



WaveRunner

FZR

— **GX1800 (F2R)**

FZS

— **GX1800A (F2C)**

SERVICE MANUAL

LIT-18616-03-18

F2C-28197-1M-11

NOTICE

This manual has been prepared by Yamaha primarily for use by Yamaha dealers and their trained mechanics when performing maintenance procedures and repairs to Yamaha equipment. It has been written to suit the needs of persons who have a basic understanding of the mechanical and electrical concepts and procedures inherent in the work, for without such knowledge attempted repairs or service to the equipment could render it unsafe or unfit for use.

Because Yamaha has a policy of continuously improving its products, models may differ in detail from the descriptions and illustrations given in this publication. Use only the latest edition of this manual. Authorized Yamaha dealers are notified periodically of modifications and significant changes in specifications and procedures, and these are incorporated in successive editions of this manual.

Important information

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

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

WARNING

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

NOTICE

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

TIP

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

WaveRunner
FZR, FZS
SERVICE MANUAL
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LIT-18616-03-18

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Periodic check and adjustment	 CHK ADJ
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Chapter 1

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How to use this manual

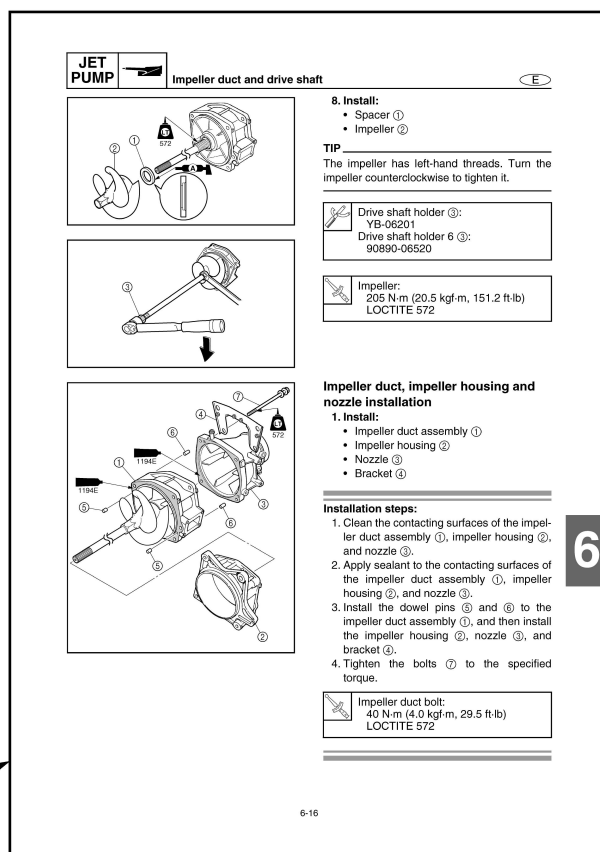
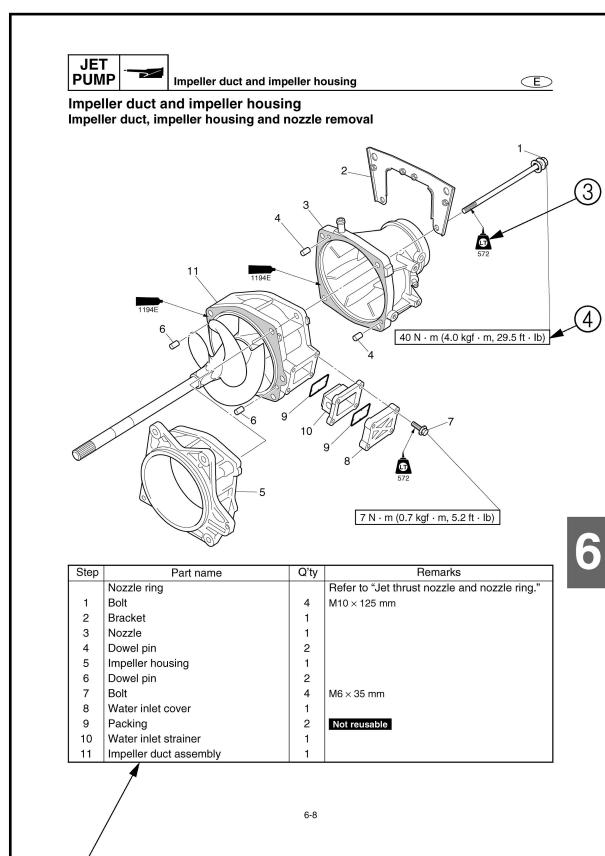
Manual format

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). To assemble or install the components, reverse the steps indicated in the component list.
- 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).

TIP

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





① 	②
③ 	④
⑤ 	⑥
⑦ 	⑧
⑨ 	⑩
⑪ 	⑫
⑬ 	⑭
⑮ 	⑯
⑰ 	⑱

Symbols

Symbols ① to ⑥ indicate specific data.

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

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

- ⑦ Apply 4-stroke motor oil
- ⑧ Apply water resistant grease
(Yamaha grease A)
- ⑨ Apply molybdenum disulfide grease
- ⑩ Apply Epnoc grease AP #0
- ⑪ Apply Silicone grease

Symbols ⑫ to ⑱ in an exploded diagram indicate the type of sealant or locking agent and the application point.

- ⑫ Apply ThreeBond 1194E or ThreeBond 1280B
- ⑬ Apply Gasket Maker
- ⑭ Apply LOCTITE 271 (red)
- ⑮ Apply LOCTITE 242 (blue)
- ⑯ Apply LOCTITE 572
- ⑰ Apply LOCTITE 648
- ⑱ Apply silicone sealant

TIP

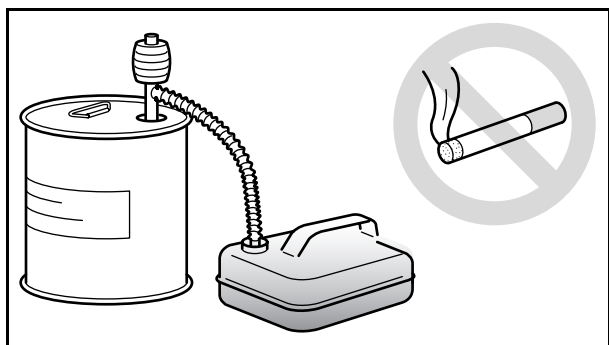
Additional symbols may be used in this manual.



Abbreviation

The following abbreviations are used in this service manual.

Abbreviation	Description
API	American Petroleum Institute
APS	Accelerator position sensor
BOW	Bow end
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



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.

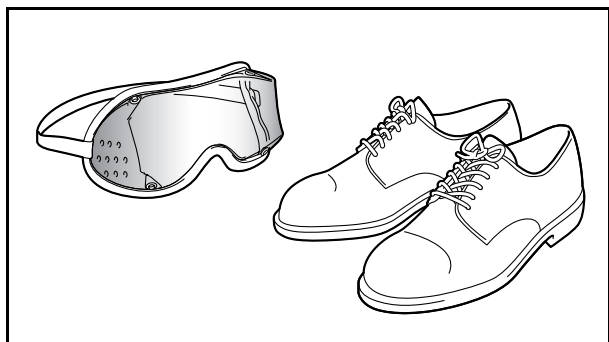
Ventilation

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), make 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.

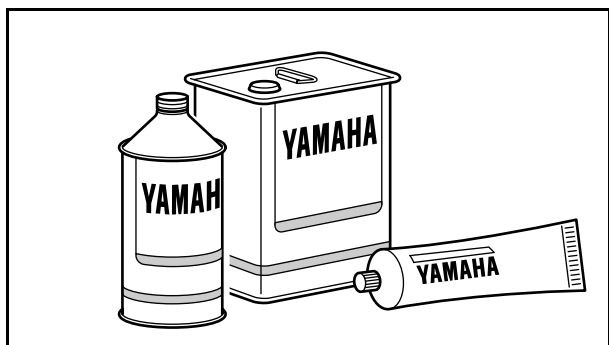


Parts, lubricants, and sealants

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

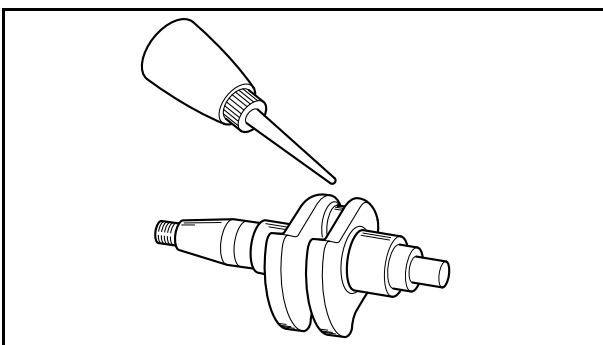
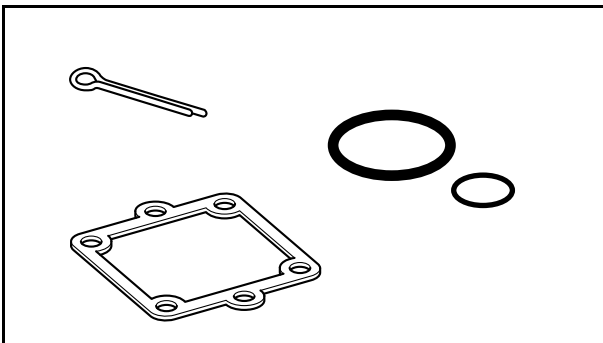
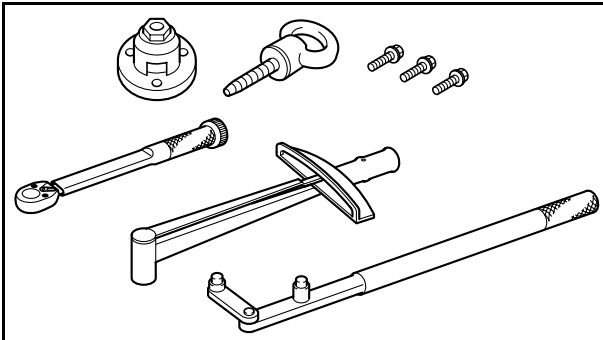
Under normal conditions, the lubricants mentioned in this manual should not harm or be hazardous to your skin. However, you should follow these precautions to minimize any risk when working with lubricants.

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, others.
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

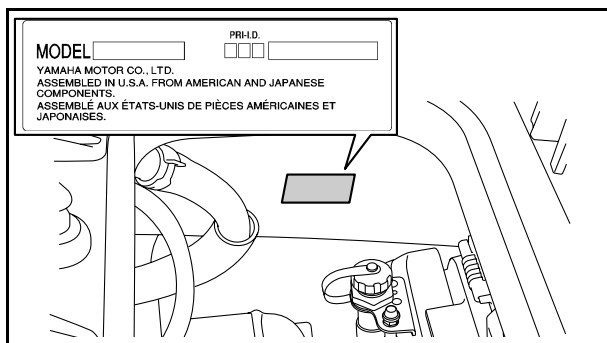
Follow the tightening torque specifications provided throughout the manual. When tightening nuts, bolts, and screws, tighten the large sizes first, and tighten fasteners starting in the center and moving outward.

Non-reusable parts

Always use new gaskets, seals, O-rings, cotter pins, others, 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, make 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

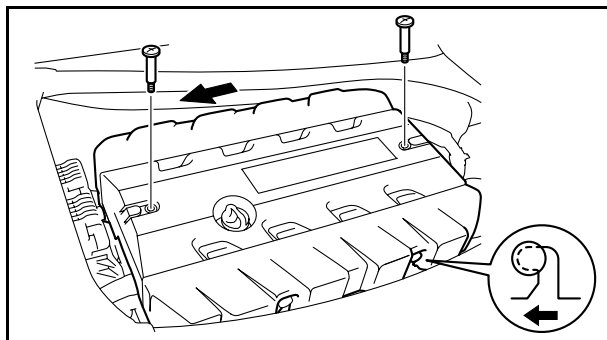
Primary I.D. number

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

Starting primary I.D. number:

F2R: 800101

F2C: 800101

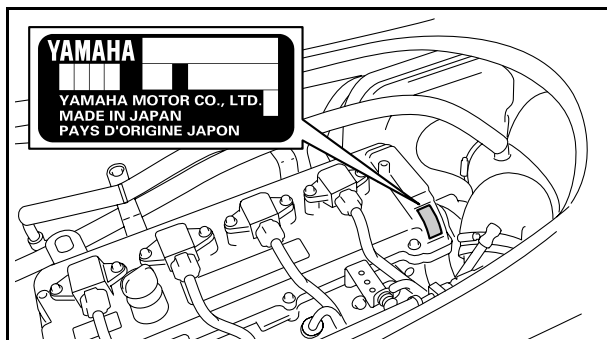


Engine serial number

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

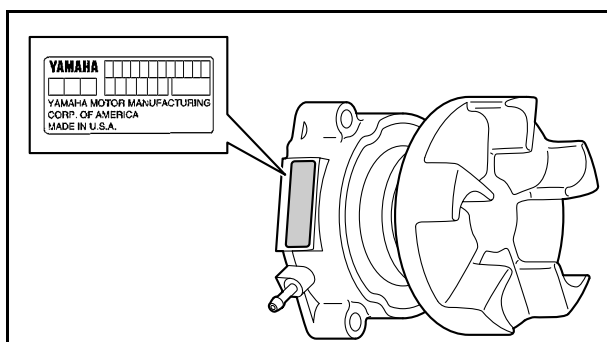
TIP

- 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.



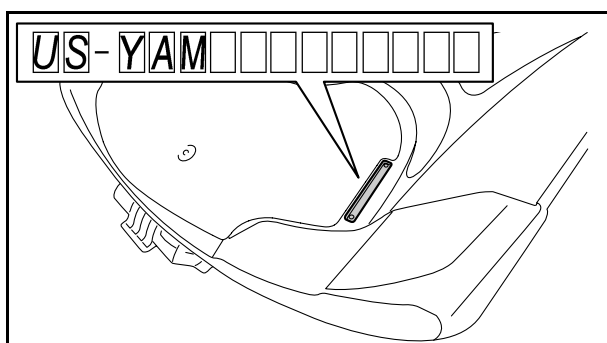
Starting serial number:

6AN: 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

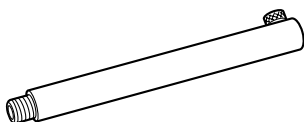
Using the correct special tools recommended by Yamaha will aid the work and enable accurate assembly and tune-up. Improvisations and using improper tools can damage the equipment.

TIP

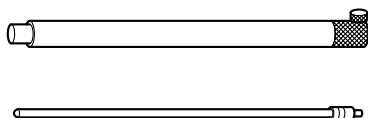
- For USA and Canada, use part numbers starting with "YB-", "YM-", "YU-", or "YW-."
- For other countries, use part numbers starting with "90890-."

Measuring

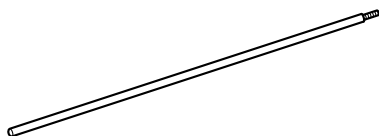
- ① Gauge stand
90890-06725



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



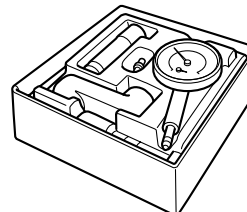
- ③ Dial gauge needle
90890-06584



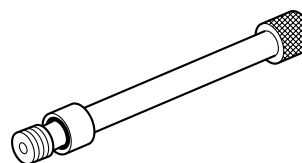
- ④ Dial gauge
YU-03097



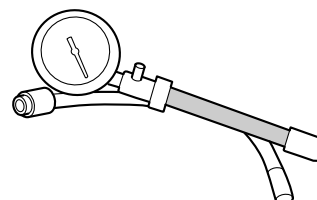
90890-01252



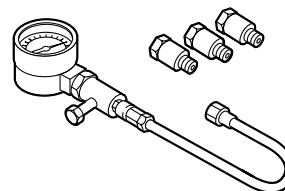
- ⑤ Compression gauge extension
90890-06582



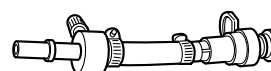
- ⑥ Compression gauge
YU-33223



90890-03160

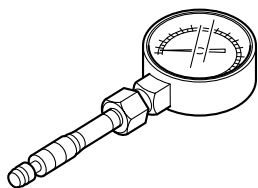


- ⑦ Fuel pressure gauge adapter
YW-06842
90890-06842

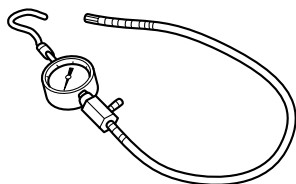




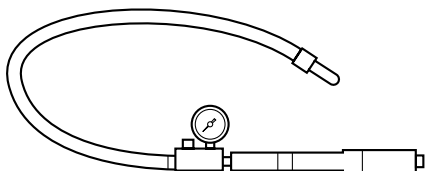
- ⑧ Fuel pressure gauge
YB-06766



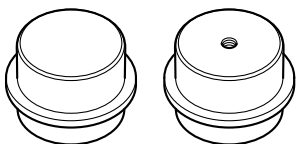
90890-06786



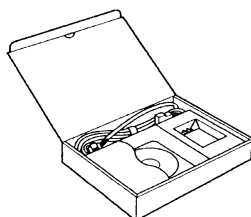
- ⑨ Leakage tester
90890-06840



- ⑩ Air cooler attachment
90890-06731



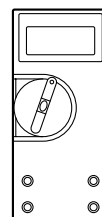
- ⑪ YDIS (connecting kit)
60V-85300-04



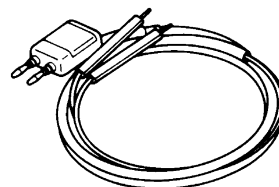
- ⑫ YDIS (CD-ROM, Ver. 1.30)
60V-WS853-04
YDIS (CD-ROM, Ver. 1.32)
60V-WS853-05



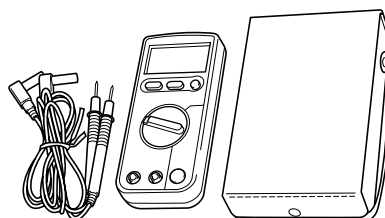
- ⑬ Digital multimeter
YU-34899-A



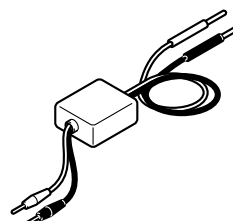
- ⑭ Peak voltage adapter
YU-39991



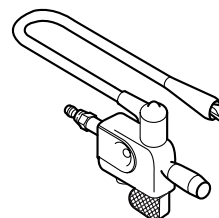
- ⑮ Digital circuit tester
90890-03174



- ⑯ Peak voltage adapter B
90890-03172

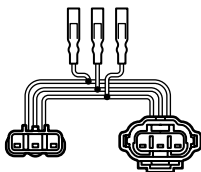


- ⑰ Spark checker
YM-34487
Ignition tester
90890-06754

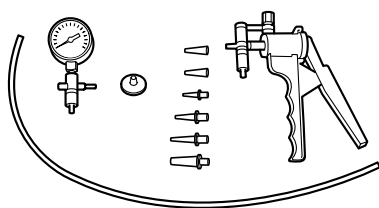




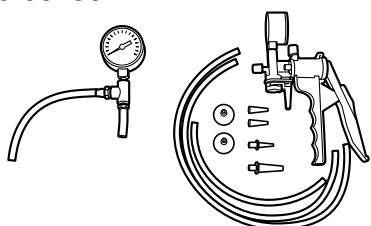
- ⑱ Test harness (3 pins)
YB-06877
Test harness HM090-3 (3 pins)
90890-06877



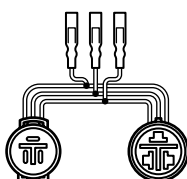
- ⑲ Lower unit pressure/vacuum tester
YB-35956-A



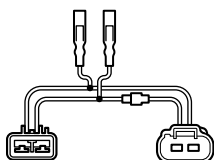
- ⑳ Vacuum/pressure pump gauge set
90890-06756



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

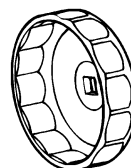


- ㉒ Test harness (2 pins)
90890-06850

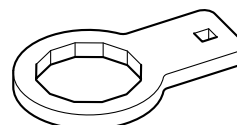


Removal and installation

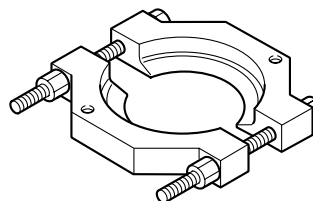
- ① Oil filter wrench
90890-06830



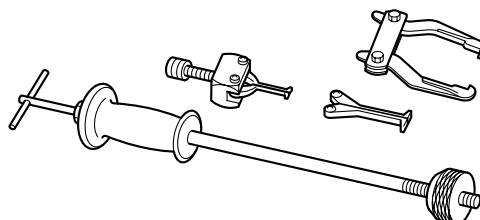
- ② Exhaust pipe wrench
90890-06726



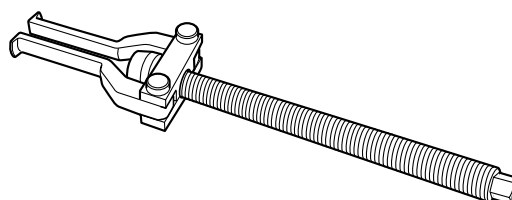
- ③ Bearing separator
90890-06534



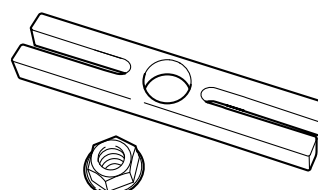
- ④ Slide hammer and adapters
YB-06096



- ⑤ Bearing puller assembly
90890-06535

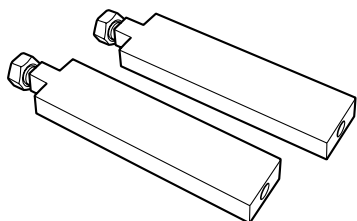


- ⑥ Stopper guide plate
90890-06501

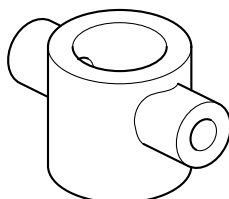




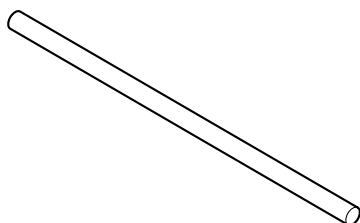
- ⑦ Stopper guide stand
90890-06538



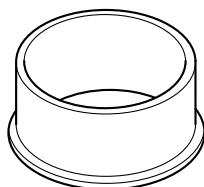
- ⑧ Shaft holder
90890-06721



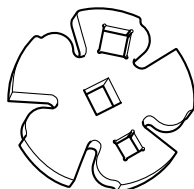
- ⑨ Driver handle
90890-06722



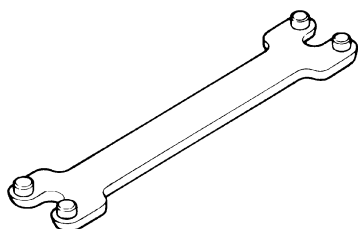
- ⑩ Bearing inner race attachment
90890-06661



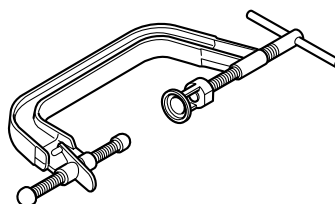
- ⑪ Coupler wrench
90890-06729



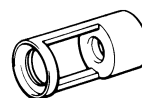
- ⑫ Camshaft wrench
90890-06724



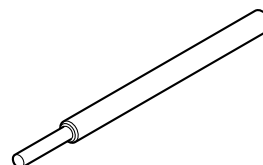
- ⑬ Valve spring compressor
YM-04019
90890-04019



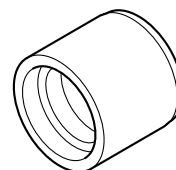
- ⑭ Compressor adapter
YM-04114
Valve spring compressor attachment
90890-04114



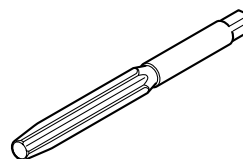
- ⑮ Valve guide remover
YB-06801
90890-06801



- ⑯ Valve guide installer
YB-06810
90890-06810

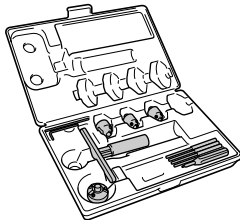


- ⑰ Valve guide reamer
YM-01196
90890-06804

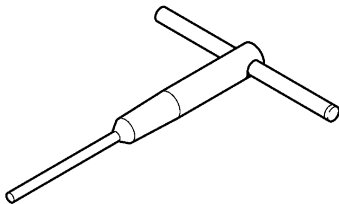




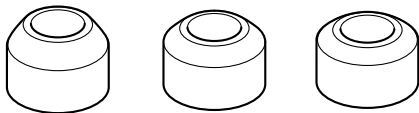
- ⑱ Neway valve seat kit
YB-91044



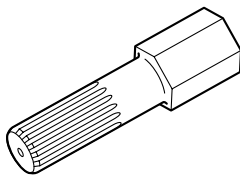
- ⑲ Valve seat cutter holder
90890-06812



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



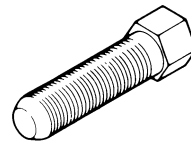
- ㉑ Crankshaft holder
90890-06732



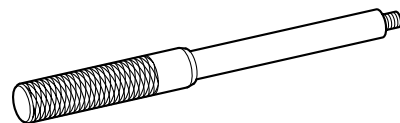
- ㉒ Flywheel puller
90890-06723



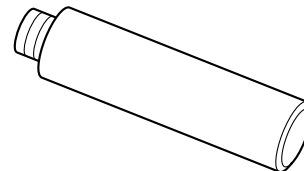
- ㉓ Rotor puller
90890-01080



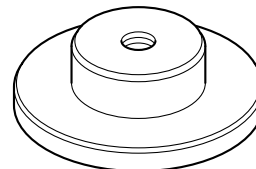
- ㉔ Driver handle (small)
YB-06229



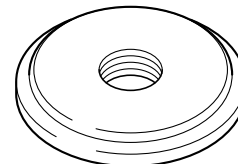
- ㉕ Driver rod LS
90890-06606



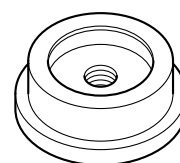
- ㉖ Bearing and seal installer
YW-06356



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

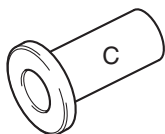


- ㉘ Forward bearing race installer
YB-06258

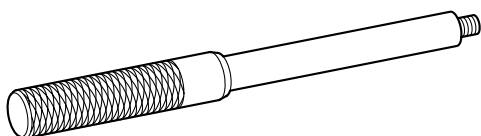




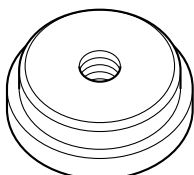
- ②⑨ Bearing pressure C
90890-02393



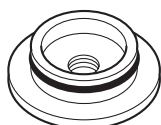
- ③⑩ Driver handle (large)
YB-06071



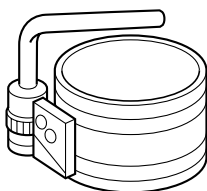
- ③⑪ Forward gear outer race installer
YB-41446



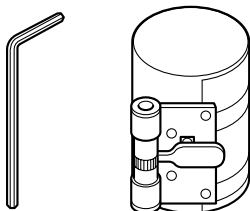
- ③⑫ Ball bearing attachment
90890-06657



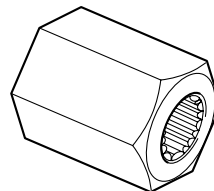
- ③⑬ Piston ring compressor
YM-08037



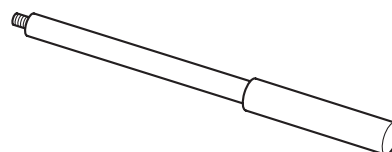
90890-05158



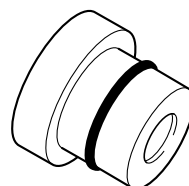
- ③⑭ Drive shaft holder
YB-06201
Drive shaft holder 6
90890-06520



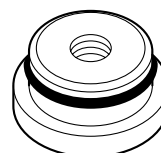
- ③⑮ Driver rod L3
90890-06652



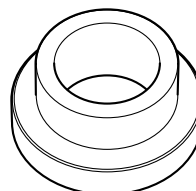
- ③⑯ Drive shaft needle bearing installer and
remover
YB-06194



- ③⑰ Needle bearing attachment
90890-06609

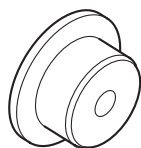


- ③⑱ Bearing attachment
90890-06728

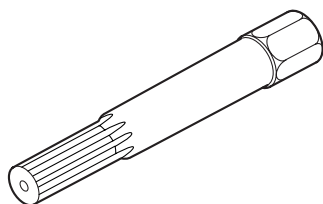




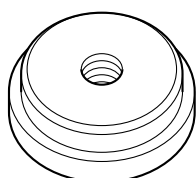
- ③⑨ Bearing cup installer
YB-06167



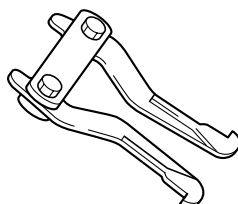
- ④⑩ Shaft holder
90890-06730



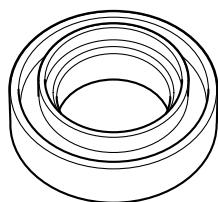
- ④① Needle bearing installer
YB-06434



- ④② Bearing puller legs
YB-06523



- ④③ Bearing attachment
90890-06727

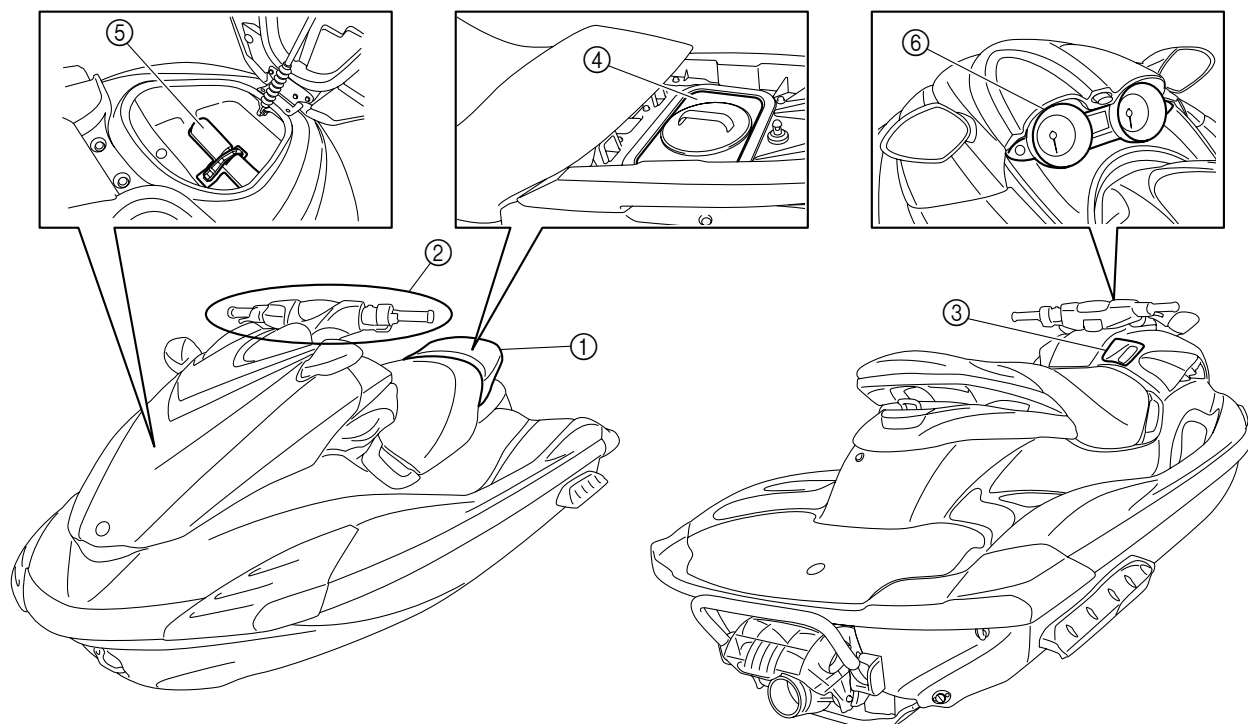




Feature and benefit

Watercraft overview

The FZR and FZS feature a newly designed hull, which is made of NanoXcel. Because the FZR is designed for 2 riders and the FZS is designed for 3 riders, the shape of the rear seat is different for each model. Only the FZS is equipped with a reboarding step.



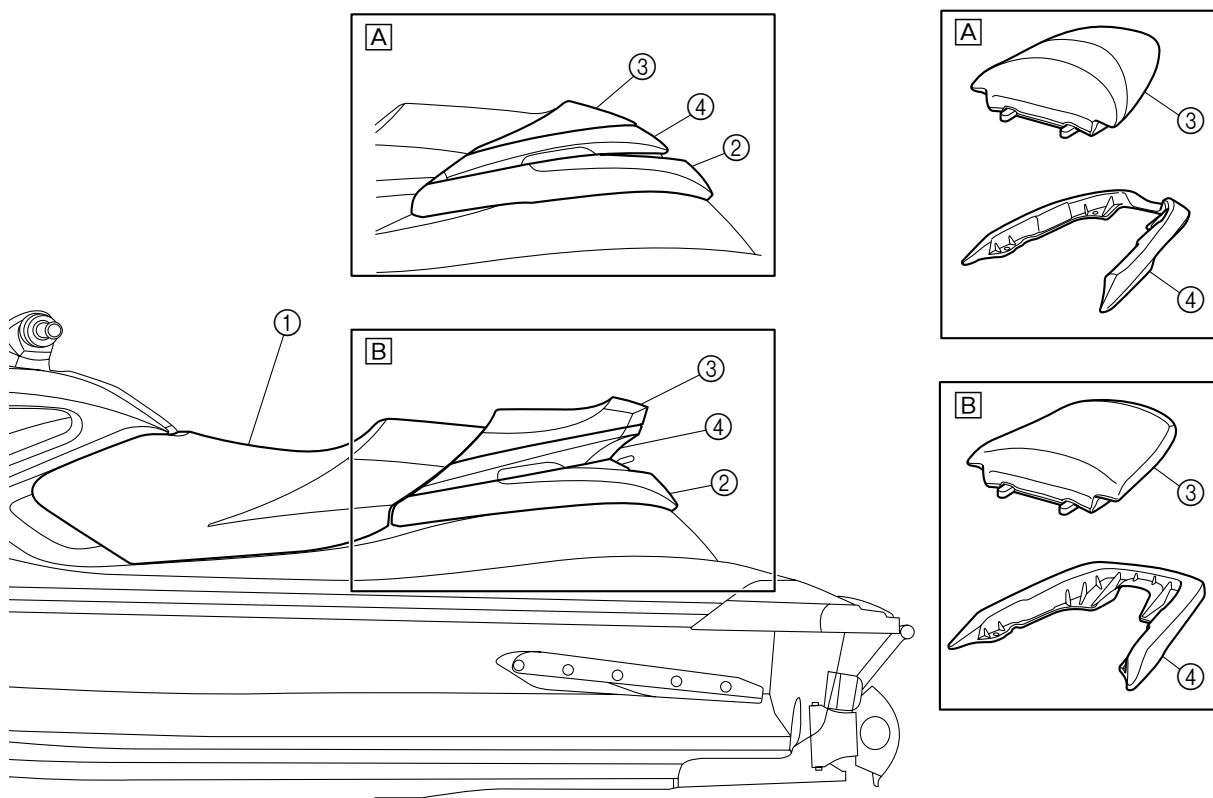
New features

- ① Rear seat
- ② Telescopic steering system
- ③ Shift lever assembly
- ④ Watertight compartment
- ⑤ Fire extinguisher holder and cover
- ⑥ Dual analog meter unit



Rear seat

The rear seats and handgrips for the FZR and FZS have different shape. Therefore, the rear seats and handgrips are not interchangeable.



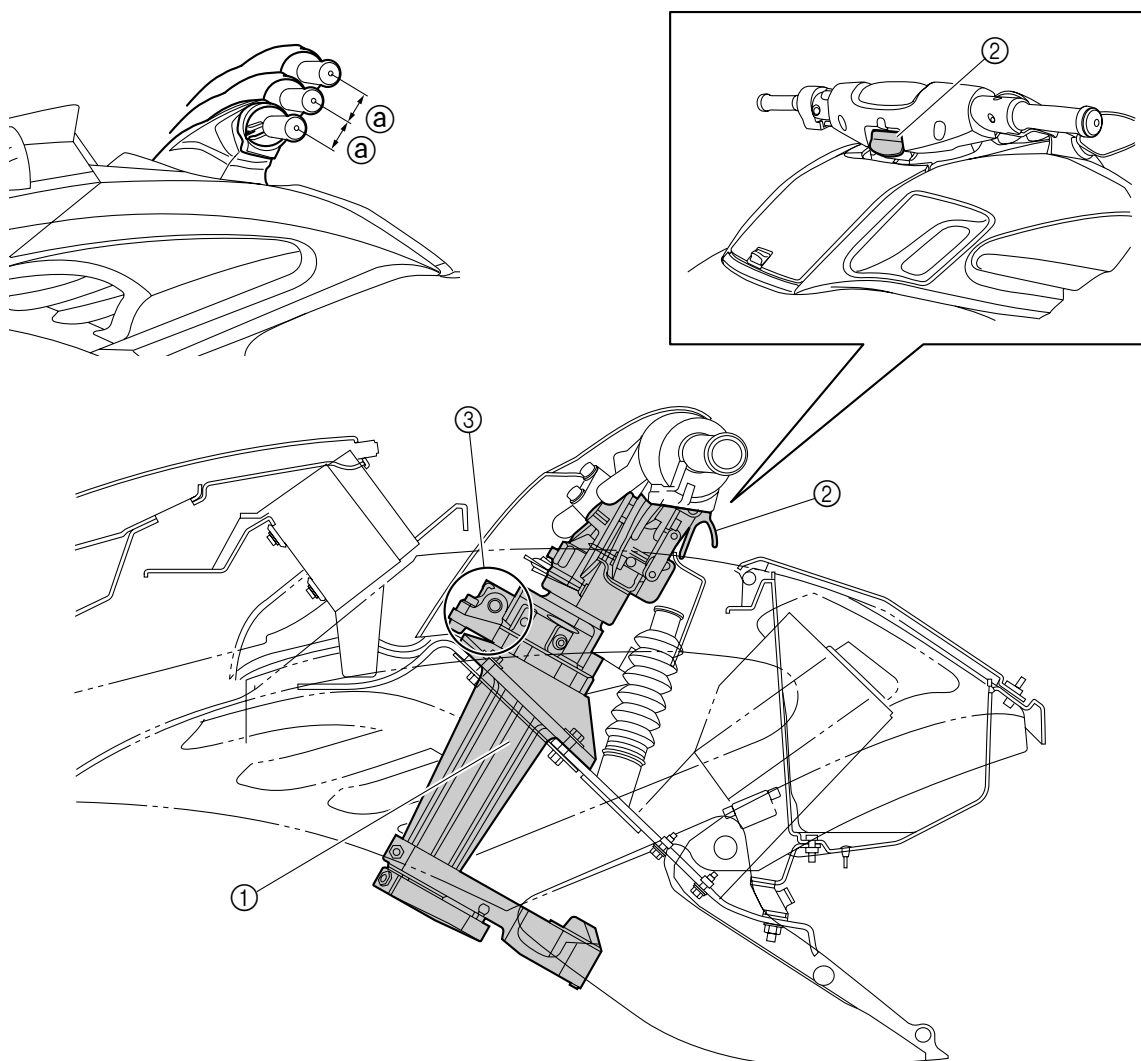
- ① Front seat
- ② Deck beam
- ③ Rear seat
- ④ Handgrip

- A** FZR
- B** FZS



Telescopic steering system

The FZR and FZS feature a newly designed steering master. The position of the handlebar can be adjusted up or down to 3 positions using the lock lever. In addition, the watercraft are equipped with an OTS system, which has been used for other models.



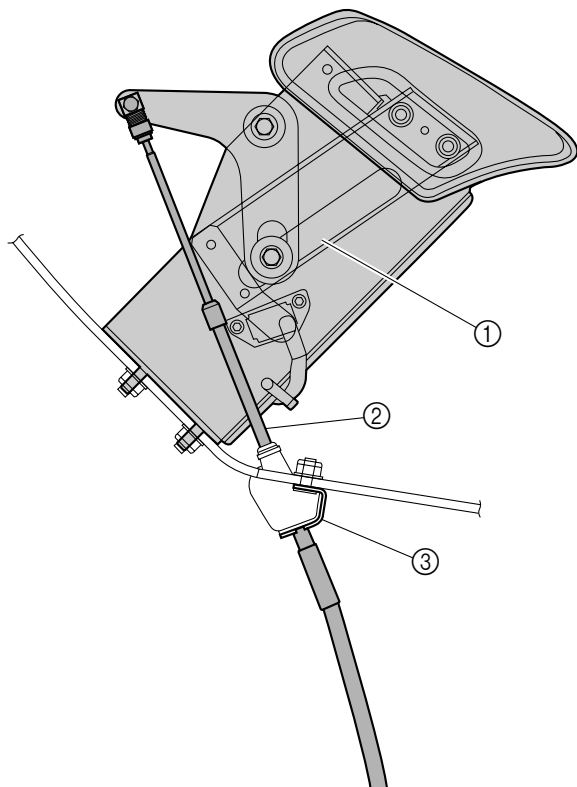
- ① Steering master assembly
- ② Lock lever
- ③ Steering sensor

② 50 mm (2.0 in)

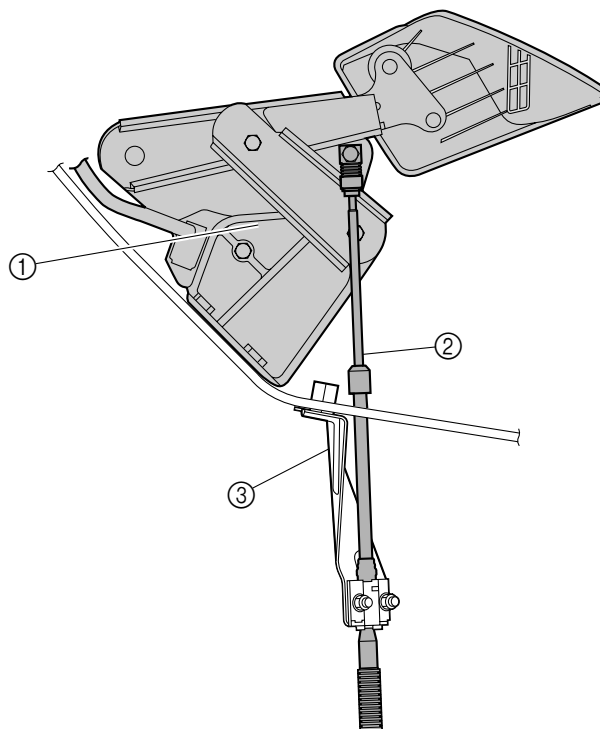


Shift lever assembly

The FZR and FZS feature a new mechanism for the shift lever assembly. Compared to the FX SHO series, the shape of the shift cable bracket and the installation angle of the shift cable have changed.



A



B

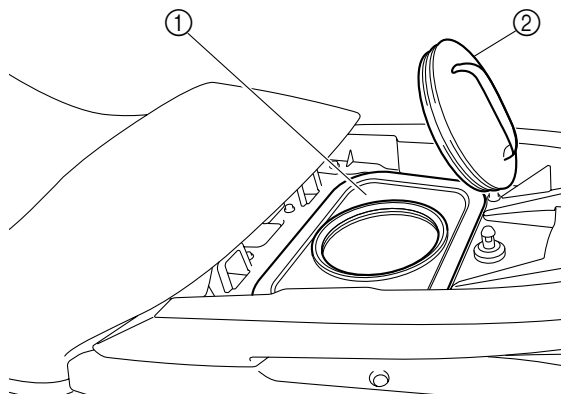
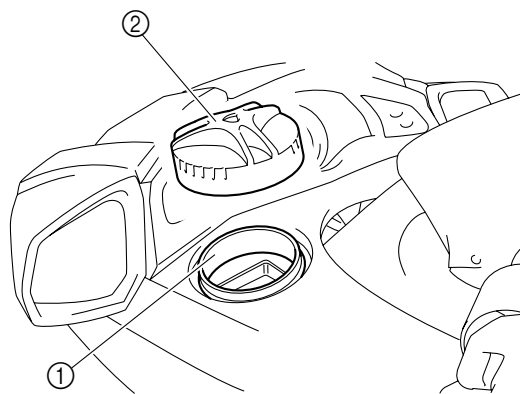
- ① Shift lever assembly
- ② Shift cable
- ③ Shift cable bracket

- A** FZR, FZS
- B** FX SHO series



Watertight compartment

The watertight compartment for the FZR and FZS is located under the rear seat. This was changed from the FX SHO series where the watertight compartment is located in front of the handlebar.


A

B

- ① Watertight compartment
- ② Watertight compartment cap

- A** FZR, FZS
- B** FX SHO series



Watertight compartment capacity:

FZR, FZS:

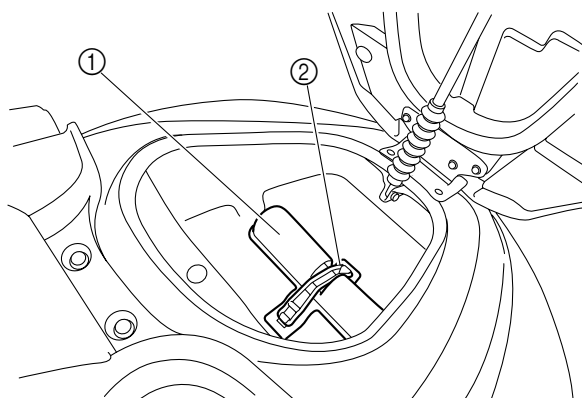
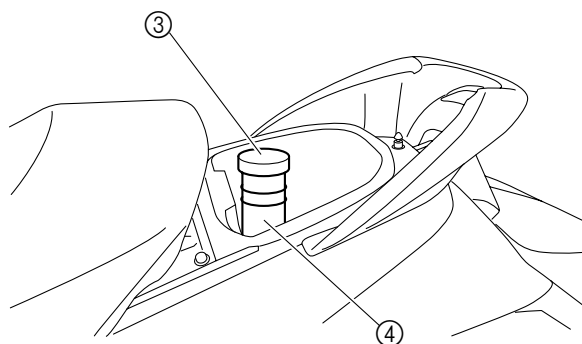
8.7 L (2.3 US gal, 1.9 Imp. gal)

FX SHO series:

2.7 L (0.7 US gal, 0.6 Imp. gal)

Fire extinguisher location

The fire extinguisher holder and cover for the FZR and FZS are located in the front storage compartment. This was changed from the FX SHO series where the fire extinguisher container is located under the rear seat.


A

B

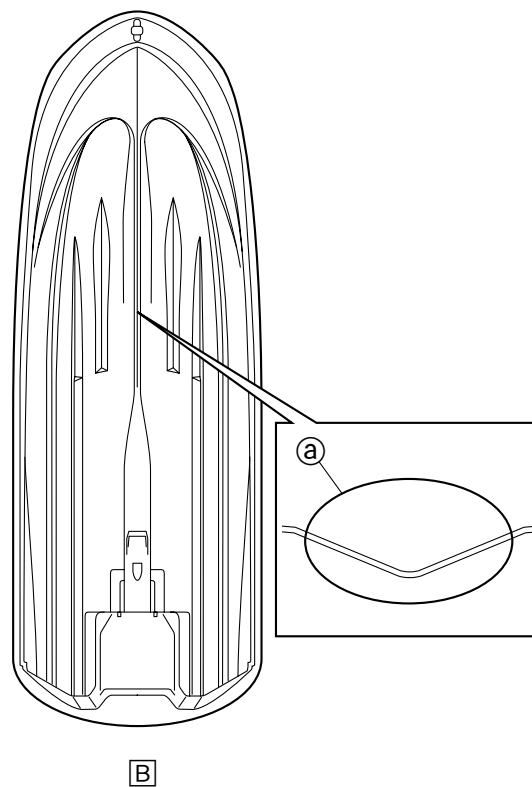
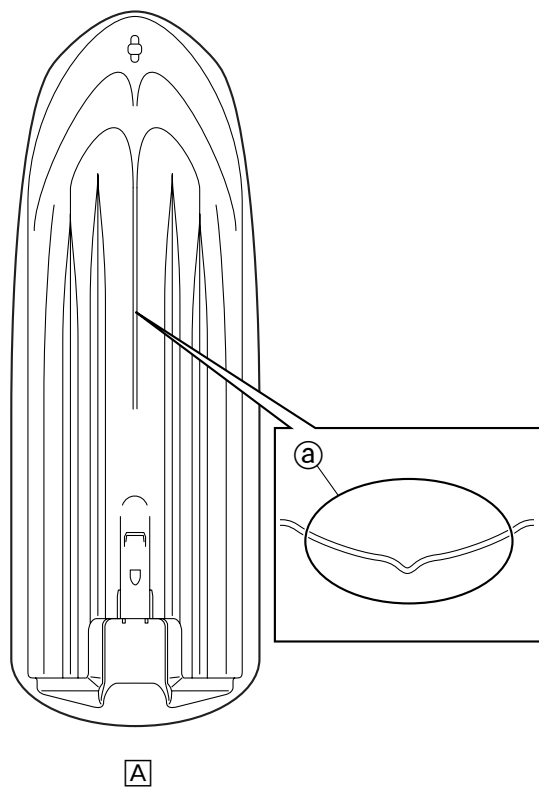
- ① Fire extinguisher holder and cover
- ② Band
- ③ Fire extinguisher container cap
- ④ Fire extinguisher container

- A** FZR, FZS
- B** FX SHO series



Hull design

The FZR and FZS feature a newly designed rounded-keel hull. Therefore, the shape of the keel line ① is different than the keel line for the FX SHO series.



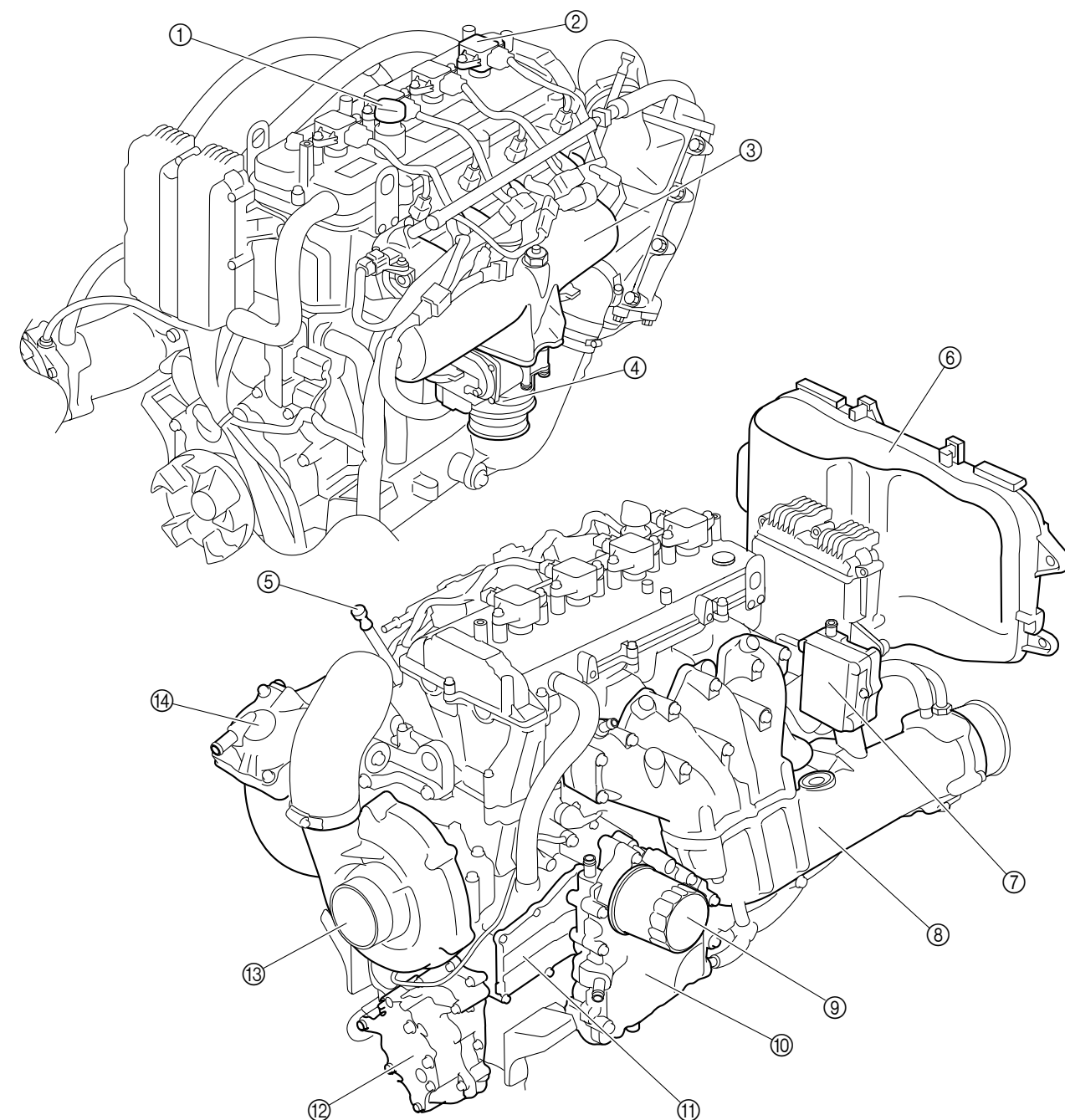
A FZR, FZS (Rounded keel)

B FX SHO series (V-shape)



Engine overview

The FZR and FZS feature the same 1.8 L in-line 4-cylinder supercharged engine as the FX SHO series.



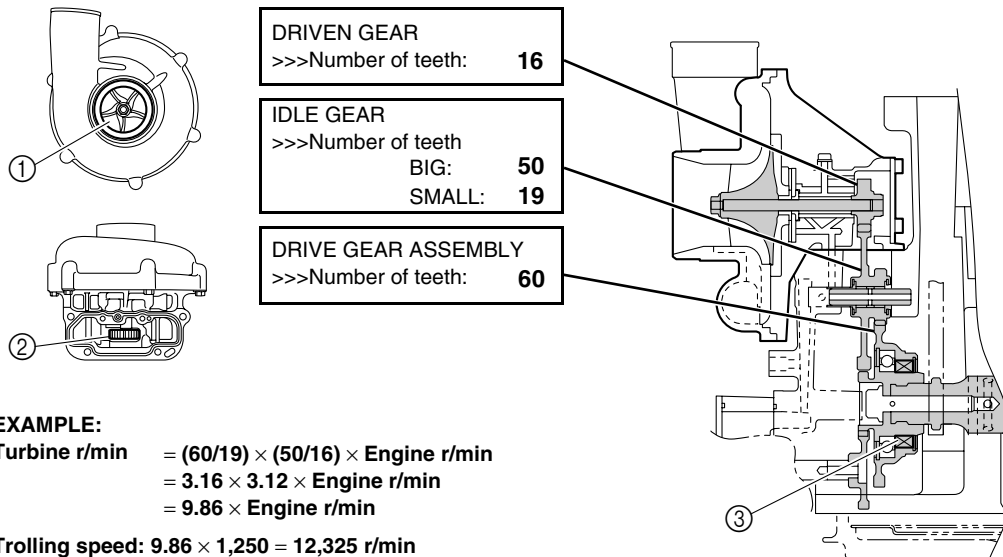
- ① Oil filler cap
- ② Ignition coil
- ③ Intake manifold
- ④ Throttle body assembly
- ⑤ Oil level gauge
- ⑥ Electrical box
- ⑦ Rectifier regulator

- ⑧ 4 in 1 exhaust system
- ⑨ Oil filter
- ⑩ Oil cooler assembly
- ⑪ Oil separator tank
- ⑫ Oil pump assembly
- ⑬ Supercharger assembly
- ⑭ Air cooler assembly



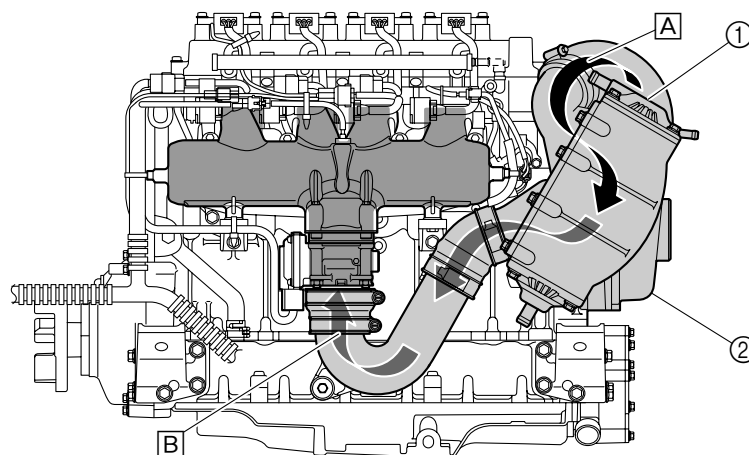
Supercharger assembly

The supercharger is equipped with a gear-driven impeller that compresses the intake air. 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.



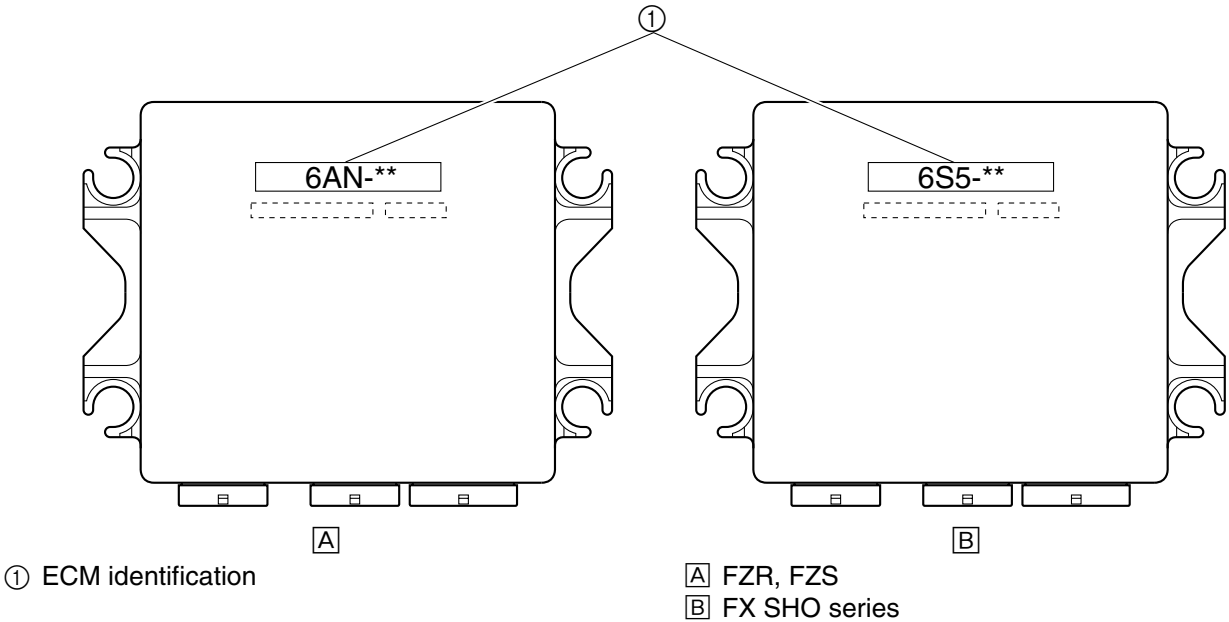
Air cooler assembly

The air cooler assembly uses cooling water to cool the intake air that has been compressed in the supercharger.



ECM

The FZR and FZS are not equipped with the cruise assist and no-wake mode functions from the FX SHO series. Therefore, the ECM for the FZR and FZS is different than the ECM for the FX SHO series and the ECMs are not interchangeable.

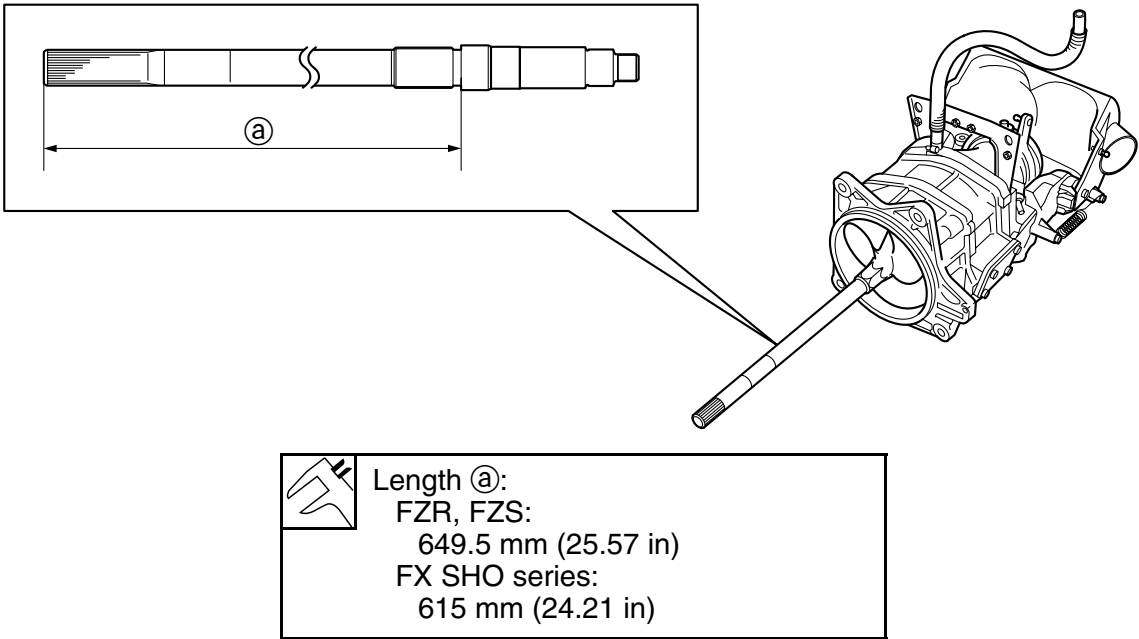


Identification table

Model	ECM identification
FZR, FZS	6AN-**
FX SHO series	6S5-**

Drive shaft

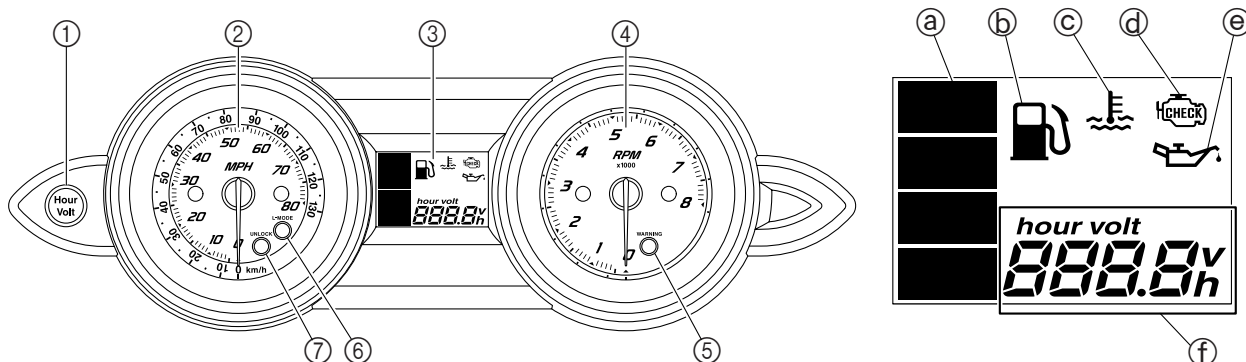
The drive shaft for the FZR and FZS is 34.5 mm (1.36 in) longer than the drive shaft for the FX SHO series. Therefore, the drive shafts are not interchangeable.





Dual analog meter unit

The FZR and FZS feature a newly designed dual analog meter unit.



Item	Functions
① “Hour Volt” button	Switches the display to the hour meter or to the voltmeter.
② 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).
③ Information display	Shows watercraft operating conditions. a Fuel level meter b Fuel indicator c Engine overheat warning indicator d Check engine warning indicator e Oil pressure warning indicator f Hour meter/voltmeter
④ Tachometer	Shows the engine speed (RPM).
⑤ “WARNING” indicator light	Flashes or comes on, together with each warning indicator in the information display, when a malfunction has occurred.
⑥ “L-MODE” indicator light	Comes on when the L-MODE (low-RPM mode) is selected.
⑦ “UNLOCK” indicator light	Comes on when the unlock mode of the Yamaha Security System is selected.

Initial operation

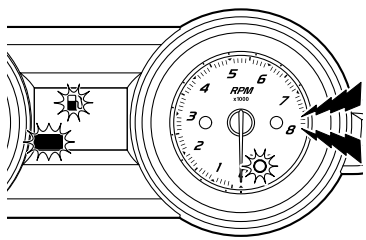
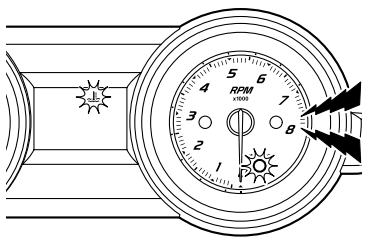
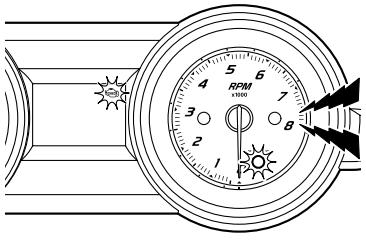
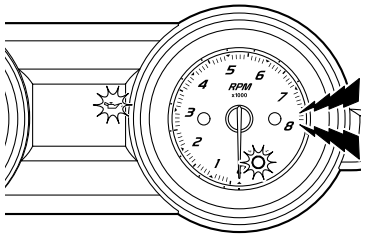
When the unlock button on the remote control transmitter is pushed, the buzzer sounds 2 or 3 times, the speedometer ② and tachometer ④ make 1 sweep, the information display ③, the “WARNING” indicator light ⑤, and the “L-MODE” indicator light ⑥ come on for 2 seconds, and then the unit starts to operate normally.

Hour meter/voltmeter^{*1}

	The hour meter shows the hours of engine operation that have elapsed since the watercraft was new.
	The voltmeter shows the battery voltage. When the battery voltage is normal, the voltmeter displays approximately 12 volts. If the battery voltage has dropped significantly, “LO” is displayed on the voltmeter. If the battery voltage has risen significantly, “HI” is displayed.

^{*1} Push the “Hour Volt” button ① for at least 1 second to switch the display to the hour meter or to the voltmeter.

Information display warnings

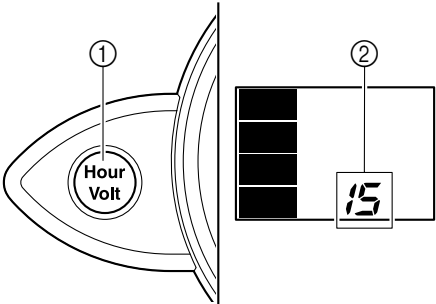
	Condition	Action	“WARNING” indicator light	Buzzer ^{*1}
	The fuel remaining in the fuel tank drops to about 18 L ^{*2} .	The lowest fuel level segment and the fuel indicator flash.	Flashes	Sounds intermittently
	The engine temperature rises above specification.	The engine over-heat warning indicator flashes 5 times, and then comes on.	Flashes 5 times, and then comes on	Sounds intermittently, and then sounds continuously
	A sensor malfunction or a short circuit is detected.	The check engine warning indicator flashes.	Flashes	Sounds intermittently
	The oil pressure does not rise to specification.	The oil pressure warning indicator flashes.	Flashes	Sounds intermittently

^{*1} Push the “Hour Volt” button to stop the buzzer.

^{*2} Fuel tank capacity: 70 L (18.5 US gal, 15.4 Imp.gal)

Self-diagnosis

While the engine is running, the diagnostic codes can be checked by pushing the “Hour Volt” button for approximately 8 seconds. Because more than 1 diagnostic code cannot be shown even if multiple malfunctions have occurred, it is recommended to use the YDIS.

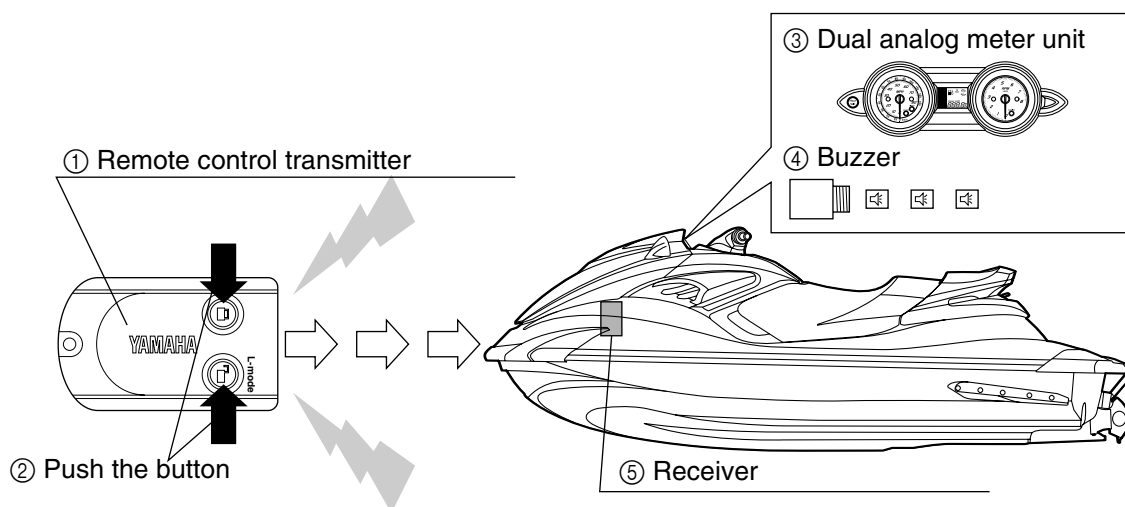


- ① “Hour Volt” button
- ② Diagnostic code

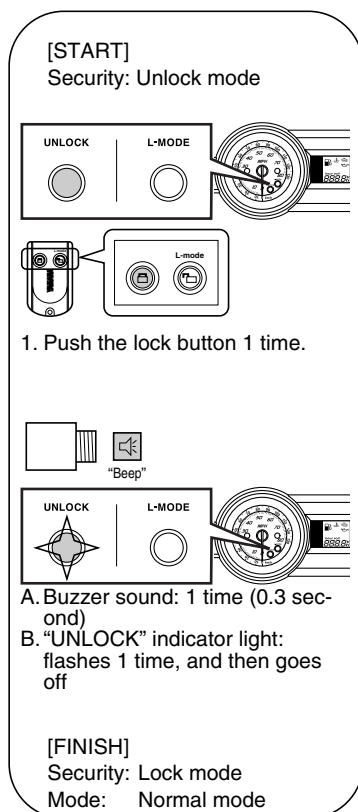


Yamaha Security System

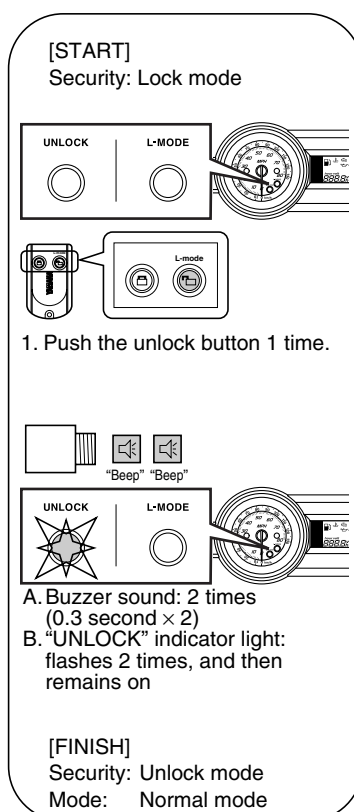
The following operations can be performed by pushing the buttons on the remote control transmitter.



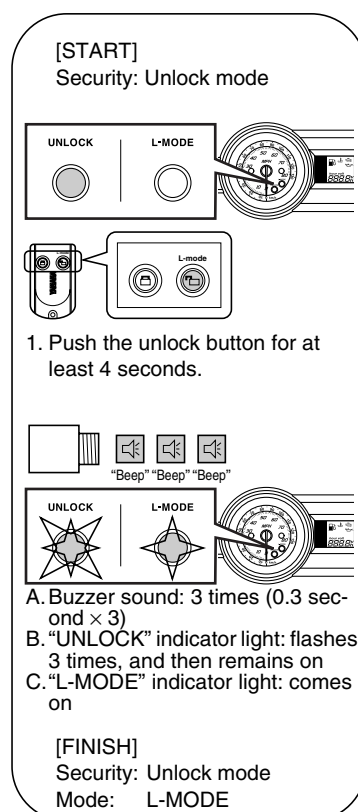
A Unlock → Lock



B Lock → Unlock



C L-MODE



TIP

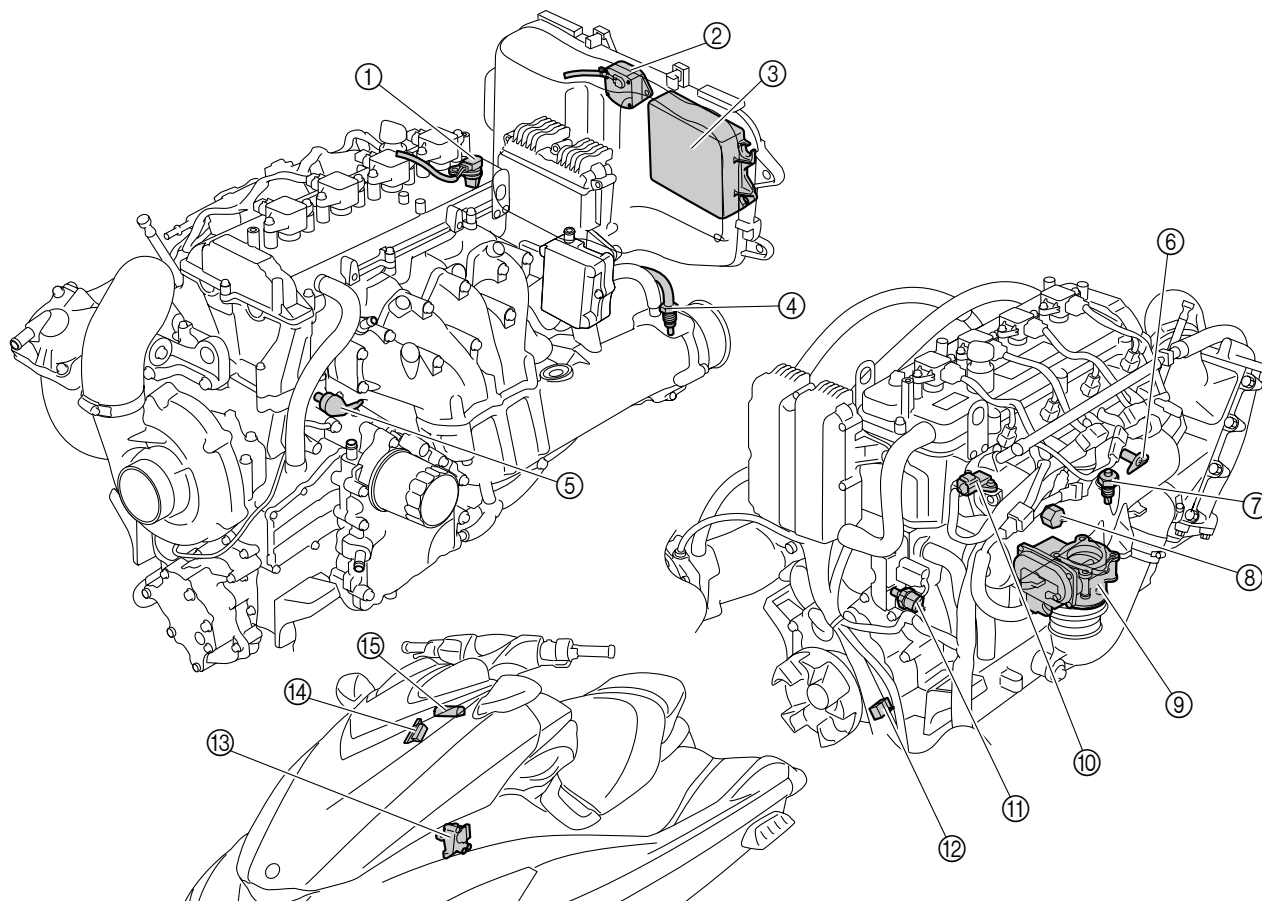
When the Yamaha Security System is set to the lock mode, the current selection for the operation mode, L-mode or normal mode, is saved. Accordingly, when the Yamaha Security System is set to the unlock mode, the number of times that the buzzer sounds will change depending on the currently selected operation mode. The buzzer sounds 2 times for the normal mode or 3 times for the L-mode.



Technical tips

Engine control

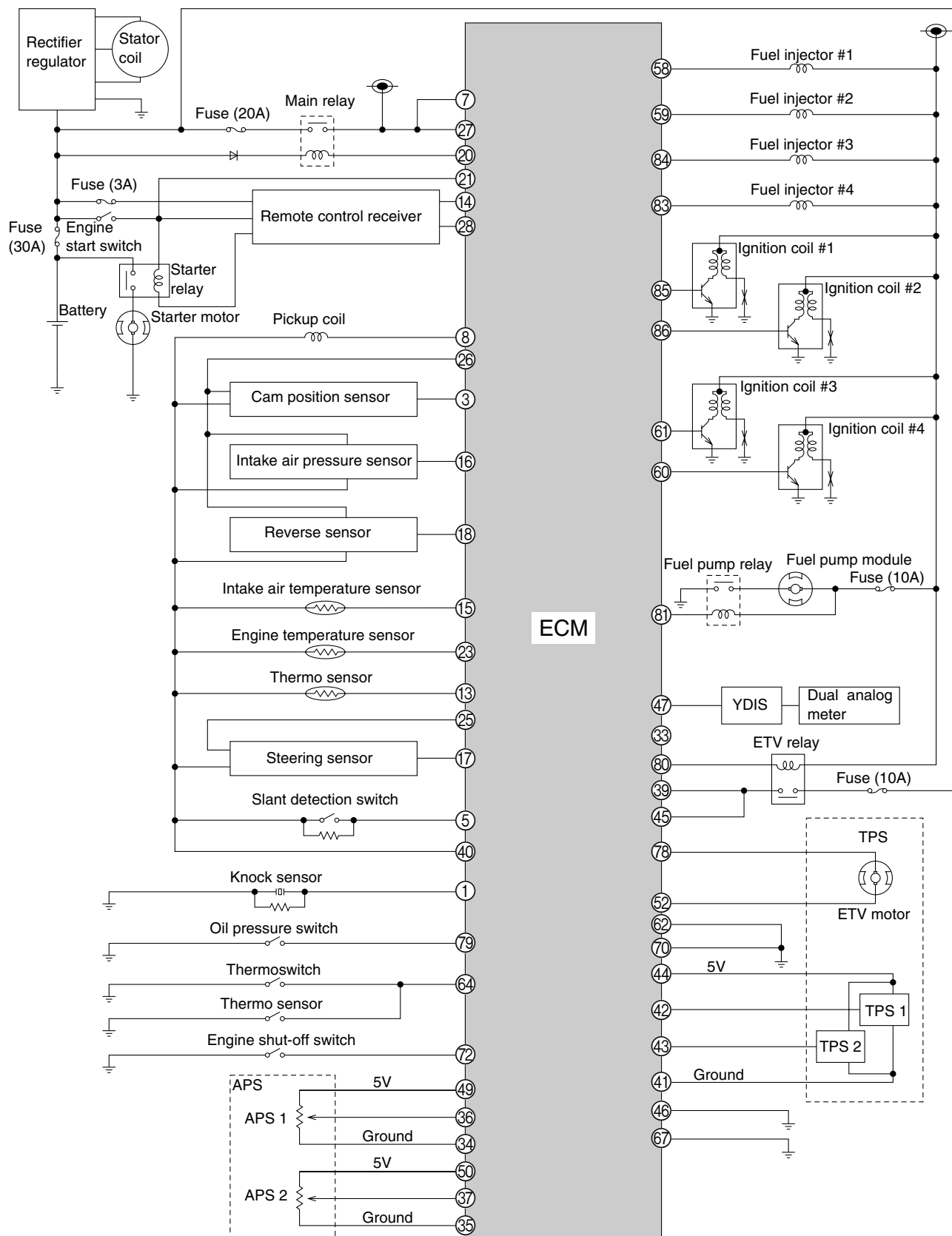
The ECM controls ignition timing and fuel injection with information received from the sensors and switches installed on the engine and on the basis of the 3D map saved in the ECM.



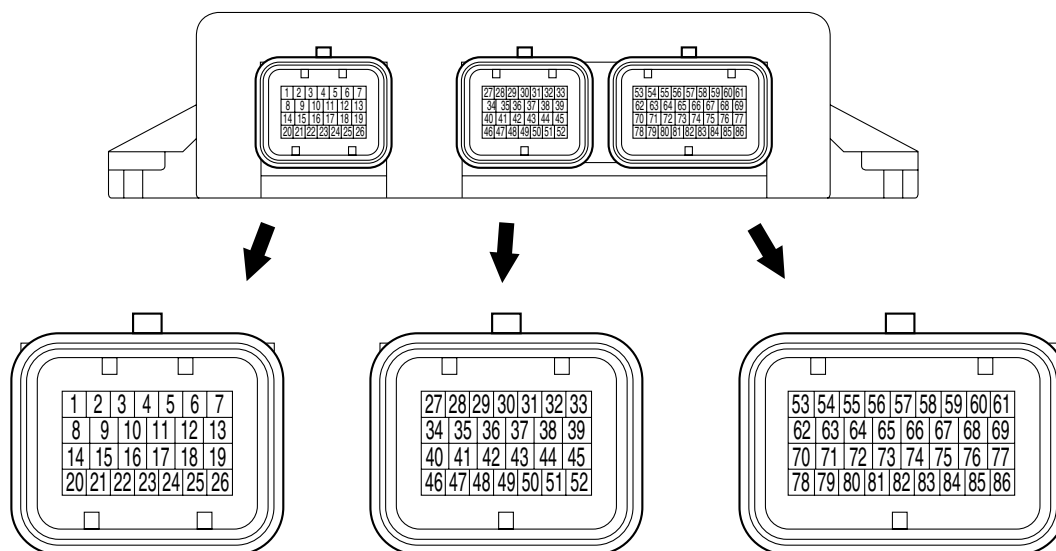
Part name	Functions
① Cam position sensor	Detects the rotational position of the camshaft.
② Slant detection switch	Detects whether the watercraft is capsized.
③ ECM	Properly controls ignition timing, fuel injection, opening angle of the electronic control throttle valve (ETV), and other functions with information received from the sensors and switches.
④ Thermo sensor	Detects the temperature of the exhaust cooling water.
⑤ Oil pressure switch	Detects the pressure of the engine oil.
⑥ Thermoswitch	Detects the temperature of the cylinder block.
⑦ Intake air temperature sensor	Detects the temperature of the intake air.
⑧ Knock sensor	Detects engine knock.
⑨ Throttle body assembly (TPS)	Detects the opening angle of the electronic control throttle valve (ETV).
⑩ Intake air pressure sensor	Detects the pressure of the intake air.
⑪ Engine temperature sensor	Detects the temperature of the cylinder block.
⑫ Pickup coil	Detects the rotational position of the crankshaft.
⑬ APS	Detects the opening angle of the APS pulley.
⑭ Reverse sensor	Detects the position of the shift lever.
⑮ Steering sensor	Detects when the handlebar is turned sharply to the right or left and a load is applied.



ECM circuit diagram



⦿ : Indicates a connection between the symbols.


ECM coupler layout


No.	Lead color	External connection lead	No.	Lead color	External connection lead	No.	Lead color	External connection lead
1	G	Knock sensor	15	B/R	Intake air temperature sensor	29	—	—
2	—	—	16	P/G	Intake air pressure sensor	30	—	—
3	G/O	Cam position sensor	17	W/L	Steering sensor	31	—	—
4	—	—	18	G/W	Reverse sensor	32	—	—
5	L/B	Slant detection switch	19	—	—	33	—	—
6	—	—	20	Y/G	Main and fuel pump relay (main relay)	34	B/R	APS 1 ground
7	R/Y	Battery power source	21	Y	Engine start switch	35	B/W	APS 2 ground
8	W/B	Pickup coil	22	—	—	36	P/R	APS 1
9	—	—	23	B/Y	Engine temperature sensor	37	P/W	APS 2
10	—	—	24	—	—	38	—	—
11	—	—	25	O/R	Steering sensor power source	39	R/Y	ETV relay power source (contact)
12	—	—	26	O	Sensor power source	40	B/O	Sensor ground
13	B/L	Thermo sensor	27	R/Y	Battery power source	41	B/O	TPS ground
14	Y/W	Main relay drive signal	28	W	Immobilizer serial communication	42	P	TPS 1



No.	Lead color	External connection lead	No.	Lead color	External connection lead	No.	Lead color	External connection lead
43	P/B	TPS 2	58	Pu/R	Fuel injector #1	73	—	—
44	O	TPS power source	59	Pu/B	Fuel injector #2	74	—	—
45	R/Y	ETV relay power source (contact)	60	B/G	Ignition coil #4	75	—	—
46	B	ECM ground	61	B/Y	Ignition coil #3	76	—	—
47	W/B	Self-diagnosis lead (communication), dual analog meter unit communication	62	B	ETV ground	77	—	—
48	—	—	63	—	—	78	G	ETV motor (positive)
49	O/R	APS 1 power source	64	P	Thermoswitch	79	P/W	Oil pressure switch
50	O/W	APS 2 power source	65	—	—	80	Y/W	ETV relay power source (coil)
51	—	—	66	—	—	81	L/R	Main and fuel pump relay (fuel pump relay)
52	L	ETV motor (negative)	67	B	Ground	82	—	—
53	—	—	68	—	—	83	Pu/G	Fuel injector #4
54	—	—	69	—	—	84	Pu/Y	Fuel injector #3
55	—	—	70	B	ETV ground	85	B/R	Ignition coil #1
56	—	—	71	—	—	86	B/W	Ignition coil #2
57	—	—	72	W	Engine shut-off switch			

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/Y : Purple/yellow

R/Y : Red/yellow

W/B : White/black

W/L : White/blue

Y/G : Yellow/green

Y/W : Yellow/white


Control system

Item	Condition	Action	Remarks
Reverse with traction control	Shift lever is in the reverse position and the reverse sensor operates.	Maximum engine speed is limited to 3,000 r/min.	Cancel: Shift lever is returned to the forward position.
Overheat warning control	- Engine temperature rises rapidly in a short time. - Thermoswitch is on. - Exhaust cooling water temperature exceeds 75 °C (167 °F).	- Opening angle of the ETV is regulated. - Maximum engine speed is limited to approximately 3,500–3,800 r/min.	Cancel: - Stop the engine and wait for 30 seconds or more. - Engine temperature is below 140 °C (248 °F) with the thermoswitch off. - Exhaust cooling water temperature is below 70 °C (158 °F) with the ETV fully closed. If the engine is stopped during overheat warning control, it can be restarted.
Oil pressure warning control	Control is activated when the following conditions are present: - Oil pressure switch is on. - ETV is open. - Engine speed exceeds 4,500 r/min.	- Opening angle of the ETV is regulated. - Maximum engine speed is limited to approximately 3,500–3,800 r/min.	Cancel: - Engine is stopped and electric power supply to the ECM is stopped. - Engine is restarted and the oil pressure switch is off. If the engine is stopped during oil pressure warning control, it can be restarted.
ETV failure control	ETV failed, or open or short circuit is detected in ETV circuit.	- Opening angle of the ETV is fixed to the default opening angle. - Maximum engine speed is limited to 3,000 r/min. - Ignition timing is controlled.	



Item	Condition	Action			Remarks
Cam position sensor failure control	Control is activated when the following conditions are maintained for 10 seconds: • Cam position sensor failed. • Engine speed exceeds approximately 1,000 r/min.	• Opening angle of the ETV is regulated. • Maximum engine speed is limited to approximately 3,500–3,800 r/min.			Cancel: Engine is stopped.
	Control is activated when the following conditions are present: • Cam position sensor failed. • Engine speed exceeds 5,000 r/min.	Ignition and fuel injection are cut to all cylinders and the engine is stopped.			
Battery disconnection warning	Battery cable is disconnected during normal operation.	Control is performed using the same actions as the ETV failure control.			
Idle speed control	Throttle lever is in the fully closed (idle) position.	Engine speed is limited to 1,150–1,350 r/min.			
Over revolution control	Engine speed exceeds 7,800 r/min.	Ignition is controlled.			
		Condition	Action	r/min	
		Normal	None	Below 7,800	
		Level 1	Ignition is cut off to 1 cylinder.	7,800–8,200	
		Level 2	Ignition is cut off to 2 cylinders.		
		Level 3	Ignition is cut off to 3 cylinders.		
		Level 4	Ignition is cut off to all cylinders.		



Item	Condition	Action	Remarks
L-MODE control	L-MODE is activated.	• Opening angle of the ETV is regulated. • Ignition timing is controlled. • Maximum engine speed is limited to 5,400 r/min.	Cancel: L-MODE is deactivated.
Slant detection control	Control is activated when the following conditions are present: • Slant detection switch is on. • Engine speed is 3,000 r/min or less.	Ignition and fuel injection are cut to all cylinders and the engine is stopped.	Cancel: Engine is stopped. * The check engine warning indicator does not come on and the buzzer does not sound.
High intake air pressure control	Control is activated when the following conditions are maintained for 1.5 seconds: • Intake air pressure exceeds 145 kPa. • Engine speed exceeds 7,550 r/min.	Opening angle of the ETV is regulated so that it does not exceed the opening angle when the pressure control was activated.	Cancel: APS pulley is returned to the fully closed position.
Knock control	Control is activated when the following conditions are present: • Knock sensor detects the engine knock. • Engine speed exceeds 2,000 r/min after the engine has been warmed up.	Ignition timing is controlled (retarded).	



— MEMO —

Chapter 2

Specification

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General specification

Item	Unit	Model	
		FZR	FZS
Model code			
Hull		F2R	F2C
Engine/jet		6AN/6AN	
Dimensions			
Length	mm (in)	3,350 (131.9)	3,370 (132.7)
Width	mm (in)	1,230 (48.4)	
Height	mm (in)	1,160 (45.7)	
Weight			
Dry weight	kg (lb)	366 (807)	369 (813)
Maximum capacity	Person/kg (lb)	2/160 (353)	3/240 (529)
Performance			
Maximum fuel consumption	L/h (US gal/h, Imp.gal/h)	71.3 (18.8, 15.7)	
Cruising range	h	0.98	
Engine			
Engine type		4-stroke, L4, DOHC	
Displacement	cm ³ (cu. in)	1,812 (110.6)	
Bore × stroke	mm (in)	86.0 × 78.0 (3.39 × 3.07)	
Compression ratio		8.6:1	
Exhaust system		Wet exhaust	
Lubrication system		Wet sump	
Cooling system		Water cooled	
Starting system		Electric starter	
Ignition system		TCI	
Maximum ignition timing advance	Degree	BTDC 20	
Spark plug (manufacturer)		LFR6A (NGK)	
Spark plug gap	mm (in)	0.8–0.9 (0.031–0.035)	
Generator output	A @ r/min	23.3–25.3 @ 6,000	
Drive unit			
Propulsion system		Jet pump	
Jet pump type		Axial flow, single stage	
Impeller rotation		Counterclockwise (viewed from rear)	
Transmission		Direct drive from engine	
Jet thrust nozzle horizontal angle	Degree	24 + 24	
Trim system		Manual 5 positions	
Jet thrust nozzle trim angle	Degree	–10, –5, 0, 5, 10	
Reverse system		Reverse gate	

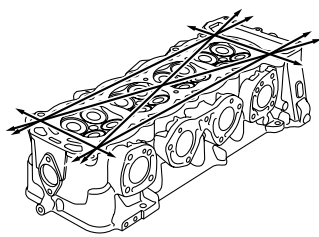
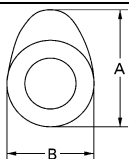
Item	Unit	Model	
		FZR	FZS
Fuel and oil			
Fuel type		Regular unleaded gasoline	
Minimum fuel rating	PON*	86	
	RON*	90	
Fuel tank capacity	L (US gal, Imp.gal)	70 (18.5, 15.4)	
Engine oil type		4-stroke motor oil	
Engine oil grade	API SAE	SE, SF, SG, SH, SJ, or SL 10W-30, 10W-40, 20W-40, or 20W-50	
Engine oil quantity			
Total amount	L (US qt, Imp.qt)	4.3 (4.5, 3.8)	
Without oil filter replacement	L (US qt, Imp.qt)	3.0 (3.2, 2.6)	
With oil filter replacement	L (US qt, Imp.qt)	3.1 (3.3, 2.7)	
Battery			
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

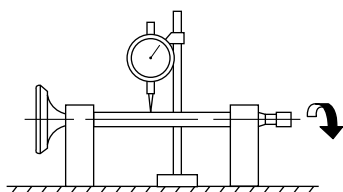
RON*: Research Octane Number

Maintenance specifications

Engine

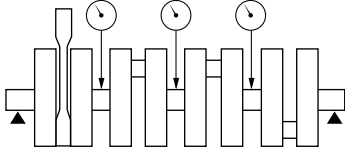
Item	Unit	Model	
		FZR	FZS
Power unit Compression pressure ^{*1}	kPa (kgf/cm ² , psi)	610 (6.1, 86.8)	
Air cooler Holding pressure Water passage Air passage	kPa (kgf/cm ² , psi) kPa (kgf/cm ² , psi)	200 (2.0, 28.5) 100 (1.0, 14.2)	
Oil cooler Holding pressure Water passage	kPa (kgf/cm ² , psi)	200 (2.0, 28.5)	
Cylinder head 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)	
Camshaft 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), with spark plugs removed from all cylinders.
 The figures are for reference only.

Item	Unit	Model	
		FZR	FZS
Timing chain			
Model/number of links		97RH2015–152PX/152	
Tensioning system		Automatic	
Valve			
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	
		FZR	FZS
Valve spring			
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)	
Cylinder			
Bore size	mm (in)	86.000–86.015 (3.3858–3.3864)	
Piston			
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)	
Piston pin			
Outside diameter	mm (in)	21.991–22.000 (0.8658–0.8661)	
Piston ring			
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	
		FZR	FZS
Connecting rod 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)	
Crankshaft Crankshaft journal diameter Crankshaft pin diameter Crankshaft runout limit 	mm (in)	39.976–40.000 (1.5739–1.5748) 41.976–42.000 (1.6526–1.6535) 0.03 (0.0012)	
Crankshaft pin oil clearance Crankshaft journal oil clearance Bearing color code	mm (in)	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	
Oil filter Oil filter type		Cartridge type	
Oil pump Oil pump type		Trochoid	
Thermostat 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	
		FZR	FZS
Throttle body Manufacturer ID mark Trolling speed Throttle cable installation length	r/min mm (in)	Mikuni 6S5 00 1,150–1,350 18.4 ± 1.0 (0.72 ± 0.04)	
Fuel pump Pump type Fuel pressure	kPa (kgf/cm ² , psi)	Electrical 345–370 (3.45–3.70, 49.1–52.6)	

Jet pump unit

Item	Unit	Model	
		FZR	FZS
Jet pump			
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	
		FZR	FZS
Throttle lever			
Free play	mm (in)	2.0–5.0 (0.08–0.20)	

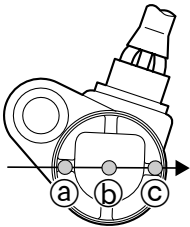
Electrical

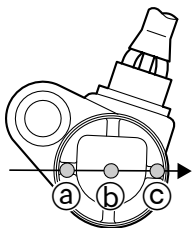
Item	Unit	Model	
		FZR	FZS
Ignition system			
ECM unit (B/R – B, B/W – B, B/Y – B, B/G – B)			
Output peak voltage			
@ cranking (loaded)	V	2.5	
@ 2,000 r/min (loaded)	V	2.6	
@ 3,500 r/min (loaded)	V	2.6	
Pickup coil (W – B)			
Output peak voltage			
@ cranking (unloaded)	V	5.4	
@ cranking (loaded)	V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

*1 The figures are for reference only.

Item	Unit	Model	
		FZR	FZS
Charging system			
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)			
@ 20 °C (68 °F)	Ω	0.31–0.38	
Rectifier regulator (R – B)			
Output peak voltage			
@ 2,000 r/min (loaded)	V	13	
@ 3,500 r/min (loaded)	V	13	
Control system			
Oil pressure switch			
Oil pressure switch continuity pressure	kPa (kgf/cm ² , 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	
		FZR	FZS
TPS			
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	
APS			
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 pulley fully closed			
APS 1	kΩ	0.50–0.90	
APS 2	kΩ	0.35–1.05	
with APS pulley fully open			
APS 1	kΩ	3.75–4.35	
APS 2	kΩ	3.60–4.50	
Cam position sensor			
Output voltage (G/O – B/O)			
Position ㉓, ㉔	V	More than 4.8	
Position ㉕	V	Less than 0.8	
			



*1 The figures are for reference only.

Item	Unit	Model	
		FZR	FZS
Fuel system			
Fuel injector			
Fuel injector resistance* ¹	Ω	11.5–12.5	
@ 20 °C (68 °F)			
Fuel sender			
Fuel sender resistance* ¹			
(Y– B)			
@ 20 °C (68 °F)			
Lower position	Ω	133.5–136.5	
Upper position	Ω	5.0–7.0	
Starting system			
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	
Starter motor			
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* ¹	mm (in)	0.2–0.7 (0.008–0.028)	
Commutator diameter	mm (in)	27.0–28.0 (1.06–1.10)	
Remote control system			
Remote control receiver			
Output voltage* ¹	V	11.0–12.0	
(L/Y – Ground)			
Indication system			
Speed sensor			
Output voltage (on pulse)			
(Y – B/Y)	mV	Less than 400	
	V	More than 11.6	

^{*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	
Fuel system						
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
Engine						
Deck beam nut		—	18	1.8	13.3	5-1
Deck beam bolt		M8	18	1.8	13.3	5-1
APS nut		—	17	1.7	12.5	5-1
Engine cover screw		M6	5	0.5	3.7	5-1
Engine cover grommet bolt		M6	6	0.6	4.4	5-3
Engine cover stay bolt		M6	8	0.8	5.9	5-3
Oil filter		—	18	1.8	13.3	5-3
Air filter case bolt		M8	12	1.2	8.9	5-3
Intake pipe clamp		—	3	0.3	2.2	5-3
Air filter case bracket nut		—	17	1.7	12.5	5-3
Breather assembly bolt		M6	8	0.8	5.9	5-5
Rectifier regulator bolt		M8	26	2.6	19.2	5-5
Pipe clamp		—	2	0.2	1.5	5-5
Exhaust pipe 1 stay bolt	1st	M8, M10	22	2.2	16.2	5-5
	2nd		42	4.2	31.0	
Exhaust manifold bolt	1st	M8	20	2.0	14.8	5-5
	2nd		35	3.5	25.8	
Electrical box bolt		M8	17	1.7	12.5	5-8
Coupling cover bolt		M6	8	0.8	5.9	5-8
Engine mounting bolt		M8	17	1.7	12.5	5-8
Damper 1 bolt		M6	6	0.6	4.4	5-9
Damper 2 bolt		M6	6	0.6	4.4	5-9
Spacer 1 bolt		M6	5	0.5	3.7	5-9
Spacer 2 bolt		M6	5	0.5	3.7	5-9
Engine mount bolt		M8	17	1.7	12.5	5-9
Exhaust pipe 3		—	63	6.3	46.5	5-24
Thermo sensor		—	20	2.0	14.8	5-24
Exhaust pipe 1 bolt	1st	M8	20	2.0	14.8	5-24
	2nd		35	3.5	25.8	
Exhaust pipe 2 bolt	1st	M8	15	1.5	11.1	5-24
	2nd		29	2.9	21.4	
Starter motor cable nut		—	5	0.5	3.7	5-27

SPEC				Tightening torques			E
Part to tightened			Thread size	Tightening torque			Refer to page
				N·m	kgf·m	ft·lb	
Starter motor bolt			M8	18	1.8	13.3	5-27
Thermostat housing bolt			M6	8	0.8	5.9	5-27
Joint 1 hose clamp			—	3	0.3	2.2	5-31
Boost pipe bolt			M8	20	2.0	14.8	5-31
Joint 2 hose clamp			—	3	0.3	2.2	5-31
Air cooler intake pipe clamp			—	4	0.4	3.0	5-31
Air cooler assembly nut	1st	—	22	2.2	16.2	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	22	2.2	16.2	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	5-33
Intake air pressure sensor bolt			M5	3.5	0.35	2.6	5-33
Intake air pressure sensor bracket bolt			M6	5	0.5	3.7	5-33
Intake manifold stay bolt	1st	M8	22	2.2	16.2	5-33	
	2nd		42	4.2	31.0		
Oil level pipe bolt			M6	8	0.8	5.9	5-33
Intake manifold bolt	1st	M8	10	1.0	7.4	5-33	
	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	5-33	
	2nd		20	2.0	14.8		
Throttle body joint bolt			M8	13	1.3	9.6	5-35
Throttle body assembly nut			—	13	1.3	9.6	5-35
Supercharger oil filler hole bolt			—	4	0.4	3.0	5-38
Oil filter bolt			—	18	1.8	13.3	5-41
Oil cooler assembly bolt			M8	18	1.8	13.3	5-41
Oil pipe holder bolt			M6	8	0.8	5.9	5-41
Oil pipe bolt			M10	21	2.1	15.5	5-41
Oil pump assembly bolt			M6	10	1.0	7.4	5-41
Drive gear assembly bolt (left-hand threads)			M12	80	8.0	59.0	5-43
Ignition coil bolt			M6	8	0.8	5.9	5-51
Spark plug			—	25	2.5	18.4	5-51
Cam position sensor bolt			M6	10	1.0	7.4	5-51
Cylinder head cover bolt			M6	8	0.8	5.9	5-51
Oil pipe bolt			M10	20	2.0	14.8	5-52
Timing chain tensioner bolt			M6	10	1.0	7.4	5-52
Camshaft cap bolt			M7	16	1.6	11.8	5-52

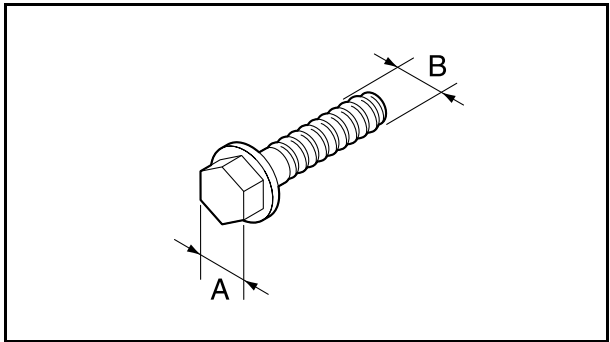
SPEC				Tightening torques				
Part to tightened			Thread size	Tightening torque			Refer to page	
				N·m	kgf·m	ft·lb		
Camshaft sprocket bolt			M7	24	2.4	17.7	5-52	
Chain guide plate bolt			M6	10	1.0	7.4	5-52	
Engine hanger bolt			M6	12	1.2	8.9	5-66	
Cylinder head assembly bolt			M6	10	1.0	7.4	5-66	
			1st	M12	48	4.8		35.4
			2nd		90°			
Drive coupling			M30	250	25.0	184.4	5-79	
Grommet bracket bolt			M6	8	0.8	5.9	5-79	
Generator cover assembly bolt			M8	26	2.6	19.2	5-79	
Transfer shaft			1st	—	50	5.0	36.9	5-79
			2nd		60°			
			3rd		250	25.0	184.4	
Holder (left-hand threads)			—	80	8.0	59.0	5-79	
Special nut			—	250	25.0	184.4	5-79	
Flywheel magneto bolt			M8	24	2.4	17.7	5-79	
Pickup coil bolt			M5	5	0.5	3.7	5-81	
Washer bolt			M5	5	0.5	3.7	5-81	
Stator coil assembly bolt			M6	14	1.4	10.3	5-81	
Clamp bolt			M6	14	1.4	10.3	5-81	
Thermoswitch bolt			M6	8	0.8	5.9	5-95	
Knock sensor			—	15	1.5	11.1	5-95	
Anode cover bolt			M8	20	2.0	14.8	5-95	
Anode bolt			M6	8	0.8	5.9	5-95	
Engine temperature sensor			—	15	1.5	11.1	5-95	
Earth plate bolt			M6	8	0.8	5.9	5-95	
Water jacket cover bolt			M6	8	0.8	5.9	5-95	
Oil pressure switch lead bolt			M4	2	0.2	1.5	5-95	
Oil pressure switch			—	8	0.8	5.9	5-95	
Oil separator tank cover bolt			M6	8	0.8	5.9	5-95	
Oil pan assembly bolt			M6	10	1.0	7.4	5-95	
Baffle plate bolt			M6	12	1.2	8.9	5-98	
Oil pipe 1 and 2 bolt			M6	9	0.9	6.6	5-98	
Bracket 1 and 2 bolt			M10	50	5.0	36.9	5-100	
Baffle plate bolt			M6	10	1.0	7.4	5-100	
Crankcase bolt			M6	10	1.0	7.4	5-100	
			1st	M10	30	3.0		22.1
			2nd		90°			
Connecting rod cap nut			1st	—	51	5.1	37.6	5-100
			2nd		90°			
Jet pump unit								
Intake grate bolt			M10	40	4.0	29	6-1	
Speed sensor screw			M5	4	0.4	3.0	6-1	
Rubber plate bolt			M6	7	0.7	5.2	6-1	
Ride plate bolt			M8	17	1.7	12.5	6-1	

SPEC		Tightening torques			E
Part to tightened	Thread size	Tightening torque			Refer to page
		N-m	kgf-m	ft-lb	
Steering cable joint nut	—	7	0.7	5.2	6-2
Steering cable joint	—	7	0.7	5.2	6-2
Spout hose clamp (hull end)	—	2	0.2	1.5	6-2
Bracket bolt	M8	17	1.7	12.5	6-2
Jet pump unit assembly bolt	M6	8	0.8	5.9	6-2
	M10	40	4.0	29.5	
Stay bolt	M8	14	1.4	10.3	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
Shift cable ball joint nut	—	8	0.8	5.9	6-6
Spring nut	—	8	0.8	5.9	6-6
Spring bolt	M8	20	2.0	14.8	6-6
Reverse gate bracket bolt	M6	8	0.8	5.9	6-6
Jet thrust nozzle bolt	M8	15	1.5	11.1	6-7
Nozzle ring bolt	M8	15	1.5	11.1	6-7
QSTS rod ball joint nut	—	8	0.8	5.9	6-7
Impeller duct bolt	M10	40	4.0	29.5	6-8
Water inlet cover/water inlet strainer bolt	M6	7	0.7	5.2	6-8
Impeller (left-hand threads)	—	205	20.5	151.2	6-9
Cap bolt	M6	8	0.8	5.9	6-9
Drive shaft nut	—	69	6.9	50.9	6-9
Flushing hose nut	—	6	0.6	4.4	6-17
Pilot water outlet joint nut	—	5	0.5	3.7	6-17
Drain joint nut	—	7	0.7	5.2	6-17
Transom plate nut	—	26	2.6	19.2	6-17
Intermediate housing assembly bolt	M8	17	1.7	12.5	6-21
Grease nipple	—	5	0.5	3.7	6-22
Driven coupling	—	205	20.5	151.2	6-22
Hull and hood					
Upper handlebar cover screw	M5	1	0.1	0.7	8-1
Lower handlebar cover screw	M6	5	0.5	3.7	8-1
Upper handlebar holder bolt	M8	20	2.0	14.8	8-2
QSTS grip assembly screw	M6	3	0.3	2.2	8-3
Left handlebar switch assembly screw	M5	3	0.3	2.2	8-3
Throttle lever assembly bolt	M5	3	0.3	2.2	8-3
Throttle cable locknut	—	7	0.7	5.2	8-3
Grip end bolt	M5	1	0.1	0.7	8-3
QSTS converter bolt	M6	5	0.5	3.7	8-10
Pulley nut	—	7	0.7	5.2	8-10
QSTS cable grommet nut	—	5.9	0.59	4.4	8-10
QSTS rod locknut	—	4	0.4	3.0	8-13
Damper nut	—	5	0.5	3.7	8-15
Hinge assembly nut	—	6	0.6	4.4	8-15

SPEC		Tightening torques			E
Part to tightened	Thread size	Tightening torque			Refer to page
		N·m	kgf·m	ft·lb	
Front hood assembly bolt	M6	5	0.5	3.7	8-15
Mirror assembly nut	—	6	0.6	4.4	8-15
Damper stay bolt	M6	5	0.5	3.7	8-15
Ventilation cover screw	M5	2	0.2	1.5	8-17
Hood lock bolt	M5	4	0.4	3.0	8-17
Dual analog meter unit cover screw	M5	2	0.2	1.5	8-20
Dual analog meter unit bolt	M5	4	0.4	3.0	8-20
Grip screw	M6	5	0.5	3.7	8-21
Side cover bolt	M6	5	0.5	3.7	8-21
Side cover nut	—	5	0.5	3.7	8-21
Side ornament bolt	M6	5	0.5	3.7	8-21
Knee pad bolt	M6	5	0.5	3.7	8-21
Side cover bracket bolt	M6	5	0.5	3.7	8-21
Center cover bolt	M6	5	0.5	3.7	8-23
Center cover nut	—	5	0.5	3.7	8-23
Shift lever assembly nut	—	5	0.5	3.7	8-23
Reverse sensor screw	M5	4	0.4	3.0	8-23
Lid lock hook/bracket bolt	M5	4	0.4	3.0	8-25
Steering master assembly bolt	M8	20	2.0	14.8	8-27
Steering arm assembly bolt	M8	17	1.7	12.5	8-28
Steering cable ball joint nut	—	7	0.7	5.2	8-28
Steering cable ball joint	—	7	0.7	5.2	8-28
Cable stopper assembly bolt	M6	7	0.7	5.2	8-28
Sensor base bolt	M8	17	1.7	12.5	8-28
Grease nipple	—	2	0.2	1.5	8-28
Lock assembly bolt	M6	7	0.7	5.2	8-28
Steering sensor bolt	M6	7	0.7	5.2	8-28
Steering cable grommet nut	—	5.9	0.59	4.4	8-32
Steering cable joint locknut	—	7	0.7	5.2	8-32
Speed sensor lead grommet nut	—	5.9	0.59	4.4	8-32
Shift cable bracket nut	—	5	0.5	3.7	8-32
Shift cable grommet nut	—	5.9	0.59	4.4	8-32
Shift cable joint locknut	—	7	0.7	5.2	8-32
Cooling water pilot outlet nut	—	4	0.4	3.0	8-36
Seat lock assembly bolt	M6	7	0.7	5.2	8-39
Deck beam nut	—	18	1.8	13.3	8-39
Projection nut	—	26	2.6	19.2	8-39
Deck beam 1 bolt	M8	18	1.8	13.3	8-39
Seat holder nut	—	15	1.5	11.1	8-39
Handgrip bolt	M8	5	0.5	3.7	8-39
Rubber hose/resonator clamp	—	3.7	0.37	2.7	8-43
Rubber hose/water tank clamp	—	3.7	0.37	2.7	8-43
Water tank/rubber hose clamp	—	3.7	0.37	2.7	8-43
Plate/rubber hose/exhaust valve nut	—	5	0.5	3.7	8-43

Part to tightened	Thread size	Tightening torque			Refer to page
		N·m	kgf·m	ft·lb	
Bow eye bolt	M6	13	1.3	9.6	8-46
Front protector 1 nut	—	5	0.5	3.7	8-46
Front protector 1 bolt	M6	2.5	0.25	1.9	8-46
Front protector 2 nut	—	5	0.5	3.7	8-46
Sponson bolt	M8	16	1.6	11.8	8-46
Ski tow nut (FZS)	—	26	2.6	19.2	8-48
Spout nut	—	5	0.5	3.7	8-48
Stern eye nut	—	15	1.5	11.1	8-48
Drain plug nut	—	2	0.2	1.5	8-48
Reboarding step assembly bolt (FZS)	M8	15	1.5	11.1	8-48
Electrical					
ECM bolt	M6	5	0.5	3.7	7-4
Slant detection switch screw	M6	4	0.4	3.0	7-4
Fuse box bolt	M6	8	0.8	5.9	7-4
Starter relay terminal bolt	M6	4	0.4	3.0	7-6
Starter motor terminal nut	—	9	0.9	6.6	7-49
Starter motor cover bolt	M6	7	0.7	5.2	7-49
Transmitter cover screw	—	0.1	0.01	0.1	7-58

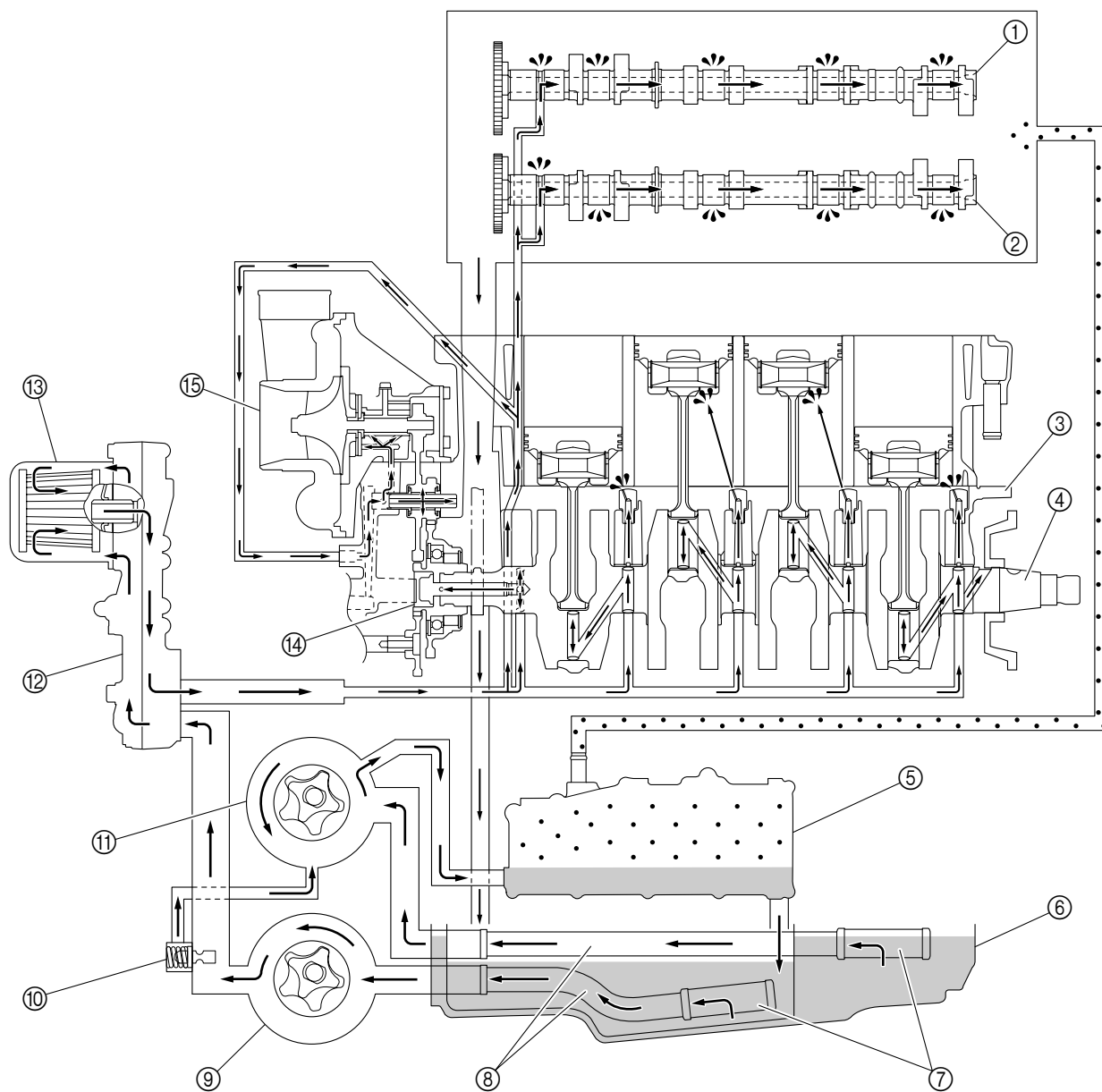
Width across flat (A)	Screw size (B)	General torque specifications		
		N·m	kgf·m	ft·lb
8 mm	M5	5	0.5	3.7
10 mm	M6	8	0.8	5.9
12 mm	M8	18	1.8	13.3
14 mm	M10	36	3.6	26.6
17 mm	M12	43	4.3	31.7



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 prevent warpage, tighten multi-fastener assemblies in a crisscross fashion and progressive stages until the specified torque is reached. Unless otherwise specified, torque specifications require clean, dry threads. Components should be at room temperature.

Lubrication system

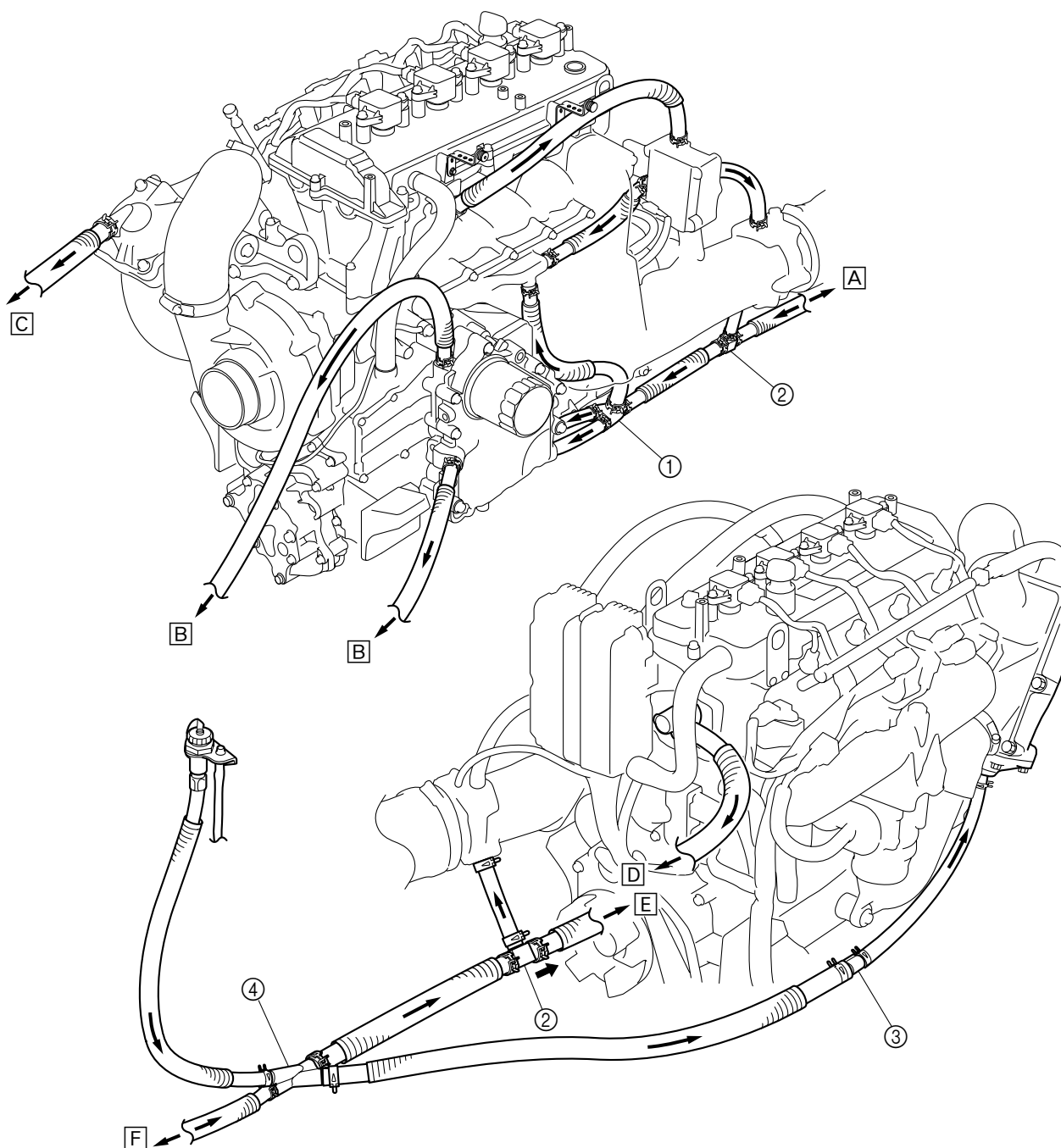


- ① Intake camshaft
- ② Exhaust camshaft
- ③ Cylinder block
- ④ Crankshaft
- ⑤ Oil separator tank
- ⑥ Oil pan
- ⑦ Oil strainer
- ⑧ Oil pipe
- ⑨ Oil pump assembly (feed pump)

- ⑩ Relief valve
- ⑪ Oil pump assembly (scavenge pump)
- ⑫ Oil cooler assembly
- ⑬ Oil filter
- ⑭ Drive gear assembly
- ⑮ Supercharger assembly

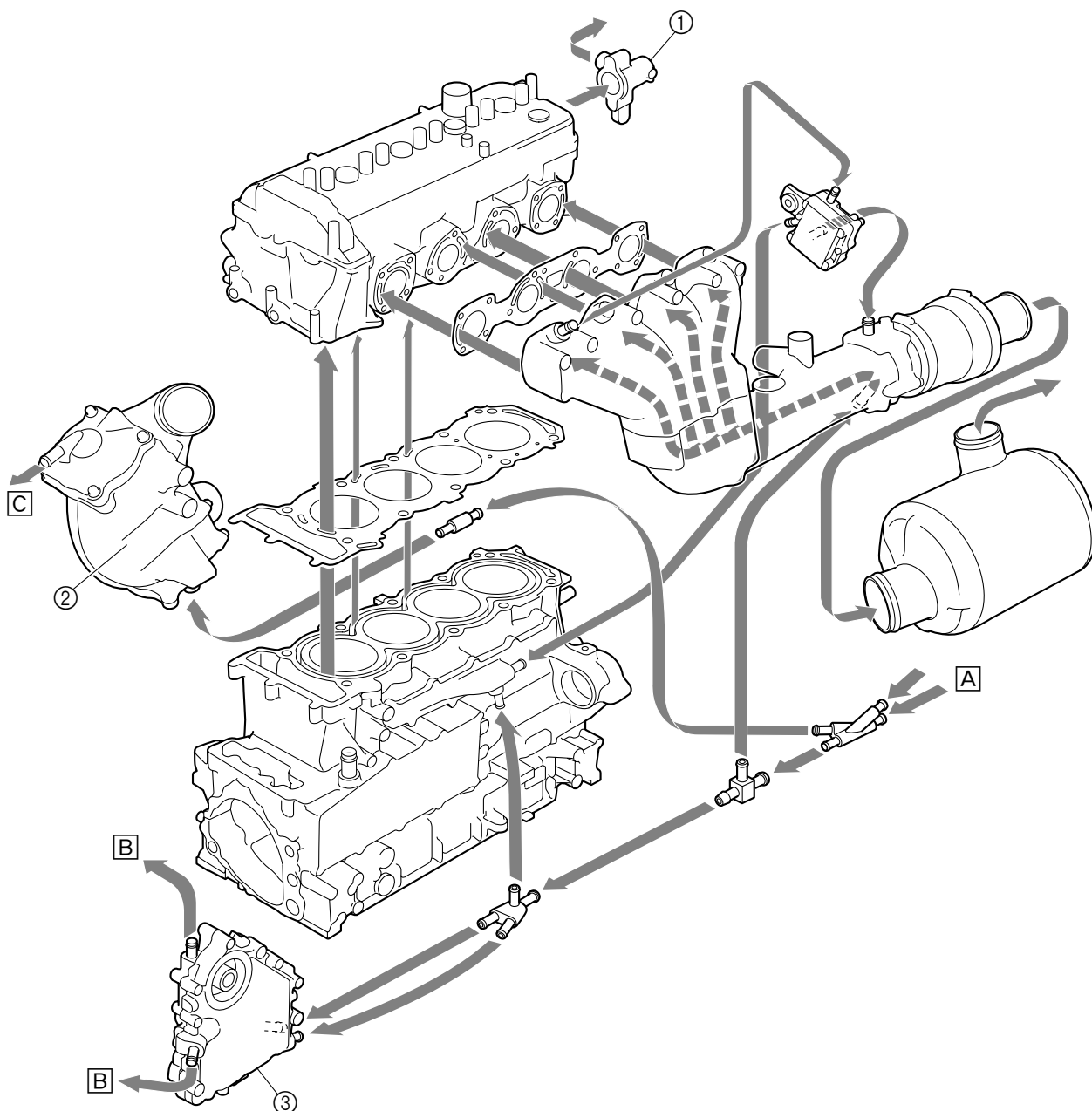
Cooling system

2



- ① Hose joint 2
- ② Hose joint 3
- ③ Hose joint 4
- ④ Hose joint 1

- [A] To hose joint 1
- [B] To cooling water pilot outlet on port side
- [C] To cooling water pilot outlet on starboard side
- [D] To drain joint
- [E] To hose joint 2
- [F] To transom plate



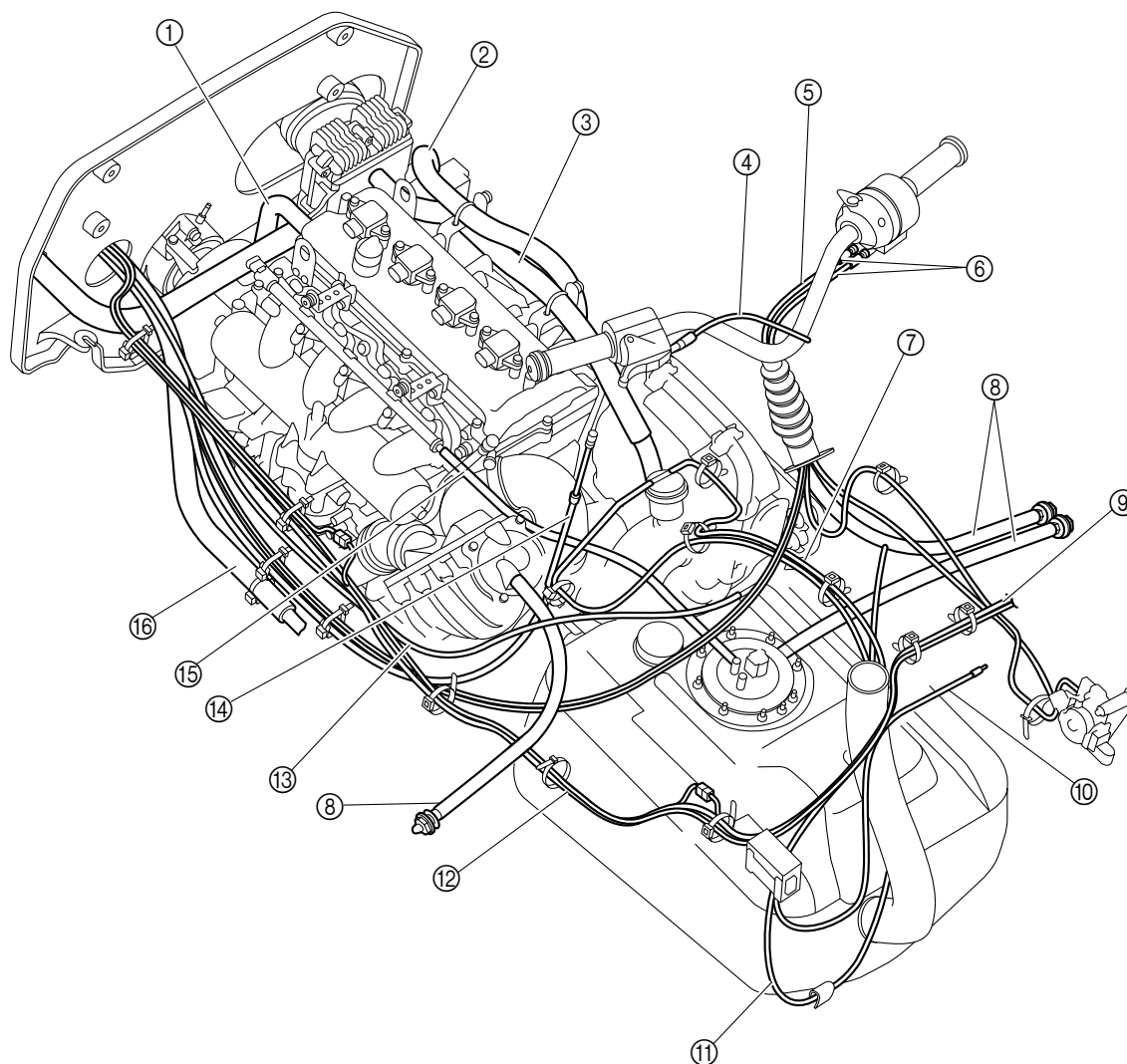
- ① Thermostat housing
- ② Air cooler assembly
- ③ Oil cooler assembly

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



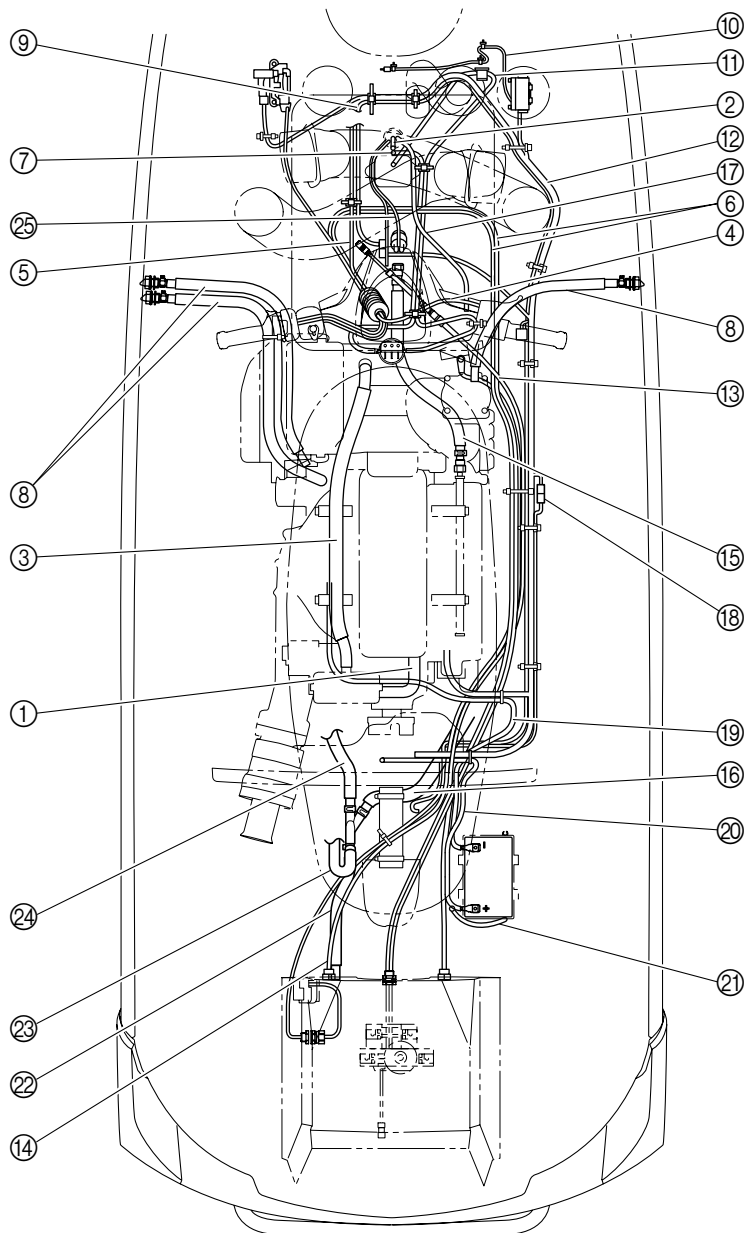
Cable and hose routing

Starboard bow view

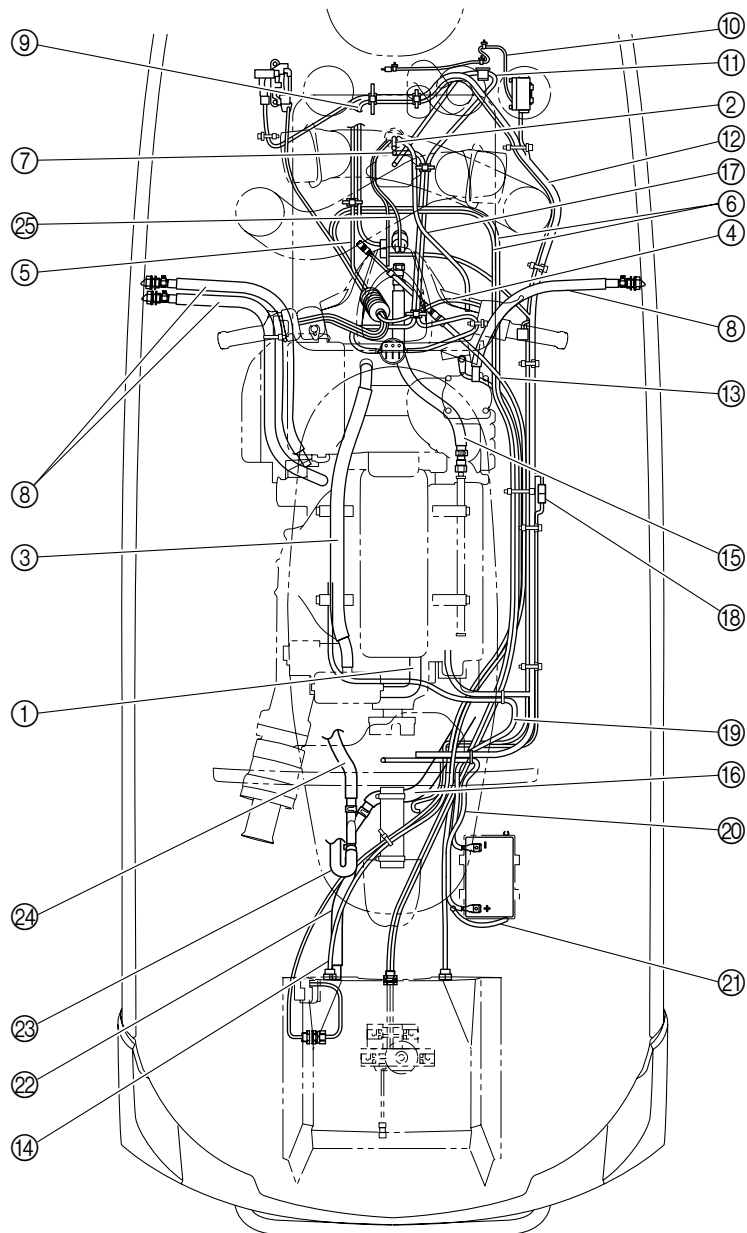


- | | |
|--|---|
| ① Breather hose (head cover to breather assembly) | ⑨ Speed sensor lead |
| ② Cooling water hose (exhaust manifold to rectifier regulator) | ⑩ Remote control receiver antenna |
| ③ Breather hose (breather assembly to intake pipe) | ⑪ Fuel tank breather hose (ventilation socket to water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

Top view

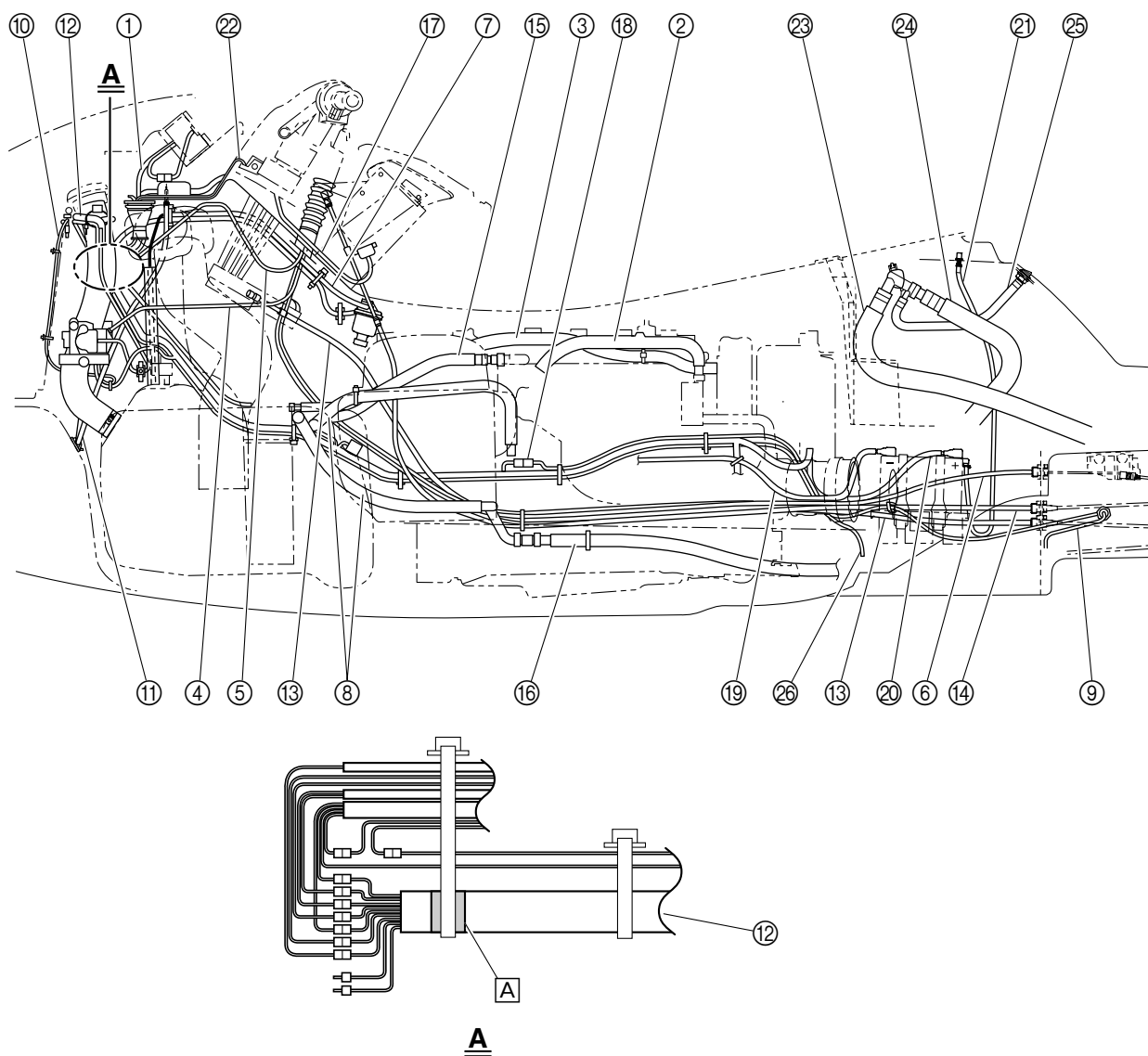


- | | |
|--|---|
| ① Breather hose (head cover to breather assembly) | ⑨ Speed sensor lead |
| ② Dual analog meter lead | ⑩ Remote control receiver antenna |
| ③ Breather hose (breather assembly to intake pipe) | ⑪ Fuel tank breather hose (ventilation socket to water separator) |
| ④ Throttle cable |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

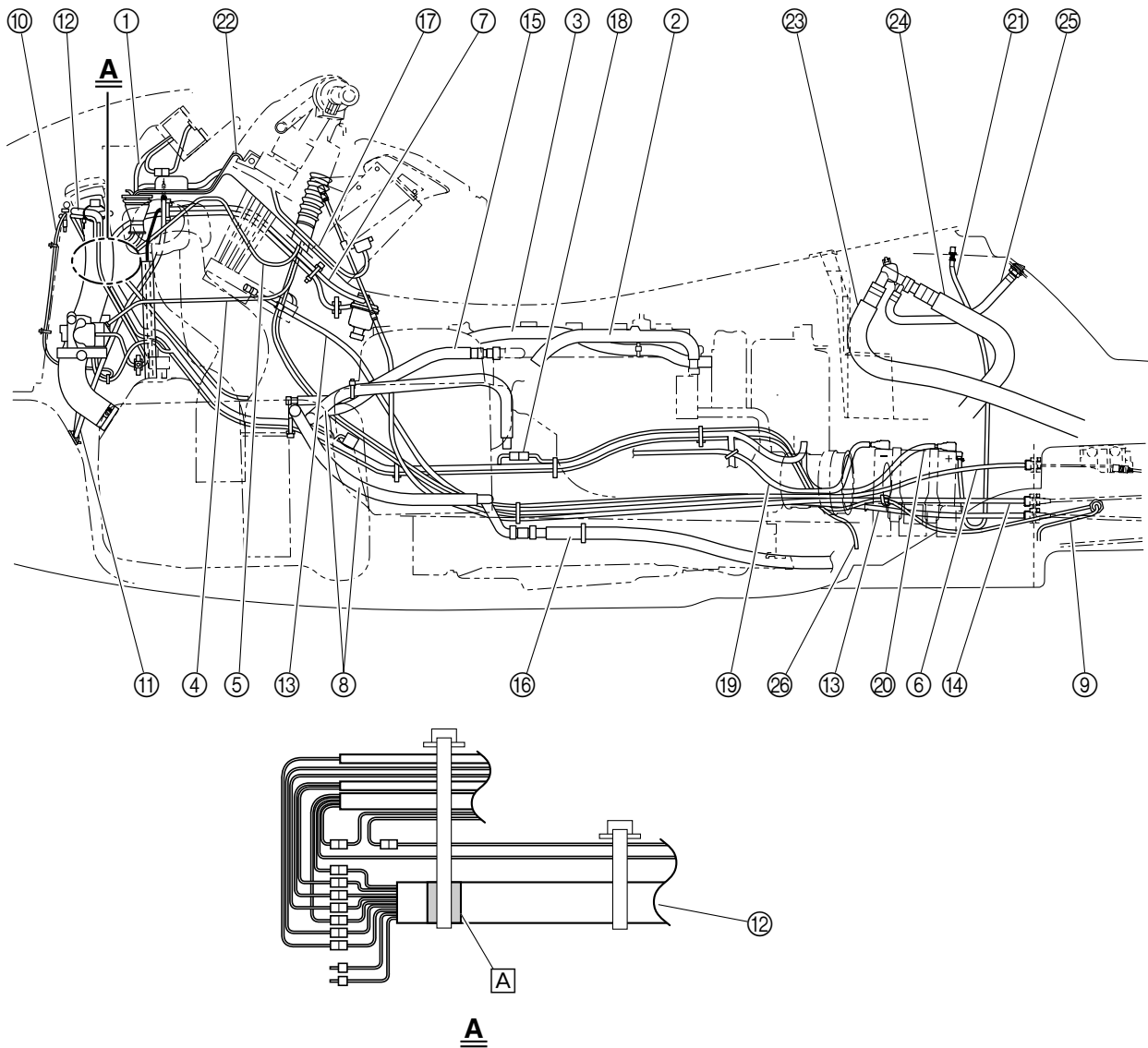


- ⑱ Negative battery cable
- ⑳ Positive battery cable
- ㉑ Battery breather hose
- ㉒ Cooling water hose (jet pump to hose joint 1)
- ㉓ Flushing hose
- ㉔ Cooling water hose (hose joint 1 to hose joint 3)
- ㉕ Buzzer lead

Port view



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



- ⑲ Negative battery cable
- ⑳ Positive battery cable
- ㉑ Battery breather hose
- ㉒ Steering sensor lead
- ㉓ Bilge hose (hose joint to drain joint)
- ㉔ Bilge hose (electric bilge pump to hose joint)
- ㉕ Bilge hose (hose joint to pilot outlet)
- ㉖ 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.

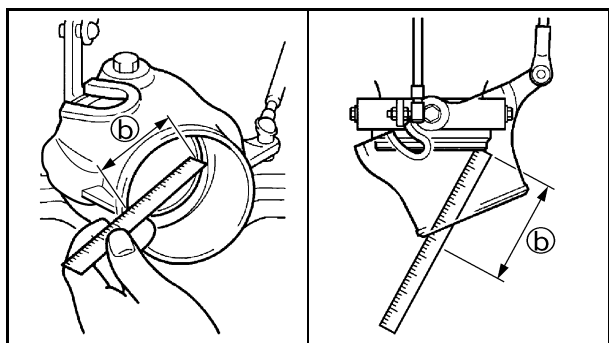
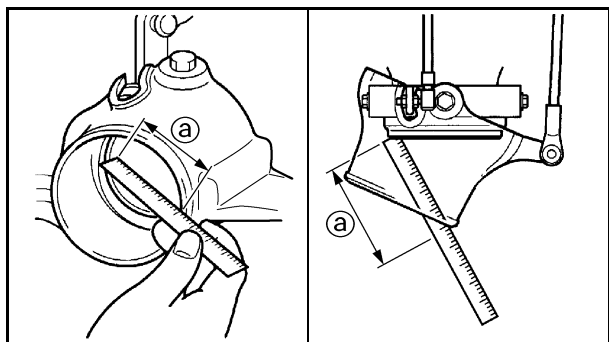
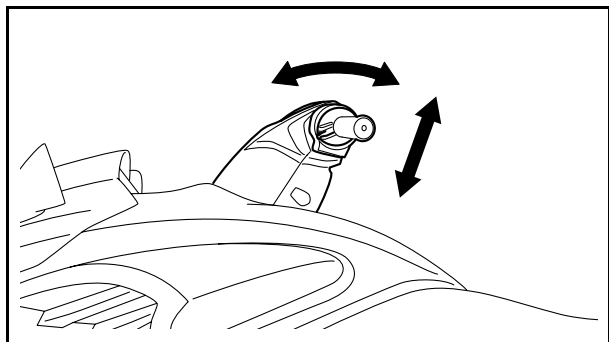
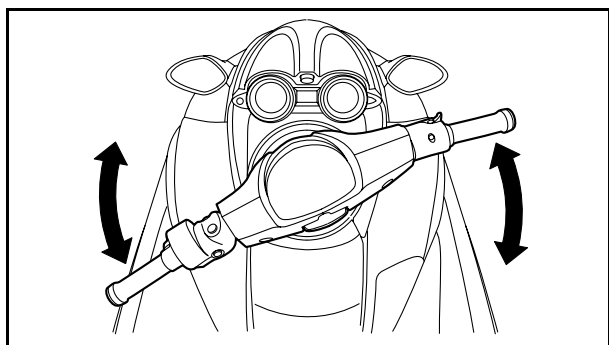
MAINTENANCE INTERVAL ITEM		INITIAL			THEREAFTER EVERY		PAGE
		10 hours	50 hours	100 hours	100 hours	200 hours	
			6 months	12 months	12 months	24 months	
Spark plugs	Check, clean, adjust	○		○	○		3-18
Lubrication points	Lubricate			○	○		3-24
Internal engine components	Lubricate	○*1 50 hours or 12 months					3-23
QSTS cables	Lubricate			○	○		3-23
Intermediate housing	Lubricate	○*2		○*3	○*3		3-23
Fuel system	Check			○	○		3-9
Fuel tank	Check, clean			○	○		3-10
Trolling speed	Check			○	○		3-9
Throttle shaft	Check			○	○		5-37
Cooling water passages	Flush	○*4					—
Water inlet strainer	Check, clean			○	○		3-21
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			○	○		3-8
Throttle cable	Check, adjust	○		○	○		3-5
Stern drain plugs	Check, replace			○	○		3-23
Battery	Check, charge			○	○		3-19
Rubber damper	Check					○	6-25
Engine mounts	Check					○	5-16
Nuts and bolts	Check	○		○	○		—
Air filter element	Check, replace			○	○		3-17
Engine oil	Replace	○	○ 50 hours or 12 months				3-15
Engine oil filter	Replace			○	○		3-16
Valve clearance	Check, adjust					○	3-11
Water separator	Check	○*4					3-11

*1: Before long-term storage

*2: Grease quantity: 33.0–35.0 cm³ (1.12–1.18 US oz, 1.16–1.23 Imp.oz)

*3: Grease quantity: 6.0–8.0 cm³ (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, push it back and forth, and up and down.
- Check for excessive play of the handlebar.

Jet thrust nozzle steering angle check and adjustment

1. Check:

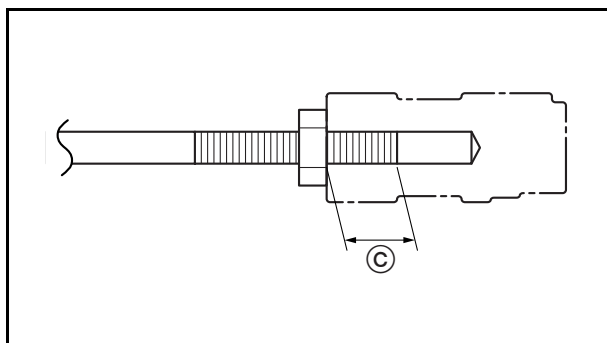
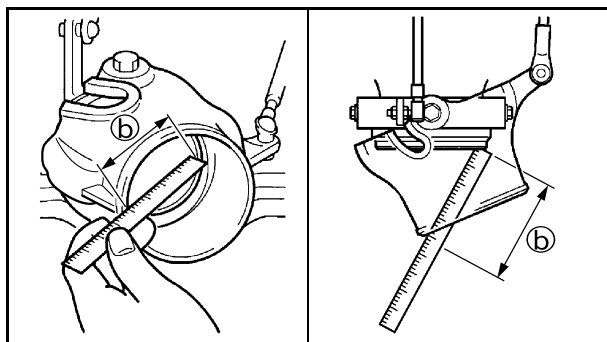
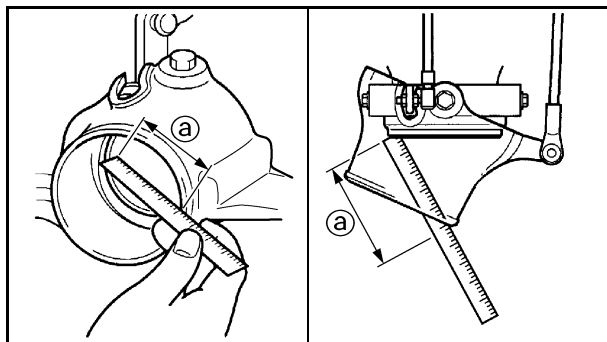
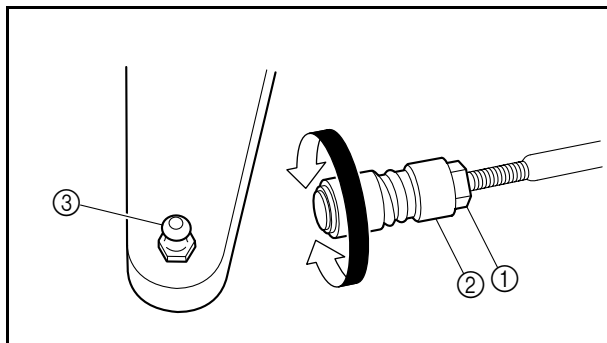
- Jet thrust nozzle distances (a) and (b)
Difference above specification → Adjust the steering cable joint.



Difference of distances (a) and (b):
Maximum 5 mm (0.2 in)

Checking steps:

- Set the QSTS grip to the neutral position.
- Turn the handlebar lock to lock.
- Measure distances (a) and (b).



2. Adjust:

- Steering cable joint (steering master end)

Adjustment steps:

- Set the QSTS grip to the neutral position.
- Loosen the locknut ①.
- Disconnect the steering cable joint ② from the ball joint ③.
- Turn the steering cable joint ② in or out to adjust the distances ① and ②.

⚠ WARNING

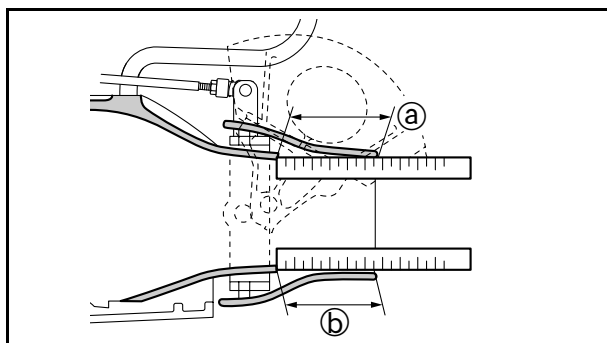
The steering cable joint must be screwed in more than 8 mm (0.31 in) ③.

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

- 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)
--	--

- Check the jet thrust nozzle angle difference of distances ① and ② again.
- 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.



Jet thrust nozzle QSTS angle check and adjustment

1. Check:

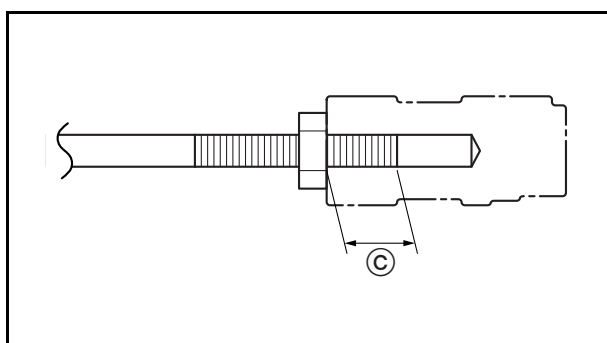
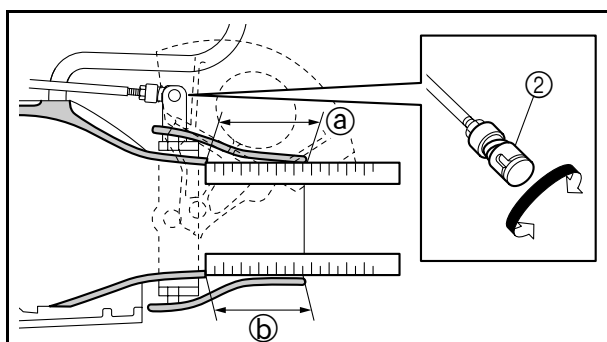
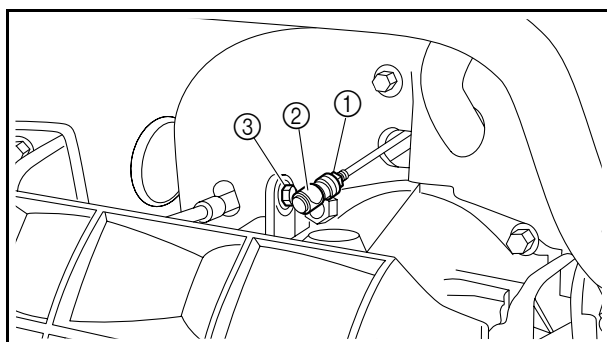
- Jet thrust nozzle angle set distances (a) and (b)
- Difference → Adjust the QSTS rod joint.

TIP

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

Checking steps:

- Set the QSTS grip to the neutral position.
- Measure the jet thrust nozzle angle set distances (a) and (b).



2. Adjust:

- QSTS rod joint

Adjustment steps:

- Set the QSTS grip to the neutral position.
- Set the shift lever to the reverse position.
- Loosen the locknut (1).
- Disconnect the QSTS rod joint (2).
- Set the shift lever to the forward position.
- Adjust the QSTS rod joint (2) until the upper and lower set distances (a) and (b) for the jet thrust nozzle are equal.
- Set the shift lever to the reverse position.

⚠ WARNING

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

Turn out	Distance (a) is increased.
Turn in	Distance (b) is increased.

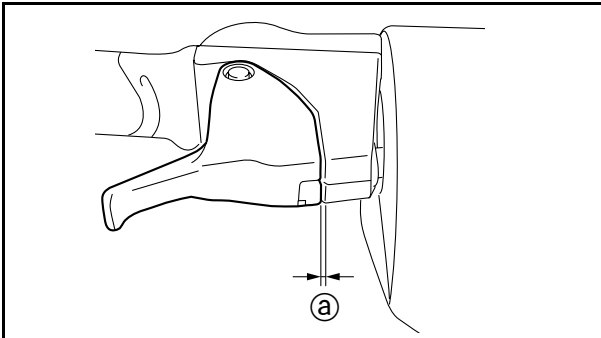
- Connect the QSTS rod joint (2) to the ball joint (3), and then tighten the locknut (1) to the specified torque.



Locknut:
4 N·m (0.4 kgf·m, 3.0 ft·lb)

9. 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.



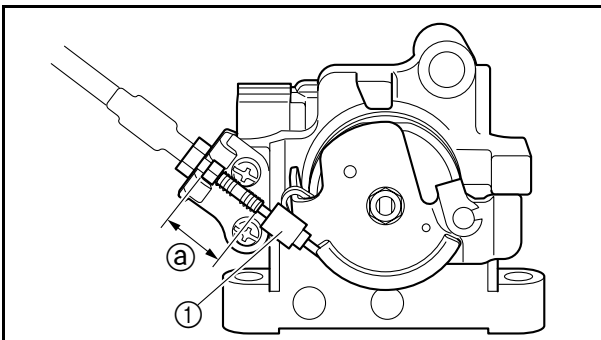
Throttle lever free play check and adjustment

1. Measure:

- Throttle lever free play ①
Out of specification → Adjust the throttle lever free play.



Throttle lever free play ①:
2.0–5.0 mm (0.08–0.20 in)



2. Adjust:

- Throttle lever free play

Adjustment steps:

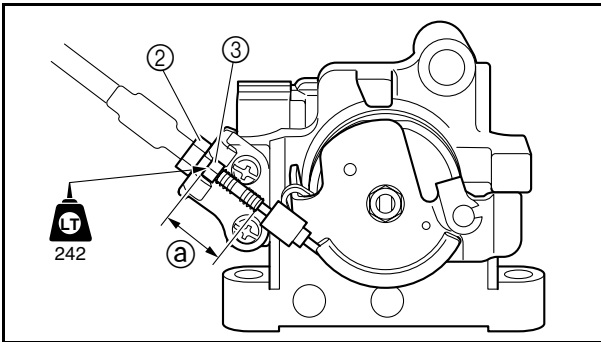
TIP

- Follow all the steps if the throttle cable has been replaced, or if it has been disconnected from the APS.
- Follow only steps 7–17 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 ① is within specification.



Throttle cable installation length ①:
 18.4 ± 1.0 mm (0.72 ± 0.04 in)

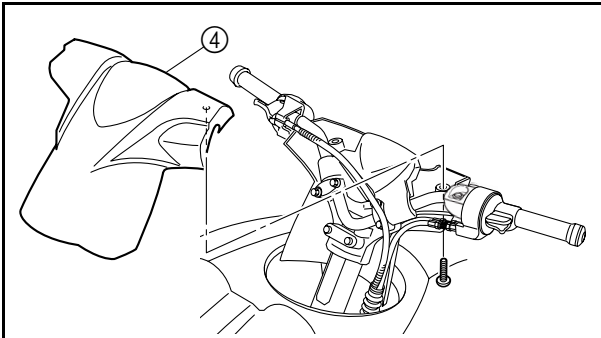


5. If the throttle cable installation length (a) is out of specification, loosen the locknut (2), and then turn the adjusting nut (3) to adjust the length.

6. Apply locking agent to the threads of the adjusting nut (3), and then tighten the locknut (2) to the specified torque.



Locknut:
7 N·m (0.7 kgf·m, 5.2 ft·lb)
LOCTITE 242

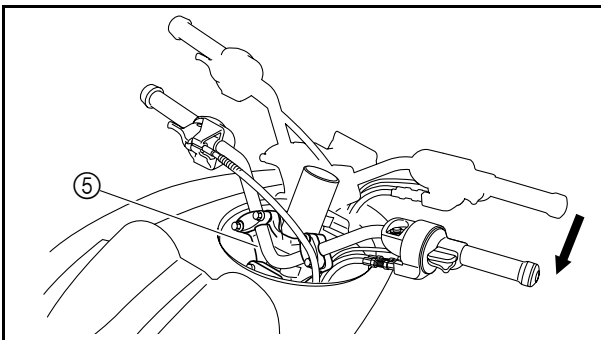


7. Remove the upper handlebar cover (4).

8. Move the handlebar bracket (5) to the lowest position.

NOTICE

Make sure to adjust the free play with the handlebar bracket in the lowest position. Otherwise, the specified free play with the handlebar bracket in the highest position cannot be obtained.



9. Slide the rubber cover (6) away from the throttle lever.

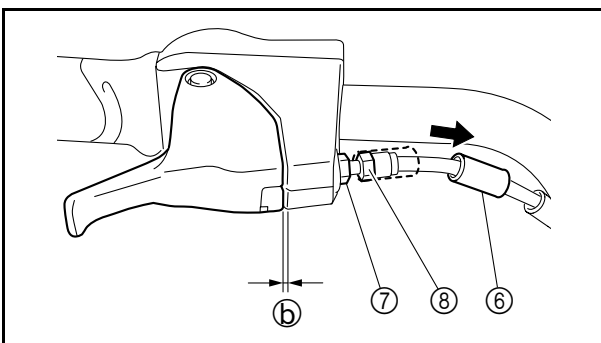
10. Loosen the locknut (7).

11. Turn the adjuster (8) in or out until the specified free play is obtained.

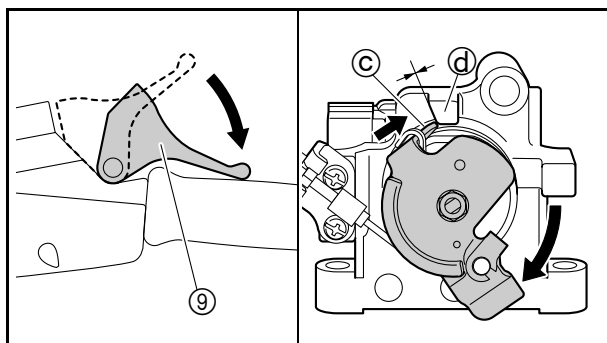
Turn in	Free play is increased.
Turn out	Free play is decreased.



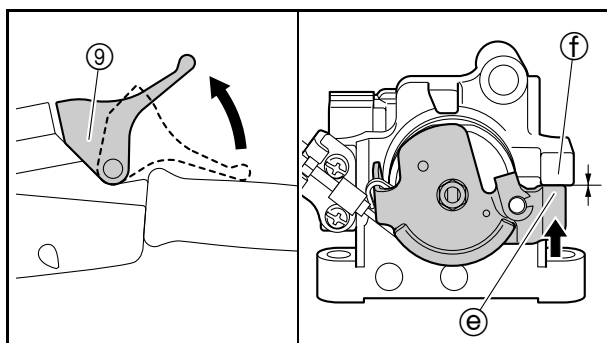
Throttle lever free play (b) with
handlebar bracket in lowest position:
2.0 mm (0.08 in)



12. Tighten the locknut (7).



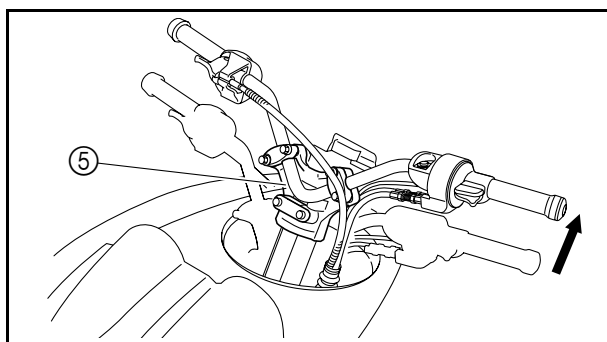
13. Squeeze the throttle lever ⑨ to the fully open position and check that the APS pulley stopper ③ contacts the fully open stopper ④ on the APS.



14. Release the throttle lever ⑨ and check that the APS pulley stopper ③ contacts the fully closed stopper ④ on the APS.

TIP

If the throttle cable free play cannot be adjusted properly, check the throttle cable routing. Refer to “Handlebar assembly installation” in Chapter 8.



15. Move the handlebar bracket ⑤ to the highest position.

16. Check that the throttle lever free play ⑥ is within specification. If out of specification, repeat steps 8–16 to readjust the throttle lever free play.



Throttle lever free play ⑥ with handlebar bracket in highest position:
2.0–5.0 mm (0.08–0.20 in)

TIP

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

17. Install the upper handlebar cover.

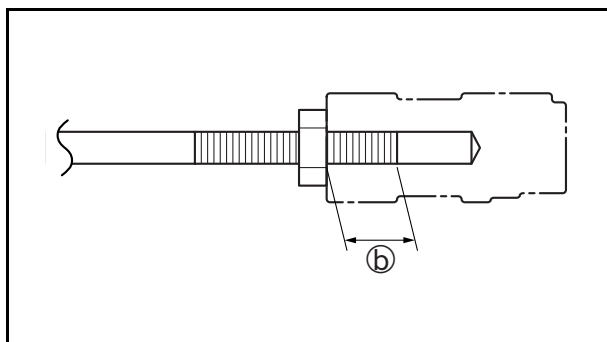
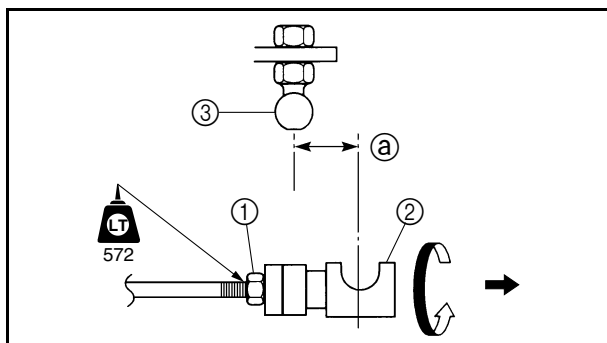
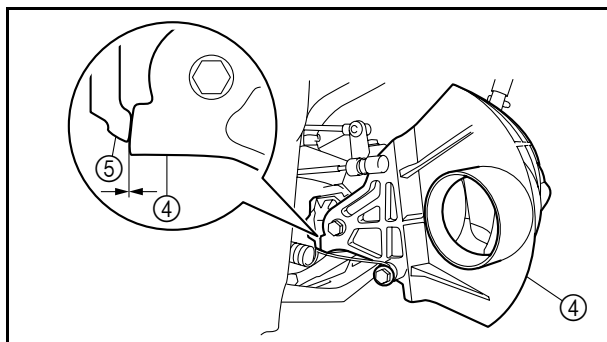
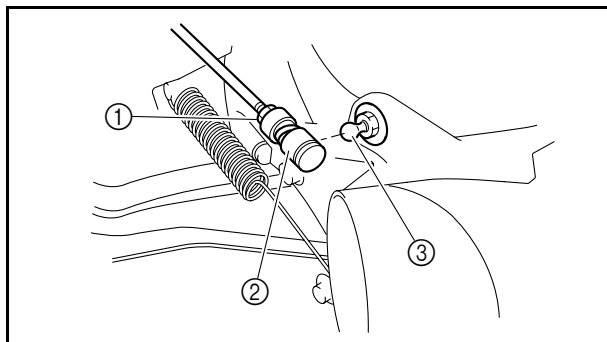
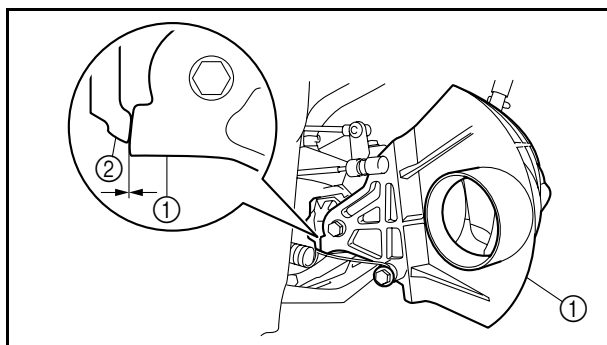


Upper handlebar cover screw:
1 N·m (0.1 kgf·m, 0.7 ft·lb)

NOTICE

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

18. Install the service lid.



Shift cable check and adjustment

1. Check:

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

Checking steps:

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

2. Adjust:

- Shift cable joint (jet pump end)

Adjustment steps:

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

- Turn the shift cable joint ② in or out until the specified distance ⑥ 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) ⑥.

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



Distance ⑥:
7.0 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:
7 N·m (0.7 kgf·m, 5.2 ft·lb)
LOCTITE 572

Trolling speed check

1. Check:

- Trolling speed
Out of specification → Check the throttle cable, APS, 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 dual analog meter unit or using the YDIS.

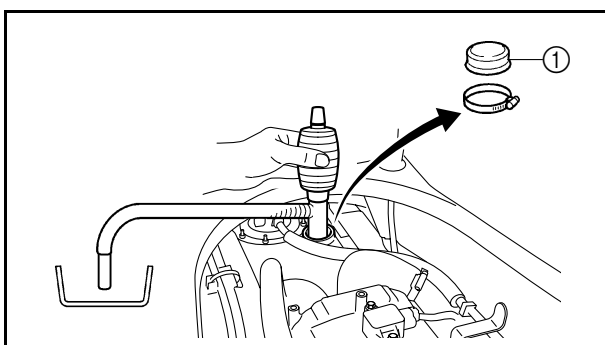
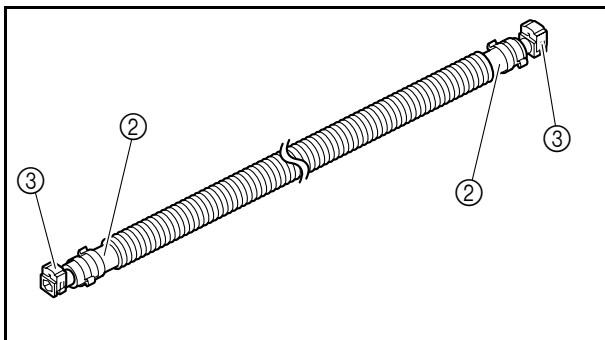
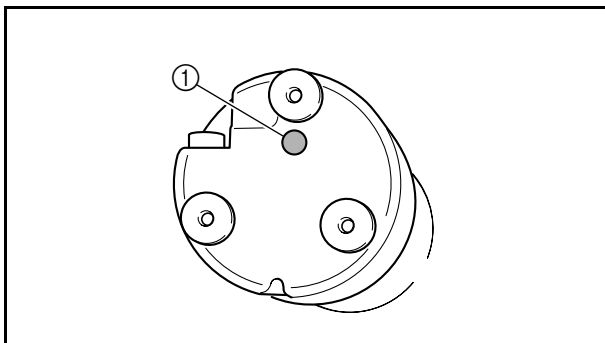


Trolling speed:
1,150–1,350 r/min

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
Cracks/damage → Replace the fuel hose.
- Quick connectors ③
Cracks/damage → Replace the quick connector.
- Fuel filler hose
Cracks/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:

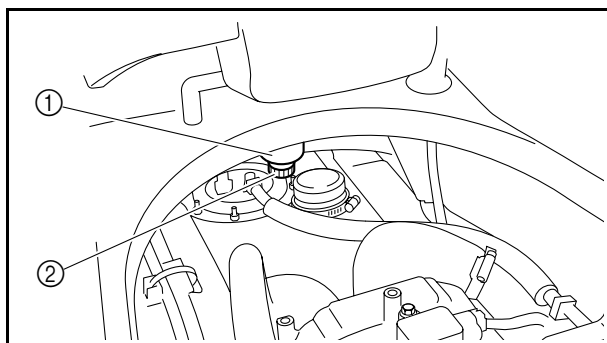
- Fuel tank
Water accumulation → Extract the water and fuel.
Cracks/damage → Replace the fuel tank.

TIP

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.
- O-ring
Crack/damage → Replace the O-ring.

TIP

To drain water from the water separator ①, loosen the drain plug ②.

Power unit

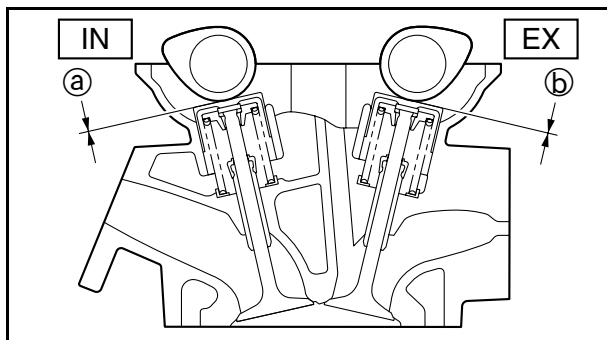
Valve clearance measurement

1. Measure:

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

TIP

Measure the valve clearance when the engine is cold.



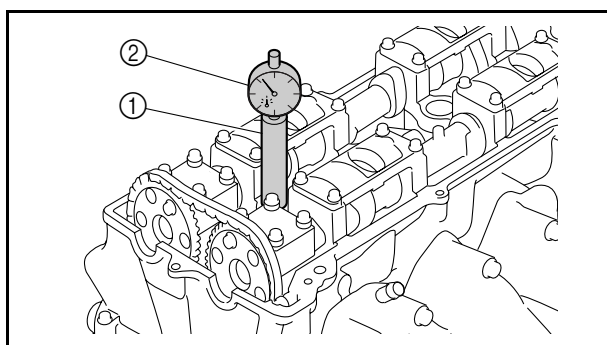
Valve clearance (cold):

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:

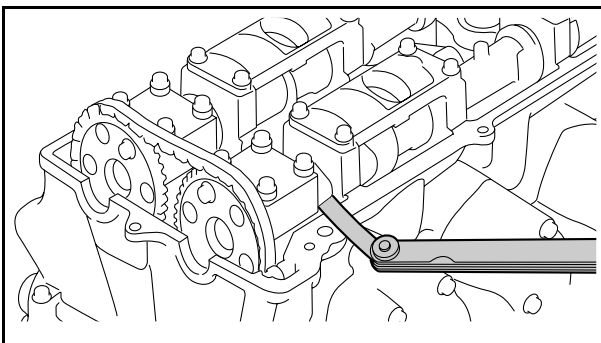
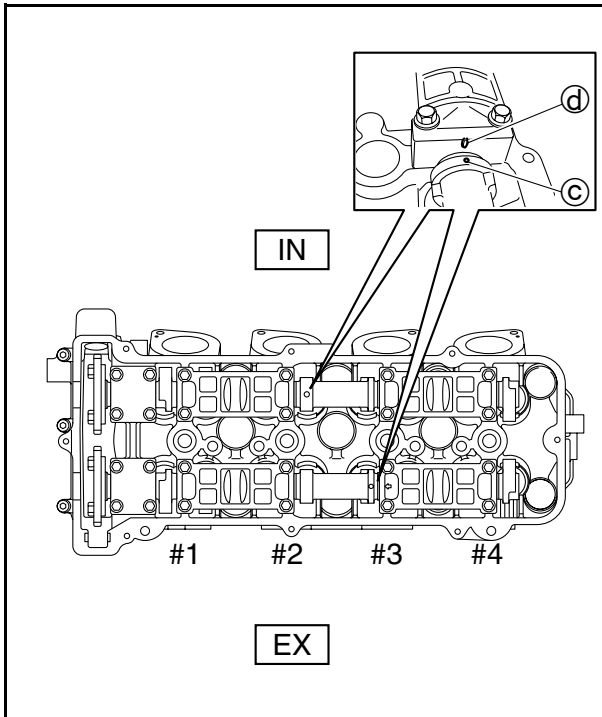
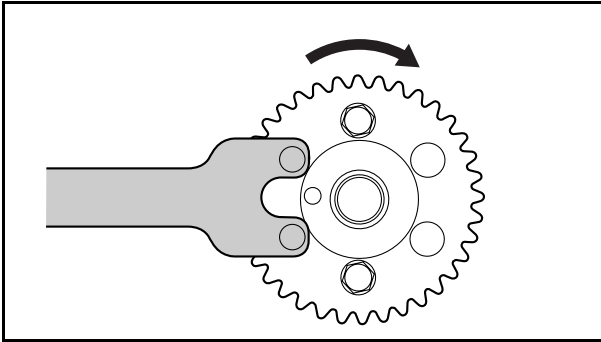
YB-06585

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.

TIP

Check that the punch marks (c) on the camshafts are aligned with the alignment marks (d) on the camshaft caps.



Camshaft wrench:
90890-06724

4. Measure the intake and exhaust valve clearances of the specified cylinders.

	#1	#2	#3	#4
IN	○		○	
EX	○	○		

○ :Specified cylinder

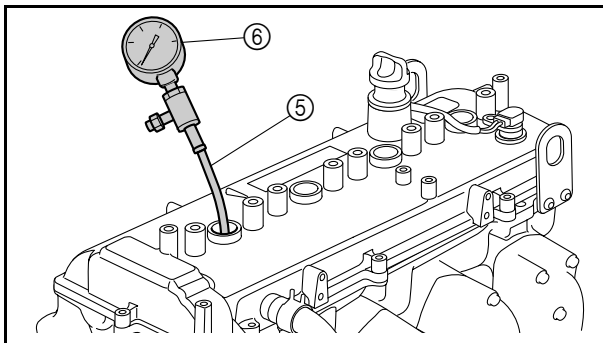
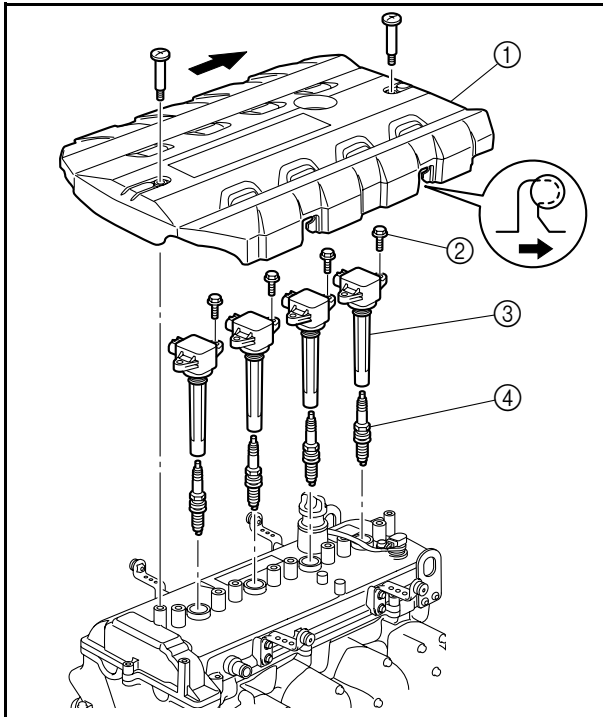
5. Install the dial gauge needle and special service tools ① and ② into spark plug hole #4.

6. Position piston #4 at TDC by turning the exhaust camshaft sprocket 180° clockwise with the special service tool.

7. Measure the intake and exhaust valve clearances of the specified cylinders.

	#1	#2	#3	#4
IN		○		○
EX			○	○

○ :Specified cylinder



Compression pressure measurement

1. Measure:

- Compression pressure

TIP

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



Compression pressure
(reference data):
610 kPa (6.1 kgf/cm², 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).

TIP

- 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.

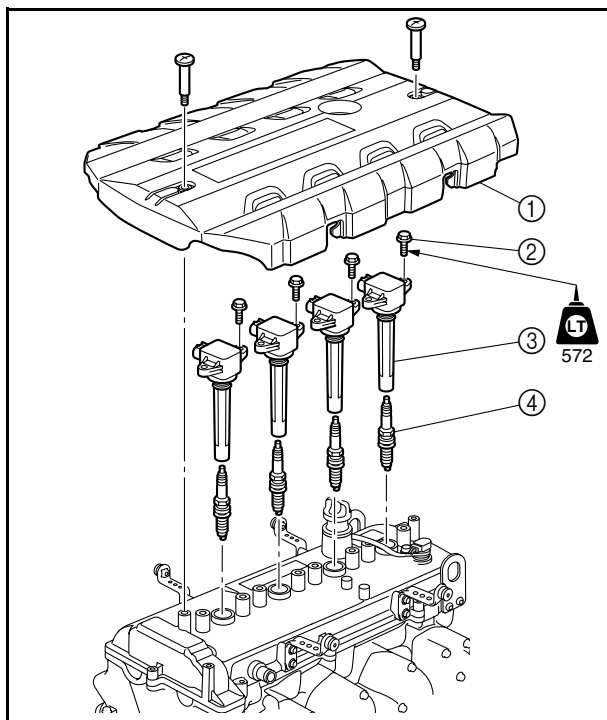
4. Install the special service tools (5) and (6).



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.

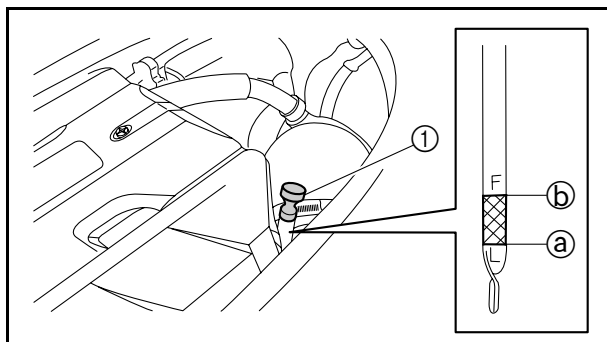
Compression pressure (with engine oil added into the cylinder)	
Reading	Check
Higher than without engine oil	Piston ring, and piston
Same as without engine oil	Valve clearance, valve, valve seat, cylinder head, and cylinder head gasket



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 ① →
Add the engine oil.
Above the maximum level mark ② →
Extract the excess engine oil.



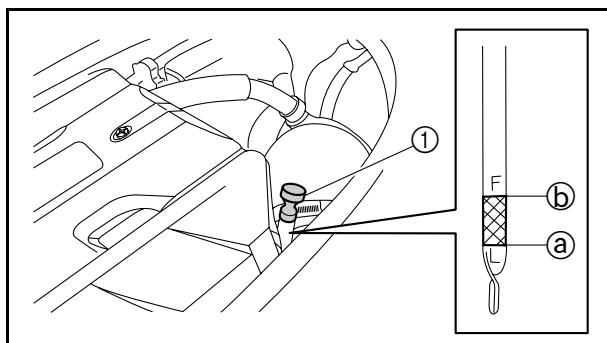
Recommended engine oil:
API: SE, SF, SG, SH, SJ, or SL
SAE: 10W-30, 10W-40, 20W-40, or
20W-50

Checking steps:

NOTICE

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

- Place the watercraft in a precisely level position on land.



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.

NOTICE

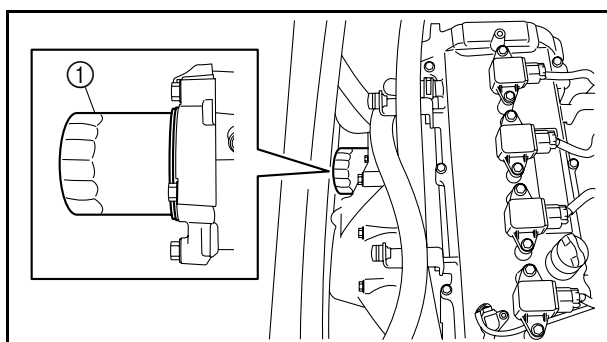
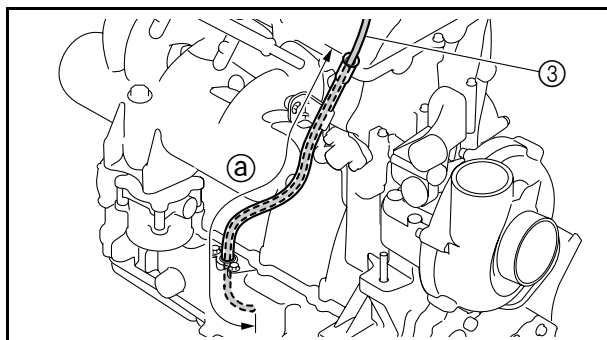
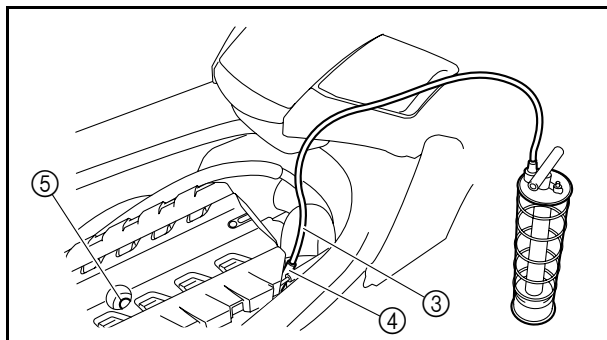
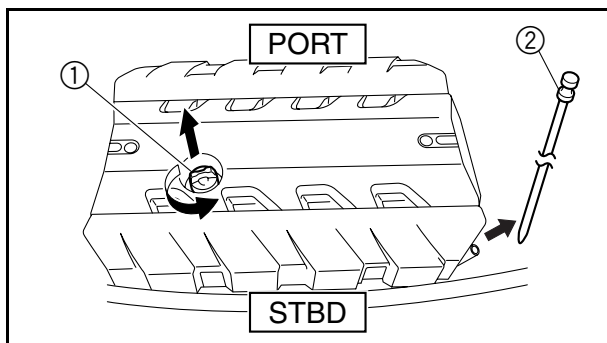
- When starting the engine to check the oil level on land, make sure to connect a garden hose to the watercraft for proper water supply.
- Make sure that debris or water does not enter the oil filler hole.

1. Change:

- Engine oil

Changing steps:

1. Place the watercraft in a precisely level position on land.
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 approximately 650 mm ④ 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 (4.5 US qt, 3.8 Imp.qt)
Without oil filter replacement:
3.0 L (3.2 US qt, 2.6 Imp.qt)
With oil filter replacement:
3.1 L (3.3 US qt, 2.7 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."

TIP

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

Oil filter replacement

1. Replace:

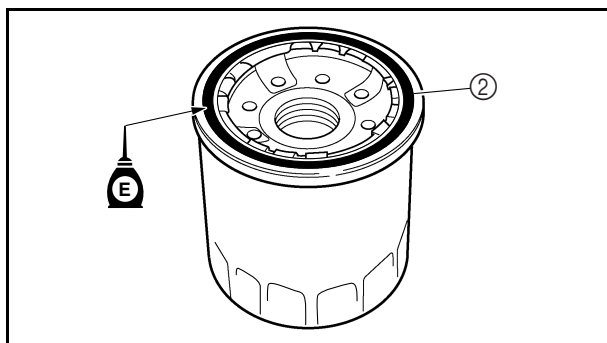
- Oil filter

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.

NOTICE

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.

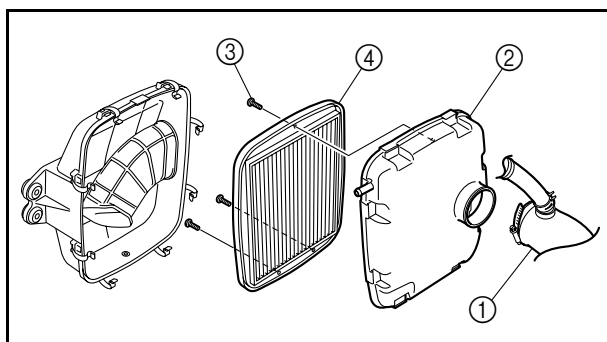
TIP

Make 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:

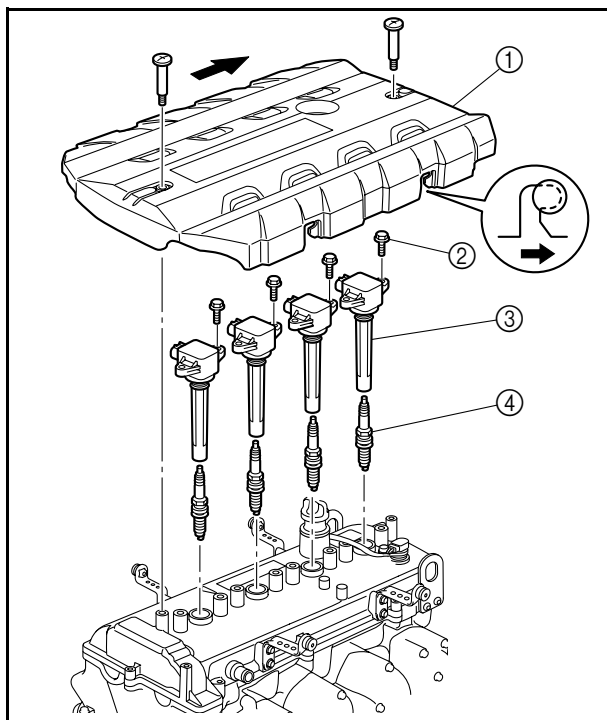
- Air filter element
Damage/dirt → Replace the air filter element.

3. Install:

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

TIP

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



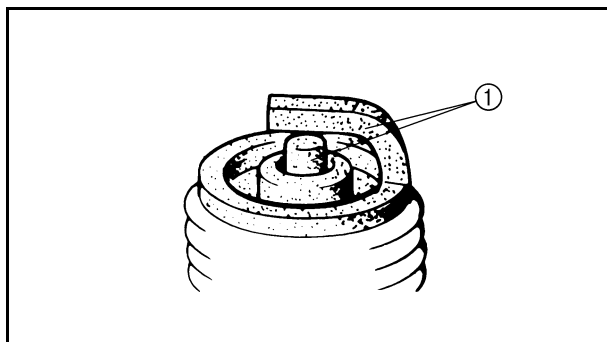
Spark plug check

1. Remove:

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

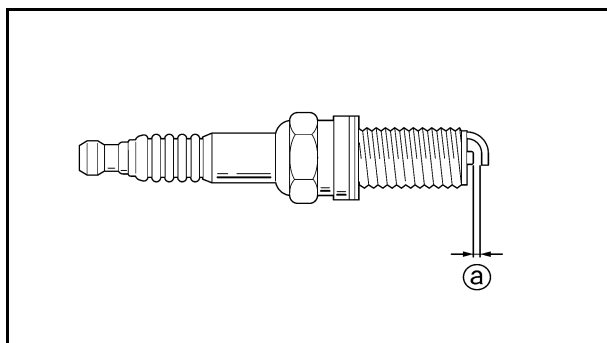
TIP

- 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.

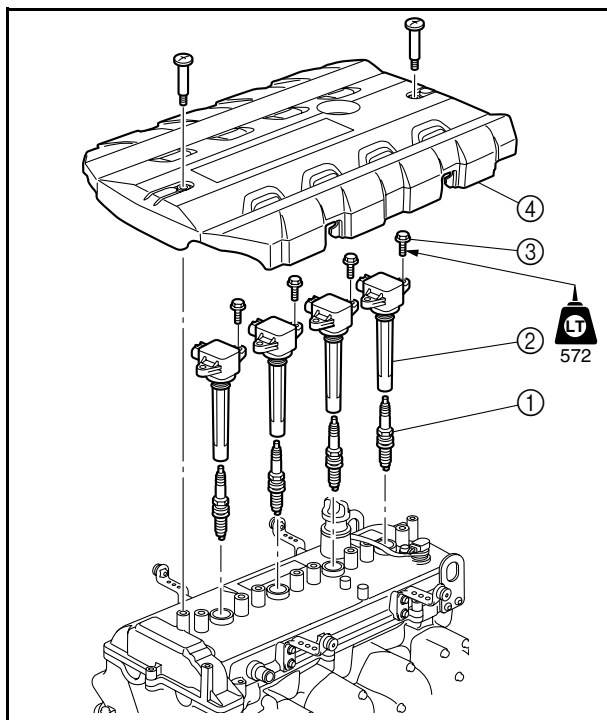


3. Measure:

- 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

TIP

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

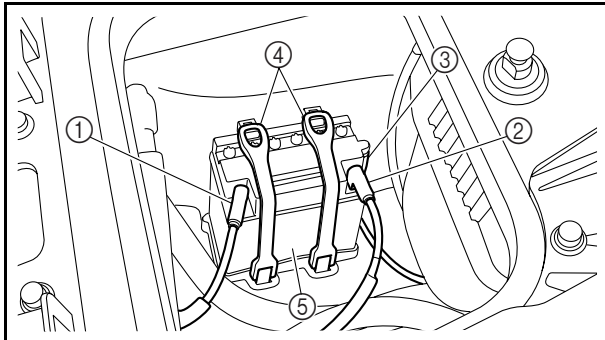
External: Flush with water.

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.

**NOTICE**

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

NOTICE

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

2. Check:

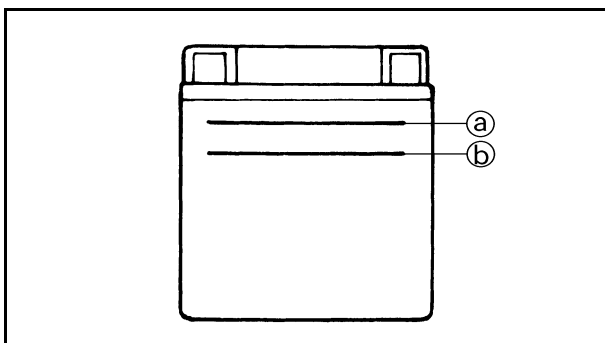
- Electrolyte level
Low → Add distilled water.

Adding steps:

1. Remove each filler cap.
2. Add distilled water.
3. When the electrolyte level reaches the upper level mark ①, 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.

TIP

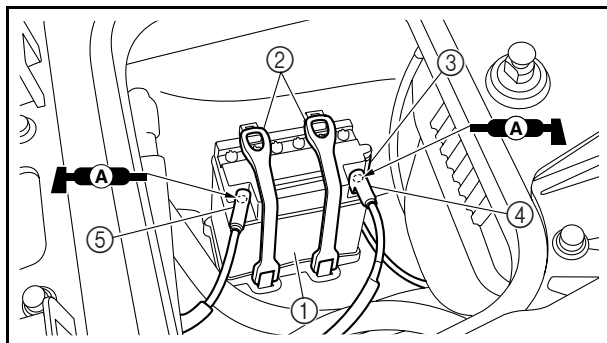
- The electrolyte level should be between the upper ① and lower ② level marks.
- Use only distilled water.

**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

NOTICE

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

TIP

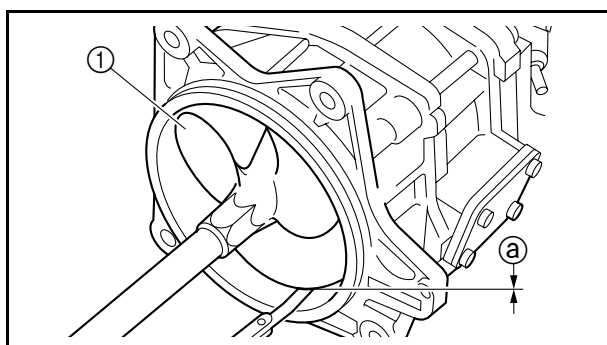
- Make sure that the battery breather hose ③ is properly connected and is not obstructed.
- Apply water resistant grease to the terminals to minimize corrosion.

Jet pump unit

Jet pump unit check

⚠ WARNING

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



1. Check:

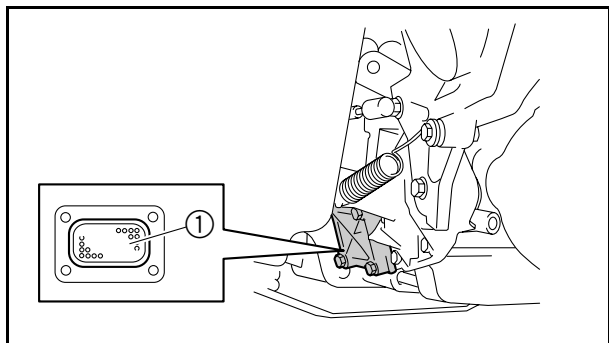
- Impeller ①
- Damage → Replace the impeller.

2. Measure:

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



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



3. Check:

- Water inlet strainer ①
Contaminants → Clean the water inlet strainer.
Cracks/damage → Replace the water inlet strainer.

Bilge strainer

Bilge strainer check

1. Remove:

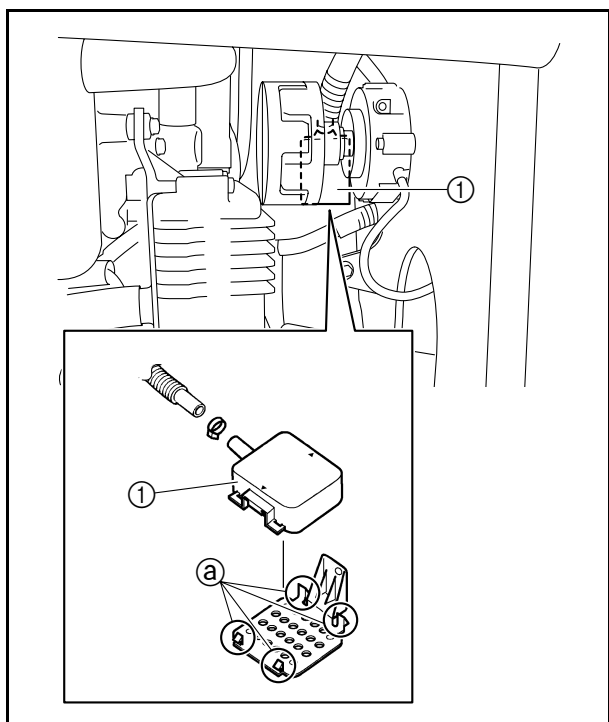
- Deck beam assembly
Refer to “Engine unit removal 1” in Chapter 5.
- Electrical box
- Coupling cover
Refer to “Engine unit removal 3” in Chapter 5.

2. Remove:

- Bilge strainer case ①

TIP

Remove the bilge strainer case ① by pushing the hooks Ⓐ on the bilge strainer inward.

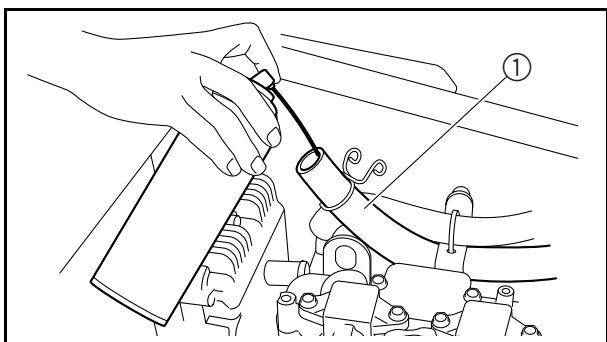
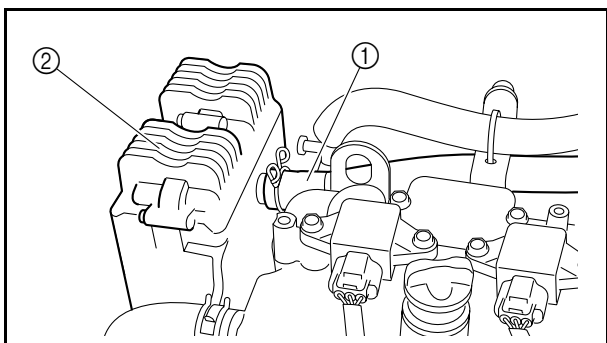
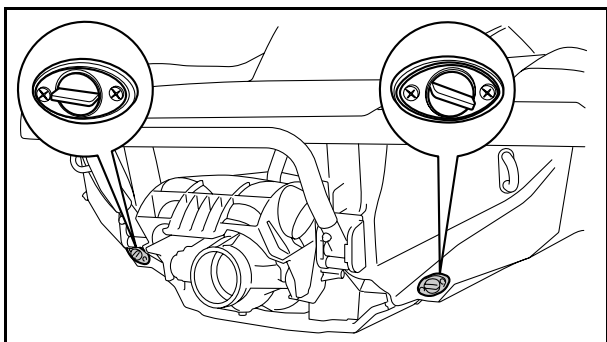
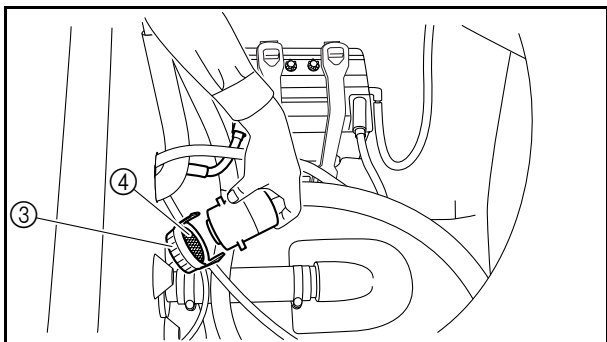
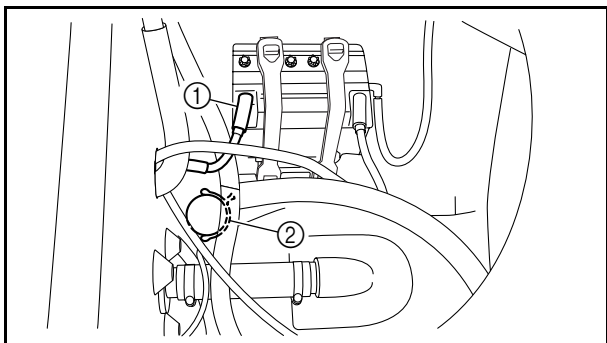


3. Check:

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

4. Install:

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



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

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.

NOTICE

Make 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.

TIP

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

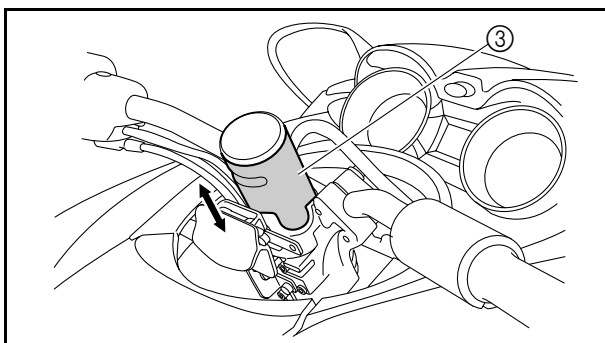
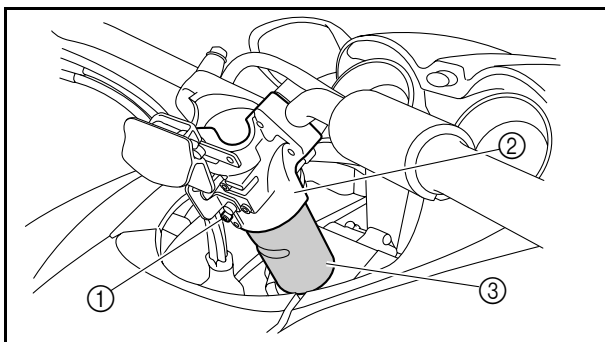
4. Connect the breather hose.
5. Install the engine cover.

Lubrication points**1. Lubricate:**

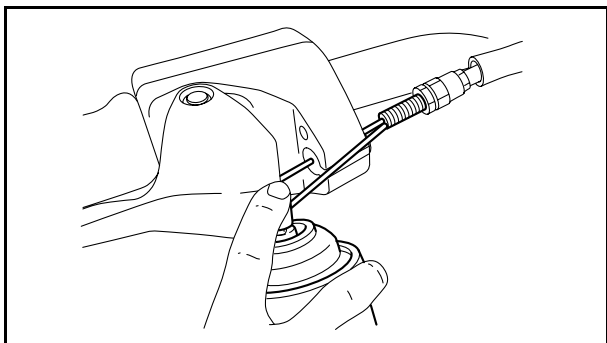
- Steering master assembly



Recommended lubricant:
Yamaha grease A

**Lubricating steps:**

1. Move the handlebar to the highest position.
2. Remove the handlebar covers.
Refer to "Handlebar cover removal" in Chapter 8.
3. Inject the recommended lubricant into the grease nipple ① until it flows from the bottom of the handlebar bracket ②.
4. Apply the recommended lubricant to the sliding surface shown on the steering shaft ③.
5. Move the handlebar bracket ② to the lowest position.
6. Apply the recommended lubricant to the sliding surface shown on the steering shaft ③.
7. Move the handlebar up and down several times to fully lubricate the steering shaft ③.
8. Remove any excess grease.
9. Install the handlebar covers.



2. Lubricate:

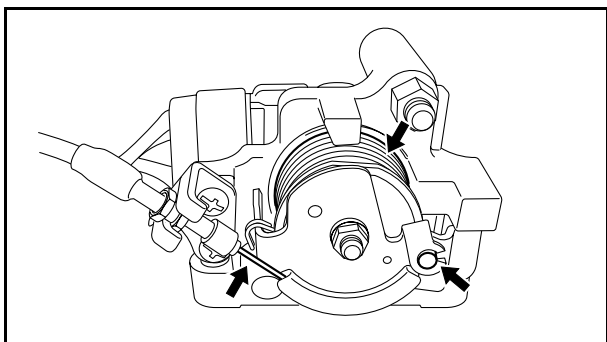
- Throttle cable (handlebar end)

TIP

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



Recommended lubricant:
Rust inhibitor

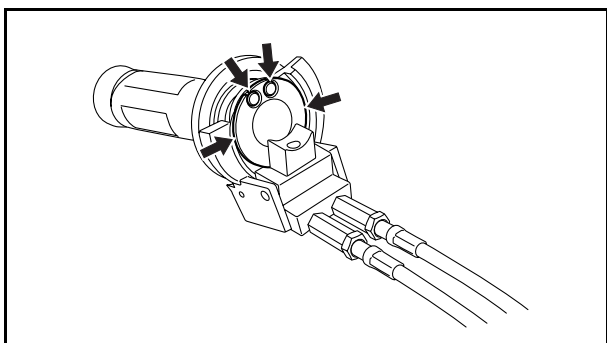


3. Lubricate:

- Throttle cable (APS end)
- Return spring



Recommended lubricant:
Yamaha grease A



4. Lubricate:

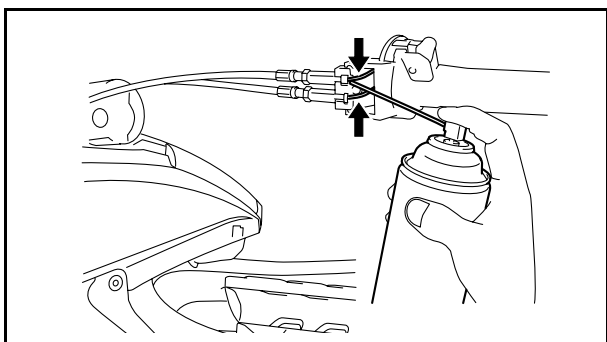
- QSTS cables (handlebar end)

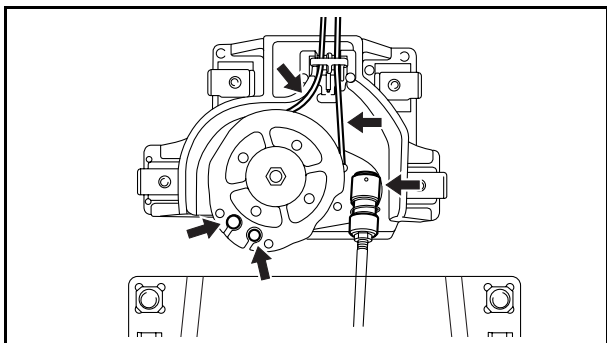
TIP

- 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





5. Lubricate:

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

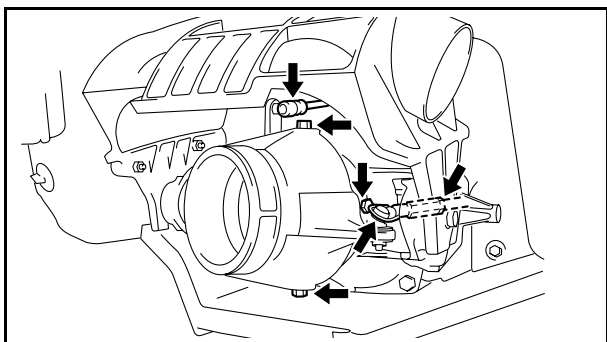
TIP

Before lubricating the QSTS cables, remove the rubber plate.

Refer to “Jet pump unit removal” in Chapter 6.



Recommended lubricant:
Yamaha grease A

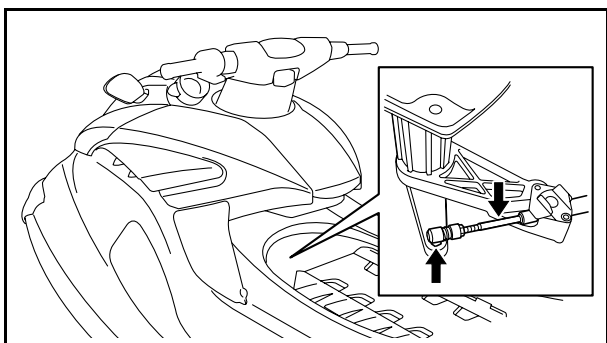


6. Lubricate:

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



Recommended lubricant:
Yamaha grease A



7. Lubricate:

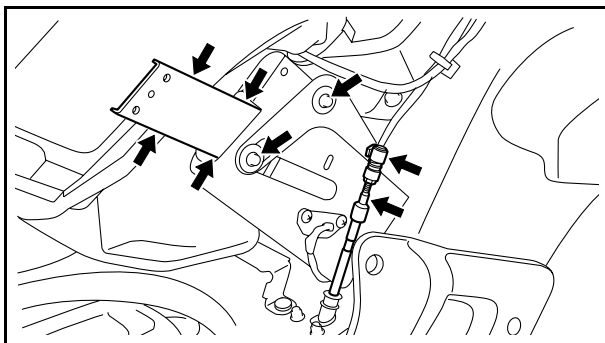
- Steering cable (steering master end)
- Steering cable joint (steering master end)

TIP

Disconnect the joint and apply a small amount of grease.



Recommended lubricant:
Yamaha grease A



8. Lubricate:

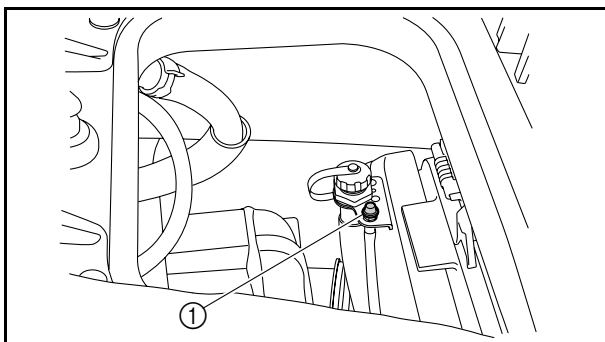
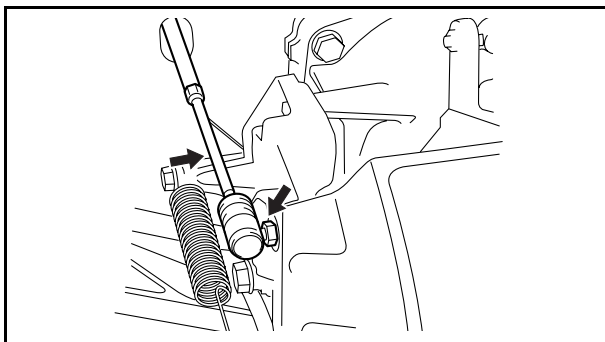
- Shift lever assembly
- Shift cable
- Shift cable joint

TIP

Before lubricating the shift lever assembly, remove the right side cover. Refer to “Side cover removal” in Chapter 8.



Recommended lubricant:
Yamaha grease A



9. Lubricate:

- Intermediate housing
(through the grease nipple ①)



Recommended lubricant:
Yamaha grease A

Grease quantity:

Initial 10 hours:

33.0–35.0 cm³

(1.12–1.18 US oz,

1.16–1.23 Imp.oz)

Every 100 hours or 12 months:

6.0–8.0 cm³

(0.20–0.27 US oz,

0.21–0.28 Imp.oz)



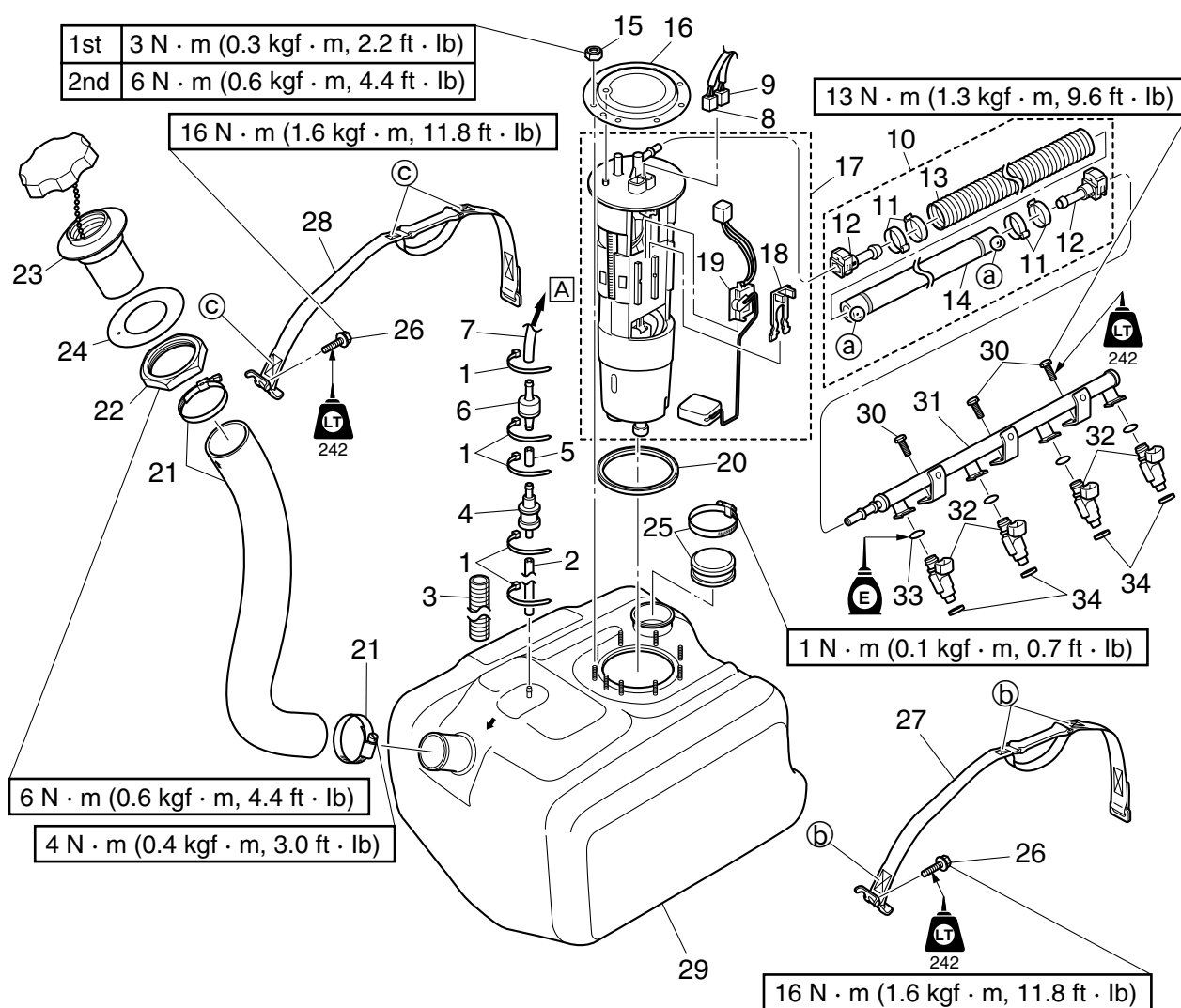
Chapter 4

Fuel system

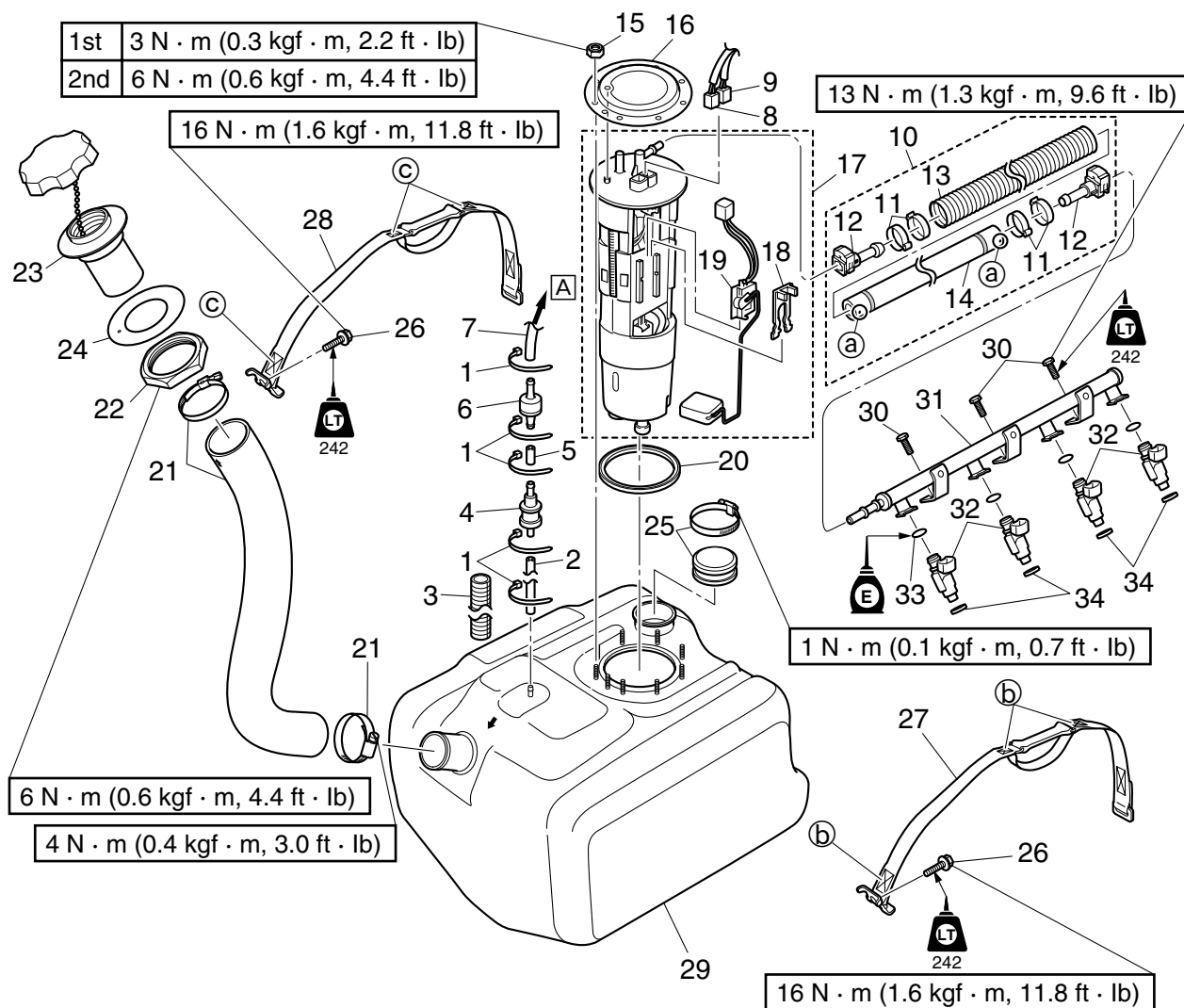
Fuel tank, fuel pump module, and fuel hose	4-1
Fuel tank removal	4-1
Fuel hose disconnection	4-4
Quick connector removal	4-4
Fuel pump module removal	4-5
Fuel sender removal	4-5
Rollover valve check	4-6
Check valve check	4-6
Fuel line check	4-7
Fuel pump module check	4-7
Fuel filler neck and hose check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

Fuel tank, fuel pump module, and fuel hose

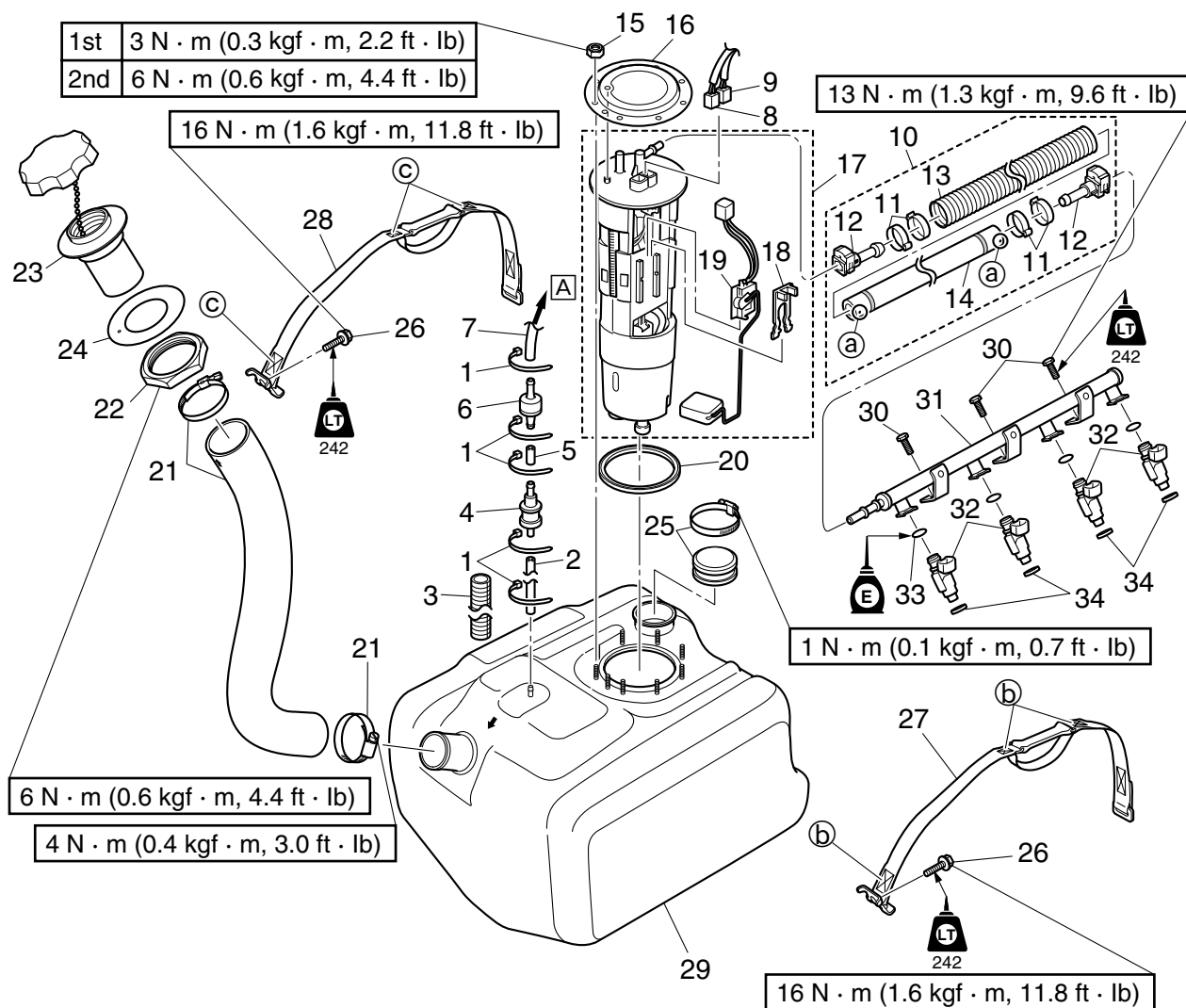
Fuel tank removal



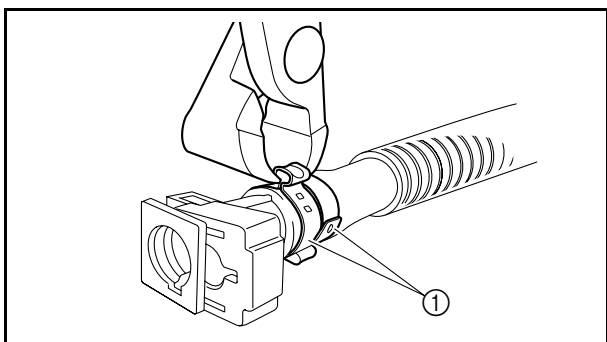
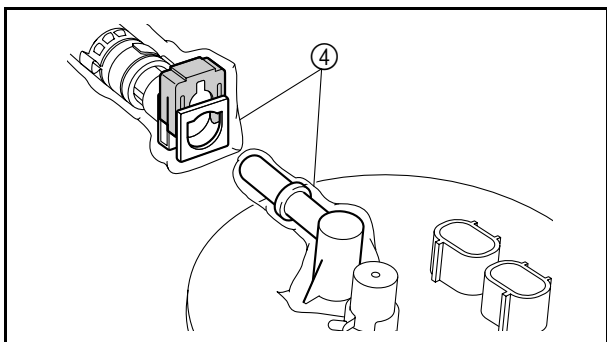
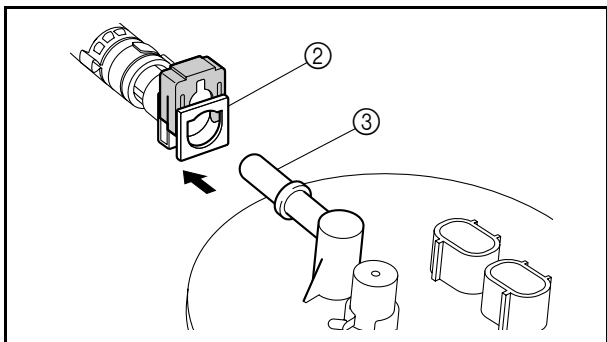
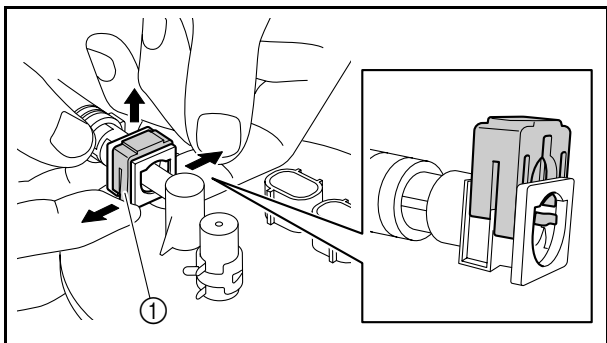
Step	Part name	Q'ty	Remarks
	Ventilation hose		Refer to "Hose removal" in Chapter 8.
1	Band	5	Not reusable
2	Fuel tank breather hose	1	
3	Corrugated tube	1	
4	Rollover valve	1	
5	Fuel tank breather hose	1	
6	Check valve	1	
7	Fuel tank breather hose	1	A To water separator
8	Fuel sender coupler	1	
9	Fuel pump module coupler	1	
10	Fuel hose assembly	1	
11	Clamp	4	Not reusable
12	Quick connector	2	



Step	Part name	Q'ty	Remarks
13	Corrugated tube	1	
14	Fuel hose	1	① Paint mark
15	Nut	9	
16	Retainer	1	
17	Fuel pump module assembly	1	
18	Stopper	1	
19	Fuel sender	1	
20	Packing	1	Not reusable
21	Clamp/fuel filler hose	2/1	
22	Nut	1	
23	Fuel filler neck	1	
24	Packing	1	Not reusable
25	Clamp/cap	1/1	



Step	Part name	Q'ty	Remarks
26	Bolt	2	M8 × 18 mm
27	Strap	1	ⓑ Blue thread
28	Strap	1	ⓒ Black thread
29	Fuel tank	1	
30	Bolt	3	M8 × 17 mm
31	Fuel rail	1	
32	Fuel injector	4	
33	O-ring	4	Not reusable
34	Seal	4	Not reusable



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 ① with your fingers as shown, and then pull up on the slider.

⚠ WARNING

Make sure to disconnect the quick connector slowly, otherwise pressured fuel could spray out.

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.

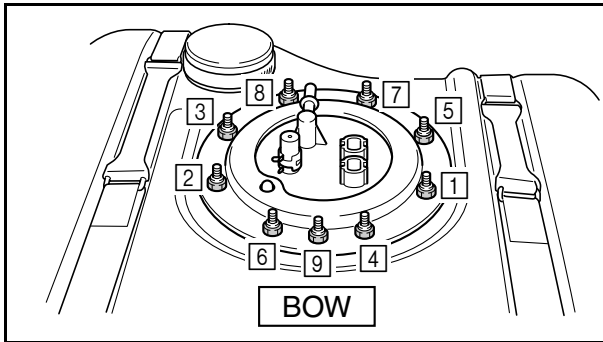
Quick connector removal

1. Remove:

- Clamps ①
- Quick connector

NOTICE

Before removing the quick connector, cut each clamp in the direction shown.



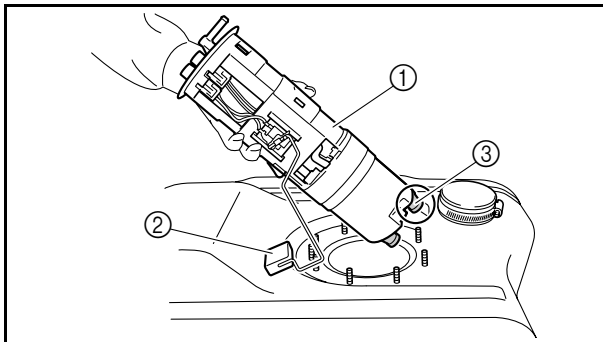
Fuel pump module removal

1. Remove:

- Nuts
- Retainer

TIP

Loosen the nuts in the sequence shown.

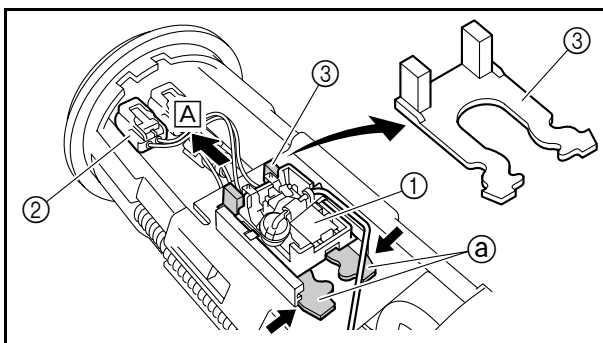


2. Remove:

- Fuel pump module assembly ①

TIP

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



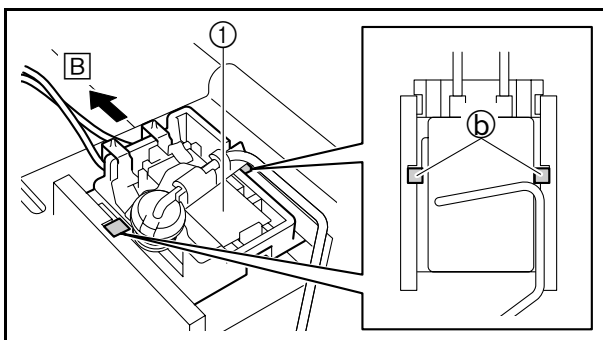
Fuel sender removal

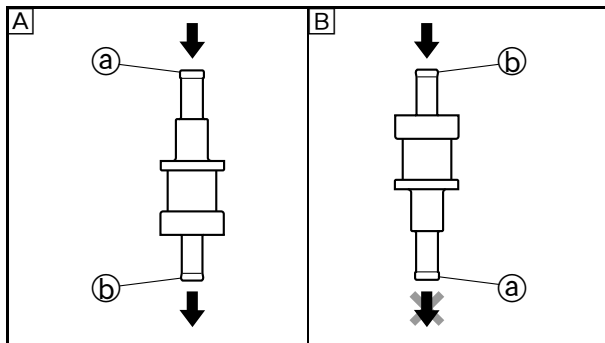
1. Remove:

- Fuel sender ①

Removal steps:

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





Rollover valve check

1. Check:

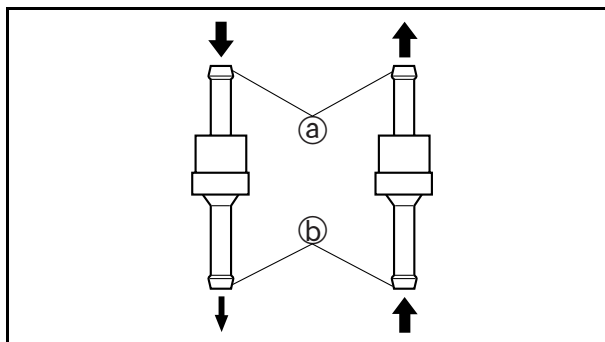
- Rollover valve
Does not function properly → Replace the rollover valve.

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.

Ⓐ Upright

Ⓑ Inverted



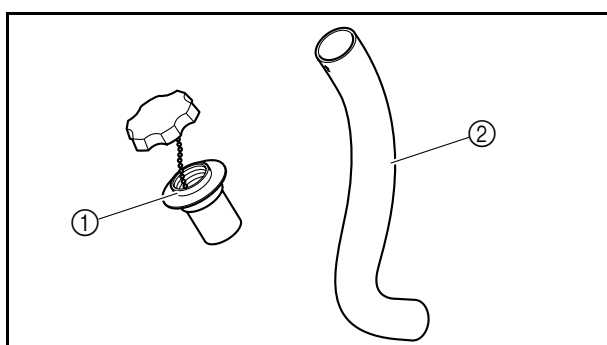
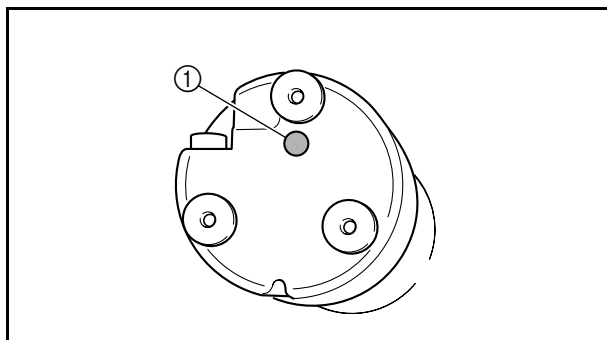
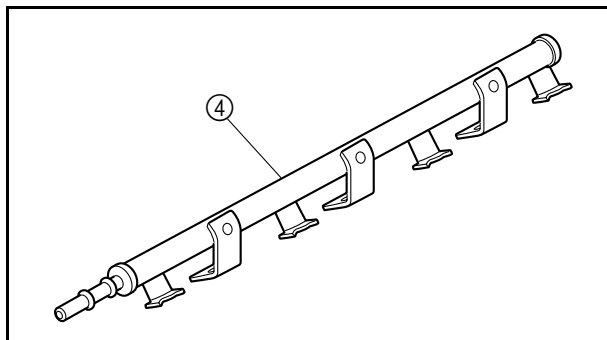
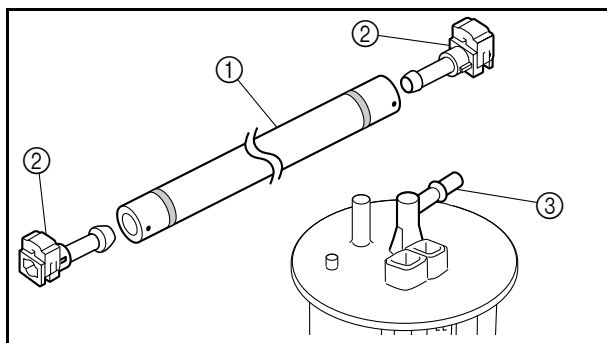
Check valve check

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
Cracks/damage → Replace the fuel hose.
- Quick connectors ②
Cracks/damage → Replace the quick connector.
- 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.

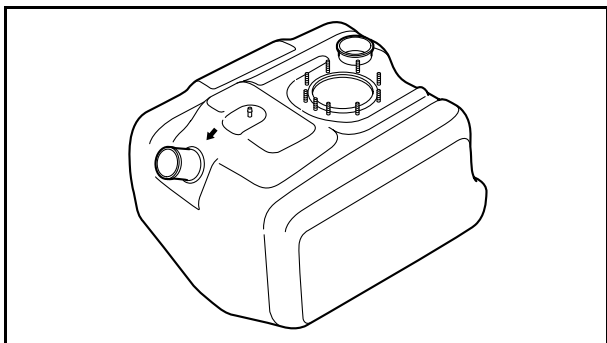
NOTICE

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

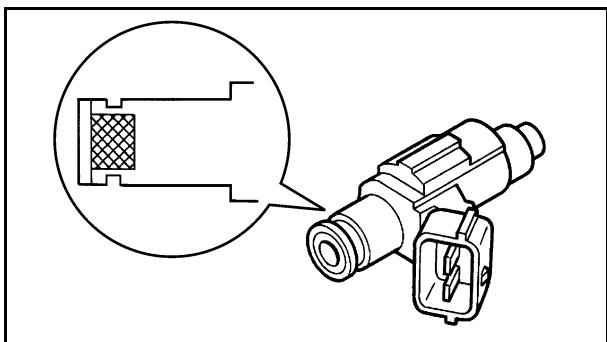
1. Check:

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

TIP

Before removing the fuel tank, it is necessary to remove the engine unit.

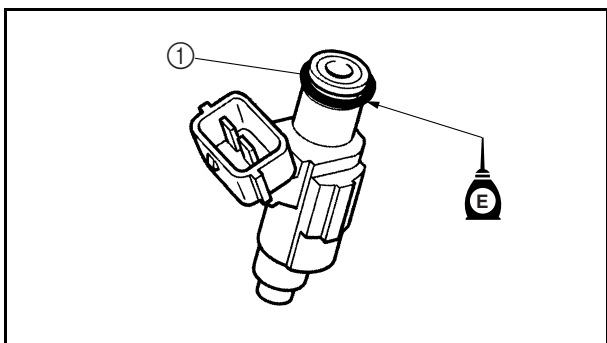
Refer to "Engine unit removal" in Chapter 5.



Fuel injector check

1. Check:

- Fuel injector
Clog/contaminants → Clean the fuel injector.
Damage → Replace the fuel injector.



Fuel injector installation

1. Install:

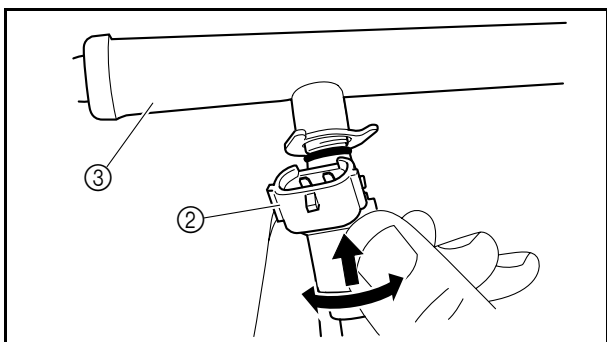
- Fuel injector

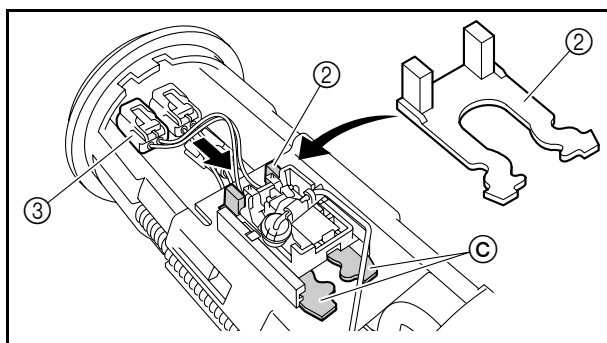
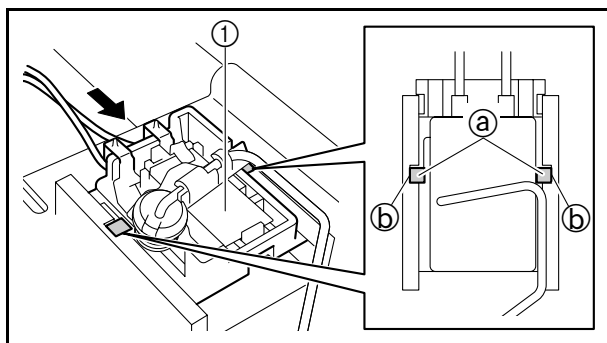
Installation steps:

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

NOTICE

Make 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.

TIP

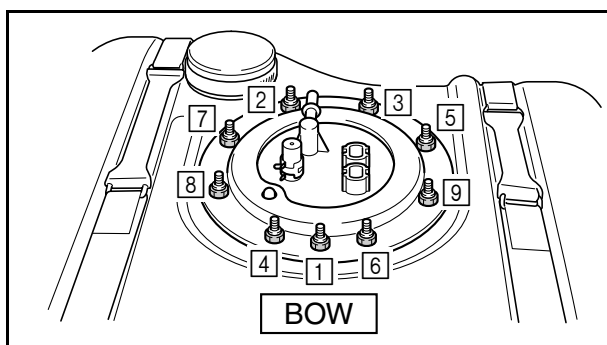
Make sure that the tabs (a) on the fuel sender ① are securely seated into the slots (b) in the fuel pump module.

2. Install the stopper ②.

TIP

Make sure that the hooks (c) on the stopper 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

TIP

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



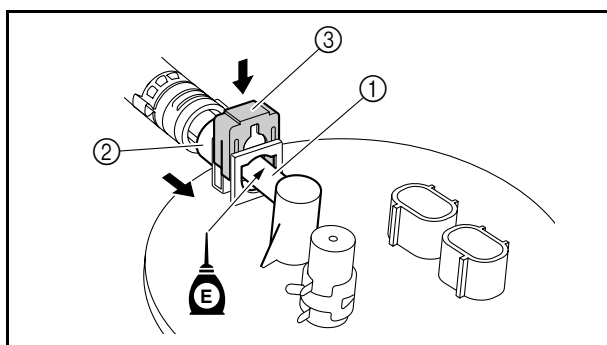
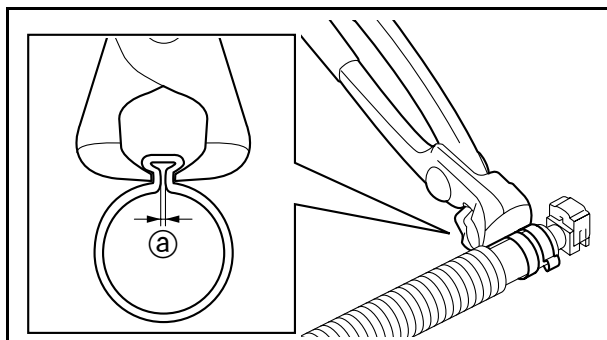
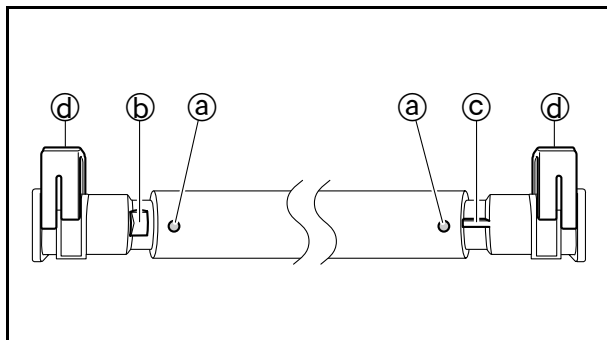
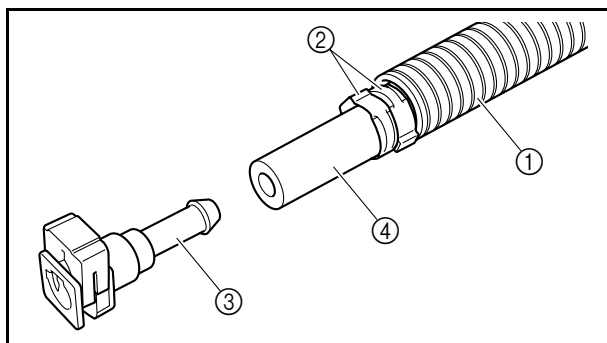
Fuel pump module nut:

1st:

3 N·m (0.3 kgf·m, 2.2 ft·lb)

2nd:

6 N·m (0.6 kgf·m, 4.4 ft·lb)



Quick connector installation

1. Install:

- Quick connectors

Installation steps:

- Install the corrugated tube ①, clamps ②, and quick connectors ③ onto the fuel hose ④.

⚠ WARNING

Do not reuse the clamps, always replace them with new ones, otherwise fuel could leak.

TIP

- Align the paint marks (a) on the fuel hose with the notch (b) and projection (c) on the quick connectors.
- Make sure to face the locking slider (d) on each quick connector in the same direction.

- Crimp the clamps ②.

TIP

- Position the crimped sections of the clamps 180° away from each other.
- Crimp each clamp as shown.
- Crimp each clamp so that the gap (a) is 1 mm (0.04 in) or less.

Fuel hose connection

1. Connect:

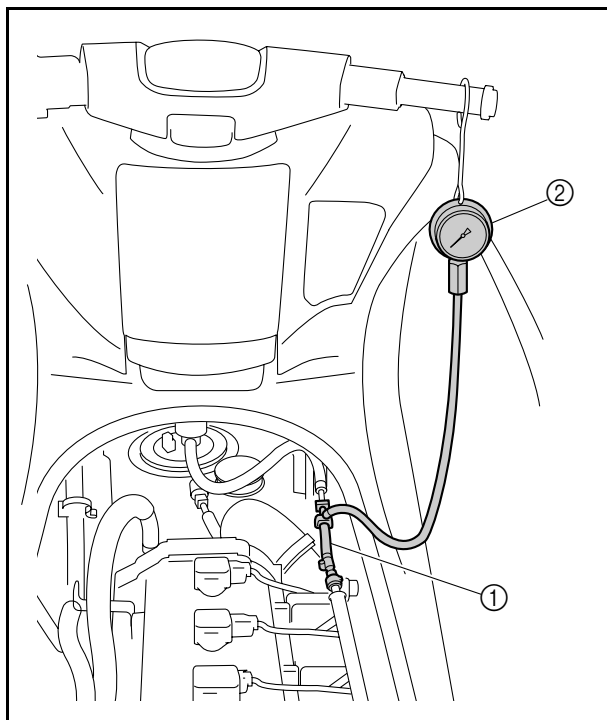
- Quick connector

Connecting steps:

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

**TIP**

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

1. Disconnect the quick connector from the fuel rail.
2. 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

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



Fuel pressure:
345–370 kPa
(3.45–3.70 kgf/cm², 49.1–52.6 psi)



Chapter 5

Power unit

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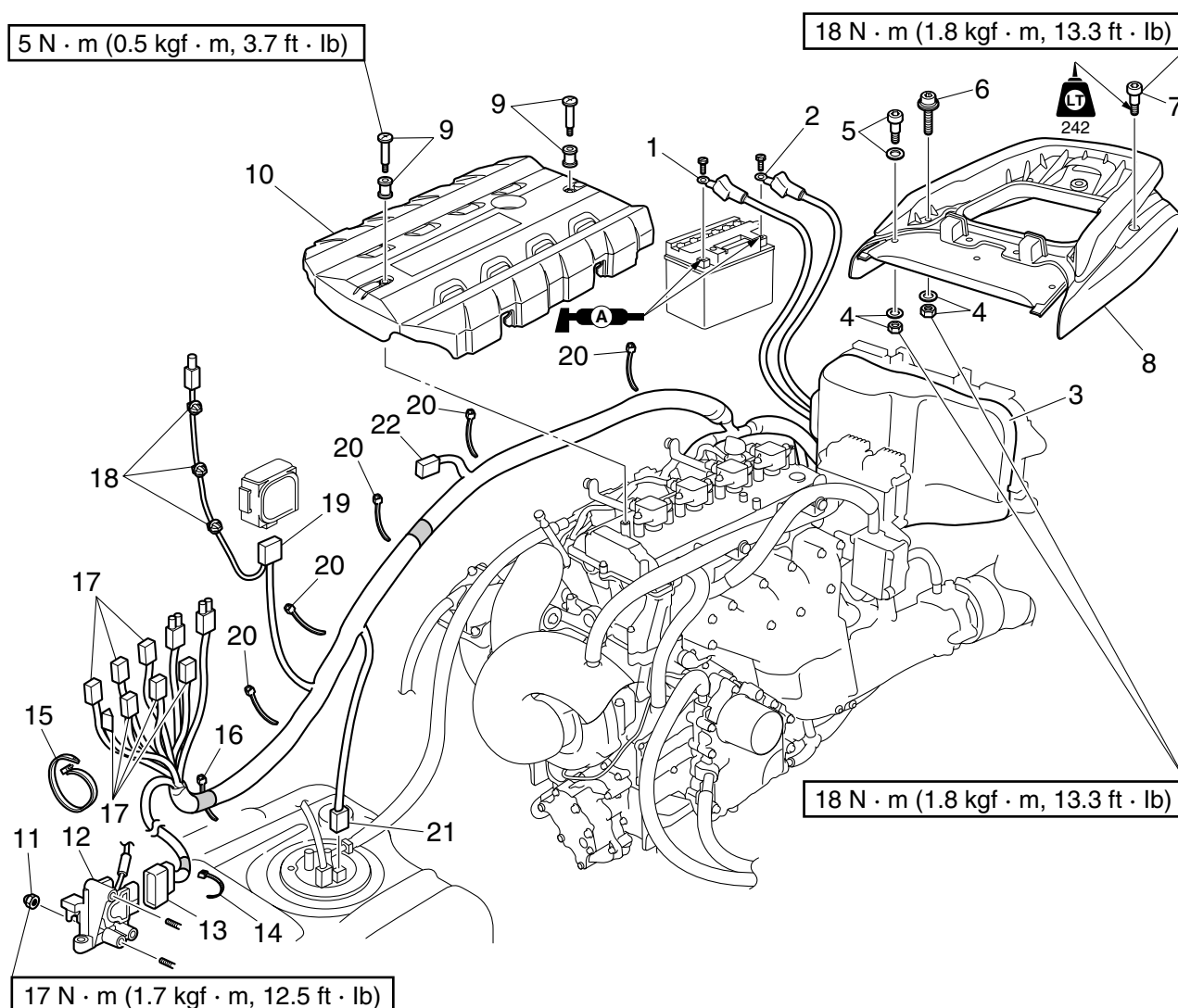
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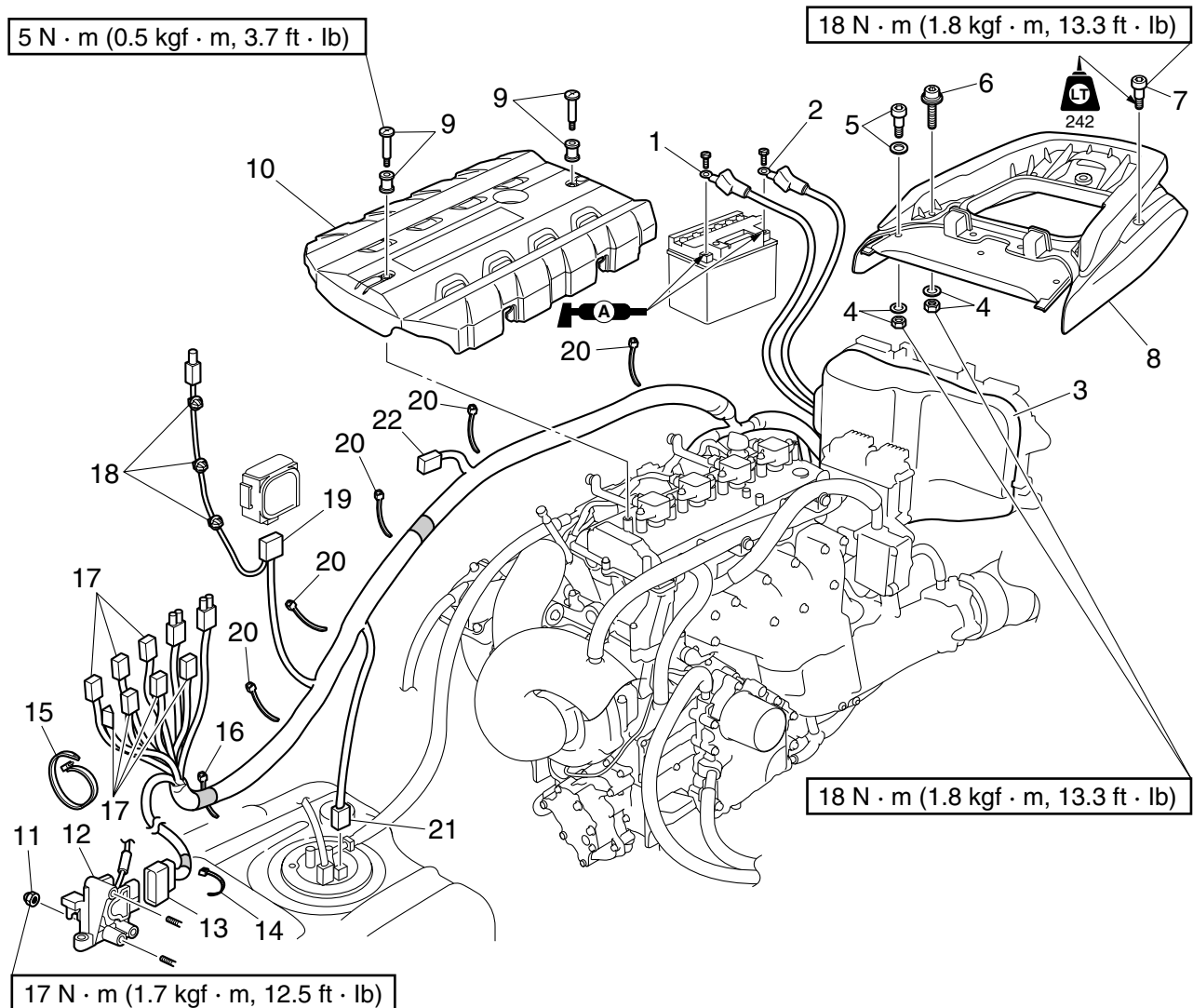
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Engine unit

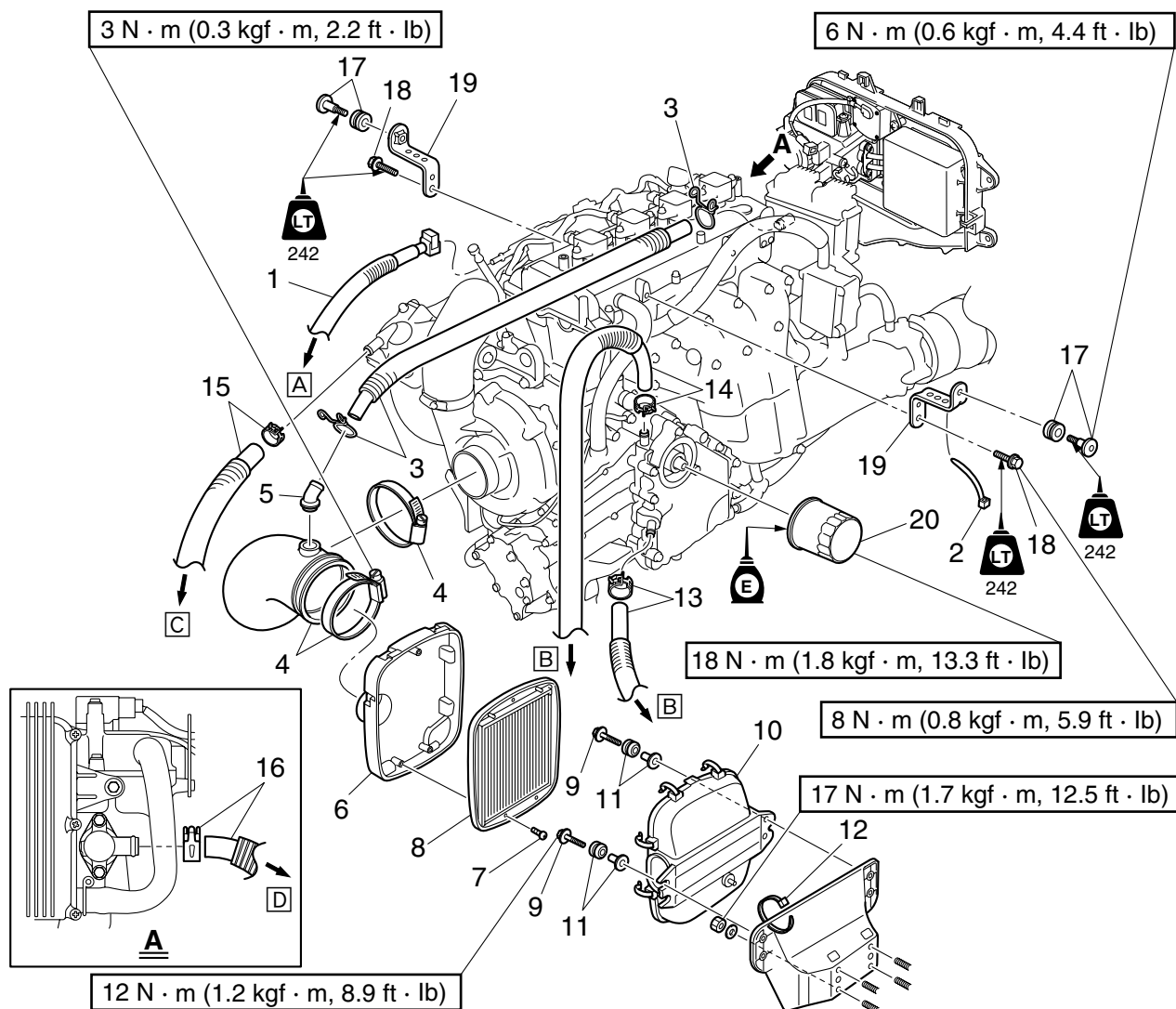
Engine unit removal 1



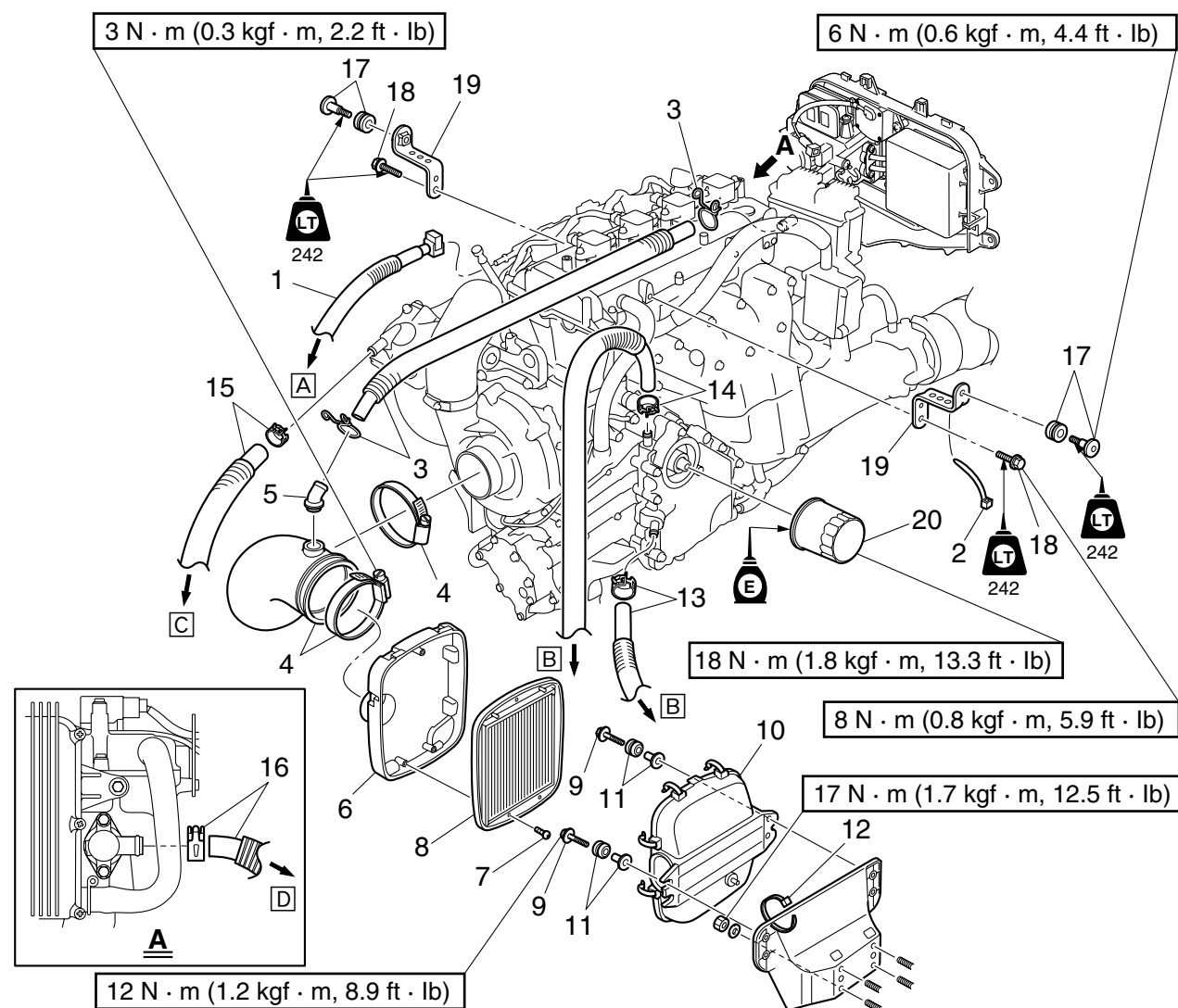
Step	Part name	Q'ty	Remarks
	Engine oil		Refer to "Engine oil change" in Chapter 3.
	Service lid		Refer to "Front hood removal" in Chapter 8.
1	Negative battery cable	1	
2	Positive battery cable	1	
3	Electrical box cover	1	
4	Nut/washer	4/4	
5	Bolt/washer	2/2	
6	Bolt	2	
7	Bolt	3	
8	Deck beam assembly	1	
9	Screw/grommet	2/2	M6 × 12 mm
10	Engine cover	1	



Step	Part name	Q'ty	Remarks
11	Nut	2	
12	APS	1	
13	APS coupler	1	
14	Plastic tie	1	
15	Plastic tie	1	
16	Plastic tie	1	
17	Coupler	7	
18	Antenna holder	3	
19	Remote control receiver coupler	1	
20	Plastic tie	5	
21	Fuel pump module coupler	1	
22	Electric bilge pump coupler	1	

Engine unit removal 2


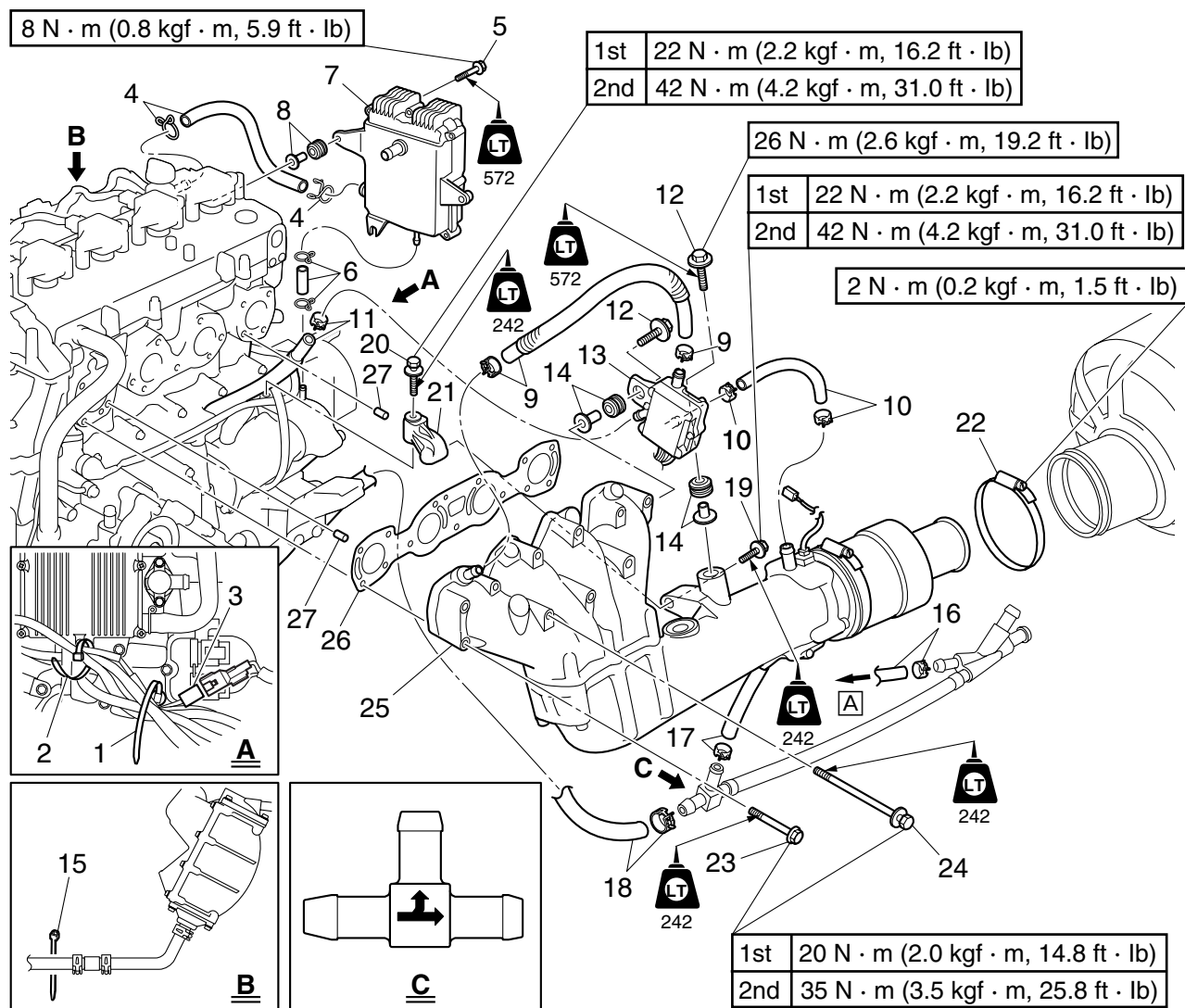
Step	Part name	Q'ty	Remarks
1	Fuel hose assembly	1	A To fuel pump module
2	Plastic tie	2	
3	Clamp/breather hose	2/1	
4	Clamp/intake pipe	2/1	
5	Connection	1	
6	Air filter case cover	1	
7	Screw	3	ø6 × 15 mm
8	Air filter element	1	
9	Bolt	4	M8 × 35 mm
10	Air filter case	1	
11	Collar/grommet	4/4	
12	Plastic tie	1	



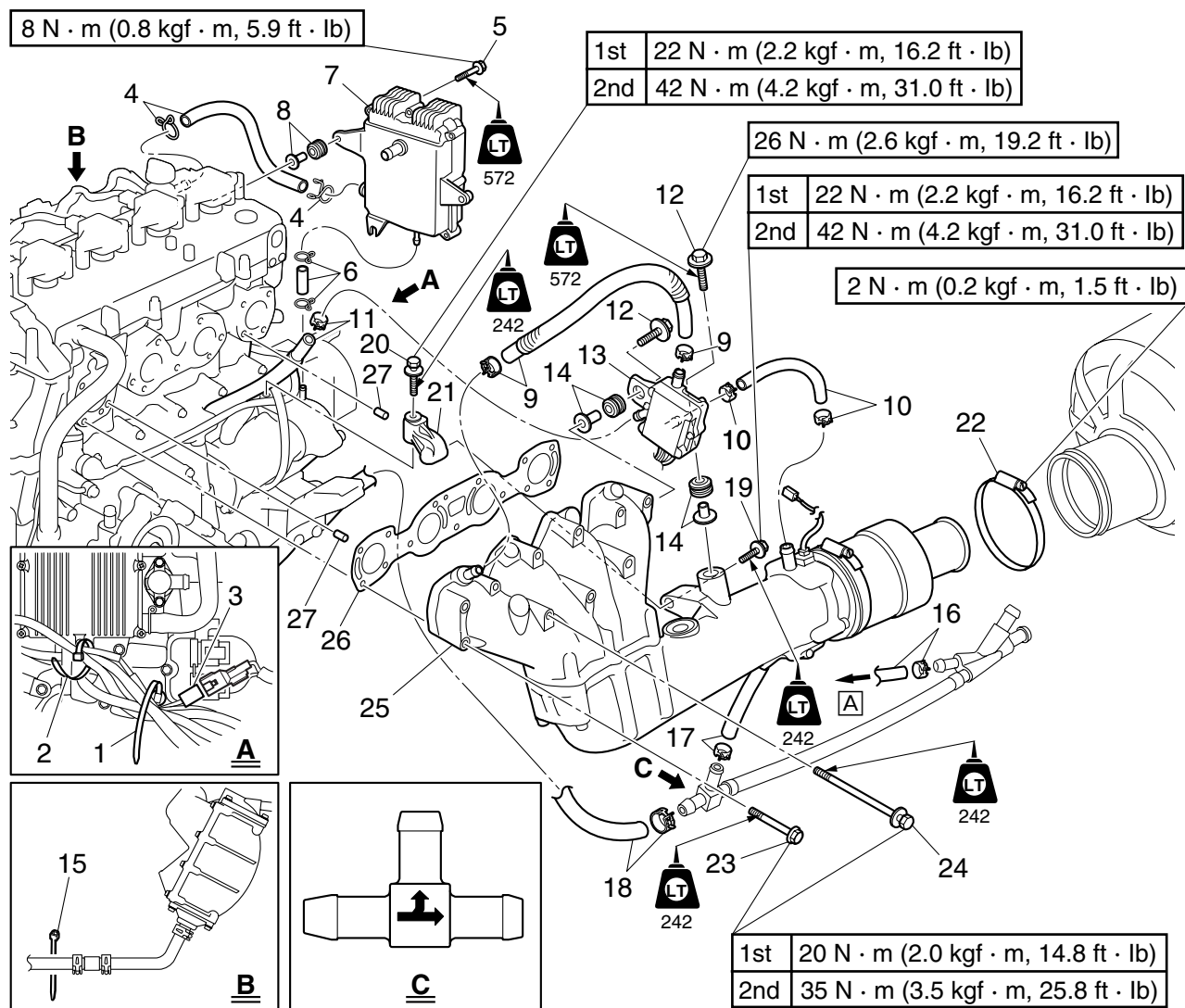
Step	Part name	Q'ty	Remarks
13	Clamp/cooling water hose	1/1	[B] To cooling water pilot outlet on port side
14	Clamp/cooling water hose	1/1	[B] To cooling water pilot outlet on port side
15	Clamp/cooling water hose	1/1	[C] To cooling water pilot outlet on starboard side
16	Clamp/cooling water hose	1/1	[D] To cooling water outlet at stern
17	Bolt/grommet	4/4	M6 × 10 mm
18	Bolt	4	M6 × 12 mm
19	Stay	4	
20	Oil filter	1	



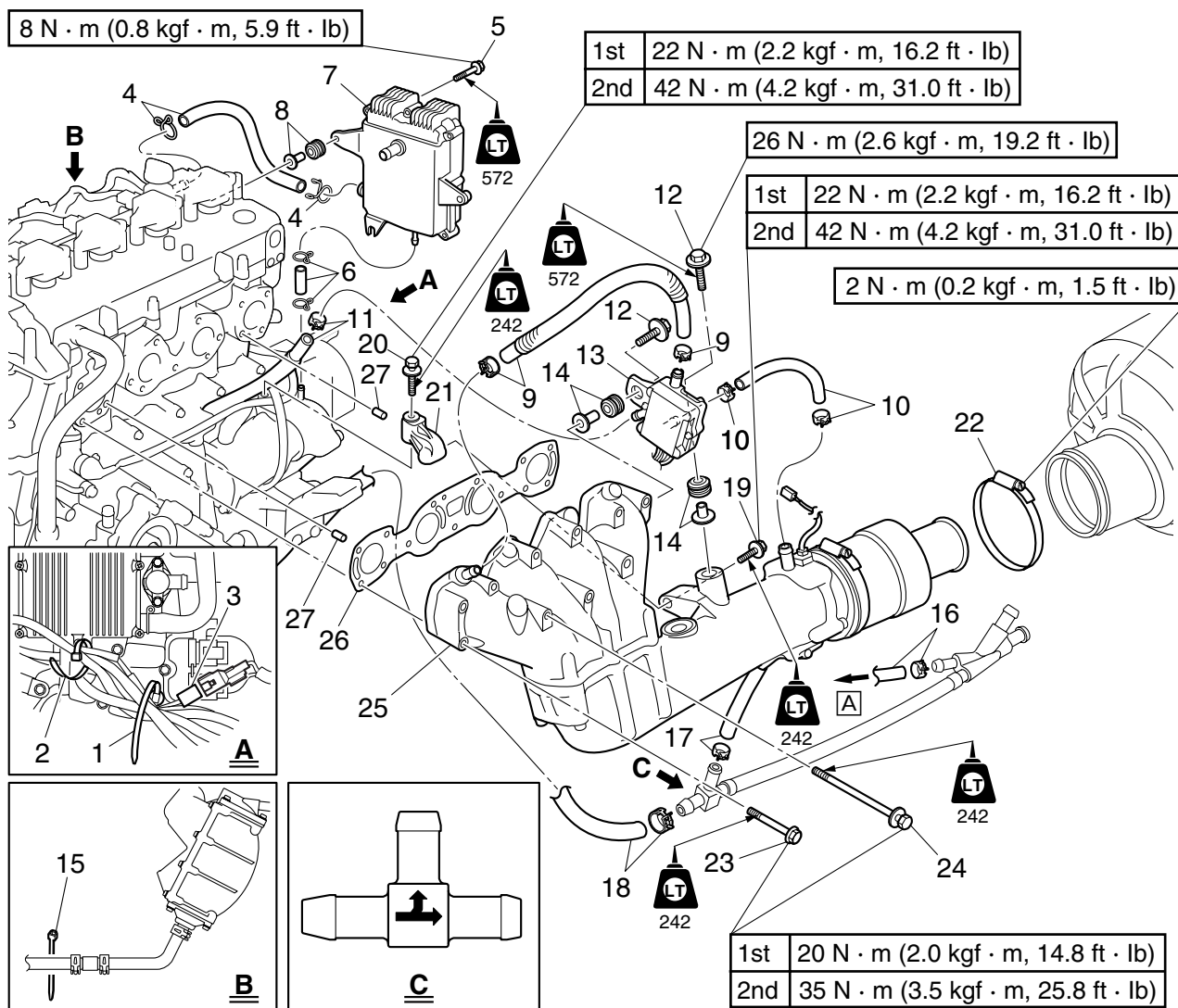
Engine unit removal 3



Step	Part name	Q'ty	Remarks
1	Plastic tie	1	M6 × 30 mm
2	Plastic tie	1	
3	Thermo sensor coupler	1	
4	Clamp/breather hose	2/1	
5	Bolt	3	
6	Clamp/breather hose	2/1	
7	Breather assembly	1	
8	Collar/grommet	3/3	
9	Clamp/cooling water hose	2/1	

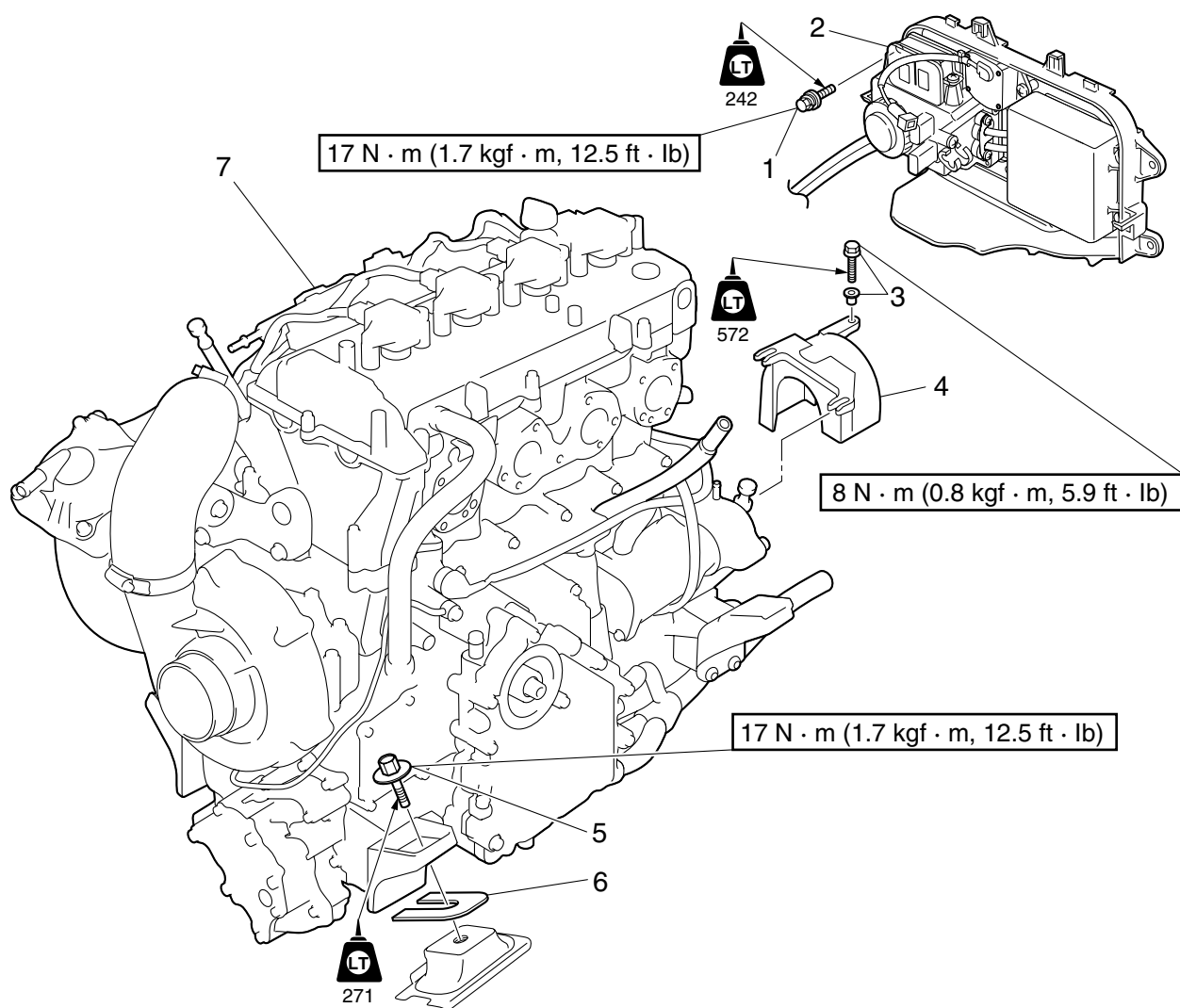


Step	Part name	Q'ty	Remarks
10	Clamp/cooling water hose	2/1	M8 × 35 mm
11	Clamp/cooling water hose	1/1	
12	Bolt	2	
13	Rectifier regulator	1	
14	Collar/grommet	2/2	
15	Plastic tie	1	
16	Clamp/cooling water hose	1/1	
17	Clamp/cooling water hose	1/1	Cooling water inlet
18	Clamp/cooling water hose	1/1	



Step	Part name	Q'ty	Remarks
19	Bolt	1	M10 × 50 mm
20	Bolt	1	M8 × 47 mm
21	Stay	1	
22	Clamp	1	
23	Bolt	8	M8 × 70 mm
24	Bolt	3	M8 × 120 mm
25	Muffler assembly	1	
26	Gasket	1	Not reusable
27	Dowel pin	2	

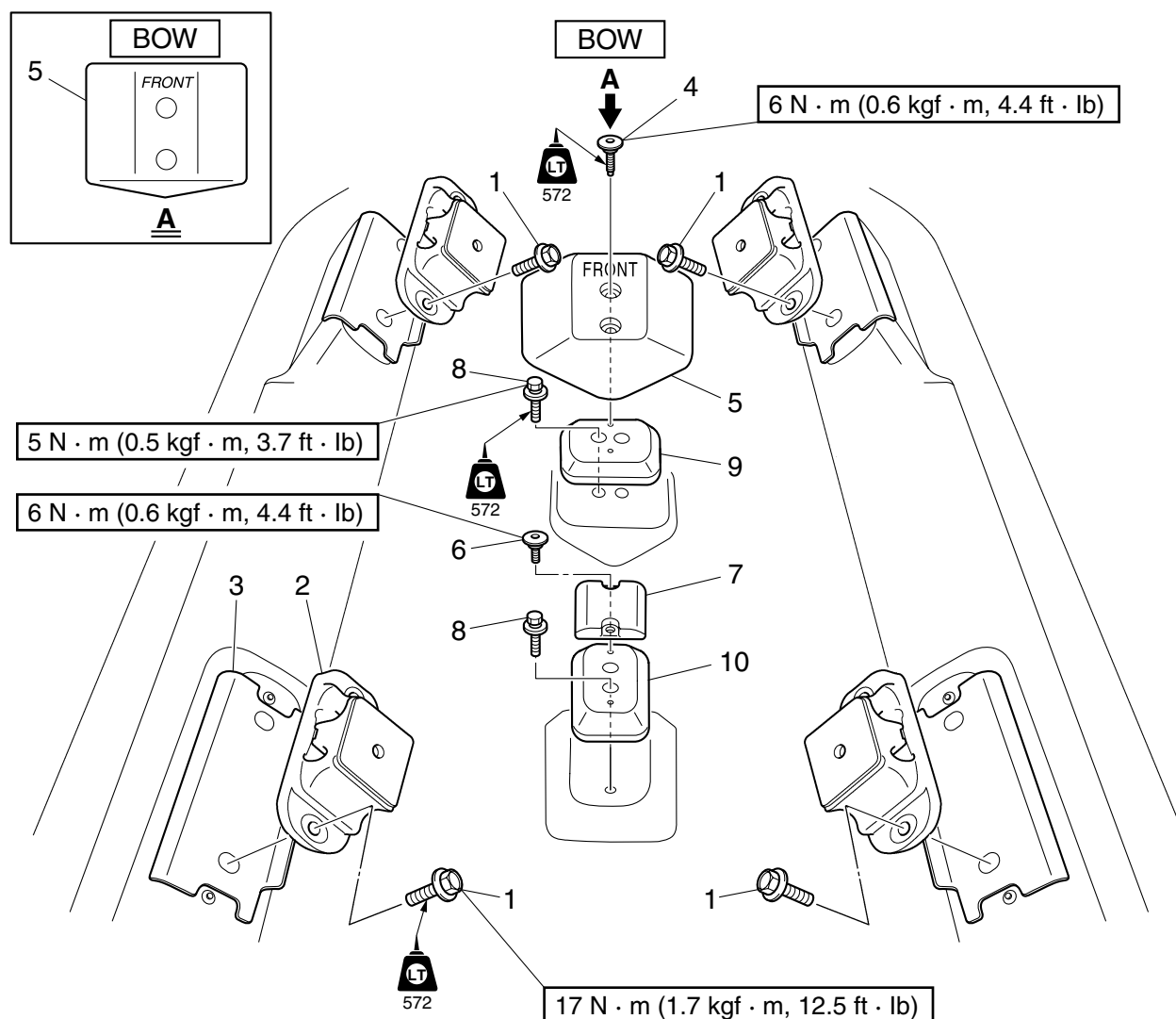
Engine unit removal 4



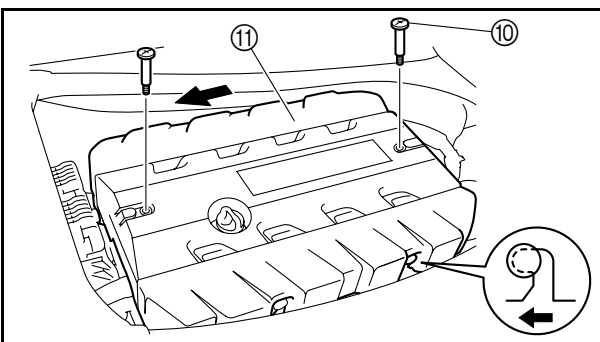
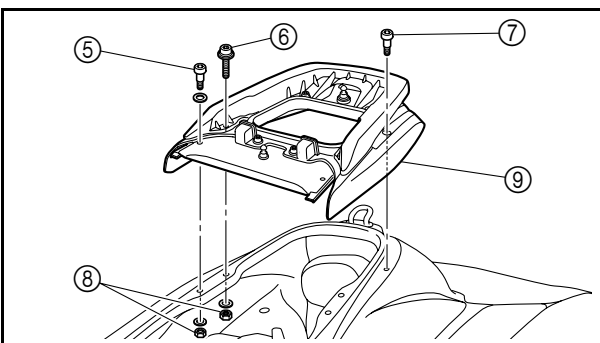
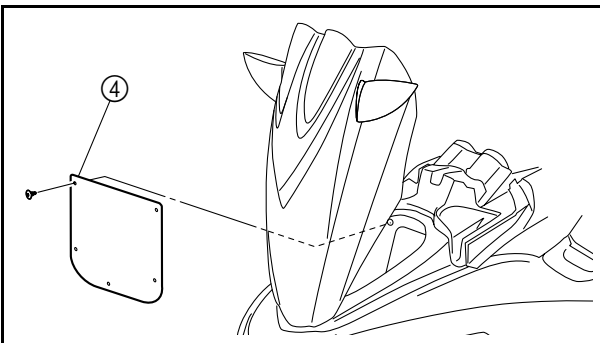
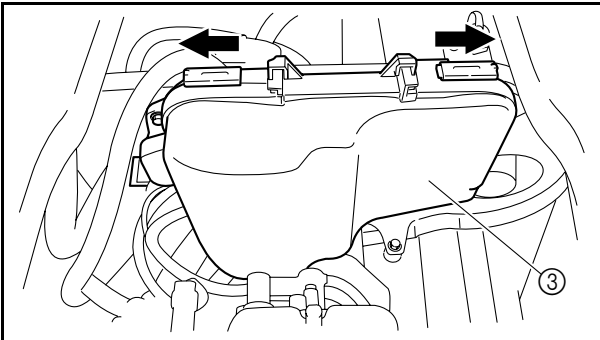
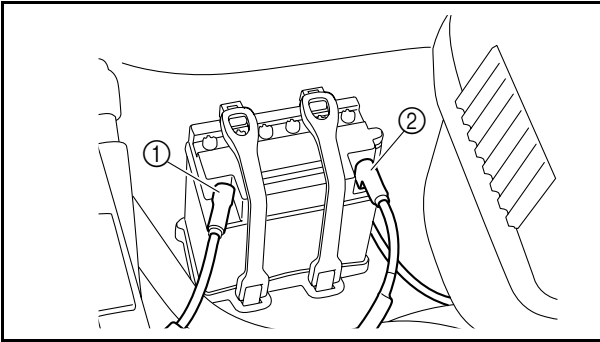
Step	Part name	Q'ty	Remarks
1	Bolt	4	M8 × 28 mm
2	Electrical box	1	
3	Bolt/collar	1/1	M6 × 25 mm
4	Coupling cover	1	
5	Engine mounting bolt	4	M8 × 37 mm
6	Shim	*	
7	Engine unit	1	

*: As required.

Engine mount removal



Step	Part name	Q'ty	Remarks
1	Bolt	8	M8 × 35 mm
2	Engine mount	4	
3	Liner	4	
4	Bolt	2	M6 × 19 mm
5	Damper 1	1	
6	Bolt	2	M6 × 12 mm
7	Damper 2	1	
8	Bolt	4	M6 × 25 mm
9	Spacer 1	1	
10	Spacer 2	1	



Engine unit removal

1. Remove:

- Engine unit

NOTICE

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

Removal steps:

1. Disconnect the negative battery cable (1) and positive battery cable (2) from the battery.

2. Remove the electrical box cover (3).

3. Extract the engine oil.

Refer to "Engine oil change" in Chapter 3.

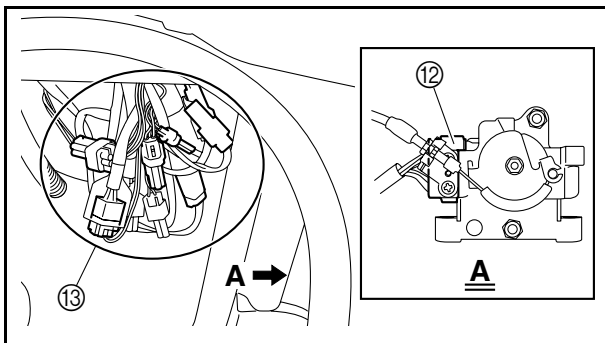
4. Remove the service lid (4).

5. Remove the deck beam bolts (5), (6), and (7) and nuts (8), and then remove the deck beam assembly (9).

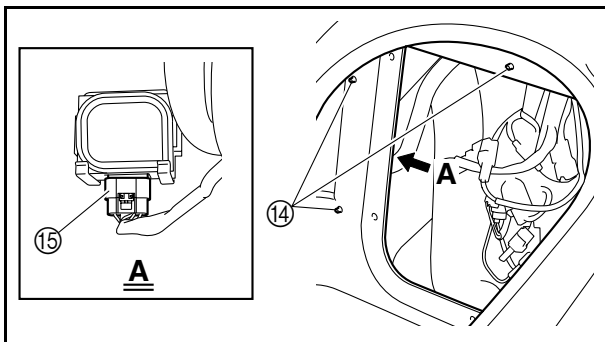
6. Remove the engine cover screws (10), and then remove the engine cover (11).

TIP

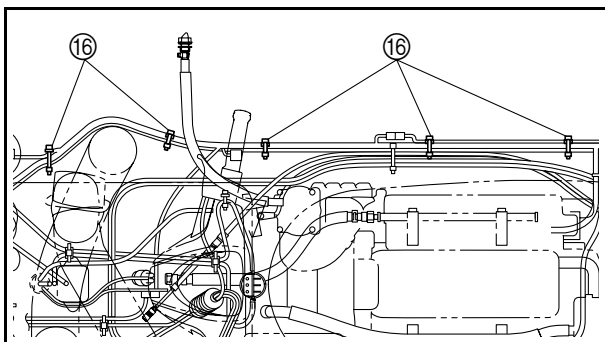
Slide the engine cover rearward, and then lift the cover to remove it.



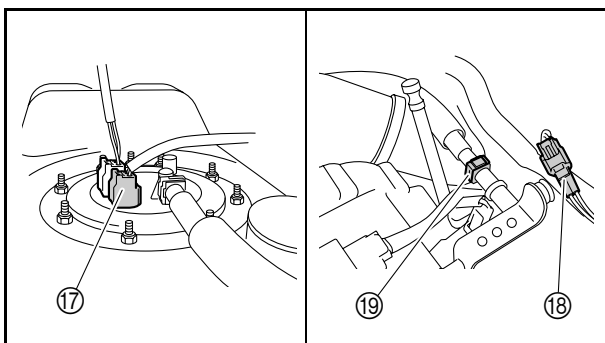
7. Disconnect the APS coupler ⑫, and the 7 dual analog meter unit, sensor, and switch couplers ⑬.



8. Remove the antenna holders ⑭.
9. Disconnect the remote control receiver coupler ⑮.



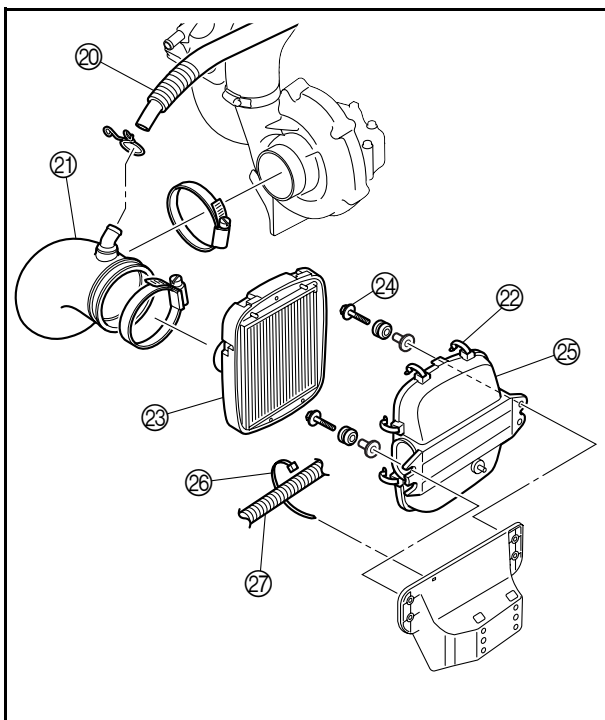
10. Remove the wiring harness from the 5 plastic ties ⑯.



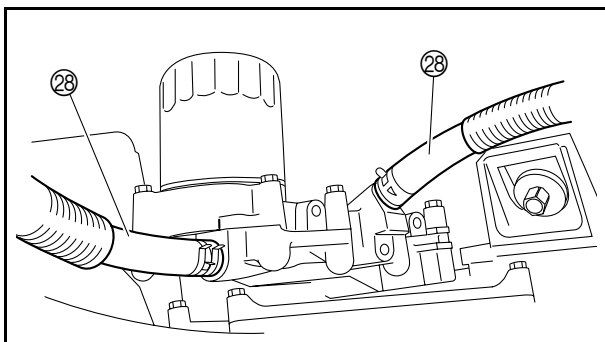
11. Disconnect the fuel pump module coupler ⑰ and electric bilge pump coupler ⑱.
12. Wrap the quick connector ⑲ with a cloth, and then disconnect it from the fuel rail. Refer to “Fuel tank removal” in Chapter 4.

⚠ WARNING

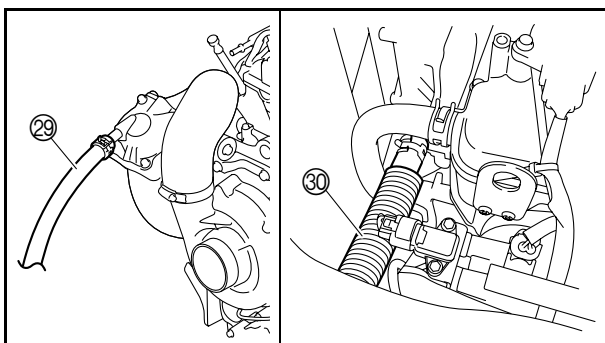
Make sure to disconnect the quick connector slowly, otherwise pressured fuel could spray out.



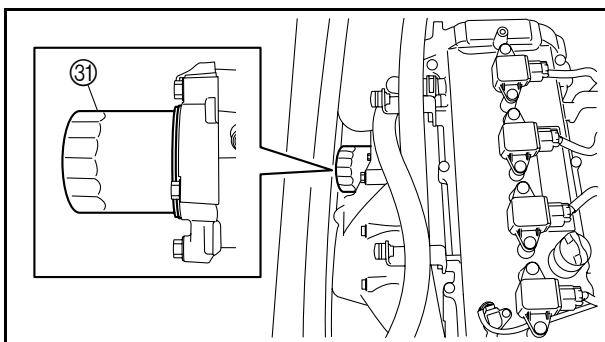
13. Disconnect the breather hose ②① from the intake pipe ②①, and then remove the intake pipe ②① from the supercharger.
14. Unhook the fasteners ②②, and then remove the air filter case cover ②③. Remove the air filter case bolts ②④, and then remove the air filter case ②⑤.
15. Remove the plastic tie ②⑥ from the cooling water hose ②⑦.



16. Disconnect the cooling water hoses ②⑧ from the oil cooler assembly.



17. Disconnect the cooling water hose ②⑨ from the air cooler and cooling water hose ③① from the thermostat housing.



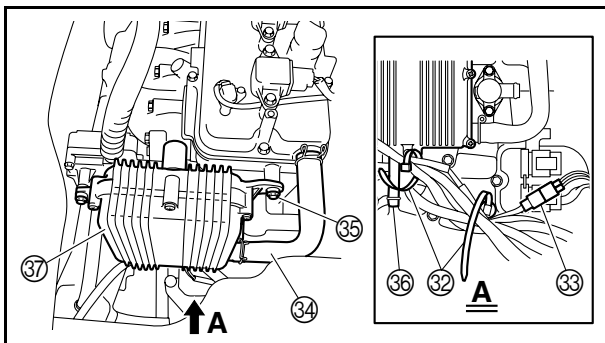
18. Place a cloth under the oil filter ③①, and then remove it with the special service tool.

TIP

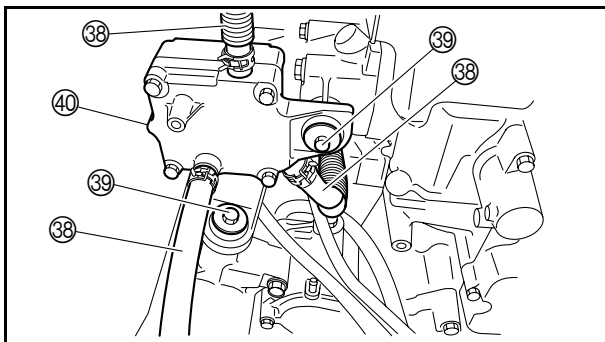
Make sure to clean up any oil spills.



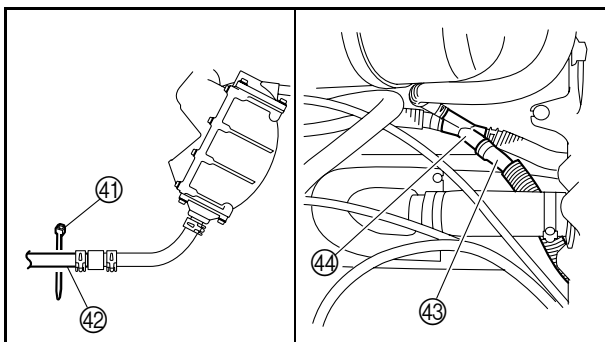
Oil filter wrench:
90890-06830



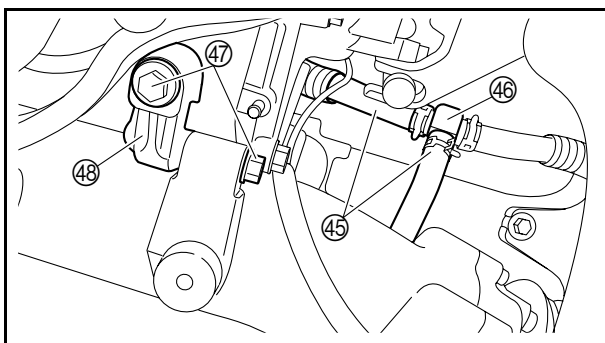
19. Remove the leads from the plastic ties ③②.
20. Disconnect the thermo sensor coupler ③③.
21. Remove the breather hose ③④.
22. Remove the breather assembly bolts ③⑤ and hose ③⑥, and then remove the breather assembly ③⑦.



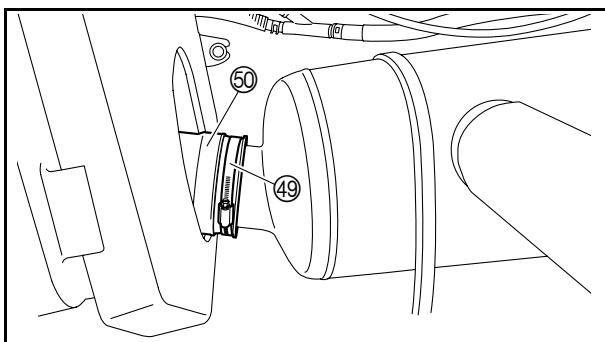
23. Remove the cooling water hoses ③⑧.
24. Remove the rectifier regulator bolts ③⑨, and then remove the rectifier regulator ④①.



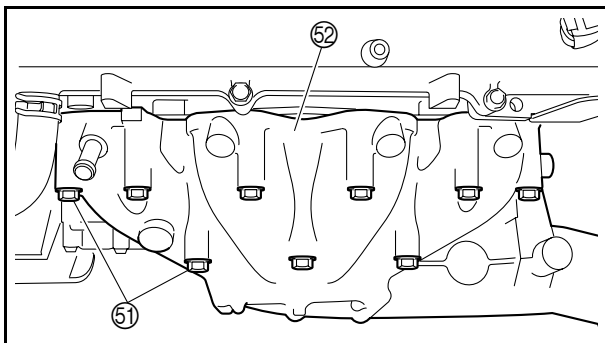
25. Remove the plastic tie ④① from the cooling water hose ④②.
26. Disconnect the cooling water hose ④③ from the hose joint 1 ④④.



27. Disconnect the cooling water hoses ④⑤ from the hose joint 3 ④⑥.
28. Remove the stay bolts ④⑦, and then remove the stay ④⑧.



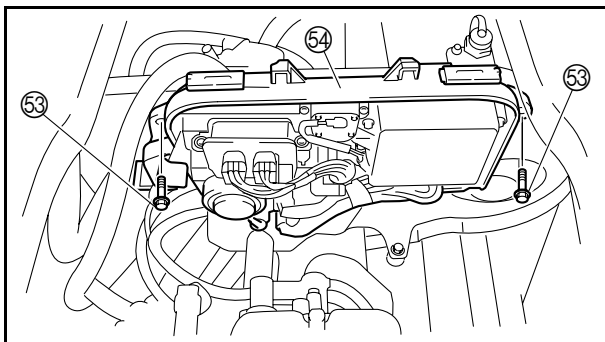
29. Remove the clamp ④⑨ from the pipe ⑤①.



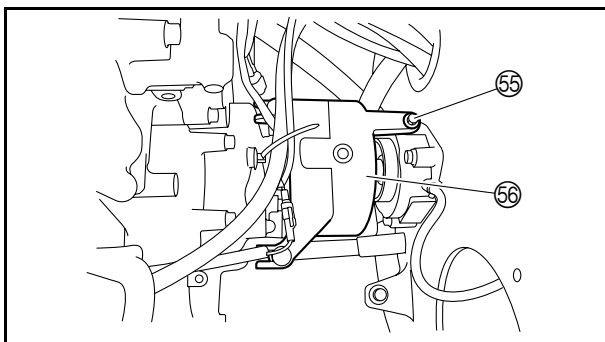
30. Remove the muffler assembly bolts (51), and then remove the muffler assembly (52).

TIP

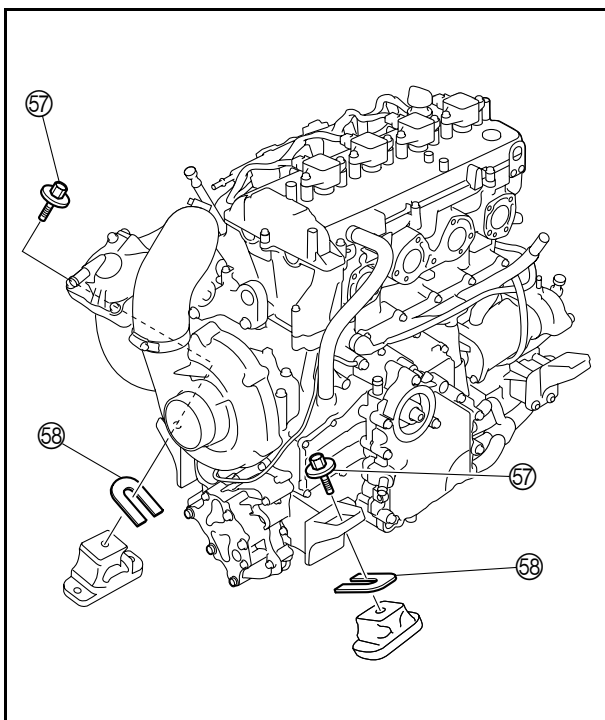
When removing the muffler assembly, move it forward and separate it from the water lock.



31. Remove the electrical box bolts (53), and then remove the electrical box (54).



32. Remove the coupling cover bolt (55) and collar, and then remove the coupling cover (56).

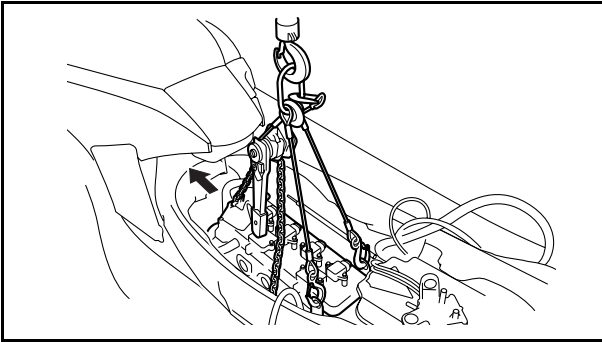


33. Loosen the engine mounting bolts (57).
34. Lift the engine unit slightly, remove the shims (58), and then lower the engine.

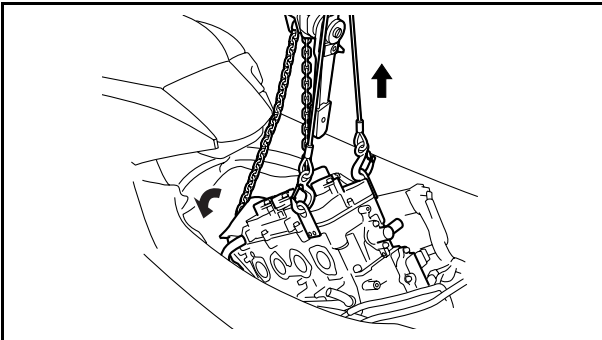
TIP

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 (57).



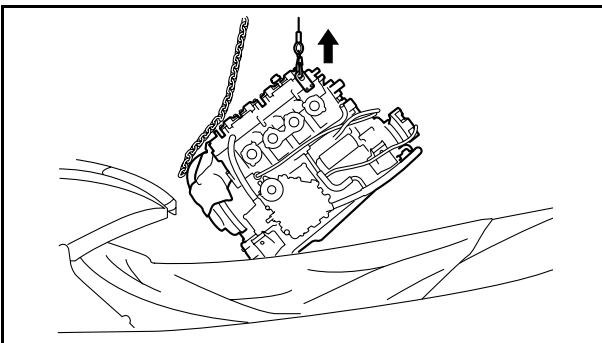
36. Suspend the engine unit using all 3 engine hangers, and then separate the unit from the engine mounts and move it forward to disconnect the coupling.



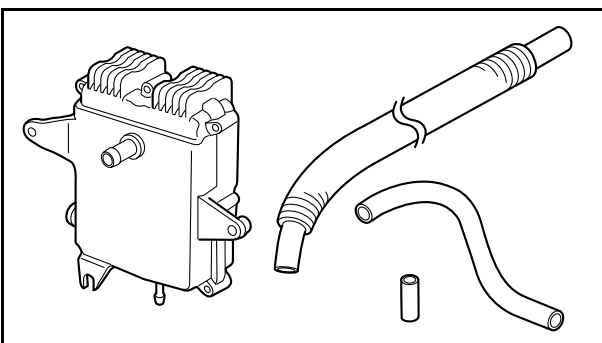
37. Lift the engine unit slightly, and then lower the front of the unit. Repeat this step until the engine unit can be removed from the engine compartment.

NOTICE

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



38. Lift the engine unit out vertically.



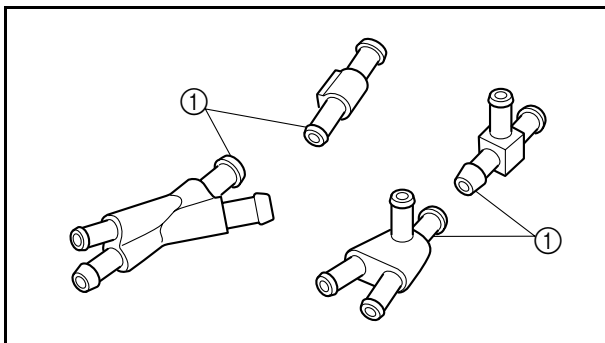
Breather assembly check

NOTICE

The breather assembly should not be disassembled.

1. Check:

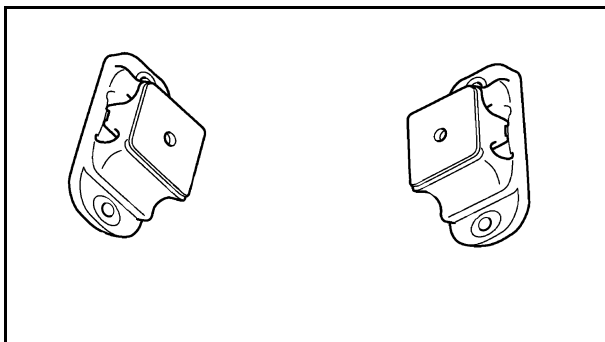
- Breather assembly
Cracks/damage → Replace the breather assembly.
- Breather hoses
Cracks/damage → Replace the breather hoses.



Hose joint check

1. Check:

- Hose joints ①
Cracks/damage → Replace the hose joints.
- Cooling water hoses
Cracks/damage → Replace the cooling water hoses.



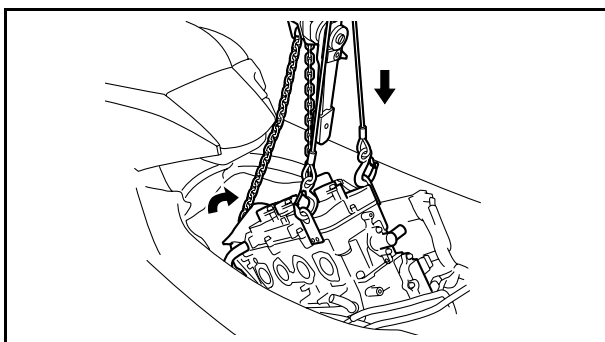
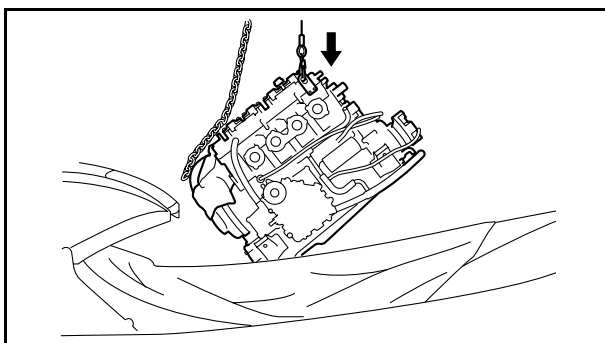
Engine mount check

1. Check:

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

TIP

- Make a note of the position of each engine mount so that it can be installed in its original place.
- When replacing the engine mounts, make sure to check the coupling clearance.



Engine unit installation

1. Install:

- Engine unit

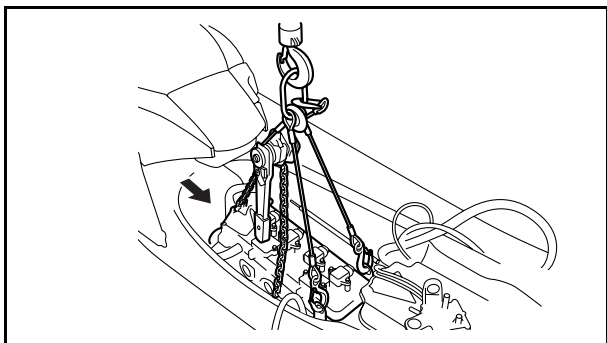
Installation steps:

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.

NOTICE

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

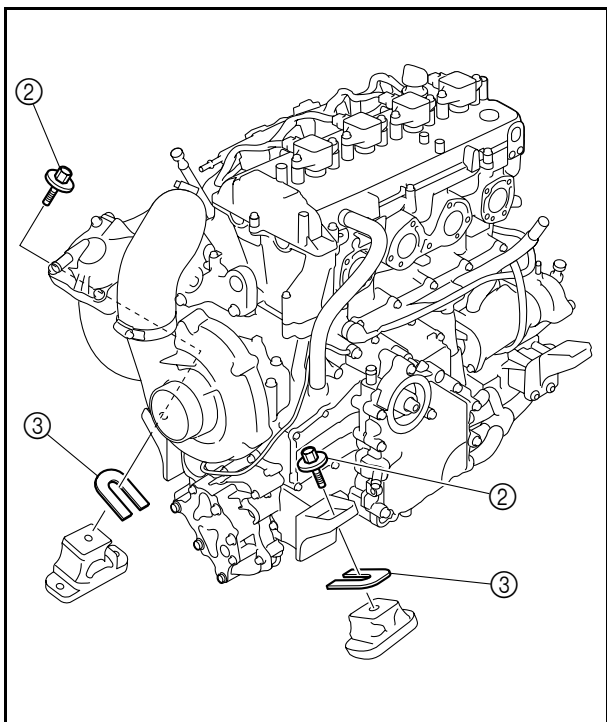
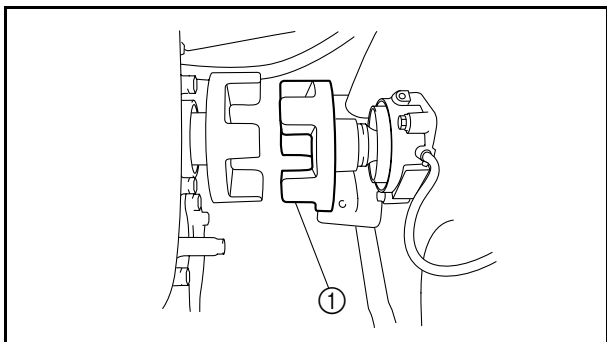
4. Lift the front of the engine unit slightly, and lower the unit. Repeat this step until the drive and driven couplings are aligned.



5. Move the engine unit rearward to connect the coupling ①, and lower the unit onto the engine mounts.

TIP

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

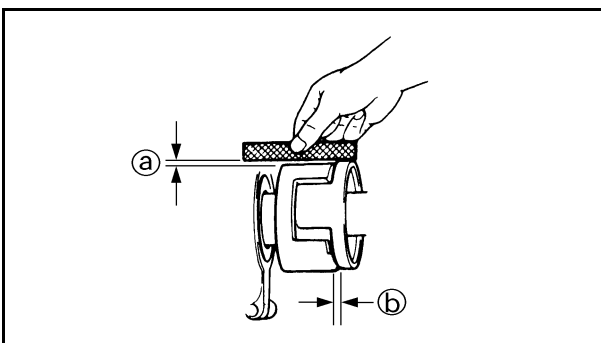
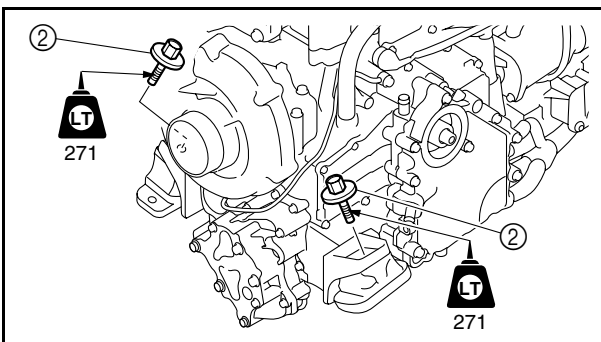
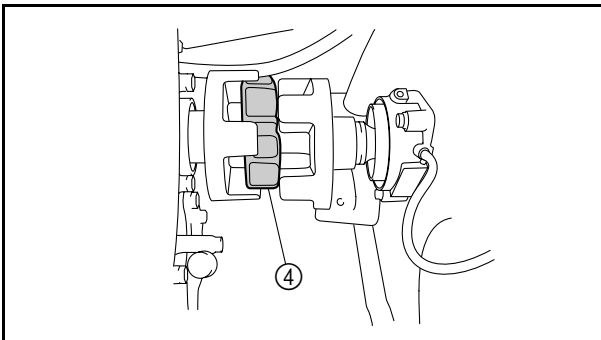
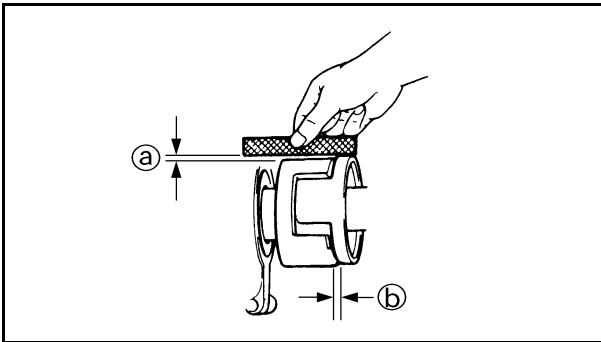


6. Temporarily install the engine mounting bolts ②.

7. Lift the engine unit slightly, install the shims ③, and then lower the engine.

TIP

Install the shims in their original positions.



8. Measure the coupling clearance (a), 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 (a):
Less than 1.0 mm (0.039 in) (without rubber damper)
Clearance (b):
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 (a) and (b) are within specification.

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

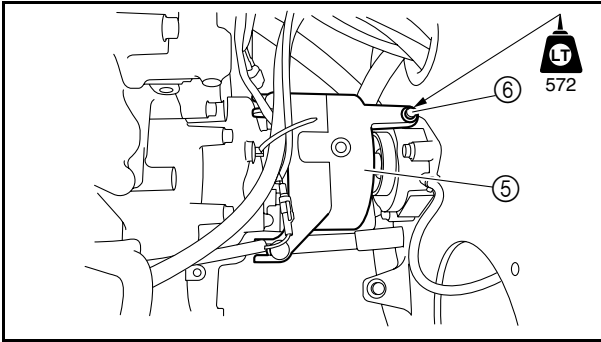


Engine mounting bolt:
17 N·m (1.7 kgf·m, 12.5 ft·lb)
LOCTITE 271

12. Check that the coupling clearances (a) and (b) are within specification. If the clearances are out of specification, adjust them again.



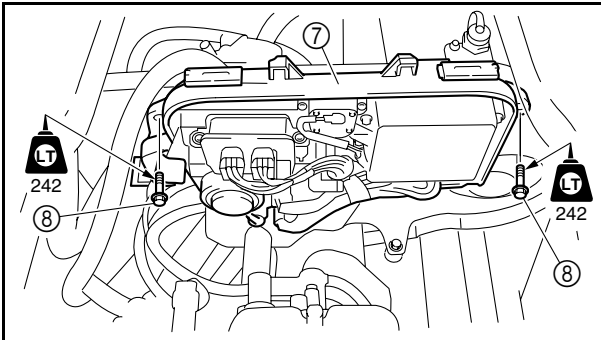
Clearance (a):
Less than 0.5 mm (0.020 in) (with rubber damper)
Clearance (b):
2.0–4.0 mm (0.079–0.157 in)



13. Install the coupling cover (5) and collar, and then tighten the coupling cover bolt (6) to the specified torque.



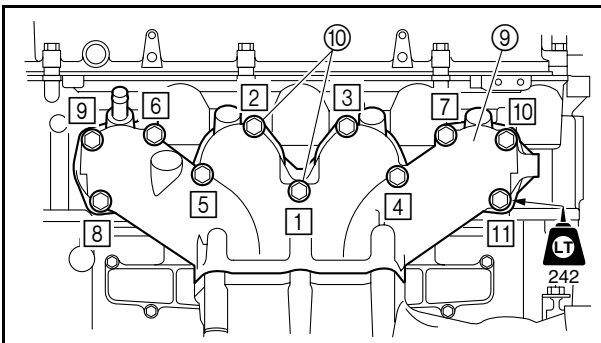
Coupling cover bolt:
8 N·m (0.8 kgf·m, 5.9 ft·lb)
LOCTITE 572



14. Install the electrical box (7), and then tighten the electrical box bolts (8) to the specified torque.



Electrical box bolt:
17 N·m (1.7 kgf·m, 12.5 ft·lb)
LOCTITE 242



15. Install the muffler assembly (9) into the water lock, and then tighten the muffler assembly bolts (10) to the specified torque.

NOTICE

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

TIP

Tighten the muffler assembly bolts in the sequence shown.

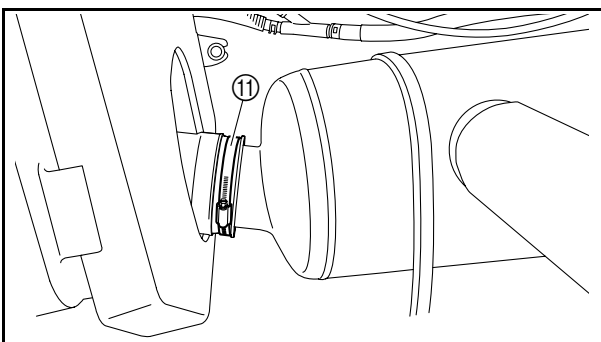


Muffler assembly bolt:
1st: 20 N·m (2.0 kgf·m, 14 ft·lb)
2nd: 35 N·m (3.5 kgf·m, 25 ft·lb)
LOCTITE 242

16. Tighten the pipe clamp (11) to the specified torque.

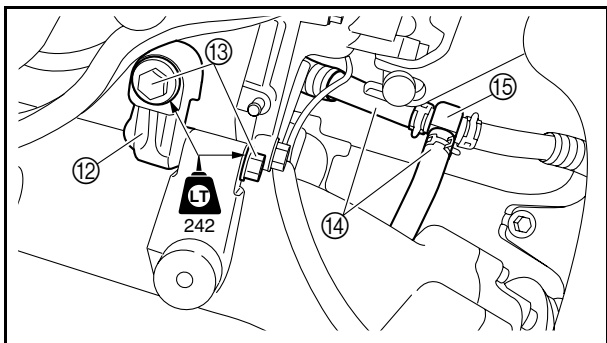


Pipe clamp:
2 N·m (0.2 kgf·m, 1.5 ft·lb)



TIP

Make sure that the pipe on the end of the muffler assembly is installed securely into the water lock.



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



Stay bolt:

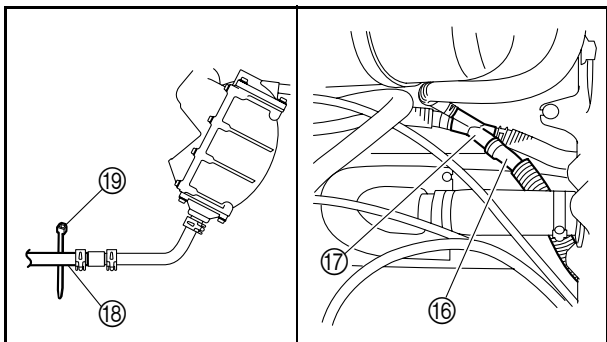
1st:

22 N·m (2.2 kgf·m, 16.2 ft·lb)

2nd:

42 N·m (4.2 kgf·m, 31.0 ft·lb)

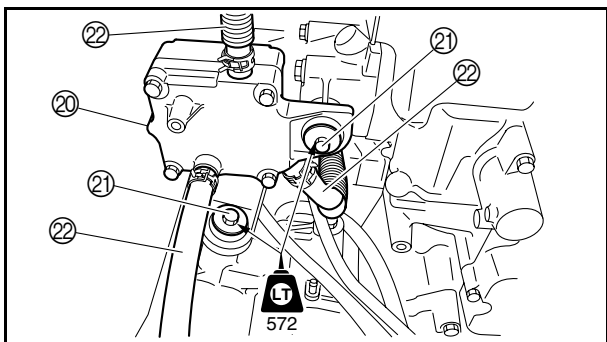
LOCTITE 242



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 cooling water hose ⑱ with the plastic tie ⑲.



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



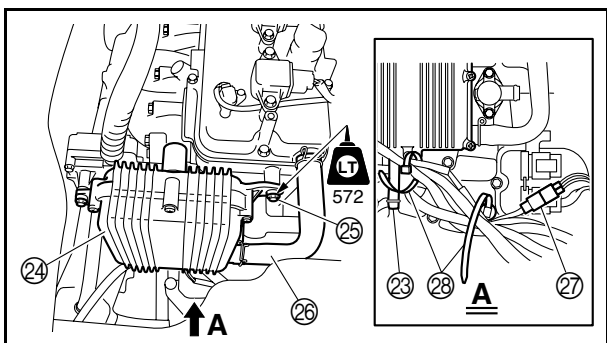
Rectifier regulator bolt:

26 N·m (2.6 kgf·m, 19.2 ft·lb)

LOCTITE 572

22. Connect the cooling water hoses ㉒.

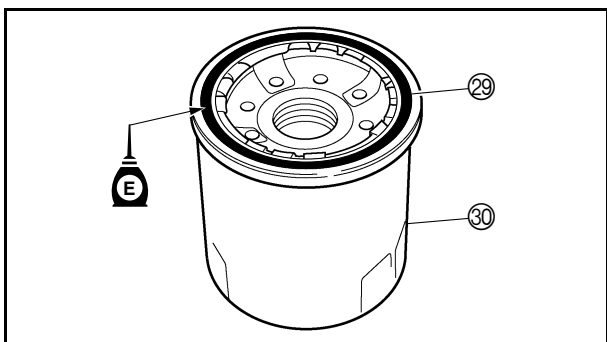
23. Install the hose ㉓ and breather assembly ㉔, and then tighten the breather assembly bolts ㉕ to the specified torque.

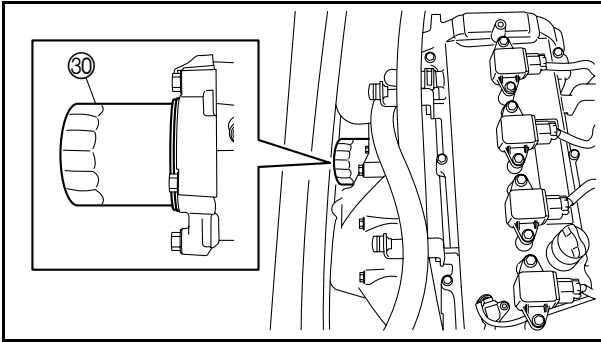


24. Connect the breather hose ㉖ and the thermo sensor coupler ㉗.

25. Clamp the leads with the plastic ties ㉘.

26. Apply a thin coat of engine oil to the O-ring ㉙ of the oil filter ㉚.





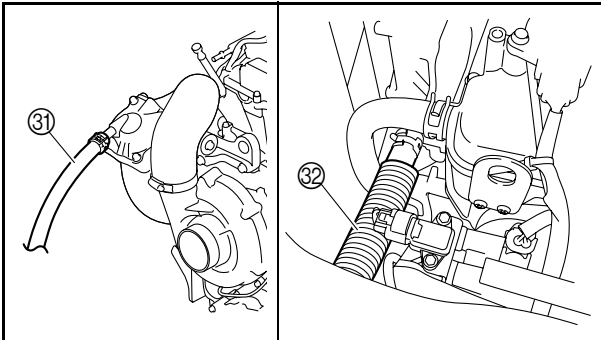
27. Install the oil filter ③⑩ with the special service tool.



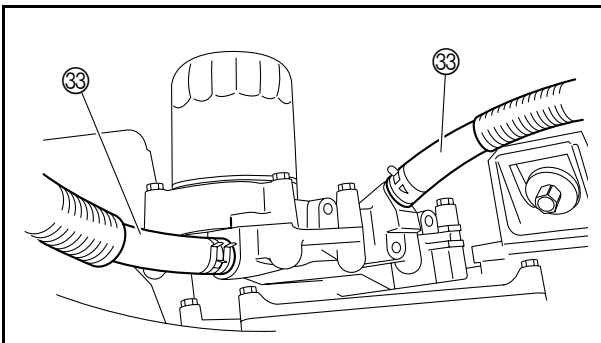
Oil filter wrench:
90890-06830



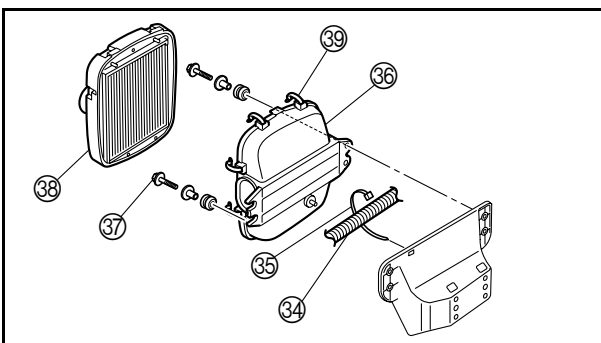
Oil filter:
18 N·m (1.8 kgf·m, 13.3 ft·lb)



28. Connect the cooling water hose ③① to the air cooler and cooling water hose ③② to the thermostat housing.



29. Connect the cooling water hoses ③③ to the oil cooler assembly.



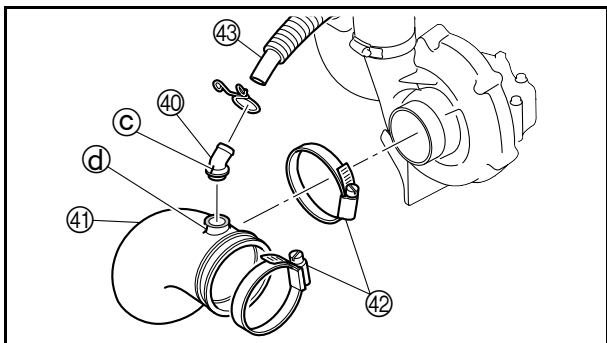
30. Clamp the cooling water hose ③④ with the plastic tie ③⑤.

31. Install the air filter case ③⑥, and then tighten the air filter case bolts ③⑦ to the specified torque.



Air filter case bolt:
12 N·m (1.2 kgf·m, 8.9 ft·lb)

32. Install the air filter case cover ③⑧, and then hook the fasteners ③⑨.



33. Apply adhesive onto the mating surface of the connection ④⑩, and then install it.

TIP

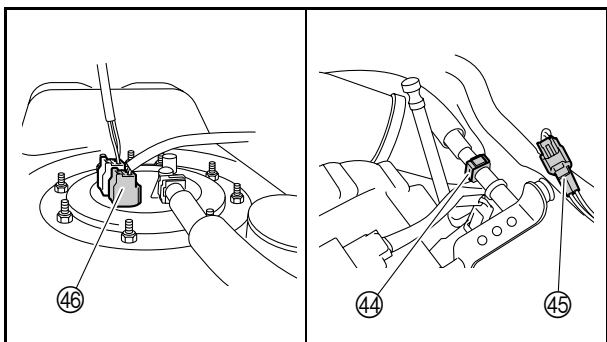
Align the mark ③ on the connection with the mark ④ on the intake pipe.

34. Install the intake pipe ④⑪, and then tighten the clamps ④⑫.



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

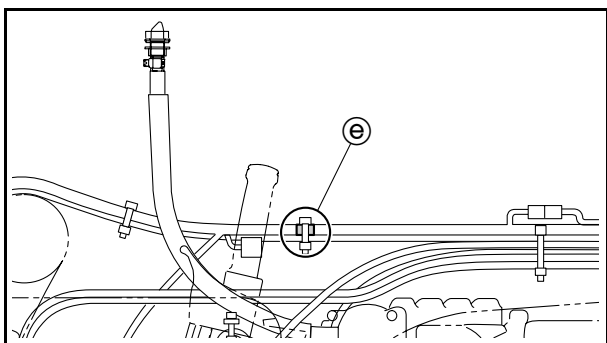
35. Connect the breather hose ④⑬ to the connection ④⑩.



36. Connect the quick connector ④⑭ to the fuel rail.

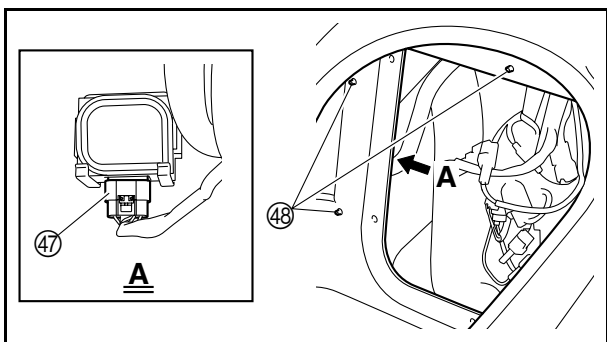
Refer to “Fuel tank removal” in Chapter 4.

37. Connect the electric bilge pump coupler ④⑮ and fuel pump module coupler ④⑯.



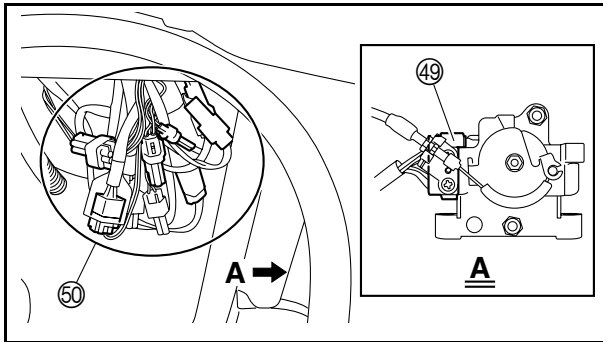
38. Align the plastic tie with the gray tape ③ on the wiring harness assembly.

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

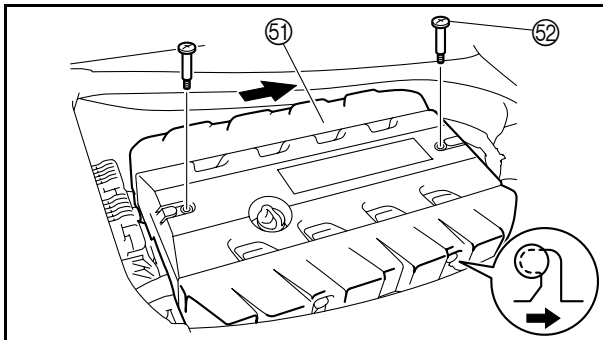


40. Connect the remote control receiver coupler ④⑰.

41. Install the antenna holders ④⑱.



42. Connect the APS coupler ④⑨, and the 7 dual analog meter unit, sensor, and switch couplers ⑤⑩.



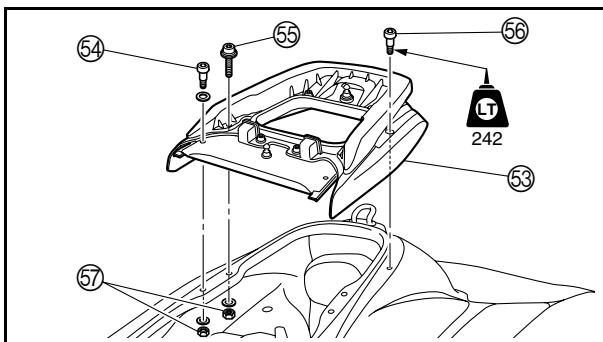
43. Install the engine cover ⑤①, and then tighten the engine cover screws ⑤② to the specified torque.

TIP

Hold the engine cover down, and slide the cover forward to install it.



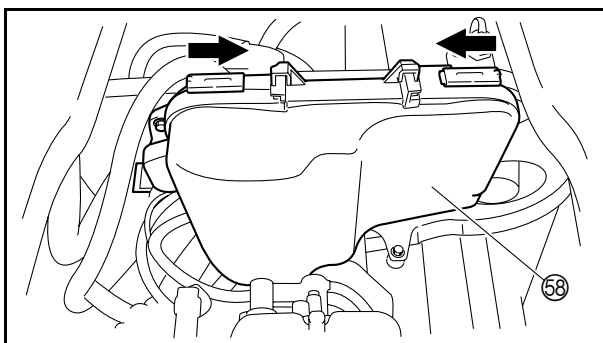
Engine cover screw:
5 N·m (0.5 kgf·m, 3.7 ft·lb)



44. Install the deck beam assembly ⑤③ and tighten the deck beam bolts ⑤④, ⑤⑤, and ⑤⑥ and nuts ⑤⑦ to the specified torque.



Deck beam bolt ⑤⑥:
18 N·m (1.8 kgf·m, 13.3 ft·lb)
LOCTITE 242
Deck beam nut ⑤⑦:
18 N·m (1.8 kgf·m, 13.3 ft·lb)

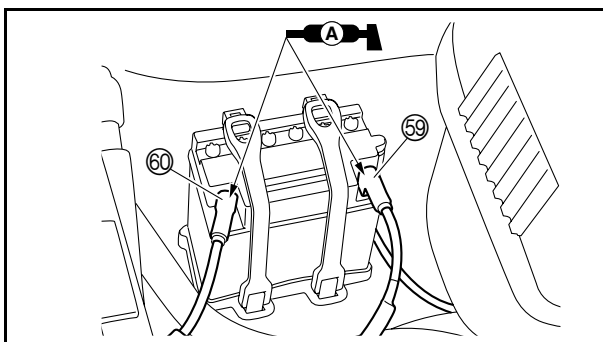


45. Install the service lid.

46. Install the electrical box cover ⑤⑧.

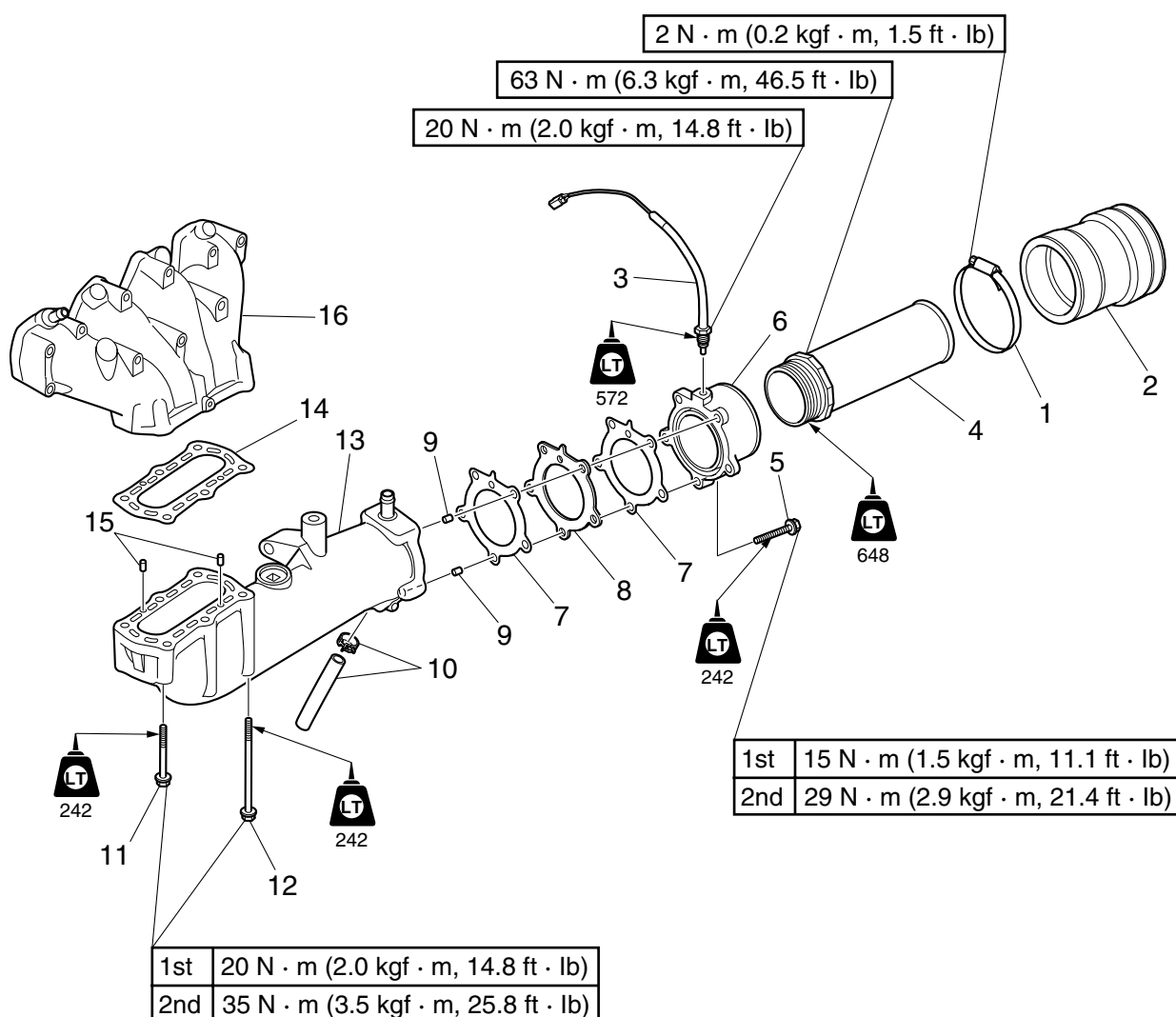
47. Connect the positive battery cable ⑤⑨ and negative battery cable ⑥⑩ to the battery.

48. Coat the battery cable terminals and battery terminals with a water resistance grease.



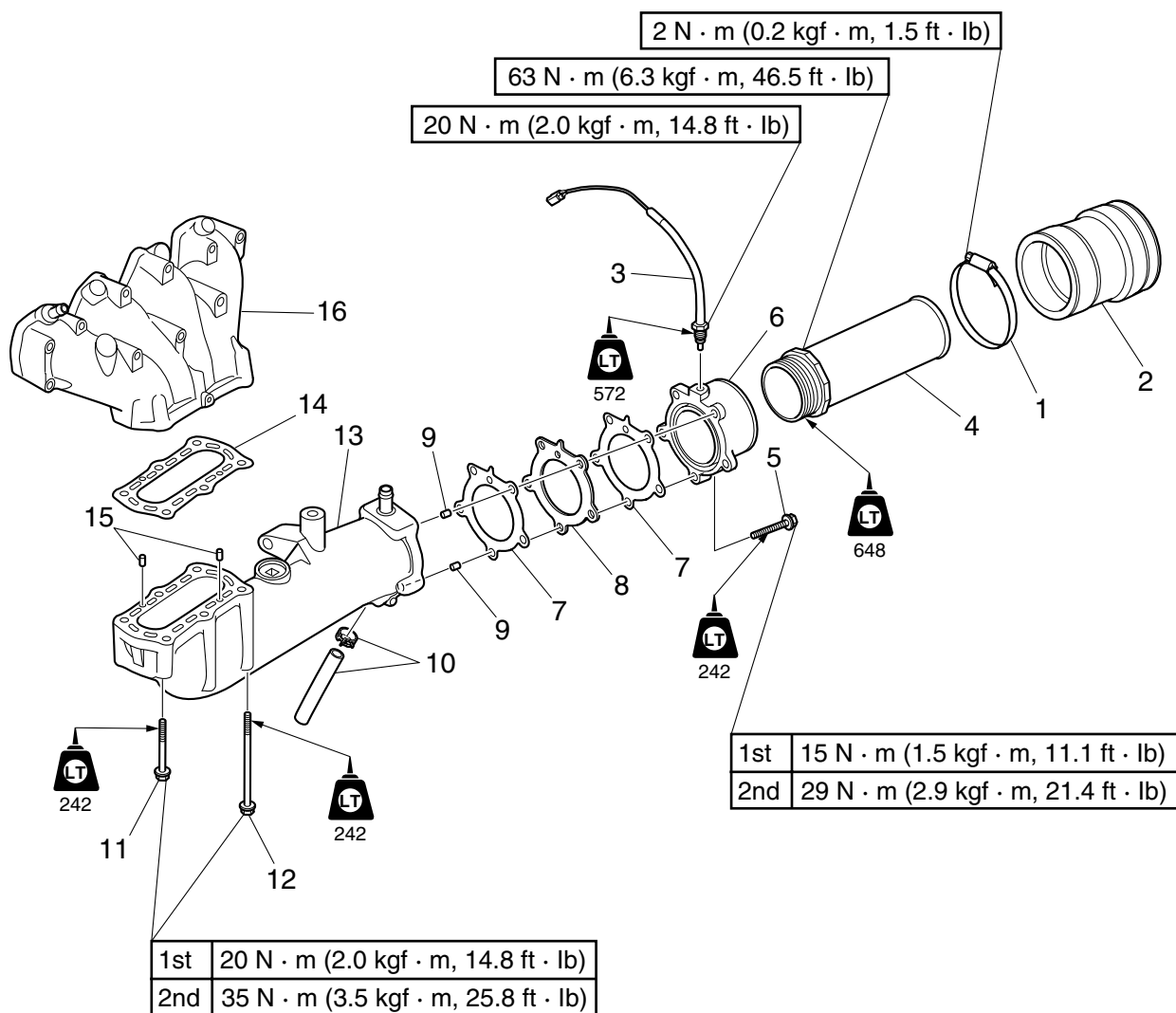
Muffler

Muffler disassembly

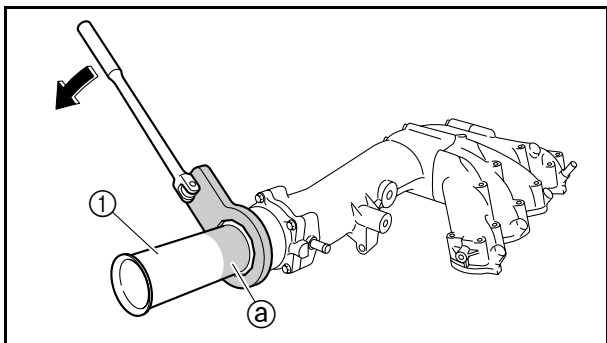


5

Step	Part name	Q'ty	Remarks
1	Clamp	1	M8 × 35 mm Not reusable
2	Pipe	1	
3	Thermo sensor	1	
4	Exhaust pipe 3	1	
5	Bolt	5	
6	Exhaust pipe 2	1	
7	Gasket	2	
8	Silencer plate	1	
9	Dowel pin	2	
10	Clamp/cooling water hose	1/1	



Step	Part name	Q'ty	Remarks
11	Bolt	2	M8 × 70 mm
12	Bolt	4	M8 × 120 mm
13	Exhaust pipe 1	1	
14	Gasket	1	Not reusable
15	Dowel pin	2	
16	Exhaust manifold	1	



Exhaust pipe 3 removal

⚠ WARNING

When using a heat gun, protect your hands by wearing heat-resistant gloves. Components become hot enough to cause burns.

1. Remove:

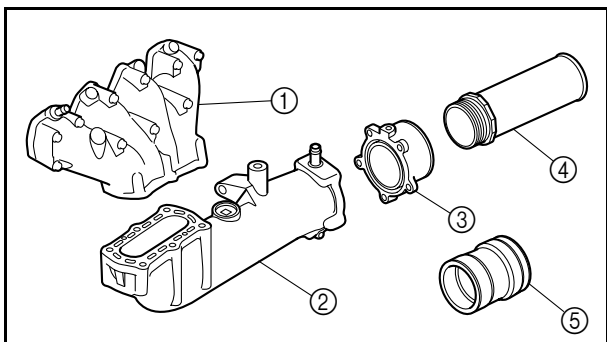
- Exhaust pipe 3 ①



Exhaust pipe wrench:
90890-06726

TIP

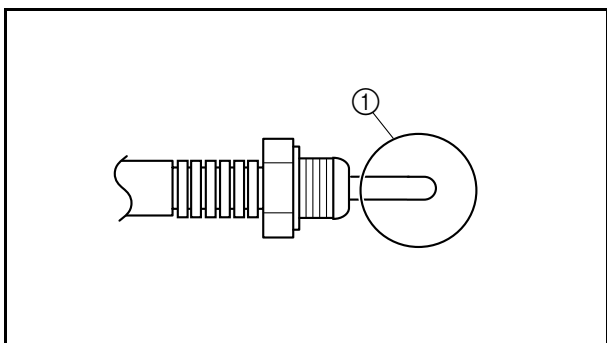
Heat the area ② of exhaust pipe 3 ① to approximately 200 °C (392 °F) with a heat gun.



Muffler check

1. Check:

- Exhaust manifold ①
 - Exhaust pipe 1 ②
 - Exhaust pipe 2 ③
 - Exhaust pipe 3 ④
 - Pipe ⑤
- Cracks/damage → Replace.



Thermo sensor check

1. Check:

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

Exhaust pipe 3 installation

1. Install:

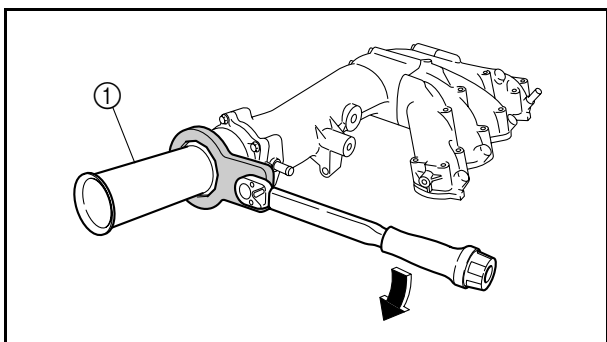
- Exhaust pipe 3 ①



Exhaust pipe wrench:
90890-06726



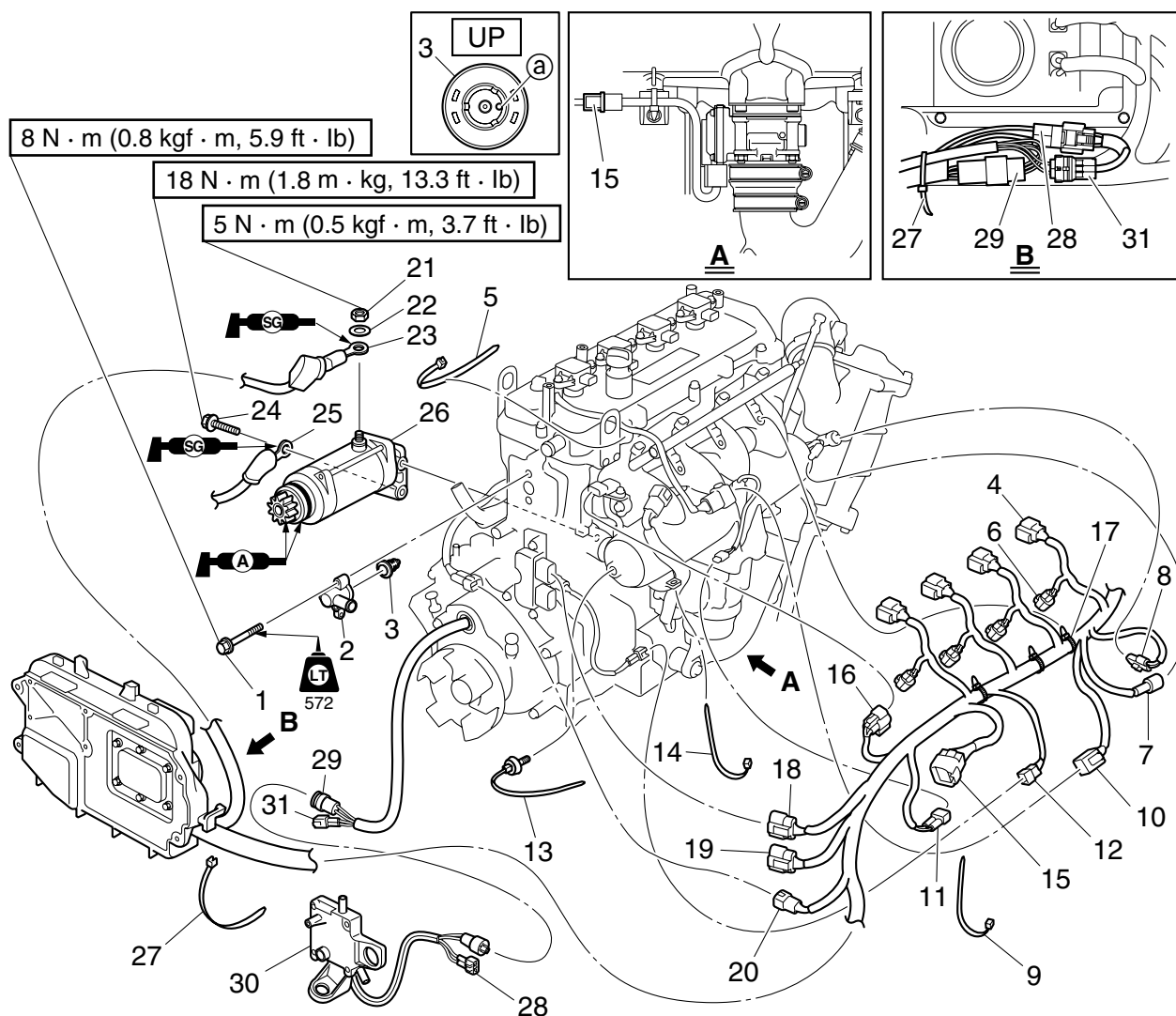
Exhaust pipe 3:
63 N·m (6.3 kgf·m, 46.5 ft·lb)
LOCTITE 648



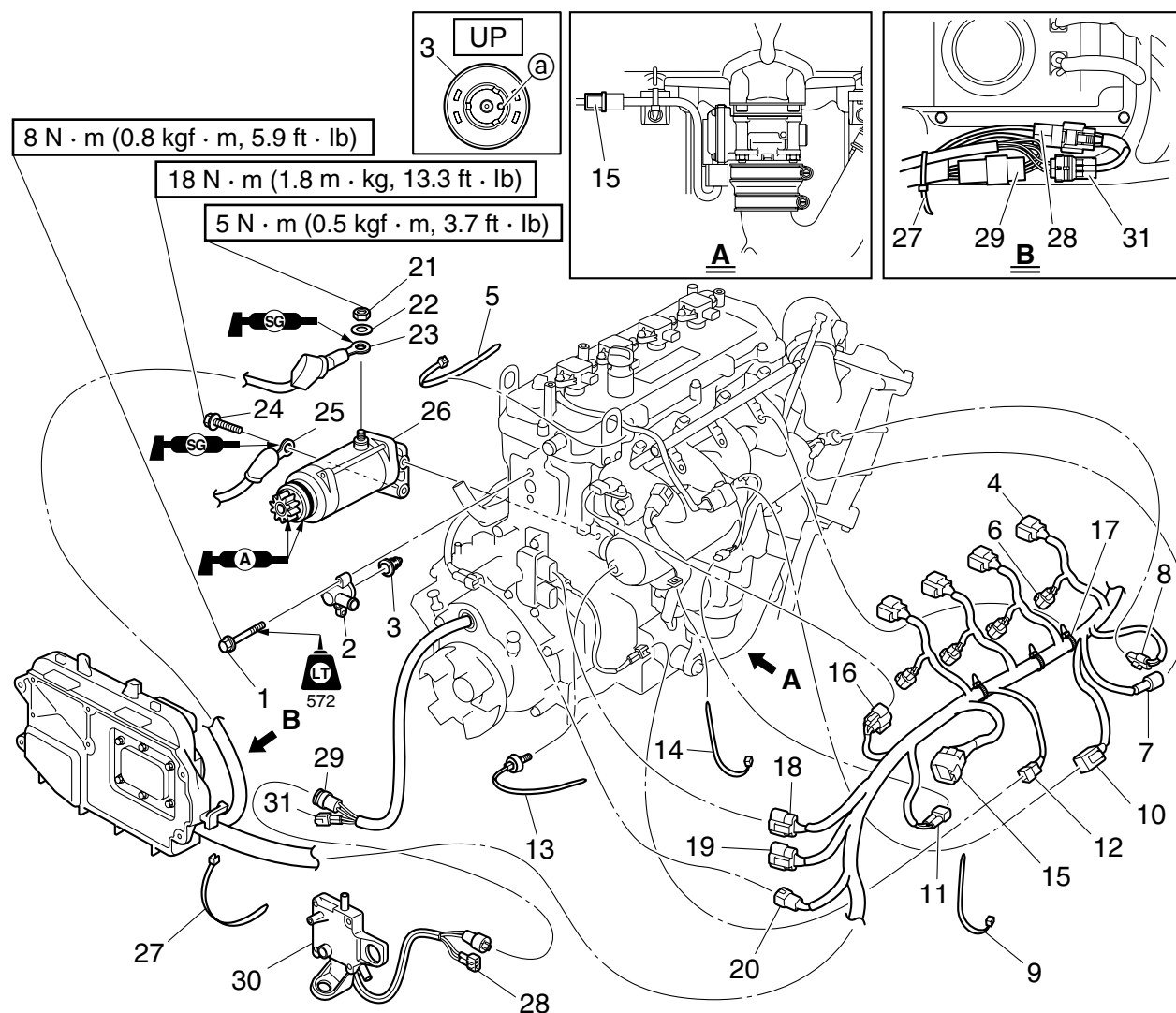


Thermostat and electrical component

Thermostat and electrical component removal

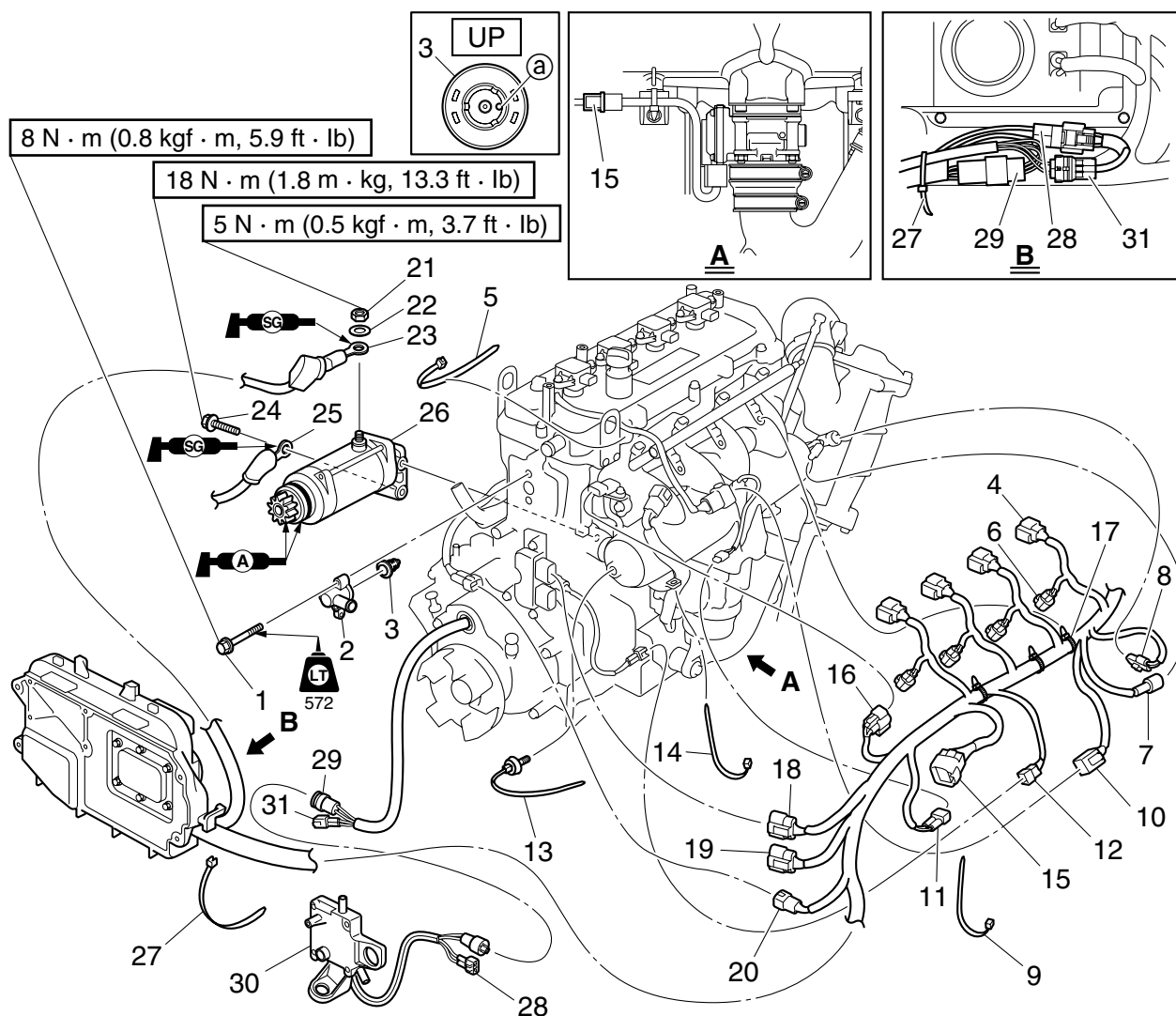


Step	Part name	Q'ty	Remarks
1	Bolt	2	M6 × 35 mm
2	Thermostat housing	1	
3	Thermostat	1	Ⓐ Hole
4	Ignition coil coupler	4	
5	Plastic tie	1	
6	Injector coupler	4	
7	Knock sensor coupler	1	
8	Thermoswitch coupler	1	
9	Plastic tie	1	
10	Cam position sensor coupler	1	
11	Intake air temperature sensor coupler	1	
12	Engine temperature sensor coupler	1	
13	Plastic tie	1	

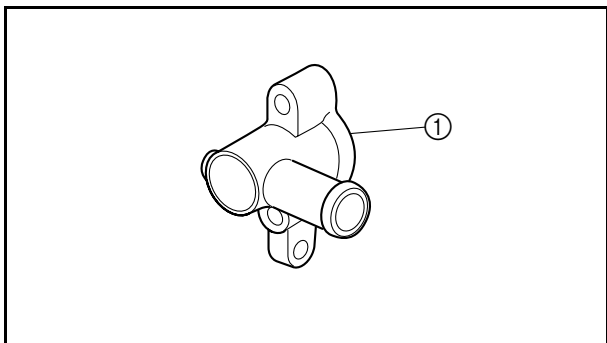


5

Step	Part name	Q'ty	Remarks
14	Plastic tie	1	
15	Throttle body assembly coupler	1	
16	Intake air pressure sensor coupler	1	
17	Clamp	3	
18	Earth plate coupler 1	1	
19	Earth plate coupler 2	1	
20	Oil pressure switch coupler	1	
21	Nut	1	
22	Washer	1	
23	Starter motor cable	1	



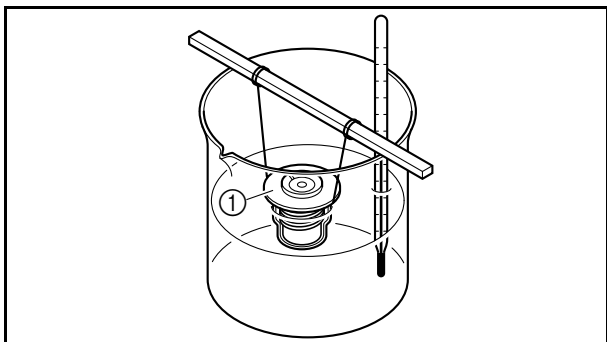
Step	Part name	Q'ty	Remarks
24	Bolt	2	M8 × 30 mm
25	Negative battery cable	1	
26	Starter motor	1	
27	Plastic tie	1	
28	Rectifier regulator coupler	1	
29	Stator coil coupler	1	
30	Rectifier regulator	1	
31	Pick up coil coupler	1	



Thermostat housing check

1. Check:

- Thermostat housing ①
Cracks/damage → Replace the thermostat housing.



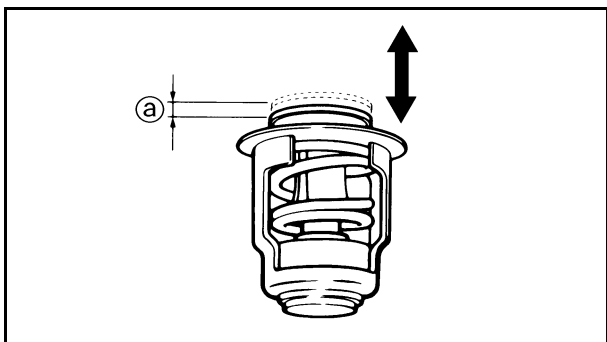
Thermostat check

1. Check:

- Thermostat valve opening ②
Out of specification → Replace the thermostat.

Checking steps:

- Suspend the thermostat ① in a container of water.
- Place a thermometer in the water and slowly heat the water.
- Measure the thermostat valve opening ② at the specified water temperatures.

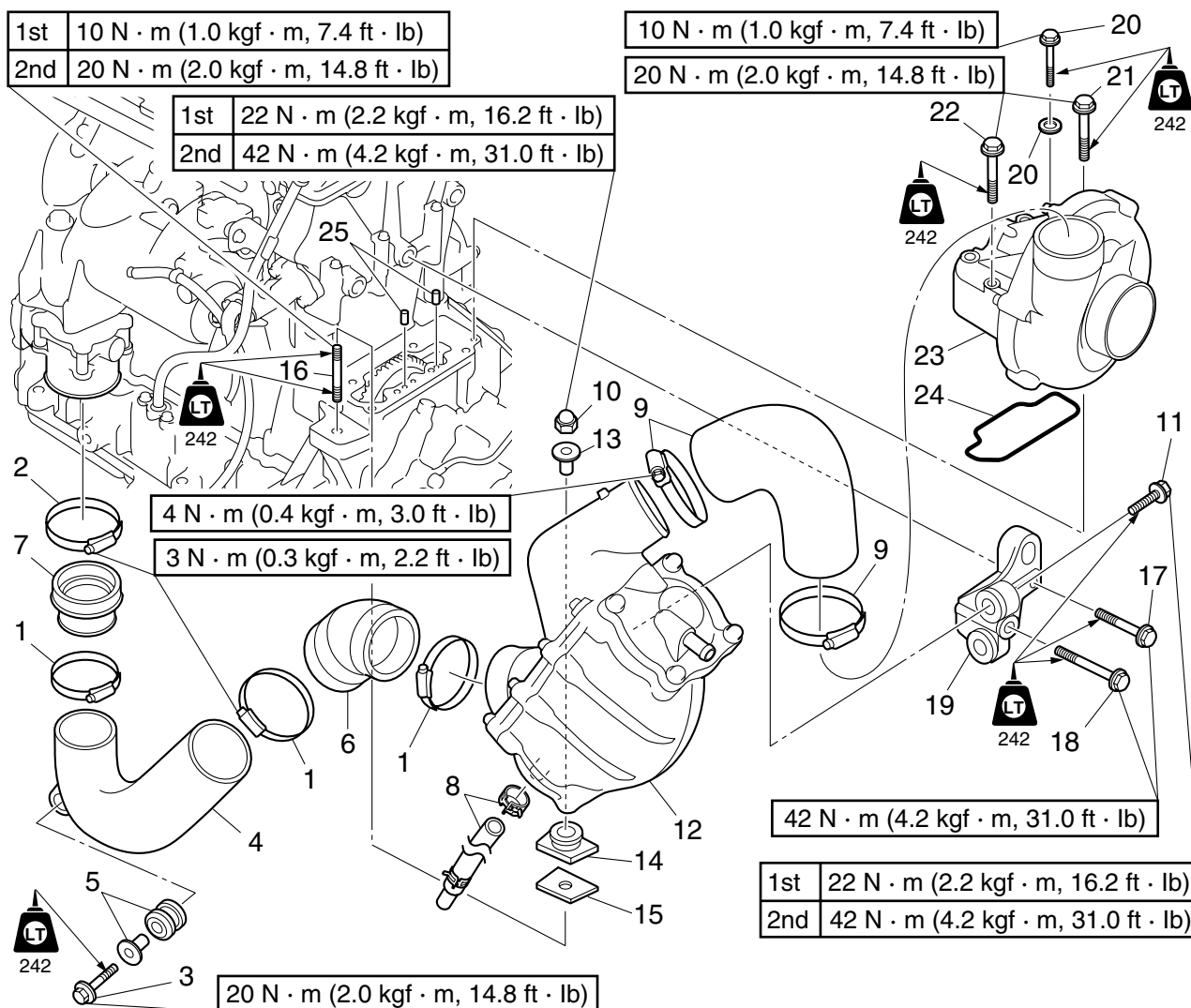


Water temperature	Valve opening
48–52 °C (118–126 °F)	0.05 mm (0.002 in) (valve begins to open)
above 60 °C (140 °F)	more than 4.3 mm (0.17 in)

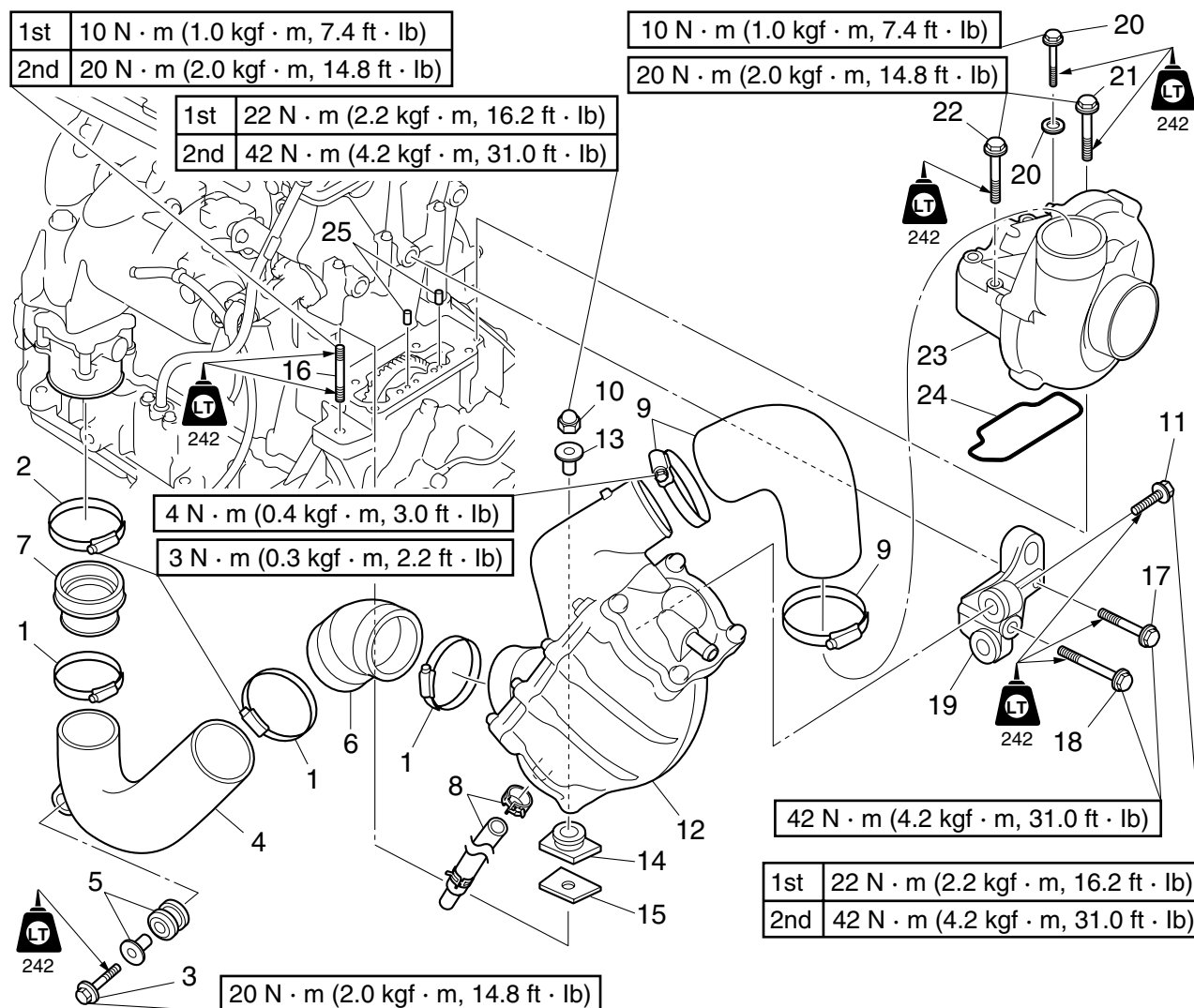


Air cooler, supercharger, and throttle body assembly

Air cooler and supercharger removal



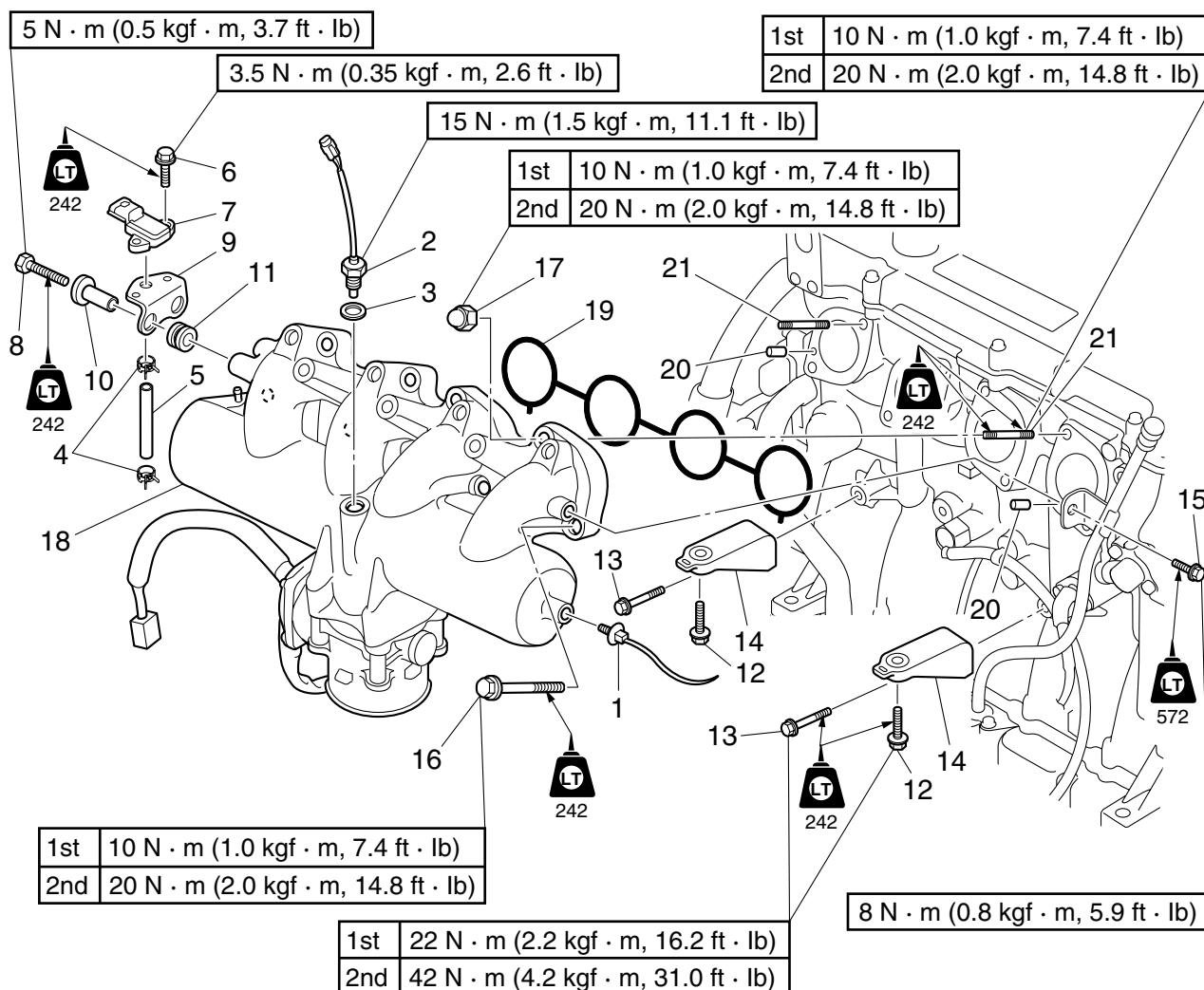
Step	Part name	Q'ty	Remarks
1	Clamp	3	M8 × 35 mm
2	Clamp	1	
3	Bolt	1	
4	Boost pipe	1	
5	Collar/grommet	1/1	
6	Joint 1	1	M10 × 45 mm
7	Joint 2	1	
8	Clamp/cooling water hose	1/1	
9	Clamp/air cooler intake pipe	2/1	
10	Nut	1	
11	Bolt	2	
12	Air cooler assembly	1	
13	Collar	1	



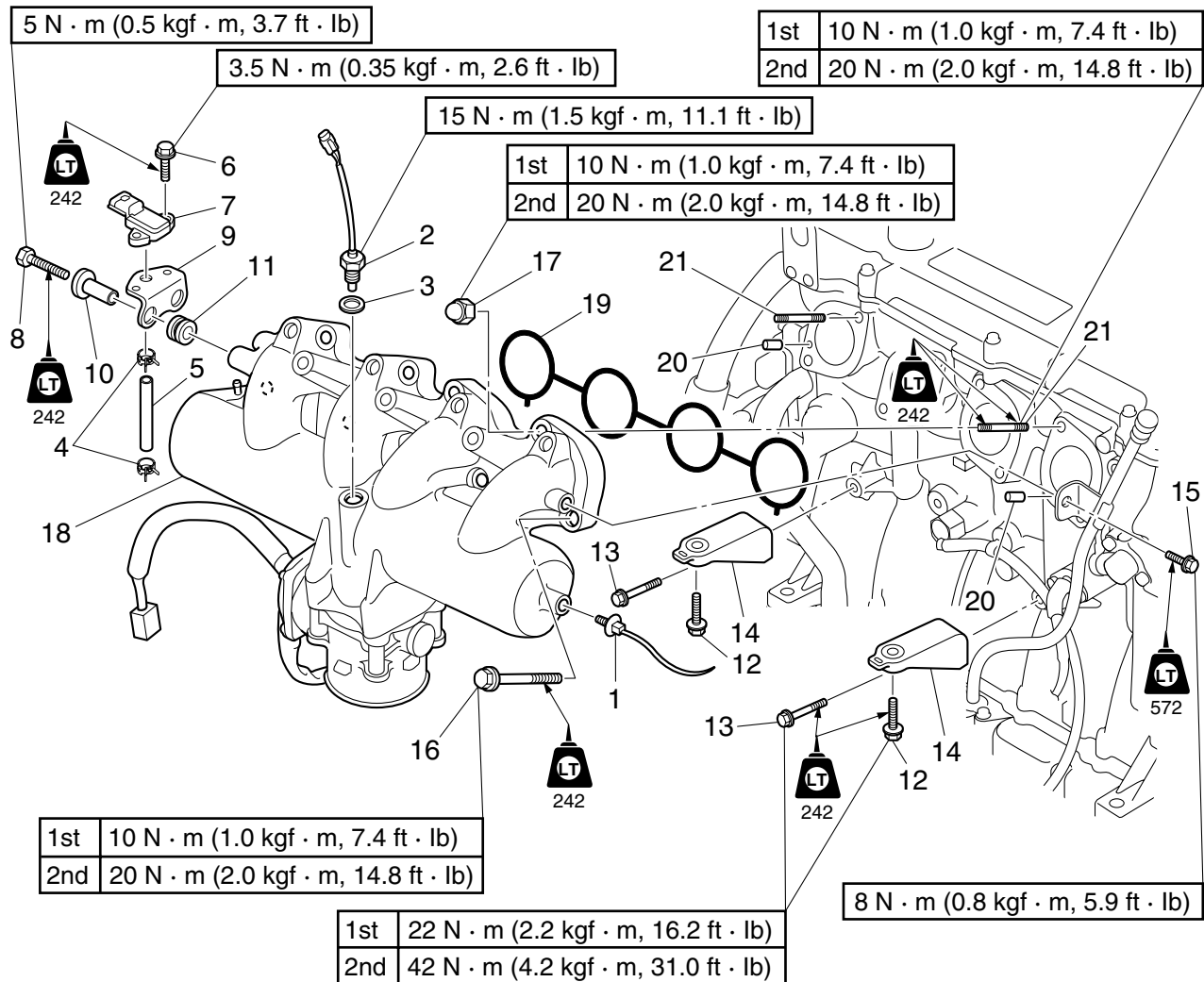
Step	Part name	Q'ty	Remarks
14	Grommet	1	
15	Plate	1	
16	Stud bolt	1	
17	Bolt	1	M10 × 50 mm
18	Bolt	1	M10 × 80 mm
19	Stay	1	
20	Bolt/washer	2/2	M6 × 65 mm
21	Bolt	3	M8 × 65 mm
22	Bolt	1	M8 × 65 mm
23	Supercharger assembly	1	
24	O-ring	1	Not reusable
25	Dowel pin	2	



Intake assembly removal



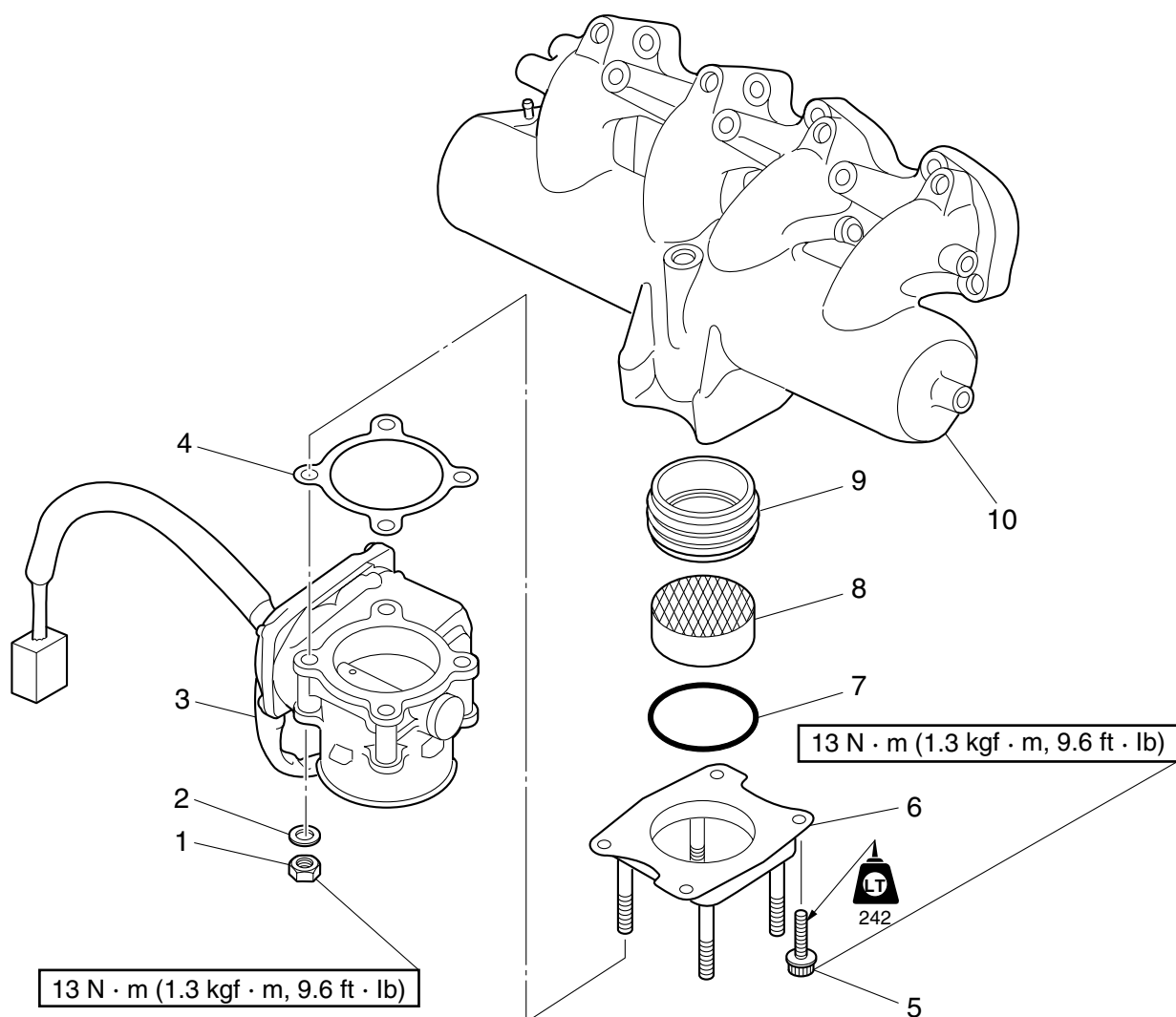
Step	Part name	Q'ty	Remarks
	Fuel injector		Refer to "Fuel tank removal" in Chapter 4.
1	Plastic tie	1	
2	Intake air temperature sensor	1	
3	Washer	1	Not reusable
4	Clamp	2	
5	Hose	1	
6	Bolt	2	M5 × 15 mm
7	Intake air pressure sensor	1	
8	Bolt	2	M6 × 25 mm
9	Bracket	1	
10	Collar	2	
11	Grommet	2	
12	Bolt	2	M8 × 25 mm



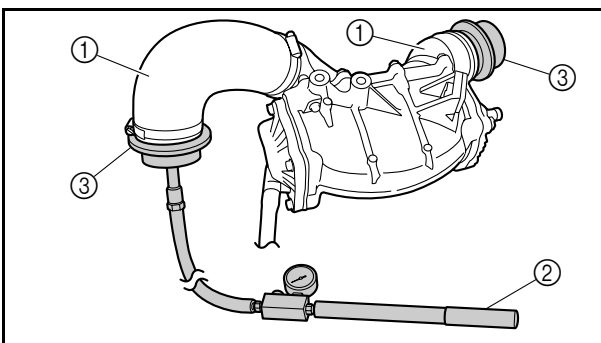
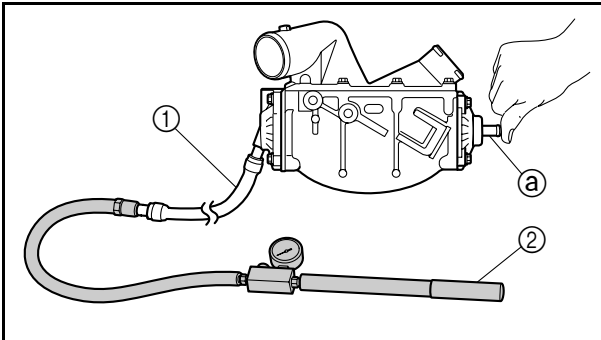
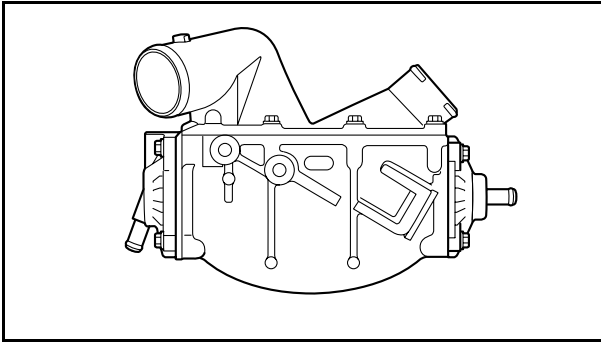
5

Step	Part name	Q'ty	Remarks
13	Bolt	2	M8 × 40 mm
14	Stay	2	
15	Bolt	1	M6 × 12 mm
16	Bolt	6	M8 × 35 mm
17	Nut	2	
18	Intake assembly	1	
19	Packing	1	Not reusable
20	Dowel pin	2	
21	Stud bolt	2	

Intake disassembly



Step	Part name	Q'ty	Remarks
1	Nut	4	
2	Washer	4	
3	Throttle body assembly	1	
4	Gasket	1	Not reusable
5	Bolt	4	M8 × 20 mm
6	Joint	1	
7	O-ring	1	Not reusable
8	Ribbon	1	
9	Holder	1	
10	Intake manifold	1	



Air cooler check

NOTICE

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:

TIP

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/cm², 28.5 psi)

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

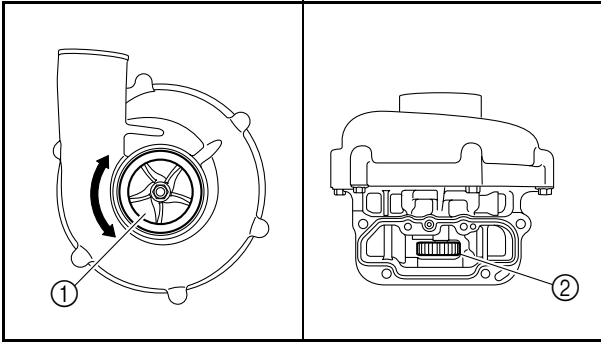


Air cooler attachment ③:
90890-06731

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



Specified positive pressure (air passage):
100 kPa (1.0 kgf/cm², 14.2 psi)



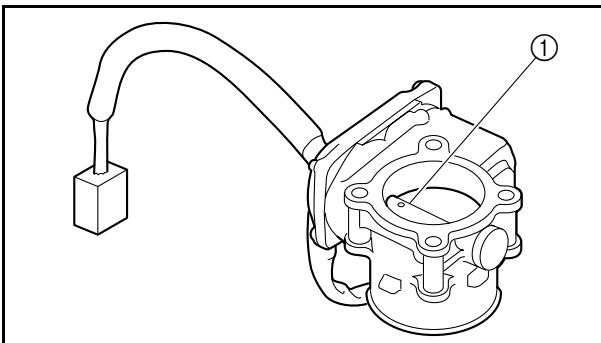
Supercharger check

NOTICE

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.



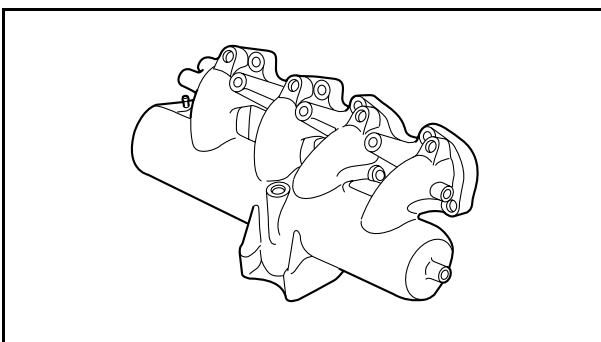
Throttle body assembly check

NOTICE

The throttle body assembly should not be disassembled.

1. Check:

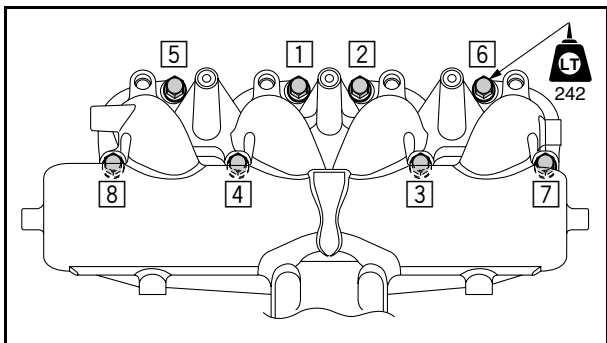
- Throttle shaft ①
Cracks/damage → Replace the throttle body assembly.
- Throttle valve opening
Refer to “Throttle position sensor” in Chapter 7.



Intake manifold check

1. Check:

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



Intake manifold installation

1. Install:

- Intake manifold

TIP

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

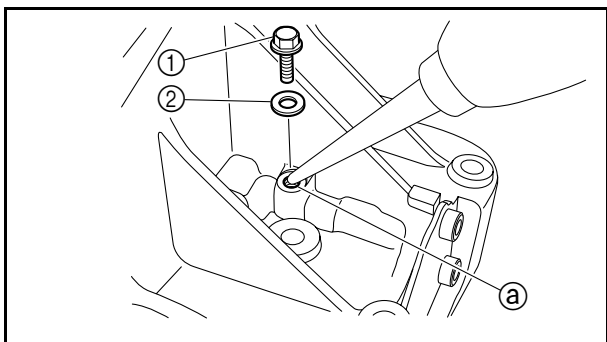
Supercharger installation

1. Lubricate:

- Supercharger impeller shaft

NOTICE

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



Lubricating steps:

1. Remove the bolt ① and gasket ②.

NOTICE

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

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

TIP

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

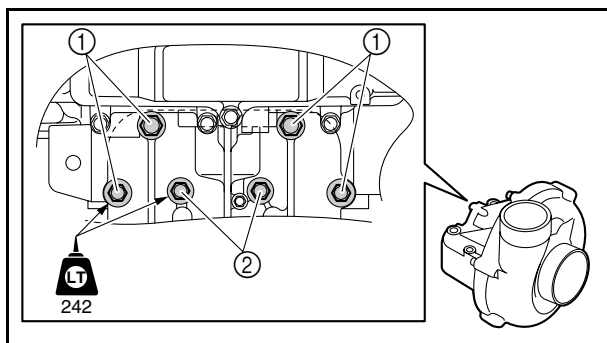
SAE: 10W-30, 10W-40, 20W-40, or 20W-50

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:

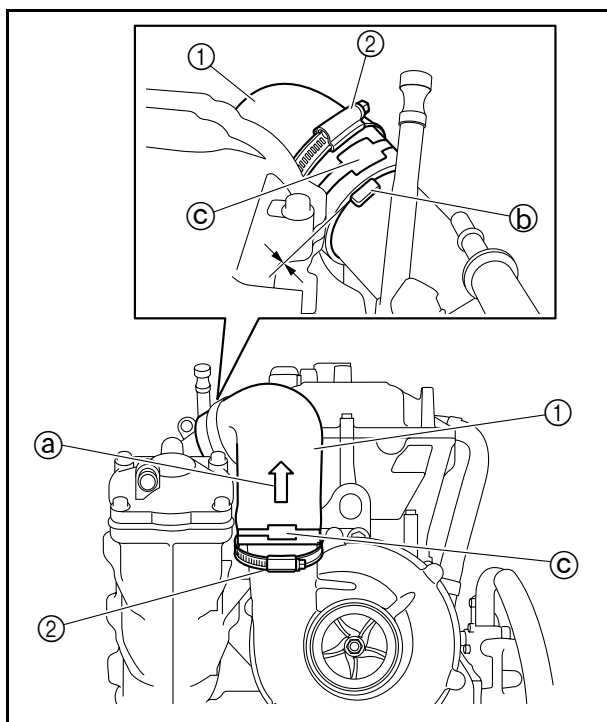
- Supercharger

TIP

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 pipe installation

1. Install:

- Air cooler intake pipe ①

Installation steps:

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

TIP

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

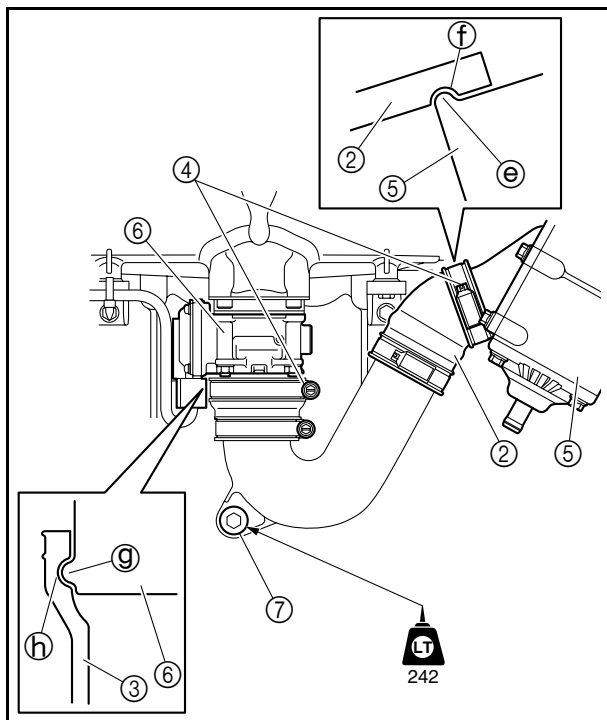
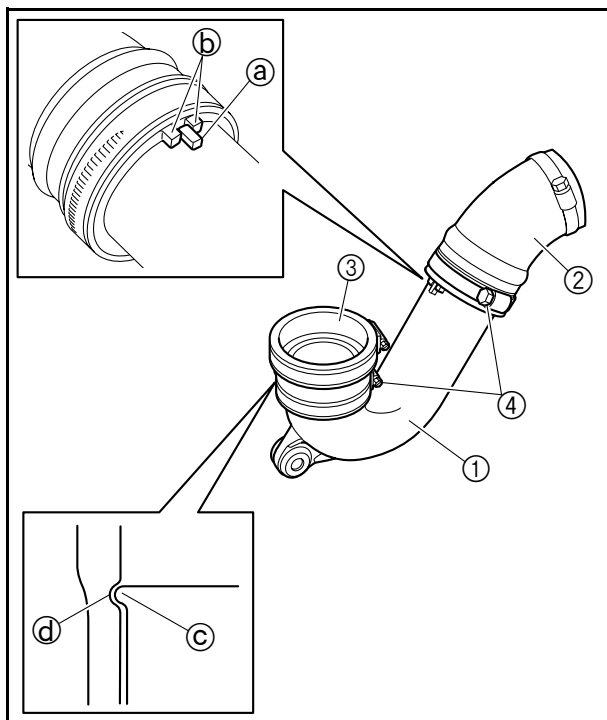
2. Tighten each clamp ② to the specified torque.

TIP

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



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



Boost pipe installation

1. Install:

- Boost pipe ①
- Joint 1 ②
- Joint 2 ③

Installation steps:

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

TIP

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

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



Joint 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.

TIP

- Fit the lip ⑤ on the air cooler assembly ⑤ into the groove ⑥ in the joint 1 ②.
- Fit the lip ⑨ on the throttle body assembly ⑥ into the groove ⑧ in the joint 2 ③.

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



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

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

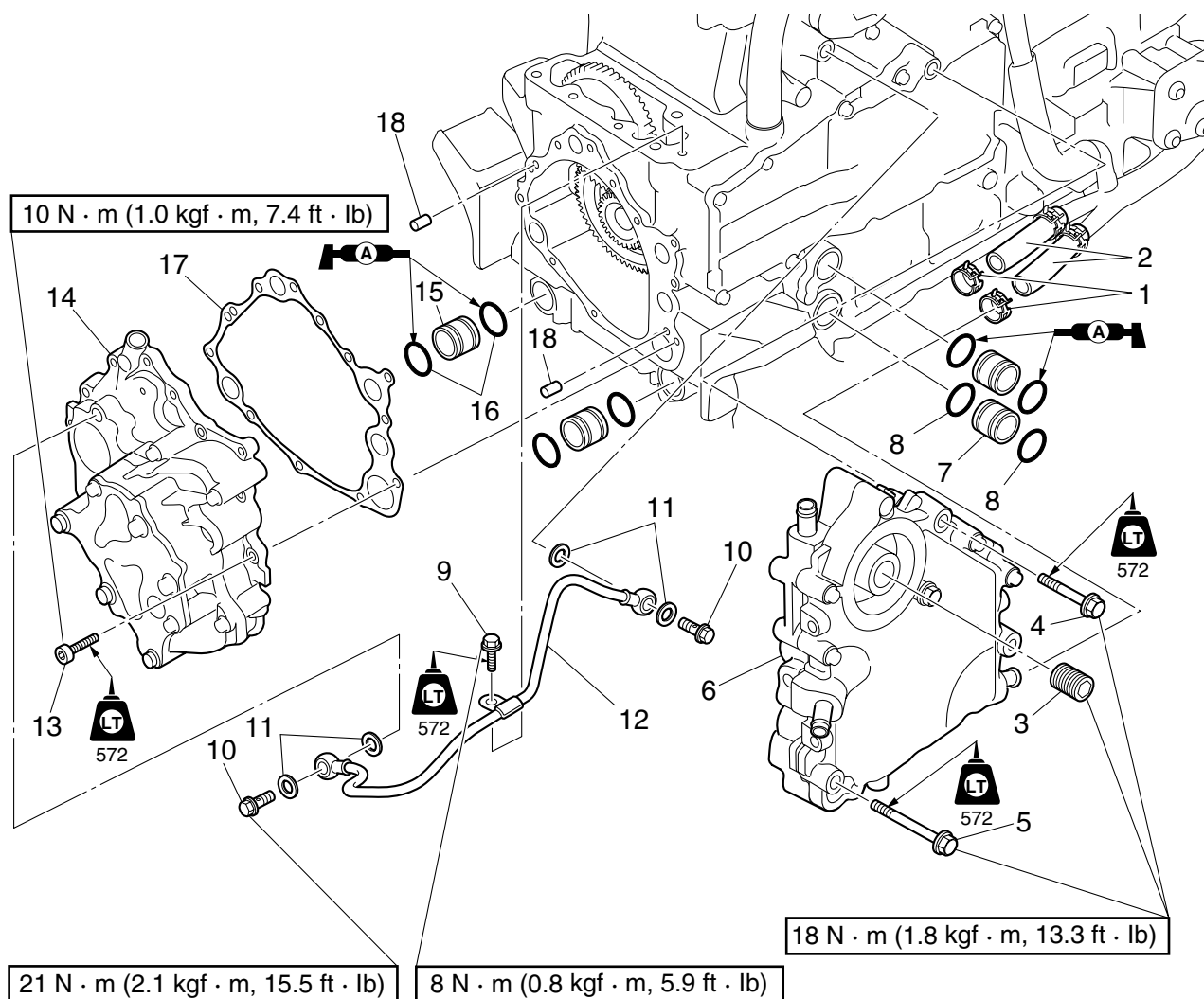


Boost pipe bolt:
20 N·m (2.0 kgf·m, 14.8 ft·lb)
LOCTITE 242

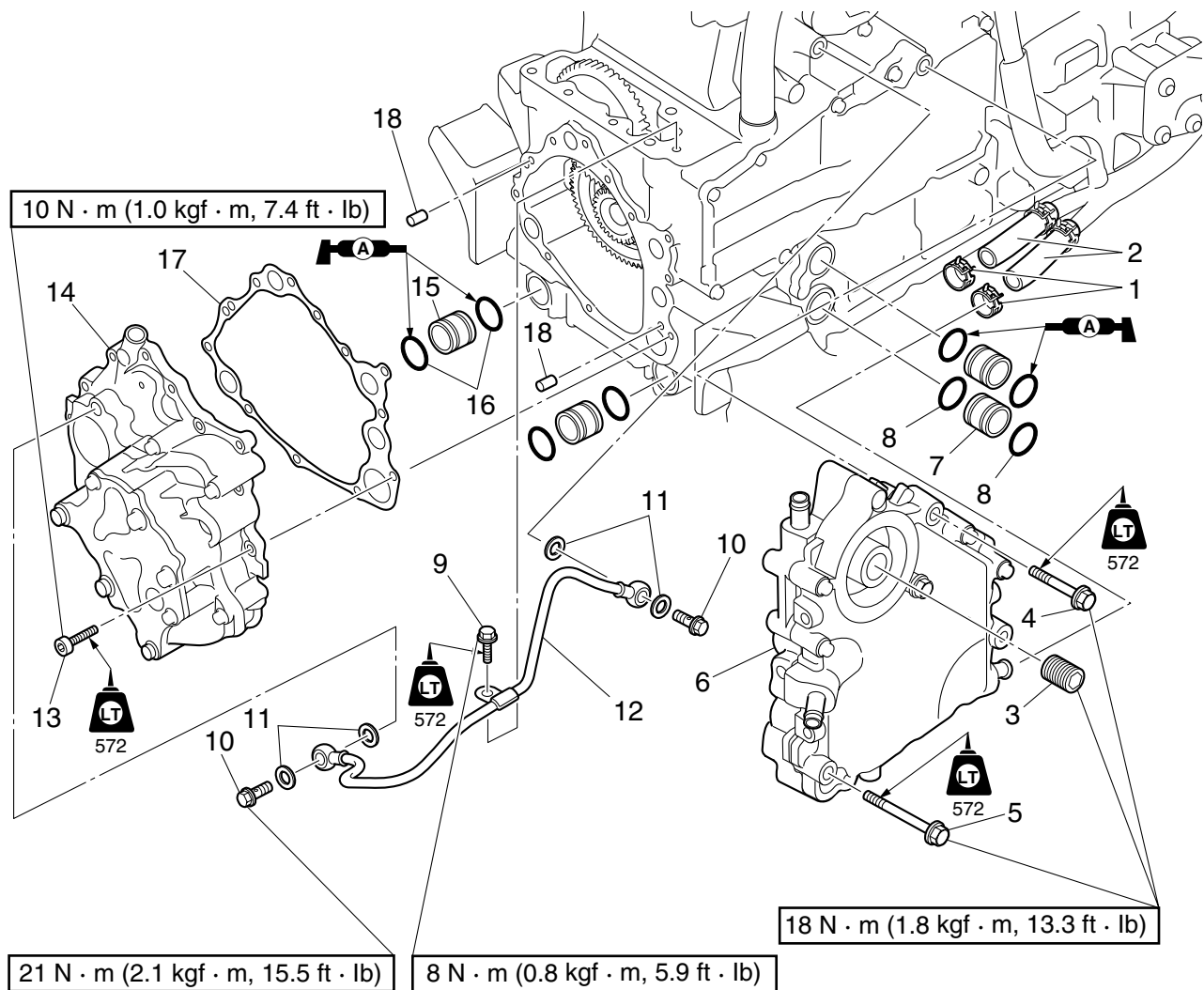


Oil cooler, oil pump assembly, and drive gear

Oil cooler and oil pump assembly removal



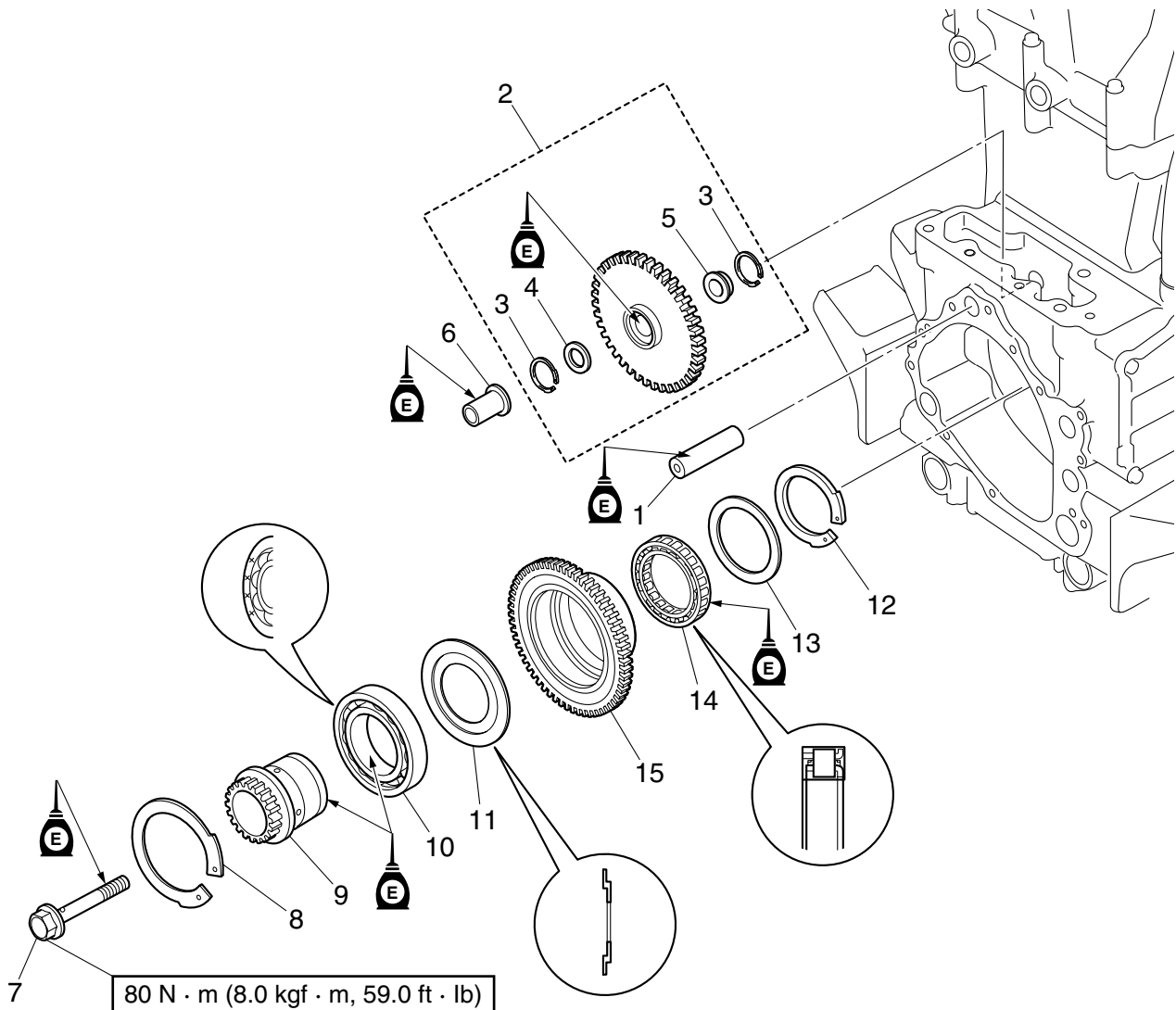
Step	Part name	Q'ty	Remarks
1	Clamp	2	
2	Cooling water hose	2	
3	Oil filter bolt	1	
4	Bolt	1	M8 × 55 mm
5	Bolt	2	M8 × 70 mm
6	Oil cooler assembly	1	
7	Connector	2	
8	O-ring	4	Not reusable
9	Bolt	1	M6 × 12 mm
10	Bolt	2	M10 × 21 mm
11	Gasket	4	Not reusable



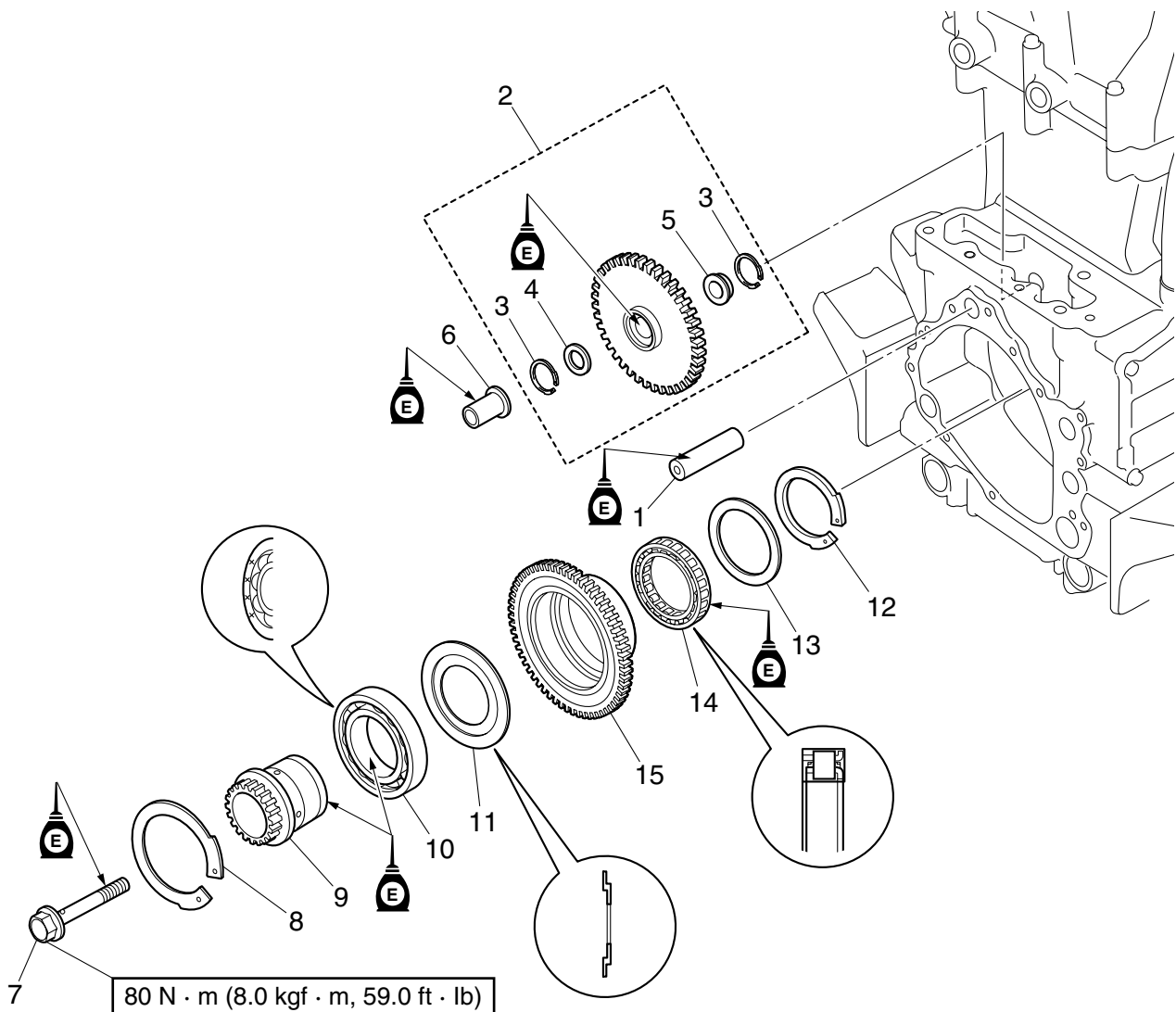
Step	Part name	Q'ty	Remarks
12	Oil pipe	1	
13	Bolt	12	M6 × 20 mm
14	Oil pump assembly	1	
15	Connector	2	
16	O-ring	4	Not reusable
17	Gasket	1	Not reusable
18	Dowel pin	2	



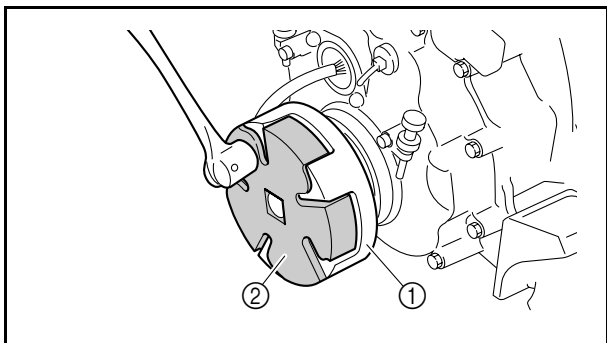
Drive gear removal



Step	Part name	Q'ty	Remarks
1	Shaft	1	Left-hand threads M12 × 58 mm
2	Idle gear assembly	1	
3	Circlip	2	
4	Washer	1	
5	Washer	1	
6	Collar	1	
7	Bolt	1	
8	Circlip	1	
9	Oil pump drive gear	1	
10	Bearing	1	



Step	Part name	Q'ty	Remarks
11	Washer	1	
12	Circlip	1	
13	Washer	1	
14	Drive gear clutch	1	
15	Supercharger drive gear	1	



Drive gear assembly removal

1. Remove:

- Drive gear assembly

Removal steps:

1. Hold the drive coupling (1) with the special service tool (2).



Coupler wrench (2):
90890-06729

2. Remove the drive gear assembly bolt (3).

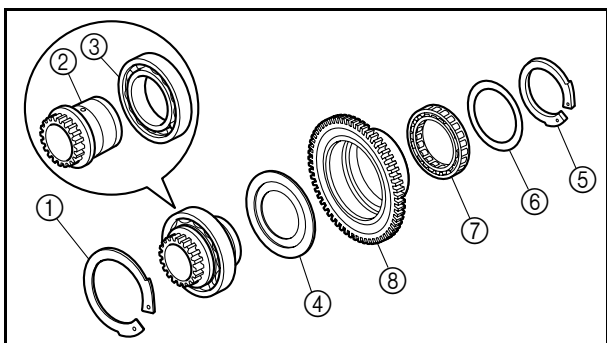
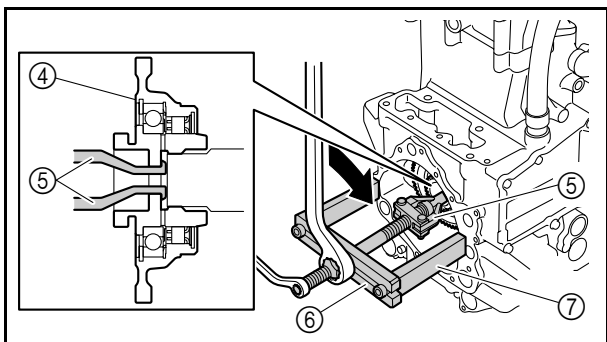
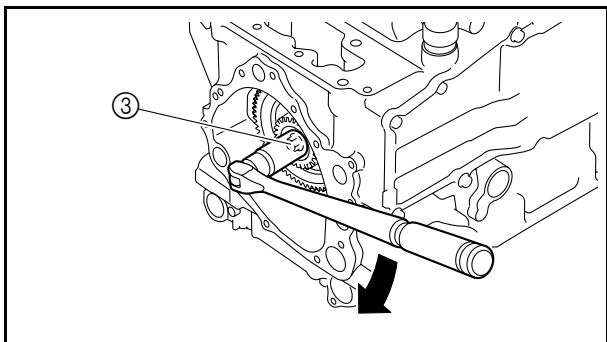
TIP

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

3. Remove the drive gear assembly (4) with the special service tools.



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



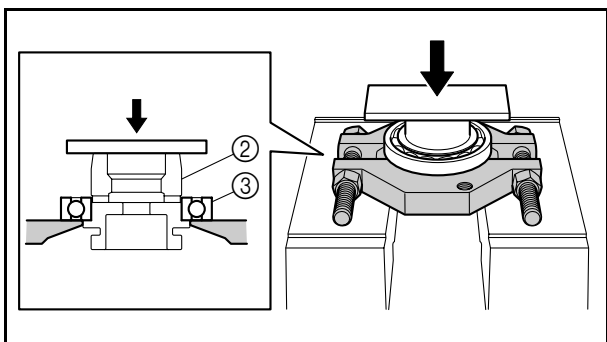
Drive gear disassembly

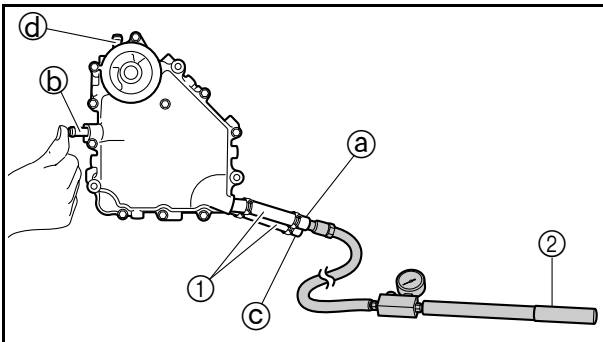
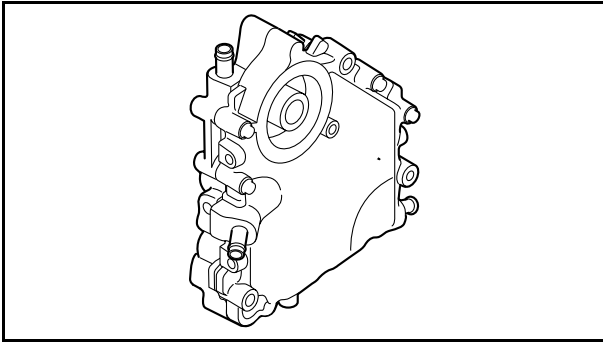
1. Remove:

- 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

NOTICE

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:

TIP

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

- Connect the special service tool ② to the inlet of the oil cooler water passage ③.



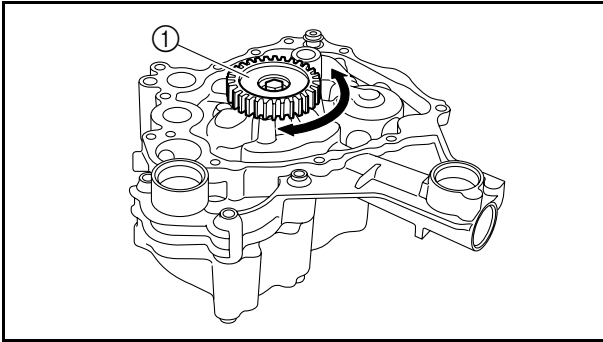
Leakage tester ②:
90890-06840

- Cover the outlet of the oil cooler water passage ④ with a finger.
- Apply the specified positive pressure and check that the pressure is maintained.



Specified positive pressure (water passage):
200 kPa (2.0 kgf/cm², 28.5 psi)

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



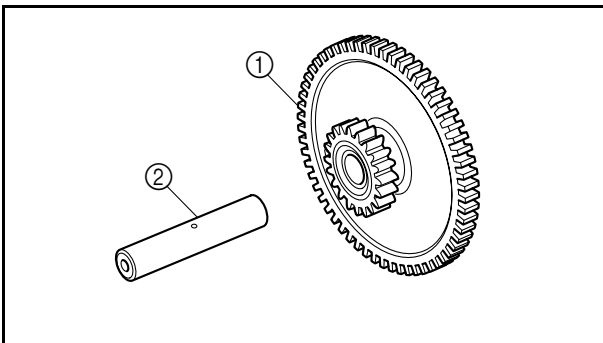
Oil pump assembly check

NOTICE

The oil pump assembly should not be disassembled.

1. Check:

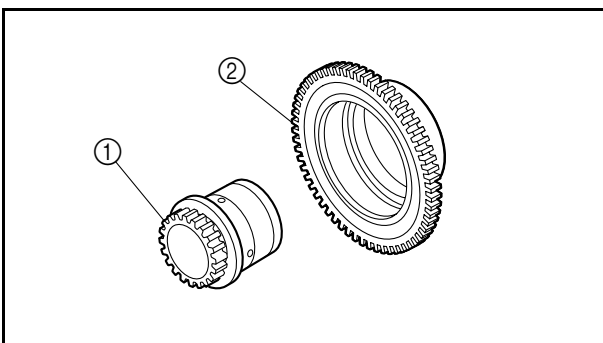
- Oil pump assembly
- Oil pump driven gear ①
Cracks/damage → Replace the oil pump assembly.
- Oil pump operation
Rough movement → Replace the oil pump assembly.



Idle gear check

1. Check:

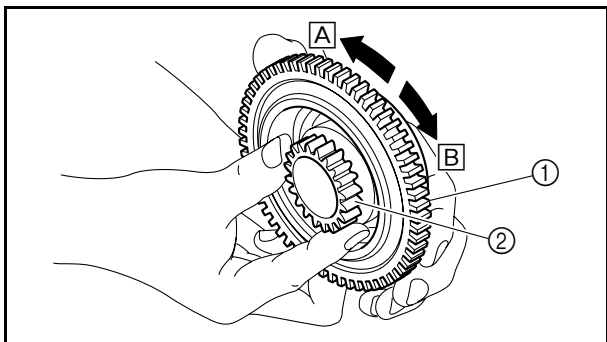
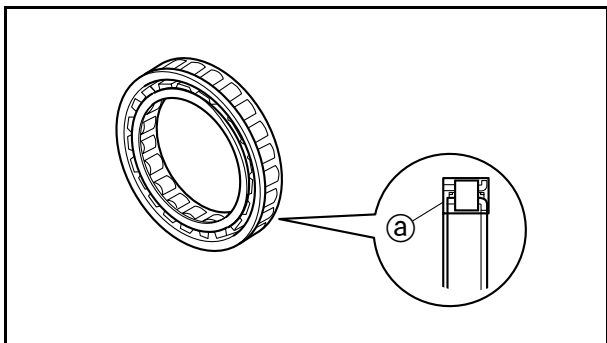
- Idle gear ①
Cracks/damage → Replace the idle gear assembly.
- Shaft ②
Bends/wear → Replace the shaft.



Drive gear check

1. Check:

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



Drive gear clutch check

1. Check:

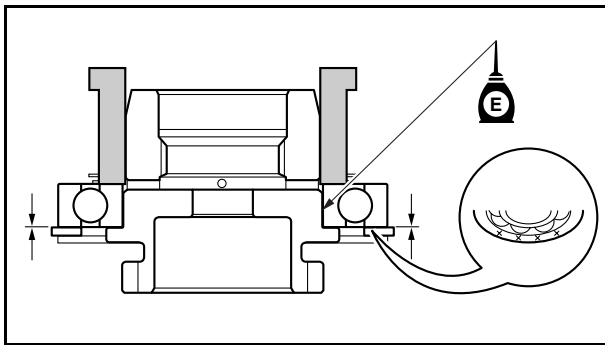
- Drive gear clutch
Cracks/damage → Replace the drive gear clutch.
- Drive gear clutch operation
Does not operate properly → Replace the drive gear clutch.

NOTICE

- Make sure that the drive gear clutch is installed so that the side ③ is facing toward the supercharger drive gear as shown.
- Check the drive gear clutch operation after installation.

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:

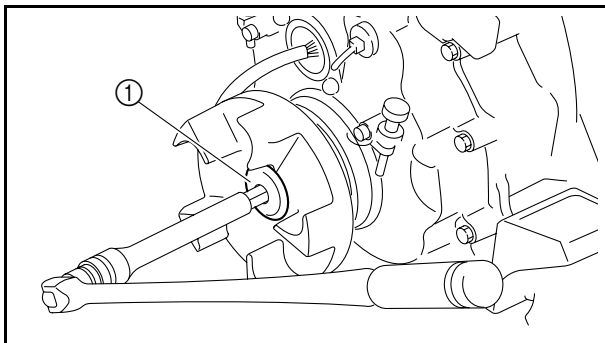
- Bearing

TIP

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



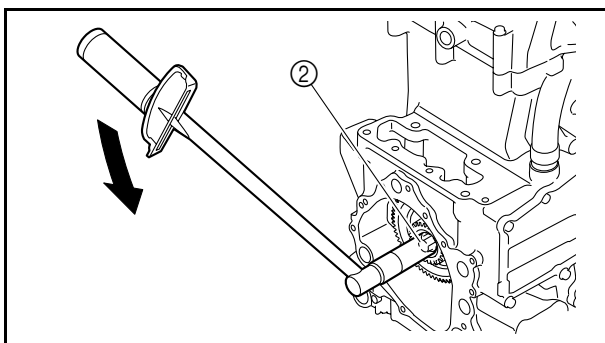
Drive gear assembly installation

1. Install:

- Drive gear assembly

Installation steps:

1. Hold the holder ①.



2. Apply engine oil to the threads of the drive gear assembly bolt ②.

3. Tighten the drive gear assembly bolt ②.

TIP

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)



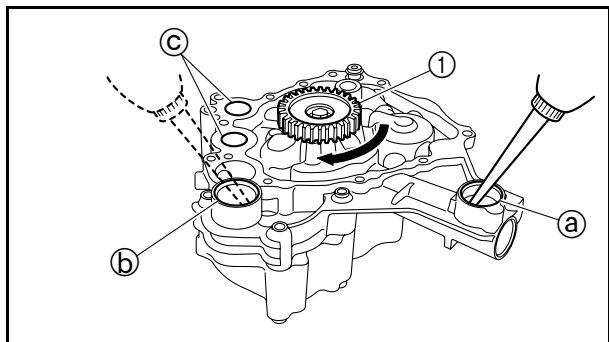
Oil pump assembly installation

1. Fill:

- Oil pump assembly

NOTICE

Make 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).

TIP

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:

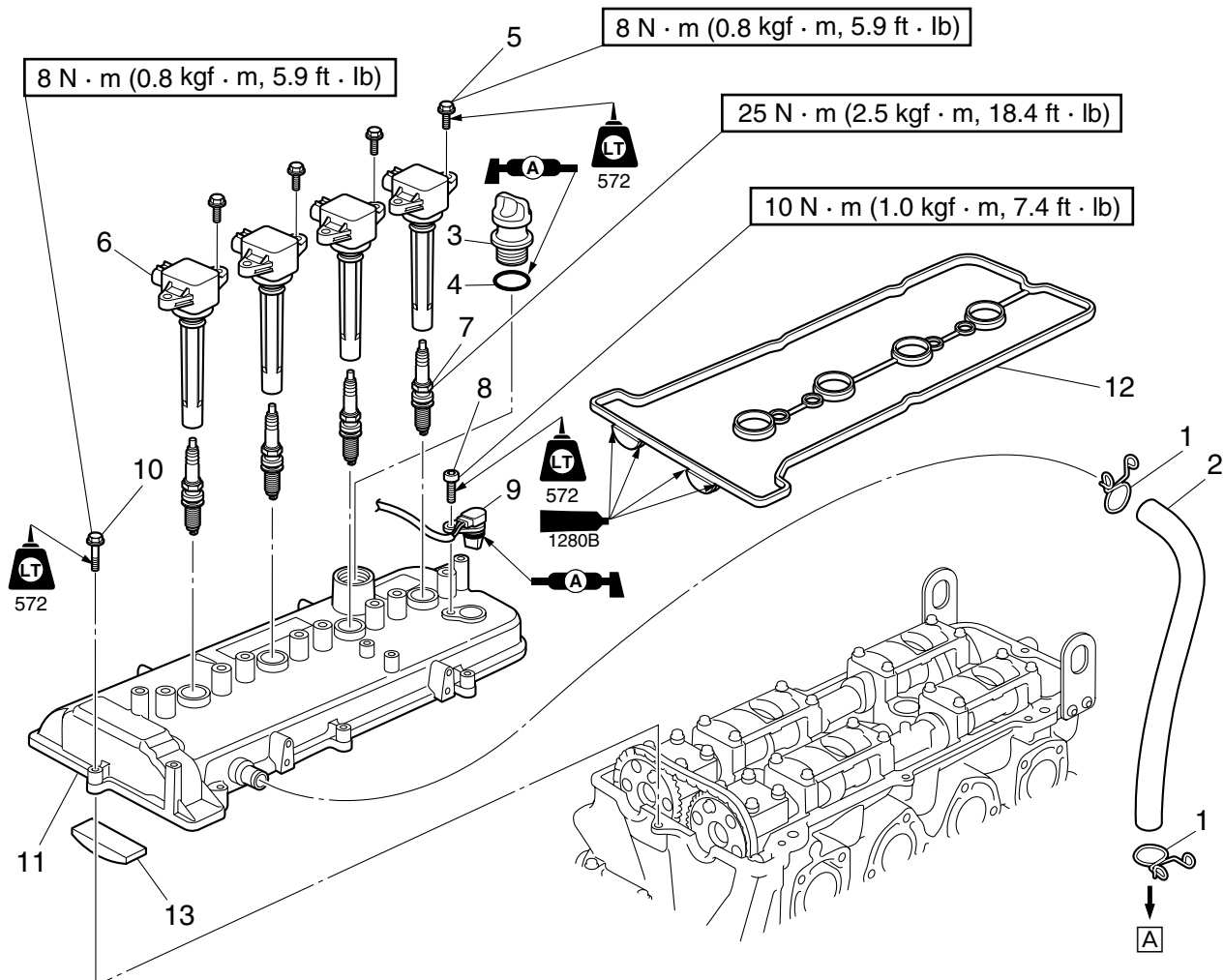
- Oil pump assembly



Oil pump assembly bolt:
10 N·m (1.0 kgf·m, 7.4 ft·lb)
LOCTITE 572

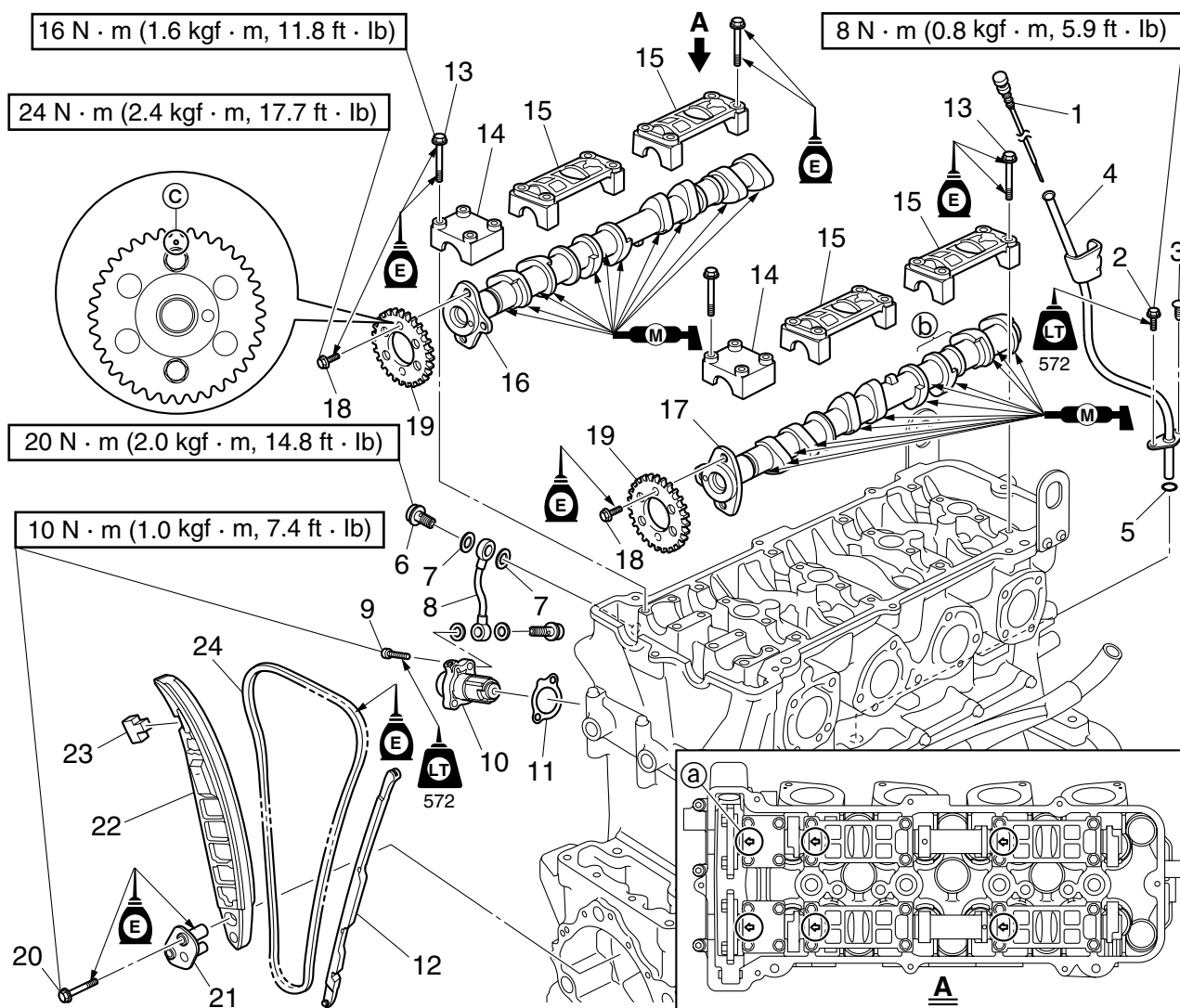
Camshaft

Cylinder head cover removal

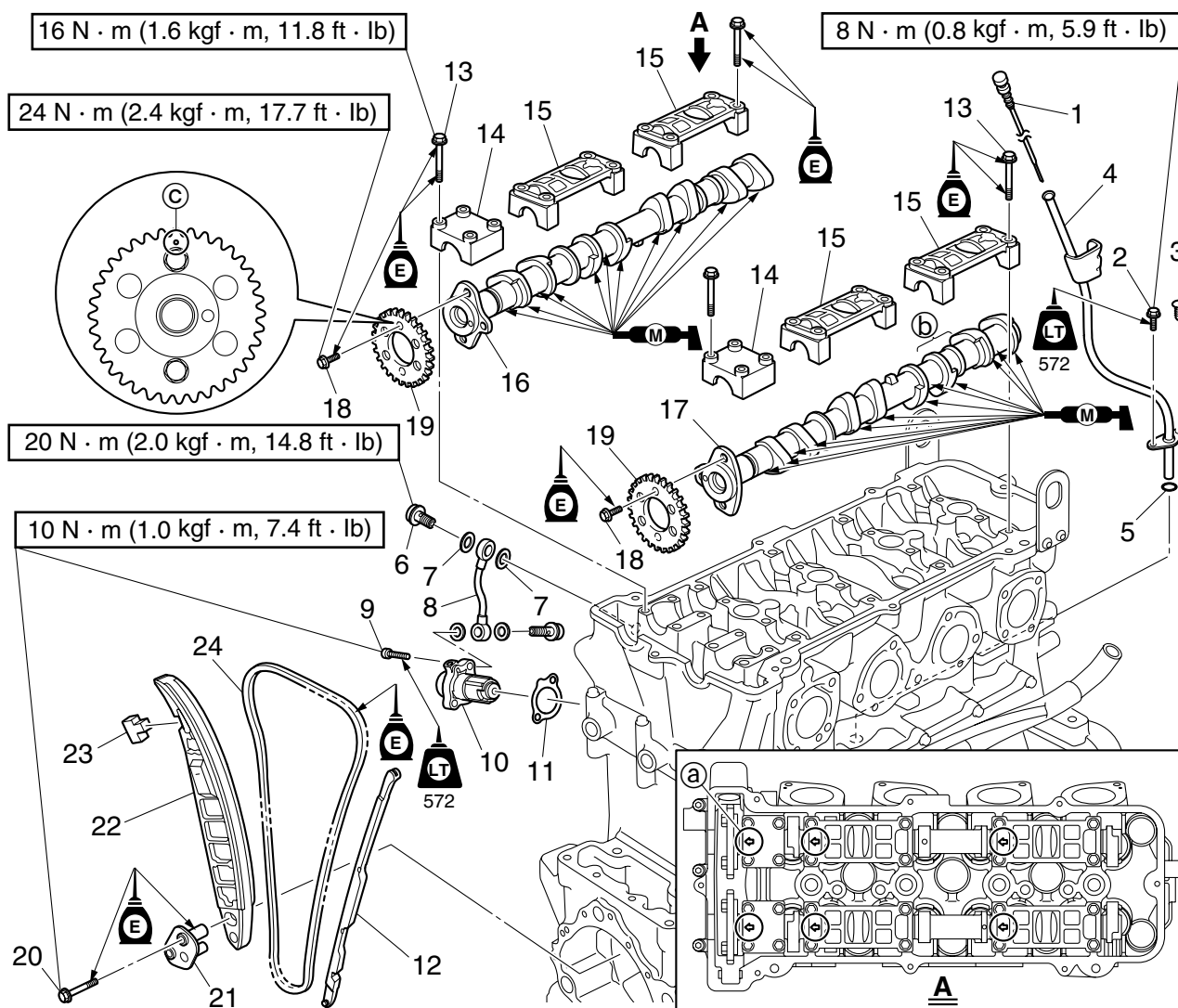


Step	Part name	Q'ty	Remarks
1	Clamp	2	[A] To cylinder block
2	Breather hose	1	
3	Oil filler cap	1	
4	O-ring	1	Not reusable
5	Bolt	8	M6 × 20 mm
6	Ignition coil	4	
7	Spark plug	4	
8	Bolt	1	M6 × 15 mm
9	Cam position sensor	1	
10	Bolt	8	M6 × 30 mm
11	Cylinder head cover	1	
12	Gasket	1	Not reusable
13	Timing chain guide (upper)	1	

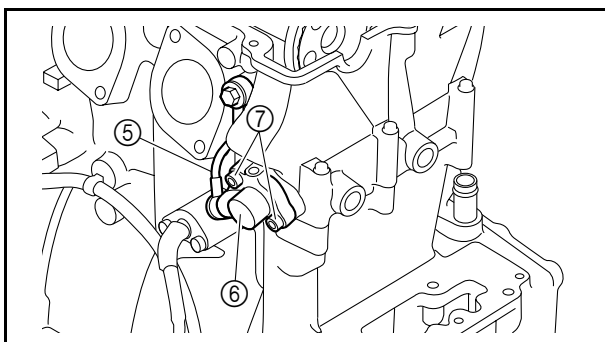
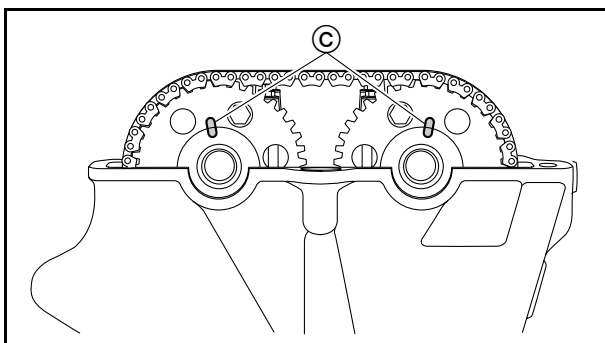
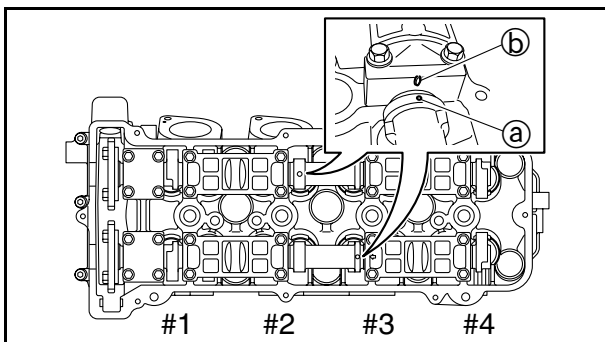
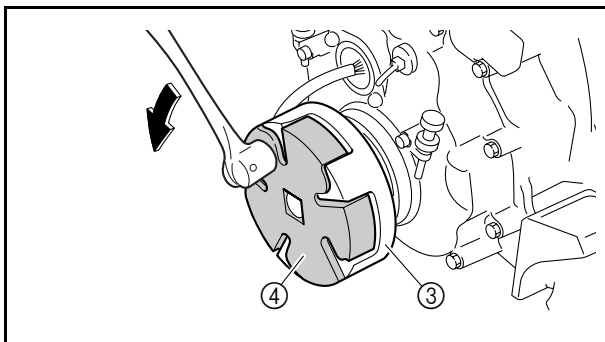
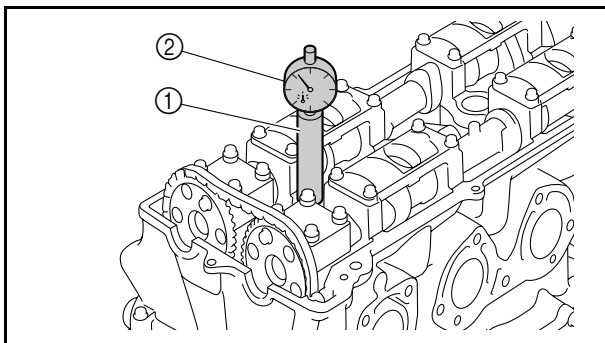
Camshaft and timing chain removal



Step	Part name	Q'ty	Remarks
1	Oil level gauge	1	
2	Bolt	1	M6 × 14 mm
3	Plug	1	
4	Oil level pipe	1	
5	O-ring	1	Not reusable
6	Bolt	2	M10 × 21 mm
7	Gasket	4	Not reusable
8	Oil pipe	1	
9	Bolt	2	M6 × 25 mm
10	Timing chain tensioner	1	
11	Gasket	1	Not reusable
12	Timing chain guide (exhaust side)	1	
13	Bolt	24	M7 × 45 mm



Step	Part name	Q'ty	Remarks
14	Camshaft cap	2	Ⓐ Arrow mark
15	Camshaft cap	4	Ⓐ Arrow mark
16	Intake camshaft	1	
17	Exhaust camshaft	1	Ⓑ Yellow paint
18	Bolt	4	M7 × 11 mm
19	Camshaft sprocket	2	Ⓒ Punch mark
20	Bolt	2	M6 × 30 mm
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.

TIP

Make sure that the punch marks (a) on the camshafts are aligned with the alignment marks (b) on the camshaft caps.



Coupler wrench ④:
90890-06729

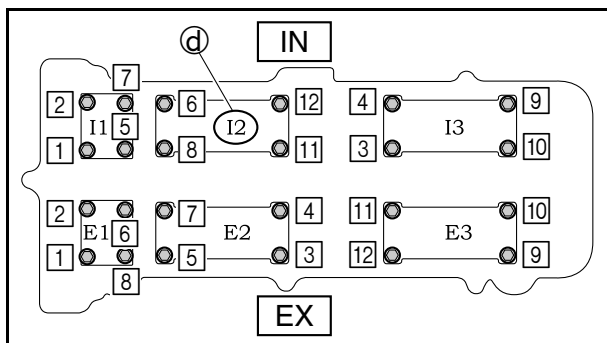
3. Make alignment marks (c) on the camshaft sprockets and camshafts.

4. Remove the oil pipe (5), gaskets, timing chain tensioner (6) and gasket.

TIP

Loosen the timing chain tensioner bolts (7) evenly.

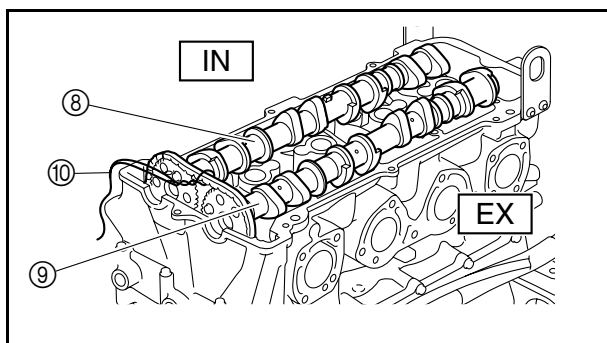
5. Remove the timing chain guide (exhaust side).



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

TIP

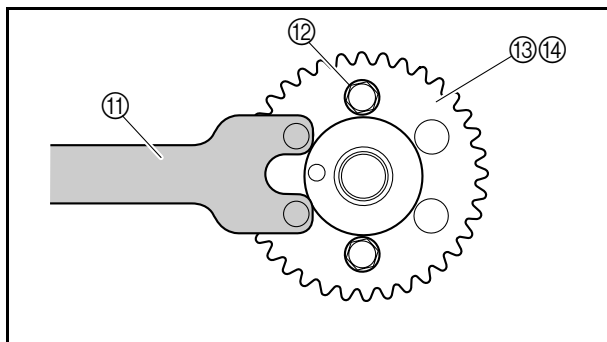
- For reference during installation, put identification marks ㉔ on the camshaft caps.
- Gradually loosen the camshaft cap bolts.



7. Remove the intake camshaft ⑧ and exhaust camshaft ⑨.

TIP

To prevent the timing chain from falling into the crankcase, secure it with a wire ⑩.



8. Hold each camshaft sprocket with the special service tool ⑪, and then loosen the bolts ⑫.



Camshaft wrench ⑪:
90890-06724

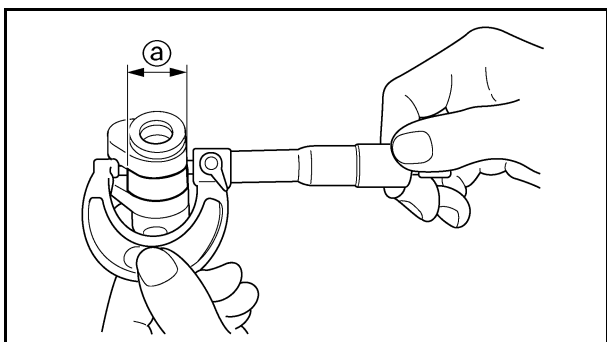
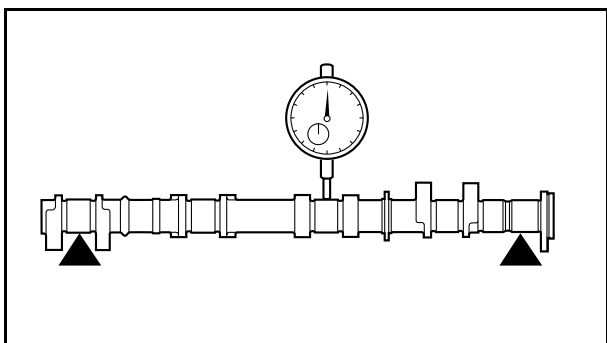
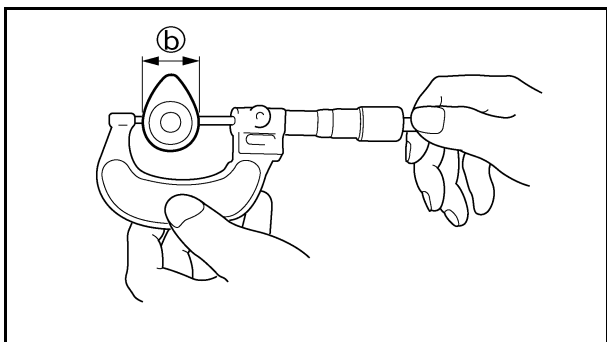
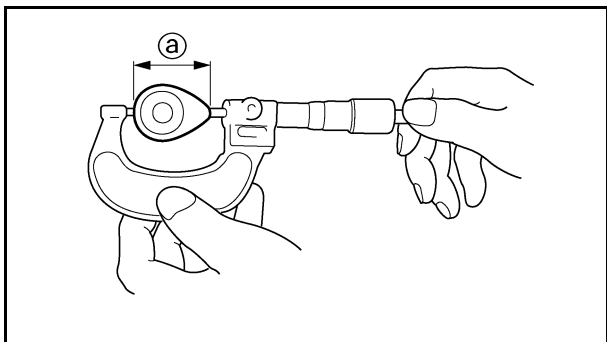
9. Remove the exhaust camshaft sprocket ⑬ and intake camshaft sprocket ⑭.



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.



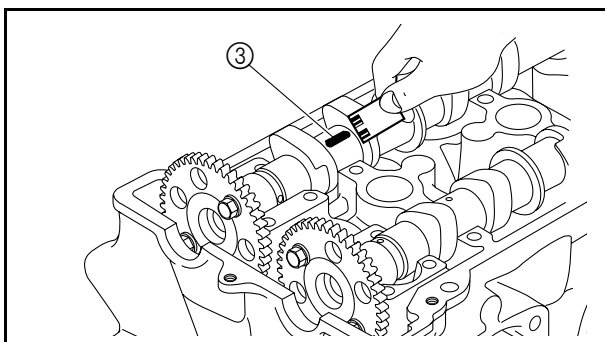
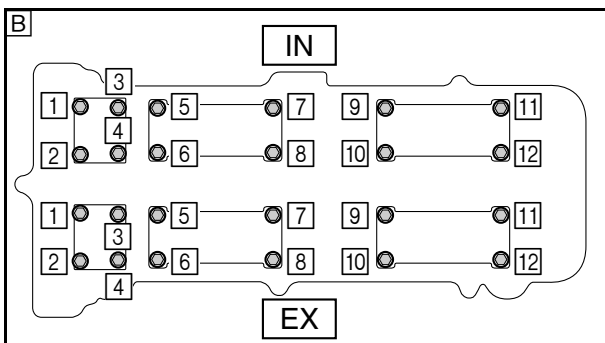
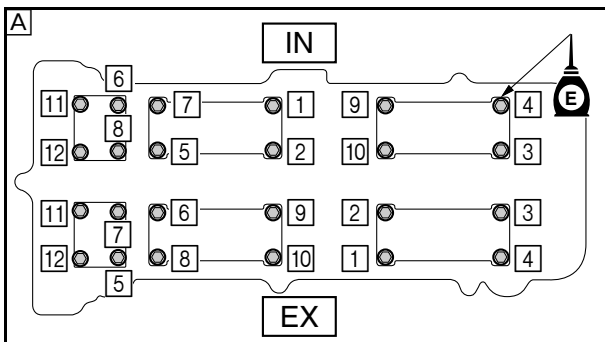
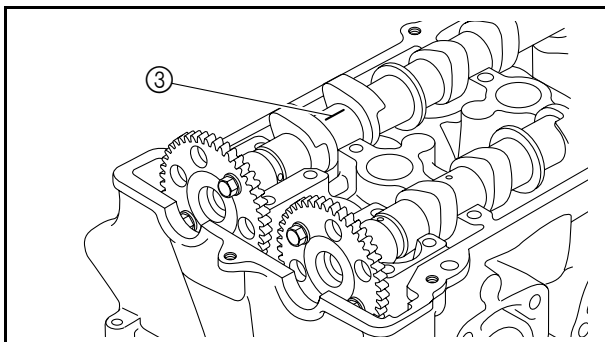
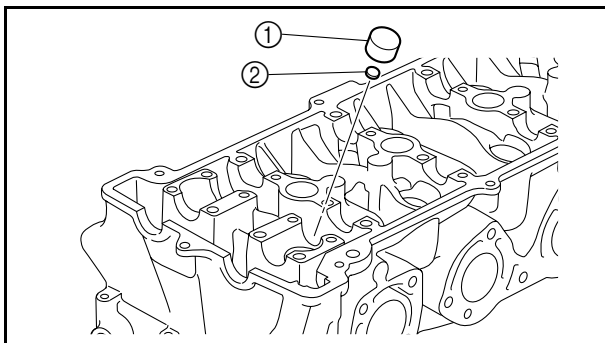
Camshaft runout limit:
0.015 mm (0.0006 in)

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:

- Remove the valve lifters ① and valve pads ②.

TIP

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

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

TIP

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

- Install the camshaft caps.
- Apply engine oil to the threads of the camshaft cap bolts.
- Tighten the camshaft cap bolts until the camshaft caps contact the cylinder head.

TIP

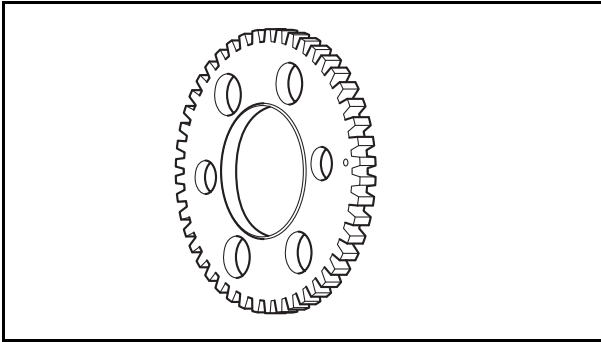
- Gradually tighten the camshaft cap bolts in the sequence shown **A**.
- Make sure to keep the camshafts level.
- Do not turn the camshafts when measuring the camshaft-journal-to-camshaft-cap clearance with the Plastigauge.

- Tighten the camshaft cap bolts to the specified torque in the sequence shown **B**.



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

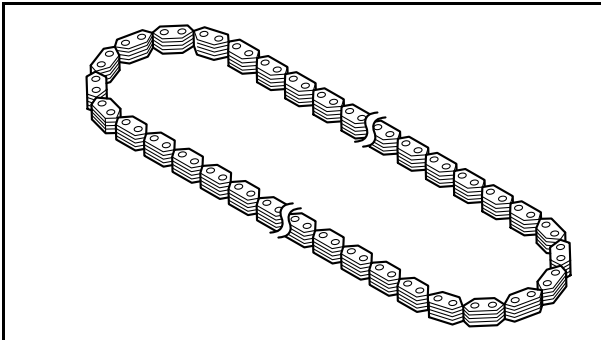
- Remove the camshaft caps, and then measure the width of the Plastigauge ③.



Camshaft sprocket check

1. Check:

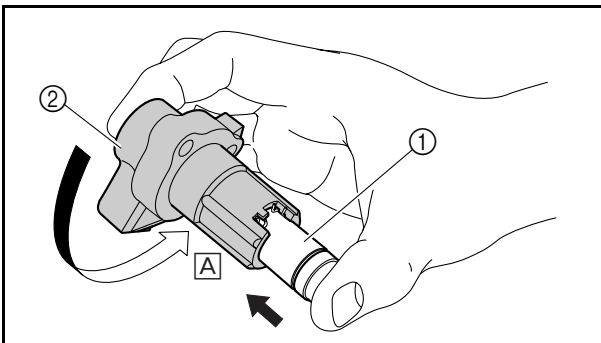
- Camshaft sprockets
Damage/wear → Replace the camshaft sprockets and timing chain as a set.



Timing chain check

1. Check:

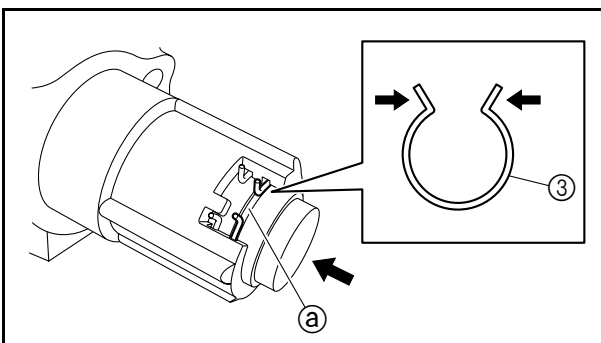
- Timing chain
Damage/stiffness/wear → Replace the timing chain and camshaft sprockets as a set.



Timing chain tensioner check

1. Check:

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



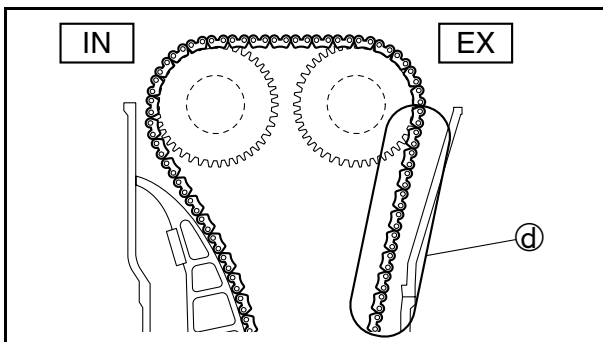
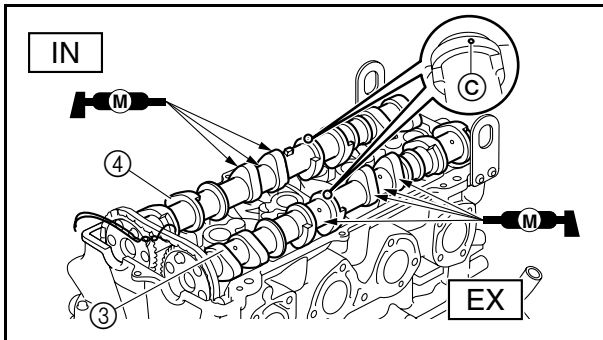
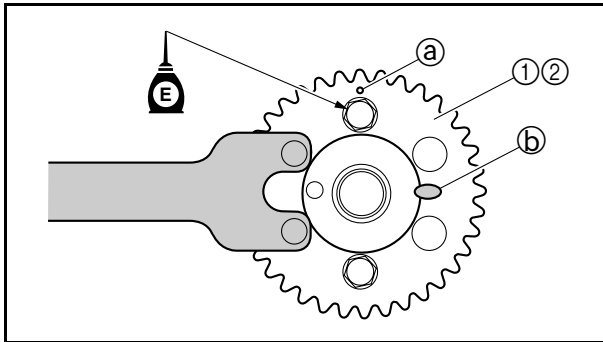
Checking steps:

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.

TIP

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.

TIP

- Install each camshaft sprocket with the punch mark ③ facing outward.
- When installing an original camshaft sprocket, make sure to align the alignment marks ④ made during removal.

3. Apply engine oil to the threads of the camshaft sprocket bolts.
4. Tighten the camshaft sprocket bolt to the specified torque.



Camshaft wrench:
90890-06724

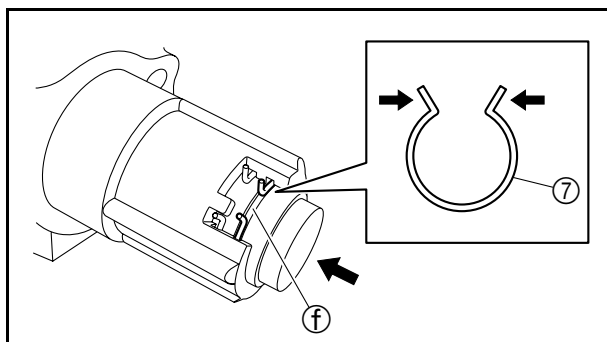
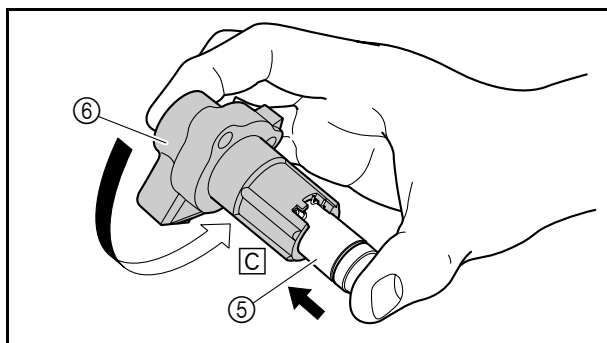
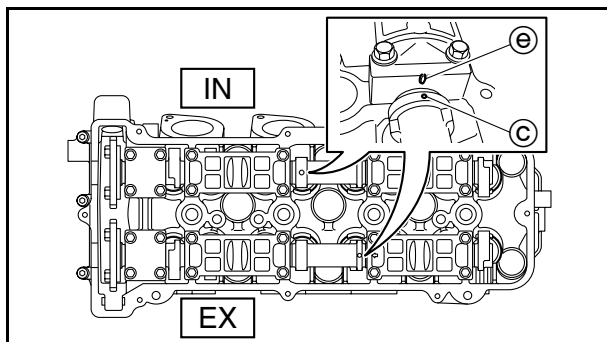
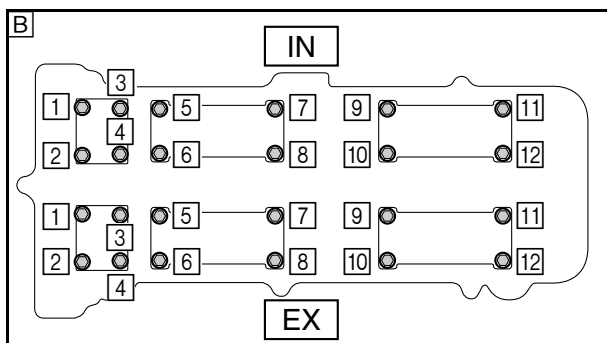
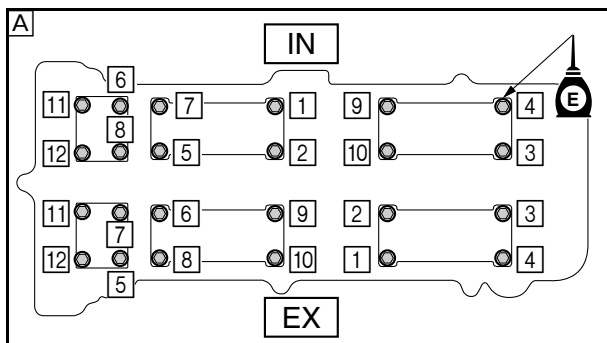


Camshaft sprocket bolt:
24 N·m (2.4 kgf·m, 17.7 ft·lb)

5. Apply molybdenum disulfide grease to the camshaft journals, camshaft journal bearings, and camshaft lobes.
6. Install the exhaust camshaft ③, and then intake camshaft ④.

TIP

- 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.



7. Install the exhaust camshaft caps and intake camshaft caps.

8. Apply engine oil to the threads of the camshaft cap bolts.

9. Tighten the camshaft cap bolts until the camshaft caps contact the cylinder head.

TIP

- Gradually tighten the camshaft cap bolts in the sequence shown **A**.
- Make sure to keep the camshafts level.

10. Tighten the camshaft cap bolts to the specified torque in the sequence shown **B**.



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

11. Install the timing chain guide (exhaust side).

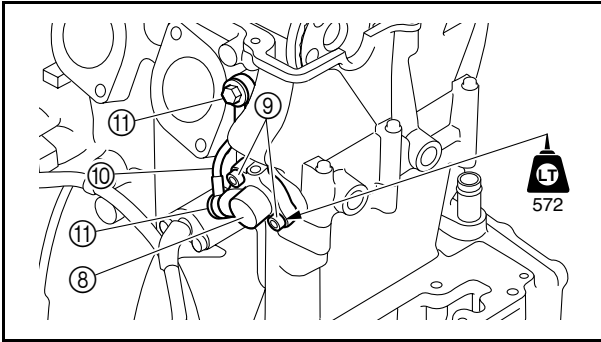
12. Remove the wire from the timing chain.

TIP

Make sure that the punch marks (C) on the camshafts are aligned with the alignment marks (E) on the camshaft caps.

13. While pushing the timing chain tensioner rod (5), turn the timing chain tensioner housing (6) in direction C until the groove (f) in the tensioner rod is aligned with the snap ring (7).

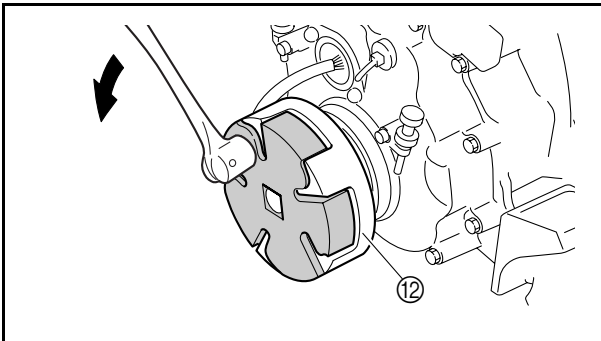
14. While squeezing the end of the snap ring (7) so that it fits into the groove (f) in the timing chain tensioner rod (5), slowly release the tensioner rod until it is locked in place.



15. Install the gasket and the timing chain tensioner (8) onto the cylinder block, and then temporarily tighten the timing chain tensioner bolts (9).
16. Install the oil pipe (10) to the cylinder block and timing chain tensioner, and then temporarily tighten the oil pipe bolts (11).
17. Tighten the oil pipe bolts (11) to the specified torque, and then tighten the timing chain tensioner bolts (9) to the specified torque.



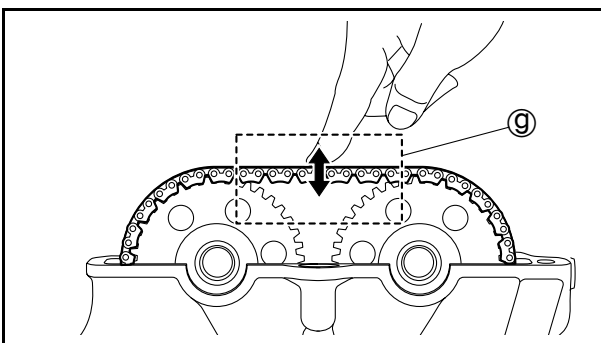
Oil pipe bolt:
20 N·m (2.0 kgf·m, 14.8 ft·lb)
Timing chain tensioner bolt:
10 N·m (1.0 kgf·m, 7.4 ft·lb)
LOCTITE 572



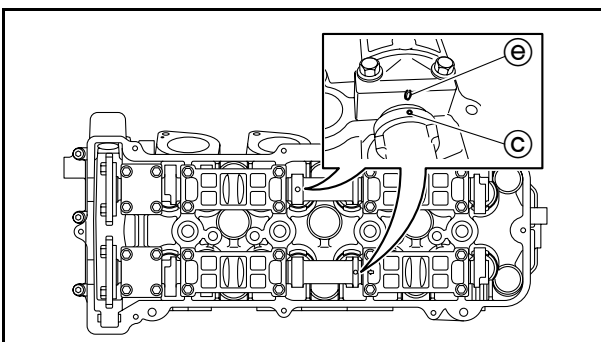
18. Turn the drive coupling (12) counterclockwise 2 turns.

TIP

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



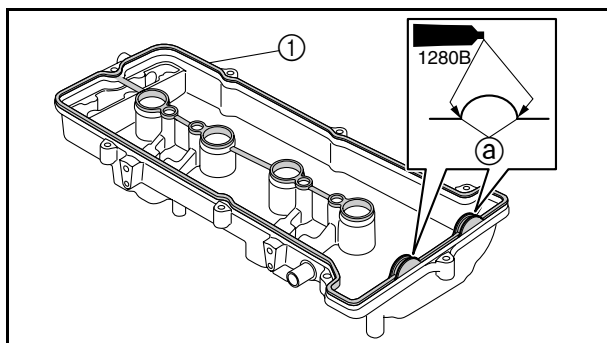
19. Check that the portion (9) of the timing chain is taut. If the timing chain is not taut, turn the drive coupling slightly clockwise, and then check that the timing chain is taut again.



20. Position piston #1 at TDC.
Refer to "Camshaft removal."

TIP

Make sure that the punch marks (C) on the camshaft are aligned with the alignment marks (E) on the camshaft caps. If the marks are not aligned, reinstall the camshafts.



Cylinder head cover installation

1. Install:

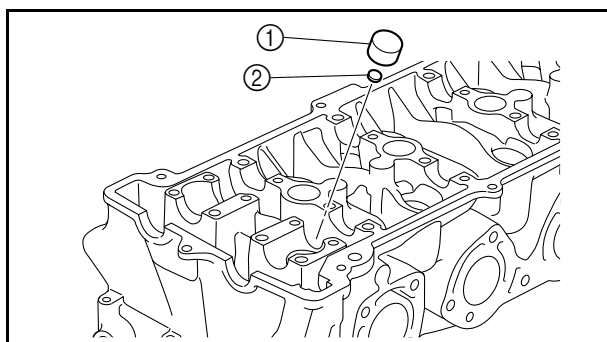
- Cylinder head cover

Installation steps:

1. Apply sealant onto the locations ① of the new cylinder head cover gasket ①.
2. 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

TIP

To measure the valve clearance, refer to “Valve clearance measurement” in Chapter 3.

1. Adjust:

- Valve clearance

Adjustment steps:

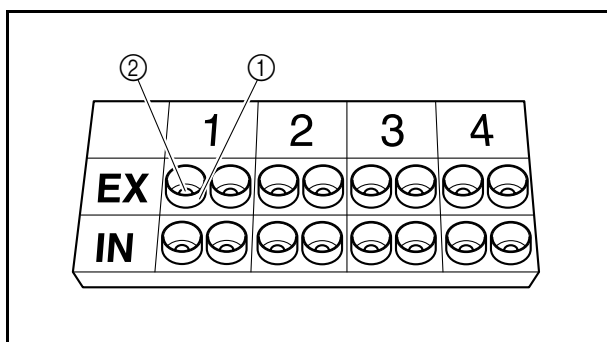
1. Remove the camshaft.
Refer to “Camshaft removal.”
2. Remove the valve lifter ① and valve pad ②.

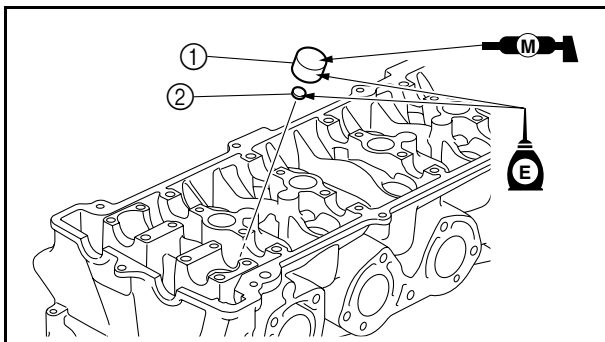
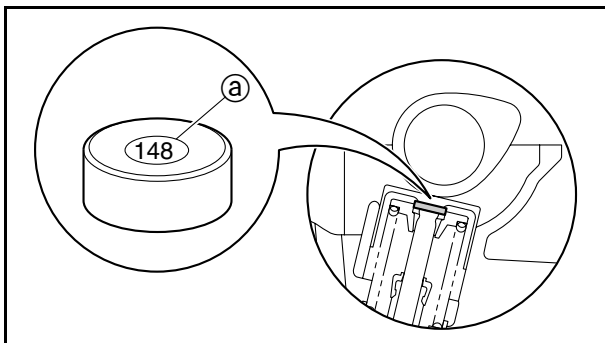
TIP

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



**TIP**

The thickness (a) 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.

TIP

Make sure that the valve lifter turns smoothly.

9. Install the camshafts, timing chain, and camshaft caps.
 Refer to "Camshaft installation."

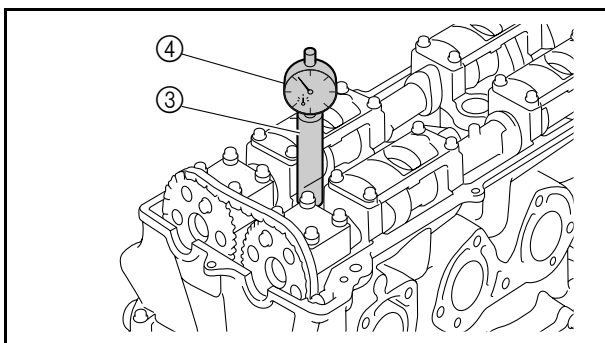


Camshaft cap bolt:
 16 N·m (1.6 kgf·m, 11.8 ft·lb)

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



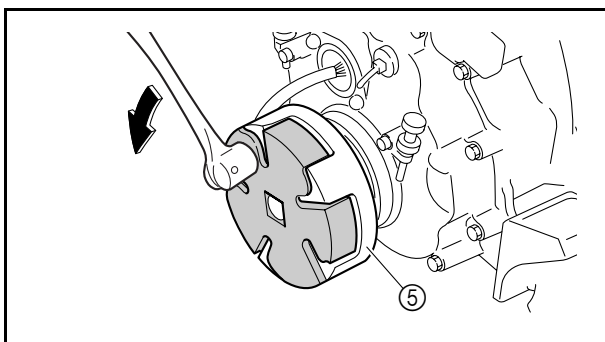
Gauge stand (3):
 90890-06725
 Dial gauge stand set:
 YB-06585
 Dial gauge (4):
 YU-03097/90890-01252
 Dial gauge needle:
 90890-06584

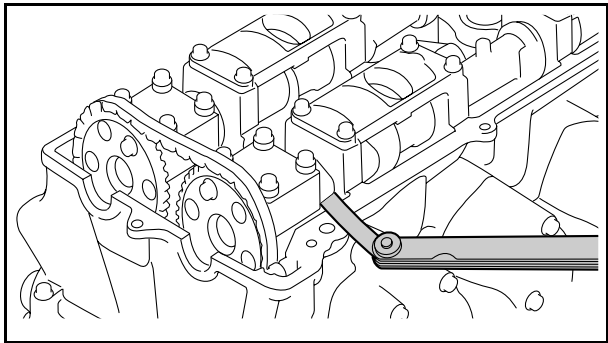
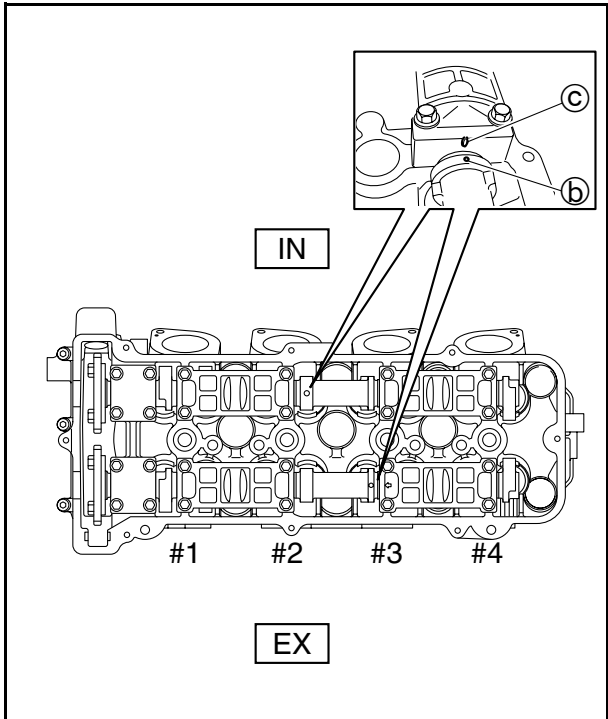


11. Position piston #1 at TDC by turning the drive coupling (5) with the special service tool.



Coupler wrench:
 90890-06729





TIP _____
 Make sure that the punch marks ⑥ on the camshafts are aligned with the alignment marks ③ on the camshaft caps.

12. Measure the intake and exhaust valve clearances of the specified cylinders.

	#1	#2	#3	#4
IN	○		○	
EX	○	○		

○ :Specified cylinder

13. Install the dial gauge needle and special service tools ③ and ④ into spark plug hole #4.
14. Position piston #4 at TDC by turning the drive coupling 360° counterclockwise with the special service tool.
15. Measure the intake and exhaust valve clearances of the specified cylinders.

	#1	#2	#3	#4
IN		○		○
EX			○	○

○ :Specified cylinder



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	215
0.15–0.19			120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220
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	225
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)

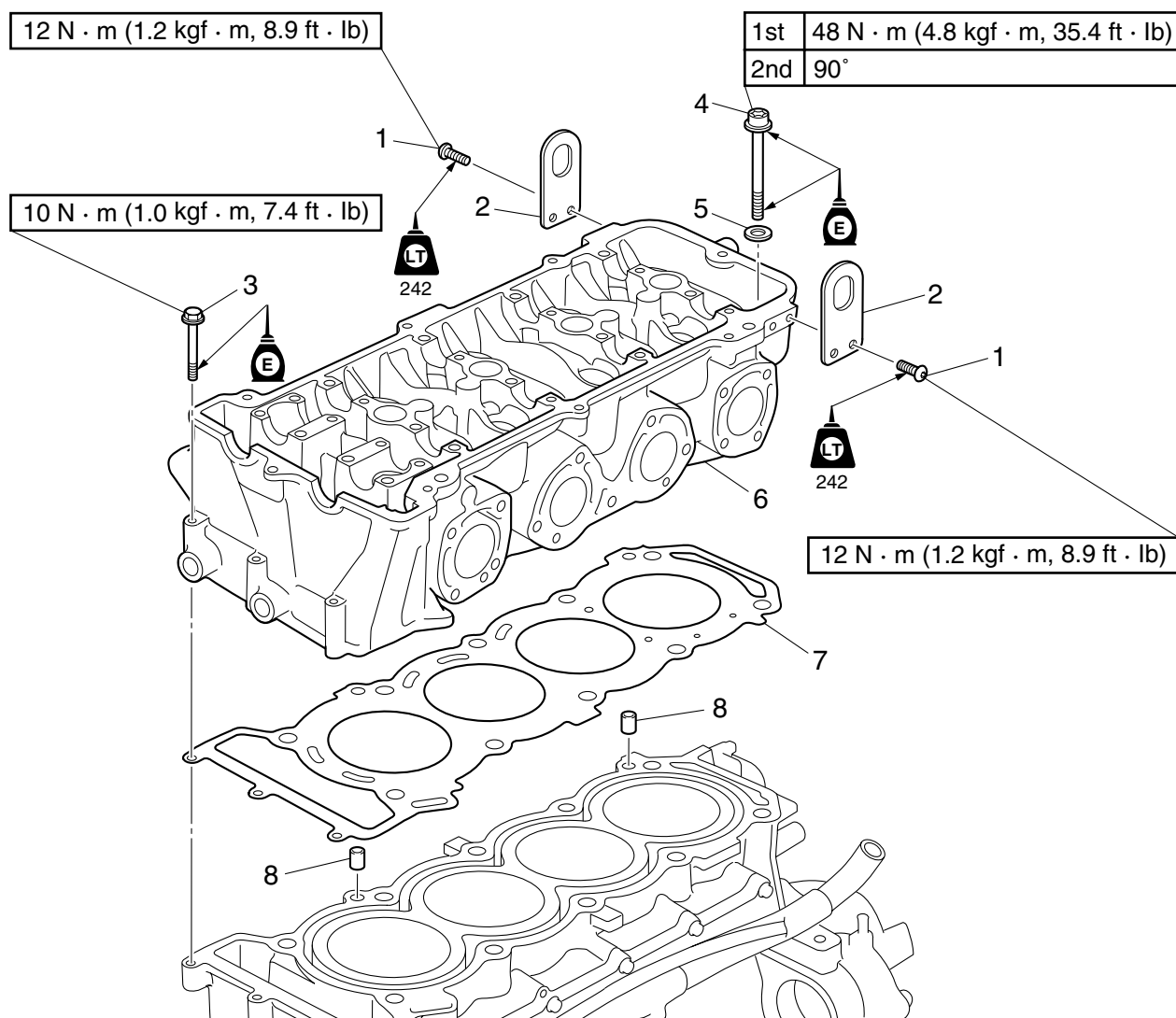
- Round off the original valve pad number 168 to 170 (thickness = 1.70 mm).

- Select the new valve pad number using the valve pad selection table.

New valve pad number is 185 (thickness = 1.85 mm)

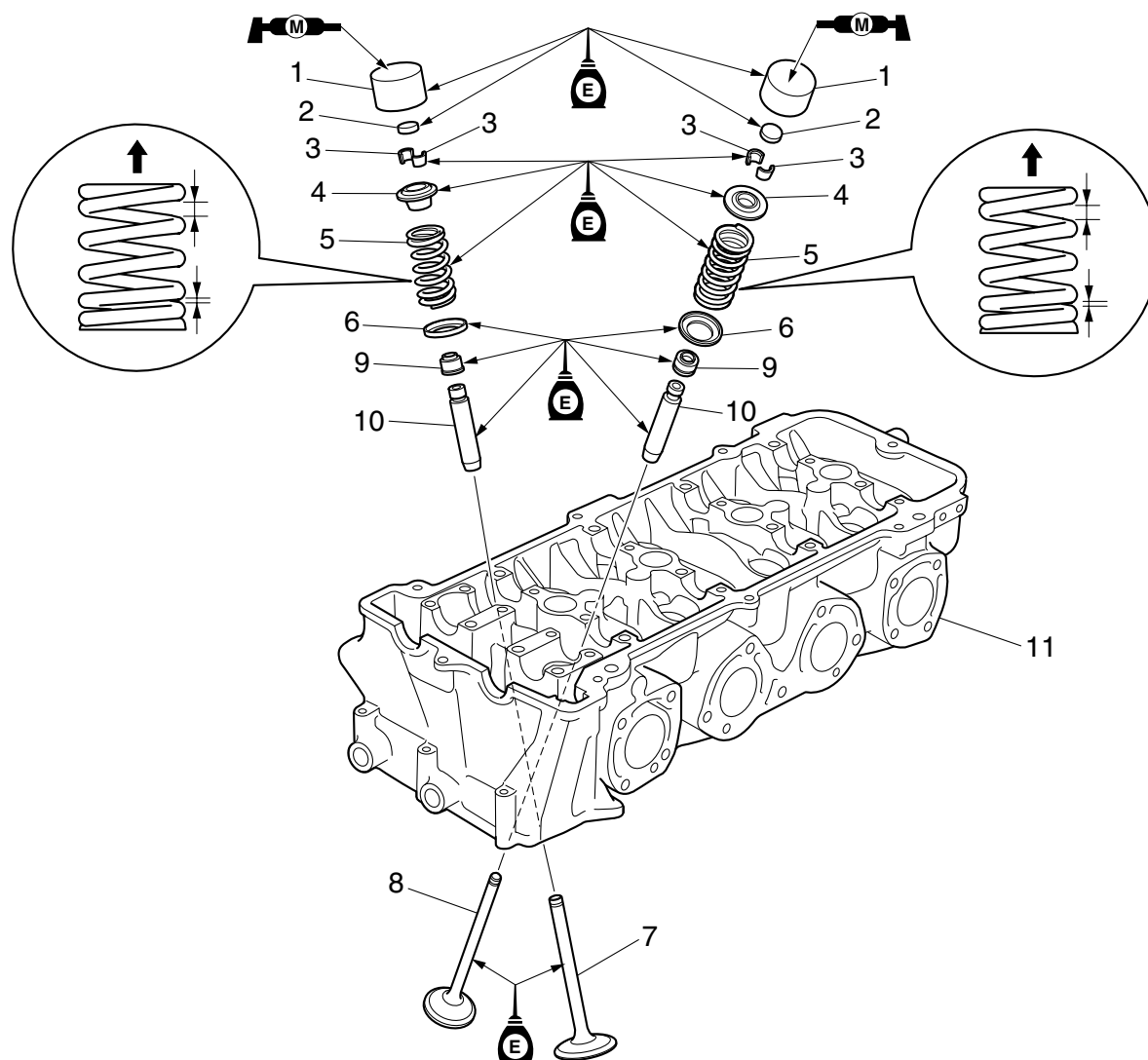
Cylinder head

Cylinder head assembly removal

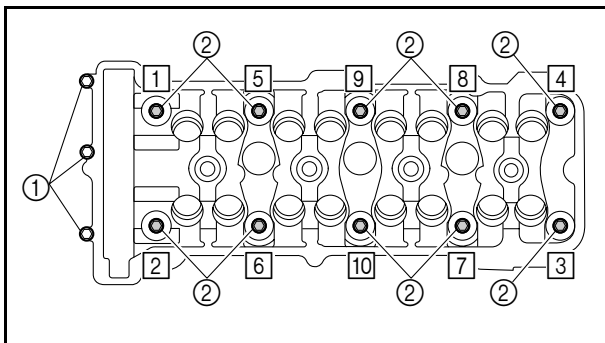


Step	Part name	Q'ty	Remarks
1	Bolt	4	M6 × 12 mm
2	Engine hanger	2	
3	Bolt	3	M6 × 55 mm
4	Cylinder head bolt	10	Not reusable M12 × 140 mm
5	Washer	10	
6	Cylinder head assembly	1	
7	Gasket	1	Not reusable
8	Dowel pin	2	

Cylinder head disassembly



Step	Part name	Q'ty	Remarks
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	Not reusable
10	Valve guide	16	Not reusable
11	Cylinder head	1	



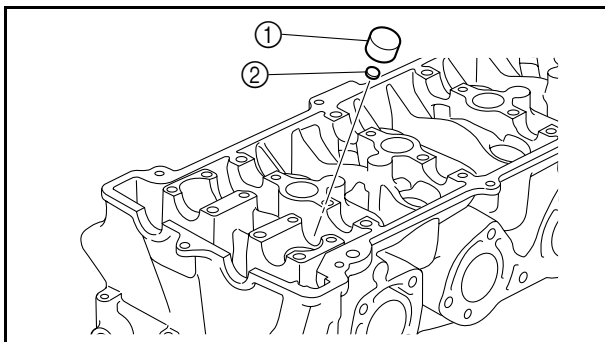
Cylinder head assembly removal

1. Remove:

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

TIP

Loosen the cylinder head bolts ② in the sequence shown.



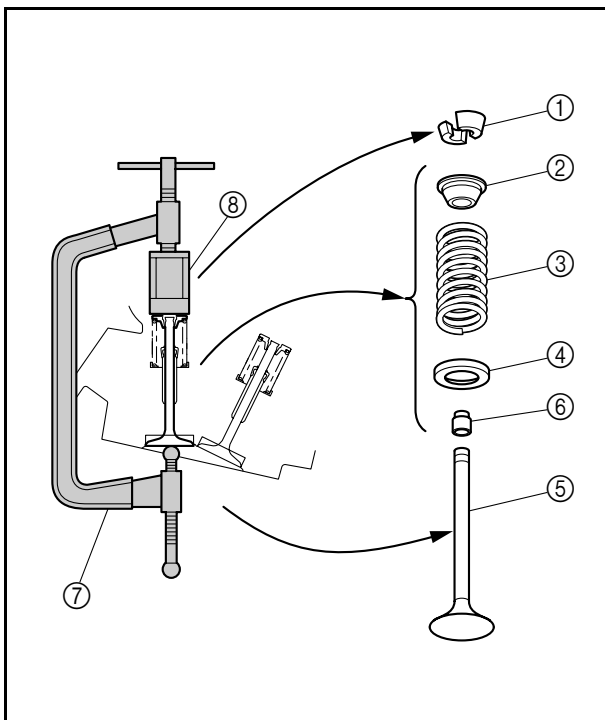
Valve removal

1. Remove:

- Valve lifter ①
- Valve pad ②

TIP

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

TIP

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

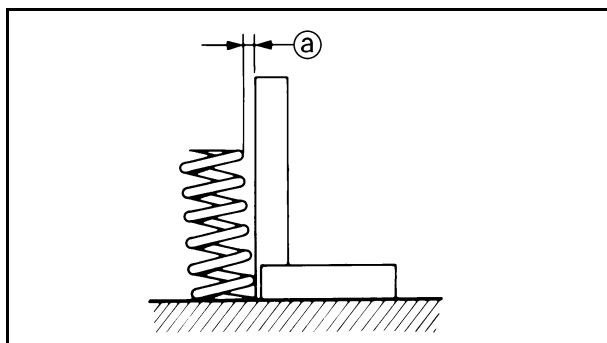
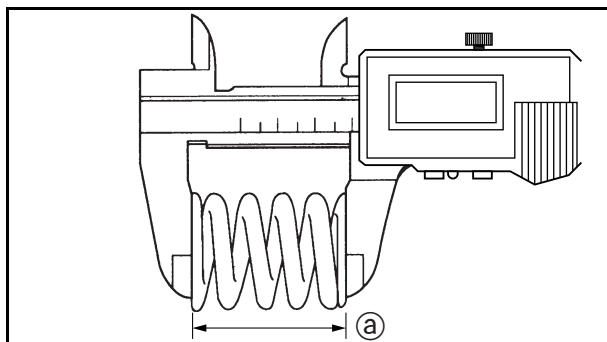
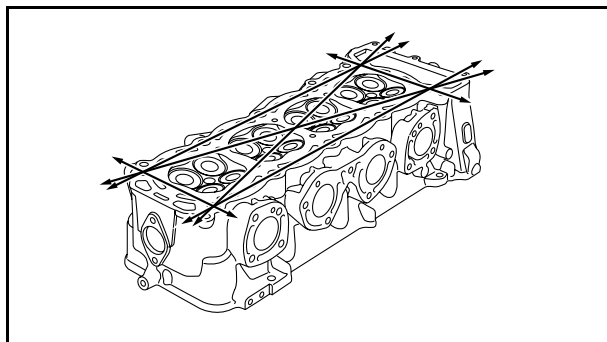
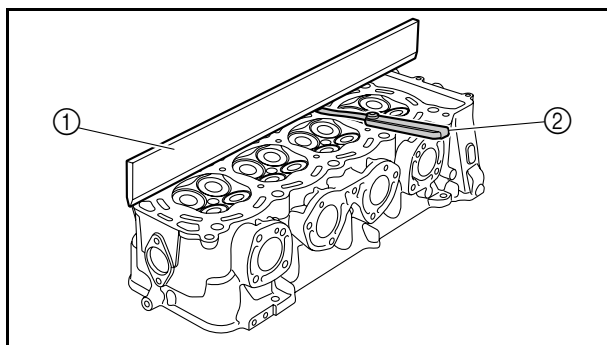
⑧:

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 ①
Out of specification → Replace the valve spring.



Valve spring free length ①:
Intake and exhaust:
45.58 mm (1.794 in)

2. Measure:

- Valve spring tilt ①
Out of specification → Replace the valve spring.



Valve spring tilt limit ①:
Intake and exhaust:
2.0 mm (0.08 in)

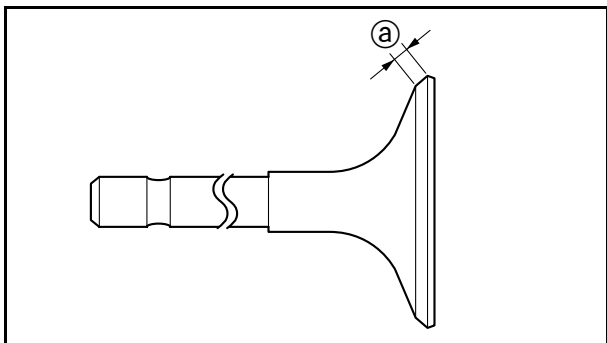
Valve check

TIP

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

1. Check:

- Valve face
Pitting → Replace the valve.

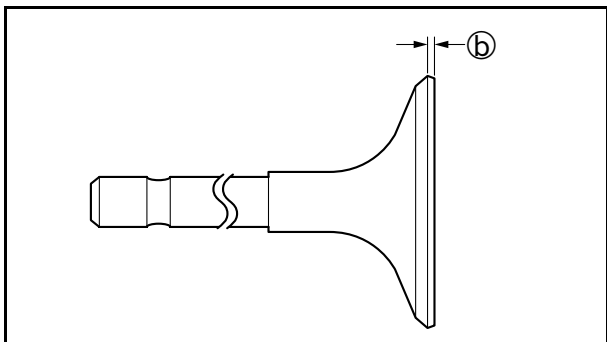


2. Measure:

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



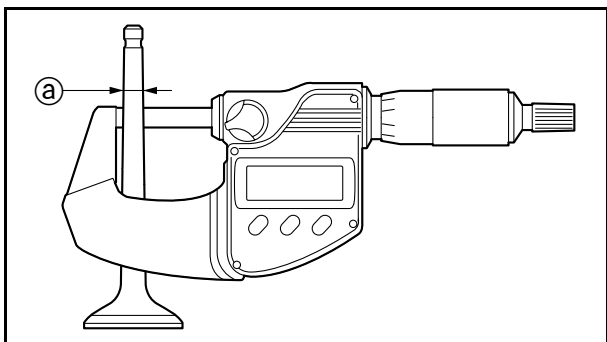
Valve face width (a):
Intake and exhaust:
2.26–2.83 mm (0.089–0.111 in)



- 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)

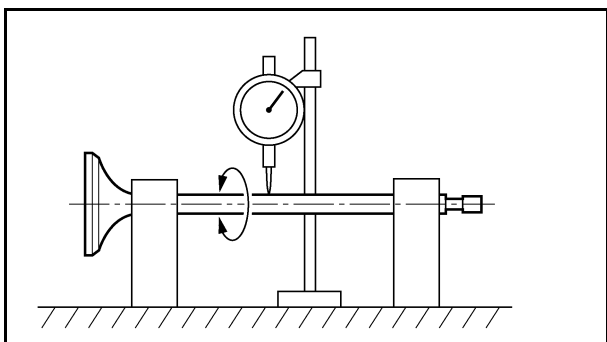


3. Measure:

- 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)

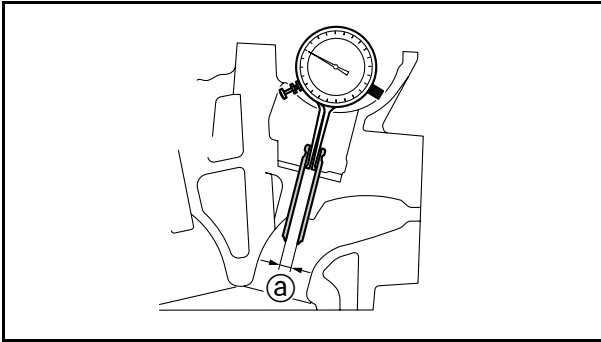


4. Measure:

- 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



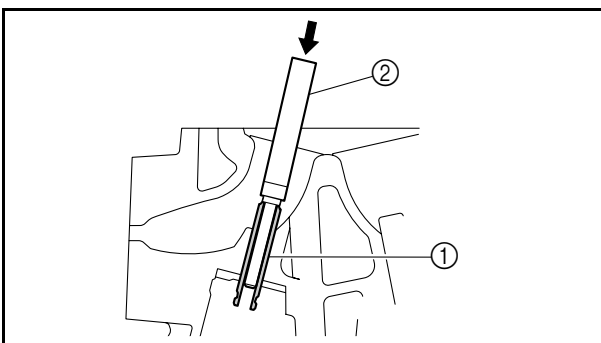
Valve guide inside diameter:
Intake and exhaust:
5.504–5.522 mm
(0.2167–0.2174 in)

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

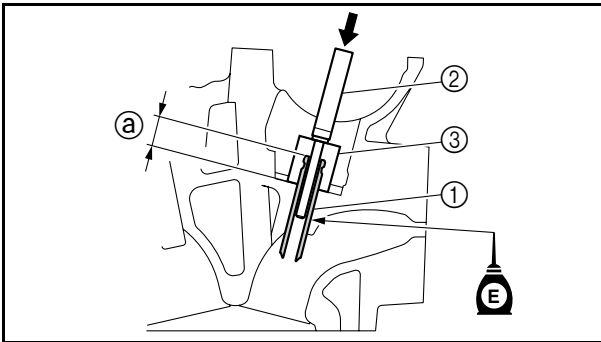
Removal steps:

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



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

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



Valve guide installation

1. Install:

- Valve guide ①

Installation steps:

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

NOTICE

Do not reuse the valve guide ①, always replace it with a new one.



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. Apply engine oil to the inner surface of the valve guide and surface of the special service tool ④.
4. Insert the special service tool ④ into the valve guide ①, and then ream the valve guide.

TIP

- Turn the valve guide reamer clockwise to ream the valve guide.
- Do not turn the special service tool ④ counterclockwise when removing the tool.

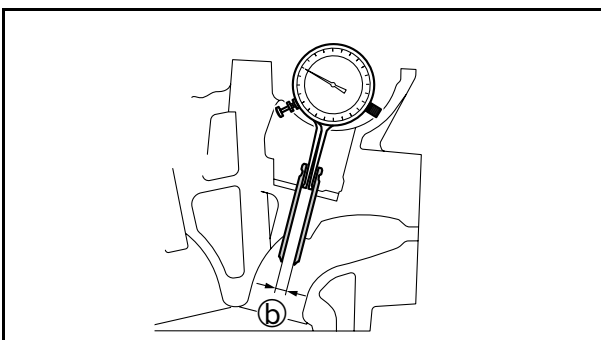
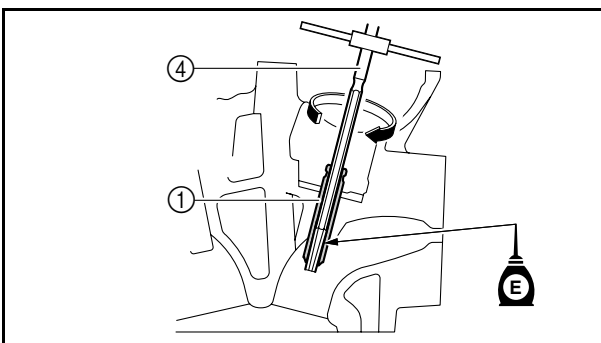


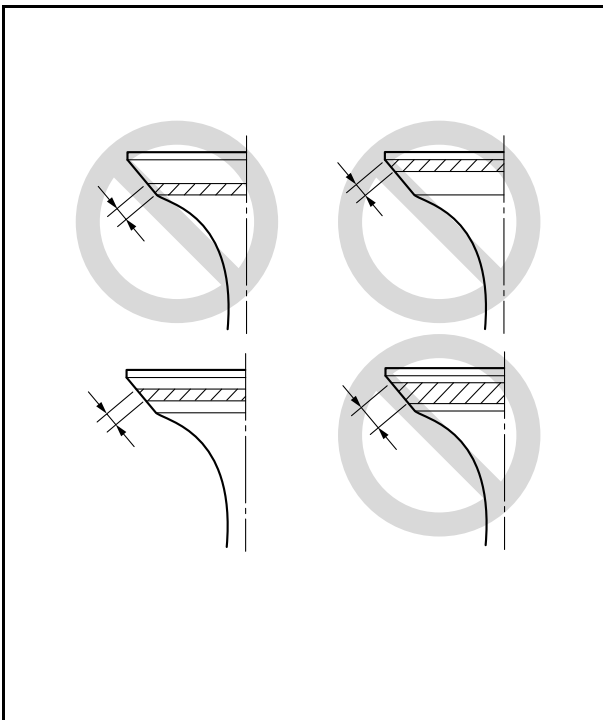
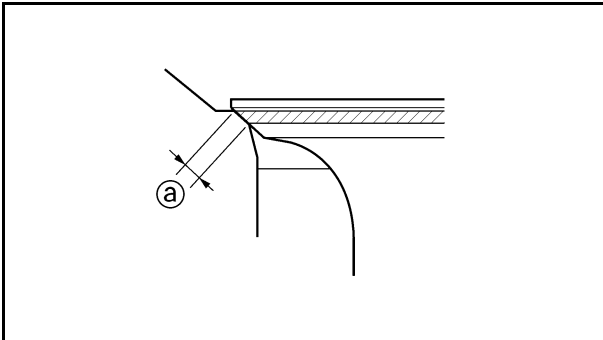
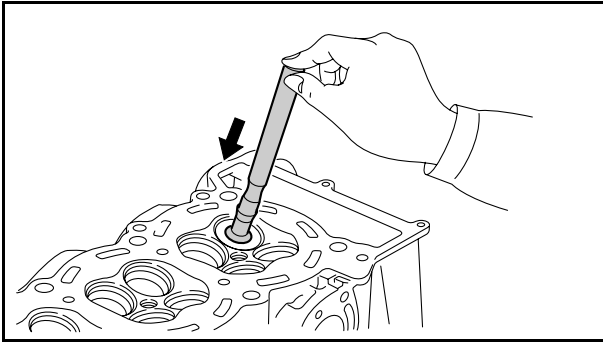
Valve guide reamer ④:
YM-01196/90890-06804

5. Clean the valve guide inner surface.
6. 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 width

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.



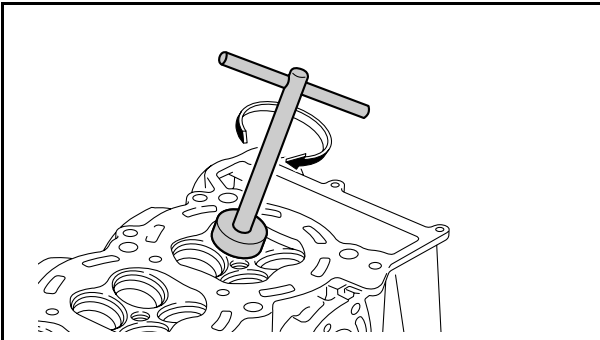
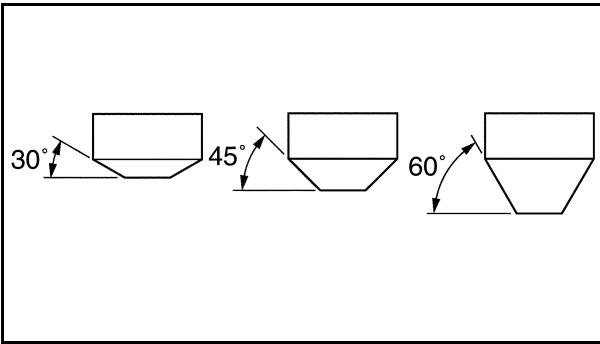
Valve seat contact width @:

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

NOTICE

Do not over cut the valve seat. Make 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.

TIP

Do not turn the special service tool counter-clockwise 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):

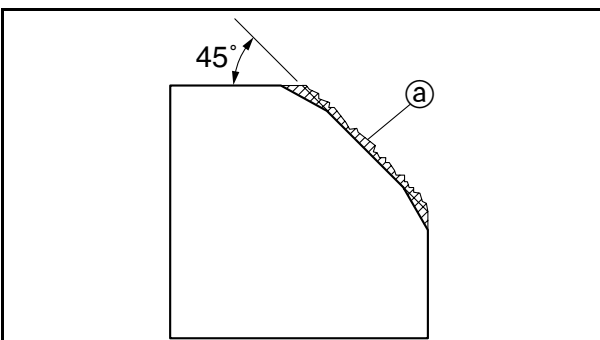
90890-06818

45° (exhaust):

90890-06555

60° (exhaust):

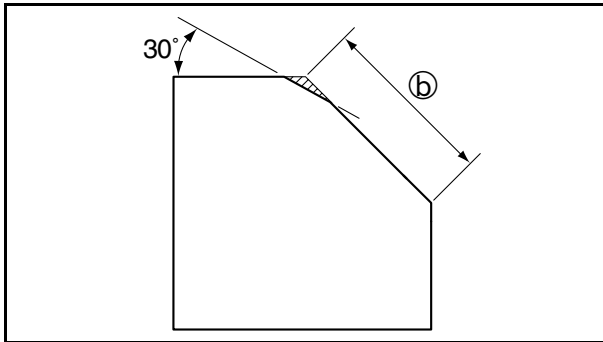
90890-06323



Refacing steps:

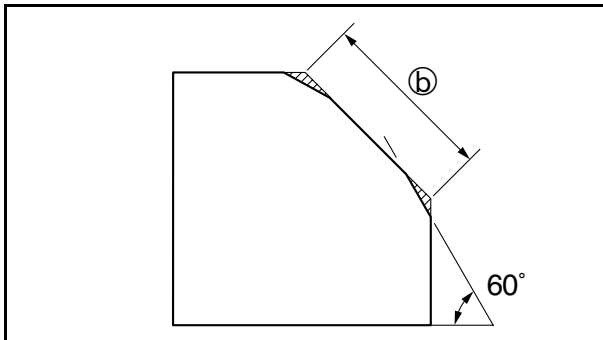
1. Cut the surface of the valve seat with a 45° cutter by turning the cutter clockwise until the valve seat face has become smooth.

Ⓐ Slag or rough surface



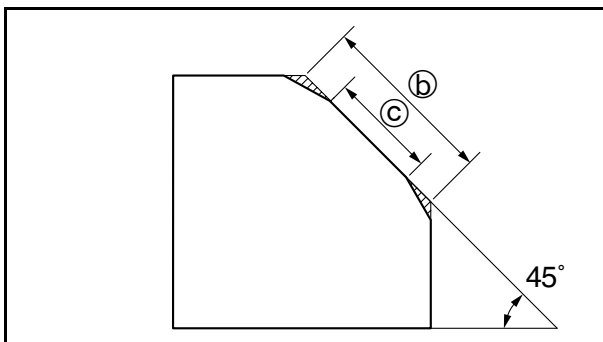
2. Use a 30° cutter to adjust the contact width of the top edge of the valve seat.

ⓑ Previous contact width



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

ⓑ Previous contact width



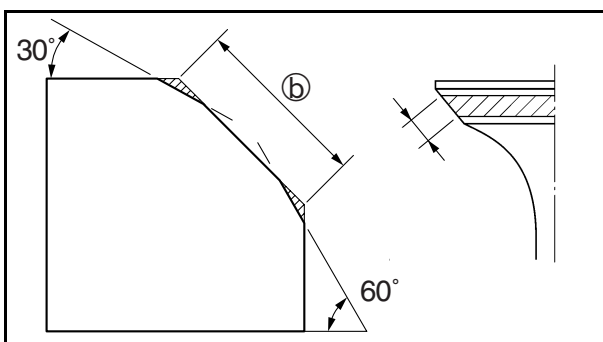
4. Use a 45° cutter to adjust the contact width of the valve seat to specification.

ⓑ Previous contact width

ⓒ Specified contact width

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

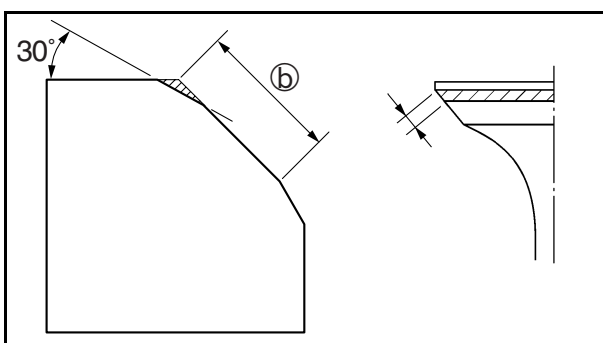
Refer to "Valve seat check."



Example:

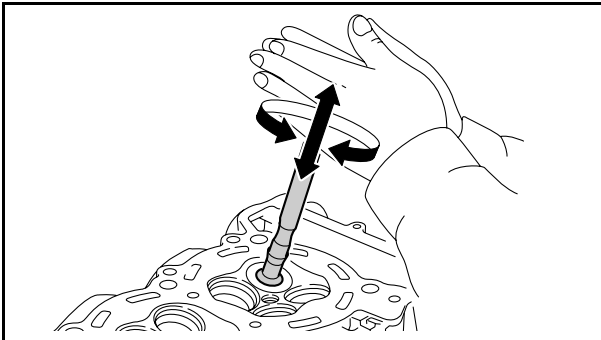
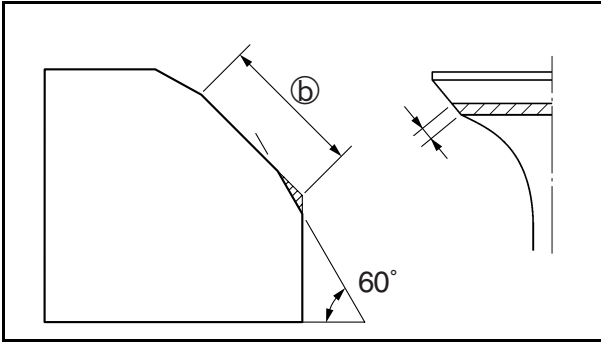
- If the valve seat contact width is too wide and situated in the center of the valve face, use a 30° cutter to cut the top edge of the valve seat, and then use a 60° cutter to cut the bottom edge to center the area and set its width.

ⓑ 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).

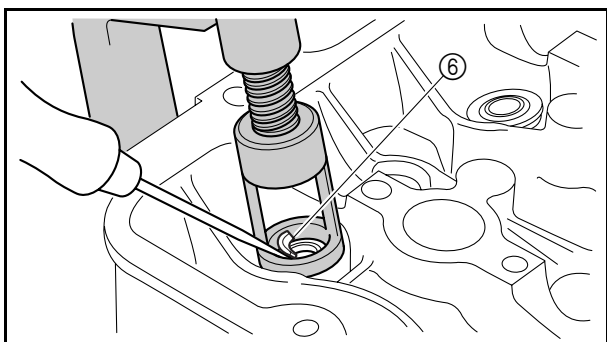
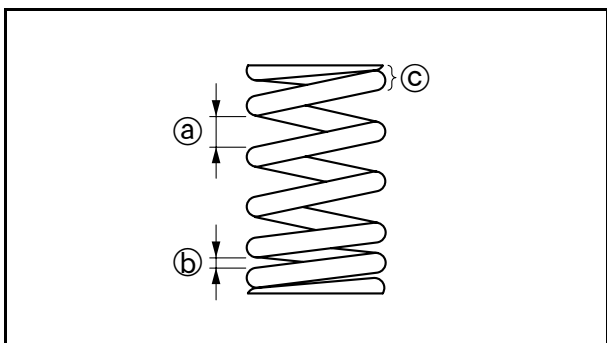
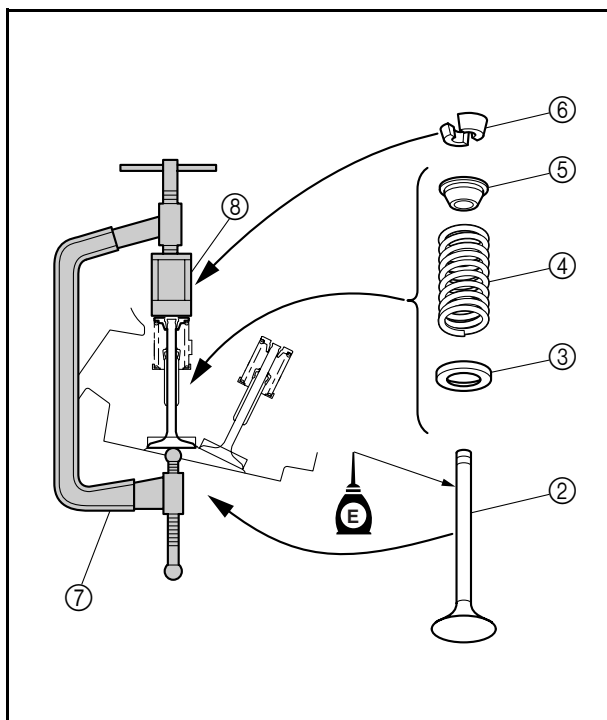
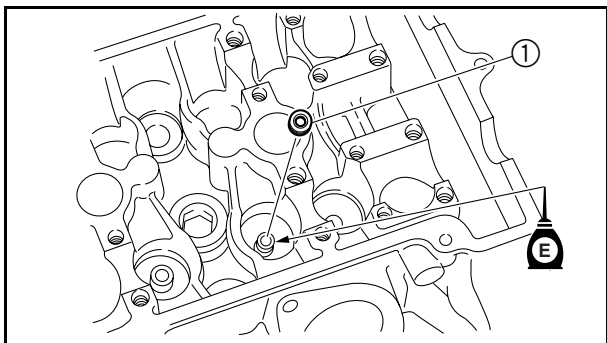
NOTICE

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

7. After every lapping procedure, 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.”

TIP

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 the valve seal ① onto the valve guide.

NOTICE

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.

TIP

- 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:

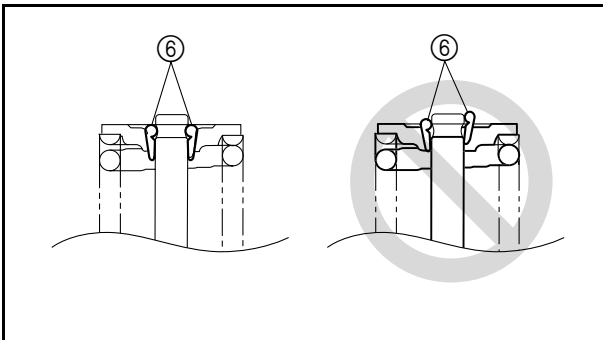
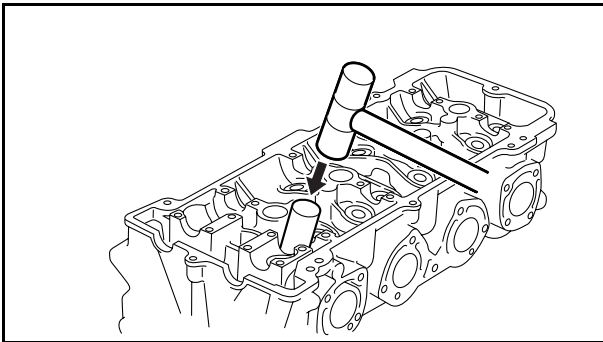
YM-04114

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 cotters ⑥ securely.

Cylinder head installation

1. Install:

- Cylinder head

Installation steps:

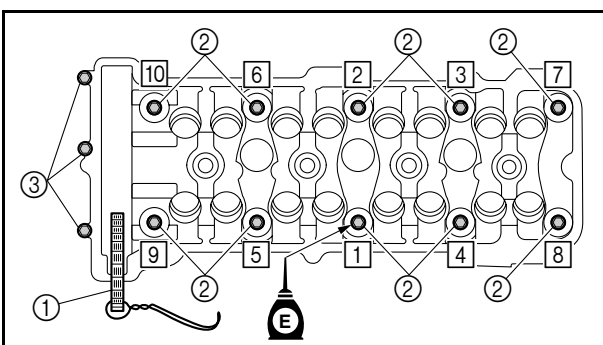
1. Pass the timing chain ① through the timing chain cavity.
2. Apply engine oil to the cylinder head bolts.
3. Tighten the cylinder head bolts ② and ③ to the specified torques.

NOTICE

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

TIP

- Tighten the cylinder head bolts in the sequence shown.
- Use a commercially available angle gauge to tighten the bolts to the specified angle.

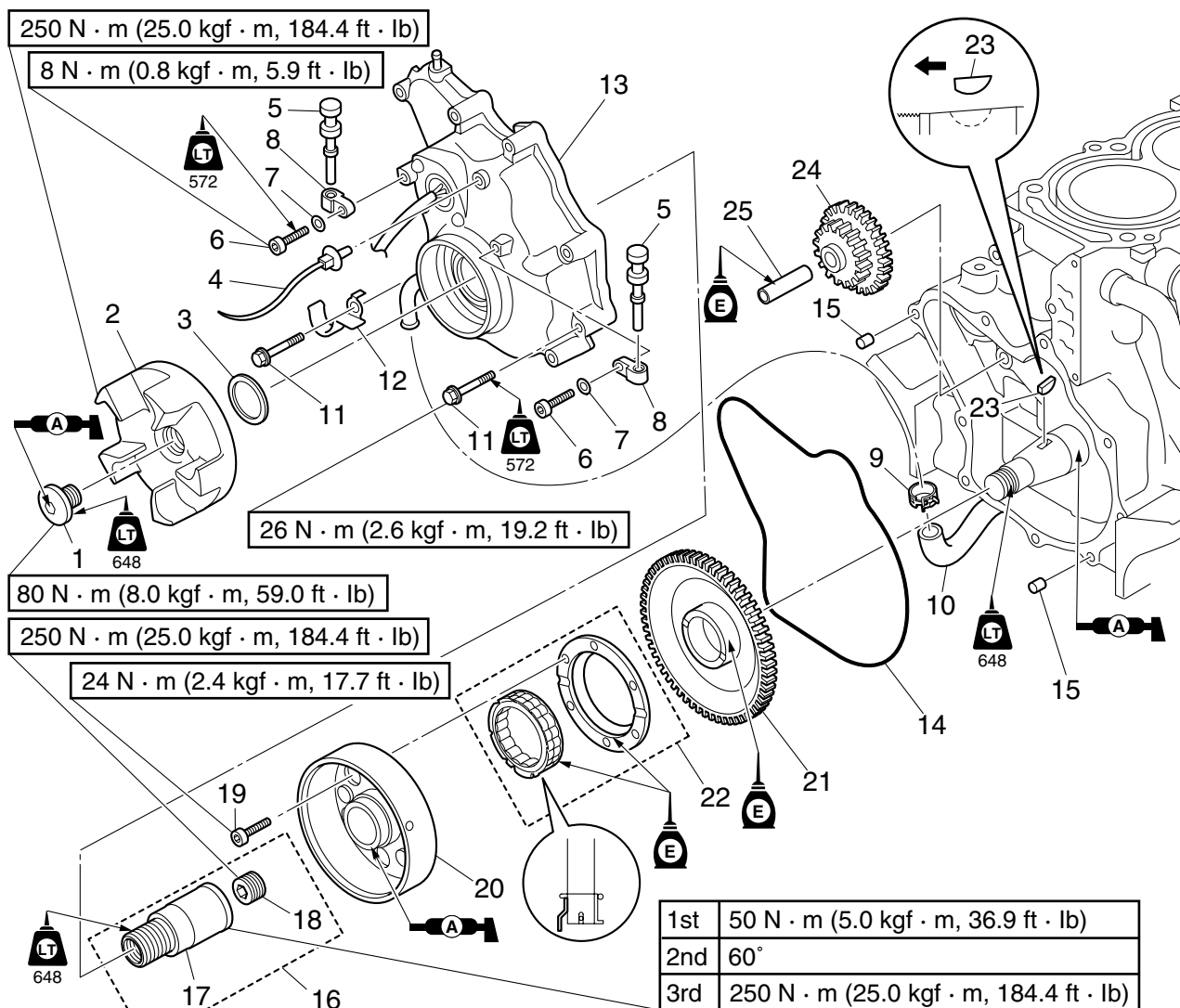


Cylinder head bolt (M12 × 140 mm) ②:
1st: 48 N·m (4.8 kgf·m, 35.4 ft·lb)
2nd: 90°
Cylinder head bolt (M6 × 55 mm) ③:
10 N·m (1.0 kgf·m, 7.4 ft·lb)

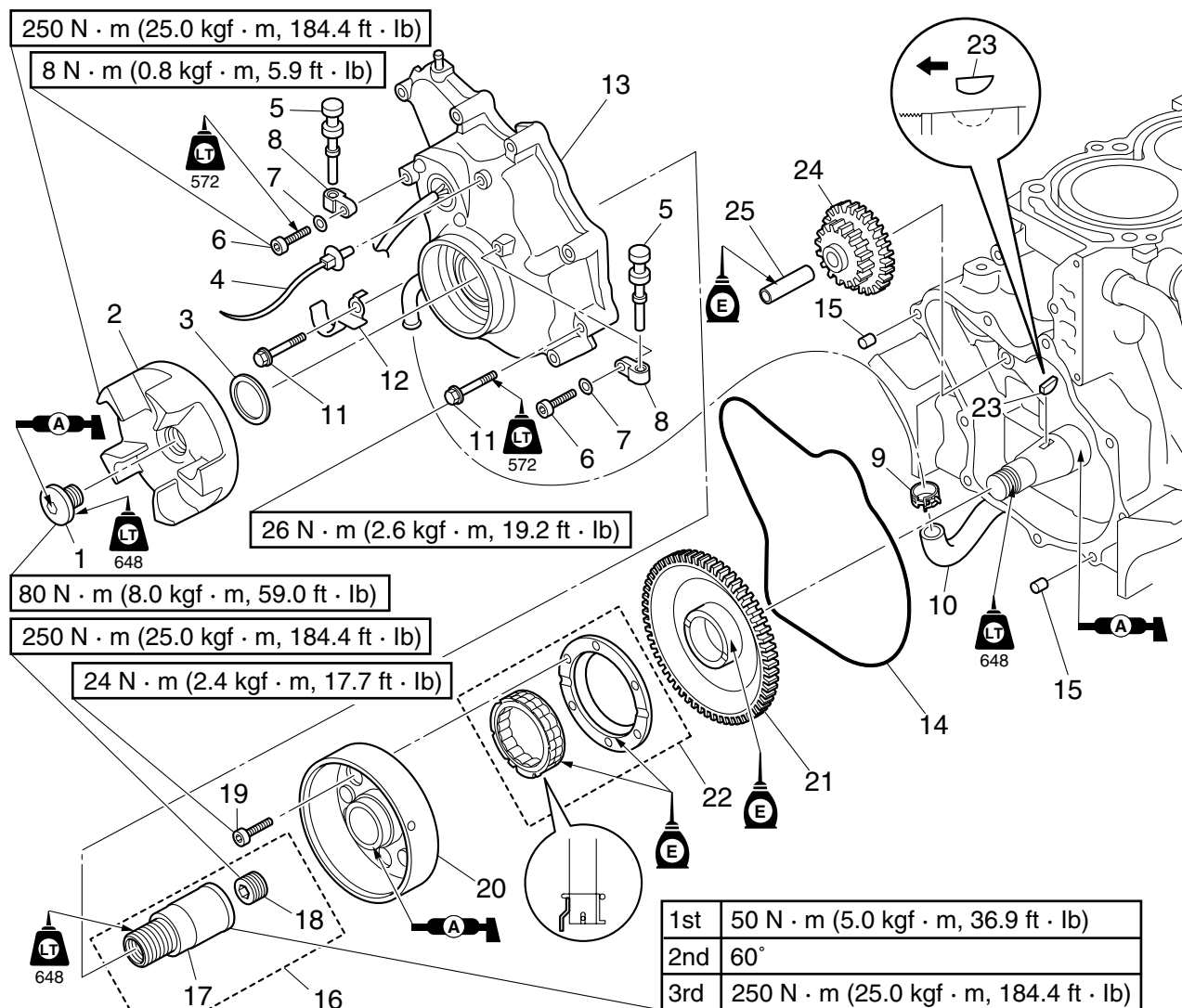


Generator cover and flywheel magneto

Generator cover and flywheel magneto removal

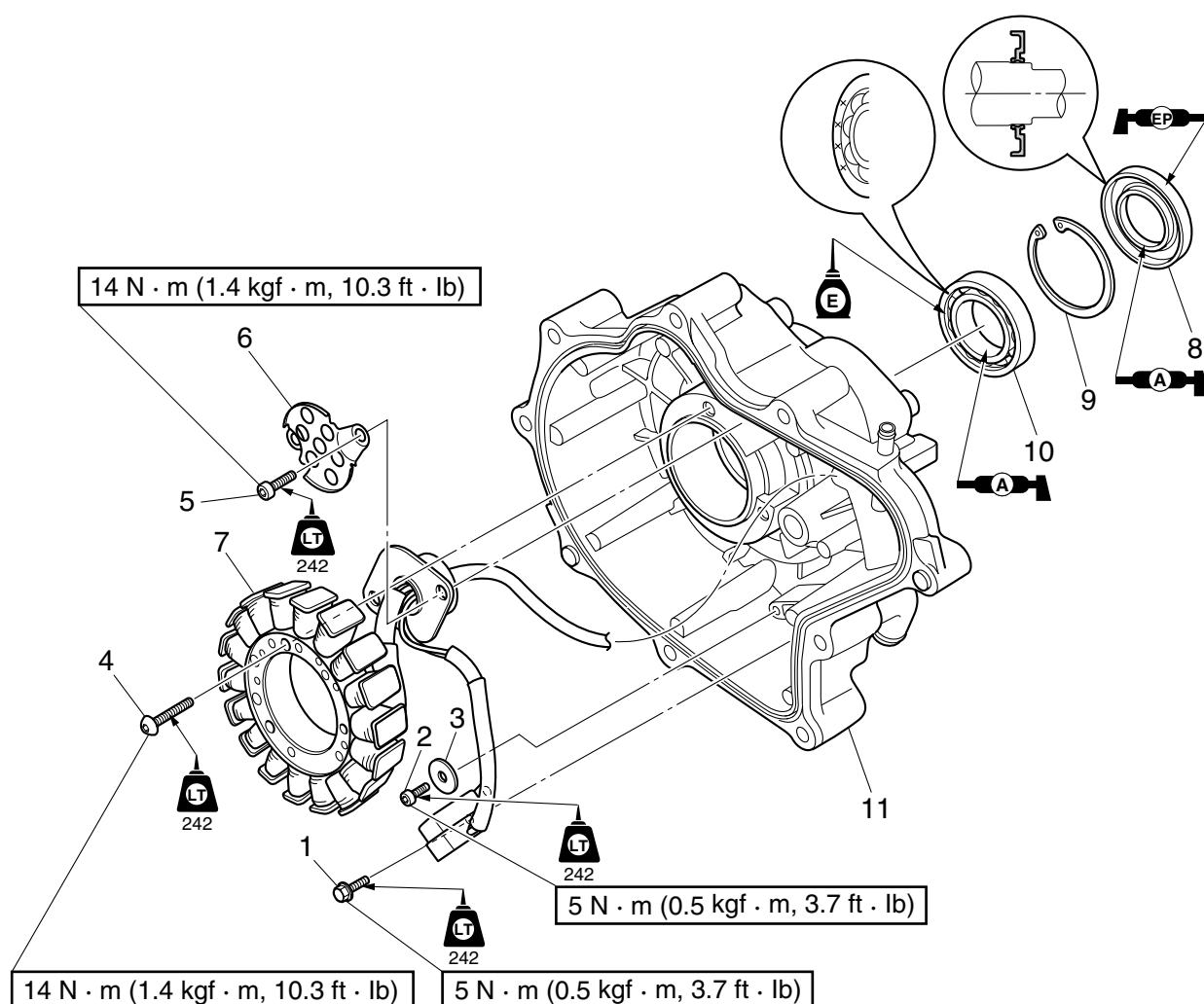


Step	Part name	Q'ty	Remarks
1	Holder	1	Left-hand threads
2	Drive coupling	1	
3	Washer	1	Not reusable
4	Plastic tie	1	
5	Grommet	2	
6	Bolt	2	M6 × 20 mm
7	Washer	2	
8	Bracket	2	
9	Clamp	1	
10	Hose	1	
11	Bolt	9	M8 × 50 mm
12	Clamp	1	
13	Generator cover assembly	1	

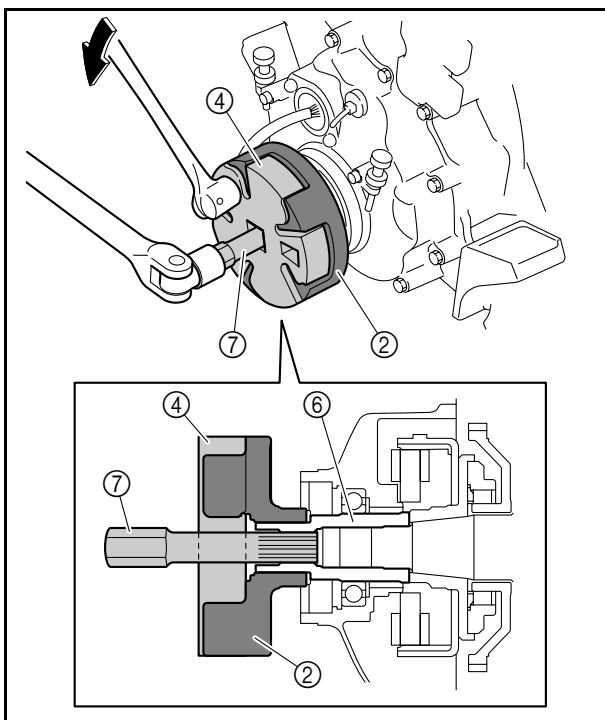
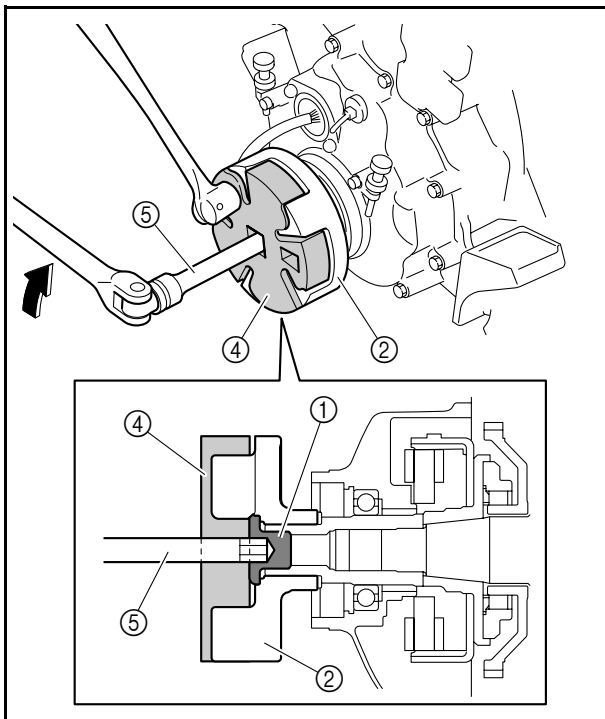
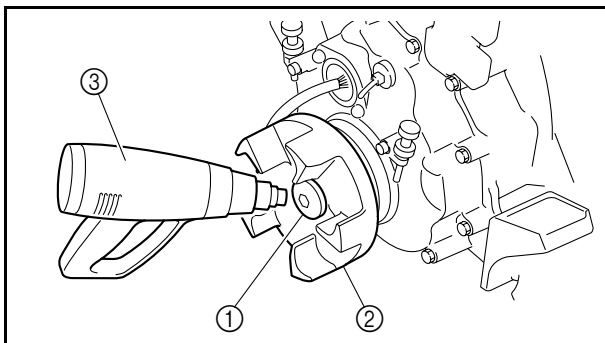


Step	Part name	Q'ty	Remarks
14	O-ring	1	Not reusable
15	Dowel pin	2	
16	Transfer shaft assembly	1	Not reusable
17	Transfer shaft	1	Not reusable
18	Special nut	1	Not reusable
19	Bolt	6	Not reusable
			M8 × 20 mm
20	Flywheel magneto	1	Not reusable
21	Starter gear	1	
22	Starter clutch assembly	1	
23	Woodruff key	1	Not reusable
24	Idle gear	1	
25	Shaft	1	

Generator cover disassembly



Step	Part name	Q'ty	Remarks
1	Bolt	2	M5 × 15 mm
2	Bolt	1	M5 × 10 mm
3	Washer	1	
4	Bolt	3	M6 × 30 mm
5	Bolt	2	M6 × 15 mm
6	Clamp	1	
7	Stator coil assembly	1	
8	Oil seal	1	Not reusable
9	Circlip	1	
10	Bearing	1	Not reusable
11	Generator cover	1	



Drive coupling removal

⚠ WARNING

When using a heat gun, protect your hands by wearing heat-resistant gloves. Components become hot enough to cause burns.

1. Remove:

- Holder ①
- Drive coupling ②

Removal steps:

1. Heat the holder ① and drive coupling ② for 20-30 minutes with a heat gun ③.

NOTICE

- Do not use a gas torch.
- Be careful not to damage the wiring harness when using the heat gun.

TIP

Heat the holder ① and drive coupling ② with a heat gun ③ at approximately 200 °C (392 °F).

2. Hold the drive coupling ② with the special service tool ④, and then loosen the holder ① with a hexagon bit socket ⑤.

TIP

- The holder ① has left-hand threads. Turn the holder clockwise to loosen it.
- Use a 12 mm hexagon bit socket ⑤ with a length of 150 mm or more.

3. Hold the transfer shaft ⑥ with the special service tool ⑦, and then remove the drive coupling ② with the special service tool ④.

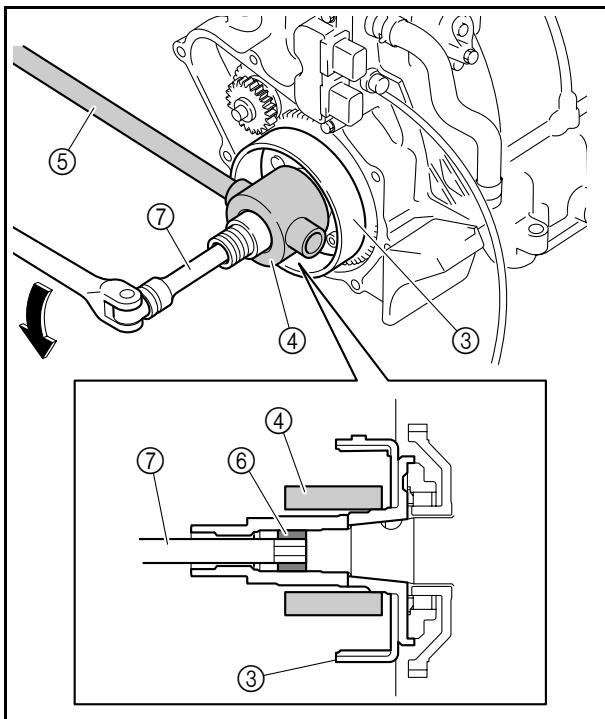
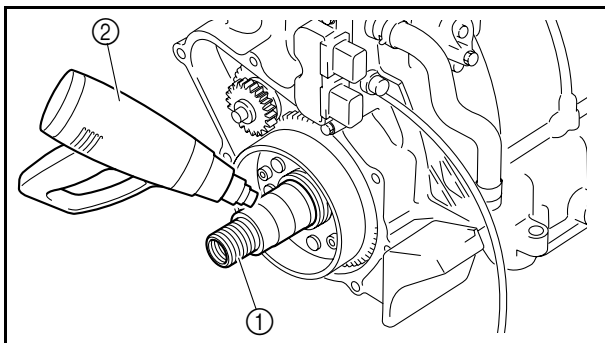


Coupler wrench ④:

90890-06729

Crankshaft holder ⑦:

90890-06732



Flywheel magneto removal

⚠ WARNING

When using a heat gun, protect your hands by wearing heat-resistant gloves. Components become hot enough to cause burns.

1. Remove:

- Generator cover assembly
- Transfer shaft assembly ①

Removal steps:

1. Remove the generator cover assembly.
2. Heat the transfer shaft assembly ① for 20-30 minutes with a heat gun ②.

NOTICE

- Do not use a gas torch.
- Be careful not to damage the wiring harness when using the heat gun.

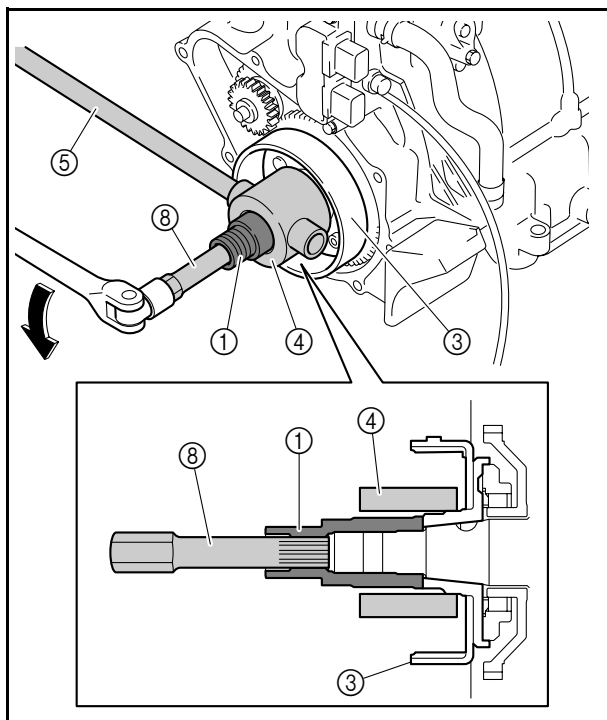
TIP

Heat the transfer shaft assembly ① with a heat gun ② at approximately 200 °C (392 °F).

3. Hold the flywheel magneto ③ with the special service tools ④ and ⑤, and then loosen the special nut ⑥ with a hexagon bit socket ⑦.

TIP

- Loosen the special nut ⑥ until it can no longer be turned.
- Use a 12 mm hexagon bit socket ⑦ with a length of 150 mm or more.



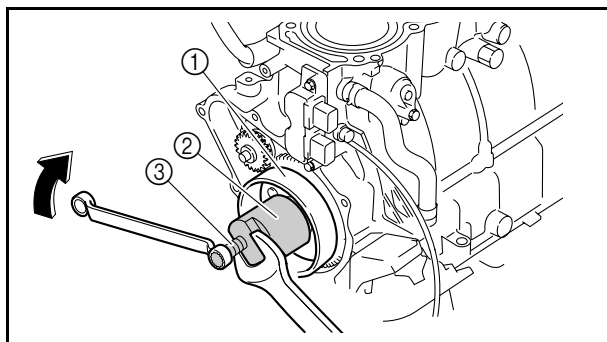
4. Hold the flywheel magneto (3) with the special service tools (4) and (5), and then remove the transfer shaft assembly (1) with the special service tool (8).



Shaft holder (4):
90890-06721
Driver handle (5):
90890-06722
Crankshaft holder (8):
90890-06732

NOTICE

Do not reuse the transfer shaft assembly (1), always replace it with a new one.



2. Remove:

- Flywheel magneto (1)

Removal steps:

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

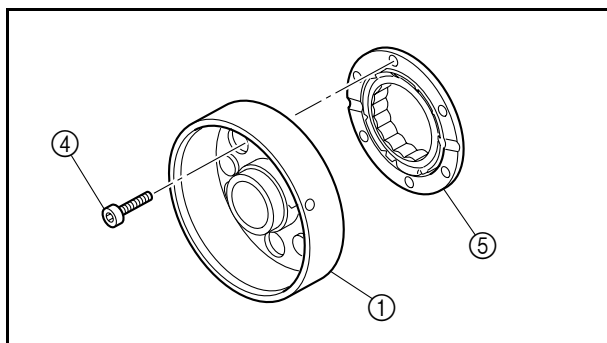


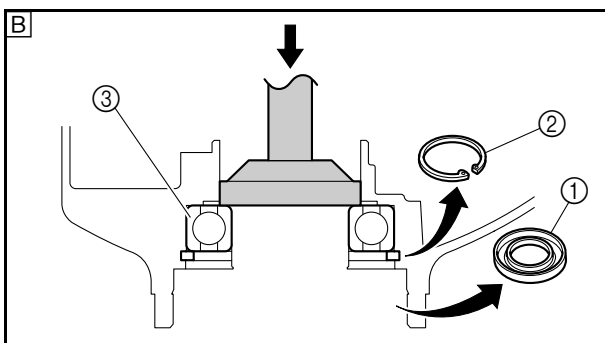
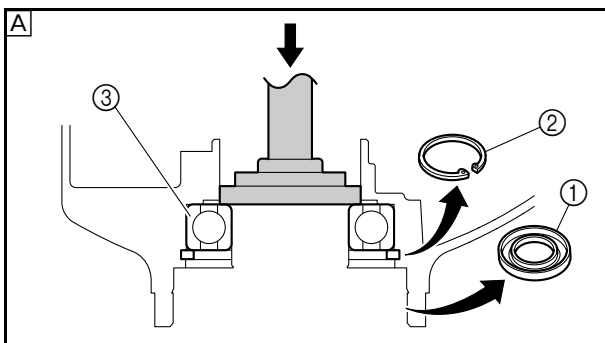
Flywheel puller (2):
90890-06723
Rotor puller (3):
90890-01080

2. Remove the Woodruff key.
3. Remove the flywheel magneto bolts (4), and then remove the starter clutch assembly (5).

NOTICE

Do not reuse the flywheel magneto (1), Woodruff key, and flywheel magneto bolts (4), always replace them with new ones.





Bearing removal

1. Remove:

- Oil seal ①
- Circlip ②
- Bearing ③

TIP

Make sure to remove the circlip before removing the bearing.



Driver handle (small):

YB-06229

Bearing and seal installer:

YW-06356

Driver rod LS:

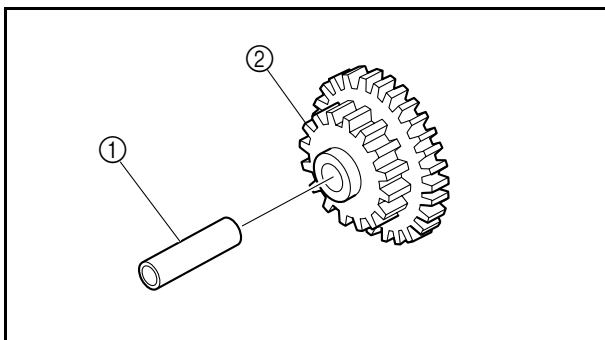
90890-06606

Bearing outer race attachment:

90890-06627

A For USA and Canada

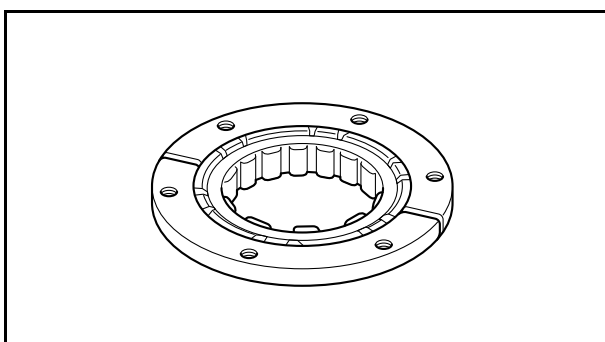
B For worldwide



Idle gear and shaft check

1. Check:

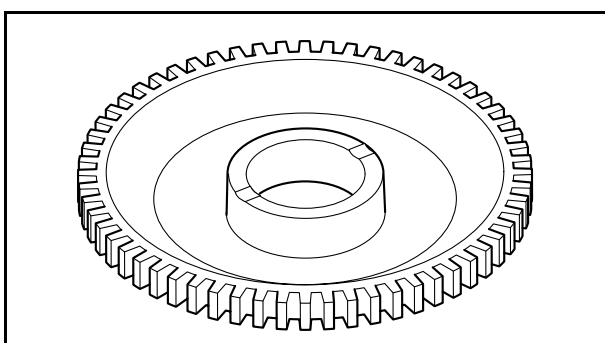
- Shaft ①
Bends/wear → Replace the idle gear shaft.
- Idle gear ②
Cracks/damage → Replace the idle gear.



Starter clutch check

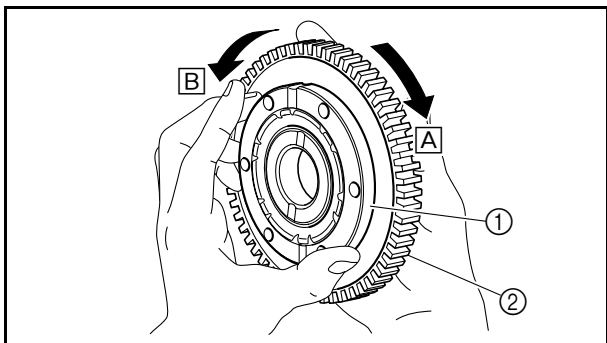
1. Check:

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



2. Check:

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

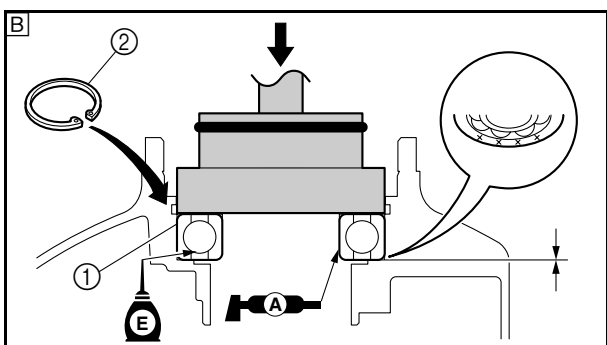
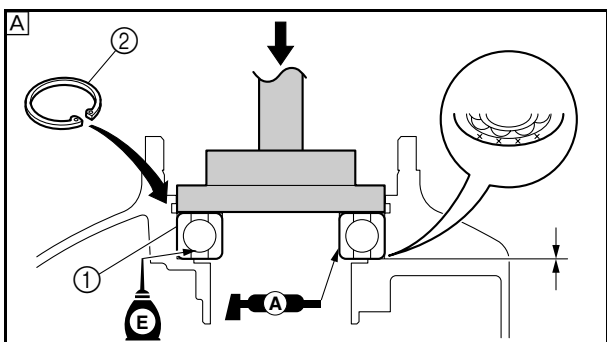


3. Check:

- Starter clutch operation
Does not operate properly → Replace the starter clutch assembly.

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

1. Install:

- Bearing ①
- Circlip ②

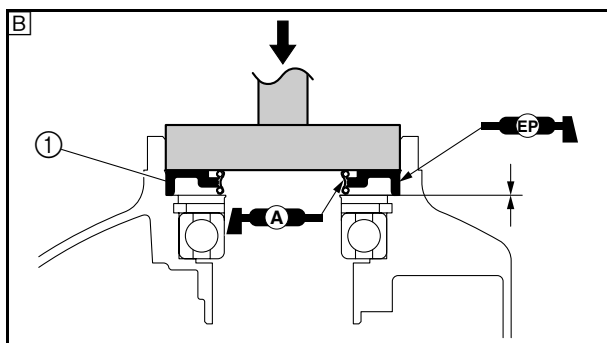
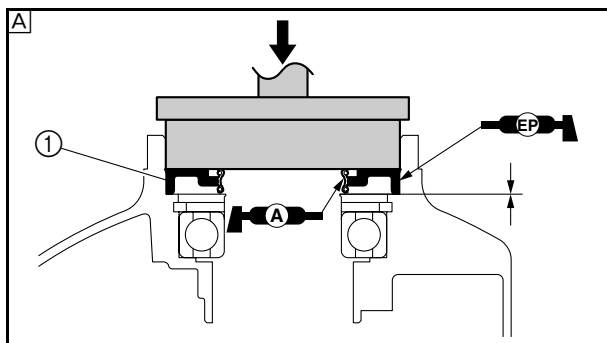
NOTICE

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



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

1. Install:

- Oil seal ①

NOTICE

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



Forward bearing race installer:

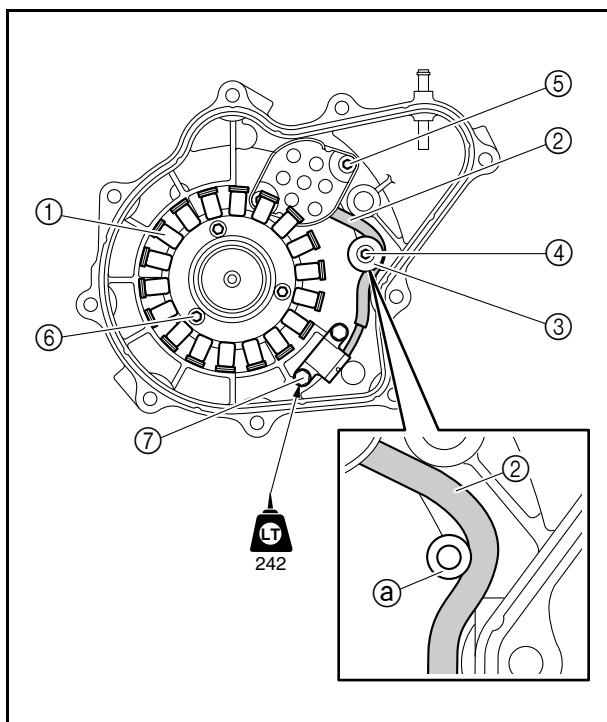
YB-06258

Bearing pressure C:

90890-02393

A For USA and Canada

B For worldwide



Generator cover assembly

1. Install:

- Stator coil assembly ①

TIP

Pass the pickup coil lead ② between the cover and the bolt hole ④, and then fasten the lead by installing the washer ③ and bolt ④.



Clamp bolt ⑤:

14 N·m (1.4 kgf·m, 10.3 ft·lb)

Stator coil bolt ⑥:

14 N·m (1.4 kgf·m, 10.3 ft·lb)

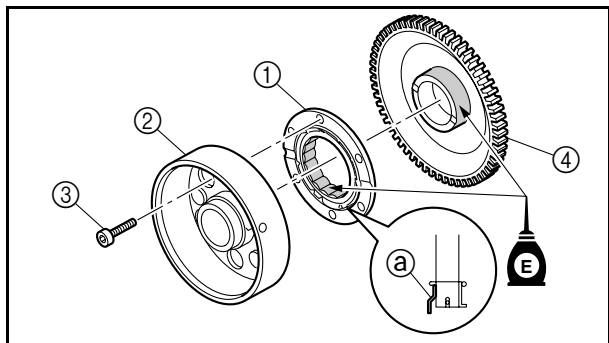
Washer bolt ④:

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
- Flywheel magneto bolts ③
- Starter gear ④

Installation steps:

1. Apply engine oil to the starter clutch rollers and contact surface of the starter gear before installation.
2. Install the starter clutch ① and flywheel magneto ② onto the starter gear ④.

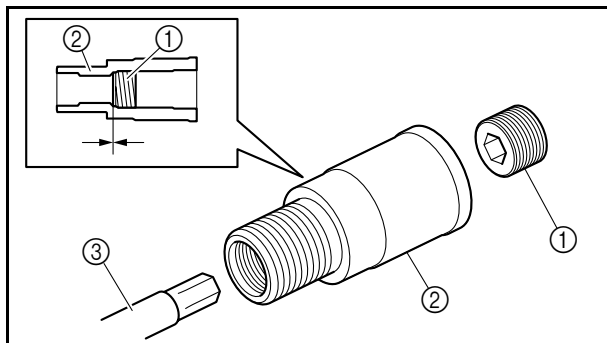
NOTICE

- Do not reuse the flywheel magneto ② and flywheel magneto bolts ③, always replace them with new ones.
- Make sure that the starter clutch is installed into the outer flange so that the side ③ is facing toward the flywheel magneto as shown.

3. Tighten the flywheel magneto bolts to the specified torque.



Flywheel magneto bolt ③:
24 N·m (2.4 kgf·m, 17.7 ft·lb)

**2. Install:**

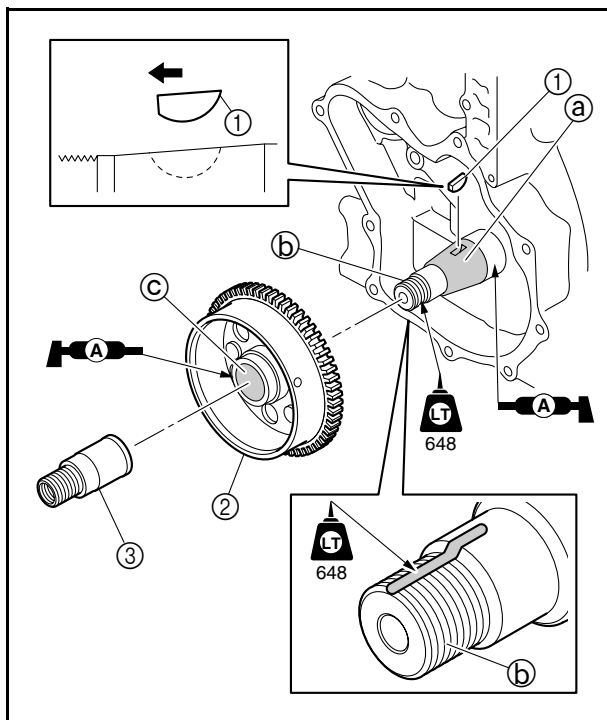
- Special nut ①
- Transfer shaft ②

Installation steps:

1. Remove any grease from the special nut ① and the inner surface of the transfer shaft ②, making sure that the threads of the nut and shaft are clean and dry.
2. Install the special nut ① into the transfer shaft ② until it can no longer be turned.

NOTICE

- Do not reuse the special nut ① and transfer shaft ②, always replace them with a new transfer shaft assembly.
- Do not scratch the ends of the special nut ① or the end of the transfer shaft ② that makes contact with the flywheel magneto.
- Insert the hexagon bit socket ③ into the threaded end of the transfer shaft ②.
- If any grease remains on the special nut ① and transfer shaft ②, or if the special nut ① is not installed completely, the transfer shaft ② cannot be installed correctly.

**3. Install:**

- Woodruff key ①
- Flywheel magneto assembly ②
- Transfer shaft assembly ③
- Generator cover assembly

Installation steps:

1. Remove any grease from the tapered portion ① and threaded portion ② of the crankshaft and the inner surface ③ of the flywheel magneto ②.

NOTICE

Make sure to remove any grease from the tapered portion ① of the crankshaft and the inner surface ③ of the flywheel magneto assembly ②, otherwise the flywheel magneto assembly cannot be installed properly.

2. Install the Woodruff key ① and flywheel magneto assembly ②.

NOTICE

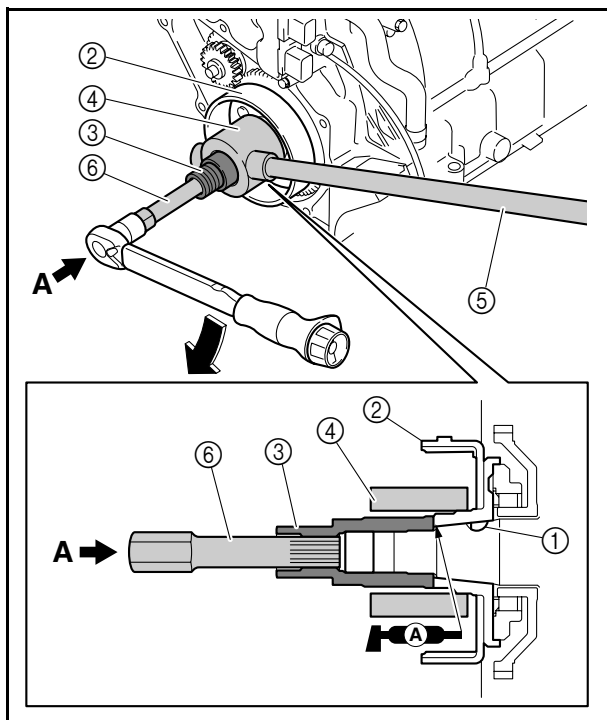
- Do not reuse the Woodruff key ① and transfer shaft assembly ③, always replace them with new ones.
- Make sure to install the Woodruff key ① so that its flat end is pointing toward the end of the crankshaft as shown.

3. Apply a line of LT648 onto the end of the crankshaft as shown.
4. Apply recommended lubricant to the mating surfaces between the flywheel magneto ② and the transfer shaft ③.



Recommended lubricant:
Yamaha grease A

5. Install the transfer shaft assembly ③.



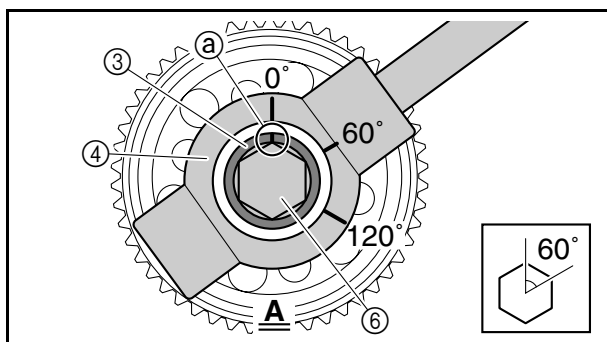
6. Hold the flywheel magneto assembly ② with the special service tools ④ and ⑤, and then tighten the transfer shaft assembly ③ to the specified torque with the special service tool ⑥.



Shaft holder ④:
90890-06721
Driver handle ⑤:
90890-06722
Crankshaft holder ⑥:
90890-06732



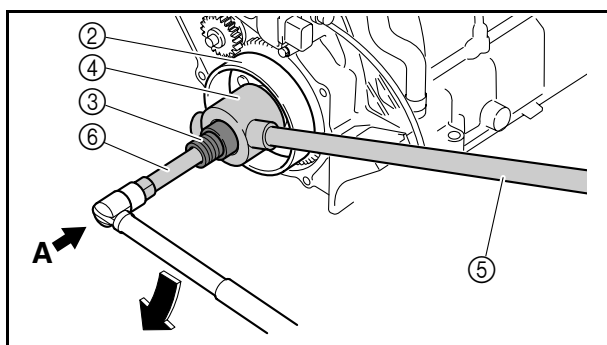
Transfer shaft assembly ③:
50 N·m (5.0 kgf·m, 36.9 ft·lb)
LOCTITE 648



7. Using the hexagonal portion of the special service tool ⑥ as reference, mark the special service tool ④ at 0°, 60°, and 120°.
8. Make a mark (a) on the transfer shaft assembly ③ where the shaft is aligned with the 0° mark on the special service tool ④.

TIP

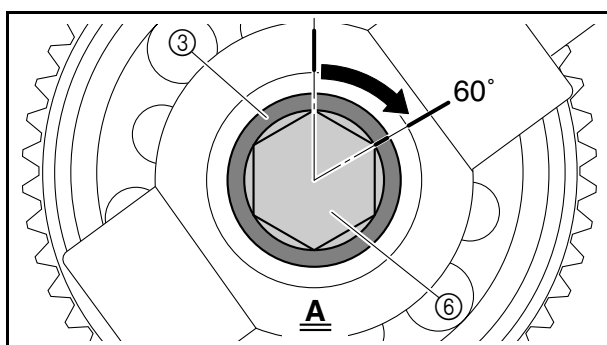
The angle from 1 corner of the hexagonal head of the special service tool ⑥ to another corner is 60°.

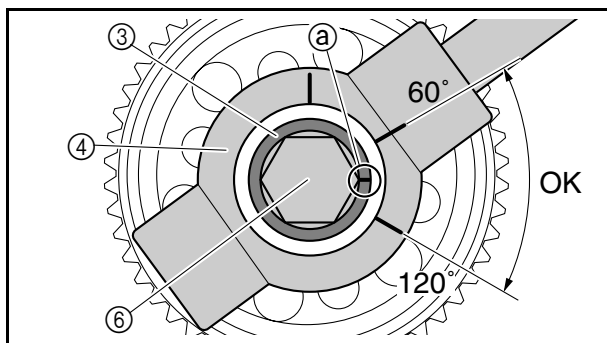


9. Hold the flywheel magneto assembly ② with the special service tools ④ and ⑤, and then tighten the transfer shaft assembly ③ to the specified angle with the special service tool ⑥.



Transfer shaft assembly ③:
60°





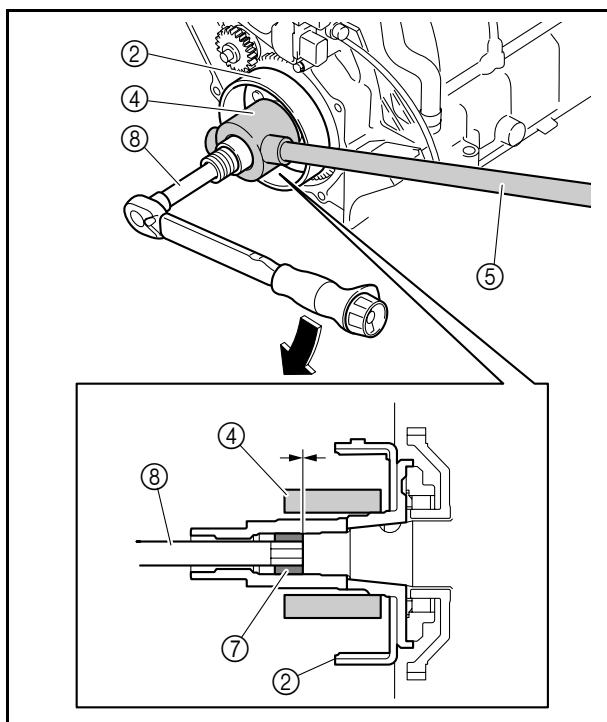
10. Tighten the transfer shaft assembly to the specified torque with the special service tool ⑥.

NOTICE

If the mark ① on the transfer shaft assembly ③ moves past the 120° mark on the special service tool ④ before the specified torque is reached, repeat the procedure from step 1.



Transfer shaft assembly ③:
250 N·m (25.0 kgf·m, 184.4 ft·lb)



11. Hold the flywheel magneto assembly ② with the special service tools ④ and ⑤, and then tighten the special nut ⑦ to the specified torque with a hexagon bit socket ⑧.

TIP

Use a 12 mm hexagon bit socket ⑧ with a length of 150 mm or more.



Shaft holder ④:
90890-06721
Driver handle ⑤:
90890-06722

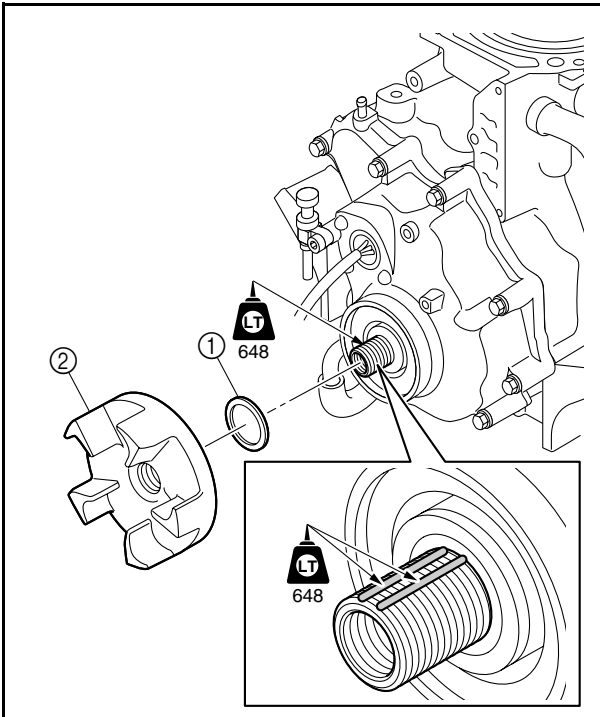


Special nut ⑦:
250 N·m (25.0 kgf·m, 184.4 ft·lb)

12. Install the generator cover assembly.

NOTICE

To allow the LT648 to set, wait approximately 1 hour after completing this procedure.



Drive coupling installation

1. Install:

- Washer ①
- Drive coupling ②

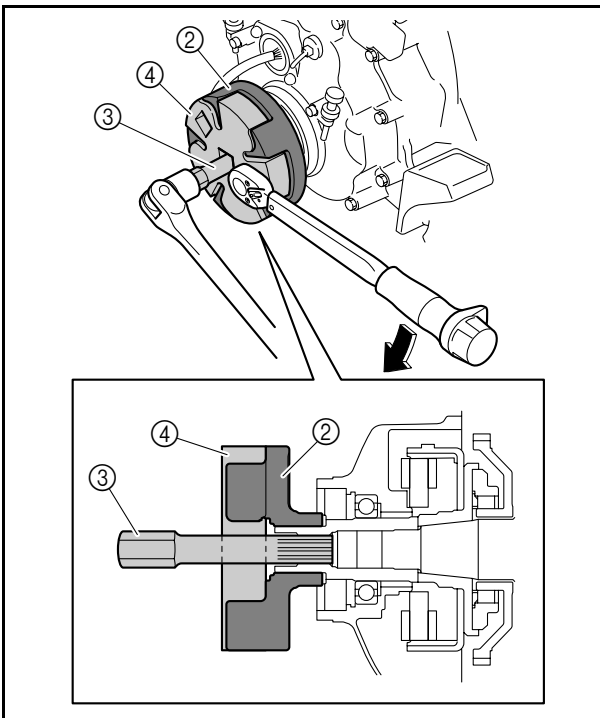
Installation steps:

1. Remove any grease from the threaded portion of the transfer shaft, making sure that the threads are clean and dry.
2. Install the washer ①.

NOTICE

Do not reuse the washer ①, always replace it with a new one.

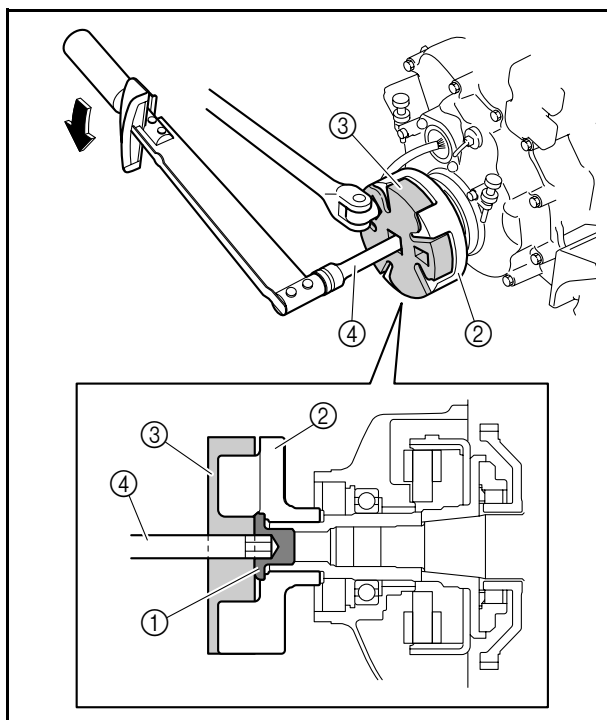
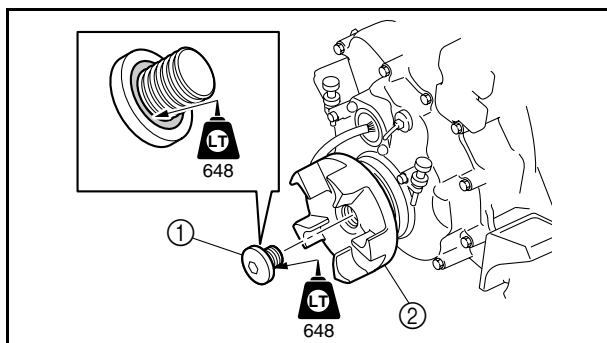
3. Apply 2 lines of LT648 onto the end of the transfer shaft as shown.
4. Install the drive coupling ②.
5. Hold the transfer shaft with the special service tool ③, and then tighten the drive coupling ② to the specified torque with the special service tool ④.



Crankshaft holder ③:
90890-06732
Coupler wrench ④:
90890-06729



Drive coupling ②:
250 N·m (25.0 kgf·m, 184.4 ft·lb)
LOCTITE 648



2. Install:

- Holder ①

Installation steps:

1. Remove any grease from the threaded portion of the holder ①.
2. Apply a ring of LT648 around the unthreaded portion of the holder ① as shown.
3. Install the holder ① temporarily.
4. Hold the drive coupling ② with the special service tool ③, and then tighten the holder ① to the specified torque with a hexagon bit socket ④.

TIP

- The holder ① has left-hand threads. Turn the holder counterclockwise to tighten it.
- Use a 12 mm hexagon bit socket ④ with a length of 150 mm or more.



Coupler wrench ③:
90890-06729



Holder ①:
80 N·m (8.0 kgf·m, 59.0 ft·lb)
LOCTITE 648

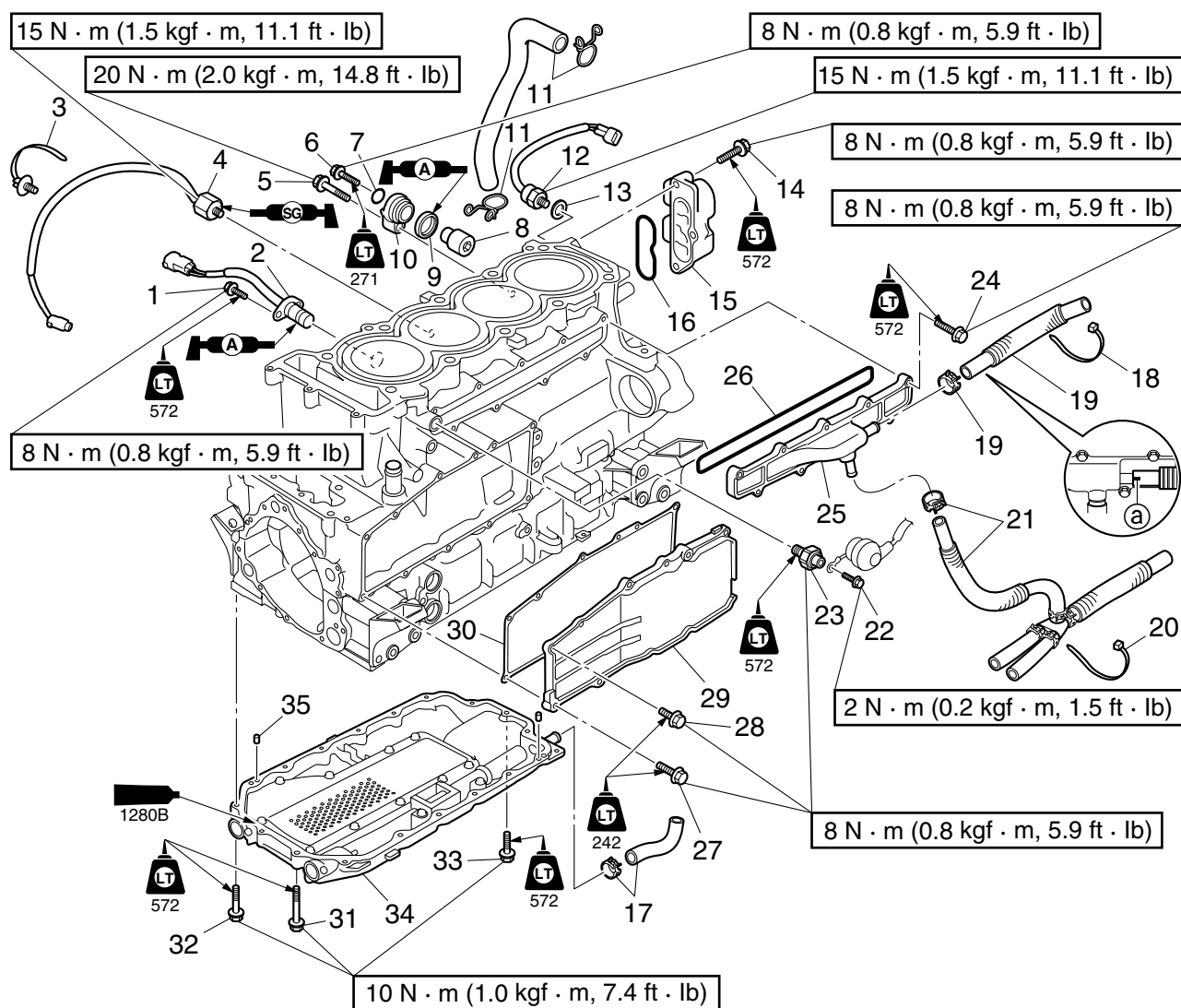
NOTICE

To allow the LT648 to set, wait approximately 1 hour after completing this procedure.

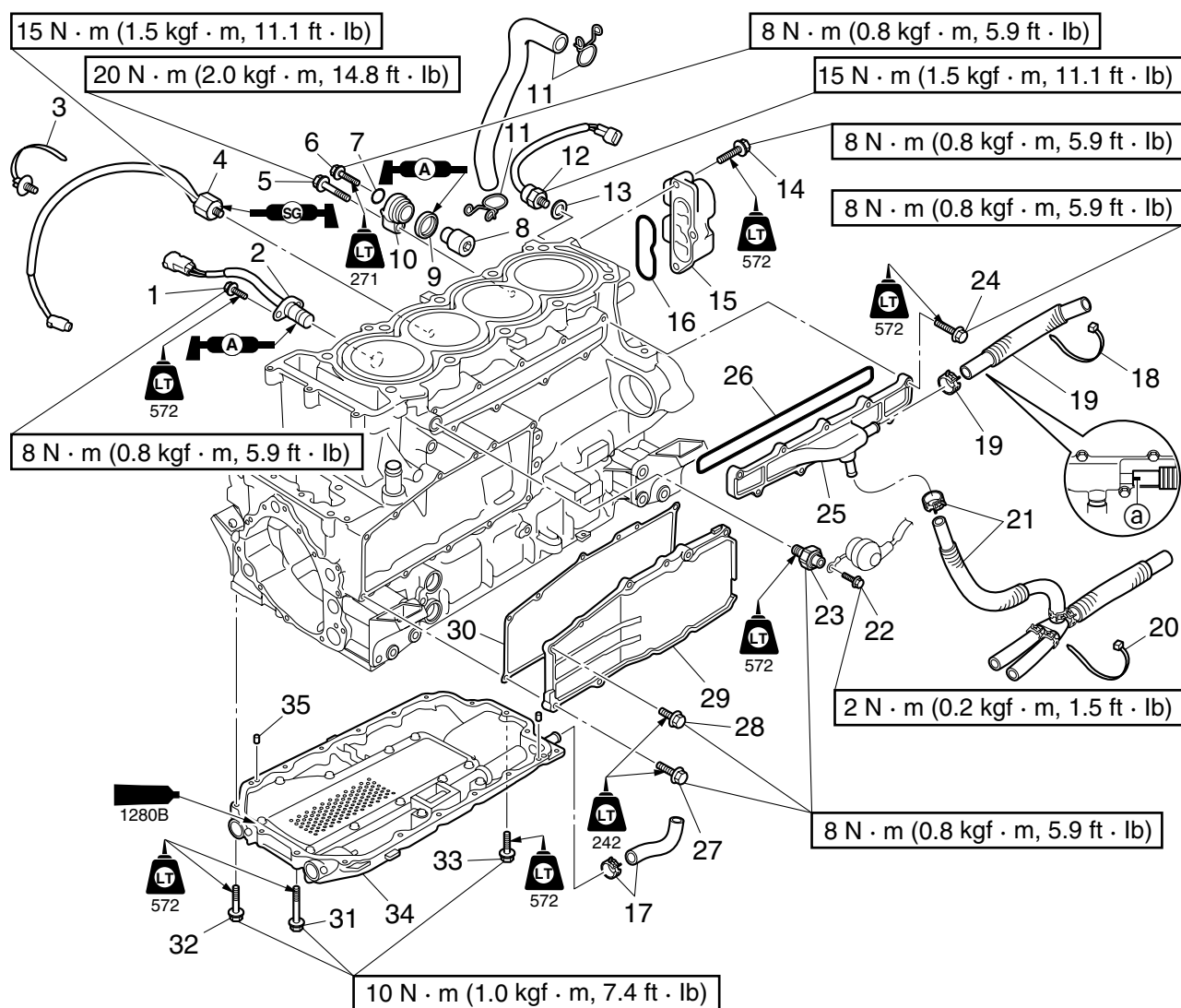


Oil separator tank and oil pan

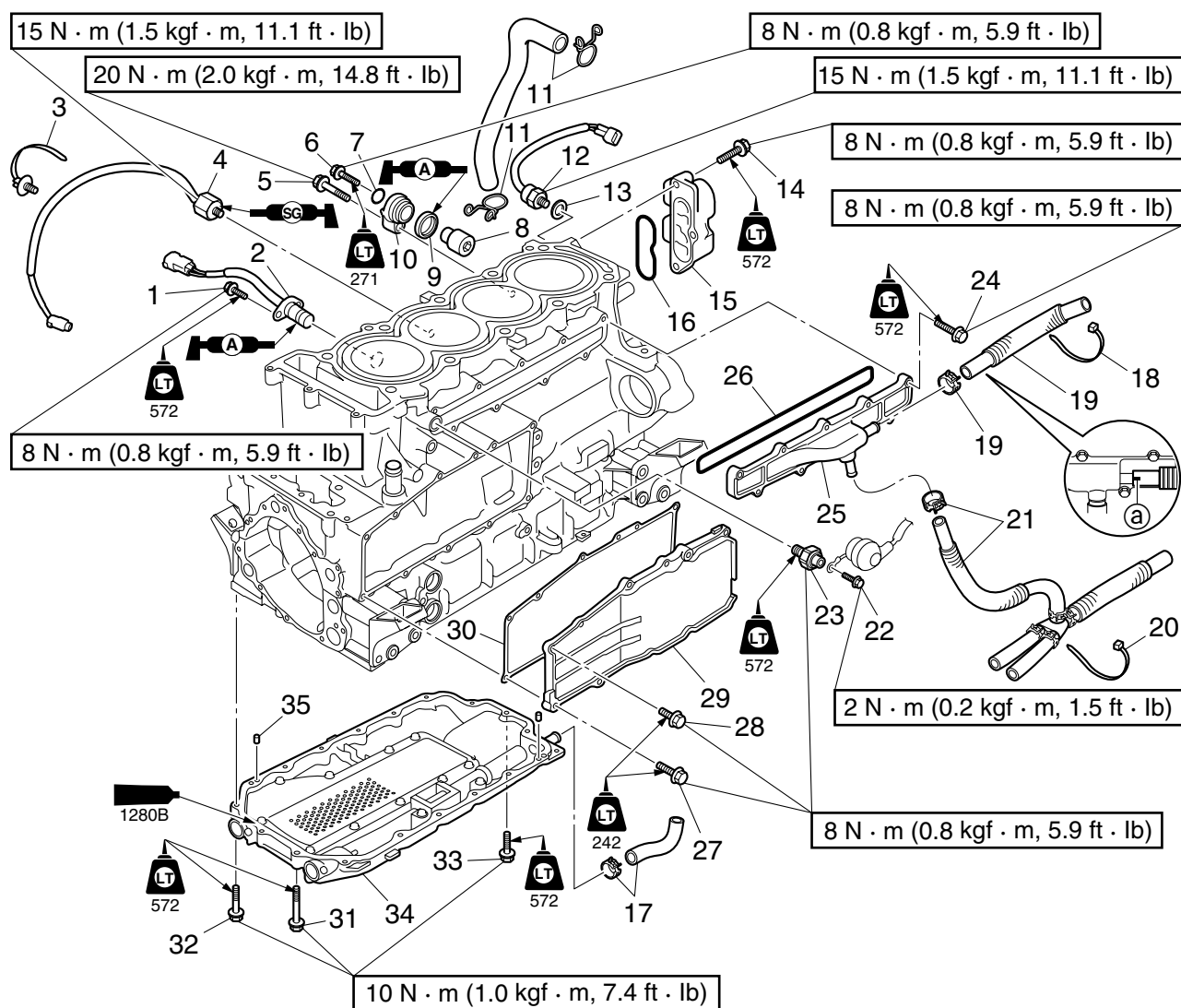
Oil separator tank and oil pan removal



Step	Part name	Q'ty	Remarks
1	Bolt	2	M6 × 16 mm
2	Thermoswitch	1	
3	Plastic tie	1	
4	Knock sensor	1	
5	Bolt	1	M8 × 40 mm
6	Bolt	1	M6 × 20 mm
7	Gasket	1	Not reusable
8	Anode	1	
9	Grommet	1	
10	Cover	1	
11	Clamp/oil return hose	2/1	
12	Engine temperature sensor	1	
13	Washer	1	



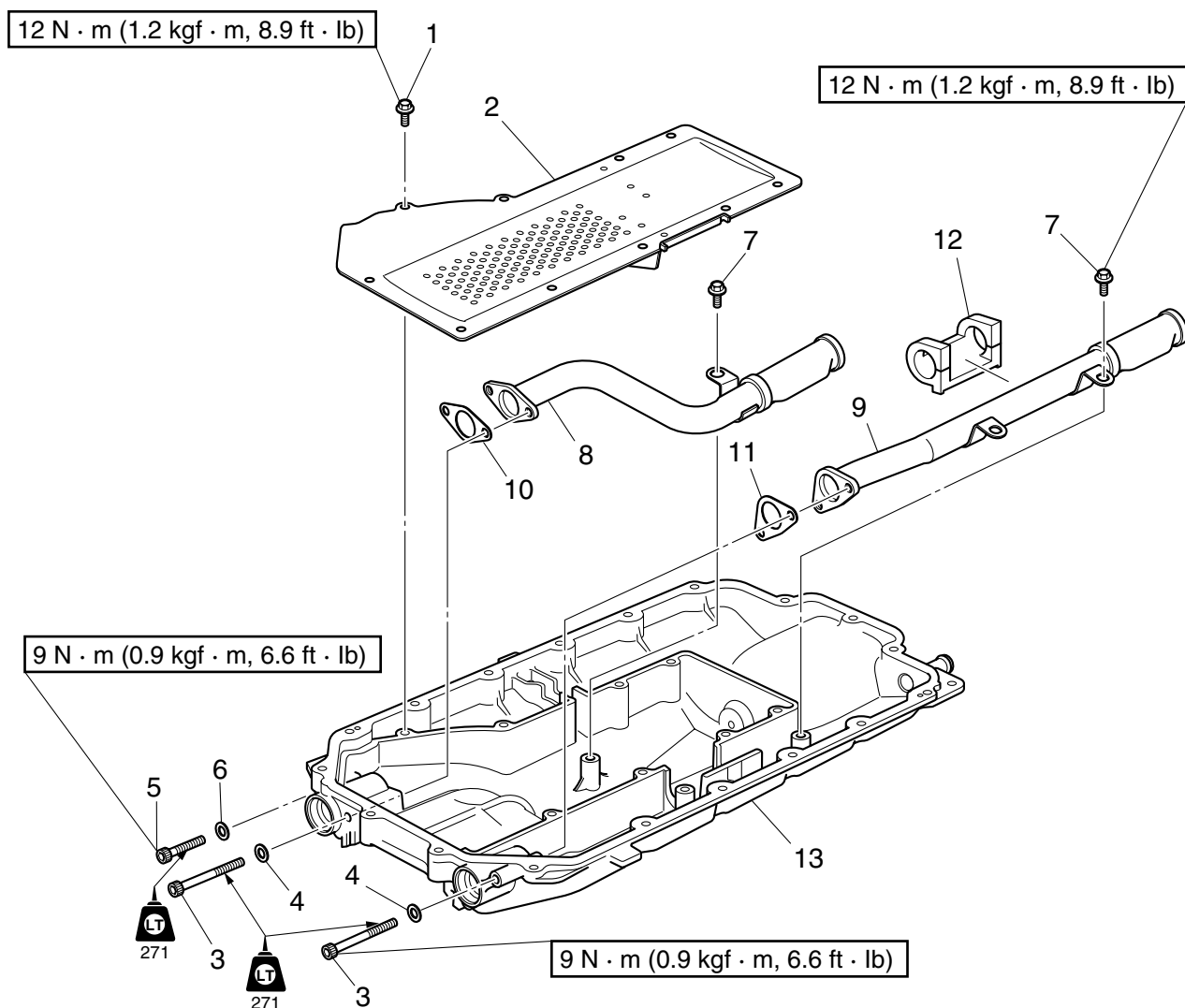
Step	Part name	Q'ty	Remarks
14	Bolt	3	M6 × 35 mm
15	Earth plate	1	
16	O-ring	1	
17	Clamp/oil hose	1/1	
18	Plastic tie	1	
19	Clamp/cooling water hose	1/1	① White paint
20	Band	1	Not reusable
21	Clamp/cooling water hose	1/1	
22	Bolt	1	M4 × 8 mm
23	Oil pressure switch	1	
24	Bolt	9	M6 × 25 mm
25	Water jacket cover	1	
26	O-ring	1	Not reusable



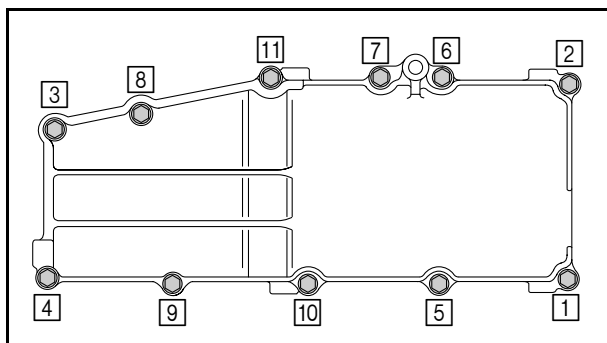
Step	Part name	Q'ty	Remarks
27	Bolt	9	M6 × 20 mm
28	Bolt	2	M6 × 14 mm
29	Oil separator tank cover	1	
30	Gasket	1	Not reusable
31	Bolt	16	M6 × 35 mm
32	Bolt	1	M6 × 30 mm
33	Bolt	1	M6 × 20 mm
34	Oil pan assembly	1	
35	Dowel pin	2	



Oil pan disassembly



Step	Part name	Q'ty	Remarks
1	Bolt	10	M6 × 14 mm
2	Baffle plate	1	
3	Bolt	3	M6 × 60 mm
4	Washer	3	
5	Bolt	1	M6 × 35 mm
6	Washer	1	
7	Bolt	3	M6 × 14 mm
8	Oil pipe 1	1	
9	Oil pipe 2	1	
10	Gasket 1	1	Not reusable
11	Gasket 2	1	Not reusable
12	Grommet	1	
13	Oil pan	1	



Oil separator tank cover removal

1. Remove:

- Oil separator tank cover

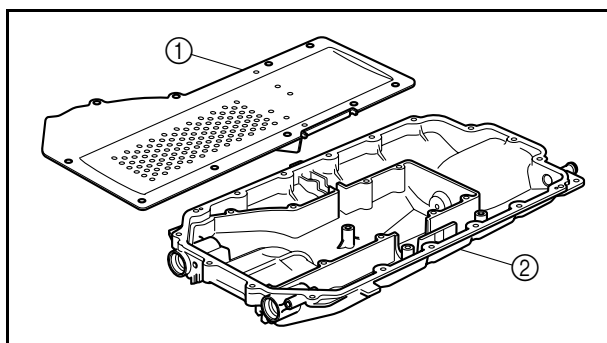
TIP

Loosen the oil separator tank cover bolts in the sequence shown.

Oil separator tank cover check

1. Check:

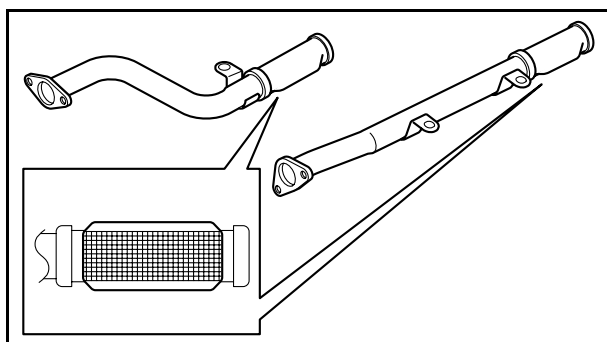
- Oil separator tank cover
Cracks/damage → Replace the oil separator tank cover.



Oil pan check

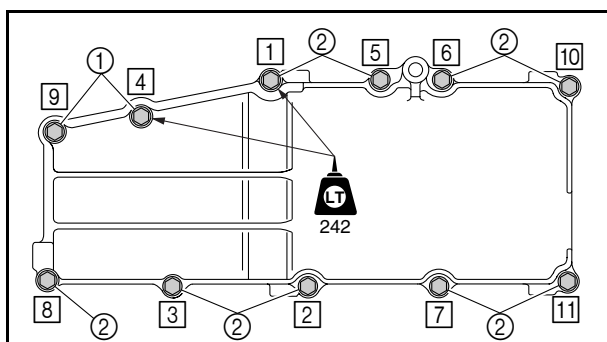
1. Check:

- 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.



Oil separator tank cover installation

1. Install:

- Oil separator tank cover
- Oil separator tank cover bolts (M6 × 14 mm) ①
- Oil separator tank cover bolts (M6 × 20 mm) ②

TIP

Tighten the oil separator tank cover bolts in the sequence shown.

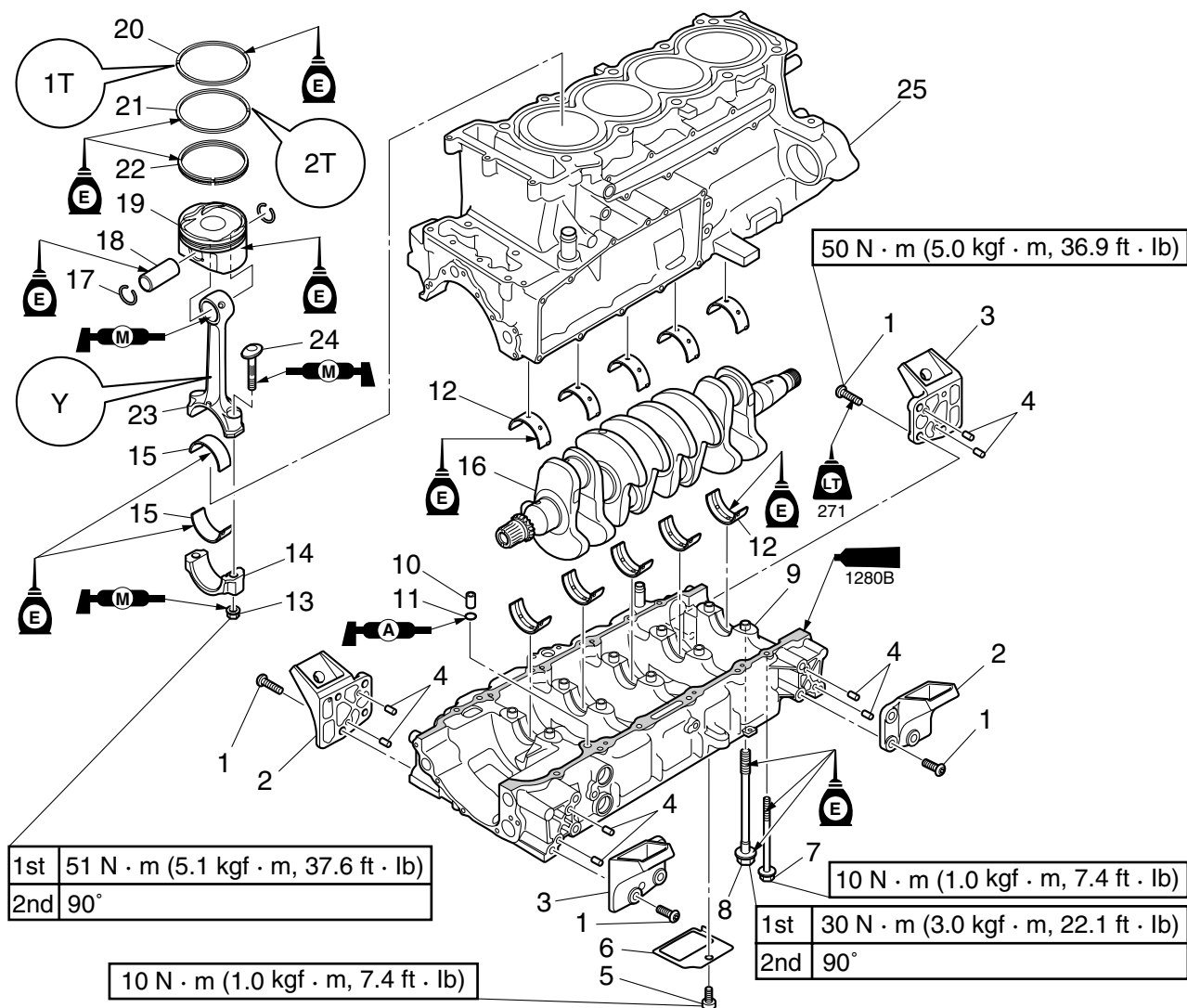


Oil separator tank cover bolt:
8 N·m (0.8 kgf·m, 5.9 ft·lb)
LOCTITE 242

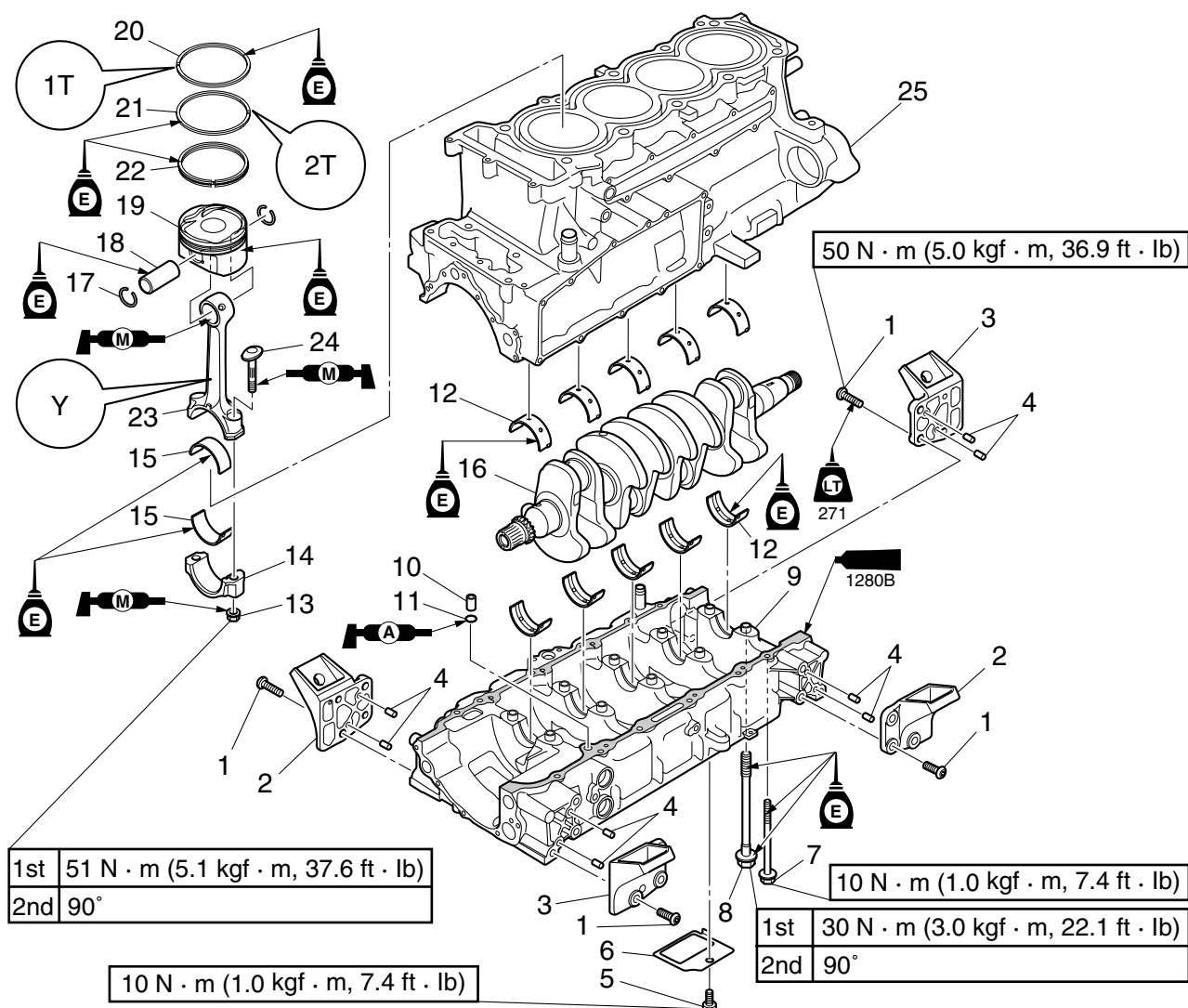


Crankcase, connecting rod, and piston

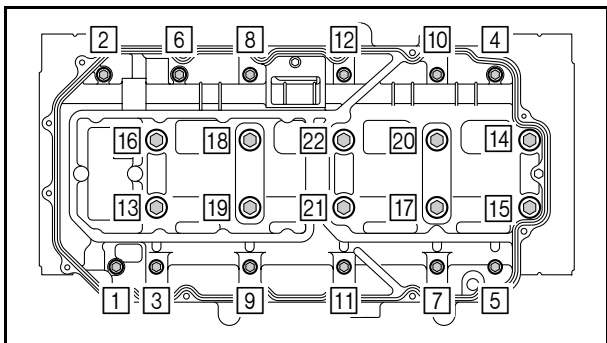
Crankcase, connecting rod, and piston disassembly



Step	Part name	Q'ty	Remarks
1	Bolt	12	M10 × 30 mm
2	Bracket 1	2	
3	Bracket 2	2	
4	Dowel pin	8	
5	Bolt	1	M6 × 12 mm
6	Baffle plate	1	
7	Bolt	12	M6 × 70 mm
8	Bolt	10	Not reusable M10 × 85 mm
9	Crankcase	1	
10	Dowel	1	
11	O-ring	1	Not reusable
12	Crankshaft journal bearing	10	



Step	Part name	Q'ty	Remarks
13	Nut	8	
14	Connecting rod cap	4	
15	Connecting rod bearing	8	
16	Crankshaft	1	
17	Piston pin clip	8	Not reusable
18	Piston pin	4	
19	Piston	4	
20	Top ring	4	
21	2nd ring	4	
22	Oil ring	4	
23	Connecting rod	4	
24	Bolt	8	Not reusable
25	Cylinder block	1	



Crankcase disassembly

1. Remove:

- Crankcase bolts (M6 × 70 mm) ①–⑫
- Crankcase bolts (M10 × 85 mm) ⑬–⑳

TIP

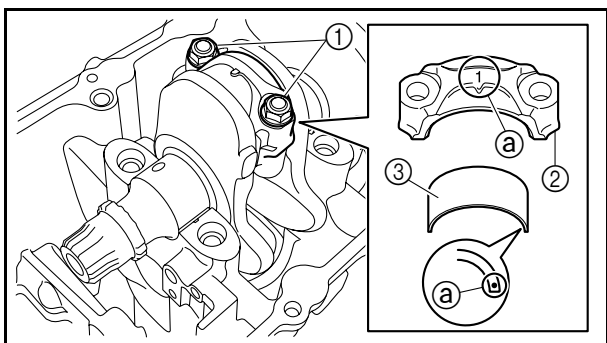
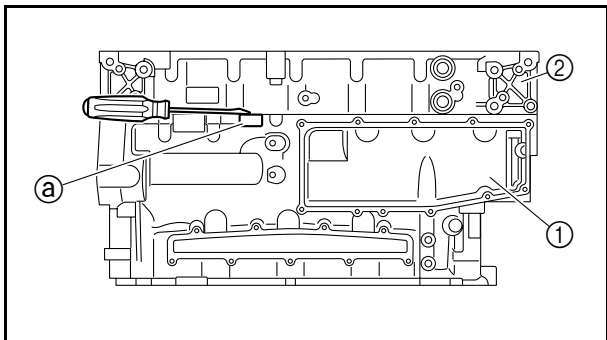
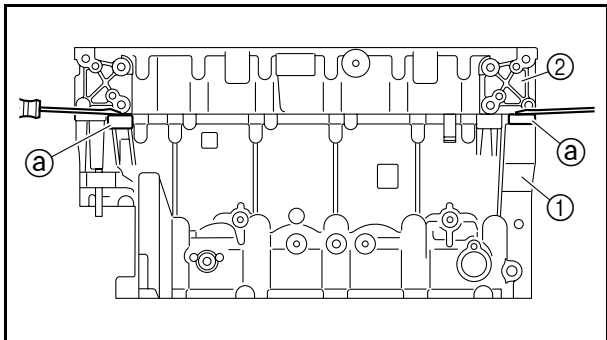
- Place the crankcase upside down on a bench.
- The numbers embossed on the crankcase indicate the crankcase tightening sequence.

2. Remove:

- Crankcase

TIP

- Insert a flat-head screwdriver between the reinforced portions ① of the cylinder block and the crankcase ② to separate them.
- Work carefully and make sure that the crankcase halves separate evenly.



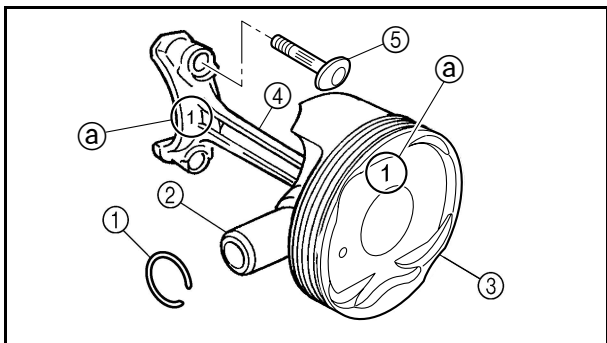
Connecting rod and piston removal

1. Remove:

- Nuts ①
- Connecting rod caps ②
- Big end bearings ③

TIP

For reference during installation, put identification marks ① on the connecting rod cap and big end bearing.

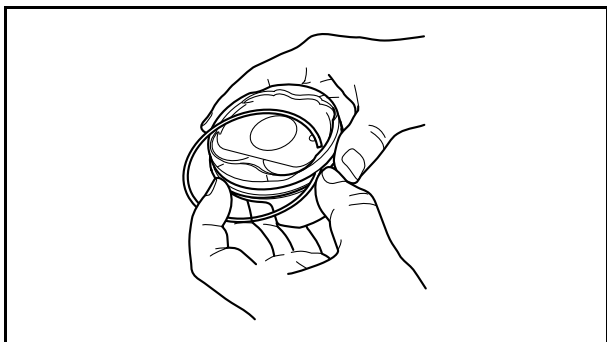


2. Remove:

- Piston pin clips ①
- Piston pin ②
- Piston ③
- Connecting rod ④
- Connecting rod cap bolts ⑤

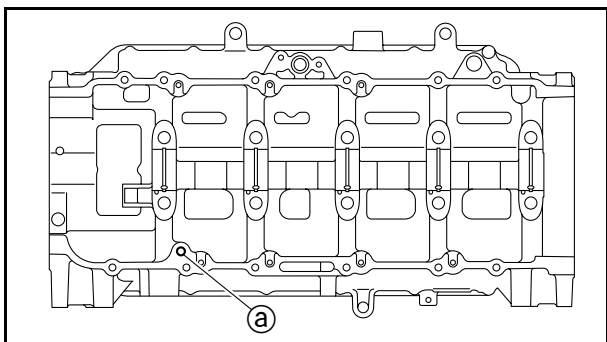
TIP

For reference during installation, put identification marks (a) on the piston crown and connecting rod.



3. Remove:

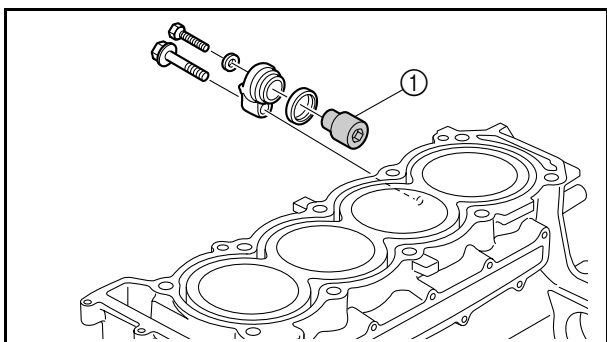
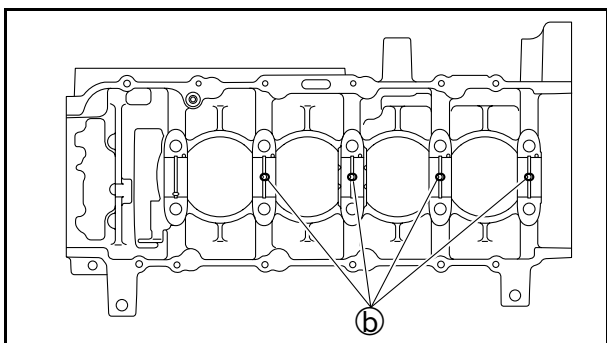
- Top ring
- 2nd ring
- Oil ring



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.

NOTICE

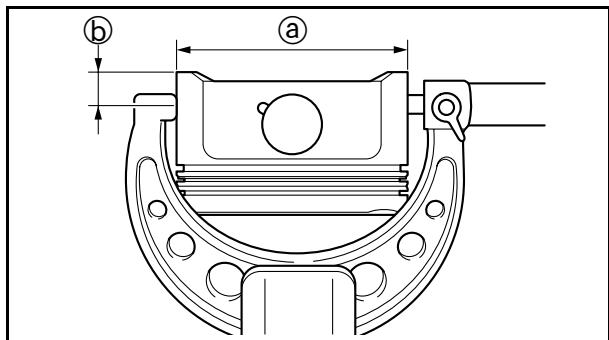
Do not oil or grease the anode, otherwise it will be ineffective.



Piston check

1. Check:

- Piston wall
Vertical scratches → Replace the piston and piston rings as a set.

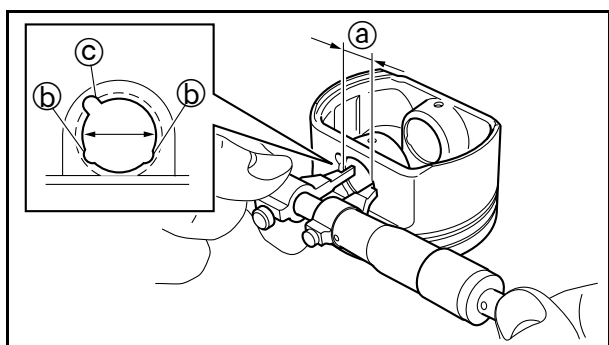


2. Measure:

- 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:

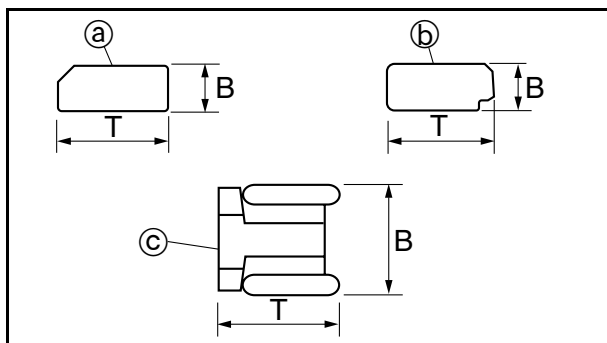
- Piston pin boss bore diameter (a)
Out of specification → Replace the piston.

TIP

When measuring the piston pin boss bore, do not measure it at the oil groove (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):

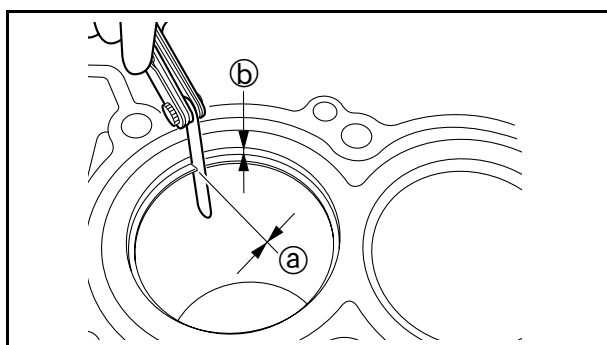
B: 1.17–1.19 mm
(0.0461–0.0469 in)

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)



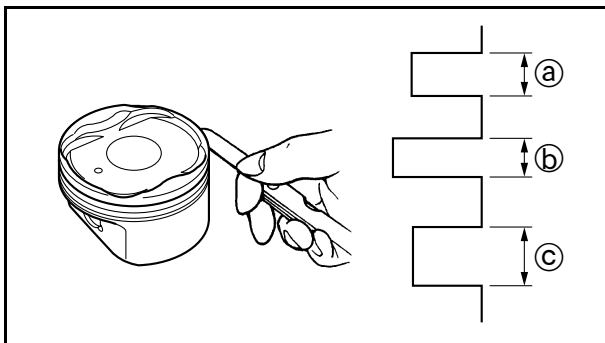
Piston ring end gap (a) (reference data):

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:**

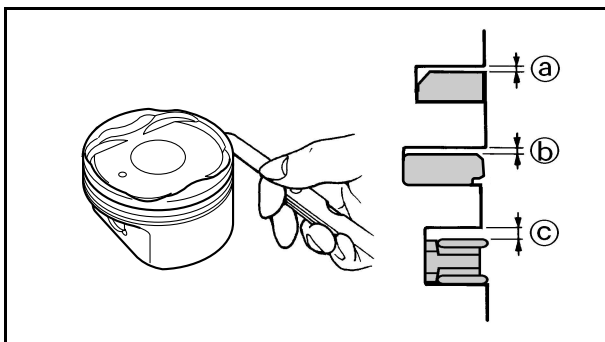
- Piston ring grooves
Out of specification → Replace the piston.

TIP

Before measuring the piston ring grooves, eliminate any carbon deposits from the piston ring grooves.

**Piston ring groove:**

- Top ring ①:
1.21–1.23 mm (0.0476–0.0484 in)
2nd ring ②:
1.21–1.23 mm (0.0476–0.0484 in)
Oil ring ③:
2.51–2.53 mm (0.0988–0.0996 in)

**4. Measure:**

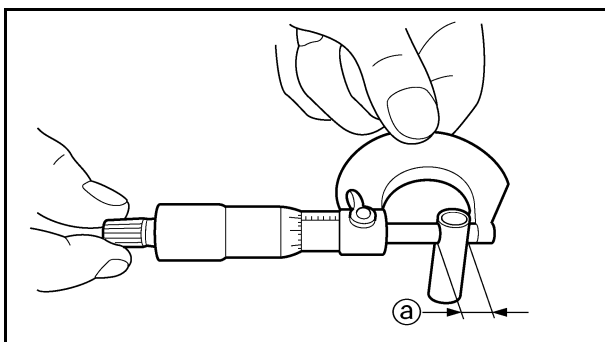
- Piston ring side clearance
Out of specification → Replace the piston and piston rings as a set.

TIP

Before measuring the piston ring side clearance, eliminate any carbon deposits from the piston ring grooves and piston rings.

**Piston ring side clearance:**

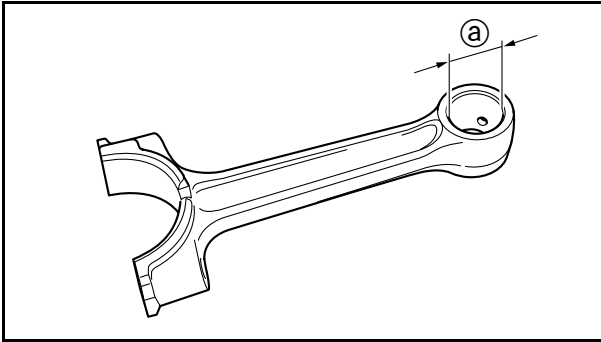
- Top ring ①:
0.02–0.06 mm (0.0008–0.0024 in)
2nd ring ②:
0.02–0.06 mm (0.0008–0.0024 in)
Oil ring ③:
0.04–0.16 mm (0.0016–0.0063 in)

**Piston pin check****1. Measure:**

- Piston pin outside diameter ①
Out of specification → Replace the piston pin.

**Piston pin outside diameter ①:**

- 21.991–22.000 mm
(0.8658–0.8661 in)



Connecting rod check

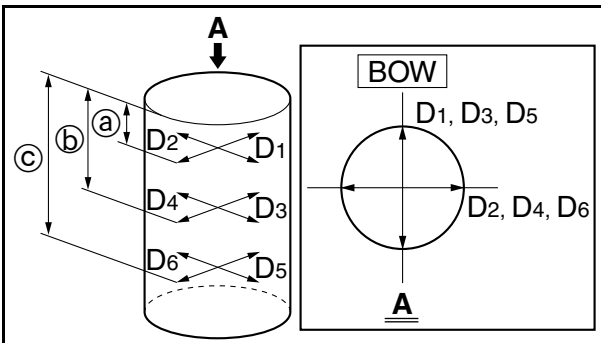
1. Measure:

- Connecting rod small end inside diameter ①
- Out of specification → Replace the connecting rod assembly.



Connecting rod small end inside diameter ①:

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_1 – D_6)
- Out of specification → Replace the cylinder block.

TIP

Measure the cylinder bore (D_1 – D_6) at measuring points ①, ②, and ③, and in directions (D_1 , D_3 , and D_5), which are parallel to the crankshaft, and directions (D_2 , D_4 , and D_6), which are at a right angle to the crankshaft.

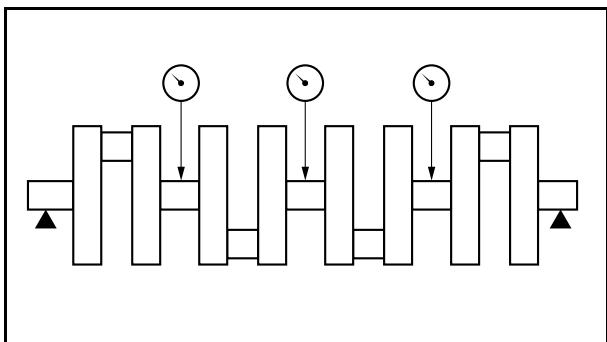
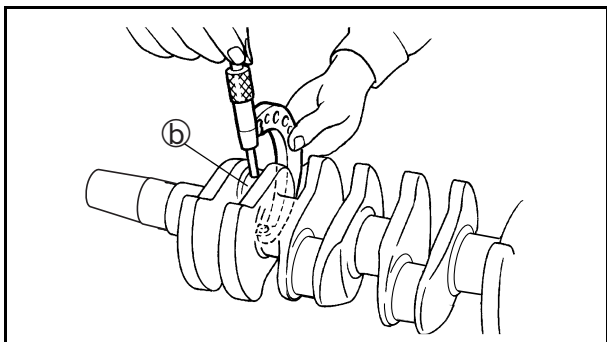
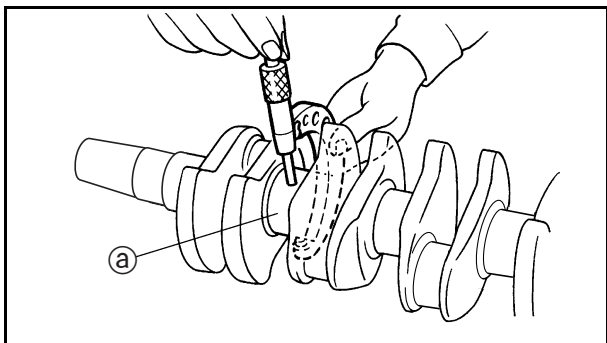


Cylinder bore (D_1 – D_6):

86.000–86.015 mm
(3.3858–3.3864 in)

Measuring points:

①: 20 mm (0.8 in)
②: 50 mm (2.0 in)
③: 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)

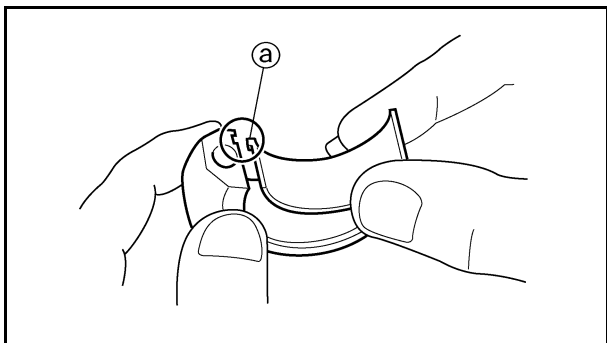
Crankshaft pin oil clearance check

1. Measure:

- Crankshaft pin oil clearance
- Out of specification → Replace the connecting rod bearings.

Measurement steps:

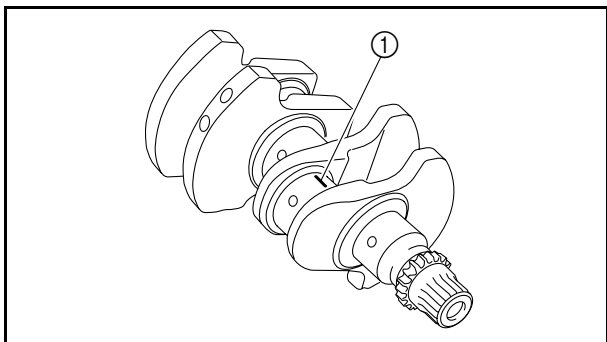
1. Clean the bearings and connecting rod big end.



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

TIP

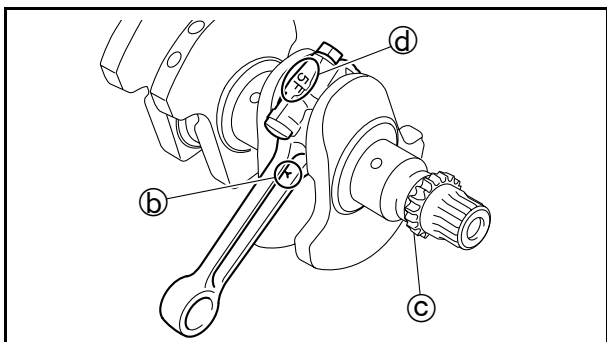
- Install the connecting rod bearings in their original positions.
- Insert the projection ① of each bearing into the slots in the connecting rod cap and connecting rod.



3. Put a piece of Plastigauge ① onto the crankshaft pin, parallel to the crankshaft.

TIP

Do not put the Plastigauge over the oil hole in the crankshaft pin.



4. Install the connecting rod onto the crankshaft pin.

TIP

- Make sure that the “Y” mark ⑥ on the connecting rod faces toward the timing chain drive gear ⑦ of the crankshaft.
- Make sure that the characters ⑧ on both the connecting rod and connecting rod cap are aligned.

5. Apply engine oil to the connecting rod bolts threads and nut seats.

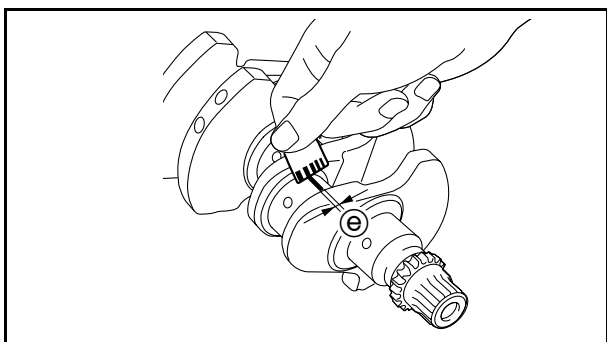
6. Tighten the connecting rod nuts to the specified torques in 2 stages.

TIP

Do not turn the connecting rod until the crankshaft pin oil clearance measurement has been completed.



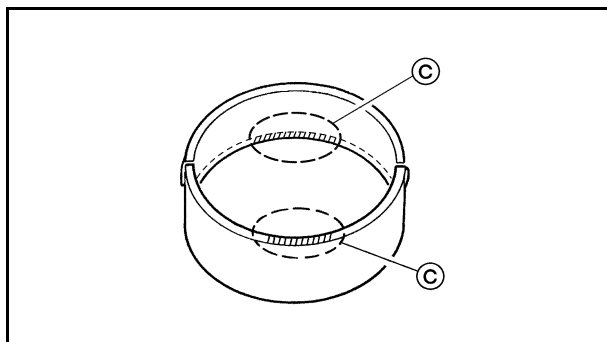
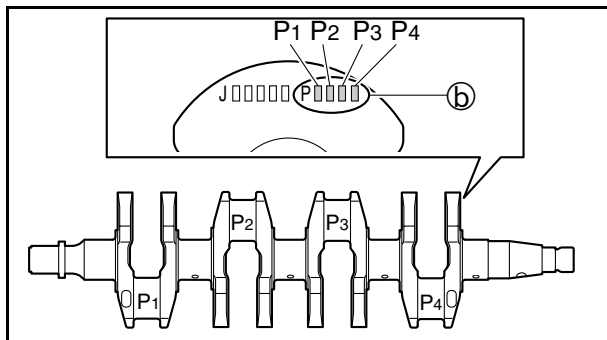
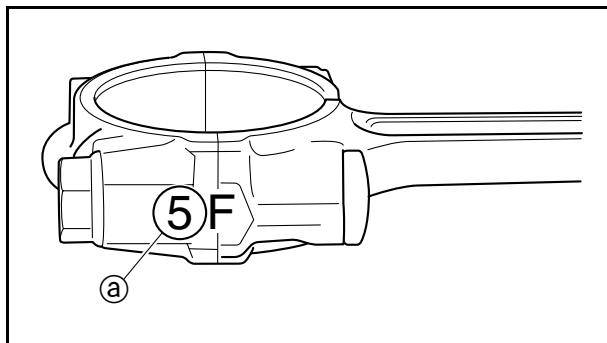
Connecting rod nut:
1st: 51 N·m (5.1 kgf·m, 37.6 ft·lb)
2nd: 90°



7. Remove the connecting rod cap and measure the width ⑨ 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 ① on the connecting rod.
2. Check the crankshaft pin size number ② on the crankshaft web.
3. Select the suitable color ③ for the connecting rod bearing from the table.

Calculation formula:

Connecting rod bearing size number =
connecting rod size number ① –
crankshaft pin size number ②

Bearing size number	Bearing color ③
1	Brown
2	Black
3	Blue
4	Green

Example:

“P1” connecting rod size number “5”

“P1” crankshaft pin size number “1”

$$5 - 1 = 4$$

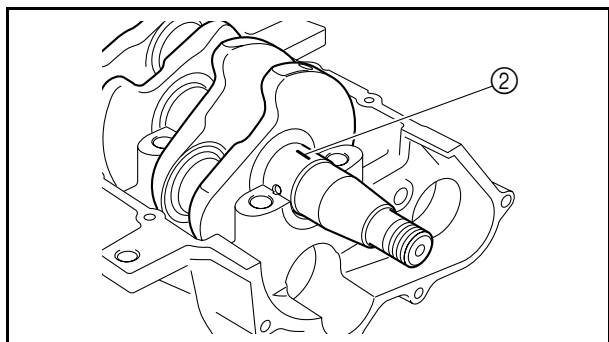
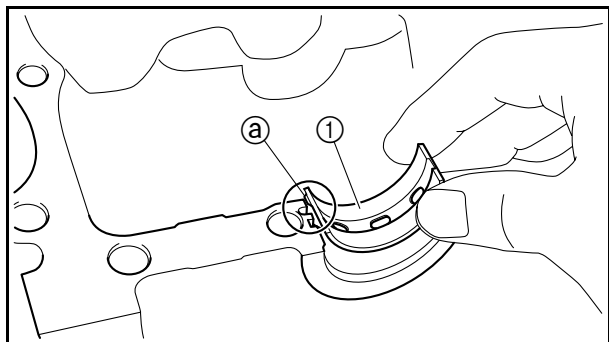
Select the size “4”, “green” connecting rod bearing.



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.

TIP

- 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.

TIP

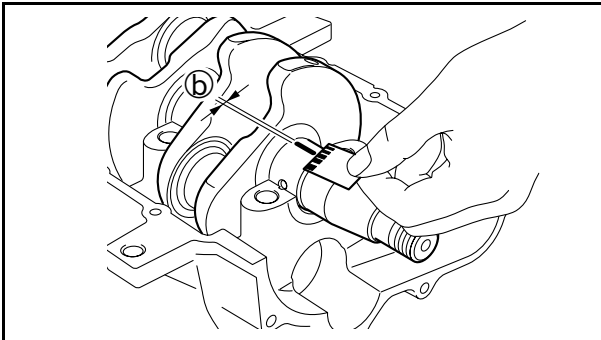
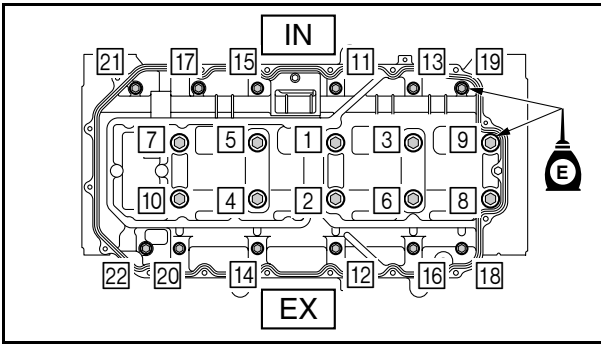
Do not put the Plastigauge over the oil hole in the main journals of the crankshaft.

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

TIP

- 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. Apply engine oil to the crankcase bolts threads.
9. Tighten the crankcase bolts to the specified torques in 2 stages.

TIP

- Tighten the crankcase bolts in the sequence shown.
- Do not turn the crankshaft until the crankshaft journal oil clearance measurement has been completed.

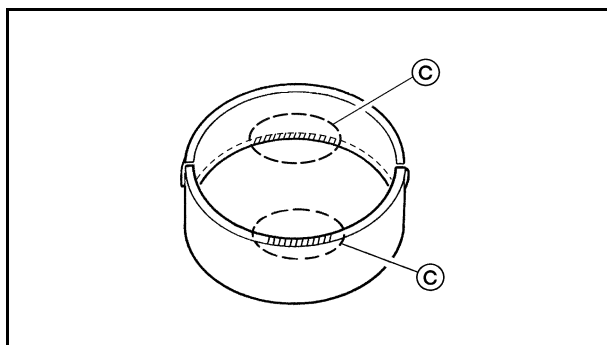
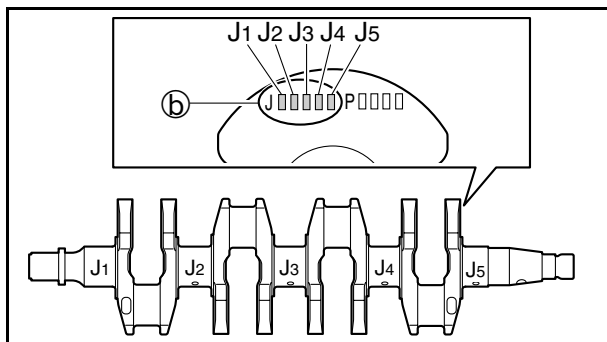
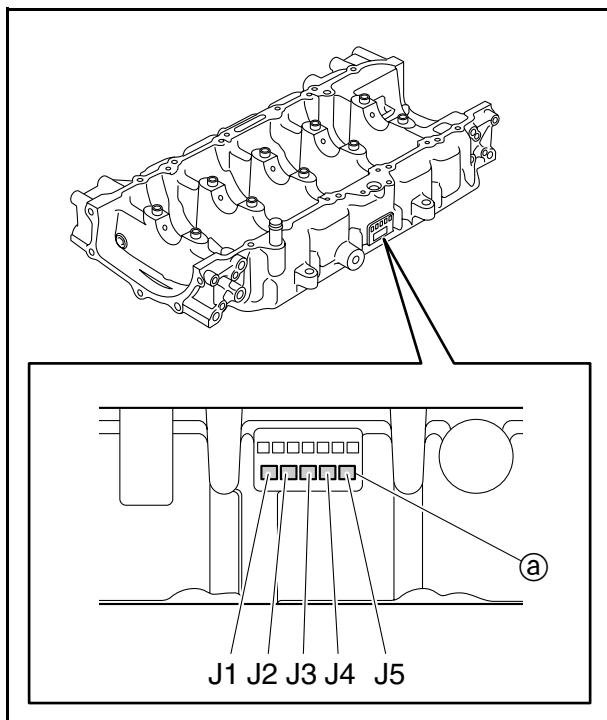


Crankcase bolt ①–⑩:
1st: 30 N·m (3.0 kgf·m, 22.1 ft·lb)
2nd: 90°
Crankcase bolt ⑪–⑫:
10 N·m (1.0 kgf·m, 7.4 ft·lb)

10. Remove the crankcase and measure the width ⑥ 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 ① on the crankcase.

TIP

If the crankcase journal sizes are the same at all positions, the size number ① 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 ② on crankshaft web.
3. Select the suitable color ③ for main bearing.

Calculation formula:

Main bearing size number =
crankcase journal size number ① –
crankshaft journal size number ②

Bearing size number	Bearing color ③
1	Brown
2	Black
3	Blue
4	Green
5	Yellow

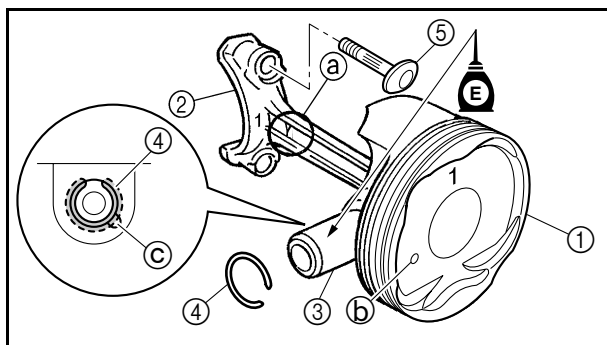
Example:

“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:

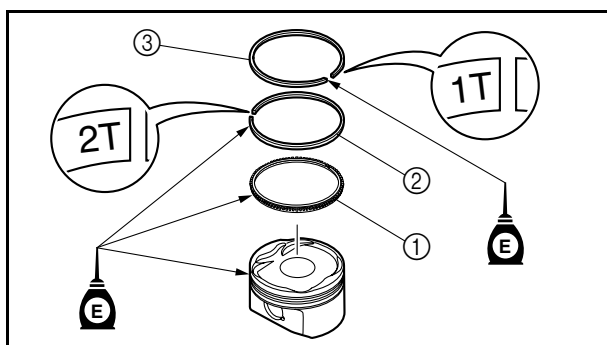
- Piston ①
- Connecting rod ②
- Piston pin ③
- Piston pin clips ④
- Connecting rod cap bolts ⑤

NOTICE

Do not reuse the piston pin clips ④ and connecting rod cap bolts ⑤, always replace them with new ones.

TIP

- When installing the connecting rod to the piston, make sure that the “Y” mark ① on the connecting rod faces toward 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:

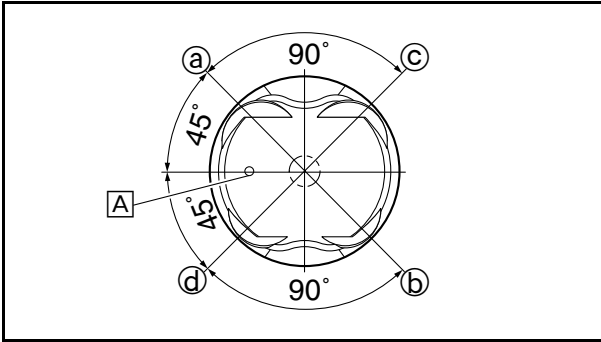
- Oil ring ①
- 2nd ring ②
- Top ring ③

NOTICE

Do not scratch the pistons or break the piston rings.

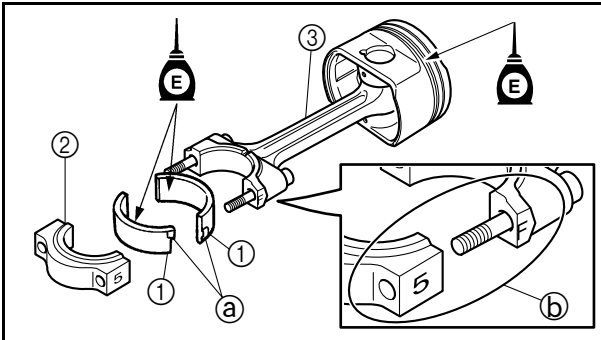
TIP

- Make 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, make sure that they move smoothly.



3. Offset:

- Piston ring end gap
- ① Top ring, oil ring expander spacer
- ② 2nd ring
- ③ Upper oil ring rail
- ④ Lower oil ring rail
- Ⓐ Front mark



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.

TIP

- Install the connecting rod bearings in their original positions.
- Insert the projections ③ of the bearings into the slots in the connecting rod cap and connecting rod.

3. Install the connecting rod cap ② into the connecting rod assembly ③.

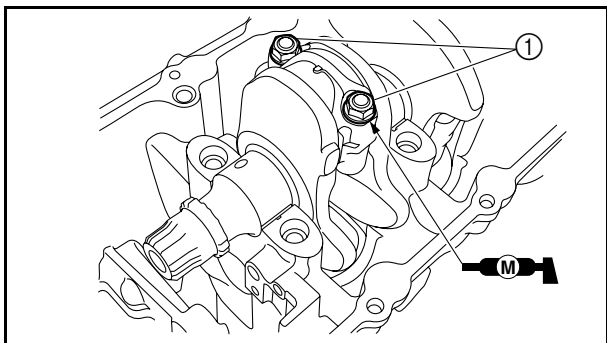
TIP

Make sure that the characters ⑥ on the connecting rod cap and connecting rod are aligned.

4. 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

TIP

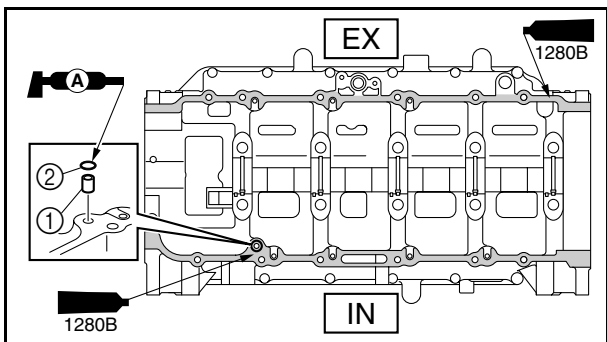
Use a commercially available angle gauge to tighten the nuts to the specified angle.



Connecting rod nut:

1st: 51 N·m (5.1 kgf·m, 37.6 ft·lb)

2nd: 90°



Crankcase assembly

1. Install:

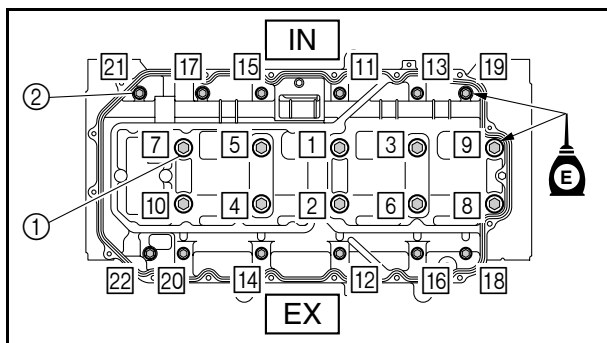
- Dowel pin ①
- O-ring ②

Installation steps:

1. Thoroughly clean all the gasket surfaces and crankcase mating surfaces.
2. Install the dowel pin ① and O-ring ②.
3. Apply sealant to the mating surface of the crankcase.

TIP

Do not get away sealant on the main bearing.

**2. Tighten:**

- Crankcase bolts (M10 × 85 mm) ①
- Crankcase bolts (M6 × 70 mm) ②

Tightening steps:

1. Apply engine oil to the threads of the crankcase bolts and flange surface of the crankcase bolts.
2. Tighten the crankcase bolts ①-⑩ to the specified torque in 2 stages.

NOTICE

Do not reuse the crankcase bolts ①, always replace them with new ones.

TIP

- Tighten the crankcase bolts in the sequence shown.
- Use a commercially available angle gauge to tighten the bolts to the specified angle.

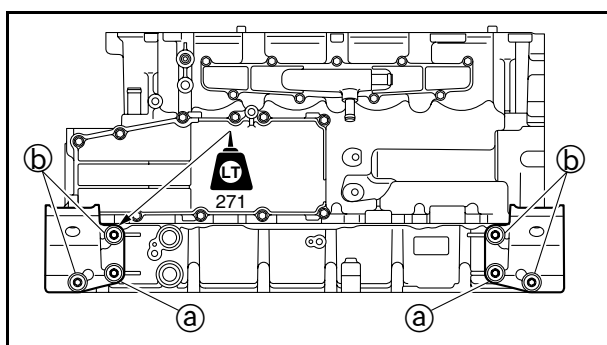
3. Tighten the crankcase bolts ⑪-⑫ to the specified torques.

TIP

Tighten the crankcase bolts 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

TIP

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

Chapter 6

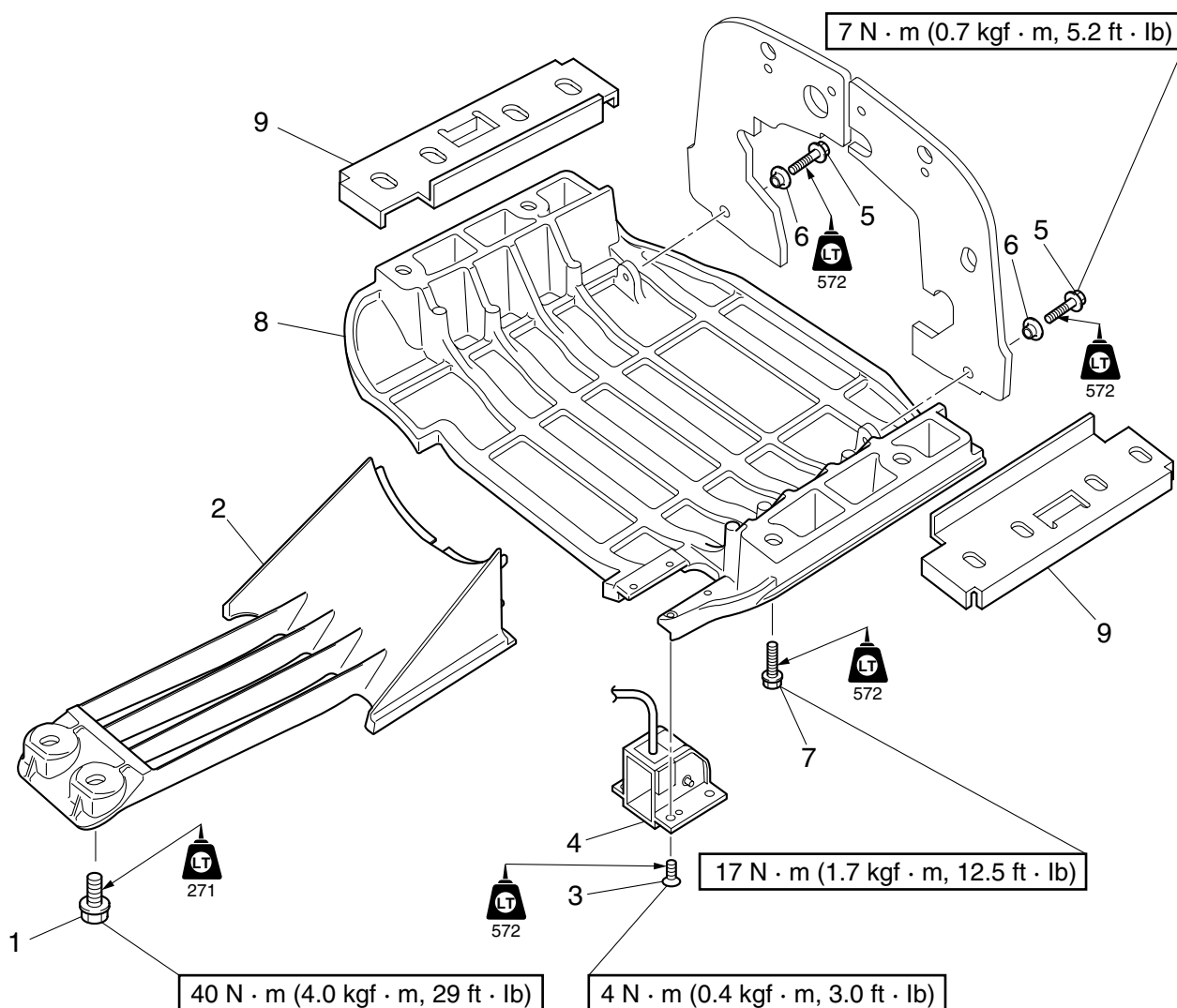
Jet pump unit

Intake grate and ride plate.....	6-1
Intake grate and ride plate removal	6-1
Jet pump unit.....	6-2
Jet pump unit removal	6-2
Jet pump unit removal	6-4
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Intake grate and ride plate

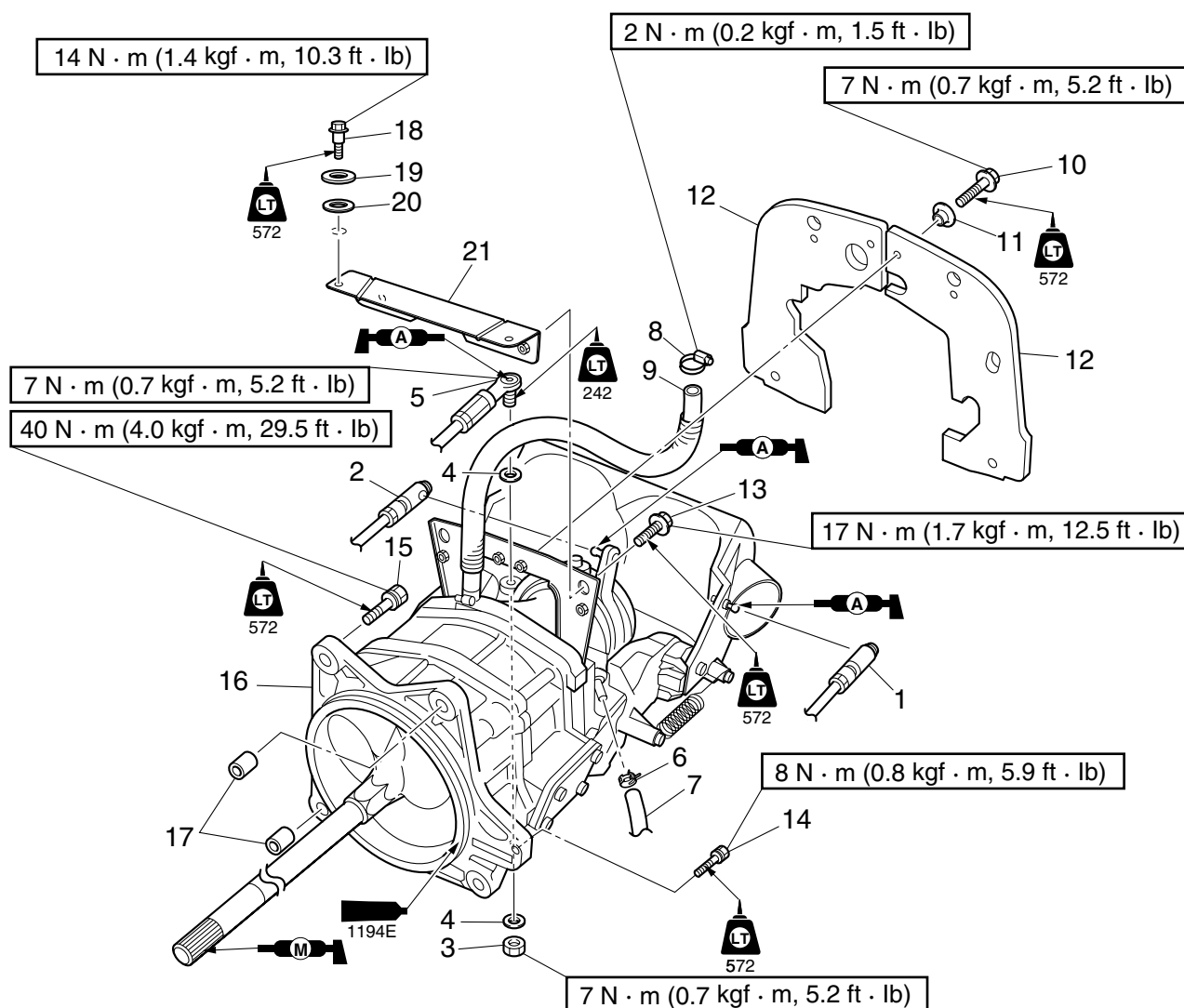
Intake grate and ride plate removal



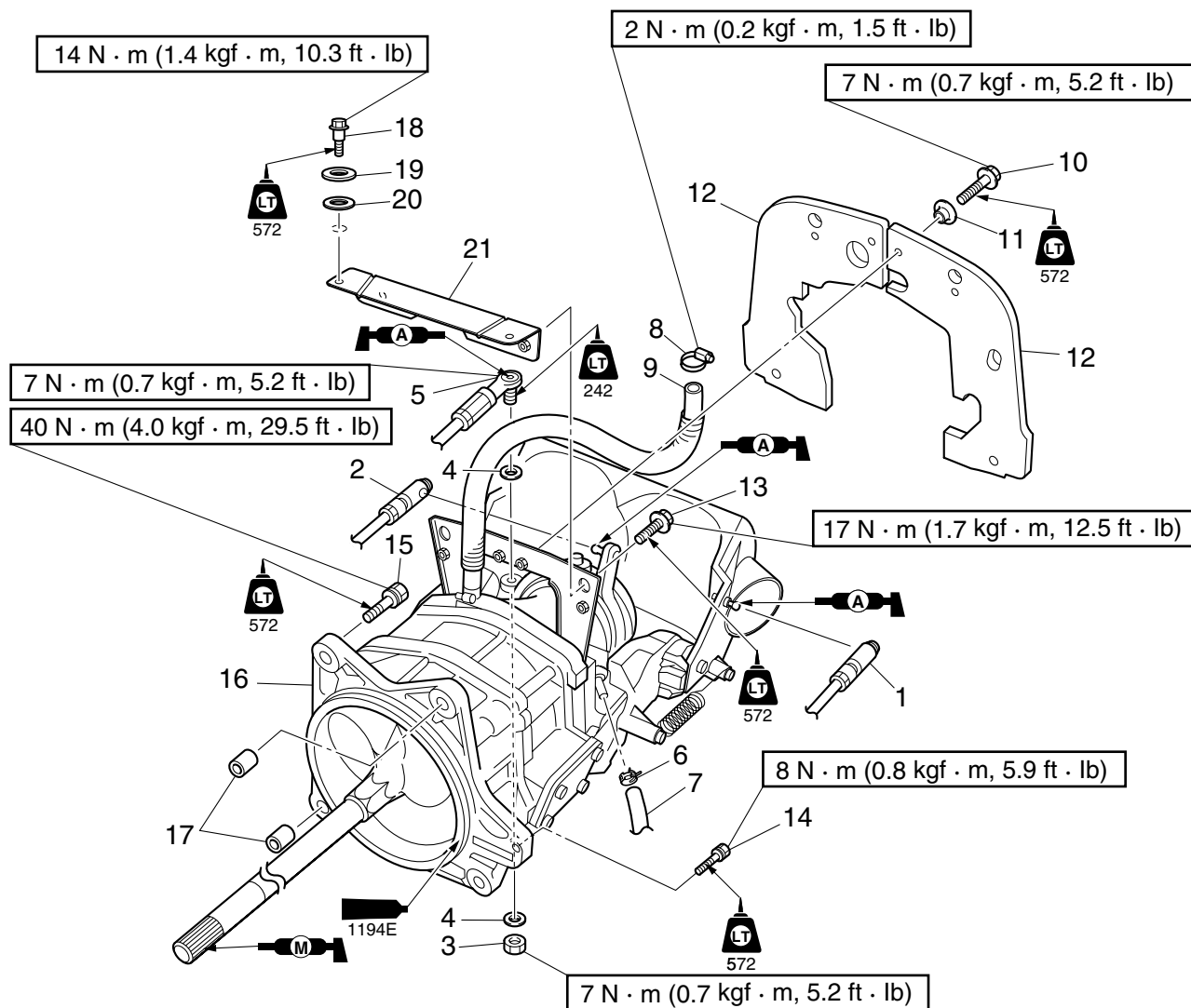
Step	Part name	Q'ty	Remarks
1	Bolt	4	M10 × 25 mm
2	Intake grate	1	
3	Screw	4	ø5 × 12 mm
4	Speed sensor	1	
5	Bolt	2	M6 × 22 mm
6	Collar	2	
7	Bolt	4	M8 × 35 mm
8	Ride plate	1	
9	Spacer	2	

Jet pump unit

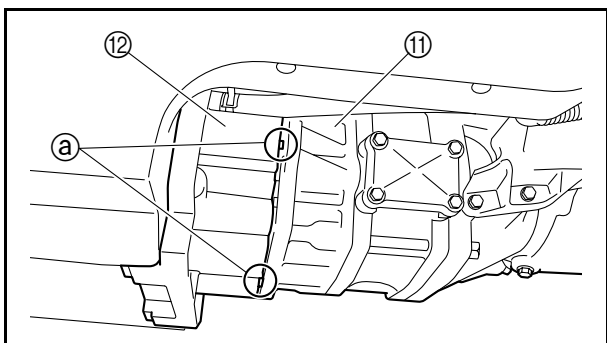
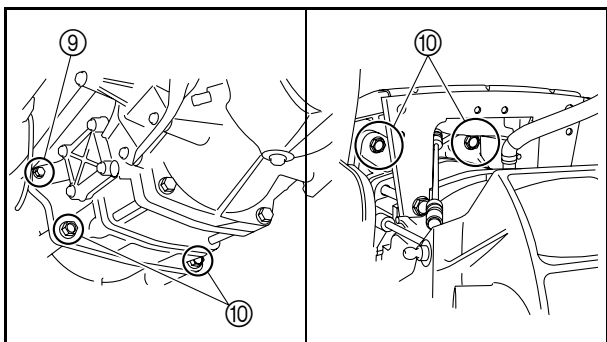
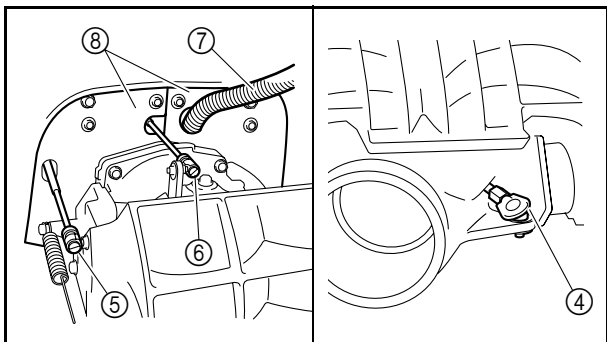
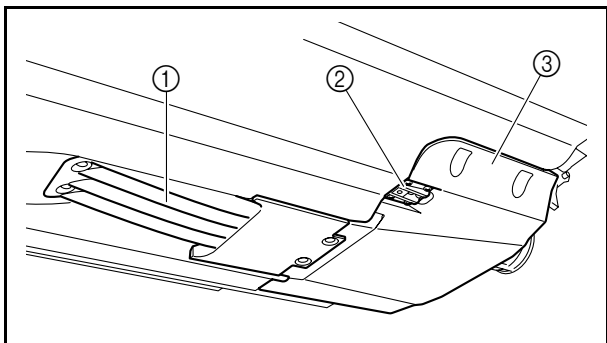
Jet pump unit removal



Step	Part name	Q'ty	Remarks
	Ride plate		Refer to "Intake grate and ride plate."
1	Shift cable joint	1	
2	QSTS rod joint	1	
3	Nut	1	
4	Washer	2	
5	Steering cable joint	1	
6	Clamp	1	
7	Bilge hose	1	
8	Clamp	1	
9	Spout hose	1	
10	Bolt	4	M6 × 22 mm
11	Collar	4	



Step	Part name	Q'ty	Remarks
12	Rubber plate	2	
13	Bolt	2	M8 × 18 mm
14	Bolt	1	M6 × 30 mm
15	Bolt	4	M10 × 45 mm
16	Jet pump unit assembly	1	
17	Dowel pin	2	
18	Bolt	2	M8 × 13 mm
19	Washer	2	
20	Gasket	2	Not reusable
21	Stay	1	



Jet pump unit removal

⚠ WARNING

Make sure to remove the battery before removing the jet pump unit.

1. Remove:

- Jet pump unit

Removal steps:

1. Remove the intake grate ①, speed sensor ②, and ride plate ③.
2. Remove the steering cable joint ④, shift cable joint ⑤, QSTS rod joint ⑥, spout hose ⑦, and rubber plates ⑧.
3. Remove the bolts ⑨ and ⑩, and then remove the jet pump unit ⑪.

TIP

Insert a flat-head screwdriver into the gap ① between the jet pump unit ⑪ and the transom plate ⑫ to separate them.

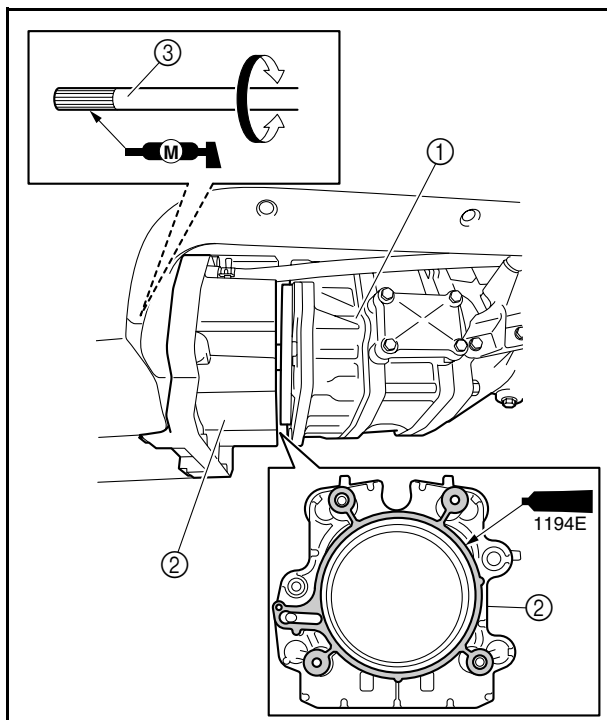
Jet pump unit installation

⚠ WARNING

Make sure to remove the battery before installing the jet pump unit.

1. Install:

- Jet pump unit



Installation steps:

1. Clean the contacting surfaces of the jet pump unit ① and transom plate ②.
2. Apply sealant to the contacting surfaces of the transom plate ②.
3. Install the jet pump unit ①.

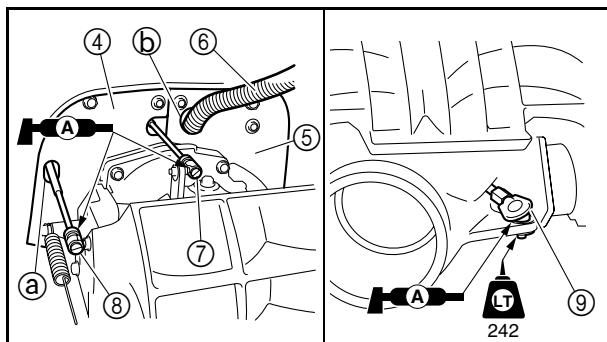
TIP

Rotate the drive shaft ③ 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



4. Install the rubber plates ④ and ⑤, spout hose ⑥, QSTS rod joint ⑦, shift cable joint ⑧, and steering cable joint ⑨.

TIP

- When installing the rubber plate ④, pass the shift cable through the hole ① in the plate.
- When installing the rubber plate ⑤, pass the spout hose ⑥ through the hole ② in the plate.
- Make sure that the steering, shifting, and QSTS operate correctly.



Rubber plate bolt:

7 N·m (0.7 kgf·m, 5.2 ft·lb)
LOCTITE 572

Spout hose clamp:

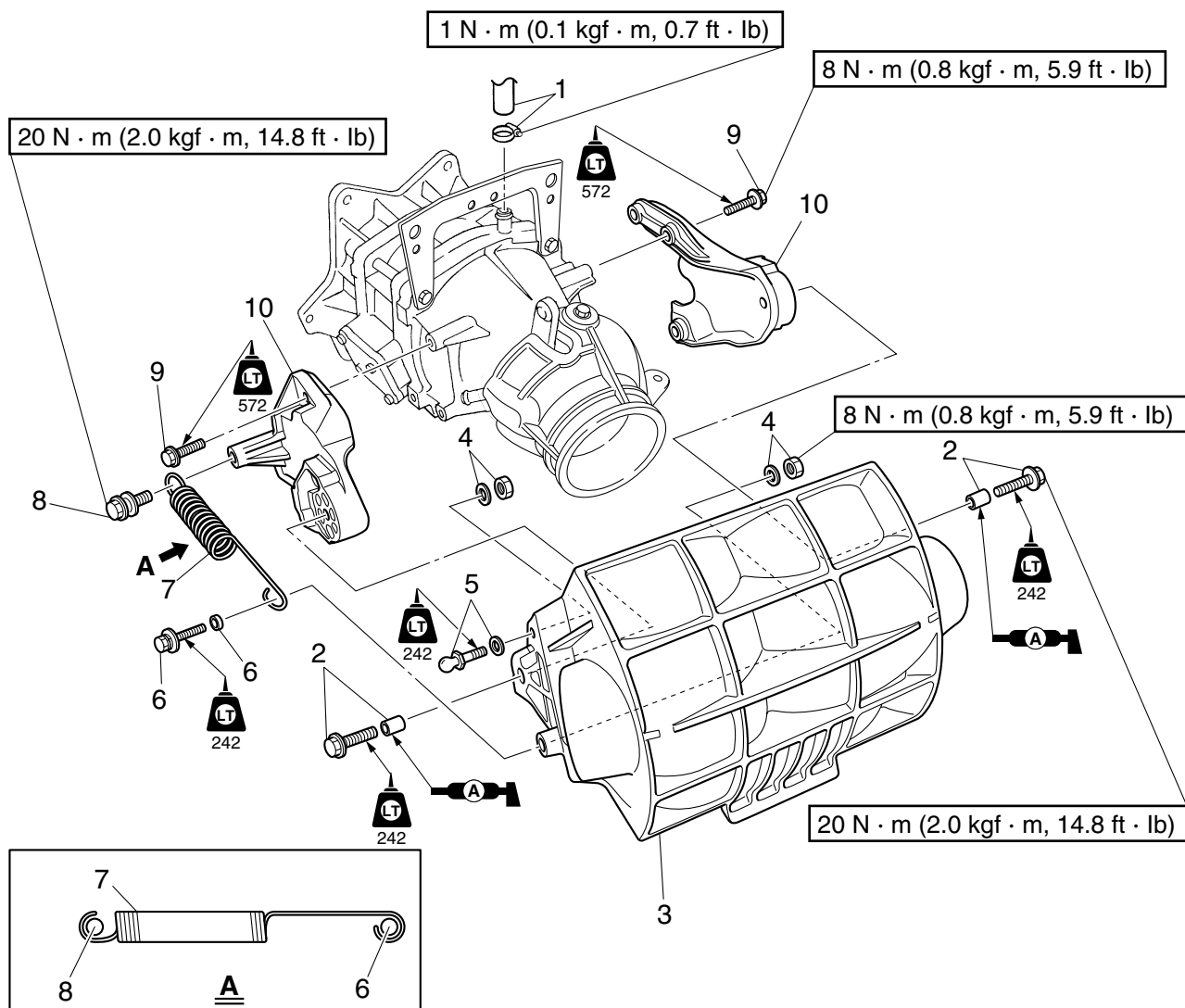
2 N·m (0.2 kgf·m, 1.5 ft·lb)

Steering cable joint:

7 N·m (0.7 kgf·m, 5.2 ft·lb)
LOCTITE 242

Reverse gate

Reverse gate removal

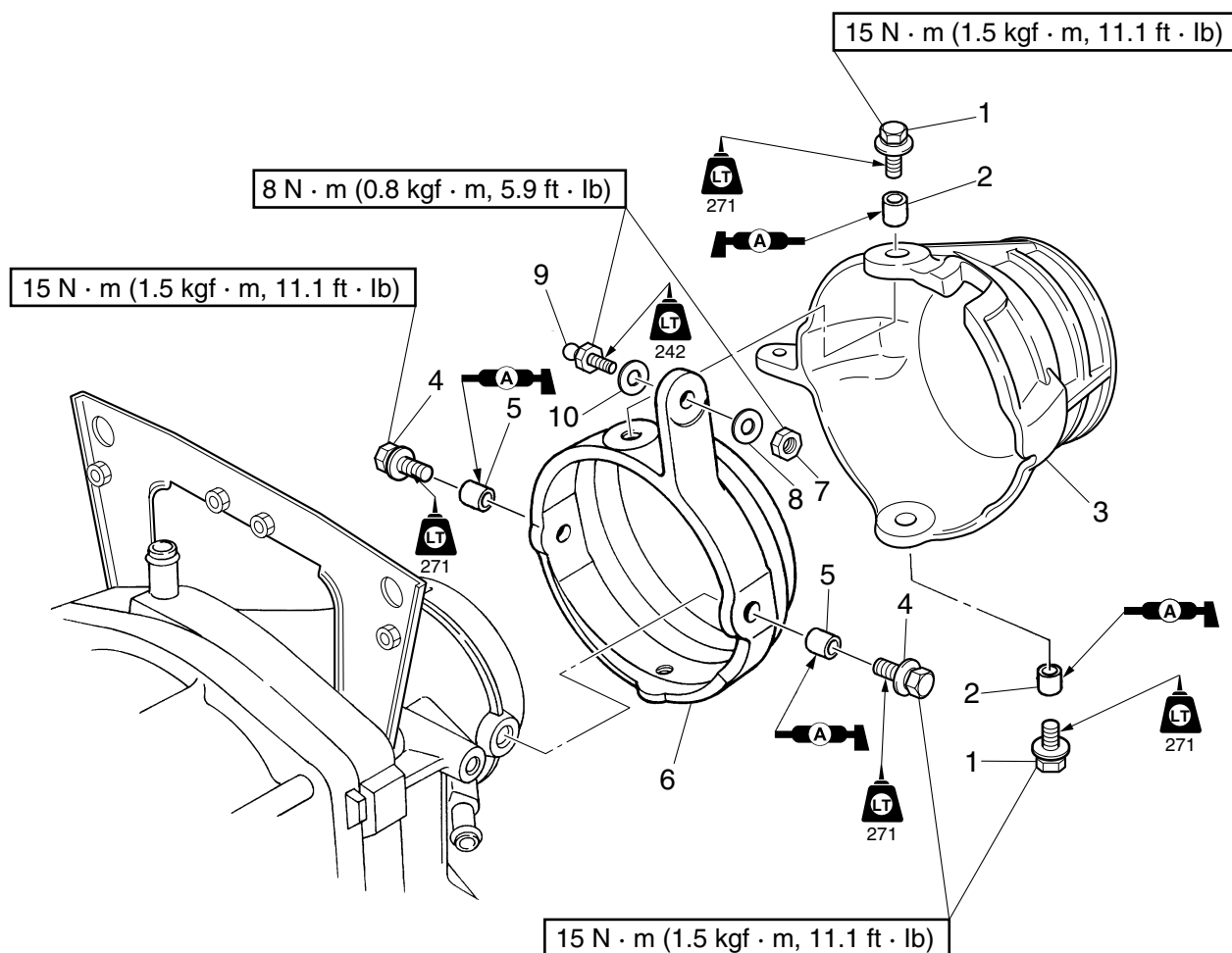


Step	Part name	Q'ty	Remarks
1	Clamp/spout hose	1/1	M8 × 25 mm
2	Bolt/collar	2/2	
3	Reverse gate assembly	1	
4	Nut/washer	2/2	
5	Shift cable ball joint/washer	1/1	M6 × 35 mm
6	Bolt/collar	1/1	
7	Spring	1	
8	Bolt	1	M8 × 14 mm
9	Bolt	6	M6 × 25 mm
10	Reverse gate bracket	2	



Jet thrust nozzle and nozzle ring

Jet thrust nozzle and nozzle ring removal

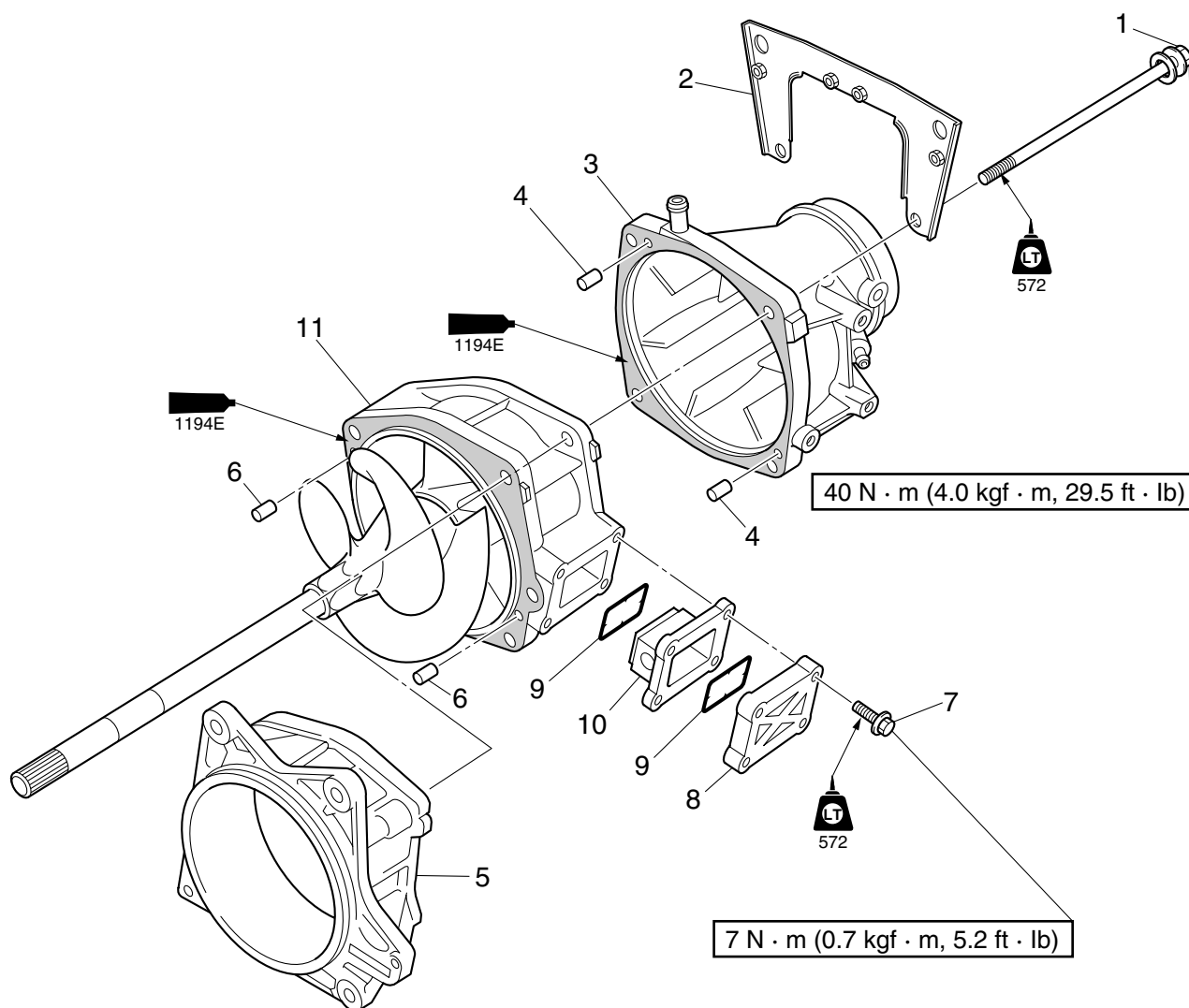


Step	Part name	Q'ty	Remarks
	Jet pump unit assembly		Refer to "Jet pump unit."
	Reverse gate		Refer to "Reverse gate."
1	Bolt	2	M8 × 20 mm
2	Collar	2	
3	Jet thrust nozzle	1	
4	Bolt	2	M8 × 20 mm
5	Collar	2	
6	Nozzle ring	1	
7	Nut	1	
8	Washer	1	
9	Ball joint	1	
10	Washer	1	



Impeller duct and impeller housing

Impeller duct, impeller housing and nozzle removal

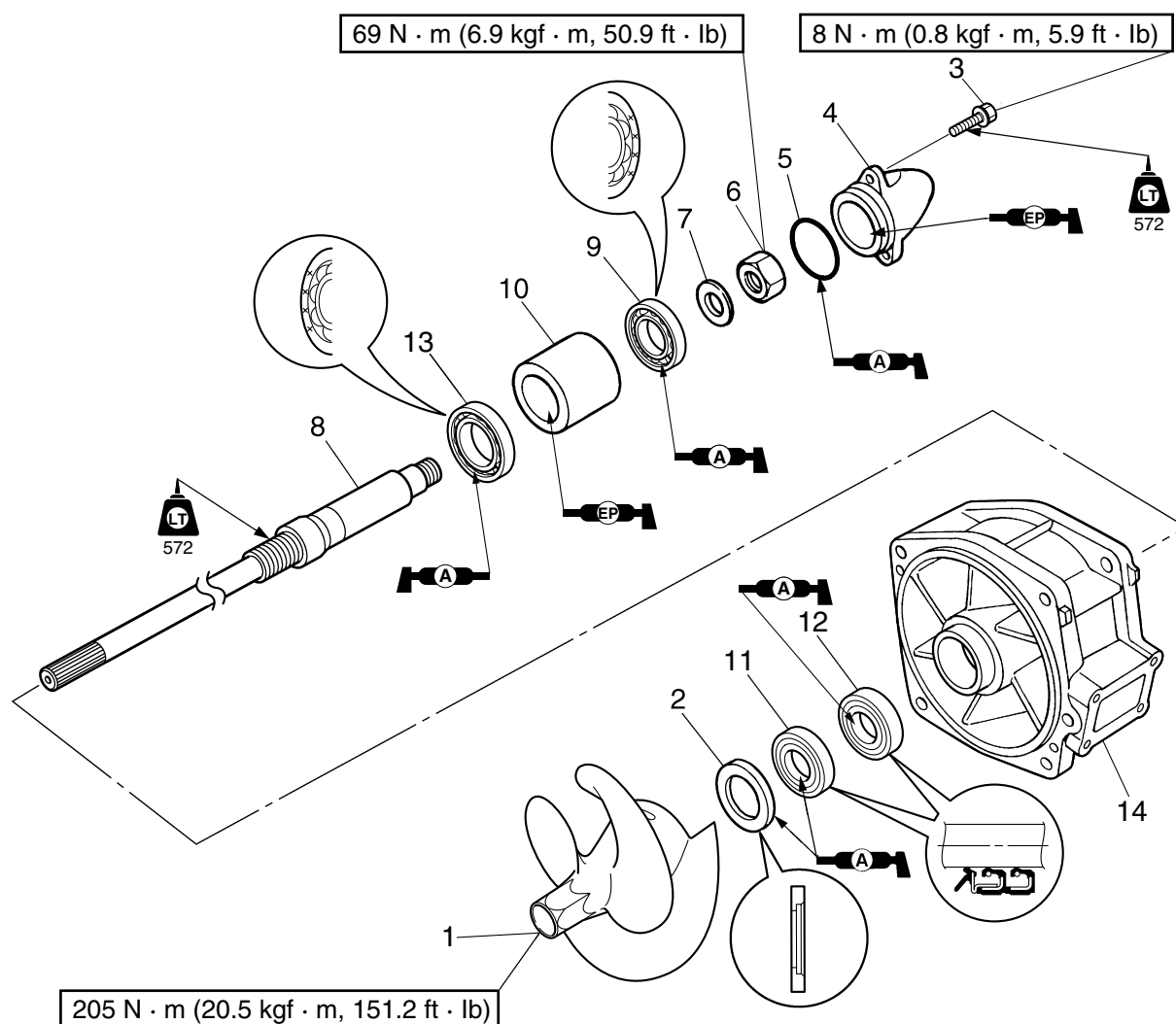


Step	Part name	Q'ty	Remarks
	Nozzle ring		Refer to "Jet thrust nozzle and nozzle ring."
1	Bolt	4	M10 × 125 mm
2	Bracket	1	
3	Nozzle	1	
4	Dowel pin	2	
5	Impeller housing	1	
6	Dowel pin	2	
7	Bolt	4	M6 × 35 mm
8	Water inlet cover	1	
9	Packing	2	Not reusable
10	Water inlet strainer	1	
11	Impeller duct assembly	1	

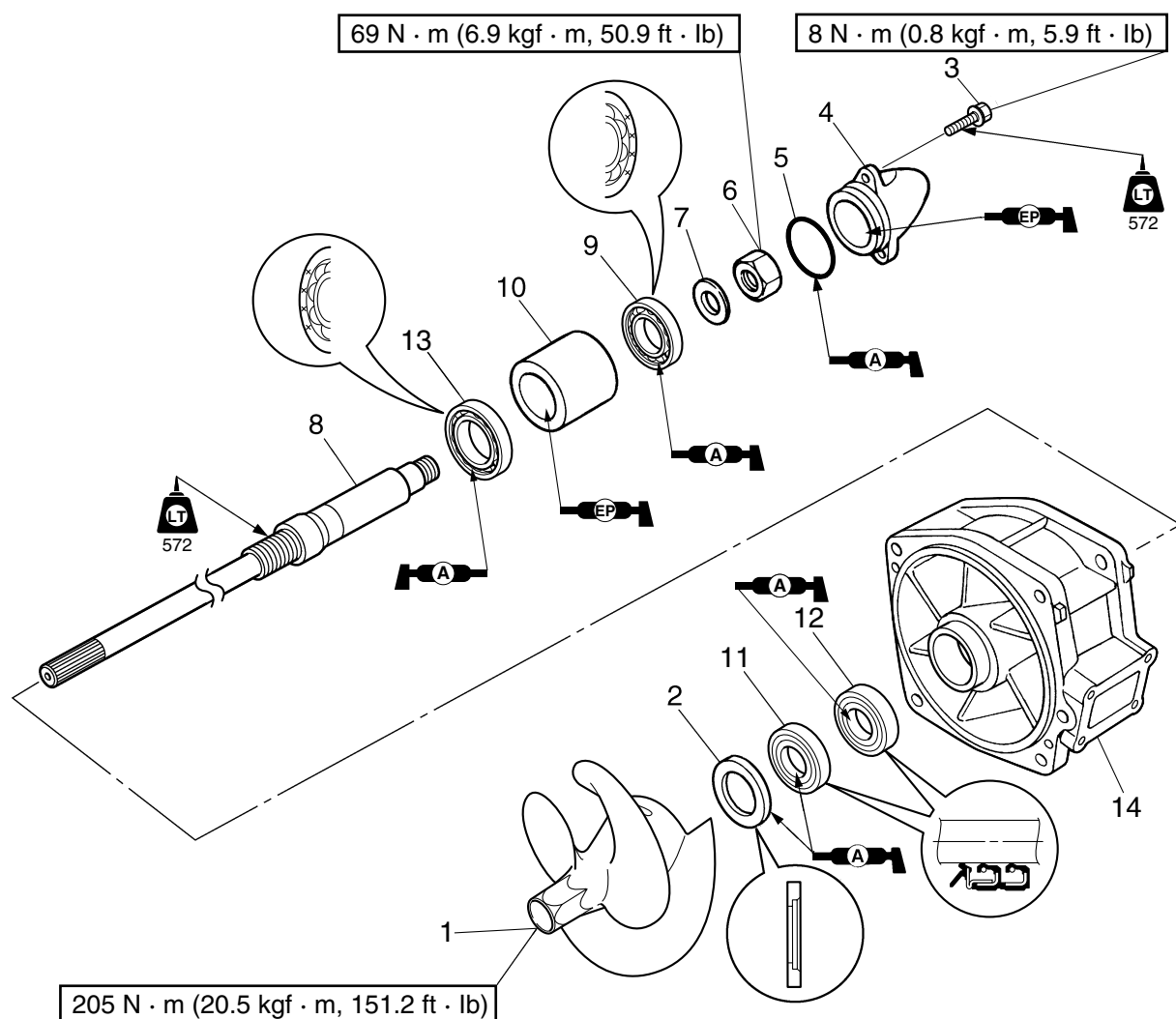


Impeller duct and drive shaft

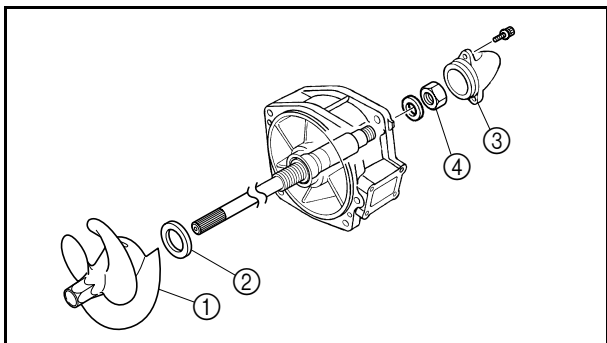
Impeller duct and drive shaft disassembly



Step	Part name	Q'ty	Remarks
1	Impeller	1	Left-hand threads
2	Spacer	1	
3	Bolt	3	M6 × 20 mm
4	Cap	1	
5	O-ring	1	Not reusable
6	Nut	1	
7	Washer	1	
8	Drive shaft	1	



Step	Part name	Q'ty	Remarks
9	Rear bearing	1	Not reusable Inside diameter: 25 mm (0.98 in)
10	Spacer	1	
11	Oil seal	1	Not reusable
12	Oil seal	1	Not reusable
13	Front bearing	1	Not reusable Inside diameter: 30 mm (1.18 in)
14	Impeller duct	1	



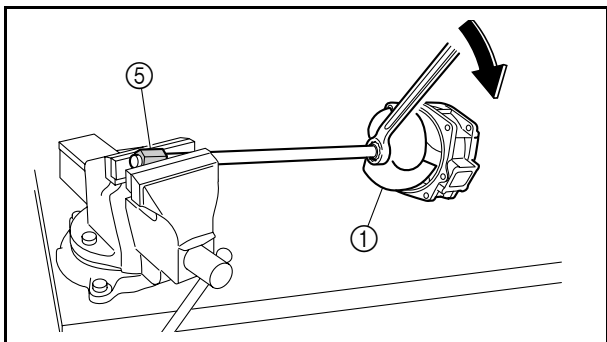
Drive shaft removal

1. Remove:

- Impeller ①
- Spacer ②
- Cap ③
- Nut ④

TIP

The impeller has left-hand threads. Turn the impeller clockwise to loosen it.

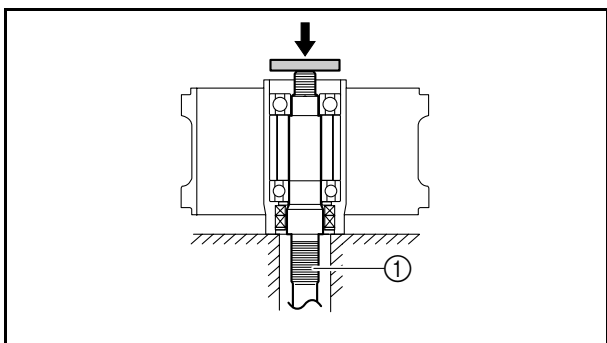
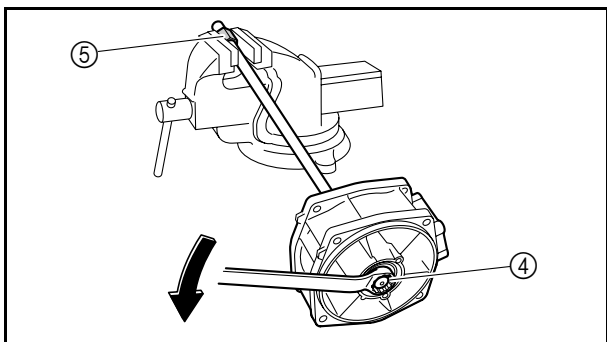


Drive shaft holder ⑤:

YB-06201

Drive shaft holder 6 ⑤:

90890-06520

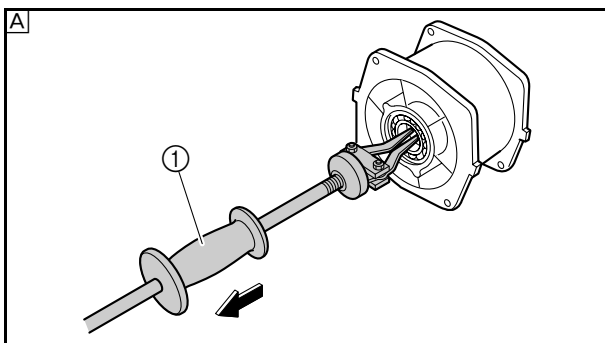


2. Remove:

- Drive shaft ①

NOTICE

Do not press the drive shaft threads directly.

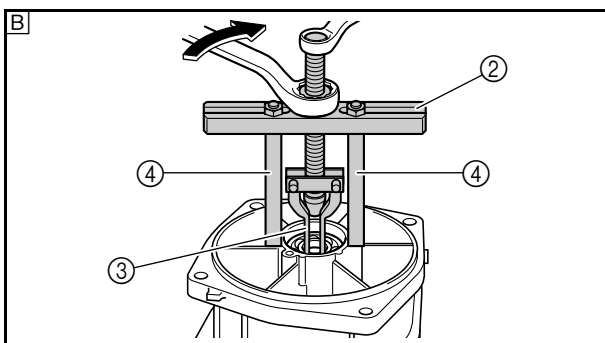


3. Remove:

- Rear bearing

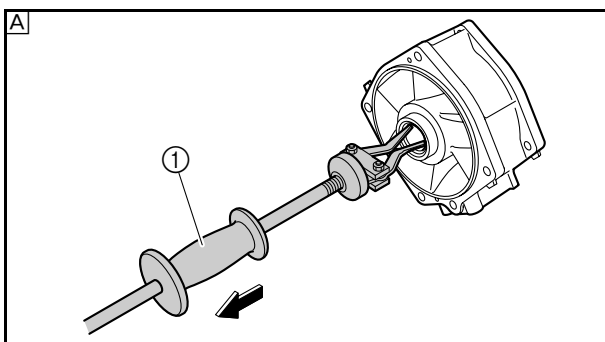


Slide hammer and adapters ①:
YB-06096
Stopper guide plate ②:
90890-06501
Bearing puller assembly ③:
90890-06535
Stopper guide stand ④:
90890-06538



A For USA and Canada

B For worldwide

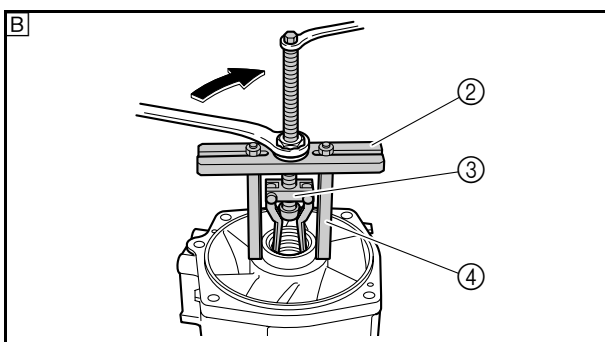


4. Remove:

- Oil seals

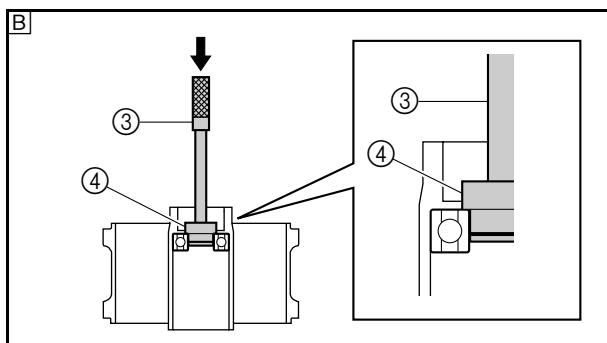
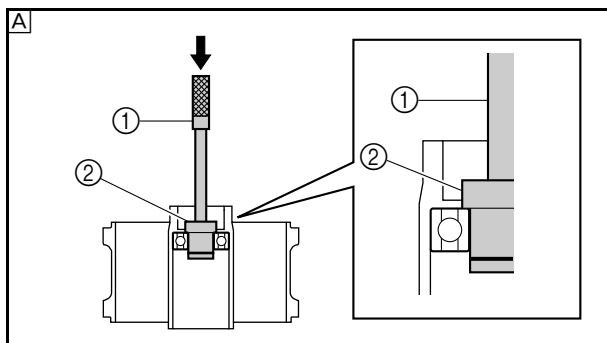


Slide hammer and adapters ①:
YB-06096
Stopper guide plate ②:
90890-06501
Bearing puller assembly ③:
90890-06535
Stopper guide stand ④:
90890-06538



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

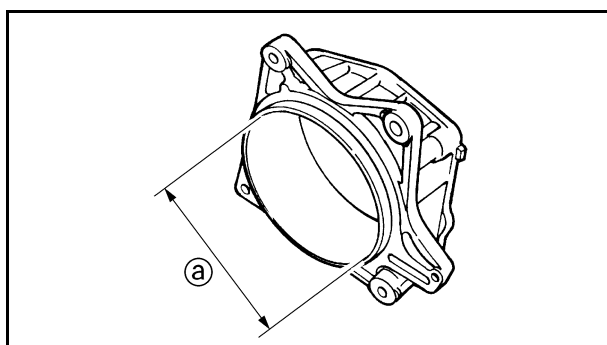
B For worldwide

Impeller check

1. Check:

- Impeller

Refer to “Jet pump unit check” in Chapter 3.



Impeller housing check

1. Measure:

- Impeller housing inside diameter (a)

Out of specification → Replace the impeller housing.



Impeller housing inside diameter (a):

155.35–155.45 mm

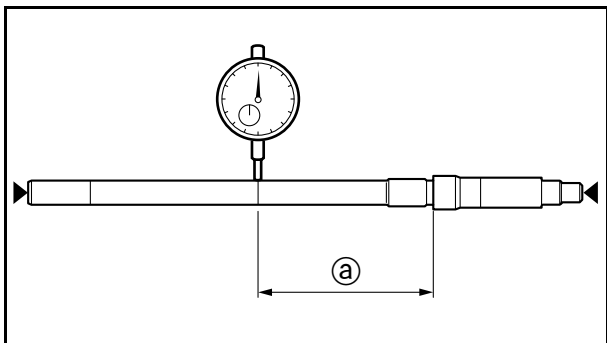
(6.116–6.120 in)

Drive shaft check

1. Check:

- Drive shaft spline

Cracks/damage → Replace the drive shaft.

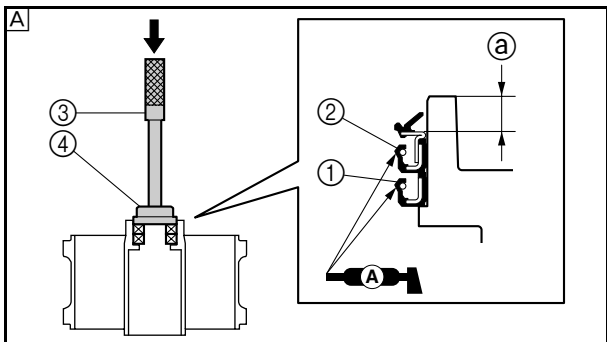


2. Measure:

- 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)



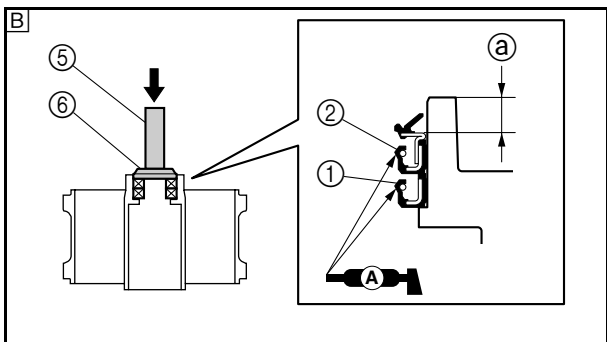
Drive shaft installation

1. Install:

- Oil seal ①
- Oil seal ②

TIP

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 ± 0.2 mm (0.28 ± 0.008 in)

[A] For USA and Canada

[B] For worldwide

2. Install:

- Front bearing (to the drive shaft)

NOTICE

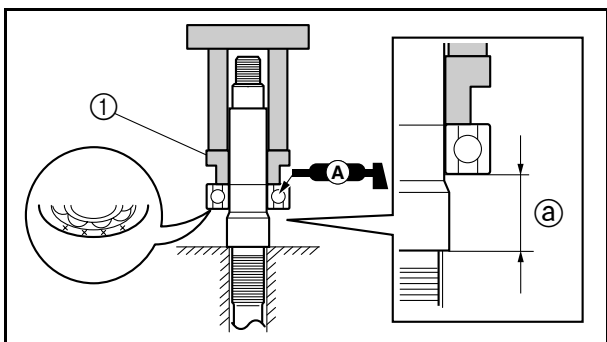
Do not reuse the front bearing, always replace it with a new one.

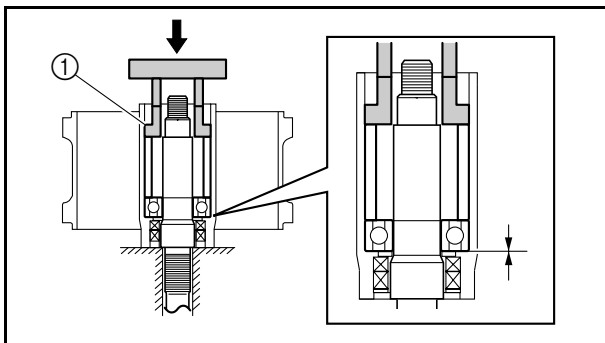


Bearing attachment ①:
90890-06728



Distance ①:
 23.0 ± 0.1 mm (0.91 ± 0.004 in)



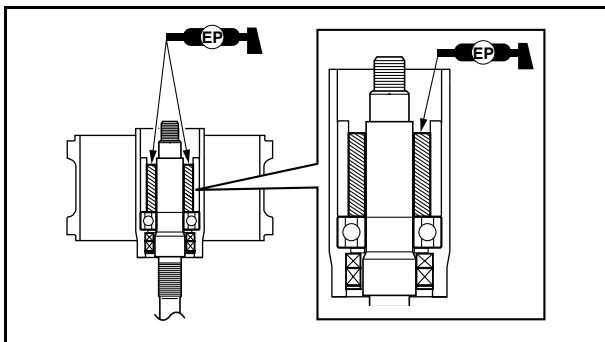


3. Install:

- Drive shaft assembly (with front bearing)
- Spacer



Bearing attachment ①:
90890-06728



4. Apply:

- EPNOC grease AP #0
(between the drive shaft and spacer)



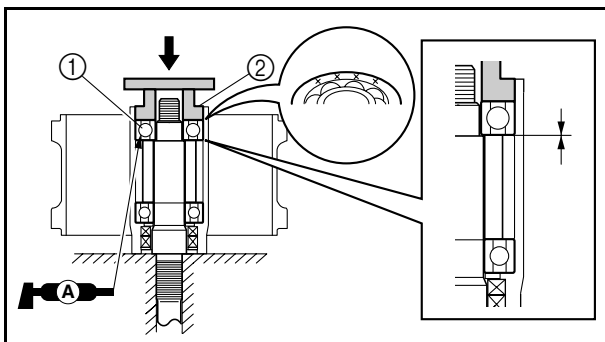
Quantity:
20 g (0.04 lb)

5. Install:

- Rear bearing ①

NOTICE

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



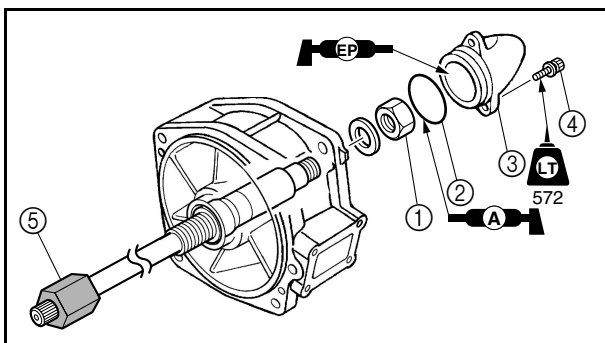
Bearing attachment ②:
90890-06728

6. Apply:

- EPNOC grease AP #0 (into the cap)



Quantity:
20 g (0.04 lb)



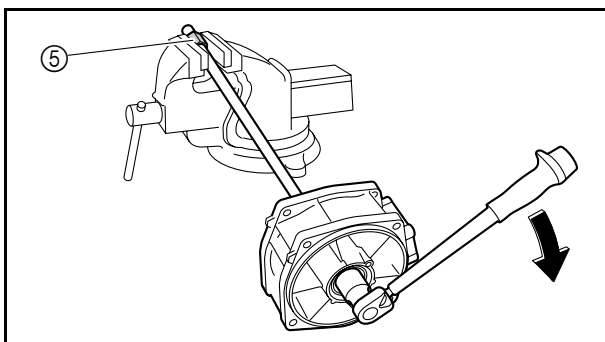
7. Install:

- Nut ①
- O-ring ②
- Cap ③
- Cap bolt ④

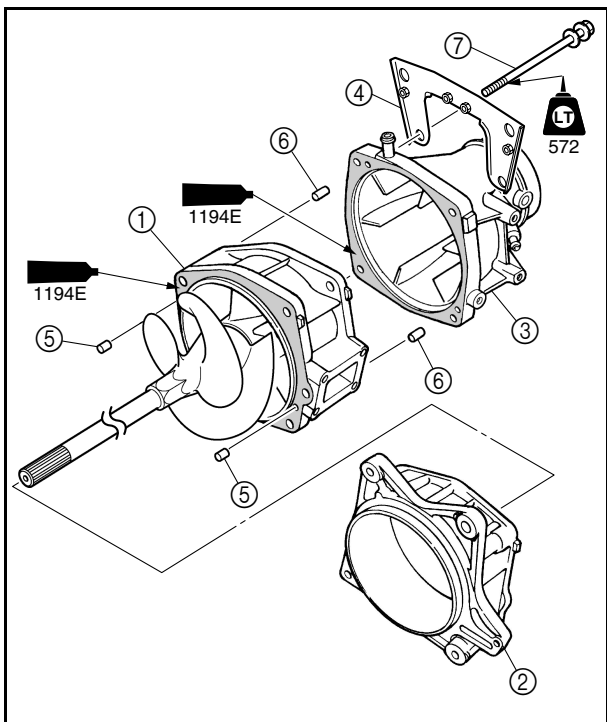
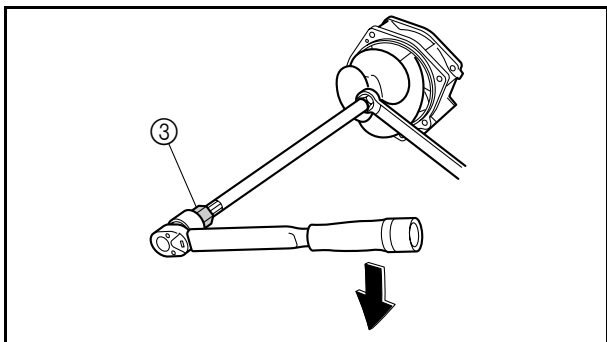
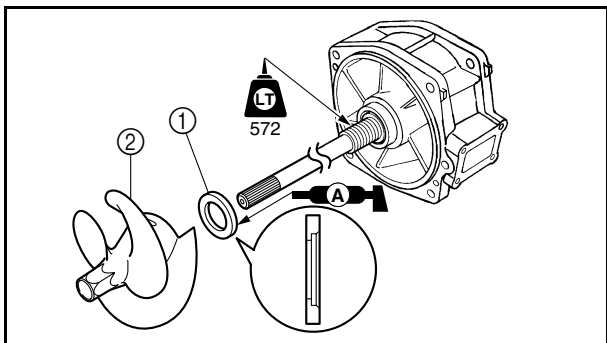


Drive shaft holder ⑤:
YB-06201

Drive shaft holder 6 ⑤:
90890-06520



Drive shaft nut:
69 N·m (6.9 kgf·m, 50.9 ft·lb)
Cap bolt:
8 N·m (0.8 kgf·m, 5.9 ft·lb)
LOCTITE 572



8. Install:

- Spacer ①
- Impeller ②

TIP

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:

205 N·m (20.5 kgf·m, 151.2 ft·lb)

LOCTITE 572

Impeller duct, impeller housing and nozzle installation

1. Install:

- Impeller duct assembly ①
- Impeller housing ②
- Nozzle ③
- Bracket ④

Installation steps:

1. Clean the contacting surfaces of the impeller duct assembly ①, impeller housing ②, and nozzle ③.
2. Apply sealant to the contacting surfaces of the impeller duct assembly ①, impeller housing ②, and nozzle ③.
3. Install the dowel pins ⑤ and ⑥ to the impeller duct assembly ①, and then install the impeller housing ②, nozzle ③, and bracket ④.
4. Tighten the bolts ⑦ to the specified torque.



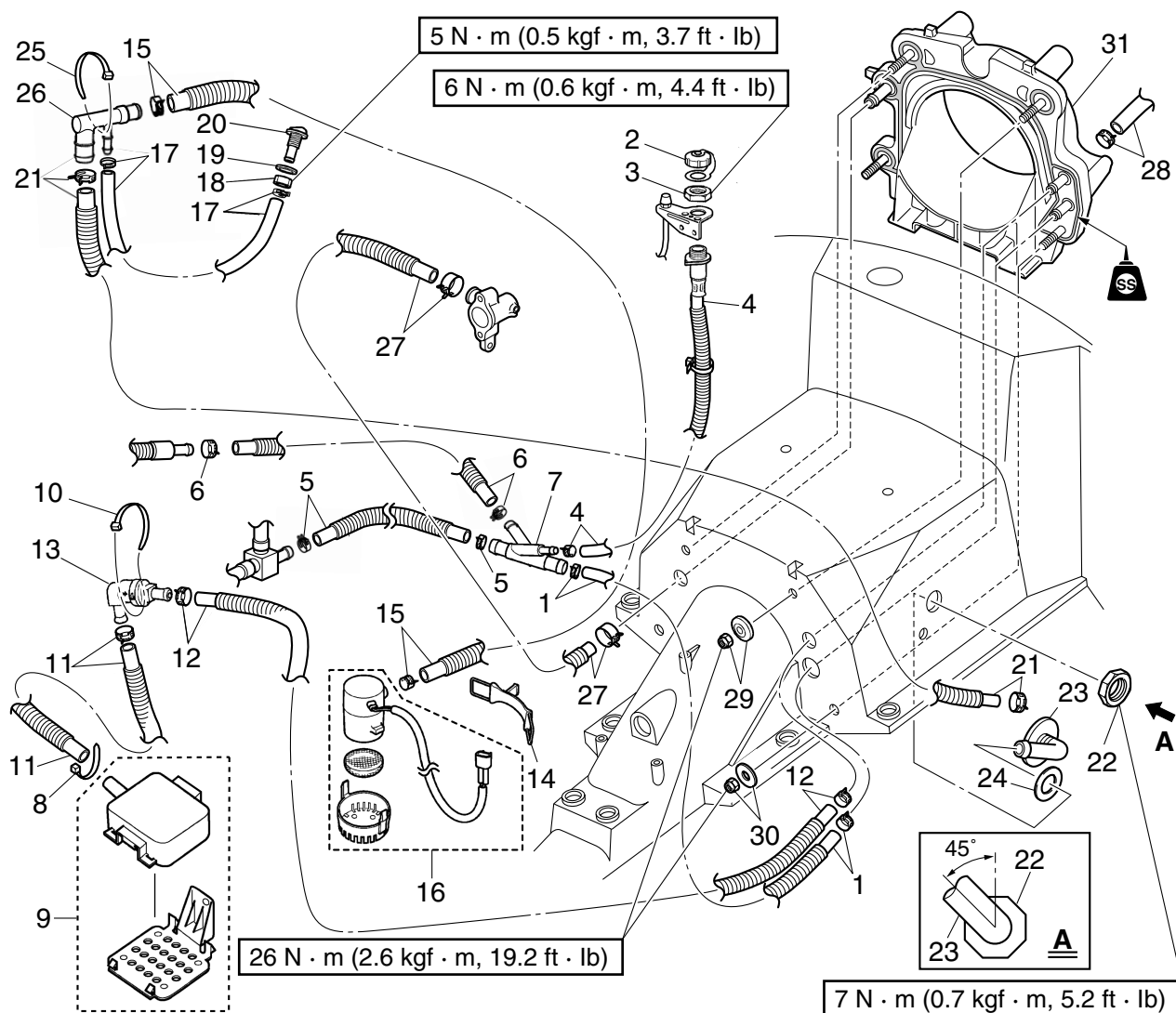
Impeller duct bolt:

40 N·m (4.0 kgf·m, 29.5 ft·lb)

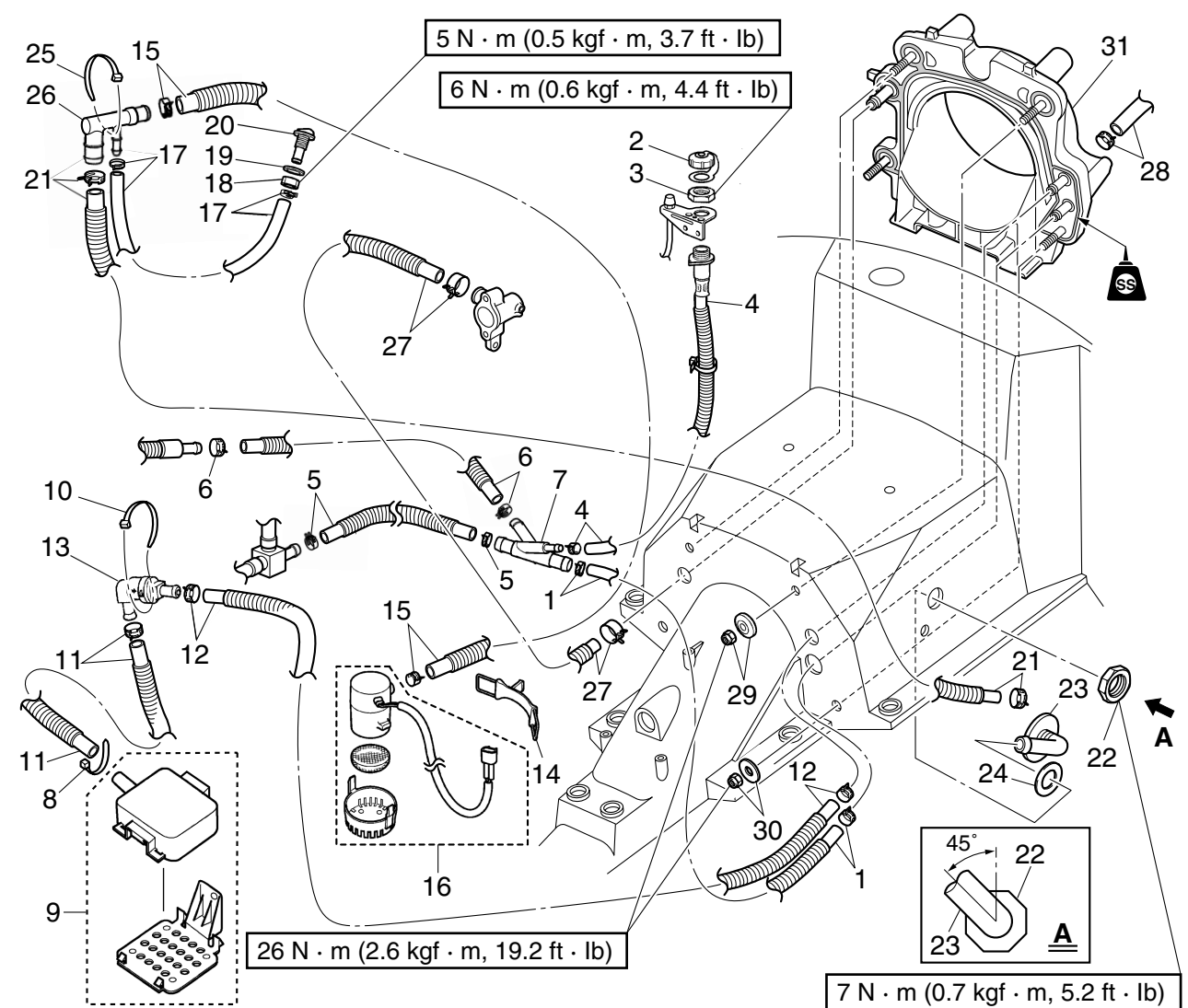
LOCTITE 572

Transom plate and hoses

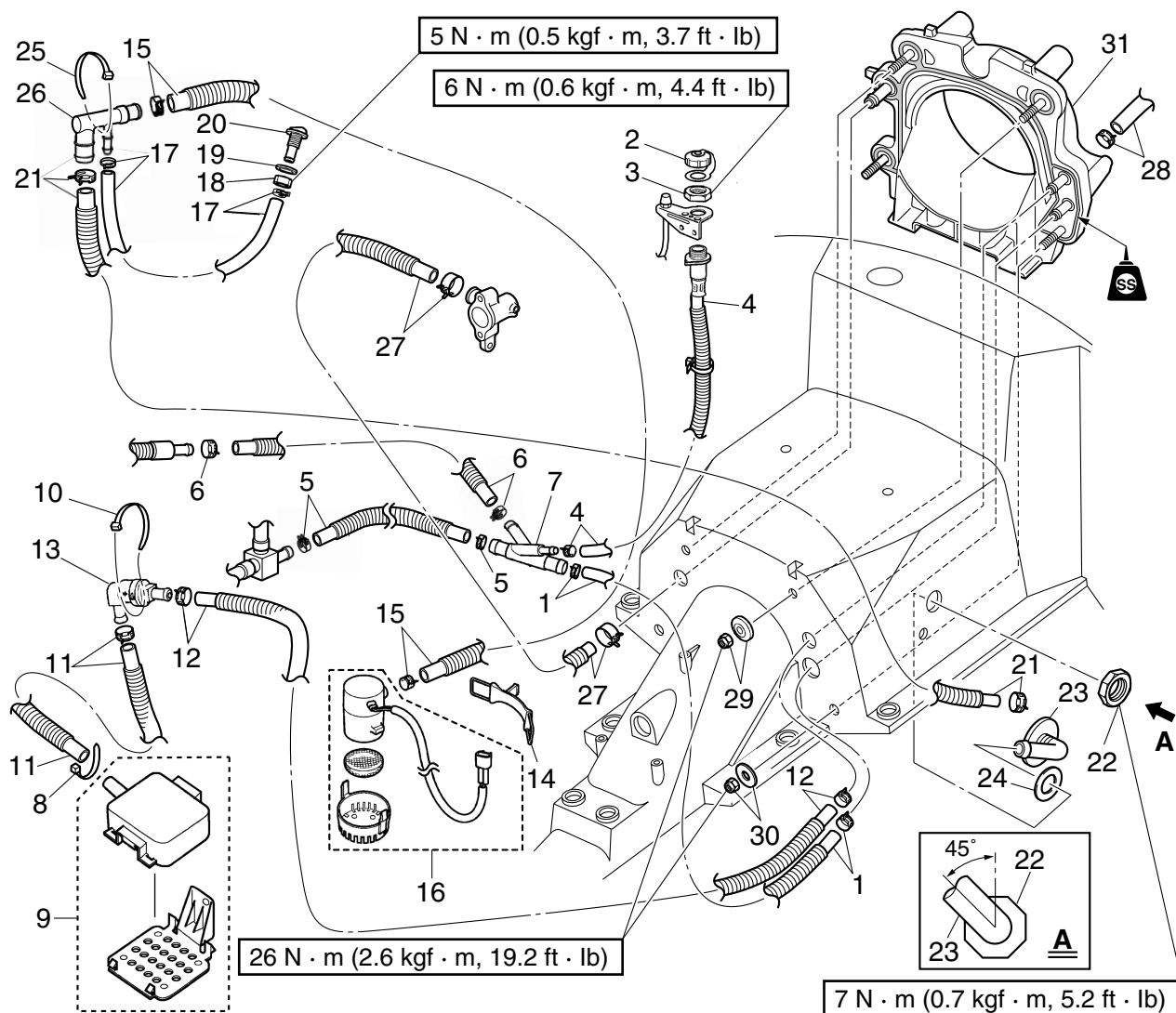
Transom plate and hose removal



Step	Part name	Q'ty	Remarks
	Exhaust system		Refer to "Exhaust system" in Chapter 8.
	Jet pump unit assembly		Refer to "Jet pump unit."
1	Clamp/cooling water hose	2/1	
2	Cap	1	
3	Nut	1	
4	Clamp/flushing hose	1/1	
5	Clamp/cooling water hose	2/1	
6	Clamp/cooling water hose	2/1	
7	Hose joint 1	1	
8	Band	1	Not reusable
9	Bilge strainer assembly	1	
10	Plastic tie	1	



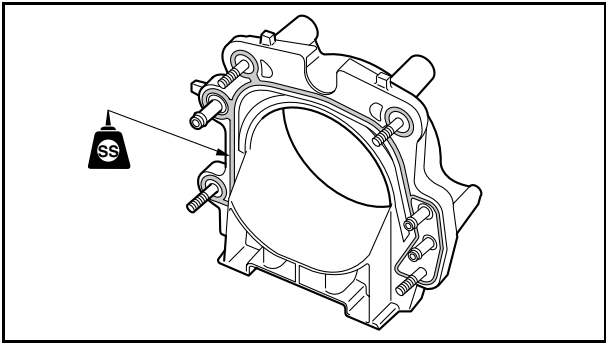
Step	Part name	Q'ty	Remarks
11	Clamp/bilge hose	1/1	Not reusable
12	Clamp/bilge hose	2/1	
13	Hose joint	1	
14	Band	1	
15	Clamp/bilge hose	2/1	
16	Electric bilge pump assembly	1	
17	Clamp/bilge hose	2/1	
18	Nut	1	
19	Gasket	1	
20	Pilot outlet	1	
21	Clamp/bilge hose	2/1	
22	Nut	1	



Step	Part name	Q'ty	Remarks
23	Drain joint	1	Not reusable
24	Packing	1	
25	Plastic tie	1	
26	Hose joint	1	
27	Clamp/cooling water hose	2/1	
28	Clamp/bilge hose	1/1	
29	Nut/washer	2/2	
30	Nut/washer	2/2	
31	Transom plate	1	

Water hose check

1. Check:
- Bilge hoses
 - Cooling water hoses
- Cracks/damage → Replace.



Transom plate installation

1. install:
- Transom plate

Installation steps:

1. Clean the contacting surfaces of the transom plate.
2. Apply silicone sealant to the contacting surfaces of the transom plate.
3. Install the transom plate.

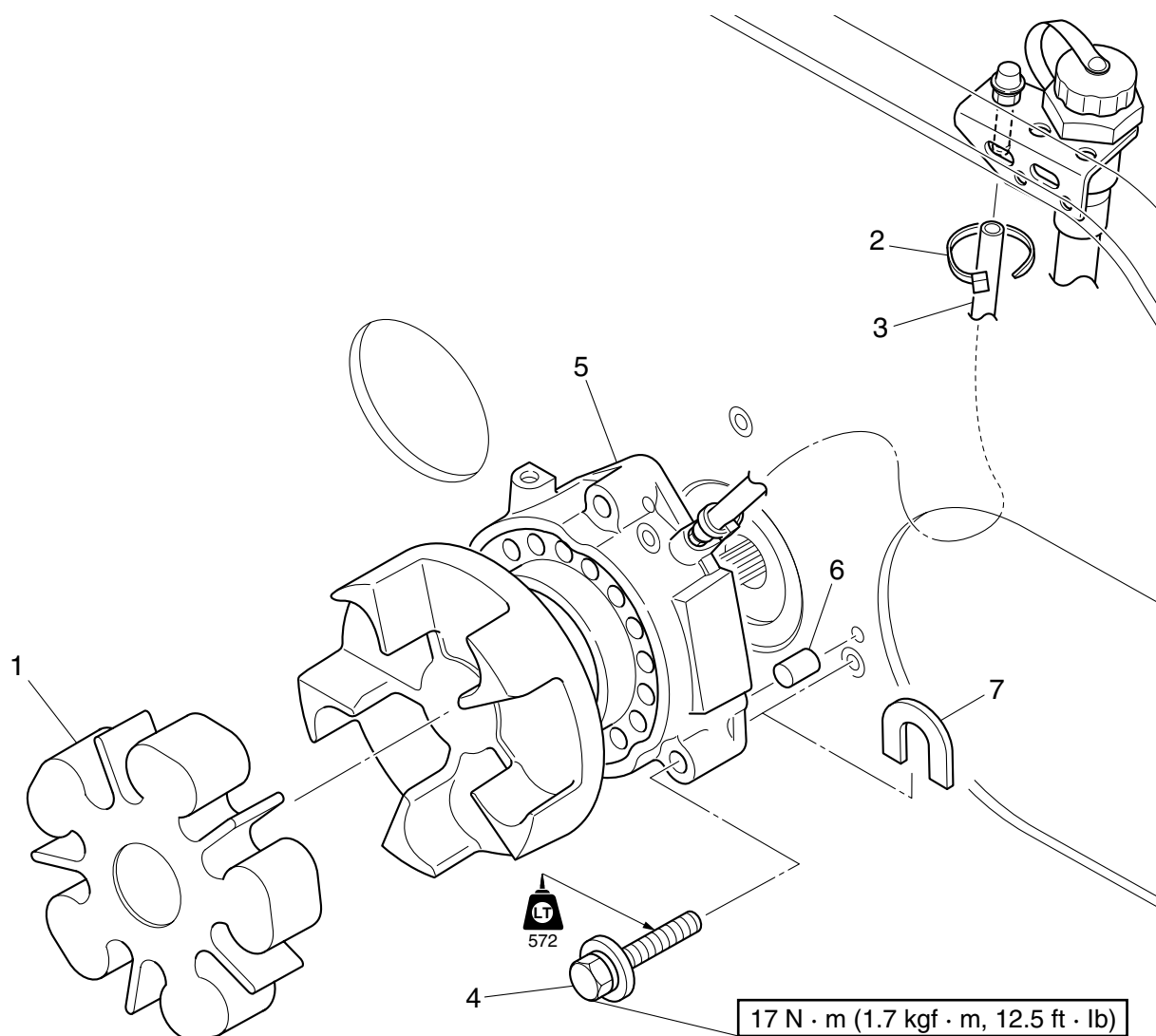


Transom plate nut:

26 N·m (2.6 kgf·m, 19.2 ft·lb)

Intermediate housing

Intermediate housing removal

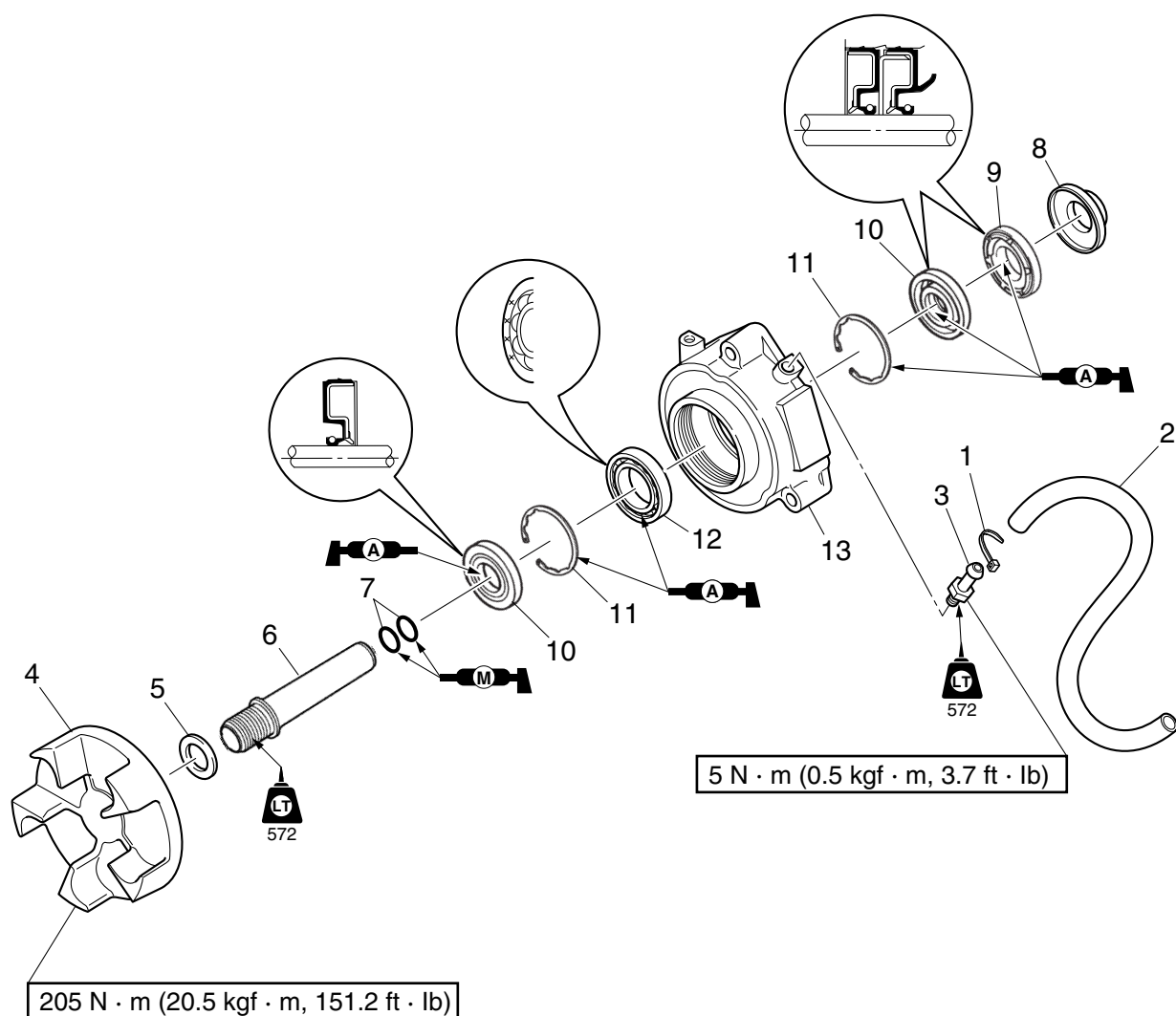


Step	Part name	Q'ty	Remarks
	Engine unit		Refer to "Engine unit" in Chapter 5.
1	Rubber damper	1	
2	Band	1	Not reusable
3	Grease hose	1	
4	Bolt	3	M8 × 48 mm
5	Intermediate housing assembly	1	
6	Dowel pin	2	
7	Shim	*	

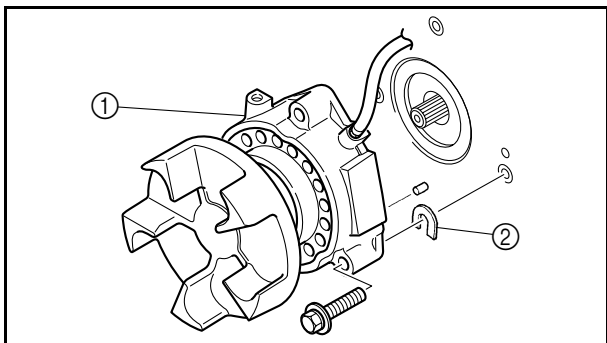
*: As required



Intermediate housing disassembly



Step	Part name	Q'ty	Remarks
1	Band	1	Not reusable
2	Grease hose	1	
3	Nipple	1	
4	Driven coupling	1	
5	Washer	1	
6	Intermediate drive shaft	1	
7	O-ring	2	Not reusable
8	Thrust washer	1	Not reusable
9	Oil seal	1	Not reusable
10	Oil seal	2	Not reusable
11	Circlip	2	Not reusable
12	Bearing	1	Not reusable
13	Intermediate housing	1	



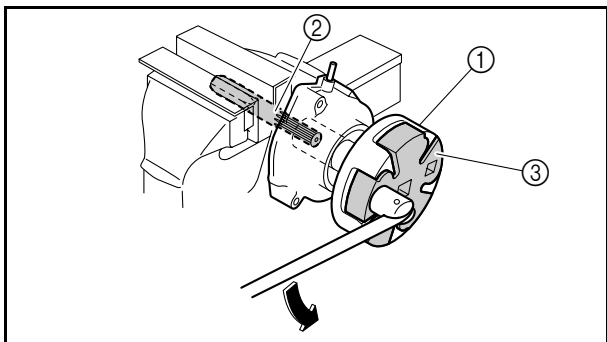
Intermediate housing removal

1. Remove:

- Intermediate housing assembly ①
- Shims ②

TIP

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

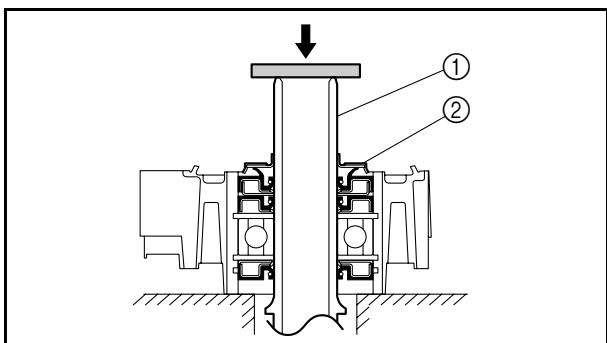
TIP

Make sure to insert the special service tool ② completely into the intermediate drive shaft.



Shaft holder ②:
90890-06730

Coupler wrench ③:
90890-06729



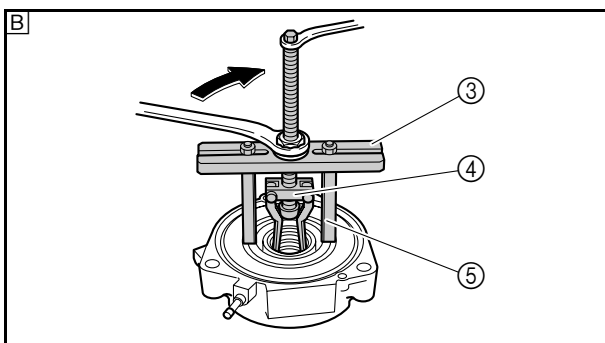
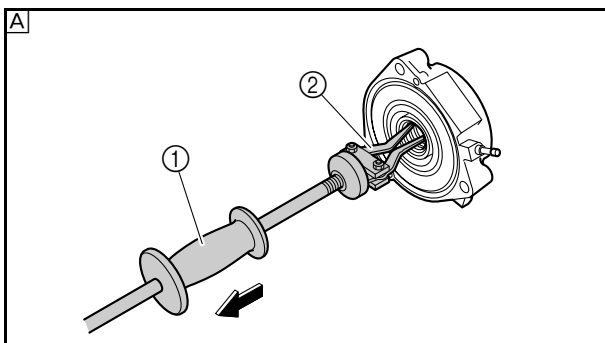
Intermediate housing disassembly

1. Remove:

- Intermediate drive shaft ①
- Thrust washer ②

NOTICE

Do not press the intermediate drive shaft directly.

**2. Remove:**

- Oil seal (front)
- Oil seals (rear)



Slide hammer and adapters ①:
YB-06096

Bearing puller legs ②:
YB-06523

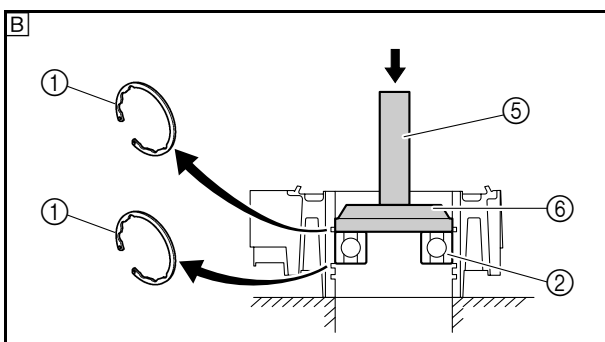
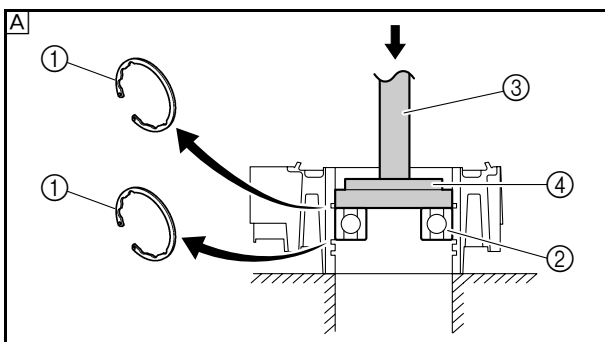
Stopper guide plate ③:
90890-06501

Bearing puller assembly ④:
90890-06535

Stopper guide stand ⑤:
90890-06538

A For USA and Canada

B For worldwide

**3. Remove:**

- Circlips ①
- Bearing ②

TIP

Make sure to remove the circlips ① before removing the bearing ②.



Driver handle (large) ③:
YB-06071

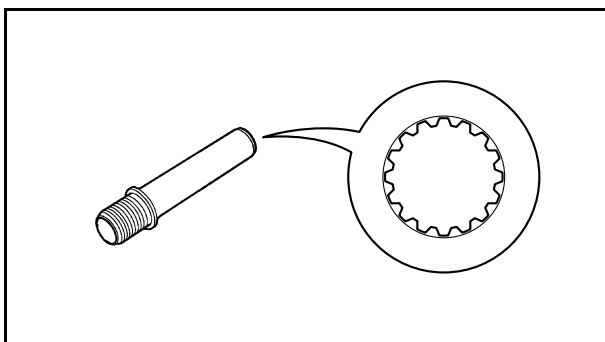
Needle bearing installer ④:
YB-06434

Driver rod LS ⑤:
90890-06606

Bearing outer race attachment ⑥:
90890-06623

A For USA and Canada

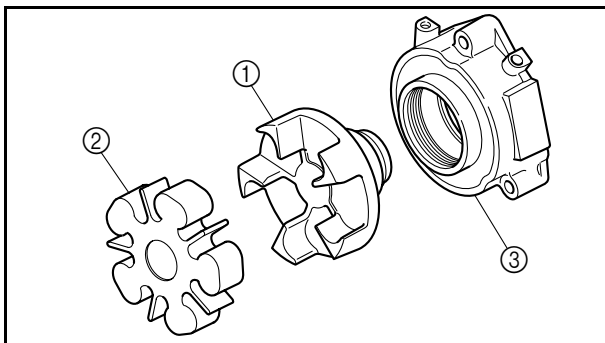
B For worldwide



Intermediate drive shaft and grease hose check

1. Check:

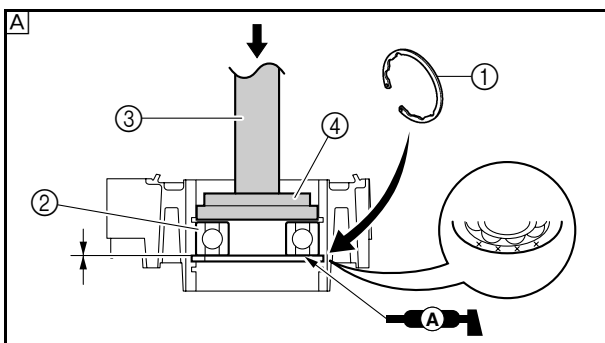
- Intermediate drive shaft spline
 - Grease hose
- Cracks/damage → Replace.



Driven coupling and intermediate housing check

1. Check:

- Driven coupling ①
 - Rubber damper ②
 - Intermediate housing ③
- Cracks/damage → Replace.



Intermediate housing assembly

1. Install:

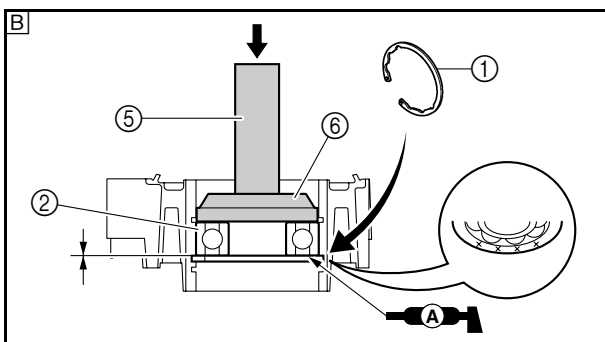
- Circlip ①
- Bearing ②

NOTICE

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

TIP

Make sure to install the circlip ①, and then install the bearing ② until it contacts the circlip.



Driver handle (large) ③:
YB-06071

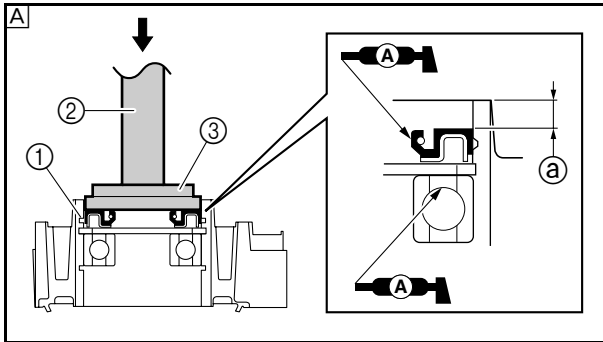
Needle bearing installer ④:
YB-06434

Driver rod LS ⑤:
90890-06606

Bearing outer race attachment ⑥:
90890-06623

A For USA and Canada

B For worldwide



2. Install:

- Oil seal ①



Driver handle (large) ②:

YB-06071

Needle bearing installer ③:

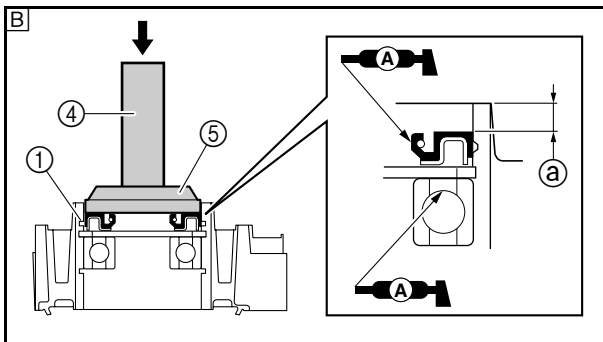
YB-06434

Driver rod LS ④:

90890-06606

Bearing outer race attachment ⑤:

90890-06623

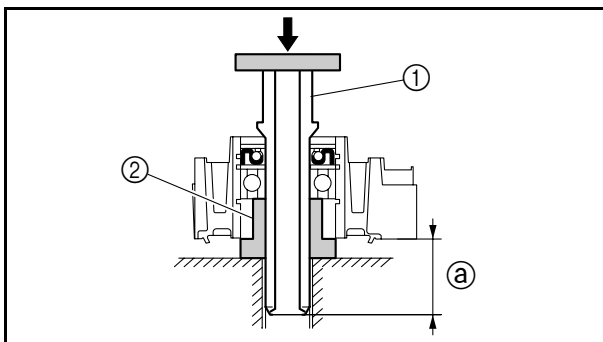


Distance ②:

$6.5 \pm 0.2 \text{ mm}$ ($0.26 \pm 0.01 \text{ in}$)

A For USA and Canada

B For worldwide



3. Install:

- Intermediate drive shaft ①



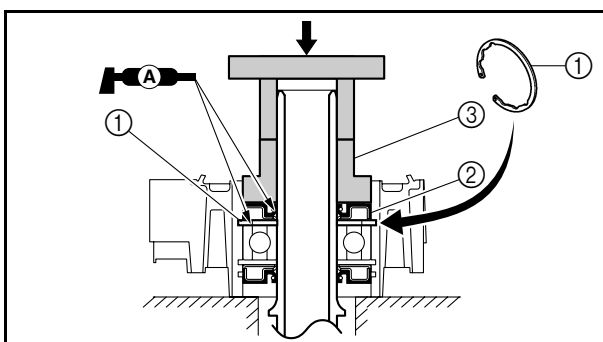
Bearing attachment ②:

90890-06728



Distance ②:

$46.0 \pm 0.5 \text{ mm}$ ($1.81 \pm 0.02 \text{ in}$)



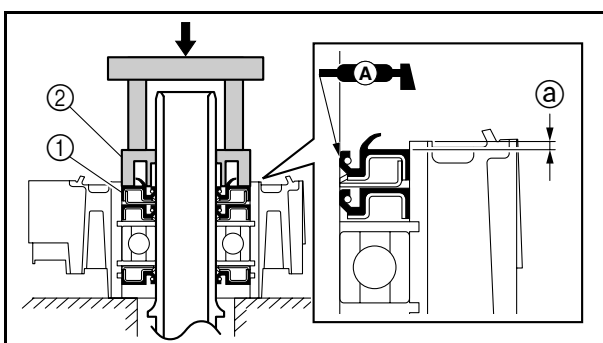
4. Install:

- Circlip ①
- Oil seal ②



Bearing attachment ③:

90890-06728



5. Install:

- Oil seal ①



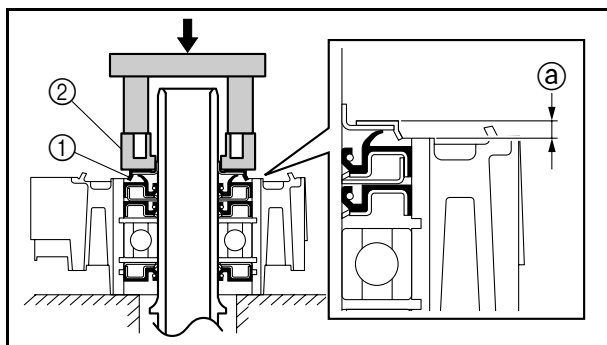
Bearing attachment ②:

90890-06727



Distance ②:

$1.6 \pm 0.2 \text{ mm}$ ($0.06 \pm 0.01 \text{ in}$)



6. Install:

- Thrust washer ①

NOTICE

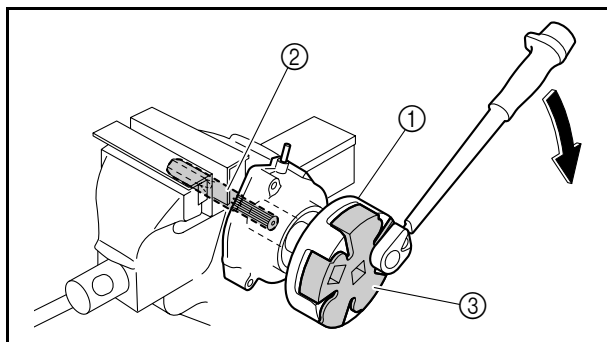
Do not reuse the thrust washer, always replace it with a new one.



Bearing attachment ②:
90890-06727



Distance ②:
 $4.4 \pm 0.3 \text{ mm}$ ($0.17 \pm 0.01 \text{ in}$)



Driven coupling installation

1. Install:

- Driven coupling ①

TIP

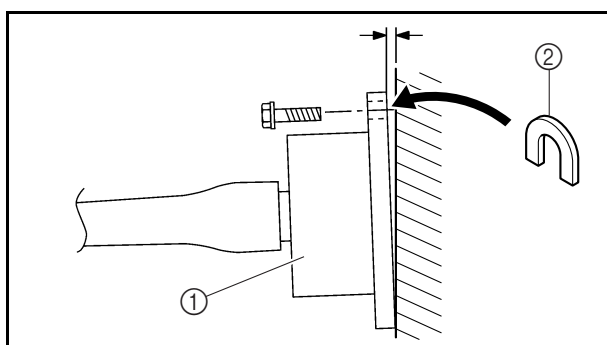
Make sure to insert the special service tool ② completely into the intermediate drive shaft.



Shaft holder ②:
90890-06730
Coupler wrench ③:
90890-06729



Driven coupling:
205 N·m (20.5 kgf·m, 151.2 ft·lb)
LOCTITE 572



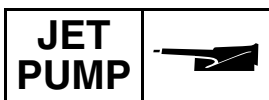
Intermediate housing installation

1. Install:

- Intermediate housing assembly ①
- Shims ②

TIP

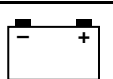
Make sure to install the shims in their original positions.



Intermediate housing

E

— MEMO —



Chapter 7

Electrical system

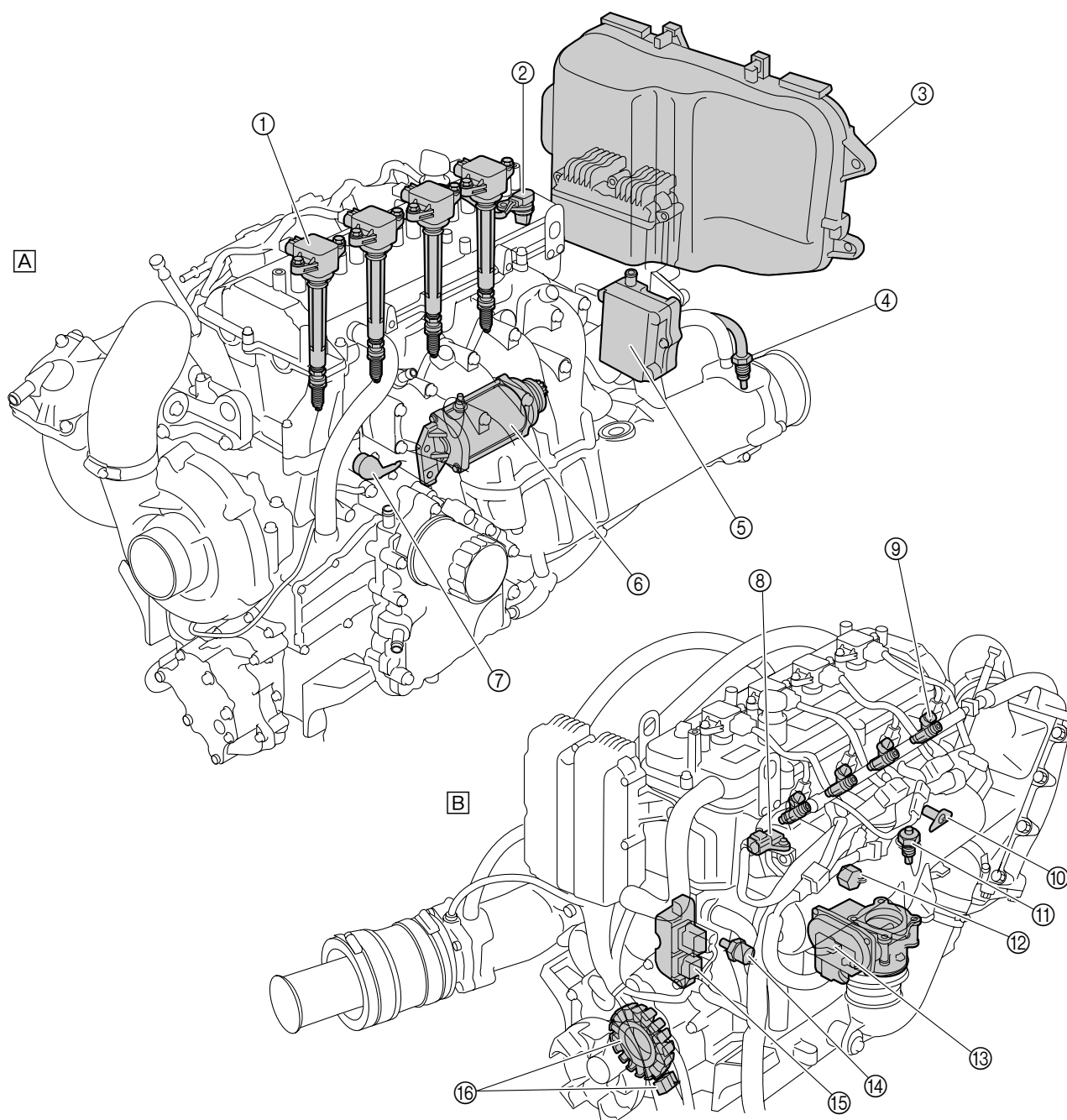
Engine electrical components	7-1
Electrical box.....	7-3
Electrical components	7-3
Electrical box disassembly	7-4
Fuse box disassembly	7-6
Electrical analysis	7-8
Check using the YDIS	7-8
Input voltage measurement	7-9
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Ignition system.....	7-10
Ignition coil.....	7-10
Pickup coil	7-13
Charging system	7-14
Stator coil.....	7-14
Rectifier regulator	7-16
Control system	7-18
Oil pressure switch	7-18
Thermoswitch	7-19
Thermo sensor	7-21
Engine temperature sensor	7-22
Intake air temperature sensor.....	7-23
Intake air pressure sensor	7-25
Knock sensor.....	7-26
Throttle position sensor	7-26
Accelerator position sensor	7-29
Electronic throttle valve relay.....	7-33
Cam position sensor.....	7-34
Slant detection switch.....	7-35
Steering sensor	7-36
Reverse sensor	7-37
ECM circuit	7-38
Earth plate	7-39
Electric bilge pump	7-40
Fuel system	7-41
Fuel injector	7-41
Fuel pump module	7-42



Starting system	7-44
Fuse.....	7-44
Left handlebar switch assembly	7-44
Main and fuel pump relay	7-45
Starter relay	7-47
 Starter motor	 7-49
Starter motor disassembly	7-49
Starter motor operation.....	7-52
Armature	7-52
Brush holder	7-54
Gear cover.....	7-54
Rear cover	7-55
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 Remote control system	 7-55
Transmitter registration.....	7-55
Remote control transmitter	7-56
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 Indication system.....	 7-60
Dual analog meter unit	7-60
Switch assembly	7-61
Speed sensor	7-61
Fuel level meter display and fuel indicator	7-63
Check engine warning indicator	7-63
Diagnostic display.....	7-64
Oil pressure warning indicator	7-64
Engine overheat warning indicator	7-65
Buzzer	7-65



Engine electrical components

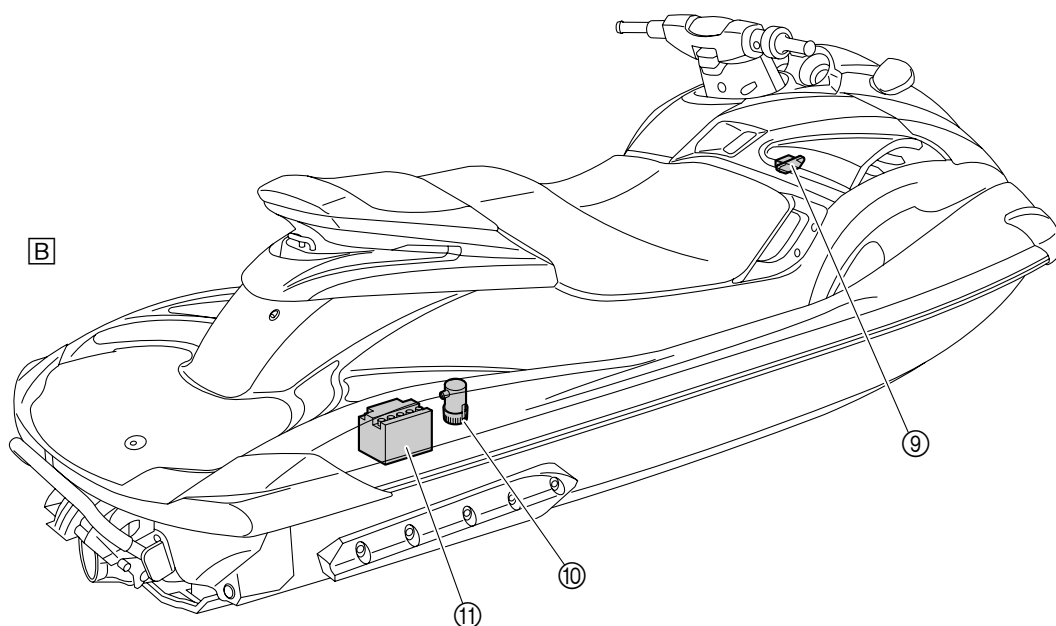
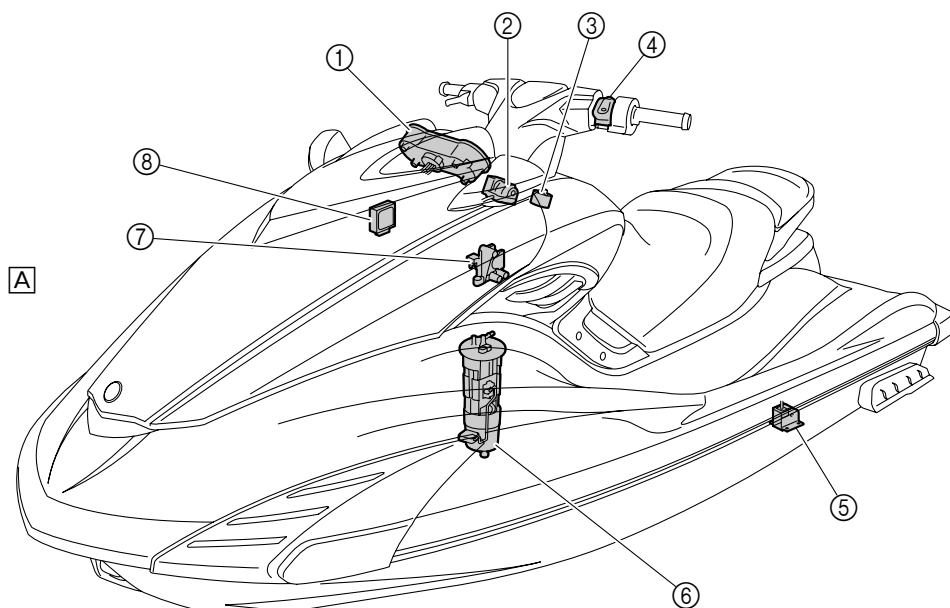


- ① Spark plugs and ignition coils
- ② Cam position sensor
- ③ Electrical box
- ④ Thermo sensor
- ⑤ Rectifier regulator
- ⑥ Starter motor
- ⑦ Oil pressure switch
- ⑧ Intake air pressure sensor
- ⑨ Fuel injectors
- ⑩ Thermoswitch
- ⑪ Intake air temperature sensor

- ⑫ Knock sensor
- ⑬ Throttle body assembly (TPS)
- ⑭ Engine temperature sensor
- ⑮ Earth plate
- ⑯ Stator coil and pickup coil

[A] Port bow view

[B] Starboard stern view



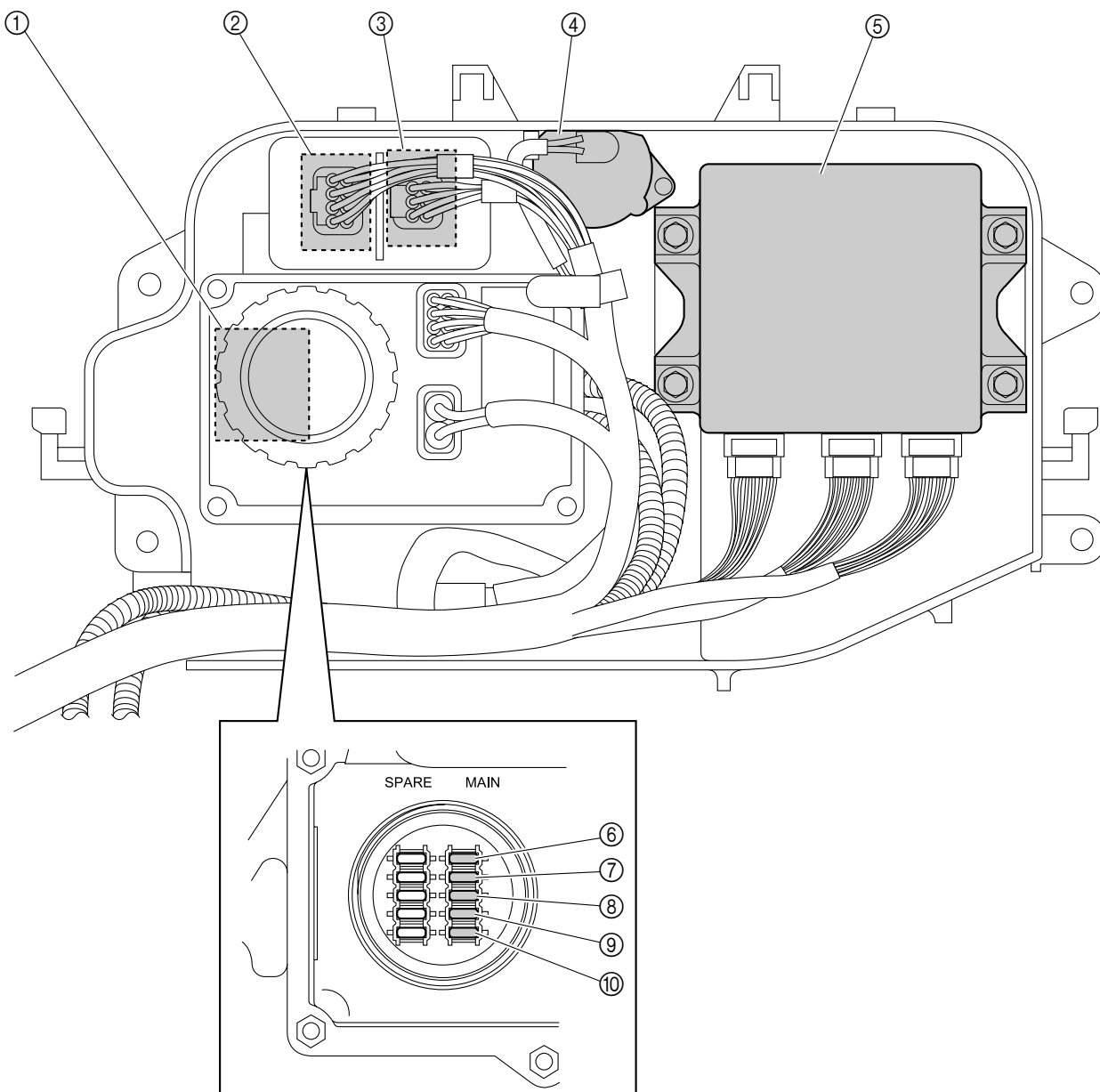
- ① Dual analog meter unit
- ② Steering sensor
- ③ Buzzer
- ④ Left handlebar switch assembly
- ⑤ Speed sensor
- ⑥ Fuel pump module and fuel sender
- ⑦ APS
- ⑧ Remote control receiver
- ⑨ Reverse sensor
- ⑩ Electric bilge pump
- ⑪ Battery

[A] Port bow view

[B] Starboard stern view

Electrical box

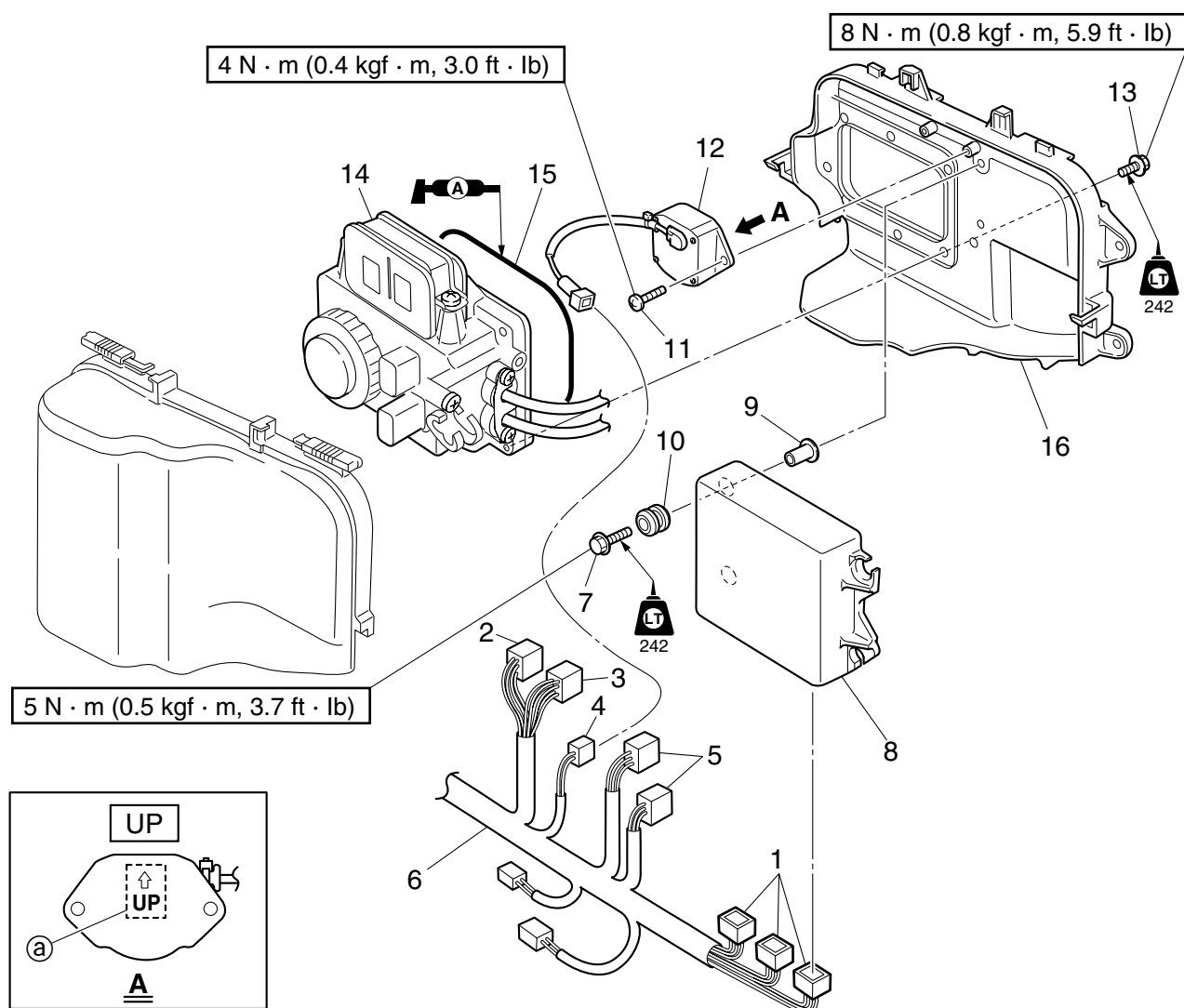
Electrical components



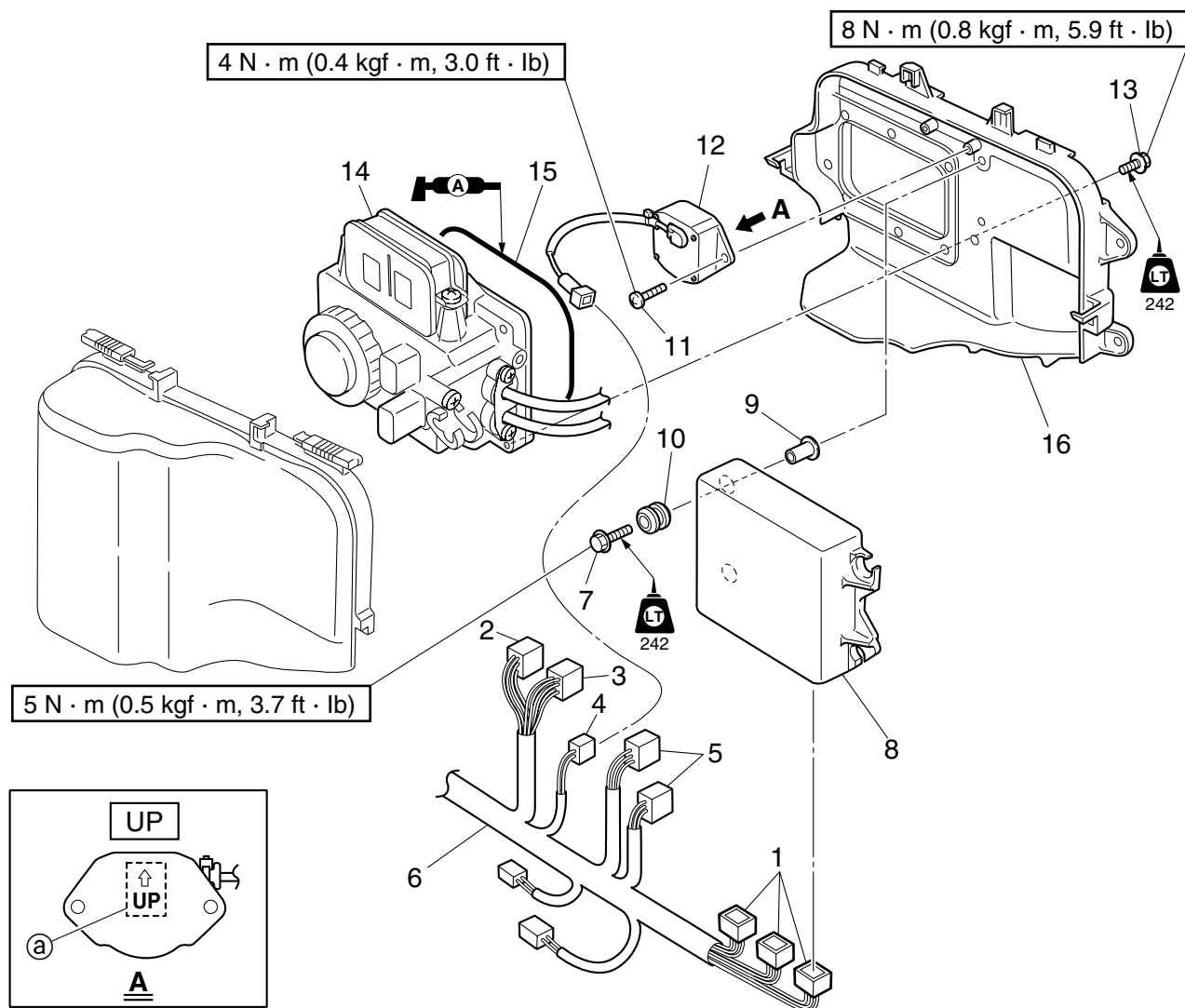
- ① Starter relay
- ② Main and fuel pump relay
- ③ ETV relay
- ④ Slant detection switch
- ⑤ ECM
- ⑥ Fuse (30 A) (battery)
- ⑦ Fuse (10 A) (main and fuel pump relay)
- ⑧ Fuse (10 A) (ETV relay)
- ⑨ Fuse (3 A) (remote control receiver)
- ⑩ Fuse (20 A) (main and fuel pump relay)



Electrical box disassembly



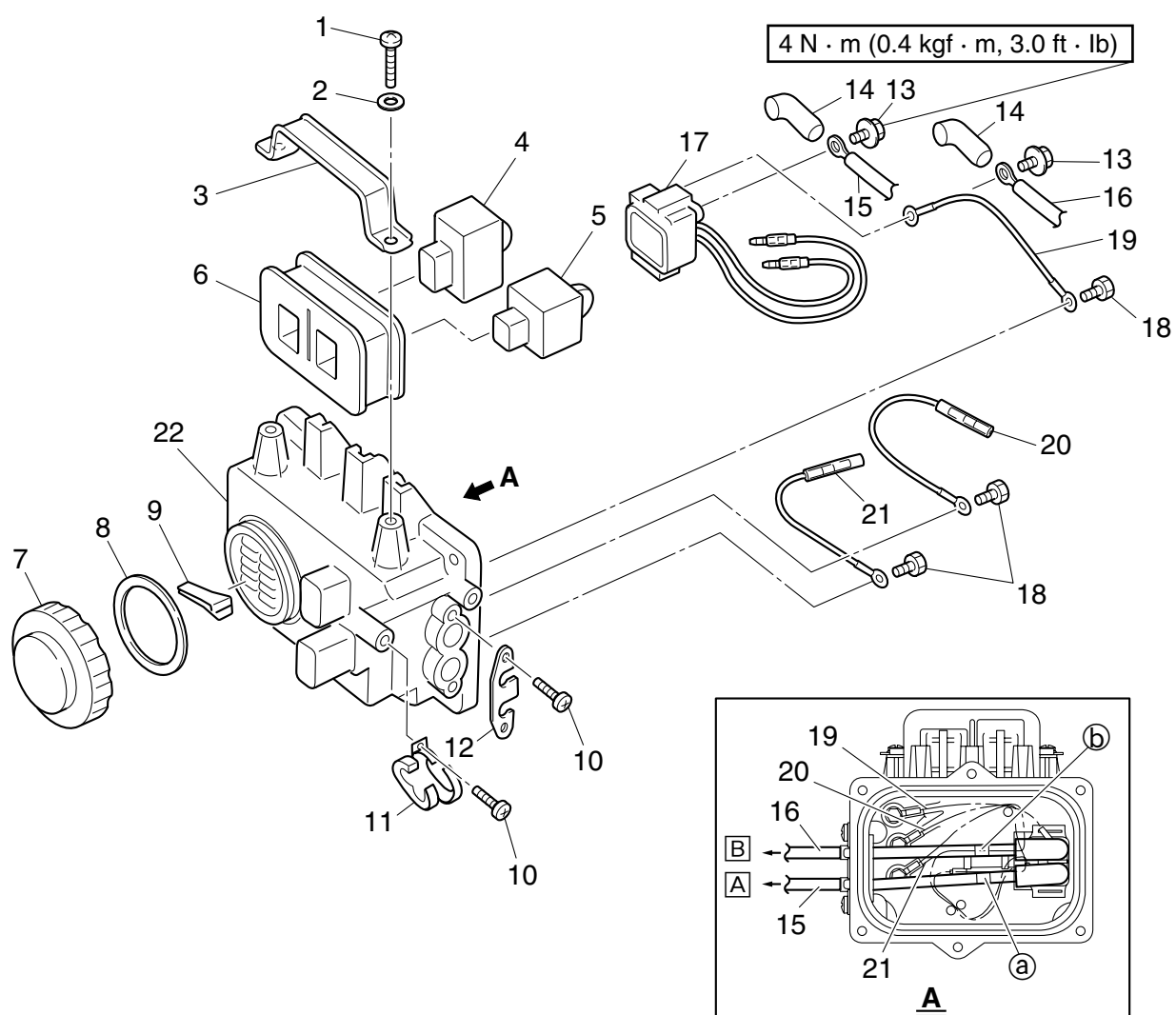
Step	Part name	Q'ty	Remarks
1	ECM coupler	3	M6 × 25 mm ø6 × 18 mm
2	Main and fuel pump relay coupler	1	
3	ETV relay coupler	1	
4	Slant detection switch coupler	1	
5	Fuse box coupler	2	
6	Wiring harness assembly	1	
7	Bolt	4	
8	ECM	1	
9	Collar	4	
10	Grommet	4	
11	Screw	2	



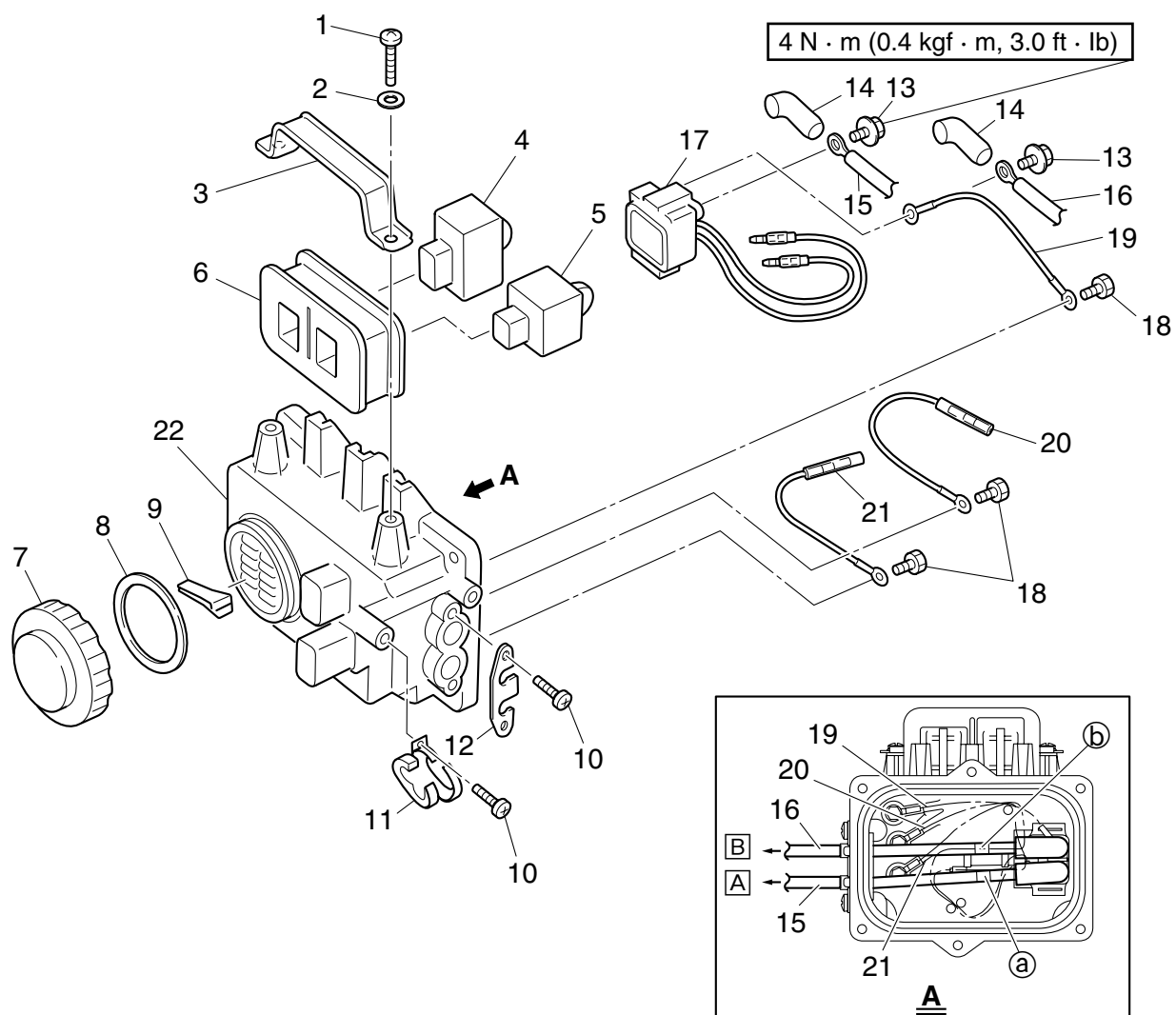
Step	Part name	Q'ty	Remarks
12	Slant detection switch	1	① "UP" mark
13	Bolt	6	M6 × 16 mm
14	Fuse box assembly	1	
15	O-ring	1	Not reusable
16	Electrical box case	1	



Fuse box disassembly



Step	Part name	Q'ty	Remarks
1	Screw	2	$\varnothing 6 \times 25$ mm Not reusable $\varnothing 6 \times 20$ mm
2	Washer	2	
3	Stay	1	
4	Main and fuel pump relay	1	
5	ETV relay	1	
6	Damper	1	
7	Cap	1	
8	Packing	1	
9	Fuse puller	1	
10	Screw	3	
11	Clamp	1	
12	Plate	1	



Step	Part name	Q'ty	Remarks
13	Bolt	2	M6 × 10 mm
14	Boot	2	
15	Starter motor cable	1	① White tape [A] To starter motor
16	Positive battery cable	1	② Gray tape [B] To battery
17	Starter relay	1	
18	Bolt	3	M6 × 7 mm
19	Lead	1	Red lead
20	Lead	1	Brown lead
21	Lead	1	Black lead
22	Housing	1	



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, make 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, make sure to delete the diagnosis record after checking the input voltage.

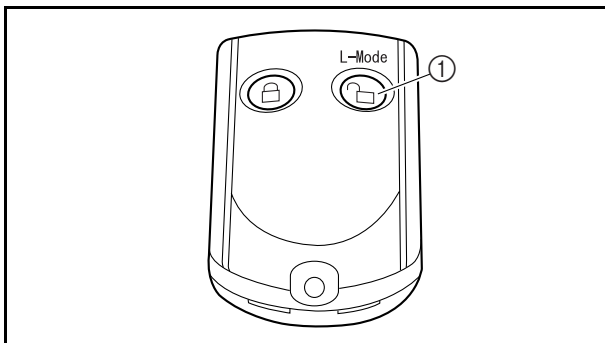
Power is supplied to the ECM for about 30 seconds after stopping the engine. Therefore, wait longer than 30 seconds before restarting the engine, otherwise the diagnostic codes will not be cleared from the ECM.

TIP

- 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, make sure to check the CD-ROM version before using it.
- To connect the YDIS, refer to “YDIS” in Chapter 9 or the YDIS (Ver. 1.32) Instruction Manual.



YDIS (connecting kit):
60V-85300-04
YDIS (CD-ROM, Ver. 1.32):
60V-WS853-05



Input voltage measurement

Push the unlock button ① on the remote control transmitter so that power is supplied to the ECM.

TIP

To check that the remote control transmitter is working correctly, refer to “Remote control transmitter.”

Peak voltage measurement

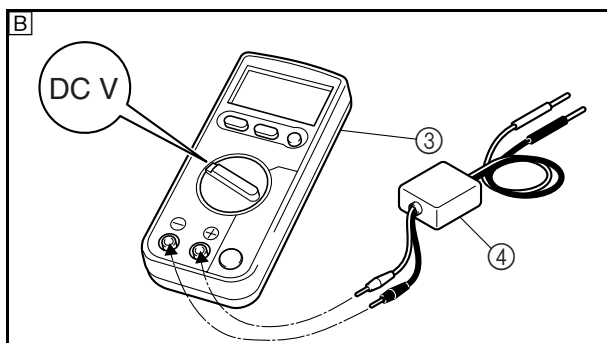
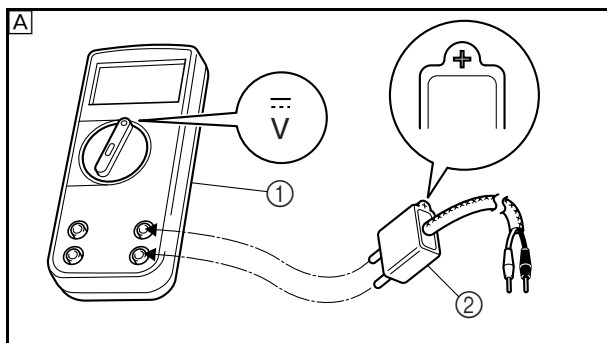
To check the electrical components or measure the peak voltage, use the special service tools. A faulty electrical component can be easily checked by measuring the peak voltage. The specified engine speed when measuring the peak voltage is affected by many factors, such as fouled spark plugs or a weak 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.

NOTICE

- 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.

**TIP**

- 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 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:

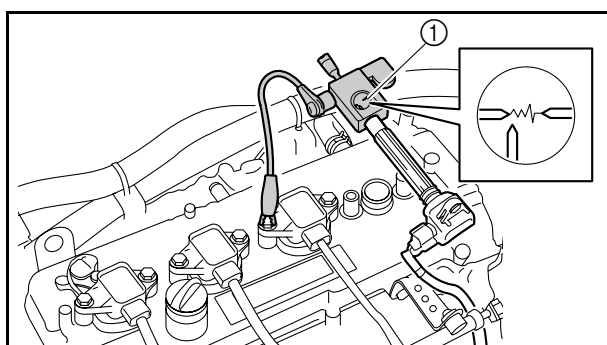
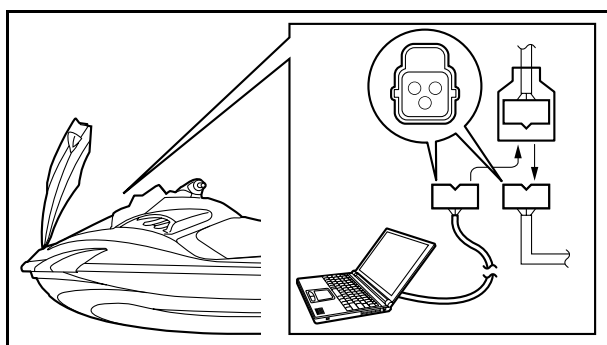
90890-03174

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.

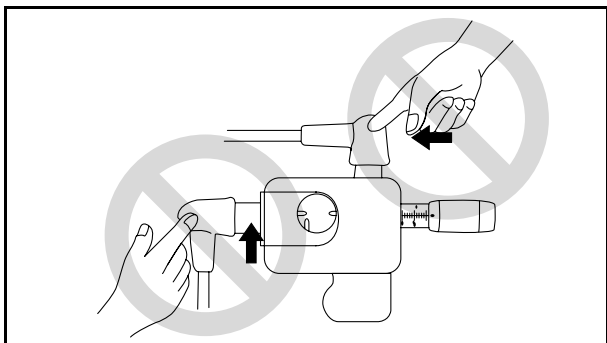


Spark checker:

YM-34487

Ignition tester:

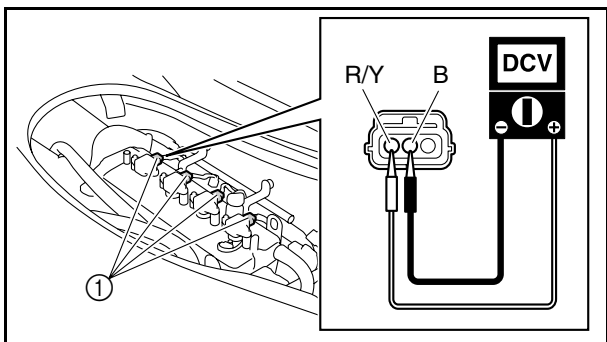
90890-06754



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 ignition spark, do not touch any of the connections of the special service tool leads.
- When performing the ignition spark 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.

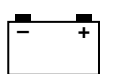
Measurement steps:

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):

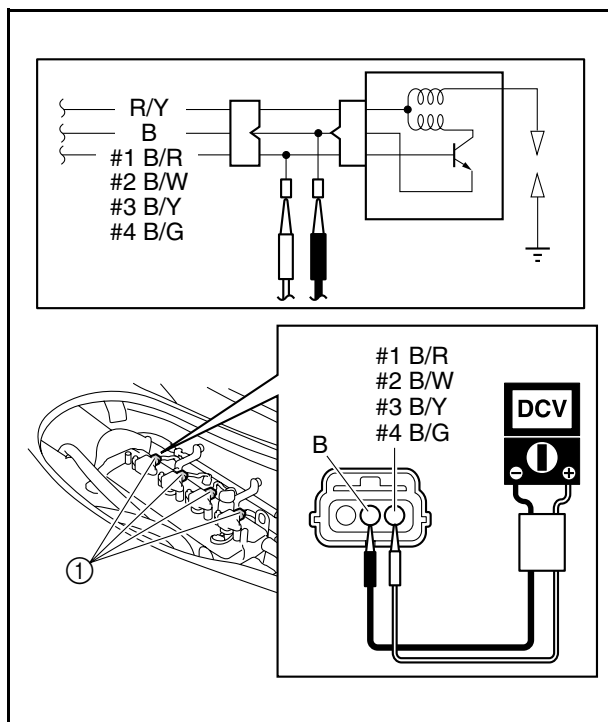
Red/yellow (R/Y) – Black (B)
12 V (battery voltage)

**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:**

- Disconnect the ignition coil couplers ①.
- Measure the ECM output peak voltage as shown.

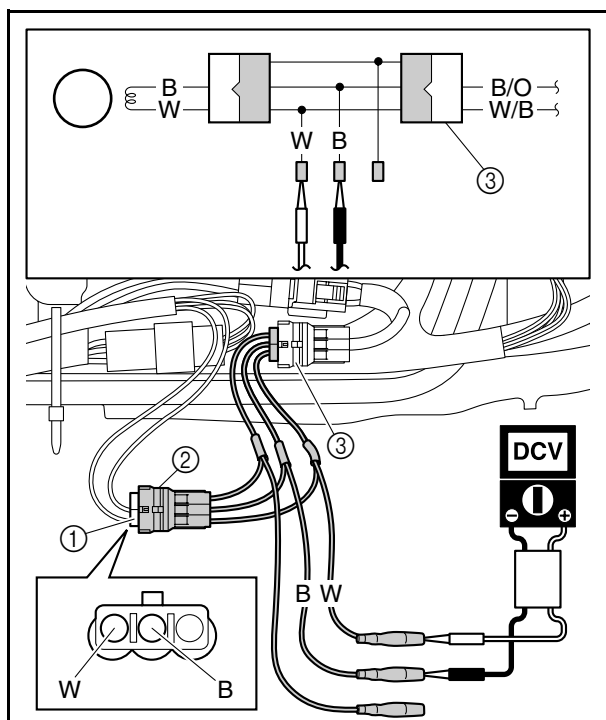
TIP

- 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:

- Disconnect the pickup coil coupler ①.
- 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

- Measure the pickup coil output peak voltage.

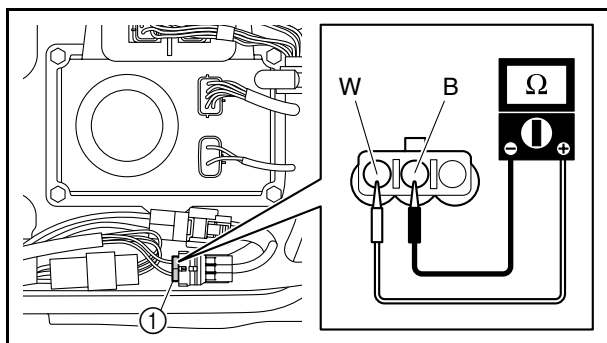
TIP

- 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.

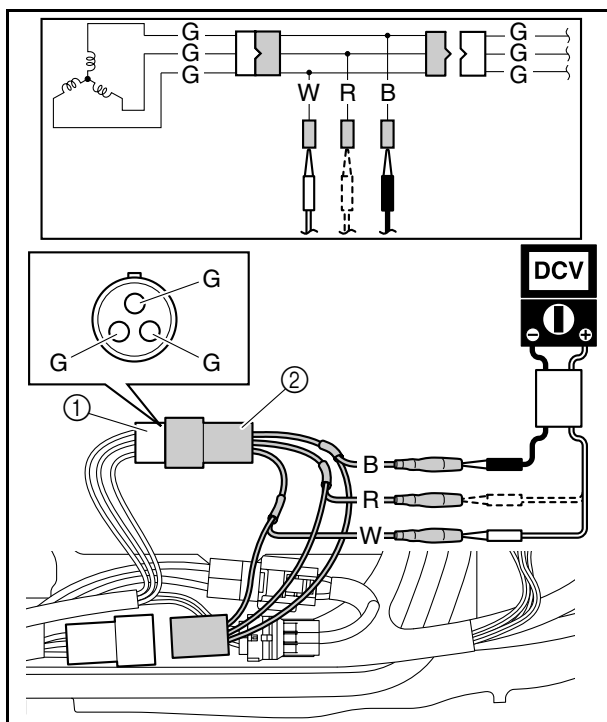
Measurement steps:

- Disconnect the pickup coil coupler ①.
- 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:

- Disconnect the stator coil coupler ①.
- 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.

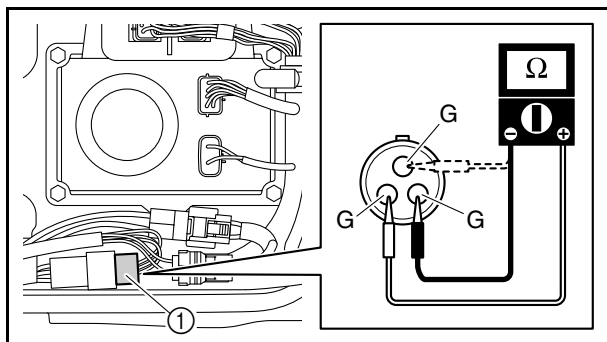
TIP

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:**

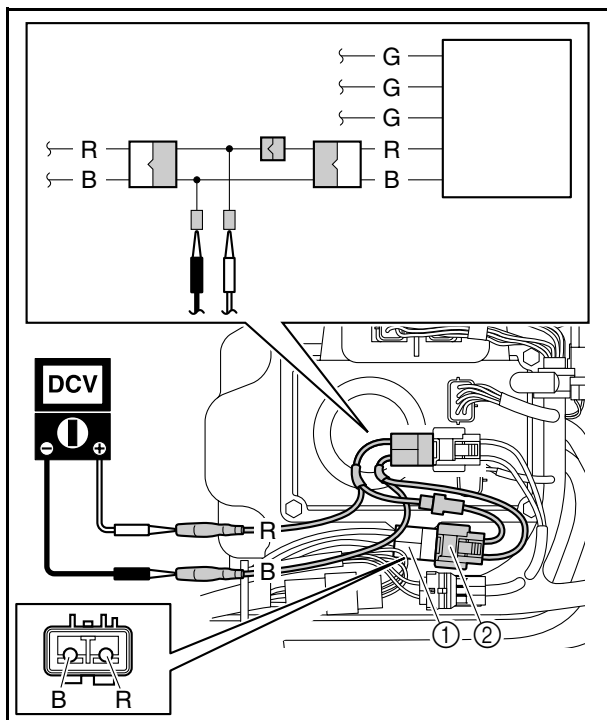
- Stator coil resistance
Out of specification → Replace the stator coil assembly.

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:

- Disconnect the rectifier regulator coupler ①.
- Connect the test harness (2 pins) ② to the rectifier regulator coupler ①.



Test harness (2 pins):
90890-06850

- Measure the rectifier regulator output peak voltage.

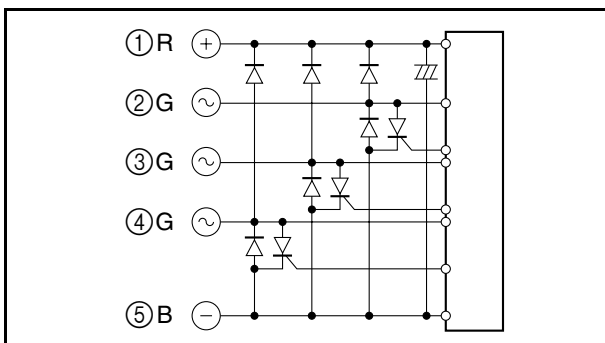
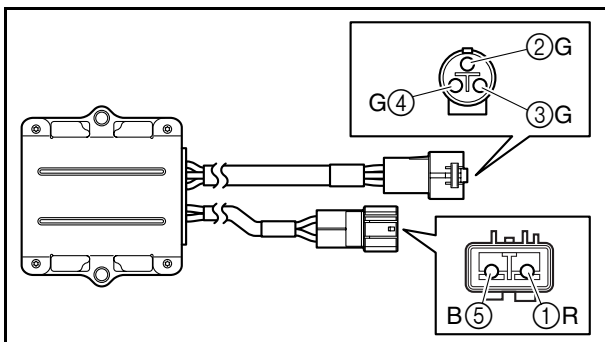
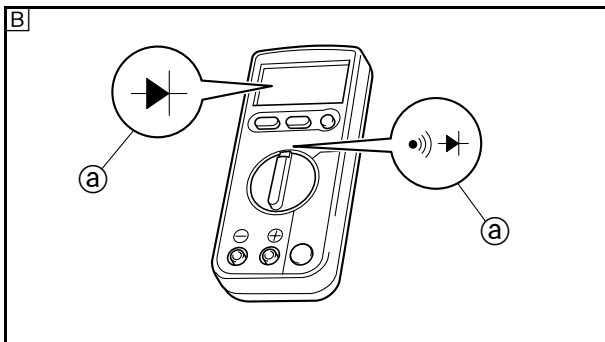
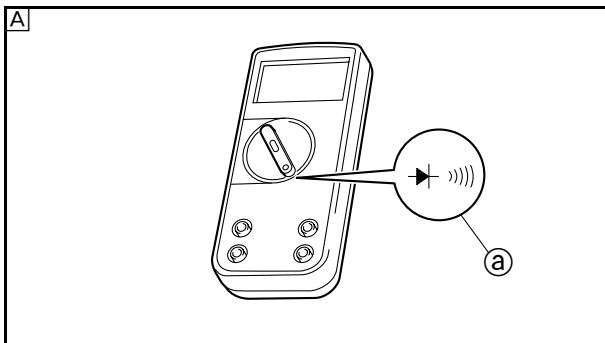
TIP

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:

- Remove the rectifier regulator.
Refer to “Engine unit removal 3” in Chapter 5.
- Check the rectifier regulator continuity.

TIP

Make sure to set the measurement range **a** when checking the rectifier regulator continuity.

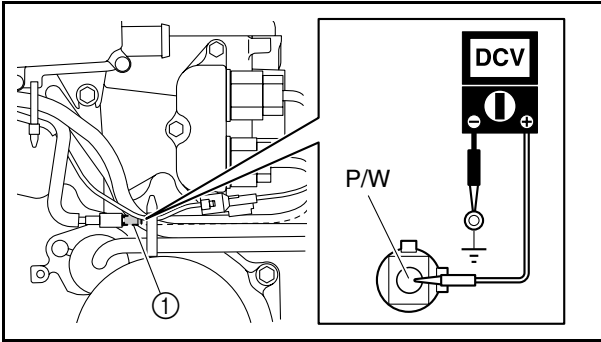
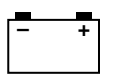
A For USA and Canada

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	
⑤ B	② G	0.43–0.51
⑤ B	③ G	0.43–0.51
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.

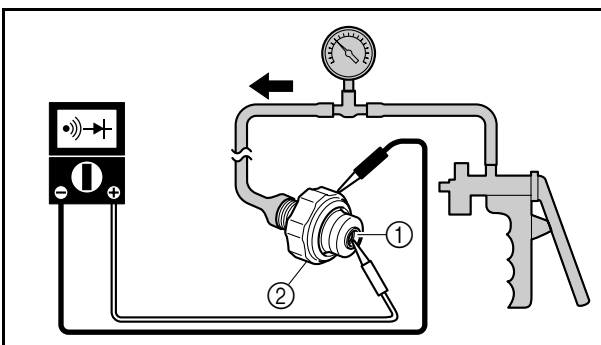
Measurement steps:

- 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

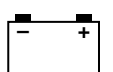


2. Check:

- 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.

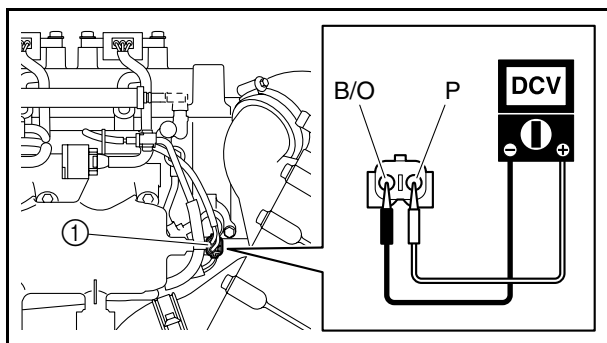
TIP

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 ² , 18.2–23.6 psi)	Continuity
Above 128–166 kPa (1.28–1.66 kgf/cm ² , 18.2–23.6 psi)	No continuity



Thermostat

1. Measure:

- Thermostat input voltage
Out of specification → Check the wiring harness.

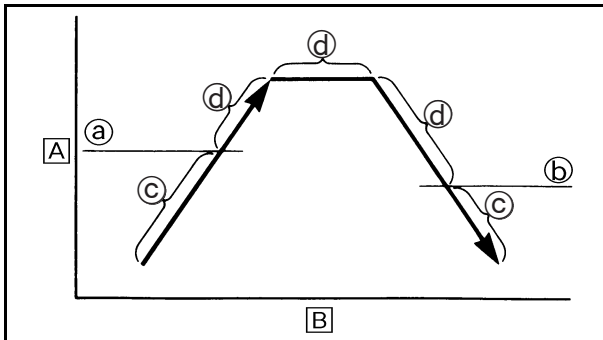
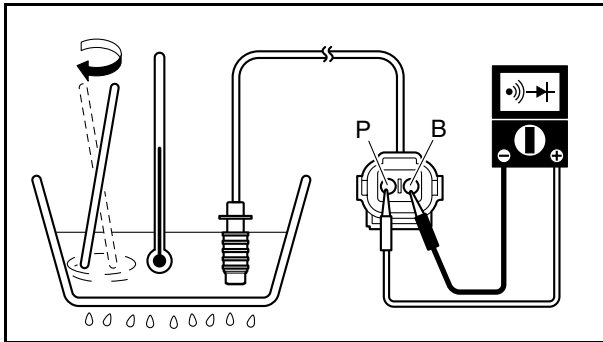
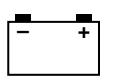
Measurement steps:

- 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:

- Remove the thermoswitch.
Refer to “Oil separator tank and oil pan removal” in Chapter 5.
- Suspend the thermoswitch in a container filled with water.
- Slowly heat the water.
- Check the continuity when the specified temperatures are reached.



Thermoswitch continuity:
Pink (P) – Black (B)

Temperature (reference data)		Pink (P) – Black (B)
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)

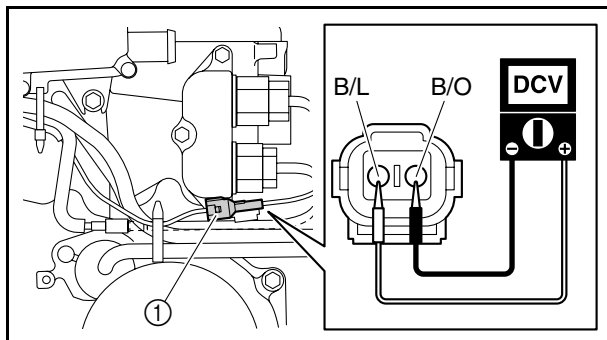
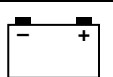
Ⓑ 80–94 °C (176–201 °F)

Ⓒ No continuity

Ⓓ Continuity

Ⓐ Temperature

Ⓑ Time



Thermo sensor

1. Measure:

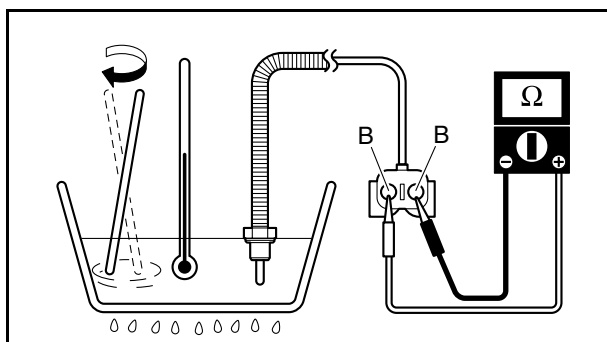
- Thermo sensor input voltage
Out of specification → Check the wiring harness.

Measurement steps:

- Disconnect the thermo sensor coupler ①.
- 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:

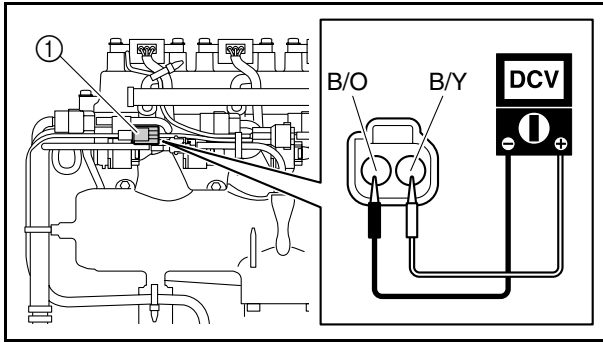
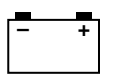
- Thermo sensor resistance (at the specified temperatures)
Out of specification → Replace the thermo sensor.

Measurement steps:

- Remove the thermo sensor.
Refer to “Muffler disassembly” in Chapter 5.
- Suspend the thermo sensor in a container filled with water.
- Slowly heat the water.
- 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.

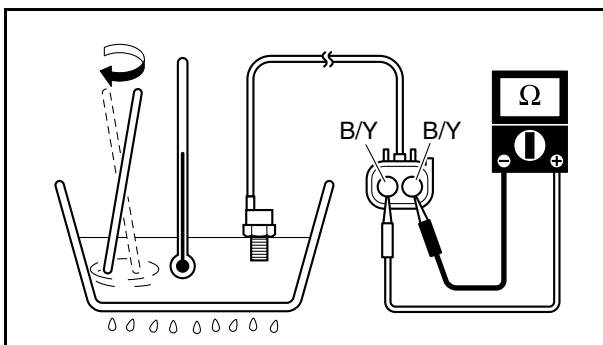
Measurement steps:

- Disconnect the engine temperature sensor coupler ①.
- 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:

- Remove the engine temperature sensor. Refer to “Oil separator tank and oil pan removal” in Chapter 5.
- Suspend the engine temperature sensor in a container filled with water.
- Slowly heat the water.



4. Measure the resistance when the specified temperatures are reached.



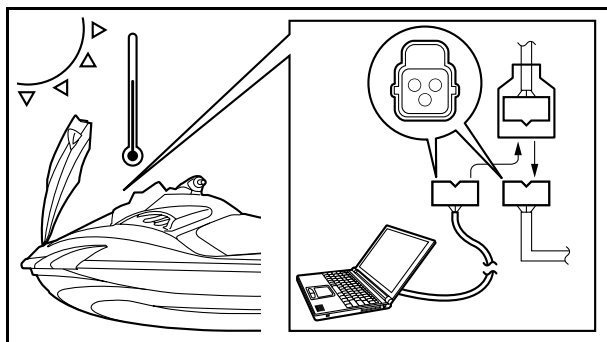
Engine temperature sensor resistance (reference data):

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.

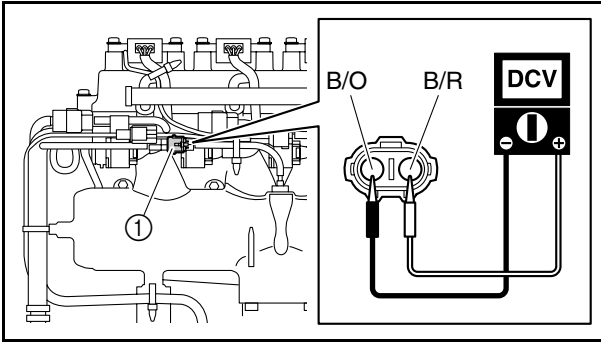
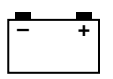
Checking steps:

1. Measure the ambient temperature.
2. Connect a computer to the watercraft and use the YDIS to display the intake air temperature.

TIP

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 ± 5 °C (± 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)
4.50–5.50 V

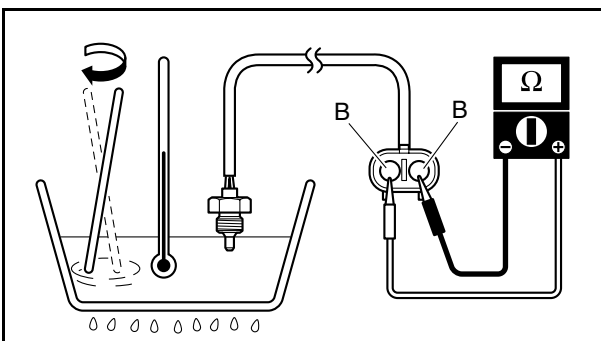
3. Measure:

- Intake air temperature sensor resistance (at the specified temperatures)

Out of specification → Replace the intake air temperature sensor.

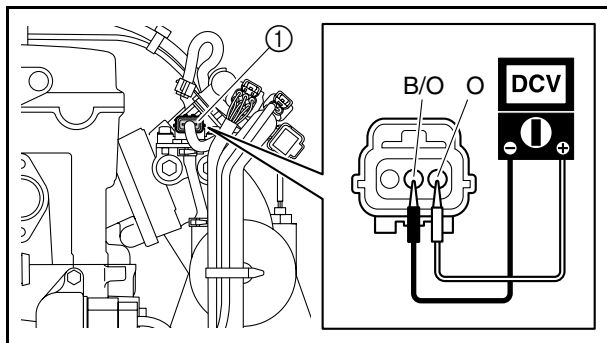
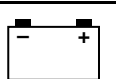
Measurement steps:

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 kΩ
80 °C (176 °F): 0.29–0.39 kΩ



Intake air pressure sensor

1. Measure:

- Intake air pressure sensor input voltage
Out of specification → Check the wiring harness.

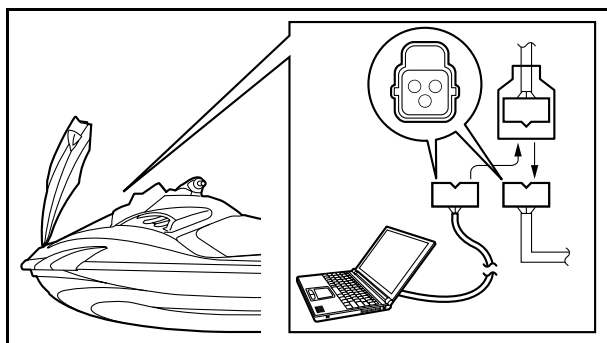
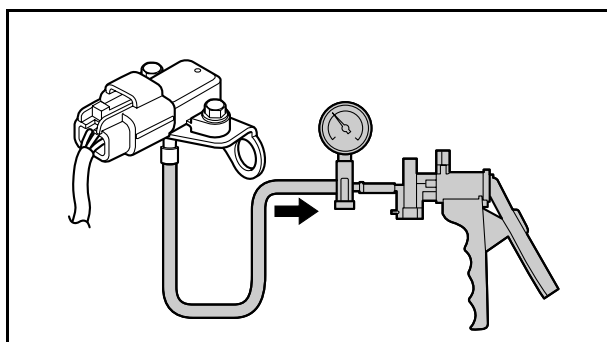
Measurement steps:

- 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:

- Connect the special service tool to the intake air pressure sensor.
- Connect a computer to the watercraft and use the YDIS to display the intake air pressure.
- Push the unlock button.
- 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



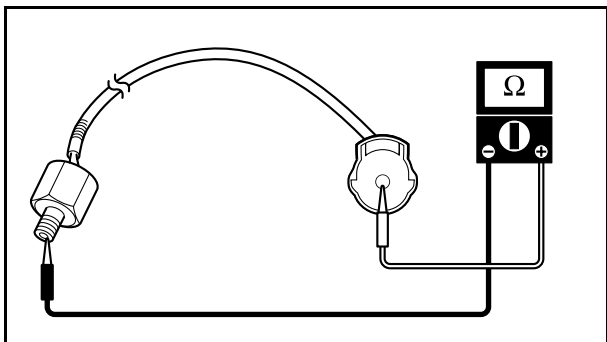
Knock sensor

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.

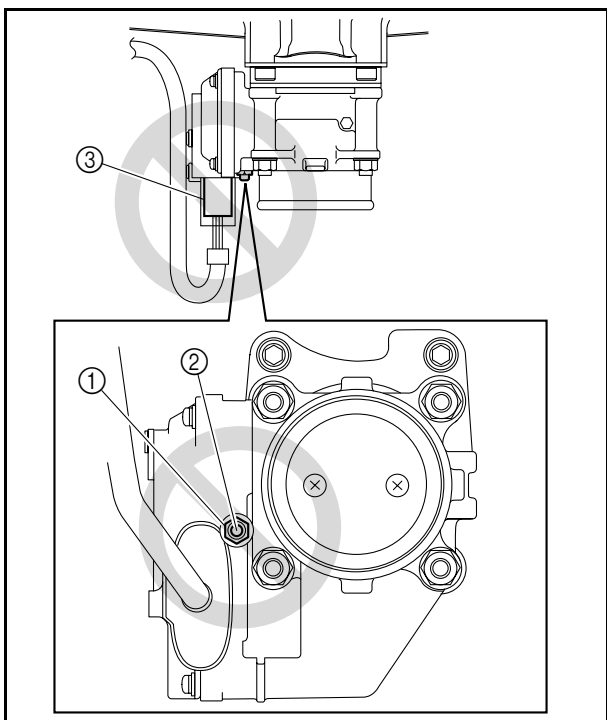


Measurement steps:

- Remove the knock sensor.
Refer to “Oil separator tank and oil pan removal” in Chapter 5.
- Measure the knock sensor resistance.



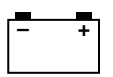
Knock sensor resistance at 20 °C
(68 °F) (reference data):
504–616 kΩ



Throttle position sensor

NOTICE

- 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.

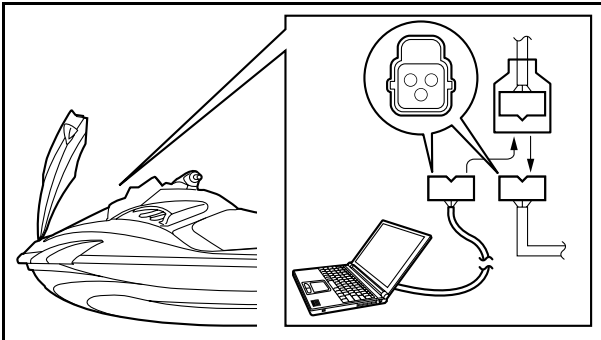
**1. Check:**

- Throttle valve opening
- TPS output voltage

Out of specification → Measure the TPS input voltage.

Checking steps:**TIP**

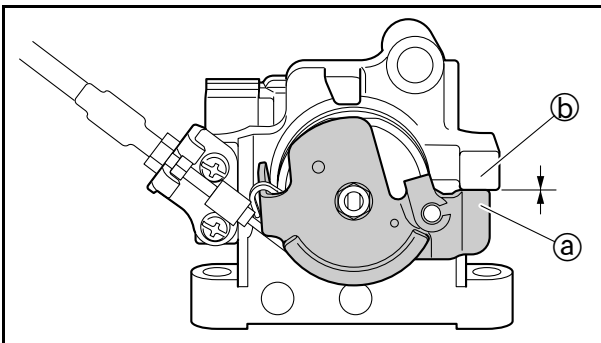
When checking the TPS using the YDIS, do not start the engine.



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.”

TIP

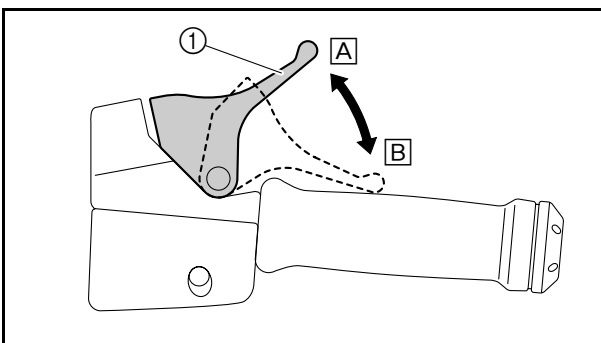
TPS 1 and TPS 2 are components of the electronic throttle valve, which cannot be disassembled.



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.

TIP

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.

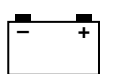


TPS 1 output voltage with throttle lever fully closed:

0.6–0.9 V

Throttle valve opening angle with throttle lever fully closed:

2.0–8.0 °



5. Operate the throttle lever ①, and then check the TPS 2 output voltage and throttle valve opening angle at the fully open position [B].

TIP

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°

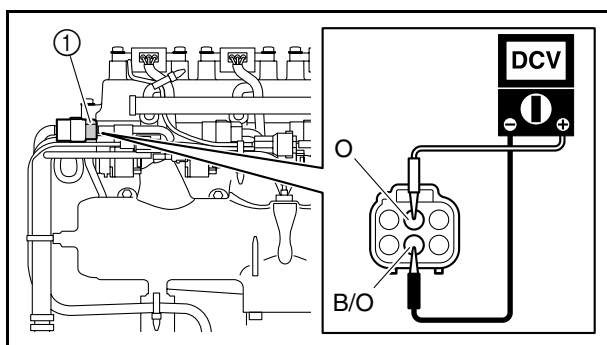
6. Operate the throttle lever ① so that the TPS 2 output voltage is at 4.5 V or less, and then check the voltage difference between TPS 1 and TPS 2.



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:**

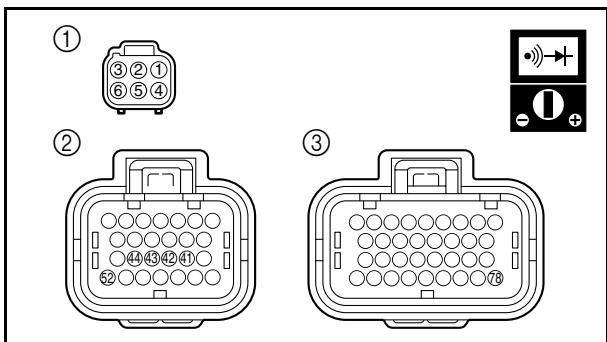
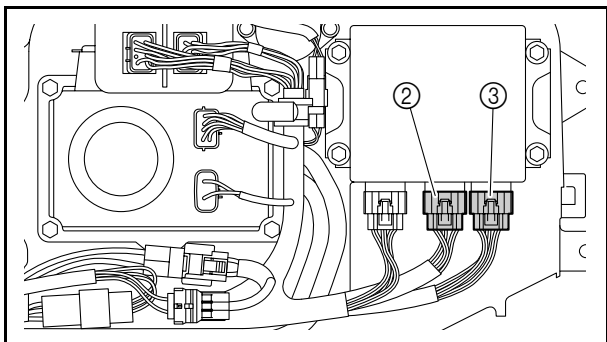
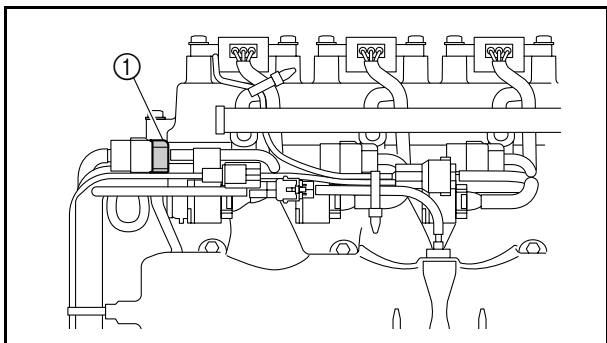
- TPS input voltage
Out of specification → Check the TPS circuit.

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 continuity
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:

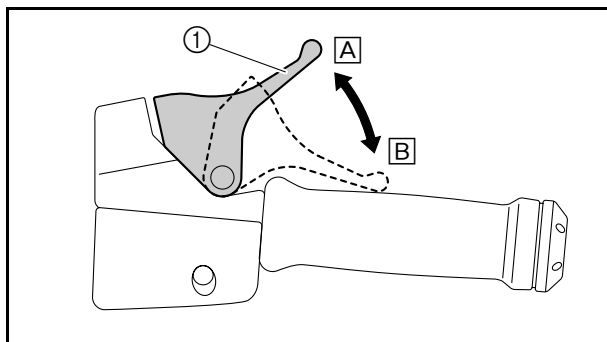
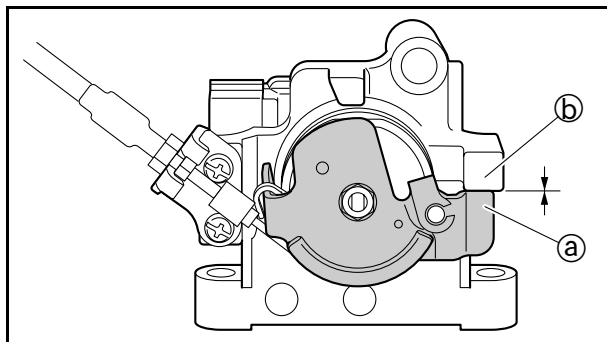
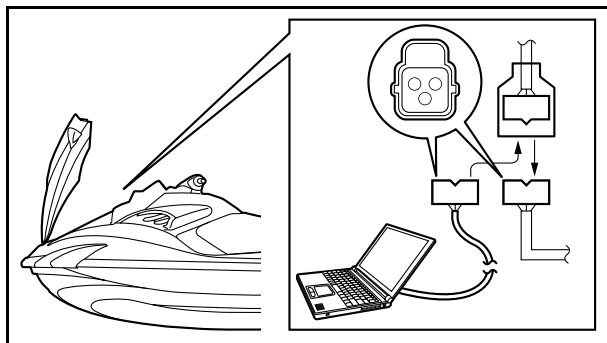
Terminal No.		Color
Coupler ①	Coupler ②, ③	
1	42	P
2	44	O
3	78	G
4	43	P/B
5	41	B/O
6	52	L

Accelerator position sensor**1. Check:**

- APS output voltage
Out of specification → Measure the APS input voltage.

Checking steps:**TIP**

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.”

TIP

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].

TIP

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].

TIP

The actual APS output voltage may vary according to environmental conditions.



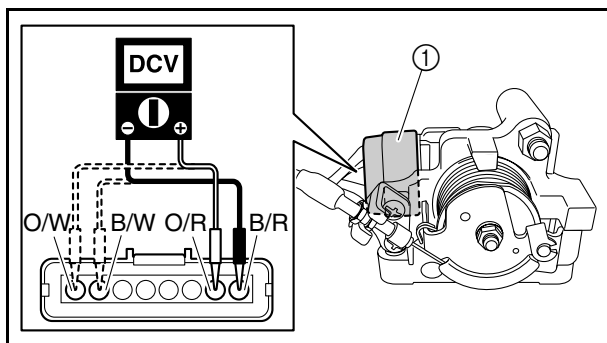
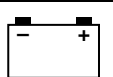
APS output voltage:

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.

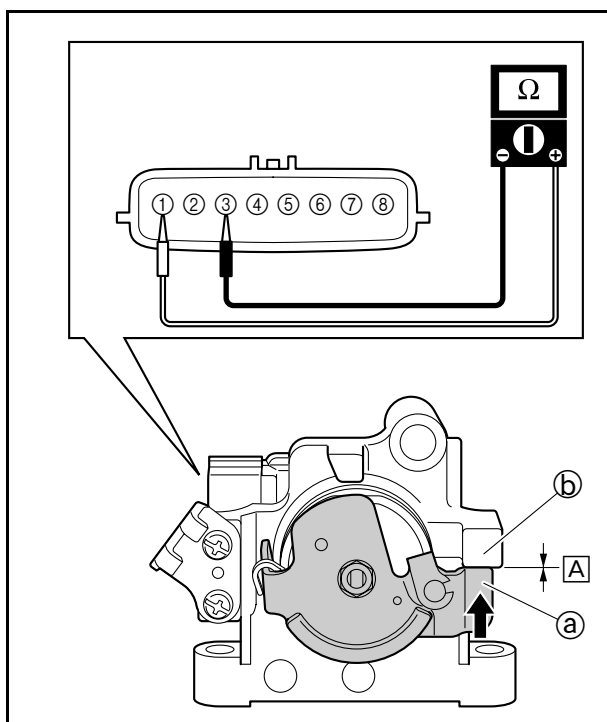
Measurement steps:

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

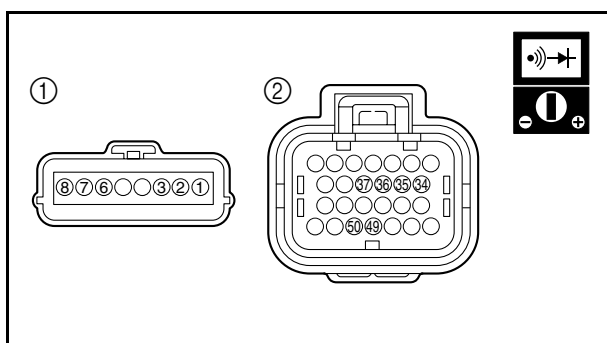
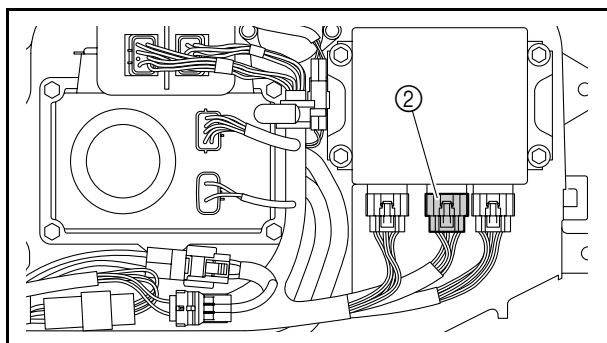
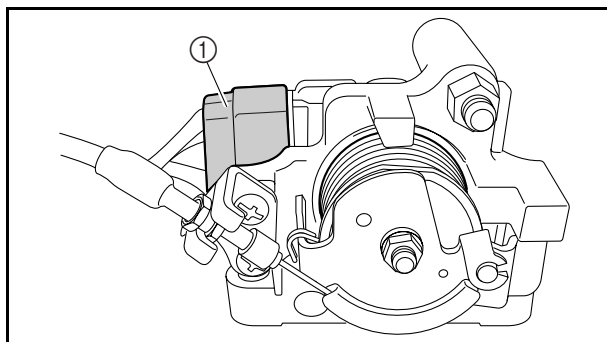
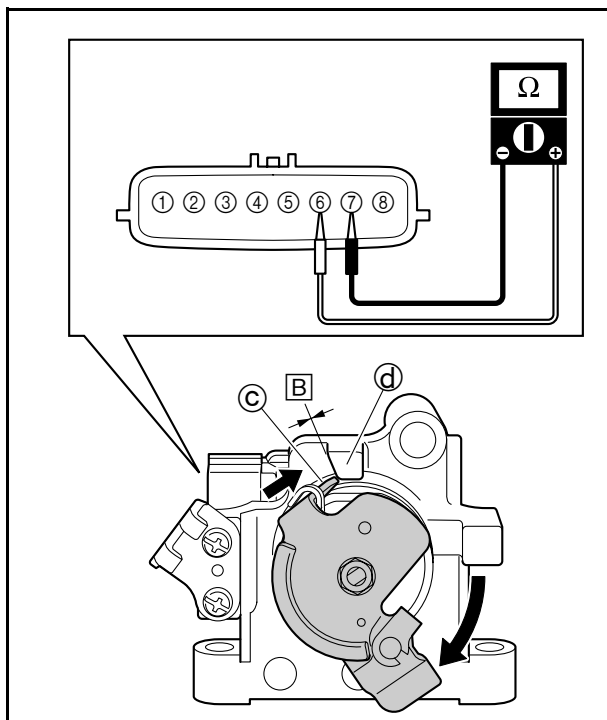
APS 2 input voltage (reference data):
Orange/white (O/W) –
Black/white (B/W)
4.75–5.25 V

**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 ④ when the APS pulley is at the fully open position ②.
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	Termi- nal	APS pulley position	
		Fully closed ①	Fully open ②
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 continuity
No continuity → Replace the wiring harness assembly.

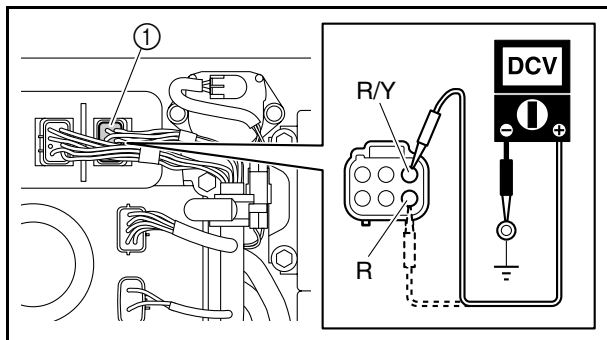
Checking steps:

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:

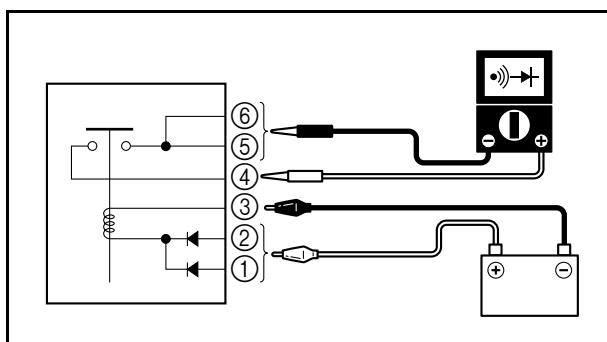
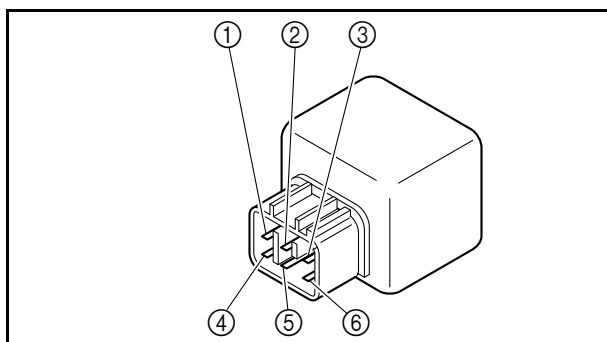
- ETV relay input voltage
Out of specification → Check the wiring harness.

Measurement steps:

- Disconnect the ETV relay coupler ①.
- 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.

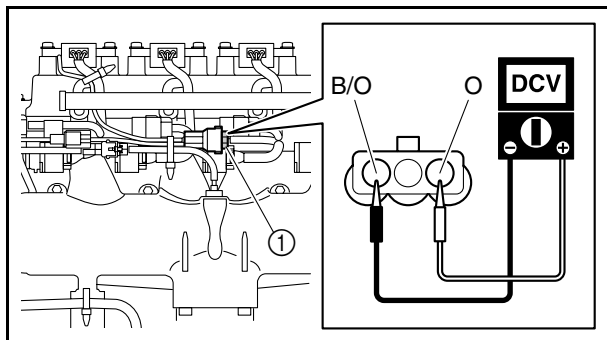
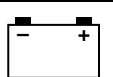
Checking steps:

- Remove the ETV relay.
Refer to “Fuse box disassembly.”
- Connect the tester leads to the ETV relay terminals ④ and ⑤ or to the terminals ④ and ⑥.
- Connect the positive battery lead to the ETV relay terminal ① or ②.
- Connect the negative battery lead to the ETV relay terminal ③.
- Check the continuity between terminals ④ and ⑤ or terminals ④ and ⑥.



ETV relay continuity:

Battery lead ① or ② – ③	Terminal ④ – ⑤ or ⑥
Disconnected	No continuity
Connected	Continuity



Cam position sensor

1. Measure:

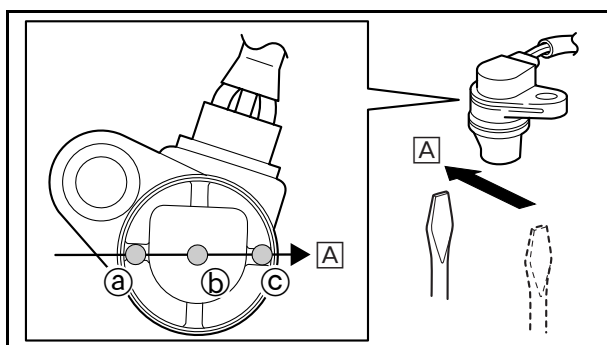
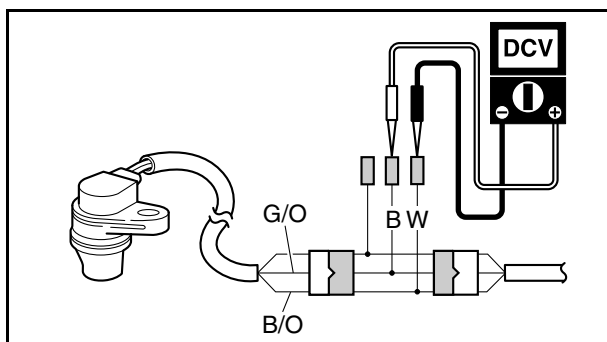
- Cam position sensor input voltage
Out of specification → Check the wiring harness.

Measurement steps:

- Disconnect the cam position sensor coupler ①.
- 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:

- Remove the cam position sensor.
Refer to “Cylinder head cover removal” in Chapter 5.
- Connect the test harness (3 pins) to the cam position sensor.
- 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.

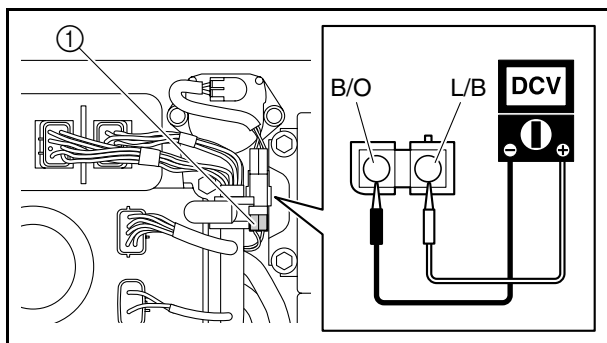


Test harness (3 pins):
YB-06877
Test harness HM090-3 (3 pins):
90890-06877



Cam position sensor output voltage:
Green/orange (G/O) –
Black/orange (B/O)

Position	Voltage (V)
①, ③	More than 4.8
②	Less than 0.8



Slant detection switch

1. Measure:

- Slant detection switch input voltage
Out of specification → Check the wiring harness.

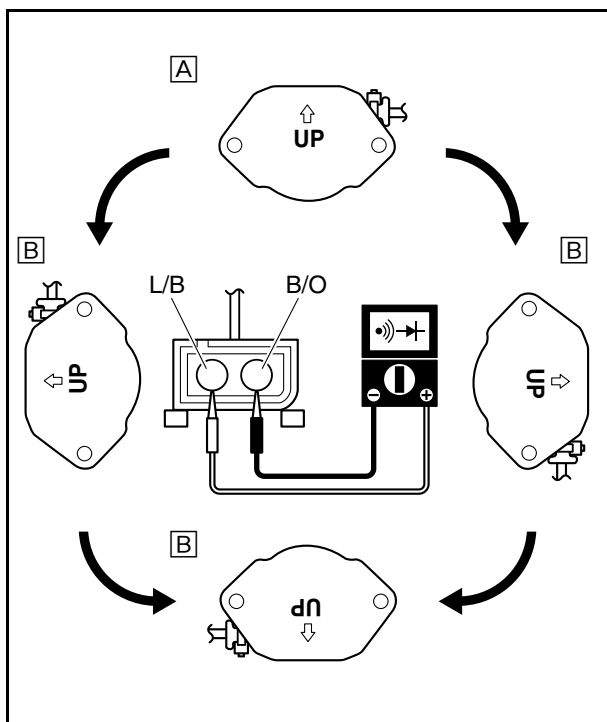
Measurement steps:

- Disconnect the slant detection switch coupler ①.
- 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:

- Remove the slant detection switch.
Refer to “Electrical box disassembly.”
- Check the slant detection switch continuity.

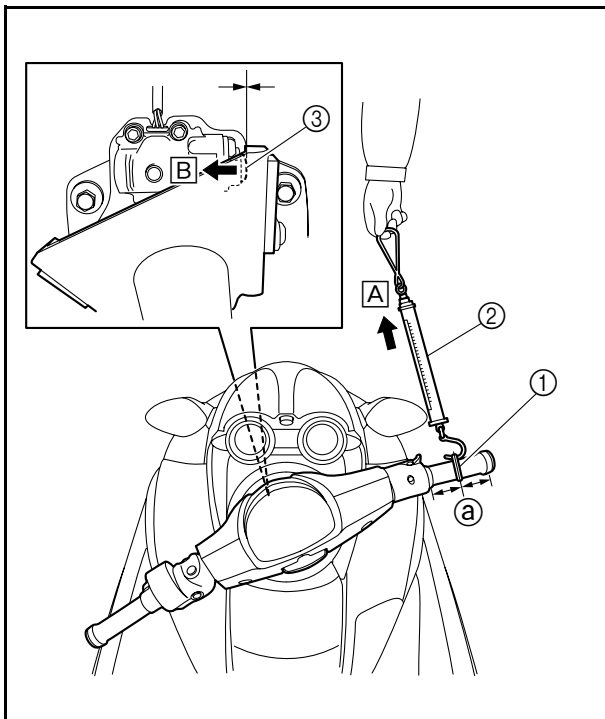
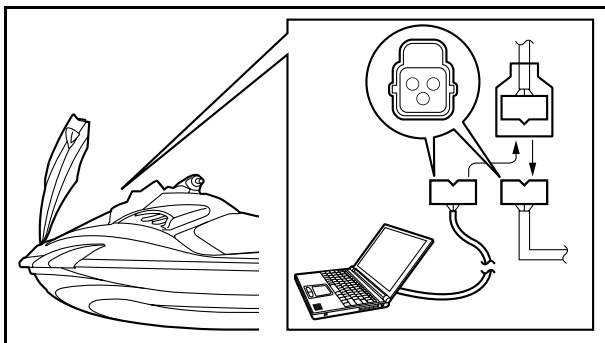
TIP

Make 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 A	No continuity
Overturned 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).

TIP

At this time, the button ③ in the steering sensor will be pushed in direction B.

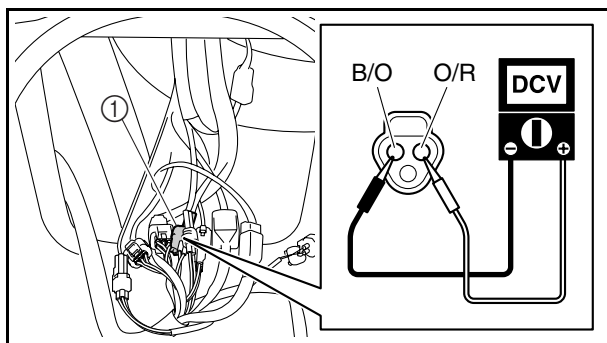
7. Check that the following is displayed in the “Engine monitor” window of the YDIS.



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:**

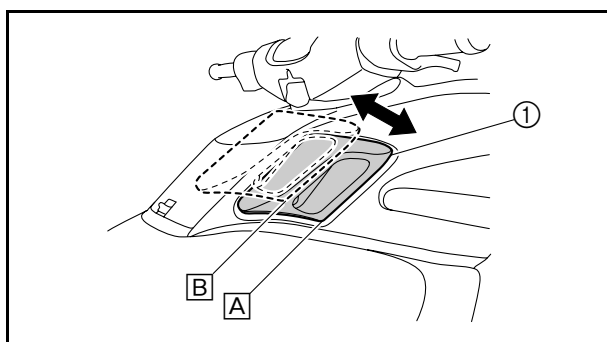
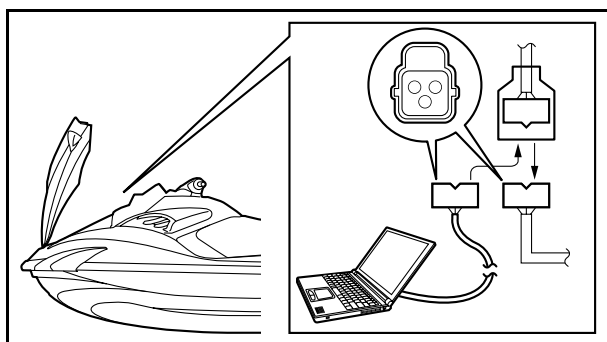
- Steering sensor input voltage
Within specification → Replace the steering sensor.
Out of specification → Check the wiring harness.

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.

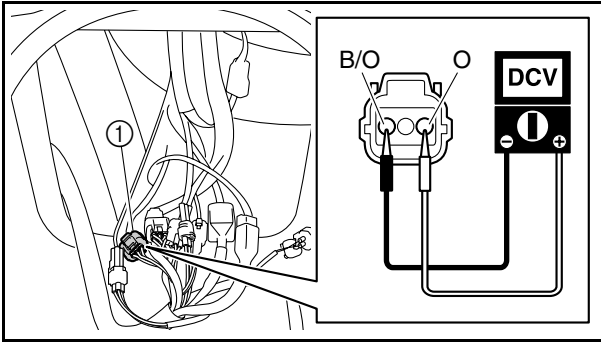
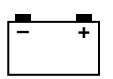
Checking steps:

- 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 A	OFF
Reverse B	ON

**2. Measure:**

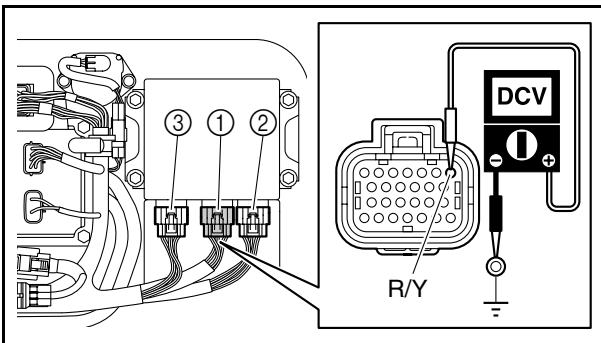
- Reverse sensor input voltage
Within specification → Replace the reverse sensor.
Out of specification → Check the wiring harness.

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

**ECM circuit****1. Measure:**

- ECM input voltage
Out of specification → Check the ECM circuit.

Measurement steps:

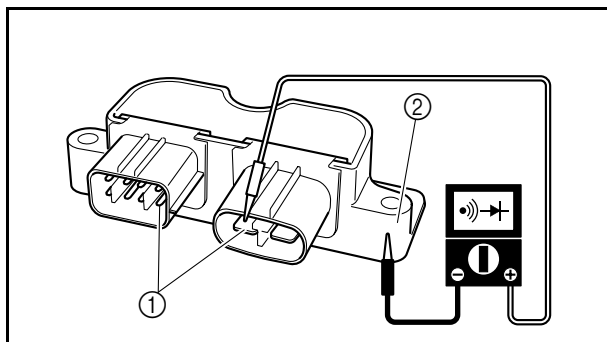
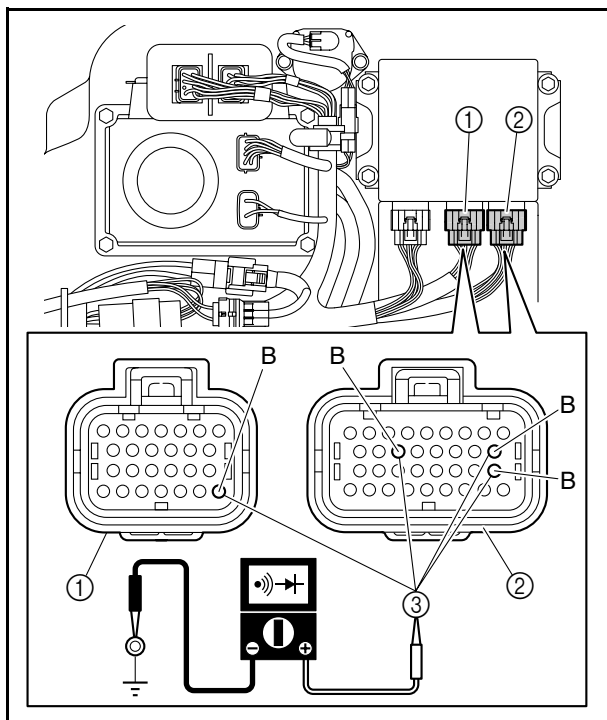
1. Disconnect the ECM coupler ①.
2. Push the unlock button, and then measure the input voltage between the ECM coupler terminal (wiring harness end) and ground.

TIP

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:

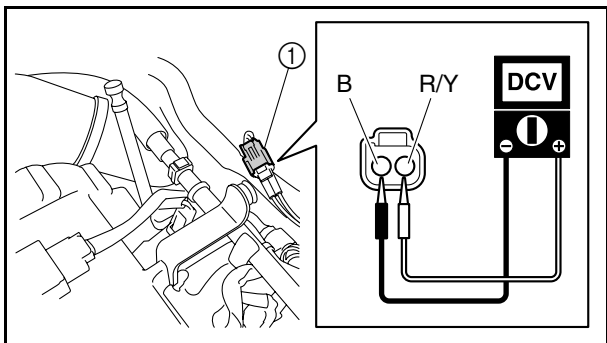
1. Disconnect the ECM couplers ① and ②.
2. Check the continuity between the ECM coupler terminals ③ (wiring harness end) and ground.

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:

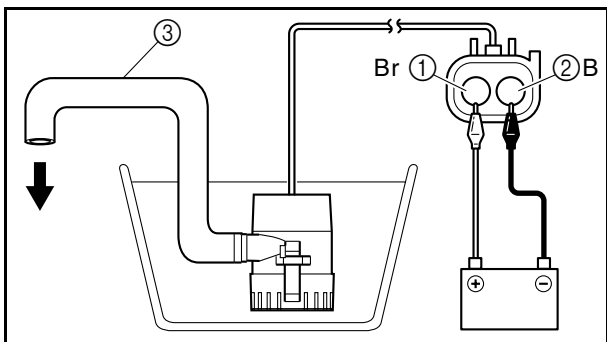
- Electric bilge pump input voltage
Out of specification → Check the wiring harness.

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)

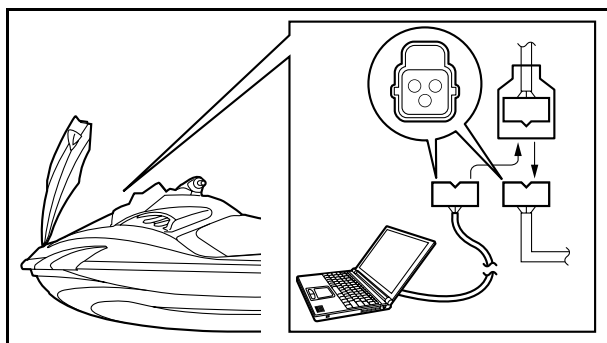
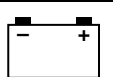


2. Check:

- 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

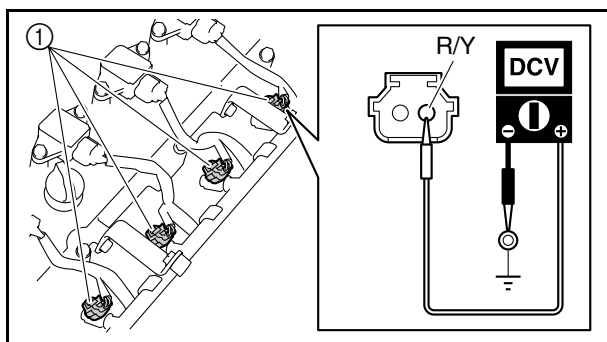
Fuel injector

1. Check:

- Fuel injector operation sound
Does not sound → Measure the fuel injector input voltage.

Checking steps:

- Connect a computer to the watercraft to use the YDIS.
- Using the “Stationary test” of the YDIS, listen for the fuel injector operation sound.



2. Measure:

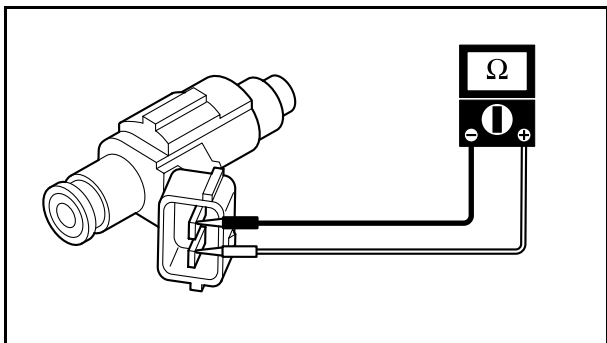
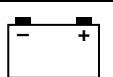
- Fuel injector input voltage
Out of specification → Check the wiring harness.

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:**

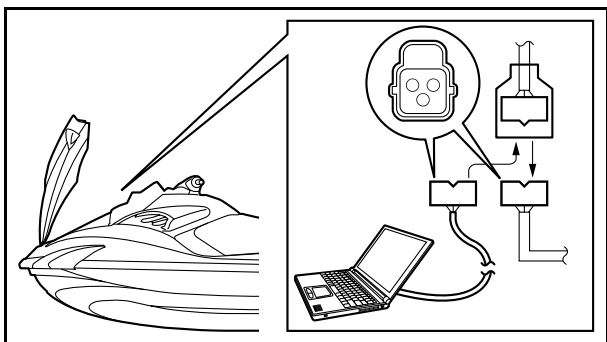
- Fuel injector resistance
Out of specification → Replace the fuel injector.

Measurement steps:

- Remove the fuel injector.
Refer to “Fuel tank removal” in Chapter 4.
- Measure the fuel injector resistance.



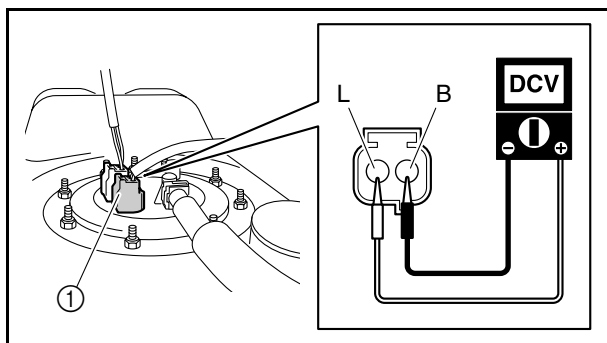
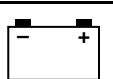
Fuel injector resistance at 20 °C
(68 °F) (reference data):
11.5–12.5 Ω

**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).

TIP

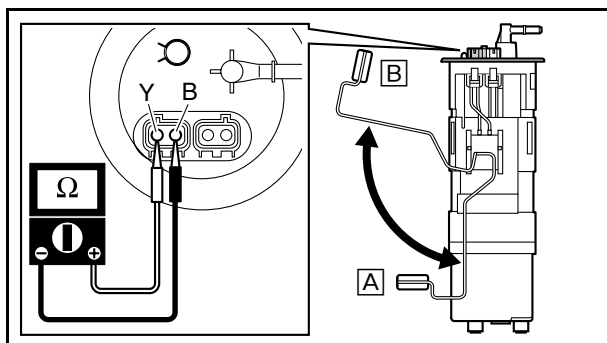
After the unlock button is pushed, voltage will only be applied to the fuel pump module for 3 seconds.



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.

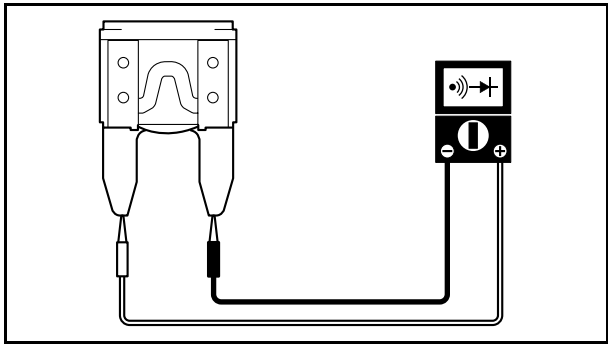
**Measurement steps:**

- 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):

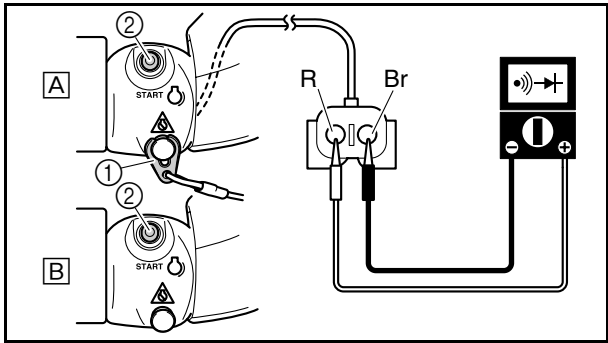
Float position	Yellow (Y) – Black (B)
Lower position A	133.5–136.5 Ω
Upper position B	5.0–7.0 Ω



Starting system

Fuse

1. Check:
- Fuse continuity
- No continuity → Replace the fuse.



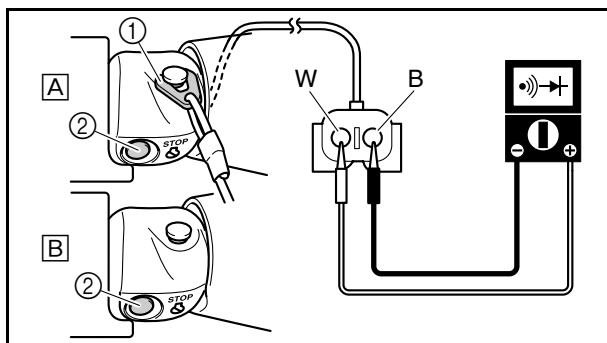
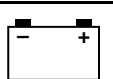
Left handlebar switch assembly

1. Check:
- Engine start switch continuity
- Out of specification → Replace the left handlebar switch assembly.

Checking steps:

- Disconnect the left handlebar switch coupler.
Refer to “Handlebar assembly removal” in Chapter 8.
- Check the engine start switch continuity.

Engine start switch continuity:		
Clip ①	Engine start switch ②	Red (R) – Brown (Br)
Installed A	Free	No continuity
	Pushed	Continuity
Removed B	Free	No continuity
	Pushed	No continuity

**2. Check:**

- Engine stop switch continuity
Out of specification → Replace the left handlebar switch assembly.

Checking steps:

- Disconnect the left handlebar switch coupler.
Refer to “Handlebar assembly removal” in Chapter 8.
- Check the engine stop switch continuity.

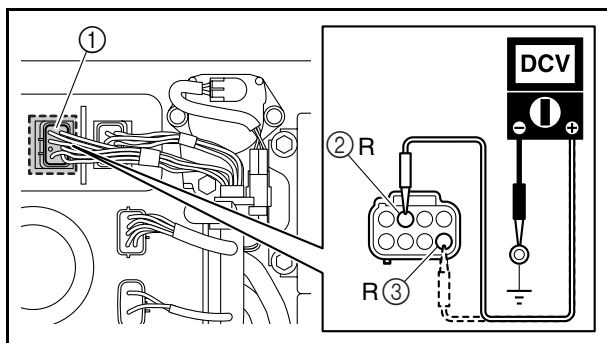


Engine stop switch continuity:

Clip ①	Engine stop switch ②	White (W) – Black (B)
Installed [A]	Free	No continuity
	Pushed	Continuity
Removed [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.

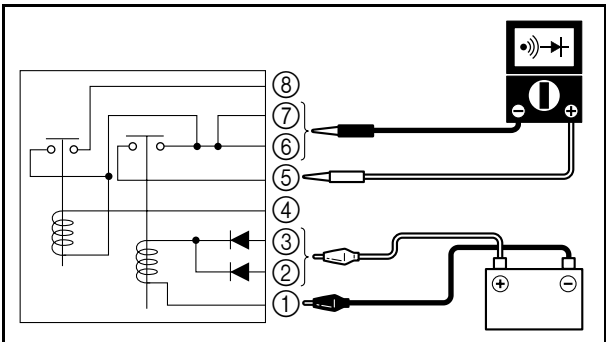
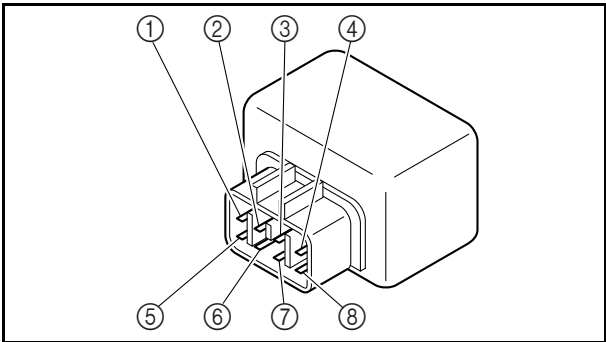
**Measurement steps:**

- Disconnect the main and fuel pump relay coupler ①.
- 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:

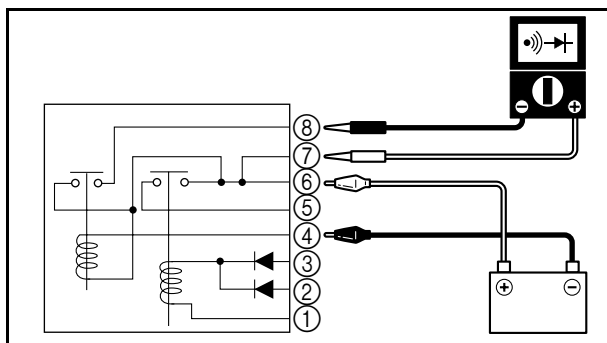
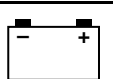
Battery lead ② or ③ – ①	Terminal ⑤ – ⑥ or ⑦
Disconnected	No continuity
Connected	Continuity

3. Check:

- Fuel pump relay continuity
Out of specification → Replace the main and fuel pump relay.

NOTICE

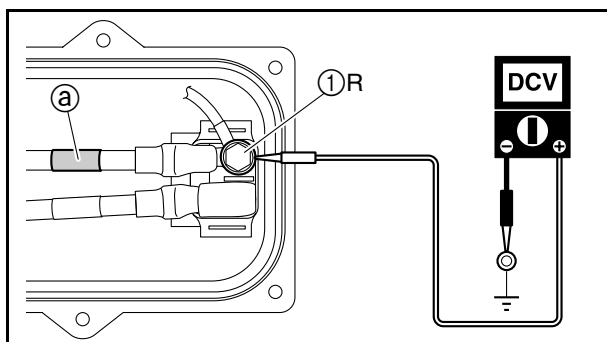
Do not reverse the battery leads, otherwise the main and fuel pump relay may be seriously damaged.

**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 – 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.

TIP

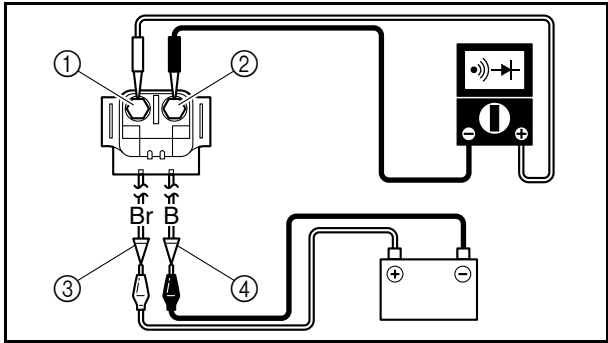
The positive battery cable is marked with gray tape ①.

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.



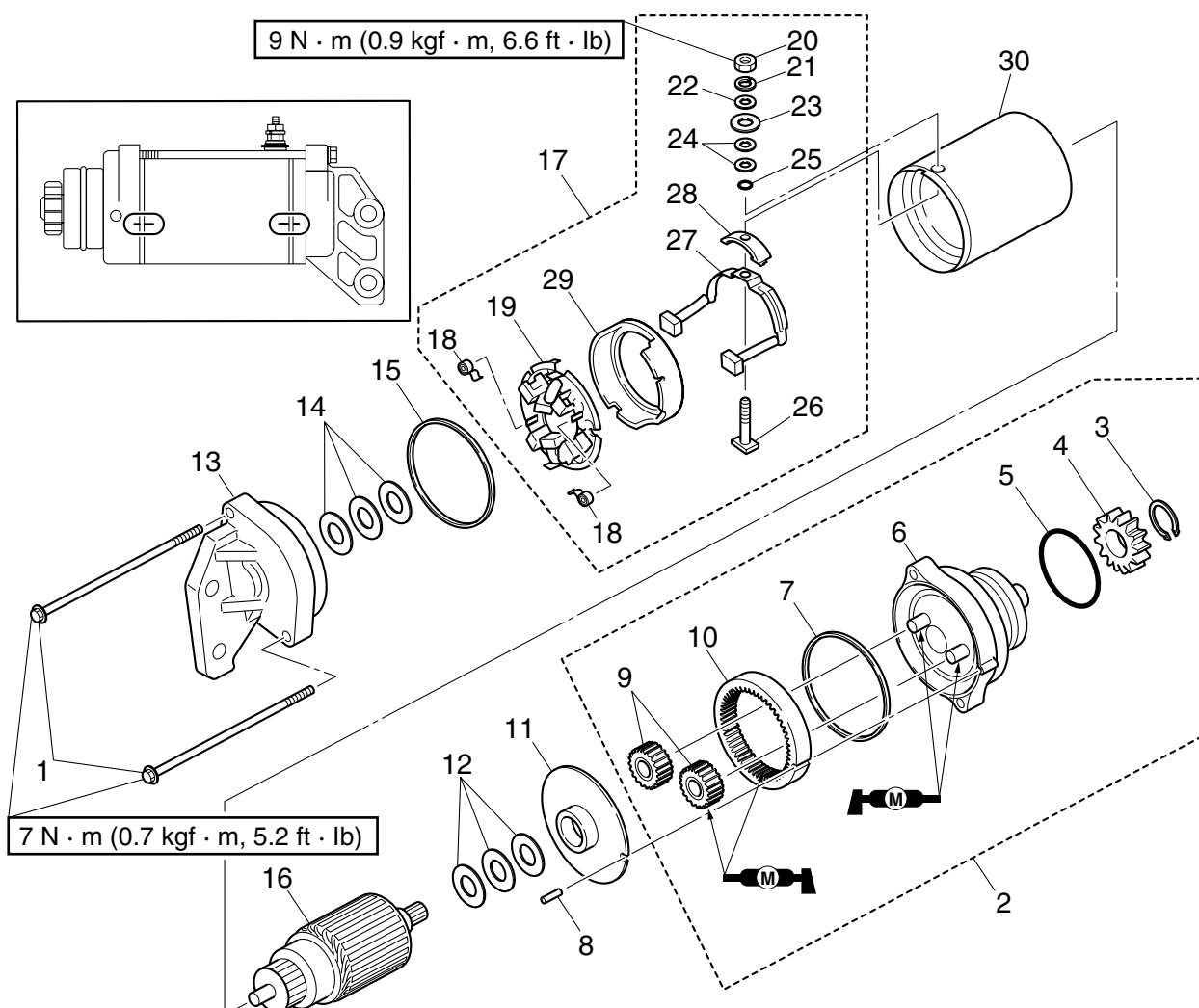
- Checking steps:
1. Remove the starter relay.
Refer to “Electrical box disassembly.”
 2. Connect the tester leads between the starter relay terminals ① and ②.
 3. Connect the positive battery lead to the terminal ③, and the negative battery lead to the terminal ④.
 4. Check the continuity between the starter relay terminals ① and ②.

 Starter relay continuity:	
Battery lead ③ – ④	Terminal ① – ②
Disconnected	No continuity
Connected	Continuity

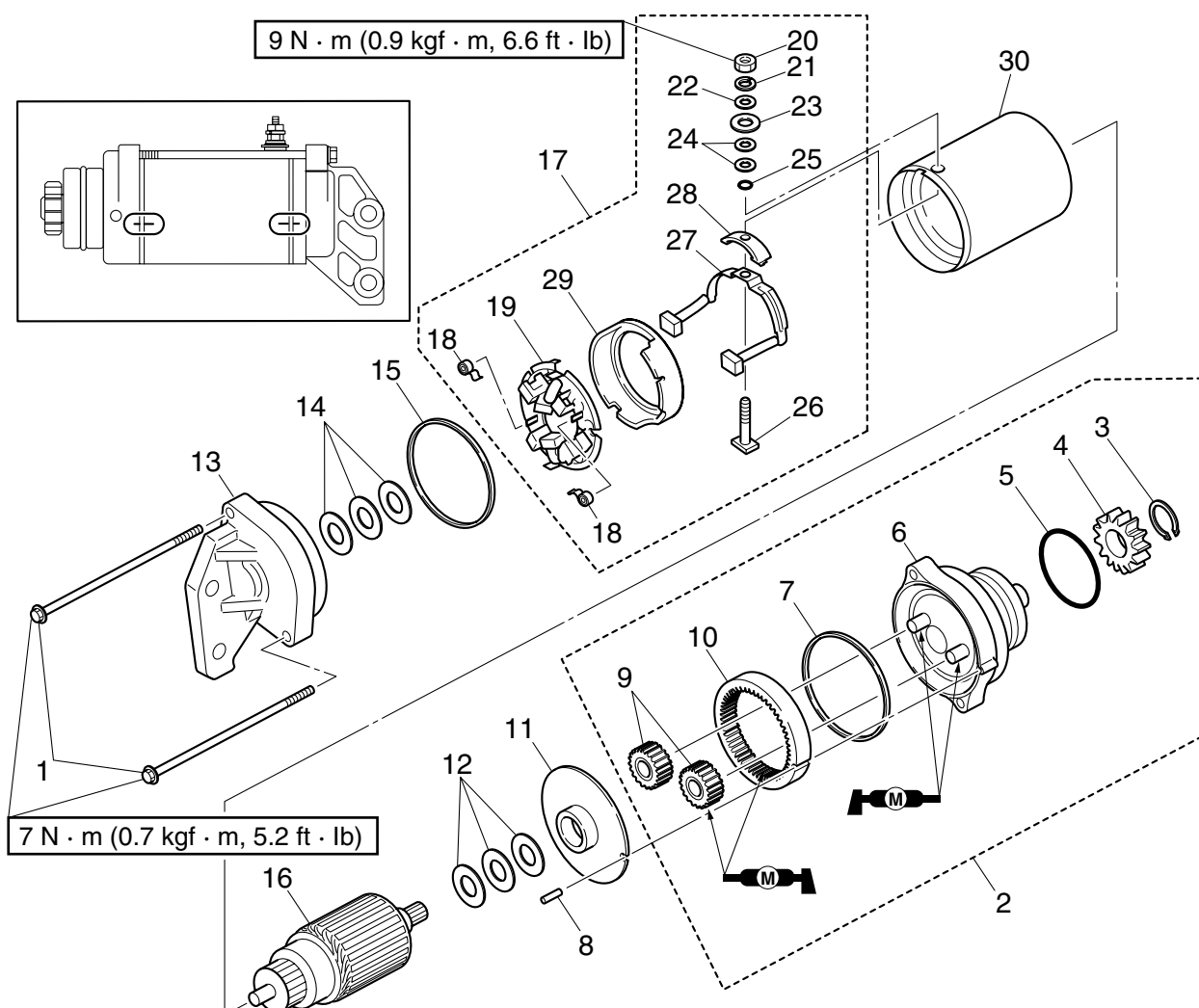


Starter motor

Starter motor disassembly

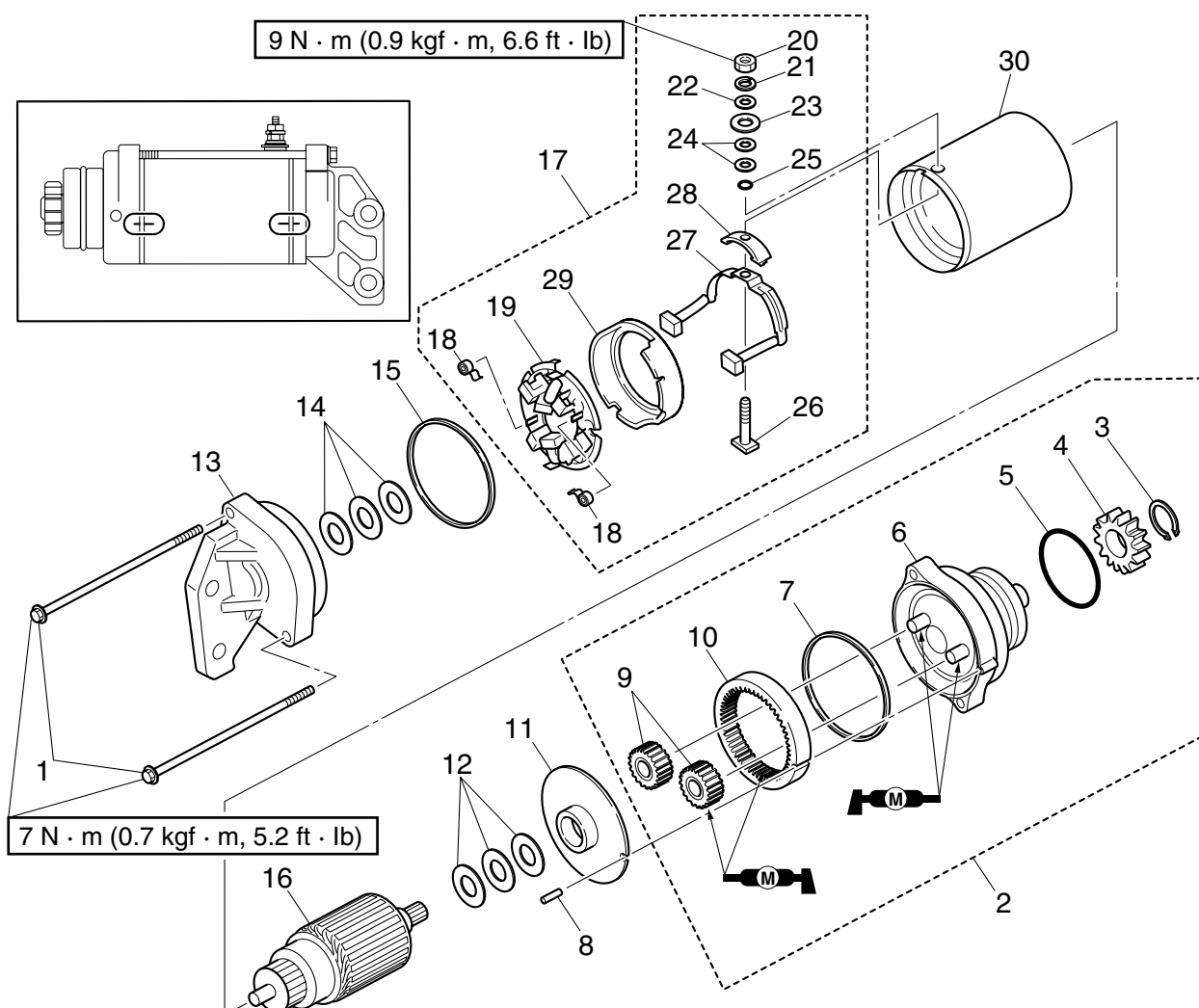


Step	Part name	Q'ty	Remarks
1	Bolt	2	M6 × 120 mm
2	Gear cover assembly	1	
3	Circlip	1	
4	Drive gear	1	
5	O-ring	1	Not reusable
6	Front cover	1	
7	Packing	1	Not reusable
8	Dowel pin	1	
9	Planetary gear	2	
10	Ring gear	1	
11	Bracket	1	

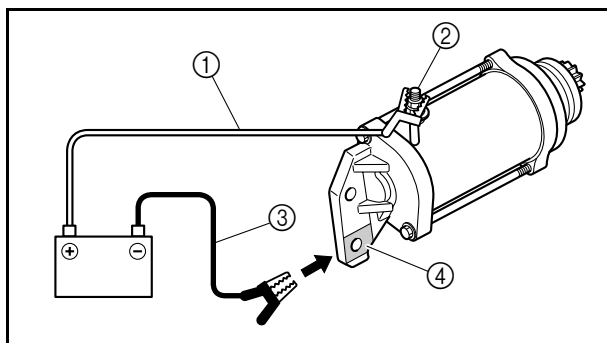
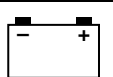


Step	Part name	Q'ty	Remarks
12	Shim	*	Not reusable
13	Rear cover	1	
14	Shim	*	
15	Packing	1	
16	Armature	1	
17	Brush holder assembly	1	
18	Brush spring	4	
19	Brush holder stay	1	
20	Nut	1	
21	Spring washer	1	
22	Washer	1	

*: As required.



Step	Part name	Q'ty	Remarks
23	Insulator washer 1	1	Not reusable
24	Insulator washer 2	2	
25	O-ring	1	
26	Terminal bolt	1	
27	Lead plate	1	
28	Terminal insulator	1	
29	Plate cover	1	
30	Starter motor yoke	1	



Starter motor operation

1. Check:

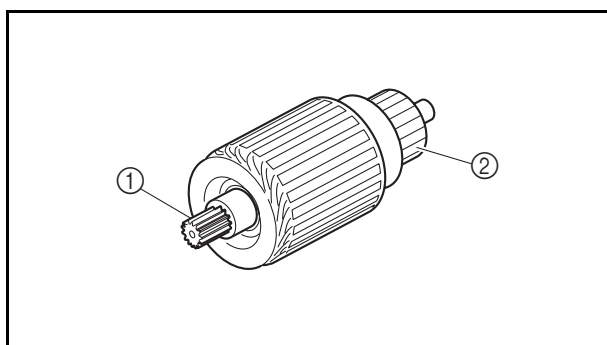
- Starter motor operation
Does not operate → Check the starter motor.

Checking steps:

- Hold the starter motor in a vise using aluminum plates on both sides.
- Connect the positive battery cable ① to the starter motor terminal bolt ②.
- Connect the negative battery cable ③ to the starter motor body ④.
- Check the starter motor operation.

TIP

- Check the starter motor operation for a few seconds.
- If the starter motor is disassembled, make sure to check the operation again after assembling it.



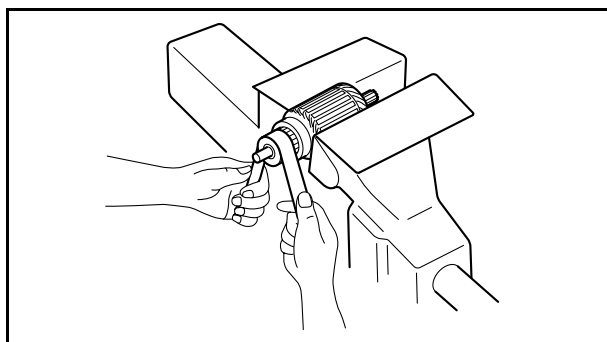
Armature

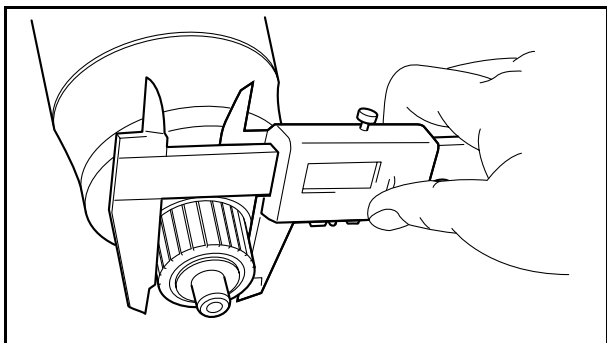
1. Check:

- Armature shaft ①
Damage/wear → Replace the armature.
- Commutator ②
Dirt → Clean with 600-grit sandpaper.

TIP

Remove all metal particles with compressed air.

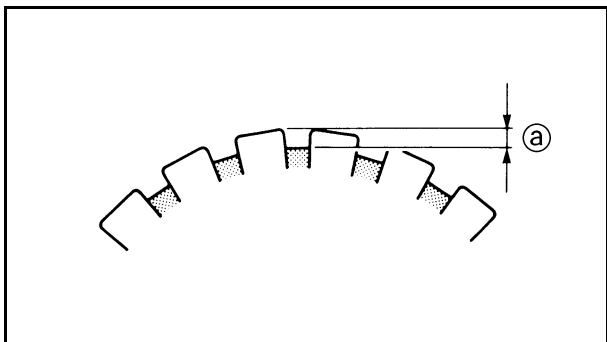


**2. Measure:**

- Commutator diameter
Out of specification → Replace the armature.



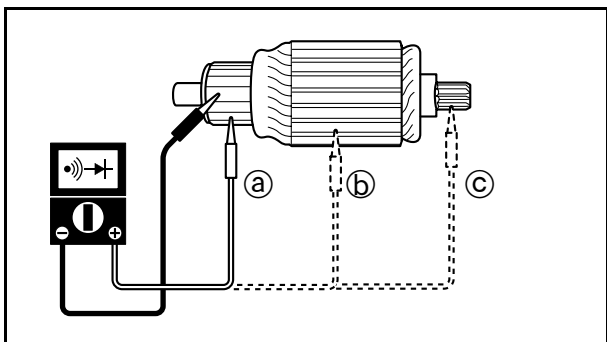
Commutator diameter:
27.0–28.0 mm (1.06–1.10 in)

**3. Measure:**

- Commutator undercut ①
Out of specification → Replace the armature.



Commutator undercut ①
(reference data):
0.2–0.7 mm (0.008–0.028 in)

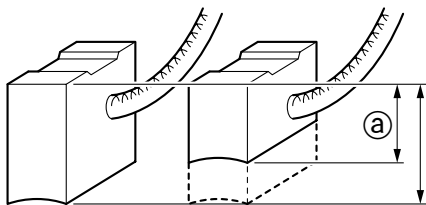
**4. Check:**

- Armature coil continuity
Out of specification → Replace the armature.



Armature coil continuity:

Commutator segments ①	Continuity
Segment ① – Armature core ②	No continuity
Segment ① – Armature shaft ③	No continuity



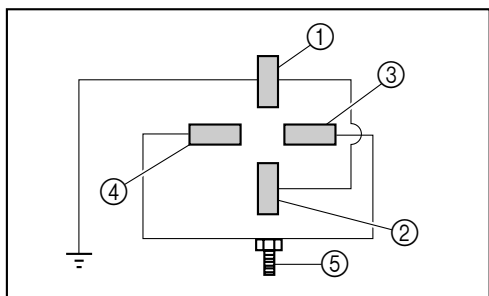
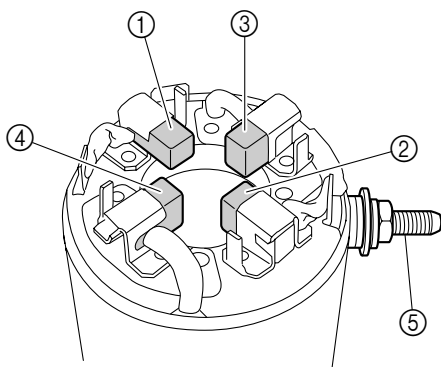
Brush holder

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)



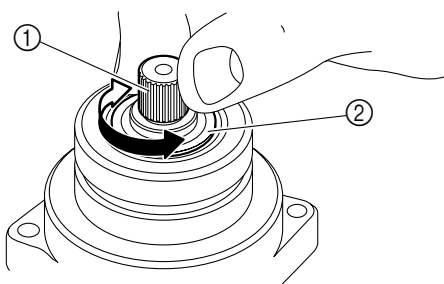
2. Check:

- 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



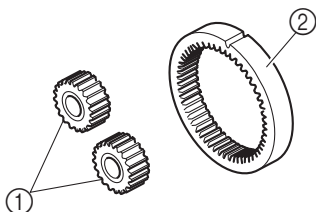
Gear cover

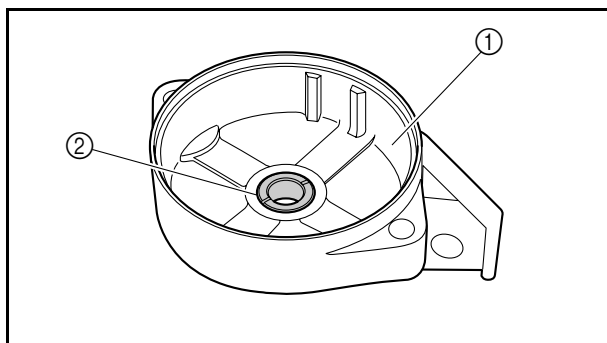
1. Check:

- 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.

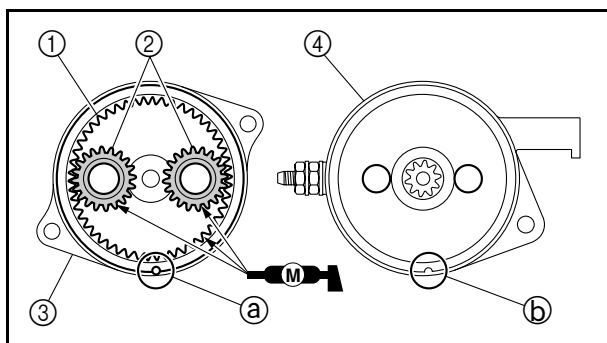




Rear cover

1. Check:

- Rear cover ①
 - Metal ②
- Cracks/damage → Replace the rear cover assembly.



Starter motor assembly

1. Install:

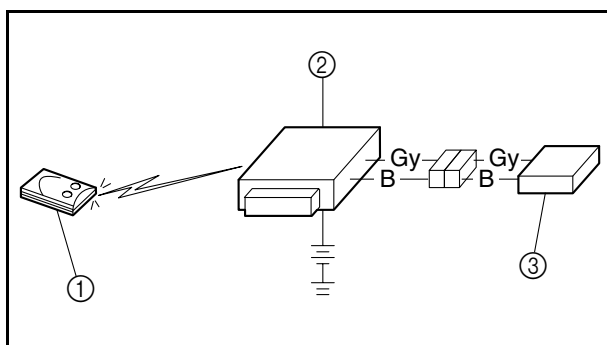
- Gear cover assembly

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.

TIP

Make sure that the notch ① in the ring gear is aligned with the projection ② on the starter motor yoke ④.



Remote control system

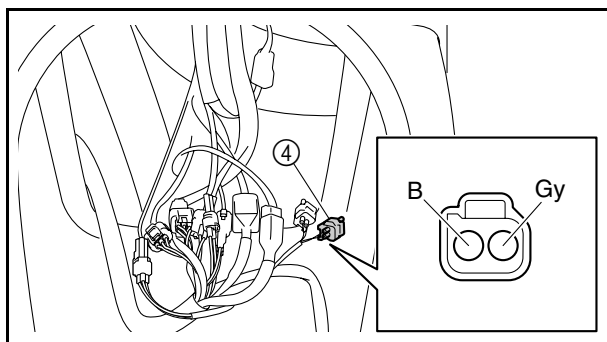
Transmitter registration

1. Register:

- ID code

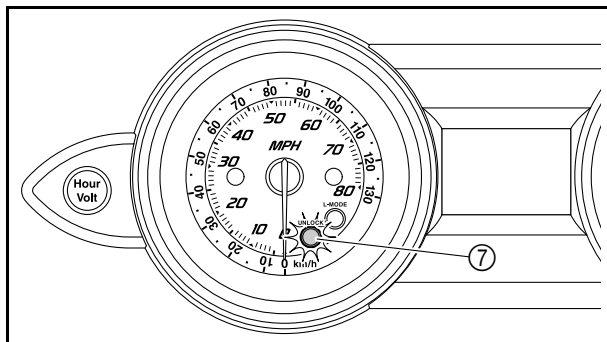
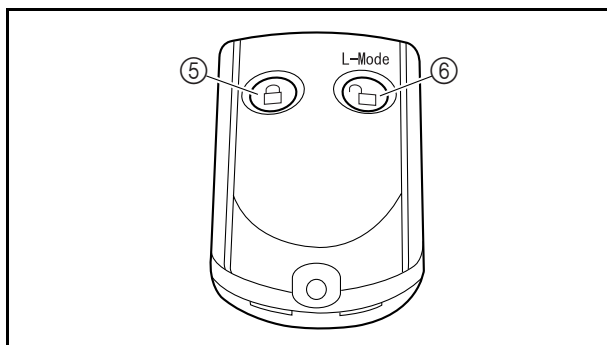
TIP

- 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.



2. Push the lock button (5) or unlock button (6) to transmit the ID code from the remote control transmitter to be registered.

TIP

- 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.)

3. After confirming that the registration of the ID code has been completed using the “UNLOCK” indicator light (7), transmit the next ID code.

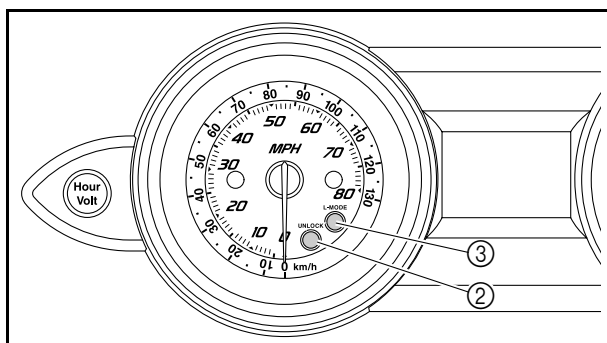
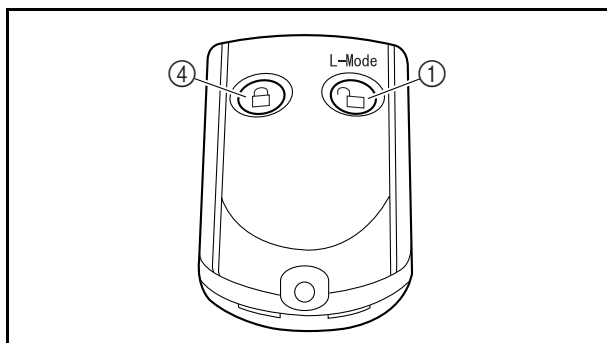
TIP

- 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.

4. 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.

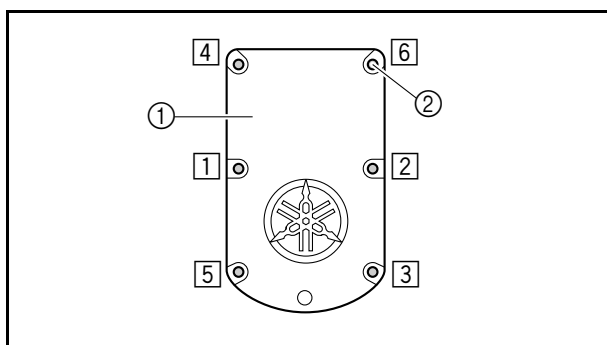
**Checking steps:**

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.

TIP

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:**

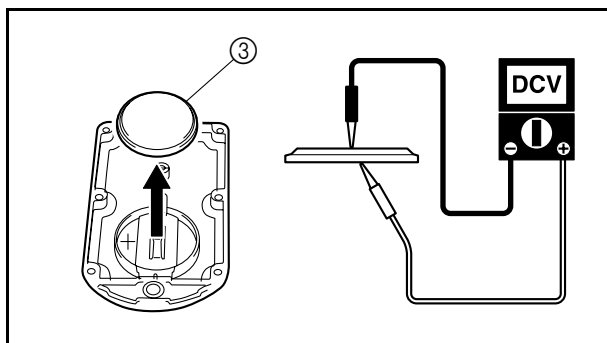
- Remote control transmitter battery voltage
Below specification → Replace the remote control transmitter battery.

Measurement steps:

1. Remove the transmitter cover ①.

TIP

Loosen the transmitter cover screws ② in the sequence shown.



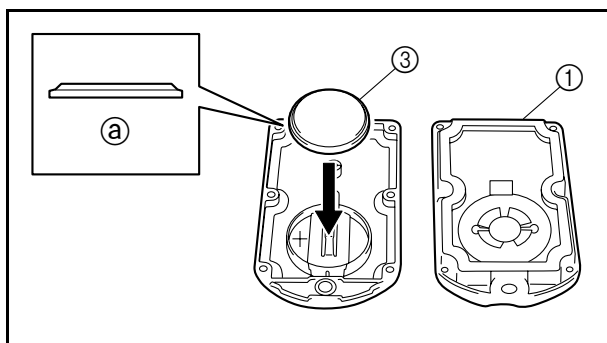
2. Remove the battery ③.
3. Measure the battery voltage.

NOTICE

- 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.

TIP

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 ①.

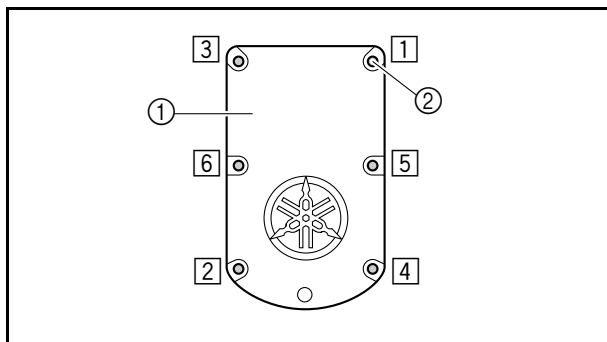
TIP

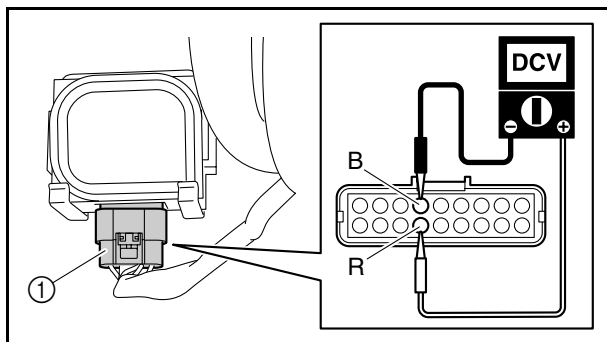
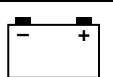
Install the battery (CR2016) ③ with the positive side (a) facing down.

5. Tighten the transmitter cover screws ② in the sequence shown.



Transmitter cover screw:
0.1 N·m (0.01 kgf·m, 0.1 ft·lb)





Remote control receiver

1. Measure:

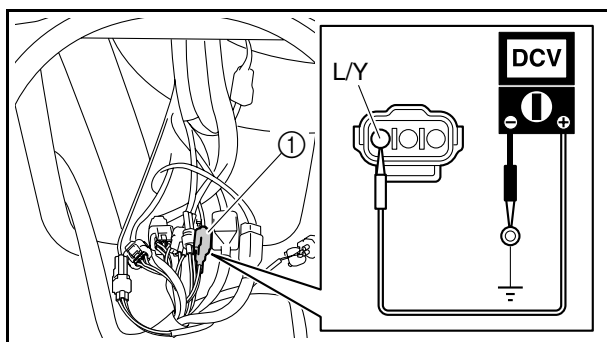
- Remote control receiver input voltage
Out of specification → Check the wiring harness.

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:

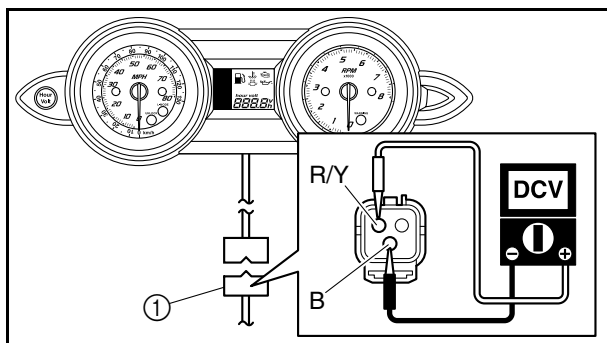
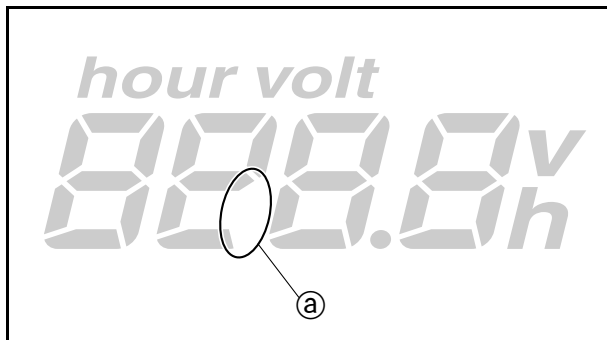
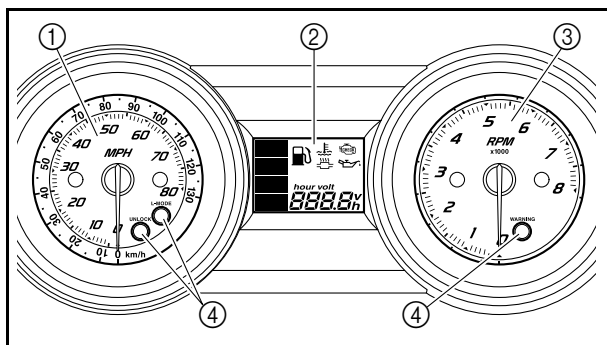
- Remote control receiver output voltage
Out of specification → Replace the remote control receiver.

Measurement steps:

- Disconnect the dual analog meter unit coupler ① from the remote control receiver.
- Push the unlock button, and then measure the remote control receiver output voltage at the dual analog meter unit 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

Dual analog meter unit

1. Check:

- Dual analog meter unit external appearance

Cracked meter housing/meter is fogged/
shows signs of water intrusion →
Replace the dual analog meter unit.

2. Check:

- Information display
Intermittent or missing segment (a) →
Replace the dual analog meter unit.
No display → Measure the dual analog
meter unit input voltage.

TIP

- Push the unlock button, and then check that all indicator lights and display elements on the dual analog meter unit light up.

① Speedometer

② Information display

③ Tachometer

④ Indicator lights

- When pushing the unlock button, the speedometer and tachometer make 1 sweep, all displays light up for 2 seconds, and then it starts to operate normally.

3. Measure:

- Dual analog meter unit input voltage
Within specification → Replace the dual
analog meter unit.
Out of specification → Check the wiring
harness.

Measurement steps:

1. Disconnect the dual analog meter unit coupler ①.
2. Push the unlock button, and then measure the input voltage at the dual analog meter unit coupler terminals (wiring harness end).



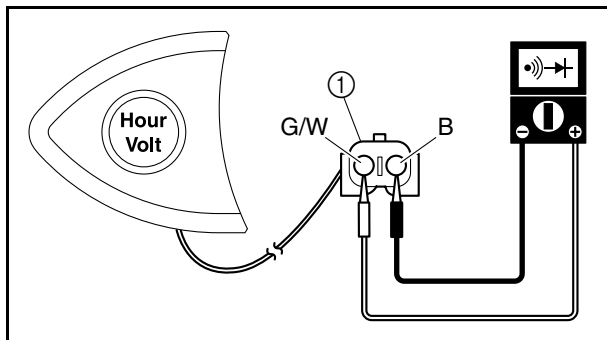
Dual analog meter unit input voltage:
Red/yellow (R/Y) – Black (B)
12 V (battery voltage)



Switch assembly

1. Check:

- Switch assembly continuity
Out of specification → Replace the switch assembly.



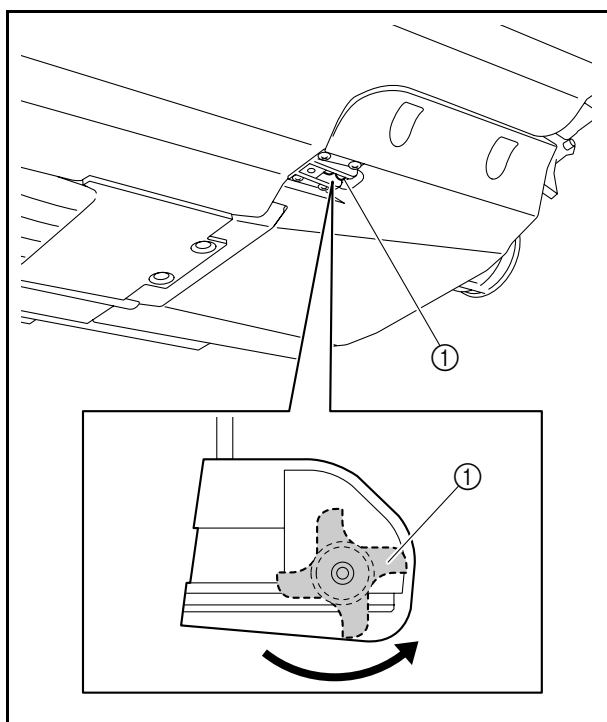
Checking steps:

- Disconnect the switch assembly coupler ①.
Refer to “Dual analog meter unit and cover removal” in Chapter 8.
- Check the switch assembly continuity.



Switch assembly continuity:

Button	Position	Green/white (G/W)–Black (B)
“Hour Volt” button	Free	No continuity
	Pushed	Continuity



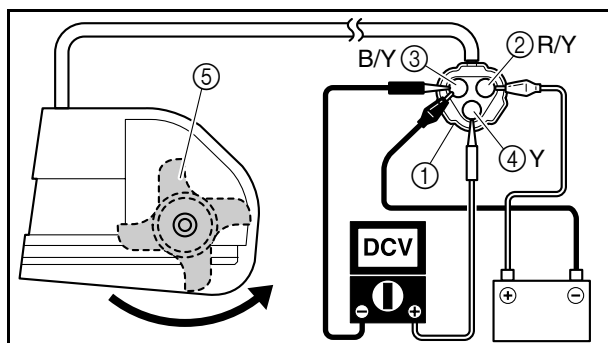
Speed sensor

1. Check:

- Speed sensor paddle wheel ①
Cracks/damage/rough movement → Replace the speed sensor.

**2. Measure:**

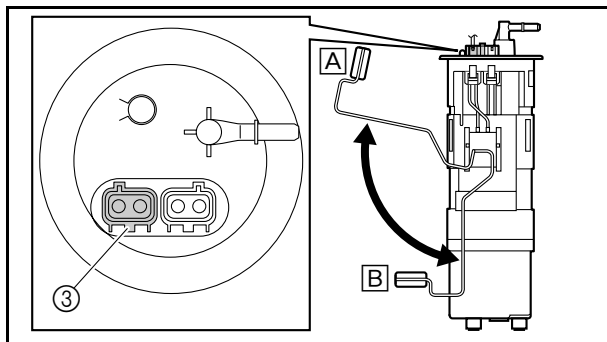
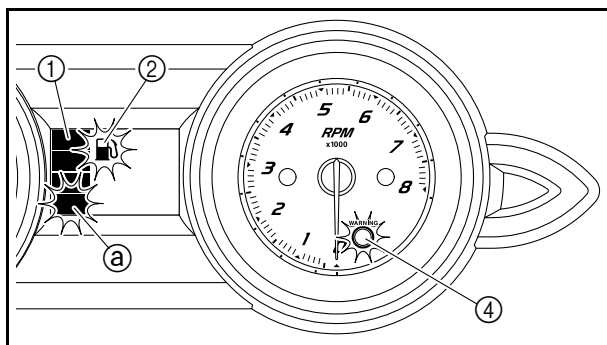
- Speed sensor output voltage
Out of specification → Replace the speed sensor.

**Measurement steps:**

1. Disconnect the speed sensor coupler ①.
Refer to “Dual analog meter unit and cover 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



Fuel level meter display and fuel indicator

1. Check:

- Fuel level meter display ① and fuel indicator ②

Do not come on → Replace the dual analog meter unit.

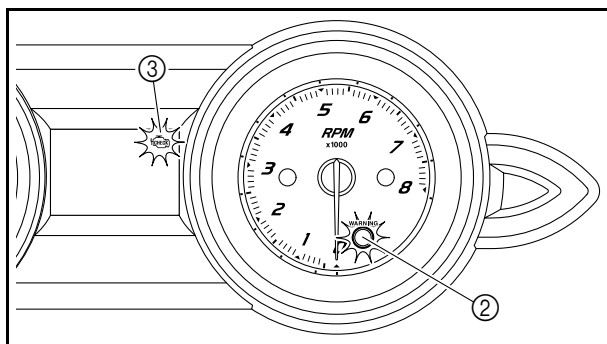
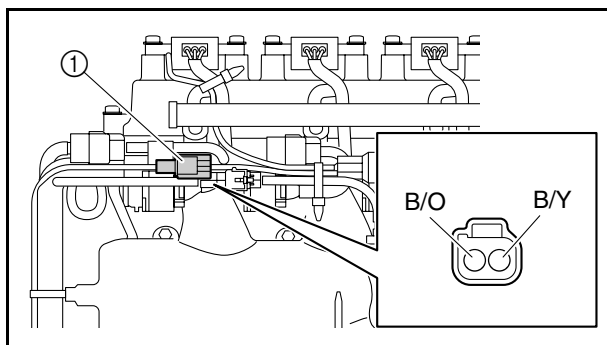
Checking steps:

- 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 indicator ②, the lowest fuel level segment a, and the “WARNING” indicator light ④ blink.

Check engine warning indicator

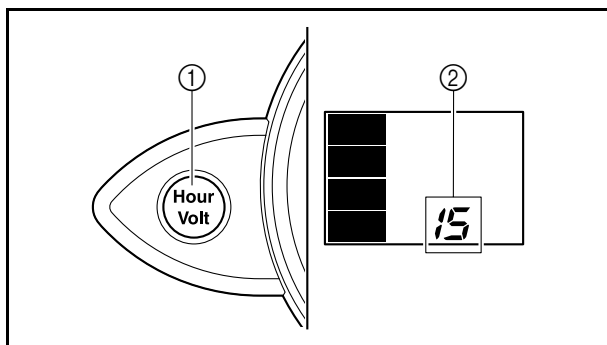
1. Check:

- 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 dual analog meter unit.



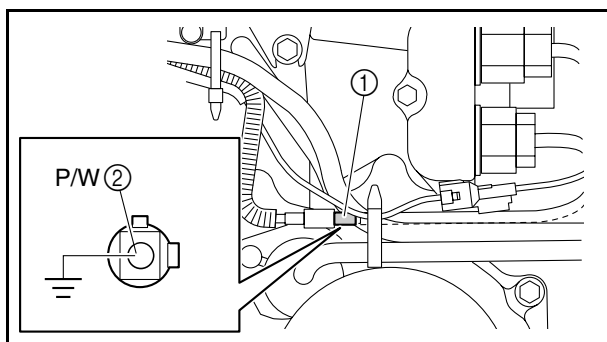
Diagnostic display

1. Check:

- Diagnostic display
Does not come on → Check the “Diagnosis record” of the YDIS.

Checking steps:

- Create a condition so that a diagnostic code is recorded.
- Push the unlock button.
- Push the “Hour Volt” button ① for approximately 8 seconds and check that the diagnostic code ② is indicated.
- 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 dual analog meter unit.



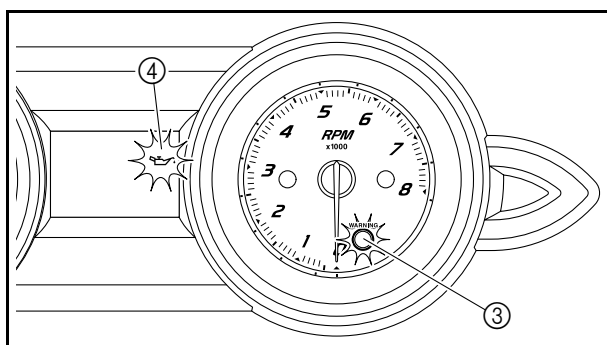
Oil pressure warning indicator

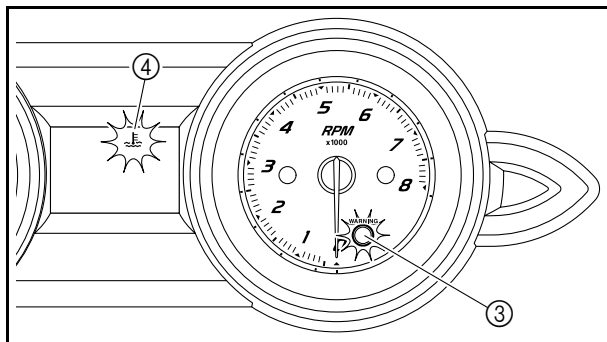
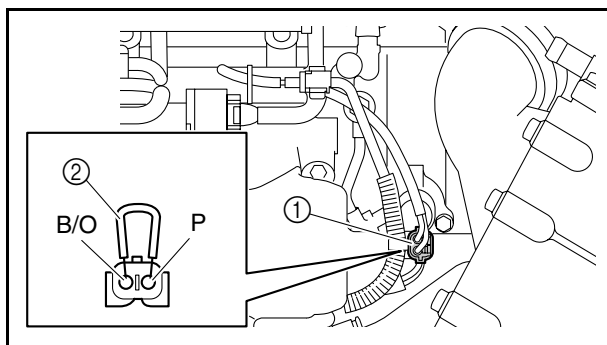
1. Check:

- Oil pressure warning indicator
Does not come on → Check the “Diagnosis record” of the YDIS.

Checking steps:

- Disconnect the oil pressure switch coupler ①, and then ground the terminal ②.
- Start the engine.
- Increase the engine speed to 4,500 r/min or more.
- Check that the “WARNING” indicator light ③ and the oil pressure warning indicator ④ blink, and the buzzer sounds intermittently.
- 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 dual analog meter unit.





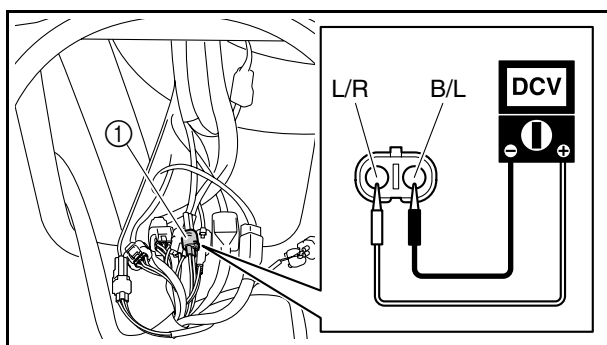
Engine overheat warning indicator

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 dual analog meter unit.



Buzzer

1. Measure:

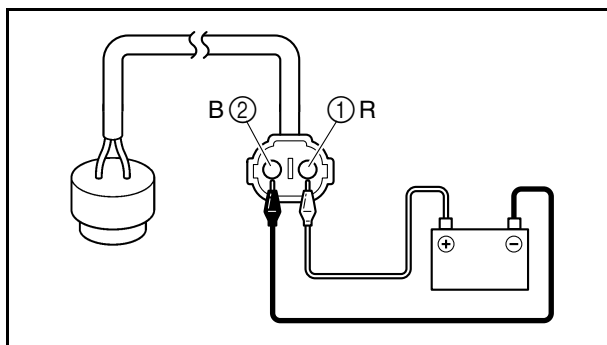
- Buzzer input voltage
Out of specification → Check the wiring harness.

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.

Chapter 8

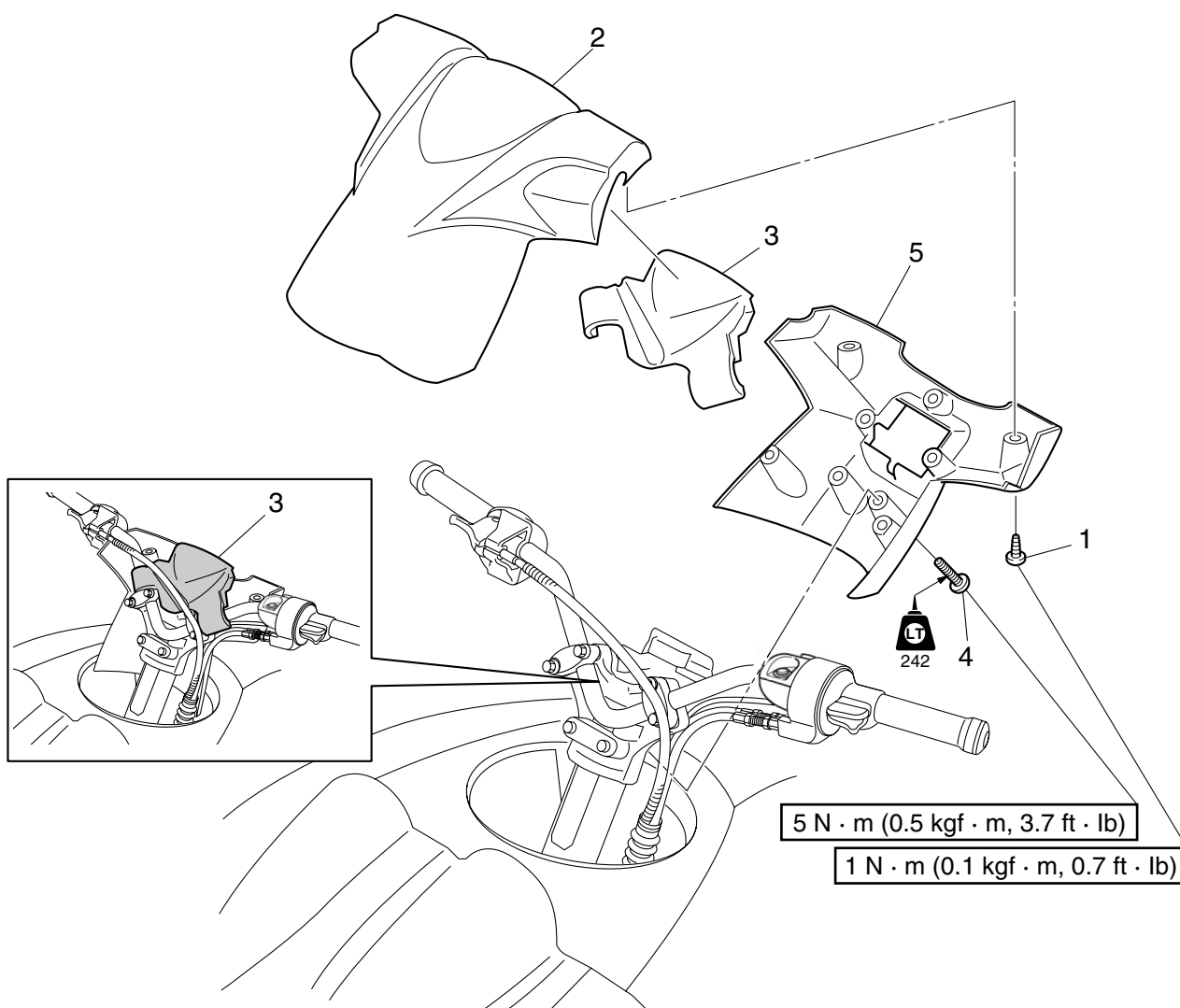
Hull and hood

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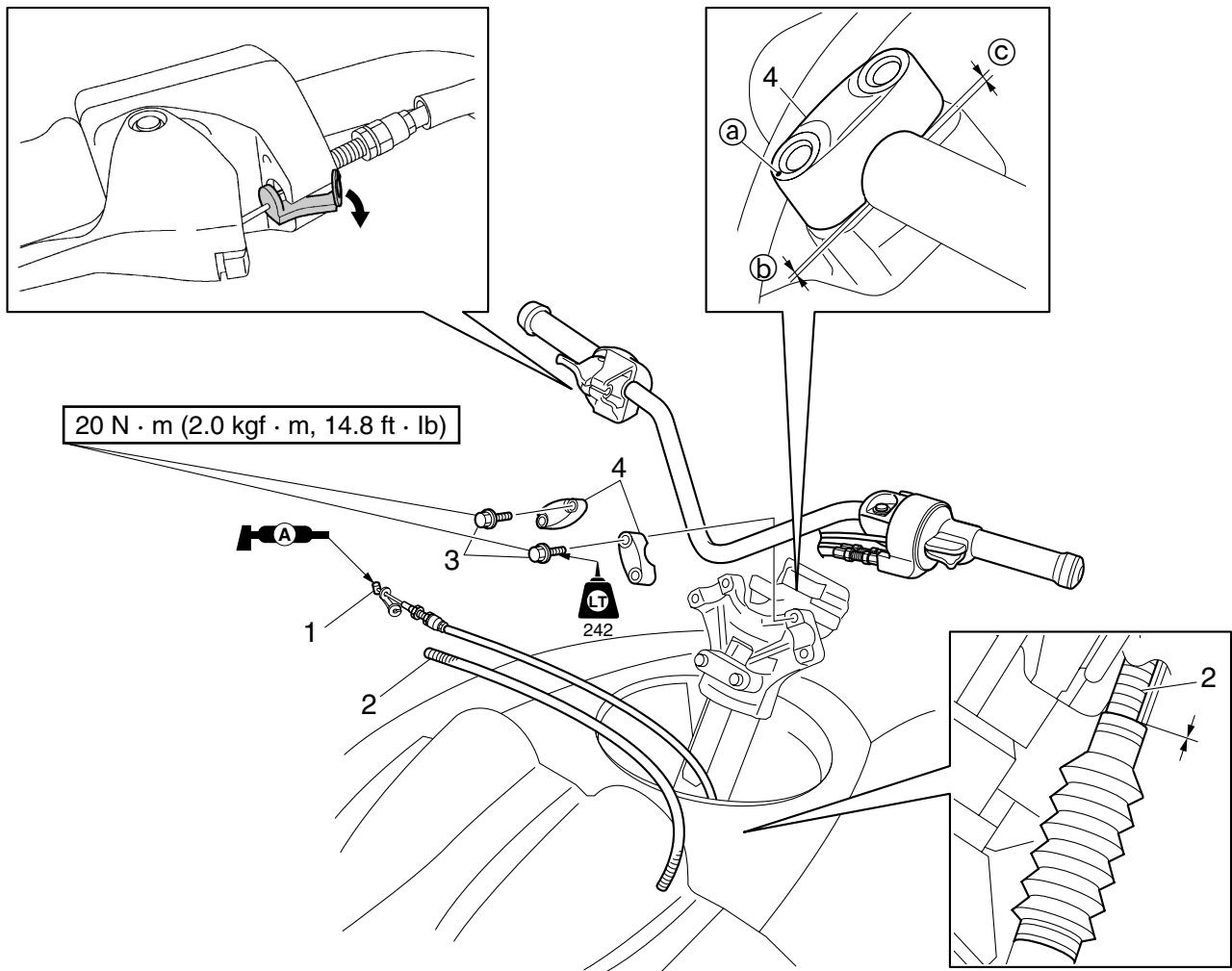
Handlebar

Handlebar cover removal

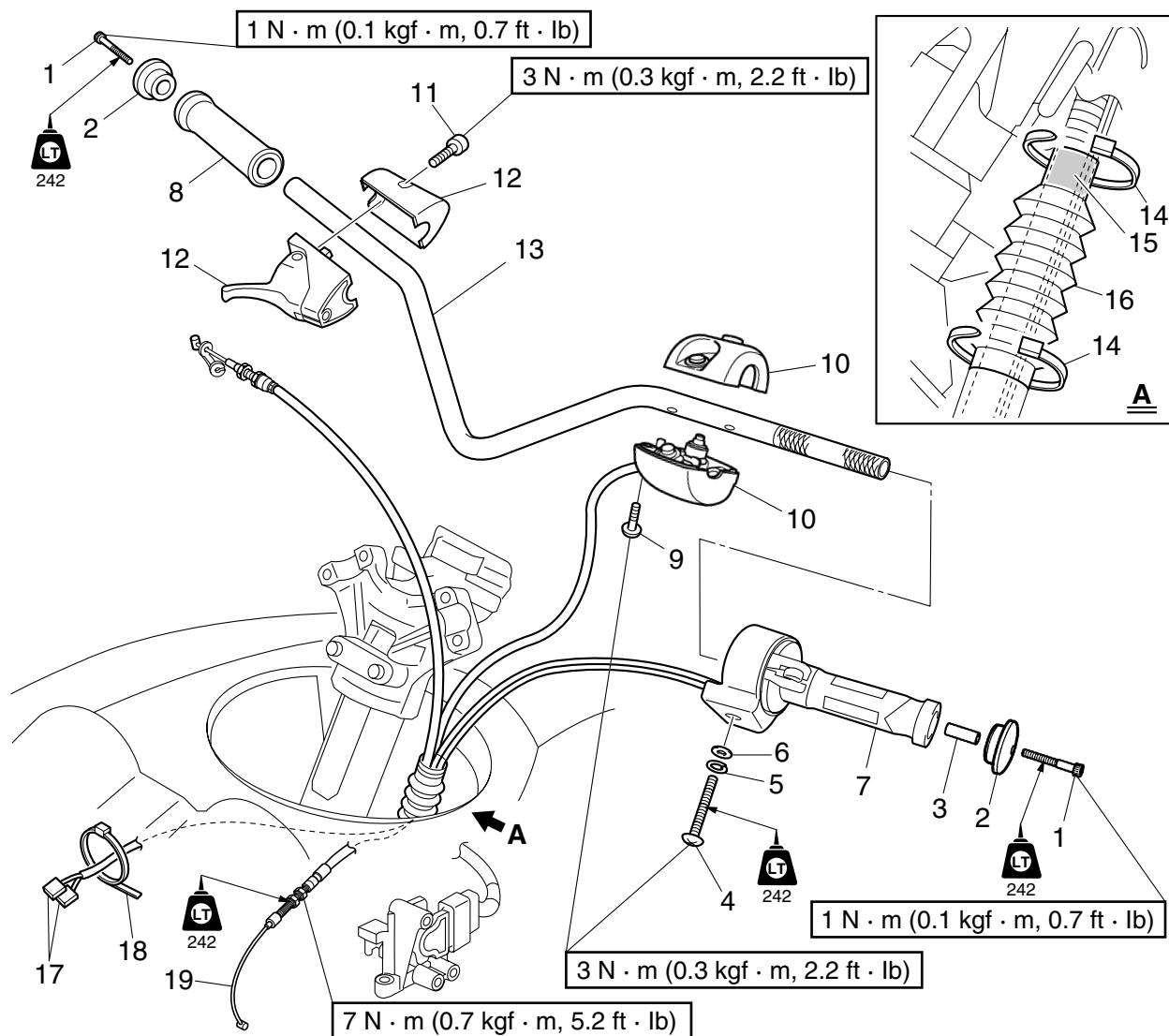


Step	Part name	Q'ty	Remarks
1	Screw	5	ø5 × 15 mm
2	Upper handlebar cover	1	
3	Steering pad	1	
4	Screw	4	ø6 × 14 mm
5	Lower handlebar cover	1	

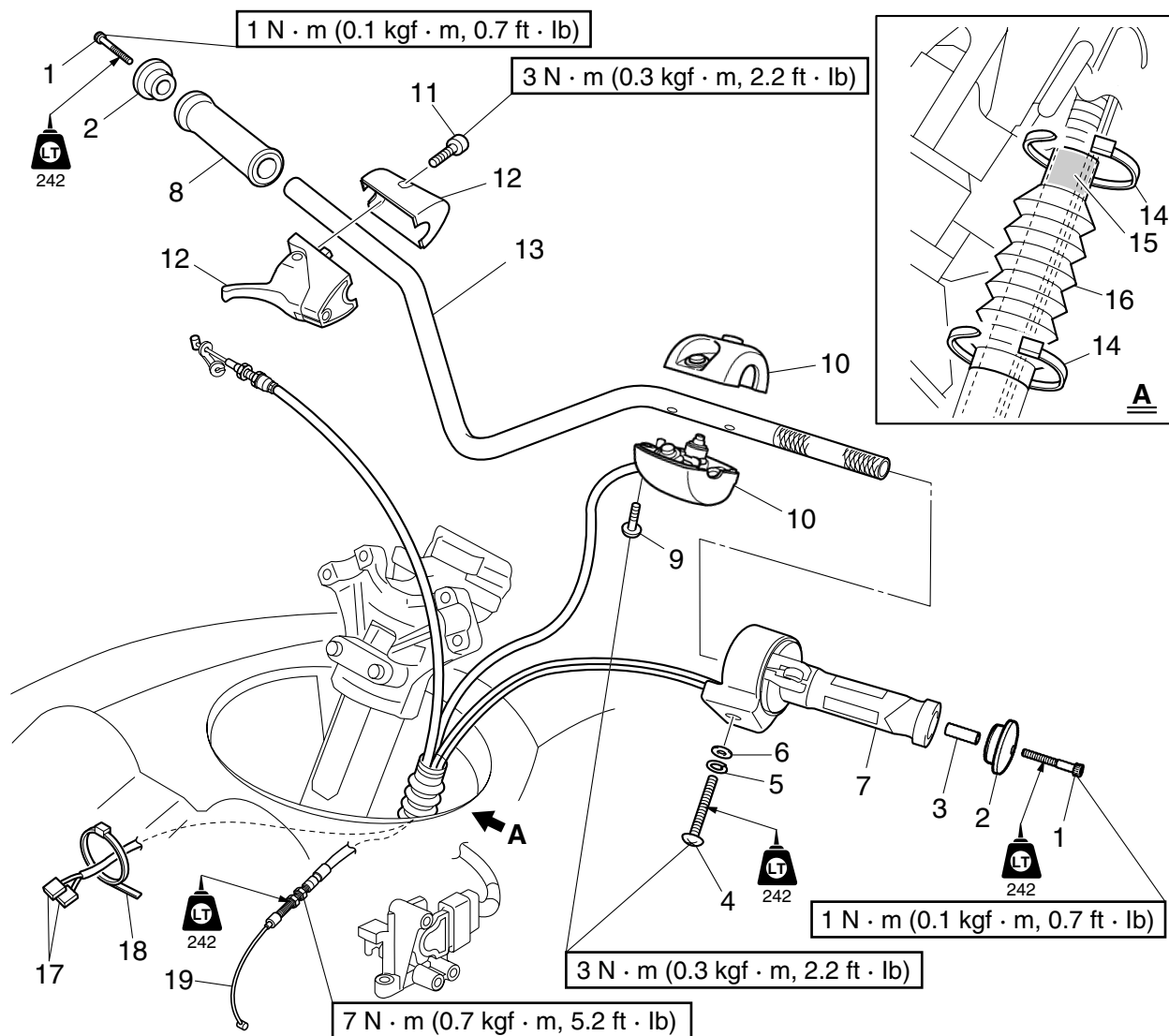
Handlebar holder removal



Step	Part name	Q'ty	Remarks
1	Throttle cable	1	
2	Corrugated tube	1	
3	Bolt	4	M8 × 48 mm
4	Upper handlebar holder	2	(a) Punch mark (b) 0.4 mm (0.02 in) (c) 2.4 mm (0.09 in)

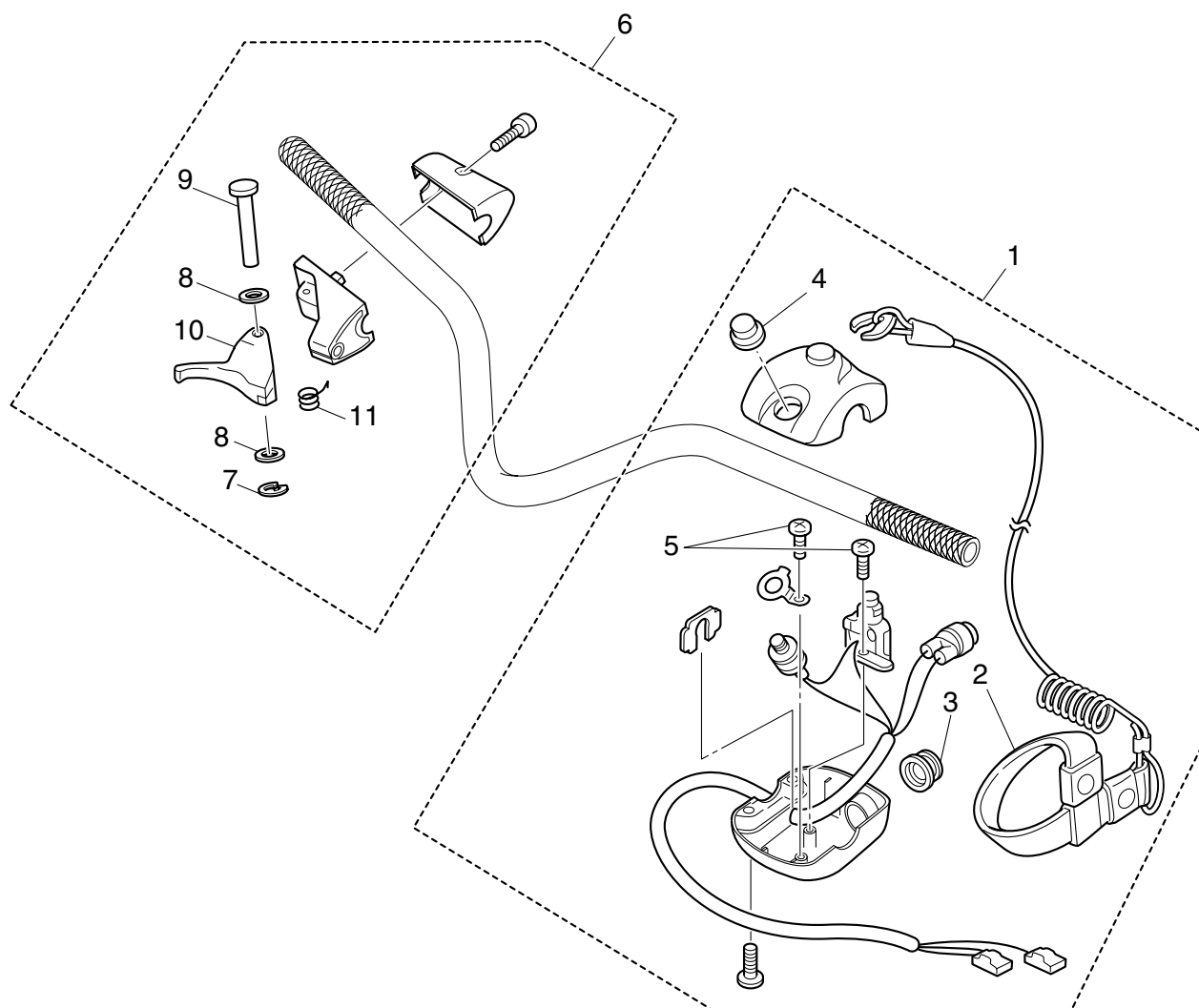
Handlebar assembly removal


Step	Part name	Q'ty	Remarks
1	Bolt	2	M5 × 35 mm
2	Grip end	2	
3	Spacer	1	
4	Screw	1	ø6 × 70 mm
5	Spring washer	1	
6	Washer	1	
7	QSTS grip assembly	1	
8	Right handlebar grip	1	
9	Screw	2	ø5 × 25 mm

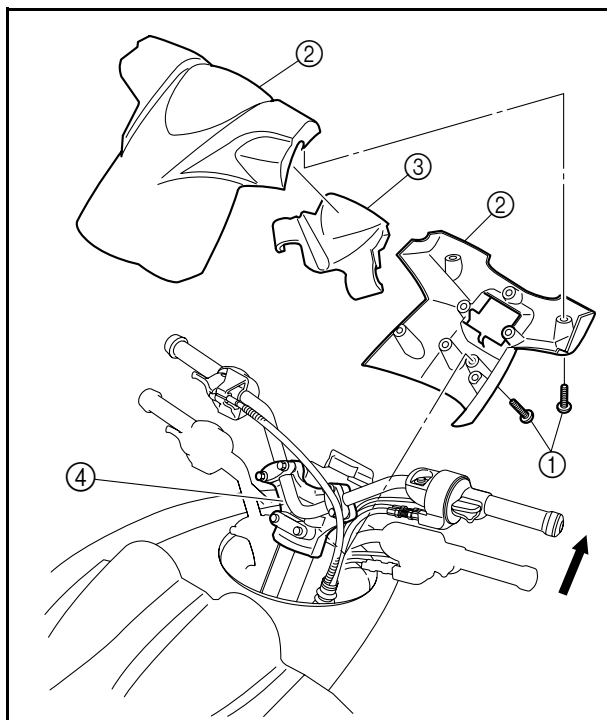


Step	Part name	Q'ty	Remarks
10	Left handlebar switch assembly	1	M5 × 25 mm Not reusable
11	Bolt	2	
12	Throttle lever assembly	1	
13	Handlebar	1	
14	Plastic tie	2	
15	Packing	1	
16	Boot	1	
17	Left handlebar switch coupler	2	
18	Plastic tie	1	
19	Throttle cable	1	

Left handlebar switch disassembly



Step	Part name	Q'ty	Remarks
1	Left handlebar switch assembly	1	ø3 × 8 mm
2	Engine shut-off cord	1	
3	Stop button assembly	1	
4	Start button assembly	1	
5	Screw	2	
6	Throttle lever assembly	1	
7	E-ring	1	
8	Washer	2	
9	Shaft	1	
10	Lever	1	
11	Spring	1	



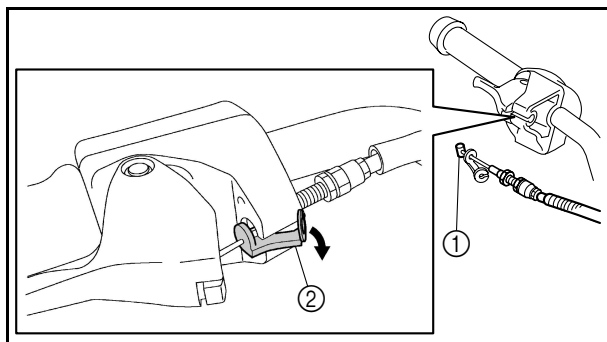
Handlebar cover removal

1. Remove:

- Handlebar cover screws ①
- Handlebar covers ②
- Steering pad ③

TIP

Move the handlebar ④ to the highest position.



Throttle cable removal

1. Remove:

- Throttle cable ①

NOTICE

Make sure to remove the throttle cable seal ② as shown.

Handlebar check

1. Check:

- Handlebar
Bends/cracks/damage → Replace the handlebar.

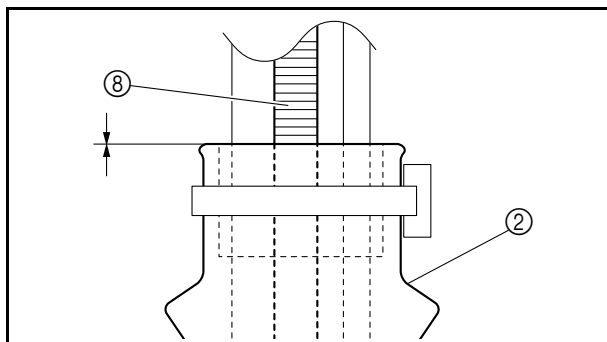
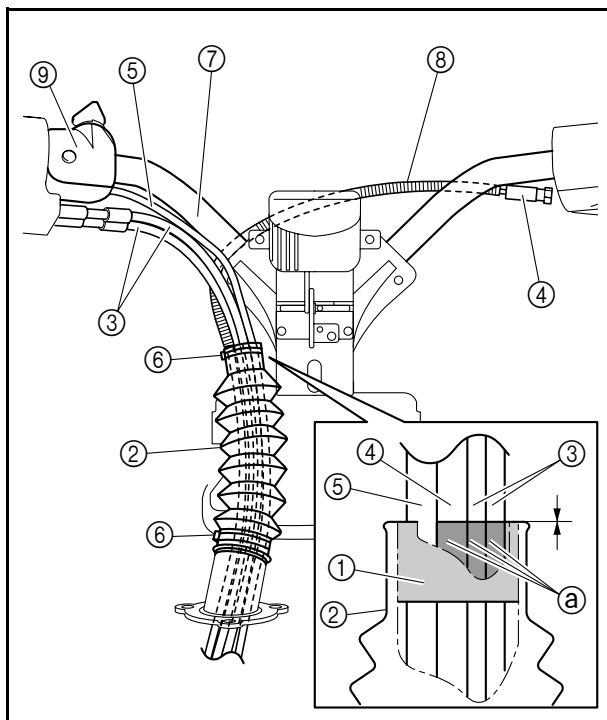
Left handlebar switch assembly check

1. Check:

- Left handlebar switch assembly
Cracks/damage → Replace the left handlebar switch assembly.

TIP

To check the operation and continuity of the left handlebar switch assembly, refer to “Left handlebar switch assembly” in Chapter 7.



Handlebar assembly installation

1. Install:

- Packing ①
- Grommet ②
- QSTS cables ③
- Throttle cable ④
- Left handlebar switch lead ⑤
- Plastic ties ⑥
- Handlebar ⑦
- Corrugated tube (throttle cable) ⑧
- Left handlebar switch assembly ⑨

Installation steps:

1. Wrap the packing ① around the QSTS cables ③, throttle cable ④ and left handlebar switch lead ⑤.

TIP

Make sure to align the upper edge of the packing with the upper edge of the white tape ③ on the cables.

2. Install the packing ① into the grommet ②.

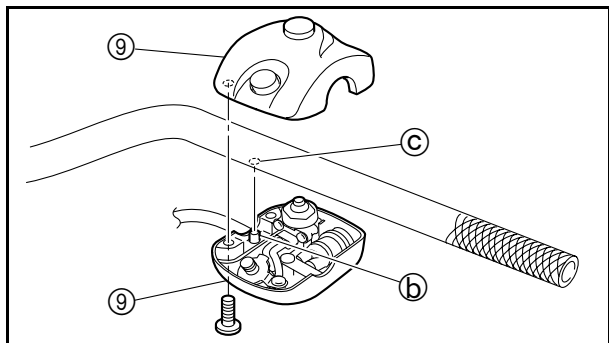
TIP

Make sure to align the upper edge of the packing with the upper edge of the grommet.

3. Fasten the end of the grommet with the plastic tie ⑥.

TIP

Position the corrugated tube ⑧ for the throttle cable so that the end of the tube makes contact with the grommet ② as shown.



- Install the left handlebar switch assembly 9.

TIP _____
Align the projection (b) on the handlebar switch assembly with the handlebar hole (c).



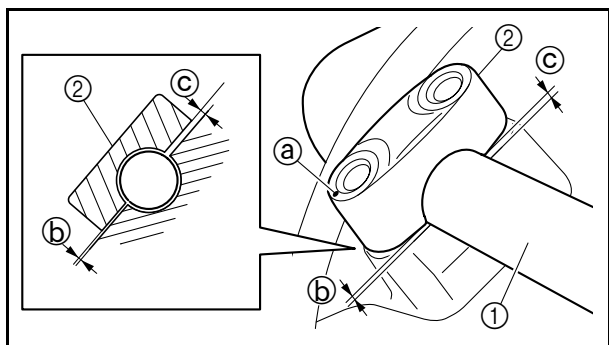
Left handlebar switch screw:
3 N·m (0.3 kgf·m, 2.2 ft·lb)

- Install the throttle lever assembly.

TIP _____
Tighten the upper bolt first when installing the throttle lever assembly.



Throttle lever assembly bolt:
3 N·m (0.3 kgf·m, 2.2 ft·lb)



2. Install:

- Handlebar 1
- Upper handlebar holders 2

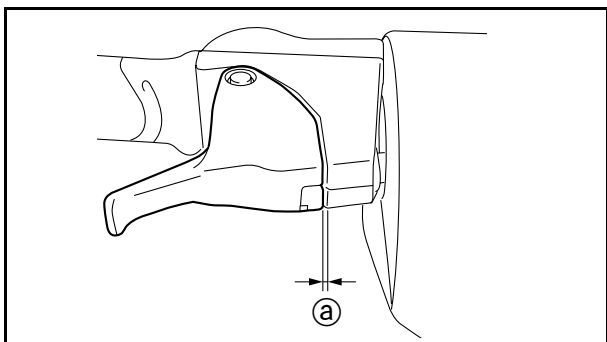
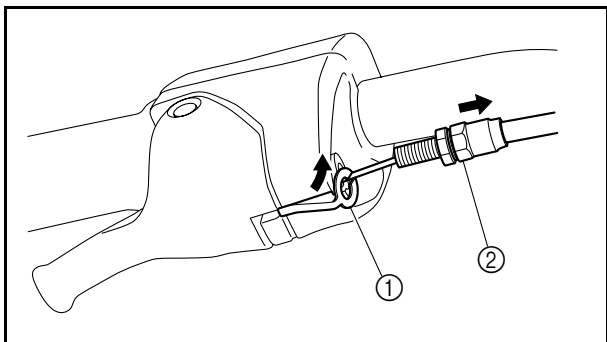
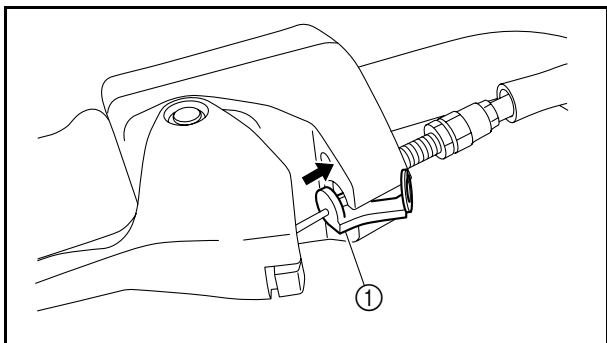
TIP _____
Install the upper handlebar holders 2 with the punch marks (a) facing down, making sure that clearance (b) is narrower than clearance (c).



Clearance (reference data):
(b): 0.4 mm (0.02 in)
(c): 2.4 mm (0.09 in)



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

**3. Install:**

- Throttle cable
- Right handlebar grip

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.

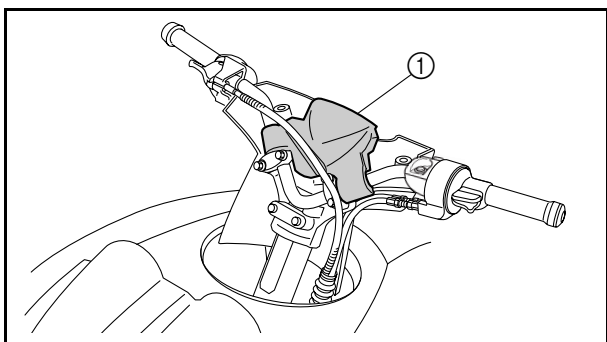
NOTICE

Make sure to adjust the free play with the handlebar bracket in the lowest position. Otherwise, the specified free play with the handlebar bracket in the highest position cannot be obtained.



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

5. Apply adhesive to the handlebar and the inner surface of the handlebar grip.
6. Install the right handlebar grip.

**Handlebar cover installation****1. Install:**

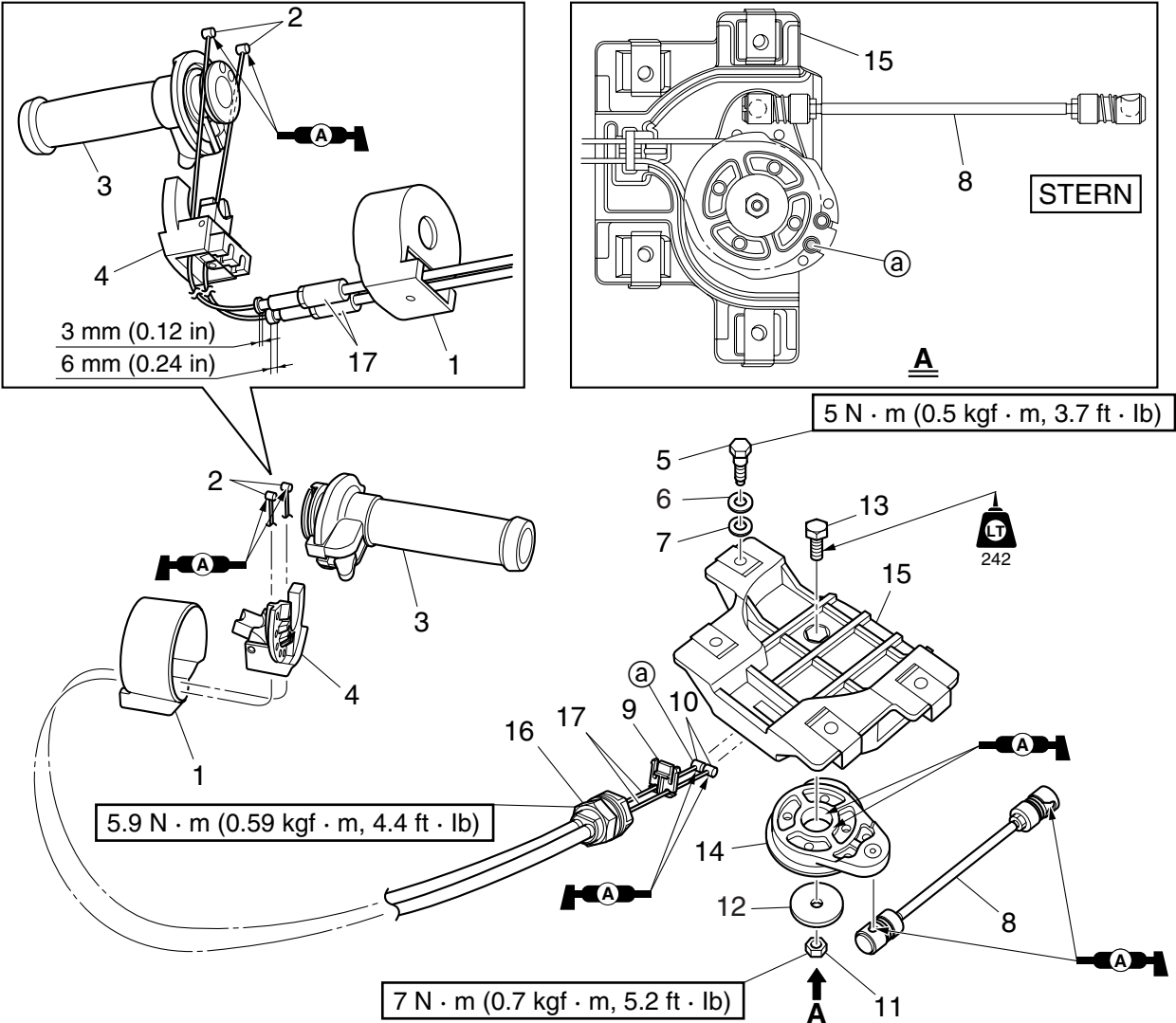
- Lower handlebar cover
- Steering pad (1)
- Upper handlebar cover

TIP

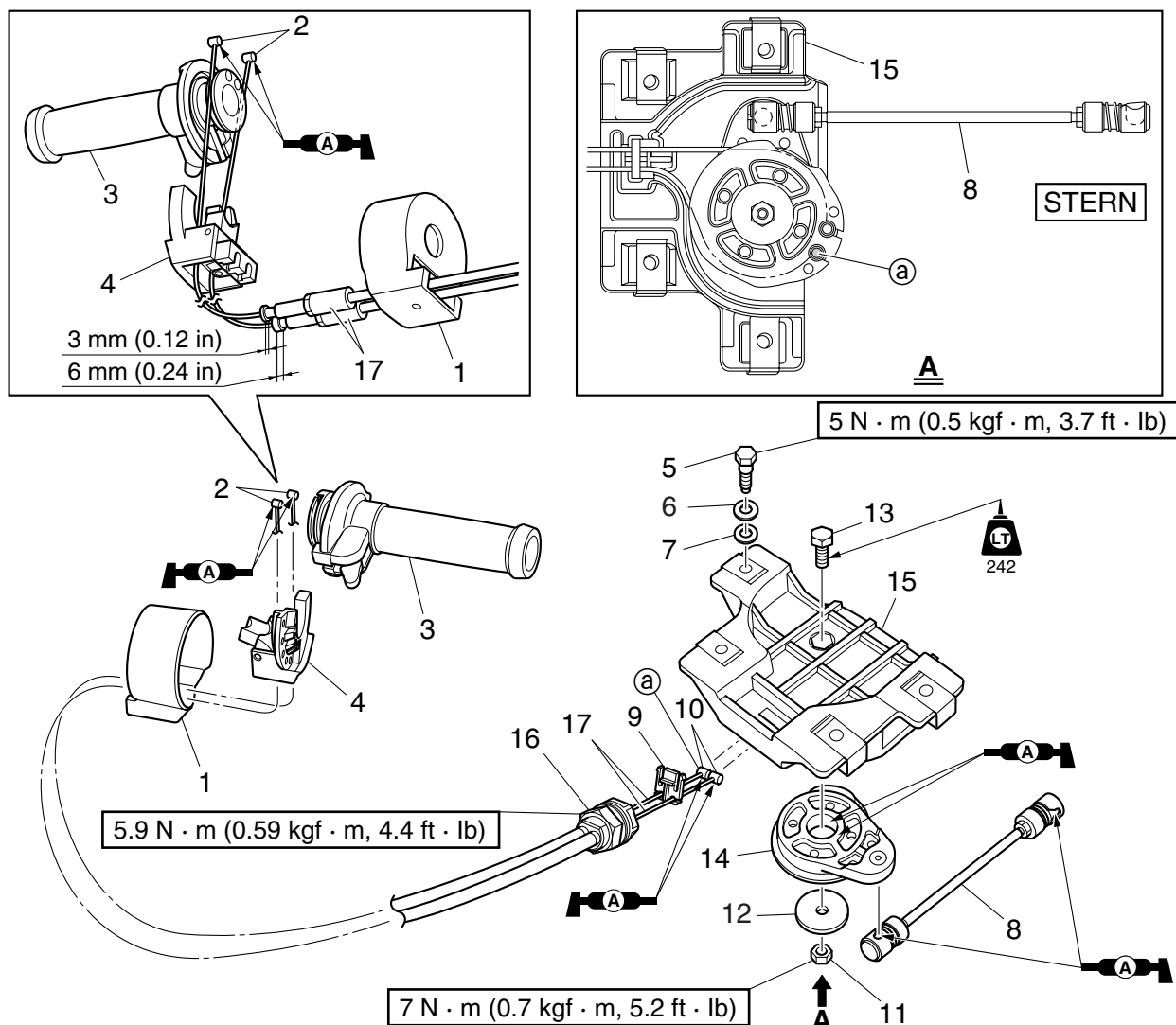
Fit the throttle cable into the groove in the steering pad.

QSTS grip and converter

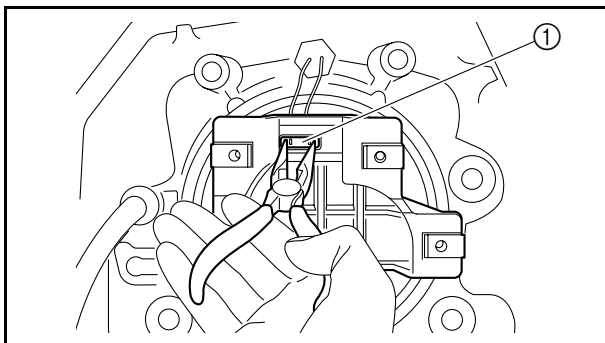
QSTS grip and converter disassembly



Step	Part name	Q'ty	Remarks
	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	4	M6 × 33 mm
6	Washer	4	
7	Washer	4	
8	QSTS rod	1	



Step	Part name	Q'ty	Remarks
9	Cable guide	1	(a) Yellow paint mark M6 × 14 mm
10	Cable end	2	
11	Nut	1	
12	Washer	1	
13	Bolt	1	
14	Pulley	1	
15	QSTS converter	1	
16	Nut	1	
17	QSTS cable	2	

**QSTS cable removal****1. Remove:**

- QSTS converter

2. Remove:

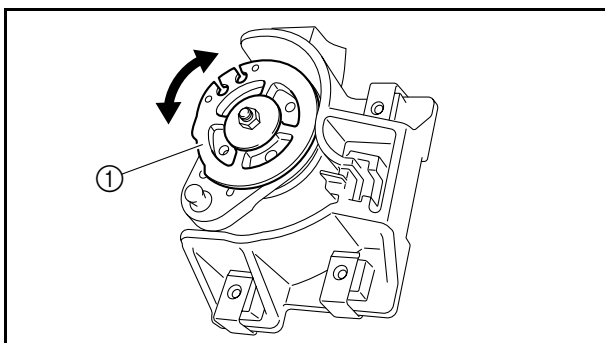
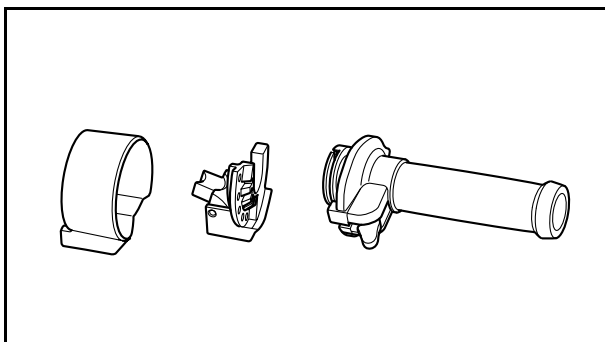
- Cable guide ①

TIP

Remove the cable guide ① with needlenose pliers as shown.

3. Remove:

- QSTS cable ends

**QSTS check****1. Check:**

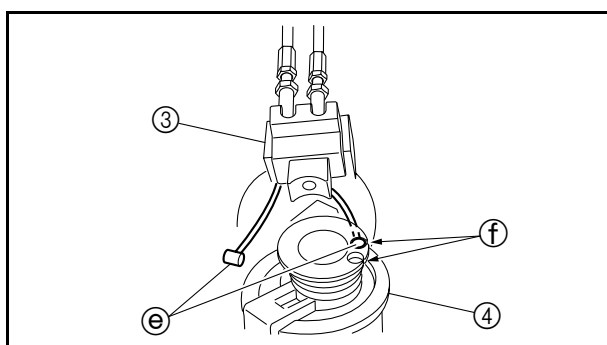
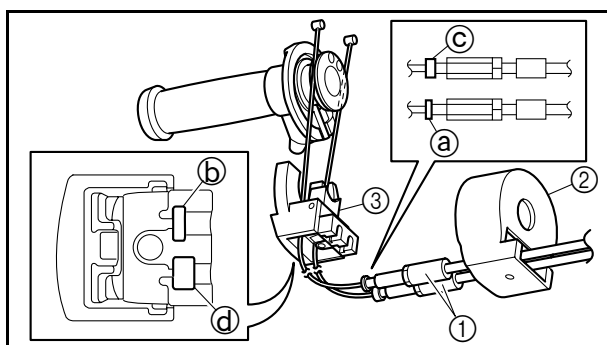
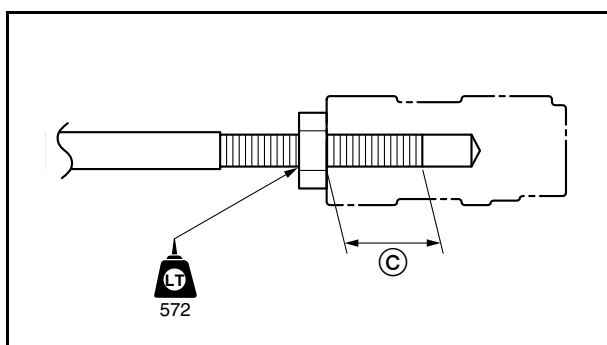
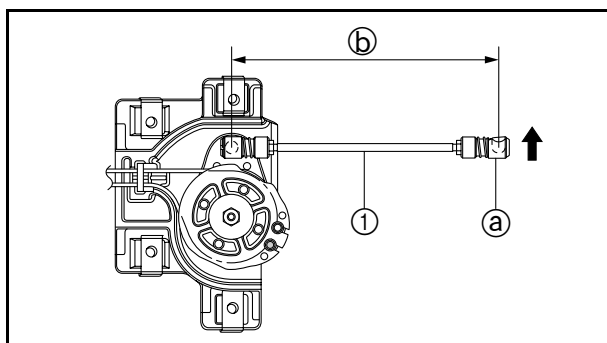
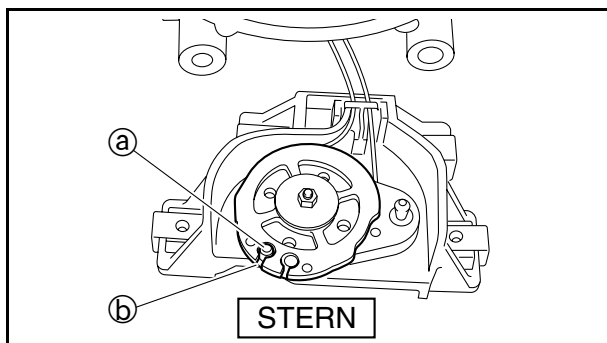
- QSTS grip
Cracks/damage/wear → Replace the QSTS grip.

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

NOTICE

- Make 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

TIP

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)

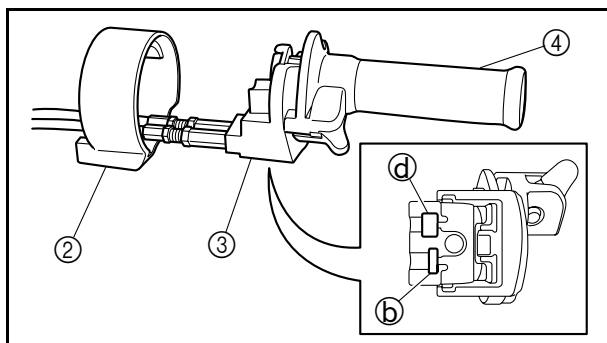
Installation steps:

1. Pass the QSTS cables ① through the cover ② and housing ③ as shown.

TIP

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.

TIP

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.

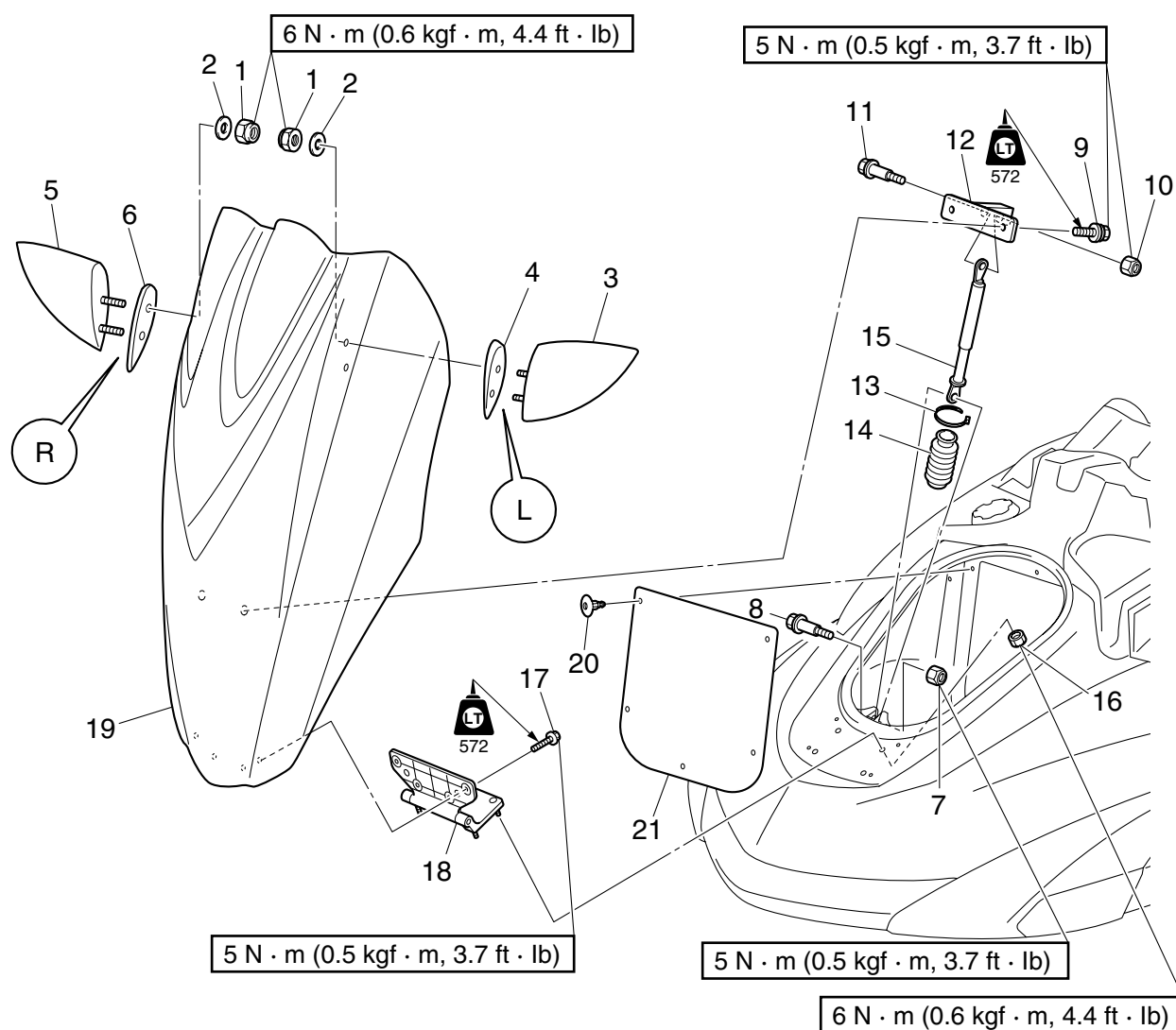
5. Fit the cover ② into the housing ③ and grip ④.

4. Check:

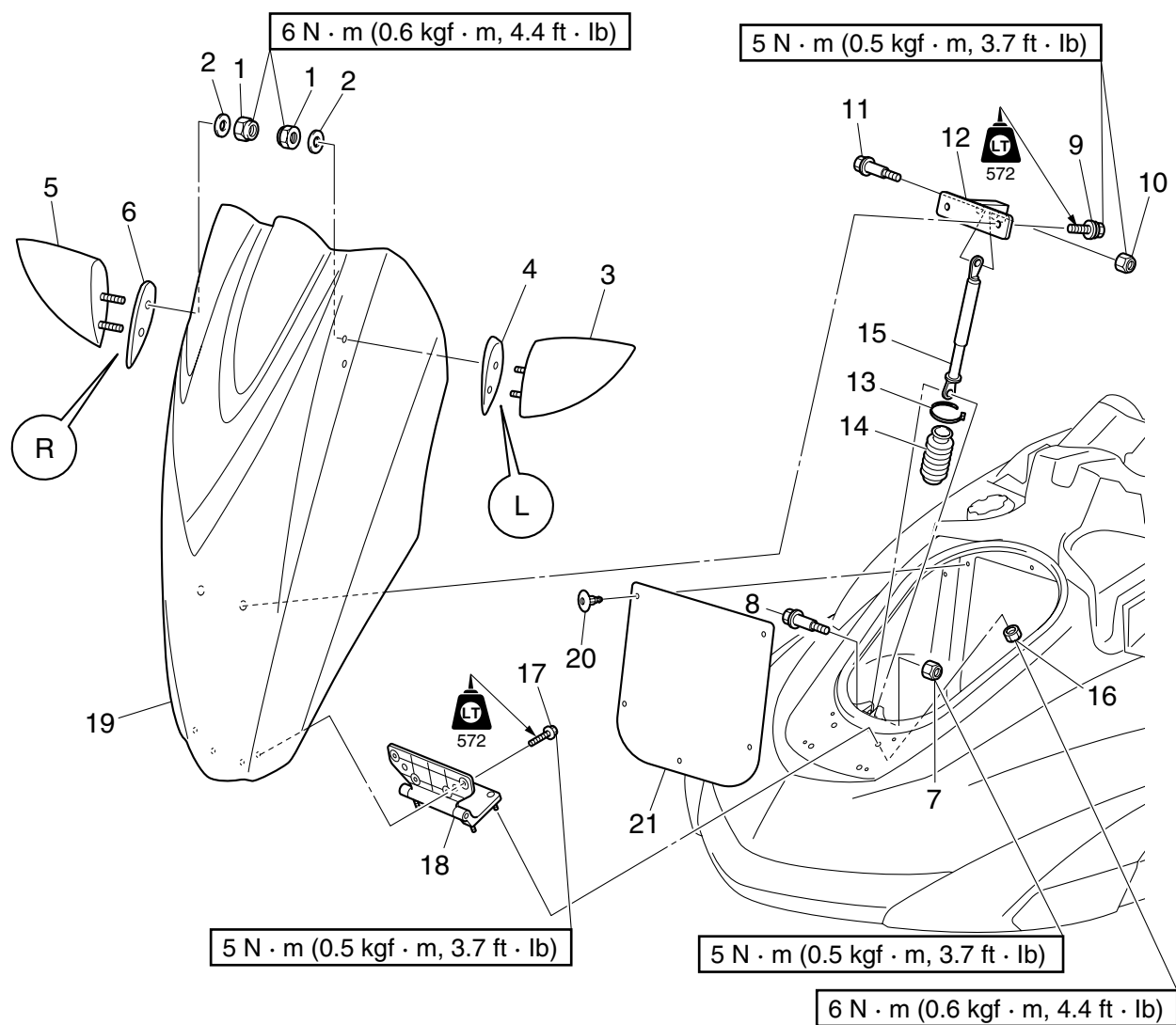
- QSTS nozzle angle
Refer to “Jet thrust nozzle steering angle check and adjustment” in Chapter 3.

Front hood

Front hood removal

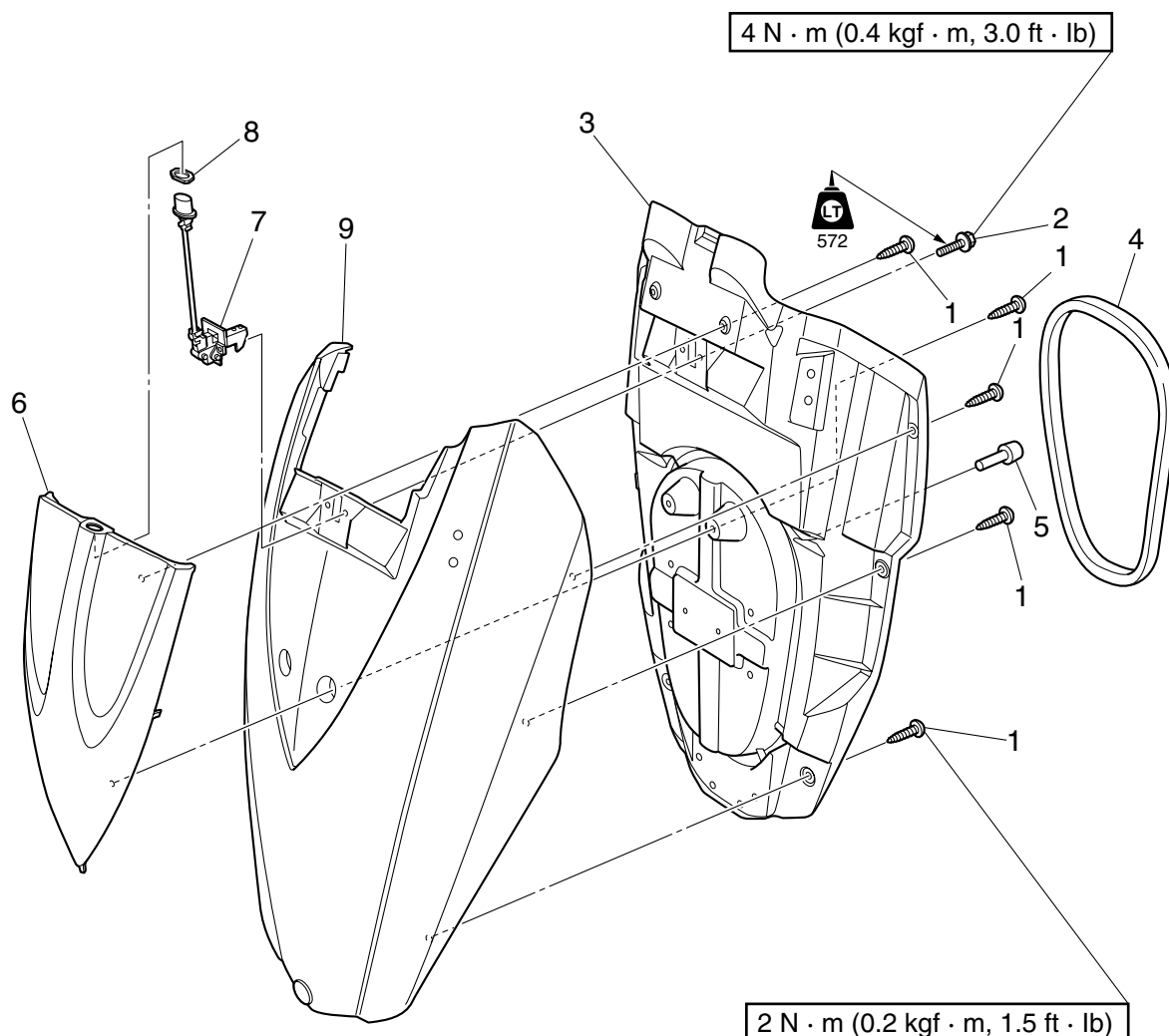


Step	Part name	Q'ty	Remarks
1	Nut	4	
2	Washer	4	
3	Left mirror	1	
4	Left mirror spacer	1	
5	Right mirror	1	
6	Right mirror spacer	1	
7	Nut	1	
8	Bolt	1	M6 × 10 mm
9	Bolt	2	M6 × 18 mm
10	Nut	1	
11	Bolt	1	M6 × 10 mm

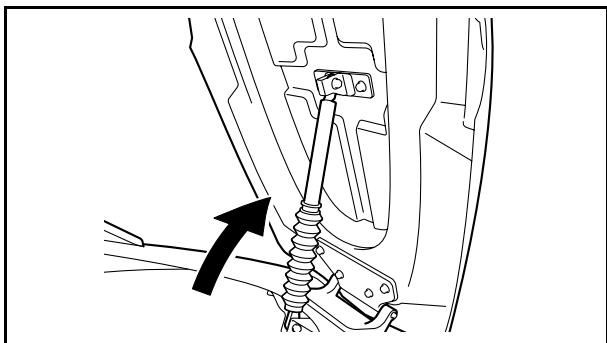


Step	Part name	Q'ty	Remarks
12	Damper stay	1	Not reusable M6 × 30 mm
13	Band	1	
14	Boot	1	
15	Damper	1	
16	Nut	4	
17	Bolt	4	
18	Hinge	1	
19	Front hood assembly	1	
20	Rivet	5	
21	Service lid	1	

Front hood disassembly



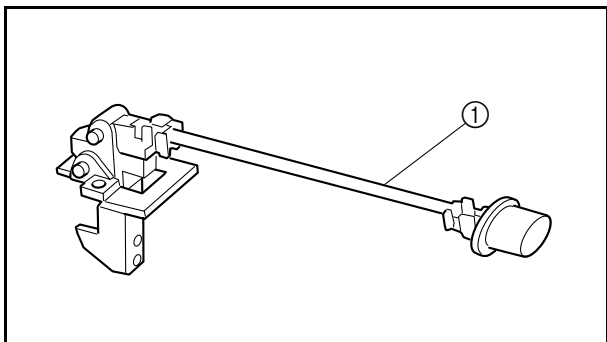
Step	Part name	Q'ty	Remarks
1	Screw	14	ø5 × 15 mm
2	Bolt	2	M5 × 20 mm
3	Ventilation cover	1	
4	Packing	1	Not reusable
5	Damper	2	Not reusable
6	Visor	1	
7	Hood lock	1	
8	Packing	1	
9	Front hood	1	



Damper check

1. Check:

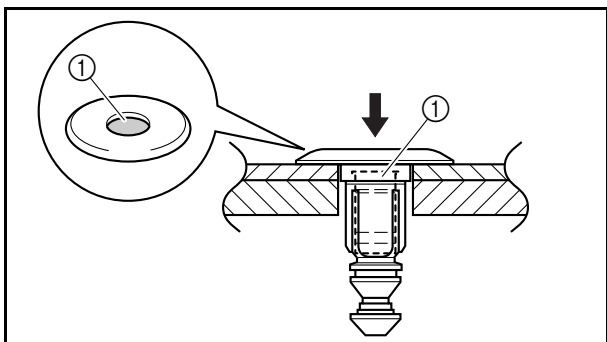
- Damper assembly
Does not hold front hood open →
Replace the damper assembly.



Hood lock check

1. Check:

- Hood lock ①
Does not lock → Check the hood lock
installation.
Cracks/damage → Replace the hood
lock.



Rivet removal

1. Remove:

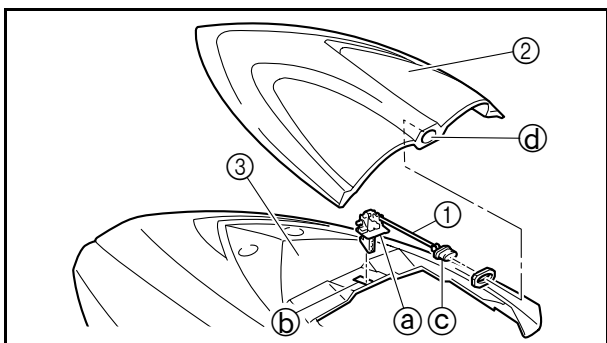
- Rivets

TIP

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.



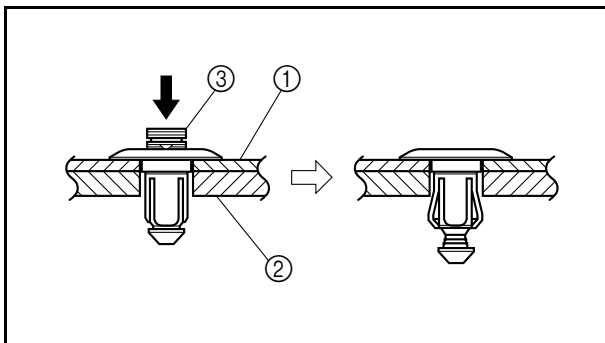
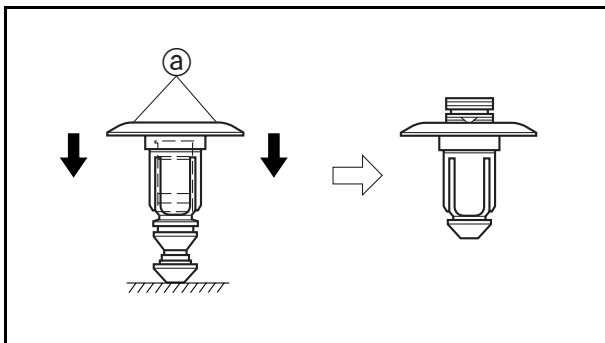
Front hood assembly

1. Install:

- Hood lock ①
- Visor ②

TIP

Fit the locking portion ① of the hood lock into the hole ② in the front hood ③ and fit the button ④ on the hood lock into the hole ⑤ in the visor.



Rivet installation

1. Install:

- Rivets

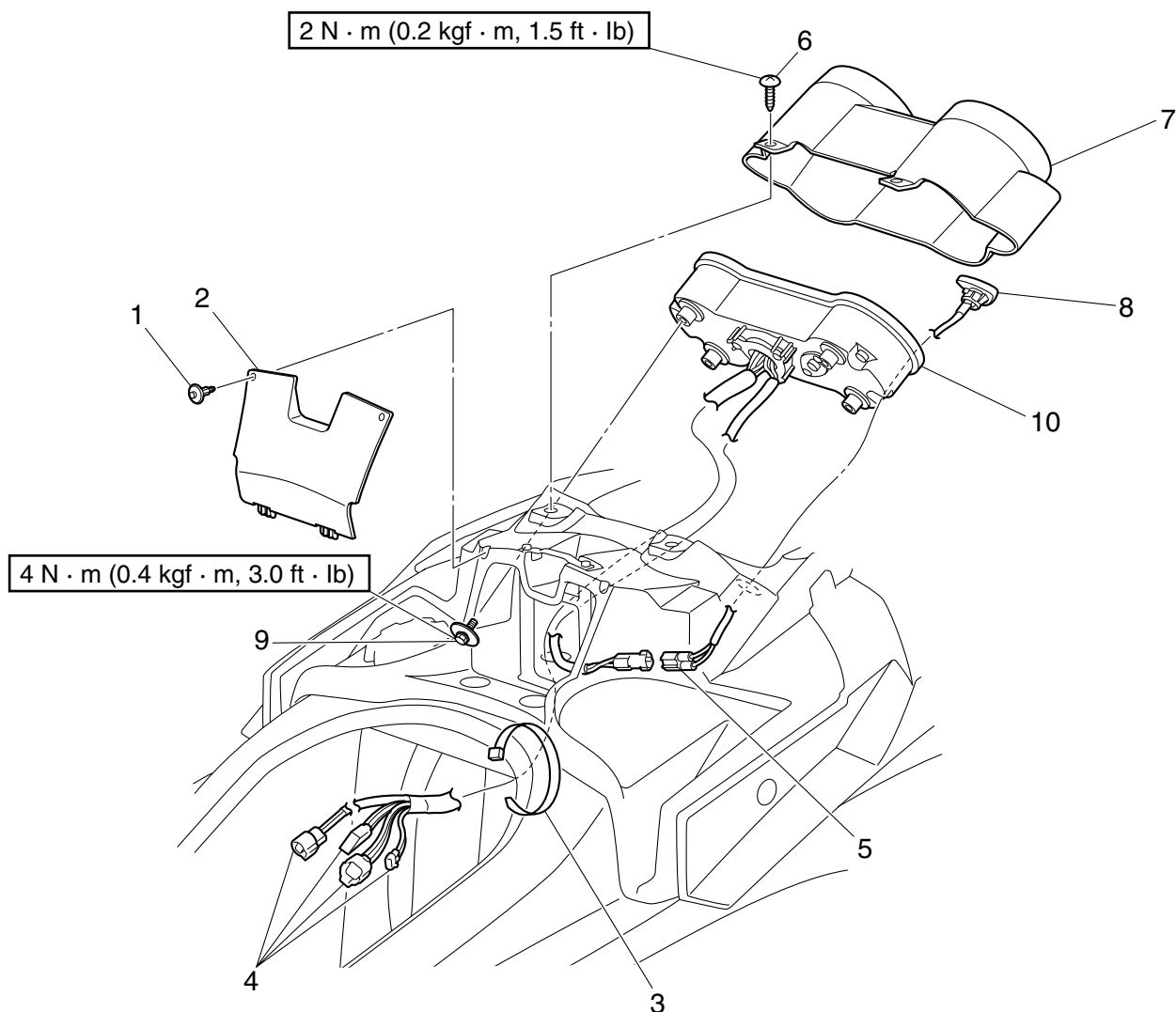
Installation steps:

TIP

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.

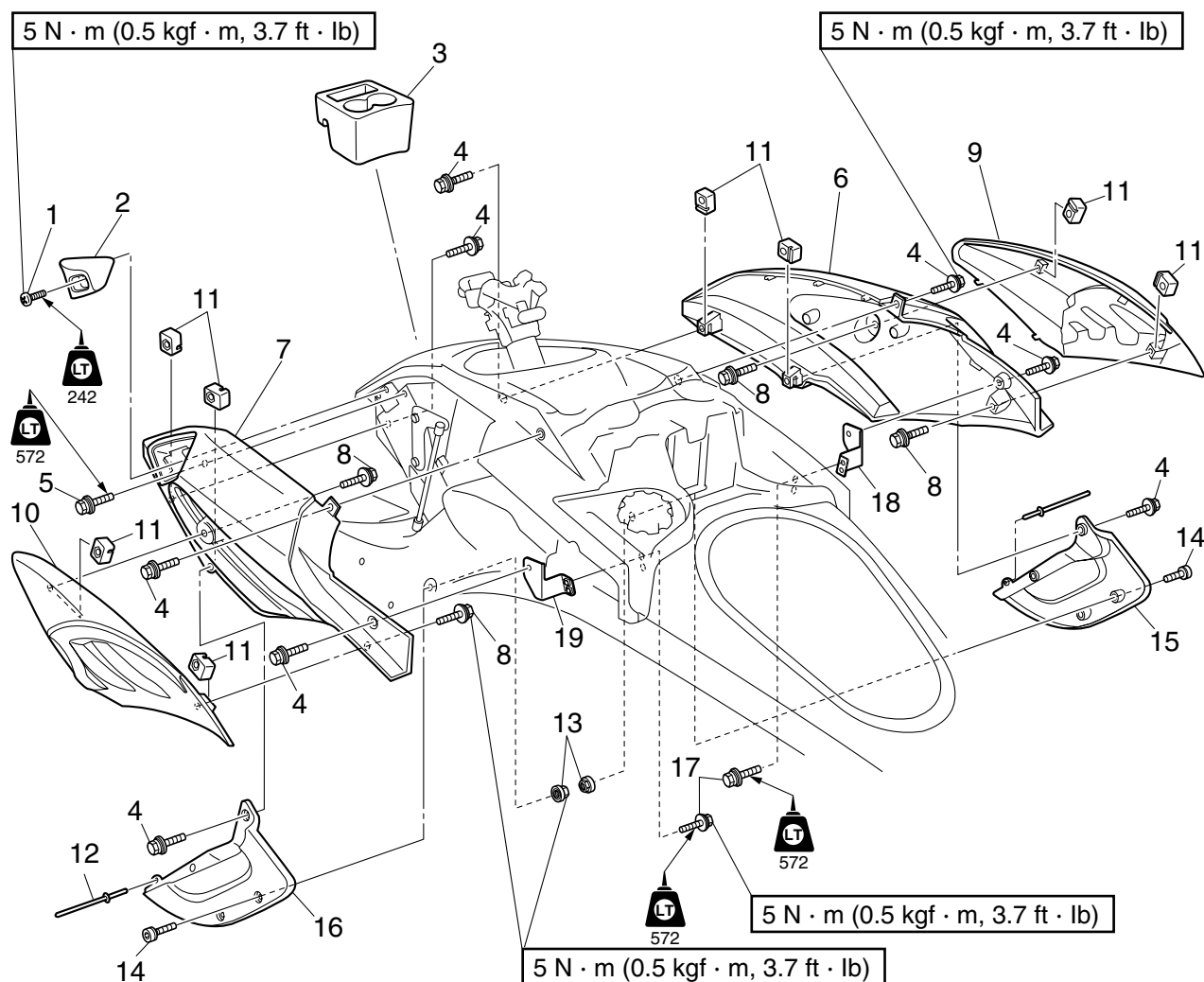
-
1. Insert a rivet completely in the holes in both the service lid ① and inner hull ②.
 2. Push in the rivet pin ③ until it clicks and is flush with the top of the rivet.
-

Steering console cover
Dual analog meter unit and cover removal

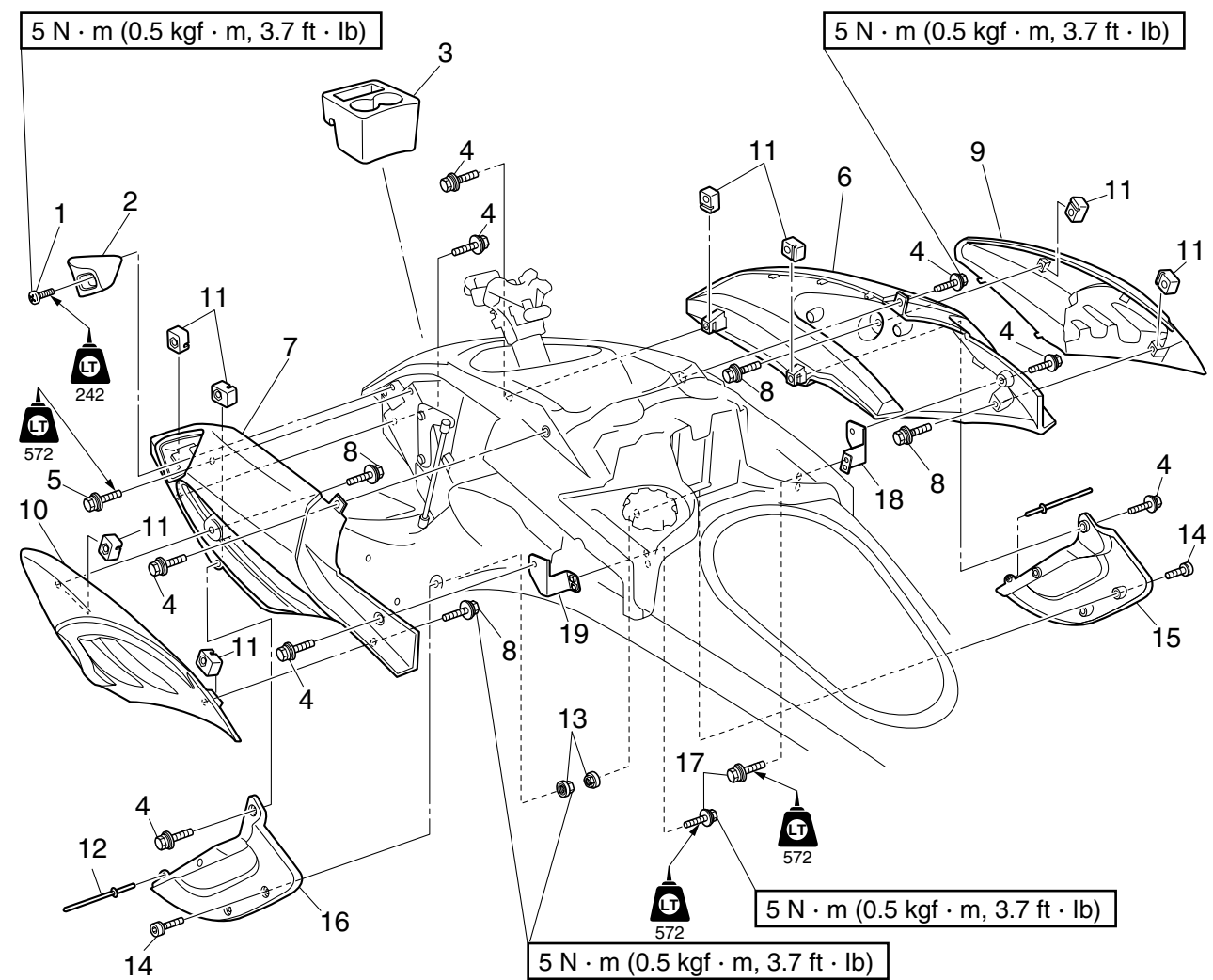


Step	Part name	Q'ty	Remarks
	Handlebar assembly		Refer to "Handlebar assembly removal."
	Service lid		Refer to "Front hood removal."
1	Rivet	2	
2	Cover	1	
3	Plastic tie	1	
4	Dual analog meter unit coupler	4	
5	Switch assembly coupler	1	
6	Screw	2	ø5 × 15 mm
7	Dual analog meter unit cover	1	
8	Switch assembly	1	
9	Bolt	4	M5 × 12 mm
10	Dual analog meter unit	1	

Side cover removal

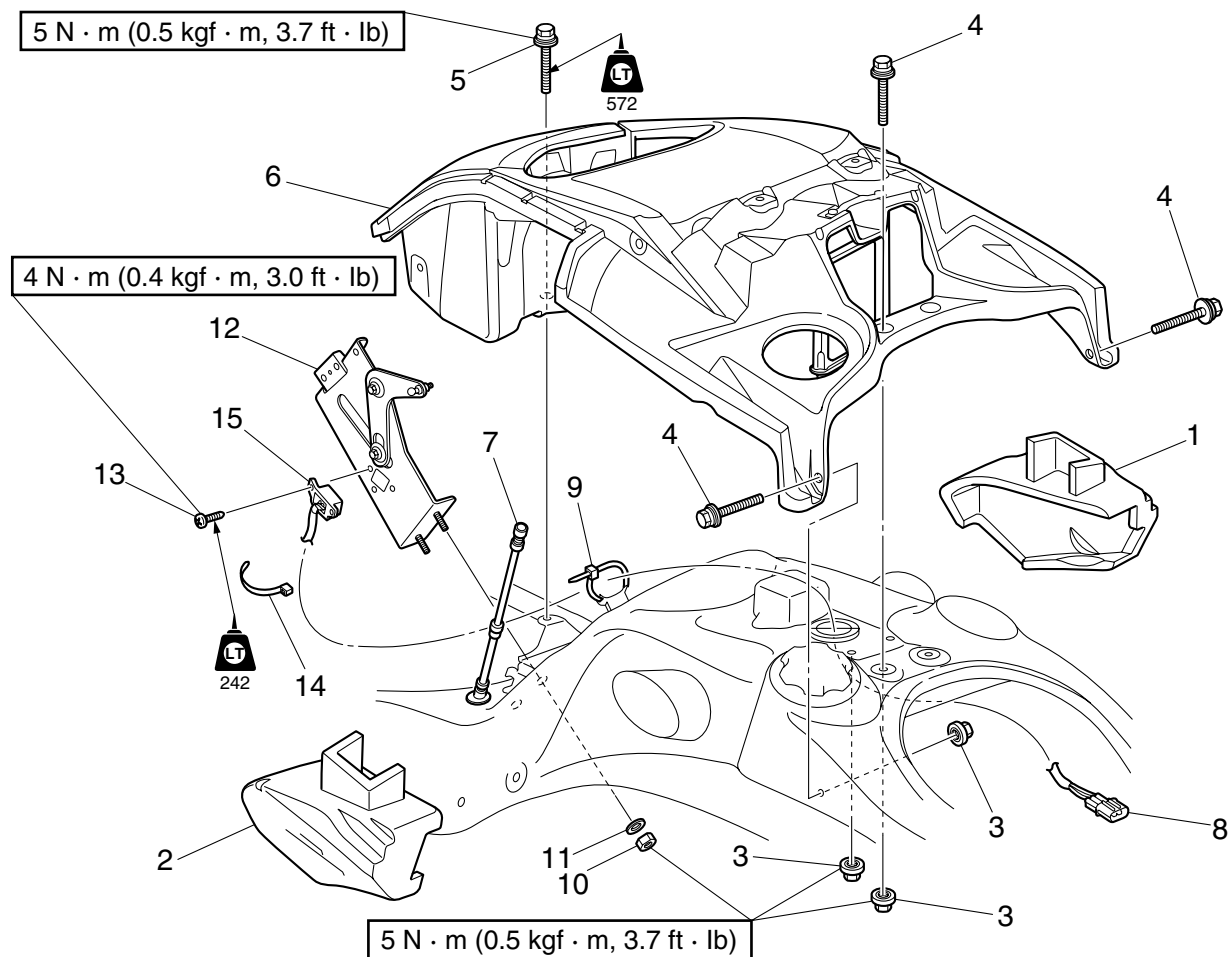


Step	Part name	Q'ty	Remarks
1	Screw	2	ø6 × 14 mm
2	Grip	1	
3	Drink holder	1	
4	Bolt	8	M6 × 29 mm
5	Bolt	1	M6 × 29 mm
6	Left side cover	1	
7	Right side cover	1	
8	Bolt	4	M6 × 29 mm
9	Left side ornament	1	
10	Right side ornament	1	

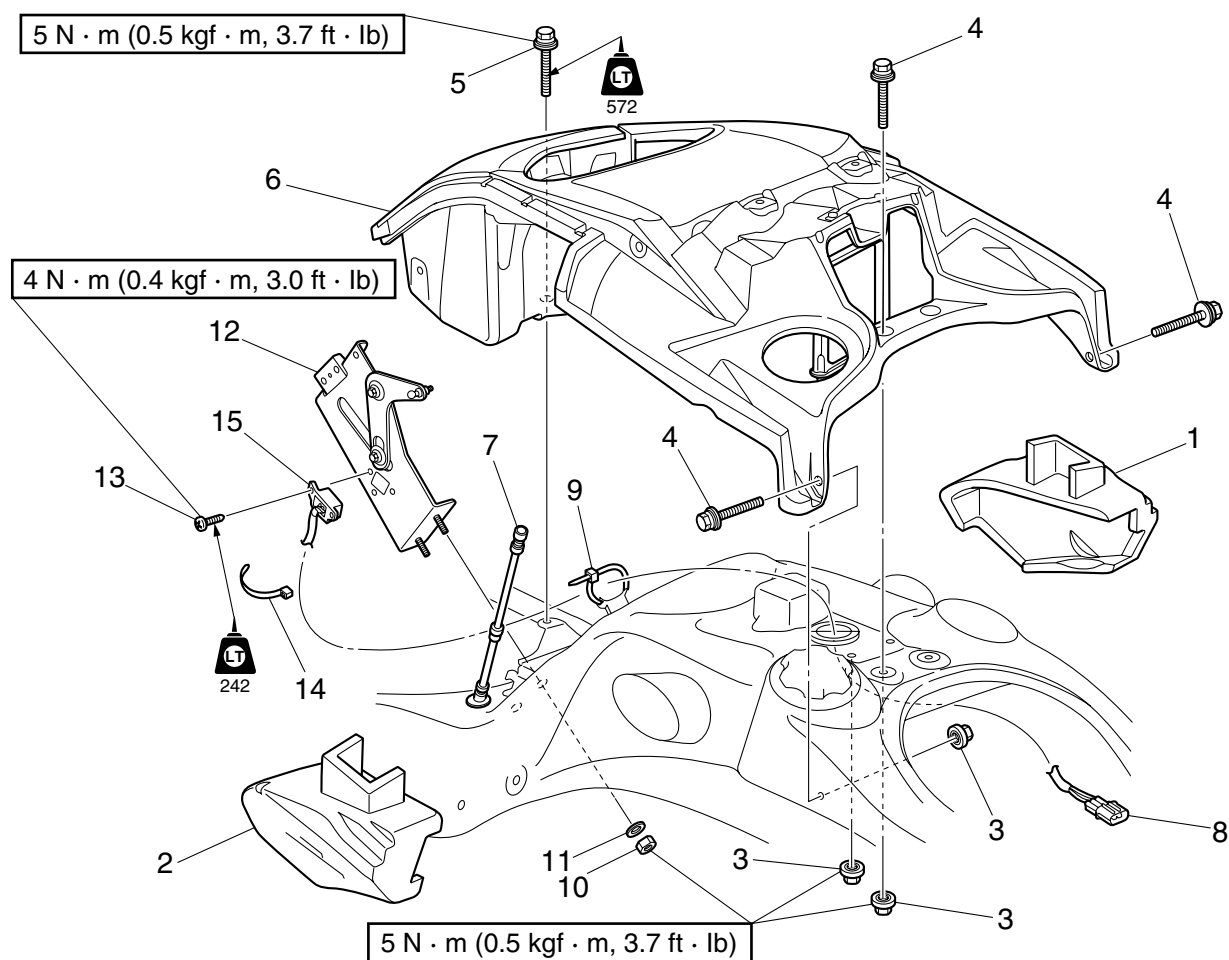


Step	Part name	Q'ty	Remarks
11	Nut	8	Not reusable M6 × 20 mm M6 × 29 mm
12	Rivet	2	
13	Nut	6	
14	Bolt	6	
15	Left knee pad	1	
16	Right knee pad	1	
17	Bolt	4	
18	Left side cover bracket	1	
19	Right side cover bracket	1	

Center cover removal

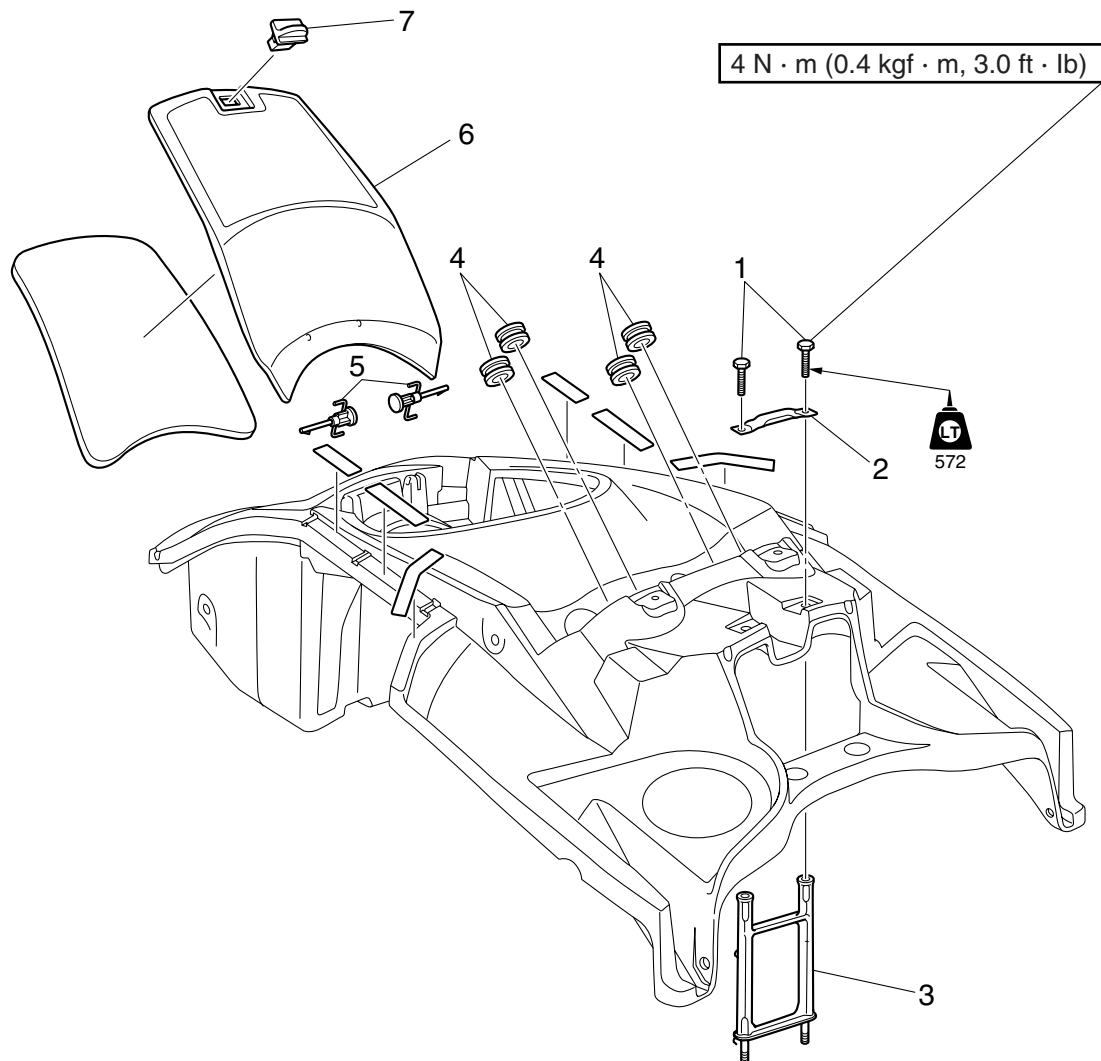


Step	Part name	Q'ty	Remarks
1	Left induction box	1	M6 × 29 mm
2	Right induction box	1	
3	Nut	6	
4	Bolt	4	
5	Bolt	1	
6	Center cover	1	
7	Shift cable end	1	
8	Reverse sensor coupler	1	
9	Plastic tie	1	
10	Nut	2	
11	Washer	2	

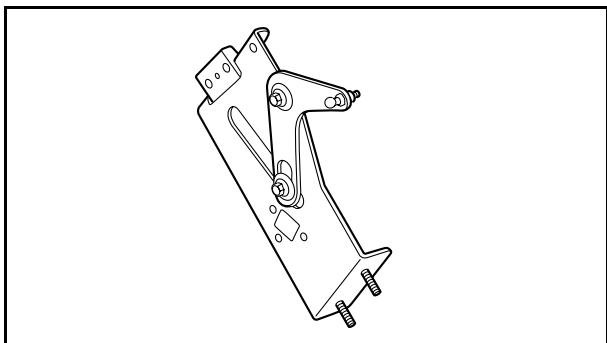


Step	Part name	Q'ty	Remarks
12	Shift lever assembly	1	
13	Screw	2	ø5 × 12 mm
14	Band	1	Not reusable
15	Reverse sensor	1	

Center cover disassembly



Step	Part name	Q'ty	Remarks
1	Bolt	2	M5 × 20 mm
2	Lid lock hook	1	
3	Bracket	1	
4	Grommet	4	
5	Hinge pin	2	
6	Center console box lid	1	
7	Lock	1	



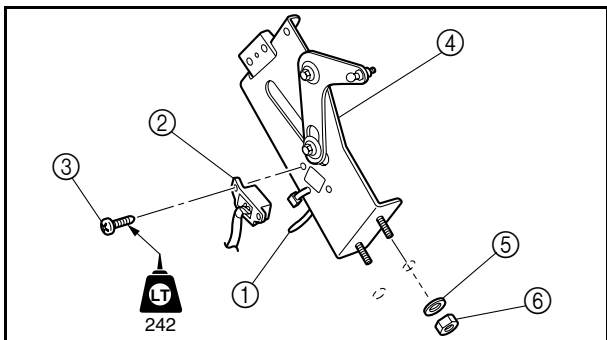
Shift lever check

1. Check:

- Shift lever assembly
Crack/damage → Replace the shift lever assembly.

NOTICE

Do not disassemble the shift lever assembly except the reverse sensor.



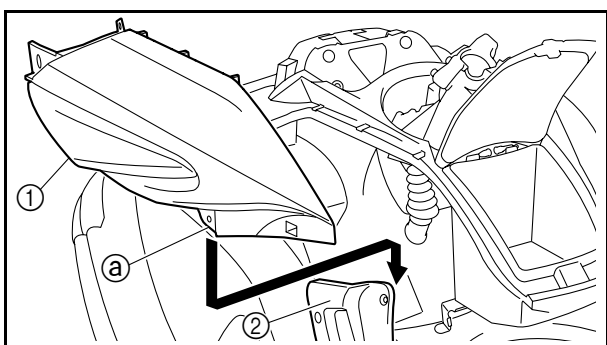
Shift lever installation

1. Remove:

- Band ①
- Reverse sensor ②
- Screws ③
- Shift lever assembly ④
- Washers ⑤
- Nuts ⑥



Reverse sensor screw:
4 N·m (0.4 kgf·m, 3.0 ft·lb)
LOCTITE 242
Shift lever assembly nut:
5 N·m (0.5 kgf·m, 3.7 ft·lb)



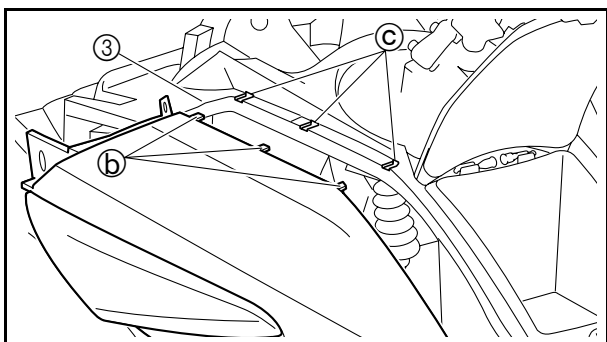
Side cover installation

1. Install:

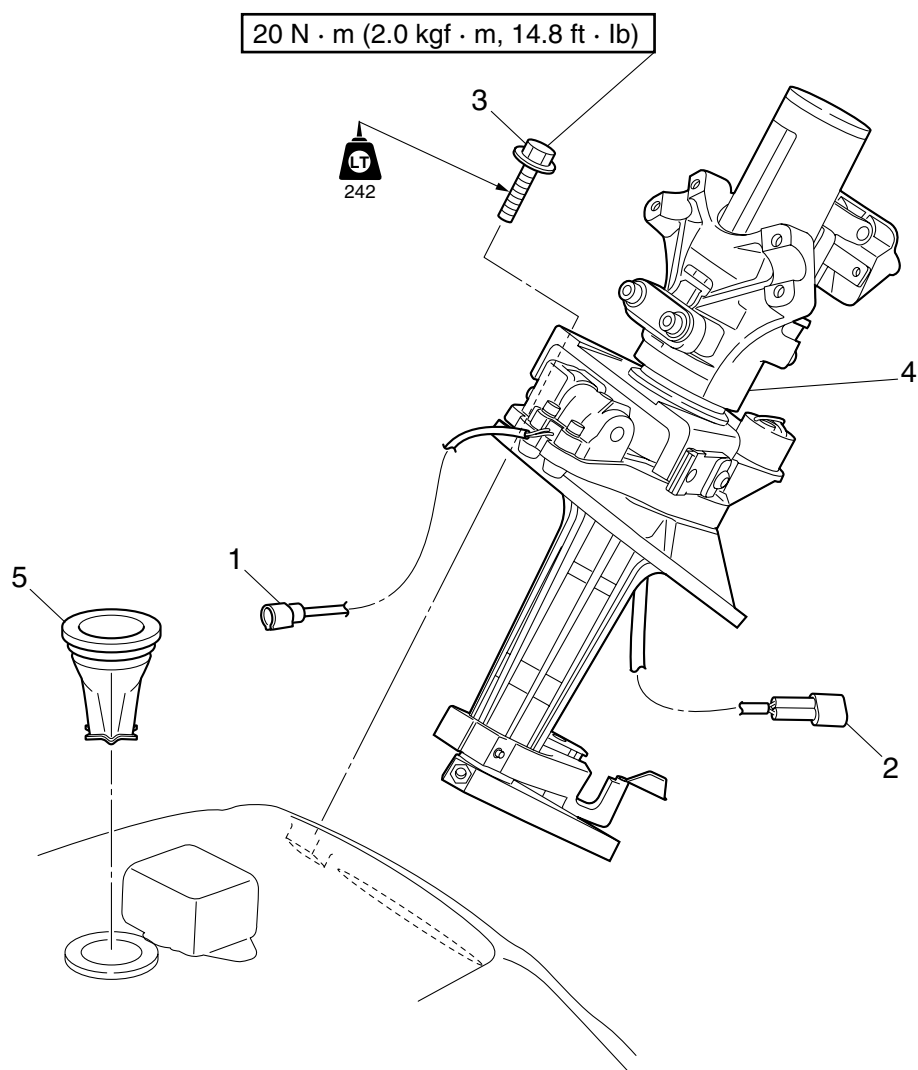
- Side covers ①

TIP

- When installing a side cover ①, position the lower portion ③ of the cover between the knee pad ② and the hull.
- Fit the protrusions ④ on the cover into the holes ⑤ in the center cover ⑥.

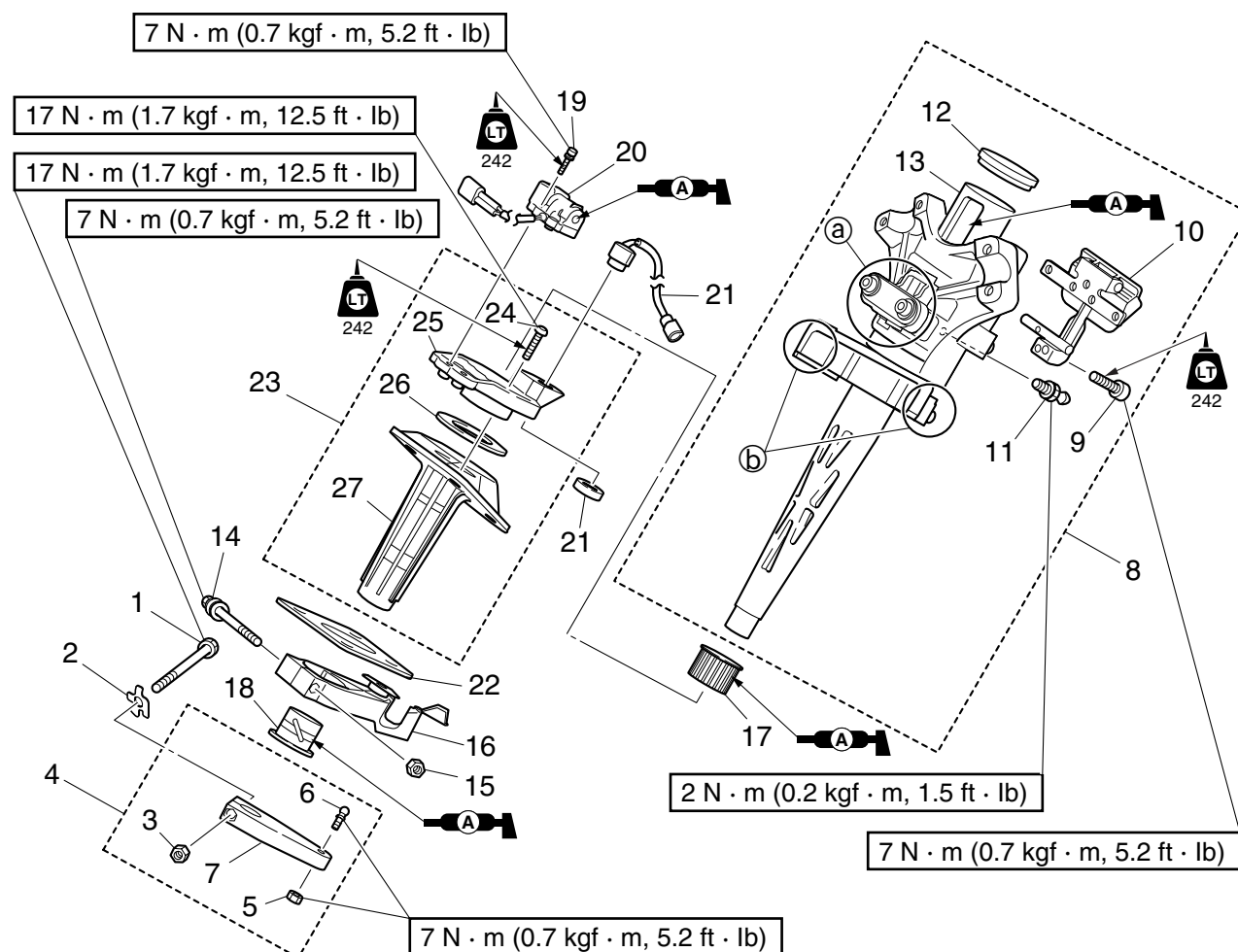


Steering master
Steering master removal

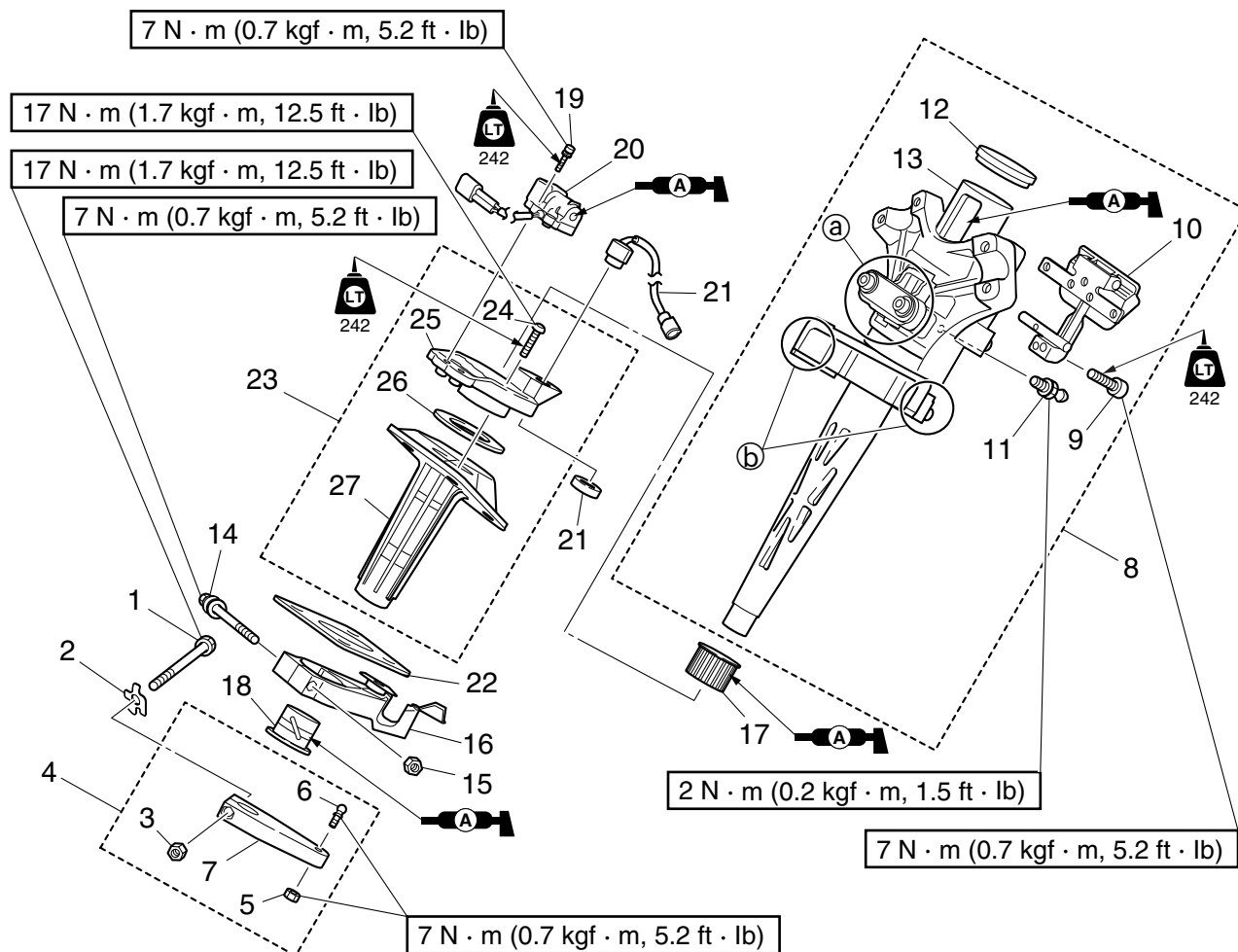


Step	Part name	Q'ty	Remarks
	Center cover assembly		Refer to "Steering console cover."
	Steering cable joint		Refer to "Remote control cables and speed sensor lead."
1	Steering sensor coupler	1	
2	Buzzer coupler	1	
3	Bolt	4	M8 × 30 mm
4	Steering master assembly	1	
5	Grommet	1	

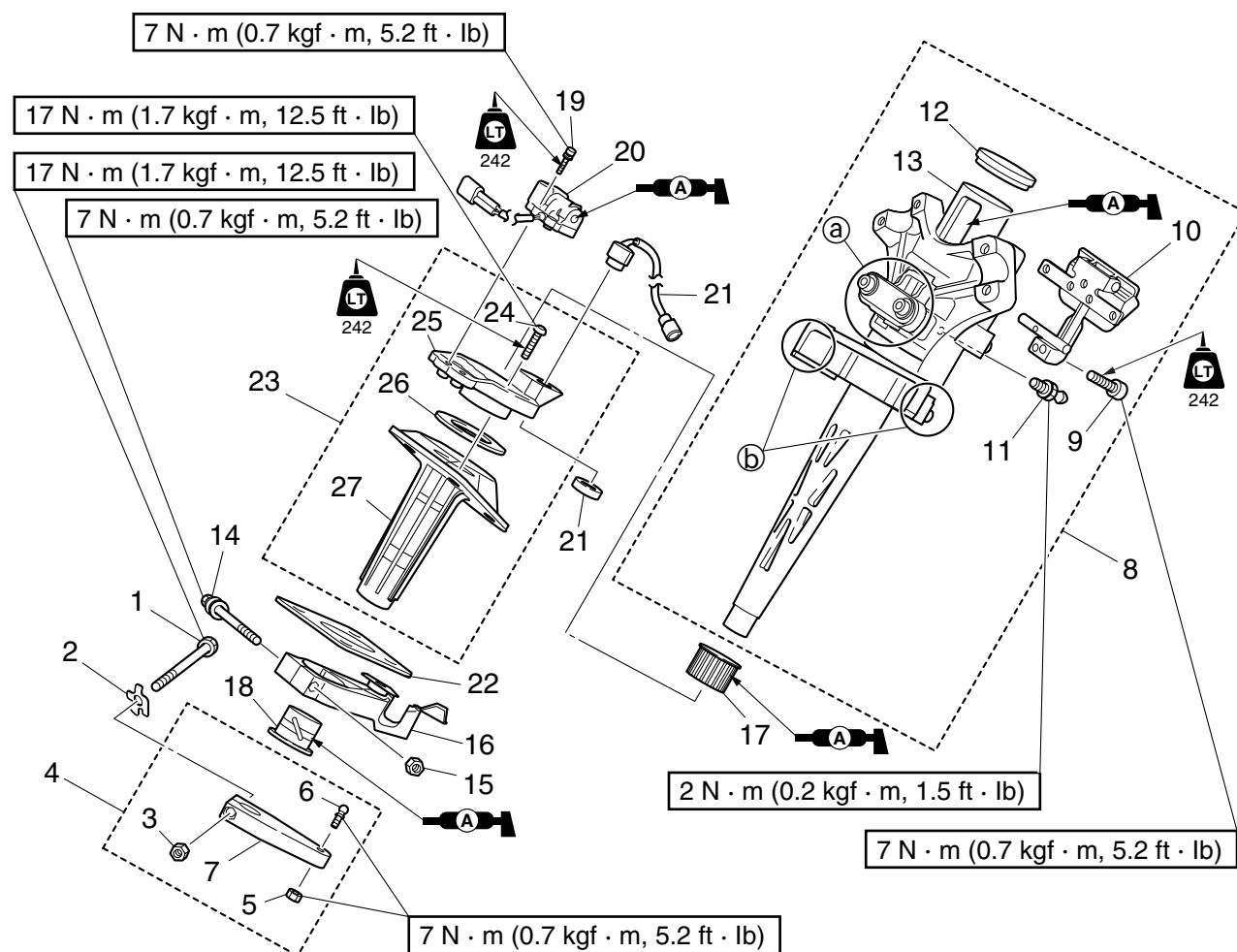
Steering master disassembly



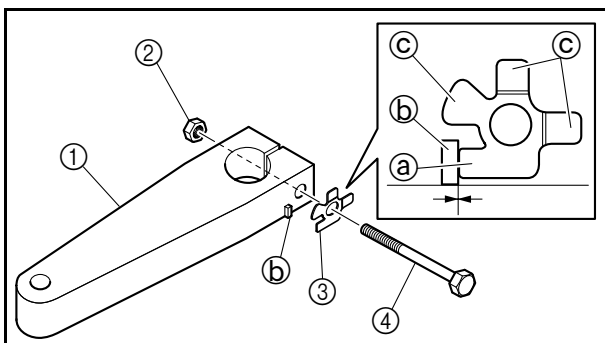
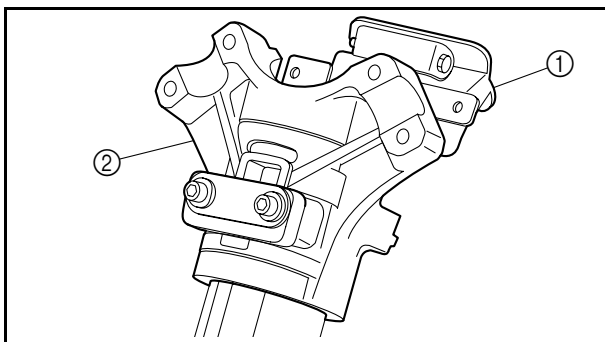
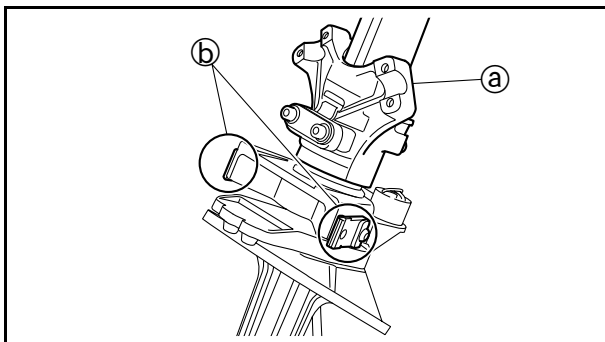
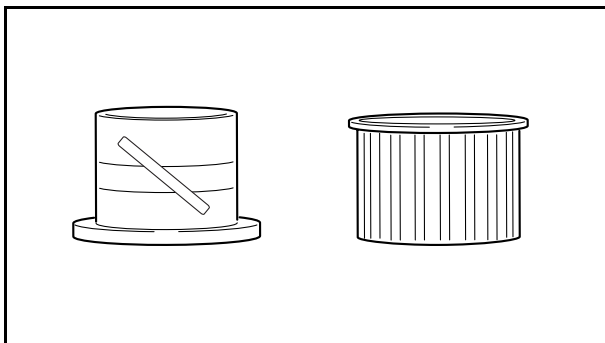
Step	Part name	Q'ty	Remarks
1	Bolt	1	M8 × 50 mm
2	Plate	1	
3	Nut	1	
4	Steering arm assembly	1	
5	Nut	1	
6	Steering cable ball joint	1	
7	Arm	1	
8	Steering shaft assembly	1	Do not disassemble the handlebar bracket ① and board spring ②.
9	Bolt	3	M6 × 12 mm
10	Lock assembly	1	



Step	Part name	Q'ty	Remarks
11	Grease nipple	1	M6 × 60 mm
12	Cap	1	
13	Shaft assembly	1	
14	Bolt	1	
15	Nut	1	M6 × 25 mm
16	Cable stopper	1	
17	Bushing	1	
18	Bushing	1	
19	Bolt	4	M6 × 25 mm
20	Steering sensor	1	



Step	Part name	Q'ty	Remarks
21	Buzzer	1	
22	Rubber seal	1	Not reusable
23	Housing assembly	1	
24	Bolt	4	M8 × 30 mm
25	Sensor base	1	
26	Seal	1	Not reusable
27	Housing	1	



Steering master component check

1. Check:

- Bushings
Cracks/damage/wear → Replace the bushings.

2. Check:

- Steering shaft assembly
Cracks/damage → Replace the steering shaft assembly.

NOTICE

- Do not disassemble the handlebar bracket ①.
- Do not disassemble the board spring ②, otherwise the OTS will not function properly.

3. Check:

- Lock assembly ①
Cracks/damage → Replace the lock assembly.
- Handlebar bracket ②
Cracks/damage → Replace the steering shaft assembly.
- Handlebar bracket operation
Does not operate smoothly → Clean or replace the steering shaft assembly.

TIP

After checking the handlebar bracket, lubricate the bracket.

Refer to "Lubrication points" in Chapter 3.

Steering arm installation

1. Install:

- Arm ①
- Nut ②
- Plate ③
- Bolt ④

TIP

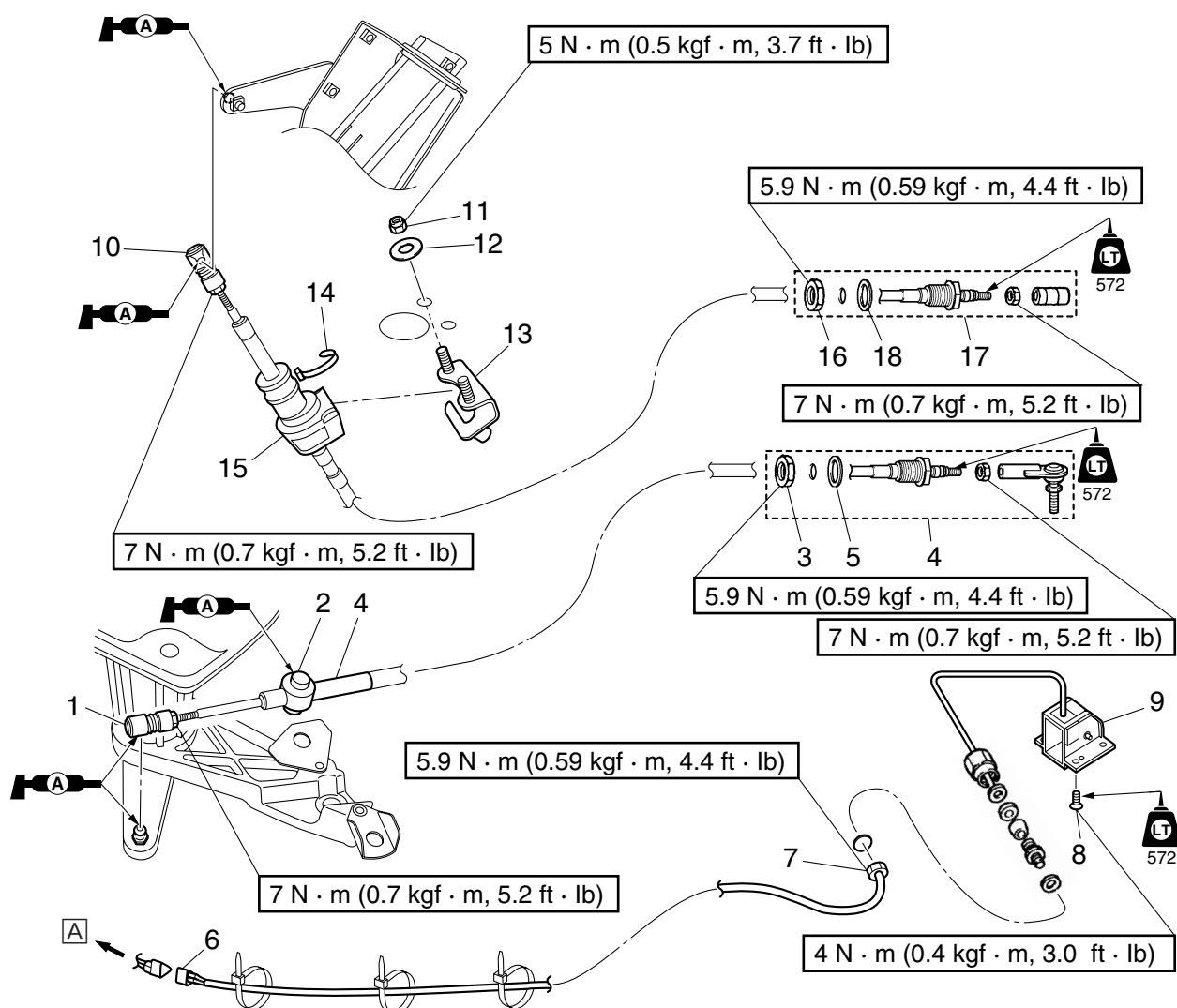
- Align the tab ① on the plate ③ with the projection ② on the arm ①.
- Bend a tab ③ along a flat side of the bolt.



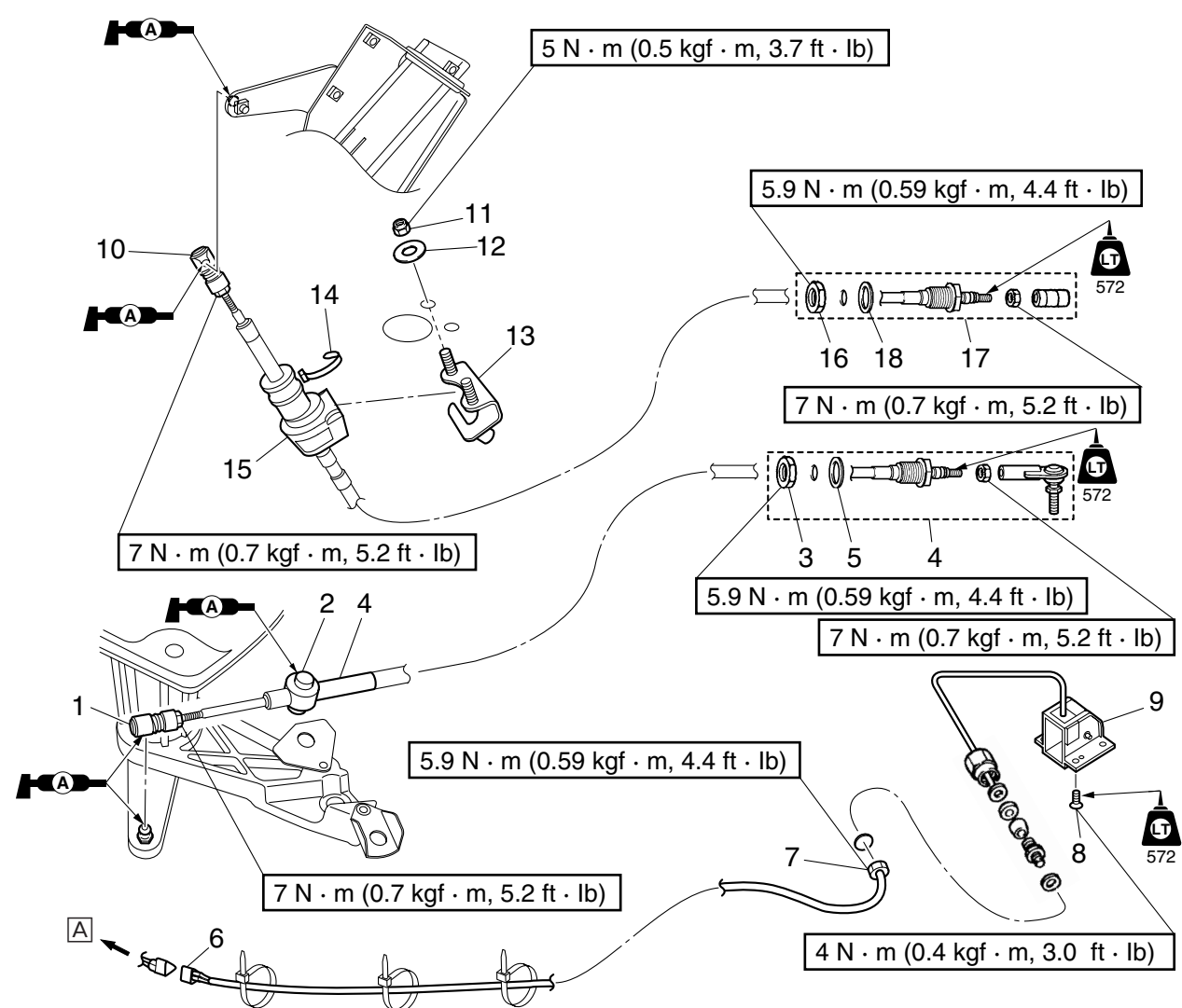
Arm bolt:
17 N·m (1.7 kgf·m, 12.5 ft·lb)

Remote control cables and speed sensor lead

Remote control cables and speed sensor lead removal



Step	Part name	Q'ty	Remarks
	Service lid		Refer to "Front hood removal."
	Front seat assembly		Refer to "Seat and handgrip removal."
	Right side cover		Refer to "Side cover removal."
1	Steering cable joint	1	
2	Drum nut	1	
3	Nut	1	
4	Steering cable	1	
5	Packing	1	Not reusable
6	Speed sensor coupler	1	
7	Nut	1	
8	Screw	4	ø5 × 12 mm
9	Speed sensor	1	[A] To dual analog meter unit



Step	Part name	Q'ty	Remarks
10	Shift cable joint	1	
11	Nut	2	
12	Washer	2	
13	Shift cable bracket	1	
14	Band	1	Not reusable
15	Grommet	1	
16	Nut	1	
17	Shift cable	1	
18	Packing	1	Not reusable



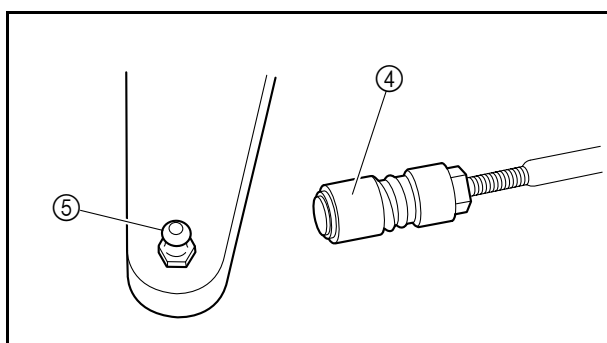
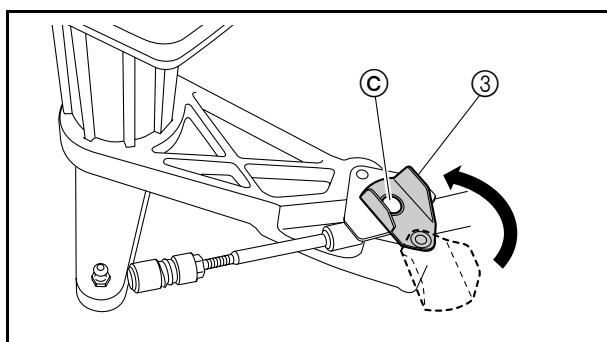
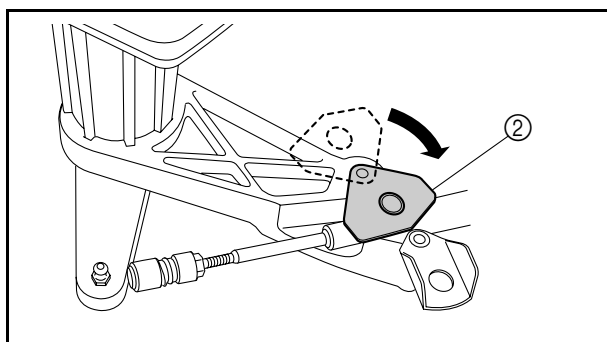
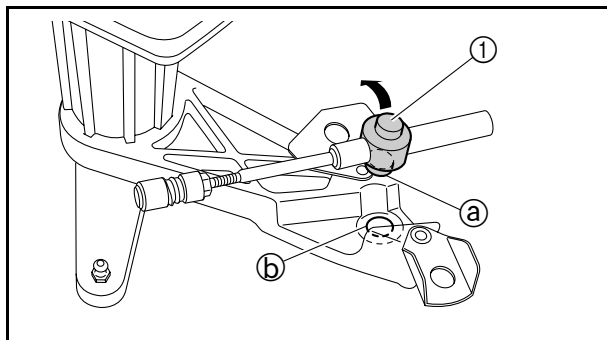
Steering cable installation (steering master end)

⚠ WARNING

If a cable becomes damaged, replace it. Never attempt to repair a damaged cable.

1. Install:

- Steering cable



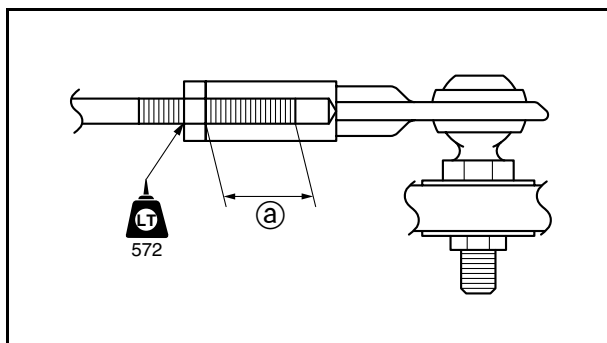
Installation steps:

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 into the indentation, rotate the drum nut (1) counterclockwise a maximum of 90° for proper alignment.

NOTICE

Do not attempt to twist the steering cable to align it. Make 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

TIP

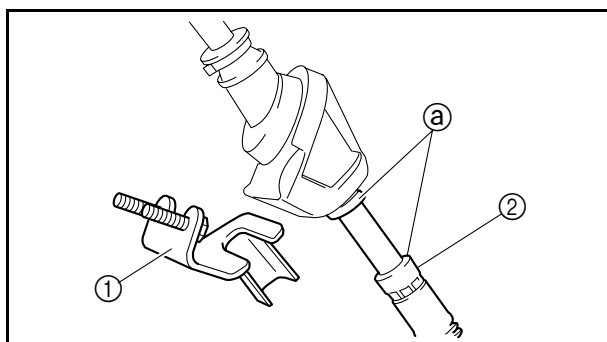
To adjust the steering cable. Refer to “Jet thrust nozzle steering angle check and adjustment” in Chapter 3.



Steering cable set length ① (jet pump end):
14.5 ± 1 mm (0.57 ± 0.04 in)



Steering cable locknut (jet pump end):
7 N·m (0.7 kgf·m, 5.2 ft·lb)
LOCTITE 572



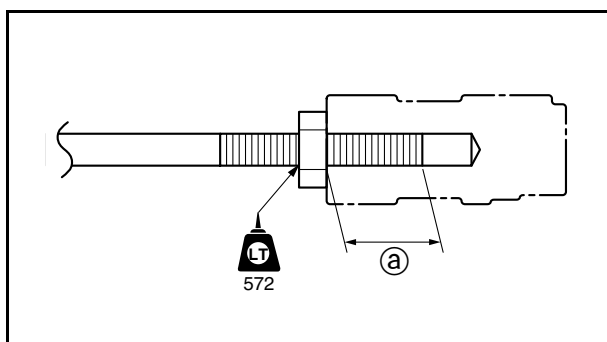
Shift cable installation (shift lever end)

1. Install:

- Shift cable bracket ①

TIP

Install the shift cable bracket ① between the flanges ② on the shift cable ②.



Shift cable installation (jet pump end)

1. Install:

- Shift cable

TIP

To adjust the shift cable. Refer to “Shift cable check and adjustment” in Chapter 3.



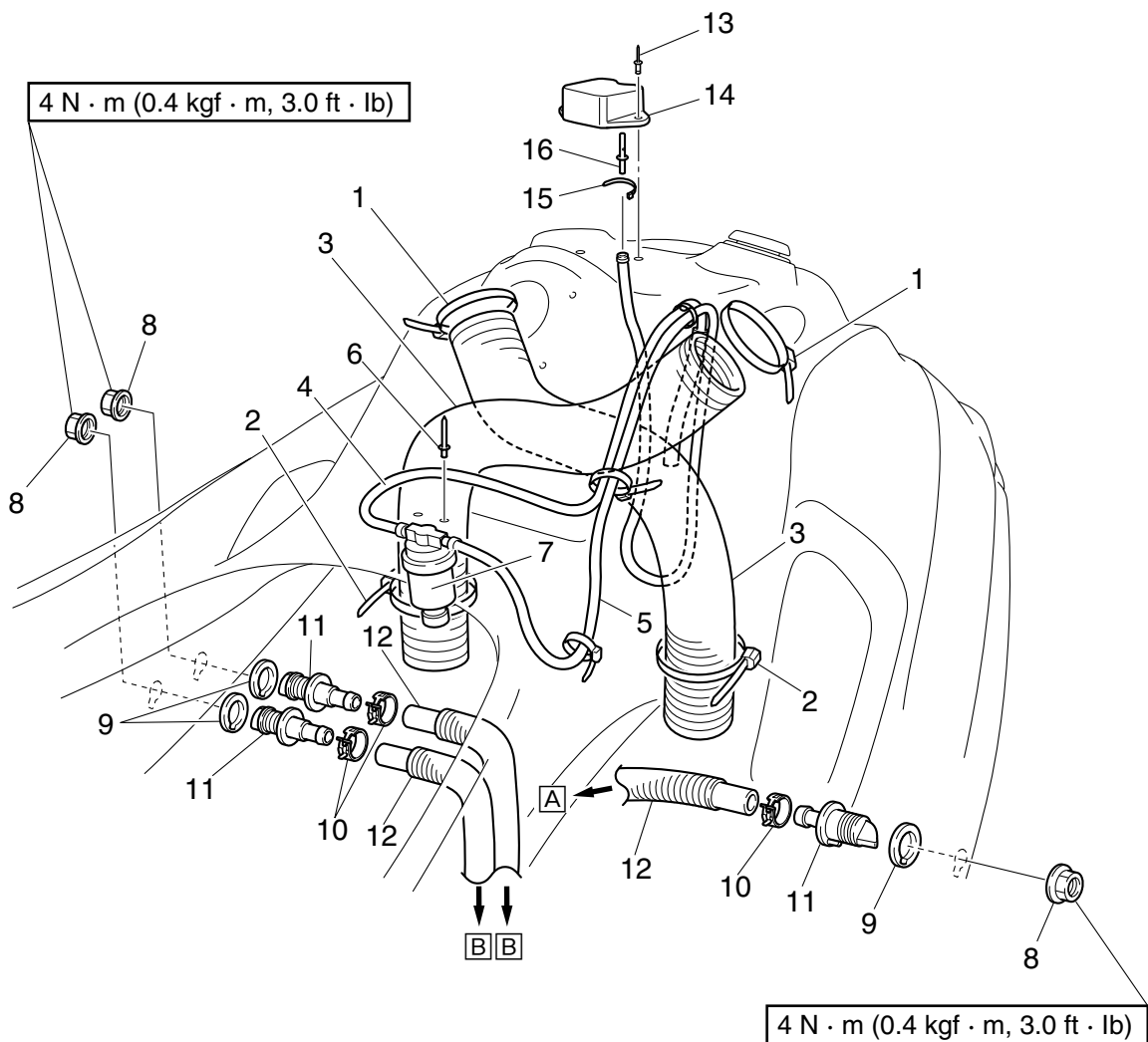
Shift cable set length ① (jet pump end):
13.0 ± 0.8 mm (0.51 ± 0.03 in)



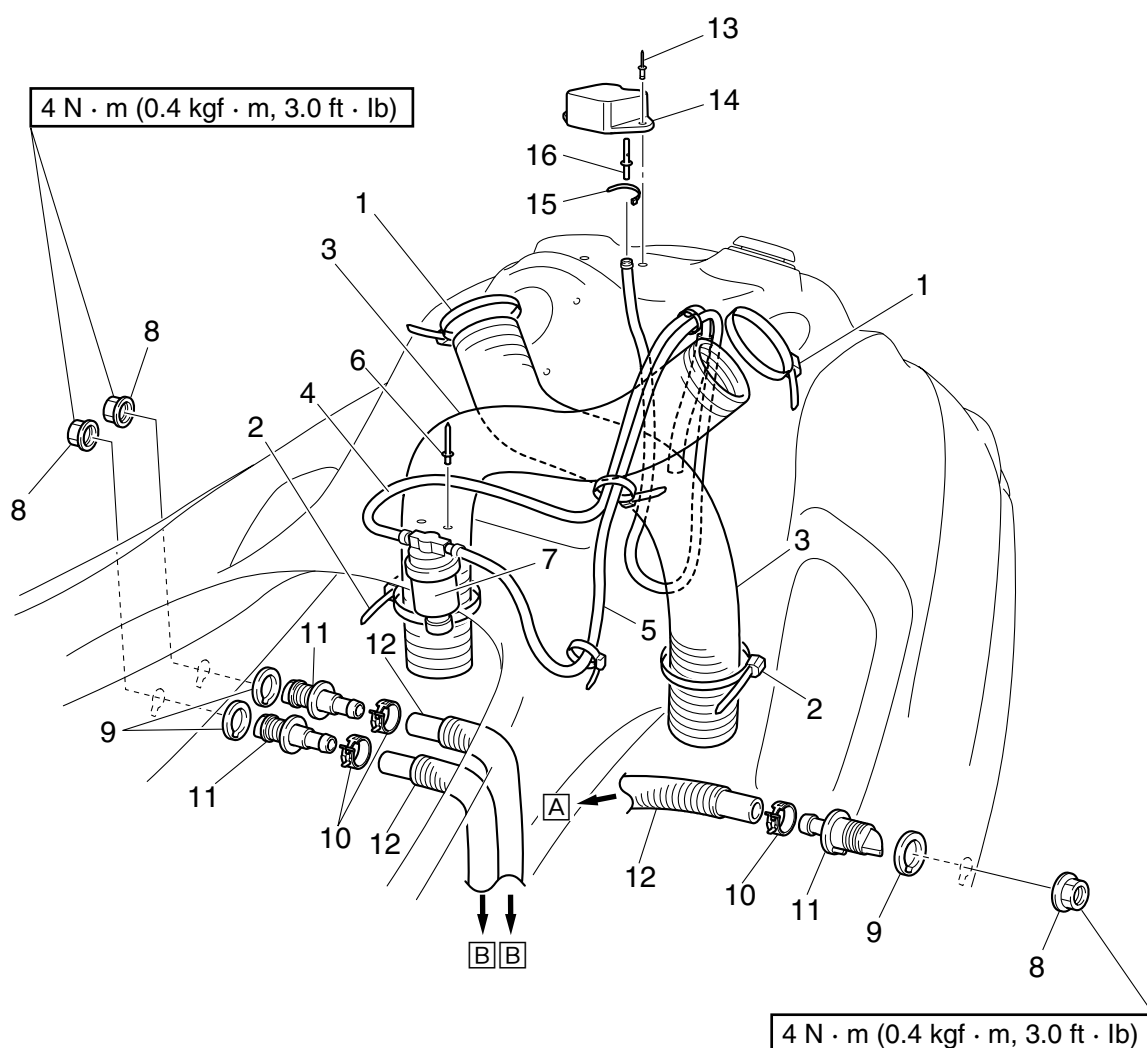
Shift cable locknut (jet pump end):
7 N·m (0.7 kgf·m, 5.2 ft·lb)
LOCTITE 572

Hoses

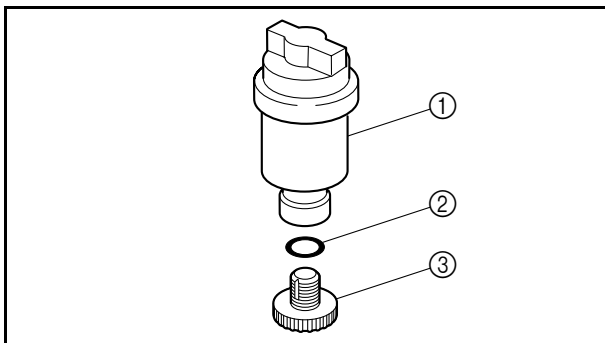
Hose removal



Step	Part name	Q'ty	Remarks
	Engine unit		Refer to "Engine unit" in Chapter 5.
1	Band	2	Not reusable
2	Band	2	Not reusable
3	Ventilation hose	2	
4	Fuel tank breather hose 1	1	
5	Fuel tank breather hose 2	1	
6	Rivet	2	Not reusable
7	Water separator	1	
8	Nut	3	
9	Packing	3	Not reusable
10	Clamp	3	



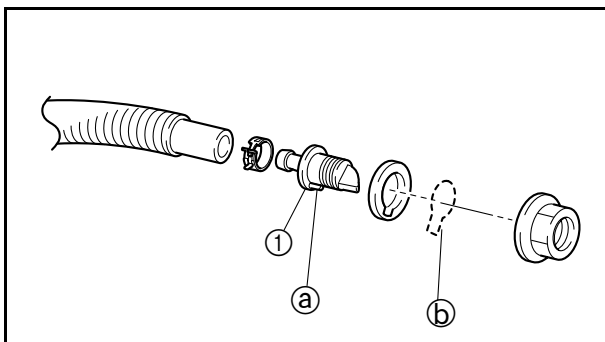
Step	Part name	Q'ty	Remarks
11	Cooling water pilot outlet	3	A To air cooler/ B To oil cooler Not reusable
12	Cooling water hose	3	
13	Rivet	2	
14	Ventilation socket	1	
15	Band	1	
16	Ventilation pipe	1	



Water separator check

1. Check:

- Water separator ①
Cracks/damage → Replace the water separator.
- O-ring ②
Cracks/damage → Replace the O-ring.
- Drain plug ③
Cracks/damage → Replace the drain plug.



Cooling water pilot outlet installation

1. Install:

- Cooling water pilot outlets ①

TIP

Align each projection (a) with the slits (b).

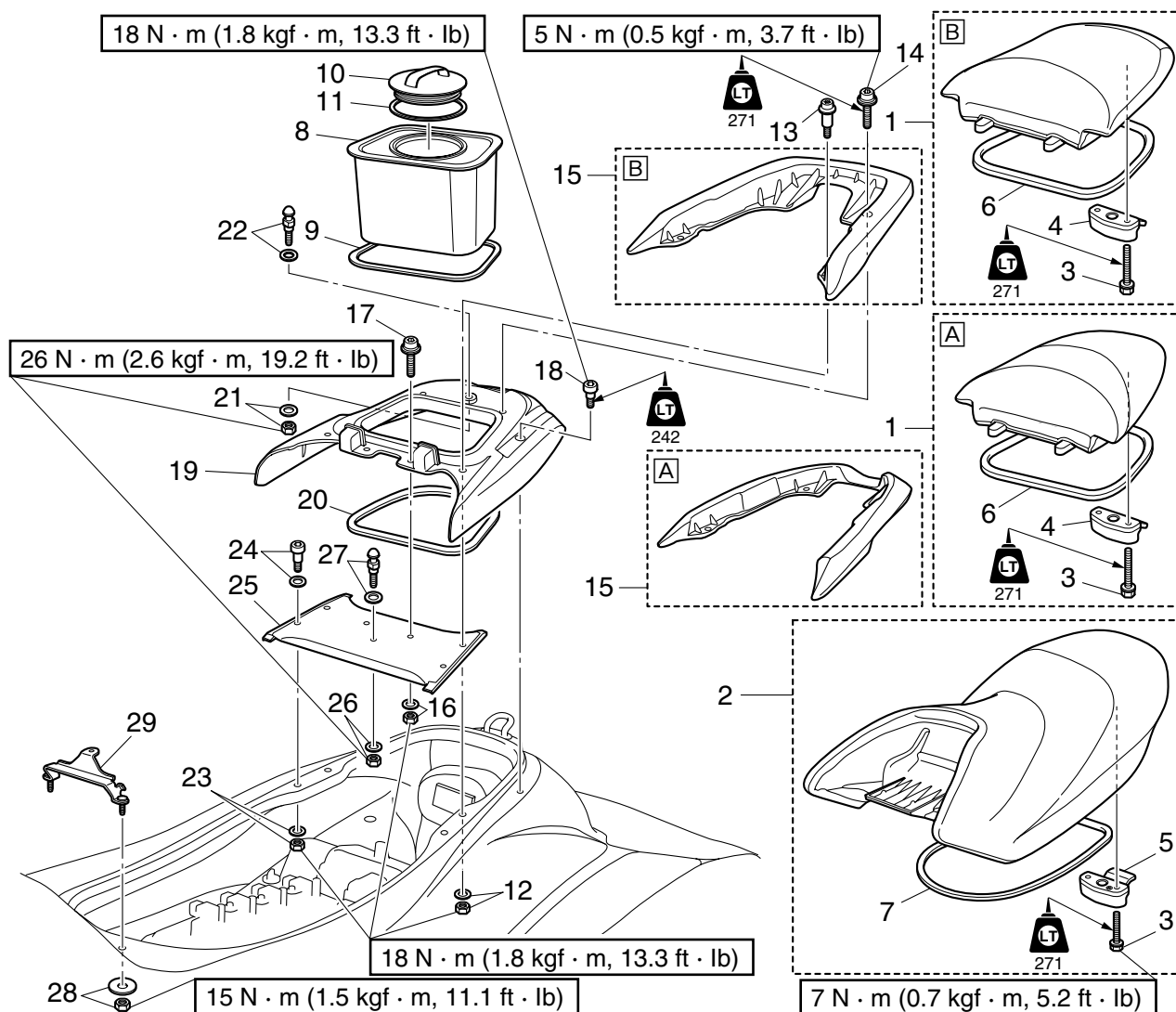


Cooling water pilot outlet nut:
4 N·m (0.4 kgf·m, 3.0 ft·lb)

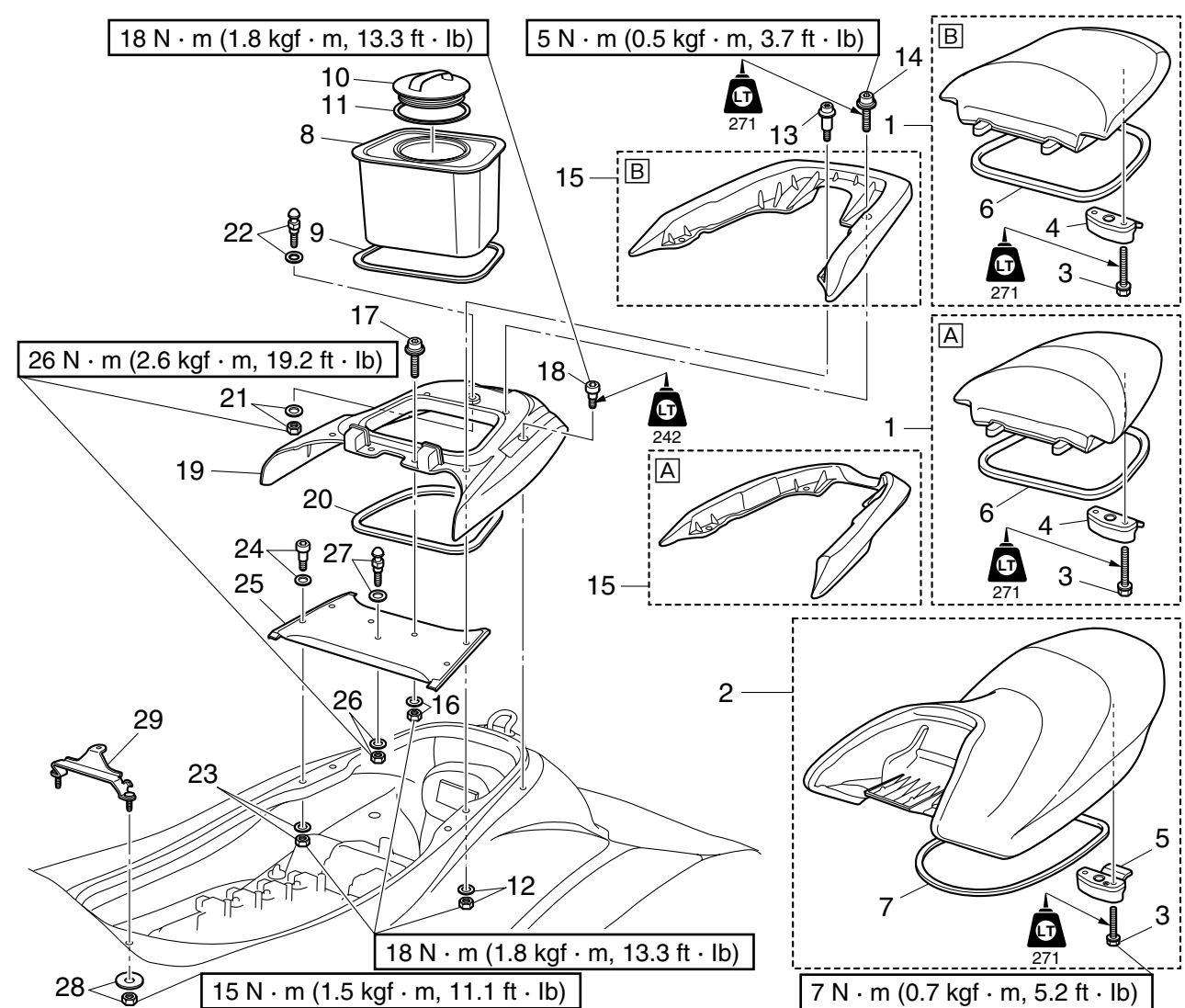


Seats and handgrip

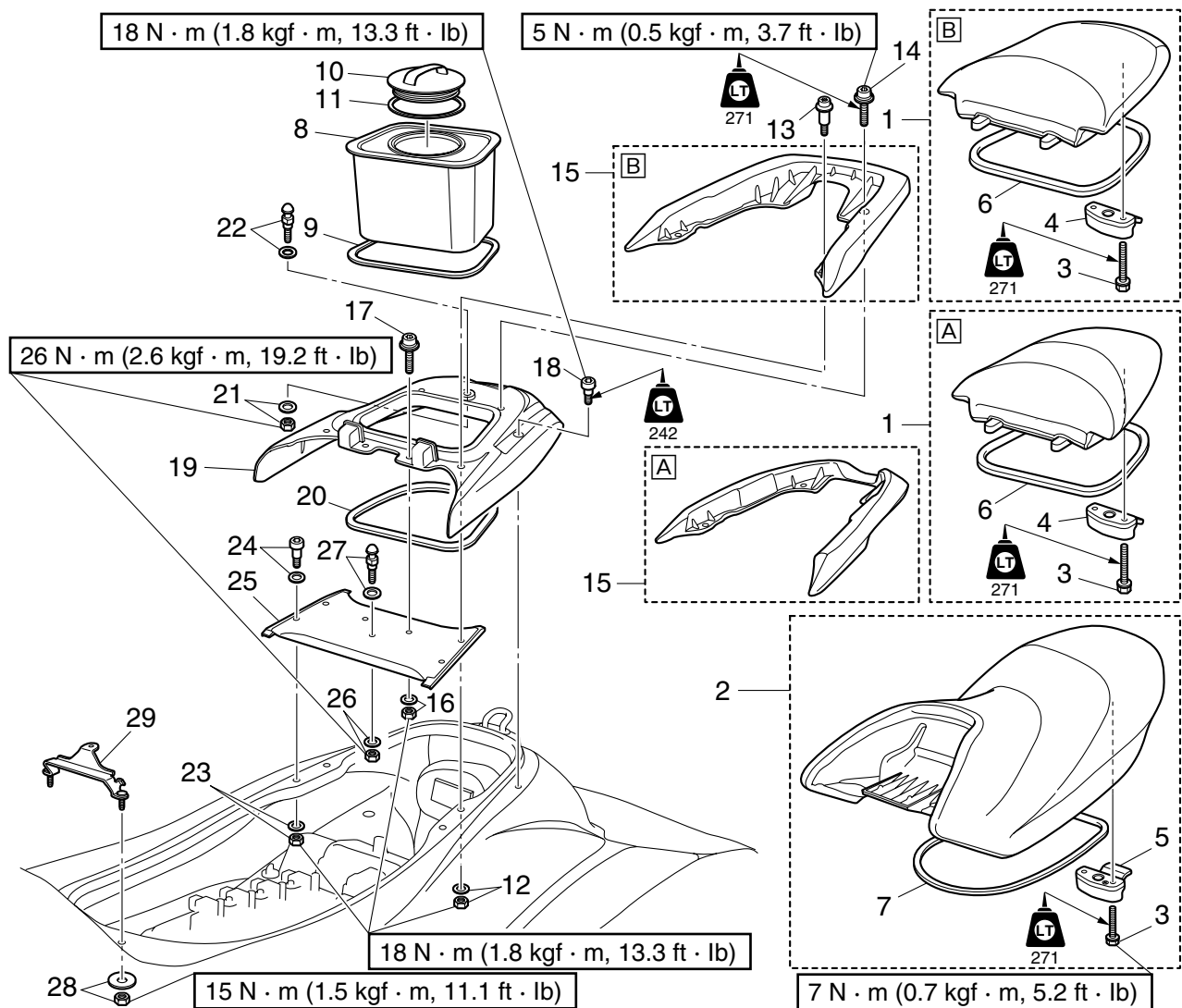
Seat and handgrip removal



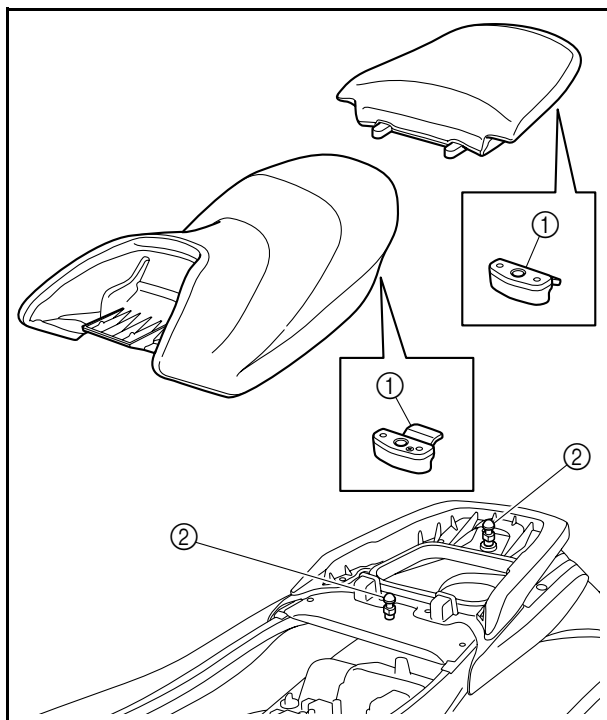
Step	Part name	Q'ty	Remarks
1	Rear seat assembly	1	A FZR/ B FZS
2	Front seat assembly	1	
3	Bolt	4	M6 × 40 mm
4	Seat lock assembly (rear)	1	
5	Seat lock assembly (front)	1	
6	Packing (rear)	1	Not reusable
7	Packing (front)	1	Not reusable
8	Seat storage compartment	1	
9	Packing	1	Not reusable



Step	Part name	Q'ty	Remarks
10	Seat storage compartment cap	1	
11	Packing	1	
12	Nut/washer	2/2	
13	Bolt	2	M8 × 19 mm (T27)
14	Bolt	2	M8 × 30 mm (T40)
15	Handgrip	1	[A] FZR/[B] FZS
16	Nut/washer	2/2	
17	Bolt	2	M8 × 30 mm
18	Bolt	3	M8 × 10 mm



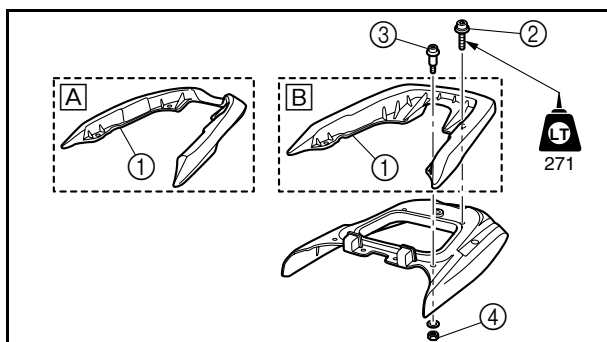
Step	Part name	Q'ty	Remarks
19	Deck beam 1	1	Not reusable M8 × 19 mm
20	Packing	1	
21	Nut/washer	1/1	
22	Projection/washer	1/1	
23	Nut/washer	2/2	
24	Bolt/washer	2/2	
25	Deck beam 2	1	
26	Nut/washer	1/1	
27	Projection/washer	1/1	
28	Nut/washer	2/2	
29	Seat holder	1	



Seat lock check

1. Check:

- Seat lock assembly ①
Does not lock → Replace the seat lock assembly.
- Projection ②
Damage → Replace the projection.



Handgrip installation

1. Install:

- Handgrip ①

TIP

- The handgrips for the FZR and FZS are not interchangeable.
- The bolts ② are T27 TORX bolts and the bolts ③ are T40 TORX bolts.

A FZR

B FZS

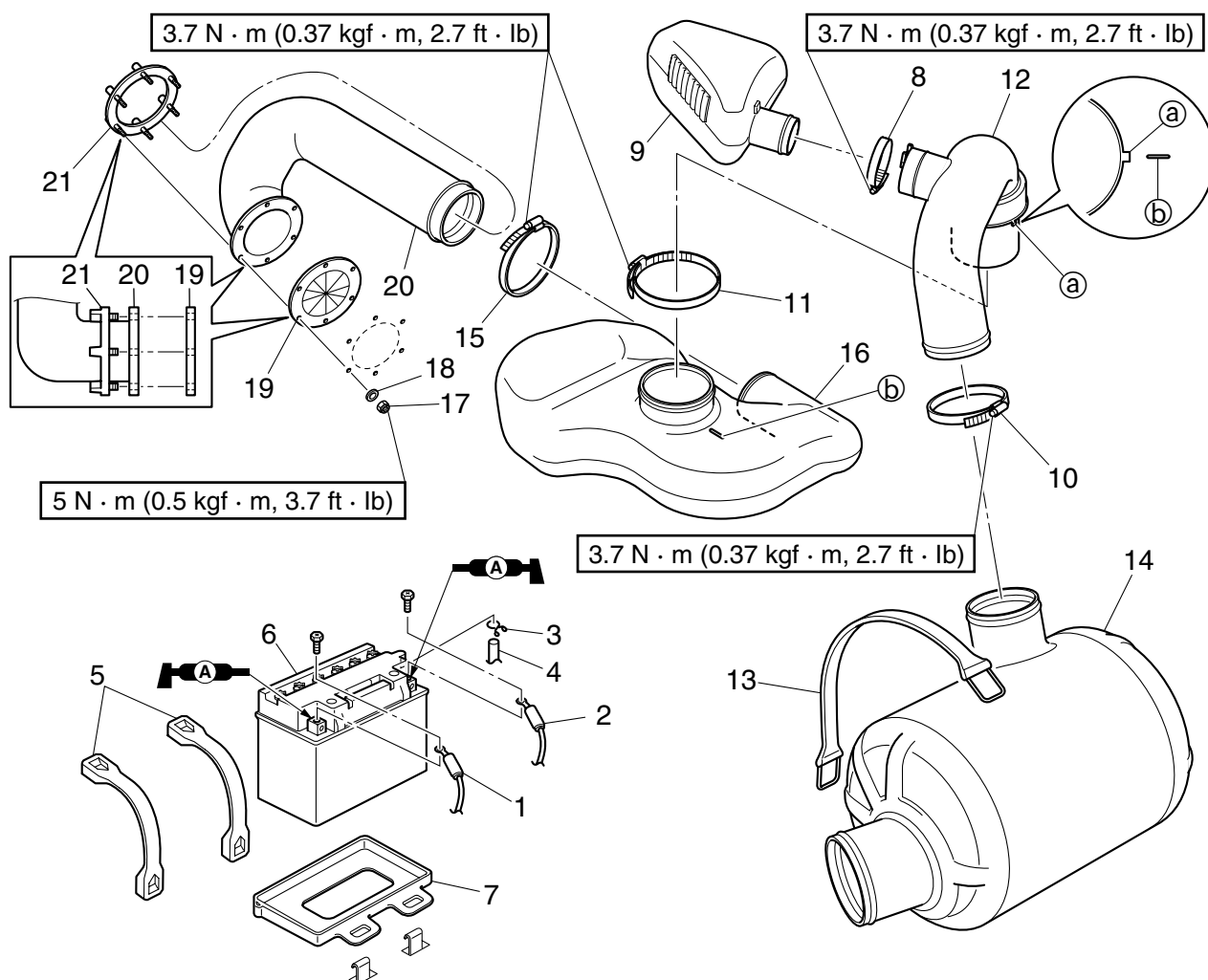


Handgrip bolt ②:
5 N·m (0.5 kgf·m, 3.7 ft·lb)
LOCTITE 271

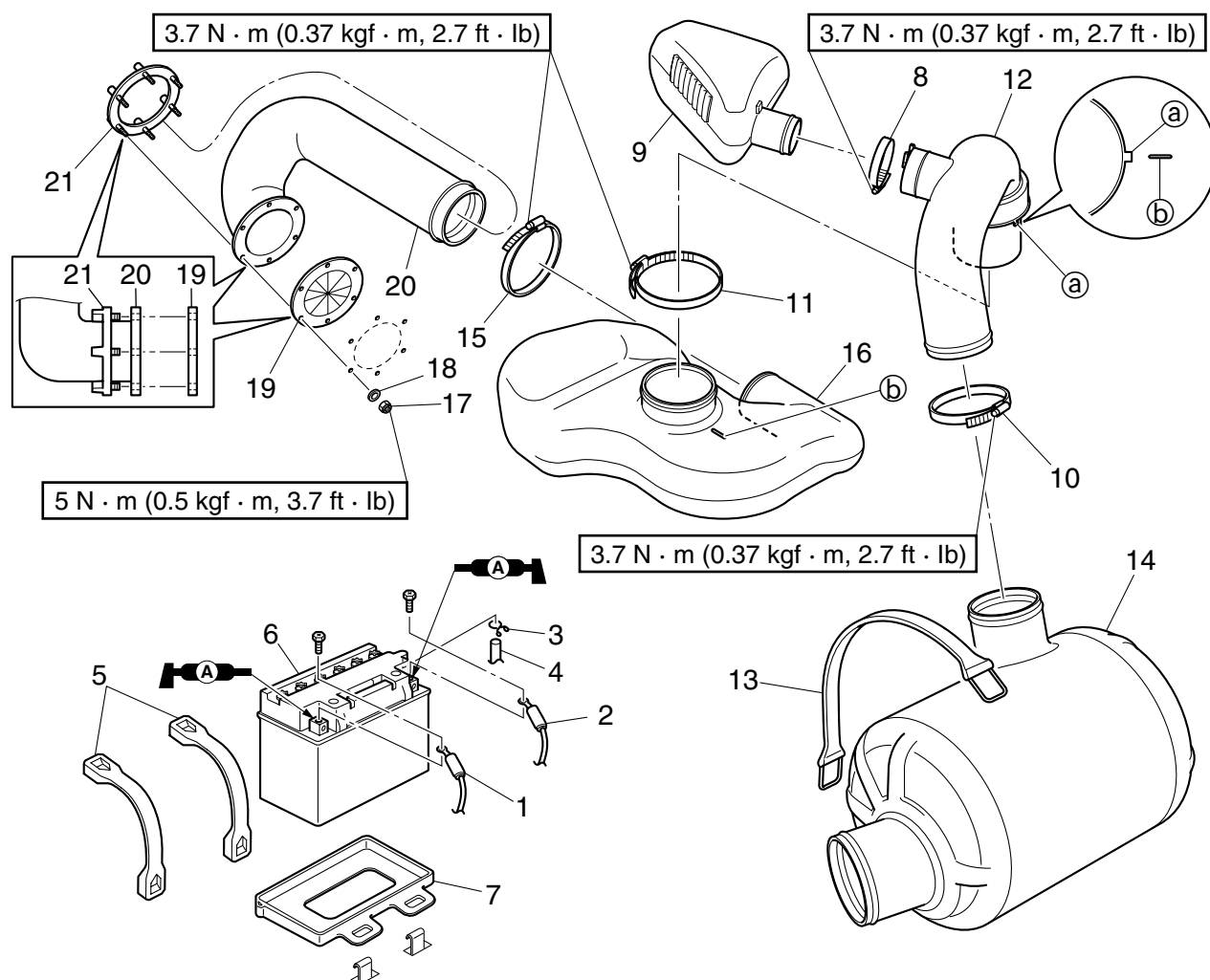
Handgrip nut ④:
18 N·m (1.8 kgf·m, 13.3 ft·lb)

Exhaust system

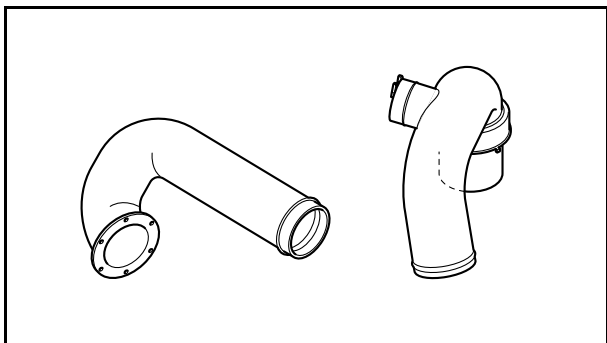
Exhaust system and battery removal



Step	Part name	Q'ty	Remarks
	Deck beam assembly		Refer to "Engine unit" in Chapter 5.
	Muffler assembly		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	1	
4	Battery breather hose	1	
5	Band	2	
6	Battery	1	
7	Battery case	1	
8	Clamp	1	
9	Resonator	1	
10	Clamp	1	



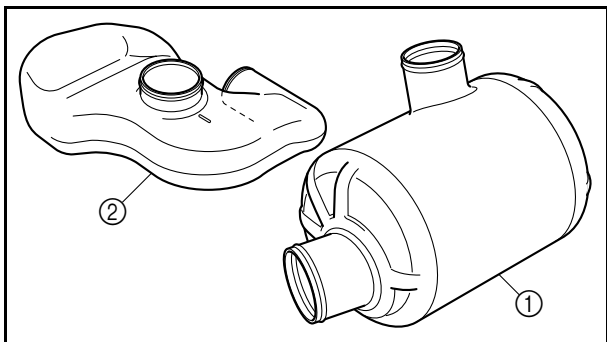
Step	Part name	Q'ty	Remarks
11	Clamp	1	① Projection ② Alignment mark Not reusable
12	Rubber hose	1	
13	Band	1	
14	Water lock	1	
15	Clamp	1	
16	Water tank	1	
17	Nut	6	
18	Washer	6	
19	Exhaust valve	1	
20	Rubber hose	1	
21	Plate	1	



Exhaust system check

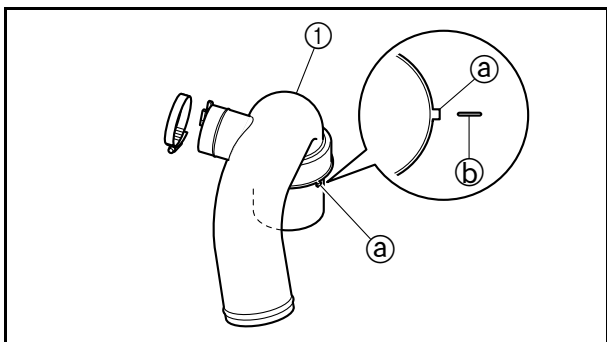
1. Check:

- Rubber hoses
Burns/cracks/damage → Replace the rubber hoses.



2. Check:

- Water lock ①
- Water tank ②
Cracks/damage/leaks → Replace.



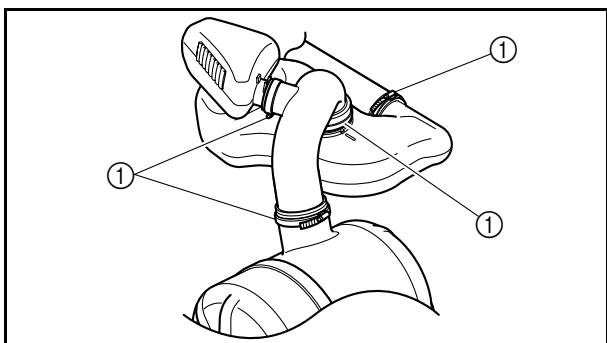
Rubber hose installation

1. Install:

- Rubber hose ①

TIP

Align the projection ① on the rubber hose with the alignment mark ② on the water tank.



2. Tighten:

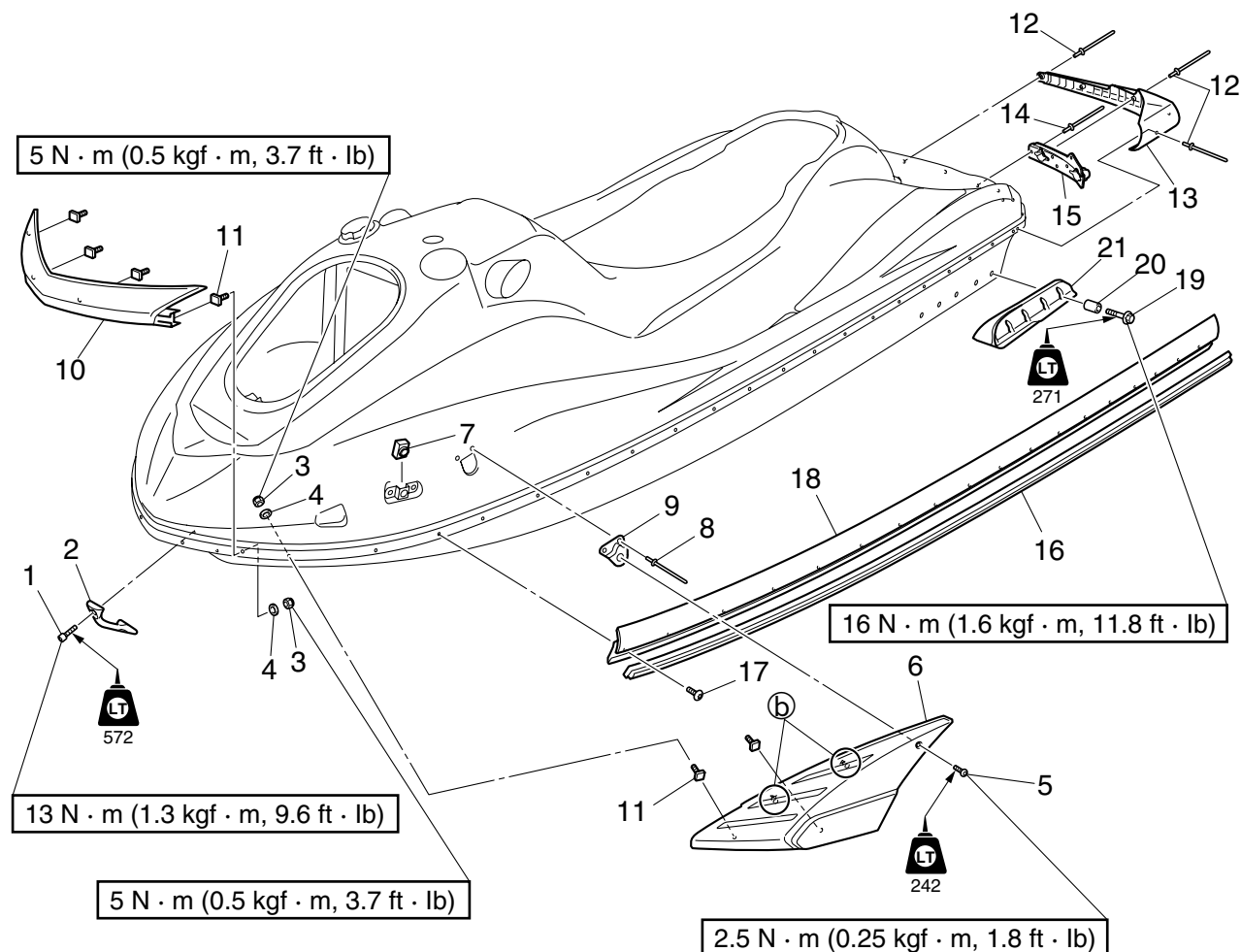
- Clamps ①



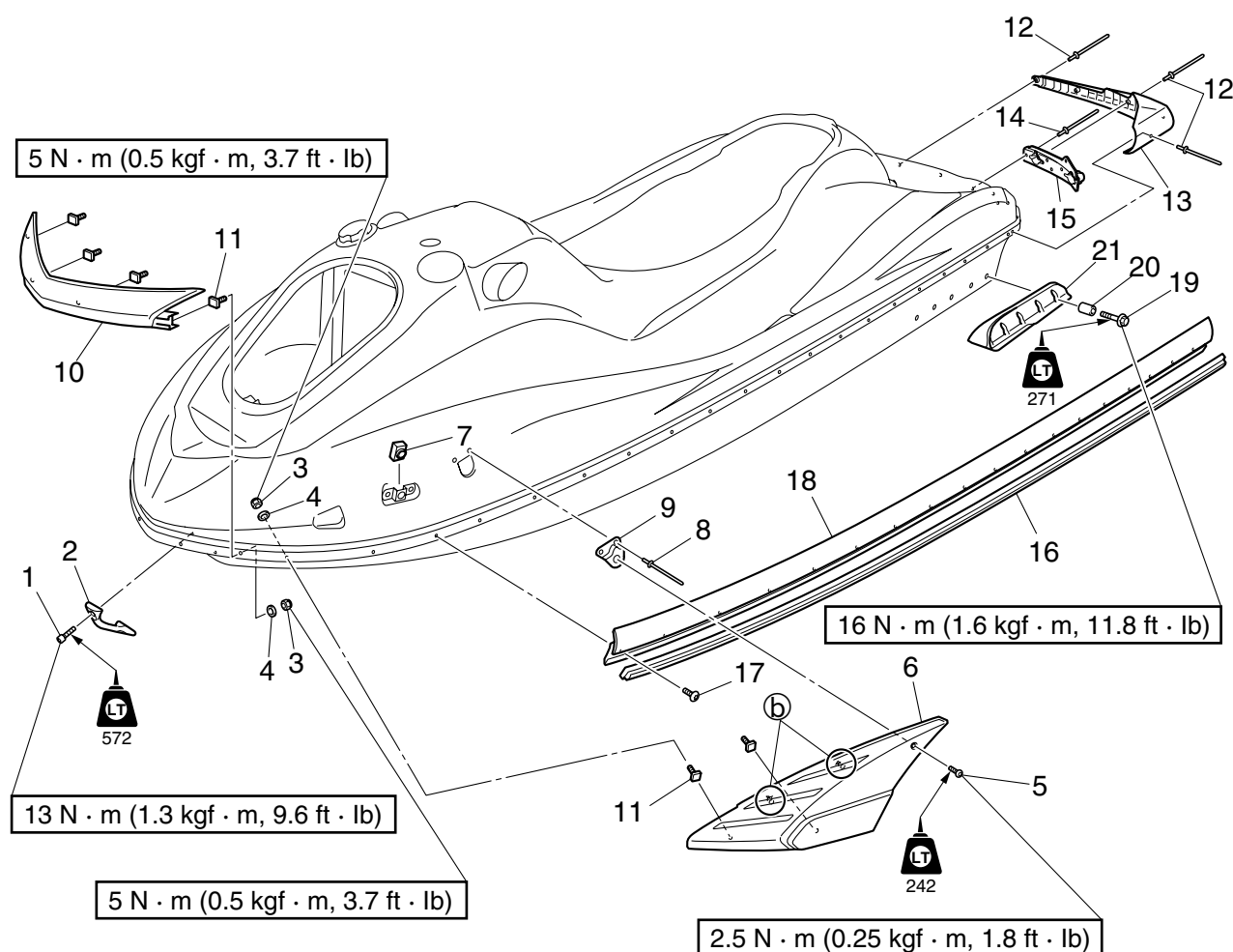
Clamp:
3.7 N·m (0.37 kgf·m, 2.7 ft·lb)

Deck and hull

Deck and hull disassembly 1

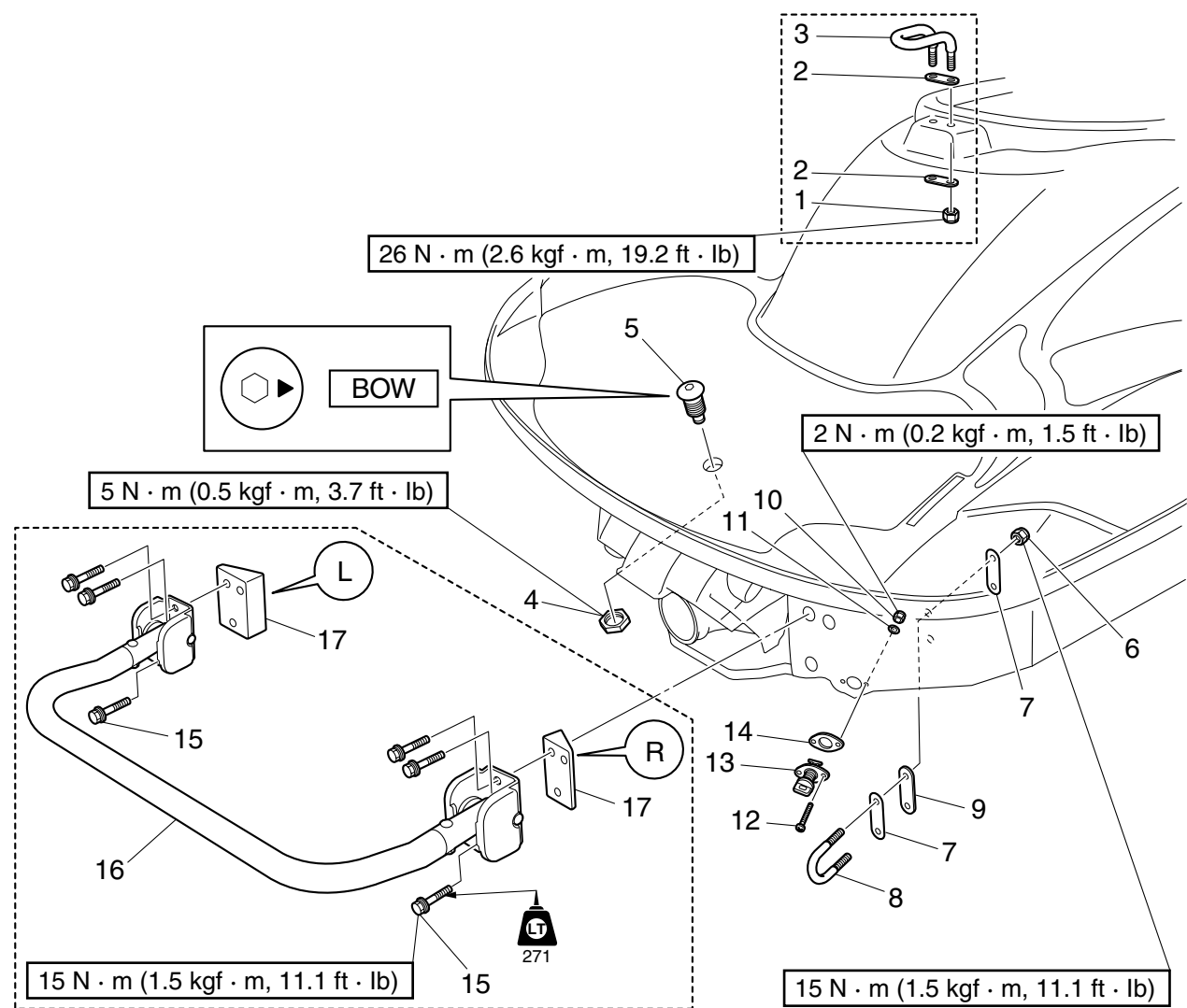


Step	Part name	Q'ty	Remarks
1	Bolt	2	M6 × 20 mm
2	Bow eye	1	
3	Nut	8	
4	Washer	8	
5	Bolt	2	M6 × 15 mm
6	Front protector 1	2	
7	Grommet	2	
8	Rivet	4	Not reusable
9	Bracket	2	
10	Front protector 2	1	
11	Bolt	8	M6 × 25 mm
12	Rivet	9	Not reusable

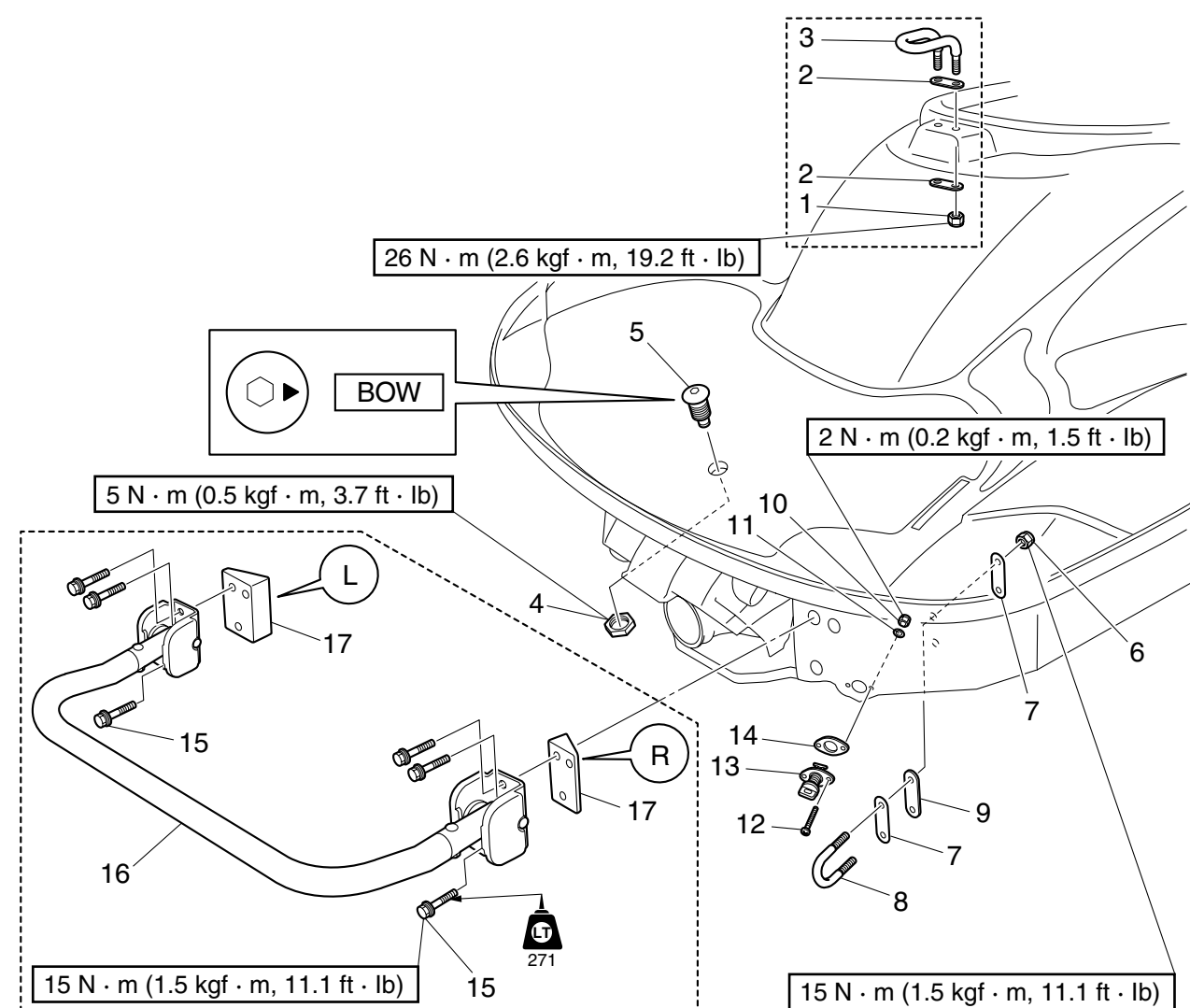


Step	Part name	Q'ty	Remarks
13	Rear protector	2	Not reusable ø5 × 12 mm M8 × 40 mm
14	Rivet	10	
15	Gunwale bracket	2	
16	Inner gunwale	2	
17	Screw	36	
18	Side gunwale	2	
19	Bolt	10	
20	Collar	10	
21	Sponson	2	

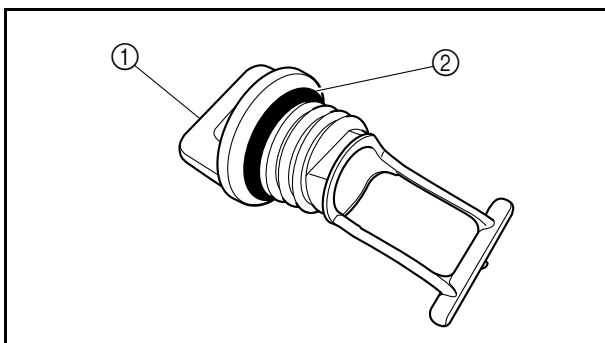
Deck and hull disassembly 2



Step	Part name	Q'ty	Remarks
1	Nut	2	FZS
2	Plate	2	FZS
3	Ski tow	1	FZS
4	Nut	1	
5	Spout	1	
6	Nut	4	
7	Plate	4	
8	Stern eye	2	
9	Packing	2	Not reusable
10	Nut	4	



Step	Part name	Q'ty	Remarks
11	Washer	4	$\varnothing 5 \times 25 \text{ mm}$ Not reusable $M8 \times 48 \text{ mm}$ FZS FZS FZS
12	Screw	4	
13	Drain plug	2	
14	Packing	2	
15	Bolt	6	
16	Reboarding step assembly	1	
17	Spacer	2	

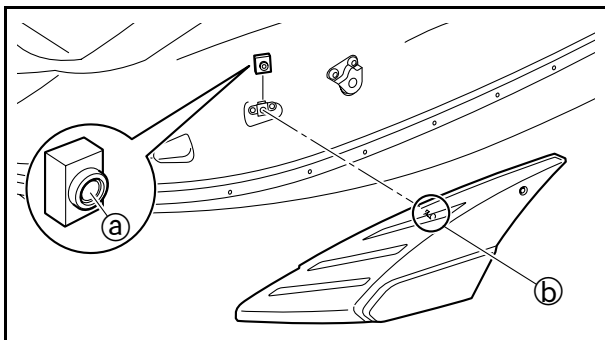


Drain plug check

1. Check:

- Drain plug ①
- O-ring ②

Cracks/damage → Replace the drain plug.



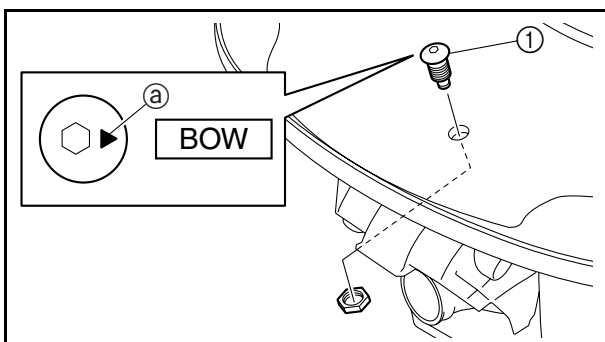
Front protector 1 installation

1. Install:

- Front protectors

TIP

Apply soapy water to the inner surfaces (a) of the grommets before installing the projections (b) of the front protectors.



Spout installation

1. Install:

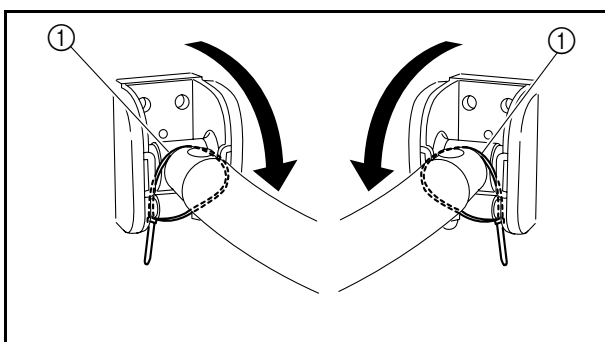
- Spout ①

TIP

Face the mark (a) toward the bow.



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



Reboarding step installation (FZS)

1. Install:

- Reboarding step

Installation steps:

1. Fasten the brackets on 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:
15 N·m (1.5 kgf·m, 11.1 ft·lb)
LOCTITE 271

**HULL
HOOD**



Deck and hull

E

— MEMO —

Chapter 9

Troubleshooting

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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® 2000, Windows XP, or Windows Vista (for Ver. 1.32), 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.

TIP

Make sure to use YDIS (Ver. 1.30 or Ver. 1.32) 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: FZR, FZS

1	Engine speed	11	Fuel injection duration	21	No-Wake mode switch
2	Intake pressure ^(*1)	12	Engine temperature	22	Cruise assist switch
3	Throttle position sensor 1 ^(*2)	13	Intake temperature ^(*6)	23	Cruise assist up switch
4	Throttle valve opening (0-90)	14	Ex.manifold water temp. sensor ^(*7)	24	Cruise assist down switch
5	Throttle position sensor 2 ^(*3)	15	Engine stop lanyard switch ^(*8)	25	Reverse switch ^(*11)
6	Accelerator position sensor 1 ^(*4)	16	Overheat thermoswitch ^(*9)	26	Main relay ^(*12)
7	Accelerator position sensor 2 ^(*5)	17	Slant detection switch	27	ETV relay
8	Atmospheric pressure	18	Oil press switch ^(*10)	28	Fuel pump relay ^(*12)
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): Thermoswitch

(*10): Oil pressure switch

(*11): Reverse sensor

(*12): Main and fuel pump relay

TIP

All of the items (1–28) will be displayed in YDIS. However, because the FZR and FZS are not equipped with the functions for items 21–24, “OFF” will always be displayed for these items.

4. **Stationary test:** Operation tests can be performed with the engine off.

Items: FZR, FZS

1	Ignite ignition coil (#1–#4)	2	Operate injector (#1–#4)	3	Operate electric fuel pump ^(*)
---	------------------------------	---	--------------------------	---	---

(*) : 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. You can also save the ECM record data in a file so that you can read and display the graph later.

Items: FZR, FZS

1	Engine speed	3	Throttle position sensor	5	Intake pressure ^(*)
2	Battery voltage (12–16)	4	Engine temperature	6	Oil press switch ^(*)

(*) : Intake air pressure

(*) : Oil pressure switch

7. **ECM record data graph:** When a malfunction occurs in the engine control system, 4 seconds (2 seconds before and after the malfunction) of recorded data is 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: FZR, FZS

1	Engine speed	10	Ref. TPS voltage ^(*7)	19	No-Wake mode
2	Accelerator position sensor 1 ^(*1)	11	Ref. acc. pos. sensor voltage ^(*8)	20	Low-RPM mode
3	Accelerator position sensor 2 ^(*2)	12	Target TPS voltage for ISC ^(*9)	21	Engine stop lanyard switch ^(*11)
4	Steering sensor	13	Engine stop mode	22	Main relay ^(*12)
5	Throttle position sensor 1 ^(*3)	14	Engine start mode	23	ETV relay
6	Throttle position sensor 2 ^(*4)	15	Engine stop mode with SW ^(*10)	24	Overheat thermoswitch ^(*13)
7	Intake pressure ^(*5)	16	OTS mode	25	Oil press switch ^(*14)
8	Battery voltage	17	Cruise assist mode	26	Warning
9	Target TPS voltage ^(*6)	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

TIP

- To display the data and graphs, refer to the YDIS (Ver. 1.30 or Ver. 1.32) Instruction Manual.
- All of the items (1–27) will be displayed in YDIS. However, because the FZR and FZS are not equipped with the functions for items 17 and 19, no data will be recorded for these items.

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



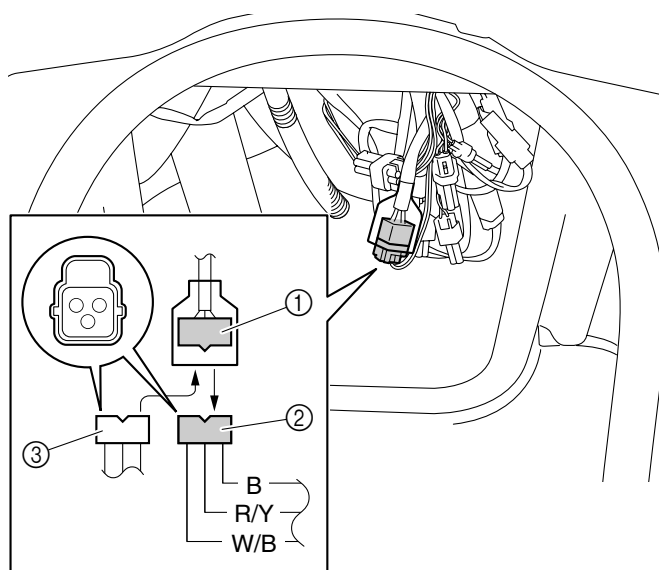
2



3

Operating

Connecting the communication cable to the watercraft



- ① Wiring harness coupler
- ② Meter coupler
- ③ 3-pin communication coupler

TIP

Be careful not to pinch the communication cable between the front hood and the deck or to damage it.

Engine unit troubleshooting

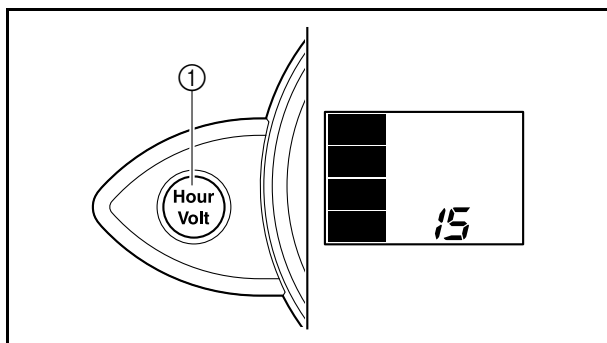
TIP

- 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 dual analog meter unit 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 troubleshooting (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, make 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, make sure to delete the diagnosis record after checking the input voltage.
-

Using the YDIS for engine unit troubleshooting

TIP

- 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 is described in the “Diagnostic code table”, 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 “Hour Volt” button ① for approximately 8 seconds and check if a diagnostic code is indicated on the dual analog meter unit.

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 dual analog meter unit. However, because the dual analog meter unit 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		
		Dual analog meter unit	YDIS	
			Diagnosis	Diagnosis record
01	Normal	○	—	—
13	Pulser coil ^(*1) malfunction	○	○	○
15	Engine temp sensor ^(*2) malfunction	○	○	○
17	Knock sensor malfunction	○	○	○
19	Battery voltage malfunction	○	○	○
23	Intake temp sensor ^(*3) malfunction	○	○	○
24	Cam position sensor malfunction	○	○	○
29	Intake press sensor ^(*4) malfunction	○	○	○
47	Slant detection switch malfunction	○	○	○
55	Steering sensor malfunction	○	○	○
65	EX. manifold water temp. sensor ^(*5) malfunction	○	○	○
78	Reverse switch ^(*6) 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	○	○	○
252	Overheat warning	—	—	○
253	Low oil pressure warning	—	—	○

(*1): Pickup coil

(*2): Engine temperature sensor

(*3): Intake air temperature sensor

(*4): Intake air pressure sensor

(*5): Thermo sensor

(*6): Reverse sensor

Diagnostic code and checking step

Diagnostic code	Item	Symptom	Checking steps	Refer to page
13	Pulser coil ^(*1) malfunction	Engine will not start	1. Measure the pickup coil output peak voltage.	7-13
			2. Measure the pickup coil resistance.	7-13
			3. Check the white/black (W/B) and black/orange (B/O) pickup coil wiring harness leads for continuity.	WD
15	Engine temp sensor ^(*2) malfunction	Trolling speed is unstable ^(*3)	1. Check the engine temperature using the YDIS.	9-1
			2. Measure the engine temperature sensor input voltage.	7-22
			3. Check the black/yellow (B/Y) and black/orange (B/O) engine temperature sensor wiring harness leads for continuity.	WD
			4. Measure the engine temperature sensor resistance.	7-22
17	Knock sensor malfunction	Normal operation	1. Check that the knock sensor is installed correctly.	5-95
			2. Measure the knock sensor resistance.	7-26
			3. Check the green (G) knock sensor wiring harness lead for continuity.	WD
19	Battery voltage malfunction	Trolling speed is unstable ^(*3)	1. Check the battery voltage using the YDIS.	9-1
			2. Check the fuse for continuity.	7-44
			3. Measure the stator coil output peak voltage.	7-14
			4. Measure the rectifier regulator output peak voltage.	7-16
			5. Check the battery cables and terminals for proper connection.	8-43

(^{*1}): Pickup coil

(^{*2}): Engine temperature sensor

(^{*3}): This symptom may only be exhibited in certain environmental conditions.

WD: Refer to the wiring diagram.

Diagnosis code	Item	Symptom	Checking steps	Refer to page
23	Intake temp sensor ^(*1) malfunction	Trolling speed is unstable ^(*3)	1. Check the intake air temperature using the YDIS.	7-23
			2. Measure the intake air temperature sensor input voltage.	7-23
			3. Check the black/red (B/R) and black/orange (B/O) intake air temperature sensor wiring harness leads for continuity.	WD
			4. Measure the intake air temperature sensor resistance.	7-23
24	Cam position sensor malfunction	Engine speed is limited	1. Measure the cam position sensor input voltage.	7-34
			2. Check the orange (O), green/orange (G/O), and black/orange (B/O) cam position sensor wiring harness leads for continuity.	WD
			3. Measure the cam position sensor output voltage.	7-34
29	Intake press sensor ^(*2) malfunction	Engine stalls Trolling speed is unstable ^(*3)	1. Check the intake air pressure using the YDIS.	9-1
			2. Measure the intake air pressure sensor input voltage.	7-25
			3. Check the orange (O), pink/green (P/G), and black/orange (B/O) intake air pressure sensor wiring harness leads for continuity.	WD
			4. Check the intake air pressure sensor operation.	7-25
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.	7-35
			3. Check the blue/black (L/B) and black/orange (B/O) slant detection switch wiring harness leads for continuity.	WD
			4. Check the slant detection switch continuity.	7-35

(*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.

Diagnosis code	Item	Symptom	Checking steps	Refer to page
55	Steering sensor malfunction	Normal operation	1. Check the steering sensor operation using the YDIS.	7-36
			2. Measure the steering sensor input voltage.	7-36
			3. Check the orange/red (O/R), white/blue (W/L), and black/orange (B/O) steering sensor wiring harness leads for continuity.	WD
65	Ex. manifold water temp. sensor ^(*) malfunction	Normal operation	1. Check the thermo sensor operation using the YDIS.	9-1
			2. Measure the thermo sensor input voltage.	7-21
			3. Check the black/blue (B/L) and black/orange (B/O) thermo sensor wiring harness leads for continuity.	WD
			4. Measure the thermo sensor resistance.	7-21
78	Reverse switch ^(*) malfunction	Normal operation	1. Check the reverse sensor operation using the YDIS.	7-37
			2. Measure the reverse sensor input voltage.	7-37
			3. Check the orange (O), green/white (G/W), and black/orange (B/O) reverse sensor wiring harness leads for continuity.	WD

(*) : Thermo sensor

(*) : Reverse sensor

WD: Refer to the wiring diagram.

Diagnosis code	Item	Symptom	Checking steps	Refer to page
112 113 114	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Check the TPS output voltage and throttle valve opening using the YDIS.	7-26
			2. Check the ECM circuit for continuity.	7-38
			3. Check the ETV relay for continuity.	7-33
			4. Check the charging system. • Stator coil output peak voltage • Stator coil resistance • Rectifier regulator output peak voltage • Rectifier regulator continuity	7-14 7-14 7-16 7-16
			5. Check the fuse for continuity.	7-44
			6. Check the battery voltage and specific gravity.	3-19
			7. Check the red (R) and black (B) power supply circuit cables and leads for continuity.	WD
115 116	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Check the pink (P), orange (O), pink/black (P/B), and black/orange (B/O) throttle body assembly wiring harness leads for continuity.	WD
			2. Check the TPS output voltage and throttle valve opening using the YDIS.	7-26
			3. Check the throttle shaft and throttle inner surface for wear or damage.	5-37
117 118 119	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Check the throttle body assembly coupler terminals for rust and corrosion.	—
			2. Check the green (G) and blue (L) throttle body assembly wiring harness leads for continuity.	WD
			3. Check the ECM circuit for continuity.	7-38
121	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Cross-check the ECM or replace.	—
122	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Cross-check the throttle body assembly.	—

(*) : Throttle body assembly

WD: Refer to the wiring diagram.

Diagnosis- tic code	Item	Symptom	Checking steps	Refer to page
123	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Check the ETV relay and fuse (ETV relay) for continuity.	7-33 7-44
			2. Check the ECM circuit for continuity.	7-38
124 125 127 128	Throttle position sensor malfunction	Engine speed is limited	1. Check the pink (P), orange (O), pink/black (P/B), and black/orange (B/O) throttle body assembly wiring harness leads for continuity.	WD
			2. Check the ECM circuit for continuity.	7-38
126	Throttle position sensor malfunction	Engine speed is limited	1. Check the TPS output voltage using the YDIS.	7-26
			2. Check the ECM circuit for continuity.	7-38
129	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Check the TPS output voltage using the YDIS.	7-26
			2. Check the ETV relay and fuse (ETV relay) for continuity.	7-33 7-44
131 132 133 134	Accelerator position sensor malfunction	Engine speed is limited	1. Check the APS output voltage using the YDIS.	7-29
			2. Check the APS circuit for continuity.	7-29
			3. Measure the APS 1 and 2 resistance.	7-29
135	Accelerator position sensor malfunction	Engine speed is limited	1. Measure the APS 1 and 2 resistance.	7-29
			2. Check the APS circuit for continuity.	7-29

(*) : Throttle body assembly
WD: Refer to the wiring diagram.

Diagnostic code	Item	Symptom	Checking steps	Refer to page
136 137 138 139	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Check the ECM circuit for continuity.	7-38
			2. Check the ETV relay for continuity.	7-33
			3. Check the charging system. • Stator coil output peak voltage • Stator coil resistance • Rectifier regulator output peak voltage • Rectifier regulator continuity	7-14 7-14 7-16 7-16
			4. Check the fuse for continuity.	7-44
			5. Check the battery voltage and specific gravity.	3-19
			6. Check the red (R) and black (B) power supply circuit cables and leads for continuity.	WD
141	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Check the ECM circuit for continuity.	7-38
			2. Check the ETV relay and fuse (ETV relay) for continuity.	7-33 7-44
142	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Check the TPS output voltage and throttle valve opening using the YDIS.	7-26
			2. Check the throttle shaft and throttle inner surface for wear or damage.	5-37
143 144	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Check the ECM circuit for continuity.	7-38
			2. Check the ETV relay for continuity.	7-33
			3. Check the charging system. • Stator coil output peak voltage • Stator coil resistance • Rectifier regulator output peak voltage • Rectifier regulator continuity	7-14 7-14 7-16 7-16
			4. Check the fuse for continuity.	7-44
			5. Check the battery voltage and specific gravity.	3-19
			6. Check the red (R) and black (B) power supply circuit cables and leads for continuity.	WD
145	Electronic throttle system ^(*) malfunction	Engine speed is limited	1. Check the ETV relay and fuse (ETV relay) for continuity.	7-33 7-44
			2. Check the throttle shaft and throttle inner surface for wear or damage.	5-37

(*)1: Throttle body assembly

WD: Refer to the wiring diagram.

Diagnosis- tic code	Item	Symptom	Checking steps	Refer to page
252	Overheat warning	Engine speed is limited	1. Check the cooling water passages for obstructions.	2-18
			2. Measure the engine temperature sensor resistance.	7-22
			3. Check that there is no short circuit between the black/yellow (B/Y) and black/orange (B/O) engine temperature sensor wiring harness leads*.	WD
			4. Check the thermoswitch for continuity.	7-19
			5. Check that there is no short circuit between the pink (P) and black/orange (B/O) thermoswitch wiring harness leads*.	WD
			6. Measure the thermo sensor resistance.	7-21
			7. Check that there is no short circuit between the black/blue (B/L) and black/orange (B/O) thermo sensor wiring harness leads*.	WD
253	Low oil pressure warning	Engine speed is limited	1. Check the oil pressure switch for continuity.	7-18
			2. Check that there is no short circuit in the pink/white (P/W) oil pressure switch wiring harness lead*.	WD
			3. Check the oil passages for obstructions.	2-17

WD: Refer to the wiring diagram.

*: Disconnect the sensor coupler or switch coupler, and then check that there is no short circuit at the coupler (wiring harness end).

Engine unit troubleshooting (diagnostic code not detected)

Troubleshooting when diagnostic codes are not available consists of the following 3 items.

Symptom 1: Specific trouble conditions

Symptom 2: Trouble conditions of an area or individual part

Cause: The content considered as the trouble factors for symptom 2

—: Not applicable

Symptom 1: Engine does not crank.

Symptom 2	Cause	Checking step	Refer to page
Starter motor does not operate	Yamaha Security System set to lock mode	Check that the Yamaha Security System is set to the unlock mode.	7-56
	Discharged battery	Check the battery voltage and specific gravity.	3-19
	Loose connection of battery terminal	Check the battery cable and terminal for proper connection.	8-43
	Blown fuse	Check the fuse for continuity.	7-44
	Starter relay malfunction	Check the starter relay.	7-47
	Engine start switch malfunction	Check the engine start switch. (left handlebar switch)	7-44
	Short, open, or loose connection in starter motor circuit	Measure the starter relay input voltage.	7-47
		Check the wiring harness.	WD
	Starter motor malfunction	Disassemble and check the starter motor.	7-49
	Stuck piston or crankshaft	Disassemble and check the engine unit.	5-100
	Stuck impeller	Disassemble and check the jet pump unit.	6-9
Starter motor operates, but the engine does not crank	Idle gear or starter clutch malfunction	Check the idle gear, starter clutch, or crankshaft Woodruff key.	5-79

WD: Refer to the wiring diagram.

Symptom 1: Engine will not start (engine cranks).

Symptom 2	Cause	Checking step	Refer to page
Throttle valve does not move properly.	Throttle lever squeezed	Check that the throttle lever is in the fully closed position.	—
	Throttle cable installed incorrectly	Adjust the throttle lever free play.	3-5
	APS malfunction	Measure the APS 1 and 2 resistance.	7-29
	TPS malfunction	Check the throttle valve opening.	7-26
	Throttle valve malfunction	Check the throttle body assembly.	5-37
Discharged battery	Battery performance decrement	Check the battery voltage and specific gravity.	3-19
	Stator coil assembly malfunction	Check the stator coil assembly.	7-14
	Short, open, or loose connection in charging circuit	Check the battery cable and terminal for proper connection.	8-43
		Check the wiring harness.	WD
ECM does not operate	Blown fuse	Check the fuse for continuity.	7-44
	Main and fuel pump relay malfunction	Check the main and fuel pump relay.	7-45
	Short, open, or loose connection in ECM circuit	Measure the ECM input voltage.	7-38
		Check the ECM circuit for continuity.	7-38
	ECM malfunction	Replace the ECM.	—
Spark plug does not spark (all cylinders)	Engine shut-off cord (lanyard) clip not installed	Check that the engine shut-off cord (lanyard) clip is installed properly.	7-44
	Engine stop switch malfunction	Check the engine stop switch continuity. (left handlebar switch)	7-44
	Pickup coil malfunction	Measure the pickup coil output peak voltage.	7-13
		Measure the pickup coil resistance.	7-13
	Short, open, or loose connection in pickup coil circuit	Check the white/black (W/B) and black/orange (B/O) pickup coil wiring harness leads for continuity.	WD
	Short, open, or loose connection in ignition coil circuit	Measure the ignition coil input voltage (from the battery).	7-10
		Check the red/yellow (R/Y), black (B), black/red (B/R), black/white (B/W), black/yellow (B/Y), and black/green (B/G) ignition coil wiring harness leads for continuity.	WD
	ECM malfunction	Measure the ECM output peak voltage.	7-10

WD: Refer to the wiring diagram.

Symptom 2	Cause	Checking step	Refer to page
Fuel not supplied (all cylinders)	Fuel leakage	Check the fuel hose.	3-10
	Blown fuse	Check the fuse for continuity.	7-44
	Clogged fuel pump filter	Clean the fuel pump filter.	4-7
	Fuel pump module malfunction	Check the fuel pump module operation sound using the YDIS.	7-42
		Measure the fuel pump module input voltage.	7-42
		Check the blue (L) and black (B) fuel pump module wiring harness leads for continuity.	WD
	Main and fuel pump relay malfunction	Check the main and fuel pump relay.	7-45
	Fuel not supplied to the fuel rail	Measure the fuel pressure.	4-11
Compression pressure is low	Compression leakage	Measure the compression pressure.	3-13
		Measure the valve clearance.	3-11
		Check the camshaft for damage.	5-56
		Check the cylinder head gasket and cylinder head warpage.	5-68
		Check the valve and valve seat for wear.	5-73
		Check the piston and piston ring for damage.	5-104 5-105
		Check the cylinder for damage.	5-107
	Improper valve timing	Check the timing chain.	5-58

WD: Refer to the wiring diagram.

Symptom 1: Unstable engine idle speed, poor acceleration, poor performance, or limited engine speed

Symptom 2	Cause	Checking step	Refer to page
Throttle valve does not move properly	Throttle cable installed incorrectly.	Adjust the throttle lever free play.	3-5
	Throttle valve malfunction	Check the throttle body assembly.	5-37
Spark plug does not spark (some cylinders)	Spark plug malfunction	Check the spark plug.	3-18
	Ignition coil malfunction	Check the ignition spark.	7-10
	Short, open, or loose connection in ignition coil circuit	Measure the ignition coil input voltage (from the battery).	7-10
		Check the red/yellow (R/Y), black (B), black/red (B/R), black/white (B/W), black/yellow (B/Y), and black/green (B/G) ignition coil wiring harness leads for continuity.	WD
	ECM malfunction	Measure the ECM output peak voltage.	7-10
Fuel not supplied (some cylinders)	Fuel injector malfunction	Check the fuel injector operation sound using the YDIS.	7-41
		Measure the fuel injector resistance.	7-41
		Check the fuel injector O-ring.	4-1
	Short, open, or loose connection in fuel injector circuit	Measure the fuel injector input voltage.	7-41
		Check the red/yellow (R/Y), purple/red (Pu/R), purple/black (Pu/B), purple/yellow (Pu/Y), and purple/green (Pu/G) fuel injector wiring harness leads for continuity.	WD
	Clogged fuel injector filter	Clean the fuel injector.	4-8
	ECM malfunction	Replace the ECM.	—
Compression pressure is low	Compression leakage	Measure the compression pressure.	3-13
		Measure the valve clearance.	3-11
		Check the camshaft for damage.	5-56
		Check the cylinder head gasket and cylinder head warpage.	5-68
		Check the valve and valve seat for wear.	5-73
		Check the piston and piston ring for damage.	5-104 5-105
		Check the cylinder for damage.	5-107
	Improper valve timing	Check the timing chain.	5-58

WD: Refer to the wiring diagram.

Symptom 1: High engine idle speed

Symptom 2	Cause	Checking step	Refer to page
—	Throttle cable installed incorrectly.	Adjust the throttle lever free play and check the cable routing.	3-5

Symptom 1: Limited engine speed

Symptom 2	Cause	Checking step	Refer to page
- Buzzer sounds intermittently - Overheat warning indicator blinks - Check engine warning indicator blinks	Clogged cooling water passage	Check the cooling water pilot outlet for water discharge.	—
		Check the cooling water passage.	2-18
	Thermostat malfunction	Check the thermostat.	5-30
- Buzzer sounds intermittently - Oil pressure warning indicator blinks	Insufficient engine oil	Check the engine oil level.	3-14
		Check for engine oil leakage.	2-17
		Check the oil passage.	2-17
	Oil pressure switch malfunction	Check the oil pressure switch continuity.	7-18
		Check that there is no short circuit in the pink/white (P/W) oil pressure switch wiring harness lead.	WD
—	APS malfunction	Check the APS.	3-5 7-29
	TPS malfunction	Check the throttle body assembly.	5-37 7-26
	Shift lever malfunction	Check the reverse sensor.	7-37

WD: Refer to the wiring diagram.

Symptom 1: Discharged battery

Symptom 2	Cause	Checking step	Refer to page
—	Battery performance decrease	Check the battery voltage and specific gravity.	3-19
	Loose connection of battery terminal	Check the battery cable and terminal for proper connection.	8-43
	Short, open, or loose connection in charging circuit	Check the charging circuit for wiring connection and damage.	WD
	Stator coil malfunction	Measure the stator coil output peak voltage.	7-14
		Measure the stator coil resistance.	7-14
	Rectifier regulator malfunction	Measure the rectifier regulator output peak voltage.	7-16

WD: Refer to the wiring diagram.

Symptom 1: Poor performance

Symptom 2	Cause	Checking step	Refer to page
Watercraft cannot reach high speeds	Jet pump unit malfunction	Check the impeller, impeller duct, and intake grate.	6-9
	Water entered hull	Check the drain plugs and O-rings for damage.	8-50
		Check the cooling water hoses for damage.	2-18
		Check the water lock, water tank, and rubber hoses for damage.	8-45
		Check the exterior of the hull for damage.	—

— MEMO —

Wiring diagram

FZR, FZS

- 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 Thermoswitch
- 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 Buzzer
- ㉟ Fuel pump module
- ㊱ Steering sensor
- ㊲ Fuel sender
- ㊳ Dual analog meter unit
- ㊴ Speed sensor
- ㊵ Switch assembly
- ㊶ Engine start switch
- ㊷ Engine stop switch
- ㊸ Engine shut-off switch

Ⓐ To entry box

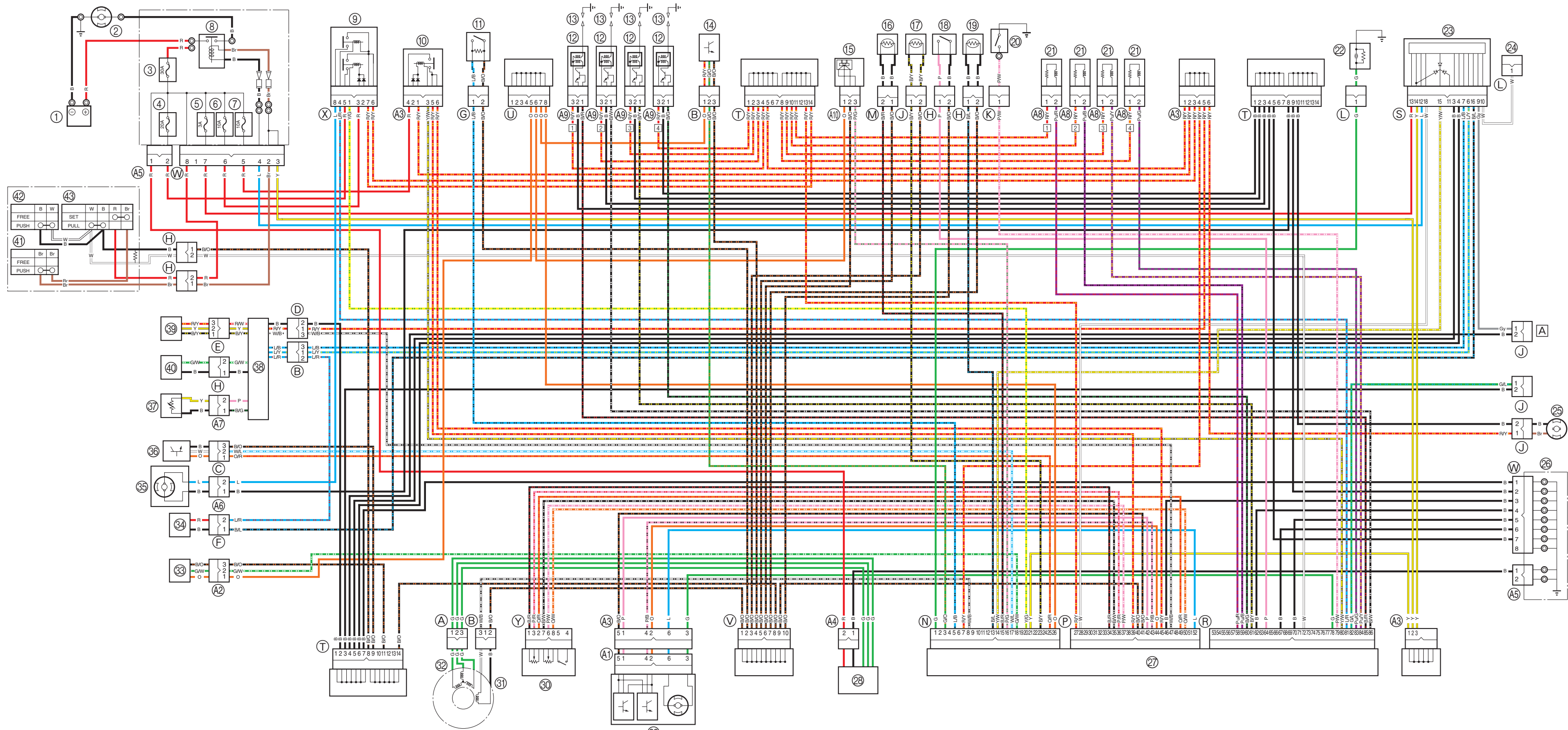
Color code

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/Y	: Purple/yellow
R/Y	: Red/yellow
W/B	: White/black
W/L	: White/blue
Y/G	: Yellow/green
Y/W	: Yellow/white



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FZR, FZS



	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)
B															