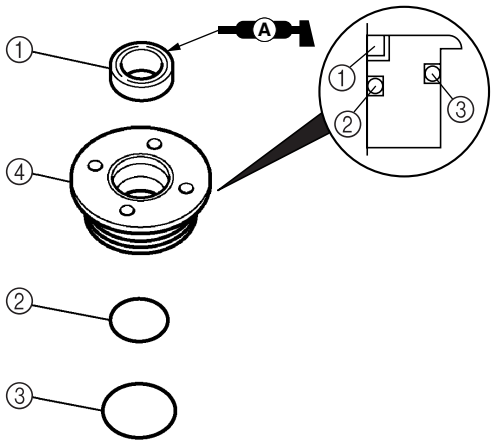
Do not push the trim rams down while installing them into the trim cylinders. Otherwise, the power trim and tilt fluid may spurt out from the unit.

Trim & tilt wrench: 90890-06548

Trim cylinder end screw ⑤:
80 N·m (8.0 kgf·m, 58 ft·lb)

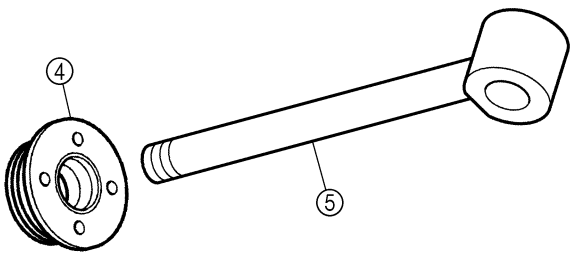
Assembling the tilt ram

1. Install the new dust seal ①, and O-rings ② and ③ into the tilt cylinder end screw ④.



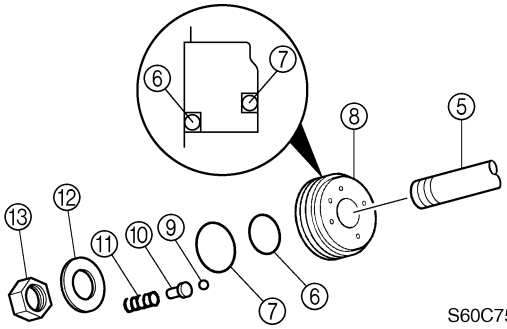
S60C7565

2. Install the tilt cylinder end screw ④ to the tilt ram ⑤.



S60C7570

3. Hold the tilt ram end in a vise using aluminum plates on both sides.
4. Install new O-rings ⑥ and ⑦ into the tilt piston ⑧.
5. Install the balls ⑨, absorber valve pins ⑩, and spring ⑪ as shown.
6. Install the tilt piston ⑧, washer ⑫, and nut ⑬ to the tilt ram ⑤, and then tighten the nut to the specified torque.



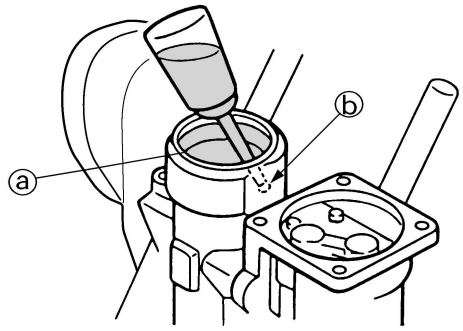
S60C7575

Tilt piston nut ⑬:
100 N·m (10 kgf·m, 72 ft·lb)

Installing the tilt ram

1. Fill the tilt cylinder ⓐ with the recommended fluid to the correct level as shown.

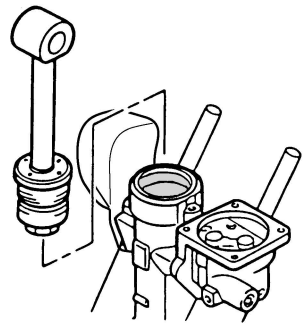
2. Add a small amount of the recommended fluid through the cylinder body hole ⓑ as shown.

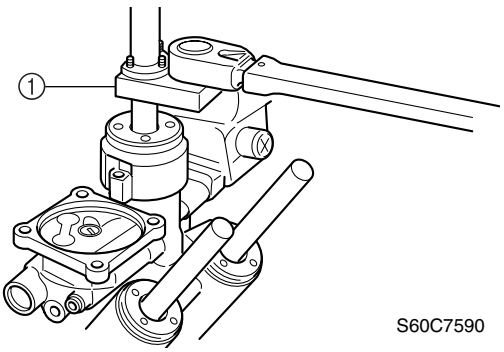


S60C7580

Recommended power trim and tilt fluid:
ATF Dexron II

3. Install the tilt piston assembly into the tilt cylinder, and then tighten the tilt cylinder end screw ① to the specified torque.


S60C7585



S60C7590

⚠ WARNING

To prevent the power trim and tilt fluid from spurting out due to internal pressure, the tilt ram should be kept at full length.

NOTE:

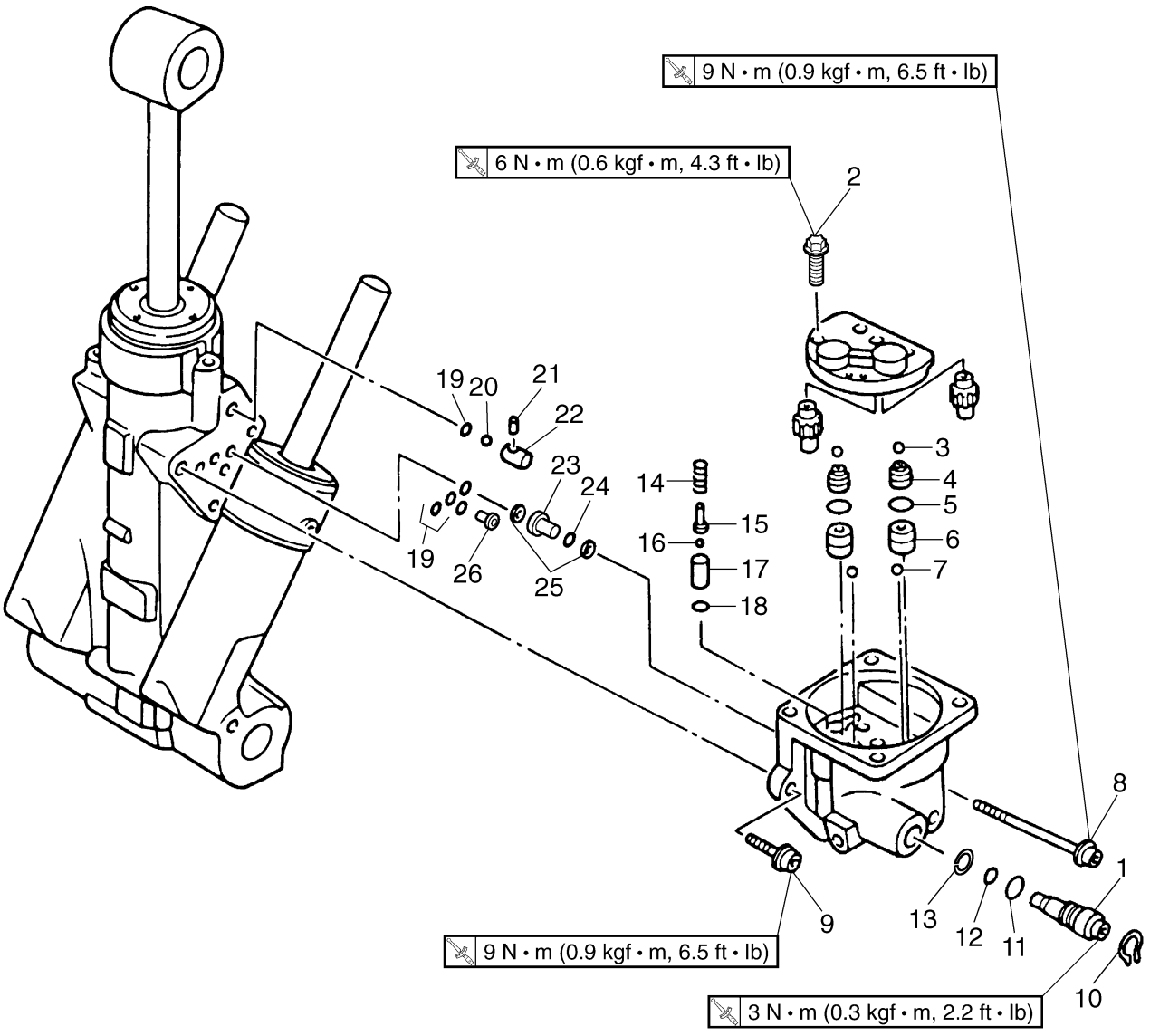
Place the tilt cylinder end screw at the bottom of the tilt ram and install the tilt piston assembly into the tilt cylinder.

Trim & tilt wrench: 90890-06548

Trim cylinder end screw:
130 N·m (13 kgf·m, 94 ft·lb)

7

Gear pump (F100B)

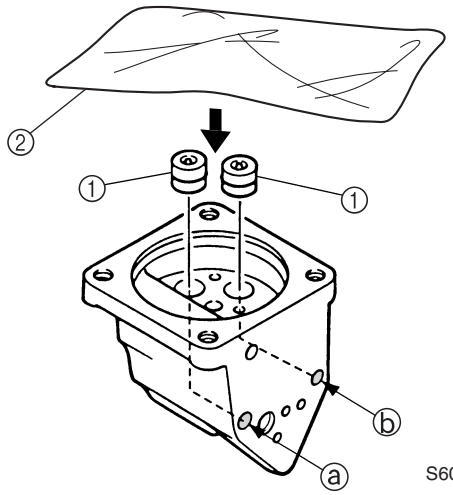


S60C7360

No.	Part name	Q'ty	Remarks
1	Manual valve	1	
2	Bolt	2	M5 × 16 mm
3	Ball	2	
4	Shuttle piston	2	
5	O-ring	2	**Not reusable**
6	Main valve	2	
7	Ball	2	
8	Bolt	1	M8 × 85 mm
9	Bolt	2	M8 × 24 mm
10	Circlip	1	
11	O-ring	1	**Not reusable**
12	O-ring	1	**Not reusable**
13	Backup ring	1	
14	Spring	1	
15	Absorber valve pin	1	
16	Ball	1	
17	Up-relief valve seat	1	
18	O-ring	1	**Not reusable**
19	O-ring	5	**Not reusable**
20	Ball	1	
21	Pin	1	
22	Valve seat	1	
23	Down-relief valve	1	
24	O-ring	1	**Not reusable**
25	Filter	2	
26	Valve pin	1	

Disassembling the gear pump

1. Remove the main valves ①.



S60C7420

⚠ WARNING

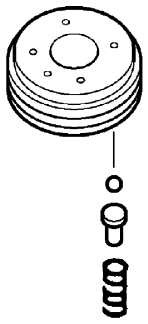
Never look into the pump housing opening because the main valves and power trim and tilt fluid may be expelled out forcefully.

NOTE:

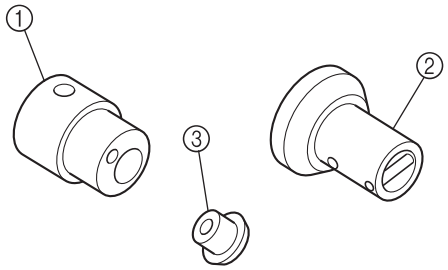
To remove the main valves, cover the pump housing with a clean cloth ②, and then blow compressed air through holes ⓐ and ⓑ while holding the cloth down.

Checking the valves

1. Check the operation of the tilt piston absorber valves and the valves for dirt or residue. Clean if necessary.

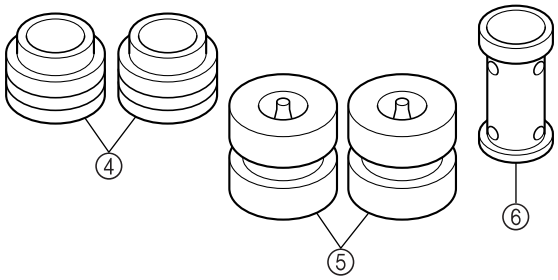

S60C7465

2. Check the valve seat ①, down-relief valve ②, and valve pin ③ for dirt or residue. Clean if necessary.



S60C7470

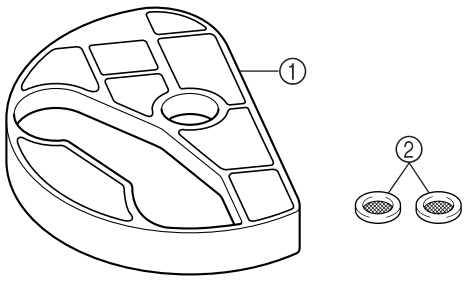
3. Check the shuttle pistons ④, main valves ⑤, and up-relief valve seat ⑥ for dirt or residue. Clean if necessary.



S60C7475

Checking the filters

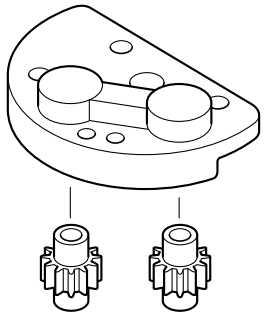
1. Check the gear pump filter ① and down-relief valve filters ② for dirt or residue. Clean if necessary.



S60C7480

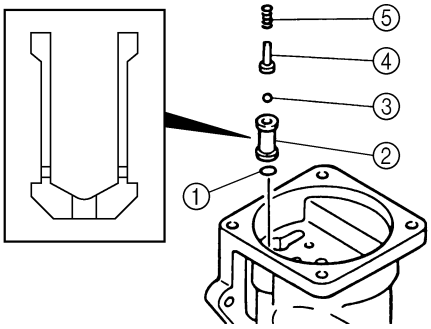
Checking the gear pump

1. Check the gear pump assembly for damage or excessive wear. Replace if necessary.


S60C7490

Assembling the pump housing

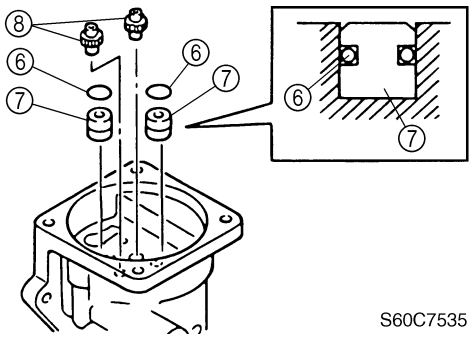
1. Install the new O-ring ①, up-relief valve seat ②, ball (3.18 mm [0.125 in]) ③, absorber valve pin ④, and spring ⑤ into the pump housing.



S60C7530

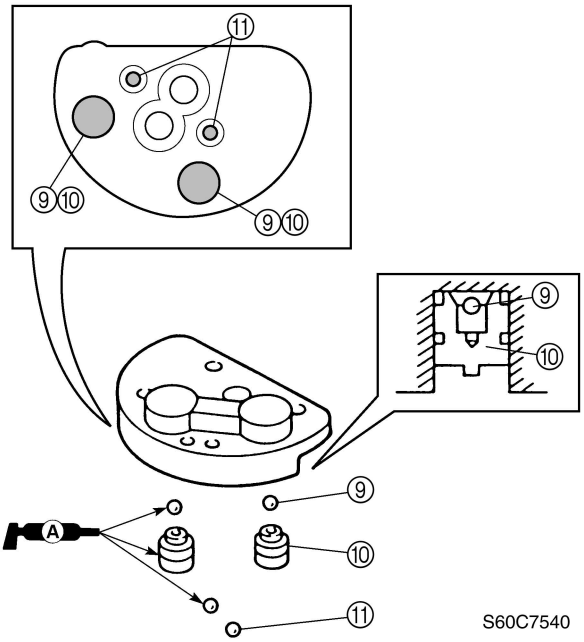
2. Install the new O-rings ⑥ onto the main valves ⑦.

3. Install the main valves ⑦ and pump gears ⑧ into the pump housing.



S60C7535

4. Install the balls (3.18 mm [0.125 in]) ⑨, shuttle pistons ⑩, and balls (4.76 mm [0.187 in]) ⑪ into the gear pump.



S60C7540

CAUTION:

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

NOTE:

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

5. Install the gear pump ⑫ to the pump housing, and then tighten the bolts ⑬ to the specified torque.

NOTE:

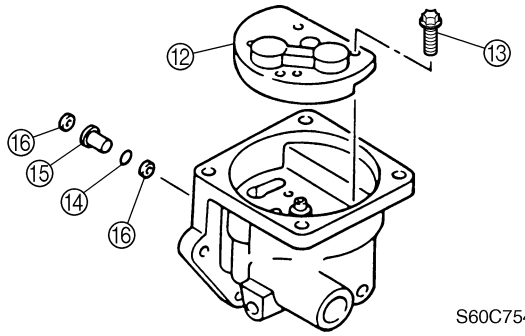
Tighten the bolts evenly and make sure that the pump gears turn smoothly.

	Gear pump bolt ⑬: 6 N·m (0.6 kgf·m, 4.3 ft·lb)

7

6. Install the new O-ring ⑭ to the down-relief valve ⑮.

7. Install the filters ⑯ and down-relief valve ⑮ into the pump housing as shown.

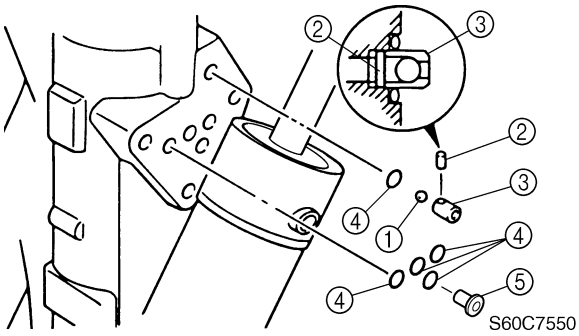


S60C7545

Installing the pump housing

1. Install the ball ① and pin ② into the valve seat ③.

2. Install the valve seat ③, new O-rings ④, and valve pin ⑤ into the cylinder body.



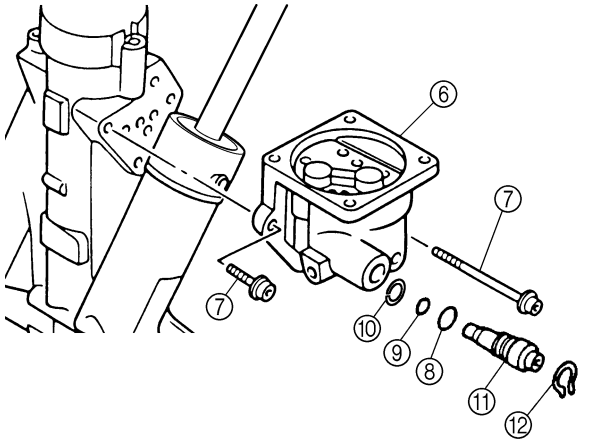
S60C7550

NOTE:
When installing the valve seat assembly, make sure that the pin is on the tilt cylinder side as shown.

3. Install the pump housing ⑥ to the cylinder body, and then tighten the bolts ⑦ to the specified torque.

4. Install the new O-rings ⑧ and ⑨, and backup ring ⑩ to the manual valve ⑪.

5. Install the manual valve ⑪ to the pump housing, tighten it to the specified torque, and then install the circlip ⑫.

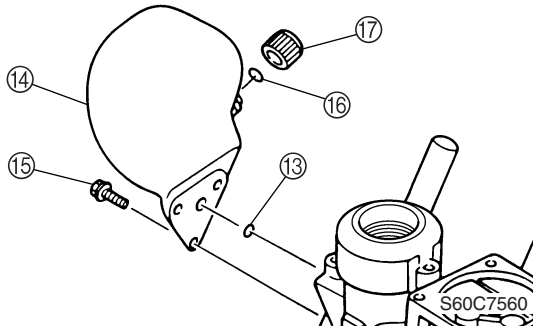


S60C7555

Pump housing bolt ⑦:
9 N·m (0.9 kgf·m, 6.5 ft·lb)
Manual valve ⑪:
3 N·m (0.3 kgf·m, 2.2 ft·lb)

6. Install the new O-ring ⑬ and reservoir ⑭ to the cylinder body, and then tighten the bolts ⑮ to the specified torque.

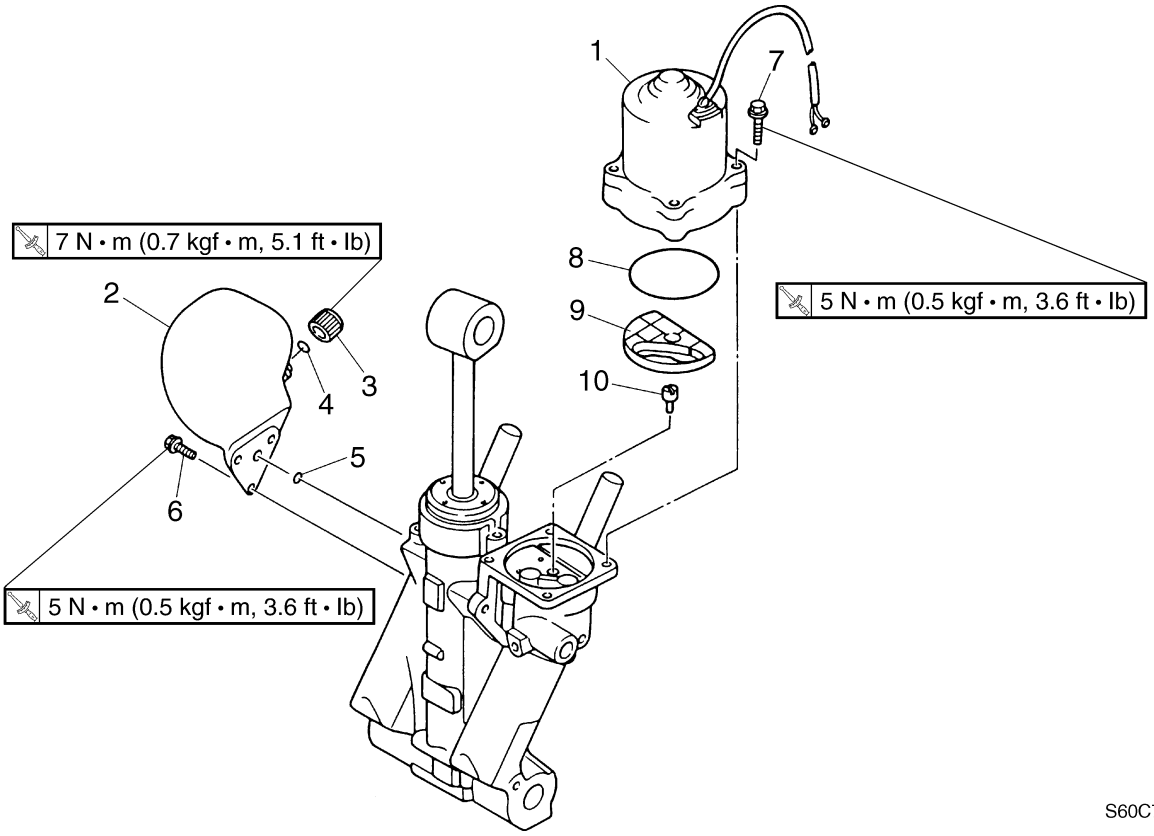
7. Install the new O-ring ⑯ into the reservoir cap ⑰, and then tighten the reservoir cap finger tighten to the reservoir.



S60C7560

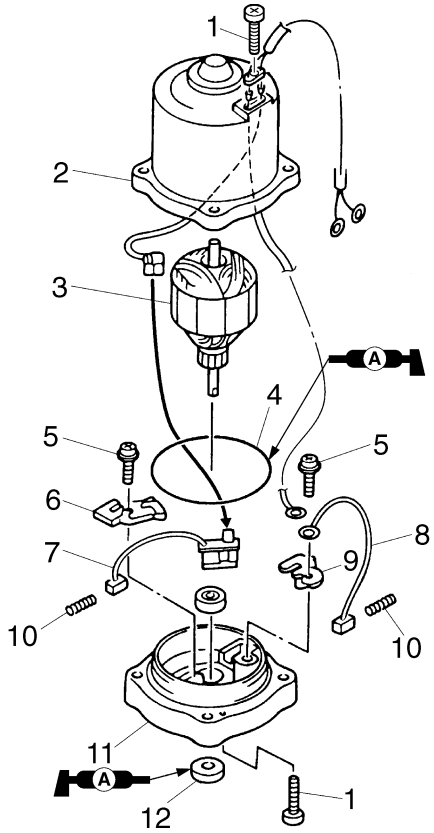
Reservoir bolt ⑮:
5 N·m (0.5 kgf·m, 3.6 ft·lb)

Power trim and tilt motor (F100B)



No.	Part name	Q'ty	Remarks
1	Power trim and tilt motor	1	
2	Reservoir	1	
3	Reservoir cap	1	
4	O-ring	1	**Not reusable**
5	O-ring	1	**Not reusable**
6	Bolt	3	M6 × 13 mm
7	Bolt	4	M6 × 35 mm
8	O-ring	1	**Not reusable**
9	Filter	1	
10	Joint	1	

7



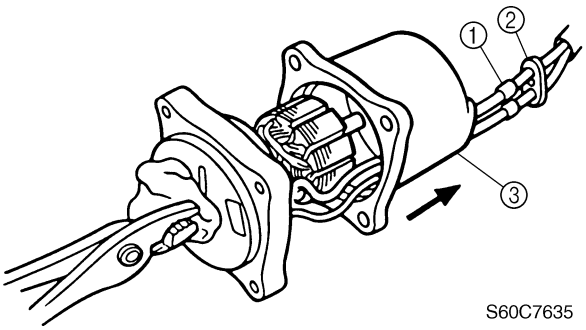
S60C7630

No.	Part name	Q'ty	Remarks
1	Screw	3	M4 × 15 mm
2	Yoke	1	
3	Armature	1	
4	O-ring	1	**Not reusable**
5	Screw	2	M4 × 10 mm
6	Brush holder	1	
7	Brush 2	1	
8	Brush 1	1	
9	Brush holder	1	
10	Brush spring	2	
11	PTT motor base	1	
12	Oil seal	1	**Not reusable**

Disassembling the power trim and tilt motor

1. Remove the PTT motor screws.

2. Remove the lead holder ① and spacer ② from the yoke ③, and then slide them towards the leads.



S60C7635

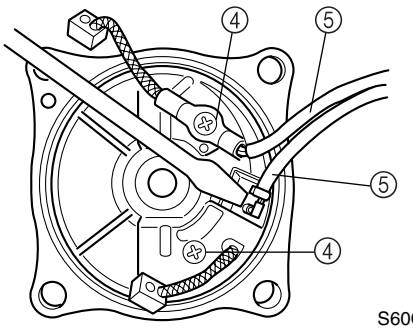
CAUTION:

- **Keep the PTT motor leads inside the yoke.**
- **Do not allow grease or oil to contact the commutator.**

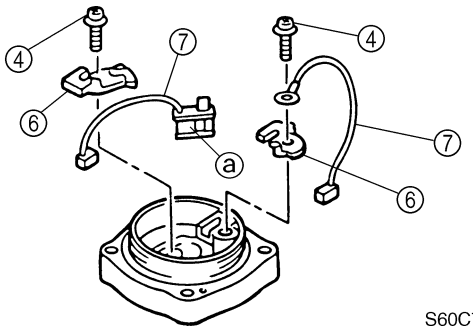
NOTE:

Place a clean cloth over the end of the armature shaft and carefully pull the armature from the yoke with a pair of pliers as shown.

3. Remove the screws ④, disconnect the PTT motor leads ⑤, and then remove the brush holders ⑥ and brushes ⑦.



S60C7640



S60C7645

CAUTION:

Do not touch the bimetal ⓐ, otherwise the operation of the breaker may be affected.

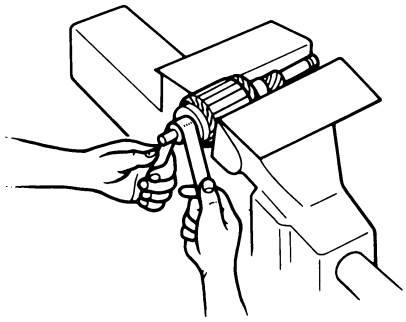
NOTE:

Hold the brush with a screwdriver as shown, and then disconnect the PTT motor lead (blue).

7

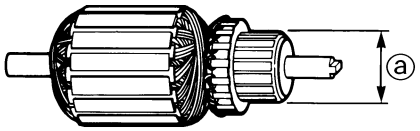
Checking the power trim and tilt motor

1. Check the commutator for dirt or foreign substances. Clean with #600 grit sandpaper if necessary.


S60C7650

2. Check the commutator undercut for dirt or foreign substances. Clean with compressed air if necessary.

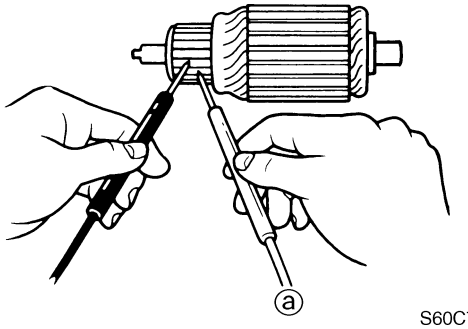
3. Measure the commutator diameter ⓐ. Replace if out of specification.



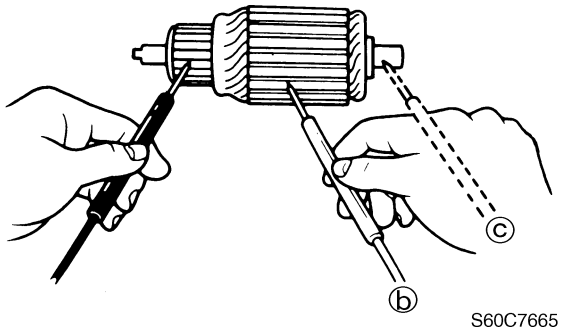
S60C7655

Commutator diameter limit ⓐ:
21 mm (0.83 in)

4. Check the armature coil for continuity. Replace if out of specifications.



S60C7660

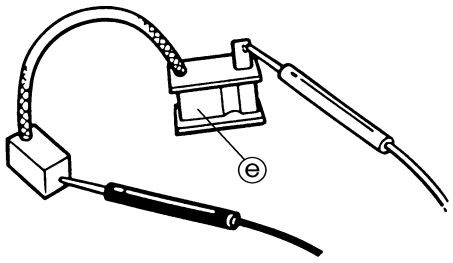


S60C7665

Armature coil continuity

Commutator segments ⓑ	Continuity
Segment-laminations ⓒ	No continuity
Segment-shaft ⓓ	No continuity

5. Check the brush for continuity. Replace if there is no continuity.

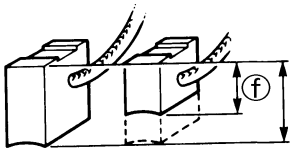


S60C7670

CAUTION:

Do not touch the bimetal ⓔ, otherwise the operation of the breaker may be affected.

6. Measure the brush length. Replace if out of specification.

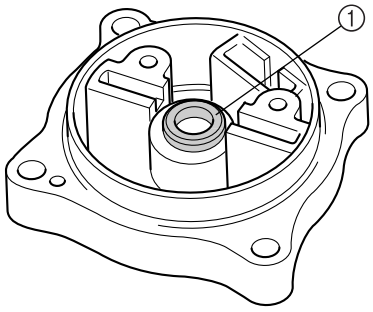


S60C7675

Brush length limit ⓕ:
4.8 mm (0.19 in)

7. Check the base for cracks or damage. Replace if necessary.

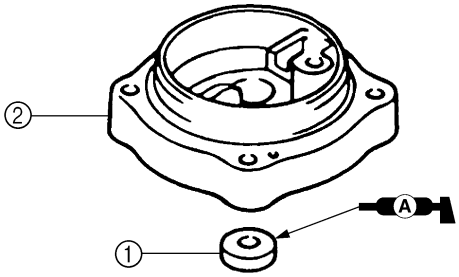
8. Check the bearing ① and oil seal for damage or wear. Replace the PTT motor base if necessary.



S60C7680

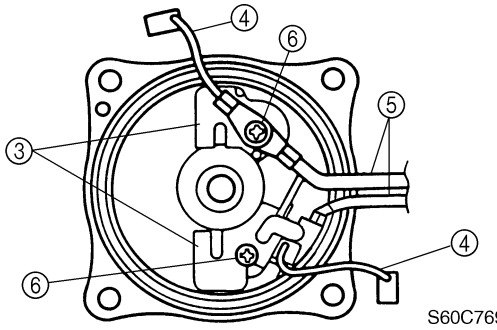
Assembling the power trim and tilt motor

1. Install the oil seal ① into the motor base ② as shown.



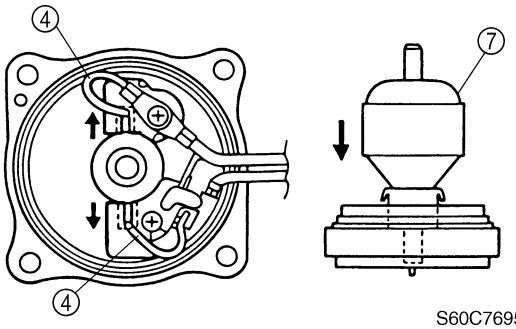
S60C7685

2. Install the brush holders ③, brushes ④, PTT motor leads ⑤, and screws ⑥ to the motor base as shown.



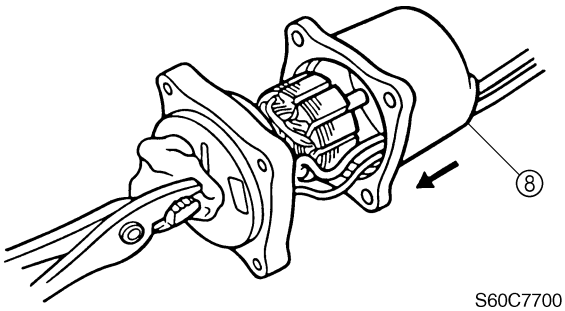
S60C7690

3. Install the brush springs into the motor base, and push the brushes ④ into the holders, and then install the armature ⑦.



S60C7695

4. Install the new O-ring and yoke ⑧ to the motor base.

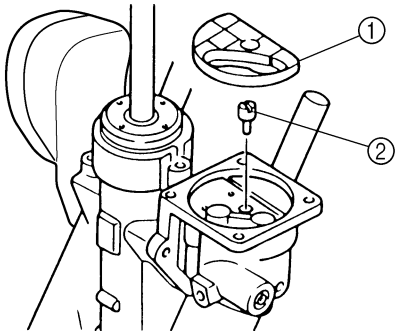


S60C7700

NOTE:
Place a clean cloth over the end of the armature shaft, hold the shaft with a pair of pliers as shown, then carefully slide the yoke onto the armature.

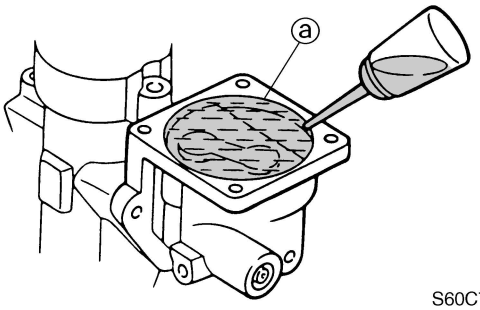
Installing the power trim and tilt motor

1. Install the filter ① and joint ② into the pump housing.



S60C7595

2. Fill the pump housing ⓐ with the recommended fluid to the correct level as shown.



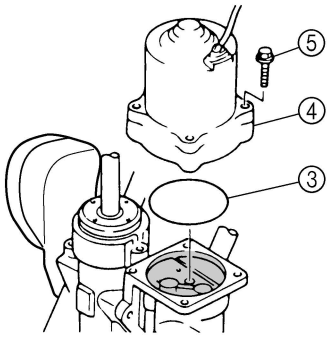
S60C7600

Recommended power trim and tilt fluid:
ATF Dexron II

3. Remove all of the air bubbles with a syringe or suitable tool.

NOTE:
Turn the joint with a screwdriver, and then remove any air between the pump gear teeth.

4. Install the new O-ring ③, power trim and tilt motor ④, and then tighten the bolts ⑤ to the specified torque.



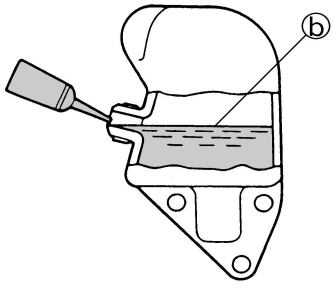
S60C7605

NOTE:
Align the armature shaft with the recess in the joint.

PTT motor bolt ⑤:
5 N·m (0.5 kgf·m, 3.6 ft·lb)

5. Remove the reservoir cap.

6. Fill the reservoir ⓑ with the recommended fluid to the brim of the filler hole as shown.



S60C7610

Recommended power trim and tilt fluid:
ATF Dexron II

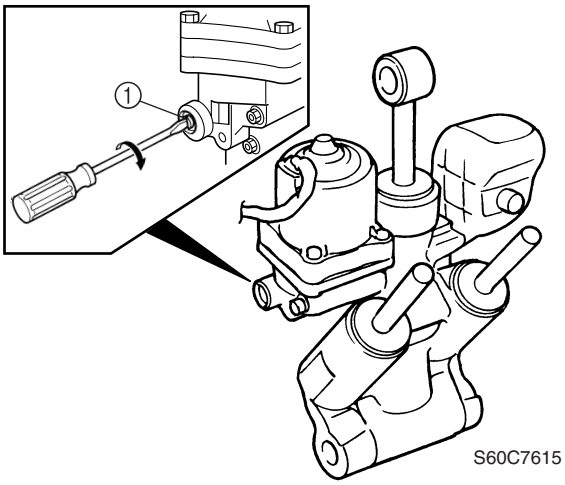
7. Install the reservoir cap, and then tighten it to the specified torque.

	Reservoir cap: 7 N·m (0.7 kgf·m, 5.1 ft·lb)

Bleeding the power trim and tilt unit (F100B)

Not installed

1. Tighten the manual valve ① by turning it clockwise.



2. Place the power trim and tilt unit in an upright position.

3. Check the fluid level in the reservoir.

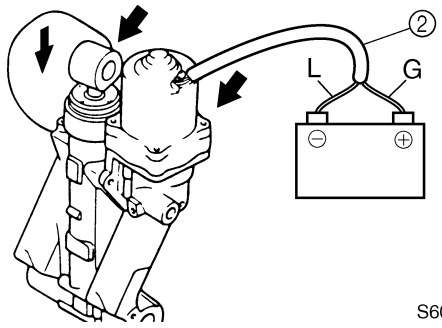
NOTE:
The fluid level should be at the brim of the filler hole.

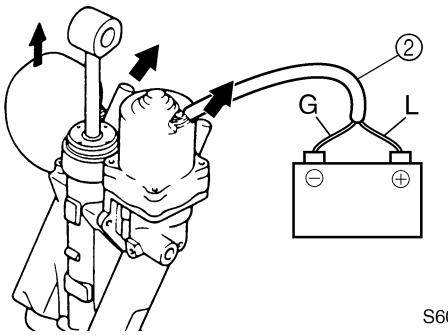
4. If necessary, add sufficient fluid of the recommended type to the correct level.

	Recommended power trim and tilt fluid: ATF Dexron II

5. Install the reservoir cap.

6. Connect the PTT motor leads ② to the battery terminals.





Ram	PTT motor lead	Battery terminal
Up	Blue (L)	⊕
	Green (G)	⊖
Down	Green (G)	⊕
	Blue (L)	⊖

7. Reverse the PTT motor leads between the battery terminals to fully extend the tilt ram and trim rams, and then reverse them again to fully retract the rams.

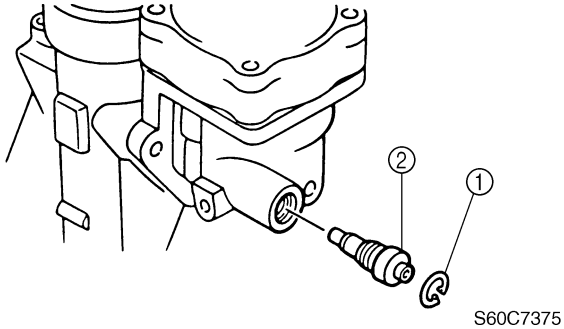
NOTE:
- Repeat this procedure so that the rams go up and down four to five times (be sure to wait a few seconds before switching the leads).
- The sound of the power trim and tilt motor will change when the rams are fully extended.
- If the rams do not move up and down easily, push and pull on the rams to assist operation.

8. Check the fluid level again when the rams are fully extended. Add sufficient fluid, if necessary, and then repeat step 7.

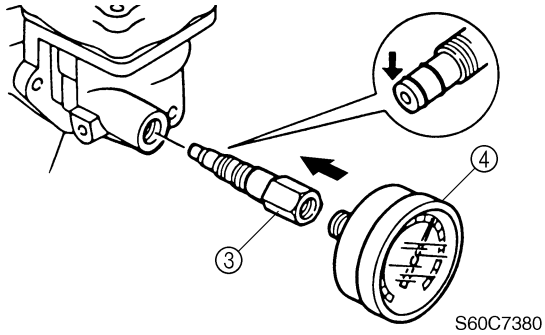
NOTE:
Repeat this procedure until the fluid remains at the correct level.

Checking the hydraulic pressure

1. Check the hydraulic pressure. Check the internal parts if out of specification.
2. Fully extend the power trim and tilt rams.
3. Remove the circlip ①.
4. Remove the manual valve ②, and install the up relief fitting ③ and hydraulic pressure gauge ④, and then tighten them to the specified torques.



S60C7375



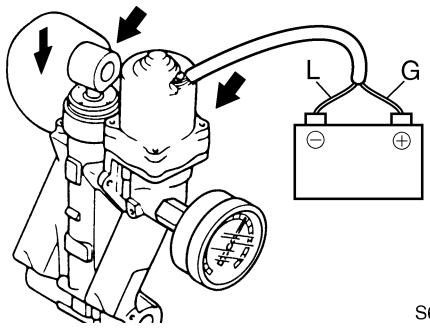
S60C7380

NOTE:
Be sure to remove the manual valve, and then quickly attach the special tools before any fluid comes out.

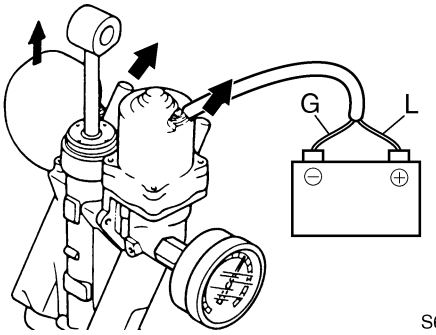
Up relief fitting ③: 90890-06773
Hydraulic pressure gauge ④:
90890-06776

Up relief fitting:
4 N·m (0.4 kgf·m, 2.9 ft·lb)
Hydraulic pressure gauge:
9 N·m (0.9 kgf·m, 6.5 ft·lb)

5. Connect the PTT motor leads to the battery terminals to fully retract the trim and tilt rams.



S60C7385



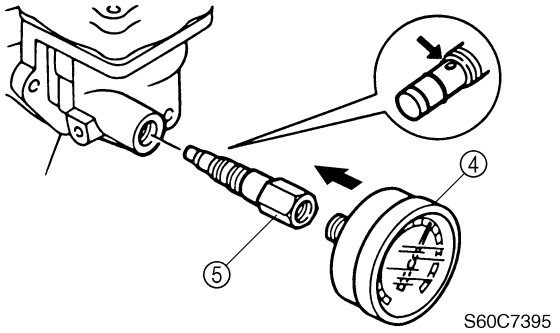
S60C7390

Ram	PTT motor lead	Battery terminal
Up	Blue (L)	⊕
	Green (G)	⊖
Down	Green (G)	⊕
	Blue (L)	⊖

6. Reverse the PTT motor leads between the battery terminals to fully extend the trim and tilt rams, and then measure the hydraulic pressure.

Hydraulic pressure (up):
7.9–9.8 MPa (80–100 kgf/cm^2)

7. After measuring the hydraulic pressure, remove the special tools and quickly attach the down relief fitting ⑤.



S60C7395

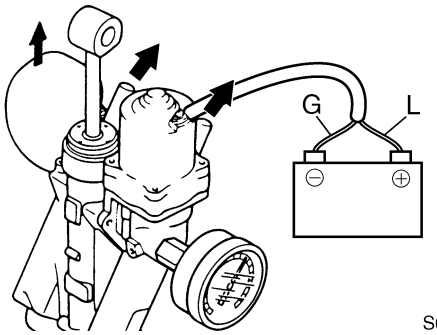
Hydraulic pressure gauge ④:
90890-06776
Down relief fitting ⑤: 90890-06774

Hydraulic pressure gauge:
9 N·m (0.9 kgf·m, 6.5 ft·lb)
Down relief fitting:
4 N·m (0.4 kgf·m, 2.9 ft·lb)

8. Reverse the PTT motor leads between the battery terminals to fully retract the trim and tilt rams, and then measure the hydraulic pressure.

Hydraulic pressure (down):
5.9–8.8 MPa (60–90 kgf/cm^2)

9. After measuring the hydraulic pressure, connect the PTT motor leads to the battery terminals to fully extend the trim and tilt rams.

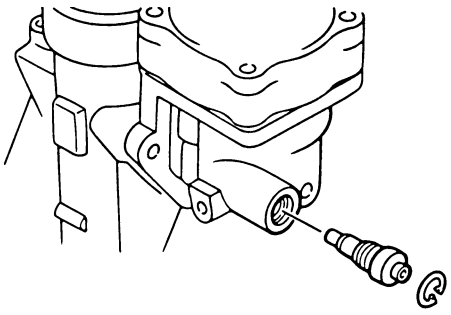


S60C7390

7

10. Remove the special tools.

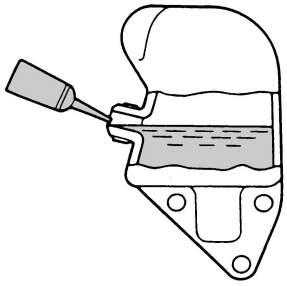
11. Install the manual valve and circlip.



S60C7400

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

13. If necessary, add fluid of the recommended type to the correct level.



S60C7405

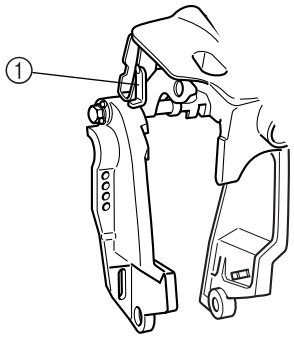
NOTE:
The fluid level should be at the brim of the filler hole.

Recommended power trim and tilt fluid:
ATF Dexron II

14. Install the reservoir cap.

Installing the power trim and tilt unit

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



S60C7705

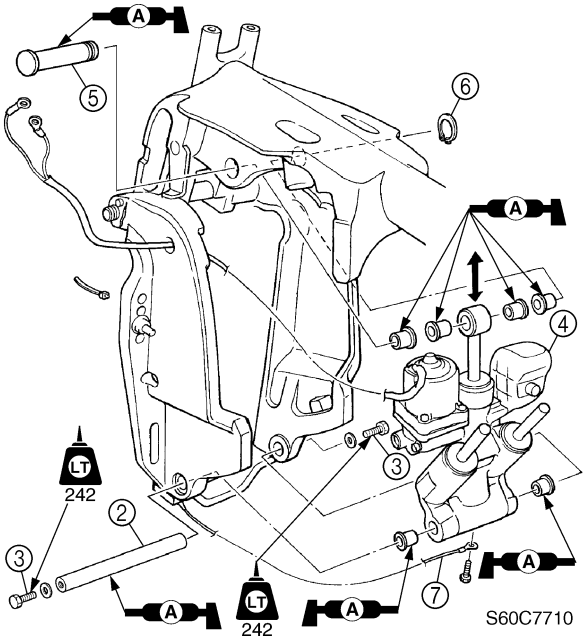
⚠ WARNING

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 power trim and tilt unit should lose fluid pressure.

2. Install the shaft ② and bolts ③ onto both clamp brackets together with the power trim and tilt unit ④.

3. Install the tilt ram upper end into the swivel bracket with the shaft ⑤ and circlip ⑥.

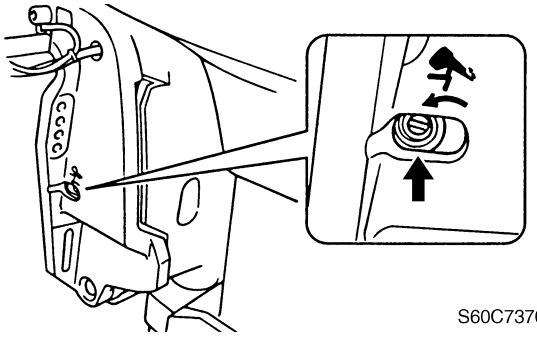
4. Connect the ground lead ⑦.



S60C7710

Built-in

1. Loosen the manual valve by turning it counterclockwise until it cannot be turned further.

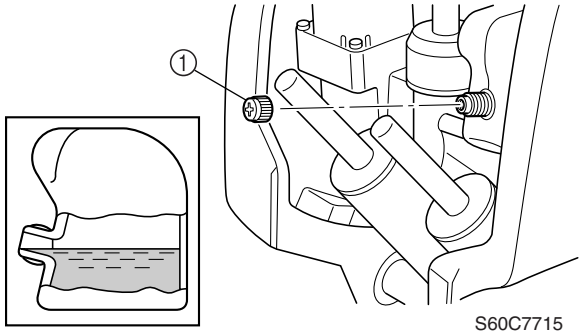

S60C7370

2. Fully tilt the outboard motor up, and then release it and let it lower by its own weight four to five times.
3. Tighten the manual valve by turning it clockwise.
4. Let the fluid settle for 5 minutes.
5. Push and hold the power trim and tilt switch in the up position until the outboard motor is fully tilted up.
6. 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 power trim and tilt unit should lose fluid pressure.

7. Remove the reservoir cap ①, and then check the fluid level in the reservoir.
8. If necessary, add sufficient fluid of the recommended type to the correct level.



S60C7715

NOTE:

The fluid level should be at the brim of the filler hole.

Recommended power trim and tilt fluid:
ATF Dexron II

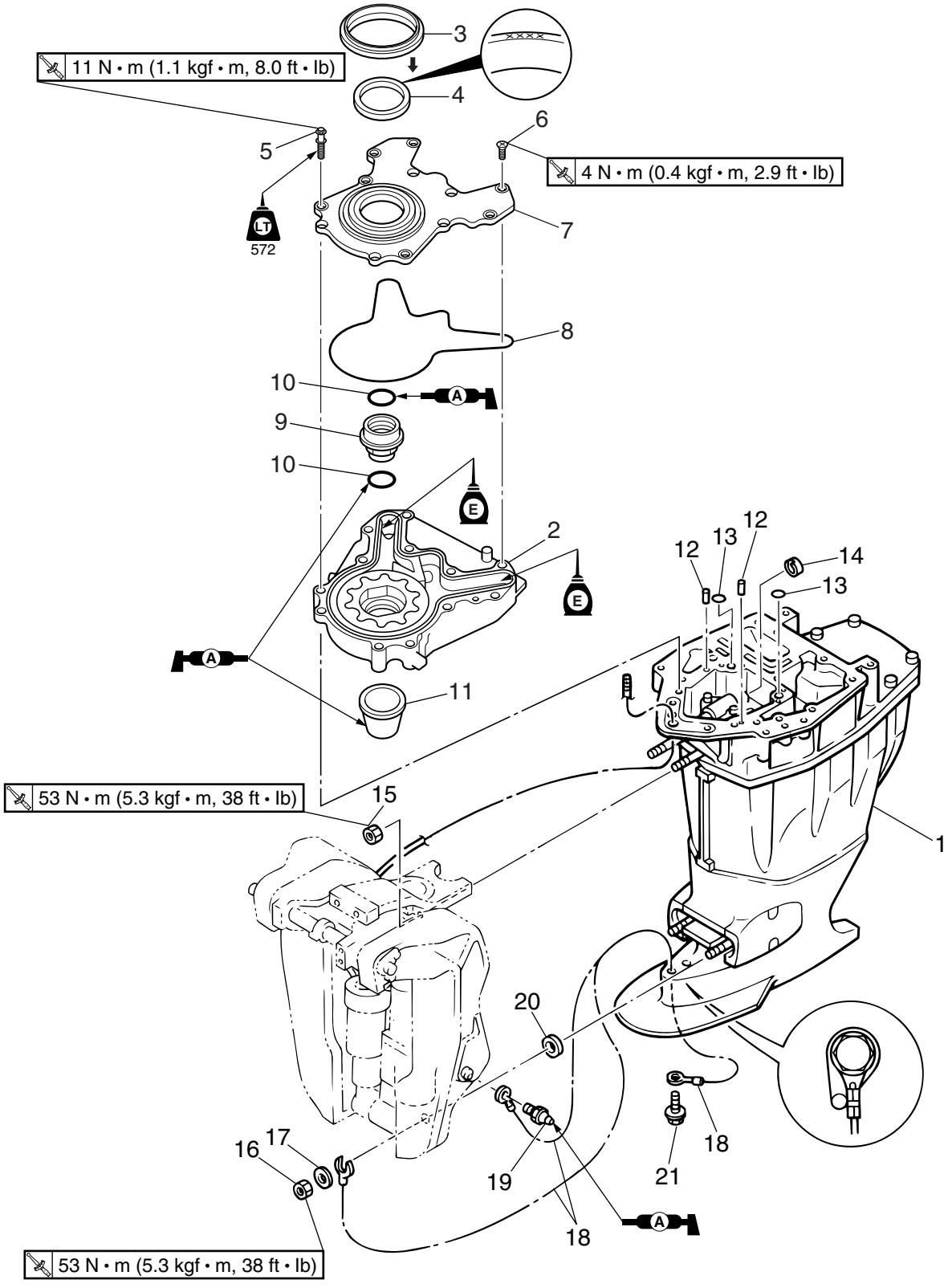
9. Install the reservoir cap.

NOTE:

Repeat this procedure until the fluid remains at the correct level.

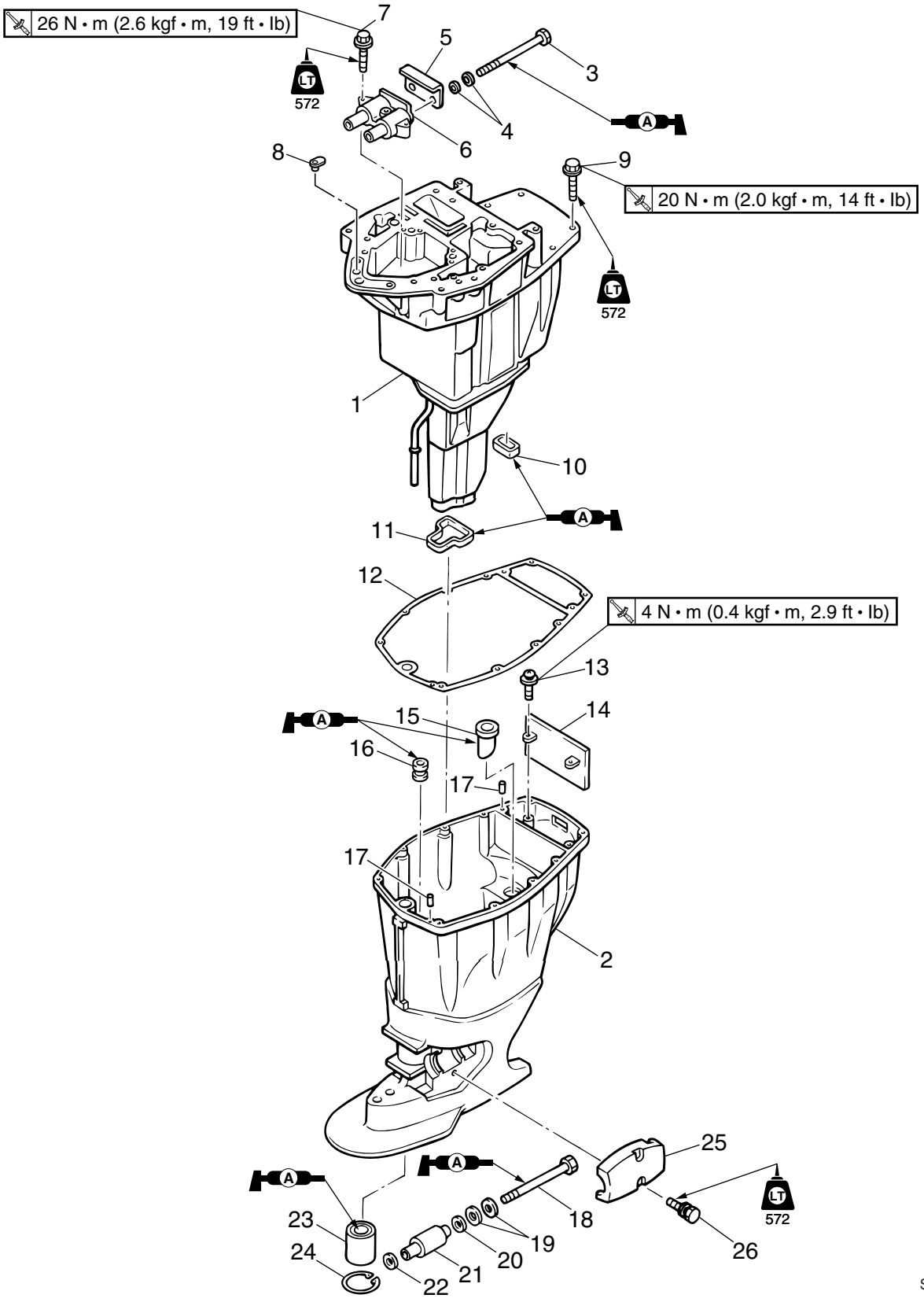
7

Upper case (F100C)

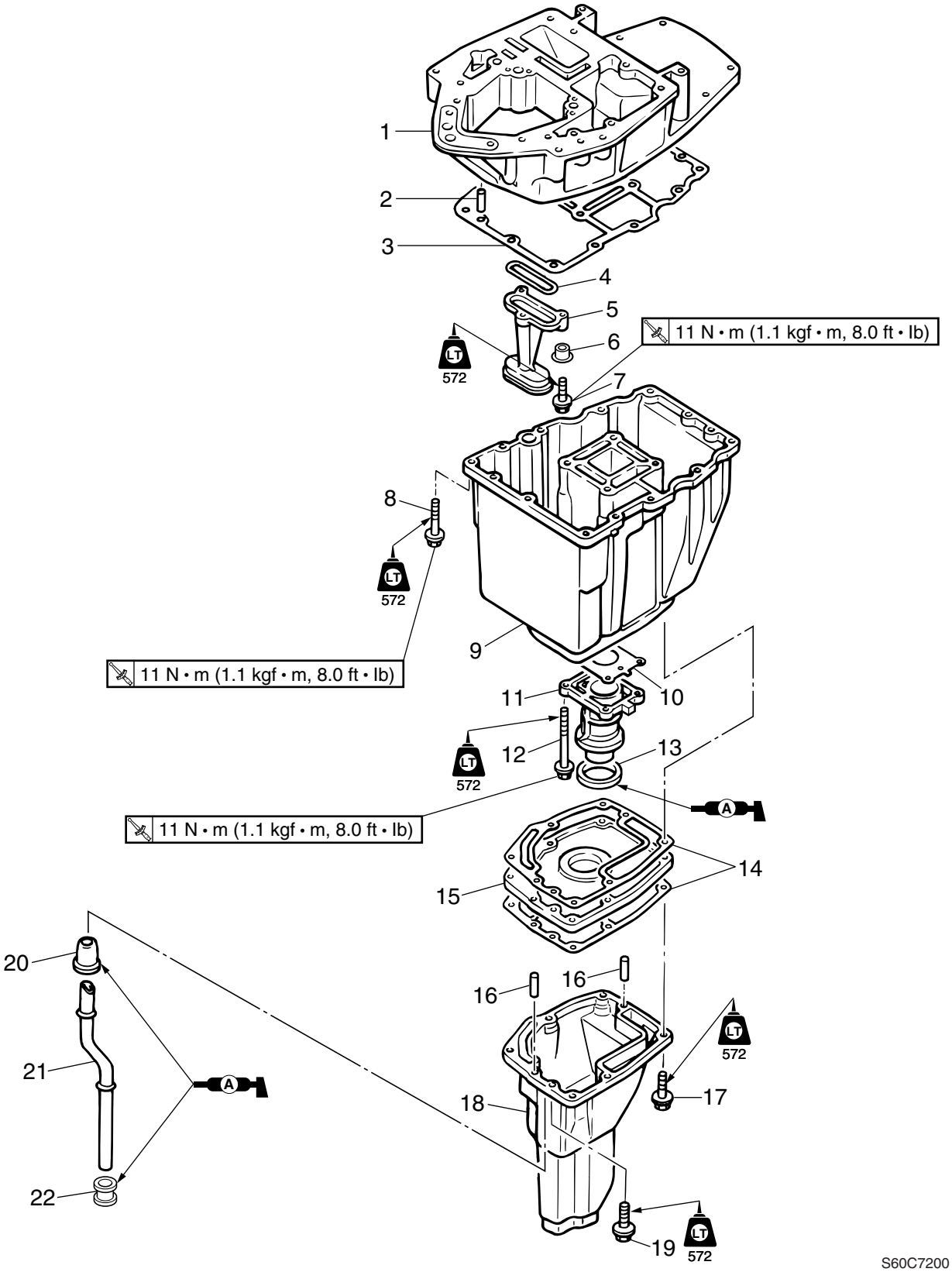


No.	Part name	Q'ty	Remarks
1	Upper case assembly	1	
2	Oil pump body	1	
3	Oil seal	1	**Not reusable**
4	Oil seal	1	**Not reusable**
5	Bolt	6	M6 × 45 mm
6	Screw	6	M6 × 10 mm
7	Cover	1	
8	Gasket	1	**Not reusable**
9	Shaft	1	
10	O-ring	2	**Not reusable**
11	Oil seal	1	**Not reusable**
12	Dowel pin	2	
13	O-ring	2	**Not reusable** 1.9 × 22.9 mm
14	Damper	2	
15	Nut	2	
16	Nut	2	
17	Washer	2	
18	Ground lead	1	
19	Grease nipple	1	
20	Washer	2	
21	Bolt	1	M6 × 10 mm

Bracket unit



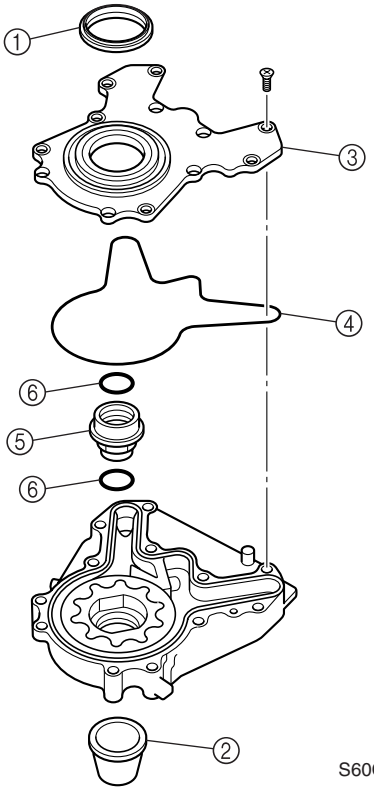
No.	Part name	Q'ty	Remarks
1	Muffler assembly	1	
2	Upper case	1	
3	Bolt	2	M12 × 194 mm
4	Washer	4	
5	Plate	1	
6	Upper mount	1	
7	Bolt	3	M8 × 45 mm
8	Grommet	1	
9	Bolt	4	M8 × 40 mm
10	Muffler seal	1	
11	Rubber seal	1	
12	Gasket	1	**Not reusable**
13	Screw	2	M6 × 15 mm
14	Baffle plate	1	
15	Damper	1	
16	Grommet	1	
17	Dowel pin	2	
18	Bolt	2	M12 × 200 mm
19	Washer	4	
20	Rubber washer	2	
21	Lower mount	2	
22	Washer	2	
23	Drive shaft bushing	1	
24	Circlip	1	
25	Mount cover	2	
26	Bolt	4	M10 × 40 mm


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
16
17
18
19
20
21
22
572
572
572
572
572
11 N • m (1.1 kgf • m, 8.0 ft • lb)
11 N • m (1.1 kgf • m, 8.0 ft • lb)
11 N • m (1.1 kgf • m, 8.0 ft • lb)
A
A
S60C7200

No.	Part name	Q'ty	Remarks
1	Exhaust guide	1	
2	Dowel pin	2	
3	Gasket	1	**Not reusable**
4	Gasket	1	**Not reusable**
5	Oil strainer	1	
6	Collar	3	
7	Bolt	3	M6 × 25 mm
8	Bolt	12	M6 × 25 mm
9	Oil pan	1	
10	Gasket	1	**Not reusable**
11	Exhaust manifold	1	
12	Bolt	4	M6 × 70 mm
13	Exhaust seal	1	
14	Gasket	2	**Not reusable**
15	Plate	1	
16	Dowel pin	2	
17	Bolt	6	M6 × 30 mm
18	Muffler	1	
19	Bolt	1	M6 × 50 mm
20	Grommet	1	
21	Pipe	1	
22	Rubber seal	1	

Disassembling the oil pump

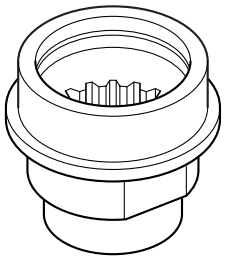
1. Remove oil seals ① and ②, the cover ③, gasket ④, shaft ⑤, and O-rings ⑥.



S60C7055

Checking the oil pump

1. Checking the shaft for cracks or wear. Replace if necessary.

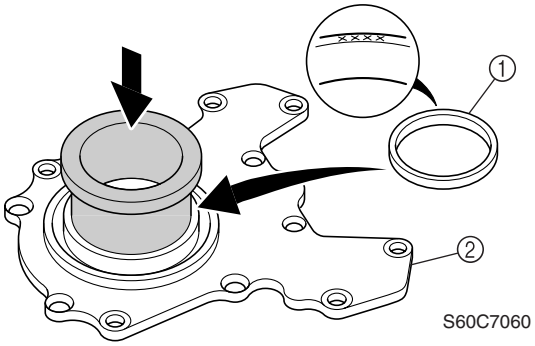

S60C7280

2. Check the oil seal and O-ring for tears. Replace if necessary.

3. Check the oil passage for dirt or residur. Clean if necessary.

Assembling the oil pump

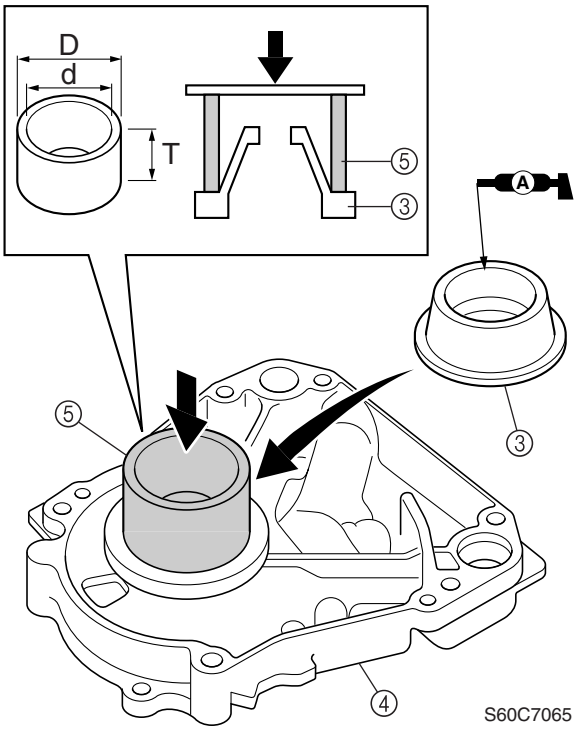
1. Install the new oil seal ① into the cover ②.



S60C7060

Bearing inner race attachment:
90890-06662

2. Install the new oil seal ③ into the oil pump body ④.



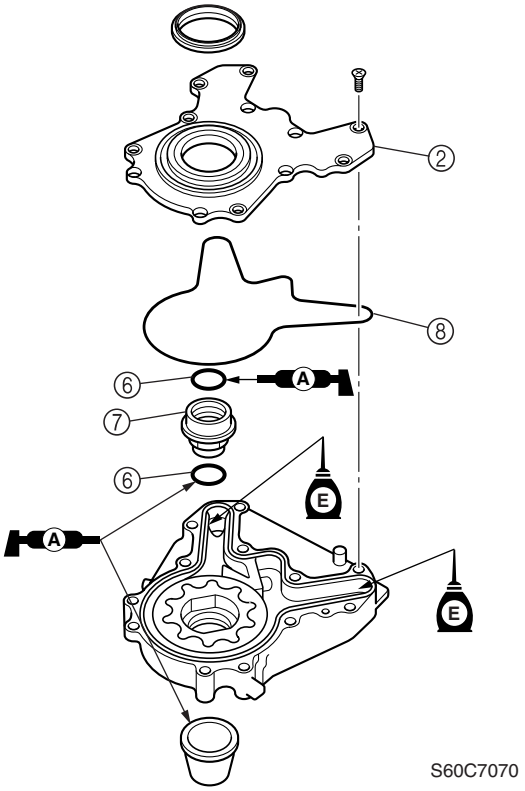
S60C7065

NOTE:
Use a general pipe with the specified measurements.

General pipe ⑤:
D = 43 mm (1.69 in)
d = 40 mm (1.57 in)
T = 30 mm (1.18 in)

3. Install the O-rings ⑥ into the shaft ⑦.

4. Install the gasket ⑧ and cover ②, and then tighten the cover screws to the specified torque.



S60C7070

Oil pump cover screw:
4 N·m (0.4 kgf·m, 2.9 ft·lb)

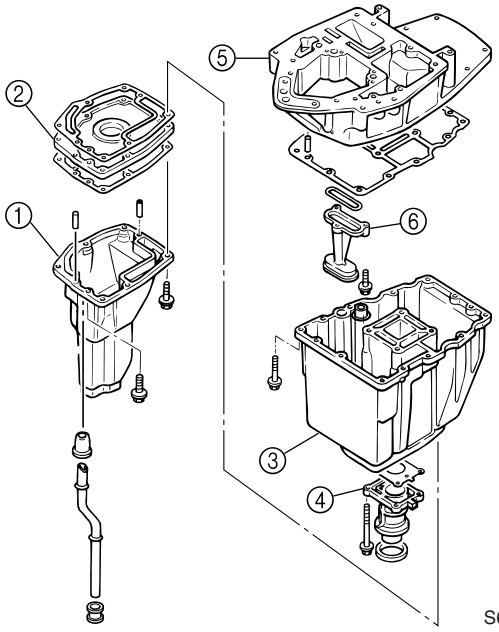
Disassembling the oil pan

1. Remove the muffler ① and plate ② from the oil pan ③.

2. Remove the exhaust manifold ④ from the oil pan ③.

3. Remove the oil pan ③ from the exhaust guide ⑤.

4. Remove the oil strainer ⑥.



S60C7205

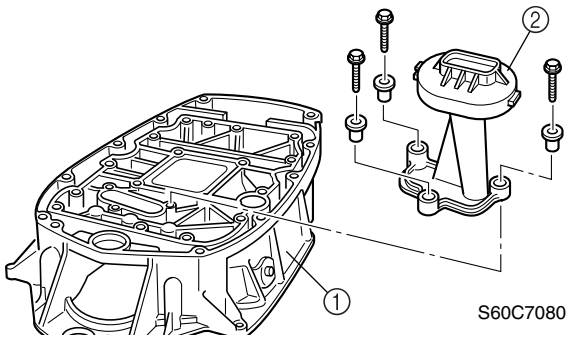
Checking the oil strainer

1. Check the oil strainer for dirt and residue. Clean if necessary.

Assembling the oil pan

1. Install the gaskets onto the exhaust guide ①.

2. Install the oil strainer ② and bolts, and then tighten the bolts to the specified torque.

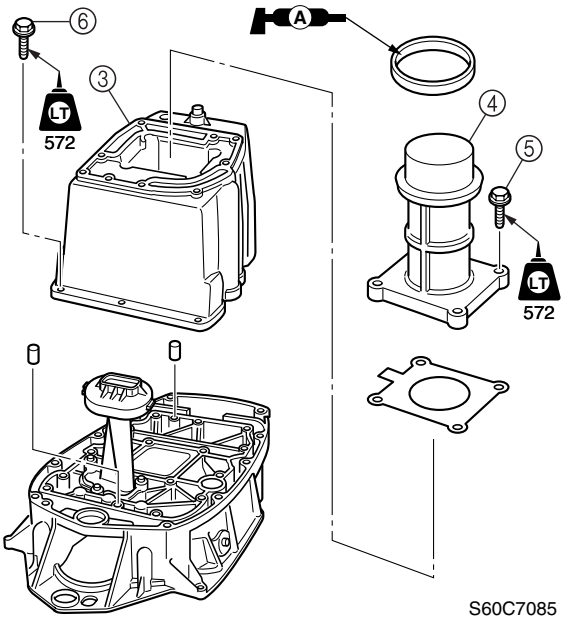


S60C7080

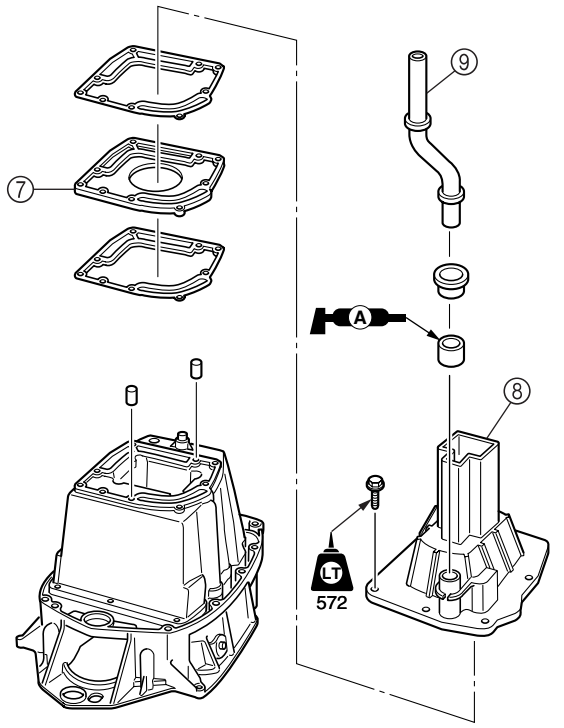
Oil strainer bolt:
11 N·m (1.1 kgf·m, 8.0 ft·lb)

7

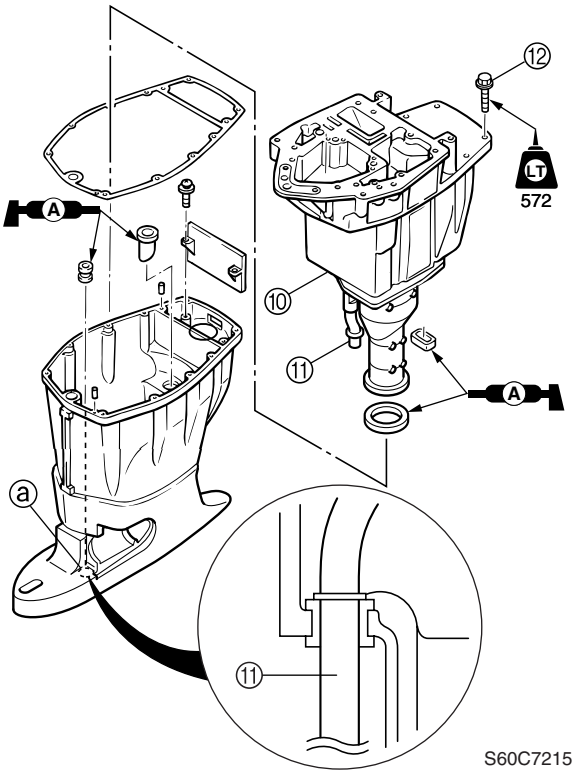
3. Install the oil pan ③ and then tighten the bolts finger tight.
4. Install the exhaust manifold ④ and bolts, and then tighten the bolts finger tight.
5. Tighten the exhaust manifold bolts ⑤, then the oil pan bolts ⑥.
6. Install the plate ⑦ and the muffler ⑧ into the oil pan.
7. Install the water pipe ⑨.
8. Install the muffler assembly ⑩ by inserting the tip of the water pipe ⑪ into the joint hole ⓐ of the upper case.
9. Install the muffler assembly bolts ⑫, and then tighten them to the specified torque.



S60C7085



S60C7210



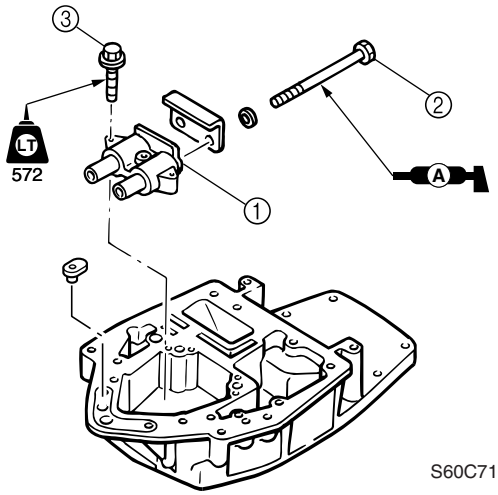
S60C7215

	Muffler assembly bolt ⑫: 20 N·m (2.0 kgf·m, 14 ft·lb)

Installing the upper case

1. Install the upper mount ① and bolts ② into the upper case.

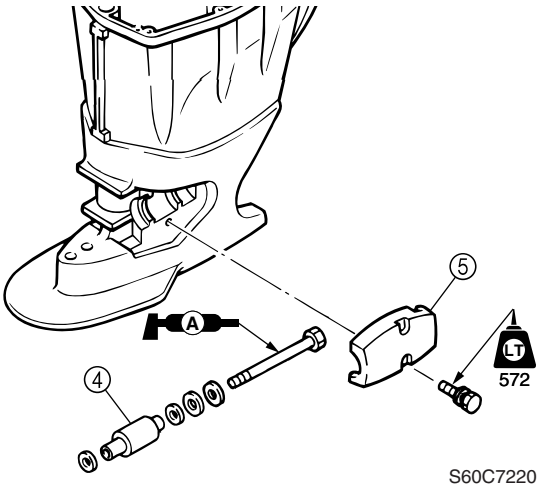
2. Install the bolts ③, and then tighten them to the specified torque.



	Upper mount bolt ③: 26 N·m (2.6 kgf·m, 19 ft·lb)

3. Install the lower mounts ④ to the upper case.

4. Install the mount cover ⑤.

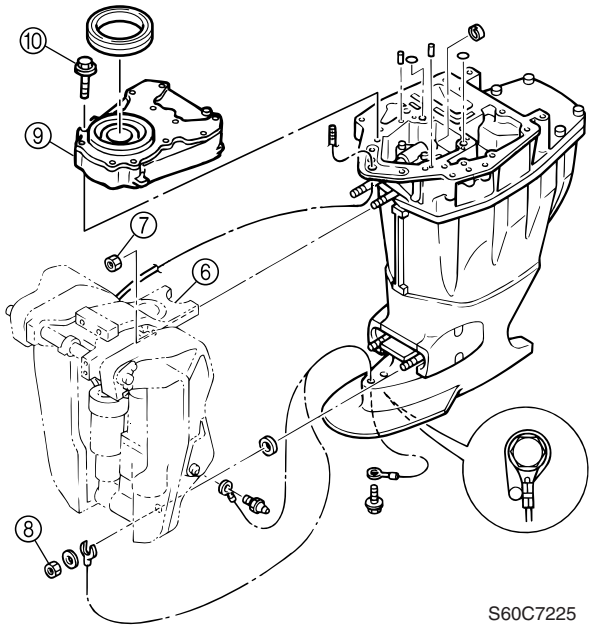


5. Install the upper and lower mounting bolts into the swivel bracket ⑥ simultaneously.

6. Install the upper mounting nut ⑦ and lower mounting nut ⑧, and then tighten them to the specified torques.

NOTE:
Before tightening the lower mounting nut, be sure to connect the ground lead to the lower mounting bolt.

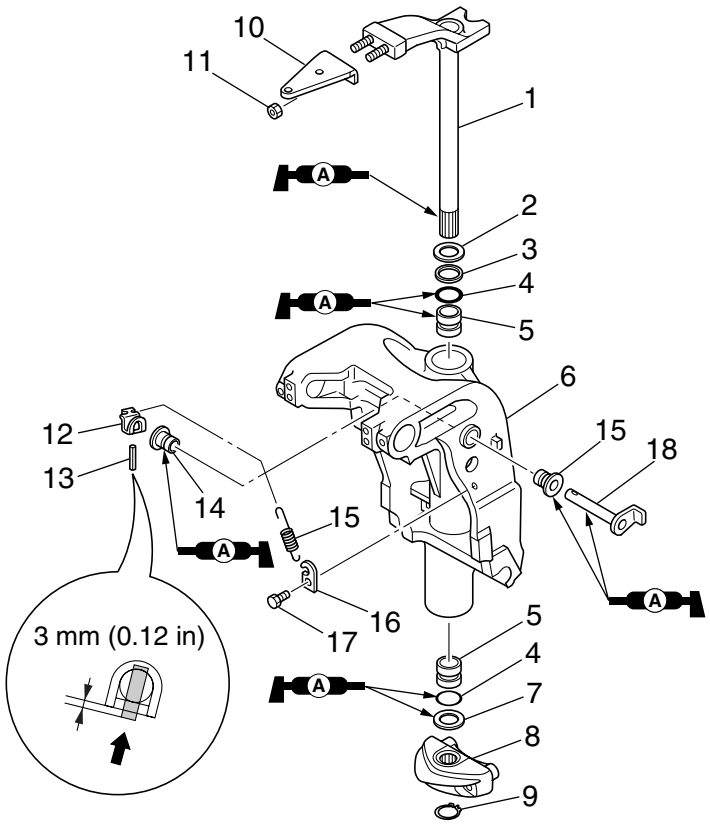
7. Install the oil pump assembly ⑨.



	Upper mounting nut ⑦: 53 N·m (5.3 kgf·m, 38 ft·lb) Lower mounting nut ⑧: 53 N·m (5.3 kgf·m, 38 ft·lb) Oil pump bolt ⑩: 11 N·m (1.1 kgf·m, 8.0 ft·lb)

7

Swivel bracket and clamp brackets (F100C)

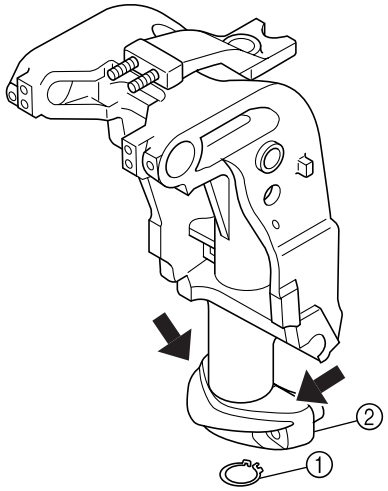


S60C7230

No.	Part name	Q'ty	Remarks
1	Steering arm	1	
2	Washer	1	
3	Bushing	1	
4	O-ring	2	**Not reusable** 3.8 × 36.5 mm
5	Bushing	2	
6	Swivel bracket	1	
7	Washer	1	
8	Steering yoke	1	
9	Circlip	1	
10	Steering hook	1	
11	Nut	2	
12	Tilt stop lever joint	1	
13	Pin	1	
14	Bushing	2	
15	Spring	1	
16	Spring holder	1	
17	Bolt	1	M6 × 10 mm
18	Tilt stop lever	1	

Removing the steering arm

1. Remove the circlip ①.
2. Remove the steering yoke ② by striking it with a plastic hammer.

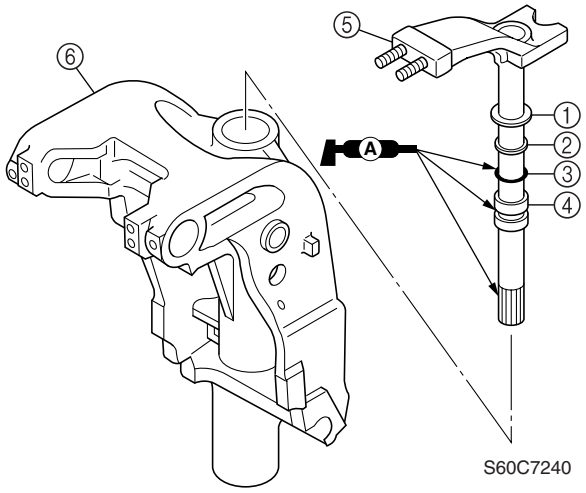


S60C7235

3. Remove the steering arm from the swivel bracket by pulling the arm off the bracket.

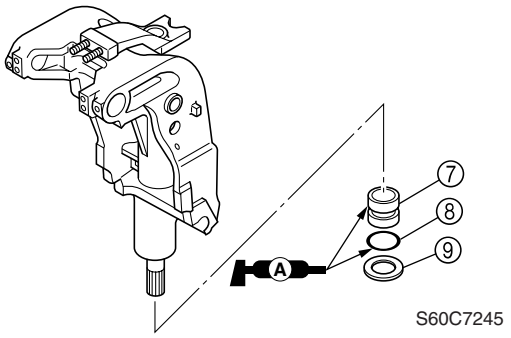
Installing the steering arm

1. Install the washer ①, bushing ②, O-ring ③, and bushing ④ onto the steering arm ⑤.
2. Place the swivel bracket ⑥ in an upright position, and then install the steering arm onto the swivel bracket.



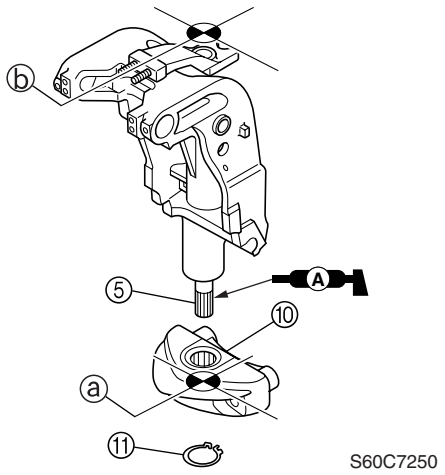
S60C7240

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



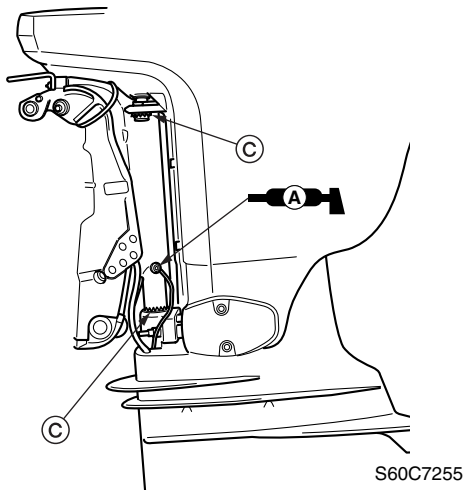
S60C7245

4. Install the steering arm ⑤ into the steering yoke ⑩ by aligning the center ⓐ of the yoke with the center ⓑ of the steering arm.
5. Install the circlip ⑪.



S60C7250

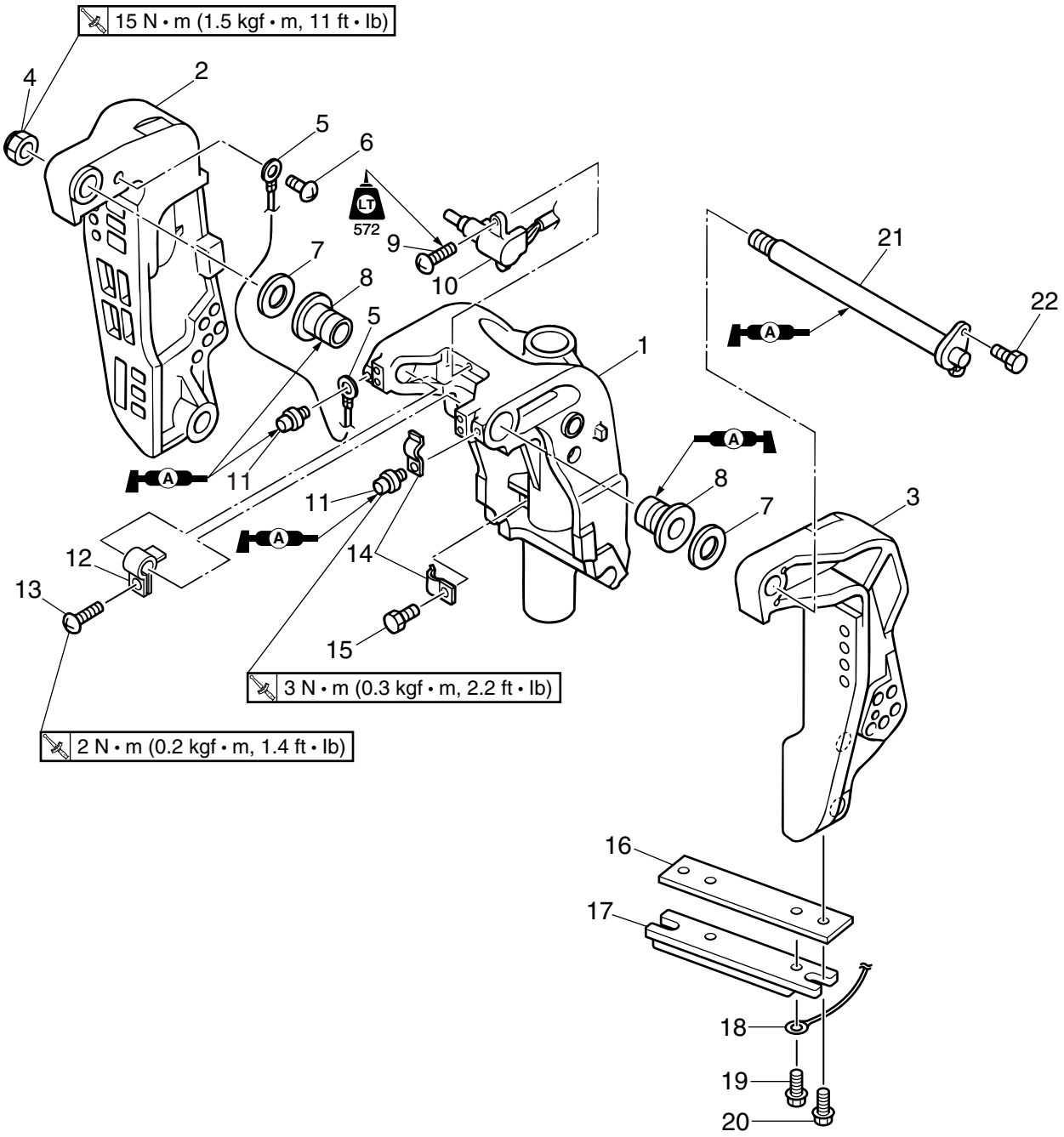
6. Inject grease into the grease nipple until grease comes out from both the upper and lower bushings ⓒ.



S60C7255

7

Clamp brackets (F100C)

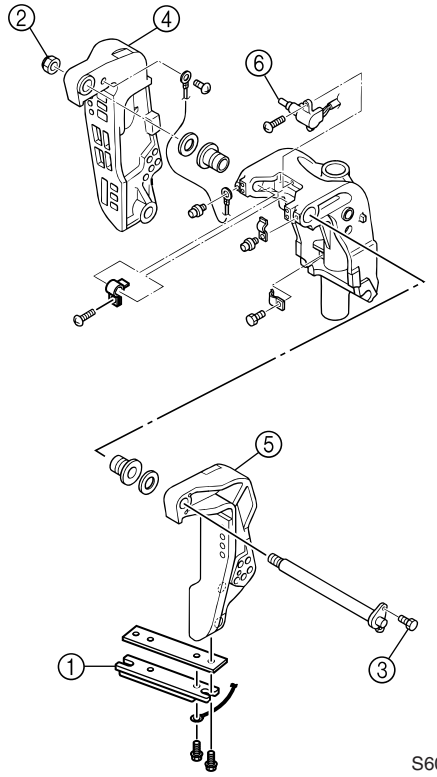


S60C7260

No.	Part name	Q'ty	Remarks
1	Swivel bracket assembly	1	
2	Starboard clamp bracket	1	
3	Port clamp bracket	1	
4	Self-locking nut	1	
5	Ground lead	1	
6	Screw	1	M6 × 12 mm
7	Washer	2	
8	Bushing	2	
9	Screw	2	M6 × 16 mm
10	Trim sensor	1	
11	Grease nipple	2	
12	Trim sensor cam	1	
13	Screw	1	M6 × 25 mm
14	Clamp	2	
15	Bolt	1	M6 × 10 mm
16	Plate	1	
17	Anode	1	
18	Ground lead	1	
19	Bolt	2	M6 × 14 mm
20	Bolt	2	M6 × 16 mm
21	Through tube	1	
22	Bolt	1	M8 × 20 mm

Removing the clamp brackets

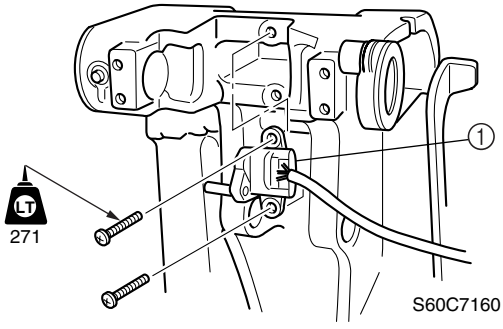
1. Remove the power trim and tilt unit. For removal procedures, see “Removing the power trim and tilt unit” in this chapter.
2. Remove the anode ①.
3. Loosen the self-locking nuts ② and bolt ③, and then remove clamp brackets ④ and ⑤.
4. Remove the trim sensor ⑥.



S60C7265

Installing the clamp brackets

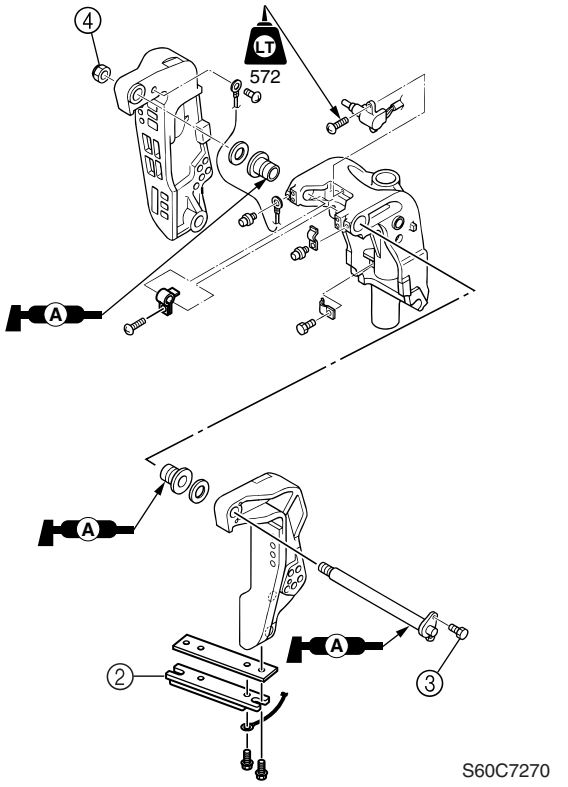
1. Install the trim sensor ① onto the swivel bracket assembly.



S60C7160

NOTE:
Adjust the trim sensor after installing the power trim and tilt unit.

2. Assemble the clamp brackets and the swivel bracket by installing the anode ②, bolt ③, and self-locking nuts ④, then tightening the nuts to the specified torque.

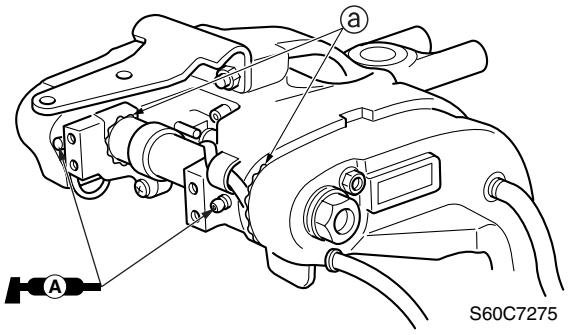


S60C7270

Self-locking nut ④:
15 N·m (1.5 kgf·m, 11 ft·lb)

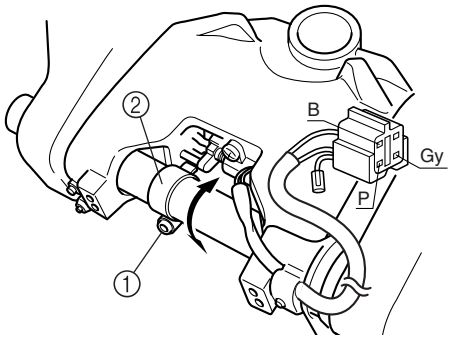
3. Install the power trim and tilt unit. For installation procedures, see “Installing the power trim and tilt unit” in this chapter.

4. Inject grease into both grease nipples until grease comes out from the bushings ⓐ.



Adjusting the trim sensor cam

1. Fully tilt the outboard motor down.
2. Loosen the screw ①.
3. Adjust the position of the trim sensor cam ② until the specified resistance is obtained.



Trim sensor resistance:
Pink (P) – Black (B)
9–11 Ω at 20 °C (68 °F)

4. Tighten the screw ①.

Trim sensor cam screw ①:
2 N·m (0.2 kgf·m, 1.4 ft·lb)

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

⚠ WARNING

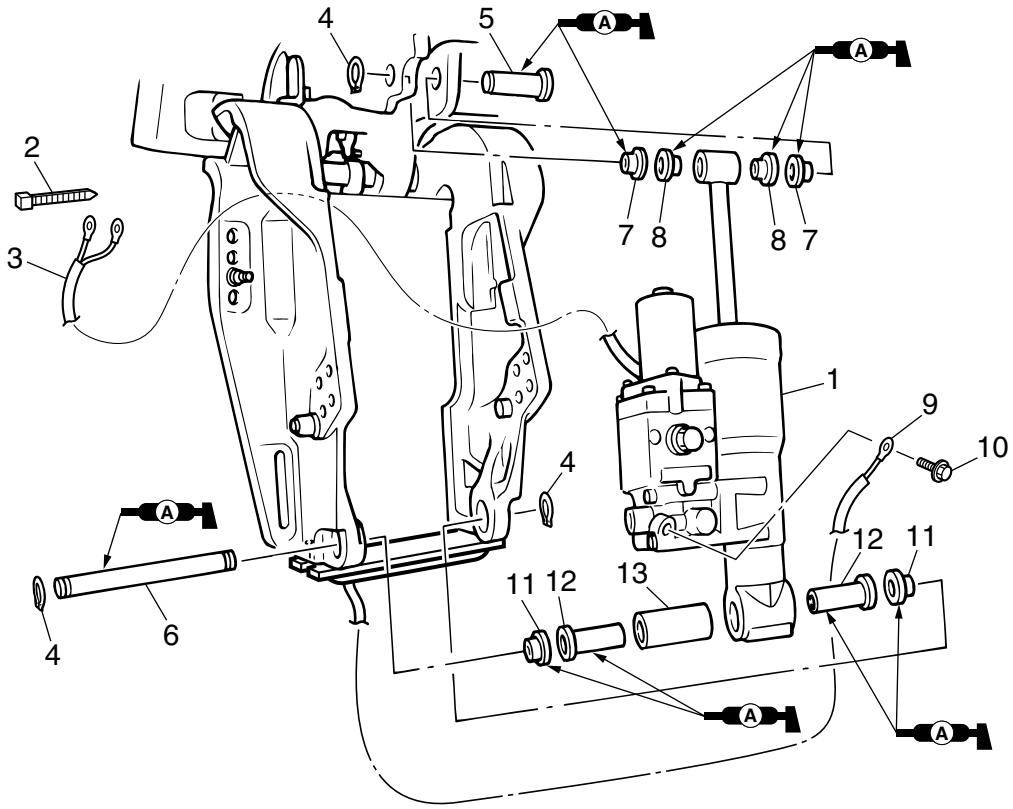
After tilting up the outboard motor, be sure to support it with the tilt stop lever. Otherwise, the outboard motor could suddenly lower if the power trim and tilt unit should lose fluid pressure.

6. Measure the trim sensor resistance. Check the trim sensor if out of specification.

Trim sensor resistance:
Pink (P) – Black (B)
238.8–378.8 Ω at 20 °C (68 °F)

7

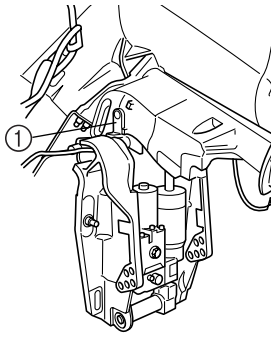
Power trim and tilt unit (F100C)



No.	Part name	Q'ty	Remarks
1	Power trim and tilt unit	1	
2	Plastic tie	3	**Not reusable**
3	PTT motor lead	2	
4	Circlip	3	
5	Shaft	1	
6	Shaft	1	
7	Bushing	2	
8	Bushing	2	
9	Ground lead	1	
10	Bolt	1	M6 × 10 mm
11	Bushing	2	
12	Bushing	2	
13	Spacer	1	

Removing the power trim and tilt unit

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



S60C7750

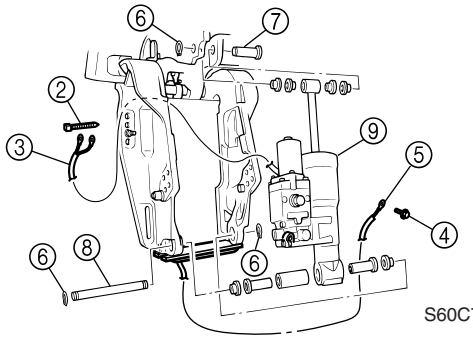
⚠ WARNING

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 power trim and tilt unit should lose fluid pressure.

NOTE:

If the power trim and tilt does not operate, loosen the manual valve and tilt the outboard motor up manually.

2. Loosen the plastic ties ②, and then pull out the PTT motor lead ③.
3. Remove the bolt ④ and disconnect the ground lead ⑤.
4. Remove the circlips ⑥, then shafts ⑦ and ⑧.
5. Remove the power trim and tilt unit ⑨.



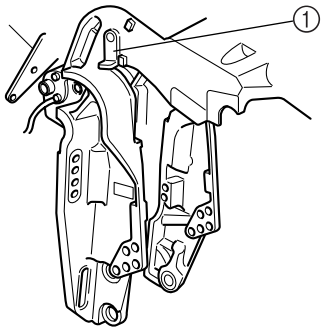
S60C7755

NOTE:

To remove the power trim and tilt unit, lower the tilt ram slightly.

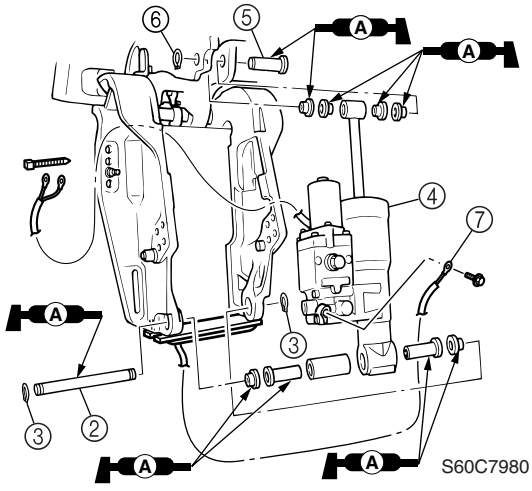
Installing the power trim and tilt unit

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



S60C7975

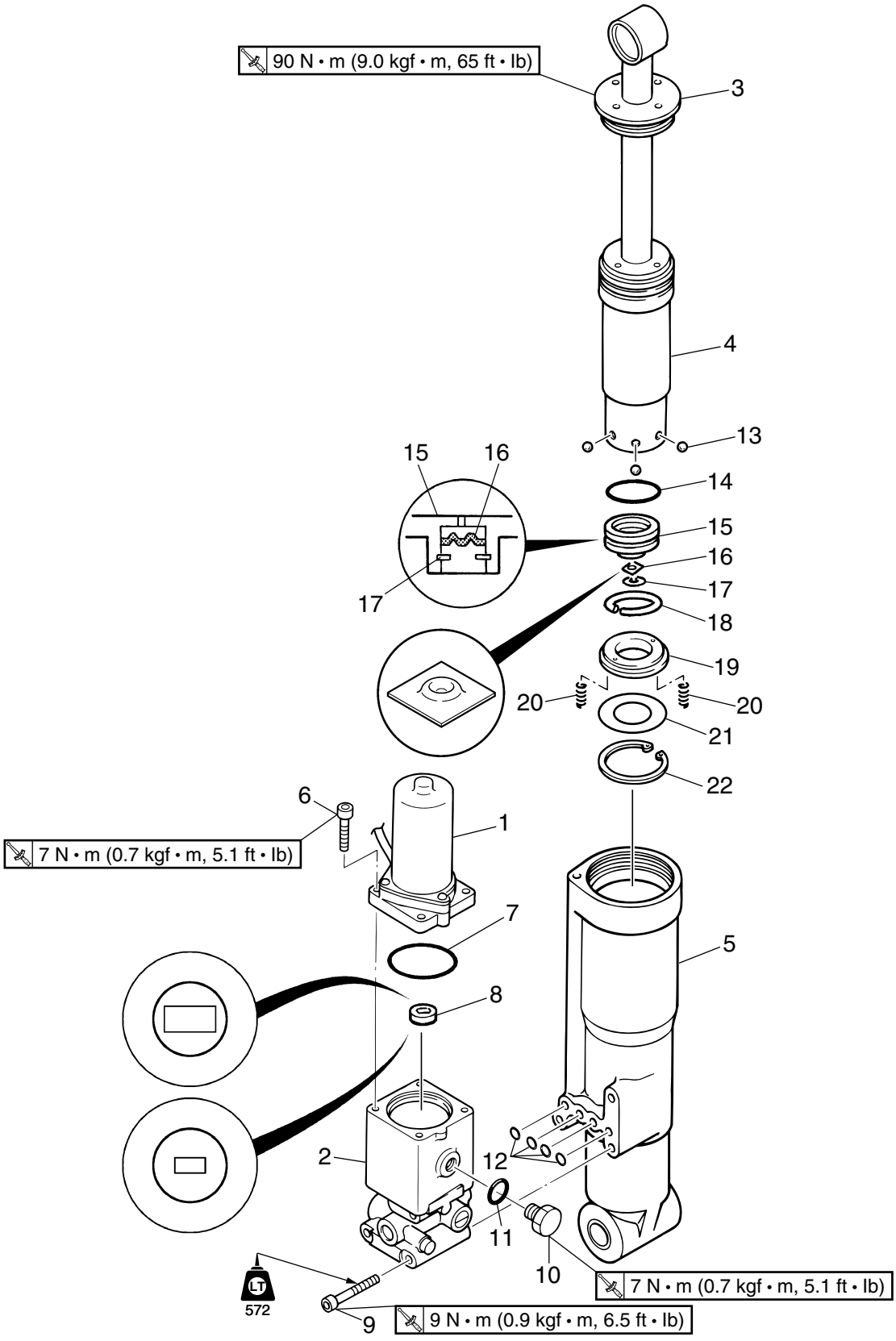
2. Install the shaft ② and circlips ③ onto both clamp brackets together with the power trim and tilt unit ④.
3. Install the tilt ram upper end into the swivel bracket with the shaft ⑤ and circlip ⑥.
4. Connect the ground lead ⑦.



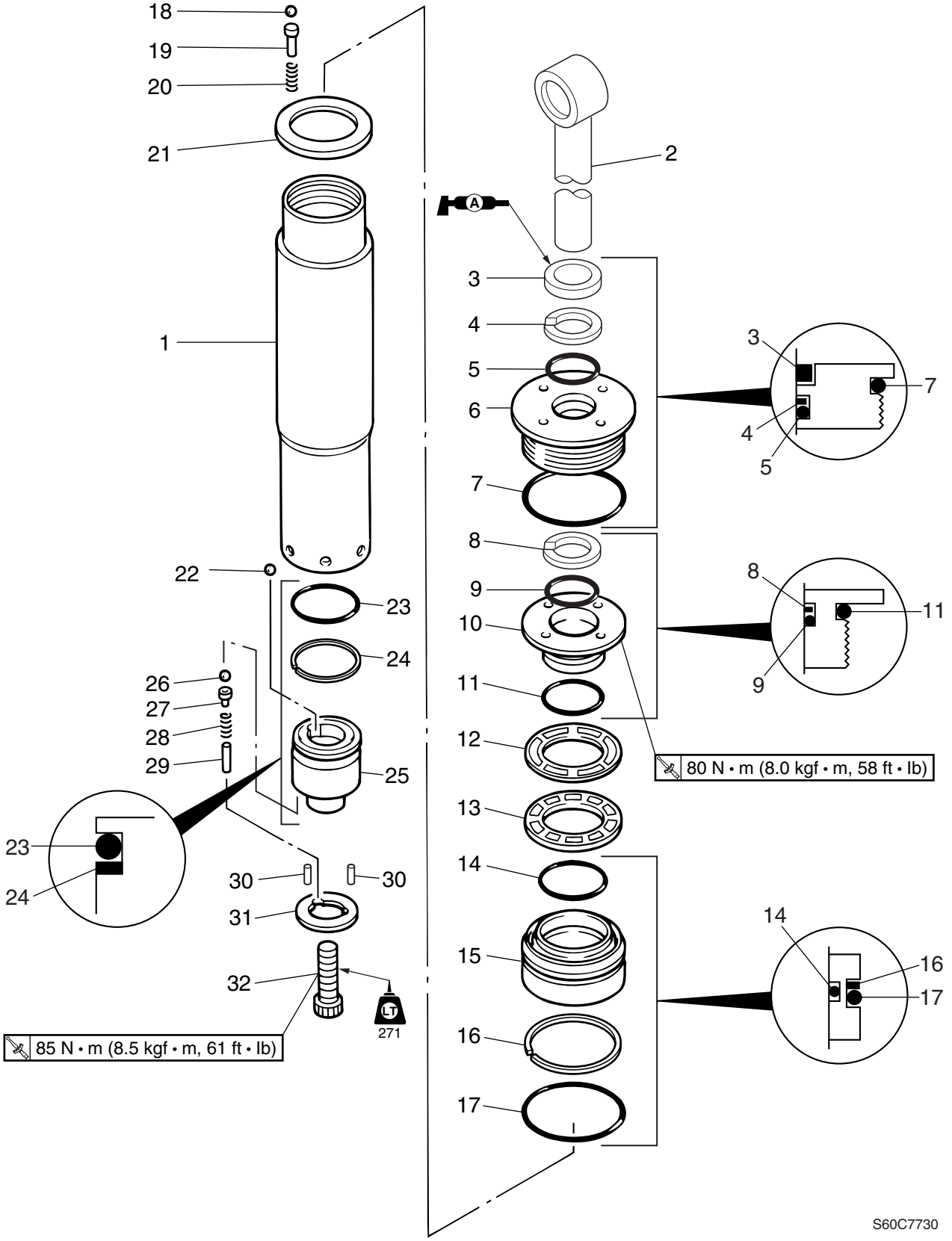
S60C7980

7

Tilt cylinder and trim cylinder (F100C)



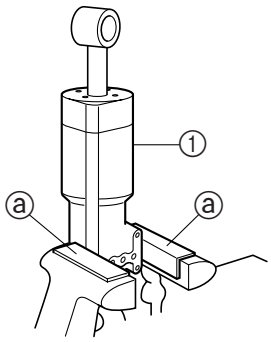
No.	Part name	Q'ty	Remarks
1	Power trim and tilt motor	1	
2	Pump housing assembly	1	
3	Tilt cylinder end screw	1	
4	Trim cylinder assembly	1	
5	Tilt cylinder assembly	1	
6	Bolt	4	M6 × 20 mm
7	O-ring	1	**Not reusable**
8	Joint	1	
9	Bolt	3	M6 × 75 mm
10	Reservoir cap	1	
11	O-ring	1	**Not reusable** 1.9 × 12.6 mm
12	O-ring	4	**Not reusable** 1.5 × 8.5 mm
13	Ball	6	
14	O-ring	1	**Not reusable**
15	Free piston	1	
16	Valve seal	1	
17	Circlip	1	
18	Circlip	1	**Not reusable**
19	Trim cylinder base	1	
20	Spring	2	
21	Plate	1	
22	Circlip	1	


18
19
20
21
1
22
23
24
26
27
28
29
25
23
24
30
30
31
32
LT
271
85 N • m (8.5 kgf • m, 61 ft • lb)
2
A
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
80 N • m (8.0 kgf • m, 58 ft • lb)
3
7
4
5
8
11
9
14
16
17
S60C7730

No.	Part name	Q'ty	Remarks
1	Trim cylinder	1	
2	Tilt ram	1	
3	Dust seal	1	**Not reusable**
4	Backup ring	1	
5	O-ring	1	**Not reusable** 2.4 × 22.6 mm
6	Tilt cylinder end screw	1	
7	O-ring	1	**Not reusable**
8	Backup ring	1	
9	O-ring	1	**Not reusable** 2.4 × 22.6 mm
10	Trim cylinder end screw	1	
11	O-ring	1	**Not reusable**
12	Plate	1	
13	Filter	1	
14	O-ring	1	**Not reusable**
15	Trim piston	1	
16	Backup ring	1	
17	O-ring	1	**Not reusable**
18	Ball	5	
19	Absorber valve pin	5	
20	Spring	5	
21	Plate	1	
22	Ball	1	
23	O-ring	1	**Not reusable** 3.5 × 35.7 mm
24	Backup ring	1	
25	Tilt piston	1	
26	Ball	4	
27	Absorber valve pin	4	
28	Spring	4	
29	Pin	4	
30	Pin	2	
31	Washer	1	
32	Bolt	1	M12 × 45 mm

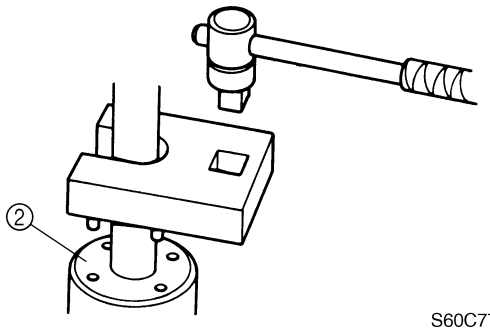
Disassembling the tilt cylinder

1. Hold the power trim and tilt unit ① in a vise using aluminum plates ⓐ on both sides.



S60C7760

2. Loosen the tilt cylinder end screw ②, and then remove it.



S60C7765

⚠ WARNING

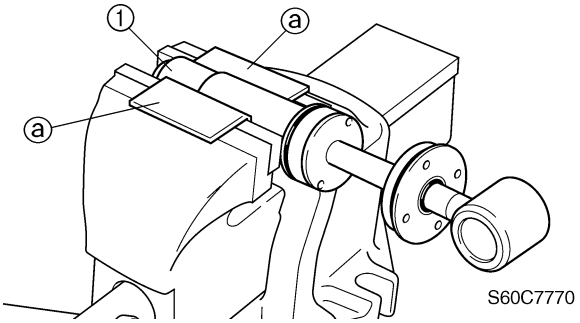
Make sure that the ram is fully extended before removing the end screw.

Cylinder-end screw wrench:
90890-06544

3. Drain the fluid.

Disassembling the trim cylinder

1. Hold the trim cylinder ① in a vise using aluminum plates ⓐ on both sides.

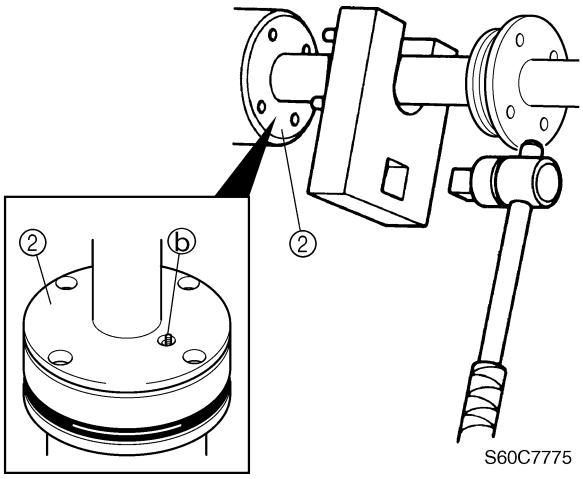


S60C7770

NOTE:

Place the trim cylinder in the vise horizontally.

2. Loosen the trim cylinder end screw ②, and then remove it.



S60C7775

CAUTION:

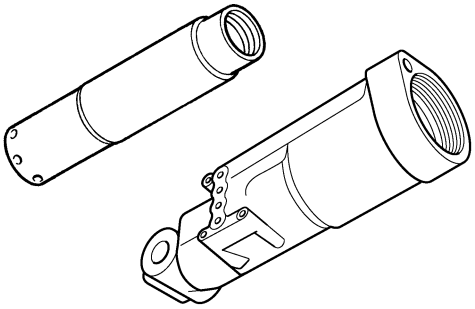
Do not damage the check valve ⓑ when loosening the end screw.

Cylinder-end screw wrench:
90890-06544

Checking the tilt cylinder and trim cylinder

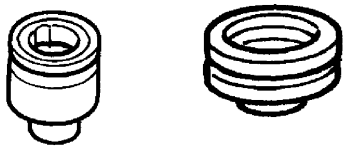
1. Check the power trim and tilt unit for cracks or corrosion. Replace if necessary.

2. Check the inner walls of the trim cylinder and tilt cylinder for scratches. Replace if necessary.



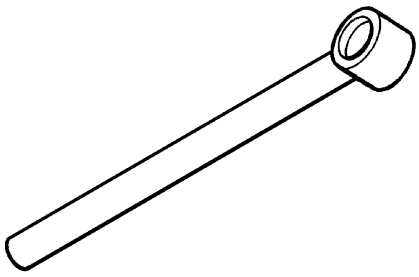
S60C7795

3. Check the outer surface of the tilt piston and free piston for scratches. Replace if necessary.



S60C7800

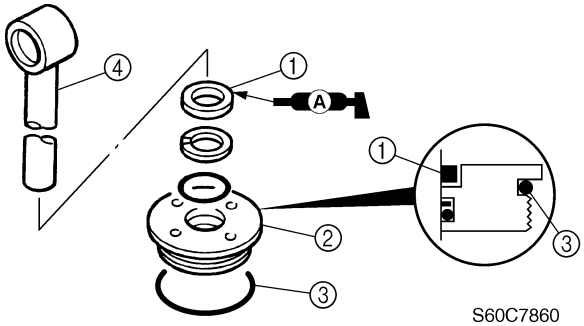
4. Check the tilt ram for bends or excessive corrosion. Polish with #400–600 grit sandpaper if there is light rust or replace if necessary.



S60C7805

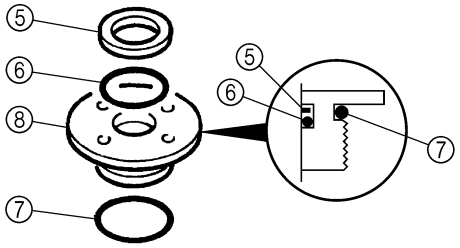
Assembling the trim cylinder

1. Install the new dust seal ① into the tilt cylinder end screw ②.
2. Install the O-ring ③ onto the end screw.
3. Install the tilt ram ④ into the end screw.



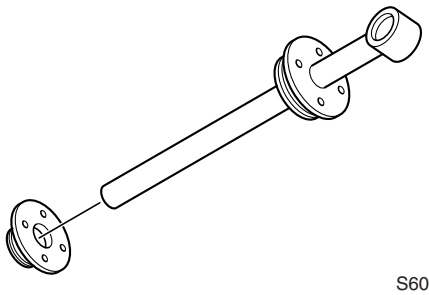
S60C7860

4. Install the backup ring ⑤ and O-rings ⑥ and ⑦ into the trim cylinder end screw ⑧.



S60C7865

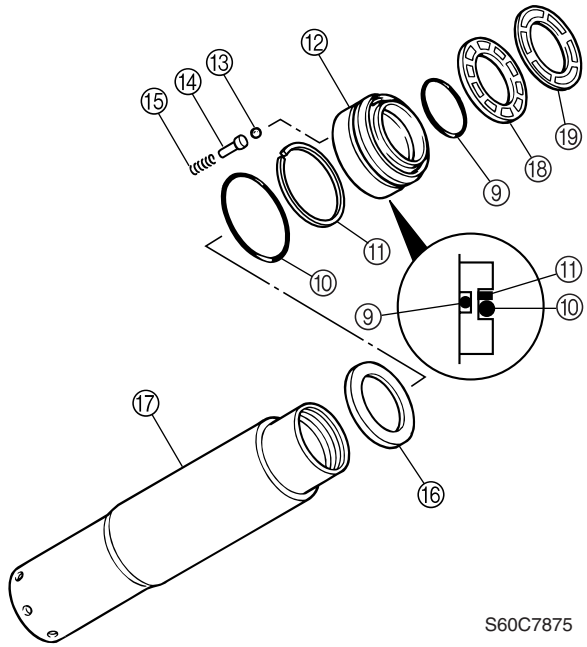
5. Install the trim cylinder end screw onto the tilt ram.



S60C7870

6. Install O-rings ⑨ and ⑩, and backup ring ⑪ onto the trim piston ⑫.
7. Install the balls ⑬, absorber valve pins ⑭ and springs ⑮ into the trim piston, and then install the plate ⑯ and trim piston to the trim cylinder ⑰.

8. Install the filter ⑱ and plate ⑲ to the trim cylinder.

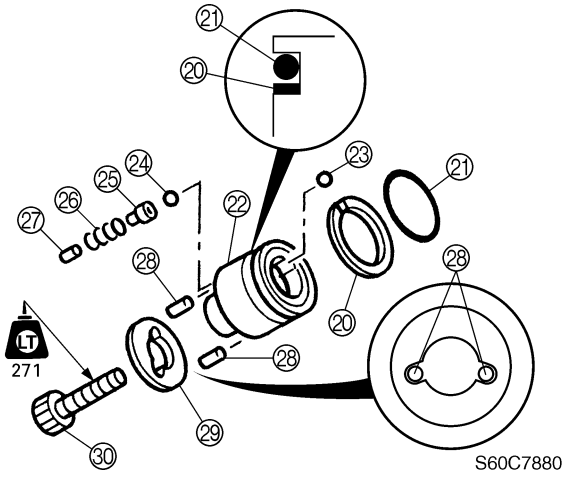


9. Install the backup ring ⑳ and O-ring ㉑ into the tilt piston ㉒.

10. Install balls ㉓ and ㉔, the absorber valve pin ㉕, springs ㉖, pins ㉗ and ㉘, and washer ㉙ into the tilt piston.

11. Hold the tilt ram end in a vise using aluminum plates on both sides.

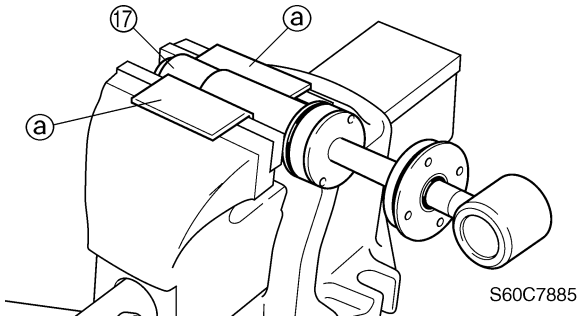
12. Install the tilt piston to the tilt ram by installing the bolt ㉚, then tightening it to the specified torque.



	Tilt piston ㉚: 85 N·m (8.5 kgf·m, 61 ft·lb)

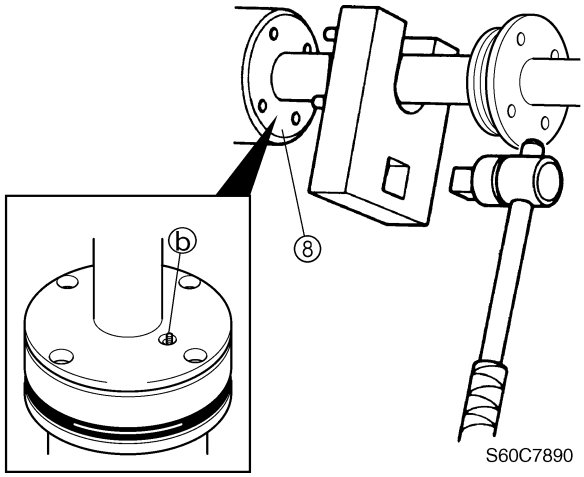
13. Install the trim cylinder onto the tilt ram.

14. Hold the trim cylinder ⑰ in a vise using aluminum plates ⓐ on both sides.



NOTE:
Place the trim cylinder in the vise horizontally.

15. Install the trim cylinder end screw ⑧, and then tighten it to the specified torque.



CAUTION:
Do not damage the check valve ⓑ when tightening the end screw.

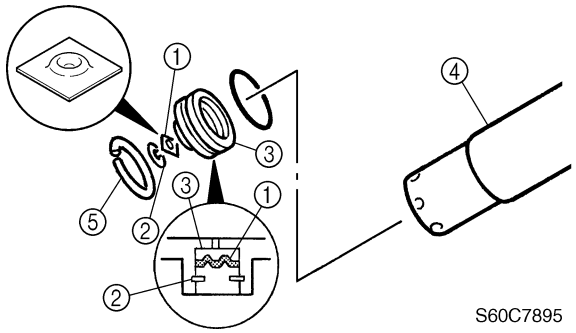
	Cylinder-end screw wrench: 90890-06544

Trim cylinder end screw ⑧:
80 N·m (8.0 kgf·m, 58 ft·lb)

Assembling the tilt cylinder

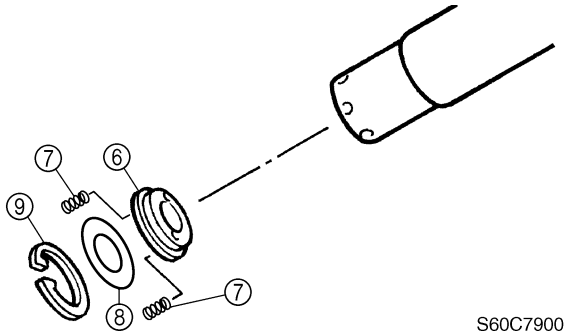
1. Install the valve seal ① and the circlip ② into the free piston ③ as shown.

2. Install the free piston into the trim cylinder ④ by installing the circlip ⑤.



S60C7895

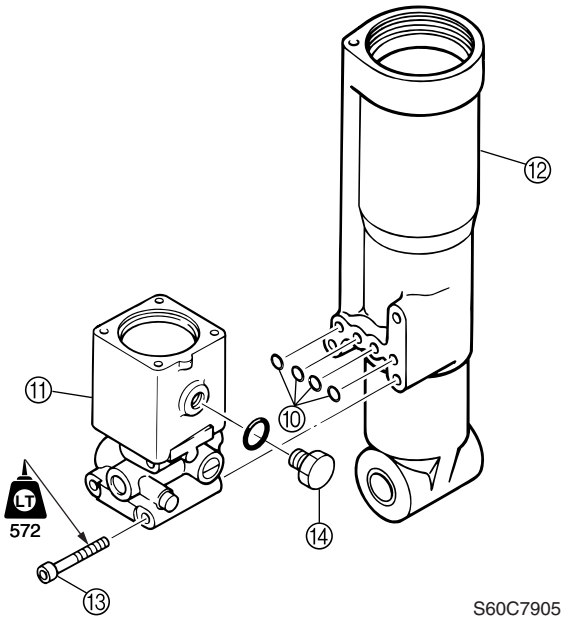
3. Install the trim cylinder base ⑥, springs ⑦, and plate ⑧ into the trim cylinder with the circlip ⑨.



S60C7900

4. Install the O-rings ⑩ and pump housing assembly ⑪ to the tilt cylinder ⑫ by installing the bolts ⑬, then tightening them to the specified torque.

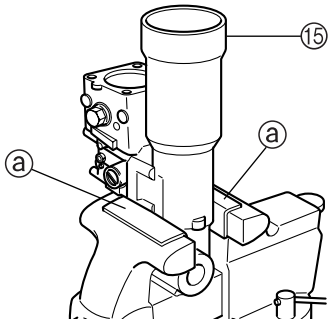
5. Install the reservoir cap ⑭ to the specified torque.



S60C7905

Pump housing bolt ⑬:
9 N·m (0.9 kgf·m, 6.5 ft·lb)
Reservoir cap ⑭:
7 N·m (0.7 kgf·m, 5.1 ft·lb)

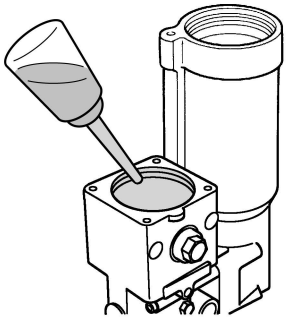
6. Hold the power trim ⑮ in a vise using aluminum plates ⓐ on both sides.



S60C7910

7

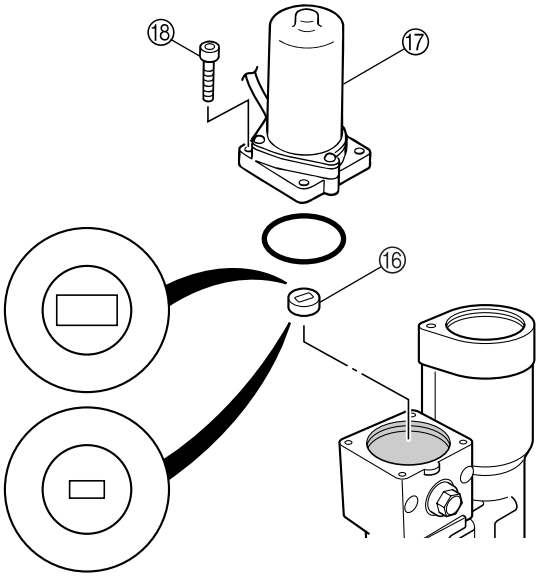
7. Fill the reservoir with the recommended fluid to the correct level as shown.



S60C7915

Recommended power trim and tilt fluid:
ATF Dexron II

8. Install the joint ⑯ and power trim and tilt motor ⑰ by installing the bolts ⑱, then tightening them to the specified torque.

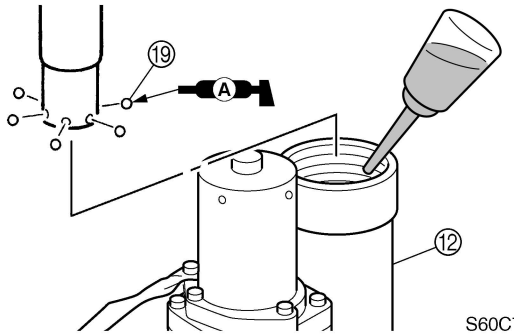


S60C7920

PTT motor bolt ⑱:
7 N·m (0.7 kgf·m, 5.1 ft·lb)

9. Add fluid of the recommended type to the first level at the bottom of the tilt cylinder ⑫.

10. Install the balls ⑲ into the trim cylinder, and then insert the trim cylinder into the tilt cylinder ⑫.

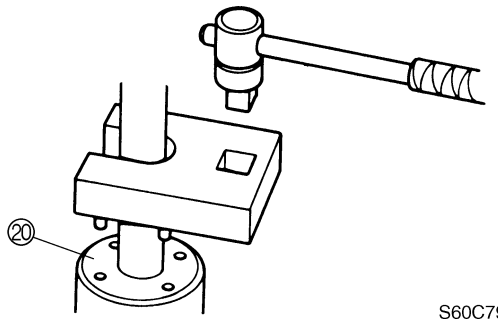


S60C7925

NOTE:
Apply grease to the balls to prevent them from falling out of the cylinder.

Recommended power trim and tilt fluid:
ATF Dexron II

11. Pull the tilt ram until it is fully extended, install the tilt cylinder end screw ⑳, and then tighten it to the specified torque.

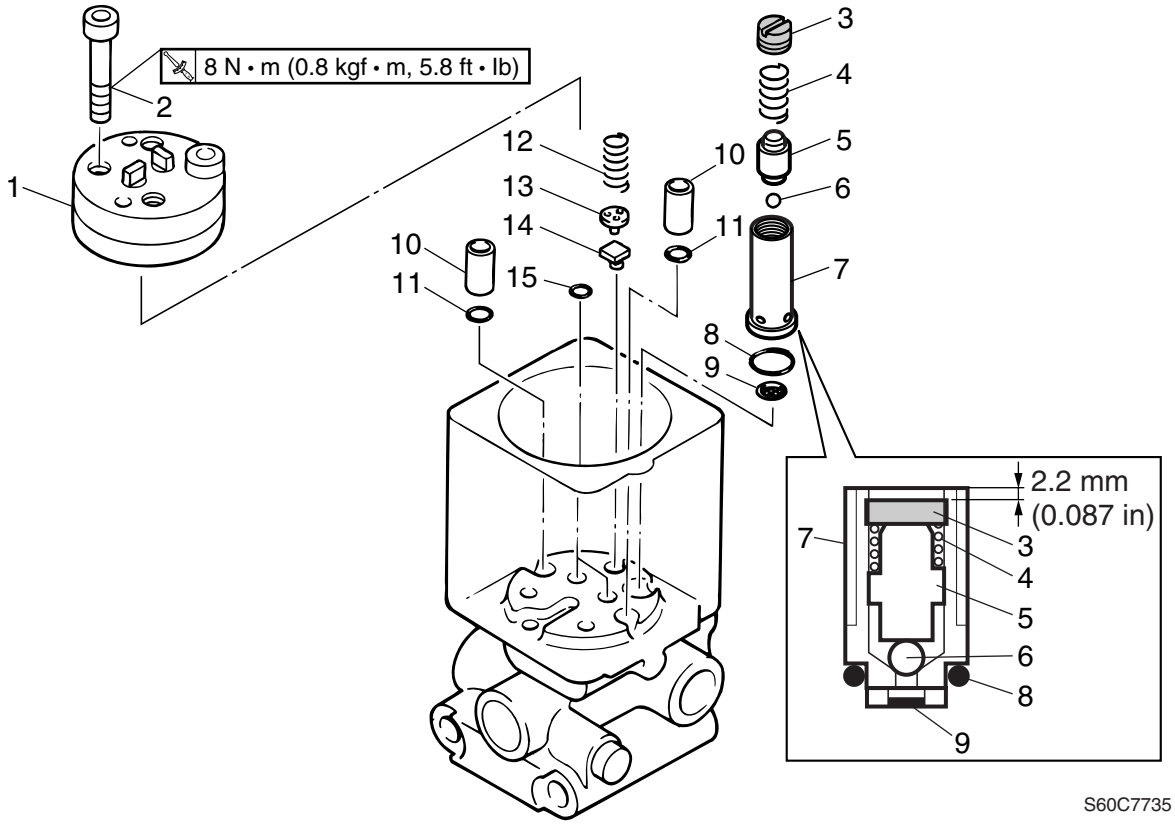


S60C7930

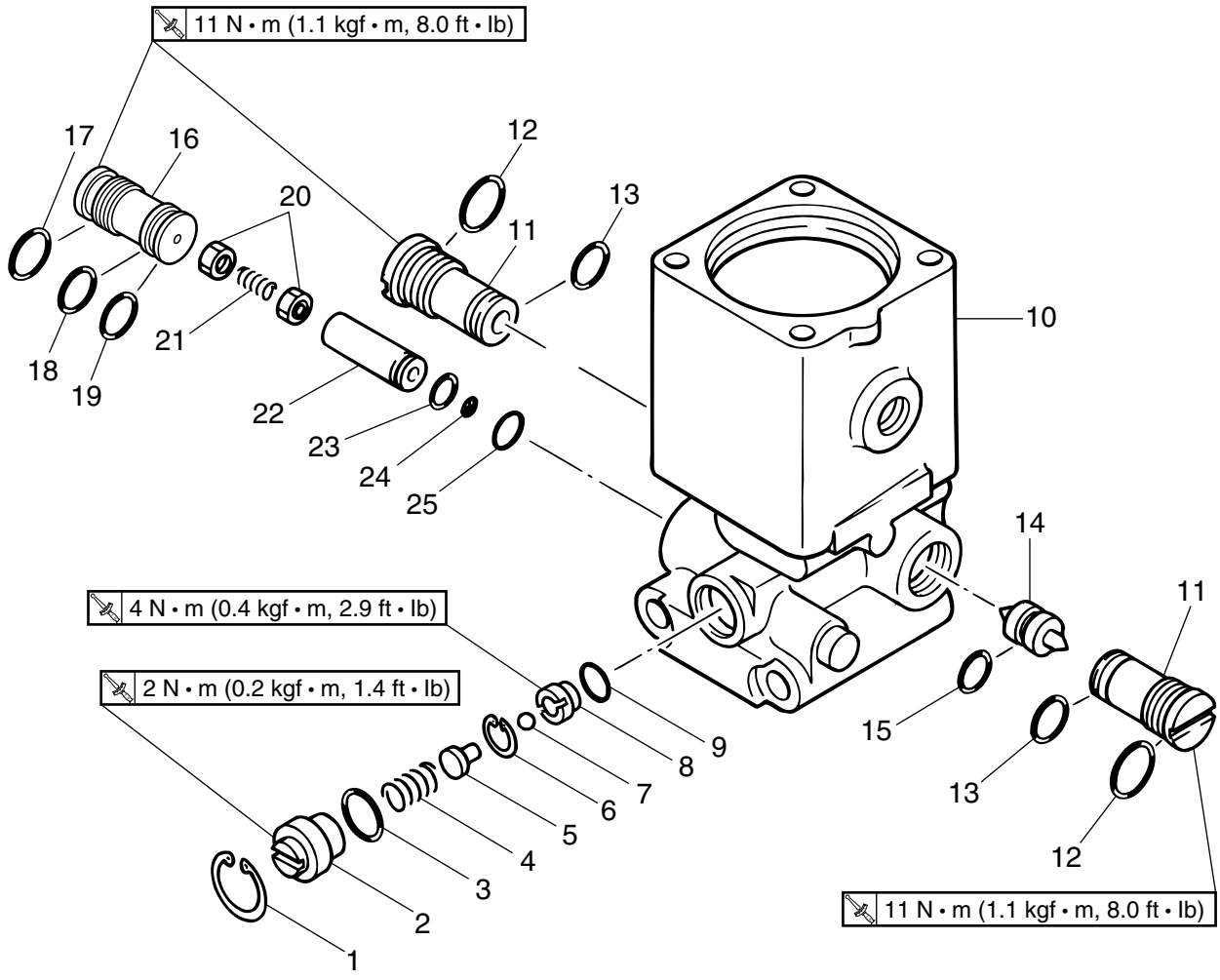
Cylinder-end screw wrench:
90890-06544

Tilt cylinder end screw ⑳:
90 N·m (9.0 kgf·m, 65 ft·lb)

Gear pump (F100C)



No.	Part name	Q'ty	Remarks
1	Gear pump	1	
2	Bolt	3	M6 × 35 mm
3	Cap	1	
4	Down-relief spring	1	
5	Absorber valve pin	1	
6	Ball	1	
7	Relief valve seat	1	
8	O-ring	1	**Not reusable** 1.5 × 13.7 mm
9	Filter	1	
10	Filter	2	
11	O-ring	2	**Not reusable**
12	Down-relief spring	1	
13	Valve support pin	1	
14	Relief valve seal	1	
15	O-ring	2	**Not reusable**

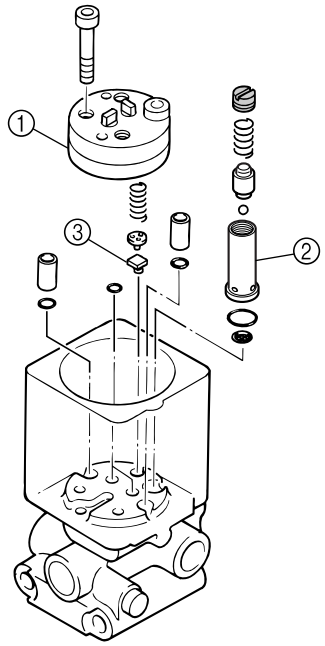

11 N • m (1.1 kgf • m, 8.0 ft • lb)
17
16
12
20
13
11
21
10
18
19
22
23
24
25
14
4 N • m (0.4 kgf • m, 2.9 ft • lb)
11
2 N • m (0.2 kgf • m, 1.4 ft • lb)
9
15
8
7
13
6
5
4
12
3
2
11 N • m (1.1 kgf • m, 8.0 ft • lb)
1

S60C7740

No.	Part name	Q'ty	Remarks
1	Circlip	1	
2	Manual valve	1	
3	O-ring	1	**Not reusable** 2.4 × 22.6 mm
4	Manual release spring	1	
5	Manual release pin	1	
6	Circlip	1	
7	Ball	1	
8	Manual valve seat	1	
9	O-ring	1	**Not reusable** 1.5 × 8.5 mm
10	Pump housing	1	
11	Main valve	2	
12	O-ring	2	**Not reusable**
13	O-ring	2	**Not reusable**
14	Shuttle piston	1	
15	O-ring	1	**Not reusable** 1.9 × 12.6 mm
16	Main valve	1	
17	O-ring	1	**Not reusable**
18	O-ring	1	**Not reusable**
19	O-ring	1	**Not reusable**
20	Valve seat	2	
21	Spring	1	
22	Relief valve seat	1	
23	O-ring	1	**Not reusable** 1.9 × 10.6 mm
24	Filter	1	
25	O-ring	1	**Not reusable** 1.9 × 9.6 mm

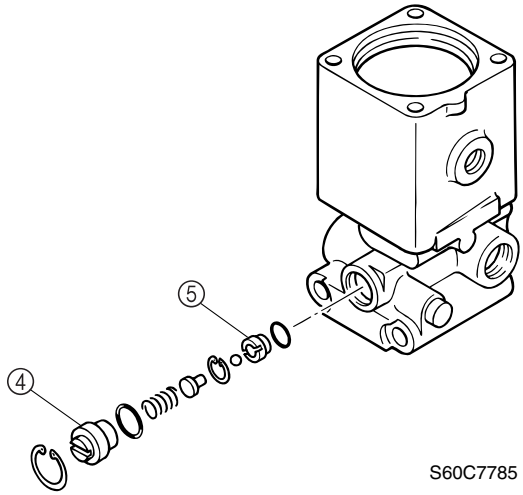
Disassembling the gear pump

1. Remove the gear pump ①.
2. Remove the relief valve seat ② and relief valve seal ③.



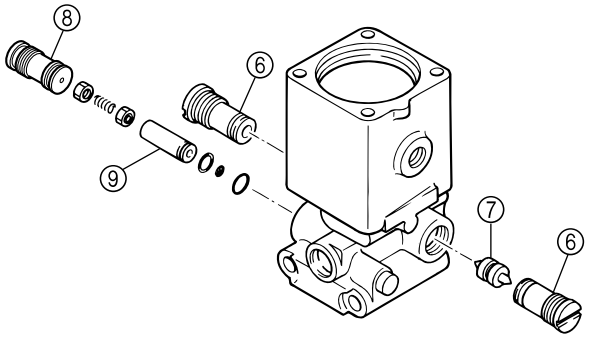
S60C7780

3. Remove the manual valve ④ and manual valve seat ⑤.



S60C7785

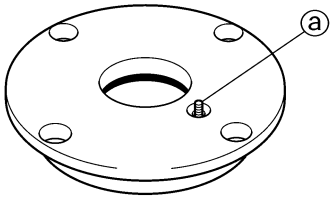
4. Remove the main valves ⑥ and shuttle piston ⑦.
5. Remove the main valve ⑧ and relief valve seat ⑨.



S60C7790

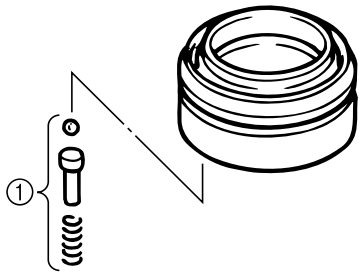
Checking the valves

1. Check the operation of the check valve ⓐ of the trim cylinder end screw and the valve for dirt or residue. Clean if necessary.

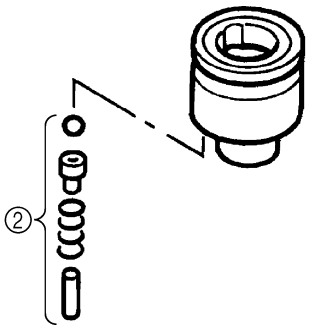


S60C7810

2. Check the operation of the trim piston absorber valves ① and tilt piston absorber valves ②, and the valves for dirt or residue. Clean if necessary.



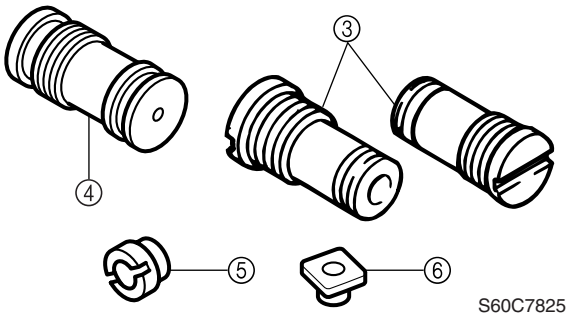
S60C7815



S60C7820

3. Check main valves ③ and ④ for dirt or residue. Clean if necessary.

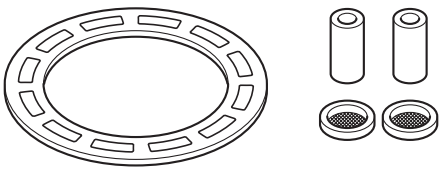
4. Check the manual valve seat ⑤ and relief valve seat ⑥ for dirt or residue. Clean if necessary.



S60C7825

Checking the filters

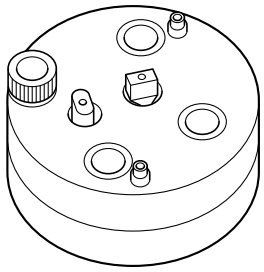
1. Check the filters for dirt or residue. Clean if necessary.



S60C7830

Checking the gear pump

1. Check the gear pump for damage. Replace if necessary.

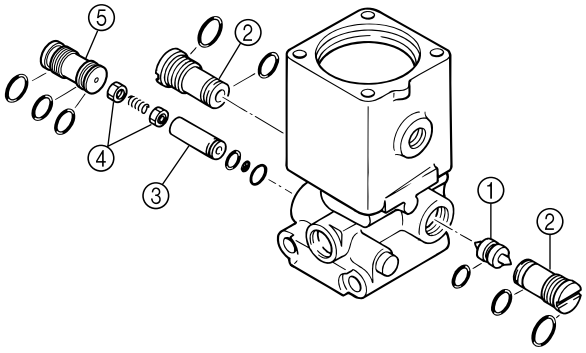


S60C7835

Assembling the gear pump

1. Install the shuttle piston ① and main valves ②, and then tighten the valves to the specified torque.

2. Install the relief valve seat ③, valve seats ④, and main valve ⑤, and then tighten the valve to the specified torque.



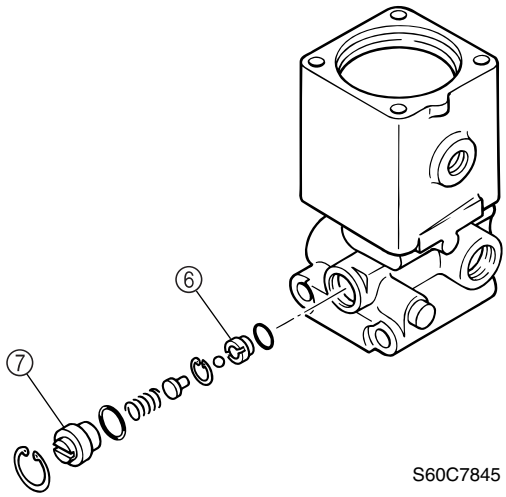
S60C7840

	Main valve ② and ⑤: 11 N·m (1.1 kgf·m, 8.0 ft·lb)

7

3. Install the manual valve seat ⑥, and then tighten it to the specified torque.

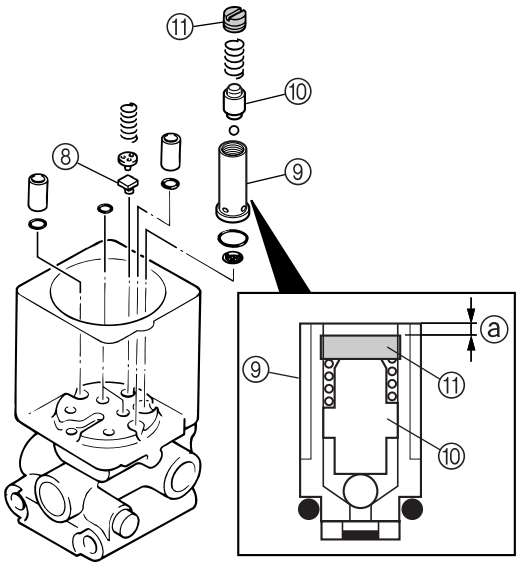
4. Install the manual valve ⑦, and then tightening it to the specified torque.



Manual valve seat ⑥:
4 N·m (0.4 kgf·m, 2.9 ft·lb)
Manual valve ⑦:
2 N·m (0.2 kgf·m, 1.4 ft·lb)

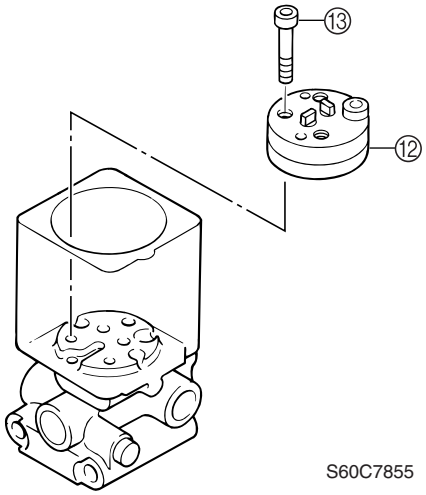
5. Install the relief valve seal ⑧, relief valve seat ⑨, and absorber valve pin ⑩.

6. Tighten the cap ⑪ into the relief valve seat to the specified depth ⓐ.



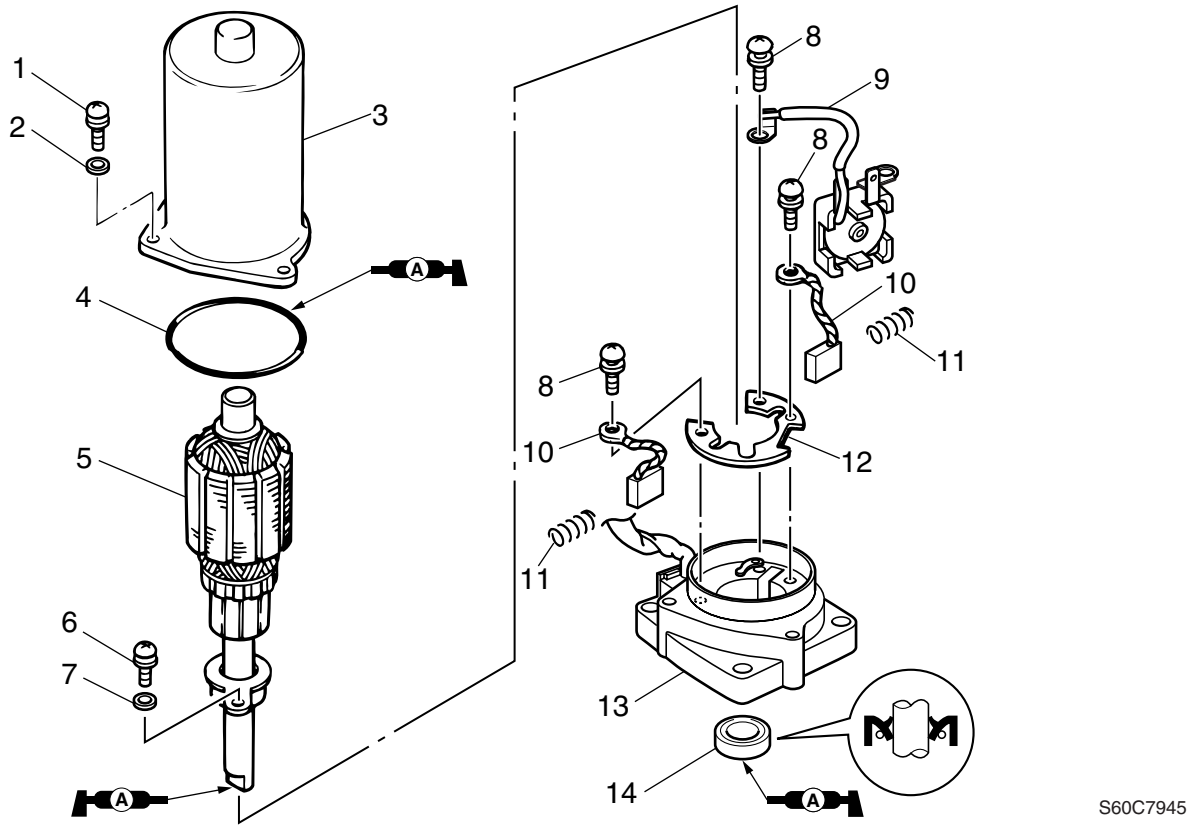
Depth ⓐ: 2.2 mm (0.087 in)

7. Install the gear pump ⑫ by installing the bolts ⑬, then tightening them to the specified torque.



Gear pump bolt ⑬:
8 N·m (0.8 kgf·m, 5.8 ft·lb)

Power trim and tilt motor (F100C)

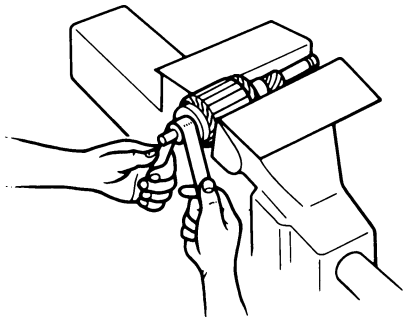


No.	Part name	Q'ty	Remarks
1	Screw	3	M5 × 12 mm
2	Washer	3	
3	Yoke	1	
4	O-ring	1	**Not reusable**
5	Armature	1	
6	Screw	1	M4 × 10 mm
7	Washer	1	
8	Screw	3	M4 × 10 mm
9	Circuit breaker	1	
10	Brush	2	
11	Brush spring	2	
12	Brush holder	1	
13	PTT motor base	1	
14	Oil seal	1	**Not reusable**

7

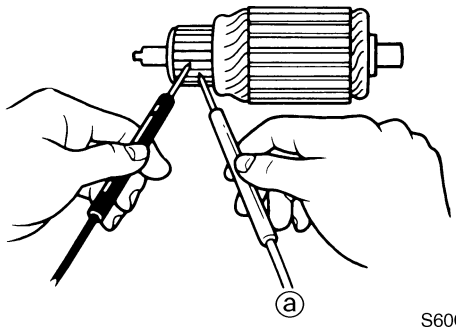
Checking the power trim and tilt motor

1. Check the commutator for dirt or foreign substances. Clean with #600 grit sandpaper if necessary.

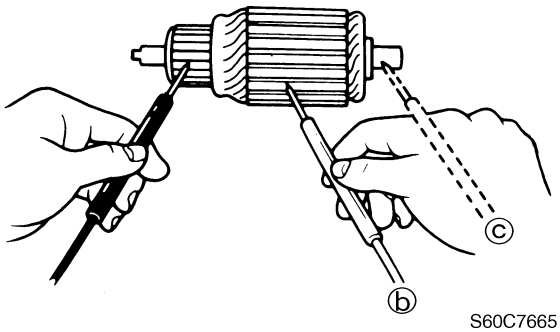

S60C7650

2. Check the commutator undercut for dirt or foreign substances. Clean with compressed air if necessary.

3. Check the armature coil for continuity. Replace if out of specifications.



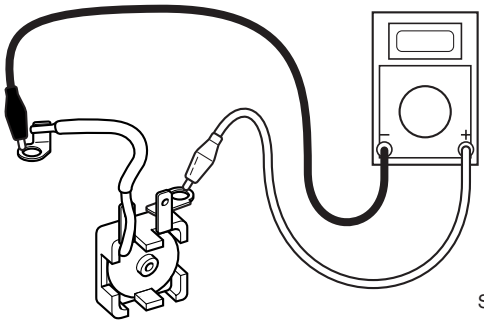
S60C7660



S60C7665

Armature coil continuity	
Commutator segments ⓐ	Continuity
Segment-laminations ⓑ	No continuity
Segment-shaft ⓒ	No continuity

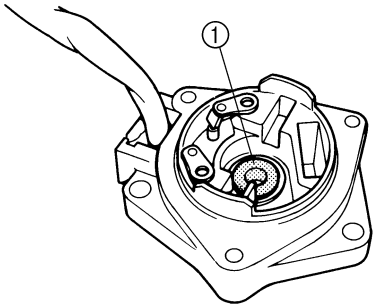
4. Check the circuit breaker for continuity. Replace if there is no continuity.



S60C7950

5. Check the base for cracks or damage. Replace if necessary.

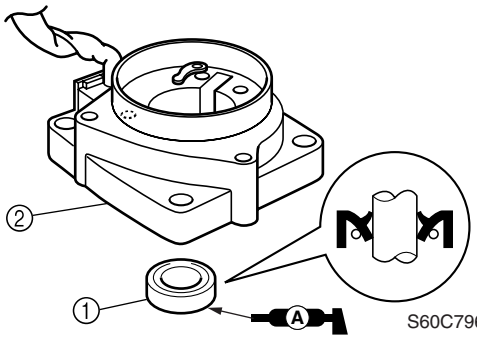
6. Check the oil seal ① for damage or wear. Replace if necessary.



S60C7960

Assembling the power trim and tilt motor

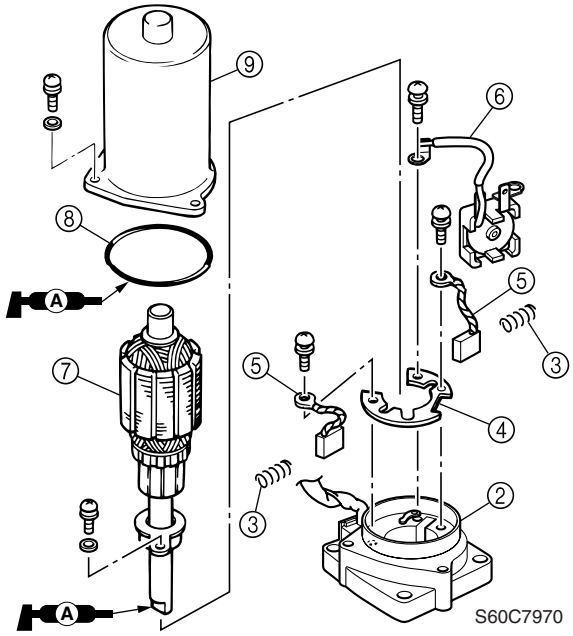
1. Install the oil seal ① into the motor base ② as shown.



S60C7965

2. Install the springs ③ into the motor base ②, then the brush holder ④ into the motor base together with the brushes ⑤ and circuit breaker ⑥.

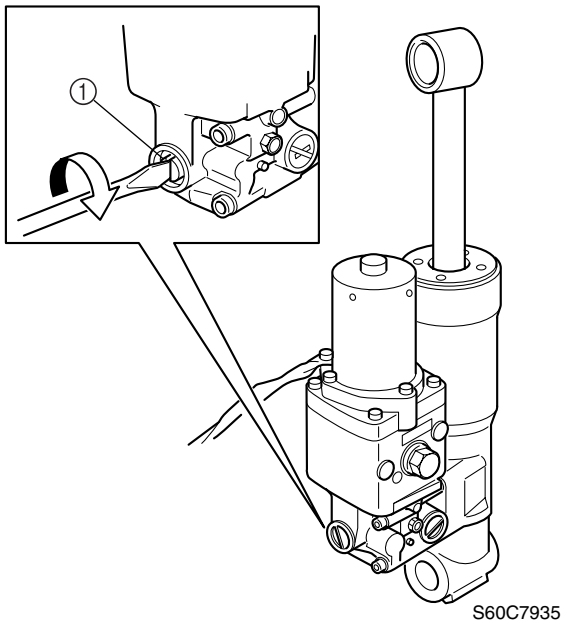
3. Install the armature ⑦, O-ring ⑧, and yoke ⑨.



Bleeding the power trim and tilt unit (F100C)

Not installed

1. Close the manual valve ① by turning it clockwise.



2. Place the power trim and tilt unit in an upright position.

3. Check the fluid level in the reservoir.

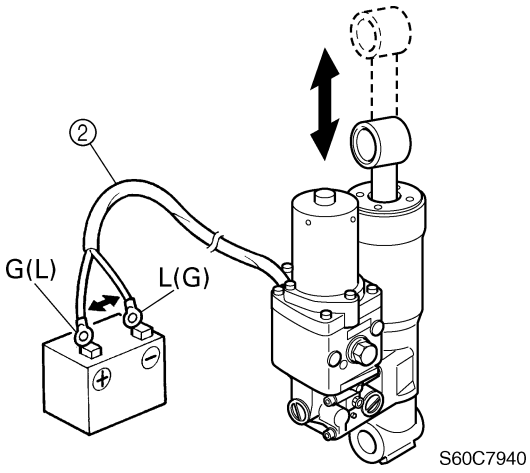
NOTE:
The fluid level should be at the brim of the filler hole.

4. If necessary, add sufficient fluid of the recommended type to the correct level.

Recommended power trim and tilt fluid:
ATF Dexron II

5. Install the reservoir cap.

6. Connect the PTT motor leads ② to the battery terminals.



Tilt ram	PTT motor lead	Battery terminal
Up	Blue (L)	⊕
	Green (G)	⊖
Down	Green (G)	⊕
	Blue (L)	⊖

7. Reverse the PTT motor leads between the battery terminals to fully extend the tilt ram, and then reverse them again to fully retract the ram.

7

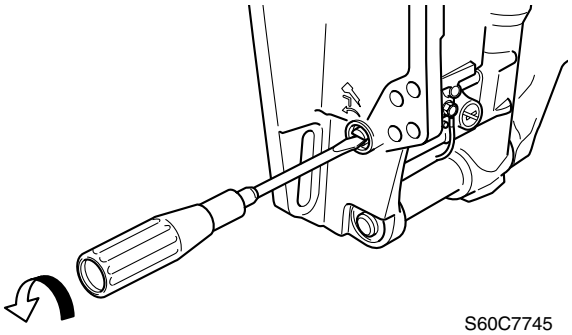
NOTE:
- Repeat this procedure so that the tilt ram goes up and down four to five times (be sure to wait a few seconds before switching the leads).
- The sound of the power trim and tilt motor will change when the tilt ram is fully extended.

8. Check the fluid level again when the tilt ram is fully extended. Add sufficient fluid, if necessary, and then repeat step 7.

NOTE:
Repeat this procedure until the fluid remains at the correct level.

Built-in

1. Loosen the manual valve by turning it counterclockwise until it cannot be turned further.


S60C7745

2. Fully tilt the outboard motor up, and then release it and let it lower by its own weight four to five times.

3. Tighten the manual valve by turning it clockwise.

4. Let the fluid settle for 5 minutes.

5. Push and hold the power trim and tilt switch in the up position until the outboard motor is fully tilted up.

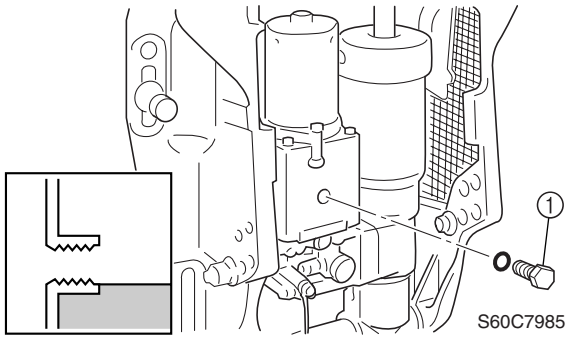
6. Support the outboard motor with the tilt stop lever, and then let the fluid settle for 5 minutes.

⚠ 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 power trim and tilt unit should lose fluid pressure.

7. Remove the reservoir cap ①, and then check the fluid level in the reservoir.

8. If necessary, add sufficient fluid of the recommended type to the correct level.



S60C7985

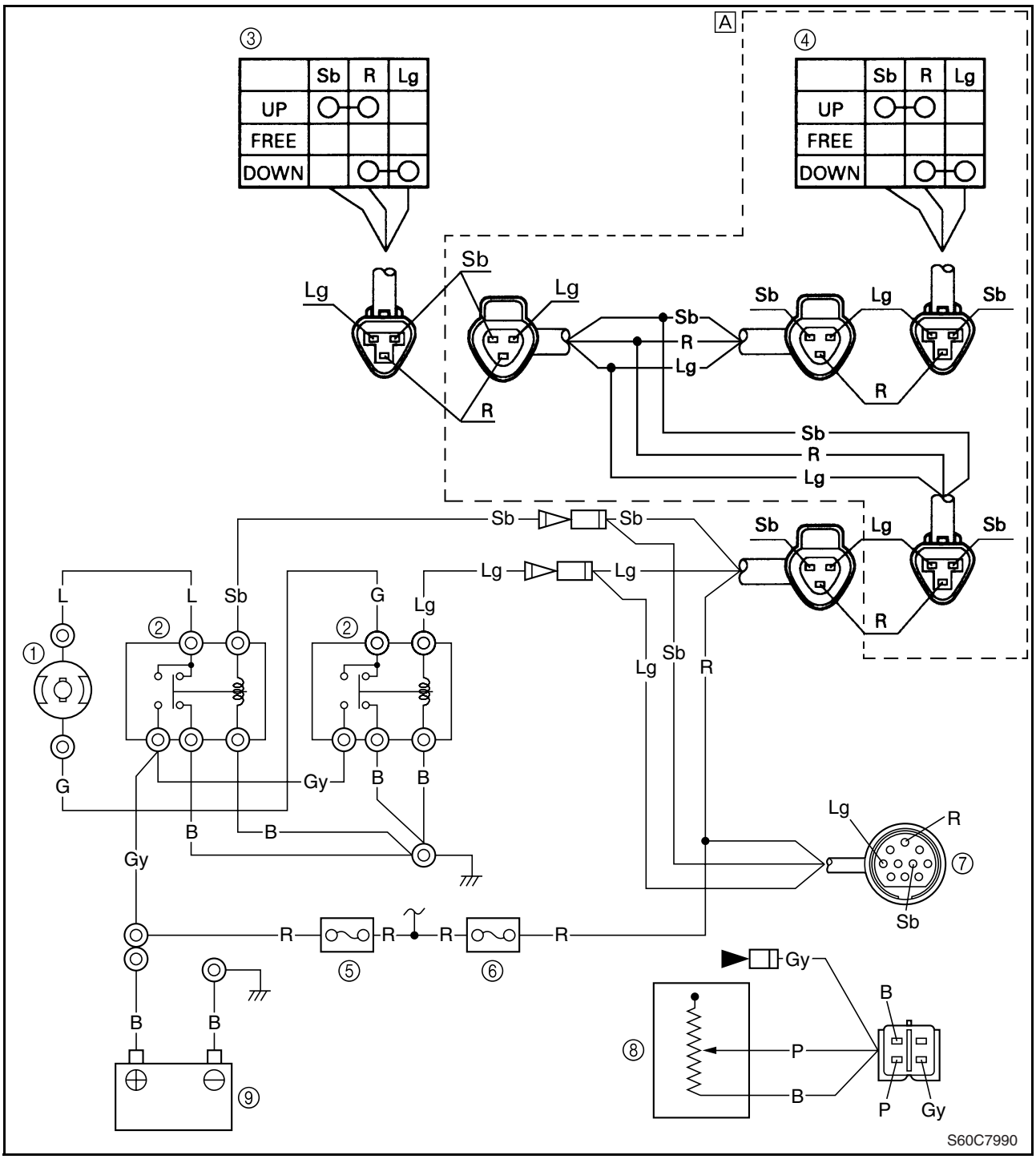
NOTE:
The fluid level should be at the brim of the filler hole.

Recommended power trim and tilt fluid:
ATF Dexron II

9. Install the reservoir cap.

NOTE:
Repeat this procedure until the fluid remains at the correct level.

Power trim and tilt electrical system



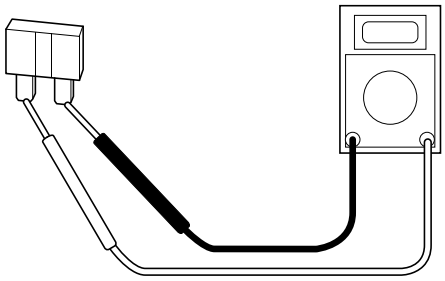
① Power trim and tilt motor
② Power trim and tilt relay
③ Trailer switch
④ Power trim and tilt switch
⑤ Fuse (30 A)
⑥ Fuse (20 A)
⑦ 10-P coupler
⑧ Trim sensor
⑨ Battery

A Tiller handle model

B : Black
G : Green
Gy : Gray
L : Blue
Lg : Light green
P : Pink
R : Red
Sb : Sky blue

Checking the fuse

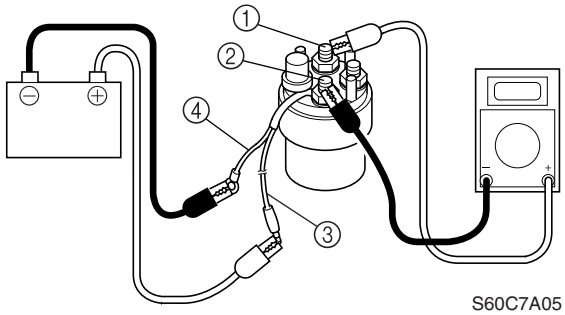
1. Check the fuse for continuity. Replace if there is no continuity.



S60C7995

Checking the power trim and tilt relay

1. Connect the digital circuit tester between power trim and tilt relay terminals ① and ②.
2. Connect the light green (Lg) lead or sky blue (Sb) lead ③ to the positive battery terminal and the black (B) lead ④ to the negative battery terminal as shown.
3. Check for continuity between terminals ① and ②. Replace if there is no continuity.
4. Disconnect the black (B) lead ④. Check for continuity between terminals ① and ②. Replace if there is continuity.



S60C7A05

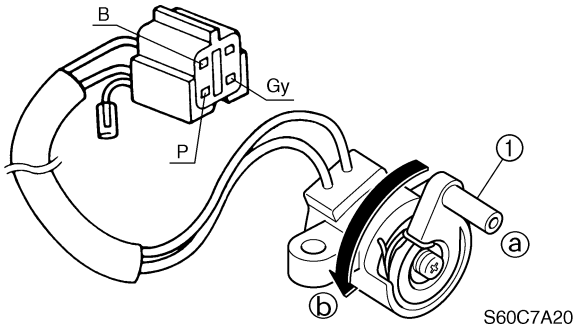
Checking the power trim and tilt switch/trailer switch

1. Check the power trim and tilt switch/trailer switch for continuity. Replace if out of specification.

	Lead color		
Switch position	Sky blue (Sb)	Red (R)	Light green (Lg)
Up	○	○	
Free			
Down		○	○

Checking the trim sensor

1. Measure the trim sensor resistance. Replace if out of specification.



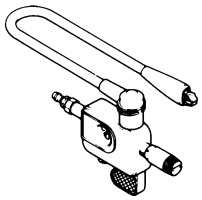
S60C7A20

Trim sensor resistance:
Pink (P) – Black (B)
9–11 Ω at 20 °C (68 °F) ⓐ
238.8–378.8 Ω at 20 °C (68 °F) ⓑ

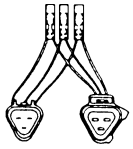
NOTE:
Turn the lever ① and measure the resistance as it gradually changes.

Electrical systems

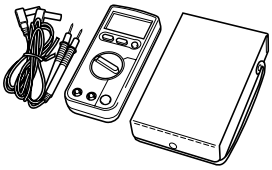
Special service tools



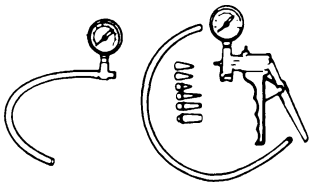
Ignition tester
90890-06754



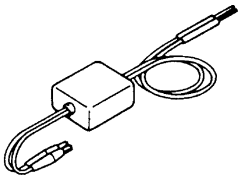
Test harness (3 pins)
90890-06757



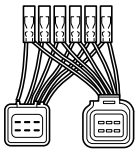
Digital circuit tester
90890-03174



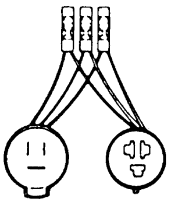
Vacuum/pressure pump gauge set
90890-06756



Peak voltage adaptor
90890-03172



Test harness (6 pins)
90890-06772



Test harness (3 pins)
90890-06770

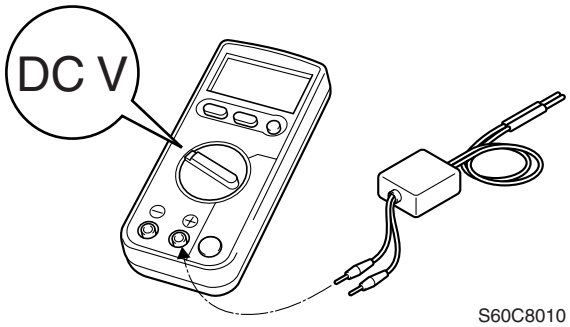
Checking the electrical components

Measuring the peak voltage

NOTE:

Before troubleshooting the peak voltage, check that all electrical connections are tight and free from corrosion, and that the battery is fully charged to 12 V.

The condition of the ignition system can be determined by measuring the peak voltage. Cranking speed is effected by many factors, such as fouled or weak spark plugs, or a weak battery. If one of these factors is present, the peak voltage will be lower than specification. In addition, if the peak voltage is lower than specification the engine will not operate properly.



S60C8010

⚠ WARNING

When checking the peak voltage, do not touch any of the connections of the digital tester leads.

NOTE:

- Use the peak voltage adaptor with the digital circuit tester.
- When measuring the peak voltage, set the selector on the digital circuit tester to the **DC voltage mode**.
- Connect the positive pin on the peak voltage adaptor to the positive terminal of the digital circuit tester.

Measuring the lower resistance

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

Correct value =
displayed measurement – internal resistance

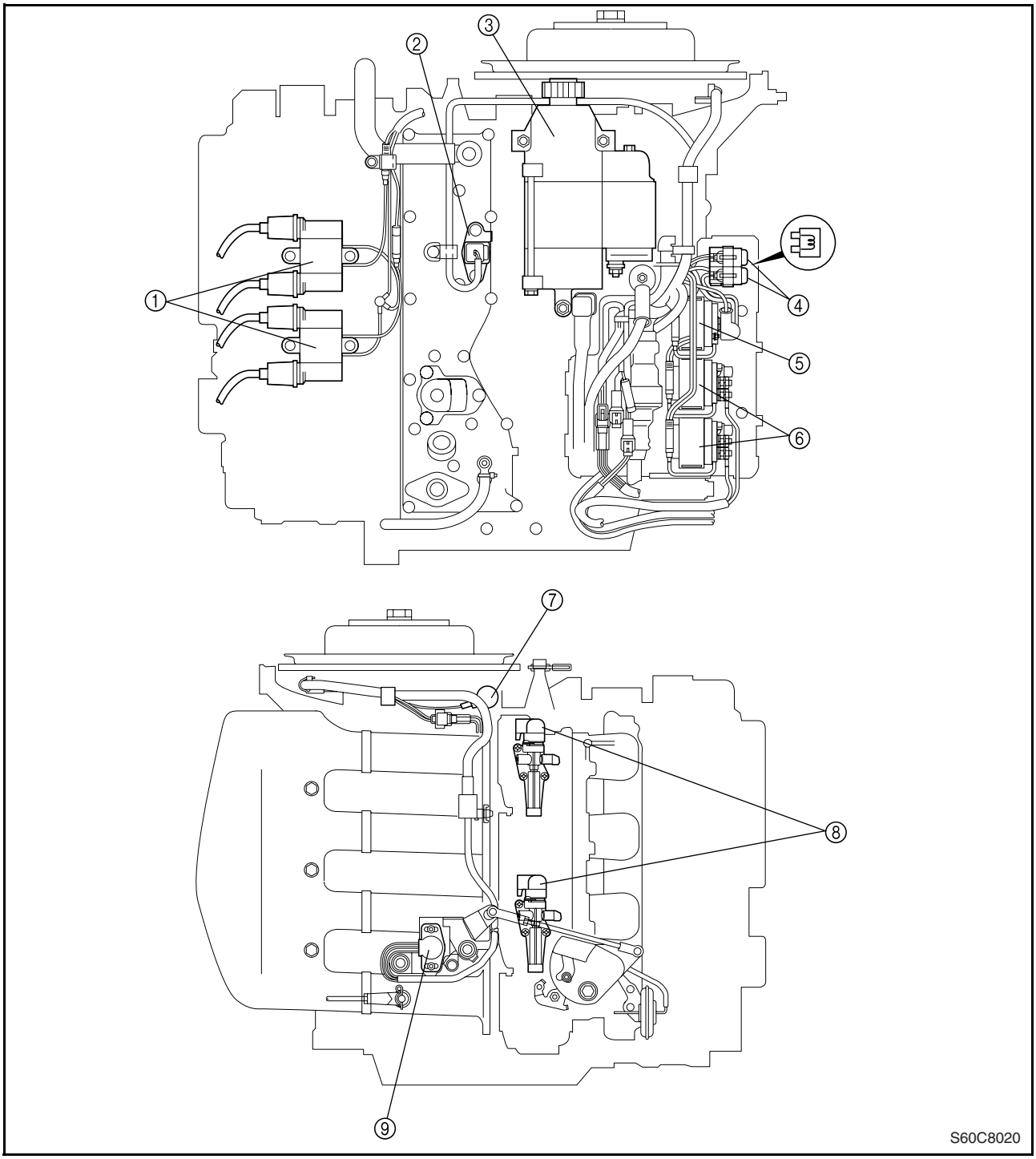
NOTE:

Obtain the internal resistance of the digital circuit tester by connecting both of its probes and checking the display.

8

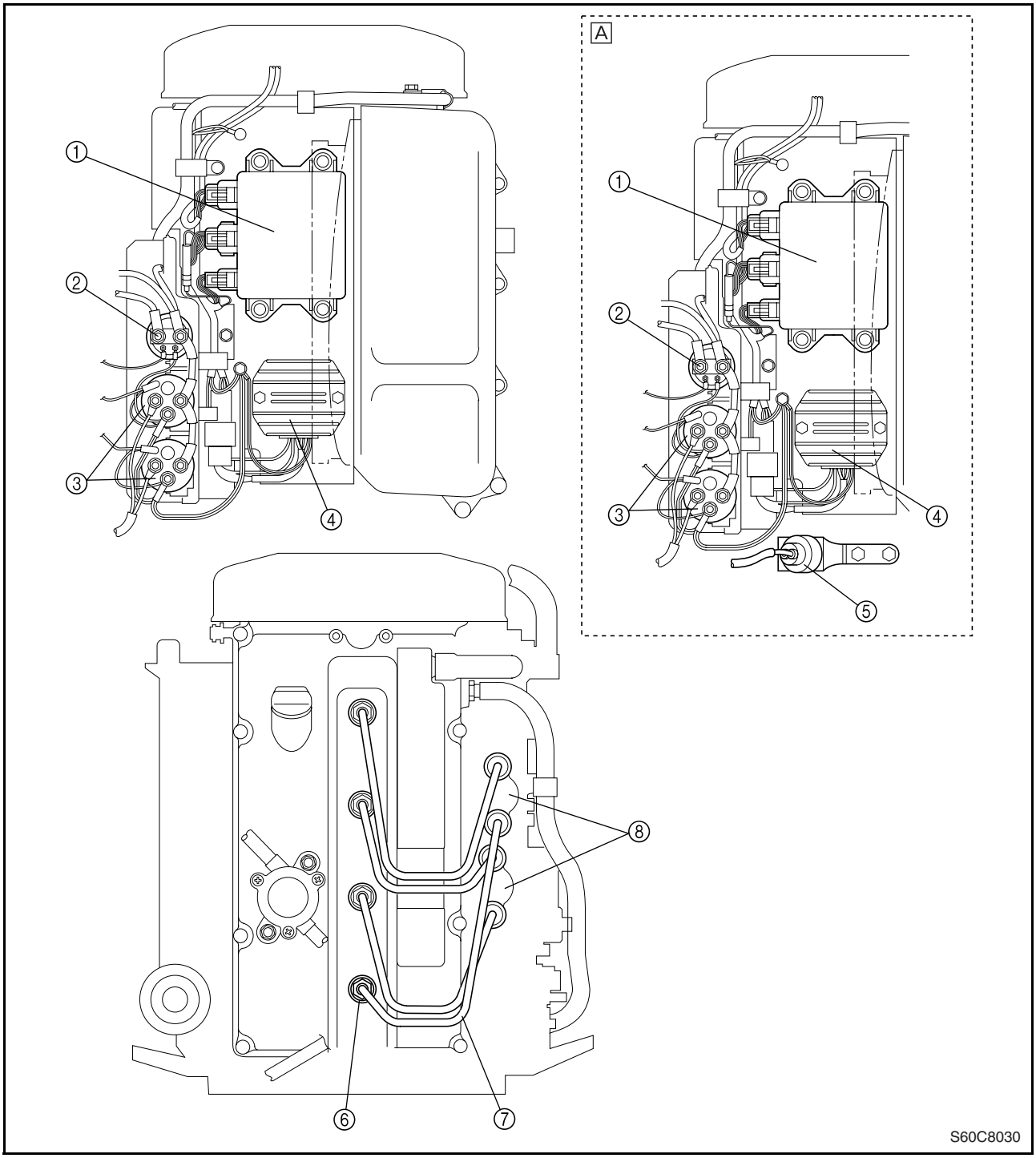
Electrical components

Starboard and port views



① Ignition coils
② Thermo sensor
③ Starter motor
④ Fuse
⑤ Starter relay
⑥ Power trim and tilt relays
⑦ Oil pressure switch
⑧ Prime Start
⑨ Throttle position sensor

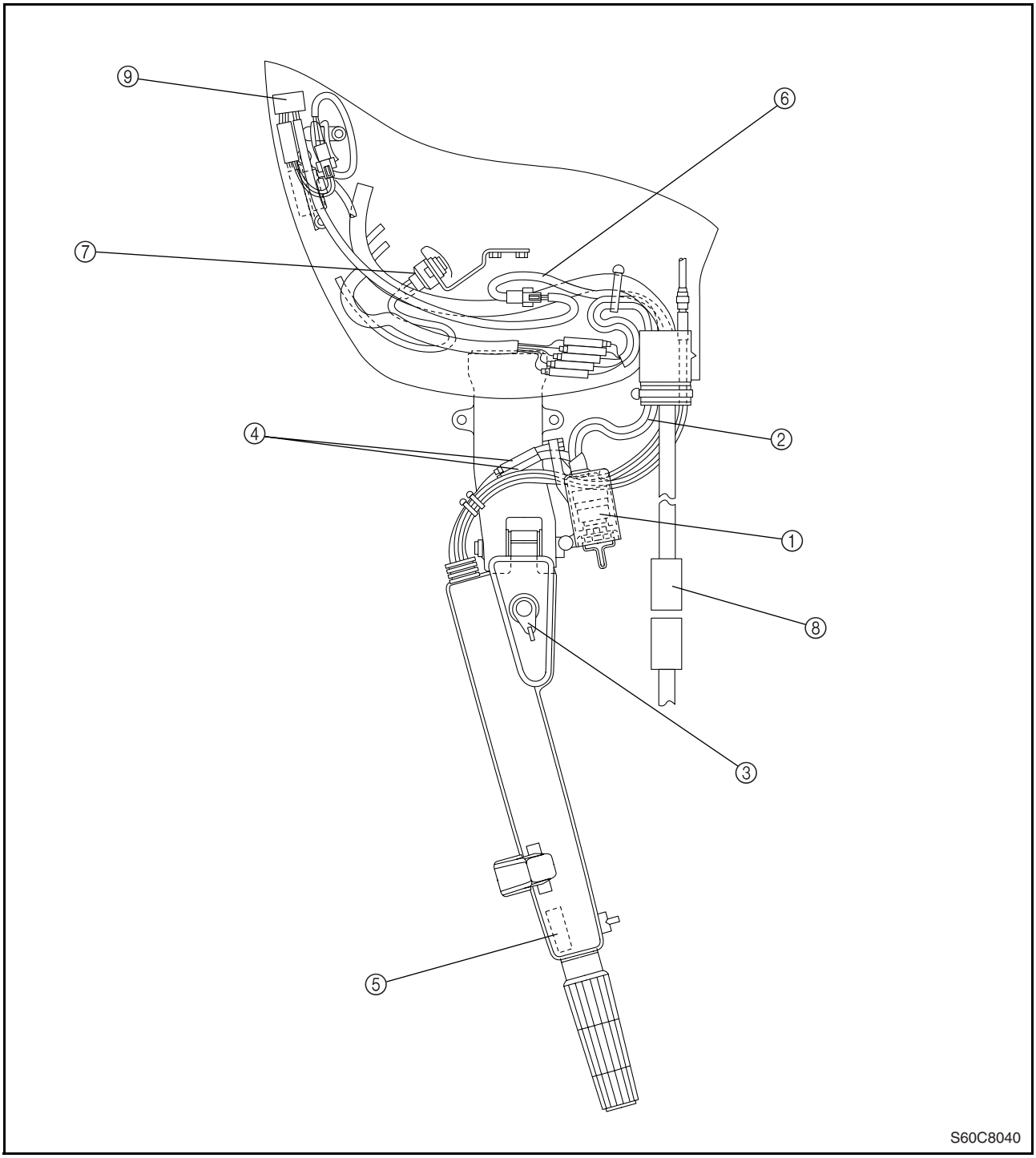
Front and rear views



① CDI unit
② Starter relay
③ Power trim and tilt relays
④ Rectifier Regulator
⑤ Neutral switch (tiller handle model)
⑥ Spark plug
⑦ High-tension cords
⑧ Ignition coils

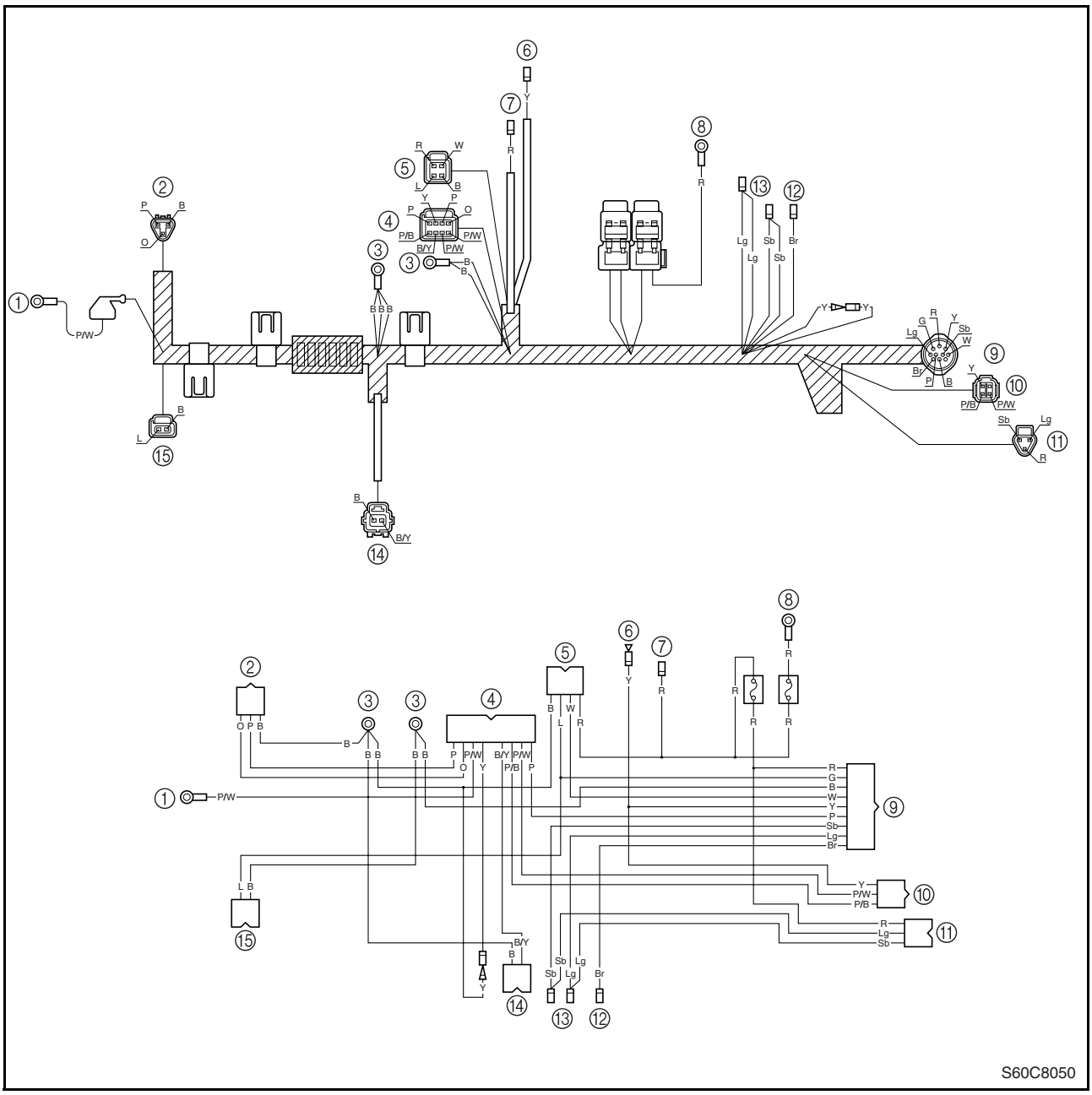
Ⓐ Tiller handle model

Tiller handle model



① Engine start switch
② Engine start switch harness
③ Engine shut-off switch
④ Engine shut-off switch connector
⑤ Power trim and tilt switch
⑥ PTT switch lead
⑦ Neutral switch
⑧ Wiring harness extension
⑨ Connector assembly

Wiring harness

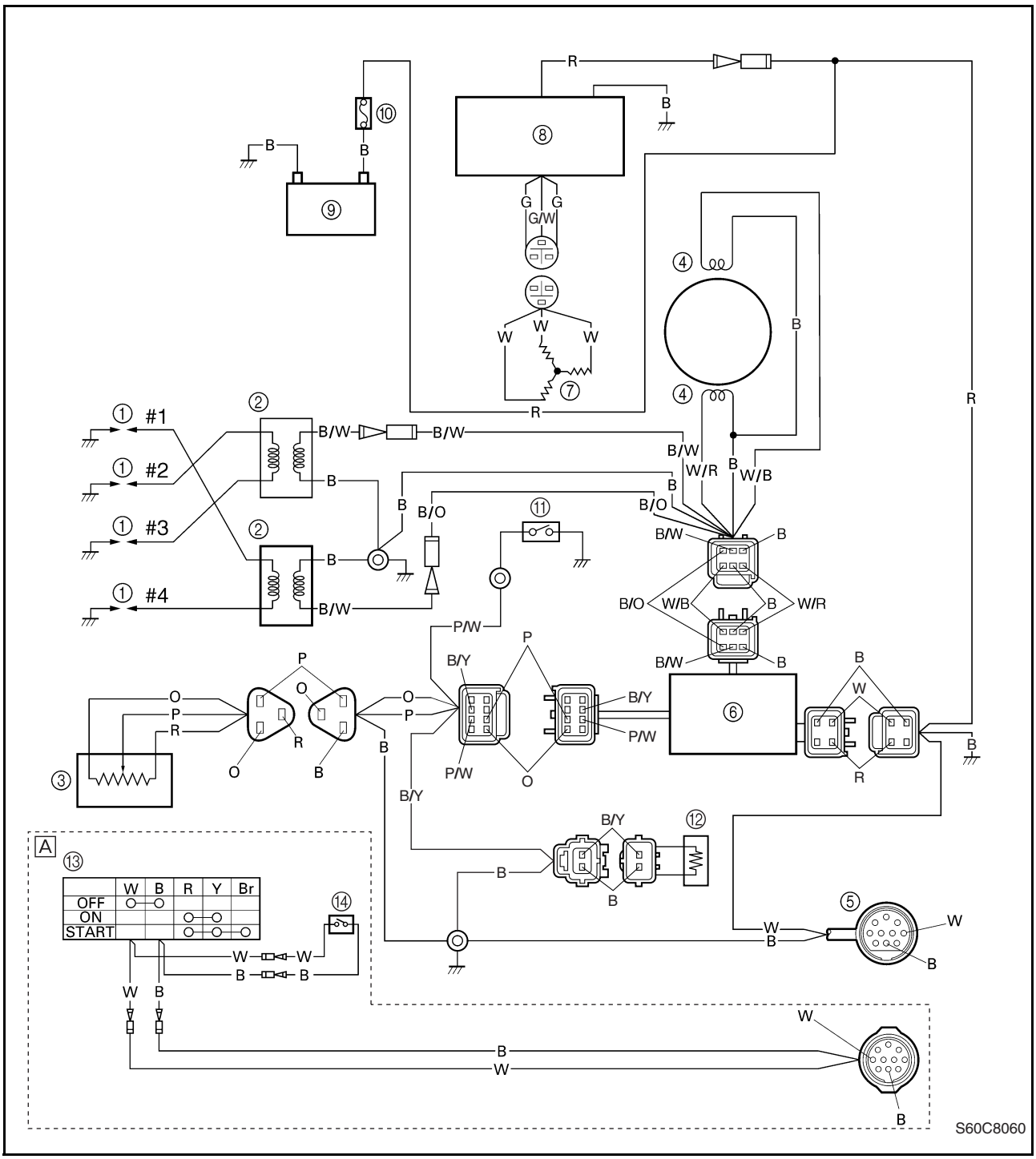


Connect to:
① Oil pressure switch
② Throttle position sensor
③ Ground
④ CDI unit
⑤ CDI unit
⑥ Hour meter
⑦ Rectifier Regulator
⑧ Starter relay
⑨ Remote control box or wiring harness extension
⑩ Warning indicator or wiring harness extension
⑪ Trailer switch or power trim and tilt switch
⑫ Starter relay
⑬ Power trim and tilt relays
⑭ Thermo sensor
⑮ Prime Start

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

8

Ignition system and ignition control system



① Spark plugs
② Ignition coils
③ Throttle position sensor
④ Pulser coils
⑤ 10-P coupler
⑥ CDI unit
⑦ Lighting coil
⑧ Rectifier Regulator
⑨ Battery
⑩ Fuse (30 A)
⑪ Oil pressure switch
⑫ Thermo sensor
⑬ Engine start switch
⑭ Engine shut-off switch

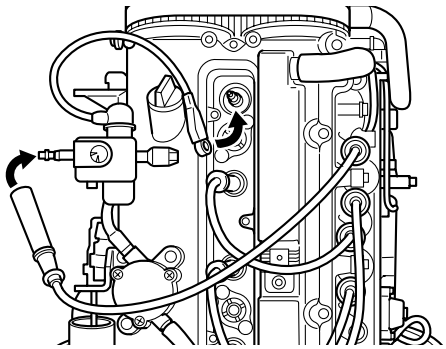
Ⓐ Tiller handle model

B : Black
Br : Brown
G : Green
O : Orange
P : Pink
R : Red
W : White
Y : Yellow
B/O : Black/orange
B/W : Black/white
B/Y : Black/yellow
G/W : Green/white
P/W : Pink/white
W/B : White/black
W/R : White/red

Checking the ignition spark gap

1. Remove the cover and disconnect the spark plug caps from the spark plugs.

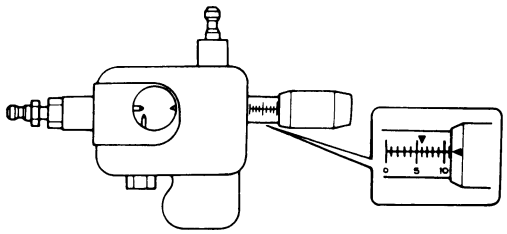
2. Connect a spark plug cap to the special service tool.



S60C8070

Ignition tester: 90890-06754

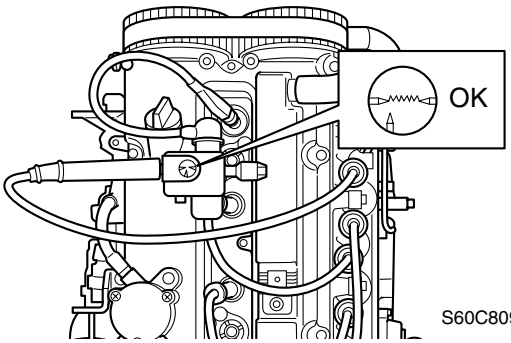
3. Set the spark gap length on the adjusting knob.



S60C8080

Ignition spark gap: 11 mm (0.4 in)

4. Crank the engine and observe the spark through the discharge window of the spark gap tester. Check the ignition coil if out of specification.



S60C8090

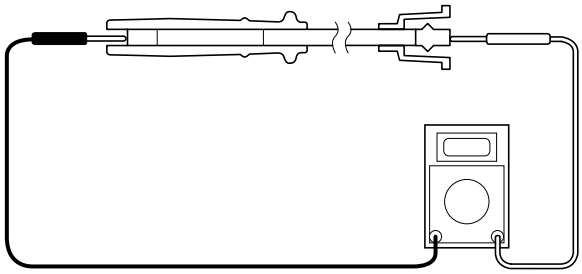
⚠ WARNING

- **Do not touch any of the connections of the spark gap tester leads.**
- **Do not let sparks leak out of the removed spark plug caps.**
- **Keep flammable gas or liquids away, since this test can produce sparks.**

Checking the high-tension cords

1. Remove the high-tension cords from the ignition coil.

2. Measure the high-tension cord resistance. Replace if out of specification.



S60C8100

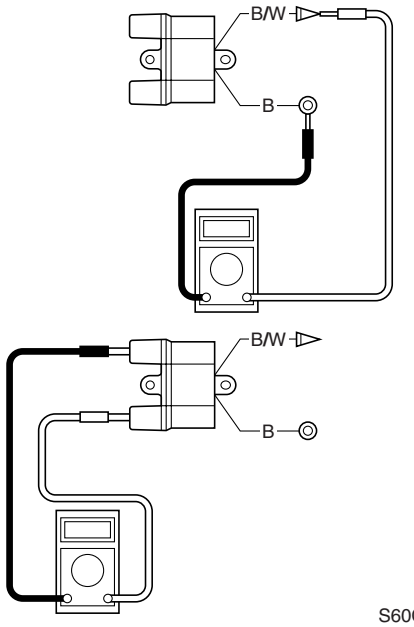
High-tension cord resistance:
#1: 4.5–10.7 kΩ
#2: 3.3–8.0 kΩ
#3: 3.7–8.9 kΩ
#4: 4.3–10.2 kΩ

8

Checking the ignition coil

1. Remove the high-tension cords from the ignition coil.

2. Measure the ignition coil resistance. Replace if out of specification.

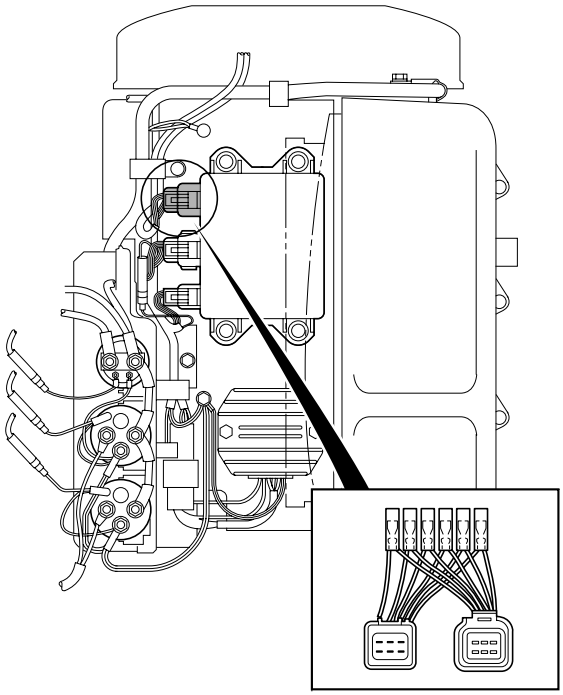


S60C8110

Ignition coil resistance:
Primary coil:
Black/white (B/W) – Black (B)
0.08–0.11 Ω at 20 °C (68 °F)
Secondary coil:
3.5–4.7 kΩ at 20 °C (68 °F)

Checking the CDI unit

1. Measure the CDI unit output peak voltage. If below specification, measure the Rectifier Regulator output peak voltage and pulser coil output peak voltage. Replace the CDI unit if the output peak voltage of the Rectifier Regulator and pulser coil is above specification.



S60C8120

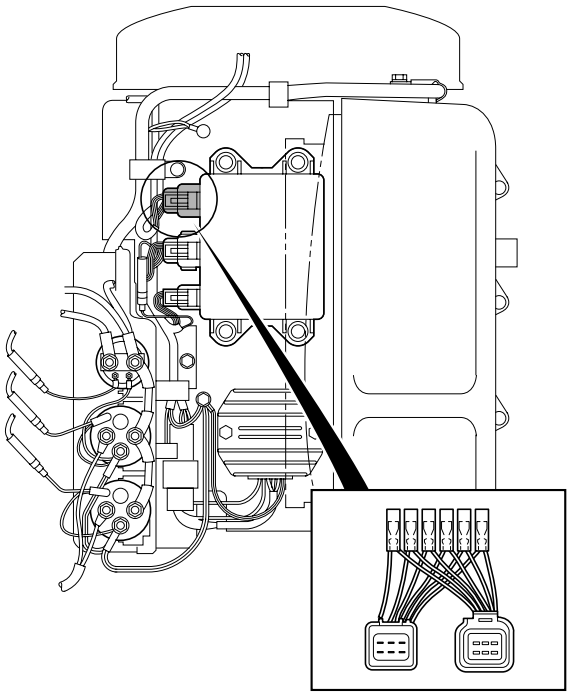
Digital circuit tester: 90890-03174
Peak voltage adaptor: 90890-03172
Test harness (6 pins): 90890-06772

CDI unit output peak voltage:
Black/orange (B/O) – Black (B)
Black/white (B/W) – Black (B)

r/min	Loaded		
	Cranking	1,500	3,500
DC V	124	125	126

Checking the pulser coil

1. Measure the pulser coil output peak voltage. Replace the pulser coil if below specification.



S60C8140

NOTE:
- Use the peak voltage adaptor with the digital circuit tester.
- 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 adaptor: 90890-03172
Test harness (6 pins): 90890-06772

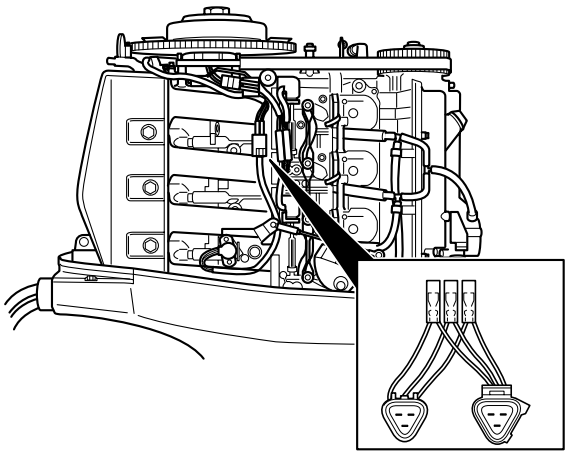
Pulser coil output peak voltage:
White/red (W/R) – Black (B)
White/black (W/B) – Black (B)

r/min	Unloaded	Loaded		
	Cranking		1,500	3,500
DC V	3.5	2.5	9.0	14.0

Pulser coil resistance (use as reference):
White/red (W/R) – Black (B)
White/black (W/B) – Black (B)
445–545 Ω at 20 °C (68 °F)

Checking the throttle position sensor

1. Start the engine and warm it up 5 minutes to check the stability of the engine.
2. Measure the throttle position sensor input voltage. Replace the CDI unit if out of specification.
3. Measure the throttle position sensor output voltage. Replace the CDI unit if out of specification.



S60C8160

Test harness (3 pins): 90890-06757

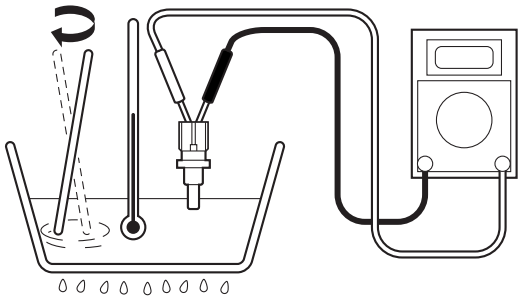
8

Throttle position sensor input voltage:
Red (R) – Orange (O)
5 V
Throttle position sensor output voltage:
Pink (P) – Orange (O)
0.48–5.25 V

NOTE:
Make sure that the throttle position sensor output voltage is within specification when the throttle is fully closed and fully open.

Checking the thermo sensor

1. Place the thermo sensor in a container of water and slowly heat the water.



S60C8170

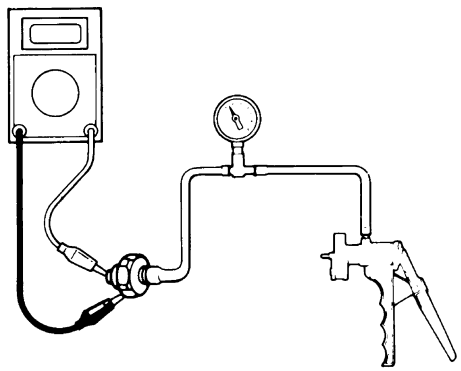
2. Measure the thermo sensor resistance. Replace if out of specification.

Thermo sensor resistance:
at 20 °C (68 °F): 2.45 kΩ
at 40 °C (104 °F): 1.15 kΩ
at 60 °C (140 °F): 0.59 kΩ
at 80 °C (176 °F): 0.32 kΩ

Checking the oil pressure switch

1. Connect the special service tool to the oil pressure switch.

2. Slowly operate the special service tool.



S60C8180

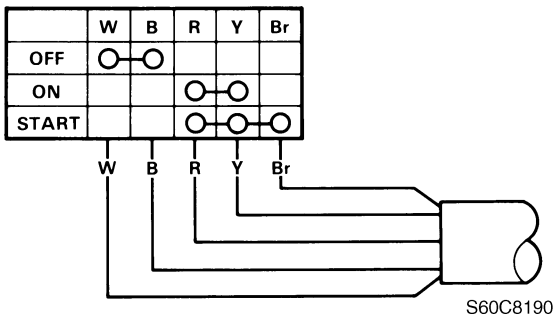
3. Check the switch for continuity at the specified pressure. Replace if there is no continuity.

Vacuum/pressure pump gauge set:
90890-06756

Specified oil pressure:
150 kPa (1.5 kgf/cm^2, 21.3 psi)

Checking the engine start switch

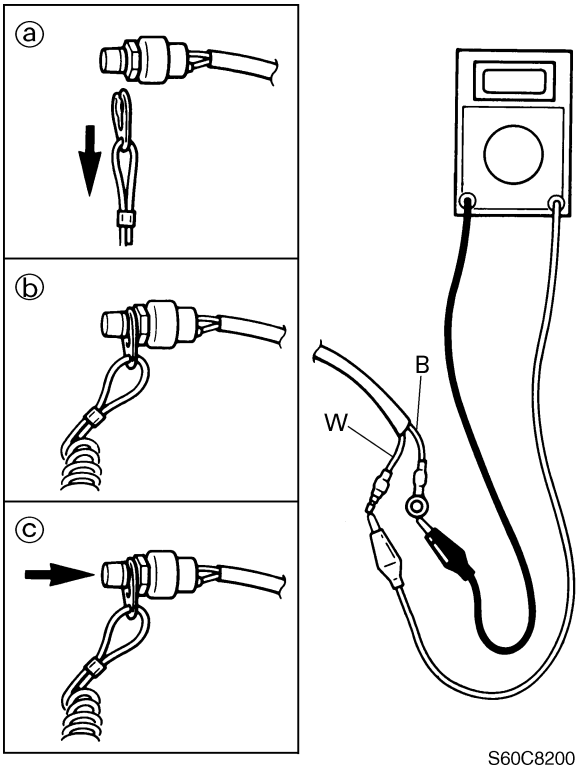
1. Check the engine start switch for continuity. Replace if there is no continuity.



	Lead color				
Switch position	White (W)	Black (B)	Red (R)	Yellow (Y)	Brown (Br)
OFF	○—○				
ON			○—○		
START			○—○	○—○	

Checking the engine shut-off switch

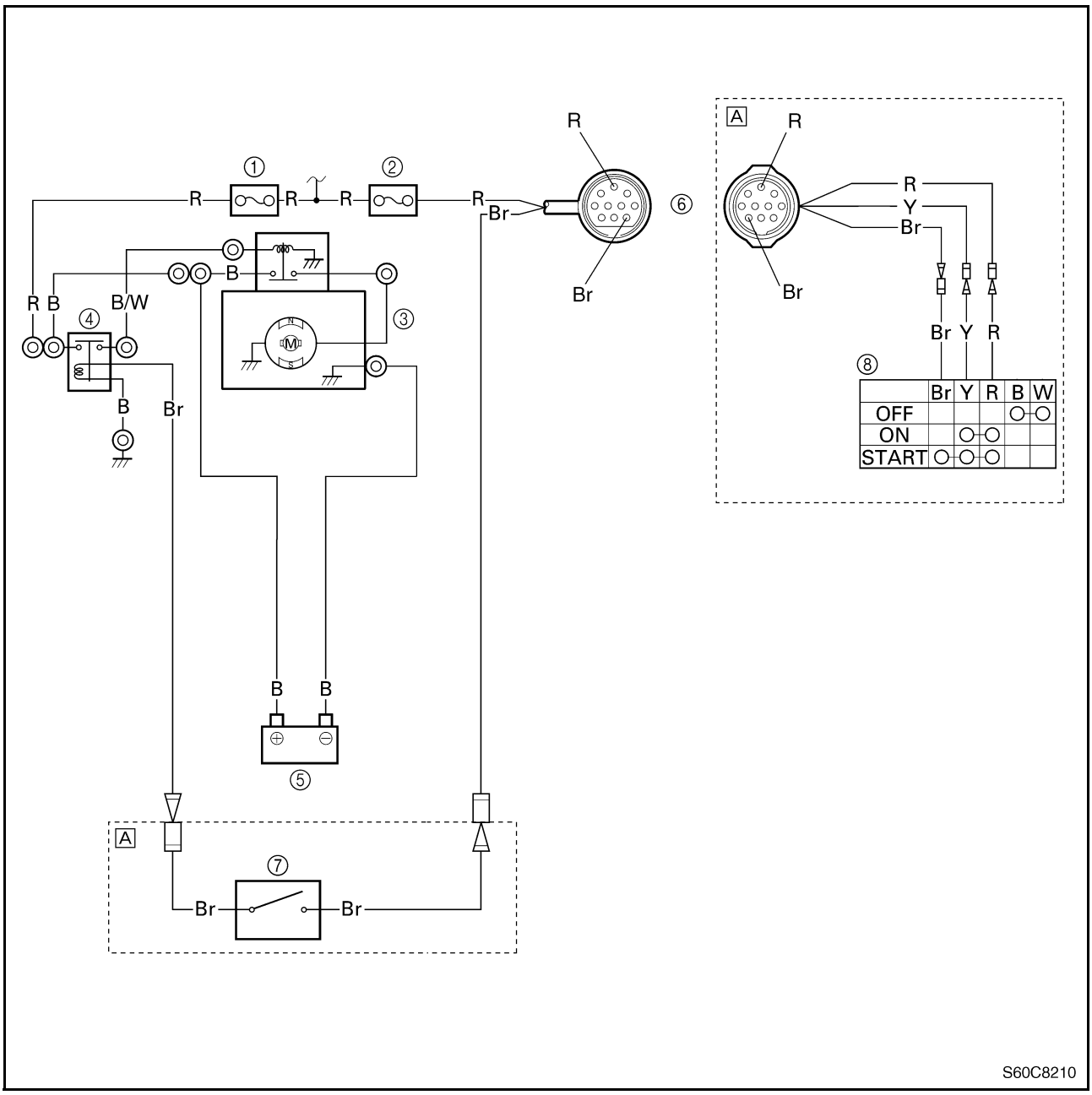
1. Check the engine shut-off switch for continuity. Replace if there is no continuity.



	Lead color	
	White (W)	Black (B)
Remove the lock plate ⓐ	○—○	
Install the lock plate ⓑ		
Push the button ⓒ	○—○	

8

Starting system



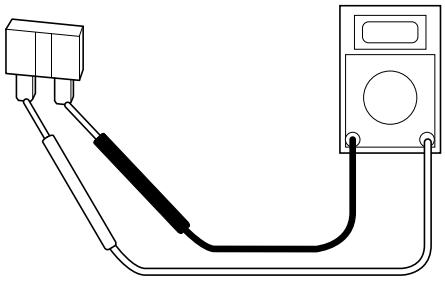
① Fuse (30 A)
② Fuse (20 A)
③ Starter motor
④ Starter relay
⑤ Battery
⑥ 10-pin coupler
⑦ Neutral switch
⑧ Engine start switch

A Tiller handle model

B : Black
Br : Brown
R : Red
W : White
Y : Yellow
B/W : Black/white

Checking the fuse

1. Check the fuse for continuity. Replace if there is no continuity.



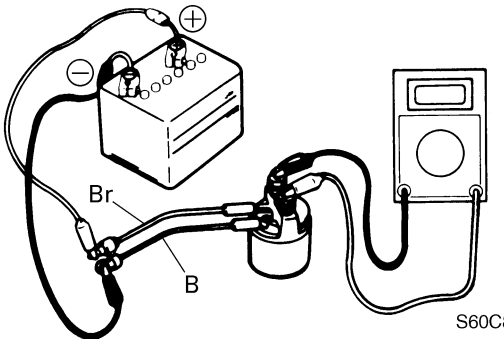
S60C8220

Checking the wiring harness (10 pins)

1. Check the wiring harness for continuity. Replace if there is no continuity.

Checking the starter relay

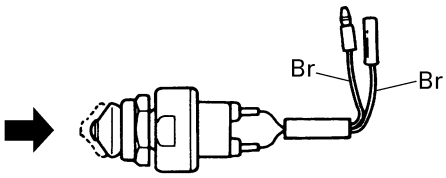
1. Connect the digital circuit tester leads to the starter relay terminals.
2. Connect the brown (Br) lead to the positive battery terminal.
3. Connect the black (B) lead to the negative battery terminal.
4. Check for continuity between the starter relay terminals. Replace if there is no continuity.
5. Check that there is no continuity between the starter relay terminals after disconnecting the brown or black lead. Replace if there is continuity.



S60C8230

Checking the neutral switch

1. Check the neutral switch for continuity. Replace if there is no continuity.

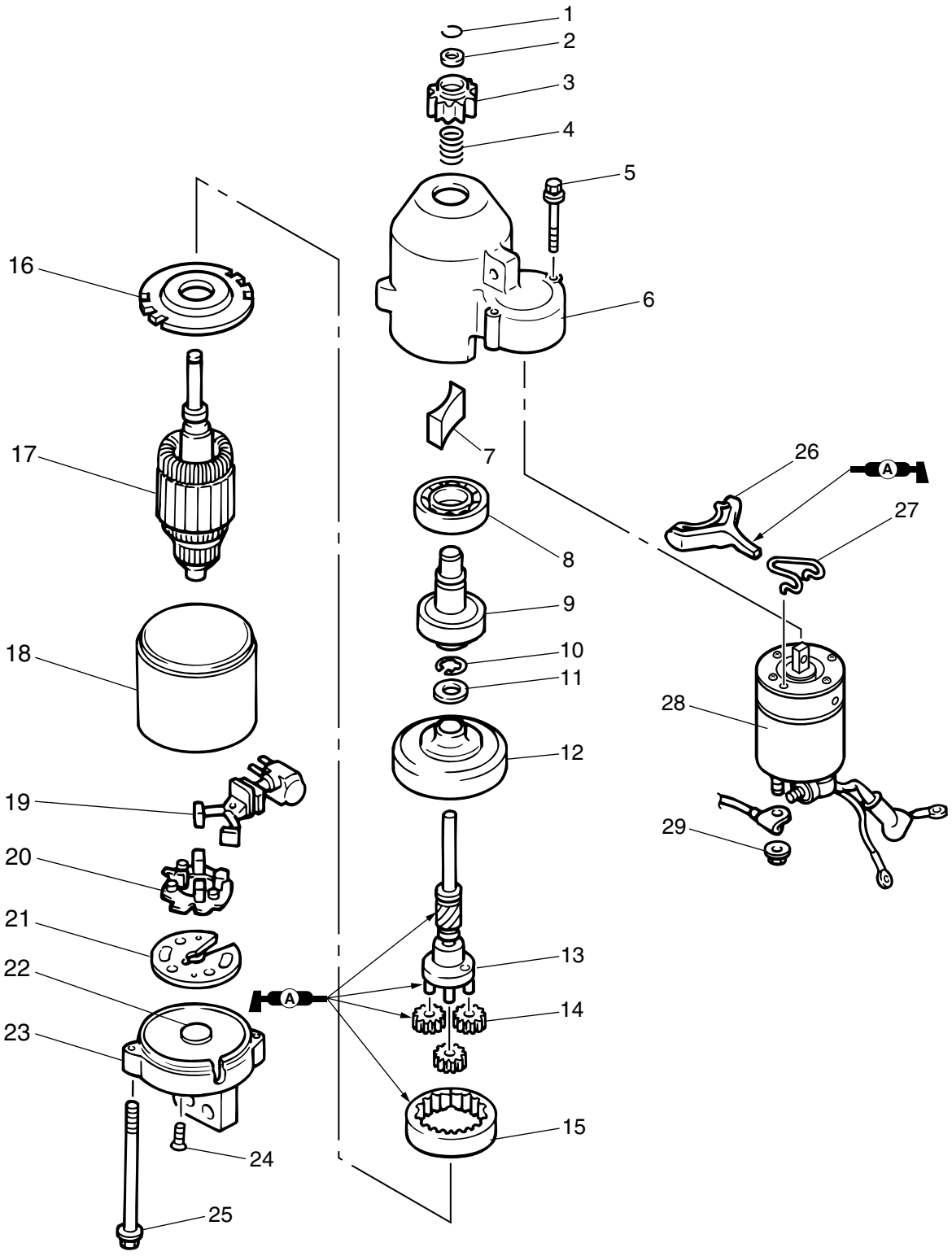


S60C8240

	Lead color	
	Brown (Br)	Brown (Br)
Free		
Push	○	○

8

Starter motor

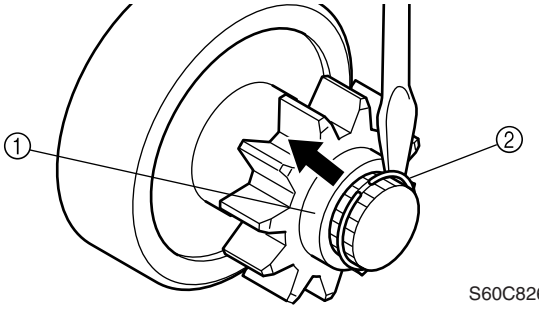


S60C8250

No.	Part name	Q'ty	Remarks
1	Clip	1	
2	Pinion stopper	1	
3	Starter motor pinion	1	
4	Spring	1	
5	Bolt	2	M6 × 52 mm
6	Housing	1	
7	Rubber seal	1	
8	Bearing	1	
9	Clutch assembly	1	
10	E-clip	1	**Not reusable**
11	Thrust washer	1	
12	Center bracket	1	
13	Pinion shaft	1	
14	Planetary gear	3	
15	Outer gear	1	
16	Plate	1	
17	Armature	1	
18	Stator	1	
19	Brush assembly	1	
20	Brush holder assembly	1	
21	Plate	1	
22	Thrust washer	1	
23	Lower bracket	1	
24	Screw	2	M4 × 14 mm
25	Bolt	2	M6 × 120 mm
26	Shift lever	1	
27	Spring	1	
28	Relay assembly	1	
29	Nut	1	

Removing the starter motor pinion

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

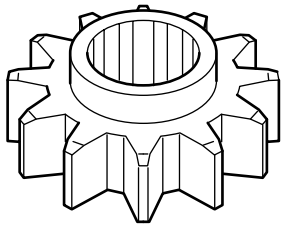


S60C8260

NOTE:
Remove the clip with a thin screwdriver.

Checking the starter motor pinion

1. Check the pinion teeth for cracks or wear. Replace if necessary.

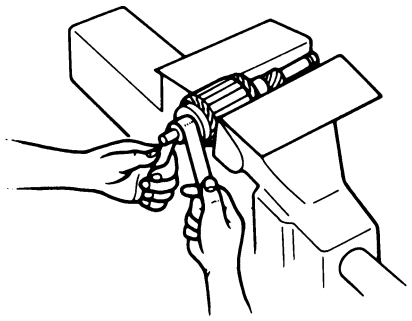

S60C8270

2. Check for smooth operation. Replace if necessary.

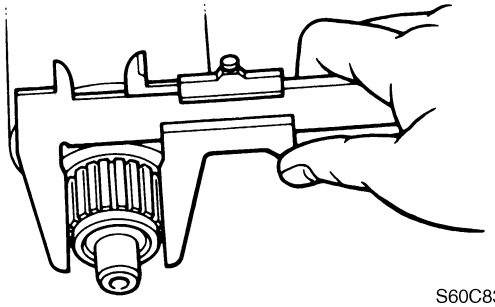
NOTE:
Turn the pinion clockwise to check that it operates smoothly and turn it counterclockwise to check that it locks in place.

Checking the armature

1. Check the commutator for dirt. Clean with #600 grid sandpaper and compressed air if necessary.

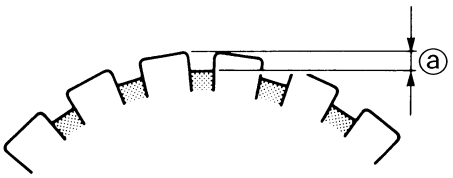

S60C8290

2. Measure the commutator diameter. Replace the armature if out of specification.


S60C8300

Commutator diameter limit:
28.0 mm (1.10 in)

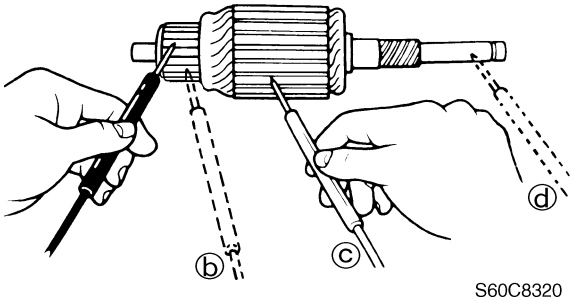
3. Measure the commutator undercut ⓐ. Replace the armature if out of specification.



S60C8310

	Commutator undercut limit ⓐ: 0.2 mm (0.01 in)

4. Check the armature for continuity. Replace if out of specifications.

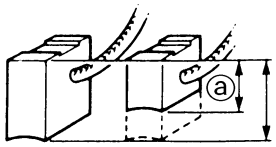


S60C8320

Armature continuity	
Commutator segments ⓑ	Continuity
Segment – Armature core ⓒ	No continuity
Segment – Armature shaft ⓓ	No continuity

Checking the brushes

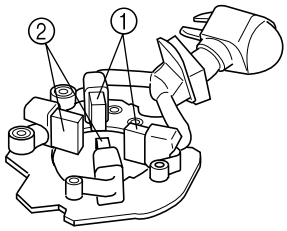
1. Measure the brush length. Replace the brush assembly if out of specification.



S60C8330

	Brush length limit ⓐ: 9.5 mm (0.37 in)

2. Check the brush holder assembly for continuity. Replace if out of specifications.



S60C8340

Brush continuity	
Brush ① – Brush ②	No continuity

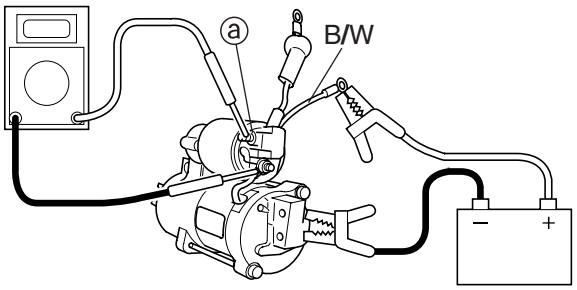
8

Checking the relay assembly

1. Connect the tester leads between the relay terminals as shown.

2. Connect the positive battery terminal to the black and white (B/W) lead.

3. Connect the negative battery terminal to the starter motor body.



S60C8350

CAUTION:

- **Do not connect the battery for more than one second, otherwise the relay may be damaged.**
- **Do not connect the positive battery terminal the position ⓐ shown.**

4. Check that there is continuity between the relay terminals. Replace if there is no continuity.

5. Check that there is no continuity after the negative battery terminal is removed. Replace if there is continuity.

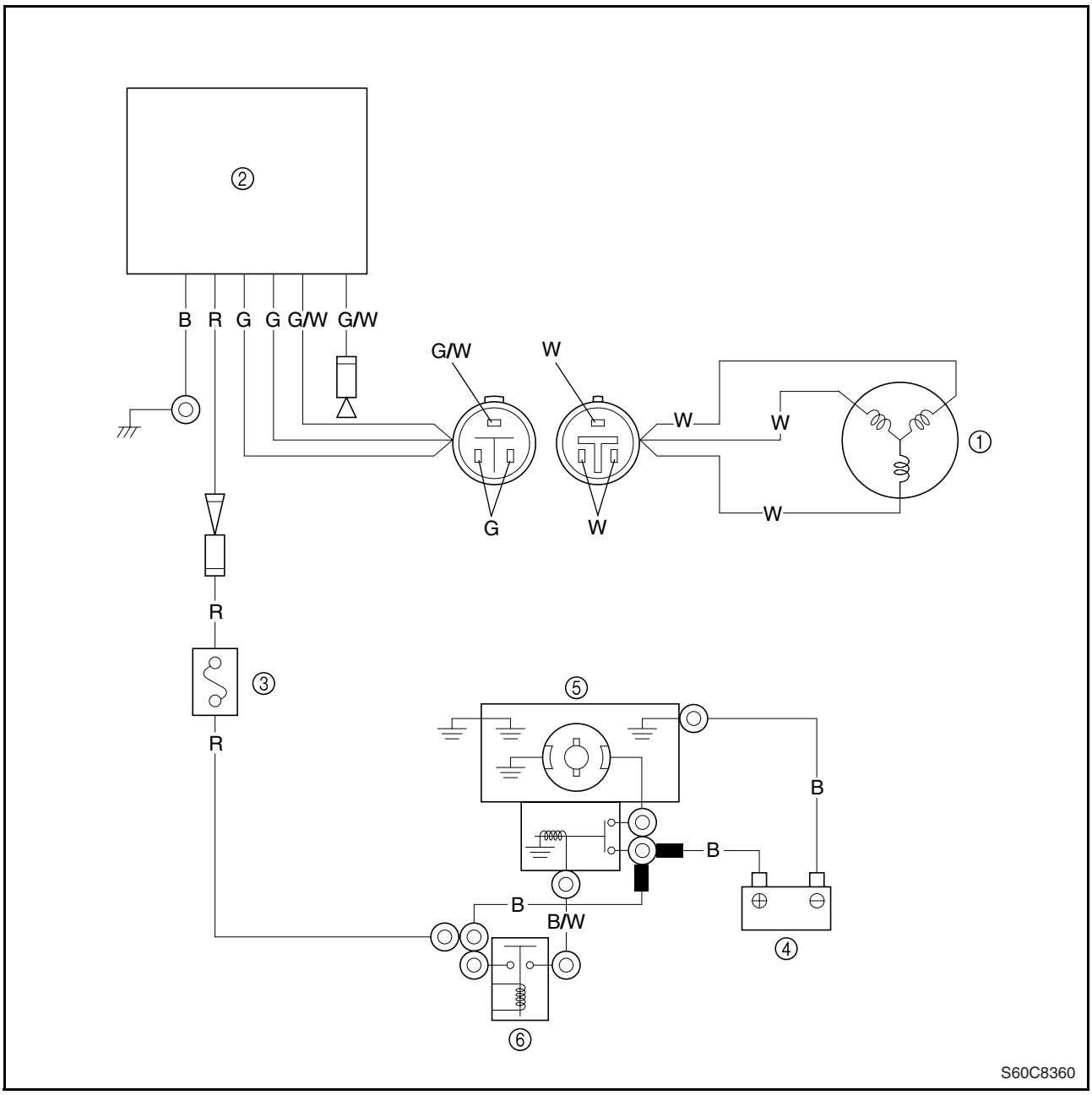
NOTE:

The starter motor pinion should be pushed out while the relay is on.

Checking the starter motor operation

1. Check the operation of the starter motor after installing it to the power unit.

Charging system



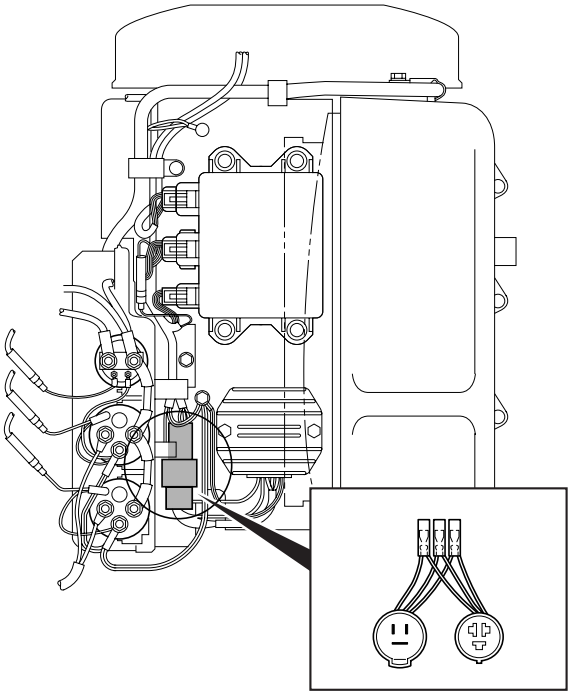
① Lighting coil
② Rectifier Regulator
③ Fuse (30 A)
④ Battery
⑤ Starter motor
⑥ Starter relay

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

8

Checking the lighting coil

1. Measure the lighting coil output peak voltage. Replace the lighting coil if below specification.



S60C8130

Digital circuit tester: 90890-03174
Peak voltage adaptor: 90890-03172
Test harness (3 pins): 90890-06770

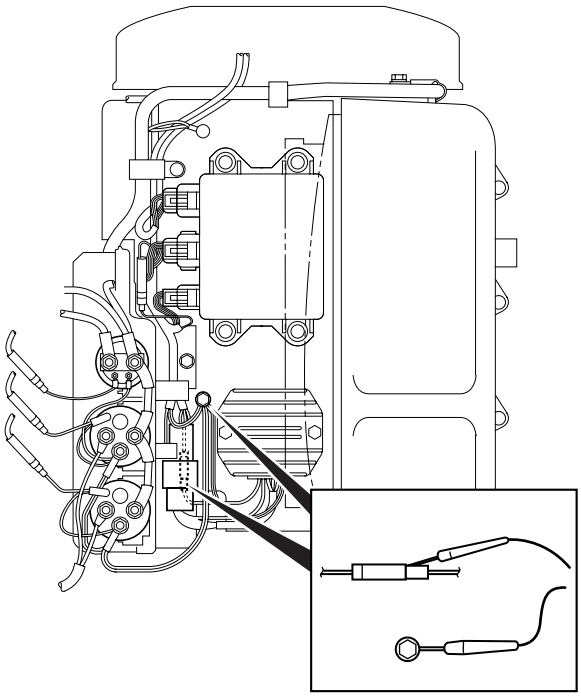
Lighting coil output peak voltage:
White (W) – White (W)

r/min	Unloaded	Loaded		
	Cranking		1,500	3,500
DC V	7.5	8.0	15.5	15.5

Lighting coil resistance (use as reference):
White (W) – White (W)
0.32–0.48 Ω at 20 °C (68 °F)

Checking the Rectifier Regulator

1. Measure the Rectifier Regulator output peak voltage. If below specification, measure the lighting coil output peak voltage. Replace the Rectifier Regulator if the output peak voltage of the lighting coil is above specification.



S60C8150

Digital circuit tester: 90890-03174
Peak voltage adaptor: 90890-03172

Rectifier Regulator output peak voltage:
Red (R) – Black (B)

r/min	Unloaded	
	1,500	3,500
DC V	17.5	19.0

NOTE:
Disconnect the output lead (red lead) of the Rectifier Regulator when measuring the output peak voltage.

TRBL SHTG ?

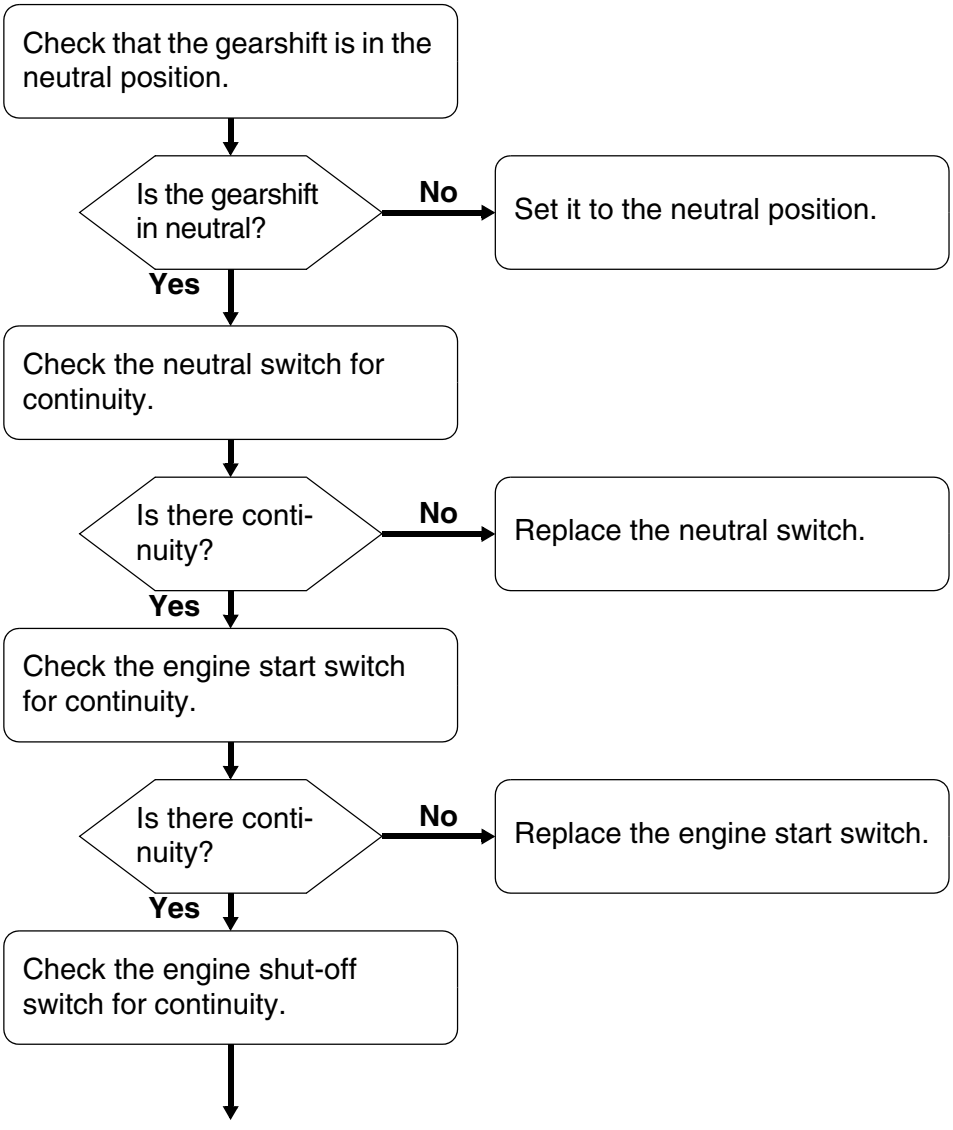
Troubleshooting

9

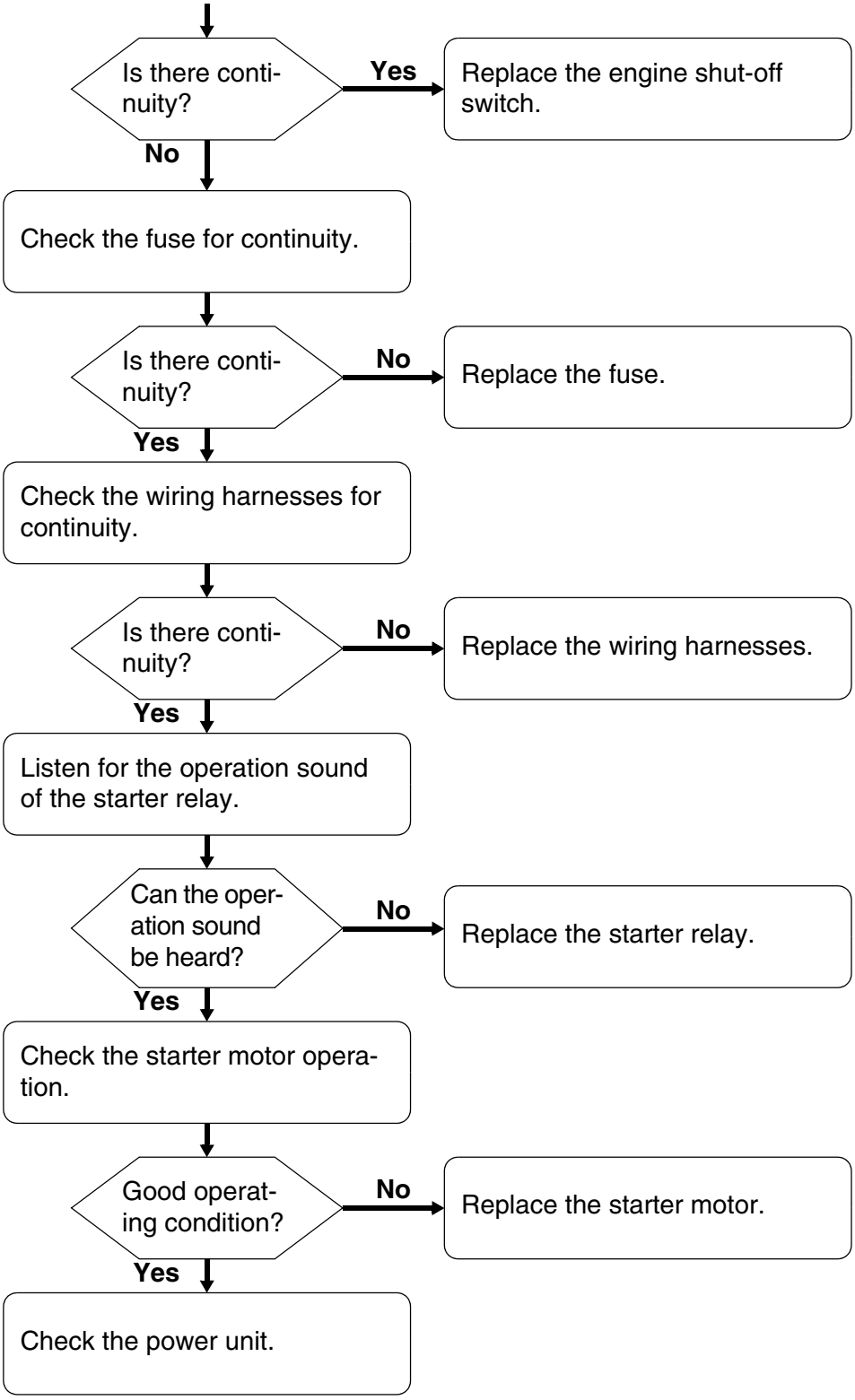
NOTE:
- To diagnose a mechanical malfunction, use the troubleshooting charts pertaining to the trouble located in this chapter. Also, when checking and maintaining the outboard motor, see Chapters 4–8, to check the part necessary to carry out safety maintenance.
- Check that all electrical connections are tight and free from corrosion, and that the battery is fully charged to 12 V.

Power unit

Symptom: Engine does not crank.
- Check the starting system.
- Check the power unit.



Continued on next page.

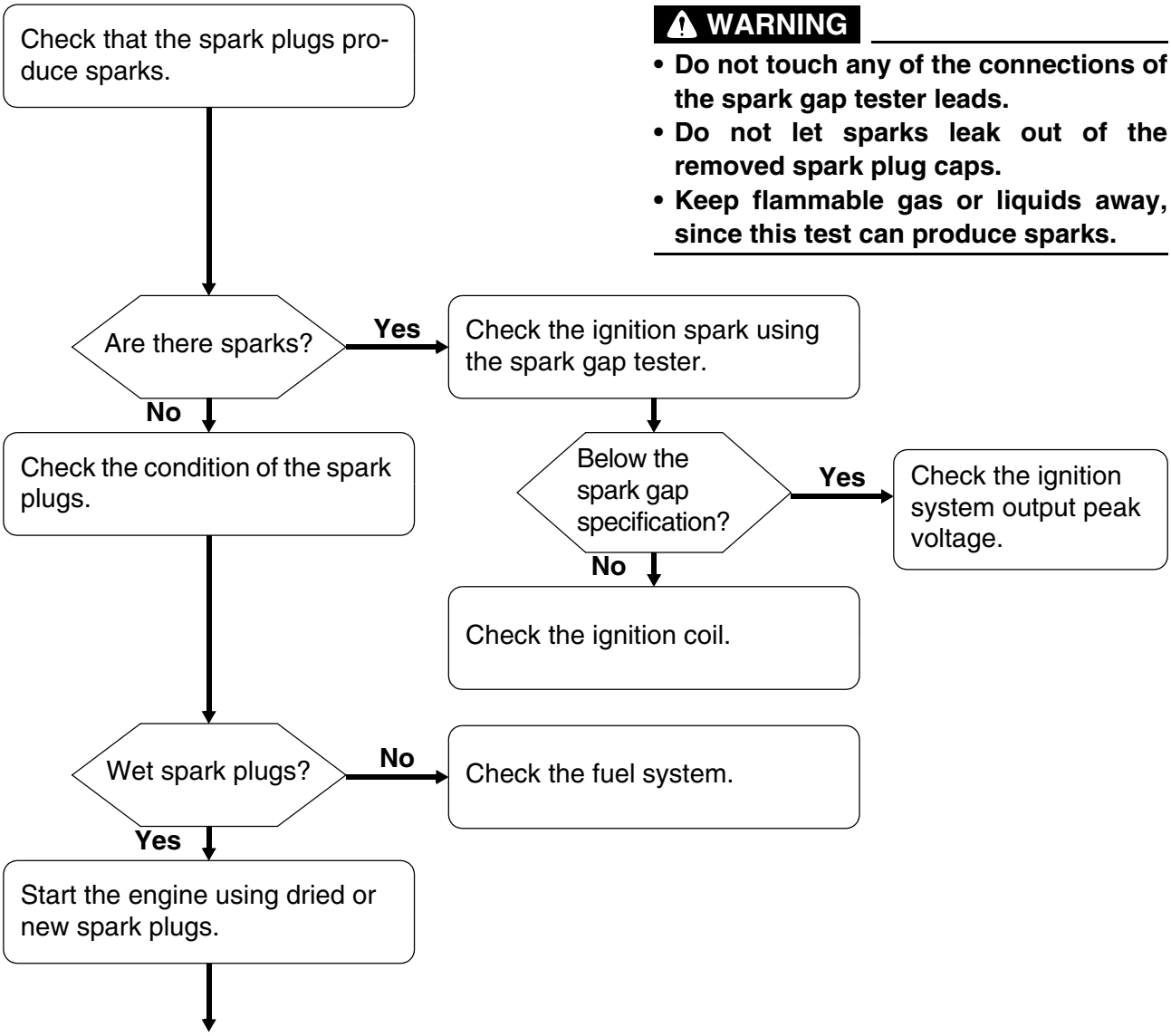

Is there continuity?
Yes
Replace the engine shut-off switch.
No
Check the fuse for continuity.
Is there continuity?
No
Replace the fuse.
Yes
Check the wiring harnesses for continuity.
Is there continuity?
No
Replace the wiring harnesses.
Yes
Listen for the operation sound of the starter relay.
Can the operation sound be heard?
No
Replace the starter relay.
Yes
Check the starter motor operation.
Good operating condition?
No
Replace the starter motor.
Yes
Check the power unit.

Symptom: Engine cranks, but will not start.

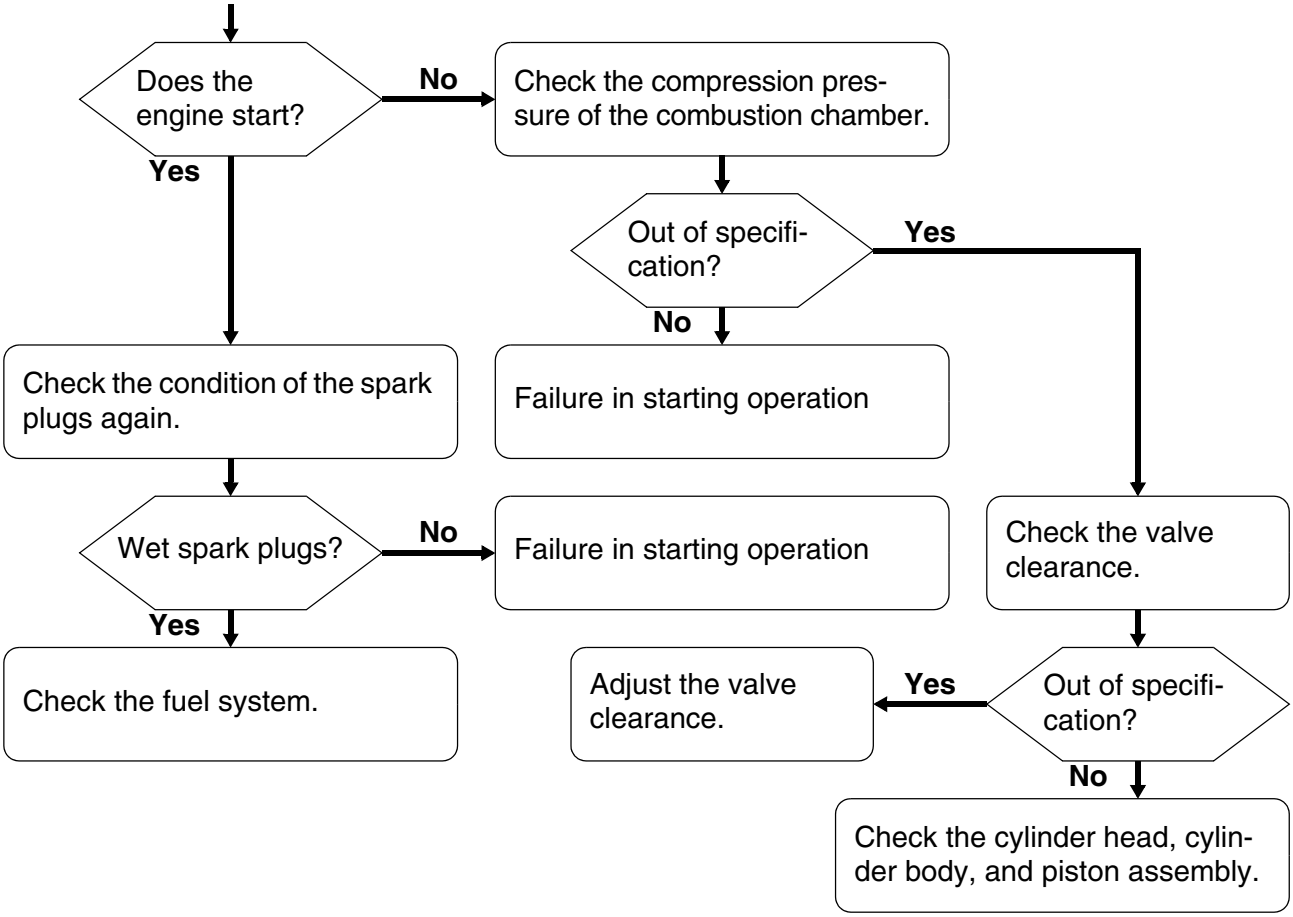
- Check the ignition system.
- Check the fuel system.
- Check the compression pressure of the power unit.

⚠ WARNING

- **Do not touch any of the connections of the spark gap tester leads.**
- **Do not let sparks leak out of the removed spark plug caps.**
- **Keep flammable gas or liquids away, since this test can produce sparks.**



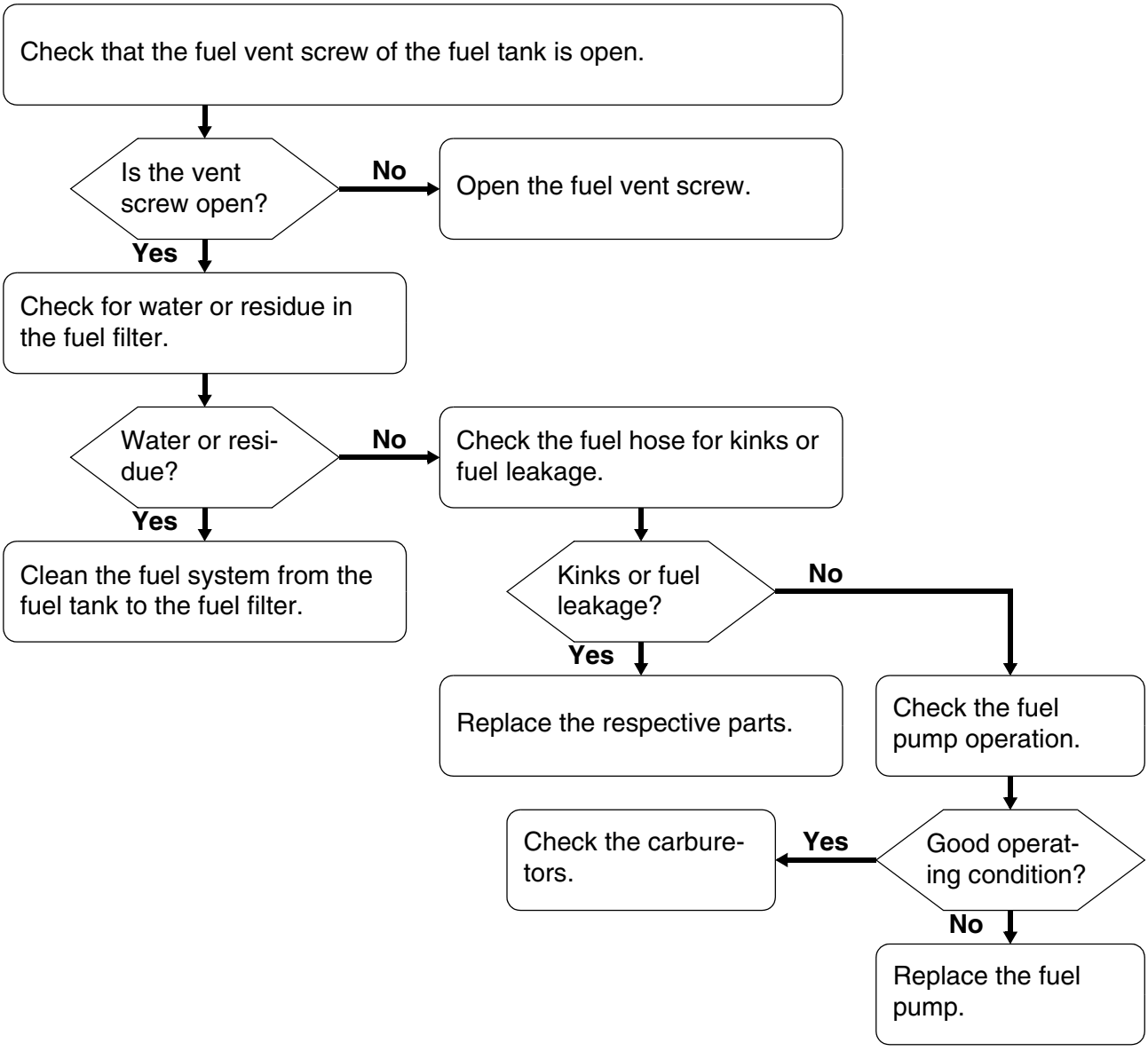
Continued on next page.


Does the engine start?
No
Check the compression pressure of the combustion chamber.
Yes
Out of specification?
Yes
No
Check the condition of the spark plugs again.
Failure in starting operation
Wet spark plugs?
No
Failure in starting operation
Check the valve clearance.
Yes
Check the fuel system.
Adjust the valve clearance.
Yes
Out of specification?
No
Check the cylinder head, cylinder body, and piston assembly.

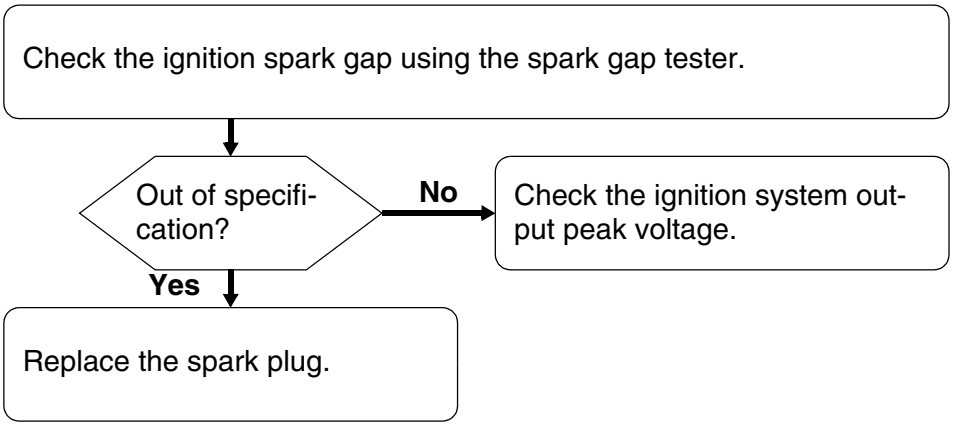
Symptom: Engine can be started, but does not remain on.

- Check the fuel system.
- Check the ignition system.
- Check the compression pressure of the power unit.

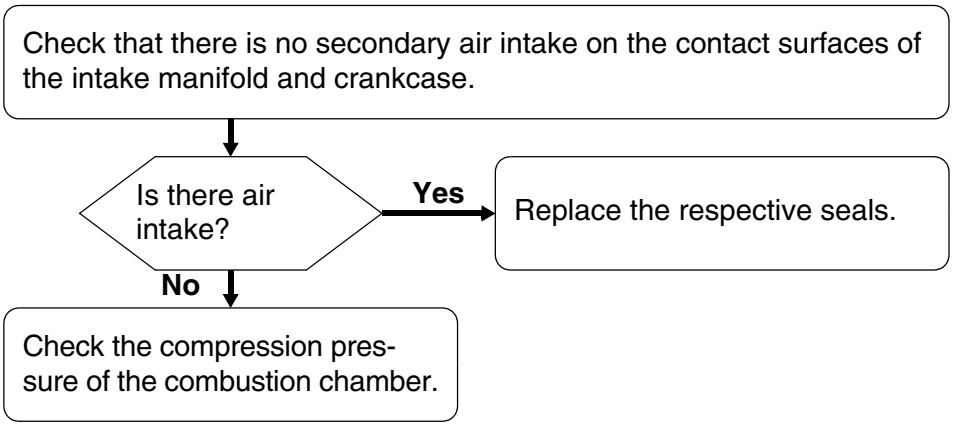
(Fuel system)



(Ignition system)

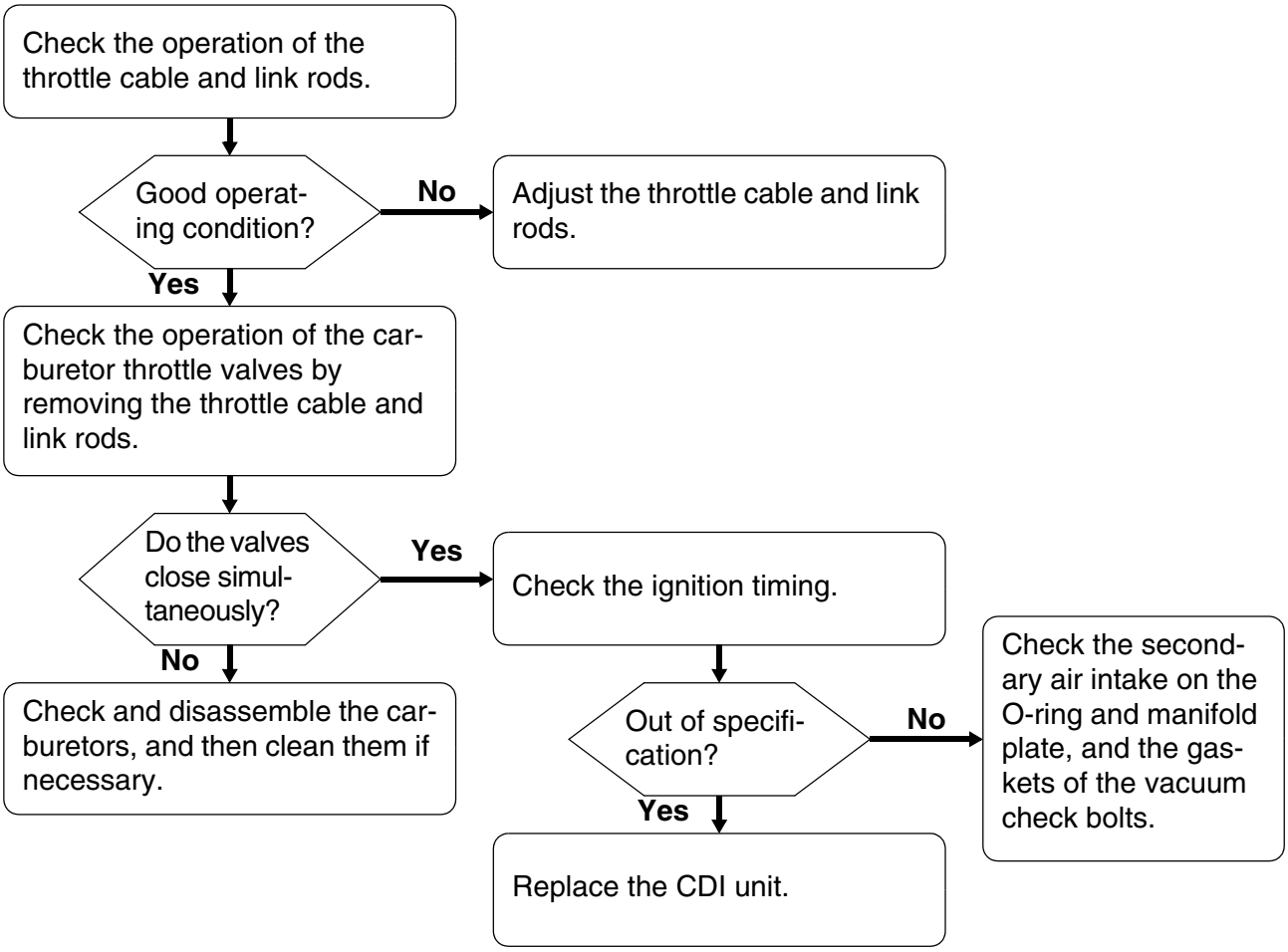


(Compression pressure)

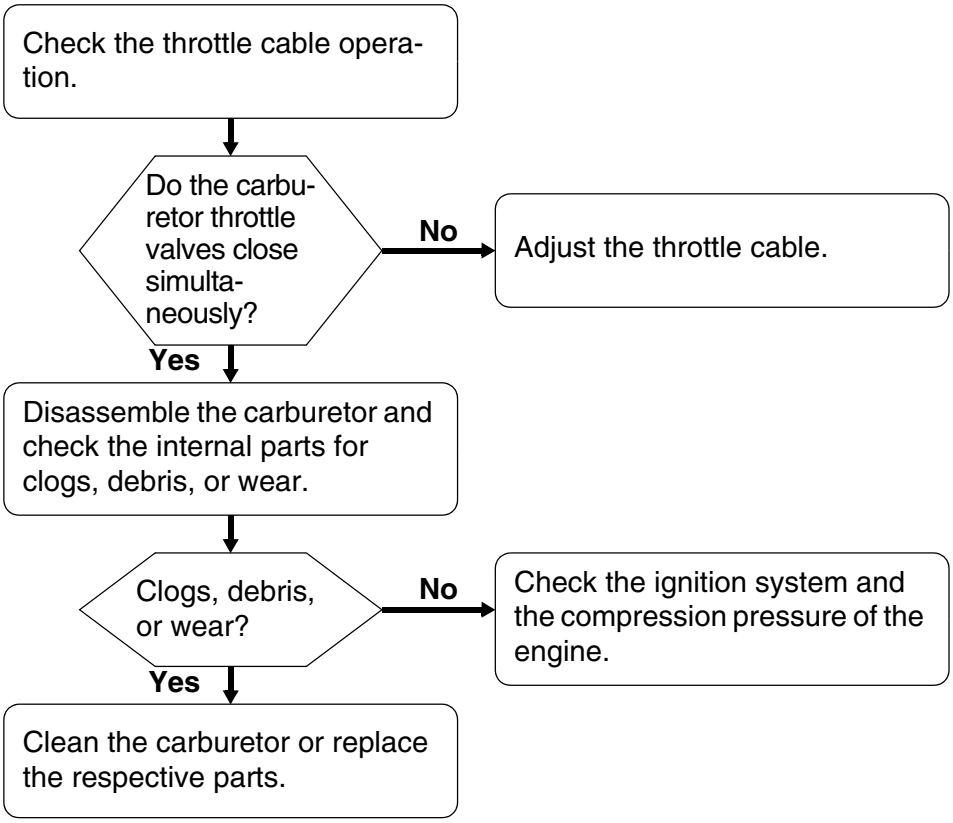


Symptom: The engine idle speed is not steady, but increases or decreases.

- Check the carburetors.
- Check the air intake system.
- Check the ignition system.

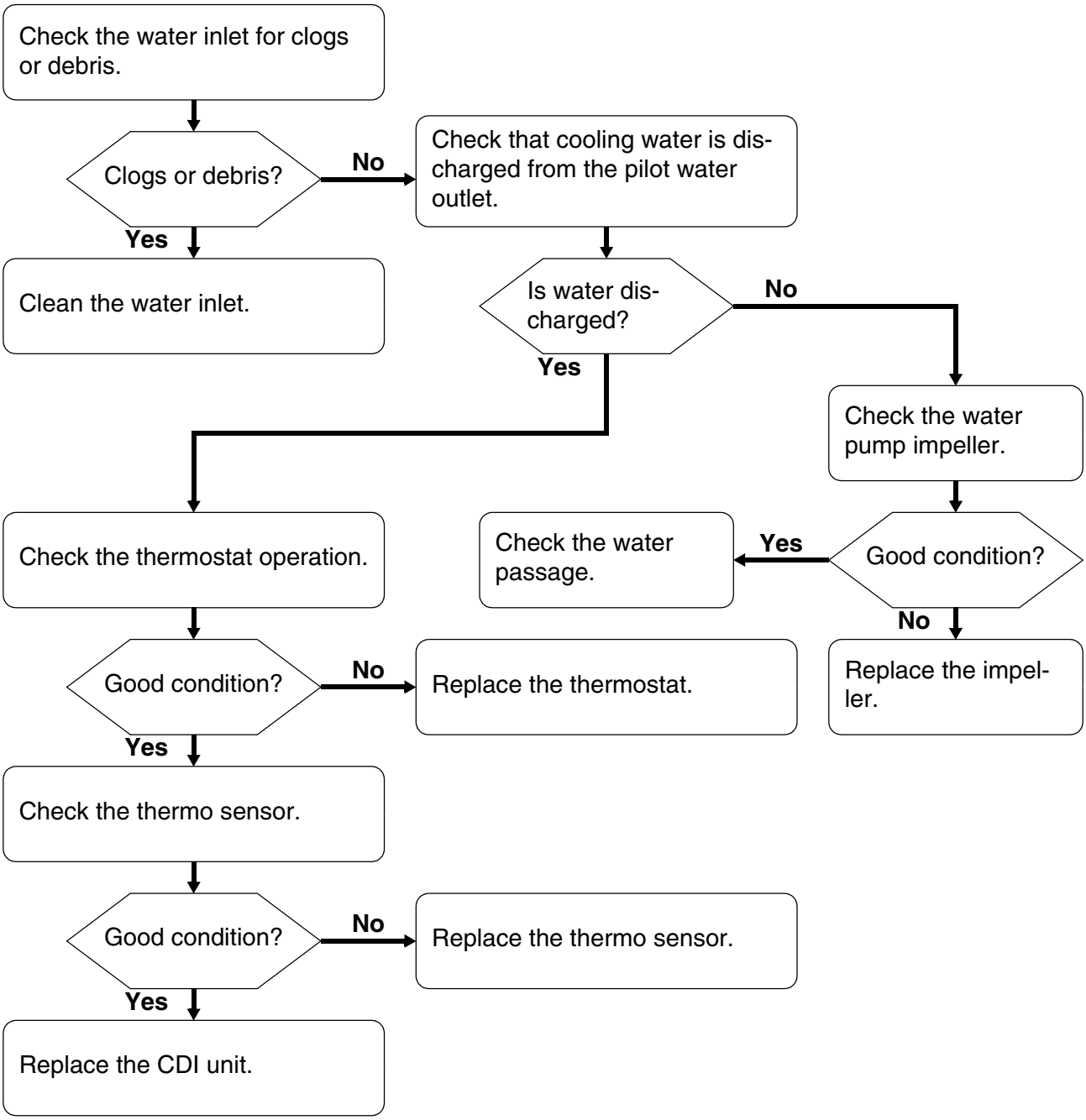


Symptom: Engine does not accelerate when the throttle is opened quickly.
The engine turns off when the throttle is opened quickly.
Acceleration is tardy and the engine is likely to stop at any moment.
- Check the carburetors.
- Check the ignition system.
- Check the compression pressure of the power unit.

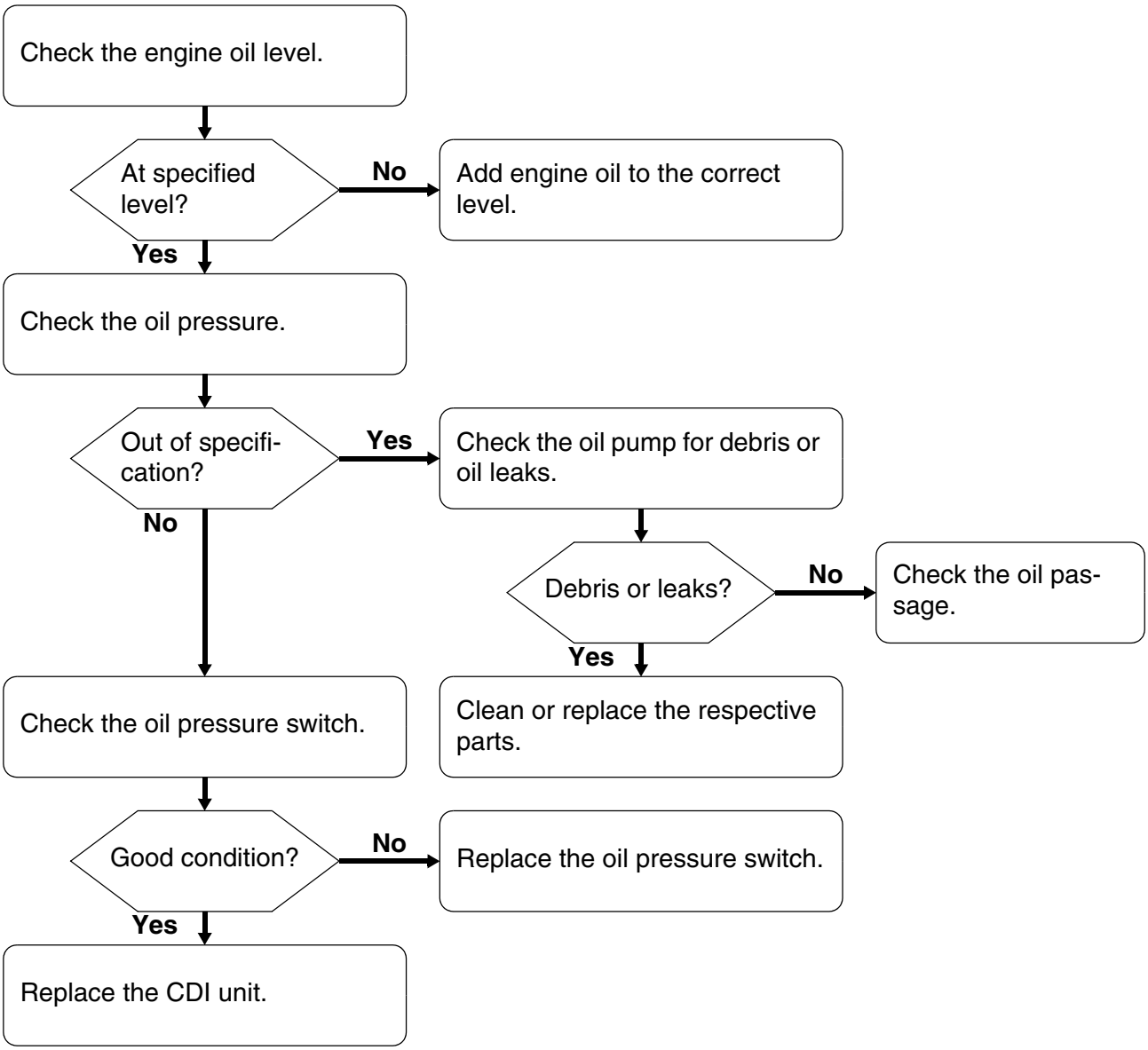


Symptom: Engine can run, but engine speed will not increase.
Overheat warning indicator is on.
Oil pressure warning indicator is on.
Warning indicator is on and buzzer is sounding.
- Check the water cooling system.
- Check the lubricating system.

(Cooling system)

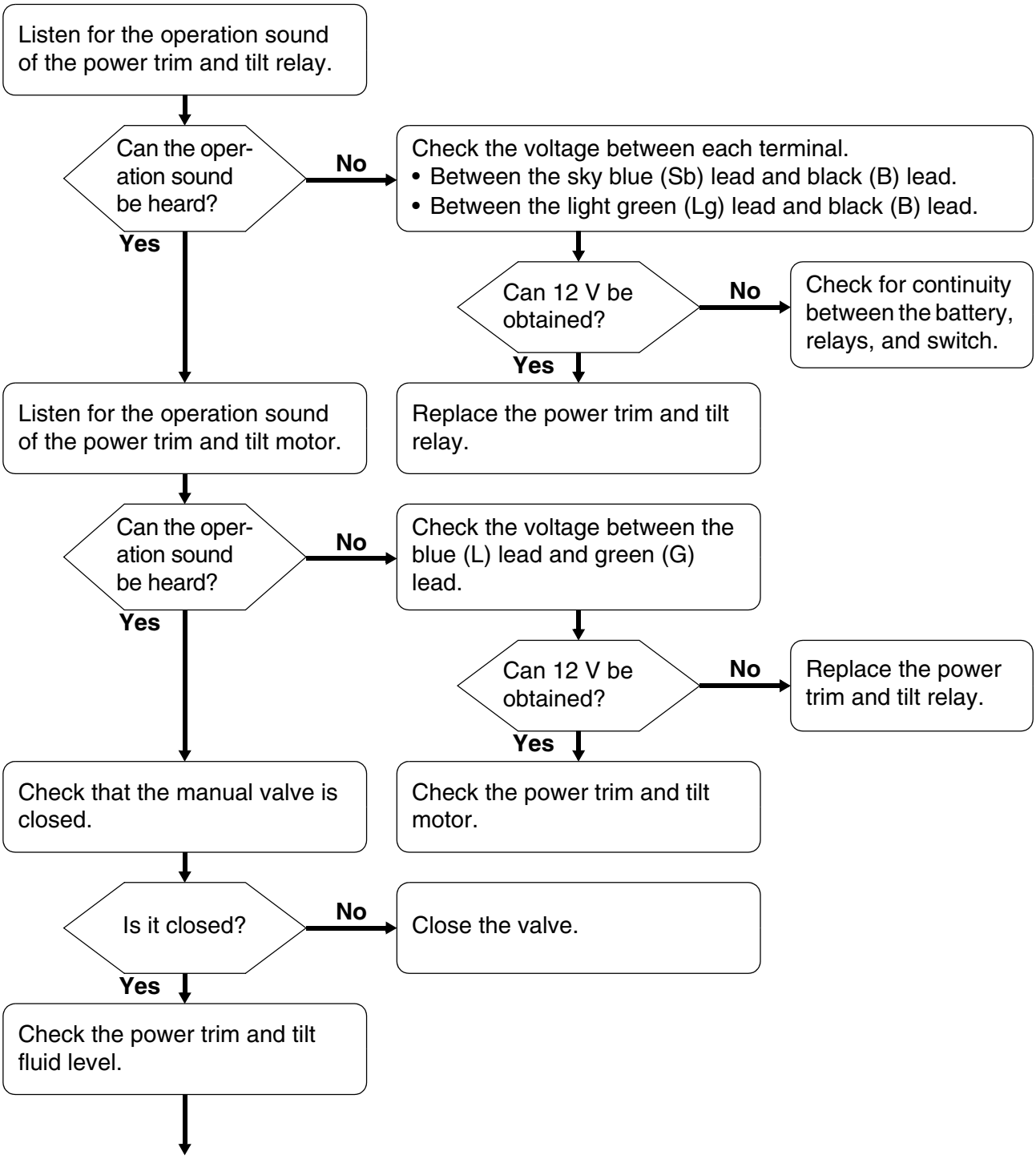


(Lubricating system)

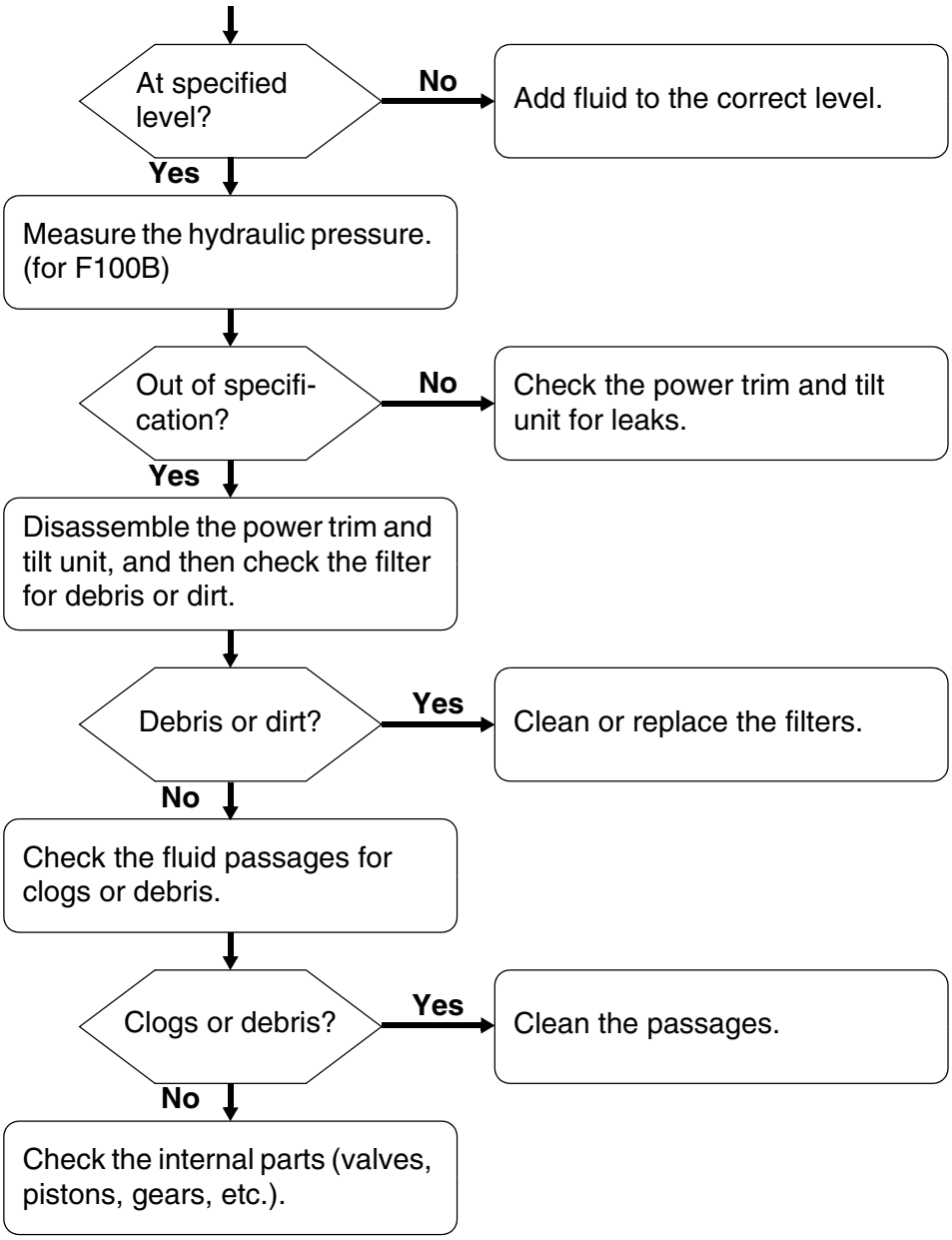


Bracket unit

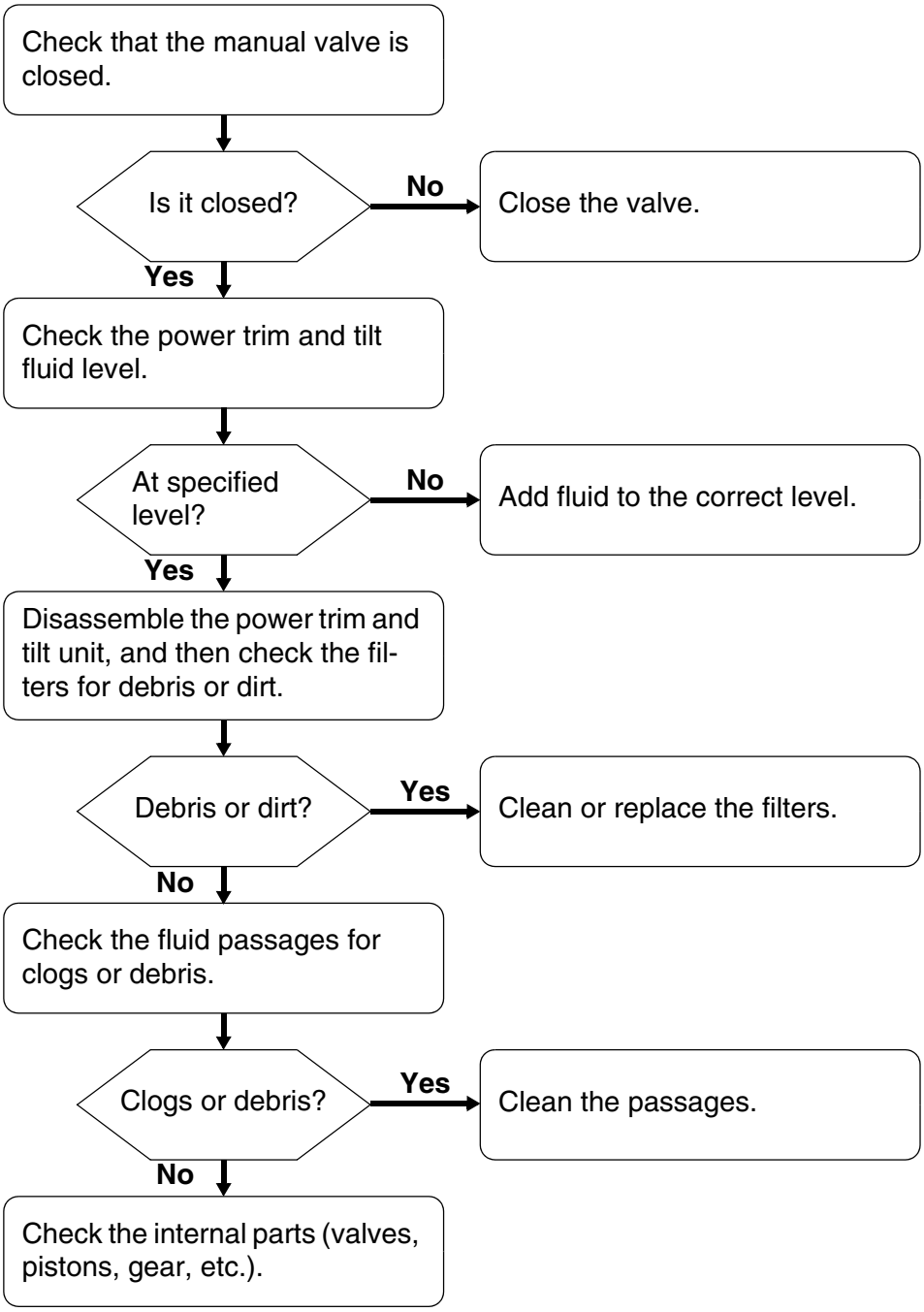
Symptom: Power trim and tilt unit does not operate.



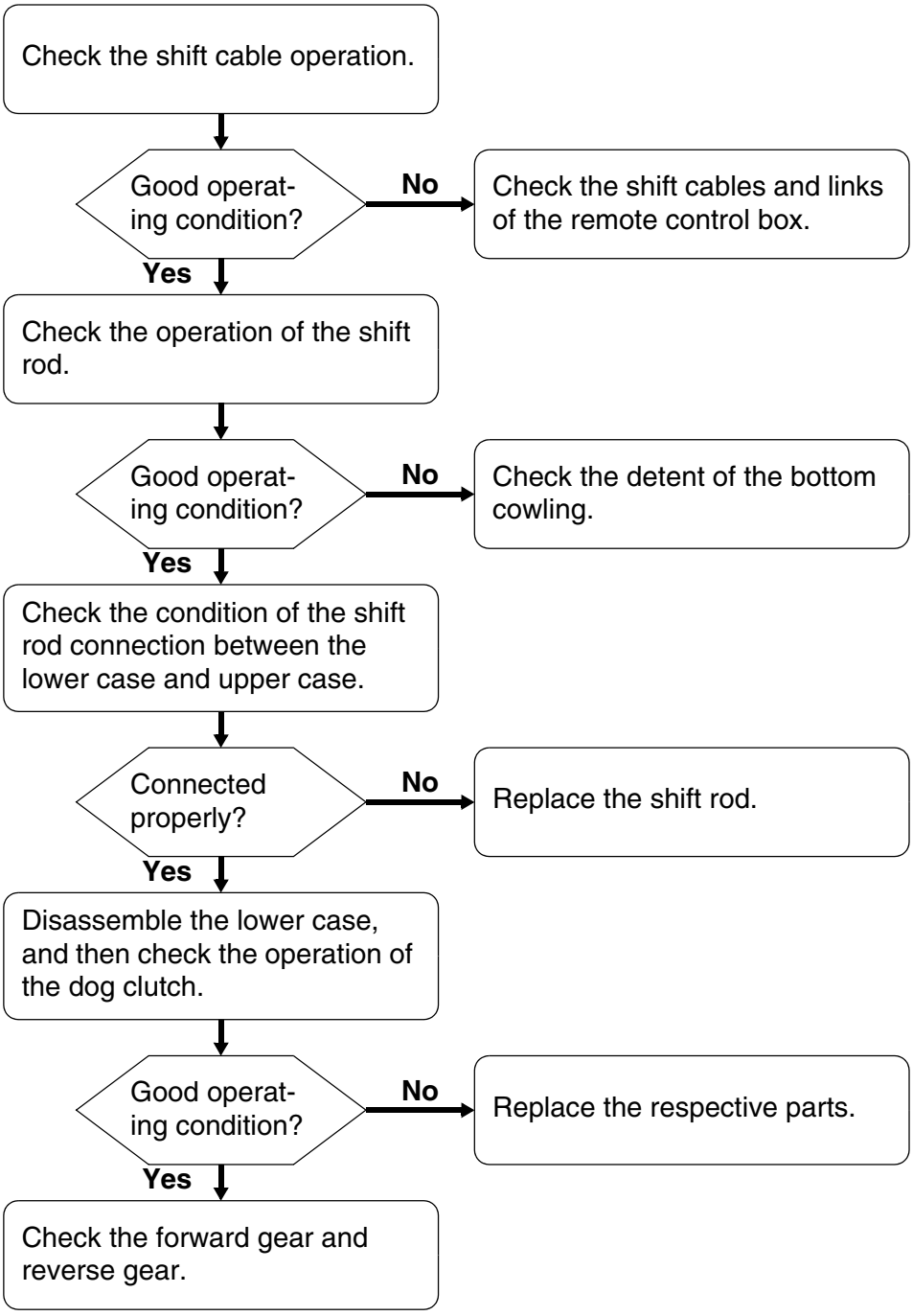
Continued on next page.


At specified level?
No
Add fluid to the correct level.
Yes
Measure the hydraulic pressure. (for F100B)
Out of specifi-cation?
No
Check the power trim and tilt unit for leaks.
Yes
Disassemble the power trim and tilt unit, and then check the filter for debris or dirt.
Debris or dirt?
Yes
Clean or replace the filters.
No
Check the fluid passages for clogs or debris.
Clogs or debris?
Yes
Clean the passages.
No
Check the internal parts (valves, pistons, gears, etc.).

Symptom: Power trim and tilt unit does not hold the outboard motor up.



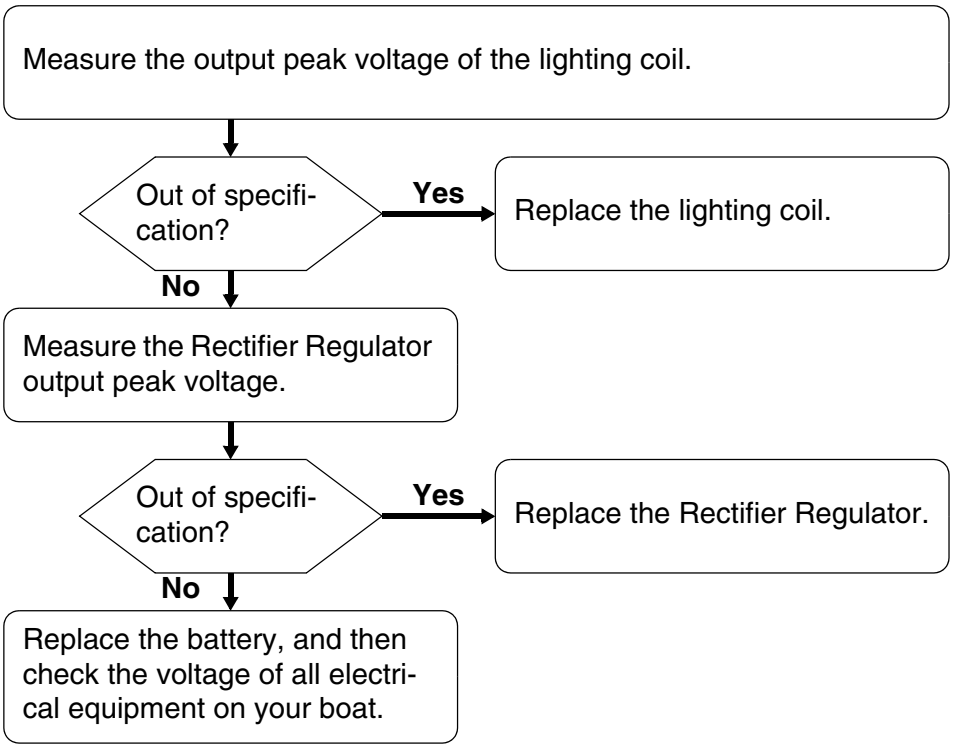
Symptom: Shift mechanism of the forward gear and reverse gear does not operate properly.



Electrical systems

Symptom: Battery becomes weaker quickly.

• Check the charging system.



A.

B.

C.

D.

E.

F.

G.

T.

U.

V.

W.

Wiring diagram
F100BET, F100CET

① Battery
② Power trim and tilt motor
③ Starter motor
④ Starter relay
⑤ Power trim and tilt relay
⑥ Rectifier Regulator
⑦ Lighting coil
⑧ Pulser coil
⑨ Ignition coil
⑩ Spark plug
⑪ Throttle position sensor
⑫ Trim sensor
⑬ CDI unit
⑭ Oil pressure switch
⑮ Prime Start
⑯ Hour meter
⑰ Fuse (30A)
⑱ Fuse (20A)
⑲ Neutral switch
⑳ Trailer switch
㉑ Power trim and tilt switch
㉒ Trim sensor
㉓ Engine stop switch
㉔ Engine start switch

Ⓐ Tiller handle model

Color code

B	: Black
Br	: Brown
G	: Green
Gr	: 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
G/R	: Green/red
G/W	: Green/white
P/B	: Pink/black
P/W	: Pink/white
W/B	: White/black
W/R	: White/red

YAMAHA MOTOR CO., LTD.
Printed in the Netherlands
Jun. 2001 – 0.5 × 1 CR
(F100BET, F100CET)
(E)

F100BET, F100CET