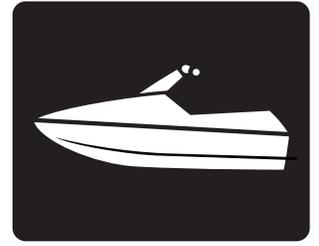




**YAMAHA**



**WaveRunner  
FX SHO  
FX Cruiser SHO**

**SERVICE MANUAL**



**LIT-18616-03-12**

**F1W-28197-1K-11**

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## 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, passengers, a bystander, or a person inspecting or repairing the watercraft.**

### CAUTION:

**A CAUTION indicates special precautions that must be taken to avoid damage to the watercraft.**

### NOTE:

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

WaveRunner  
FX SHO, FX Cruiser SHO  
SERVICE MANUAL  
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LIT-18616-03-12

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# Chapter 1

## General information

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## How to use this manual

### Manual format

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

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

**NOTE:**

For troubleshooting procedures, refer to “Trouble analysis” in Chapter 9.

**JET PUMP** Jet thrust nozzle and nozzle ring

**Jet thrust nozzle and nozzle ring removal**

④

③

①

Step	Procedure/Part name	Qty	Service points
	Jet pump unit assembly		Refer to "Jet pump unit."
	Reverse gate		Refer to "Reverse gate."
1	Bolt/collar	2/2	
2	Jet thrust nozzle	1	
3	Bolt/collar	2/2	
4	Nozzle ring	1	
5	Nut/washer	1/1	
6	Ball joint/washer	1/1	Reverse the removal steps for installation.

6-8

**JET PUMP** Impeller duct and drive shaft

⑤

8. Install:

- Spacer ①
- Impeller ②

**NOTE:**  
The impeller has left-hand threads. Turn the impeller counterclockwise to tighten it.

Drive shaft holder ③:  
YB-06201  
Drive shaft holder 6 ④:  
90890-06520

Impeller:  
75 N • m (7.5 kgf • m, 54 ft • lb)  
LOCTITE 575

**Impeller duct and impeller housing installation**

1. Install:

- Dowel pins ①
- Impeller duct assembly ②
- Dowel pins ③
- Nozzle ④

**NOTE:**  
Clean the contacting surfaces before applying ThreeBond 1194E.

6-17



① <b>GEN INFO</b> 	② <b>SPEC</b> 
③ <b>CHK ADJ</b> 	④ <b>FUEL</b> 
⑤ <b>POWR</b> 	⑥ <b>JET PUMP</b> 
⑦ <b>ELEC</b> 	⑧ <b>HULL HOOD</b> 
⑨ <b>TRBL ANLS</b> 	⑩ 
⑪ 	⑫ 
⑬ 	⑭ 
⑮ 	⑯ 
⑰ 	⑱ 
⑲ 	⑳ 
㉑ 	㉒ 
㉓ 	㉔ 

**Symbols**

Symbols ① to ⑨ are designed to indicate the content of a chapter.

- ① General information
- ② Specification
- ③ Periodic check and adjustment
- ④ Fuel system
- ⑤ Power unit
- ⑥ Jet pump unit
- ⑦ Electrical system
- ⑧ Hull and hood
- ⑨ Trouble analysis

Symbols ⑩ to ⑮ indicate specific data.

- ⑩ Special service tool
- ⑪ Specified oil or fluid
- ⑫ Specified engine speed
- ⑬ Specified tightening torque
- ⑭ Specified measurement
- ⑮ Specified electrical value (resistance, voltage, electric current)

Symbols ⑯ to ⑲ in an exploded diagram indicate the grade of lubricant and the lubrication point.

- ⑯ Apply 4-stroke motor oil
- ⑰ Apply water resistant grease (Yamaha grease A)
- ⑱ Apply ThreeBond 1104J or ThreeBond 1280B
- ⑲ Apply molybdenum disulfide grease

Symbols ⑳ to ㉔ in an exploded diagram indicate the type of sealant or locking agent and the application point.

- ㉑ Apply Gasket Maker
- ㉒ Apply LOCTITE 271 (red)
- ㉓ Apply LOCTITE 242 (blue)
- ㉔ Apply LOCTITE 572
- ㉔ Apply silicone sealant

**NOTE:**

Additional symbols may be used in this manual.



**Abbreviation**

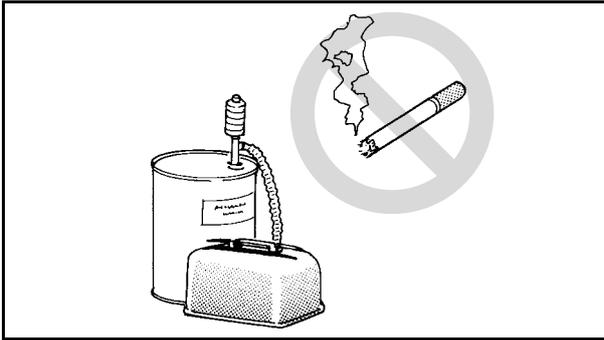
The following abbreviations are used in this service manual.

Abbreviation	Description
API	American Petroleum Institute
APS	Accelerator position sensor
BOW	Bow end
DOWN	Downside
ECM	Electronic Control Module
ETV	Electronic throttle valve
EX	Exhaust
IN	Intake
OL	Overload
OTS	Off-throttle steering system
PORT	Port side
QSTS	Quick Shift Trim System
RPM	Revolutions Per Minute
SAE	Society of Automotive Engineers
STBD	Starboard side
STERN	Stern end
TCI	Transistor Controlled Ignition
TDC	Top Dead Center
TPS	Throttle Position Sensor
UP	Upside
YDIS	Yamaha Diagnostic System
YEMS	Yamaha Engine Management System

**Grease table**

The following table contains sealants, locking agents, and lubricants used in this service manual that are not listed on the "Symbols" page.

Symbol	Name	Application
	Epnoc grease AP #0	Lubricant
	Silicone grease	Water resistant grease
	ThreeBond 1194E	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.

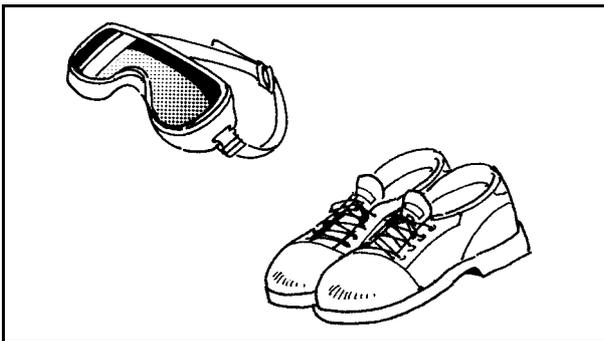
### Ventilation

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.

### Self-protection

Protect your eyes by wearing safety glasses or safety goggles during all operation involving drilling and grinding, or when using an air compressor.

Protect your hands and feet by wearing protective gloves and safety shoes when necessary.

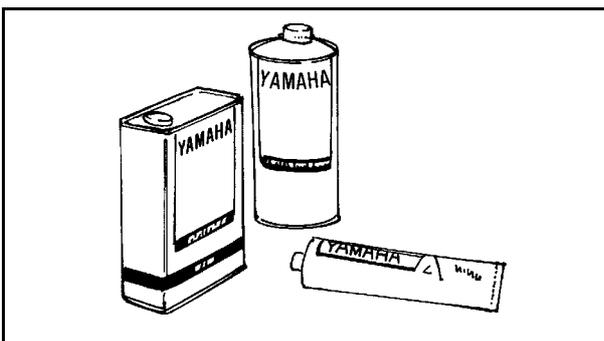


### Parts, lubricants, and sealants

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

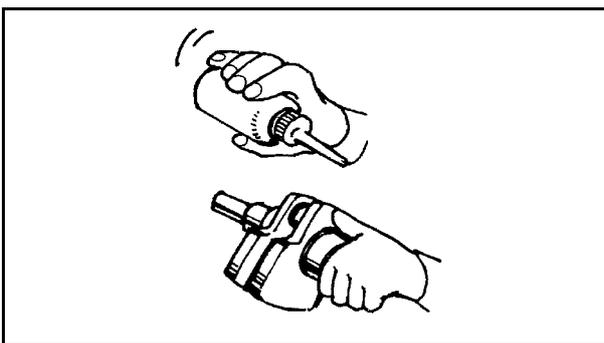
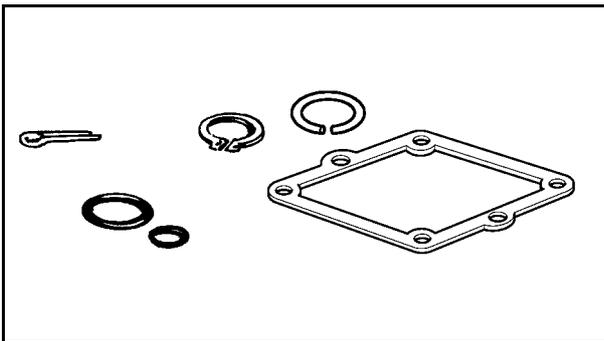
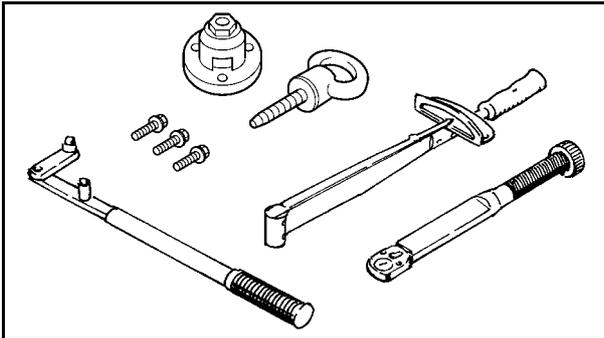
Under normal conditions, the lubricants mentioned in this manual should not harm or be hazardous to your skin. However, you should follow these precautions to minimize any risk when working with lubricants.

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





5. Keep a supply of clean, lint-free cloths for wiping up spills, etc.
6. Maintain good standards of personal and industrial hygiene.



## Good working practices

### Special service tool

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

### Tightening torques

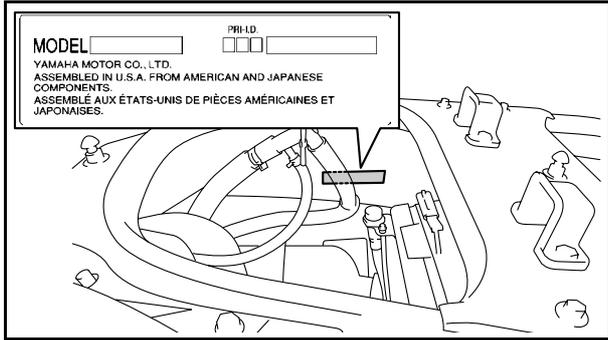
Follow the tightening torque specifications provided throughout the manual. When tightening nuts, bolts, and screws, tighten the large sizes first, and tighten fasteners starting in the center and moving outward.

### Non-reusable parts

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

## Disassembly and assembly

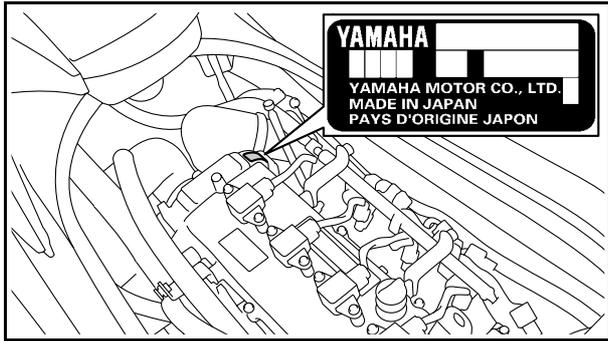
1. Use compressed air to remove dust and dirt during disassembly.
2. Apply oil or fluid to the contact surfaces of moving parts before assembly.
3. Install bearings with the manufacture identification mark in the direction indicated in the installation procedure. In addition, be sure to lubricate the 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 number  
Primary I.D. number**

The primary I.D. number is stamped on a label attached to the inside of the engine compartment.

Starting primary I.D. number:  
F1W: 800101

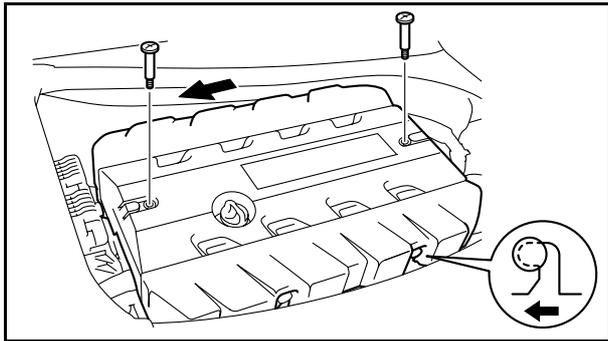


**Engine serial number**

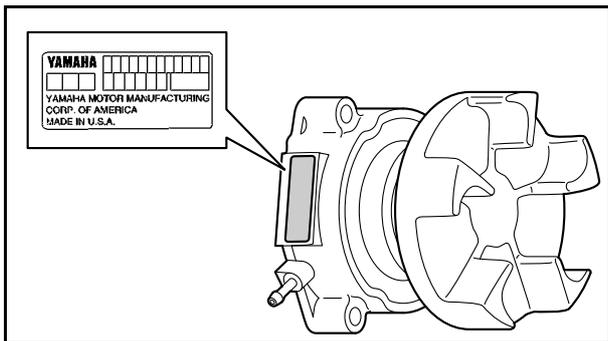
The engine serial number is stamped on a label attached to the engine unit.

**NOTE:**

- The label stamped with the engine serial number is located on the cylinder head cover. Remove the engine cover to check the engine serial number.
- Slide the engine cover rearward, and then lift the cover to remove it.

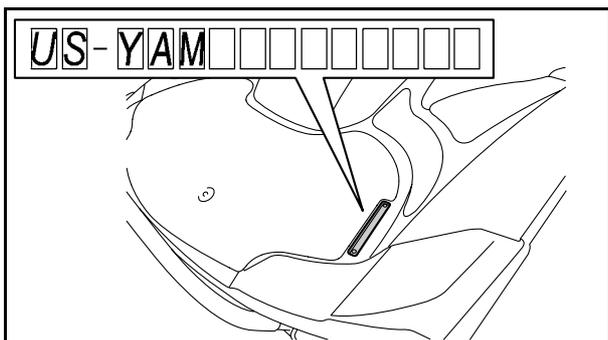


Starting serial number:  
6S5: 1000001



**Jet pump unit serial number**

The jet pump unit serial number is stamped on a label attached to the intermediate housing.



**Hull identification number (H.I.N.)**

The H.I.N. is stamped on a plate attached to the boarding platform.



**Special service tool**

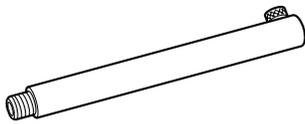
Using the correct special tools recommended by Yamaha will aid the work and enable accurate assembly and tune-up. Improvisations and using improper tools can damage the equipment.

**NOTE:** \_\_\_\_\_

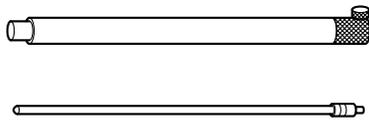
- For USA and Canada, use part numbers starting with "YB-", "YM-", "YU-", or "YW-."
- For other countries, use part numbers starting with "90890-."

**Measuring**

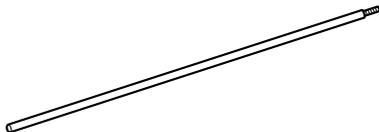
- ① Gauge stand  
90890-06725



- ② Dial gauge stand set (use needle only)  
YB-06585



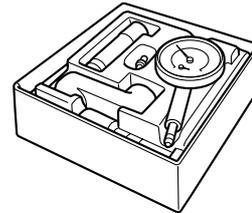
- ③ Dial gauge needle  
90890-06584



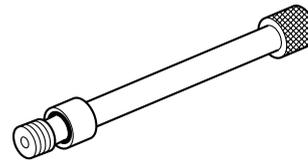
- ④ Dial gauge  
YU-03097



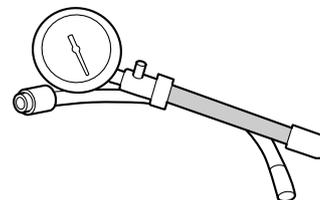
90890-01252



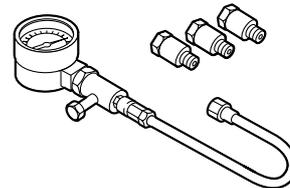
- ⑤ Compression gauge extension  
90890-06582



- ⑥ Compression gauge  
YU-33223



90890-03160

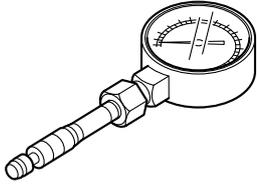


- ⑦ Fuel pressure gauge adapter  
YW-06842  
90890-06842



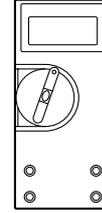


- ⑧ Fuel pressure gauge  
YB-06766

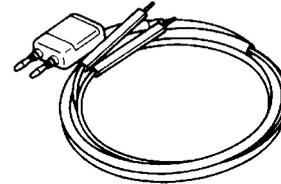


90890-06786

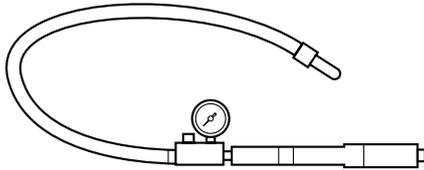
- ⑬ Digital multimeter  
YU-34899-A



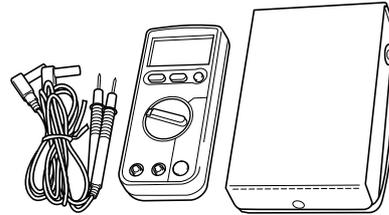
- ⑭ Peak voltage adapter  
YU-39991



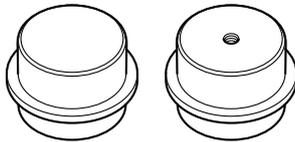
- ⑨ Leakage tester  
90890-06840



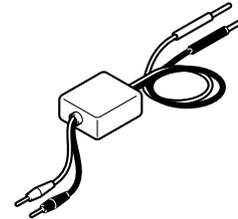
- ⑮ Digital circuit tester  
90890-03174



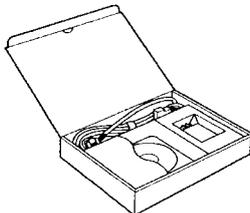
- ⑩ Air cooler attachment  
90890-06731



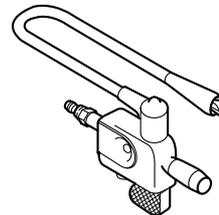
- ⑯ Peak voltage adapter B  
90890-03172



- ⑪ YDIS (connecting kit)  
60V-85300-04



- ⑰ Spark checker  
YM-34487  
Ignition tester  
90890-06754

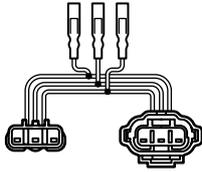


- ⑫ YDIS (CD-ROM, Ver. 1.30)  
60V-WS853-04

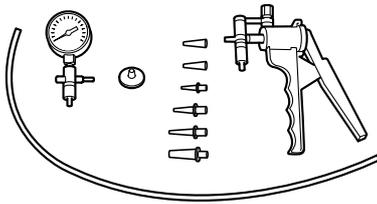




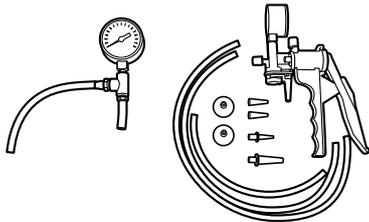
- ⑱ Test harness (3 pins)  
YB-06877  
Test harness HM090-3 (3 pins)  
90890-06877



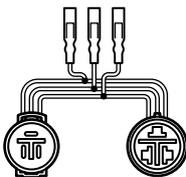
- ⑲ Lower unit pressure/vacuum tester  
YB-35956-A



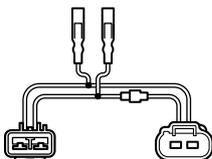
- ⑳ Vacuum/pressure pump gauge set  
90890-06756



- ㉑ Test harness (3 pins)  
YB-06870  
Test harness SMT250-3 (3 pins)  
90890-06870

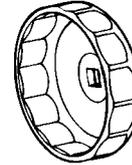


- ㉒ Test harness (2 pins)  
90890-06850

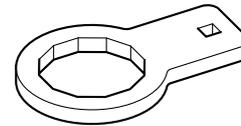


**Removal and installation**

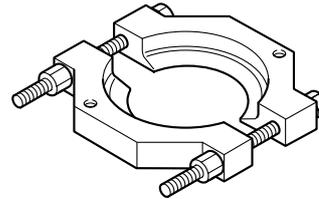
- ① Oil filter wrench  
90890-06830



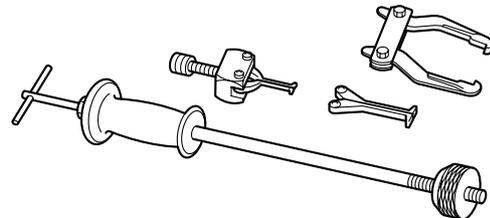
- ② Exhaust pipe wrench  
90890-06726



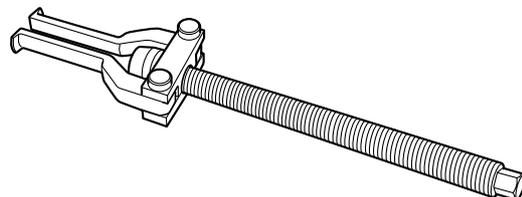
- ③ Bearing separator  
90890-06534



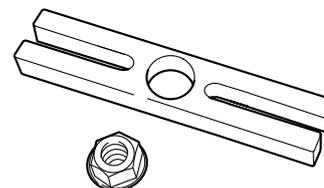
- ④ Slide hammer and adapters  
YB-06096



- ⑤ Bearing puller assembly  
90890-06535

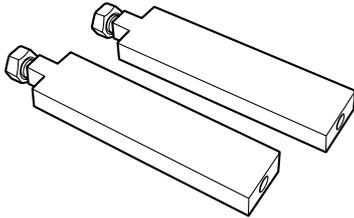


- ⑥ Stopper guide plate  
90890-06501

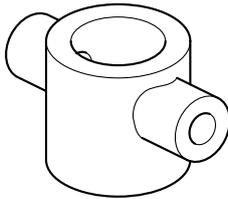




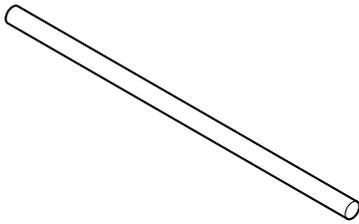
- ⑦ Stopper guide stand  
90890-06538



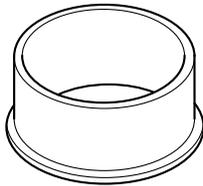
- ⑧ Shaft holder  
90890-06721



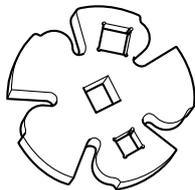
- ⑨ Driver handle  
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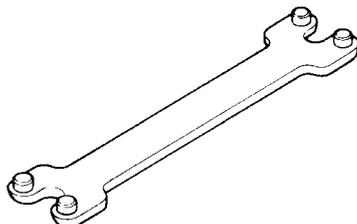
- ⑩ Bearing inner race attachment  
90890-06661



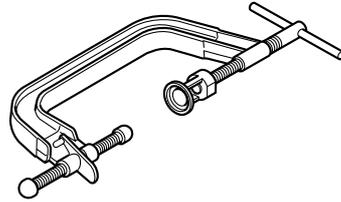
- ⑪ Coupler wrench  
90890-06729



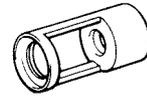
- ⑫ Camshaft wrench  
90890-06724



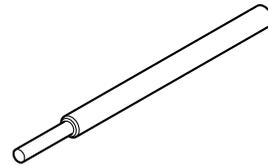
- ⑬ Valve spring compressor  
YM-04019  
90890-04019



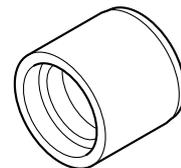
- ⑭ Compressor adapter  
YM-04114  
Valve spring compressor attachment  
90890-04114



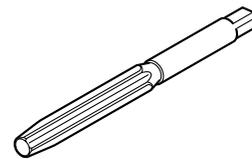
- ⑮ Valve guide remover  
YB-06801  
90890-06801



- ⑯ Valve guide installer  
YB-06810  
90890-06810

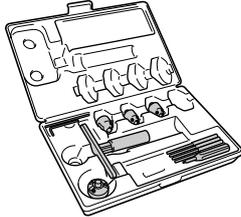


- ⑰ Valve guide reamer  
YM-01196  
90890-06804

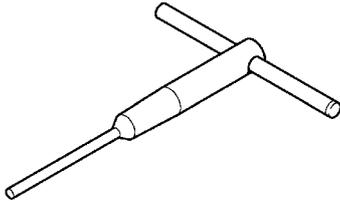




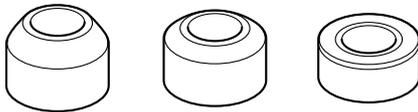
- ⑱ Neway valve seat kit  
YB-91044



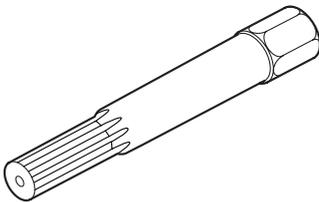
- ⑲ Valve seat cutter holder  
90890-06812



- ⑳ Valve seat cutter  
Intake  
90890-06720 (30°)  
90890-06325 (45°)  
90890-06324 (60°)  
Exhaust  
90890-06818 (30°)  
90890-06555 (45°)  
90890-06323 (60°)



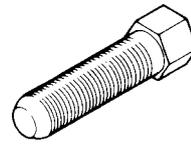
- ㉑ Crankshaft holder  
YB-06562  
90890-06562



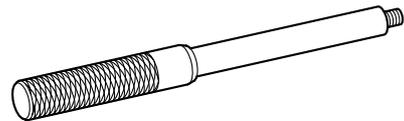
- ㉒ Flywheel puller  
90890-06723



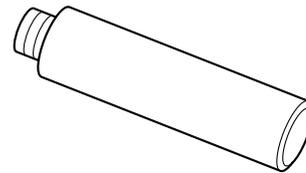
- ㉓ Rotor puller  
90890-01080



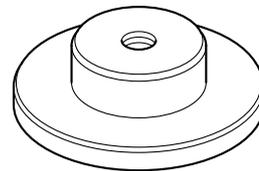
- ㉔ Driver handle (small)  
YB-06229



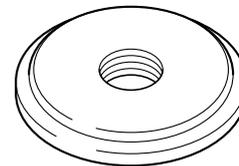
- ㉕ Driver rod LS  
90890-06606



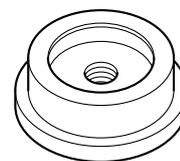
- ㉖ Bearing and seal installer  
YW-06356



- ㉗ Bearing outer race attachment  
90890-06623, 90890-06627, 90890-06628

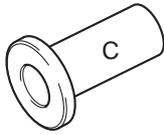


- ㉘ Forward bearing race installer  
YB-06258

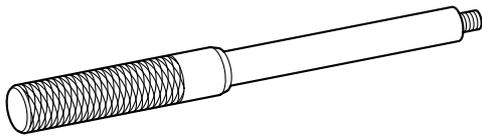




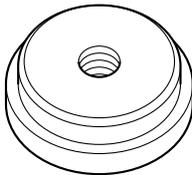
- ②⑨ Bearing pressure C  
90890-02393



- ③⑩ Driver handle (large)  
YB-06071



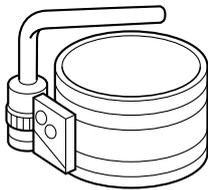
- ③① Forward gear outer race installer  
YB-41446



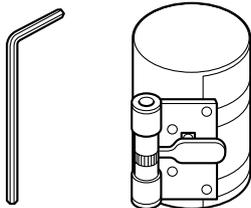
- ③② Ball bearing attachment  
90890-06657



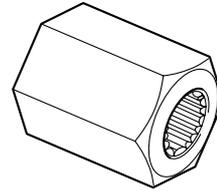
- ③③ Piston ring compressor  
YM-08037



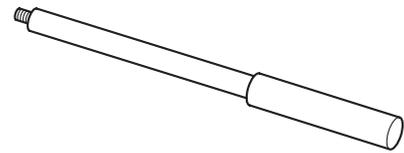
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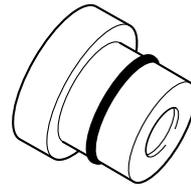
- ③④ Drive shaft holder  
YB-06201  
Drive shaft holder 6  
90890-06520



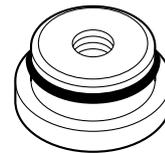
- ③⑤ Driver rod L3  
90890-06652



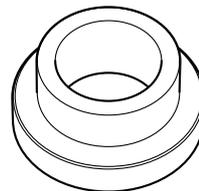
- ③⑥ Drive shaft needle bearing installer and  
remover  
YB-06194



- ③⑦ Needle bearing attachment  
90890-06609



- ③⑧ Bearing attachment  
90890-06728

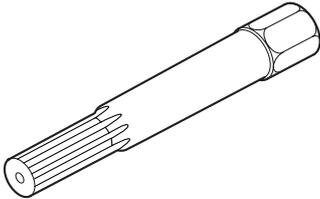




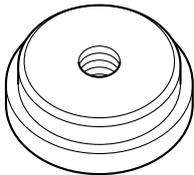
- ③⑨ Bearing cup installer  
YB-06167



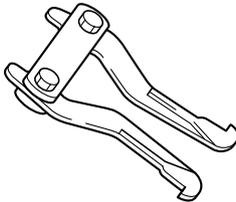
- ④⑩ Shaft holder  
90890-06730



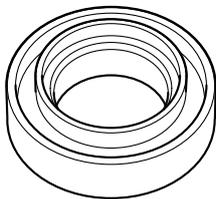
- ④① Needle bearing installer  
YB-06434



- ④② Bearing puller legs  
YB-06523



- ④③ Bearing attachment  
90890-06727

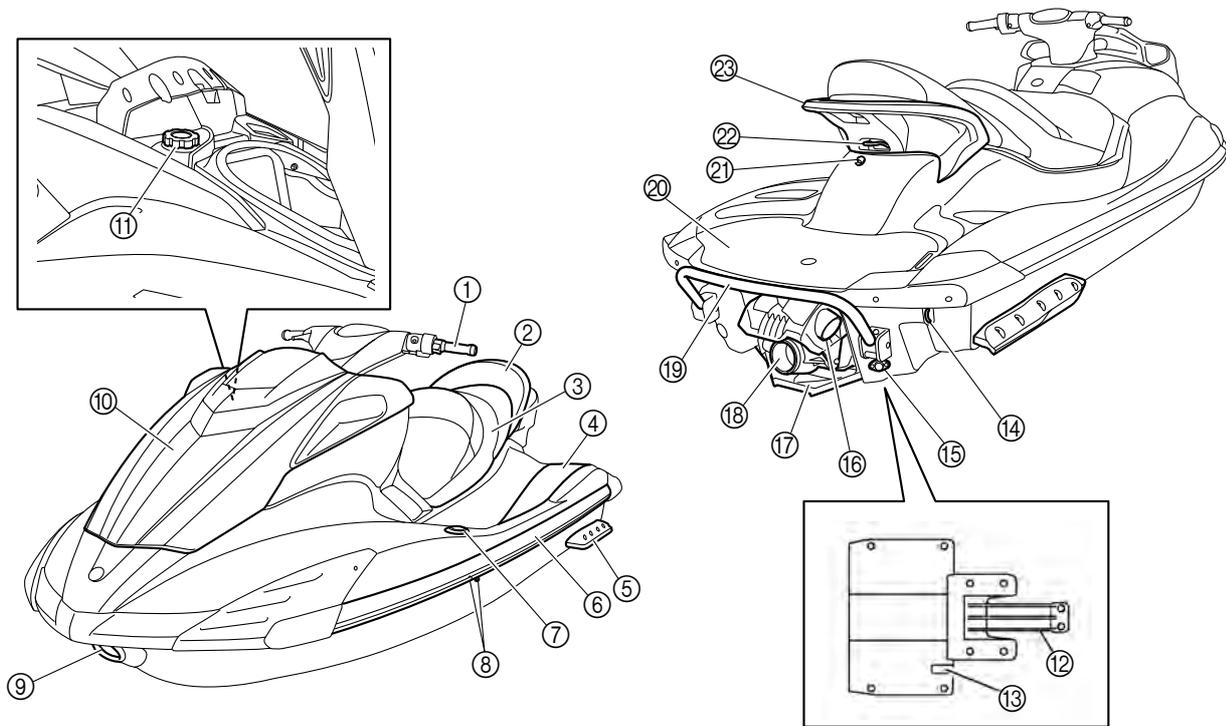




**Feature and benefit**

**Watercraft overview**

The FX SHO series features a newly designed deck, while keeping the popular hull design of the FX. Both the deck and hull are made of NanoXcel, which is 25% lighter compared to conventional materials. The fuel filler cap is now located under the hood.

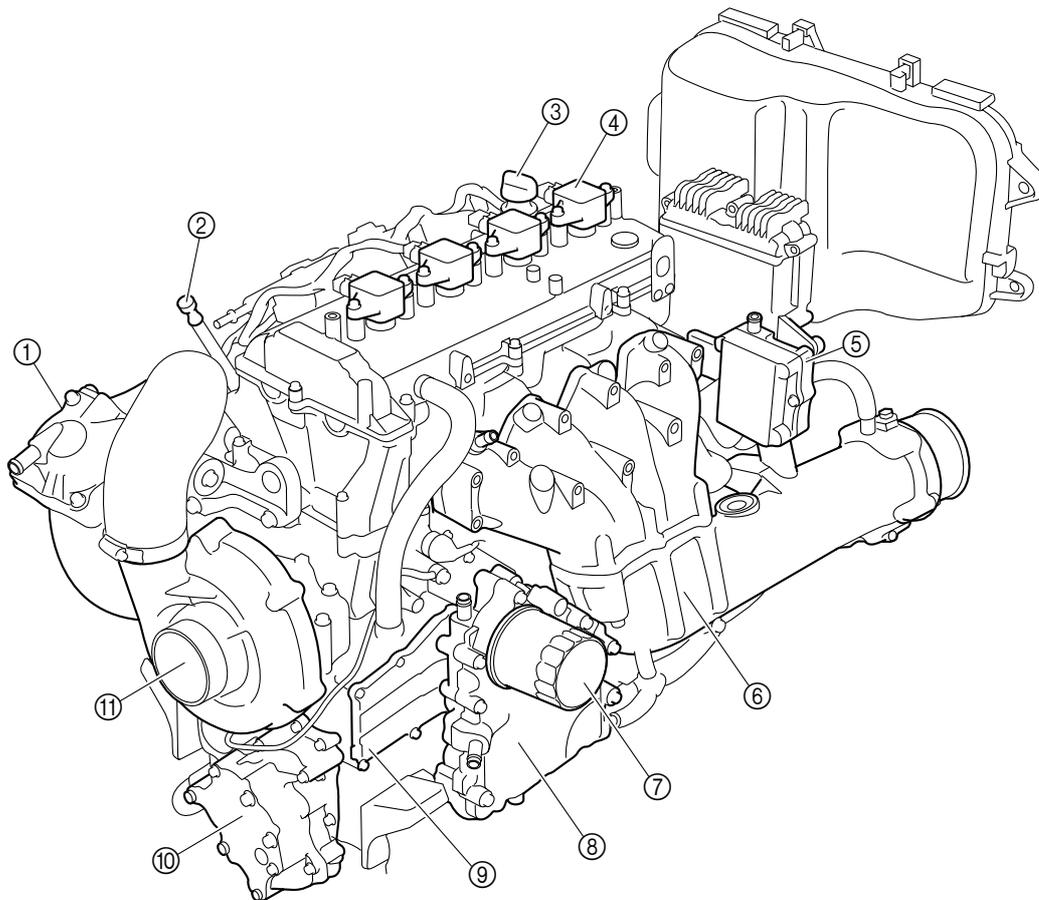


- ① Handlebar
- ② Rear seat assembly
- ③ Front seat assembly
- ④ Foot well
- ⑤ Sponson
- ⑥ Gunwale
- ⑦ Pull-up cleat (FX Cruiser SHO)
- ⑧ Cooling water pilot outlet
- ⑨ Bow eye
- ⑩ Front hood assembly
- ⑪ Fuel filler cap
- ⑫ Intake grate
- ⑬ Speed sensor (FX SHO)  
Speed and water temperature sensor (FX Cruiser SHO)
- ⑭ Stern eye
- ⑮ Drain plug
- ⑯ Reverse gate
- ⑰ Ride plate
- ⑱ Jet thrust nozzle
- ⑲ Reboarding step assembly
- ⑳ Boarding platform
- ㉑ Electric bilge pilot outlet
- ㉒ Ski tow
- ㉓ Hand grip



**Engine overview**

The FX SHO series features a newly designed 1.8 L in-line 4-cylinder supercharged engine. Because of its light and compact design, this engine is roughly the same size as the MR-1 engine used on the FX series watercraft. Both high output and low fuel consumption are achieved using regular unleaded gasoline. The engine meets environmental regulations and complies with the 2006 U.S. EPA (Environmental Protection Agency) emission regulations and the 2008 CARB (California Air Resources Board) 3-star emission regulations.

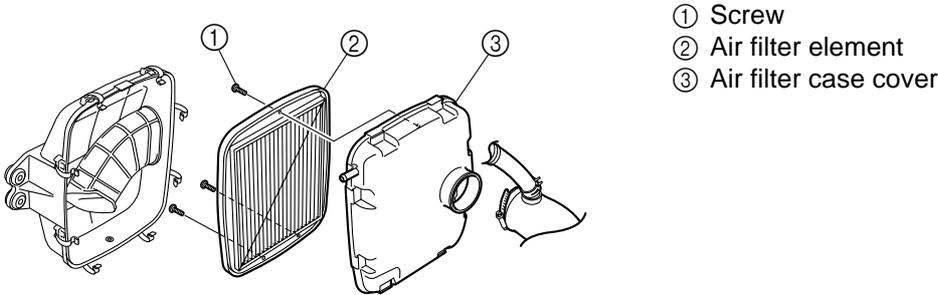


- ① Air cooler assembly
- ② Oil level gauge
- ③ Oil filler cap
- ④ Ignition coil
- ⑤ Rectifier regulator
- ⑥ 4 in 1 exhaust system
- ⑦ Oil filter
- ⑧ Oil cooler assembly
- ⑨ Oil separator tank
- ⑩ Oil pump assembly
- ⑪ Supercharger assembly



**Air filter case and air filter element**

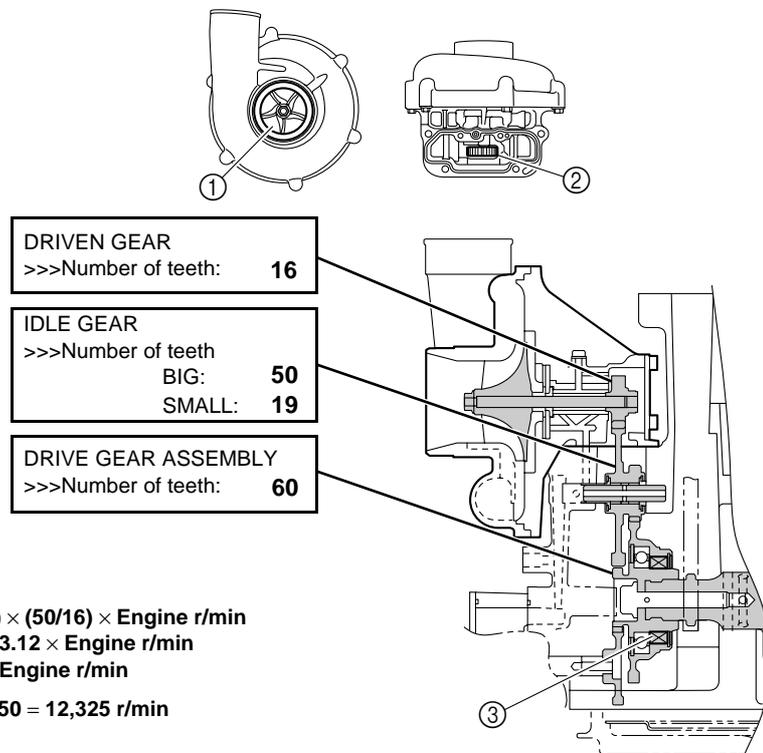
The air filter case and air filter element have been newly designed to handle the increased intake air volume. The air filter element itself is made of water-repellent material, which prevents water from entering the engine. In addition, the air filter element is secured to the air filter case cover using screws.



- ① Screw
- ② Air filter element
- ③ Air filter case cover

**Supercharger assembly**

The supercharger is located on the front of the engine, and is a centrifugal type that rotates the impeller for supercharging. The impeller uses a step-up gear with 2 steps to transmit the rotation of the crankshaft. The impeller rotates about 10 times faster than the crankshaft. The impeller drive gear is equipped with a one-way clutch; therefore, even if the engine stops when the impeller is rotating at high speed, the structure of the impeller allows it alone to continue rotating. The supercharger has excellent durability and is very quiet. In addition, the supercharger is easy to service.



**EXAMPLE:**  
 Turbine r/min =  $(60/19) \times (50/16) \times \text{Engine r/min}$   
 =  $3.16 \times 3.12 \times \text{Engine r/min}$   
 =  $9.86 \times \text{Engine r/min}$

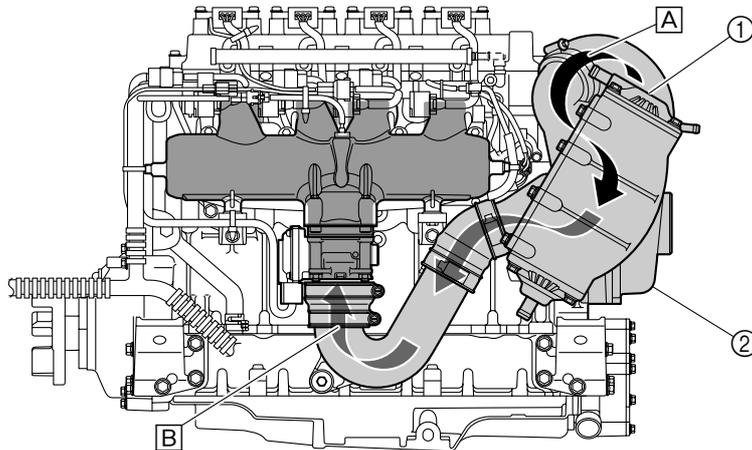
**Trolling speed:**  $9.86 \times 1,250 = 12,325 \text{ r/min}$

- ① Impeller
- ② Gear
- ③ One-way clutch



**Air cooler assembly**

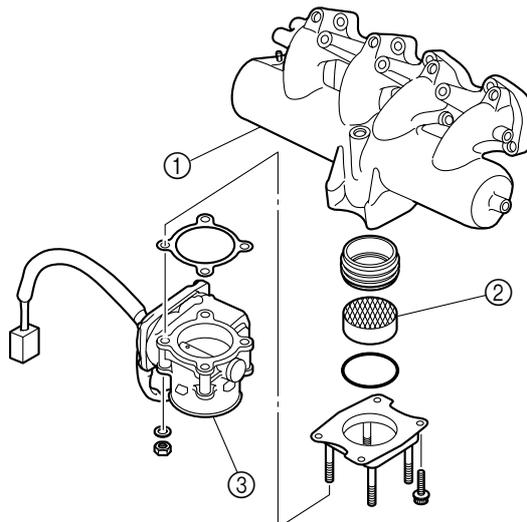
The air cooler assembly uses cooling water to cool the intake air that has been compressed in the supercharger. While the air cooler assembly has an extremely compact design, it functions as a highly efficient heat exchanger to cool the intake air.



- ① Air cooler assembly
- ② Supercharger assembly
- A Compressed air
- B Cooled air

**Intake system**

The intake system has incorporated an electronic control throttle valve (ETV). By using the ETV, the intake system itself is compact and is able to perform various engine controls. Furthermore, the intake air that passes through the ETV is balanced in the intake manifold before it is supplied to each cylinder.



- ① Intake manifold
- ② Ribbon
- ③ Throttle body assembly



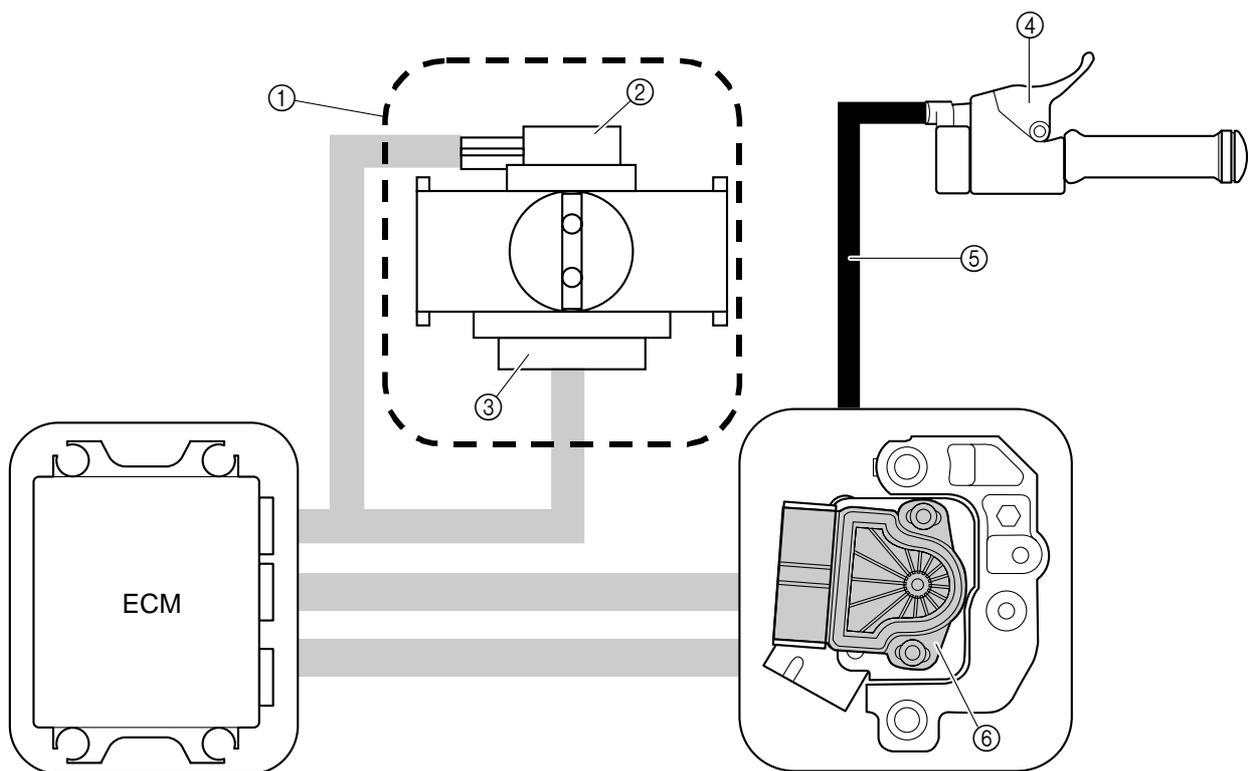
**Electronic control throttle valve (ETV) system**

The flow chart shows a typical ETV system.

The ETV system consists of a throttle lever, a throttle cable, an accelerator position sensor, electronic control throttle bodies, and an electronic control module (ECM).

A throttle cable connects the throttle lever and the APS. The accelerator position sensor (APS) detects the changes in operation of the throttle lever and changes the output voltage of the APS accordingly. This voltage is then transmitted from the APS to the ECM. In accordance with the voltage input from the APS, the ECM operates the DC motor, which is installed on the ETV, and sets the throttle valve to the opening angle that corresponds to the changes in operation of the throttle lever.

At the same time, the throttle position sensor (TPS), which is located on the same axle, detects the changes in the opening angle of the throttle valve and outputs the information to the ECM for optimum operation.



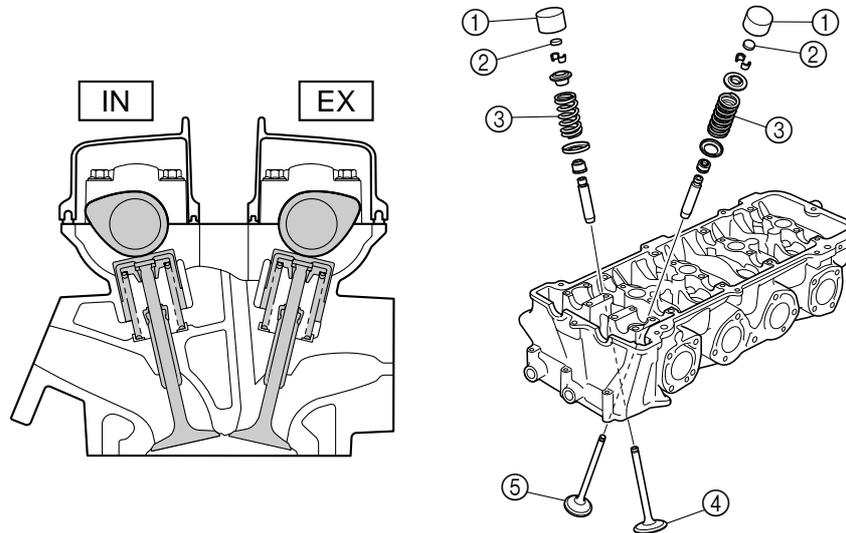
- ① Throttle body assembly
- ② TPS
- ③ DC-motor
- ④ Throttle lever
- ⑤ Throttle cable
- ⑥ APS





**Cylinder head assembly**

The newly designed cylinder head has 4 valves per cylinder: 2 intake valves and 2 exhaust valves. The shapes of the combustion chamber and piston have been designed to obtain the optimum compression ratio. The valve lifter is a direct-acting type with a valve pad. The valve spring is a single type.

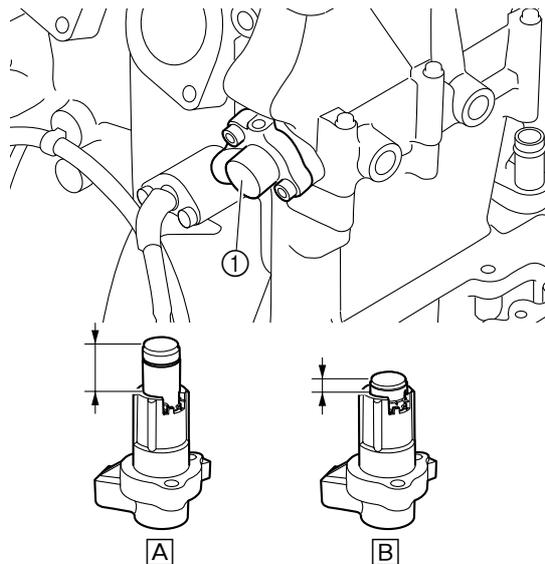


- ① Valve lifter
- ② Valve pad
- ③ Valve spring

- ④ Intake valve
- ⑤ Exhaust valve

**Hydraulic timing chain tensioner**

A hydraulic timing chain tensioner has been adopted in order to ensure that the tension on timing chain is maintained. When the engine is started and engine oil is supplied to the timing chain tensioner, the structure of the tensioner ensures that the rod is maintained in the proper position.



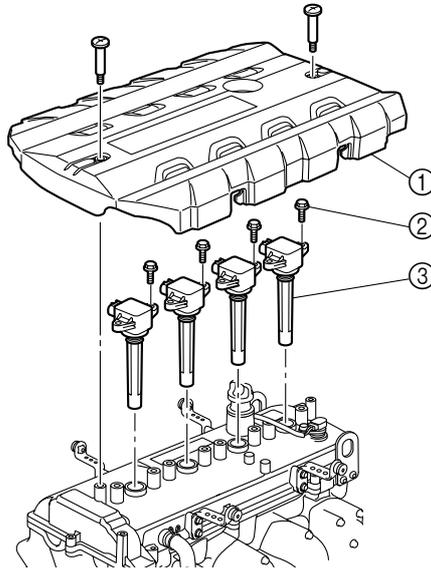
- ① Timing chain tensioner

- A** Fully extended rod position
- B** Fully retracted rod position



**Ignition coil**

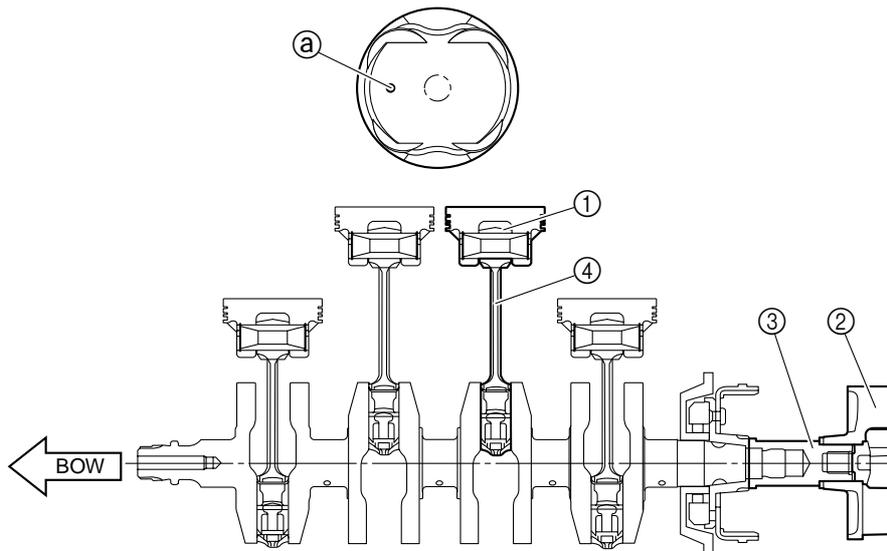
The ignition coils are a direct-ignition type with a coil installed to each cylinder. The coils are installed to the cylinder head cover using 2 bolts each, which ensures a secure installation and waterproofing of the spark plug holes.



- ① Engine cover
- ② Bolt
- ③ Ignition coil

**Piston and connecting rod**

The pistons and connecting rods have been newly designed. The shape of the piston crown has been designed to achieve the optimum compression ratio and the shape of the connecting rod has been designed to handle the high output. Furthermore, a mark to indicate the installation direction has been placed on the piston crown.

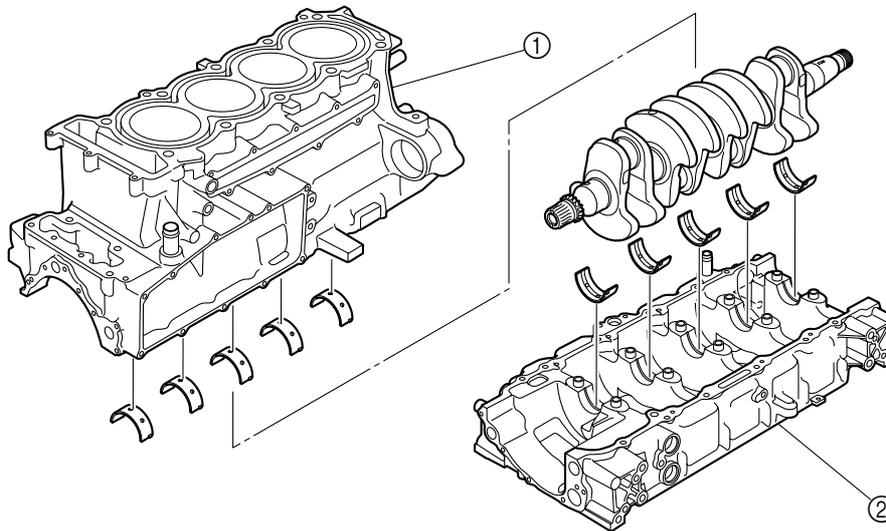


- ① Piston
- ② Drive coupling
- ③ Transfer shaft
- ④ Connecting rod
- ① Piston installation direction mark



### Cylinder block and crankcase

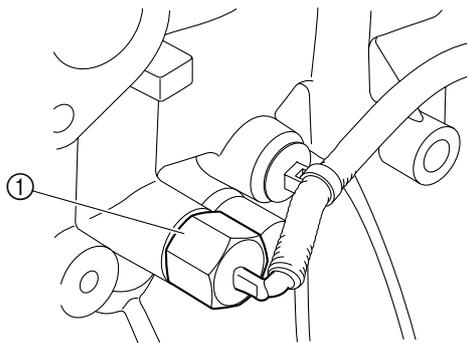
The cylinder block and crankcase have been newly designed. Cast-in iron sleeves, which offer the same high reliability of conventional sleeves, have been adopted. The crankshaft journal portions of the crankcase use a ladder-deck structure in order to achieve high rigidity.



- ① Cylinder block
- ② Crankcase

### Knock sensor

The knock sensor is installed directly to the cylinder block. The knock sensor detects vibration that is generated by knocking in the combustion chambers and transmits the information to the ECM. If the ECM determines that knocking is occurring, it adjusts the ignition timing to control the knocking and protect the engine from damage.

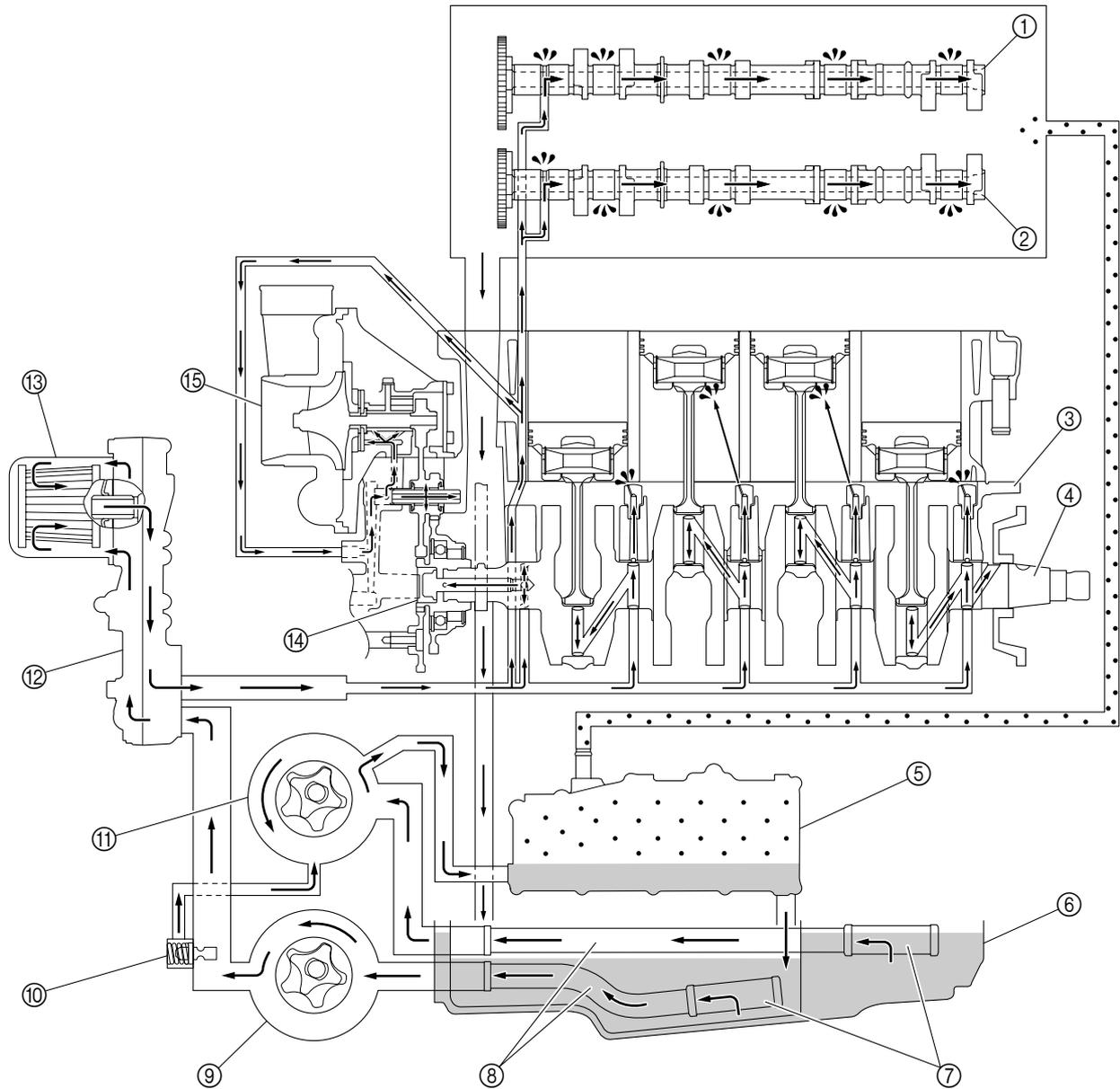


- ① Knock sensor



**Lubrication system**

The FX SHO employs a wet sump lubrication system, which is different from conventional models. There are 2 oil pumps, the scavenge pump and feed pump, located in the oil pan at the bottom of the engine to draw in and pressure feed the engine oil.

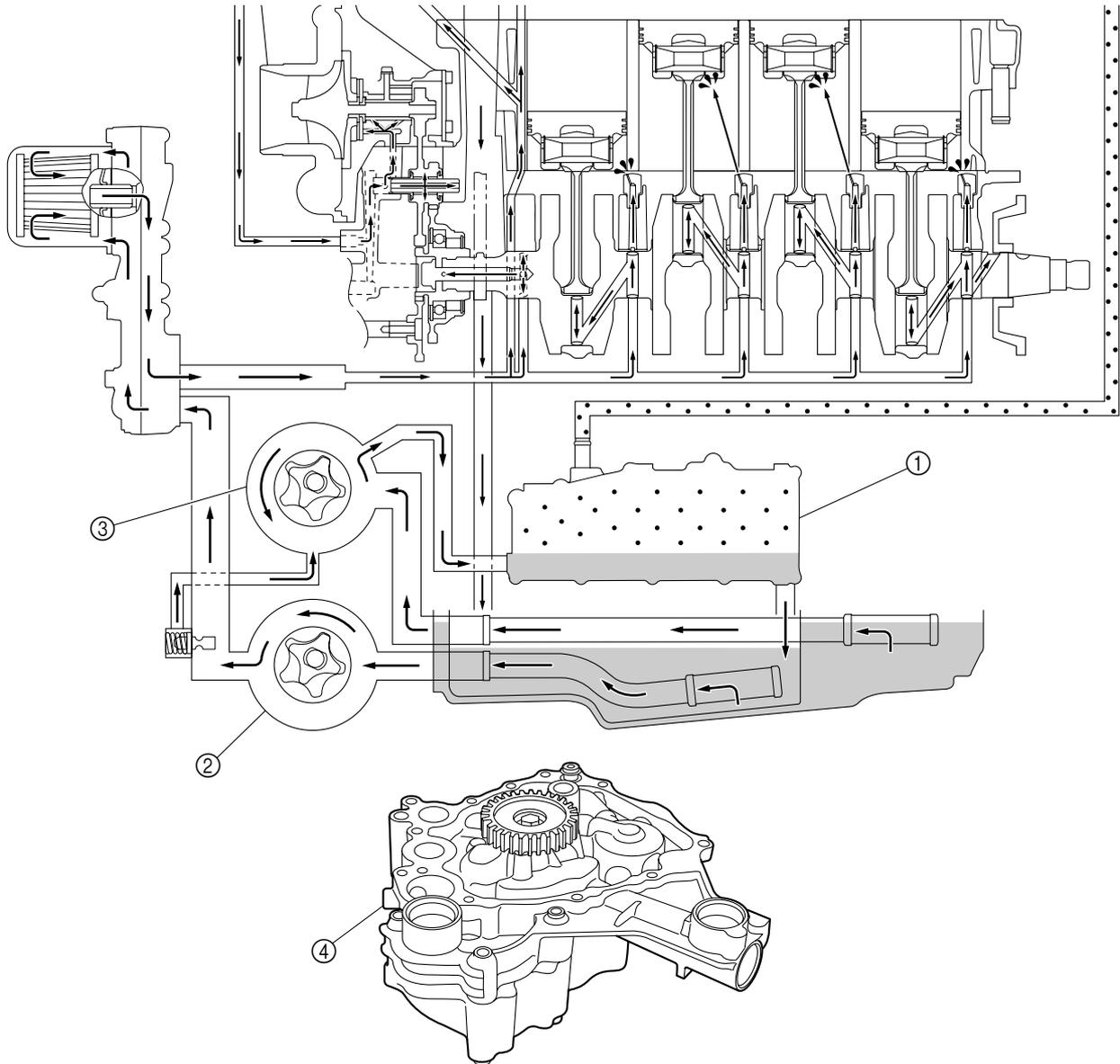


- ① Intake camshaft
- ② Exhaust camshaft
- ③ Cylinder block
- ④ Crankshaft
- ⑤ Oil separator tank
- ⑥ Oil pan
- ⑦ Oil strainer
- ⑧ Oil pipe
- ⑨ Oil pump assembly (feed pump)
- ⑩ Relief valve
- ⑪ Oil pump assembly (scavenge pump)
- ⑫ Oil cooler assembly
- ⑬ Oil filter
- ⑭ Drive gear assembly
- ⑮ Supercharger assembly



**Oil pump assembly**

The oil pump assembly is comprised of 2 oil pumps: the scavenge pump and the feed pump. The scavenge pump pressure feeds engine oil from the oil pan to the oil separator tank. The feed pump supplies engine oil from the oil pan to the various engine components.

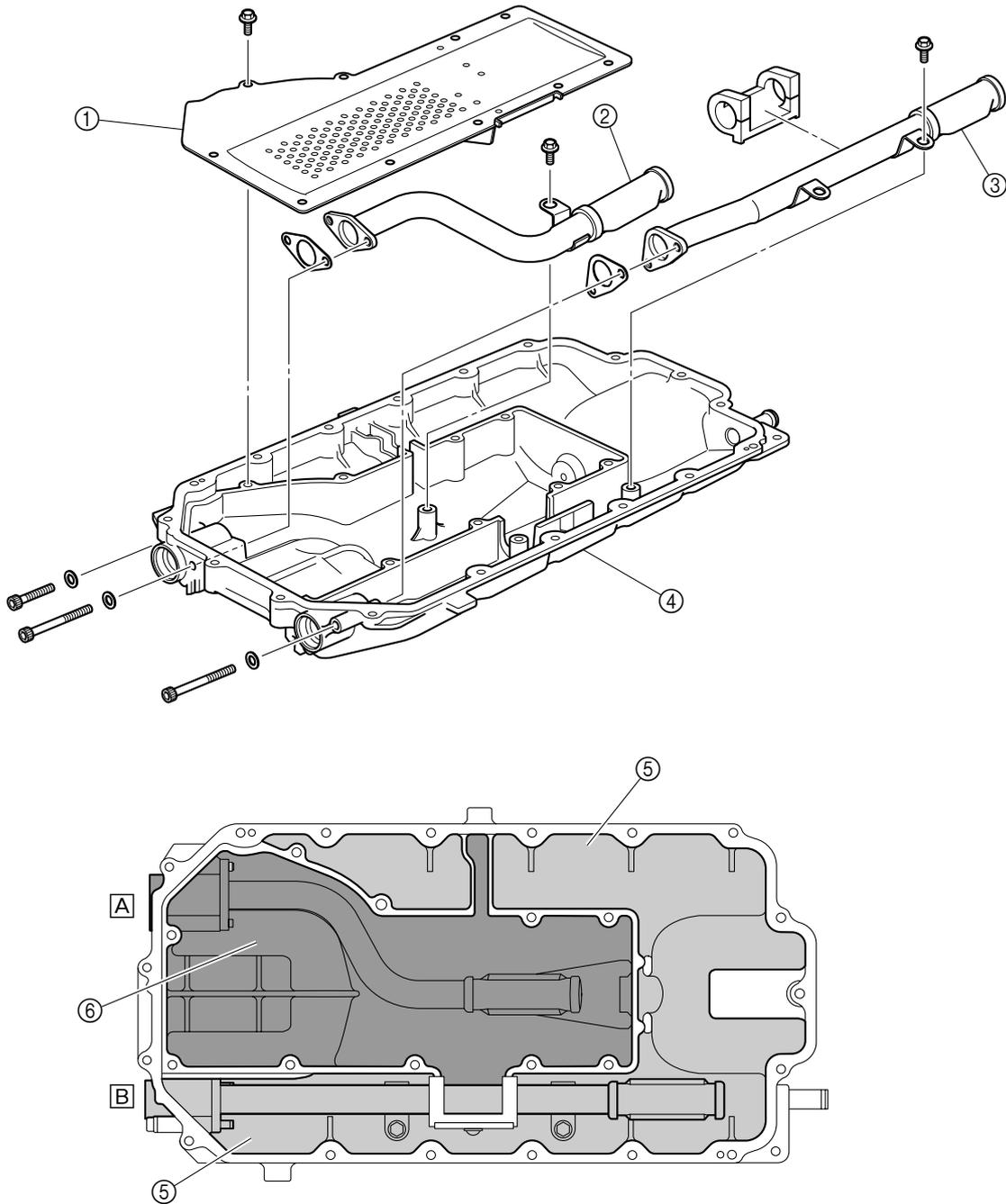


- ① Oil separator tank
- ② Oil pump assembly (feed pump)
- ③ Oil pump assembly (scavenge pump)
- ④ Oil pump assembly



**Oil pan**

The wet-sump type oil pan is divided into 2 internal compartments. Engine oil in the inner oil pan is pressure-fed to the various engine components by the feed pump. Engine oil in the outer oil pan is sent to the oil separator tank by the scavenge pump, and then it flows into the inner oil pan. By using 2 internal compartments, a stable supply of engine oil is possible even under the harsh operating conditions of watercraft.



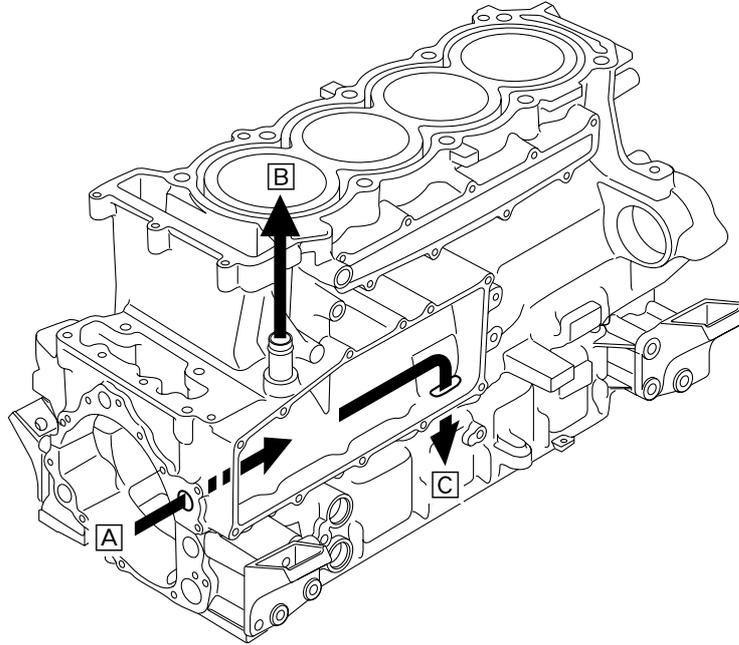
- ① Baffle plate
- ② Strainer (feed)
- ③ Strainer (scavenge)
- ④ Oil pan
- ⑤ Outer oil pan

- ⑥ Inner oil pan
- Ⓐ To feed pump
- Ⓑ To scavenge pump



**Oil separator tank**

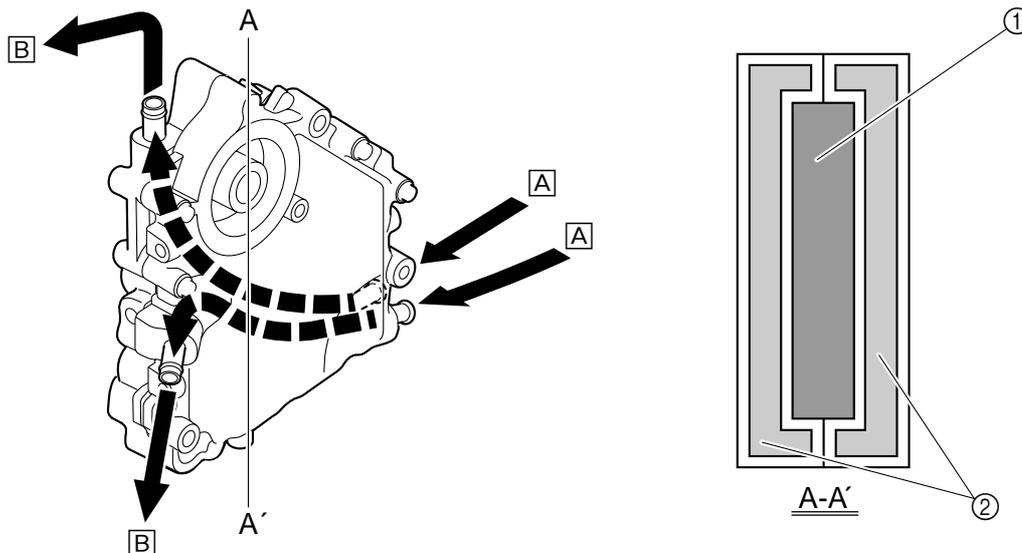
The scavenge pump pressure feeds the engine oil to the oil separator tank. The oil separator tank separates the gas from the engine oil. The gas is routed to the cylinder head cover as blow-by gas and the engine oil flows into the inner oil pan at the center of the oil pan.



- A** From scavenge pump
- B** To cylinder head
- C** To inner oil pan

**Oil cooler assembly**

The mounting location for the oil filter is integrated into the oil cooler assembly. Cooling water flows on both sides of the engine oil to effectively cool the oil.

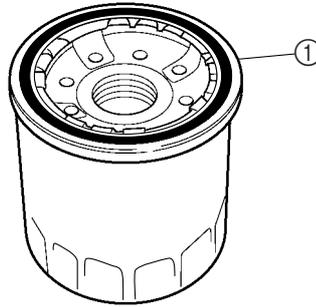


- ① Engine oil
- ② Cooling water
- A** From jet pump unit
- B** To cooling water pilot outlet on port side



**Oil filter**

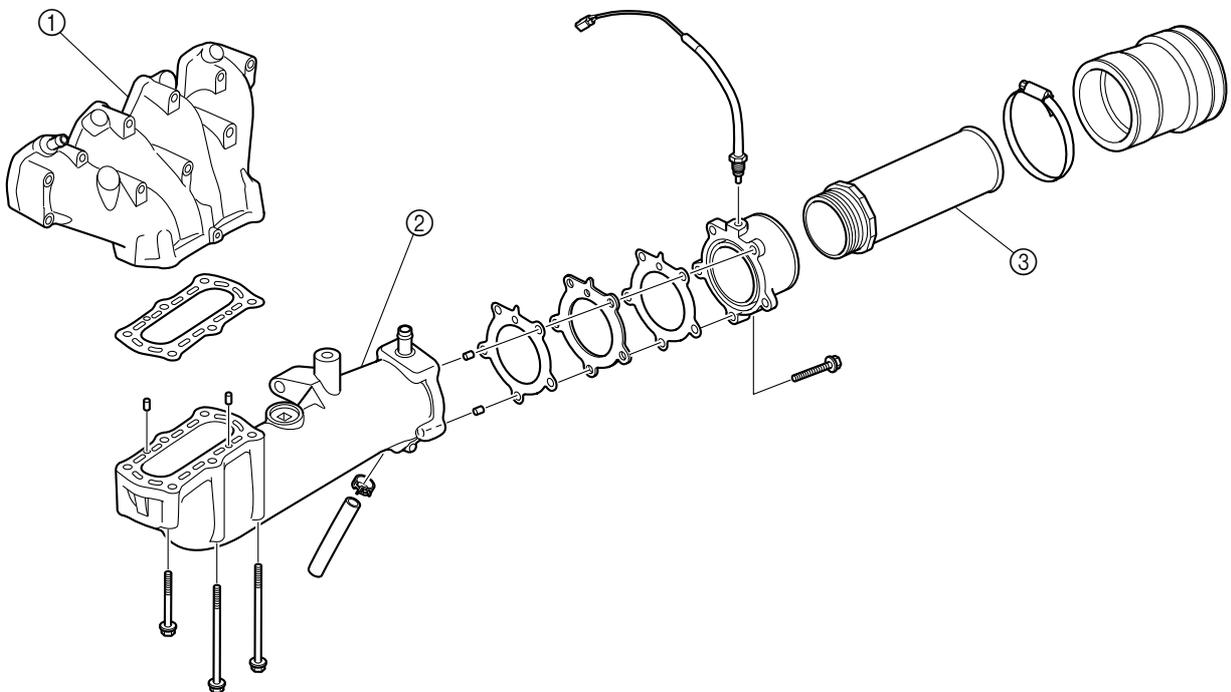
The oil filter has been changed from the conventional 5GH type to the 69J type. The 69J type oil filter is also used on large outboard motors.



① Oil filter

**Exhaust system**

The exhaust system features a compact design that uses double-pipe construction and a 4-in-1 system to collect the exhaust gas before it is routed through the exhaust pipe 1. In addition, exhaust pipe 3 is connected to the rear end of the exhaust pipe 1 in order to extend the exhaust outlet into the water lock. This prevents back-flow of water into the exhaust passage.



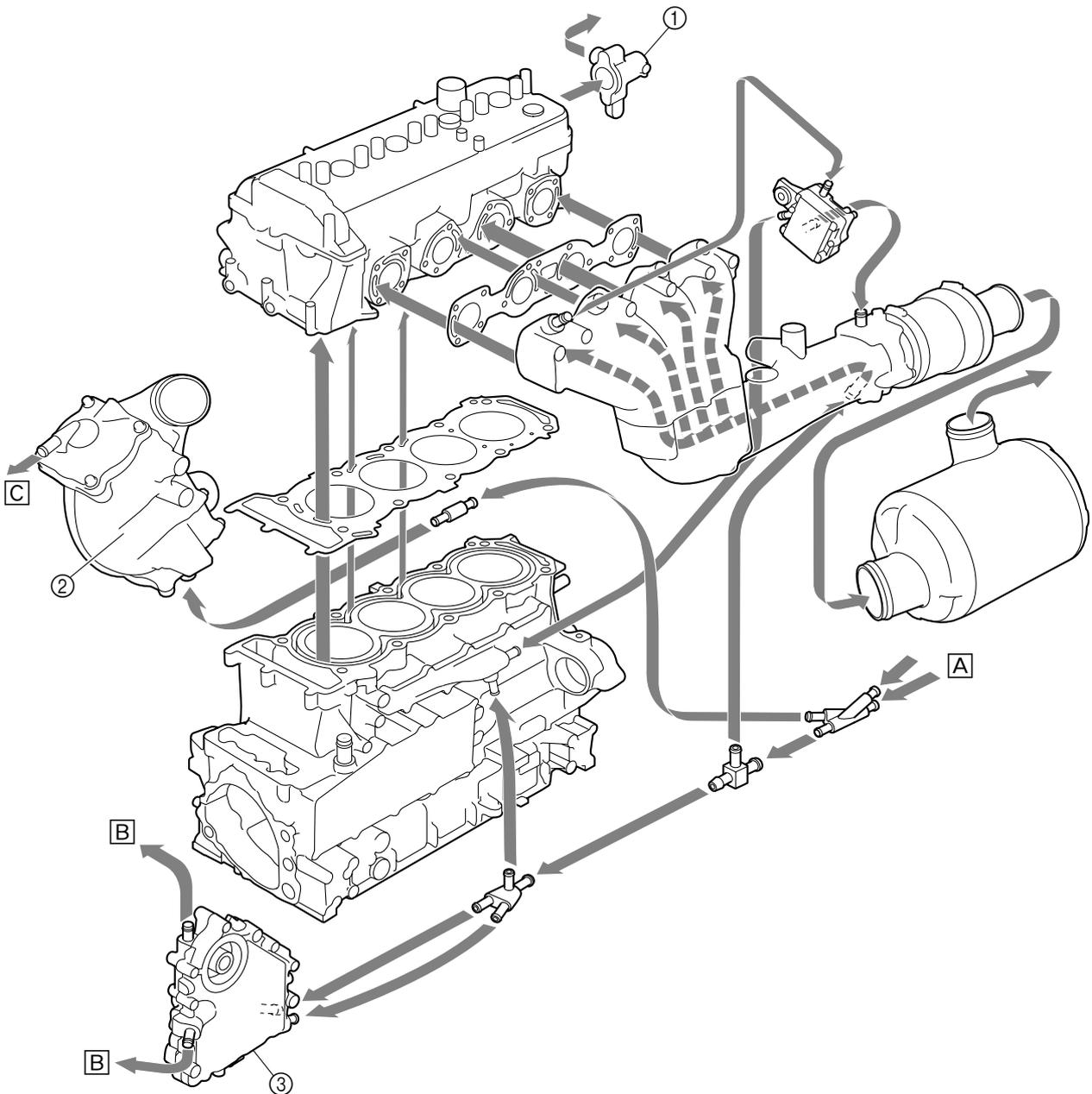
- ① Exhaust manifold
- ② Exhaust pipe 1
- ③ Exhaust pipe 3





**Cooling system**

The cooling water is divided into cooling water for the engine and cooling water for the air cooler assembly. The cooling water for the air cooler assembly is at the lowest temperature and it cools the intake air. In addition, a portion of the cooling water for the engine flows directly to the oil cooler assembly. This allows the oil cooler assembly to cool the engine oil with cooling water at the same temperature as the cooling water for the air cooler assembly. The cooling water for the engine first cools the exhaust system, which is at the highest temperature. The cooling water then flows to the cylinder head where the thermostat, which is installed to the cylinder head, maintains the cooling water at a fixed temperature.



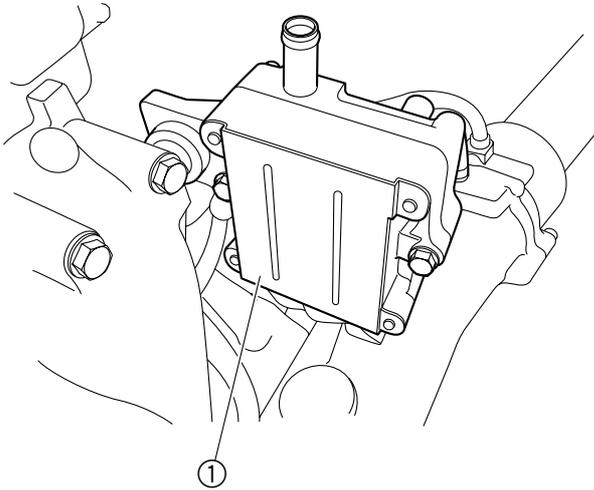
- ① Thermostat housing
- ② Air cooler assembly
- ③ Oil cooler assembly

- Ⓐ From jet pump unit
- Ⓑ To cooling water pilot outlet on port side
- Ⓒ To cooling water pilot outlet on starboard side

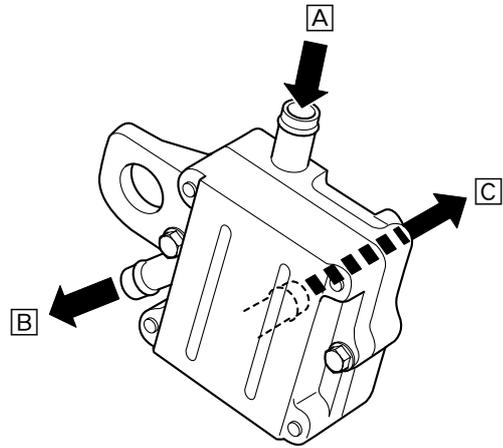


**Water cooled rectifier regulator**

To improve the reliability of the charging system, a water cooled rectifier regulator has been adopted for the first time in a WaveRunner. By changing to a water-cooled system, a more stable supply of electrical output has been achieved.



① Rectifier regulator



- Ⓐ From exhaust manifold
- Ⓑ To cylinder block
- Ⓒ To exhaust pipe 1



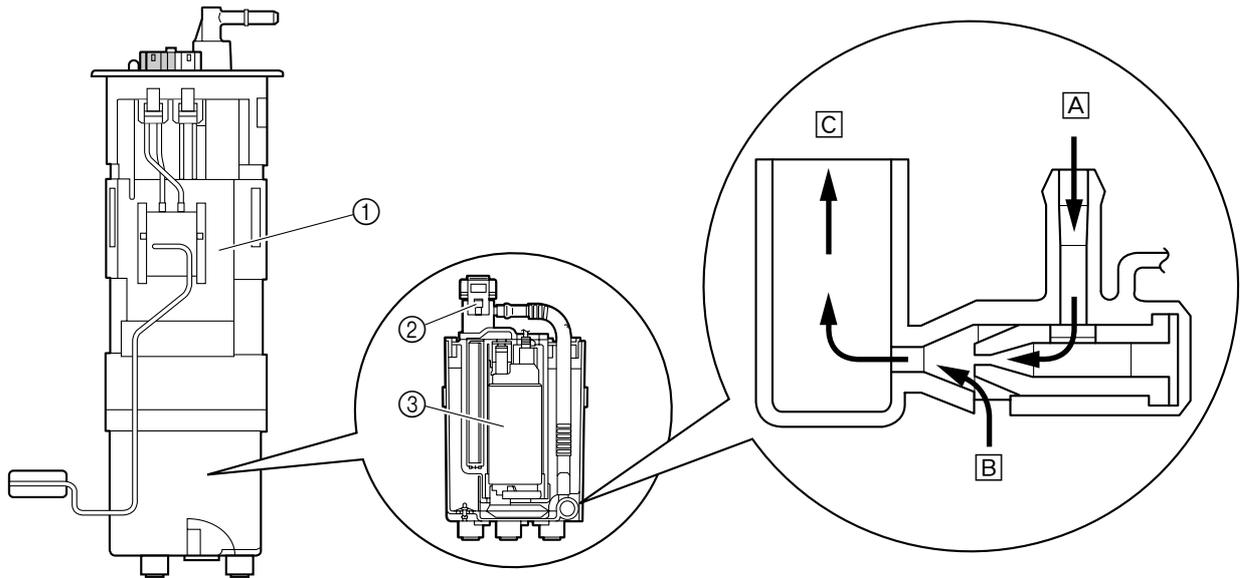
**In-tank fuel pump module**

A fuel pump module is integrated in the fuel tank.

A fuel sender is installed to the side of the pump module.

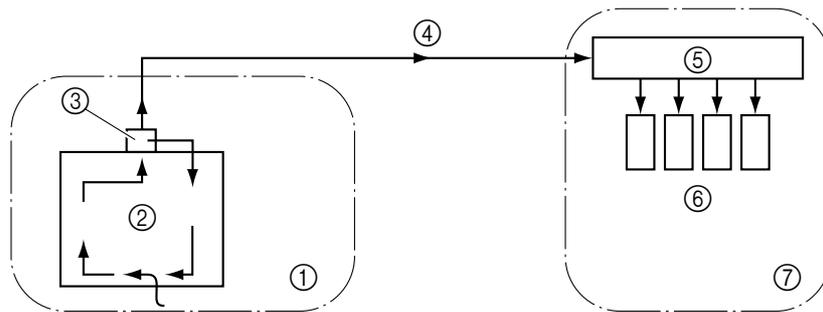
A pressure regulator at the fuel pump outlet controls pressure to the fuel line.

Remaining fuel returns to the bottom of the fuel pump, and then re-enters the fuel pump inlet nearby. With the suction generated at this time, fuel in the fuel tank is fed into the fuel pump module. As a result, fuel is supplied to the fuel pump inlet without interruption for reliable fuel pressure.



- ① Fuel pump module assembly
- ② Pressure regulator
- ③ Fuel pump

- A From pressure regulator
- B From fuel tank
- C To fuel pump module



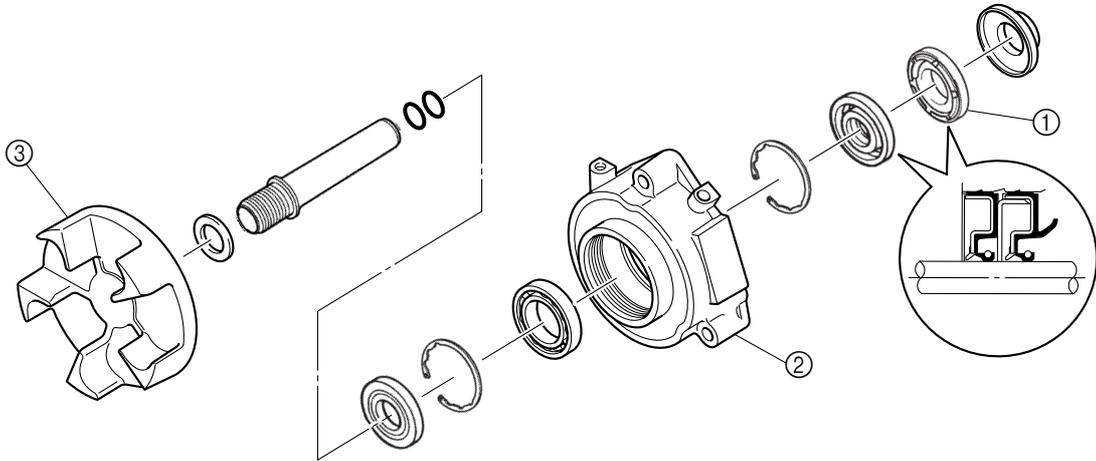
- ① Fuel pump module assembly
- ② Fuel pump module
- ③ Pressure regulator
- ④ Fuel line

- ⑤ Fuel rail
- ⑥ Fuel injector
- ⑦ Engine unit



**Large intermediate housing and oil seal**

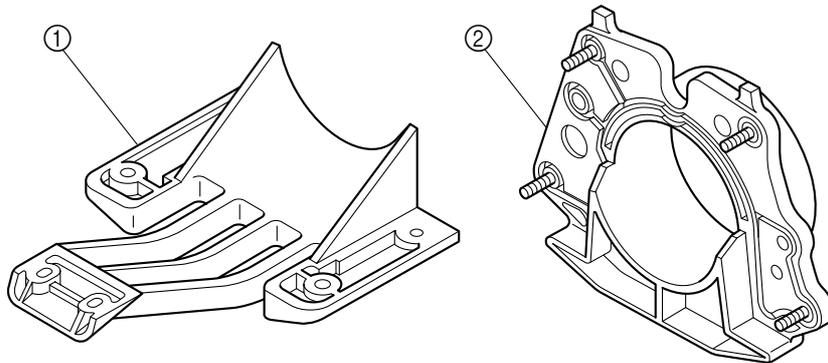
In order to handle the high output, the intermediate housing has been strengthened. Furthermore, lipped oil seals have been adopted to improve waterproofing.



- ① Oil seal
- ② Intermediate housing
- ③ Driven coupling

**Intake grate**

The grate of the intake grate has been changed to 3 bars and the components have been combined into a single part. This improves serviceability. In addition, the transom plate and spacer have been combined into a single part, which improves the rigidity and serviceability of the part.

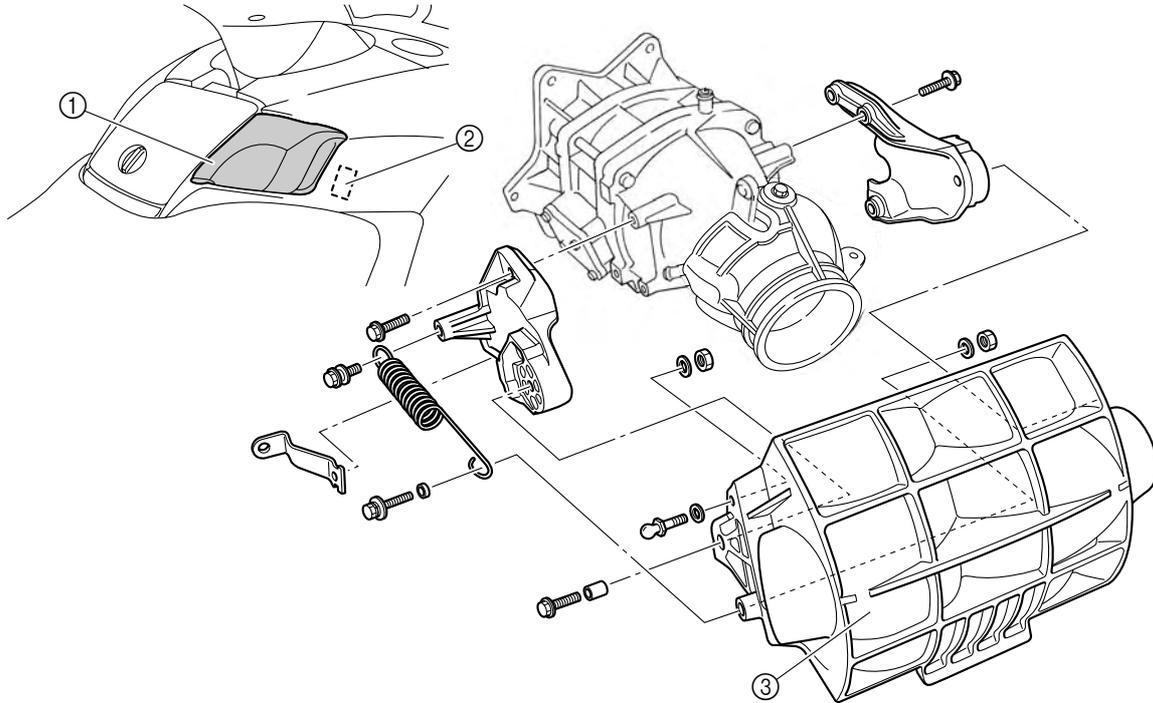


- ① Intake grate
- ② Transom plate



**Reverse gate assembly**

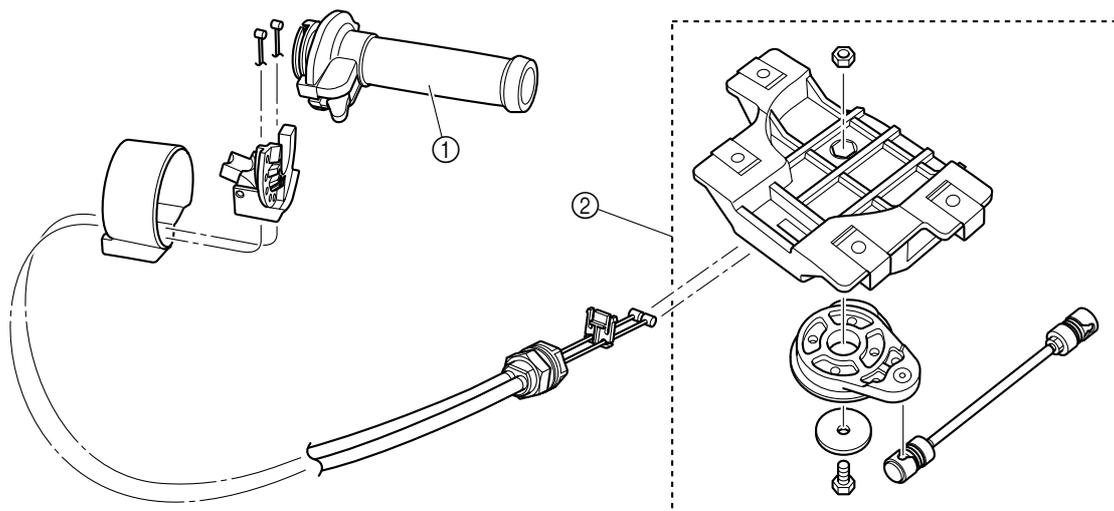
A reverse gate assembly shape has been adopted. In addition, a reverse sensor has been adopted to detect when the watercraft is operating in reverse, which improves reverse performance by activating the “reverse with traction control.”



- ① Shift lever
- ② Reverse sensor
- ③ Reverse gate assembly

**QSTS**

The shape and installation location of the QSTS converter assembly have been changed from those of conventional models in order to improve operability.



- ① QSTS grip
- ② QSTS converter



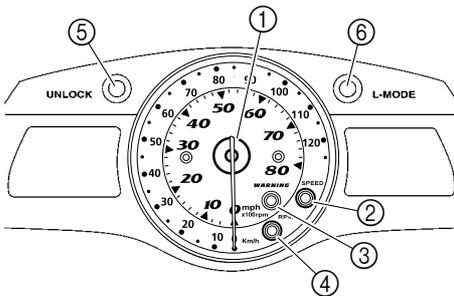
**Multifunction meter**

A multifunction meter with an analog speedometer/tachometer located in the center has been adopted. This meter is basically comprised of 3 types of meters. When the multifunction meter starts operating, the analog speedometer/tachometer makes 1 sweep, all displays light up for 2 seconds, and then the meter starts to operate normally. The indicator lights and displays of the multifunction meter will continue to operate for 25 seconds after the engine stops.



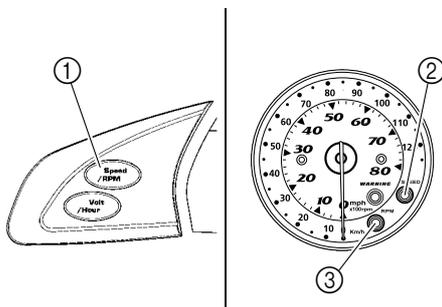
- ① Analog speedometer/tachometer and indicator lights
- ② Left multifunction display and operation buttons
- ③ Right multifunction display and operation buttons (FX Cruiser SHO)

The analog speedometer/tachometer and indicator lights have the following functions.



- ① Analog speedometer/tachometer
- ② "SPEED" indicator light
- ③ "WARNING" indicator light
- ④ "RPM" indicator light
- ⑤ "UNLOCK" indicator light
- ⑥ "L-MODE" indicator light

The analog speedometer/tachometer can be used as a speedometer or a tachometer; however, both cannot be selected at the same time. To switch between the speedometer and the tachometer functions, push the "Speed/RPM" button for at least 1 second when the multifunction meter is operating. The "SPEED" indicator light comes on when the analog speedometer is selected. The "RPM" indicator light comes on when the analog tachometer is selected.



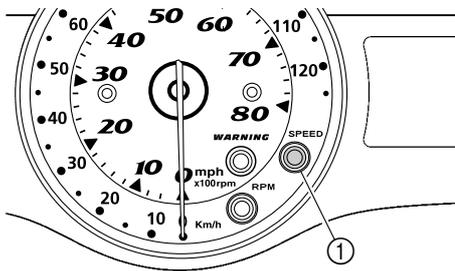
- ① "Speed/RPM" button
- ② "SPEED" indicator light
- ③ "RPM" indicator light



The analog speedometer shows the watercraft speed against water. The **large inner numbers** on the meter show the watercraft speed in **miles per hour (mph)** and the **small outer numbers** show the speed in **kilometers per hour (km/h)** when the speedometer function is selected.

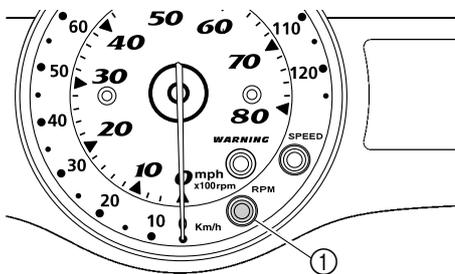
To switch the speedometer display between kilometers and miles, push the “Volt/Hour” button for at least 1 second, within 10 seconds after the multifunction meter starts operating. The “SPEED” indicator light comes on when the analog speedometer is selected. The “SPEED” indicator light blinks 3 times in the following instances:

- The analog speedometer/tachometer is switched to the speedometer function when miles are selected as the display units.
- The display units of the multifunction meter are switched to miles from kilometers.
- Miles are selected as the display units when the multifunction meter starts operating.



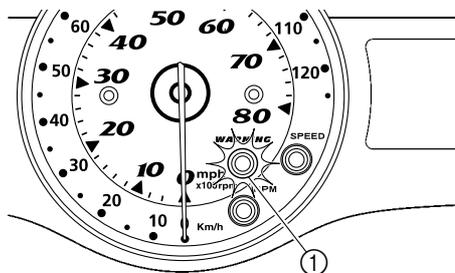
① “SPEED” indicator light

The “RPM” indicator light comes on when the analog tachometer is selected. The analog tachometer shows the engine speed (r/min). The **large inner numbers** on the meter show the **engine speed (x100 r/min)** when the tachometer function is selected.



① “RPM” indicator light

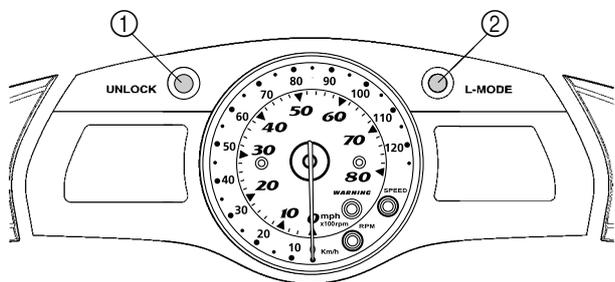
The “WARNING” indicator light blinks or comes on, together with a warning indicator, when a malfunction has occurred.



① “WARNING” indicator light

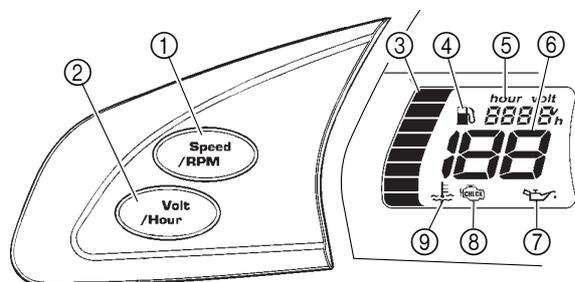


The “UNLOCK” indicator light comes on when the unlock mode of the Yamaha Security System is selected. The watercraft can be ridden normally when this light is on. The “L-MODE” indicator light comes on when the L-MODE is selected.



- ① “UNLOCK” indicator light
- ② “L-MODE” indicator light

The left multifunction display has the following functions.



- ① “Speed/RPM” button
- ② “Volt/Hour” button
- ③ Fuel level meter
- ④ Fuel level warning indicator
- ⑤ Hour meter/volt meter
- ⑥ Digital speedometer
- ⑦ Oil pressure warning indicator
- ⑧ Check engine warning indicator
- ⑨ Engine overheat warning indicator

To switch the speedometer display between kilometers and miles, push the “Volt/Hour” button for at least 1 second, within 10 seconds after the multifunction meter starts operating.

To switch the display between the hour meter and the voltmeter, push the “Volt/Hour” button for at least 1 second after the meter is displayed for more than 10 seconds. The voltmeter displays the battery voltage; however, if the battery voltage is significantly low, “LO” is displayed on the voltmeter and if the voltage is significantly high, “HI” is displayed.

The left multifunction display indicates the following warnings.

- Fuel level warning: If the fuel remaining in the fuel tank drops to about 18 L, the lowest 2 fuel level segments, the fuel level warning indicator, and the “WARNING” indicator light begin to blink. The buzzer also starts sounding intermittently.
- Oil pressure warning: If the oil pressure does not rise to specification, the “WARNING” indicator light and the oil pressure warning indicator begin to blink, and the buzzer sounds intermittently. At the same time, the engine speed is limited to help prevent damage.
- Engine overheat warning: If the engine temperature rises above specification, the “WARNING” indicator light and the engine overheat warning indicator blink, and then come on. The buzzer also begins to sound intermittently, and then it sounds continuously. After the light and indicator start to blink and the buzzer sounds, the engine speed is limited to help prevent damage.
- Check engine warning: If a sensor malfunction or a short circuit is detected, the “WARNING” indicator light and the check engine warning indicator begin to blink, and the buzzer sounds intermittently.

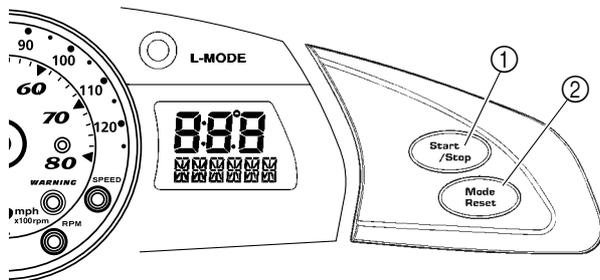
Press any button on the multifunction meter to stop the buzzer when a warning is indicated.



**Right multifunction display (FX Cruiser SHO)**

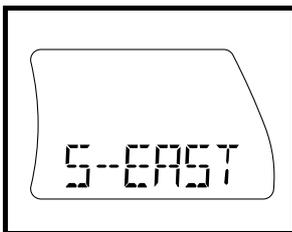
The display mode of the right multifunction display changes in the following order each time the “Mode/Reset” button is pushed briefly.

Compass → Average speed → Tripmeter → Trip timer → Fuel consumption per hour → Fuel consumption per kilometer/mile → Water temperature → Air temperature

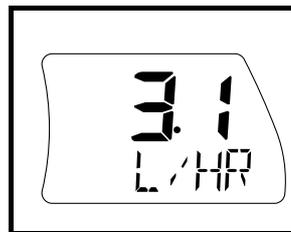


- ① “Start/Stop” button
- ② “Mode/Reset” button

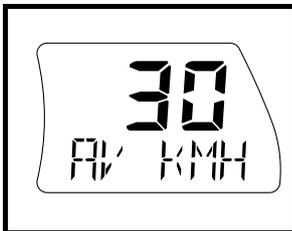
To switch the display units between kilometers and miles, push the “Volt/Hour” button for at least 1 second, within 10 seconds after the multifunction meter starts operating.



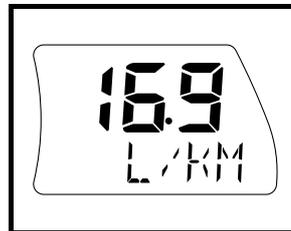
**1. Compass**  
This display shows the current direction of the watercraft using the 8 major compass points.



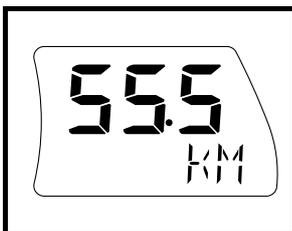
**5. Fuel consumption per hour**  
This display shows the current fuel consumption in gallons per hour “G/HR” or liters per hour “L/HR.”



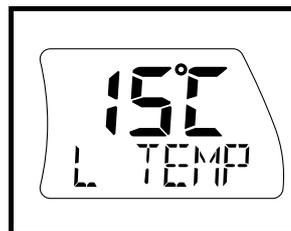
**2. Average speed**  
This display shows the average speed in miles per hour “AV MPH” or kilometers per hour “AV KMH” since it was reset.



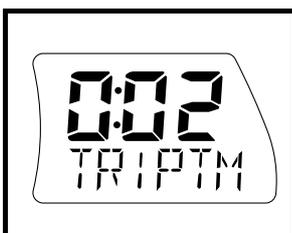
**6. Fuel consumption per kilometer/mile**  
This display shows the current fuel consumption in gallons per mile “G/MILE” or liters per kilometer “L/KM.”



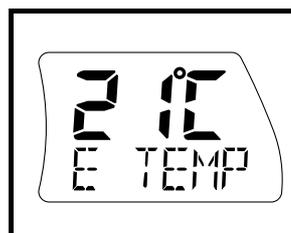
**3. Tripmeter**  
This display shows the distance traveled in miles “MILES” or kilometers “KM” since it was reset.



**7. Water temperature**  
This display shows the ambient water temperature “L TEMP” (lake temperature).



**4. Trip timer**  
This display shows the hours of operation “TRIPTM” since it was reset.

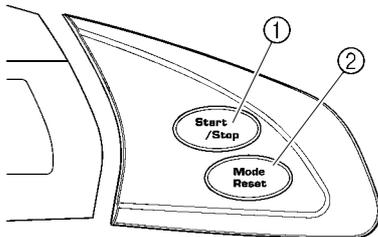


**8. Air temperature**  
This display shows the ambient air temperature “E TEMP” (environmental temperature).



### Average speed, tripmeter, and trip time measurements

Average speed, tripmeter (distance traveled), and trip time are recorded once measurements have started, regardless of the current display. To start the measurements, push the “Start/Stop” button for less than 1 second. The beeper sounds 1 time. To stop the measurements, push the “Start/Stop” button for less than 1 second. The beeper sounds 1 time. To restart the measurements, push the “Start/Stop” button for less than 1 second. The beeper sounds 1 time. To reset the displays, push the “Mode/Reset” button for at least 2 seconds while the measurements are stopped. The beeper sounds 2 times. The displays can be reset only when the measurements are stopped. The measurements are not saved if the engine is stopped. The displays are reset automatically when they go off 25 seconds after the engine stops.



- ① “Start/Stop” button
- ② “Mode/Reset” button

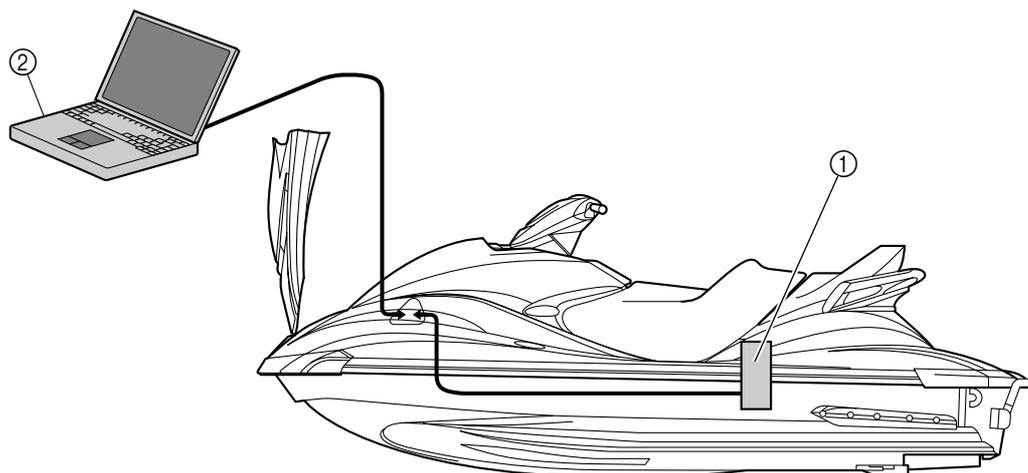


**Electrical system**

**Yamaha diagnostic system (YDIS)**

This model is equipped with the Yamaha Diagnostic System (YDIS).

By connecting a computer to the ECM, quick detection of malfunctions and parts that are difficult to check such as the fuel injectors and fuel pump module can be checked easily.

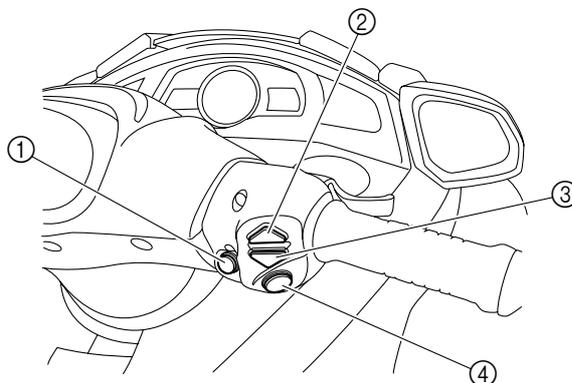


- ① ECM
- ② Personal computer (CD-ROM Ver. 1.30)

**Cruise assist and no-wake mode**

The cruise assist and no-wake mode are new functions. Both functions can be operated easily using the buttons on the right handlebar switch assembly.

- Cruise assist: The cruise assist is a function for maintaining a set engine speed between approximately 3,000 r/min and approximately 7,000 r/min.
- No-wake mode: The no-wake mode is a function for operating the watercraft at a low speed to limit the watercraft's wake.



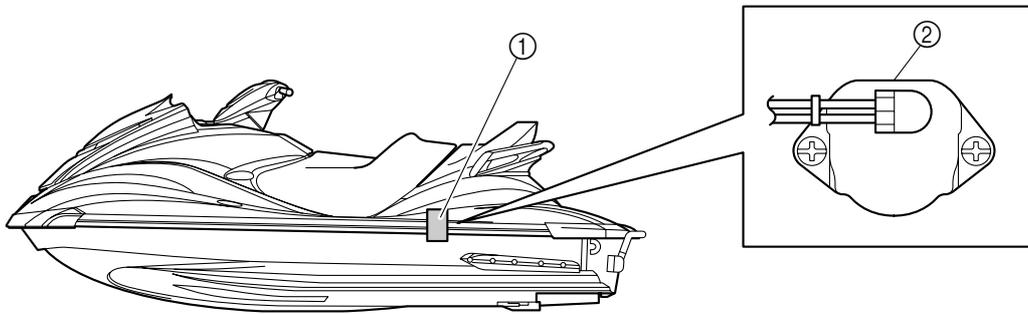
- ① “NO-WAKE MODE” switch
- ② Up switch (for cruise assist)
- ③ Down switch (for cruise assist)
- ④ “SET” switch (for cruise assist)



**Slant detection switch**

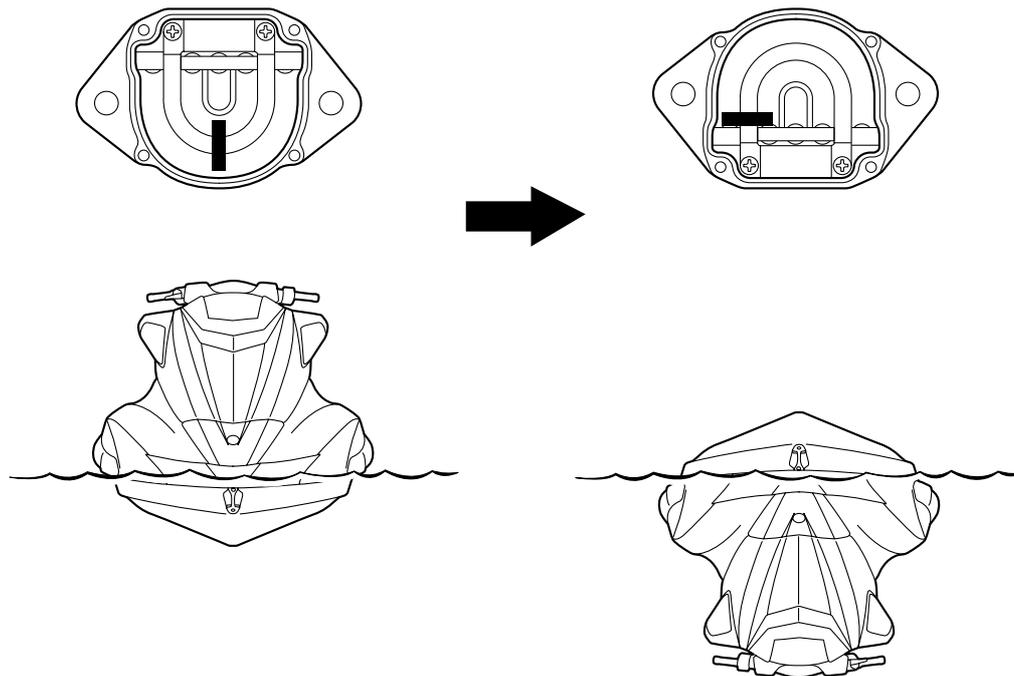
When the watercraft is overturned, the slant detection switch turns on and the ECM stops the engine to protect the engine.

If engine speed is less than 3,000 r/min, the engine is turned off. However, if engine speed exceeds 3,000 r/min, the engine is not turned off to prevent improper operation of the switch.



Normal position of watercraft  
(No circuit continuity)

Overturned watercraft  
(Circuit continuity)



- ① Fuse box
- ② Slant detection switch



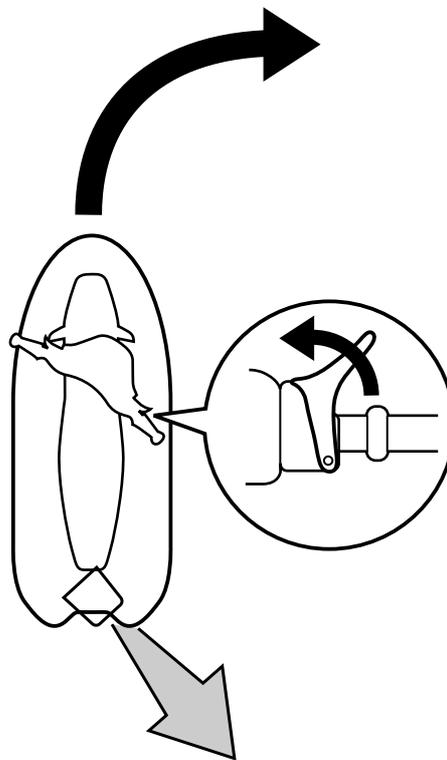
### Off-throttle steering (OTS) system

The off-throttle steering (OTS) system of the YEMS activates when the operator releases the throttle lever and attempts to steer the watercraft. This assists the operator in turning while the watercraft is decelerating.

The system will activate once the operator reaches planing speed but will not activate during docking or low-speed maneuvering.

The OTS system is activated when the ECM senses the following conditions:

- The engine speed is maintained above 4,000 r/min for a few seconds
- The throttle lever is released completely
- The handlebar is turned sharply to the right or left and is applied load.
- Some steering will be available with this system, but the watercraft will turn more sharply if throttle is applied. For the best steering and turning performance, apply throttle while turning the handlebar.



### L-MODE (low-rpm mode) and Yamaha Security System

#### L-MODE:

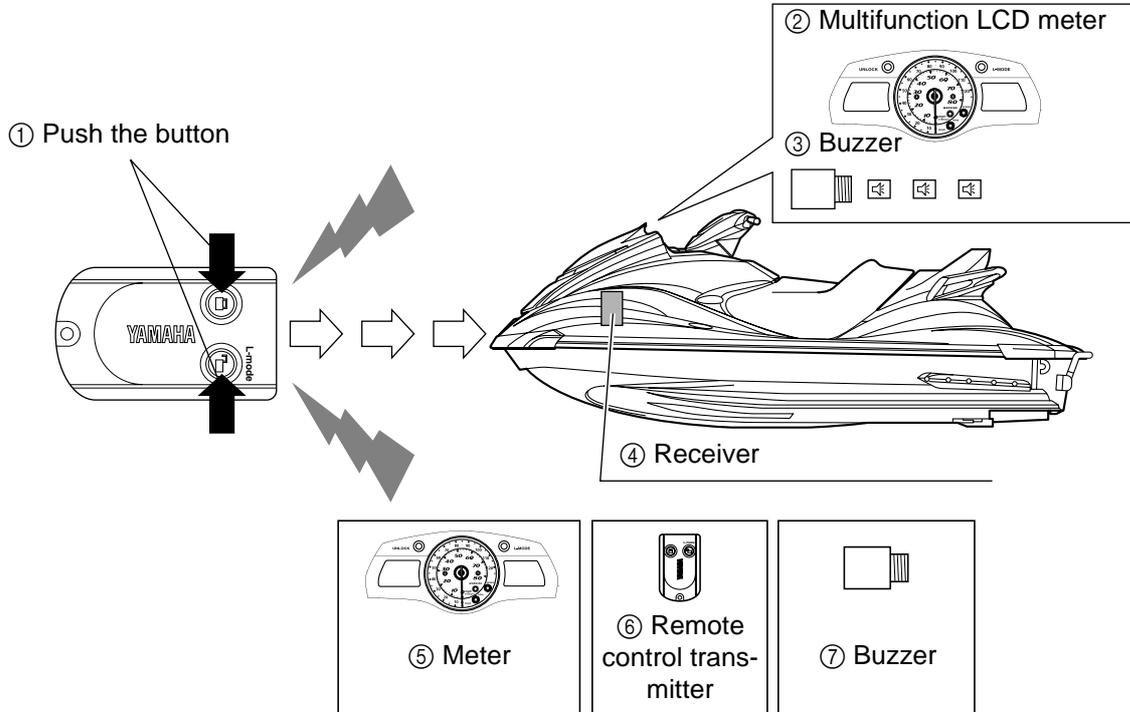
The user can select the normal mode or the L-MODE.

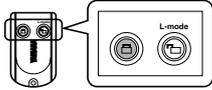
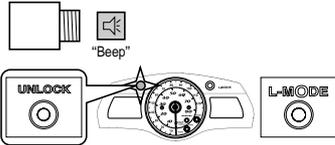
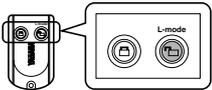
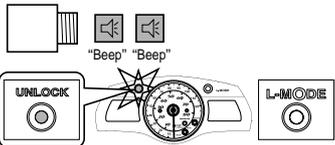
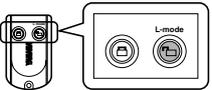
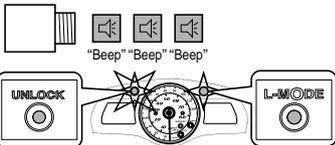
The engine speed in the L-MODE is limited to approximately 5,400 r/min or less. The modes can be selected by pressing the unlock button on the remote control transmitter.



**Yamaha Security System:**

The user can set the Yamaha Security System to the lock mode using the remote control transmitter to prevent the engine from starting. To start the engine, the Yamaha Security System must be set to the unlock mode.



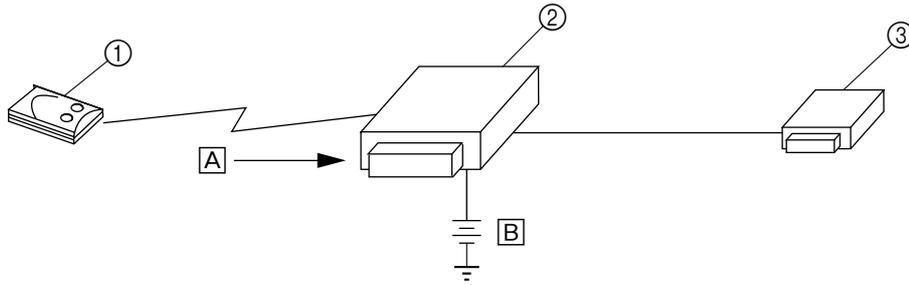
A Unlock → Lock	B Lock → Unlock	C L-MODE
<p>[START] Security: Unlock mode</p>   <p>1. Push the lock button 1 time.</p>  <p>A. Buzzer sound: 1 time (0.3 seconds) B. UNLOCK indicator light: flashes 1 time, and then goes off</p> <p>[FINISH] Security: Lock mode Mode: Normal mode</p>	<p>[START] Security: Lock mode</p>   <p>1. Push the unlock button 1 time.</p>  <p>A. Buzzer sound: 2 times (0.3 seconds × 2) B. UNLOCK indicator light: flashes 2 times, and then remains on</p> <p>[FINISH] Security: Unlock mode Mode: Normal mode</p>	<p>[START] Security: Unlock mode</p>   <p>1. Push the unlock button for at least 4 seconds.</p>  <p>A. Buzzer sound: 3 times (0.3 seconds × 3) B. UNLOCK indicator light: flashes 3 times, and then remains on C. L-Mode indicator light: comes on</p> <p>[FINISH] Security: Unlock mode Mode: L-MODE</p>



**Remote control transmitter**

**Transmitter registration function (performed by dealers):**

ID codes can be added or re-registered by connecting the entry box to the receiver. ID codes from up to 5 remote control transmitters can be registered.



- ① Remote control transmitter
- ② Remote control receiver
- ③ Entry box

- A Transmission
- B Power supply connection to the battery



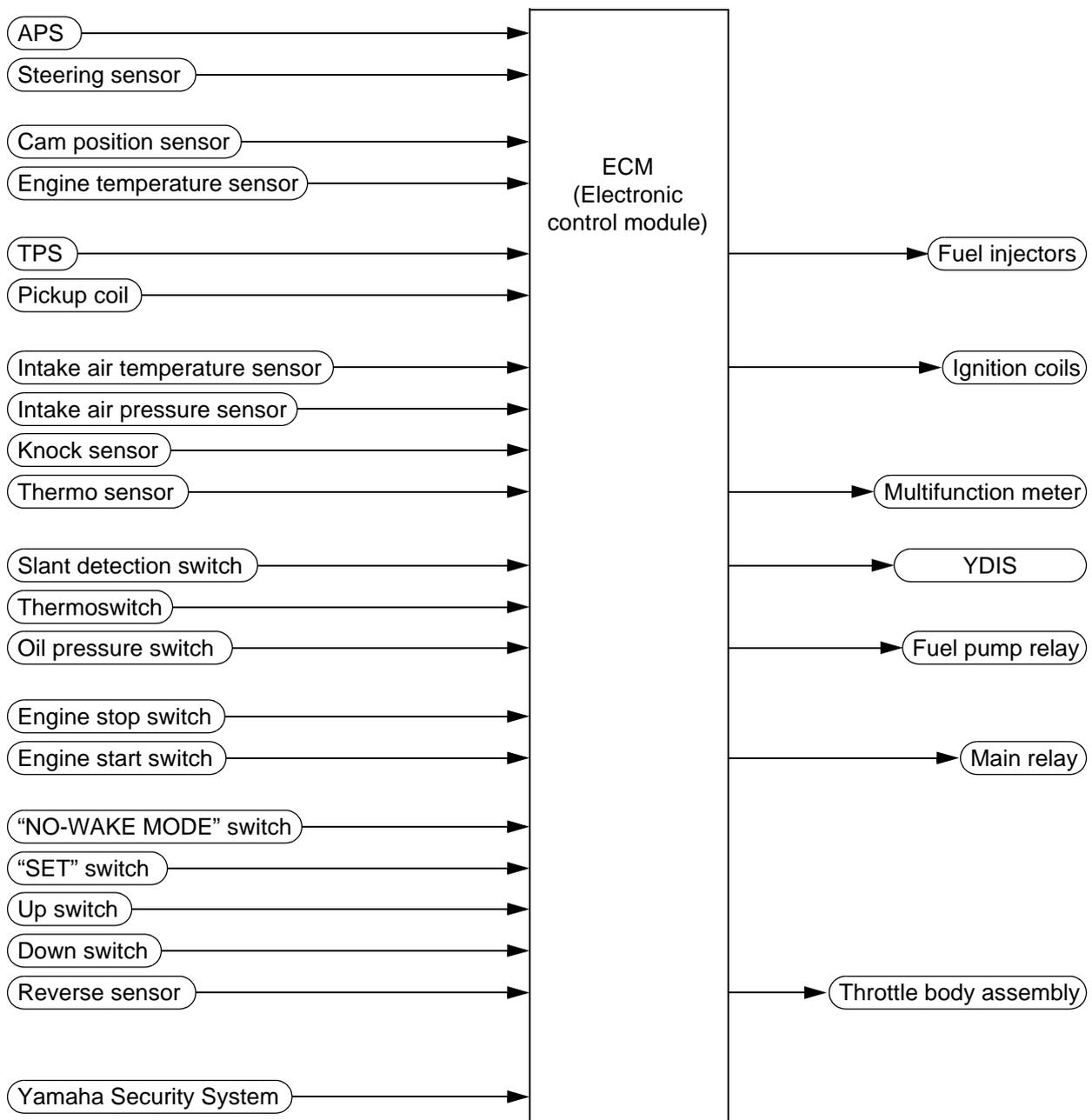
## Technical tips

### Engine control

The ECM controls ignition timing and fuel injection with information received from the sensors and switches installed on the engine and on the basis of the 3D map saved in the ECM.

The following sensors and switches are used for the engine control.

APS, steering sensor, cam position sensor, engine temperature sensor, TPS, pickup coil, intake air temperature sensor, intake air pressure sensor, knock sensor, thermo sensor, slant detection switch, thermostwitch, oil pressure switch, engine stop switch, engine start switch, "NO-WAKE MODE" switch, right handlebar switch ("SET," up, and down), and reverse sensor.





**Cruise assist control**

The cruise assist has been added as a new function. The cruise assist is a function for maintaining a set engine speed while cruising. Activation of the cruise assist will be confirmed by the beeper and the digital speedometer display. The cruise assist can only be set between engine speeds of approximately 3,000 r/min and approximately 7,000 r/min. The cruise assist cannot be activated in the L-MODE.

To activate the cruise assist:

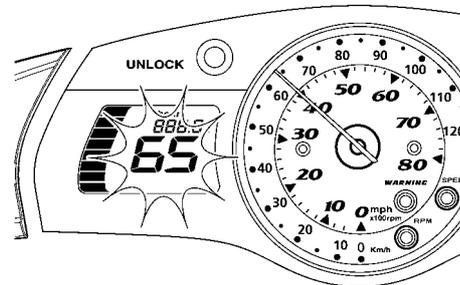
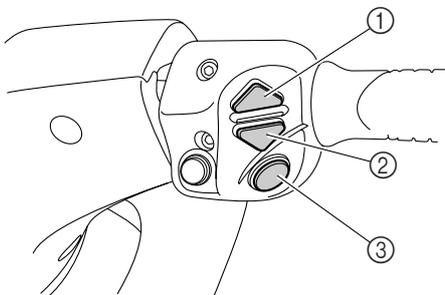
- (1) Operate the throttle lever until the desired engine speed is reached.
- (2) Once the engine speed reaches the desired cruise assist setting, push the “SET” switch.

When the cruise assist is activated, the beeper sounds 3 times quickly and the digital speedometer display starts flashing. To keep the cruise assist activated, be sure to keep the throttle lever squeezed further than the position at which the cruise assist was set.

Once the cruise assist is activated, the engine speed can be increased by pushing the up switch or decreased by pushing the down switch. Each time a switch is pushed, the beeper will sound 1 time quickly and the engine speed will change. However, the adjustment is limited to a maximum of five increments above or below the initial cruise assist setting.

To deactivate the cruise assist:

Relax your grip on the throttle lever. The beeper sounds 2 times quickly and the digital speedometer display stops flashing when the cruise assist is deactivated. The cruise assist is also deactivated when the engine is stopped.



- ① Up switch
- ② Down switch
- ③ “SET” switch

Number of beeps	Cruise assist operation	Digital speedometer display
● ● ●	Activated	Starts flashing
● ●	Deactivated	Stops flashing
●	Engine speed increases or decreases	Continues flashing



**No-wake mode control**

The no-wake mode has been added as a new function. The no-wake mode is a function for operating the watercraft at a low speed to limit the watercraft's wake. In this mode, the ECM automatically maintains the engine speed at approximately 2,100 r/min. When the no-wake mode is activated, "5" (when miles are selected) or "8" (when kilometers are selected) starts flashing in the digital speedometer display to inform the rider that the mode has been activated. The no-wake mode cannot be activated immediately after starting the engine. After starting the engine, wait for 5 seconds or more before activating the mode.

To activate the no-wake mode:

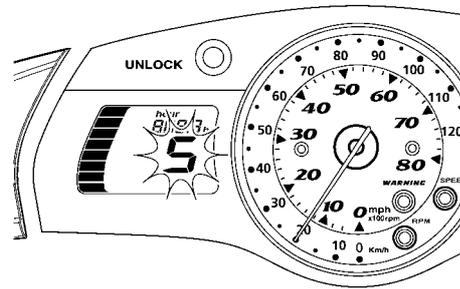
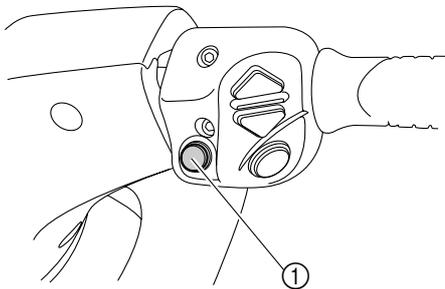
Push and hold the "NO-WAKE MODE" switch. When the no-wake mode is activated, the beeper sounds 3 times quickly and "5" (when miles are selected) or "8" (when kilometers are selected) starts flashing in the digital speedometer display. Keep the throttle lever in the idle position when the no-wake mode is activated.

To deactivate the no-wake mode:

Perform one of the following procedures to deactivate the no-wake mode.

- Push the "NO-WAKE MODE" switch.
- Squeeze the throttle lever.
- Move the shift lever to the reverse position.
- Stop the engine.

The beeper sounds 2 times quickly and the digital speedometer display stops flashing when the no-wake mode is deactivated.



① "NO-WAKE MODE" switch

Number of beeps	No-wake mode operation	Digital speedometer display
● ● ●	Activated	Starts flashing
● ●	Deactivated	Stops flashing



**Reverse with traction control**

The reverse with traction control is activated when the shift lever is in the reverse position and the reverse sensor operates. The reverse with traction control limits the engine speed to 3,000 r/min so that an efficient water flow is produced when the watercraft is operating in reverse. The reverse with traction control is deactivated when the shift lever is returned to the forward position. The no-wake mode cannot be activated when the reverse with traction control is activated.

**Idle speed control**

The ETV maintains a steady engine idle speed under various operating conditions.

Condition	Engine rpm limit (r/min)
Normal	1,150–1,350

**Over revolution control**

Condition	Over revolution control (total number of cylinders)	Engine (r/min)
Normal	None	Under 7,800
Level 1	1	7,800–8,200
Level 2	2	
Level 3	3	
Level 4	4	

**L-MODE (low-rpm mode) control**

- In the L-MODE, the ETV regulates the opening angle of the throttle valve and controls ignition timing.
- Maximum engine speed is limited to approximately 5,400 r/min.

**Slant detection control**

The slant detection control is activated under the following conditions.

- If the engine speed is below 3,000 r/min.
- If the slant detection switch is on.

If the slant detection control is activated, ignition and fuel injection are cut to all cylinders and the engine is turned off.

If the slant detection control is activated, no indication is made on the multifunction meter.

The slant detection control is not deactivated until the engine is turned off.

**High intake air pressure control**

The high intake air pressure control is activated under the following conditions.

- If the engine speed exceeds 7,550 r/min.
- If the intake air pressure exceeds 145 kPa.
- If the above conditions are maintained for 1.5 seconds.

Meter & buzzer: No indication or buzzer sounds.

ECM: The throttle valve is closed until the above conditions are no longer present.

The throttle valve doesn't open until the high intake air pressure control is canceled.

Cancel: The throttle lever is released to the fully closed position.

**Knock control**

The knock control system retards the ignition timing to prevent the occurrence of engine knock.

The knock control is activated under the following conditions.

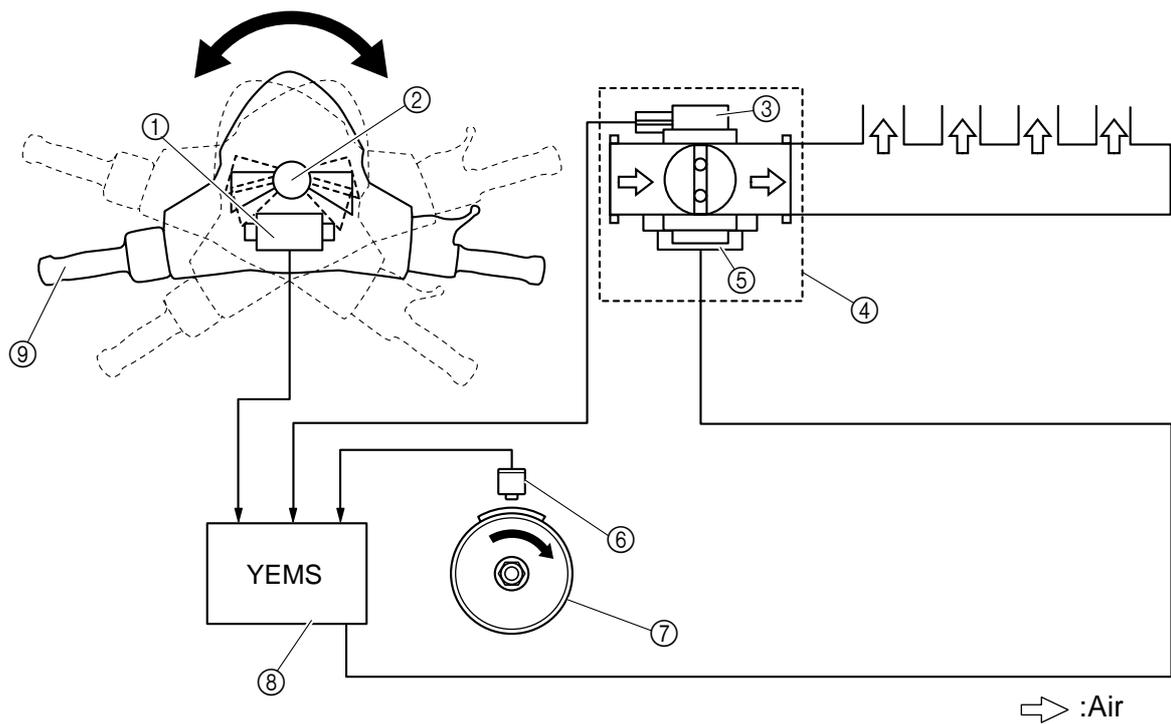
- If the engine speed is higher than 2,000 r/min after warming up the engine.
- If the knock sensor detects the engine knock.



**Off-throttle steering (OTS) control**

**Off-throttle steering (OTS) system operates as follows:**

1. The engine speed is maintained above 4,000 r/min for a few seconds.
2. The APS detects when the throttle lever is completely released.
3. The steering sensor detects on when the handlebar is turned sharply to the right or left and is applied load.
4. The ECM sends a signal to the throttle body assembly.
5. The ETV is operated and air is introduced into the intake manifold.
6. The ECM controls the opening of the ETV to provide forward thrust and steering.



- ① Steering sensor
- ② Steering shaft
- ③ TPS
- ④ Throttle body assembly
- ⑤ DC-motor
- ⑥ Pickup coil
- ⑦ Flywheel magneto
- ⑧ ECM
- ⑨ Handlebar

Start the engine and operate it for several seconds with the engine speed above 4,000 r/min. Release the throttle lever, and then fully turn the handlebar to the left or right. The ECM will send a signal to the DC motor of the throttle body assembly to open the ETV, raising the engine speed.



## Remote control transmitter control

To set the Yamaha Security System, the user aims the remote control transmitter at the watercraft and presses the lock or unlock button to remotely turn the Yamaha Security System relay ON or OFF. The unlock button can also be used to remotely select the normal mode or L-MODE.

### (1) Turning the Yamaha Security System relay ON/OFF:

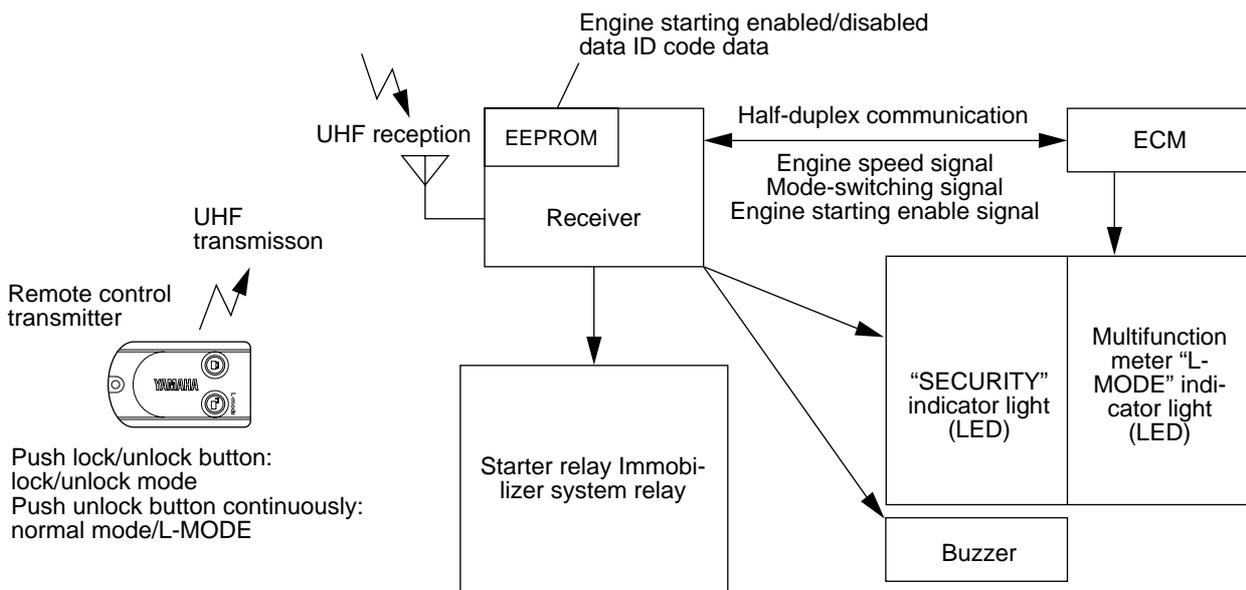
The remote control transmitter sends an encoded radio wave signal to the receiver when the lock and unlock buttons are pushed. The antenna of the receiver receives this signal. If the ID code matches a registered ID code, the receiver transmits a signal to turn the Yamaha Security System relay ON and a lock/unlock signal to the ECM to enable/disable starting of the engine.

### (2) ECM engine startability control:

The ECM prevents the engine from being started until the ID code from the remote control transmitter is verified and the signal to enable the engine to be started is received.

### (3) Normal mode/L-MODE:

If the unlock button on the remote control transmitter is pressed continuously for more than 4 seconds, the transmitter sends a mode-switching signal to the ECM to switch to the normal mode or L-MODE.





## Warning control

### Overheat warning control

The overheat warning control is activated under the following conditions.

- If the engine temperature rises rapidly within several seconds.
- If the thermostitch is on.
- If the exhaust cooling water temperature exceed 75°C (167 °F)

If the overheat warning control is activated, the overheat warning indicator comes on and the buzzer sounds.

In addition, the opening angle of the ETV is regulated and the maximum engine speed is limited to approximately 3,500–3,800 r/min by the ECM.

If the engine is turned off during overheat warning control, the engine can be restarted.

The overheat warning control is deactivated under the following conditions.

- If the engine is turned off within 30 seconds.
- If the engine temperature is below 140°C (248 °F) with the thermostitch off.
- If the exhaust cooling water temperature is below 70°C (158 °F) with the throttle fully closed.

### Oil pressure warning control

The oil pressure warning control is activated under the following conditions.

- If the engine speed exceeds 4,500 r/min.
- If the ETV is open.
- If the oil pressure switch is on.

If the oil pressure warning control is activated, the oil pressure indicator on the multifunction meter comes on and the buzzer sounds.

In addition, the opening angle of the ETV is regulated and the maximum engine speed is limited to approximately 3,500–3,800 r/min by the ECM.

If the engine is turned off during oil pressure warning control, the engine can be restarted.

The oil pressure warning control is deactivated if the engine is turned off and electric power to the ECM is stopped or when the engine is restarted and the oil switch is off.

### ETV failure control

The ETV failure control is activated when a malfunction in the ETV system is detected or a malfunction occurs. When the ETV failure control is activated, the maximum engine speed is limited to 3,000 r/min.

If the ETV failure control is activated, the opening angle of the ETV is fixed to the default opening angle and ignition timing control is activated.

The ETV failure control is not deactivated until the engine is turned off and electric power to the ECM is stopped (30 seconds or more after the engine has been turned off).

**Cam position sensor failure control**

The cam position sensor failure control is activated under the following conditions.

- If the cam position sensor failed.
- If the engine speed exceeds about 1,000 r/min.
- If the above conditions are maintained for 10 seconds.

Meter & buzzer: No indication or buzzer sounds.

ECM: The opening angle of the ETV is regulated and the engine speed is limited to 3,500–3,800 r/min.

If the engine speed exceeds 5,000 r/min, the ECM cuts the ignition and fuel injection.

Cancel: The engine is turned off.

**Battery disconnection warning**

The ETV failure control is activated when a battery cable is disconnected during normal operation.



**Fail-safe function table**

Symptom	Ignition control	Fuel injection control	Function
Incorrect pickup coil signal malfunction	None	None	None
Incorrect cam position sensor signal	Sensor malfunction occurs after cylinder identification: normal control. Sensor malfunction occurs before cylinder identification: group ignition. If a signal is received from the cam position sensor: normal ignition is resumed.	Sensor malfunction occurs after cylinder identification: normal injection. Sensor malfunction occurs before cylinder identification: group injection. If a signal is received from the cam position sensor: normal injection is resumed.	When Fail-safe is active, engine speed is restricted to below about 3,800 r/min. Fail-safe is not deactivated until the engine is turned off.
Incorrect engine temperature sensor signal	Normal control using pseudo engine temperature.	Normal control using pseudo engine temperature.	Pseudo engine temperature is calculated by the intake air temperature.
Incorrect intake air temperature sensor signal	Normal control using pseudo intake air temperature.	Normal control using pseudo intake air temperature.	Pseudo intake air temperature is 40 °C (104 °F).
Incorrect intake air pressure sensor signal	Normal control using pseudo intake air pressure.	Normal control using pseudo intake air pressure.	Pseudo intake air pressure is set according to engine speed and the throttle opening angle. Cancel cruise assist mode control, OTS control, no wake mode control and high intake air pressure warning control.
Incorrect battery voltage	Normal control	Normal control	Cruise assist mode and no wake mode are canceled.
Incorrect slant detection switch signal	Normal control	Normal control	Slant detection switch control is canceled.
Incorrect OTS steering sensor signal	Normal control	Normal control	OTS control is canceled.
Incorrect no wake mode switch signal	Normal control	Normal control	No wake mode control is canceled.
Incorrect reverse sensor signal	Normal control	Normal control	Reverse traction control and no wake mode control are canceled.
Incorrect knock sensor signal	Normal control	Normal control	none



Symptom	Ignition control	Fuel injection control	Function
Incorrect cooling water temperature sensor signal	Normal control	Normal control	Pseudo cooling water temperature is set to 50 °C (122 °F).
ETV system malfunction	ETV failure control	ETV failure control	ETV failure control



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**— MEMO —**

## Chapter 2 Specification

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**General specification**

Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Model code</b> Hull Engine/jet		F1W 6S5/6S5	
<b>Dimensions</b> Length Width Height	mm (in) mm (in) mm (in)	3,370 (132.7) 1,230 (48.4) 1,160 (45.7)      1,240 (48.8)	
<b>Weight</b> Dry weight Maximum capacity	kg (lb) Person/kg (lb)	376 (829)	381 (840) 3/240 (530)
<b>Performance</b> Maximum fuel consumption Cruising range	L/h (US gal/h, Imp.gal/h) h	71.3 (18.8, 15.7) 0.98	
<b>Engine</b> Engine type Displacement Bore × stroke Compression ratio Exhaust system Lubrication system Cooling system Starting system Ignition system Maximum ignition timing advance Spark plug (manufacturer) Spark plug gap Generator output	cm <sup>3</sup> (cu. in) mm (in)       Degree  mm (in) A @ r/min	4-stroke, L4, DOHC 1,812 (110.6) 86.0 × 78.0 (3.39 × 3.07) 8.6:1 Wet exhaust Wet sump Water cooled Electric starter TCI BTDC 20  LFR6A (NGK) 0.8–0.9 (0.031–0.035) 23.3–25.3 @ 6,000	
<b>Drive unit</b> Propulsion system Jet pump type Impeller rotation Transmission Jet thrust nozzle horizontal angle Trim system Jet thrust nozzle trim angle Reverse system	    Degree  Degree	Jet pump Axial flow, single stage Counterclockwise (viewed from rear) Direct drive from engine 24 + 24  Manual 5 positions –10, –5, 0, 5, 10 Reverse gate	

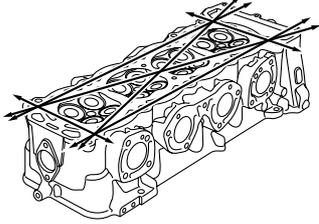
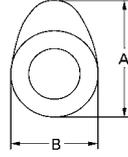
Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Fuel and oil</b>			
Fuel type		Regular unleaded gasoline	
Minimum fuel rating	PON*	86	
	RON*	90	
Fuel tank capacity	L (US gal, Imp.gal)	70 (18.5, 15.4)	
Engine oil type		4-stroke motor oil	
Engine oil grade	API SAE	SE, SF, SG, SH, SJ, or SL 10W-30, 10W-40, 20W-40, or 20W-50	
Engine oil quantity			
Total amount	L (US qt, Imp.qt)	4.3 (4.55, 3.78)	
Without oil filter replacement	L (US qt, Imp.qt)	3.0 (3.17, 2.64)	
With oil filter replacement	L (US qt, Imp.qt)	3.1 (3.28, 2.73)	
<b>Battery</b>			
Type		Fluid	
Capacity	V/Ah	12/19	
Specific gravity @ 20 °C (68 °F)		1.265	

PON\*: Pump Octane Number = (Motor Octane Number + Research Octane Number)/2

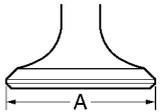
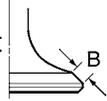
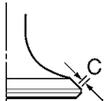
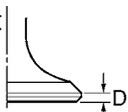
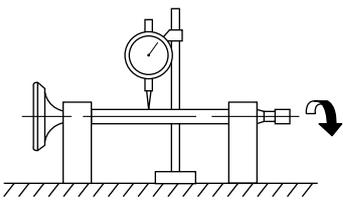
RON\*: Research Octane Number

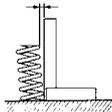
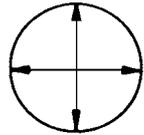
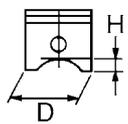
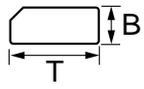
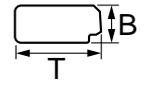
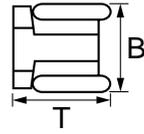


**Maintenance specifications**  
**Engine**

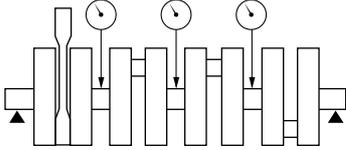
Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Power unit</b> Compression pressure *1	kPa (kgf/cm <sup>2</sup> , psi)	610 (6.1, 86.8)	
<b>Air cooler</b> Holding pressure Water passage Air passage	kPa (kgf/cm <sup>2</sup> , psi) kPa (kgf/cm <sup>2</sup> , psi)	200 (2.0, 28.5) 100 (1.0, 14.2)	
<b>Oil cooler</b> Holding pressure Water passage	kPa (kgf/cm <sup>2</sup> , psi)	200 (2.0, 28.5)	
<b>Cylinder head</b> Warpage limit  (lines indicate straightedge position) Camshaft cap inside diameter	mm (in) mm (in)	0.1 (0.004) 25.000–25.021 (0.9843–0.9851)	
<b>Camshaft</b> Drive system Intake A Intake B Exhaust A Exhaust B Camshaft journal diameter Camshaft-journal-to-camshaft-cap clearance Camshaft runout limit	 mm (in) mm (in) mm (in) mm (in) mm (in) mm (in) mm (in)	Chain drive 40.9 (1.610) 32.0 (1.260) 41.0 (1.614) 32.2 (1.268) 24.960–24.980 (0.9827–0.9835) 0.020–0.061 (0.0008–0.0024) 0.015 (0.0006)	

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

Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Timing chain</b>			
Model/number of links		97RH2015–152PX/152	
Tensioning system		Automatic	
<b>Valve</b>			
Valve clearance (cold)			
Intake	mm (in)	0.14–0.23 (0.006–0.009)	
Exhaust	mm (in)	0.28–0.37 (0.011–0.015)	
Valve dimensions			
Valve head diameter A			
Intake	mm (in)	33.9–34.1 (1.335–1.343)	
Exhaust	mm (in)	28.9–29.1 (1.138–1.146)	
			
Valve face width B			
Intake and exhaust	mm (in)	2.26–2.83 (0.089–0.111)	
			
Valve seat contact width C			
Intake	mm (in)	1.40–1.60 (0.055–0.063)	
Exhaust	mm (in)	1.50–1.70 (0.059–0.067)	
			
Valve margin thickness D			
Intake and exhaust	mm (in)	0.80–1.20 (0.031–0.047)	
			
Valve stem diameter			
Intake	mm (in)	5.477–5.492 (0.2156–0.2162)	
Exhaust	mm (in)	5.464–5.479 (0.2151–0.2157)	
Valve guide inside diameter			
Intake and exhaust	mm (in)	5.504–5.522 (0.2167–0.2174)	
Valve-stem-to-valve-guide clearance			
Intake	mm (in)	0.012–0.045 (0.0005–0.0018)	
Exhaust	mm (in)	0.025–0.058 (0.0010–0.0023)	
Valve guide installation height			
Intake and exhaust	mm (in)	12.3–12.7 (0.484–0.500)	
Valve stem runout limit			
Intake and exhaust	mm (in)	0.01 (0.0004)	
			

Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Valve spring</b>			
Free length			
Intake and exhaust	mm (in)	45.58 (1.794)	
Installed length			
Intake and exhaust	mm (in)	34.00 (1.339)	
Tilt limit			
Intake and exhaust	mm (in)	2.0 (0.08)	
			
<b>Cylinder</b>			
Bore size	mm (in)	86.000–86.015 (3.3858–3.3864)	
			
<b>Piston</b>			
Piston outside diameter D	mm (in)	85.915–85.930 (3.3825–3.3831)	
Measuring point H	mm (in)	10.0 (0.39)	
Piston ring groove			
Top ring	mm (in)	1.21–1.23 (0.0476–0.0484)	
2nd ring	mm (in)	1.21–1.23 (0.0476–0.0484)	
Oil ring	mm (in)	2.51–2.53 (0.0988–0.0996)	
Piston pin boss bore diameter	mm (in)	22.004–22.015 (0.8663–0.8667)	
			
<b>Piston pin</b>			
Outside diameter	mm (in)	21.991–22.000 (0.8658–0.8661)	
<b>Piston ring</b>			
Top ring			
Type		Barrel	
Dimension B	mm (in)	1.17–1.19 (0.0461–0.0469)	
Dimension T	mm (in)	2.85–3.05 (0.112–0.120)	
End gap (installed)*1	mm (in)	0.30–0.45 (0.012–0.018)	
Side clearance	mm (in)	0.02–0.06 (0.0008–0.0024)	
2nd ring			
Type		Taper	
Dimension B	mm (in)	1.17–1.19 (0.0461–0.0469)	
Dimension T	mm (in)	2.60–2.80 (0.102–0.110)	
End gap (installed)*1	mm (in)	0.45–0.60 (0.018–0.024)	
Side clearance	mm (in)	0.02–0.06 (0.0008–0.0024)	
Oil ring			
Dimension B	mm (in)	2.37–2.47 (0.093–0.097)	
Dimension T*1	mm (in)	2.50 (0.098)	
End gap (installed)*1	mm (in)	0.10–0.35 (0.004–0.014)	
Side clearance	mm (in)	0.04–0.16 (0.0016–0.0063)	
			
			
			

\*1 The figures are for reference only.

Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Connecting rod</b> Bearing color code Small end inside diameter	mm (in)	1. Brown 2. Black 3. Blue 4. Green 22.015–22.028 (0.8667–0.8672)	
<b>Crankshaft</b> Crankshaft journal diameter Crankshaft pin diameter Crankshaft runout limit  Crankshaft pin oil clearance Crankshaft journal oil clearance Bearing color code	mm (in) mm (in) mm (in)  mm (in) mm (in)	39.976–40.000 (1.5739–1.5748) 41.976–42.000 (1.6526–1.6535) 0.03 (0.0012)  0.020–0.056 (0.0008–0.0022) 0.024–0.053 (0.0009–0.0021) 1. Brown 2. Black 3. Blue 4. Green 5. Yellow	
<b>Oil filter</b> Oil filter type		Cartridge type	
<b>Oil pump</b> Oil pump type		Trochoid	
<b>Thermostat</b> Opening temperature @ 0.05 mm (0.002 in) Fully open temperature Valve open lower limit	°C (°F) °C (°F) mm (in)	48–52 (118–126) 60 (140) More than 4.3 (0.17)	

**Fuel system**

Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Throttle body</b> Type/quantity Manufacturer ID mark Trolling speed Throttle cable installation length	r/min mm (in)	IM54-3D04/1 Mikuni 6S5 00 1,150–1,350 18.4 ± 1.0 (0.72 ± 0.04)	
<b>Fuel pump</b> Pump type Fuel pressure	kPa (kgf/cm <sup>2</sup> , psi)	Electrical 345–370 (3.45–3.70, 49.1–52.6)	

**Jet pump unit**

Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Jet pump</b>			
Impeller housing inside diameter	mm (in)	155.35–155.45 (6.116–6.120)	
Impeller material		Stainless steel	
Number of impeller blades		3	
Impeller pitch angle	Degree	16.0	
Impeller-to-housing clearance	mm (in)	0.35–0.45 (0.014–0.018)	
Impeller clearance limit	mm (in)	0.6 (0.024)	
Drive shaft runout limit	mm (in)	0.3 (0.012)	
Nozzle diameter	mm (in)	82.2–82.8 (3.24–3.26)	

**Hull and hood**

Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Throttle lever</b>			
Free play	mm (in)	2.0–5.0 (0.08–0.20)	

**Electrical**

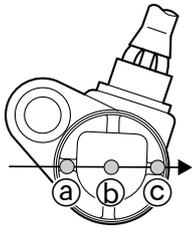
Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Ignition system</b>			
ECM unit (B/R – B, B/W – B, B/Y – B, B/G – B)			
Output peak voltage			
@cranking (loaded)	V	2.5	
@2,000 r/min (loaded)	V	2.6	
@3,500 r/min (loaded)	V	2.6	
Pickup coil (W – B)			
Output peak voltage			
@cranking (unloaded)	V	5.4	
@cranking (loaded)	V	4.6	
@2,000 r/min (loaded)	V	18.1	
@3,500 r/min (loaded)	V	23.9	
Pickup coil resistance <sup>*1</sup> (W – B)			
@ 20 °C (68 °F)	Ω	459–561	

\*1 The figures are for reference only.

Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Charging system</b>			
Stator coil (G – G)			
Output peak voltage			
@ cranking (unloaded)	V		8.4
@ 2,000 r/min (unloaded)	V		42.7
@ 3,500 r/min (unloaded)	V		74.0
Stator coil resistance*1 (G – G)	Ω		0.31–0.38
@ 20 °C (68 °F)			
Rectifier regulator (R – B)			
Output peak voltage			
@ 2,000 r/min (loaded)	V		13
@ 3,500 r/min (loaded)	V		13
<b>Control system</b>			
Oil pressure switch			
Oil pressure switch continuity pressure	kPa (kgf/cm <sup>2</sup> , psi)		128–166 (1.28–1.66, 18.2–23.6)
Thermoswitch			
Thermoswitch continuity temperature	°C (°F)		94–100 (201–212)
Thermoswitch no continuity temperature	°C (°F)		80–94 (176–201)
Thermo sensor			
Thermo sensor resistance*1 (B – B)			
@ 0 °C (32 °F)	kΩ		24.0–37.1
@ 100 °C (212 °F)	kΩ		0.87–1.18
Engine temperature sensor			
Engine temperature sensor resistance*1 (B/Y – B/Y)			
@ 20 °C (68 °F)	kΩ		54.2–69.0
@ 100 °C (212 °F)	kΩ		3.12–3.48
Intake air temperature sensor			
Intake air temperature sensor resistance*1 (B – B)			
@ 0 °C (32 °F)	kΩ		5.4–6.6
@ 80 °C (176 °F)	kΩ		0.29–0.39
Knock sensor			
Knock sensor resistance*1			
@ 20 °C (68 °F)	kΩ		504–616

\*1 The figures are for reference only.

Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>TPS</b>			
TPS output voltage with throttle lever fully closed			
TPS 1	V	0.6–0.9	
with throttle lever fully open			
TPS 2	V	4.6–4.7	
Throttle valve opening angle with throttle lever fully closed	degree	2.0–8.0	
with throttle lever fully open	degree	more than 70	
<b>APS</b>			
APS output voltage with throttle lever fully closed			
APS 1	V	0.50–0.90	
APS 2	V	0.35–1.05	
with throttle lever fully open			
APS 1	V	3.75–4.35	
APS 2	V	3.60–4.50	
APS resistance *1 @ 20°C (68°F) with APS pully fully closed			
APS 1	kΩ	0.50–0.90	
APS 2	kΩ	0.35–1.05	
with APS pully fully open			
APS 1	kΩ	3.75–4.35	
APS 2	kΩ	3.60–4.50	
<b>Cam position sensor</b>			
Output voltage (G/O – B/O)			
Position (a), (c)	V	More than 4.8	
Position (b)	V	Less than 0.8	



\*1 The figures are for reference only.

Item	Unit	Model	
		FX SHO	FX Cruiser SHO
<b>Fuel system</b>			
Fuel injector			
Fuel injector resistance* <sup>1</sup> @ 20 °C (68 °F)	Ω	11.5–12.5	
Fuel sender			
Fuel sender resistance* <sup>1</sup> (Y– B) @ 20 °C (68 °F)			
Lower position	Ω	133.5–136.5	
Upper position	Ω	5.0–7.0	
<b>Starting system</b>			
Fuse			
Rating			
Battery	V/A	12/30	
Main and fuel pump relay	V/A	12/20	
Main and fuel pump relay	V/A	12/10	
ETV relay	V/A	12/10	
Remote control receiver	V/A	12/3	
<b>Starter motor</b>			
Type		Constant mesh	
Output	kW	0.6	
Cranking time limit	Seconds	30	
Brush length	mm (in)	5.0–12.5 (0.20–0.49)	
Commutator undercut* <sup>1</sup>	mm (in)	0.2–0.7 (0.008–0.028)	
Commutator diameter	mm (in)	27.0–28.0 (1.06–1.10)	
<b>Remote control system</b>			
Remote control receiver			
Output voltage* <sup>1</sup> (L/Y – Ground)	V	11.0–12.0	
<b>Indication system</b>			
Speed sensor			
Output voltage (on pulse) (Y – B/Y)	mV	Less than 400	—
	V	More than 11.6	—
	mV	—	Less than 400
	V	—	More than 4.5
Speed and water temperature sensor resistance* <sup>1</sup> (Y – B/Y) @ 25 °C (77 °F)	kΩ	—	10

\*1 The figures are for reference only.

**Tightening torques**  
**Specified torques**

Part to tightened		Thread size	Tightening torque			Refer to page
			N·m	kgf·m	ft·lb	
<b>Fuel system</b>						
Fuel pump module assembly nut	1st	—	3	0.3	2.2	4-1
	2nd		6	0.6	4.4	
Strap bolt		M8	16	1.6	11.8	4-1
Fuel rail bolt		M8	13	1.3	9.6	4-1
Fuel tank cap clamp		—	1	0.1	0.7	4-1
Fuel filler neck nut		—	6	0.6	4.4	4-1
Fuel filler hose clamp		—	4	0.4	3.0	4-1
<b>Engine</b>						
APS nut		—	17	1.7	12.5	5-1
Engine cover bolt		M6	5	0.5	3.7	5-1
Engine cover grommet bolt		M6	6	0.6	4.4	5-4
Engine cover stay bolt		M6	10	1.0	7.4	5-4
Oil filter		—	18	1.8	13.3	5-4
Air filter case bolt		M8	13	1.3	9.6	5-4
Intake pipe clamp		—	3	0.3	2.2	5-4
Breather assembly bolt		M6	8	0.8	5.9	5-6
Rectifier regulator bolt		M8	26	2.6	19.2	5-6
Pipe clamp		—	2	0.2	1.5	5-6
Exhaust pipe 1 stay bolt	1st	M8, M10	23	2.3	17.0	5-6
	2nd		42	4.2	31.0	
Exhaust manifold bolt	1st	M8	20	2.0	14.8	5-6
	2nd		35	3.5	25.8	
Electrical box bolt		M8	17	1.7	12.5	5-9
Coupling cover bolt		M6	8	0.8	5.9	5-9
Engine mounting bolt		M8	17	1.7	12.5	5-9
Damper 1 bolt		M6	6	0.6	4.4	5-10
Damper 2 bolt		M6	6	0.6	4.4	5-10
Engine mount bolt		M8	17	1.7	12.5	5-10
Exhaust pipe 3		—	60	6.0	44.3	5-25
Thermo sensor		—	20	2.0	14.8	5-25
Exhaust pipe 1 bolt	1st	M8	20	2.0	14.8	5-25
	2nd		35	3.5	25.8	
Exhaust pipe 2 bolt	1st	M8	15	1.5	11.1	5-25
	2nd		29	2.9	21.4	
Starter motor cable nut		—	5	0.5	3.7	5-28
Starter motor bolt		M8	18	1.8	13.3	5-28
Boost pipe joint clamp		—	3	0.3	2.2	5-31
Boost pipe bolt		M8	20	2.0	14.8	5-31
Boost pipe hose clamp		—	3	0.3	2.2	5-31
Air cooler intake hose clamp		—	4	0.4	3.0	5-31

Part to tightened		Thread size	Tightening torque			Refer to page
			N-m	kgf-m	ft-lb	
Air cooler assembly nut	1st	—	23	2.3	17.0	5-31
	2nd		42	4.2	31.0	
Stud bolt	1st	M10	10	1.0	7.4	5-31
	2nd		20	2.0	14.8	
Air cooler assembly bolt	1st	M10	23	2.3	17.0	5-31
	2nd		42	4.2	31.0	
Air cooler stay bolt		M10	42	4.2	31.0	5-31
Supercharger assembly bolt		M6	10	1.0	7.4	5-31
		M8	20	2.0	14.8	
Intake air temperature sensor		—	15	1.5	11.1	5-34
Intake air pressure sensor bolt		M5	3.5	0.35	2.6	5-34
Intake air pressure sensor bracket bolt		M6	5	0.5	3.7	5-34
Intake manifold stay bolt	1st	M8	23	2.3	17.0	5-34
	2nd		42	4.2	31.0	
Oil level pipe bolt		M6	8	0.8	5.9	5-34
Intake manifold bolt	1st	M8	10	1.0	7.4	5-34
	2nd		20	2.0	14.8	
Intake manifold nut	1st	—	10	1.0	7.4	
	2nd		20	2.0	14.8	
Stud bolt	1st	M8	10	1.0	7.4	5-34
	2nd		20	2.0	14.8	
Throttle body joint bolt		M8	13	1.3	9.6	5-36
Throttle body assembly nut		—	13	1.3	9.6	5-36
Supercharger oil filler hole bolt		—	4	0.4	3.0	5-39
Oil filter bolt		—	18	1.8	13.3	5-42
Oil cooler assembly bolt		M8	19	1.9	14.0	5-42
Oil pipe holder bolt		M6	8	0.8	5.9	5-42
Oil pipe bolt		M10	21	2.1	15.5	5-42
Oil pump assembly bolt		M6	11	1.1	8.1	5-42
Drive gear assembly bolt		M12	80	8.0	59.0	5-44
Ignition coil bolt		M6	8	0.8	5.9	5-52
Spark plug		—	25	2.5	18.4	5-52
Cam position sensor bolt		M6	10	1.0	7.4	5-52
Cylinder head cover bolt		M6	8	0.8	5.9	5-52
Oil pipe bolt		M10	20	2.0	14.8	5-53
Timing chain tensioner bolt		M6	10	1.0	7.4	5-53
Camshaft cap bolt		M7	16	1.6	11.8	5-53
Camshaft sprocket bolt		M7	24	2.4	17.7	5-53
Chain guide plate bolt		M6	10	1.0	7.4	5-53
Engine hanger bolt		M6	12	1.2	8.9	5-67
Cylinder head assembly bolt	1st	M12	48	4.8	35.4	5-67
	2nd		90°			
Drive coupling		M30	80	8.0	59.0	5-80

Part to tightened	Thread size	Tightening torque			Refer to page	
		N·m	kgf·m	ft·lb		
Grommet bracket bolt	M6	8	0.8	5.9	5-80	
Generator cover assembly bolt	M8	26	2.6	19.2	5-80	
Transfer shaft	—	120	12.0	88.5	5-80	
Flywheel magneto bolt	M8	24	2.4	17.7	5-80	
Pickup coil bolt	M5	5	0.5	3.7	5-82	
Washer bolt	M5	5	0.5	3.7	5-82	
Stator coil assembly bolt	M6	15	1.5	11.1	5-82	
Clamp bolt	M6	15	1.5	11.1	5-82	
Thermoswitch bolt	M6	8	0.8	5.9	5-90	
Knock sensor	—	15	1.5	11.1	5-90	
Anode cover bolt	M8	20	2.0	14.8	5-90	
Anode bolt	M6	8	0.8	5.9	5-90	
Engine temperature sensor	—	15	1.5	11.1	5-90	
Earth plate bolt	M6	8	0.8	5.9	5-90	
Water jacket cover bolt	M6	8	0.8	5.9	5-90	
Oil pressure switch lead bolt	M4	2	0.2	1.5	5-90	
Oil pressure switch	—	8	0.8	5.9	5-90	
Oil separator tank cover bolt	M6	8	0.8	5.9	5-90	
Oil pan assembly bolt	M6	10	1.0	7.4	5-90	
Baffle plate bolt	M6	12	1.2	8.9	5-94	
Oil pipe 1 and 2 bolt	M6	9	0.9	6.6	5-94	
Bracket 1 and 2 bolt	M10	50	5.0	36.9	5-96	
Baffle plate bolt	M6	10	1.0	7.4	5-96	
Crankcase bolt	M6	10	1.0	7.4	5-96	
	1st	M10	30	3.0		22.1
	2nd		90°			
Connecting rod cap nut	1st	—	51	5.1	37.6	5-96
	2nd		90°			
Thermostat housing bolt	M6	8	0.8	5.9	5-116	
<b>Jet pump unit</b>						
Intake grate bolt	M6	8	0.8	5.9	6-1	
	M8	17	1.7	12.5		
Ride plate bolt	M8	17	1.7	12.5	6-1	
Speed sensor screw (FX SHO)/Speed and water temperature sensor screw (FX Cruiser SHO)	M5	4	0.4	3.0	6-1	
Steering cable joint nut	—	7	0.7	5.2	6-2	
Spout hose clamp (hull end)	—	2	0.2	1.5	6-2	
Rubber plate bolt	M6	7	0.7	5.2	6-2	
Jet pump unit assembly bolt	M6	8	0.8	5.9	6-2	
	M10	40	4.0	29.5		
Stay bolt	M8	15	1.5	11.1	6-2	
Spout hose clamp (jet pump end)	—	1	0.1	0.7	6-6	
Reverse gate assembly bolt	M8	20	2.0	14.8	6-6	

Part to tightened	Thread size	Tightening torque			Refer to page
		N-m	kgf-m	ft-lb	
Spring nut	—	8	0.8	5.9	6-6
Spring bolt	M8	20	2.0	14.8	6-6
Shift cable ball joint nut	—	8	0.8	5.9	6-6
Reverse gate stay bolt	M6	8	0.8	5.9	6-6
Bracket 1 and 2 bolt	M6	8	0.8	5.9	6-6
Jet thrust nozzle bolt	M8	16	1.6	11.8	6-8
Nozzle ring bolt	M8	16	1.6	11.8	6-8
QSTS rod ball joint nut	—	8	0.8	5.9	6-8
Water inlet cover/water inlet strainer bolt	M6	7	0.7	5.2	6-9
Impeller duct bolt	M10	40	4.0	29.5	6-9
Impeller (left-hand threads)	M25	110	11.0	81.1	6-10
Cap bolt	M6	8	0.8	5.9	6-10
Drive shaft nut	—	69	6.9	50.9	6-10
Flushing hose nut	—	6	0.6	4.4	6-18
Pilot water outlet joint nut	—	5	0.5	3.7	6-18
Transom plate nut	—	26	2.6	19.2	6-18
Drain joint nut	—	7	0.7	5.2	6-18
Intermediate housing assembly bolt	M8	17	1.7	12.5	6-22
Grease nipple	—	5	0.5	3.7	6-23
Driven coupling	M30	36	3.6	26.6	6-23
<b>Hull and hood</b>					
Upper handlebar cover screw	M4	1	0.1	0.7	8-1
Lower handlebar cover screw	M5	1	0.1	0.7	8-1
	M6	5	0.5	3.7	
Steering pad bolt	M6	1	0.1	0.7	8-2
Upper handlebar holder bolt	M8	21	2.1	15.5	8-3
QSTS grip assembly screw	M6	3	0.3	2.2	8-4
Left handlebar switch assembly screw	M5	3	0.3	2.2	8-4
Right handlebar switch assembly bolt	M5	3	0.3	2.2	8-4
Handle boss cover screw	M6	1	0.1	0.7	8-4
Throttle cable locknut	—	7	0.7	5.2	8-4
Grip end bolt	M5	1	0.1	0.7	8-4
QSTS converter bolt	M6	5	0.5	3.7	8-12
Pulley bolt	M6	7	0.7	5.2	8-12
QSTS cable grommet nut	—	5.9	0.59	4.4	8-12
QSTS rod locknut	—	4	0.4	3.0	8-15
Damper nut	—	5	0.5	3.7	8-17
Hinge assembly nut	—	6	0.6	4.4	8-17
Front hood assembly bolt	M6	5	0.5	3.7	8-17
Mirror assembly bolt	M8	13	1.3	9.6	8-17
Mirror ornament screw	M4	1	0.1	0.7	8-17
Mirror nut	—	5	0.5	3.7	8-17
Multifunction meter cover screw	M5	2	0.2	1.5	8-22



Part to tightened	Thread size	Tightening torque			Refer to page
		N·m	kgf·m	ft·lb	
Multifunction meter bolt	M5	4	0.4	3.0	8-22
Side cover bolt	M6	5	0.5	3.7	8-24
Side ornament nut	—	5	0.5	3.7	8-24
Center cover nut	—	5	0.5	3.7	8-25
Shift lever assembly nut	—	5	0.5	3.7	8-25
Box cap	—	2	0.2	1.5	8-25
Lid lock hook/bracket bolt	M5	4	0.4	3.0	8-27
Steering arm assembly bolt	M8	16	1.6	11.8	8-29
Steering cable ball joint nut	—	7	0.7	5.2	8-29
Cable stopper assembly bolt	M6	7	0.7	5.2	8-29
Steering master assembly nut	—	21	2.1	15.5	8-29
Compass sensor nut (FX Cruiser SHO)	—	4	0.4	3.0	8-29
Bracket 1 and 2 bolt	M5	4	0.4	3.0	8-31
Steering sensor bolt	M6	7	0.7	5.2	8-31
Steering master housing bolt	M6	7	0.7	5.2	8-31
Steering cable grommet nut	—	5.9	0.59	4.4	8-36
Steering cable locknut (steering master end and jet pump end)	—	7	0.7	5.2	3-3, 8-36
Speed sensor lead grommet nut	—	5.9	0.59	4.4	8-36
Shift cable holder nut	—	7	0.7	5.2	8-36
Shift cable bracket nut	—	16	1.6	11.8	8-36
Shift cable grommet nut	—	5.9	0.59	4.4	8-36
Shift cable locknut (jet pump end)	—	2.9	0.29	2.1	8-36
Cooling water pilot outlet nut	—	4	0.4	3.0	8-41
Seat lock assembly bolt	M6	6	0.6	4.4	8-43
Deck beam nut	—	18	1.8	13.3	8-43
Projection nut	—	26	2.6	19.2	8-43
Rear seat stay nut	—	6	0.6	4.4	8-43
Seat holder nut	—	16	1.6	11.8	8-43
Hand grip nut	—	5	0.5	3.7	8-43
Rubber hose/resonator clamp	—	3.7	0.37	2.7	8-46
Rubber hose/water tank clamp	—	3.7	0.37	2.7	8-46
Water tank/rubber hose clamp	—	3.7	0.37	2.7	8-46
Plate/rubber hose/exhaust valve nut	—	5	0.5	3.7	8-46
Battery box bolt	M6	5.4	0.54	3.9	8-46
Bow eye bolt	M6	13	1.3	9.6	8-50
Front protector 1 nut	—	5	0.5	3.7	8-50
Front protector 1 bolt	M6				
Front protector 2 nut	—	5	0.5	3.7	8-50
Pull-up cleat assembly bolt	M6	2	0.2	1.5	8-50
Sponson bolt	M8	16	1.6	11.8	8-50
Ski tow nut	—	16	1.6	11.8	8-52
Spout nut	—	5	0.5	3.7	8-52
Stern eye nut	—	16	1.6	11.8	8-52

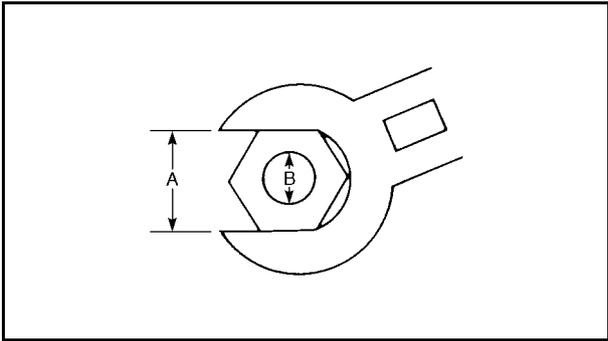
Part to tightened	Thread size	Tightening torque			Refer to page
		N·m	kgf·m	ft·lb	
Drain plug nut	—	2	0.2	1.5	8-52
Reboarding step assembly bolt	M8	16	1.6	11.8	8-52
<b>Electrical</b>					
Fuse box bolt	M8	13	1.3	9.6	7-4
Slant detection switch screw	M6	4	0.4	3.0	7-4
ECM bolt	M6	5	0.5	3.7	7-4
Lead bolt (red, brown, and black)	M6	10	1.0	7.4	7-6
Starter motor terminal nut	—	9	0.9	6.6	7-53
Starter motor cover bolt	M6	6	0.6	4.4	7-53
Transmitter cover screw	—	0.1	0.01	0.1	7-62



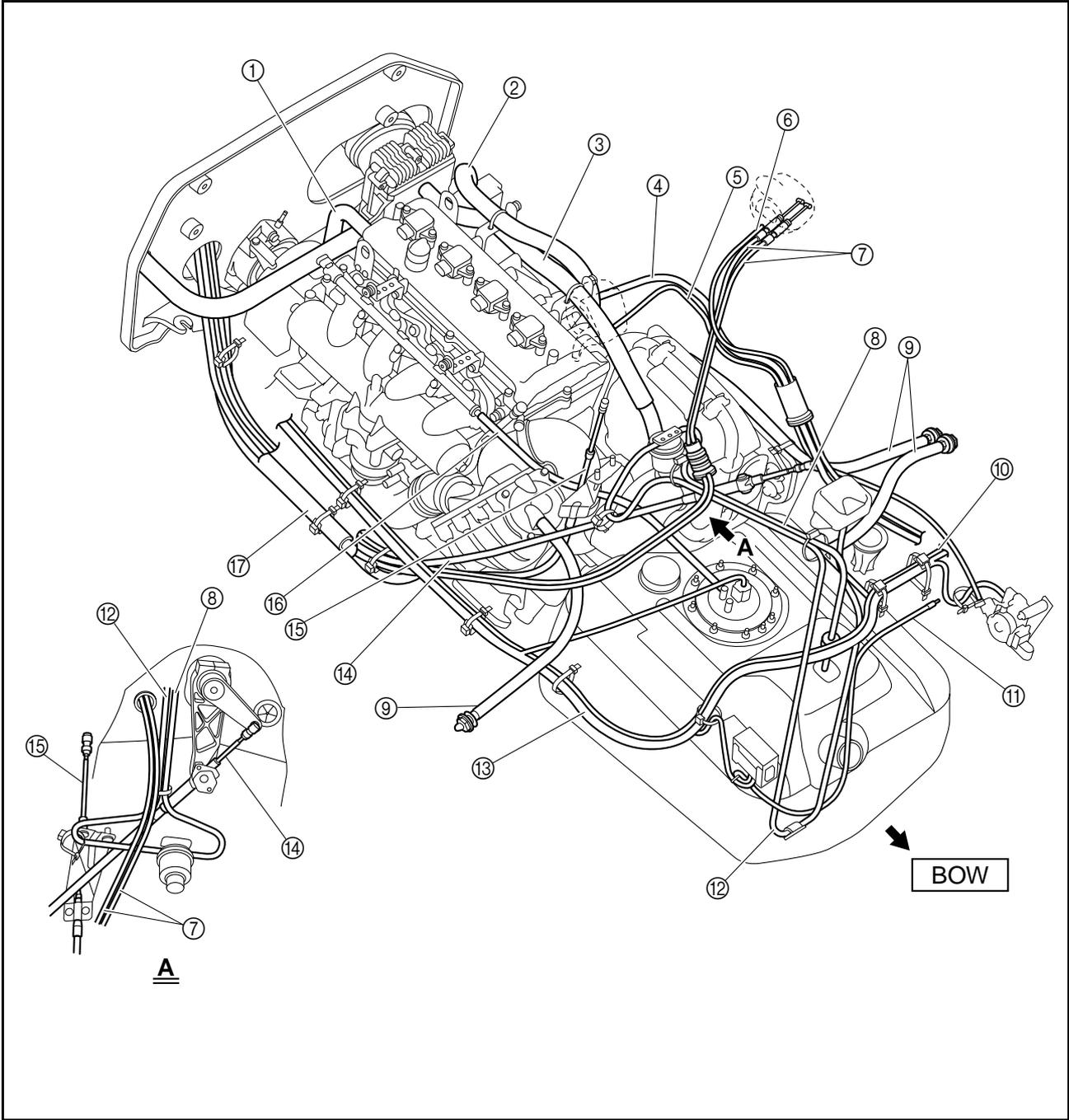
Nut (A)	Bolt (B)	General torque specifications		
		N·m	kgf·m	ft·lb
8 mm	M5	5	0.5	3.7
10 mm	M6	8	0.8	5.9
12 mm	M8	18	1.8	13.3
14 mm	M10	36	3.6	26.6
17 mm	M12	43	4.3	31.7

**General torque**

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



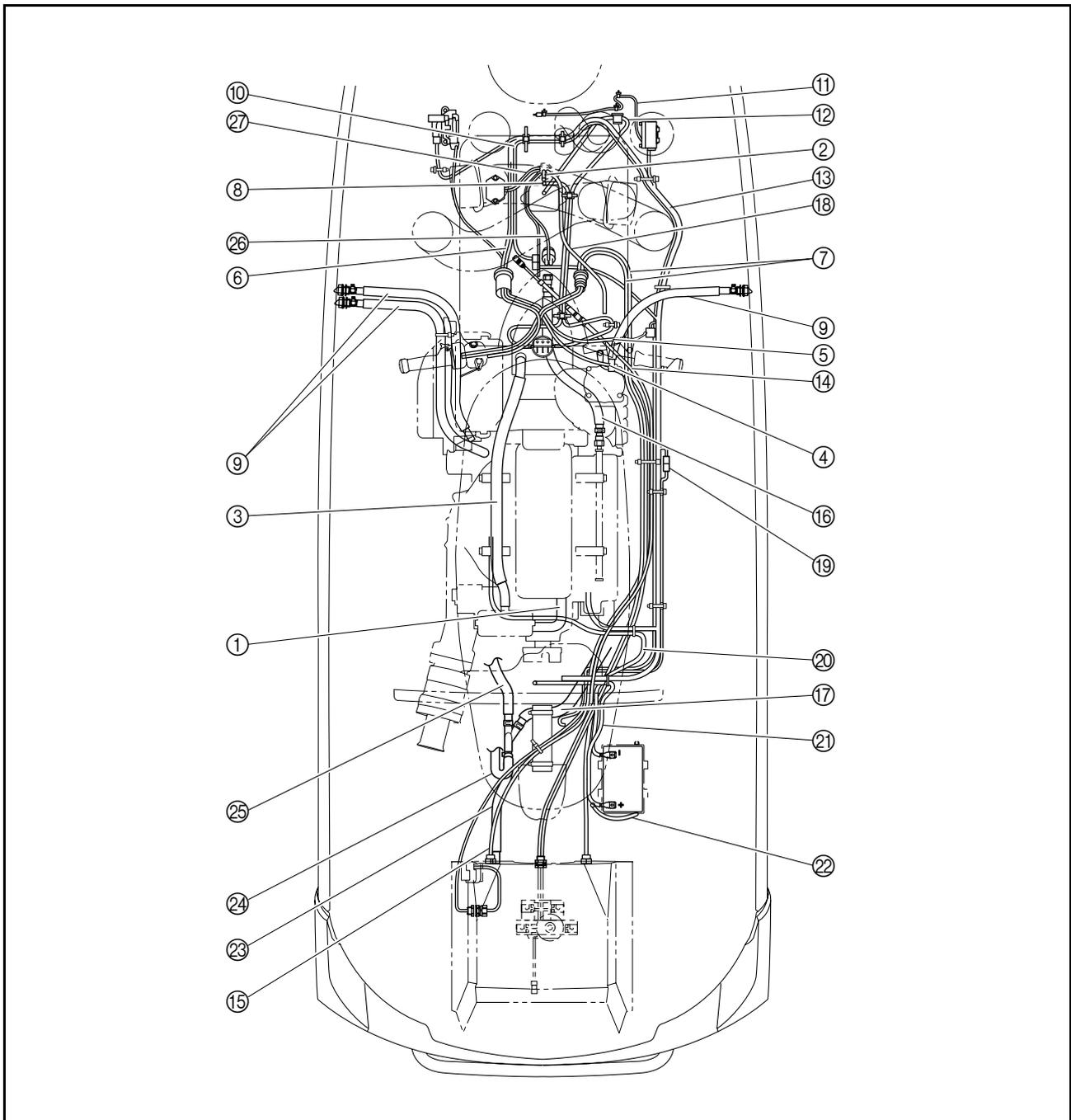
**Cable and hose routing**  
**Starboard bow view**



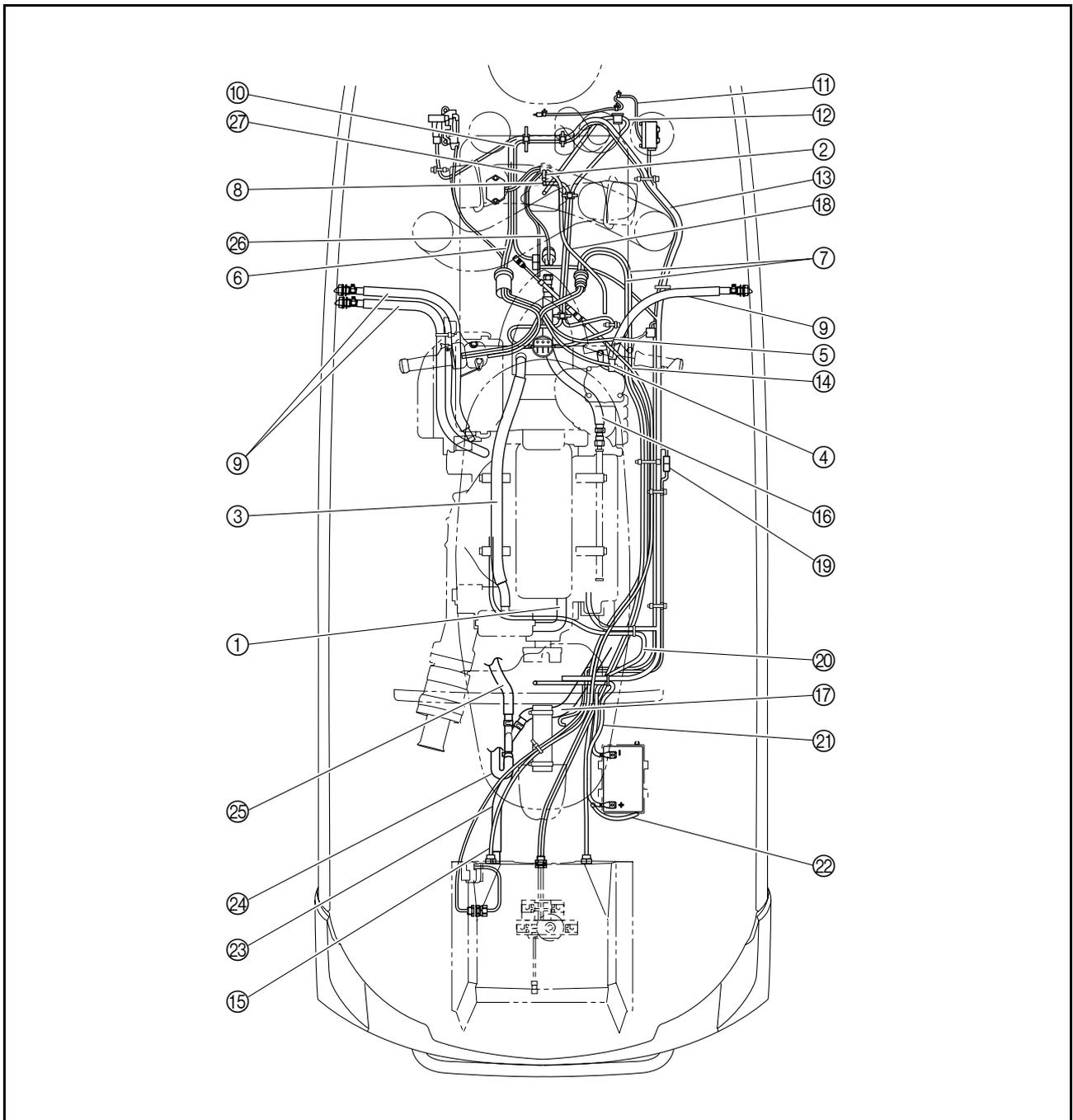
- |  |   |
|--|---|
| ① Breather hose (head cover to breather assembly)              | ⑨ Cooling water pilot outlet hose                                 |
| ② Cooling water hose (exhaust manifold to rectifier regulator) | ⑩ Speed sensor lead   |
| ③ Breather hose (breather assembly to intake pipe)             | ⑪ Remote control receiver antenna                                 |
| ④ Right handlebar switch lead                                  | ⑫ Fuel tank breather hose (ventilation socket to water separator) |
| ⑤ Throttle cable   | ⑬ Wiring harness  |
| ⑥ Left handlebar switch lead                                   | ⑭ Steering cable  |
| ⑦ QSTS cable   | ⑮ Shift cable   |
| ⑧ Fuel tank breather hose (water separator to fuel tank)       | ⑯ Fuel hose (fuel tank to fuel rail)                              |
|  | ⑰ Cooling water hose (hose joint 1 to hose joint 4)               |



## Top view

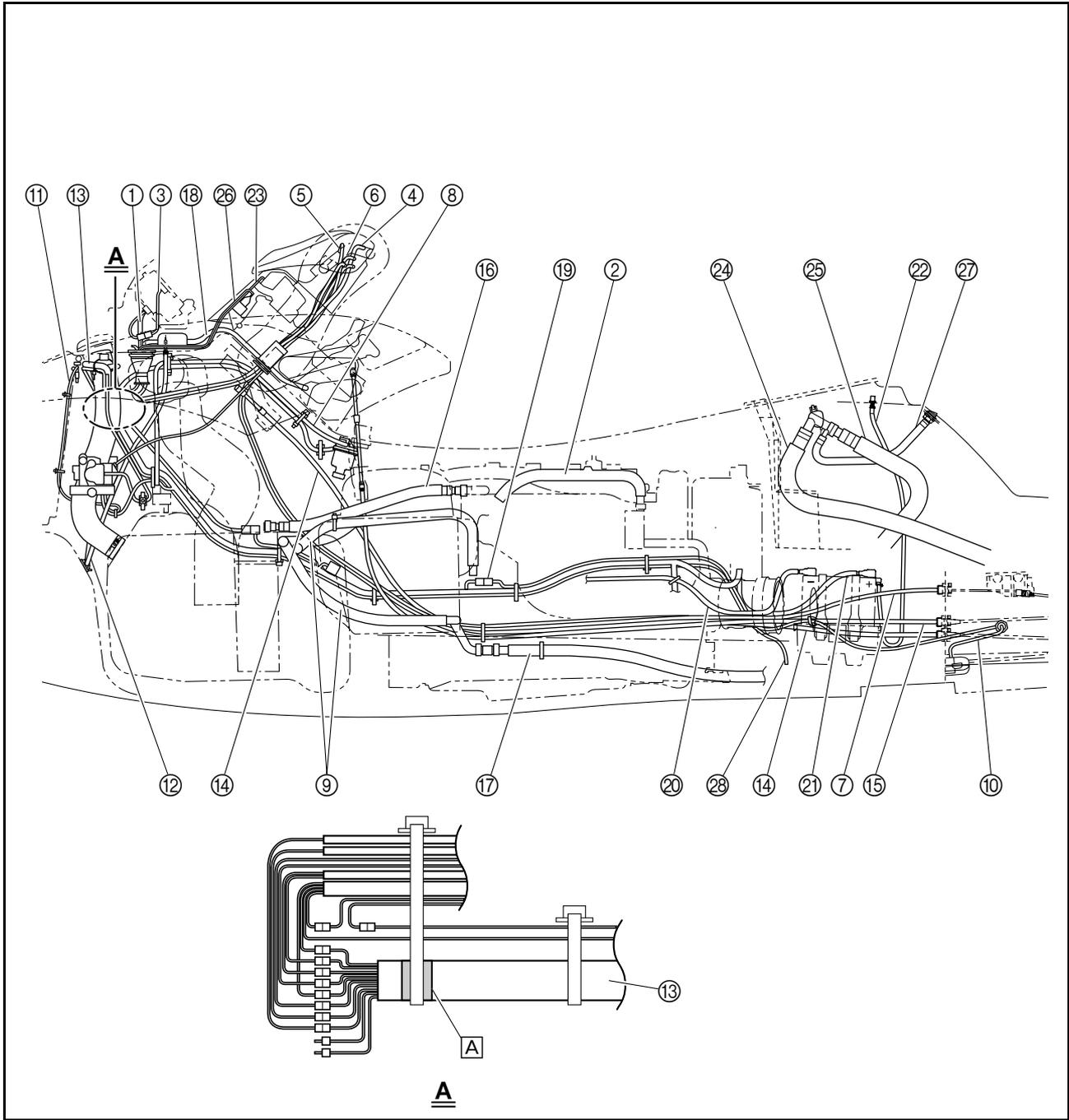


- |  |   |
|--|---|
| ① Breather hose (head cover to breather assembly)        | ⑨ Cooling water pilot outlet hose                                 |
| ② Multifunction meter lead                               | ⑩ Speed sensor lead   |
| ③ Breather hose (breather assembly to intake pipe)       | ⑪ Remote control receiver antenna                                 |
| ④ Right handlebar switch lead                            | ⑫ Fuel tank breather hose (ventilation socket to water separator) |
| ⑤ Throttle cable   | ⑬ Wiring harness  |
| ⑥ Left handlebar switch lead                             | ⑭ Steering cable  |
| ⑦ QSTS cable   | ⑮ Shift cable   |
| ⑧ Fuel tank breather hose (water separator to fuel tank) | ⑯ Fuel hose (fuel tank to fuel rail)                              |
|  | ⑰ Cooling water hose (hose joint 1 to hose joint 4)               |
|  | ⑱ Reverse sensor lead   |

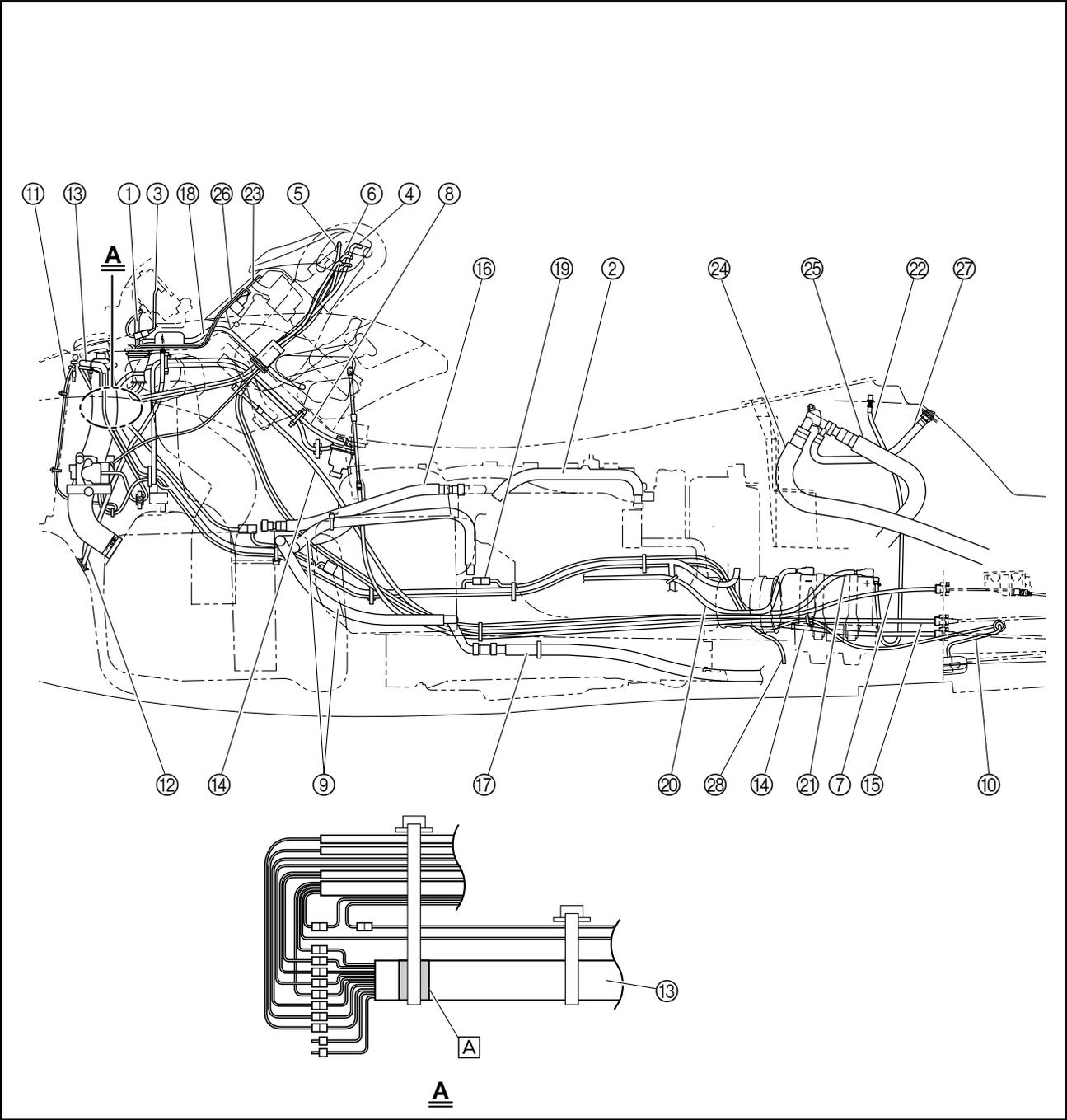


- ⑱ Electric bilge pump coupler
- ⑳ Negative battery cable
- ㉑ Positive battery cable
- ㉒ Battery breather hose
- ㉓ Cooling water hose (jet pump to hose joint 1)
- ㉔ Flushing hose
- ㉕ Cooling water hose (hose joint 1 to hose joint 3)
- ㉖ Buzzer lead
- ㉗ Compass and air temperature sensor lead (FX Cruiser SHO)

**Port view**



- |  |   |
|--|---|
| ① Multifunction meter lead                                     | ⑩ Speed sensor lead   |
| ② Cooling water hose (exhaust manifold to rectifier regulator) | ⑪ Remote control receiver antenna                                 |
| ③ Left operation button lead                                   | ⑫ Fuel tank breather hose (ventilation socket to water separator) |
| ④ Right handlebar switch lead                                  | ⑬ Wiring harness  |
| ⑤ Throttle cable   | ⑭ Steering cable  |
| ⑥ Left handlebar switch lead                                   | ⑮ Shift cable   |
| ⑦ QSTS cable   | ⑯ Fuel hose (fuel tank to fuel rail)                              |
| ⑧ Fuel tank breather hose (water separator to fuel tank)       | ⑰ Cooling water hose (hose joint 1 to hose joint 4)               |
| ⑨ Cooling water pilot outlet hose                              | ⑱ Reverse sensor lead   |
|  | ⑲ Electric bilge pump coupler                                     |



- ⑳ Negative battery cable
- ㉑ Positive battery cable
- ㉒ Battery breather hose
- ㉓ Steering sensor lead
- ㉔ Bilge hose (hose joint to drain joint)
- ㉕ Bilge hose (electric bilge pump to hose joint)
- ㉖ Buzzer lead
- ㉗ Bilge hose (hose joint to pilot outlet)
- ㉘ Electric bilge pump lead

**A** Fasten the wiring harness with the plastic tie, making sure to align the tie with the gray tape on the harness.

---

— MEMO —

## Chapter 3

### Periodic check and adjustment

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### Maintenance interval chart

The following chart should be considered strictly as a guide to general maintenance intervals. Depending on operating conditions, the maintenance intervals should be changed.

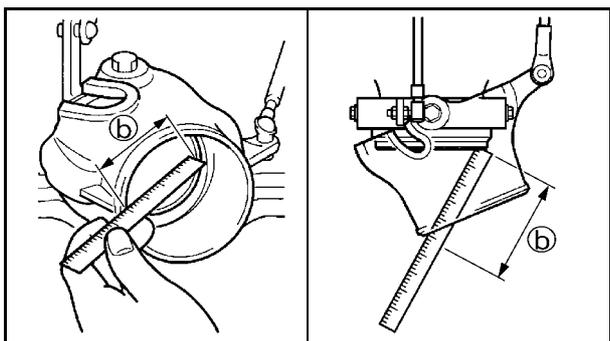
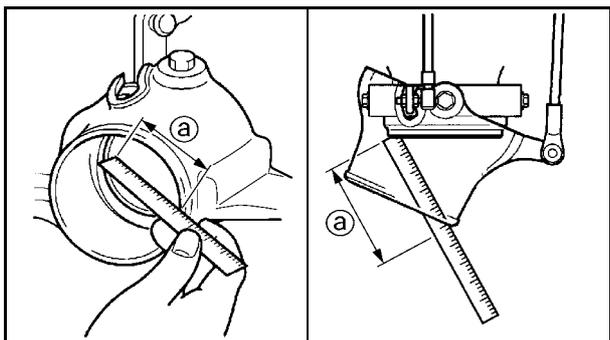
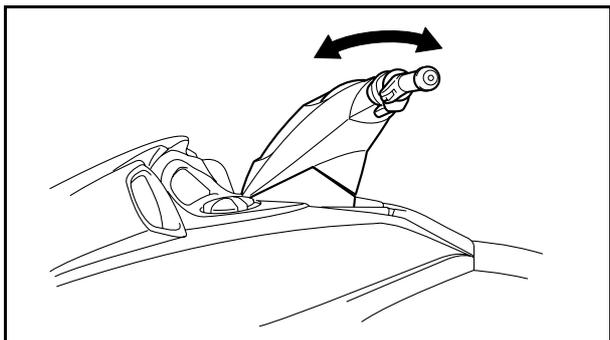
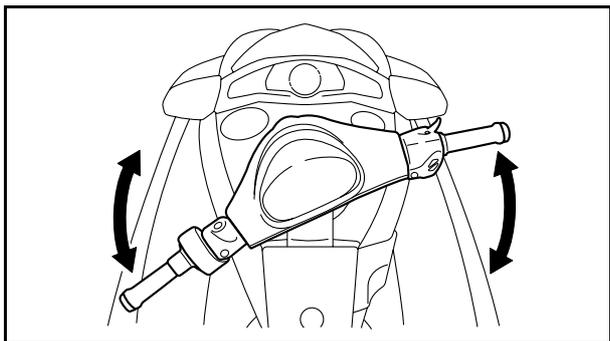
MAINTENANCE INTERVAL  ITEM		INITIAL			THEREAFTER EVERY		PAGE
		10 hours	50 hours	100 hours	100 hours	200 hours	
			6 months	12 months	12 months	24 months	
Spark plugs	Check, clean, adjust	○		○	○		3-17
Lubrication points	Lubricate			○	○		3-24
Internal engine components	Lubricate	○*1 50 hours or 12 months					3-23
Supercharger	Lubricate	○	○		○ 50 hours or 6 months		5-39
QSTS cables	Lubricate			○	○		3-24
Intermediate housing	Lubricate	○*2		○*3	○*3		3-24
Fuel system	Check			○	○		3-9
Fuel tank	Check, clean			○	○		3-9
Trolling speed	Check			○	○		3-7
Throttle shaft	Check			○	○		5-38
Cooling water passages	Flush	○*4					—
Water inlet strainer	Check, clean			○	○		3-22
Bilge strainer	Clean			○	○		3-22
Electric bilge pump strainer	Check, clean			○	○		3-23
Impeller	Check			○	○		3-21
Jet thrust nozzle angle	Check, adjust			○	○		3-2
Steering master	Check	○		○	○		3-2
QSTS mechanism	Check, adjust	○		○	○		3-4
Shift cable and reverse gate	Check, adjust			○	○		3-7
Throttle cable	Check, adjust	○		○	○		3-5
Stern drain plugs	Check, replace			○	○		3-23
Battery	Check, charge			○	○		3-19
Rubber damper	Check					○	6-27
Engine mounts	Check					○	5-17
Nuts and bolts	Check	○		○	○		—
Air filter element	Check, replace			○	○		3-16
Engine oil	Replace	○	○ 50 hours or 12 months				3-14
Engine oil filter	Replace			○	○		3-15
Valve clearance	Check, adjust					○	3-10
Water separator	Check	○*4					3-10

\*1: Before long-term storage

\*2: Grease quantity: 33.0–35.0 cm<sup>3</sup> (1.12–1.18 US oz, 1.16–1.23 Imp.oz)

\*3: Grease quantity: 6.0–8.0 cm<sup>3</sup> (0.20–0.27 US oz, 0.21–0.28 Imp.oz)

\*4: After every use



## Periodic service

### Control system

#### Steering system check

##### 1. Check:

- Steering system  
Excessive play → Check the bushings, bolts, and nuts.  
Refer to “Handlebar assembly removal” in Chapter 8.

##### Checking steps:

- Turn the handlebar lock to lock and push it back and forth.
- Check for excessive play of the handlebar.

#### Jet thrust nozzle steering angle check and adjustment

##### 1. Check:

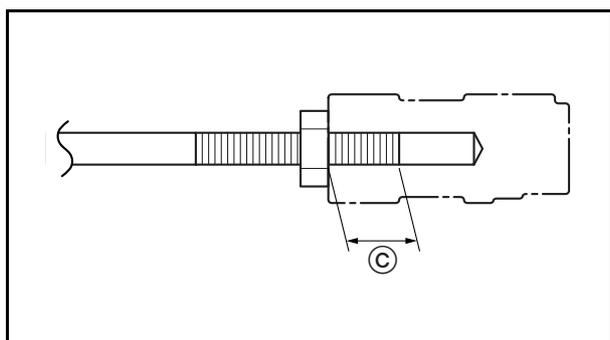
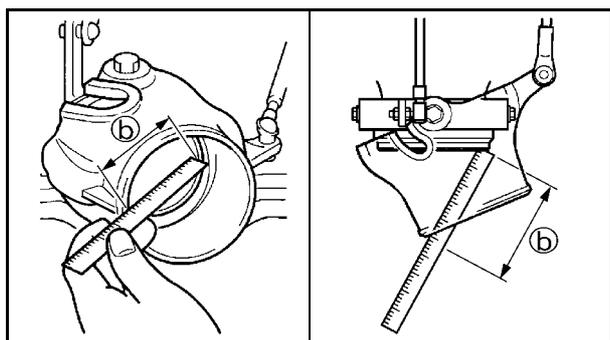
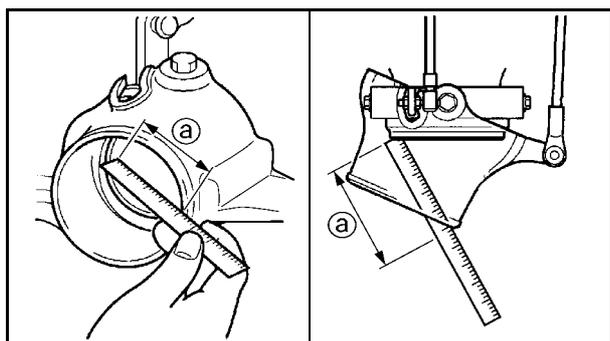
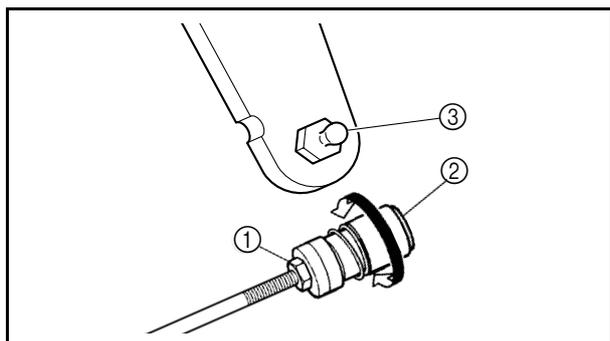
- Jet thrust nozzle distances ① and ②  
Difference above specification → Adjust the steering cable joint.



Difference of distances ① and ②:  
Maximum 5 mm (0.2 in)

##### Checking steps:

- Set the QSTS grip to the neutral position.
- Turn the handlebar lock to lock.
- Measure distances ① and ②.



**2. Adjust:**

- Steering cable joint (steering master end)

**Adjustment steps:**

1. Set the QSTS grip to the neutral position.
2. Remove the service lid.  
Refer to "Front hood removal" in Chapter 8.
3. Loosen the locknut ①.
4. Disconnect the steering cable joint ② from the ball joint ③.
5. Turn the steering cable joint ② in or out to adjust the distances ① and ②.

**⚠ WARNING**

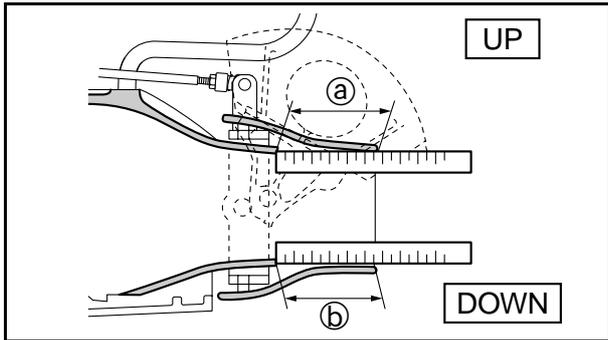
The steering cable joint must be screwed in more than 8 mm (0.31 in) ③.

Turn in	Distance ① is increased.
Turn out	Distance ② is increased.

6. Connect the steering cable joint ②, and then tighten the locknut ① to the specified torque.

	Locknut: 7 N·m (0.7 kgf·m, 5.2 ft·lb)
---	--

7. Check the jet thrust nozzle angle difference of distances ① and ② again.
8. If the steering cable cannot be properly adjusted using the cable joint at the steering master end, adjust the cable joint at the jet pump end so that the difference of distances ① and ② is within specification. Refer to "Steering cable installation (jet pump end)" in Chapter 8.
9. Install the service lid.



### Jet thrust nozzle QSTS angle check and adjustment

#### 1. Check:

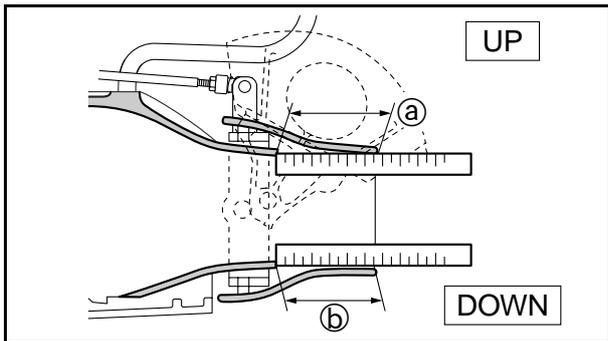
- Jet thrust nozzle angle set distances ① and ②
- Difference → Adjust the QSTS rod joint.

#### NOTE:

Before measuring the jet thrust nozzle QSTS angle make sure that the steering position of the jet thrust nozzle is centered.

#### Checking steps:

1. Set the QSTS grip to the neutral position.
2. Measure the jet thrust nozzle angle set distances ① and ②.



#### 2. Adjust:

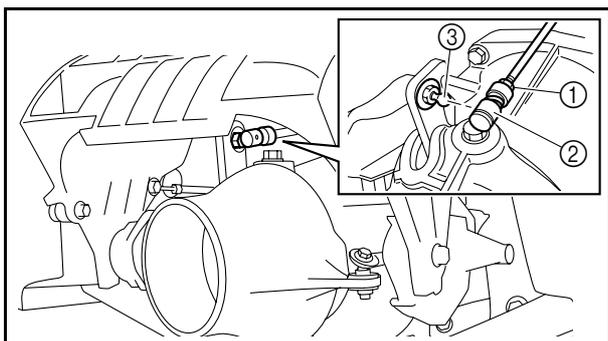
- QSTS rod joint

#### Adjustment steps:

1. Set the QSTS grip to the neutral position.
2. Loosen the locknut ①.
3. Disconnect the QSTS rod joint ②.
4. Adjust the QSTS rod joint ② until the upper and lower set distances ① and ② for the jet thrust nozzle are equal.

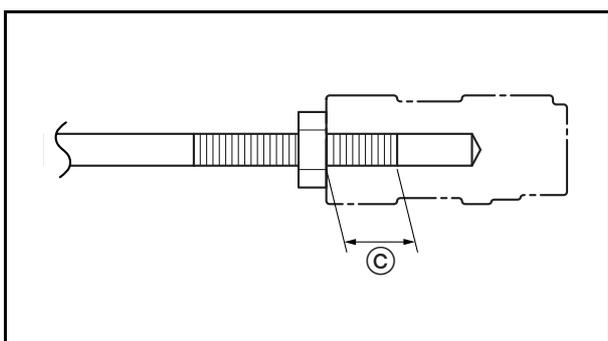
#### ⚠ WARNING

The QSTS rod joint must be screwed in more than 8 mm (0.31 in) ③.



Turn out	Distance ① is increased.
Turn in	Distance ② is increased.

5. Connect the QSTS rod joint ② to the ball joint ③, and then tighten the locknut ① to the specified torque.

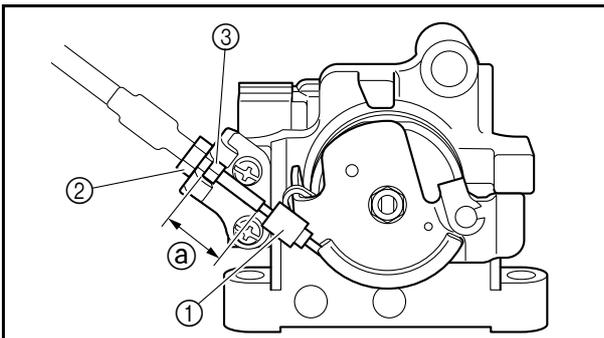
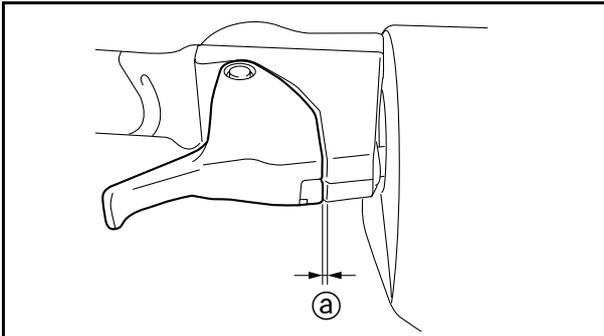


	Locknut: 4 N·m (0.4 kgf·m, 3.0 ft·lb)
---	--



6. If the QSTS rod cannot be properly adjusted using the rod joint at the jet pump end, check the rod joint at the QSTS converter end.

Refer to “QSTS grip and converter disassembly” in Chapter 8.



### Throttle lever free play check and adjustment

#### 1. Measure:

- Throttle lever free play ②  
Out of specification → Adjust the throttle lever free play.



Throttle lever free play ②:  
2.0–5.0 mm (0.08–0.20 in)

#### 2. Adjust:

- Throttle lever free play

### Adjustment steps:

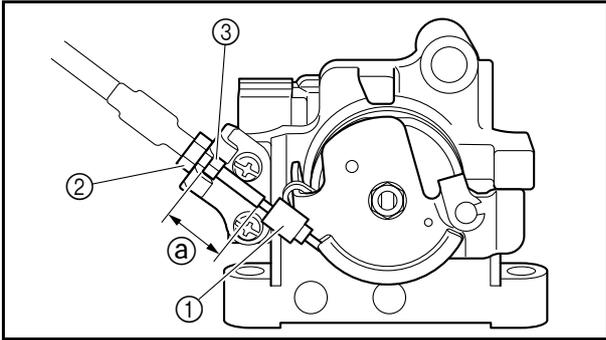
#### NOTE:

- Follow all the steps if the throttle cable has been replaced, or if it has been disconnected from the APS.
- Follow only steps 6–13 if the throttle cable has not been disconnected from the APS.

1. Face the handlebar straight ahead.
2. Remove the service lid.  
Refer to “Front hood removal” in Chapter 8.
3. Slide the boot ①.
4. Check that the throttle cable installation length ② is within specification.



Throttle cable installation length ②:  
 $18.4 \pm 1.0$  mm ( $0.72 \pm 0.04$  in)



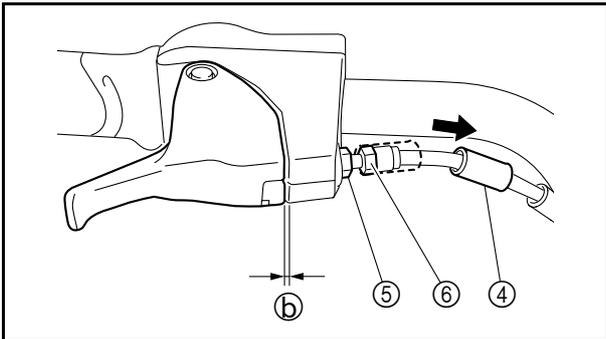
- If the throttle cable installation length (a) is out of specification, loosen the locknut (2), turn the adjusting nut (3) to adjust the length, and then tighten the locknut (2) to the specified torque.

**NOTE:**

Apply locking agent to the threads of the adjusting nut (3).

	Locknut: 7 N·m (0.7 kgf·m, 5.2 ft·lb) LOCTITE 242
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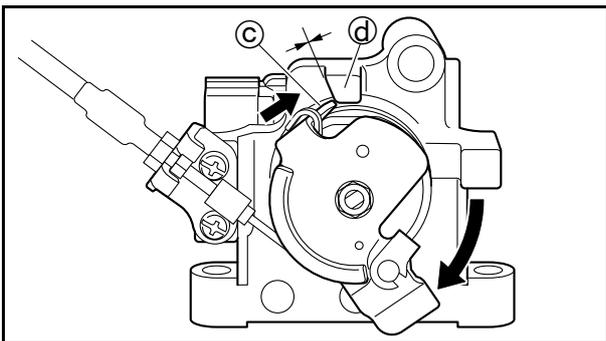
- Remove the handlebar cover. Refer to "Steering pad removal (FX SHO)" and "Steering pad removal (FX Cruiser SHO)" in Chapter 8.
- Slide the rubber cover (4) away from the throttle lever.
- Loosen the locknut (5).
- Turn the adjuster (6) in or out until the specified free play is obtained.



Turn in	Free play is increased.
Turn out	Free play is decreased.

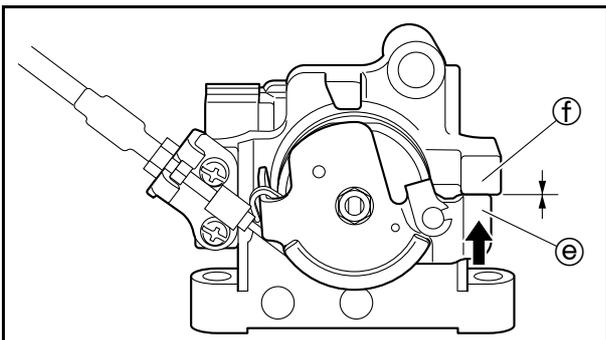
	Throttle lever free play (b): 2.0–5.0 mm (0.08–0.20 in)
---	--

- Tighten the locknut (5).
- Squeeze the throttle lever to the fully open position and check that the APS pulley stopper (c) contacts the fully open stopper (d) on the APS.
- Release the throttle lever and check that the APS pulley stopper (e) contacts the fully closed stopper (f) on the APS.



**NOTE:**

If the throttle cable free play cannot be adjusted properly, replace the throttle cable.



	Handlebar cover screw: 1 N·m (0.1 kgf·m, 0.7 ft·lb)
---	--



14. Install the service lid.

**NOTE:**

Make sure that the throttle cable is not pulled when the handlebar is turned to the right and left.

**Trolling speed check**

**1. Check:**

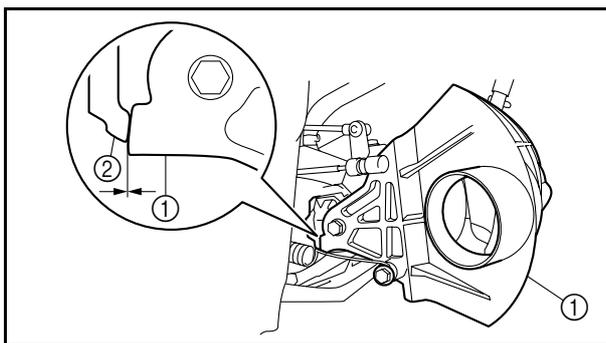
- Trolling speed  
Out of specification → Check the throttle cable or throttle body assembly.

**Checking steps:**

1. Place the watercraft in the water.
2. Start the engine and allow it to warm up for 5 minutes.
3. Check the engine trolling speed using the tachometer of the multifunction meter or using the YDIS.



Trolling speed:  
1,150–1,350 r/min



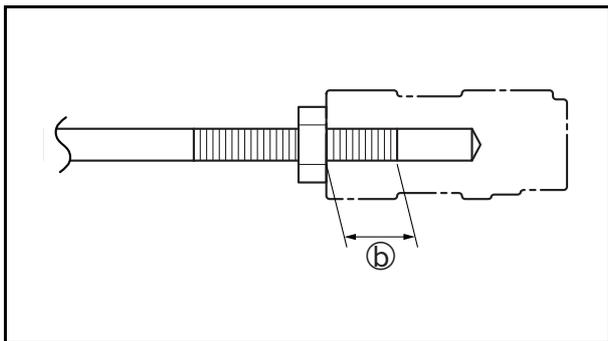
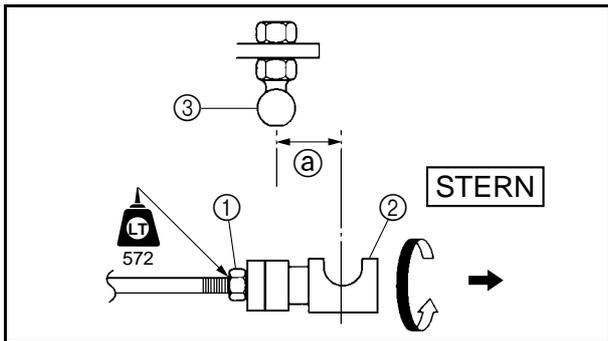
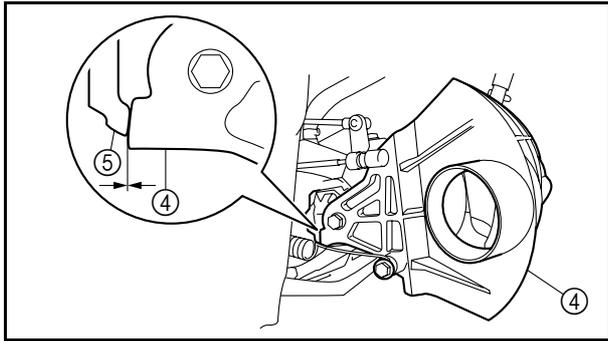
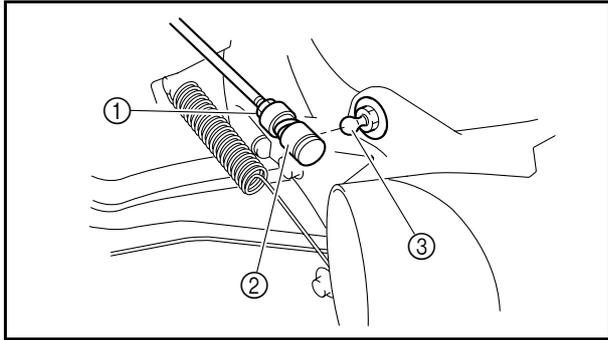
**Shift cable check and adjustment**

**1. Check:**

- Reverse gate position  
Incorrect → Adjust the shift cable joint.

**Checking steps:**

1. Set the shift lever to the reverse position.
2. Check that the reverse gate ① contacts the stopper ②.



**2. Adjust:**

- Shift cable joint (jet pump end)

**Adjustment steps:**

1. Set the shift lever to the reverse position.
2. Loosen the locknut ①.
3. Disconnect the shift cable joint ② from the ball joint ③.
4. Situate the reverse gate ④ to the stopper ⑤.

5. Turn the shift cable joint ② in or out until the specified distance ③ between the center of the joint and the center of the ball joint ③ is obtained.

**⚠ WARNING**

The shift cable joint must be screwed in more than 8 mm (0.31 in) ③.

Turn in	Distance is decreased.
Turn out	Distance is increased.

Distance ③:  
7 mm (0.28 in)

6. Connect the shift cable joint ② to the ball joint ③, and then tighten the locknut ① to the specified torque.

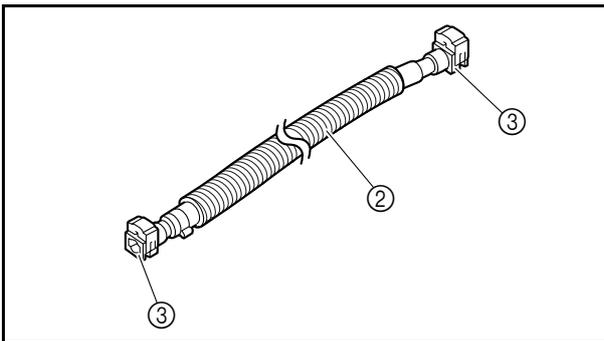
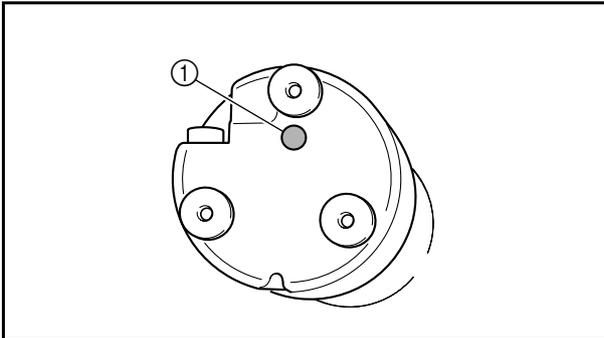
Locknut:  
2.9 N·m (0.29 kgf·m, 2.1 ft·lb)  
LOCTITE 572



## Fuel system

### **⚠ WARNING**

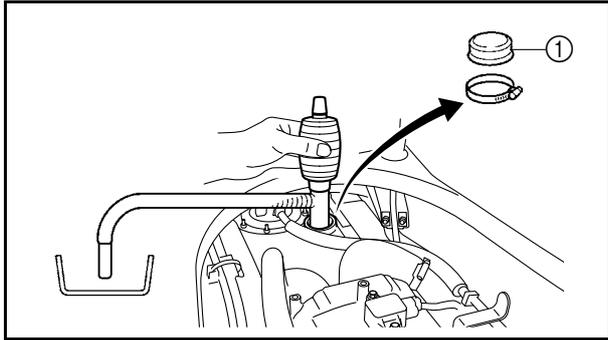
- Before checking the fuel system, remove the battery and then remove the fuel tank filler cap to reduce any pressure inside the fuel tank.
- Always reduce the fuel pressure in the fuel line before checking the line or the fuel pipe. If the fuel pressure is not released, pressurized fuel could spray out.
- When removing fuel system parts, wrap them in a cloth and take care that no fuel spills into the engine compartment.



### Fuel line check

#### 1. Check:

- Fuel pump filter ①  
Clog/contaminants → Clean the fuel pump filter.
- Fuel hose ②
- Quick connectors ③  
Cracks/damage → Replace the fuel hose.
- Fuel filler hose  
Damage → Replace the fuel filler hose.
- Fuel filler neck  
Cracks/damage → Replace the fuel filler neck.
- Fuel rail  
Cracks/damage → Replace the fuel rail.  
Refer to “Fuel tank, fuel pump module, and fuel hose” in Chapter 4.



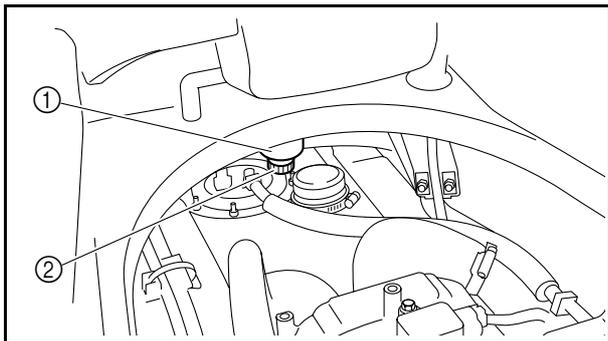
**2. Check:**

- Fuel tank  
Water accumulation → Extract the water and fuel.  
Cracks/damage → Replace the fuel tank.

**NOTE:** \_\_\_\_\_  
To extract water and fuel from the fuel tank, remove the cap ① and use a siphon pump.



Fuel tank cap clamp:  
1 N·m (0.1 kgf·m, 0.7 ft·lb)



**Water separator check**

**1. Check:**

- Water separator ①  
Water accumulation → Drain the water.

**NOTE:** \_\_\_\_\_  
To drain water from the water separator ①, remove the drain plug ②.

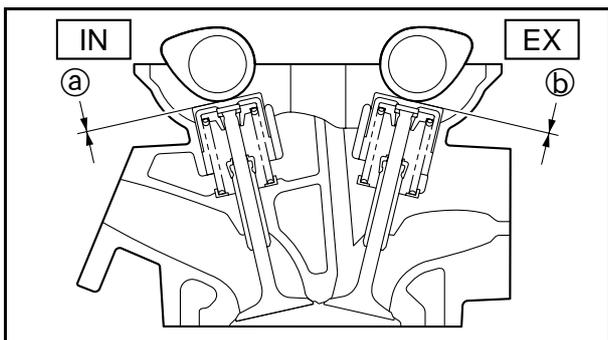
**Power unit**

**Valve clearance measurement**

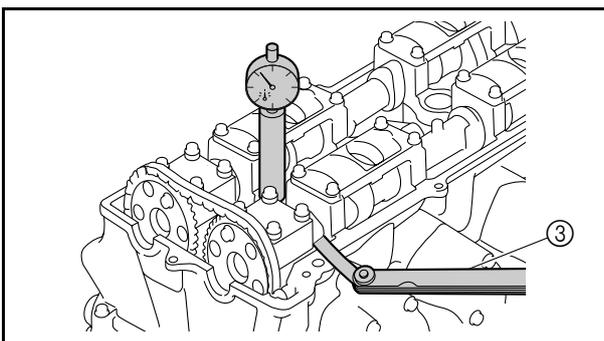
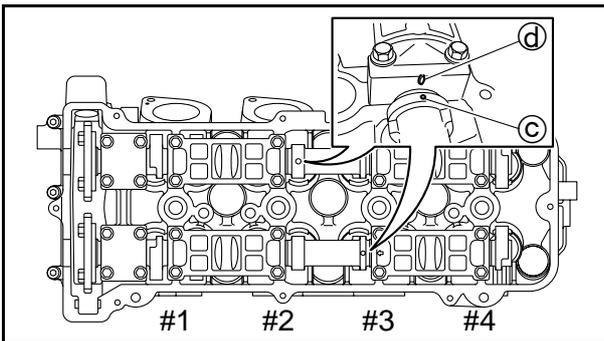
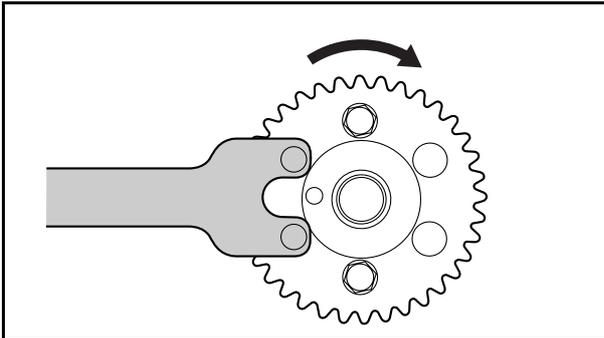
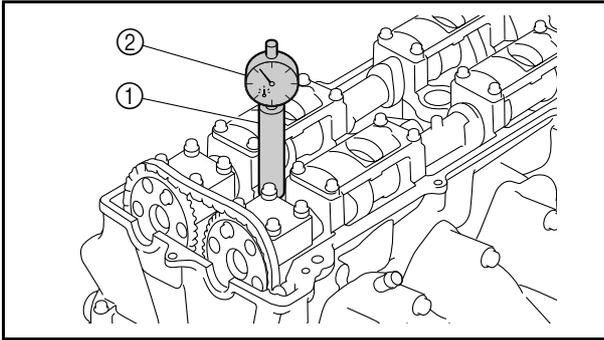
**1. Measure:**

- Valve clearance  
Out of specification → Adjust the valve clearance.  
Refer to “Valve clearance adjustment” in Chapter 5.

**NOTE:** \_\_\_\_\_  
Measure the valve clearance when the engine is cold.



Valve clearance (cold):  
Intake ①:  
0.14–0.23 mm (0.006–0.009 in)  
Exhaust ②:  
0.28–0.37 mm (0.011–0.015 in)



**Measurement steps:**

1. Remove the spark plugs and cylinder head cover.  
Refer to "Cylinder head cover removal" in Chapter 5.
2. Install the dial gauge needle and special service tools ① and ② into spark plug hole #1.



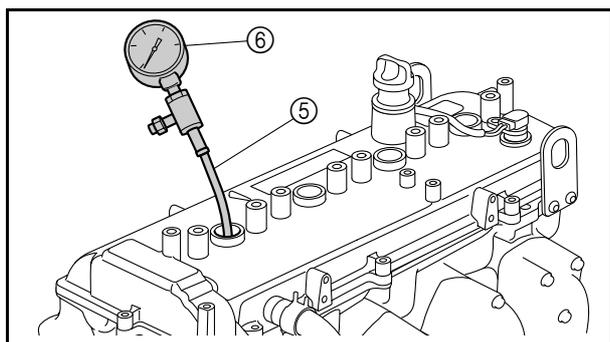
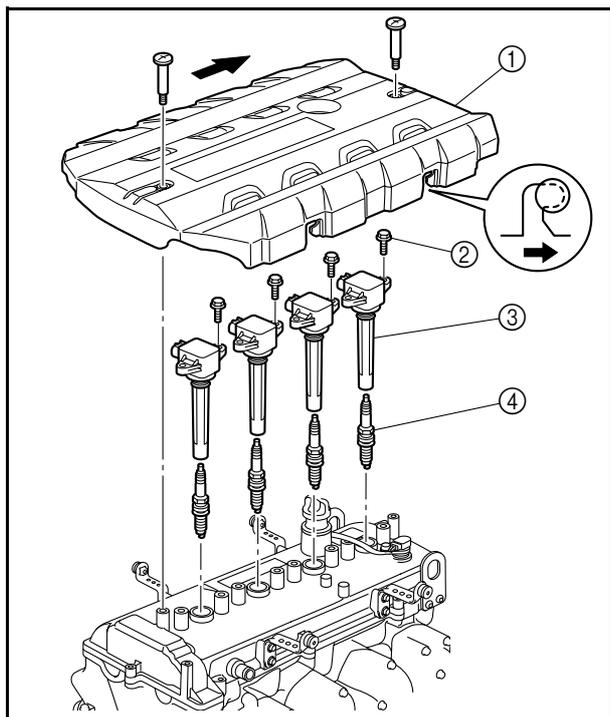
Gauge stand:  
90890-06725  
Dial gauge stand set:  
YB-06585  
Dial gauge:  
YU-03097/90890-01252  
Dial gauge needle:  
90890-06584

3. Position piston #1 at TDC by turning the exhaust camshaft sprocket clockwise with the special service tool.



Camshaft wrench:  
90890-06724

4. Check that the punch marks (c) on the camshafts are aligned with the alignment marks (d) on the camshaft caps.
5. Measure the intake and exhaust valve clearances for cylinder #1 with the thickness gauge ③.
6. Position piston #2 at TDC by turning the exhaust camshaft sprocket an additional 90° clockwise, and then measure the intake and exhaust valve clearances for cylinder #2.
7. Position piston #4 at TDC by turning the exhaust camshaft sprocket an additional 90° clockwise, and then measure the intake and exhaust valve clearances for cylinder #4.
8. Position piston #3 at TDC by turning the exhaust camshaft sprocket an additional 90° clockwise, and then measure the intake and exhaust valve clearances for cylinder #3.



## Compression pressure measurement

### 1. Measure:

- Compression pressure

### NOTE:

Make sure that the battery voltage is more than 12 V.



Compression pressure  
(reference data):  
610 kPa (6.1 kgf/cm<sup>2</sup>, 86.8 psi)

### Measurement steps:

1. Place the watercraft in the water.
2. Start the engine, allow it to warm up for 5 minutes, and then stop the engine.
3. Remove the engine cover ①, bolts ②, ignition coils ③, and spark plugs ④.

### NOTE:

- Slide the engine cover rearward, and then lift the cover to remove it.
- Be careful not to get water or any other foreign substances in the spark plug holes.

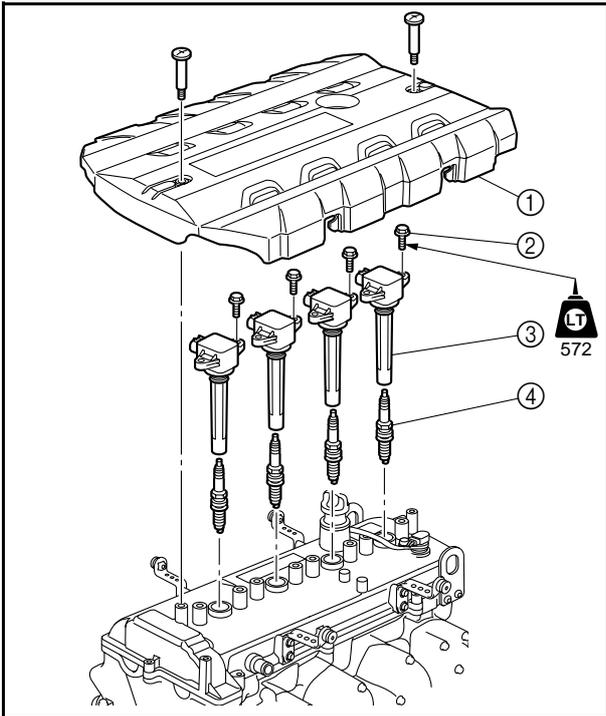
4. Install the special service tools ⑤ and ⑥.



Compression gauge extension ⑤:  
90890-06582  
Compression gauge ⑥:  
YU-33223/90890-03160

5. Crank the engine until the reading on the compression gauge stabilizes.
6. Measure the compression pressure for all cylinders according to steps 4–5.
7. If the compression pressure is below specification, squirt a few drops of engine oil into the cylinder and measure again.

Compression pressure (with engine oil added into the cylinder)	
Reading	Check
Higher than without engine oil	Piston ring, and piston
Same as without engine oil	Valve clearance, valve, valve seat, cylinder head, and cylinder head gasket



8. Install the spark plugs (4), ignition coils (3), bolts (2), and engine cover (1).

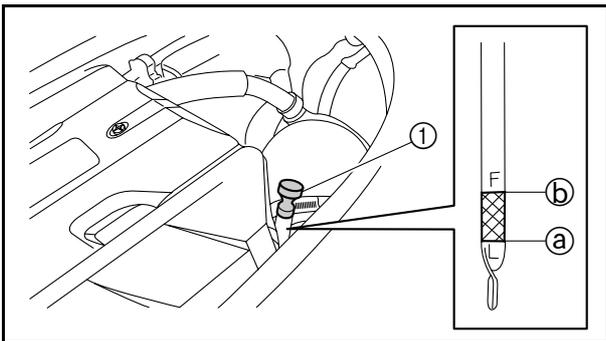


Spark plug:  
25 N·m (2.5 kgf·m, 18.4 ft·lb)

Ignition coil bolt:  
8 N·m (0.8 kgf·m, 5.9 ft·lb)

LOCTITE 572

Engine cover bolt:  
5 N·m (0.5 kgf·m, 3.7 ft·lb)



### Engine oil level check

#### 1. Check:

- Engine oil level  
Below the minimum level mark (a) →  
Add the engine oil.  
Above the maximum level mark (b) →  
Extract the excess engine oil.



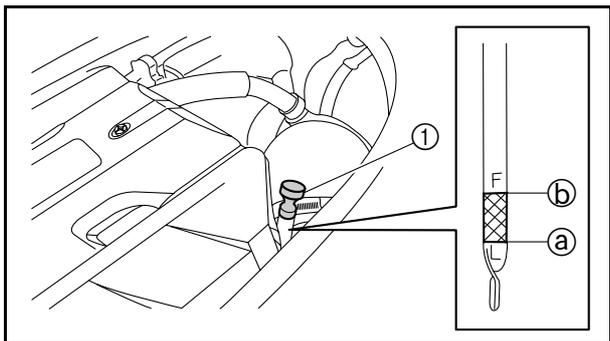
Recommended engine oil:  
API: SE, SF, SG, SH, SJ, or SL  
SAE: 10W-30, 10W-40, 20W-40, or  
20W-50

### Checking steps:

#### CAUTION:

**Make sure that debris or water does not enter the oil filler hole.**

1. Place the watercraft in a precisely level position on land with the engine stopped.



2. Remove the oil level gauge ①, wipe the gauge clean, and then install the gauge into the oil level pipe completely.
3. Remove the oil level gauge ① again to check that the oil level is between the minimum level mark ① and maximum level mark ② on the gauge.
4. Install the oil level gauge.

### Engine oil change

#### **⚠ WARNING**

Be careful when handling the engine oil to avoid burns. The engine oil is hot immediately after the engine is turned off.

#### **CAUTION:**

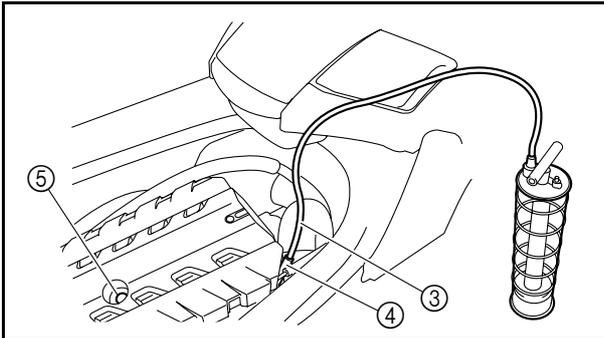
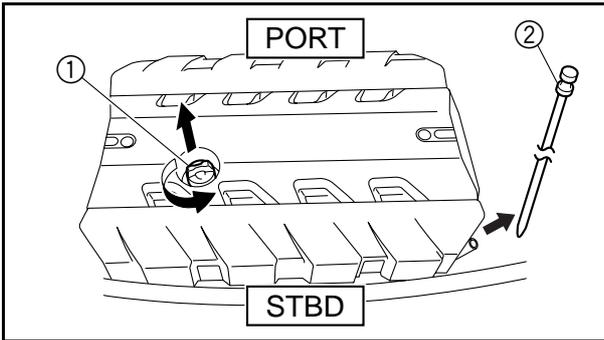
When checking the oil level on land, be sure to connect a garden hose to the watercraft for proper water supply.

#### 1. Change:

- Engine oil

#### Changing steps:

1. Place the watercraft in a precisely level position on land with the engine stopped.
2. Start the engine, allow it to warm up for 5 minutes, and then stop the engine.



3. Remove the oil filler cap ① and oil level gauge ②.
4. Insert the tube ③ of an oil changer into the oil level pipe ④.
5. Operate the oil changer to extract the oil.
6. Fill the crankcase with the specified amount of the recommended engine oil through the oil filler hole ⑤.

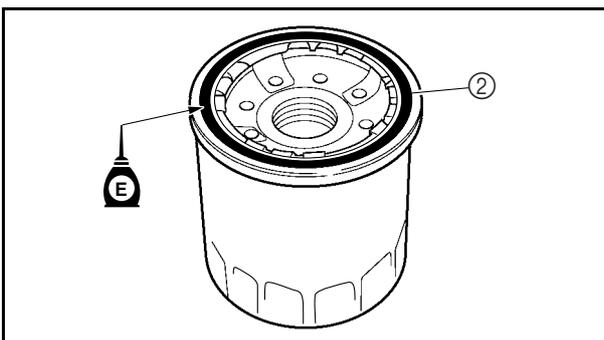
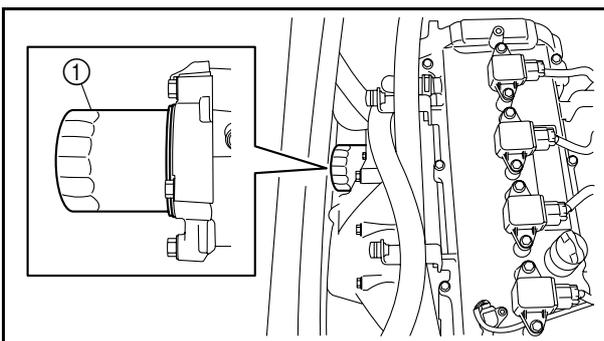


Recommended engine oil:  
 API: SE, SF, SG, SH, SJ, or SL  
 SAE: 10W-30, 10W-40, 20W-40, or 20W-50  
 Engine oil quantity:  
 Total amount:  
 4.3 L (4.55 US qt, 3.78 Imp.qt)  
 Without oil filter replacement:  
 3.0 L (3.17 US qt, 2.64 Imp.qt)  
 With oil filter replacement:  
 3.1 L (3.28 US qt, 2.73 Imp.qt)

7. Install the oil filler cap ① and oil level gauge ②.
8. Check the engine oil level.  
 Refer to "Engine oil level check."

**NOTE:**

When adding engine oil, wait approximately 5 minutes until the engine oil settles.



**Oil filter replacement**

1. Replace:
  - Oil filter

**Replacing steps:**

1. Remove the engine cover.
2. Place a rag under the oil filter ①.
3. Remove the oil filter with the special service tool.



Oil filter wrench:  
 90890-06830

4. Lubricate the O-ring ② of the new oil filter with a thin coat of engine oil.

**CAUTION:**

**Make sure the O-ring ② is positioned correctly in the groove of the oil filter.**



5. Tighten a new oil filter to the specified torque with the special service tool.

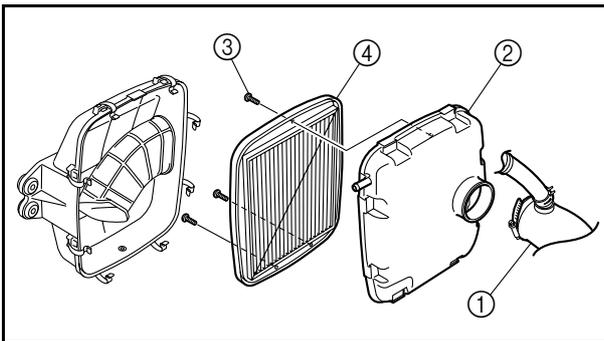
**NOTE:** \_\_\_\_\_

Be sure to clean up any oil spills.



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

6. Install the engine cover.



**Air filter element check**

**1. Remove:**

- Intake pipe ①
- Air filter case cover ②
- Screws ③
- Air filter element ④

**2. Check:**

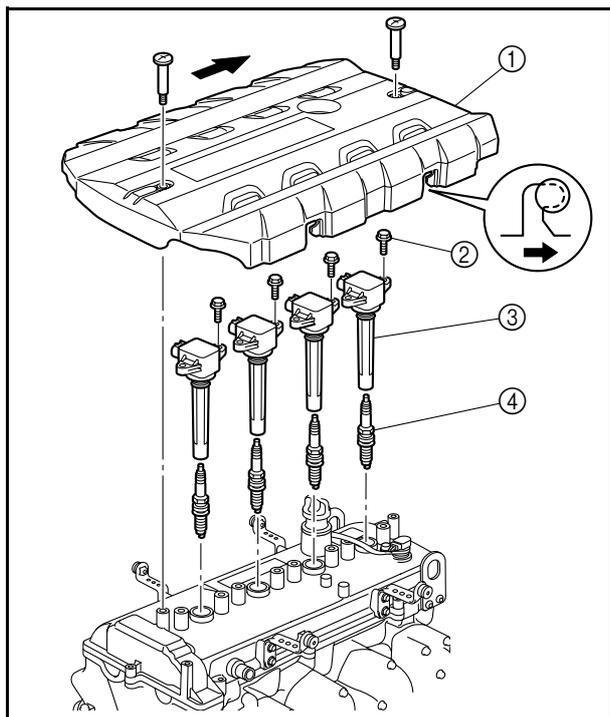
- Air filter element  
Damage/dirt → Replace the air filter element.

**3. Install:**

- Air filter element
- Screws
- Air filter case cover
- Intake pipe

**NOTE:** \_\_\_\_\_

- Make sure that the screws are installed securely.
- Make sure that the air filter case cover is installed in the filter case properly.



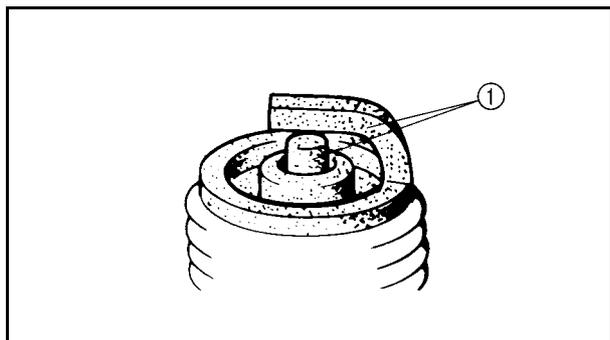
## Spark plug check

### 1. Remove:

- Engine cover ①
- Ignition coil bolts ②
- Ignition coils ③
- Spark plugs ④

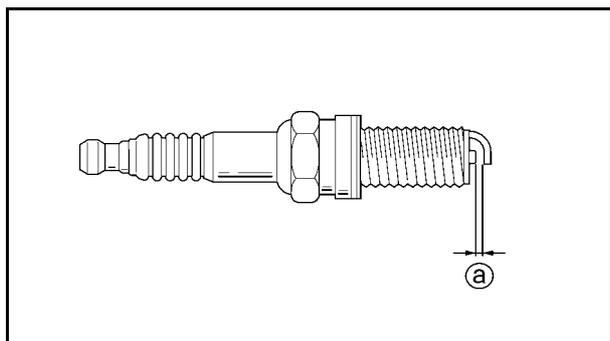
### NOTE:

- Slide the engine cover rearward, and then lift the cover to remove it.
- Be careful not to get water or any other foreign substances in the spark plug holes.



### 2. Check:

- Electrodes ①
- Spark plug  
Carbon deposits → Clean the spark plug.  
Damage/wear → Replace the spark plug.

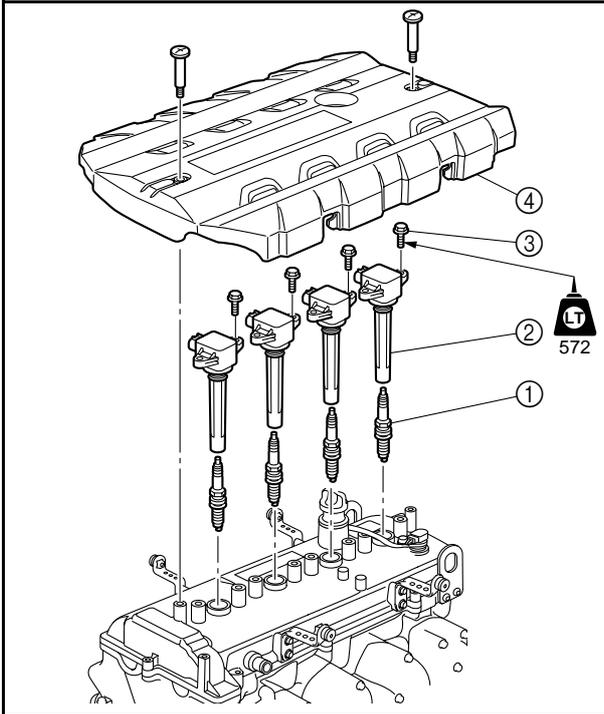


### 3. Measure:

- Spark plug gap ②  
Out of specification → Replace the spark plug.



Specified spark plug (manufacturer):  
LFR6A (NGK)  
Spark plug gap ②:  
0.8–0.9 mm (0.031–0.035 in)



**4. Install:**

- Spark plugs ①

**NOTE:**

Before installing a spark plug, clean the gasket surface and spark plug surface.



Spark plug:  
25 N·m (2.5 kgf·m, 18.4 ft·lb)

**5. Install:**

- Ignition coils ②
- Ignition coil bolts ③
- Engine cover ④



Ignition coil bolt ③:  
8 N·m (0.8 kgf·m, 5.9 ft·lb)  
LOCTITE 572  
Engine cover bolt:  
5 N·m (0.5 kgf·m, 3.7 ft·lb)



## Electrical

### Battery check

**⚠ WARNING**

Battery electrolyte is poisonous and dangerous, causing severe burns, etc. Electrolyte contains sulfuric acid. Avoid contact with skin, eyes or clothing.

**Antidotes**

**External:** Flush with water.

**Internal:** Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately.

**Eyes:** Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc., well away. If using or charging the battery in an enclosed space, make sure that it is well ventilated. Always shield your eyes when working near batteries.

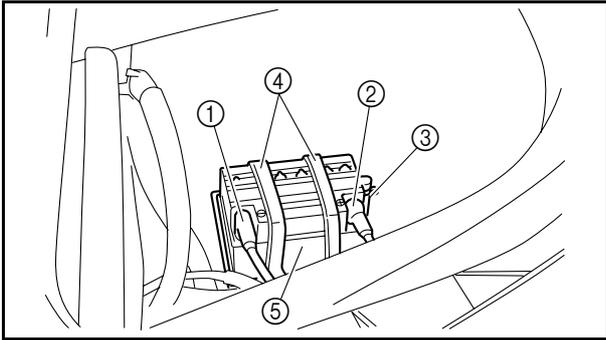
**KEEP OUT OF THE REACH OF CHILDREN.**

**CAUTION:**

Be careful not to place the battery on its side.

Make sure to remove the battery from the battery compartment when adding battery electrolyte or charging the battery.

When checking the battery, make sure the breather hose is connected to the battery and not obstructed.



**1. Remove:**

- Negative battery cable ①
- Positive battery cable ②
- Battery breather hose ③
- Bands ④
- Battery ⑤

**CAUTION:**

**When removing the battery, disconnect the negative battery cable first.**

**2. Check:**

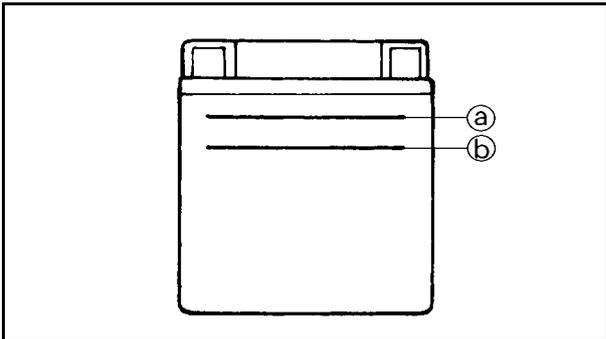
- Electrolyte level  
Low → Add distilled water.

**Adding steps:**

1. Remove each filler cap.
2. Add distilled water.
3. When the electrolyte level reaches the upper level mark (a), allow the cell to stand for 20 minutes. If the electrolyte level drops, add more distilled water so the level reaches the upper level mark.

**NOTE:**

- The electrolyte level should be between the upper (a) and lower (b) level marks.
- Use only distilled water.

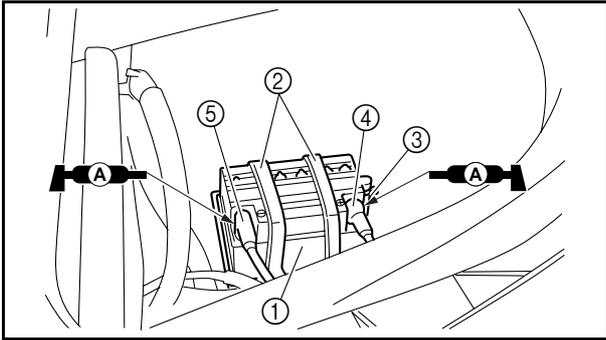


**3. Check:**

- Specific gravity  
Out of specification → Charge the battery.



Specific gravity at 20 °C (68 °F):  
1.265



**4. Install:**

- Battery ①
- Bands ②
- Battery breather hose ③
- Positive battery cable ④
- Negative battery cable ⑤

**CAUTION:**

Connect the positive battery cable ④ to the battery terminal first.

**NOTE:**

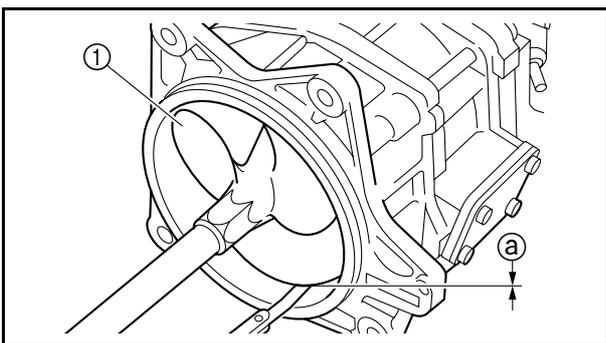
- Make sure that the battery breather hose ③ is properly connected and is not obstructed.
- Coat the terminals with water resistant grease to minimize terminal corrosion.

**Jet pump unit**

**Jet pump unit check**

**⚠ WARNING**

Be sure to remove the battery before checking the jet pump unit.



**1. Check:**

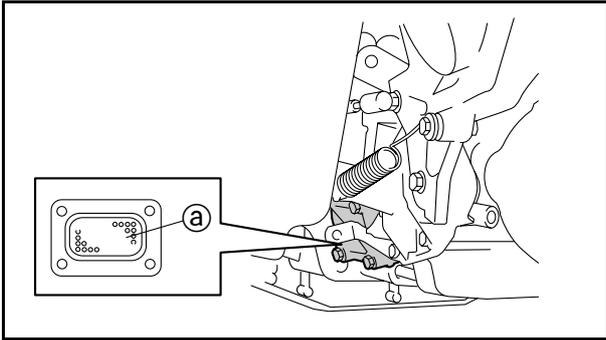
- Impeller ①  
Damage → Replace the impeller.

**2. Measure:**

- Impeller-to-housing clearance ②  
Out of specification → Measure the impeller housing inside diameter. Refer to “Impeller duct and impeller housing removal” in Chapter 6.



Impeller-to-housing clearance ②:  
0.35–0.45 mm (0.014–0.018 in)



**3. Check:**

- Water inlet strainer (a)  
Contaminants → Clean the water inlet strainer.  
Cracks/damage → Replace the water inlet strainer.

**Bilge pump**

**Bilge strainer check**

**1. Remove:**

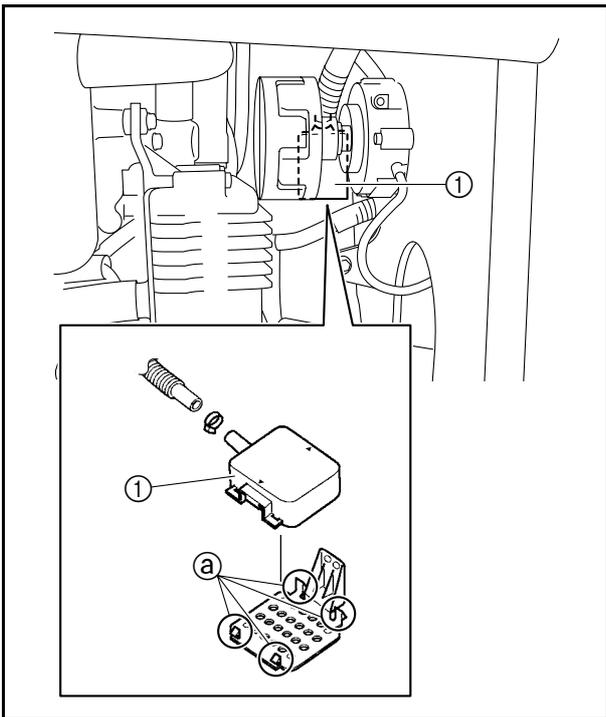
- Deck beam  
Refer to “Seat and hand grip removal” in Chapter 8.
- Electrical box
- Coupling cover  
Refer to “Engine unit removal 3” in Chapter 5.

**2. Remove:**

- Bilge strainer case (1)

**NOTE:**

Remove the bilge strainer case (1) by pushing the hooks (a) on the bilge strainer inward.

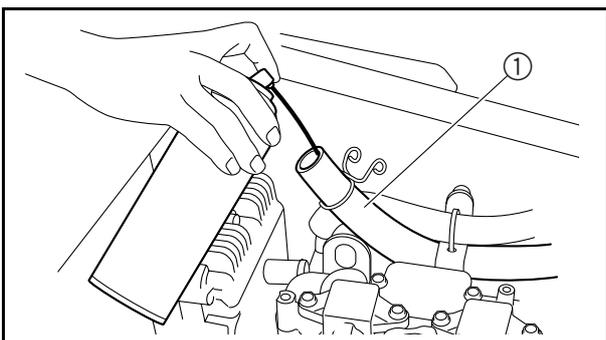
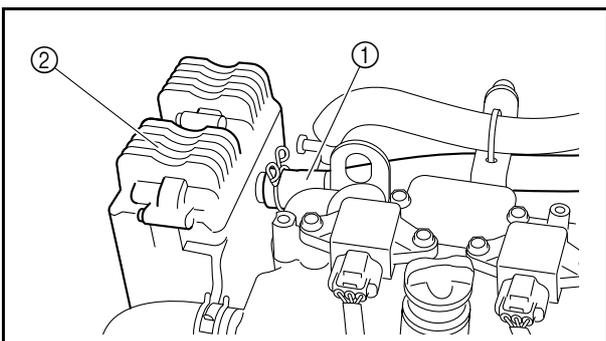
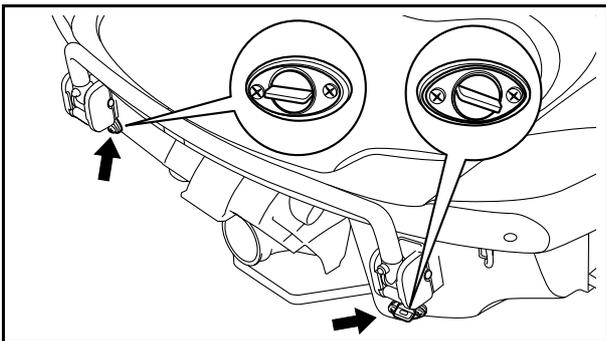
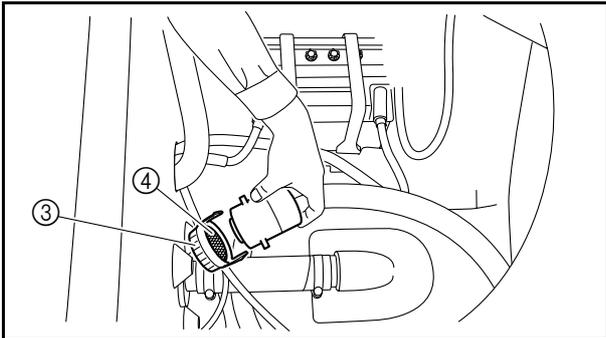
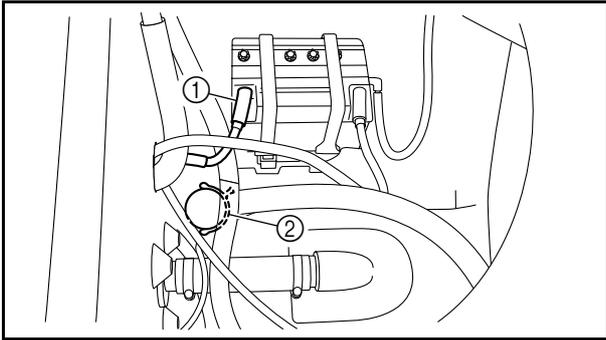


**3. Check:**

- Bilge strainer  
Contaminants → Clean the bilge strainer.  
Cracks/damage → Replace the bilge strainer.

**4. Install:**

- Bilge strainer case
- Coupling cover
- Electrical box
- Deck beam



### Electric bilge pump strainer check

#### 1. Remove:

- Negative battery cable ①
- Band ②
- Electric bilge pump cap ③
- Electric bilge pump strainer ④

#### 2. Check:

- Electric bilge pump strainer  
Contaminants → Clean the cap and strainer.

#### 3. Install:

- Electric bilge pump strainer
- Electric bilge pump cap
- Band
- Negative battery cable

### General

#### Drain plug check

##### 1. Check:

- Drain plugs
- O-rings  
Cracks/damage → Replace the O-ring.

#### Throttle valve and engine internal components

##### 1. Lubricate:

- Throttle valve
- Engine internal components

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#### Lubricating steps:

1. Remove the engine cover.
2. Disconnect the breather hose ① from the breather assembly ② side.
3. Start the engine, and then spray a rust inhibitor through the breather hose ① for about 5 seconds while the engine is running.



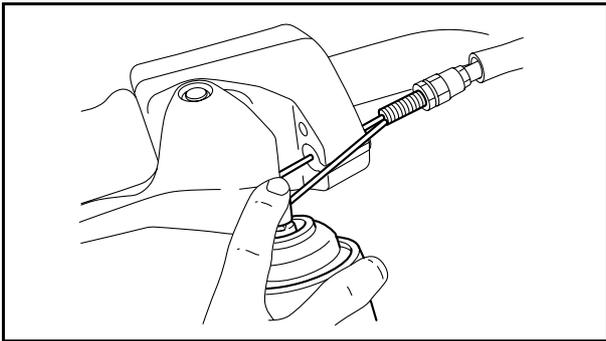
**CAUTION:** \_\_\_\_\_

Be sure to supply sufficient water and water pressure to the cooling water passages when lubricating the engine internal components on land, otherwise the engine could overheat.

**NOTE:** \_\_\_\_\_

While spraying the rust inhibitor into the breather hose, the engine speed will drop.

4. Connect the breather hose.
5. Install the engine cover.



**Lubrication points**

**1. Lubricate:**

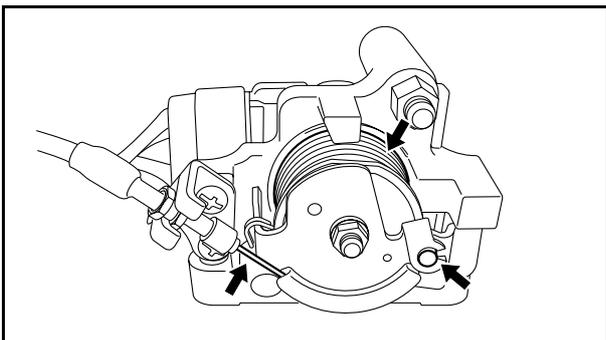
- Throttle cable (handlebar end)

**NOTE:** \_\_\_\_\_

- Before lubricating the throttle cable, disconnect it from the throttle lever assembly.
- After lubricating the throttle cable, be sure to adjust the throttle lever free play. Refer to "Throttle lever free play check and adjustment."



Recommended lubricant:  
Rust inhibitor

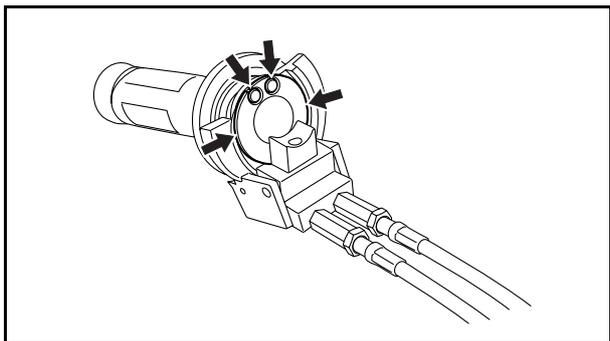


**2. Lubricate:**

- Throttle cable (APS end)
- Return spring



Recommended lubricant:  
Yamaha grease A

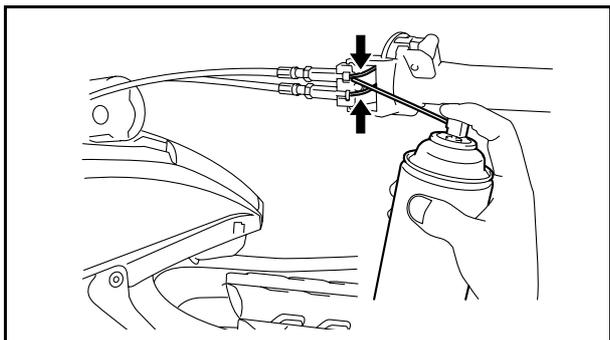


**3. Lubricate:**

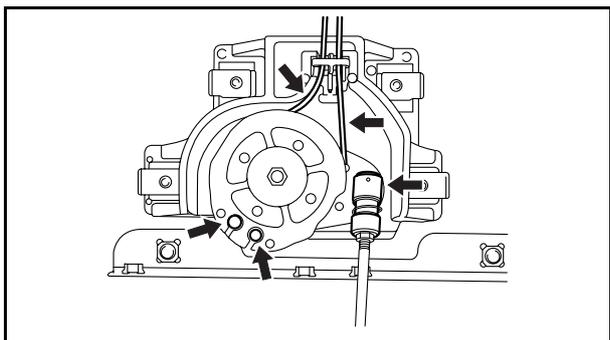
- QSTS cables (handlebar end)

**NOTE:**

- Before lubricating the QSTS cables, remove the QSTS grip assembly from the handlebar. Refer to "Handlebar assembly removal" in Chapter 8.
- Spray the rust inhibitor into the outer cables, and apply grease to the inner cables.



Recommended lubricant:  
Yamaha grease A  
Rust inhibitor

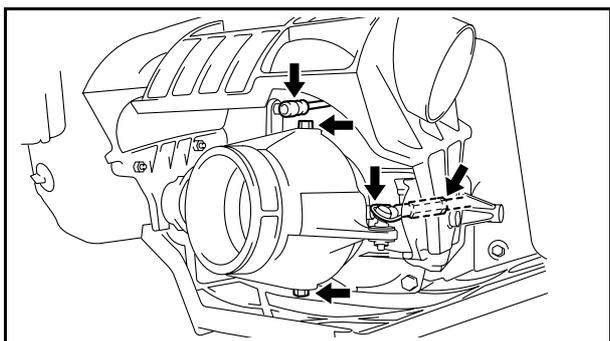


**4. Lubricate:**

- QSTS cables (pulley end)
- QSTS rod joint (pulley end)



Recommended lubricant:  
Yamaha grease A

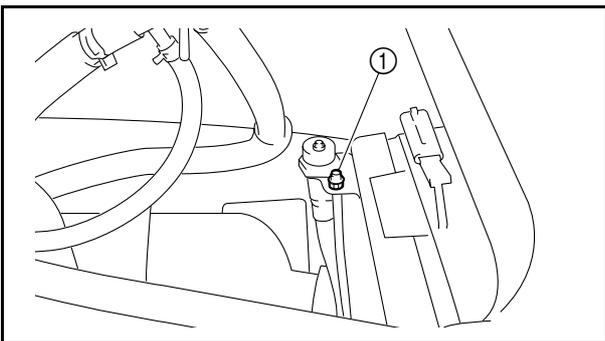
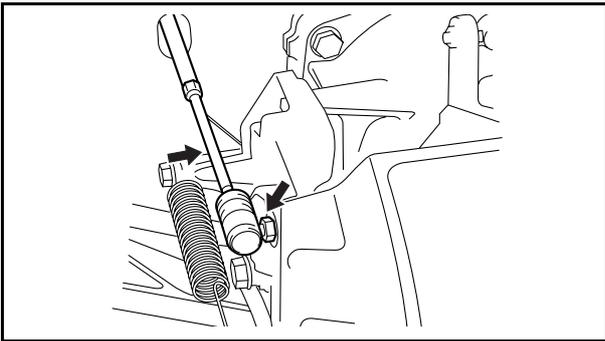
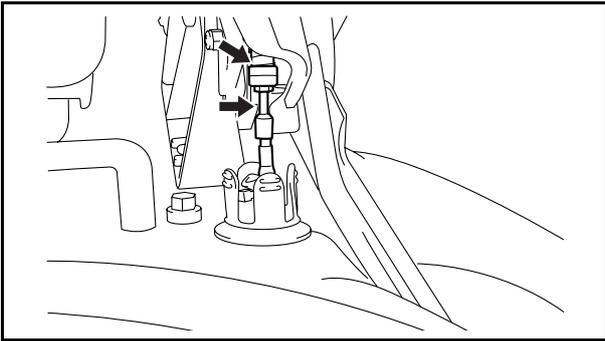
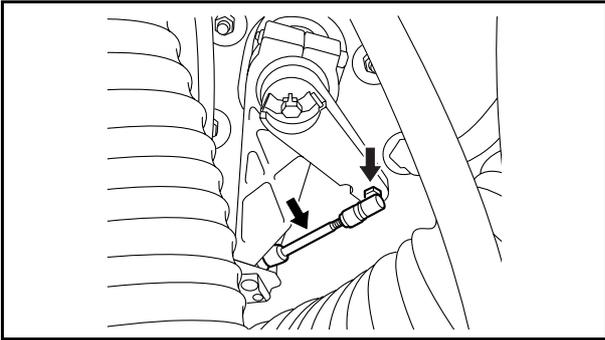


**5. Lubricate:**

- Nozzle pivot shaft
- Steering cable (nozzle end)
- Steering cable end (nozzle end)
- QSTS rod joint (nozzle end)



Recommended lubricant:  
Yamaha grease A



**6. Lubricate:**

- Steering cable (steering master end)
- Steering cable joint (steering master end)
- Shift cable
- Shift cable joint

**NOTE:**

Disconnect the joints and apply a small amount of grease.



Recommended lubricant:  
Yamaha grease A

**7. Lubricate:**

- Intermediate housing  
(through the grease nipple ①)



Recommended lubricant:  
Yamaha grease A

Grease quantity:

Initial 10 hours:

33.0–35.0 cm<sup>3</sup>

(1.12–1.18 US oz,

1.16–1.23 Imp.oz)

Every 100 hours or 12 months:

6.0–8.0 cm<sup>3</sup>

(0.20–0.27 US oz,

0.21–0.28 Imp.oz)

CHK  
ADJ



General

E

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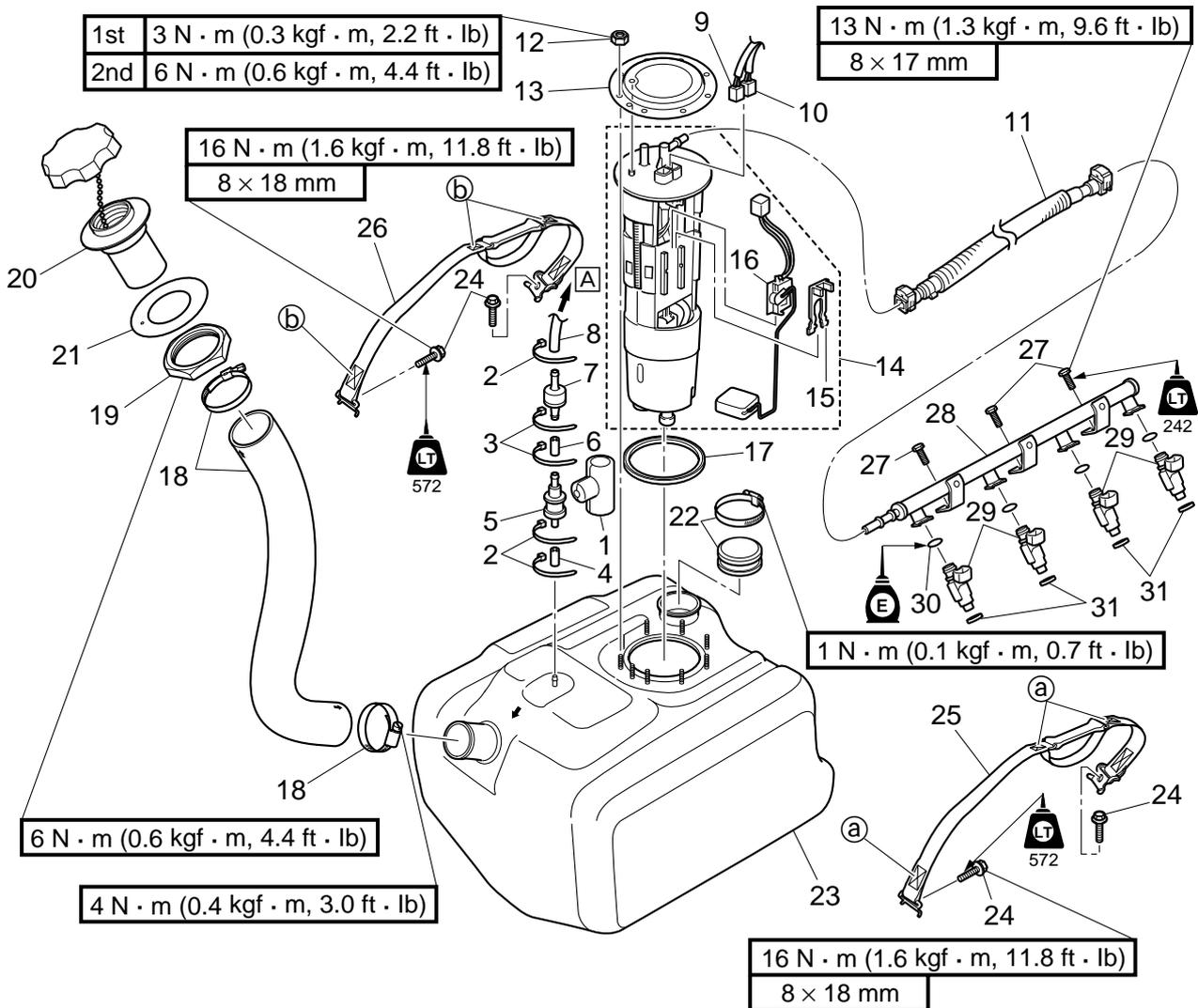
— MEMO —

## Chapter 4 Fuel system

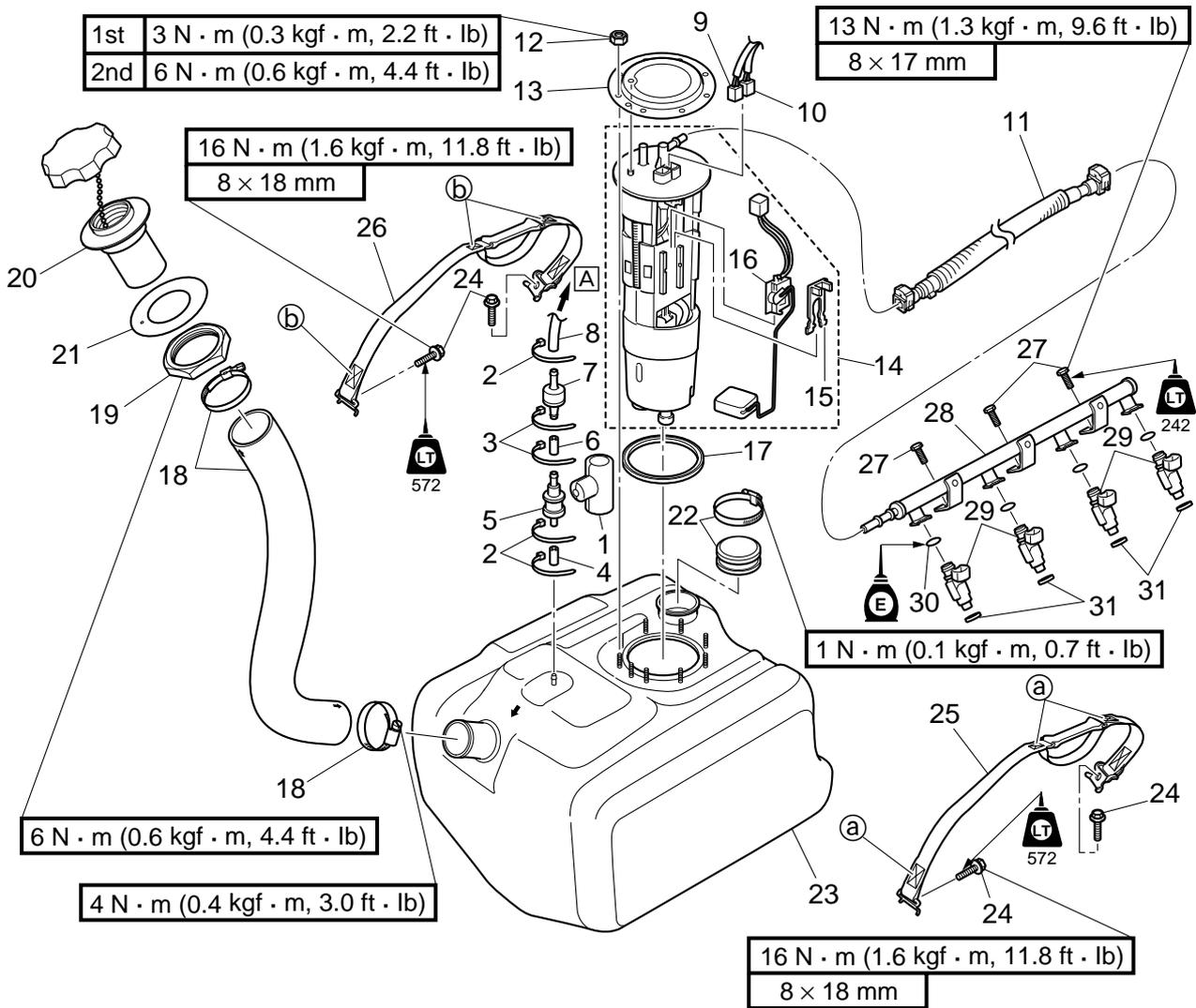
<b>Fuel tank, fuel pump module, and fuel hose .....</b>	<b>4-1</b>
Fuel tank removal .....	4-1
Fuel hose disconnection .....	4-5
Fuel pump module removal .....	4-5
Fuel sender removal .....	4-6
Rollover valve check .....	4-7
Check valve check .....	4-7
Fuel line check .....	4-8
Fuel pump module check .....	4-8
Fuel filler neck and hose check .....	4-8
Fuel tank check .....	4-8
Fuel injector check .....	4-9
Fuel injector installation .....	4-9
Fuel sender installation .....	4-9
Fuel pump module installation .....	4-10
Fuel hose connection .....	4-10
Fuel pressure measurement .....	4-11



Fuel tank, fuel pump module, and fuel hose  
 Fuel tank removal

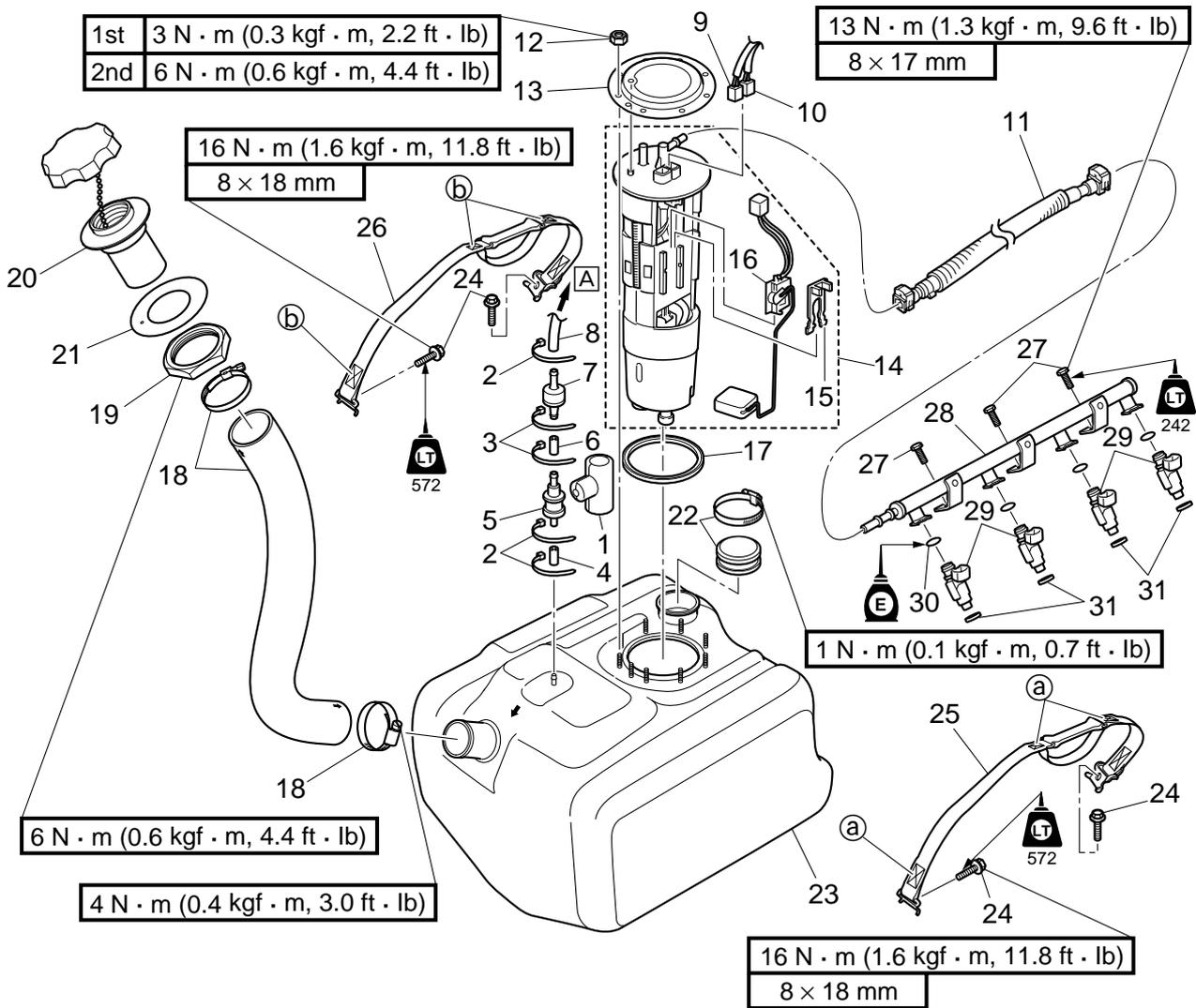


Step	Procedure/Part name	Q'ty	Service points
	Engine unit		Refer to "Engine unit" in Chapter 5. <b>NOTE:</b> _____ When removing the fuel pump module assembly only, it is not necessary to remove the engine unit.
	Ventilation hose		Refer to "Hose removal" in Chapter 8.
1	Cover	1	
2	Band	3	<b>Not reusable</b>
3	Band	2	<b>Not reusable</b>
4	Fuel tank breather hose	1	
5	Rollover valve	1	
6	Fuel tank breather hose	1	

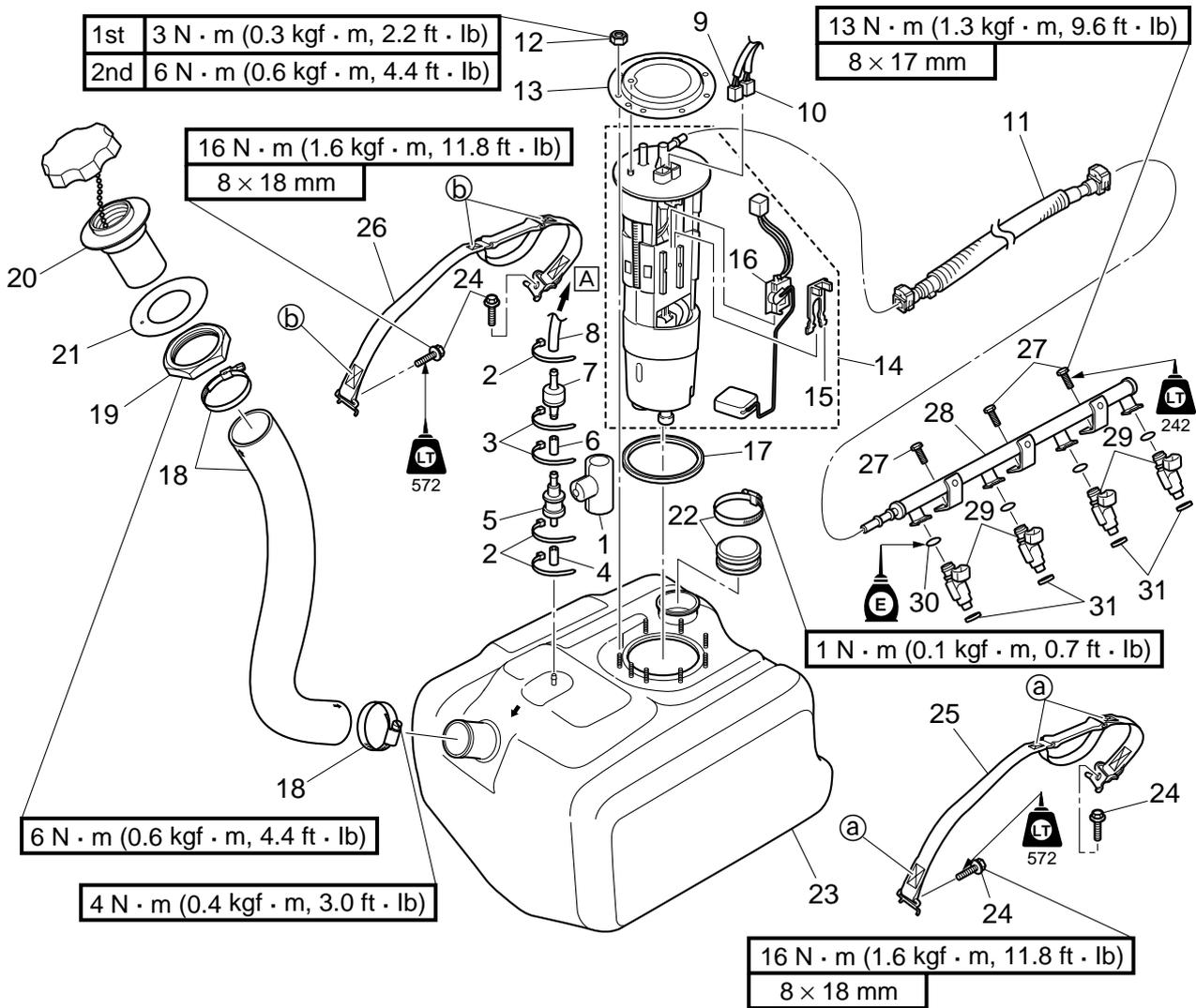


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Step	Procedure/Part name	Q'ty	Service points
7	Check valve	1	
8	Fuel tank breather hose	1	Ⓐ To water separator
9	Fuel sender coupler	1	
10	Fuel pump module coupler	1	
11	Fuel hose assembly	1	<b>CAUTION:</b> _____ Do not remove the quick connectors from the fuel hose assembly.
12	Nut	9	
13	Retainer	1	

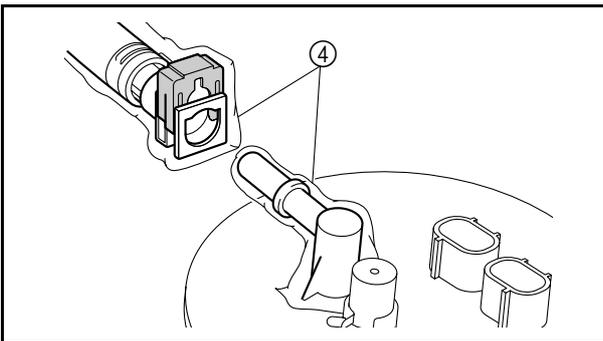
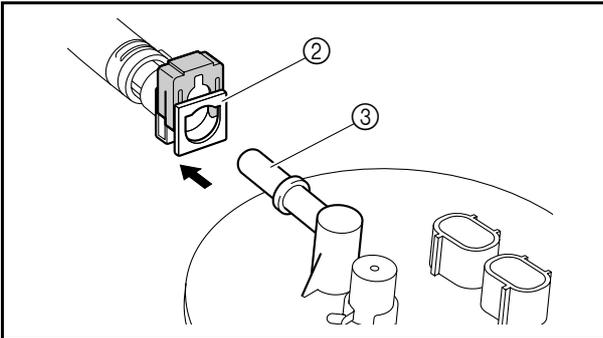
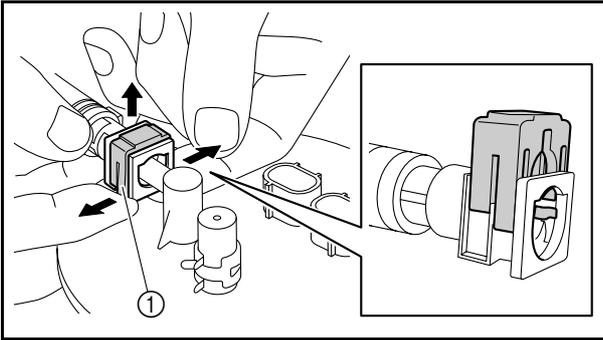


Step	Procedure/Part name	Q'ty	Service points
14	Fuel pump module assembly	1	
15	Stopper	1	
16	Fuel sender	1	
17	Packing	1	<b>Not reusable</b>
18	Clamp/fuel filler hose	2/1	
19	Nut	1	
20	Fuel filler neck	1	
21	Rubber seal	1	<b>Not reusable</b>
22	Clamp/cap	1/1	



4

Step	Procedure/Part name	Q'ty	Service points
23	Fuel tank	1	
24	Bolt	4	
25	Strap	1	Ⓐ Pink thread
26	Strap	1	Ⓑ Brown thread
27	Bolt	3	
28	Fuel rail	1	
29	Fuel injector	4	
30	O-ring	4	<b>Not reusable</b>
31	Seal	4	<b>Not reusable</b>
Reverse the removal steps for installation.			



### Fuel hose disconnection

**⚠ WARNING**

- Before checking the fuel system, remove the battery and then remove the fuel tank filler cap to reduce any pressure inside the fuel tank.
- Always reduce the fuel pressure in the fuel line before servicing the line or the fuel pipe. If the fuel pressure is not released, pressurized fuel could spray out.

**1. Disconnect:**

- Quick connector

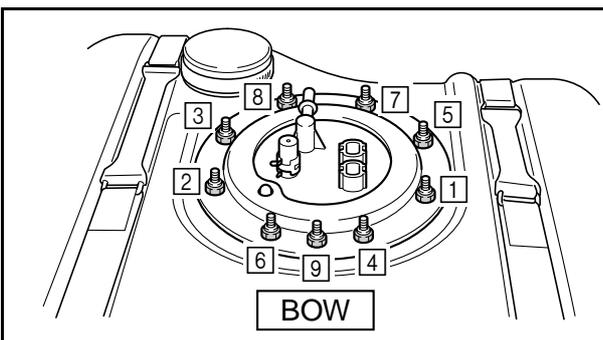
**Disconnecting steps:**

1. Wrap the quick connector with a cloth.
2. Spread apart the ends of the locking slider (red plastic) ① with your fingers as shown, and then pull up on the slider.

**NOTE:**

If the quick connector is removed suddenly, pressurized fuel could spray out. To gradually release the fuel pressure, be sure to remove the quick connector slowly.

3. Disconnect the quick connector ② from the fuel pipe ③ directly.
4. Cover the quick connector and fuel pipe with a plastic bag ④ to protect them from dirt.



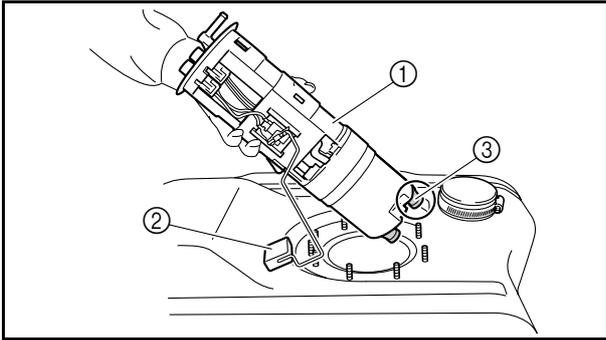
### Fuel pump module removal

**1. Remove:**

- Nuts
- Retainer

**NOTE:**

Loosen the nuts in the sequence shown.

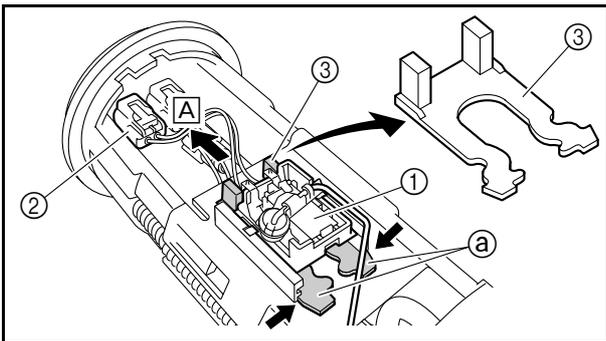


**2. Remove:**

- Fuel pump module assembly ①

**NOTE:**

- Remove the fuel pump module assembly ① at an angle so that the float ② does not catch on the fuel tank.
- Be careful that the rubber cap ③ does not come off when removing the fuel pump module assembly ①.



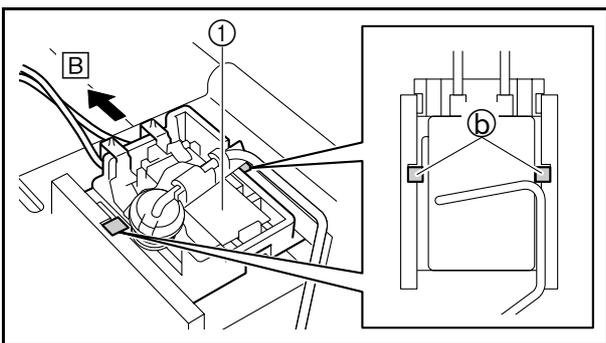
**Fuel sender removal**

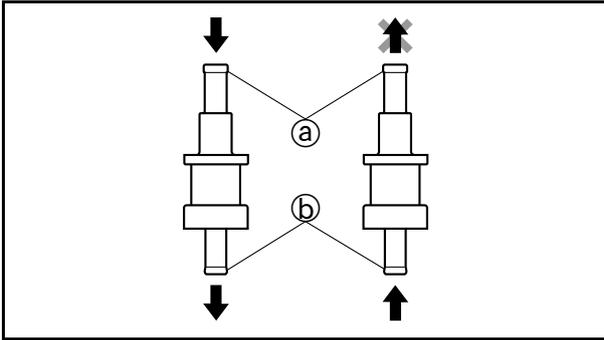
**1. Remove:**

- Fuel sender ①

**Removal steps:**

1. Disconnect the fuel sender coupler ②.
2. Squeeze the hooks ④ on the retaining clip ③, and then slide the clip in direction A to remove it.
3. Push the tabs ⑥ on the fuel sender ①, and then slide the sender in direction B to remove it.





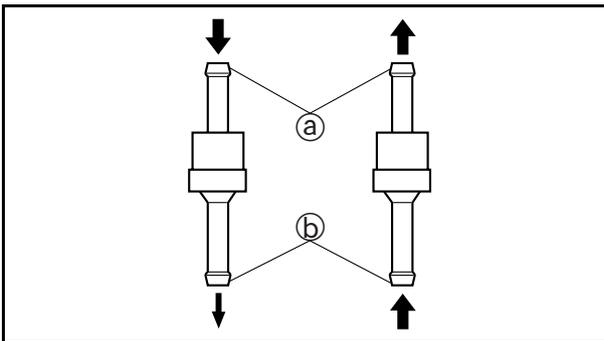
### Rollover valve check

#### 1. Check:

- Rollover valve  
Does not function properly → Replace the rollover valve.

#### Checking steps:

1. Blow into the end ① of the rollover valve, and make sure that airflow from the end ② is unrestricted.
2. Blow into the end ② of the rollover valve, and make sure that air does not come out from the end ①.



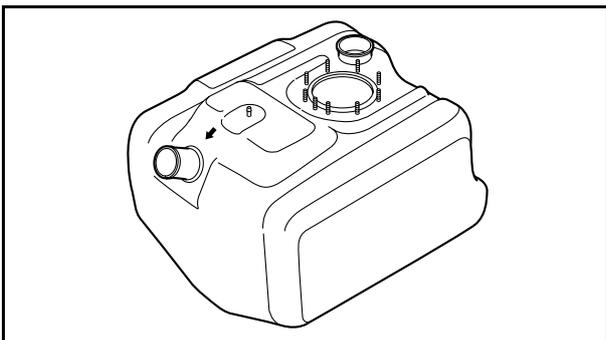
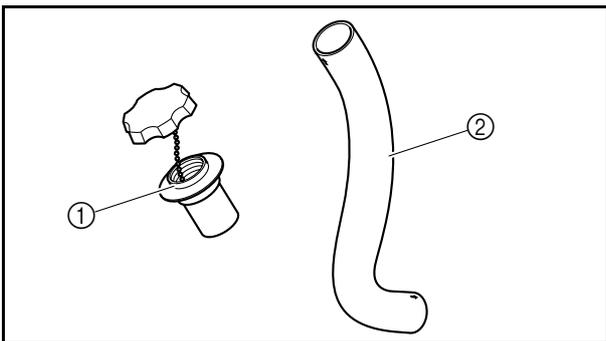
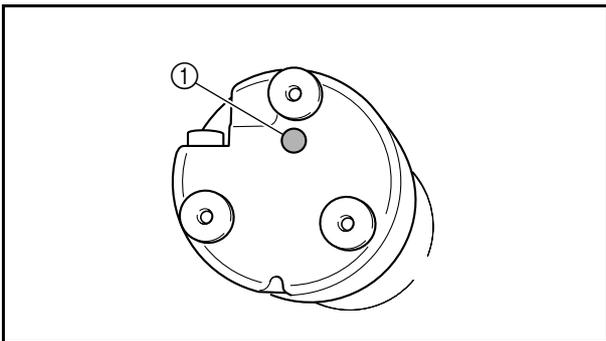
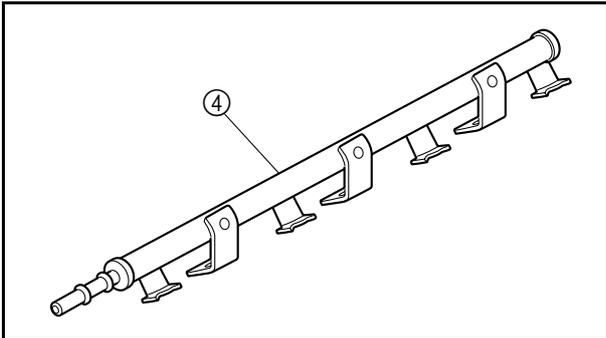
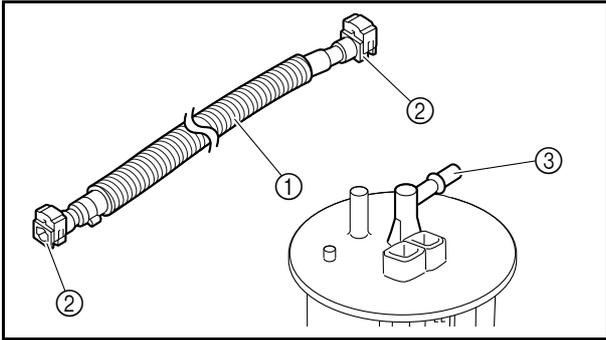
### Check valve check

#### 1. Check:

- Check valve  
Does not function properly → Replace the check valve.

#### Checking steps:

1. Blow into the end ① of the check valve, and make sure that airflow from the end ② is restricted.
2. Blow into the end ② of the check valve, and make sure that airflow from the end ① is unrestricted.



**Fuel line check**

**1. Check:**

- Fuel hose ①
- Quick connectors ②  
Cracks/damage → Replace the fuel hose assembly.

**CAUTION:** \_\_\_\_\_

**Do not remove the quick connectors from the fuel hose assembly.**

- Fuel pipe ③ (fuel pump module end)  
Cracks/damage → Replace the fuel pump module assembly.
- Fuel rail ④  
Cracks/damage → Replace the fuel rail.

**Fuel pump module check**

**1. Check:**

- Fuel pump filter ①  
Clog/contaminants → Clean the fuel pump filter with kerosene or gasoline.

**CAUTION:** \_\_\_\_\_

**Do not disassemble the fuel pump module.**

**Fuel filler neck and hose check**

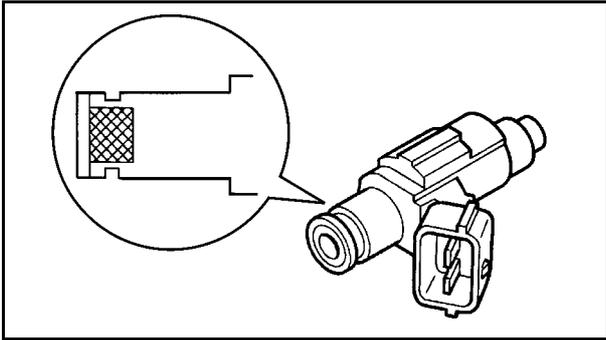
**1. Check:**

- Fuel filler neck ①  
Cracks/damage → Replace the fuel filler neck.
- Fuel filler hose ②  
Cracks/damage → Replace the fuel filler hose.

**Fuel tank check**

**1. Check:**

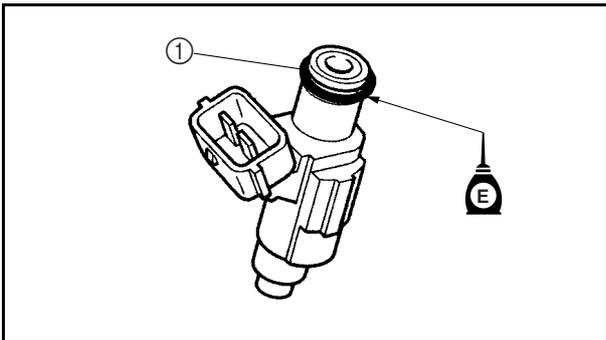
- Fuel tank  
Cracks/damage → Replace the fuel tank.



**Fuel injector check**

**1. Check:**

- Fuel injector  
Dirt/residue → Clean the fuel injector.  
Damage → Replace the fuel injector.



**Fuel injector installation**

**1. Install:**

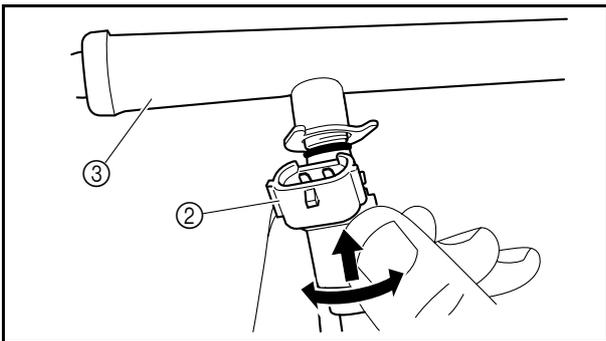
- Fuel injector

**Installation steps:**

1. Apply a thin coat of engine oil to the O-ring ①.
2. While turning the fuel injector ② slowly to the left and right, install it to the fuel rail ③.

**CAUTION:**

Be sure to apply a thin coat of engine oil to the O-ring before installing the fuel injector to the fuel rail, otherwise the O-ring could twist and break, causing fuel leakage.



**Fuel sender installation**

**1. Install:**

- Fuel sender ①

**Installation steps:**

1. Install the fuel sender ①.

**NOTE:**

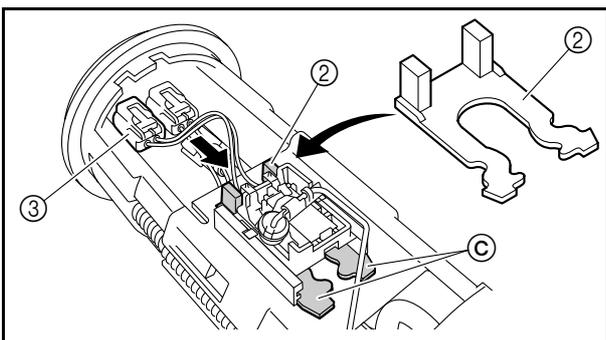
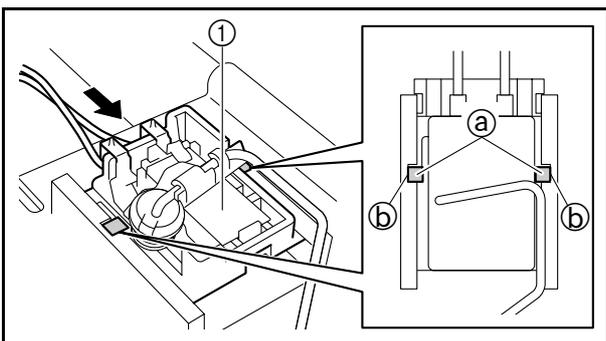
Make sure that the tabs ① on the fuel sender ① are securely seated into the slots ② in the fuel pump module.

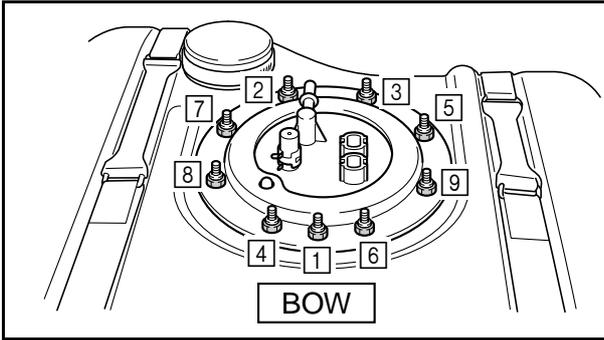
2. Install the retaining clip ②.

**NOTE:**

Make sure that the hooks ③ on the retaining clip ② are securely hooked onto the fuel pump module.

3. Connect the fuel sender coupler ③.





**Fuel pump module installation**

**1. Install:**

- Fuel pump module assembly

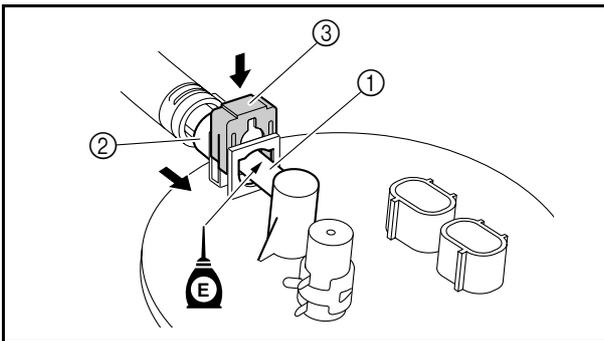
**NOTE:**

Tighten the nuts to the specified torques in the sequence shown.



**Fuel pump module nut:**

- 1st:  
3 N·m (0.3 kgf·m, 2.2 ft·lb)
- 2nd:  
6 N·m (0.6 kgf·m, 4.4 ft·lb)



**Fuel hose connection**

**1. Connect:**

- Quick connector

**Connecting steps:**

1. Apply a thin coat of engine oil to the contact surfaces of the fuel pipe ①.
2. Connect the quick connector ② onto the fuel pipe ①.
3. Push down on the locking slider ③ until it clicks.

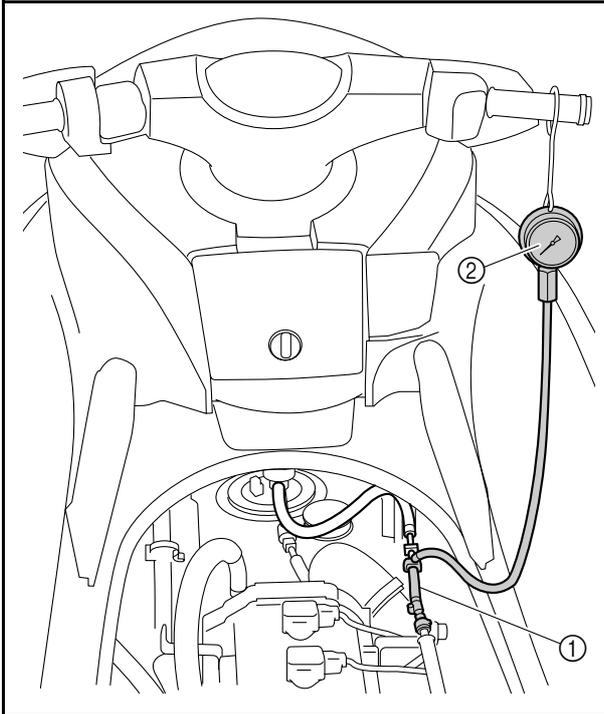
**NOTE:**

If the fuel hose quick connector ② is not installed completely onto the fuel pipe ①, the locking slider ③ cannot be pushed down.

4. Confirm that the fuel hose quick connector is correctly installed by making sure there is a small amount of free play when the quick connector is pulled and pushed.

**NOTE:**

If there is no free play in the fuel hose quick connector, disconnect the fuel hose and check the O-ring for damage and proper installation.



## Fuel pressure measurement

### 1. Measure:

- Fuel pressure  
Out of specification → Replace the fuel pump module assembly.

### Measurement steps:

- Disconnect the quick connector from the fuel rail.
- Install the special service tools ① and ② as shown.



Fuel pressure gauge adapter ①:  
YW-06842/90890-06842

Fuel pressure gauge ②:  
YB-06766/90890-06786

- Start the engine and allow it to warm up for 5 minutes.
- Measure the fuel pressure.

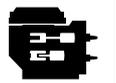


Fuel pressure:  
345–370 kPa  
(3.45–3.70 kgf/cm<sup>2</sup>, 49.1–52.6 psi)

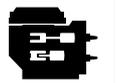


## Chapter 5 Power unit

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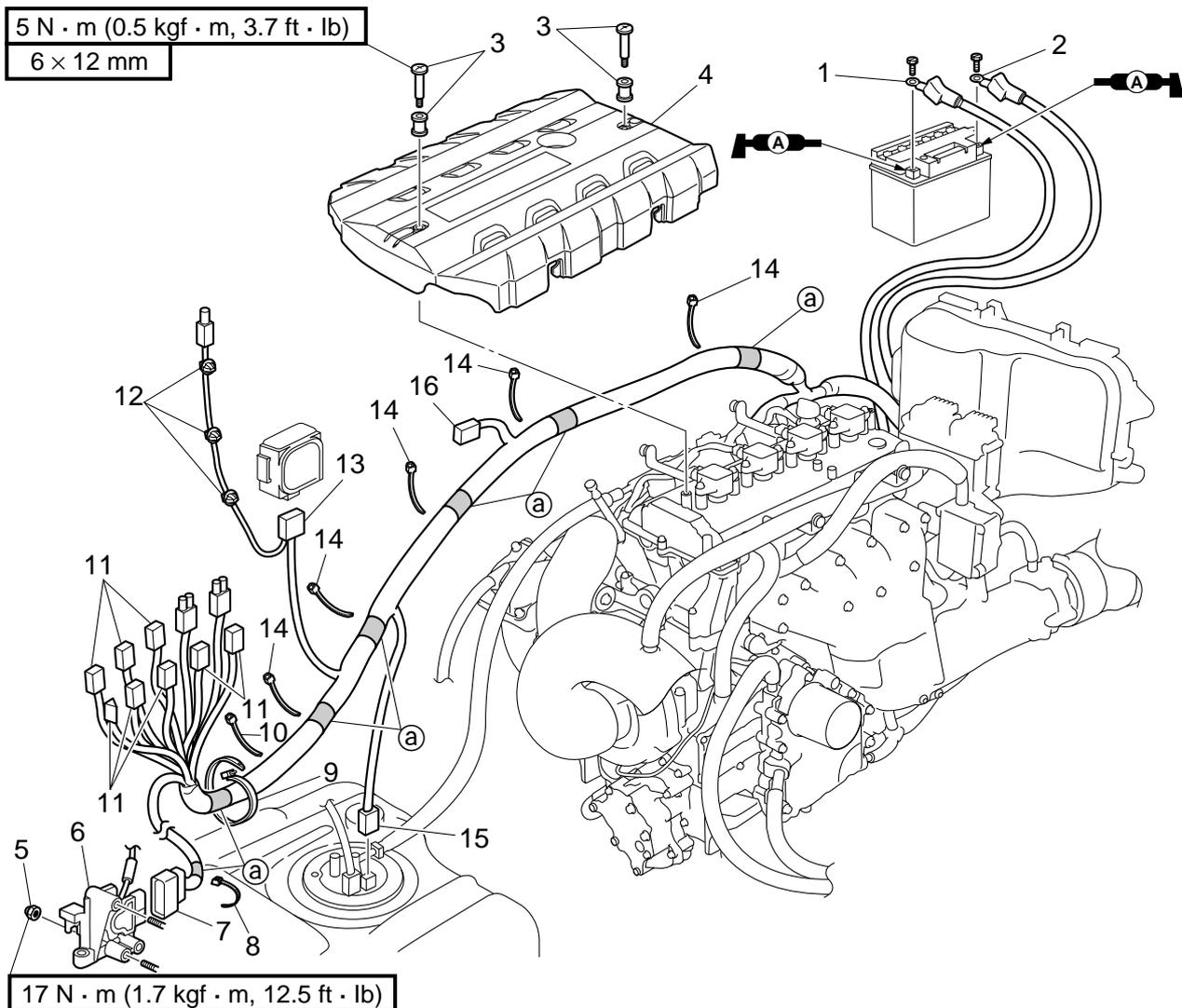


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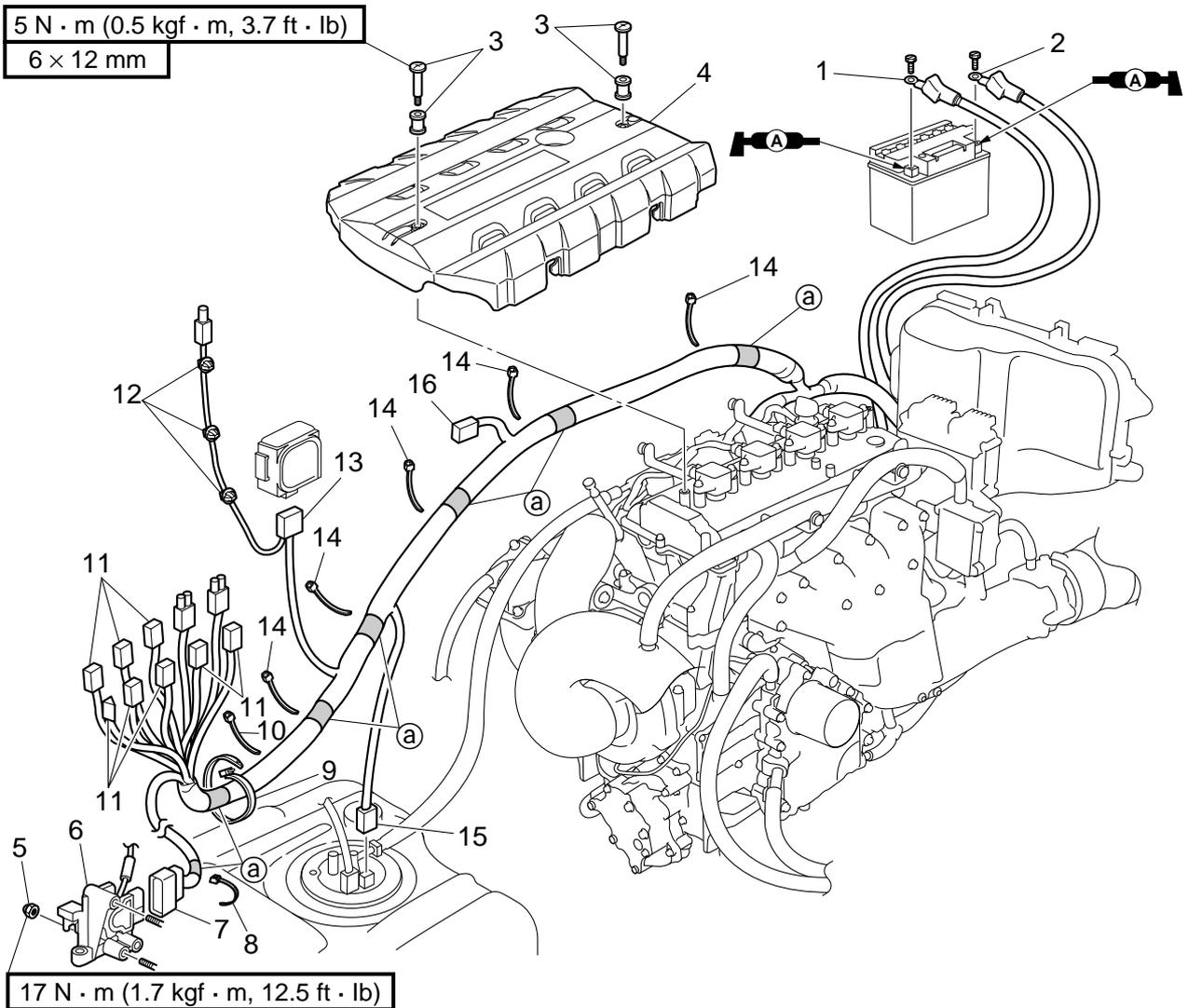


# Engine unit

## Engine unit removal 1

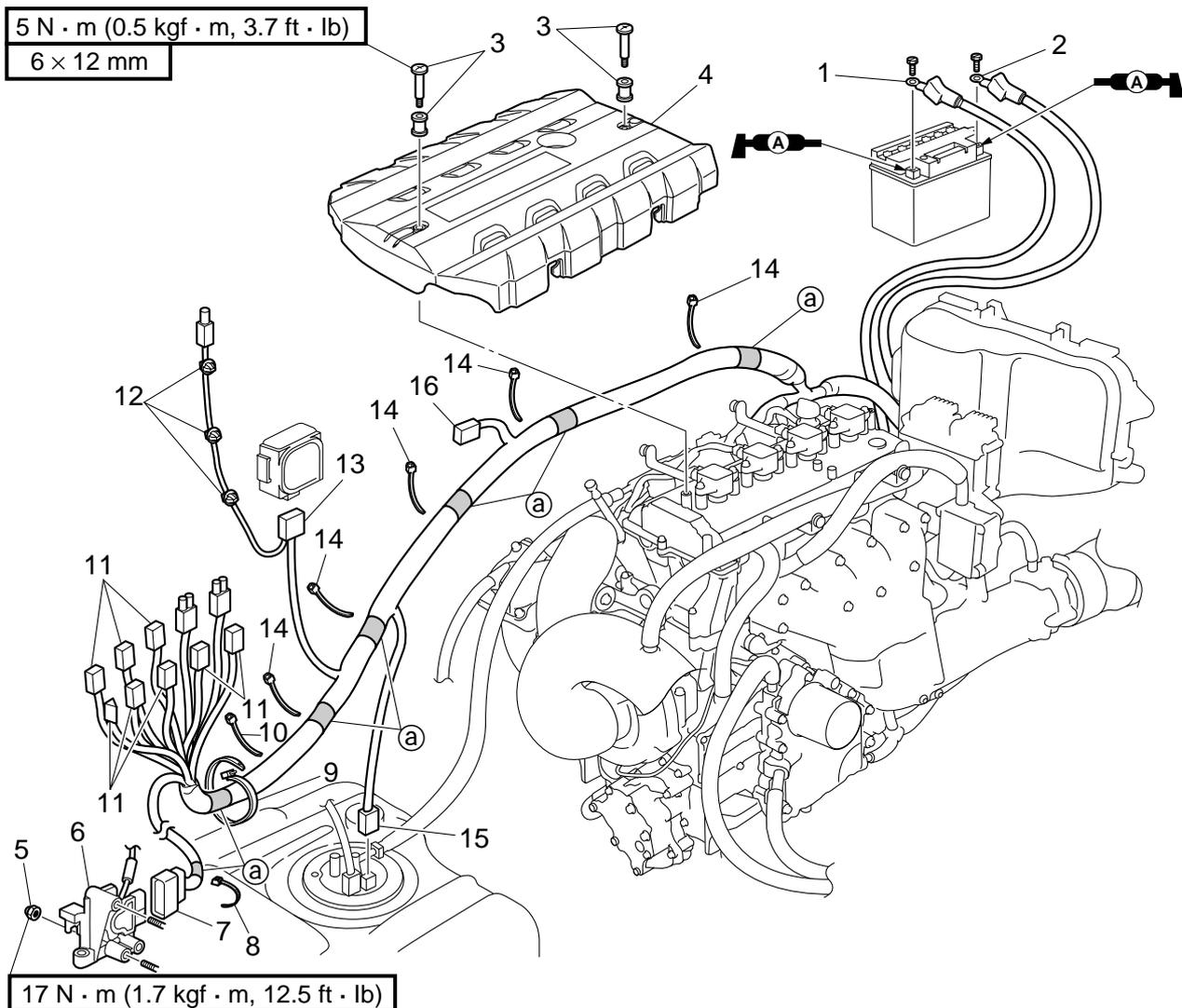


Step	Procedure/Part name	Q'ty	Service points
	Engine oil		Refer to "Engine oil change" in Chapter 3.
	Service lid		Refer to "Front hood removal" in Chapter 8.
	Deck beam		Refer to "Seat and hand grip removal" in Chapter 8.
	Shift cable bracket		Refer to "Remote control cables and speed sensor lead removal" in Chapter 8.
1	Negative battery cable	1	
2	Positive battery cable	1	
3	Bolt/grommet	2/2	
4	Engine cover	1	
5	Nut	2	



5

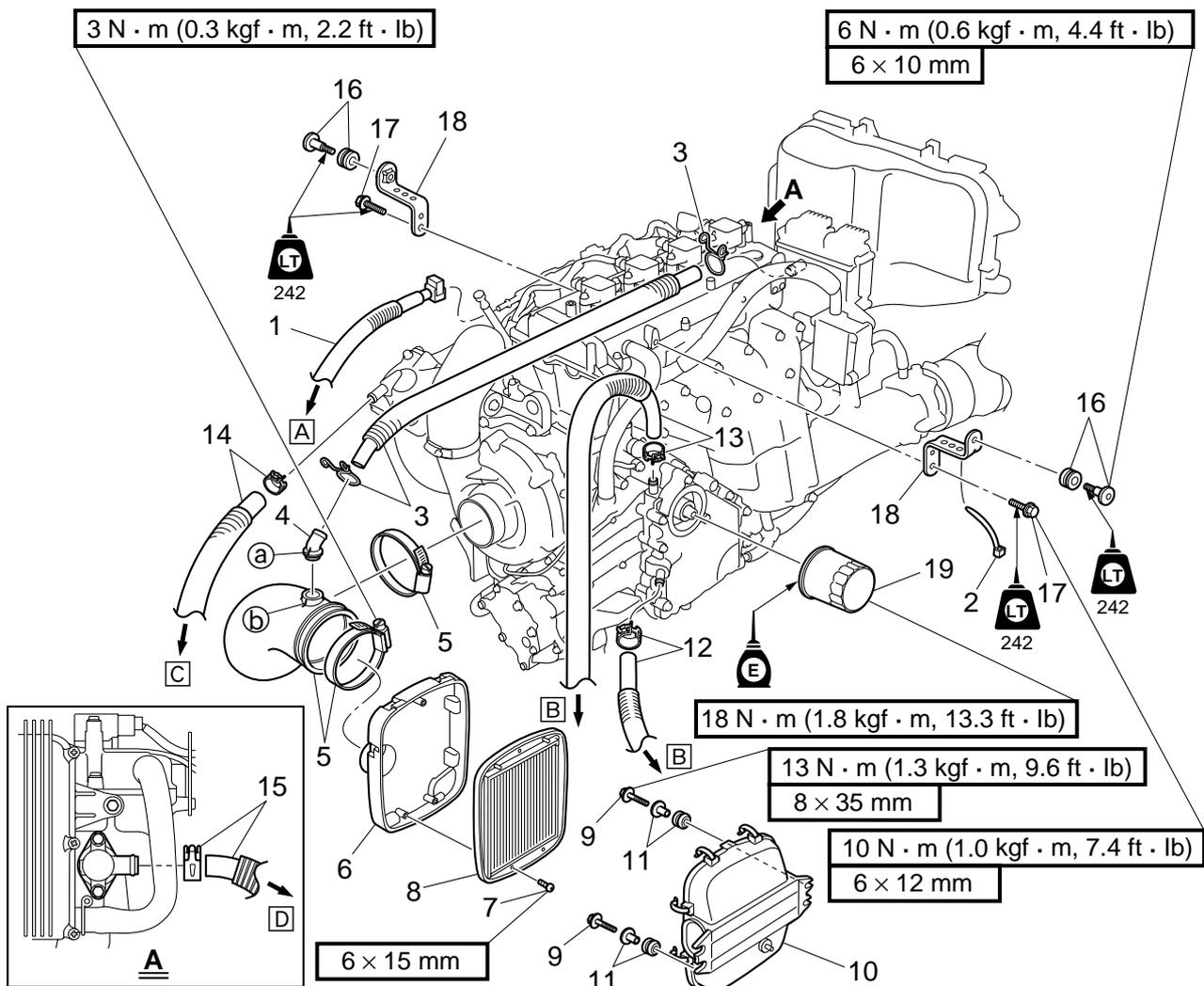
Step	Procedure/Part name	Q'ty	Service points
6	APS	1	<b>NOTE:</b> _____ Align the plastic ties with the gray tape (a) on the wiring harness assembly.
7	APS coupler	1	
8	Plastic tie	1	
9	Plastic tie	1	<b>NOTE:</b> _____ Disconnect the multifunction meter, sensor, and switch couplers.
10	Plastic tie	1	
11	Coupler	8	



Step	Procedure/Part name	Q'ty	Service points
12	Antenna holder	3	
13	Remote control receiver coupler	1	
14	Plastic tie	5	
15	Fuel pump module coupler	1	
16	Electric bilge pump coupler	1	
			Reverse the removal steps for installation.

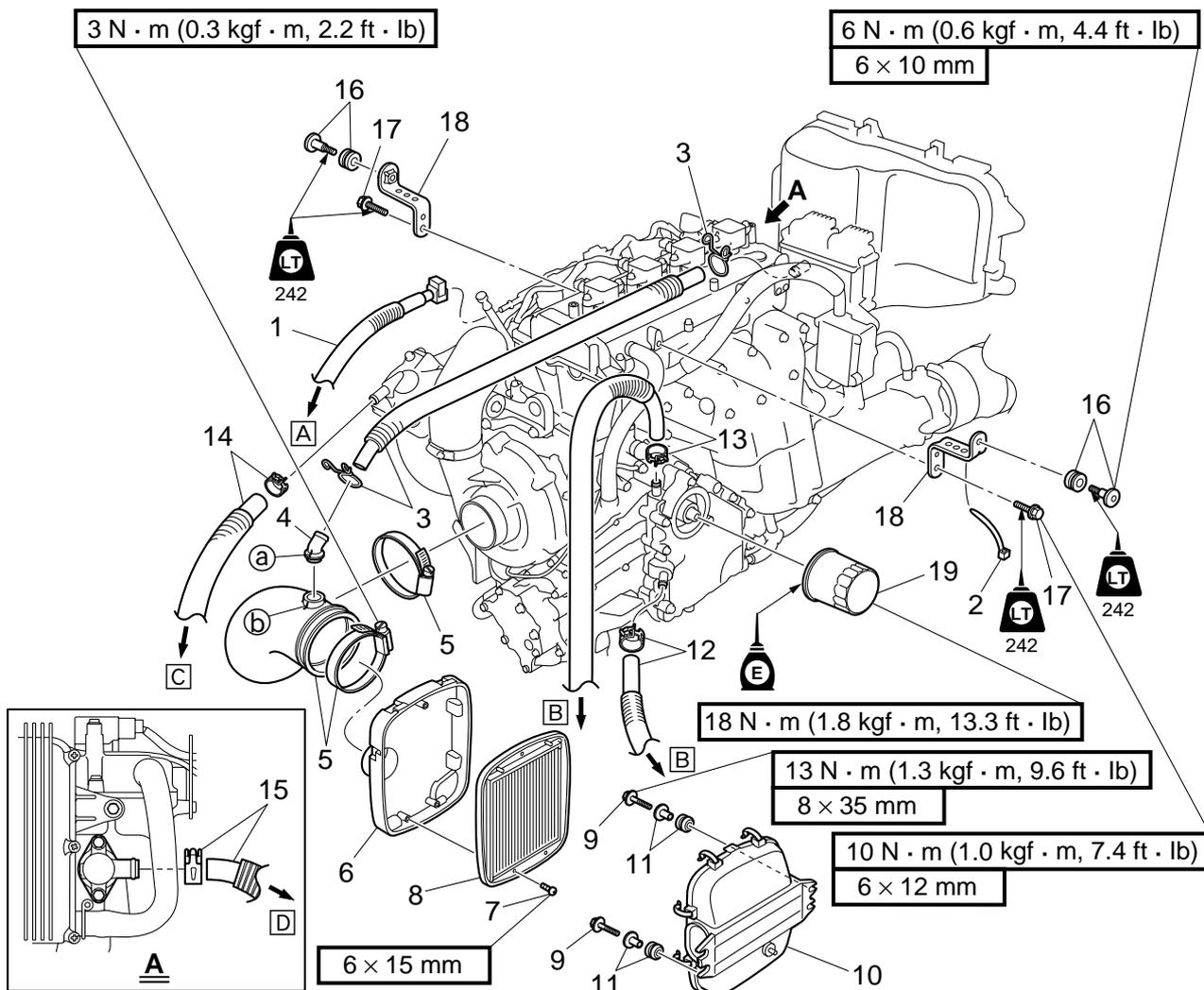


Engine unit removal 2



5

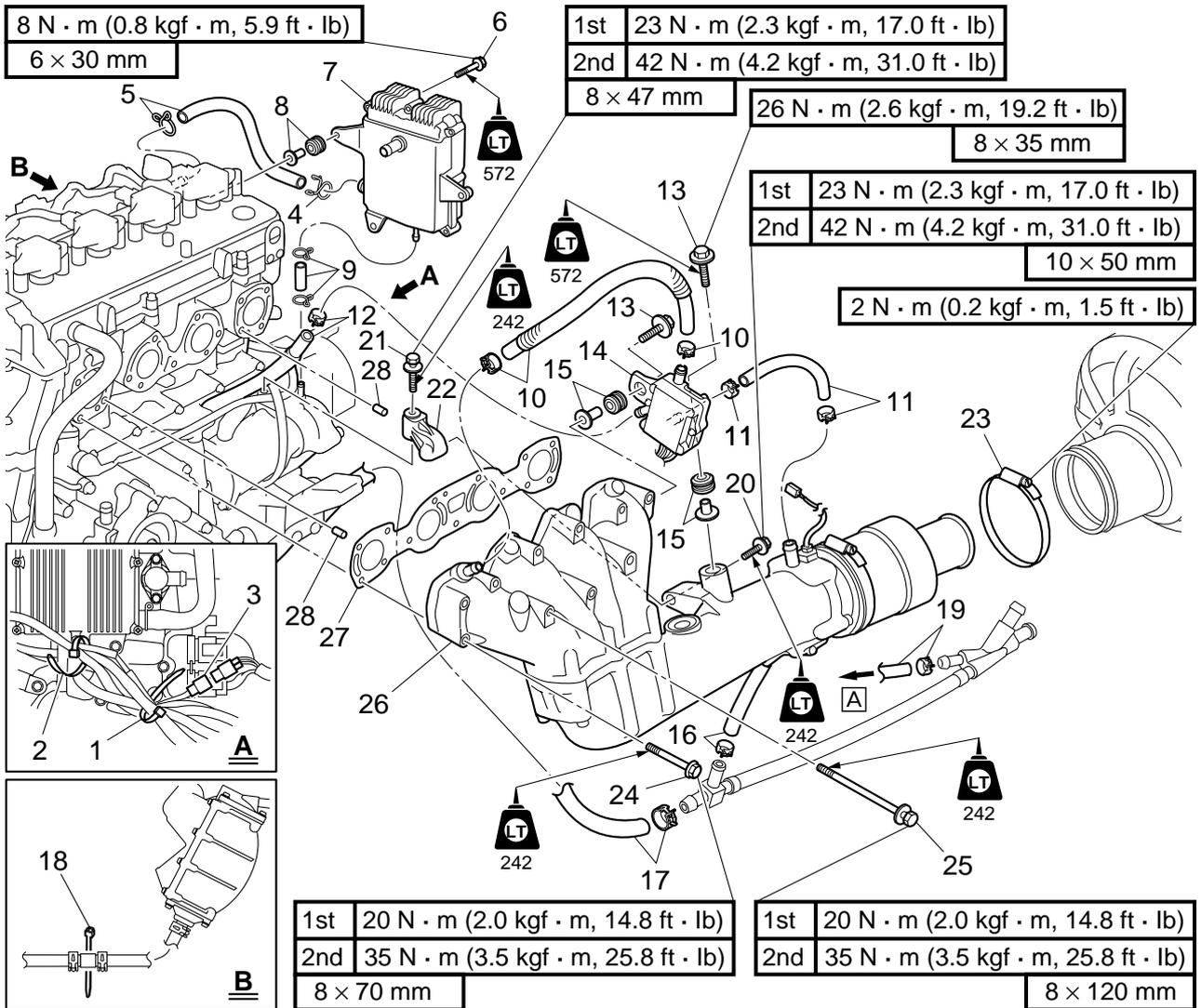
Step	Procedure/Part name	Q'ty	Service points
1	Fuel hose assembly	1	<b>A</b> To fuel pump module
2	Plastic tie	2	
3	Clamp/breather hose	2/1	
4	Connection	1	<b>NOTE:</b> _____ Align the mark <b>Ⓐ</b> on the connection with the mark <b>Ⓑ</b> on the intake pipe.
5	Clamp/intake pipe	2/1	
6	Air filter case cover	1	
7	Screw	3	
8	Air filter element	1	
9	Bolt	4	



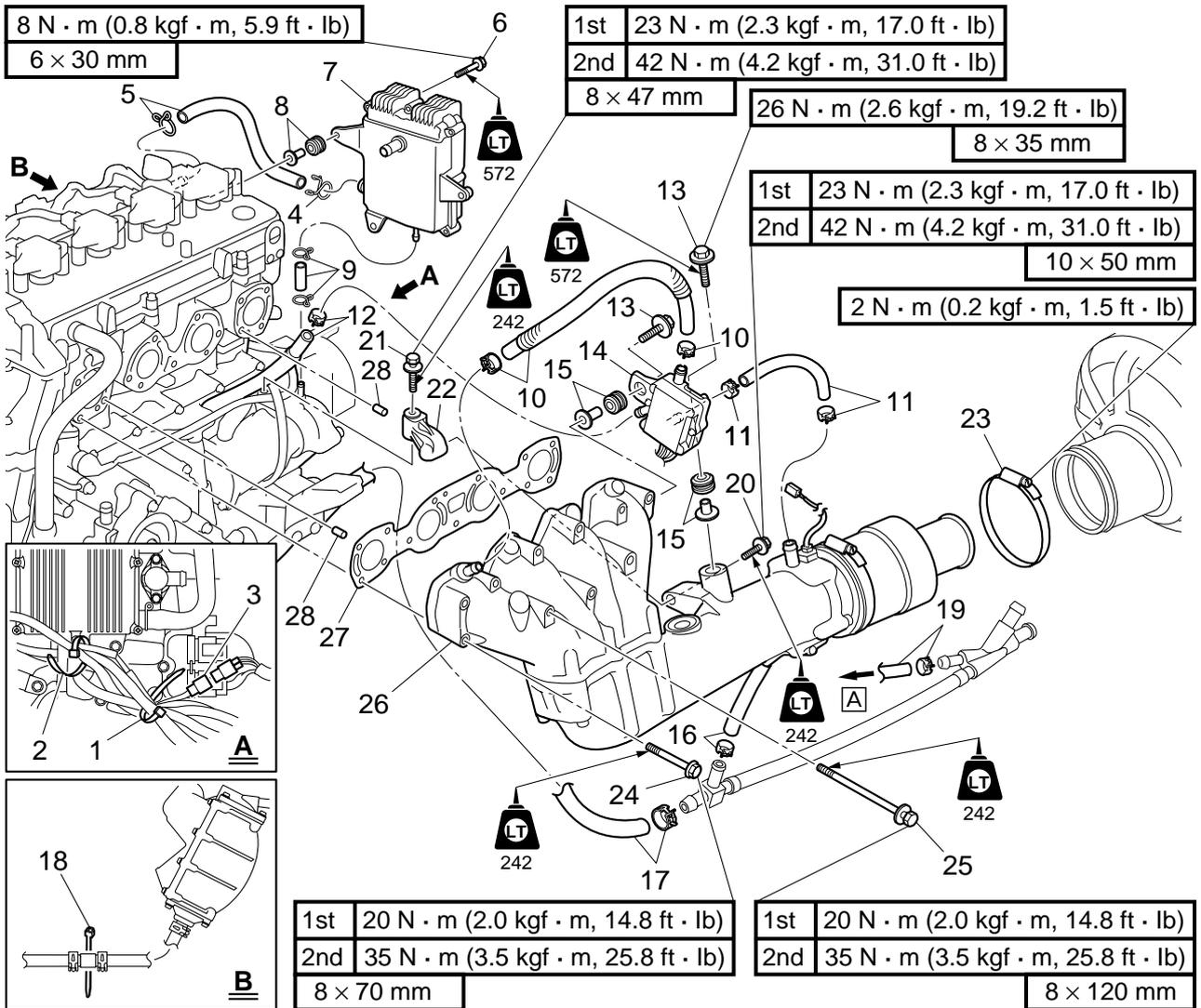
Step	Procedure/Part name	Q'ty	Service points
10	Air filter case	1	
11	Collar/grommet	4/4	
12	Clamp/cooling water hose	1/1	<b>B</b> To cooling water pilot outlet on port side
13	Clamp/cooling water hose	1/1	<b>B</b> To cooling water pilot outlet on port side
14	Clamp/cooling water hose	1/1	<b>C</b> To cooling water pilot outlet on starboard side
15	Clamp/cooling water hose	1/1	<b>D</b> To cooling water outlet on starboard side of stern
16	Bolt/grommet	4/4	
17	Bolt	4	
18	Stay	4	
19	Oil filter	1	
			Reverse the removal steps for installation.



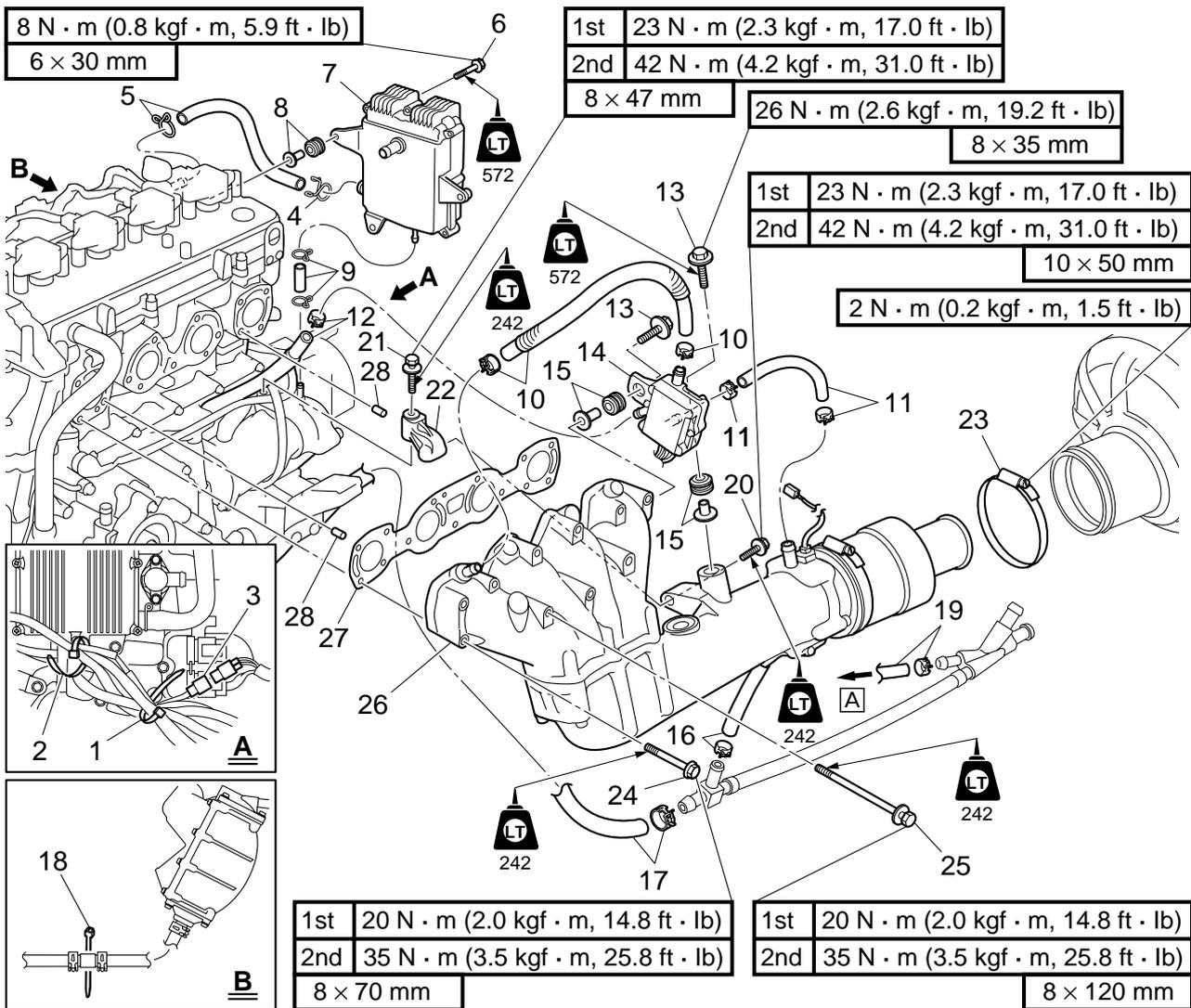
Engine unit removal 3



Step	Procedure/Part name	Q'ty	Service points
1	Plastic tie	1	
2	Plastic tie	1	
3	Thermo sensor coupler	1	
4	Clamp	1	
5	Clamp/breather hose	1/1	
6	Bolt	3	
7	Breather assembly	1	
8	Collar/grommet	3/3	
9	Clamp/breather hose	2/1	
10	Clamp/cooling water hose	2/1	
11	Clamp/cooling water hose	2/1	



Step	Procedure/Part name	Q'ty	Service points	
12	Clamp/cooling water hose	1/1	Cooling water inlet	
13	Bolt	2		
14	Rectifier regulator	1		
15	Collar/grommet	2/2		
16	Clamp/cooling water hose	1/1		
17	Clamp/cooling water hose	1/1		
18	Plastic tie	1		
19	Clamp/cooling water hose	1/1		Ⓐ To air cooler
20	Bolt	1		
21	Bolt	1		

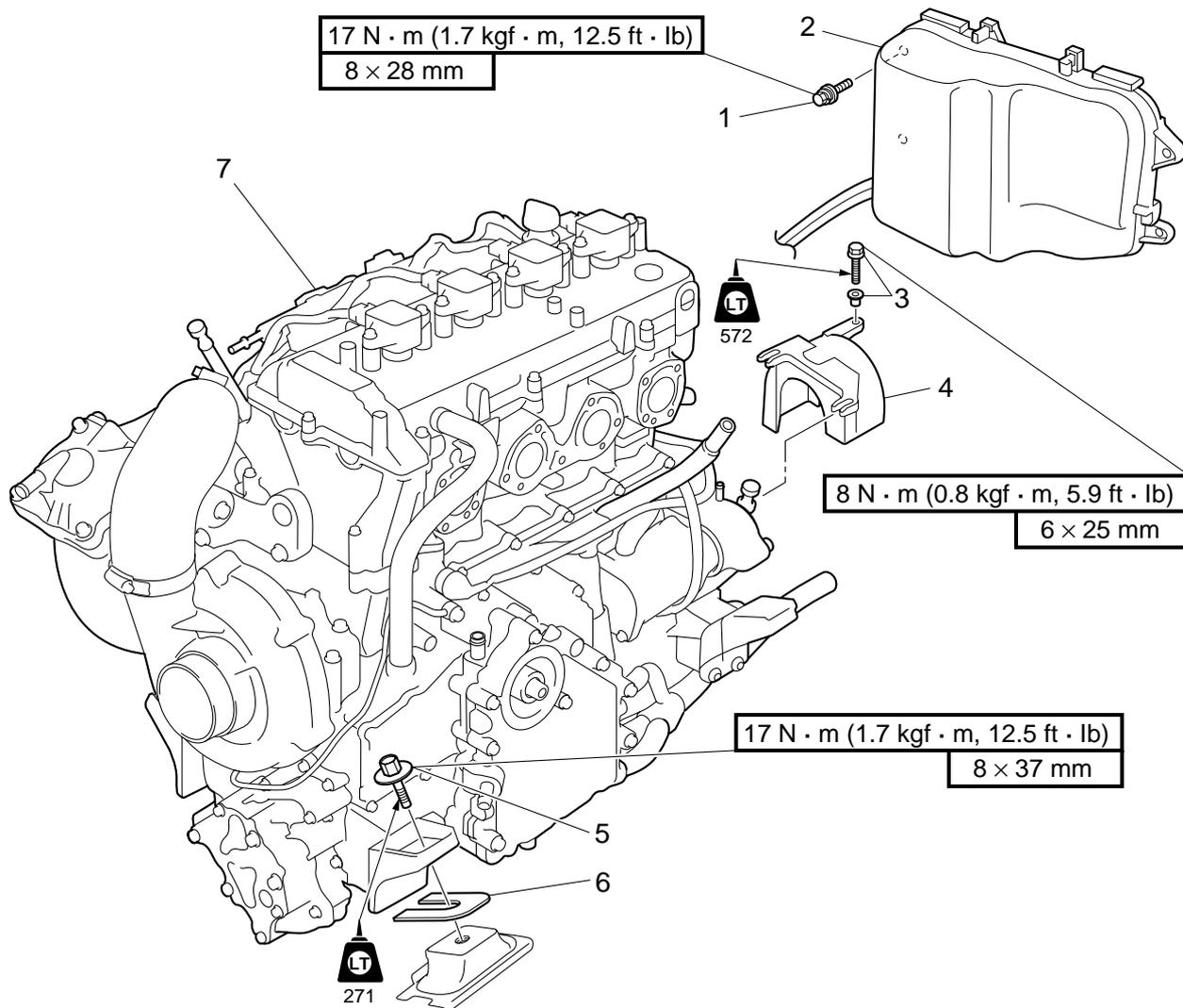


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Step	Procedure/Part name	Q'ty	Service points
22	Stay	1	
23	Clamp	1	
24	Bolt	8	
25	Bolt	3	
26	Muffler	1	
27	Gasket	1	<b>Not reusable</b>
28	Dowel pin	2	



**Engine unit removal 4**

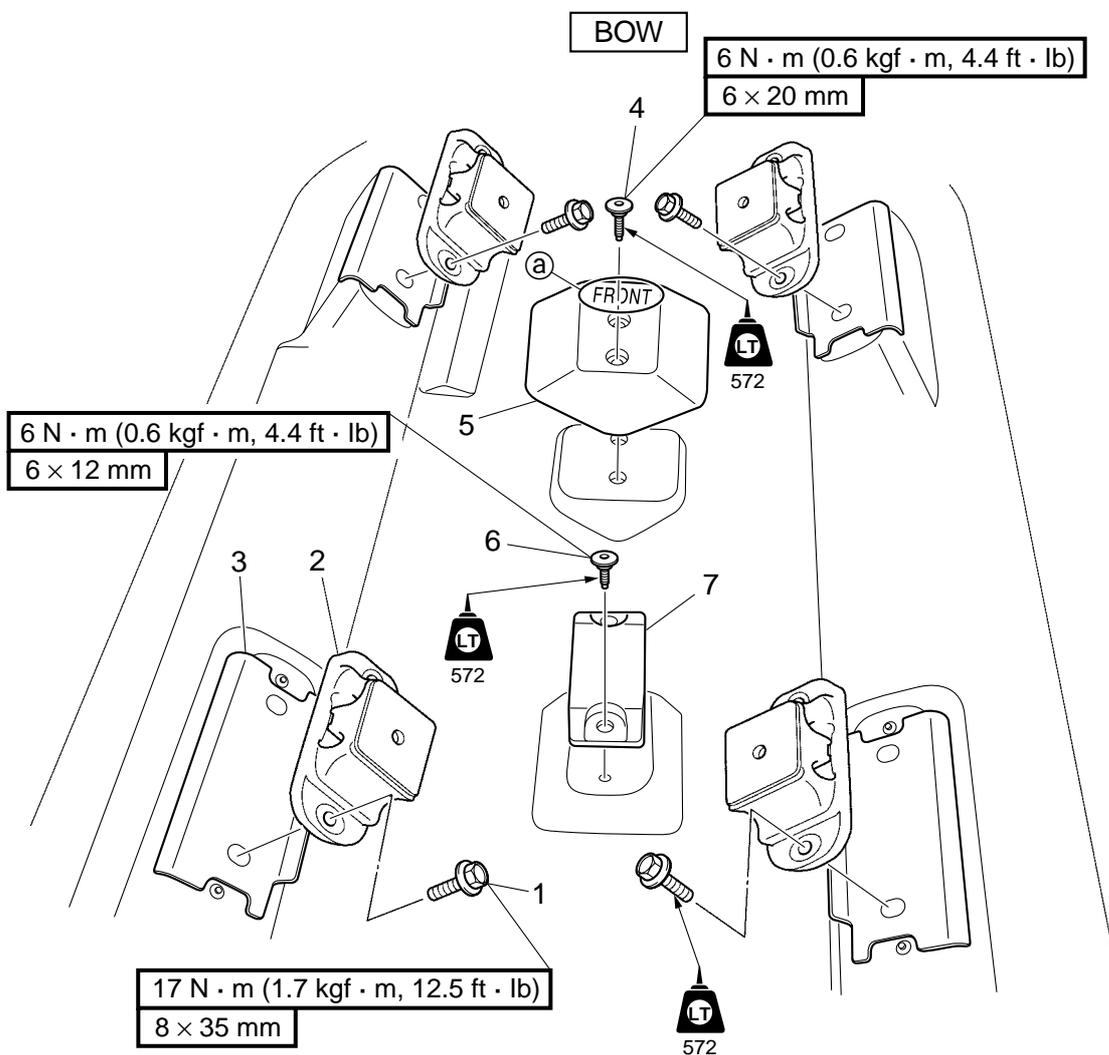


Step	Procedure/Part name	Q'ty	Service points
1	Bolt	4	Reverse the removal steps for installation.
2	Electrical box	1	
3	Bolt/collar	1/1	
4	Coupling cover	1	
5	Engine mounting bolt	4	
6	Shim	*	
7	Engine unit	1	

\*: As required.

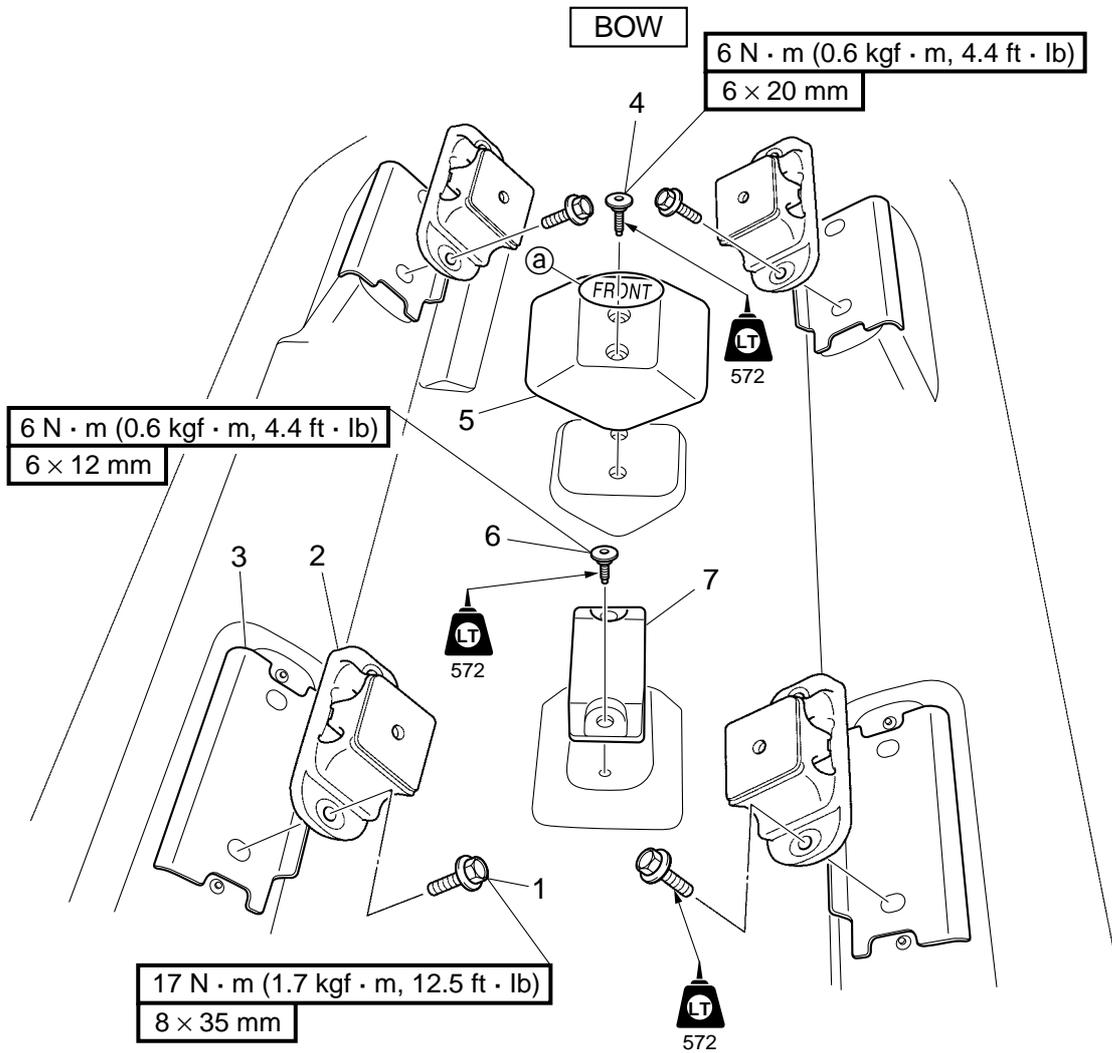


Engine mount removal

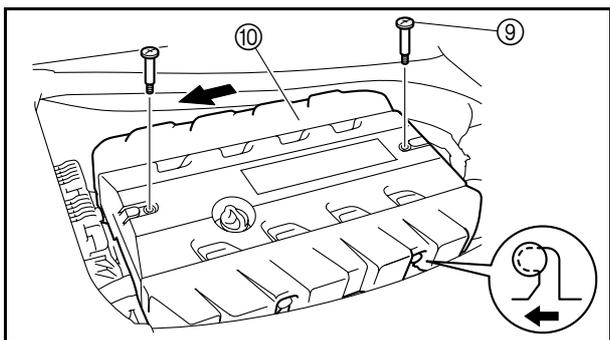
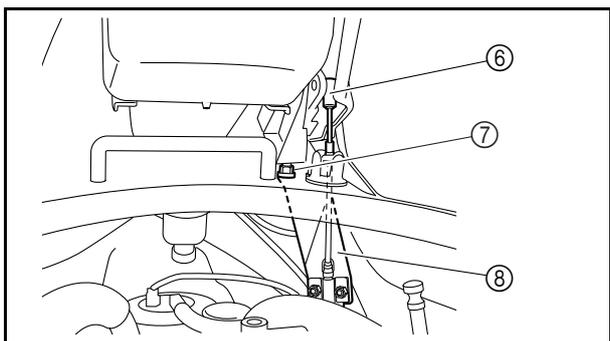
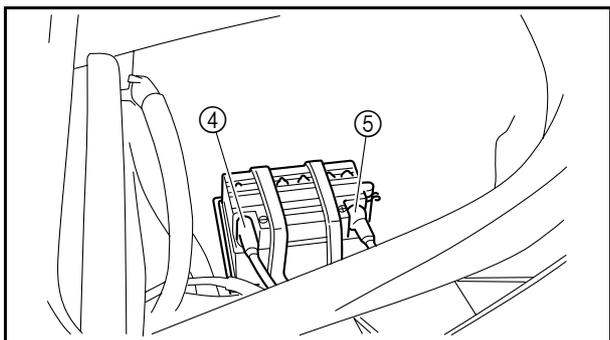
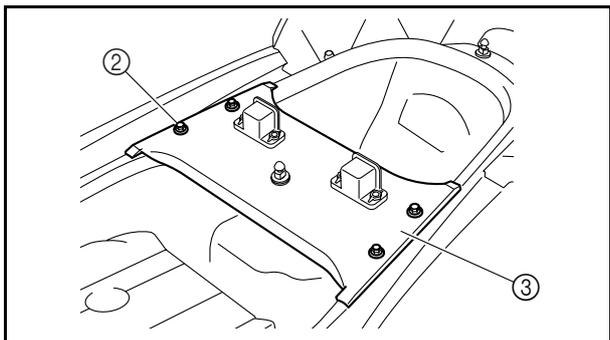
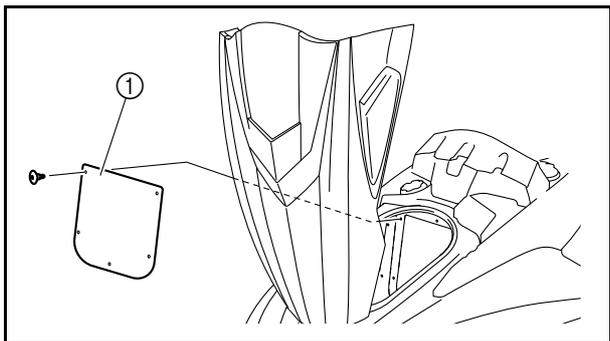


5

Step	Procedure/Part name	Q'ty	Service points
1	Bolt	8	<p><b>NOTE:</b> _____</p> <ul style="list-style-type: none"> <li>• Make a note of the position of each engine mount so that it can be installed in its original place.</li> <li>• Be sure to adjust the coupling clearance.</li> </ul>
2	Engine mount	4	
3	Liner	4	<p><b>NOTE:</b> _____</p> <p>Install the damper 1 with the mark @ toward the bow.</p>
4	Bolt	2	
5	Damper 1	1	



Step	Procedure/Part name	Q'ty	Service points
6	Bolt	2	Reverse the removal steps for installation.
7	Damper 2	1	



## Engine unit removal

### 1. Remove:

- Engine unit

### CAUTION:

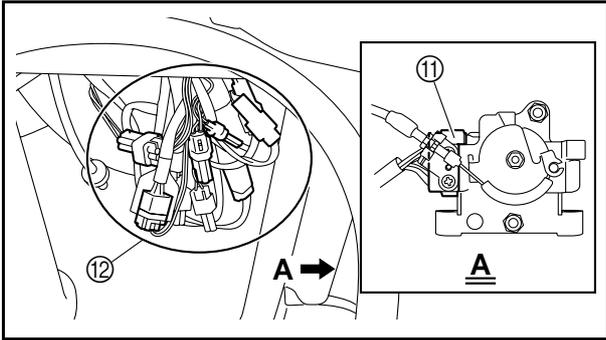
Before removing the engine, be sure to take adequate measures to protect the deck opening from damage.

### Removal steps:

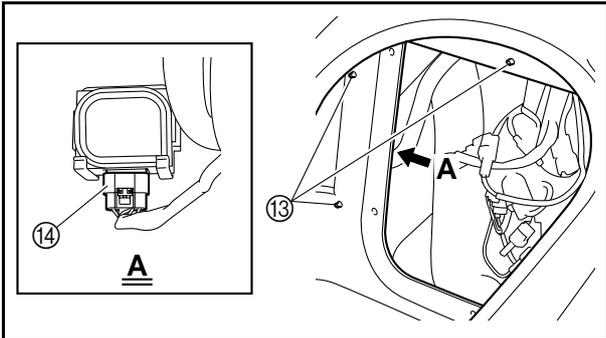
1. Extract the engine oil.  
Refer to "Engine oil change" in Chapter 3.
2. Remove the service lid ①.
3. Remove the deck beam bolts ② and nuts, and then remove the deck beam ③.
4. Disconnect the negative battery cable ④ and positive battery cable ⑤ from the battery.
5. Disconnect the shift cable joint ⑥, and then remove the shift cable bracket nuts ⑦.
6. Remove the shift cable bracket ⑧.
7. Remove the engine cover bolts ⑨, and then remove the engine cover ⑩.

### NOTE:

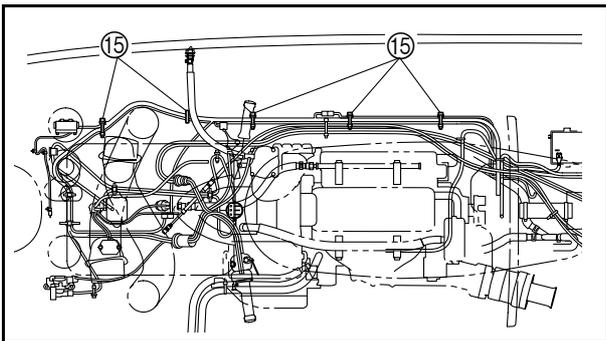
Slide the engine cover rearward, and then lift the cover to remove it.



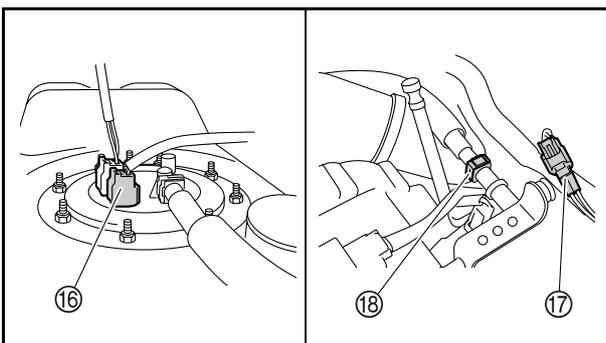
8. Disconnect the APS coupler (11), and the 8 multifunction meter, sensor, and switch couplers (12).



9. Remove the antenna holders (13).  
10. Disconnect the remote control receiver coupler (14).



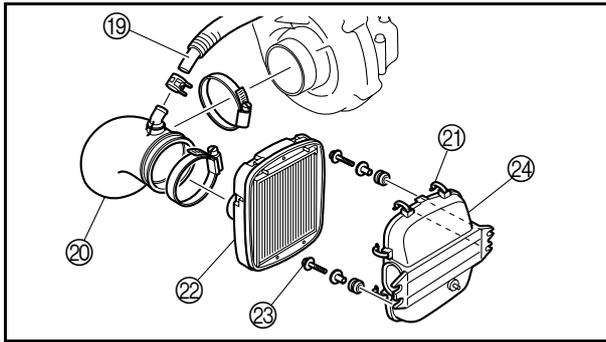
11. Remove the wiring harness from the 5 plastic ties (15).



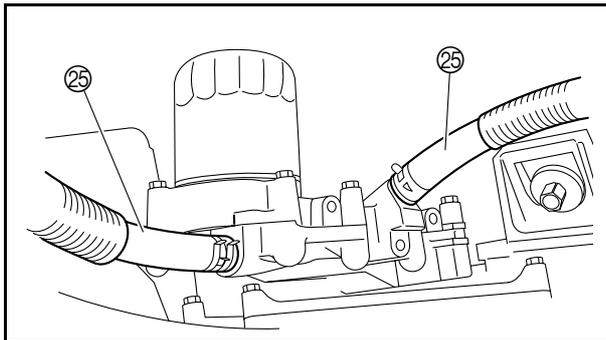
12. Disconnect the fuel pump module coupler (16) and electric bilge pump coupler (17).  
13. Remove the fuel tank filler cap to reduce the fuel pressure.  
14. Wrap the quick connector (18) with a cloth, and then disconnect it from the fuel rail. Refer to "Fuel tank removal" in Chapter 4.

**⚠ WARNING**

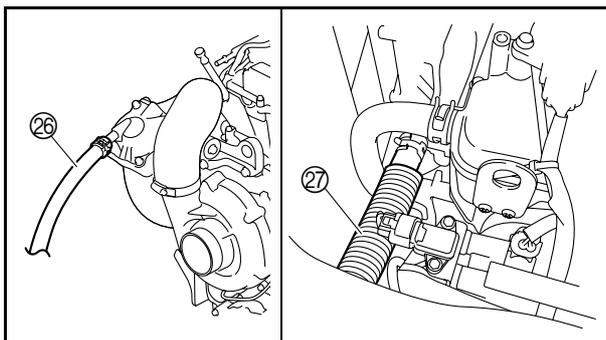
Always reduce the fuel pressure in the fuel line before servicing the line or the fuel pipe. If the fuel pressure is not released, pressurized fuel could spray out.



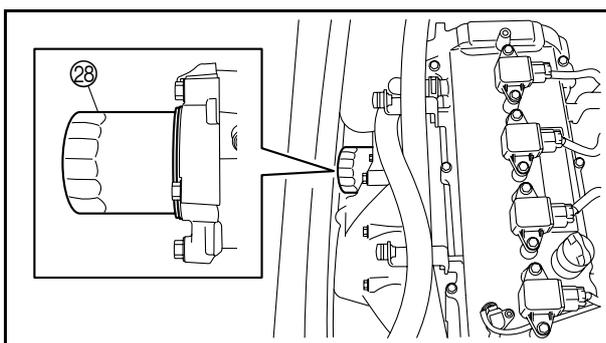
- 15. Disconnect the breather hose ⑱ from the intake pipe ⑳, and then remove the intake pipe ⑳ from the supercharger.
- 16. Unhook the fasteners ㉑, and then remove the air filter case cover ㉒. Remove the air filter case bolts ㉓, and then remove the air filter case ㉔.



- 17. Disconnect the cooling water hoses ㉕ from the oil cooler assembly.



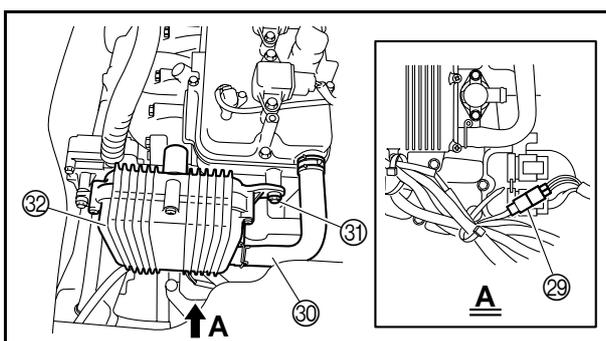
- 18. Disconnect the cooling water hose ㉖ from the air cooler and cooling water hose ㉗ from the thermostat housing.



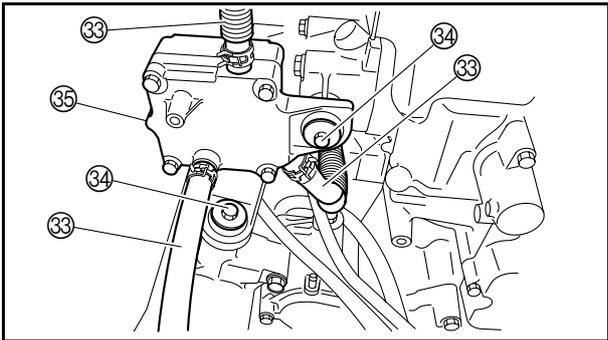
- 19. Place a cloth under the oil filter ㉘, and then remove it with the special service tool.

**NOTE:** \_\_\_\_\_  
Be sure to clean up any oil spills.

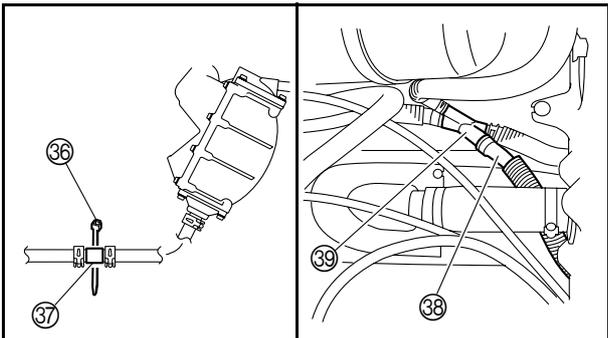
	Oil filter wrench: 90890-06830
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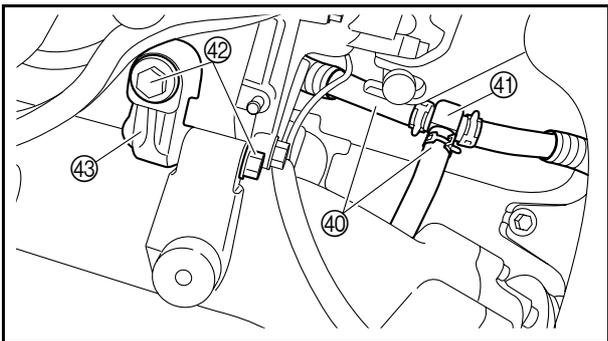
- 20. Disconnect the thermo sensor coupler ㉙.
- 21. Remove the breather hose ㉚.
- 22. Remove the breather assembly bolts ㉛, and then remove the breather assembly ㉜.



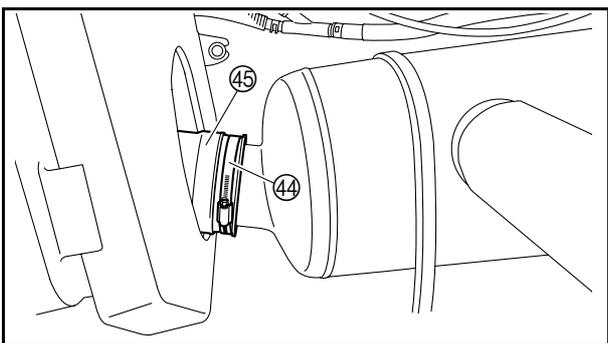
- 23. Remove the cooling water hoses ③③.
- 24. Remove the rectifier regulator bolts ③④, and then remove the rectifier regulator ③⑤.



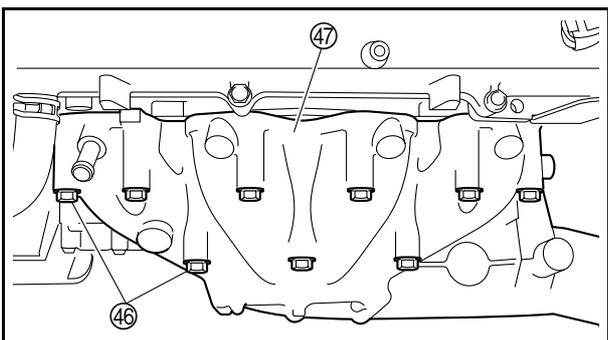
- 25. Remove the plastic tie ③⑥ from the hose joint 4 ③⑦.
- 26. Disconnect cooling water hose ③⑧ from the hose joint 1 ③⑨.



- 27. Disconnect the cooling water hoses ④① from the hose joint 3 ④②.
- 28. Remove the stay bolts ④②, and then remove the stay ④③.

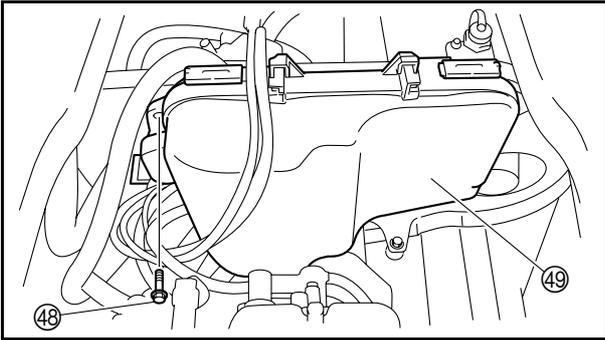


- 29. Remove the clamp ④④ from the pipe ④⑤.

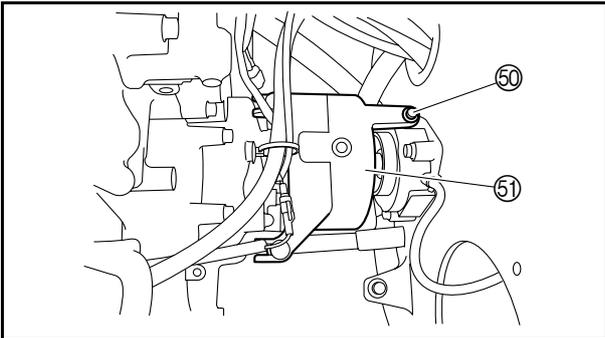


- 30. Remove the muffler assembly bolts ④⑥, and then remove the muffler assembly ④⑦.

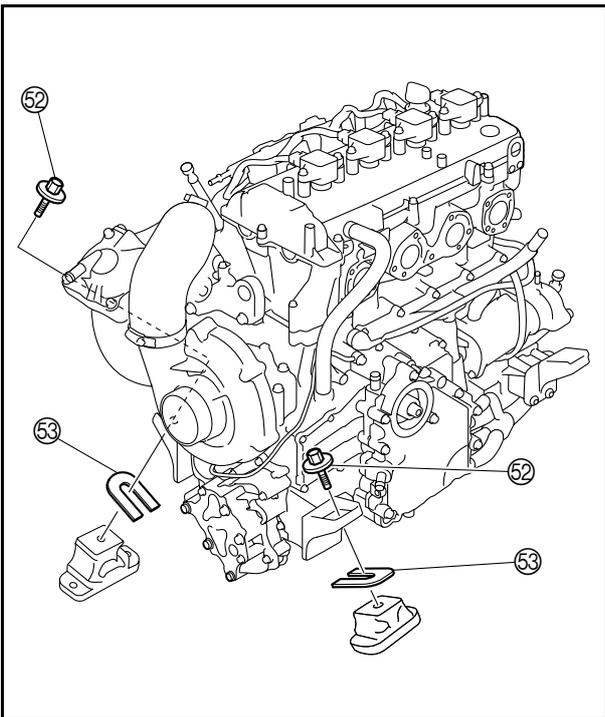
**NOTE:** \_\_\_\_\_  
 When removing the muffler assembly, move it forward and separate it from the water lock.  
 \_\_\_\_\_



31. Remove the electrical box bolts ④⑧, and then remove the electrical box ④⑨.



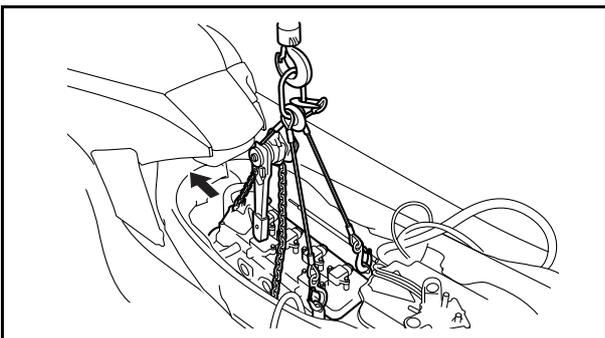
32. Remove the coupling cover bolt ⑤⑩, and then remove the coupling cover ⑤⑪.



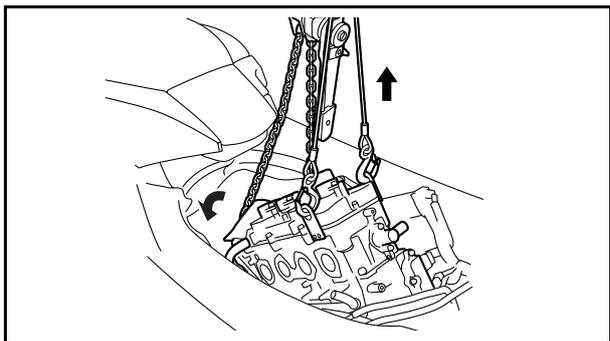
33. Loosen the engine mounting bolts ⑤②.  
34. Lift the engine unit slightly, remove the shims ⑤③, and then lower the engine.

**NOTE:** \_\_\_\_\_  
Make a note of the position of each removed shim so that it can be installed in its original position.

35. Remove the engine mounting bolts ⑤②.



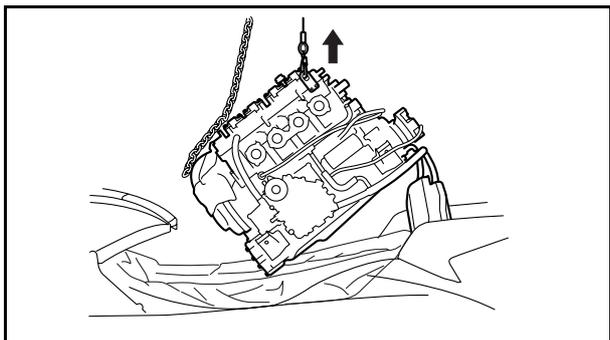
36. Suspend the engine unit using all 3 engine hangers, and then separate the unit from the engine mounts and move it forward to disconnect the coupling.



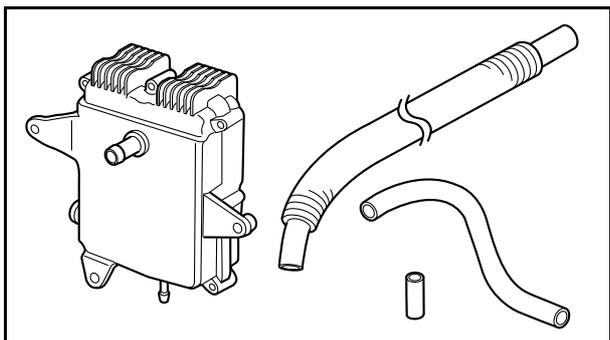
37. Lift the engine unit slightly, and then lower the front of the unit. Repeat this step until the engine unit can be removed from the engine compartment.

**CAUTION:** \_\_\_\_\_

When removing the engine unit, take care to avoid causing damage to the hull and deck opening.



38. Lift the engine unit out vertically.



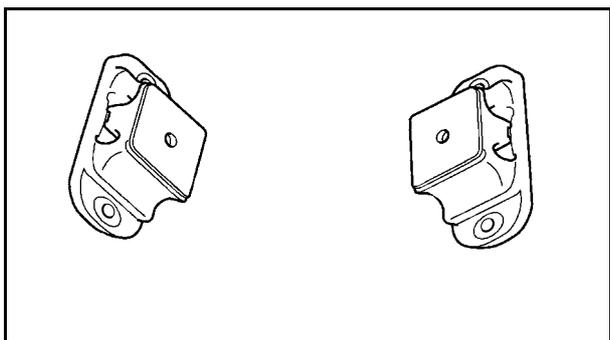
**Breather assembly check**

**CAUTION:** \_\_\_\_\_

The breather assembly should not be disassembled.

**1. Check:**

- Breather assembly
  - Breather hoses
- Cracks/damage → Replace the breather assembly.



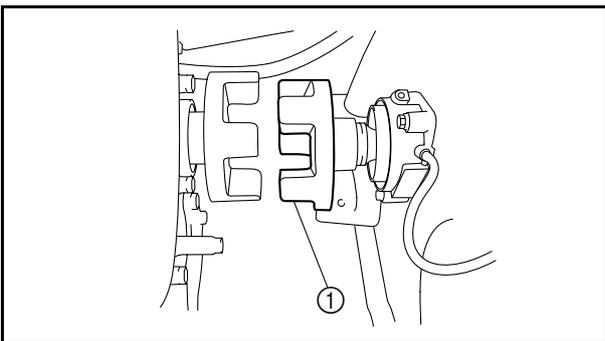
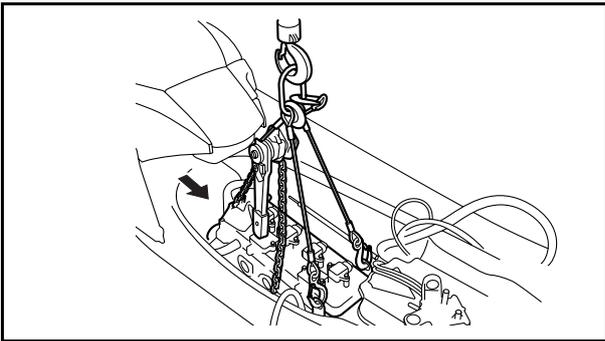
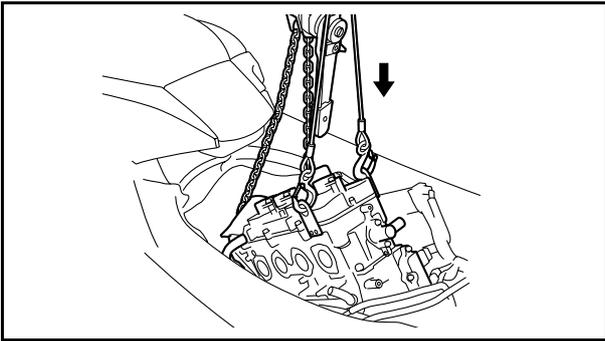
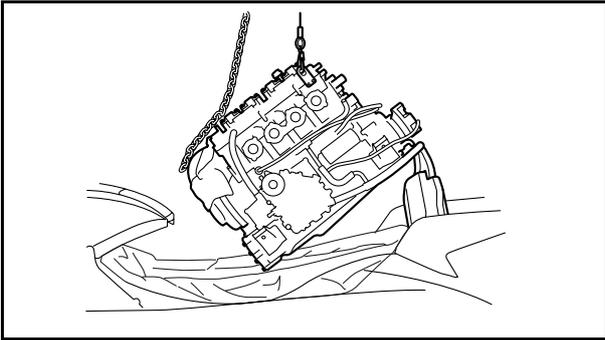
**Engine mount check**

**1. Check:**

- Engine mounts
- Cracks/damage → Replace the engine mounts.

**NOTE:** \_\_\_\_\_

When replacing the engine mounts, be sure to check the coupling clearance.



## Engine unit installation

### 1. Install:

- Engine unit

### Installation steps:

1. Suspend the engine unit using all 3 engine hangers.
2. Lower the front of the engine unit.
3. Lower the engine unit into the engine compartment vertically.

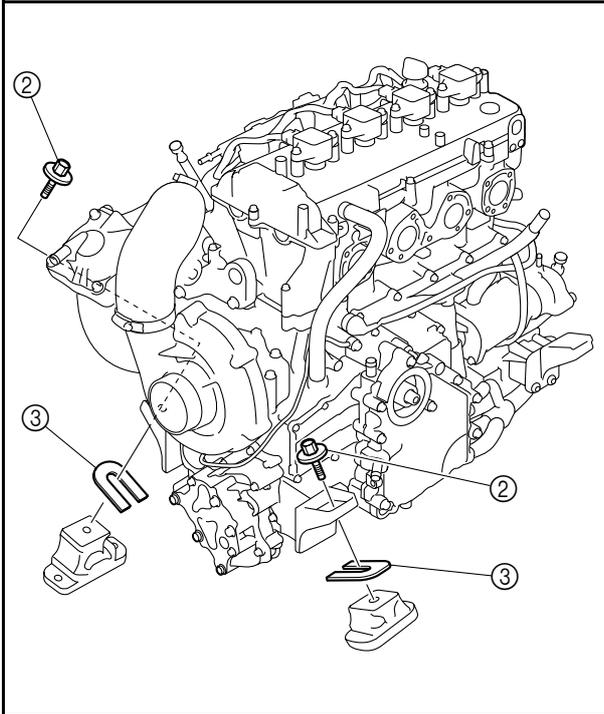
### CAUTION:

When installing the engine unit, take care to avoid causing damage to the hull and deck opening.

4. Lift the front of the engine unit slightly, and lower the unit. Repeat this step until the drive and driven couplings are aligned.
5. Move the engine unit rearward to connect the coupling ①, and lower the unit onto the engine mounts.

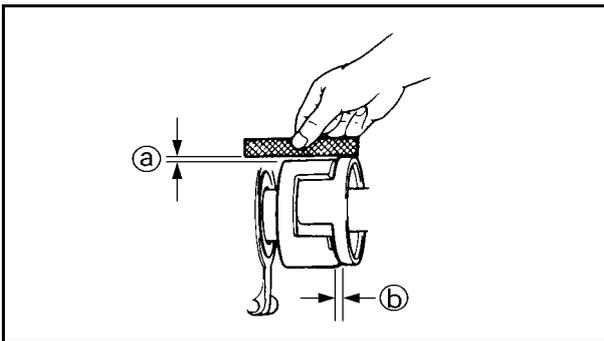
### NOTE:

Do not install the rubber damper until the coupling clearance adjustment has been made.



6. Temporarily install the engine mounting bolts ②.
7. Lift the engine unit slightly, install the shims ③, and then lower the engine.

**NOTE:** \_\_\_\_\_  
 Install the shims in their original positions.

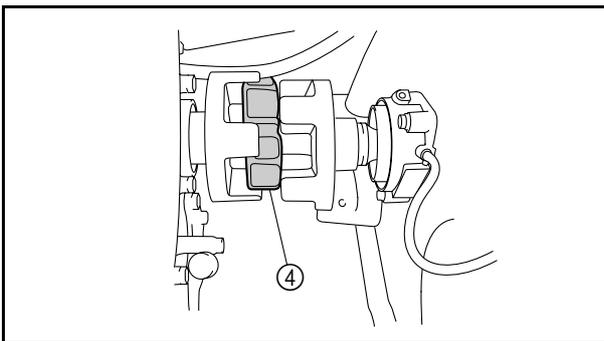


8. Measure the coupling clearance ①, and if necessary, add or remove shims ③ so that the clearance is within specification.

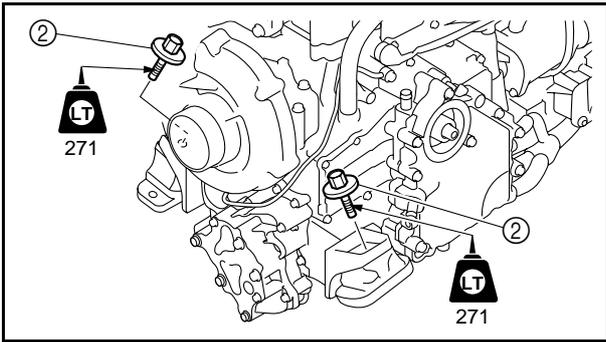
Available shim thicknesses:  
 0.10, 0.30, 0.50, 1.00, and 2.00 mm



Clearance ①:  
 Less than 1.0 mm (0.039 in) (without rubber damper)  
 Clearance ②:  
 2.0–4.0 mm (0.079–0.157 in)

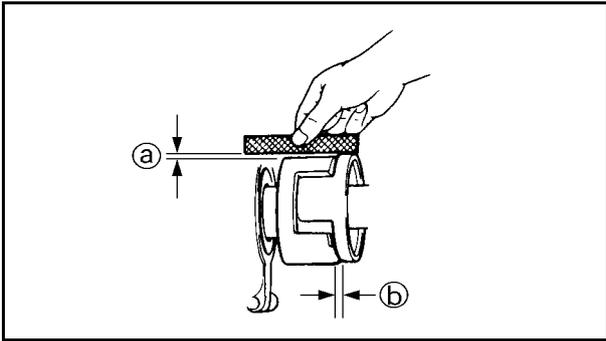


9. Install the rubber damper ④.
10. Adjust the position of the engine unit so that the coupling clearances ① and ② are within specification.



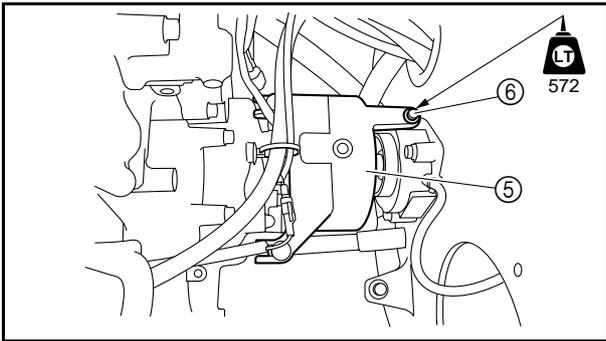
11. Tighten the engine mounting bolts ② to the specified torque.

	<p>Engine mounting bolt:                  17 N·m (1.7 kgf·m, 12.5 ft·lb)                  LOCTITE 271</p>
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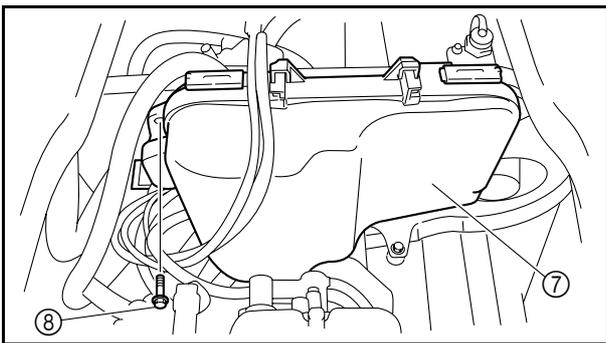
12. Check that the coupling clearances ③ and ④ are within specification. If the clearances are out of specification, adjust them again.

	<p>Clearance ③:                  Less than 0.5 mm (0.020 in) (with rubber damper)                  Clearance ④:                  2.0–4.0 mm (0.079–0.157 in)</p>
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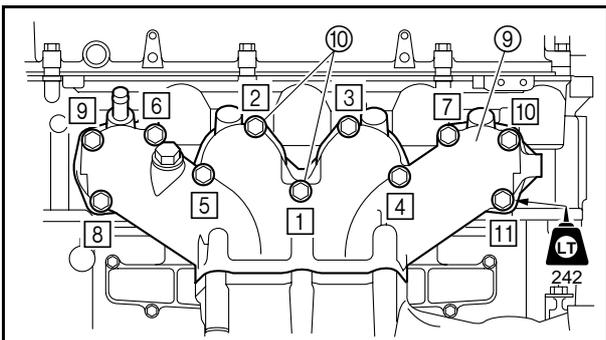
13. Install the coupling cover ⑤ and collar, and then tighten the coupling cover bolt ⑥ to the specified torque.

	<p>Coupling cover bolt:                  8 N·m (0.8 kgf·m, 5.9 ft·lb)                  LOCTITE 572</p>
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14. Install the electrical box ⑦, and then tighten the electrical box bolts ⑧ to the specified torque.

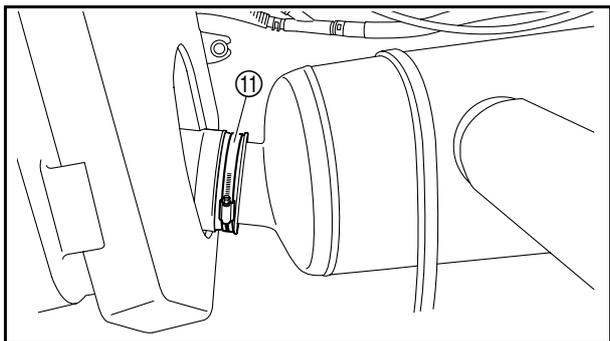
	<p>Electrical box bolt:                  17 N·m (1.7 kgf·m, 12.5 ft·lb)</p>
--	---



15. Install the muffler assembly ⑨ into the water lock, and then tighten the muffler assembly bolts ⑩ to the specified torque in the sequence shown.

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

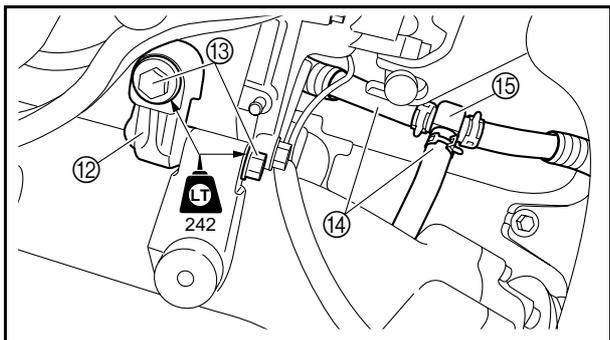
	<p>Muffler assembly bolt:                  1st: 20 N·m (2.0 kgf·m, 14 ft·lb)                  2nd: 35 N·m (3.5 kgf·m, 25 ft·lb)                  LOCTITE 242</p>
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16. Tighten the pipe clamp ⑪ to the specified torque.



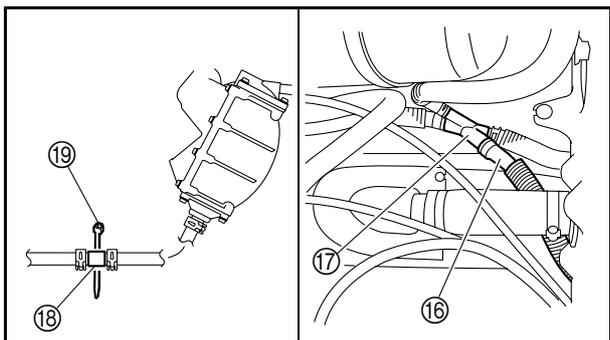
Pipe clamp:  
2 N·m (0.2 kgf·m, 1.5 ft·lb)



17. Install the stay ⑫, and then tighten the stay bolts ⑬ to the specified torque.



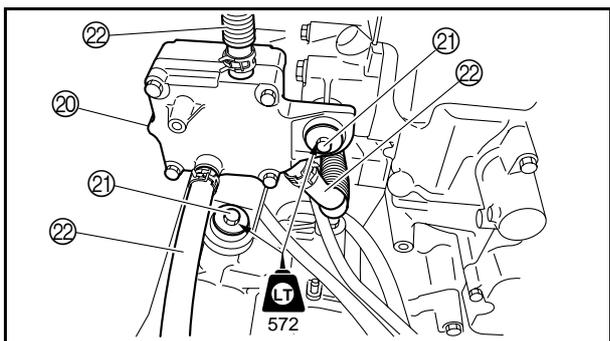
Stay bolt:  
1st:  
23 N·m (2.3 kgf·m, 17.0 ft·lb)  
2nd:  
42 N·m (4.2 kgf·m, 31.0 ft·lb)  
LOCTITE 242



18. Connect the cooling water hoses ⑭ to the hose joint 3 ⑮.

19. Connect the cooling water hose ⑯ to the hose joint 1 ⑰.

20. Clamp the hose joint 4 ⑱ with the plastic tie ⑲.



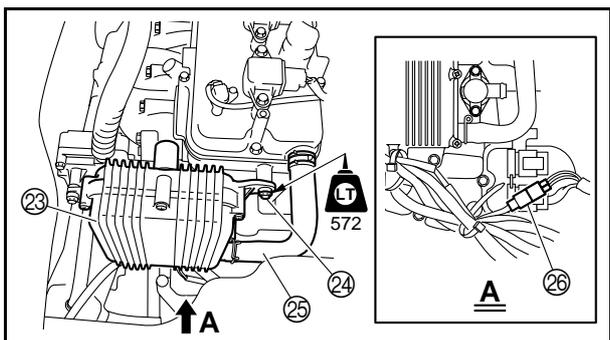
21. Install the rectifier regulator ⑳, and then tighten the rectifier regulator bolts ㉑ to the specified torque.



Rectifier regulator bolt:  
26 N·m (2.6 kgf·m, 19.2 ft·lb)  
LOCTITE 572

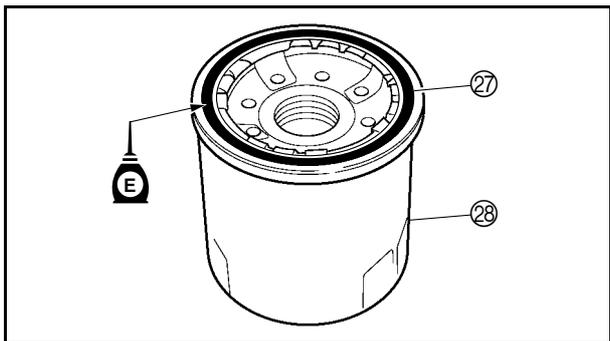
22. Connect the cooling water hoses ㉒.

23. Install the breather assembly ㉓, and then tighten the breather assembly bolts ㉔ to the specified torque.

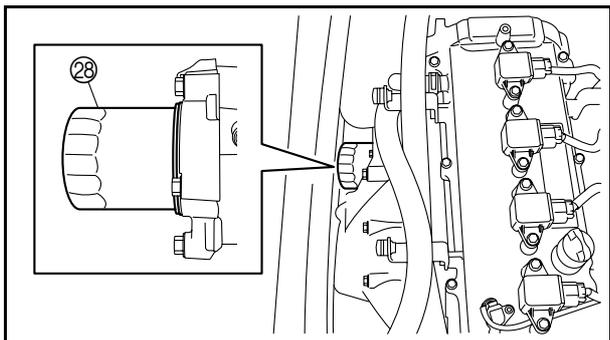


Breather assembly bolt:  
8 N·m (0.8 kgf·m, 5.9 ft·lb)  
LOCTITE 572

24. Connect the breather hose ㉕ and the thermo sensor coupler ㉖.



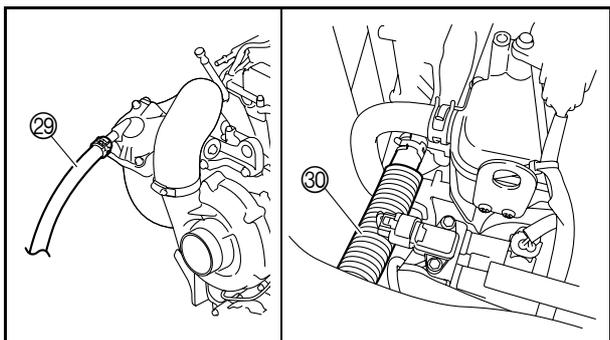
25. Apply a thin coat of engine oil to the O-ring ②⑦ of the oil filter ②⑧.



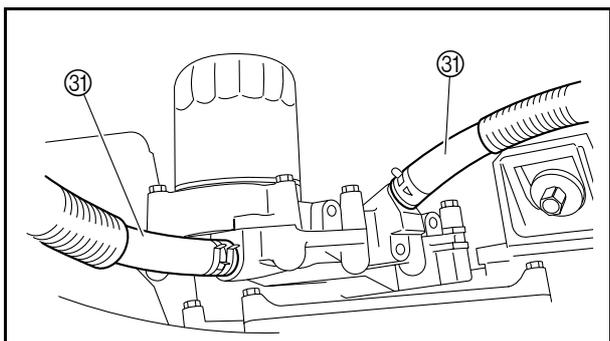
26. Install the oil filter ②⑧ with the special service tool.

 Oil filter wrench:  
90890-06830

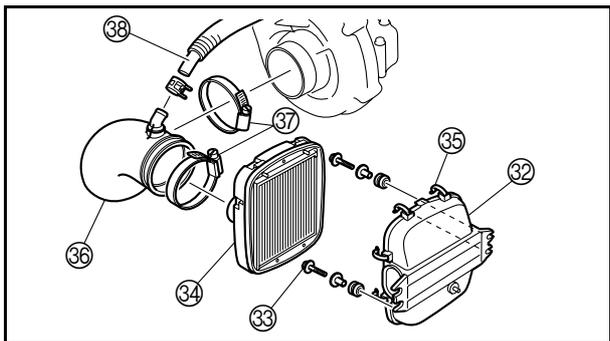
 Oil filter:  
18 N·m (1.8 kgf·m, 13.3 ft·lb)



27. Connect the cooling water hose ②⑨ to the air cooler and cooling water hose ③⑩ to the thermostat housing.



28. Connect the cooling water hoses ③① to the oil cooler assembly.



29. Install the air filter case (32), and then tighten the air filter case bolts (33) to the specified torque.



Air filter case bolt:  
13 N·m (1.3 kgf-m, 9.6 ft-lb)

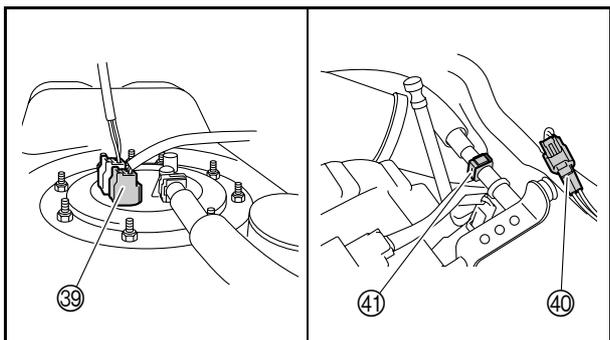
30. Install the air filter case cover (34), and then hook the fasteners (35).

31. Install the intake pipe (36), and then tighten the clamps (37).



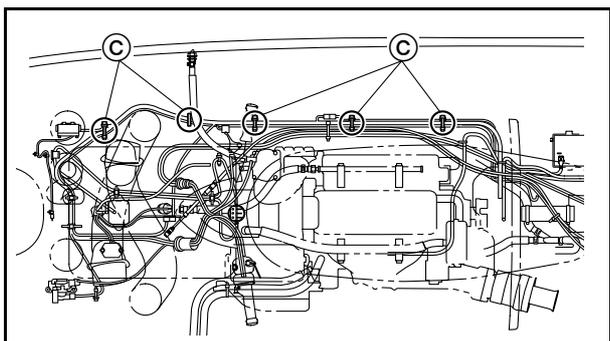
Intake pipe clamp:  
3 N·m (0.3 kgf-m, 2.2 ft-lb)

32. Connect the breather hose (38) to the intake pipe (36).



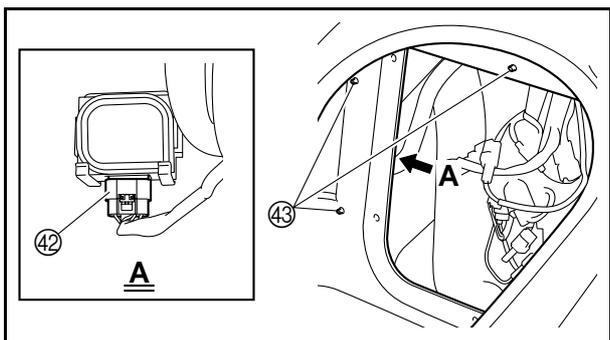
33. Connect the fuel pump module coupler (39) and electric bilge pump coupler (40).

34. Connect the quick connector (41) to the fuel rail.  
Refer to "Fuel tank removal" in Chapter 4.



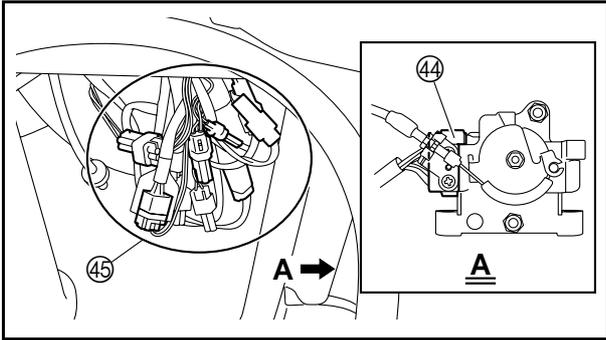
35. Clamp the wiring harness assembly with 5 plastic ties.

**NOTE:** \_\_\_\_\_  
Align the plastic ties with the gray tape (C) on the wiring harness assembly.  
\_\_\_\_\_

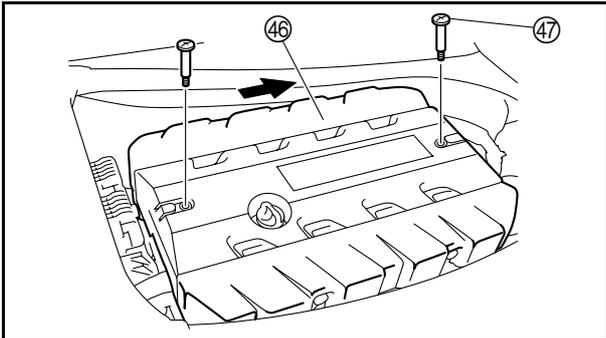


36. Connect the remote control receiver coupler (42).

37. Install the antenna holders (43).



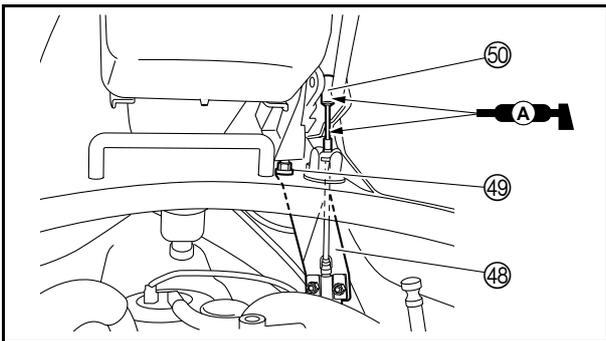
38. Connect the APS coupler (44), and the 8 multifunction meter, sensor, and switch couplers (45).



39. Install the engine cover (46), and then tighten the engine cover bolts (47) to the specified torque.

**NOTE:** \_\_\_\_\_  
Hold the engine cover down, and slide the cover forward to install it.

 Engine cover bolt:  
5 N·m (0.5 kgf·m, 3.7 ft·lb)

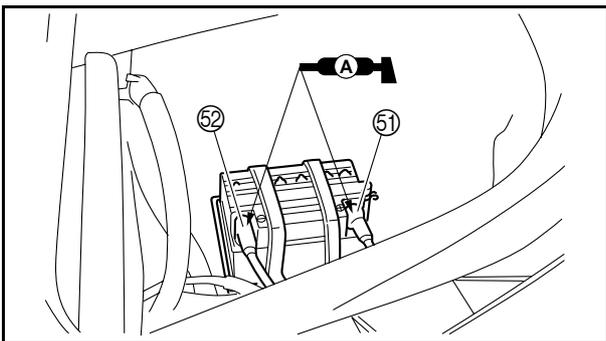


40. Install the shift cable bracket (48), and then tighten the shift cable bracket nuts (49) to the specified torque.

 Shift cable bracket nut:  
16 N·m (1.6 kgf·m, 11.8 ft·lb)

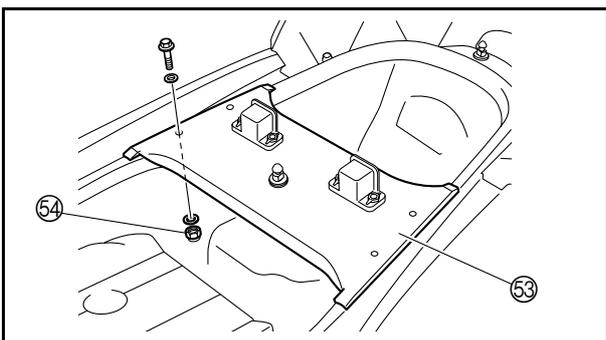
41. Connect the shift cable joint (50).

**NOTE:** \_\_\_\_\_  
Apply grease to the shift cable joint and shift cable.



42. Connect the positive battery cable (51) and negative battery cable (52) to the battery.

**NOTE:** \_\_\_\_\_  
After connecting the battery cables to the battery, coat the battery cable terminals and battery terminals with a water resistance grease to minimize terminal corrosion.

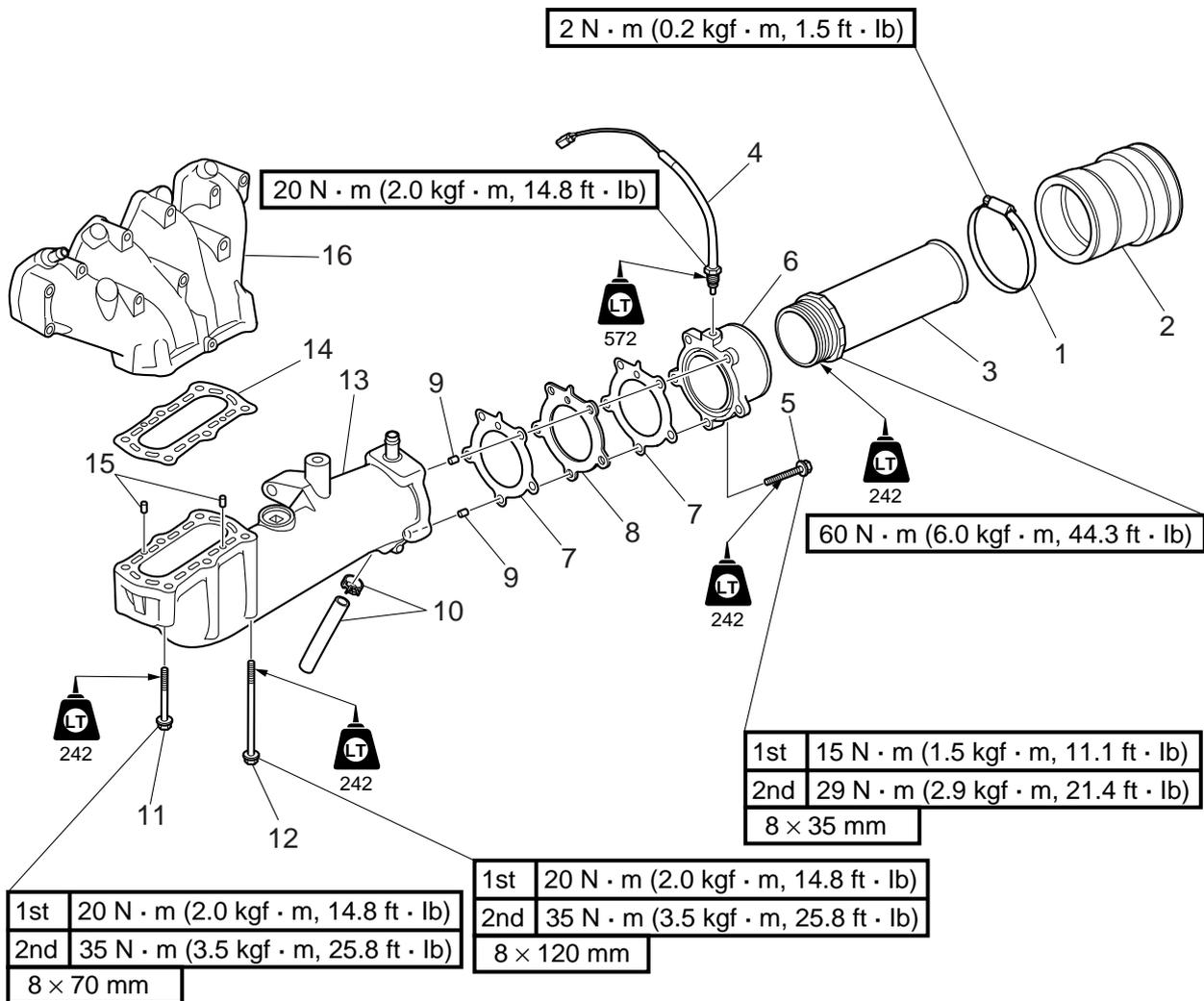


43. Install the deck beam (53) and tighten the deck beam nuts (54) to the specified torque.

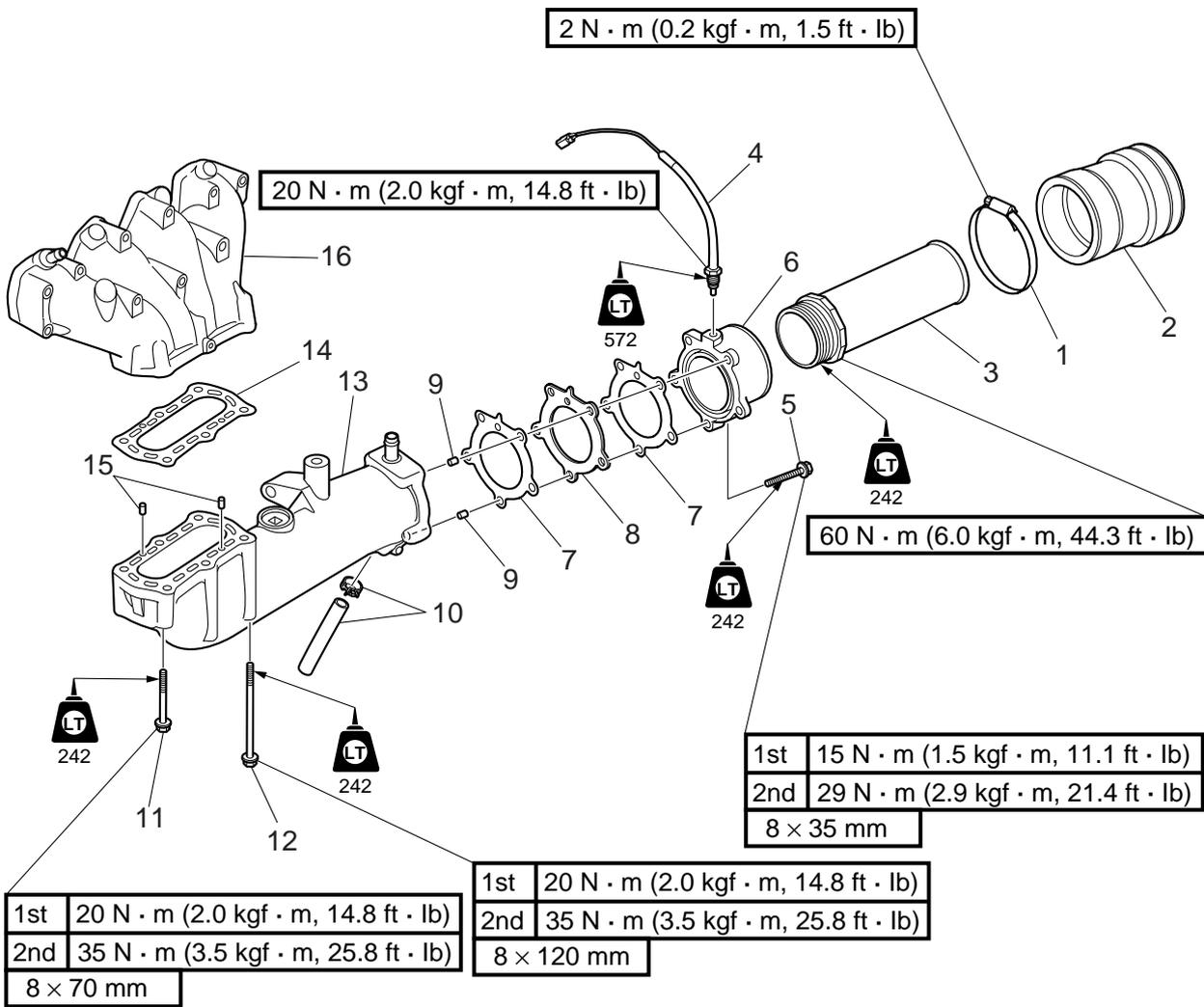
 Deck beam nut:  
18 N·m (1.8 kgf·m, 13.3 ft·lb)



**Muffler**  
**Muffler disassembly**

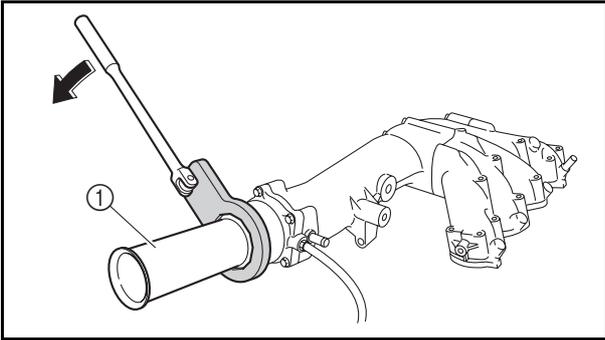


Step	Procedure/Part name	Q'ty	Service points
1	Clamp	1	
2	Pipe	1	
3	Exhaust pipe 3	1	
4	Thermo sensor	1	
5	Bolt	5	
6	Exhaust pipe 2	1	
7	Gasket	2	<b>Not reusable</b>
8	Silencer plate	1	
9	Dowel pin	2	
10	Clamp/cooling water hose	1/1	



5

Step	Procedure/Part name	Q'ty	Service points
11	Bolt	2	<p><b>Not reusable</b></p> <p>Reverse the disassembly steps for assembly.</p>
12	Bolt	4	
13	Exhaust pipe 1	1	
14	Gasket	1	
15	Dowel pin	2	
16	Exhaust manifold	1	



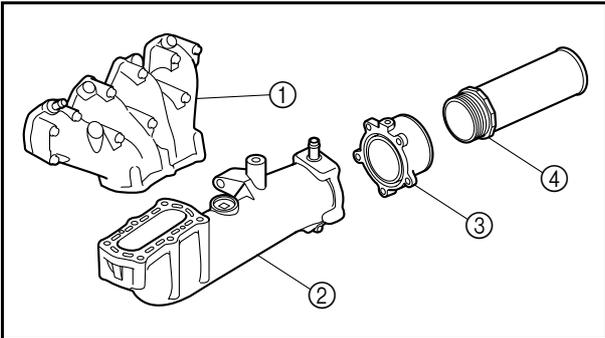
**Exhaust pipe 3 removal**

**1. Remove:**

- Exhaust pipe 3 ①



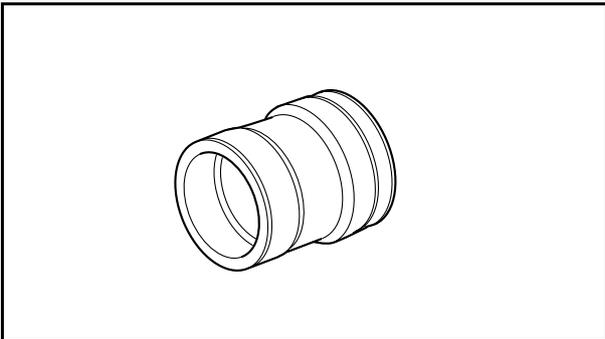
Exhaust pipe wrench:  
90890-06726



**Muffler check**

**1. Check:**

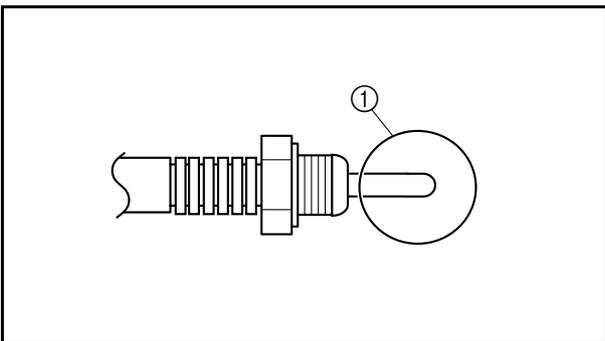
- Exhaust manifold ①
  - Exhaust pipe 1 ②
  - Exhaust pipe 2 ③
  - Exhaust pipe 3 ④
- Cracks/damage → Replace.



**Pipe check**

**1. Check:**

- Pipe
- Cracks/damage → Replace the pipe.



**Thermo sensor check**

**1. Check:**

- Thermo sensor tube ①
- Bends/damage → Replace the thermo sensor.

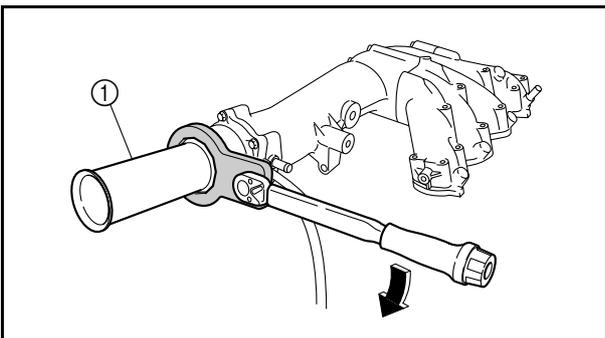
**Exhaust pipe 3 installation**

**1. Install:**

- Exhaust pipe 3 ①



Exhaust pipe wrench:  
90890-06726

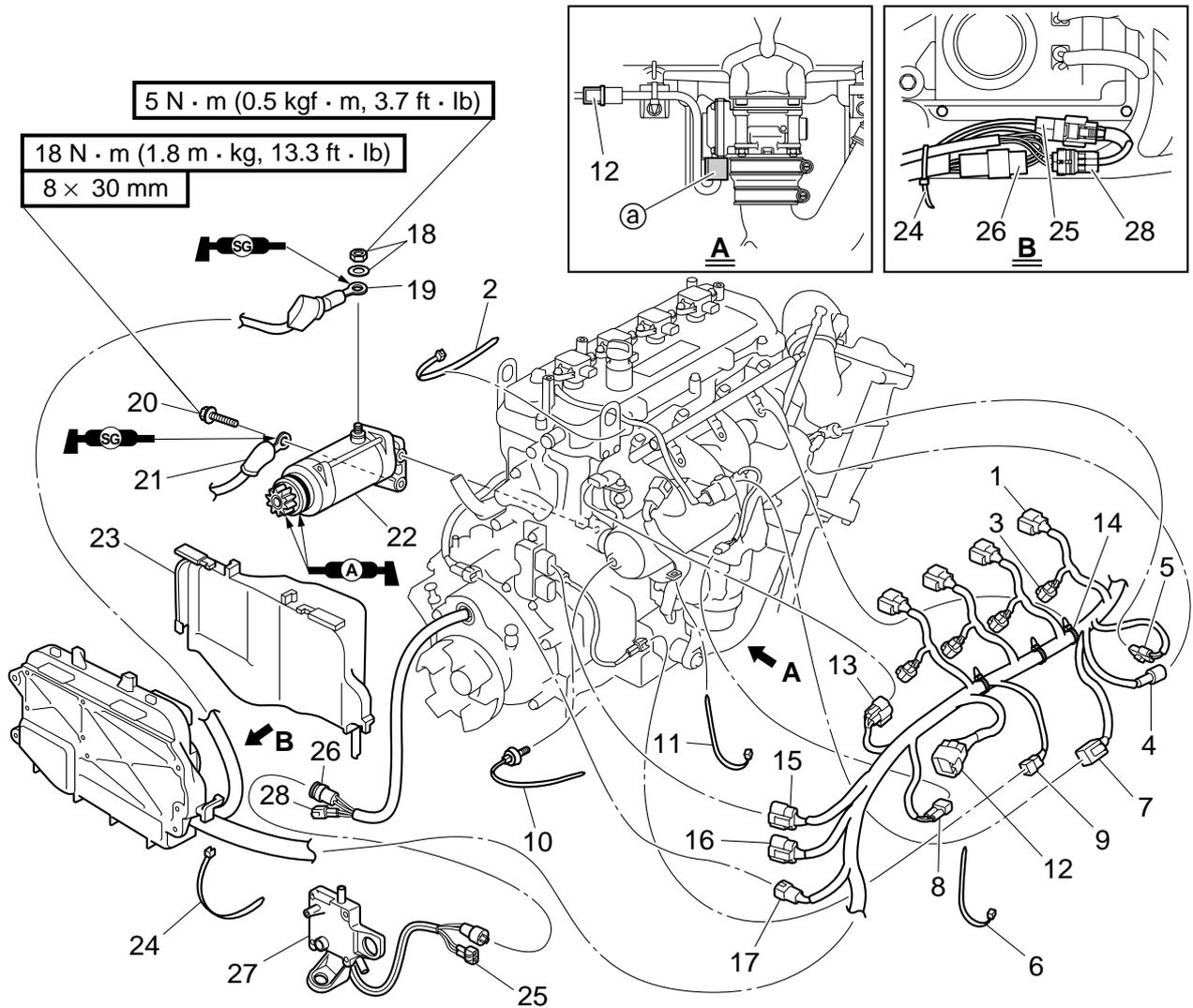


Exhaust pipe 3:  
60 N·m (6.0 kgf·m, 44.3 ft·lb)  
LOCTITE 242

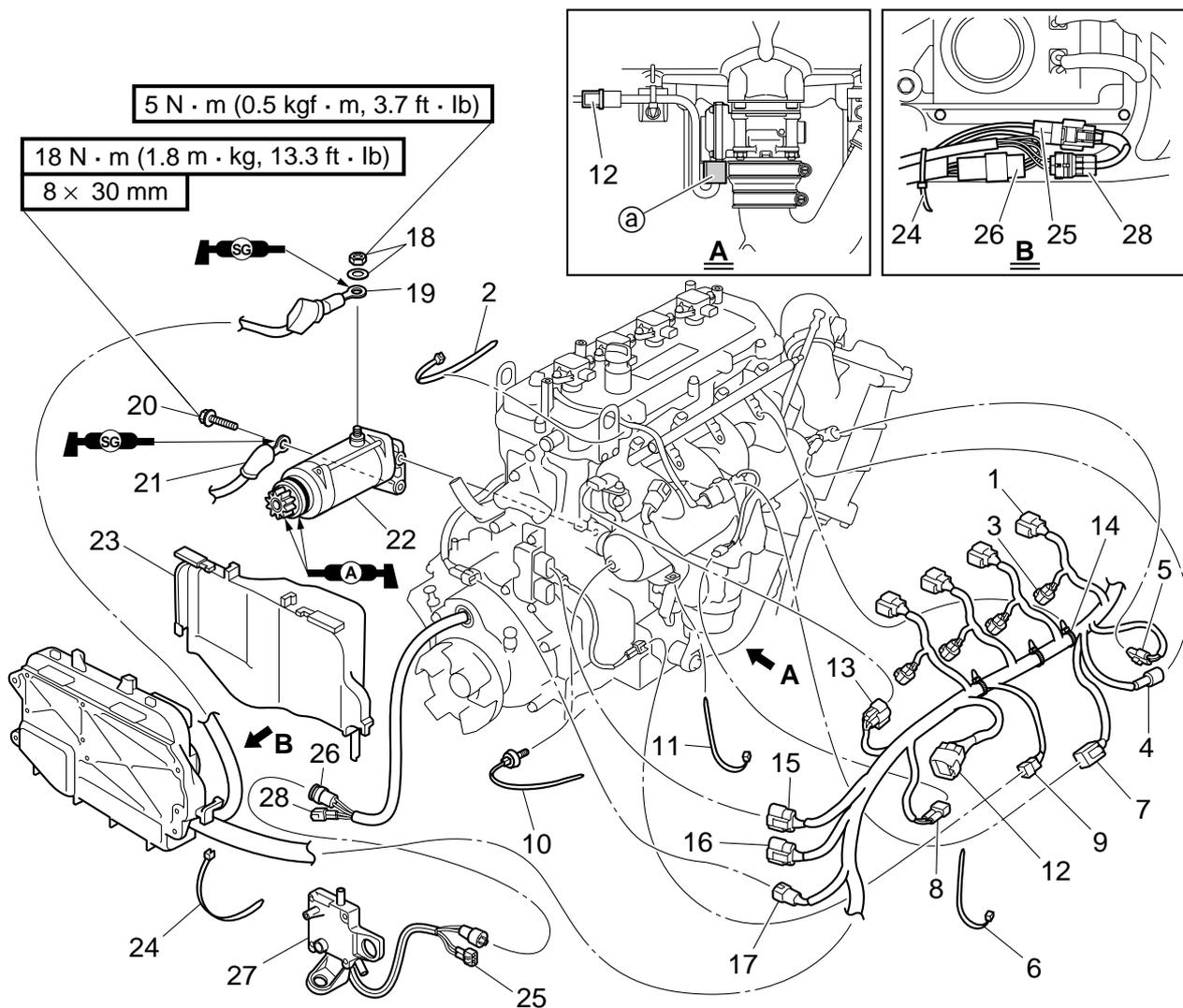


**Electrical box and starter motor**

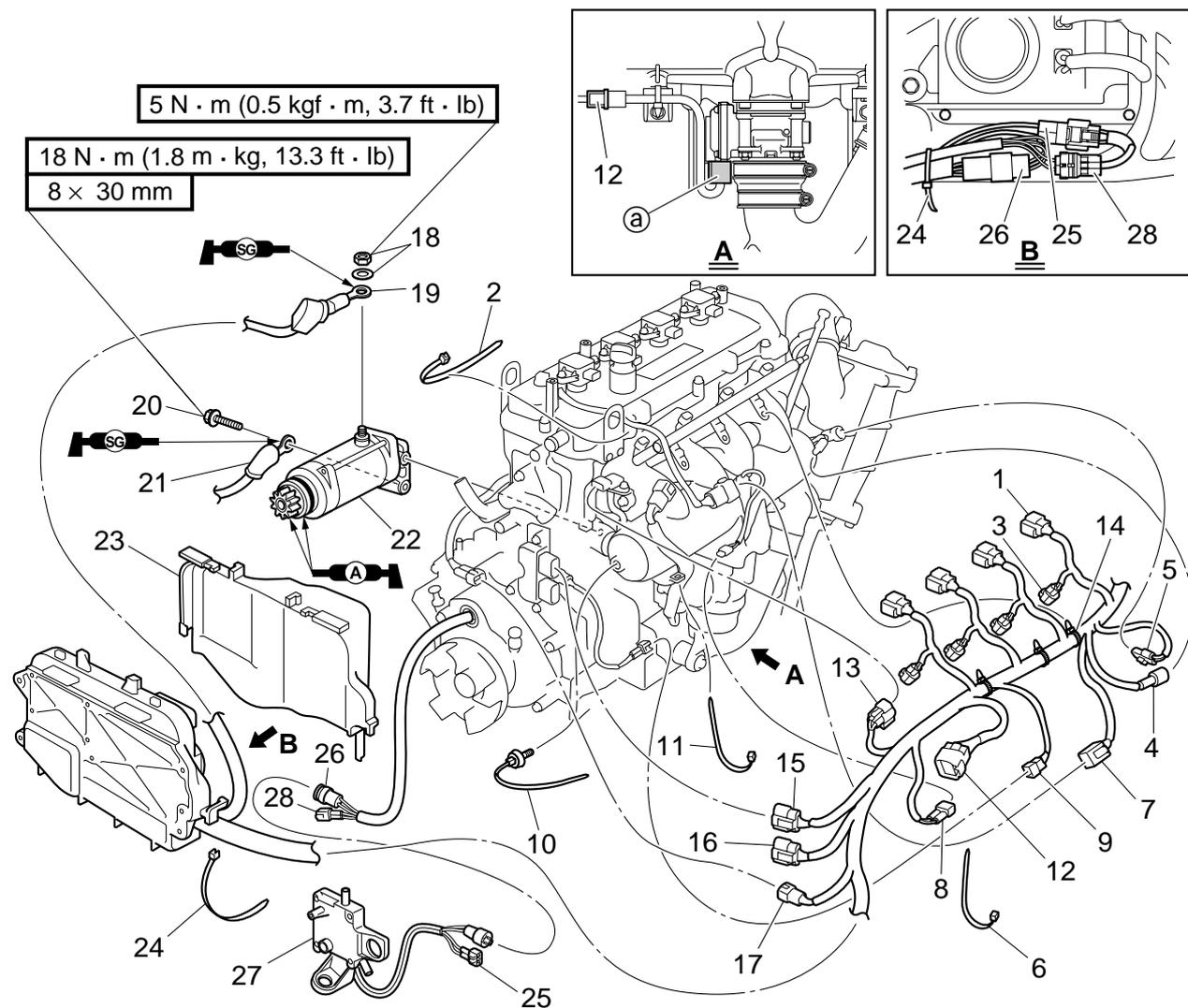
**Electrical box and starter motor removal**



Step	Procedure/Part name	Q'ty	Service points
1	Ignition coil coupler	4	
2	Plastic tie	1	
3	Injector coupler	4	
4	Knock sensor coupler	1	
5	Thermoswitch coupler	1	
6	Plastic tie	1	
7	Cam position sensor coupler	1	
8	Intake air temperature sensor coupler	1	
9	Engine temperature sensor coupler	1	
10	Plastic tie	1	



Step	Procedure/Part name	Q'ty	Service points
11	Plastic tie	1	<p><b>CAUTION:</b> _____</p> <p><b>Do not disconnect the throttle body assembly coupler (a).</b></p>
12	Throttle body assembly coupler	1	
13	Intake air pressure sensor coupler	1	
14	Clamp	3	
15	Earth plate coupler 1	1	
16	Earth plate coupler 2	1	
17	Oil pressure switch coupler	1	
18	Nut/washer	1/1	
19	Starter motor cable	1	



5 N · m (0.5 kgf · m, 3.7 ft · lb)

18 N · m (1.8 m · kg, 13.3 ft · lb)

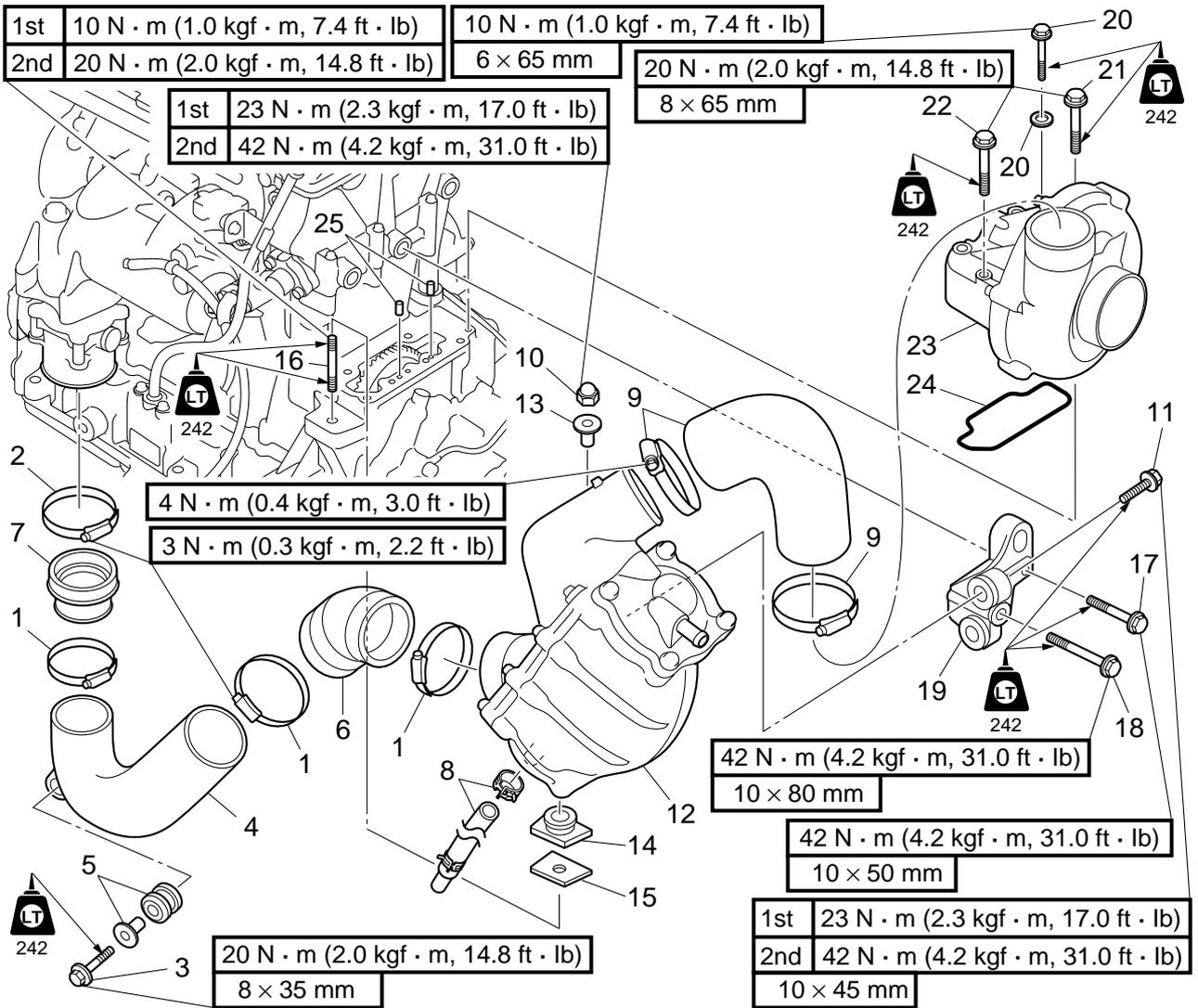
8 × 30 mm

5

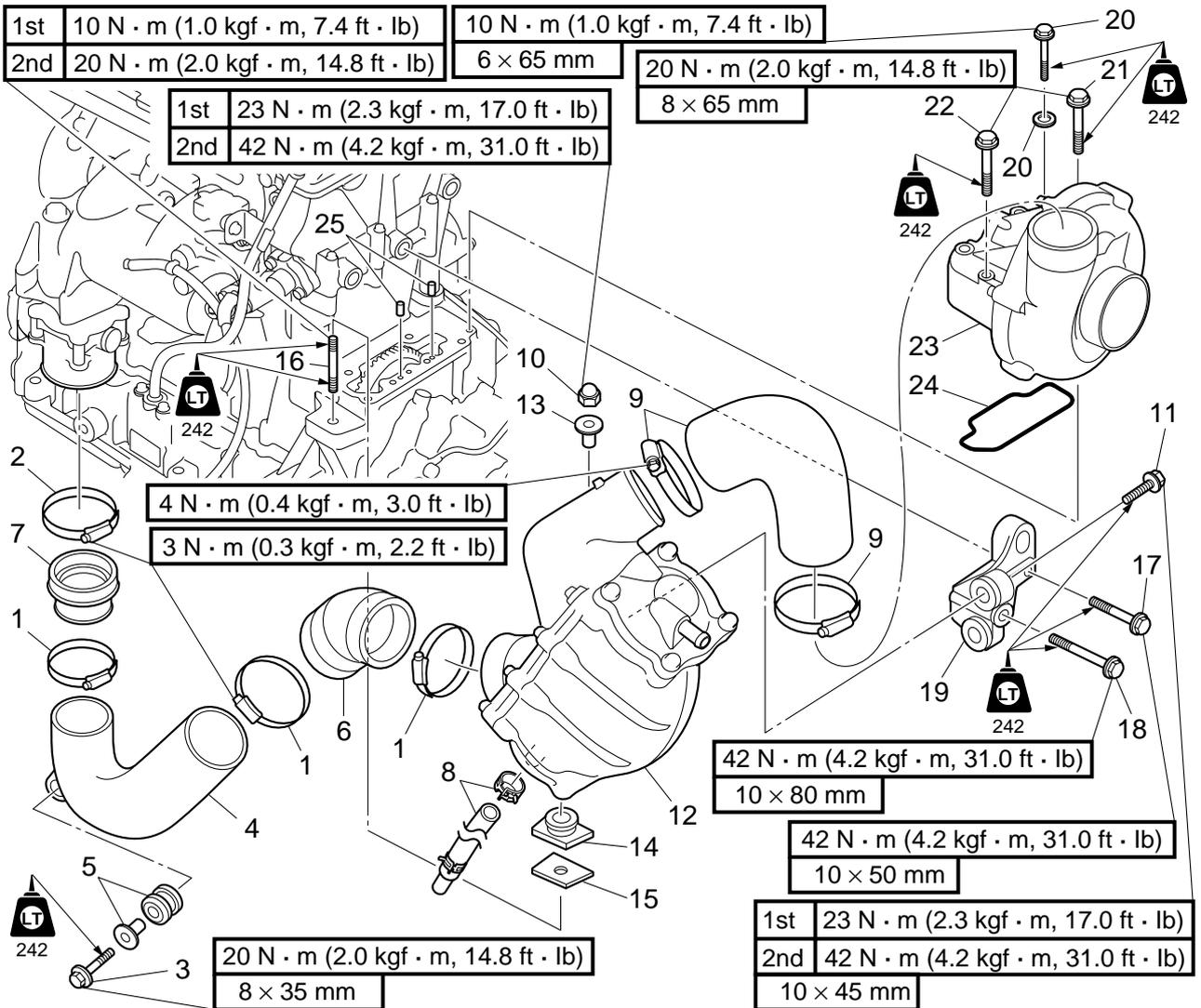
Step	Procedure/Part name	Q'ty	Service points
20	Bolt	2	Reverse the removal steps for installation.
21	Negative battery cable	1	
22	Starter motor	1	
23	Electrical box cover	1	
24	Plastic tie	1	
25	Rectifier regulator coupler	1	
26	Stator coil coupler	1	
27	Rectifier regulator	1	
28	Pick up coil coupler	1	



**Air cooler, supercharger, and throttle body assembly**  
**Air cooler and supercharger removal**

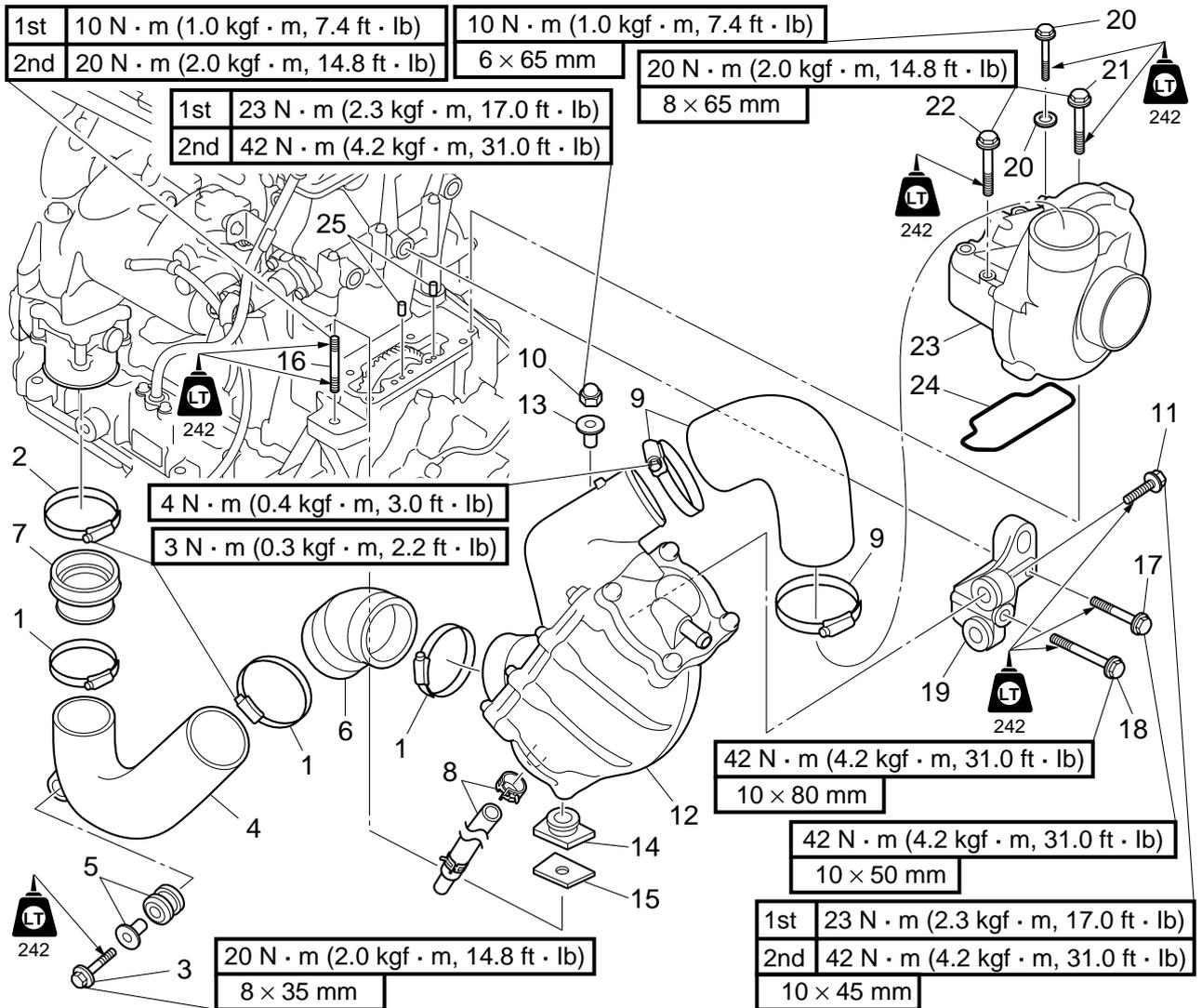


Step	Procedure/Part name	Q'ty	Service points
1	Clamp	3	
2	Clamp	1	
3	Bolt	1	
4	Boost pipe	1	
5	Collar/grommet	1/1	
6	Hose	1	
7	Joint	1	
8	Clamp/cooling water hose	1/1	
9	Clamp/air cooler intake hose	2/1	
10	Nut	1	



**5**

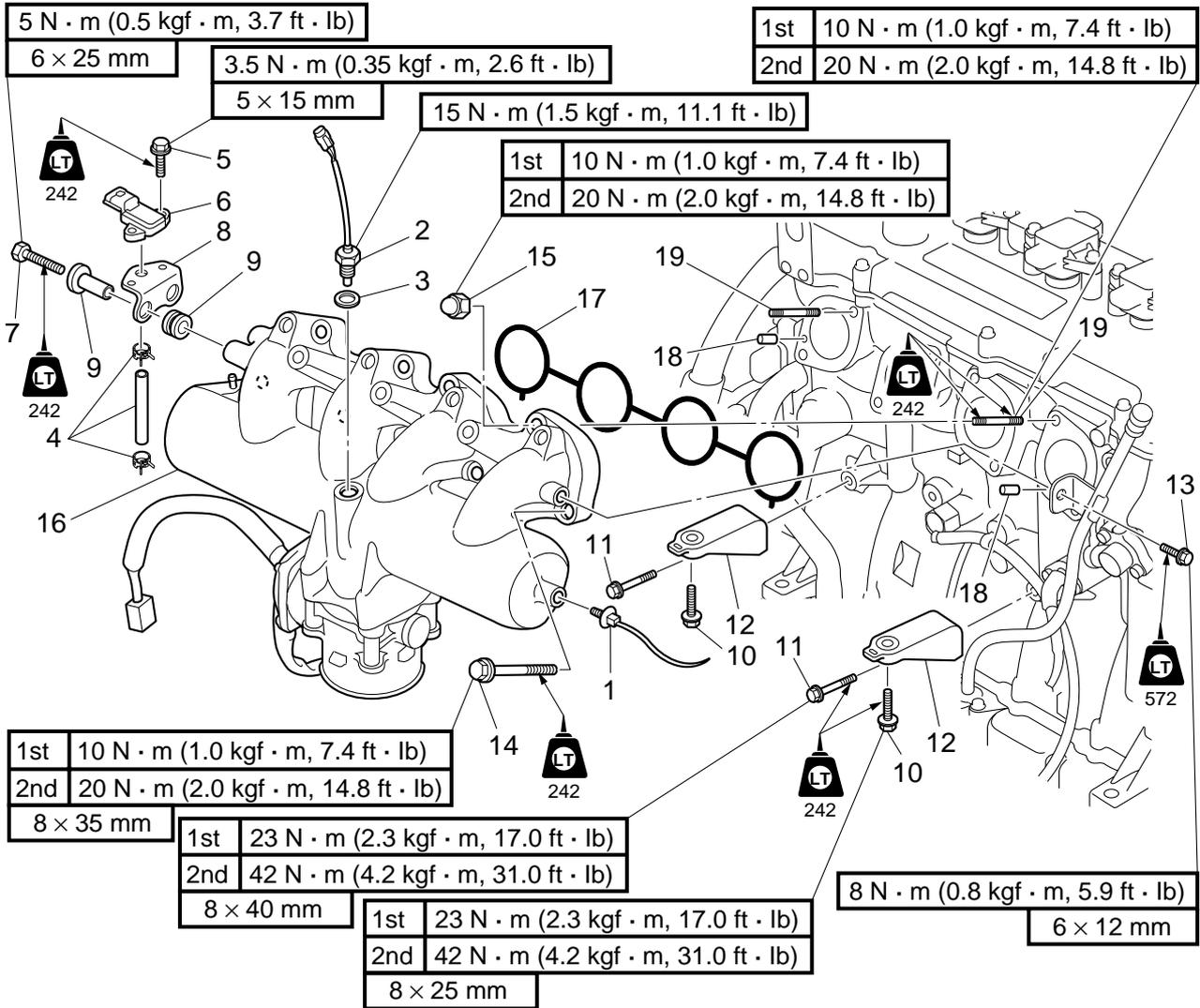
Step	Procedure/Part name	Q'ty	Service points
11	Bolt	2	
12	Air cooler assembly	1	
13	Collar	1	
14	Grommet	1	
15	Plate	1	
16	Stud bolt	1	
17	Bolt	1	
18	Bolt	1	
19	Stay	1	



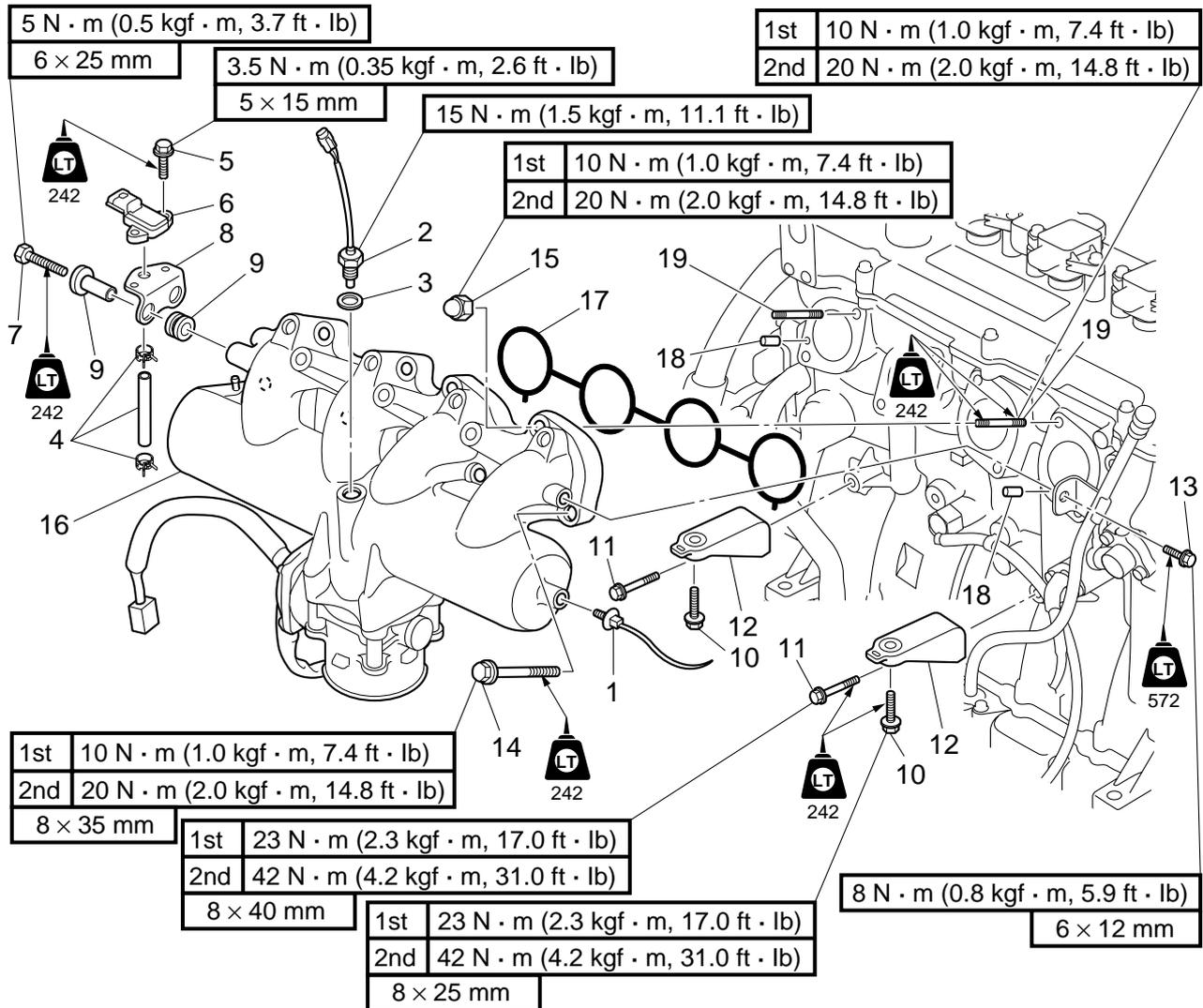
Step	Procedure/Part name	Q'ty	Service points
20	Bolt/washer	2/2	<p><b>Not reusable</b></p> <p>Reverse the removal steps for installation.</p>
21	Bolt	3	
22	Bolt	1	
23	Supercharger assembly	1	
24	O-ring	1	
25	Dowel pin	2	



Intake assembly removal



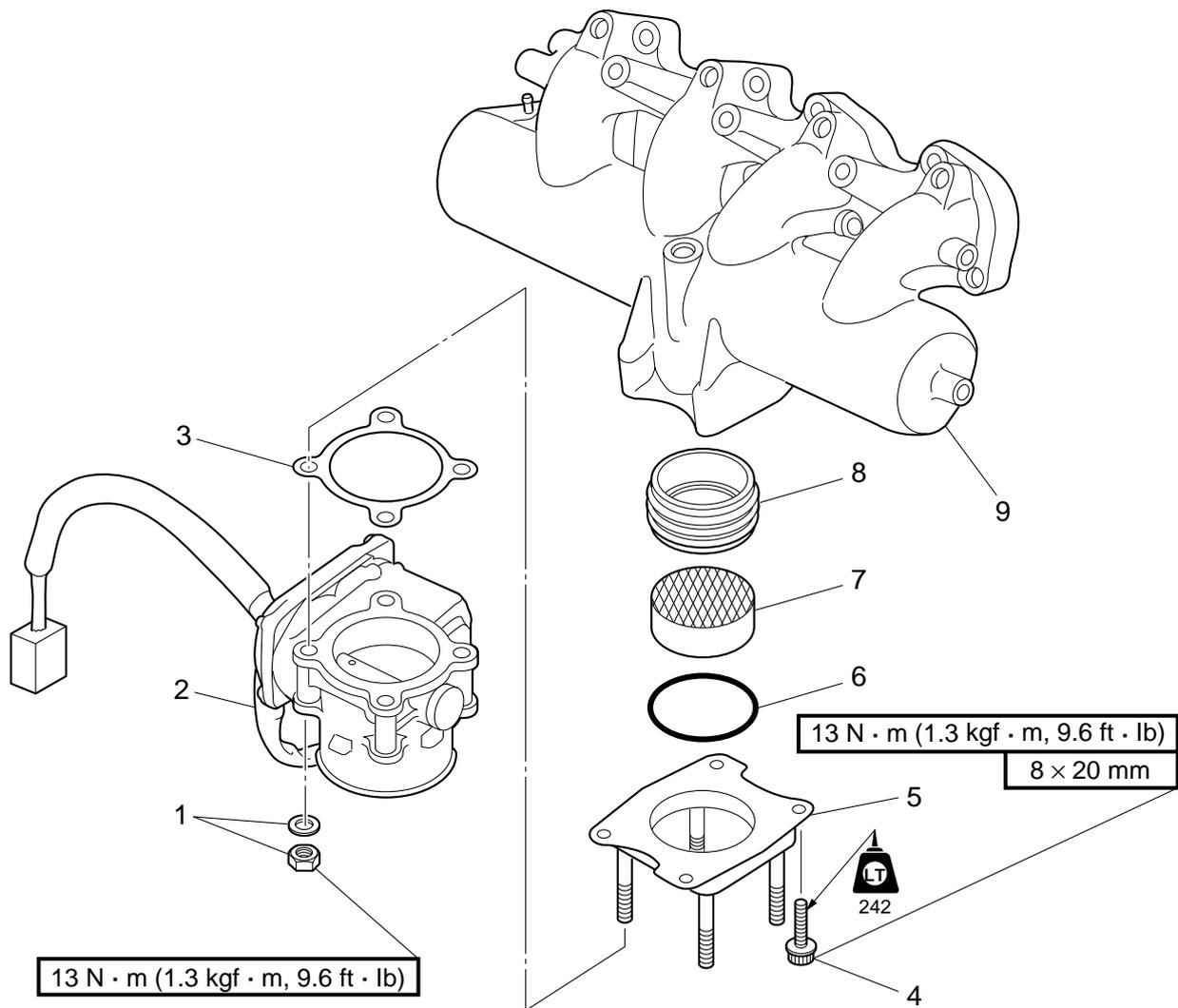
Step	Procedure/Part name	Q'ty	Service points
	Fuel injector		Refer to "Fuel tank removal" in Chapter 4.
1	Plastic tie	1	
2	Intake air temperature sensor	1	
3	Washer	1	<b>Not reusable</b>
4	Clamp/hose	2/1	
5	Bolt	2	
6	Intake air pressure sensor	1	
7	Bolt	2	
8	Bracket	1	
9	Collar/grommet	2/2	
10	Bolt	2	



Step	Procedure/Part name	Q'ty	Service points
11	Bolt	2	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p><b>Not reusable</b></p> </div> <p>Reverse the removal steps for installation.</p>
12	Stay	2	
13	Bolt	1	
14	Bolt	6	
15	Nut	2	
16	Intake assembly	1	
17	Packing	1	
18	Dowel pin	2	
19	Stud bolt	2	

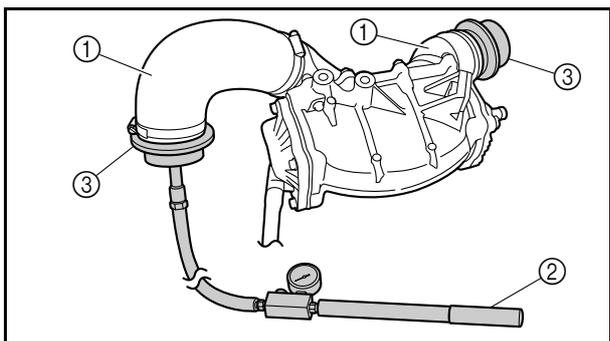
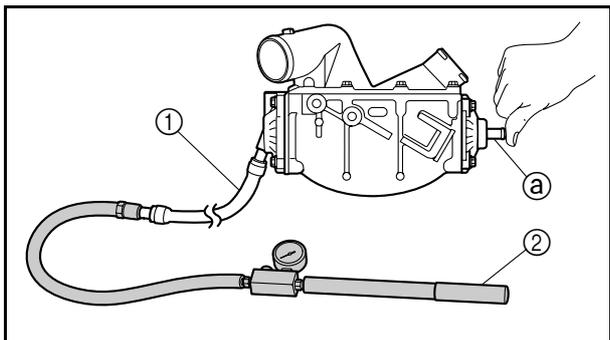
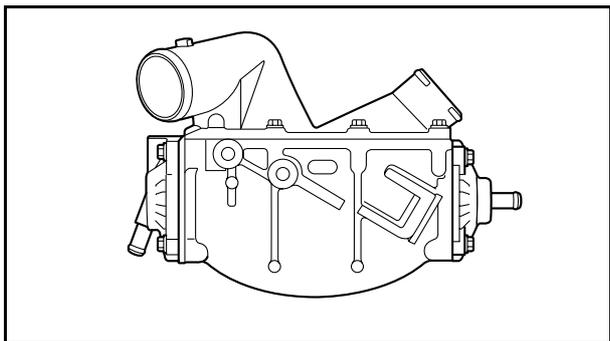


Intake disassembly



5

Step	Procedure/Part name	Q'ty	Service points
1	Nut/washer	4/4	
2	Throttle body assembly	1	
3	Gasket	1	<b>Not reusable</b>
4	Bolt	4	
5	Joint	1	
6	O-ring	1	<b>Not reusable</b>
7	Ribbon	1	
8	Holder	1	
9	Intake manifold	1	
			Reverse the disassembly steps for assembly.



**Air cooler check**

**CAUTION:**

The air cooler assembly should not be disassembled.

**1. Check:**

- Air cooler assembly  
Cracks/damage → Replace the air cooler assembly.
- Air cooler holding pressure  
Cannot be maintained → Replace the air cooler assembly.

**Checking steps:**

**NOTE:**

When checking the air cooler, connect the hoses ① to the air cooler.

1. Connect the special service tool ② to the inlet or outlet of the air cooler water passage.



Leakage tester ②:  
90890-06840

2. Cover the other end ① of the water passage with a finger.
3. Apply the specified positive pressure and check that the pressure is maintained.



Specified positive pressure (water passage):  
200 kPa (2.0 kgf/cm<sup>2</sup>, 28.5 psi)

4. Connect the special service tools ② and ③ to the inlet and outlet of the air cooler air passage.

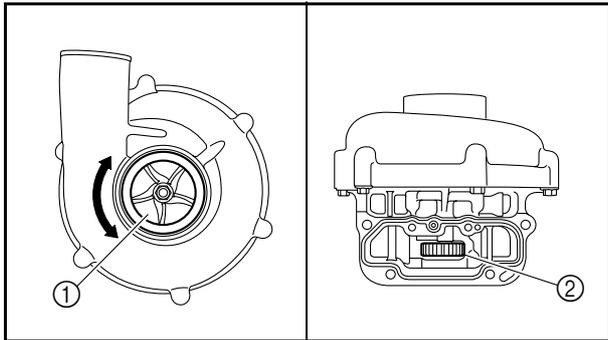


Air cooler attachment ③:  
90890-06731

5. Apply the specified positive pressure and check that the pressure is maintained.



Specified positive pressure (air passage):  
100 kPa (1.0 kgf/cm<sup>2</sup>, 14.2 psi)



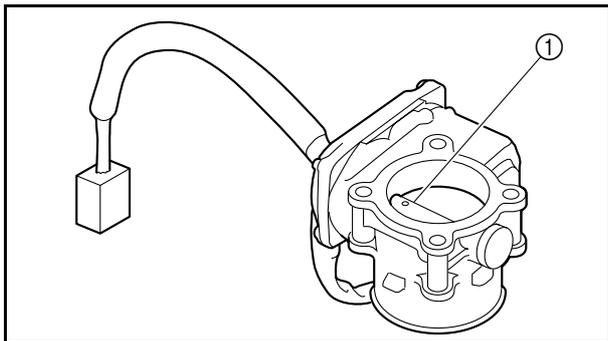
### Supercharger check

**CAUTION:** \_\_\_\_\_

The supercharger should not be disassembled.

**1. Check:**

- Impeller ①
- Gear ②  
Cracks/damage → Replace the supercharger assembly.
- Supercharger operation  
Rough movement → Replace the supercharger assembly.



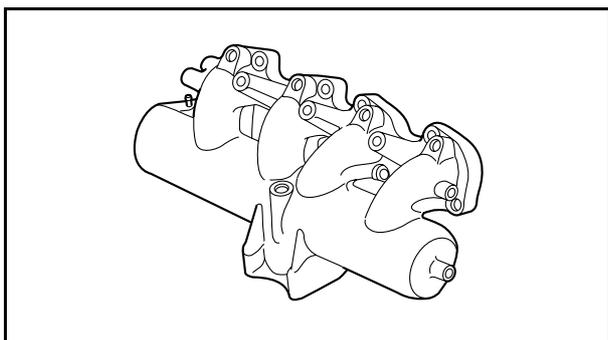
### Throttle body assembly check

**CAUTION:** \_\_\_\_\_

The throttle body assembly should not be disassembled.

**1. Check:**

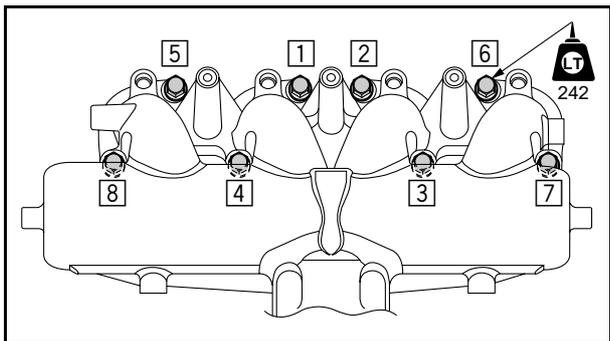
- Throttle shaft ①  
Cracks/damage → Replace the throttle body assembly.
- Throttle valve opening  
Refer to “Throttle position sensor” in Chapter 7.



### Intake manifold check

**1. Check:**

- Intake manifold  
Cracks/damage → Replace the intake manifold.



**Intake manifold installation**

**1. Install:**

- Intake manifold

**NOTE:**

Tighten the bolts to the specified torques in the sequence shown.



Intake manifold bolt:  
 1st: 10 N·m (1.0 kgf·m, 7.4 ft·lb)  
 2nd: 20 N·m (2.0 kgf·m, 14.8 ft·lb)  
 LOCTITE 242

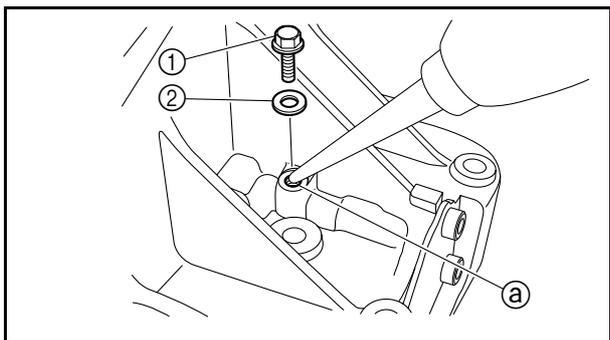
**Supercharger installation**

**1. Lubricate:**

- Supper charger impeller shaft

**CAUTION:**

Before installing the supercharger assembly, be sure to lubricate the supercharger impeller shaft with engine oil.



**Lubricating steps:**

1. Remove the bolt ① and gasket ②.

**CAUTION:**

Do not reuse the gasket ②, always replace it with a new one.

2. Lubricate the supercharger impeller shaft with engine oil through the oil filler hole ③.

**NOTE:**

Turn the supercharger impeller while lubricating the supercharger impeller shaft through the hole ③.

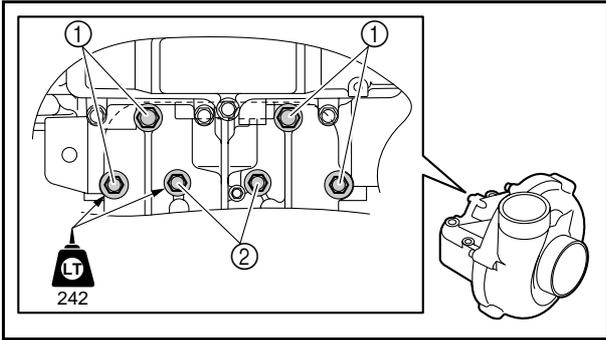


Recommended engine oil:  
 API: SE, SF, SG, SH, SJ, or SL  
 SAE: 10W-30, 10W-40, 20W-40, or 20W-50

3. Tighten the bolt ① to the specified torque.



Supercharger oil filler hole bolt:  
 4 N·m (0.4 kgf·m, 3.0 ft·lb)



**2. Install:**

- Supercharger

**Installation step:**

1. Tighten the supercharger bolts ①, and then bolts ② to the specified torque.

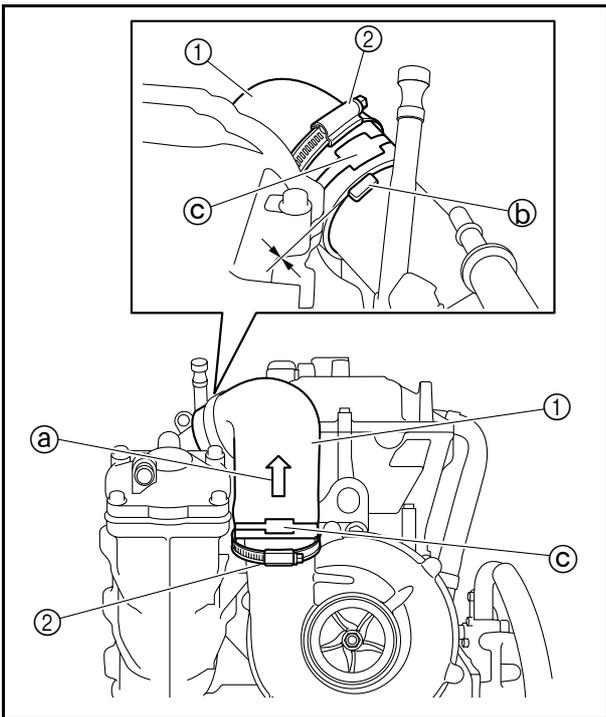


Supercharger bolt (M8 × 65 mm) ①:  
20 N·m (2.0 kgf·m, 14.8 ft·lb)

LOCTITE 242

Supercharger bolt (M6 × 65 mm) ②:  
10 N·m (1.0 kgf·m, 7.4 ft·lb)

LOCTITE 242



**Air cooler intake hose installation**

**1. Install:**

- Air cooler intake hose ①

**Installation steps:**

1. Install the air cooler intake hose ① between the supercharger and air cooler.

**NOTE:**

- Make sure that the arrow mark ③ on the air cooler intake hose ① is pointing up.
- Make sure that the hose ① contacts the projection ④ on the air cooler.

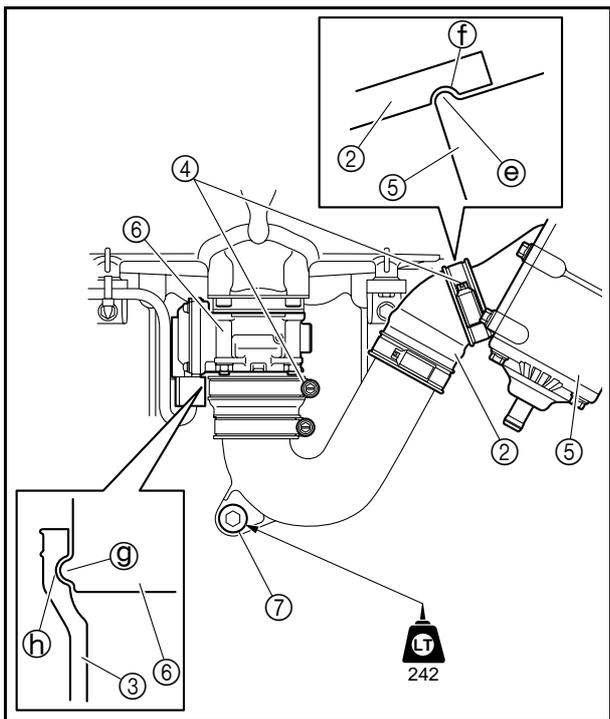
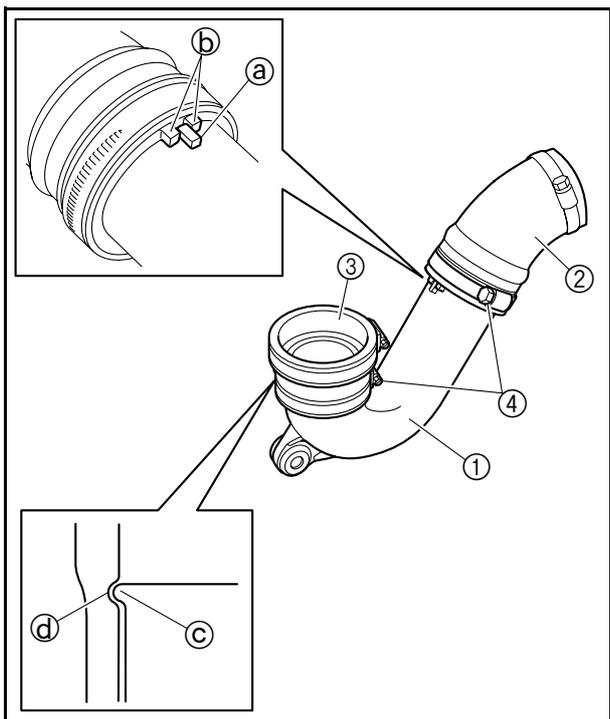
2. Tighten each clamp ② to the specified torque.

**NOTE:**

Fit each hose clamp ② over the white paint mark ⑤ on each end of the air cooler intake hose ①, making sure that the fastener of the clamp is aligned with the wide portion of the paint mark as shown.



Air cooler intake hose clamp:  
4 N·m (0.4 kgf·m, 3.0 ft·lb)



### Boost pipe installation

#### 1. Install:

- Boost pipe ①
- Hose ②
- Joint ③

#### Installation steps:

1. Install the hose ② and joint ③ to the boost pipe ①.

#### NOTE:

- Fit the projection ① on the boost pipe ① between the projections ② on the hose ②.
- Fit the lip ③ on the boost pipe ① into the groove ④ in the joint ③.

2. Tighten the hose clamps ④ to the specified torque.

	Hose clamp: 3 N·m (0.3 kgf·m, 2.2 ft·lb)
---	---

3. Install the boost pipe assembly between the air cooler assembly ⑤ and the throttle body assembly ⑥.

#### NOTE:

- Fit the lip ⑤ on the air cooler assembly ⑤ into the groove ⑥ in the hose ②.
- Fit the lip ⑦ on the throttle body assembly ⑤ into the groove ⑧ in the joint ③.

4. Tighten the hose clamps ④ to the specified torque.

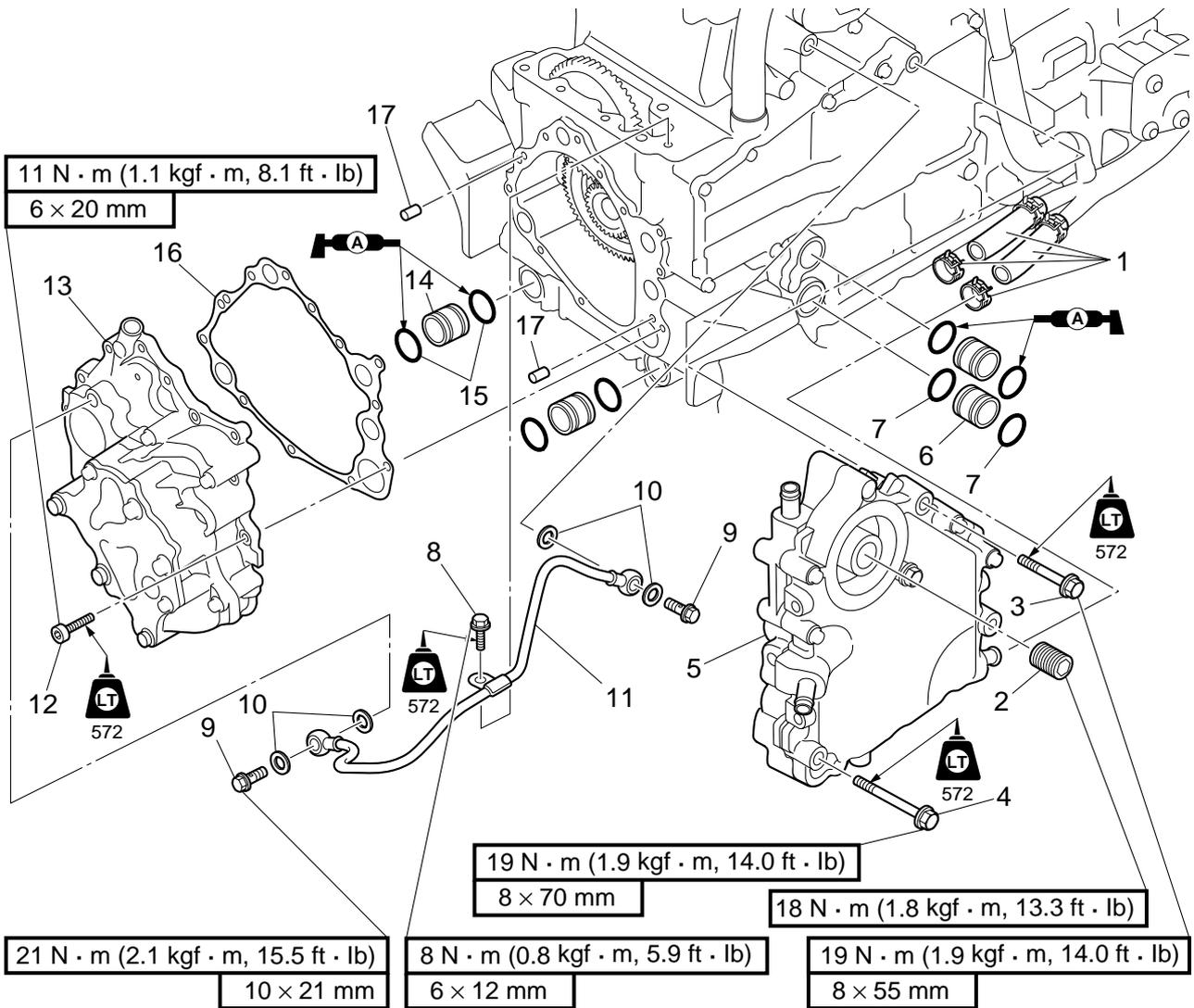
	Hose clamp: 3 N·m (0.3 kgf·m, 2.2 ft·lb)
---	---

5. Tighten the boost pipe bolt ⑦ to the specified torque.

	Boost pipe bolt: 20 N·m (2.0 kgf·m, 14.8 ft·lb) LOCTITE 242
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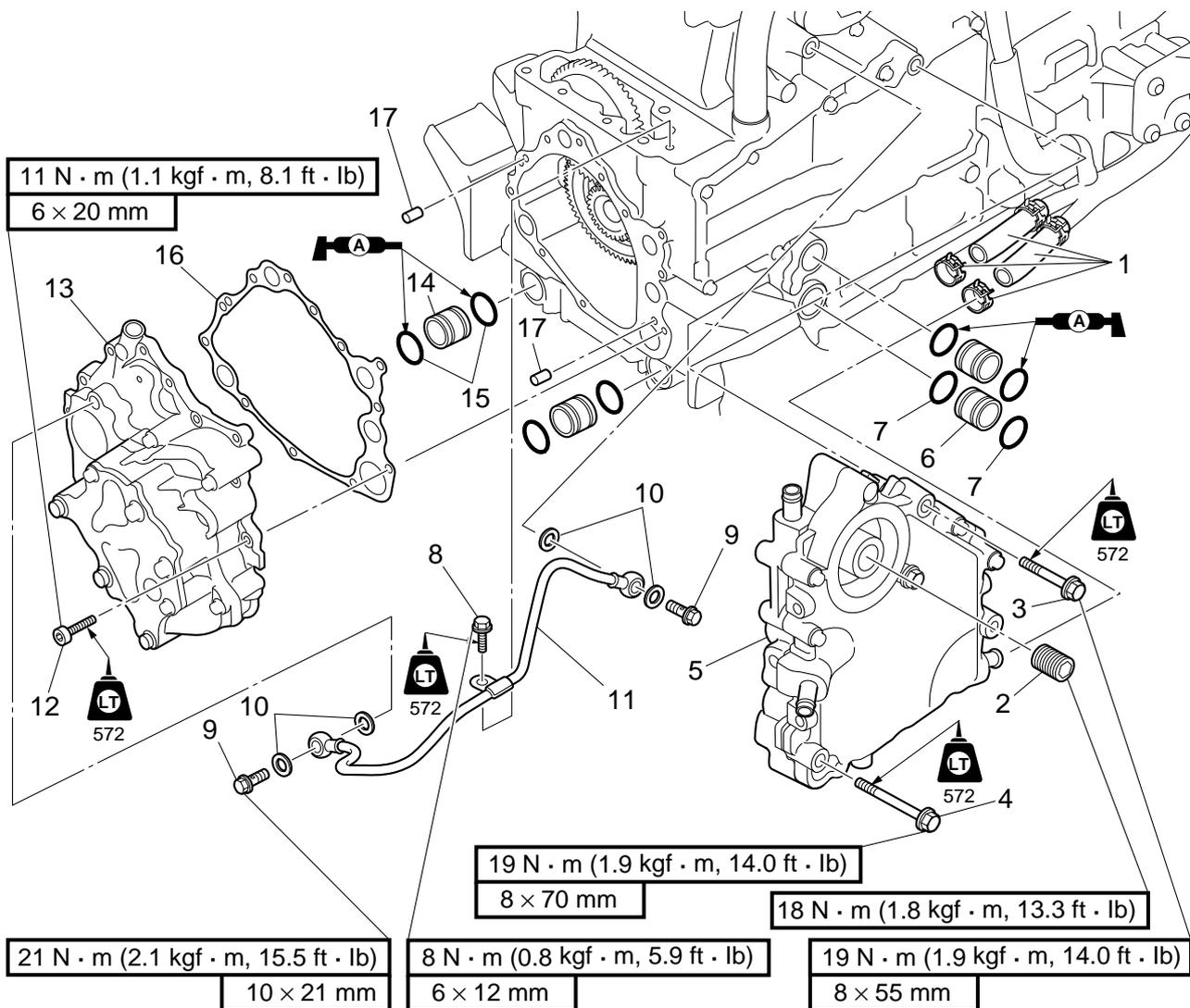


**Oil cooler, oil pump assembly, and drive gear**  
**Oil cooler and oil pump assembly removal**



5

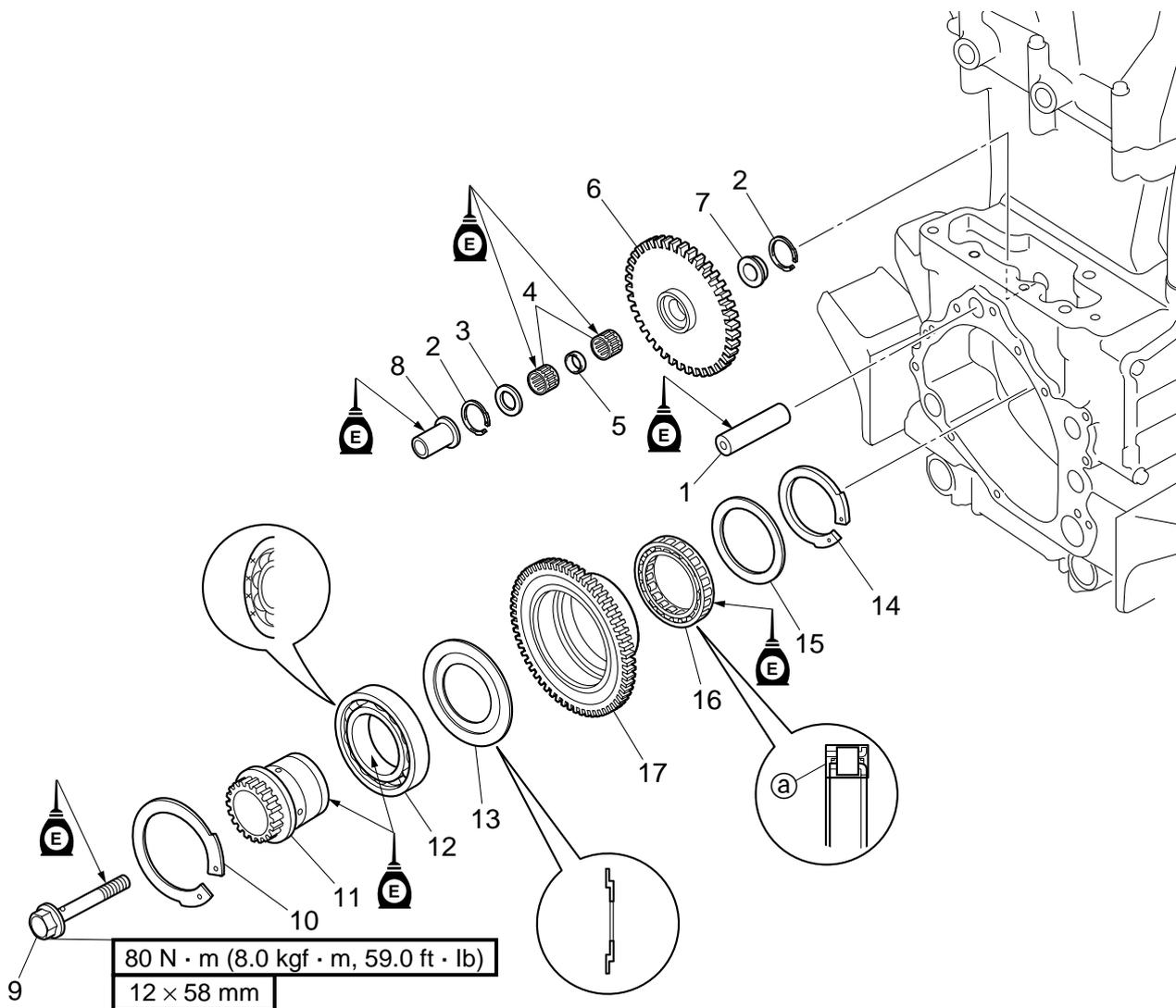
Step	Procedure/Part name	Q'ty	Service points
1	Clamp/cooling water hose	2/2	
2	Oil filter bolt	1	
3	Bolt	1	
4	Bolt	2	
5	Oil cooler assembly	1	
6	Connector	2	
7	O-ring	4	<b>Not reusable</b>
8	Bolt	1	
9	Bolt	2	
10	Gasket	4	<b>Not reusable</b>



Step	Procedure/Part name	Q'ty	Service points
11	Oil pipe	1	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">Not reusable</div> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">Not reusable</div> </div> Reverse the removal steps for installation.
12	Bolt	12	
13	Oil pump assembly	1	
14	Connector	2	
15	O-ring	4	
16	Gasket	1	
17	Dowel pin	2	

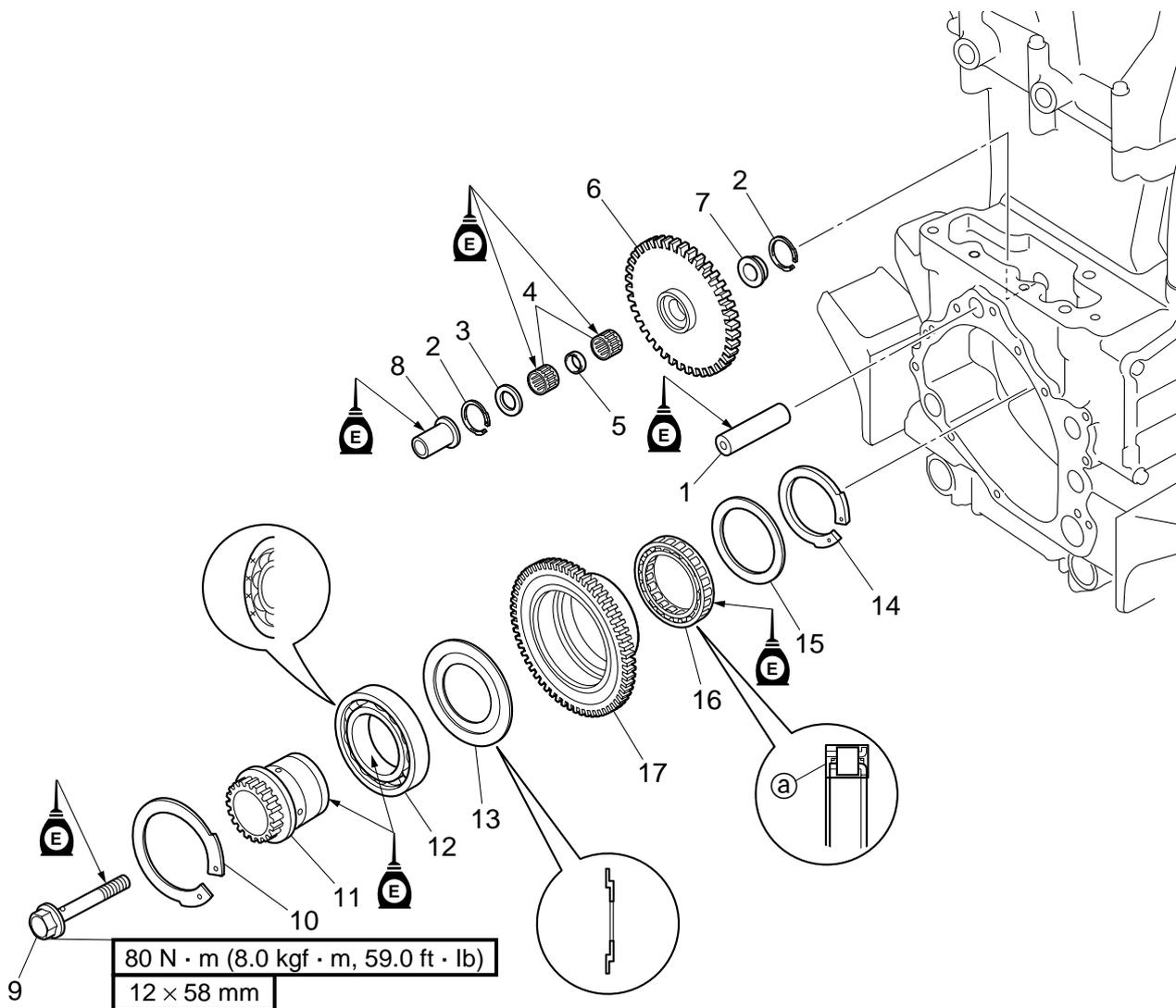


Drive gear removal

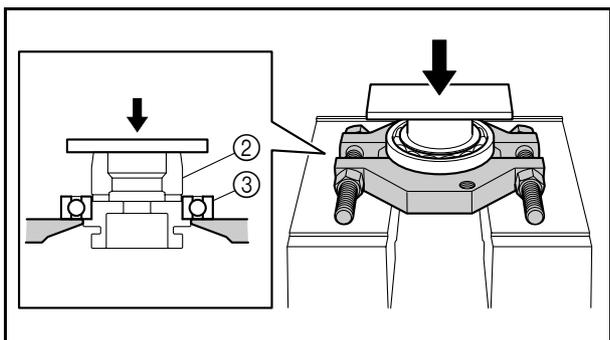
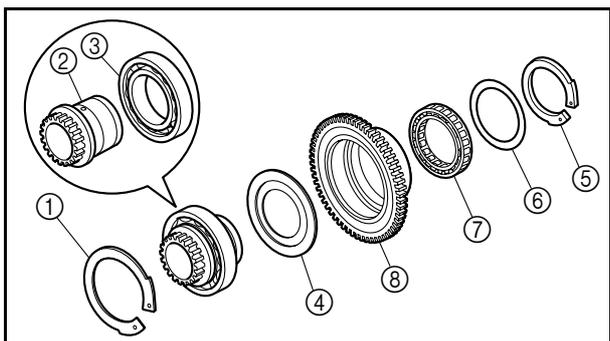
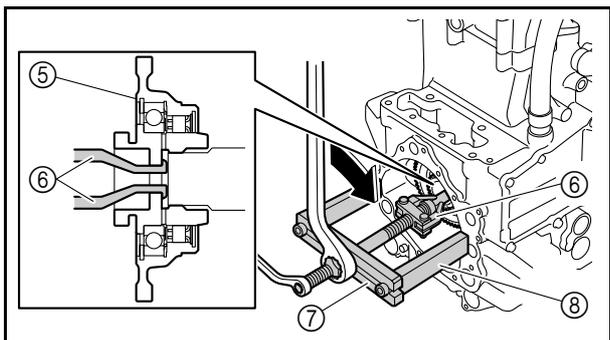
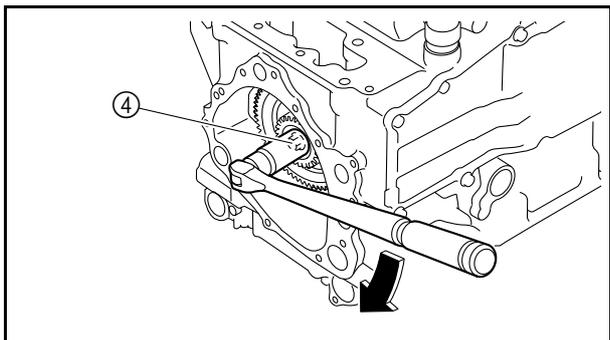
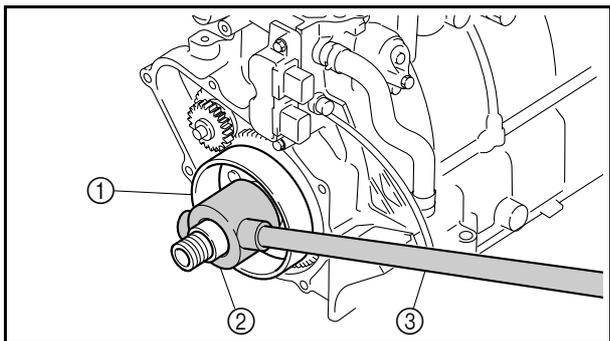


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Step	Procedure/Part name	Q'ty	Service points
1	Shaft	1	
2	Circlip	2	
3	Washer	1	
4	Bearing	2	
5	Collar	1	
6	Idle gear	1	
7	Washer	1	
8	Collar	1	
9	Bolt	1	Left-hand threads
10	Circlip	1	
11	Oil pump drive gear	1	
12	Bearing	1	



Step	Procedure/Part name	Q'ty	Service points
13	Washer	1	<p><b>CAUTION:</b></p> <ul style="list-style-type: none"> <li>• Make sure that the drive gear clutch is installed so that the side <b>a</b> is facing toward the supercharger drive gear as shown.</li> <li>• Check the drive gear clutch operation after installation.</li> </ul>
14	Circlip	1	
15	Washer	1	
16	Drive gear clutch	1	
17	Supercharger drive gear	1	Reverse the removal steps for installation.



### Drive gear assembly removal

#### 1. Remove:

- Drive gear assembly

#### Removal steps:

1. Remove the drive coupling and generator cover.  
Refer to "Generator cover and flywheel magneto removal."
2. Hold the flywheel magneto ① with the special service tools ② and ③.



Shaft holder ②:  
90890-06721

Driver handle ③:  
90890-06722

3. Remove the drive gear assembly bolt ④.

#### NOTE:

The drive gear assembly bolt has left-hand threads. Turn the bolt clockwise to loosen it.

4. Remove the drive gear assembly ⑤ with the special service tools.



Bearing puller assembly ⑥:  
90890-06535

Stopper guide plate ⑦:  
90890-06501

Stopper guide stand ⑧:  
90890-06538

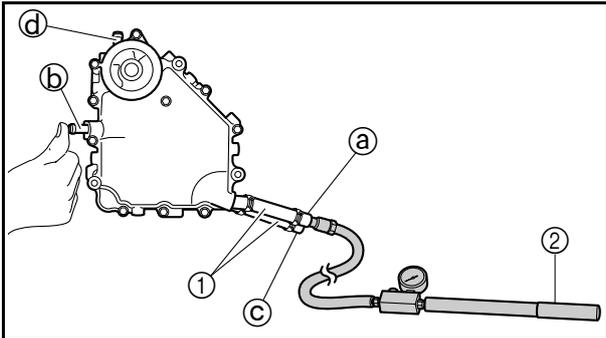
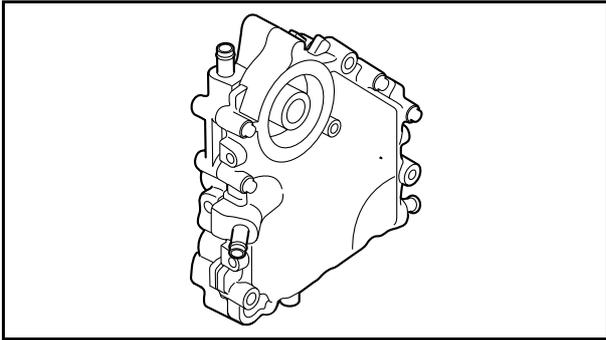
### Drive gear disassembly

#### 1. Remove:

- Circlip ①
- Oil pump drive gear ②
- Bearing ③
- Washer ④
- Circlip ⑤
- Washer ⑥
- Drive gear clutch ⑦
- Supercharger drive gear ⑧



Bearing separator:  
90890-06534



### Oil cooler assembly check

**CAUTION:** \_\_\_\_\_

The oil cooler assembly should not be disassembled.

**1. Check:**

- Oil cooler assembly  
Cracks/damage → Replace the oil cooler assembly.
- Oil cooler holding pressure  
Cannot be maintained → Replace the oil cooler assembly.

**Checking steps:**

**NOTE:** \_\_\_\_\_

When checking the oil cooler, connect the hoses ① to the oil cooler.

1. Connect the special service tool ② to the inlet of the oil cooler water passage ①.



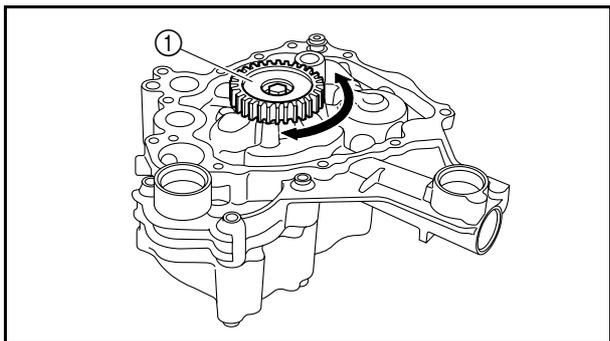
Leakage tester ②:  
90890-06840

2. Cover the outlet of the oil cooler water passage ② with a finger.
3. Apply the specified positive pressure and check that the pressure is maintained.



Specified positive pressure (water passage):  
200 kPa (2.0 kgf/cm<sup>2</sup>, 28.5 psi)

4. Repeat steps 1–3 to check the oil cooler water passage between ③ and ④.



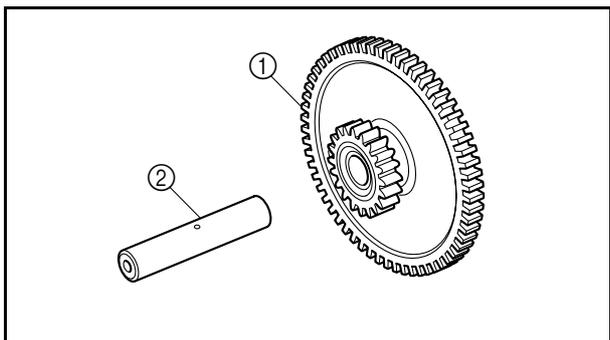
### Oil pump assembly check

**CAUTION:** \_\_\_\_\_

The oil pump assembly should not be disassembled.

**1. Check:**

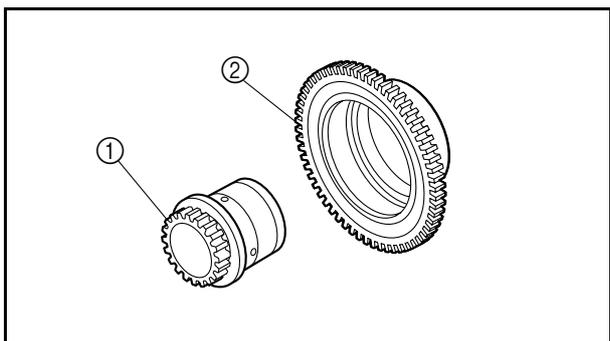
- Oil pump assembly
- Oil pump driven gear ①  
Cracks/damage → Replace the oil pump assembly.
- Oil pump operation  
Rough movement → Replace the oil pump assembly.



### Idle gear check

**1. Check:**

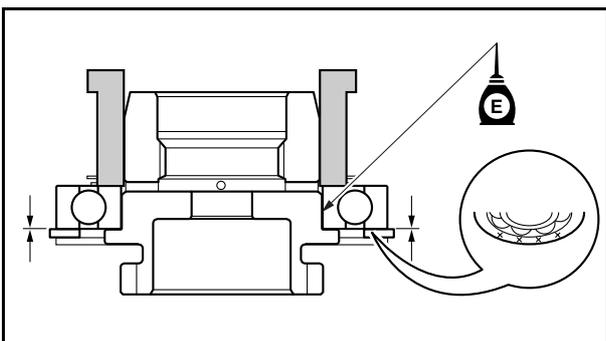
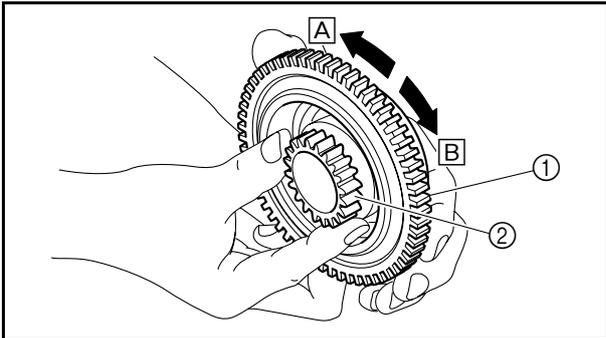
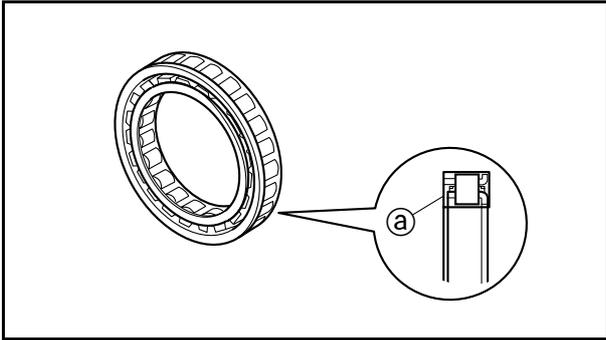
- Idle gear ①  
Cracks/damage → Replace the idle gear.
- Shaft ②  
Bends/wear → Replace the shaft.



### Drive gear check

**1. Check:**

- Oil pump drive gear ①
- Supercharger drive gear ②  
Cracks/damage → Replace.



**Drive gear clutch check**

**1. Check:**

- Drive gear clutch  
Cracks/damage → Replace the drive gear clutch.
- Drive gear clutch operation  
Does not operate properly → Replace the drive gear clutch.

**CAUTION:**

Make sure that the drive gear clutch is installed so that the side **a** is facing toward the supercharger drive gear as shown.

**Checking steps:**

1. Install the drive gear clutch onto the supercharger drive gear ①.
2. Install the oil pump drive gear ② onto the supercharger drive gear ①.
3. Hold the oil pump drive gear ②.
4. Turn the supercharger drive gear ① counterclockwise **A** and check that it does not turn.
5. Turn the supercharger drive gear ① clockwise **B** and check that it turns smoothly.

**Oil pump drive gear assembly**

**1. Install:**

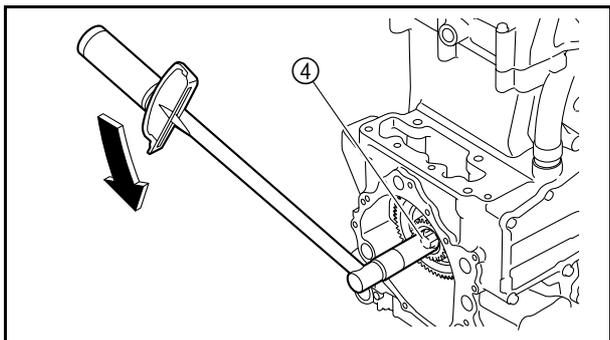
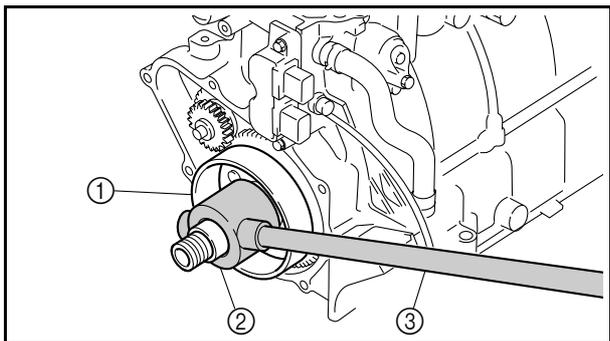
- Bearing

**NOTE:**

Use a pipe that is at least 22 mm (0.87 in) long and has an outer diameter of 55 mm (2.17 in) and an inner diameter of 45 mm (1.77 in). (For USA and Canada)



Bearing inner race attachment:  
90890-06661



### Drive gear assembly installation

#### 1. Install:

- Drive gear assembly

#### Installation steps:

1. Hold the flywheel magneto ① with the special service tools ② and ③.



Shaft holder ②:  
90890-06721

Driver handle ③:  
90890-06722

2. Tighten the drive gear assembly bolt ④.

#### NOTE:

- Apply engine oil to the threads of the drive gear assembly bolt.
- The drive gear assembly bolt has left-hand threads. Turn the bolt counterclockwise to tighten it.



Drive gear assembly bolt:  
80 N·m (8.0 kgf·m, 59.0 ft·lb)

3. Install the generator cover and drive coupling.

Refer to "Generator cover and flywheel magneto removal."



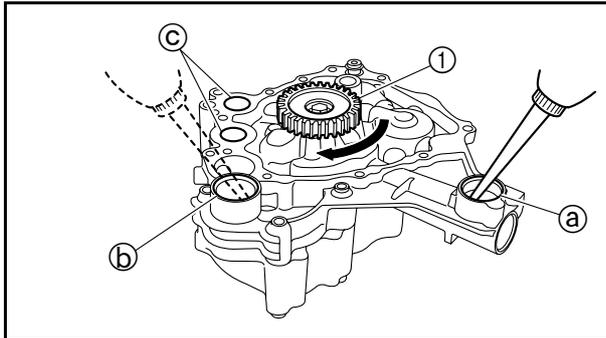
### Oil pump assembly installation

**1. Fill:**

- Oil pump assembly

**CAUTION:** \_\_\_\_\_

Be sure to fill the oil pump assembly with engine oil through the scavenge and feed ports.



**Filling steps:**

1. Fill the oil pump assembly with engine oil through the feed port (a) and scavenge port (b).

**NOTE:** \_\_\_\_\_

The oil level should be up to the brim.



Recommended engine oil:  
SAE: 10W-30, 10W-40, 20W-40, or 20W-50  
API: SE, SF, SG, SH, SJ, or SL

2. Turn the driven gear (1) of the oil pump clockwise while filling the oil pump assembly.
3. Continue filling the oil pump assembly until engine oil comes out of the ports (c).

**2. Install:**

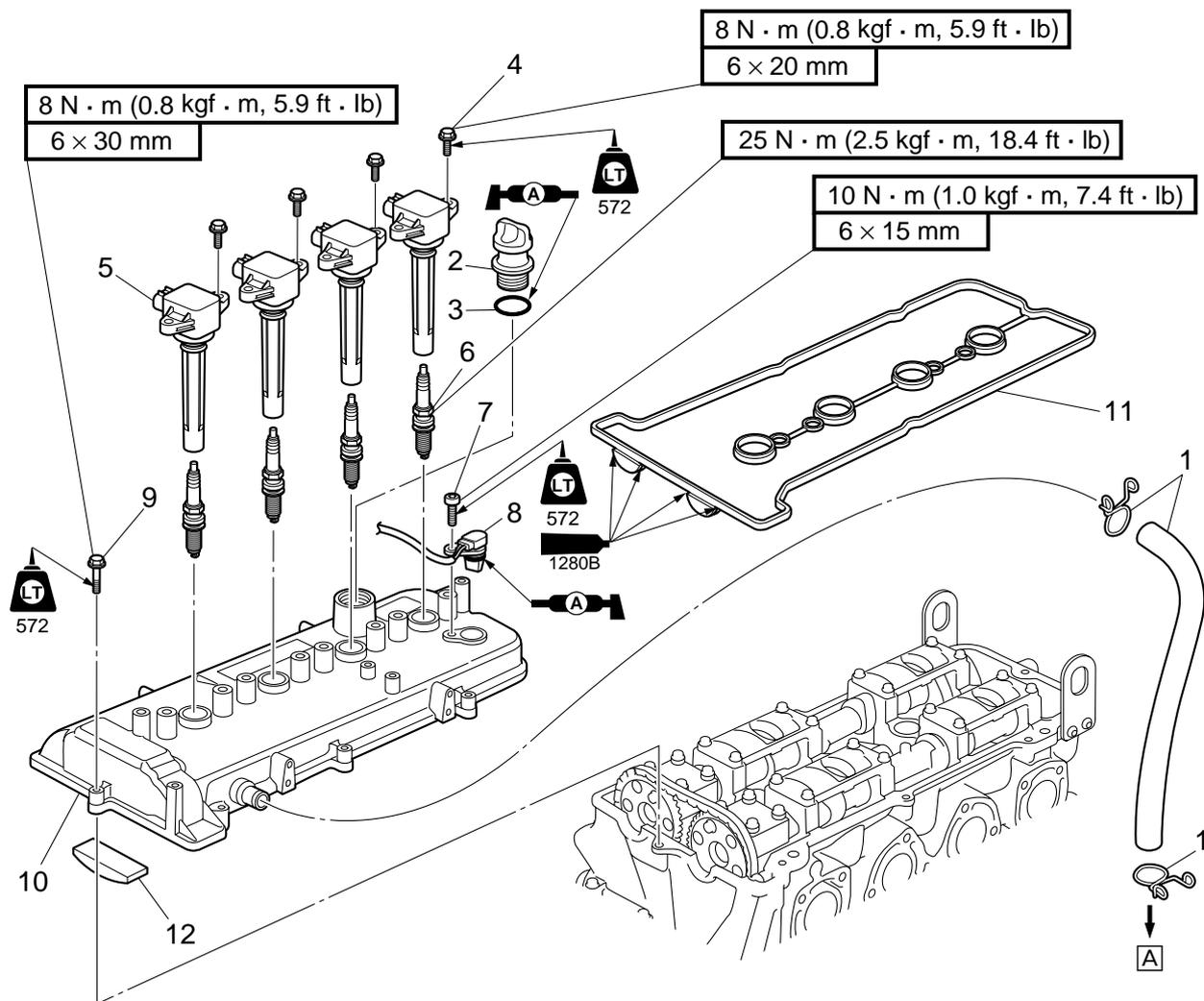
- Oil pump assembly



Oil pump assembly bolt:  
11 N·m (1.1 kgf·m, 8.1 ft·lb)  
LOCTITE 572



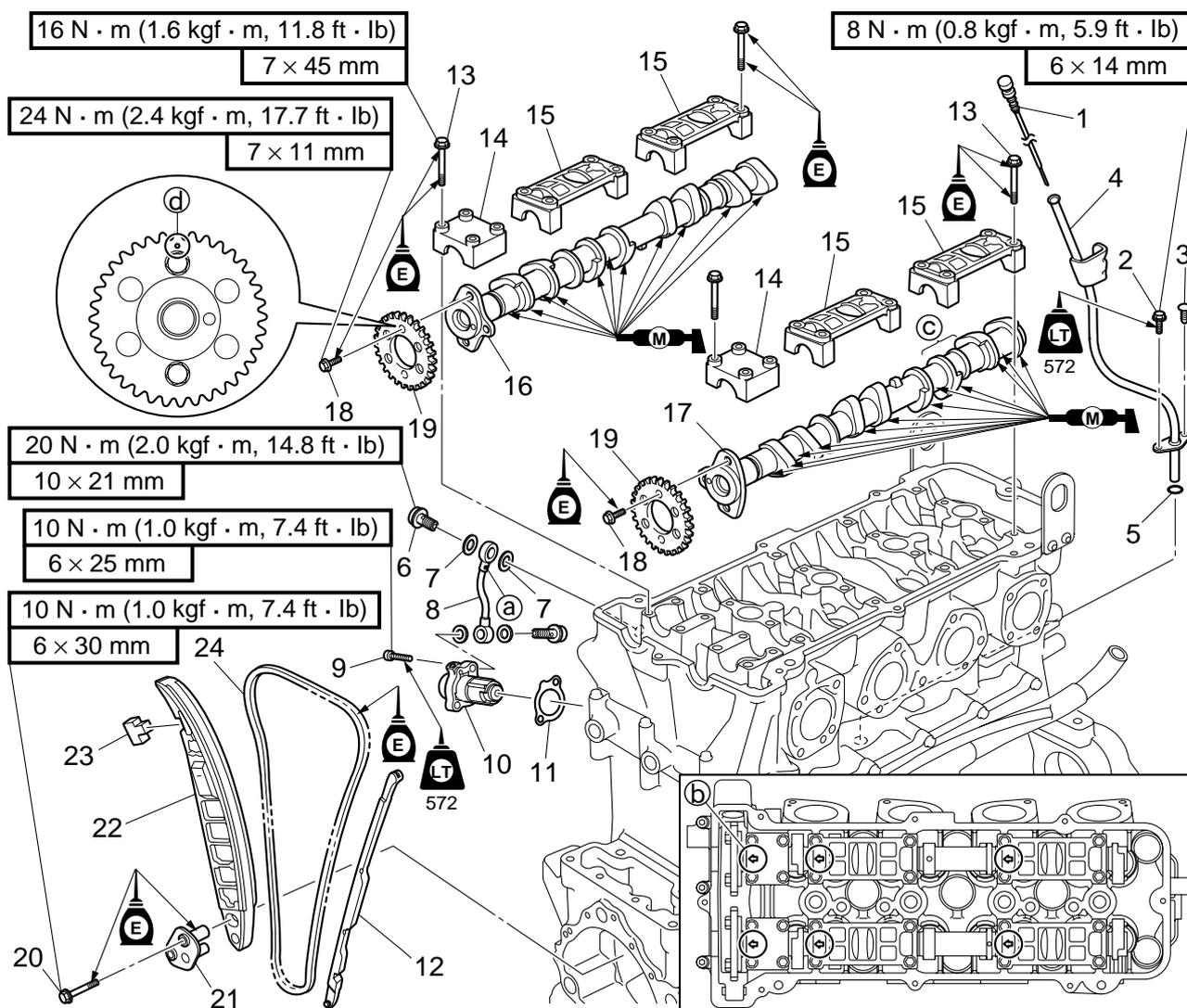
### Camshaft Cylinder head cover removal



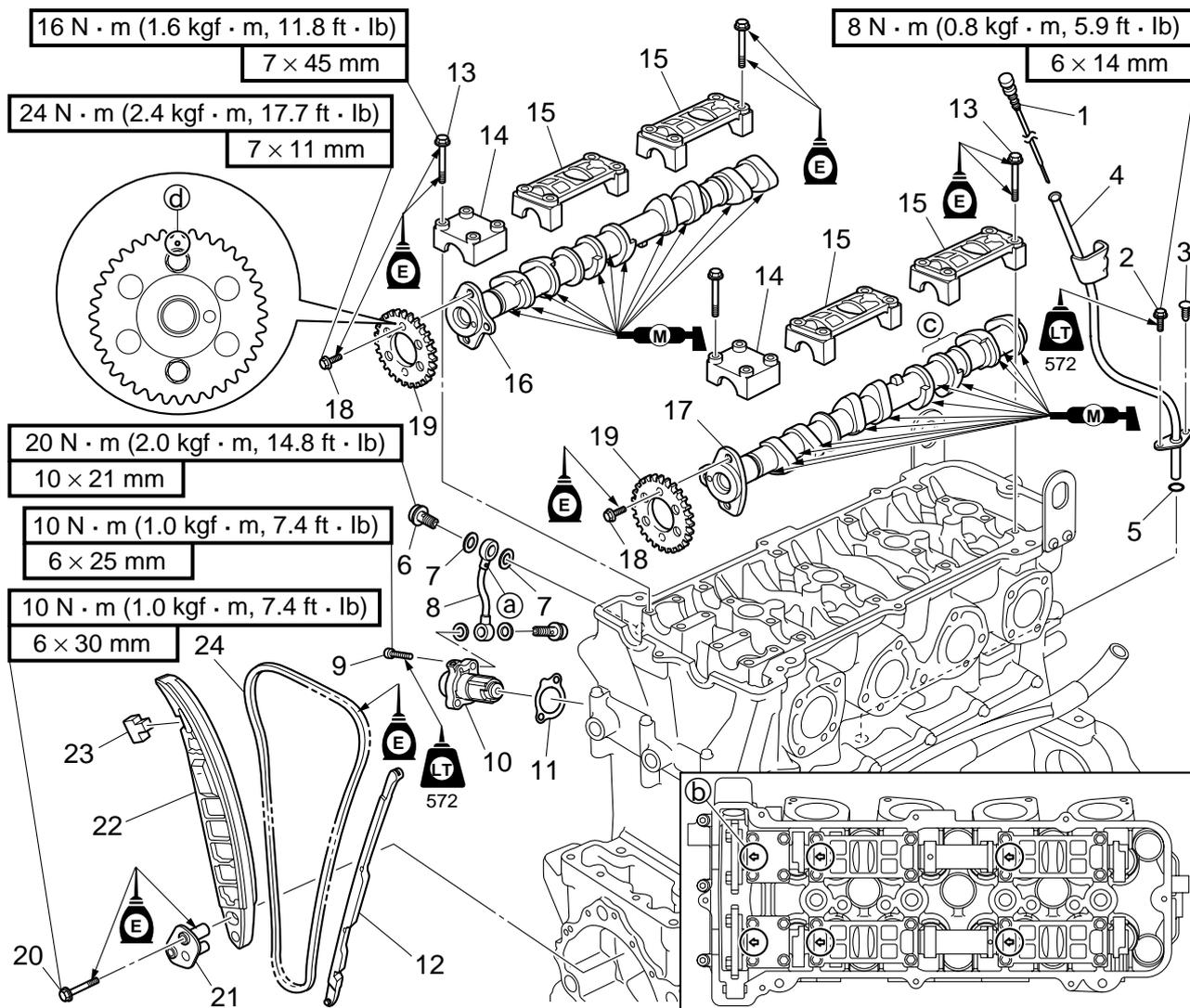
Step	Procedure/Part name	Q'ty	Service points
1	Clamp/breather hose	2/1	A To cylinder block
2	Oil filler cap	1	
3	O-ring	1	<b>Not reusable</b>
4	Bolt	8	
5	Ignition coil	4	
6	Spark plug	4	
7	Bolt	1	
8	Cam position sensor	1	
9	Bolt	8	
10	Cylinder head cover	1	
11	Gasket	1	<b>Not reusable</b>
12	Timing chain guide (upper)	1	
			Reverse the removal steps for installation.



### Camshaft and timing chain removal

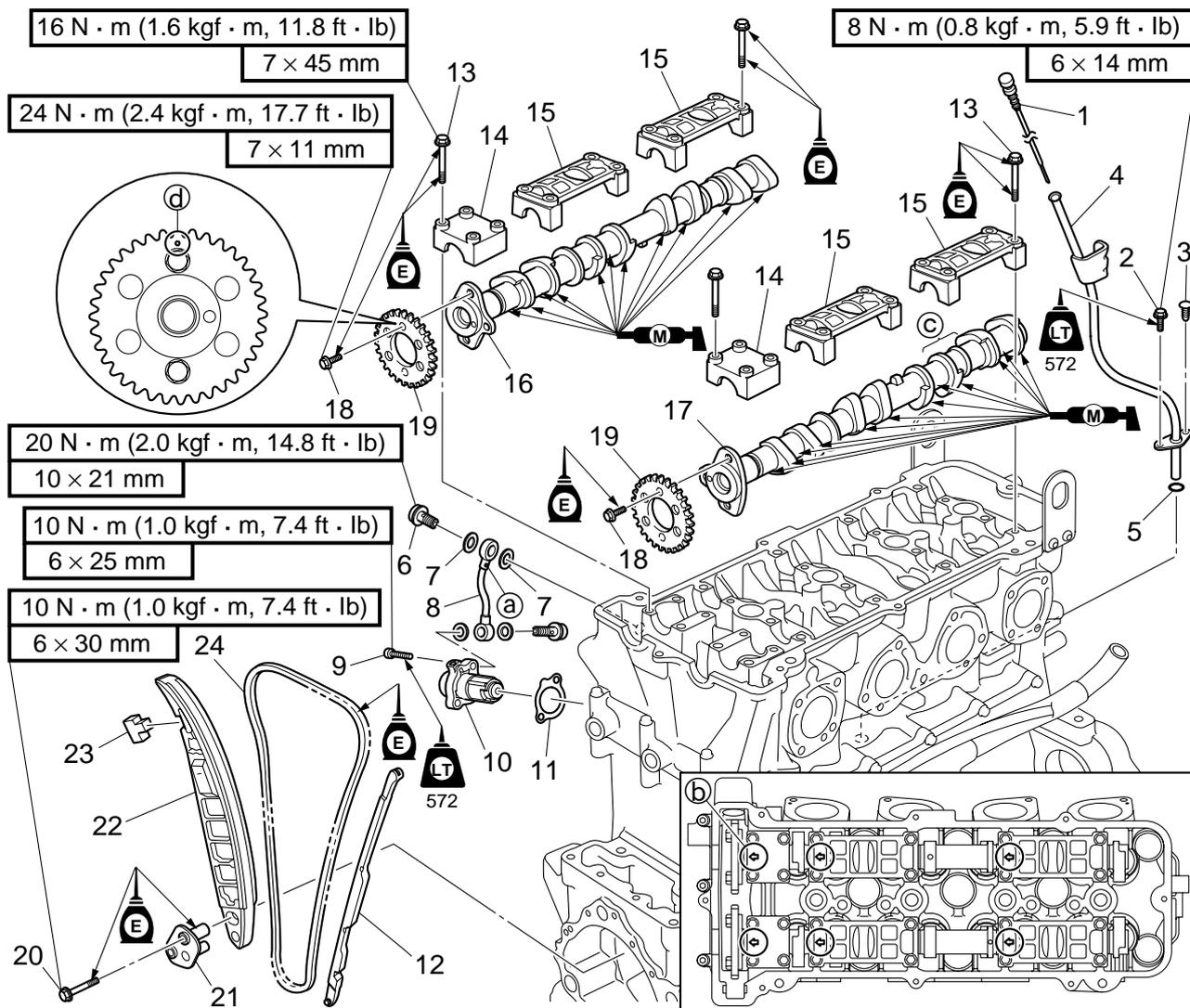


Step	Procedure/Part name	Q'ty	Service points
1	Oil level gauge	1	
2	Bolt	1	
3	Plug	1	
4	Oil level pipe	1	
5	O-ring	1	<b>Not reusable</b>
6	Bolt	2	
7	Gasket	4	<b>Not reusable</b>
8	Oil pipe	1	@ Yellow paint
9	Bolt	2	<b>NOTE:</b> _____ Loosen the timing chain tensioner bolts evenly.

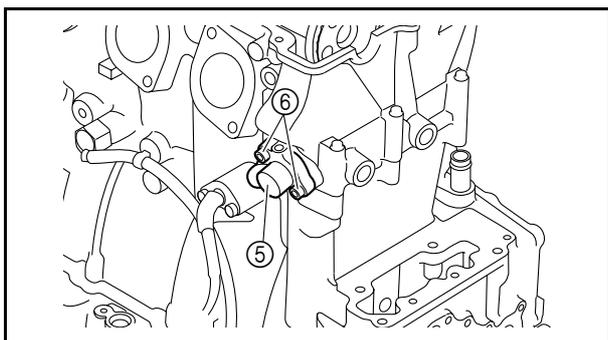
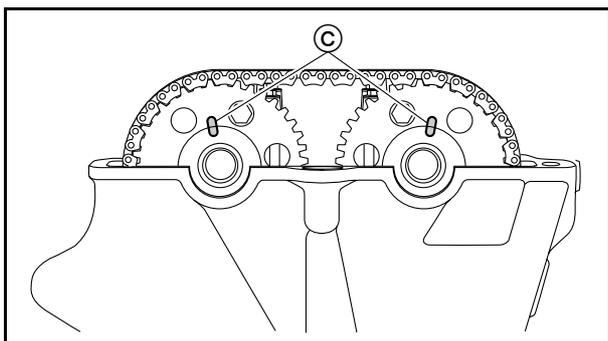
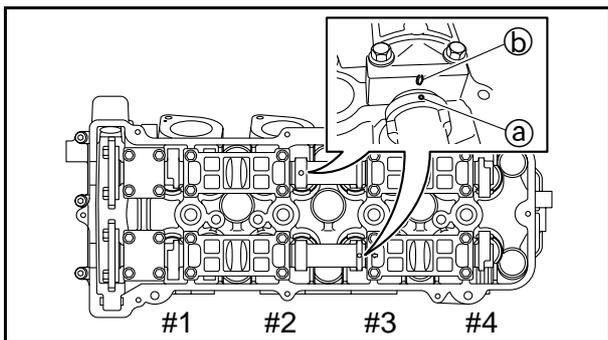
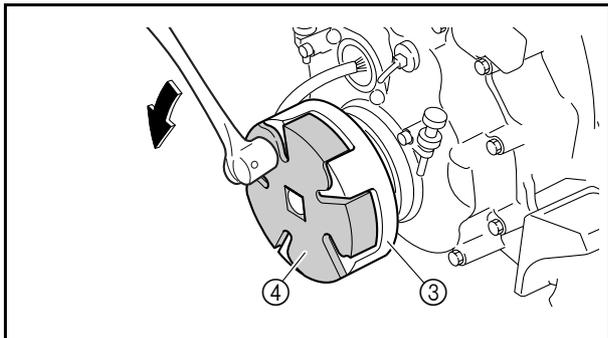
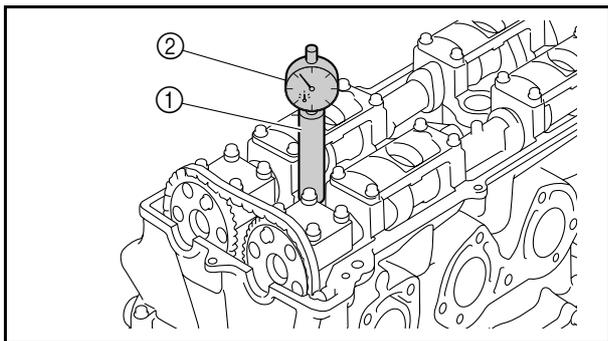


5

Step	Procedure/Part name	Q'ty	Service points
10	Timing chain tensioner	1	<p><b>Not reusable</b></p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>Install the camshaft caps so that the arrow marks <b>(b)</b> point toward the timing chain.</li> <li>The exhaust camshaft is marked with yellow paint <b>(C)</b>.</li> <li>Install each camshaft sprocket with the punch mark <b>(d)</b> facing outward.</li> </ul>
11	Gasket	1	
12	Timing chain guide (exhaust side)	1	
13	Bolt	24	
14	Camshaft cap	2	
15	Camshaft cap	4	
16	Intake camshaft	1	
17	Exhaust camshaft	1	
18	Bolt	4	
19	Camshaft sprocket	2	



Step	Procedure/Part name	Q'ty	Service points
20	Bolt	2	Reverse the removal steps for installation.
21	Chain guide plate	1	
22	Timing chain guide (intake side)	1	
23	Timing chain tensioner pad	1	
24	Timing chain	1	



### Camshaft removal

#### 1. Remove:

- Camshafts

#### Removal steps:

1. Install the special service tools ① and ② into spark plug hole #1.



Gauge stand ①:  
90890-06725  
Dial gauge stand set:  
YB-06585  
Dial gauge ②:  
YU-03097/90890-01252  
Dial gauge needle:  
90890-06584

2. Position piston #1 at TDC by turning the drive coupling ③ counterclockwise with the special service tool ④, using the dial gauge to ensure that the piston has reached TDC.



Coupler wrench ④:  
90890-06729

3. Check that the punch marks ① on the camshafts are aligned with the marks ② on the camshaft caps.

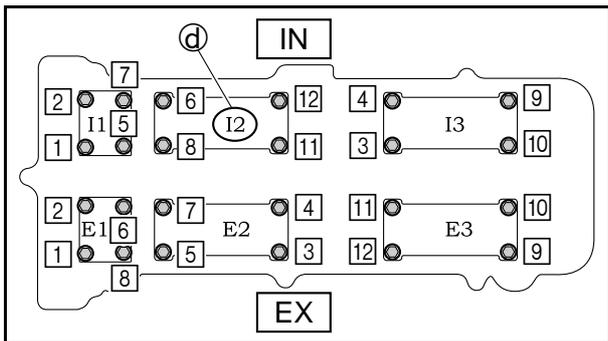
4. Make alignment marks ③ on the camshaft sprockets and camshafts.

5. Remove the timing chain tensioner ⑤ and gasket.

**NOTE:** \_\_\_\_\_

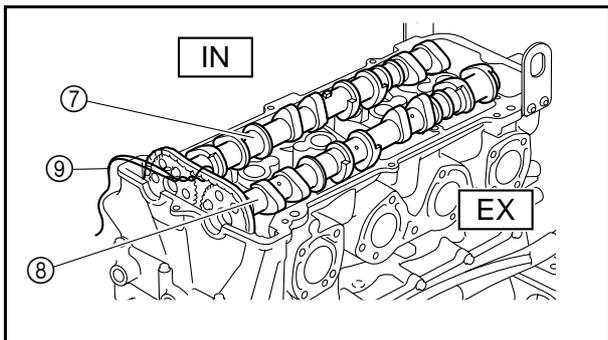
Loosen the timing chain tensioner bolts ⑥ evenly.

6. Remove the timing chain guide (exhaust side).



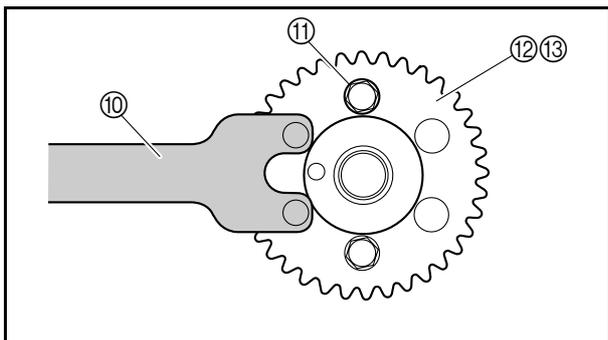
7. Loosen the intake and exhaust camshaft cap bolts in the sequence shown.

**NOTE:** \_\_\_\_\_  
 For reference during installation, put identification marks **d** on the camshaft caps.



8. Remove the intake camshaft **7** and exhaust camshaft **8**.

**NOTE:** \_\_\_\_\_  
 To prevent the timing chain from falling into the crankcase, secure it with a wire **9**.



9. Hold each camshaft sprocket with the special service tool **10**, and then loosen the bolts **11**.



Camshaft wrench **10**:  
 90890-06724

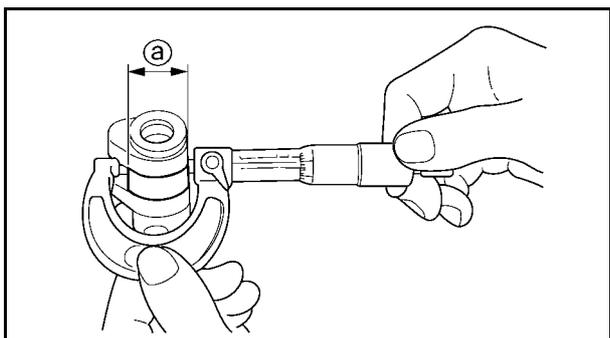
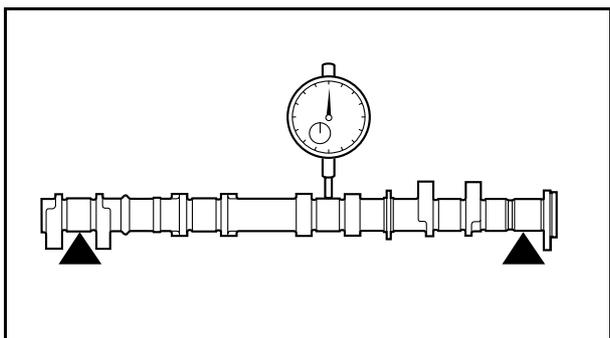
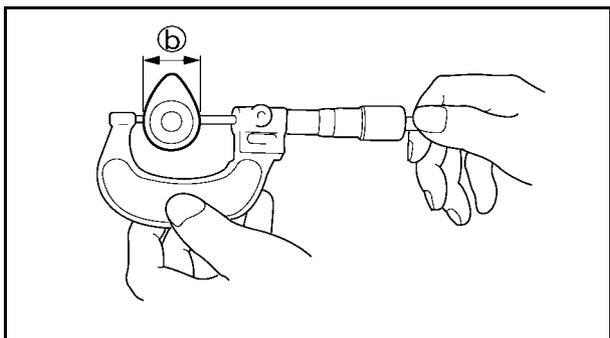
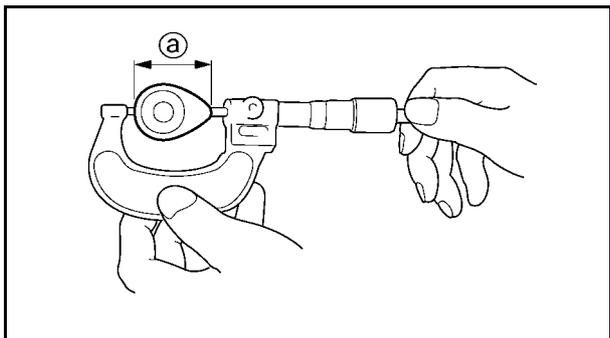
10. Remove the exhaust camshaft sprocket **12** and intake camshaft sprocket **13**.



### Camshaft check

#### 1. Check:

- Camshaft lobes  
Pitting/scratches → Replace the camshaft.



#### 2. Measure:

- Camshaft lobe dimensions (a) and (b)  
Out of specification → Replace the camshaft.



Camshaft lobe dimensions:

Intake:

(a) 40.9 mm (1.610 in)

(b) 32.0 mm (1.260 in)

Exhaust:

(a) 41.0 mm (1.614 in)

(b) 32.2 mm (1.268 in)

#### 3. Measure:

- Camshaft runout  
Out of specification → Replace the camshaft.



Camshaft runout limit:

0.015 mm (0.0006 in)

#### 4. Measure:

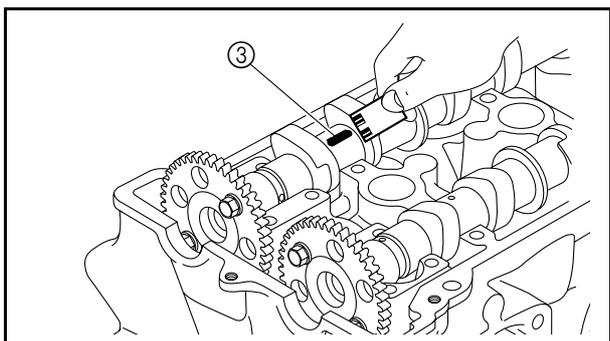
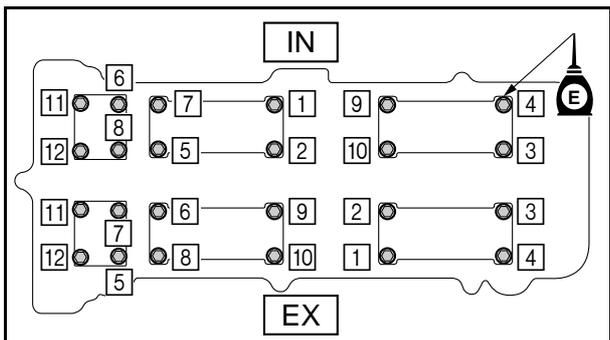
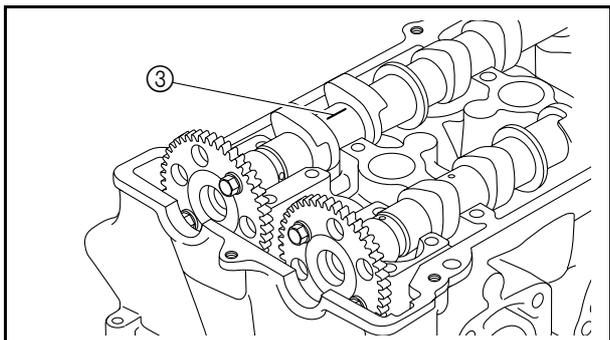
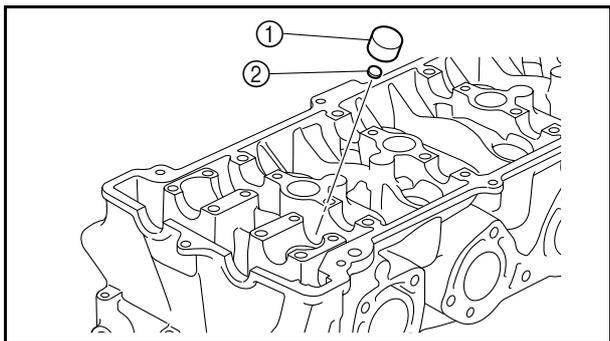
- Camshaft journal diameter (a)  
Out of specification → Replace the camshaft.



Camshaft journal diameter (a):

24.960–24.980 mm

(0.9827–0.9835 in)



**5. Measure:**

- Camshaft-journal-to-camshaft-cap clearance

Out of specification → Replace the cylinder head assembly.



Camshaft-journal-to-camshaft-cap clearance:  
0.020–0.061 mm (0.0008–0.0024 in)

**Measurement steps:**

1. Remove the valve lifters ① and valve pads ②.

**NOTE:**

Make a note of the position of each valve lifter and valve pad so that they can be installed in their original positions.

2. Place the camshafts on the cylinder head.
3. Put a piece of Plastigauge ③ on each camshaft journal.

**NOTE:**

Do not put the Plastigauge over the oil hole in the camshaft journal.

4. Install the camshaft caps and bolts.
5. Gradually tighten the camshaft cap bolts to the specified torque in the sequence shown.

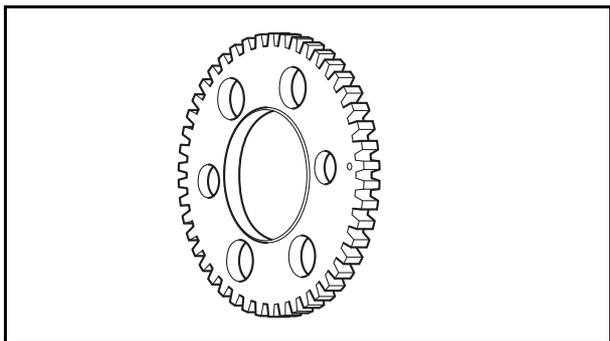
**NOTE:**

- Apply engine oil to the threads of the camshaft cap bolts.
- Make sure to keep the camshafts level.
- Do not turn the camshafts when measuring the camshaft-journal-to-camshaft-cap clearance with the Plastigauge.



Camshaft cap bolt:  
16 N·m (1.6 kgf·m, 11.8 ft·lb)

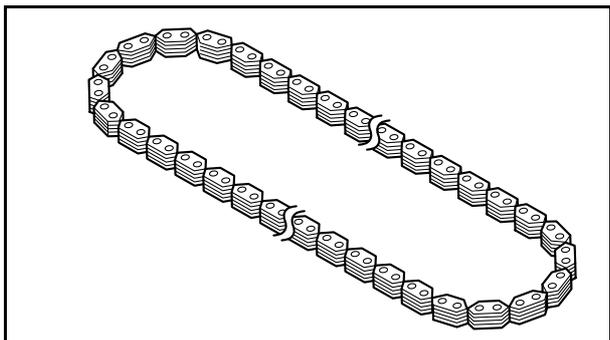
6. Remove the camshaft caps, and then measure the width of the Plastigauge ③.



### Camshaft sprocket check

#### 1. Check:

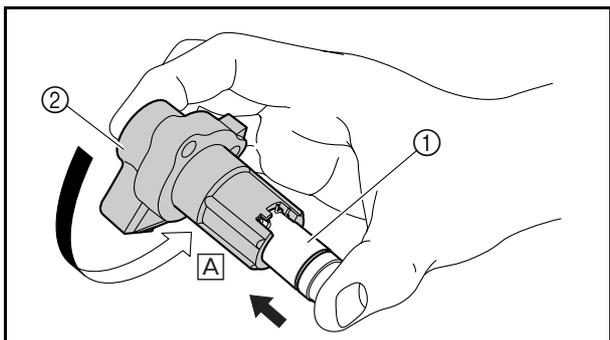
- Camshaft sprockets  
Damage/wear → Replace the camshaft sprockets and timing chain as a set.



### Timing chain check

#### 1. Check:

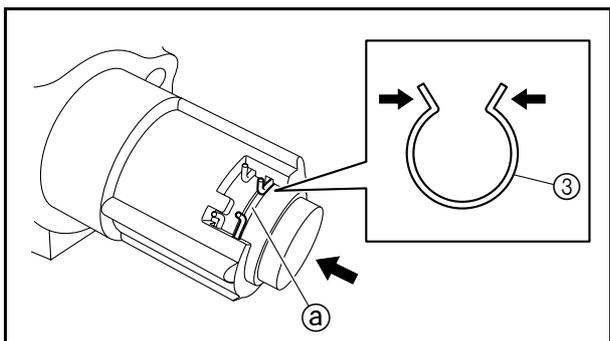
- Timing chain  
Damage/stiffness/wear → Replace the timing chain and camshaft sprockets as a set.



### Timing chain tensioner check

#### 1. Check:

- Timing chain tensioner  
Cracks/damage/rough movement → Replace the timing chain tensioner.



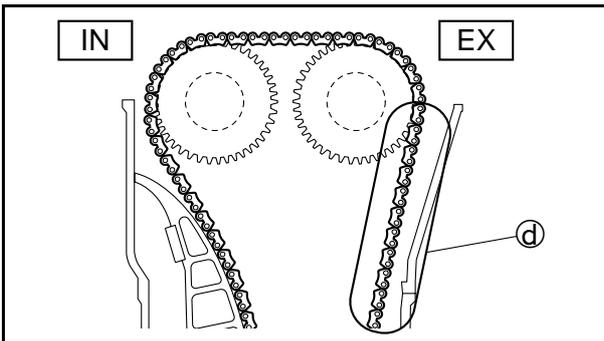
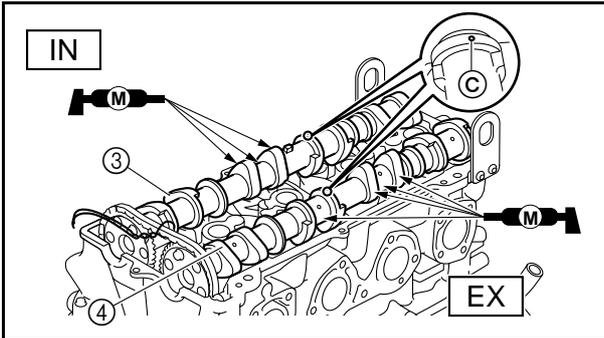
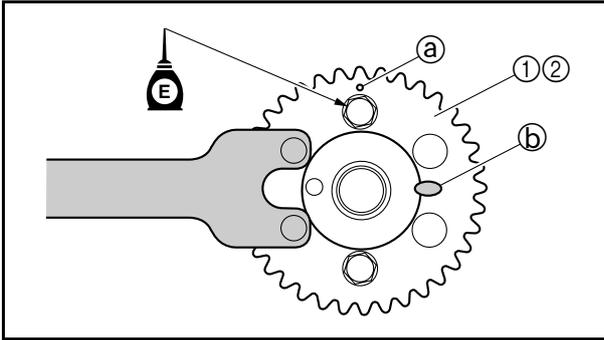
#### Checking steps:

1. While pushing the timing chain tensioner rod ①, turn the timing chain tensioner housing ② in direction A until the groove ③ in the tensioner rod is aligned with the snap ring ③.
2. While squeezing the end of the snap ring ③ so that it fits into the groove ③ in the timing chain tensioner rod ①, slowly release the tensioner rod until it is locked in place.

#### NOTE:

Make sure that the timing chain tensioner rod ① is locked in place before releasing the snap ring ③.

3. Slightly push the timing chain tensioner rod ①. Check that the snap ring ③ releases the timing chain tensioner rod ①, allowing the tensioner rod to pop out.



## Camshaft installation

### 1. Install:

- Camshafts

### Installation steps:

1. Position piston #1 at TDC.  
Refer to "Camshaft removal."
2. Install the exhaust camshaft sprocket ① and intake camshaft sprocket ②.

### NOTE:

- Install each camshaft sprocket with the punch mark ③ facing outward.
- When installing an original camshaft sprocket, be sure to align the alignment marks ④ made during removal.
- Apply engine oil to the threads of the camshaft sprocket bolts.



Camshaft wrench:  
90890-06724

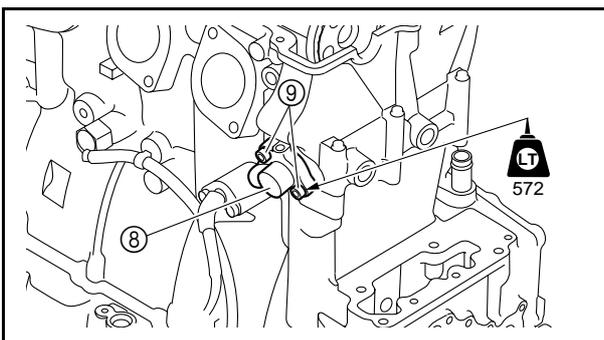
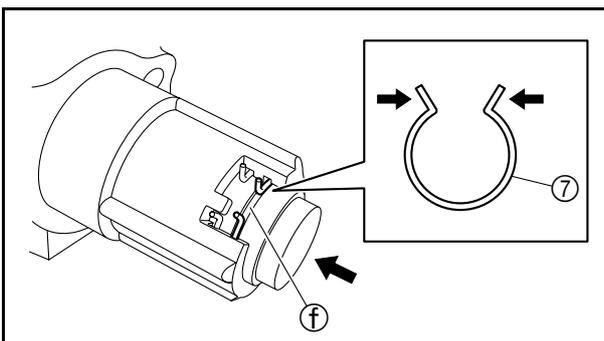
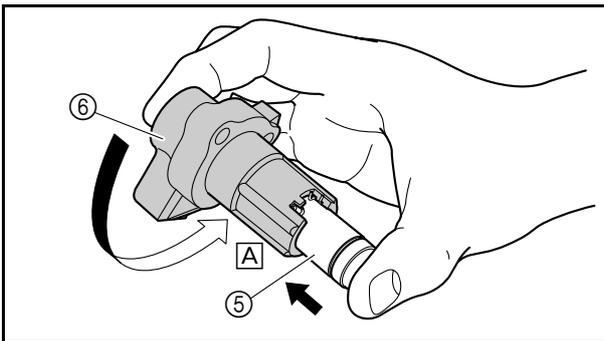
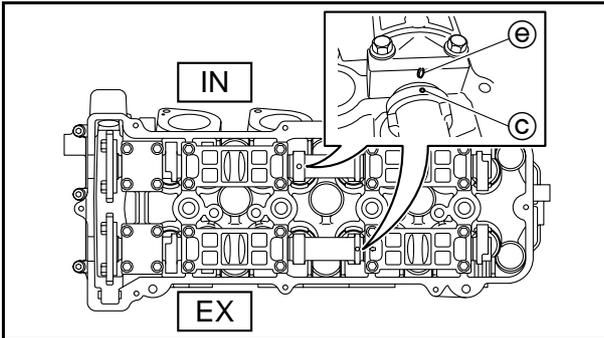
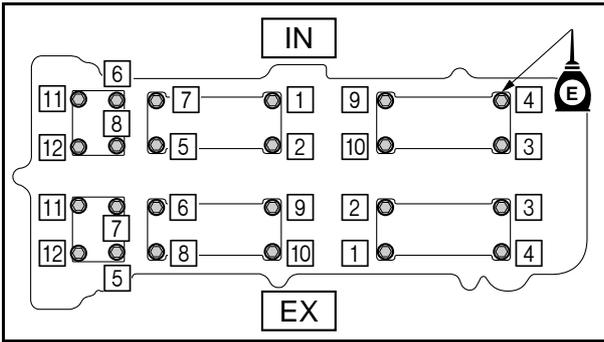


Camshaft sprocket bolt:  
24 N·m (2.4 kgf·m, 17.7 ft·lb)

3. Install the exhaust camshaft ③, and then intake camshaft ④.

### NOTE:

- Make sure that the punch marks ③ on the camshafts face up.
- When installing the exhaust camshaft ③, make sure that the exhaust side ④ of the timing chain is taut.
- Apply molybdenum disulfide grease to the camshaft journals, camshaft journal bearings, and camshaft lobes.



4. Install the exhaust camshaft caps, intake camshaft caps, and bolts.
5. Gradually tighten the camshaft cap bolts to the specified torque in the sequence shown.

**NOTE:**

- Apply engine oil to the threads of the camshaft cap bolts.
- Make sure to keep the camshafts level.



Camshaft cap bolt:  
16 N·m (1.6 kgf·m, 11.8 ft·lb)

6. Install the timing chain guide (exhaust side).
7. Remove the wire from the timing chain.
8. Check that the punch marks (C) on the camshafts are aligned with the alignment marks (E) on the camshaft caps.
9. While pushing the timing chain tensioner rod (5), turn the timing chain tensioner housing (6) in direction (A) until the groove (f) in the tensioner rod is aligned with the snap ring.
10. While squeezing the end of the snap ring (7) so that it fits into the groove (f) in the timing chain tensioner rod (5), slowly release the tensioner rod until it is locked in place.
11. Install a new gasket and the timing chain tensioner (8) onto the cylinder block, and then tighten the timing chain tensioner bolts (9) to the specified torque.

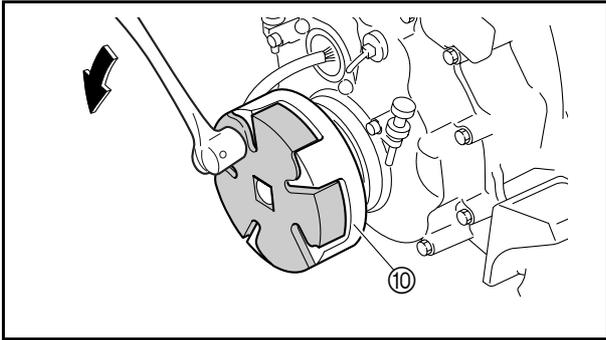
**CAUTION:**

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

- Tighten the bolts (9) evenly.



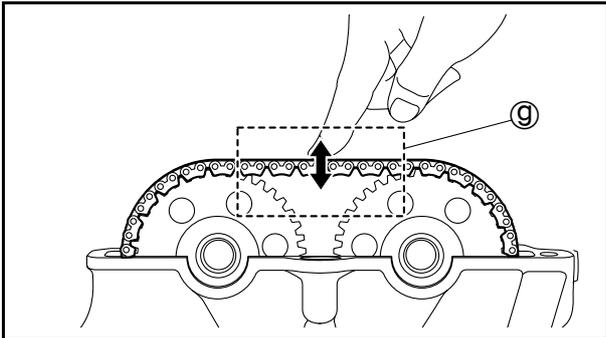
Timing chain tensioner bolt:  
10 N·m (1.0 kgf·m, 7.4 ft·lb)  
LOCTITE 572



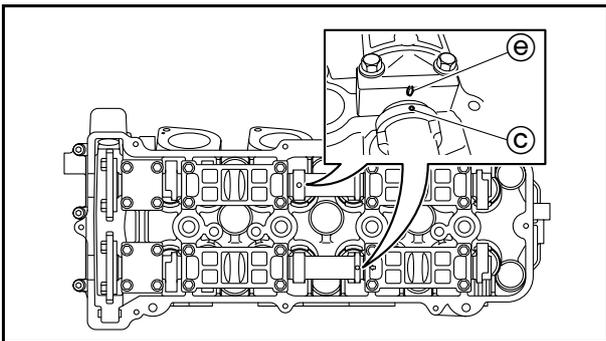
12. Turn the drive coupling ⑩ counterclockwise 2 turns.

**NOTE:**

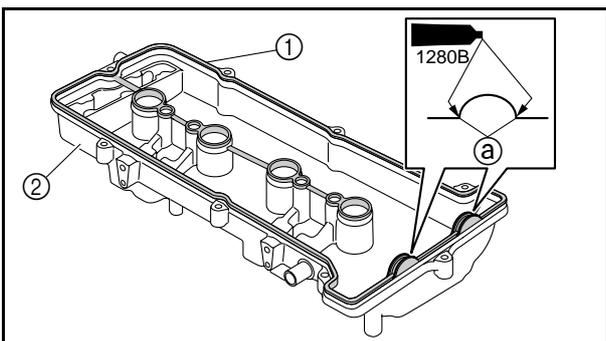
Make sure that the camshafts turn smoothly. If the camshafts do not turn smoothly, reinstall camshafts. Refer to the installation steps.



13. Check that the portion ⑨ of the timing chain is taut. If the timing chain is not taut, turn the drive coupling slightly clockwise, and then check that the timing chain is taut again.



14. Position piston #1 at TDC.  
Refer to “Camshaft removal.”  
15. Check that the punch marks ③ of the camshaft are aligned with the alignment marks ④ on the camshaft caps. If the punch marks are not aligned, reinstall the camshafts.



**Cylinder head cover installation**

**1. Install:**

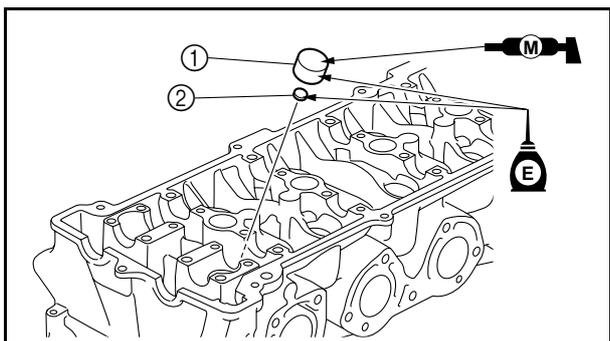
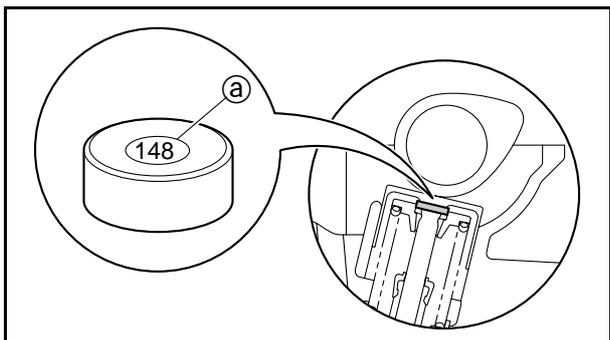
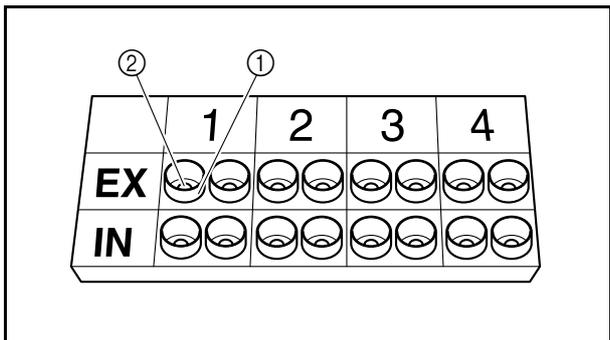
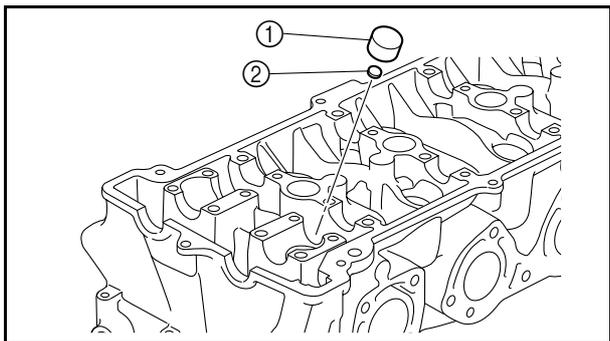
- Cylinder head cover gasket ①
- Cylinder head cover ②

**NOTE:**

- Apply sealant onto the locations ① of the new cylinder head cover gasket ①.
- Tighten the cylinder head cover bolts in a crisscross pattern.



Cylinder head cover bolt:  
8 N·m (0.8 kgf·m, 5.9 ft·lb)  
LOCTITE 572



### Valve clearance adjustment

**NOTE:** \_\_\_\_\_  
 To measure the valve clearance, refer to “Valve clearance measurement” in Chapter 3.

- 1. Adjust:**
- Valve clearance

**Adjustment steps:**

1. Remove the camshaft.  
 Refer to “Camshaft removal.”
2. Remove the valve lifter ① and valve pad ②.

**NOTE:** \_\_\_\_\_  
 Make a note of the position of each valve lifter ① and valve pad ② so that they can be installed in their original positions.

3. Select the proper valve pad from the following table.

Valve pad thickness range		Available valve pads
Nos. 120–230	1.20–2.30 mm	23 thicknesses in 0.05 mm increments

**NOTE:** \_\_\_\_\_  
 The thickness ① of each valve pad is marked in hundredths of millimeters on the side that touches the valve lifter.

4. Round off the original valve pad number according to the following table.

Last digit	Rounded value
0, 1, 2	0
4, 5, 6	5
8, 9	10

5. Select the new valve pad number from the valve pad selection table.
6. Apply the valve pad and valve lifter with engine oil.
7. Install the selected valve pad ② and the valve lifter ①.

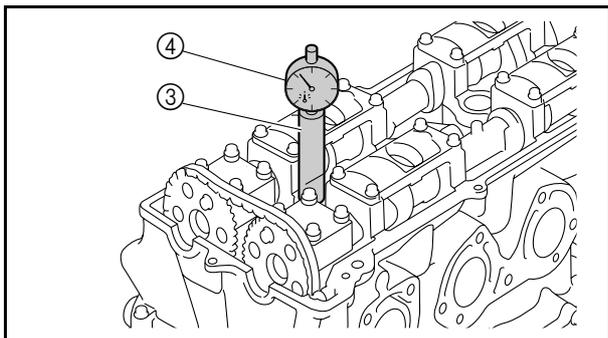


8. Rotate the valve lifter and check that it turns smoothly.
9. Install the camshafts, timing chain, and camshaft caps.  
Refer to "Camshaft installation."



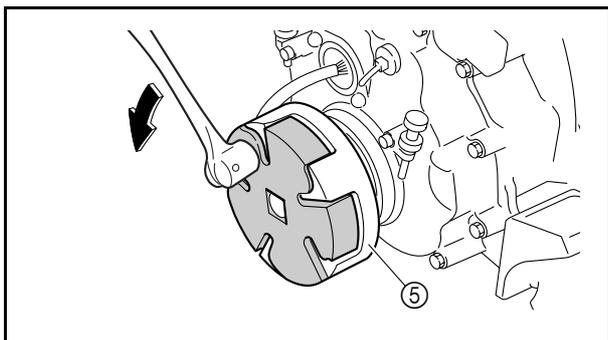
Camshaft cap bolt:  
16 N·m (1.6 kgf·m, 11.8 ft·lb)

10. Install the special service tools ③ and ④ into spark plug hole #1.



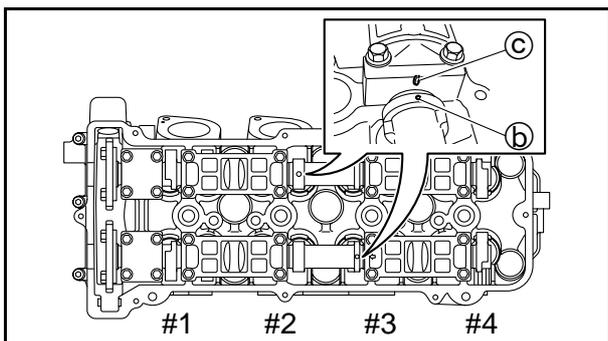
Gauge stand ③:  
90890-06725  
Dial gauge stand set:  
YB-06585  
Dial gauge ④:  
YU-03097/90890-01252  
Dial gauge needle:  
90890-06584

11. Position piston #1 at TDC by turning the drive coupling ⑤ with the special service tool.



Coupler wrench:  
90890-06729

12. Check that the punch marks ⑥ on the camshafts are aligned with the alignment marks ⑦ on the camshaft caps.

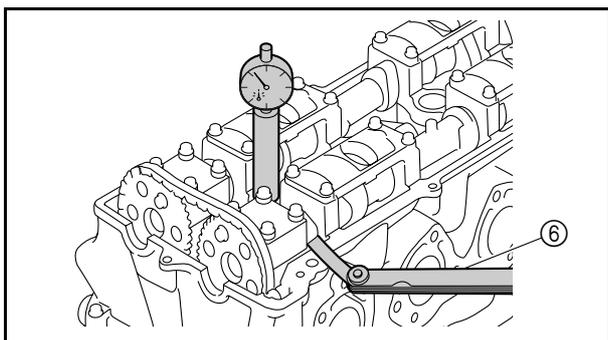


13. Measure the intake and exhaust valve clearances for cylinder #1 with the thickness gauge ⑧.

14. Position piston #2 at TDC by turning the drive coupling an additional 180° counter-clockwise, and then measure the intake and exhaust valve clearances for cylinder #2.

15. Position piston #4 at TDC by turning the drive coupling an additional 180° counter-clockwise, and then measure the intake and exhaust valve clearances for cylinder #4.

16. Position piston #3 at TDC by turning the drive coupling an additional 180° counter-clockwise, and then measure the intake and exhaust valve clearances for cylinder #3.





**Intake**

MEASURED CLEARANCE	ORIGINAL VALVE PAD NUMBER																								
	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230		
0.00-0.02					120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210		
0.03-0.06				120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215		
0.07-0.10			120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220		
0.11-0.13		120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225		
0.14-0.23	STANDARD CLEARANCE																								
0.24-0.26	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230			
0.27-0.31	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230				
0.32-0.36	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230					
0.37-0.41	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230						
0.42-0.46	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230							
0.47-0.51	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230								
0.52-0.56	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230									
0.57-0.61	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230										
0.62-0.66	165	170	175	180	185	190	195	200	205	210	215	220	225	230											
0.67-0.71	170	175	180	185	190	195	200	205	210	215	220	225	230												
0.72-0.76	175	180	185	190	195	200	205	210	215	220	225	230													
0.77-0.81	180	185	190	195	200	205	210	215	220	225	230														
0.82-0.86	185	190	195	200	205	210	215	220	225	230															
0.87-0.91	190	195	200	205	210	215	220	225	230																
0.92-0.96	195	200	205	210	215	220	225	230																	
0.97-1.01	200	205	210	215	220	225	230																		
1.02-1.06	205	210	215	220	225	230																			
1.07-1.11	210	215	220	225	230																				
1.12-1.16	215	220	225	230																					
1.17-1.21	220	225	230																						
1.22-1.26	225	230																							
1.27-1.31	230																								

**Example:**  
 Measured valve clearance is 0.29 mm (0.0114 in)  
 Original valve pad number is 148 (thickness = 1.48 mm)  
 • Round off the original valve pad number 148 to 150 (thickness = 1.50 mm).  
 • Select the new valve pad number using the valve pad selection table.  
 New valve pad number is 160 (thickness = 1.60 mm)

**Exhaust**

MEASURED CLEARANCE	ORIGINAL VALVE PAD NUMBER																								
	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230		
0.00-0.01								120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195		
0.02-0.04							120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200		
0.05-0.09						120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205		
0.10-0.14					120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210		
0.15-0.19				120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215		
0.20-0.24			120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220		
0.25-0.27		120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225		
0.28-0.37	STANDARD CLEARANCE																								
0.38-0.40	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230			
0.41-0.45	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230				
0.46-0.50	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230					
0.51-0.55	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230						
0.56-0.60	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230							
0.61-0.65	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230								
0.66-0.70	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230									
0.71-0.75	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230										
0.76-0.80	165	170	175	180	185	190	195	200	205	210	215	220	225	230											
0.81-0.85	170	175	180	185	190	195	200	205	210	215	220	225	230												
0.86-0.90	175	180	185	190	195	200	205	210	215	220	225	230													
0.91-0.95	180	185	190	195	200	205	210	215	220	225	230														
0.96-1.00	185	190	195	200	205	210	215	220	225	230															
1.01-1.05	190	195	200	205	210	215	220	225	230																
1.06-1.10	195	200	205	210	215	220	225	230																	
1.11-1.15	200	205	210	215	220	225	230																		
1.16-1.20	205	210	215	220	225	230																			
1.21-1.25	210	215	220	225	230																				
1.26-1.30	215	220	225	230																					
1.31-1.35	220	225	230																						
1.36-1.40	225	230																							
1.41-1.45	230																								

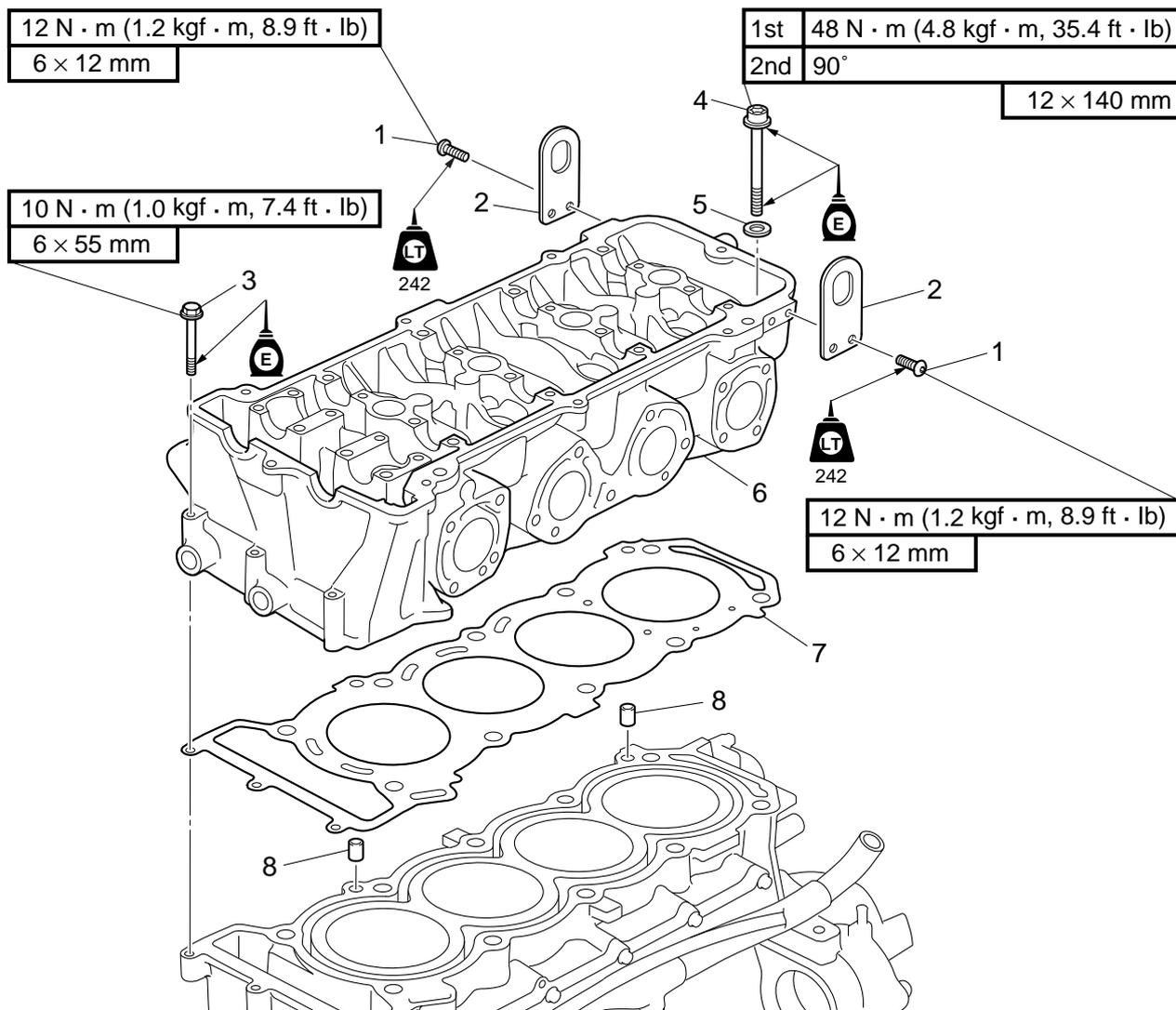
**Example:**  
 Measured valve clearance is 0.47 mm (0.0185 in)  
 Original valve pad number is 168 (thickness = 1.68 mm)  
 • Round off the original valve pad number 168 to 170 (thickness = 1.70 mm).  
 • Select the new valve pad number using the valve pad selection table.  
 New valve pad number is 185 (thickness = 1.85 mm)





### Cylinder head

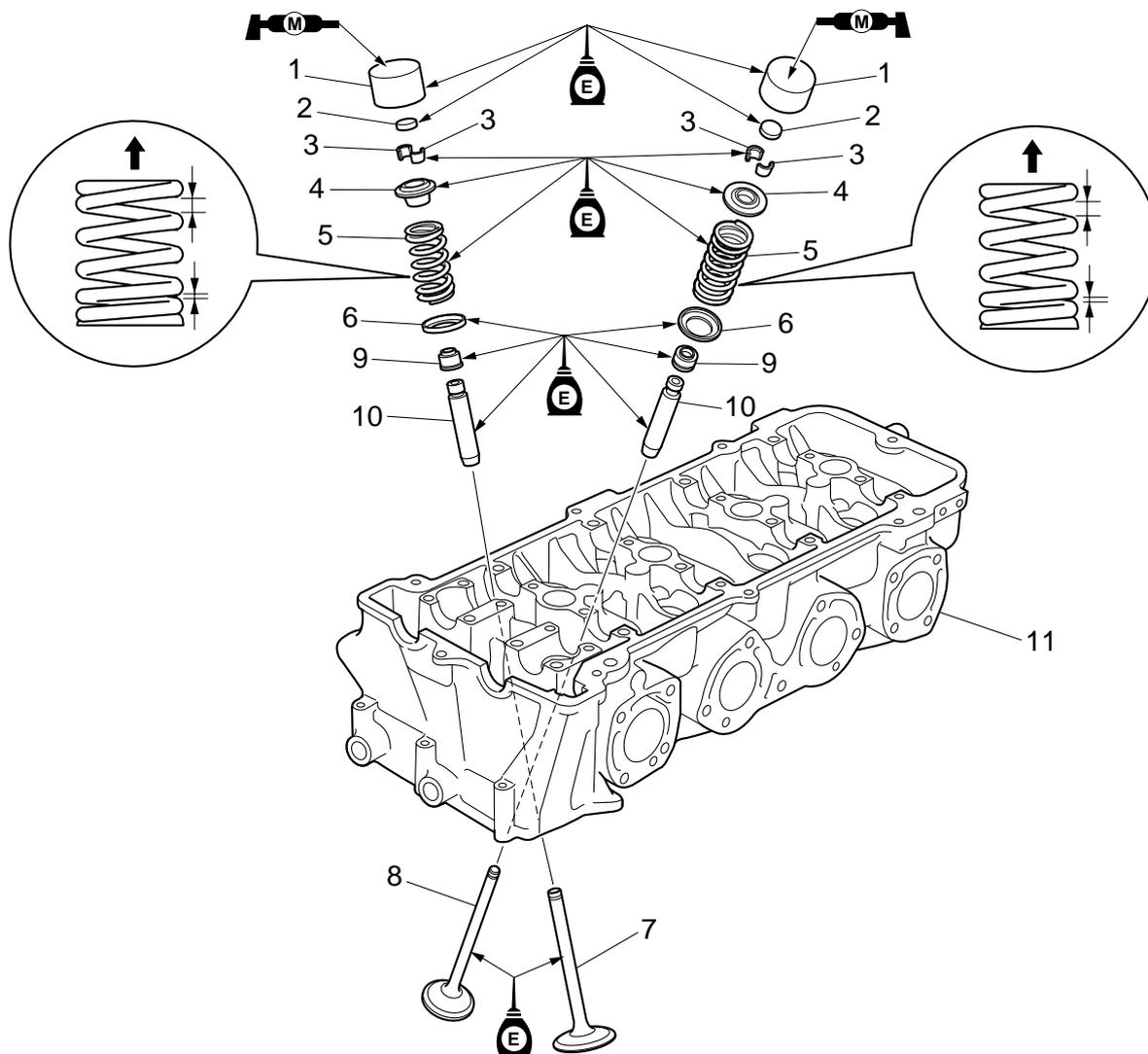
### Cylinder head assembly removal



Step	Procedure/Part name	Q'ty	Service points
1	Bolt	4	
2	Engine hanger	2	
3	Bolt	3	
4	Cylinder head bolt	10	<b>Not reusable</b>
5	Washer	10	
6	Cylinder head assembly	1	
7	Gasket	1	<b>Not reusable</b>
8	Dowel pin	2	
			Reverse the removal steps for installation.



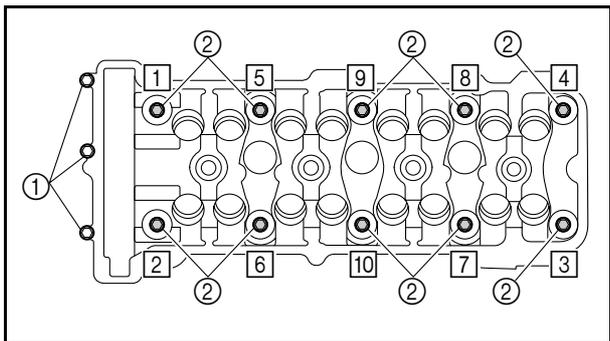
Cylinder head disassembly



5

Step	Procedure/Part name	Q'ty	Service points
1	Valve lifter	16	
2	Valve pad	16	
3	Valve cotter	32	
4	Upper spring seat	16	
5	Valve spring	16	
6	Lower spring seat	16	
7	Intake valve	8	
8	Exhaust valve	8	
9	Valve seal	16	<b>Not reusable</b>
10	Valve guide	16	<b>Not reusable</b>
11	Cylinder head	1	

Reverse the disassembly steps for assembly.



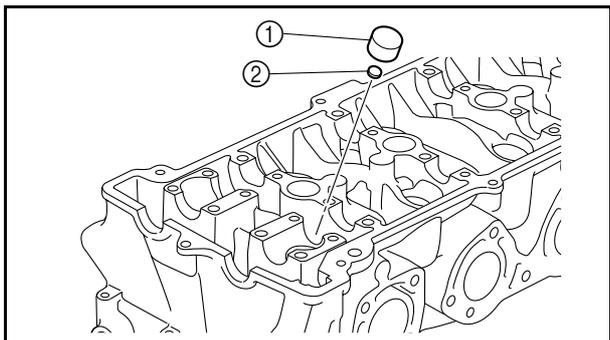
### Cylinder head assembly removal

#### 1. Remove:

- Cylinder head bolts (M6 × 55 mm) ①
- Cylinder head bolts (M12 × 140 mm) ②

#### NOTE:

Loosen the cylinder head bolts ② in the sequence shown.



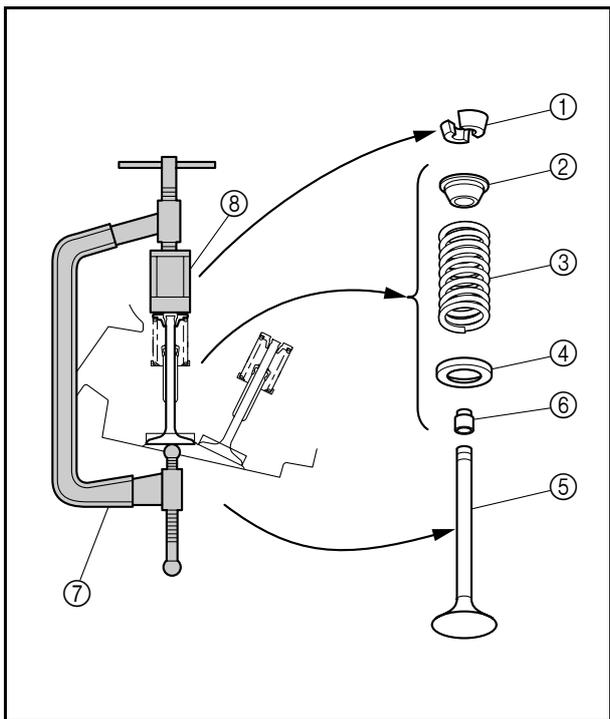
### Valve removal

#### 1. Remove:

- Valve lifter ①
- Valve pad ②

#### NOTE:

Make a note of the position of each valve lifter ① and valve pad ② so that they can be installed in their original positions.



#### 2. Remove:

- Valve cotters ①
- Upper spring seat ②
- Valve spring ③
- Lower spring seat ④
- Valve ⑤
- Valve seal ⑥

#### NOTE:

Make a note of the position of each valve, spring, and other part so that they can be installed in their original positions.



Valve spring compressor ⑦:  
YM-04019/90890-04019

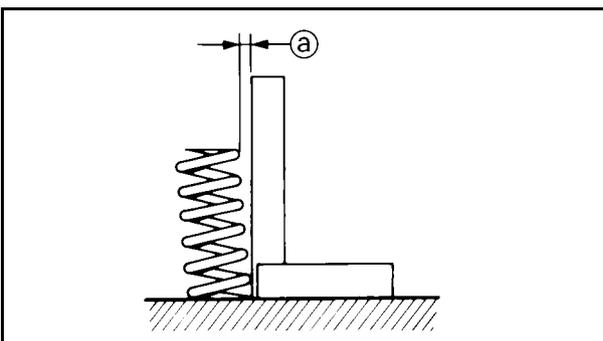
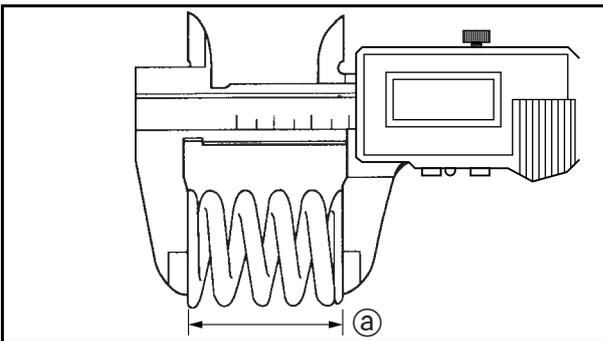
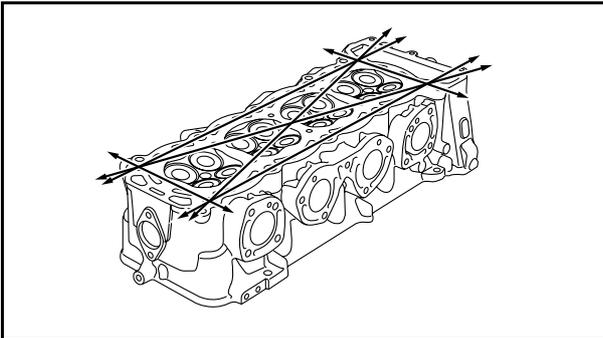
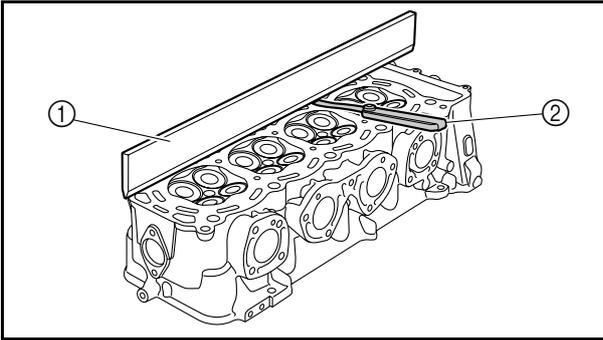
Compressor adapter ⑧:  
YM-04114

Valve spring compressor attachment  
⑧:  
90890-04114

### Cylinder head check

#### 1. Check:

- Cylinder head  
Damage/eroded → Replace the cylinder head.
- Cylinder head water jacket  
Mineral deposits/rust → Eliminate deposits or rust.



**2. Measure:**

- Cylinder head warpage  
Out of specification → Replace the cylinder head.

**Measurement steps:**

1. Eliminate carbon deposits from the combustion chambers.
2. Check the cylinder head warpage using a straightedge ① and thickness gauge ② in the directions shown.



Cylinder head warpage limit:  
0.1 mm (0.004 in)

**Valve spring check**

**1. Measure:**

- Valve spring free length @  
Out of specification → Replace the valve spring.



Valve spring free length @:  
Intake and exhaust:  
45.58 mm (1.794 in)

**2. Measure:**

- Valve spring tilt @  
Out of specification → Replace the valve spring.



Valve spring tilt limit @:  
Intake and exhaust:  
2.0 mm (0.08 in)

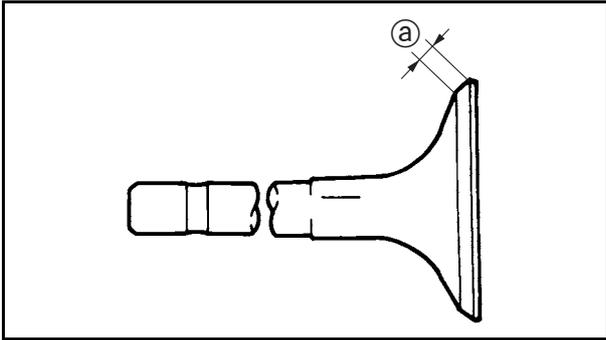
**Valve check**

**NOTE:**

To ensure accurate measurements, be sure to clean the valves before measuring them.

**1. Check:**

- Valve face  
Pitting → Replace the valve.

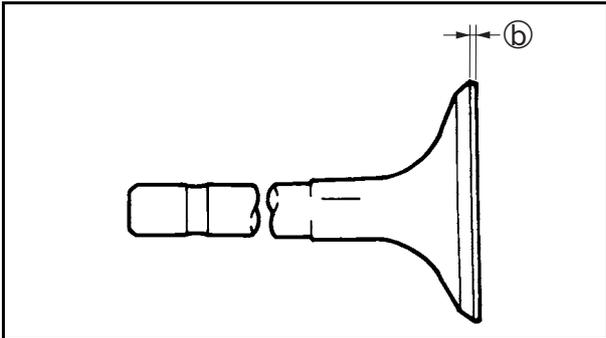


**2. Measure:**

- Valve face width (a)  
Out of specification → Replace the valve.



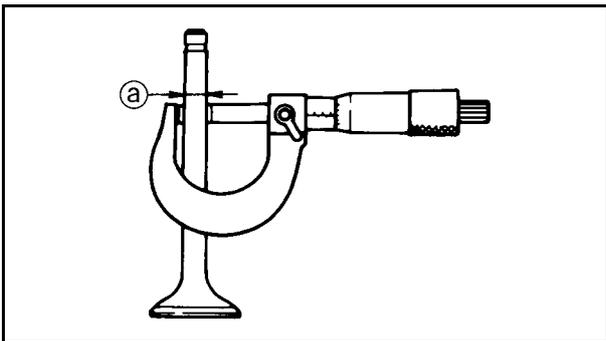
Valve face width (a):  
Intake and exhaust:  
2.26–2.83 mm (0.089–0.111 in)



- Valve margin thickness (b)  
Out of specification → Replace the valve.



Valve margin thickness (b):  
Intake and exhaust:  
0.80–1.20 mm (0.031–0.047 in)

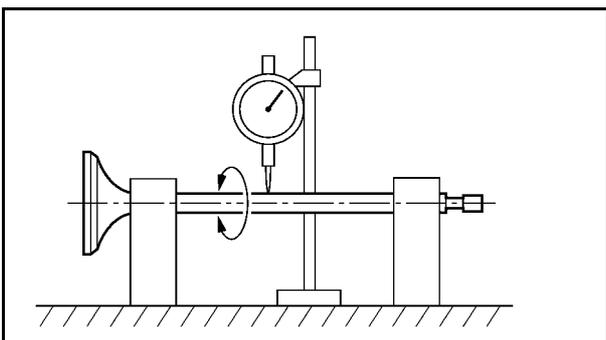


**3. Measure:**

- Valve stem diameter (a)  
Out of specification → Replace the valve.



Valve stem diameter (a):  
Intake:  
5.477–5.492 mm  
(0.2156–0.2162 in)  
Exhaust:  
5.464–5.479 mm  
(0.2151–0.2157 in)

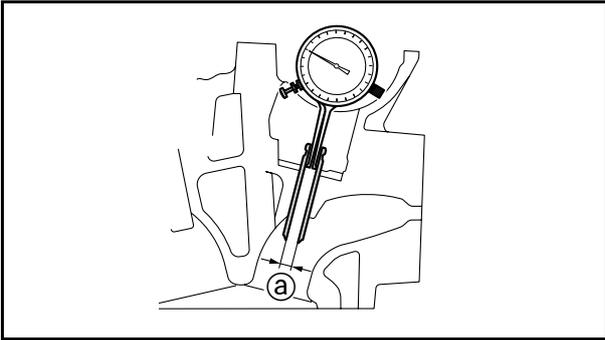


**4. Measure:**

- Valve stem runout  
Out of specification → Replace the valve.



Valve stem runout limit:  
Intake and exhaust:  
0.01 mm (0.0004 in)



### Valve guide check

#### 1. Measure:

- Valve guide inside diameter ①



Valve guide inside diameter:  
 Intake and exhaust:  
 5.504–5.522 mm  
 (0.2167–0.2174 in)

#### 2. Calculate:

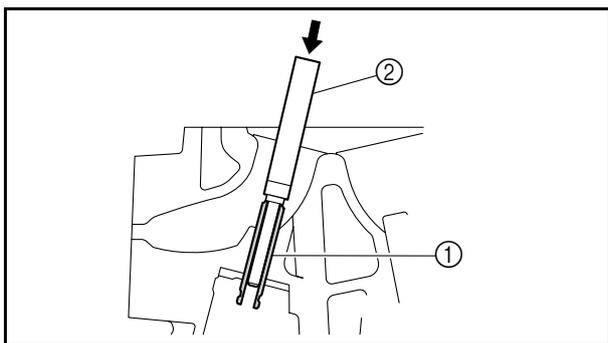
- Valve stem-to-valve guide clearance  
 Out of specification → Replace the valve and valve guide.



Valve stem-to-valve guide clearance =  
 valve guide inside diameter – valve  
 stem diameter:

Intake:  
 0.012–0.045 mm  
 (0.0005–0.0018 in)

Exhaust:  
 0.025–0.058 mm  
 (0.0010–0.0023 in)



### Valve guide removal

#### 1. Remove:

- Valve guide ①

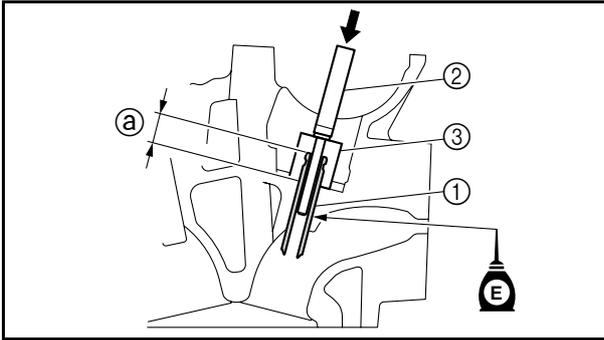
#### Removal steps:

1. Insert the special service tool ② into the combustion chamber end of the valve guide ①.



Valve guide remover ②:  
 YB-06801/90890-06801

2. Strike the special service tool to drive the valve guide out of the cylinder head.



**Valve guide installation**

**1. Install:**

- New valve guide ①

**Installation steps:**

1. Insert the special service tools ② and ③ into the camshaft end of a new valve guide ①.



Valve guide remover ②:  
YB-06801/90890-06801  
Valve guide installer ③:  
YB-06810/90890-06810

2. Strike the special service tool to drive the valve guide into the cylinder head.

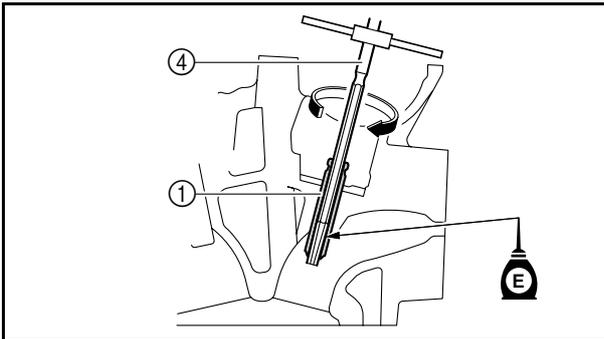


Valve guide installation height ④:  
Intake and exhaust:  
12.3–12.7 mm (0.484–0.500 in)

3. Insert the special service tool ④ into the valve guide ①, and then ream the valve guide.

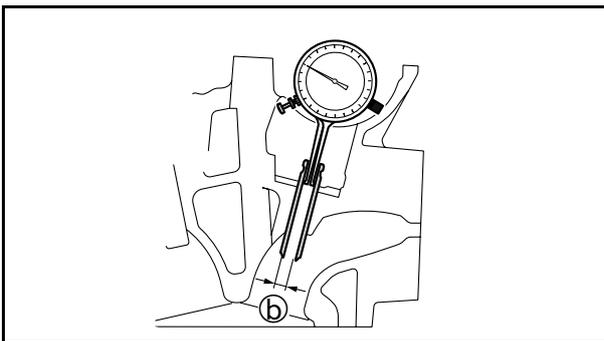
**NOTE:**

- Apply engine oil to the inner surface of the valve guide and surface of the special service tool ④.
- Turn the valve guide reamer clockwise to ream the valve guide.
- Do not turn the special service tool ④ counterclockwise when removing the tool.

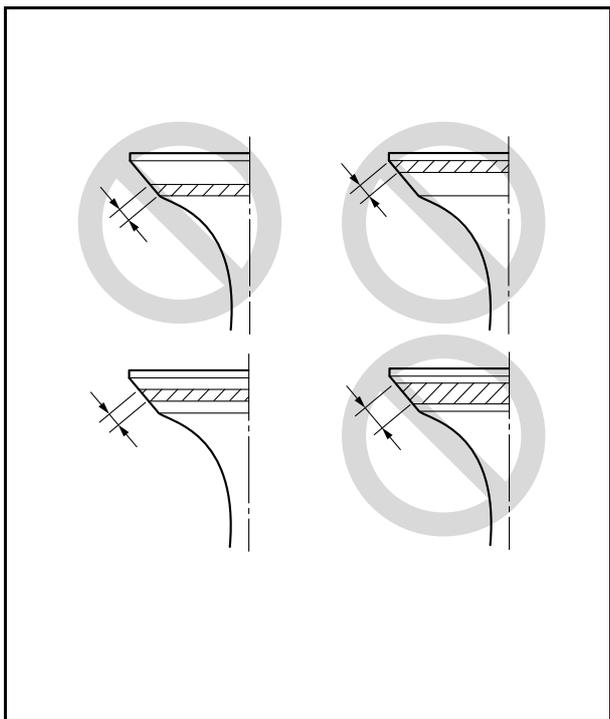
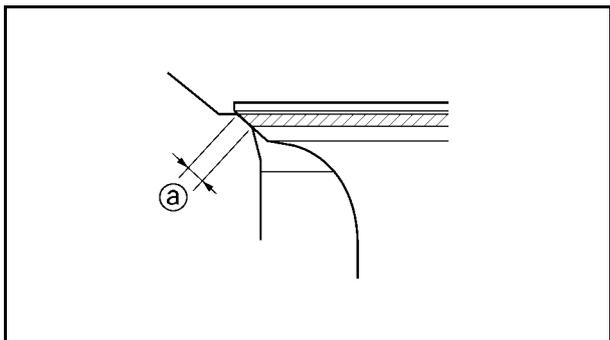
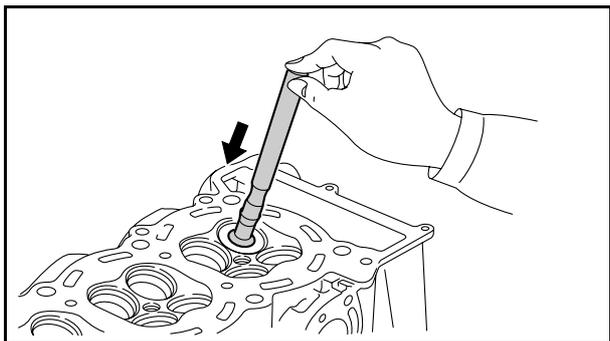


Valve guide reamer ④:  
YM-01196/90890-06804

4. Clean the valve guide inner surface.
5. Measure the valve guide inside diameter.



Valve guide inside diameter ⑤:  
Intake and exhaust:  
5.504–5.522 mm  
(0.2167–0.2174 in)



### Valve seat check

#### 1. Measure:

- Valve seat contact  
Does not seat properly → Reface the valve seat.

#### Measurement steps:

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



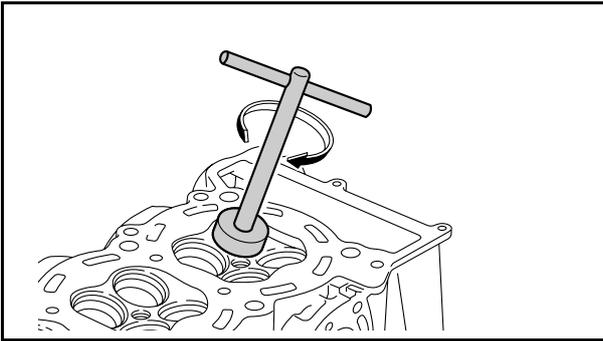
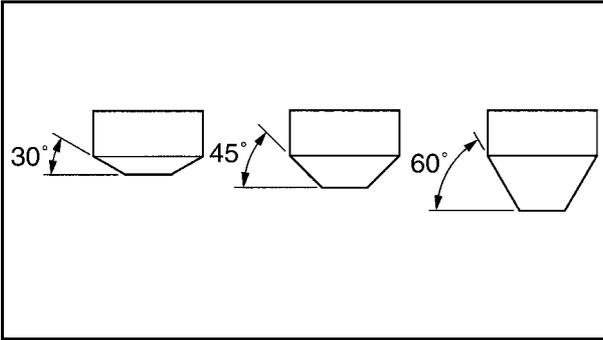
Valve seat contact width @:

Intake:

1.40–1.60 mm (0.055–0.063 in)

Exhaust:

1.50–1.70 mm (0.059–0.067 in)



### Valve seat refacing

**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.

**NOTE:** \_\_\_\_\_

Does not turn the special service tool counterclockwise when refacing the valve seat.

**1. Reface:**

- Valve seats



Neway valve seat kit:  
YB-91044

Valve seat cutter holder:  
90890-06812

Valve seat cutter:  
30° (intake):  
90890-06720

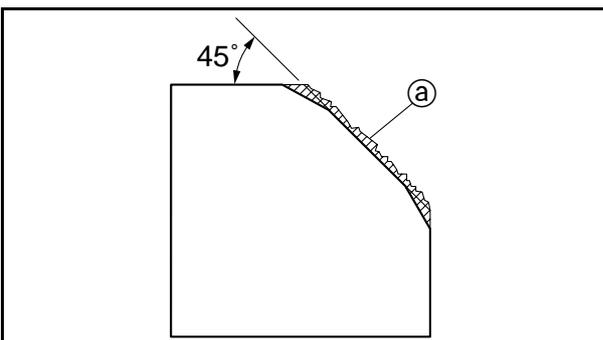
45° (intake):  
90890-06325

60° (intake):  
90890-06324

30° (exhaust):  
90890-06818

45° (exhaust):  
90890-06555

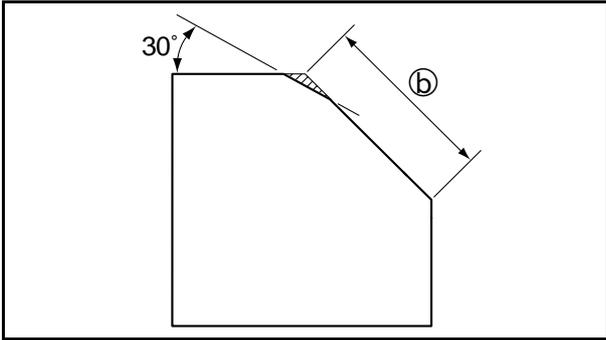
60° (exhaust):  
90890-06323



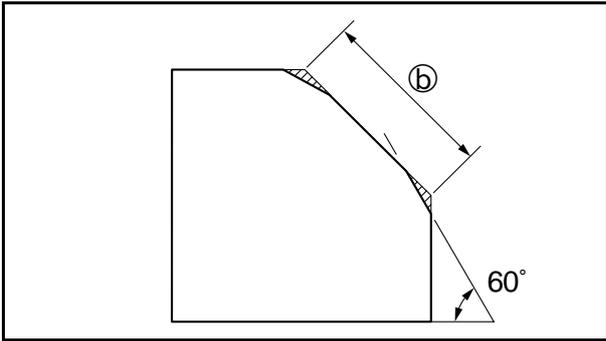
**Refacing steps:**

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

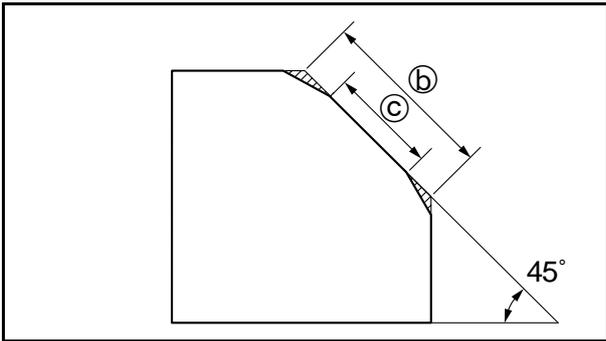
Ⓐ Slag or rough surface



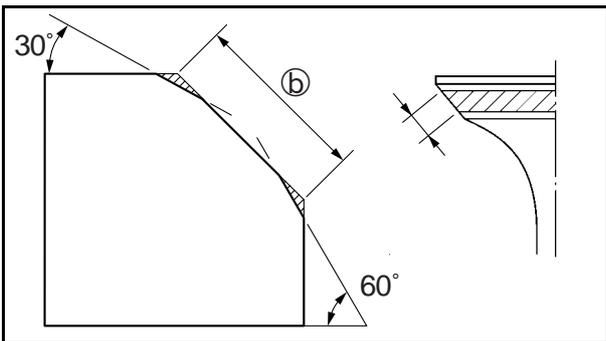
2. Use a 30° cutter to adjust the contact width of the top edge of the valve seat.
- ⓑ Previous contact width



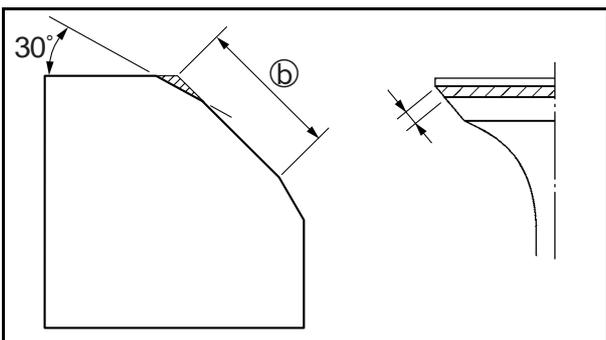
3. Use a 60° cutter to adjust the contact width of the bottom edge of the valve seat.
- ⓑ Previous contact width



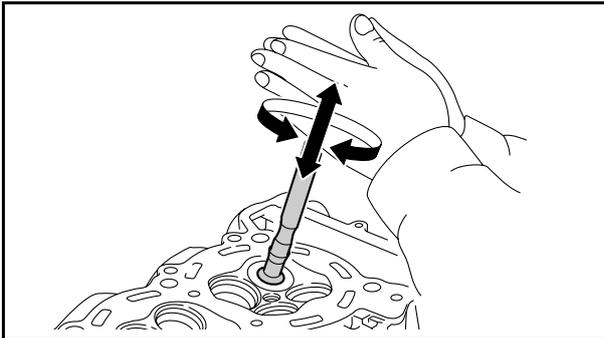
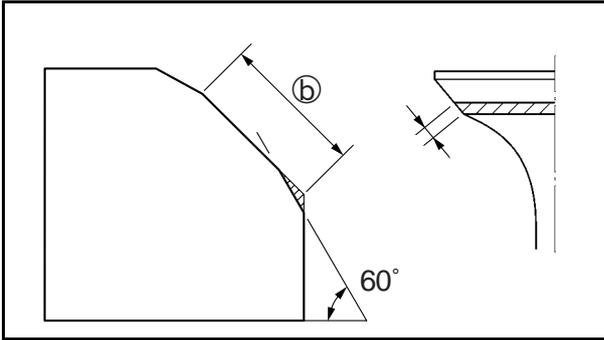
4. Use a 45° cutter to adjust the contact width of the valve seat to specification.
- ⓑ Previous contact width
- ⓒ Specified contact width
5. Check the valve seat contact area of the valve.
- Refer to “Valve seat check.”



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



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



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

ⓑ Previous contact width

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

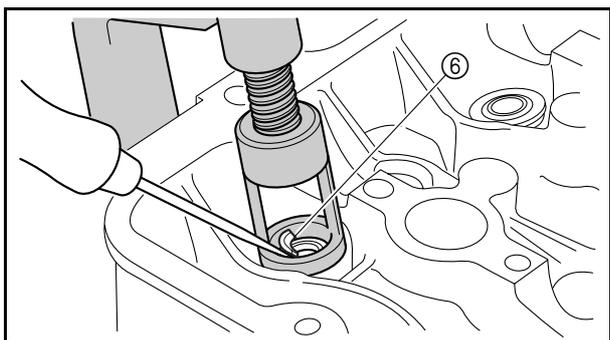
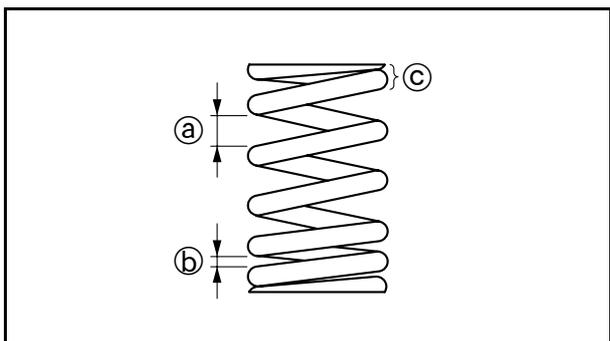
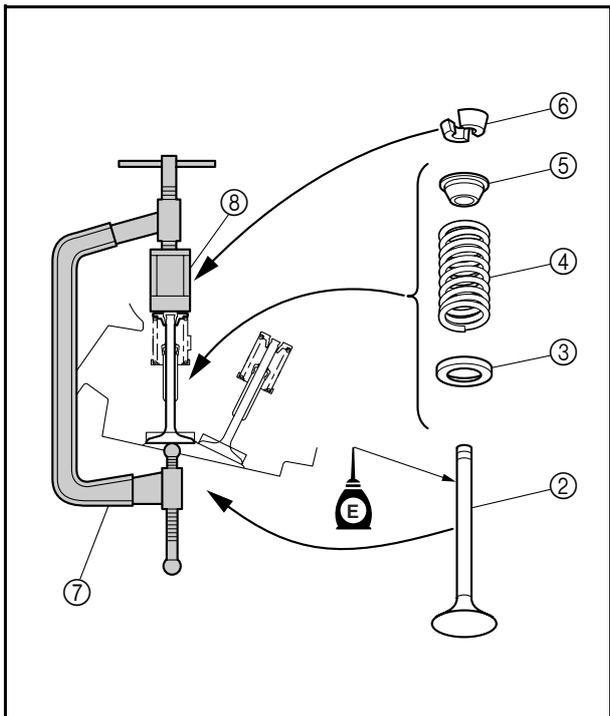
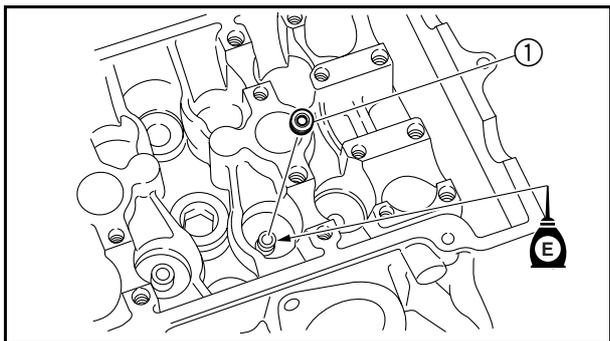
**CAUTION:** \_\_\_\_\_

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

7. After every lapping procedure, be sure to clean off any remaining lapping compound from the cylinder head and the valves.
8. Check the valve seat contact area of the valve again.  
Refer to “Valve seat check.”

**NOTE:** \_\_\_\_\_

After refacing the valve seat, check that the valve clearance is within specification. Refer to “Valve clearance measurement” in Chapter 3.



## Valve installation

### 1. Install:

- Valve seal ①
- Valve ②
- Lower spring seat ③
- Valve spring ④
- Upper spring seat ⑤
- Valve cotters ⑥

### Installation steps:

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

### CAUTION:

**Do not reuse the valve seal, always replace it with a new one.**

2. Install the valve ②, lower spring seat ③, valve spring ④, and upper spring seat ⑤ in the sequence shown, and then attach the special service tools ⑦ and ⑧.

### NOTE:

- When installing a new valve, always replace the valve guide and valve seal with new ones.
- Install the valve spring with the larger pitch (a) toward the camshaft and the smaller pitch (b) toward the combustion chamber.
- The end (c) of the valve spring with the larger pitch is painted red.



Valve spring compressor ⑦:

YM-04019/90890-04019

Compressor adapter ⑧:

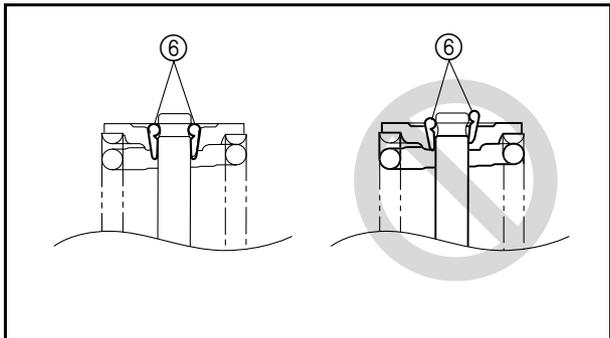
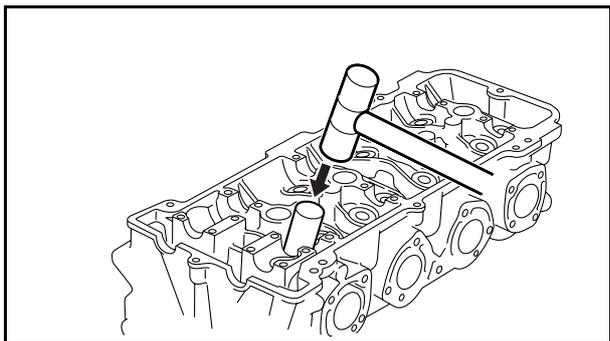
YM-04114

Valve spring compressor attachment

⑧:

90890-04114

3. Compress the valve spring, and then install the valve cotters ⑥.



4. Lightly tap the upper spring seat with a plastic hammer to set the valve cotteners ⑥ securely.

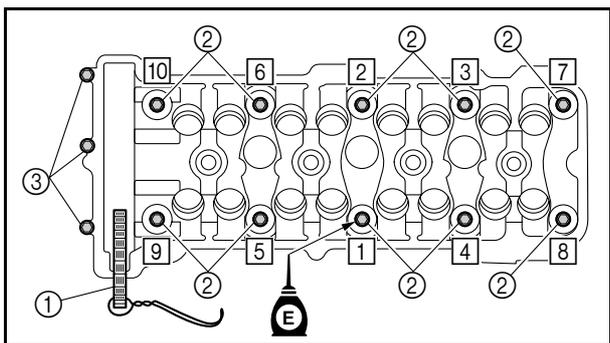
**Cylinder head installation**

**1. Install:**

- Cylinder head

**CAUTION:**

Do not reuse the cylinder head bolts ① and the cylinder head gasket, always replace them with new ones.



**Installation steps:**

1. Pass the timing chain ① through the timing chain cavity.
2. Apply engine oil to the cylinder head bolts.
3. Tighten the cylinder head bolts ② and ③ to the specified torques in the sequence shown.

**NOTE:**

Use a commercially available angle gauge to tighten the bolts to the specified angle.

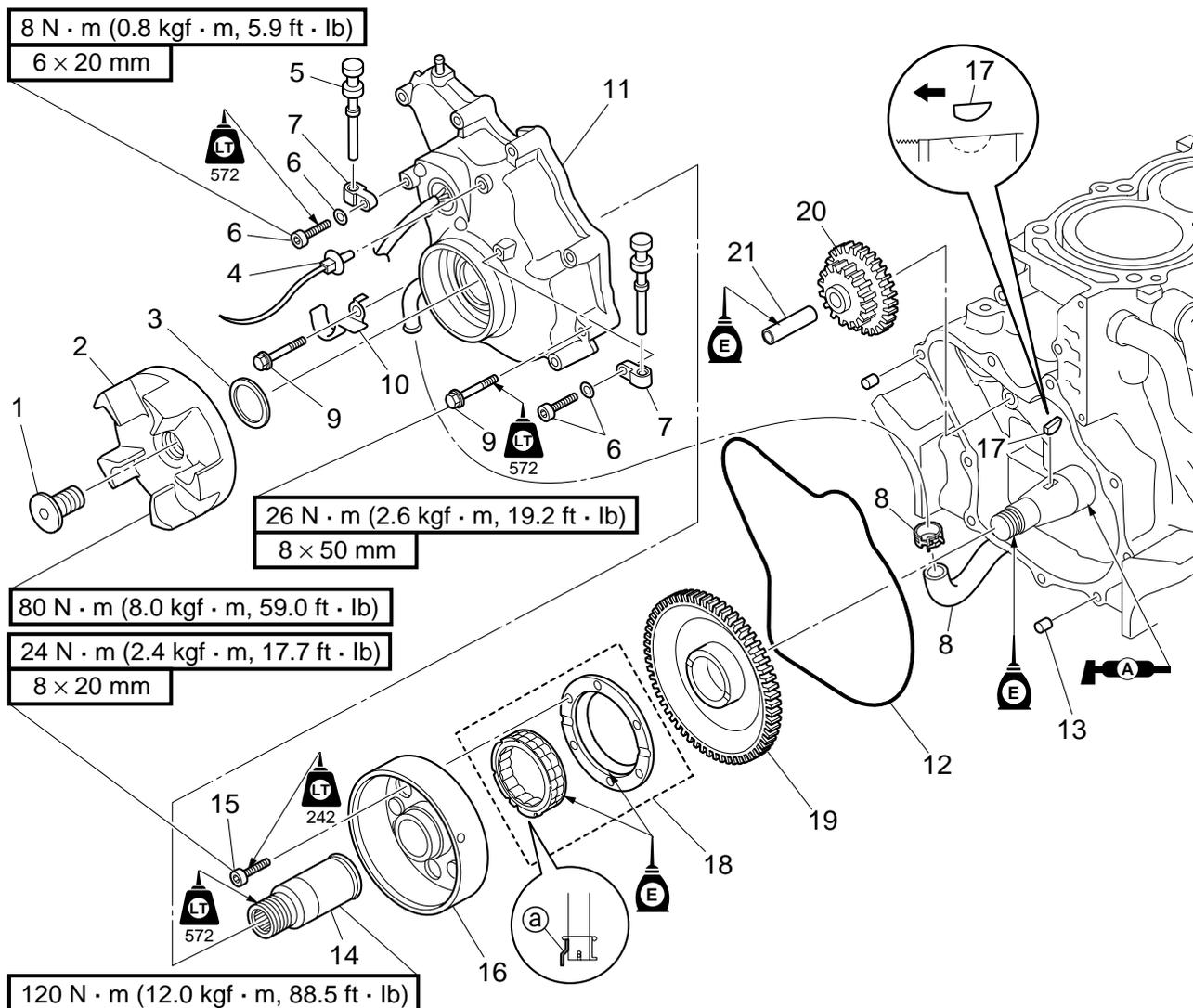


Cylinder head bolt (M12 × 140 mm) ②:  
 1st: 48 N·m (4.8 kgf·m, 35.4 ft·lb)  
 2nd: 90°  
 Cylinder head bolt (M6 × 55 mm) ③:  
 10 N·m (1.0 kgf·m, 7.4 ft·lb)



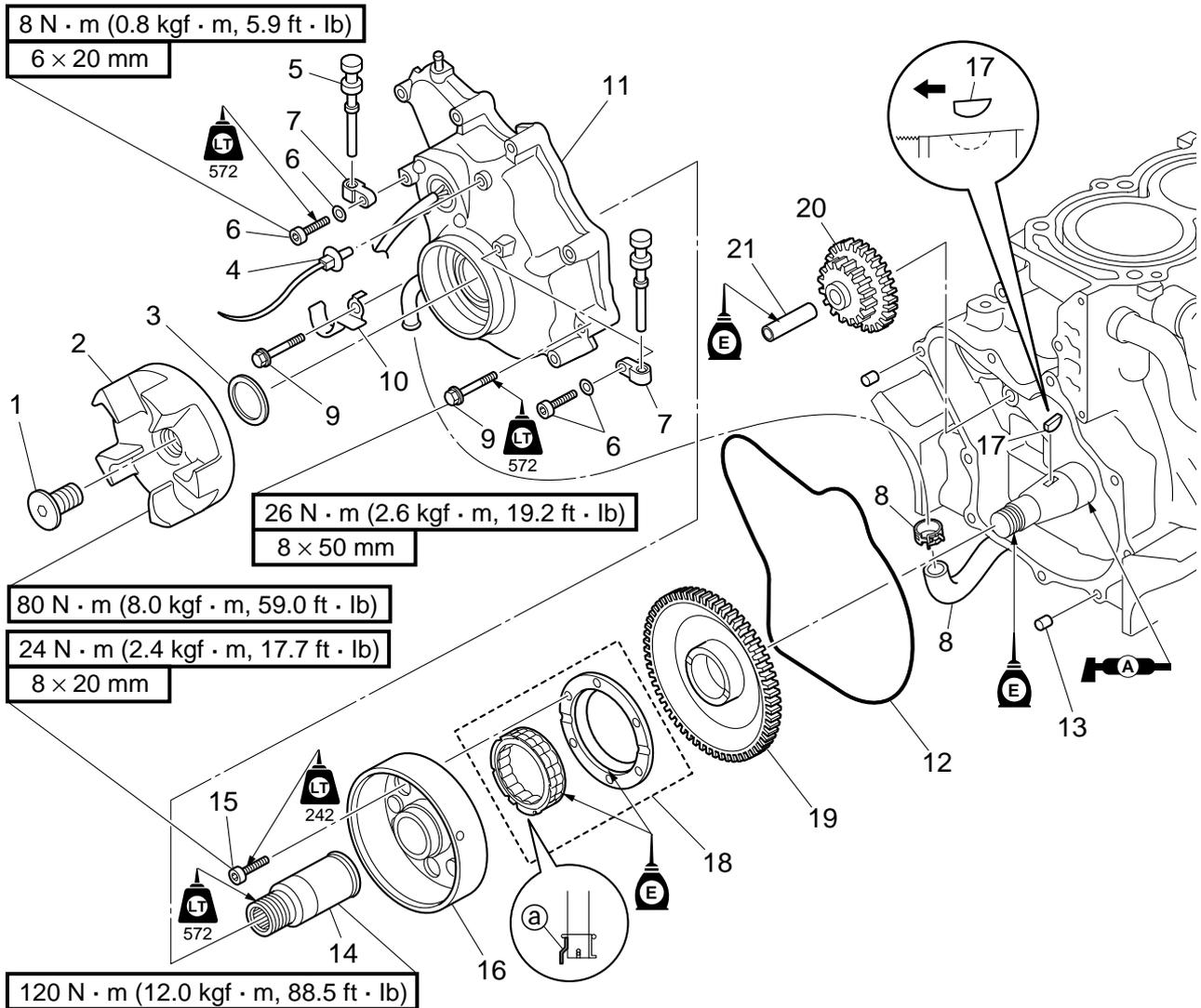
# Generator cover and flywheel magneto

## Generator cover and flywheel magneto removal



5

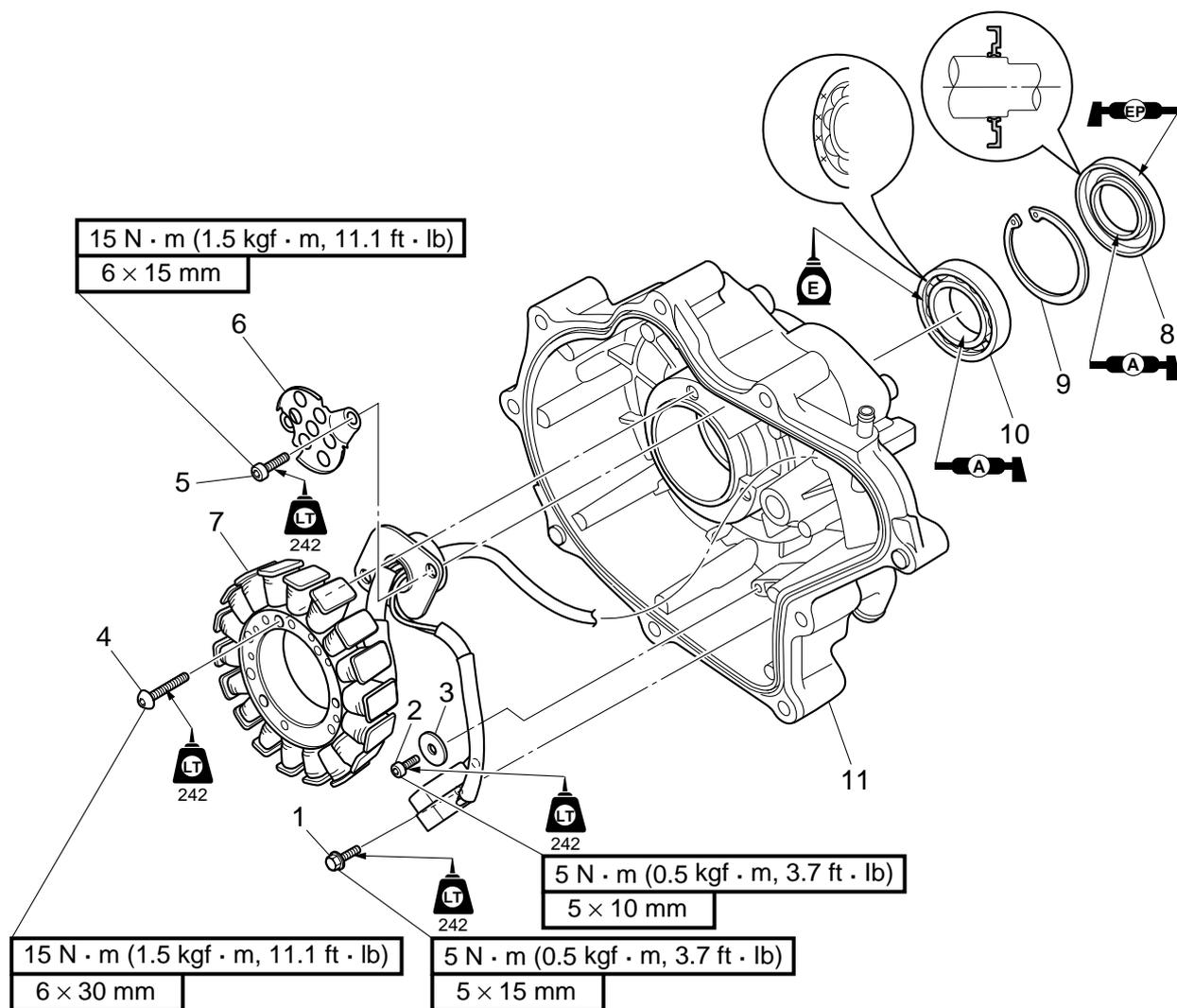
Step	Procedure/Part name	Q'ty	Service points
1	Plug	1	
2	Drive coupling	1	
3	Washer	1	
4	Plastic tie	1	
5	Grommet	2	
6	Bolt/washer	2/2	
7	Bracket	2	
8	Clamp/hose	1/1	
9	Bolt	9	
10	Clamp	1	
11	Generator cover assembly	1	
12	O-ring	1	<b>Not reusable</b>
13	Dowel pin	2	



Step	Procedure/Part name	Q'ty	Service points
14	Transfer shaft	1	<p><b>CAUTION:</b> _____</p> <p>Make sure that the starter clutch is installed into the outer flange so that the side <b>a</b> is facing toward the flywheel magneto as shown.</p>
15	Bolt	6	
16	Flywheel magneto	1	
17	Woodruff key	1	
18	Starter clutch assembly	1	
19	Starter gear	1	<p>Reverse the removal steps for installation.</p>
20	Idle gear	1	
21	Shaft	1	

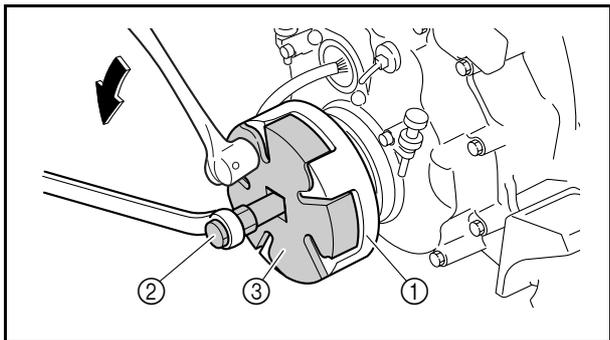


Generator cover disassembly



5

Step	Procedure/Part name	Q'ty	Service points
1	Bolt	2	
2	Bolt	1	
3	Washer	1	
4	Bolt	3	
5	Bolt	2	
6	Clamp	1	
7	Stator coil assembly	1	
8	Oil seal	1	<b>Not reusable</b>
9	Circlip	1	
10	Bearing	1	<b>Not reusable</b>
11	Generator cover	1	
			Reverse the disassembly steps for assembly.



### Drive coupling removal

**1. Remove:**

- Drive coupling ①

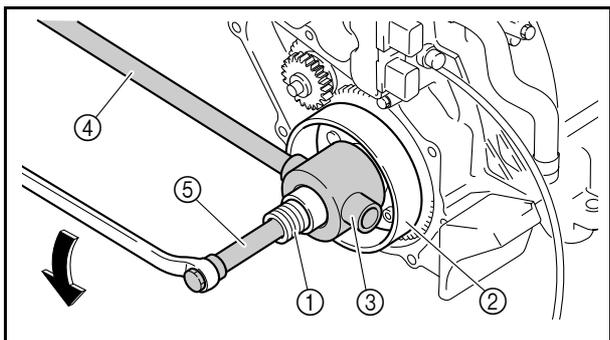
**Removal steps:**

1. Remove the plug from the drive coupling.
2. Hold the transfer shaft with the special service tool ②, and then remove the drive coupling ① with the special service tool ③.



Crankshaft holder ②:  
YB-06562/90890-06562

Coupler wrench ③:  
90890-06729



### Flywheel magneto removal

**1. Remove:**

- Transfer shaft ①

**Removal step:**

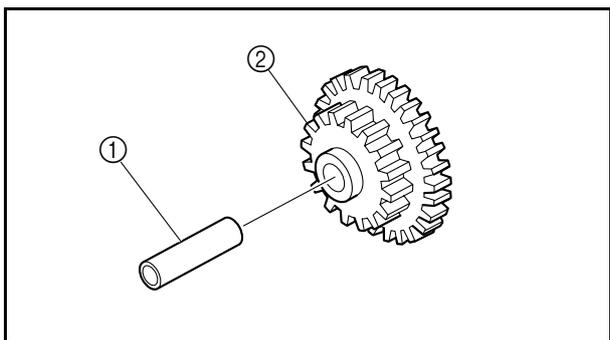
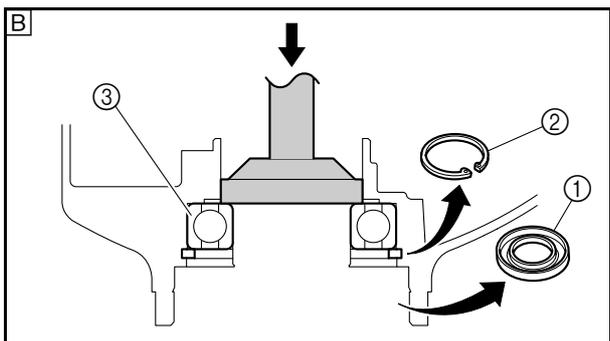
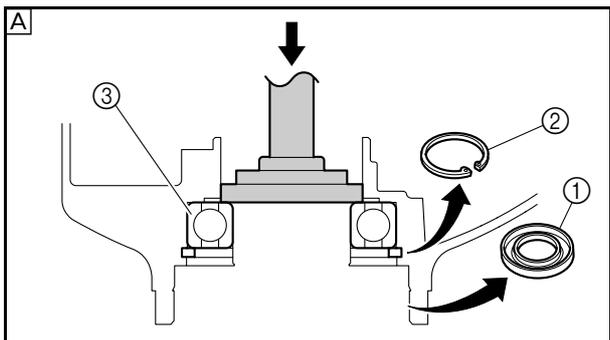
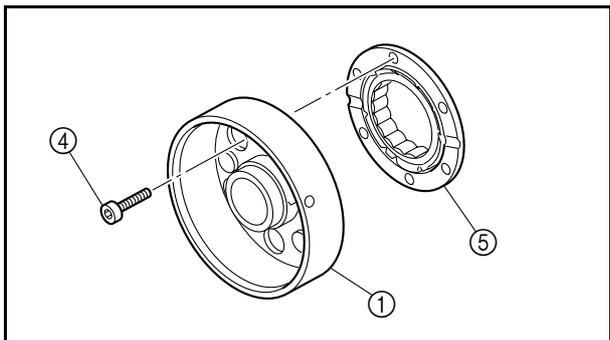
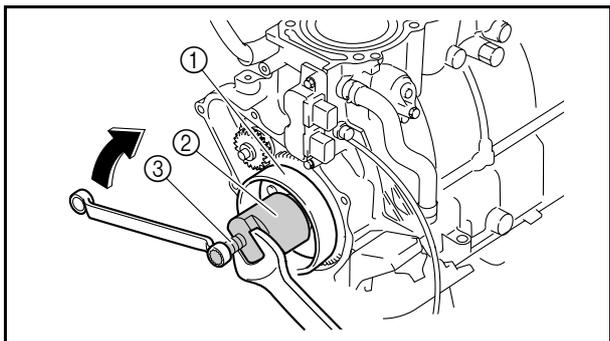
1. Hold the flywheel magneto ② with the special service tools ③ and ④, and then remove the transfer shaft ① with the special service tool ⑤.



Shaft holder ③:  
90890-06721

Driver handle ④:  
90890-06722

Crankshaft holder ⑤:  
YB-06562/90890-06562



**2. Remove:**

- Flywheel magneto ①

**Removal steps:**

1. Remove the flywheel magneto ① with the special service tools ② and ③.



Flywheel puller ②:  
90890-06723  
Rotor puller ③:  
90890-01080

2. Remove the flywheel magneto bolts ④, and then remove the starter clutch assembly ⑤.

**Bearing removal**

**1. Remove:**

- Oil seal ①
- Circlip ②
- Bearing ③

**NOTE:** \_\_\_\_\_  
Be sure to remove the circlip before removing the bearing.



Driver handle (small):  
YB-06229  
Bearing and seal installer:  
YW-06356  
Driver rod LS:  
90890-06606  
Bearing outer race attachment:  
90890-06627

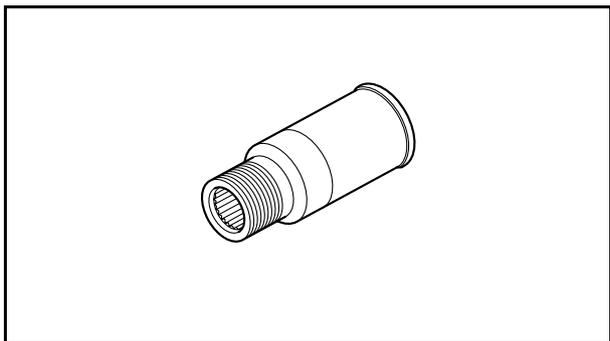
Ⓐ For USA and Canada

Ⓑ For worldwide

**Idle gear and shaft check**

**1. Check:**

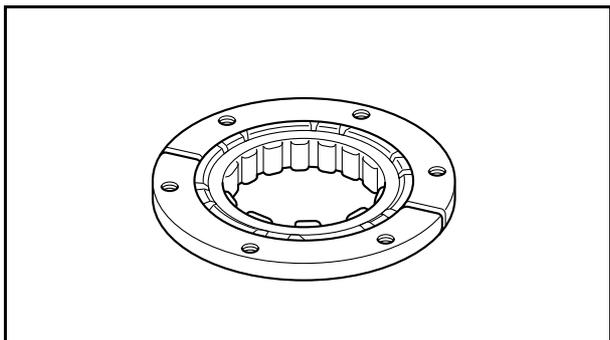
- Shaft ①  
Bends/wear → Replace the idle gear shaft.
- Idle gear ②  
Cracks/damage → Replace the idle gear.



**Transfer shaft check**

**1. Check:**

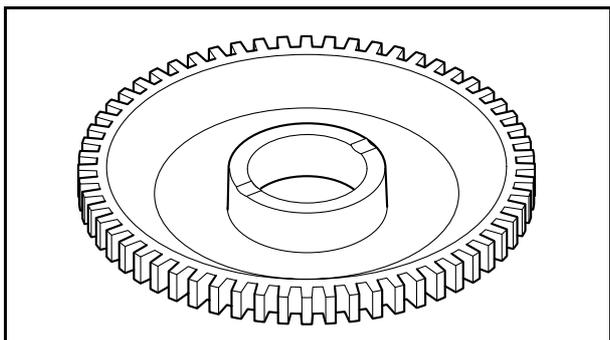
- Transfer shaft  
Cracks/damage → Replace the transfer shaft.



**Starter clutch check**

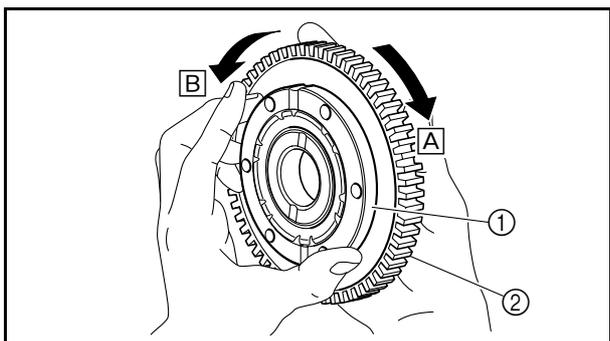
**1. Check:**

- Starter clutch rollers  
Cracks/damage → Replace the starter clutch assembly.



**2. Check:**

- Starter gear  
Cracks/damage → Replace the starter gear.



**3. Check:**

- Starter clutch operation  
Does not operate properly → Replace the starter clutch assembly.

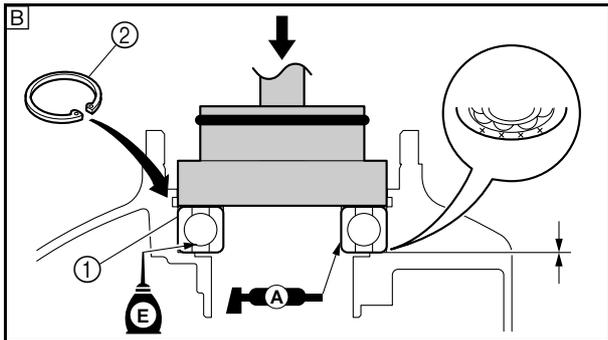
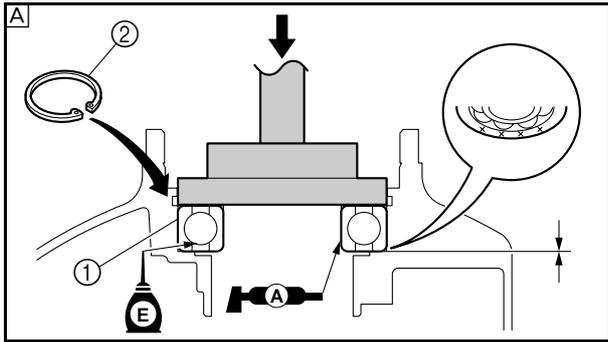
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**Checking steps:**

1. Install the starter clutch assembly ① onto the starter gear ② and hold the starter clutch assembly.
  2. Turn the starter gear clockwise [A] and check that it turns smoothly.
  3. Turn the starter gear counterclockwise [B] and check that it does not turn.
- 
-



**Bearing installation**

**CAUTION:** \_\_\_\_\_

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

**1. Install:**

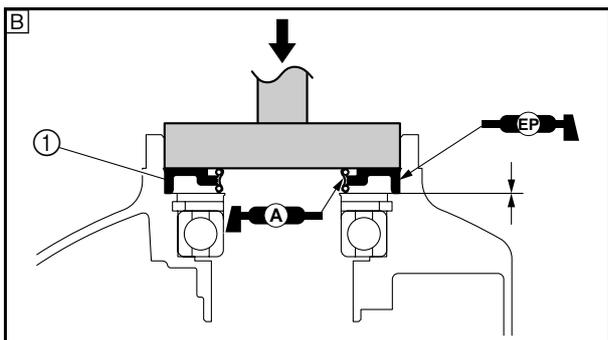
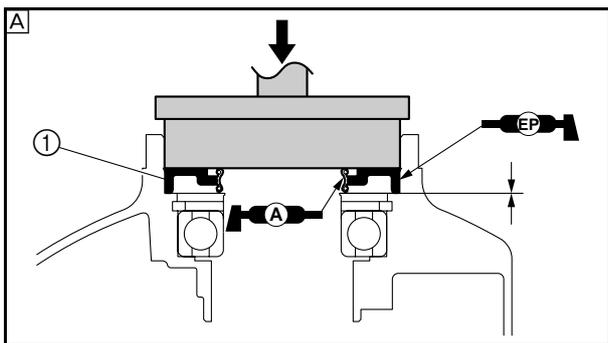
- Bearing ①
- Circlip ②



Driver handle (large):  
YB-06071  
Forward gear outer race installer:  
YB-41446  
Driver rod LS:  
90890-06606  
Ball bearing attachment:  
90890-06657

A For USA and Canada

B For worldwide



**Oil seal installation**

**CAUTION:** \_\_\_\_\_

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

**1. Install:**

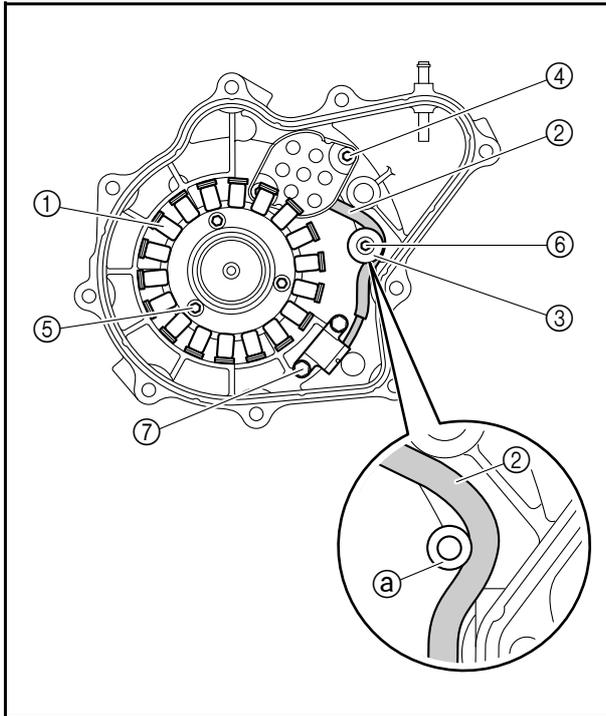
- Oil seal ①



Forward bearing race installer:  
YB-06258  
Bearing pressure C:  
90890-02393

A For USA and Canada

B For worldwide



### Generator cover assembly

#### 1. Install:

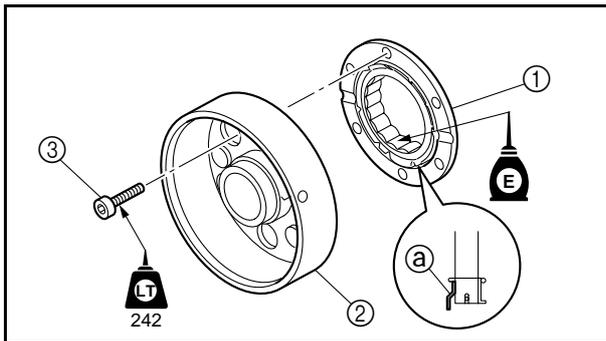
- Stator coil assembly ①

#### NOTE:

Pass the pickup coil lead ② between the cover and the bolt hole (a), and then hold the washer ③.



- Clamp bolt ④:  
15 N·m (1.5 kgf·m, 11.1 ft·lb)
- Stator coil bolt ⑤:  
15 N·m (1.5 kgf·m, 11.1 ft·lb)
- Washer bolt ⑥:  
5 N·m (0.5 kgf·m, 3.7 ft·lb)
- Pickup coil bolt ⑦:  
5 N·m (0.5 kgf·m, 3.7 ft·lb)
- LOCTITE 242



### Flywheel magneto installation

#### 1. Install:

- Starter clutch assembly ①
- Flywheel magneto ②
- Bolts ③

#### CAUTION:

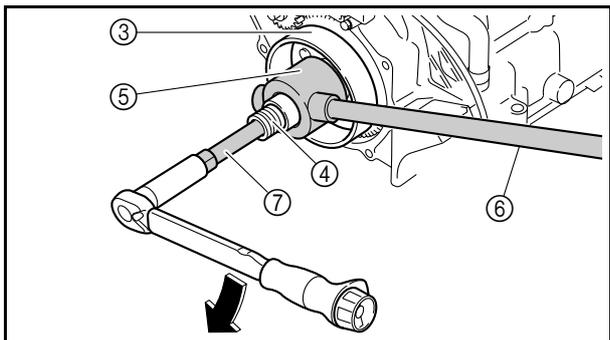
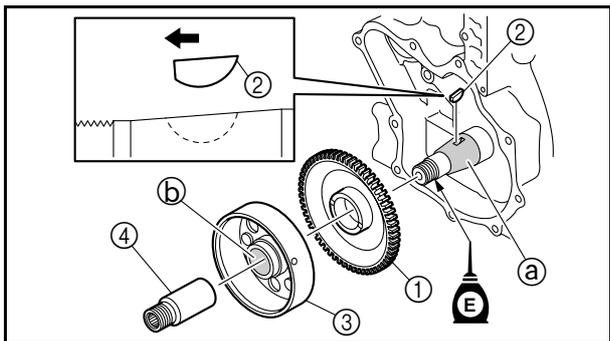
Make sure that the starter clutch is installed into the outer flange so that the side (a) is facing toward the flywheel magneto as shown.

#### NOTE:

Apply engine oil to the starter clutch rollers before installation.



- Flywheel magneto bolt:  
24 N·m (2.4 kgf·m, 17.7 ft·lb)
- LOCTITE 242



**2. Install:**

- Starter gear ①
- Woodruff key ②
- Flywheel magneto ③
- Transfer shaft ④

**Installation steps:**

1. Install the starter gear ①, woodruff key ②, flywheel magneto ③, and transfer shaft ④.

**NOTE:**

Be sure to remove any grease from the tapered portion ① of the crankshaft and the inner surface ② of the flywheel magneto ③.

2. Hold the flywheel magneto ③ with the special service tools ④ and ⑤, and then tighten the transfer shaft ④ with the special service tool ⑥.

**NOTE:**

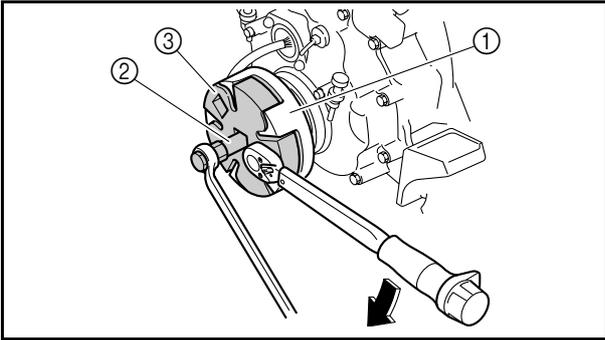
Apply engine oil the threads of the crankshaft before installing the transfer shaft.



Shaft holder ④:  
90890-06721  
Driver handle ⑤:  
90890-06722  
Crankshaft holder ⑥:  
YB-06562/90890-06562



Transfer shaft:  
120 N·m (12.0 kgf·m, 88.5 ft·lb)



## Drive coupling installation

### 1. Install:

- Drive coupling ①

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### Installation step:

1. Hold the transfer shaft with the special service tool ②, and then tighten the drive coupling ① with the special service tool ③.



Crankshaft holder ②:  
YB-06562/90890-06562

Coupler wrench ③:  
90890-06729



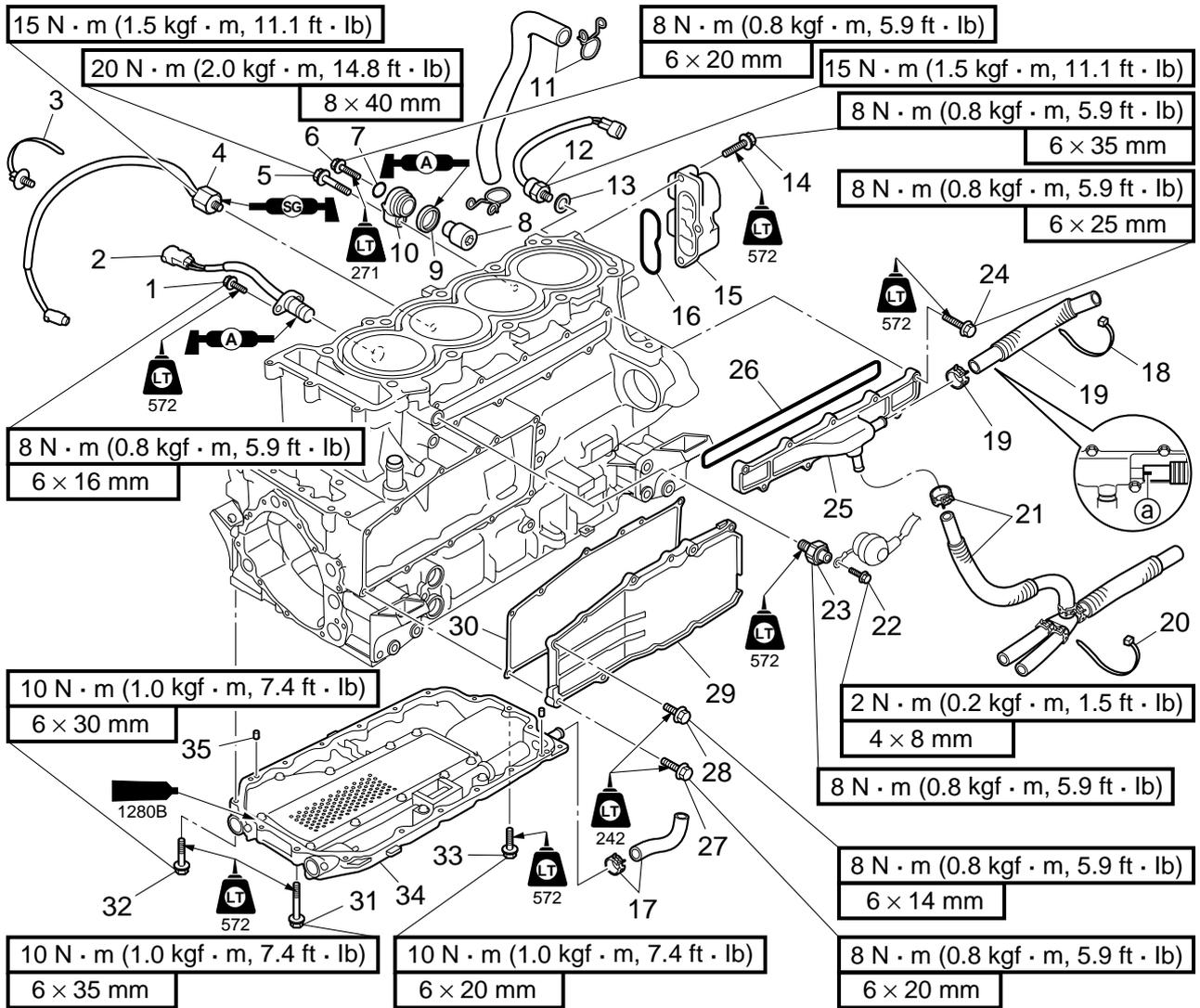
Drive coupling:  
80 N·m (8.0 kgf·m, 59.0 ft·lb)  
LOCTITE 572

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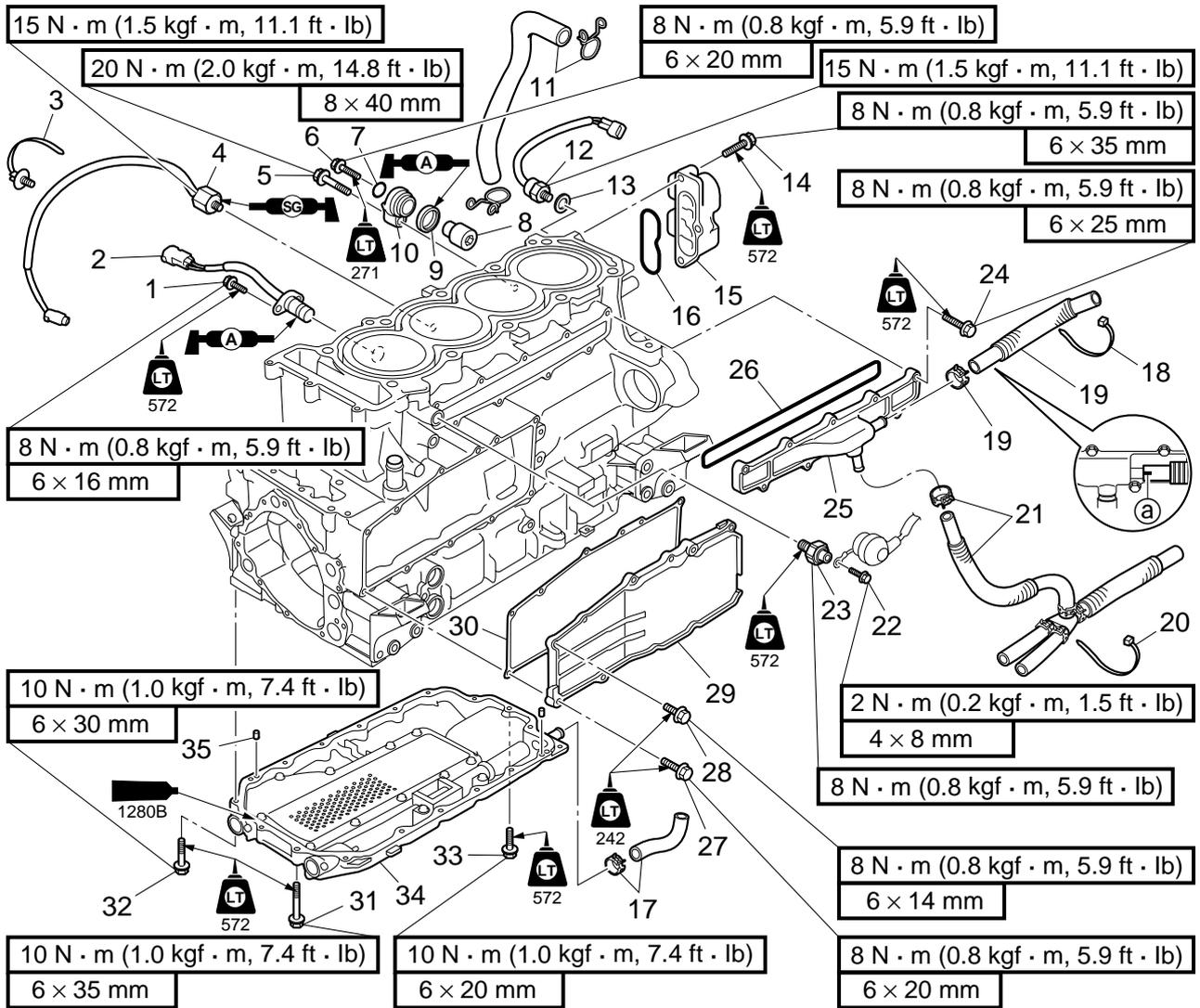
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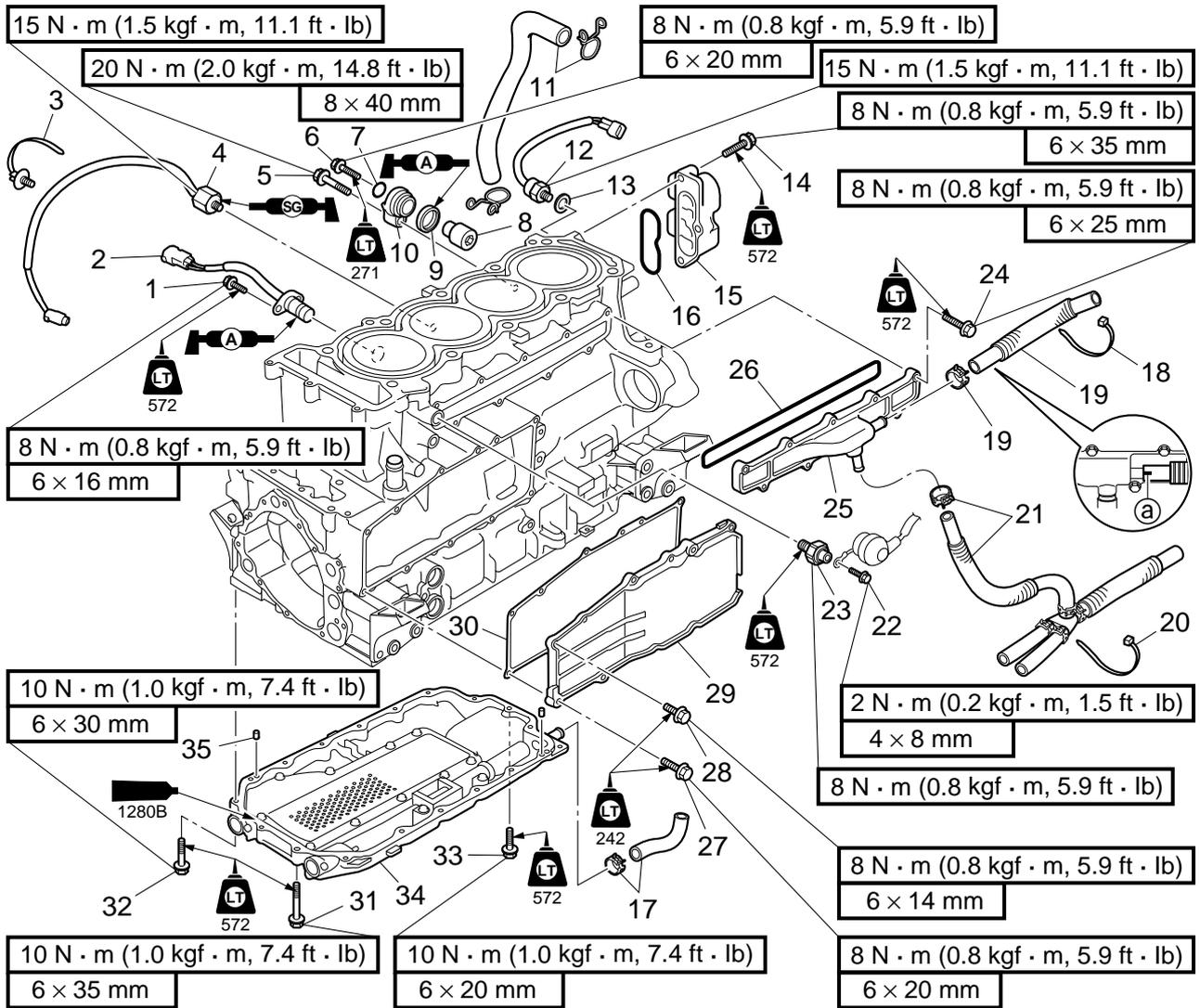
**Oil separator tank and oil pan**  
**Oil separator tank and oil pan removal**



Step	Procedure/Part name	Q'ty	Service points
1	Bolt	2	
2	Thermoswitch	1	
3	Plastic tie	1	
4	Knock sensor	1	
5	Bolt	1	
6	Bolt	1	
7	Gasket	1	<b>Not reusable</b>
8	Anode	1	
9	Grommet	1	
10	Cover	1	
11	Clamp/oil return hose	2/1	

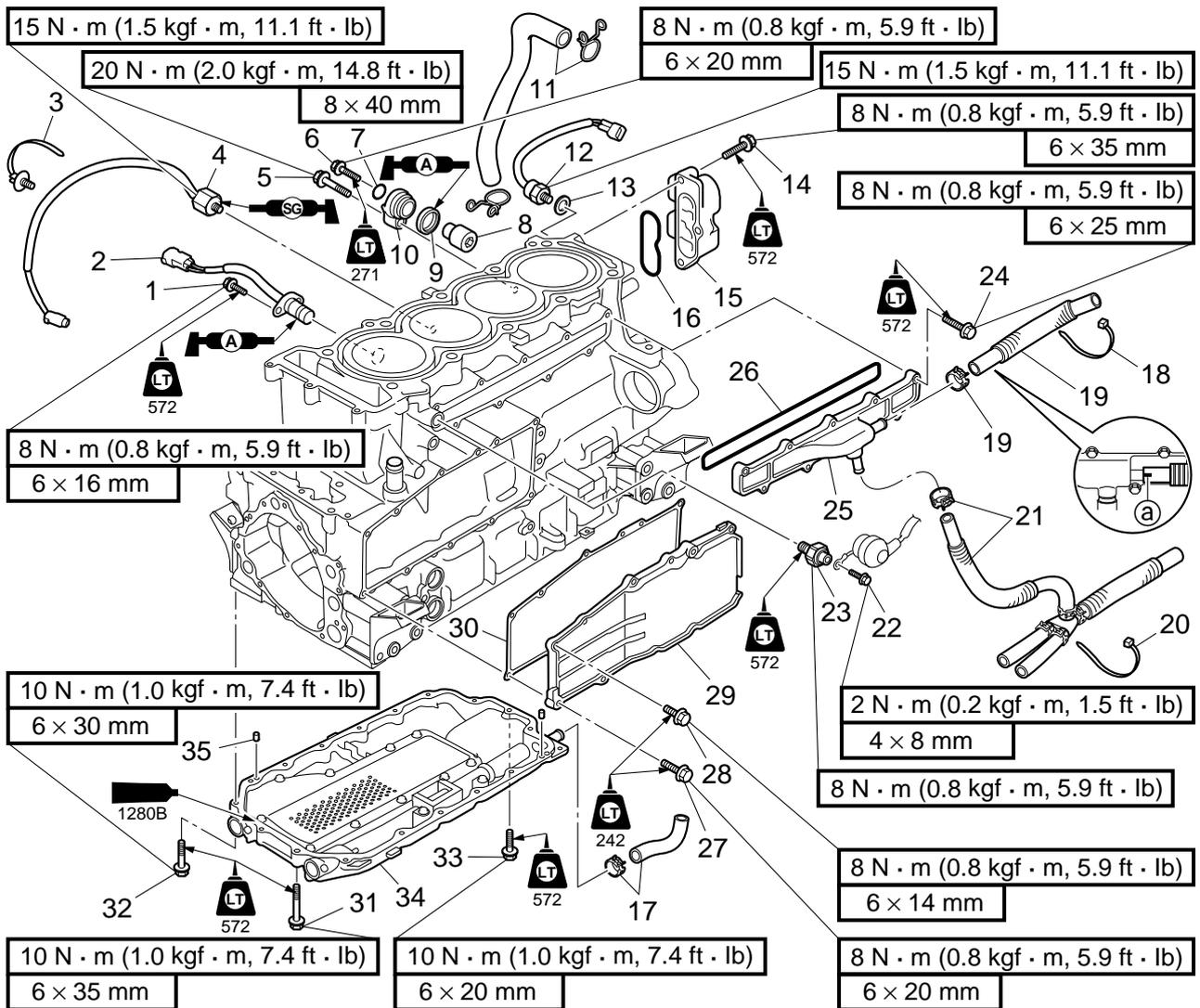


Step	Procedure/Part name	Q'ty	Service points
12	Engine temperature sensor	1	<b>NOTE:</b> _____ Install the cooling water hose with the white paint @ facing away from the crankcase.
13	Washer	1	
14	Bolt	3	
15	Earth plate	1	
16	O-ring	1	
17	Clamp/oil hose	1/1	
18	Plastic tie	1	
19	Clamp/cooling water hose	1/1	



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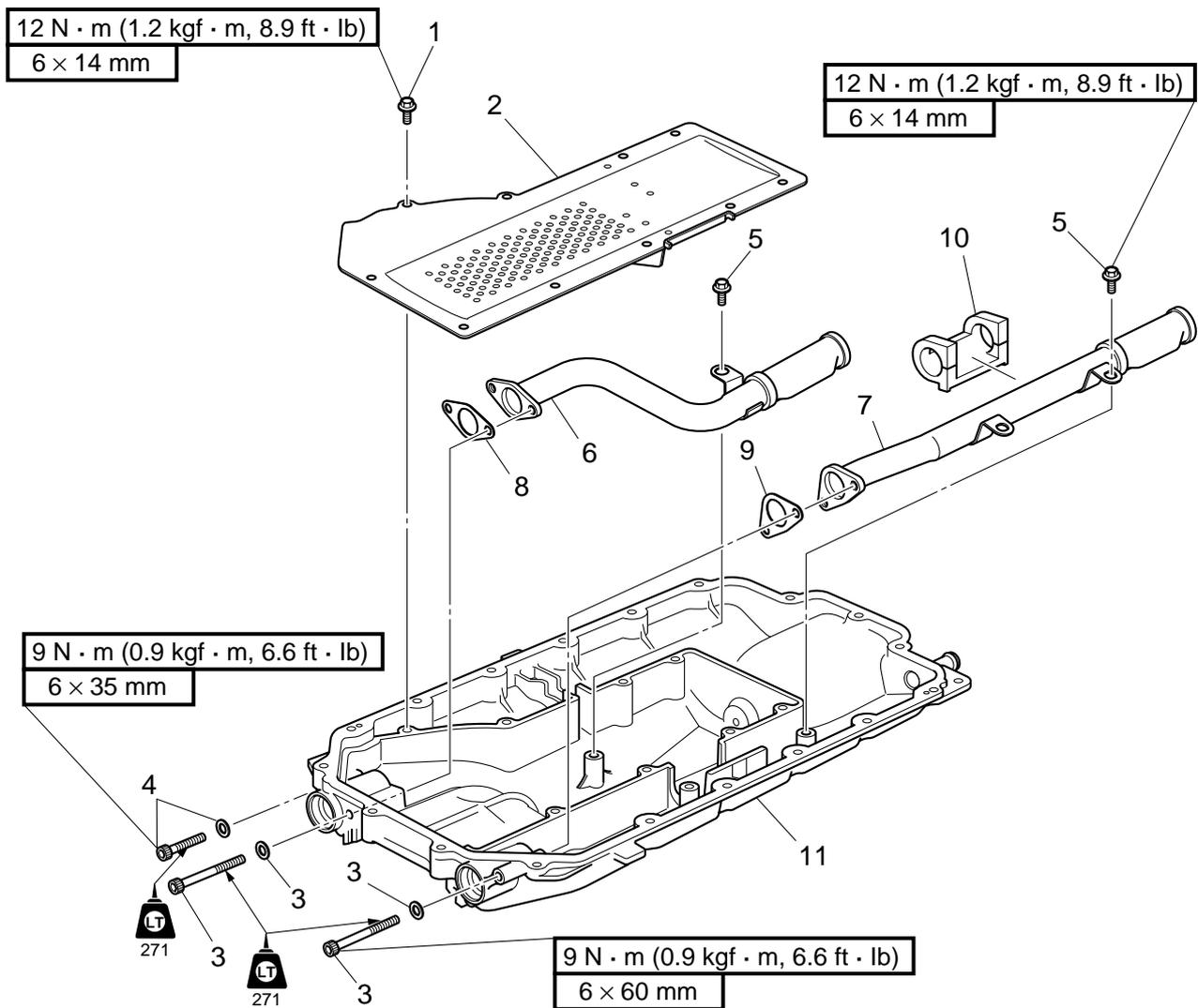
Step	Procedure/Part name	Q'ty	Service points
20	Band	1	<b>Not reusable</b>
21	Clamp/cooling water hose	1/1	
22	Bolt	1	
23	Oil pressure switch	1	
24	Bolt	9	
25	Water jacket cover	1	
26	Gasket	1	<b>Not reusable</b>
27	Bolt	9	
28	Bolt	2	
29	Oil separator tank cover	1	



Step	Procedure/Part name	Q'ty	Service points
30	Gasket	1	<p><b>Not reusable</b></p> <p>Reverse the removal steps for installation.</p>
31	Bolt	16	
32	Bolt	1	
33	Bolt	1	
34	Oil pan assembly	1	
35	Dowel pin	2	

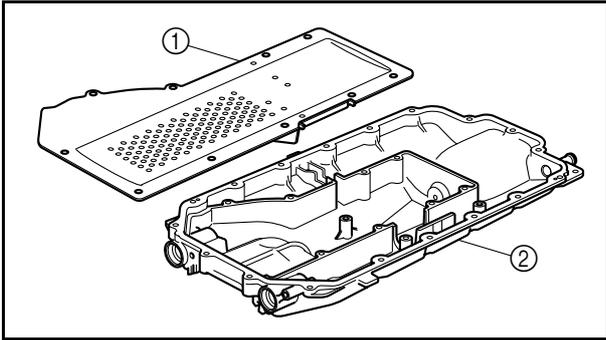


Oil pan disassembly



5

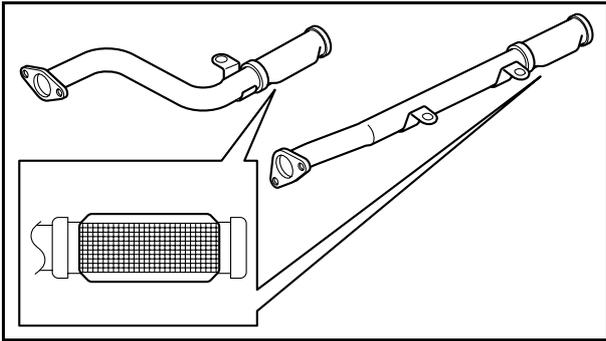
Step	Procedure/Part name	Q'ty	Service points
1	Bolt	10	
2	Baffle plate	1	
3	Bolt/washer	3/3	
4	Bolt/washer	1/1	
5	Bolt	3	
6	Oil pipe 1	1	
7	Oil pipe 2	1	
8	Gasket 1	1	<b>Not reusable</b>
9	Gasket 2	1	<b>Not reusable</b>
10	Grommet	1	
11	Oil pan	1	
			Reverse the disassembly steps for assembly.



**Oil pan check**

**1. Check:**

- Baffle plate ①  
Clog/contaminants → Clean the baffle plate.  
Cracks/damage → Replace the baffle plate.
- Oil pan ②  
Cracks/damage → Replace the oil pan.

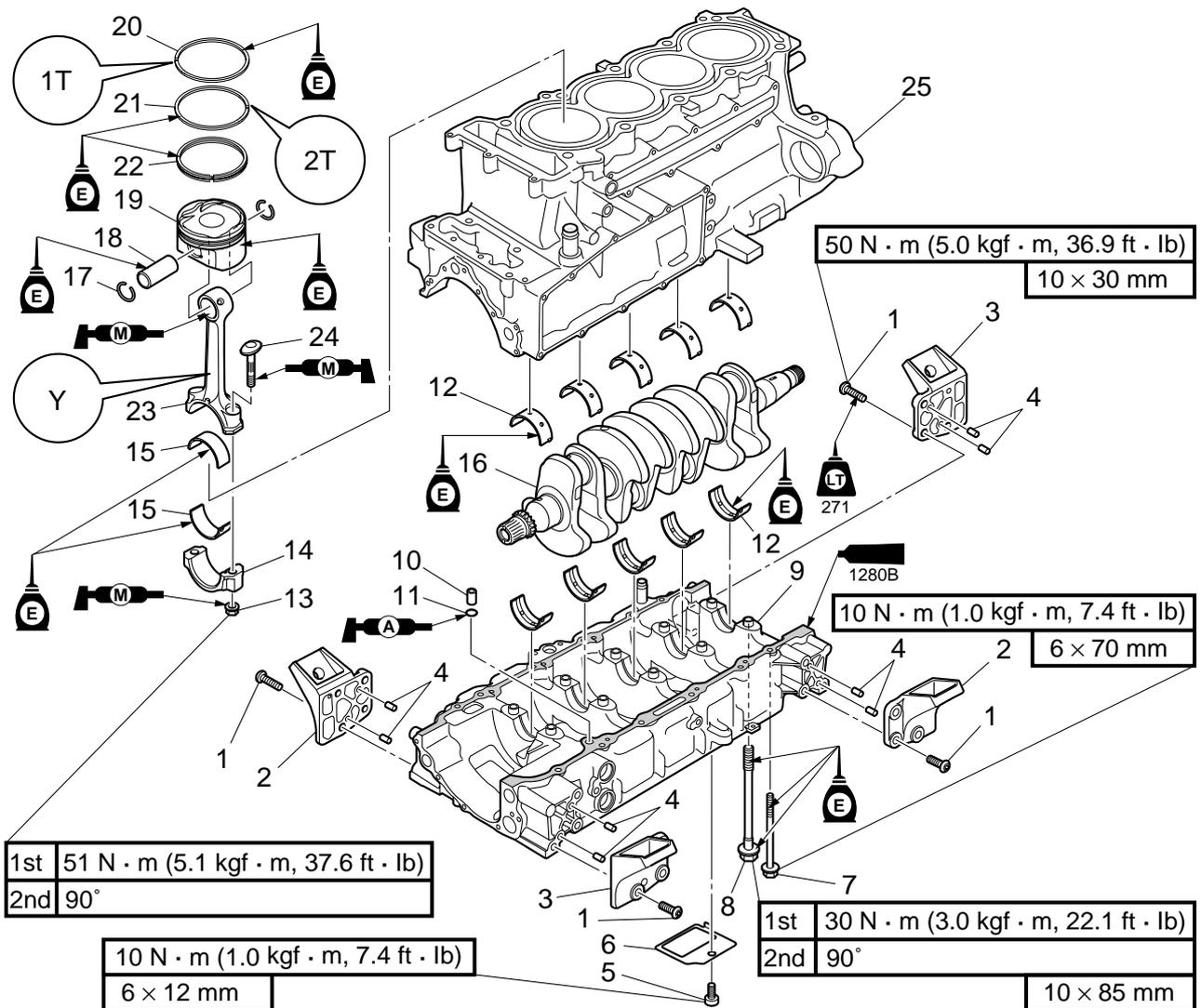


**2. Check:**

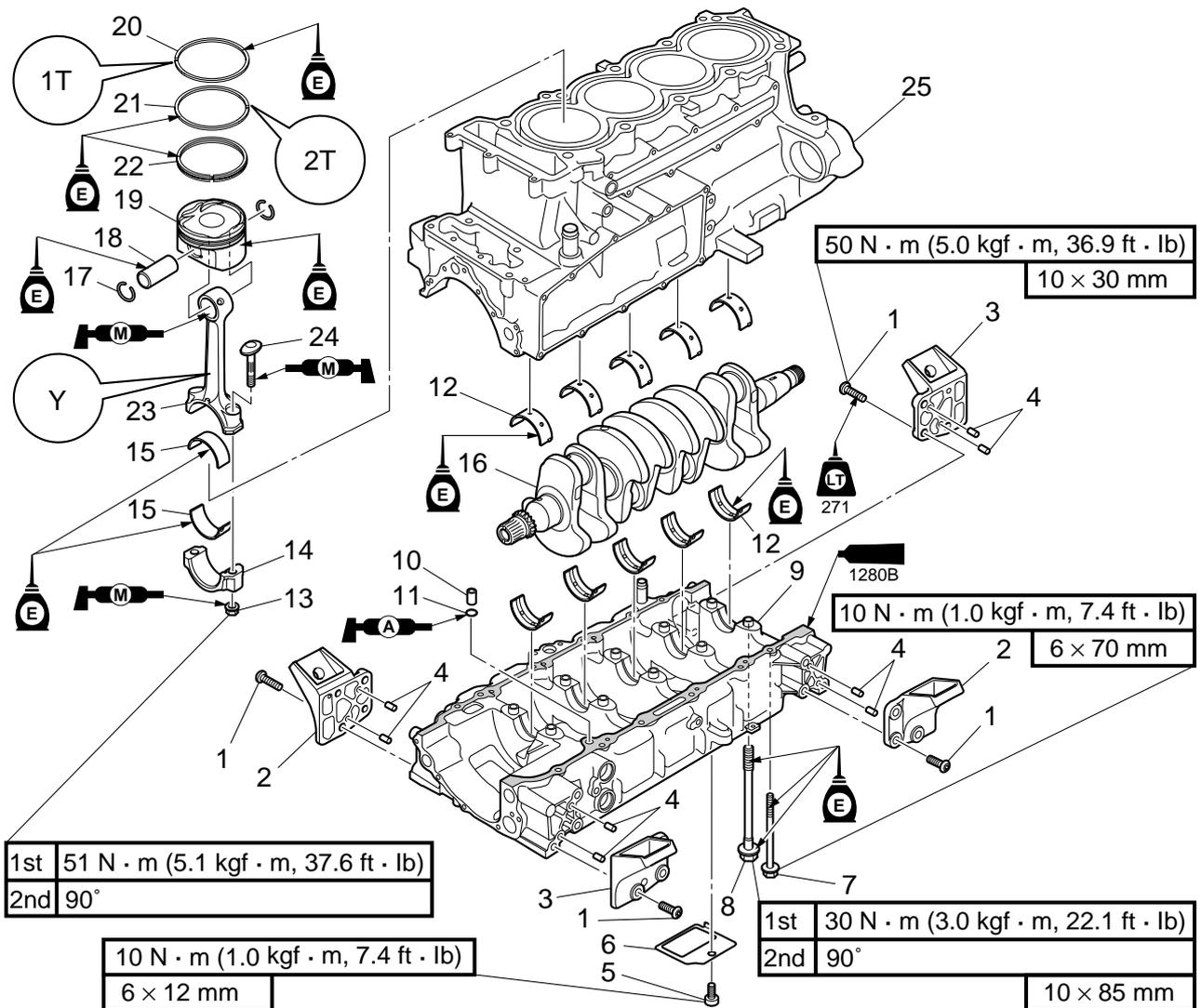
- Oil pipe  
Clog/contaminants → Clean the oil pipe.  
Cracks/damage → Replace the oil pipe.



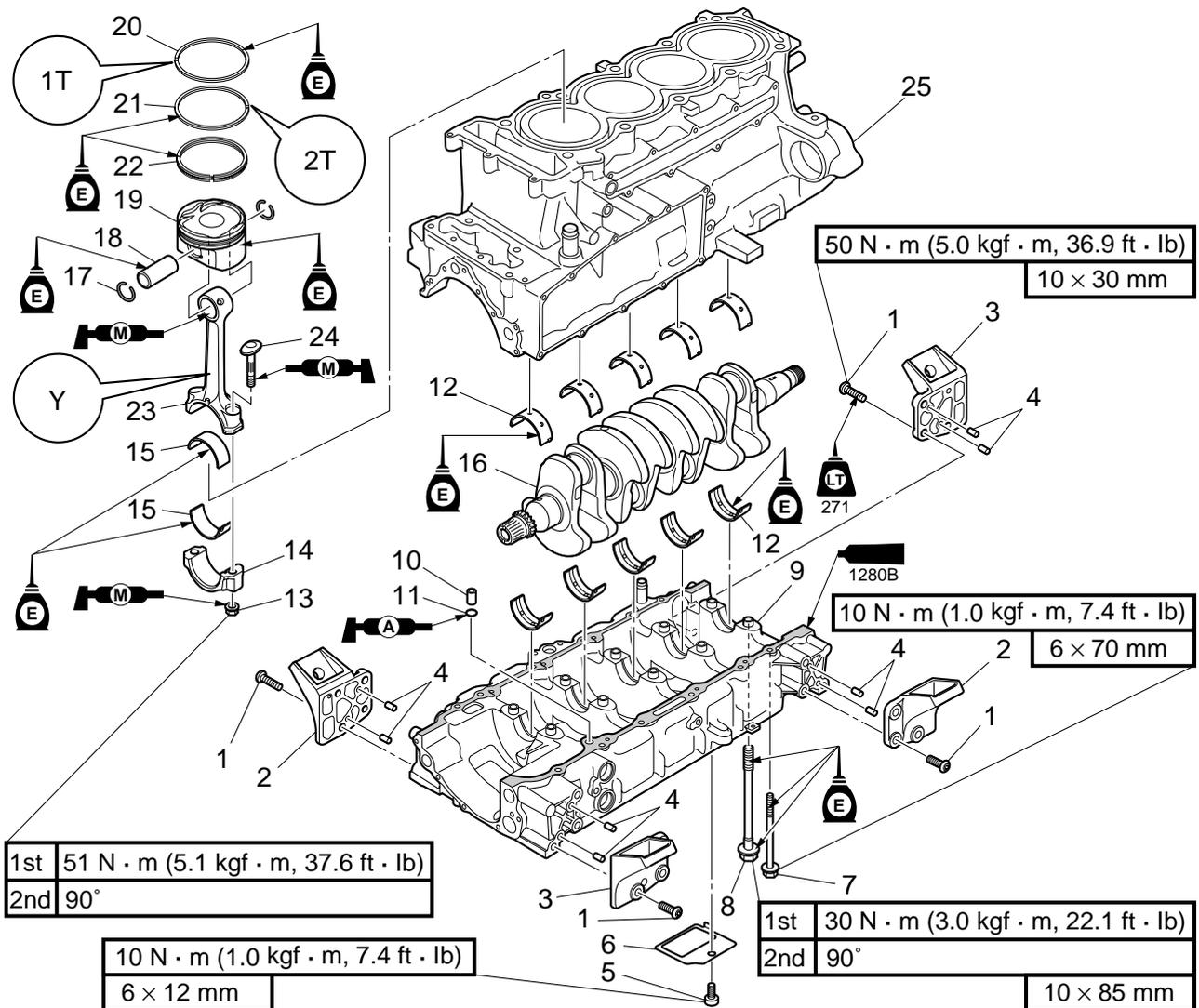
**Crankcase, connecting rod, and piston**  
**Crankcase, connecting rod, and piston disassembly**



Step	Procedure/Part name	Q'ty	Service points
1	Bolt	12	
2	Bracket 1	2	
3	Bracket 2	2	
4	Dowel pin	8	
5	Bolt	1	
6	Baffle plate	1	
7	Bolt	12	
8	Bolt	10	<b>Not reusable</b>
9	Crankcase	1	
10	Dowel	1	

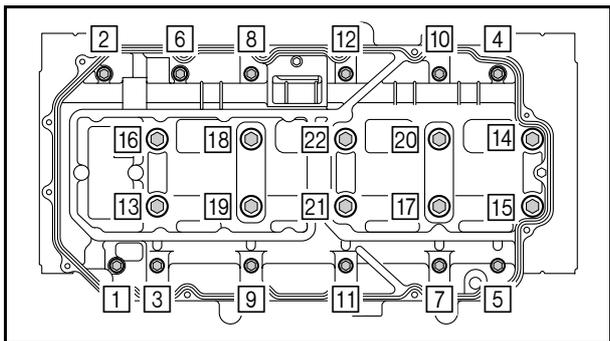


Step	Procedure/Part name	Q'ty	Service points
11	O-ring	1	<b>Not reusable</b>
12	Crankshaft journal bearing	10	
13	Nut	8	
14	Connecting rod cap	4	
15	Connecting rod bearing	8	
16	Crankshaft	1	
17	Piston pin clip	8	<b>Not reusable</b>
18	Piston pin	4	
19	Piston	4	



5

Step	Procedure/Part name	Q'ty	Service points
20	Top ring	4	<p><b>Not reusable</b></p> <p>Reverse the disassembly steps for assembly.</p>
21	2nd ring	4	
22	Oil ring	4	
23	Connecting rod	4	
24	Bolt	8	
25	Cylinder block	1	



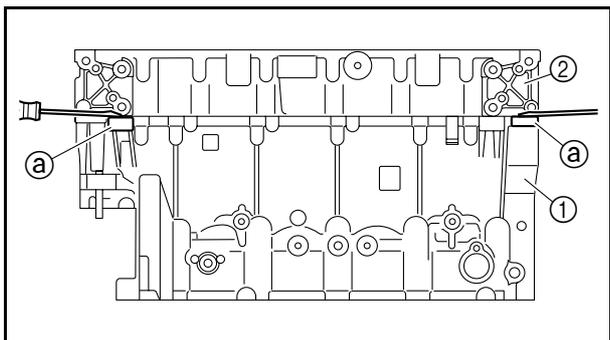
### Crankcase disassembly

**1. Remove:**

- Crankcase bolts (M6 × 70 mm) ①-⑫
- Crankcase bolts (M8 × 85 mm) ⑬-⑳

**NOTE:** \_\_\_\_\_

- Place the crankcase upside down on a bench.
- The numbers embossed on the crankcase indicate the crankcase tightening sequence.

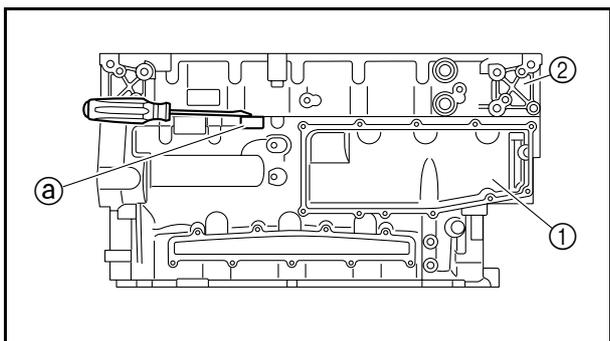


**2. Remove:**

- Crankcase

**NOTE:** \_\_\_\_\_

- Insert a flat-head screwdriver between the reinforced portions ① of the cylinder block ① and the crankcase ② to separate them.
- Work carefully and make sure the crankcase halves separate evenly.



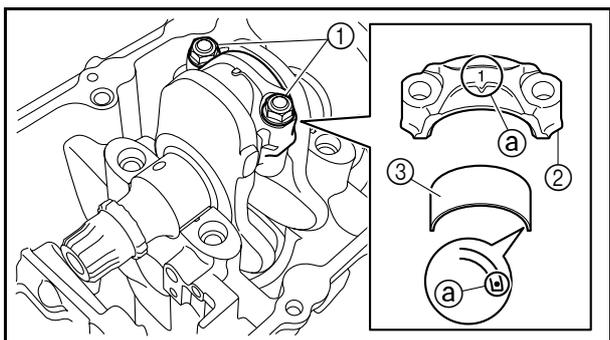
### Connecting rod and piston removal

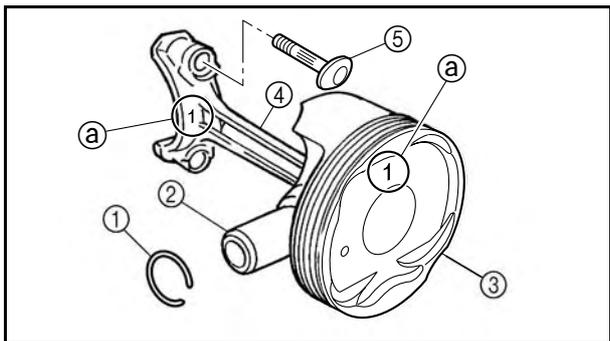
**1. Remove:**

- Nuts ①
- Connecting rod caps ②
- Big end bearings ③

**NOTE:** \_\_\_\_\_

For reference during installation, put identification marks ① on the connecting rod cap and big end bearing.



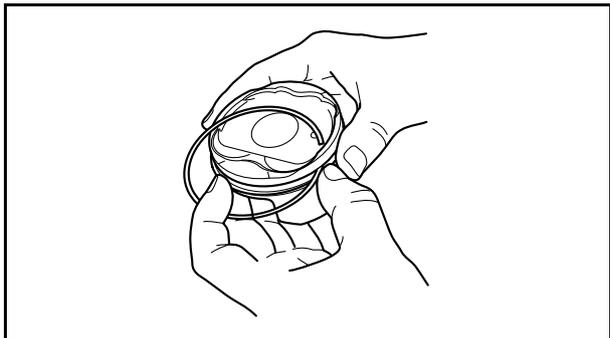


**2. Remove:**

- Piston pin clips ①
- Piston pin ②
- Piston ③
- Connecting rod ④
- Connecting rod cap bolts ⑤

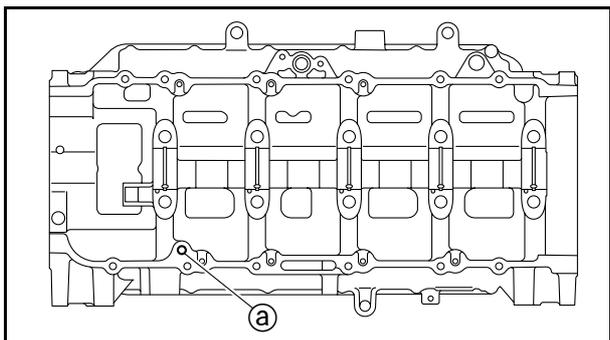
**NOTE:**

For reference during installation, put identification marks (a) on the piston crown and connecting rod.



**3. Remove:**

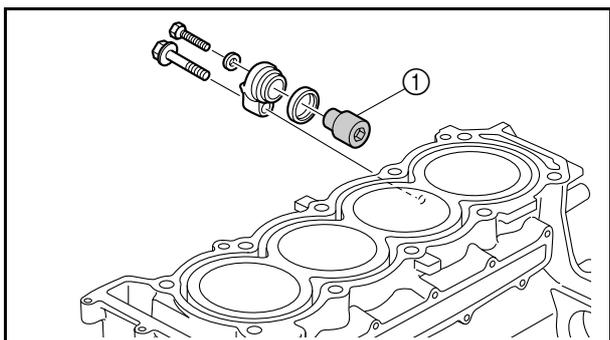
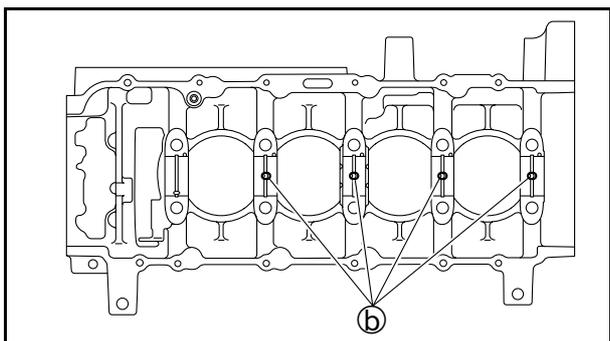
- Top ring
- 2nd ring
- Oil ring



**Crankcase check**

**1. Check:**

- Crankcase  
Cracks/damage → Replace the crankcase assembly.
- Oil delivery passage (a)
- Oil spray passage (b)  
Obstruction → Blow out with compressed air.



**Anode check**

**1. Check:**

- Anode ①  
Eroded → Replace the anode.

**CAUTION:**

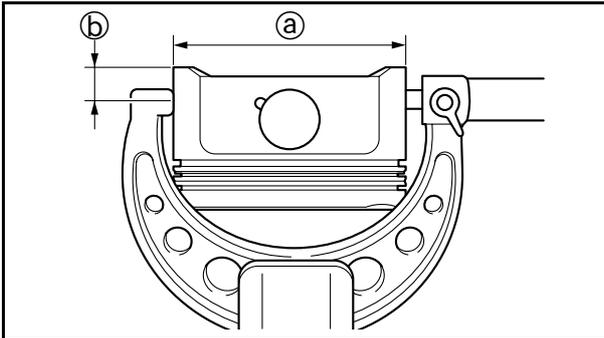
Do not oil or grease the anode, otherwise it will be ineffective.



**Piston check**

**1. Check:**

- Piston wall  
Vertical scratches → Replace the piston and piston rings as a set.

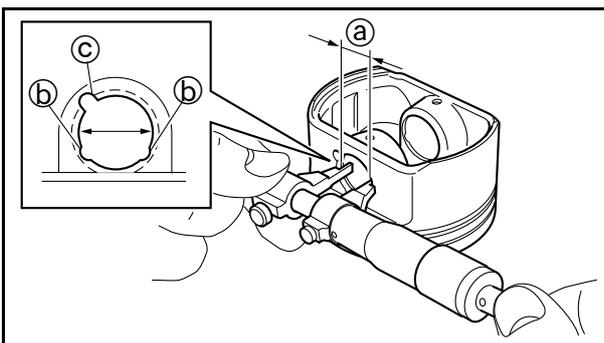


**2. Measure:**

- Piston outside diameter (a)  
Out of specification → Replace the piston.



Piston outside diameter (a):  
85.915–85.930 mm  
(3.3825–3.3831 in)  
Measuring point (b):  
10.0 mm (0.39 in)



**3. Measure:**

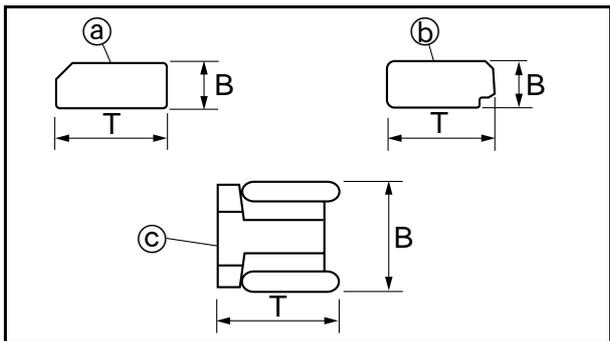
- Piston pin boss bore diameter (a)  
Out of specification → Replace the piston.

**NOTE:**

When measuring the piston pin boss bore, do not measure it at the oil grooves (b) or ring groove (c).



Piston pin boss bore diameter (a):  
22.004–22.015 mm  
(0.8663–0.8667 in)



**Piston ring check**

**1. Measure:**

- Piston ring dimensions B and T  
Out of specification → Replace the piston rings as a set.



**Piston ring dimensions:**

**Top ring (a):**

B: 1.17–1.19 mm  
(0.0461–0.0469 in)

T: 2.85–3.05 mm  
(0.112–0.120 in)

**2nd ring (b):**

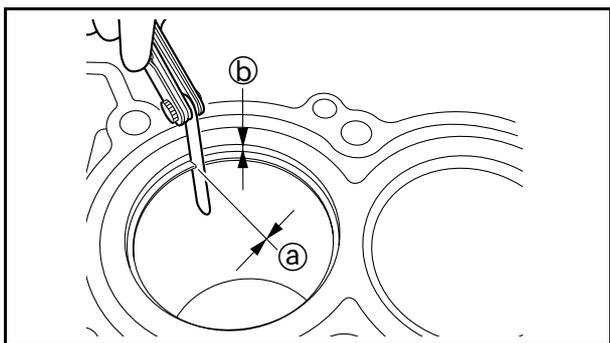
B: 1.17–1.19 mm  
(0.0461–0.0469 in)

T: 2.60–2.80 mm  
(0.102–0.110 in)

**Oil ring (c):**

B: 2.37–2.47 mm  
(0.093–0.097 in)

T (reference data):  
2.50 mm (0.098 in)



**2. Measure:**

- Piston ring end gap (a)



**Piston ring end gap (a)**

(reference data):

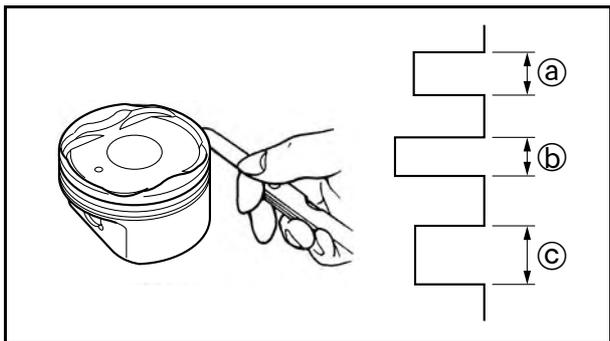
Top ring:  
0.30–0.45 mm (0.012–0.018 in)

2nd ring:  
0.45–0.60 mm (0.018–0.024 in)

Oil ring:  
0.10–0.35 mm (0.004–0.014 in)

Measuring point (b):

5 mm (0.2 in)



**3. Measure:**

- Piston ring grooves  
Out of specification → Replace the piston.

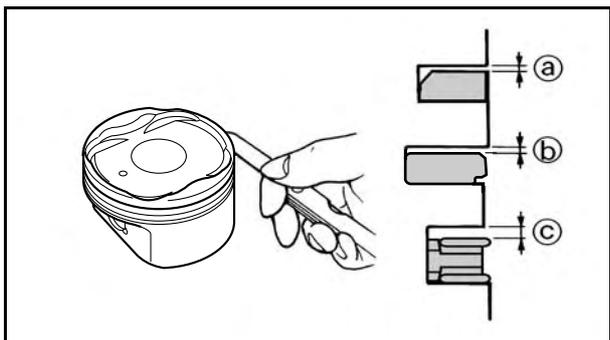
**NOTE:**

Before measuring the piston ring grooves, eliminate any carbon deposits from the piston ring grooves.



**Piston ring groove:**

- Top ring (a):  
1.21–1.23 mm (0.0476–0.0484 in)
- 2nd ring (b):  
1.21–1.23 mm (0.0476–0.0484 in)
- Oil ring (c):  
2.51–2.53 mm (0.0988–0.0996 in)



**4. Measure:**

- Piston ring side clearance  
Out of specification → Replace the piston and piston rings as a set.

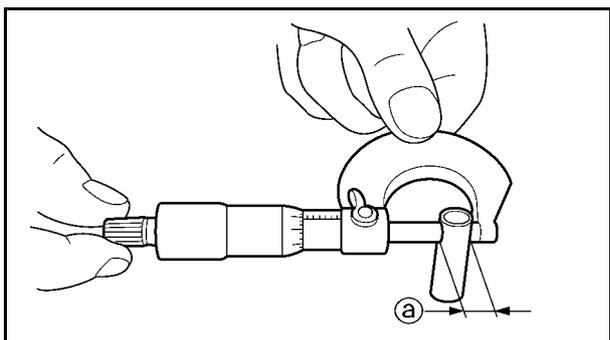
**NOTE:**

Before measuring the piston ring side clearance, eliminate any carbon deposits from the piston ring grooves and piston rings.



**Piston ring side clearance:**

- Top ring (a):  
0.02–0.06 mm (0.0008–0.0024 in)
- 2nd ring (b):  
0.02–0.06 mm (0.0008–0.0024 in)
- Oil ring (c):  
0.04–0.16 mm (0.0016–0.0063 in)



**Piston pin check**

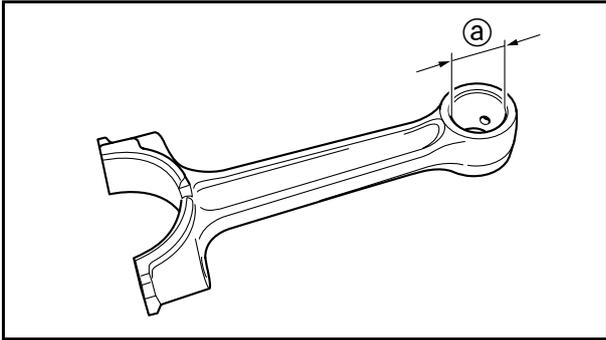
**1. Measure:**

- Piston pin outside diameter (a)  
Out of specification → Replace the piston pin.



**Piston pin outside diameter (a):**

- 21.991–22.000 mm  
(0.8658–0.8661 in)



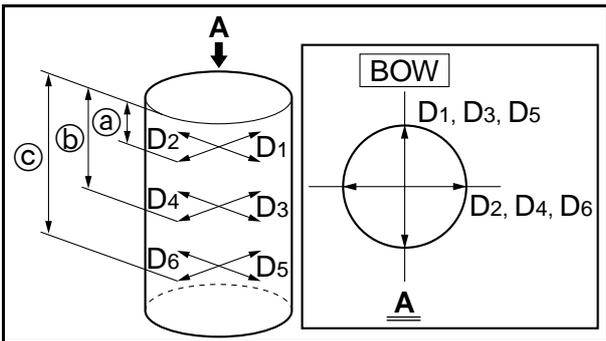
**Connecting rod check**

**1. Measure:**

- Connecting rod small end inside diameter Ⓐ  
Out of specification → Replace the connecting rod assembly.



Connecting rod small end inside diameter Ⓐ:  
22.015–22.028 mm  
(0.8667–0.8672 in)



**Cylinder check**

**1. Check:**

- Cylinder wall  
Vertical scratches → Replace the cylinder block.

**2. Measure:**

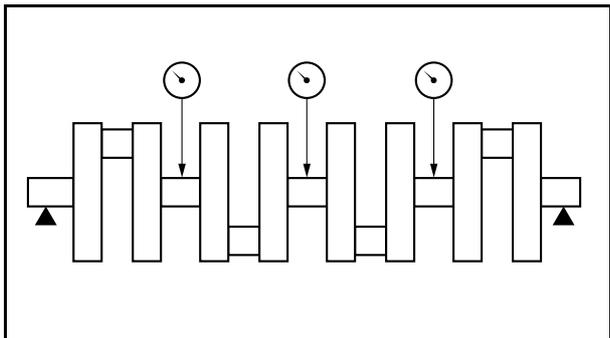
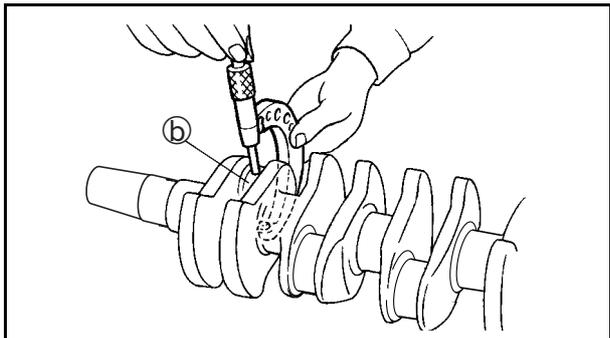
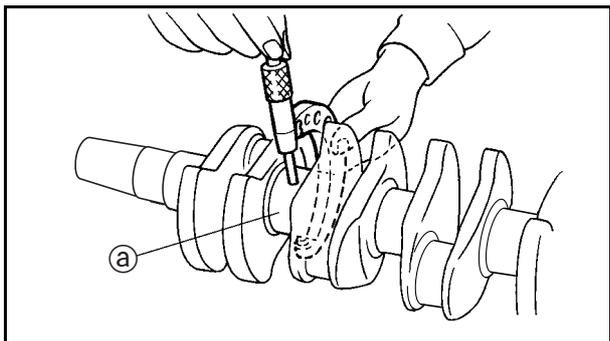
- Cylinder bore (D<sub>1</sub>–D<sub>6</sub>)  
Out of specification → Replace the cylinder block.

**Measurement step:**

1. Measure the cylinder bore (D<sub>1</sub>–D<sub>6</sub>) at measuring points Ⓐ, Ⓑ, and Ⓒ, and in directions (D<sub>1</sub>, D<sub>3</sub>, and D<sub>5</sub>), which are parallel to the crankshaft, and directions (D<sub>2</sub>, D<sub>4</sub>, and D<sub>6</sub>), which are at a right angle to the crankshaft.



Cylinder bore (D<sub>1</sub>–D<sub>6</sub>):  
86.000–86.015 mm  
(3.3858–3.3864 in)  
Measuring points:  
Ⓐ: 20 mm (0.8 in)  
Ⓑ: 50 mm (2.0 in)  
Ⓒ: 80 mm (3.1 in)



## Crankshaft check

### 1. Measure:

- Crankshaft journal (a) diameter
  - Crankshaft pin (b) diameter
- Out of specification → Replace the crankshaft.



Crankshaft journal (a) diameter:  
39.976–40.000 mm  
(1.5739–1.5748 in)

Crankshaft pin (b) diameter:  
41.976–42.000 mm  
(1.6526–1.6535 in)

### 2. Measure:

- Crankshaft runout
- Out of specification → Replace the crankshaft.



Crankshaft runout limit:  
0.03 mm (0.0012 in)

## Crankshaft pin oil clearance check

### 1. Measure:

- Crankshaft pin oil clearance
- Out of specification → Replace the connecting rod bearings.

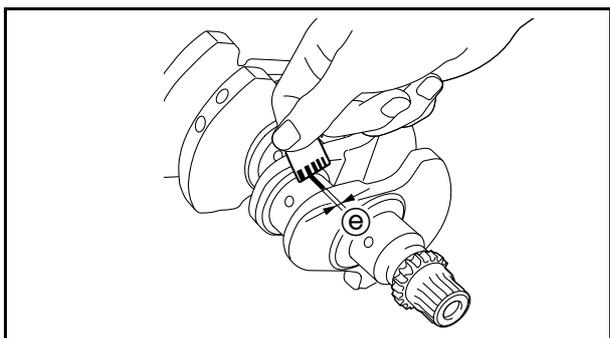
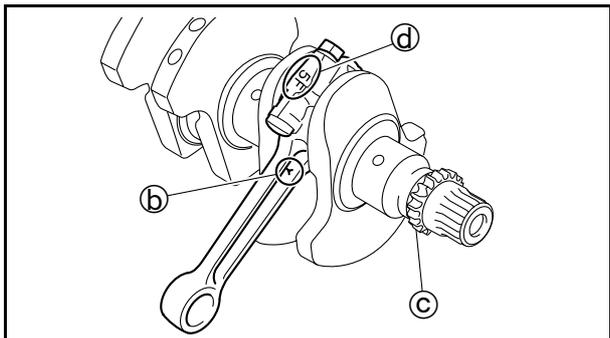
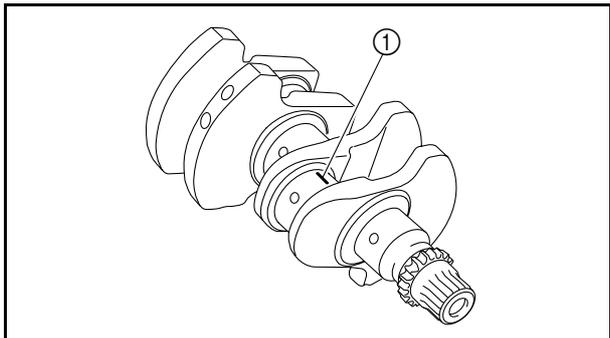
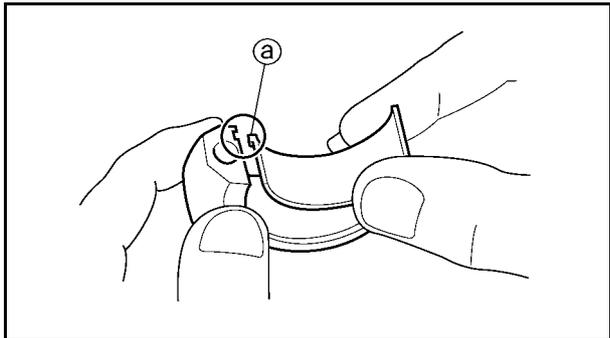
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### Measurement steps:

1. Clean the bearings and connecting rod big end.



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

**NOTE:** \_\_\_\_\_

- Install the connecting rod bearings in their original positions.
- Insert the projection (a) of each bearing into the slots in the connecting rod cap and connecting rod.

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

**NOTE:** \_\_\_\_\_

Do not put the Plastigauge over the oil hole in the crankshaft pin.

4. Install the connecting rod onto the crankshaft pin.

**NOTE:** \_\_\_\_\_

- Apply engine oil to the connecting rod bolts threads and nut seats.
- Make sure that the “Y” mark (b) on the connecting rod faces towards the timing chain drive gear (c) of the crankshaft.
- Make sure that the characters (d) on both the connecting rod and connecting rod cap are aligned.

5. Tighten the connecting rod nuts to the specified torques in 2 stages.

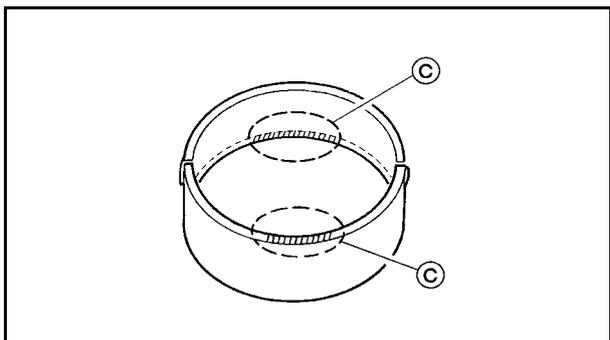
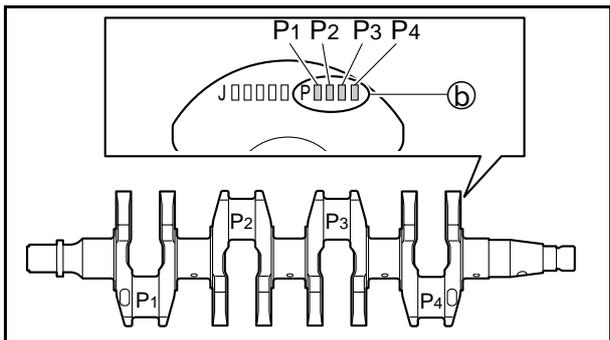
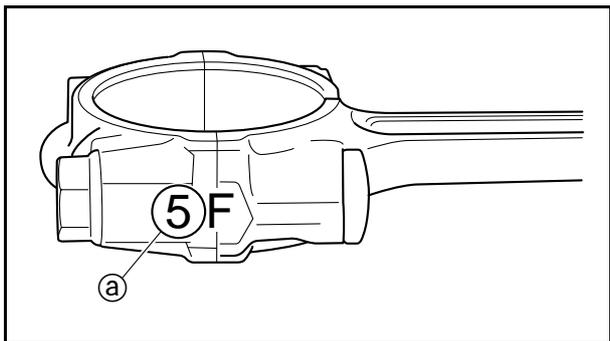
**NOTE:** \_\_\_\_\_

Do not turn the connecting rod until the crankshaft pin oil clearance measurement has been completed.

	Connecting rod nut: 1st: 51 N·m (5.1 kgf·m, 37.6 ft·lb) 2nd: 90°
---	--

6. Remove the connecting rod cap and measure the width (e) of the compressed Plastigauge on each crankshaft pin.

	Crankshaft pin oil clearance: 0.020–0.056 mm (0.0008–0.0022 in)
---	--



**2. Select:**

- Connecting rod bearing

**Selecting steps:**

1. Check the connecting rod size number (a) on the connecting rod.
2. Check the crankshaft pin size number (b) on the crankshaft web.
3. Select the suitable color (c) for the connecting rod bearing from the table.

Calculation formula:

Connecting rod bearing size number = connecting rod size number (a) – crankshaft pin size number (b)

Bearing size number	Bearing color (c)
1	Brown
2	Black
3	Blue
4	Green

Example:

“P1” connecting rod size number “5”

“P1” crankshaft pin size number “1”

$$5 - 1 = 4$$

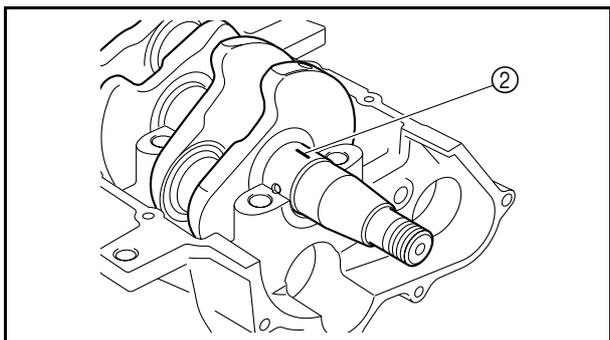
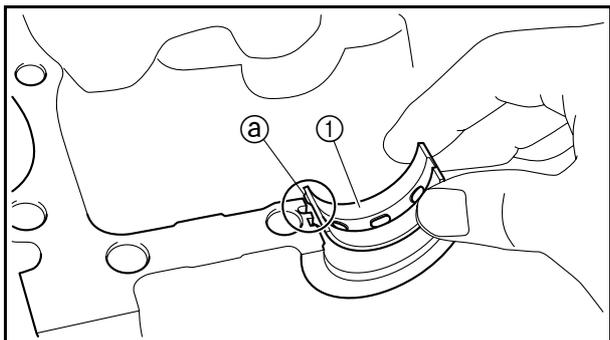
Select the size “4”, “green” connecting rod bearing.



## Crankshaft journal oil clearance check

### 1. Measure:

- Crankshaft journal oil clearance  
Out of specification → Replace the crankshaft journal bearings.




---

### Measurement steps:

1. Clean the bearings, crankshaft journals, and bearing portions of the crankcase and cylinder block.
2. Place the cylinder block upside down on a bench.
3. Install half of the main bearings ① into the cylinder block.

### NOTE:

- Install the crankshaft journal bearings in their original positions.
- Insert the projection ① of each bearing into the slots in the cylinder block.

4. Install the crankshaft.
5. Put a piece of Plastigauge ② on each crankshaft journal, parallel to the crankshaft.

### NOTE:

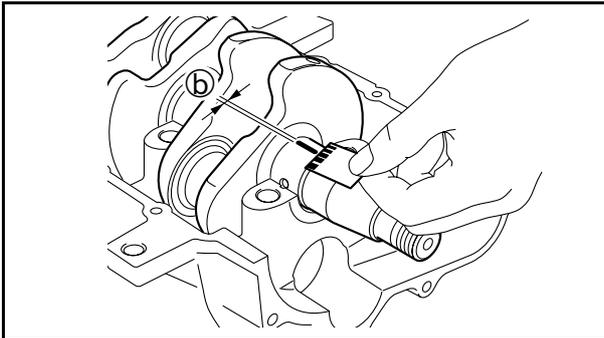
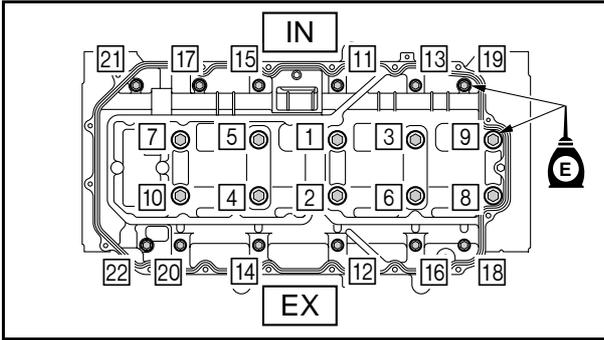
Do not put the Plastigauge over the oil hole in the main journals of the crankshaft.

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

### NOTE:

- Install the crankshaft journal bearings in their original positions.
- Insert the projection ① of each bearing into the slots in the crankcase.

7. Install the crankcase onto the cylinder block.



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

**NOTE:** \_\_\_\_\_

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

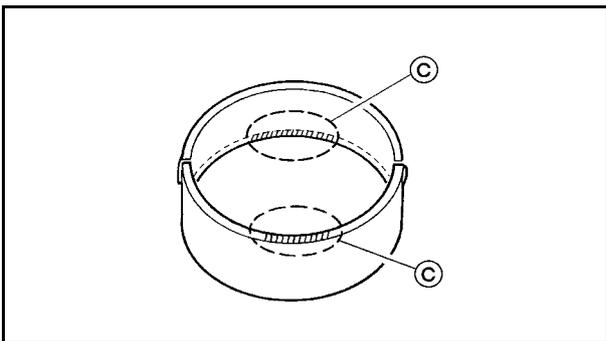
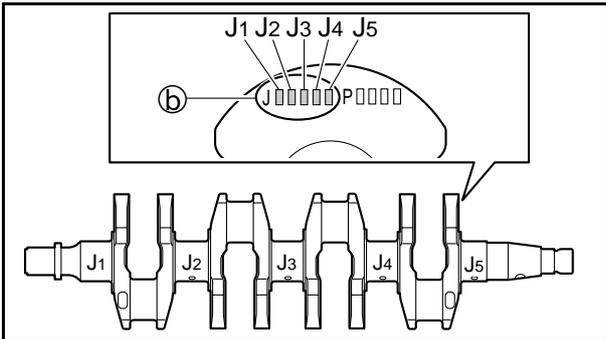
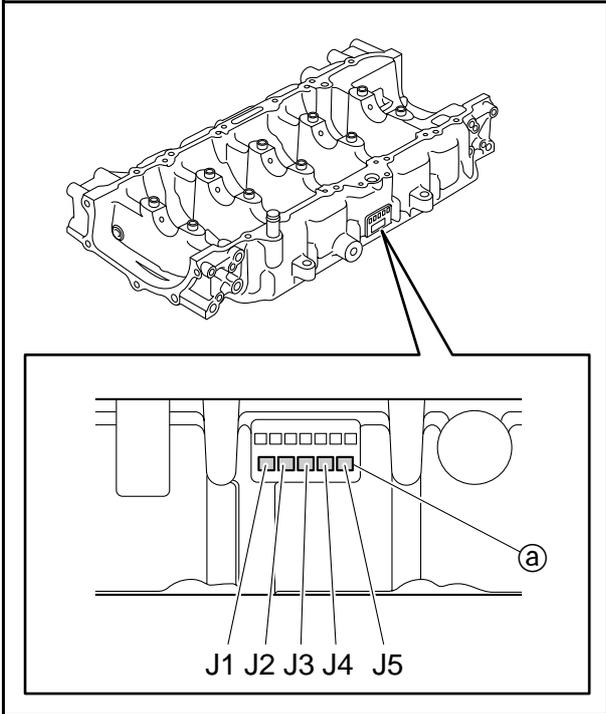


Crankcase bolt 1-10:  
 1st: 30 N·m (3.0 kgf·m, 22.1 ft·lb)  
 2nd: 90°  
 Crankcase bolt 11-22:  
 10 N·m (1.0 kgf·m, 7.4 ft·lb)

9. Remove the crankcase and measure the width **b** of the compressed Plastigauge on each crankshaft journal.



Crankshaft journal oil clearance:  
 0.024–0.053 mm (0.0009–0.0021 in)



**2. Select:**

- Crankshaft main journal bearing

**Selecting steps:**

1. Check the crankcase journal size number **a** on the crankcase.

**NOTE:**

If the crankcase journal sizes are the same at all positions, the size number **a** is stamped only at the “J1” position.

Example:

If “J1”–“J5” are different:

□□□□□□	J1	J2	J3	J4	J5
55545	5	5	5	4	5

If “J1”–“J5” are the same:

□□□□□□	J1	J2	J3	J4	J5
5	5	5	5	5	5

2. Check the crankshaft journal size number **b** on crankshaft web.
3. Select the suitable color **c** for main bearing.

Calculation formula:

Main bearing size number =  
crankcase journal size number **a** –  
crankshaft journal size number **b**

Bearing size number	Bearing color <b>c</b>
1	Brown
2	Black
3	Blue
4	Green
5	Yellow

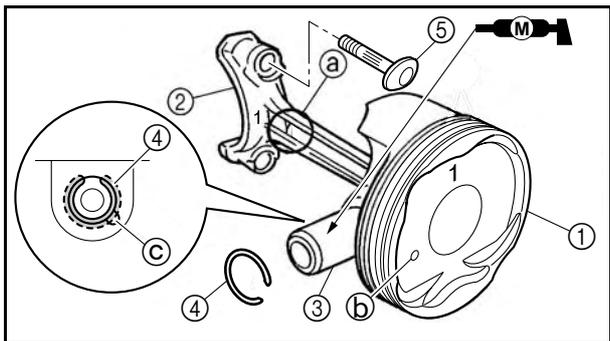
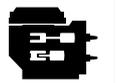
Example:

“J1” crankcase journal size number “5”

“J1” crankshaft journal size number “2”

$$5 - 2 = 3$$

Select the size “3”, “blue” main bearing.



### Connecting rod and piston installation

#### 1. Install:

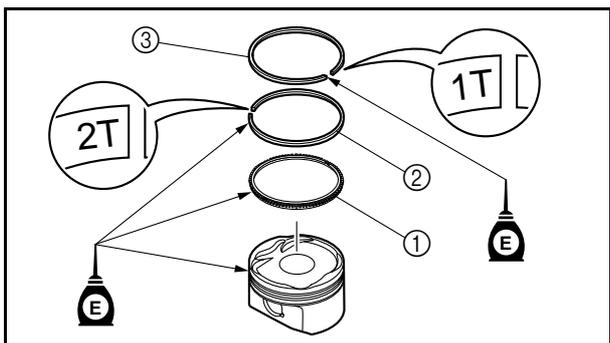
- Piston ①
- Connecting rod ②
- Piston pin ③
- Piston pin clips ④
- Connecting rod cap bolts ⑤

#### CAUTION:

Do not reuse the piston pin clips ④ and connecting rod cap bolts ⑤, always replace them with new ones.

#### NOTE:

- When installing the connecting rod to the piston, make sure that the “Y” mark ① on the connecting rod faces towards the front mark ② on the piston crown.
- Do not allow the piston pin clip ends to align with the piston pin slot ③.



#### 2. Install:

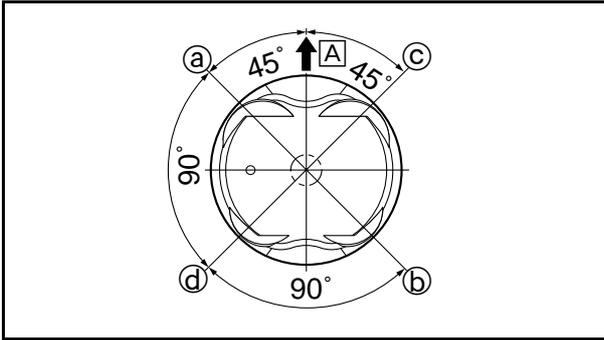
- Oil ring ①
- 2nd ring ②
- Top ring ③

#### CAUTION:

Do not scratch the pistons or break the piston rings.

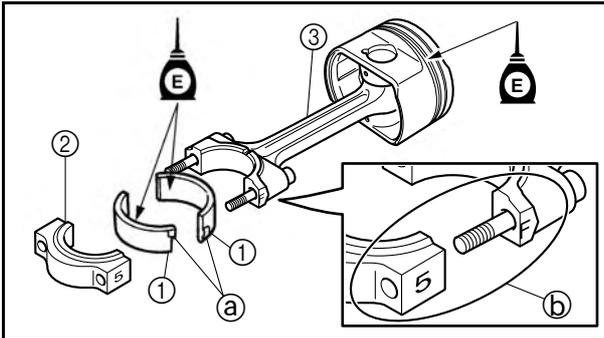
#### NOTE:

- Be sure to install the piston rings so that the “1T” mark on the top ring and the “2T” mark on the 2nd ring face up.
- After installing the piston rings, check that they move smoothly.



**3. Offset:**

- Piston ring end gap
- Ⓐ Top ring, oil ring expander spacer
- Ⓑ 2nd ring
- Ⓒ Upper oil ring rail
- Ⓓ Lower oil ring rail
- Ⓐ Intake side

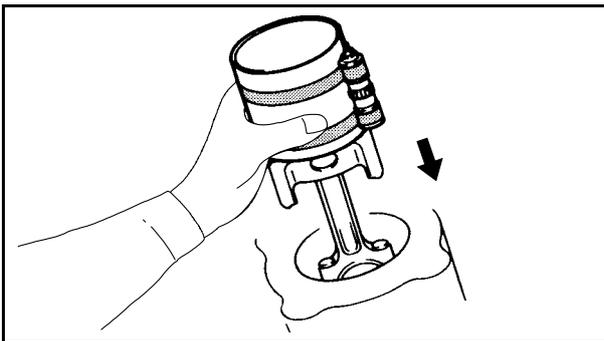


**4. Install:**

- Connecting rod bearings ①
- Connecting rod cap ②
- Connecting rod assembly ③

**Installation steps:**

1. Clean the bearings and connecting rod big end.
2. Install the upper bearing into the connecting rod assembly ③ and lower bearing into the connecting rod cap ②.



**NOTE:**

- Install the connecting rod bearings in their original positions.
- Insert the projections Ⓐ of the bearings into the slots in the connecting rod cap and connecting rod.
- Align the characters Ⓑ on the connecting rod cap and connecting rod.

3. While compressing the piston rings with the special service tool, install the connecting rod assembly into the cylinder.



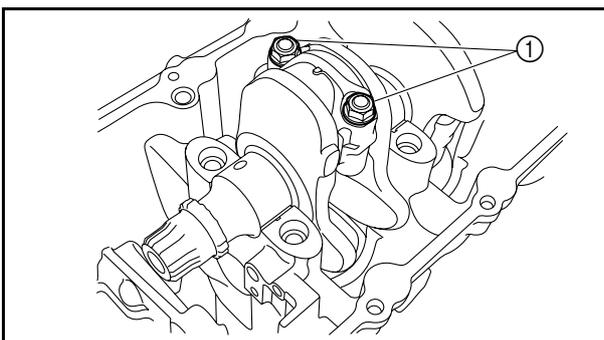
Piston ring compressor:  
YM-08037/90890-05158

**5. Tighten:**

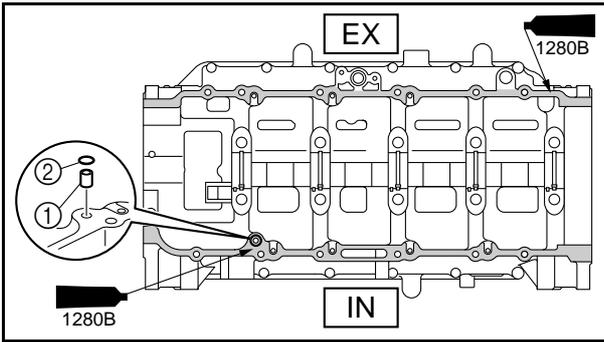
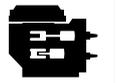
- Connecting rod nuts ①

**NOTE:**

Use a commercially available angle gauge to tighten the nuts to the specified angle.



Connecting rod nut:  
1st: 51 N·m (5.1 kgf·m, 37.6 ft·lb)  
2nd: 90°



**Crankcase assembly**

**1. Install**

- Dowel pin ①
- O-ring ②

**NOTE:**

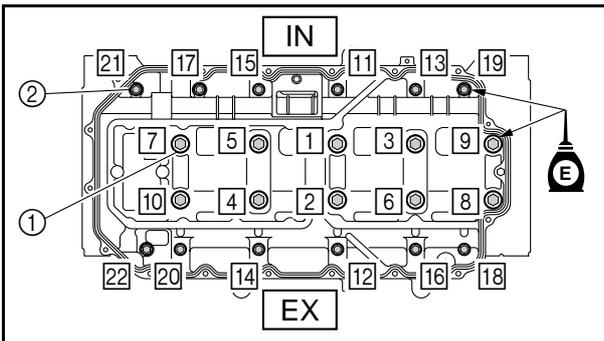
- Thoroughly clean all the gasket surfaces and crankcase mating surfaces.
- Apply sealant to the mating surface of the crankcase.
- Do not get away sealant on the main bearing.

**2. Install:**

- Crankcase bolts (M10 × 85 mm) ①
- Crankcase bolts (M6 × 70 mm) ②

**CAUTION:**

**Do not reuse the crankcase bolts ①, always replace them with new ones.**



**NOTE:**

Apply engine oil to the threads of the crankcase bolts and flange surface of the crankcase bolts.

**Installing steps:**

1. Tighten the crankcase bolts ①-⑩ to the specified torque in 2 stages in the sequence shown.

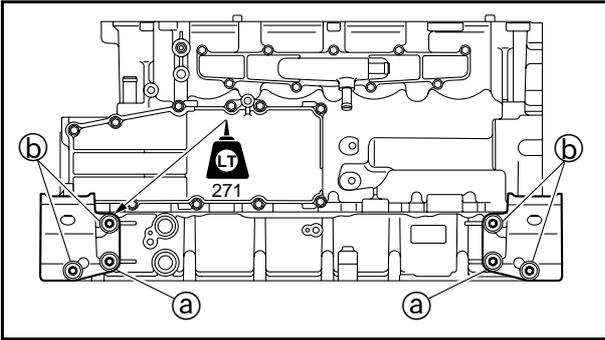
**NOTE:**

Use a commercially available angle gauge to tighten the bolts to the specified angle.

2. Tighten the bolts ⑪-⑫ to the specified torques in the sequence shown.



Crankcase bolt ①-⑩:  
 1st: 30 N·m (3.0 kgf·m, 22.1 ft·lb)  
 2nd: 90°  
 Crankcase bolt ⑪-⑫:  
 10 N·m (1.0 kgf·m, 7.4 ft·lb)



**3. Tighten:**

- Bracket bolts

**NOTE:** \_\_\_\_\_

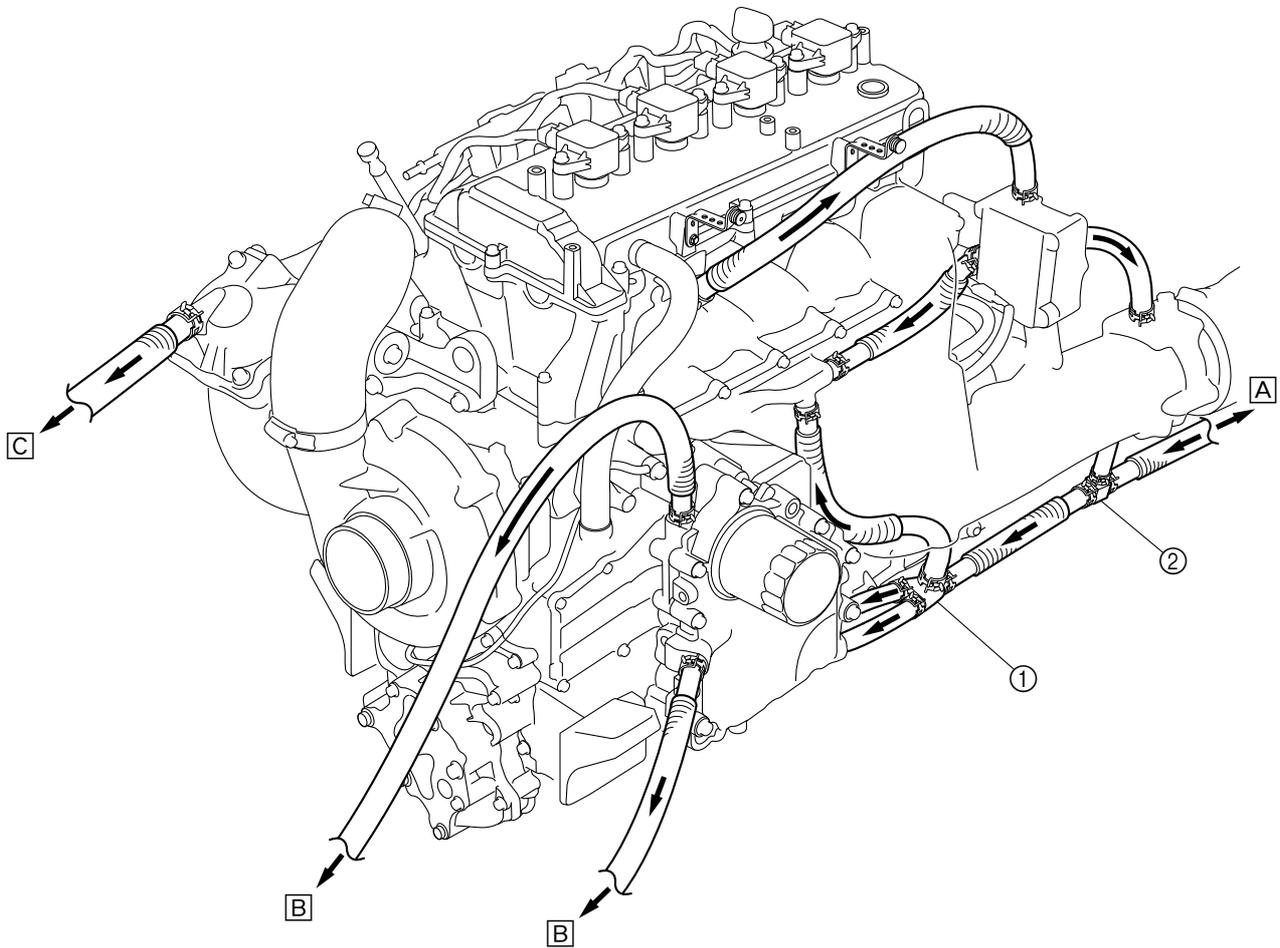
Tighten the bolts (a), and then tighten the bolts (b).



Bracket bolt:  
50 N·m (5.0 kgf·m, 36.9 ft·lb)  
LOCTITE 271



**Cooling water**  
**Cooling water hose routing**

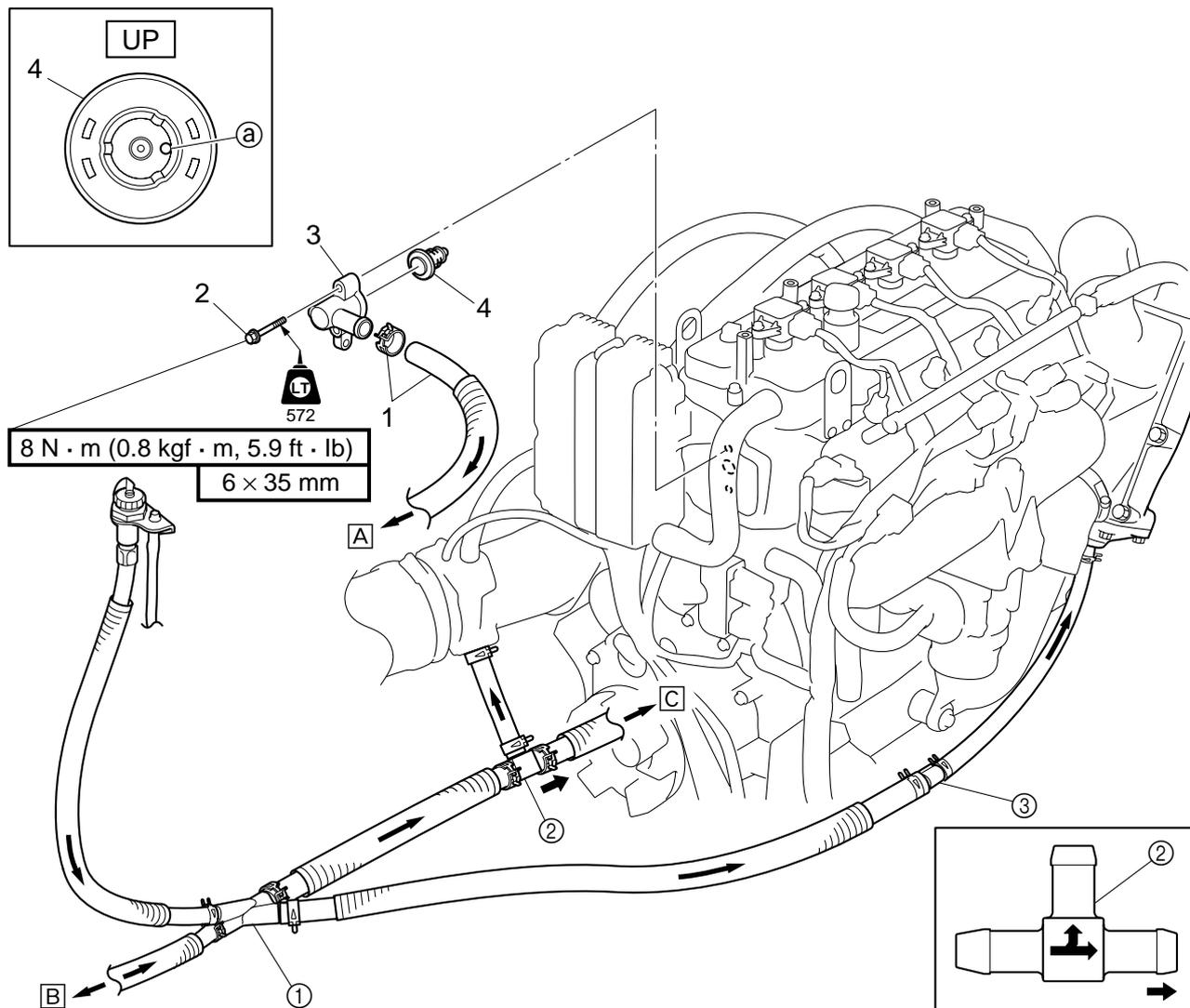


- ① Hose joint 2
- ② Hose joint 3

- Ⓐ To hose joint 1
- Ⓑ To cooling water pilot outlet on port side
- Ⓒ To cooling water pilot outlet on starboard side



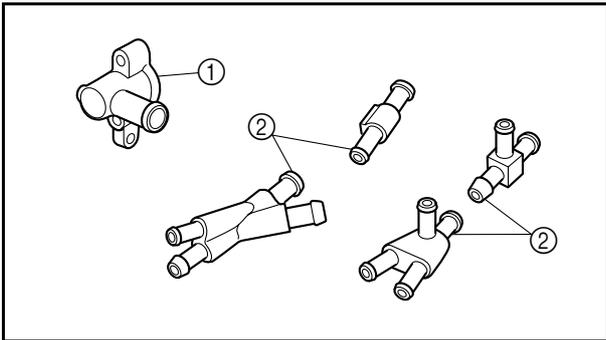
Thermostat removal



Step	Procedure/Part name	Q'ty	Service points
1	Clamp/cooling water hose	1/1	<b>NOTE:</b> _____ Install the thermostat so that the hole (a) is positioned as shown. _____ Reverse the removal steps for installation.
2	Bolt	2	
3	Thermostat housing	1	
4	Thermostat	1	

- ① Hose joint 1
- ② Hose joint 3
- ③ Hose joint 4

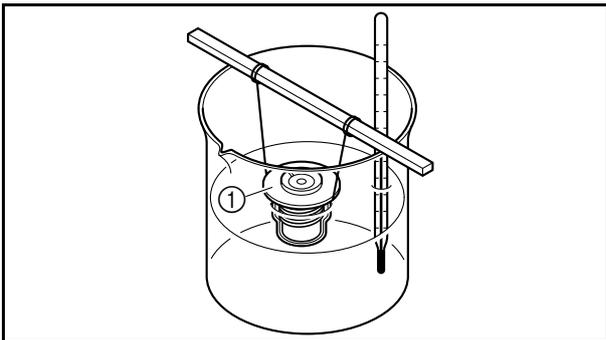
- ⓑ To transom plate
- ⓒ To hose joint 2



**Cooling water line check**

**1. Check:**

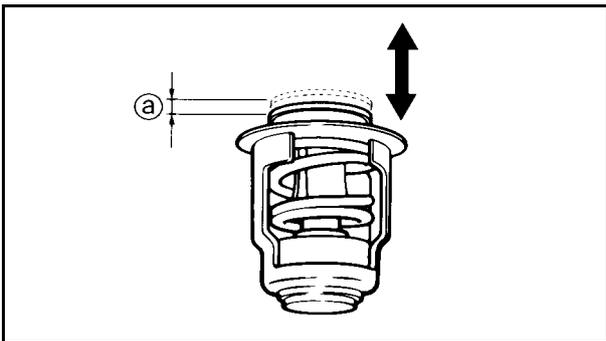
- Thermostat housing ①
  - Hose joints ②
  - Cooling water hoses
- Cracks/damage → Replace.



**Thermostat check**

**1. Check:**

- Thermostat valve opening ②
- Out of specification → Replace the thermostat.



**Checking steps:**

1. Suspend the thermostat ① in a container of water.
2. Place a thermometer in the water and slowly heat the water.
3. Measure the thermostat valve opening ② at the specified water temperatures.

	Water temperature	Valve opening
	48–52 °C (118–126 °F)	0.05 mm (0.002 in) (valve begins to open)
	above 60 °C (140 °F)	more than 4.3 mm (0.17 in)

POWR



Cooling water

E

— MEMO —

5

## Chapter 6

### Jet pump unit

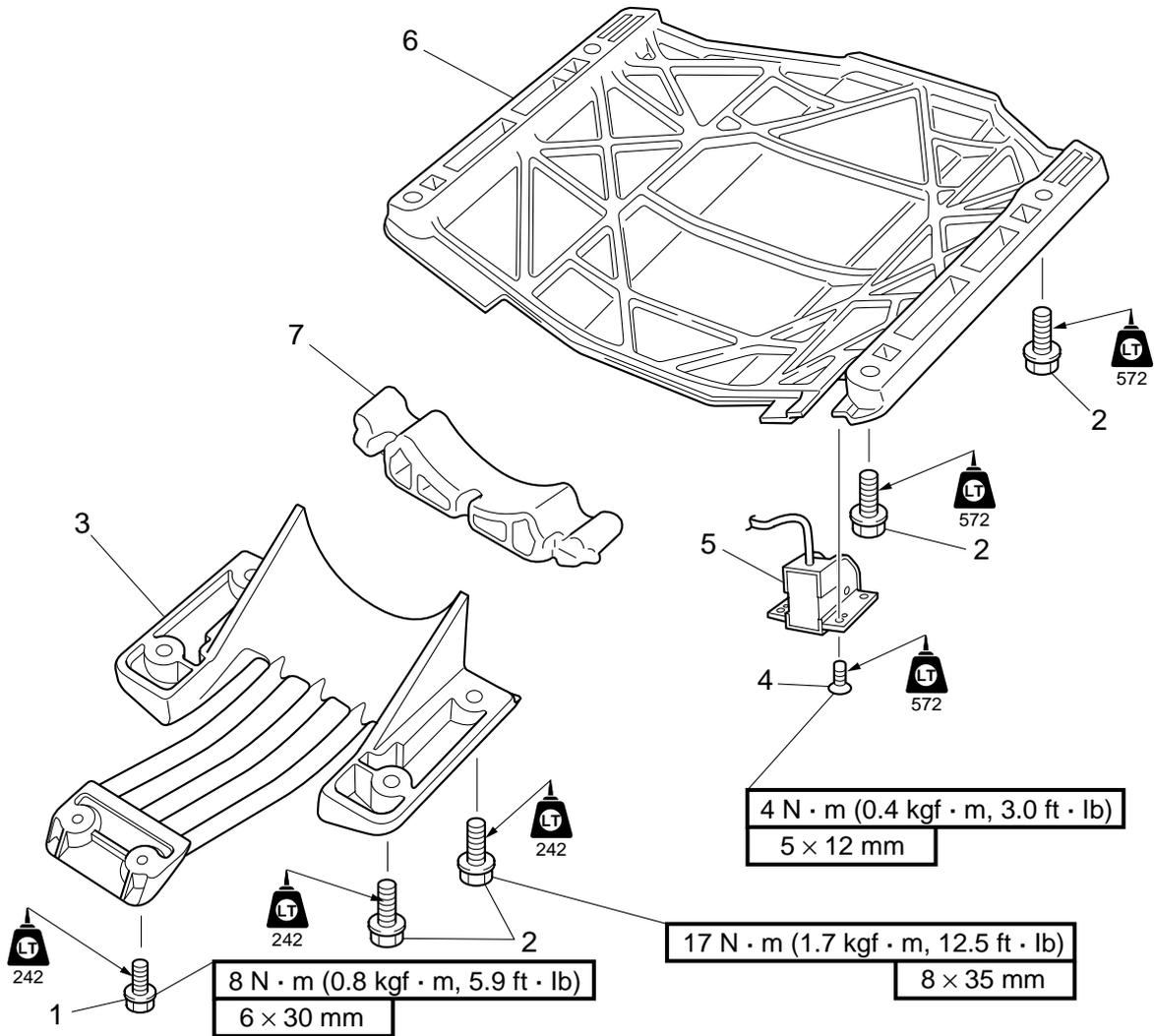
<b>Intake grate and ride plate.....</b>	<b>6-1</b>
Intake grate and ride plate removal .....	6-1
 <b>Jet pump unit.....</b>	 <b>6-2</b>
Jet pump unit removal .....	6-2
Jet pump unit removal .....	6-4
Jet pump unit installation .....	6-5
 <b>Reverse gate.....</b>	 <b>6-6</b>
Reverse gate removal .....	6-6
 <b>Jet thrust nozzle and nozzle ring.....</b>	 <b>6-8</b>
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 <b>Impeller duct and impeller housing.....</b>	 <b>6-9</b>
Impeller duct and impeller housing removal .....	6-9
 <b>Impeller duct and drive shaft .....</b>	 <b>6-10</b>
Impeller duct and drive shaft disassembly .....	6-10
Drive shaft removal.....	6-12
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Impeller housing check.....	6-14
Drive shaft check .....	6-14
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Transom plate installation.....	6-21

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Intermediate housing removal .....	6-22
Intermediate housing disassembly .....	6-23
Intermediate housing removal .....	6-25
Driven coupling removal .....	6-25
Intermediate drive shaft removal .....	6-25
Oil seal removal .....	6-26
Bearing removal .....	6-26
Intermediate drive shaft and grease hose check .....	6-26
Driven coupling and intermediate housing check .....	6-27
Bearing installation .....	6-27
Oil seal installation.....	6-28
Driven coupling installation.....	6-29
Intermediate housing installation .....	6-29



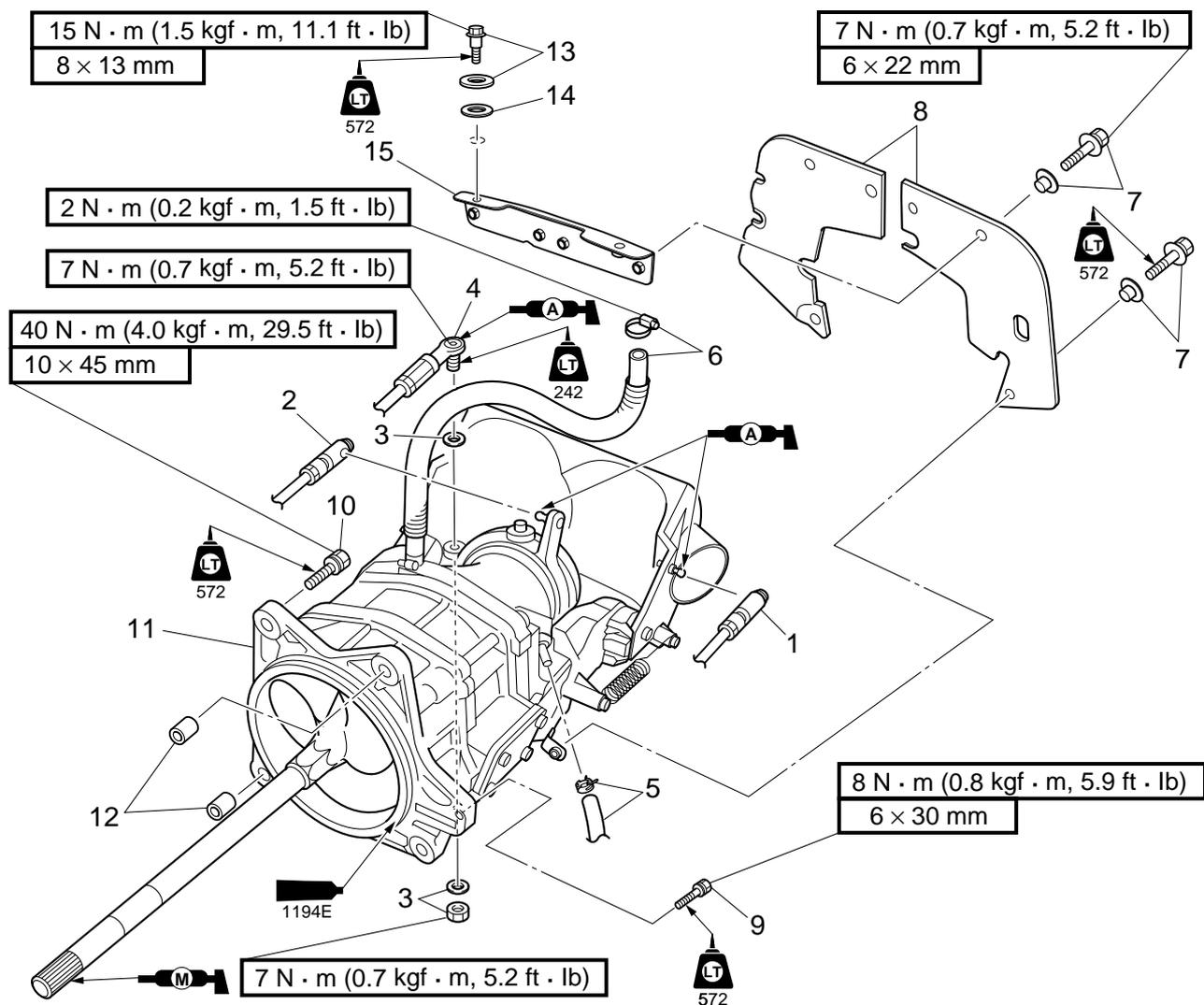
**Intake grate and ride plate**  
**Intake grate and ride plate removal**



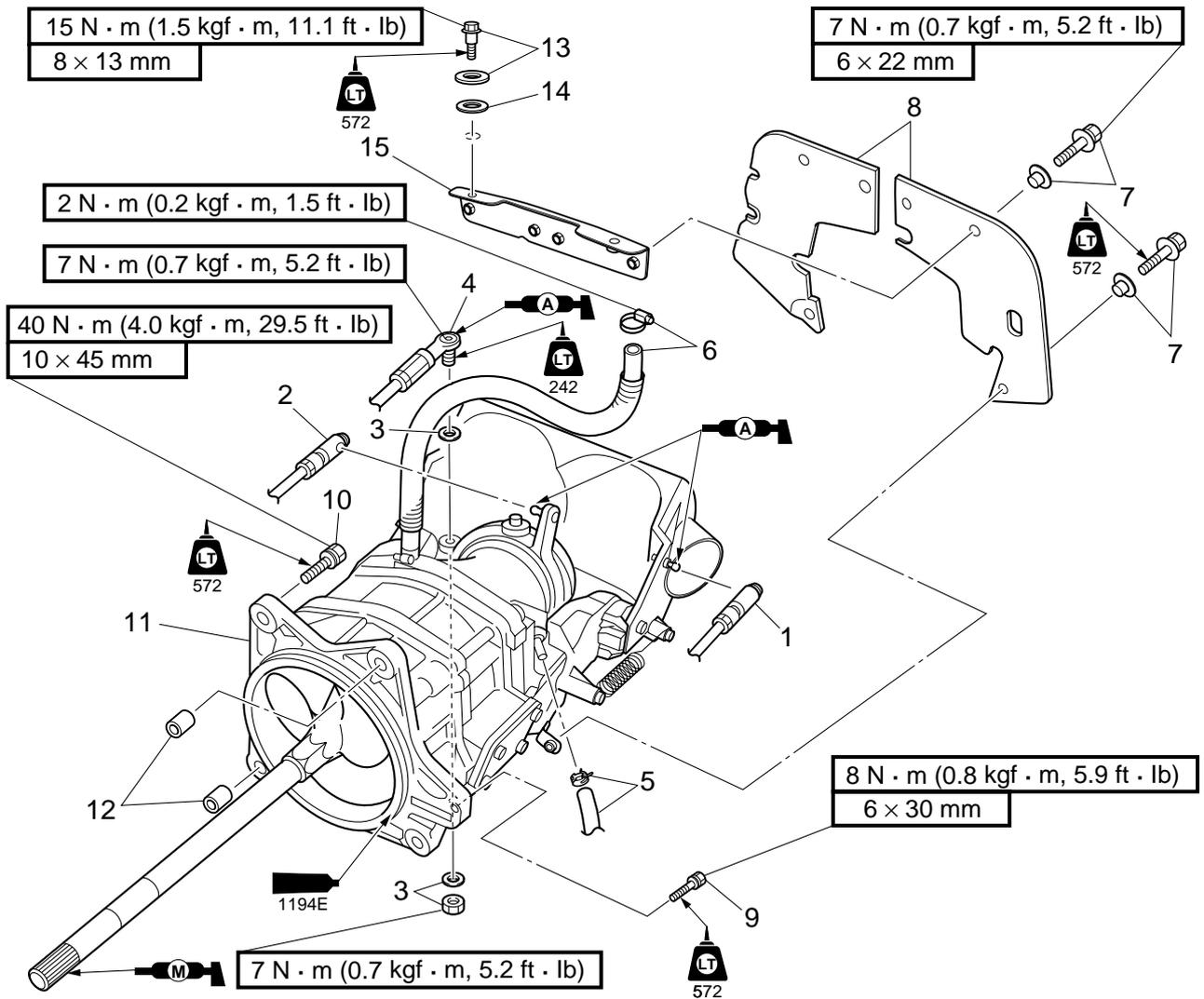
Step	Procedure/Part name	Q'ty	Service points
1	Bolt	2	
2	Bolt	8	
3	Intake grate	1	
4	Screw	4	
5	Speed sensor	1	FX SHO
	Speed and water temperature sensor	1	FX Cruiser SHO
6	Ride plate	1	
7	Spacer	1	
			Reverse the removal steps for installation.



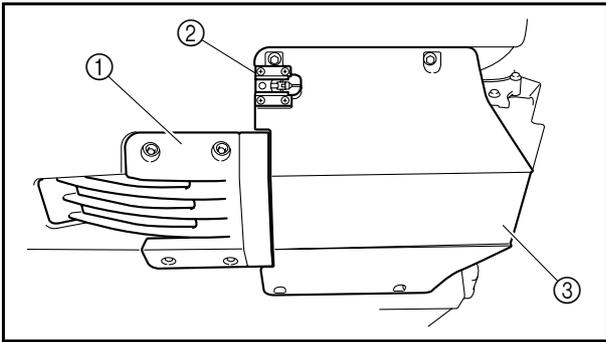
**Jet pump unit**  
**Jet pump unit removal**



Step	Procedure/Part name	Q'ty	Service points
	Ride plate		Refer to "Intake grate and ride plate."
1	Shift cable joint	1	
2	QSTS rod joint	1	
3	Nut/washer	1/2	
4	Steering cable joint	1	
5	Clamp/bilge hose	1/1	
6	Clamp/spout hose	1/1	
7	Bolt/collar	6/6	
8	Rubber plate	2	
9	Bolt	1	
10	Bolt	4	



Step	Procedure/Part name	Q'ty	Service points
11	Jet pump unit assembly	1	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Not reusable</div> Reverse the removal steps for installation.
12	Dowel pin	2	
13	Bolt/washer	2/2	
14	Gasket	2	
15	Stay	1	



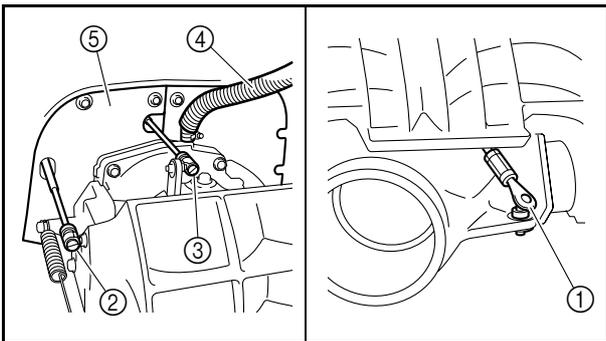
## Jet pump unit removal

### **⚠ WARNING**

Be sure to remove the battery before removing the jet pump unit.

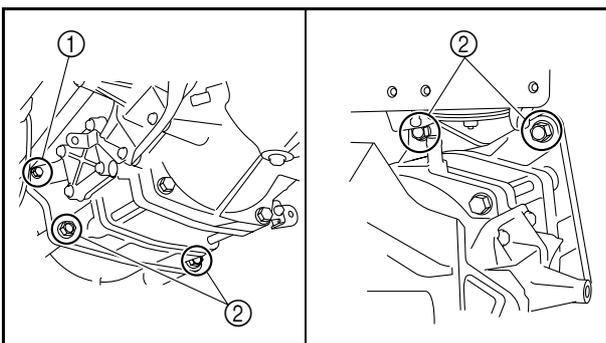
#### 1. Remove:

- Intake grate ①
- Speed sensor ② (FX SHO)  
Speed and water temperature sensor ② (FX Cruiser SHO)
- Ride plate ③



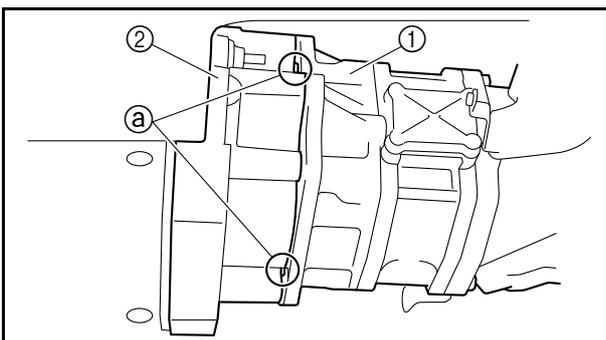
#### 2. Remove:

- Steering cable joint ①
- Shift cable joint ②
- QSTS rod joint ③
- Spout hose ④
- Rubber plats ⑤



#### 3. Remove:

- Bolt (M6 × 30 mm) ①
- Bolts (M10 × 45 mm) ②

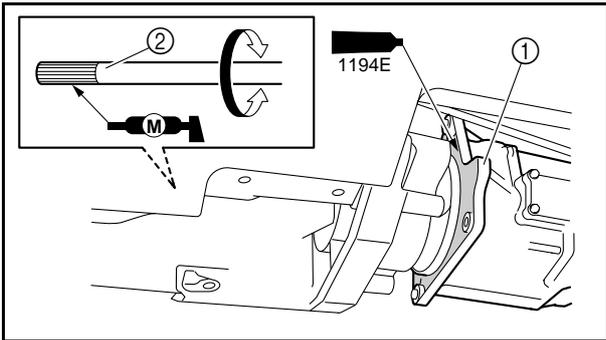


#### 4. Remove:

- Jet pump unit ①

#### **NOTE:**

Insert a flat-head screwdriver into the gap **a** between the jet pump unit ① and the transom plate ② to separate them.



## Jet pump unit installation

### **⚠ WARNING**

Be sure to remove the battery before installing the jet pump unit.

#### 1. Install:

- Jet pump unit ①

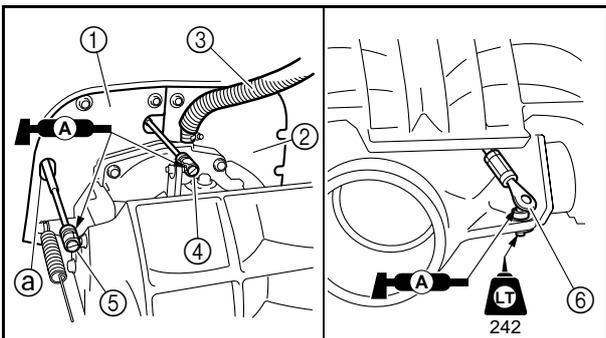
#### NOTE:

Rotate the drive shaft ② to align the splines on the drive shaft with the splines on the inside of the intermediate drive shaft.



#### Jet pump unit assembly bolt:

- M10 × 45 mm:  
40 N·m (4.0 kgf·m, 29.5 ft·lb)  
LOCTITE 572
- M6 × 30 mm:  
8 N·m (0.8 kgf·m, 5.9 ft·lb)  
LOCTITE 572



#### 2. Install:

- Rubber plate ①
- Rubber plate ②
- Spout hose ③
- QSTS rod joint ④
- Shift cable joint ⑤
- Steering cable joint ⑥

#### NOTE:

When installing the rubber plate ①, pass the shift cable ⑤ through the hole ① in the plate.



#### Rubber plate bolt:

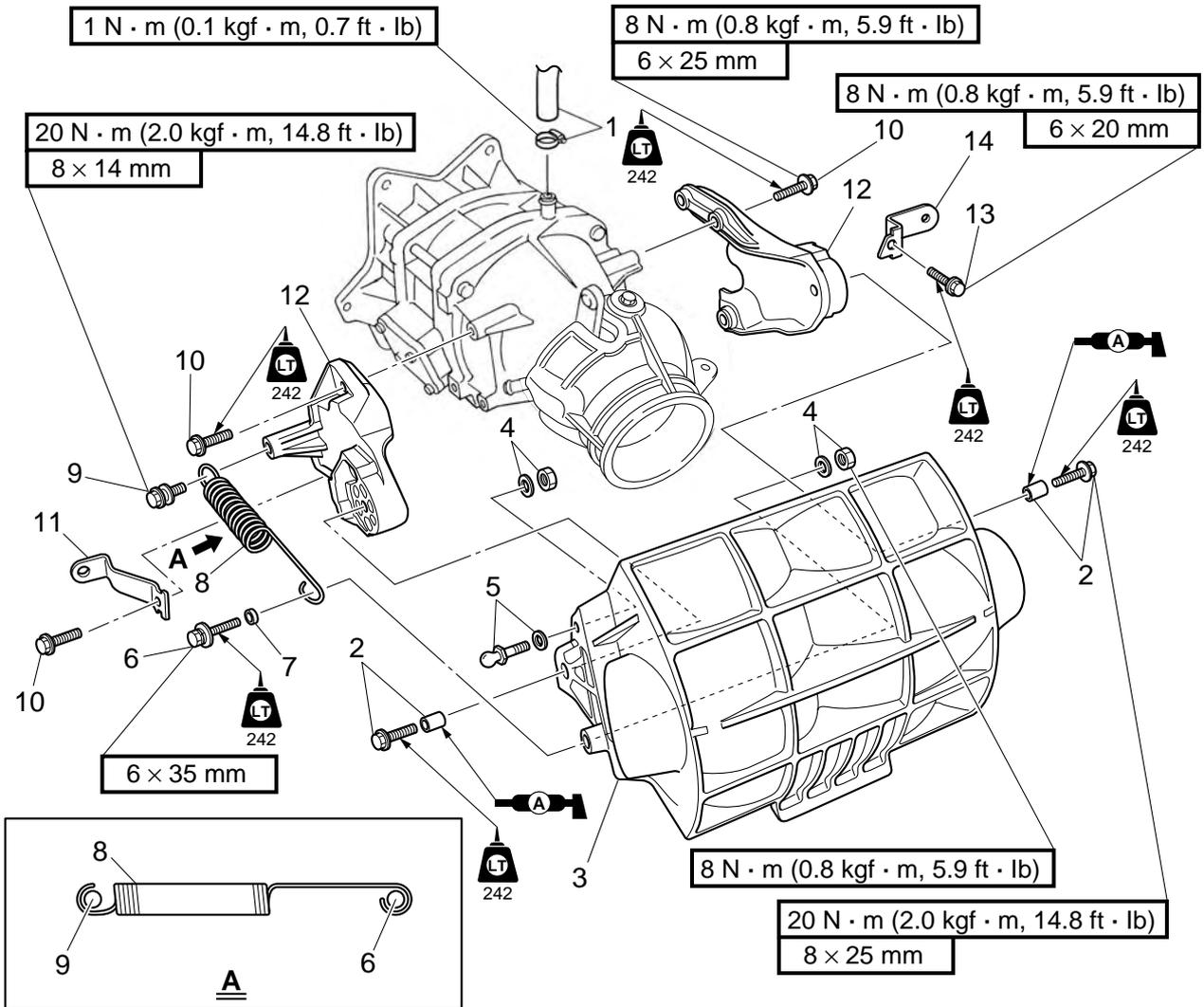
- 7 N·m (0.7 kgf·m, 5.2 ft·lb)  
LOCTITE 572
- Spout hose clamp:  
2 N·m (0.2 kgf·m, 1.5 ft·lb)
- Steering cable joint:  
7 N·m (0.7 kgf·m, 5.2 ft·lb)  
LOCTITE 242

#### 3. Check:

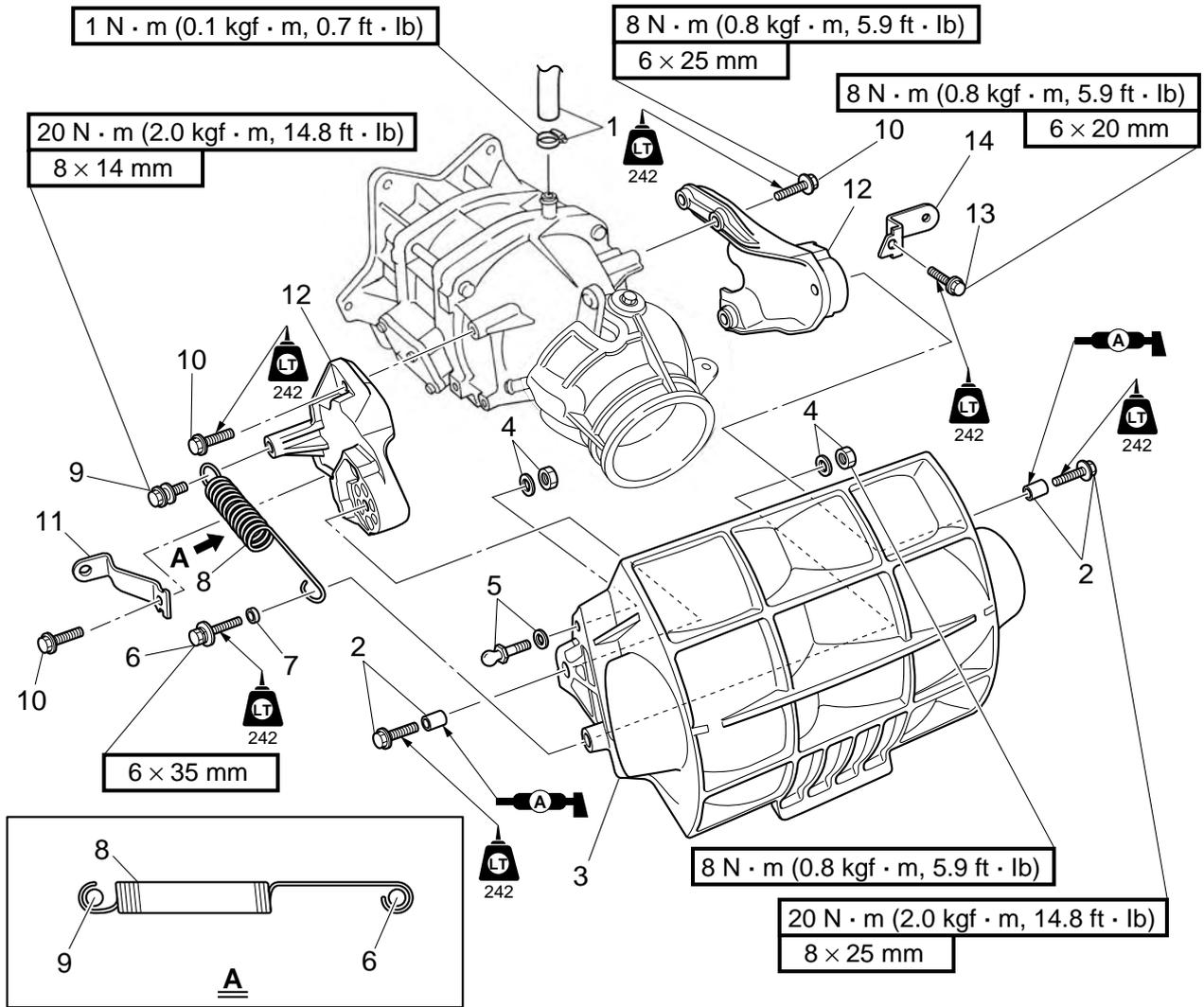
- Steering operation
  - Shift operation
  - QSTS operation
- Do not operate correctly → Reinstall.



**Reverse gate**  
**Reverse gate removal**



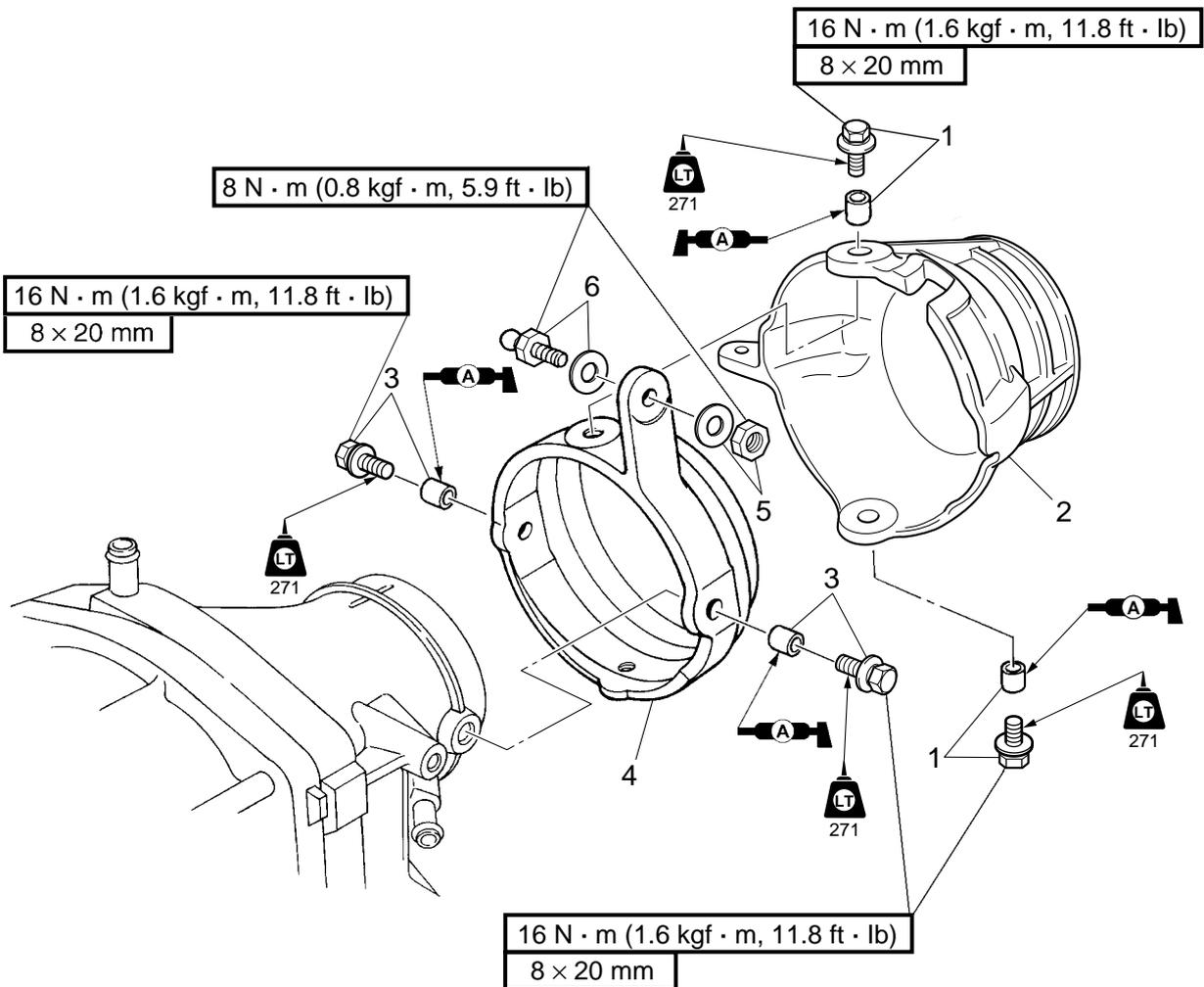
Step	Procedure/Part name	Q'ty	Service points
1	Clamp/spout hose	1/1	<p><b>NOTE:</b> _____</p> <p>Install the spring as shown.</p> <p>_____</p>
2	Bolt/collar	2/2	
3	Reverse gate assembly	1	
4	Nut/washer	2/2	
5	Shift cable ball joint/washer	1/1	
6	Bolt	1	
7	Collar	1	
8	Spring	1	
9	Bolt	1	
10	Bolt	6	



Step	Procedure/Part name	Q'ty	Service points
11	Bracket 2	1	Reverse the removal steps for installation.
12	Reverse gate stay	2	
13	Bolt	1	
14	Bracket 1	1	

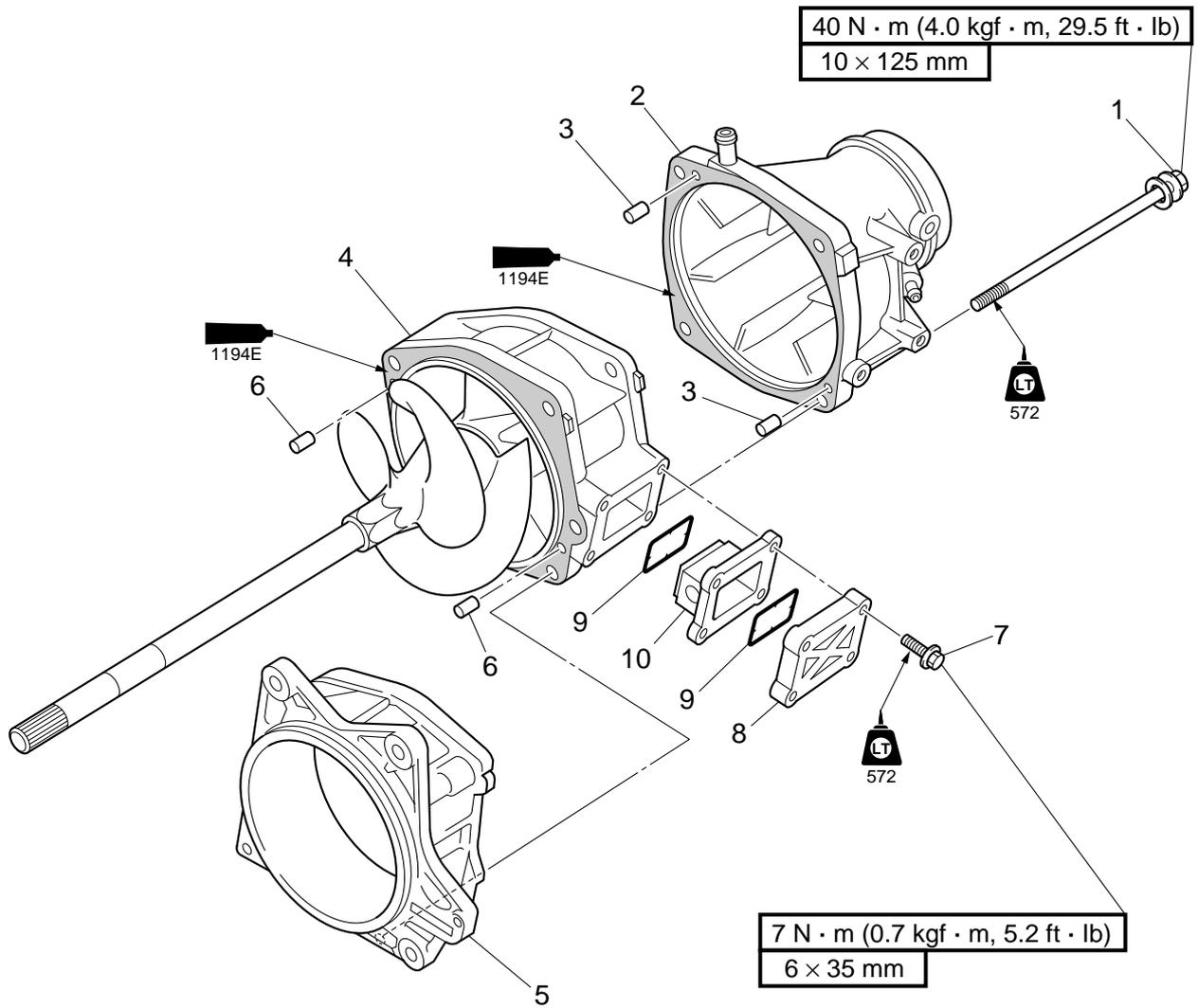


**Jet thrust nozzle and nozzle ring**  
**Jet thrust nozzle and nozzle ring removal**



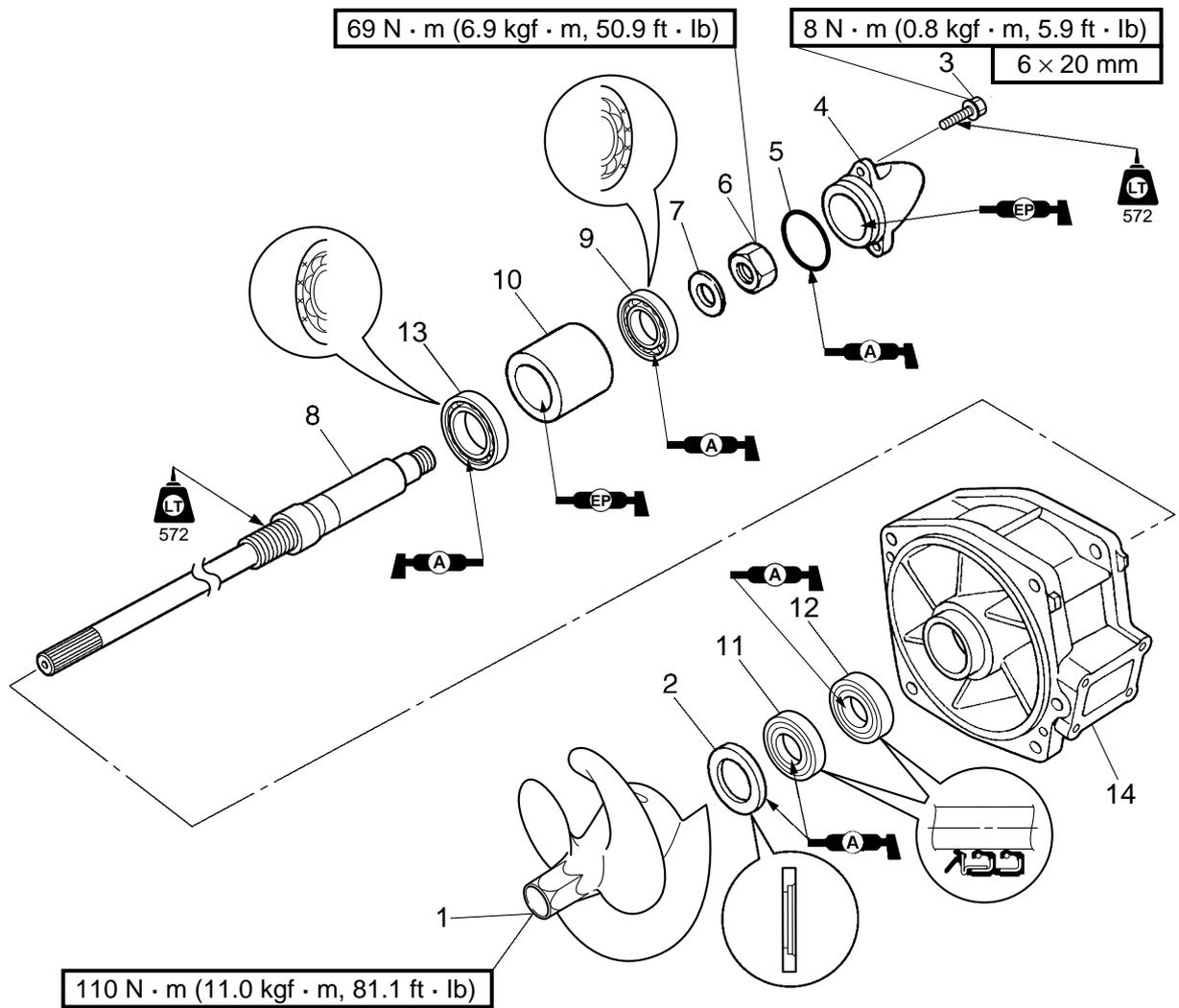
Step	Procedure/Part name	Q'ty	Service points
	Jet pump unit assembly		Refer to "Jet pump unit."
	Reverse gate		Refer to "Reverse gate."
1	Bolt/collar	2/2	
2	Jet thrust nozzle	1	
3	Bolt/collar	2/2	
4	Nozzle ring	1	
5	Nut/washer	1/1	
6	Ball joint/washer	1/1	
			Reverse the removal steps for installation.

**Impeller duct and impeller housing**  
**Impeller duct and impeller housing removal**

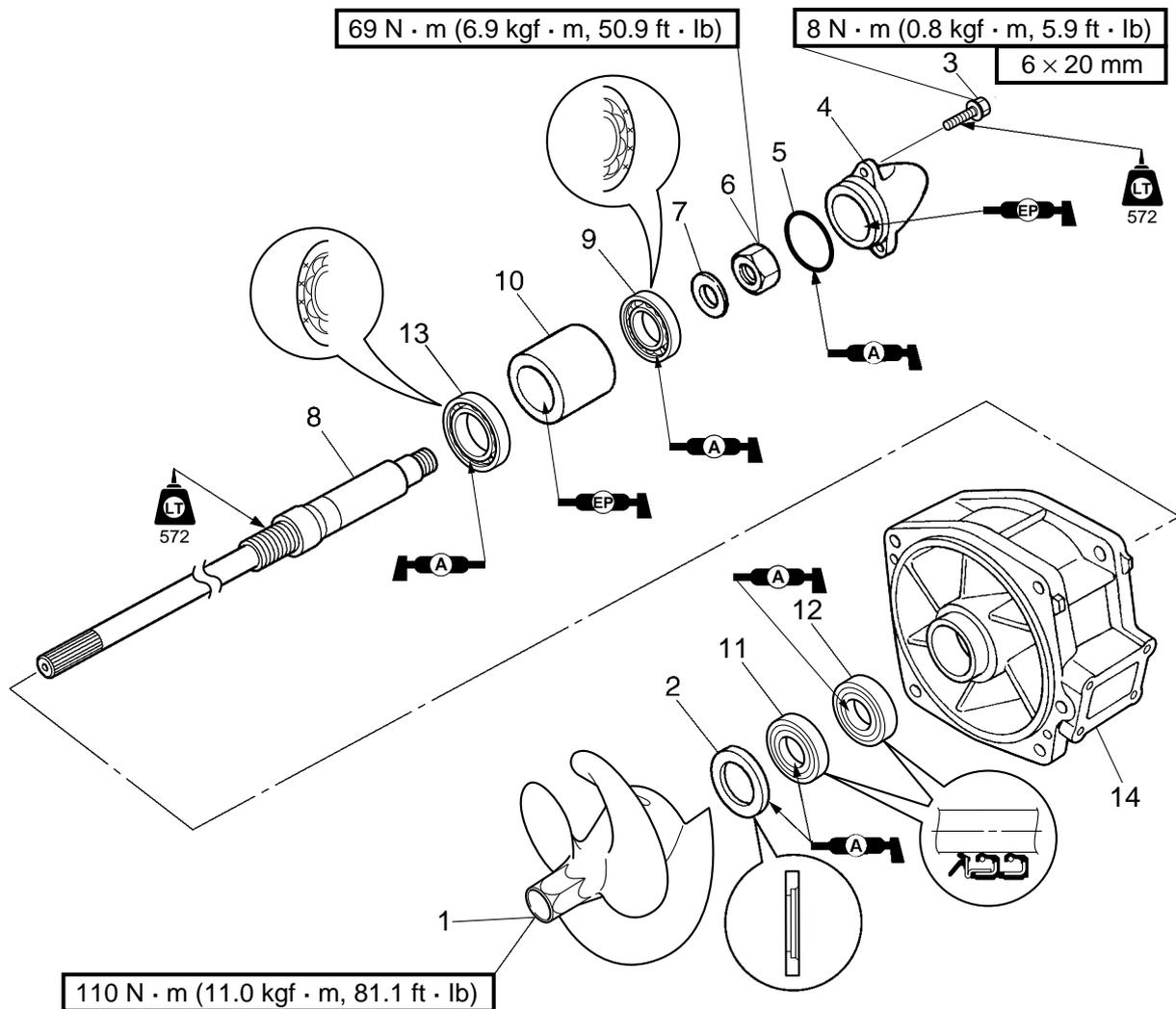


Step	Procedure/Part name	Q'ty	Service points
	Nozzle ring		Refer to "Jet thrust nozzle and nozzle ring."
1	Bolt	4	
2	Nozzle	1	
3	Dowel pin	2	
4	Impeller duct assembly	1	
5	Impeller housing	1	
6	Dowel pin	2	
7	Bolt	4	
8	Water inlet cover	1	
9	Packing	2	<b>Not reusable</b>
10	Water inlet strainer	1	
			Reverse the removal steps for installation.

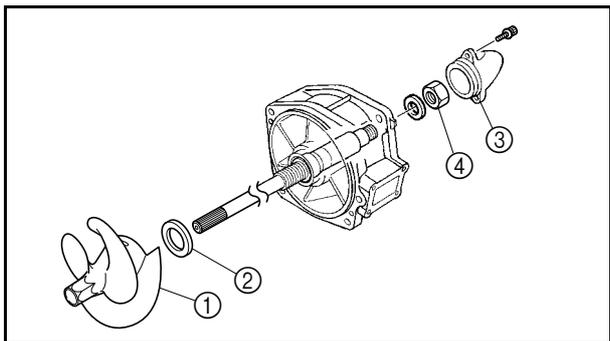
**Impeller duct and drive shaft**  
**Impeller duct and drive shaft disassembly**



Step	Procedure/Part name	Q'ty	Service points
1	Impeller	1	<b>NOTE:</b> _____ The impeller has left-hand threads.
2	Spacer	1	
3	Bolt	3	
4	Cap	1	
5	O-ring	1	<b>Not reusable</b>
6	Nut	1	
7	Washer	1	



Step	Procedure/Part name	Q'ty	Service points
8	Drive shaft	1	
9	Rear bearing	1	<b>Not reusable</b> Inside diameter: 25 mm (0.98 in)
10	Spacer	1	
11	Oil seal	1	<b>Not reusable</b>
12	Oil seal	1	<b>Not reusable</b>
13	Front bearing	1	<b>Not reusable</b> Inside diameter: 30 mm (1.18 in)
14	Impeller duct	1	Reverse the disassembly steps for assembly.

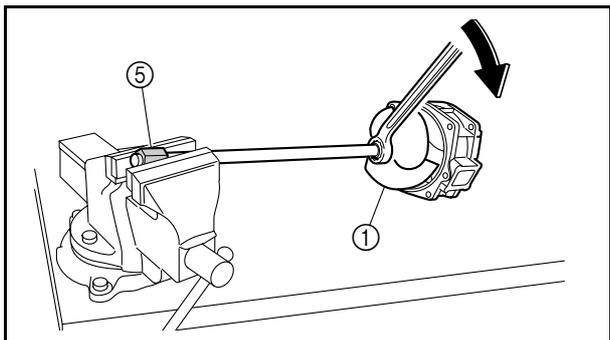


**Drive shaft removal**

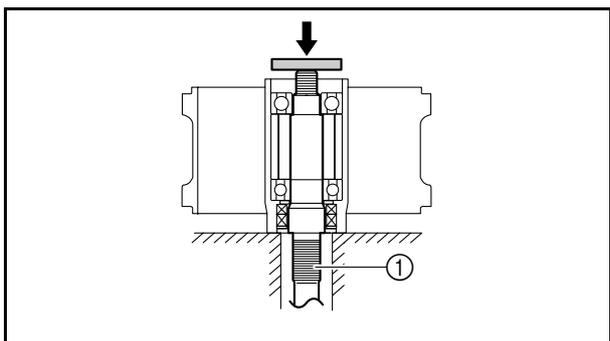
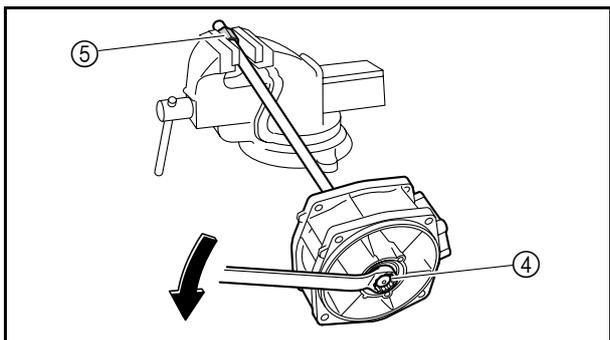
**1. Remove:**

- Impeller ①
- Spacer ②
- Cap ③
- Nut ④

**NOTE:** \_\_\_\_\_  
 The impeller has left-hand threads. Turn the impeller clockwise to loosen it.



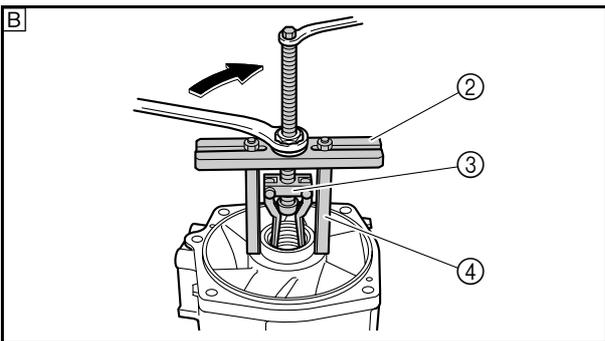
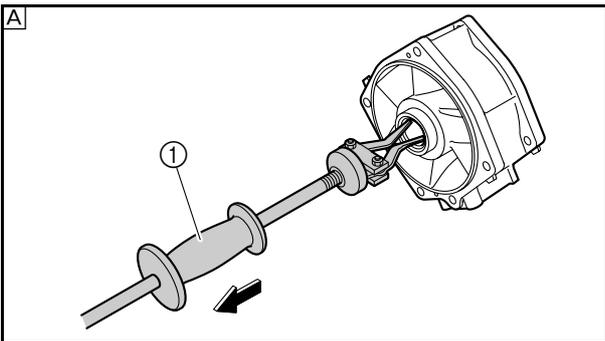
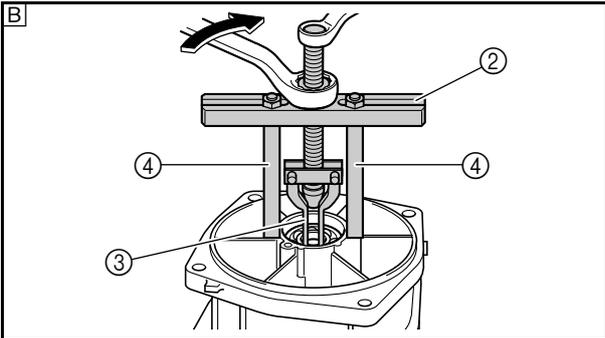
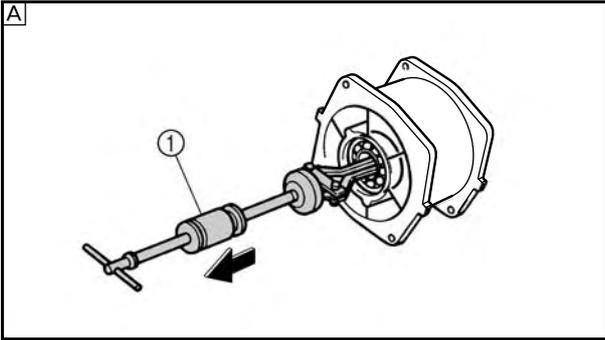
 Drive shaft holder ⑤:  
 YB-06201  
 Drive shaft holder 6 ⑤:  
 90890-06520



**2. Remove:**

- Drive shaft ①

**NOTE:** \_\_\_\_\_  
 Do not press the drive shaft threads directly.



**3. Remove:**

- Rear bearing



Slide hammer and adapters ①:  
YB-06096  
Stopper guide plate ②:  
90890-06501  
Bearing puller assembly ③:  
90890-06535  
Stopper guide stand ④:  
90890-06538

- A** For USA and Canada  
**B** For worldwide

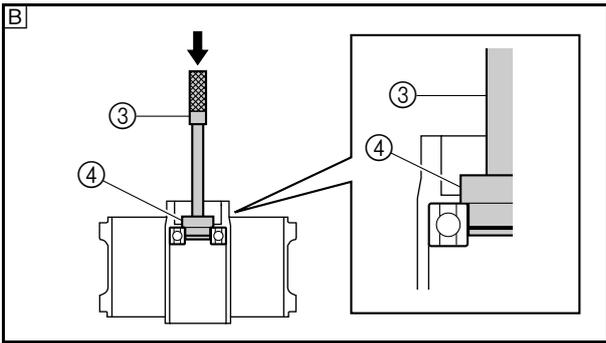
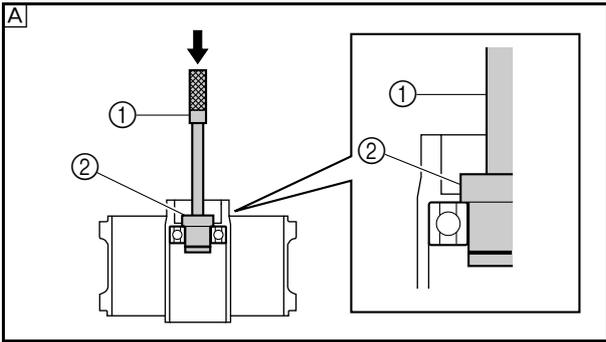
**4. Remove:**

- Oil seals



Slide hammer and adapters ①:  
YB-06096  
Stopper guide plate ②:  
90890-06501  
Bearing puller assembly ③:  
90890-06535  
Stopper guide stand ④:  
90890-06538

- A** For USA and Canada  
**B** For worldwide



**5. Remove:**

- Front bearing



Driver handle (large) ①:  
YB-06071  
Drive shaft needle bearing installer and remover ②:  
YB-06194  
Driver rod L3 ③:  
90890-06652  
Needle bearing attachment ④:  
90890-06609

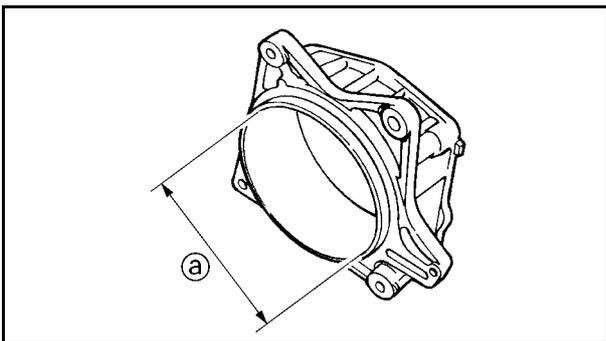
**A** For USA and Canada

**B** For worldwide

**Impeller check**

**1. Check:**

- Impeller  
Refer to “Jet pump unit check” in Chapter 3.



**Impeller housing check**

**1. Measure:**

- Impeller housing inside diameter @  
Out of specification → Replace the impeller housing.

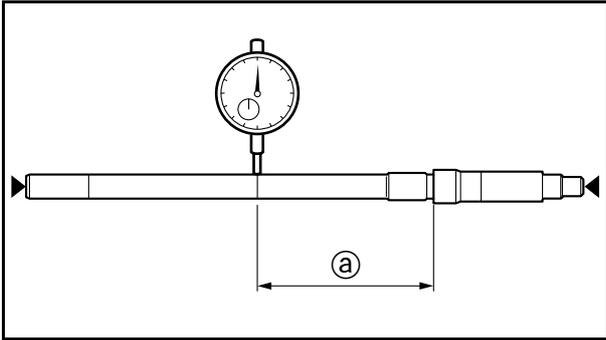


Impeller housing inside diameter @:  
155.35–155.45 mm  
(6.116–6.120 in)

**Drive shaft check**

**1. Check:**

- Drive shaft spline  
Cracks/damage → Replace the drive shaft.

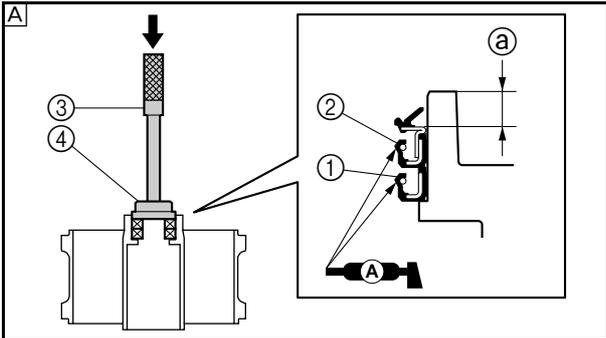


**2. Measure:**

- Drive shaft runout  
Out of specification → Replace the drive shaft.



Drive shaft runout limit:  
0.3 mm (0.012 in)  
Measuring point ①:  
310 mm (12.20 in)



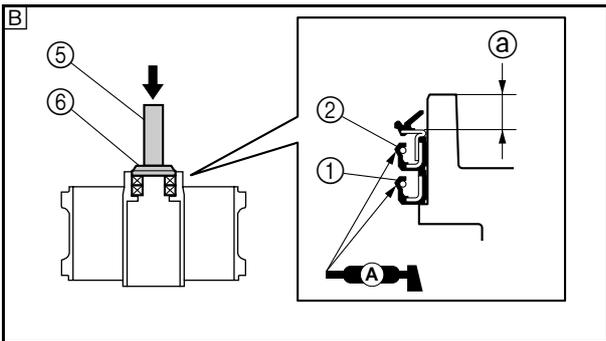
**Drive shaft installation**

**1. Install:**

- Oil seal ①
- Oil seal ②

**NOTE:**

Install the oil seal ① halfway into the impeller duct, and then install the oil seal ②.

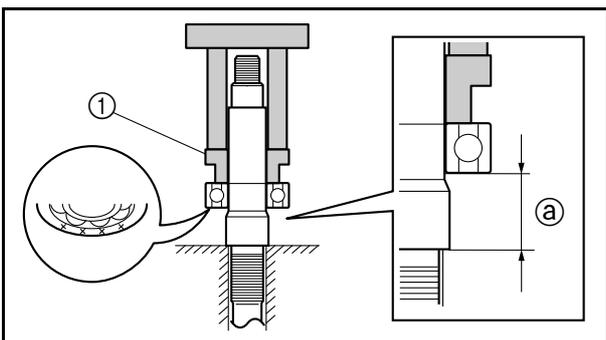


Driver handle (large) ③:  
YB-06071  
Bearing cup installer ④:  
YB-06167  
Driver rod LS ⑤:  
90890-06606  
Bearing outer race attachment ⑥:  
90890-06628



Distance ①:  
 $7.0 \pm 0.2$  mm ( $0.28 \pm 0.008$  in)

- Ⓐ For USA and Canada
- Ⓑ For worldwide



**2. Install:**

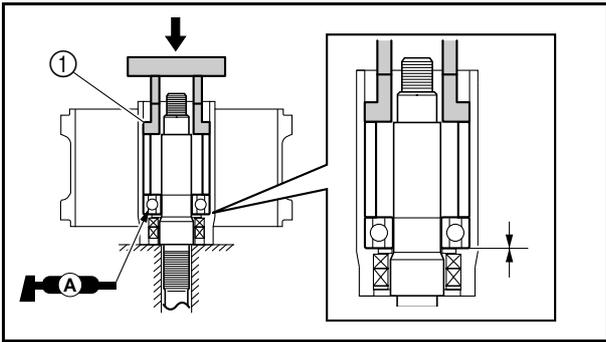
- Front bearing (to the drive shaft)



Bearing attachment ①:  
90890-06728



Distance ①:  
 $23.0 \pm 0.1$  mm ( $0.91 \pm 0.004$  in)

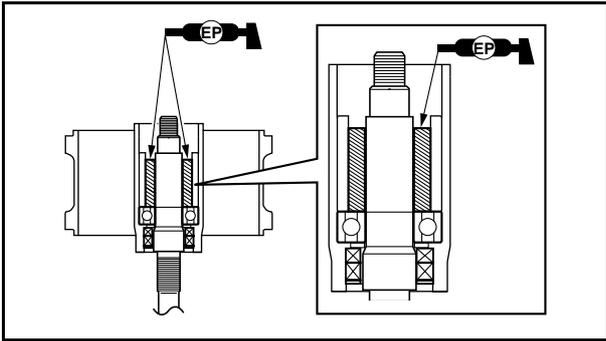


**3. Install:**

- Drive shaft assembly (with front bearing)
- Spacer



Bearing attachment ①:  
90890-06728

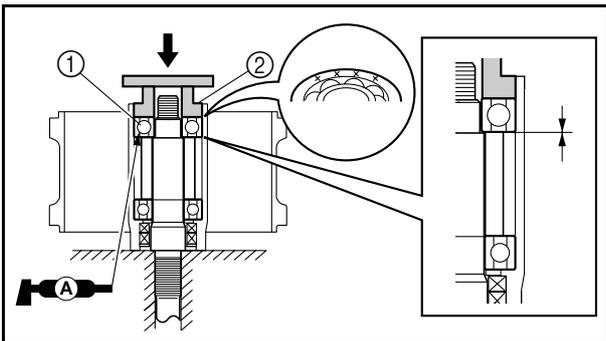


**4. Apply:**

- EPNOC grease AP #0  
(between the drive shaft and spacer)



Quantity:  
20 g (0.04 lb)

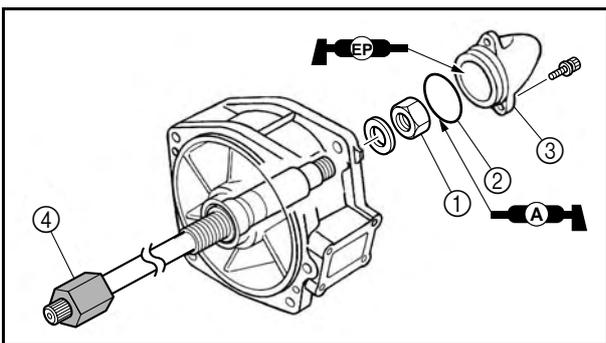


**5. Install:**

- Rear bearing ①



Bearing attachment ②:  
90890-06728

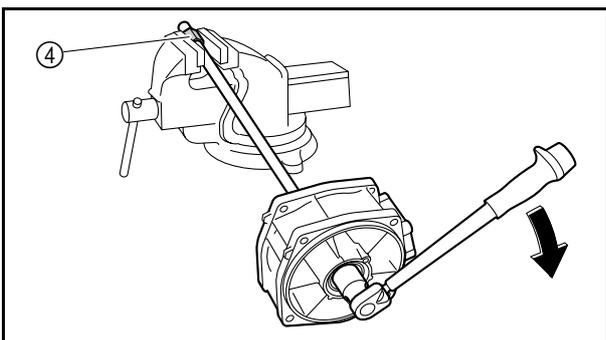


**6. Apply:**

- EPNOC grease AP #0 (into the cap)



Quantity:  
20 g (0.04 lb)



**7. Install:**

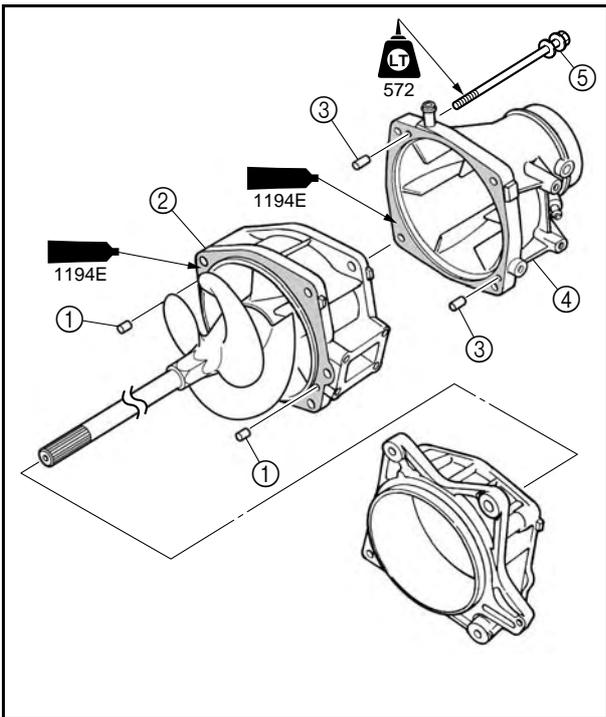
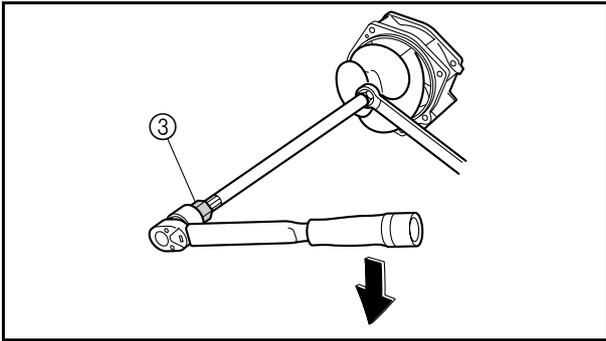
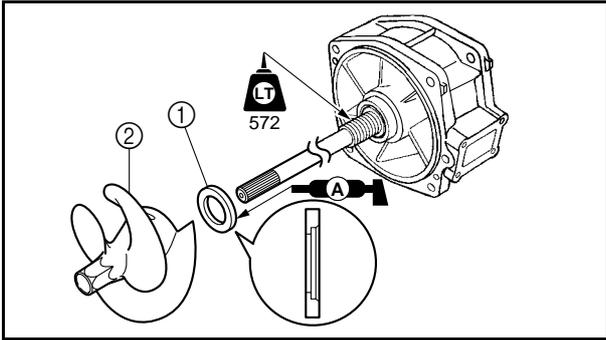
- Nut ①
- O-ring ②
- Cap ③



Drive shaft holder ④:  
YB-06201  
Drive shaft holder 6 ④:  
90890-06520



Drive shaft nut:  
69 N·m (6.9 kgf·m, 50.9 ft·lb)



**8. Install:**

- Spacer ①
- Impeller ②

**NOTE:**

The impeller has left-hand threads. Turn the impeller counterclockwise to tighten it.



Drive shaft holder ③:  
YB-06201  
Drive shaft holder 6 ③:  
90890-06520



Impeller:  
110 N·m (11.0 kgf·m, 81.1 ft·lb)  
LOCTITE 572

**Impeller duct and impeller housing installation**

**1. Install:**

- Dowel pins ①
- Impeller duct assembly ②
- Dowel pins ③
- Nozzle ④
- Bolts ⑤

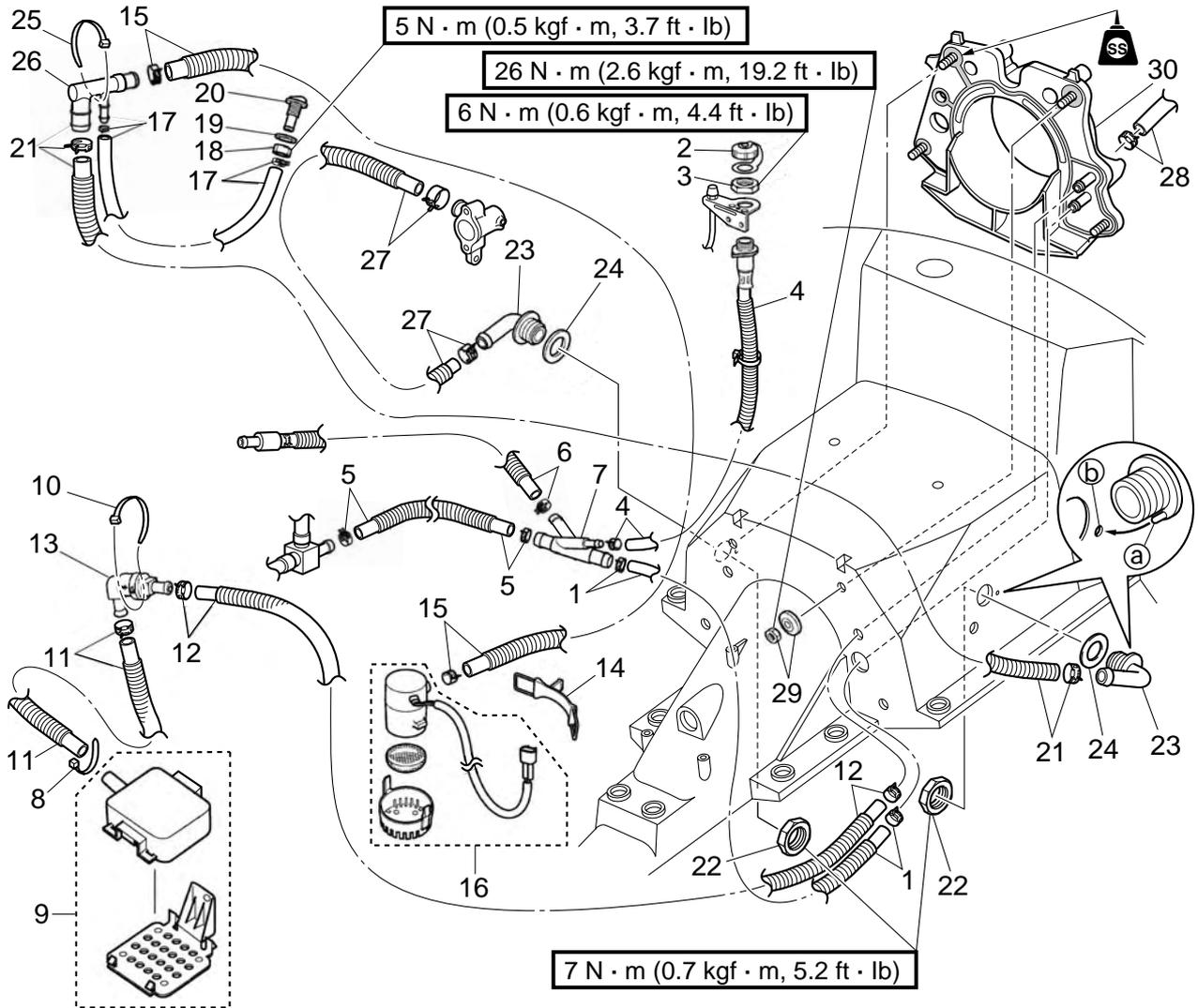
**NOTE:**

Clean the contacting surfaces before applying sealant.

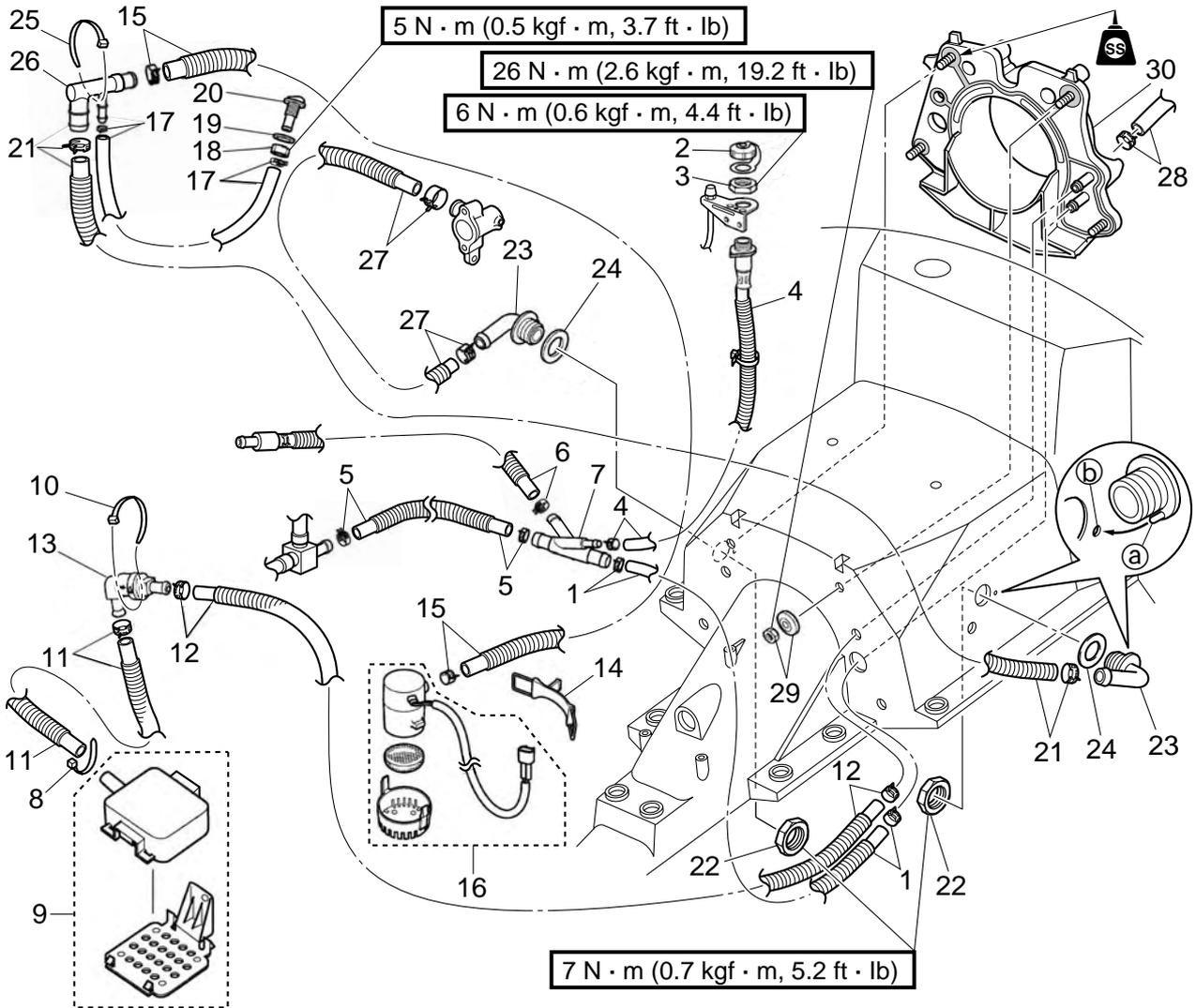


Impeller duct bolt:  
40 N·m (4.0 kgf·m, 29.5 ft·lb)  
LOCTITE 572





Step	Procedure/Part name	Q'ty	Service points
11	Clamp/bilge hose	1/1	
12	Clamp/bilge hose	2/1	
13	Hose joint	1	
14	Band	1	
15	Clamp/bilge hose	2/1	
16	Electric bilge pump assembly	1	
17	Clamp/bilge hose	2/1	
18	Nut	1	
19	Gasket	1	<b>Not reusable</b>
20	Pilot outlet	1	
21	Clamp/bilge hose	2/1	
22	Nut	2	



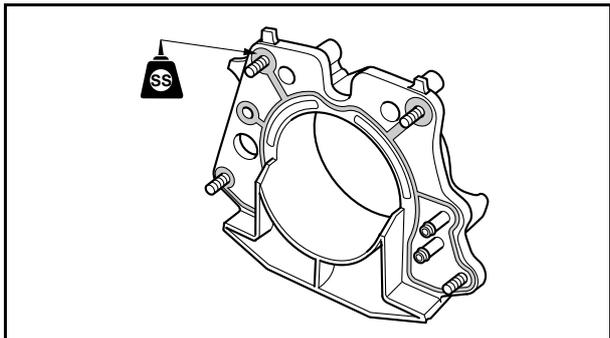
Step	Procedure/Part name	Q'ty	Service points
23	Drain joint	2	<b>NOTE:</b> _____ Align the projections ① with the holes ② on the hull.
24	Packing	2	<b>Not reusable</b>
25	Plastic tie	1	
26	Hose joint	1	
27	Clamp/cooling water hose	2/1	
28	Clamp/bilge hose	1/1	
29	Nut/washer	4/4	
30	Transom plate	1	Reverse the removal steps for installation.



### Water hose check

**1. Check:**

- Bilge hoses
  - Cooling water hoses
- Cracks/damage → Replace.



### Transom plate installation

**1. install:**

- Transom plate

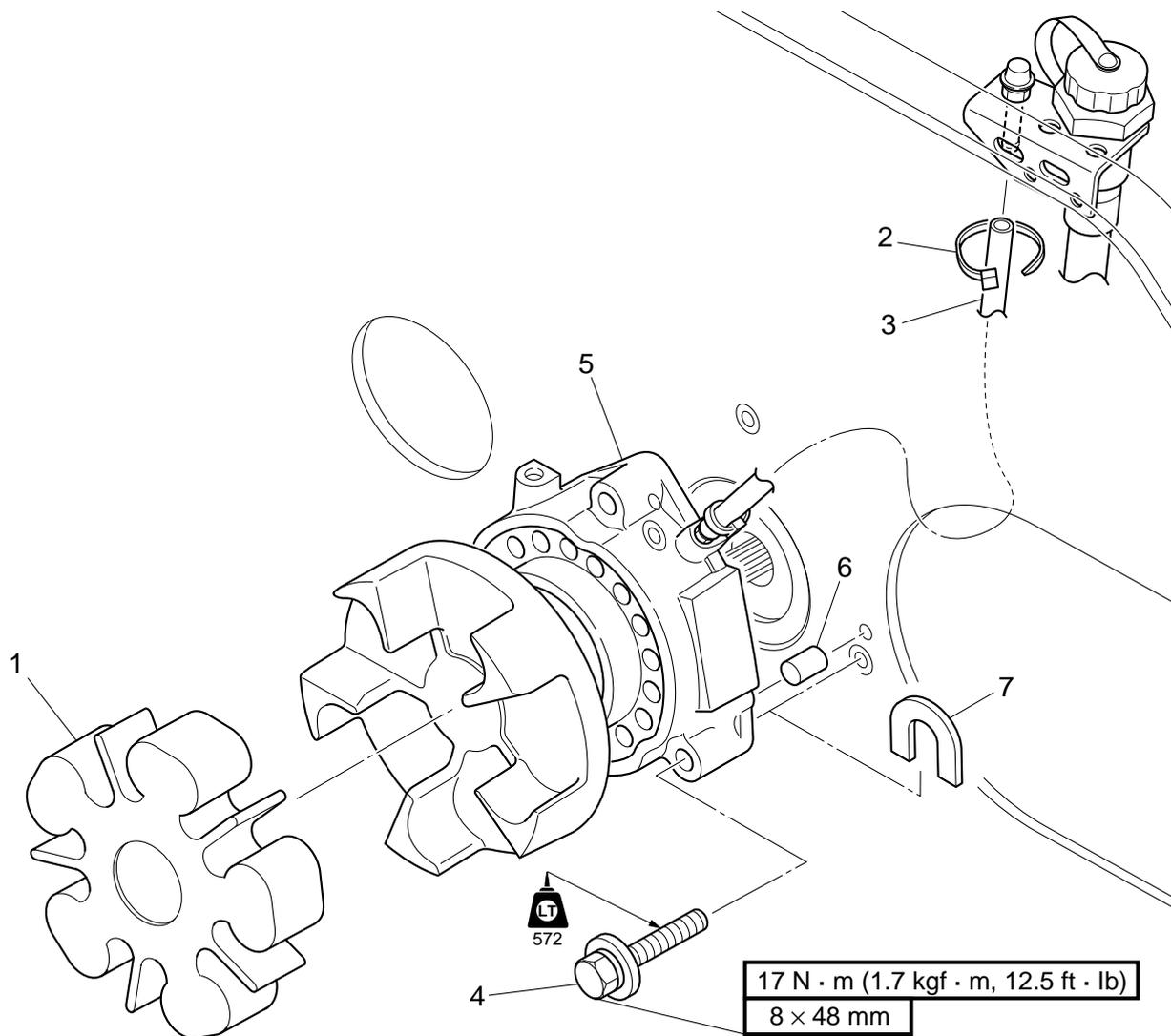
**NOTE:** \_\_\_\_\_  
Clean the contacting surfaces before applying silicone sealant.



Transom plate nut:  
26 N·m (2.6 kgf·m, 19.2 ft·lb)



**Intermediate housing**  
**Intermediate housing removal**

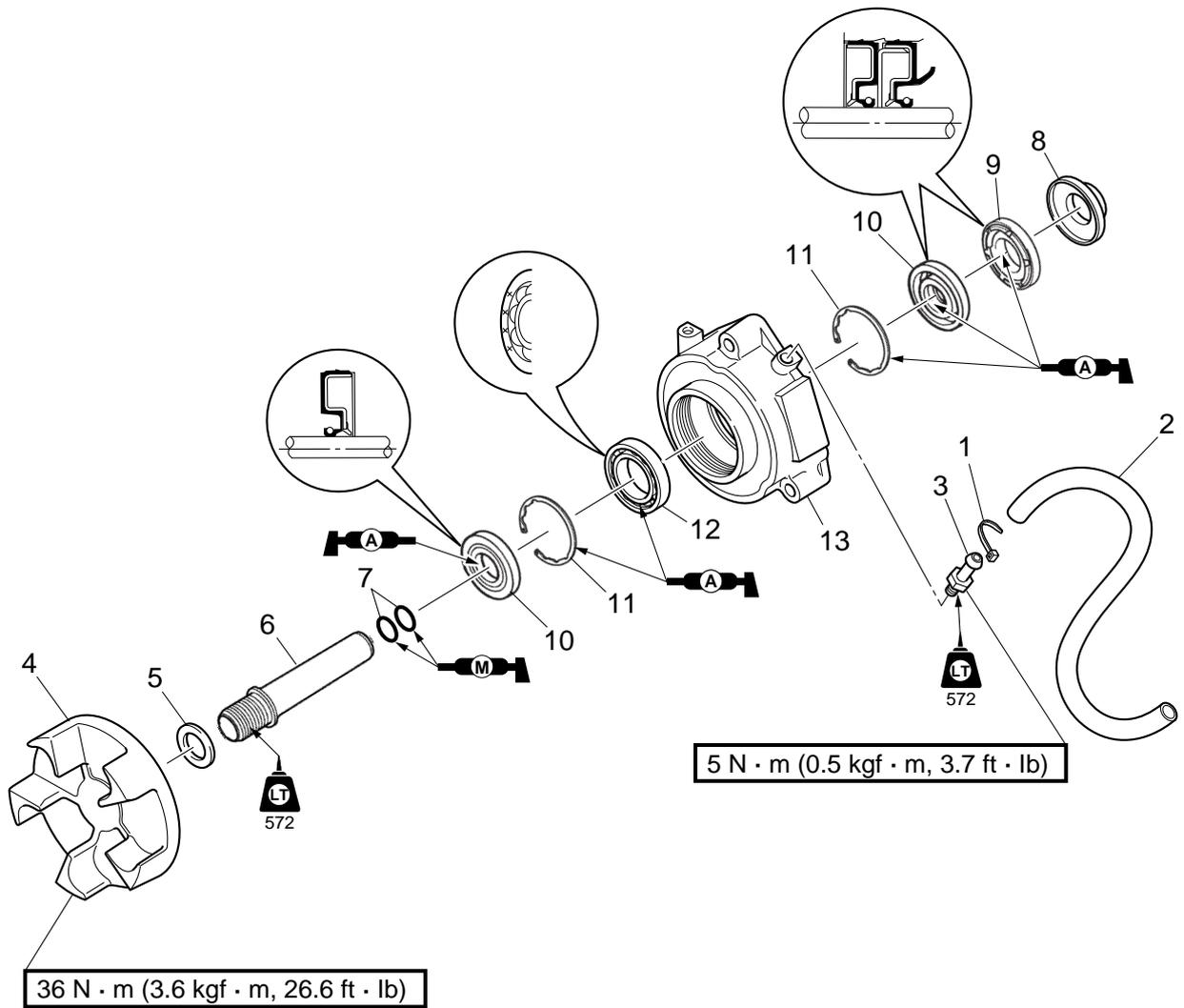


Step	Procedure/Part name	Q'ty	Service points
	Engine unit		Refer to "Engine unit" in Chapter 5.
1	Rubber damper	1	
2	Band	1	<b>Not reusable</b>
3	Grease hose	1	
4	Bolt	3	
5	Intermediate housing assembly	1	
6	Dowel pin	2	
7	Shim	*	<b>NOTE:</b> _____ Install the shims in their original positions. _____ Reverse the removal steps for installation.

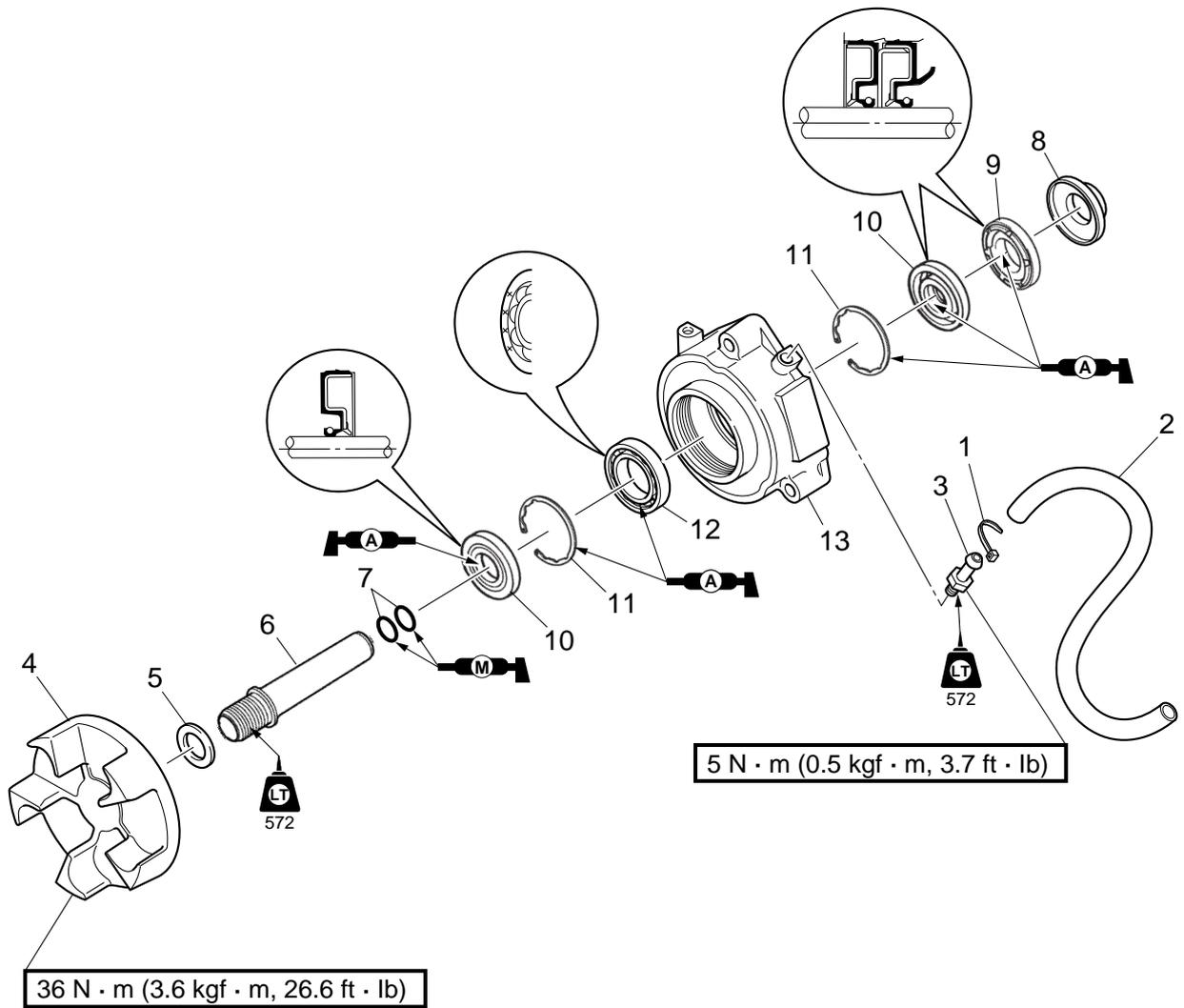
\*: As required



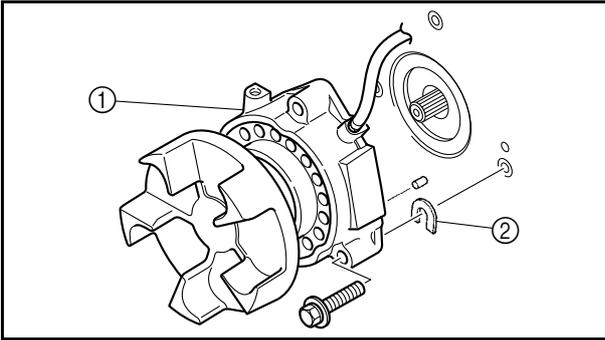
**Intermediate housing disassembly**



Step	Procedure/Part name	Q'ty	Service points
1	Band	1	<b>Not reusable</b>
2	Grease hose	1	
3	Nipple	1	
4	Driven coupling	1	
5	Washer	1	
6	Intermediate drive shaft	1	
7	O-ring	2	<b>Not reusable</b>
8	Thrust washer	1	<b>Not reusable</b>
9	Oil seal	1	<b>Not reusable</b>
10	Oil seal	2	<b>Not reusable</b>
11	Circlip	2	<b>Not reusable</b>



Step	Procedure/Part name	Q'ty	Service points
12	Bearing	1	<b>Not reusable</b>
13	Intermediate housing	1	Reverse the disassembly steps for assembly.



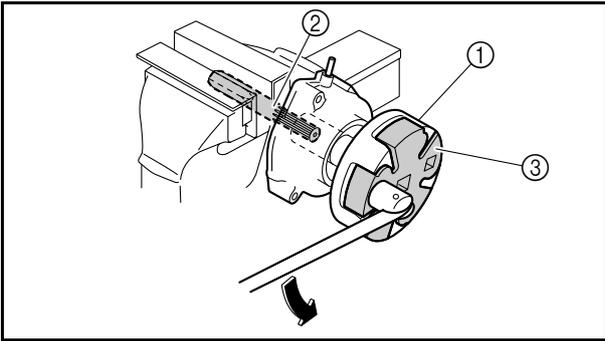
**Intermediate housing removal**

**1. Remove:**

- Intermediate housing assembly ①
- Shims ②

**NOTE:** \_\_\_\_\_

Make a note of the position of each removed shim ② so that it can be installed in its original position.



**Driven coupling removal**

**1. Remove:**

- Driven coupling ①

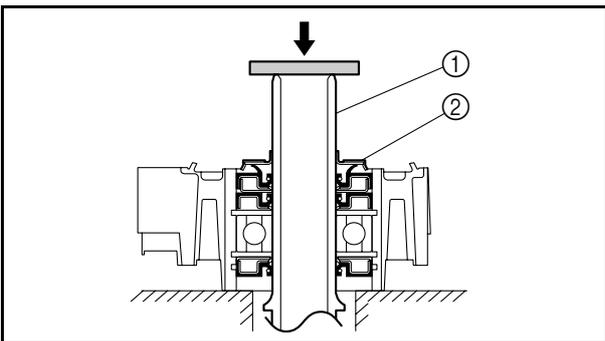
**NOTE:** \_\_\_\_\_

Make sure that the special service tool ② is inserted completely into the intermediate drive shaft.



Shaft holder ②:  
90890-06730

Coupler wrench ③:  
90890-06729



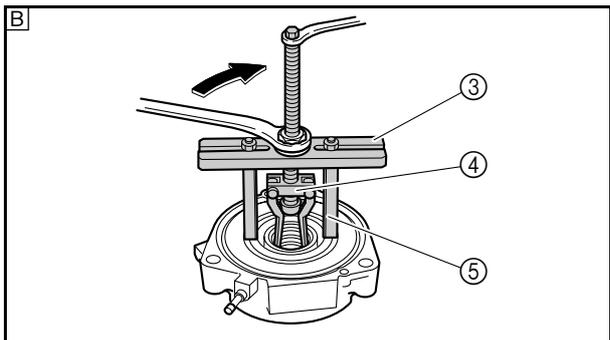
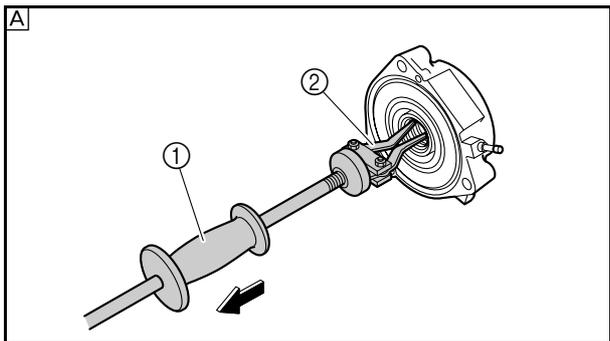
**Intermediate drive shaft removal**

**1. Remove:**

- Intermediate drive shaft ①
- Thrust washer ②

**NOTE:** \_\_\_\_\_

Do not press the intermediate drive shaft directly.



**Oil seal removal**

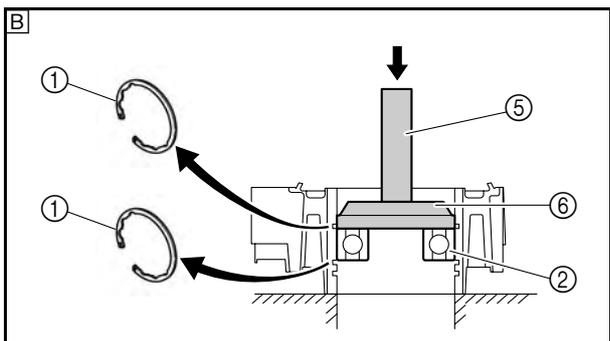
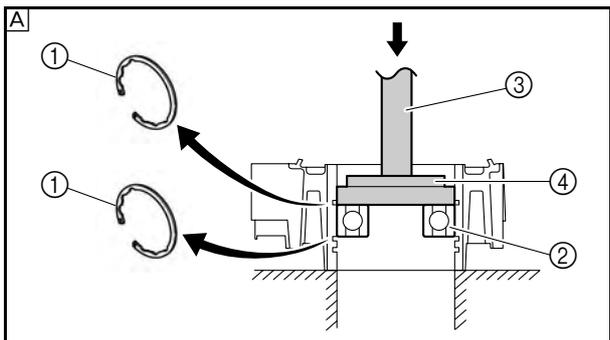
**1. Remove:**

- Oil seal (front)
- Oil seals (rear)



- Slide hammer and adapters ①:  
YB-06096  
Bearing puller legs ②:  
YB-06523  
Stopper guide plate ③:  
90890-06501  
Bearing puller assembly ④:  
90890-06535  
Stopper guide stand ⑤:  
90890-06538

- A** For USA and Canada  
**B** For worldwide



**Bearing removal**

**1. Remove:**

- Circlips ①
- Bearing ②

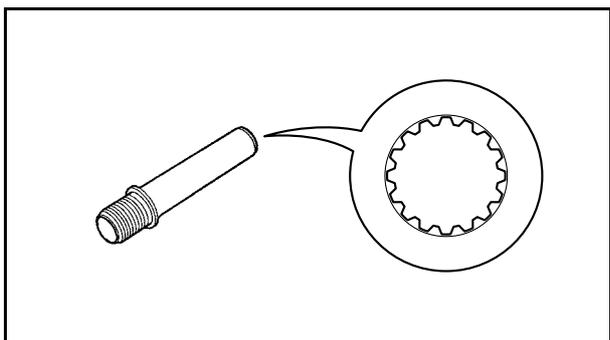
**NOTE:**

Remove the circlips ① before removing the bearing ②.



- Driver handle (large) ③:  
YB-06071  
Needle bearing installer ④:  
YB-06434  
Driver rod LS ⑤:  
90890-06606  
Bearing outer race attachment ⑥:  
90890-06623

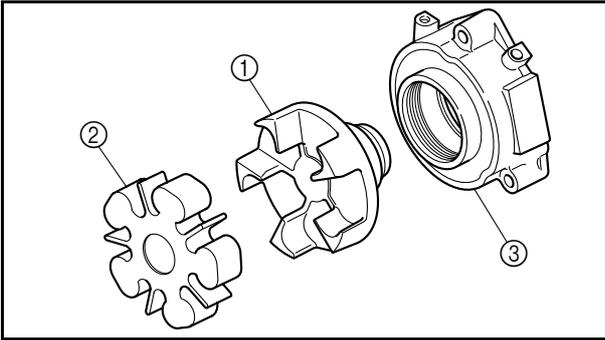
- A** For USA and Canada  
**B** For worldwide



**Intermediate drive shaft and grease hose check**

**1. Check:**

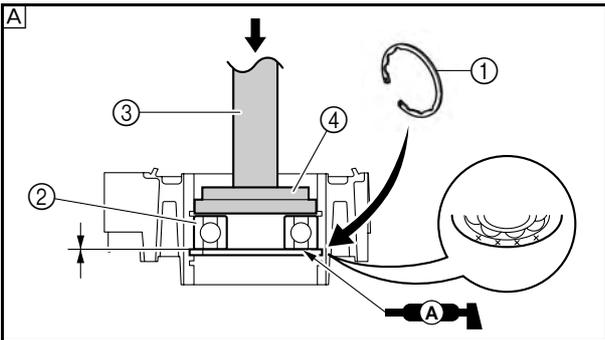
- Intermediate drive shaft spline
- Grease hose  
Cracks/damage → Replace.



### Driven coupling and intermediate housing check

**1. Check:**

- Driven coupling ①
  - Rubber damper ②
  - Intermediate housing ③
- Cracks/damage → Replace.



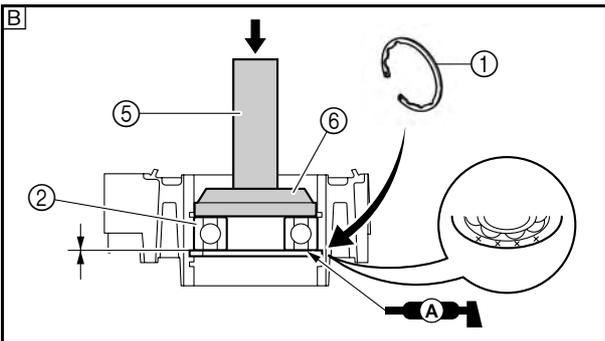
### Bearing installation

**CAUTION:** \_\_\_\_\_

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

**1. Install:**

- Circlip ①
- Bearing ②



**Installing step:**

1. Install the circlip ①, and then install the bearing ② until it contacts the circlip.



Driver handle (large) ③:

YB-06071

Needle bearing installer ④:

YB-06434

Driver rod LS ⑤:

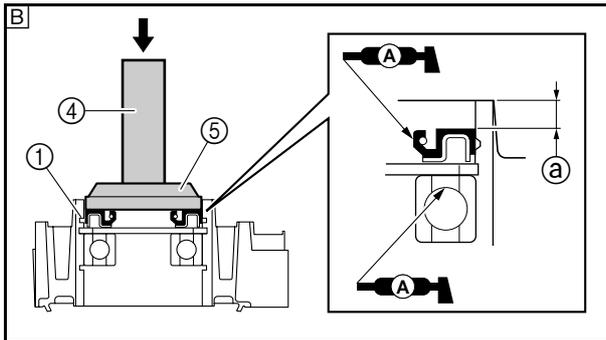
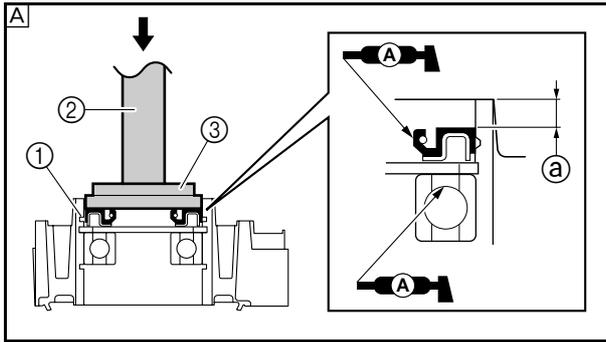
90890-06606

Bearing outer race attachment ⑥:

90890-06623

**A** For USA and Canada

**B** For worldwide



**Oil seal installation**

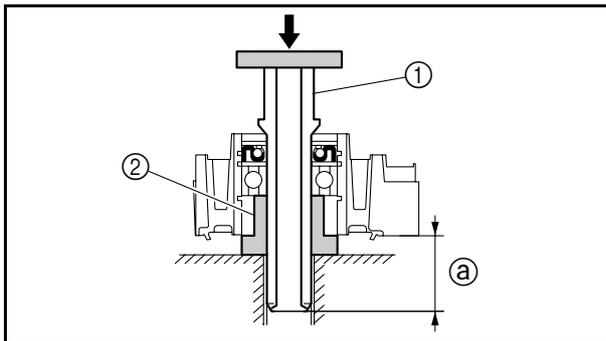
**1. Install:**

- Oil seal ①

	Driver handle (large) ②: YB-06071
	Needle bearing installer ③: YB-06434
	Driver rod LS ④: 90890-06606
	Bearing outer race attachment ⑤: 90890-06623

	Distance ①: $6.5 \pm 0.2 \text{ mm}$ ( $0.26 \pm 0.01 \text{ in}$ )
--	--

- A** For USA and Canada
- B** For worldwide

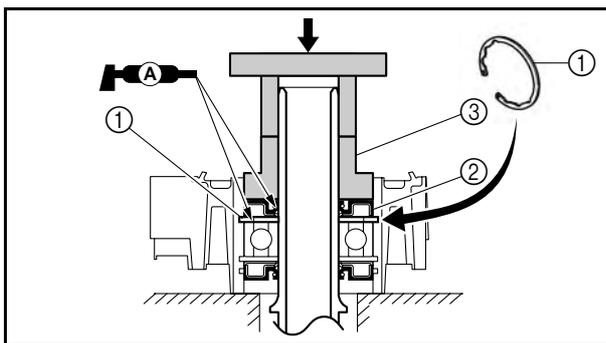


**2. Install:**

- Intermediate drive shaft ①

	Bearing attachment ②: 90890-06728
--	--------------------------------------

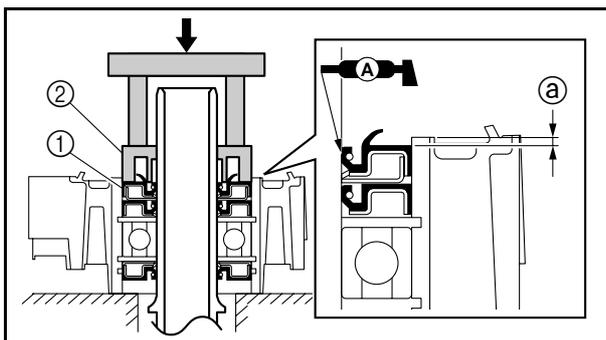
	Distance ①: $46.0 \pm 0.5 \text{ mm}$ ( $1.81 \pm 0.02 \text{ in}$ )
--	---



**3. Install:**

- Circlip ①
- Oil seal ②

	Bearing attachment ③: 90890-06728
--	--------------------------------------

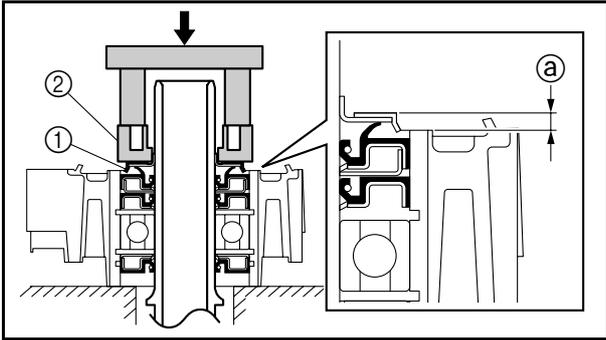


**4. Install:**

- Oil seal ①

	Bearing attachment ②: 90890-06727
--	--------------------------------------

	Distance ①: $1.6 \pm 0.2 \text{ mm}$ ( $0.06 \pm 0.01 \text{ in}$ )
--	--



**5. Install:**

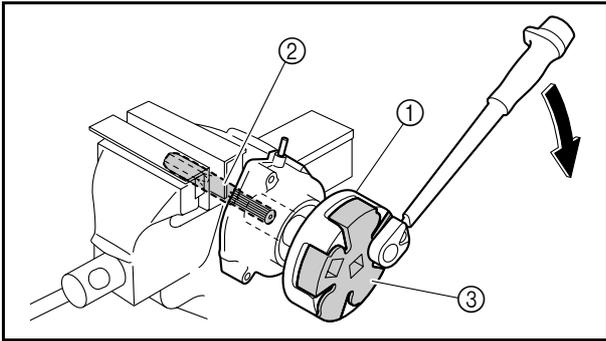
- Thrust washer ①



Bearing attachment ②:  
90890-06727



Distance ②:  
4.4 ± 0.3 mm (0.17 ± 0.01 in)



**Driven coupling installation**

**1. Install:**

- Driven coupling ①

**NOTE:**

Make sure that the special service tool ② is inserted completely into the intermediate drive shaft.

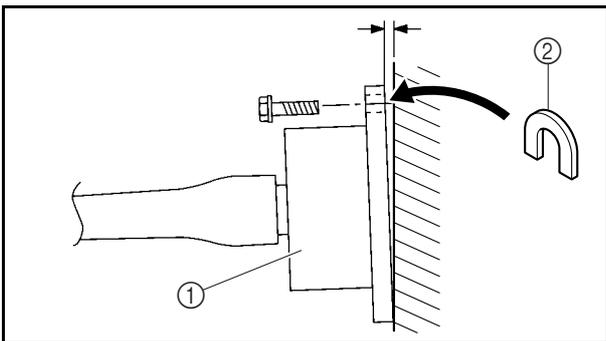


Shaft holder ②:  
90890-06730

Coupler wrench ③:  
90890-06729



Driven coupling:  
36 N·m (3.6 kgf·m, 26.6 ft·lb)  
LOCTITE 572



**Intermediate housing installation**

**1. Install:**

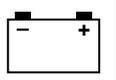
- Intermediate housing assembly ①
- Shims ②

**NOTE:**

Be sure to install the shims in their original positions.



— MEMO —



## Chapter 7

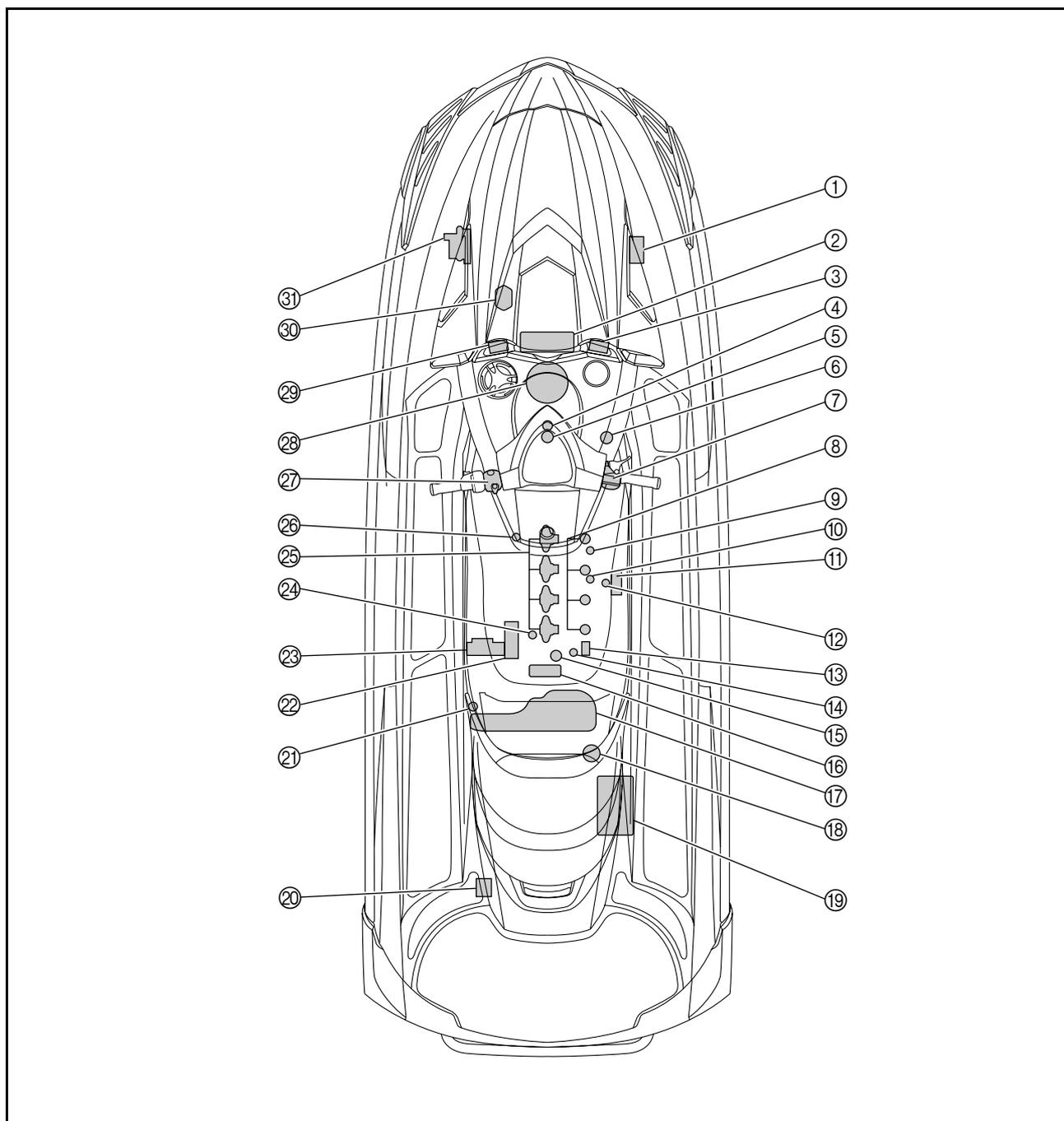
### Electrical system

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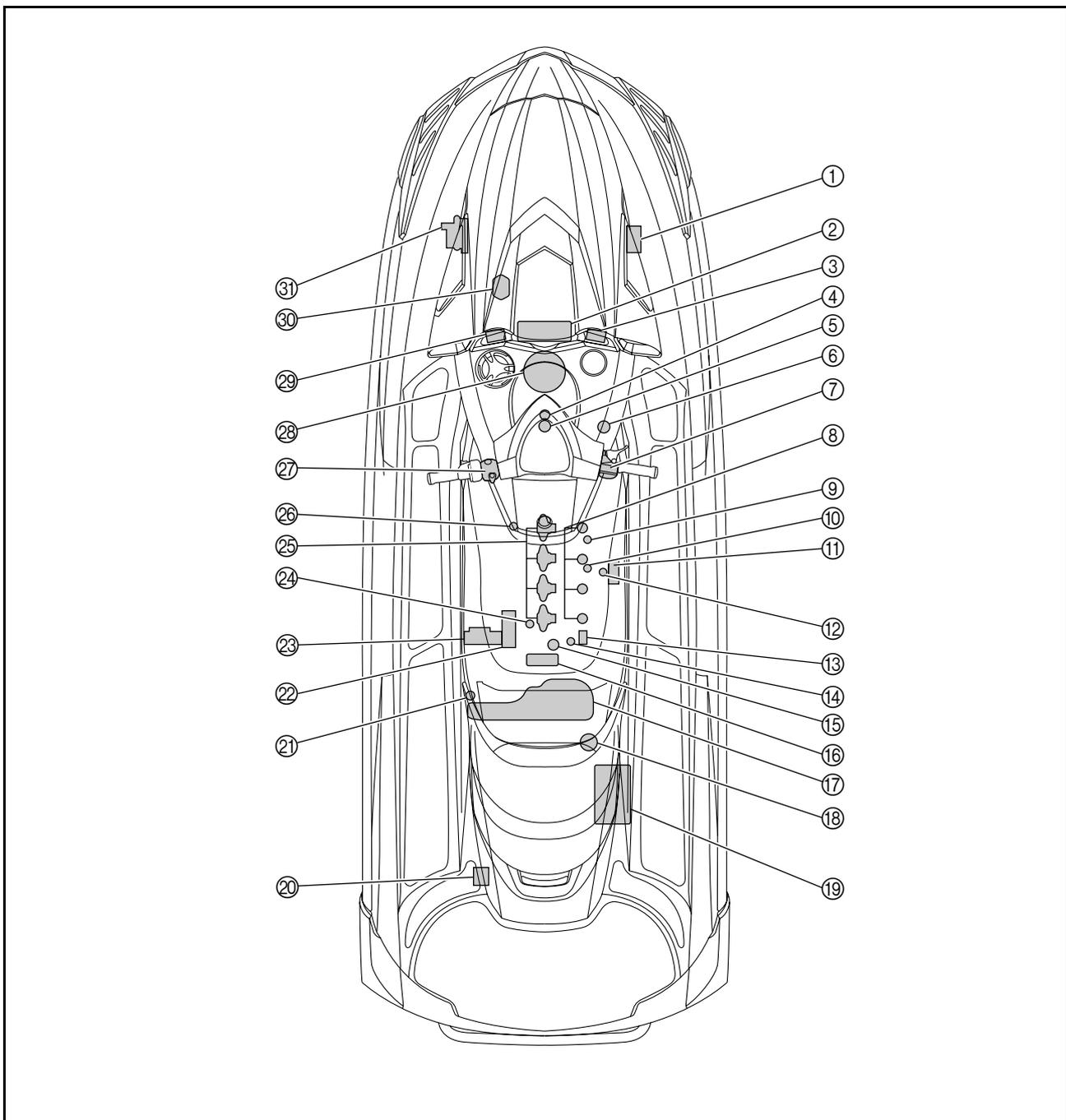
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## Electrical components



- |   |                                 |
|---|---------------------------------|
| ① Remote control receiver                             | ⑪ TPS                           |
| ② Multifunction meter                                 | ⑫ Intake air temperature sensor |
| ③ Right operation button assembly<br>(FX Cruiser SHO) | ⑬ Intake air pressure sensor    |
| ④ Steering sensor                                     | ⑭ Engine temperature sensor     |
| ⑤ Buzzer  | ⑮ Earth plate                   |
| ⑥ Reverse sensor                                      | ⑯ Stator coil and pickup coil   |
| ⑦ Right handlebar switch assembly                     | ⑰ Electrical box                |
| ⑧ Fuel injectors                                      | ⑱ Electric bilge pump           |
| ⑨ Thermoswitch  | ⑲ Battery                       |
| ⑩ Knock sensor  |                                 |

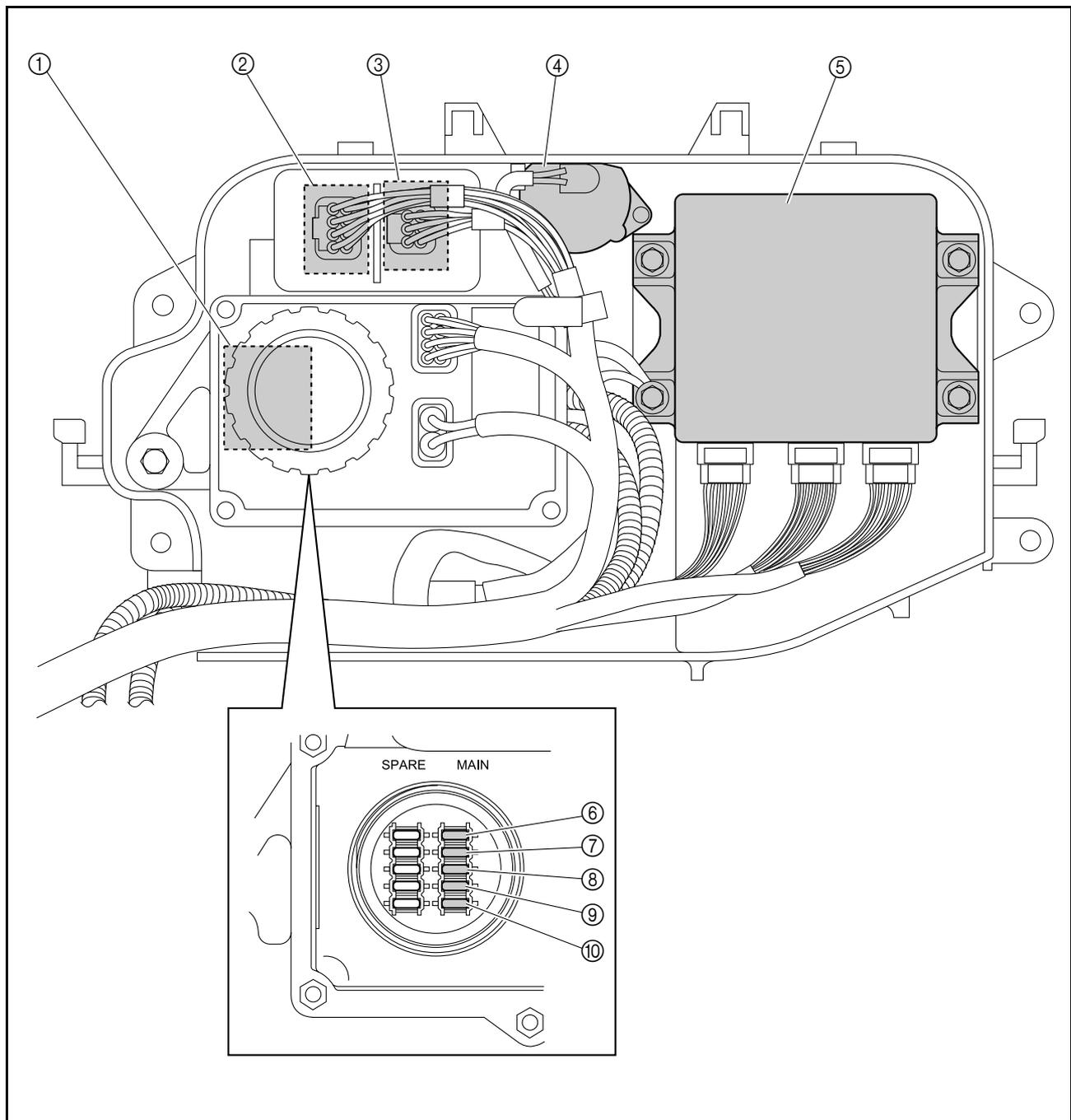


- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>⑳ Speed sensor (FX SHO)</li> <li>Speed and water temperature sensor (FX Cruiser SHO)</li> <li>㉑ Thermo sensor</li> <li>㉒ Starter motor</li> <li>㉓ Rectifier regulator</li> <li>㉔ Cam position sensor</li> <li>㉕ Spark plugs and ignition coils</li> <li>㉖ Oil pressure switch</li> <li>㉗ Left handlebar switch assembly</li> <li>㉘ Fuel pump module and fuel sender</li> </ul> | <ul style="list-style-type: none"> <li>㉙ Left operation button assembly</li> <li>㉚ Compass and air temperature sensor (FX Cruiser SHO)</li> <li>㉛ APS</li> </ul> |
|---|--|



## Electrical box

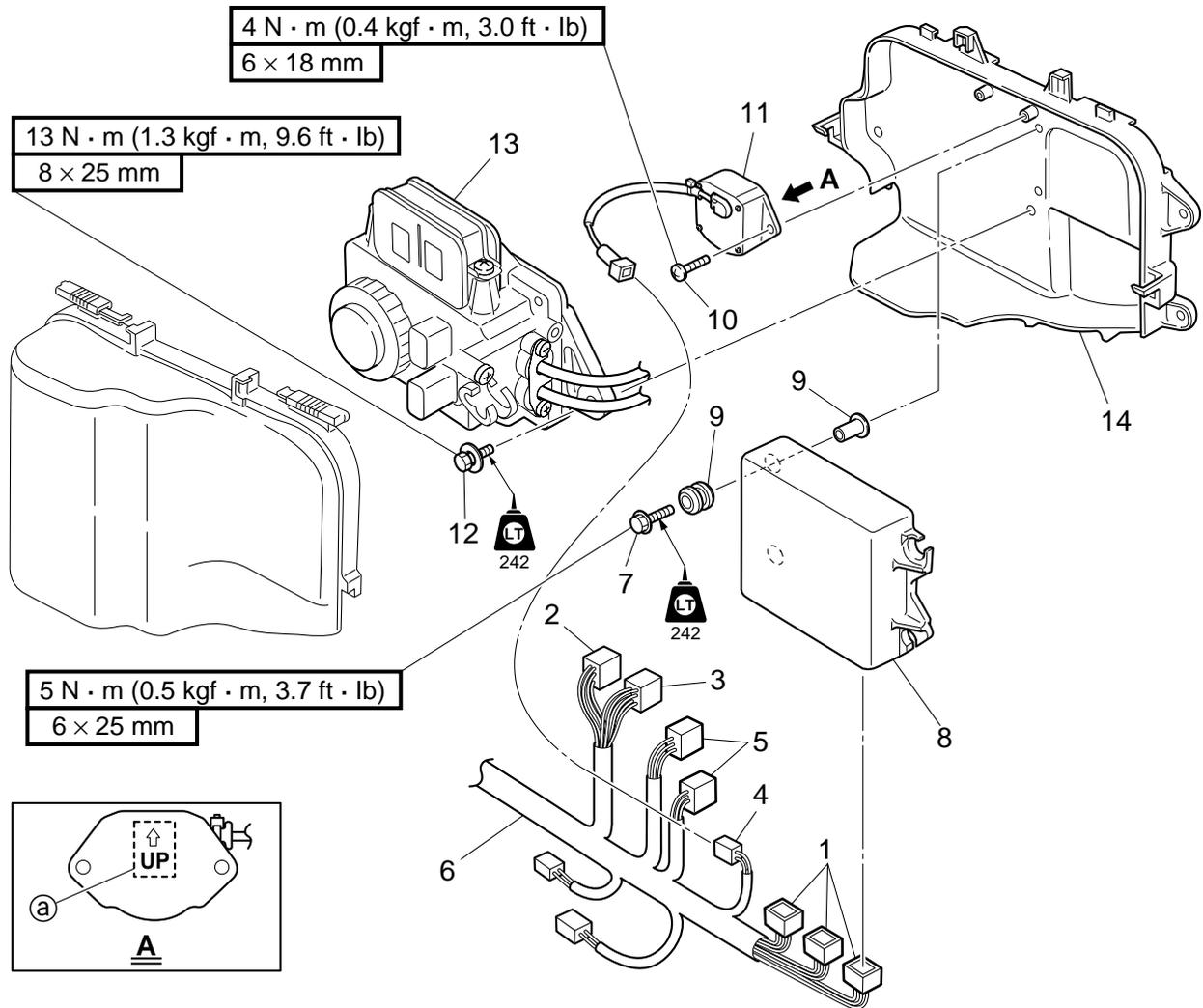
### Electrical components



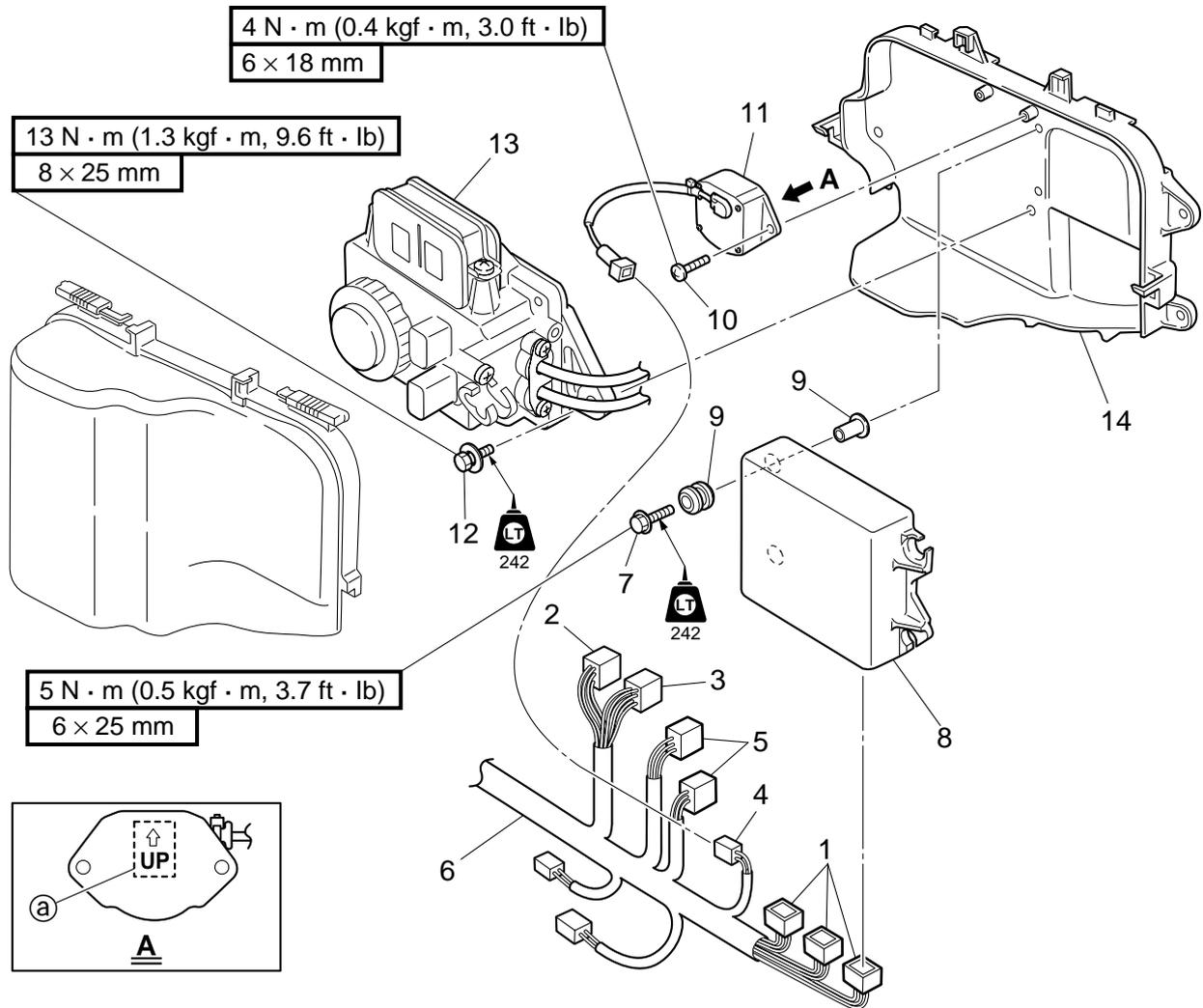
- ① Starter relay
- ② Main and fuel pump relay
- ③ ETV relay
- ④ Slant detection switch
- ⑤ ECM
- ⑥ Fuse (30 A) (battery)
- ⑦ Fuse (10 A) (main and fuel pump relay)
- ⑧ Fuse (10 A) (ETV relay)
- ⑨ Fuse (3 A) (remote control receiver)
- ⑩ Fuse (20 A) (main and fuel pump relay)



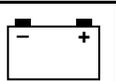
Electrical box disassembly



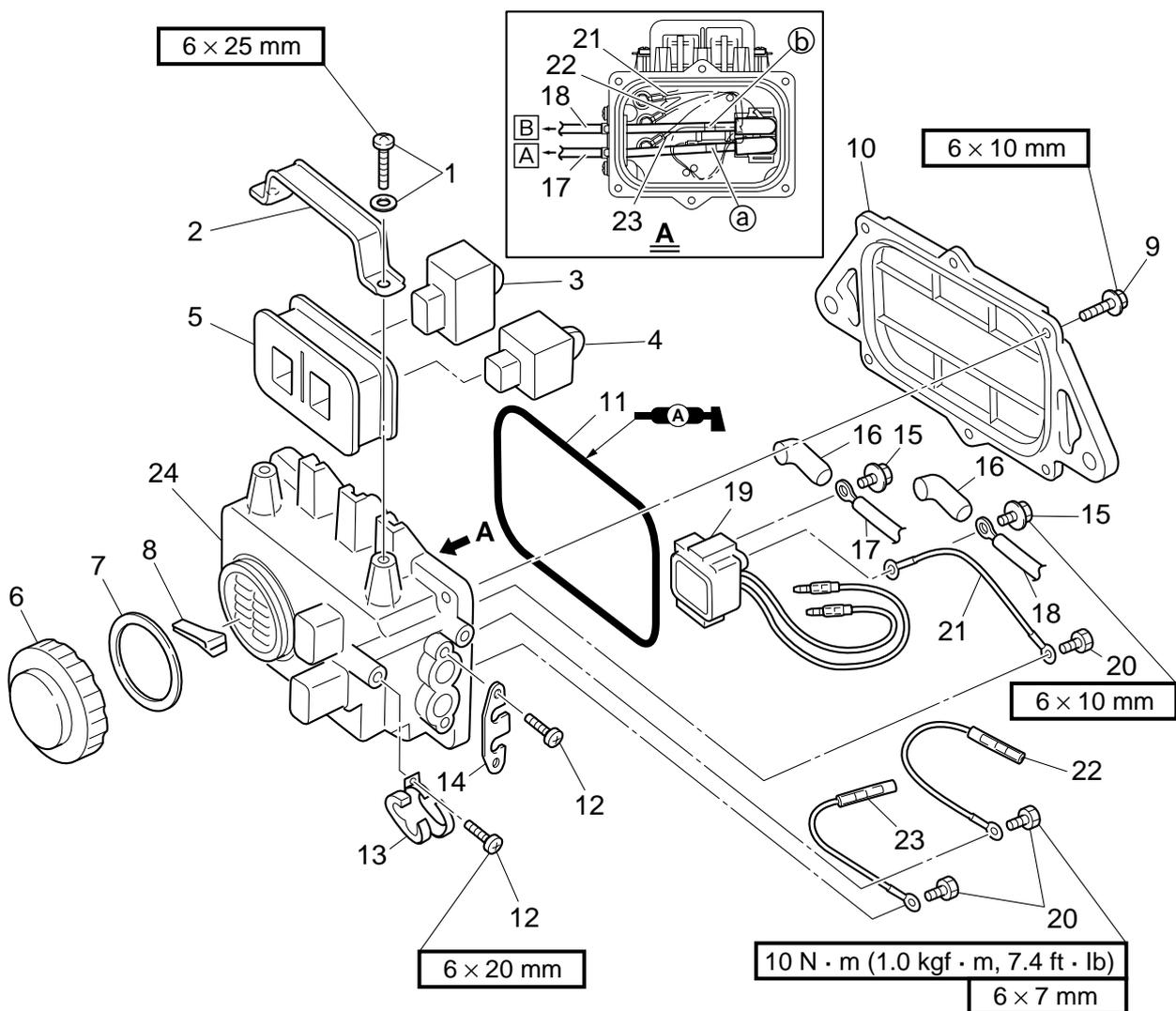
Step	Procedure/Part name	Q'ty	Service points
1	ECM coupler	3	
2	Main and fuel pump relay coupler	1	
3	ETV relay coupler	1	
4	Slant detection switch coupler	1	
5	Fuse box coupler	2	
6	Wiring harness assembly	1	
7	Bolt	4	
8	ECM	1	
9	Collar/grommet	4/4	
10	Screw	2	



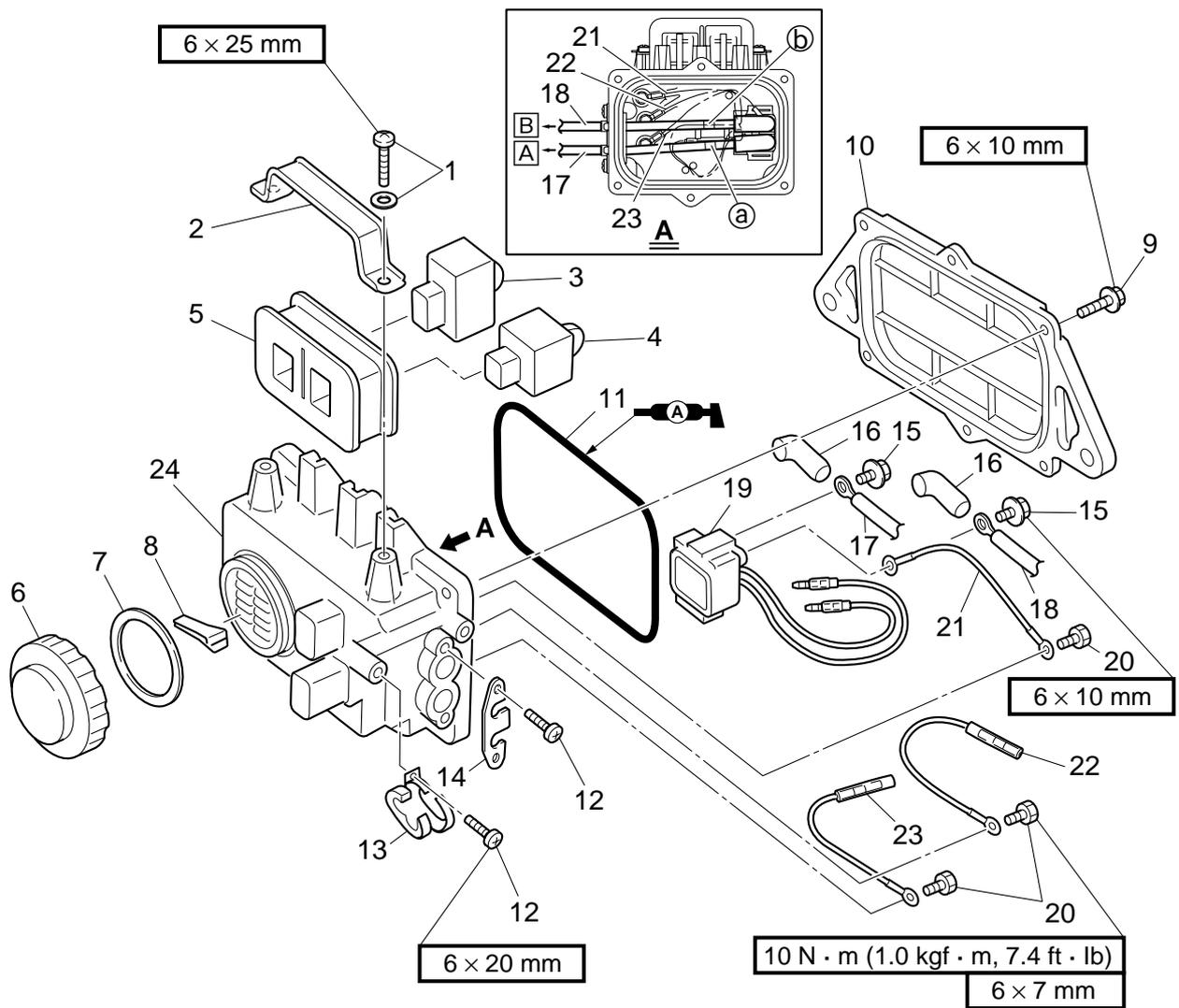
Step	Procedure/Part name	Q'ty	Service points
11	Slant detection switch	1	<b>NOTE:</b> _____ Install the slant detection switch with the "UP" mark ⓐ facing upward.
12	Bolt	2	
13	Fuse box assembly	1	
14	Electrical box case	1	
			Reverse the disassembly steps for assembly.



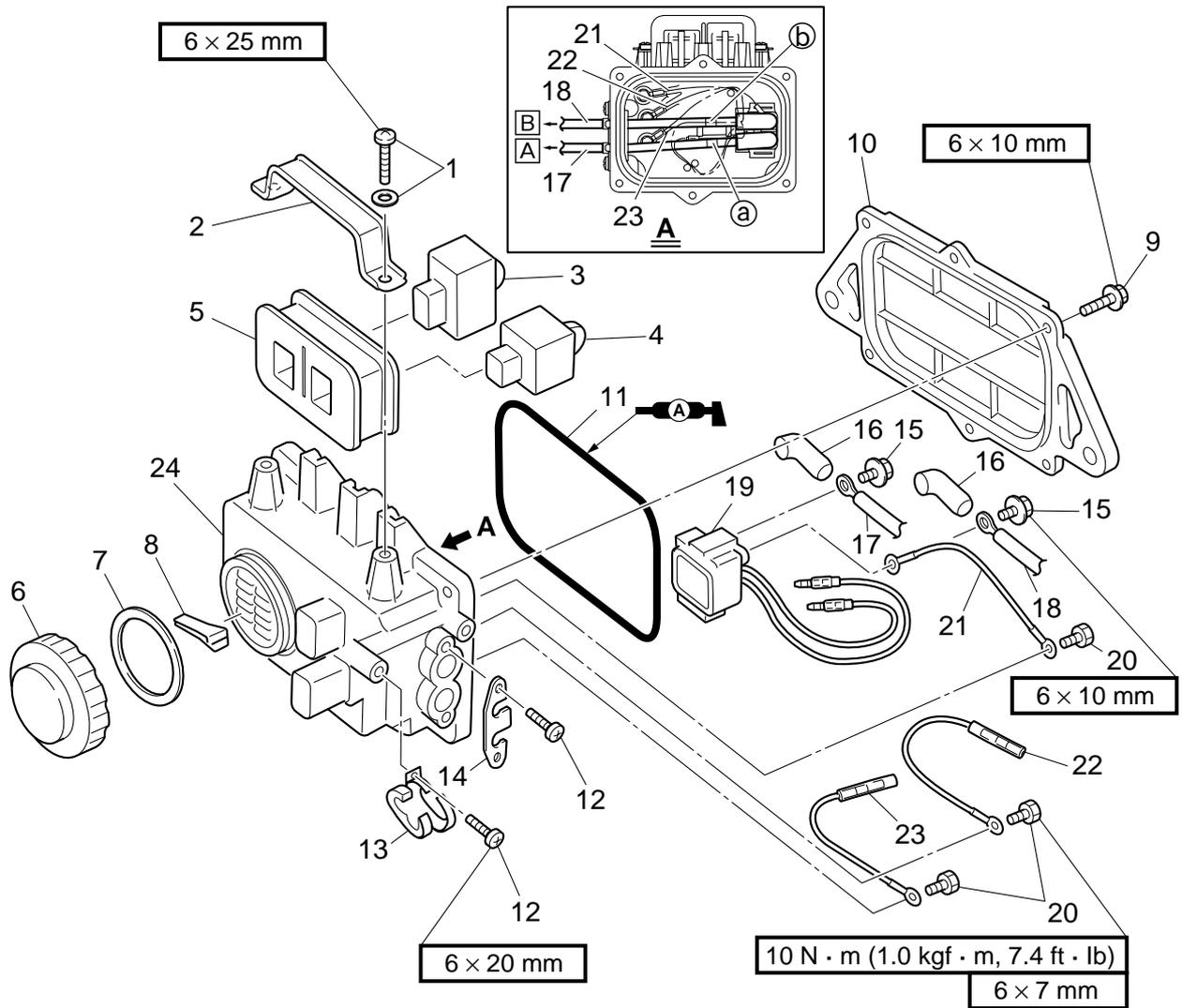
Fuse box disassembly



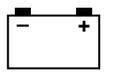
Step	Procedure/Part name	Q'ty	Service points
1	Screw/washer	2/2	
2	Stay	1	
3	Main and fuel pump relay	1	
4	ETV relay	1	
5	Damper	1	
6	Cap	1	
7	Packing	1	<b>Not reusable</b>
8	Fuse puller	1	
9	Bolt	6	
10	Cover	1	
11	Gasket	1	<b>Not reusable</b>
12	Screw	3	



Step	Procedure/Part name	Q'ty	Service points
13	Clamp	1	@ White tape A To starter motor b Gray tape B To battery <b>CAUTION:</b> The starter motor will not function if the cables are reversed.
14	Plate	1	
15	Bolt	2	
16	Boot	2	
17	Starter motor cable	1	
18	Positive battery cable	1	
19	Starter relay	1	



Step	Procedure/Part name	Q'ty	Service points
20	Bolt	3	
21	Lead	1	Red lead
22	Lead	1	Brown lead
23	Lead	1	Black lead
24	Housing	1	
			Reverse the disassembly steps for assembly.



## Electrical analysis

### Check using the YDIS

When checking the TPS, APS, or other sensors, use the YDIS.

When deleting the diagnosis record in the YDIS, be sure to check the time that the diagnostic codes were detected.

When checking the input voltage of a part, the coupler or connector must be disconnected. As a result, the ECM determines that the part is disconnected and a diagnostic code is detected. Therefore, be sure to delete the diagnosis record after checking the input voltage.

Power is supplied to the ECM for about 30 seconds after stopping the engine. Therefore, wait longer than 30 seconds before restarting the engine, otherwise the diagnostic codes will not be cleared from the ECM.

#### NOTE:

- Before checking the electrical components, make sure that the battery is fully charged.
- If the tester leads are connected while using the YDIS, diagnostic codes will be detected.
- If a diagnosis record is displayed and it is caused by the checking steps, delete the record by using the "Diagnosis record" function of the YDIS.
- The YDIS requires that you use an exclusive communication cable and CD-ROM to connect to a computer. For a description of the communication cable and CD-ROM to be used, refer to "YDIS" in Chapter 9. Also, be sure to check the CD-ROM version before using it.
- To connect the YDIS, refer to "YDIS" in Chapter 9 or the YDIS (Ver. 1.30) Instruction Manual.

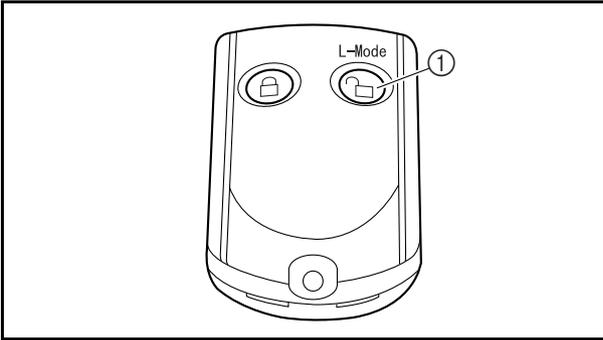
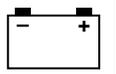


YDIS (connecting kit):

60V-85300-04

YDIS (CD-ROM, Ver. 1.30):

60V-WS853-04



### Input voltage measurement

Push the unlock button ① on the remote control transmitter so that power is supplied to the ECM.

**NOTE:** \_\_\_\_\_

To check that the remote control transmitter is working correctly, refer to “Remote control transmitter.”

---

### Peak voltage measurement

To check the electrical components or measure the peak voltage, use the special service tools. A faulty electrical component can be easily checked by measuring the peak voltage. The specified engine speed when measuring the peak voltage is affected by many factors, such as fouled spark plugs or a weak battery. If one of these factors is present, the peak voltage cannot be measured properly.

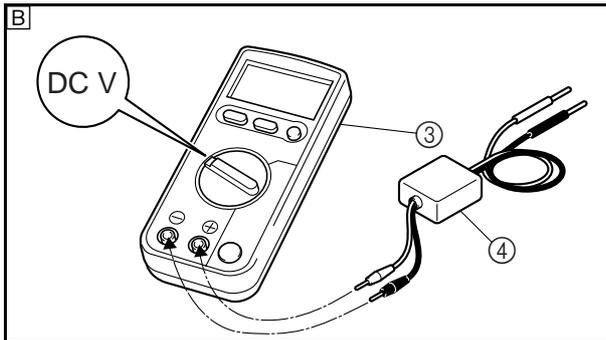
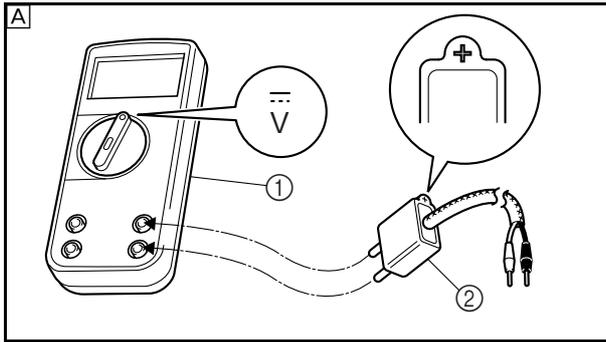
**⚠ WARNING** \_\_\_\_\_

When checking the peak voltage, do not touch any of the connections of the digital tester leads.

---

**CAUTION:** \_\_\_\_\_

- When testing the voltage between the terminals of an electrical component with the digital tester, do not allow any of the leads to touch any metal parts.
  - Place the watercraft in the water when starting the engine, otherwise the engine could be damaged.
-

**NOTE:**

- Before measuring the peak voltage, check all wiring for proper connection and corrosion, and check that the battery is fully charged.
- Use the peak voltage adapter with the recommended digital circuit tester.
- Connect the positive pin of the peak voltage adapter to the positive terminal of the digital circuit tester, and the negative pin to the negative terminal.
- When measuring the peak voltage, set the selector on the digital circuit tester to the **DC voltage mode**.



Digital multimeter ①:

YU-34899-A

Peak voltage adapter ②:

YU-39991

Digital circuit tester ③:

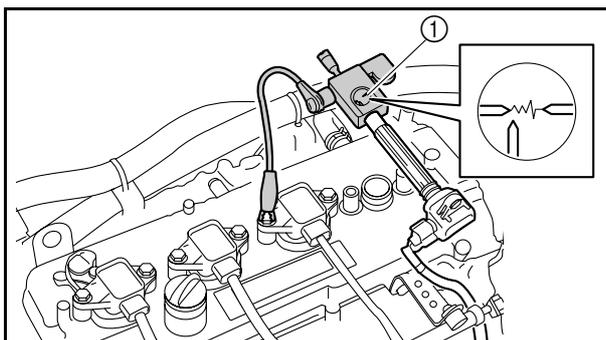
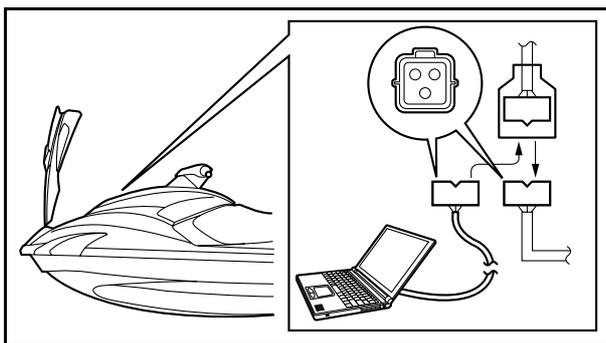
90890-03174

Peak voltage adapter B ④:

90890-03172

A For USA and Canada

B For worldwide

**Ignition system****Ignition coil****1. Check:**

- Ignition spark  
No spark → Measure the ignition coil input voltage.

**Checking steps:**

1. Connect a computer to the watercraft and use the YDIS.
2. Remove the ignition coil for the cylinder that will be tested.
3. Connect the ignition coil to the special service tool ①.

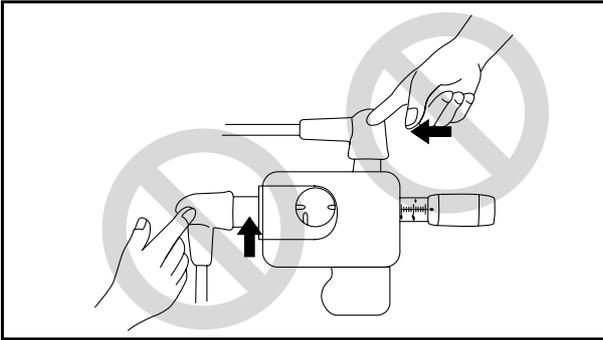


Spark checker:

YM-34487

Ignition tester:

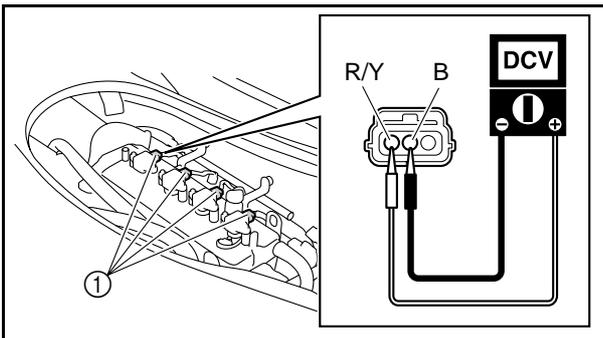
90890-06754



4. Using the “Stationary test” of the YDIS, observe the ignition spark through the discharge window in the special service tool.

### **⚠ WARNING**

- When checking the spark gap, do not touch any of the connections of the special service tool leads.
- When performing the spark gap check, keep flammable gas or liquids away, since this test can produce sparks.



### 2. Measure:

- Ignition coil input voltage (from the battery)  
Out of specification → Check the wiring harness.

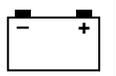
### Measurement steps:

1. Disconnect the ignition coil couplers ①.
2. Push the unlock button, and then measure the input voltage at the ignition coil coupler terminals (wiring harness end).



Ignition coil input voltage (from the battery):

Red/yellow (R/Y) – Black (B)  
12 V (battery voltage)

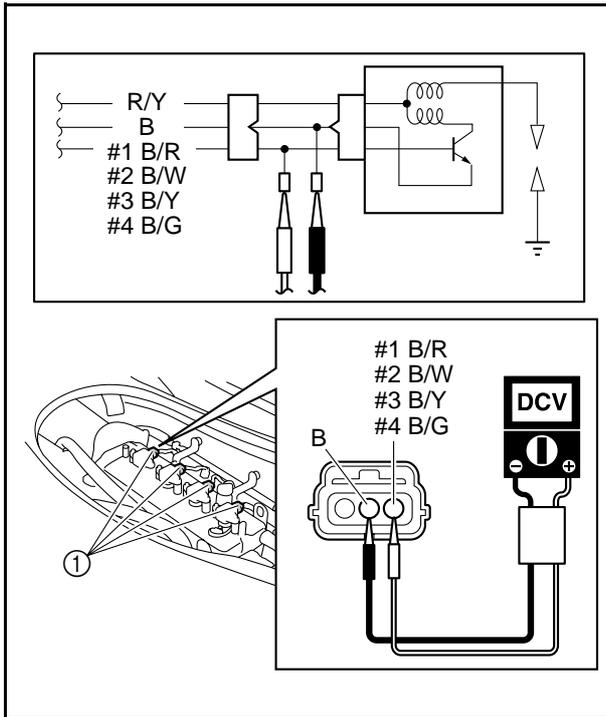


**3. Measure:**

- ECM output peak voltage  
 Within specification → Replace the ignition coil.  
 Below specification → Check the pickup coil.  
 Refer to “Pickup coil.”

**⚠ WARNING**

**When checking the electrical components, do not touch any of the connections of the digital tester leads.**



**Measurement steps:**

1. Disconnect the ignition coil couplers ①.
2. Measure the ECM output peak voltage as shown.

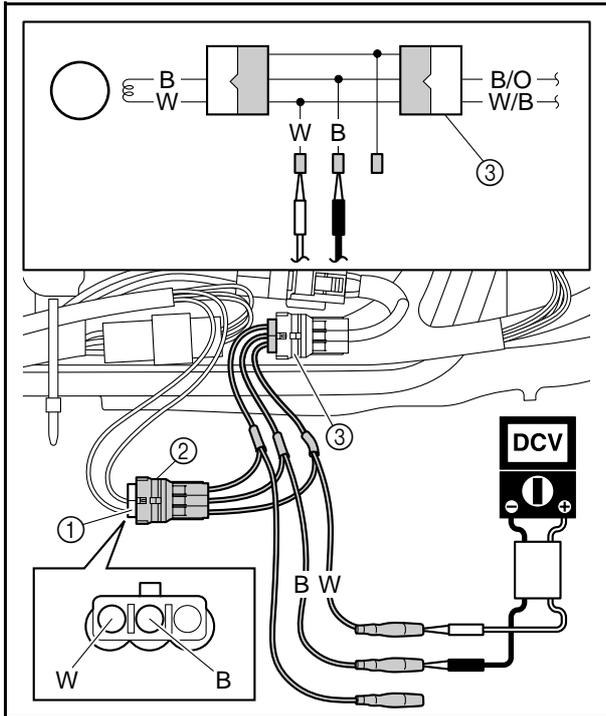
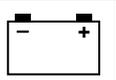
**NOTE:**

- If measuring the ECM output peak voltage under the “Cranking” condition, disconnect the fuel injector couplers for all cylinders.
- To crank the engine, connect the engine shut-off cord (lanyard) to the engine shut-off switch, and then push the engine start switch.



ECM output peak voltage:  
 #1 Black/red (B/R) – Black (B)  
 #2 Black/white (B/W) – Black (B)  
 #3 Black/yellow (B/Y) – Black (B)  
 #4 Black/green (B/G) – Black (B)

r/min	Loaded		
	Cranking	2,000	3,500
V	2.5	2.6	2.6



**Pickup coil**

**1. Measure:**

- Pickup coil output peak voltage  
Below specification → Measure the pickup coil resistance.

**Measurement steps:**

1. Disconnect the pickup coil coupler ①.
2. Connect the test harness (3 pins) ② to the pickup coil coupler ①.



Test harness (3 pins):  
YB-06877  
Test harness HM090-3 (3 pins):  
90890-06877

3. Measure the pickup coil output peak voltage.

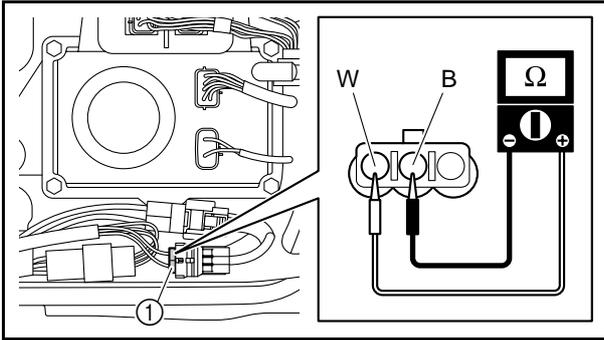
**NOTE:**

- To crank the engine, connect the engine shut-off cord (lanyard) to the engine shut-off switch, and then push the engine start switch and engine stop switch simultaneously.
- If measuring the pickup coil output peak voltage under the “Cranking” and “Unloaded” conditions, disconnect the coupler ③.



Pickup coil output peak voltage:  
White (W) – Black (B)

r/min	Unloaded	Loaded		
	Cranking	2,000	3,500	
V	5.4	4.6	18.1	23.9

**2. Measure:**

- Pickup coil resistance  
Out of specification → Replace the stator coil assembly.

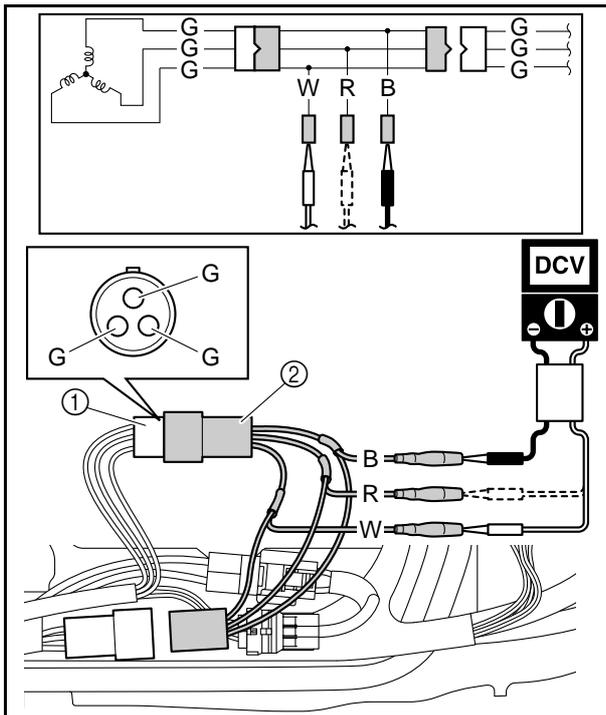
**Measurement steps:**

1. Disconnect the pickup coil coupler ①.
2. Measure the pickup coil resistance.



Pickup coil resistance at 20 °C (68 °F)  
(reference data):

White (W) – Black (B)  
459–561 Ω

**Charging system****Stator coil****1. Measure:**

- Stator coil output peak voltage  
Below specification → Measure the stator coil resistance.

**Measurement steps:**

1. Disconnect the stator coil coupler ①.
2. Connect the test harness (3 pins) ② to the stator coil coupler ①.

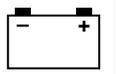


Test harness (3 pins):

YB-06870

Test harness SMT250-3 (3 pins):

90890-06870



3. Measure the stator coil output peak voltage.

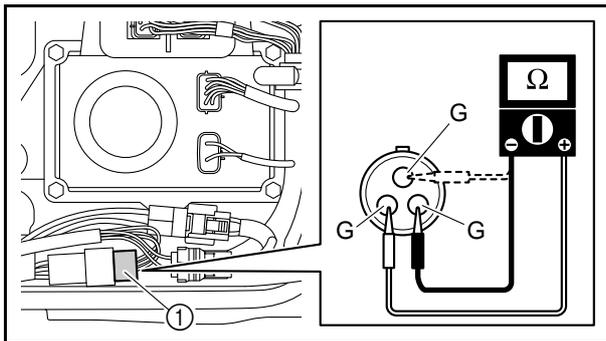
**NOTE:**

To crank the engine, connect the engine shut-off cord (lanyard) to the engine shut-off switch, and then push the engine start switch and engine stop switch simultaneously.



Stator coil output peak voltage:  
Green (G) – Green (G)

r/min	Unloaded		
	Cranking	2,000	3,500
V	8.4	42.7	74.0

**2. Measure:**

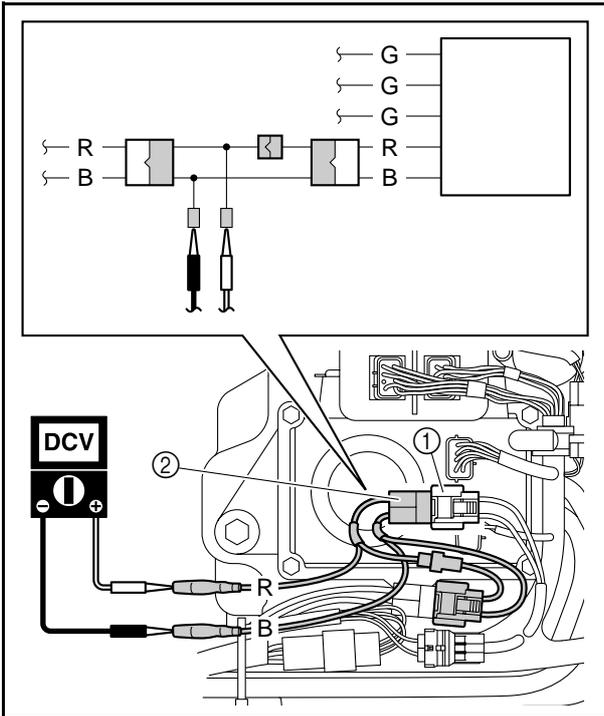
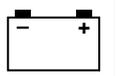
- Stator coil resistance  
Out of specification → Replace the stator coil assembly.

**Measurement steps:**

- Disconnect the stator coil coupler ①.
- Measure the stator coil resistance.



Stator coil resistance at 20 °C (68 °F)  
(reference data):  
Green (G) – Green (G)  
0.31–0.38 Ω



**Rectifier regulator**

**1. Measure:**

- Rectifier regulator output peak voltage  
Below specification → Check the rectifier regulator continuity.

**Measurement steps:**

1. Disconnect the rectifier regulator coupler ①.
2. Connect the test harness (2 pins) ② to the rectifier regulator coupler ①.

 Test harness (2 pins):  
90890-06850

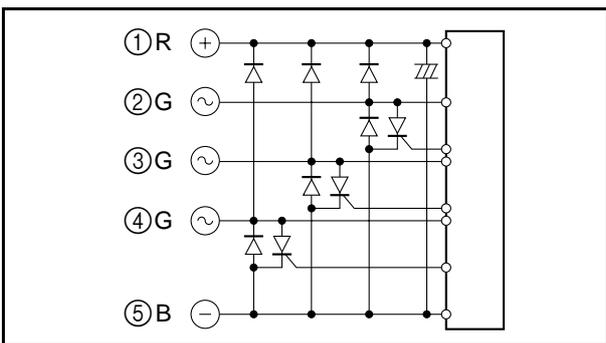
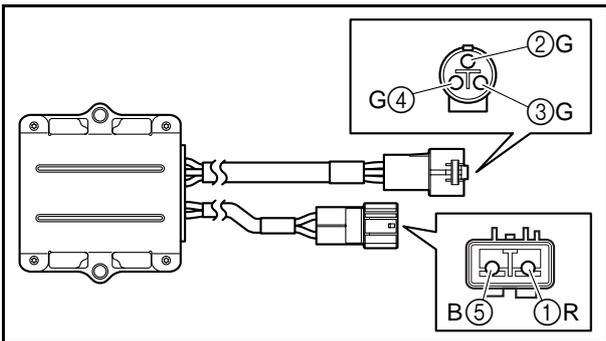
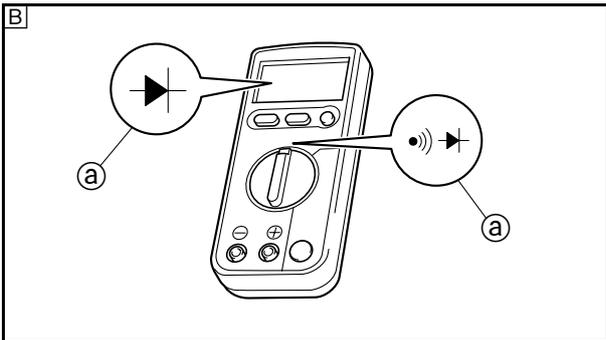
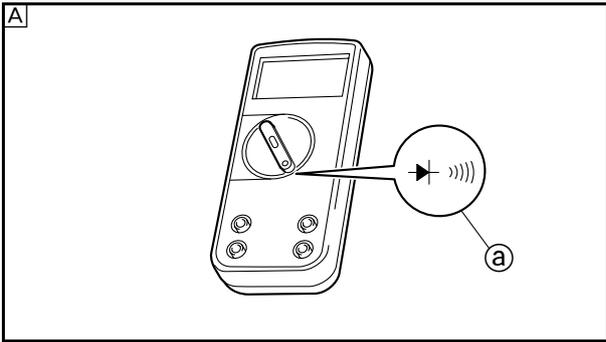
3. Measure the rectifier regulator output peak voltage.

**NOTE:** \_\_\_\_\_

Do not use the peak voltage adapter to measure the output voltage.

 Rectifier regulator output peak voltage:  
Red (R) – Black (B)

r/min	Loaded	
	2,000	3,500
V	13	13



**2. Check:**

- Rectifier regulator continuity  
Out of specification → Replace the rectifier regulator.

**Checking steps:**

1. Remove the rectifier regulator.  
Refer to “Engine unit removal 3” in Chapter 5.
2. Check the rectifier regulator continuity.

**NOTE:**

Be sure to set the measurement range **a** when checking the rectifier regulator continuity.

**A** For USA and Canada

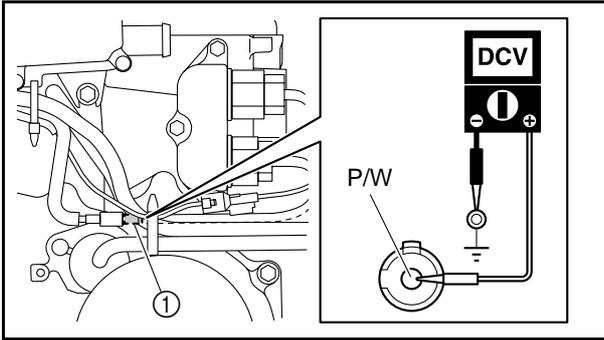
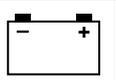
**B** For worldwide



Rectifier regulator continuity (testing diode):

Tester lead		Display value (V) (reference data)
+	-	
① R	② G	OL
① R	③ G	
① R	④ G	
① R	⑤ B	0.43–0.51
⑤ B	② G	
⑤ B	③ G	
⑤ B	④ G	0.43–0.51
⑤ B	① R	0.66–0.74
② G	① R	0.43–0.51
③ G	① R	0.43–0.51
④ G	① R	0.43–0.51
② G	⑤ B	OL
③ G	⑤ B	
④ G	⑤ B	

OL: overload



## Control system

### Oil pressure switch

#### 1. Measure:

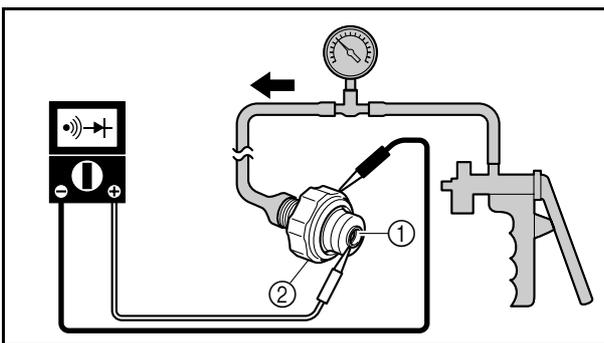
- Oil pressure switch input voltage  
Out of specification → Check the wiring harness.

#### Measurement steps:

- Disconnect the oil pressure switch coupler ①.
- Push the unlock button, and then measure the input voltage between the oil pressure switch coupler terminal (wiring harness end) and ground.



Oil pressure switch input voltage  
(reference data):  
Pink/white (P/W) – Ground  
11.0–12.0 V

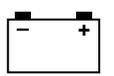


#### 2. Check:

- Oil pressure switch continuity  
Out of specification → Replace the oil pressure switch.

#### Checking steps:

- Remove the oil pressure switch.  
Refer to “Oil separator tank and oil pan removal” in Chapter 5.
- Connect the tester leads to the terminal thread ① and body ② of the oil pressure switch as shown.
- Connect a vacuum/pressure pump gauge to the oil pressure switch, and then apply positive pressure.



4. Check the oil pressure switch continuity.

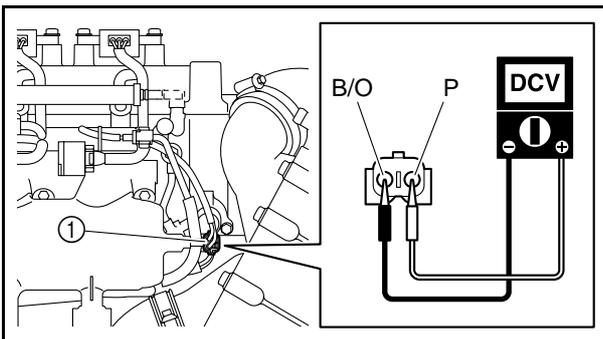
**NOTE:**

Use a commercially available vacuum/pressure pump gauge and meter.



Oil pressure switch continuity:

Pressure	Terminal thread ① – Body ②
Below 128–166 kPa (1.28–1.66 kgf/cm <sup>2</sup> , 18.2–23.6 psi)	Continuity
Above 128–166 kPa (1.28–1.66 kgf/cm <sup>2</sup> , 18.2–23.6 psi)	No continuity

**Thermostat****1. Measure:**

- Thermostat input voltage  
Out of specification → Check the wiring harness.

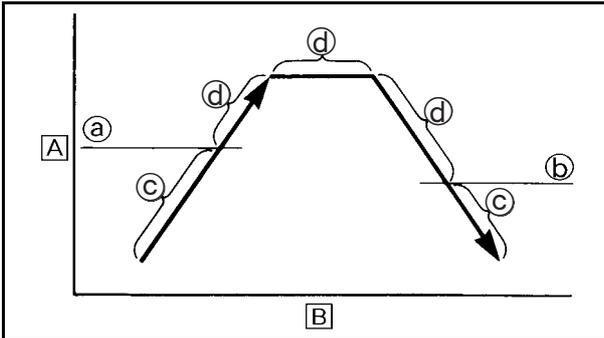
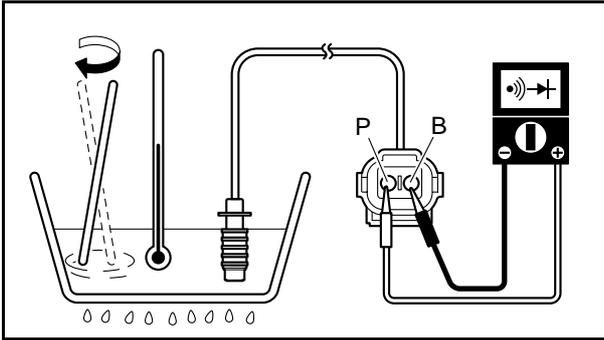
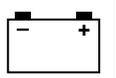
**Measurement steps:**

- Disconnect the thermostat coupler ①.
- Push the unlock button, and then measure the input voltage at the thermostat coupler terminals (wiring harness end).



Thermostat input voltage (reference data):

Pink (P) – Black/orange (B/O)  
11.0–12.0 V



**2. Check:**

- Thermoswitch continuity (at the specified temperatures)  
Out of specification → Replace the thermoswitch.

**Checking steps:**

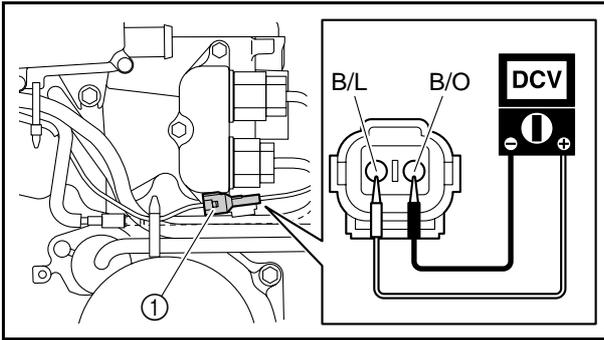
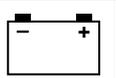
1. Remove the thermoswitch.  
Refer to “Oil separator tank and oil pan removal” in Chapter 5.
2. Suspend the thermoswitch in a container filled with water.
3. Slowly heat the water.
4. Check the continuity when the specified temperatures are reached.



Thermoswitch continuity:  
Pink (P) – Black/orange (B/O)

Temperature (reference data)		Pink (P) – Black/orange (B/O)
Increasing	Below 94–100 °C (201–212 °F)	No continuity
	Above 94–100 °C (201–212 °F)	Continuity
Decreasing	Above 80–94 °C (176–201 °F)	Continuity
	Below 80–94 °C (176–201 °F)	No continuity

- Ⓐ 94–100 °C (201–212 °F)
- Ⓑ 80–94 °C (176–201 °F)
- Ⓒ No continuity
- Ⓓ Continuity
- Ⓐ Temperature
- Ⓑ Time



## Thermo sensor

### 1. Measure:

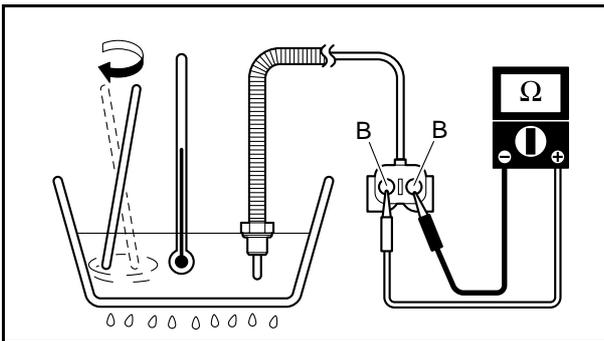
- Thermo sensor input voltage  
Out of specification → Check the wiring harness.

### Measurement steps:

1. Disconnect the thermo sensor coupler ①.
2. Push the unlock button, and then measure the input voltage at the thermo sensor coupler terminals (wiring harness end).



Thermo sensor input voltage  
(reference data):  
Black/blue (B/L) –  
Black/orange (B/O)  
4.75–5.25 V



### 2. Measure:

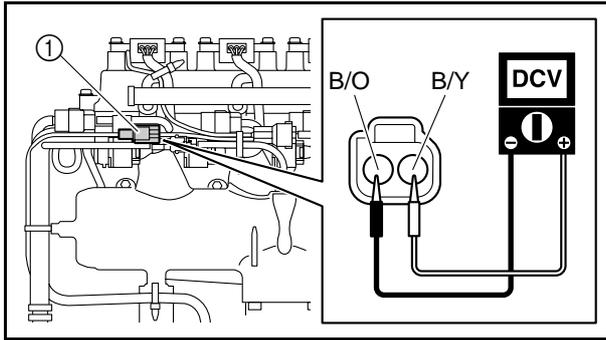
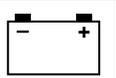
- Thermo sensor resistance (at the specified temperatures)  
Out of specification → Replace the thermo sensor.

### Measurement steps:

1. Remove the thermo sensor.  
Refer to “Muffler disassembly” in Chapter 5.
2. Suspend the thermo sensor in a container filled with water.
3. Slowly heat the water.
4. Measure the resistance when the specified temperatures are reached.



Thermo sensor resistance (reference data):  
Black (B) – Black (B)  
0 °C (32 °F): 24.0–37.1 kΩ  
100 °C (212 °F): 0.87–1.18 kΩ



## Engine temperature sensor

### 1. Measure:

- Engine temperature sensor input voltage  
Out of specification → Check the wiring harness.

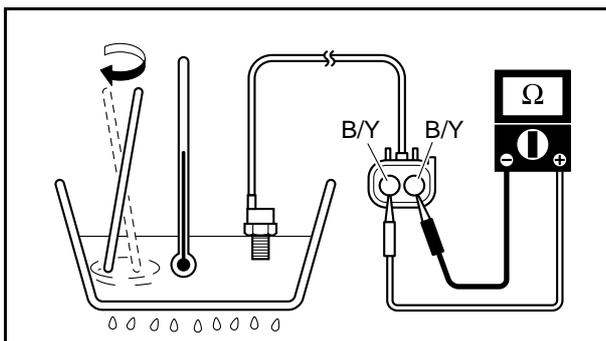
### Measurement steps:

1. Disconnect the engine temperature sensor coupler ①.
2. Push the unlock button, and then measure the input voltage at the engine temperature sensor coupler terminals (wiring harness end).



Engine temperature sensor input voltage (reference data):

Black/yellow (B/Y) –  
Black/orange (B/O)  
4.75–5.25 V



### 2. Measure:

- Engine temperature sensor resistance (at the specified temperatures)  
Out of specification → Replace the engine temperature sensor.

### Measurement steps:

1. Remove the engine temperature sensor. Refer to “Oil separator tank and oil pan removal” in Chapter 5.
2. Suspend the engine temperature sensor in a container filled with water.
3. Slowly heat the water.



4. Measure the resistance when the specified temperatures are reached.



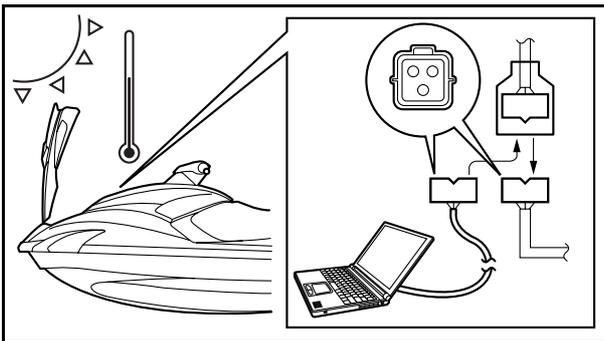
Engine temperature sensor resistance  
(reference data):

Black/yellow (B/Y) –

Black/yellow (B/Y)

20 °C (68 °F): 54.2–69.0 kΩ

100 °C (212 °F): 3.12–3.48 kΩ



### Intake air temperature sensor

#### 1. Check:

- Intake air temperature  
Incorrect reading → Measure the intake air temperature sensor input voltage.

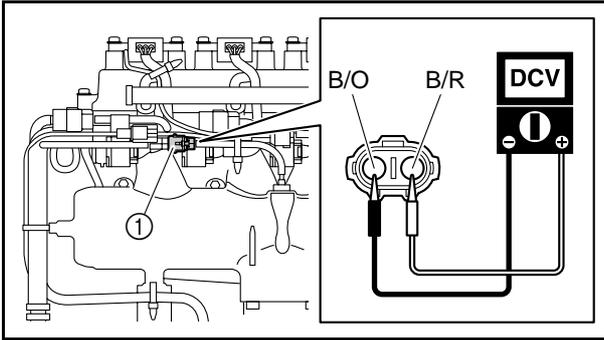
#### Checking steps:

1. Measure the ambient temperature.
2. Connect a computer to the watercraft and use the YDIS to display the intake air temperature.

#### NOTE: \_\_\_\_\_

Check the intake air temperature sensor when the engine is cold.

3. If the ambient temperature and the displayed intake air temperature differ by more than  $\pm 5$  °C ( $\pm 9$  °F), measure the intake air temperature sensor resistance.

**2. Measure:**

- Intake air temperature sensor input voltage

Within specification → Measure the intake air temperature sensor resistance.

Out of specification → Check the wiring harness.

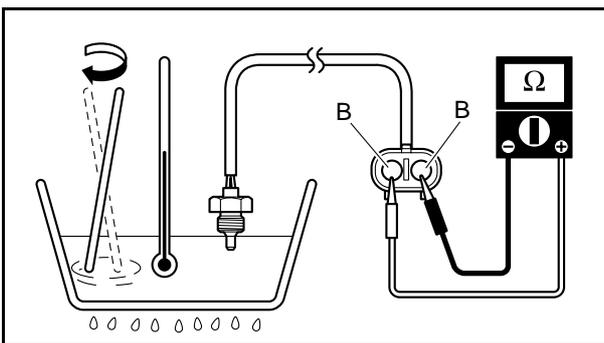
**Measurement steps:**

1. Disconnect the intake air temperature sensor coupler ①.
2. Push the unlock button, and then measure the input voltage at the intake air temperature sensor coupler (wiring harness end).



Intake air temperature sensor input voltage (reference data):

Black/red (B/R) –  
Black/orange (B/O)  
4.75–5.25 V

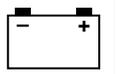
**3. Measure:**

- Intake air temperature sensor resistance (at the specified temperatures)

Out of specification → Replace the intake air temperature sensor.

**Measurement steps:**

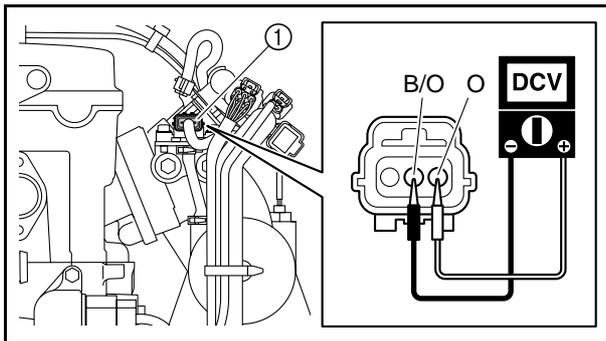
1. Remove the intake air temperature sensor. Refer to “Intake assembly removal” in Chapter 5.
2. Suspend the intake air temperature sensor in a container filled with water.
3. Slowly heat the water.



4. Measure the resistance when the specified temperatures are reached.



Intake air temperature sensor  
resistance (reference data):  
Black (B) – Black (B)  
0 °C (32 °F): 5.4–6.6 k $\Omega$   
80 °C (176 °F): 0.29–0.39 k $\Omega$



### Intake air pressure sensor

#### 1. Measure:

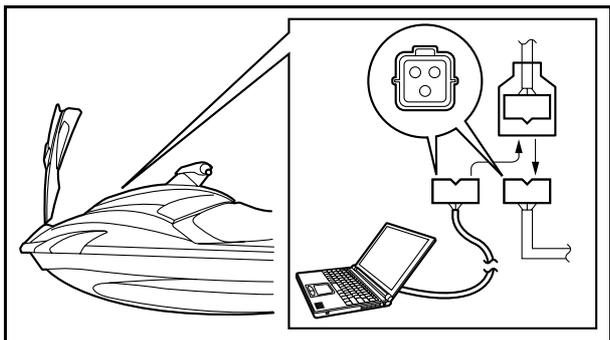
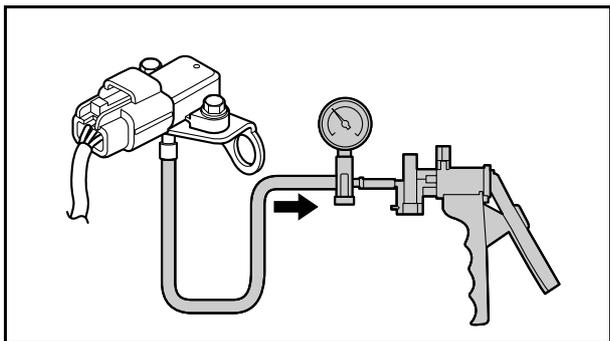
- Intake air pressure sensor input voltage  
Out of specification → Check the wiring harness.

#### Measurement steps:

- Disconnect the intake air pressure sensor coupler ①.
- Push the unlock button, and then measure the input voltage at the intake air pressure sensor coupler terminals (wiring harness end).



Intake air pressure sensor input  
voltage (reference data):  
Orange (O) – Black/orange (B/O)  
4.75–5.25 V

**2. Check:**

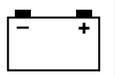
- Intake air pressure sensor operation  
Does not operate → Replace the intake air pressure sensor.

**Checking steps:**

1. Connect the special service tool to the intake air pressure sensor.
2. Connect a computer to the watercraft and use the YDIS to display the intake air pressure.
3. Push the unlock button.
4. Apply negative pressure to the intake air pressure sensor slowly and check that the displayed intake air pressure decreases.



Lower unit pressure/vacuum tester:  
YB-35956-A  
Vacuum/pressure pump gauge set:  
90890-06756



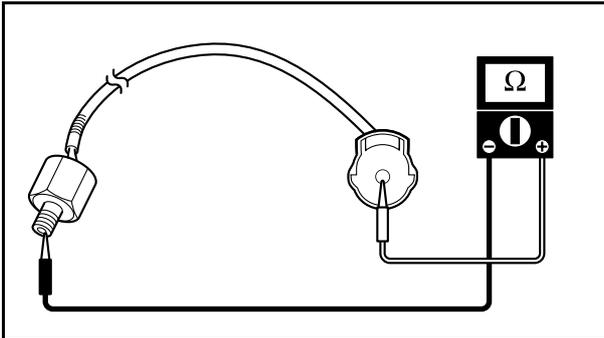
## Knock sensor

### 1. Check:

- Knock sensor ground connection  
Knock sensor not grounded when installed → Install the knock sensor correctly.  
Refer to “Oil separator tank and oil pan removal” in Chapter 5.

### 2. Measure:

- Knock sensor resistance  
Out of specification → Replace the knock sensor.

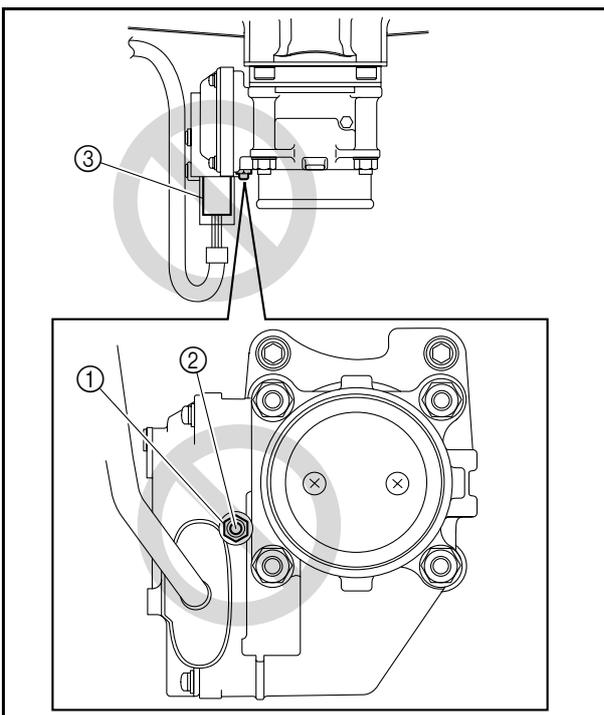


### Measurement steps:

1. Remove the knock sensor.  
Refer to “Oil separator tank and oil pan removal” in Chapter 5.
2. Measure the knock sensor resistance.



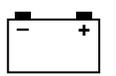
Knock sensor resistance at 20 °C  
(68 °F) (reference data):  
504–616 kΩ



## Throttle position sensor

### CAUTION:

- Do not loosen the throttle stop screw nut ① and do not turn the throttle stop screw ②.
- Do not disconnect the throttle body assembly coupler (throttle body end) ③.

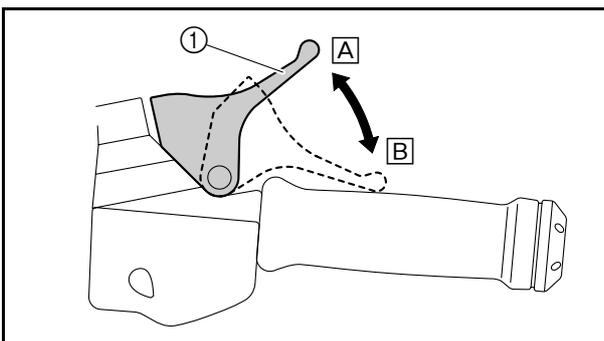
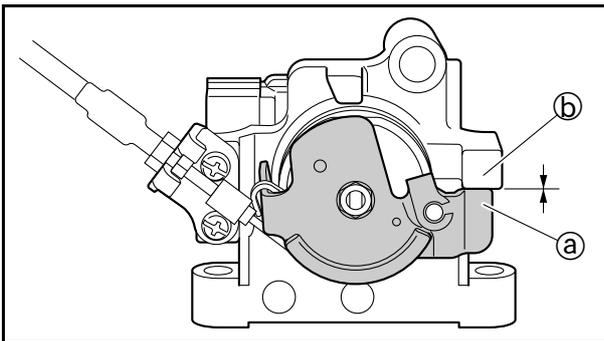
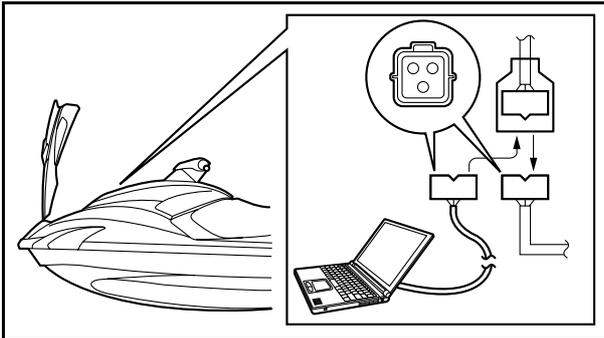
**1. Check:**

- Throttle valve opening
- TPS output voltage

Out of specification → Measure the TPS input voltage.

**Checking steps:****NOTE:**

When checking the TPS using the YDIS, do not start the engine.



1. Connect a computer to the watercraft and use the YDIS to display “Throttle position sensor 1,” “Throttle valve opening,” and “Throttle position sensor 2.”

**NOTE:**

TPS 1 and TPS 2 are components of the electronic throttle valve, which cannot be disassembled.

2. Squeeze the throttle lever slowly and check that the displayed throttle valve opening increases.
3. Check that the APS pulley stopper (a) contacts the fully closed stopper (b) when the throttle lever (1) is at the fully closed position [A].

**NOTE:**

To adjust the throttle cable, refer to “Throttle lever free play check and adjustment” in Chapter 3.

4. Push the unlock button, and then check the TPS 1 output voltage and throttle valve opening angle at the fully closed position [A].

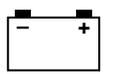


TPS 1 output voltage with throttle lever fully closed:

0.6–0.9 V

Throttle valve opening angle with throttle lever fully closed:

2.0–8.0 °



- Operate the throttle lever ①, and then check the TPS 2 output voltage and throttle valve opening angle at the fully open position ②.

**NOTE:**

The actual TPS output voltage and throttle valve opening angle may vary according to environmental conditions and engine temperature.



TPS 2 output voltage with throttle lever fully open:  
4.6–4.7 V  
Throttle valve opening angle with throttle lever fully open:  
more than 70°

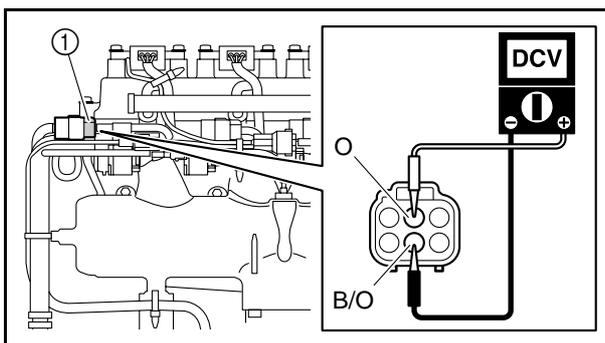
- Operate the throttle lever ① so that the TPS 2 output voltage is at 4.5 V or less, and then check the voltage difference between TPS 1 and TPS 2.



TPS output voltage difference:  
1.9–2.1 V

Example:

If the TPS 1 output voltage is 2.5 V and the TPS 2 output voltage is 4.5 V, then  $4.5 - 2.5 = 2.0$  V.

**2. Measure:**

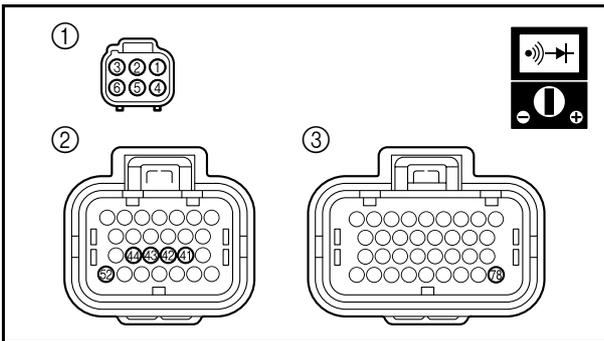
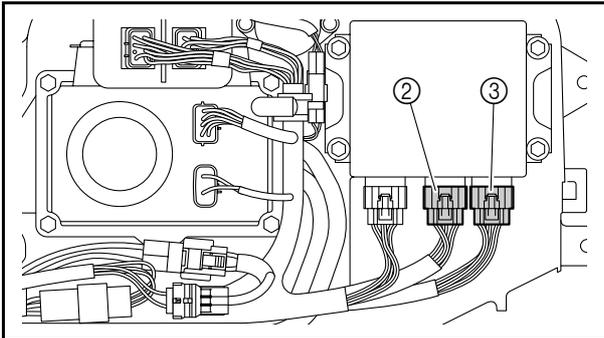
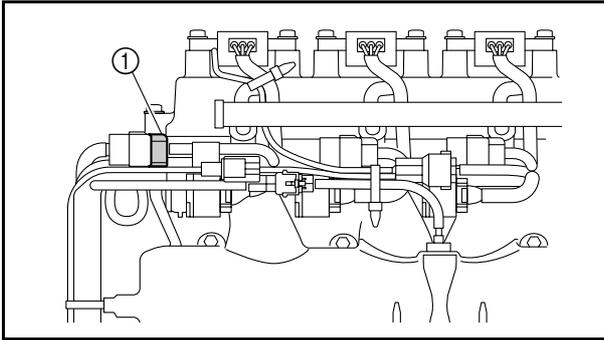
- TPS input voltage  
Out of specification → Check the TPS circuit.

**Measurement steps:**

- Disconnect the throttle body assembly coupler ①.
- Push the unlock button, and then measure the input voltage at the throttle body assembly coupler terminals (wiring harness end).



TPS input voltage (reference data):  
Orange (O) – Black/orange (B/O)  
4.75–5.25 V

**3. Check:**

- TPS circuit  
No continuity → Replace the wiring harness assembly.  
Wiring harness is correct → Replace the throttle body assembly.

**Checking steps:**

1. Disconnect the throttle body assembly coupler ①.
2. Disconnect the ECM couplers ② and ③.
3. Check the wiring harness for continuity.



Wiring harness continuity:

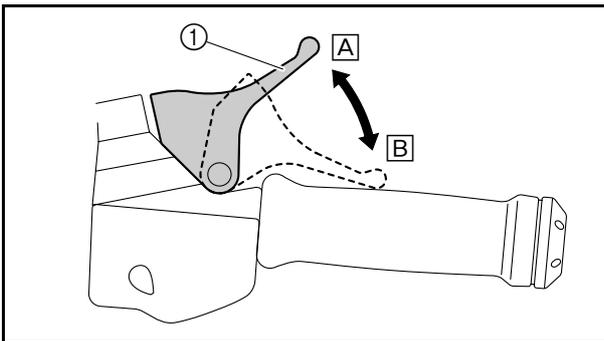
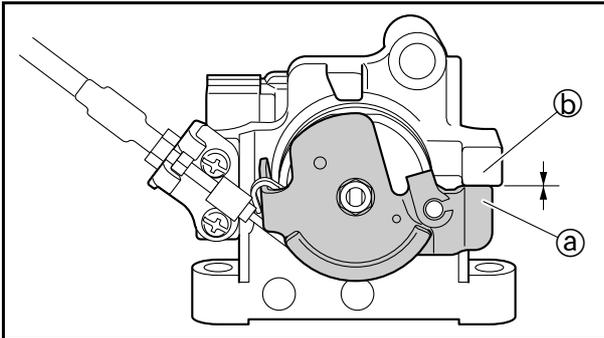
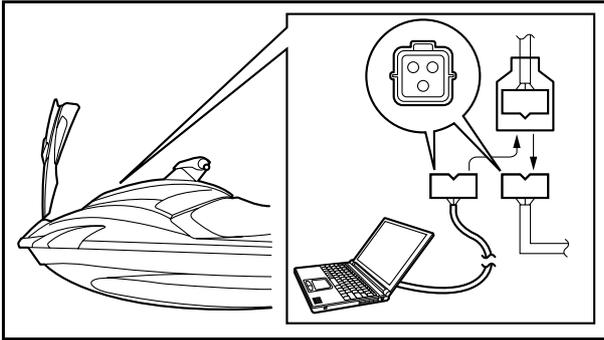
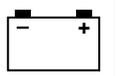
Terminal No.		Color
Coupler ①	Coupler ②, ③	
1	42	P
2	44	O
3	78	G
4	43	P/B
5	41	B/O
6	52	L

**Accelerator position sensor****1. Check:**

- APS output voltage  
Out of specification → Measure the APS input voltage.

**Checking steps:****NOTE:**

When checking the APS using the YDIS, do not start the engine.



1. Connect a computer to the watercraft and use the YDIS to display the “Accelerator position sensor 1” and “Accelerator position sensor 2.”

**NOTE:** APS 1 and APS 2 are a single unit, which cannot be disassembled.

2. Check that the APS pulley stopper (a) contacts the fully closed stopper (b) when the throttle lever (1) is at the fully closed position (A).

**NOTE:** To adjust the throttle cable, refer to “Throttle lever free play check and adjustment” in Chapter 3.

3. Push the unlock button, operate the throttle lever (1), and then check the output voltages of APS 1 and APS 2 at the fully closed position (A) and fully open position (B).

**NOTE:** The actual APS output voltage may vary according to environmental conditions.



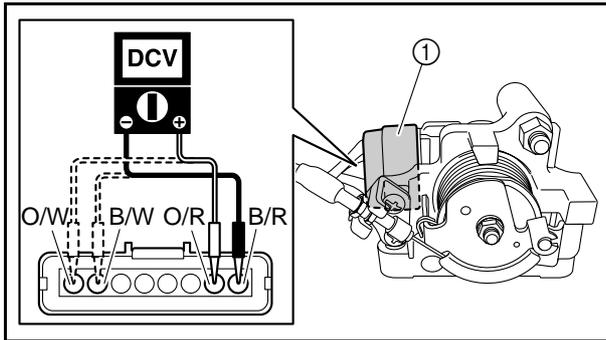
APS output voltage:

Item	Throttle lever position	
	Fully closed (A)	Fully open (B)
APS 1	0.50–0.90 V	3.75–4.35 V
APS 2	0.35–1.05 V	3.60–4.50 V

4. Squeeze the throttle lever (1) to the fully open position, and then check the voltage difference between APS 1 and APS 2.



APS output voltage difference (with throttle lever fully open):  
0.75 V or less

**2. Measure:**

- APS input voltage  
Within specification → Measure the APS resistance.  
Out of specification → Check the APS circuit.

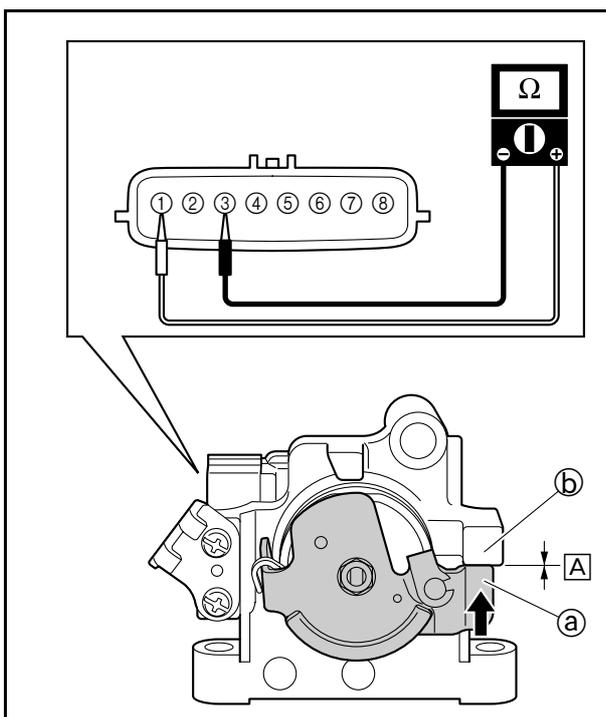
**Measurement steps:**

1. Disconnect the APS coupler ①.
2. Push the unlock button, and then measure the input voltage at the APS coupler terminals (wiring harness end).



APS 1 input voltage (reference data):  
Orange/red (O/R) – Black/red (B/R)  
4.75–5.25 V

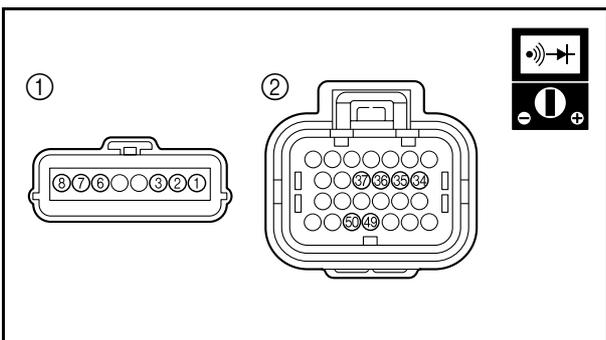
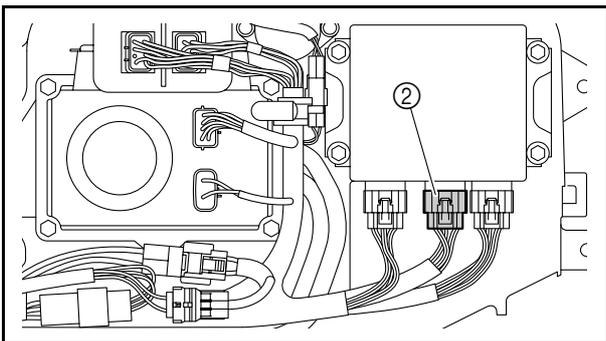
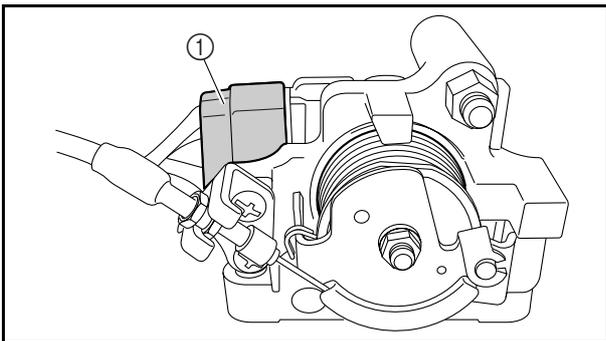
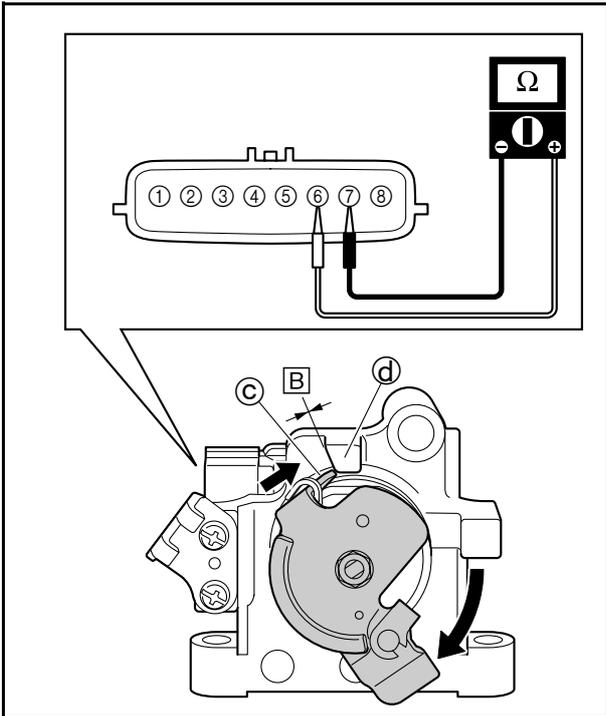
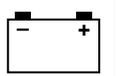
APS 2 input voltage (reference data):  
Orange/white (O/W) –  
Black/white (B/W)  
4.75–5.25 V

**3. Measure:**

- APS resistance  
Out of specification → Replace the APS.

**Measurement steps:**

1. Disconnect the APS coupler.
2. Check that the APS pulley stopper (a) contacts the fully closed stopper (b) when the APS pulley is at the fully closed position (A).



3. Check that the APS pulley stopper © contacts the fully open stopper Ⓐ when the APS pulley is at the fully open position Ⓑ.
4. Measure the resistance of the APS at the fully closed position and fully open position.

APS resistance at 20 °C (68 °F) (reference data):			
Item	Terminal	APS pulley position	
		Fully closed Ⓐ	Fully open Ⓑ
APS 1	1-3	0.50-0.90 kΩ	3.75-4.35 kΩ
APS 2	6-7	0.35-1.05 kΩ	3.60-4.50 kΩ

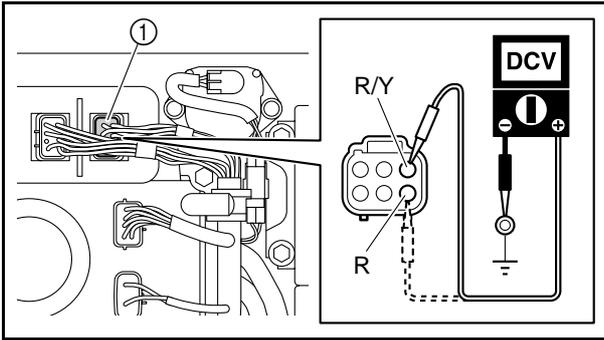
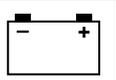
**4. Check:**

- APS circuit  
No continuity → Replace the wiring harness assembly.

**Checking steps:**

1. Disconnect the APS coupler ①.
2. Disconnect the ECM coupler ②.
3. Check the wiring harness for continuity.

Wiring harness continuity:		
Terminal No.		Color
Coupler ①	Coupler ②	
1	34	B/R
2	49	O/R
3	36	P/R
6	37	P/W
7	35	B/W
8	50	O/W



**Electronic throttle valve relay**

**1. Measure:**

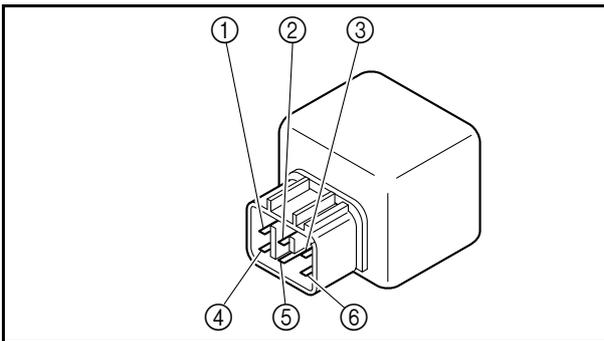
- ETV relay input voltage  
Out of specification → Check the wiring harness.

**Measurement steps:**

1. Disconnect the ETV relay coupler ①.
2. Push the unlock button, and then measure the input voltage between the ETV relay coupler terminals and ground.



ETV relay input voltage:  
Red/yellow (R/Y) – Ground  
Red (R) – Ground  
12 V (battery voltage)

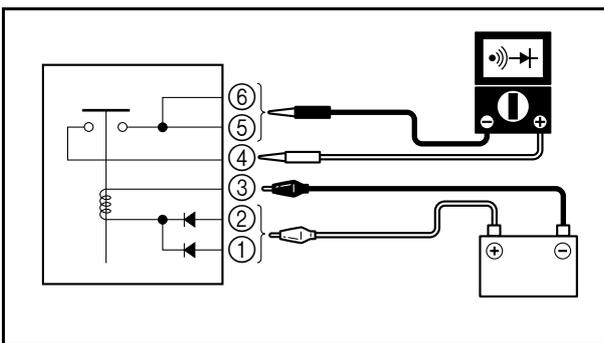


**2. Check:**

- ETV relay continuity  
Out of specification → Replace the ETV relay.

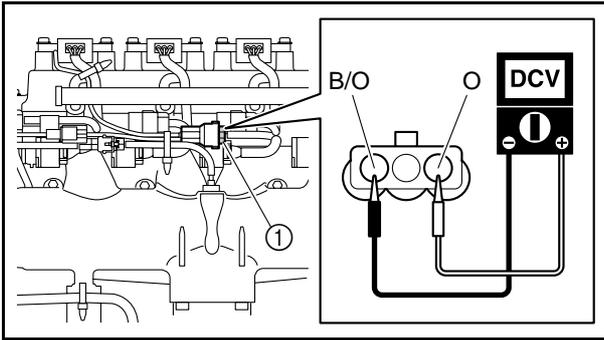
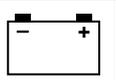
**Checking steps:**

1. Remove the ETV relay.  
Refer to “Fuse box disassembly.”
2. Connect the tester leads to the ETV relay terminals ④ and ⑤ or to the terminals ④ and ⑥.
3. Connect the positive battery lead to the ETV relay terminal ① or ②.
4. Connect the negative battery lead to the ETV relay terminal ③.
5. Check the continuity between terminals ④ and ⑤ or terminals ④ and ⑥.



ETV relay continuity:

Battery lead ① or ② – ③	Terminal ④ – Terminal ⑤ or ⑥
Disconnected	No continuity
Connected	Continuity



### Cam position sensor

#### 1. Measure:

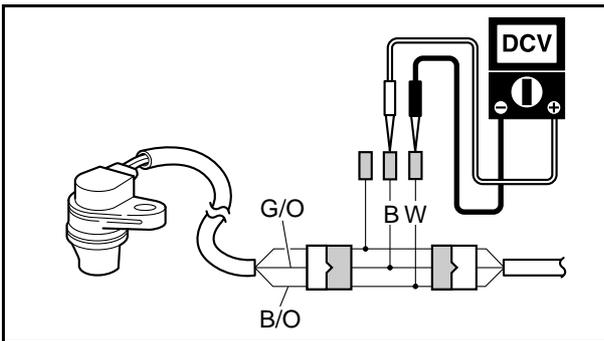
- Cam position sensor input voltage  
Out of specification → Check the wiring harness.

#### Measurement steps:

1. Disconnect the cam position sensor coupler ①.
2. Push the unlock button, and then measure the input voltage at the cam position sensor coupler terminals (wiring harness end).



Cam position sensor input voltage (reference data):  
Orange (O) – Black/orange (B/O)  
4.75–5.25 V

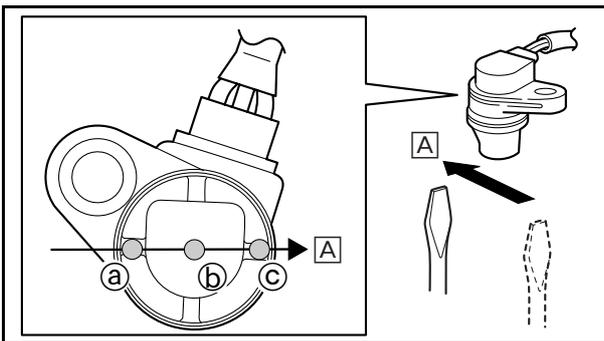


#### 2. Measure:

- Cam position sensor output voltage  
Out of specification → Replace the cam position sensor.

#### Measurement steps:

1. Remove the cam position sensor. Refer to “Cylinder head cover removal” in Chapter 5.
2. Connect the test harness (3 pins) to the cam position sensor.
3. Push the unlock button, and then measure the output voltage when a screwdriver is passed under the cam position sensor in direction **A** as shown.

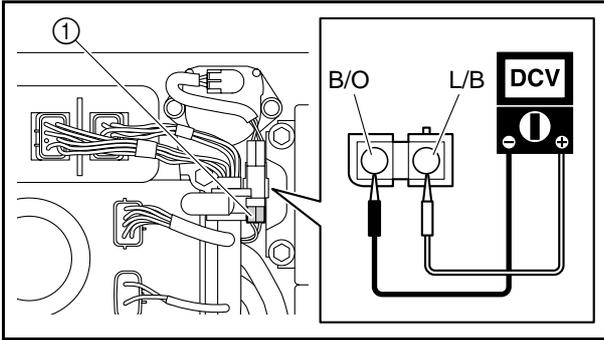
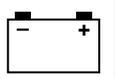


Test harness (3 pins):  
YB-06877  
Test harness HM090-3 (3 pins):  
90890-06877



Cam position sensor output voltage:  
Green/orange (G/O) –  
Black/orange (B/O)

Position	Voltage (V)
Ⓐ, Ⓒ	More than 4.8
Ⓑ	Less than 0.8



**Slant detection switch**

**1. Measure:**

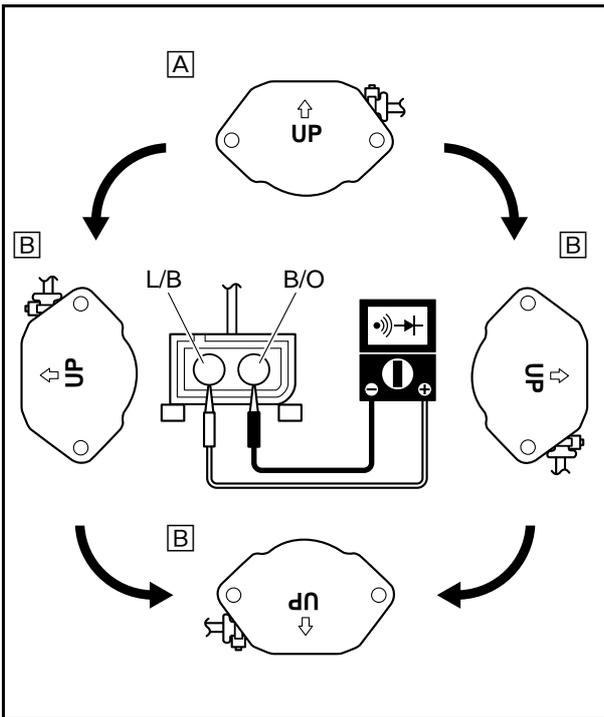
- Slant detection switch input voltage  
Out of specification → Check the wiring harness.

**Measurement steps:**

1. Disconnect the slant detection switch coupler ①.
2. Push the unlock button, and then measure the input voltage at the slant detection switch coupler (wiring harness end).



Slant detection switch input voltage (reference data):  
Blue/black (L/B) –  
Black/orange (B/O)  
4.75–5.25 V



**2. Check:**

- Slant detection switch continuity  
Out of specification → Replace the slant detection switch.

**Checking steps:**

1. Remove the slant detection switch. Refer to “Electrical box disassembly.”
2. Check the slant detection switch continuity.

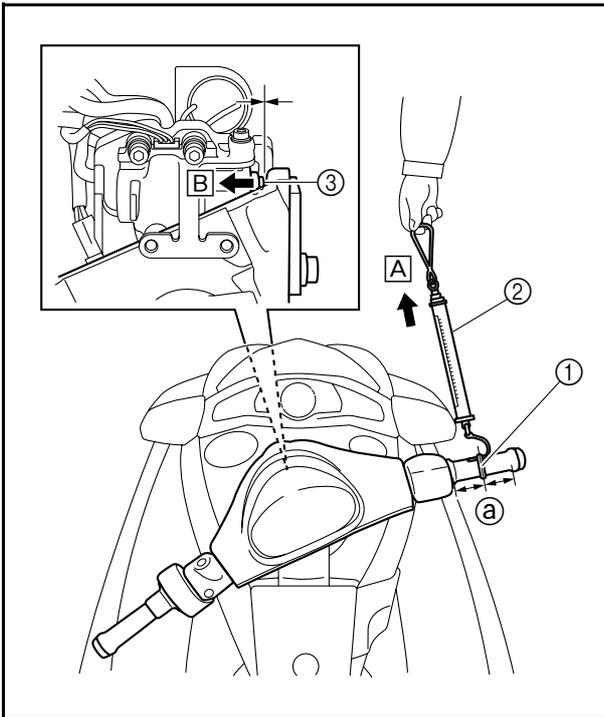
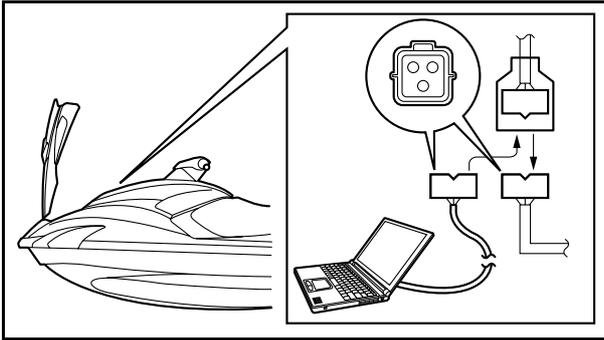
**NOTE:**

Be sure to turn the switch over to both the left and right as shown.



Slant detection switch continuity:

Position	Blue/black (L/B) – Black/orange (B/O)
Normal position <b>A</b>	No continuity
Overturned <b>B</b>	Continuity



## Steering sensor

### 1. Check:

- Steering sensor operation  
Does not operate → Measure the steering sensor input voltage.

### Checking steps:

1. Connect a computer to the watercraft to use the YDIS.
2. Turn the handlebar all the way to the left or right.
3. Install a plastic tie ① loosely around the center ② of the handlebar grip as shown.
4. Hook a spring gauge ② onto the plastic tie ①.
5. Push the unlock button.
6. Hold the spring gauge ② at a 90° angle from the handlebar grip, and then pull the spring gauge in direction A as shown with a force of 10 kgf (22 lb).

### NOTE:

At this time, the button ③ in the steering sensor will be pushed in direction B.

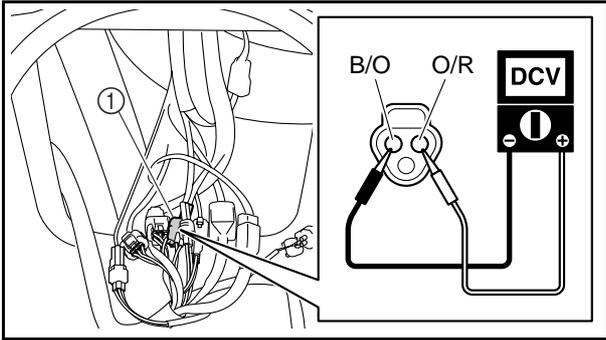
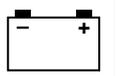
7. Check that the following is displayed in the “Engine monitor” window of the YDIS.



Steering sensor operation:

Handlebar	YDIS display
Not pulled	OFF
Pulled	ON

8. Use the same procedure to check that the steering sensor operates correctly when the handlebar is turned to both the left and right.



**2. Measure:**

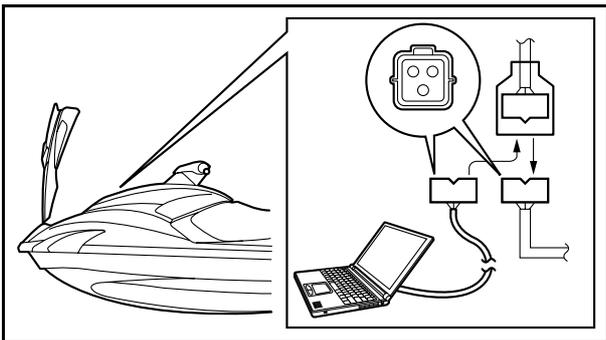
- Steering sensor input voltage  
 Within specification → Replace the steering sensor.  
 Out of specification → Check the wiring harness.

**Measurement steps:**

- Disconnect the steering sensor coupler ①.
- Push the unlock button, and then measure the input voltage at the steering sensor coupler terminals (wiring harness end).



Steering sensor input voltage (reference data):  
 Orange/red (O/R) –  
 Black/orange (B/O)  
 4.75–5.25 V



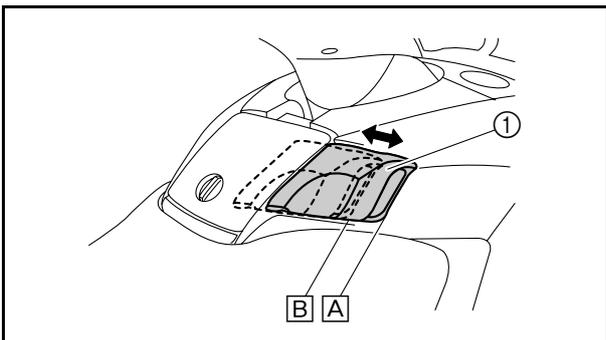
**Reverse sensor**

**1. Check:**

- Reverse sensor operation  
 Does not operate → Measure the reverse sensor input voltage.

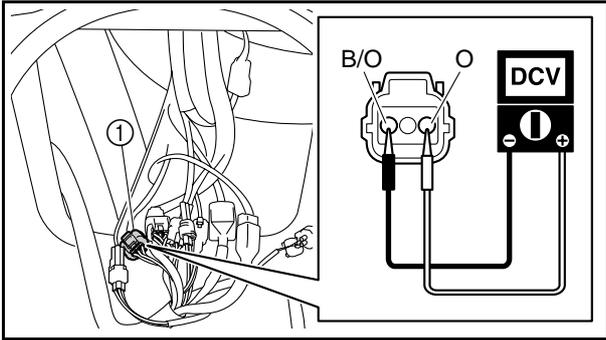
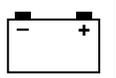
**Checking steps:**

- Connect a computer to the watercraft to use the YDIS.
- Push the unlock button.
- Operate the shift lever ① and check that the following is displayed in the “Engine monitor” window of the YDIS.



Reverse sensor operation:

Shift lever position	YDIS display
Forward <b>A</b>	OFF
Reverse <b>B</b>	ON



**2. Measure:**

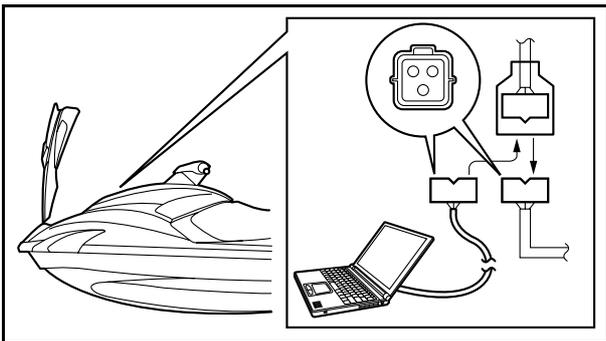
- Reverse sensor input voltage  
 Within specification → Replace the reverse sensor.  
 Out of specification → Check the wiring harness.

**Measurement steps:**

1. Disconnect the reverse sensor coupler ①.
2. Push the unlock button, and then measure the input voltage at the reverse sensor coupler terminals (wiring harness end).



Reverse sensor input voltage (reference data):  
 Orange (O) – Black/orange (B/O)  
 4.75–5.25 V



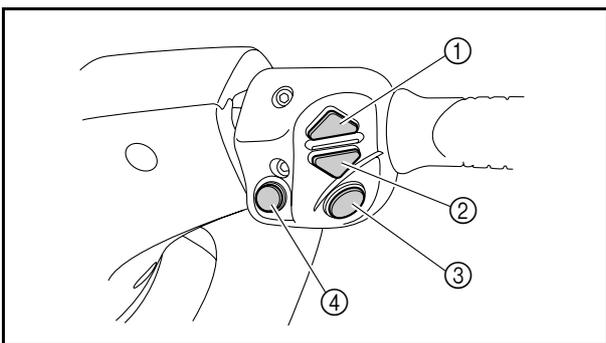
**Right handlebar switch assembly**

**1. Check:**

- Right handlebar switch operation  
 Does not operate → Measure the right handlebar switch input voltage.

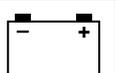
**Checking steps:**

1. Connect a computer to the watercraft to use the YDIS.
2. Push the unlock button.
3. Operate the switches ①–④ and check that the following is displayed in the “Engine monitor” window of the YDIS.



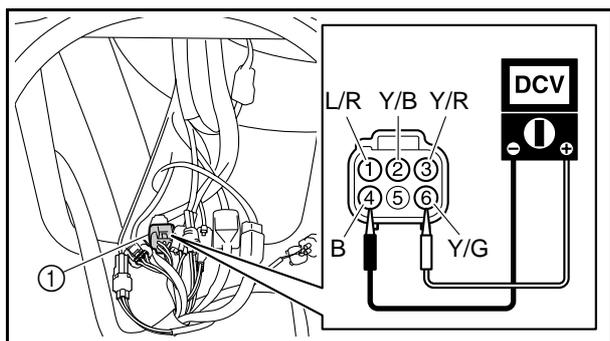
Right handlebar switch operation:

Switch		YDIS display
Up ①	Free	OFF
Down ②		
“SET” ③	Pushed	ON
“NO-WAKE MODE” ④		



## 2. Measure:

- Right handlebar switch input voltage  
Within specification → Replace the right handlebar switch assembly.  
Out of specification → Check the wiring harness.



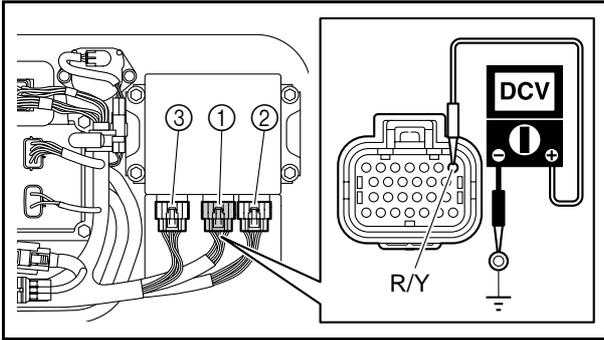
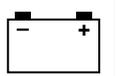
### Measurement steps:

1. Disconnect the right handlebar switch coupler ①.
2. Push the unlock button, and then measure the input voltage at the right handlebar switch coupler terminals (wiring harness end).



Right handlebar switch input voltage (reference data):

Terminal	Color	Voltage (V)
1-4	L/R-B	4.75-5.25
2-4	Y/B-B	4.75-5.25
3-4	Y/R-B	11.0-12.0
6-4	Y/G-B	11.0-12.0



## ECM circuit

### 1. Measure:

- ECM input voltage  
Out of specification → Check the ECM circuit.

### Measurement steps:

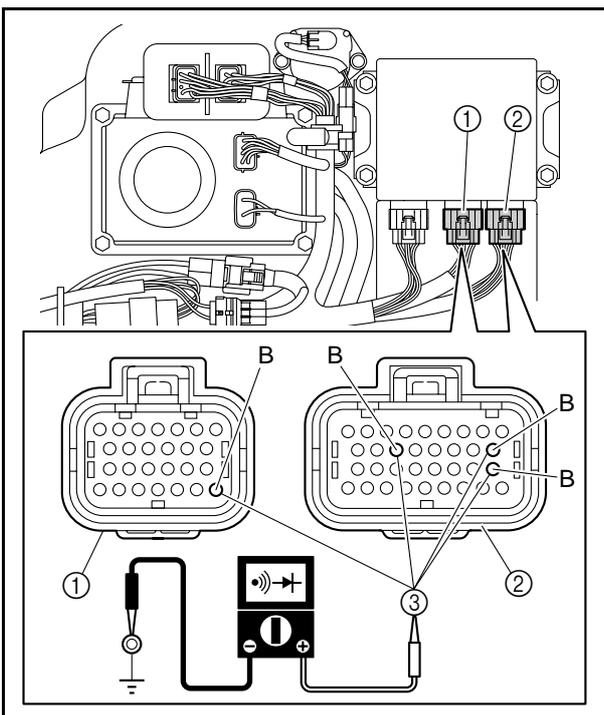
- Disconnect the ECM coupler ①.
- Push the unlock button, and then measure the input voltage between the ECM coupler terminal (wiring harness end) and ground.

### NOTE:

Do not disconnect the coupler ② or coupler ③ when measuring the ECM input voltage.



ECM input voltage:  
Red/yellow (R/Y) – Ground  
12 V (battery voltage)

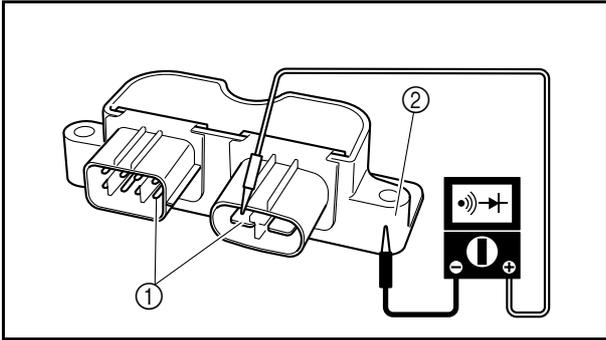
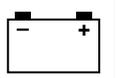


### 2. Check:

- ECM circuit continuity  
No continuity → Replace the wiring harness assembly.

### Checking steps:

- Disconnect the ECM couplers ① and ②.
- Check the continuity between the ECM coupler terminals ③ (wiring harness end) and ground.



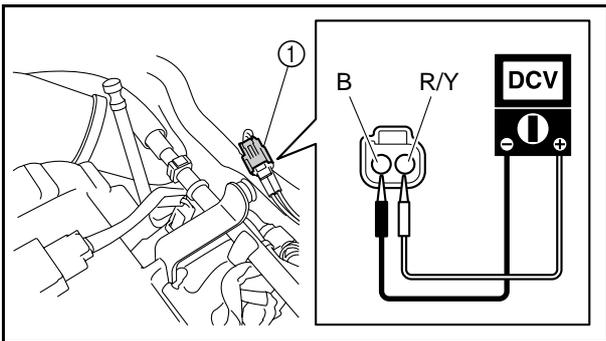
## Earth plate

### 1. Check:

- Earth plate continuity  
No continuity → Replace the earth plate.

### Checking steps:

1. Remove the earth plate.  
Refer to “Oil separator tank and oil pan removal” in Chapter 5.
2. Check the continuity between each terminal ① and the housing ②.



## Electric bilge pump

### 1. Measure:

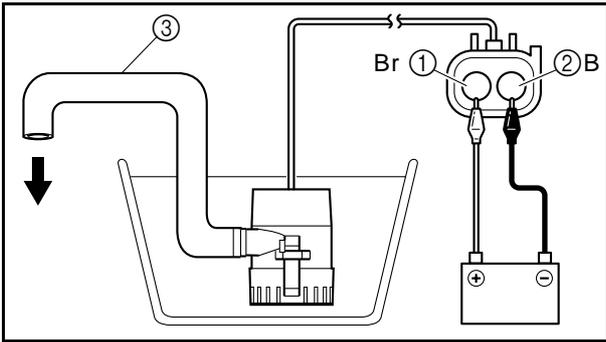
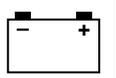
- Electric bilge pump input voltage  
Out of specification → Check the wiring harness.

### Measurement steps:

1. Disconnect the electric bilge pump coupler ①.
2. Push the unlock button, and then measure the input voltage at the electric bilge pump coupler (wiring harness end).



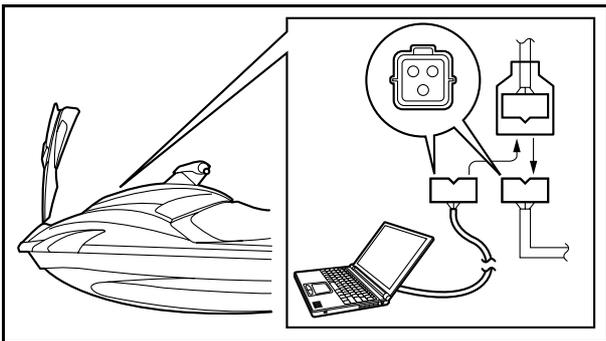
Electric bilge pump input voltage:  
Red/yellow (R/Y) – Black (B)  
12 V (battery voltage)

**2. Check:**

- Electric bilge pump operation  
Does not operate → Replace the electric bilge pump.

**Checking steps:**

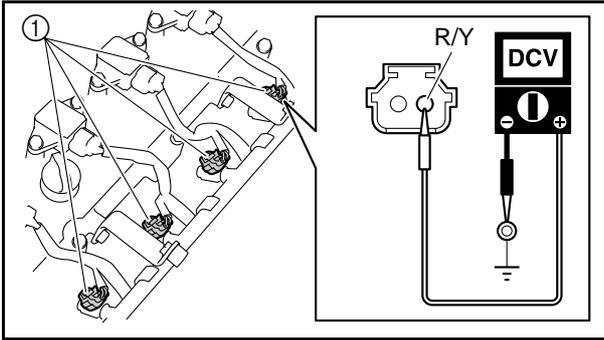
1. Remove the electrical bilge pump.  
Refer to “Transom plate and hose removal” in Chapter 6.
2. Suspend the electric bilge pump in a container filled with water.
3. Connect the positive battery lead to the terminal ①, and the negative battery lead to the terminal ②.
4. Check that water flows from the electric bilge pump hose ③.

**Fuel system****Fuel injector****1. Check:**

- Fuel injector operation sound  
Does not sound → Measure the fuel injector input voltage.

**Checking steps:**

1. Connect a computer to the watercraft to use the YDIS.
2. Using the “Stationary test” of the YDIS, listen for the fuel injector operation sound.

**2. Measure:**

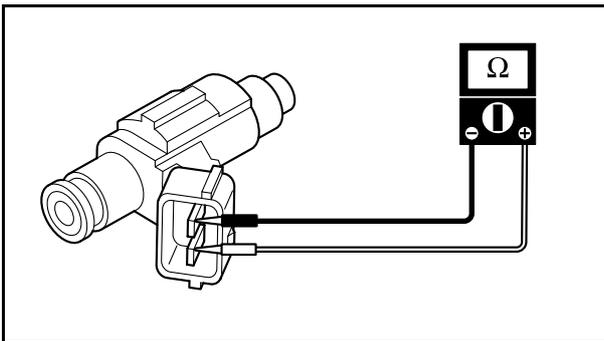
- Fuel injector input voltage  
Out of specification → Check the wiring harness.

**Measurement steps:**

- Disconnect the fuel injector couplers ①.
- Push the unlock button, and then measure the input voltage between the fuel injector coupler terminals (wiring harness end) and ground.



Fuel injector input voltage:  
Red/yellow (R/Y) – Ground  
12 V (battery voltage)

**3. Measure:**

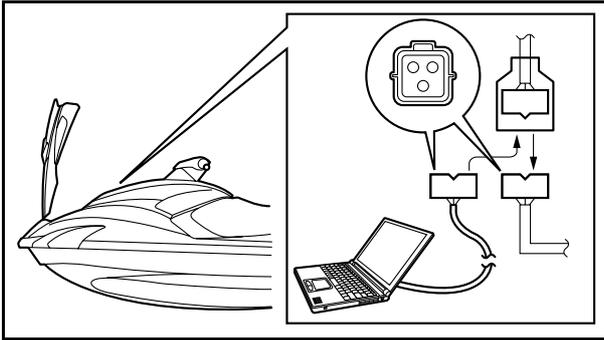
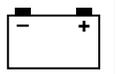
- Fuel injector resistance  
Out of specification → Replace the fuel injector.

**Measurement steps:**

- Remove the fuel injector.  
Refer to “Fuel tank removal” in Chapter 4.
- Measure the fuel injector resistance.



Fuel injector resistance at 20 °C  
(68 °F) (reference data):  
11.5–12.5 Ω



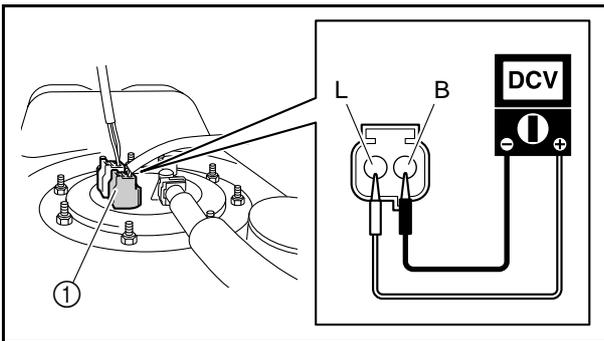
## Fuel pump module

### 1. Check:

- Fuel pump module operation sound  
Does not sound → Measure the fuel pump module input voltage.

### Checking steps:

- Connect a computer to the watercraft to use the YDIS.
- Using the “Stationary test” of the YDIS, listen for the fuel pump module operation sound.



### 2. Measure:

- Fuel pump module input voltage  
Out of specification → Check the wiring harness.

### Measurement steps:

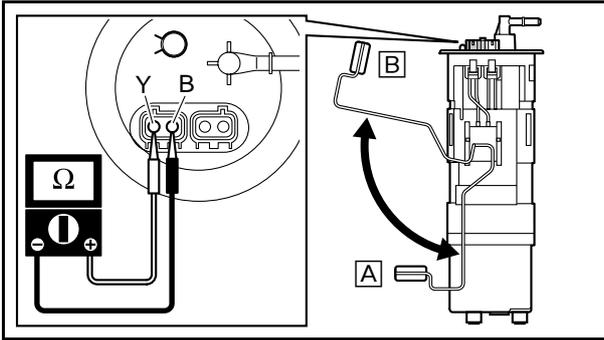
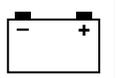
- Disconnect the fuel pump module coupler ①.
- Push the unlock button, and then measure the input voltage at the fuel pump module coupler terminals (wiring harness end).

### NOTE:

After the unlock button is pushed, voltage will only be applied to the fuel pump module for 3 seconds.



Fuel pump module input voltage:  
Blue (L) – Black (B)  
12 V (battery voltage)

**3. Measure:**

- Fuel sender resistance  
Out of specification → Replace the fuel sender.  
Refer to “Fuel sender removal” in Chapter 4.

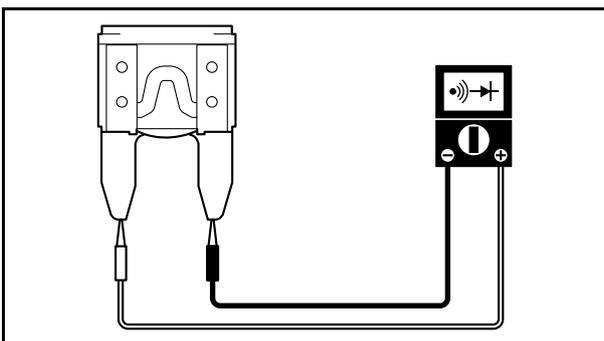
**Measurement steps:**

- Remove the fuel pump module.  
Refer to “Fuel tank removal” in Chapter 4.
- Measure the fuel sender resistance.

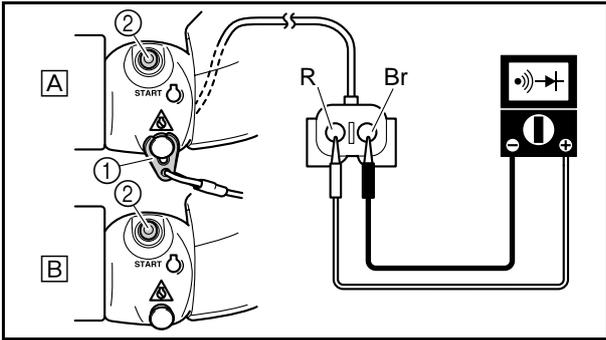
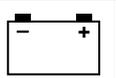


Fuel sender resistance at 20 °C  
(68 °F) (reference data):

Float position	Yellow (Y) – Black (B)
Lower position <b>A</b>	133.5–136.5 Ω
Upper position <b>B</b>	5.0–7.0 Ω

**Starting system****Fuse****1. Check:**

- Fuse continuity  
No continuity → Replace the fuse.



**Left handlebar switch assembly**

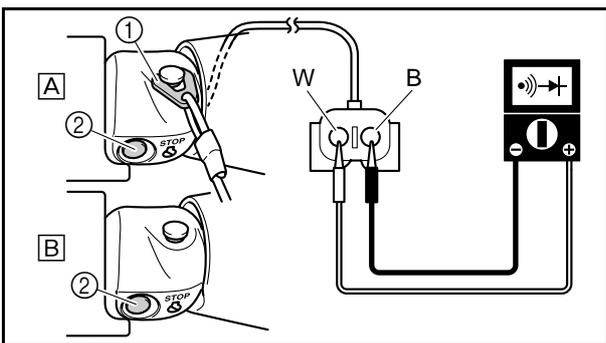
**1. Check:**

- Engine start switch continuity  
Out of specification → Replace the left handlebar switch assembly.

**Checking steps:**

1. Disconnect the left handlebar switch coupler.  
Refer to “Handlebar assembly removal” in Chapter 8.
2. Check the engine start switch continuity.

 Engine start switch continuity:		
Clip ①	Engine start switch ②	Red (R) – Brown (Br)
Installed <span style="border: 1px solid black; padding: 0 2px;">A</span>	Free	No continuity
	Pushed	Continuity
Removed <span style="border: 1px solid black; padding: 0 2px;">B</span>	Free	No continuity
	Pushed	No continuity

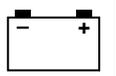


**2. Check:**

- Engine stop switch continuity  
Out of specification → Replace the left handlebar switch assembly.

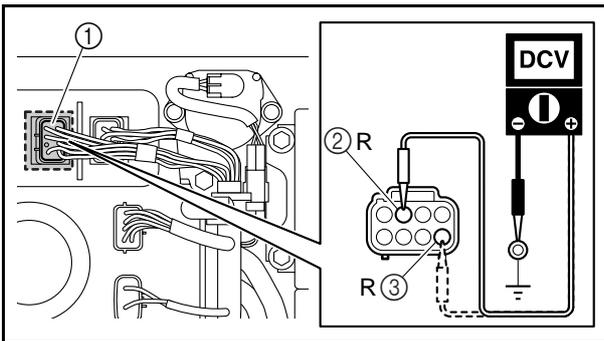
**Checking steps:**

1. Disconnect the left handlebar switch coupler.  
Refer to “Handlebar assembly removal” in Chapter 8.



2. Check the engine stop switch continuity.

 Engine stop switch continuity:		
Clip ①	Engine stop switch ②	White (W) – Black (B)
Installed <b>A</b>	Free	No continuity
	Pushed	Continuity
Removed <b>B</b>	Free	Continuity
	Pushed	Continuity



**Main and fuel pump relay**

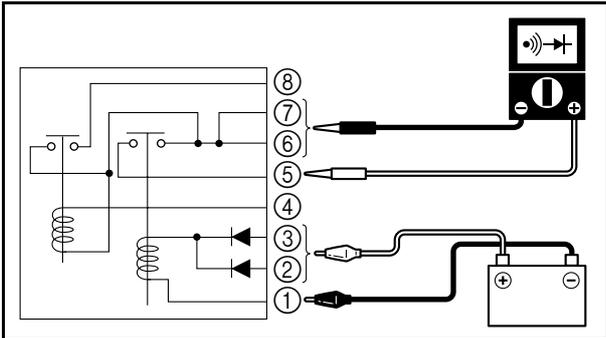
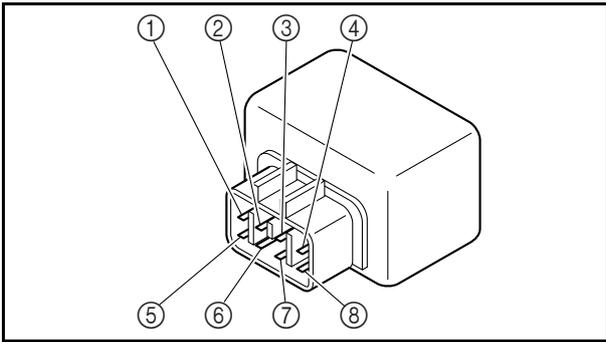
1. Measure:

- Main and fuel pump relay input voltage  
Out of specification → Check the wiring harness.

**Measurement steps:**

1. Disconnect the main and fuel pump relay coupler ①.
2. Measure the input voltage between the main and fuel pump relay coupler terminals ② or ③ (wiring harness end) and ground.

 Main and fuel pump relay input voltage:	
Red (R) – Ground	12 V (battery voltage)



**2. Check:**

- Main relay continuity  
Out of specification → Replace the main and fuel pump relay.

**Checking steps:**

1. Remove the main and fuel pump relay. Refer to “Fuse box disassembly.”
2. Connect the tester leads to the main and fuel pump relay terminals ⑤ and ⑥ or to the terminals ⑤ and ⑦.
3. Connect the positive battery lead to the main and fuel pump relay terminal ② or ③.
4. Connect the negative battery lead to the main and fuel pump relay terminal ①.
5. Check the continuity between the terminals ⑤ and ⑥ or the terminals ⑤ and ⑦.



Main relay continuity:

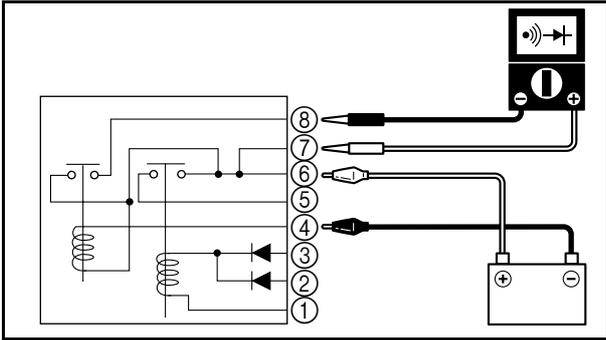
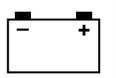
Battery lead ② or ③ – ①	Terminal ⑤ – Terminal ⑥ or ⑦
Disconnected	No continuity
Connected	Continuity

**3. Check:**

- Fuel pump relay continuity  
Out of specification → Replace the main and fuel pump relay.

**CAUTION:**

Do not reverse the battery leads, otherwise the main and fuel pump relay may be seriously damaged.



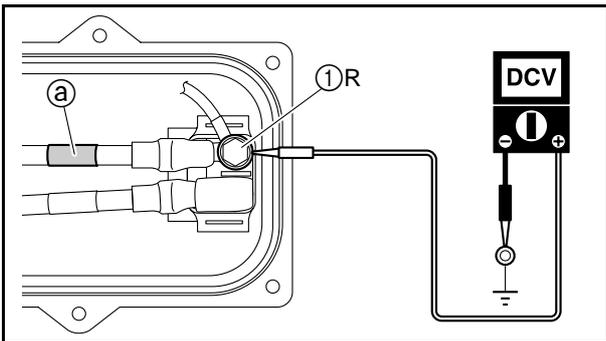
**Checking steps:**

1. Connect the tester leads to the main and fuel pump relay terminals ⑦ and ⑧.
2. Connect the positive battery lead to the main and fuel pump relay terminal ⑥.
3. Connect the negative battery lead to the main and fuel pump relay terminal ④.
4. Check the continuity between the terminals ⑦ and ⑧.



**Fuel pump relay continuity:**

Battery lead ⑥ – ④	Terminal ⑦ – Terminal ⑧
Disconnected	No continuity
Connected	Continuity



**Starter relay**

**1. Measure:**

- Starter relay input voltage  
Out of specification → Check the wiring harness.

**Measurement steps:**

1. Slide the boot away from the starter relay terminal ①.

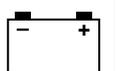
**NOTE:**

The positive battery cable is marked with gray tape ①.

2. Measure the input voltage between the starter relay terminal ① and ground.



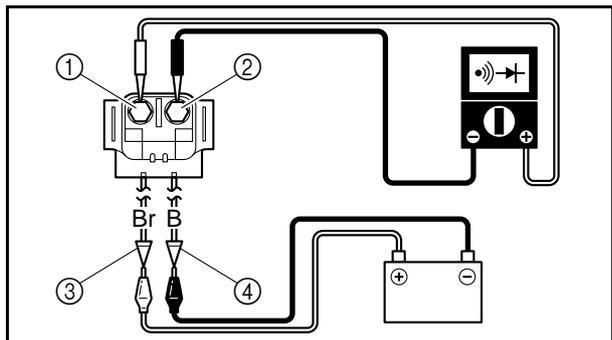
**Starter relay input voltage:**  
Red (R) – Ground  
12 V (battery voltage)

**2. Check:**

- Starter relay continuity  
Out of specification → Replace the starter relay.

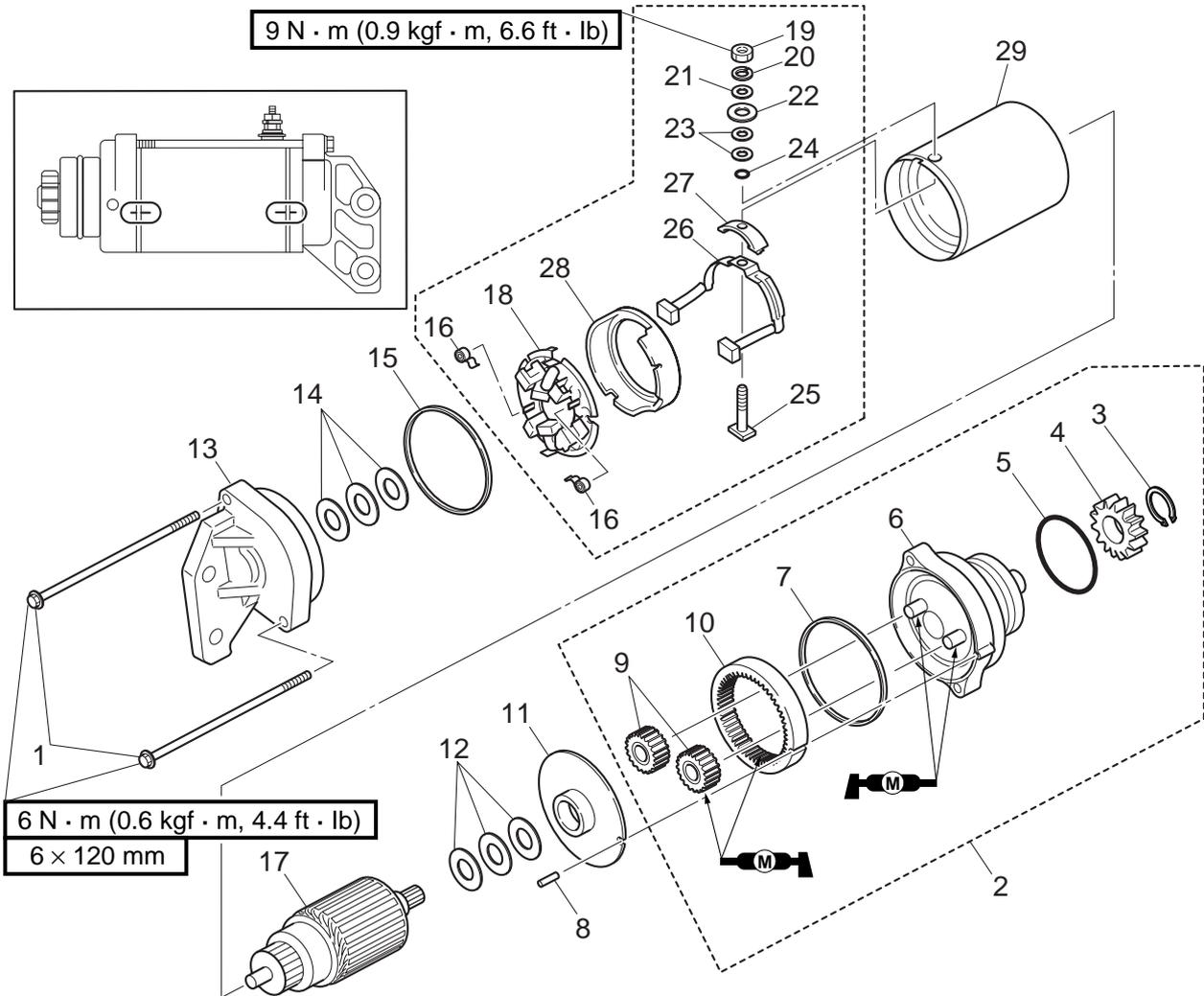
**Checking steps:**

1. Remove the starter relay.  
Refer to “Electrical box disassembly.”
2. Connect the tester leads between the starter relay terminals ① and ②.
3. Connect the positive battery lead to the terminal ③, and the negative battery lead to the terminal ④.
4. Check the continuity between the starter relay terminals ① and ②.

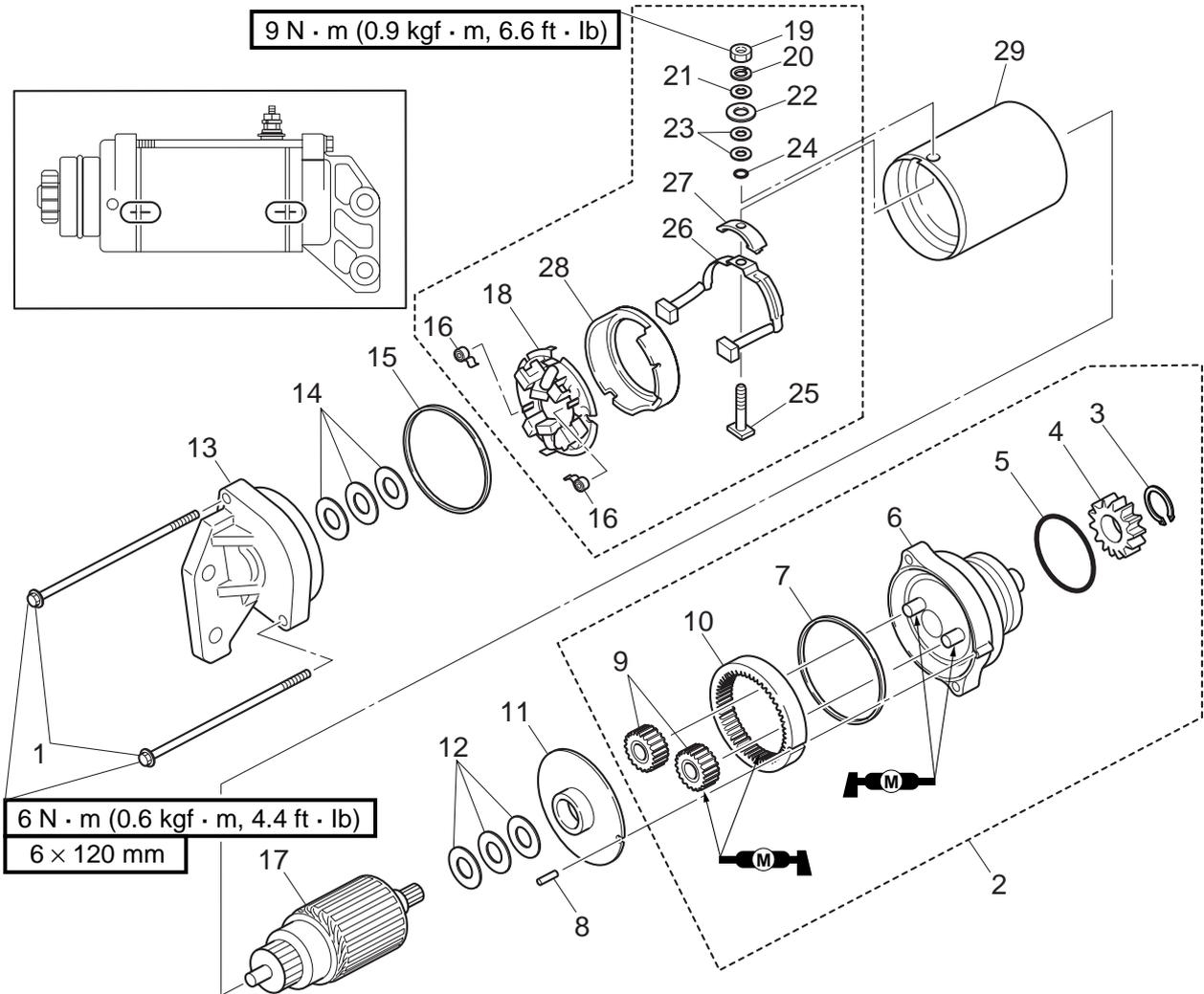
**Starter relay continuity:**

Battery lead ③ – ④	Terminal ① – Terminal ②
Disconnected	No continuity
Connected	Continuity

**Starter motor**  
**Starter motor disassembly**

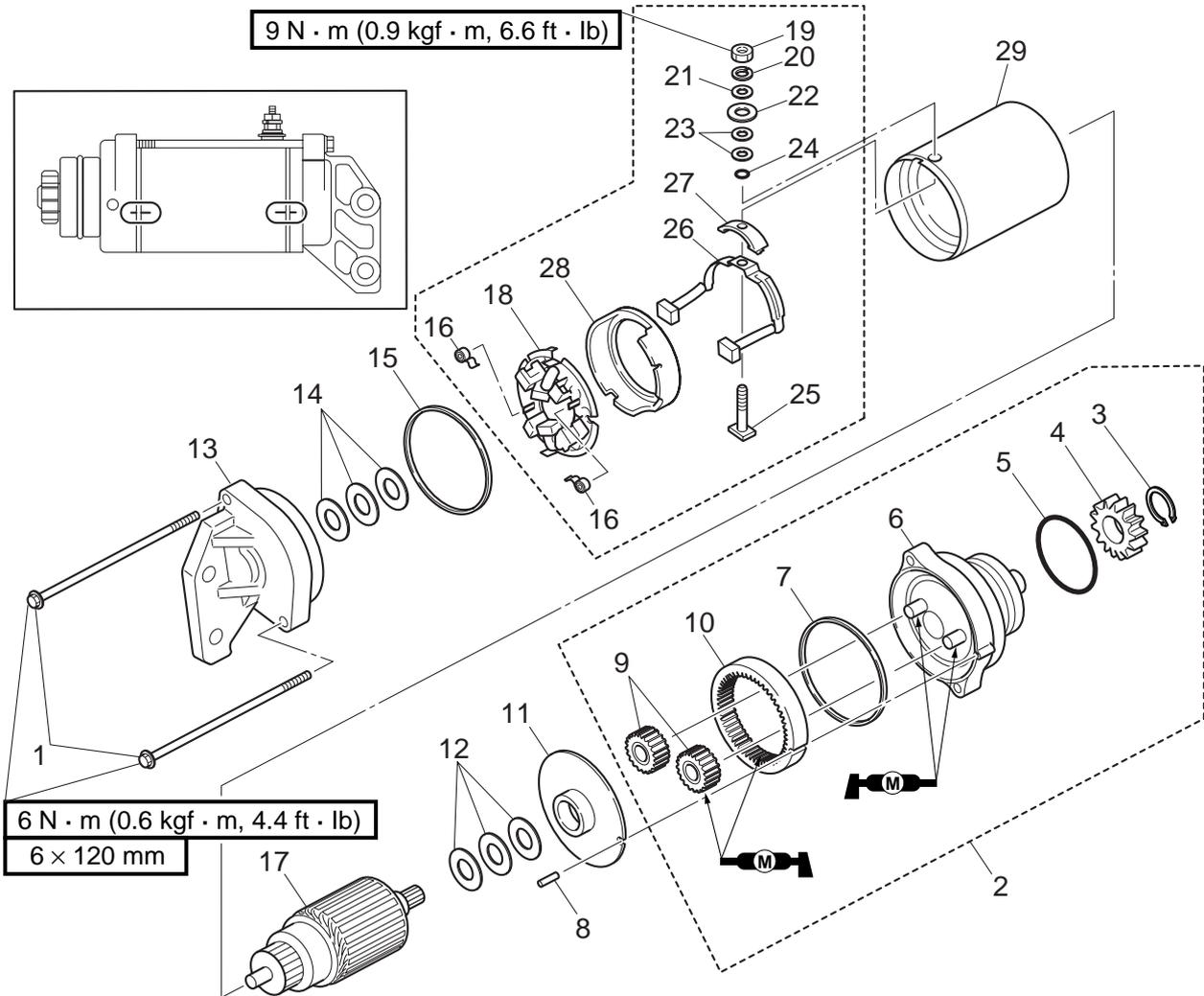


Step	Procedure/Part name	Q'ty	Service points
1	Bolt	2	
2	Gear cover assembly	1	
3	Circlip	1	
4	Drive gear	1	
5	O-ring	1	<b>Not reusable</b>
6	Front cover	1	
7	Packing	1	<b>Not reusable</b>
8	Dowel pin	1	
9	Planetary gear	2	
10	Ring gear	1	
11	Bracket	1	

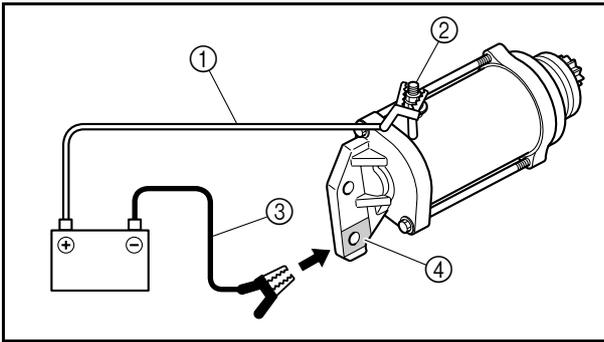
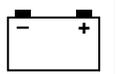


Step	Procedure/Part name	Q'ty	Service points
12	Shim	*	
13	Rear cover	1	
14	Shim	*	
15	Packing	1	<b>Not reusable</b>
16	Brush spring	4	
17	Armature	1	
18	Brush holder stay	1	
19	Nut	1	
20	Spring washer	1	
21	Washer	1	
22	Insulator washer 1	1	

\*: As required.



Step	Procedure/Part name	Q'ty	Service points
23	Insulator washer 2	2	<b>Not reusable</b>
24	O-ring	1	
25	Terminal bolt	1	
26	Lead plate	1	
27	Terminal insulator	1	
28	Plate cover	1	
29	Starter motor yoke	1	
			Reverse the disassembly steps for assembly.



## Starter motor operation

### 1. Check:

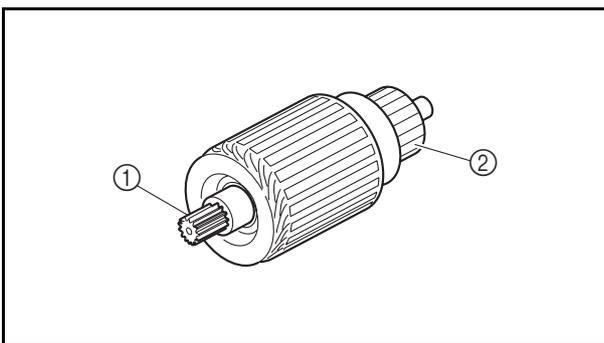
- Starter motor operation  
Does not operate → Check the starter motor.

### Checking steps:

1. Hold the starter motor in a vise using aluminum plates on both sides.
2. Connect the positive battery cable ① to the starter motor terminal bolt ②.
3. Connect the negative battery cable ③ to the starter motor body ④.
4. Check the starter motor operation.

### NOTE:

- Check the starter motor operation for a few seconds.
- If the starter motor is disassembled, be sure to check the operation again after assembling it.



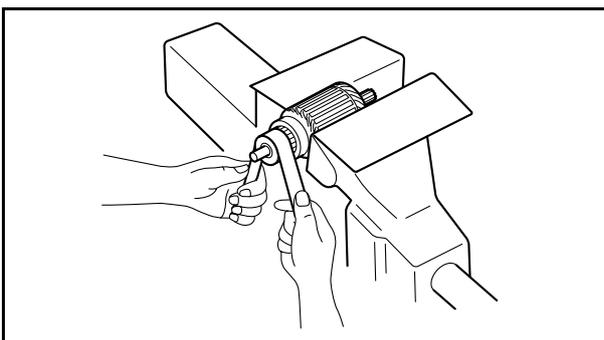
## Armature

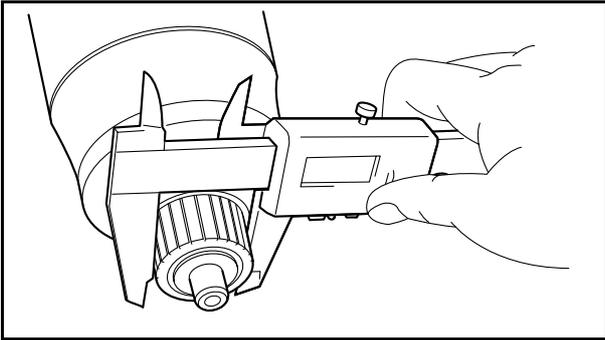
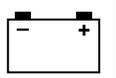
### 1. Check:

- Armature shaft ①  
Wear/damage → Replace the armature.
- Commutator ②  
Dirt → Clean with 600-grit sandpaper.

### NOTE:

Remove all metal particles with compressed air.



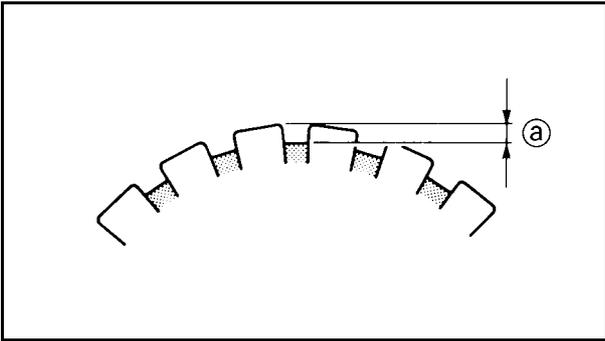


**2. Measure:**

- Commutator diameter  
Out of specification → Replace the armature.



Commutator diameter:  
27.0–28.0 mm (1.06–1.10 in)

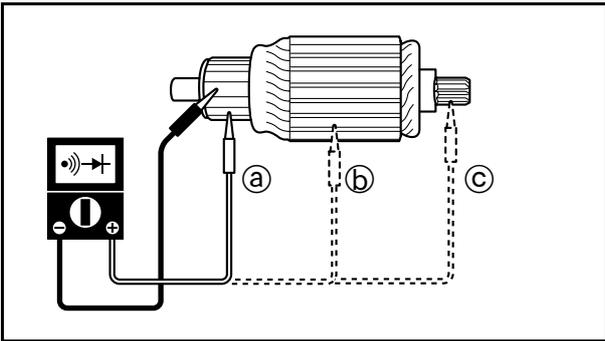


**3. Measure:**

- Commutator undercut @  
Out of specification → Replace the armature.



Commutator undercut @  
(reference data):  
0.2–0.7 mm (0.008–0.028 in)



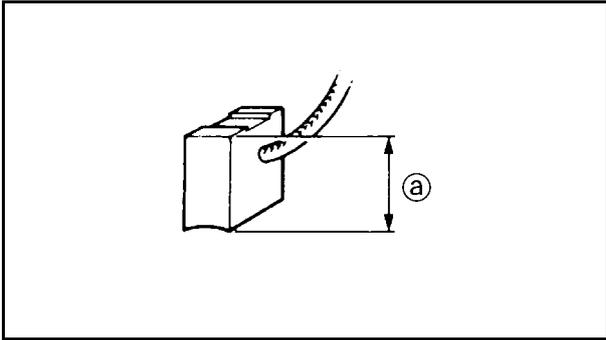
**4. Check:**

- Armature coil continuity  
Out of specification → Replace the armature.



Armature coil continuity:

Commutator segments @	Continuity
Segment @ – Armature core @	No continuity
Segment @ – Armature shaft @	No continuity



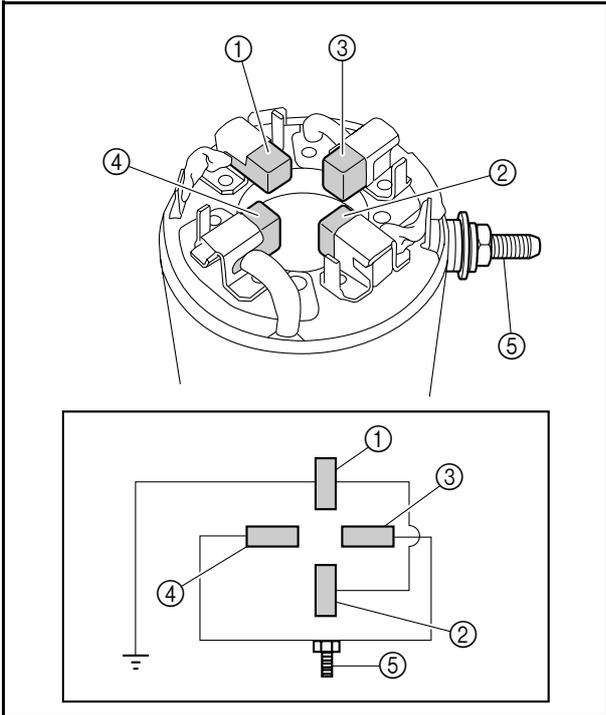
**Brush holder**

**1. Measure:**

- Brush length ①  
Out of specification → Replace the brush holder assembly.



Brush length ①:  
5.0–12.5 mm (0.20–0.49 in)



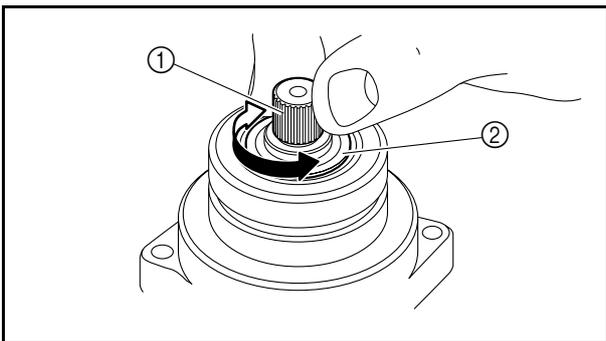
**2. Check:**

- Brush holder continuity  
Out of specification → Replace the brush holder assembly.



Brush holder continuity:

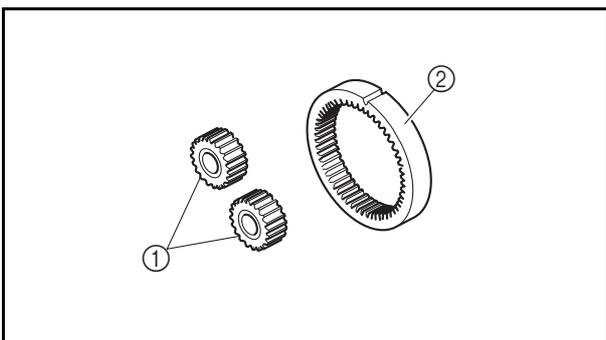
Brush ① – Brush ② Brush ③ – Brush ④ Brush ③ – Terminal ⑤ Brush ④ – Terminal ⑤	Continuity
For all brush and terminal combinations not listed above.	No continuity



**Gear cover**

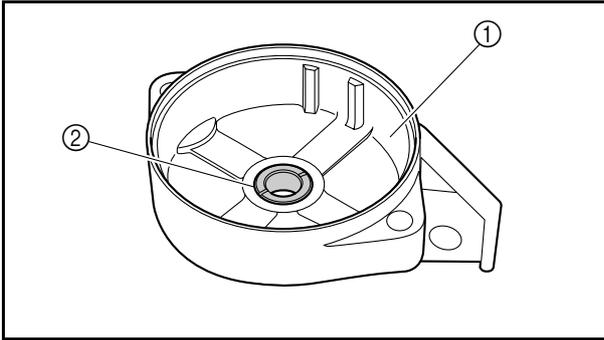
**1. Check:**

- Drive shaft ①
- Bearing ②  
Rough movement/wear → Replace the gear cover assembly.



**2. Check:**

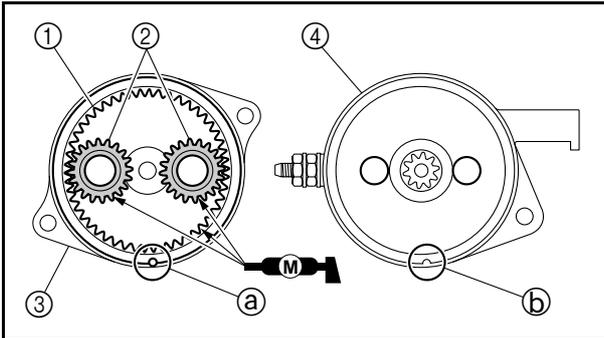
- Planetary gears ①
- Ring gear ②  
Broken gear teeth → Replace the gear cover assembly.



**Rear cover**

**1. Check:**

- Rear cover ①
  - Metal ②
- Cracks/damage → Replace the rear cover assembly.



**Starter motor assembly**

**1. Install:**

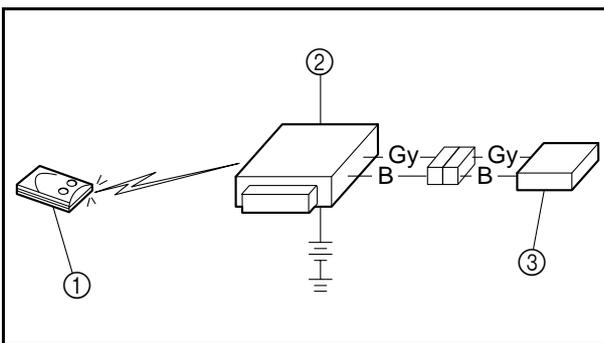
- Gear cover assembly

**Installation steps:**

1. Install the ring gear ①, planetary gears ②, and dowel pin to the front cover ③.
2. Install the front cover to the starter motor yoke ④.

**NOTE:**

Make sure the notch ① in the ring gear is aligned with the projection ② on the starter motor yoke ④.



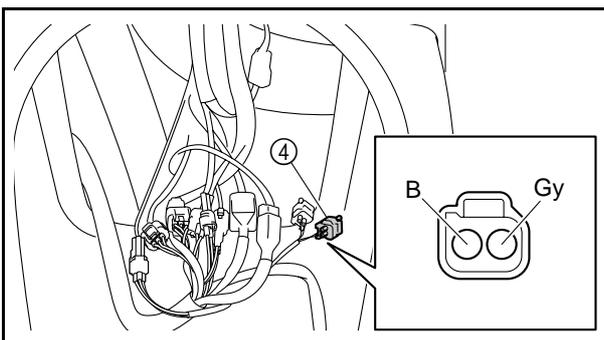
**Remote control system  
Transmitter registration**

**1. Register:**

- ID code

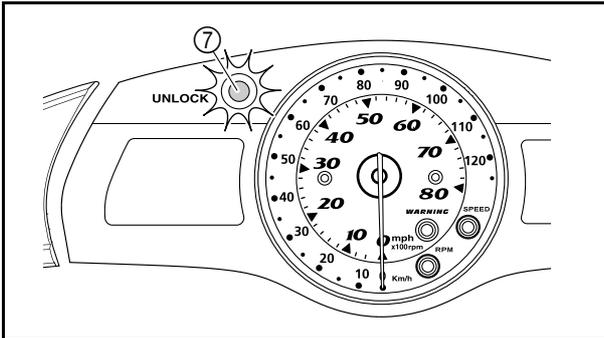
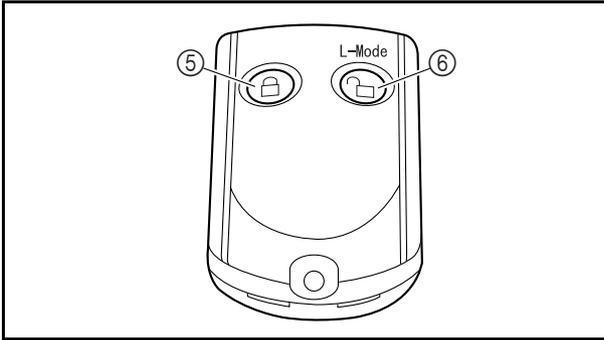
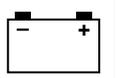
**NOTE:**

- The remote control transmitter ① can be added or re-registered with the remote control receiver ② by connecting the entry box ③.
- The entry box is necessary to register the ID code of a remote control transmitter.



**Registration steps:**

1. Connect the entry box to the 2-pin communication coupler ④.



- Push the lock button ⑤ or unlock button ⑥ to transmit the ID code from the remote control transmitter to be registered.

**NOTE:**

- At this time, the system enters the registration mode to register the first code. All existing ID codes will be deleted from the remote control receiver.
- The “UNLOCK” indicator light ⑦ blinks when the registration of the ID code has been completed. (If the registration could not be completed, the “UNLOCK” indicator light comes on. Re-transmit the ID code.)

- After confirming that the registration of the ID code has been completed using the “UNLOCK” indicator light ⑦, transmit the next ID code.

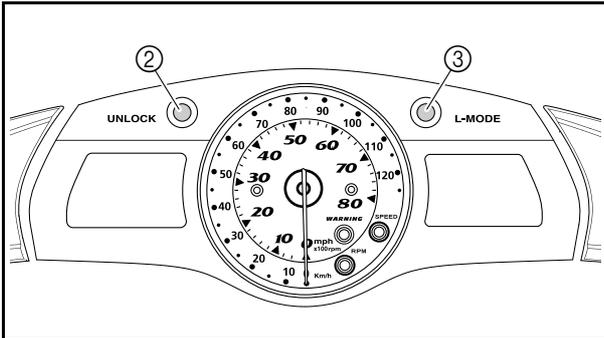
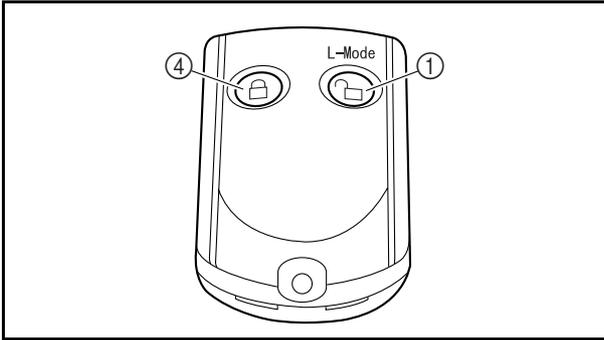
**NOTE:**

- Up to 5 remote control transmitters can be registered in any sequence, regardless of whether they are original equipment or additional transmitters.
- The same ID code cannot be registered twice in the remote control receiver.

- After ID code registration has been completed, disconnect the entry box to exit the registration mode.

**Remote control transmitter****1. Check:**

- Remote control transmitter operation  
Does not operate → Measure the remote control transmitter battery voltage or check the remote control receiver.



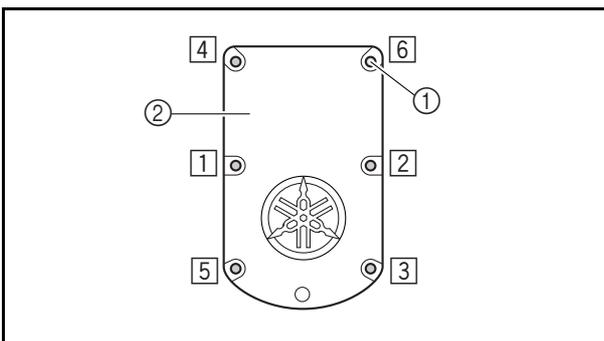
**Checking steps:**

1. Push the unlock button ①. The buzzer sounds 2 times.
2. Check that the “UNLOCK” indicator light ② comes on.
3. Push the unlock button ① for more than 4 seconds. The buzzer sounds 3 times.
4. Check that the “L-MODE” indicator light ③ comes on.
5. Push the lock button ④. The buzzer sounds once.
6. Check that the “UNLOCK” indicator light ② goes off.

**NOTE:**

While the engine is running, input from the remote control transmitter is not received.

Number of beeps	Yamaha Security System mode
1 beep	Lock
2 beeps	Unlock (normal mode)
3 beeps	L-MODE (low-rpm mode)



**2. Measure:**

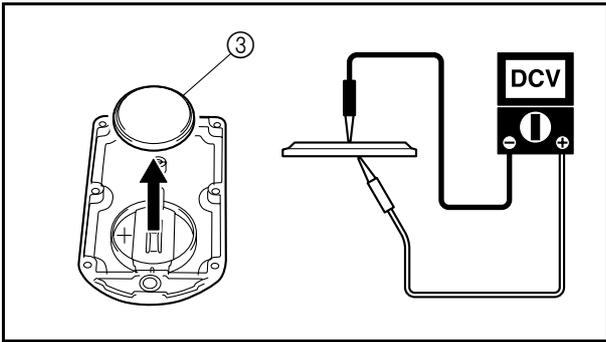
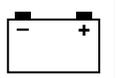
- Remote control transmitter battery voltage  
Below specification → Replace the remote control transmitter battery.

**Measurement steps:**

1. Remove the transmitter cover screws ① and cover ②.

**NOTE:**

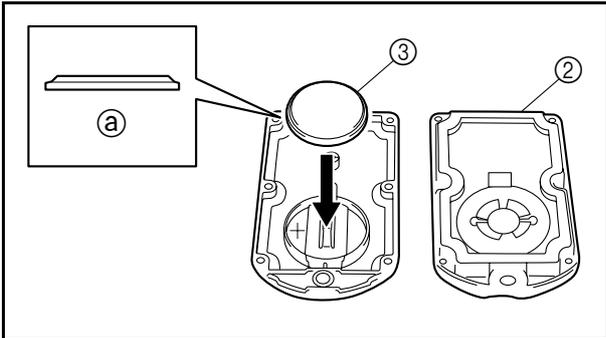
Loosen the transmitter cover screws ① in the sequence shown.



2. Remove the battery ③.
3. Measure the battery voltage.

**CAUTION:** \_\_\_\_\_

- Do not touch the internal parts except the battery.
- Do not touch the battery directly with your hands. Use a pair of non-conductive tweezers to replace the battery.



**NOTE:** \_\_\_\_\_

Refer to local hazardous waste regulations when disposing of transmitter batteries.

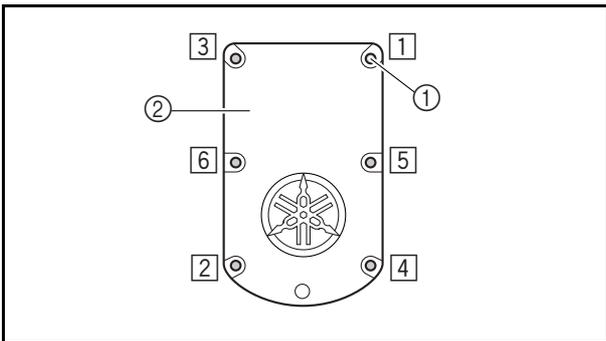


Remote control transmitter battery voltage:  
3.0 V

4. Install the battery ③ and transmitter cover ②.

**NOTE:** \_\_\_\_\_

Install the battery (CR2016) ③ with the positive side a facing down.



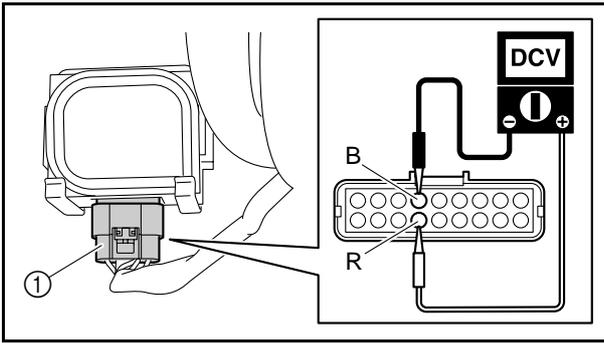
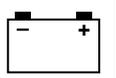
5. Install the transmitter cover screws ①.

**NOTE:** \_\_\_\_\_

Tighten the transmitter cover screws ① in the sequence shown



Transmitter cover screw:  
0.1 N·m (0.01 kgf·m, 0.1 ft·lb)



## Remote control receiver

### 1. Measure:

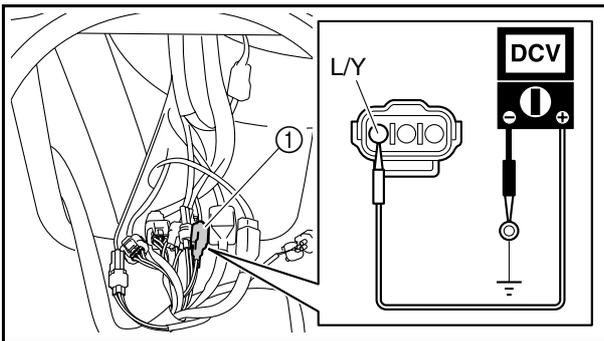
- Remote control receiver input voltage  
Out of specification → Check the wiring harness.

### Measurement steps:

- Disconnect the remote control receiver coupler ①.
- Measure the input voltage at the remote control receiver coupler terminals (wiring harness end).



Remote control receiver input voltage:  
Red (R) – Black (B)  
12 V (battery voltage)



### 2. Measure:

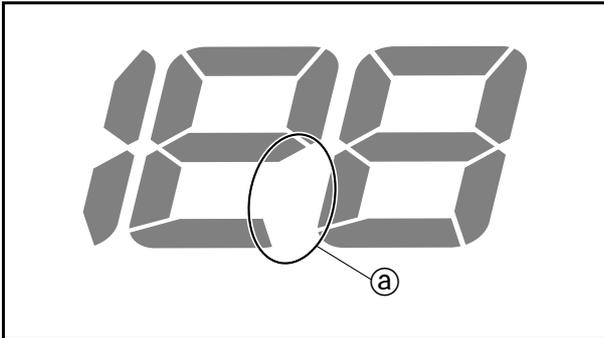
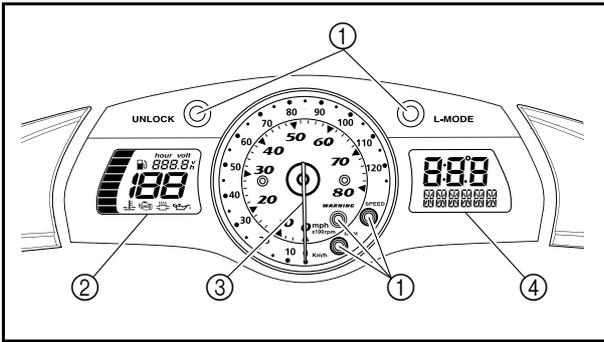
- Remote control receiver output voltage  
Out of specification → Replace the remote control receiver.

### Measurement steps:

- Disconnect the multifunction meter coupler ① from the remote control receiver.
- Push the unlock button, and then measure the remote control receiver output voltage at the multifunction meter coupler terminal (wiring harness end) and ground.



Remote control receiver output voltage (reference data):  
Blue/yellow (L/Y) – Ground  
11.0–12.0 V



## Indication system

### Multifunction meter

#### 1. Check:

- Multifunction meter external appearance  
Cracked meter housing/meter is fogged/  
shows signs of water intrusion →  
Replace the multifunction meter.

#### 2. Check:

- Multifunction meter display  
Intermittent or missing segment (a) →  
Replace the multifunction meter.  
No display → Measure the multifunction  
meter input voltage.

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#### Checking step:

1. Push the unlock button, and then check that all indicator lights and display elements on the multifunction meter light up.

- ① Indicator lights
- ② Left multifunction display
- ③ Analog speedometer/tachometer
- ④ Right multifunction display (FX Cruiser SHO)

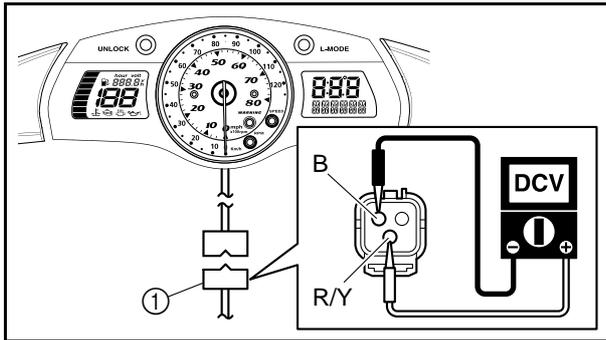
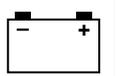
#### NOTE:

When pushing the unlock button, the analog speedometer/tachometer makes 1 sweep, all displays light up for 2 seconds, and then it starts to operate normally.

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### 3. Measure:

- Multifunction meter input voltage  
Within specification → Replace the multifunction meter.  
Out of specification → Check the wiring harness.

#### Measurement steps:

1. Disconnect the multifunction meter coupler ①.
2. Push the unlock button, and then measure the input voltage at the multifunction meter coupler terminals (wiring harness end).



Multifunction meter input voltage:  
Red/yellow (R/Y) – Black (B)  
12 V (battery voltage)

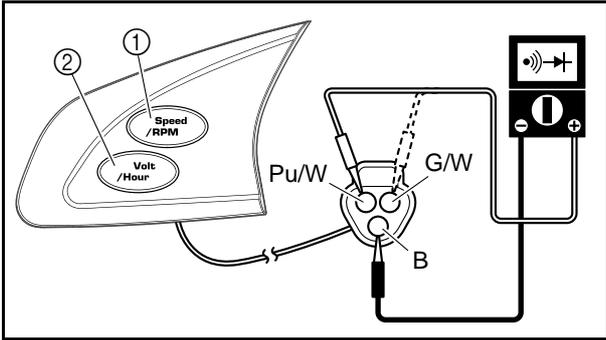
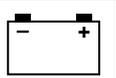
### Operation button assembly

#### 1. Check:

- Left operation button continuity  
Out of specification → Replace the left operation button assembly.

#### Checking steps:

1. Disconnect the left operation button coupler.  
Refer to “Multifunction meter and cover removal” in Chapter 8.



2. Check the left operation button continuity.

Left operation button continuity:

Button	Position	Leads		
		Pu/W	B	G/W
"Speed/RPM" button ①	Free			
	Pushed	○—○		
"Volt/Hour" button ②	Free			
	Pushed		○—○	

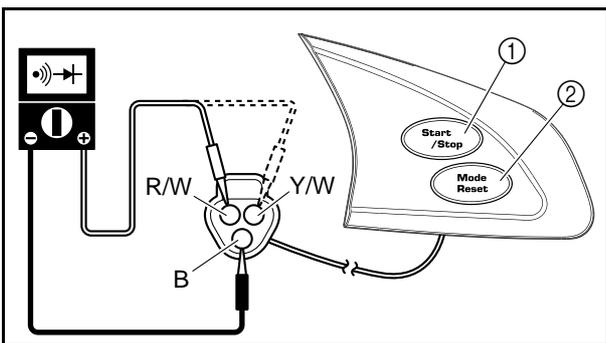
**NOTE:** \_\_\_\_\_  
 "○—○" indicates a continuity of electricity.

**2. Check:**

- Right operation button continuity (FX Cruiser SHO)  
 Out of specification → Replace the right operation button assembly.

**Checking steps:**

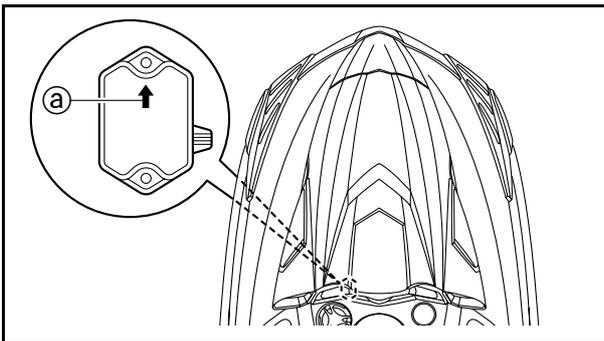
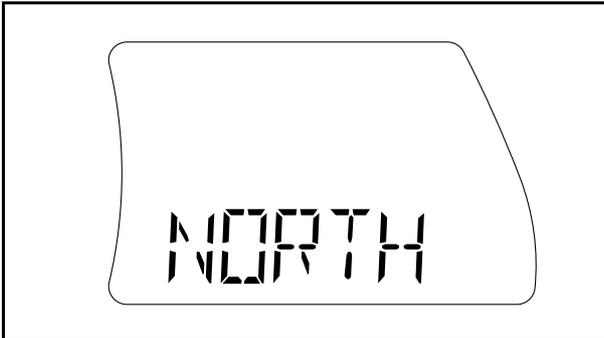
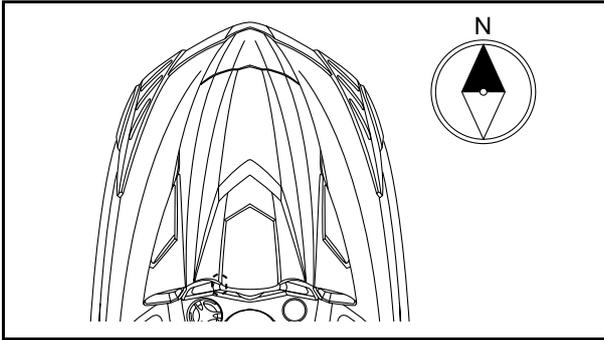
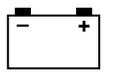
1. Disconnect the right operation button coupler.  
 Refer to "Multifunction meter and cover removal" in Chapter 8.
2. Check the right operation button assembly continuity.



Right operation button continuity:

Button	Position	Leads		
		R/W	B	Y/W
"Start/Stop" button ①	Free			
	Pushed	○—○		
"Mode/Reset" button ②	Free			
	Pushed		○—○	

**NOTE:** \_\_\_\_\_  
 "○—○" indicates a continuity of electricity.



## Compass display (FX Cruiser SHO)

### 1. Check:

- Compass display  
Incorrect reading → Check the installation condition of the compass and air temperature sensor.

### Checking steps:

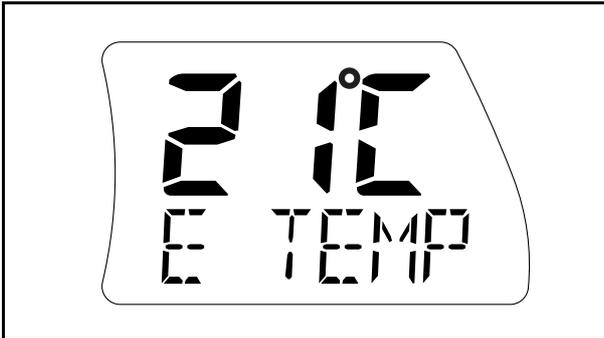
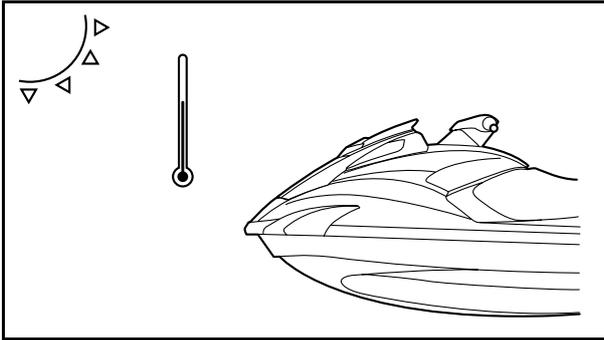
1. Using a compass for reference, point the watercraft north.
2. Select the compass display mode of the multifunction meter and check that "NORTH" appears on the meter.

### 2. Check:

- Compass and air temperature sensor installation condition  
Installed correctly → Replace the compass and air temperature sensor.

### Checking steps:

1. Remove the center cover.  
Refer to "Center cover removal" in Chapter 8.
2. Check that the arrow @ on the compass and air temperature sensor is facing toward the bow.



### Air temperature display (FX Cruiser SHO)

#### 1. Check:

- Air temperature display  
Incorrect reading → Replace the compass and air temperature sensor.

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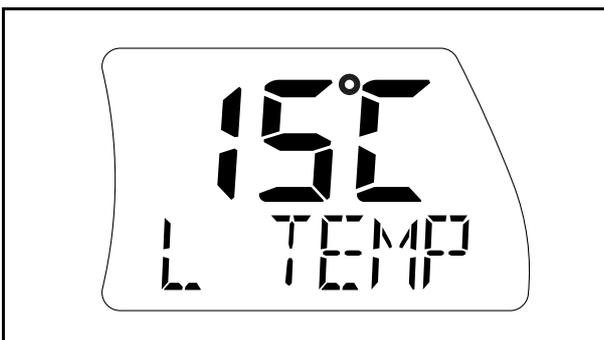
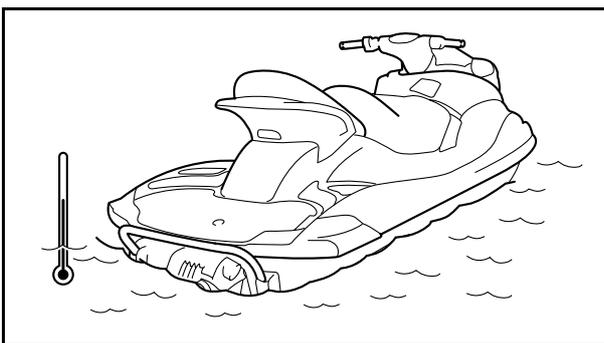
#### Checking steps:

1. Measure the ambient air temperature.
2. Select the air temperature display mode of the multifunction meter and check the air temperature displayed on the meter.
3. Check the air temperature displayed on the multifunction meter is less than  $\pm 5\text{ }^{\circ}\text{C}$  ( $\pm 9\text{ }^{\circ}\text{F}$ ) different from the ambient air temperature.

#### NOTE:

Check the air temperature display when the engine is cold.

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### Water temperature display (FX Cruiser SHO)

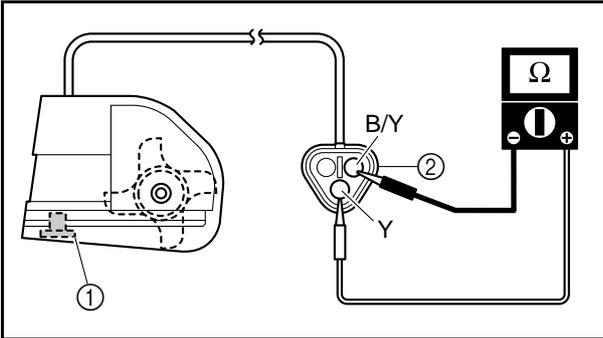
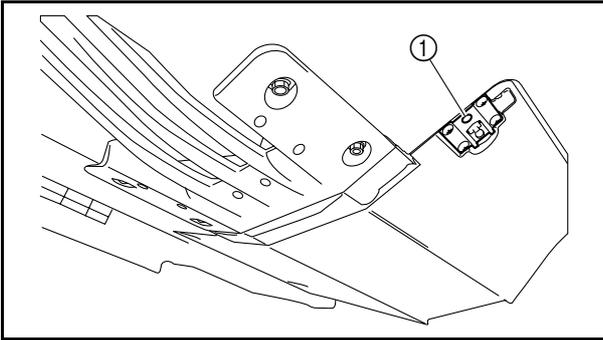
#### 1. Check:

- Water temperature display  
Incorrect reading → Measure the speed and water temperature sensor resistance.

---

#### Checking steps:

1. Measure the ambient water temperature.
  2. Select the water temperature display mode of the multifunction meter and check the water temperature displayed on the meter.
  3. Check the water temperature displayed on the multifunction meter is less than  $\pm 5\text{ }^{\circ}\text{C}$  ( $\pm 9\text{ }^{\circ}\text{F}$ ) different from the ambient water temperature.
-

**2. Measure:**

- Speed and water temperature sensor ① resistance  
Within specification → Replace the compass and air temperature sensor.  
Out of specification → Replace the speed and water temperature sensor.

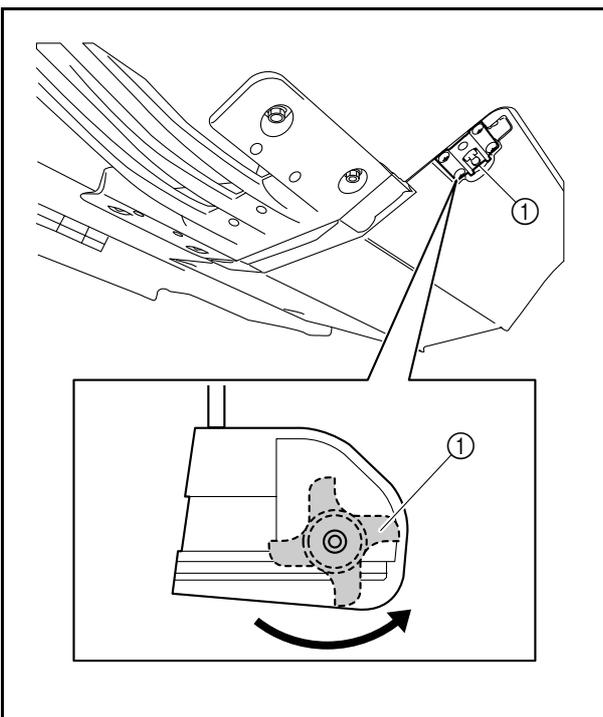
**Measurement steps:**

1. Disconnect the speed and water temperature sensor coupler ②.  
Refer to “Steering master removal” in Chapter 8.
2. Measure the resistance of the water temperature sensor ①.

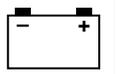


Speed and water temperature sensor resistance at 25 °C (77 °F) (reference data):

Yellow (Y) – Black/yellow (B/Y)  
10 kΩ

**Speed sensor****1. Check:**

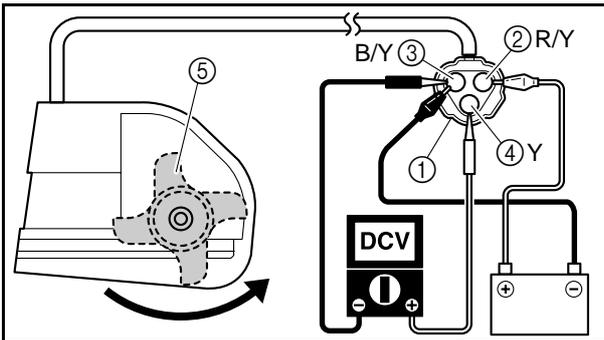
- Speed sensor paddle wheel ①  
Cracks/damage/rough movement → Replace the speed sensor (FX SHO) or speed and water temperature sensor (FX Cruiser SHO).



## Digital speedometer display (FX SHO)

### 1. Measure:

- Speed sensor output voltage  
Within specification → Replace the multifunction meter.  
Out of specification → Replace the speed sensor.



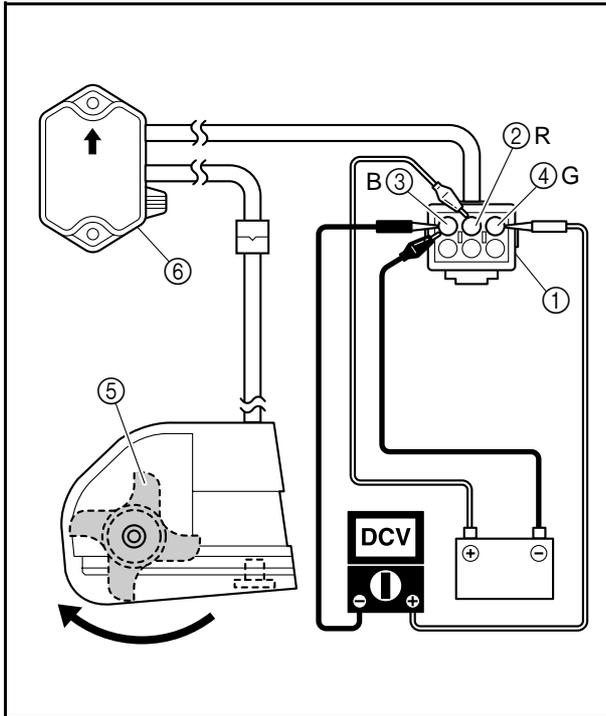
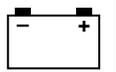
### Measurement steps:

1. Disconnect the speed sensor coupler ①.  
Refer to “Steering master removal” in Chapter 8.
2. Connect the positive battery lead to the terminal ②, and the negative battery lead to the terminal ③.
3. Connect the tester leads between the terminal ④ and terminal ③.
4. Rotate the paddle wheel ⑤ by hand and measure the output voltage between the terminal ④ and terminal ③.



Speed sensor output voltage  
(dependant on the paddle wheel  
position):

Yellow (Y) – Black/yellow (B/Y)  
Less than 400 mV/  
More than 11.6 V



## Digital speedometer display (FX Cruiser SHO)

### 1. Measure:

- Speed and water temperature sensor output voltage  
Within specification → Replace the multifunction meter.  
Out of specification → Replace the speed and water temperature sensor or compass and air temperature sensor.

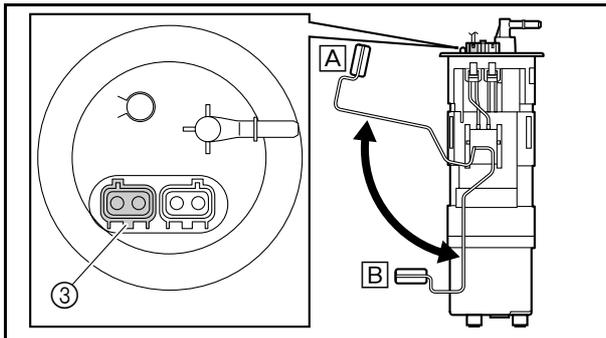
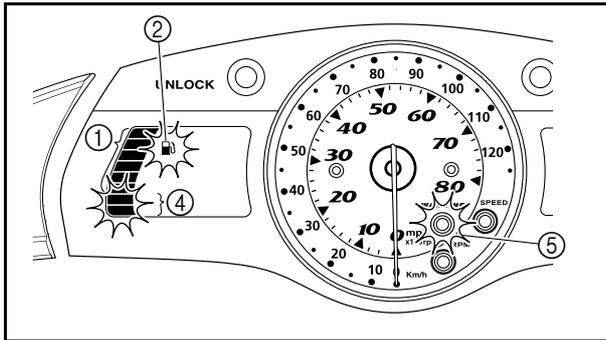
### Measurement steps:

- Disconnect the compass and air temperature sensor coupler ①.  
Refer to “Steering master removal” in Chapter 8.
- Connect the positive battery lead to the terminal ②, and the negative battery lead to the terminal ③.
- Connect the tester leads between the terminal ④ and terminal ③.
- Rotate the paddle wheel ⑤ by hand and measure the output voltage between the terminal ④ and terminal ③.



Speed and water temperature sensor output voltage (dependant on the paddle wheel position):  
Green (G) – Black (B)  
Less than 400 mV/  
More than 4.5 V

- Check the output voltage again after replacing the speed and water temperature sensor. If still out of specification, replace the compass and air temperature sensor ⑥.



## Fuel level meter display and fuel level warning indicator

### 1. Check:

- Fuel level meter display ① and fuel level warning indicator ②

Do not come on → Replace the multi-function meter.

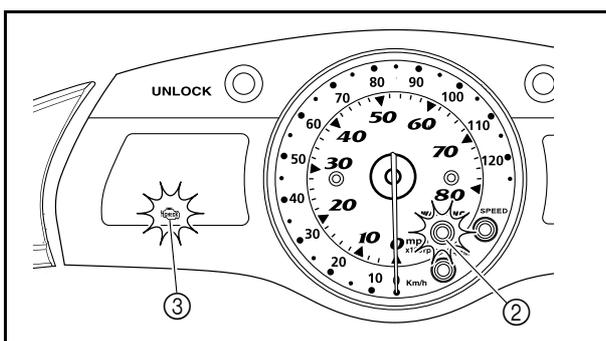
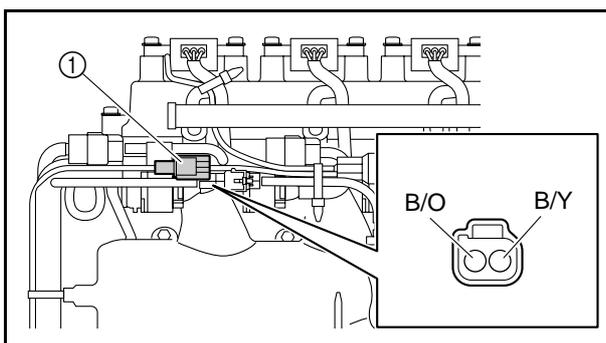
### Checking steps:

- Remove the fuel pump module assembly. Refer to “Fuel tank removal” in Chapter 4.
- Connect the fuel sender coupler ③.
- Lift the float to the upper position [A].
- Push the unlock button.
- Check that all fuel level segments come on.
- Lower the float to the lowest position [B].
- Check that the fuel level warning indicator ②, the lowest 2 fuel level segments ④, and the “WARNING” indicator light ⑤ blink.

## Check engine warning indicator

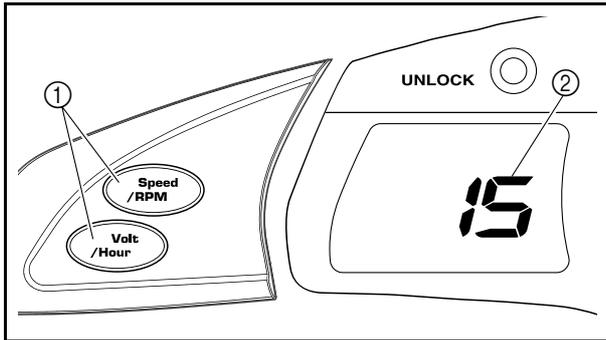
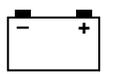
### 1. Check:

- Check engine warning indicator Does not come on → Check the “Diagnosis record” of the YDIS.



### Checking steps:

- Disconnect the engine temperature sensor coupler ①.
- Push the unlock button.
- Check that the “WARNING” indicator light ② and the check engine warning indicator ③ begin to blink.
- If the light and indicator do not blink, check the “Diagnosis record” of the YDIS. If a diagnosis record is available and it is caused by the checking steps, replace the multifunction meter.



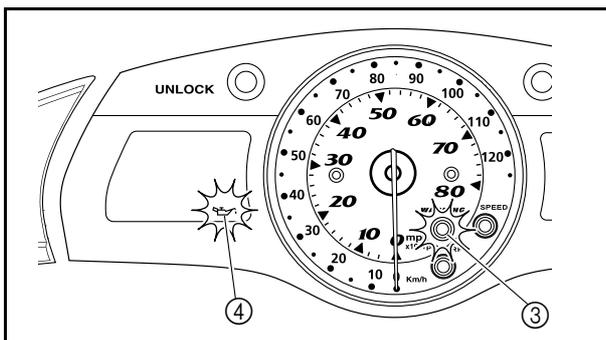
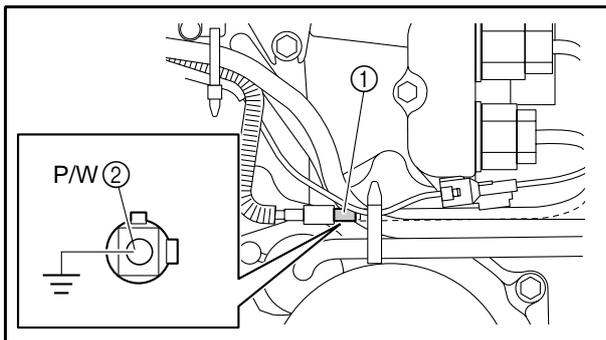
## Diagnostic display

### 1. Check:

- Diagnostic display  
Does not come on → Check the “Diagnosis record” of the YDIS.

### Checking steps:

1. Create a condition so that a diagnostic code is recorded.
2. Push the unlock button.
3. Simultaneously push the 2 buttons ① for 8 seconds and check that the diagnostic code ② is indicated.
4. If the diagnostic code is not indicated, check the “Diagnosis record” of the YDIS. If a diagnosis record is available and it is caused by the checking steps, replace the multifunction meter.



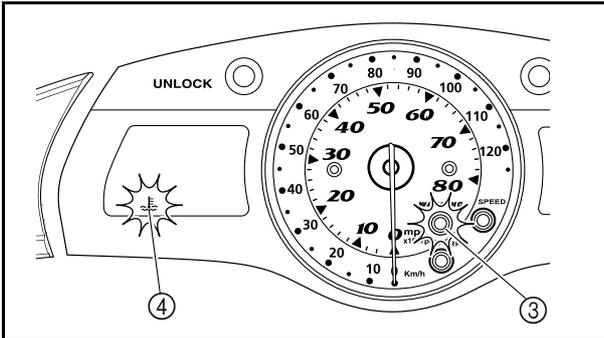
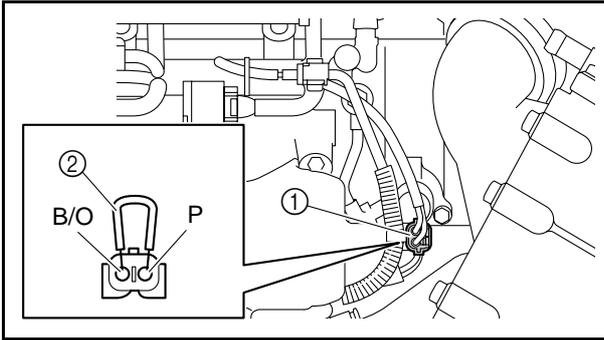
## Oil pressure warning indicator

### 1. Check:

- Oil pressure warning indicator  
Does not come on → Check the “Diagnosis record” of the YDIS.

### Checking steps:

1. Disconnect the oil pressure switch coupler ①, and then ground the terminal ②.
2. Start the engine.
3. Increase the engine speed to 4,500 r/min or more.
4. Check that the “WARNING” indicator light ③ and the oil pressure warning indicator ④ blink, and the buzzer sounds intermittently.
5. If the light and indicator do not blink, check the “Diagnosis record” of the YDIS. If a diagnosis record is available and it is caused by the checking steps, replace the multifunction meter.



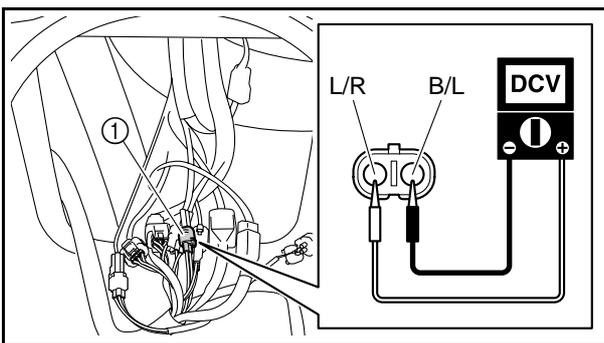
## Engine overheat warning indicator

### 1. Check:

- Engine overheat warning indicator  
Does not come on → Check the “Diagnosis record” of the YDIS.

### Checking steps:

1. Disconnect the thermoswitch coupler ①.
2. Connect the jumper lead ② to the thermoswitch coupler terminals (wiring harness end).
3. Start the engine and operate it at trolling speed for about 2 minutes.
4. Check that the “WARNING” indicator light ③ and the engine overheat warning indicator ④ blink, and then come on, and the buzzer begins to sound intermittently, and then it sounds continuously.
5. If the light and indicator do not blink, check the “Diagnosis record” of the YDIS. If a diagnosis record is available and it is caused by the checking steps, replace the multifunction meter.



## Buzzer

### 1. Measure:

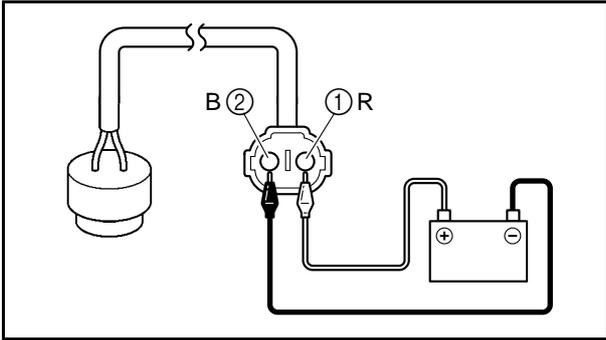
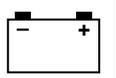
- Buzzer input voltage  
Out of specification → Check the wiring harness.

### Measurement steps:

1. Disconnect the buzzer coupler ①.
2. Push the unlock button, and then measure the input voltage at the buzzer coupler terminals (wiring harness end).



Buzzer input voltage (reference data):  
Blue/red (L/R) – Black/blue (B/L)  
11.0–12.0 V

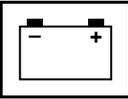
**2. Check:**

- Buzzer operation  
Does not sound → Replace the buzzer.

**Checking steps:**

1. Remove the buzzer.  
Refer to “Steering master disassembly” in Chapter 8.
2. Connect the positive battery lead to the terminal ① and the negative battery lead to the terminal ②.
3. Check that the buzzer sounds.

**ELEC**



Indication system

E

**— MEMO —**

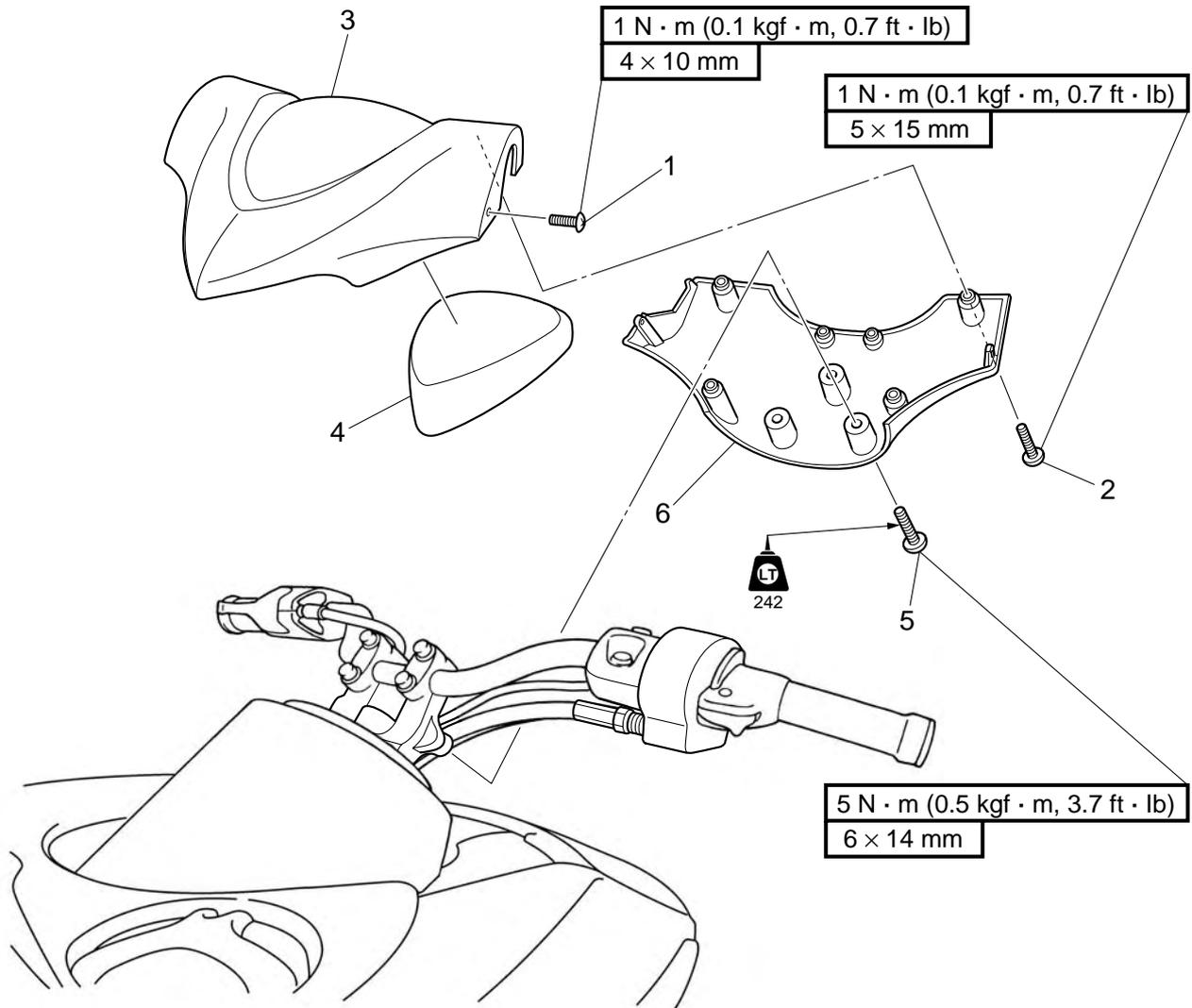
## Chapter 8 Hull and hood

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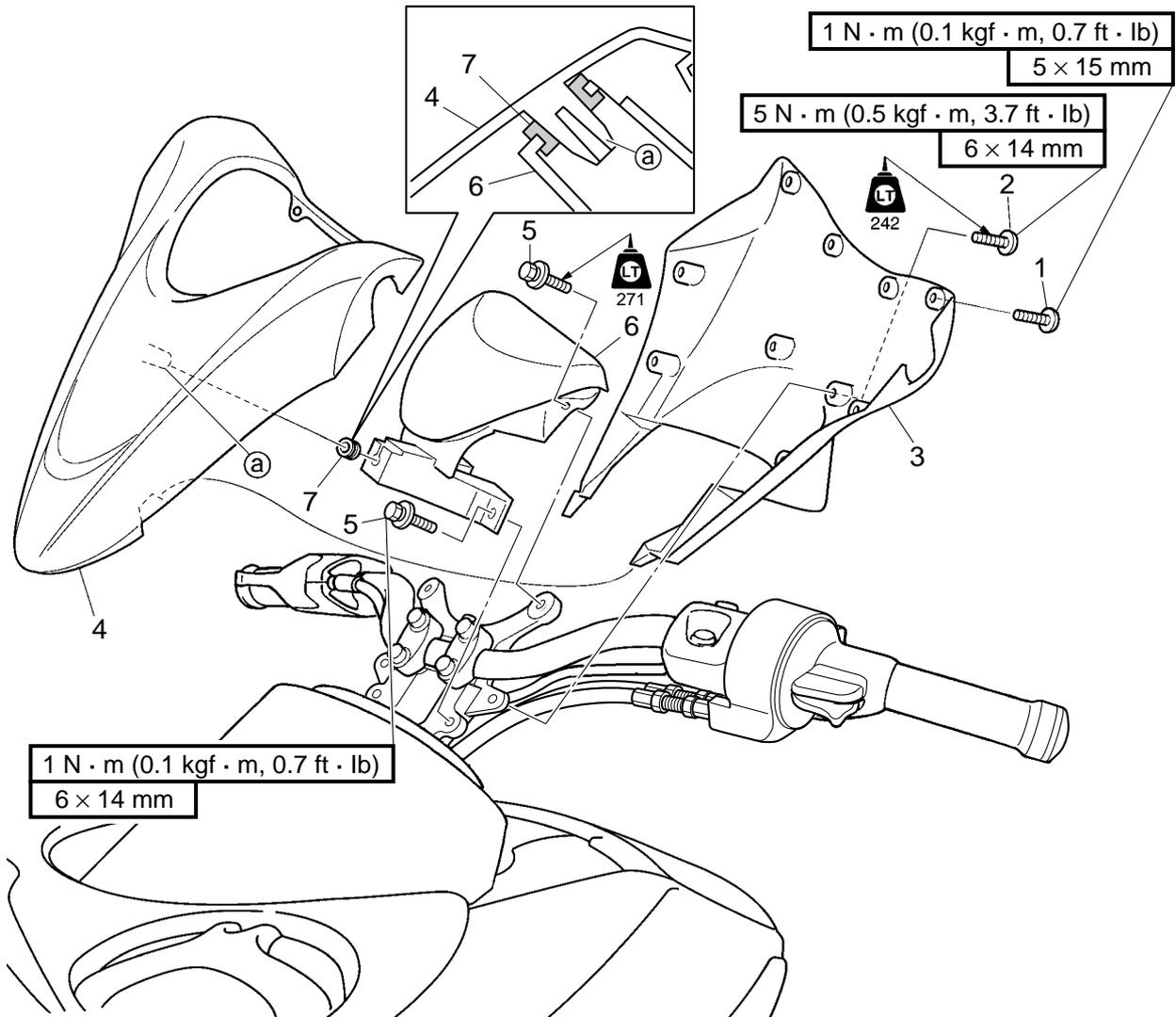
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**Handlebar**  
**Steering pad removal (FX SHO)**



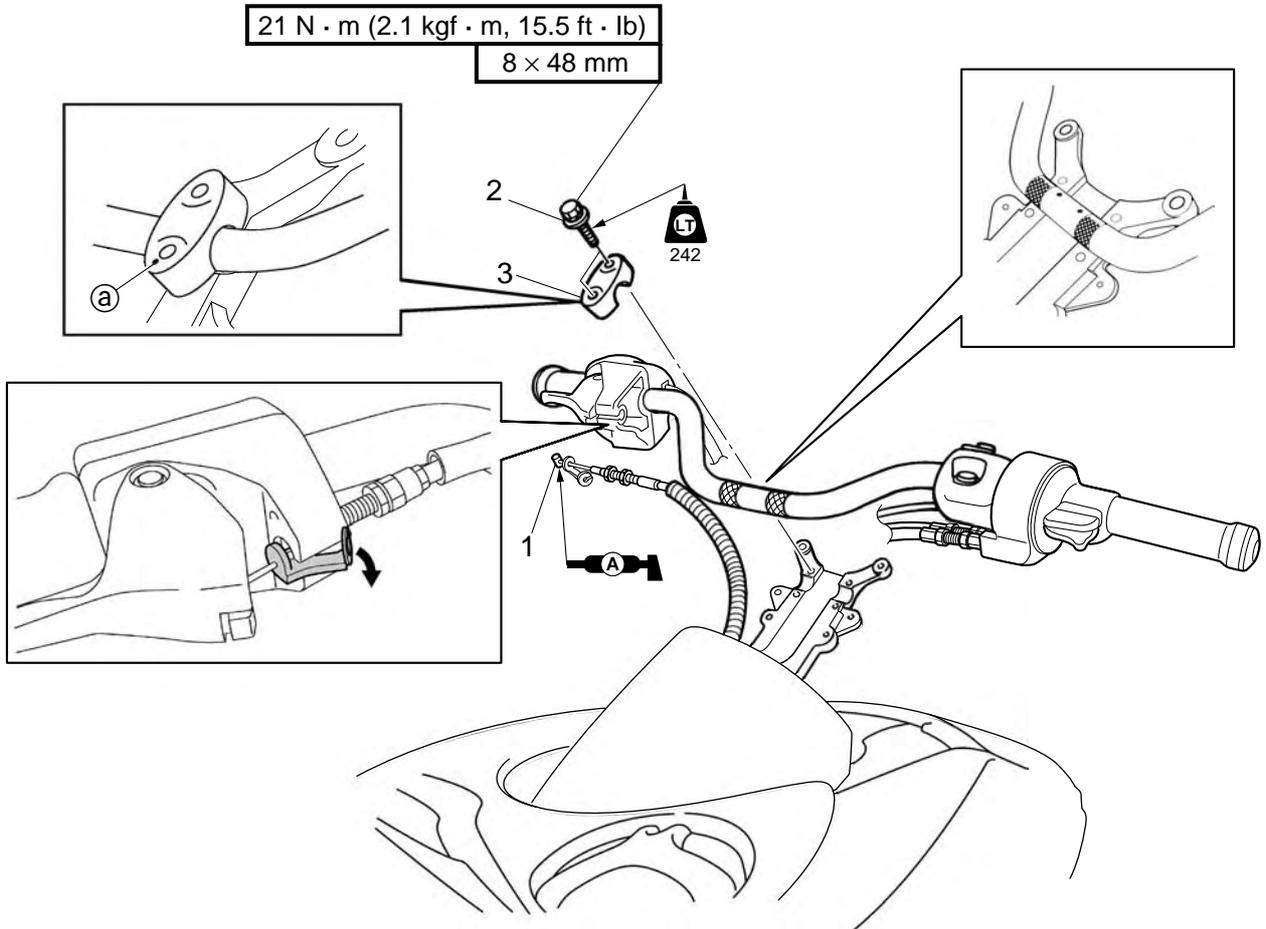
Step	Procedure/Part name	Q'ty	Service points
1	Screw	2	Reverse the removal steps for installation.
2	Screw	6	
3	Upper handlebar cover	1	
4	Steering pad	1	
5	Screw	3	
6	Lower handlebar cover	1	

**Steering pad removal (FX Cruiser SHO)**



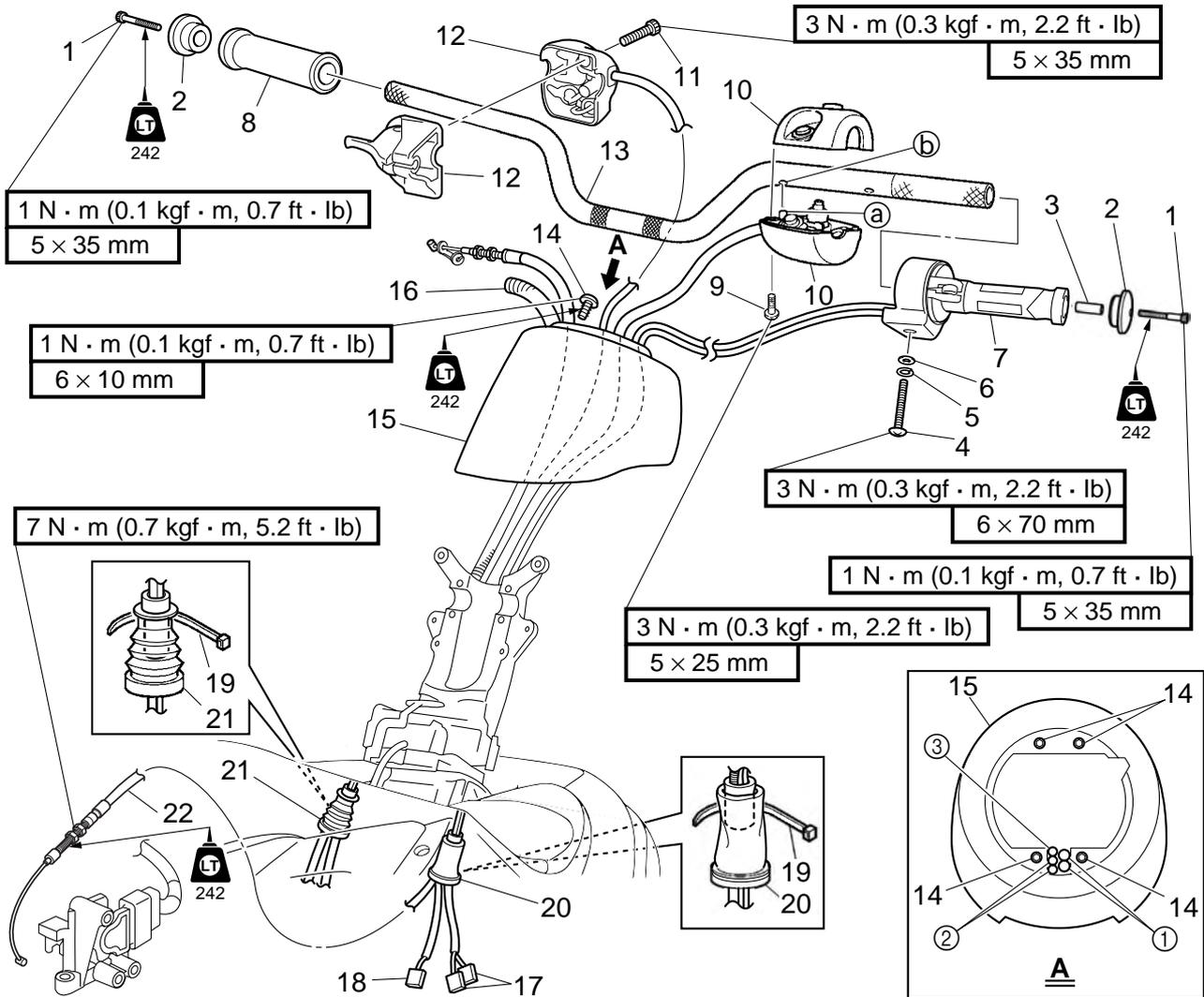
Step	Procedure/Part name	Q'ty	Service points
1	Screw	8	<p><b>NOTE:</b> _____</p> <p>Be sure to insert the projection (a) on the upper handlebar cover completely into the grommet.</p>
2	Screw	2	
3	Lower handlebar cover	1	
4	Upper handlebar cover	1	
5	Bolt	4	<p>Reverse the removal steps for installation.</p>
6	Steering pad	1	
7	Grommet	1	

**Handlebar holder removal**

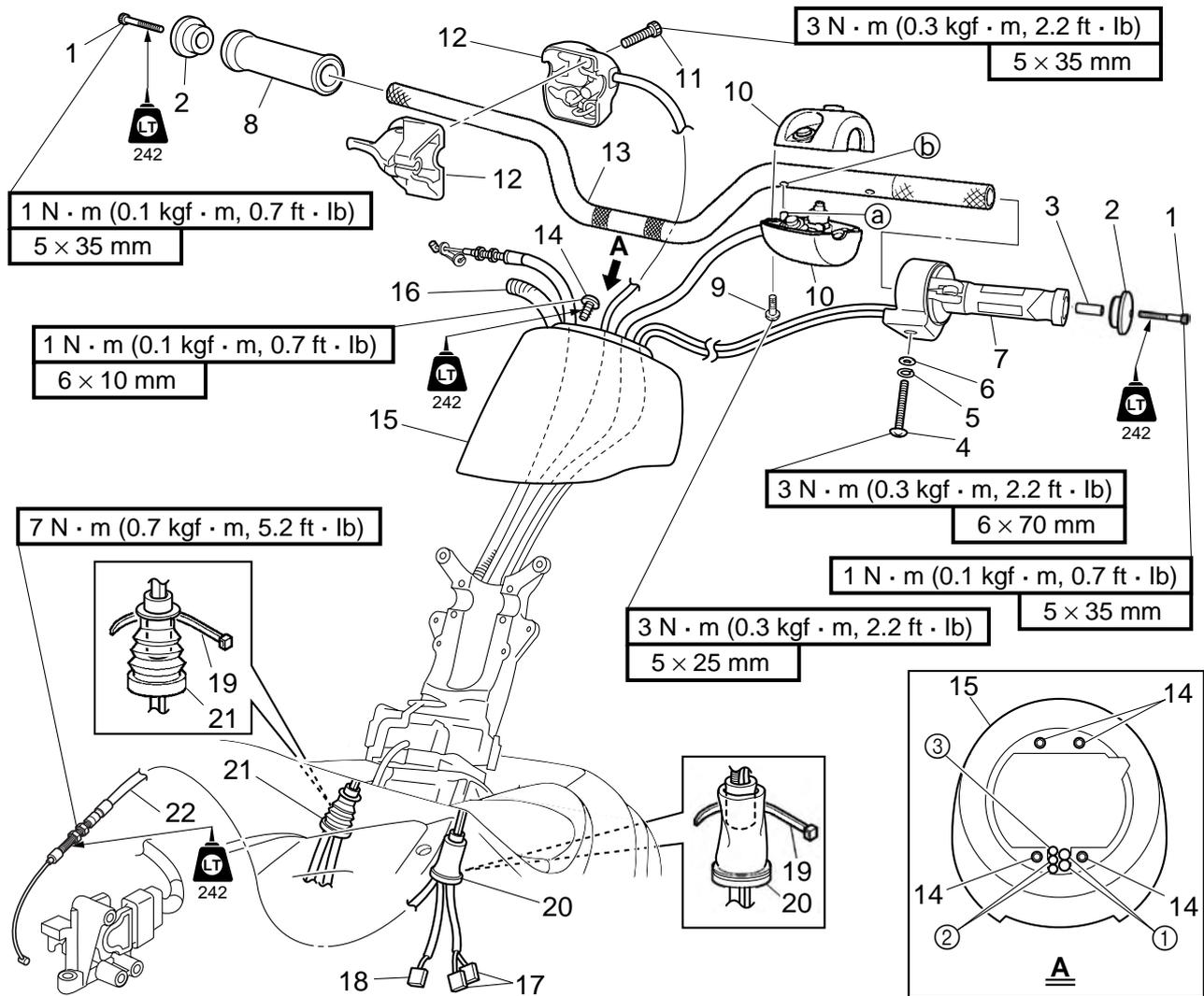


Step	Procedure/Part name	Q'ty	Service points
1	Throttle cable	1	<b>NOTE:</b> _____ Be sure to remove the throttle cable seal as shown.
2	Bolt	4	
3	Upper handlebar holder	2	@ Punch mark Reverse the removal steps for installation.

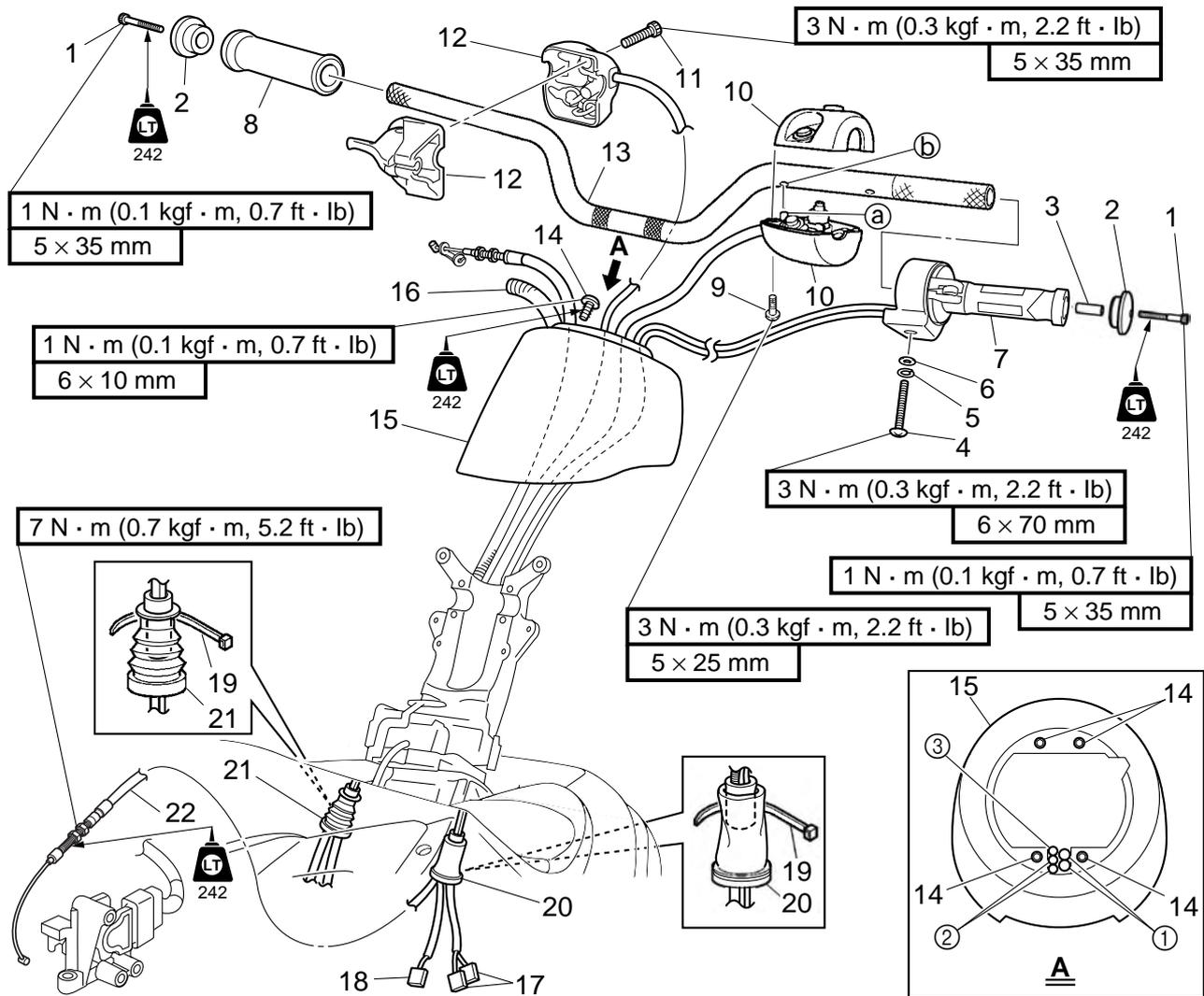
**Handlebar assembly removal**



Step	Procedure/Part name	Q'ty	Service points
1	Bolt	2	<p><b>NOTE:</b> _____                      Apply adhesive to the handlebar and the inner surface of the handlebar grip.                      _____</p>
2	Grip end	2	
3	Spacer	1	
4	Screw	1	
5	Spring washer	1	
6	Washer	1	
7	QSTS grip assembly	1	
8	Right handlebar grip	1	
9	Screw	2	

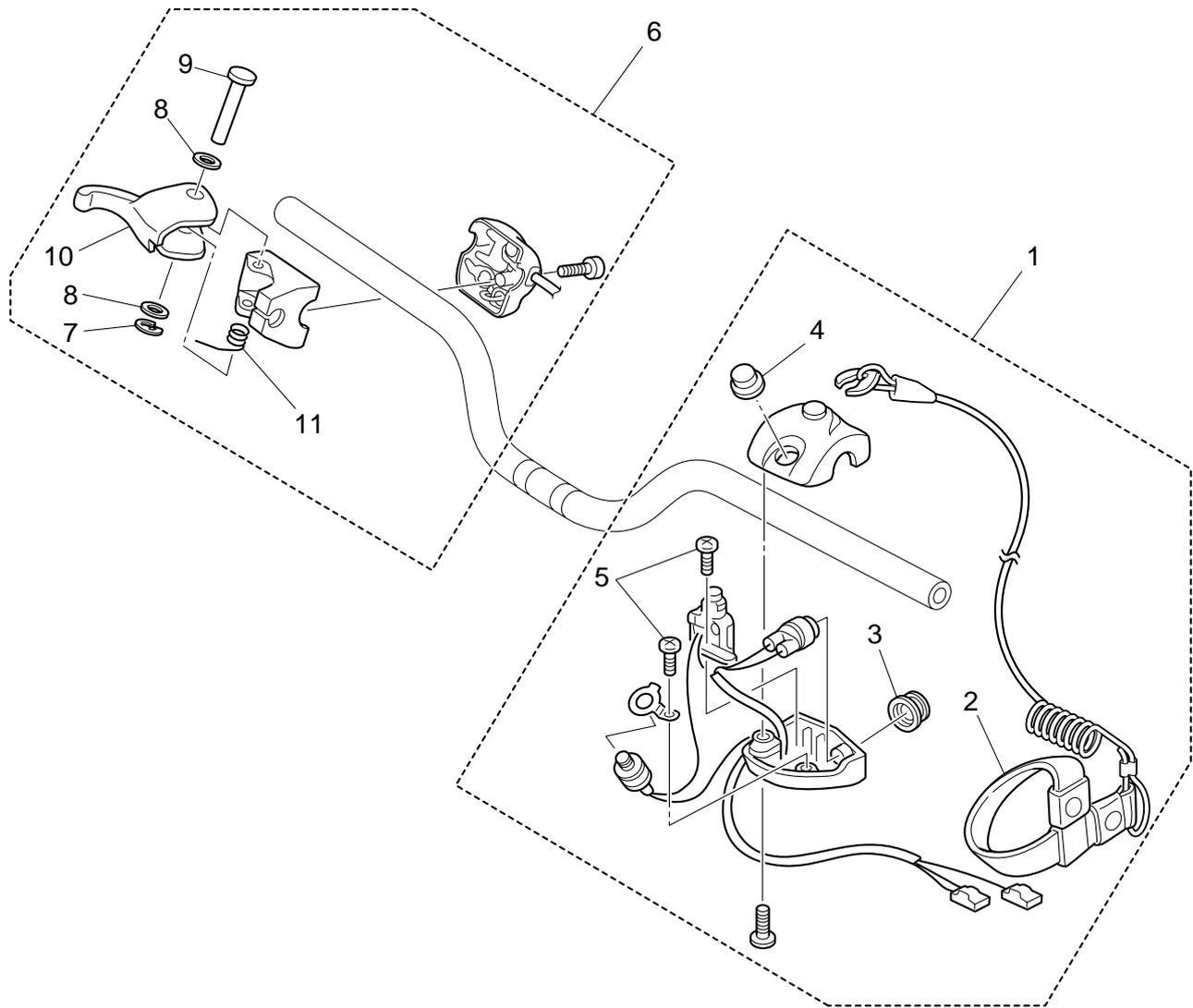


Step	Procedure/Part name	Q'ty	Service points
10	Left handlebar switch assembly	1	<b>NOTE:</b> _____ Align the projection ① on the handlebar switch assembly with the handlebar hole ②.
11	Bolt	2	<b>NOTE:</b> _____ Tighten the upper bolt first when installing the right handlebar switch assembly.
12	Right handlebar switch assembly	1	
13	Handlebar	1	
14	Screw	4	



Step	Procedure/Part name	Q'ty	Service points
15	Handle boss cover	1	<p><b>NOTE:</b> _____</p> <ul style="list-style-type: none"> <li>Route the QSTS cables ① through the starboard side in the cutout of handle boss cover.</li> <li>Route the handlebar switch leads ② and throttle cable ③ through the port side in the cutout of handle boss cover.</li> </ul>
16	Corrugated tube (throttle cable)	1	
17	Left handlebar switch coupler	2	
18	Right handlebar switch coupler	1	
19	Plastic tie	2	<p>Reverse the removal steps for installation.</p>
20	Grommet	1	
21	Grommet	1	
22	Throttle cable	1	

**Left and right handlebar switch disassembly**



Step	Procedure/Part name	Q'ty	Service points
1	Left handlebar switch assembly	1	Reverse the disassembly steps for assembly.
2	Engine shut-off cord	1	
3	Stop button assembly	1	
4	Start button assembly	1	
5	Screw	2	
6	Right handlebar switch assembly	1	
7	E-ring	1	
8	Washer	2	
9	Shaft	1	
10	Lever	1	
11	Spring	1	



### Handlebar check

**1. Check:**

- Handlebar  
Bends/cracks/damage → Replace the handlebar.

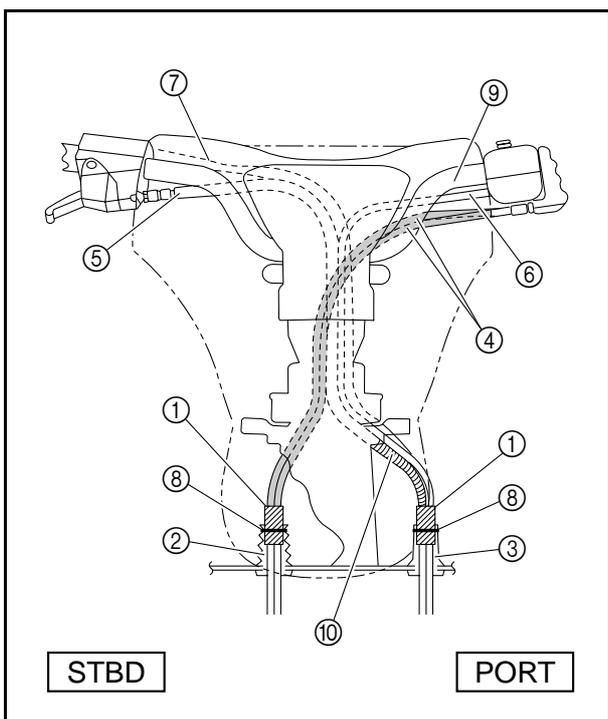
### Handlebar switch assembly check

**1. Check:**

- Left handlebar switch assembly
- Right handlebar switch assembly  
Cracks/damage → Replace the handlebar switch assembly.

**NOTE:** \_\_\_\_\_

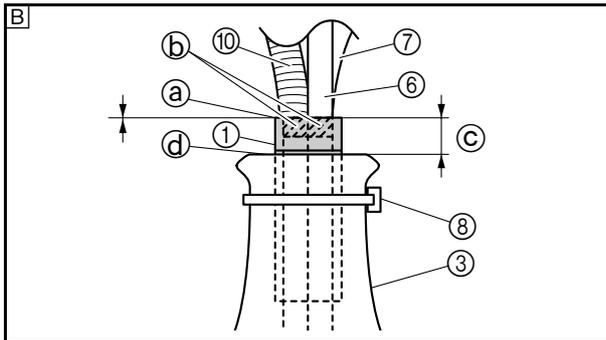
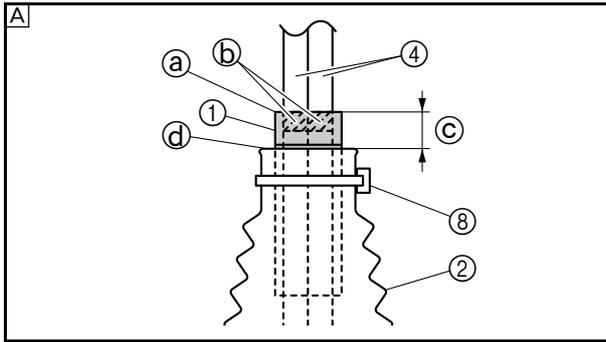
To check the operation and continuity of the left hand right handlebar switches, refer to “Left handlebar switch assembly” and “Right handlebar switch assembly” in Chapter 7.



### Handlebar assembly installation

**1. Install:**

- Packings ①
- Grommet ②
- Grommet ③
- QSTS cables ④
- Throttle cable ⑤
- Left handlebar switch lead ⑥
- Right handlebar switch lead ⑦
- Plastic ties ⑧
- Handlebar ⑨
- Corrugated tube (throttle cable) ⑩



**Installation steps:**

1. Wrap the packings ①, making sure to align the upper edge ② of the packing with the upper edge of the marking tape ③ on the lead and cable.



**Marking tape ③:**

**FX SHO:**

- Throttle cable – White
- QSTS cable – White
- Handlebar switch leads – Blue

**FX Cruiser SHO:**

- Throttle cable – Gray
- QSTS cable – Blue
- Handlebar switch leads – Blue

2. Install the packing into the grommets ② and ③.
3. Make sure that the edge of the packing is the specified distance C from the upper edge ④ of the grommet.



**Installation distance C:**

10 mm (0.39 in)

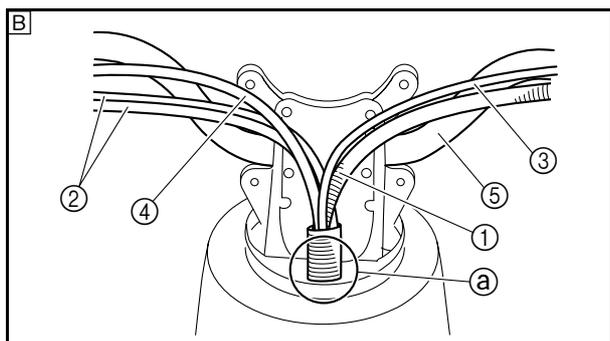
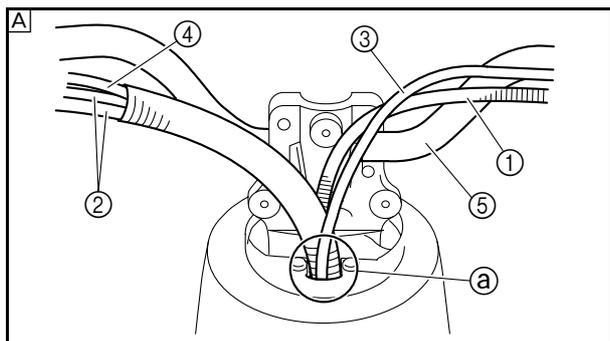
4. Fasten the end of each grommet with the plastic tie ⑧.

**NOTE:**

Position the corrugated tube ⑩ for the throttle cable so that the end of the tube makes contact with the packing ① as shown.

**A** STBD

**B** PORT



**2. Route:**

- Throttle cable ①
- QSTS cable ②
- Right handlebar switch lead ③
- Left handlebar switch lead ④

**Routing steps:**

1. Route the throttle cable ① as shown.
2. Make sure that the throttle cable ①, QSTS cables ②, and handlebar switch leads ③ and ④ pass through the opening ① in the center of the handle boss cover. Reroute the cables and leads if they are not routed correctly.
3. Make sure that there is slack in the throttle cable ①, QSTS cables ②, and handlebar switch leads ③ and ④ when the handlebar ⑤ is turned to the left and right. Reroute the cables and lead if there is no slack.

**A** FX SHO

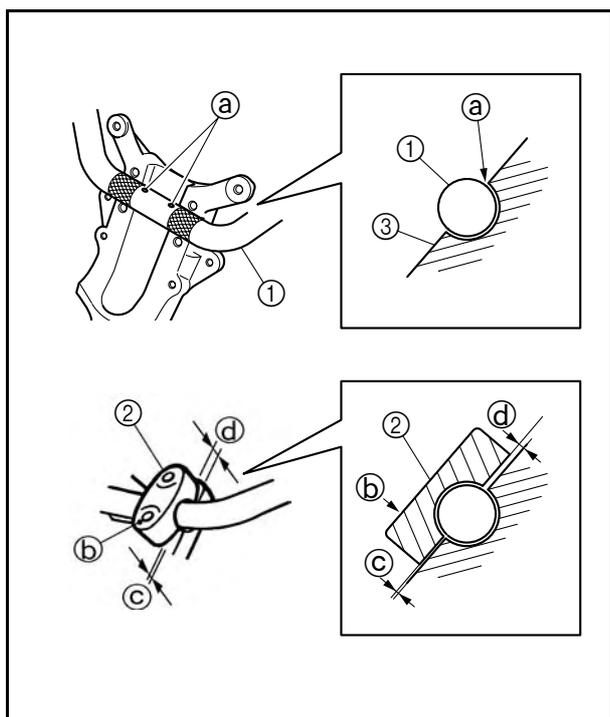
**B** FX Cruiser SHO

**3. Install:**

- Handlebar ①
- Upper handlebar holders ②

**Installation steps:**

1. Align the punch marks ① on the handlebar ① with the top surface of the steering shaft ③.
2. Install the upper handlebar holders ② with the punch marks ② facing forward, making sure that clearance ③ is narrower than clearance ④.

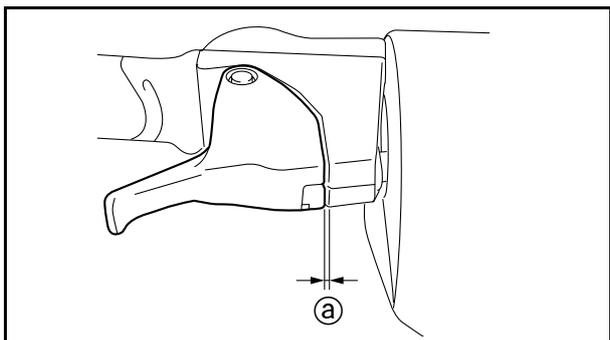
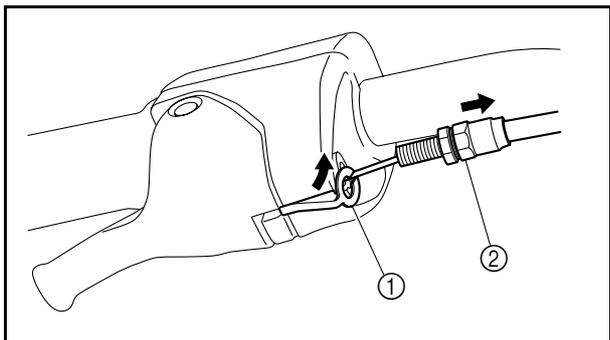
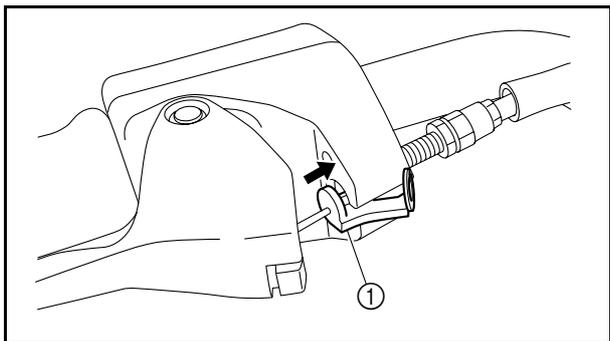


**Clearance (reference data):**

- ③: 0.4 mm (0.02 in)
- ④: 2.4 mm (0.09 in)



**Handlebar holder bolt:**  
21 N·m (2.1 kgf·m, 15.5 ft·lb)  
LOCTITE 242



**4. Install:**

- Throttle cable

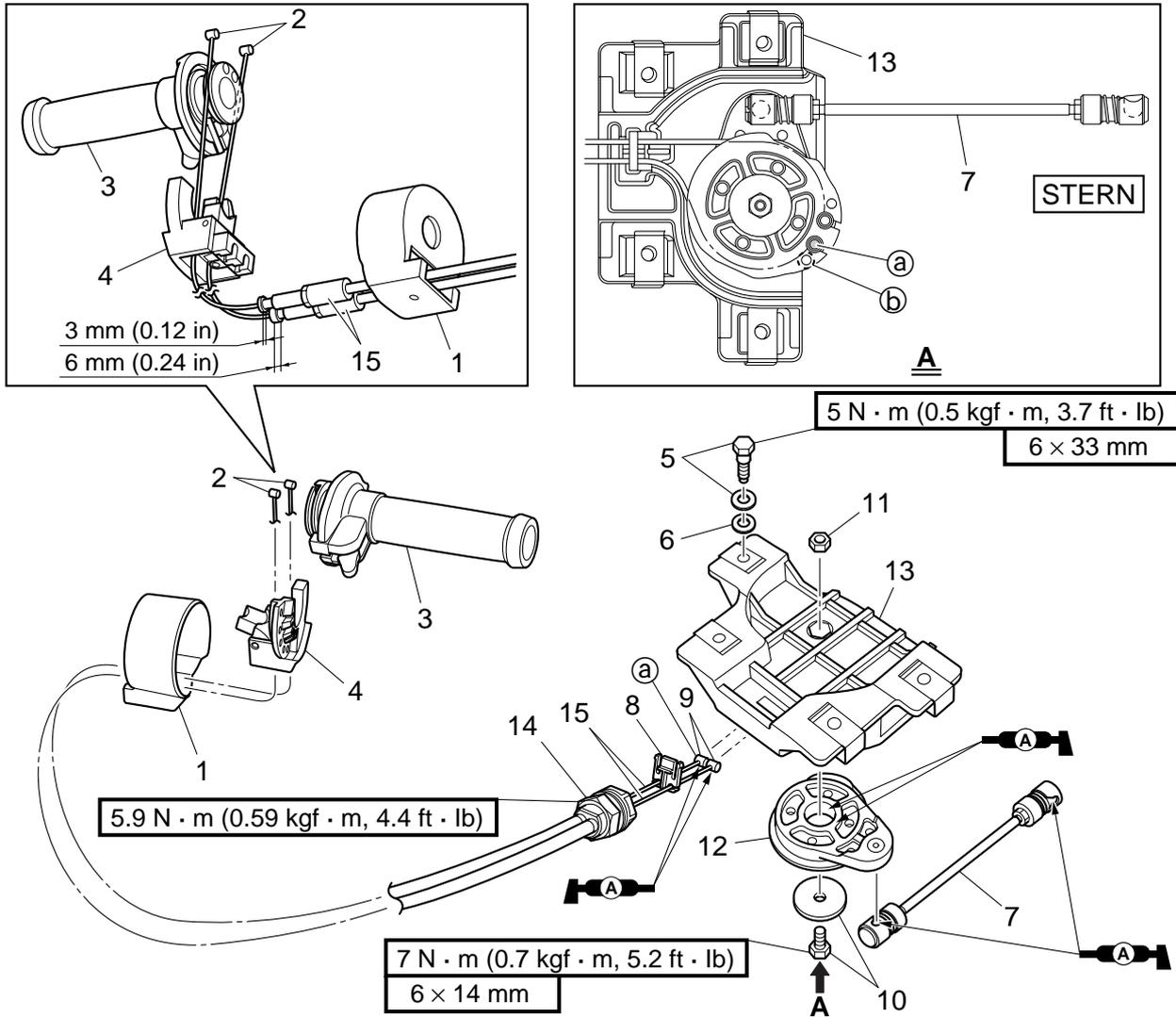
**Installation steps:**

1. Install the throttle cable end into the throttle lever.
2. Fit the seal ① into the groove in the bracket.
3. Pull the throttle cable ② in the direction of the arrow shown, and then fit the end of the seal ① around the inner cable.
4. Adjust the throttle lever free play.  
Refer to "Throttle lever free play check and adjustment" in Chapter 3.

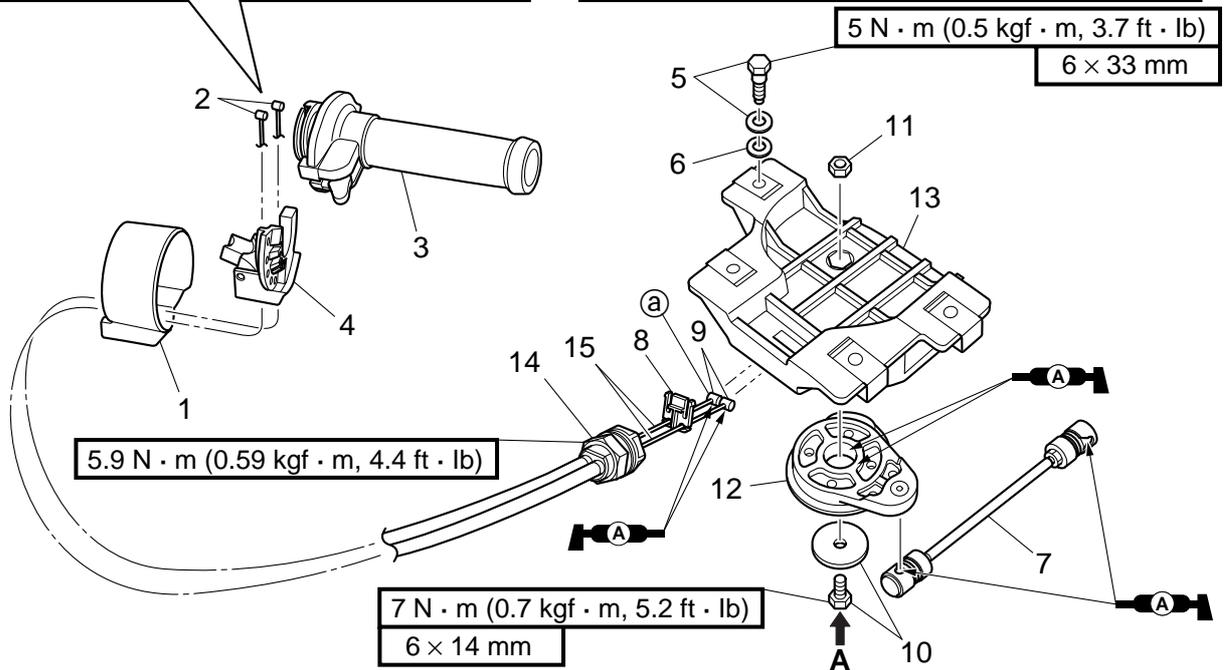
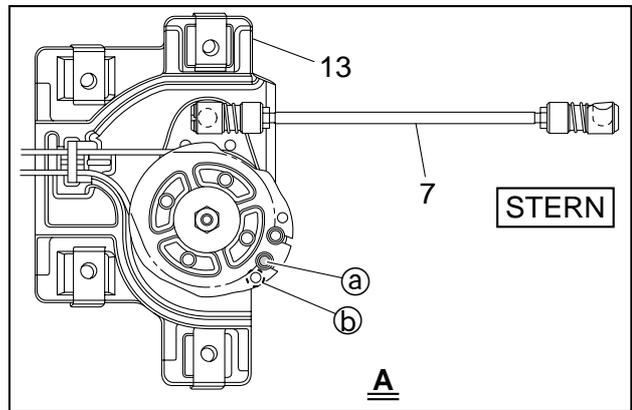
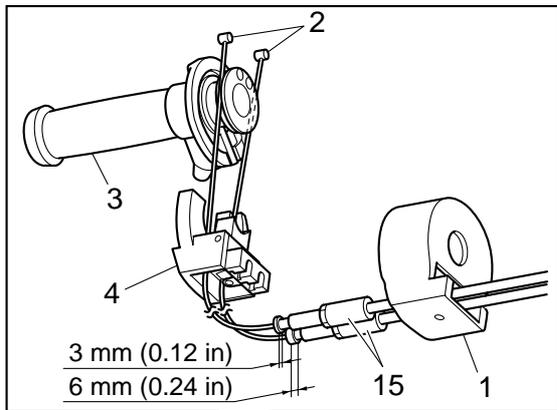


Throttle lever free play ②:  
2.0–5.0 mm (0.08–0.20 in)

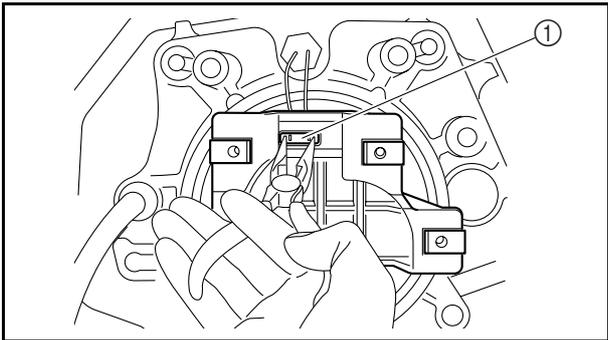
**QSTS grip and converter**  
**QSTS grip and converter disassembly**



Step	Procedure/Part name	Q'ty	Service points
	Jet pump unit		Refer to "Jet pump unit removal" in Chapter 6.
	Water tank		Refer to "Exhaust system and battery removal."
	QSTS grip assembly		Refer to "Handlebar assembly removal."
1	Cover	1	
2	Cable end	2	
3	Grip	1	
4	Housing	1	
5	Bolt/washer	4/4	
6	Washer	4	
7	QSTS rod	1	



Step	Procedure/Part name	Q'ty	Service points
8	Cable guide	1	(a) Yellow paint mark  <b>NOTE:</b> _____ Before disassembly, make identification mark near the pulley STBD hole (b). _____
9	Cable end	2	
10	Bolt/washer	1/1	
11	Nut	1	
12	Pulley	1	
13	QSTS converter	1	Reverse the disassembly steps for assembly.
14	Nut	1	
15	QSTS cable	2	

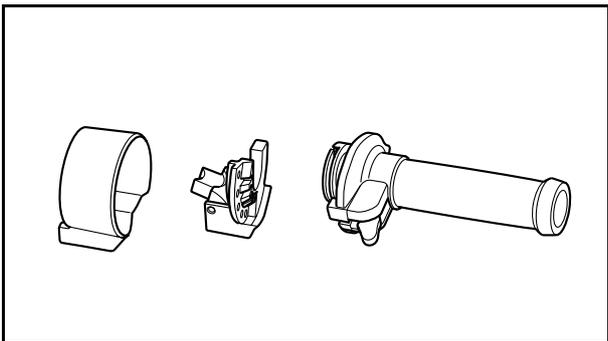


**QSTS cable removal**

- 1. Remove:**
  - QSTS converter
- 2. Remove:**
  - Cable guide ①

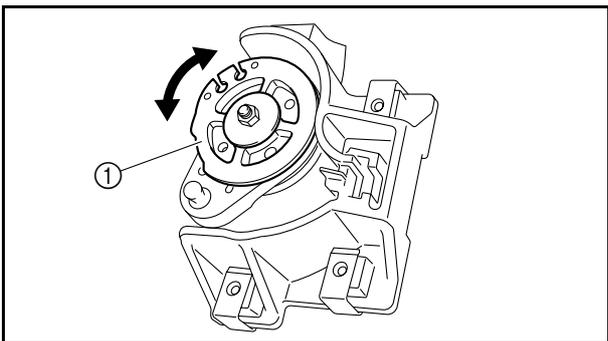
**NOTE:** \_\_\_\_\_  
 Remove the cable guide ① with needle-nose pliers as shown.

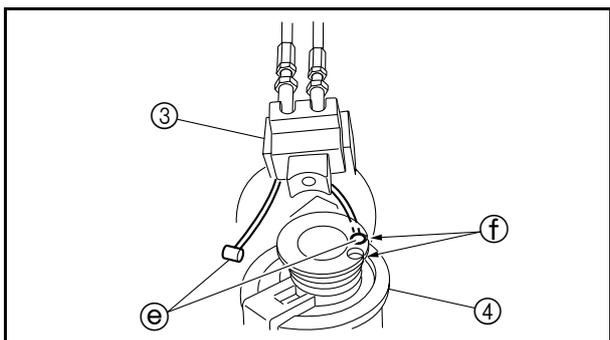
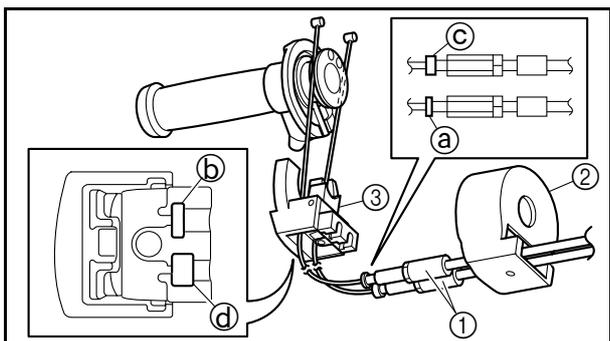
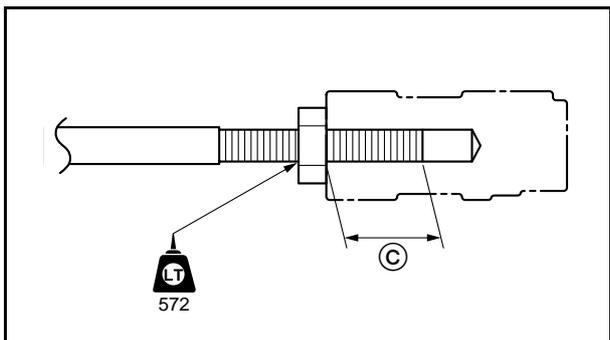
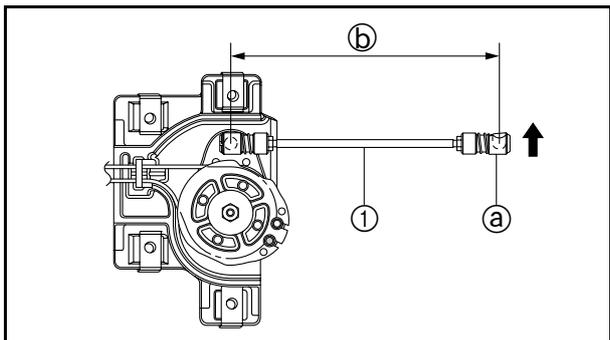
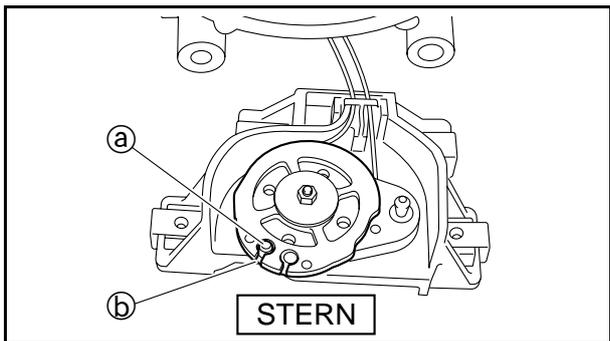
- 3. Remove:**
  - QSTS cable ends



**QSTS check**

- 1. Check:**
  - QSTS grip  
 Cracks/damage/wear → Replace the QSTS grip.
- 2. Check:**
  - QSTS cables  
 Damage/kinks → Replace the QSTS cables.
  - QSTS rod  
 Bends/damage → Replace the QSTS rod.
- 3. Check:**
  - Pulley ①  
 Rough movement/stiffness → Clean the pulley.  
 Damage → Replace the pulley.
  - QSTS converter  
 Cracks/damage/wear → Replace the QSTS converter.





**QSTS cable installation**

**1. Install:**

- QSTS cable ends

**NOTE:**

- Be sure to fit the QSTS cable end with yellow paint mark **a** into the STBD hole **b** of the pulley.
- Be careful not to twist the QSTS cables.

**2. Install:**

- QSTS rod **1**

**NOTE:**

Face the hole in the joint **a** of the QSTS rod **1** in the direction shown.



QSTS rod set length **b**:  
176 ± 0.5 mm (6.93 ± 0.02 in)



QSTS rod locknut:  
4 N·m (0.4 kgf·m, 3.0 ft·lb)  
LOCTITE 572

**⚠ WARNING**

The QSTS rod joint must be screwed in more than 8 mm (0.31 in) **c**.

**3. Install:**

- QSTS cables (handlebar end)

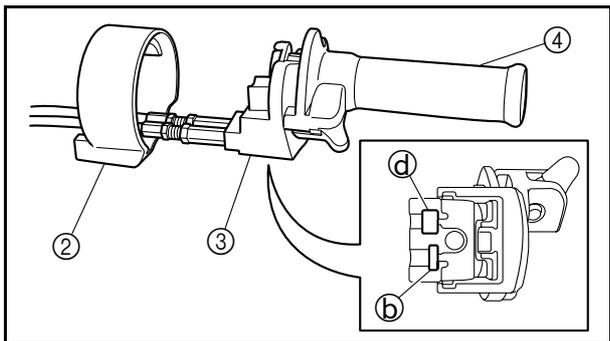
**Installation steps:**

1. Pass the QSTS cables **1** through the cover **2** and housing **3** as shown.

**NOTE:**

Pass the cable with the thin end **a** into the hole of the narrow groove **b** side and the cable with the thick end **c** into the hole of the wide groove **d** side.

2. Fit the cable ends **e** into the holes **f** of the grip **4**.



3. Fit the grip ④ into the housing ③.
4. Fit the QSTS cables ① into the housing ③.

**NOTE:** \_\_\_\_\_

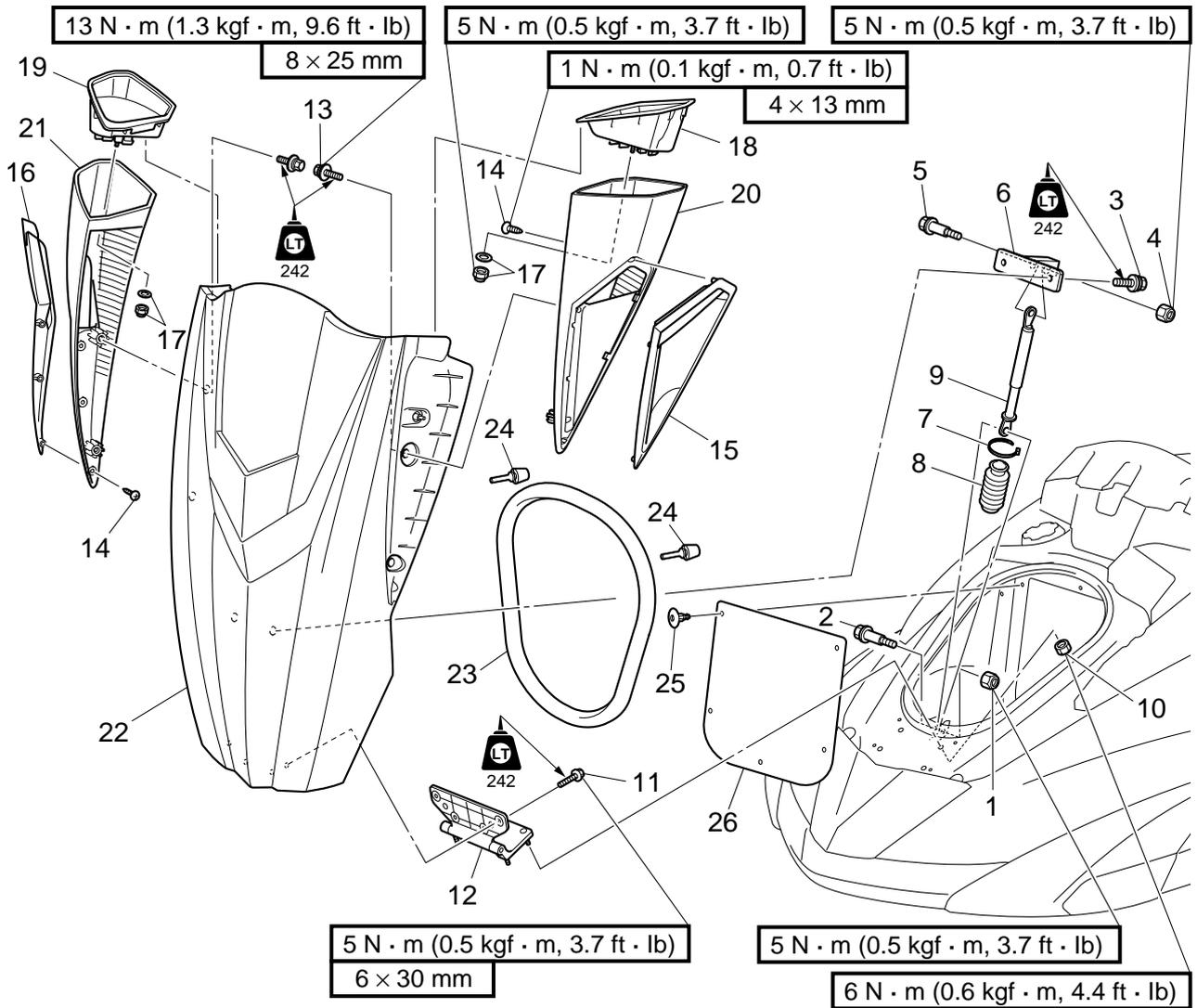
Fit the cable with the thin end ③ into the opening with the narrow groove ⑥ and the cable with the thick end ④ into the opening with the wide groove ⑦.

5. Fit the cover ② into the housing ③ and grip ④.

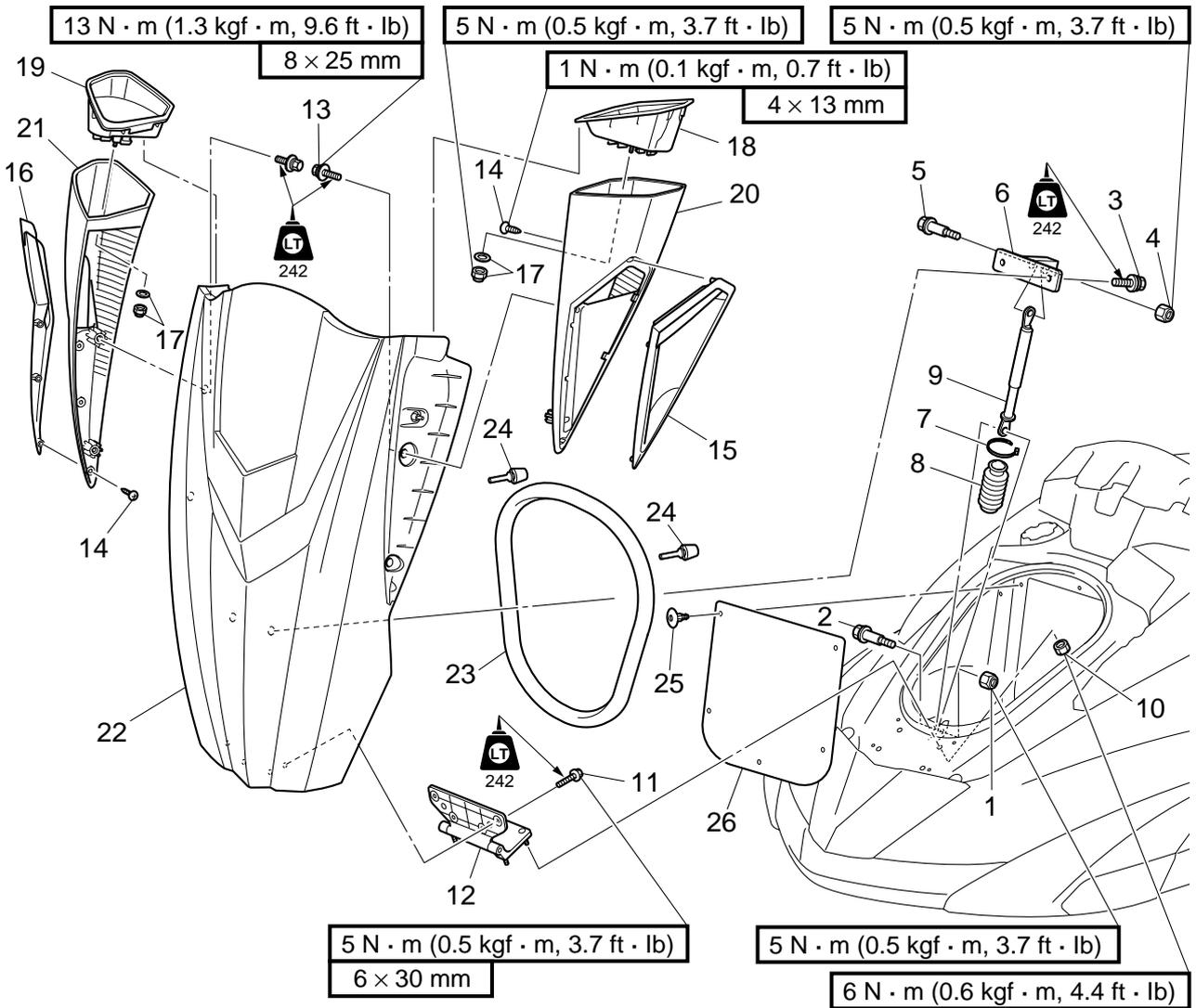
**4. Check:**

- QSTS nozzle angle  
Refer to “Jet thrust nozzle steering angle check and adjustment” in Chapter 3.

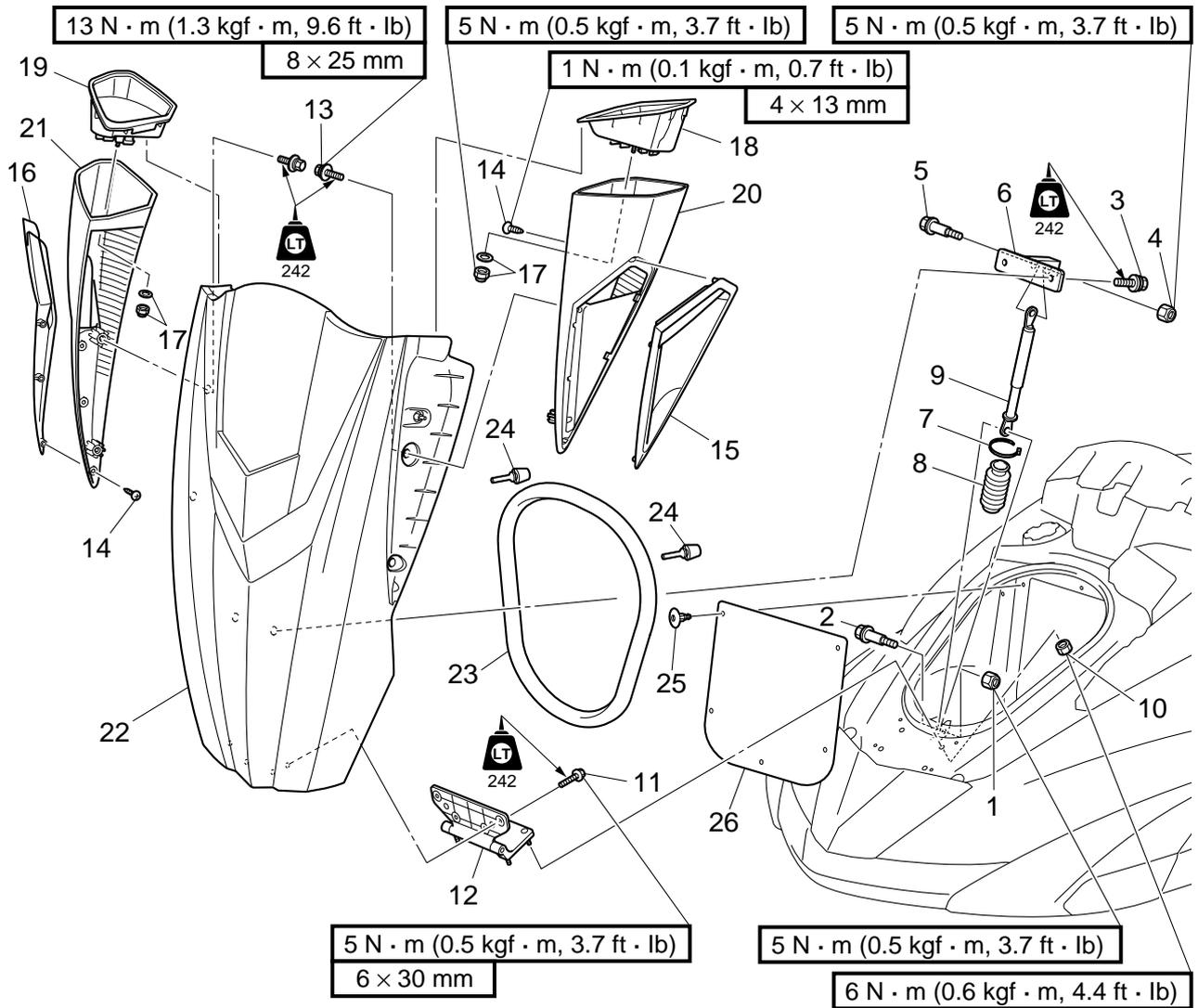
**Front hood**  
**Front hood removal**



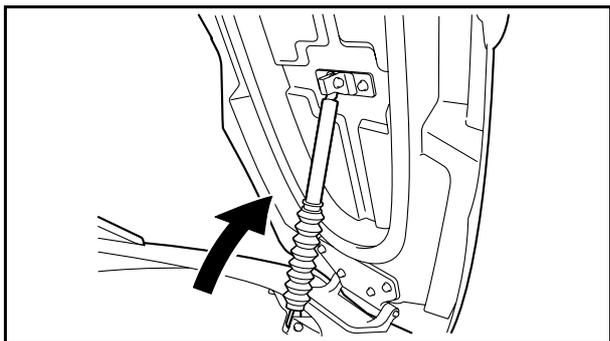
Step	Procedure/Part name	Q'ty	Service points
1	Nut	1	
2	Bolt	1	
3	Bolt	2	
4	Nut	1	
5	Bolt	1	
6	Damper stay	1	
7	Band	1	<b>Not reusable</b>
8	Boot	1	
9	Damper	1	
10	Nut	4	



Step	Procedure/Part name	Q'ty	Service points
11	Bolt	4	
12	Hinge	1	
13	Bolt	4	
14	Screw	8	
15	Left mirror ornament	1	
16	Right mirror ornament	1	
17	Nut/washer	2/2	
18	Left mirror	1	
19	Right mirror	1	
20	Left mirror cover	1	



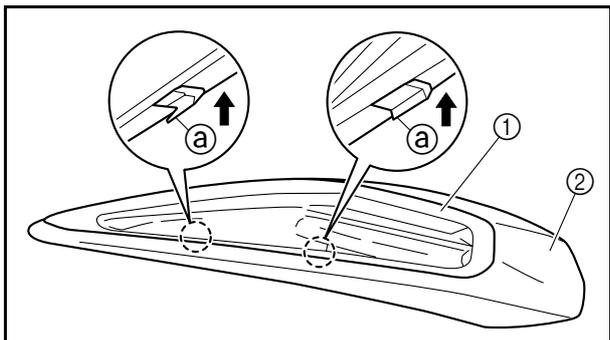
Step	Procedure/Part name	Q'ty	Service points
21	Right mirror cover	1	
22	Front hood	1	
23	Packing	1	<b>Not reusable</b>
24	Damper	2	<b>Not reusable</b>
25	Rivet	5	
26	Service lid	1	
Reverse the removal steps for installation.			



### Damper check

#### 1. Check:

- Damper assembly  
Does not hold front hood open →  
Replace the damper assembly.



### Mirror disassembly

#### 1. Remove:

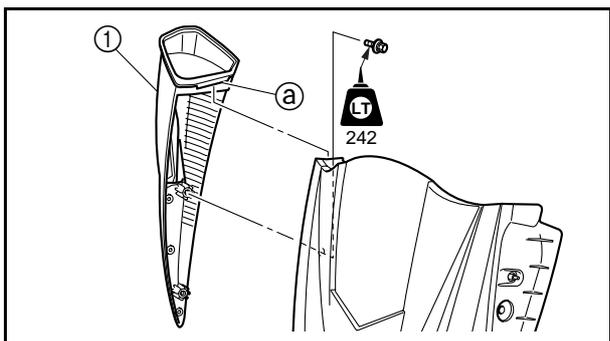
- Mirror ornament ①

#### Removal step:

1. Push the projections ② on the mirror ornament ① shown and remove the ornament from the mirror cover ②.

#### NOTE:

Be careful not to break the mirror ornament projections when removing the ornaments.



### Mirror assembly installation

#### 1. Install:

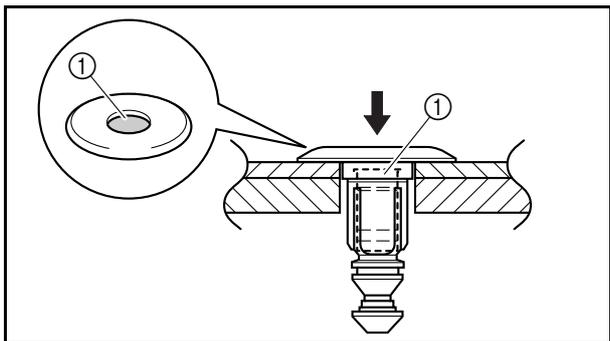
- Mirror assembly ①

#### NOTE:

When installing a mirror assembly, be sure to hook the projection ② on the mirror onto the front hood.



Mirror assembly bolt:  
13 N·m (1.3 kgf·m, 9.6 ft·lb)  
LOCTITE 242



**Rivet removal**

**1. Remove:**

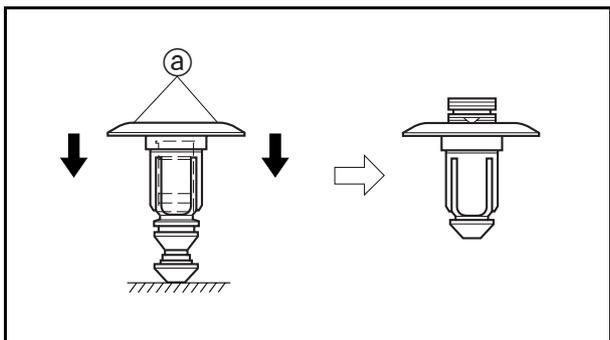
- Rivets

**Removal step:**

1. Push in the rivet pin ① until it clicks and is below the top of the rivet.

**2. Check:**

- Rivets  
Cracks/damage → Replace the rivets.



**Rivet installation**

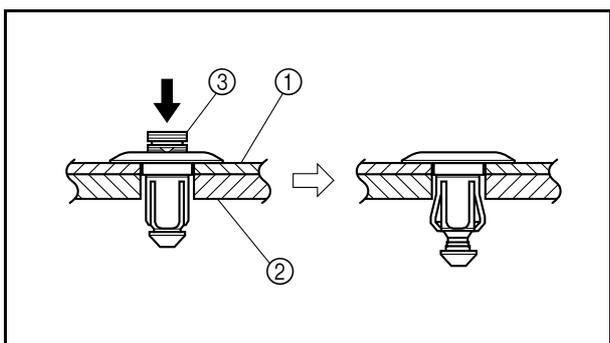
**1. Install:**

- Rivets

**Installation steps:**

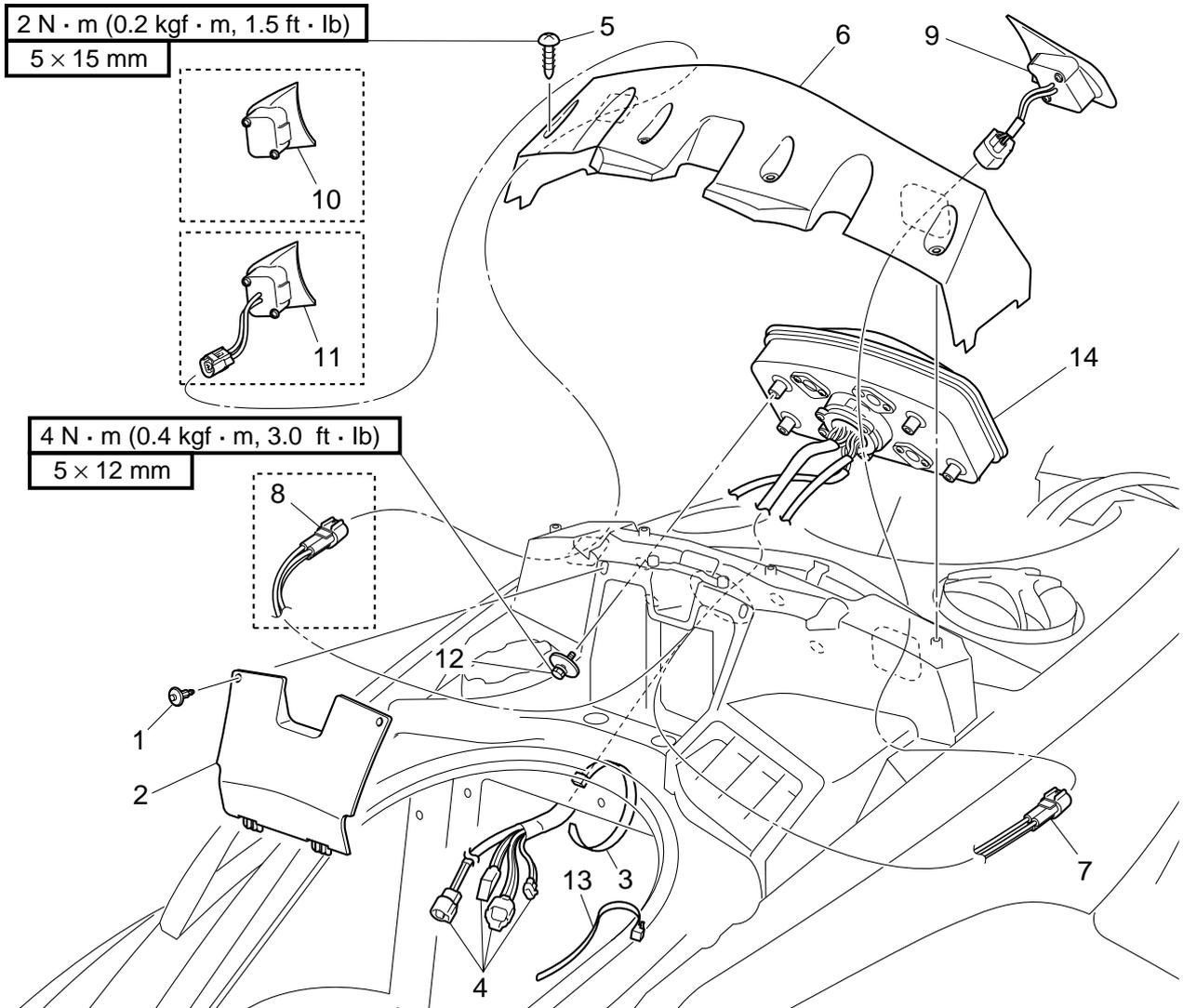
**NOTE:** \_\_\_\_\_

Before reinstalling a rivet, hold the rivet flange ① with both hands and push the rivet pin perpendicularly against a hard flat surface until the pin protrudes from the top of the rivet.

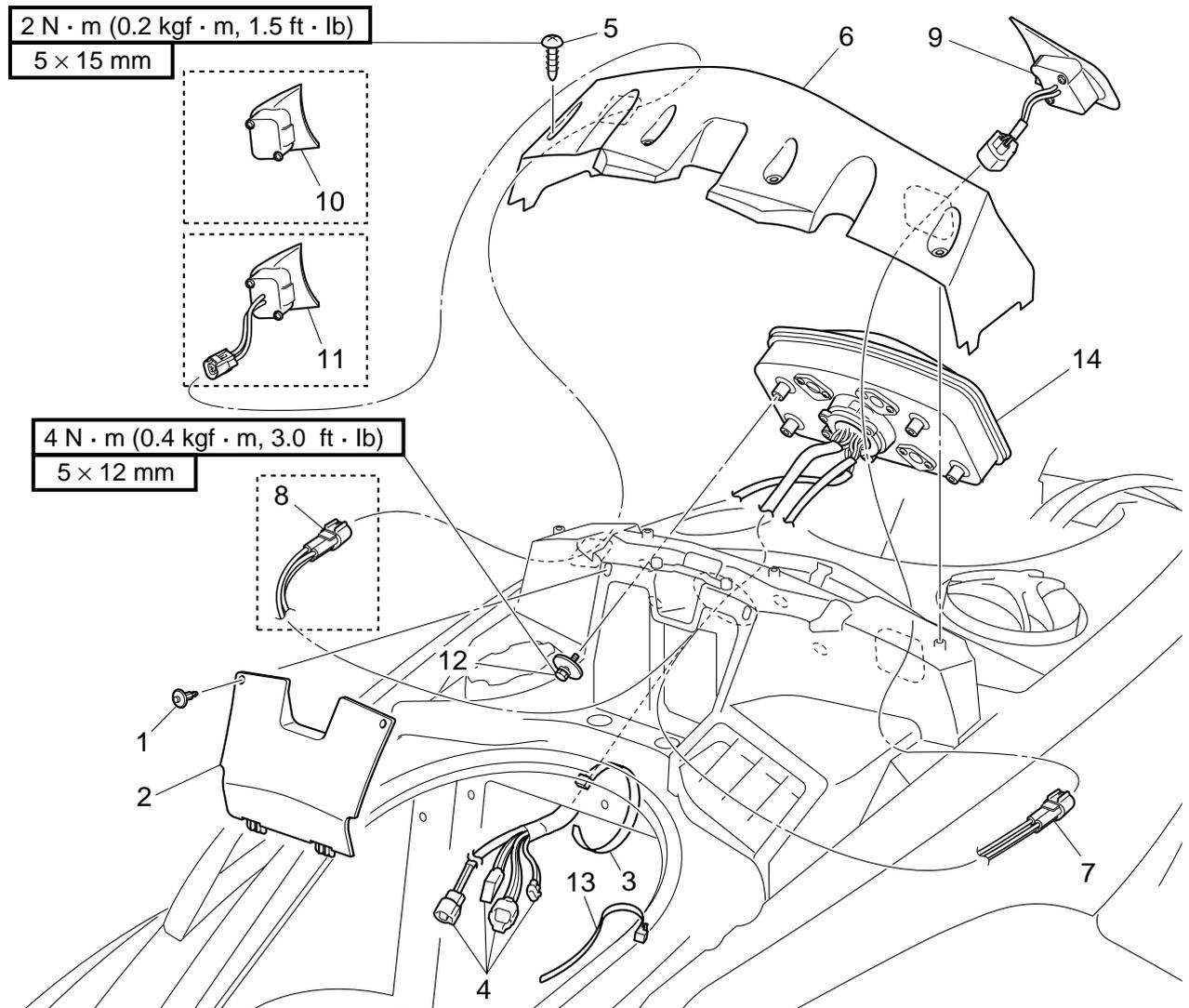


1. Insert a rivet completely in the holes in both the service lid ① and inner hull ②.
2. Push in the rivet pin ③ until it clicks and is flush with the top of the rivet.

**Steering console cover**  
**Multifunction meter and cover removal**

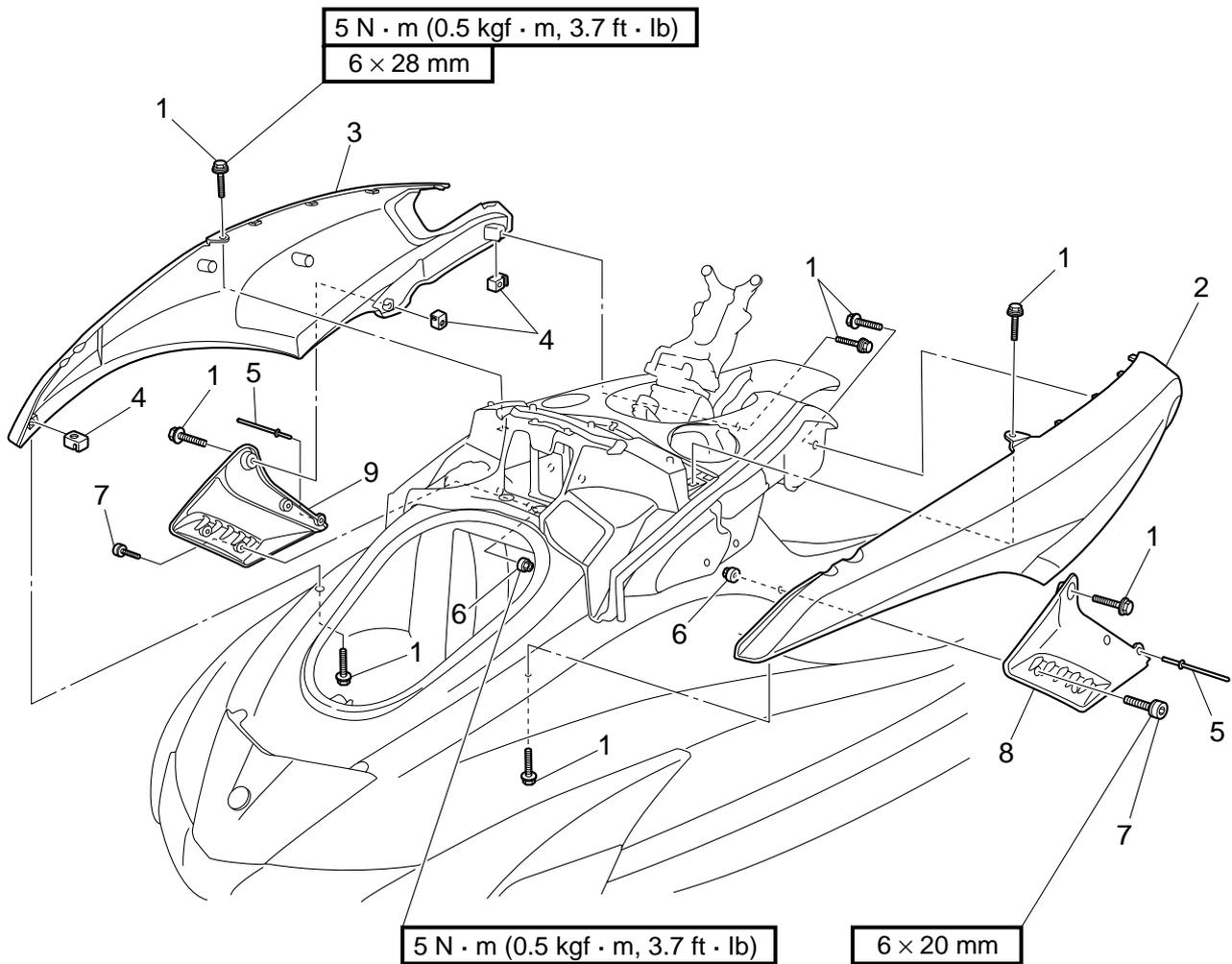


Step	Procedure/Part name	Q'ty	Service points
	Handlebar assembly		Refer to "Handlebar assembly removal."
	Service lid		Refer to "Front hood removal."
1	Rivet	2	
2	Cover	1	
3	Plastic tie	1	
4	Multifunction meter coupler	4	
5	Screw	4	
6	Multifunction meter cover	1	
7	Left operation button coupler	1	
8	Right operation button coupler	1	FX Cruiser SHO



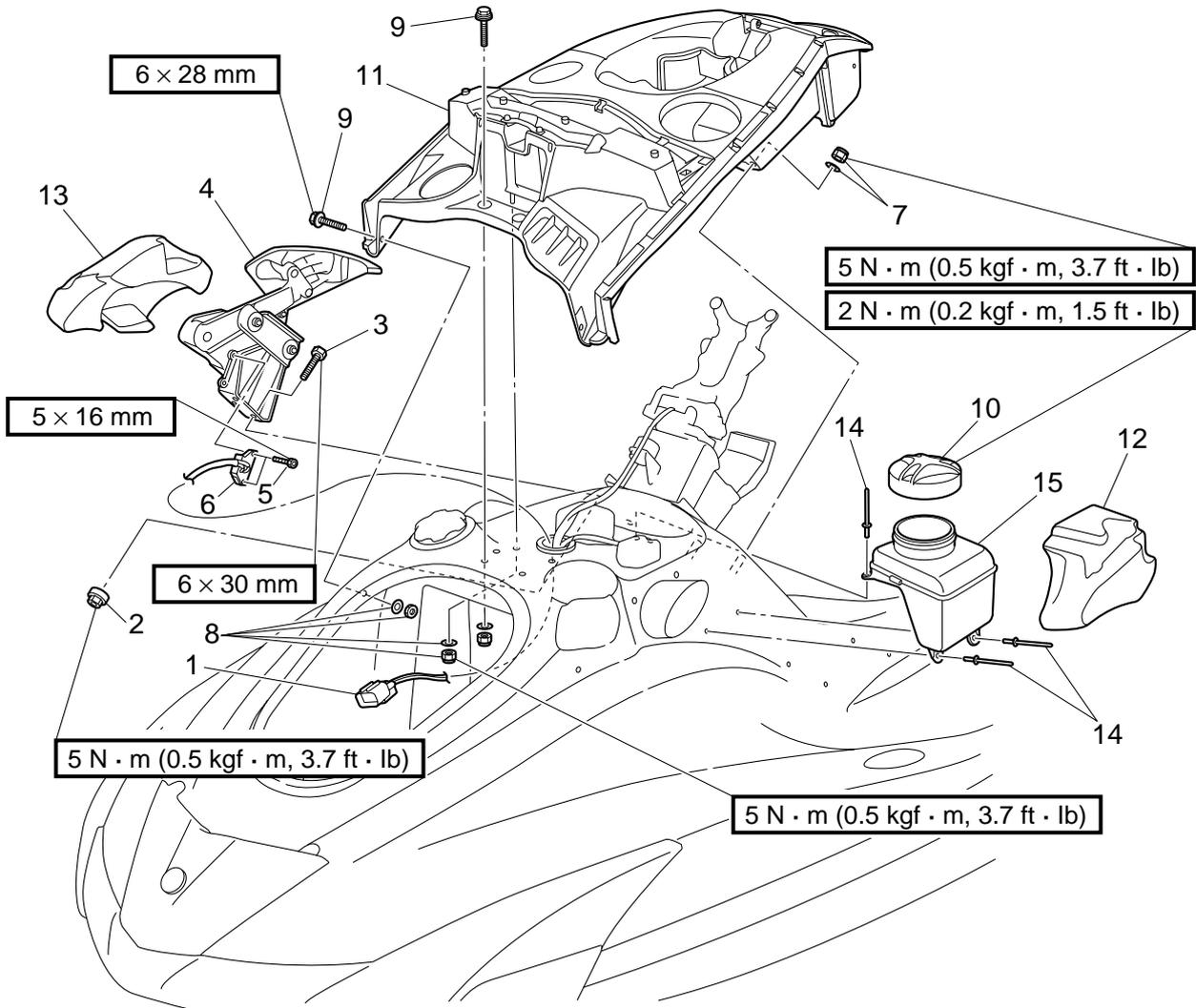
Step	Procedure/Part name	Q'ty	Service points
9	Left operation button assembly	1	
10	Cover	1	FX SHO
11	Right operation button assembly	1	FX Cruiser SHO
12	Bolt	4	
13	Plastic tie	1	
14	Multifunction meter	1	
			Reverse the removal steps for installation.

Side cover removal

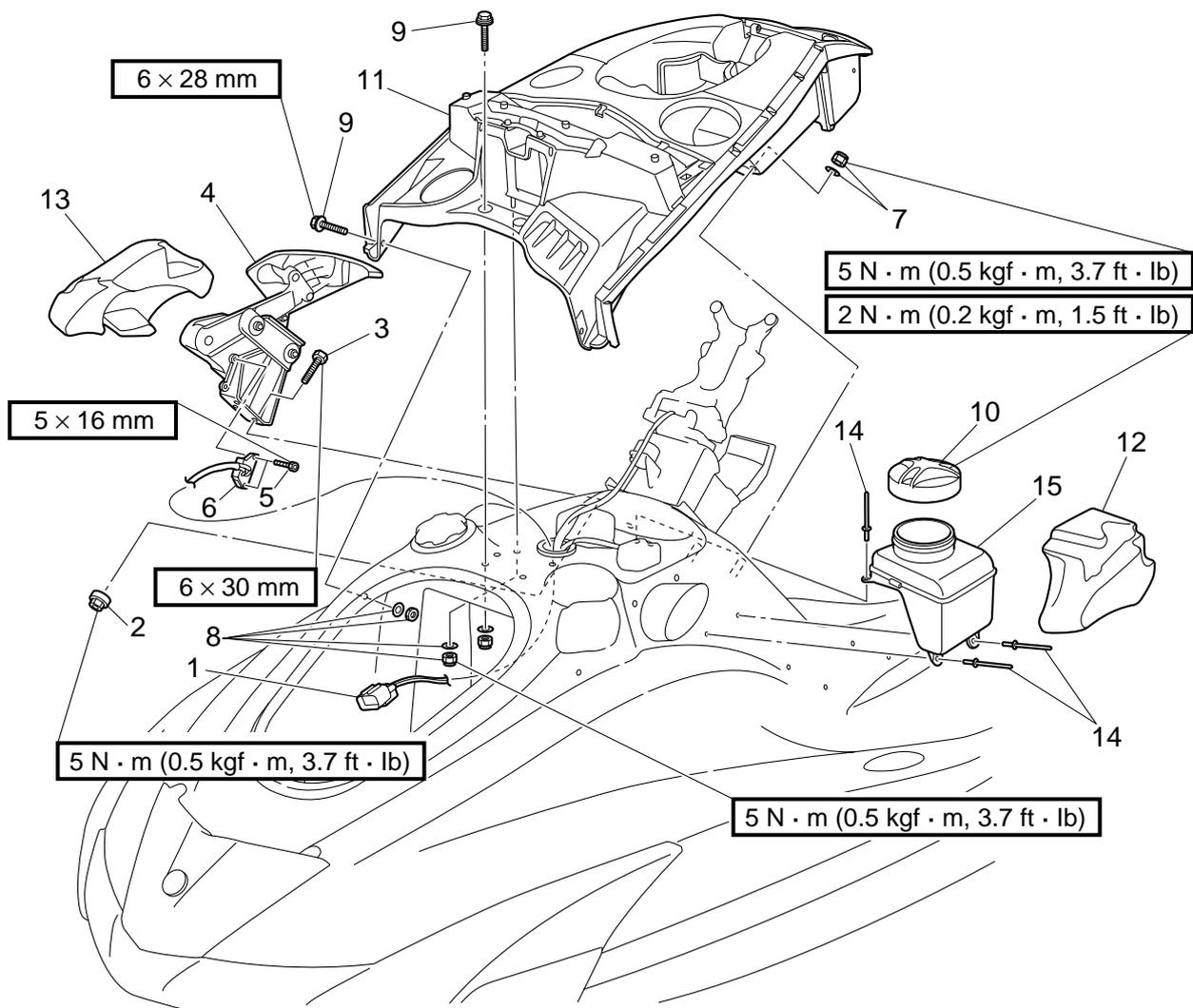


Step	Procedure/Part name	Q'ty	Service points
1	Bolt	8	<div style="border: 1px solid black; padding: 5px; display: inline-block;">Not reusable</div>
2	Left side cover	1	
3	Right side cover	1	
4	Nut	6	
5	Rivet	2	
6	Nut	6	
7	Bolt	6	
8	Left side ornament	1	
9	Right side ornament	1	
			Reverse the removal steps for installation.

**Center cover removal**

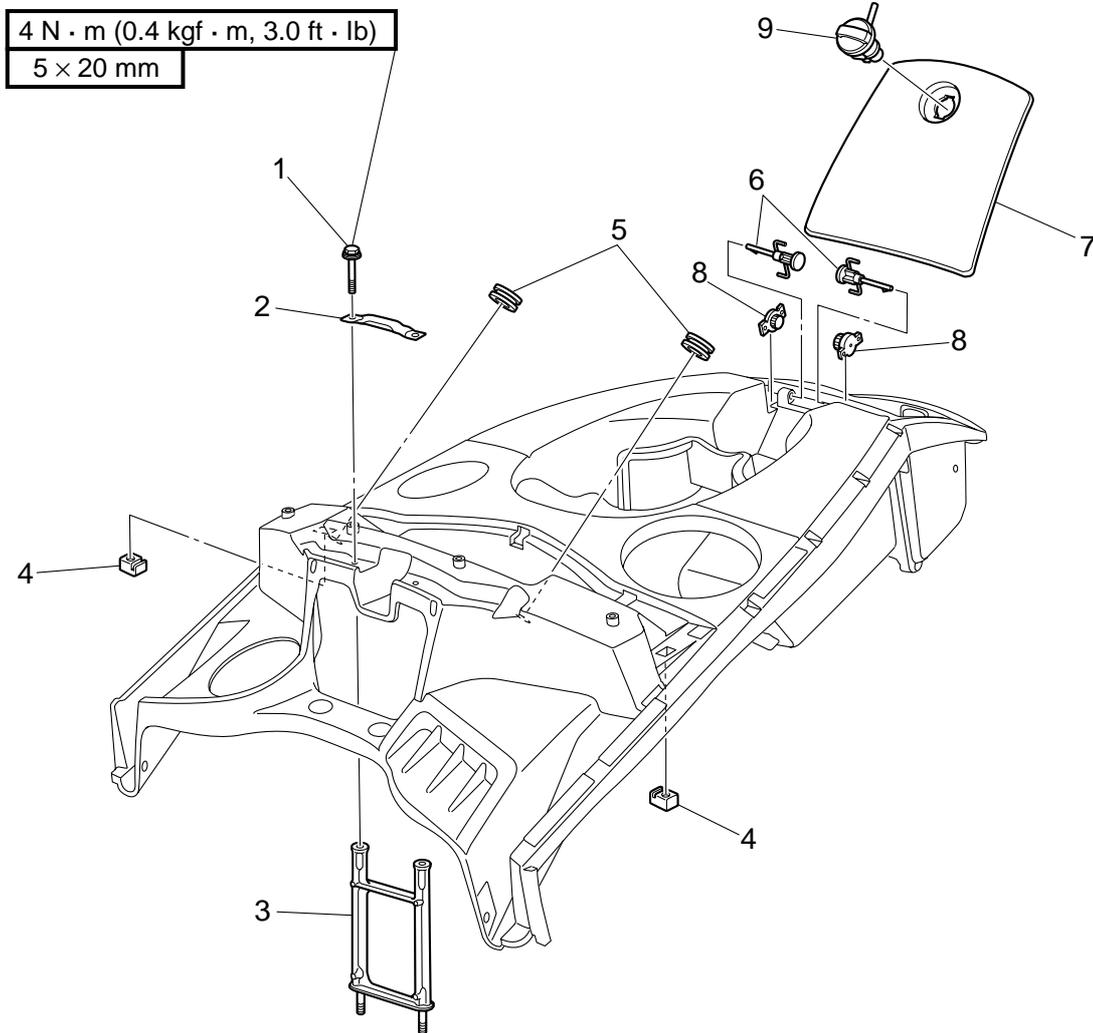


Step	Procedure/Part name	Q'ty	Service points
1	Reverse sensor coupler	1	
2	Nut	3	
3	Bolt	3	
4	Shift lever assembly	1	
5	Bolt	2	
6	Reverse sensor	1	
7	Nut/washer	2/2	
8	Nut/washer	6/6	
9	Bolt	4	

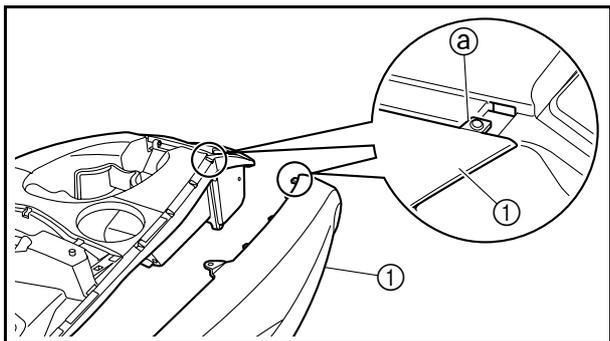


Step	Procedure/Part name	Q'ty	Service points
10	Box cap	1	<p><b>Not reusable</b></p> <p>Reverse the removal steps for installation.</p>
11	Center cover	1	
12	Left induction box	1	
13	Right induction box	1	
14	Rivet	3	
15	Box	1	

**Center cover disassembly**



Step	Procedure/Part name	Q'ty	Service points
1	Bolt	2	Reverse the disassembly steps for assembly.
2	Lid lock hook	1	
3	Bracket	1	
4	Nut	2	
5	Grommet	4	
6	Hinge pin	2	
7	Center console box lid	1	
8	Gear	2	
9	Lock	1	



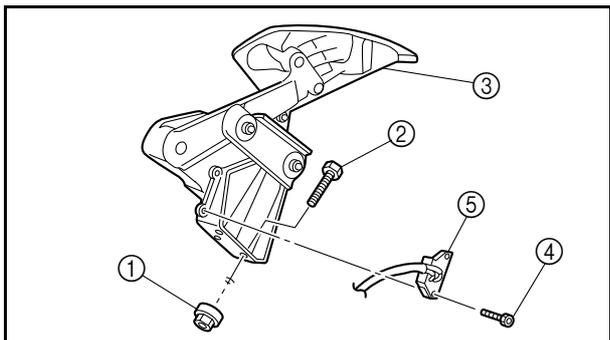
**Side cover removal**

**1. Remove:**

- Side cover ①

**NOTE:**

While removing the side cover ①, push down on the cover near the tab ② to release the raised portion on the tab.



**Shift lever removal**

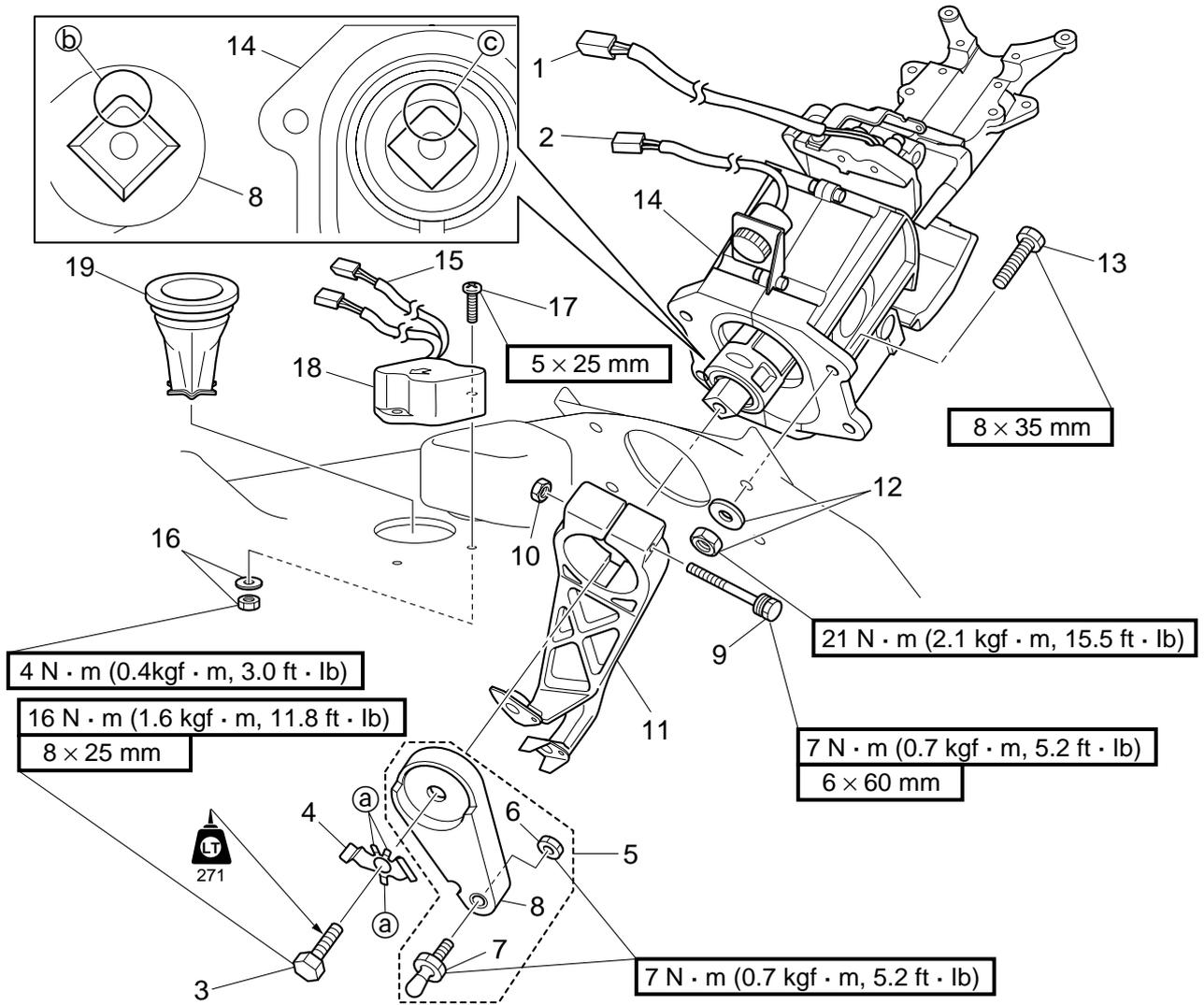
**1. Remove:**

- Nut ①
- Bolt ②
- Shift lever assembly ③
- Bolt ④
- Reverse sensor ⑤

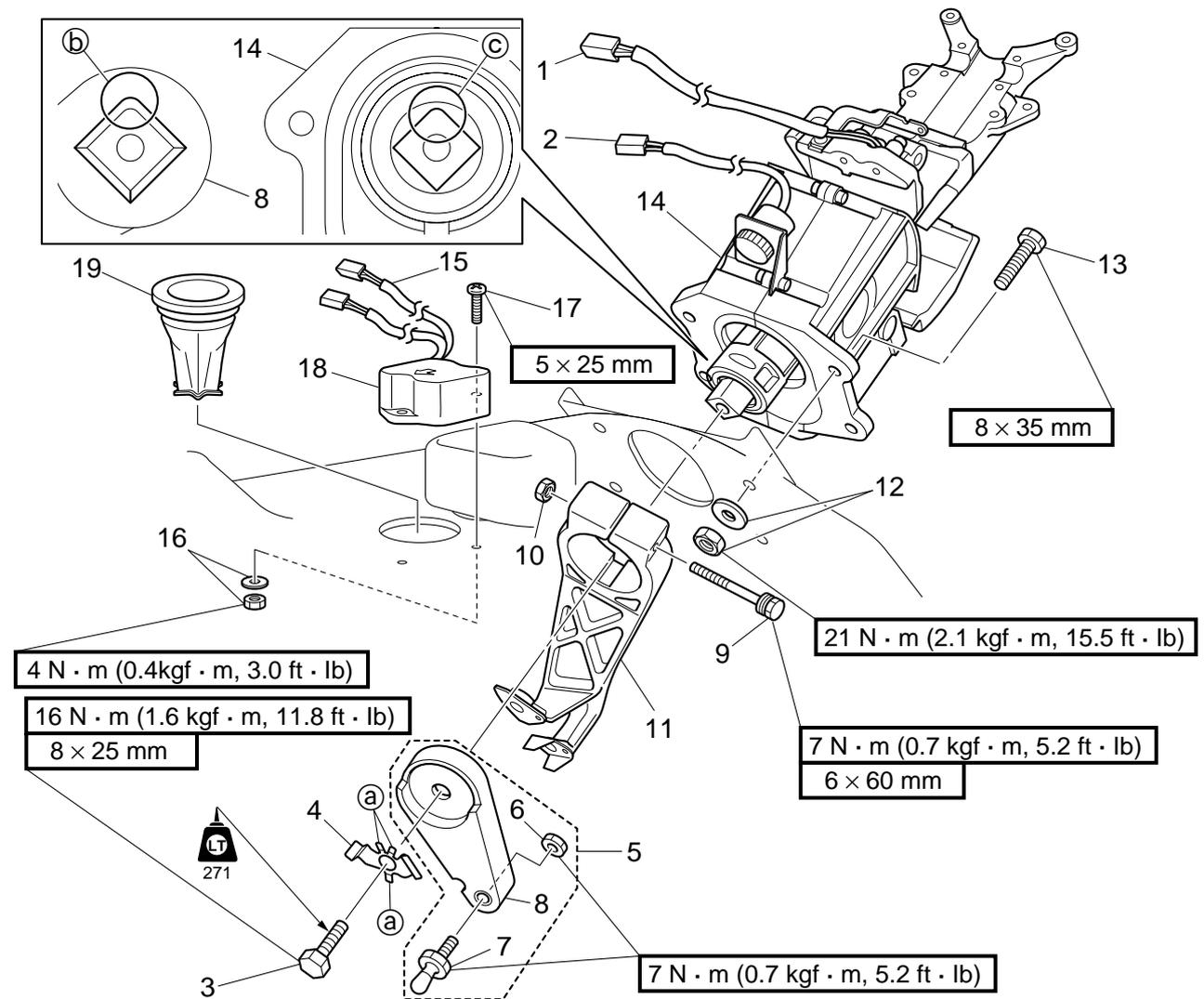
**CAUTION:**

Do not disassemble the shift lever assembly except the reverse sensor.

**Steering master**  
**Steering master removal**

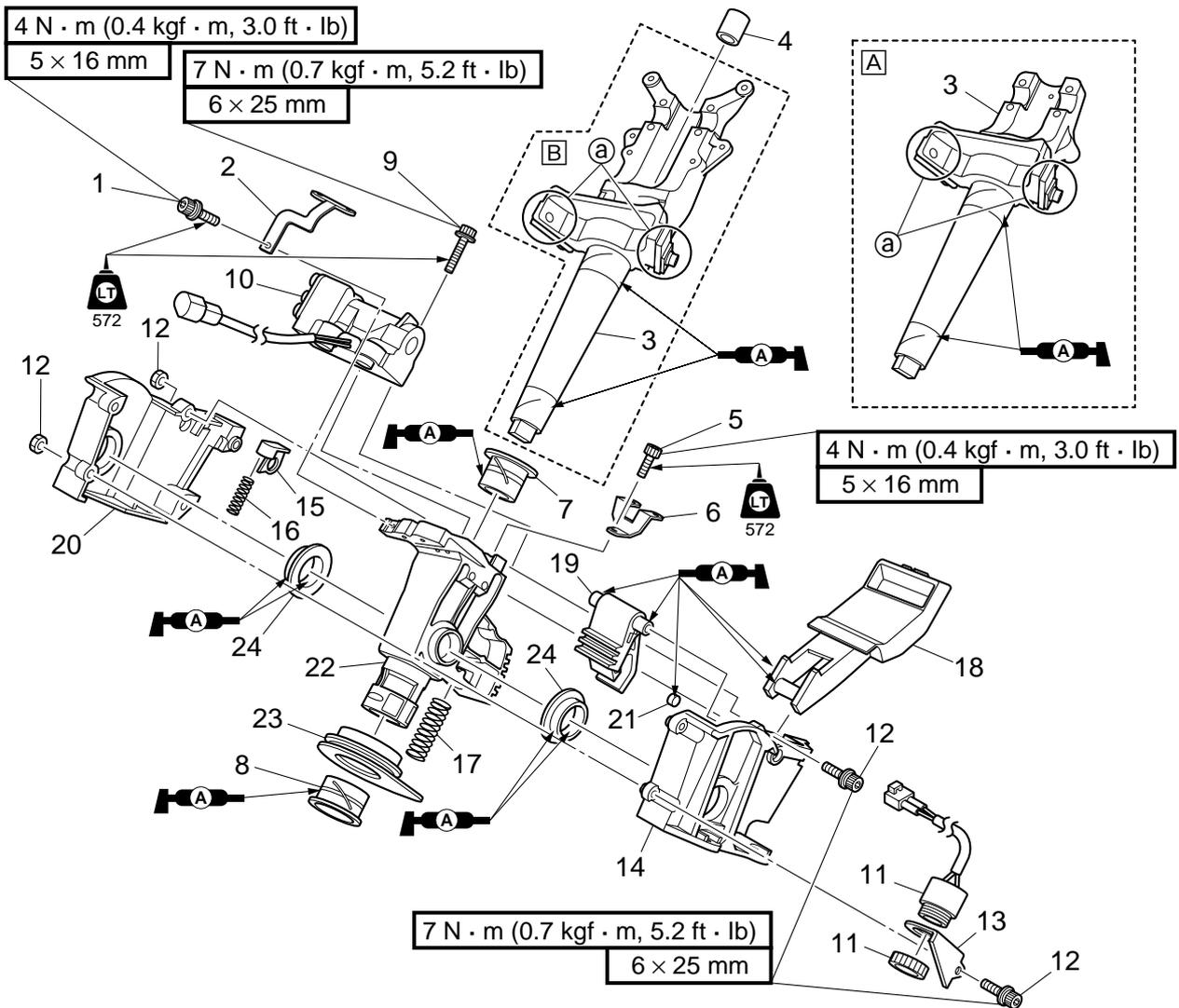


Step	Procedure/Part name	Q'ty	Service points
	Center cover assembly		Refer to "Steering console cover."
	Steering cable joint		Refer to "Remote control cables and speed sensor lead."
1	Steering sensor coupler	1	
2	Buzzer coupler	1	
3	Bolt	1	
4	Plate	1	<b>NOTE:</b> _____ Bend a tab (a) along a flat side of the bolt.
5	Steering arm assembly	1	
6	Nut	1	
7	Steering cable ball joint	1	
8	Arm	1	<b>NOTE:</b> _____ Align the rounded portions (b) and (c).

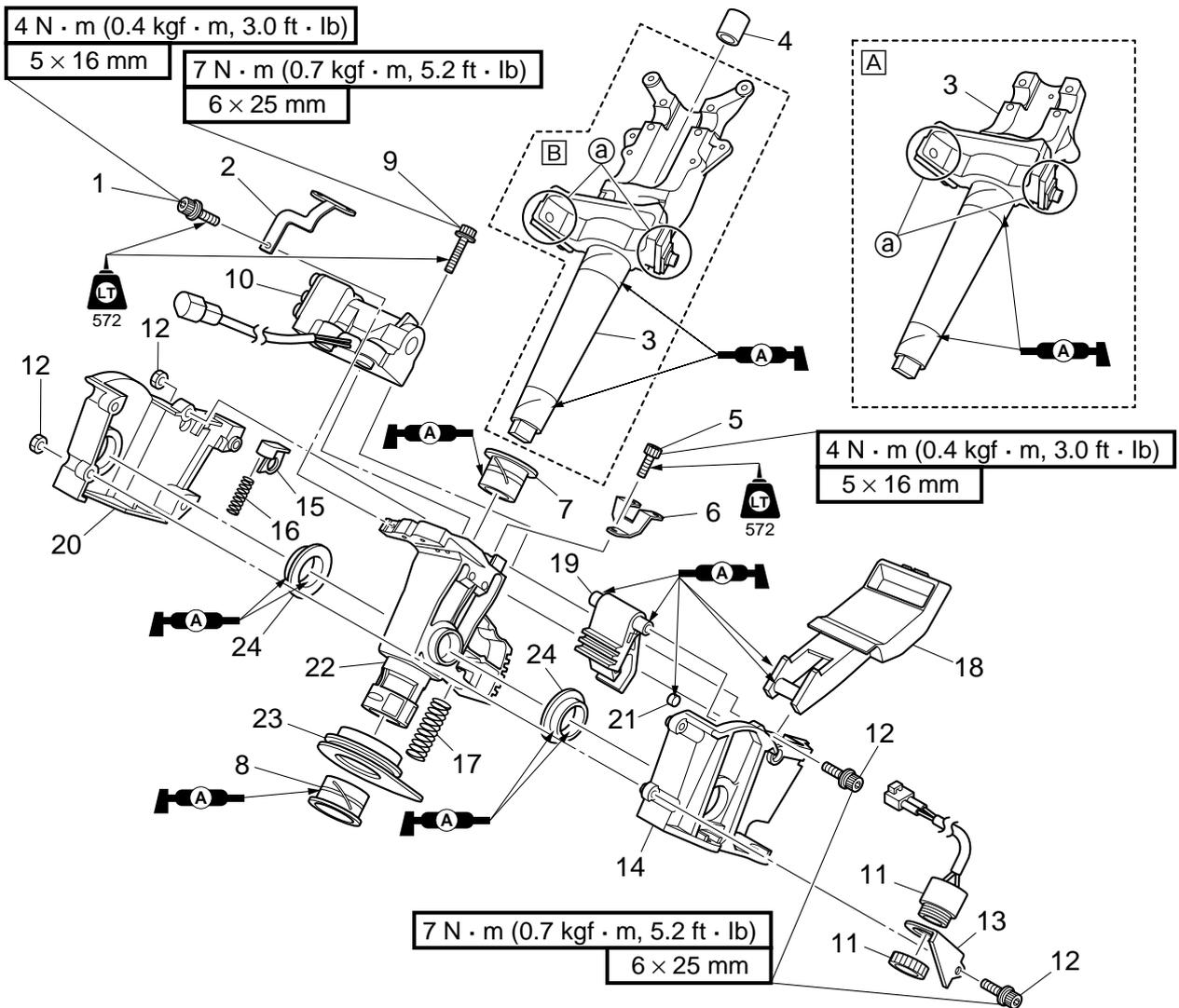


Step	Procedure/Part name	Q'ty	Service points
9	Bolt	1	
10	Nut	1	
11	Cable stopper	1	
12	Nut/washer	4/4	
13	Bolt	4	
14	Steering master assembly	1	
15	Speed sensor coupler	1	FX Cruiser SHO
16	Nut/washer	2/2	FX Cruiser SHO
17	Screw	2	FX Cruiser SHO
18	Compass and air temperature sensor	1	FX Cruiser SHO
19	Grommet	1	
Reverse the removal steps for installation.			

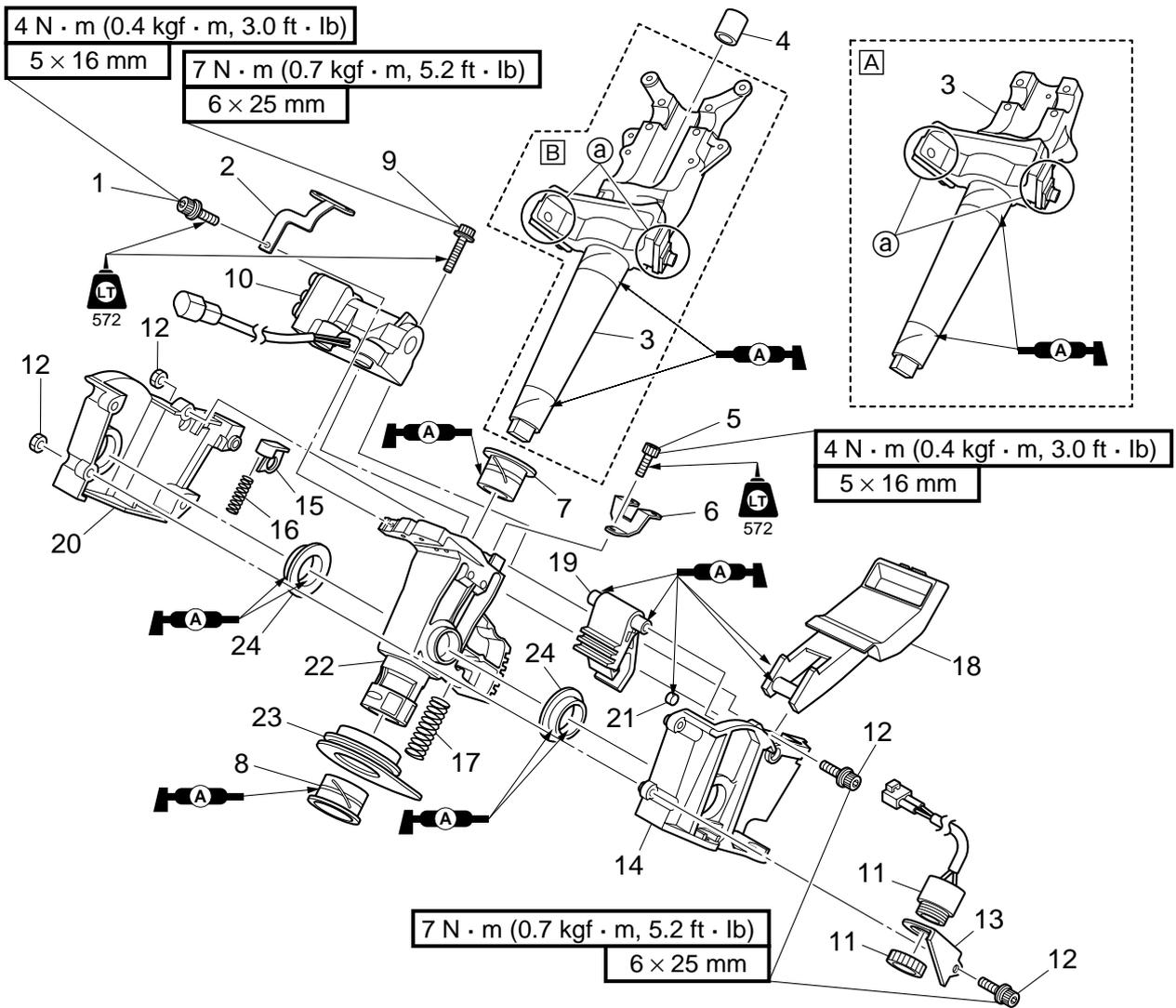
**Steering master disassembly**



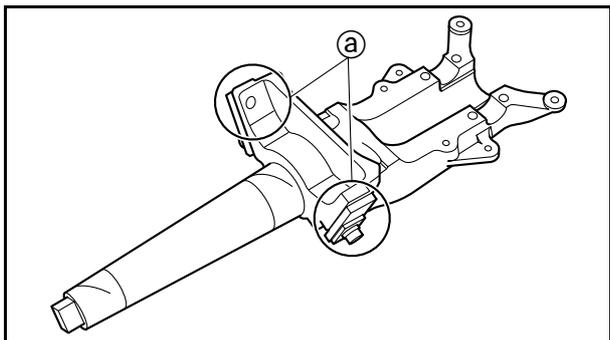
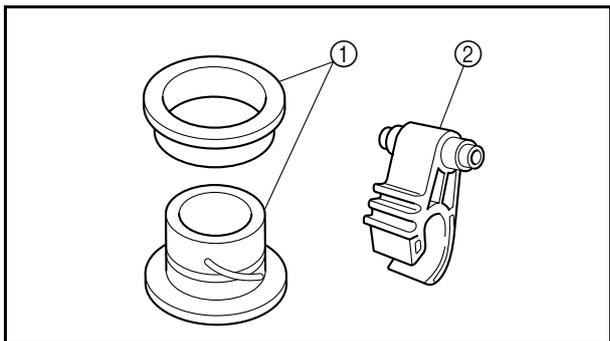
Step	Procedure/Part name	Q'ty	Service points
1	Bolt	1	[A] FX SHO/[B] FX Cruiser SHO <b>CAUTION:</b> _____ Do not disassemble the board spring (a), otherwise the OTS does not function properly. _____
2	Bracket 1	1	
3	Steering shaft	1	
4	Pipe seal	1	<b>Not reusable</b>
5	Bolt	1	
6	Bracket 2	1	
7	Bushing	1	



Step	Procedure/Part name	Q'ty	Service points
8	Bushing	1	
9	Bolt	4	
10	Steering sensor	1	
11	Buzzer	1	
12	Bolt/nut	5/5	
13	Bracket 3	1	
14	Left housing	1	
15	Spring holder	1	
16	Spring 1	1	
17	Spring 2	1	
18	Lever	1	
19	Lock	1	
20	Right housing	1	



Step	Procedure/Part name	Q'ty	Service points
21	Bushing	4	<p><b>Not reusable</b></p> <p>Reverse the disassembly steps for assembly.</p>
22	Steering tube	1	
23	Rubber seal	1	
24	Bushing	2	



**Steering master component check**

**1. Check:**

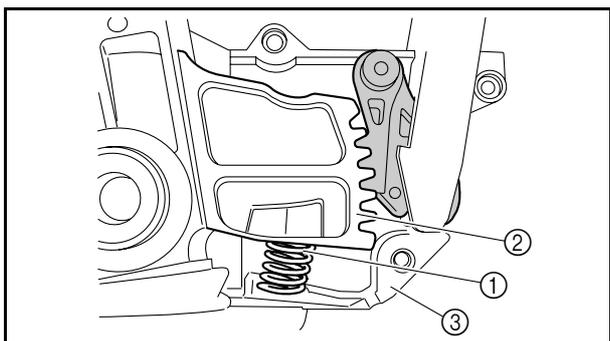
- Bushings ①
- Lock ②  
Cracks/damage/wear → Replace.

**2. Check:**

- Steering shaft  
Cracks/damage → Replace the steering shaft.

**CAUTION:** \_\_\_\_\_

**Do not disassemble the board spring (a), otherwise the OTS does not function properly.**



**Spring installation**

**1. Install:**

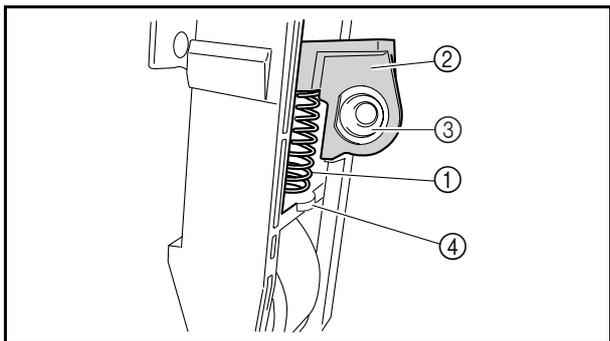
- Spring 2 ①

**NOTE:** \_\_\_\_\_

Before installing the spring 2 ①, install the steering tube ② to the right housing ③.

**Installation steps:**

1. Angle the steering tube ② as shown.
2. While compressing the spring 2 ①, install it into the steering tube ②.

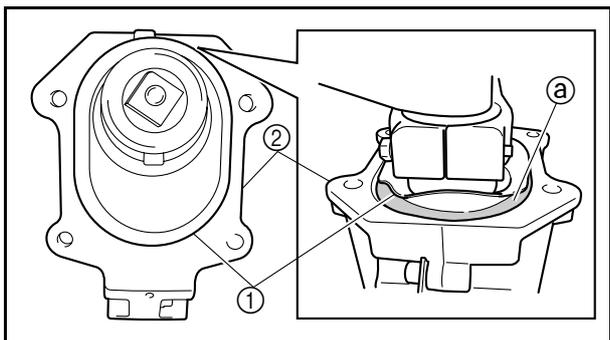


**2. Install:**

- Spring 1 ①

**Installation steps:**

1. Install the spring 1 ① into the spring holder ②, and then install the holder to the right housing ③.
2. While compressing the spring 1 ①, install it into the lever ④.



**Rubber seal installation**

**1. Install:**

- Rubber seal ①
- Steering master assembly ②

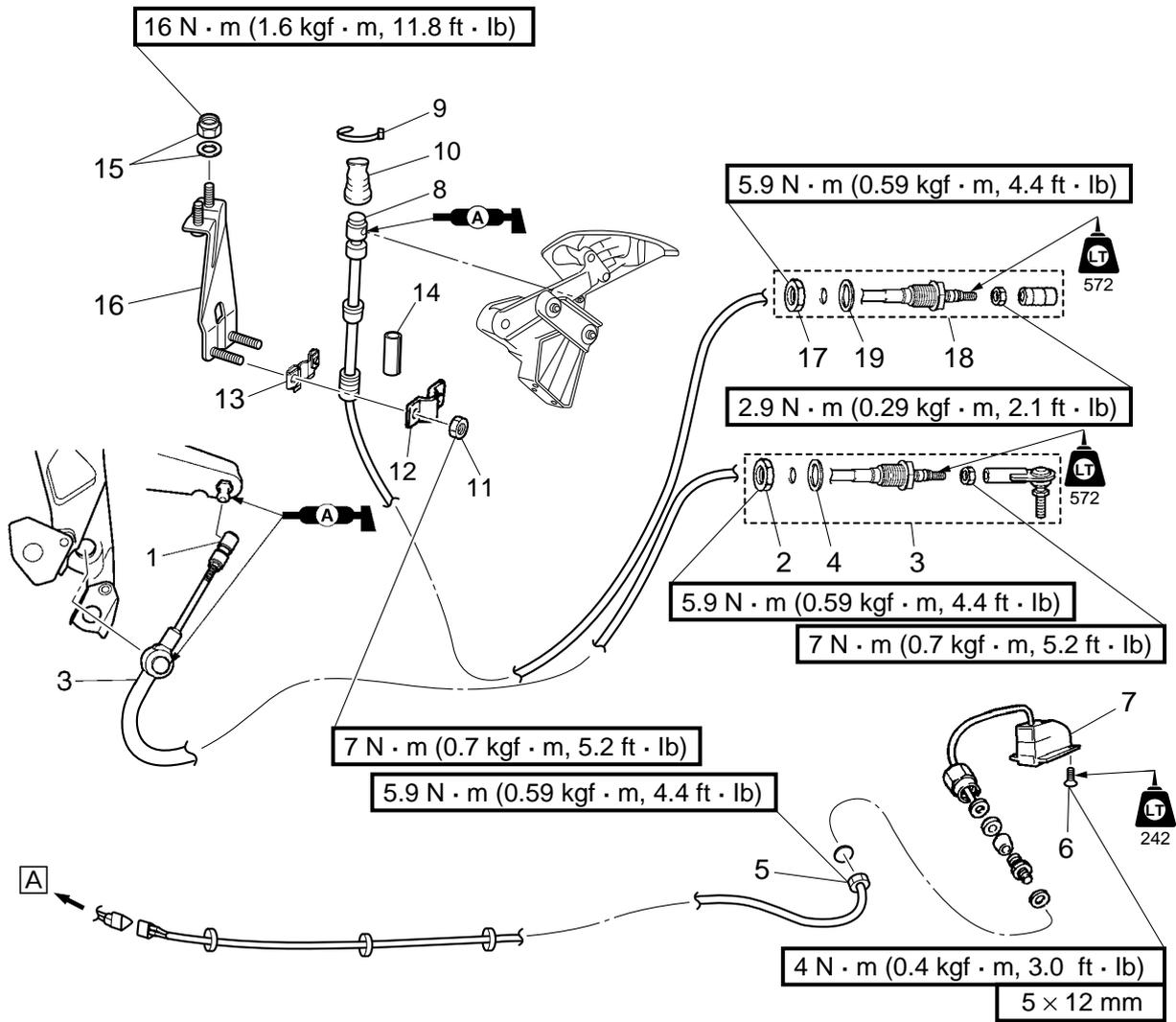
**CAUTION:**

**Do not reuse the rubber seal, always replace it with a new one.**

**Installation step:**

1. Apply instant adhesive onto the mating surfaces of the rubber seal ① and steering master assembly ② in the area ③ shown, and then install the seal.





Step	Procedure/Part name	Q'ty	Service points
9	Band	1	<b>Not reusable</b>
10	Grommet	1	
11	Nut	2	
12	Shift cable holder 1	1	
13	Shift cable holder 2	1	
14	Packing	1	<b>Not reusable</b>
15	Nut/washer	2/2	
16	Shift cable bracket	1	
17	Nut	1	
18	Shift cable	1	
19	Seal	1	<b>Not reusable</b>
Reverse the removal steps for installation.			

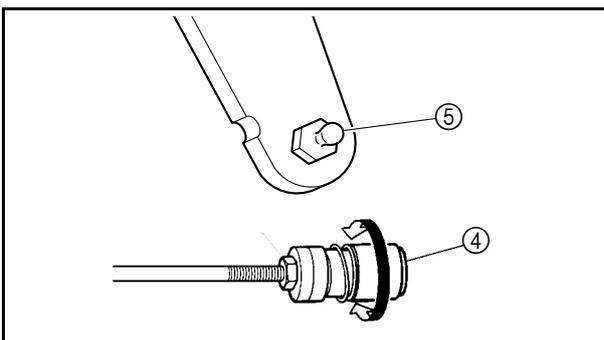
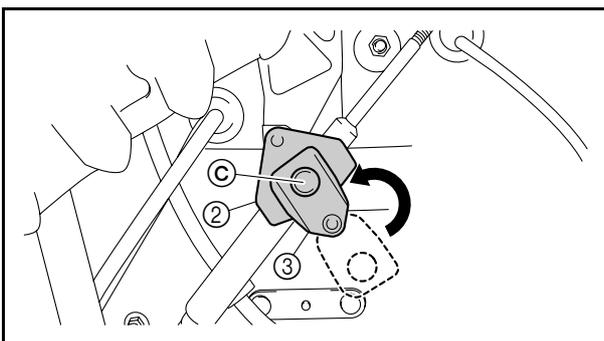
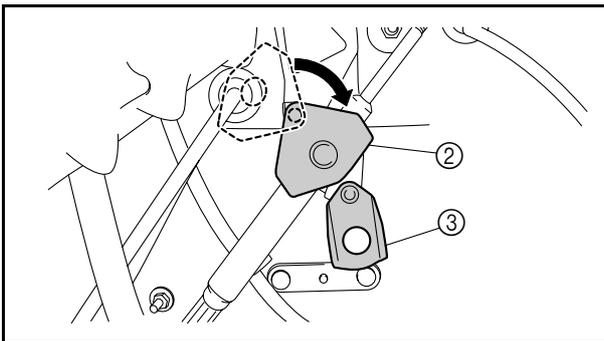
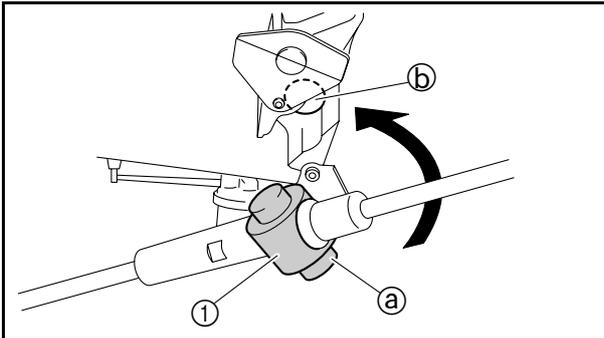
**Steering cable installation (steering master end)**

**⚠ WARNING**

If a cable becomes damaged, replace it. Never attempt to repair a damaged cable.

**1. Install:**

- Steering cable



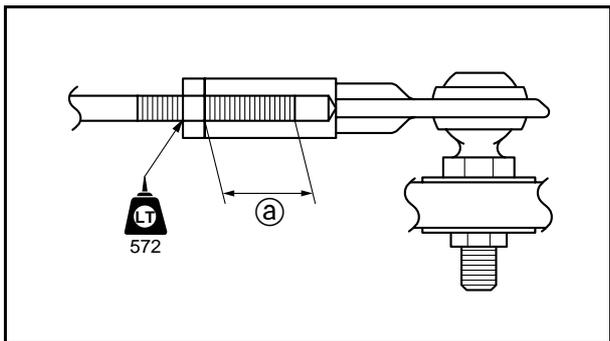
**Installation steps:**

1. Insert the projection (a) on the steering cable completely into the indentation (b) in the cable stopper assembly.
2. If the projection (a) on the steering cable is not aligned properly to fit back the indentation, rotate the drum nut (1) counterclockwise a maximum of 90° for proper alignment.

**CAUTION:**

Do not attempt to twist the steering cable to align it. Be sure to turn the drum nut (1) to install the steering cable.

3. Slightly pull out the clamp plate (2) on the cable stopper assembly, and then rotate it clockwise to lock it in place securely.
4. Rotate the clamp plate (3) on the cable stopper assembly counterclockwise, making sure to fit the hole in the plate onto the projection (c) on the other clamp plate (2).
5. Connect the steering cable joint (4) to the ball joint (5).



**Steering cable installation (jet pump end)**

**1. Install:**

- Steering cable

**NOTE:**

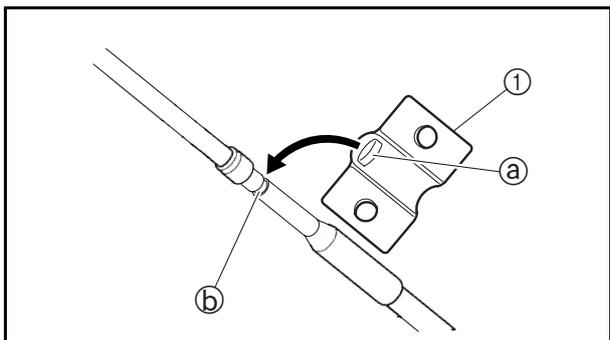
To adjust the steering cable. Refer to “Jet thrust nozzle steering angle check and adjustment” in Chapter 3.



Steering cable set length **a** (jet pump end):  
 $14.5 \pm 1 \text{ mm}$  ( $0.57 \pm 0.04 \text{ in}$ )



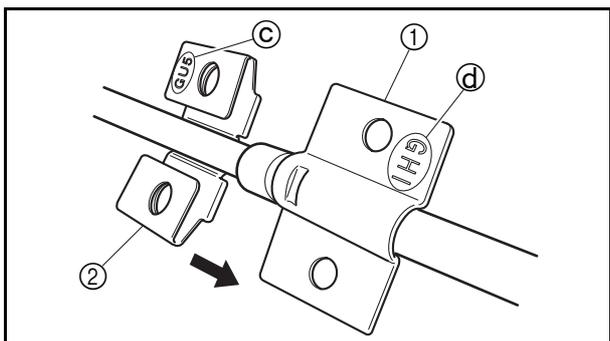
Steering cable locknut (jet pump end):  
 $7 \text{ N}\cdot\text{m}$  ( $0.7 \text{ kgf}\cdot\text{m}$ ,  $5.2 \text{ ft}\cdot\text{lb}$ )  
 LOCTITE 572



**Shift cable installation (shift lever end)**

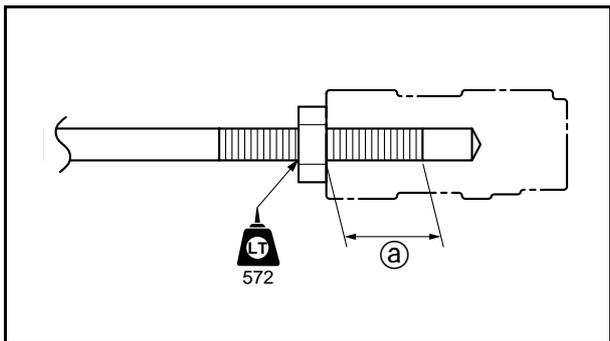
**1. Install:**

- Shift cable holders



**Installation steps:**

1. Install the shift cable holder **1** so that the projection **a** on the holder fits into the groove **b** in the outer cable.
2. Slide the shift cable holder **2** onto the shift cable holder **1** so that the marks **c** and **d** are positioned as shown.



**Shift cable installation (jet pump end)**

**1. Install:**

- Shift cable

**NOTE:** \_\_\_\_\_

To adjust the shift cable. Refer to “Shift cable check and adjustment” in Chapter 3.

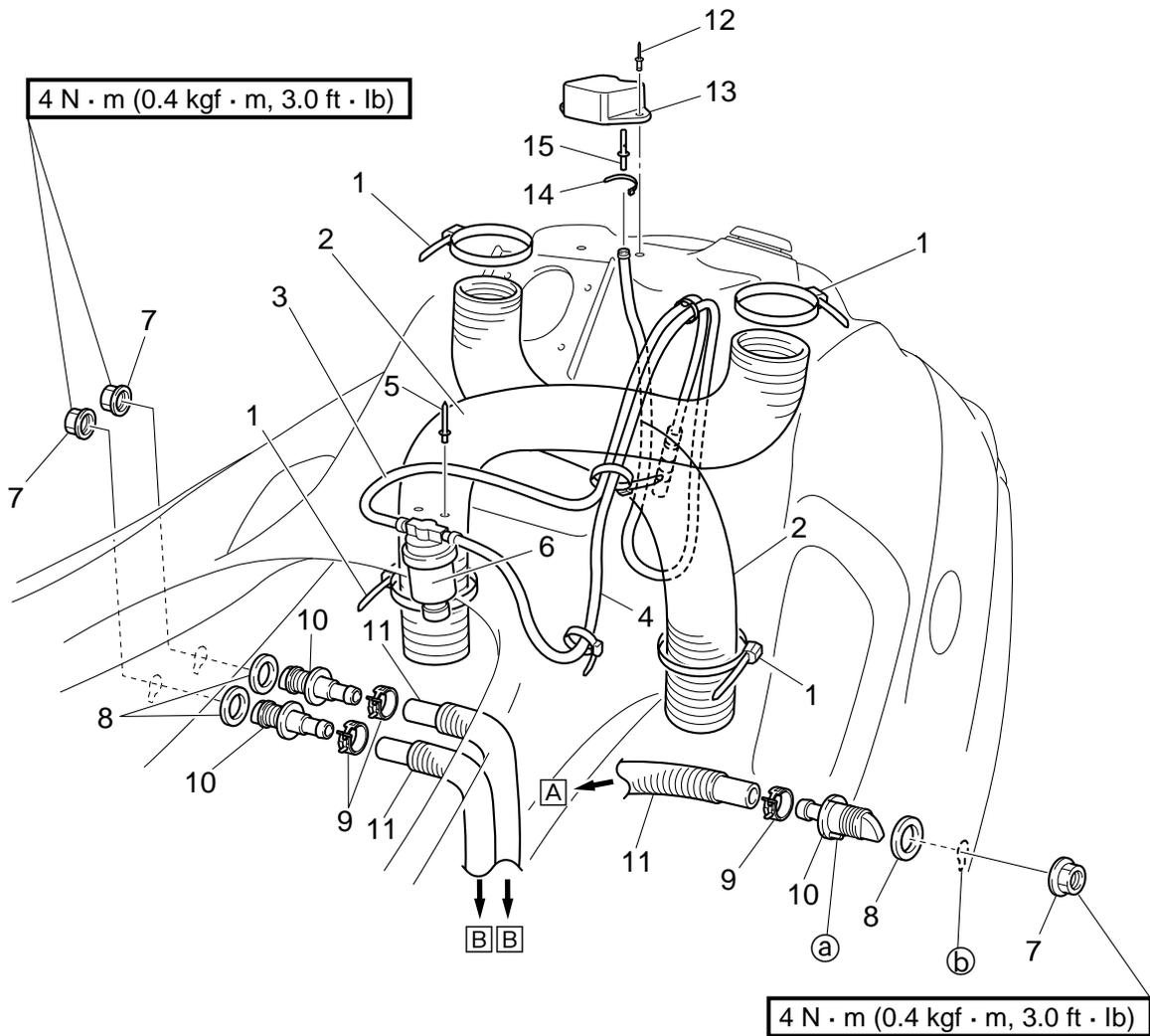


Shift cable set length (a) (jet pump end):  
13.0 ± 0.8 mm (0.51 ± 0.03 in)

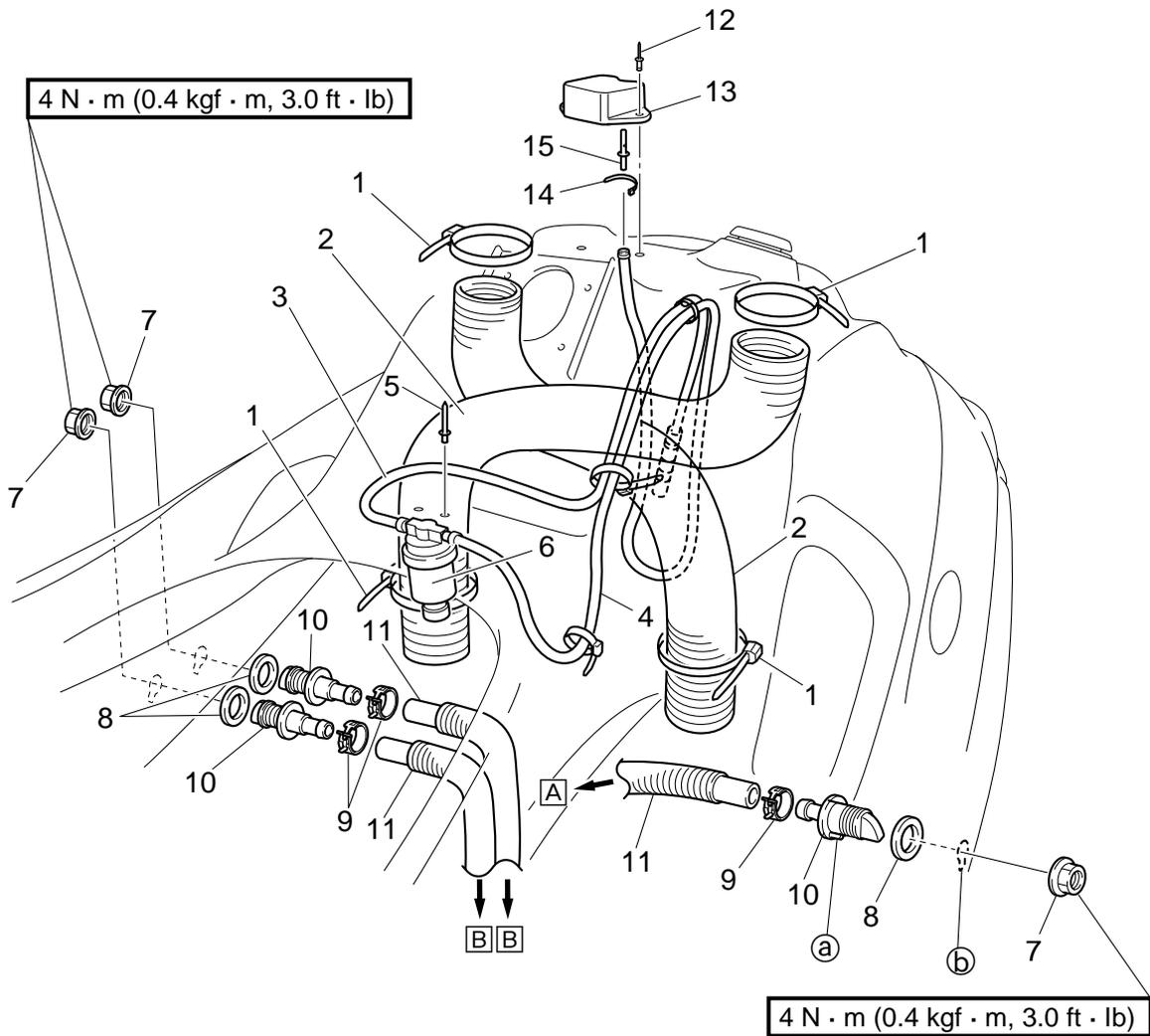


Shift cable locknut (jet pump end):  
2.9 N·m (0.29 kgf·m, 2.1 ft·lb)  
LOCTITE 572

**Hoses**  
**Hose removal**

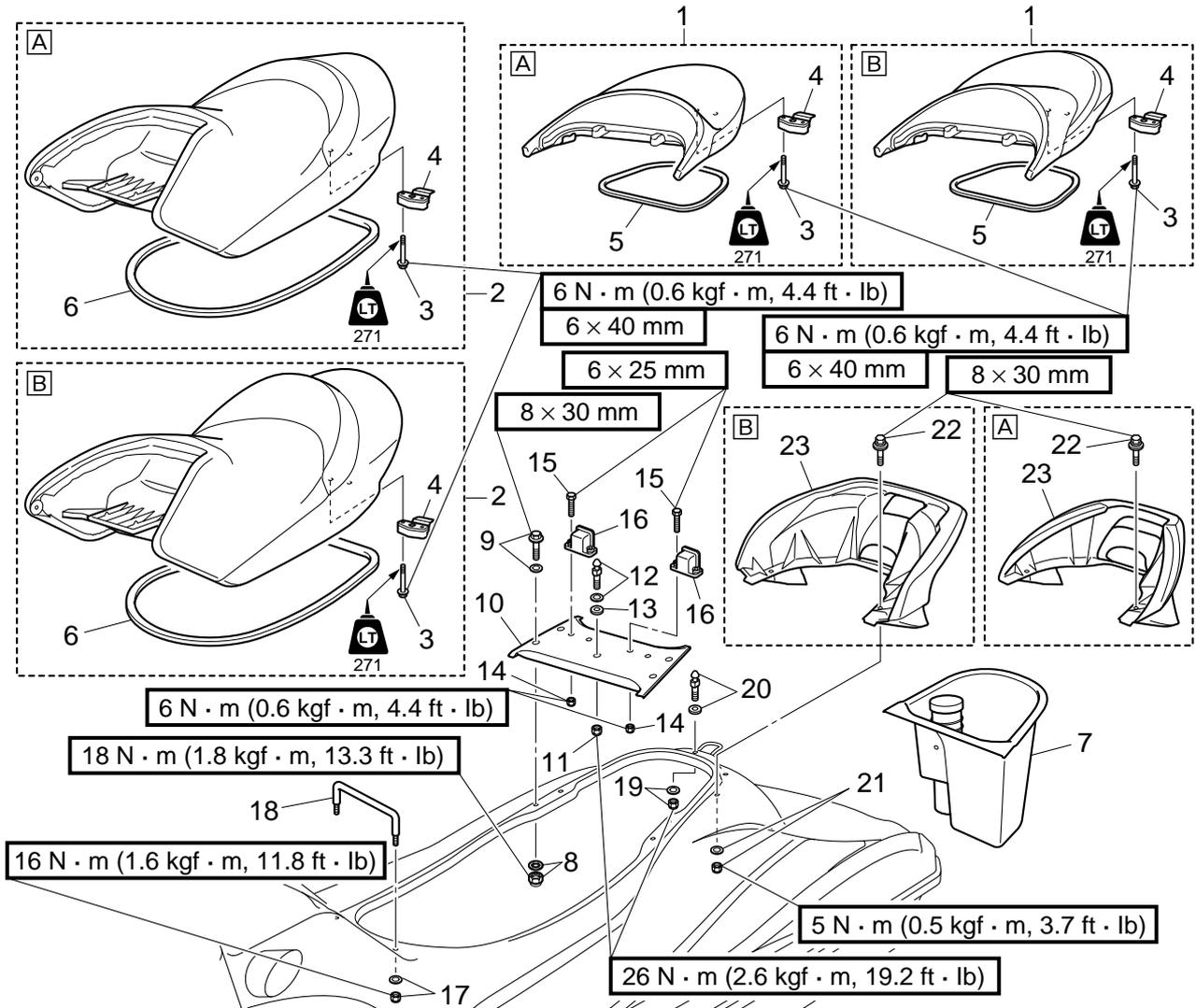


Step	Procedure/Part name	Q'ty	Service points
	Engine unit		Refer to "Engine unit" in Chapter 5.
1	Band	4	<b>Not reusable</b>
2	Ventilation hose	2	
3	Fuel tank breather hose 1	1	
4	Fuel tank breather hose 2	1	
5	Rivet	2	<b>Not reusable</b>
6	Water separator	1	
7	Nut	3	
8	Seal	3	<b>Not reusable</b>
9	Clamp	3	

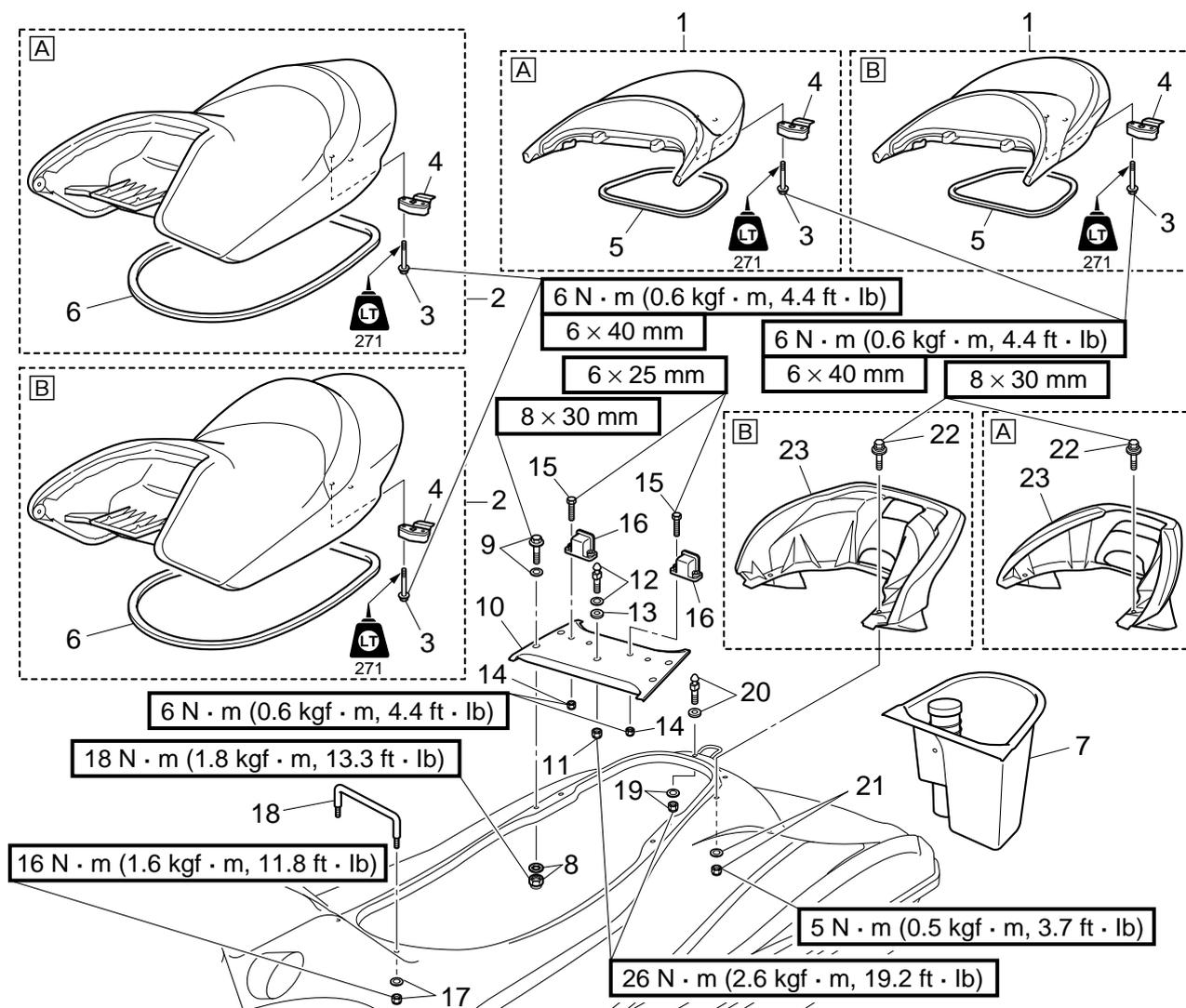


Step	Procedure/Part name	Q'ty	Service points
10	Cooling water pilot outlet	3	<b>NOTE:</b> _____ Align each projection (a) with the slits (b).
11	Cooling water hose	3	(A) To air cooler/(B) To oil cooler
12	Rivet	2	<b>Not reusable</b>
13	Ventilation socket	1	
14	Band	1	<b>Not reusable</b>
15	Ventilation pipe	1	
			Reverse the removal steps for installation.

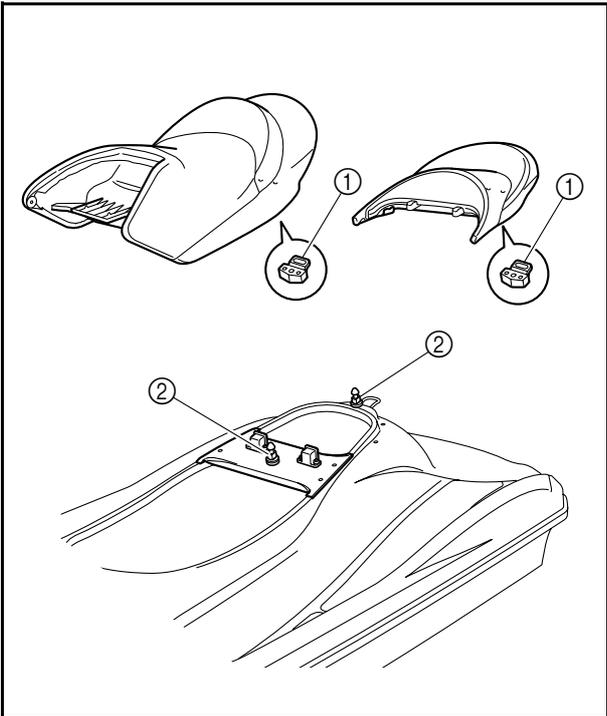
**Seats and hand grip**  
**Seat and hand grip removal**



Step	Procedure/Part name	Q'ty	Service points
1	Rear seat assembly	1	<b>A</b> FX SHO/ <b>B</b> FX Cruiser SHO
2	Front seat assembly	1	<b>A</b> FX SHO/ <b>B</b> FX Cruiser SHO
3	Bolt	4	
4	Seat lock assembly	2	
5	Packing (rear)	1	<b>Not reusable</b>
6	Packing (front)	1	<b>Not reusable</b>
7	Seat storage compartment	1	
8	Nut/washer	4/4	
9	Bolt/washer	4/4	
10	Deck beam	1	
11	Nut	1	
12	Projection/washer	1/1	



Step	Procedure/Part name	Q'ty	Service points
13	Seal	1	<b>Not reusable</b>
14	Nut	4	
15	Bolt	4	
16	Rear seat stay	2	
17	Nut/washer	2/2	
18	Seat holder	1	
19	Nut/washer	1/1	
20	Projection/washer	1/1	
21	Nut/washer	4/4	
22	Bolt	4	
23	Hand grip	1	<b>A</b> FX SHO/ <b>B</b> FX Cruiser SHO Reverse the removal steps for installation.

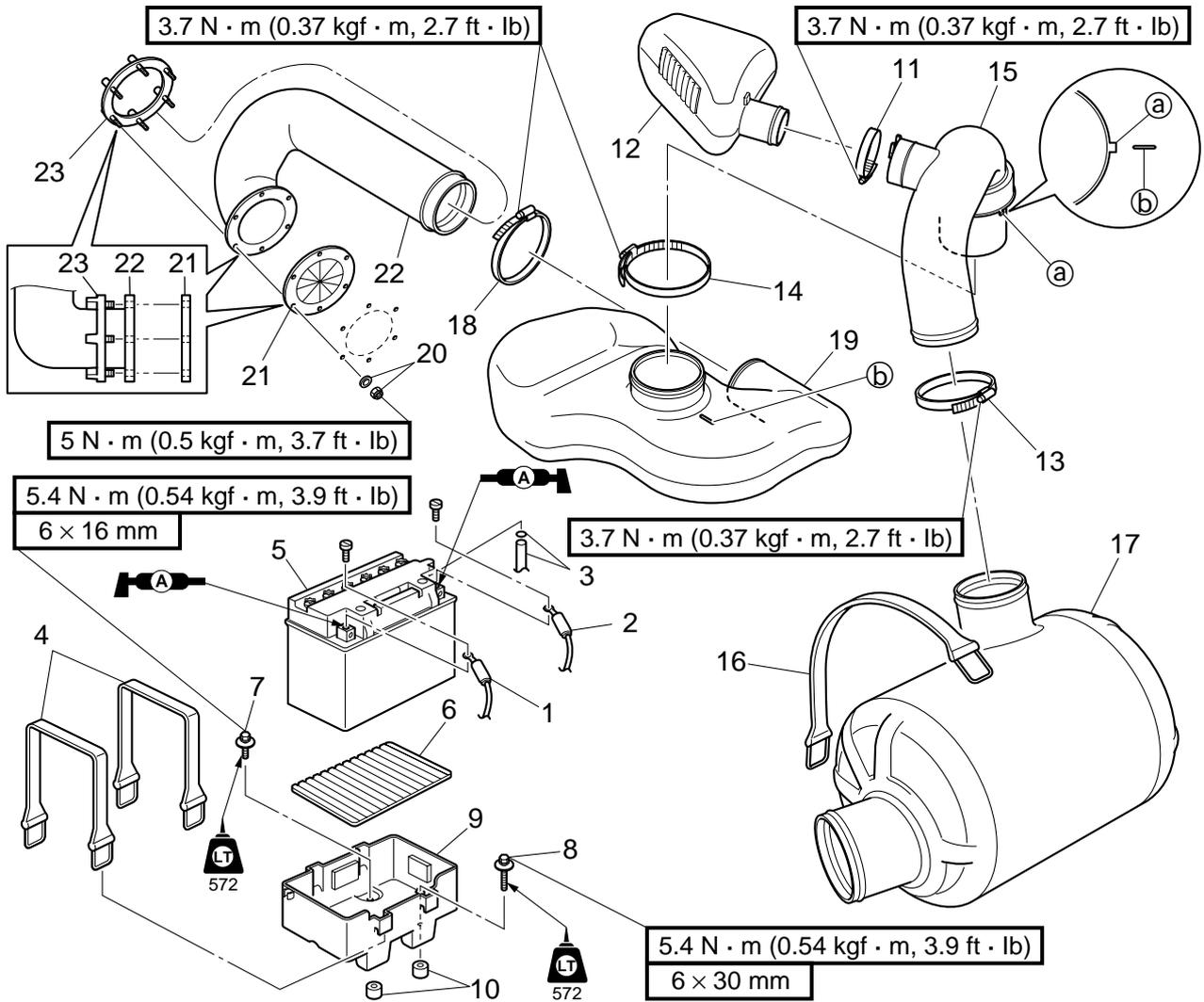


**Seat lock check**

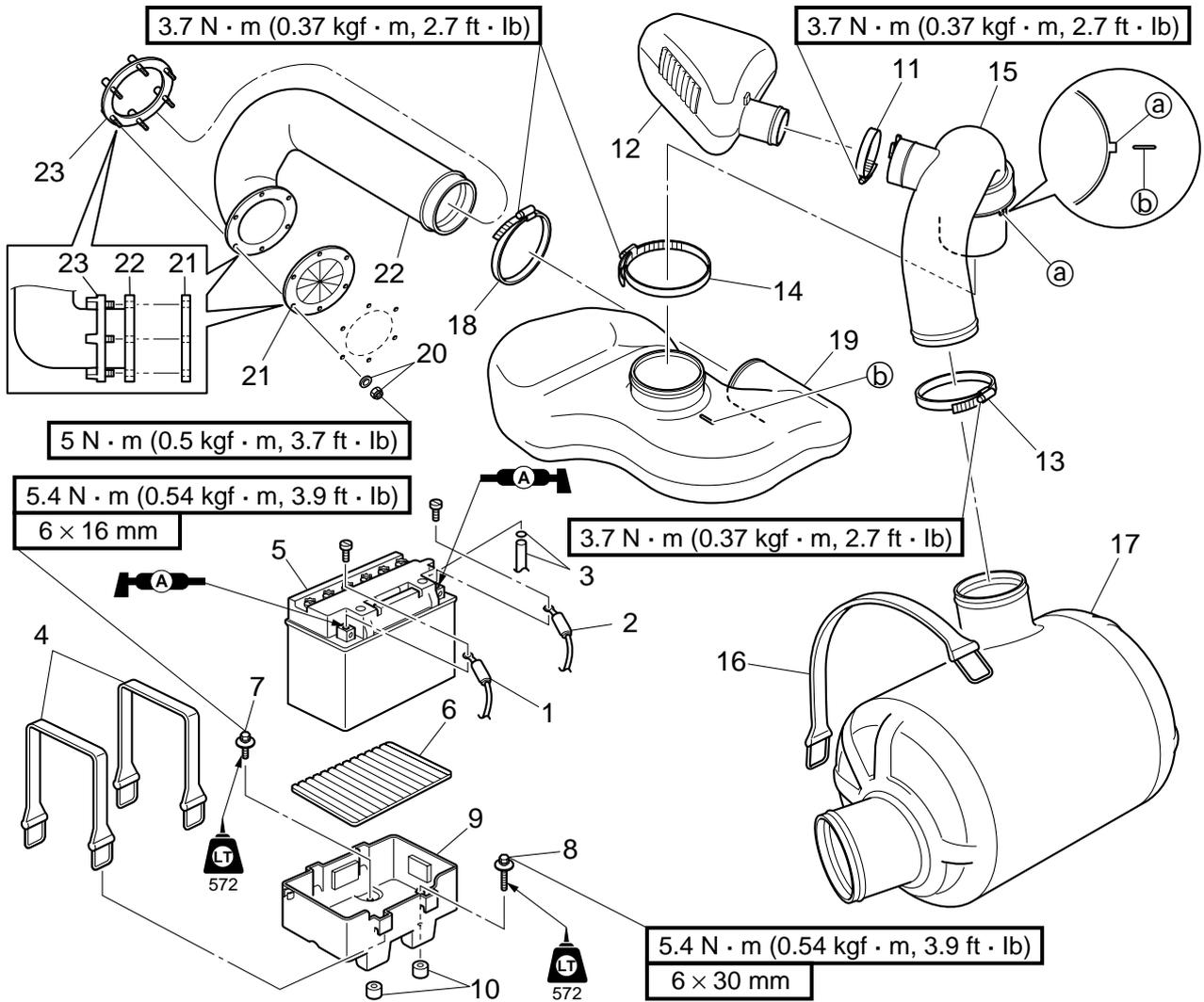
**1. Check:**

- Seat lock assembly ①  
Does not lock → Replace the seat lock assembly.
- Projection ②  
Damage → Replace the projection.

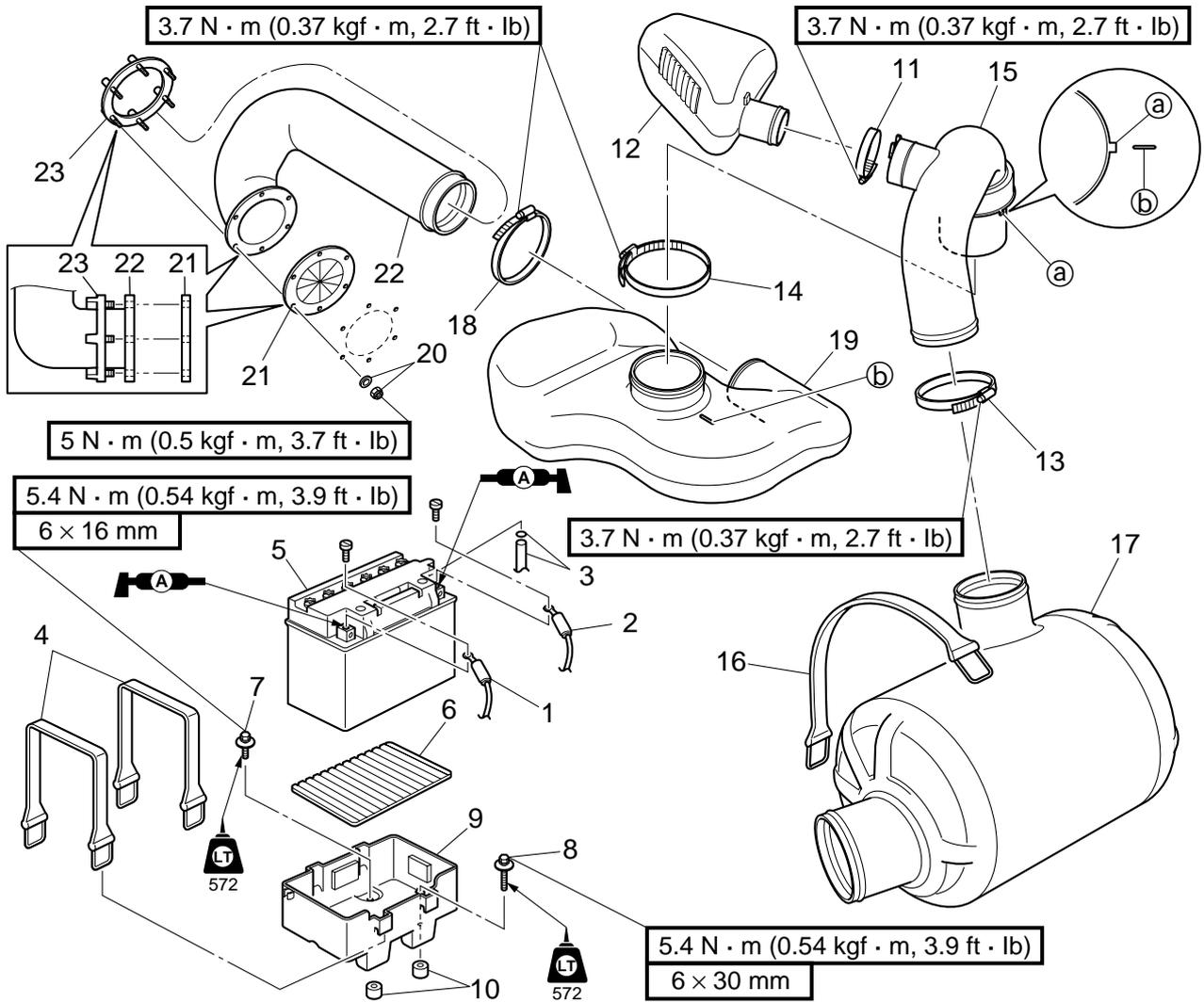
**Exhaust system**  
Exhaust system and battery removal



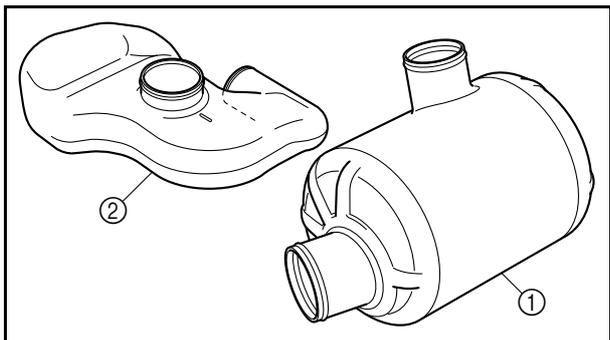
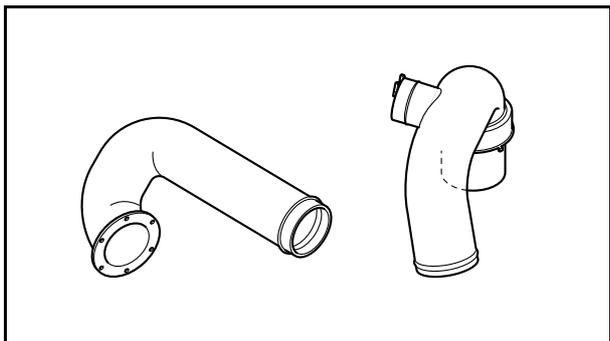
Step	Procedure/Part name	Q'ty	Service points
	Deck beam		Refer to "Seat and hand grip removal."
	Muffler		Refer to "Engine unit" in Chapter 5.
	Rubber plate		Refer to "Jet pump unit removal" in Chapter 6.
1	Negative battery cable	1	
2	Positive battery cable	1	
3	Clip/battery breather hose	1/1	
4	Band	2	
5	Battery	1	
6	Damper	1	
7	Bolt	2	
8	Bolt	2	
9	Battery box	1	
10	Spacer	2	



Step	Procedure/Part name	Q'ty	Service points
11	Clamp	1	<p><b>NOTE:</b> _____</p> <p>Align the projection <b>Ⓐ</b> on the rubber hose with the alignment mark <b>Ⓑ</b> on the water tank.</p>
12	Resonator	1	
13	Clamp	1	
14	Camp	1	
15	Rubber hose	1	
16	Band	1	
17	Water lock	1	
18	Clamp	1	
19	Water tank	1	
20	Nut/washer	6/6	



Step	Procedure/Part name	Q'ty	Service points
21	Exhaust valve	1	<b>Not reusable</b>
22	Rubber hose	1	
23	Plate	1	
			Reverse the removal steps for installation.



### Exhaust system check

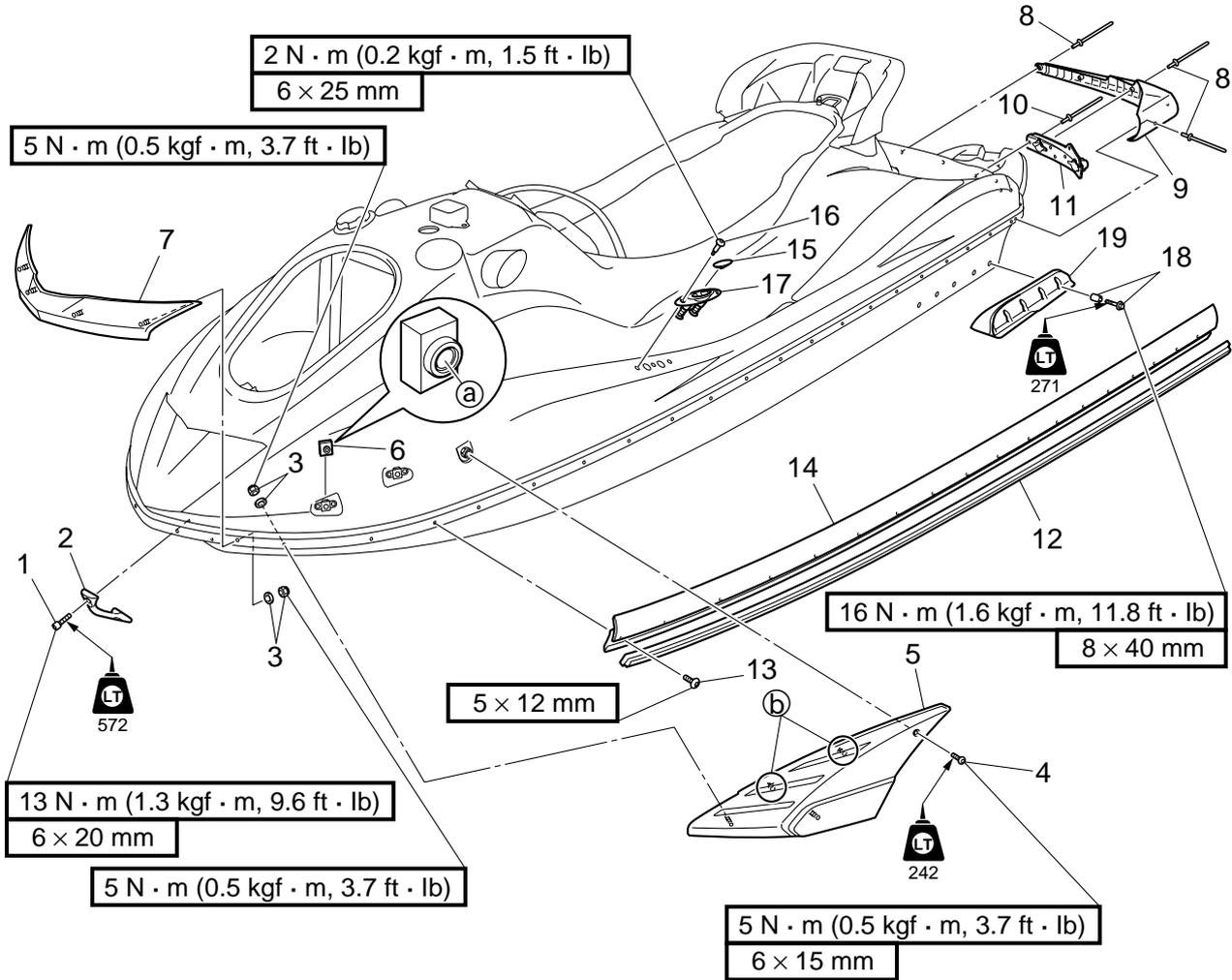
#### 1. Check:

- Rubber hoses  
Burns/cracks/damage → Replace the rubber hoses.

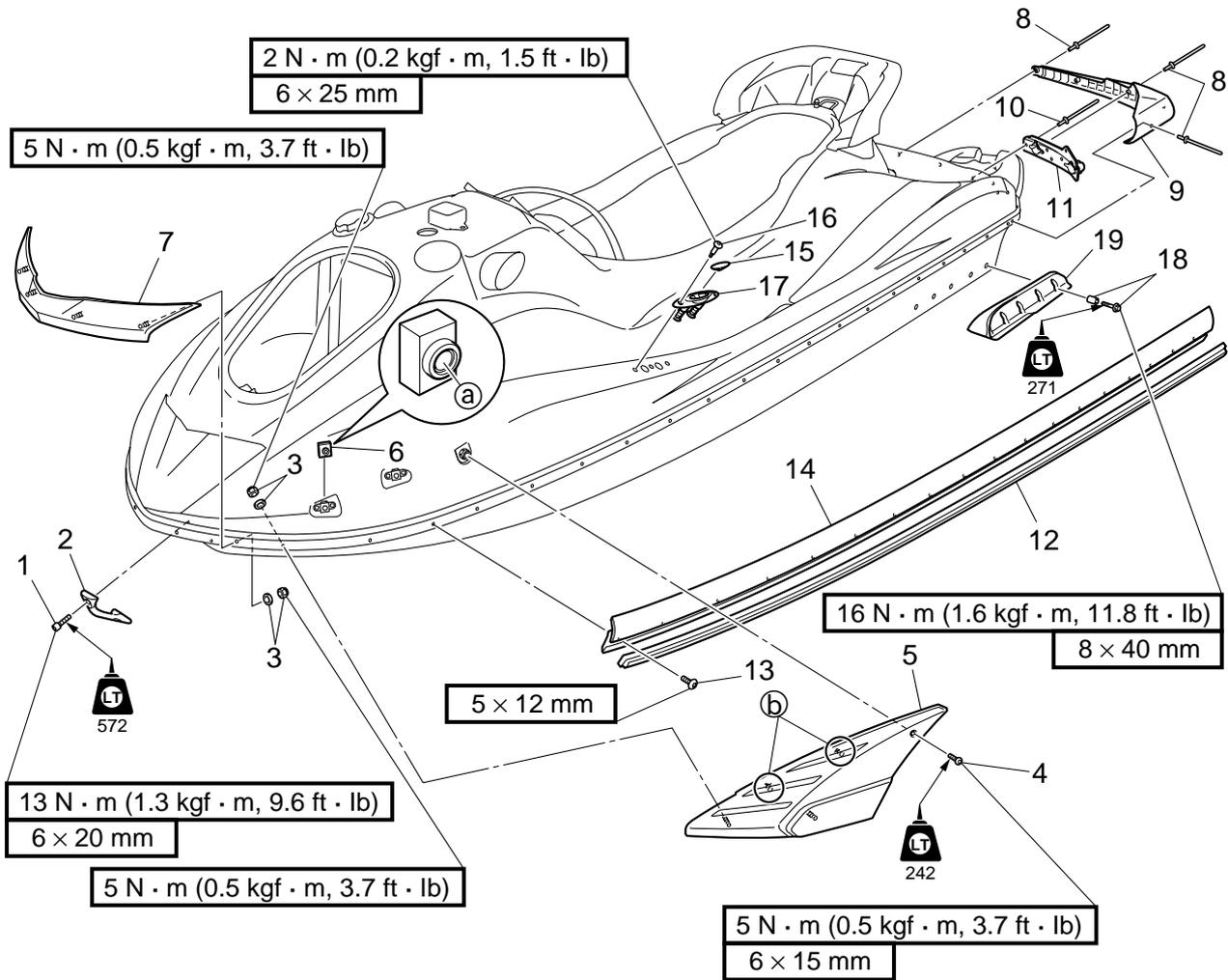
#### 2. Check:

- Water lock ①
- Water tank ②  
Cracks/damage/leaks → Replace.

**Deck and hull**  
**Deck and hull disassembly 1**

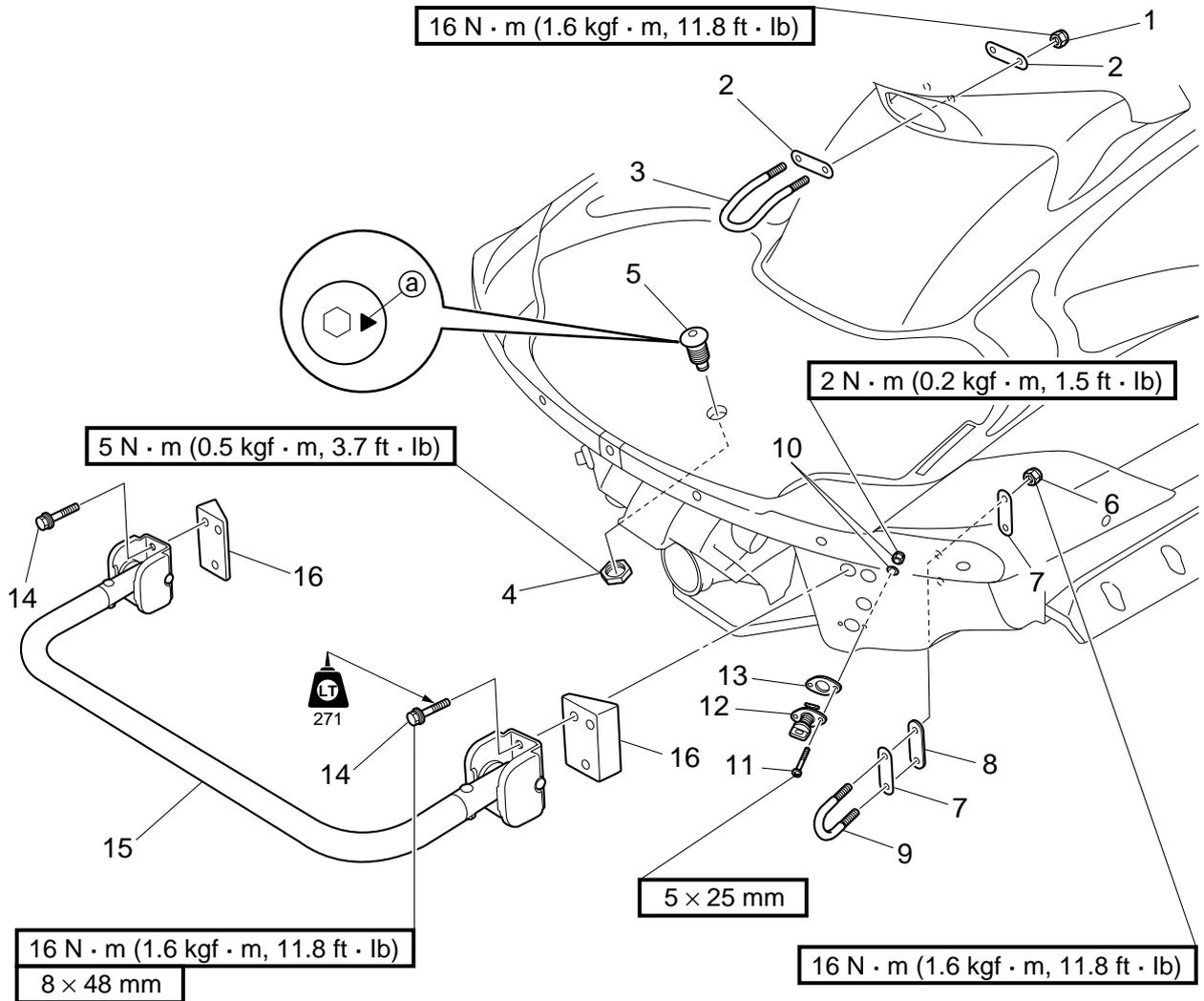


Step	Procedure/Part name	Q'ty	Service points
1	Bolt	2	<p><b>NOTE:</b> _____ Apply soapy water to the inner surfaces <b>a</b> of the grommets before installing the projections <b>b</b> of the front protectors.</p>
2	Bow eye	1	
3	Nut/washer	8/8	
4	Bolt	2	
5	Front protector 1	2	
6	Grommet	4	
7	Front protector 2	1	<p><b>Not reusable</b></p>
8	Rivet	9	
9	Rear protector	2	
10	Rivet	10	

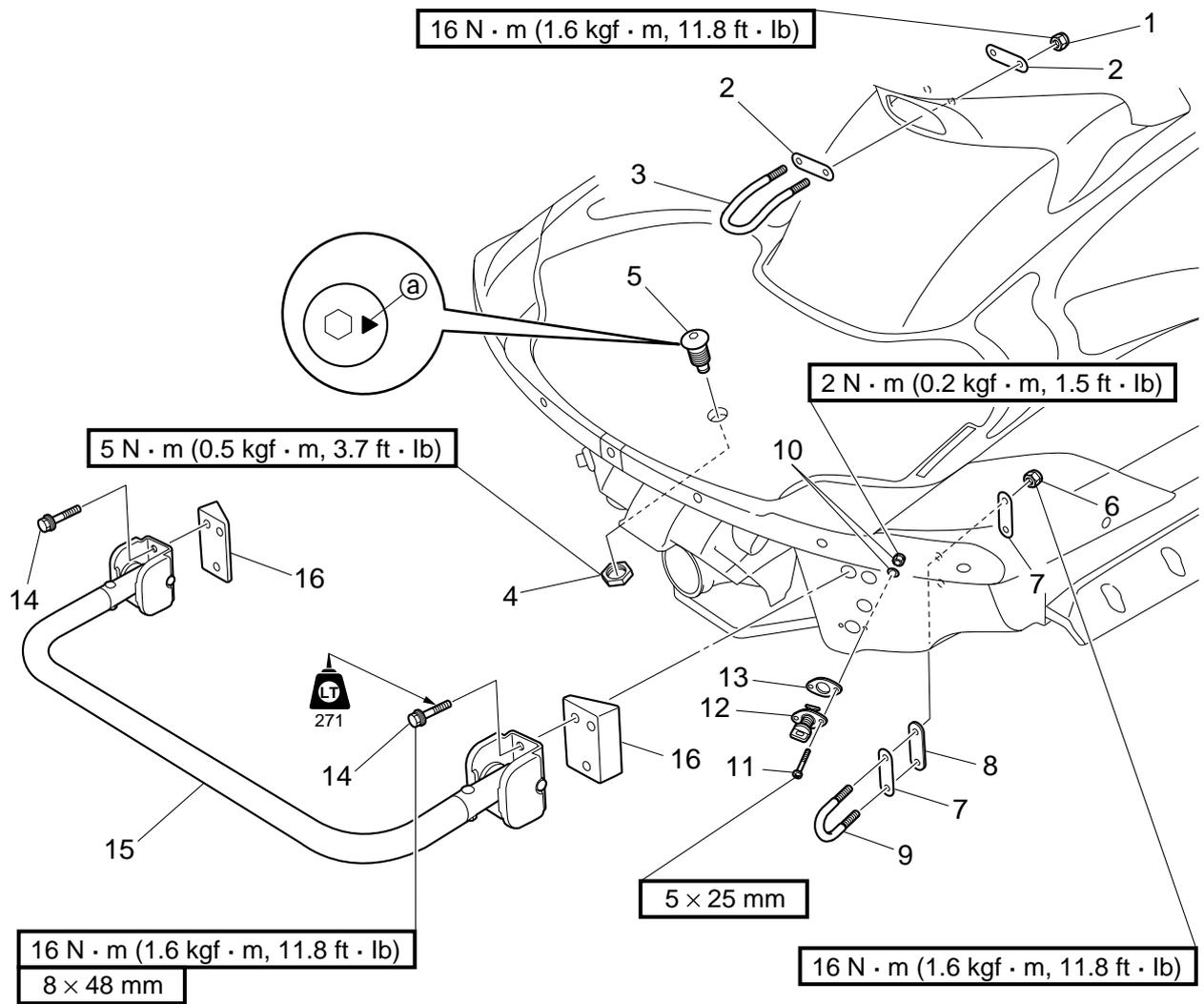


Step	Procedure/Part name	Q'ty	Service points
11	Gunwale bracket	2	
12	Inner gunwale	2	
13	Screw	36	
14	Side gunwale	2	
15	Pull-up cleat cover	2	FX Cruiser SHO
16	Bolt	6	FX Cruiser SHO
17	Pull-up cleat assembly	2	FX Cruiser SHO
18	Bolt/collar	10/10	
19	Sponson	2	
			Reverse the disassembly steps for assembly.

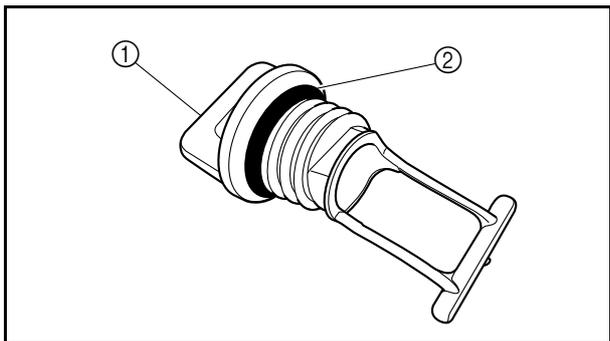
**Deck and hull disassembly 2**



Step	Procedure/Part name	Q'ty	Service points
1	Nut	2	<p><b>NOTE:</b> _____ Face the mark ⓐ toward the bow.</p>
2	Plate	2	
3	Ski tow	1	
4	Nut	1	
5	Spout	1	
6	Nut	4	<p><b>Not reusable</b></p>
7	Plate	4	
8	Packing	2	
9	Stern eye	2	
10	Nut/washer	4/4	
11	Screw	4	



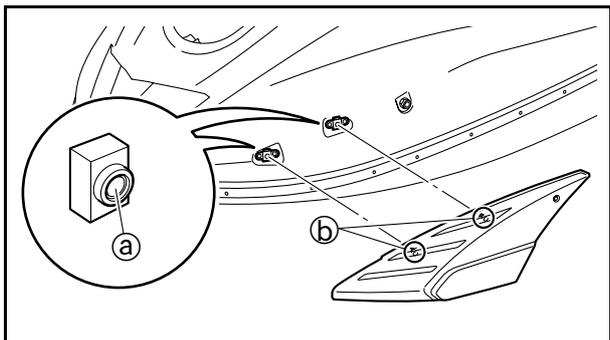
Step	Procedure/Part name	Q'ty	Service points
12	Drain plug	2	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Not reusable</div>
13	Packing	2	
14	Bolt	6	
15	Reboarding step assembly	1	
16	Spacer	2	
			Reverse the disassembly steps for assembly.



**Drain plug check**

**1. Check:**

- Drain plug ①
  - O-ring ②
- Cracks/damage → Replace the drain plug.



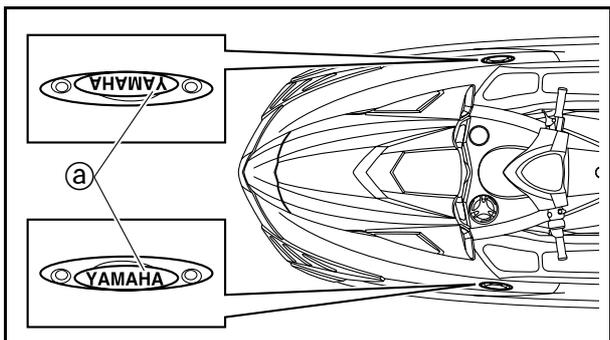
**Front protector 1 installation**

**1. Install:**

- Front protectors

**NOTE:**

Apply soapy water to the inner surfaces ① of the grommets before installing the projections ② of the front protectors.



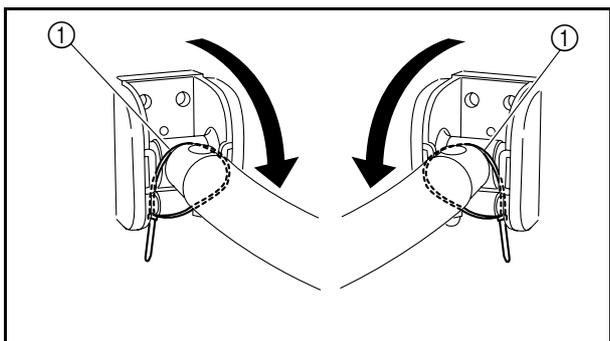
**Pull-up cleat cover installation (FX Cruiser SHO)**

**1. Install:**

- Pull-up cleat covers

**NOTE:**

Make sure that the word “YAMAHA” ① on each pull-up cleat cover can be read correctly from the side of the watercraft as shown.



**Reboarding step installation**

**1. Install:**

- Reboarding step

**Installation steps:**

1. Fasten the brackets in both sides of the reboarding step in the down position with plastic ties ① as shown so that they will not return to the up position.
2. Finger tighten all of the bolts, and then tighten them to the specified torque.



Reboarding step assembly bolt:  
16 N·m (1.6 kgf·m, 11.8 ft·lb)  
LOCTITE 271

**HULL  
HOOD**



Deck and hull

E

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**— MEMO —**

## Chapter 9 Trouble analysis

<b>YDIS</b> .....	<b>9-1</b>
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Functions.....	9-1
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Trouble analysis chart.....	9-15

## YDIS

### Introduction

#### Features

The newly developed YDIS provides quicker detection and analysis of engine malfunctions. By connecting your computer to the ECM of a watercraft using the communication cable, this software can be used to display sensor data and data stored in the ECM on a computer's monitor. If this software is run on Microsoft Windows<sup>®</sup> 2000 or Windows XP, the information can be displayed in colorful graphics. Also, the software can be operated using either a mouse or a keyboard. In addition, the data for the main functions (Diagnosis, Diagnosis record, Engine monitor, Data logger, and Record of engine oil exchange) can be saved on a disk or printed out.

#### NOTE:

Be sure to use YDIS (Ver. 1.30) with this model.

### Functions

#### Scan tool

1. **Diagnosis:** Each sensor's status and each ECM diagnostic code or item is displayed. This enables you to find malfunctioning parts and controls quickly. The diagnostic codes displayed are the same as those described in "Diagnostic code and checking step" in this chapter.
2. **Diagnosis record:** Sensors that had been activated and ECM diagnostic codes that have been recorded are displayed. This allows you to check the watercraft's record of malfunctions. The diagnostic codes displayed are the same as those described in "Diagnostic code and checking step" in this chapter.

3. **Engine monitor:** Each sensor status and the ECM data are displayed. This enables you to find malfunctioning parts quickly. In addition, the data displayed using the Engine Monitor function can be displayed in a graph.

**Items: For FX SHO, FX Cruiser SHO**

1	Engine speed	11	Fuel injection duration	21	No-Wake mode switch <sup>(*11)</sup>
2	Intake pressure <sup>(*1)</sup>	12	Engine temperature	22	Cruise assist switch <sup>(*12)</sup>
3	Throttle position sensor 1 <sup>(*2)</sup>	13	Intake temperature <sup>(*6)</sup>	23	Cruise assist up switch <sup>(*13)</sup>
4	Throttle valve opening (0-90)	14	Ex.manifold water temp. sensor <sup>(*7)</sup>	24	Cruise assist down switch <sup>(*14)</sup>
5	Throttle position sensor 2 <sup>(*3)</sup>	15	Engine stop lanyard switch <sup>(*8)</sup>	25	Reverse switch <sup>(*15)</sup>
6	Accelerator position sensor 1 <sup>(*4)</sup>	16	Overheat thermostwitch <sup>(*9)</sup>	26	Main relay <sup>(*16)</sup>
7	Accelerator position sensor 2 <sup>(*5)</sup>	17	Slant detection switch	27	ETV relay
8	Atmospheric pressure	18	Oil press switch <sup>(*10)</sup>	28	Fuel pump relay <sup>(*16)</sup>
9	Ignition timing	19	Engine start switch		
10	Battery voltage (12-16)	20	Steering sensor		

(\*1): Intake air pressure

(\*2): TPS 1

(\*3): TPS 2

(\*4): APS 1

(\*5): APS 2

(\*6): Intake air temperature

(\*7): Thermo sensor

(\*8): Engine shut-off switch

(\*9): Thermostwitch

(\*10): Oil pressure switch

(\*11): "NO-WAKE MODE" switch

(\*12): "SET" switch

(\*13): Up switch

(\*14): Down switch

(\*15): Reverse sensor

(\*16): Main and fuel pump relay

4. **Stationary test:** Operation tests can be performed with the engine off.

**Items: For FX SHO, FX Cruiser SHO**

1	Ignite ignition coil (#1–#4)	2	Operate injector (#1–#4)	3	Operate electric fuel pump <sup>(*1)</sup>
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(\*1): Operate fuel pump module

5. **Active test:** With the engine running, each cylinder is dropped and the engine speed is checked for changes to determine if the cylinder is malfunctioning. These tests can be performed quickly.

6. **Data logger:** From the data stored in the ECM, no more than 2 items of 78 seconds of recorded data are displayed on a graph. In addition, the operating time as compared to the engine speed and the total operating time are displayed. This allows you to check the operating status of the engine. For FX SHO, FX Cruiser SHO models, you can also save the ECM record data in a file so that you can read and display the graph later.

**Items: For FX SHO, FX Cruiser SHO**

1	Engine speed	3	Throttle position sensor	5	Intake pressure <sup>(*1)</sup>
2	Battery voltage (12–16)	4	Engine temperature	6	Oil press switch <sup>(*2)</sup>

(\*1): Intake air pressure

(\*2): Oil pressure switch

7. **ECM record data graph:** When a malfunction occurs in the ETV system, 4 seconds (2 seconds before and after the malfunction) of recorded data are saved in the ECM. This data can be displayed on a graph using the “ECM record data graph” of the Data logger function.  
 When the communication cable is used to connect a computer to the ECM, the ECM record data can be saved and viewed on the computer.  
 The saved ECM record data can also be viewed offline.

**Items: For FX SHO, FX Cruiser SHO**

1	Engine speed	10	Ref. TPS voltage <sup>(*7)</sup>	19	No-Wake mode
2	Accelerator position sensor 1 <sup>(*1)</sup>	11	Ref. acc. pos. sensor voltage <sup>(*8)</sup>	20	Low-RPM mode
3	Accelerator position sensor 2 <sup>(*2)</sup>	12	Target TPS voltage for ISC <sup>(*9)</sup>	21	Engine stop lanyard switch <sup>(*11)</sup>
4	Steering sensor	13	Engine stop mode	22	Main relay <sup>(*12)</sup>
5	Throttle position sensor 1 <sup>(*3)</sup>	14	Engine start mode	23	ETV relay
6	Throttle position sensor 2 <sup>(*4)</sup>	15	Engine stop mode with SW <sup>(*10)</sup>	24	Overheat thermoswitch <sup>(*13)</sup>
7	Intake pressure <sup>(*5)</sup>	16	OTS mode	25	Oil press switch <sup>(*14)</sup>
8	Battery voltage	17	Cruise assist mode	26	Warning
9	Target TPS voltage <sup>(*6)</sup>	18	Reverse mode	27	ETV limit

- (\*1): APS 1
- (\*2): APS 2
- (\*3): TPS 1
- (\*4): TPS 2
- (\*5): Intake air pressure
- (\*6): Target TPS voltage  
 This item shows the target output voltage of the TPS.  
 This value is the control voltage that the ECM requires to set the target opening angle of the throttle valve.
- (\*7): Reference TPS voltage  
 This item shows the criterion output voltage of the TPS.  
 This value is used to detect the TPS output voltage during engine operation.
- (\*8): Reference APS voltage  
 This item shows the criterion output voltage of the APS.  
 This value is used to detect the APS output voltage when the throttle lever is opened.
- (\*9): Target TPS voltage for Idle Speed Control  
 ECM controls the engine idle speed by using the throttle valve attached to the TPS.  
 This target voltage is used by the ECM to achieve the target opening angle of the throttle valve at the engine idle speed.
- (\*10): Engine stop mode with switch
- (\*11): Engine shut-off switch
- (\*12): Main and fuel pump relay
- (\*13): Thermoswitch
- (\*14): Oil pressure switch

**NOTE:**

To display the displays and graphs, refer to the YDIS (Ver. 1.30) Instruction Manual.

8. **Some files:** Other applications can be selected and run while continuing to run the diagnostic program.

**Contents**

- 1. CD-ROM (software + instruction manual)
- 2. Adapter
- 3. Communication cable



1



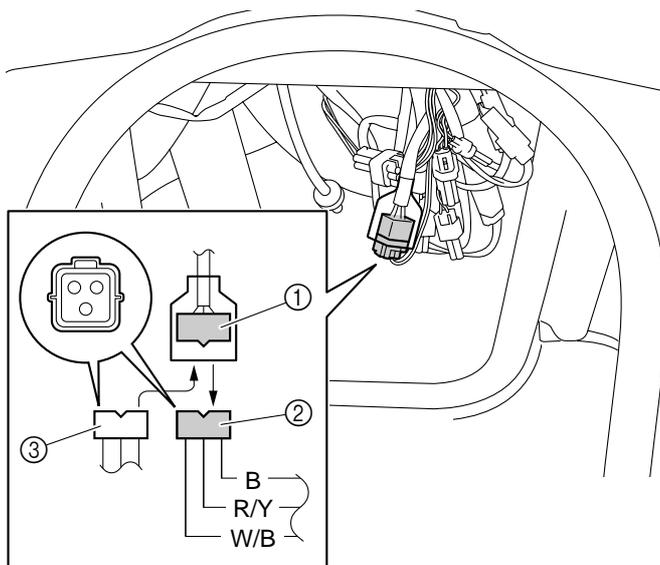
2



3

**Operating**

**Connecting the communication cable to the watercraft**



- ① Wiring harness coupler
- ② Meter coupler
- ③ 3-pin communication coupler

**NOTE:**

Be careful not to pinch the communication cable between the front hood and the deck or to damage it.

## Engine unit trouble analysis

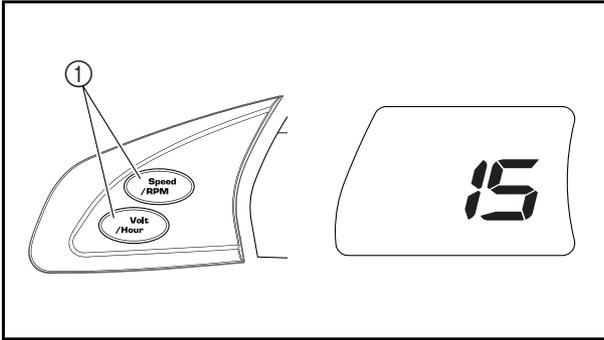
**NOTE:** \_\_\_\_\_

- Before troubleshooting the engine unit, make sure that fresh fuel of the specified type has been used.
- Check that the battery is charged and that its specific gravity is within specification.
- Check the diagnostic code using the YDIS (or self-diagnosis) first, and then check the electronic control system by following the diagnostic code chart.
- The multifunction meter cannot display more than 1 diagnostic code. Even if multiple diagnostic codes are present, only 1 will be displayed.
- When a three-digit diagnostic code is detected, check the data logger of the “ECM record data graph” as well.
- Using the YDIS is recommended because self-diagnosis may be insufficient for proper troubleshooting of the ETV system (throttle body assembly, TPS, and APS).
- If a diagnostic code is not detected, check the engine unit according to “Engine unit trouble analysis (diagnostic code not detected).”
- Before using the YDIS or checking the engine unit, check the ECM circuit. To check the ECM circuit, refer to “ECM circuit” in Chapter 7.
- Check that all wiring connections are properly secured and that they are not rusty or corroded.
- Check that the engine shut-off cord (lanyard) is connect to the engine shut-off switch.
- When deleting the diagnosis record on the YDIS, be sure to check the time that the diagnostic codes were detected.
- When checking the input voltage of a part, the coupler or connector must be disconnected. As a result, the ECM determines that the part is disconnected and a diagnostic code is detected. Therefore, be sure to delete the diagnosis record after checking the input voltage.

## Using the YDIS for engine unit trouble analysis

**NOTE:** \_\_\_\_\_

- Use the diagnostic codes displayed by the YDIS to check each part according to the “Diagnostic code and checking step” table.
- Delete the diagnostic codes after checking, repairing, or replacing a part, and check that the diagnostic codes are not detected again. If the same diagnostic codes are detected, the ECM may be faulty.
- Check the items listed in the table, if all the items are in good condition, delete the diagnostic code, and then check the diagnostic codes again. If the same diagnostic codes are detected again, the ECM is faulty.
- A breakdown of the engine symptoms are described in the table below, however, multiple malfunctions that have been duplicated cannot be limited to these items. The symptoms may change according to the operating conditions and other conditions.

**Self-diagnosis**

With the engine running, press the 2 buttons ① simultaneously for 8 seconds and check if a diagnostic code is indicated on the multifunction meter.

If the YDIS is not used to check the symptoms listed in the "Diagnostic code table," the diagnostic codes can be checked easily with the self-diagnosis in the multifunction meter. However, because the multifunction meter cannot display more than 1 diagnostic code even if there are multiple diagnostic codes, using the YDIS is recommended.

Diagnostic code table

Code No.	Symptom	Diagnostic code output		
		Multifunction meter	YDIS	
			Diagnosis	Diagnosis record
01	Normal	○	—	—
13	Pulser coil <sup>(*1)</sup> malfunction	○	○	○
15	Engine temp sensor <sup>(*2)</sup> malfunction	○	○	○
17	Knock sensor malfunction	○	○	○
19	Battery voltage malfunction	○	○	○
23	Intake temp sensor <sup>(*3)</sup> malfunction	○	○	○
24	Cam position sensor malfunction	○	○	○
29	Intake press sensor <sup>(*4)</sup> malfunction	○	○	○
47	Slant detection switch malfunction	○	—	○
55	Steering sensor malfunction	○	○	○
65	EX. manifold water temp. sensor <sup>(*5)</sup> malfunction	○	○	○
68	No-Wake mode switch <sup>(*6)</sup> malfunction	○	○	○
78	Reverse switch <sup>(*7)</sup> malfunction	○	○	○
112, 113, 114, 115, 116, 117, 118, 119, 121, 122, 123, 129, 136, 137, 138, 139, 141, 142, 143, 144, 145	Electronic throttle system malfunction	○	○	○
124, 125, 126, 127, 128	Throttle position sensor malfunction	○	○	○
131, 132, 133, 134, 135	Accelerator position sensor malfunction	○	○	○

- (\*1): Pickup coil
- (\*2): Engine temperature sensor
- (\*3): Intake air temperature sensor
- (\*4): Intake air pressure sensor
- (\*5): Thermo sensor
- (\*6): "NO-WAKE MODE" switch
- (\*7): Reverse sensor

**Diagnostic code and checking step**

Diagnos- tic code	Item	Symptom	Checking steps	Refer to page
13	Pulser coil <sup>(*1)</sup> malfunction	Engine will not start	1. Measure the pickup coil output peak voltage.	7-14
			2. Measure the pickup coil resistance.	7-14
			3. Check the white/black and black/ orange (W/B and B/O) pickup coil wir- ing harness leads for continuity.	WD
15	Engine temp sensor <sup>(*2)</sup> malfunction	Trolling speed is unstable <sup>(*3)</sup>	1. Check the engine temperature using the YDIS.	9-1
			2. Measure the engine temperature sen- sor input voltage.	7-23
			3. Check the black/yellow and black/ orange (B/Y and B/O) engine tempera- ture sensor wiring harness leads for continuity.	WD
			4. Measure the engine temperature sen- sor resistance.	7-23
17	Knock sensor malfunction	Normal operation	1. Check that the knock sensor is installed correctly.	5-90
			2. Measure the knock sensor resistance.	7-28
			3. Check the green (G) knock sensor wir- ing harness lead for continuity.	WD
19	Battery voltage malfunction	Trolling speed is unstable <sup>(*3)</sup>	1. Check the battery voltage using the YDIS.	9-1
			2. Check the fuse for continuity.	7-47
			3. Measure the stator coil output peak voltage.	7-15
			4. Measure the rectifier regulator output peak voltage.	7-17
			5. Check the battery cables and termi- nals for proper connection.	8-46

(\*1): Pickup coil

(\*2): Engine temperature sensor

(\*3): This symptom may only be exhibited in certain environmental conditions.

WD: Refer to the wiring diagram.

Diagnos- tic code	Item	Symptom	Checking steps	Refer to page
23	Intake temp sensor <sup>(*1)</sup> malfunction	Trolling speed is unstable <sup>(*3)</sup>	1. Check the intake air temperature using the YDIS.	7-24
			2. Measure the intake air temperature sensor input voltage.	7-24
			3. Check the black/red and black/orange (B/R and B/O) intake air temperature sensor wiring harness leads for continuity.	WD
			4. Measure the intake air temperature sensor resistance.	7-24
24	Cam position sensor malfunction	Engine speed is limited	1. Measure the cam position sensor input voltage.	7-36
			2. Check the orange, green/orange, and black/orange (O, G/O, and B/O) cam position sensor wiring harness leads for continuity.	WD
			3. Measure the cam position sensor output voltage.	7-36
29	Intake press sensor <sup>(*2)</sup> malfunction	Engine stalls Trolling speed is unstable <sup>(*3)</sup>	1. Check the intake air pressure using the YDIS.	9-1
			2. Measure the intake air pressure sensor input voltage.	7-26
			3. Check the orange, pink/green, and black/orange (O, P/G, and B/O) intake air pressure sensor wiring harness leads for continuity.	WD
			4. Check the intake air pressure sensor operation.	7-26
47	Slant detection switch malfunction	Normal operation	1. Check the slant detection switch operation using the YDIS.	9-1
			2. Measure the slant detection switch input voltage.	7-37
			3. Check the blue/black and black/orange (L/B and B/O) slant detection switch wiring harness leads for continuity.	WD
			4. Check the slant detection switch continuity.	7-37

(\*1): Intake air temperature sensor

(\*2): Intake air pressure sensor

(\*3): This symptom may only be exhibited in certain environmental conditions.

WD: Refer to the wiring diagram.

Diagnos- tic code	Item	Symptom	Checking steps	Refer to page
55	Steering sensor malfunction	Normal operation	1. Check the steering sensor operation using the YDIS.	7-38
			2. Measure the steering sensor input voltage.	7-38
			3. Check the orange/red, white/blue, and black/orange (O/R, W/L, and B/O) steering sensor wiring harness leads for continuity.	WD
65	Ex. manifold water temp. sensor <sup>(*1)</sup> malfunction	Normal operation	1. Check the thermo sensor operation using the YDIS.	9-1
			2. Measure the thermo sensor input voltage.	7-22
			3. Check the black/blue and black/orange (B/L and B/O) thermo sensor wiring harness leads for continuity.	WD
			4. Measure the thermo sensor resistance.	7-22
68	No-Wake mode switch malfunction	Normal operation	1. Check the right handlebar switch operation using the YDIS.	7-40
			2. Measure the right handlebar switch input voltage.	7-40
			3. Check the blue/red, yellow/black, yellow/red, yellow/green, and black (L/R, Y/B, Y/R, Y/G, and B) right handlebar switch assembly wiring harness leads for continuity.	WD
78	Reverse switch <sup>(*2)</sup> malfunction	Normal operation	1. Check the reverse sensor operation using the YDIS.	7-39
			2. Measure the reverse sensor input voltage.	7-39
			3. Check the orange, green/white, and black/orange (O, G/W, and B/O) reverse sensor wiring harness leads for continuity.	WD

(\*1): Thermo sensor

(\*2): Reverse sensor

WD: Refer to the wiring diagram.

Diagnosis code	Item	Symptom	Checking steps	Refer to page
112 113 114	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Check the TPS output voltage and throttle valve opening using the YDIS.	7-28
			2. Check the ECM circuit for continuity.	7-42
			3. Check the ETV relay for continuity.	7-35
			4. Check the charging system. • Stator coil output peak voltage • Stator coil resistance • Rectifier regulator output peak voltage • Rectifier regulator continuity	7-15 7-15 7-17 7-17
			5. Check the fuse for continuity.	7-47
			6. Check the battery voltage and specific gravity.	3-19
			7. Check the red and black (R and B) power supply circuit cables and leads for continuity.	WD
115 116	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Check the pink, orange, pink/black, and black/orange (P, O, P/B, and B/O) throttle body assembly wiring harness leads for continuity.	WD
			2. Check the TPS output voltage and throttle valve opening using the YDIS.	7-28
			3. Check the throttle shaft and throttle inner surface for wear or damage.	5-38
117 118 119	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Check the throttle body assembly coupler terminals for rust and corrosion.	—
			2. Check the green and blue (G and L) throttle body assembly wiring harness leads for continuity.	WD
			3. Check the ECM circuit for continuity.	7-42
121	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Cross-check the ECM or replace.	—
122	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Cross-check the throttle body assembly.	—

(\*) : Throttle body assembly  
WD: Refer to the wiring diagram.

Diagnosis code	Item	Symptom	Checking steps	Refer to page
123	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Check the ETV relay and fuse (ETV relay) for continuity.	7-35 7-3
			2. Check the ECM circuit for continuity.	7-42
124 125 127 128	Throttle position sensor malfunction	Engine speed is limited	1. Check the pink, orange, pink/black, and black/orange (P, O, P/B, and B/O) throttle body assembly wiring harness leads for continuity.	WD
			2. Check the ECM circuit for continuity.	7-42
126	Throttle position sensor malfunction	Engine speed is limited	1. Check the TPS output voltage using the YDIS.	7-28
			2. Check the ECM circuit for continuity.	7-42
129	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Check the TPS output voltage using the YDIS.	7-28
			2. Check the ETV relay and fuse (ETV relay) for continuity.	7-35 7-3
131 132 133 134	Accelerator position sensor malfunction	Engine speed is limited	1. Check the APS output voltage using the YDIS.	7-31
			2. Check the APS circuit for continuity.	7-31
			3. Measure the APS 1 and 2 resistance.	7-31
135	Accelerator position sensor malfunction	Engine speed is limited	1. Measure the APS 1 and 2 resistance.	7-31
			2. Check the APS circuit for continuity.	7-31

(\*) : Throttle body assembly  
WD: Refer to the wiring diagram.

Diagnosis code	Item	Symptom	Checking steps	Refer to page
136 137 138 139	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Check the ECM circuit for continuity.	7-42
			2. Check the ETV relay for continuity.	7-35
			3. Check the charging system. • Stator coil output peak voltage • Stator coil resistance • Rectifier regulator output peak voltage • Rectifier regulator continuity	7-15 7-15 7-17 7-17
			4. Check the fuse for continuity.	7-47
			5. Check the battery voltage and specific gravity.	3-19
			6. Check the red and black (R and B) power supply circuit cables and leads for continuity.	WD
141	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Check the ECM circuit for continuity. 2. Check the ETV relay and fuse (ETV relay) for continuity.	7-42 7-35 7-3
142	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Check the TPS output voltage and throttle valve opening using the YDIS.	7-28
			2. Check the throttle shaft and throttle inner surface for wear or damage.	5-38
143 144	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Check the ECM circuit for continuity.	7-42
			2. Check the ETV relay for continuity.	7-35
			3. Check the charging system. • Stator coil output peak voltage • Stator coil resistance • Rectifier regulator output peak voltage • Rectifier regulator continuity	7-15 7-15 7-17 7-17
			4. Check the fuse for continuity.	7-47
			5. Check the battery voltage and specific gravity.	3-19
			6. Check the red and black (R and B) power supply circuit cables and leads for continuity.	WD
145	Electronic throttle system <sup>(*)</sup> malfunction	Engine speed is limited	1. Check the ETV relay and fuse (ETV relay) for continuity.	7-35 7-3
			2. Check the throttle shaft and throttle inner surface for wear or damage.	5-38

(\*) : Throttle body assembly  
WD: Refer to the wiring diagram.

**Engine unit trouble analysis (diagnostic code not detected)**  
**Trouble analysis chart**

Trouble mode														Check items	
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOW OIL PRESSURE	LOOSE STEERING	BILGE INCREASE	IRREGULAR WARNING INDICATION	Relative item	Reference chapter
														<b>FUEL SYSTEM</b>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Fuel tank breather hose	4
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Check valve	4
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>		Fuel hose	4
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Fuel pump	4, 7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Fuel filter	4
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>		Fuel tank	4
													<input type="checkbox"/>	Fuel sender	4, 7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Fuel rail	4
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Fuel injectors	4, 7

Trouble mode													Check items		
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOW OIL PRESSURE	LOOSE STEERING	BILGE INCREASE	IRREGULAR WARNING INDICATION	Relative item	Reference chapter
													<b>POWER UNIT</b>		
									<input type="checkbox"/>			<input type="checkbox"/>		Water passage	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Compression pressure	3
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>			<input type="checkbox"/>	Engine oil	3
										<input type="checkbox"/>				Oil filter	3
<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Air filter	3					
				<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	Air cooler	5
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Supercharger	5
				<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		Oil cooler	5
									<input type="checkbox"/>				<input type="checkbox"/>	Oil pump	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Valves and valve seats	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Valve pads	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Camshafts	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Timing chain	5
		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Drive coupling	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Cylinder head gasket	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		Cylinder block	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Crankcase	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Crankshaft	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Piston rings	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Pistons	5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						Bearings	5
		<input type="checkbox"/>		<input type="checkbox"/>				<input type="checkbox"/>						Thermostat	5
												<input type="checkbox"/>		Pilot water hose	5
								<input type="checkbox"/>				<input type="checkbox"/>		Water hose	5

Trouble mode													Check items		
ENGINE WILL NOT START	HARD STARTING	ROUGH IDLING	HIGH IDLING	ENGINE STALLS	POOR ACCELERATION	ENGINE WILL NOT STOP	POOR PERFORMANCE	LIMITED ENGINE SPEED	OVERHEATING	LOW OIL PRESSURE	LOOSE STEERING	BILGE INCREASE	IRREGULAR WARNING INDICATION	Relative item	Reference chapter
													JET PUMP UNIT		
														Bilge strainer	3
					○		○		○				○	Impeller duct	6
					○		○	○						Impeller	6
					○		○							Intake grate	6
	○	○			○		○							Bearings	6
									○					Water inlet hose	6
													○	Bilge hose	6
													○	Bilge hose joint	6
					○		○							Rubber damper	6
													ELECTRICAL		
○	○	○		○	○		○							Spark plugs	3
○	○	○		○	○		○	○						Ignition coils	7
							○	○					○	Oil pressure switch	7
													○	Electric bilge pump	7
○														Engine start switch	7
○						○								Engine stop switch	7
○					○									Engine shut-off switch	7
○		○		○										Main and fuel pump relay	7
○														Starter relay	7
○														Starter motor	7
○														Remote control receiver	7
													HULL AND HOOD		
													○	Steering master	8
○	○	○		○	○		○	○					○	Water lock	8
○	○	○		○	○		○	○					○	Exhaust hose	8
													○	Drain plugs	8

---

— MEMO —

# Wiring diagram

## FX SHO/FX Cruiser SHO

- ① Battery
- ② Starter motor
- ③ Fuse (30 A)
- ④ Fuse (20 A)
- ⑤ Fuse (3 A)
- ⑥ Fuse (10 A)
- ⑦ Fuse (10 A)
- ⑧ Starter relay
- ⑨ Main and fuel pump relay
- ⑩ ETV relay
- ⑪ Slant detection switch
- ⑫ Ignition coil
- ⑬ Spark plug
- ⑭ Cam position sensor
- ⑮ Intake air pressure sensor
- ⑯ Intake air temperature sensor
- ⑰ Engine temperature sensor
- ⑱ Thermostitch
- ⑲ Thermo sensor
- ⑳ Oil pressure switch
- ㉑ Fuel injector
- ㉒ Knock sensor
- ㉓ Remote control receiver
- ㉔ Antenna
- ㉕ Electric bilge pump
- ㉖ Earth plate
- ㉗ ECM
- ㉘ Rectifier regulator
- ㉙ Throttle body assembly
- ㉚ APS
- ㉛ Pickup coil
- ㉜ Stator coil
- ㉝ Reverse sensor
- ㉞ Right handlebar switch assembly
- ㉟ Buzzer
- ㊱ Fuel pump module
- ㊲ Steering sensor
- ㊳ Fuel sender
- ㊴ Multifunction meter
- ㊵ Compass and air temperature sensor  
(FX Cruiser SHO)
- ㊶ Speed sensor (FX SHO)  
Speed and water temperature sensor  
(FX Cruiser SHO)
- ㊷ Left operation button assembly
- ㊸ Right operation button assembly  
(FX Cruiser SHO)
- ㊹ Engine start switch
- ㊺ Engine stop switch
- ㊻ Engine shut-off switch

- [A] To entry box
- [B] To tachometer
- [C] FX Cruiser SHO

### Color code

B	: Black
Br	: Brown
G	: Green
Gy	: Gray
L	: Blue
O	: Orange
P	: Pink
R	: Red
W	: White
Y	: Yellow
B/G	: Black/green
B/L	: Black/blue
B/O	: Black/orange
B/R	: Black/red
B/W	: Black/white
B/Y	: Black/yellow
G/L	: Green/blue
G/O	: Green/orange
G/W	: Green/white
L/B	: Blue/black
L/R	: Blue/red
L/Y	: Blue/yellow
O/R	: Orange/red
O/W	: Orange/white
P/B	: Pink/black
P/G	: Pink/green
P/R	: Pink/red
P/W	: Pink/white
Pu/B	: Purple/black
Pu/G	: Purple/green
Pu/R	: Purple/red
Pu/W	: Purple/white
Pu/Y	: Purple/yellow
R/W	: Red/white
R/Y	: Red/yellow
W/B	: White/black
W/L	: White/blue
Y/B	: Yellow/black
Y/G	: Yellow/green
Y/R	: Yellow/red
Y/W	: Yellow/white

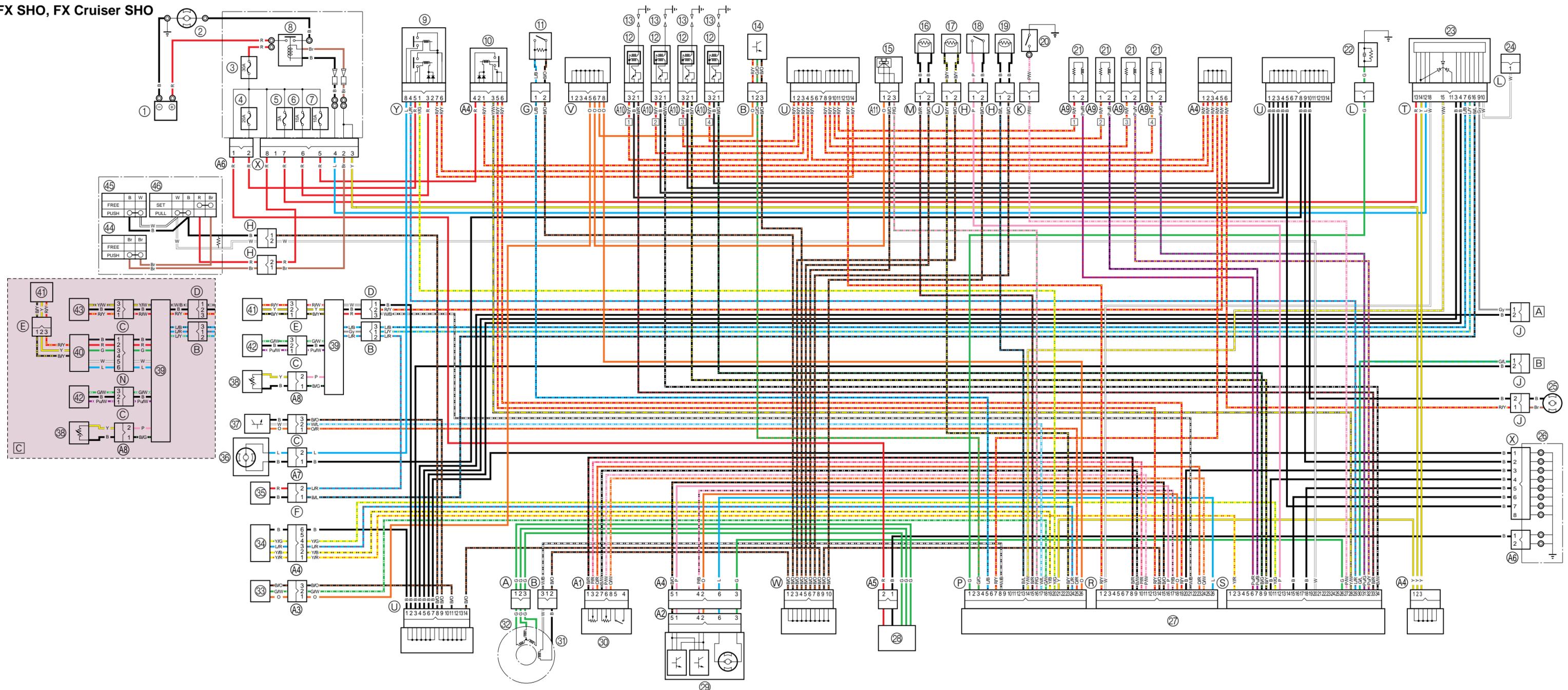




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(E)

FX SHO, FX Cruiser SHO



	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(J)	(K)	(L)	(M)	(N)
↔													
↔													

	(P)	(R)	(S)	(T)	(U)	(V)	(W)	(X)	(Y)	(A1)	(A2)	(A3)	(A4)	
↔														
								(A5)	(A6)	(A7)	(A8)	(A9)	(A10)	(A11)