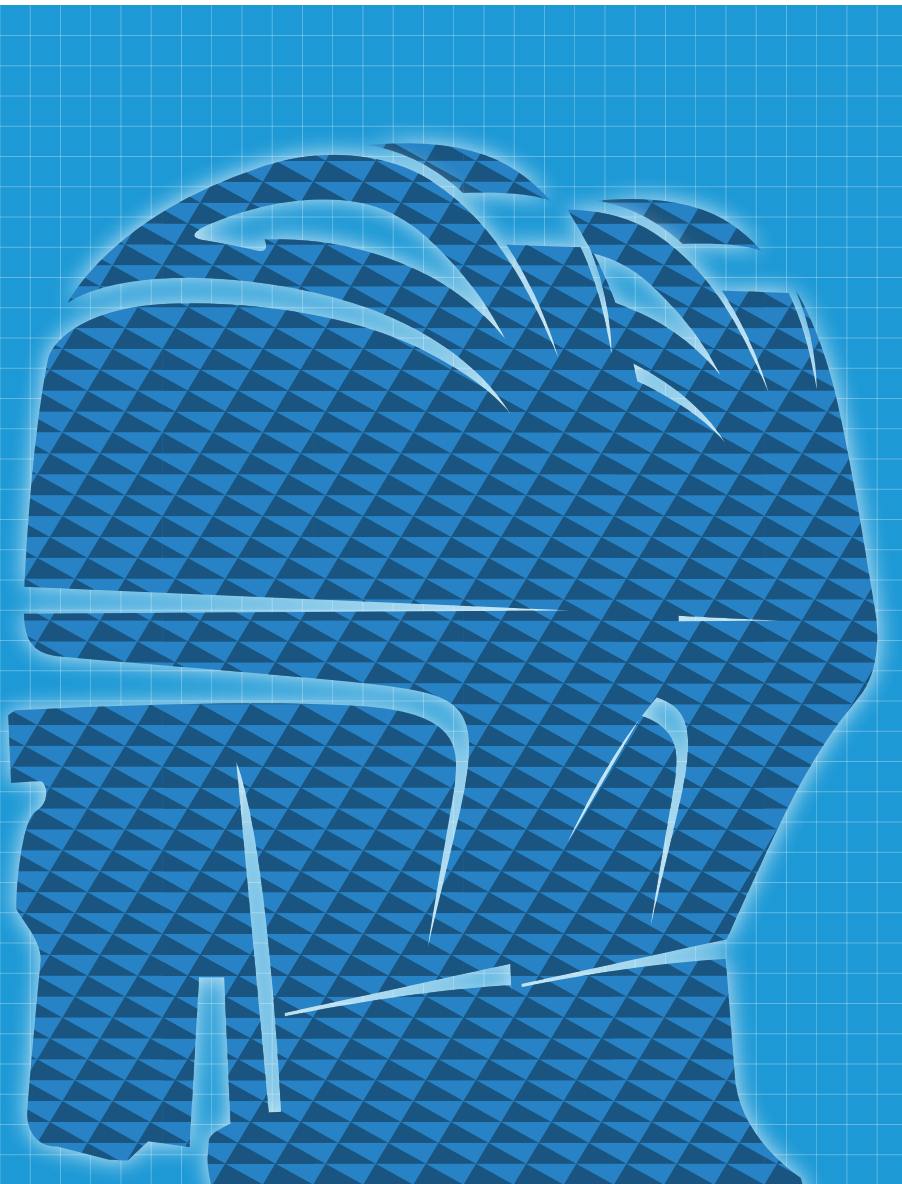




F75F ^(6JX)

F100G ^(6JY)



SERVICE MANUAL

6JY-28197-Z0-11


Preface

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 the Bronze Technical Certificate of the YTA (Yamaha Technical Academy) marine or the equivalent 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 subsequent editions of this manual. Also, up-to-date parts information is available on YPEC-web. Additional information and up-to-date information on Yamaha products and services are available on Yamaha Service Portal.

Important information

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

: This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

WARNING

A WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

NOTICE

A NOTICE indicates special precautions that must be taken to avoid damage to the outboard motor or other property.

TIP:

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

**F75F, F100G
SERVICE MANUAL
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6JY-28197-Z0-11**

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Model information

Applicable model

This manual applies to the following models.

Model name	Approved model code	Starting serial No.
F75FET	6JX	1000001–
F75FEHT	6JX	
F100GET	6JY	
F100GEHT	6JY	

Model name designation

F 100 G EHT X

1 2 3 4 5

1	Model category	F: 4-stroke
2	Output horsepower	75/100
3	Model generation	F/G
4	Model variation	Level 1: Starting method E: Electric start Level 2: Control method None: Remote control without tiller handle H: Tiller handle Level 3: Trim and tilt method T: PT/T (Power trim and tilt)
5	Motor transom height	L: (20 in) X: (25 in)

General feature

- Commercial models based on the F90C (6FP) and F100F (6HJ)
- External designs of L4 engines (115, 130, 150, 200 HP) preserved.
- Electronic fuel injected, 4-stroke, L4, SOHC, 16-valve, 1832 cm³ (111.8 cu. in) engine
- Low exhaust emissions conform to EU2, US EPA, CARB 3-STAR, and JBIA regulations (F100G (6JY)).

a. Power unit

- Spiny cylinder sleeve
- Offset cylinder
- Damperless flywheel
- Large diameter intake and exhaust valve heads
- Single big bore throttle body
- Long intake manifold
- Low noise exhaust system
- Simple SOHC valve system

b. Electrical

- Fuse box with built-in relays
- Electronic fuel injection control
- ISC (Idle Speed Control)
- Knock control
- Over-revolution control
- Fail-safe
- Self-diagnosis system with YDIS (2.40 and later versions)
- Alert systems including low oil pressure, overheat, and water detection
- High generator output (maximum 35 A)
- Water-cooled rectifier/regulator
- Built-in hour meter (tiller handle model)
- 6Y5 digital tachometer (remote control model)
- Tilt limiter (optional)

c. Bracket unit

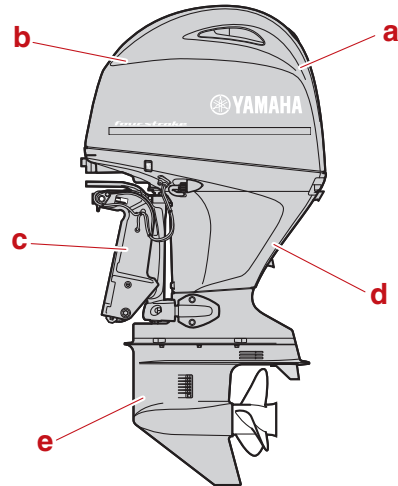
- Single ram PTT unit
- Long span mount

d. Upper case

- 2-piece upper casing
- Labyrinth idle exhaust system

e. Lower unit

- Lower unit, shared with F115B (6EK).



Important safety and service information

Important safety and service information

To prevent an accident or injury and to provide quality service, observe the following information.

Rotating parts

- Hands, feet, hair, jewelry, clothing, personal flotation device straps, and so on, can become entangled with internal rotating parts of the engine, resulting in serious injury or death.
- Keep the top cowling installed whenever possible. Do not remove or install the top cowling when the engine is running.
- Only operate the engine with the top cowling removed according to the specific instructions in the manual. Keep hands, feet, hair, jewelry, clothing, personal flotation device straps, and so on, away from any exposed moving parts.

Hot parts

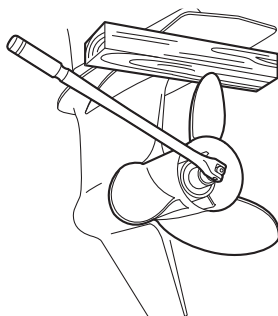
During and after operation, engine parts are hot enough to cause burns. Do not touch any parts under the top cowling until the engine has cooled.

Electric shock

Do not touch any electrical parts while starting or operating the engine. Otherwise, shock or electrocution could result.

Propeller

Do not hold the propeller with your hands when loosening or tightening the propeller nut. Sharp propeller edges can cause injury. Place a wood block between gear case and propeller to hold the propeller for removal and installation.



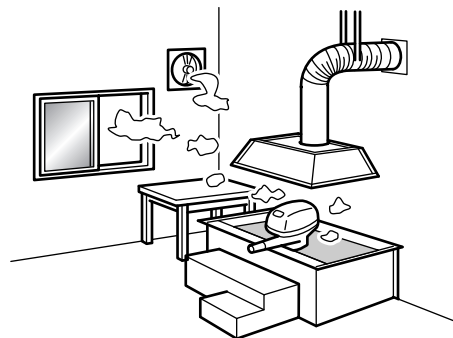
Handling of gasoline

- Gasoline is highly flammable. Keep gasoline and all flammable products away from heat, sparks, and open flames.
- Gasoline is poisonous and can cause injury or death. Handle gasoline with care. Never siphon gasoline by mouth. If you swallow some gasoline, inhale a lot of gasoline vapor, or get some gasoline in your eyes, see your doctor immediately. If gasoline spills on your skin, wash with soap and water. If gasoline spills on your clothing, change your clothes.



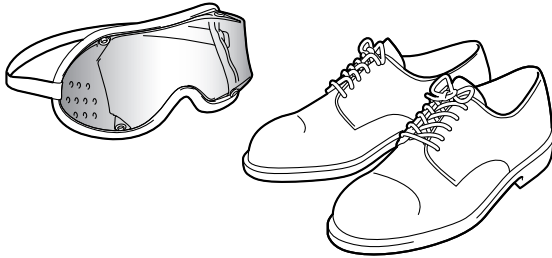
Ventilation

- Gasoline vapor and exhaust gases are heavier than air and extremely poisonous. If gasoline vapor or exhaust gases are inhaled in large quantities, it may cause loss of consciousness and death within a short time.
- When test running an engine indoors (for example, in a water tank) make sure to do so where adequate ventilation can be maintained.



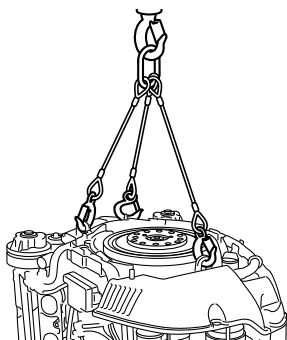
Self-protection

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



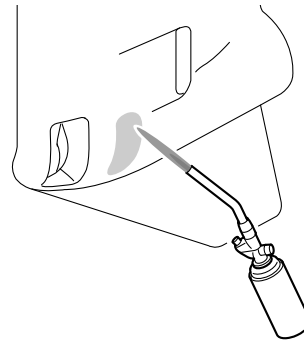
Lifting outboard motors

- Outboard motors weighing 18 kg (40 lb) and over must be carried by a crane or equivalent.
- Use a wire cable lifting harness of adequate strength to lift up the outboard motor in a stable manner.
- Lift and suspend the outboard motor in a stable manner using the designated lifting attachment points.
- Do not work on or under an outboard motor while it is suspended from a lifting device. Securely mount the motor on a suitable work stand or place it on a stable work surface as soon as possible.



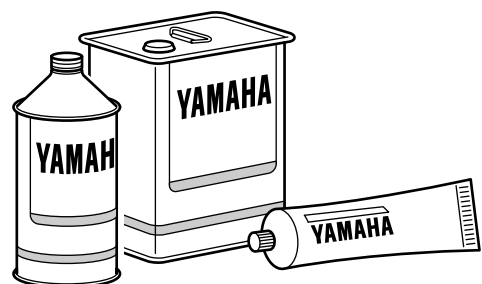
Handling of gas torch

- Improper handling of a gas torch may result in burns. For information on the proper handling of the gas torch, see the operation manual issued by the manufacturer.
- When using a gas torch, keep it away from gasoline and oil to prevent a fire.
- Components become hot enough to cause burns. Do not touch any hot components directly.



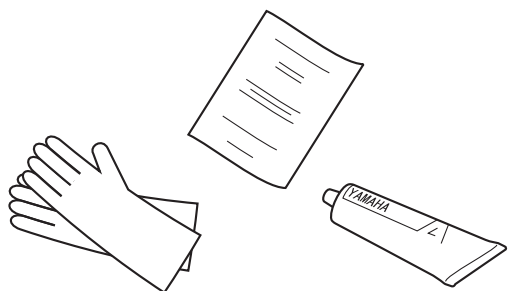
Parts, lubricants, and sealants

Use only genuine Yamaha parts, lubricants, and sealants, or those recommended by Yamaha, when servicing or repairing the outboard motor. Failures caused by the use of parts, lubricants, or sealants that are not equivalent in design and quality to genuine Yamaha parts, lubricants, or sealants will not be covered by warranty.



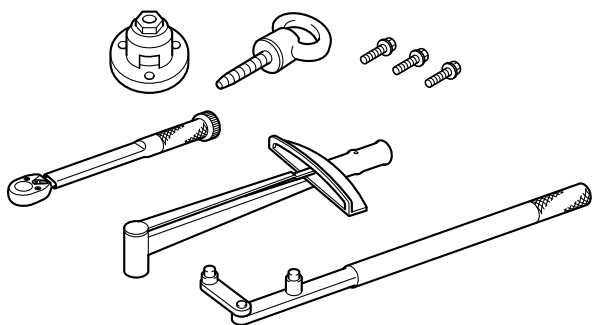
Handling of lubricants and sealants

- Follow all instructions and safety precautions provided on the product label and the material safety data sheet (MSDS/SDS) for lubricants, sealants, and other shop chemicals.
- Wear impervious gloves, eye protection, or other protective apparel when required.
- Wash skin thoroughly after contact with lubricants, sealants, and other shop chemicals, and change clothing if contaminated with them.



Special service tools

For safety and to help protect parts from damage, use the recommended special service tools.

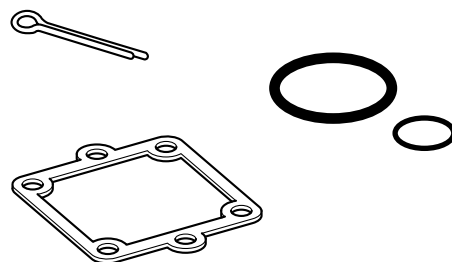


Tightening torque

When tightening nuts, bolts, and screws, follow the tightening instructions provided throughout the manual. If the tightening order is not specified, tighten the large sizes first, and then tighten the small sizes, starting from the center and moving outward.

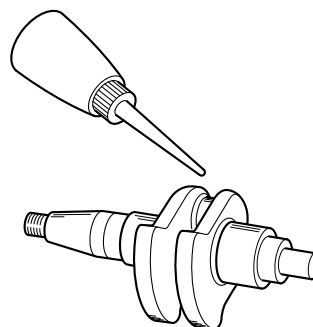
Non-reusable parts

Always use new gaskets, seals, O-rings, cotter pins, and so on, when installing or assembling parts.



Disassembly and assembly

- Use compressed air to remove dust and dirt during disassembly.
- Apply engine oil to the contact surfaces of moving parts before assembly.



- During disassembly, cover all openings, such as intake and exhaust ports, to prevent foreign materials from entering the engine. Foreign materials could cause severe internal damage when the engine is started.
- Install bearings so that the bearing identification mark is facing in the direction indicated in the installation procedure. In addition, make sure to lubricate the bearings liberally.
- Apply a thin coat of water resistant grease to the lip and periphery of an oil seal before installation.
- Check that moving parts operate normally after assembly.
- When starting the engine after reassembly, check for fuel and water leaks from hoses and pipes that were disconnected or removed while servicing.
- When assembling the PTT/PT unit, do not use a rag. Otherwise, dust and particles could get on the PTT/PT unit components, causing poor performance.

Disposal of used components and chemicals

Obey all federal, state and local regulations when disposing of used components and/or chemicals such as crate frames, replaced parts, gaskets, oil, and so on.

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 following information as a guide for effective and quality service.

- Parts are shown and detailed in an exploded diagram and are listed in the component list (see “1” in the following figure for an example page).
- The component list consists of the removal or disassembly order numbers (“ \downarrow ”), part names, quantities, and remarks, which indicate the bolt and screw dimensions and other information (see “2” in the following figure). For the installation or assembly procedure, reverse the order.
- Symbols are used to indicate important aspects of a procedure, such as the grade of lubricant and the lubrication points (see “3” in the following figure).
- Tightening torque specifications are provided in the exploded diagrams (see “4” in the following figure), and in the related detailed instructions. Some torque specifications are listed in stages as torque figures or angles in degrees.
- Separate procedures and illustrations are used to explain the details of removal, checking, and installation where necessary (see “5” in the following figure for an example page). Detailed explanations of the procedures are expressed by using lower case letters such as a, b, c, (see “6” in the following figure).
- Numbers enclosed in brackets are used to indicate the removal or tightening order of bolts, screws, and other parts (see “7” in the following figure).

TIP:

For troubleshooting procedures, see Chapter 4, “Troubleshooting”.

Crankcase

16 N·m (1.6 kgf·m, 12 lb·ft)
2) 60°

14 N·m (1.4 kgf·m, 10 lb·ft)
2) 28 N·m (2.8 kgf·m, 21 lb·ft)

13 N·m (1.3 kgf·m, 9.6 lb·ft)
2) 60°

#	Part name	Q'ty	Remarks
1	Bolt M8 × 55 mm	10	
2	Bolt M10 × 105 mm	10	
3	Crankcase	1	
4	Dowel pin	10	
5	O-ring	1	
6	Bolt M8 × 36 mm	8	
7	Connecting rod assembly	4	
8	Bearing	8	
9	Piston ring set	4	
10	Clip	8	
11	Pin	4	
12	Piston	4	
13	Thrust bearing	2	Locating crankcase side
14	Bearing	5	
15	Crankshaft	1	

7-46

Crankcase

a. 60°

b. Check the mark "a" on the crank web and the mark "b" on the cylinder block.

Crankscrew bolt (M10) "2" [1]-[10]
1st: 16 N·m (1.6 kgf·m, 12 lb·ft)
2nd: 60°

Crankscrew bolt (M8) "3" [11]-[20]
1st: 14 N·m (1.4 kgf·m, 10 lb·ft)
2nd: 28 N·m (2.8 kgf·m, 21 lb·ft)

h. Remove the crankcase, and then measure the width of the compressed Plastigauge (PG-1) on each crankshaft journal.

c. Select the suitable colors "1" for the crankshaft journal bearing from the "Crankshaft journal bearing selection table" (7-60).

Selecting the crankshaft journal bearing
When replacing the crankshaft journal bearing, select the bearing as follows:

- Select:
 - Crankshaft journal bearing
 - a. Remove the crankshaft journal bearings.

7-58

Conditions when testing and adjusting

Conditions can affect specifications when checking, measuring and making certain adjustments. Service data in this manual was determined under the following conditions:

- Electrical resistance for components such as ignition coils and sensors was measured at 20 °C (68 °F).
- Engine compression was measured at:
 - Sea level
 - 20 °C (68 °F)
 - All spark plugs removed
 - Throttle valve at WOT (depending on model specification)
- Trim/tilt angles shown are when the transom angle is 12 degrees.

Abbreviation


The following abbreviations are used in this service manual.

Abbreviation	Description
ECM	Electronic Control Module
ISC	Idle Speed Control
PCV	Pressure Control Valve
PT	Power Tilt
PTT	Power Trim and Tilt
TPS	Throttle Position Sensor
VST	Vapor Separator Tank
YDIS	Yamaha Diagnostic System

Color code

B	 Black	Lg	 Light green	Sb	 Sky blue
Br	 Brown	Or	 Orange	W	 White
G	 Green	P	 Pink	Y	 Yellow
Gy	 Gray	Pu	 Purple		
L	 Blue	R	 Red		

TIP:

For example, "R/Y" stands for a Red with Yellow tracer stripe wire. 

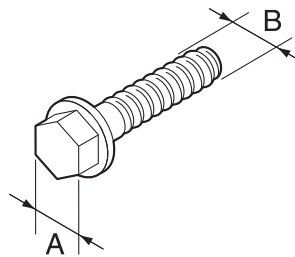
Specified tightening torque

Specified tightening torques are provided for specific nuts, bolts, and screws. Specified tightening torque specifications are provided in the exploded diagrams and in the related working instructions. When tightening these fasteners, follow the tightening torque specifications and procedures indicated throughout the manual to meet the design aims of the outboard motor.

General tightening torque

This chart indicates the tightening torques for standard fasteners with a standard ISO thread pitch.

Width across flats (A)	Thread size (B)	General torque specifications		
		N·m	kgf·m	lb·ft
8 mm	M5	5	0.5	3.7
10 mm	M6	8	0.8	5.9
12 mm	M8	18	1.8	13
14 mm	M10	36	3.6	27
17 mm	M12	52	5.2	38



Symbol








Symbol

Illustrated symbols are used to identify the specifications which appear.













Symbol	Definition	Symbol	Definition
	Filling fluid		Lubricant
	Special tool		Tightening torque
	Wear limit, clearance		Engine speed
	Electrical data	New	Replace the part with a new one.

Lubricant, sealant, and thread locking agent

Symbols in an exploded diagram or illustration indicate the grade of lubricant and the lubrication points.

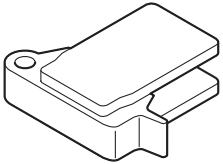


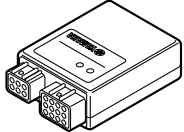
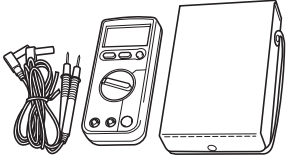
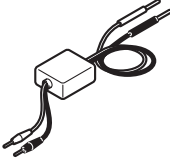

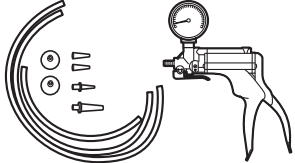
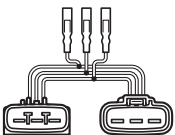
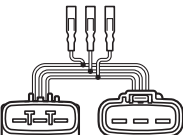
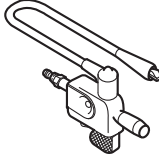
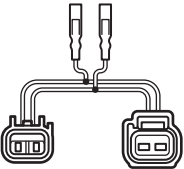
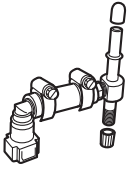
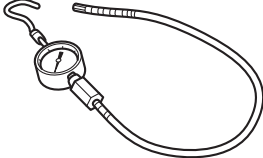
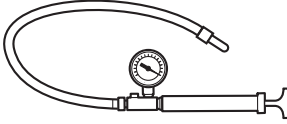

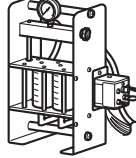
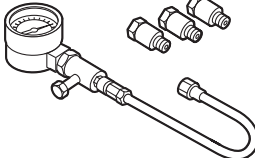
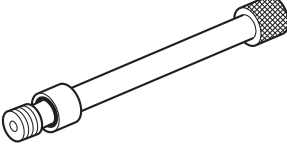
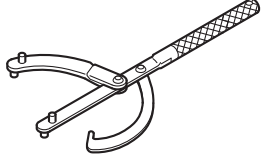
Symbol	Name	Application
	YAMALUBE 4	Lubricant
	YAMALUBE outboard gear oil	Lubricant
	Water resistant grease (Yamaha grease A)	Lubricant
	Low temperature resistant grease (Yamaha grease C)	Lubricant
	Corrosion resistant grease (Yamaha grease D)	Lubricant
	Molybdenum disulfide grease	Lubricant
	YAMAHA WR-No.2 grease	Lubricant

Symbols in an exploded diagram or illustration indicate the type of sealant or thread locking agent and the application points.

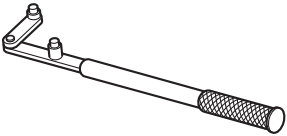
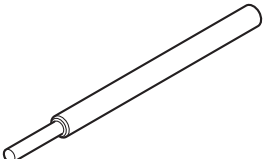
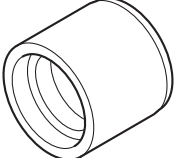
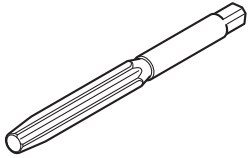
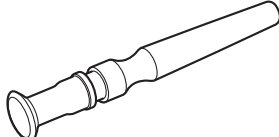
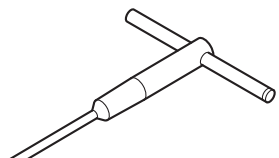

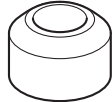
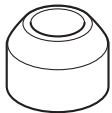
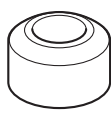
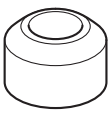
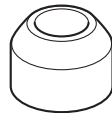
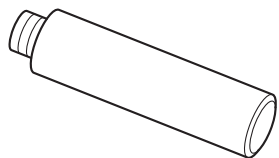
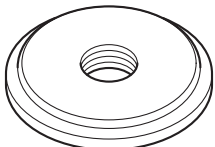
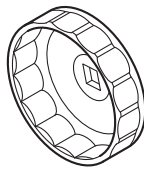
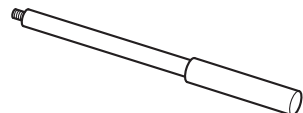
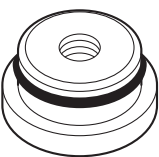
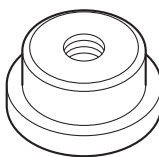
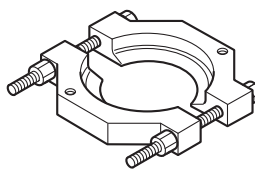
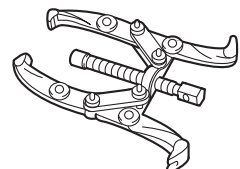
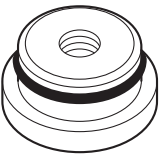
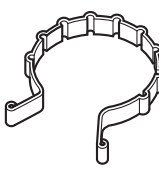
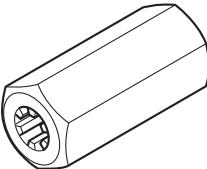
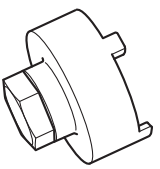
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	ThreeBond 1280B	Sealant
	ThreeBond 1303	Thread locking agent
	ThreeBond 1322D	Thread locking agent
	ThreeBond 1324	Thread locking agent
	ThreeBond 1342H	Thread locking agent
	ThreeBond 1377B	Thread locking agent
	ThreeBond 1530B	Adhesive
	ThreeBond 1533D	Sealant
	LOCTITE 242 (blue)	Thread locking agent
	LOCTITE 271 (red)	Thread locking agent
	LOCTITE 572 (white)	Sealant

Special service tool

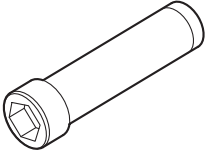
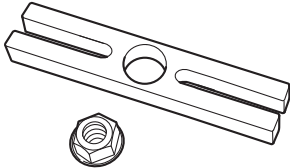
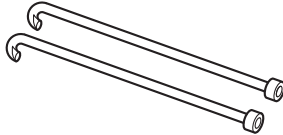
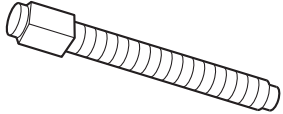
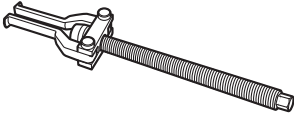
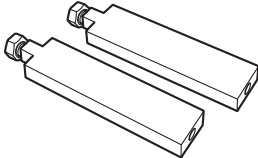
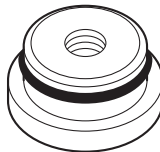
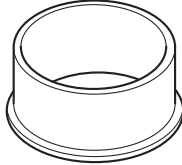
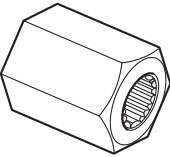
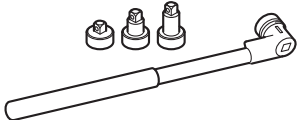
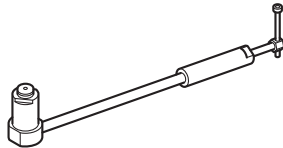
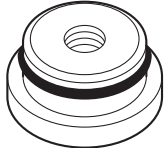
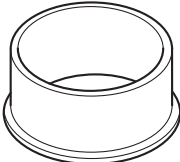
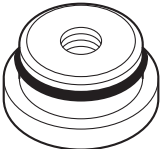
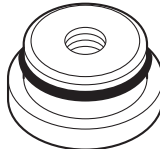
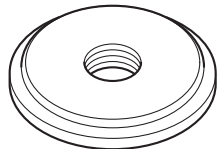
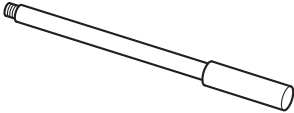
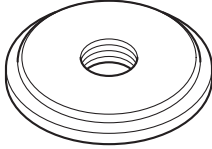
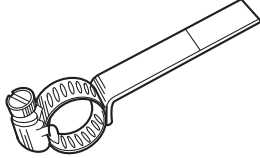
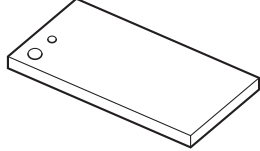

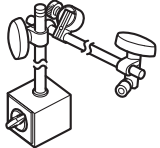
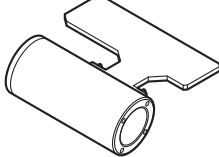
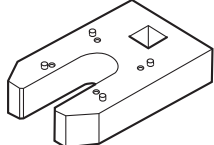
Special service tools with Yamaha part numbers (90890-*****) are distributed by the Parts Division. Some of the special service tools are only available from the Marine Service Division.

<p>Flywheel stopper B 90890-06686</p> 	<p>Lifting eye 90890-06953</p> 	<p>Bolt hexagon with washer 90890-06821</p> 	<p>YDIS 2 HARDWARE KIT II 90890-06884</p> 
<p>Digital circuit tester 90890-03243</p> 	<p>Peak voltage adapter B 90890-03172</p> 	<p>Tester leads 90890-06881</p> 	<p>Vacuum/pressure pump gauge set 90890-06945</p> 
<p>Test harness QLWD-3 90890-06923</p> 	<p>Test harness QLW-3 90890-06922</p> 	<p>Ignition checker (Spark gap tester) 90890-06754</p> 	<p>Test harness FWY-2 90890-06917</p> 
<p>Fuel pressure gauge adapter 90890-06946</p> 	<p>Fuel pressure gauge 90890-06753</p> 	<p>Leakage tester 90890-06840</p> 	<p>Small end bearing installer 90890-06528</p> 
<p>Fuel injection meter FIM20000ME</p> 	<p>Compression gauge 90890-03160</p> 	<p>Compression gauge extension M12 90890-06687</p> 	<p>Rotor holder 90890-01235</p> 

Special service tool

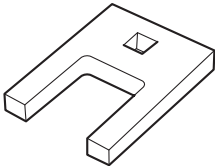
<p>Flywheel holder 90890-06522</p> 	<p>Valve guide remover/installer 90890-06801</p> 	<p>Valve guide installer 90890-06810</p> 	<p>Valve guide reamer 90890-06804</p> 
<p>Valve lapper 90890-04101</p> 	<p>Valve seat cutter holder 90890-06316</p> 	<p>Valve seat cutter 30° 90890-06326</p> 	<p>Valve seat cutter 45° 90890-06325</p> 
<p>Valve seat cutter 60° 90890-06324</p> 	<p>Valve seat cutter 30° 90890-06328</p> 	<p>Valve seat cutter 45° 90890-06312</p> 	<p>Valve seat cutter 60° 90890-06315</p> 
<p>Driver rod LS 90890-06606</p> 	<p>Bearing outer race attachment 90890-06623</p> 	<p>Oil filter wrench 90890-01426</p> 	<p>Driver rod L3 90890-06652</p> 
<p>Needle bearing attach- ment 90890-06611</p> 	<p>Needle bearing attach- ment 90890-06607</p> 	<p>Bearing separator 90890-06534</p> 	<p>Gear puller 90890-06540</p> 
<p>Needle bearing attach- ment 90890-06615</p> 	<p>Piston slider 90890-06530</p> 	<p>Shift rod socket 90890-06681</p> 	<p>Ring nut wrench 3 90890-06511</p> 

Special service tool

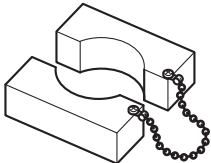
<p>Ring nut wrench extension 90890-06513</p> 	<p>Stopper guide plate 90890-06501</p> 	<p>Bearing housing puller claw L 90890-06502</p> 	<p>Center bolt 90890-06504</p> 
<p>Bearing puller assembly 90890-06535</p> 	<p>Stopper guide stand 90890-06538</p> 	<p>Needle bearing attachment 90890-06653</p> 	<p>Bearing inner race attachment 90890-06640</p> 
<p>Drive shaft holder 6 90890-06520</p> 	<p>Pinion nut holder 90890-06715</p> 	<p>Hydraulic drive shaft pusher 90890-06688</p> 	<p>Needle bearing attachment 90890-06610</p> 
<p>Bearing inner race attachment 90890-06642</p> 	<p>Needle bearing attachment 90890-06609</p> 	<p>Needle bearing attachment 90890-06613</p> 	<p>Bearing outer race attachment 90890-06628</p> 
<p>Driver rod LL 90890-06605</p> 	<p>Bearing outer race attachment 90890-06620</p> 	<p>Backlash indicator 90890-06706</p> 	<p>Magnet base plate 90890-07003</p> 
<p>Dial gauge set 90890-03238</p> 	<p>Magnet base B 90890-06844</p> 	<p>Pinion height gauge 90890-06670</p> 	<p>Cylinder end screw wrench 90890-06591</p> 

Special service tool

Tilt rod wrench
90890-06569



PTT piston vice attachment
90890-06572



Specification

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Clamp bracket dimensions.....	1-3

Specification data

For specification data, see Appendix, "Specification" (A-1).

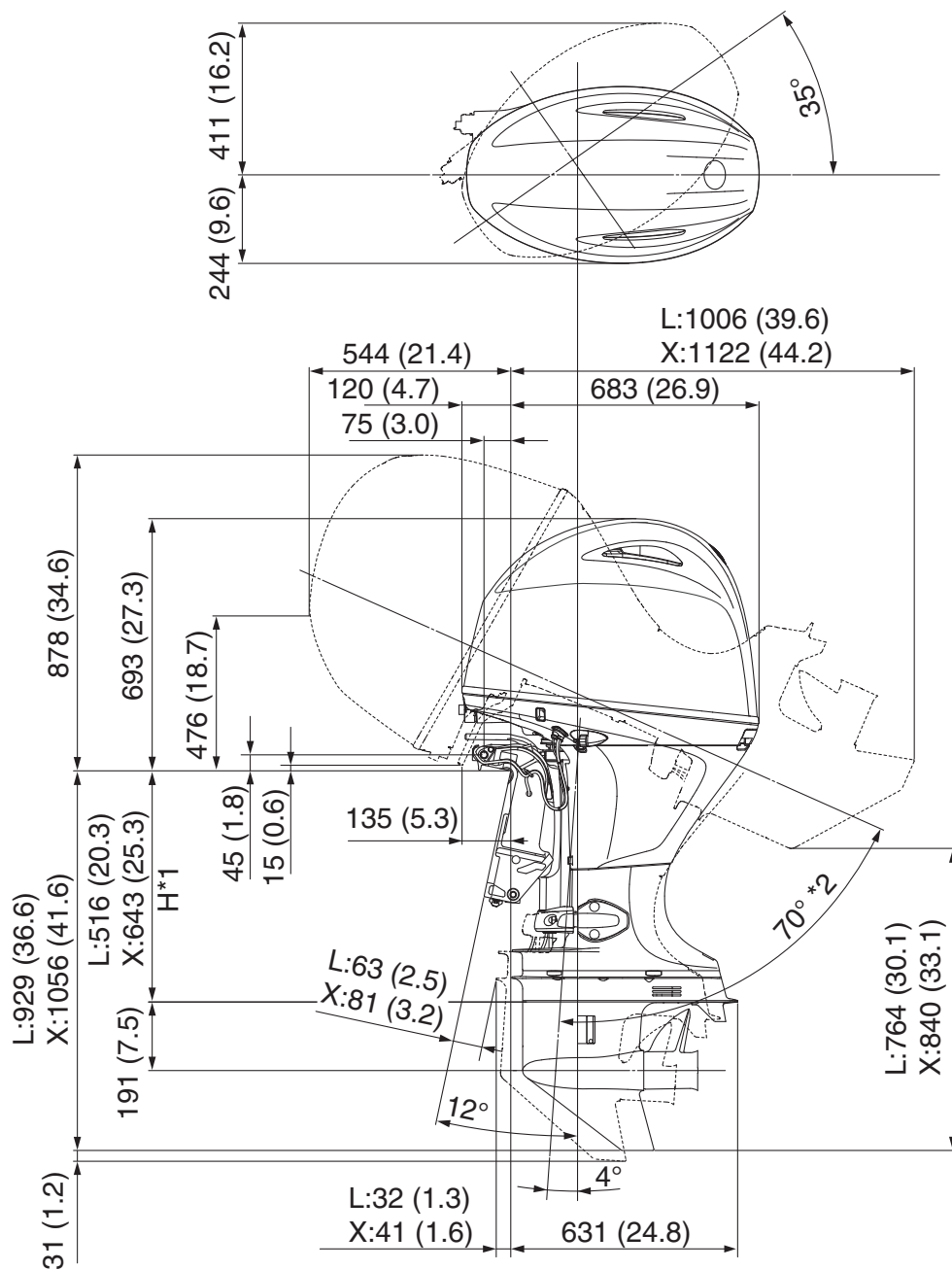
External dimensions

TIP: _____

The dimension values may include reference values.

F75FET, F100GET

mm (in)



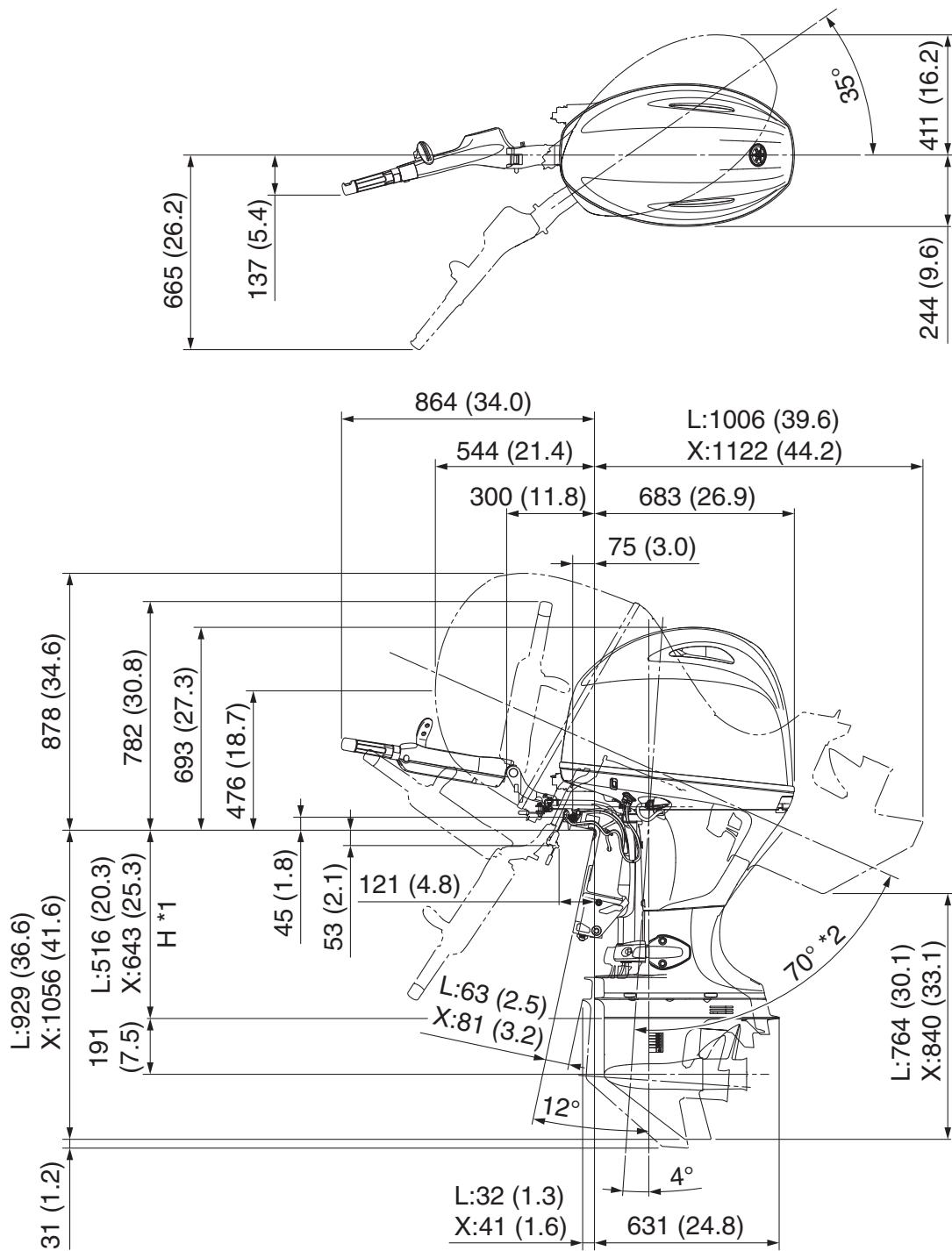
*1. Motor transom height

*2. Fully tilt-up angle (Not tilt support angle)

External dimensions

F75FEHT, F100GEHT

mm (in)



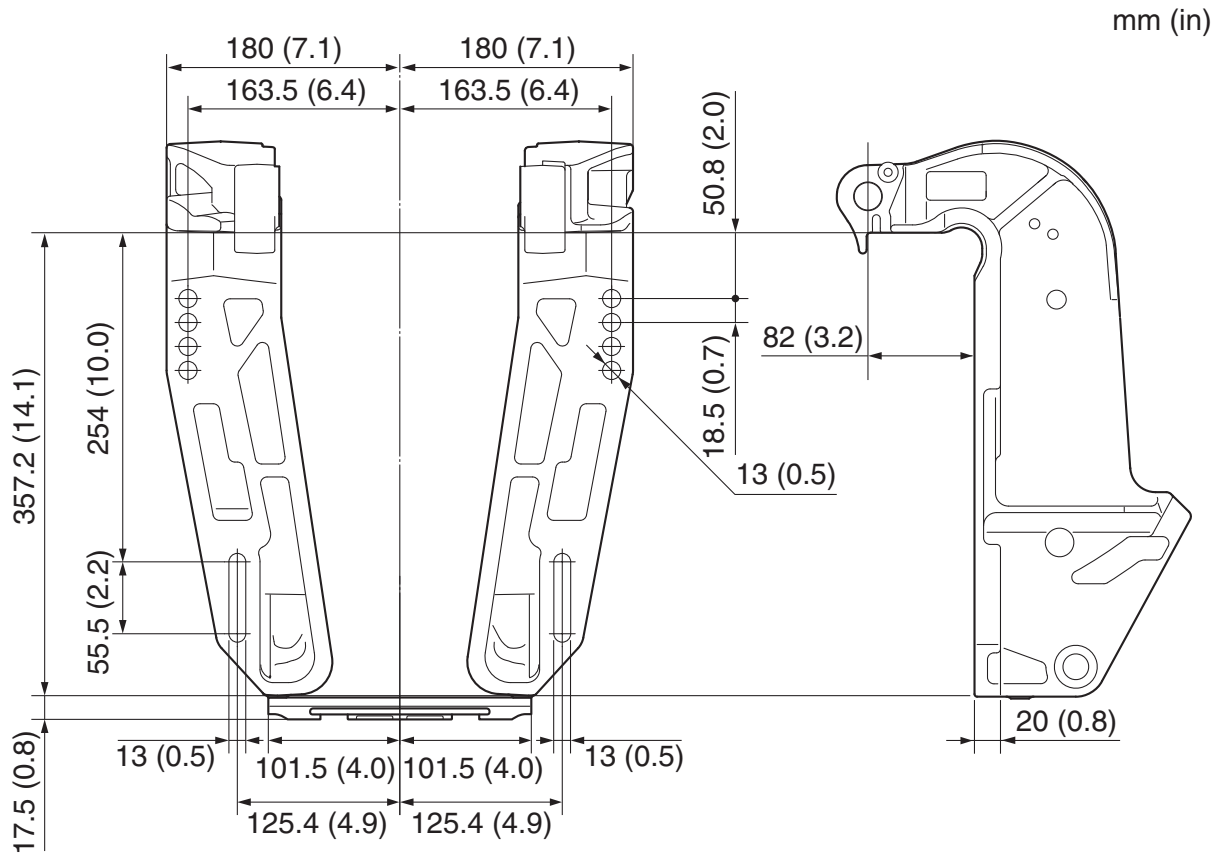
*1. Motor transom height

*2. Fully tilt-up angle (Not tilt support angle)

Clamp bracket dimensions

TIP:

The dimension values may include reference values.



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Technical feature and description

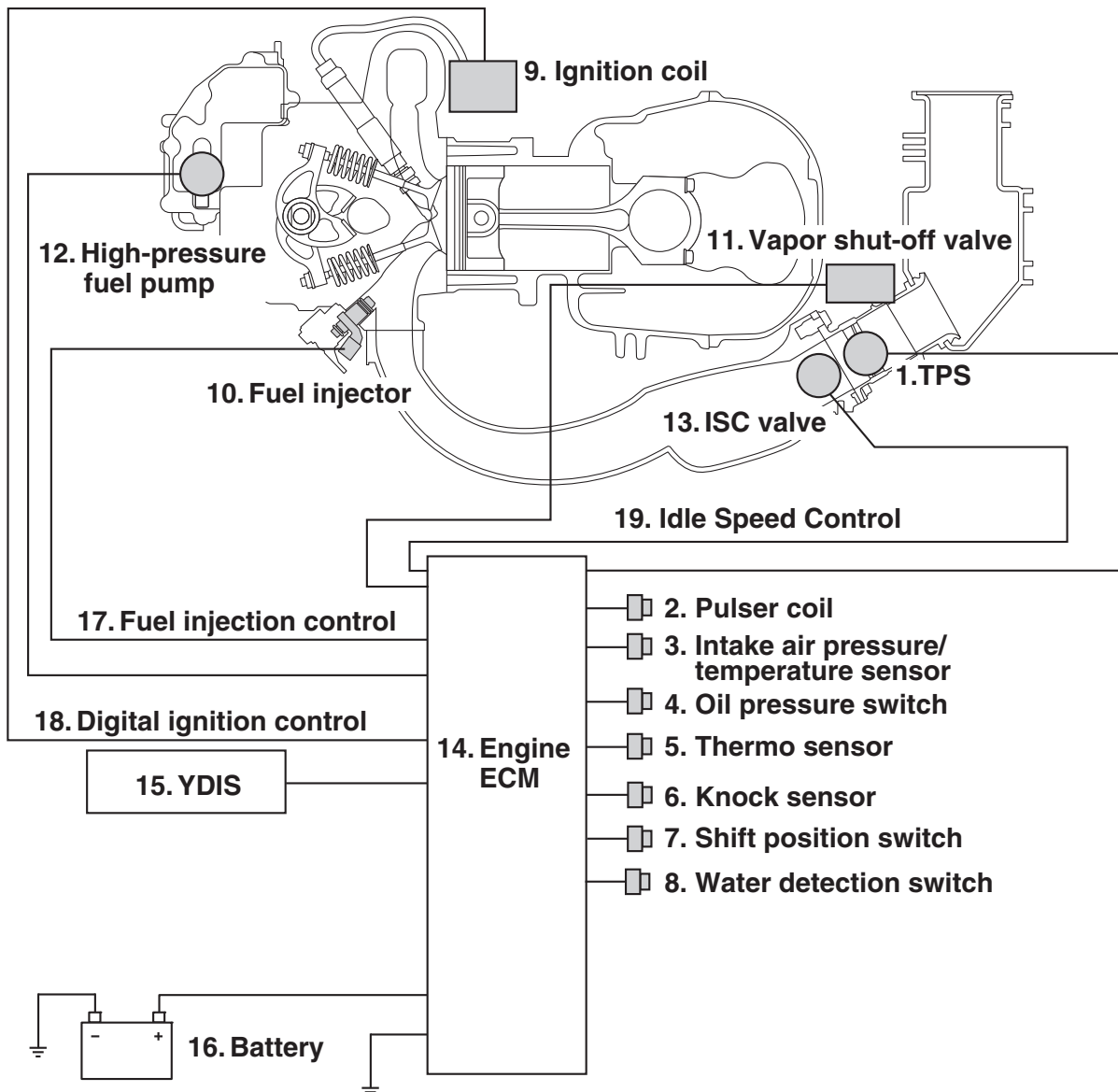
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Electronic control system

This model uses an electronic fuel injection control, digital ignition control, ISC (Idle Speed Control), knock control, over-rev control, alert control, and fail-safe control.

The engine ECM performs these controls based on signals received from each sensor and switch.

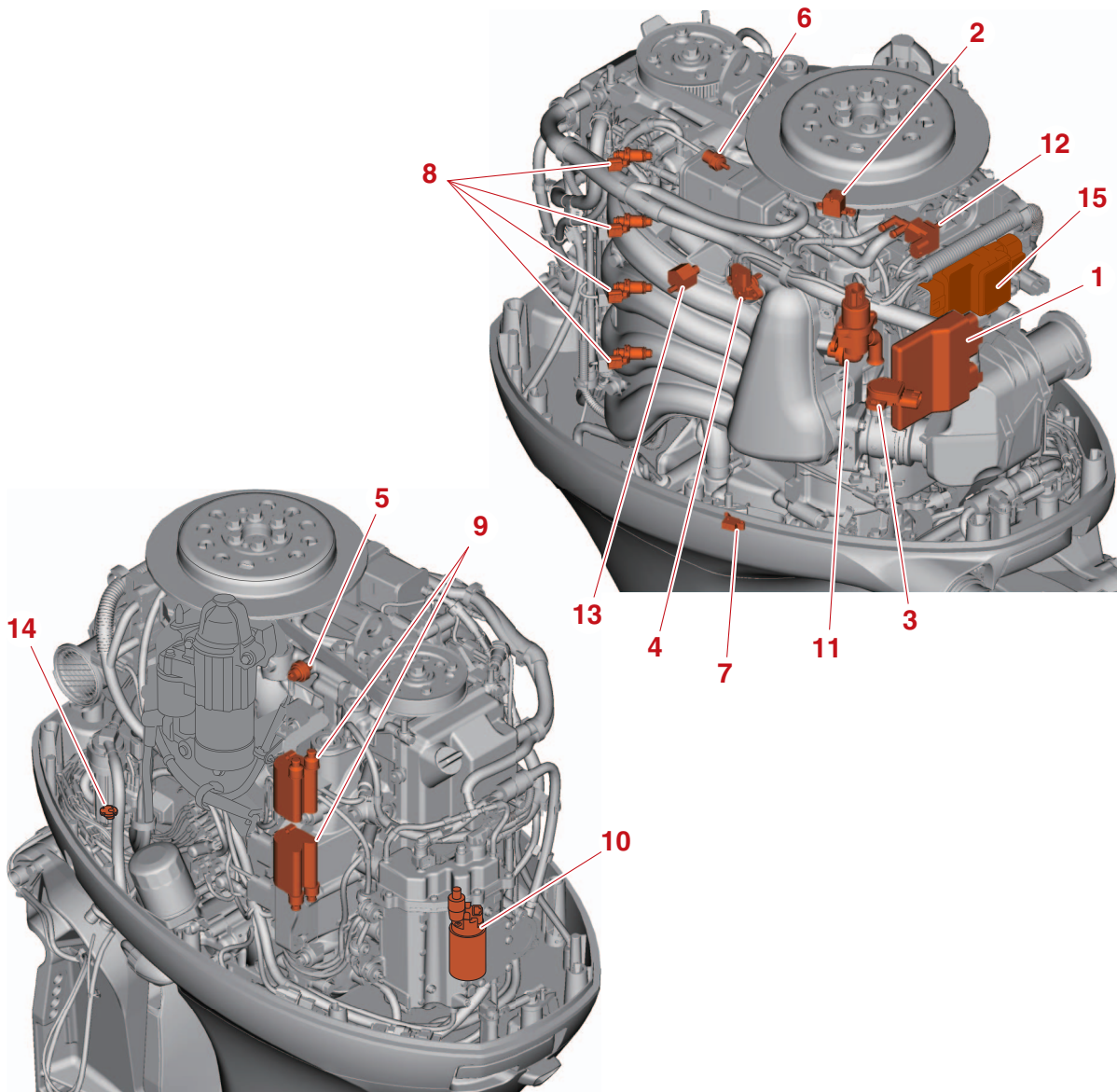
The engine ECM is equipped with a self-diagnosis function which can be used to check trouble codes on the YDIS.



1. TPS
2. Pulser coil
3. Intake air pressure/temperature sensor
4. Oil pressure switch
5. Thermo sensor
6. Knock sensor
7. Shift position switch
8. Water detection switch
9. Ignition coil

10. Fuel injector
11. Vapor shut-off valve
12. High-pressure fuel pump
13. ISC valve
14. Engine ECM
15. YDIS
16. Battery
17. Fuel injection control
18. Digital ignition control
19. Idle Speed Control

Electrical components

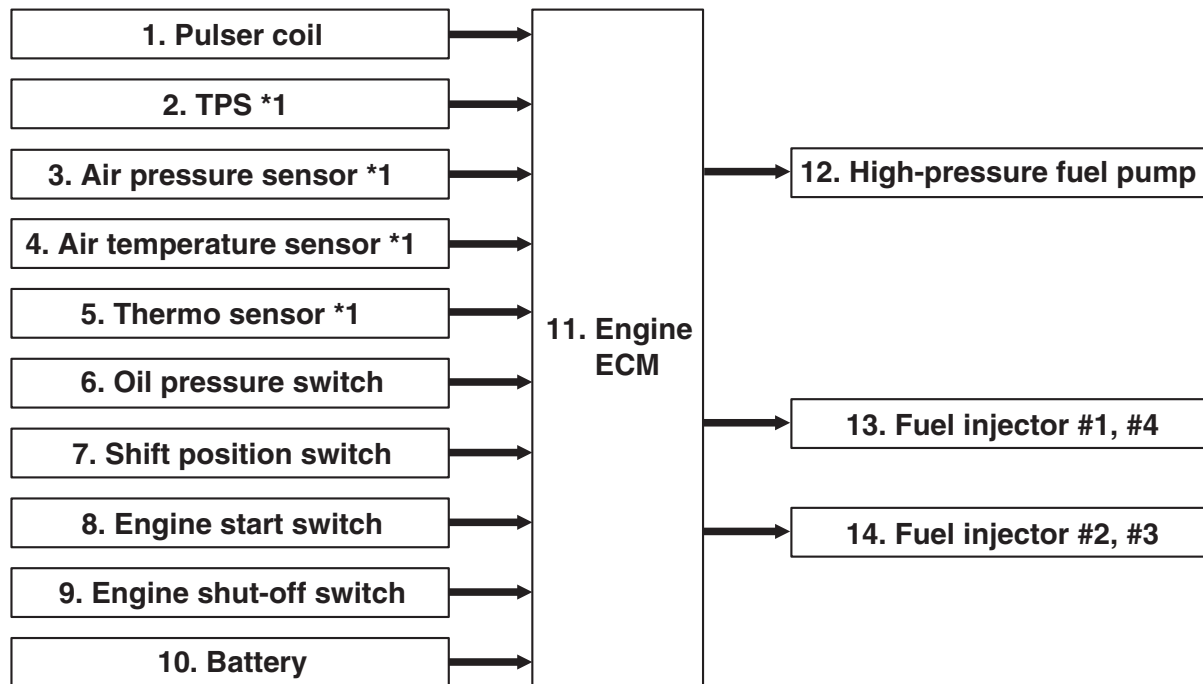


Electronic control system

Part name		Function
1	Engine ECM	Determines the engine operating conditions based on the input signals from the sensors which are installed at various locations on the engine, and transmits control signals to each actuator.
2	Pulser coil	Detects the engine speed and crankshaft angle.
3	TPS	Detects the throttle valve opening angle.
4	Intake air pressure/temperature sensor	Detects the intake air temperature and pressure.
5	Oil pressure switch	Detects oil pressure decrease.
6	Thermo sensor	Detects water temperature.
7	Shift position switch	Detects the neutral position.
8	Fuel injector	Injects fuel.
9	Ignition coil	Produces high voltage to ignite a spark plug.
10	High-pressure fuel pump	Pressurizes and feeds the fuel to the fuel rails for injection.
11	ISC valve	Adjusts the intake air distribution to the engine when the throttle valve is fully closed.
12	Vapor shut-off valve	Controls the amount of vapor gas that is sent from the VST to the intake system to be reburned.
13	Knock sensor	Detects engine knocking.
14	Water detection switch	Detects water accumulated in the fuel filter.
15	Fuse box	Contains the main relay, high-pressure fuel pump relay, starter relay, and various fuses, and controls the power supply for the electrical components of the outboard motor.

Electronic fuel injection control

The engine ECM switches the control mode between the start-up mode, normal operating mode, and fuel injection cutoff mode according to the signals from the sensors. In addition, various compensations are made to determine the actual fuel injection timing and fuel injection volume. Additionally, when the engine start switch is turned to ON, the engine ECM opens the injectors once before activating the high-pressure pump relay to prevent them from sticking.



1. Pulser coil

2. TPS *1

3. Air pressure sensor *1

4. Air temperature sensor *1

5. Thermo sensor *1

6. Oil pressure switch

7. Shift position switch

8. Engine start switch

9. Engine shut-off switch

10. Battery

11. Engine ECM

12. High-pressure fuel pump

13. Fuel injector #1, #4

14. Fuel injector #2, #3

*1. Sensors used for compensations.

Electronic control system

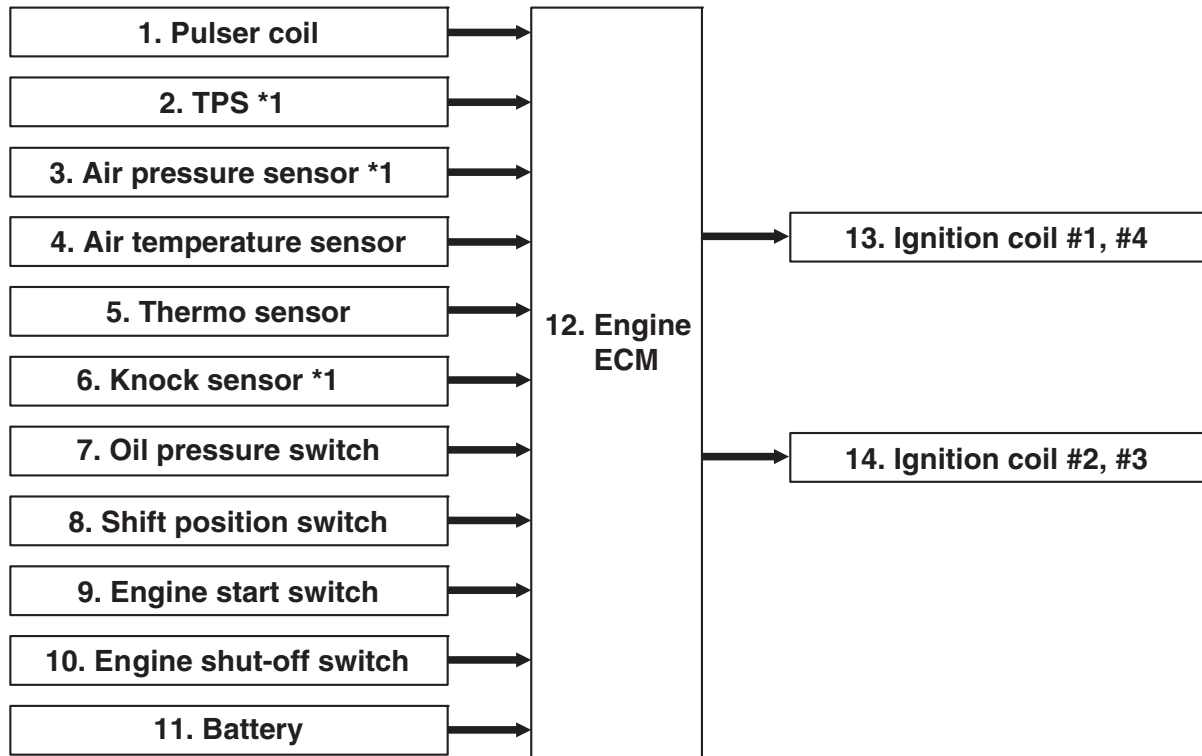
Mode	Controls performed by engine ECM	
Start-up mode	For quick engine start (to shorten cranking time), fuel is injected into all cylinders until the cylinders have been identified.	
Normal operating mode	Fuel is injected into cylinders in groups, to #1 and #4, and to #2 and #3 (to all cylinders during acceleration).	
Fuel injection cut off mode	Cutoff when engine shut-off switch is on	Fuel injection is cut when the clip is removed (engine shut-off switch: ON).
	Cutoff when over-revving	To protect the engine, fuel injection is skipped when the engine speed is more than the specified level.
	Cutoff during deceleration	To suppress generation of unburned gas and improve the fuel efficiency, fuel injection is cut during deceleration under a specific driving condition.

Ignition timing control

This model uses group ignition in cylinders #1 and #4, and in cylinders #2 and #3.

The engine ECM switches the control mode between the start-up mode, normal operating mode, and ignition cutoff mode according to the signals from the sensors.

In addition, various compensations are made to determine the actual ignition timing and the energization time of current to the ignition coil.



- | | |
|---------------------------|----------------------------|
| 1. Pulser coil | 8. Shift position switch |
| 2. TPS *1 | 9. Engine start switch |
| 3. Air pressure sensor *1 | 10. Engine shut-off switch |
| 4. Air temperature sensor | 11. Battery |
| 5. Thermo sensor | 12. Engine ECM |
| 6. Knock sensor *1 | 13. Ignition coil #1, #4 |
| 7. Oil pressure switch | 14. Ignition coil #2, #3 |

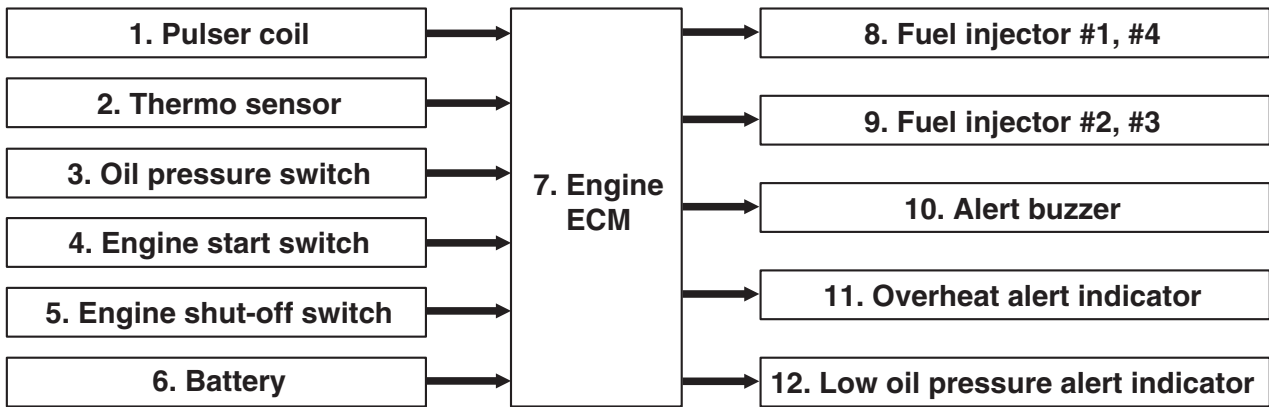
*1. Sensors used for compensations.

Electronic control system

Mode	Control items	Controls performed by engine ECM
Start-up mode	Ignition timing when starting	Ignition takes place in all cylinders at BTDC 10° during cranking.
Normal operating mode	Normal ignition timing	Ignition timing is set based on signals from the pulser coil and the TPS, and all necessary compensations are made.
Ignition cut-off mode	Ignition cutoff when engine shut-off switch is on	Ignition is cut when the clip is removed (engine shut-off switch: ON).

Engine protection control

When engine overheating or low oil pressure is detected, the engine ECM controls fuel injection to protect the engine.



- 1. Pulser coil
- 2. Thermo sensor
- 3. Oil pressure switch
- 4. Engine start switch
- 5. Engine shut-off switch
- 6. Battery

- 7. Engine ECM
- 8. Fuel injector #1, #4
- 9. Fuel injector #2, #3
- 10. Alert buzzer
- 11. Overheat alert indicator
- 12. Low oil pressure alert indicator

Control name	Condition	Controls performed by ECM
Overheat control	Cooling water temperature is 80 °C (176 °F) or more after approximately 1 minute have elapsed since the engine was started or after engine speed is 2000 r/min or more for more than approximately 20 seconds.	Fuel injection will be controlled to limit engine speed to approximately 2000 r/min. The overheat alert indicator comes on, and the alert buzzer sounds. Control stops when the cooling water temperature is less than 70 °C (158 °F).
Low oil pressure control	The oil pressure switch is ON for a specified time after 5 seconds have elapsed since the engine was started with the engine speed more than 1000 r/min (the time required for judgement varies depending on the cooling water temperature, engine speed, and so on).	Fuel injection will be controlled to limit engine speed to approximately 2000 r/min. The low oil pressure alert indicator comes on, and the alert buzzer sounds.

ISC valve control

The engine ECM adjusts the opening of the ISC valve so that engine speed is maintained at a target value when the throttle valve is fully closed.

Knock control

The engine ECM receives a knock signal from the knock sensor that is installed to the cylinder block. To protect the engine from damage, the engine ECM retards the ignition timing and decreases the engine speed according to the amount of knocking.

If the knocking occurs frequently, the ignition timing is retarded until knocking is no longer detected, and the retarded ignition timing is maintained, using the learning function.

Regardless of the preceding conditions, the knock control also activates when the thermo sensor is malfunctioning.

	Water temperature	
Engine speed	53 °C (127.4 °F) or less	More than 53 °C (127.4 °F)
More than 500 r/min	Knock control does not activate	Knock control activates

Battery removal control

If the battery terminal has been removed, the fuel injection and ignition for all cylinders are shut-off to stop the engine and protect the rectifier/regulator.

Fail-safe

In the fail-safe control, the engine ECM enters the fail-safe control mode when an electrical component malfunctions.

The fail-safe control system records the trouble codes according to the engine trouble conditions.

Trouble code	Item	Trouble conditions to be detected	Control and operation
15	Thermo sensor	Open or short circuit in the thermo sensor circuit. Output voltage is less than 0.1 V or more than 4.5 V.	Control is performed based on the intake air temperature when starting. Set to 40 °C (104 °F) when running. High engine idle speed.
17	Knock sensor	Short or open circuit in the knock sensor circuit. Output voltage is less than 0.9 V or more than 4.0 V.	Ignition timing is retarded.
18	TPS	Open or short circuit in the TPS circuit. Output voltage is less than 0.3 V or more than 4.7 V.	Control is performed based on the intake air pressure.
19	Battery voltage	Voltage is 12 V or less for 2 minutes, even when engine speed is 2000 r/min or more.	High engine idle speed.
23	Air temperature sensor	Open or short circuit in the air temperature sensor circuit. Output voltage is less than 0.1 V or more than 4.6 V.	Set to 40 °C (104 °F). High engine idle speed.

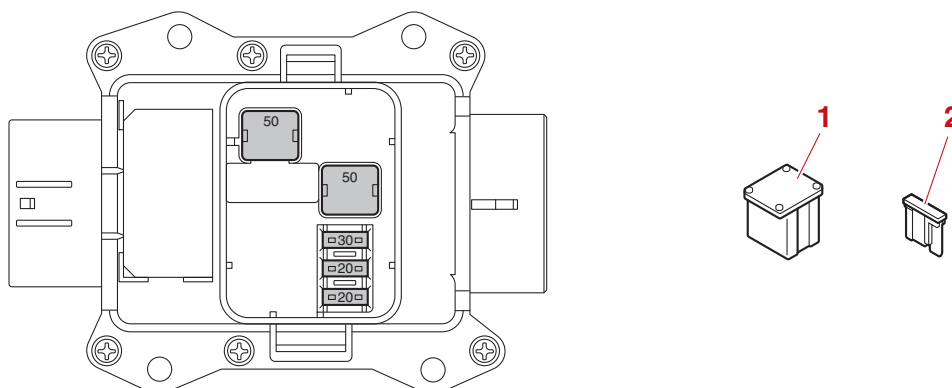
Electronic control system

Trouble code	Item	Trouble conditions to be detected	Control and operation
27	Water in fuel filter	The shift position switch is on and the water detection switch is on.	The alert buzzer sounds.
28	Shift position switch	Cranking while in gear. Cranking while the shift position switch circuit is open-circuited.	ECM does not control.
29	Air pressure sensor	Open or short circuit in the air pressure sensor circuit. Output voltage is less than 0.2 V or more than 4.5 V.	Control is performed based on the TPS. High engine idle speed.
44	Engine shut-off switch	Cranking when the clip is removed.	Fuel injection is cut.
56	Main power supply	Main relay is off and the output voltage is more than the specified level.	ECM does not control.
57	Starter magnet power supply	Starter relay is on and the output voltage is less than the specified level. Starter relay is off and the output voltage is more than the specified level.	ECM does not control.
58	HP fuel pump PWR supply	High-pressure fuel pump is on and the output voltage is less than the specified level. High-pressure fuel pump is off and the output voltage is more than the specified level.	ECM does not control.
86	Immobilizer	Open or short circuit in the Y-COP circuit. Communication error continues for more than 3 seconds.	The engine starts, but the engine speed is limited to less than 2600 r/min.

Fuse box

This model is fitted with a newly developed fuse box which is an assembly part containing various integrated relays. With this new fuse box, the number of parts has been reduced and the serviceability has been improved. The fuse type has also been changed. This new fuse is not compatible with the previous one.

A self-diagnosis function to detect malfunctions in each relay (power supply circuit) has been added to the engine ECM because it is not possible to remove built-in relays individually for testing. When a malfunction occurs, the Check Engine icon is displayed on a multifunction display and a trouble code is detected.

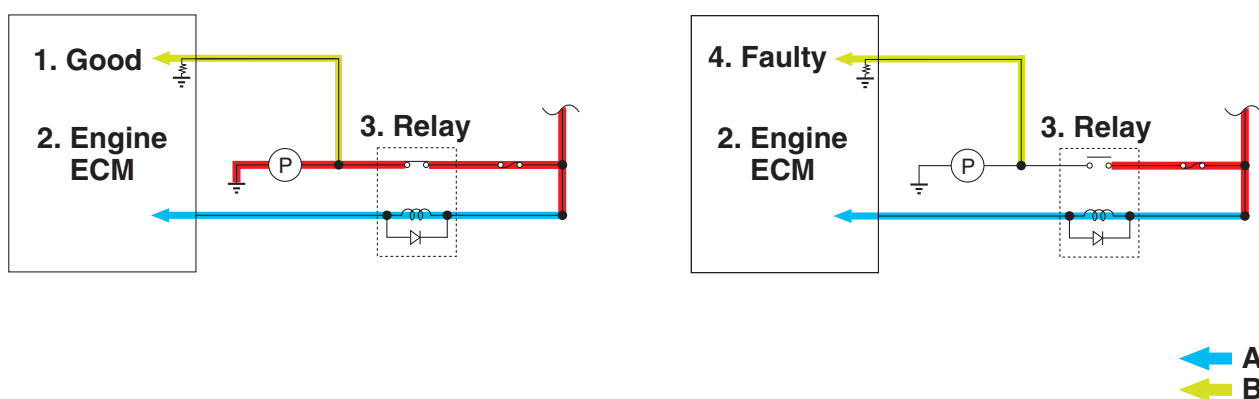


1. Fuse (50 A)

2. Fuse (20 A–30 A)

Self-diagnosis of power supply circuit

The engine ECM monitors the voltage after a relay is turned on and determines whether the relay functions properly in accordance with the relay activation request.



1. Good
2. Engine ECM
3. Relay
4. Faulty

- A. Request
- B. Determination

Trouble code detecting conditions

A trouble code is detected if the relays cannot be turned on or off in response to a request from the engine ECM. However, if the main relay cannot be turned on, trouble codes are not detected because the engine ECM is not in operation.

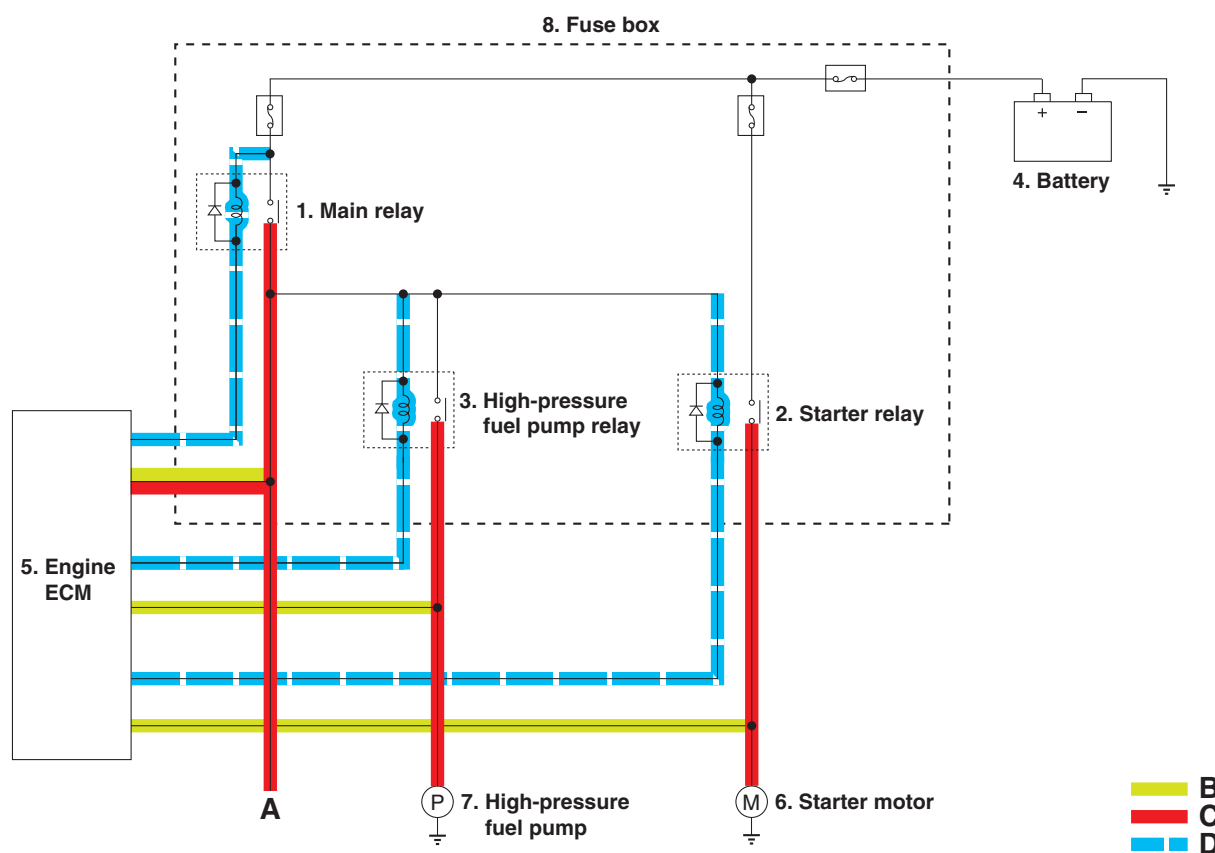
Circuit	Trouble code		Remarks
	Stuck OFF	Stuck ON	
Main relay	—	56	
Starter relay	57	57	The engine ECM monitors requests input by engine start switch.
High-pressure fuel pump relay	58	58	

Relays cannot be turned on (stuck OFF)

The cause may include: blown fuse, open circuit in wire harness or exciting coil, corrosion or presence of foreign material at relay connections, incorrect requests or determination of the engine ECM.

Relays cannot be turned off (stuck ON)

The cause may include: deposition at relay connections, short circuit in wire harnesses, incorrect requests or determination of the engine ECM.



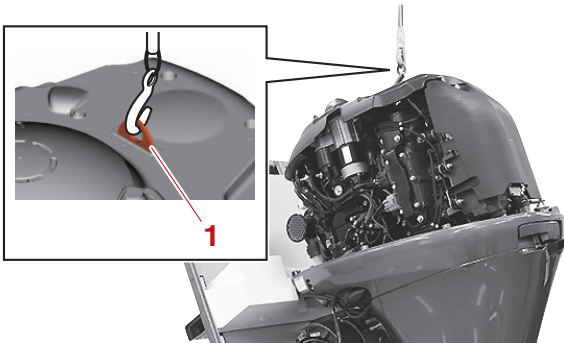
1. Main relay
 2. Starter relay
 3. High-pressure fuel pump relay
 4. Battery
 5. Engine ECM
 6. Starter motor
 7. High-pressure fuel pump
 8. Fuse box
- A. To sensors and actuators
- B. Circuit used for power supply voltage detection
- C. Power supply circuit when relay is ON
- D. Relay activation request (excitation) circuit

Serviceability

Lifting the outboard motor

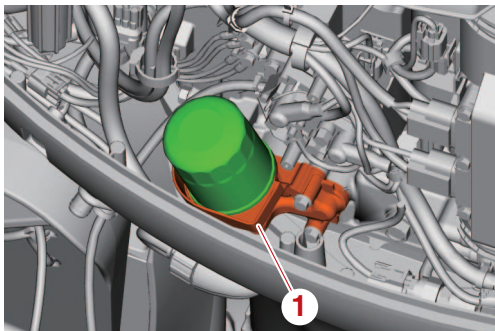
The outboard motor can be suspended without removing the flywheel magneto cover by attaching the lifting harness to the designated lifting point “1”.

However, use the special service tool (lifting eye) when removing the engine from the outboard motor.



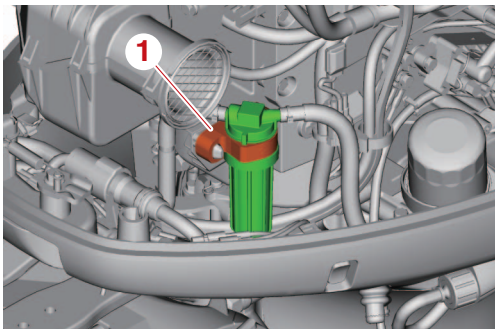
Oil catch tray

The oil filter is mounted on the oil catch tray “1” to prevent oil from dripping during oil filter replacement.



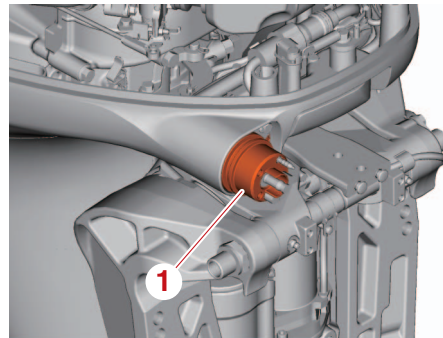
Fuel filter

The mounting method of the fuel filter has been changed to a rubber holder “1” type. This allows fuel filter removal without the use of a tool, improving serviceability.



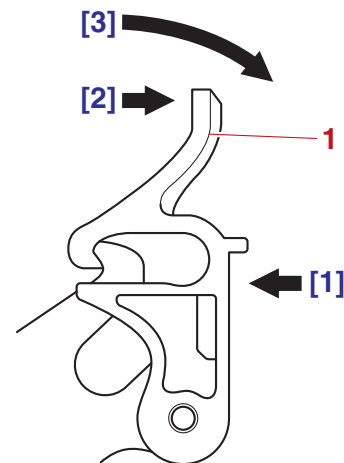
Rigging grommet

The rigging grommet “1” is located on the STBD side for easier rigging.



Cable clamp

The shape of cable clamp “1” has been changed to improve the cable holding performance and reliability. To remove it, while pressing and holding [1] and [2], turn the cable clamp “1” in direction [3].

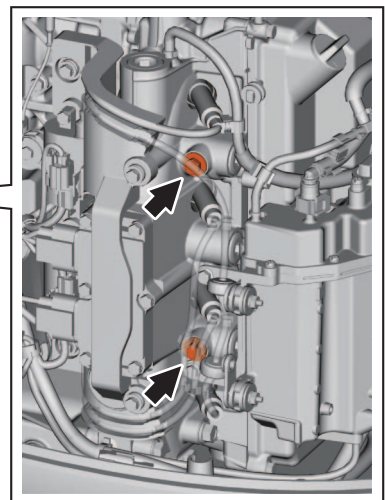
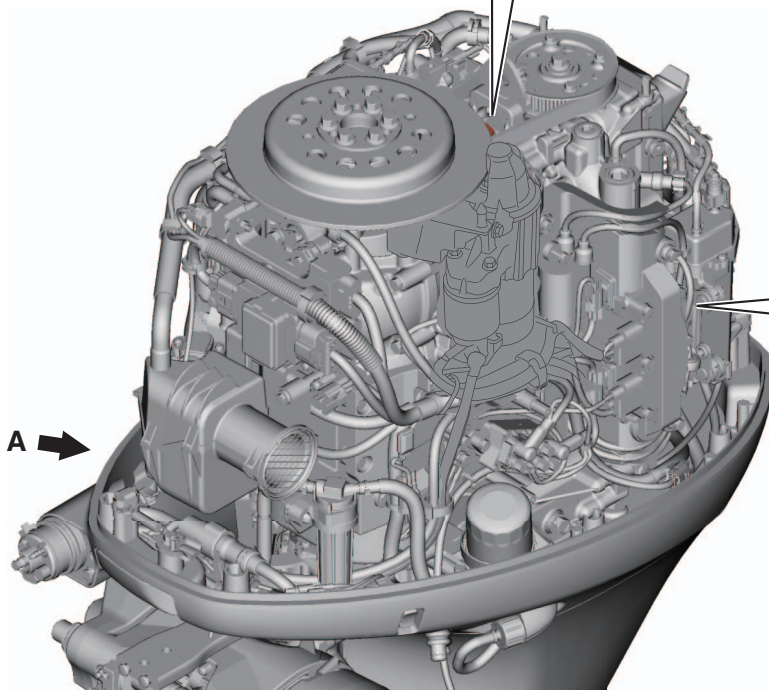
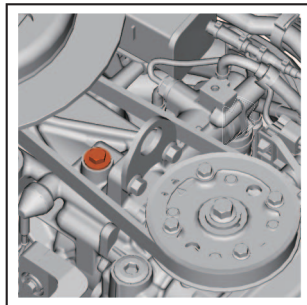


Anode

The locations of the anodes in the cooling water passages have been optimized, making the anode replacement easier, for better serviceability.



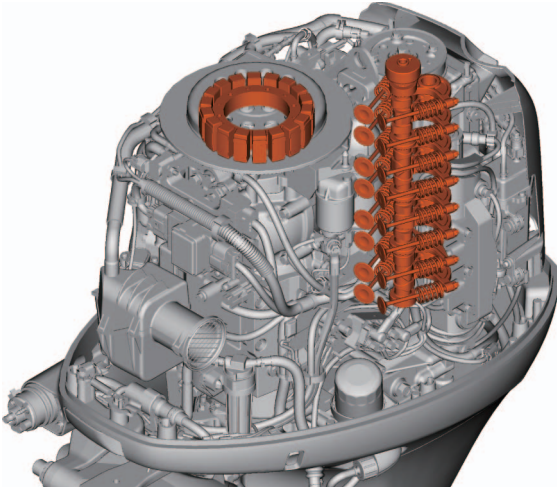
A



Power unit system

Overview

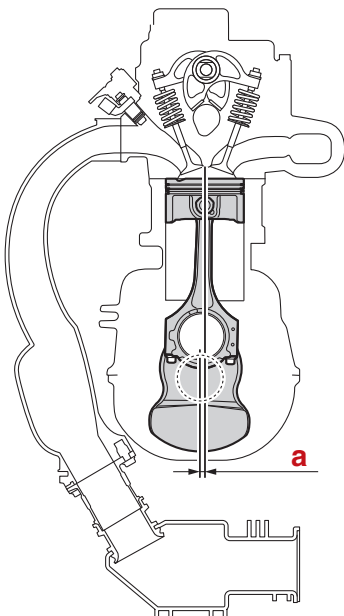
This model uses a 4-stroke L4 engine. With the same engine displacement as the larger models, this engine produces higher torque than other models in the same class. The SOHC valve system has been adopted to make this engine compact and lightweight.



Cylinder block

This model employs an offset cylinder, which has an offset “a” between the center points of the crankshaft and cylinder.

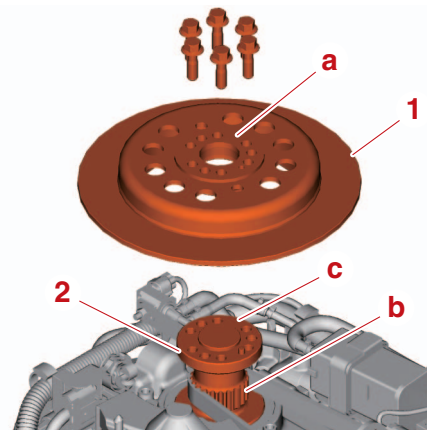
An over-sized piston (0.25 mm (0.0098 in)) that matches this engine is available.



Flywheel and crankshaft

This model uses the flange mount “a” type flywheel “1”.

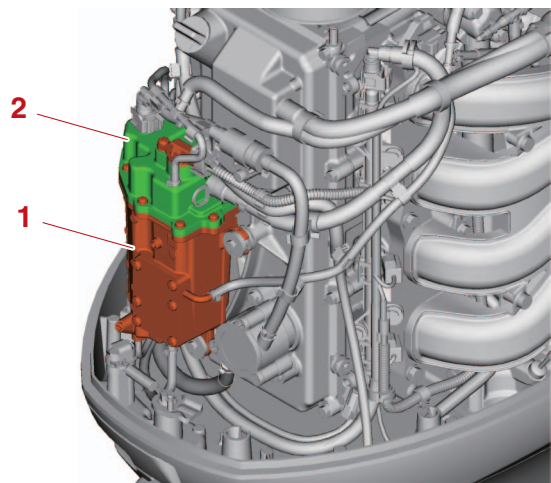
The crankshaft “2” is formed as a one-piece casting with integrated drive sprocket “b” and the flywheel mounting flange “c”, improving serviceability and reliability of the valve train.



Vapor separator

The vapor separator “1” is located at the optimum position where it is accessible during maintenance and less susceptible to engine heat.

The lightweight vapor separator cover “2” is made of resin.



Lower unit

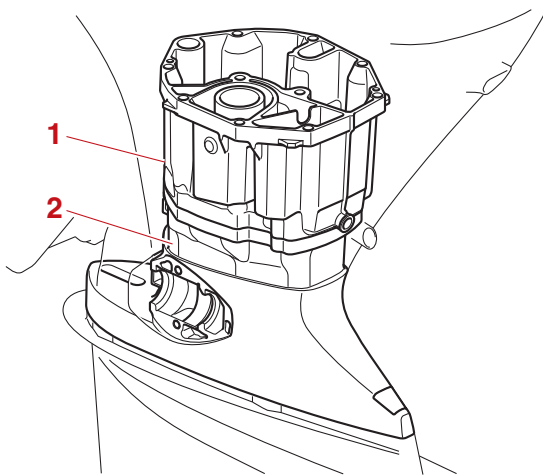
Overview

This model uses the proven lower unit that is used on F115 (6EK). Therefore, required special service tools and service procedures for F115 (6EK) apply to this model also.

Bracket unit

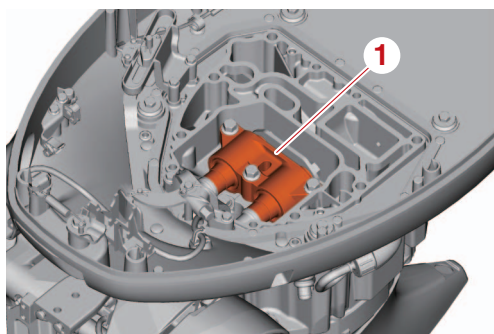
Upper case

The upper case with oil pan is used to reduce the weight. Therefore, the upper case "1", "2" has been separated into 2 pieces, upper part and lower part. Alumite treatment has also been applied to improve the resistance against corrosion.



Upper mount, lower mount

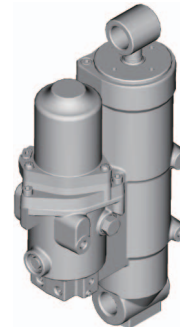
The large-size upper mount piece "1" and lower mount that are equipped on F150 (63P)-class models are used on this model. As a result, vibrations that occur at low engine speeds have been reduced.



PTT unit

This model uses the PTT unit of the same type as the F115 (6EK).

The up-relief hydraulic pressure setting has been changed from 16.0 MPa (160.0 kgf/cm², 2320.0 psi [F115/6EK]) to 12.5 MPa (125.0 kgf/cm², 1812.5 psi) to match this model.



Electrical system

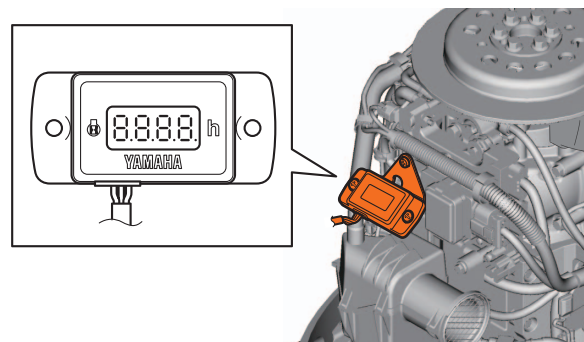
Hour meter (tiller handle model)

The hour meter has been incorporated on the F75FEHT and F100GEHT.

The hour meter makes it possible to check the operating hours of the outboard motor, which is used to keep track of periodic checks and adjustments, and so on.

When the engine switch is turned on, all LEDs on the display will illuminate for two seconds, and then the operating hours will be displayed. A signal from the ECM, via the green and white (G/W) lead, is sent to the hour meter as the operating hours accumulate.

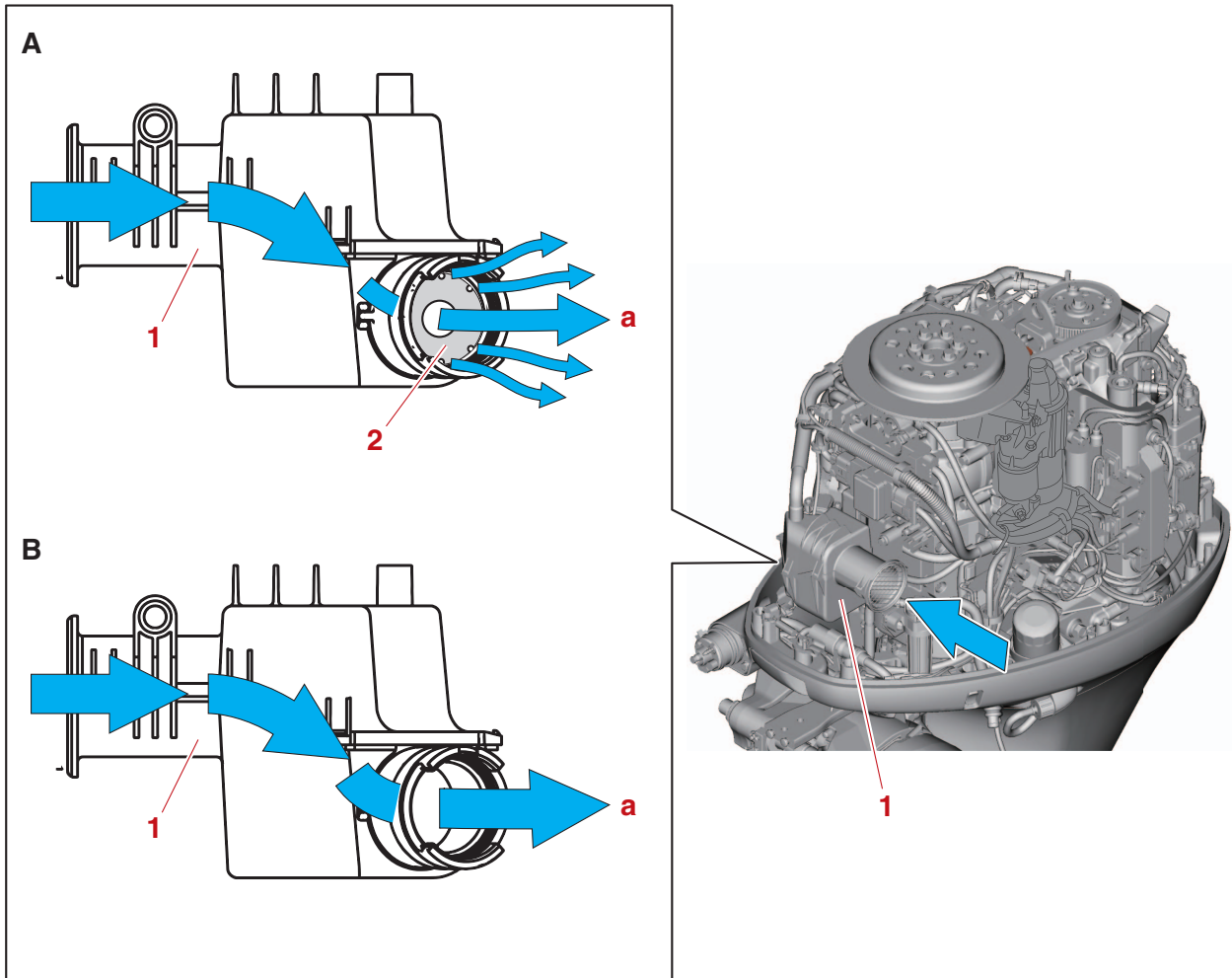
The value of the operating hours cannot be reset.



Fuel system Silencer

For the F75F model, the orifice plate is located at the silencer joint.

On the other hand, the F100G model has no plate. The orifice plate will limit the intake air volume to save the output power.



- 1. Intake silencer
- 2. Orifice plate

- A. F75F
- B. F100G

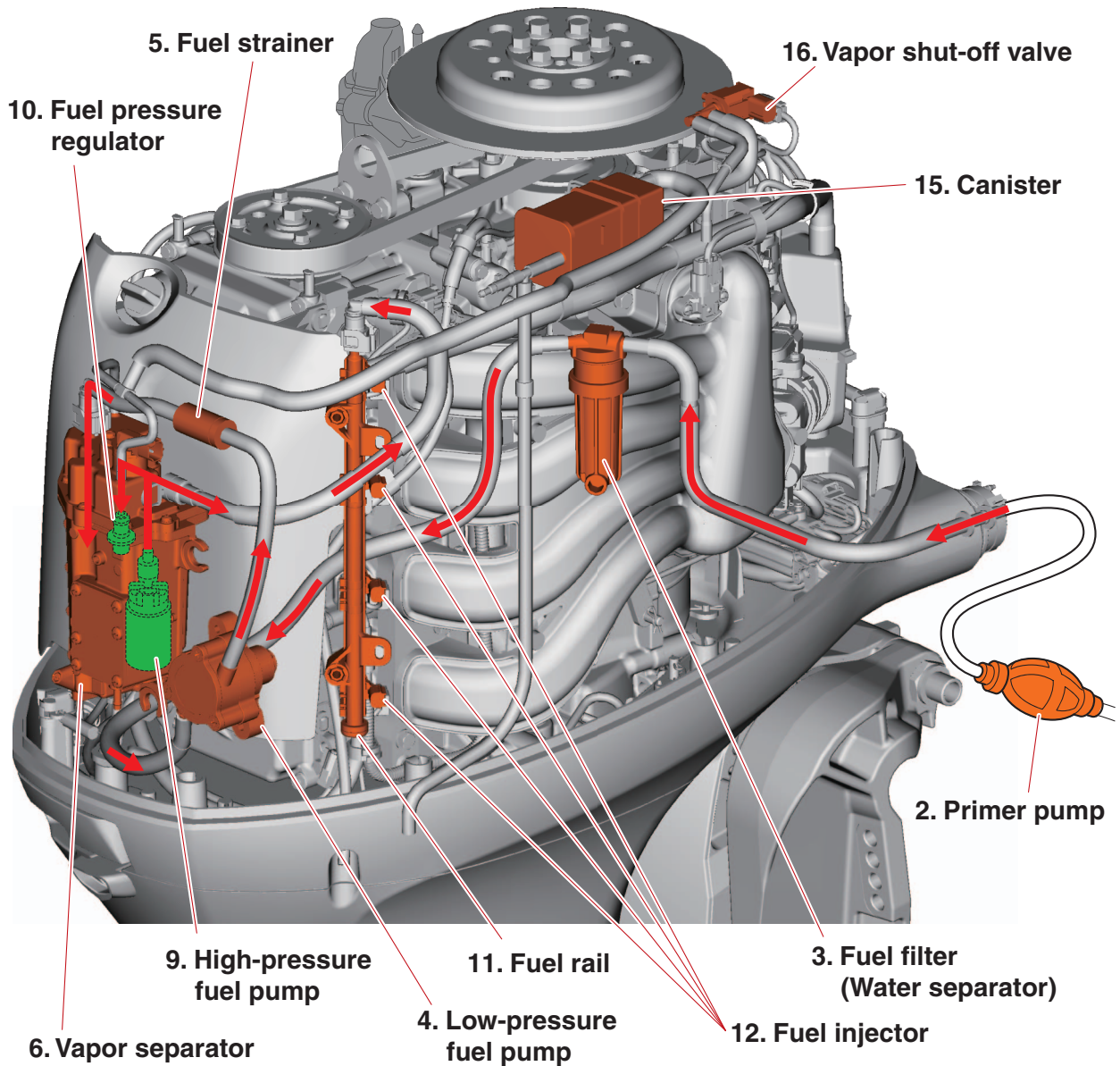
- a. Intake air

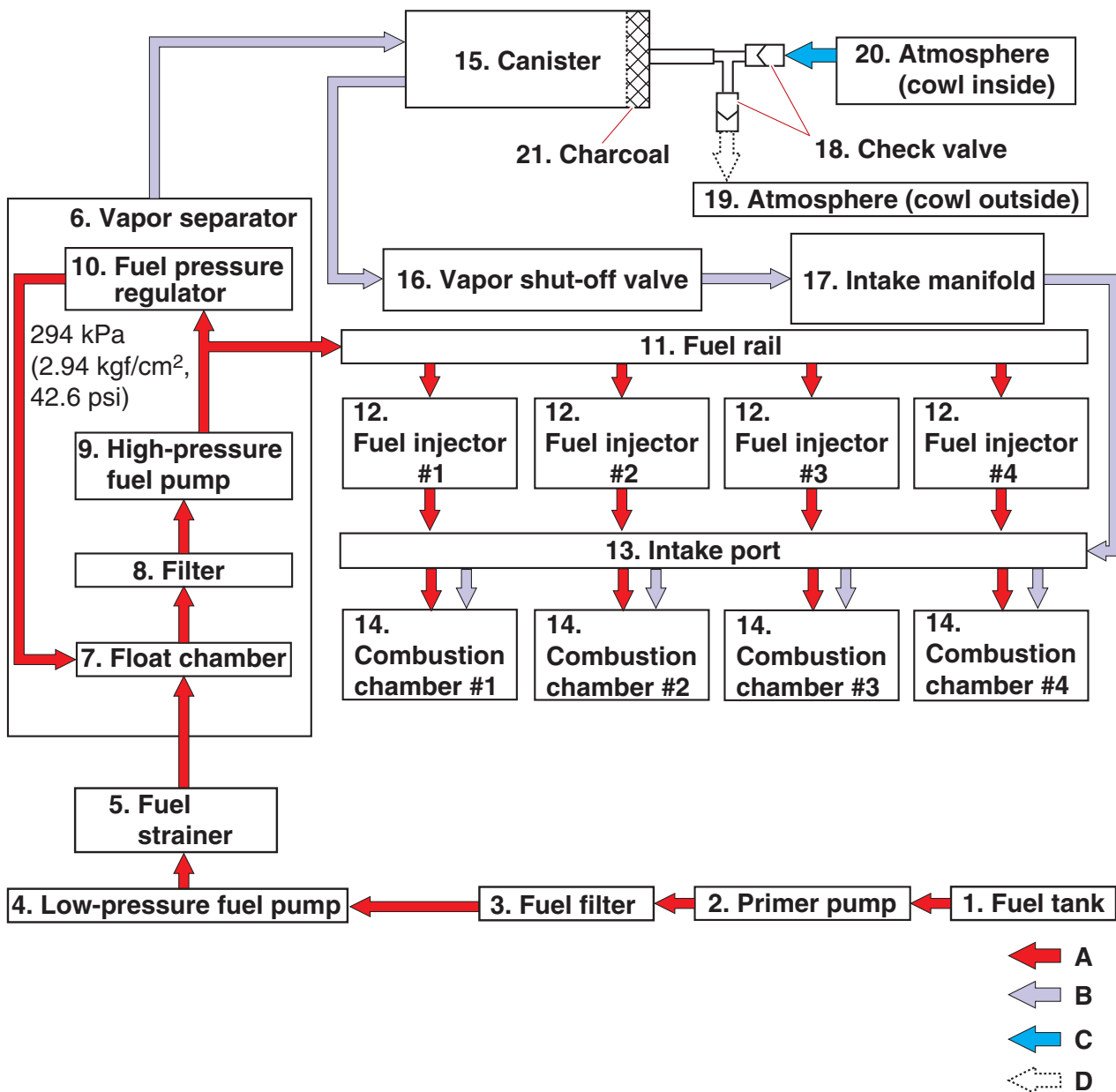
High-pressure fuel pump control

The high pressure fuel pump operates for 5 seconds after the engine start switch is turned to ON, and always operates while the engine is running.

The pump stops 1 second later after the engine stops.

Fuel diagram

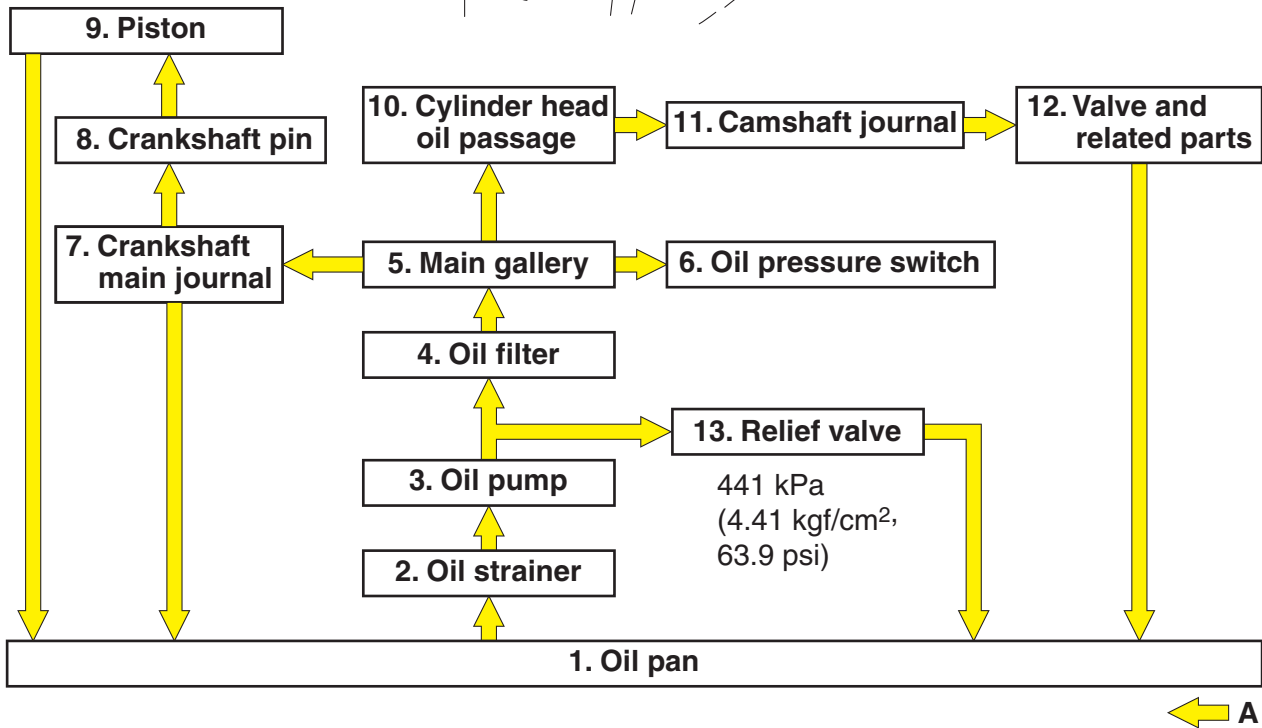
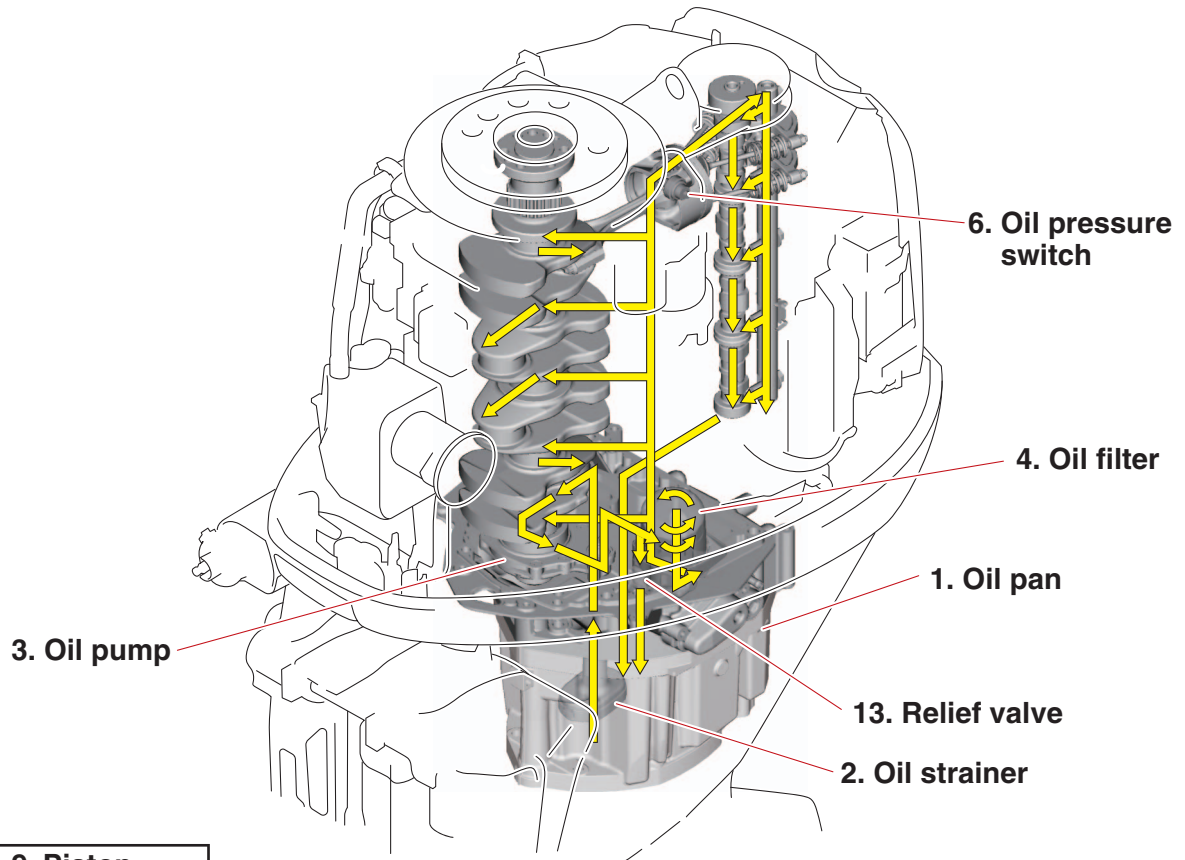




1. Fuel tank
2. Primer pump
3. Fuel filter (Water separator)
4. Low-pressure fuel pump
5. Fuel strainer
6. Vapor separator
7. Float chamber
8. Filter
9. High-pressure fuel pump
10. Fuel pressure regulator
11. Fuel rail
12. Fuel injector
13. Intake port
14. Combustion chamber

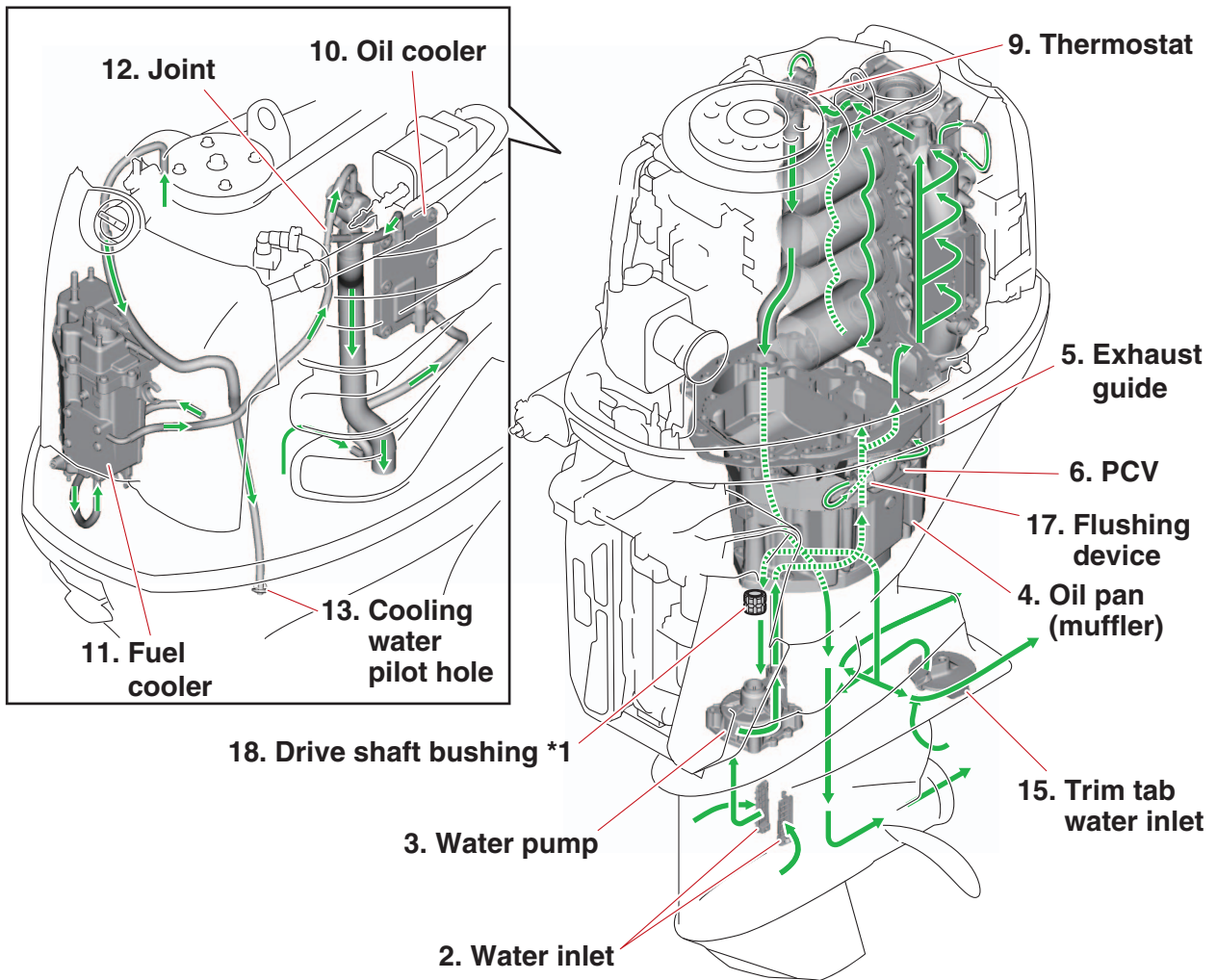
15. Canister
 16. Vapor shut-off valve
 17. Intake manifold
 18. Check valve
 19. Atmosphere (cowl outside)
 20. Atmosphere (cowl inside)
 21. Charcoal
- A. Fuel flow
 B. Vapor gas flow
 C. Air flow
 D. Purified gas flow

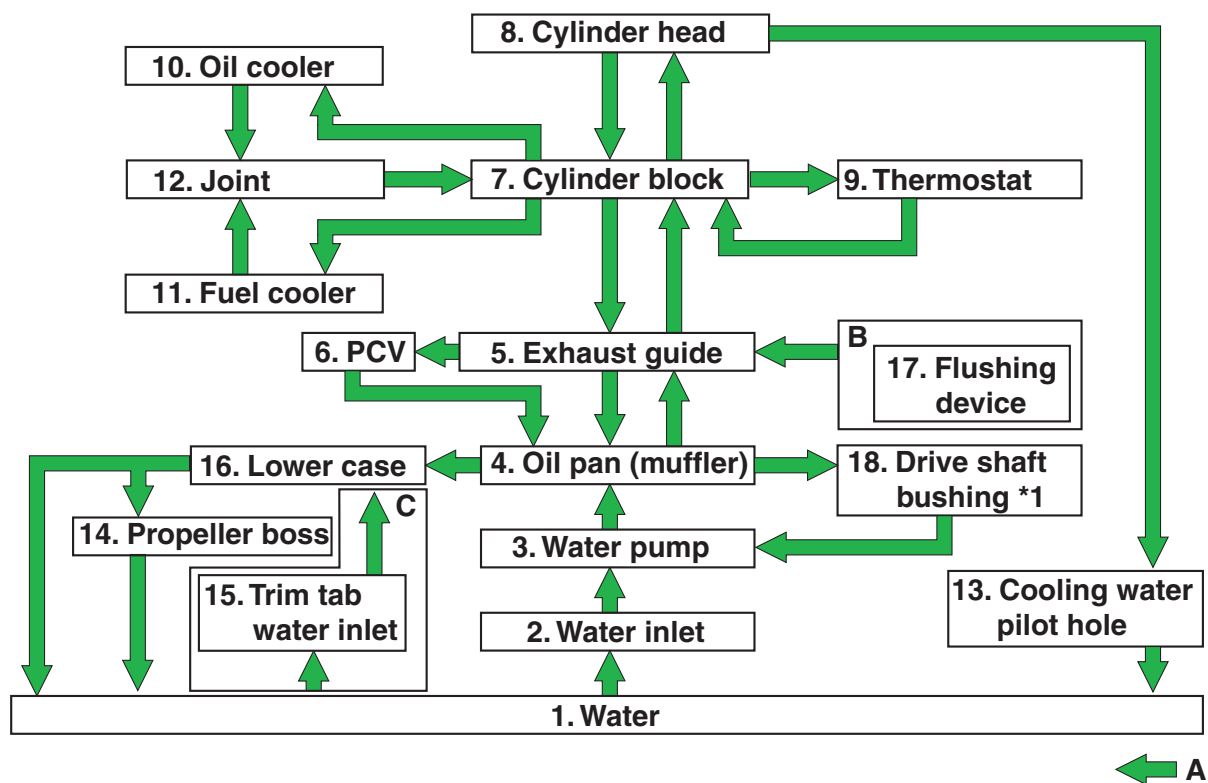
Lubrication system
Lubrication diagram



1. Oil pan
 2. Oil strainer
 3. Oil pump
 4. Oil filter
 5. Main gallery
 6. Oil pressure switch
 7. Crankshaft main journal
 8. Crankshaft pin
 9. Piston
 10. Cylinder head oil passage
 11. Camshaft journal
 12. Valve and related parts
 13. Relief valve
- A. Engine oil flow

Cooling system
Cooling diagram





- 1. Water
- 2. Water inlet
- 3. Water pump
- 4. Oil pan (muffler)
- 5. Exhaust guide
- 6. PCV
- 7. Cylinder block
- 8. Cylinder head
- 9. Thermostat
- 10. Oil cooler
- 11. Fuel cooler
- 12. Joint

- 13. Cooling water pilot hole
- 14. Propeller boss
- 15. Trim tab water inlet
- 16. Lower case
- 17. Flushing device
- 18. Drive shaft bushing *1

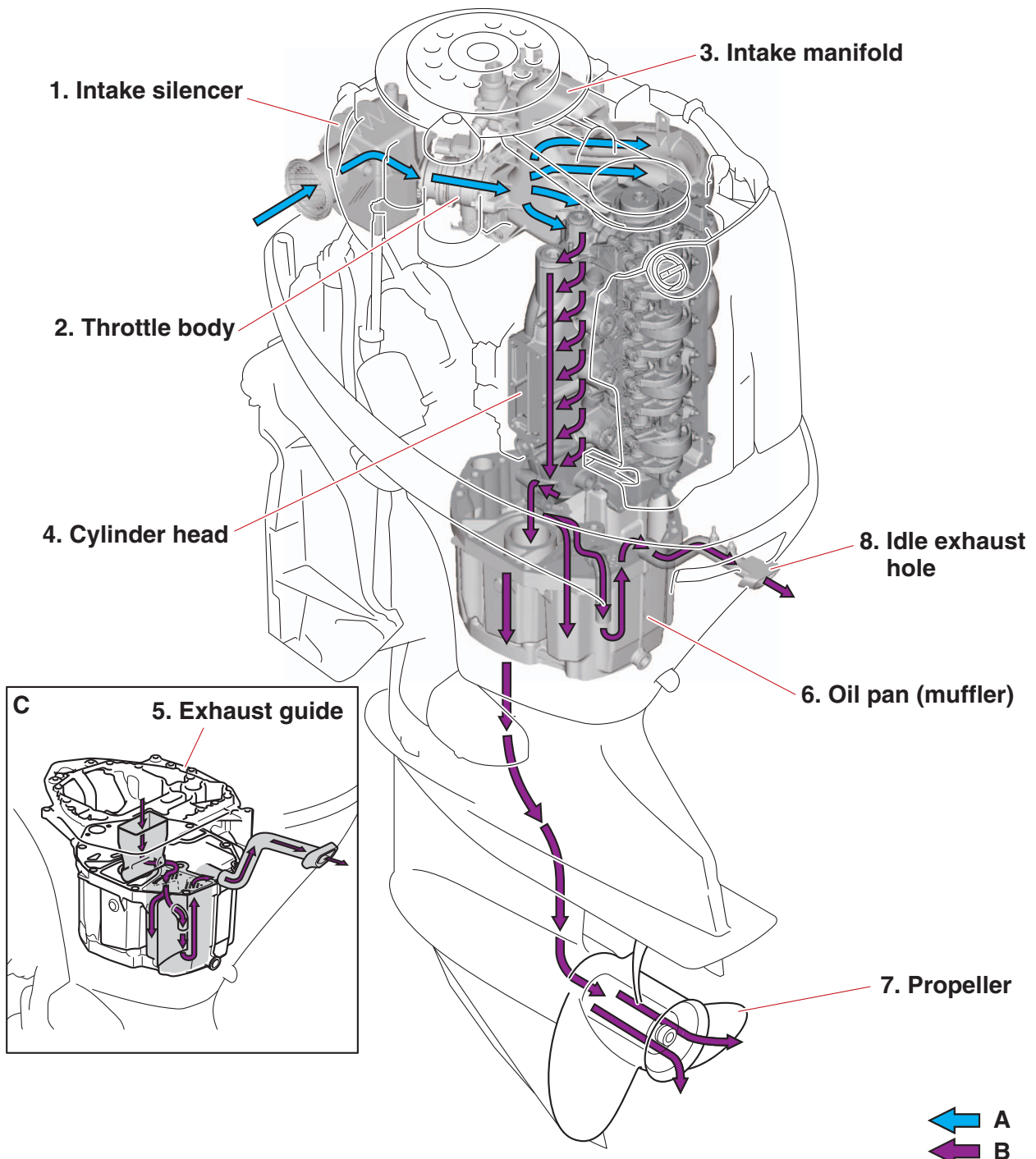
A. Cooling water flow

B. When flushing the cooling water passages

C. Hydrodynamic water pressure for cooling the propeller boss damper

*1. X-transom model

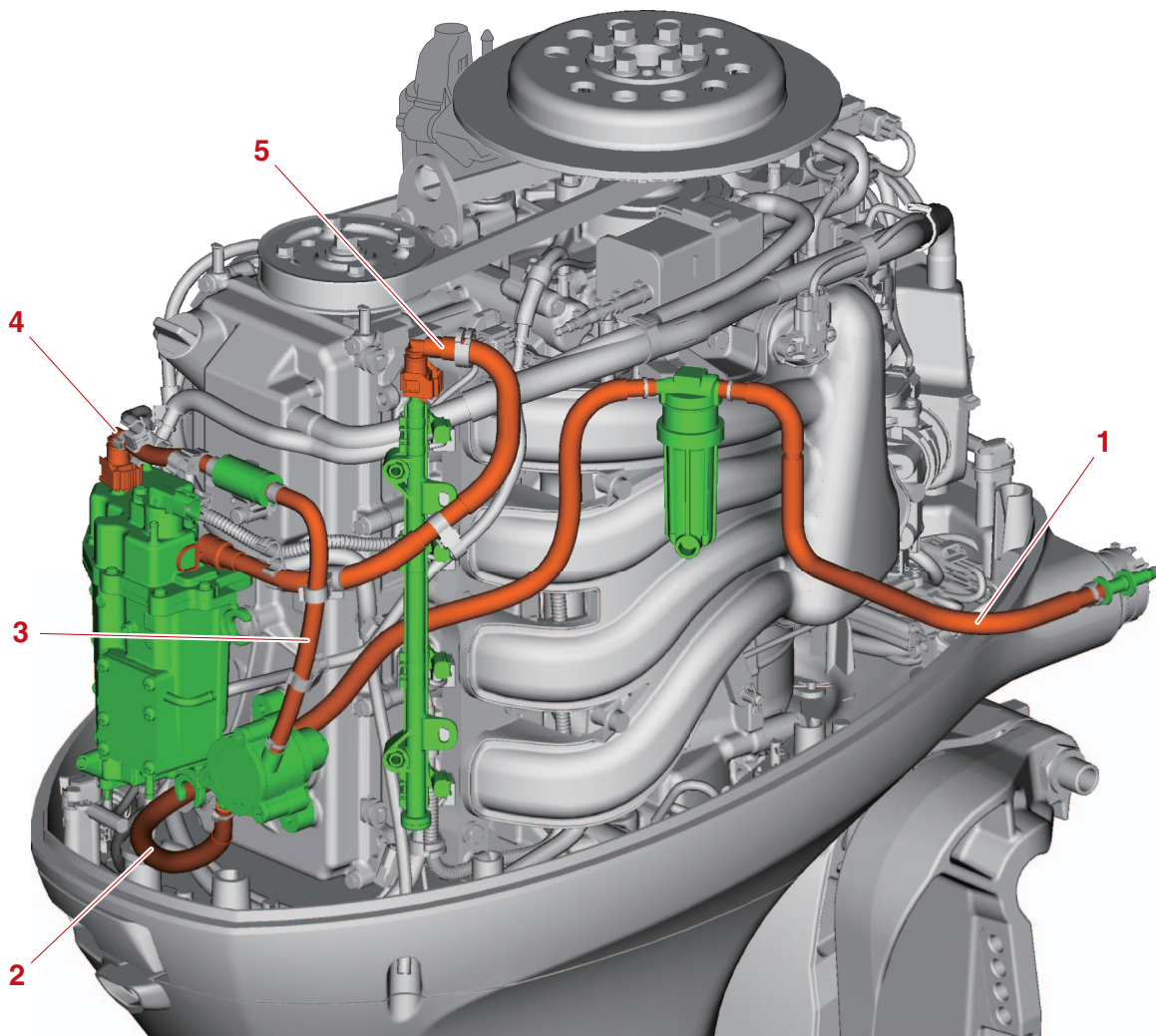
Intake and exhaust system
Intake and exhaust diagram



- 1. Intake silencer
- 2. Throttle body
- 3. Intake manifold
- 4. Cylinder head
- 5. Exhaust guide
- 6. Oil pan (muffler)
- 7. Propeller
- 8. Idle exhaust hole

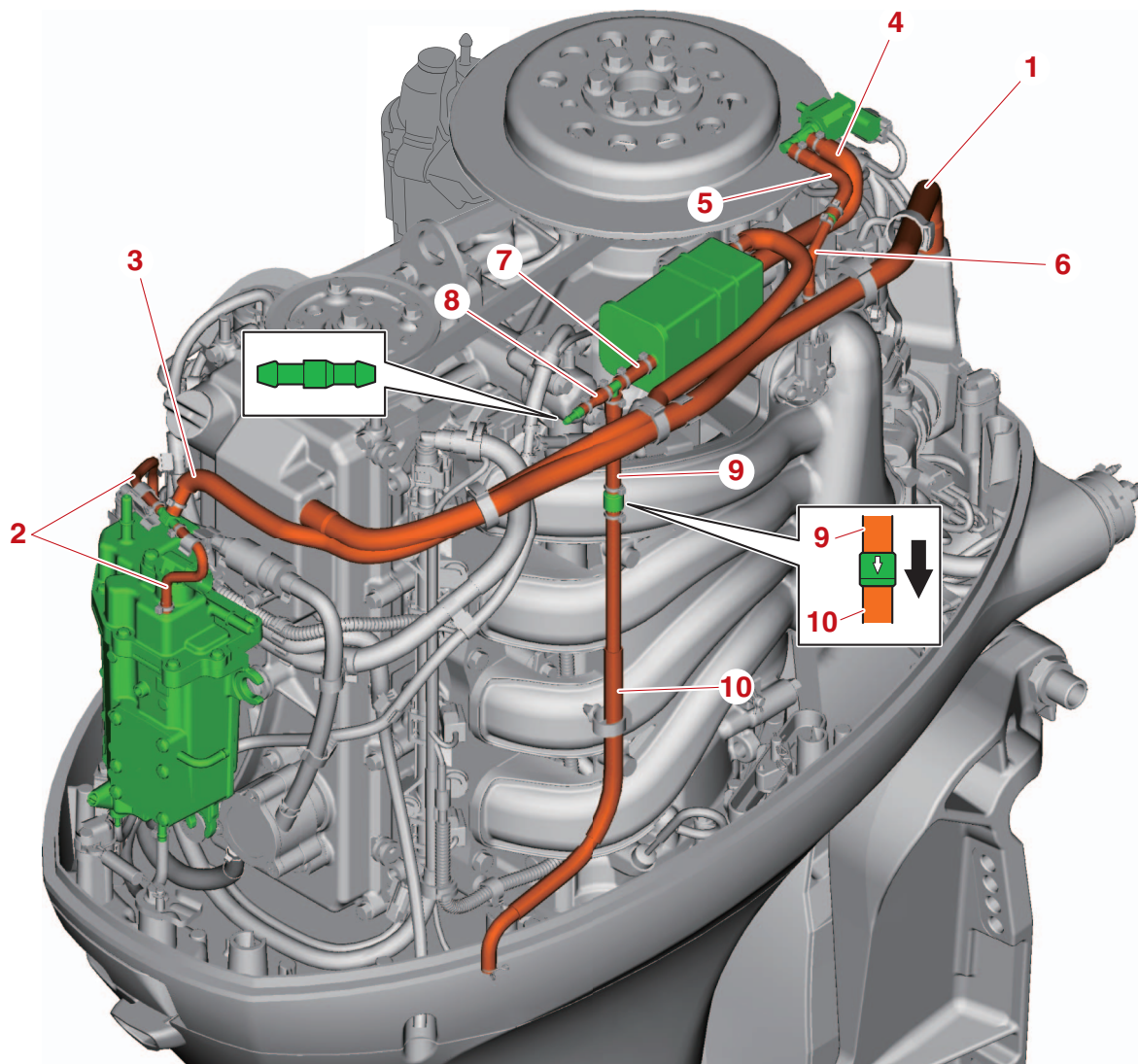
- A. Intake air flow
- B. Exhaust gas flow
- C. Labyrinth idle exhaust system

Hose routing Fuel hose



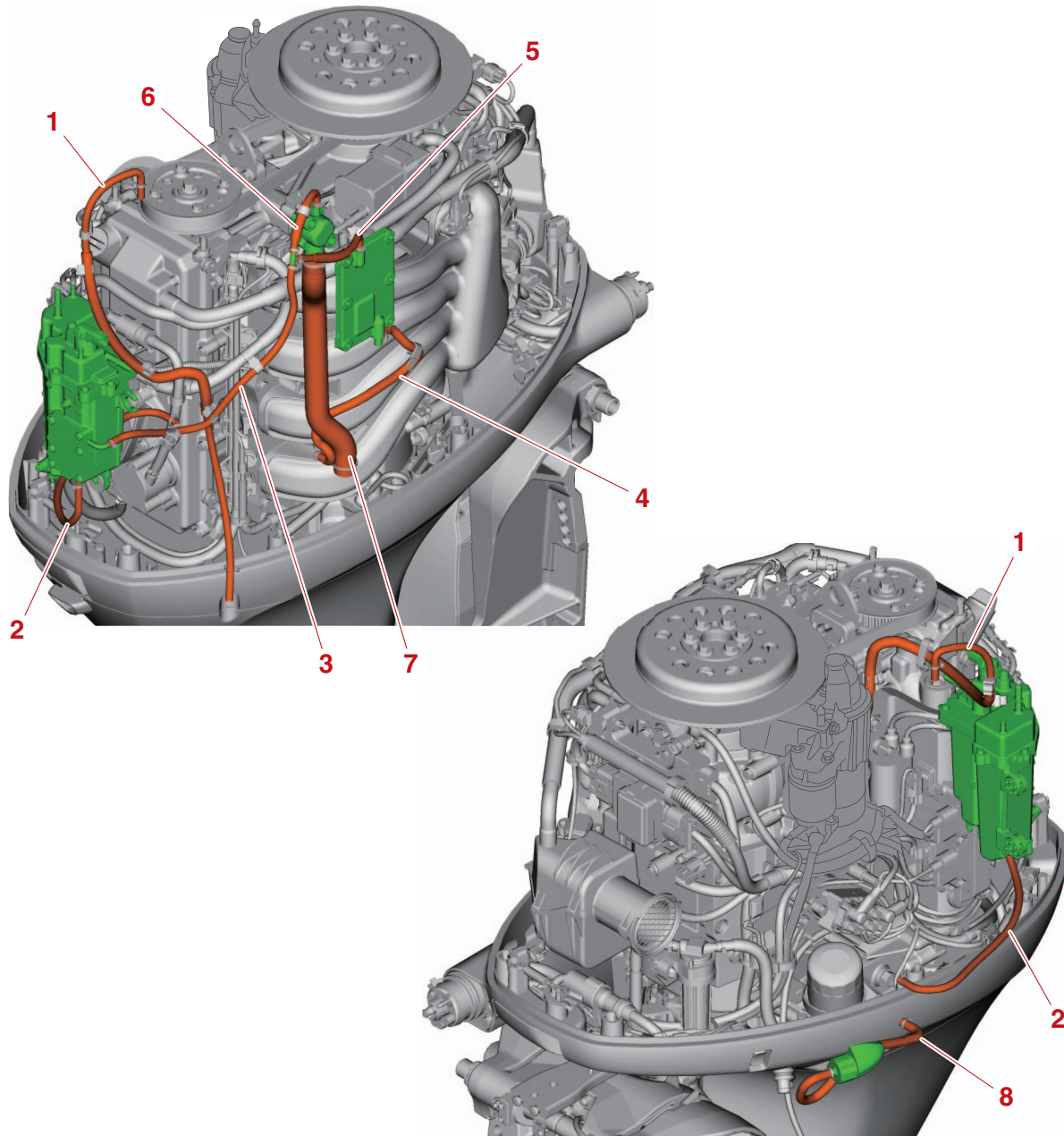
1. Joint to fuel filter assembly
2. Fuel filter assembly to low-pressure fuel pump
3. Low-pressure fuel pump to fuel strainer
4. Fuel strainer to vapor separator
5. Vapor separator to fuel rail

Vapor gas hose and blowby hose



1. Cylinder head cover to intake silencer
2. Vapor separator to joint
3. Joint to canister tank port
4. Canister purge port to vapor shut-off valve
5. Vapor shut-off valve to joint
6. Joint to intake manifold
7. Canister atmospheric port to joint
8. Check valve to joint
9. Joint to check valve
10. Check valve to bottom cowling

Cooling water hose



1. Cylinder head to cooling water pilot hole
2. Cylinder block to fuel cooler
3. Fuel cooler to joint
4. Cylinder block to oil cooler
5. Oil cooler to joint
6. Joint to thermostat cover
7. Thermostat cover to cylinder block
8. Flushing hose adapter to exhaust guide

Rigging information

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Important reminder on rigging

Outboard motor mounting instructions

⚠ WARNING

- Overpowering a boat could cause severe instability. Do not install an outboard motor with more horsepower than the maximum rating on the capacity plate of the boat. If the boat does not have a capacity plate, consult the boat manufacturer.
 - Improper mounting of the outboard motor could result in hazardous conditions, such as poor handling, loss of control, or fire hazards.
-

⚠ WARNING

Too much weight on the transom can change the center of gravity, buoyancy, operating balance, or performance of the boat, which could cause loss of control or swamping. Consult the boat manufacturer for the maximum engine weight allowable on the transom, which is different from the overall boat capacity. Overloading the transom with an outboard motor that is too heavy could also damage the hull, transom, deck, or helm area, as well as the outboard motor and other equipment.

⚠ WARNING

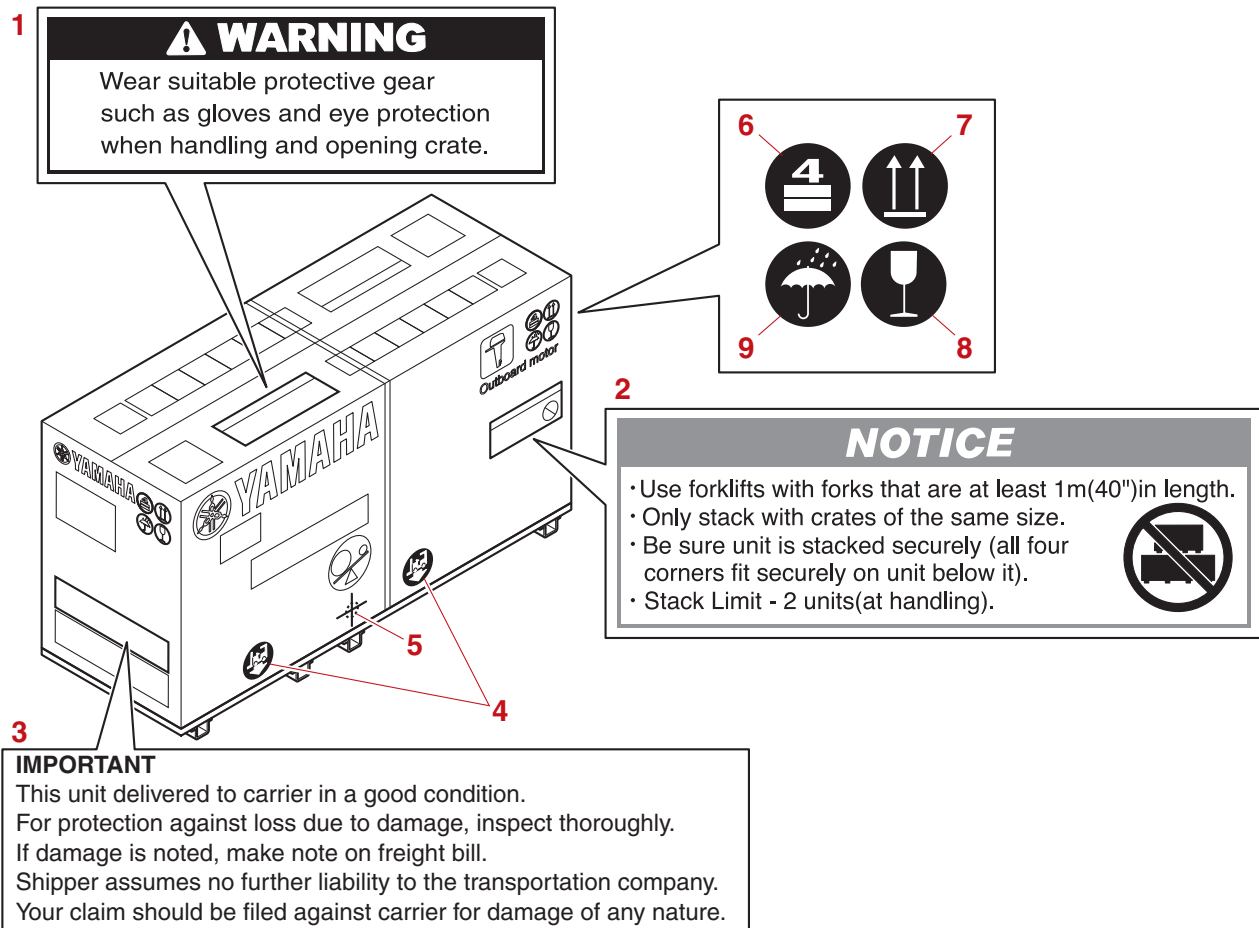
Before mounting the outboard motor, consult the manufacturer of the engine jack plates or brackets. Excessive loads could damage the engine jack plates, brackets, boat transom, steering system, or engine. These damages could cause loss of control.

Crate handling

Crate top cover pictograph description

The following pictographs are important when handling the crate.

Read the notice and understand what each pictograph means to prevent damage to the outboard motor when handling, transporting, and storing the crate.



1. WARNING

Wear suitable protective gear such as gloves and eye protection when handling and opening crate.

2. NOTICE

- Use forklifts with forks that are at least 1 m (40 in) in length.
- Only stack with crates of the same size.
- Be sure unit is stacked securely (all four corners fit securely on unit below it).
- Stack Limit - 2 units (at handling).

3. IMPORTANT

This unit delivered to carrier in a good condition.

For protection against loss due to damage, inspect thoroughly.

If damage is noted, make note on freight bill.

Shipper assumes no further liability to the transportation company.

Your claim should be filed against carrier for damage of any nature.

4. Lifting fork insert position

5. Crate barycentric position

6. Stack limit: Maximum 4 units for storage

7. Upward indication

8. Care handling indication

9. Water avoidance indication

Uncrating Uncrating procedure

WARNING

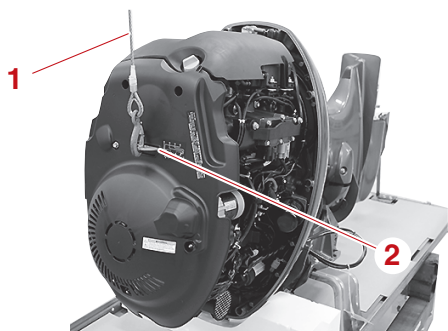
Wear gloves to avoid injury from sharp steel edges while uncrating.

1. Uncrate:
 - Outboard motor
 - a. Check the crate for shipping damage. If any damage is found, consult your Yamaha agency.
 - b. Cut the strap, and then remove the top cover.
 - c. Remove all of the bolts from the bottom plate, and then remove the frame.

NOTICE

Be careful not to damage the outboard motor.

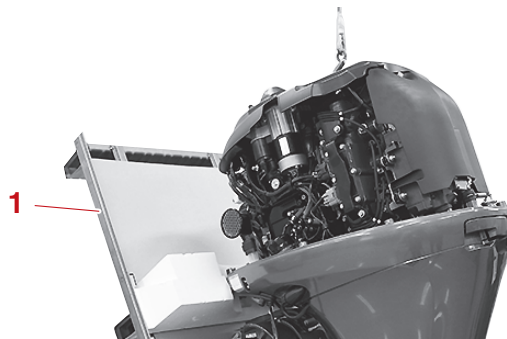
- d. Remove the wrapping, and then check the outboard motor for concealed damage. If any damage is found, consult your Yamaha agency.
- e. Remove the top cowling.
- f. Install the lifting harness "1" to the engine hanger "2".
- g. Apply tension to the lifting harness.



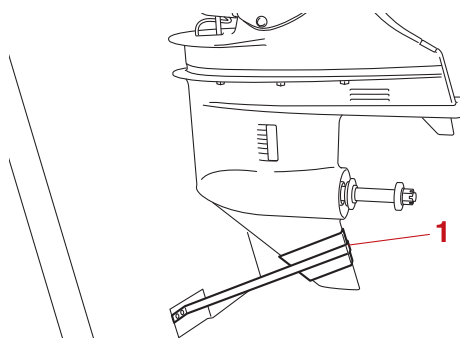
- h. Lift up the outboard motor carefully along with the bottom frame "1".

NOTICE

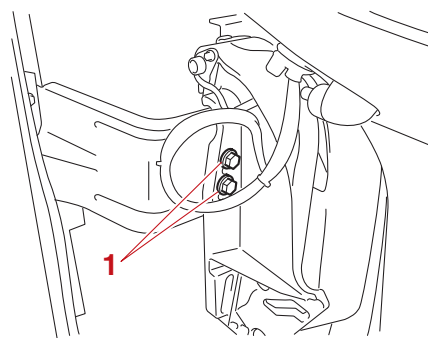
Make sure that the lifting harnesses do not damage any parts of the outboard motor.



- i. Remove the skleg holder "1".



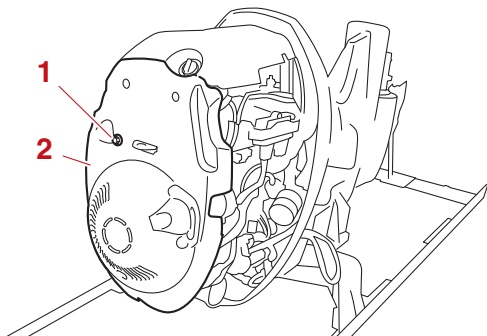
- j. Remove the bolts "1".



- k. Remove the steering retainer.
- l. Install a hydraulic steering cylinder or steering cable following the recommendation of the manufacturer (remote control model).
- m. For the procedure of outboard motor mounting on boat, see "Rigging Guide" (6YR-2819Y-**).
- n. Remove the lifting harness, and then install the top cowling.

TIP: _____
Use the following procedure to suspend the outboard motor using the special service tool.

1. Remove the bolt "1", and then remove the flywheel magneto cover "2".



2. Attach the special service tool "1" to prevent the flywheel magneto from turning.

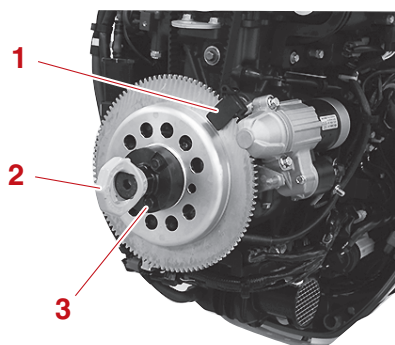
TIP: _____
The special service tool "1" is installed to tighten the lifting eye bolts "3" to the specified torque.

3. Install the special service tool "2" to the flywheel magneto, and then tighten the lifting eye bolts "3" to the specified torque.

NOTICE

When lifting the outboard motor, make sure to use the specified special service tool. Other bolts and hanging jigs could bend or break, causing the outboard motor to fall.

4. Remove the special service tool "1" from the flywheel magneto.



Flywheel stopper B "1"
90890-06686
Lifting eye "2"
90890-06953
Bolt hexagon with washer "3"
90890-06821



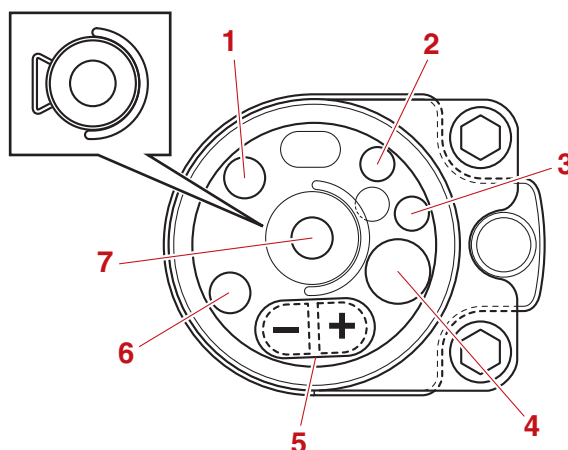
Lifting eye bolt "3"
36 N·m (3.6 kgf·m, 27 lb·ft)

5. Install the lifting harness to the lifting eye.

Rigging grommet mounting

Rigging grommet description

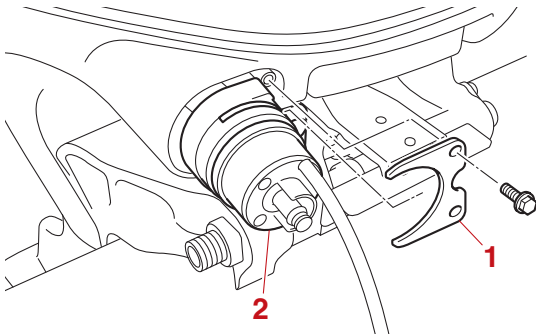
Pass all the rigging components through the proper holes in the rigging grommet.



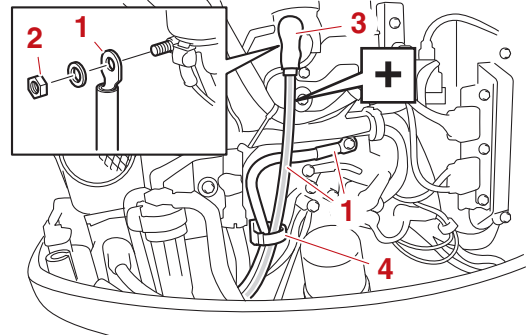
1. Throttle cable
2. Speedometer hose
3. Gauge harness
4. Main wire harness
5. Battery cable
6. Shift cable
7. Fuel hose

Rigging grommet mounting

1. Remove:
 - Grommet holder "1"
 - Rigging grommet "2"

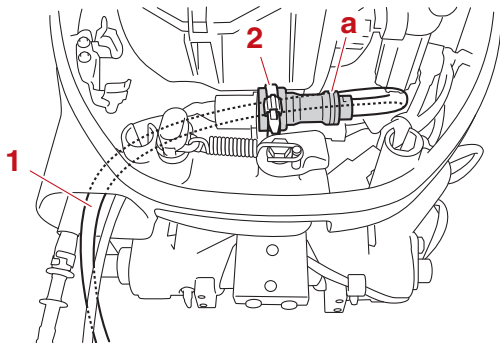


- c. Install the rubber cap "3".
- d. Fasten the battery cable "1" using the holder "4".



Installing the main wire harness

1. Install:
 - Main wire harness
 - a. Route the main wire harness "1" through the bottom cowling. See "Bottom cowling" (5-9).
 - b. Connect the main wire harness coupler (10-pin) "a", and then secure it using the holder "2".




Installing the battery cable

1. Install:
 - Battery cable
 - a. Route the battery cable "1" through the bottom cowling. See "Bottom cowling" (5-9).
 - b. Connect the positive and negative terminals of the battery cable "1", and then tighten the positive battery cable nut "2" to the specified torque.

TIP:

The positive battery cable is marked with red tape and "+" marks.

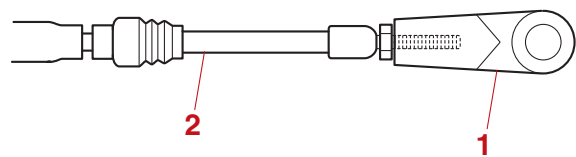
	Positive battery cable nut "2" 9 N·m (0.9 kgf·m, 6.6 lb·ft)
---	--

Installing the shift cable

⚠ WARNING

Always perform the cable adjustment in advance, following the procedures in the instruction accompanied with remote control box.

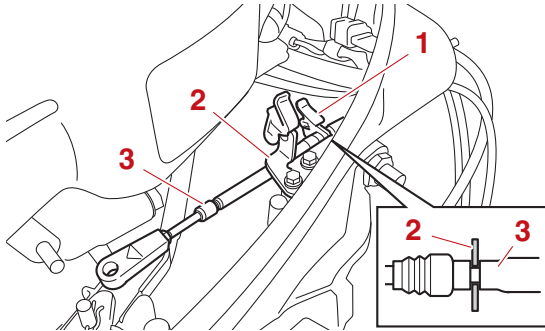
1. Install:
 - Shift cable
 - a. Fully screw in the shift cable joint "1" to the shift cable "2".



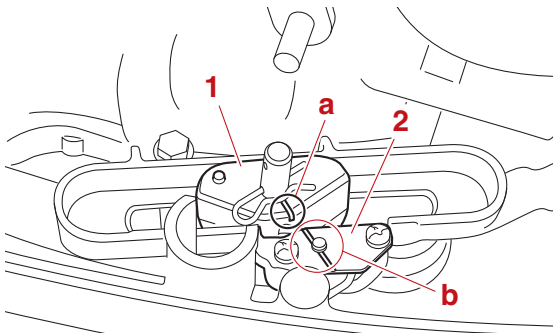
- b. Move the remote control lever or shift lever to the N position.
- c. Disengage the cable clamp "1" from the bracket "2". See "Cable clamp" (2-14).

Rigging grommet mounting

- d. Install the shift cable "3" to the bracket "2", and then fasten it using the cable clamp "1".



- e. Align the mark "a" on the bushing "1" with the mark "b" on the plate "2".

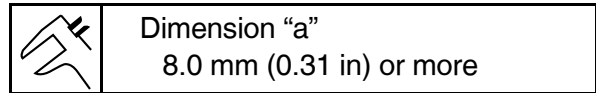
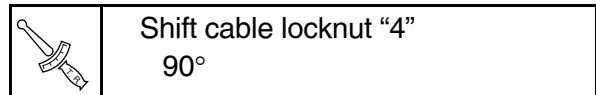
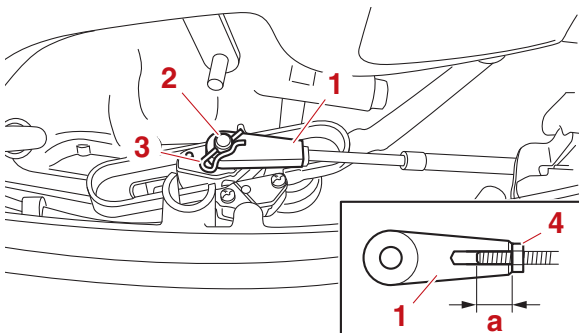


- f. Adjust the shift cable joint "1", and then install it to the pin "2".

WARNING

The shift cable joint must be screwed in 8.0 mm (0.31 in) or more.

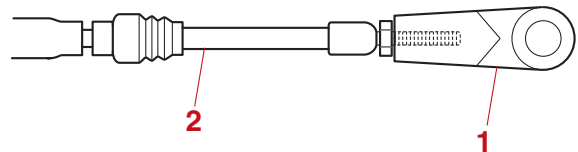
- g. Install the clip "3", and then check that the shift cable locknut "4" is fully seated on the shift cable joint "1".
- h. Tighten the shift cable locknut "4" from its fully seated position to the specified angle.



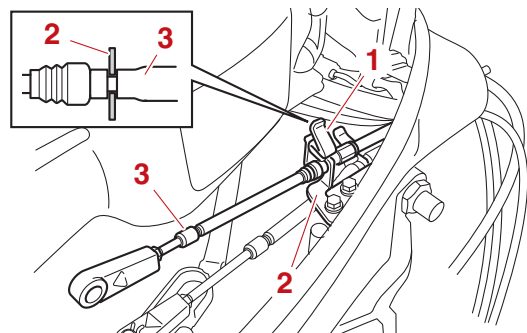
2. Check:
- Shift cable operation
Improper → Repeat from step (1).

Installing the throttle cable

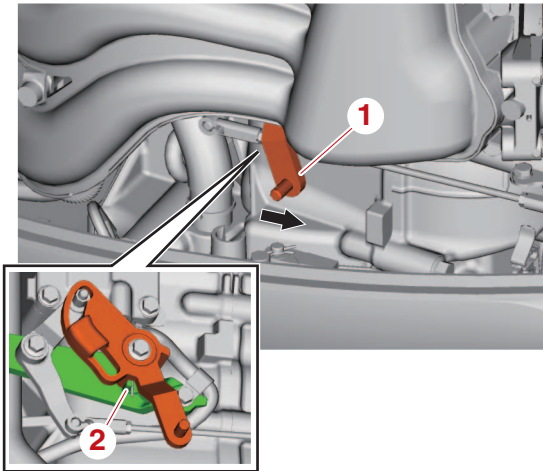
1. Install:
- Throttle cable
 - Fully screw in the throttle cable joint "1" to the throttle cable "2".



- Disengage the cable clamp "1" from the bracket "2". See "Cable clamp" (2-14).
- Install the throttle cable "3" to the bracket "2", and then fasten it using the cable clamp "1".



- d. Move the accelerator cam "1" so that it contacts the stopper "2".

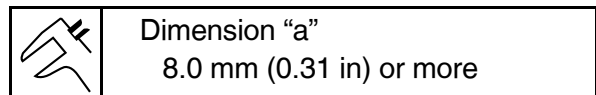
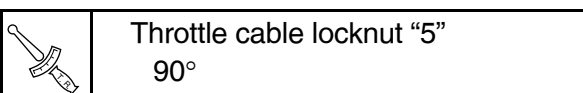
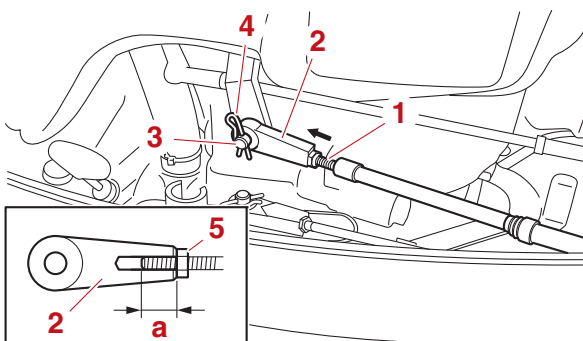


- e. Pull the inner cable "1" using the force of 15 N (1.5 kgf, 3.4 lbf) to remove any free play in the cable.
- f. Adjust the throttle cable joint "2", and then install it to the pin "3" of the accelerator cam.

WARNING

The throttle cable joint must be screwed in 8.0 mm (0.31 in) or more.

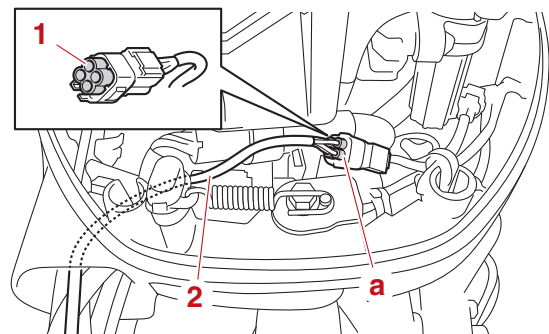
- g. Install the clip "4", and then check that the throttle cable locknut "5" is fully seated on the throttle cable joint "2".
- h. Tighten the throttle cable locknut "5" from its fully seated position to the specified angle.



2. Check:
- Throttle cable operation
Improper → Repeat from step (1).

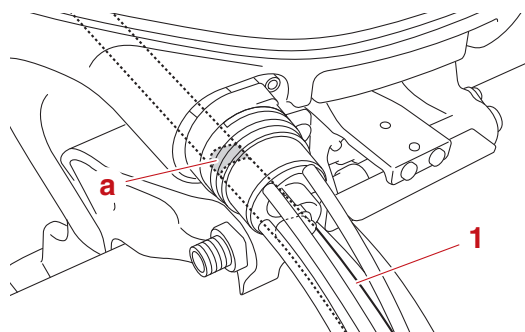
Installing the conventional gauge (6Y5/6Y7) harness

1. Install:
- Gauge harness
 - Remove the cap "1".
 - Route the gauge harness "2" through the bottom cowling.
 - Connect the gauge harness coupler "a". See "Bottom cowling" (5-9).

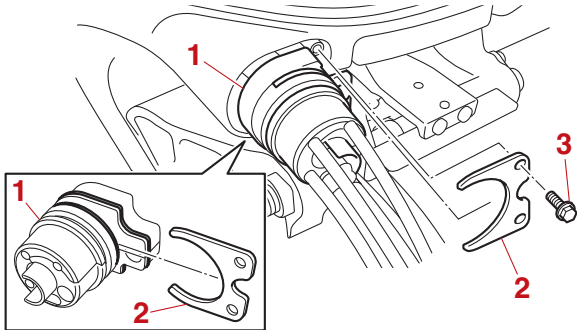



Installing the rigging grommet

1. Install:
- Rigging grommet
 - Route each cable, harness, and hose through the proper holes in the rigging grommet. See "Rigging grommet description" (3-4).
 - Align the tape "a" on the battery cable "1" with the outer end of the rigging grommet.

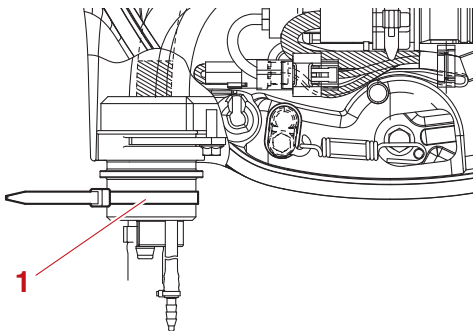


- c. Install the rigging grommet "1" along with the grommet holder "2", and then tighten the grommet holder bolts "3" to the specified torque.

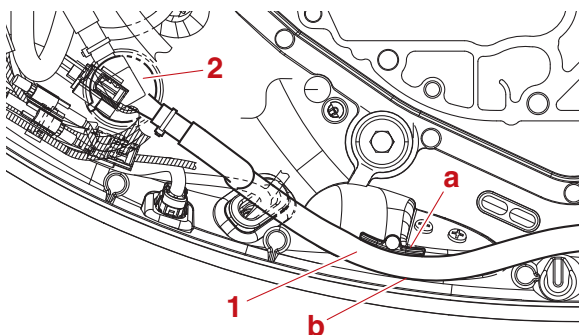


	<p>Grommet holder bolt "3" 10 N·m (1.0 kgf·m, 7.4 lb·ft)</p>
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- d. Fasten the rigging grommet using the plastic tie "1".

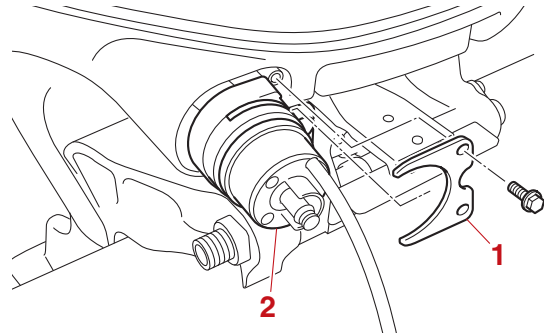


- e. After installing the rigging grommet, pull the fuel hose "1" to the fuel filter assembly "2" side, and then route the loose portion between the bottom rib "a" and the inner wall "b".

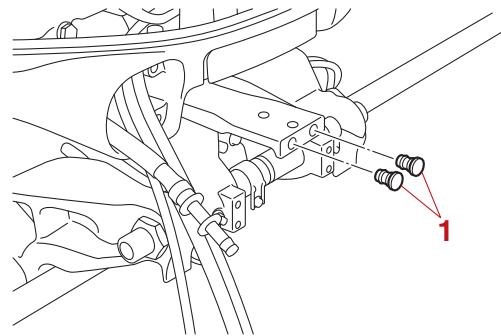


Tiller handle (tiller handle model) Installing the tiller handle

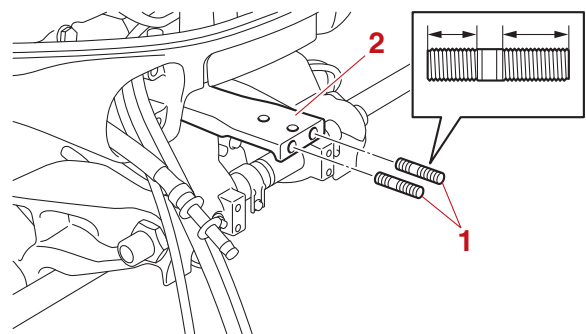
1. Install:
- Tiller handle
 - a. Remove the grommet holder "1" from the rigging grommet "2", and then remove the rigging grommet "2".




- b. Remove the plugs "1".



- c. Install the stud bolts "1" to the steering arm "2", and then tighten them to the specified torque.

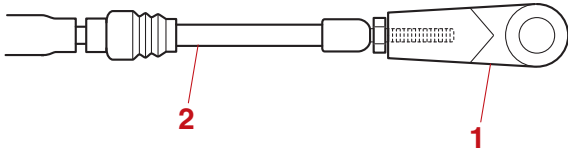


	<p>Stud bolt "1" 20 N·m (2.0 kgf·m, 15 lb·ft)</p>
---	---

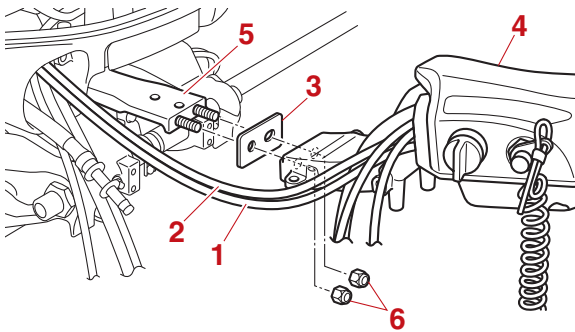
- d. Move the shift lever to the N position.

Tiller handle (tiller handle model)

- e. Install the shift cable joint “1” and throttle cable joint “1” to the shift cable “2” and throttle cable “2”.

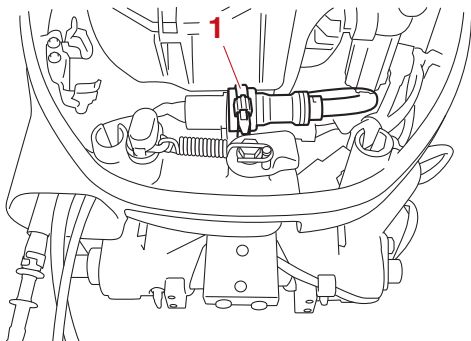


- f. Route the shift cable “1” and throttle cable “2” through the bottom cowling.
- g. Install the plate “3” and tiller handle assembly “4” to the steering arm “5”, and then tighten the tiller handle nuts “6” to the specified torque.

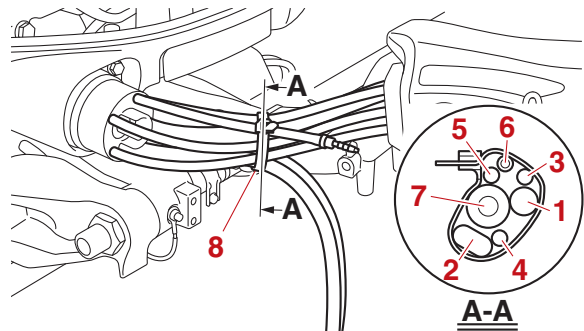


	<p>Tiller handle nut “6” 40 N·m (4.0 kgf·m, 30 lb·ft)</p>
--	---

- h. Release the holder “1”.

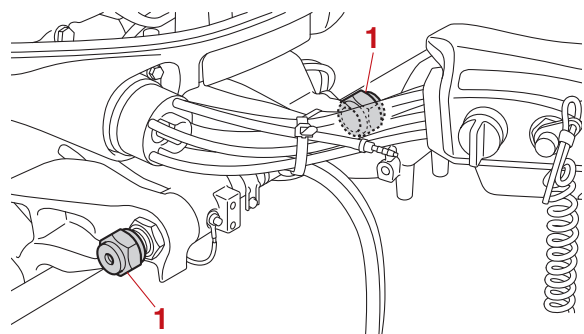



- i. Install the gauge harness, main wire harness, and battery cable. See “Installing the conventional gauge (6Y5/6Y7) harness” (3-7), “Installing the main wire harness” (3-5), and “Installing the battery cable” (3-5).
- j. Install the shift cable. See steps (b)–(h) in “Installing the shift cable” (3-5).
- k. Install the throttle cable. See steps (b)–(h) in “Installing the throttle cable” (3-6).
- l. Install the rigging grommet. See “Installing the rigging grommet” (3-7).
- m. Fasten the main wire harness “1”, battery cable “2”, gauge harness “3”, shift cable “4”, throttle cable “5”, speedometer hose “6”, and fuel hose “7” using the plastic tie “8”.



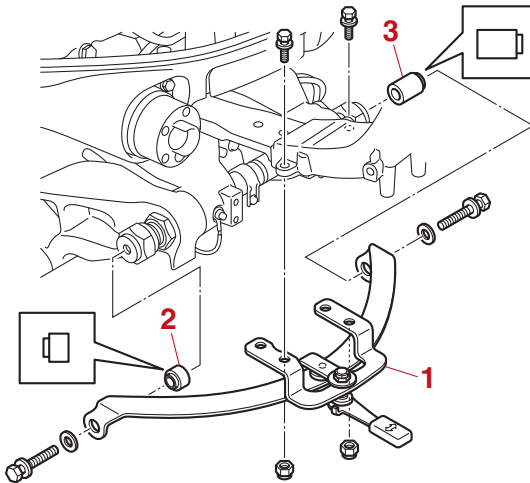
Installing the friction plate

1. Install:
 - Friction plate
 - a. Install the friction plate nuts “1” onto both through tube ends, and then tighten them to the specified torque.



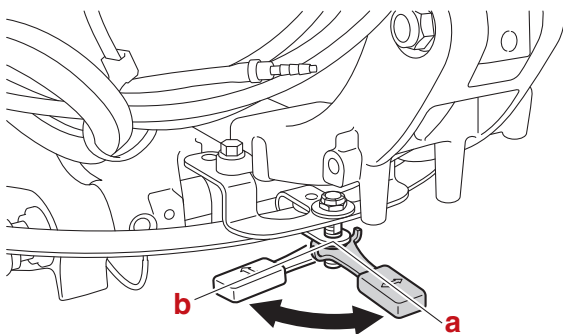
	<p>Friction plate nut "1" 19.6 N·m (1.96 kgf·m, 14.5 lb-ft)</p>
---	---

- b. Install the friction plate assembly "1" and collars "2" and "3".



- c. Check the friction plate assembly for the amount of friction.

TIP: _____
Make sure that the hoses, harnesses, leads, and cables do not interfere with the friction plate assembly.



- a. Increase the friction
b. Decrease the friction

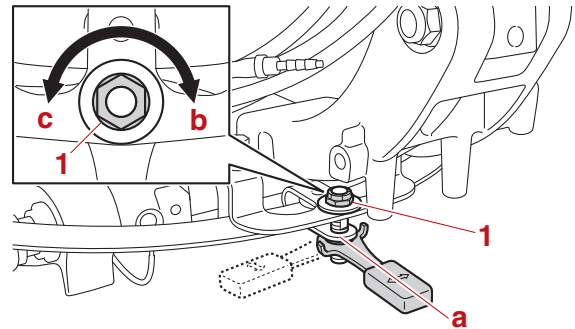
- d. Adjust the friction adjusting nut "1" so that the steering operates properly.

⚠ WARNING _____

Do not overtighten the friction adjuster. If there is too much resistance, it could be difficult to steer, which could result in an accident.

TIP: _____

- Tighten or loosen the friction adjusting nut "1" at the steering lock lever in the position "a".
- To increase the friction, tighten the friction adjusting nut "1" in direction "b".
- To decrease the friction, loosen the friction adjusting nut "1" in direction "c".



Optional equipment

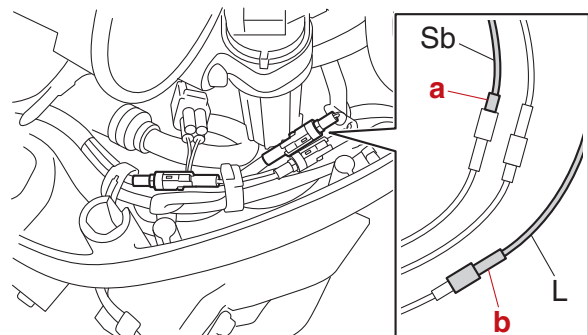
Installing the tilt limiter (remote control model)

See TILT LIMITER INSTALLATION MANUAL (68V-2819K-**-XX) for details of the components. "XX" (2-digit suffix) varies depending on the language.

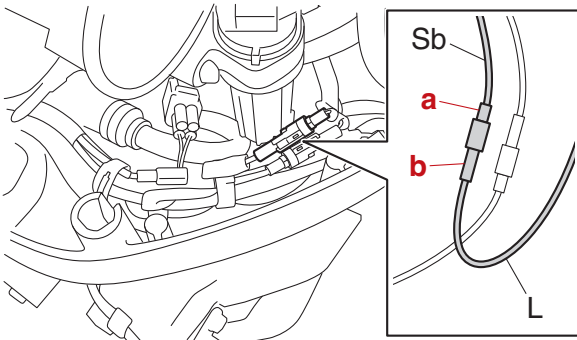
Deactivating the tilt limiter (remote control model)

To fully tilt the outboard motor up, deactivate the tilt limiter according to the following procedure.

1. Deactivate:
 - Tilt limiter
 - a. Disconnect the tilt limiter couplers "a" and "b".



- b. Connect the tilt limiter couplers “a” and “b”.



Battery installation

⚠ WARNING

Make sure to connect the battery properly and select the proper cable sizes. Otherwise, a fire could result.

NOTICE

Do not reverse the battery connections. Otherwise, the charging system could be damaged.

Rigging recommendation

Battery cable length

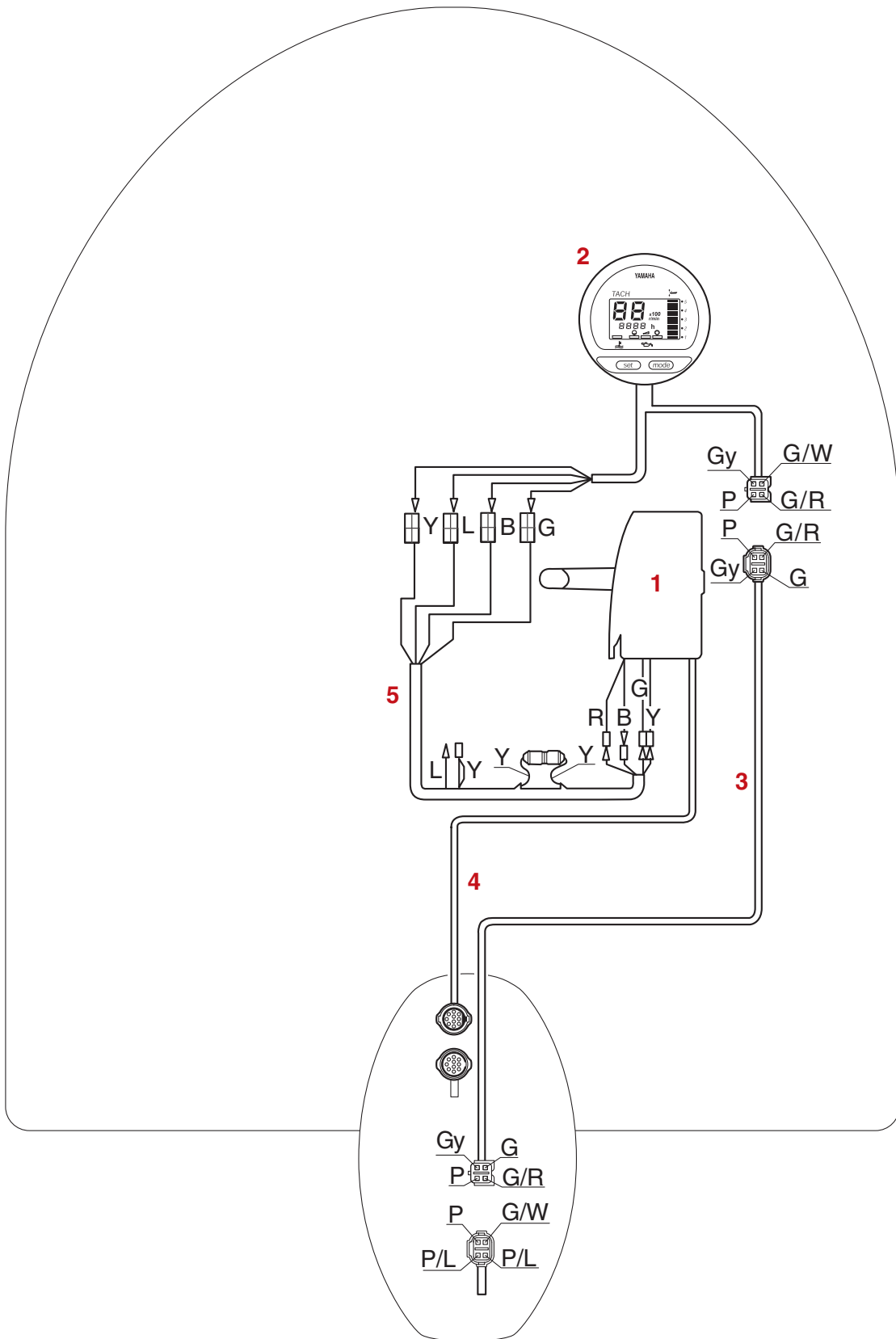
The battery cable length from the negative terminal of the battery cable to the rigging grommet.

The positive battery cable is 100 mm (3.9 in) longer than the negative battery cable.

See “Specification” (A-1).

System diagram

Single engine application (conventional gauge, remote control model)




System diagram

Ref. No.	Part name	Part No.	Remarks
1	Remote control box	703-48205-B3	
		703-48205-23	
2	Tachometer	6Y5-8350T-E0	
3	Conventional gauge harness	6Y5-83653-20	7 m (23 ft)
4	Main wire harness	—	
5	Wire lead for digital meter	6Y5-83553-00	2.5 m (8 ft)

Propeller selection

With the engine speed at full throttle operating range and under a maximum boat load, the engine speed should be within the upper half of the full throttle operating speed range.

	Full throttle operating range 5000–6000 r/min
---	--

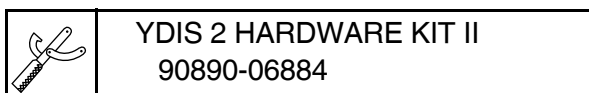
Blade	Dia. (in)	Pitch (in)	Mark	Material	Part number	Remarks
3	14	11	K	Aluminum	6E5-45954-00	
3	13 5/8	13	K	Aluminum	6E5-45949-00	
3	13 5/8	14	K	Aluminum	6E5-45958-00	
3	13 1/2	15	K	Aluminum	6E5-45947-00	
3	13 1/4	17	K	Aluminum	6E5-45945-01	
3	13	19	K	Aluminum	6E5-45941-00	
3	12 5/8	21	K	Aluminum	6E5-45943-00	
3	13	23	K	Aluminum	6E5-45952-00	
3	13	25	K	Aluminum	6E5-45956-00	
3	13 1/2	14	K	Stainless steel	688-45932-60	
3	13 1/2	16	K	Stainless steel	688-45978-60	
3	13	17	K	Stainless steel	688-45930-02	
3	13	19	K	Stainless steel	688-45970-03	
3	13	21	K	Stainless steel	688-45972-02	
3	13	23	K	Stainless steel	688-45974-02	
3	13	25	K	Stainless steel	688-45976-01	

Troubleshooting

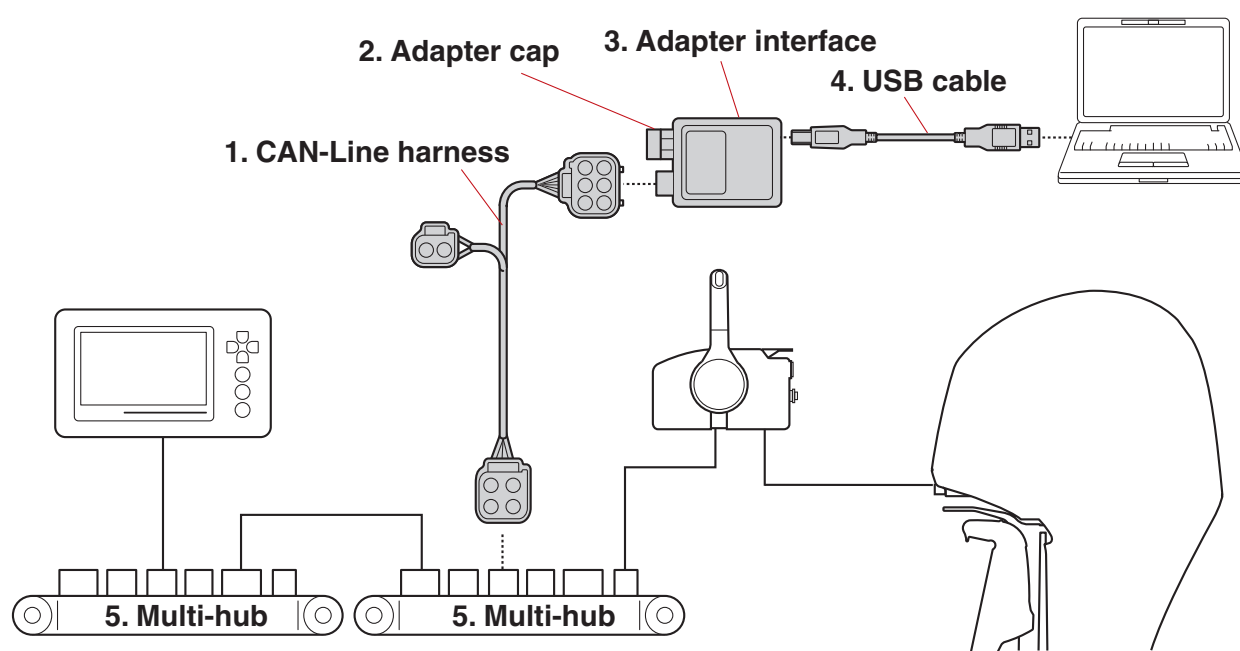
YDIS	4-1
Connecting the communication cable	4-1
ECM reprogramming	4-3
Outboard motor troubleshooting	4-4
Troubleshooting procedure	4-4
Troubleshooting the power unit using the YDIS	4-4
Trouble code and checking step	4-5
Troubleshooting procedure (trouble code not detected)	4-7
Troubleshooting the power unit	4-8
Troubleshooting the PTT unit	4-13
Troubleshooting the lower unit	4-14

YDIS

The Yamaha Diagnostic System uses precision fault diagnosis to offer better serviceability at a time when there is increasing demand for service tools for electronically controlled products. It provides quick, reliable, safe, and reasonable service, and is intended to obtain customer satisfaction. The Yamaha Diagnostic System features updated software and expanded tool functions that allow it to respond to new models and technologies, maintaining compatibility with regulations. See YDIS (Ver. 2.40 or later) instruction manual for detailed information.

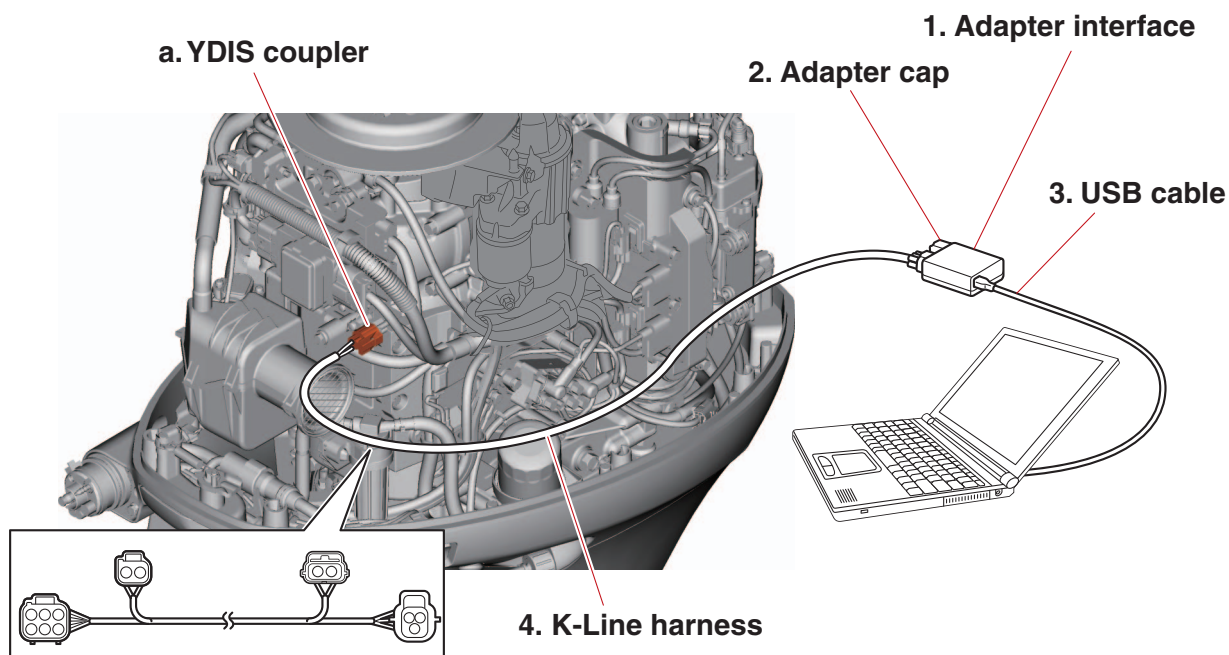


Connecting the communication cable CAN-Line



1. CAN-Line harness
2. Adapter cap
3. Adapter interface
4. USB cable
5. Multi-hub

K-Line



- 1. Adapter interface
- 2. Adapter cap
- 3. USB cable
- 4. K-Line harness
- a. YDIS coupler (gray)

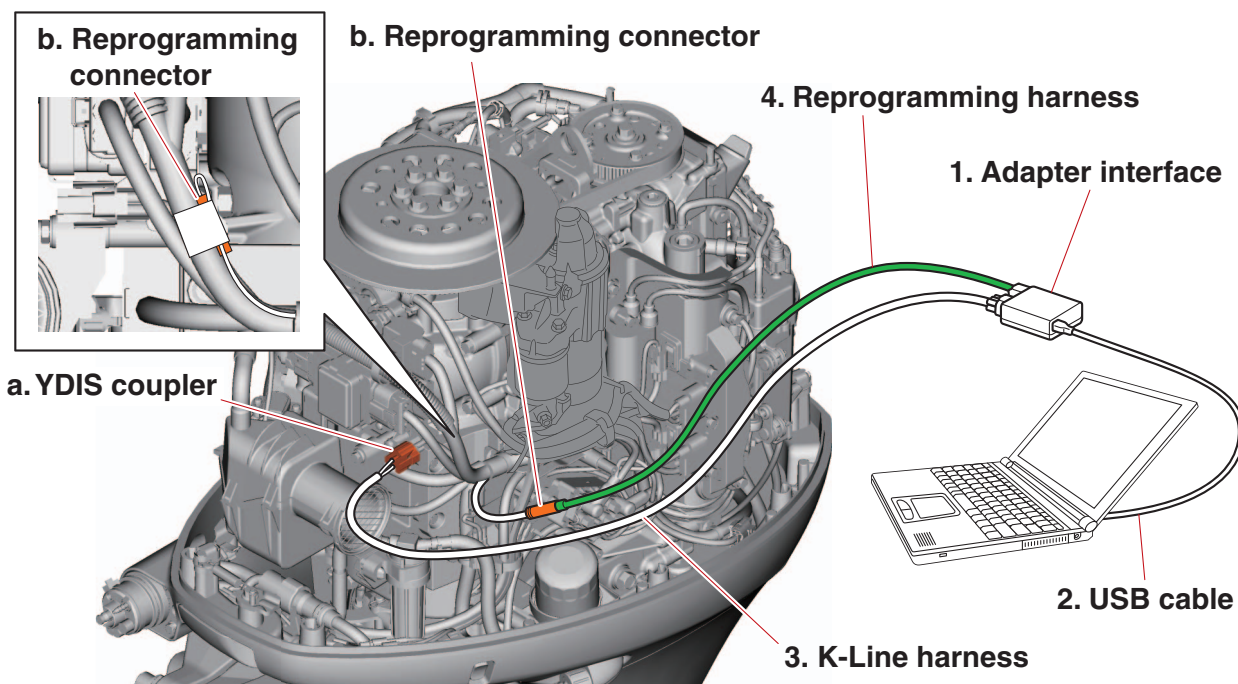
ECM reprogramming

Program update function

This function allows you to update the engine ECM program to the latest version using a reprogramming harness (VPP harness).

Writing function of engine serial numbers

A new function enables you to write an engine serial number to a new, replacement part engine ECM (supplied by the Part Division). With this new function, it will be possible to reprogram engine ECMs that are supplied as replacement parts by communicating with YMAN.



1. Adapter interface
 2. USB cable
 3. K-Line harness
 4. Reprogramming harness
- a. YDIS coupler (gray)
 - b. Reprogramming connector (green/orange)

Outboard motor troubleshooting

Troubleshooting procedure

1. Before troubleshooting the outboard motor, check that fresh fuel of the specified type has been used.
2. Check that all electrical connections are secure and free from corrosion, and that the battery is fully charged.
3. Check the trouble code using the YDIS first, and then check the electronic control system following the trouble code chart.
4. When a trouble code is detected, check the data logger of the engine ECM record graph as well.
5. If a trouble code is not detected, check the power unit according to "Troubleshooting the power unit" (4-8).
6. Before using the YDIS to check the power unit, check the engine ECM circuit. See "Checking the engine ECM circuit" (5-18).

TIP:

- When deleting the diagnosis record on the YDIS, make sure to check the time that the trouble codes were detected.
- When checking the input voltage of a part, the coupler or connector must be disconnected. As a result, the engine ECM determines that the part is disconnected and a trouble code is detected. Therefore, make sure to delete the diagnosis record after checking the input voltage.
- Since the main relay comes on for approximately 10 seconds after the engine start switch is turned to OFF, the power of the engine ECM cannot be turned off. Therefore, if the engine start switch is turned to ON within 10 seconds after it was turned to OFF, the trouble codes cannot be deleted.

Troubleshooting the power unit using the YDIS

1. Use the trouble codes displayed by the YDIS to check each part according to the table of "Trouble code and checking step" (4-5).
2. Delete the trouble codes after checking, repairing, or replacing a part and check that the trouble codes are not detected again. If the same trouble codes are detected, the engine ECM may be faulty.
3. Check the items listed in the table. If all of the items are in good condition, delete the trouble codes, and then check the trouble codes again. If the same trouble codes are detected again, the engine ECM is faulty.

Trouble code table

✓: Indicated

—: Not indicated

Code No.	Item	YDIS diagnosis	YDIS diagnosis record
15	Thermo sensor	✓	✓
17	Knock sensor	✓	✓
18	TPS	✓	✓

Outboard motor troubleshooting

Code No.	Item	YDIS diagnosis	YDIS diagnosis record
19	Battery voltage	✓	✓
23	Air temperature sensor	✓	✓
27	Water in fuel filter	✓	✓
28	Shift position switch	✓	✓
29	Air pressure sensor	✓	✓
44	Engine shut-off switch	✓	—
56	Main power supply	✓	✓
57	Starter magnet power supply	✓	✓
58	HP fuel pump PWR supply	✓	✓
86	Immobilizer	✓	✓

Trouble code and checking step

—: Not applicable

Trouble code	Item (Condition)	Symptom	Checking steps	See page
15	Thermo sensor (Out of specification)	“Check Engine” is displayed. High engine idle speed Degraded acceleration performance Declining maximum engine speed Overheat	Measure the thermo sensor input voltage.	5-31
			Measure the thermo sensor resistance.	5-31
			Check for wiring continuity between the thermo sensor and the engine ECM.	A-8 A-10
17	Knock sensor (Irregular signal)	“Check Engine” is displayed. High engine idle speed	Measure the knock sensor resistance.	5-32
			Check for wiring continuity between the knock sensor and the engine ECM.	A-8 A-10
18	TPS (Out of specification)	“Check Engine” is displayed. High engine idle speed Degraded acceleration performance	Measure the TPS output voltage and opening angle using the YDIS.	5-19
			Measure the TPS input voltage.	5-19
			Check for wiring continuity between the TPS and the engine ECM.	A-8 A-10

Outboard motor troubleshooting

Trouble code	Item (Condition)	Symptom	Checking steps	See page
19	Battery voltage (Below specified voltage)	Battery voltage and battery alert are displayed. Engine operates normally. Engine does not restart (depends on battery condition).	Check the battery cable and terminals for proper connection.	10-8
			Measure the lighting coil output peak voltage.	5-25
			Measure the lighting coil resistance.	5-25
			Measure the rectifier/regulator output peak voltage.	5-26
			Check the rectifier/regulator for continuity.	5-26
23	Air temperature sensor (Out of specification)	"Check Engine" is displayed. High engine idle speed	Check the intake air temperature using the YDIS.	5-30
			Check for wiring continuity between the intake air pressure/temperature sensor and the engine ECM.	A-8 A-10
27	Water in fuel filter (Water in fuel filter)	"Water in fuel" is displayed. Alert buzzer comes on while the shift is in the N position.	Check the fuel filter for water.	—
			Measure the water detection switch input voltage.	5-22
			Check the water detection switch for continuity.	5-22
			Check for wiring continuity between the water detection switch and the engine ECM.	A-8 A-10
28	Shift position switch (Irregular signal)	"Check Engine" is displayed. Engine operates normally.	Check the gear shift operation.	10-5
			Measure the shift position switch input voltage.	5-32
			Check the shift position switch for continuity.	5-32
			Check for wiring continuity between the shift position switch and the engine ECM.	A-8 A-10
29	Air pressure sensor (Out of specification)	"Check Engine" is displayed. High engine idle speed Declining maximum engine speed	Measure the intake air pressure/temperature sensor input voltage.	5-31
			Check for wiring continuity between the intake air pressure sensor and the engine ECM.	A-8 A-10

Outboard motor troubleshooting

Trouble code	Item (Condition)	Symptom	Checking steps	See page
56	Main power supply (Irregular signal)	“Check Engine” is displayed. Main relay is not turned off even if the main switch is OFF. Battery discharges.	Check for wiring short between the main switch and the engine ECM.	A-8 A-10 A-12
			Check for wiring short between the fuse box and the engine ECM.	A-8 A-10
			Replace the fuse box.	7-22
57	Starter magnet power supply (Irregular signal)	“Check Engine” is displayed. Engine does not crank. Starter motor cannot be turned on or off.	Check the fuse.	5-5
			Check for wiring open or short between the engine start switch and the engine ECM.	A-8 A-10 A-12
			Check for wiring open or short between the fuse box and the engine ECM.	A-8 A-10
			Check for wiring open or short between the fuse box and the starter motor.	A-8 A-10
			Replace the fuse box.	7-22
58	HP fuel pump PWR	“Check Engine” is displayed. Engine stalls. High-pressure fuel pump cannot be turned on or off.	Check for wiring open or short between the fuse box and the engine ECM.	A-8 A-10
			Check for wiring open or short between the fuse box and the high-pressure fuel pump.	A-8 A-10
			Replace the fuse box.	7-22
86	Immobilizer (Communication error)	“Check Engine” is displayed. Declining maximum engine speed	Measure the remote control receiver input voltage.	—

Troubleshooting procedure (trouble code not detected)

Troubleshooting consists of the following 5 items:

Symptom 1: Specific trouble conditions

Symptom 2: Trouble conditions of an area or individual part

Cause: Trouble causes of symptom 2

Checking steps: Method for checking

See page: Reference page

—: Not applicable

Troubleshooting the power unit

Symptom 1: Engine does not crank.

Symptom 2	Cause	Checking steps	See page
Starter motor does not operate	Gear shift not in the N position	Set the gear shift to the N position.	10-5
	Blown fuse	Check the fuse.	5-5
	Main relay malfunction	Check the main relay.	5-18
	Engine start switch malfunction	Check the engine start switch.	5-33
	Neutral switch malfunction	Check the neutral switch.	—
	Short, open, or loose connection in starter motor circuit	Check the wire harness for continuity.	A-9 A-11
	Starter motor malfunction	Disassemble and check the starter motor.	5-35
Starter motor operates, but the engine does not crank	Stuck piston or crankshaft	Disassemble and check the power unit.	7-46
	Stuck drive shaft	Check the drive shaft bushing.	9-17
		Disassemble and check the lower unit.	8-10

Symptom 1: Engine will not start (engine cranks).

Symptom 2	Cause	Checking steps	See page
Engine ECM does not operate	Blown fuse	Check the fuse.	5-5
	Short, open, or loose connection in the engine ECM circuit	Check for wire harness continuity between the main relay and the engine ECM.	5-18
		Check for continuity between the engine ECM and ground.	5-18
Spark plug does not produce a spark (all cylinders)	Pulser coil malfunction	Measure the pulser coil output peak voltage.	5-29
		Checking the pulser coil air gap.	7-2
		Measure the pulser coil resistance.	5-29
	Short, open, or loose connection in the pulser coil circuit	Check for wire harness continuity between the pulser coil and the engine ECM.	A-8 A-10

Outboard motor troubleshooting

Symptom 2	Cause	Checking steps	See page
Fuel not supplied (all cylinders)	Pinched or kinked fuel hose	Check the fuel hose.	2-26
	Clogged fuel filter element	Check the fuel filter element for dirt and obstructions.	6-6
	Clogged fuel strainer	Check the fuel strainer for dirt and obstructions.	6-9
	Fuel leakage	Check the fuel line for leakage.	2-26
	High-pressure fuel pump malfunction	Check the high-pressure fuel pump operation using the YDIS.	5-23
		Measure the high-pressure fuel pump resistance.	5-23
	Short, open, or loose connection in high-pressure fuel pump circuit	Measure the high-pressure fuel pump input voltage.	5-23
		Check for continuity between the high-pressure fuel pump and the fuse box.	A-8 A-10
		Check for continuity between the high-pressure fuel pump and ground.	A-8 A-10
	Fuel pump malfunction	Check the fuel pump for leakage.	6-9
Check the diaphragm for tears.		6-10	
Check the camshaft.		7-38	
Compression pressure is low	Improper valve timing	Check the valve timing.	7-13
		Check the timing belt.	7-13
	Compression leakage	Check the valve for bends or sticking.	7-32
		Check the piston and piston rings for damage.	7-46
		Check the cylinder for scratches.	7-48
—	Intake air passage malfunction	Check the ISC valve for sticking.	5-20
		Check the intake manifold and throttle body for air leakage.	6-19

Outboard motor troubleshooting

Symptom 1: Unstable engine idle speed, poor acceleration, poor performance, or limited engine speed.

Symptom 2	Cause	Checking steps	See page
Throttle valve does not move properly	Throttle valve malfunction	Check the throttle valve for proper movement.	6-21
	Throttle link rod and the throttle cable are not installed properly	Adjust the throttle link rod and the throttle cable.	6-22 3-6
Spark plug does not produce a spark (some cylinders)	Spark plug malfunction	Check the spark plugs.	7-18
	Short, open, or loose connection in ignition coil circuit	Check for wiring continuity between the ignition coil and the engine ECM.	A-8 A-10
		Check for wiring continuity between the ignition coil and the fuse box.	A-8 A-10
	Ignition coil malfunction	Measure the ignition coil resistance.	5-28
	Spark plug cap malfunction	Measure the spark plug cap resistance.	5-29
	Engine ECM malfunction	Replace the engine ECM.	7-22
Fuel pressure is low	Fuel leakage	Check for fuel leakage.	2-26
	Clogged fuel filter element	Check the fuel filter element for dirt and obstructions.	6-6
	Clogged fuel strainer	Check the fuel strainer for dirt and obstructions.	6-9
	High-pressure fuel line malfunction	Check the high-pressure fuel pump.	5-23
	Pressure regulator malfunction	Replace the pressure regulator.	6-15
Fuel not supplied (some cylinders)	Fuel injector malfunction	Check the fuel injector operation using the YDIS.	5-23
		Measure the fuel injector resistance.	5-23
	Short, open, or loose connection in fuel injector circuit	Measure the fuel injector input voltage.	5-23
		Check for continuity between the fuel injector and the fuse box.	A-8 A-10
		Check for continuity between the fuel injector and the engine ECM.	A-8 A-10
	Clogged fuel injector filter	Replace the fuel injector.	6-17
	Engine ECM malfunction	Replace the engine ECM.	7-22

Outboard motor troubleshooting

Symptom 2	Cause	Checking steps	See page
Compression pressure is low	Improper valve timing	Check the valve timing.	7-13
		Check the timing belt.	7-13
	Compression leakage	Measure the valve clearance.	7-2
		Check the rocker arm for damage.	7-37
		Check the camshaft for damage.	7-38
		Check the valve and valve seat for wear.	7-32 7-34
		Check the piston and piston ring for damage.	7-46
		Check the cylinder for scratches.	7-48

Symptom 1: High engine idle speed.

Symptom 2	Cause	Checking steps	See page
—	Air leakage (throttle valve–cylinder head)	Check the gaskets of the intake manifolds and throttle body.	6-19
		Check the intake manifold for cracks.	6-21
	Throttle link rod and the throttle cable are not installed properly	Adjust the throttle link rod and the throttle cable.	6-22 3-6
	ISC valve malfunction	Check the ISC valve operation using the YDIS.	5-20
		Measure the ISC valve resistance.	5-20

Symptom 1: Limited engine speed (below 2000–3000 r/min).

Symptom 2	Cause	Checking steps	See page
Buzzer comes on, overheat alert indicator comes on	Clogged cooling water inlet	Check the pilot hole for cooling water discharge.	10-9
		Check the cooling water inlet.	10-15
	Water pump malfunction	Check the impeller.	8-4
		Check the impeller key.	8-4
		Check the insert cartridge.	8-4
	Water leakage from water pump housing	Check the water pump housing.	8-4
		Check the outer plate cartridge.	8-4
	Clogged cooling water passages	Check the cooling water passages.	2-23
	Open PCV	Check the PCV.	9-19
	Thermostat malfunction	Check the thermostat.	7-26

Outboard motor troubleshooting

Symptom 2	Cause	Checking steps	See page
Buzzer comes on, oil pressure alert indicator comes on	Insufficient engine oil	Check the engine oil level.	10-8
		Check for engine oil leakage.	2-21
		Check the valve seals and valves.	7-30
		Check the piston rings.	7-49
	Engine oil pressure decrease	Check the oil pressure switch.	5-20
		Check the oil pump.	7-43
		Check the oil strainer.	9-19
		Check the relief valve.	7-42
		Check the oil passages (power unit and the oil pump).	2-21
		Replace the oil filter.	10-18

Symptom 1: Discharged battery.

Symptom 2	Cause	Checking steps	See page
Low voltage indicator activates on the gauge	Battery performance decrease	Check the battery capacity and specific gravity.	10-8
		Check the battery cable and terminals for proper connections.	3-5
	Short, open, or loose connection in charging circuit	Check the charging circuit for wiring connection and damage.	A-9 A-11
	Lighting coil malfunction	Measure the lighting coil output peak voltage.	5-25
		Measure the lighting coil resistance.	5-25
	Rectifier/regulator malfunction	Measure the rectifier/regulator output peak voltage.	5-26
		Check the rectifier/regulator for continuity.	5-26

Troubleshooting the PTT unit

Symptom 1: PTT unit does not operate.

Symptom 2	Cause	Checking steps	See page
PTT relay does not operate	Blown fuse	Check the fuse.	5-5
	PTT switch malfunction	Check the PTT switch.	5-41
	PTT relay malfunction	Check the PTT relay.	5-40
	Short, open, or loose connection of the wire harness	Measure the PTT switch input voltage.	5-41
		Measure the PTT relay input voltage.	5-40
		Check for continuity between the PTT switch and the PTT relay.	A-9 A-11 A-12
PTT motor does not operate	PTT motor malfunction	Check the PTT motor.	9-31
	Bent trim and tilt ram	Check the trim and tilt ram.	9-39
	Stuck trim and tilt ram	Disassemble and check the PTT unit.	9-39
	Short, open, or loose connection in PTT motor circuit	Check for continuity between the PTT motor and the PTT relay terminal.	A-9 A-11
PTT fluid pressure does not increase	Manual valve open	Check the manual valve.	9-25
	Insufficient PTT fluid	Add sufficient PTT fluid.	10-21
	PTT fluid leakage	Check for PTT fluid leakage.	10-5
	Clogged fluid passage	Disassemble and check the PTT unit.	9-35 9-39
		Check the filter for dirt and obstructions.	9-37
		Check the valves for damage.	9-37
		Check the fluid passages for obstructions.	9-35 9-39
	PTT motor malfunction	Check the PTT motor.	9-31
Gear pump malfunction	Check the gear pump operation.	9-25	

Outboard motor troubleshooting

Symptom 1: PTT unit does not hold the outboard motor up.

Symptom 2	Cause	Checking steps	See page
PTT fluid pressure does not increase	Manual valve open	Check the manual valve.	9-25
	Insufficient PTT fluid	Add sufficient PTT fluid.	10-21
	PTT fluid leakage	Check for PTT fluid leakage.	10-5
	Clogged fluid passages	Disassemble and check the PTT unit.	9-35 9-39
		Check the valves for damage.	9-37
		Check the fluid passages for obstructions.	9-35 9-39

Troubleshooting the lower unit

Symptom 1: Shift mechanism of the forward gear and reverse gear does not operate properly.

Symptom 2	Cause	Checking steps	See page
—	Shift cable is not adjusted properly	Adjust the shift cable.	3-5
	Shift rod does not operate properly	Check the shift rod for wear.	8-4
		Check the detent mechanism.	9-9
—	Shift mechanism malfunction (in lower unit)	Check the shift rod connection.	8-17
		Check the dog clutch.	8-8
		Check the forward gear, reverse gear, and pinion for damage and wear.	8-12 8-8 8-12

Electrical system

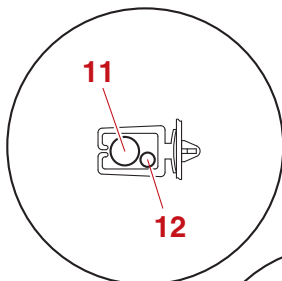
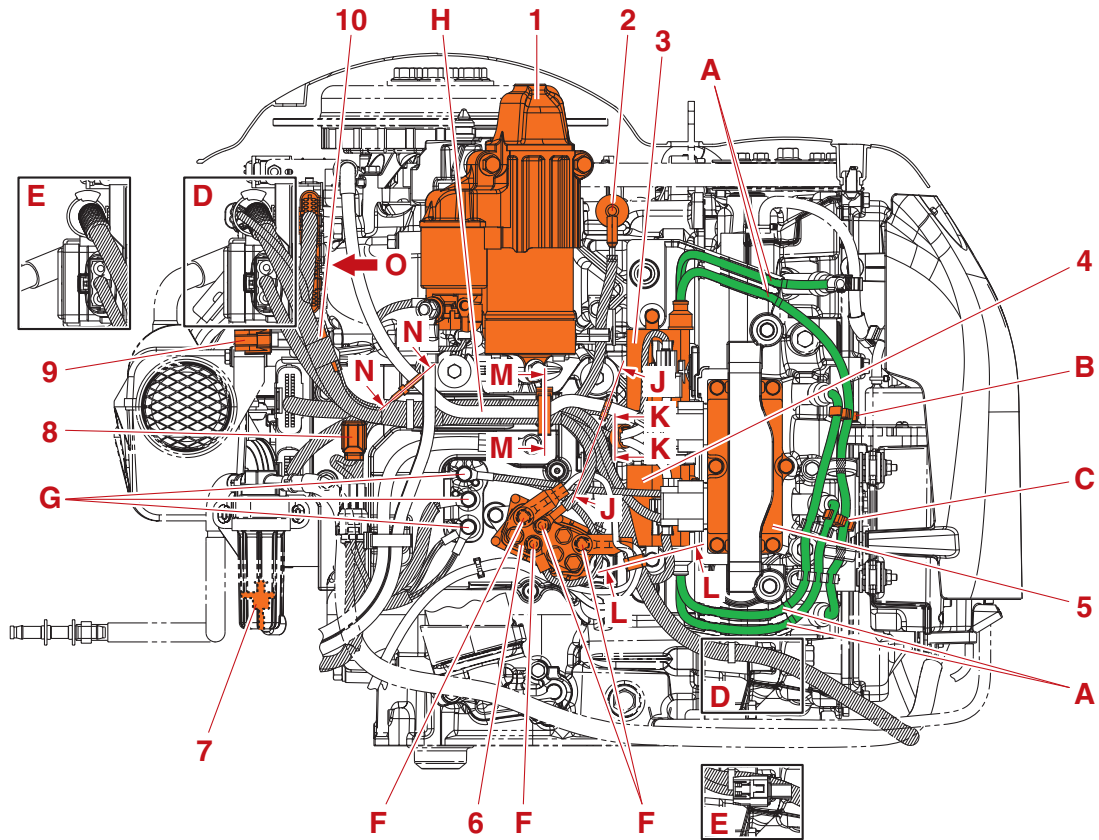
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Electrical system

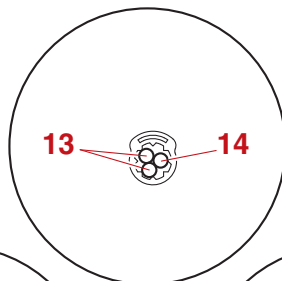
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Electrical component and wire harness routing

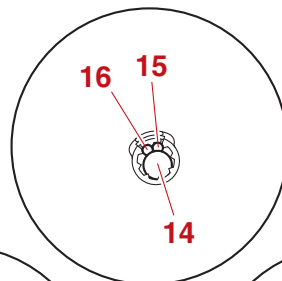
Port



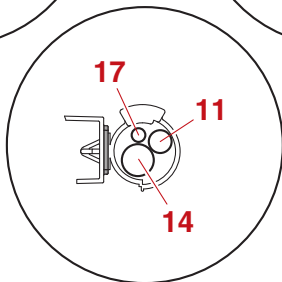
J-J



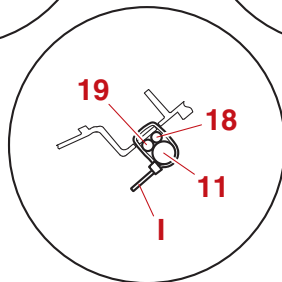
K-K



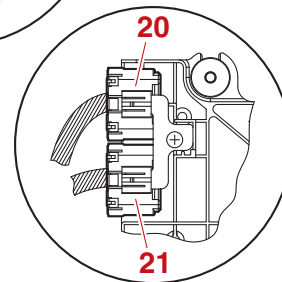
L-L



M-M



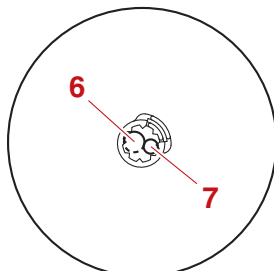
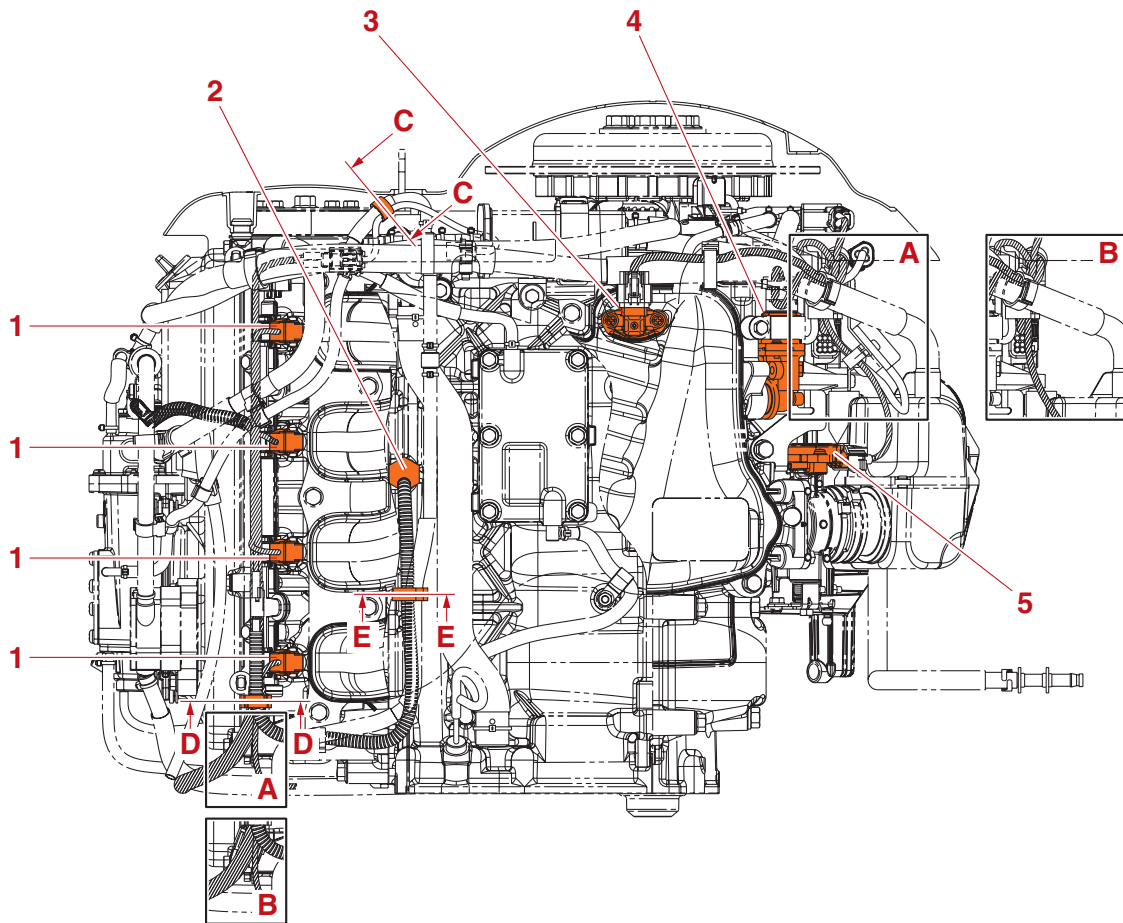
N-N



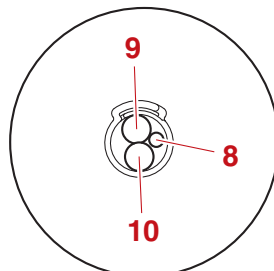
O-O

1. Starter motor
 2. Oil pressure switch
 3. Ignition coil #1, #4
 4. Ignition coil #2, #3
 5. Rectifier/regulator
 6. PTT relay
 7. Water detection switch
 8. Diode
 9. YDIS coupler
 10. Reprogramming connector
 11. Lighting coil lead
 12. PTT relay lead
 13. Ignition coil lead
 14. Wire harness
 15. PTT motor lead (Blue)
 16. PTT motor lead (Green)
 17. Rectifier/regulator lead
 18. Magnet switch lead
 19. Starter motor lead
 20. Joint connector 1
 21. Joint connector 2
- A. Align the tape markings for cylinder identification on the spark plug wires with the bracket end, and then install the spark plug wires.
 - B. Fasten the spark plug wires of the ignition coils #2 and #4 using the clamp. When doing so, make sure that the wires do not interfere with each other.
 - C. Fasten the spark plug wires of the ignition coils #3 and #4 using the clamp. When doing so, make sure that the wires do not interfere with each other.
 - D. Tiller handle model
 - E. Remote control model
 - F. Install the terminals in the direction shown in the illustration. Make sure that the terminals do not move after installation.
 - G. Make sure that the ground terminal contacts the detent, and then secure it.
 - H. Make sure that the lighting coil lead has no slack.
 - I. Tighten the plastic tie so that it has no slack. Make sure the plastic tie is attached in the direction shown in the figure, and do not cut off the end of the plastic tie.

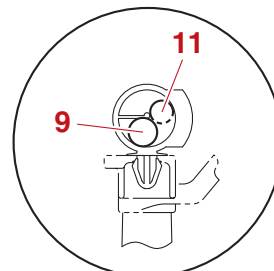
Starboard



C-C



D-D

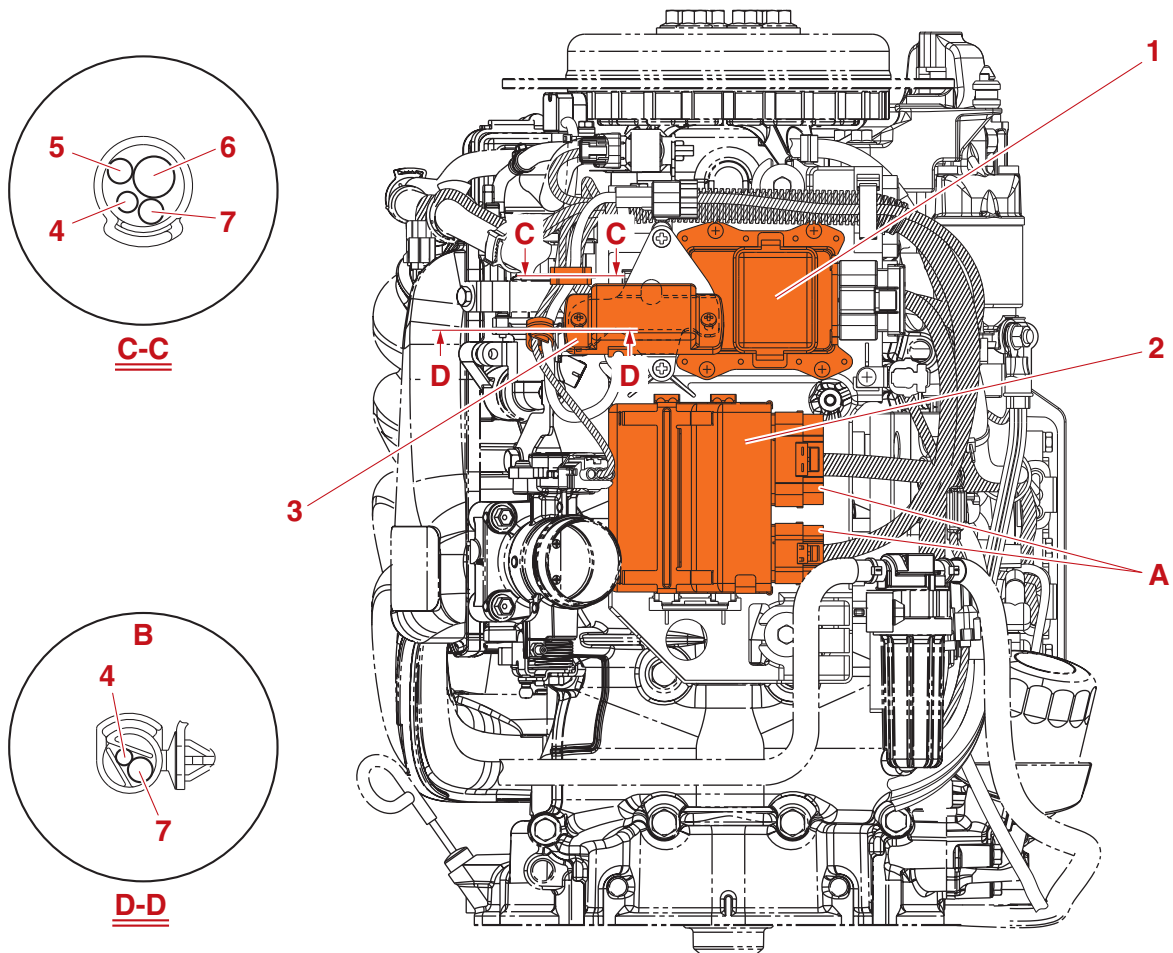


E-E

- 1. Fuel injector
- 2. Knock sensor
- 3. Intake air pressure/temperature sensor
- 4. ISC valve
- 5. TPS
- 6. Cooling water hose
- 7. Thermo sensor lead
- 8. Shift position switch lead
- 9. Knock sensor lead

- 10. Wire harness
- 11. Vapor gas hose
- A. Tiller handle model
- B. Remote control model

Front

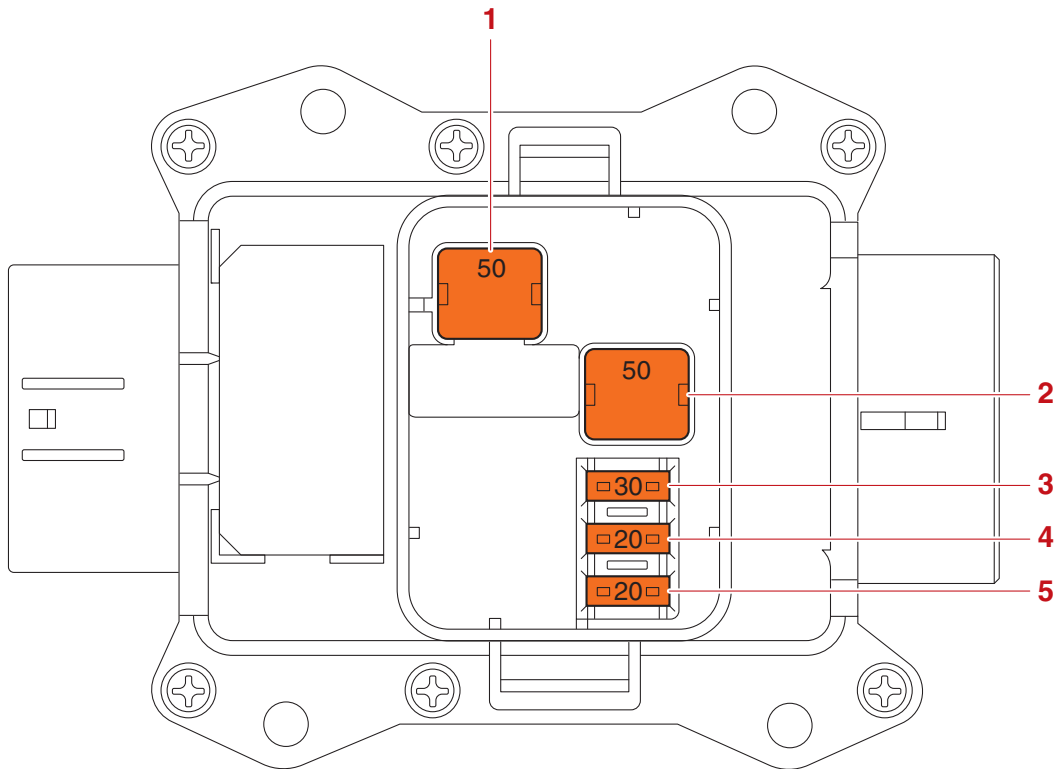


1. Fuse box
2. Engine ECM
3. Hour meter (tiller handle model)
4. TPS lead
5. Pulser coil lead
6. Fuse box lead
7. Hour meter lead (tiller handle model)

B. Tiller handle model

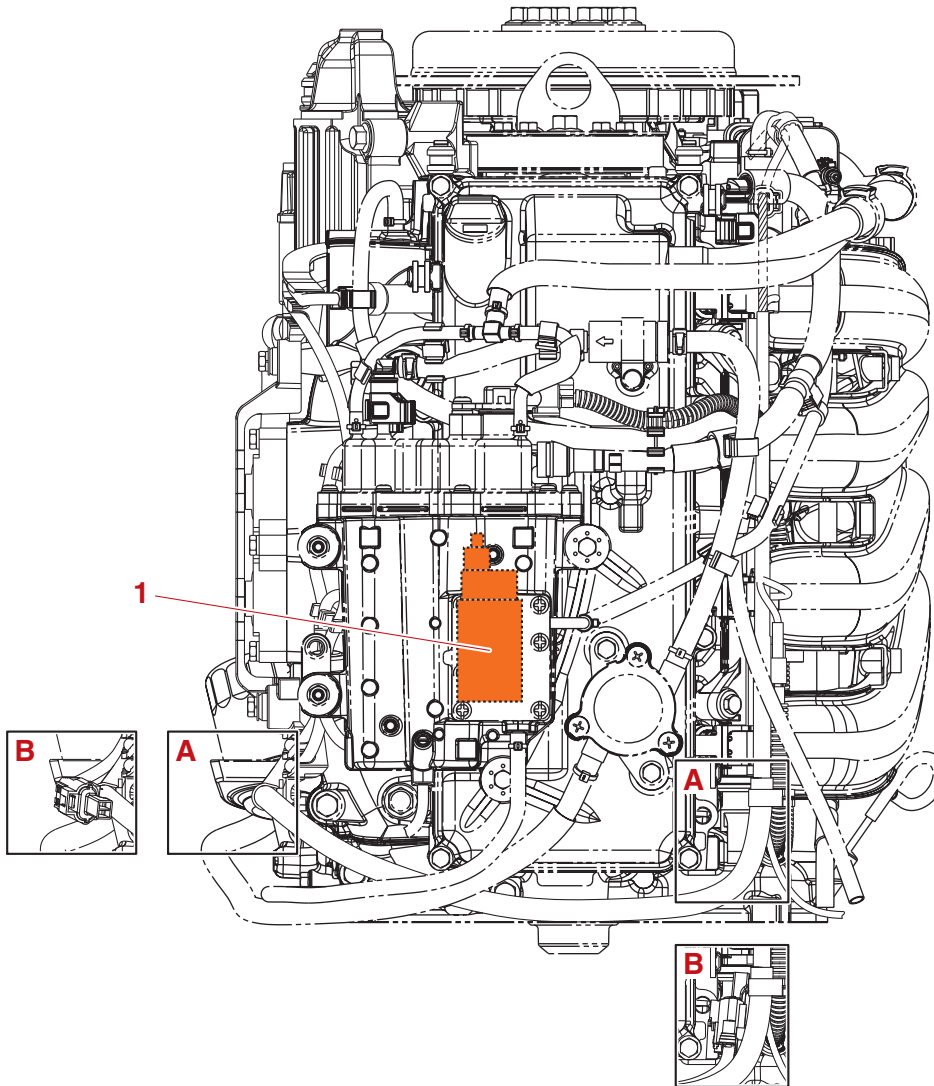
A. Insert the ECM couplers until they are connected.

Fuse holder



1. Fuse (50 A) (spare)
2. Fuse (50 A) (battery)
3. Fuse (30 A) (starter relay)
4. Fuse (20 A) (main switch, PTT switch)
5. Fuse (20 A) (engine ECM, ignition coil, high-pressure fuel pump, fuel injector, vapor shut-off valve)

Rear

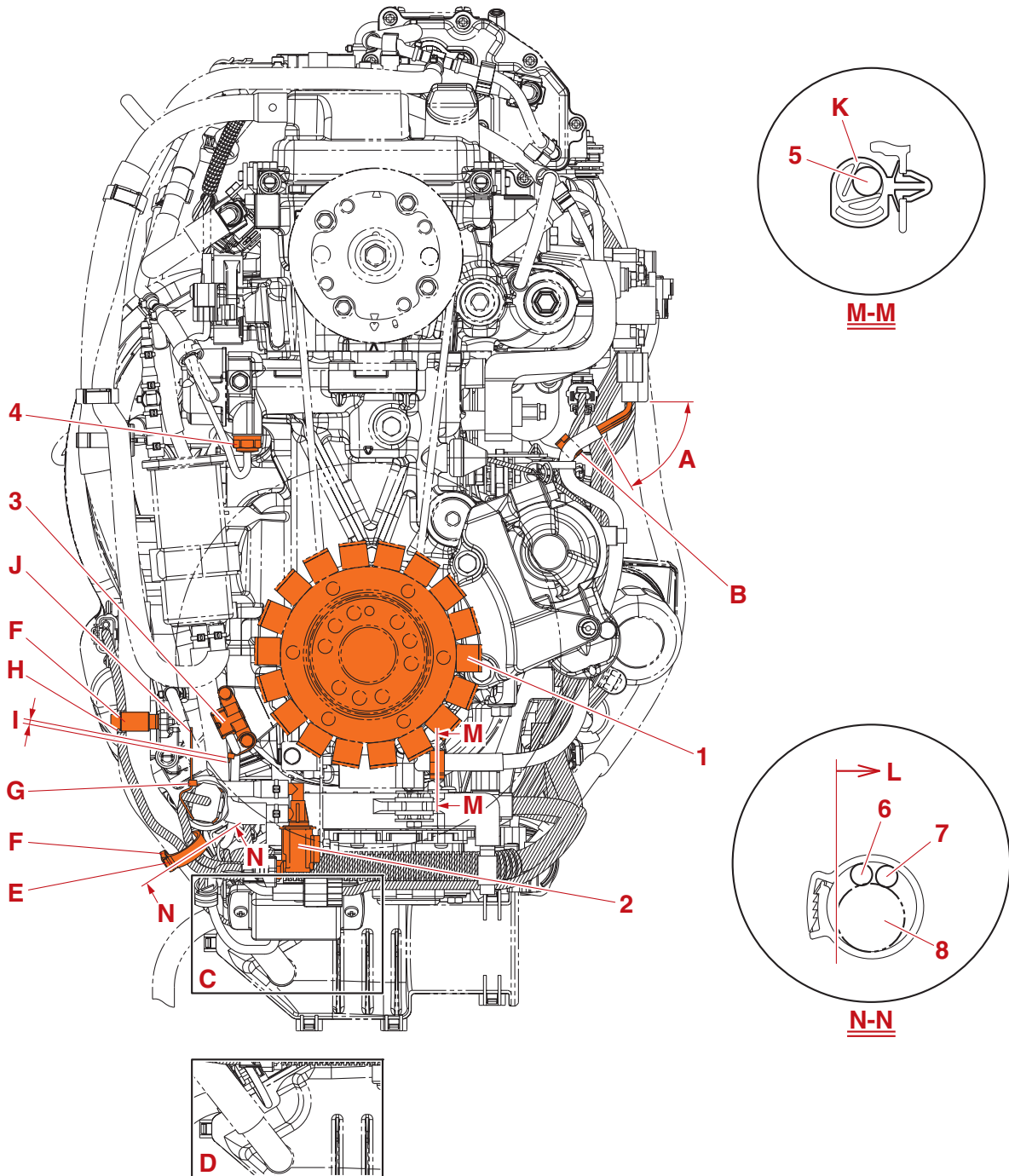


1. High-pressure fuel pump

A. Tiller handle model

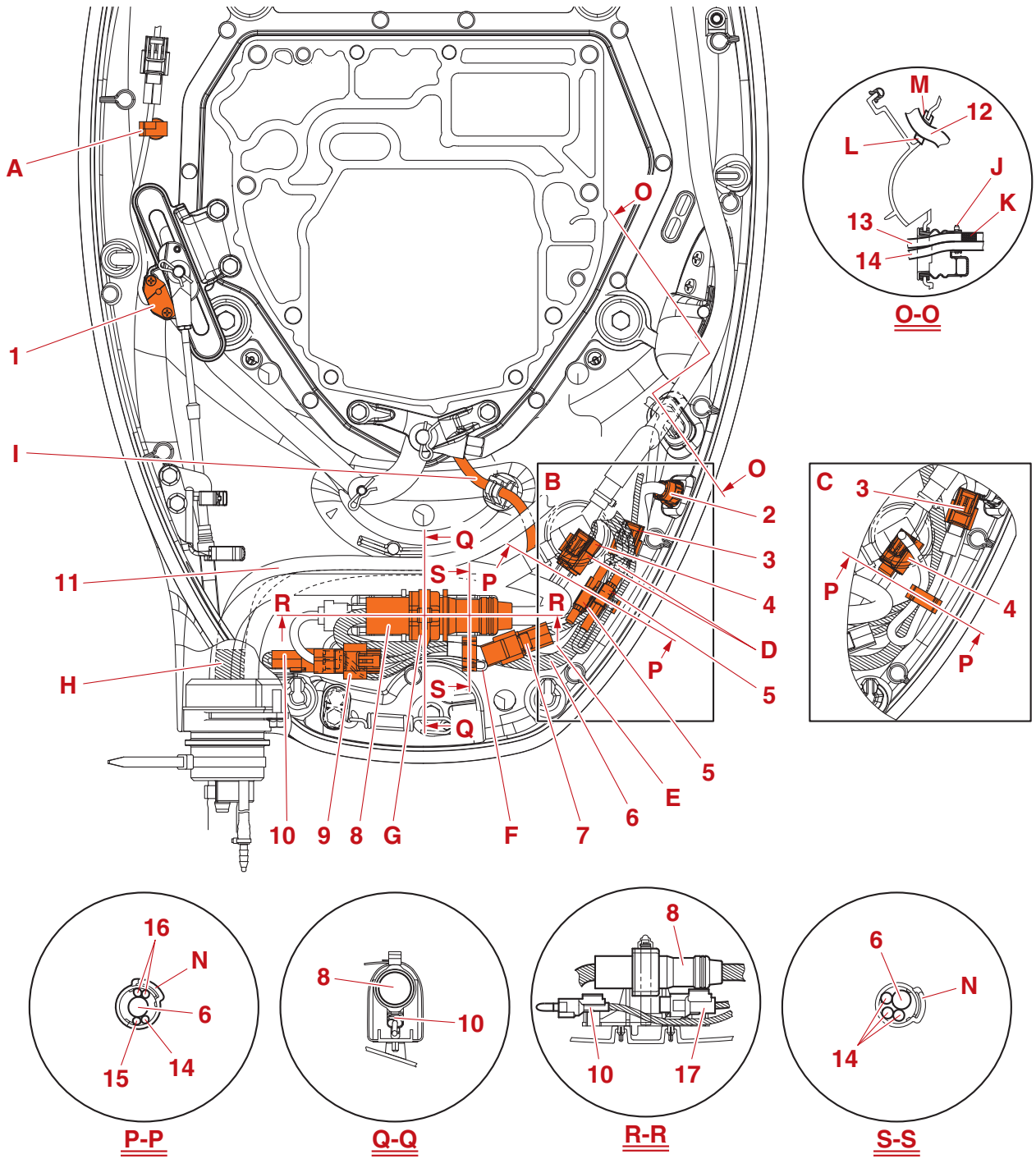
B. Remote control model

Top



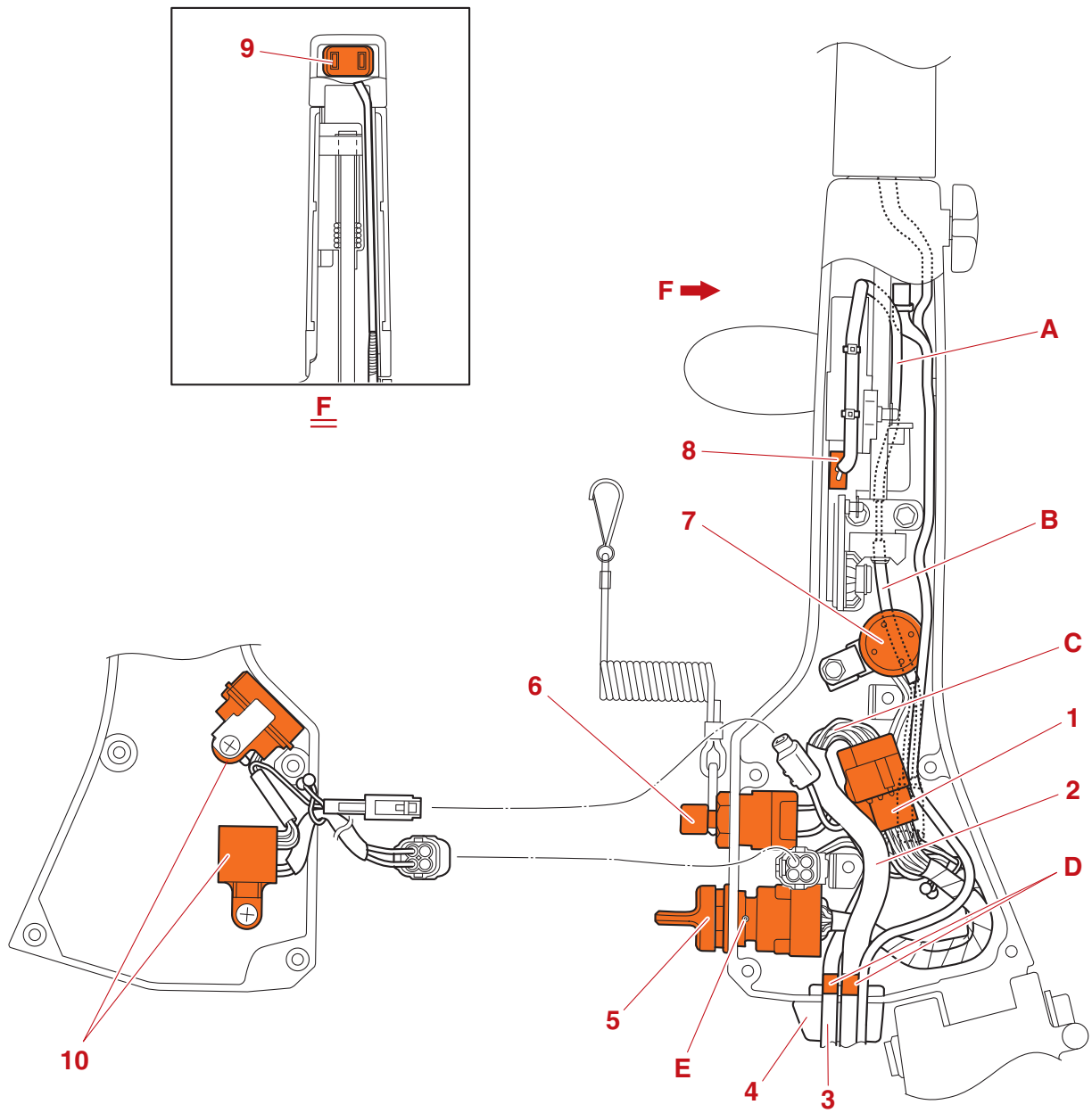
1. Lighting coil (stator assembly)
 2. Vapor shut-off valve
 3. Pulser coil
 4. Thermo sensor
 5. Lighting coil lead
 6. Intake air pressure/temperature sensor lead
 7. ISC valve lead
 8. Blowby hose
- A. 25 mm (0.98 in) or less
 - B. Using the clamp, fasten the ignition coil lead at the protective tube of the lighting coil lead over the clamp.
 - C. Tiller handle model
 - D. Remote control model
 - E. Align the marking position of the blowby hose with the positioning tape of the wire harness, and then fasten the blowby hose and wire harness using the clamp.
 - F. Route the intake air pressure/temperature sensor lead without any slack.
 - G. Fasten the ISC valve lead to the ISC valve coupler using the plastic tie so that the lead has no slack.
When doing so, it does not matter in which direction the plastic tie is wound.
 - H. Using the clamp, fasten the blowby hose at the positioning tape of the intake air pressure/temperature sensor lead.
 - I. Fasten the pulser coil lead to the base magnet boss using the clamp, and then cut the end of clamp so that it is less than 1 mm (0.04 in).
 - J. Arrange the end of the plastic tie so that it interferes with neither the mounting boss of the flywheel magnet cover nor the pulser coil lead.
Do not cut off the end of the plastic tie.
 - K. Install the clamp to the base magnet boss as shown, and then fasten the lighting coil lead using the clamp.
 - L. Arrange the intake air pressure/temperature sensor lead and ISC valve lead inside the end surface of the blowby hose.

Bottom cowling



1. Shift position switch
 2. PTT switch
 3. Water detection switch coupler
 4. PTT switch coupler
 5. Tilt limiter coupler (remote control model)
 6. Wire harness
 7. 6Y8 multifunction meter communication coupler
 8. Main wire harness coupler (10-pin)
 9. Trolling switch coupler
 10. Trim sensor coupler
 11. Battery cable
 12. Flushing hose
 13. PTT motor lead
 14. Trim sensor lead
 15. PTT switch lead
 16. Water detection switch lead
 17. Gauge harness coupler
- A. Fasten the shift position switch lead using the clamp.
 - B. Remote control model
 - C. Tiller handle model
 - D. Install the PTT switch coupler and wire harness at the position shown.
 - E. Route the PTT switch lead under the main wire harness coupler (10-pin).
 - F. Fold the trim sensor lead to remove any slack, and then fasten it using the clamp.
 - G. Install the clamp so that the end is pointing forward.
 - H. Align the tape of the battery cable with the end of the rigging grommet, and then install the battery cable.
 - I. Route the speedometer hose so that it does not interfere with the handle gear shift.
 - J. Cut off the end of the clamp so that it is 1 mm (0.04 in) or less.
 - K. Align the end of white tape on the PTT lead with the grommet end.
 - L. Install the grommet so that the part without the groove faces the bottom side and the stamped side faces inside.
 - M. Stamped position
 - N. Install the clamp in the direction shown in the illustration.

Tiller handle (tiller handle model)

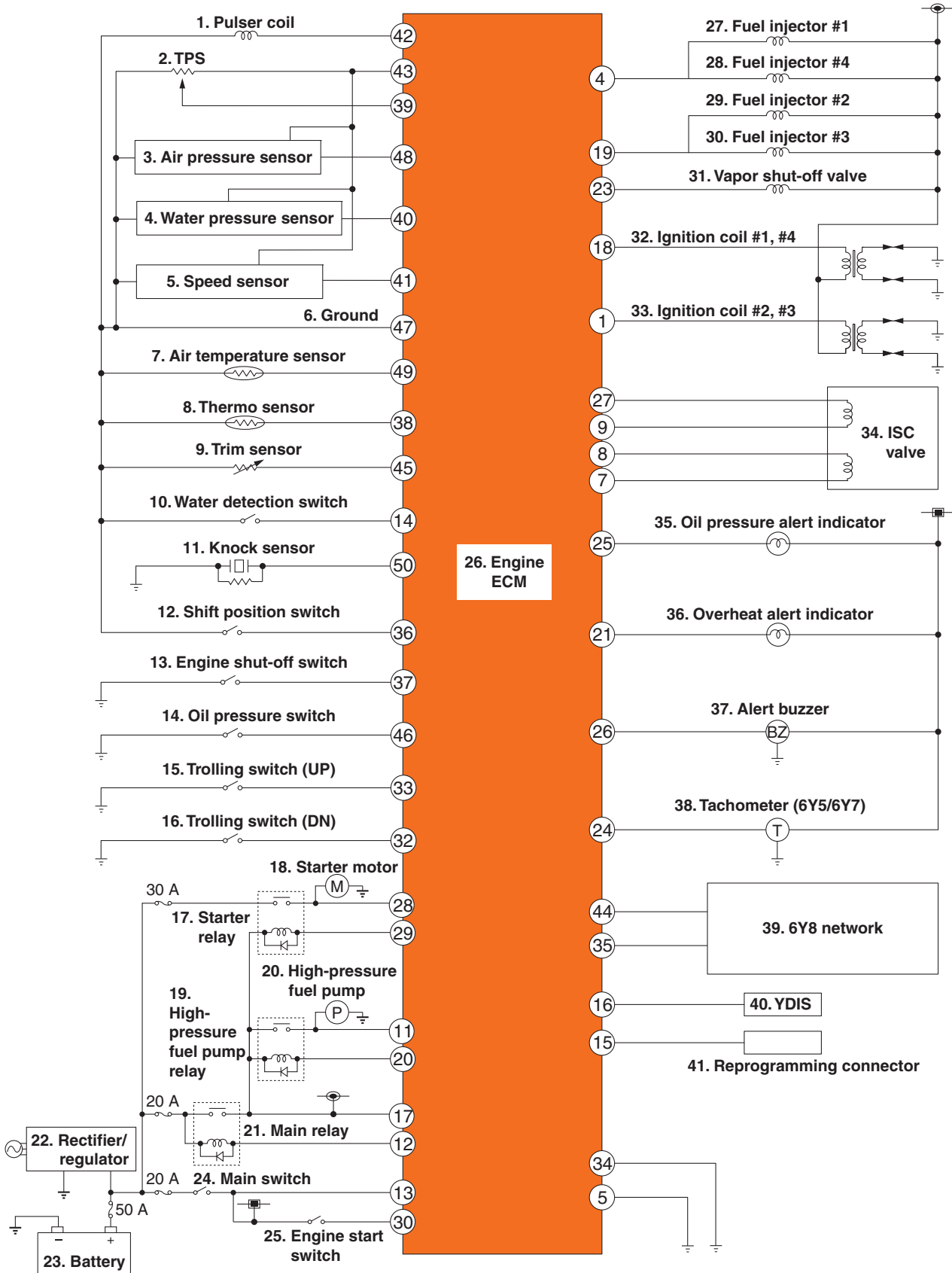


1. Engine start switch coupler
 2. Extension wire harness
 3. Alert indicator harness
 4. Grommet
 5. Engine start switch
 6. Engine shut-off switch
 7. Alert buzzer
 8. Neutral switch
 9. PTT switch
 10. Alert indicator
- A. Run the leads (blue and black) under the control link assembly.
 - B. Run the neutral switch leads (brown) under the buzzer.
 - C. Bend the extension wire harness "2", and then connect the harness coupler. This harness bending position must be 10.0 mm (0.39 in) or more away from the engine start switch coupler "1". The bend radius should be 10.0 mm (0.39 in) or more.
 - D. Align the tape ends of the extension wire harness "2" and the alert indicator harness "3" with the end of the grommet "4".
 - E. Install the engine start switch "5" with the hole of the switch facing upward.

ECM circuit diagram

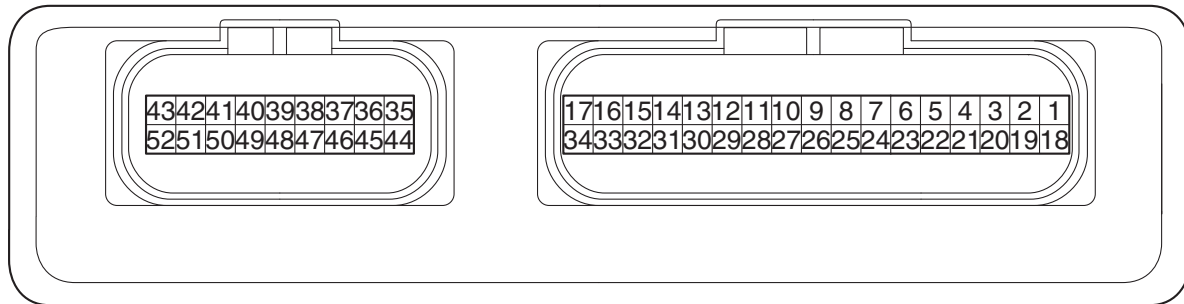
⊕, ⊖: Indicate a connection between the symbols.

The circled numbers in the illustration indicate the engine ECM terminal numbers.



1. Pulser coil
2. TPS
3. Air pressure sensor
4. Water pressure sensor
5. Speed sensor
6. Ground
7. Air temperature sensor
8. Thermo sensor
9. Trim sensor
10. Water detection switch
11. Knock sensor
12. Shift position switch
13. Engine shut-off switch
14. Oil pressure switch
15. Trolling switch (UP)
16. Trolling switch (DN)
17. Starter relay
18. Starter motor
19. High-pressure fuel pump relay
20. High-pressure fuel pump
21. Main relay
22. Rectifier/regulator
23. Battery
24. Main switch
25. Engine start switch
26. Engine ECM
27. Fuel injector #1
28. Fuel injector #4
29. Fuel injector #2
30. Fuel injector #3
31. Vapor shut-off valve
32. Ignition coil #1, #4
33. Ignition coil #2, #3
34. ISC valve
35. Oil pressure alert indicator
36. Overheat alert indicator
37. Alert buzzer
38. Tachometer (6Y5/6Y7)
39. 6Y8 network
40. YDIS
41. Reprogramming connector

ECM coupler layout



No.	Connecting part	Color
1	Ignition coil #2, #3	Black/White
2	—	—
3	—	—
4	Fuel injector #1, #4	Purple
5	Ground	Black
6	—	—
7	ISC valve	Yellow/Red
8	ISC valve	Green/Yellow
9	ISC valve	Yellow/Green
10	—	—
11	High-pressure fuel pump relay power source	Red/Yellow
12	Main relay	Blue
13	Main switch	Yellow
14	Water detection switch	Blue/White
15	Reprogramming connector	Green/Orange
16	YDIS	White/Black
17	Battery power source	Red/Yellow
18	Ignition coil #1, #4	Red/Black
19	Fuel injector #2, #3	Yellow
20	High-pressure fuel pump relay	Blue
21	Overheat alert indicator	Pink/Blue
22	—	—
23	Vapor shut-off valve	Green/Black

No.	Connecting part	Color
24	Tachometer (6Y5/6Y7)	Green
25	Oil pressure alert indicator	Green/White
26	Alert buzzer	Pink
27	ISC valve	Green/Red
28	Starter relay power source	Brown
29	Starter relay	Blue
30	Engine start switch	Brown
31	—	—
32	Trolling switch (DN)	White/Blue
33	Trolling switch (UP)	Yellow/Blue
34	Ground	Black
35	6Y8 network	Blue
36	Shift position switch	Blue/Yellow
37	Engine shut-off switch	White
38	Thermo sensor	Black/White
39	TPS	Pink/Blue
40	Water pressure sensor*1	Blue/Black
41	Speed sensor*1	Blue/Red
42	Pulser coil	White/Black
43	Sensor power source	Orange
44	6Y8 network	White
45	Trim sensor	Pink
46	Oil pressure switch	Pink/White
47	Sensor ground	Black
48	Air pressure sensor	Yellow/Green

No.	Connecting part	Color
49	Air temperature sensor	Black/Yellow
50	Knock sensor	Green
51	—	—
52	—	—

*1: F75FET, F100GET

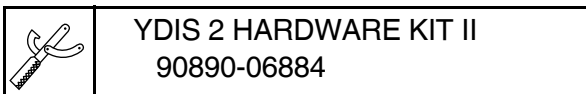
Checking the electrical component

Using the YDIS

When checking the TPS, ISC valve, high-pressure fuel pump, fuel injector, and related sensors, use the YDIS.

TIP: _____

- When deleting the diagnosis record in the YDIS, make sure to check the time that the trouble codes were detected.
- When checking the input voltage of a part, the coupler or connector must be disconnected. As a result, the engine ECM determines that the part is disconnected and a trouble code is detected. Therefore, make sure to delete the diagnosis record after checking the input voltage.
- To connect and operate the YDIS, see the YDIS (Ver. 2.40 or later) instruction manual.
- The software is available through YMAN (Yamaha Marine Associate Network).



Measuring the peak voltage

WARNING

When measuring the peak voltage, do not touch any of the connections of the digital tester probes.

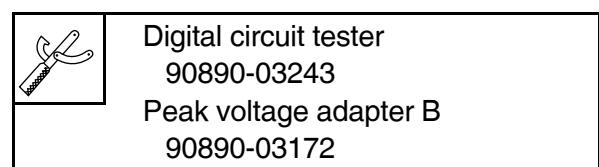
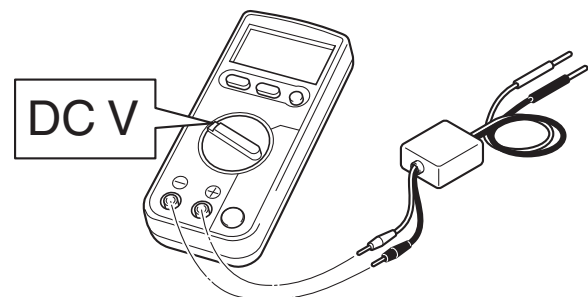
NOTICE

When measuring the peak voltage between the terminals of an electrical component using the digital tester, make sure that the leads do not contact any metal parts. Otherwise, the electrical component may short-circuit and be damaged.

To check the electrical components or measure the peak voltage, use the special service tools. A malfunctioning electrical component can be checked easily 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.

TIP: _____

- Before measuring the peak voltage, check all of the wire harnesses for corrosion. Also, make sure that the wire harnesses are connected properly and that the battery is fully charged.
- Use peak voltage adapter with the recommended digital circuit tester.
- Connect the positive pin of 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 digital circuit tester to the DC voltage mode.



Using the digital tester

The electrical technical data applies to the measurements taken using the Yamaha recommended tester.

The resistance values shown are the values taken before the engine is started. The actual resistance may vary depending on the environmental conditions and ambient temperature.

The input voltage changes depending on the battery voltage. Check the battery and wire harness if the input voltage is less than the specified value. Check the components between the battery and the input voltage measuring point if there is no problem with the battery and wire harness.

If the tester probe cannot be inserted into the coupler, prepare a test lead suitable for the measurement.



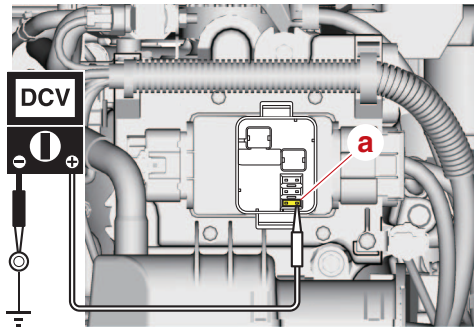
	Tester leads 90890-06881
--	-----------------------------

Engine control unit and component

Checking the main relay

The main relay cannot be removed for testing or replaced as a single unit because it is a component part of the fuse box. See "Fuse box" (2-11).

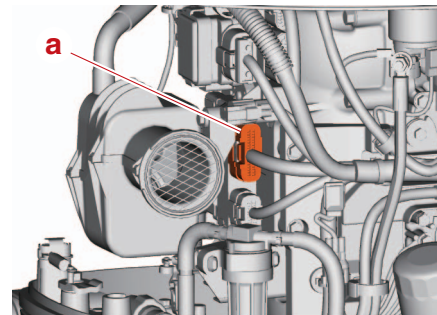
1. Check:
 - Trouble code on the YDIS
See "Troubleshooting procedure" (4-4).
2. Measure:
 - Main fuse input voltage
Out of specification → See "Troubleshooting the power unit" (4-8).



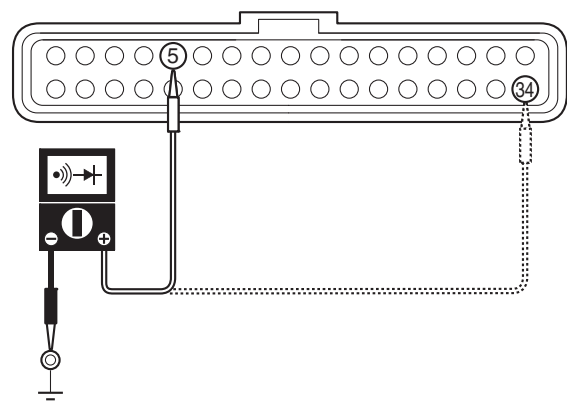
	Main fuse input voltage 12 V Main fuse "a"–Ground
--	---


Checking the engine ECM circuit

1. Disconnect:
 - Engine ECM coupler "a"




2. Check:
 - Engine ECM ground circuit continuity
Out of specification → Replace the wire harness.

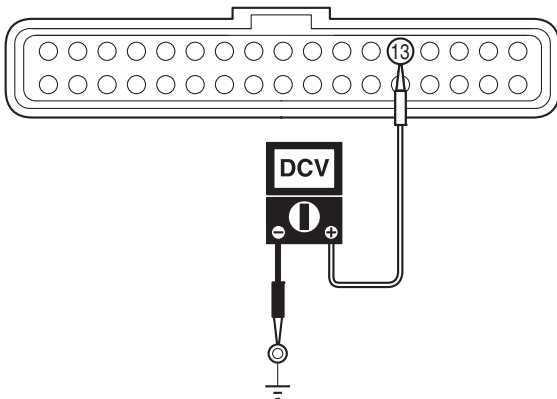


	<p>Engine ECM ground circuit continuity</p> <p>Terminal 5–Ground</p> <p>Terminal 34–Ground</p>
---	--

3. Measure:
- Engine ECM input voltage
- Out of specification → Check the wire harness for continuity.

	<p>Engine ECM input voltage</p> <p>12 V</p> <p>Terminal 13–Ground</p>
---	---

- a. Turn the engine start switch to ON, and then measure the input voltage at the engine ECM coupler terminal and ground.




- b. Turn the engine start switch to OFF.

4. Connect:
- Engine ECM coupler


Checking the TPS

1. Measure:
- TPS output voltage
- Out of specification → Check the TPS input voltage.

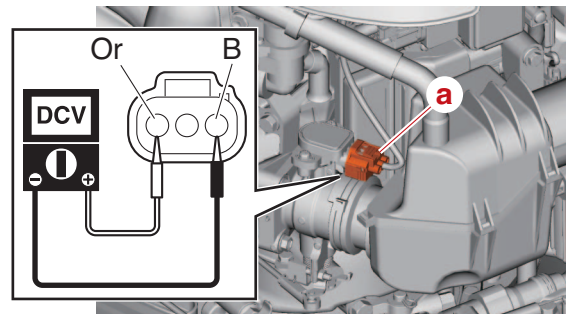
	<p>Output voltage at throttle valve fully closed</p> <p>0.58 V</p> <p>Throttle valve opening angle at throttle valve fully closed (reference data)</p> <p>0.0 °</p>
---	---

- a. Connect the YDIS to display “TPS voltage”.
- b. Start the engine and warm it up for 5–10 minutes, and then stop it.
- c. Turn the engine start switch to ON, and then measure the TPS output voltage when the remote control lever is at the fully closed position.
- d. Turn the engine start switch to OFF.

2. Measure:
- TPS input voltage
- Out of specification → Check the wire harness for continuity.

	<p>Input voltage</p> <p>5 V</p> <p>Orange (Or)–Black (B)</p>
---	--


- a. Disconnect the TPS coupler “a”.
- b. Turn the engine start switch to ON, and then measure the TPS input voltage at the TPS coupler.



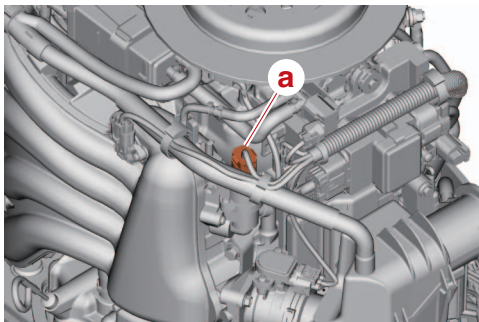
- c. Turn the engine start switch to OFF.
- d. Connect the TPS coupler.

Checking the ISC valve

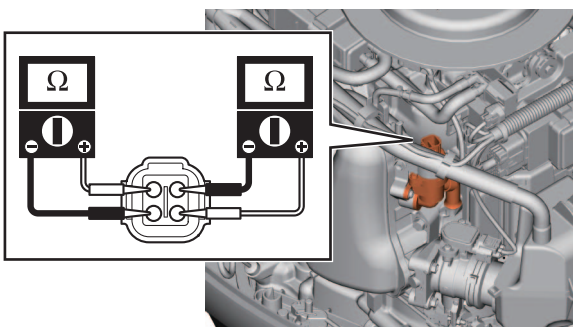
1. Check:
 - ISC valve operation (using the YDIS “Stationary test”)
No operating sound → Check the ISC valve resistance.
2. Check:
 - ISC valve operation (using the YDIS “Active test”)
No change in engine speed → Check the ISC valve resistance.
 - a. Start the engine, and then check that the engine speed increases using the YDIS “Active test”.
 - b. Stop the engine.
3. Measure:
 - ISC valve resistance
Out of specification → Replace.

	Resistance 27.0–33.0 Ω
---	---------------------------

- a. Disconnect the ISC valve coupler “a”.



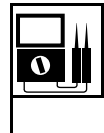
- b. Measure the resistance between the ISC valve terminals.



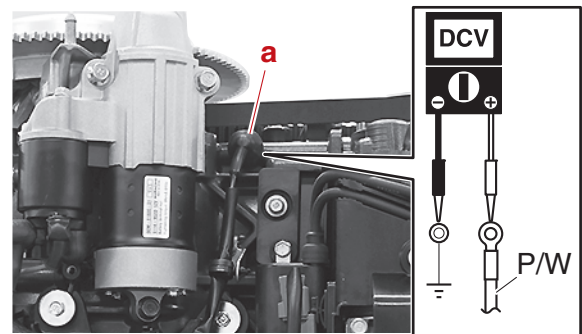
- c. Connect the ISC valve coupler.

Checking the oil pressure switch

1. Measure:
 - Oil pressure switch input voltage
Out of specification → Check the wire harness for continuity.

	Oil pressure switch input voltage 12 V Pink/White (P/W)–Ground
---	--

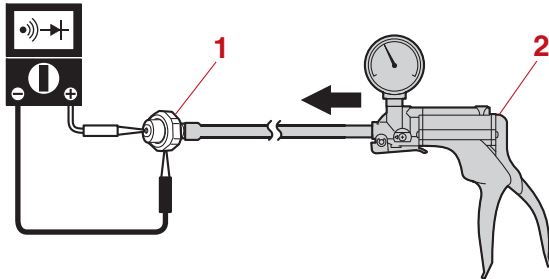
- a. Disconnect the oil pressure switch lead “a”.
- b. Turn the engine start switch to ON, and then measure the oil pressure switch input voltage.





- c. Turn the engine start switch to OFF.
- d. Connect the oil pressure lead. See “Wire harness” (7-19).

2. Check:
 - Oil pressure switch continuity
Out of specification → Replace.
 - a. Remove the oil pressure switch “1”.
 - b. Connect the special service tool “2” to the oil pressure switch “1”.

- c. Apply positive pressure to the oil pressure switch “1” slowly, and then check that continuity is lost in the range of the working pressure.



 Vacuum/pressure pump gauge set “2”
90890-06945

 Oil pressure switch
Working pressure
127.50–166.70 kPa (1.275–1.667 kgf/cm², 18.49–24.17 psi)

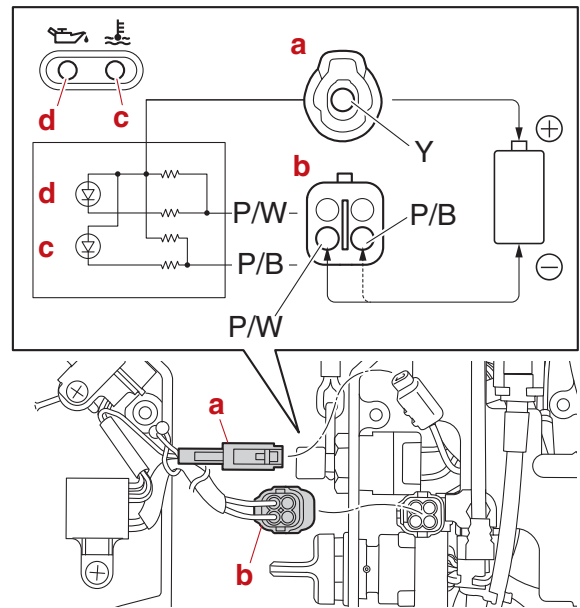
- d. Disconnect the special service tool.
- e. Install the oil pressure switch. See “Cylinder block” (7-42).

Checking the alert indicator (tiller handle model)

1. Check:
 - Alert indicator continuity
Out of specification → Replace.
 - a. Remove the tiller handle cover, and then disconnect the alert indicator couplers “a” and “b”.
 - b. Connect the battery (1.5 V) to the alert indicator couplers “a” and “b”. Check that the overheat alert indicator “c” or the oil pressure alert indicator “d” comes on. Replace the alert indicator if it does not come on.

NOTICE

Do not apply a voltage higher than 1.7 V when checking the LED.



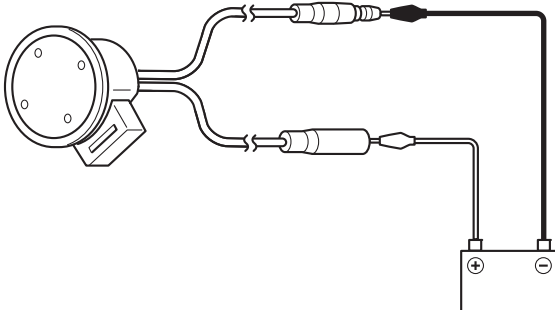
Lighting-up	Terminal	Battery
Overheat alert indicator “c”	Yellow (Y)	(+)
	Pink/Black (P/B)	(-)
Oil pressure alert indicator “d”	Yellow (Y)	(+)
	Pink/White (P/W)	(-)

- c. Connect the alert indicator couplers and, and then install the tiller handle cover.

Checking the alert buzzer

1. Check:
 - Alert buzzer continuity
Out of specification → Replace.
 - a. Remove the alert buzzer.

- b. Connect the battery leads to the alert buzzer connectors, and check that the alert buzzer comes on. Replace the alert buzzer if it does not come on.



- c. Install the alert buzzer.

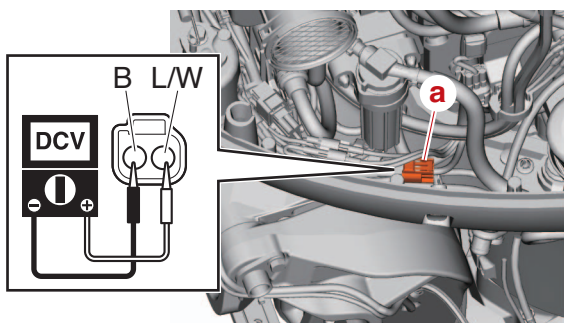
Fuel control unit and component

Checking the water detection switch

1. Measure:
 - Water detection switch input voltage
Out of specification → Check the wire harness for continuity.

	Input voltage 12 V Blue/White (L/W)–Black (B)
--	---

- a. Disconnect the water detection switch coupler “a”.
- b. Turn the engine start switch to ON, and then measure the input voltage at the water detection switch coupler.

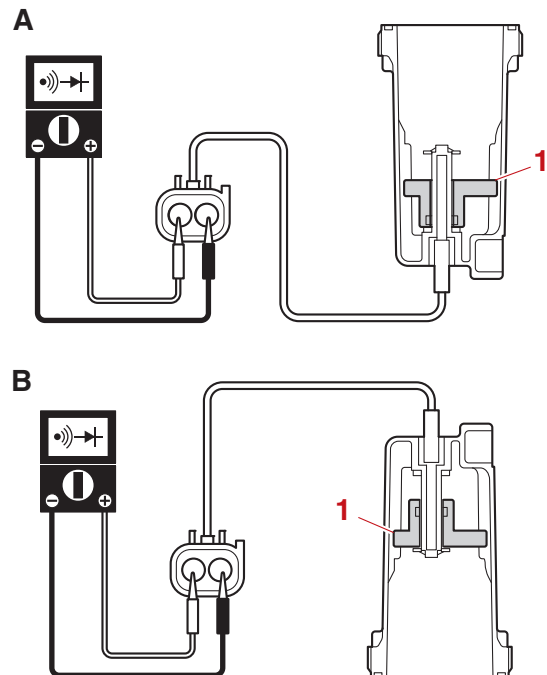


- c. Turn the engine start switch to OFF.
- d. Connect the water detection switch coupler.

2. Check:
 - Water detection switch continuity
Out of specification → Replace the fuel cup assembly.
 - a. Remove the fuel cup assembly. See “Fuel filter” (6-4).
 - b. Check that the float “1” moves smoothly.
 - c. Check the water detection switch for continuity when the float “1” is in positions “A” and “B”.

NOTICE

Do not remove the clip and float.




	Water detection switch continuity No continuity Float position “A” Continuity Float position “B”
--	--

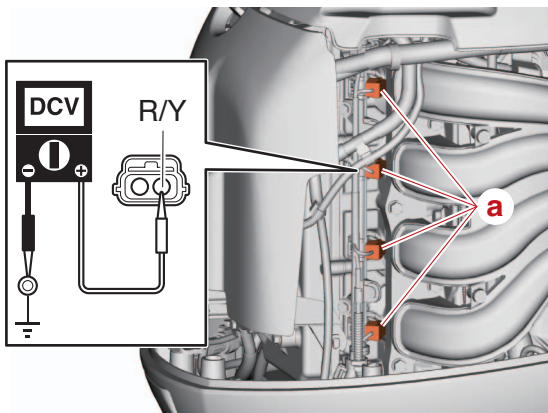
- d. Install the fuel cup assembly. See “Fuel filter” (6-4).

Checking the fuel injector

1. Check:
 - Fuel injector operation (using the YDIS “Stationary test”)
 - No operating sound → Check the fuel injector input voltage.
2. Measure:
 - Fuel injector input voltage
 - Out of specification → Check the wire harness for continuity.


	Input voltage 12 V Red/Yellow (R/Y)–Ground
---	--

- a. Disconnect the fuel injector couplers “a”.
- b. Turn the engine start switch to ON, and then measure the input voltage between the fuel injector coupler terminal and ground.



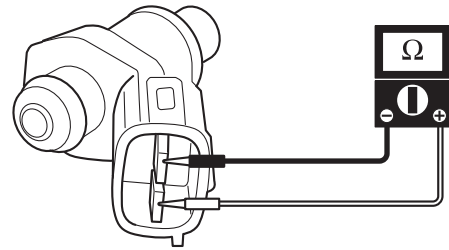
- c. Turn the engine start switch to OFF.
- d. Connect the fuel injector couplers.

3. Measure:
 - Fuel injector resistance
 - Out of specification → Replace.

	Resistance (reference data) 12.20 Ω
---	--

- a. Disconnect the fuel injector couplers.


- b. Measure the fuel injector resistance.



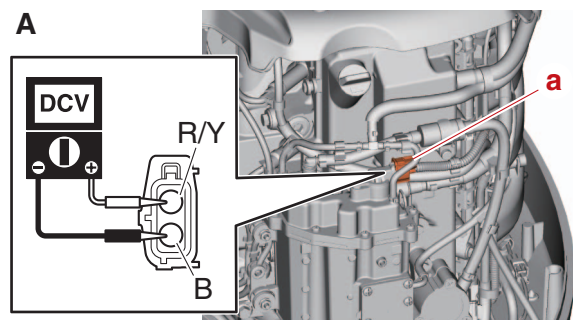
- c. Connect the fuel injector couplers.

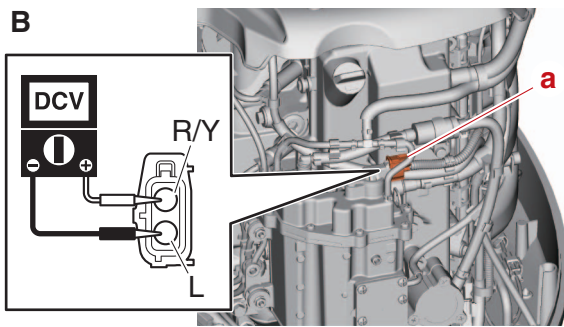
Checking the high-pressure fuel pump

1. Check:
 - High-pressure fuel pump operation (using the YDIS “Stationary test”)
 - No operating sound → Check the high-pressure fuel pump input voltage.
2. Measure:
 - High-pressure fuel pump input voltage
 - Out of specification → Check the wire harness for continuity.

	Input voltage 12 V Red/Yellow (R/Y)–Black (B) (F75FEHT, F100GEHT) Red/Yellow (R/Y)–Blue (L) (F75FET, F100GET)
---	--

- a. Disconnect the high-pressure fuel pump coupler “a”.
- b. Connect the tester probes to the terminals of the high-pressure fuel pump coupler, and then measure the input voltage within 5 seconds after turning the engine start switch to ON.





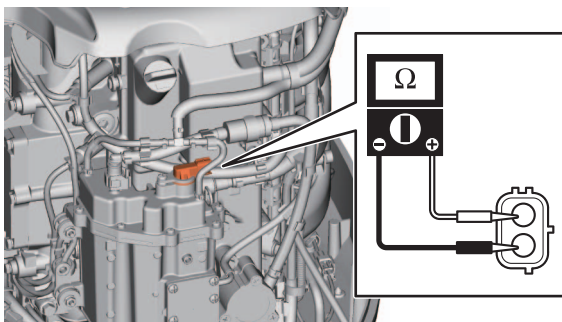
- A. F75FEHT, F100GEHT
- B. F75FET, F100GET

- c. Turn the engine start switch to OFF.
- d. Connect the high-pressure fuel pump coupler.

3. Measure:
- High-pressure fuel pump resistance
Out of specification → Replace.

	Resistance (reference data) 0.7 Ω
--	--------------------------------------

- a. Disconnect the high-pressure fuel pump coupler.
- b. Measure the high-pressure fuel pump motor resistance.



- c. Connect the high-pressure fuel pump coupler.

Checking the high-pressure fuel pump relay

The high-pressure fuel pump relay cannot be removed for testing or replaced as a single unit because it is a component part of the fuse box. See “Fuse box” (2-11).

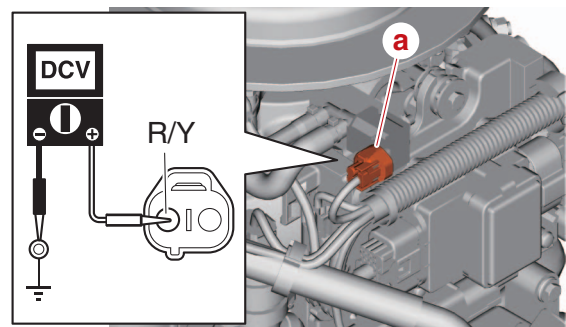
1. Check:
 - Trouble code on the YDIS
See “Troubleshooting procedure” (4-4).
2. Measure:
 - Main fuse input voltage
See step (2) in “Checking the main relay” (5-18).

Checking the vapor shut-off valve

1. Measure:
 - Vapor shut-off valve input voltage
Out of specification → Check the wire harness for continuity.

	Input voltage 12 V Red/Yellow (R/Y)–Ground
--	--

- a. Disconnect the vapor shut-off valve coupler “a”.
- b. Turn the engine start switch to ON, and then measure the input voltage between the vapor shut-off valve coupler terminal and ground.



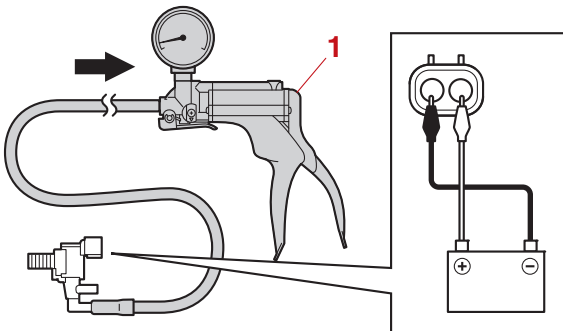
- c. Turn the engine start switch to OFF.
- d. Connect the vapor shut-off valve coupler.

2. Check:
 - Vapor shut-off valve operation
Not operating → Replace.
 - a. Remove the vapor shut-off valve, and then connect the special service tool “1” to the vapor shut-off valve.
 - b. Apply the specified negative pressure to the vapor shut-off valve.

- c. Check that the vapor shut-off valve opens and the negative pressure is released when the battery leads are connected to the vapor shut-off valve terminals.

NOTICE

Connect the battery leads to the vapor shut-off valve terminals for only a few seconds.



	Vacuum/pressure pump gauge set "1" 90890-06945
--	--

	Specified negative pressure 67.0 kPa (0.67 kgf/cm ² , 9.7 psi)
--	--

- d. Disconnect the special service tool.
- e. Install the vapor shut-off valve.

3. Measure:

- Vapor shut-off valve resistance
Out of specification → Replace.

	Resistance 30.0–34.0 Ω
--	---------------------------

- a. Disconnect the vapor shut-off valve coupler.
- b. Measure the resistance between the vapor shut-off valve terminals.
- c. Connect the vapor shut-off valve coupler.

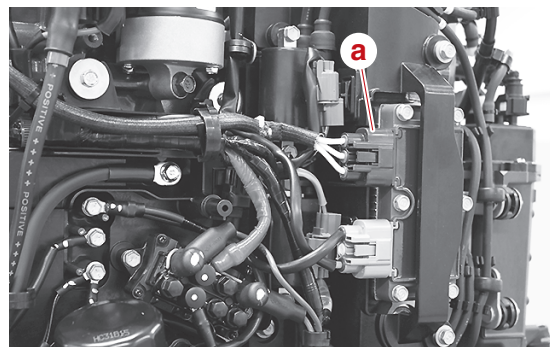
Charging unit and component
Checking the lighting coil (stator assembly)

1. Measure:

- Lighting coil output peak voltage
Out of specification → Measure the lighting coil resistance.

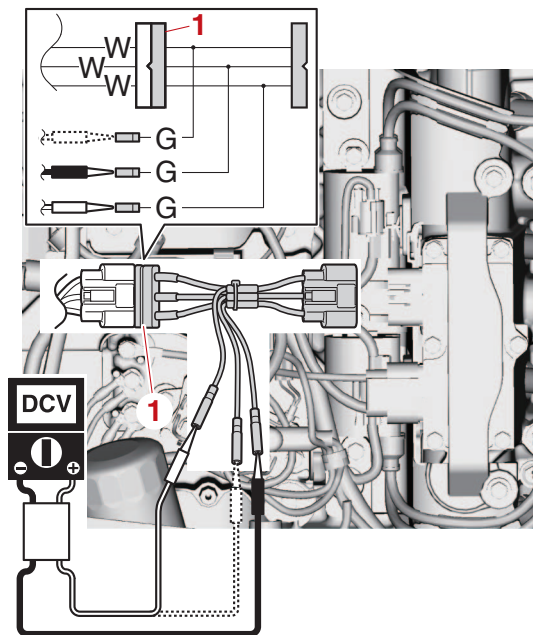
Lighting coil output peak voltage (reference data) White (W)–White (W)			
r/min	Unloaded		
	Cranking	1500	3500
DC V	11.1	40.7	93.7


- a. Disconnect the lighting coil coupler "a".



- b. Connect the special service tool "1".
- c. Remove the clip from the engine shut-off switch.
- d. While cranking the engine, measure the peak voltage.
- e. Insert the clip into the engine shut-off switch.
- f. Start the engine, and then measure the peak voltage at the specified engine speed.


- g. Measure the lighting coil output peak voltage between all combinations of the connectors.



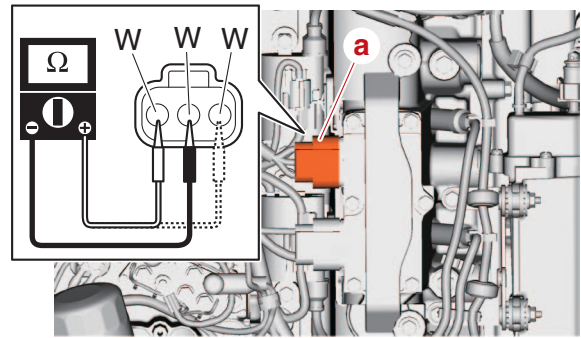
 Test harness QLWD-3 "1"
90890-06923

- h. Stop the engine, and then disconnect the special service tool.
i. Connect the lighting coil coupler.

2. Measure:
• Lighting coil resistance
Out of specification → Replace.

 Resistance (reference data)
0.2 Ω
White (W)–White (W)

- a. Disconnect the lighting coil coupler "a".
b. Measure the lighting coil resistance.



- c. Connect the lighting coil coupler.

Checking the rectifier/regulator

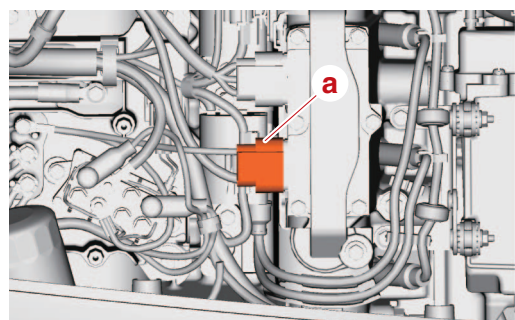
NOTICE

Do not connect the battery cables in reverse. Otherwise, the rectifier/regulator could be damaged.

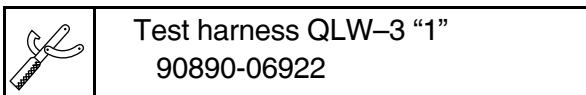
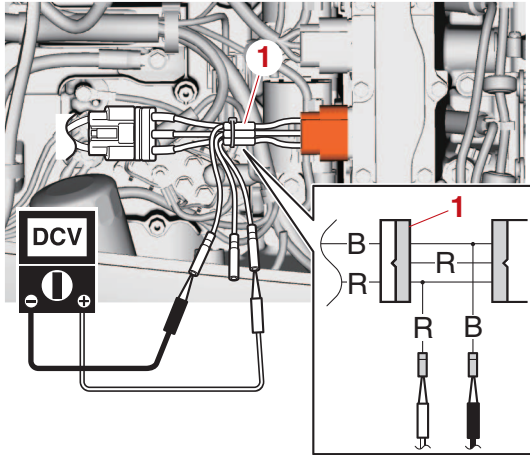
1. Measure:
• Rectifier/regulator output voltage
Out of specification → Check the rectifier/regulator for continuity.

Rectifier/regulator output voltage (reference data) Red (R)–Black (B)		
r/min	Loaded	
	1500	3500
DC V	13	13

- a. Disconnect the rectifier/regulator coupler "a".



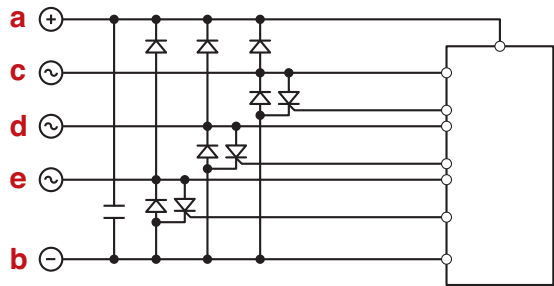
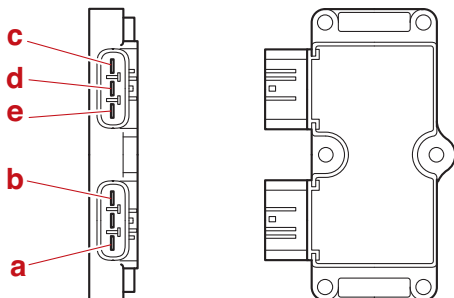
- b. Connect the special service tool "1", and then measure the rectifier/regulator output voltage at the specified engine speed.



- c. Disconnect the special service tool.
- d. Connect the rectifier/regulator coupler.

2. Check:

- Rectifier/regulator continuity
Out of specification → Replace.
 - a. Disconnect the rectifier/regulator coupler.
 - b. Set the digital circuit tester to the diode mode, and then check the rectifier/regulator for continuity.



Rectifier/regulator continuity (testing diode mode)		
Tester probe		Display value (reference data)
(+)	(-)	
a	b	OL
	c	
	d	
	e	
b	a	0.5–0.6 V
	c	0.5–0.6 V
	d	
c	a	0.5–0.6 V
	b	OL
	d	
	e	
d	a	0.5–0.6 V
	b	OL
	c	
	e	
e	a	0.5–0.6 V
	b	OL
	c	
	d	

OL: Indicates an overload

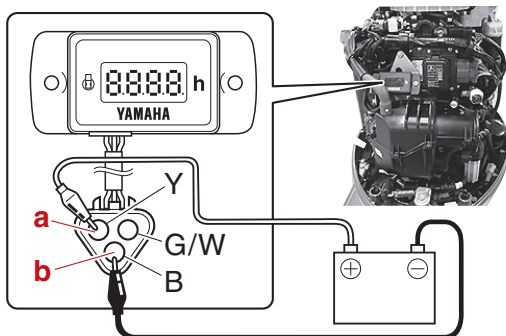
- c. Connect the rectifier/regulator coupler.

Checking the hour meter

1. Disconnect:
 - Hour meter coupler

2. Check:

- Hour meter operation
Hour meter if there is no illuminated → Replace.
- a. Connect the battery leads to the hour meter coupler terminals “a” and “b”.
- b. Check for hour meter displayed all the segment has been illuminated for 2 seconds.



- c. Disconnect the battery leads to the hour meter coupler terminals.

3. Connect:

- Hour meter coupler

Ignition unit and component

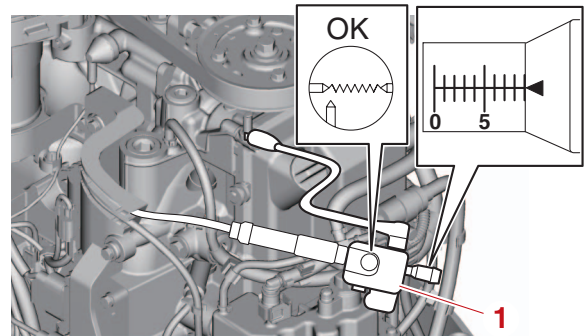
Checking the ignition spark

1. Check:

- Ignition spark
No spark → Check ignition system circuit.
- a. Disconnect the spark plug cap from the spark plug.
- b. Connect the spark plug cap to the special service tool “1”.
- c. Check the ignition spark using the YDIS “Stationary test”.

WARNING

Do not touch any of the connections of the special service tool.



	Ignition checker (Spark gap tester) “1” 90890-06754
--	---

- d. Remove the special service tool, and then connect the spark plug cap.

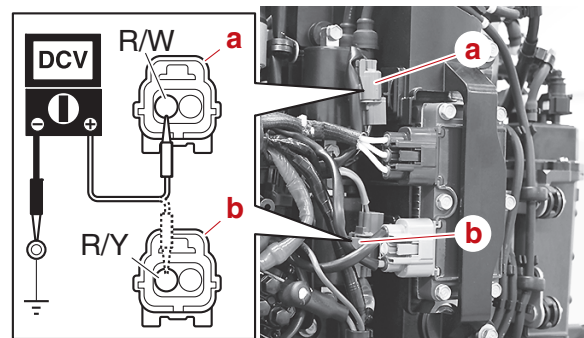
Checking the ignition coil

1. Measure:

- Ignition coil input voltage
Out of specification → Check the wire harness for continuity.

	Input voltage 12 V #1, #4 Red/White (R/W)–Ground #2, #3 Red/Yellow (R/Y)–Ground
--	--

- a. Disconnect the ignition coil couplers “a” and “b”.
- b. Turn the engine start switch to ON, and then measure the input voltage at the ignition coil coupler terminal and ground.

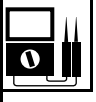


- c. Turn the engine start switch to OFF.

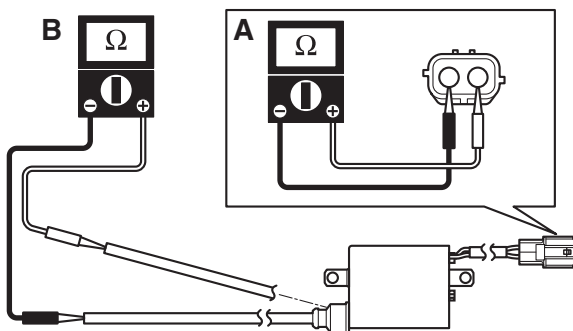
d. Connect the ignition coil couplers.

2. Measure:

- Ignition coil resistance
Out of specification → Replace.

	Primary coil resistance 1.870–2.530 Ω Secondary coil resistance 10.80–14.61 kΩ
---	---

- a. Disconnect the ignition coil couplers.
- b. Disconnect the spark plug caps from the spark plugs.
- c. Remove the spark plug caps from the ignition coil.
- d. Measure the ignition coil resistance.




A. Primary coil
B. Secondary coil

- e. Install the spark plug caps to the ignition coil.
- f. Connect the spark plug caps and ignition coil couplers.

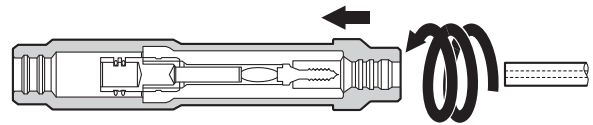
Checking the spark plug cap

1. Measure:

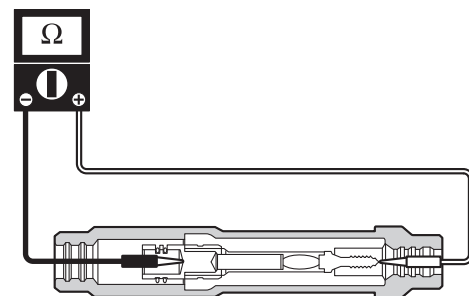
- Spark plug cap resistance
Out of specification → Replace.

	Spark plug cap resistance (reference data) 5.0 kΩ
---	--

- a. Remove the spark plug cap from the spark plug wire by turning the spark plug cap counterclockwise.



- b. Measure the spark plug cap resistance.



- c. Install the spark plug cap to the spark plug wire by turning the spark plug cap clockwise.

Checking the pulser coil

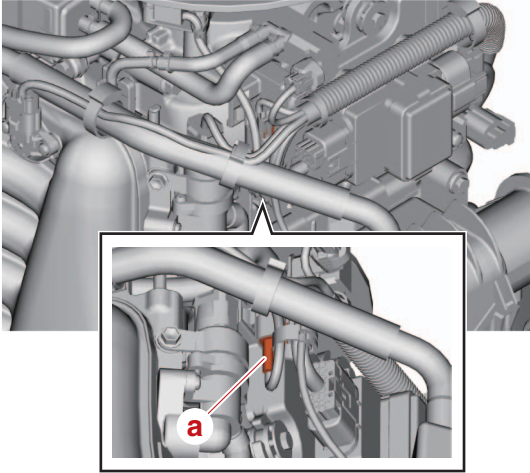
1. Measure:

- Pulser coil output peak voltage
Out of specification → Measure the pulser coil resistance.

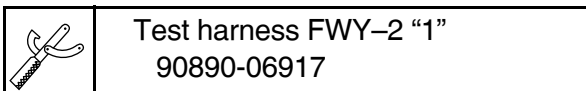
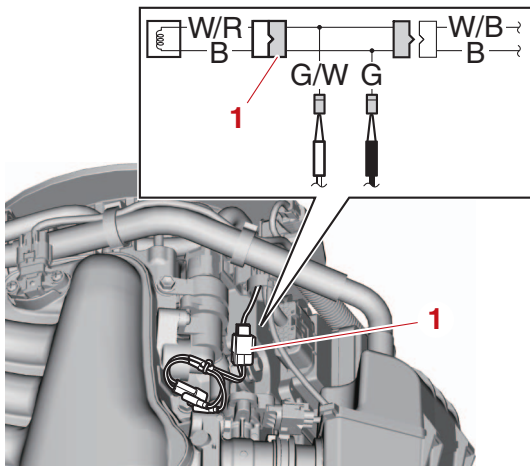
Pulser coil output peak voltage (reference data) White/Red (W/R)–Black (B)				
r/min	Unloaded	Loaded		
	Cranking	1500	3500	
DC V	9.6	9.0	26.8	31.6

Ignition unit and component

- a. Disconnect the pulser coil coupler “a”.

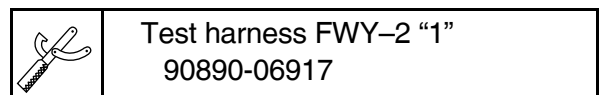
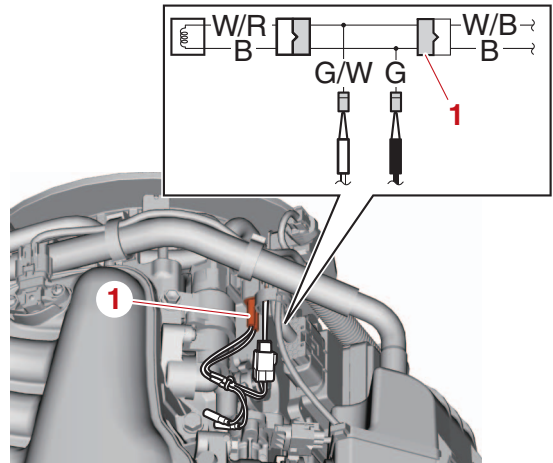


- b. Connect the special service tool “1” to the pulser coil coupler (pulser coil end).
- c. While cranking the engine, measure the peak voltage under unloaded condition.

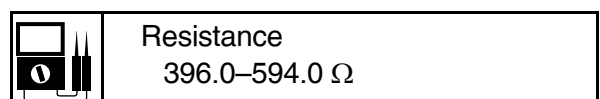


- d. Connect the special service tool “1” to the pulser coil coupler (wire harness end).
- e. Remove the clip from the engine shut-off switch.
- f. While cranking the engine, measure the peak voltage under loaded condition.

- g. Insert the clip into the engine shut-off switch.
- h. Start the engine, and then measure the peak voltage at the specified engine speed.



- i. Stop the engine.
- j. Disconnect the special service tool.
- k. Connect the pulser coil coupler.
2. Measure:
- Pulser coil resistance
Out of specification → Replace.



- a. Disconnect the pulser coil coupler.
- b. Measure the pulser coil resistance.
- c. Connect the pulser coil coupler.

Checking the intake air temperature sensor

The intake air pressure sensor is a component of the intake air pressure/temperature sensor.

1. Check:
 - Intake air temperature sensor operation
Not operating → Check the wire harness for continuity.
 - a. Measure the ambient temperature.
 - b. Connect the YDIS to display “Intake air temperature”.
 - c. Check that the difference between the ambient temperature and the displayed intake air temperature is within $\pm 5\text{ }^{\circ}\text{C}$ ($\pm 9\text{ }^{\circ}\text{F}$).


TIP:

- Check the intake air temperature sensor when the engine is cold.
- When checking the intake air temperature sensor, remove the top cowling and do not start the engine.

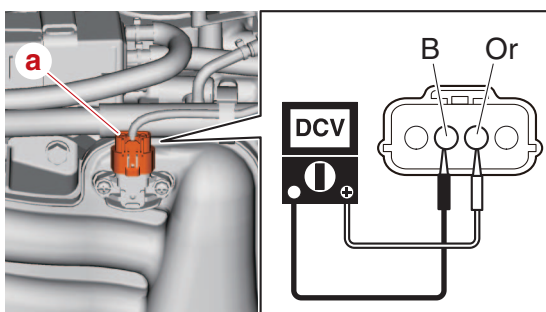
Checking the intake air pressure sensor

The intake air pressure sensor is a component of the intake air pressure/temperature sensor.

1. Measure:
 - Intake air pressure sensor input voltage
Out of specification → Check the wire harness for continuity.

	Input voltage 5 V Orange (Or)–Black (B)
---	---


- a. Disconnect the intake air pressure/temperature sensor coupler “a”.
- b. Turn the engine start switch to ON, and then measure the input voltage at the intake air pressure sensor coupler.



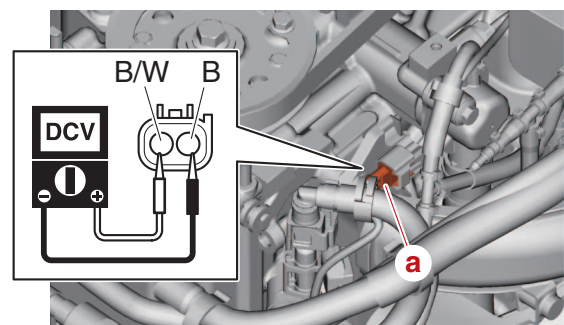
- c. Turn the engine start switch to OFF.
- d. Connect the intake air pressure/temperature sensor coupler.

Checking the thermo sensor

1. Measure:
 - Thermo sensor input voltage
Out of specification → Check the wire harness for continuity.


	Input voltage 5 V Black/White (B/W)–Black (B)
---	---

- a. Disconnect the thermo sensor coupler “a”.
- b. Turn the engine start switch to ON, and then measure the input voltage at the thermo sensor coupler.



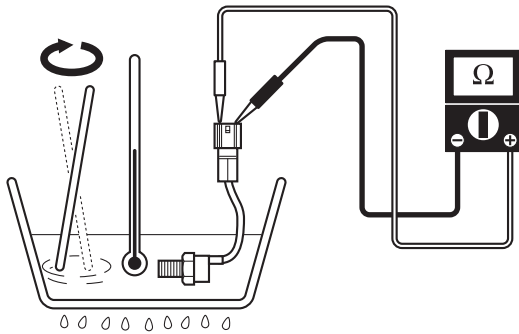
- c. Turn the engine start switch to OFF.
- d. Connect the thermo sensor coupler.

2. Measure:
 - Thermo sensor resistance
Out of specification → Replace.

	Resistance at 75 °C (167 °F) 0.360-0.383 kΩ
---	--

- a. Remove the thermo sensor.
- b. Place the thermo sensor in a container of water and heat the water slowly.

- c. Measure the thermo sensor resistance.



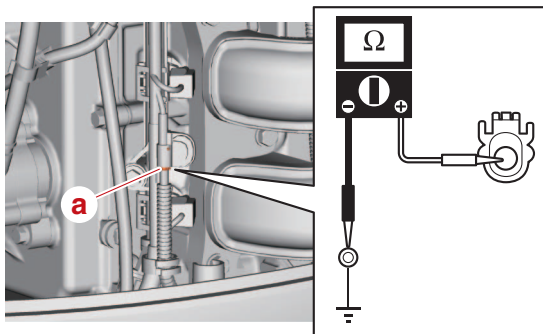
- d. Install the thermo sensor. See “Oil cooler” (7-25).

Checking the knock sensor

1. Measure:
- Knock sensor resistance
Out of specification → Replace.

	Resistance 504–616 kΩ
--	--------------------------

- a. Disconnect the knock sensor coupler “a”.
- b. Measure the knock sensor resistance.



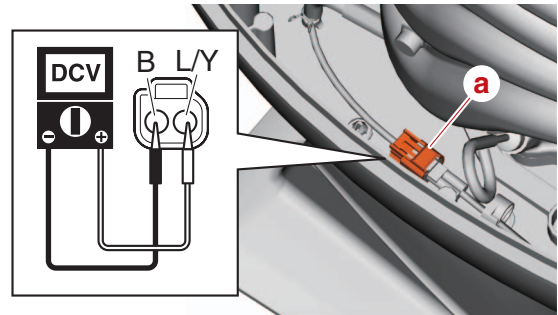
- c. Connect the knock sensor coupler.

Checking the shift position switch

1. Measure:
- Shift position switch input voltage
Out of specification → Check the wire harness for continuity.

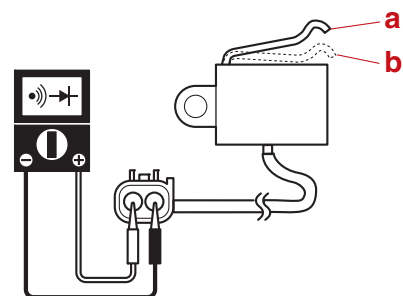
	Input voltage 5 V Blue/Yellow (L/Y)–Black (B)
--	---

- a. Disconnect the shift position switch coupler “a”.
- b. Turn the engine start switch to ON, and then measure the input voltage at the shift position switch coupler.



- c. Turn the engine start switch to OFF.
- d. Connect the shift position switch coupler.

2. Check:
- Shift position switch continuity
Out of specification → Replace.
- a. Remove the shift position switch.
- b. Check the shift position switch for continuity.

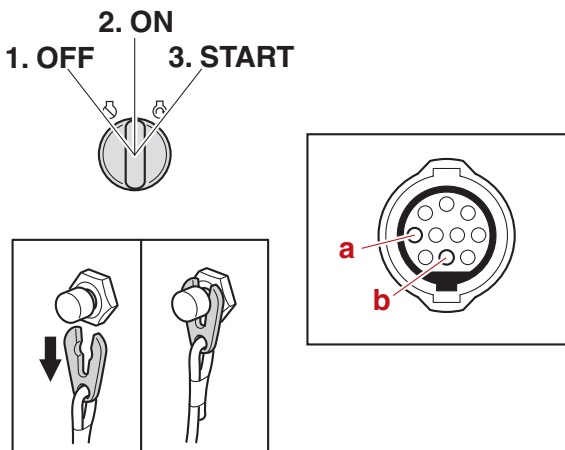


	Shift position switch continuity No continuity Switch position “a” Continuity Switch position “b”
--	---

- c. Install the shift position switch. See “Shift rod and shift bracket” (9-9).

Checking the engine shut-off switch

1. Check:
 - Engine shut-off switch continuity
Out of specification → Replace.
 - a. Disconnect the main wire harness coupler or switch panel coupler.
 - b. Turn the engine start switch to ON, and then check the engine shut-off switch for continuity.



1. OFF
2. ON
3. START

Engine shut-off switch continuity		
Clip	Terminal	
	"a"	"b"
Removed	○ — ○	
Installed		

- c. Turn the engine start switch to OFF.
- d. Connect the main wire harness coupler or switch panel coupler.

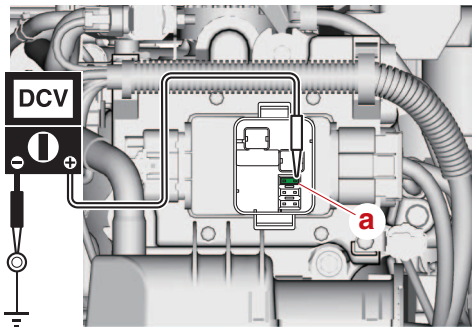
Starting unit and component

Checking the starter relay

The starter relay cannot be removed for testing or replaced as a single unit because it is a component part of the fuse box. See "Fuse box" (2-11).

1. Check:
 - Trouble code on the YDIS
See "Troubleshooting procedure" (4-4).

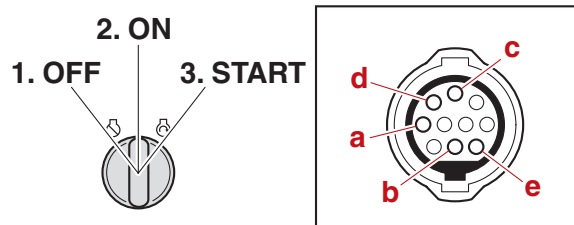
2. Measure:
 - Main fuse input voltage
See step (2) in "Checking the main relay" (5-18).
3. Measure:
 - Starter fuse input voltage
Out of specification → See "Troubleshooting the power unit" (4-8).



	Starter fuse input voltage
	12 V
	Starter fuse "a"—Ground

Checking the engine start switch

1. Check:
 - Engine start switch continuity
Out of specification → Replace.
 - a. Disconnect the main wire harness coupler or switch panel coupler.
 - b. Check the engine start switch for continuity.

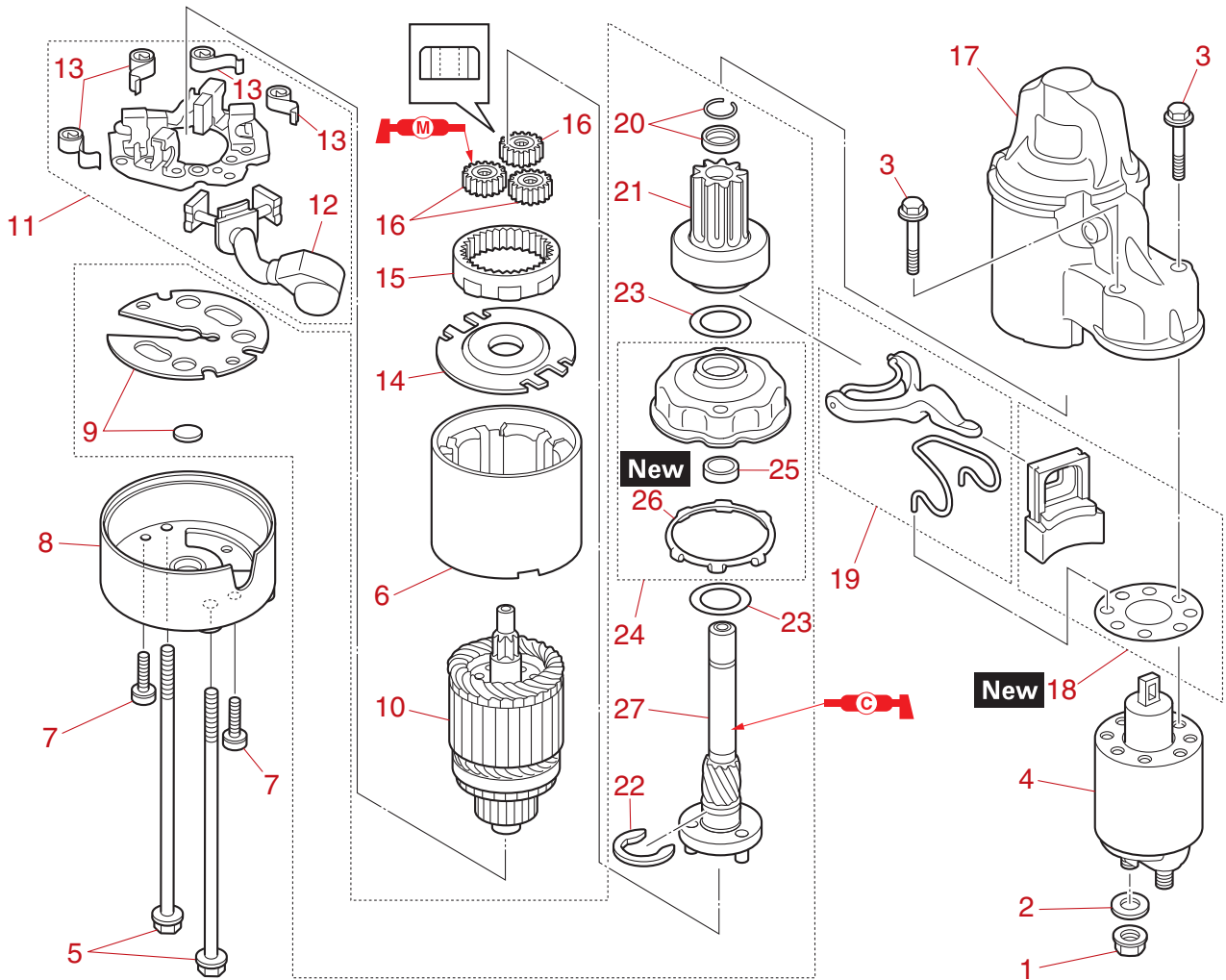


1. OFF
2. ON
3. START

Engine start switch continuity					
Switch position	Terminal				
	"a"	"b"	"c"	"d"	"e"
OFF	○—○				
ON			○—○		
START			○—○—○		

- c. Connect the main wire harness coupler or switch panel coupler.

Starter motor



↑↓	Part name	Q'ty	Remarks
1	Nut M8	1	
2	Washer	1	
3	Bolt M6 × 35 mm	2	
4	Magnet switch	1	
5	Bolt M5 × 127 mm	2	
6	Stator	1	
7	Screw M4 × 16 mm	2	
8	Bracket	1	
9	Washer set	1	
10	Armature	1	
11	Brush holder assembly	1	
12	Brush assembly	1	
13	Brush spring	4	
14	Plate	1	
15	Outer gear	1	
16	Planetary gear	3	
17	Cover	1	
18	Seal set	1	

↑↓	Part name	Q'ty	Remarks
19	Lever assembly	1	
20	Stopper	1	
21	Pinion assembly	1	
22	E-clip	1	
23	Washer	2	
24	Bracket assembly	1	
25	Bearing	1	
26	Gasket	1	
27	Pinion shaft	1	

Removing the starter motor

NOTICE

Before removing the starter motor, make sure to disconnect the negative battery terminal.

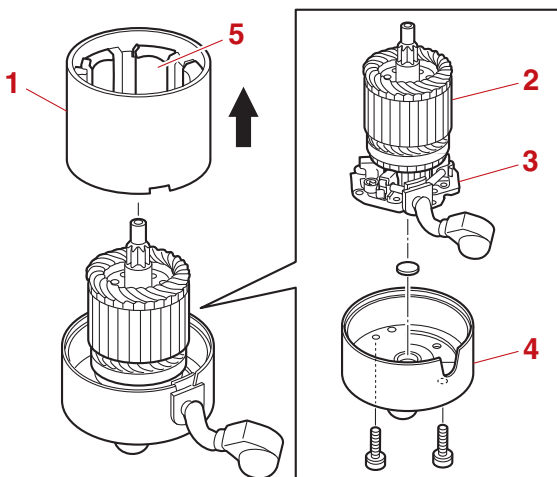
1. Remove:
 - Starter motor
 - See "Starter motor" (7-16).

Disassembling the starter motor

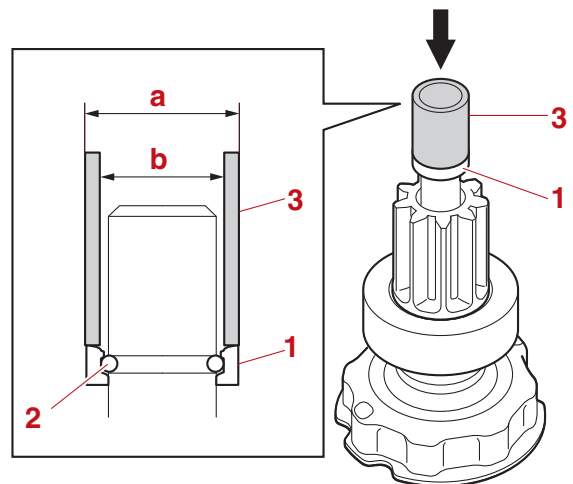
1. Remove:
 - Stator
 - Bracket screw
 - Bracket
 - Armature
 - a. Remove the stator "1".
 - b. Remove the armature "2" along with the brush holder assembly "3" from the bracket "4".


NOTICE

Do not disassemble the stator. Do not remove the magnets "5" from it.



2. Remove:
 - Pinion stopper
 - Clip
 - a. Push the pinion stopper "1" down, and then remove the clip "2".



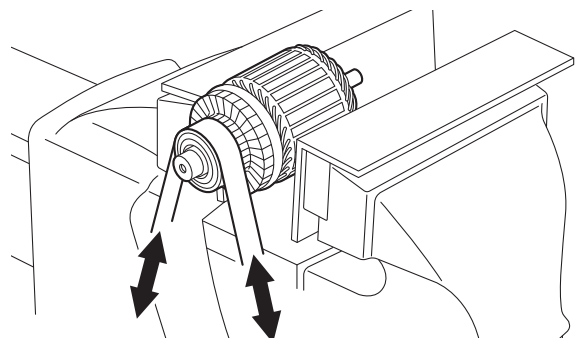
	Pipe "3" (commercially available) "a": 18.0 mm (0.71 in) "b": 13.0 mm (0.51 in)
---	--

Checking the starter motor pinion

1. Check:
 - Pinion teeth
Cracked/worn → Replace the pinion.
2. Check:
 - Pinion movement
Not smooth → Replace.
 - a. Turn the pinion counterclockwise to check that it operates smoothly and turn it clockwise to check that it locks in place.

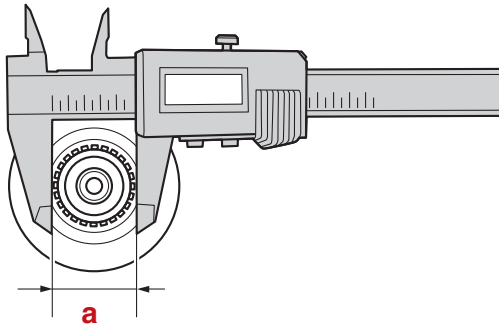
Checking the armature (starter motor)

1. Check:
 - Commutator
Dirty → Clean using 600-grit sandpaper and compressed air.



2. Measure:

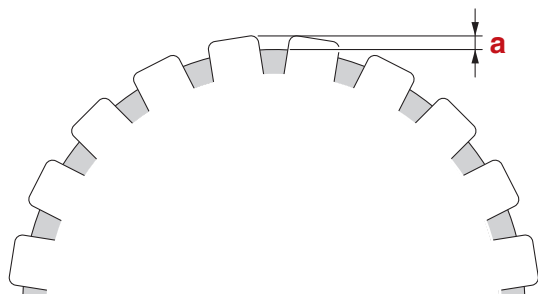
- Commutator diameter "a"
Below specification → Replace the armature.



	Standard commutator diameter
	29.0 mm (1.14 in)
	Wear limit
	28.0 mm (1.10 in)

3. Measure:

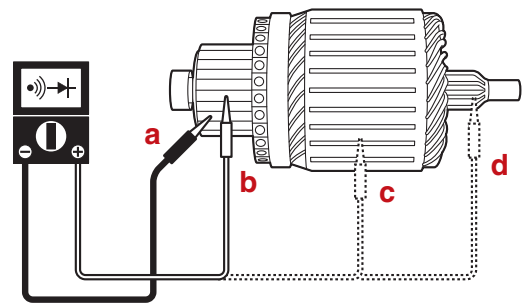
- Commutator undercut "a"
Below specification → Replace the armature.



	Standard commutator undercut
	0.7 mm (0.03 in)
	Wear limit
	0.2 mm (0.01 in)

4. Check:

- Armature continuity
Out of specification → Replace the armature.

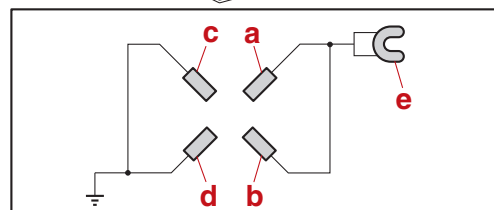
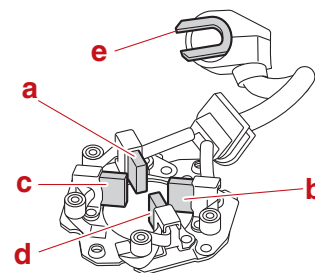


Armature continuity			
"a"	"b"	"c"	"d"
○ — ○			

Checking the brush holder

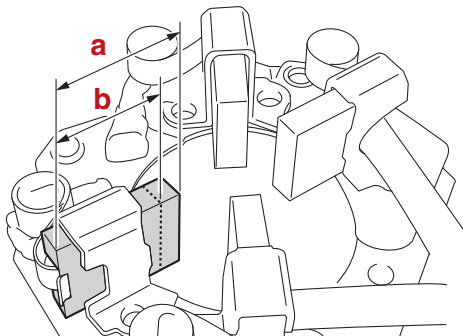
1. Check:

- Brush holder assembly continuity
Out of specification → Replace.



Brush holder assembly continuity				
"a"	"b"	"c"	"d"	"e"
○ — ○ — ○ — ○ — ○				
		○ — ○		

2. Measure:
- Brush length
- Below specification → Replace the brush.



- a. Standard brush length
b. Wear limit

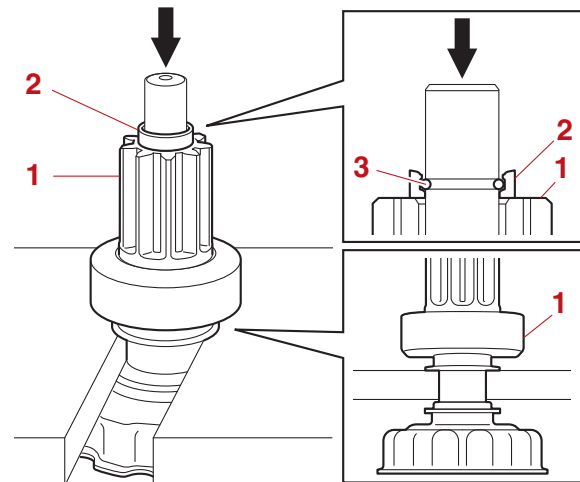
	Standard brush length
	15.5 mm (0.61 in)
	Wear limit
	9.5 mm (0.37 in)

Assembling the starter motor

NOTICE

Do not apply grease or oil to the commutator of the armature.

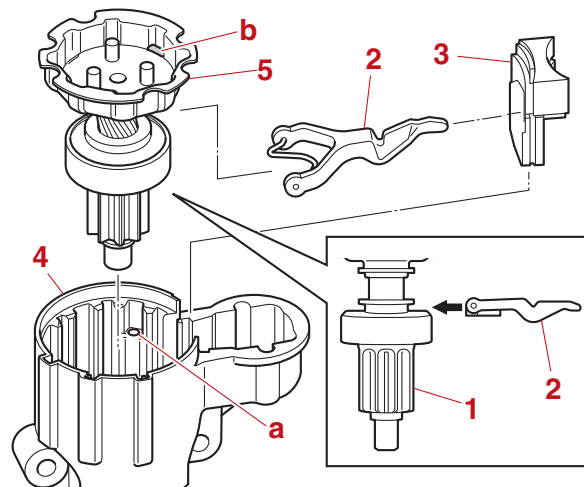
1. Install:
- Washer (to the pinion shaft)
 - Gasket **New** (to the bracket)
 - Bearing (to the bracket)
 - Bracket (to the pinion shaft)
 - Washer (to the pinion shaft)
 - E-clip (to the pinion shaft)
2. Install:
- Pinion assembly “1”
 - Pinion stopper “2”
 - Clip “3”



3. Install:
- Pinion shaft assembly “1”
 - Lever “2”
 - Rubber seal “3” **New**

TIP:

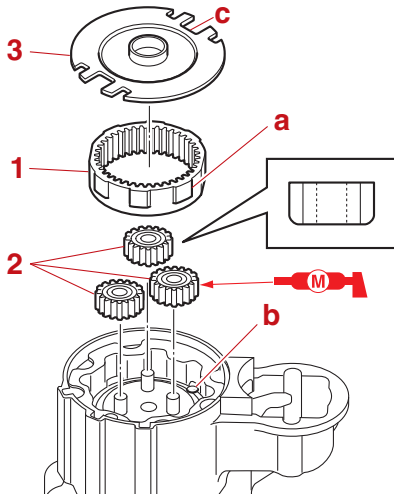
Align the holes “a” in the cover “4” with the holes “b” in the bracket “5”.



4. Install:
- Outer gear “1”
 - Planetary gear “2”
 - Plate “3”

TIP: _____

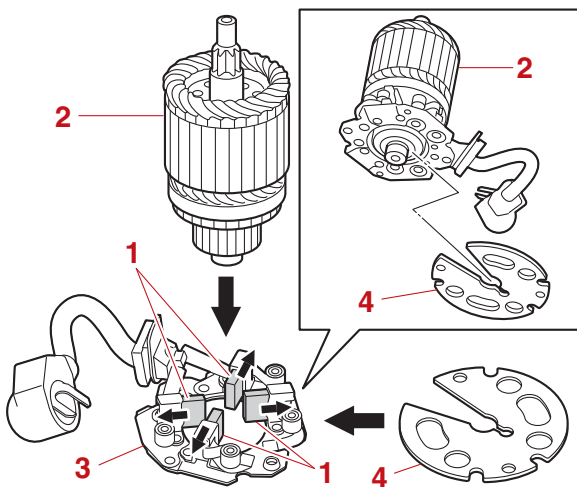
- Be careful not to align the protrusions “a” on the outer gear “1” with the holes “b” in the bracket.
- Align the notches “c” in the plate “3” with the holes “b” in the bracket.



5. Install:
- Brush spring (to the brush holder)
 - Brush assembly (to the brush holder)

6. Install:
- Armature
 - Plate
- a. Push the brushes “1” into the holders, and then install the armature “2” to the brush holder assembly “3”.

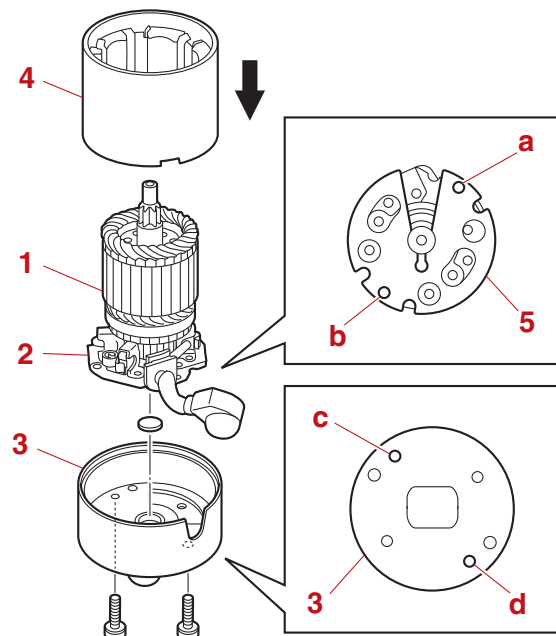
- b. Install the plate “4”.



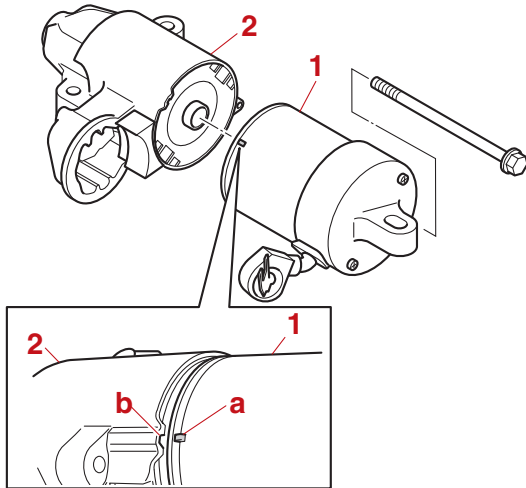
7. Install:
- Brush holder assembly
 - Bracket
 - Bracket screw
 - Stator
- a. Install the armature “1” along with the brush holder assembly “2” to the bracket “3”, and then install the stator “4”.

TIP: _____

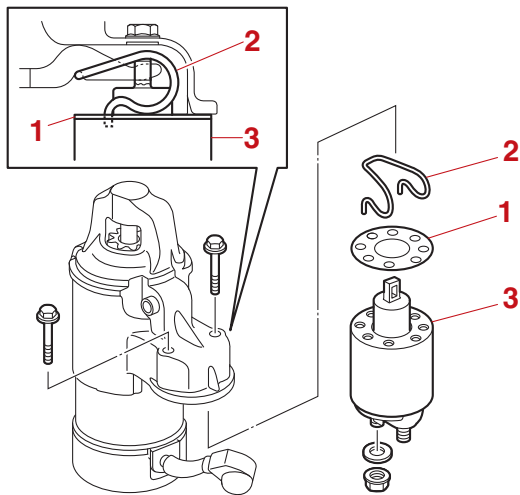
Align the holes “a” and “b” in the plate “5” with the holes “c” and “d” in the bracket “3”.



8. Install:
 - Stator bolt
 - a. Align the protrusion “a” on the stator “1” with the slot “b” in the cover assembly “2”, and then assemble the starter motor.



9. Install:
 - Gasket “1” **New**
 - Spring “2”
 - Magnet switch “3”



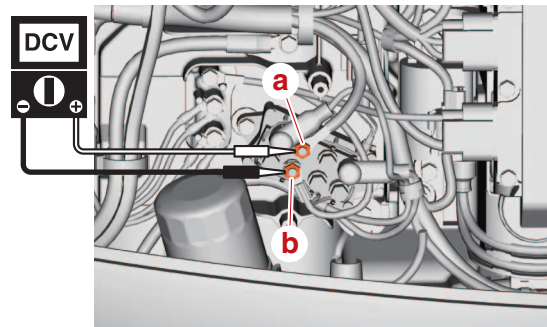
Installing the starter motor

1. Install:
 - Starter motor
See “Starter motor” (7-16).

PTT system

Checking the PTT relay

1. Measure:
 - PTT relay input voltage
Out of specification → Check the wire harness for continuity.
 - a. Remove the caps.
 - b. Measure the input voltage between the PTT relay terminal “a” and terminal “b”.



	Input voltage
	12 V
	Terminal “a”–Terminal “b”

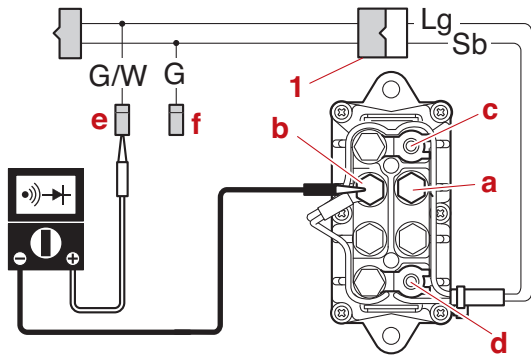
- c. Install the caps.
2. Check:
 - PTT relay continuity
Out of specification → Replace.
 - a. Disconnect the battery power source, ground lead, PTT motor leads, and PTT relay coupler.


NOTICE

Before disconnecting the PTT relay terminals, make sure to disconnect the battery negative terminal.

- b. Remove the PTT relay.
 - c. Connect the special service tool “1”.

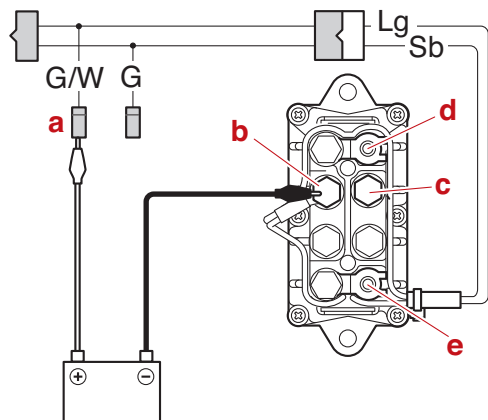
d. Check the PTT relay for continuity.



 Test harness FWY-2 "1"
90890-06917

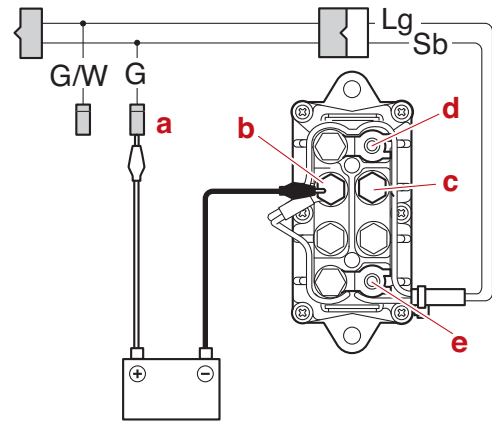
PTT relay continuity					
"a"	"b"	"c"	"d"	"e"	"f"
	○ — ○ — ○ — ○ — ○				

e. Connect the positive battery lead to the terminal "a", and the negative battery lead to the terminal "b", and then check the PTT relay for continuity.



PTT relay continuity			
"b"	"c"	"d"	"e"
	○ — ○ — ○ — ○		
○ — ○			

f. Connect the positive battery lead to the terminal "a", and the negative battery lead to the terminal "b", and then check the PTT relay for continuity.



PTT relay continuity			
"b"	"c"	"d"	"e"
	○ — ○ — ○ — ○		
○ — ○			

g. Disconnect the special service tool.

h. Install the PTT relay.


i. Connect the PTT relay coupler, battery power source, ground lead, and PTT motor leads.

Checking the PTT switch (on bottom cowling)

1. Measure:

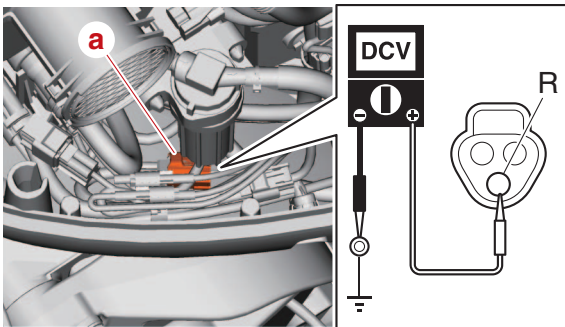
- PTT switch input voltage

Out of specification → Check the wire harness for continuity.

	Input voltage
	12 V
	Red (R)–Ground

a. Disconnect the PTT switch coupler "a".

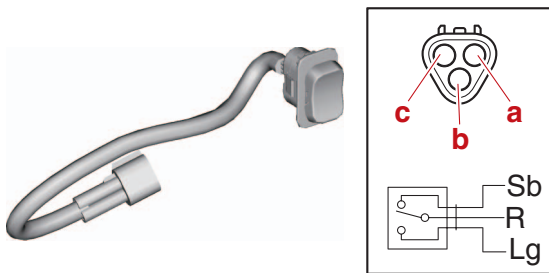
- b. Measure the input voltage between the PTT switch coupler terminal and ground.



- c. Connect the PTT switch coupler.

2. Check:

- PTT switch continuity
Out of specification → Replace.
- a. Disconnect the PTT switch coupler.
- b. Check the PTT switch for continuity.



PTT switch continuity			
Switch position	Terminal		
	“a”	“b”	“c”
UP	○	○	
DN		○	○

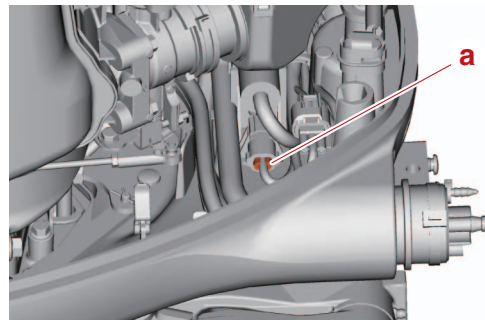
- c. Connect the PTT switch coupler.

Checking the trim sensor

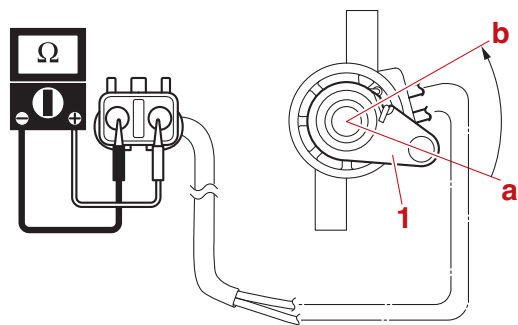
1. Measure:
- Trim sensor resistance
Out of specification → Replace.

	Free position resistance
	239–379 Ω
	Setting resistance
	9–11 Ω

- a. Disconnect the trim sensor coupler “a”, and then remove the trim sensor.



- b. Measure the trim sensor resistance.
- c. Turn the trim sensor lever “1” from the free position “a” to the setting position “b”, and then measure the resistance as it gradually changes.



- d. Install the trim sensor, and then connect the trim sensor coupler.

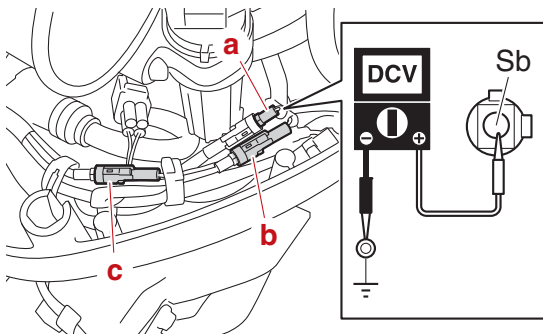
Checking the tilt limiter (remote control model)


1. Measure:
- Tilt limiter input voltage
Out of specification → Check the wire harness for continuity.

	Input voltage
	12 V
	Sky blue (Sb)–Ground

- a. Disconnect the tilt limiter couplers “a”, “b”, and “c”.

- b. Measure the input voltage at the tilt limiter coupler “a” with the up side of the PTT switch pushed.



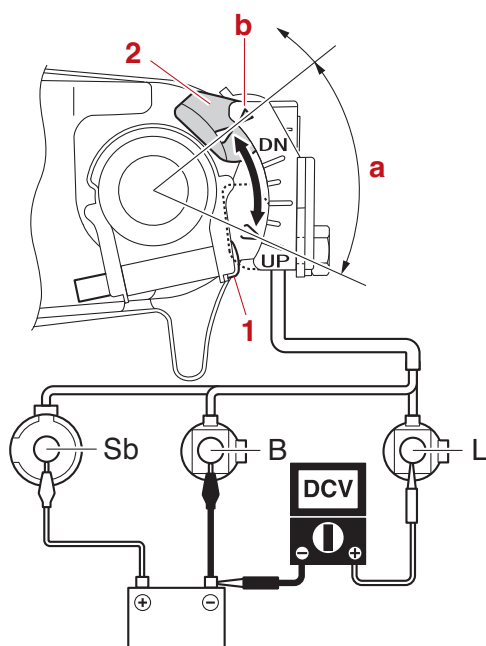
	Output voltage
	12 V at “a”
	0 V when passing “b”
Blue (L)–Ground	

- d. Connect the tilt limiter couplers.
e. Set the tilt limiter.

- c. Connect the tilt limiter couplers.

2. Measure:

- Tilt limiter output voltage
Out of specification → Replace.
- a. Disconnect the tilt limiter couplers.
- b. Connect the battery leads to the tilt limiter couplers.
- c. Loosen the screw “1”, and measure the output voltage at range “a”. Slide the magnet “2” to mark “b”. When the magnet passes mark “b”, measure the output voltage again.



Fuel system

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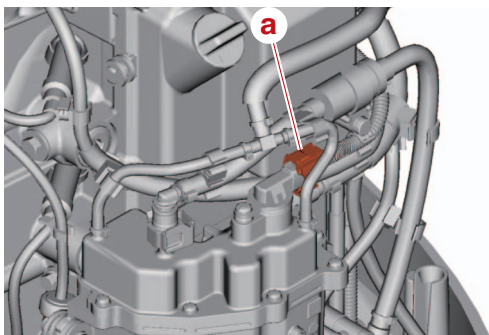
Fuel system

Reducing the fuel pressure

⚠ WARNING

Before servicing the high-pressure fuel line or vapor separator, make sure to reduce the fuel pressure in the fuel line. Otherwise, pressurized fuel could spray out.

1. Reduce:
 - Fuel pressure
 - a. Disconnect the high-pressure fuel pump coupler “a”.



- b. Start the engine.

TIP: After disconnecting the high-pressure fuel pump coupler, wait until the engine stalls.

- c. After the engine stalls, crank the engine 2 or 3 times.
 - d. Turn the engine start switch to OFF.
 - e. Connect the high-pressure fuel pump coupler.

Disconnecting the quick connector

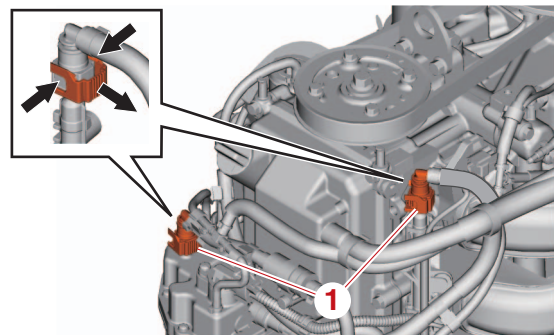
⚠ WARNING

Before disconnecting the quick connector, reduce the fuel pressure. Otherwise, pressurized fuel could spray out.

Cover the fuel components using a rag to prevent fuel from spilling out.

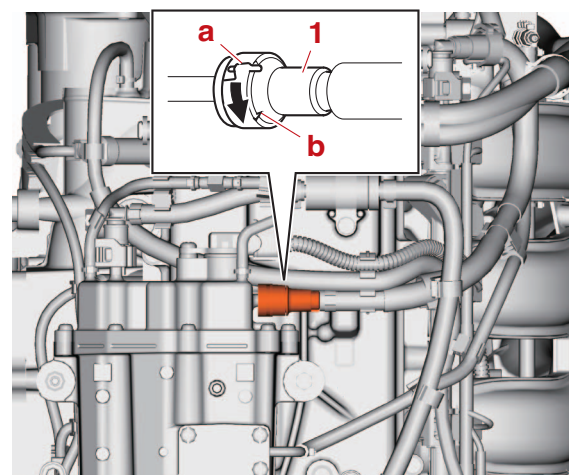
1. Disconnect:
 - Quick connector
 - a. Reduce the fuel pressure. See “Reducing the fuel pressure” (6-1).
 - b. Wrap a rag around the quick connectors “1”.
 - c. Disconnect the quick connectors “1”.

TIP: Cover the quick connectors, fuel rail, and vapor separator with a plastic bag to prevent damage and dirt from entering them.



- d. Wrap a rag around the quick connector “1”, and then push the quick connector tab “a” toward the stopper “b”.

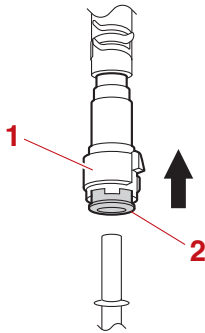
NOTICE Do not push the quick connector tab past the stopper. Otherwise, the quick connector could be damaged.



- e. Disconnect the quick connector “1”.

TIP: _____

- After disconnecting the quick connector “1”, be careful not to lose the retainer “2”.
- Cover the quick connector and vapor separator with a plastic bag to prevent damage and dirt from entering them.



Measuring the fuel pressure

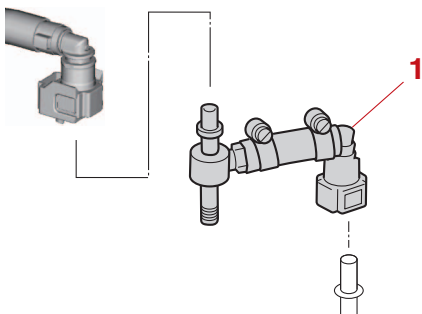
Cover the fuel components using a rag to prevent fuel from spilling out.

1. Measure:
 - Fuel pressure
Out of specification → Check the fuel line.



Fuel pressure at engine start switch to “ON” within 5 seconds
310 kPa (3.1 kgf/cm², 45.0 psi)
Fuel pressure at idle speed
320 kPa (3.2 kgf/cm², 46.4 psi)

- Reduce the fuel pressure. See “Reducing the fuel pressure” (6-1).
- Disconnect the quick connector from the fuel rail. See “Disconnecting the quick connector” (6-1).
- Connect the special service tool “1” to the quick connector and the fuel rail.

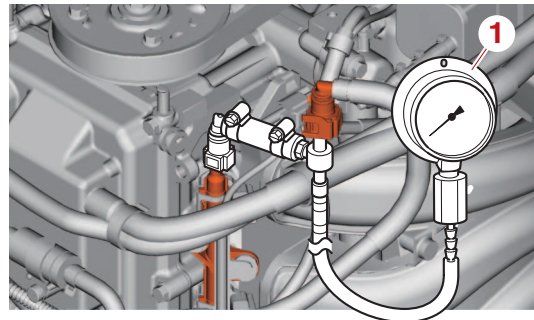


Fuel pressure gauge adapter “1”
90890-06946

- Connect the special service tool “1”.

WARNING

To prevent fuel from leaking out, screw in the gauge gently until it is connected firmly.



Fuel pressure gauge “1”
90890-06753

- Install the flywheel magneto cover.
- Turn the engine start switch to ON, and then measure the fuel pressure within 5 seconds.

TIP: _____

- The fuel pressure will decrease 5 seconds after the engine start switch is turned to ON.
- The high-pressure fuel pump does not operate when the engine start switch is turned to ON again within 10 seconds after turning the engine start switch to OFF.

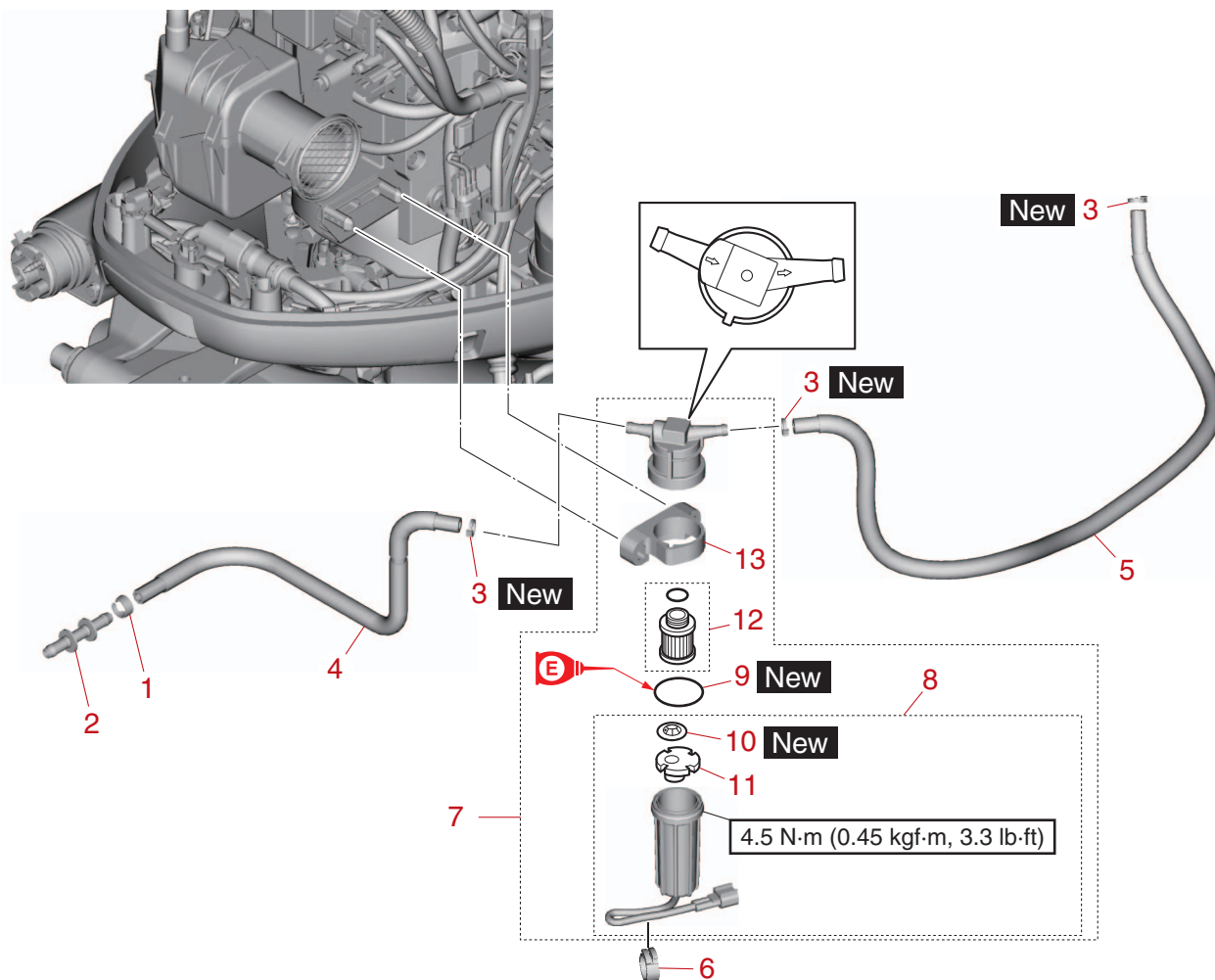
- Start the engine and warm it up until the engine idle speed stabilizes at 700–800 r/min.
- Measure the fuel pressure.
- Turn the engine start switch to OFF.
- Reduce the fuel pressure. See “Reducing the fuel pressure” (6-1).
- Disconnect the special service tool.

⚠ WARNING

Before disconnecting the special service tools, cover the end of the hose using a clean and dry rag.

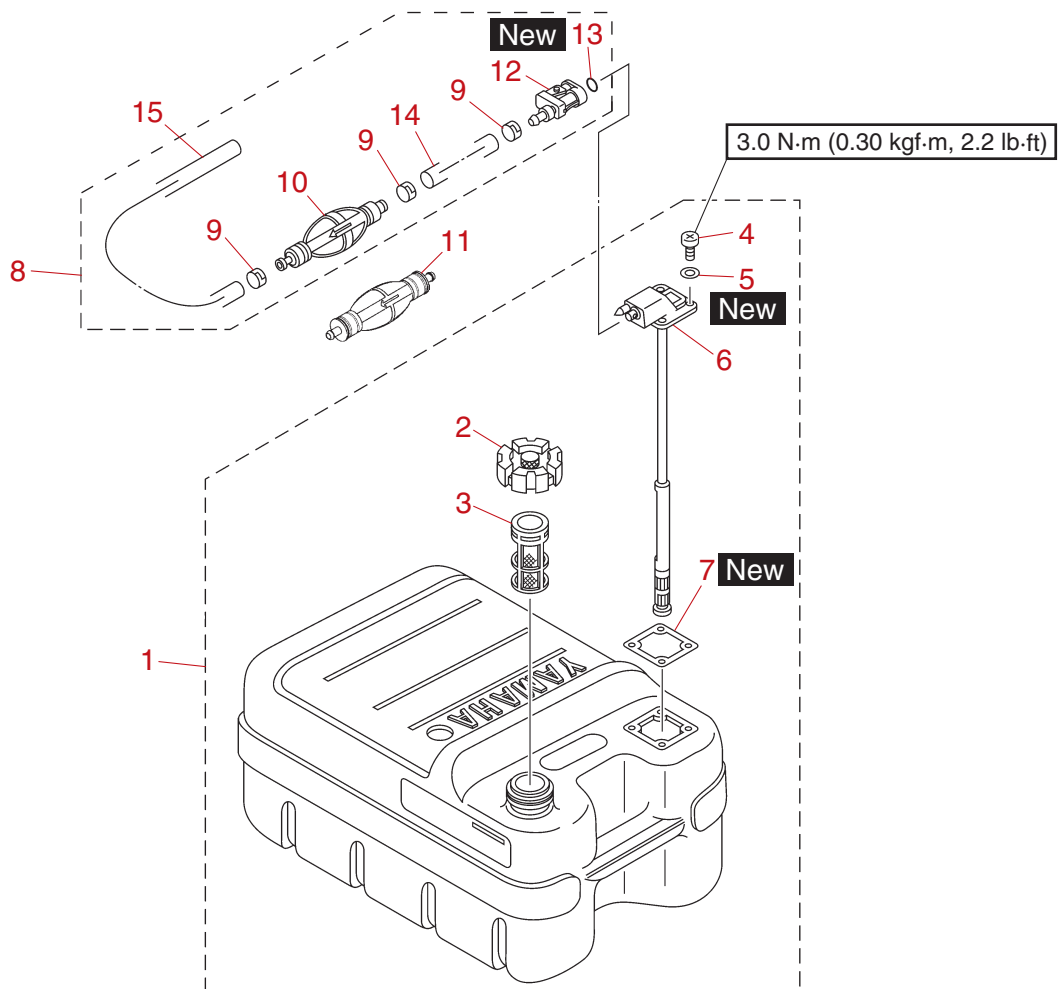
- I. Connect the quick connector to the fuel rail.

Fuel filter



↑↓	Part name	Q'ty	Remarks
1	Band	1	
2	Joint pipe	1	
3	Plastic tie	3	
4	Hose	1	
5	Hose	1	
6	Clamp	1	
7	Fuel filter assembly	1	
8	Fuel cup assembly	1	
9	O-ring	1	
10	Clip	1	
11	Float	1	
12	Fuel filter element	1	
13	Band	1	

Fuel tank



↑↓	Part name	Q'ty	Remarks
1	Fuel tank	1	*1
2	Cap	1	*1
3	Fuel filter	1	*1
4	Screw M5 × 16 mm	4	*1
5	Seal	4	*1
6	Fuel joint	1	*1
7	Gasket	1	*1
8	Fuel hose	1	*2

↑↓	Part name	Q'ty	Remarks
9	Clamp	3	*2
10	Primer pump	1	*2
11	Primer pump	1	*3
12	Joint	1	
13	O-ring	1	*2
14	Hose	1	*2
15	Hose	1	*2

*1: F75F

*2: F75F, F100G (Except for CRB (EPA))

*3: F100G (CRB (EPA))

Removing the fuel filter assembly

Cover the fuel components using a rag to prevent fuel from spilling out.

Checking the fuel filter assembly

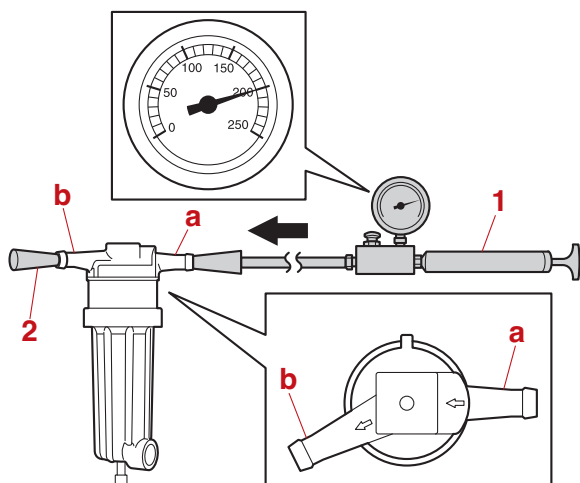
1. Check:

- No air leakage

Air leakage → Replace the O-ring, fuel cup assembly, or fuel filter assembly.

a. Connect the leakage tester “1” to the fuel inlet “a”.

b. Block the fuel outlet “b” using a rubber plug “2”, and then apply the specified positive pressure. Replace the O-ring, fuel cup assembly, or fuel filter assembly if the specified pressure cannot be maintained for 15 seconds or more.

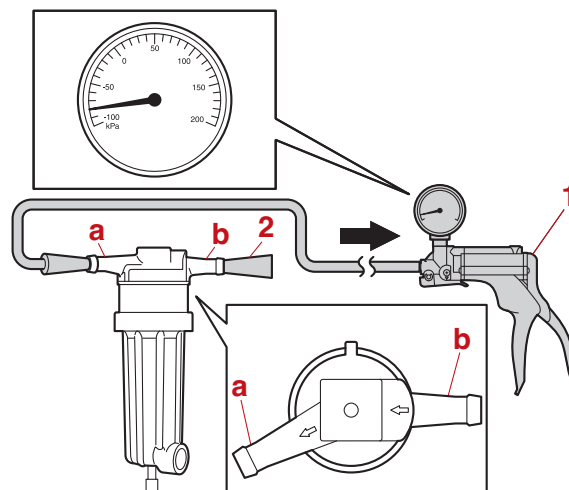


	Leakage tester “1” 90890-06840 Leakage tester “1” (commercially available)
--	---

	Fuel inlet holding pressure (positive pressure) 200 kPa (2.00 kgf/cm ² , 29.0 psi)
--	--

c. Connect the special service tool “1” to the fuel outlet “a”.

d. Block the fuel inlet “b” using a rubber plug “2”, and then apply the specified negative pressure. Replace the O-ring, fuel cup assembly, or fuel filter assembly if the specified pressure cannot be maintained for 15 seconds or more.



	Vacuum/pressure pump gauge set “1” 90890-06945
--	--

	Fuel outlet holding pressure (negative pressure) 80 kPa (0.80 kgf/cm ² , 11.6 psi)
--	--

Checking the fuel filter element

1. Check:

- Fuel filter element
Dirt/residue → Replace.

Checking the fuel cup assembly

1. Check:

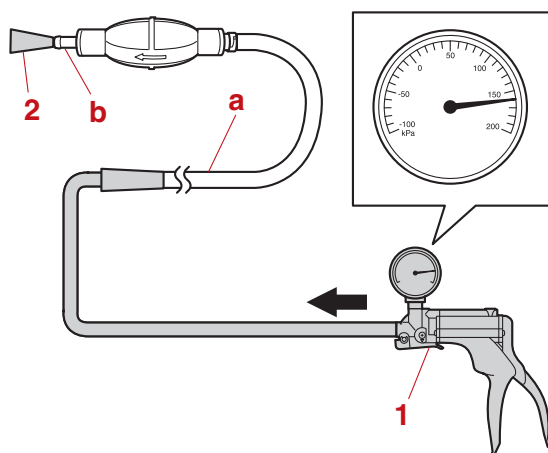
- Fuel cup assembly
Foreign material → Clean.
Cracked → Replace.

NOTICE

When cleaning the fuel cup assembly, do not remove the clip and float.

Checking the primer pump

1. Check:
 - No air leakage
Air leakage → Replace.
 - a. Connect the special service tool “1” to the primer pump inlet “a”.
 - b. Block the fuel outlet “b” using a rubber plug “2”, and then apply the specified positive pressure. Replace the primer pump if the specified pressure cannot be maintained for 30 seconds or more.



	Vacuum/pressure pump gauge set “1” 90890-06945
--	--

	Positive pressure 166.7 kPa (1.67 kgf/cm ² , 24.2 psi) (F100GEHT, F100GET_CRB/CHN/NME/OTH, F75FEHT, F75FET) 179.5 kPa (1.80 kgf/cm ² , 26.0 psi) (F100GET_CRB (EPA))
--	--

	Fuel cup assembly 4.5 N·m (0.45 kgf·m, 3.3 lb·ft)
--	--

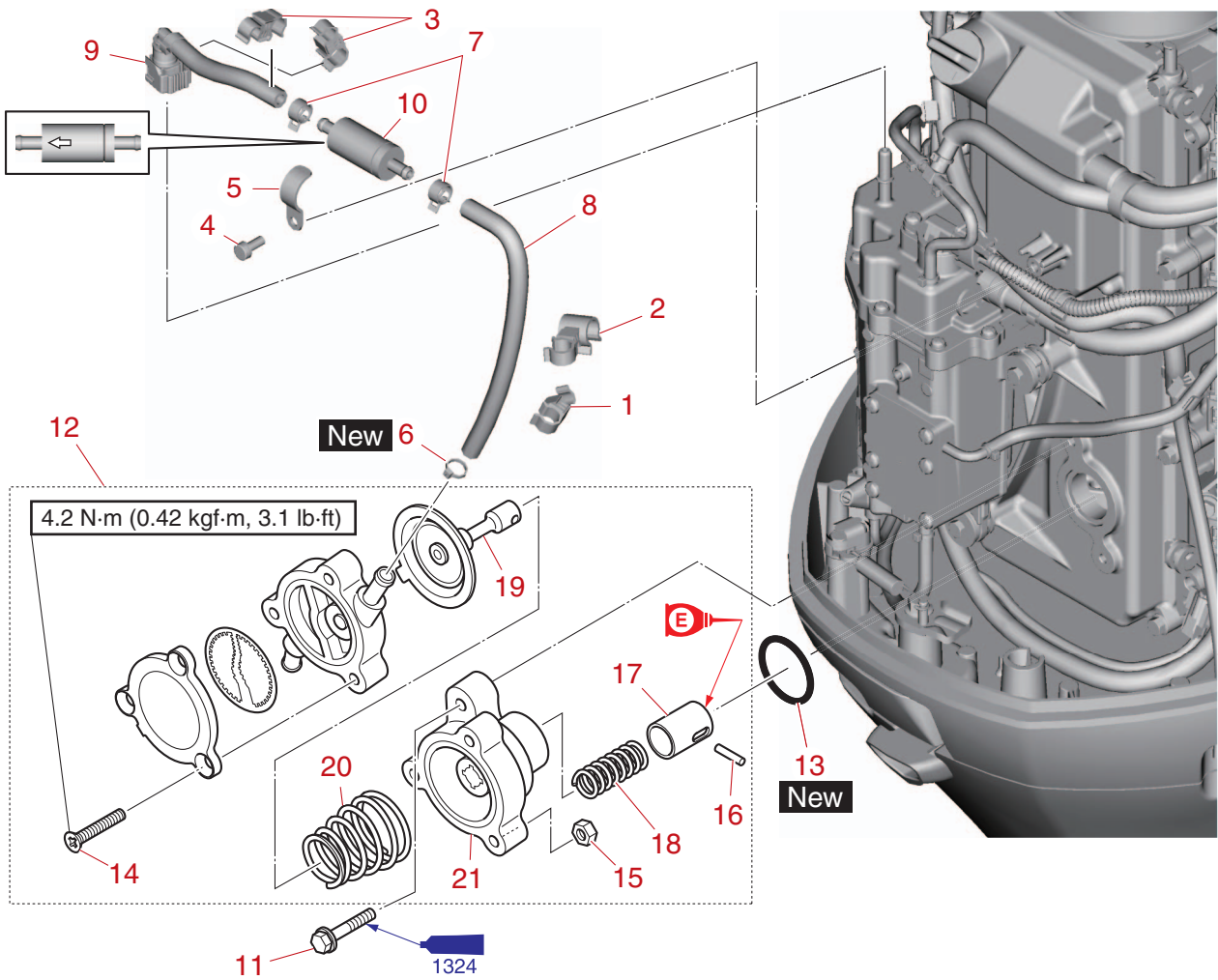
Installing the fuel filter assembly

1. Install:
 - Fuel filter assembly
 - Clamp
 - Hose
 - Plastic tie **New**
 - Joint pipe
 - Band

Assembling the fuel filter assembly

1. Install:
 - Band
 - Fuel filter element
 - Float
 - Clip **New**
 - O-ring **New**
 - Fuel cup assembly

Fuel pump assembly



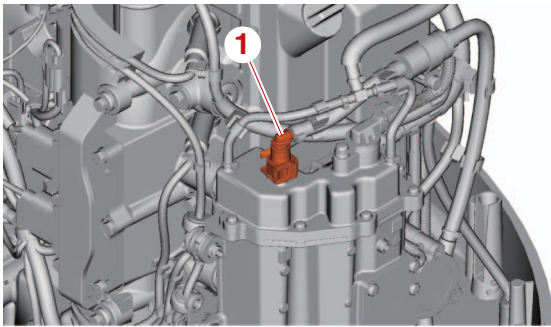
↑↓	Part name	Q'ty	Remarks
1	Clamp	1	
2	Clamp	1	
3	Clamp	2	
4	Bolt M6 × 16 mm	1	
5	Bracket	1	
6	Plastic tie	1	
7	Clip	2	
8	Hose	1	
9	Hose	1	
10	Fuel strainer	1	
11	Bolt M6 × 30 mm	2	
12	Fuel pump assembly	1	
13	O-ring	1	
14	Screw M6 × 36 mm	3	
15	Nut M6	3	
16	Pin	1	
17	Plunger	1	
18	Spring	1	

↑↓	Part name	Q'ty	Remarks
19	Diaphragm	1	
20	Spring	1	
21	Fuel pump body	1	

Removing the fuel pump assembly

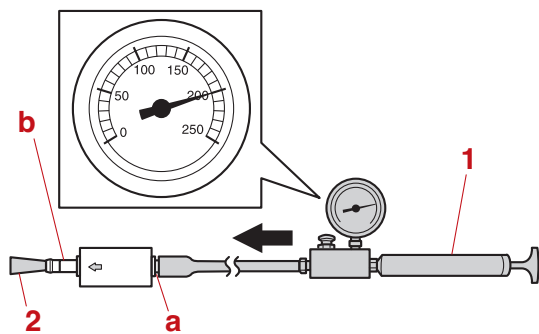
Cover the fuel components using a rag to prevent fuel from spilling out.

1. Disconnect:
 - Quick connector "1"
 See "Disconnecting the quick connector" (6-1).



Checking the fuel strainer

1. Check:
 - No air leakage
 Air leakage → Replace.
 - a. Connect the leakage tester "1" to the fuel inlet "a".
 - b. Block the fuel outlet "b" using a rubber plug "2", and then apply the specified positive pressure. Replace the fuel strainer if the specified pressure cannot be maintained for 15 seconds or more.

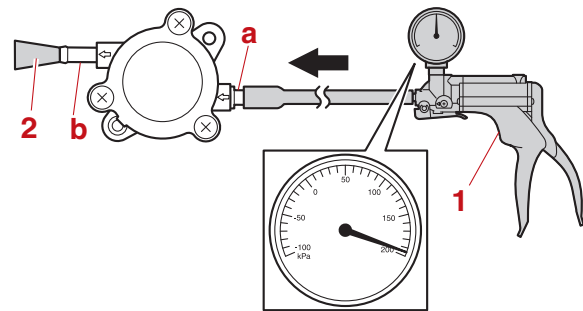


	Leakage tester "1" 90890-06840
	Leakage tester "1" (commercially available)

	Holding pressure (positive pressure) 200.0 kPa (2.00 kgf/cm ² , 29.0 psi)
--	---

Checking the fuel pump assembly

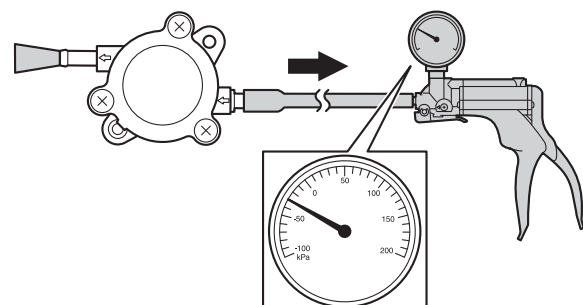
1. Check:
 - No air leakage
 Air leakage → Disassemble and check the fuel pump. See "Disassembling the fuel pump assembly" (6-10).
 - a. Connect the special service tool "1" to the fuel pump inlet "a".
 - b. Block the fuel pump outlet "b" using a rubber plug "2", and then apply the specified positive pressure. Check that there is no air leakage.



	Vacuum/pressure pump gauge set "1" 90890-06945
--	--

	Fuel inlet holding pressure (positive pressure) 196.0 kPa (1.96 kgf/cm ² , 28.4 psi)
--	--

- c. Apply the specified negative pressure, and then check that there is no air leakage.

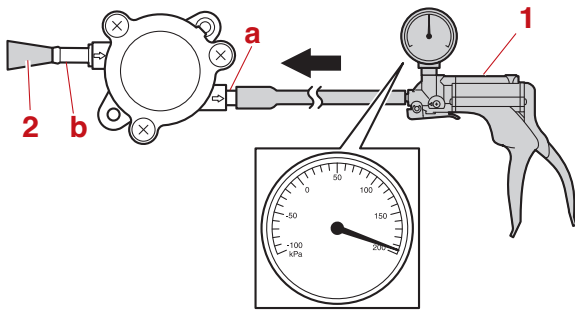


Fuel pump assembly



Fuel inlet holding pressure (negative pressure)
30.0 kPa (0.30 kgf/cm², 4.4 psi)

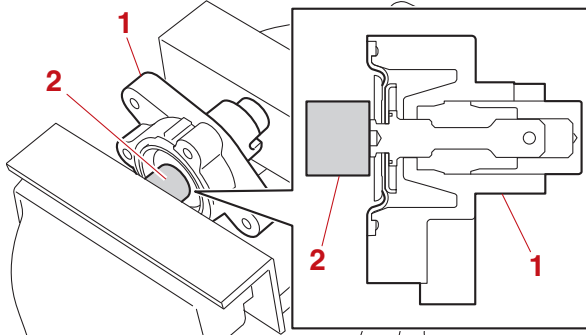
- d. Connect the special service tool "1" to the fuel pump outlet "a".
- e. Block the fuel pump inlet "b" using a rubber plug "2".
- f. Apply the specified positive pressure, and then check that there is no air leakage.



Fuel outlet holding pressure (positive pressure)
196.0 kPa (1.96 kgf/cm², 28.4 psi)

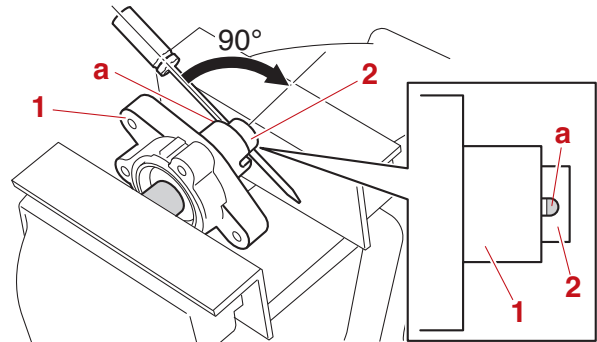
Disassembling the fuel pump assembly

1. Remove:
 - Pin
 - a. Compress the plunger spring using a vise to hold the fuel pump body "1".

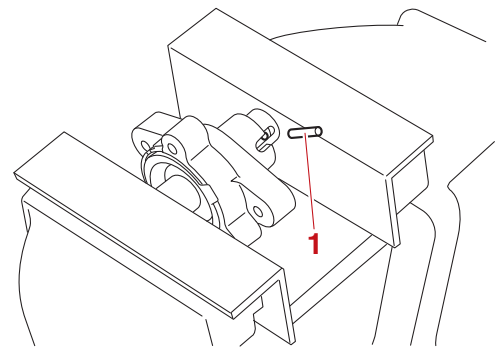


Small end bearing installer "2"
90890-06528

- b. While holding fuel pump body "1" in place, insert a flathead screwdriver into the hole "a" in the plunger "2" and turn it 90°.

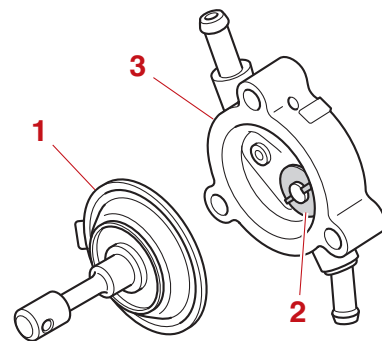


- c. Remove the pin "1".



Checking the diaphragm and valve

1. Check:
 - Diaphragm "1"
Torn/deformed/worn → Replace.
 - Valve "2"
Deformed/worn → Replace the fuel pump body "3".

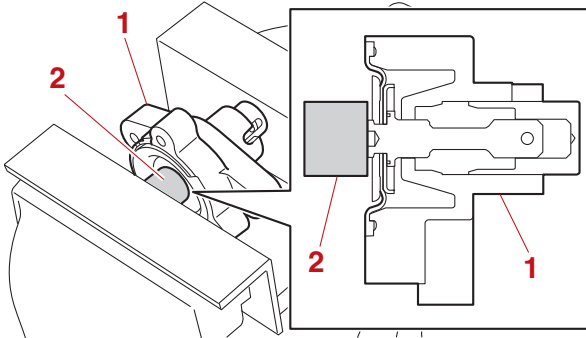


Assembling the fuel pump assembly

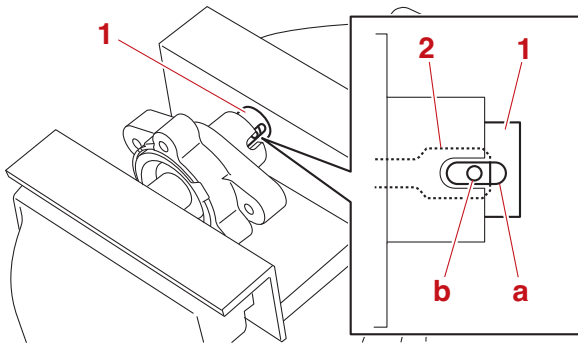
Before assembling the fuel pump assembly, clean the parts and soak the valves and diaphragm in gasoline to obtain prompt operation of the fuel pump assembly.

Fuel pump assembly

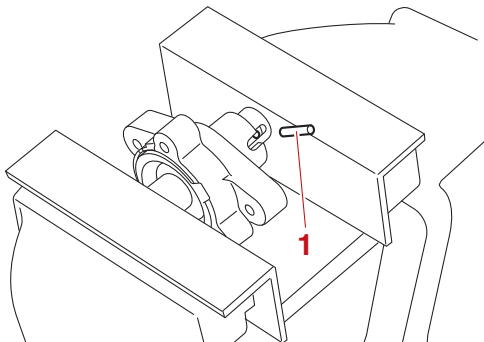
1. Install:
 - Spring (to the fuel pump body)
 - Diaphragm (to the fuel pump body)
 - Spring (to the fuel pump body)
 - Plunger (to the fuel pump body)
2. Install:
 - Pin
 - a. Compress the plunger spring using a vise to hold the fuel pump body "1".



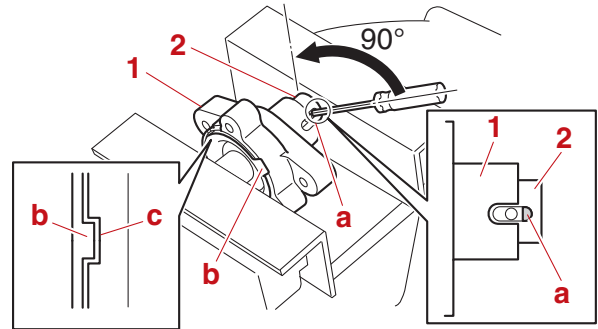
- b. Align the hole "a" in the plunger "1" with the hole "b" in the diaphragm "2".



- c. Install the pin "1".

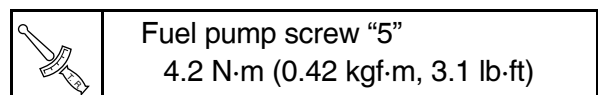
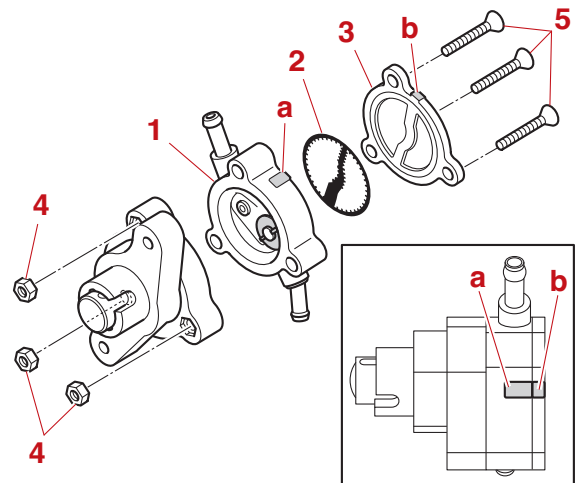


- d. While holding fuel pump body "1" in place, insert a flathead screwdriver into the hole "a" in the plunger "2" and turn it 90° until the tab "b" on the diaphragm is aligned with the slot "c" in the fuel pump body "1".



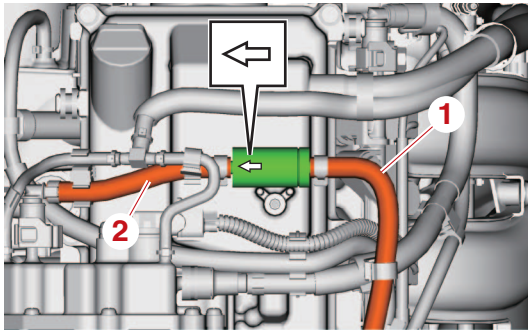
3. Install:
 - Fuel pump body "1"
 - Diaphragm "2"
 - Cover "3"
 - Nut "4"
 - Fuel pump screw "5"

TIP: Make sure to align the protrusions "a" and "b".



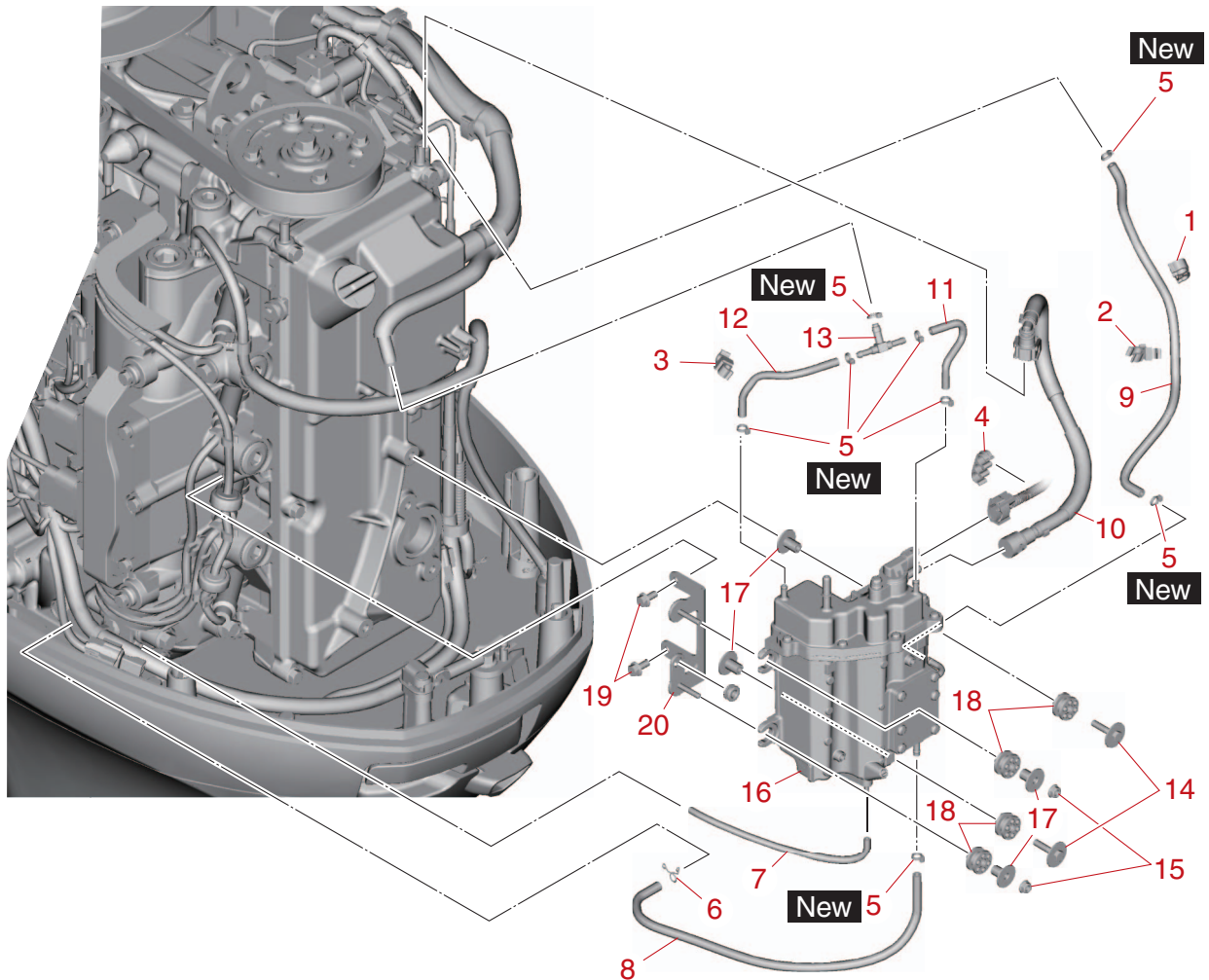
Installing the fuel pump assembly

1. Install:
 - O-ring **New** (to the fuel pump assembly)
 - Fuel pump assembly
 - Fuel pump assembly bolt
 - Clip (to the hose)
2. Connect:
 - Hose "1"
 - Hose "2"



3. Install:
 - Plastic tie **New**
 - Bracket
 - Bracket bolt
 - Clamp

Vapor separator

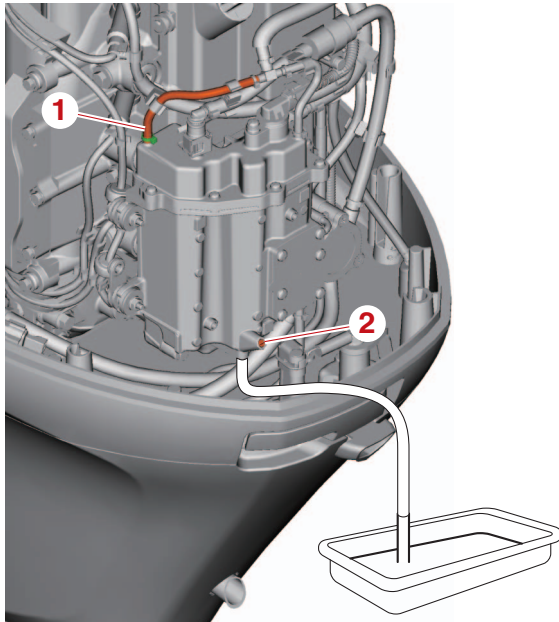


↑↓	Part name	Q'ty	Remarks
1	Clamp	1	
2	Clamp	1	
3	Clamp	1	
4	Clamp	1	
5	Plastic tie	8	
6	Clip	1	
7	Drain hose	1	
8	Hose	1	
9	Hose	1	
10	Hose	1	
11	Hose	1	
12	Hose	1	
13	Nipple	1	
14	Bolt M6 × 30 mm	2	
15	Nut M6	2	
16	Vapor separator	1	
17	Collar	4	
18	Grommet	4	


↑↓	Part name	Q'ty	Remarks
19	Bolt M6 × 14 mm	2	
20	Plate	1	

Draining the fuel

1. Drain:
 - Fuel
 - a. Disconnect the vapor gas hose “1”.
 - b. Loosen the drain screw “2”.



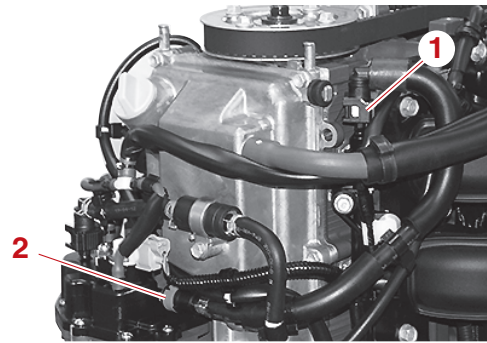
- c. Tighten the drain screw to the specified torque, and then connect the vapor gas hose.

	Drain screw 1.5 N·m (0.15 kgf·m, 1.1 lb·ft)
---	--

Removing the vapor separator

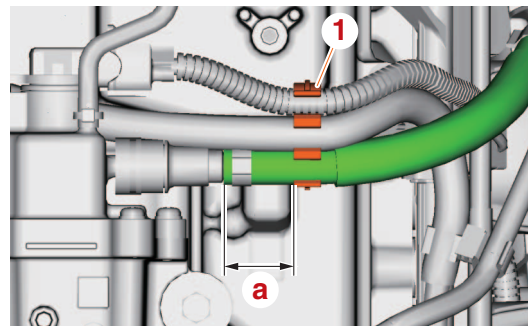
Cover the fuel components using a rag to prevent fuel from spilling out.


1. Drain:
 - Fuel
See “Draining the fuel” (6-14).
2. Disconnect:
 - Quick connectors “1” and “2”
See “Disconnecting the quick connector” (6-1).



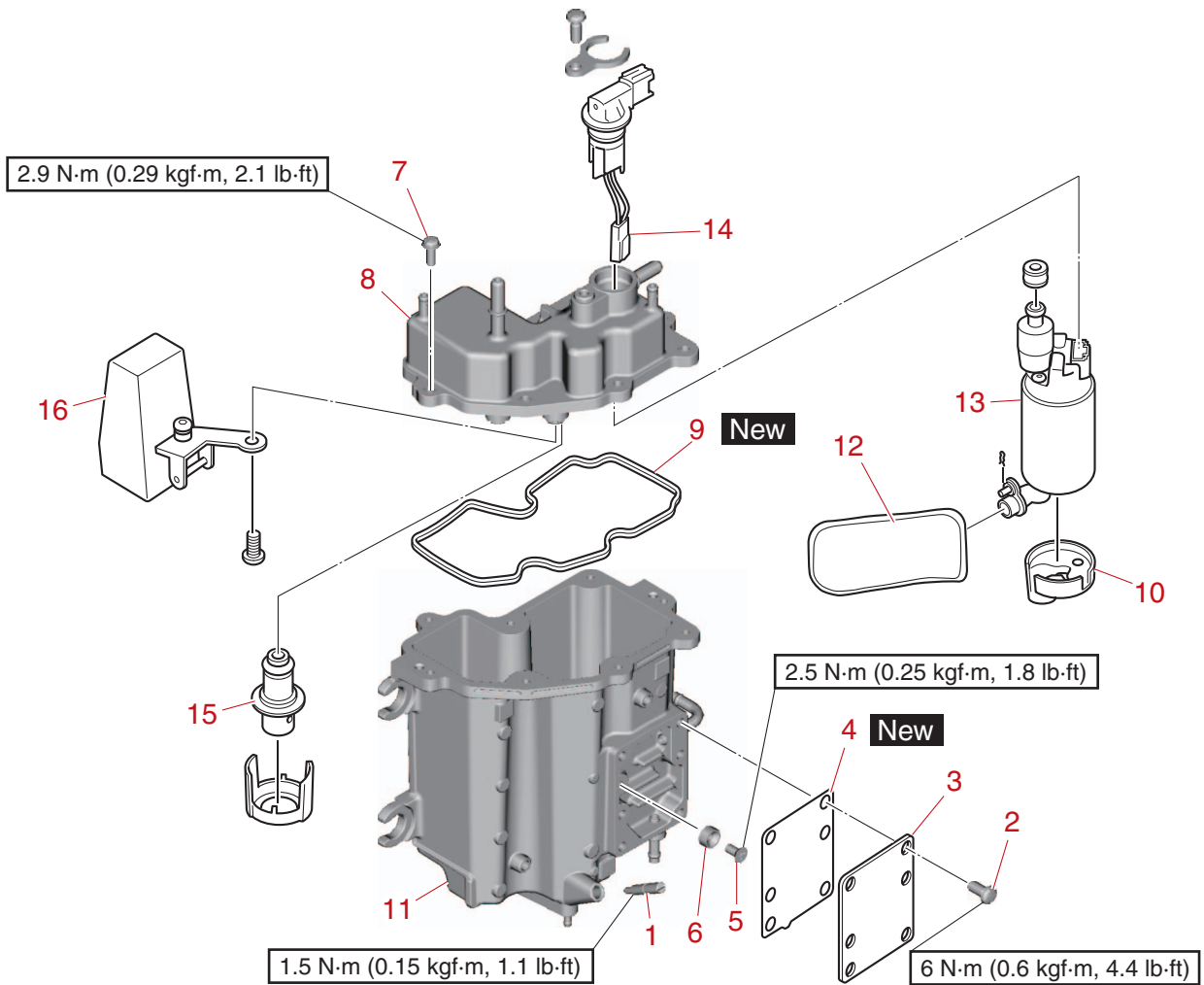
Installing the vapor separator

1. Install:
 - Plate
 - Plate bolt
 - Grommet
 - Collar
 - Vapor separator
 - Vapor separator nut
 - Vapor separator bolt
 - Clip (to the hose)
 - Hose (to the nipple)
 - Hose (to the vapor separator)
 - Drain hose
 - Plastic tie **New**
 - Clamp
 - Clamp “1”



	Specified length “a” 20 mm (0.79 in)
---	---

Vapor separator and high-pressure fuel pump




↑↓	Part name	Q'ty	Remarks
1	Drain screw	1	
2	Screw M6 × 9 mm	6	
3	Cover	1	
4	Gasket	1	
5	Screw M5 × 6 mm	1	
6	Anode	1	
7	Screw M5 × 14 mm	8	
8	Cover	1	
9	Gasket	1	
10	Cushion rubber	1	
11	Float chamber body	1	
12	Filter	1	
13	High-pressure fuel pump	1	
14	Lead	1	
15	Pressure regulator	1	
16	Float	1	

Checking the vapor separator

1. Check:
 - Needle valve
Bent/worn → Replace the float.

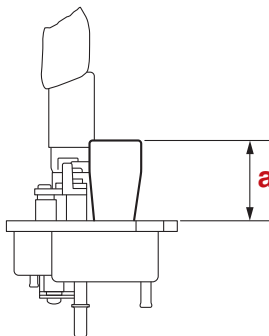


2. Check:
 - Float
Deteriorated → Replace.
3. Check:
 - Filter
Dirt or residue → Clean.
4. Measure:
 - Float height
Out of specification → Replace the float.

	Float height 50.5 mm (1.99 in)
---	-----------------------------------


- a. Place the cover assembly upside down, and then measure the float height “a”.

TIP: _____
When measuring the float height, the float should be resting on the needle valve. Do not press the float.




Assembling the vapor separator


1. Install:
 - Float
 - Pressure regulator
 - Lead
 - High-pressure fuel pump
 - Filter
 - Cushion rubber
 - Gasket **New** (to the vapor separator cover)
 - Vapor separator cover
 - Vapor separator cover screw

	Vapor separator cover screw 2.9 N·m (0.29 kgf·m, 2.1 lb·ft)
---	--


2. Install:
 - Anode
 - Anode screw

	Anode screw 2.5 N·m (0.25 kgf·m, 1.8 lb·ft)
--	--

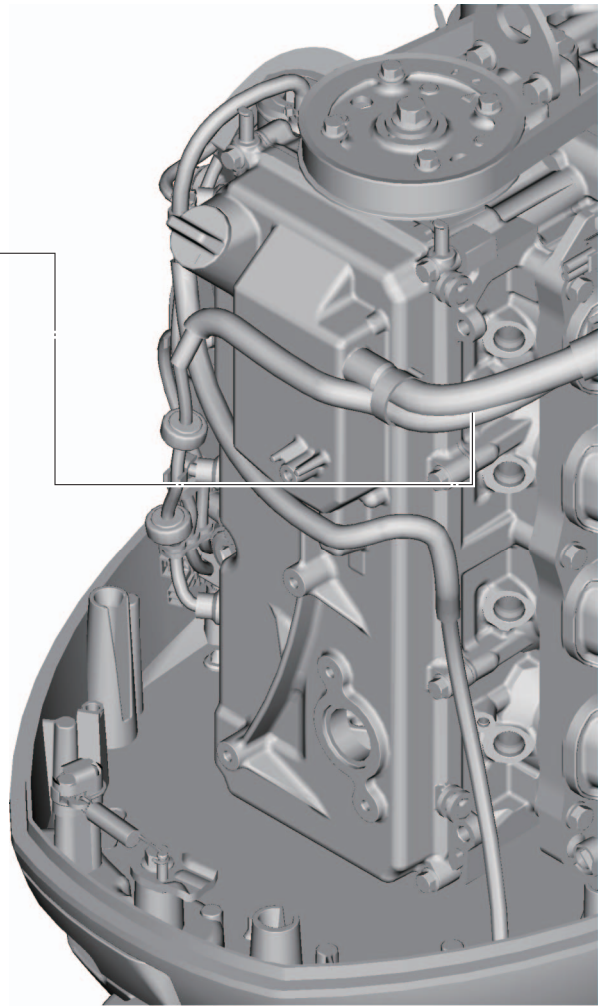
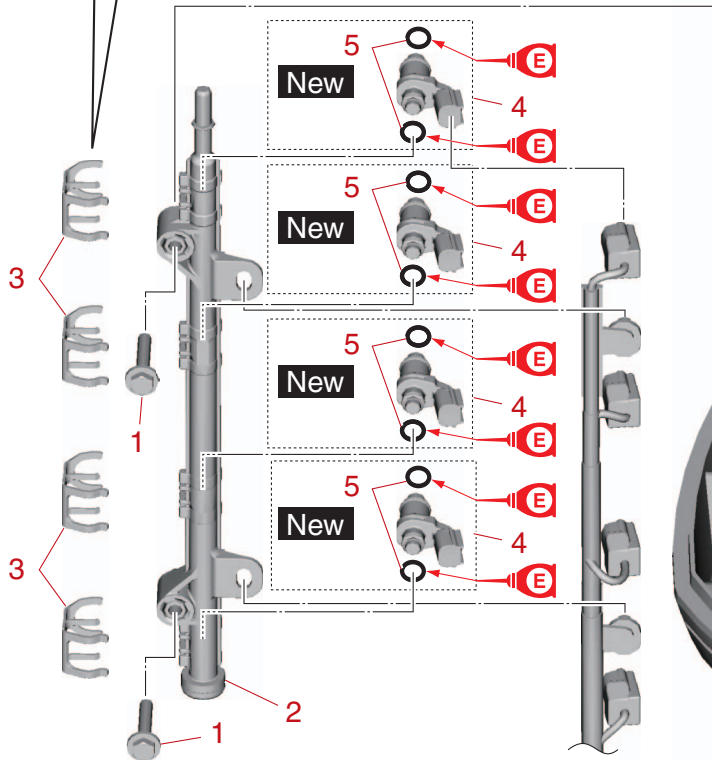
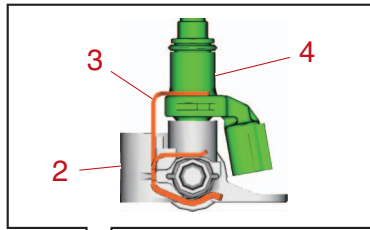
3. Install:
 - Gasket **New**
 - Fuel cooler cover
 - Fuel cooler cover screw

	Fuel cooler cover screw 6 N·m (0.6 kgf·m, 4.4 lb·ft)
---	---

4. Install:
 - Drain screw

	Drain screw 1.5 N·m (0.15 kgf·m, 1.1 lb·ft)
---	--

Fuel injector



∩∩	Part name	Q'ty	Remarks
1	Bolt M6 × 35 mm	2	
2	Fuel rail	1	
3	Holder	4	
4	Fuel injector	4	
5	O-ring set	4	2 pcs/set

Removing the fuel injector

Cover the fuel components using a rag to prevent fuel from spilling out.

1. Reduce:
 - Fuel pressure
See “Reducing the fuel pressure” (6-1).
2. Disconnect:
 - Quick connector
See “Disconnecting the quick connector” (6-1).

Checking the fuel rail and fuel injector

1. Check:
 - Fuel rail
Cracked/deformed → Replace.
2. Measure:
 - Fuel volume injected by the injector
See the “Fuel Injection Meter Operation Manual” (90894-62982-85).

WARNING

Do not use gasoline when measuring the fuel injection volume. Otherwise, the cylinder could be damaged, which can cause a gasoline leakage. Make sure to follow the instructions for operation of the fuel injection meter.

TIP:

- When measuring, obtain a result from the average of 4 measurements.
- It is not possible to obtain correct measurements under disparate test conditions.
- Make sure to fully charge the battery.
- The cylinder is graduated in increments of 2.5 cm³ (2.5 cc).
- Make sure to comply with the laws and regulations of the region when disposing of the used test fuel.



Fuel injection volume
90 cm³ (90 cc)/30 sec

Test fuel
Dry sorbent (viscosity: 1.2 ± 0.03 mm²/s, specific gravity: 0.774 [15 °C])

Test fuel temperature
22–24 °C (room temperature and test fuel temperature should be the same)

Test fuel pressure
300 ± 1.5 kPa

Measuring cylinder internal pressure (standard atmosphere pressure)
960–1060 hPa

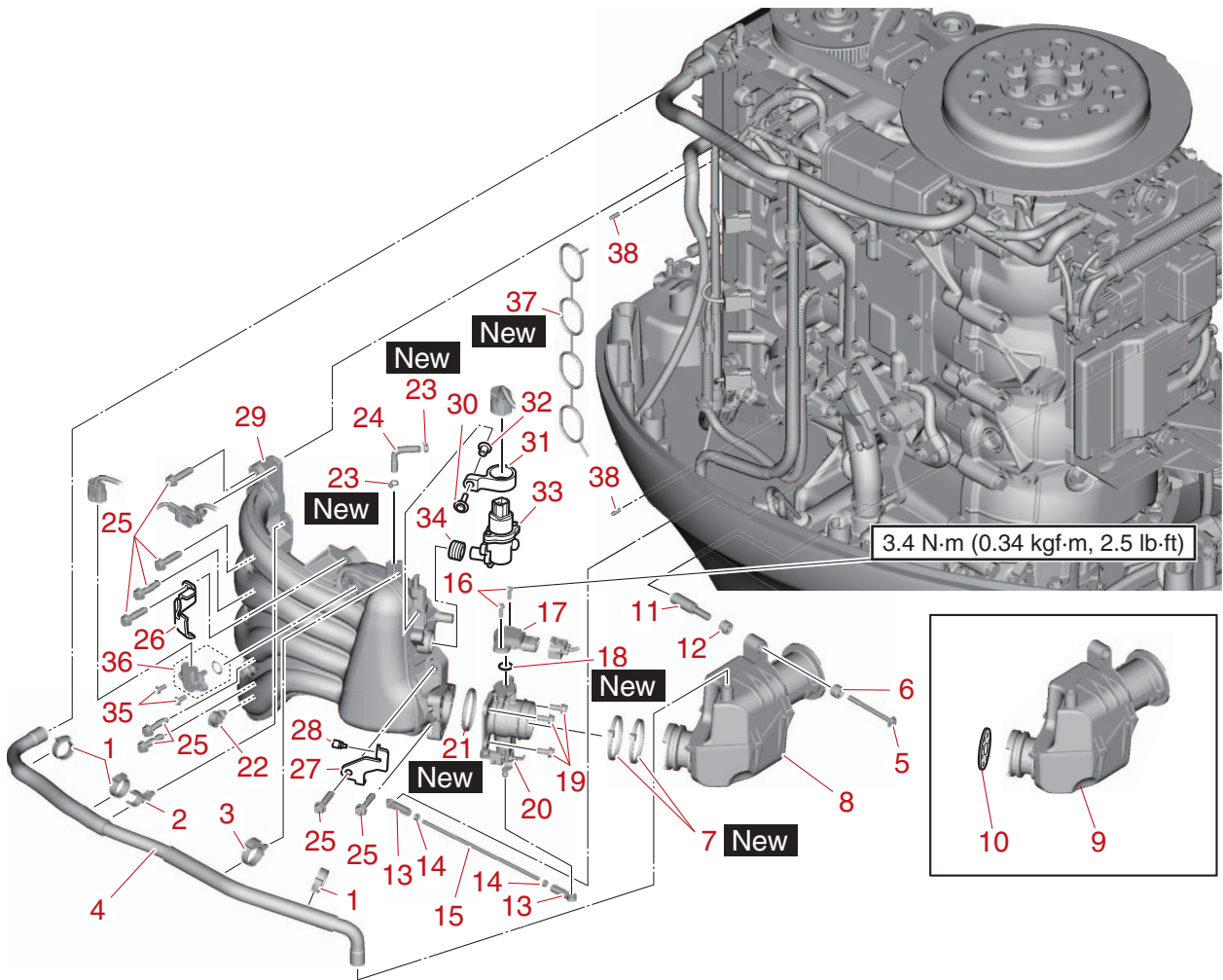
Installing the fuel injector

1. Install:
 - O-ring **New**
 - Fuel injector
 - Holder
 - Fuel rail
 - Fuel rail bolt



Fuel injection meter
FIM20000ME

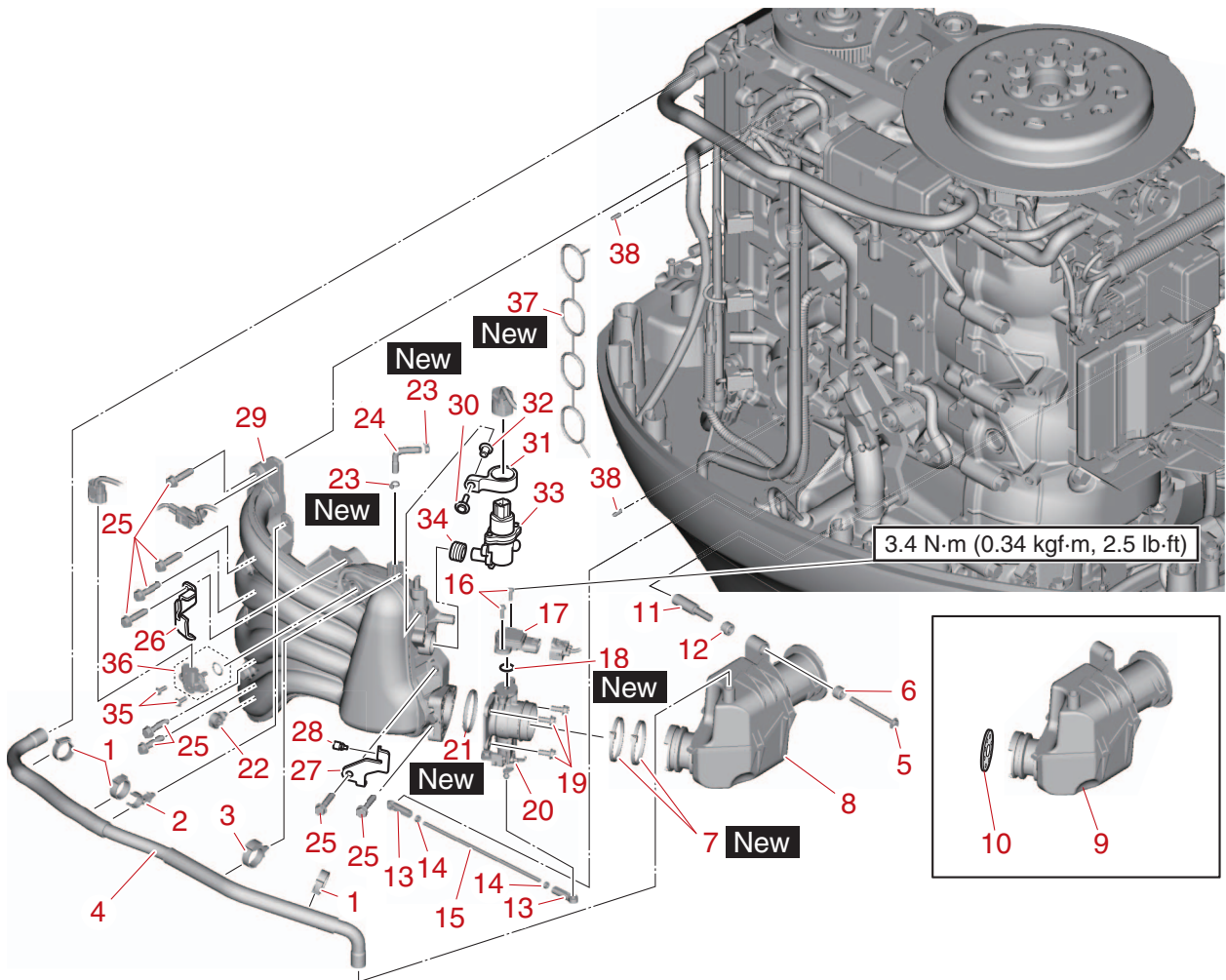
Intake silencer, intake manifold and throttle body



↑↓	Part name	Q'ty	Remarks
1	Clamp	3	
2	Holder	1	
3	Holder	1	
4	Hose	1	
5	Bolt M6 × 80 mm	1	
6	Bushing	1	
7	Plastic tie	2	
8	Intake silencer	1	*1
9	Intake silencer	1	*2
10	Plate	1	*2
11	Collar	1	
12	Bushing	1	
13	Joint	2	
14	Nut M5	2	
15	Rod	1	
16	Screw M5 × 16 mm	2	
17	TPS	1	
18	O-ring	1	

↑↓	Part name	Q'ty	Remarks
19	Bolt M6 × 16 mm	3	
20	Throttle body	1	
21	Gasket	1	
22	Holder	1	
23	Plastic tie	2	
24	Hose	1	
25	Bolt M8 × 40 mm	8	
26	Cover	1	
27	Plate	1	
28	Grommet	1	
29	Intake manifold	1	
30	Bolt M6 × 25 mm	1	
31	Damper	1	
32	Collar	1	
33	ISC valve	1	
34	Gasket	1	
35	Screw M5 × 15 mm	2	

Intake silencer, intake manifold and throttle body



↑↓	Part name	Q'ty	Remarks
36	Intake air pressure/temperature sensor	1	

↑↓	Part name	Q'ty	Remarks
37	Gasket	1	
38	Pin	2	

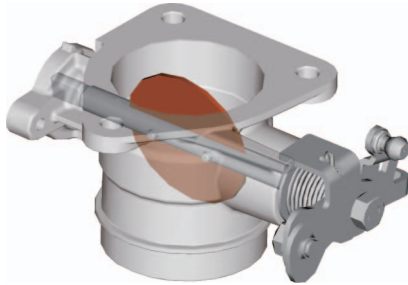
*1: F100G

*2: F75F

Intake silencer, intake manifold and throttle body

Checking the throttle body

1. Check:
 - Throttle body exterior
Cracked → Replace.
2. Check:
 - Throttle valve movement
Not smooth → Clean.



Checking the intake air pressure/temperature sensor

1. Check:
 - Intake air pressure/temperature sensor exterior
Cracked → Replace.

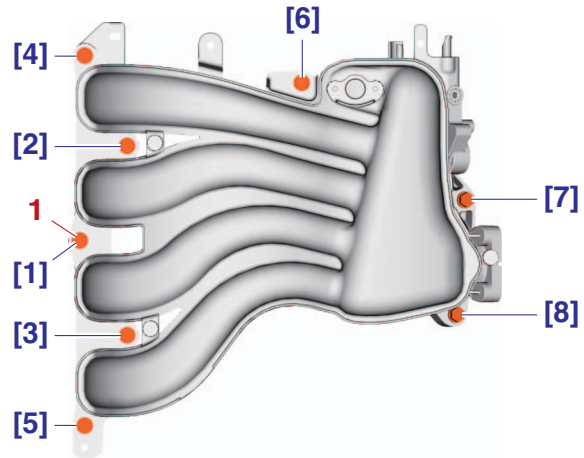
Checking the intake manifold

1. Check:
 - Intake manifold
Cracked/deformed → Replace.

Installing the intake manifold

1. Install:
 - Pin
 - Gasket **New** (to the intake manifold)
 - Intake air pressure/temperature sensor
 - Intake air pressure/temperature sensor screw
 - Gasket (to the ISC valve)
 - Collar
 - Damper
 - ISC valve
 - ISC valve bolt
 - Intake manifold
 - Grommet (to the plate)
 - Plate
 - Cover


2. Tighten:
 - Intake manifold bolt
 - a. Tighten the intake manifold bolts “1” in the order [1], [2], and so on.



3. Install:
 - Hose (to the intake manifold)
 - Plastic tie **New**
 - Holder (to the intake manifold)

Installing the throttle body

1. Install:
 - Gasket **New** (to the throttle body)
 - Throttle body
 - Throttle body bolt
 - O-ring **New**
 - TPS
 - TPS screw

	TPS screw 3.4 N·m (0.34 kgf·m, 2.5 lb·ft)
---	--

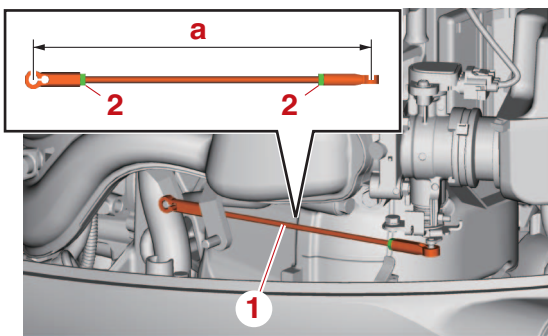
2. Install:
 - Nut (to the throttle link rod)
 - Joint (to the throttle link rod)
 - Throttle link rod
 - See “Adjusting the throttle link rod” (6-22).


Intake silencer, intake manifold and throttle body

3. Install:
- Bushing (to the intake silencer)
 - Collar (to the intake silencer)
 - Intake silencer
 - Plastic tie **New**
 - Bushing
 - Intake silencer bolt
 - Hose (to the intake silencer)
 - Holder
 - Clamp

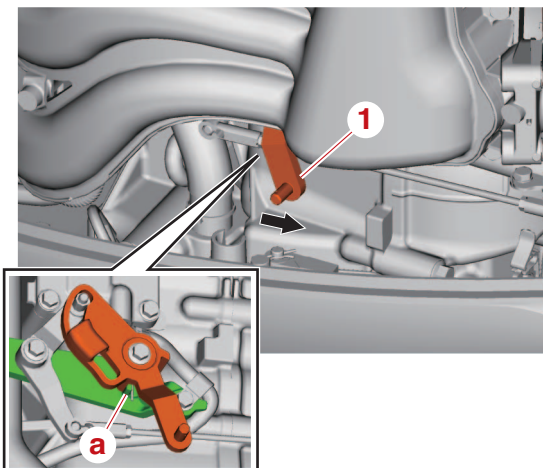
Adjusting the throttle link rod

1. Adjust:
- Remove the throttle link rod "1".
 - Adjust the length "a" of the throttle link rod "1", and then tighten the throttle link rod nuts "2".
 - Install the throttle link rod "1".

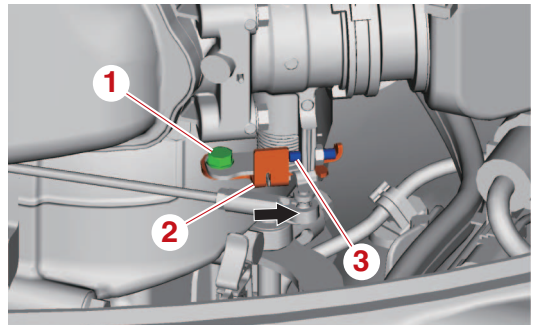


	<p>Specified length "a" 251.7–253.3 mm (9.91–9.97 in)</p>
---	---

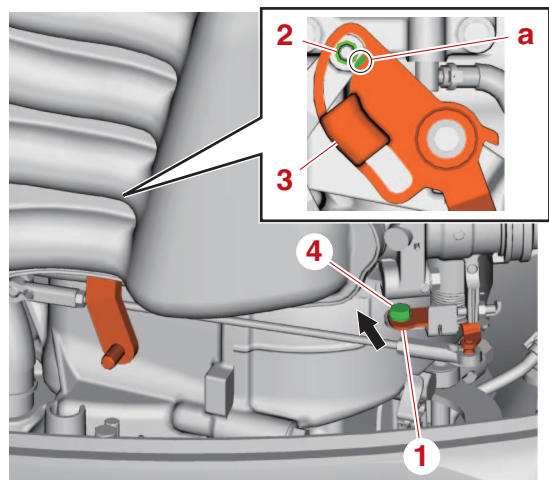
- Turn the accelerator cam "1" until it contacts the stopper "a" of the bracket.



- Loosen the throttle lever plate bolt "1", and then push the throttle lever plate "2" in the direction of the arrow so that it contacts the fully closed stopper "3" of the throttle body.



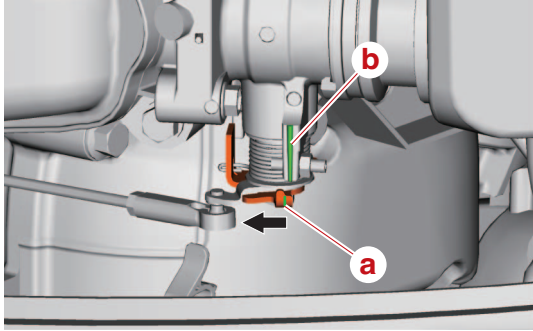
- Push the throttle lever sub plate "1" in the direction of the arrow until the bushing "2" contacts the fully closed position "a" of the accelerator cam "3", and then tighten the throttle lever plate bolt "4".



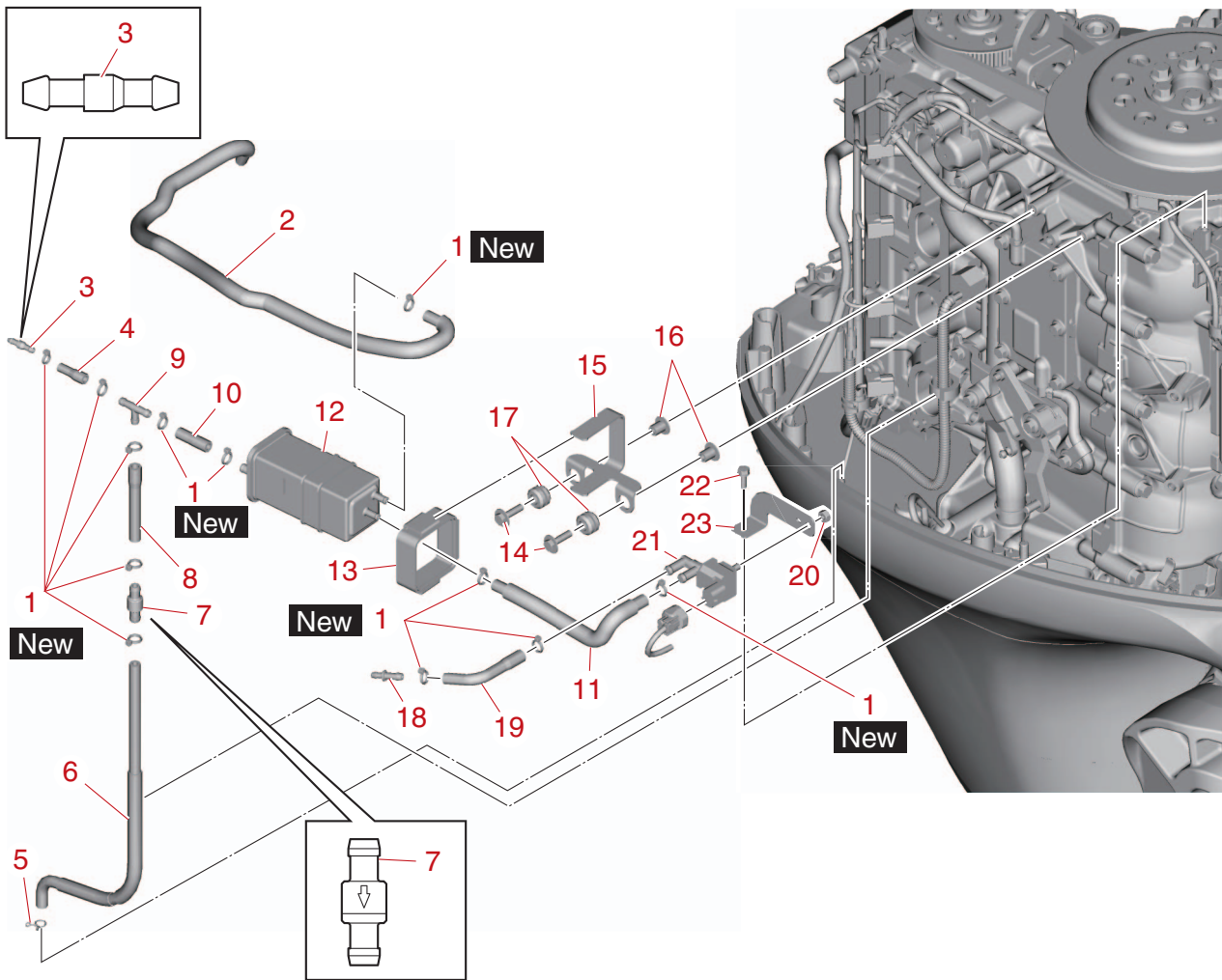
- Turn the accelerator cam to the fully closed position and then fully open position. Repeat this operation 2 or 3 times to check that the accelerator cam returns to the fully closed position.
- Check that the throttle lever plate is in contact with the fully closed stopper of the throttle body.

Intake silencer, intake manifold and throttle body

- i. Turn the accelerator cam to the fully open position. Check that the mark “a” on the throttle lever plate has passed over the mark “b” on the throttle body. Repeat from step (d) if the mark “a” has not passed the mark “b”.



Canister and vapor shut-off valve



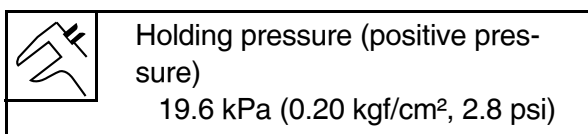
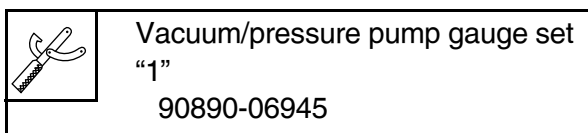
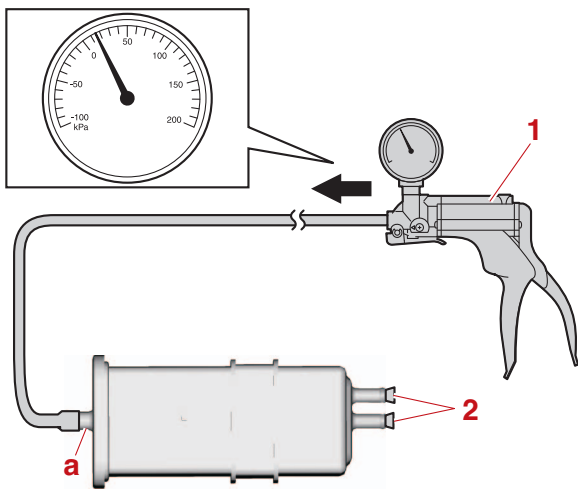
№	Part name	Q'ty	Remarks
1	Plastic tie	12	
2	Hose	1	
3	Check valve	1	
4	Hose	1	
5	Clip	1	
6	Hose	1	
7	Check valve	1	
8	Hose	1	
9	Joint	1	
10	Hose	1	
11	Hose	1	
12	Canister	1	
13	Cover	1	
14	Bolt M6 × 25 mm	2	
15	Bracket	1	
16	Collar	2	
17	Grommet	2	
18	Joint	1	

№	Part name	Q'ty	Remarks
19	Hose	1	
20	Nut M6	1	
21	Vapor shut-off valve	1	
22	Bolt M6 × 16 mm	1	
23	Bracket	1	

Canister and vapor shut-off valve

Checking the canister

1. Check:
 - Canister
Cracked → Replace.
2. Check:
 - No air leakage
Air leakage → Replace.
 - a. Connect the special service tool "1" to the atmospheric port "a" and block the other ports using rubber plugs "2".
 - b. Apply the specified positive pressure and check that there is no air leakage.



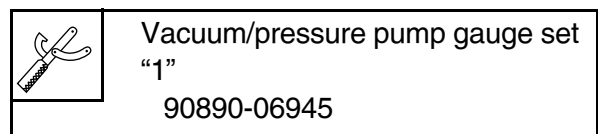
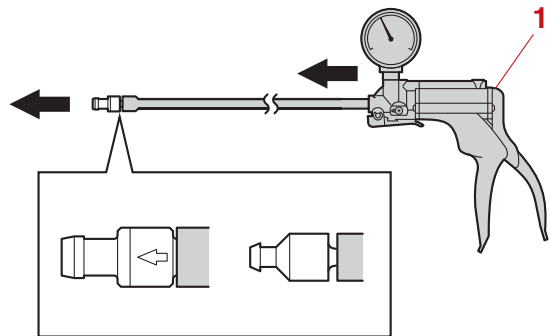
Checking the vapor shut-off valve

1. Check:
 - Vapor shut-off valve exterior
Cracked → Replace.

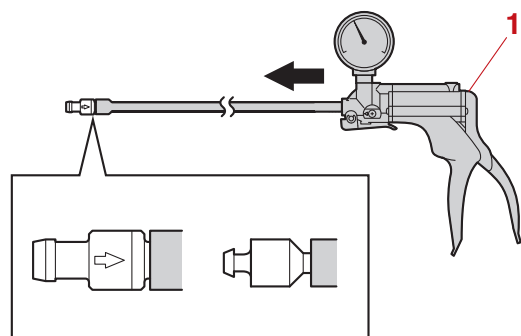
Checking the canister check valve

1. Check:
 - Air passage
No air comes out → Replace.
 - a. Connect the special service tool "1" to the canister check valve as shown in the illustration.

- b. Apply positive pressure and check that air comes out of the opposite end of the canister check valve.

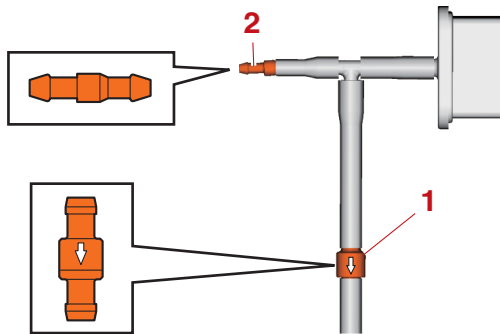


2. Check:
 - Air passage
Air comes out → Replace.
 - a. Connect the special service tool "1" to the canister check valve as shown in the illustration.
 - b. Apply positive pressure and check that no air comes out of the opposite end of the canister check valve.



Installing the vapor shut-off valve and canister

1. Install:
 - Vapor shut-off valve bracket
 - Vapor shut-off valve bracket bolt
 - Vapor shut-off valve
 - Vapor shut-off valve nut
 - Joint (to the hose)
 - Hose (to the vapor shut-off valve)
 - Grommet (to the canister bracket)
 - Collar (to the canister bracket)
 - Canister bracket
 - Canister bracket bolt
 - Cover (to the canister)
 - Canister
 - Joint (to the hose)
 - Check valves "1" and "2" (to the hose)



2. Install:
 - Clip (to the hose)
 - Hose
 - Plastic tie **New**

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Power unit


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Power unit (check and adjustment)

Checking the compression pressure

1. Check:

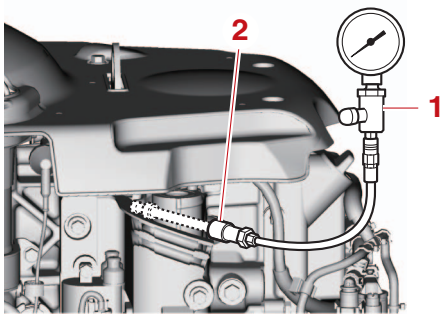
- Compression pressure
Below specification → Check the engine internal parts.


	Compression pressure Minimum (reference data) 854.0 kPa (8.54 kgf/cm ² , 123.8 psi)
---	--

- Start the engine, warm it up for 5 minutes, and then stop it.
- Remove the clip from the engine shut-off switch.
- Disconnect the fuel injector couplers and spark plug caps.
- Remove all of the spark plugs.
- Install the special service tools into the spark plug hole.

NOTICE

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




	Compression gauge "1" 90890-03160 Compression gauge extension M12 "2" 90890-06687
---	---

- Fully open the throttle.

Power unit (check and adjustment)

- Crank the engine until the reading on the compression gauge stabilizes, and then measure the compression pressure.
- Remove the special service tools.
- Install all of the spark plugs, and then tighten the spark plugs to the specified torque.


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

- Connect the spark plug caps and fuel injector couplers.

Checking the oil pressure

1. Check:

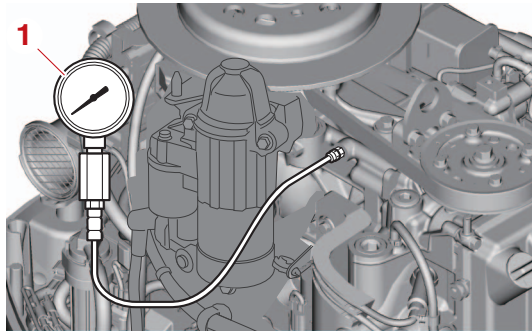
- Oil pressure
Below specification → Check the engine internal parts.

	Engine oil pressure at idle speed (reference data) 470.0 kPa (4.70 kgf/cm ² , 68.2 psi) / SL 10W-30 engine oil Engine oil pressure at 3000 r/min (reference data) 580.0 kPa (5.80 kgf/cm ² , 84.1 psi) / SL 10W-30 engine oil
---	--

- Disconnect the oil pressure switch lead from the oil pressure switch end.
- Remove the oil pressure switch, and then install an oil pressure gauge "1" to the oil pressure switch installation hole.
- Start the engine and warm it up until the engine idle speed stabilizes at 700–800 r/min.
- Measure the oil pressure.

TIP: _____

- Use a pressure gauge with an adapter that has a 1/8 pitch thread.
- The actual oil pressure may vary depending on the temperature and engine oil viscosity.



	Oil pressure gauge "1" (commercially available)
--	--

- e. Remove the oil pressure gauge.
- f. Install the oil pressure switch. See "Cylinder block" (7-42).

Checking the pulser coil air gap

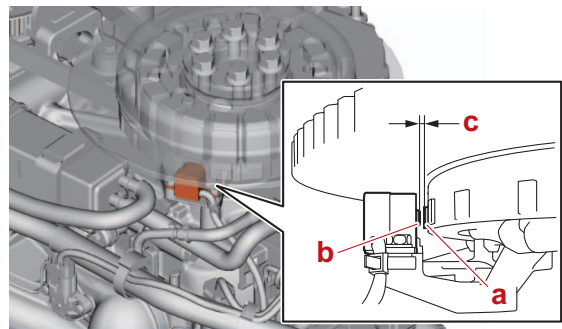
NOTICE

Do not turn the flywheel magneto counter-clockwise. Otherwise, the water pump impeller could be damaged.

1. Check:
 - Pulser coil air gap
Out of specification → Adjust the air gap.

	Pulser coil Air gap 0.36–1.14 mm (0.014–0.045 in)
--	---

- a. Turn the flywheel magneto clockwise to align the protrusion "a" on the flywheel magneto with the protrusion "b" on the pulser coil.
- b. Measure the pulser coil air gap "c".



Checking the valve clearance

- Measure the valve clearances when the engine is cold.
- Cover the fuel components using a rag to prevent fuel from spilling out.

NOTICE

Do not turn the flywheel magneto counter-clockwise. Otherwise, the water pump impeller could be damaged.

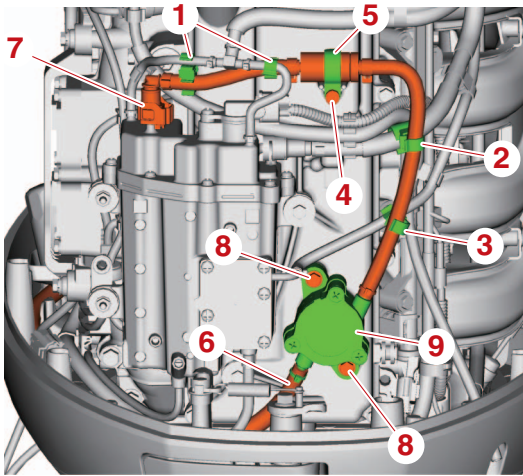
1. Check:
 - Valve clearance
Out of specification → Adjust. See "Adjusting the valve clearance" (7-5).

	Valve clearance IN (cold engine) 0.15–0.25 mm (0.0059–0.0098 in)
	Valve clearance EX (cold engine) 0.25–0.35 mm (0.0098–0.0138 in)

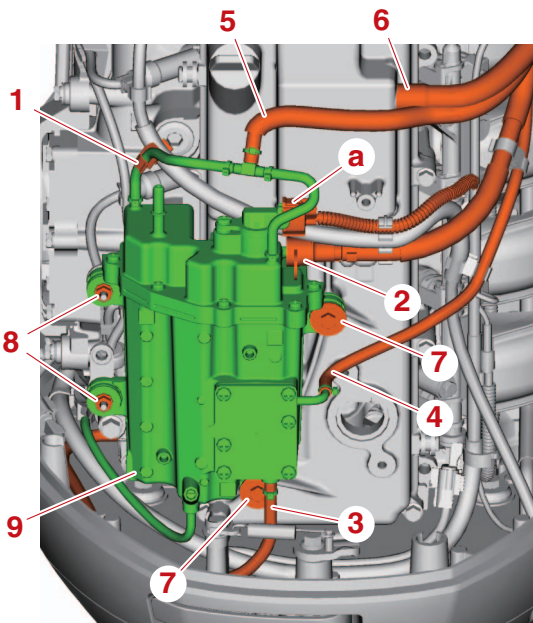
- a. Reduce the fuel pressure. See "Reducing the fuel pressure" (6-1).
- b. Drain the fuel. See "Draining the fuel" (6-14).
- c. Remove the clamps "1", "2", and "3".
- d. Remove the bracket bolt "4" and bracket "5".
- e. Disconnect the hose "6" and quick connector "7". See "Disconnecting the quick connector" (6-1).

Power unit (check and adjustment)

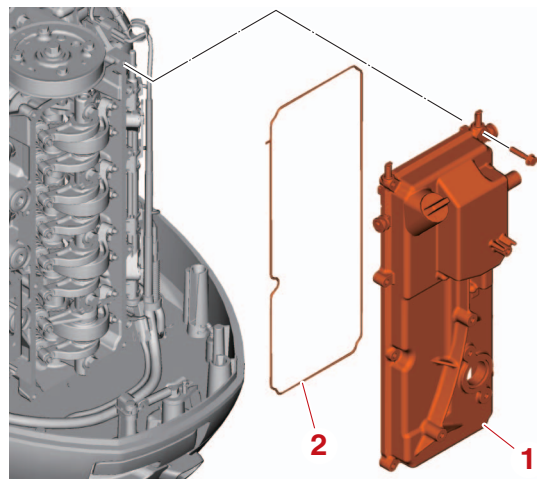
- f. Remove the fuel pump bolts "8", fuel pump assembly "9", and O-ring.



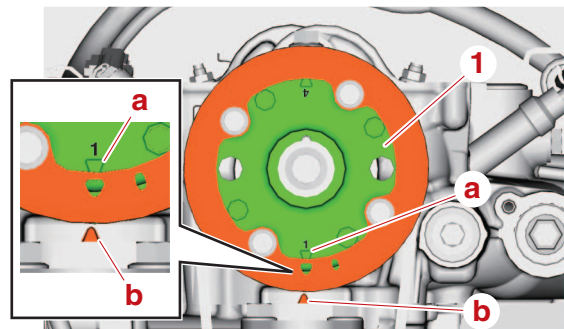
- g. Remove the clamp "1".
- h. Disconnect the high-pressure fuel pump coupler "a" and quick connector "2". See "Disconnecting the quick connector" (6-1).
- i. Disconnect the hoses "3", "4", "5", and "6".
- j. Remove the vapor separator bolts "7" and nuts "8" and vapor separator "9".



- k. Remove the cylinder head cover "1" and gasket "2".

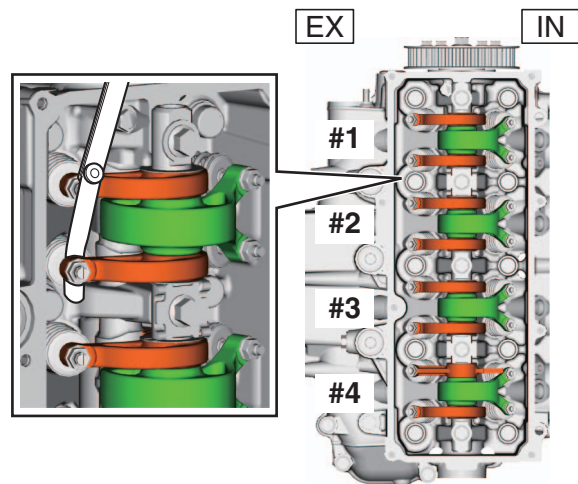


- l. Turn the flywheel magneto clockwise to align the "1 Δ " mark "a" on the driven sprocket "1" with the " Δ " mark "b" on the cylinder head.

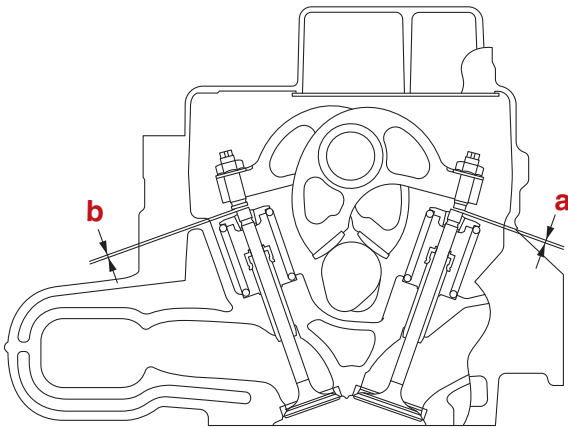


- m. Measure the valve clearances "a" and "b" according to steps (n)–(p).

TIP: _____
Write down the measurement data.



Power unit (check and adjustment)



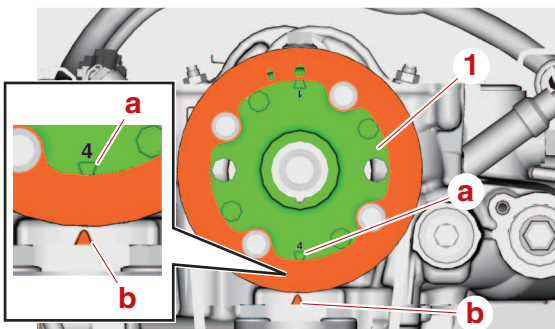
- a. Intake
- b. Exhaust

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

	#1	#2	#3	#4
IN	✓	✓	—	—
EX	✓	—	✓	—

—: Not applicable
 ✓: Specified cylinder

o. Turn the flywheel magneto clockwise 360° to align the “4 △” mark “a” on the driven sprocket “1” with the “△” mark “b” on the cylinder head.

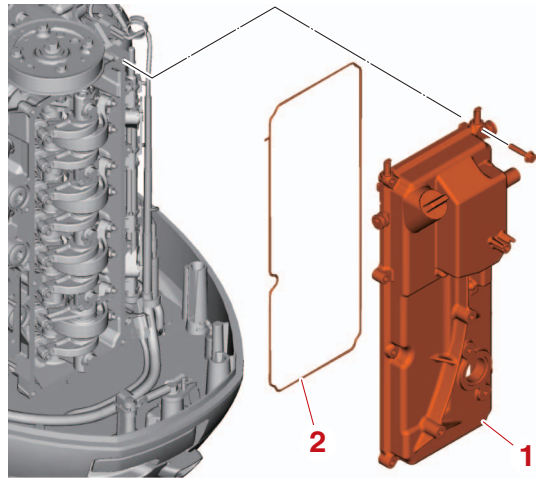


p. Measure the intake and exhaust valve clearances of the applicable cylinders.

	#1	#2	#3	#4
IN	—	—	✓	✓
EX	—	✓	—	✓

—: Not applicable
 ✓: Specified cylinder

q. Install a new gasket “2” and the cylinder head cover “1”.

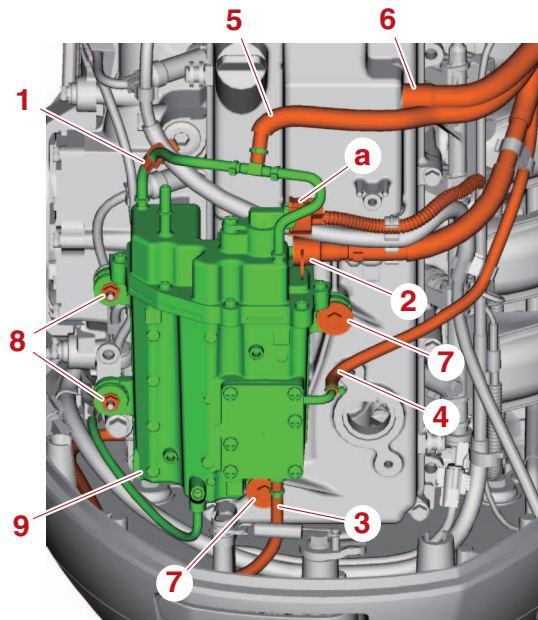


r. Install the vapor separator “9” and vapor separator nuts “8” and bolts “7”.

s. Connect the hoses “3”, “4”, “5”, and “6”.

t. Connect the high-pressure fuel pump coupler “a” and quick connector “2”.

u. Install the clamp “1”.



v. Install a new O-ring to the fuel pump assembly, and then install the fuel pump assembly to the cylinder head cover. See “Installing the fuel pump assembly” (6-12).

Adjusting the valve clearance

Adjust the valve clearances when the engine is cold.

NOTICE

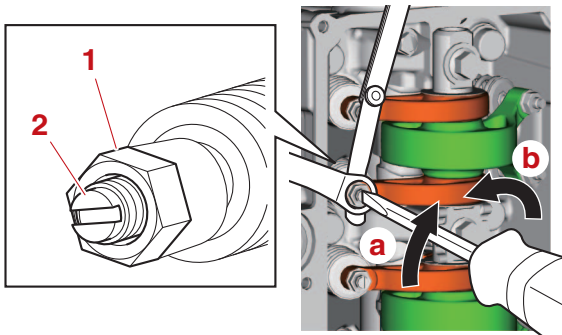
Do not turn the flywheel magneto counter-clockwise. Otherwise, the water pump impeller could be damaged.

1. Adjust:

- Valve clearance
 - a. Loosen the valve adjusting locknut “1”, and then turn the adjusting screw “2” until the valve clearance is within specification.

TIP:

- To decrease the valve clearance, turn the adjusting screw “2” in direction “a”.
- To increase the valve clearance, turn the adjusting screw “2” in direction “b”.

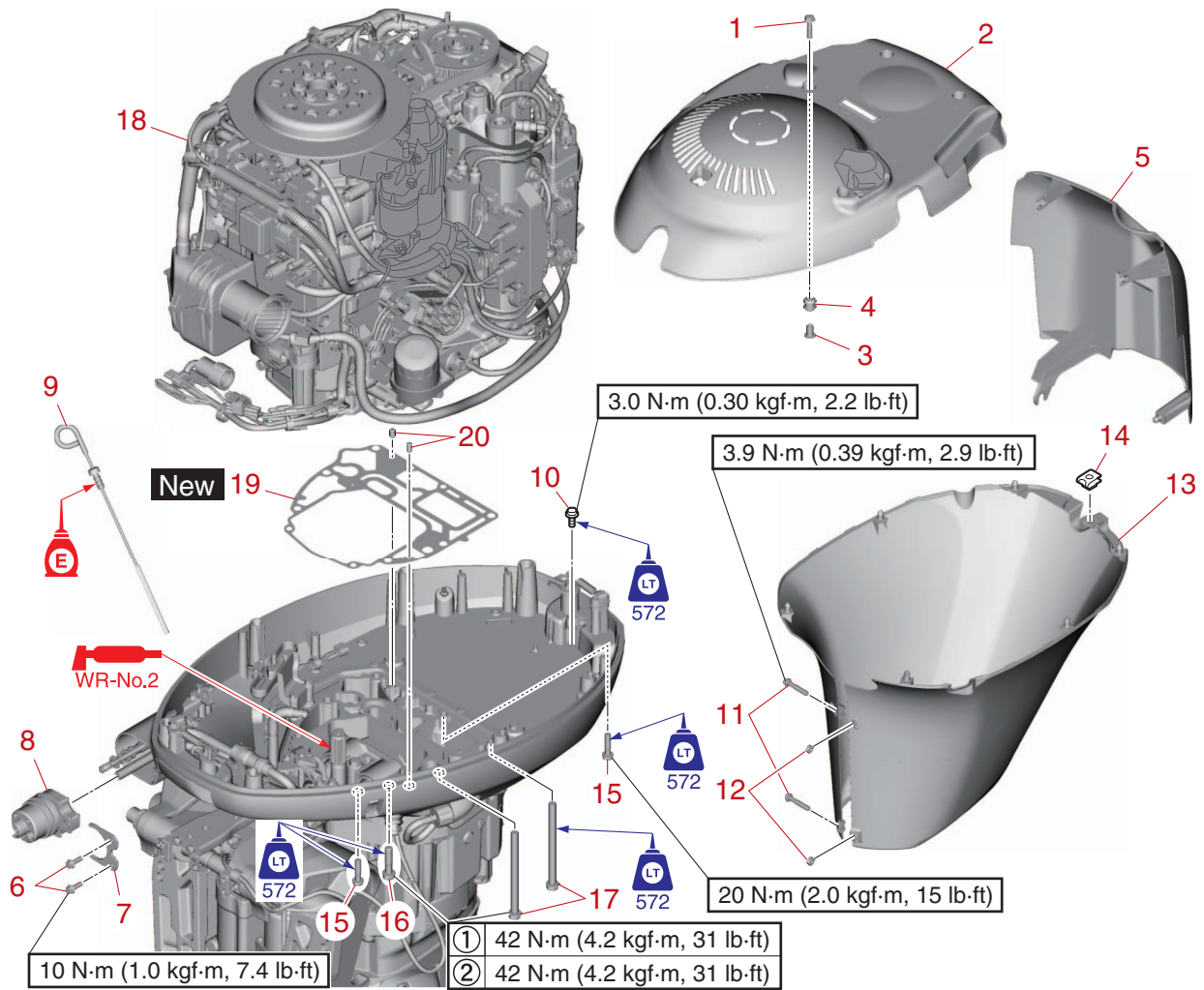


- b. Tighten the valve adjusting locknut “1” to the specified torque, and then re-check the valve clearances.



Valve adjusting locknut “1”
14 N·m (1.4 kgf·m, 10 lb-ft)

Power unit assembly



↑↓	Part name	Q'ty	Remarks
1	Bolt M6 × 30 mm	1	
2	Cover	1	
3	Collar	1	
4	Grommet	5	
5	Cover	1	
6	Bolt M6 × 20 mm	2	
7	Grommet holder	1	
8	Rigging grommet	1	
9	Dipstick	1	
10	Screw M6 × 20 mm	1	
11	Screw M6 × 40 mm	2	
12	Nut M6	2	
13	Apron	1	
14	Nut	1	
15	Bolt M8 × 35 mm	4	
16	Bolt M10 × 45 mm	2	
17	Bolt M10 × 140 mm	4	
18	Power unit assembly	1	

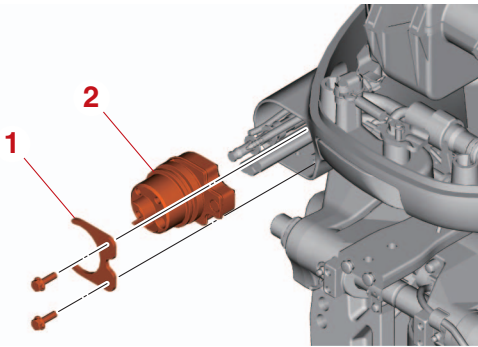
↑↓	Part name	Q'ty	Remarks
19	Gasket	1	
20	Dowel pin	2	

Removing the power unit

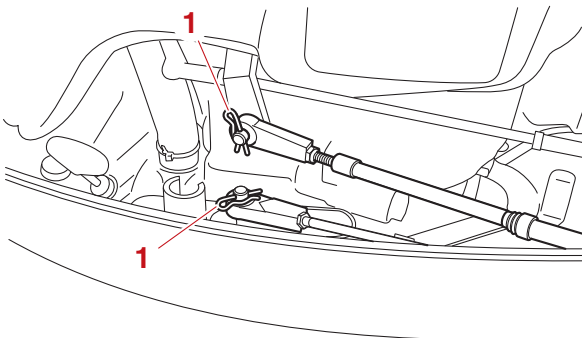
Cover the fuel components using a rag to prevent fuel from spilling out.

1. Remove:

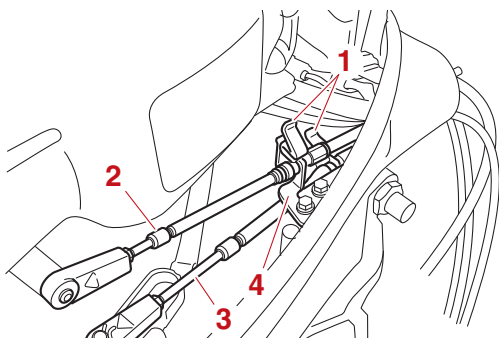
- Power unit assembly
 - a. Remove the grommet holder "1" and rigging grommet "2".



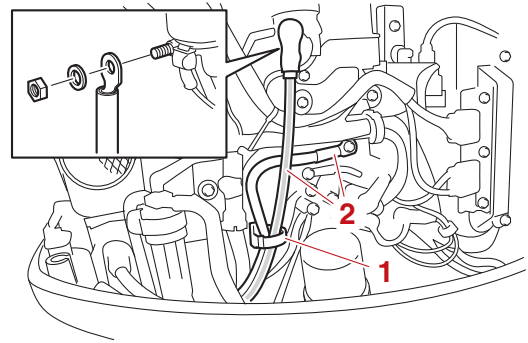
- b. Remove the clips "1".



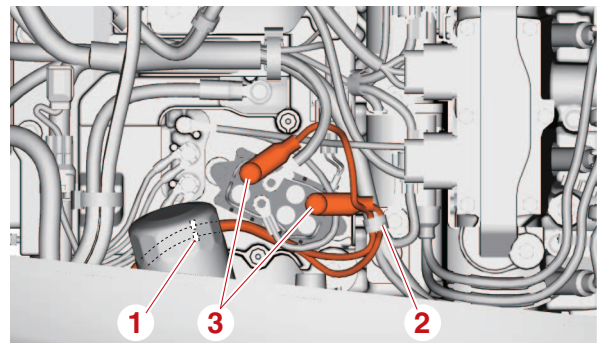
- c. Disengage the cable clamps "1", and then remove the throttle cable "2" and shift cable "3" from the bracket "4".



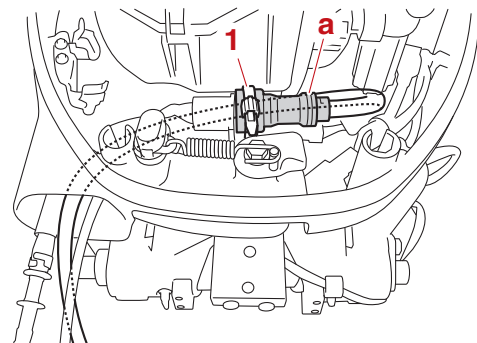
- d. Release the holder "1", and then disconnect the battery cable "2".



- e. Remove the clamps "1" and "2" from the PTT motor leads.
- f. Disconnect the PTT motor leads "3".



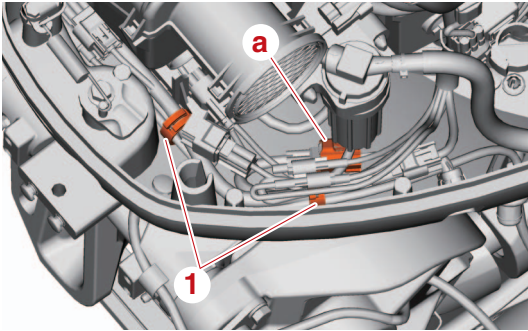
- g. Release the holder "1", and then disconnect the main wire harness coupler "a".



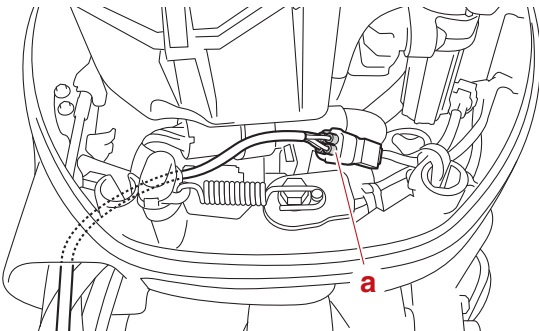
- h. Remove the clamps "1" from the wire harness.

Power unit assembly

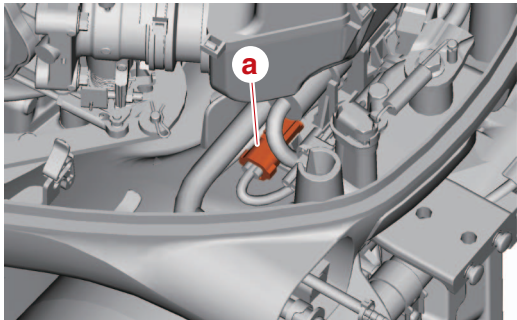
- i. Disconnect the PTT switch coupler "a".



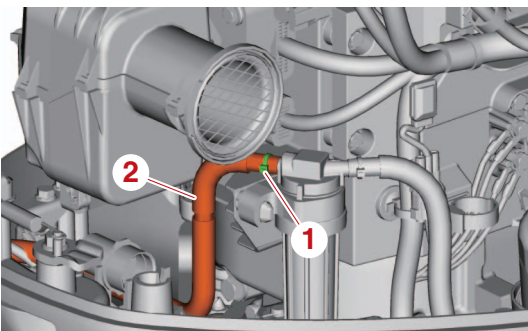
- j. Disconnect the gauge harness coupler "a".



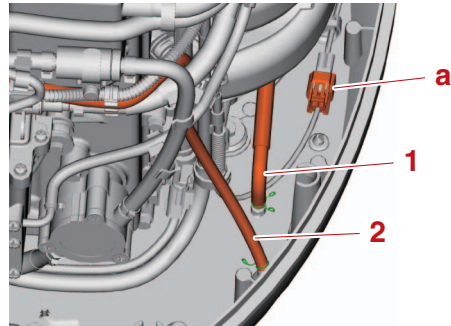
- k. Disconnect the trim sensor coupler "a".



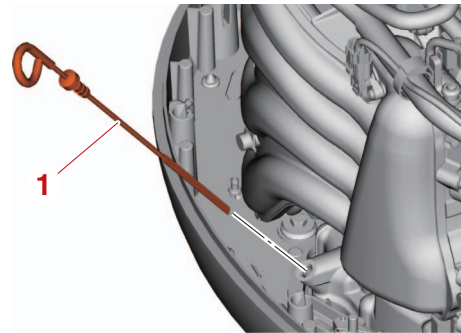
- l. Remove the plastic tie "1", and then disconnect the fuel hose "2".



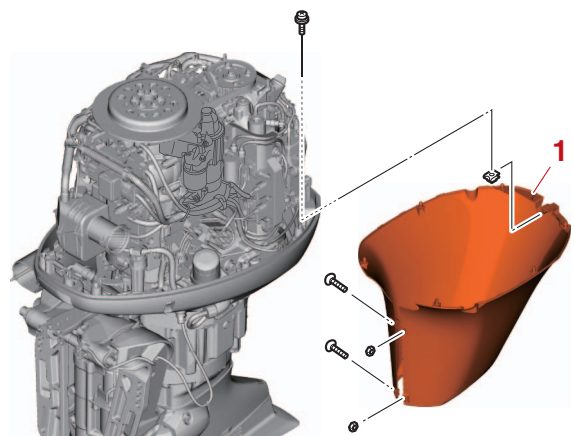
- m. Disconnect the vapor gas hose "1" and cooling water pilot hose "2".



- o. Remove the dipstick "1".



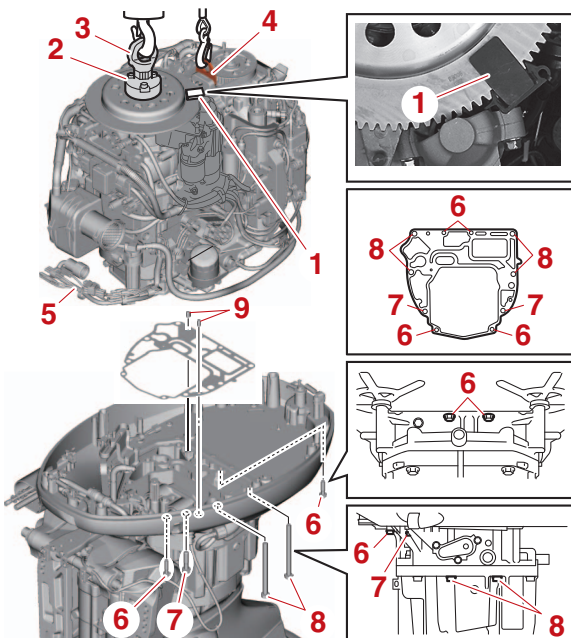
- p. Remove the apron "1".



- q. Attach the special service tool "1" to prevent the flywheel magneto from turning.

TIP: _____
The special service tool "1" is installed to tighten the lifting eye bolts "2" to the specified torque.

- r. Install the special service tool “3” to the flywheel magneto, and then tighten the lifting eye bolts “2” to the specified torque.
- s. Remove the special service tool “1” from the flywheel magneto.
- t. Hook a lifting harness onto the special service tool “3” and engine hanger “4”, and then suspend the power unit “5”.
- u. Remove the power unit mounting bolts “6”, “7”, and “8”, and then remove the power unit “5” and dowel pins “9”.



	Flywheel stopper B “1” 90890-06686 Bolt hexagon with washer “2” 90890-06821 Lifting eye “3” 90890-06953
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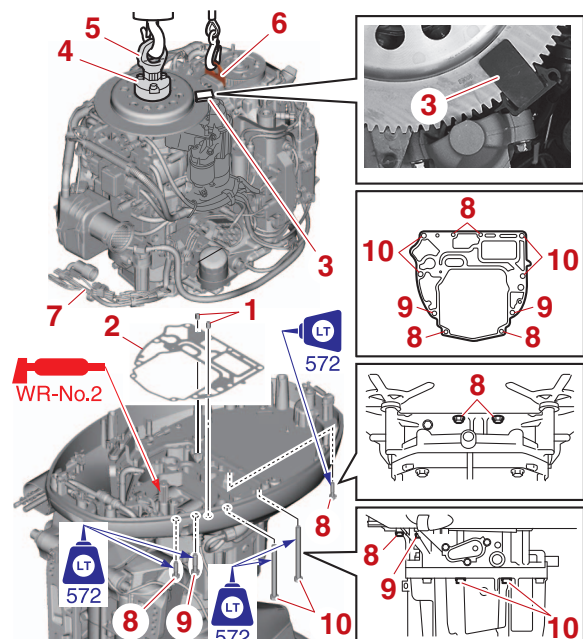
	Lifting eye bolt “2” 36 N·m (3.6 kgf·m, 27 lb·ft)
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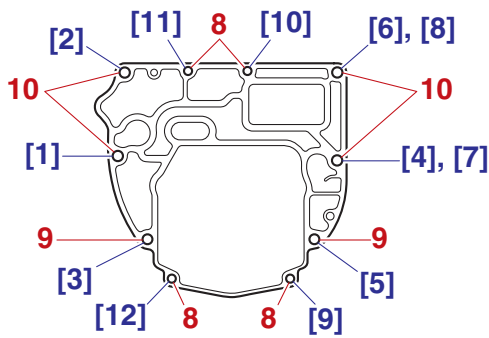
Installing the power unit

1. Install:
 - Power unit assembly
 - a. Clean the power unit mating surface, and then install the dowel pins “1” and a new gasket “2”.
 - b. Attach the special service tool “3” to prevent the flywheel magneto from turning.

TIP: The special service tool “3” is installed to tighten the lifting eye bolts “4” to the specified torque.

- c. Install the special service tool “5” to the flywheel magneto, and then tighten the lifting eye bolts “4” to the specified torque.
- d. Remove the special service tool “3” from the flywheel magneto.
- e. Hook a lifting harness onto the special service tool “5” and engine hanger “6”, and then suspend the power unit “7”.
- f. Install the power unit “7”, and then tighten the power unit mounting bolts “8”, “9”, and “10” to the specified torque in the order [1], [2], and so on.

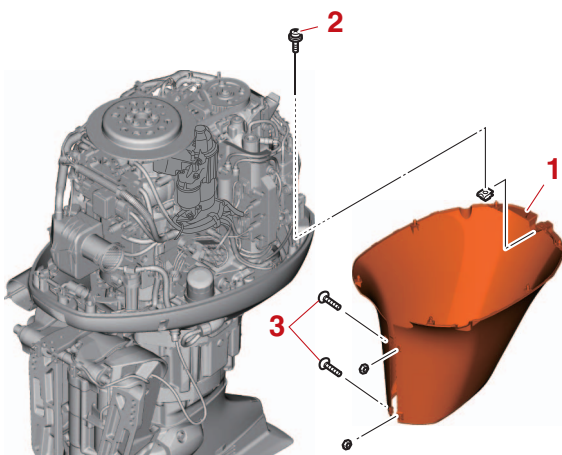




	Flywheel stopper B "3"
	90890-06686
	Bolt hexagon with washer "4"
	90890-06821
	Lifting eye "5"
	90890-06953

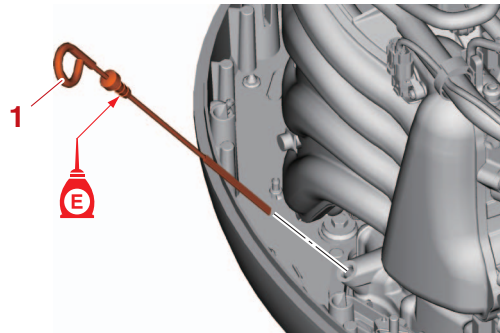
	Lifting eye bolt "4"
	36 N·m (3.6 kgf·m, 27 lb·ft)
	Power unit mounting bolt (M8) "8"
	20 N·m (2.0 kgf·m, 15 lb·ft)
	Power unit mounting bolt (M10) "9" and "10"
	1st: 42 N·m (4.2 kgf·m, 31 lb·ft) 2nd: 42 N·m (4.2 kgf·m, 31 lb·ft)

g. Install the apron "1", and then tighten the apron screws "2" and "3" to the specified torque.



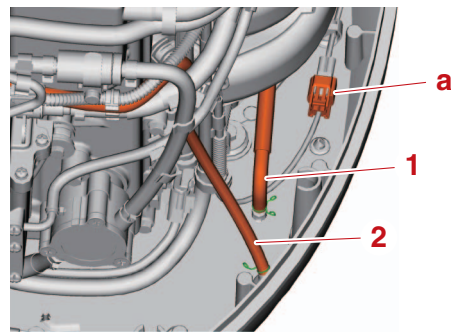
	Apron screw "2"
	3.0 N·m (0.30 kgf·m, 2.2 lb·ft)
	Apron screw "3"
	3.9 N·m (0.39 kgf·m, 2.9 lb·ft)

h. Install the dipstick "1".

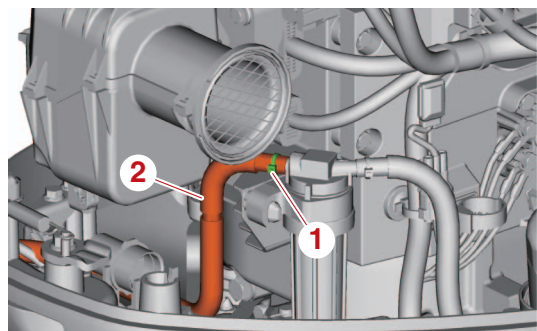


i. Connect the shift position switch coupler "a".

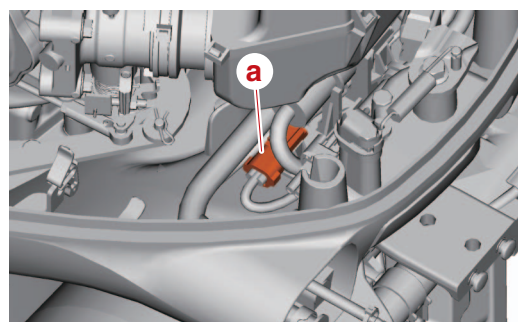
j. Connect the vapor gas hose "1" and cooling water pilot hose "2".



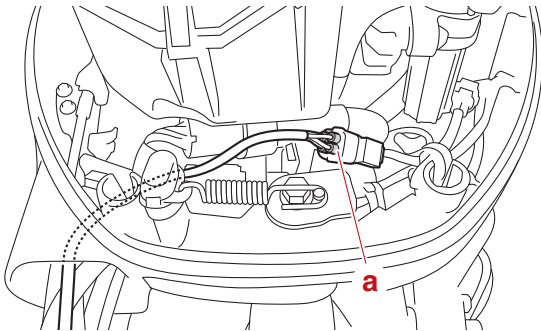
k. Connect the fuel hose "2", and then fasten it using a new plastic tie "1".



l. Connect the trim sensor coupler "a".

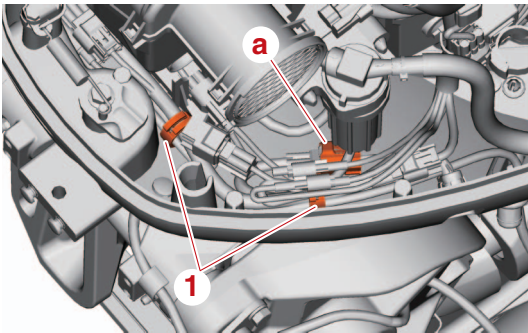


- m. Connect the gauge harness coupler “a”.

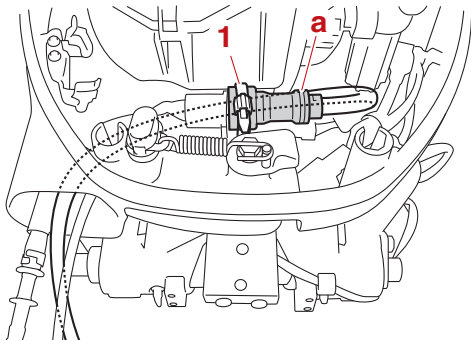


- n. Connect the PTT switch coupler “a”.

- o. Fasten the wire harness using the clamps “1”.

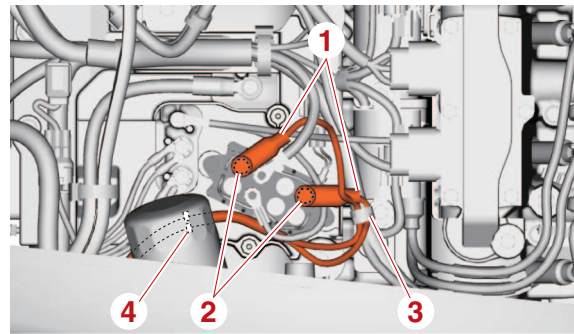



- p. Connect the main wire harness coupler “a”, and then secure it using the holder “1”.



- q. Connect the PTT motor leads “1”, and then tighten the PTT motor lead bolts “2” to the specified torque.

- r. Fasten the PTT motor leads using the clamps “3” and “4”.

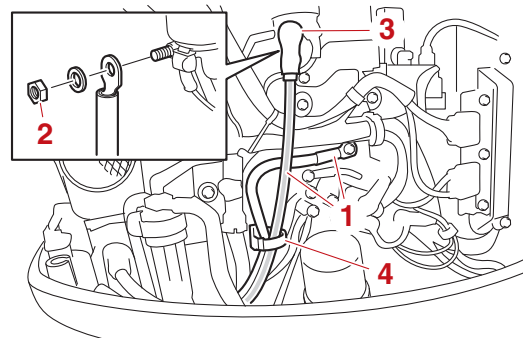



	<p>PTT motor lead bolt “2” 3.5 N·m (0.35 kgf·m, 2.6 lb·ft)</p>
---	--

- s. Connect the battery cable “1”, and then tighten the positive battery cable nut “2” to the specified torque.

- t. Install the rubber cap “3”.

- u. Fasten the battery cable “1” using the holder “4”.

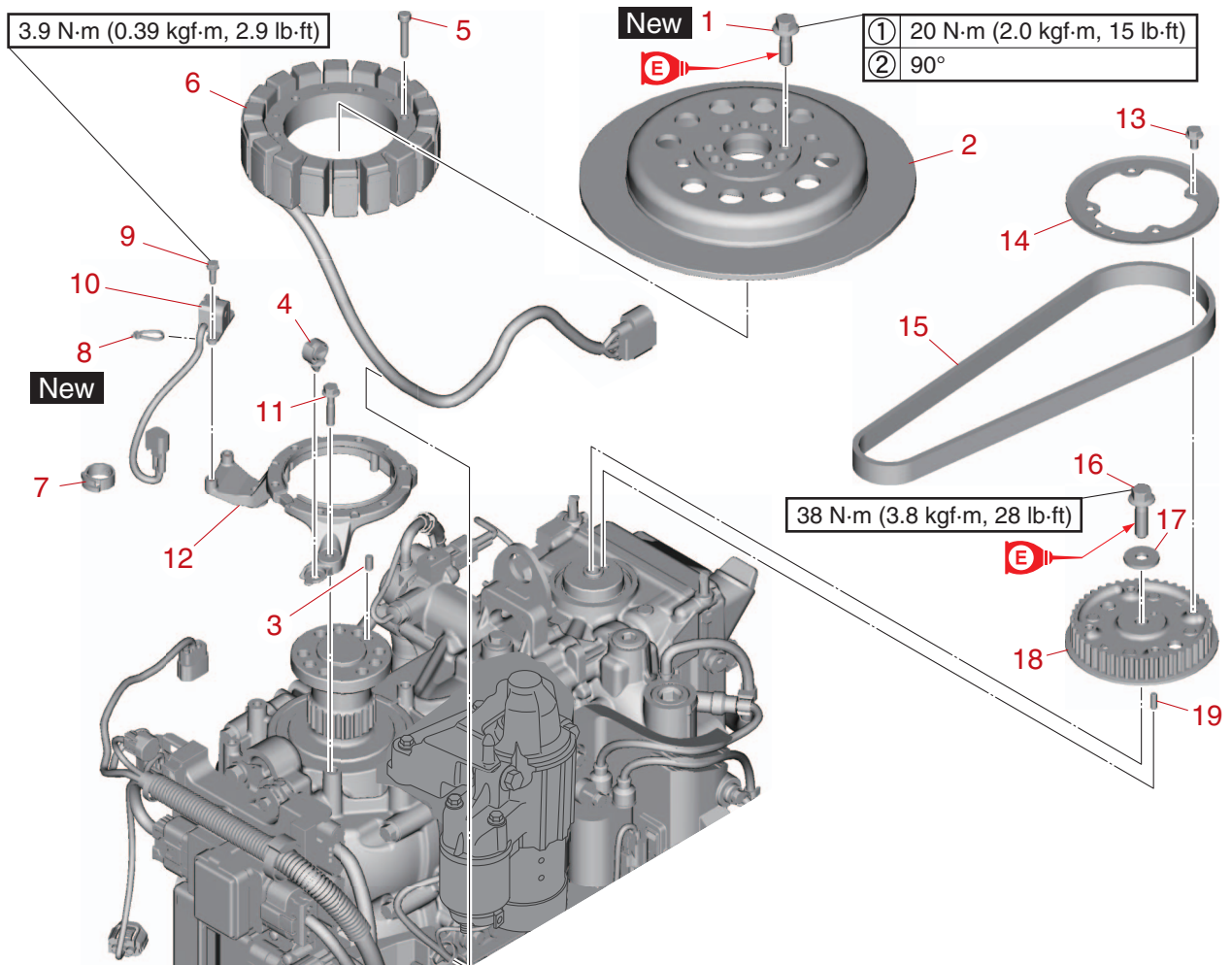


	<p>Positive battery cable nut “2” 9 N·m (0.9 kgf·m, 6.6 lb·ft)</p>
---	--

- v. Install the shift cable. See “Installing the shift cable” (3-5).

- w. Install the throttle cable. See “Installing the throttle cable” (3-6).

Flywheel magneto and timing belt

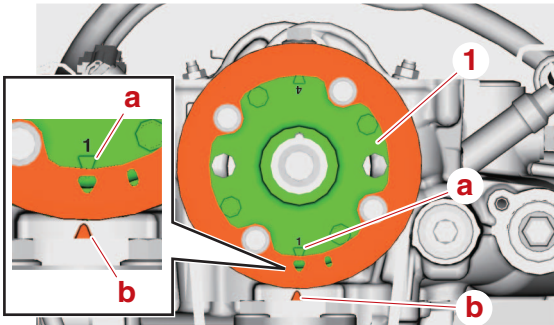


↑↓	Part name	Q'ty	Remarks
1	Bolt M10 × 33 mm	6	
2	Flywheel magneto	1	
3	Dowel pin	1	
4	Holder	1	
5	Bolt M6 × 35 mm	6	
6	Stator assembly	1	
7	Clamp	1	
8	Plastic tie	1	
9	Bolt M5 × 16 mm	2	
10	Pulser coil	1	
11	Bolt M6 × 30 mm	3	
12	Bracket	1	
13	Bolt M6 × 12 mm	4	
14	Washer	1	
15	Timing belt	1	
16	Bolt M10 × 35 mm	1	
17	Washer	1	
18	Driven sprocket	1	

↑↓	Part name	Q'ty	Remarks
19	Dowel pin	1	

Removing the flywheel magneto

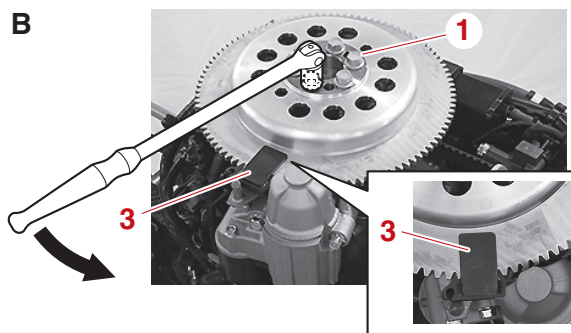
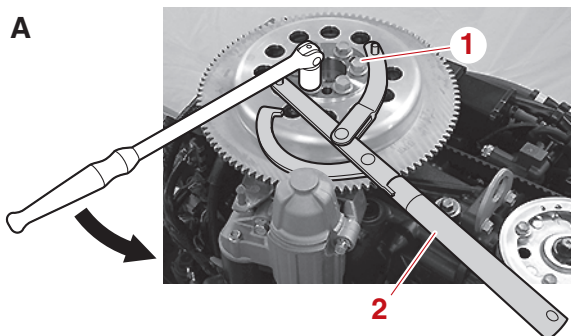
1. Turn the flywheel magneto clockwise to align the "1 \triangle " mark "a" on the driven sprocket "1" with the " \triangle " mark "b" on the cylinder head.



2. Loosen:
 - Flywheel magneto bolt "1"

NOTICE

Apply force in the direction of the arrow to prevent the special service tool "2" from slipping off easily.



- A. Conventional special service tool
B. New special service tool

	Rotor holder "2"
	90890-01235
	Flywheel stopper B "3"
	90890-06686

Removing the timing belt and sprocket

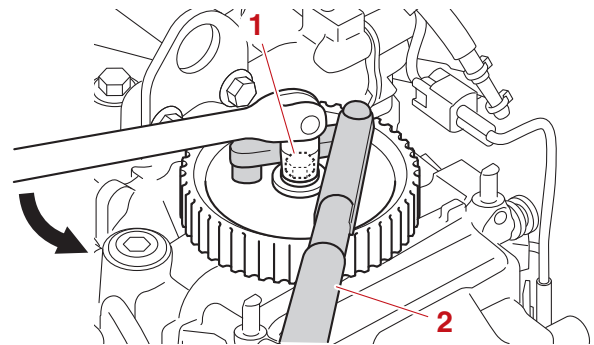
NOTICE

When the timing belt is not installed, do not turn the crankshaft or driven sprocket. Otherwise, the pistons and valves could collide with each other and be damaged.

1. Loosen:
 - Driven sprocket bolt "1"

NOTICE

When loosening the driven sprocket bolt, do not turn the camshaft.



	Flywheel holder "2"
	90890-06522

Checking the timing belt and sprocket

1. Check:
 - Interior and exterior of the timing belt
 - Drive sprocket
 - Driven sprocket
 Cracked/damaged/worn → Replace.

Installing the sprocket and timing belt

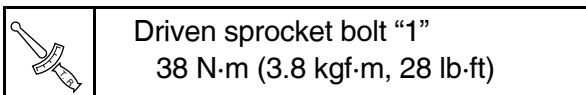
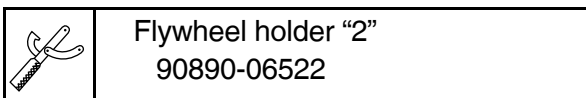
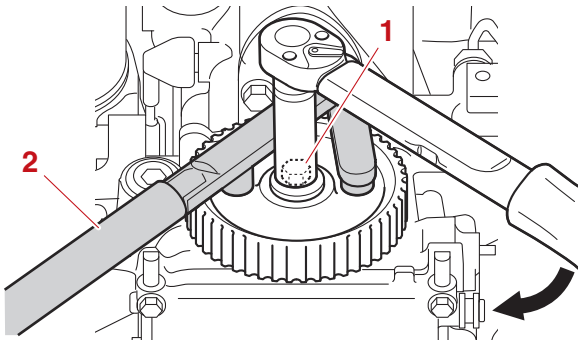
NOTICE

When the timing belt is not installed, do not turn the crankshaft or driven sprocket. Otherwise, the pistons and valves could collide with each other and be damaged.

1. Install:
 - Dowel pin (to the camshaft)
 - Driven sprocket
 - Washer

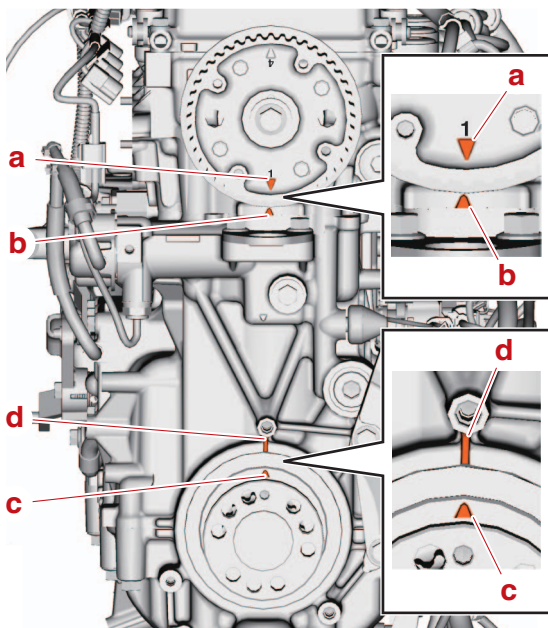
2. Tighten:

- Driven sprocket bolt "1"



3. Install:

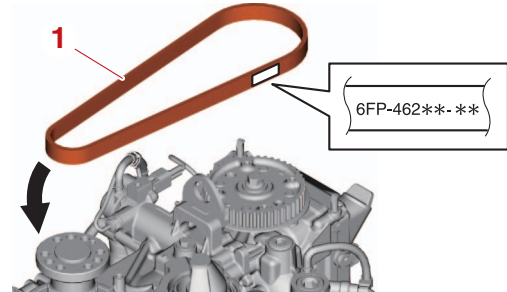
- Timing belt
 - Check that the "1 △" mark "a" on the driven sprocket is aligned with the "△" mark "b" on the cylinder head, and that the "△" mark "c" on the crankshaft is aligned with the protrusion "d" on the cylinder block.



- Install the timing belt "1".

TIP:

Be careful not to install the timing belt with the part number upside down.

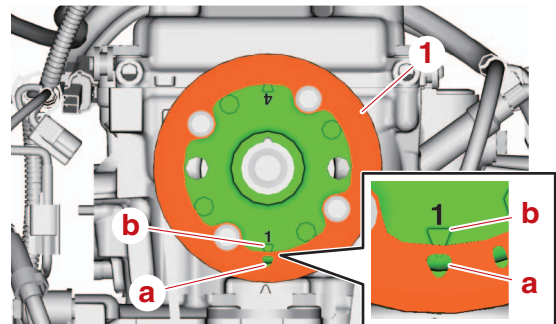


4. Install:

- Washer "1"
- Bolt

TIP:

Install the washer "1" so that the hole "a" is aligned with the "1 △" mark "b" on the driven sprocket.



Installing the stator assembly

1. Install:

- Bracket
- Bracket bolt
- Pulser coil
- Pulser coil bolt



Pulser coil bolt 3.9 N·m (0.39 kgf·m, 2.9 lb-ft)

2. Install:

- Plastic tie **New** (to the pulser coil)
- Clamp (to the pulser coil)
- Stator assembly
- Stator assembly bolt
- Holder

Installing the flywheel magneto

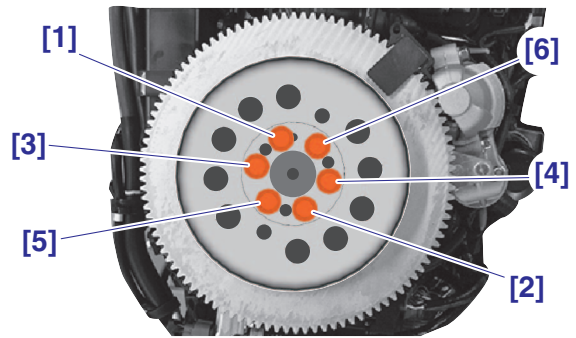
1. Install:
 - Dowel pin (to the crankshaft)
 - Flywheel magneto
2. Tighten:
 - Flywheel magneto bolt **New**
 - a. Tighten new flywheel magneto bolts "1" to the specified torque in 2 stages and in the order [1], [2], and so on.

NOTICE

Apply force in the direction of the arrow to prevent the special service tool "2" from slipping off easily.

TIP:

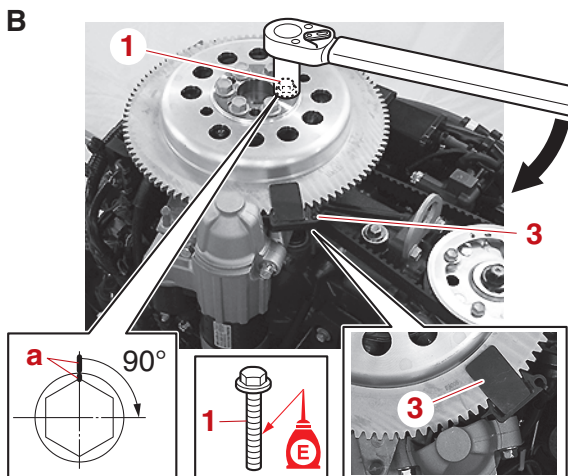
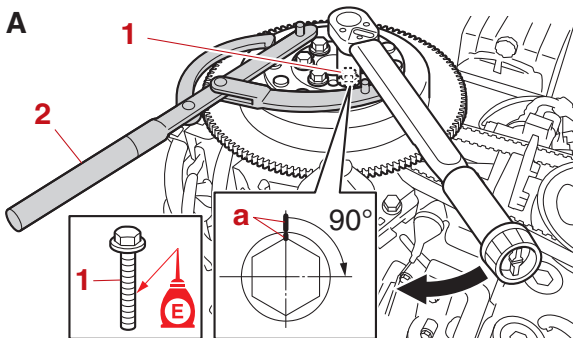
In the second tightening stage for the flywheel magneto bolts "1", mark the bolts and flywheel magneto with identification marks "a", and then tighten the bolts 90° from the marks on the flywheel magneto.



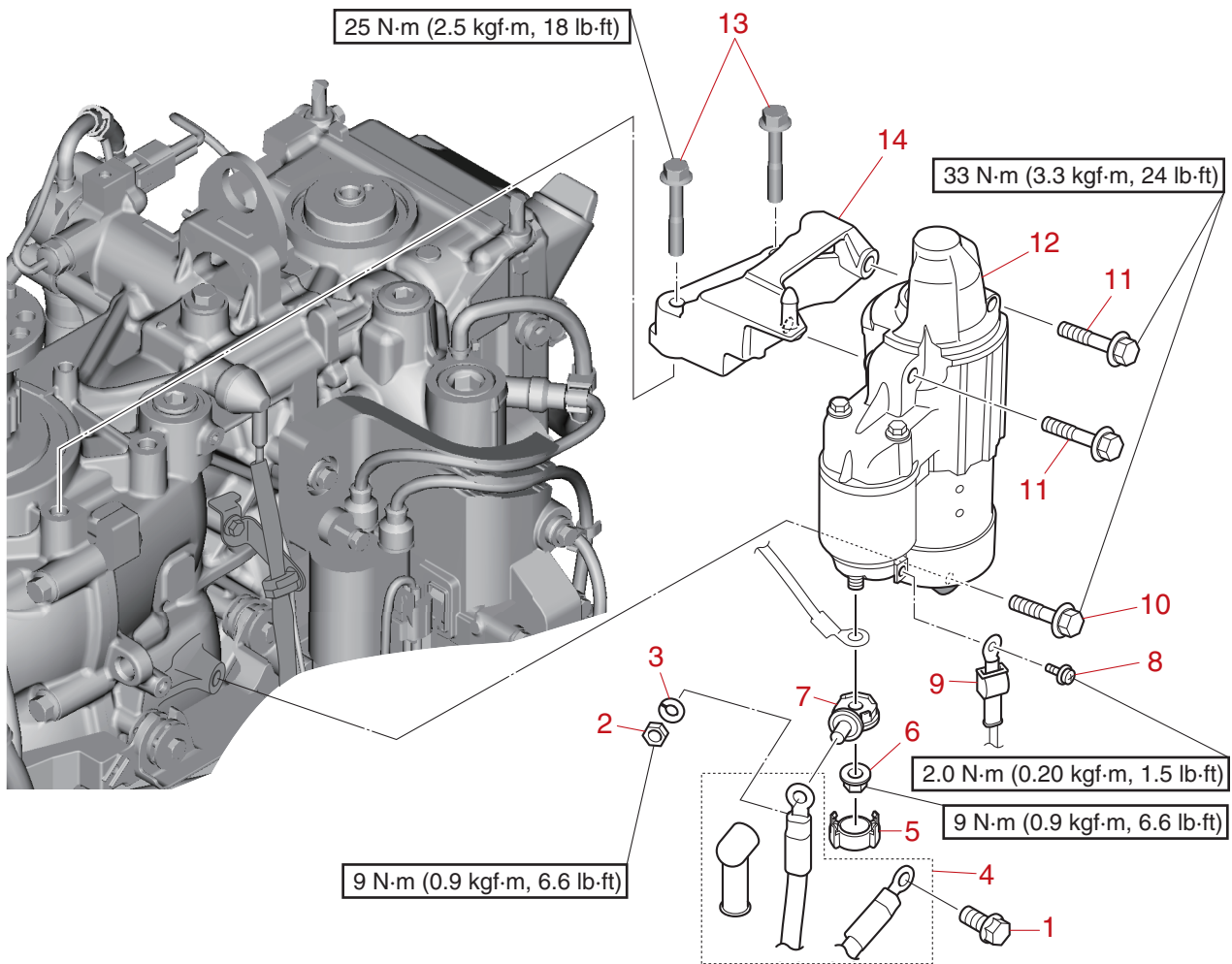
- A. Conventional special service tool
- B. New special service tool

	Rotor holder "2" 90890-01235 Flywheel stopper B "3" 90890-06686
--	--

	Flywheel magneto bolt "1" 1st: 20 N·m (2.0 kgf·m, 15 lb·ft) 2nd: 90°
--	--

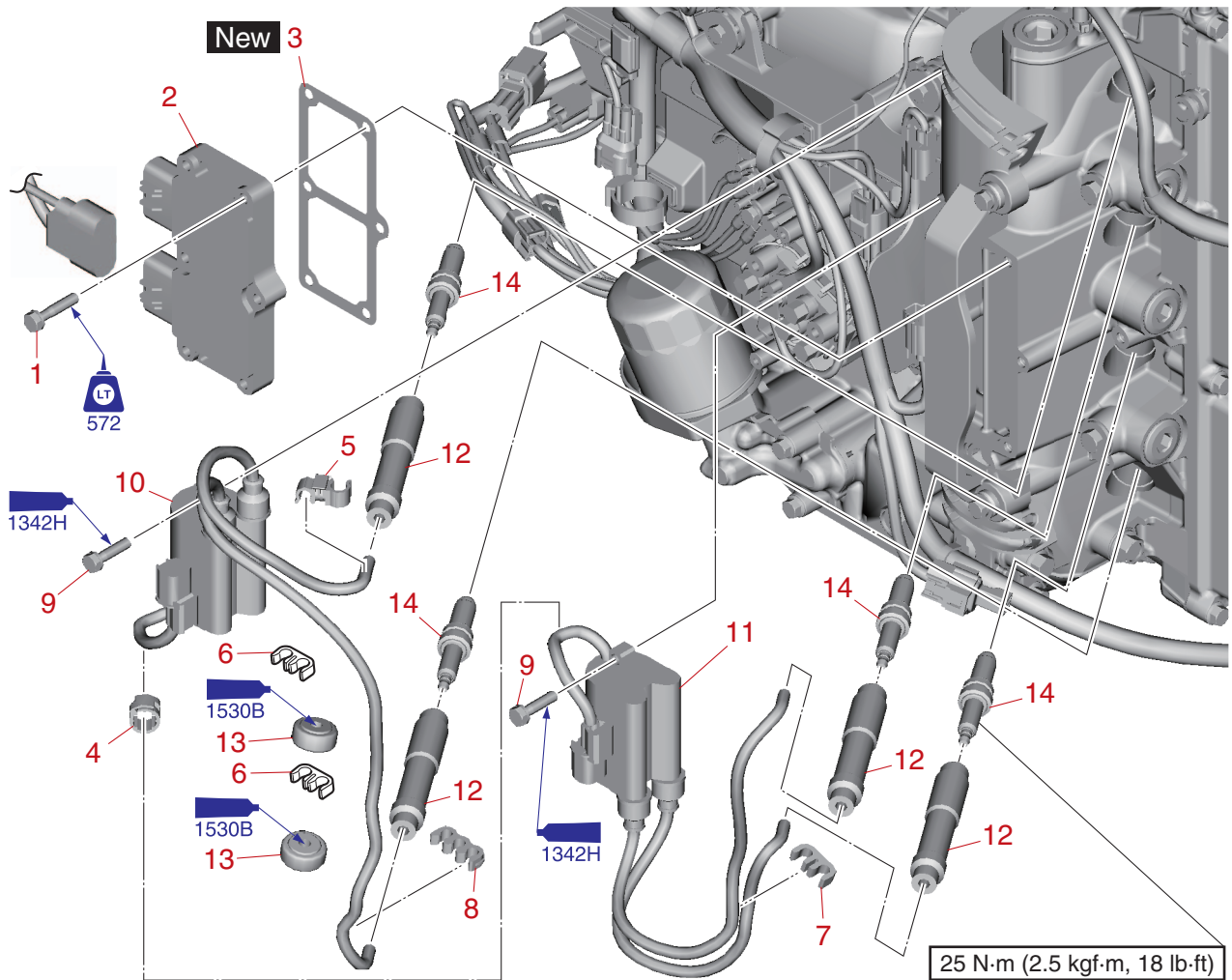


Starter motor



↑↓	Part name	Q'ty	Remarks
1	Bolt M6 × 16 mm	1	
2	Nut M8	1	
3	Washer	1	
4	Battery cable	1	
5	Cap	1	
6	Nut M8	1	
7	Terminal	1	
8	Screw M4 × 8 mm	1	
9	Cap	1	
10	Bolt M8 × 40 mm	1	
11	Bolt M8 × 45 mm	2	
12	Starter motor	1	
13	Bolt M8 × 50 mm	2	
14	Bracket	1	

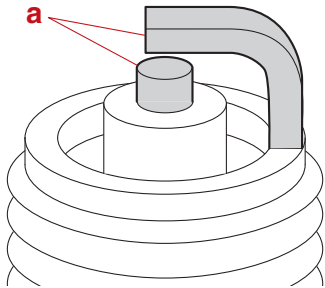
Rectifier/regulator, ignition coil, and spark plug



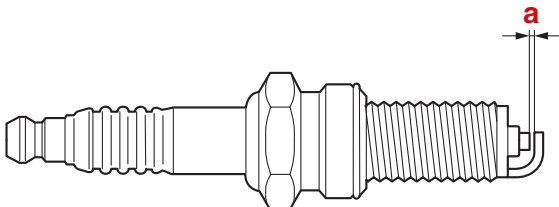
∩∩	Part name	Q'ty	Remarks
1	Bolt M6 × 30 mm	6	
2	Rectifier/regulator	1	
3	Gasket	1	
4	Clamp	1	
5	Clamp	1	
6	Clamp	2	
7	Clamp	1	
8	Clamp	1	
9	Bolt M6 × 25 mm	4	
10	Ignition coil	1	
11	Ignition coil	1	
12	Spark plug cap	4	
13	Grommet	2	
14	Spark plug M12	4	


Checking the spark plug

1. Clean the electrodes “a” using a spark plug cleaner.




2. Check:
 - Spark plug
Electrodes are eroded, edges of electrodes are rounded, insulator is damaged, or there is carbon or other deposits → Replace.
3. Measure:
 - Spark plug gap “a”
Out of specification → Adjust or replace.



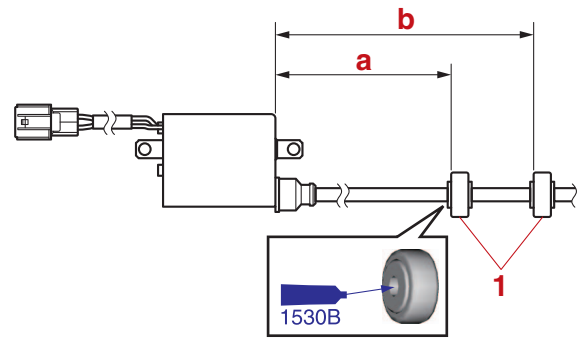
	Spark plug (NGK) LKR6E-9N Spark plug gap 0.8–0.9 mm (0.031–0.035 in)
---	---


Installing the ignition coil, rectifier/regulator, and spark plug

1. Install:
 - Spark plug

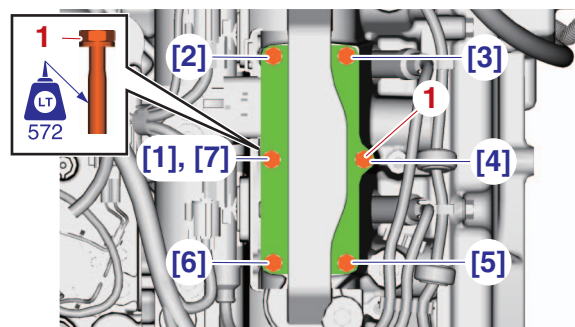
	Spark plug 25 N·m (2.5 kgf·m, 18 lb·ft)
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2. Install:
 - Grommet “1” (to the spark plug wire #4)



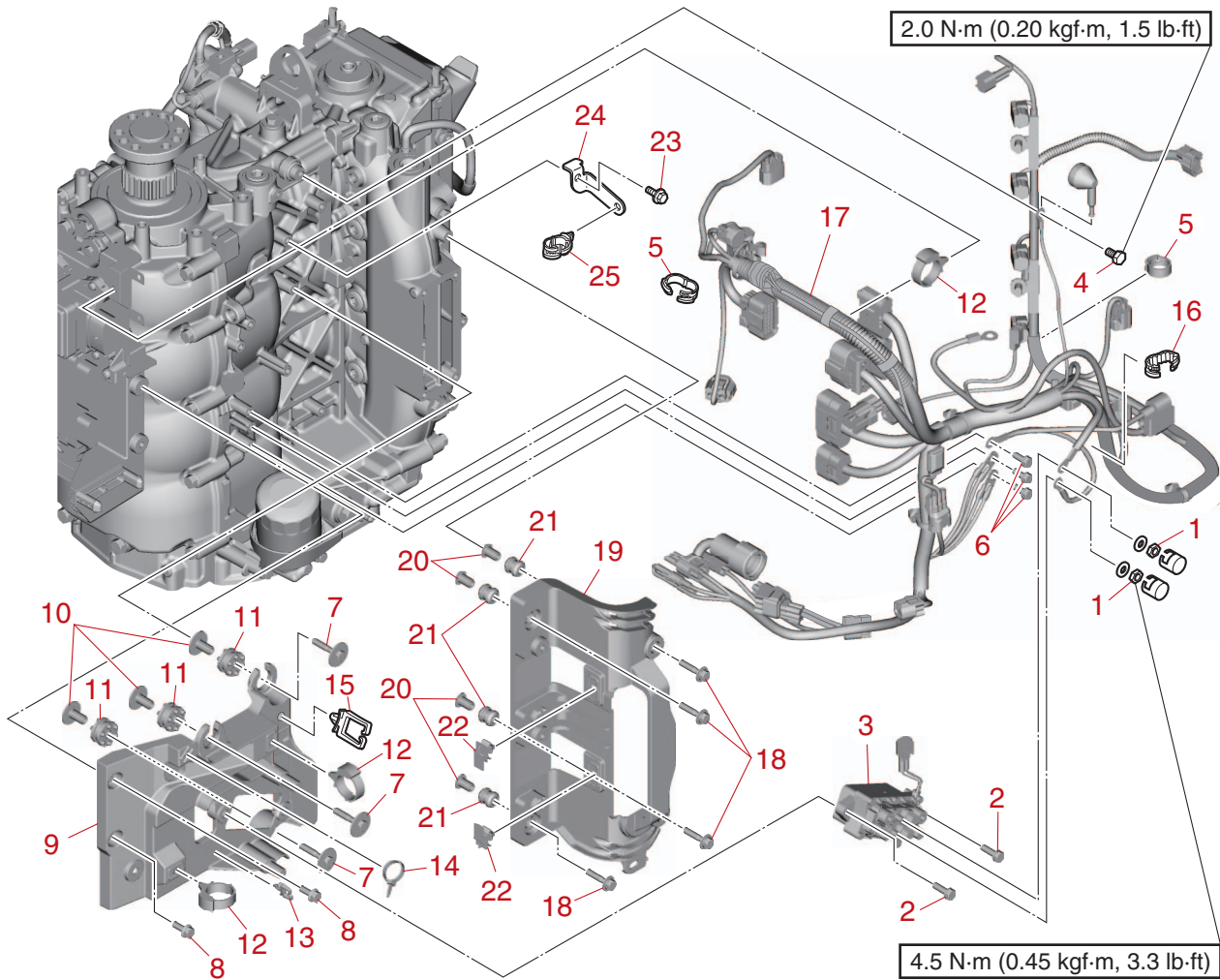
	Specified length “a”: 285–295 mm (11.22–11.61 in) “b”: 355–365 mm (13.98–14.37 in)
---	--

3. Install:
 - Spark plug cap
 - Ignition coil
 - Ignition coil bolt
 - Clamp
 - Gasket **New**
 - Rectifier/regulator
4. Tighten:
 - Rectifier/regulator bolt
 - a. Tighten the rectifier/regulator bolts “1” in the order [1], [2], and so on.



Wire harness

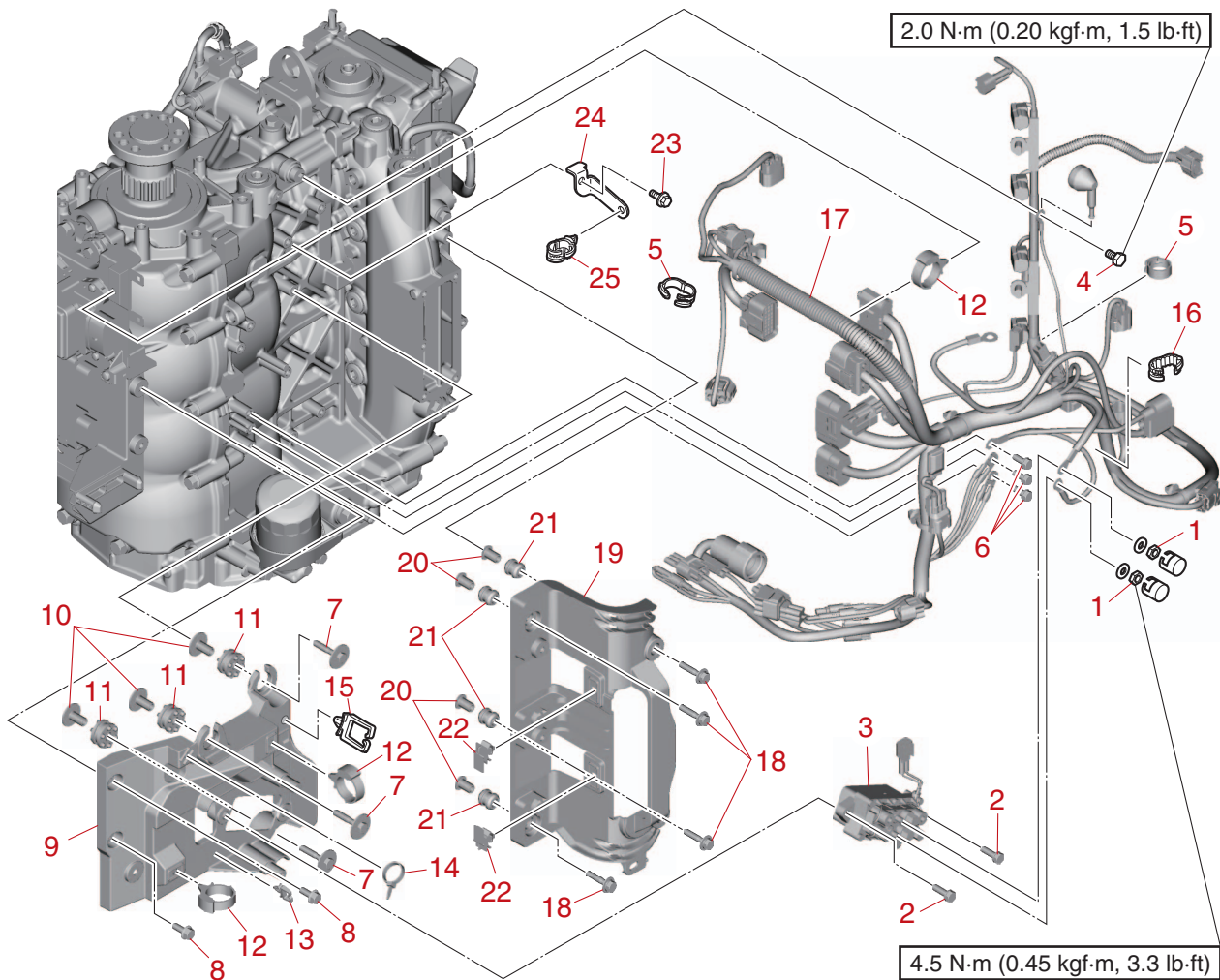
Wire harness (tiller handle model)



↑↓	Part name	Q'ty	Remarks
1	Nut M6	2	
2	Bolt M6 × 20 mm	2	
3	PTT relay	1	
4	Bolt M4 × 8 mm	1	
5	Clamp	2	
6	Bolt M6 × 16 mm	3	
7	Bolt M6 × 35 mm	3	
8	Bolt M6 × 16 mm	2	
9	Bracket	1	
10	Collar	3	
11	Grommet	3	
12	Holder	3	
13	Holder	1	
14	Plastic tie	1	
15	Holder	1	
16	Clamp	1	
17	Wire harness	1	

↑↓	Part name	Q'ty	Remarks
18	Bolt M6 × 30 mm	4	
19	Bracket	1	
20	Collar	4	
21	Grommet	4	
22	Holder	2	
23	Bolt M6 × 16 mm	1	
24	Holder	1	
25	Clamp	1	

Wire harness (remote control model)




↑↓	Part name	Q'ty	Remarks
1	Nut M6	2	
2	Bolt M6 × 20 mm	2	
3	PTT relay	1	
4	Bolt M4 × 8 mm	1	
5	Clamp	2	
6	Bolt M6 × 16 mm	3	
7	Bolt M6 × 35 mm	3	
8	Bolt M6 × 16 mm	2	
9	Bracket	1	
10	Collar	3	
11	Grommet	3	
12	Holder	3	
13	Holder	1	
14	Plastic tie	1	
15	Holder	1	
16	Clamp	1	
17	Wire harness	1	
18	Bolt M6 × 30 mm	4	


↑↓	Part name	Q'ty	Remarks
19	Bracket	1	
20	Collar	4	
21	Grommet	4	
22	Holder	2	
23	Bolt M6 × 16 mm	1	
24	Holder	1	
25	Clamp	1	

Installing the wire harness

1. Install:
 - Clamp (to the holder)
 - Holder
 - Holder bolt
 - Holder (to the ignition coil bracket)
 - Grommet (to the ignition coil bracket)
 - Collar (to the ignition coil bracket)
 - Ignition coil bracket
 - Ignition coil bracket bolt
 - Wire harness (to the PTT relay bracket)
 - Holder (to the PTT relay bracket)
 - Plastic tie (to the PTT relay bracket)
 - Holder (to the PTT relay bracket)
 - Grommet (to the PTT relay bracket)
 - Collar (to the PTT relay bracket)
 - PTT relay bracket
 - PTT relay bracket bolt
 - Ground bolt
 - Oil pressure switch lead bolt

	<p>Oil pressure switch lead bolt 2.0 N·m (0.20 kgf·m, 1.5 lb·ft)</p>
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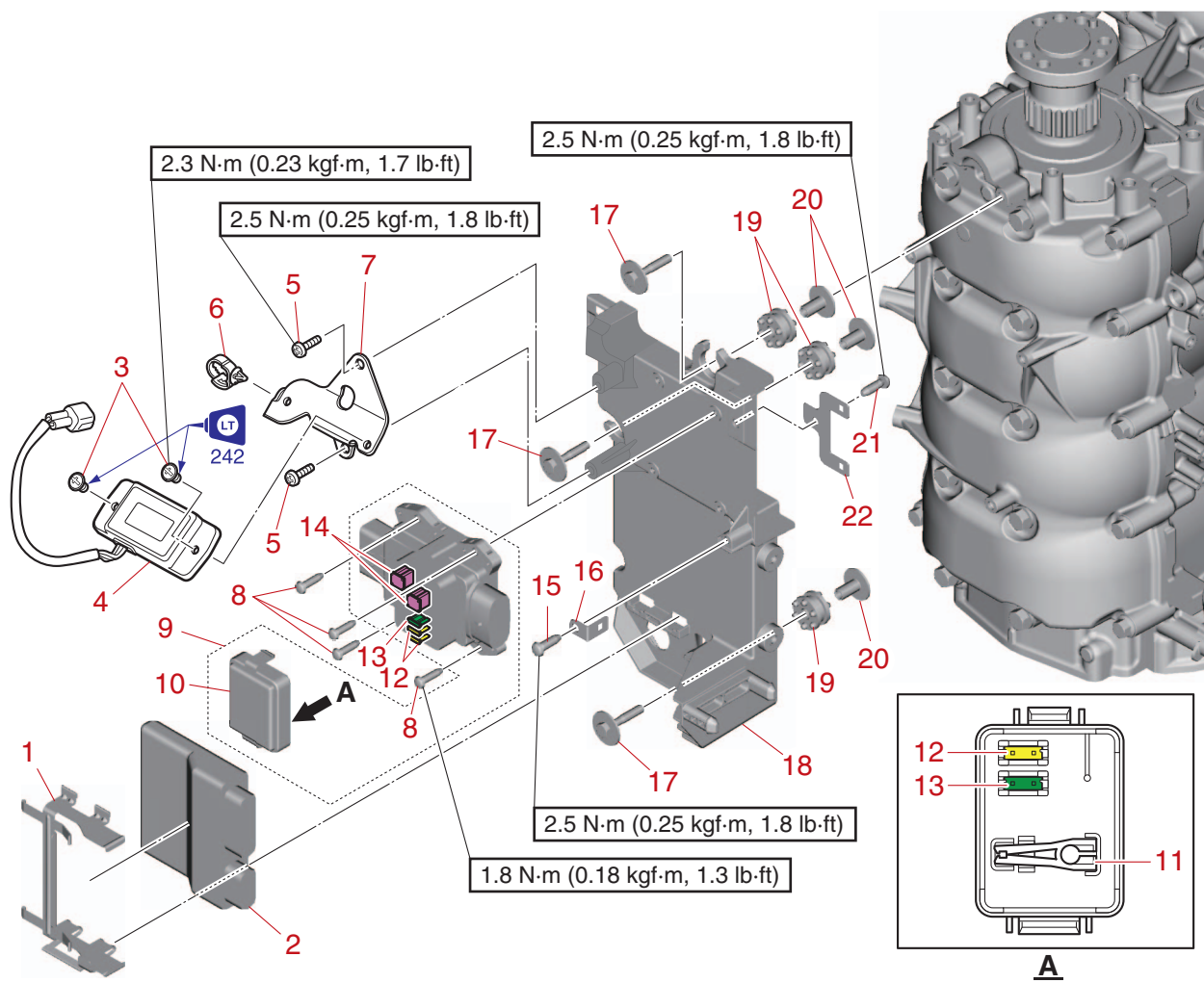
2. Install:
 - PTT relay
 - PTT relay bolt
 - PTT relay lead nut

	<p>PTT relay lead nut 4.5 N·m (0.45 kgf·m, 3.3 lb·ft)</p>
---	---

3. Install:
 - Clamp
 - Wire harness coupler

See “Electrical component and wire harness routing” (5-1).

Fuse box

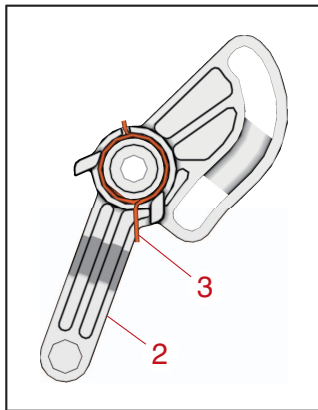


↑↓	Part name	Q'ty	Remarks
1	Lock plate	1	
2	Engine ECM	1	
3	Screw M5 × 12 mm	2	*1
4	Hour meter	1	*1
5	Screw M6 × 20 mm	2	*1
6	Holder	1	*1
7	Bracket	1	*1
8	Screw M5 × 20 mm	4	
9	Fuse box assembly	1	
10	Cover	1	
11	Fuse puller	1	
12	Fuse	3	20 A, spare is included.

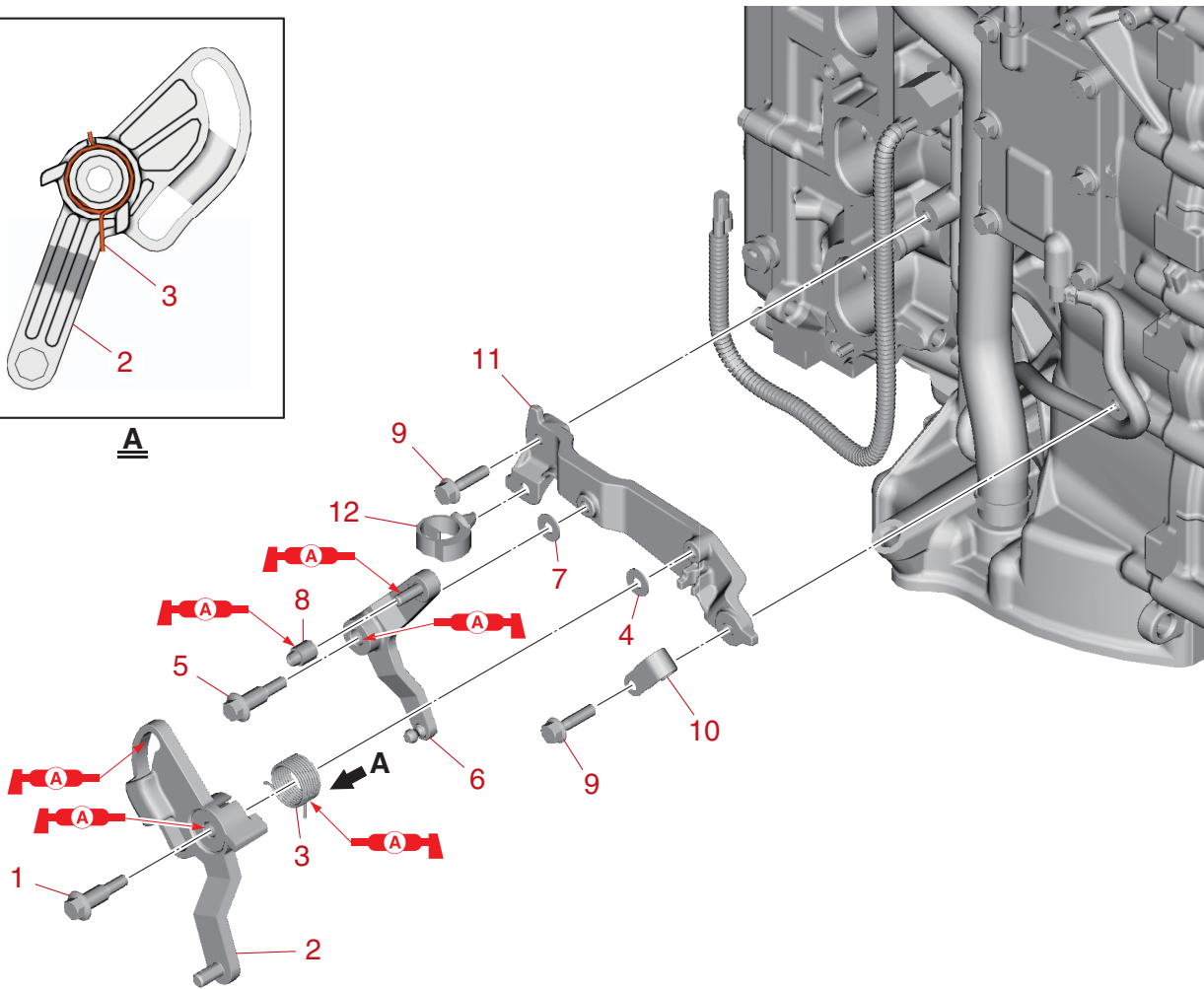
↑↓	Part name	Q'ty	Remarks
13	Fuse	2	30 A, spare is included.
14	Fuse	2	50 A, spare is included.
15	Screw M6 × 20 mm	1	
16	Holder	1	
17	Bolt M6 × 35 mm	3	
18	Bracket	1	
19	Collar	3	
20	Grommet	3	
21	Screw M6 × 20 mm	1	
22	Plate	1	

*1: F75FEHT, F100GEHT

Throttle control lever



A



∩∩	Part name	Q'ty	Remarks
1	Bolt M6 × 32 mm	1	
2	Accelerator cam	1	
3	Spring	1	
4	Washer	1	
5	Bolt M6 × 32 mm	1	
6	Throttle control lever	1	
7	Washer	1	
8	Bushing	1	
9	Bolt M6 × 25 mm	2	
10	Holder	1	
11	Bracket	1	
12	Holder	1	

Installing the throttle control lever

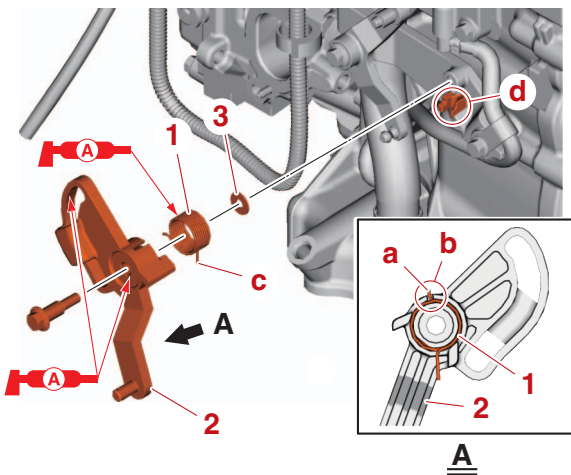
1. Install:
 - Holder
 - Bracket
 - Bracket bolt
 - Bushing (to the throttle control lever)
 - Washer
 - Throttle control lever
 - Throttle control lever bolt

2. Install:
 - Spring
 - Washer
 - Accelerator cam
 - Accelerator cam bolt
 - a. Install the spring "1" to the accelerator cam "2".

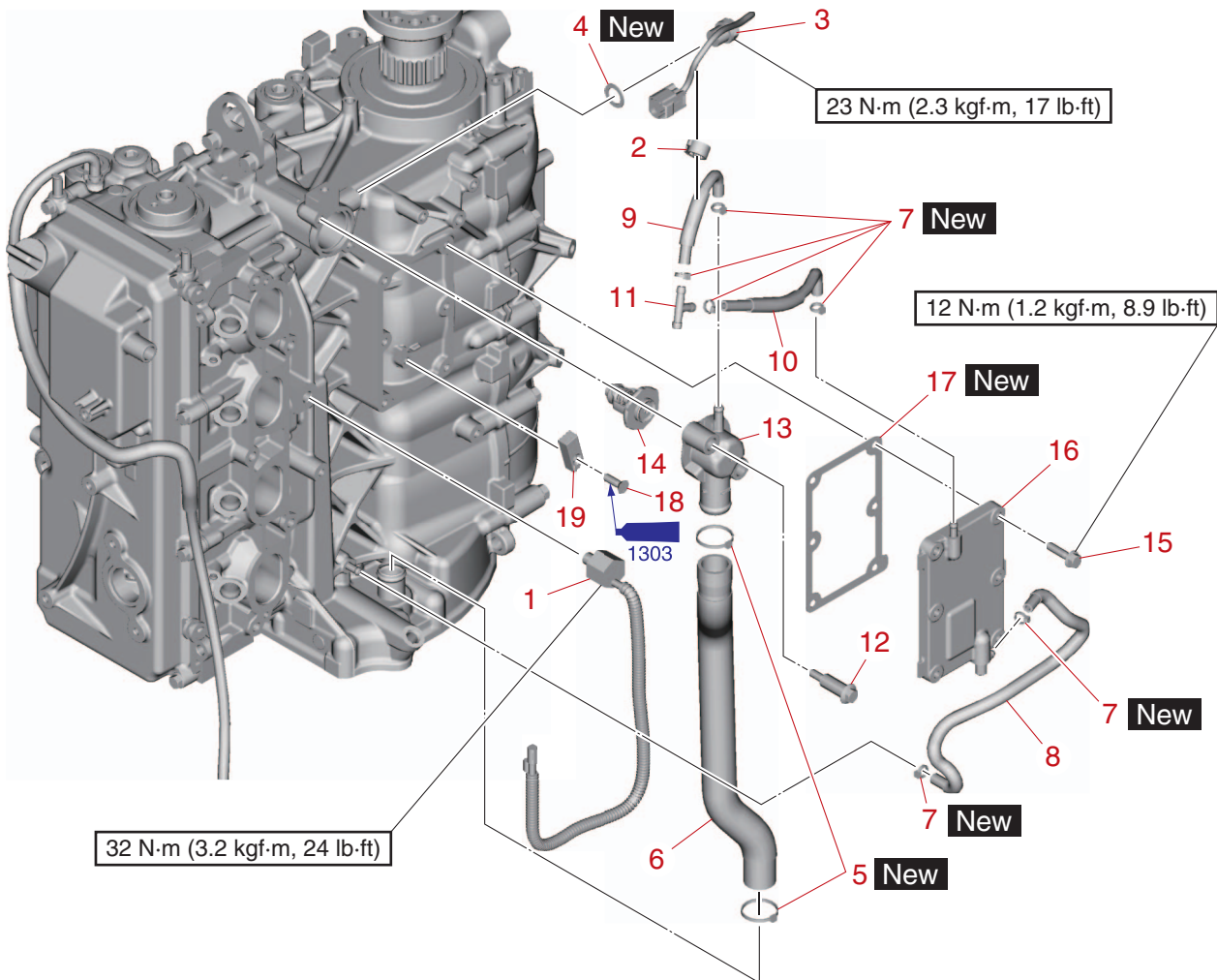
TIP: _____
 Fit the end "a" of the spring "1" into the slit "b" in the accelerator cam "2".

- b. Install the washer "3", spring "1", and accelerator cam "2".

TIP: _____
 Fit the end "c" of the spring "1" between the bosses "d" on the bracket.



Oil cooler

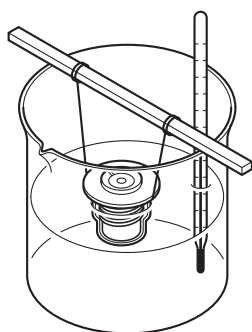


↑↓	Part name	Q'ty	Remarks
1	Knock sensor	1	
2	Clamp	1	
3	Thermo sensor	1	
4	Gasket	1	
5	Plastic tie	2	
6	Hose	1	
7	Plastic tie	6	
8	Hose	1	
9	Hose	1	
10	Hose	1	
11	Joint	1	
12	Bolt M6 × 40 mm	2	
13	Cover	1	
14	Thermostat	1	
15	Bolt M6 × 25 mm	6	
16	Cover	1	
17	Gasket	1	
18	Screw M6 × 17 mm	1	

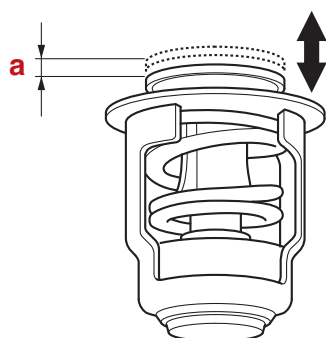
↑↓	Part name	Q'ty	Remarks
19	Anode	1	

Checking the thermostat

1. Check:
 - Thermostat valve opening at the specified water temperatures
Out of specification → Replace.
 - a. Suspend the thermostat in a container of water.
 - b. Place a thermo meter in the water, and then heat the water slowly.



- c. Measure the thermostat valve opening “a” at the specified water temperatures.



Water temperature	Valve opening “a”
58–62 °C (136–144 °F)	Starts opening
above 70 °C (158 °F)	4.3 mm (0.17 in) or above

Checking the crankcase cover anode

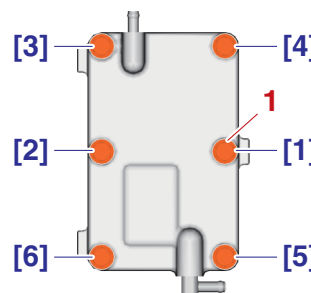
1. Check:
 - Anode
Eroded (1/2 or more) → Replace.
There is grease, oil, or scales → Clean.


NOTICE

Do not apply grease, oil, or paint to the anode.

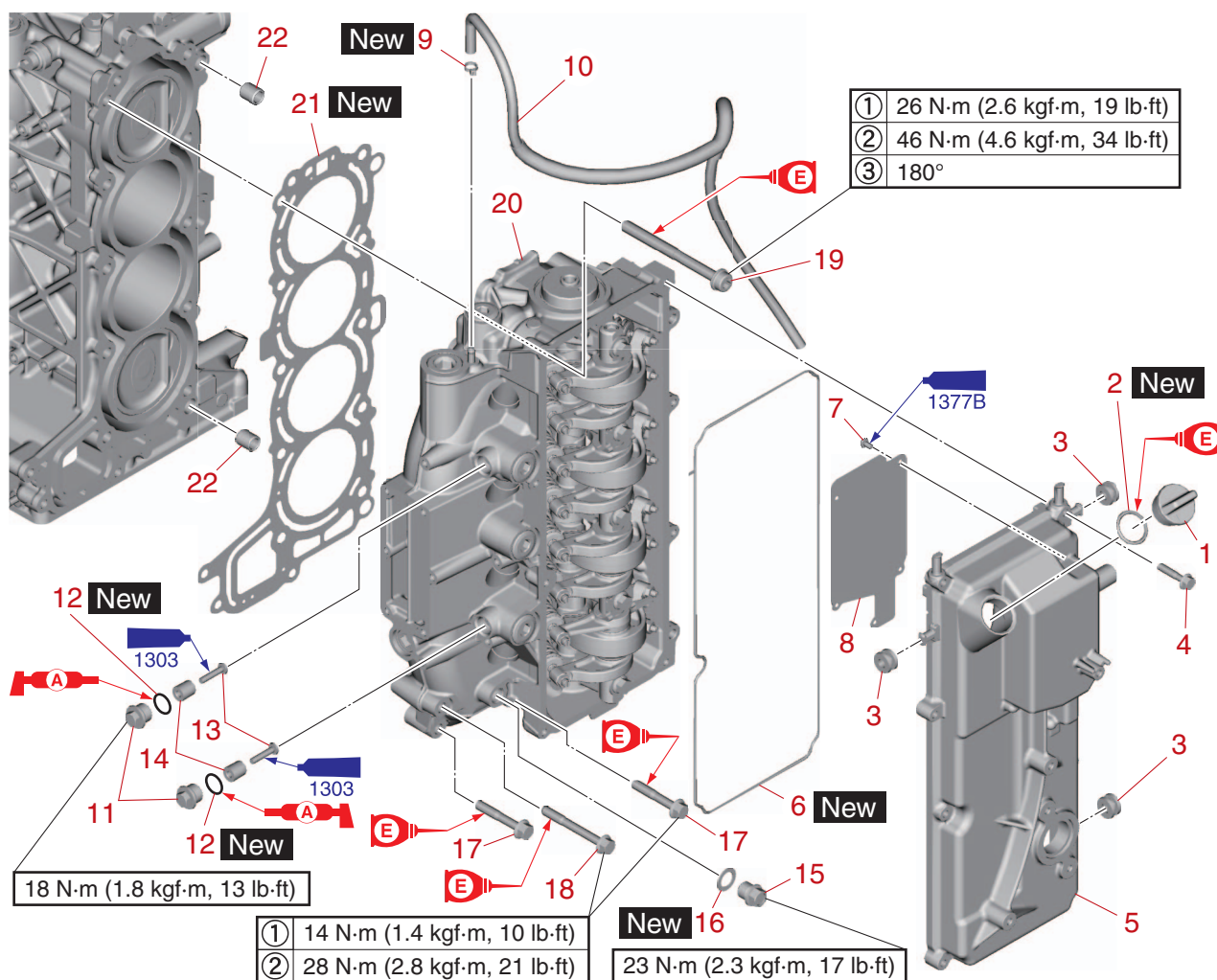
Installing the crankcase cover

1. Install:
 - Anode
 - Anode screw
 - Crankcase cover gasket **New**
 - Crankcase cover
2. Tighten:
 - a. Tighten the crankcase cover bolts “1” to the specified torque in the order [1], [2], and so on.



	Crankcase cover bolt “1” 12 N·m (1.2 kgf·m, 8.9 lb·ft)
---	---

Cylinder head



↑↓	Part name	Q'ty	Remarks
1	Oil filler cap	1	
2	O-ring	1	
3	Grommet	3	
4	Bolt M6 × 30 mm	8	
5	Cylinder head cover	1	
6	Gasket	1	
7	Screw M4 × 7 mm	5	
8	Plate	1	
9	Plastic tie	1	
10	Hose	1	
11	Plug M16 × 11 mm	2	
12	O-ring	2	
13	Screw M5 × 25 mm	2	
14	Anode	2	
15	Plug M14 × 12 mm	1	
16	Gasket	1	
17	Bolt M8 × 50 mm	2	
18	Bolt M8 × 70 mm	1	

↑↓	Part name	Q'ty	Remarks
19	Bolt M10 × 110 mm	10	
20	Cylinder head	1	
21	Gasket	1	
22	Dowel pin	2	

Removing the cylinder head

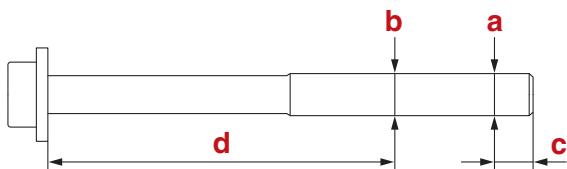
- Remove:
 - Cylinder head


NOTICE

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

Checking the cylinder head bolt

- Measure:
 - Cylinder head bolt (M10) diameter
Out of specification → Replace.
 - Measure the diameters “a” and “b” of the cylinder head bolt (M10) at the specified measuring points “c” and “d”.



	Cylinder head bolt (M10) diameter difference limit
	“a” – “b” = Less than 0.17 mm (0.01 in)
	Measuring point “c”: 10.0 mm (0.39 in)
	Measuring point “d”: 68.0 mm (2.68 in)

Checking the cylinder head anode

- Check:
 - Anode
Eroded (1/2 or more) → Replace.
There is grease, oil, or scales → Clean.

NOTICE

Do not apply grease, oil, or paint to the anodes.

Installing the cylinder head

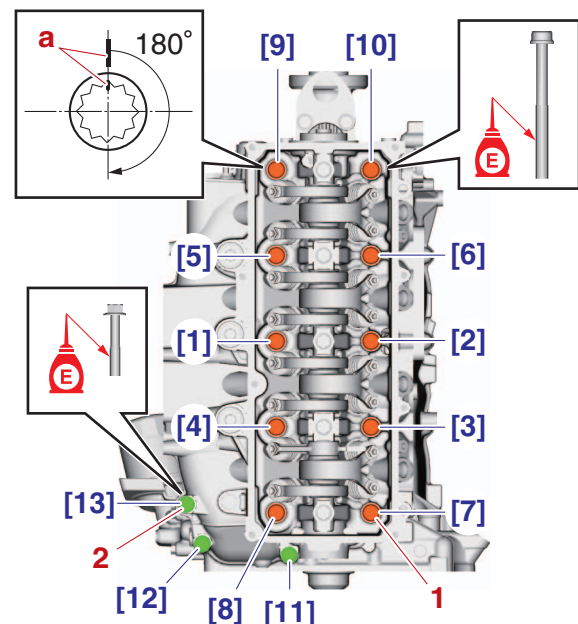
Before installing the cylinder head, check the cylinder head bolts. See “Checking the cylinder head bolt” (7-28).


- Install:
 - Dowel pin
 - Cylinder head gasket **New**
 - Cylinder head
- Tighten:
 - Cylinder head bolt (M10)
 - Cylinder head bolt (M8)
 - Tighten the cylinder head bolts (M10) “1” to the specified torques in 3 stages and in the order [1], [2], and so on.

TIP:

In the third tightening stage for the cylinder head bolts (M10) “1”, mark the bolts and cylinder head with identification marks “a”, and then tighten the bolts 180° from the marks on the cylinder head.


- Tighten the cylinder head bolts (M8) “2” to the specified torques in 2 stages and in the order [11], [12], and so on.



	<p>Cylinder head bolt (M10) "1" [1]– [10]</p> <p>1st: 26 N·m (2.6 kgf·m, 19 lb·ft) 2nd: 46 N·m (4.6 kgf·m, 34 lb·ft) 3rd: 180°</p> <p>Cylinder head bolt (M8) "2" [11]– [13]</p> <p>1st: 14 N·m (1.4 kgf·m, 10 lb·ft) 2nd: 28 N·m (2.8 kgf·m, 21 lb·ft)</p>
---	---


3. Install:

- Plug gasket **New**
- Plug

	<p>Plug</p> <p>23 N·m (2.3 kgf·m, 17 lb·ft)</p>
---	---

4. Install:

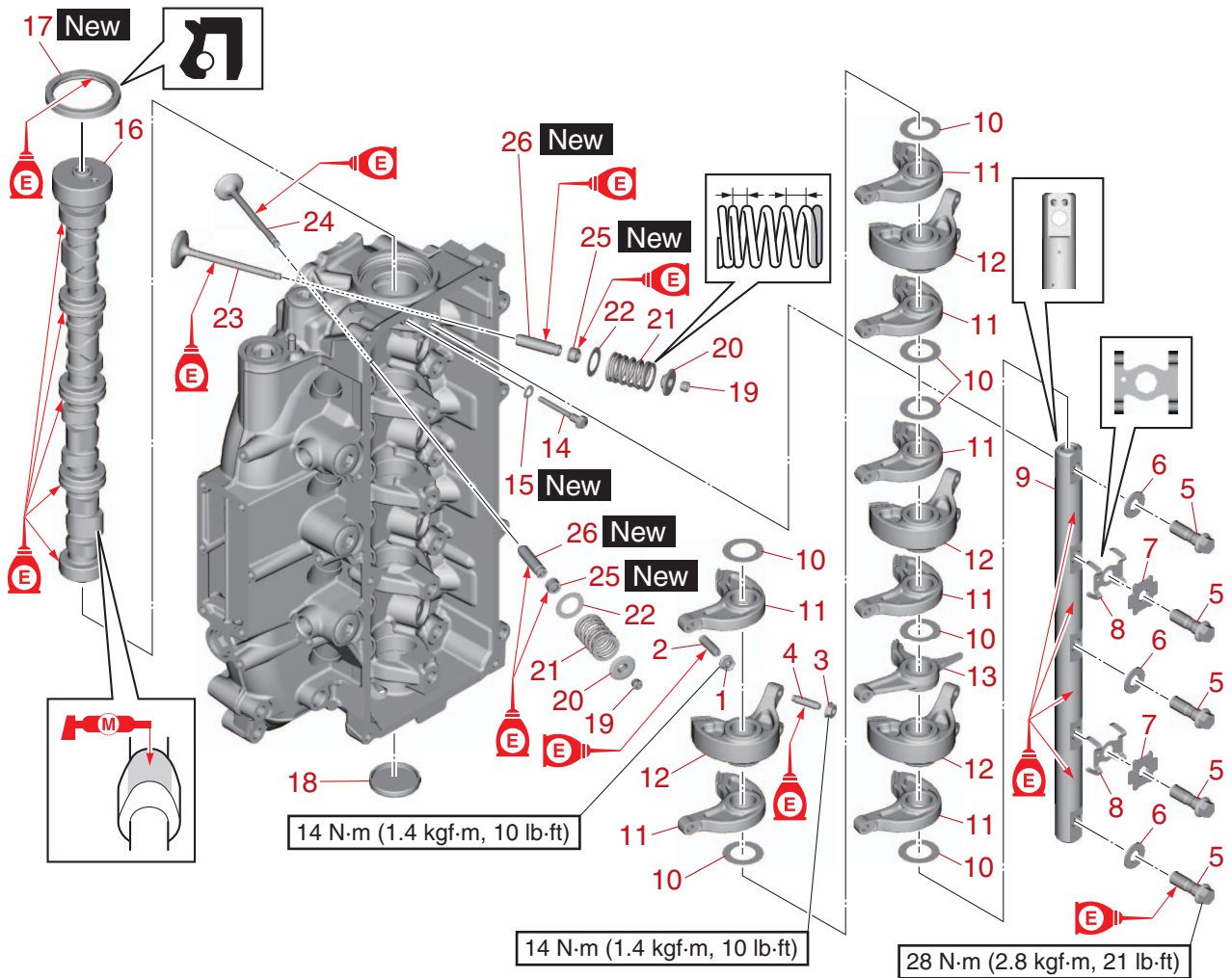
- Anode (to the anode screw)
- Anode screw (to the anode plug)
- O-ring **New** (to the anode plug)
- Anode plug

	<p>Anode plug</p> <p>18 N·m (1.8 kgf·m, 13 lb·ft)</p>
---	---

5. Install:

- Hose
- Plastic tie **New**
- Plate
- Plate screw
- Cylinder head cover gasket **New** (to the cylinder head cover)
- Cylinder head cover
- Cylinder head cover bolt
- Grommet
- O-ring **New** (to the oil filler cap)
- Oil filler cap

Camshaft and valve

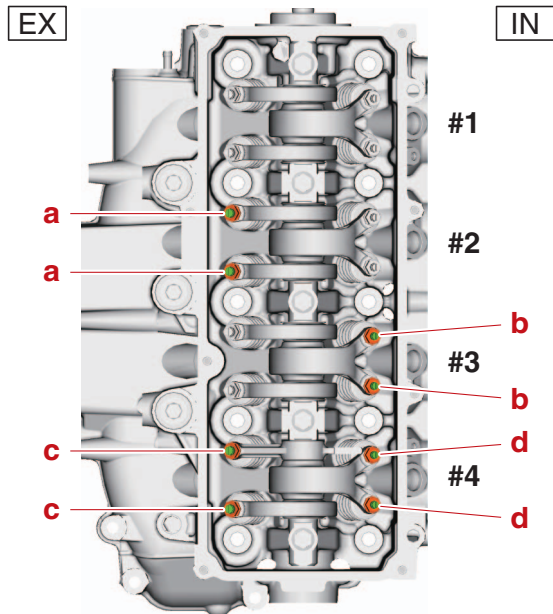


№	Part name	Q'ty	Remarks
1	Locknut M7	8	
2	Adjusting screw M7	8	
3	Locknut M6	8	
4	Adjusting screw M6	8	
5	Bolt M10 × 32 mm	5	
6	Washer	3	
7	Stopper	2	
8	Tensioner	2	
9	Shaft	1	
10	Washer	7	
11	Rocker arm	7	
12	Rocker arm	4	
13	Rocker arm	1	
14	Bolt M6 × 45 mm	1	
15	Gasket	1	
16	Camshaft	1	
17	Oil seal	1	
18	Plug	1	

№	Part name	Q'ty	Remarks
19	Valve cotter	32	
20	Retainer	16	
21	Valve spring	16	
22	Valve spring seat	16	
23	Intake valve	8	
24	Exhaust valve	8	
25	Valve stem seal	16	
26	Valve guide	16	

Disassembling the cylinder head

1. Loosen:
 - Valve adjusting locknut
 - Adjusting screw
 - a. Loosen the valve adjusting locknuts and adjusting screws on cylinders #2 (EX) "a", #3 (IN) "b", and #4 (EX "c" and IN "d").

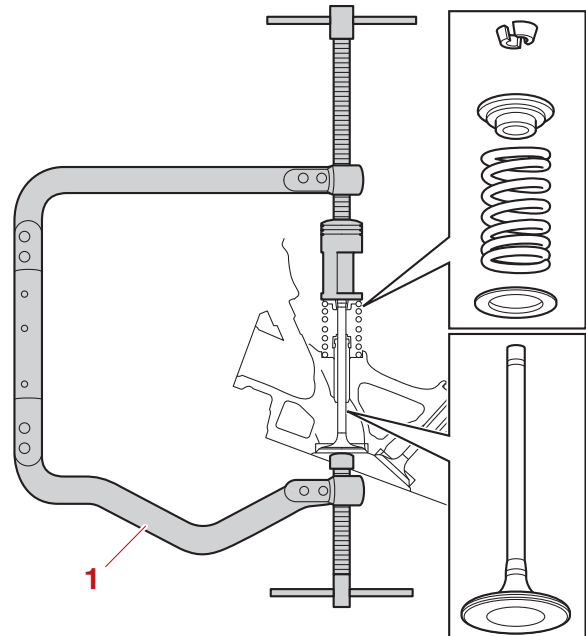



2. Remove:
 - Rocker arm shaft bolt
 - Washer
 - Stopper
 - Tensioner
 - Rocker arm shaft
 - Washer
 - Rocker arm

TIP: _____
 Make sure to keep the parts in the order of removal.

3. Remove:
 - Valve cotter
 - Retainer
 - Valve spring
 - Valve spring seat
 - Intake valve
 - Exhaust valve


TIP: _____
 Make sure to keep the parts in the order of removal.



 Valve spring compressor "1"
 (commercially available)

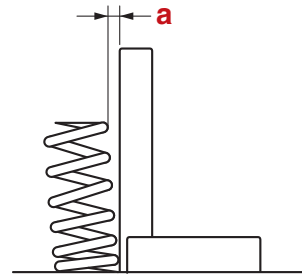
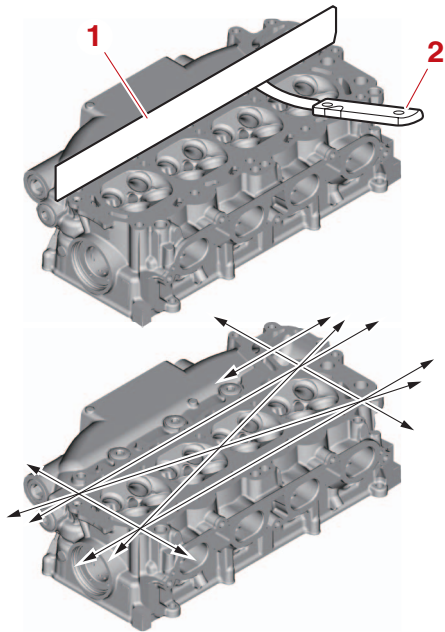
Checking the cylinder head

1. Check:
 - Cylinder head
 Damage/scratches → Replace.
 - Cylinder head warpage
 Out of specification → Replace.

 Warpage limit
 0.10 mm (0.0039 in)

- a. Remove carbon deposits from the combustion chambers, and then check the cylinder head for damage and scratches.

- b. Check the cylinder head warpage using a straightedge "1" and a thickness gauge "2" in 7 directions.



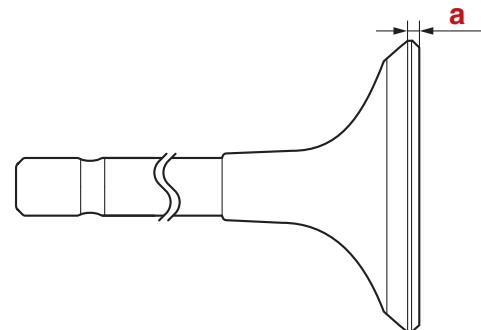
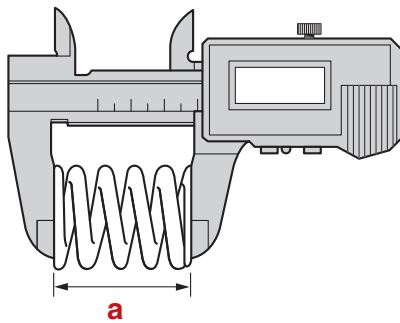
Tilt limit IN
1.7 mm (0.07 in)
Tilt limit EX
1.7 mm (0.07 in)

Checking the valve

1. Check:
 - Valve face
Pitted/worn → Replace.
2. Measure:
 - Margin thickness "a"
Out of specification → Replace.

Checking the valve spring

1. Measure:
 - Free length "a"
Below specification → Replace.



Free length IN
40.69 mm (1.60 in)
Limit
38.66 mm (1.52 in)
Free length EX
40.69 mm (1.60 in)
Limit
38.66 mm (1.52 in)

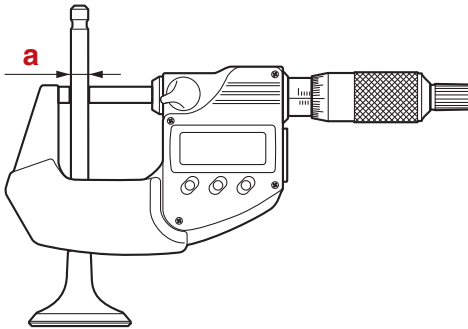


Margin thickness IN
0.80–1.20 mm (0.0315–0.0472 in)
Margin thickness EX
1.00–1.40 mm (0.0394–0.0551 in)

2. Measure:
 - Tilt "a"
Above specification → Replace.

3. Measure:

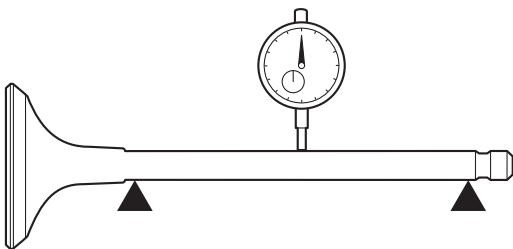
- Stem diameter “a”
Below specification → Replace.



	Diameter IN
	5.475–5.490 mm (0.2156–0.2161 in)
	Limit
	5.445 mm (0.2144 in)
	Diameter EX
	5.460–5.475 mm (0.2150–0.2156 in)
Limit	
5.430 mm (0.2138 in)	

4. Measure:

- Stem runout
Above specification → Replace.



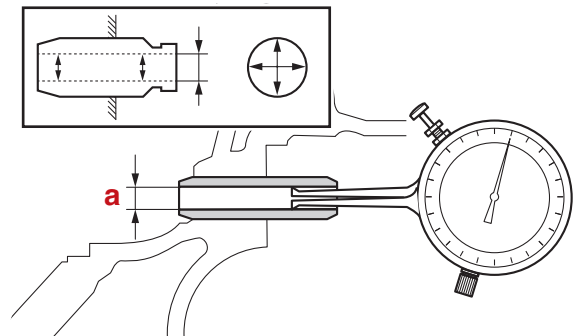
	Runout limit IN
	0.01 mm (0.0004 in)
	Runout limit EX
	0.01 mm (0.0004 in)

Checking the valve guide

Before checking the valve guides, make sure that the valve stem diameter is within specification.

1. Measure:

- Inside diameter “a”
Above specification → Replace.



	Inside diameter IN
	5.504–5.522 mm (0.2167–0.2174 in)
	Inside diameter EX
	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.

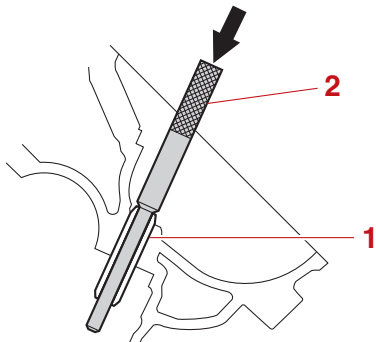
	Valve stem to valve guide clearance = Valve guide inside diameter – Valve stem diameter
	Clearance IN
	0.014–0.047 mm (0.0006–0.0019 in)
	Limit
	0.070 mm (0.0028 in)
	Clearance EX
	0.029–0.062 mm (0.0011–0.0024 in)
	Limit
0.080 mm (0.0032 in)	

Replacing the valve guide

After replacing a valve guide, check the valve seat contact area.

1. Remove:

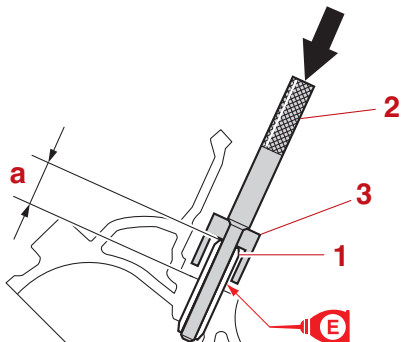
- Valve guide "1" (from the combustion chamber side)



	Valve guide remover/installer "2" 90890-06801
--	--

2. Install:

- Valve guide **New**
 - a. Install a new valve guide "1" to the specified installation height "a" from the camshaft side.



	Valve guide remover/installer "2" 90890-06801
	Valve guide installer "3" 90890-06810

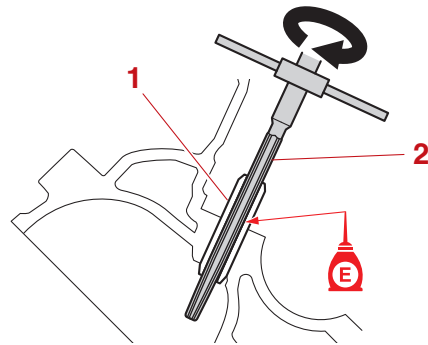
	Installation height 16.00–16.40 mm (0.6299–0.6457 in)
--	--

3. Ream:

- Valve guide "1"

TIP:

- To ream the valve guide, turn the valve guide reamer clockwise.
- When removing the valve guide reamer, do not turn it counterclockwise.
- After reaming the valve guide, make sure to clean it.



	Valve guide reamer "2" 90890-06804
--	---------------------------------------

4. Measure:

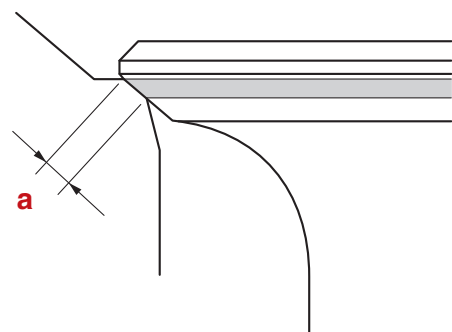
- Inside diameter

	Inside diameter IN 5.504–5.522 mm (0.2167–0.2174 in)
	Inside diameter EX 5.504–5.522 mm (0.2167–0.2174 in)

Checking the valve seat

1. Measure:

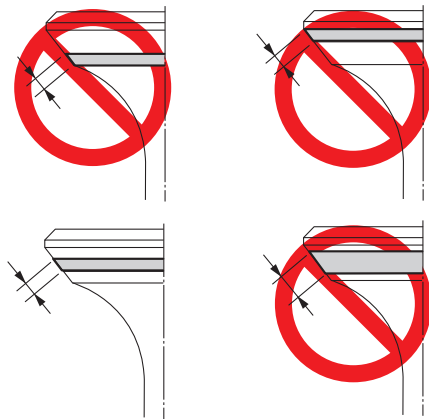
- Contact width "a"
Not seated properly/out of specification → Reface.
Uneven → Check the valve guide.



Refacing the valve seat

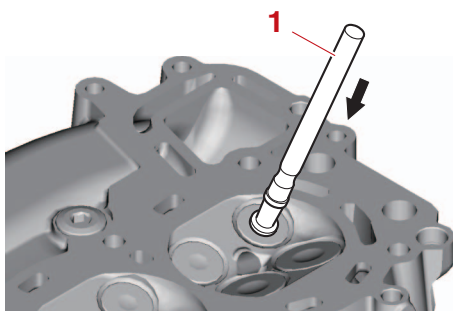
NOTICE

After every lapping procedure, make sure to clean off any remaining lapping compound from the cylinder head and valves.



	Seat contact width IN
	1.10–1.50 mm (0.0433–0.0591 in)
	Limit
	1.950 mm (0.0768 in)
	Seat contact width EX
	1.10–1.50 mm (0.0433–0.0591 in)
	Limit
	1.950 mm (0.0768 in)

- a. Remove carbon deposits from the valve.
- b. Apply a thin, even layer of blue layout fluid (Dykem) onto the valve seat.
- c. Push the valve lightly against the valve seat using the special service tool “1”.

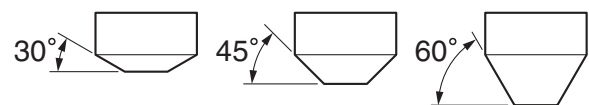


	Valve lapper “1” 90890-04101
--	---------------------------------

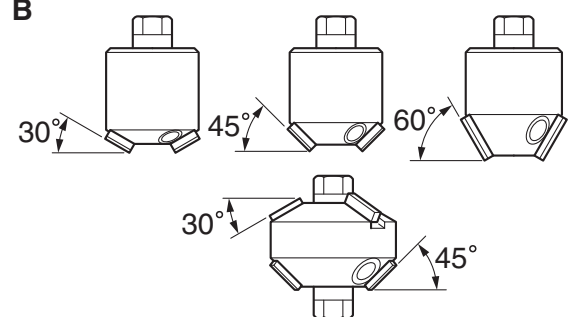
- d. Measure the valve seat contact width “a” where the blue layout fluid is adhered to the valve face.

1. Reface:
 - Valve seat

A



B



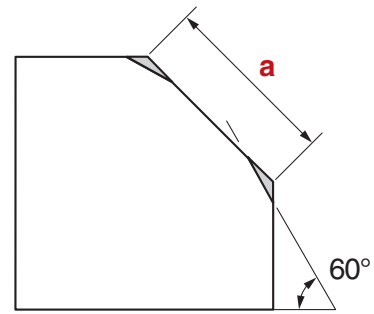
- A. Worldwide
B. USA and Canada

	Valve seat cutter holder 90890-06316
	Intake:
	Valve seat cutter 30° 90890-06326
	Valve seat cutter 45° 90890-06325
	Valve seat cutter 60° 90890-06324
	Exhaust:
	Valve seat cutter 30° 90890-06328
	Valve seat cutter 45° 90890-06312
	Valve seat cutter 60° 90890-06315

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

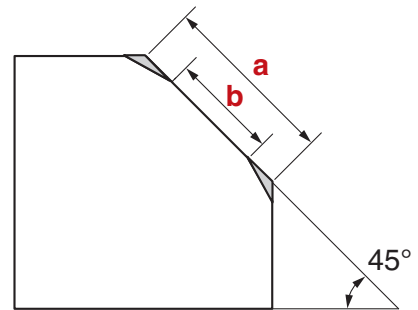
NOTICE

Do not overcut the valve seat. To prevent chatter marks, make sure to turn the cutter evenly using a downward force of 40–50 N (4.0–5.0 kgf, 8.8–11.0 lbf).



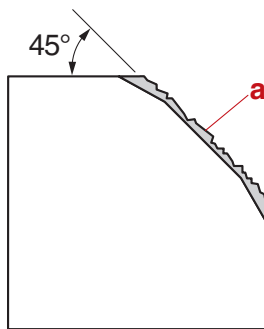
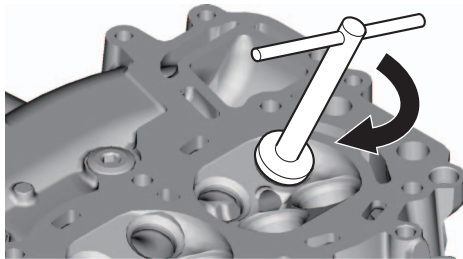
a. Previous contact width

- d. Adjust the valve seat contact width to specification using a 45° cutter.



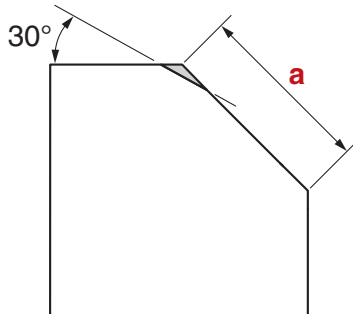
a. Previous contact width
b. Specified contact width

- e. Check the valve seat contact area of the valve. See “Checking the valve seat” (7-34).



a. Slag or rough surface

- b. Adjust the top edge of the valve seat contact width using a 30° cutter.

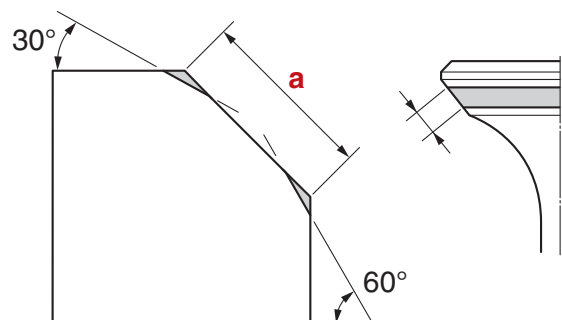


a. Previous contact width

- c. Adjust the bottom edge of the valve seat contact width using a 60° cutter.

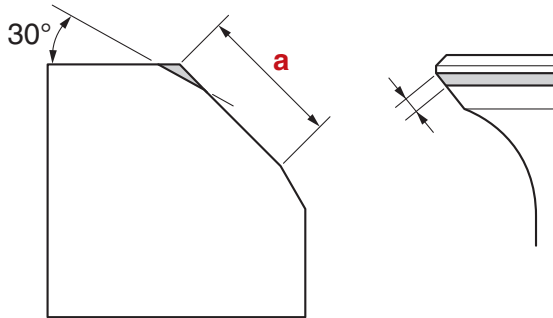
Example:

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



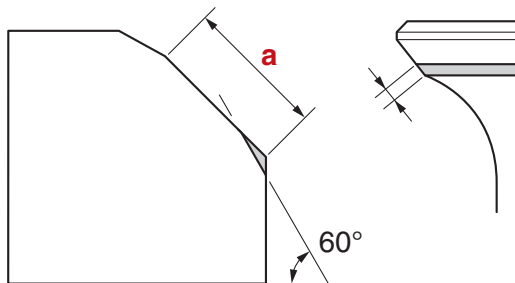
a. Previous contact width

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



a. Previous contact width

- If the valve seat contact area is too narrow and situated near the bottom edge of the valve face, cut the bottom edge of the valve seat using a 60° cutter. Set its width using a 45° cutter.

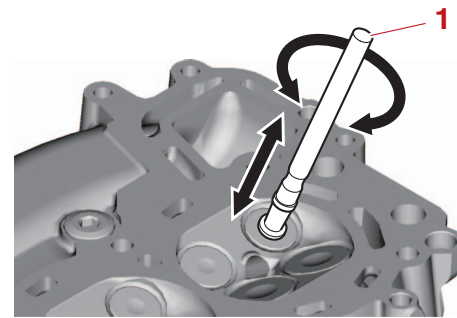


a. Previous contact width

- 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 the special service tool "1".

NOTICE

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

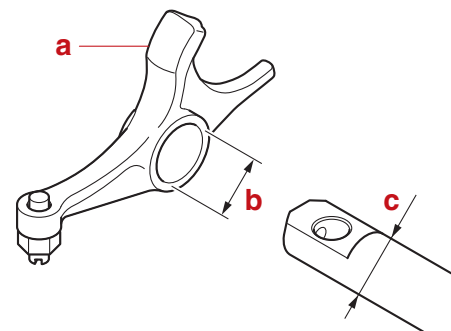



	Valve lapper "1" 90890-04101
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- Recheck the valve seat contact area of the valve. See "Checking the valve seat" (7-34).

Checking the rocker arm and rocker arm shaft

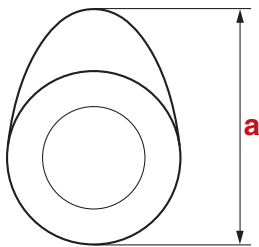
- Check:
 - Rocker arms, rocker arm shaft, and contact surface "a" of each rocker arm
Worn → Replace.
- Measure:
 - Rocker arm inside diameter "b" and rocker arm shaft outside diameter "c"
Out of specification → Replace.




	Rocker arm
	Inside diameter IN 21.000–21.018 mm (0.8268–0.8275 in)
	Inside diameter EX 21.000–21.018 mm (0.8268–0.8275 in)
	Rocker arm shaft
	Outside diameter IN 20.971–20.991 mm (0.8256–0.8264 in)
	Outside diameter EX 20.971–20.991 mm (0.8256–0.8264 in)

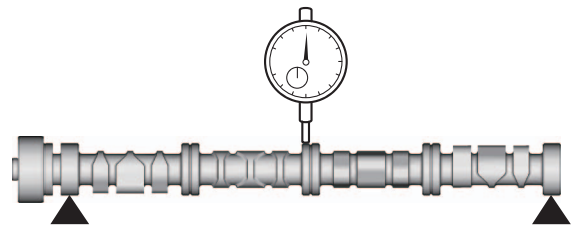
Checking the camshaft


- Measure:
 - Lobe height “a”
Below specification → Replace.



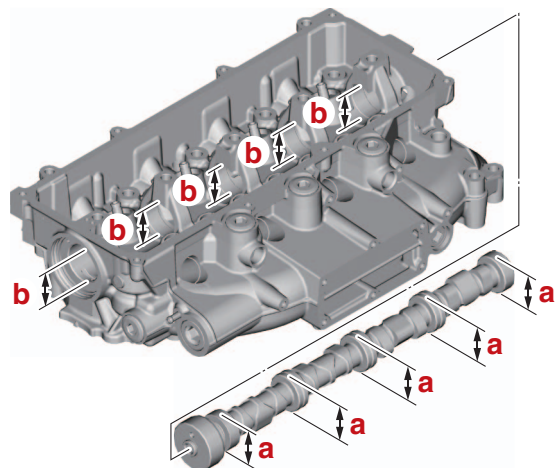
	Cam lobe height IN 30.439–30.539 mm (1.1984–1.2023 in)
	Limit 30.389 mm (1.1964 in)
	Cam lobe height EX 30.397–30.497 mm (1.1967–1.2007 in)
	Limit 30.347 mm (1.1948 in)


- Measure:
 - Runout
Above specification → Replace.



	Runout 0.030 mm (0.0012 in)
---	--------------------------------

- Measure:
 - Camshaft journal diameters “a” and cylinder head journal inside diameters “b”
Out of specification → Replace.



	Camshaft
	Journal diameter 36.923–36.943 mm (1.4537–1.4544 in)
	Cylinder head
	Journal inside diameter 37.000–37.025 mm (1.4567–1.4577 in)

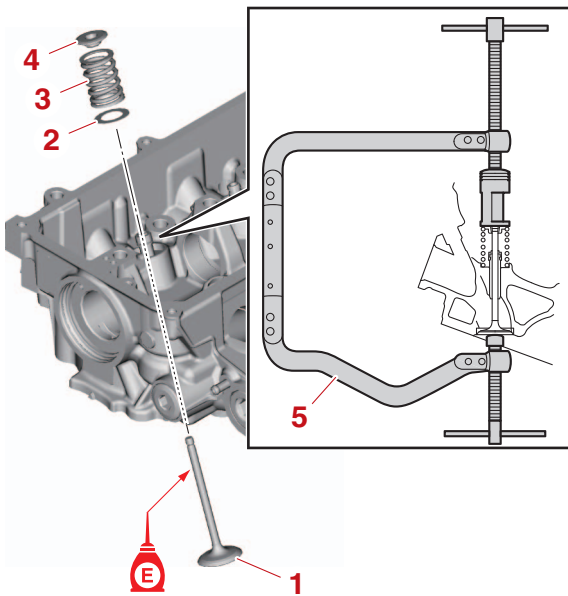
Assembling the cylinder head


- Install:
 - Valve stem seal **New**

2. Install:

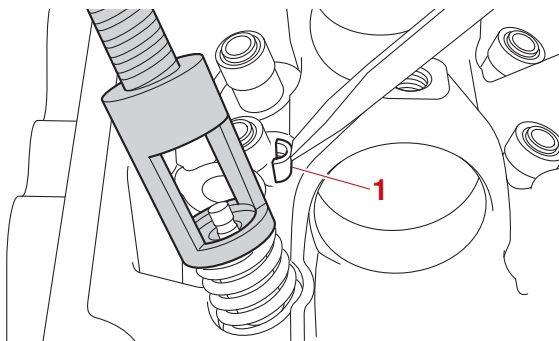
- Intake valve
- Exhaust valve
- Valve spring seat
- Valve spring
- Retainer
- Valve cotter

a. Install the valve "1", valve spring seat "2", valve spring "3", and valve spring retainer "4" in this order, and then install the valve spring compressor "5".



 Valve spring compressor "5"
(commercially available)

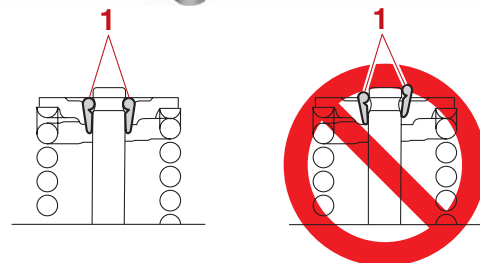
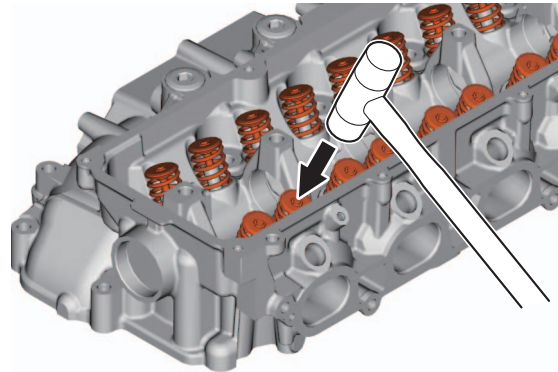
b. Compress the valve spring, and then install the valve cotters "1".



c. Tap the valve spring retainer lightly using a plastic hammer to seat the valve cotters "1" securely.

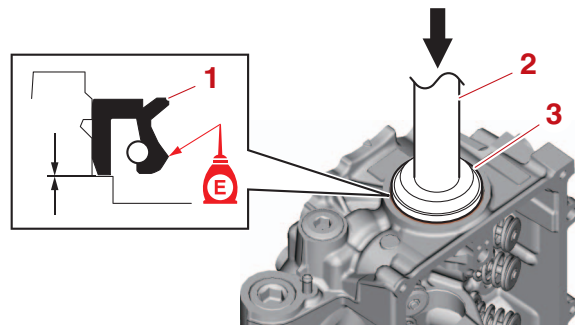
TIP: _____


Make sure that both valve cotters "1" are seated securely and evenly.



3. Install:

- Oil seal "1" **New**



 Driver rod LS "2"
90890-06606
Bearing outer race attachment "3"
90890-06623

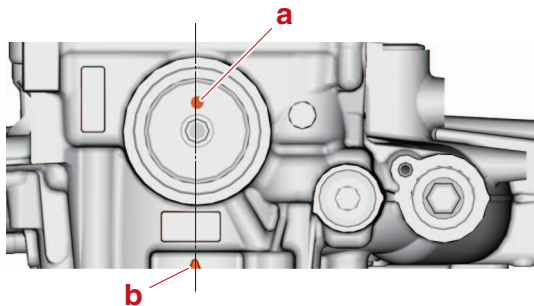
4. Install:

- Camshaft
- Gasket **New**
- Camshaft retaining bolt

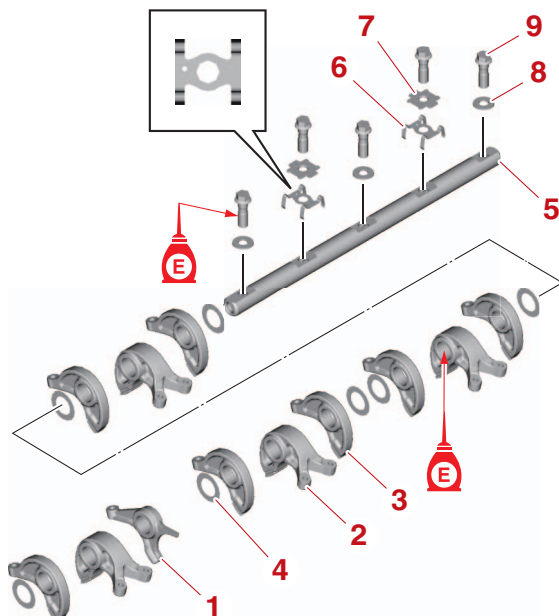
5. Install:

- Rocker arm
- Washer
- Rocker arm shaft
- Tensioner
- Stopper
- Washer
- Rocker arm shaft bolt

a. Align the dowel hole “a” in the camshaft with the “△” mark “b” on the cylinder head.



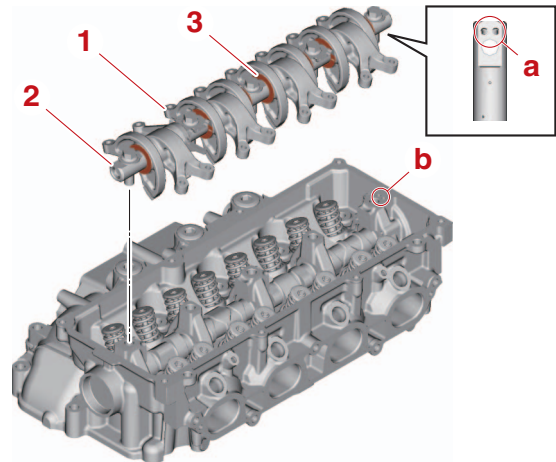
b. Assemble the rocker arms “1”, “2”, and “3”, washers “4” onto the rocker arm shaft “5”, and then install the tensioners “6”, stoppers “7”, washers “8”, and rocker arm shaft bolts “9”.



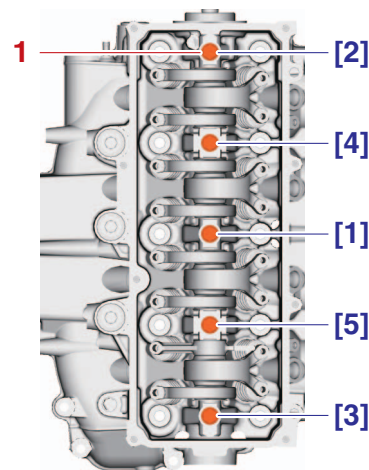
c. Install the rocker arms “1” and rocker arm shaft “2” as an assembly.


NOTICE

- Be careful not to damage the washers “3” when installing the rocker arm shaft assembly to the cylinder head.
- Make sure to install the rocker arm shaft in the correct direction aligning its oil holes “a” with the oil holes “b” in the cylinder head.



d. Tighten the rocker arm shaft bolts “1” gradually to the specified torque and in the order [1], [2], and so on.



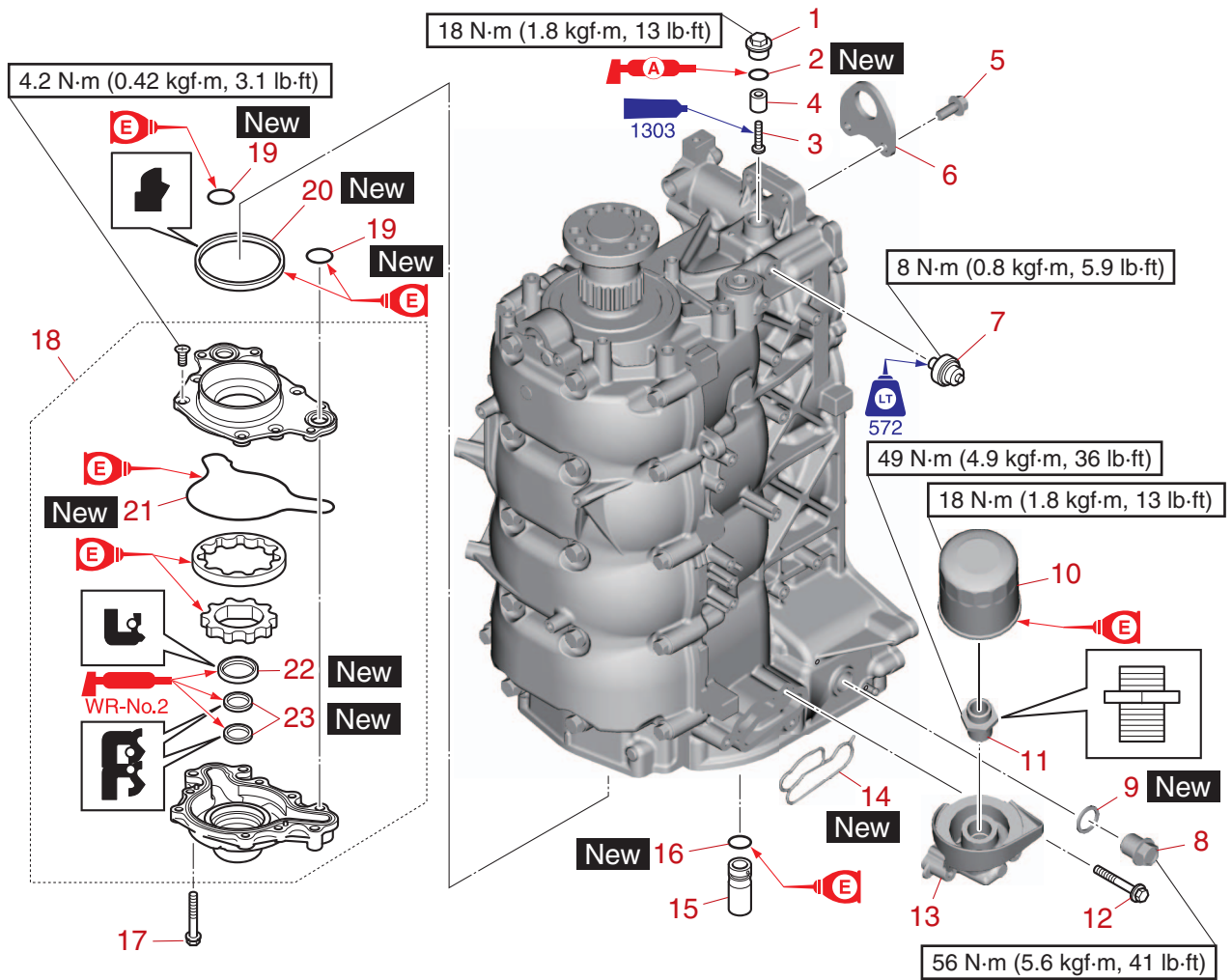
	<p>Rocker arm shaft bolt “1” 28 N·m (2.8 kgf·m, 21 lb·ft)</p>
---	---

6. Install:

- Cylinder head
See “Installing the cylinder head” (7-28).

7. Adjust:
 - Valve clearance
See “Adjusting the valve clearance” (7-5).

Cylinder block

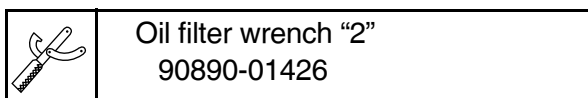
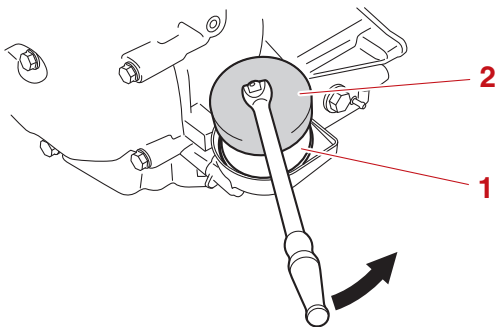


№	Part name	Q'ty	Remarks
1	Plug M16 × 10 mm	1	
2	O-ring	1	
3	Screw M5 × 26 mm	1	
4	Anode	1	
5	Bolt M8 × 20 mm	2	
6	Engine hanger	1	
7	Oil pressure switch	1	
8	Plug M18 × 20 mm	1	
9	Gasket	1	
10	Oil filter	1	
11	Union bolt M20	1	
12	Bolt M6 × 40 mm	3	
13	Bracket	1	
14	Gasket	1	
15	Relief valve	1	
16	O-ring	1	
17	Bolt M6 × 40 mm	4	
18	Oil pump assembly	1	

№	Part name	Q'ty	Remarks
19	O-ring	2	
20	Oil seal	1	
21	Gasket	1	
22	Oil seal	1	
23	Oil seal	2	

Removing the oil filter

- Remove:
 - Oil filter "1"



Checking the cylinder block anode

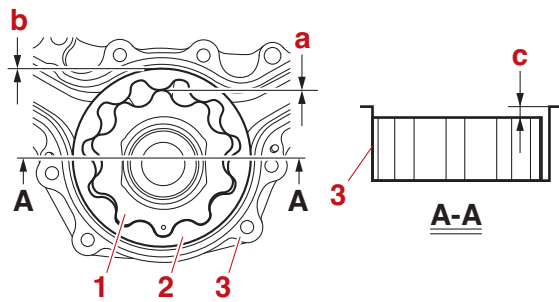
- Check:
 - Anode
 - Eroded (1/2 or more) → Replace.
 - There is grease, oil, or scales → Clean.

NOTICE

Do not apply grease, oil, or paint to the anode.

Checking the oil pump

- Check:
 - Inner surface of the oil pump housing
 - Scratched → Replace the oil pump assembly.
- Check:
 - Gear teeth of the inner rotor and outer rotor
 - Cracked/worn → Replace the oil pump assembly.
- Measure:
 - Inner rotor to outer rotor tip clearance "a", outer rotor to oil pump housing clearance "b", and oil pump housing to inner rotor and outer rotor clearance "c"
 - Out of specification → Replace the oil pump assembly.



- Inner rotor
- Outer rotor
- Oil pump housing

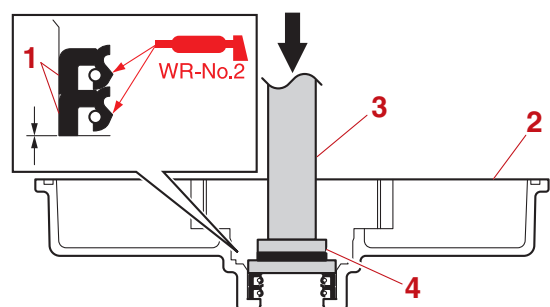
	Inner rotor to outer rotor tip clearance 0.12 mm (0.0047 in) Limit 0.16 mm (0.0063 in)
	Outer rotor to oil pump housing clearance 0.1 mm (0.0040 in) Limit 0.20 mm (0.0079 in)
	Oil pump housing to inner rotor and outer rotor clearance 0.03 mm (0.0012 in) Limit 0.12 mm (0.0047 in)


Assembling the oil pump

- Install:
 - Oil seal "1" **New** (into the oil pump housing "2")

TIP:

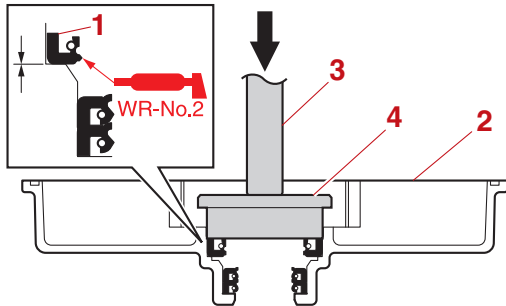
Install an oil seal halfway into the oil pump housing, and then install the other oil seal.




	Driver rod L3 "3" 90890-06652 Needle bearing attachment "4" 90890-06611
---	--

2. Install:

- Oil seal "1" **New** (into the oil pump housing "2")



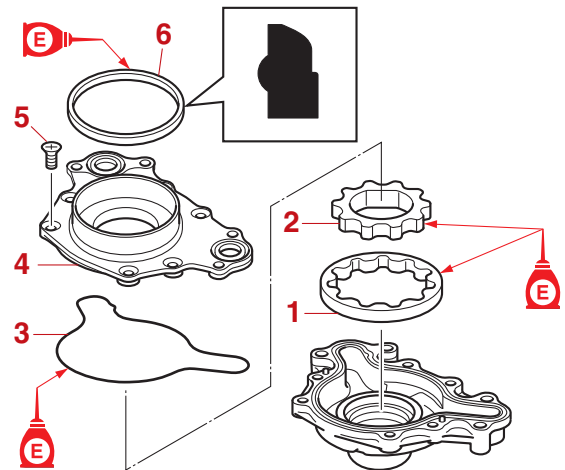
	Driver rod L3 "3" 90890-06652 Needle bearing attachment "4" 90890-06607
--	--


3. Install:

- Outer rotor "1"
- Inner rotor "2"
- Gasket "3" **New**
- Oil pump cover "4"
- Oil pump cover screw "5"
- Oil seal "6" **New**

TIP: _____

- Be sure to install the outer rotor "1" and inner rotor "2" in the same direction as when they were removed.
- Install a new oil seal "6" so that it is facing in the proper direction.

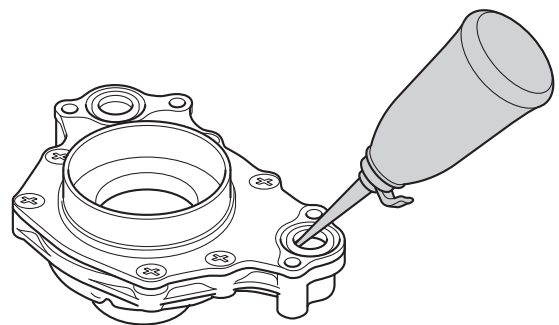


	Oil pump cover screw "5" 4.2 N·m (0.42 kgf·m, 3.1 lb-ft)
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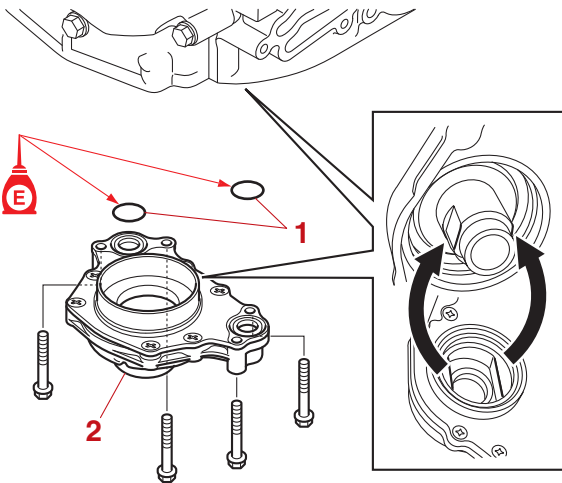
Installing the oil pump assembly

1. Install:

- O-ring **New**
- Oil pump assembly
- Oil pump assembly bolt
 - a. Fill the oil pump assembly with engine oil through the oil passage.




- b. Install new O-rings “1” and the oil pump assembly “2” by aligning the oil pump gear with the crankshaft.




3. Install:

- Plug gasket **New**
- Plug

	Plug 56 N·m (5.6 kgf·m, 41 lb·ft)
---	--------------------------------------


4. Install:

- Oil pressure switch

	Oil pressure switch 8 N·m (0.8 kgf·m, 5.9 lb·ft)
---	---

5. Install:


- Engine hanger
- Engine hanger bolt
- Anode (to the anode screw)
- Anode screw (to the anode plug)
- O-ring **New** (to the anode plug)
- Anode plug

	Anode plug 18 N·m (1.8 kgf·m, 13 lb·ft)
---	--

Installing the oil filter

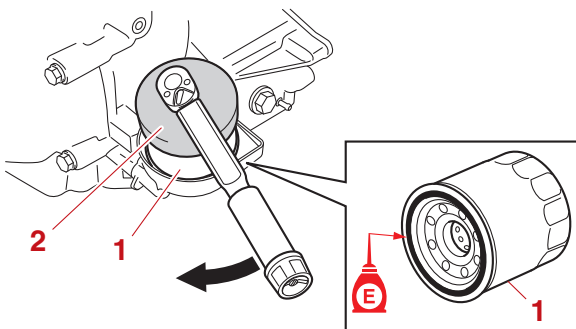
1. Install:


- O-ring **New** (to the relief valve)
- Relief valve
- Gasket **New**
- Oil filter bracket
- Oil filter bracket bolt
- Union bolt


	Union bolt 49 N·m (4.9 kgf·m, 36 lb·ft)
---	--

2. Install:

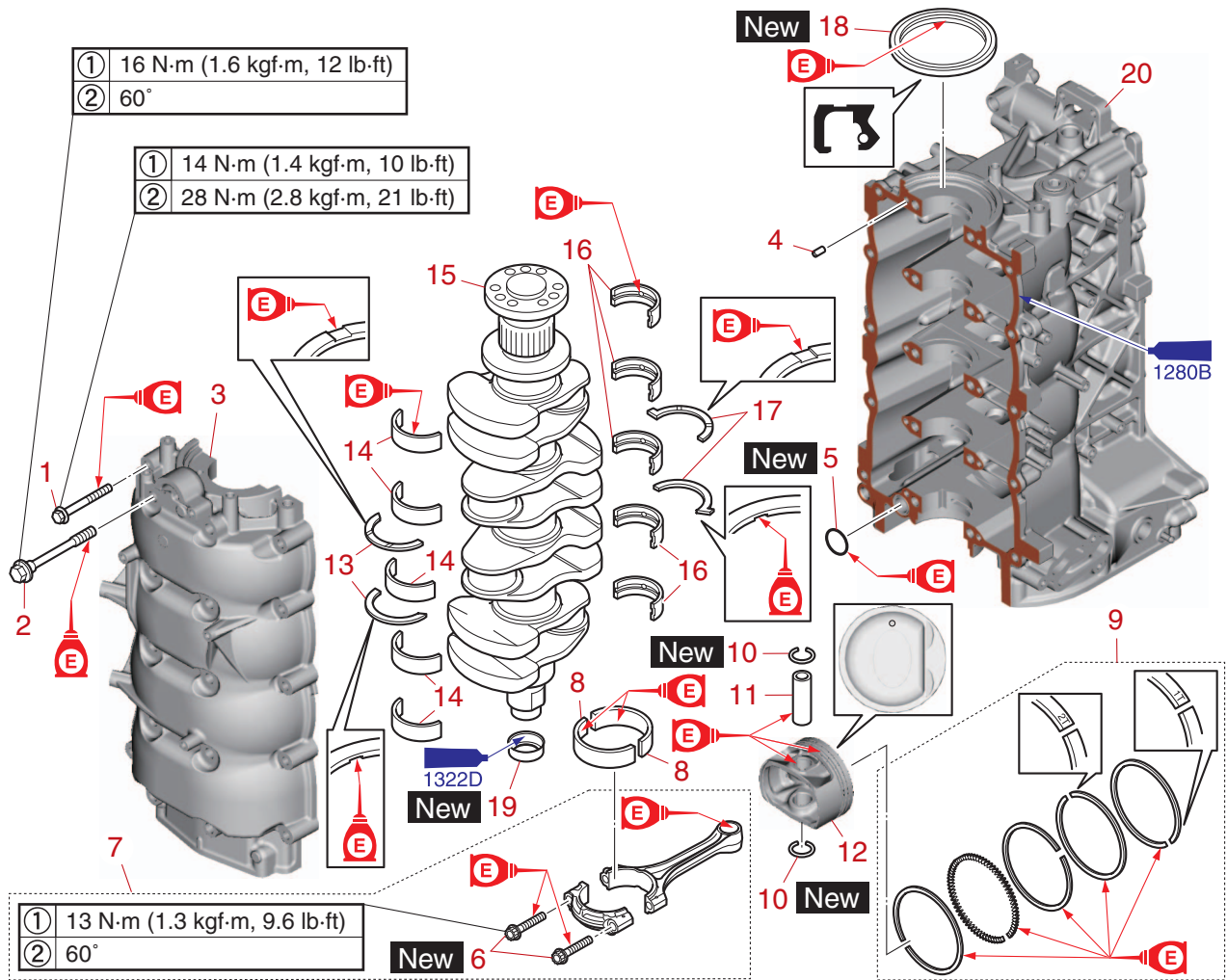
- Oil filter “1”



	Oil filter wrench “2” 90890-01426
---	--------------------------------------

	Oil filter “1” 18 N·m (1.8 kgf·m, 13 lb·ft)
---	--

Crankcase



↓↑	Part name	Q'ty	Remarks
1	Bolt M8 × 55 mm	10	
2	Bolt M10 × 105 mm	10	
3	Crankcase	1	
4	Dowel pin	10	
5	O-ring	1	
6	Bolt M8 × 36 mm	8	
7	Connecting rod assembly	4	
8	Bearing	8	
9	Piston ring set	4	
10	Clip	8	
11	Pin	4	
12	Piston	4	
13	Thrust bearing	2	Locating crankcase side
14	Bearing	5	
15	Crankshaft	1	

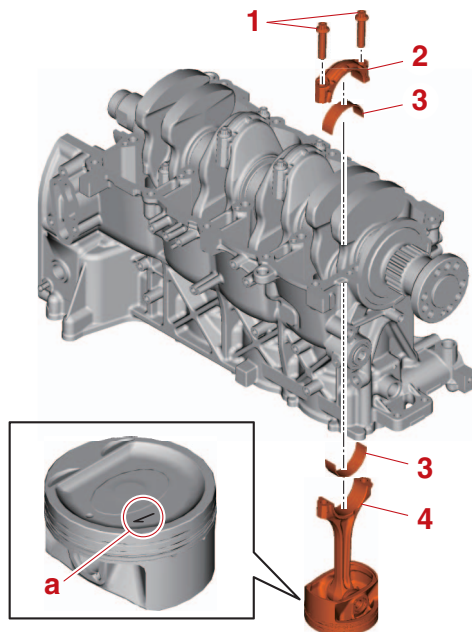
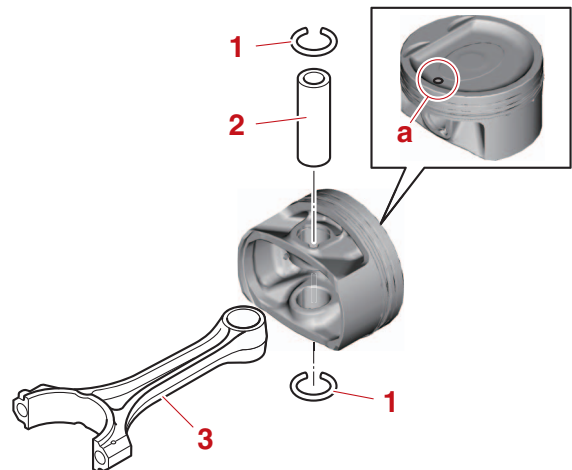
↓↑	Part name	Q'ty	Remarks
16	Bearing	5	
17	Thrust bearing	2	Locating cylinder block side
18	Oil seal	1	
19	Collar	1	
20	Cylinder block	1	

Disassembling the cylinder block

1. Remove:
 - Connecting rod bolt "1"
 - Connecting rod cap "2"
 - Crankshaft pin bearing "3"
 - Piston and connecting rod assembly "4"

TIP: _____

- To prevent mixing the piston and connecting rod assemblies "4" and connecting rod caps "2", mark each with an identification number "a" of the corresponding cylinder.
- Make sure to keep the parts in the order of removal.

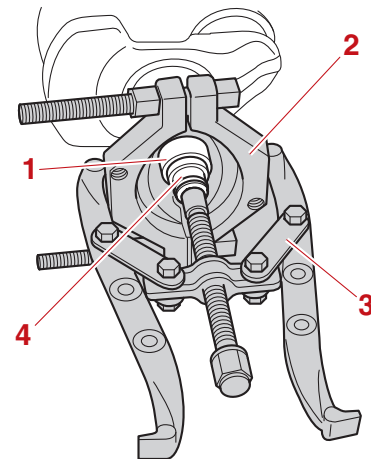



2. Remove:
 - Clip "1"
 - Piston pin "2"
 - Connecting rod "3"

TIP: _____

- Remove the piston pin from the side marked with "a".
- Make sure to keep the parts in the order of removal.

3. Remove:
 - Collar "1"

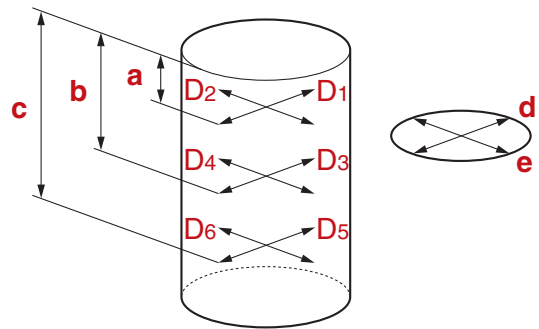
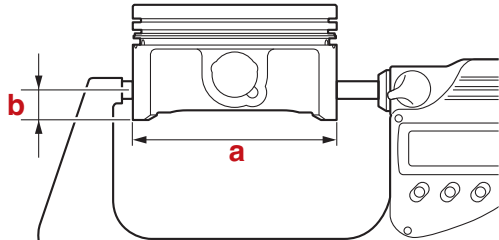


	Bearing separator "2"
	90890-06534
	Gear puller "3"
	90890-06540
	Needle bearing attachment "4"
	90890-06615


Checking the piston diameter


1. Measure:

- Piston outside diameter "a" (at the specified measuring point "b")
Below specification → Replace.



- a. 5.0 mm (0.20 in)
- b. 35.0 mm (1.38 in)
- c. 94.0 mm (3.70 in)
- d. Parallel to the crankshaft
- e. At a right angle to the crankshaft

	Piston Diameter 80.950–80.962 mm (3.1870– 3.1875 in) Limit 80.910 mm (3.1854 in) 1st oversize diameter 81.200–81.212 mm (3.1968– 3.1973 in) Measuring point 9.5 mm (0.37 in) above the bottom of the piston skirt
---	--

	Cylinder Bore 81.000–81.012 mm (3.1890– 3.1894 in) Limit 81.060 mm (3.1913 in)
---	---

Checking the piston clearance

1. Measure:

- Piston diameter
See "Checking the piston diameter" (7-48).
- Cylinder bore
See "Checking the cylinder bore" (7-48).


2. Calculate:

- Piston clearance
Out of specification → Replace the piston or cylinder block.

Checking the cylinder bore

1. Measure:

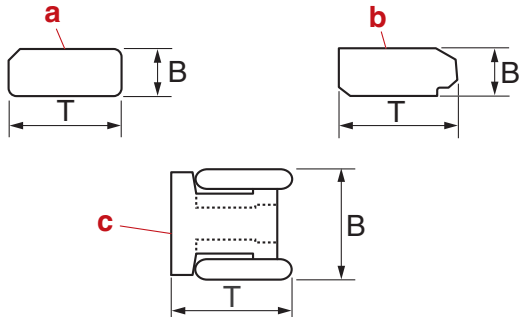
- Cylinder bore (D1–D6) (at measuring points "a", "b", and "c", and in directions "d" (D1, D3, D5) and "e" (D2, D4, D6))
Above specification → Replace the cylinder block.

	Piston clearance = Maximum cylinder bore – Piston outside diameter Piston clearance 0.038–0.062 mm (0.0015–0.0024 in) Limit 0.150 mm (0.0059 in)
---	--

Checking the piston ring

1. Measure:

- Piston ring dimensions B and T
Below specification → Replace.

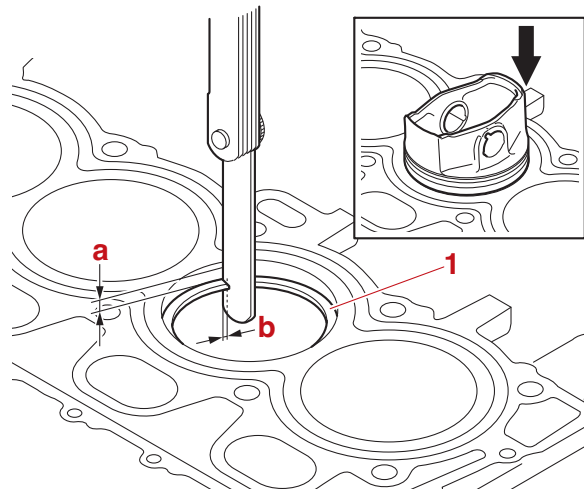


- a. Top ring
- b. 2nd ring
- c. Oil ring

Piston ring dimensions	
Top ring	
Height (B)	1.170–1.190 mm (0.0461–0.0469 in)
Width (T)	2.400–2.600 mm (0.0945–0.1024 in)
2nd ring	
Height (B)	1.170–1.190 mm (0.0461–0.0469 in)
Width (T)	2.600–2.800 mm (0.1024–0.1102 in)
Oil ring	
Height (B)	2.380–2.480 mm (0.0937–0.0976 in)
Width (T)	2.400 mm (0.0945 in)

	Top ring
	End gap
	0.15–0.30 mm (0.0059–0.0118 in)
	Limit
	0.470 mm (0.0185 in)
	2nd ring
End gap	
0.70–0.90 mm (0.0276–0.0354 in)	
Limit	
1.050 mm (0.0413 in)	
Oil ring	
End gap	
0.20–0.70 mm (0.0079–0.0276 in)	

- a. Level the piston ring “1” in the cylinder using a piston crown at the specified measuring point “a”.
- b. Measure the piston ring end gap “b”.



	Measuring point
	10.0 mm (0.39 in)

Checking the piston ring end gap

1. Measure:

- Piston ring end gap
Above specification → Replace.


Checking the piston ring groove

1. Measure:

- Piston ring groove
Above specification → Replace.



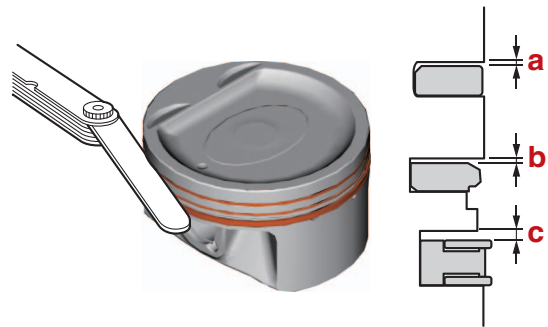
- a. Ring groove (Top)
- b. Ring groove (2nd)
- c. Ring groove (Oil)

	Piston ring groove
	Ring groove (Top) 1.23–1.25 mm (0.0484–0.0492 in)
	Ring groove (2nd) 1.22–1.24 mm (0.0480–0.0488 in)
	Ring groove (Oil) 2.51–2.53 mm (0.0988–0.0996 in)


Checking the piston ring side clearance

1. Measure:

- Piston ring side clearance
Above specification → Check the piston ring grooves and piston ring.
See “Checking the piston ring groove” (7-50) and “Checking the piston ring” (7-49).



- a. Top ring side clearance
- b. 2nd ring side clearance
- c. Oil ring side clearance

	Piston ring side clearance
	Top ring
	Side clearance 0.04–0.08 mm (0.0016–0.0032 in)
	Limit 0.130 mm (0.0051 in)
	2nd ring
	Side clearance 0.03–0.07 mm (0.0012–0.0028 in)
	Limit 0.110 mm (0.0043 in)
	Oil ring
	Side clearance 0.03–0.15 mm (0.0012–0.0059 in)

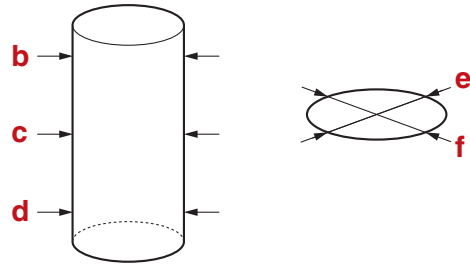
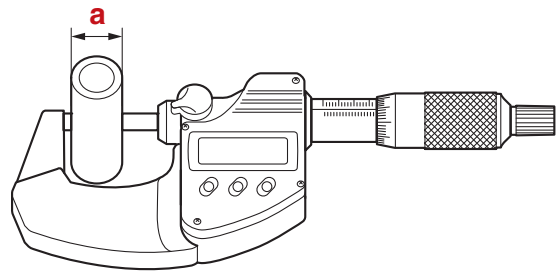
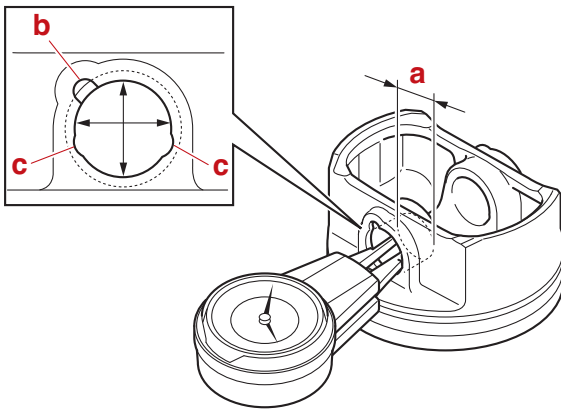
Checking the piston pin boss inside diameter


1. Measure:

- Piston pin boss inside diameter “a”
Above specification → Replace.

TIP: _____

When measuring the piston pin boss inside diameter, do not measure it at the ring groove “b” or oil groove “c”.




	Pin boss inside diameter 18.004–18.015 mm (0.7088–0.7093 in) Limit 18.035 mm (0.7100 in)
--	---


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

- Measure:
 - Connecting rod small end inside diameter and big end inside diameter
Above specification → Replace.

Checking the piston pin diameter

- Measure:
 - Piston pin outside diameter
Below specification → Replace.

	Small end inside diameter 18.005–18.018 mm (0.7089–0.7094 in) Big end inside diameter 50.025–50.045 mm (1.9695–1.9703 in)
---	--

	Pin outside diameter 17.991–18.000 mm (0.7083–0.7087 in) Limit 17.981 mm (0.7079 in)
---	---

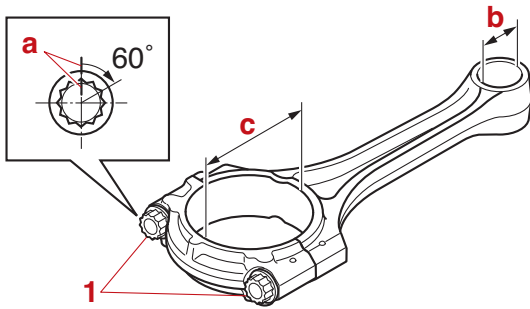
- Tighten the connecting rod bolts “1” to the specified torques in 2 stages.


- Measure the piston pin outside diameter “a” at measuring points “b”, “c”, and “d”, and in directions “e” and “f”.

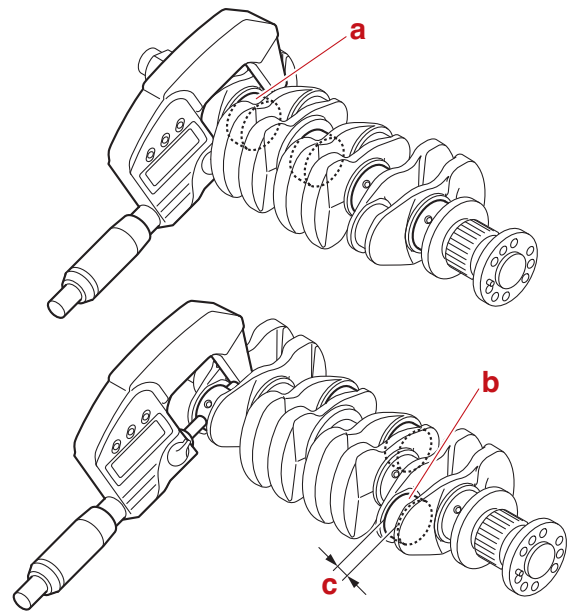
TIP: _____

- When checking the big end inside diameter, reuse the removed connecting rod bolts.
- In the second tightening stage for the connecting rod bolts “1”, mark the connecting rod bolts and the connecting rod cap with identification marks “a”, and then tighten the bolts 60° from the marks on the connecting rod cap.

- b. Measure the connecting rod small end inside diameter “b” and big end inside diameter “c”.

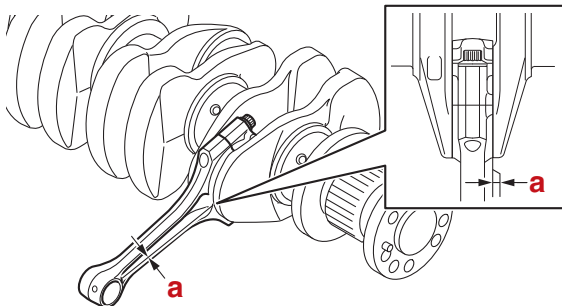



	<p>Connecting rod bolt “1” 1st: 13 N·m (1.3 kgf·m, 9.6 lb·ft) 2nd: 60°</p>
---	--




Checking the connecting rod big end side clearance

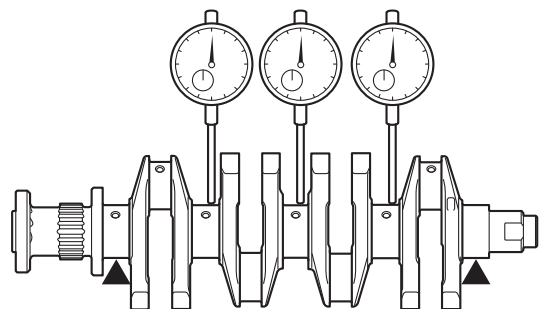
- Measure:
 - Connecting rod big end side clearance “a”
 Above specification → Check the crankshaft pin width.
 See “Checking the crankshaft” (7-52).



	<p>Big end side clearance 0.150–0.300 mm (0.0059–0.0118 in) Limit 0.35 mm (0.0138 in)</p>
---	--


	<p>Journal diameter 51.980–52.000 mm (2.0465–2.0472 in) Crankshaft pin diameter 46.980–47.000 mm (1.8496–1.8504 in) Crankshaft pin width 21.00–21.10 mm (0.8268–0.8307 in)</p>
--	---

- Measure:
 - Runout
 Above specification → Replace.



Checking the crankshaft


- Measure:
 - Crankshaft journal diameters “a”, crankshaft pin diameters “b”, and crankshaft pin widths “c”
 Out of specification → Replace.

	<p>Crankshaft Runout 0.03 mm (0.0012 in) Limit 0.04 mm (0.0016 in)</p>
---	--

Checking the big end oil clearance

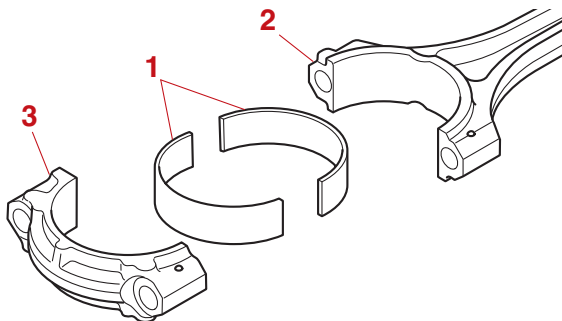
1. Measure:

- Big end oil clearance
Out of specification → Replace crankshaft pin bearing.
See “Selecting the crankshaft pin bearing” (7-54).

	Big end oil clearance
	0.017–0.040 mm (0.0007–0.0016 in)
	Limit
	0.070 mm (0.0028 in)

- Clean the crankshaft pin bearings, connecting rod, connecting rod cap, and crankshaft.
- Install the crankshaft pin bearings “1” into the connecting rod “2” and connecting rod cap “3”.

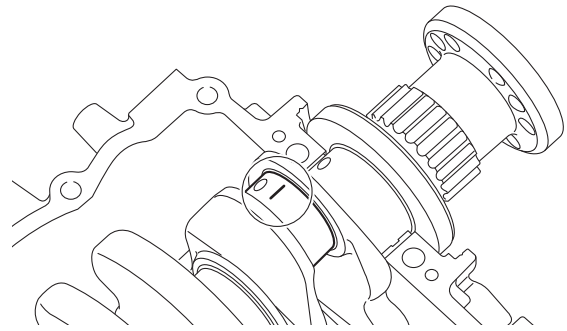
TIP: _____
Install the crankshaft pin bearings in their original positions.



- Place a piece of Plastigauge (PG-1) on the crankshaft pin, parallel to the crankshaft.

NOTICE

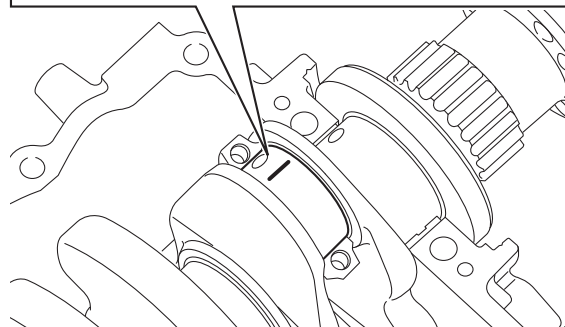
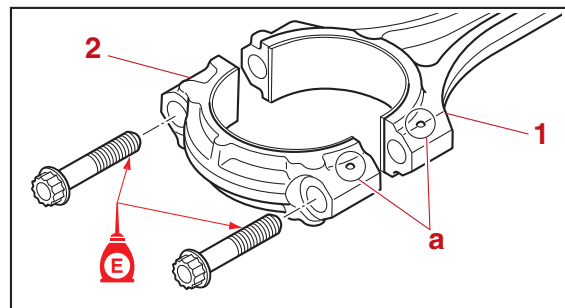
Do not place the Plastigauge (PG-1) over the oil hole in the crankshaft pin of the crankshaft.



- Install the connecting rod “1” and connecting rod cap “2” onto the crankshaft pin.

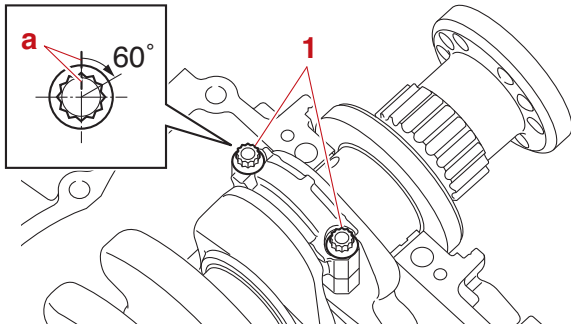
TIP: _____


- When checking the oil clearance, reuse the removed connecting rod bolts.
- Make sure that the protrusions “a” on the connecting rod “1” and connecting rod cap “2” face toward the flywheel magneto end of the crankshaft.
- Do not turn the connecting rod until the big end oil clearance measurement has been completed.



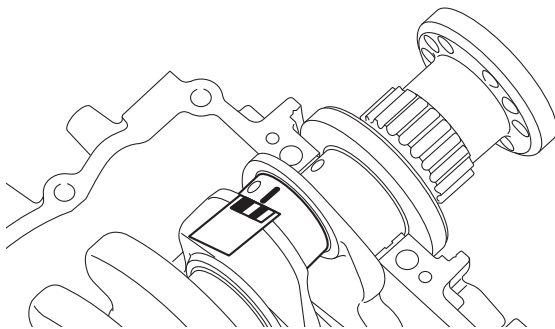
- Tighten the connecting rod bolts “1” to the specified torques in 2 stages.

TIP: _____
 In the second tightening stage for the connecting rod bolts “1”, mark the connecting rod bolts and the connecting rod cap with identification marks “a”, and then tighten the bolts 60° from the marks on the connecting rod cap.



	Connecting rod bolt “1”
	1st: 13 N·m (1.3 kgf·m, 9.6 lb·ft) 2nd: 60°

f. Remove the connecting rod cap, and then measure the width of the compressed Plastigauge (PG-1) on the crankshaft pin.



Selecting the crankshaft pin bearing

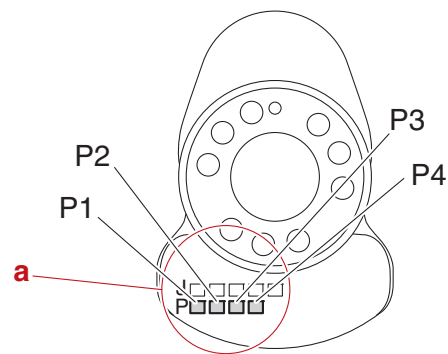
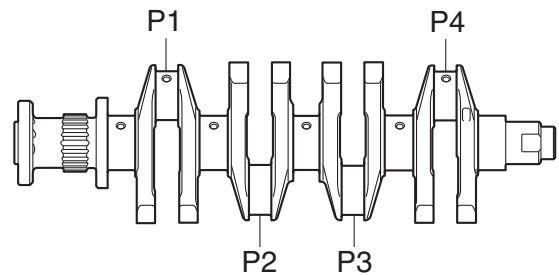
When replacing the crankshaft pin bearing, select the bearing as follows:

1. Select:
 - Crankshaft pin bearing
 - a. Measure the big end inside diameter. See “Checking the connecting rod small end inside diameter and big end inside diameter” (7-51).

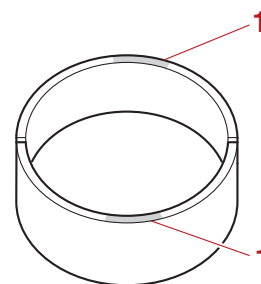
Example:

Connecting rod big end inside diameter	Number in table
50.042 mm	42

b. Check the crankshaft pin mark “a” on the crankshaft.



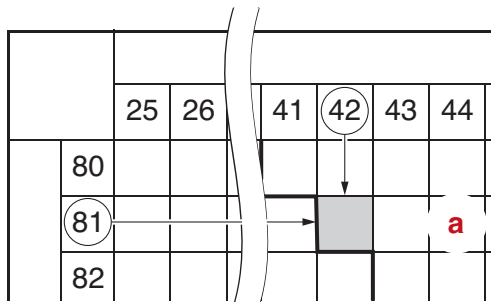
c. Select the suitable colors “1” for the crankshaft pin bearing from the “Crankshaft pin bearing selection table” (7-56).



	Rod side bearing color	Cap side bearing color
“a”	Black	Black
“b”	Red	Black
“c”	Red	Red
“d”	Blue	Red
“e”	Blue	Blue
“f”	Green	Blue
“g”	Green	Green
“h”	Yellow	Green
“i”	Yellow	Yellow

Example:

If the connecting rod big end inside diameter is “42” and the crankshaft pin mark is “81”, select the bearing colors in “a”. The rod side bearing color is black and the cap side bearing color is black.



Crankshaft pin bearing selection table


		A																				
		25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
B	80					■	■	■							■	■	■					
	81						■	■	■							■	■	■				a
	82							■	■	■							■	■	■			
	83	■								■	■	■							b	■	■	
	84	■	■								■	■	■							■	■	■
	85	■	■	■							■	■	■					c			■	■
	86		■	■	■							■	■	■							■	■
	87			■	■	■									■	■						■
	88				■	■	■									■	■					
	89					■	■	■								■	■	■				
	90						■	■	■								■	■	■			
	91							■	■	■								■	■	■		
	92	■	■								f	■	■	■						■	■	■
	93	■	■									■	■	■							■	■
	94	■	■	■									■	■	■						■	■
	95		■	■	■									■	■	■						■
	96			■	■	■									■	■	■					■
	97				■	■	■									■	■	■				
	98					■	■	■								■	■	■				
	99						■	■	■								■	■	■			
	00							■	■	■								■	■	■		

A. Connecting rod big end inside diameter
 B. Crankshaft pin mark

Checking the journal oil clearance

1. Measure:

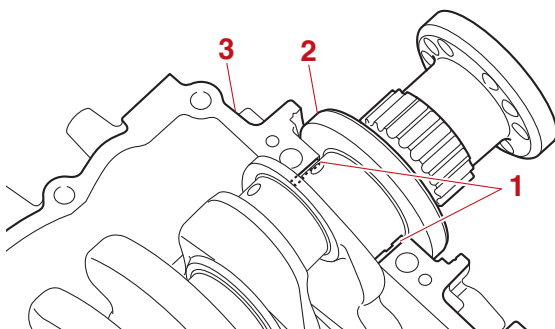
- Journal oil clearance
Out of specification → Replace crankshaft journal bearing.
See “Selecting the crankshaft journal bearing” (7-58).

	Journal oil clearance
	0.026–0.050 mm (0.0010–0.0020 in)
	Limit
	0.070 mm (0.0028 in)

- Clean the crankshaft journal bearings, crankshaft journals, and bearing portions of the crankcase and cylinder block.
- Place the cylinder block with the crankcase mating surface facing up.
- Install the crankshaft journal bearings “1” and crankshaft “2” into the cylinder block “3”.

TIP: _____

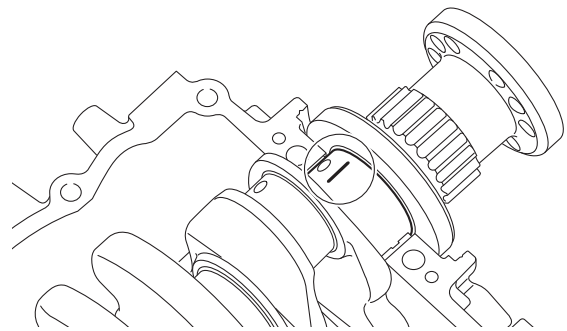
- Install the crankshaft journal bearings “1” in their original positions.
- Do not turn the crankshaft “2” until the journal oil clearance measurement has been completed.



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

NOTICE

Do not place the Plastigauge (PG-1) over the oil hole in each crankshaft journal.



- Install the crankshaft journal bearings into the crankcase.

TIP: _____

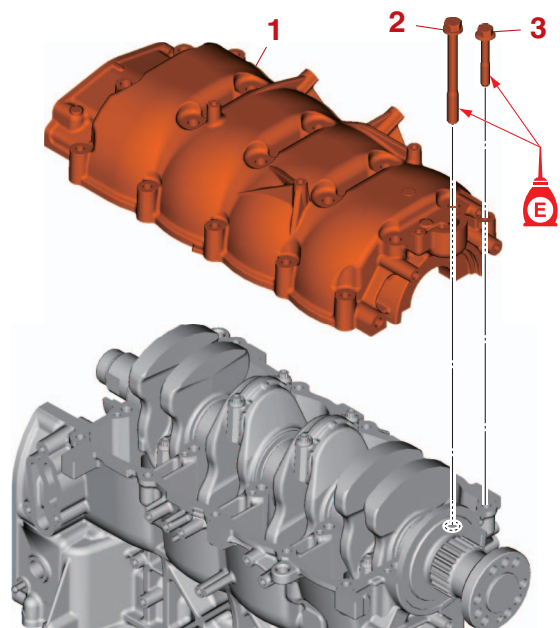
Install the crankshaft journal bearings in their original positions.

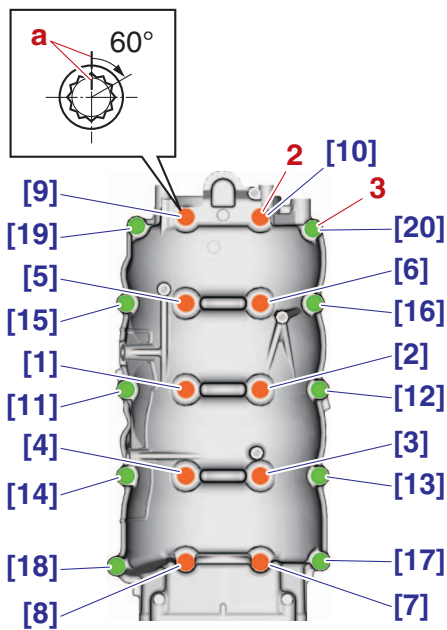
- Install the crankcase “1”, and then tighten the crankcase bolts (M10) “2” to the specified torques in 2 stages and in the order [1], [2], and so on.

TIP: _____

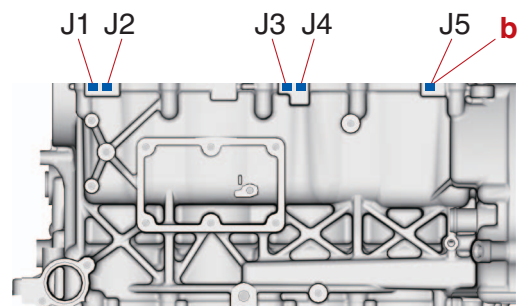
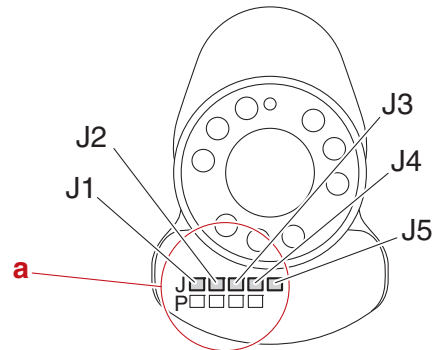
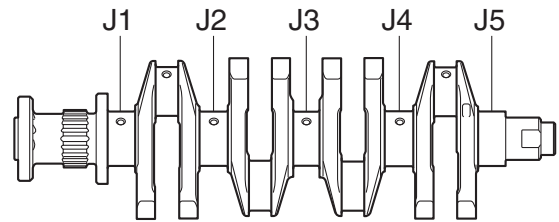
In the second tightening stage for the crankcase bolts (M10) “2”, mark the crankcase bolts (M10) and the crankcase “1” with identification marks “a”, and then tighten the bolts 60° from the marks on the crankcase.

- Tighten the crankcase bolts (M8) “3” to the specified torques in 2 stages and in the order [11], [12], and so on.



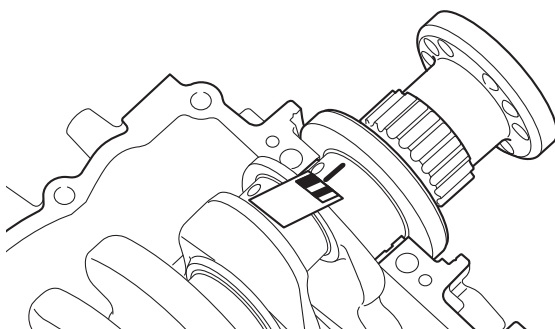


b. Check the mark “a” on the crank web and the mark “b” on the cylinder block.

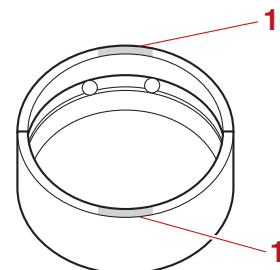


	Crankcase bolt (M10) “2” [1]–[10]
	1st: 16 N·m (1.6 kgf·m, 12 lb·ft) 2nd: 60°
	Crankcase bolt (M8) “3” [11]–[20]
	1st: 14 N·m (1.4 kgf·m, 10 lb·ft) 2nd: 28 N·m (2.8 kgf·m, 21 lb·ft)

h. Remove the crankcase, and then measure the width of the compressed Plastigauge (PG-1) on each crankshaft journal.



c. Select the suitable colors “1” for the crankshaft journal bearing from the “Crankshaft journal bearing selection table” (7-60).



Selecting the crankshaft journal bearing

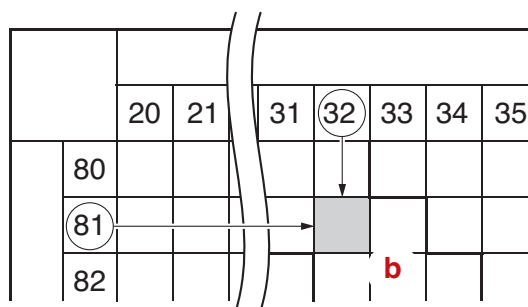
When replacing the crankshaft journal bearing, select the bearing as follows:

1. Select:
 - Crankshaft journal bearing
 - a. Remove the crankshaft journal bearings.

	Block side bearing color	Crankcase side bearing color
“a”	Black	Black
“b”	Black	Red
“c”	Red	Red
“d”	Red	Blue
“e”	Blue	Blue
“f”	Blue	Green
“g”	Green	Green
“h”	Green	Yellow
“i”	Yellow	Yellow

Example:

If the crank web mark is “81” and the cylinder block mark is “32”, select the bearing colors in “b”. The block side bearing color is black and the crankcase side bearing color is red.



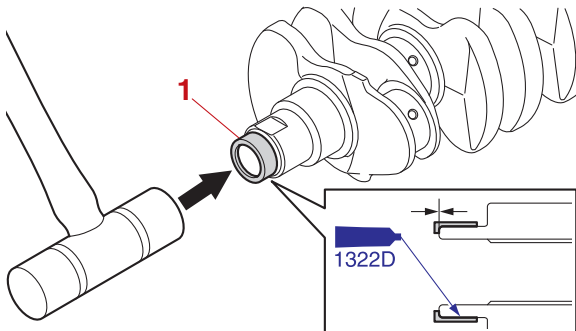
Crankshaft journal bearing selection table

		A																				
		20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38		
B	80		■	■	■							■	■	■								
	81			■	■	■							■	■	■							
	82				■	■	■							■	■	■			a			
	83					■		■							■							
	84						■	■	■							■			b	■		
	85							■	■	■								■	■	■		
	86	■							■	■	■					c			■	■	■	
	87	■	■							■	■	■								■	■	
	88	■	■	■							■										■	
	89		■	■	■																	
	90			■	■	■								■	■	■						
	91				■	■	■				e				■	■	■					
	92					■	■	■								■	■	■				
	93																■	■	■			
	94																	■	■	■		
	95	■																		■	■	■
	96	■	■																		■	■
	97	■	■	■																		■
	98																					
	99			■	■	■																
00	i				■	■	■															

- A. Cylinder block mark
- B. Crank web mark

Assembling the cylinder block

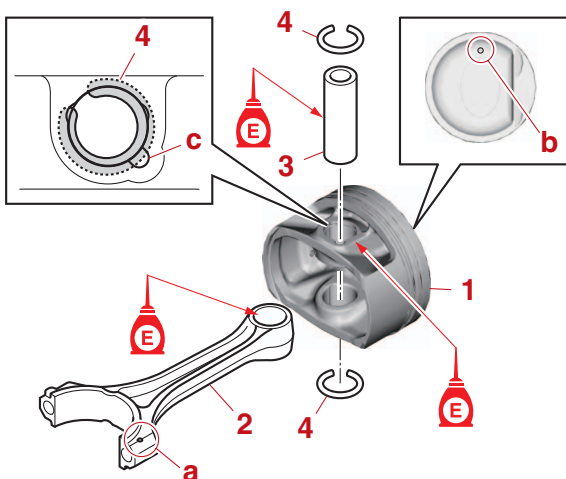
1. Install:
 - Collar **New**
 - a. Install a new collar "1" by striking it using a plastic hammer.



2. Assemble:
 - Piston "1"
 - Connecting rod "2"
 - Piston pin "3"
 - Clip "4" **New**

TIP:

- Face the protrusions "a" on the connecting rod "2" in the same direction as the mark "b" on the piston crown.
- Make sure that the clip "4" end is not aligned with the groove "c" in the piston pin boss.



3. Install:
 - Oil ring
 - 2nd ring
 - Top ring
 - a. Install the oil rings "1", 2nd ring "2", and top ring "3".

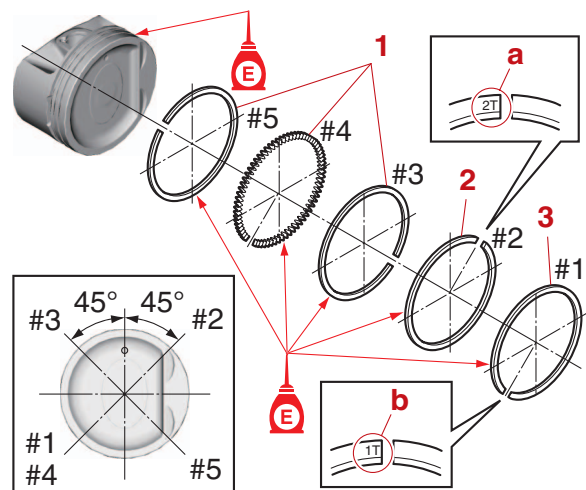
NOTICE

Do not scratch the pistons or break the piston rings.

TIP:

- Make sure that the "2T" mark "a" on the 2nd ring "2" and "1T" mark "b" on the top ring "3" are facing up.
- Make sure that the piston rings move smoothly.
- Do not deform the piston ring opening beyond the following specifications.
 - Oil ring: 11.7 mm (0.46 in)
 - 2nd ring: 21.6 mm (0.85 in)
 - Top ring: 20.0 mm (0.79 in)

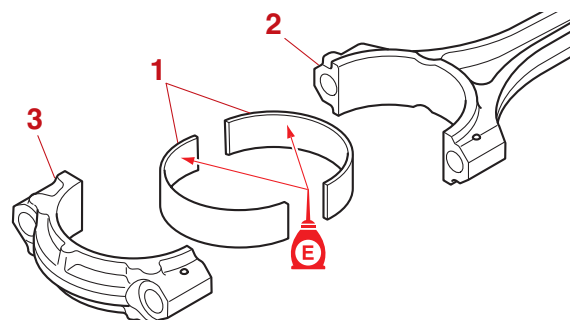
- b. Offset the piston ring end gaps.



4. Install:
 - Crankshaft pin bearing "1" (into the connecting rod "2" and connecting rod cap "3")

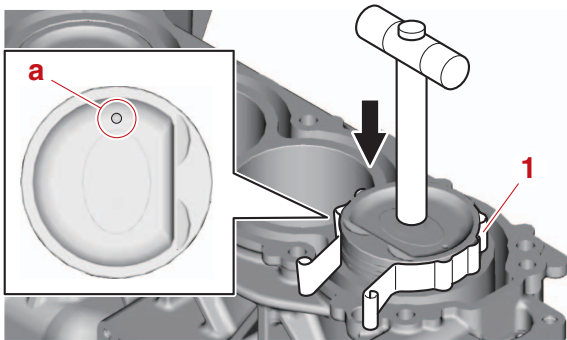
TIP:


Install the crankshaft pin bearings in the original positions.



5. Install:

- Piston
 - a. Apply engine oil to the side of the piston, piston rings, and cylinder wall, and then install the piston so that the mark “a” on the piston crown is facing toward the flywheel magneto end of the crankshaft.

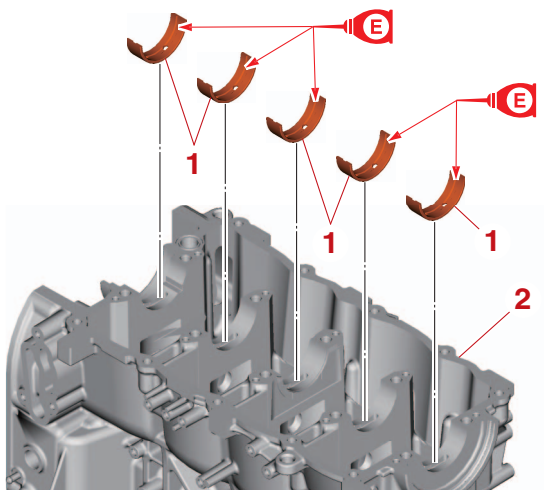


	Piston slider “1” 90890-06530
---	----------------------------------

6. Install:

- Crankshaft journal bearing “1” (into the cylinder block “2”)

TIP: Install the crankshaft journal bearings “1” in their original positions.

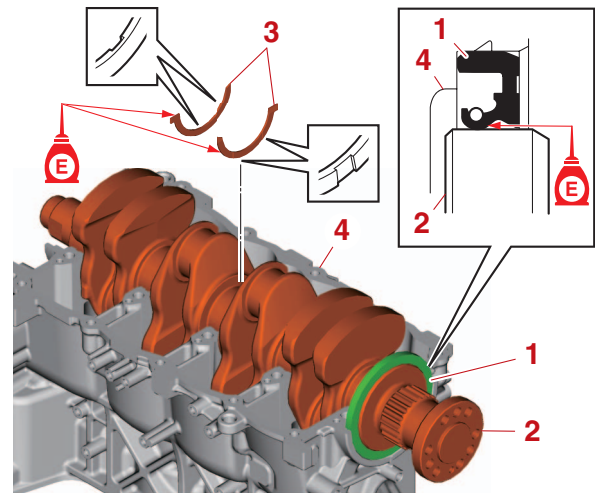


7. Install:

- Oil seal “1” **New** (into the crankshaft “2”)
- Crankshaft “2” (into the cylinder block “4”)
- Thrust bearing “3” (into the cylinder block “4”)

TIP:

- Make sure that each thrust bearing is installed with its notches facing outward.
- Slide the thrust bearing between the crankshaft and the cylinder block.

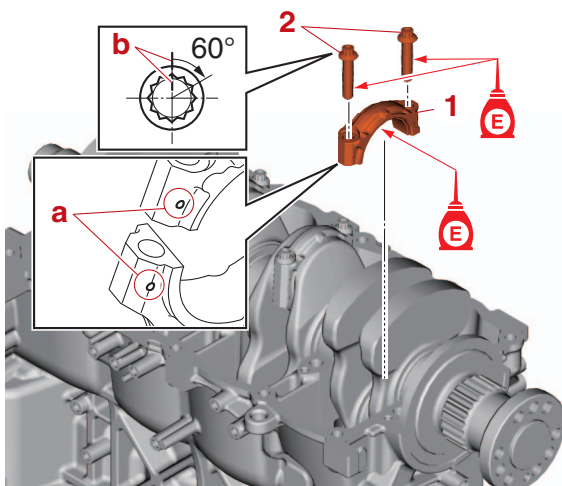



8. Install:

- Connecting rod cap
- Connecting rod bolt **New**
 - a. Install the connecting rod caps “1” to the piston and connecting rod assemblies, and then tighten new connecting rod bolts “2” to the specified torques in 2 stages.

TIP: _____

- Make sure that the protrusions “a” on the connecting rod and connecting rod caps “1” are facing toward the flywheel magneto end of the crankshaft.
- In the second tightening stage for the connecting rod bolts “2”, mark the connecting rod bolts and connecting rod cap with paint marks “b”, and then tighten the connecting rod bolts 60° from the marks on the connecting rod cap.
- After tightening the connecting rod bolts “2”, make sure that the crankshaft turns smoothly.

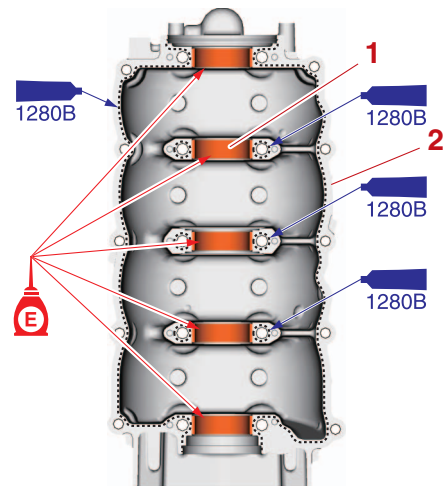


	<p>Connecting rod bolt “2”</p> <p>1st: 13 N·m (1.3 kgf·m, 9.6 lb·ft)</p> <p>2nd: 60°</p>
---	--

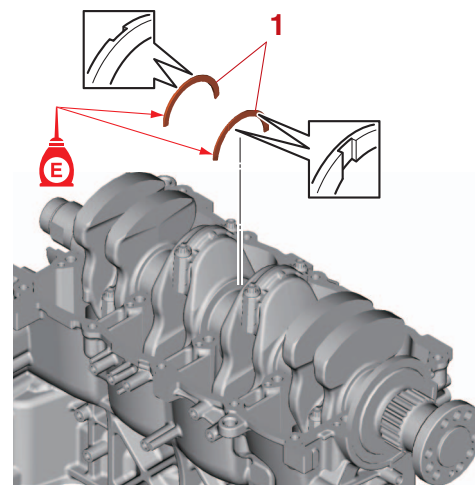
9. Install:
 - Dowel pin
10. Install:
 - Crankshaft journal bearing
 - Thrust bearing
 - O-ring **New**
 - Crankcase
 - Crankcase bolt (M10)
 - Crankcase bolt (M8)
 - a. Install the crankshaft journal bearings “1” onto the crankcase “2”.
 - b. Apply a thin, even layer of sealant onto the mating surface of the crankcase.

TIP: _____

- Install the crankshaft journal bearings “1” in their original positions.
- Do not apply any sealant to the crankshaft journal bearings “1”.



c. Install the thrust bearings “1”.



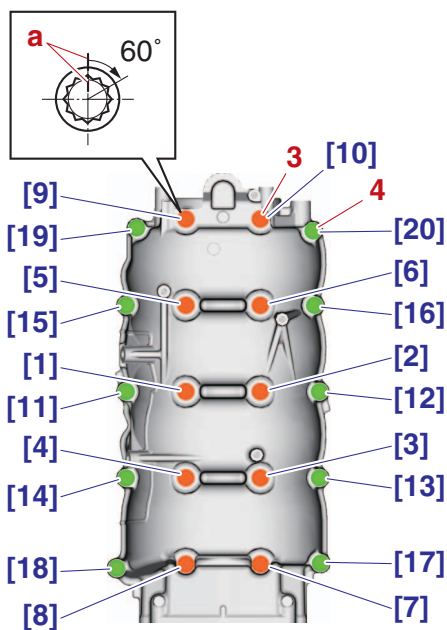
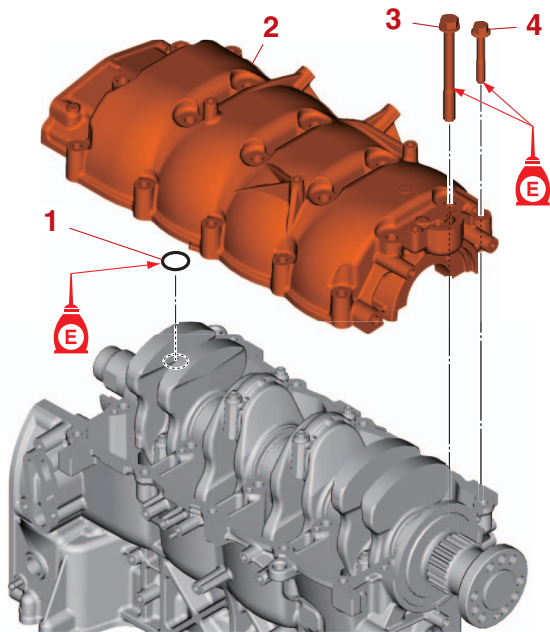
d. Install a new O-ring “1” and the crankcase “2”, and then tighten the crankcase bolts (M10) “3” to the specified torques in 2 stages and in the order [1], [2], and so on.


TIP: _____

In the second tightening stage for the crankcase bolts (M10) “3”, mark the crankcase bolts (M10) and the crankcase “2” with identification marks “a”, and then tighten the bolts 60° from the marks on the crankcase.

- e. Tighten the crankcase bolts (M8) “4” to the specified torques in 2 stages and in the order [11], [12], and so on.

TIP: After tightening the crankcase bolts “3” and “4”, make sure that the crankshaft turns smoothly.



	Crankcase bolt (M10) “3” [1]–[10] 1st: 16 N·m (1.6 kgf·m, 12 lb·ft) 2nd: 60°
	Crankcase bolt (M8) “4” [11]–[20] 1st: 14 N·m (1.4 kgf·m, 10 lb·ft) 2nd: 28 N·m (2.8 kgf·m, 21 lb·ft)

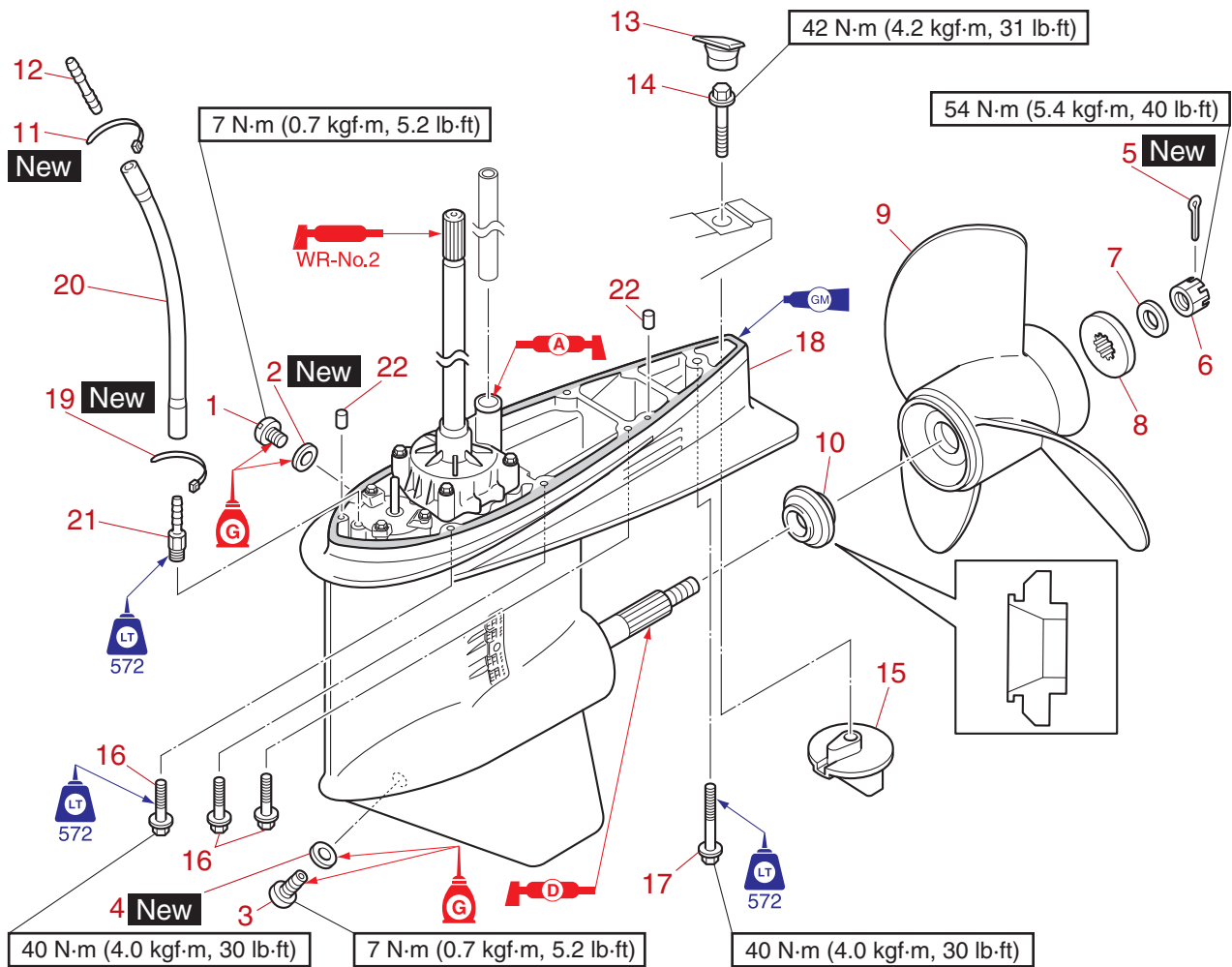
Lower unit

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Lower unit

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Lower unit



↑↓	Part name	Q'ty	Remarks
1	Oil level plug	1	
2	Gasket	1	
3	Drain screw	1	
4	Gasket	1	
5	Cotter pin	1	
6	Propeller nut	1	
7	Washer	1	
8	Spacer	1	
9	Propeller	1	
10	Spacer	1	
11	Plastic tie	1	
12	Hose joint	1	
13	Grommet	1	
14	Bolt M10 × 45 mm	1	
15	Trim tab	1	
16	Bolt M10 × 45 mm	6	
17	Bolt M10 × 70 mm	1	
18	Lower unit	1	

↑↓	Part name	Q'ty	Remarks
19	Plastic tie	1	
20	Speedometer hose	1	
21	Hose nipple	1	
22	Dowel pin	2	

Removing the lower unit

⚠ WARNING

- Make sure to disconnect the battery cables from the battery, and remove the clip from the engine shut-off switch.
- When removing the lower unit with the power unit installed, make sure to suspend the outboard motor. Otherwise, the outboard motor could fall suddenly and result in severe injuries.
- When loosening or tightening the propeller nut, do not hold the propeller using your hands.

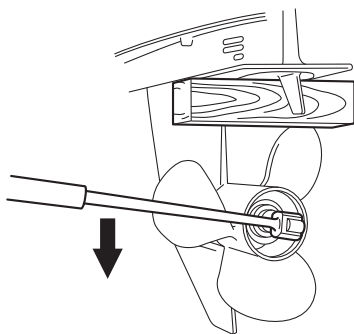
TIP:

When disassembling the lower unit, measure the backlash before disassembly. See “Measuring the forward gear backlash and reverse gear backlash before disassembly” (8-23).

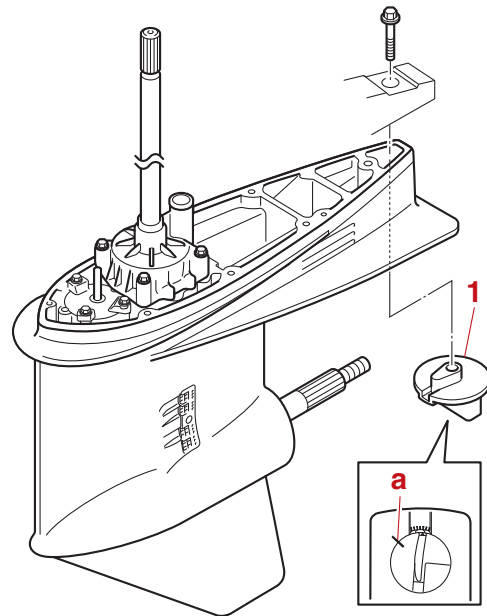
1. Drain:
 - Gear oil
See the latest edition of the owner’s manual.
2. Set the gear shift to the N position.
3. Remove:
 - Propeller nut

TIP:

Place a block of wood between the anti-cavitation plate and the propeller to prevent the propeller from turning.



4. Remove:
 - Trim tab bolt
 - Trim tab
 - a. Mark the trim tab “1” and lower case with an identification mark “a”, and then remove the trim tab “1”.



Checking the propeller

1. Check:
 - Propeller blade
 - Spline
 - Damper
Cracked/damaged/worn → Replace the propeller or dampers.

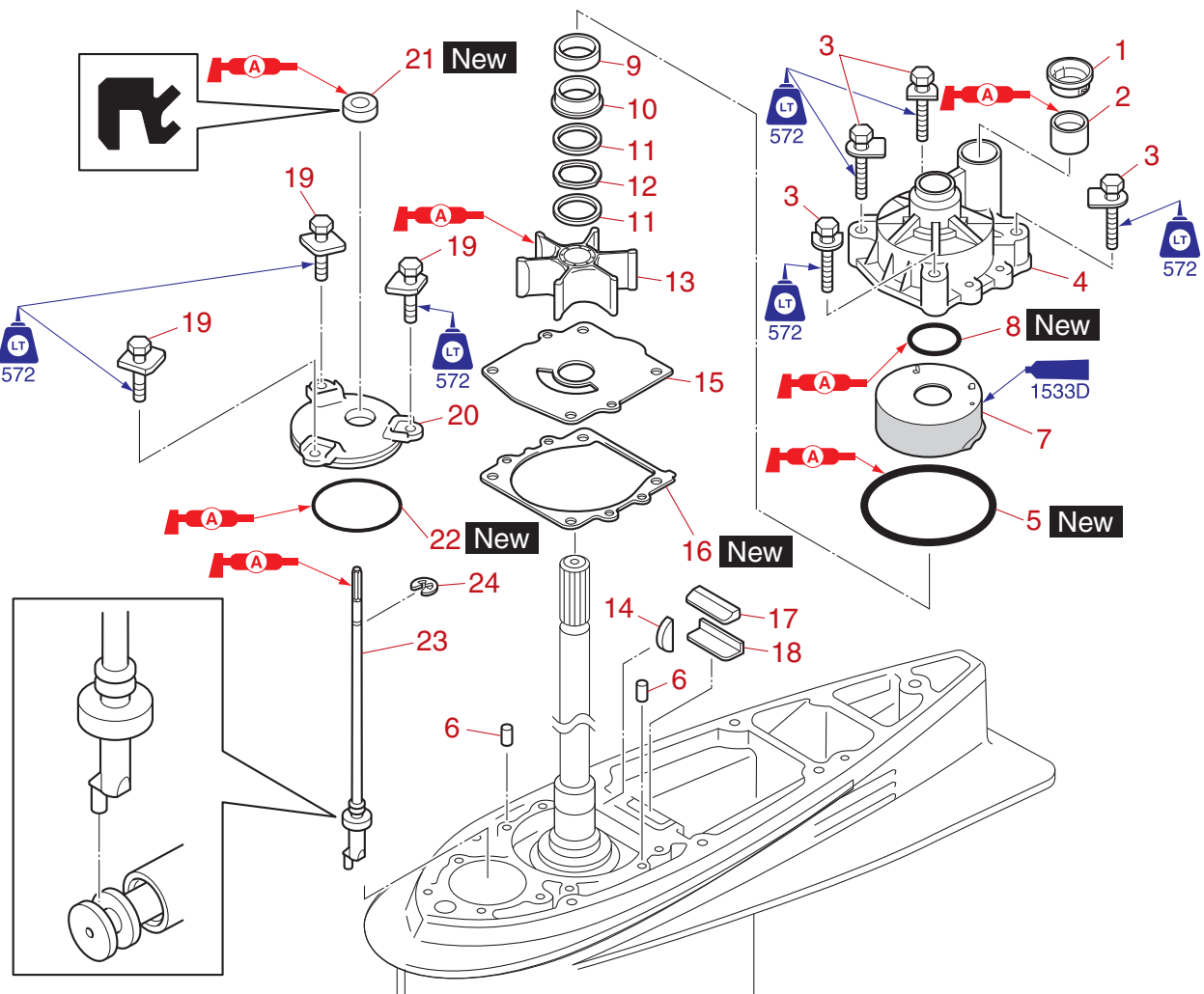
Checking the lower unit anode

1. Check:
 - Trim tab
Eroded (1/2 or more) → Replace.
There is grease, oil, or scales → Clean.

NOTICE

Do not apply grease, oil, or paint to the trim tab.

Water pump and shift rod

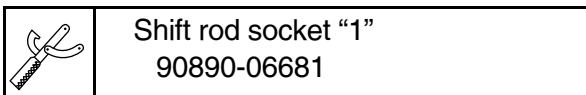
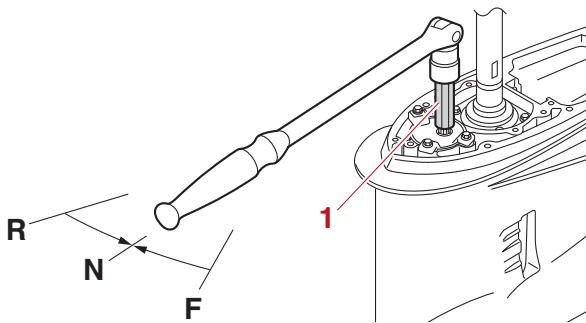


↑↓	Part name	Q'ty	Remarks
1	Cover	1	
2	Seal	1	
3	Bolt M8 × 45 mm	4	
4	Water pump housing	1	
5	O-ring	1	
6	Dowel pin	2	
7	Insert cartridge	1	
8	O-ring	1	
9	Collar	1	
10	Spacer	1	
11	Washer	2	
12	Wave washer	1	
13	Impeller	1	
14	Impeller key	1	
15	Outer plate cartridge	1	
16	Gasket	1	
17	Rubber seal	1	
18	Plate	1	

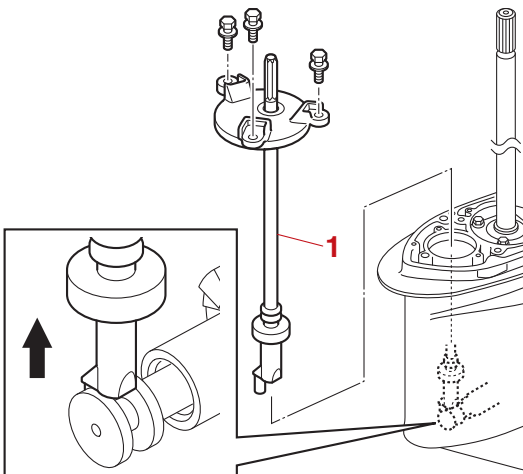
↑↓	Part name	Q'ty	Remarks
19	Bolt M6 × 20 mm	3	
20	Plate	1	
21	Oil seal	1	
22	O-ring	1	
23	Shift rod	1	
24	E-clip	1	

Removing the water pump and shift rod

1. Remove:
 - Shift rod
 - a. Set the gear shift to the N position.



- b. Remove the shift rod "1".



Checking the water pump and shift rod

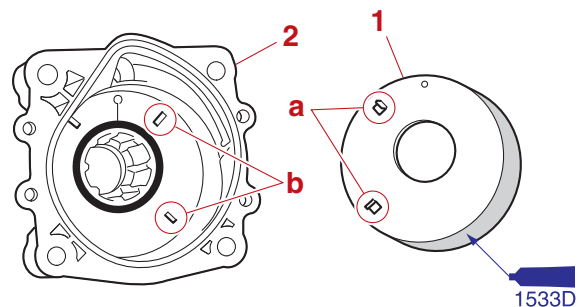
1. Check:
 - Water pump housing
Deformed → Replace.

TIP: _____
 If the engine overheats, the inside of the water pump housing may be deformed. Therefore, make sure to remove the insert cartridge when checking the water pump housing.

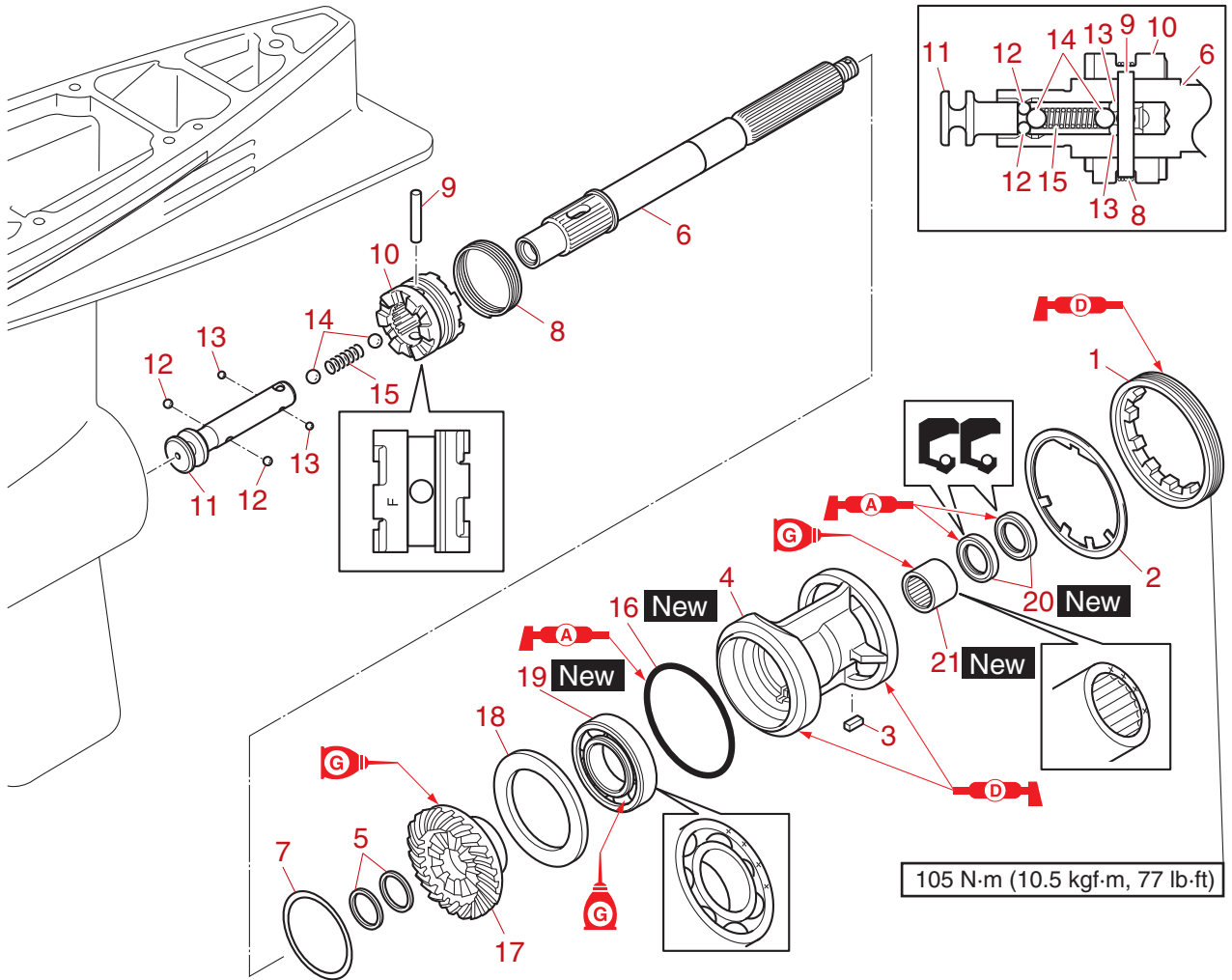
2. Check:
 - Impeller
 - Insert cartridge
Cracked/worn → Replace.
 - Impeller key
 - Keyway in the drive shaft
Deformed/worn → Replace.
 - Shift rod
Bent/cracked/worn → Replace.

Assembling the water pump housing

1. Install:
 - Seal (to the water pump housing)
 - Cover (to the water pump housing)
 - O-ring **New** (to the water pump housing)
2. Install:
 - Insert cartridge
 - a. Fit the protrusions "a" on the insert cartridge "1" into the slots "b" in the water pump housing "2".
 - b. Install the insert cartridge "1".



Propeller shaft housing



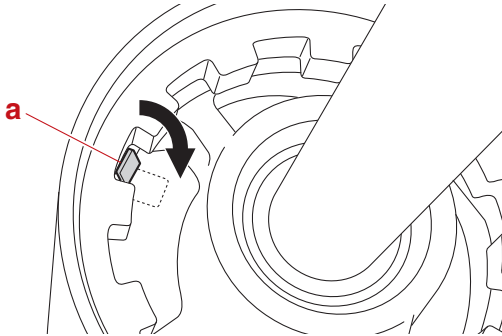
↑↓	Part name	Q'ty	Remarks
1	Ring nut M101.5	1	
2	Claw washer	1	
3	Key	1	
4	Propeller shaft housing	1	
5	Washer	2	
6	Propeller shaft	1	
7	Reverse gear shim (T2)	—	
8	Cross pin ring	1	
9	Cross pin	1	
10	Dog clutch	1	
11	Slider	1	

↑↓	Part name	Q'ty	Remarks
12	Ball 5.56 mm (0.22 in) *1	2	
13	Ball 4.76 mm (0.19 in) *1	2	
14	Ball 8.73 mm (0.34 in) *1	2	
15	Spring	1	
16	O-ring	1	
17	Reverse gear	1	
18	Thrust washer	1	
19	Ball bearing	1	
20	Oil seal	2	
21	Needle bearing	1	

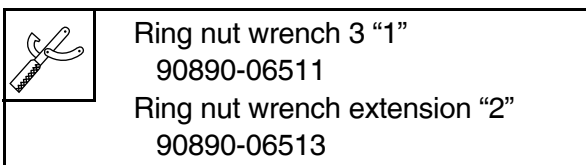
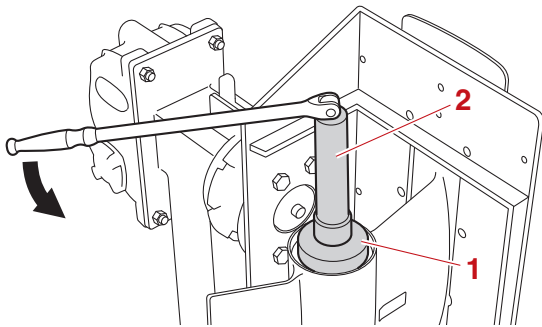
*1: Reference data

Removing the propeller shaft housing assembly

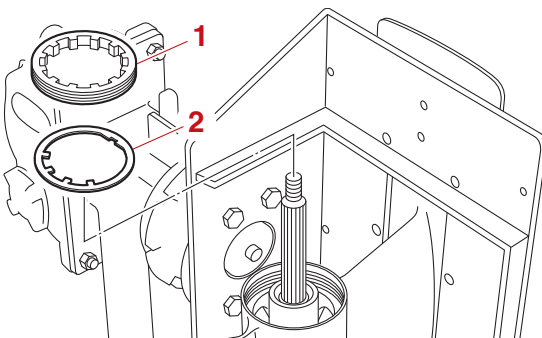
1. Remove:
 - Ring nut
 - Claw washer
 - a. Straighten the bent tab "a" on the claw washer.



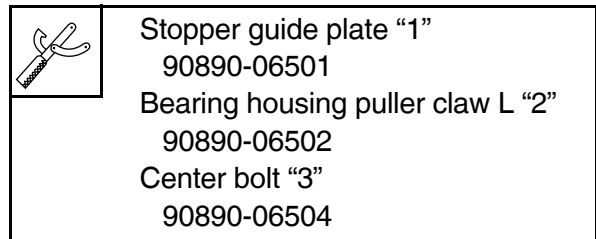
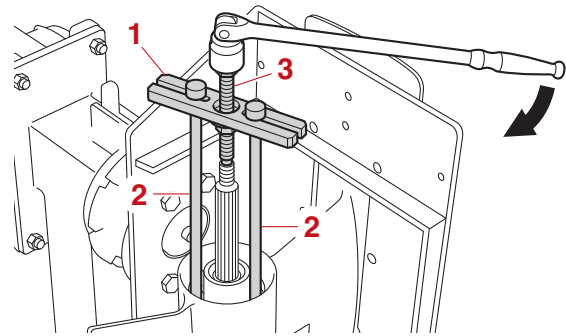
- b. Loosen the ring nut.



- c. Remove the ring nut "1" and claw washer "2".



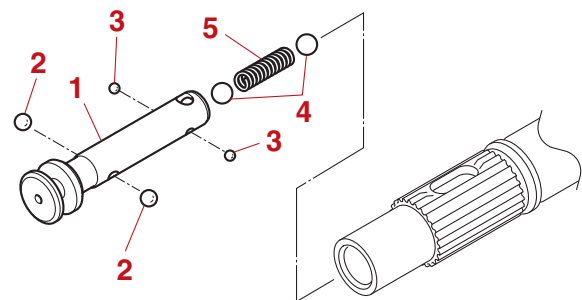
2. Remove:
 - Propeller shaft housing assembly
 - Key



Disassembling the propeller shaft assembly

1. Remove:
 - Slider "1"
 - Ball "2"
 - Ball "3"
 - Ball "4"
 - Spring "5"

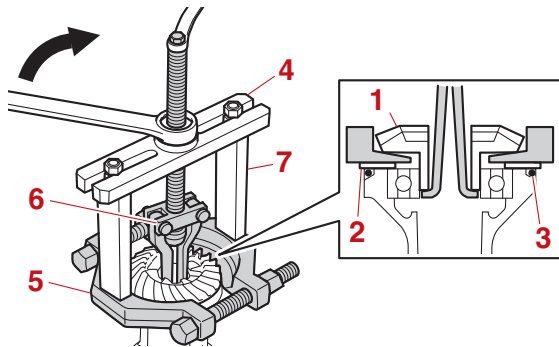
TIP: _____
When removing the slider "1", make sure that the balls do not fall out of position.




Disassembling the propeller shaft housing assembly

1. Remove:

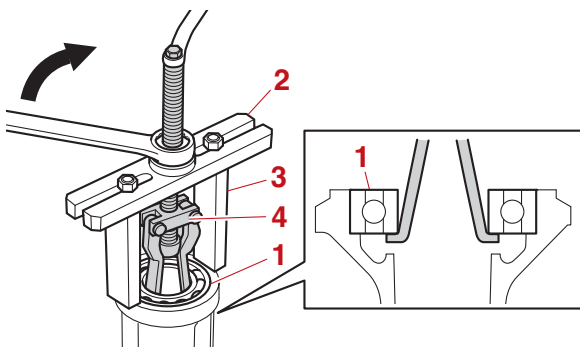
- Reverse gear "1"
- Thrust washer "2"
- O-ring "3"




	Stopper guide plate "4" 90890-06501
	Bearing separator "5" 90890-06534
	Bearing puller assembly "6" 90890-06535
	Stopper guide stand "7" 90890-06538

2. Remove:

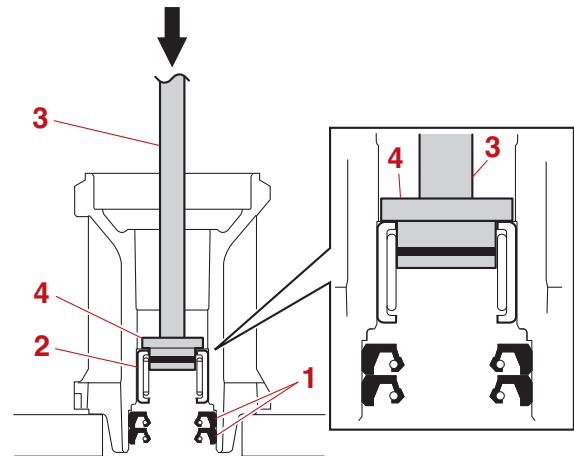
- Ball bearing "1"




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

3. Remove:

- Oil seal "1"
- Needle bearing "2"



	Driver rod L3 "3" 90890-06652
	Needle bearing attachment "4" 90890-06653

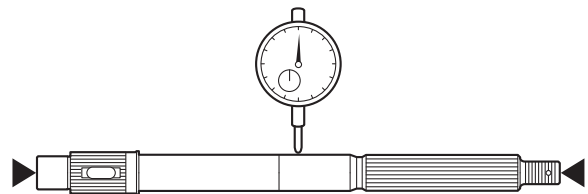
Checking the propeller shaft


1. Check:

- Propeller shaft
Damaged/worn → Replace.

2. Measure:

- Propeller shaft runout
Above specification → Replace.



	Propeller shaft Runout 0.02 mm (0.0008 in)
---	--

Checking the dog clutch

1. Check:
 - Dog clutch
 - Cross pin
 - Spring (in the slider)
 - Ball (in the slider)
 - Slider
 Cracked/worn → Replace.

Checking the propeller shaft housing

1. Check:
 - Propeller shaft housing
 Cracked/damaged → Replace.

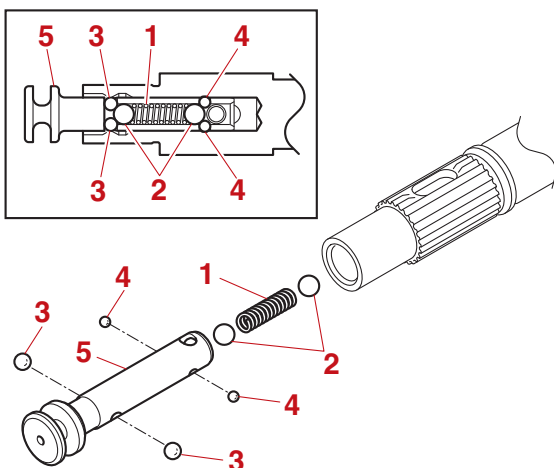
Checking the reverse gear

1. Check:
 - Teeth and dogs of the reverse gear
 Cracked/worn → Replace.

Assembling the propeller shaft assembly

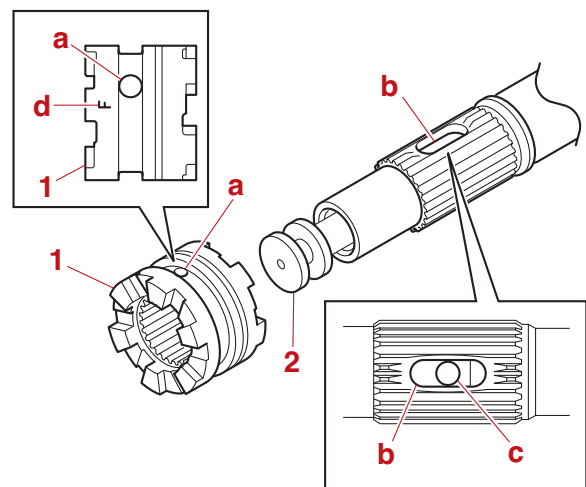
1. Install:
 - Spring "1"
 - Ball "2"
 - Ball "3"
 - Ball "4"
 - Slider "5"

TIP: _____
 When installing the slider "5", make sure that the balls do not fall out of position.

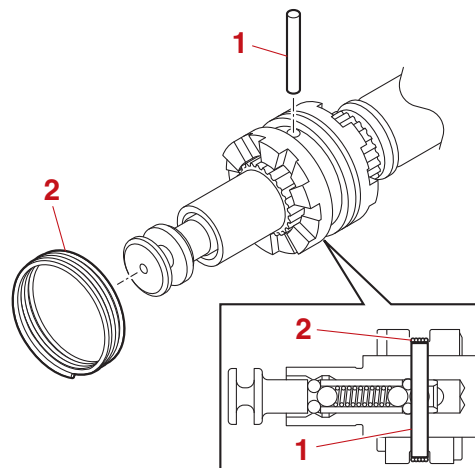


2. Install:
 - Dog clutch
 - Cross pin
 - Cross pin ring
 - a. Install the dog clutch "1" so that the hole "a" in the dog clutch "1" and the hole "b" in the propeller shaft are aligned with the hole "c" in the slider "2".

TIP: _____
 Install the dog clutch "1" so that the "F" mark "d" faces toward the slider "2" when installed.



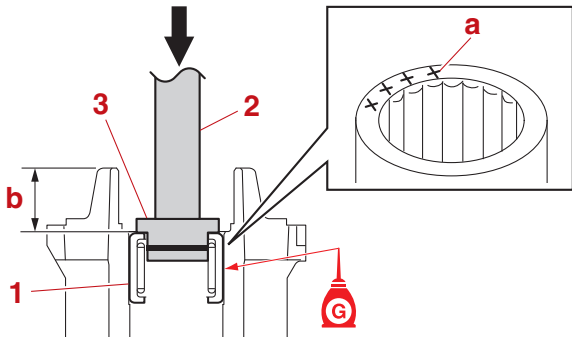
- b. Install the cross pin "1", and then install the cross pin ring "2".





Assembling the propeller shaft housing assembly

1. Install:
 - Needle bearing "1" **New** (into the propeller shaft housing)

TIP: _____
Face the bearing identification mark “a” on the needle bearing toward the propeller.

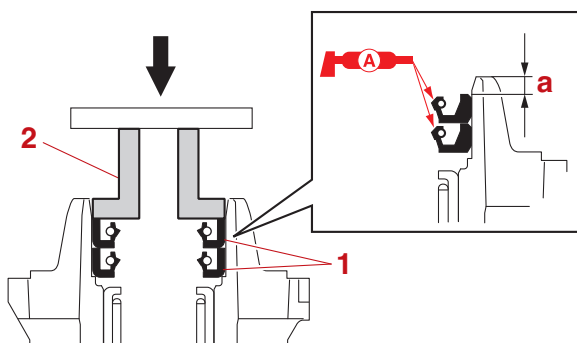



 Driver rod L3 “2”
90890-06652
Needle bearing attachment “3”
90890-06653


 Installation depth “b”
24.75–25.25 mm (0.974–0.994 in)

- Oil seal “1” **New** (into the propeller shaft housing)

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

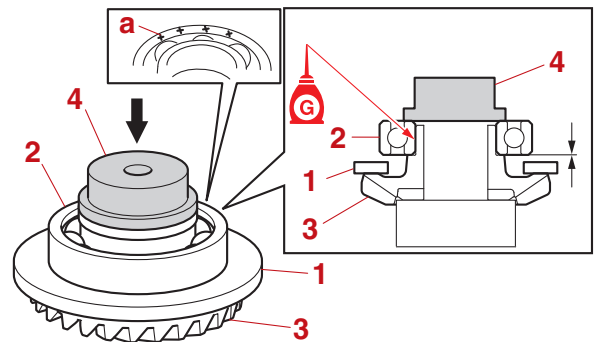



 Bearing inner race attachment “2”
90890-06640

 Installation depth “a”
4.75–5.25 mm (0.187–0.207 in)

2. Install:
 - Thrust washer “1”
 - Ball bearing “2” **New** (onto the reverse gear “3”)

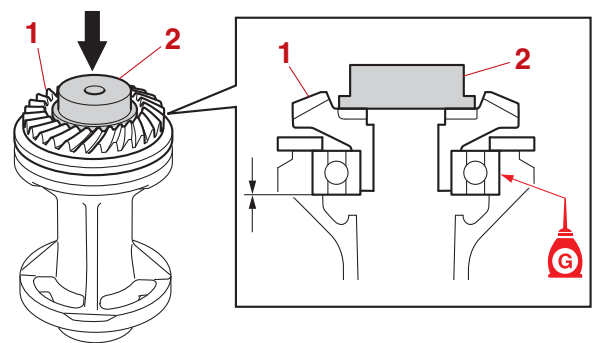
TIP: _____
Face the bearing identification mark “a” on the ball bearing toward the propeller.




 Needle bearing attachment “4”
90890-06607

3. Install:
 - Reverse gear assembly “1”

TIP: _____
After installation, check that the reverse gear turns smoothly.

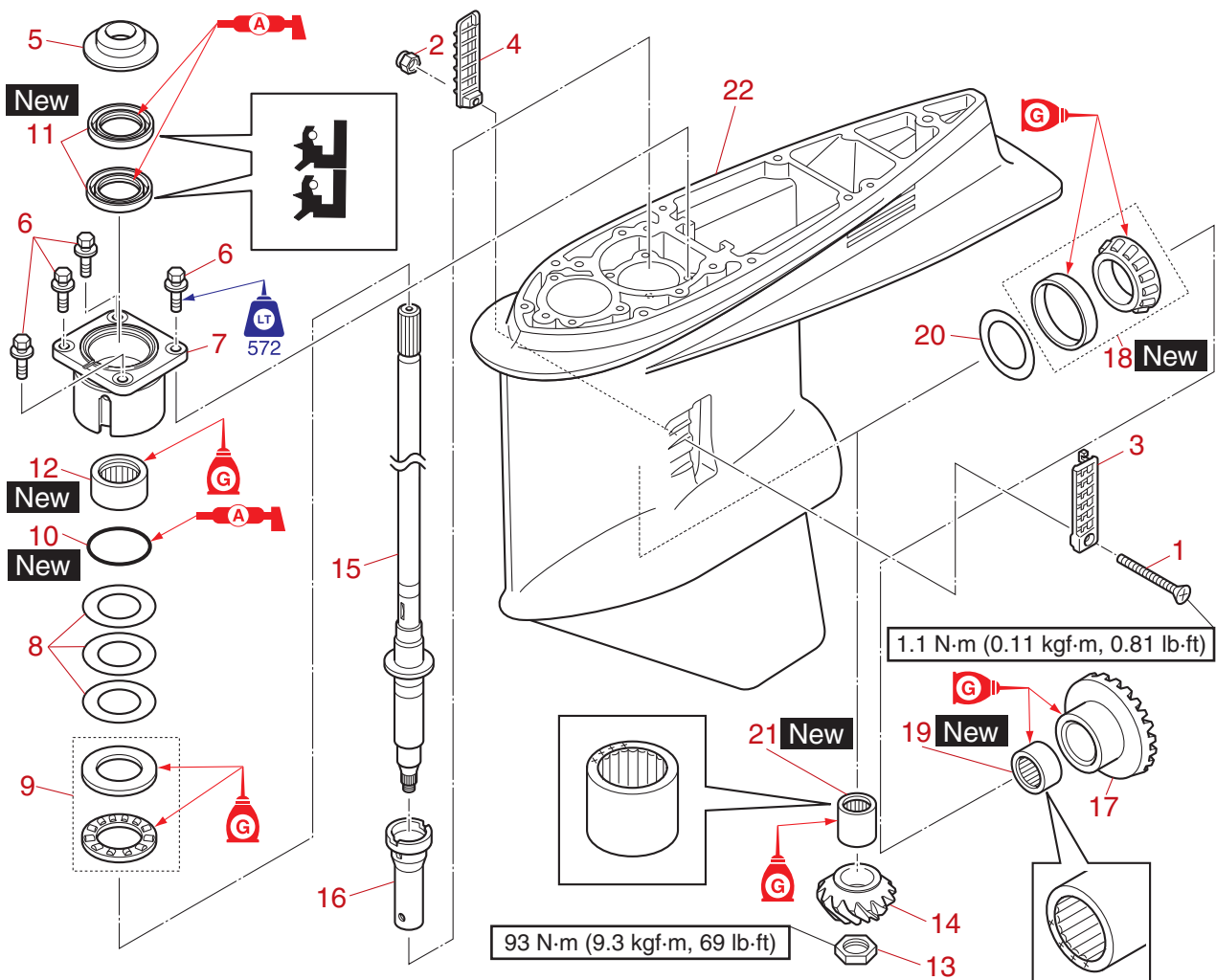


 Needle bearing attachment “2”
90890-06607

4. Check:
 - Reverse gear movement
 - Not smooth → Repeat from step (3).

5. Install:
 - O-ring **New** (to the propeller shaft housing)

Drive shaft and lower case

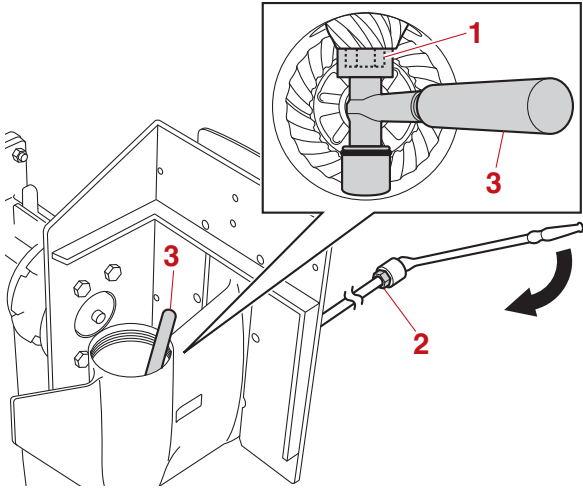



↑↓	Part name	Q'ty	Remarks
1	Screw M5 × 48 mm	1	
2	Self-locking nut	1	
3	Water inlet cover (PORT)	1	
4	Water inlet cover (STBD)	1	
5	Cover	1	
6	Bolt M8 × 25 mm	4	
7	Drive shaft housing	1	
8	Pinion shim (T3)	—	
9	Thrust bearing	1	
10	O-ring	1	
11	Oil seal	2	
12	Needle bearing	1	
13	Nut	1	
14	Pinion	1	
15	Drive shaft	1	
16	Sleeve	1	

↑↓	Part name	Q'ty	Remarks
17	Forward gear	1	
18	Tapered roller bearing	1	
19	Needle bearing	1	
20	Forward gear shim (T1)	—	
21	Needle bearing	1	
22	Lower case	1	

Removing the drive shaft

- 1. Loosen:
 - Pinion nut "1"

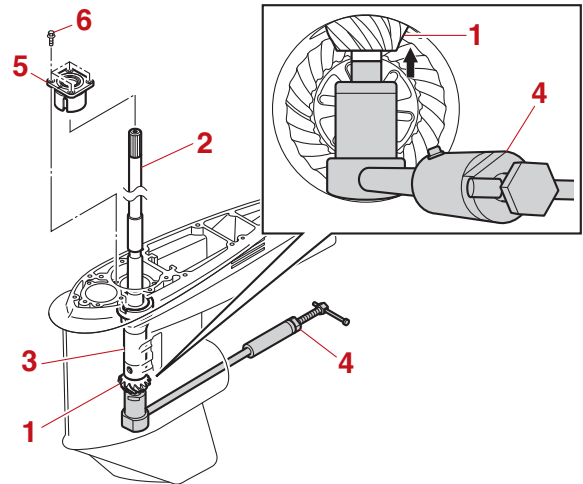



	Drive shaft holder 6 "2" 90890-06520 Pinion nut holder "3" 90890-06715
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- 2. Remove:
 - Pinion "1"
 - Drive shaft "2"
 - Sleeve "3"

TIP:

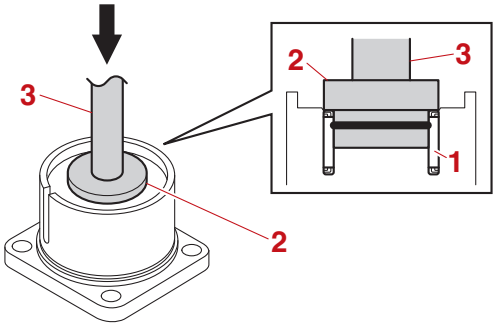
- Use the special service tool "4" if the drive shaft "2" cannot be removed manually.
- When using the special service tool "4", install the drive shaft housing "5" temporarily using the bolt "6" to prevent the drive shaft "2" from popping out, and then apply force to the drive shaft "2" gradually.




	Hydraulic drive shaft pusher "4" 90890-06688
---	---

Disassembling the drive shaft housing

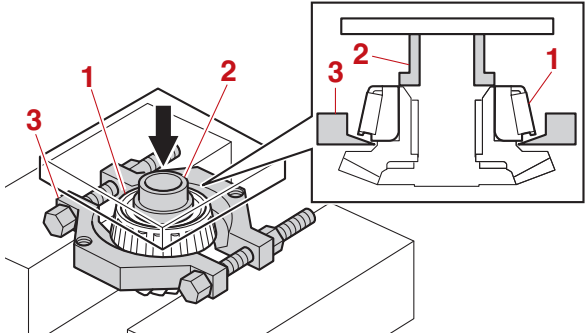
- 1. Remove:
 - Needle bearing "1"




	Needle bearing attachment "2" 90890-06610 Driver rod L3 "3" 90890-06652
--	--

Disassembling the forward gear

- 1. Remove:
 - Tapered roller bearing inner race "1"



	Bearing inner race attachment "2" 90890-06642 Bearing separator "3" 90890-06534
---	--

Disassembling the lower case

⚠ WARNING

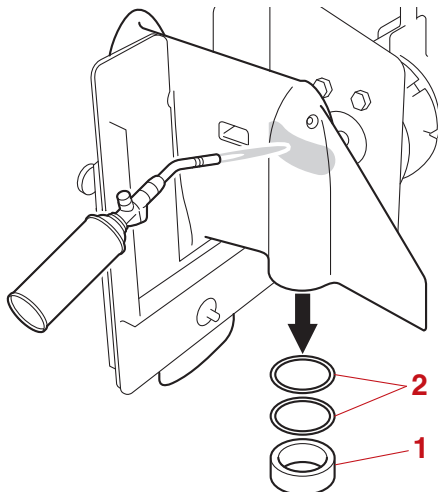
- Use heat-resistant gloves. Otherwise, burns could result.
- To prevent fires, remove any flammable substances, such as gasoline and oil, around the working area.
- Keep good ventilation while working.

1. Remove:

- Tapered roller bearing outer race
- Forward gear shim
 - a. Heat the area of the lower case where the tapered roller bearing outer race is to be removed using a gas torch, and then remove the tapered roller bearing outer race "1" and forward gear shims "2".

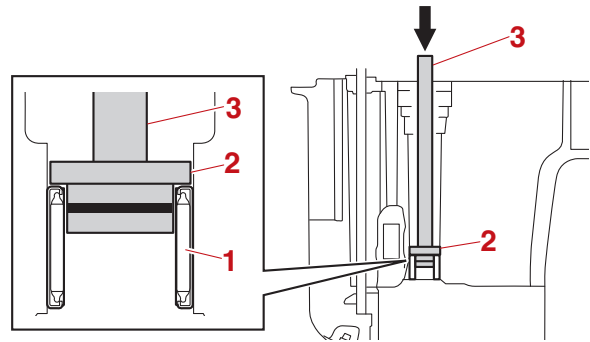
NOTICE

When heating the lower case, heat the entire installation area evenly. Otherwise, the paint on the lower case could be burned.



2. Remove:

- Needle bearing "1"



Needle bearing attachment "2"
90890-06609
Driver rod L3 "3"
90890-06652

Checking the pinion

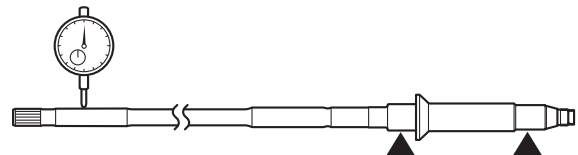
1. Check:
 - Teeth of the pinion
Cracked/worn → Replace.

Checking the forward gear

1. Check:
 - Teeth and dogs of the forward gear
Cracked/worn → Replace.

Checking the drive shaft

1. Check:
 - Drive shaft
Damaged/worn → Replace.
2. Measure:
 - Drive shaft runout
Above specification → Replace.



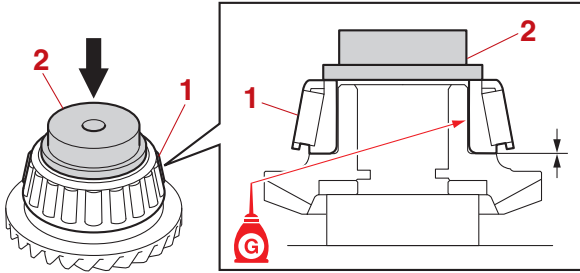
Drive shaft
Runout
1.0 mm (0.039 in)


Checking the lower case

1. Check:
 - Lower case
Cracked/damaged → Replace.

Assembling the forward gear

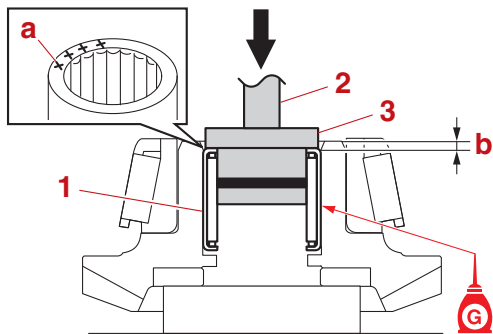
1. Install:
 - Tapered roller bearing inner race "1"
New





	Needle bearing attachment "2" 90890-06607
--	--

2. Install:
 - Needle bearing "1" **New**

TIP: _____
Face the bearing identification mark "a" on the needle bearing up.

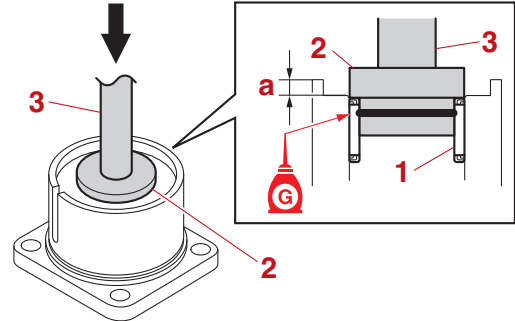



	Driver rod L3 "2" 90890-06652 Needle bearing attachment "3" 90890-06613
---	--


	Installation depth "b" 2.50–3.50 mm (0.0984–0.1378 in)
---	---

Assembling the drive shaft housing

1. Install:
 - Needle bearing "1" **New** (in the drive shaft housing)

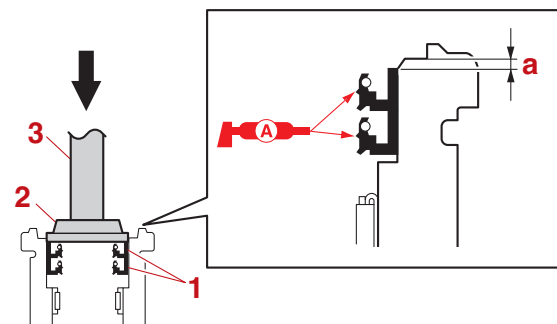



	Needle bearing attachment "2" 90890-06610 Driver rod L3 "3" 90890-06652
---	--


	Installation depth "a" 5.75–6.25 mm (0.226–0.246 in)
--	---

2. Install:
 - Oil seal "1" **New** (in the drive shaft housing)

TIP: _____
Install an oil seal halfway into the drive shaft housing, and then install the other oil seal.



	Bearing outer race attachment "2" 90890-06628 Driver rod LS "3" 90890-06606
---	--

	Installation depth "a" 0.25–0.75 mm (0.010–0.030 in)
---	---

Drive shaft and lower case

3. Install:
 - O-ring **New** (to the drive shaft housing)

Assembling the lower case

WARNING

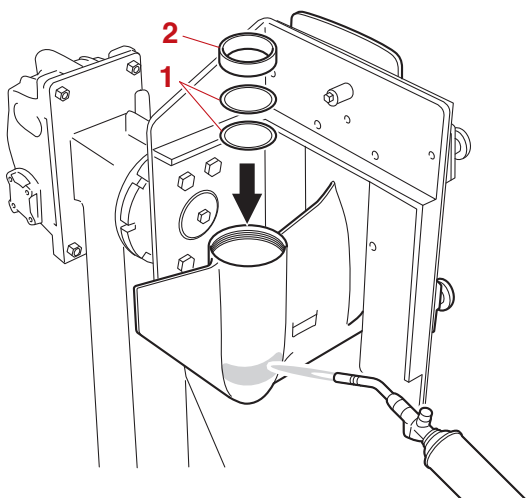
- Use heat-resistant gloves. Otherwise, burns could result.
- To prevent fires, remove any flammable substances, such as gasoline and oil, around the working area.
- Keep good ventilation while working.

1. Install:
 - Forward gear shim
 - Tapered roller bearing outer race **New**
 - a. Install the original forward gear shims "1".
 - b. Heat the area of the lower case where the tapered roller bearing outer race is to be installed using a gas torch, and then install a new tapered roller bearing outer race "2".

NOTICE

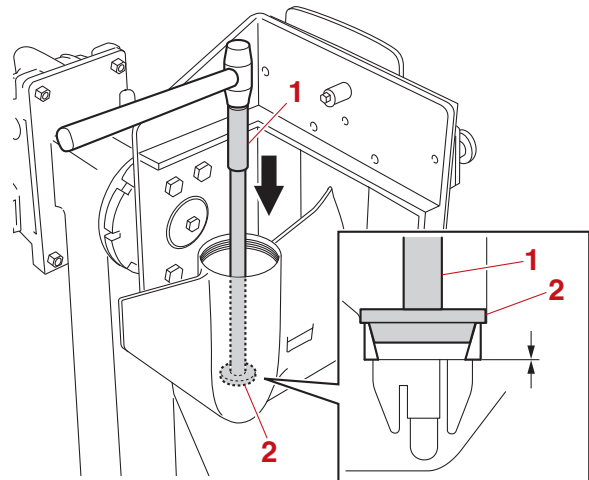
When heating the lower case, heat the entire installation area evenly. Otherwise, the paint on the lower case could be burned.


TIP: _____
Do not reuse a shim if deformed or scratched.



- c. While holding the special service tool "1", strike the tool to check that the tapered roller bearing outer race is installed properly.

TIP: _____
If a high-pitched metallic sound is produced when the special service tool is struck, the outer race is installed properly.

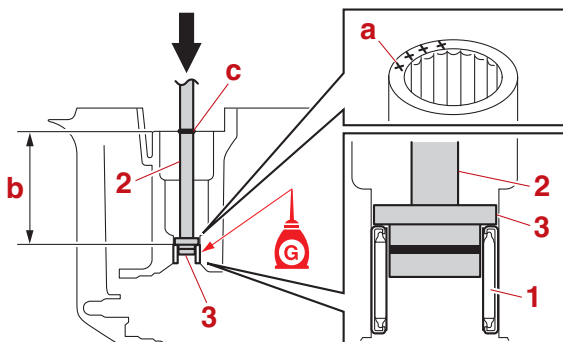



	Driver rod LL "1" 90890-06605
	Bearing outer race attachment "2" 90890-06620


2. Install:
 - Needle bearing "1" **New** (in the lower case)

TIP: _____

- Face the bearing identification mark “a” on the needle bearing up.
- Mark the driver handle at the specified installation depth “b” with an identification mark “c”, and then install the needle bearing to the specified installation depth. Make sure to measure the depth on the driver handle from the flange bottom of the special service tool “2”.




	Driver rod L3 “2” 90890-06652 Needle bearing attachment “3” 90890-06609
---	--

	Installation depth “b” 167.75–168.25 mm (6.604–6.624 in)
---	---

3. Install:
- Water inlet cover (PORT)
 - Water inlet cover (STBD)
 - Self-locking nut
 - Water inlet cover screw

TIP: _____

After installing the water inlet covers, make sure that there is no rattling.

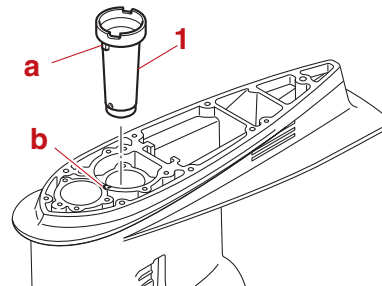
	Water inlet cover screw 1.1 N·m (0.11 kgf·m, 0.81 lb·ft)
---	---

Installing the drive shaft

1. Install:
- Forward gear assembly
 - Sleeve “1”

TIP: _____

Make sure that the protrusion “a” on the sleeve “1” is aligned with the slot “b” in the lower case.



2. Install:
- Drive shaft
 - Thrust bearing
 - Pinion shim
 - Pinion
 - Pinion nut (temporarily tighten)

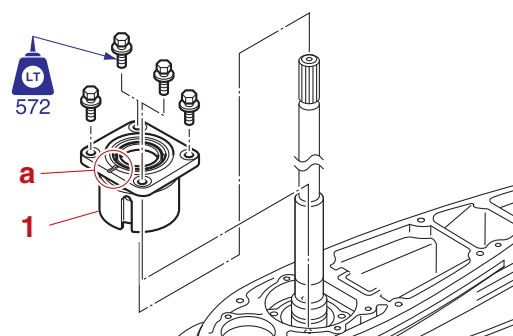
TIP: _____

When installing the pinion, lift up the drive shaft slightly and align the splines on the drive shaft with the splines on the pinion.

3. Install:
- Drive shaft housing “1”
 - Drive shaft housing bolt

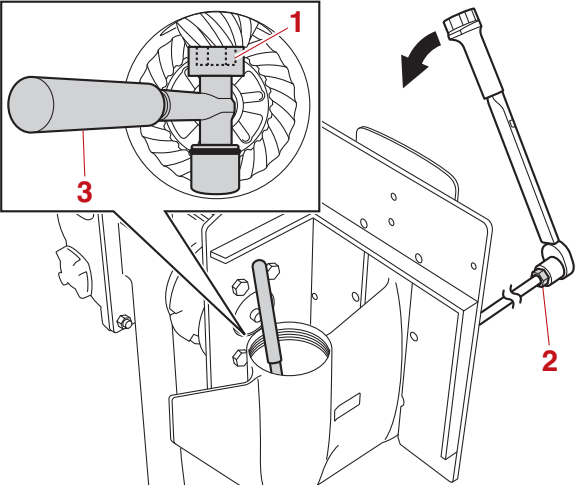
TIP: _____


Make sure to face the cutout “a” in the drive shaft housing “1” forward.




4. Install:
- Cover

5. Tighten:
- Pinion nut "1"



	Drive shaft holder 6 "2" 90890-06520 Pinion nut holder "3" 90890-06715
---	---

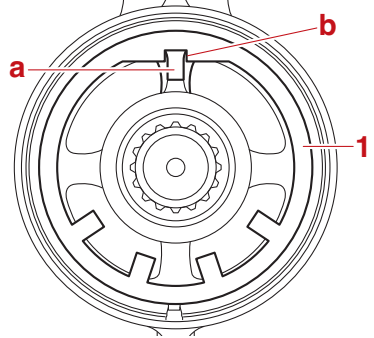
	Pinion nut "1" 93 N·m (9.3 kgf·m, 69 lb·ft)
---	--

6. Check:
- Drive shaft movement
- Not smooth → Repeat from step (1).

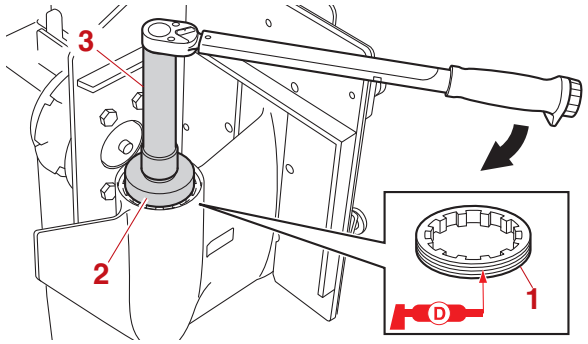
Installing the propeller shaft housing assembly


1. Install:
 - Washer (to the propeller shaft)
 - Propeller shaft assembly (to the propeller shaft housing assembly)
 - Reverse gear shim
 - Propeller shaft housing assembly
 - Key
2. Install:
 - Claw washer
 - Ring nut
 - a. Install the claw washer "1".


TIP: _____
 Make sure to fit the protrusion "a" on the propeller shaft housing into the slot "b" in the claw washer "1".



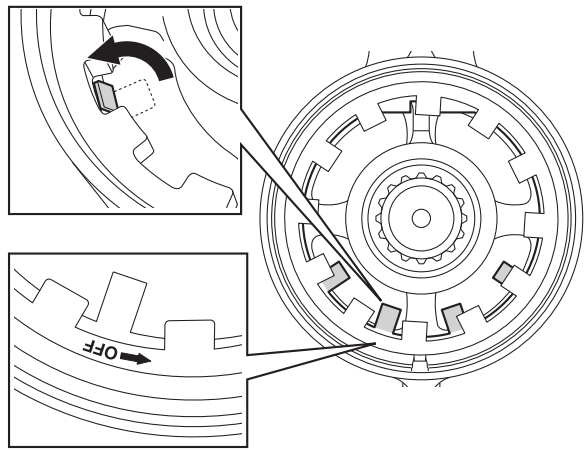
- b. Install the ring nut "1", and then tighten it to the specified torque.



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

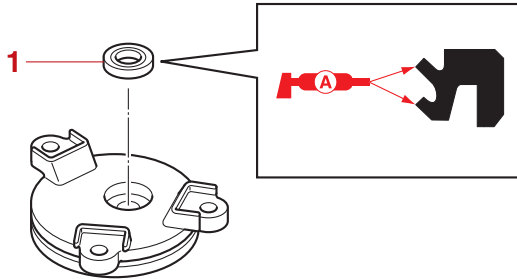
	Ring nut "1" 105 N·m (10.5 kgf·m, 77 lb·ft)
---	--

- c. Bend one of the 4 tabs on the claw washer outward, and then bend the other 3 tabs inward.



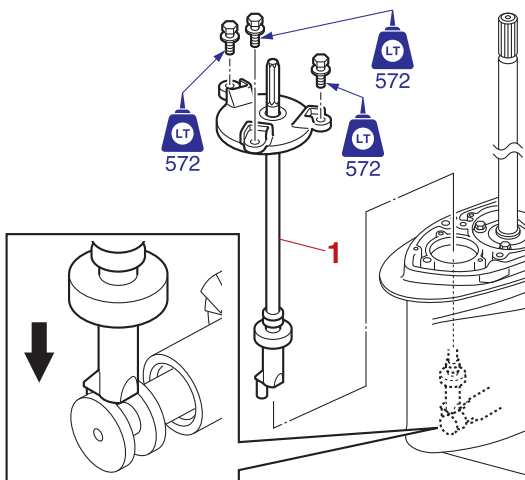
Installing the shift rod

1. Install:
 - O-ring **New** (to the shift rod plate)
 - Oil seal "1" **New**



2. Install:
 - E-clip (to the shift rod)
 - Shift rod plate (to the shift rod)
 - Shift rod "1"
 - Shift rod plate bolt

TIP: _____
 Make sure to install the shift rod "1" in the proper orientation.

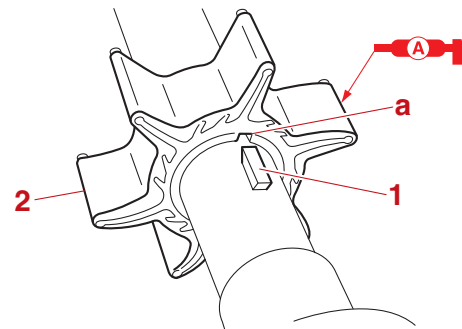


3. Check:
 - Shift rod movement
 Not smooth → Repeat from step (1).

Installing the water pump

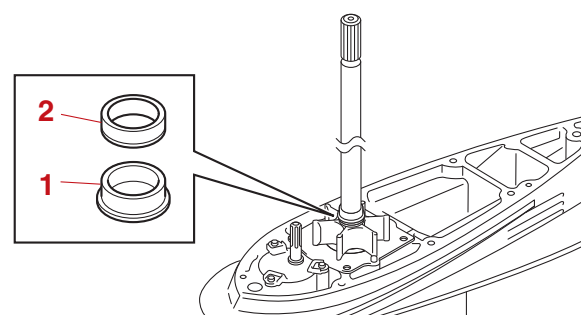
1. Install:
 - Plate
 - Rubber seal
 - Dowel pin
 - Gasket **New** (to the outer plate cartridge)
 - Outer plate cartridge

2. Install:
 - Impeller key
 - Impeller
 - a. Install the impeller key "1".
 - b. Align the slot "a" in the impeller "2" with the impeller key "1", and then install the impeller "2".



3. Install:
 - Washer
 - Wave washer
 - Spacer "1"
 - Collar "2"

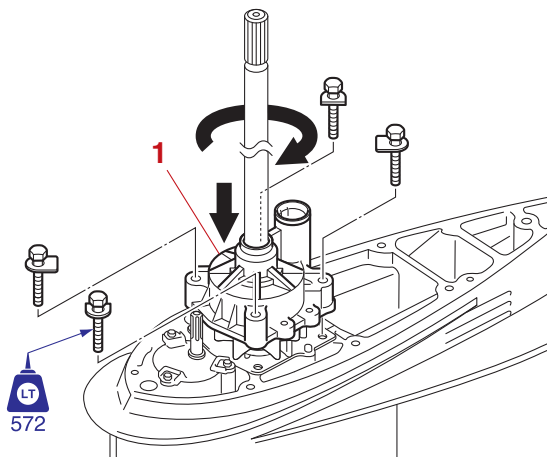
TIP: _____
 The spacer "1" and collar "2" should fit together firmly.



4. Install:
 - O-ring **New** (to the water pump housing)
 - Water pump housing "1"
 - Water pump housing bolt

NOTICE _____
 Do not turn the drive shaft counterclockwise. Otherwise, the water pump impeller could be damaged.

TIP: _____
 While turning the drive shaft clockwise, push the water pump housing down to install it.



	Lower unit
	Holding pressure
	68.6 kPa (0.69 kgf/cm ² , 9.9 psi)

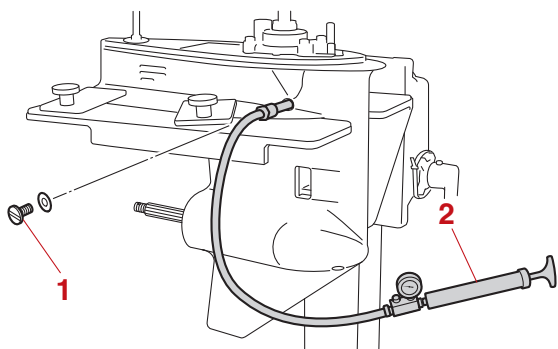
Installing the lower unit

WARNING

- Make sure to disconnect the battery cables from the battery, and remove the clip from the engine shut-off switch.
- When installing the lower unit with the power unit installed, make sure to suspend the outboard motor. Otherwise, the outboard motor could fall suddenly and result in severe injuries.
- When loosening or tightening the propeller nut, do not hold the propeller using your hands.

Checking the lower unit for air leakage

1. Check:
 - No air leakage
 Air leakage → Repair the location of the leak.
 - a. Remove the oil level plug “1”, and then install the leakage tester “2”.

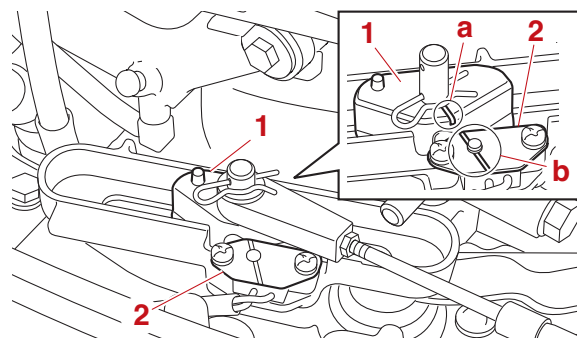


	Leakage tester “2”
	90890-06840
	Leakage tester “2” (commercially available)

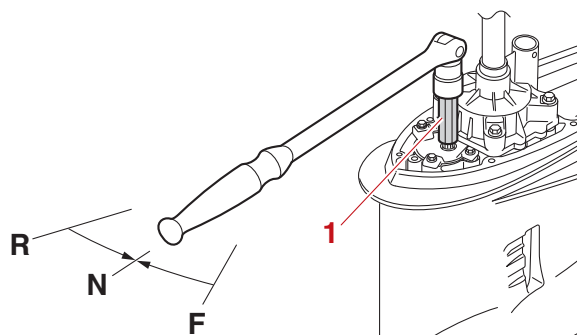
- b. Apply the specified pressure. Check that the pressure is maintained in the lower unit for 10 seconds or more.

NOTICE _____
 Do not overpressurize the lower unit. Otherwise, the oil seals could be damaged.

1. Check that the mark “a” on the bushing “1” is aligned with the mark “b” on the plate “2”.




2. Set the gear shift to the N position.

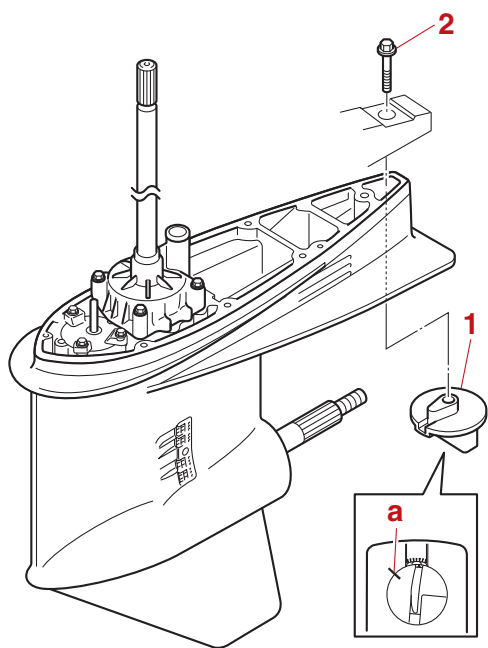



	Shift rod socket “1”
	90890-06681

3. Install:
- Dowel pin
 - Hose nipple
 - Speedometer hose
 - Hose joint
 - Plastic tie **New**
 - Lower unit
 - Lower case mounting bolt

	Lower case mounting bolt 40 N·m (4.0 kgf·m, 30 lb·ft)
---	--

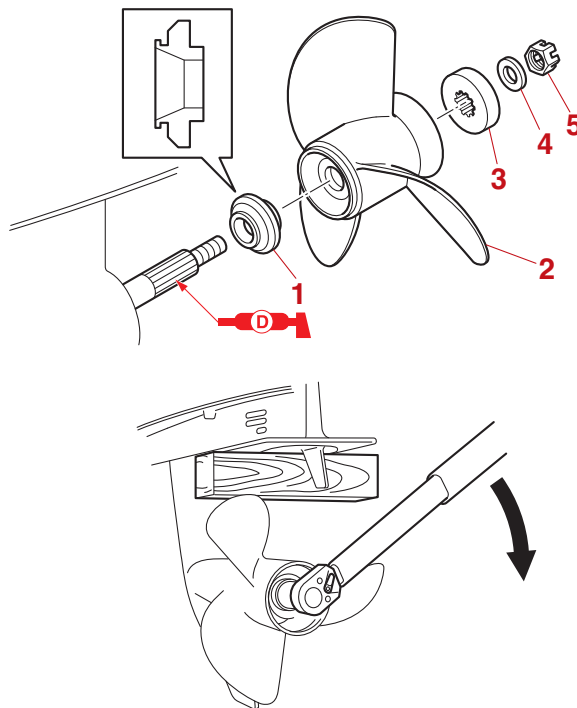
4. Install:
- Trim tab
 - Trim tab bolt
- a. Install the trim tab "1" to its original position "a", and then tighten the trim tab bolt "2" to the specified torque.




	Trim tab bolt "2" 42 N·m (4.2 kgf·m, 31 lb·ft)
---	---

5. Install:
- Grommet
 - Plastic tie **New**
 - Spacer "1"
 - Propeller "2"
 - Spacer "3"
 - Washer "4"
 - Propeller nut "5"

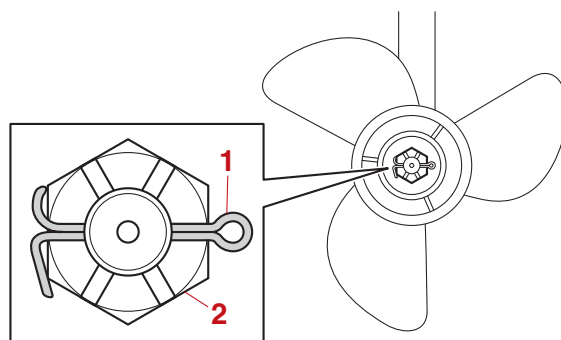
TIP: _____
 Place a block of wood between the anti-cavitation plate and the propeller to prevent the propeller from turning.



	Propeller nut "5" 54 N·m (5.4 kgf·m, 40 lb·ft)
---	---

6. Install:
- Cotter pin "1" **New**

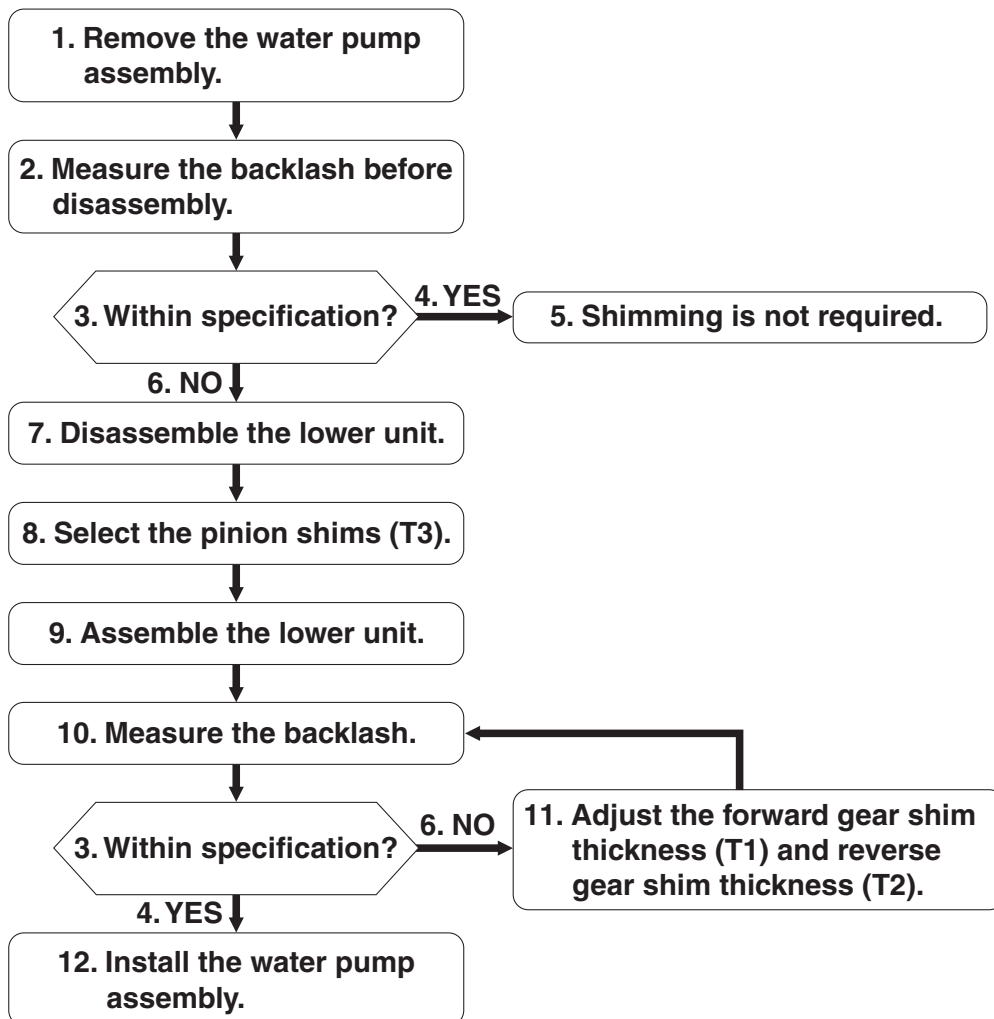
TIP: _____
 If the slots in the propeller nut "2" are not aligned with the cotter pin hole, tighten the propeller nut until they are aligned.



7. Fill:
- Gear oil
- See the latest edition of the owner's manual.

Shimming

Shimming workflow



1. Remove the water pump assembly.
2. Measure the backlash before disassembly.
3. Within specification?
4. YES
5. Shimming is not required.
6. NO
7. Disassemble the lower unit.

8. Select the pinion shims (T3).
9. Assemble the lower unit.
10. Measure the backlash.
11. Adjust the forward gear shim thickness (T1) and reverse gear shim thickness (T2).
12. Install the water pump assembly.

TIP:

- Make sure to drain the gear oil before measuring the backlash.
- If the backlash is within specification, shimming is not required.
- When assembling the original inner parts and a new lower case, shimming is required.
- When replacing the pinion, forward gear, reverse gear, bearings, drive shaft, or propeller shaft housing, shimming is required.

Shimming check sheet

Lower case deviation

Serial number	P	F	R	Remarks

Pinion height

	Measurements (mm)		
Measuring point "a"			
Measuring point "b"			
Measuring point "c"			
Measuring point "d"			
Average			
Round-down average (M)			

Forward gear backlash

	Measurements (mm)					
	Before disassembly			After disassembly		
Measuring point "a"						
Measuring point "b"						
Measuring point "c"						
Measuring point "d"						
Average						
Round-down average						

Reverse gear backlash

	Measurements (mm)					
	Before disassembly			After disassembly		
Measuring point "a"						
Measuring point "b"						
Measuring point "c"						
Measuring point "d"						
Average						
Round-down average						

Shimming

Forward gear shim (T1) thickness measurement in 2 places


(mm)	Number of shim(s)			Subtotal
0.10				
0.12				
0.15				
0.18				
0.30				
0.40				
0.50				
Total				

Reverse gear shim (T2) thickness measurement in 2 places

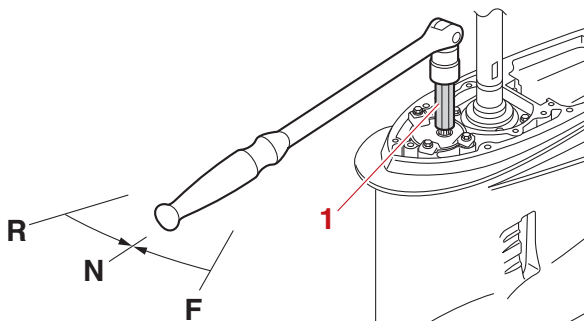
(mm)	Number of shim(s)			Subtotal
0.10				
0.12				
0.15				
0.18				
0.30				
0.40				
0.50				
Total				


Measuring the forward gear backlash and reverse gear backlash before disassembly

1. Install:
 - Lower unit (onto a repair stand)
2. Remove:
 - Water pump assembly
 - Outer plate cartridge
 - See “Water pump and shift rod” (8-3).
3. Measure:
 - Forward gear backlash
 - Reverse gear backlash
 - Out of specification → See “Selecting the pinion shim (T3)” (8-28).

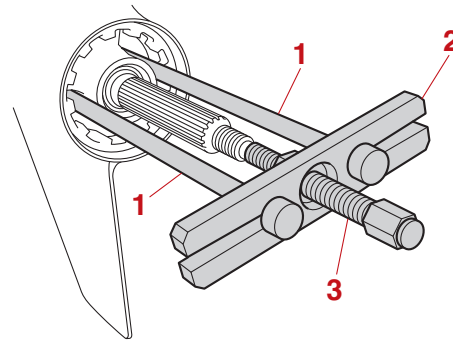
	Forward gear backlash 0.15–0.88 mm (0.0059–0.0346 in) Reverse gear backlash 0.74–1.57 mm (0.0291–0.0618 in)
---	--


a. Set the gear shift to the N position.



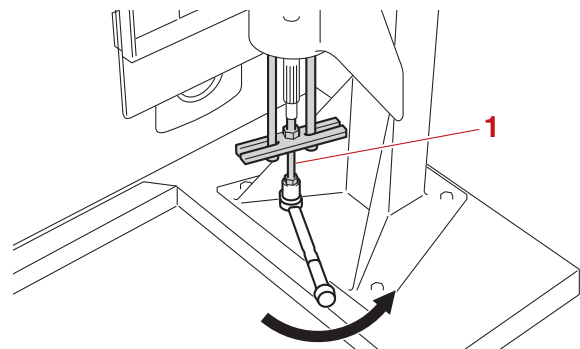
	Shift rod socket “1” 90890-06681
---	-------------------------------------


b. Set up the special service tools “1”, “2”, and “3”, and then tighten the center bolt “3” temporarily.



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

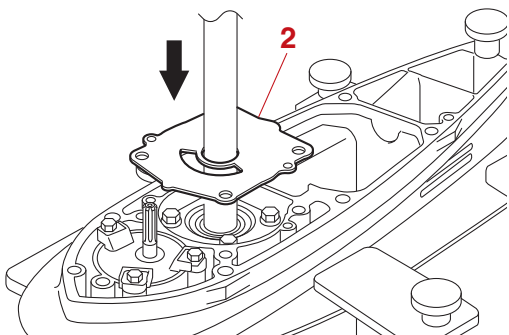
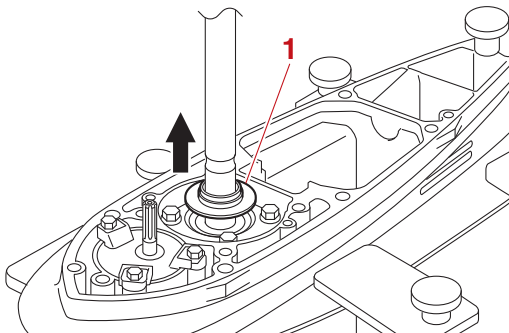
- c. Turn the lower unit so that the propeller shaft is pointing down.
- d. Turn the drive shaft 10 turns or more to seat the tapered roller bearing.
- e. While holding the drive shaft to prevent it from turning, tighten the center bolt “1” to the specified torque.



	Center bolt “1” (shimming) 5 N·m (0.5 kgf·m, 3.7 lb·ft)
---	--

f. Place the lower unit in an upright position.

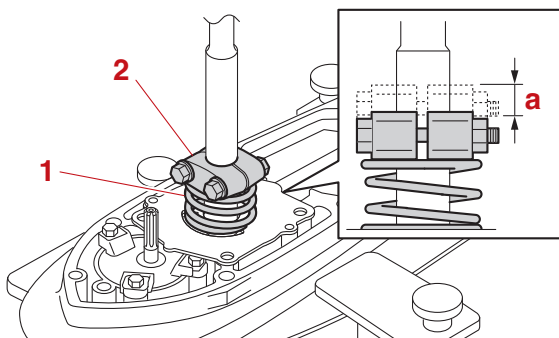
- g. Remove the cover "1", and then install the outer plate cartridge "2".



- h. Set the spring "1" on the outer plate cartridge, and then install the handle holder "2" so that the spring is compressed to the specified setting height "a".

TIP:

- After installing the handle holder, pull the drive shaft upward to remove any free play.
- Do not press the spring more than 5.0 mm (0.197 in). Otherwise, too much torque will be required to turn the drive shaft, making it difficult to obtain correct measurements.

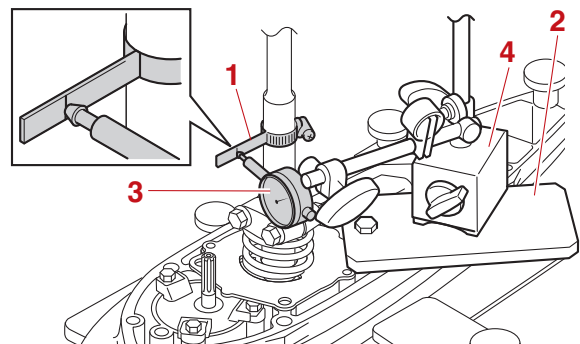


	Spring "1"
	90501-450A2 *1
	Handle holder "2"
	EU0-23814-30 (2 required) *1

*1. Order from Yamaha Parts Distribution Center.

	Setting height
	3.0–5.0 mm (0.118–0.197 in)

- i. Install the special service tool "1" onto the drive shaft at the lowest possible position where the shaft diameter is 22.4 mm (0.881 in), and then set up the special service tools "2", "3", and "4".

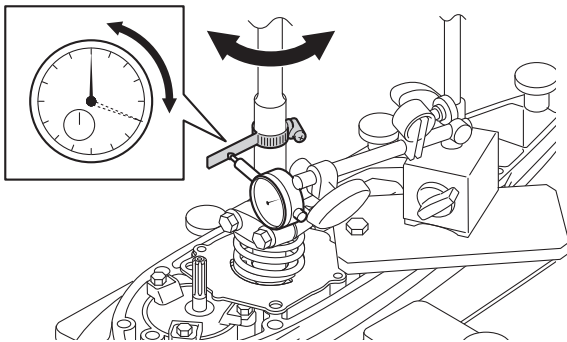


	Backlash indicator "1"
	90890-06706
	Magnet base plate "2"
	90890-07003
	Dial gauge set "3"
	90890-03238
	Magnet base B "4"
	90890-06844

- j. Turn the drive shaft slowly clockwise and counterclockwise, and then measure the backlash between where the drive shaft stops in each direction.

TIP: _____

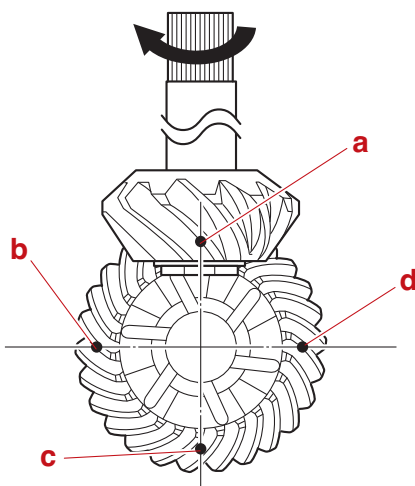
- The resistance of the spring increases the force required to turn the drive shaft. Therefore, to obtain correct measurements, consider the spring resistance force when turning the drive shaft.
- Do not turn the drive shaft using too much force. Otherwise, the forward gear will turn, leading to incorrect measurements.
- A knocking sound may be heard when the drive shaft is rotated, but this is the sound of the pinion contacting the reverse gear and does not affect the backlash measurement.



k. Turn the drive shaft 180° clockwise, and then measure the backlash again.

TIP: _____

- Measure the backlash at 4 points: “a”, “b”, “c”, and “d”, turning the drive shaft 180° clockwise after each measurement.
- Write down the measurement data in the shimming check sheet.



- I. Determine the backlash average, and then round down the average to 2 decimal places.

Example:
(mm)

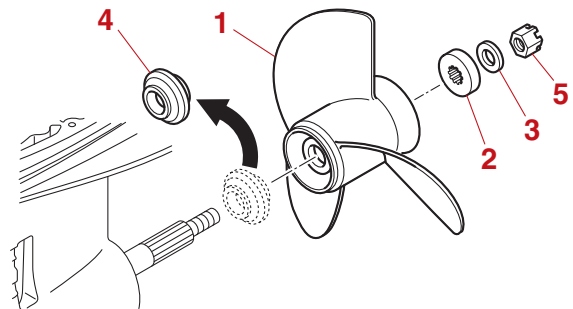
Measurement point “a”	0.30
Measurement point “b”	0.36
Measurement point “c”	0.34
Measurement point “d”	0.33
Average	0.3325
Round-down average	0.33


- m. Check that the forward gear backlash average is within specification.

TIP: _____

Adjust the shim thicknesses if the forward gear backlash is out of specification.

- n. Remove the special service tools from the propeller shaft.
- o. Apply a load to the reverse gear by installing the propeller “1”, spacer “2”, and washer “3” (without installing the spacer “4”).
- p. Tighten the propeller nut “5” to the specified torque.



	Propeller nut “5” (shimming) 10 N·m (1.0 kgf·m, 7.4 lb·ft)
---	--

- q. Repeat steps (j)–(l) to measure the reverse gear backlash.

-
- r. Check that the reverse gear backlash average is within specification.

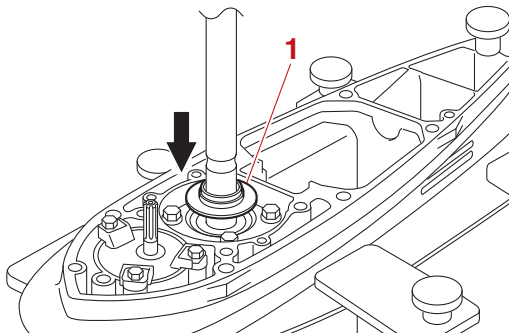
TIP:

Adjust the shim thicknesses if the reverse gear backlash is out of specification.

- s. Remove the special service tools and propeller.

4. Install:

- Cover "1"



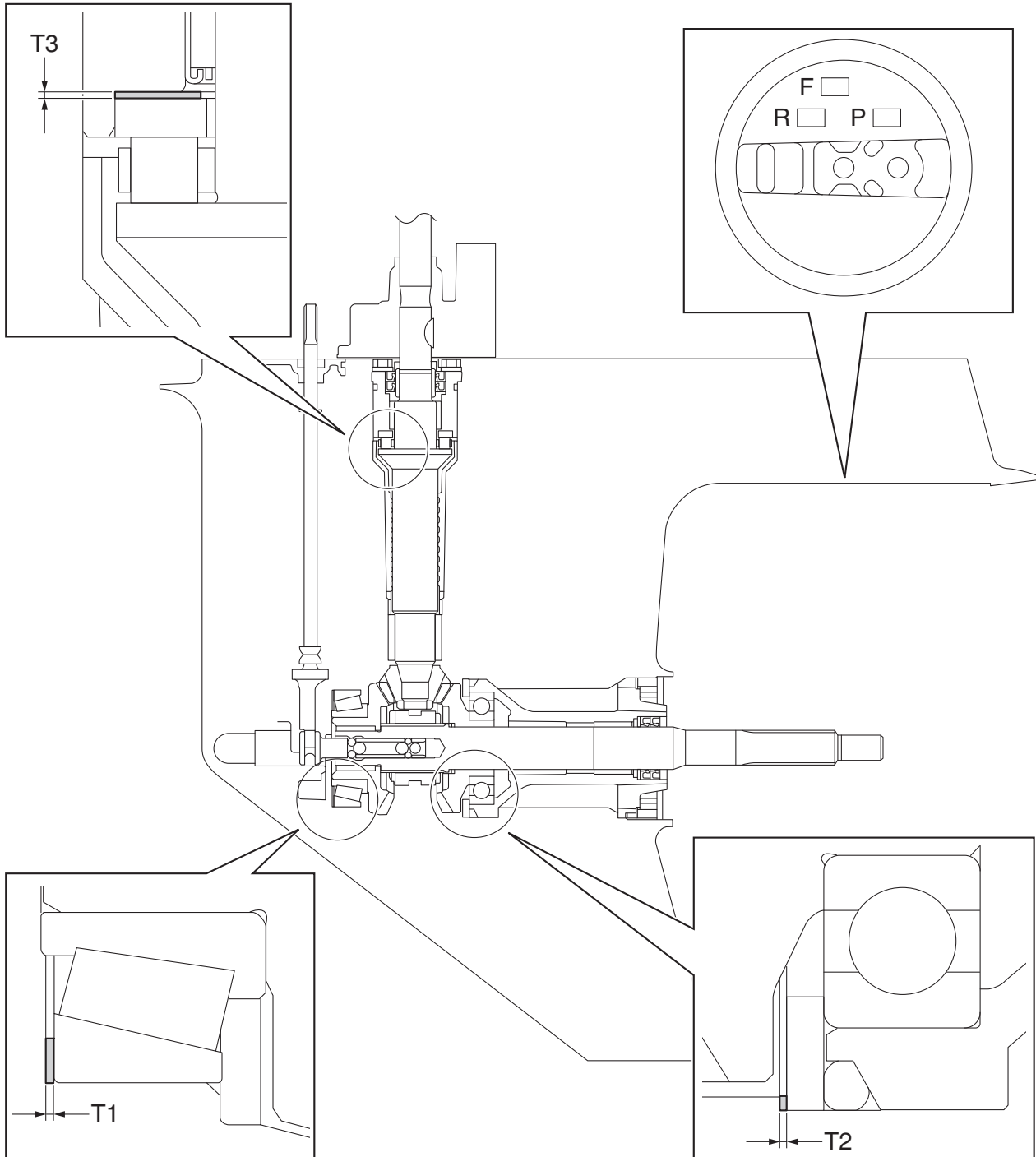
5. Install:

- Outer plate cartridge
 - Water pump assembly
- See "Installing the water pump" (8-17).

Shimming procedure

- Before selecting the forward gear shim (T1) and reverse gear shims (T2), make sure to select the pinion shims (T3).
- When assembling the lower unit to measure the backlash after selecting the pinion shims (T3), do not apply gear oil, grease, or sealant to the parts.
- When assembling the lower unit after shimming is completed, make sure to apply gear oil, grease, and sealant to the specified areas.

Shim location



Selecting the pinion shim (T3)

- Spray anti-rust lubricant on the bearing before installation. Do not apply gear oil to the parts. Otherwise, correct measurements cannot be obtained.
- Keep the parts free of foreign material, such as dirt and lint.

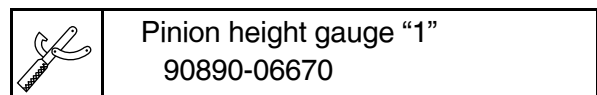
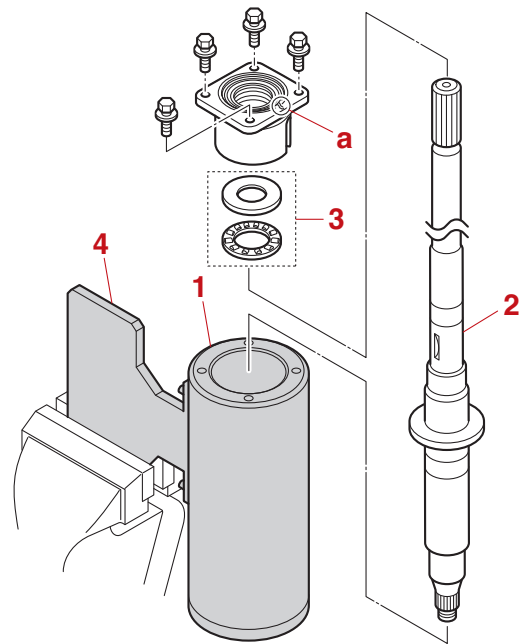
NOTICE

Be careful not to damage the measurement plane surface of the special service tool. Otherwise, correct measurements cannot be obtained.

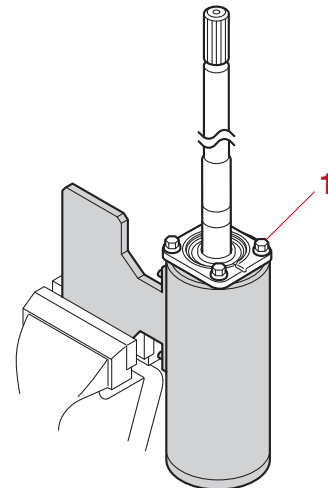
1. Select:
 - Pinion shim (T3)
 - a. Disassemble the lower unit.
 - b. Hold the special service tool "1", and then install the drive shaft "2", thrust bearing "3", and drive shaft housing assembly to the special service tool.

TIP:

- Do not install the pinion shims (T3) and O-ring. Make sure that the pinion shims (T3) are not affixed to the thrust bearing outer race.
- Make sure to install the thrust bearing outer race so that it is facing the same direction as when it was removed.
- Make sure that the cutout "a" in the drive shaft housing assembly is facing the opposite direction of the plate "4" of the special service tool.



- c. Tighten the drive shaft housing bolts "1".



- d. Install the pinion "1" and pinion nut "2", and then tighten the pinion nut "2" temporarily.

NOTICE

When tightening the pinion nut, check that the drive shaft turns smoothly.

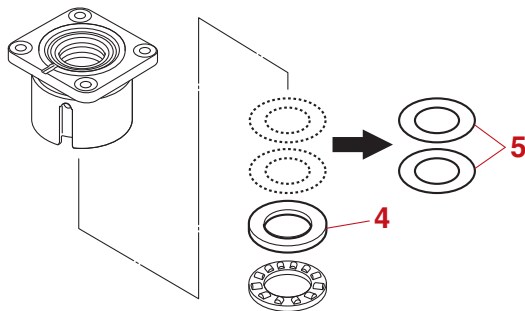
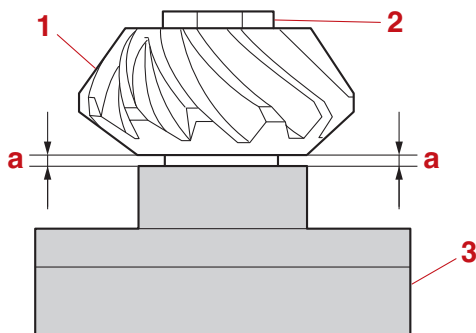
- e. Check that there is a gap "a" between the pinion "1" and the special service tool "3".

NOTICE

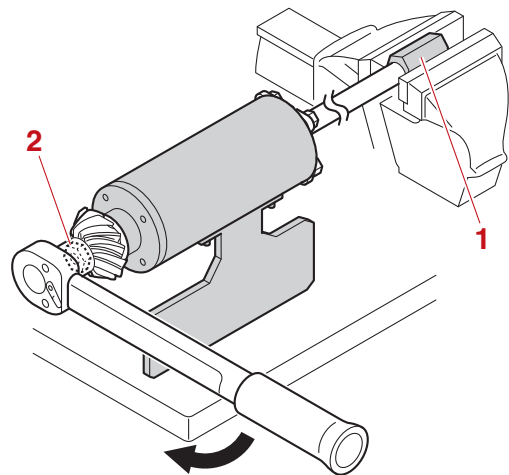
If there is no gap and the drive shaft does not turn, the special service tool could be damaged.


TIP:


If there is no gap, the thrust bearing outer race "4" may not have been installed. If the gap is 1.0 mm (0.039 in) or more, the pinion shims (T3) "5" may not have been removed.



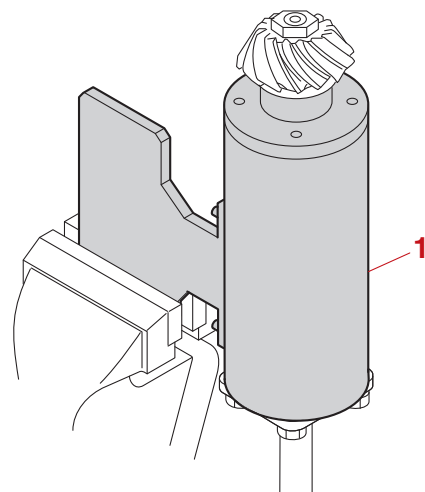
- f. Install the special service tool "1" to the drive shaft spline and hold the special service tool "1".
- g. Tighten the pinion nut "2" to the specified torque.



	Drive shaft holder 6 "1" 90890-06520
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	Pinion nut "2" 93 N·m (9.3 kgf·m, 69 lb·ft)
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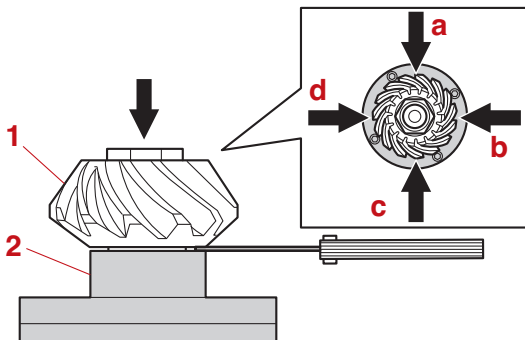
- h. Hold the special service tool "1" so that the pinion is facing up.



- i. Turn the drive shaft 10 turns or more to seat the thrust bearing.
- j. Push down on the pinion "1" so that it does not pop up, and then measure the distance between the pinion "1" and the special service tool "2".

TIP: _____

- When measuring the distance, insert the end of the thickness gauge straight into the gap at the measurement point. Do not insert the thickness gauge at an angle.
- Measure the distance at 4 points: “a”, “b”, “c”, and “d”.
- Write down the measurement data in the shimming check sheet.



- k. Determine the distance average, and then round down the average to 2 decimal places.

Example:
(mm)

Measurement point “a”	0.24
Measurement point “b”	0.24
Measurement point “c”	0.25
Measurement point “d”	0.25
Average	0.2450
Round-down average (M)	0.24

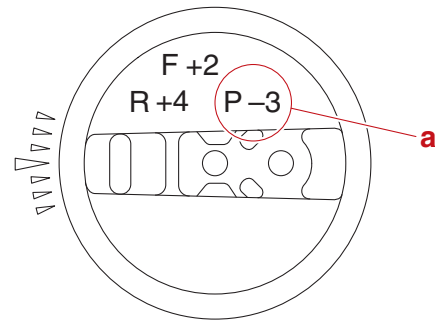
- l. Determine the pinion shim (T3) thickness adjustment using the “Pinion shim (T3) selection table” according to the rounded average (M) and the deviation (P) stamped on the lower case. See “Pinion shim (T3) selection table” (A-13).

TIP: _____

The (P) mark “a” is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the (P) mark is unreadable, replace the lower case.

	Available shim thicknesses
	Pinion shims
	0.10/0.12/0.15/0.18/0.30/0.40/0.50 mm

Example:
(M) = 0.24
(P) = -3



(T3) = 0.95 mm from the “Pinion shim (T3) selection table”.

		Pinion height measurement (M)		
		0.23	0.24	0.25
Stamped value on the lower case (P)	-2		↓	
	-3	→	0.95	
	-4			

- m. Remove the special service tools, and then install the determined pinion shims (T3).

Measuring the forward gear backlash

- Spray anti-rust lubricant on the gear and bearings before installation. Do not apply gear oil to the parts. Otherwise, correct measurements cannot be obtained.
- Keep the parts free of foreign material, such as dirt and lint.
- When measuring the forward gear or reverse gear backlash, use the original bearings and shims.

1. Install:
 - Forward gear shim (T1)
 - Tapered roller bearing outer race

TIP: _____

- If the original forward gear shims (T1) are missing, install new shims with a combined thickness of 0.72 mm.
- Do not reuse a shim if deformed or scratched.

2. Install:


- Forward gear assembly
- Drive shaft
- Pinion
See “Installing the drive shaft” (8-15).
- Propeller shaft housing assembly
See “Installing the propeller shaft housing assembly” (8-16).

3. Check:

- Drive shaft movement
Not smooth → Repeat from step (2).

4. Measure:

- Forward gear backlash
See step (3) in “Measuring the forward gear backlash and reverse gear backlash before disassembly” (8-23).
Out of specification → See “Adjusting the forward gear shim thickness (T1)” (8-31).

	Forward gear backlash 0.15–0.88 mm (0.0059–0.0346 in)
---	---

Adjusting the forward gear shim thickness (T1)

1. Remove:

- Tapered roller bearing outer race
- Forward gear shim (T1)

2. Measure:

- Thickness of original forward gear shim (T1) in 2 places.

TIP: _____

Do not reuse a shim if deformed or scratched.

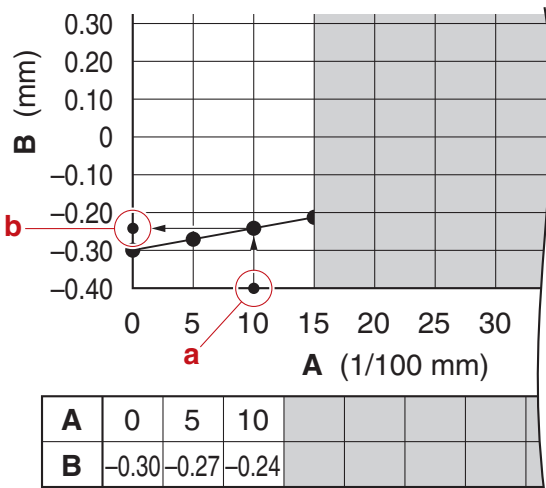
3. Select:

- Forward gear shim (T1)
 - a. Determine the forward gear shim (T1) thickness adjustment using the “Forward gear shim (T1) selection chart” according to the backlash measurement (BL1) from “Measuring the forward gear backlash”. See “Forward gear shim (T1) selection chart” (A-14).

TIP: _____

- If the shim thickness adjustment value is positive, increase the current shim thickness by that amount and, if the value is negative, decrease the current shim thickness by that amount.
- The gray-colored area on the selection chart indicates the range of the specified backlash. Shimming is not required if the measured backlash is within the gray-colored area.
- The values for the shim thickness adjustments specified in the selection chart are intended to obtain the median value within the range for the specified forward gear or reverse gear backlash.
- The table that follows the selection chart shows the shim thickness adjustments for the points marked on the chart.

Example:
 Backlash measurement (BL1) = 0.10 mm “a”
 Forward gear shim (T1) thickness adjustment = -0.24 mm “b”
 The current shim thickness must be decreased by 0.24 mm.



A. Backlash measurement (BL1)
 B. Shim thickness adjustment

b. Calculate the new forward gear shim (T1) thickness.

TIP: _____

- Use the lowest number of shims to obtain the required shim thickness.
- If the calculated shim thickness cannot be obtained with a combination of the available shims, increase or decrease the shim thickness by 0.01 mm.

Calculation formula:
 New forward gear shim (T1) thickness
 = Current forward gear shim thickness
 + Shim thickness adjustment

Example:
 Use the following formula when the shim thickness adjustment value is positive.
 Current forward gear shim thickness = 0.72 mm
 Shim thickness adjustment = 0.22 mm
 New forward gear shim (T1) thickness = 0.72 mm + 0.22 mm = 0.94 mm
 Use the following formula when the shim thickness adjustment value is negative.
 Current forward gear shim thickness = 0.72 mm
 Shim thickness adjustment = -0.24 mm
 New forward gear shim (T1) thickness = 0.72 mm + (-0.24 mm) = 0.48 mm

	Available shim thicknesses
	Forward shims
	0.10/0.12/0.15/0.18/0.30/0.40/0.50 mm

4. Install:
- Determined forward gear shim (T1)
 - Tapered roller bearing outer race

Measuring the reverse gear backlash

- Spray anti-rust lubricant on the gears and bearings before installation. Do not apply gear oil to the parts. Otherwise, correct measurements cannot be obtained.
- Keep the parts free of foreign material, such as dirt and lint.
- When measuring the forward gear or reverse gear backlash, use the original bearings and shims.


1. Install:
- Reverse gear shim (T2)
 - Propeller shaft housing assembly
 See “Installing the propeller shaft housing assembly” (8-16).

TIP: _____

- If the original reverse gear shims (T2) are missing, install new shims with a combined thickness of 0.70 mm.
- Do not reuse a shim if deformed or scratched.

2. Measure:

- Reverse gear backlash
See step (3) in “Measuring the forward gear backlash and reverse gear backlash before disassembly” (8-23).
Out of specification → See “Adjusting the reverse gear shim thickness (T2)” (8-33).

	Reverse gear backlash 0.74–1.57 mm (0.0291–0.0618 in)
---	--

Adjusting the reverse gear shim thickness (T2)

1. Remove:

- Propeller shaft housing assembly
- Reverse gear shim (T2)

2. Measure:

- Thickness of original reverse gear shim (T2) in 2 places.

TIP: _____

Do not reuse a shim if deformed or scratched.

3. Select:

- Reverse gear shim (T2)
 - a. Determine the reverse gear shim (T2) thickness adjustment using the “Reverse gear shim (T2) selection chart” according to the backlash measurement (BL2) from “Measuring the reverse gear backlash”. See “Reverse gear shim (T2) selection chart” (A-14).

TIP: _____

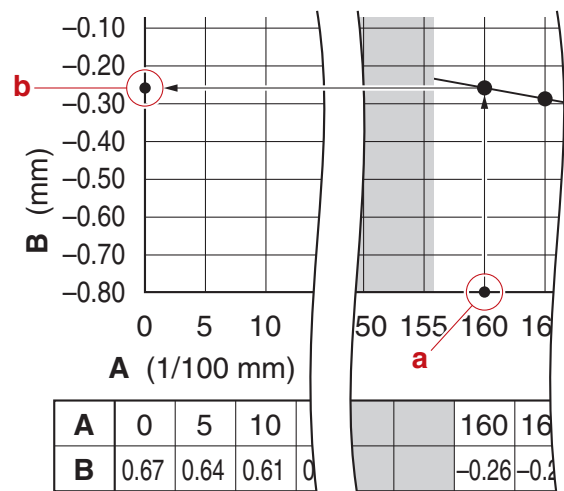
- If the shim thickness adjustment value is positive, increase the current shim thickness by that amount and, if the value is negative, decrease the current shim thickness by that amount.
- The gray-colored area on the selection chart indicates the range of the specified backlash. Shimming is not required if the measured backlash is within the gray-colored area.
- The values for the shim thickness adjustments specified in the selection chart are intended to obtain the median value within the range for the specified forward gear or reverse gear backlash.
- The table that follows the selection chart shows the shim thickness adjustments for the points marked on the chart.

Example:

Backlash measurement (BL2) = 1.60 mm “a”

Reverse gear shim (T2) thickness adjustment = -0.26 mm “b”

The current shim thickness must be decreased by 0.26 mm.



A. Backlash measurement (BL2)

B. Shim thickness adjustment

- a. Calculate the new reverse gear shim (T2) thickness.

TIP: _____

- Use the lowest number of shims to obtain the required shim thickness.
- If the calculated shim thickness cannot be obtained with a combination of the available shims, increase or decrease the shim thickness by 0.01 mm.

Calculation formula:

New reverse gear shim (T2) thickness
 = Current reverse gear shim thickness
 + Shim thickness adjustment

Example:

Use the following formula when the shim thickness adjustment value is positive.

Current reverse gear shim thickness = 0.70 mm

Shim thickness adjustment = 0.26 mm


New reverse gear shim (T2) thickness = 0.70 mm + 0.26 mm = 0.96 mm

Use the following formula when the shim thickness adjustment value is negative.

Current reverse gear shim thickness = 0.70 mm

Shim thickness adjustment = -0.26 mm

New reverse gear shim (T2) thickness = 0.70 mm + (-0.26 mm) = 0.44 mm

	Available shim thicknesses
	Reverse shims 0.10/0.12/0.15/0.18/0.30/0.40/0.50 mm

4. Install:

- Determined reverse gear shim (T2)
- Propeller shaft housing assembly

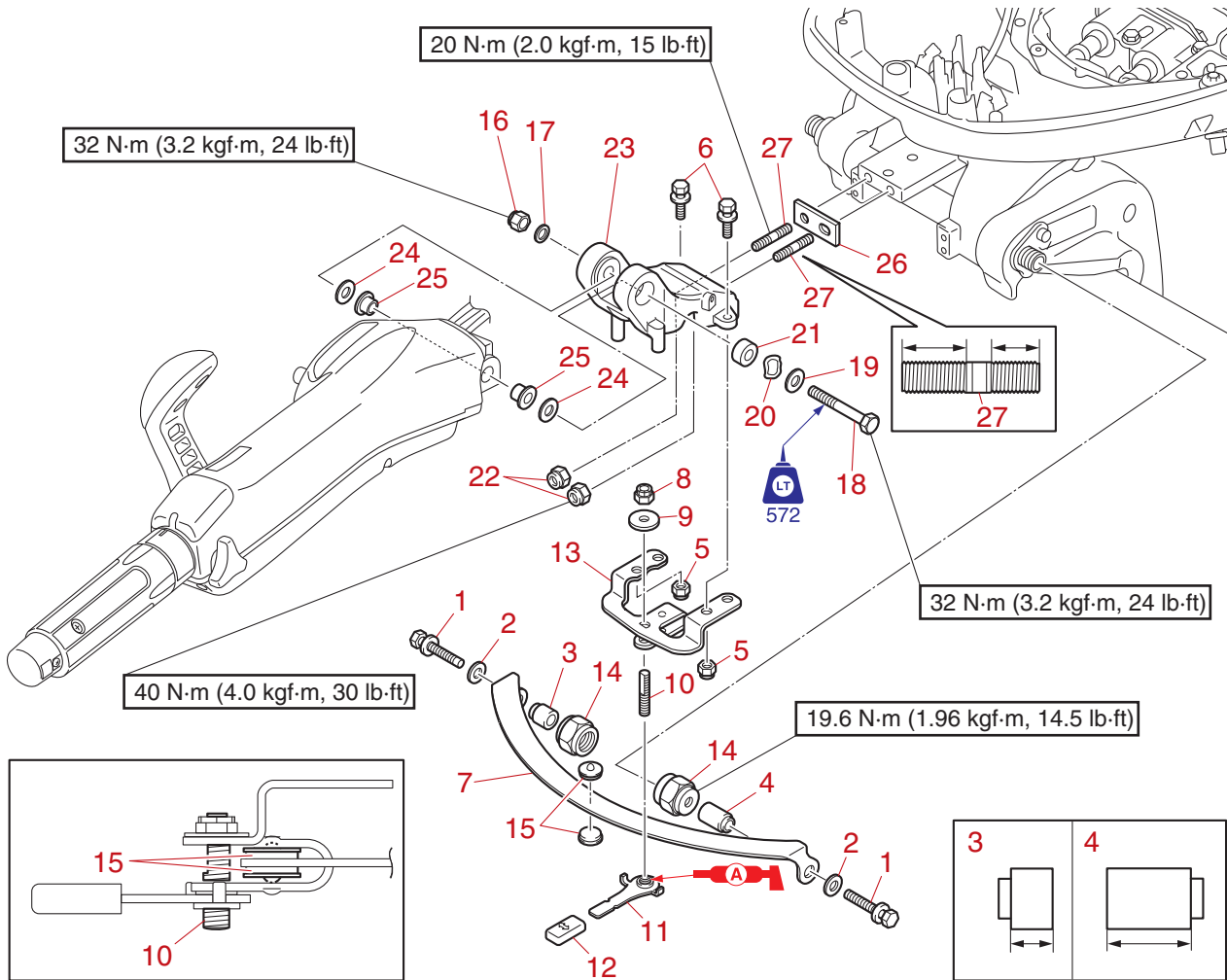
Bracket unit

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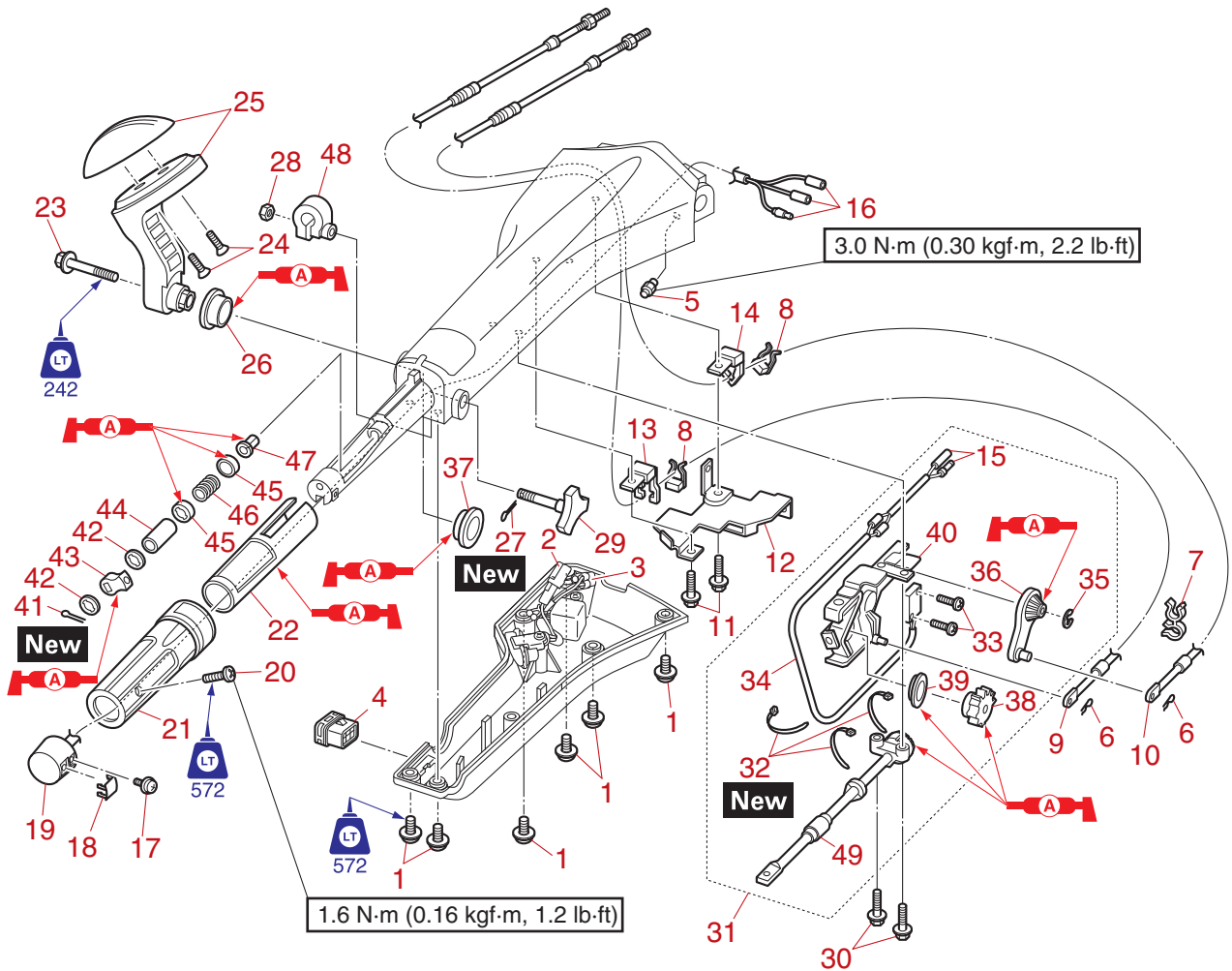
Steering friction plate (tiller handle model)



↑↓	Part name	Q'ty	Remarks
1	Bolt M8 × 50 mm	2	
2	Washer	2	
3	Collar	1	
4	Collar	1	
5	Self-locking nut M8	2	
6	Bolt M8 × 25 mm	2	
7	Friction plate	1	
8	Self-locking nut M10	1	
9	Washer	1	
10	Steering lock shaft	1	
11	Steering lock lever	1	
12	Cover	1	
13	Bracket	1	
14	Nut	2	
15	Friction piece	2	
16	Self-locking nut M12	1	
17	Washer	1	
18	Bolt M12 × 80 mm	1	

↑↓	Part name	Q'ty	Remarks
19	Washer	1	
20	Wave washer	1	
21	Collar	1	
22	Self-locking nut M10	2	
23	Bracket	1	
24	Washer	2	
25	Bushing	2	
26	Spacer	1	
27	Stud bolt	2	

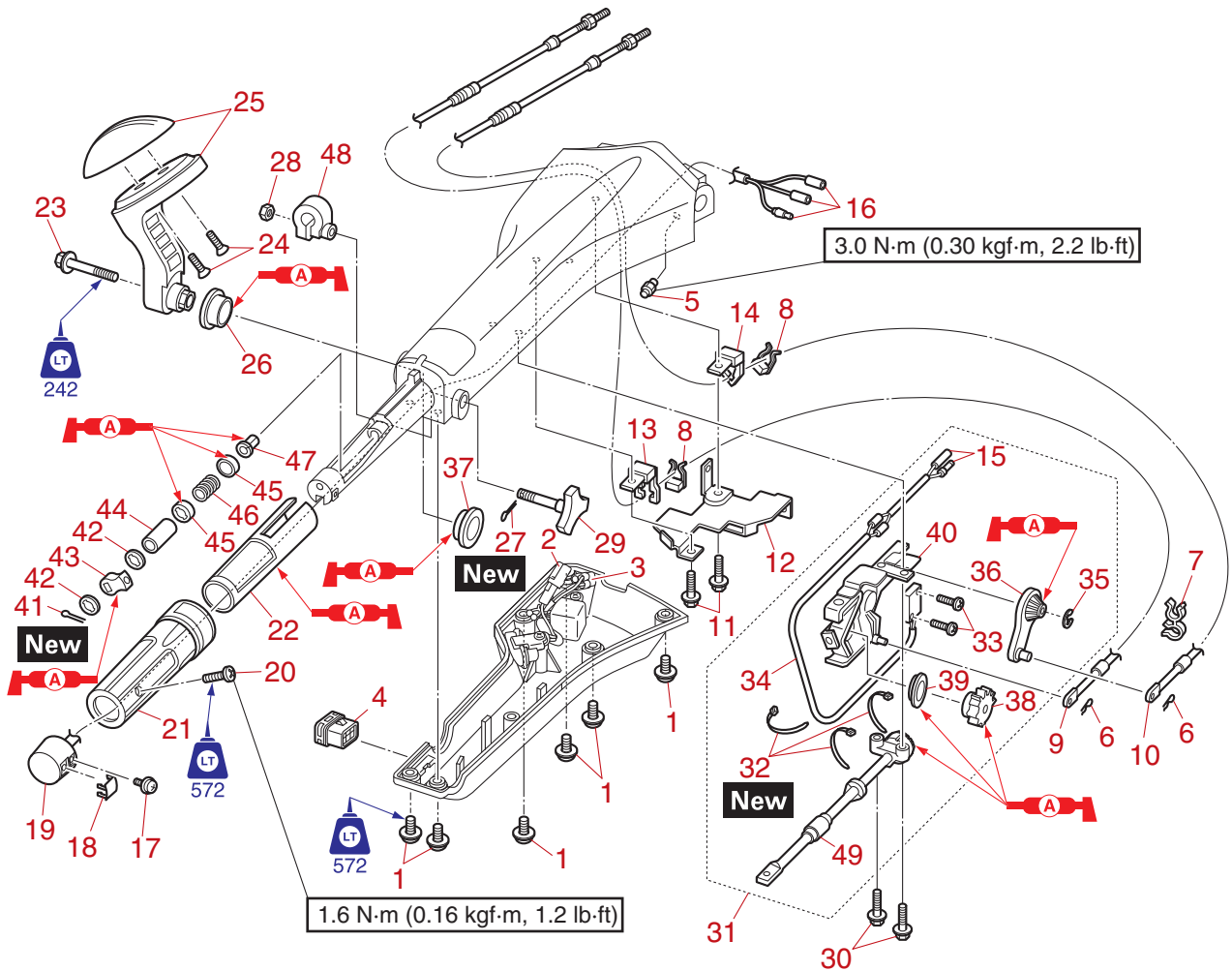
Tiller handle (tiller handle model)



∩	Part name	Q'ty	Remarks
1	Screw M6 × 16 mm	6	
2	Coupler	1	
3	Coupler	1	
4	Cap	1	
5	Grease nipple M6	1	
6	Clip	2	
7	Clamp	1	
8	Clamp	2	
9	Shift cable	1	
10	Throttle cable	1	
11	Bolt M6 × 14 mm	2	
12	Bracket	1	
13	Holder	1	
14	Holder	1	
15	Neutral switch connector	2	
16	PTT connector	3	
17	Screw M6 × 15 mm	1	

∩	Part name	Q'ty	Remarks
18	Cap	1	
19	PTT switch	1	
20	Screw M5 × 22 mm	1	
21	Throttle grip	1	
22	Bushing	1	
23	Bolt M8 × 40 mm	1	
24	Screw M6 × 16 mm	2	
25	Shift lever	1	
26	Bushing	1	
27	Cotter pin	1	
28	Nut M6	1	
29	Throttle friction adjuster	1	
30	Bolt M6 × 30 mm	2	
31	Control link assembly	1	
32	Plastic tie	3	
33	Screw M3 × 15 mm	2	
34	Neutral switch	1	

Tiller handle (tiller handle model)

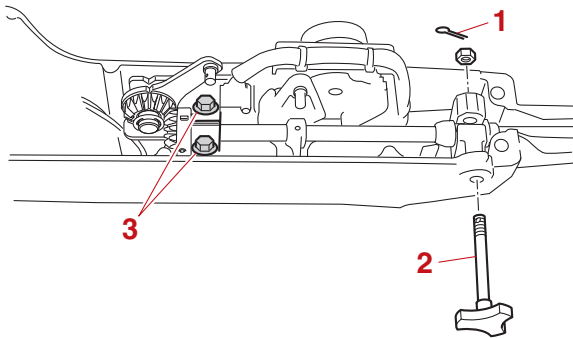


№	Part name	Q'ty	Remarks
35	E-clip	1	
36	Throttle lever	1	
37	Bushing	1	
38	Drive gear	1	
39	Bushing	1	
40	Shift link	1	
41	Cotter pin	1	
42	Washer	2	
43	Plate	1	
44	Collar	1	
45	Retainer	2	
46	Spring	1	
47	Bushing	1	
48	Friction piece	1	
49	Throttle rod	1	

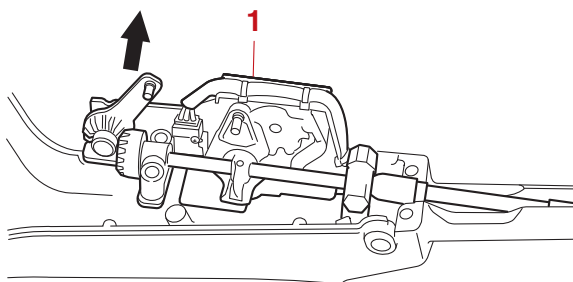
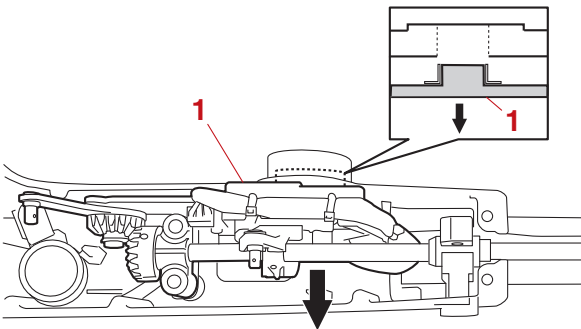
Tiller handle (tiller handle model)

Disassembling the tiller handle

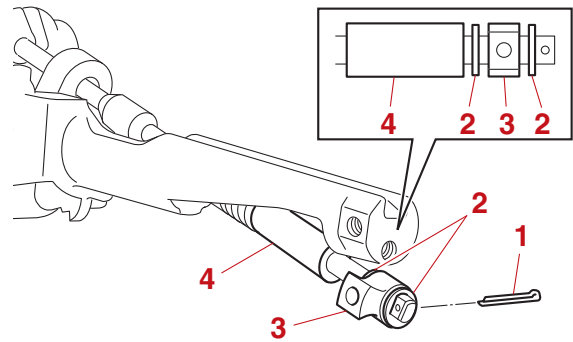
- Remove:
 - Cotter pin "1"
 - Throttle friction adjuster "2"
 - Bolt "3"



- Pull out the control link assembly "1", and then lift it up.



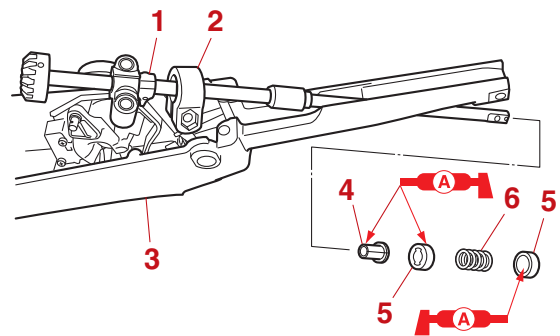
- Remove:
 - Cotter pin "1"
 - Washer "2"
 - Plate "3"
 - Collar "4"



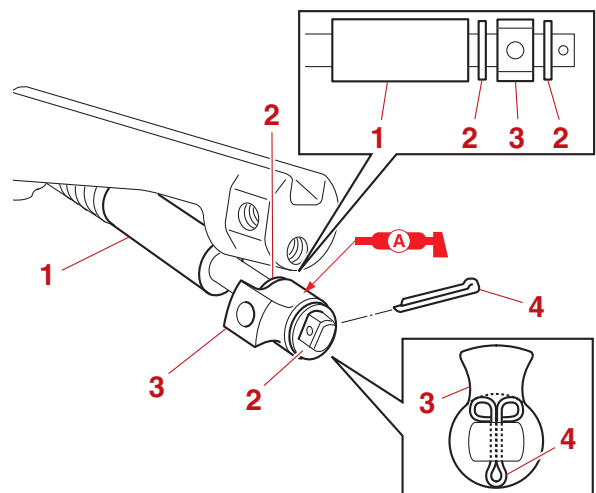
Assembling the tiller handle

- Pass the throttle rod "1" through the friction piece "2" and tiller handle "3".

- Install:
 - Bushing "4"
 - Retainer "5"
 - Spring "6"



- Install:
 - Collar "1"
 - Washer "2"
 - Plate "3"
 - Cotter pin "4" **New**

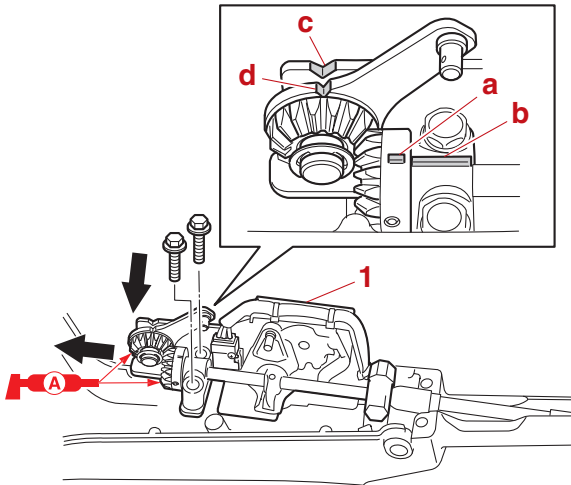


Tiller handle (tiller handle model)

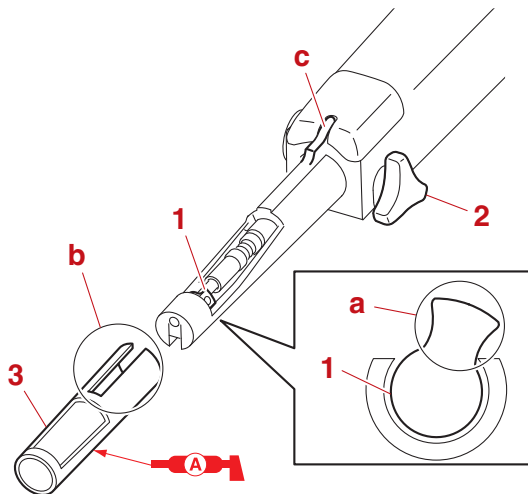
4. Install:
- Control link assembly
 - a. Align the marks “a” and “b”, and align the cutouts “c” and “d”, and then install the control link assembly “1”.

TIP:

Route the neutral switch lead under the control link assembly “1”. See “Tiller handle (tiller handle model)” (5-11).

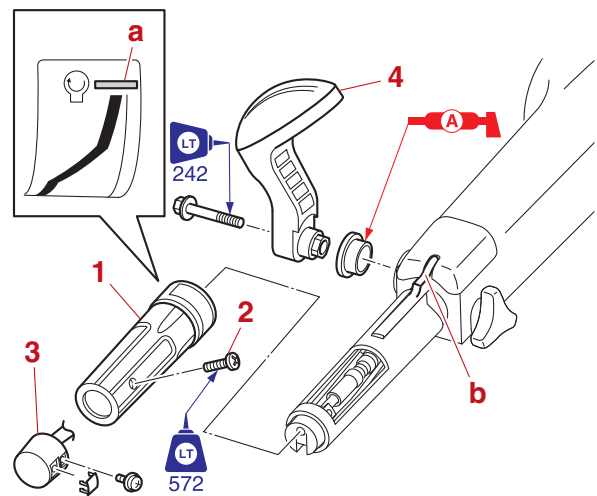



5. Install:
- Bushing
 - a. Face the section “a” of the plate “1” toward the throttle friction adjuster “2”.
 - b. Align the slot “b” in the bushing “3” with the protrusion “c” on the tiller handle, and then install the bushing “3”.



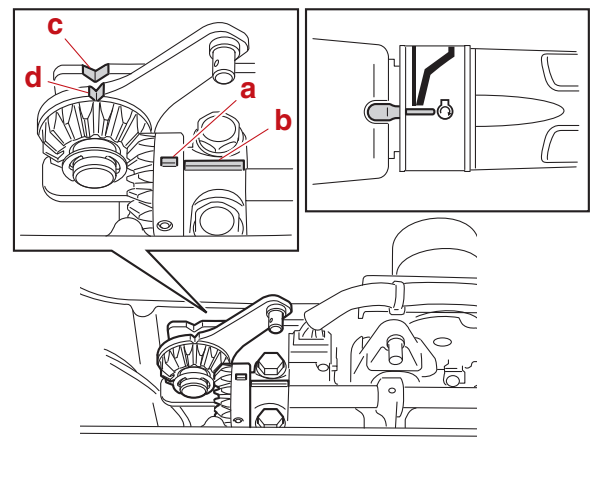
6. Install:
- Throttle grip
 - Throttle grip screw
 - a. Align the mark “a” on the throttle grip “1” with the protrusion “b” on the tiller handle, and then install the throttle grip “1”.
 - b. Tighten the throttle grip screw “2” to the specified torque.

7. Install:
- PTT switch “3”
 - Shift lever “4”



	Throttle grip screw “2” 1.6 N·m (0.16 kgf·m, 1.2 lb·ft)
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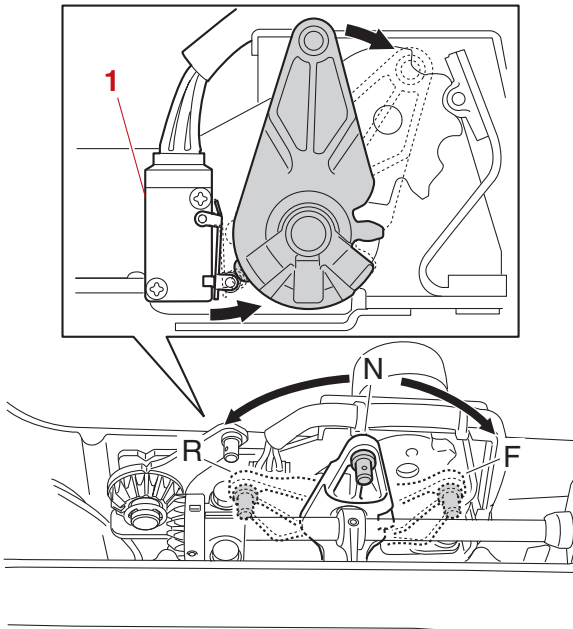
8. Check:
- Smooth operation of the throttle grip
 - Alignment of the marks “a” and “b”
 - Alignment of the cutouts “c” and “d”



Tiller handle (tiller handle model)

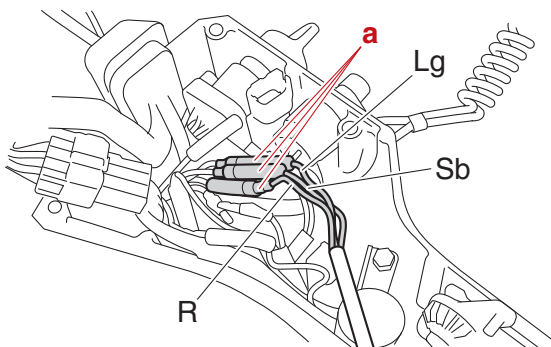
9. Check:

- Smooth operation of the shift link lever (when the shift lever is moved from the N position to the F or R position)
- Proper operation of the neutral switch "1"



10. Connect:

- PTT switch lead "a"

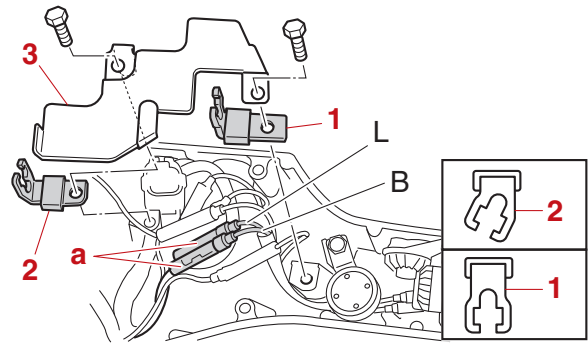


11. Connect:

- Neutral switch lead "a"

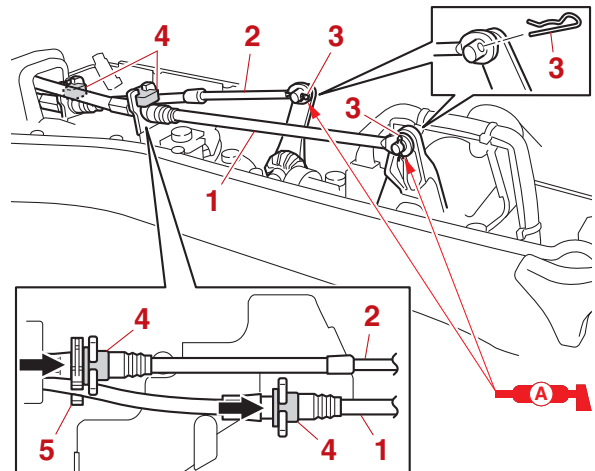
12. Install:

- Holder "1", "2"
- Bracket "3"

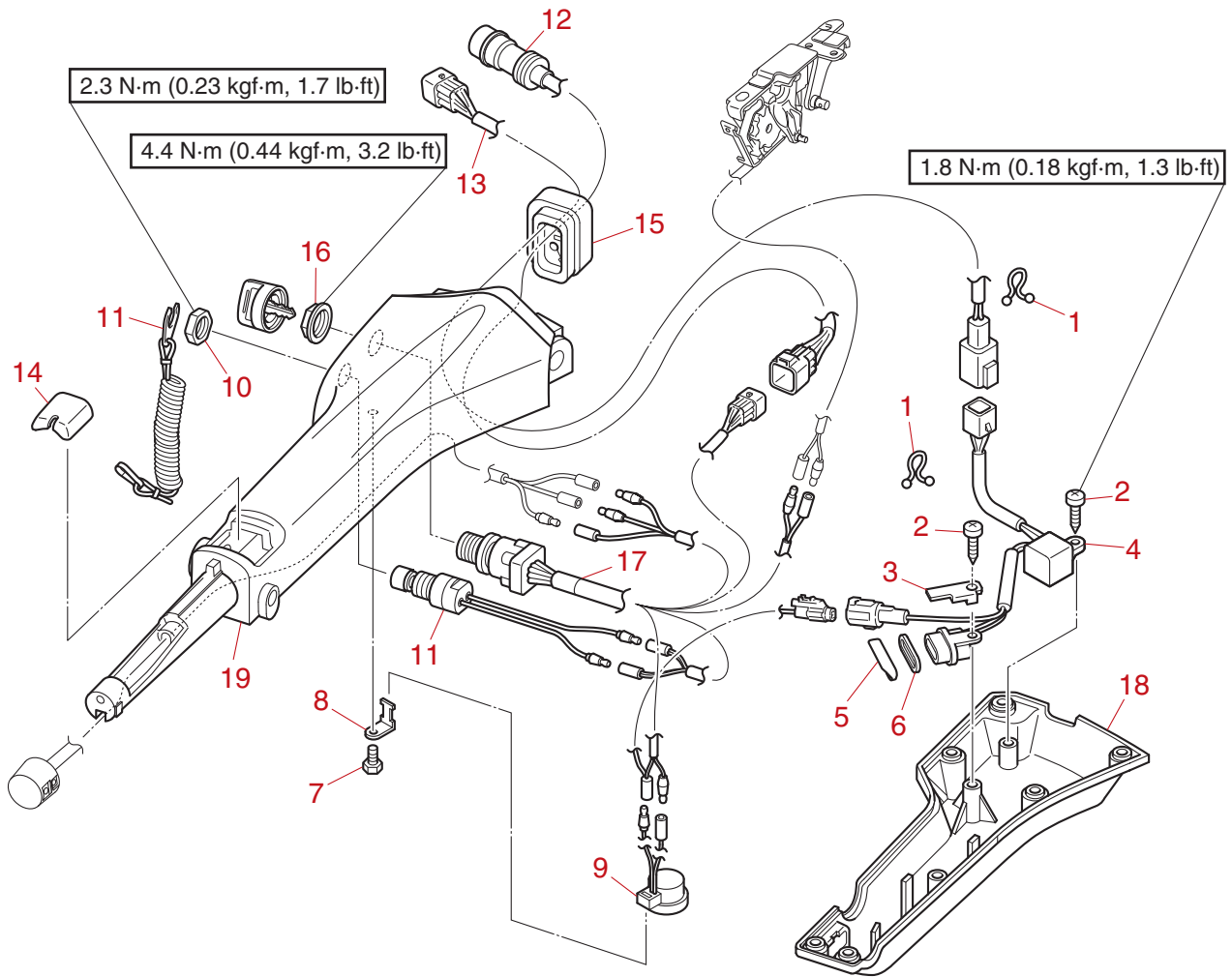


13. Install:

- Shift cable "1"
- Throttle cable "2"
- Clip "3"
- Cable clamp "4", "5"



Electrical component (tiller handle)



↑↓	Part name	Q'ty	Remarks
1	Clamp	2	
2	Screw M6 × 20 mm	2	
3	Plate	1	
4	Alert indicator	1	
5	Grommet	1	
6	Gasket	1	
7	Bolt M6 × 15 mm	1	
8	Bracket	1	
9	Buzzer	1	
10	Nut M16	1	
11	Engine shut-off switch	1	
12	Extension wire harness	1	
13	Alert indicator harness	1	
14	Cover	1	
15	Grommet	1	
16	Nut M20	1	
17	Engine start switch	1	

↑↓	Part name	Q'ty	Remarks
18	Cover	1	
19	Tiller handle	1	

Electrical component (tiller handle)

Assembling the electrical component

1. Install:
 - Engine start switch “1”
 - Engine start switch nut “2”



Engine start switch nut “2”
4.4 N·m (0.44 kgf·m, 3.2 lb·ft)

TIP:

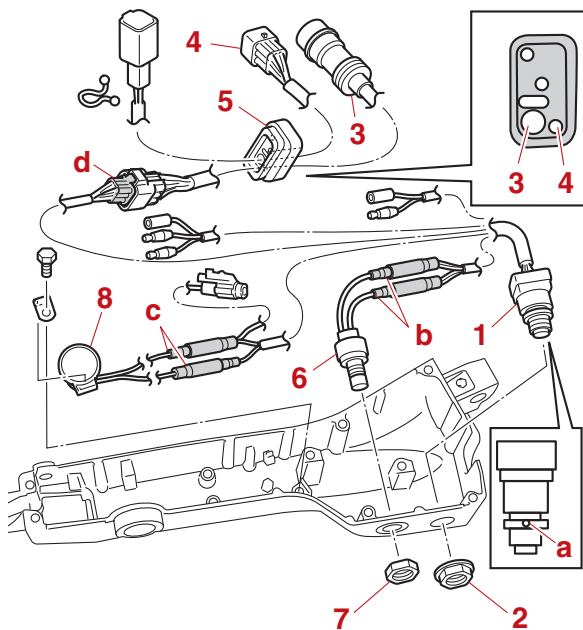
Install the engine start switch “1” so that the hole “a” is facing up.

2. Pass the extension wire harness “3” and alert indicator harness “4” through the grommet “5”, and then install them.
3. Install:
 - Engine shut-off switch “6”
 - Engine shut-off switch nut “7”

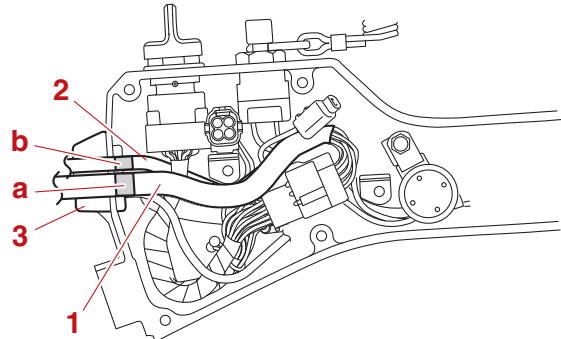


Engine shut-off switch nut “7”
2.3 N·m (0.23 kgf·m, 1.7 lb·ft)

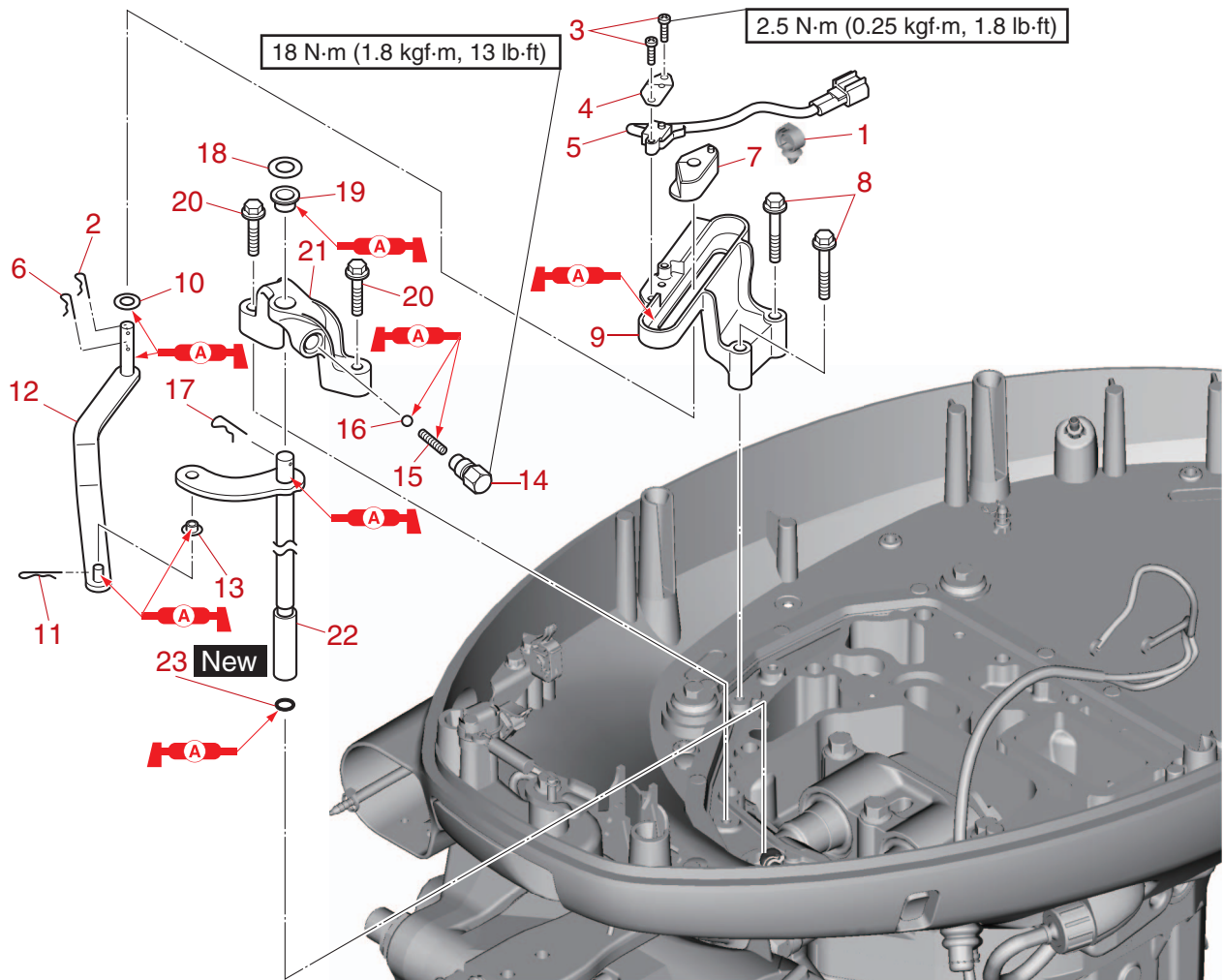
4. Install:
 - Buzzer “8”
5. Connect:
 - Engine shut-off switch connector “b”
 - Buzzer connector “c”
 - Engine start switch coupler “d”



6. Align the blue tape “a” on the extension wire harness “1” and green tape “b” on the alert indicator harness “2” with the inner end of the grommet “3”.



Shift rod and shift bracket

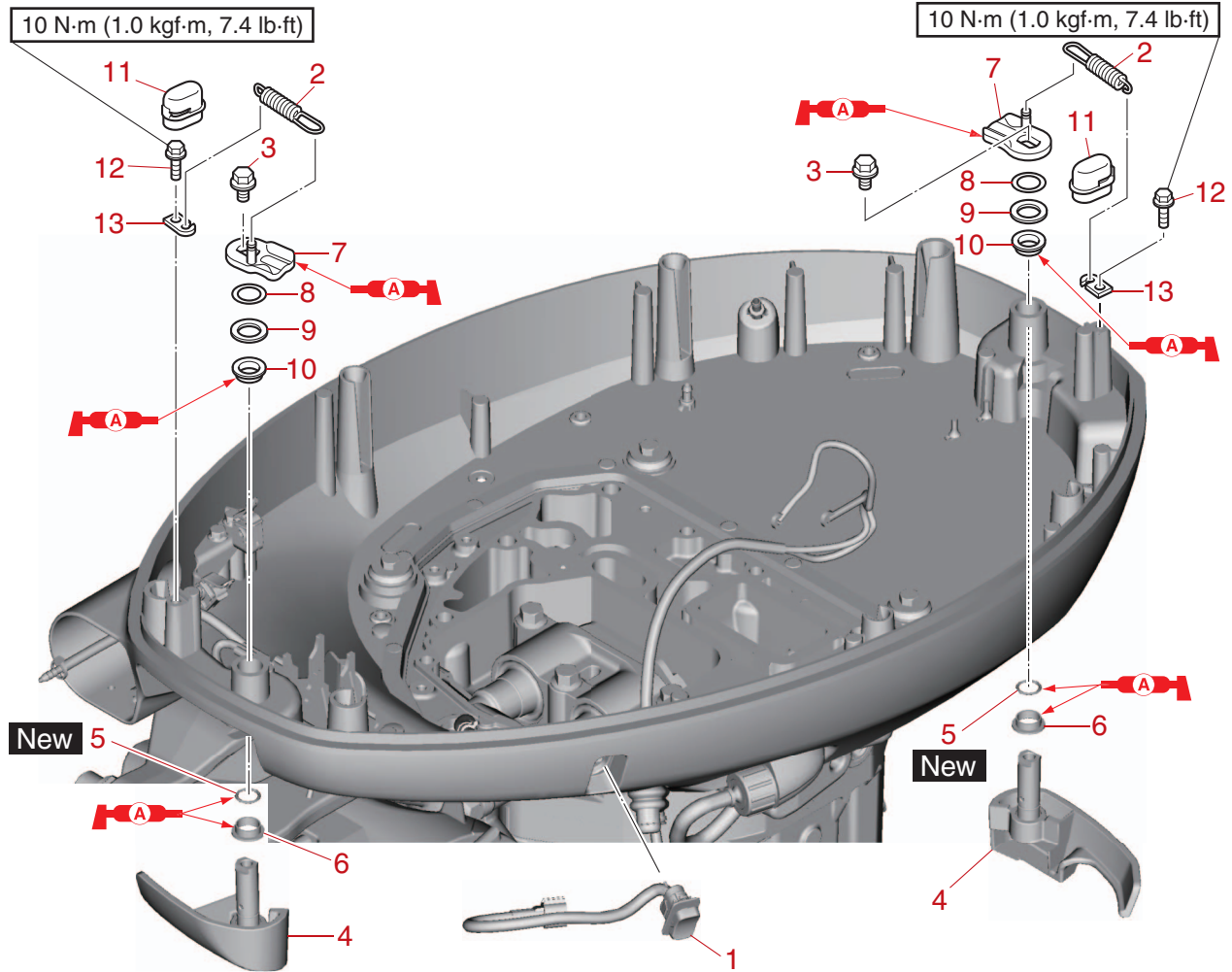


↑↓	Part name	Q'ty	Remarks
1	Holder	1	
2	Clip	1	
3	Screw M4 × 16 mm	2	
4	Plate	1	
5	Shift position switch	1	
6	Clip	1	
7	Bushing	1	
8	Bolt M6 × 40 mm	2	
9	Bracket	1	
10	Washer	1	
11	Clip	1	
12	Shift lever	1	

↑↓	Part name	Q'ty	Remarks
13	Bushing	1	
14	Shift rod detent bolt M12 × 16 mm	1	
15	Spring	1	
16	Ball 6.32 mm (0.25 in) *1	1	
17	Clip	1	
18	Washer	1	
19	Bushing	1	
20	Bolt M6 × 30 mm	2	
21	Bracket	1	
22	Shift rod	1	
23	O-ring	1	

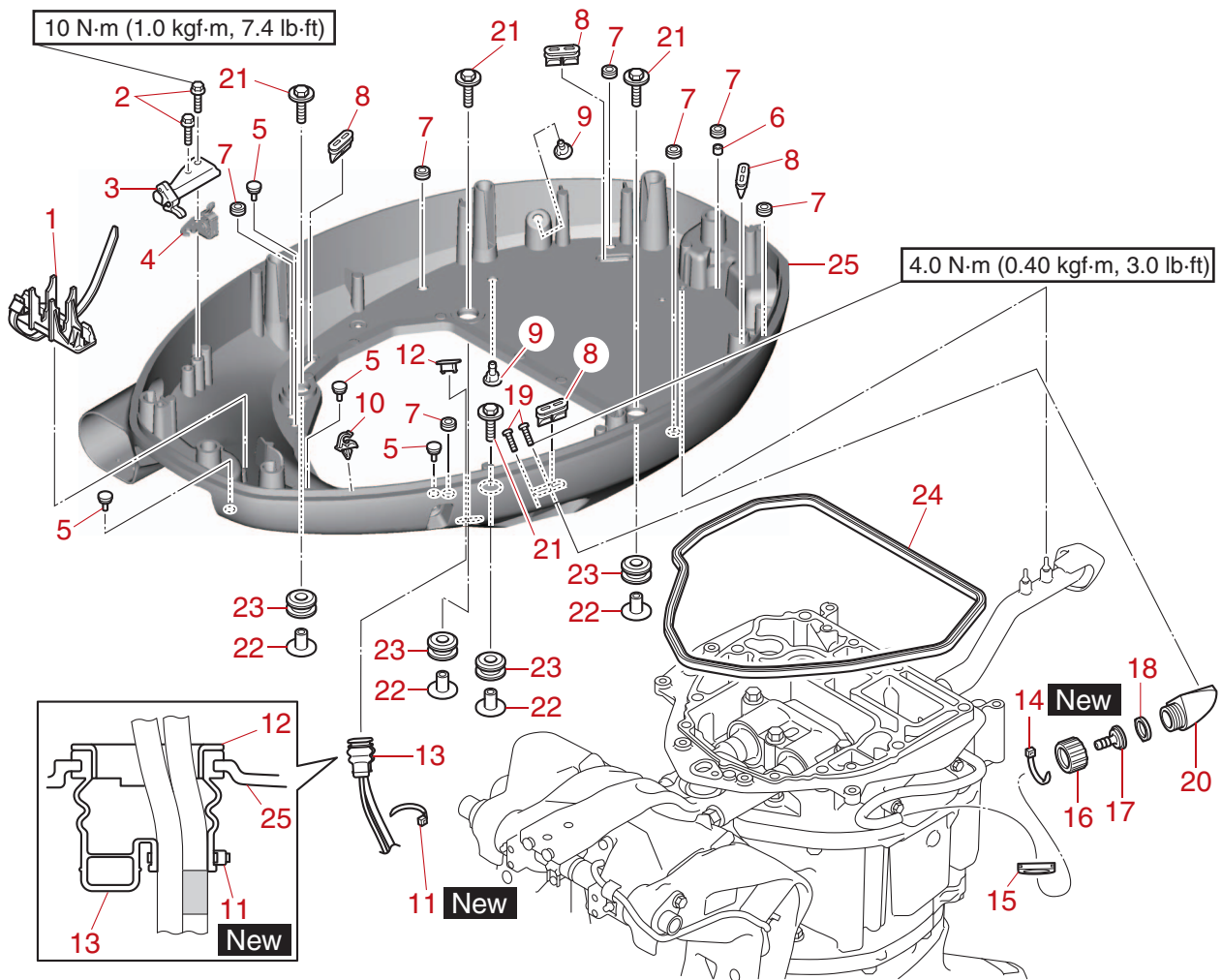
*1: Reference data

PTT switch and cowling lock lever



∩∩	Part name	Q'ty	Remarks
1	PTT switch	1	
2	Spring	2	
3	Bolt M8 × 12 mm	2	
4	Cowling lock lever	2	
5	O-ring	2	
6	Bushing	2	
7	Lever	2	
8	Wave washer	2	
9	Washer	2	
10	Bushing	2	
11	Cap	2	
12	Bolt M6 × 20 mm	2	
13	Hook	2	

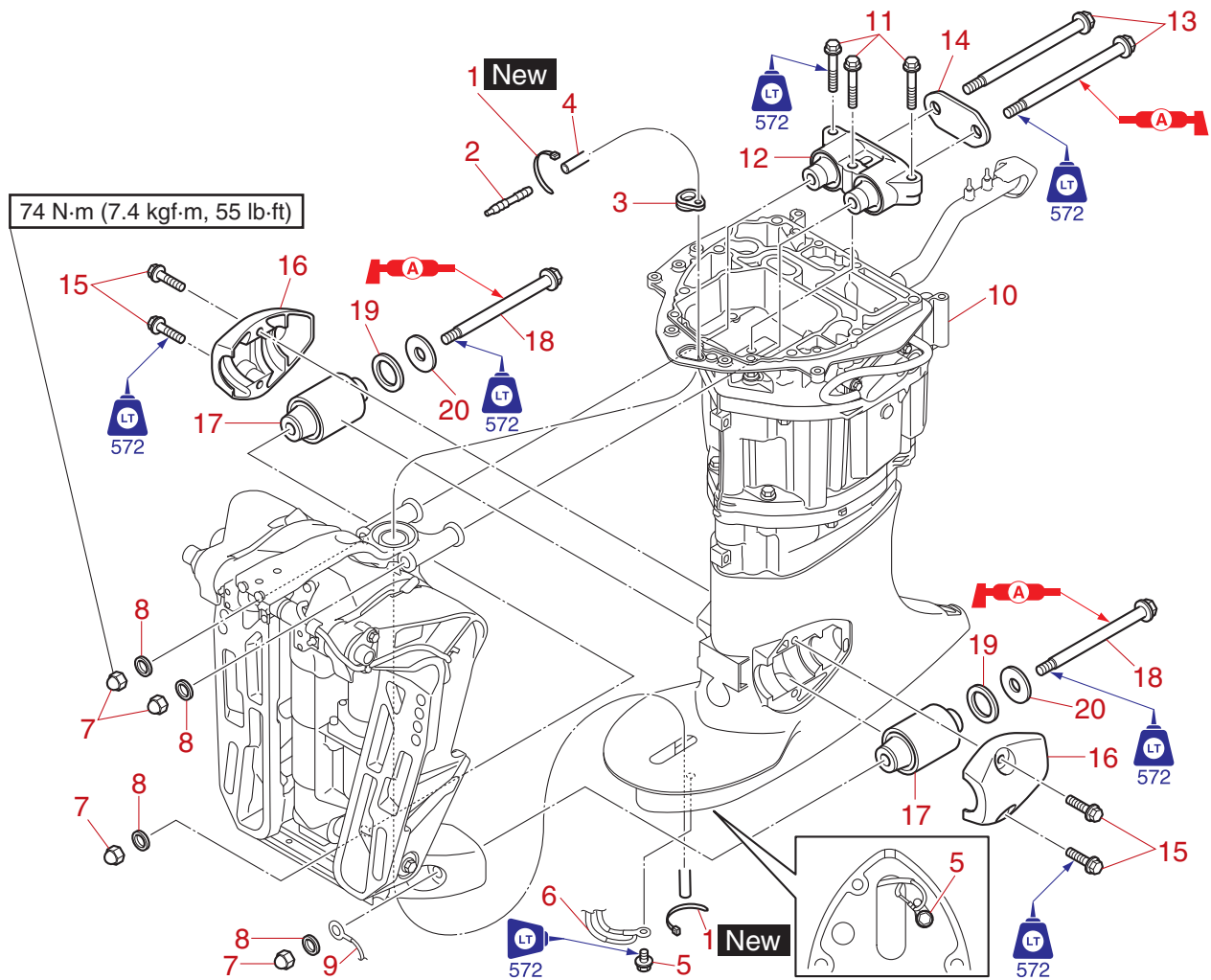
Bottom cowling



↑↓	Part name	Q'ty	Remarks
1	Holder	1	
2	Bolt M6 × 25 mm	2	
3	Bracket	1	
4	Bracket	1	
5	Grommet	4	
6	Collar	1	
7	Grommet	7	
8	Rubber seal	4	
9	Hose nipple	2	
10	Holder	1	
11	Plastic tie	1	
12	Cap	1	
13	Grommet	1	
14	Plastic tie	1	
15	Grommet	1	
16	Hose joint	1	
17	Hose joint	1	
18	Gasket	1	

↑↓	Part name	Q'ty	Remarks
19	Screw M6 × 20 mm	2	
20	Adapter	1	
21	Bolt M8 × 35 mm	4	
22	Collar	4	
23	Grommet	4	
24	Rubber seal	1	
25	Bottom cowling	1	

Upper case assembly and mount



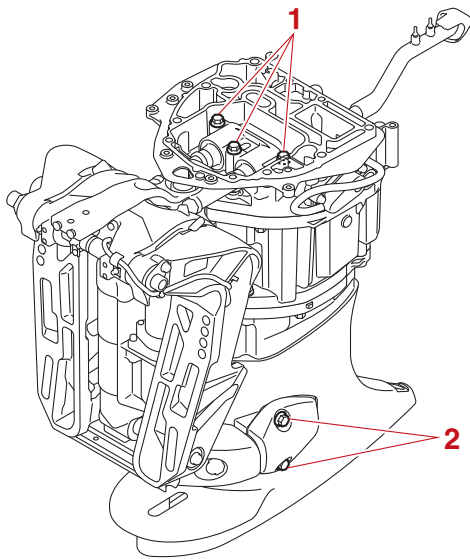
↑↓	Part name	Q'ty	Remarks
1	Plastic tie	2	
2	Nipple	1	
3	Grommet	1	
4	Speedometer hose	1	
5	Bolt M6 × 10 mm	1	
6	Ground lead	1	
7	Nut M14	4	
8	Washer	4	
9	Ground lead	1	
10	Upper case	1	
11	Bolt M10 × 60 mm	3	
12	Upper mount	1	
13	Bolt M14 × 194 mm	2	
14	Plate	1	
15	Bolt M10 × 40 mm	4	
16	Cover	2	
17	Lower mount	2	
18	Bolt M14 × 178 mm	2	

↑↓	Part name	Q'ty	Remarks
19	Washer	2	
20	Washer	2	

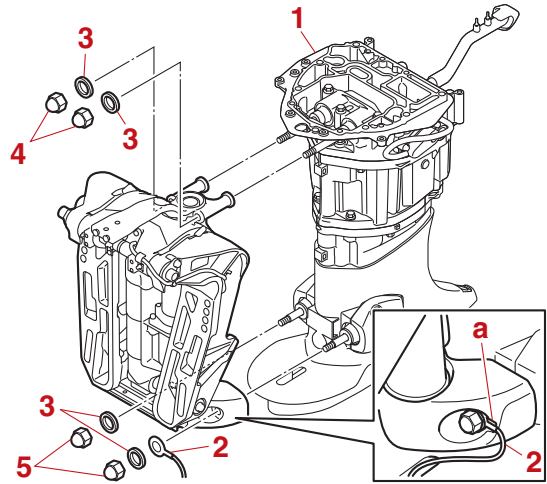
Removing the upper case


1. Drain:
 - Engine oil
2. Remove:
 - Upper case

TIP: _____
 Before removing the upper case, loosen the upper mount bolts "1" and lower mount cover bolts (PORT and STBD) "2".



TIP: _____
 Fit the ground lead "2" into the groove "a" in the steering yoke.

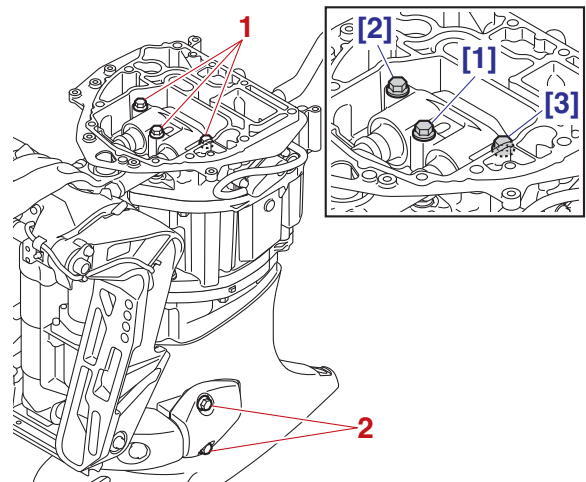


	Upper mount nut "4"
	74 N·m (7.4 kgf·m, 55 lb-ft)
	Lower mount nut "5"
	74 N·m (7.4 kgf·m, 55 lb-ft)

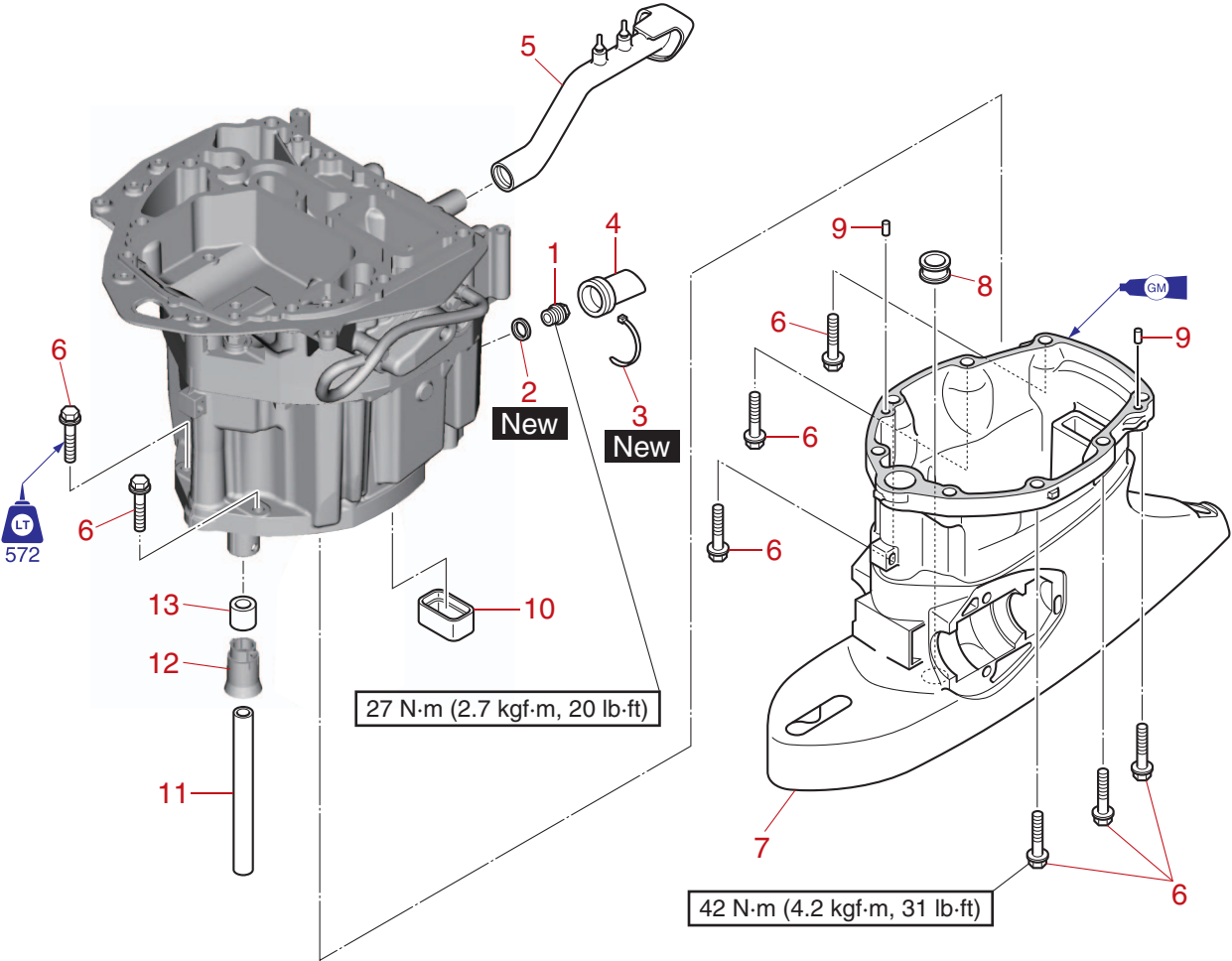
2. Tighten:
 - Upper mount mounting bolt
 - Lower mount cover bolt
 - a. Tighten the upper mount mounting bolts "1" in the order [1], [2], and so on.
 - b. Tighten the lower mount cover bolts (PORT and STBD) "2".

Installing the upper case

1. Install:
 - Plate
 - Upper mount bolt
 - Upper mount
 - Upper mount mounting bolt (temporarily tighten)
 - Washer
 - Washer
 - Lower mount bolt
 - Lower mount
 - Lower mount cover
 - Lower mount cover bolt (temporarily tighten)
 - Upper case "1"
 - Ground lead "2"
 - Washer "3"
 - Upper mount nut "4"
 - Lower mount nut "5"



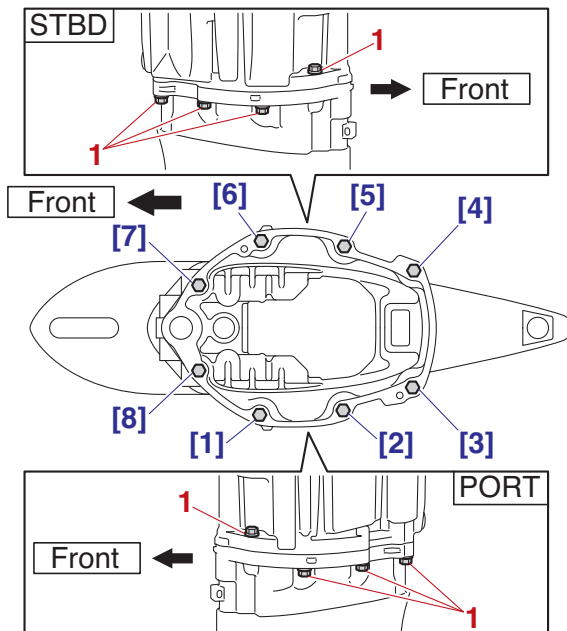
Upper case (L-transom model)




∩∩	Part name	Q'ty	Remarks
1	Drain bolt M14	1	
2	Gasket	1	
3	Plastic tie	1	
4	Damper	1	
5	Rubber seal	1	
6	Bolt M10 × 45 mm	8	
7	Upper case	1	
8	Rubber seal	1	
9	Dowel pin	2	
10	Rubber seal	1	
11	Water pipe	1	
12	Guide	1	
13	Rubber seal	1	


Assembling the upper case

1. Install:
 - Rubber seal (to the oil pan assembly)
 - Guide (to the oil pan assembly)
 - Water pipe
 - Rubber seal (to the oil pan assembly)
 - Dowel pin
 - Rubber seal (to the upper case)
 - Upper case
2. Tighten:
 - Upper case bolt
 - a. Tighten the upper case bolts “1” to the specified torque in the order [1], [2], and so on.

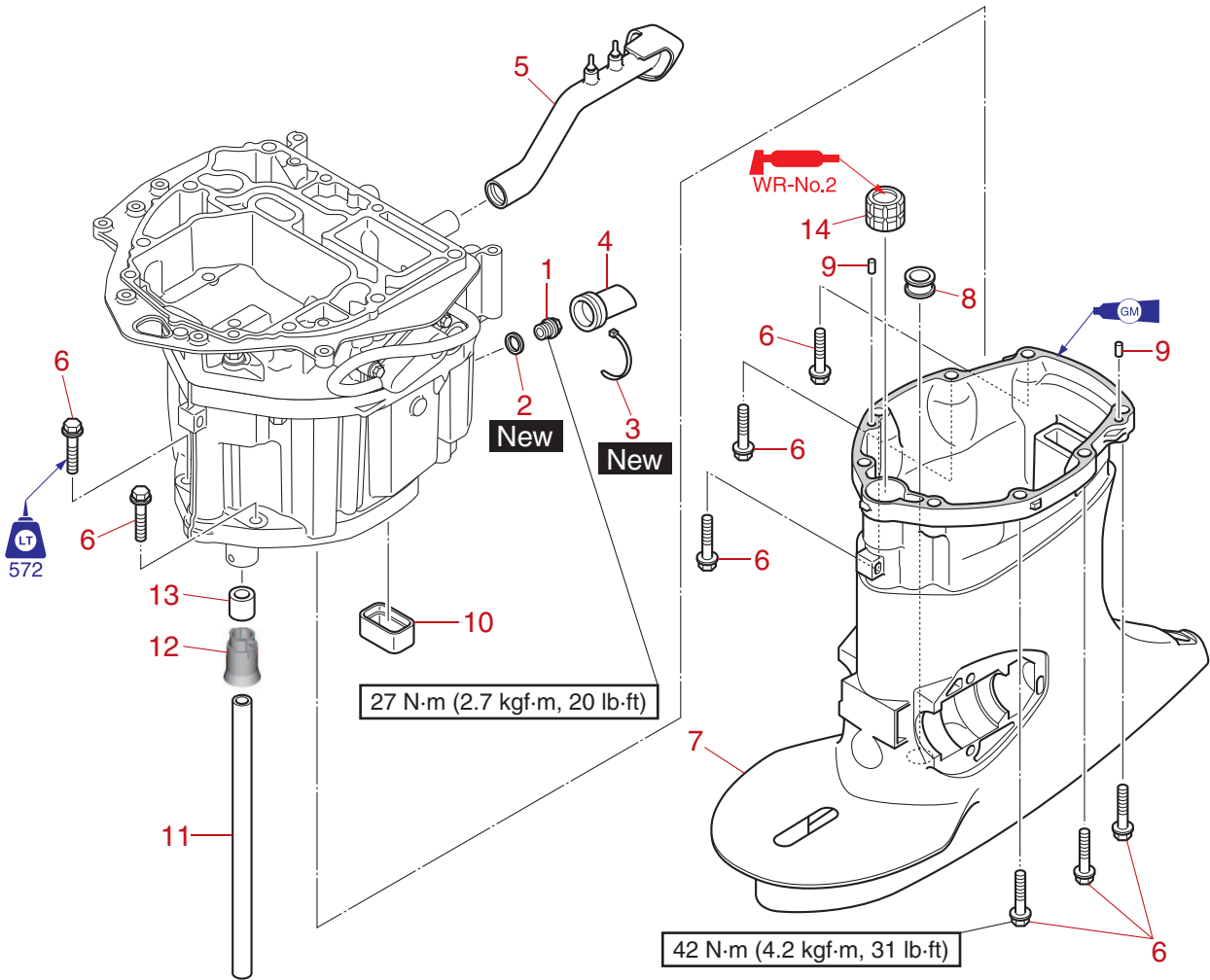


	Upper case bolt “1” 42 N·m (4.2 kgf·m, 31 lb·ft)
---	---

3. Install:
 - Rubber seal
 - Damper
 - Plastic tie **New**
 - Gasket **New**
 - Drain bolt

	Drain bolt 27 N·m (2.7 kgf·m, 20 lb·ft)
---	--

Upper case (X-transom model)

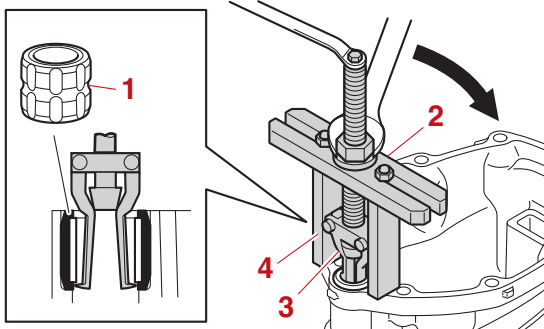



↑↓	Part name	Q'ty	Remarks
1	Drain bolt M14	1	
2	Gasket	1	
3	Plastic tie	1	
4	Damper	1	
5	Rubber seal	1	
6	Bolt M10 × 45 mm	8	
7	Upper case	1	
8	Rubber seal	1	
9	Dowel pin	2	
10	Rubber seal	1	
11	Water pipe	1	
12	Guide	1	
13	Rubber seal	1	
14	Bushing	1	

Upper case (X-transom model)

Disassembling the upper case

- Remove:
 - Drive shaft bushing "1"



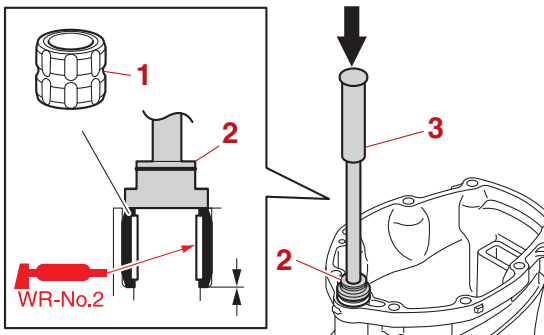
	Stopper guide plate "2" 90890-06501
	Bearing puller assembly "3" 90890-06535
	Stopper guide stand "4" 90890-06538


Checking the drive shaft bushing

- Check:
 - Drive shaft bushing
Cracked/worn → Replace.

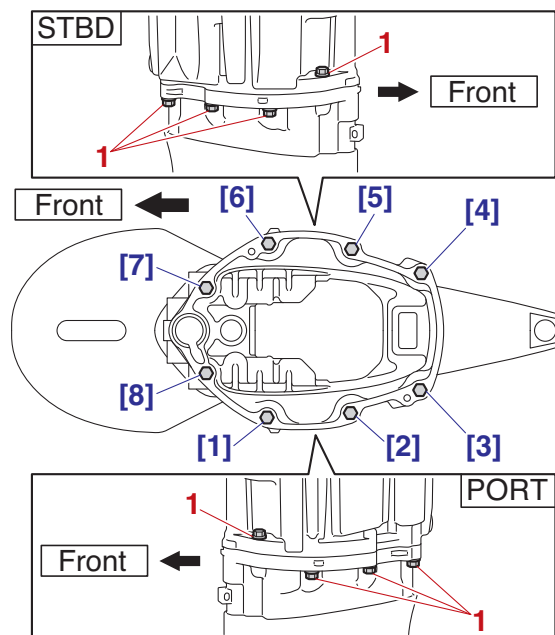
Assembling the upper case


- Install:
 - Drive shaft bushing "1"




	Needle bearing attachment "2" 90890-06611
	Driver rod L3 "3" 90890-06652

- Install:
 - Rubber seal (to the oil pan assembly)
 - Guide (to the oil pan assembly)
 - Water pipe
 - Rubber seal (to the oil pan assembly)
 - Dowel pin
 - Rubber seal (to the upper case)
 - Upper case
- Tighten:
 - Tighten the upper case bolts "1" to the specified torque in the order [1], [2], and so on.

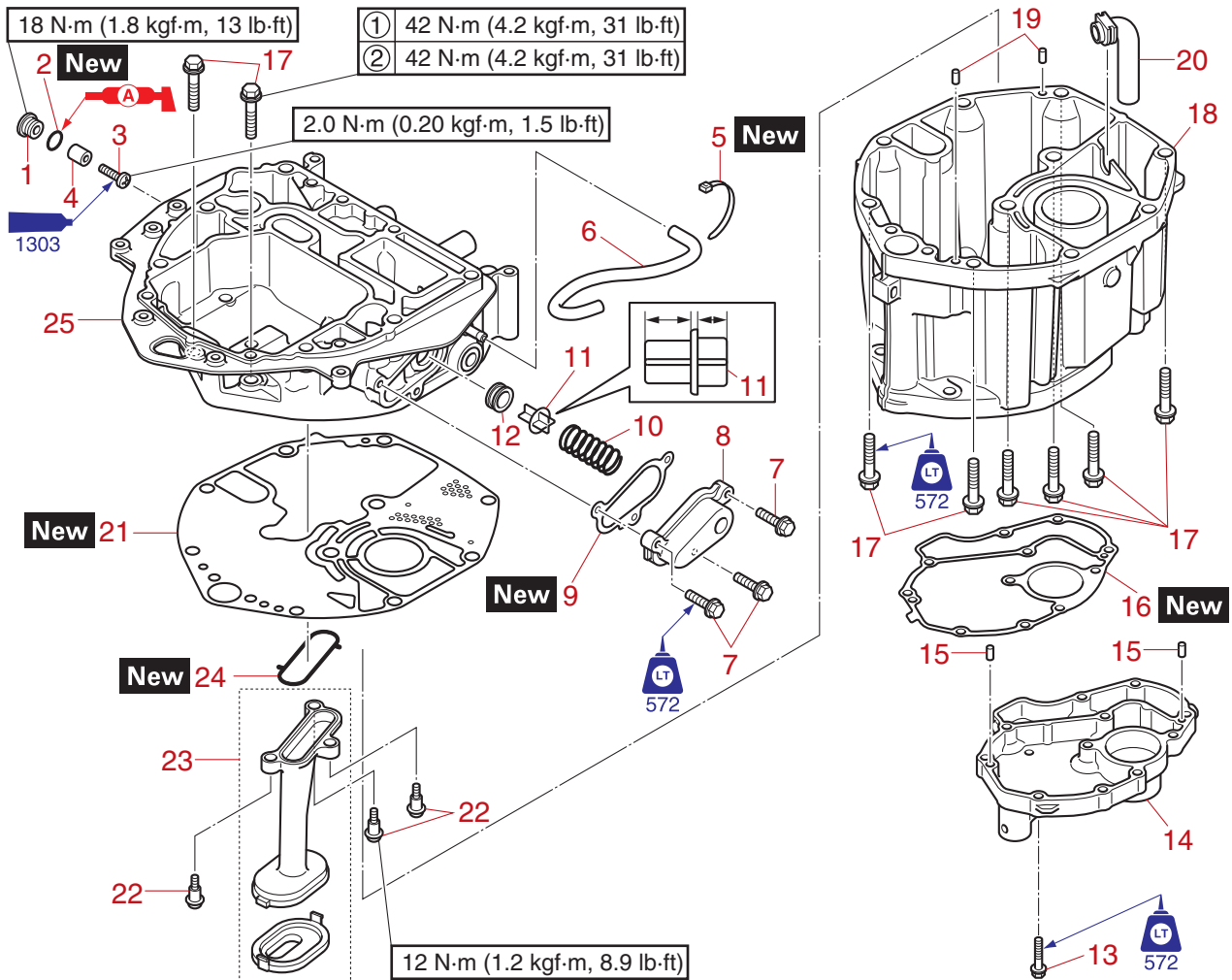


	Upper case bolt "1" 42 N·m (4.2 kgf·m, 31 lb·ft)
---	---

- Install:
 - Rubber seal
 - Damper
 - Plastic tie **New**
 - Gasket **New**
 - Drain bolt

	Drain bolt 27 N·m (2.7 kgf·m, 20 lb·ft)
---	--

Oil pan and exhaust guide



↑↓	Part name	Q'ty	Remarks
1	Plug	1	
2	O-ring	1	
3	Screw M5 × 25 mm	1	
4	Anode	1	
5	Plastic tie	1	
6	Hose	1	
7	Bolt M6 × 25 mm	3	
8	Cover	1	
9	Gasket	1	
10	Spring	1	
11	PCV	1	
12	Grommet	1	
13	Bolt M6 × 30 mm	11	
14	Plate	1	
15	Dowel pin	2	
16	Gasket	1	
17	Bolt M10 × 45 mm	8	
18	Oil pan	1	

↑↓	Part name	Q'ty	Remarks
19	Dowel pin	2	
20	Pipe	1	
21	Gasket	1	
22	Bolt M6 × 24 mm	3	
23	Oil strainer	1	
24	Gasket	1	
25	Exhaust guide	1	

Checking the oil pan and exhaust guide

1. Clean:
 - Removed parts
2. Check:
 - Exhaust guide
 - Oil pan
 - Muffler
 Corroded/cracked → Replace.

2. Install:
 - Gasket **New** (to the exhaust guide)
 - Pipe
 - Dowel pin
 - Oil pan
3. Tighten:
 - a. Tighten the oil pan bolts “1” to the specified torque in 2 stages and in the order [1], [2], and so on.

Checking the oil strainer

1. Check:
 - Oil strainer
 Dirt/residue → Clean.

Checking the PCV

1. Check:
 - PCV
 Damaged/worn → Replace.
 - Grommet
 Deformed → Replace.
 - Spring
 Deformed/fatigued → Replace.

Checking the exhaust guide anode


1. Check:
 - Anode
 Eroded (1/2 or more) → Replace.
 - There is grease, oil, or scales → Clean.

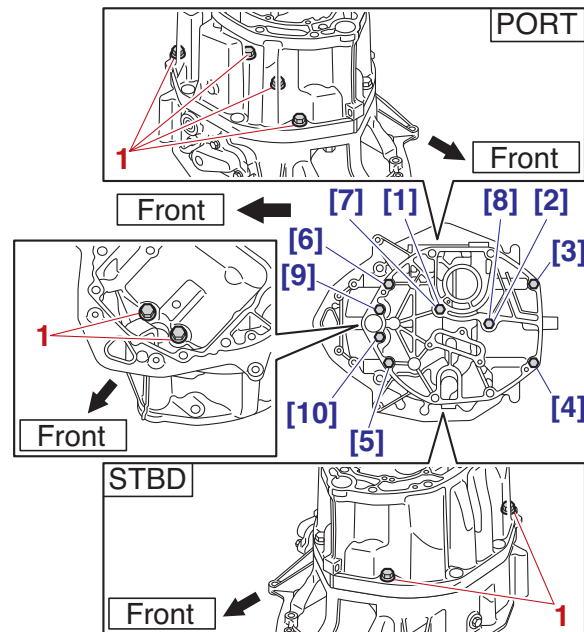
NOTICE


Do not apply grease, oil, or paint to the anode.

Assembling the oil pan and exhaust guide

1. Install:
 - Gasket **New** (to the oil strainer)
 - Oil strainer
 - Oil strainer bolt

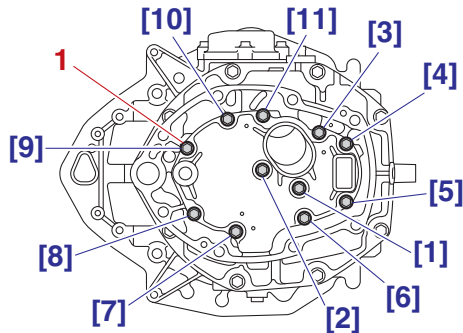
	Oil strainer bolt 12 N·m (1.2 kgf·m, 8.9 lb·ft)
---	--




	Oil pan bolt “1” 1st: 42 N·m (4.2 kgf·m, 31 lb·ft) 2nd: 42 N·m (4.2 kgf·m, 31 lb·ft)
---	--

4. Install:
 - Gasket **New** (to the oil pan)
 - Dowel pin
 - Plate


5. Tighten:
- Muffler bolt
 - a. Tighten the muffler bolts “1” in the order [1], [2], and so on.



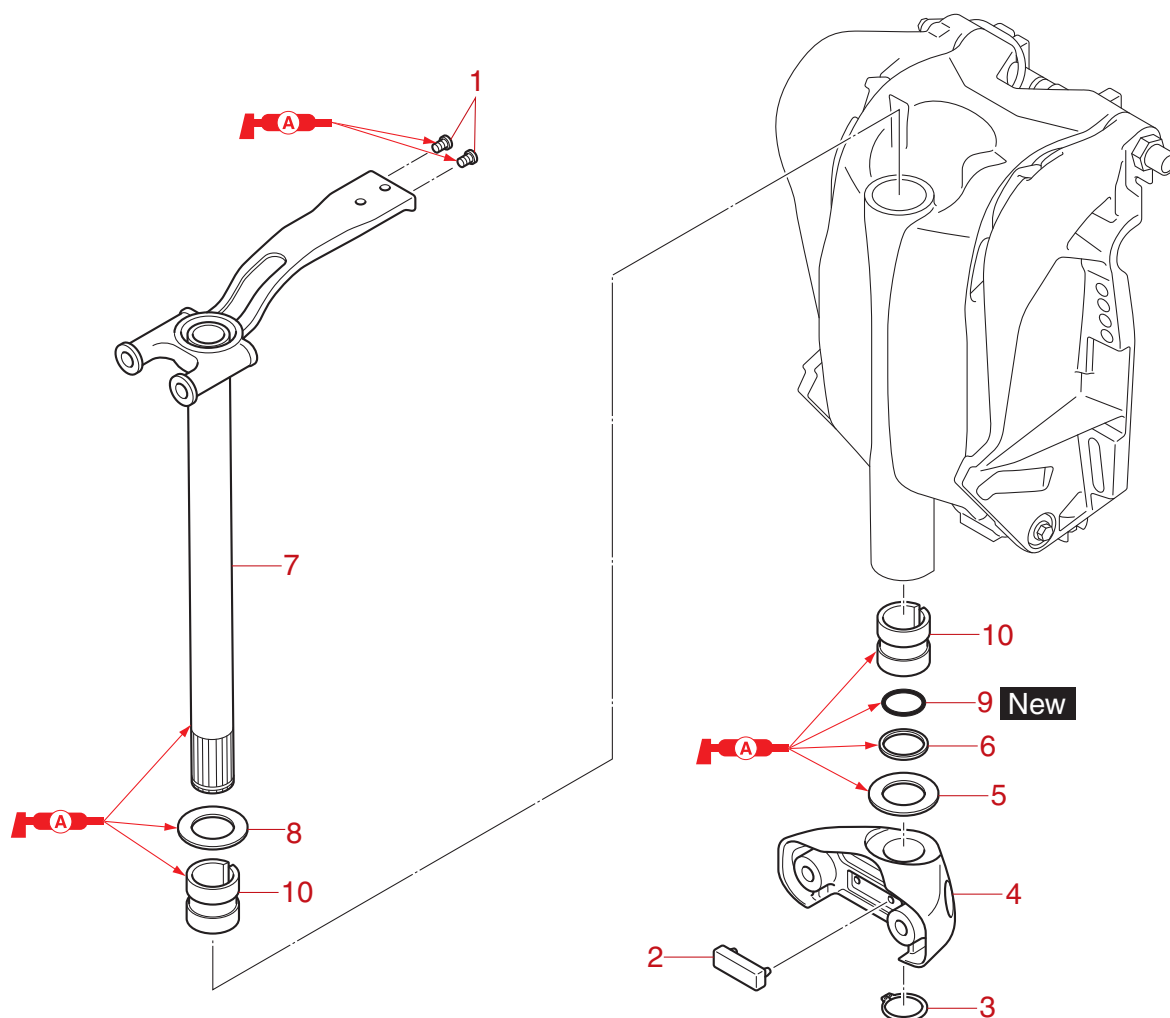
6. Install:
- Grommet
 - PCV
 - Spring
 - Gasket **New** (to the cover)
 - Cover
 - Cover bolt
 - Hose
 - Plastic tie **New**
 - Anode (to the plug screw)
 - Plug screw

	Plug screw 2.0 N·m (0.20 kgf·m, 1.5 lb·ft)
---	---

7. Install:
- O-ring **New**
 - Plug

	Plug 18 N·m (1.8 kgf·m, 13 lb·ft)
---	--------------------------------------

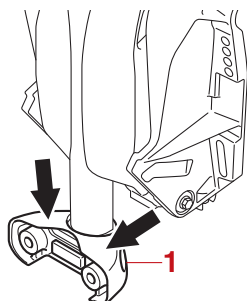
Steering arm



↕	Part name	Q'ty	Remarks
1	Plug	2	
2	Damper	1	
3	Circlip	1	
4	Steering yoke	1	
5	Washer	1	
6	Washer	1	
7	Steering arm	1	
8	Washer	1	
9	O-ring	1	
10	Bushing	2	

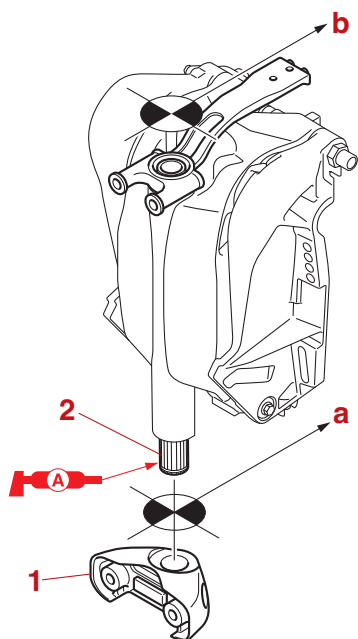
Removing the steering arm

1. Remove:
 - Steering yoke
 - a. Remove the steering yoke "1" by striking it using a copper hammer.

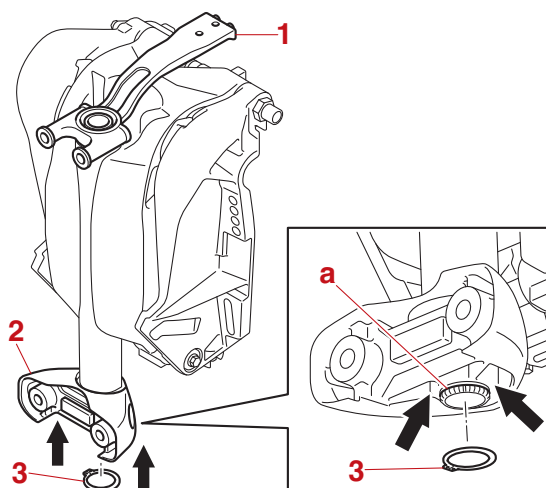


Installing the steering arm

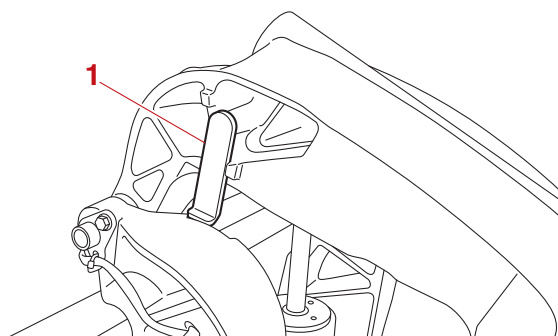
1. Install:
 - Washer (onto the steering arm)
 - Bushing (onto the steering arm)
 - Steering arm (to the swivel bracket)
 - Bushing
 - O-ring **New**
 - Washer
 - Washer
2. Install:
 - Steering yoke
 - Circlip
 - a. Install the steering yoke "1" so that the steering arm "2" and the steering yoke "1" are facing in the same direction ("a" and "b" are aligned).



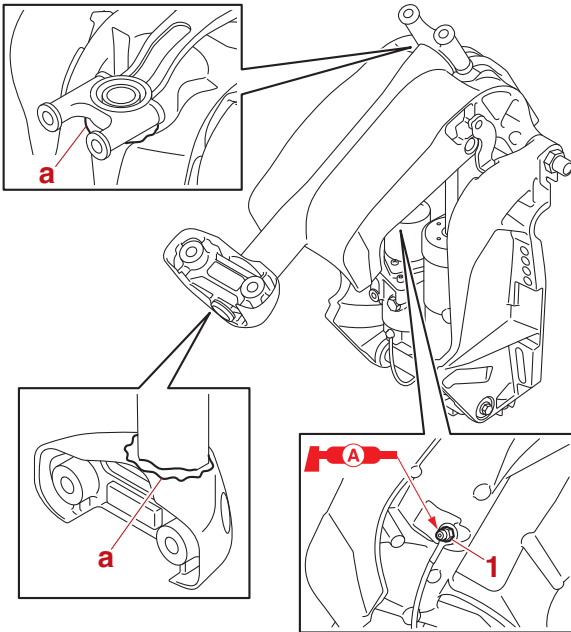
- b. Hold the steering arm "1", and then strike the steering yoke "2" using a copper hammer until the groove "a" for installing the circlip is visible.
- c. Install the circlip "3".



3. Inject:
 - Grease
 - a. Fully tilt the swivel bracket up, and then support it using the tilt stop lever "1".

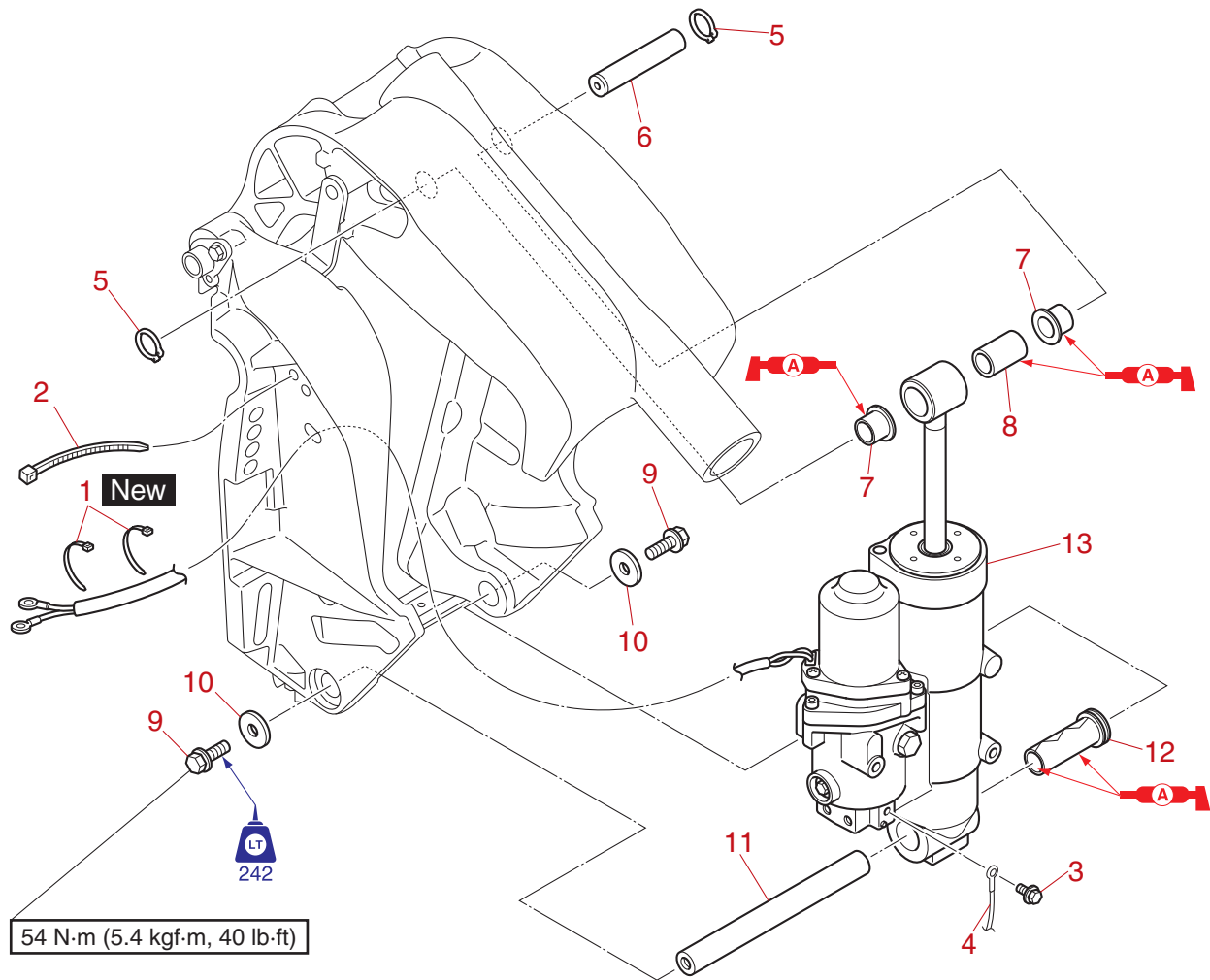


- b. Inject grease into the grease nipple "1"
until it comes out from both the upper
and lower bushings "a".



4. Install:
- Damper
 - Plug

PTT unit



↑↓	Part name	Q'ty	Remarks
1	Plastic tie	2	
2	Plastic tie	1	
3	Bolt M6 × 10 mm	1	
4	Ground lead	1	
5	Circlip	2	
6	Shaft	1	
7	Bushing	2	
8	Bushing	1	
9	Bolt M10 × 30 mm	2	
10	Washer	2	
11	Shaft	1	
12	Bushing	1	
13	PTT unit	1	

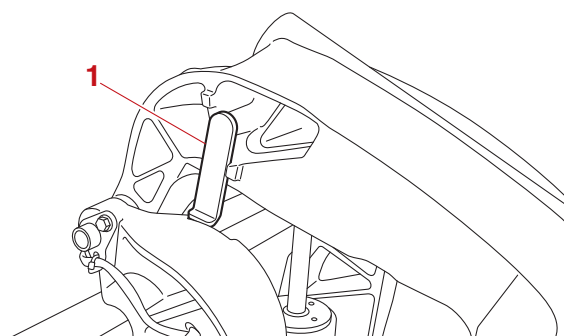
Removing the PTT unit

WARNING

When removing the PTT unit with the power unit installed, make sure to suspend the outboard motor.

TIP:

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



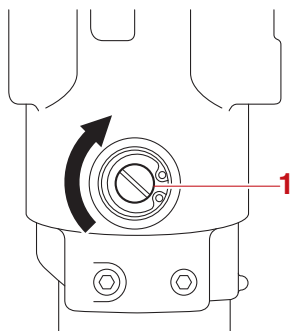
Bleeding the PTT unit

WARNING

Before removing the reservoir cap, make sure that the trim and tilt ram is fully extended. Otherwise, fluid could be expelled forcefully from the PTT unit due to internal pressure.

1. Bleed:

- PTT unit
 - a. Place the PTT unit in an upright position.
 - b. Turn the manual valve "1" clockwise to check that it is closed.

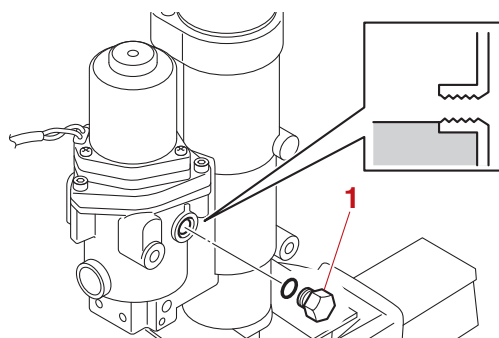


Manual valve "1"
2.0 N·m (0.20 kgf·m, 1.5 lb·ft)

- c. Remove the reservoir cap "1", and then check the fluid level.

TIP:

If the fluid is at the proper level, a small amount of fluid should flow out of the filler hole.



- d. If the fluid is below the proper level, add the recommended fluid.
- e. Install the reservoir cap, and then tighten it to the specified torque.

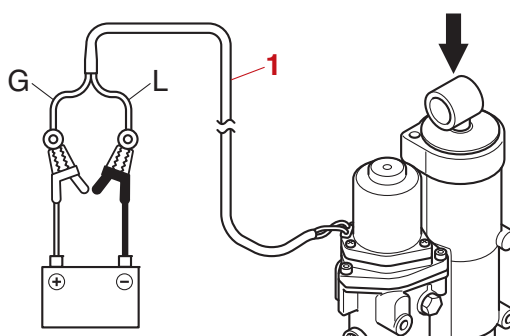


Reservoir cap
7 N·m (0.7 kgf·m, 5.2 lb·ft)

- f. Connect the battery jumper leads to the PTT motor lead "1" to fully retract the trim and tilt ram.

TIP:

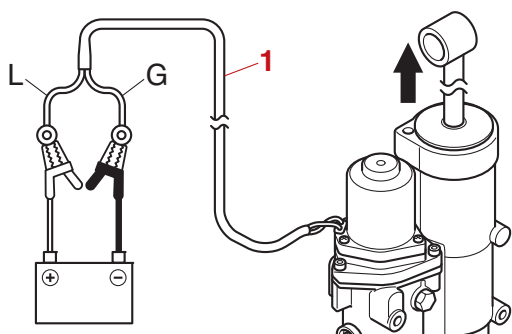
If the trim and tilt ram does not move down easily, push on the trim and tilt ram to assist operation.



Ram	PTT motor lead	Battery
Retract	Green (G)	(+)
	Blue (L)	(-)

- g. Reverse the connection between the battery jumper leads and the PTT motor lead “1” to fully extend the trim and tilt ram.

TIP: _____
If the trim and tilt ram does not move up easily, pull on the trim and tilt ram to assist operation.




Ram	PTT motor lead	Battery
Extend	Blue (L)	(+)
	Green (G)	(-)

- h. Repeat steps (f) and (g) to fully extend and retract the trim and tilt ram 4 or 5 times.
- i. Fully extend the trim and tilt ram.
- j. Remove the reservoir cap, and then check the fluid level.

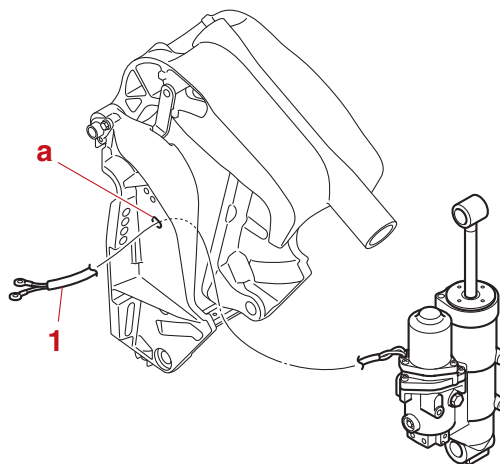
TIP: _____
If the fluid is below the proper level, add the recommended PTT fluid. Repeat steps (c)–(i) until the fluid is at the proper level.

- k. Install a new O-ring and the reservoir cap, and then tighten the reservoir cap to the specified torque.


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

Installing the PTT unit

1. Install:
 - Bushing (upper side)
2. Route:
 - PTT motor lead
 - a. Route the PTT motor lead “1” through the hole “a” in the clamp bracket (PORT).



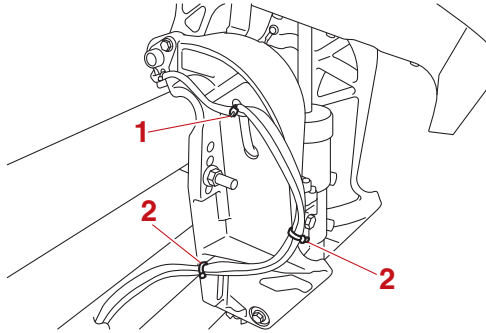
3. Install:
 - PTT unit
 - Shaft (upper side)
 - Circlip
 - Bushing (lower side)
 - Shaft (lower side)
 - Washer
 - Shaft bolt

	Shaft bolt 54 N·m (5.4 kgf·m, 40 lb·ft)
---	--

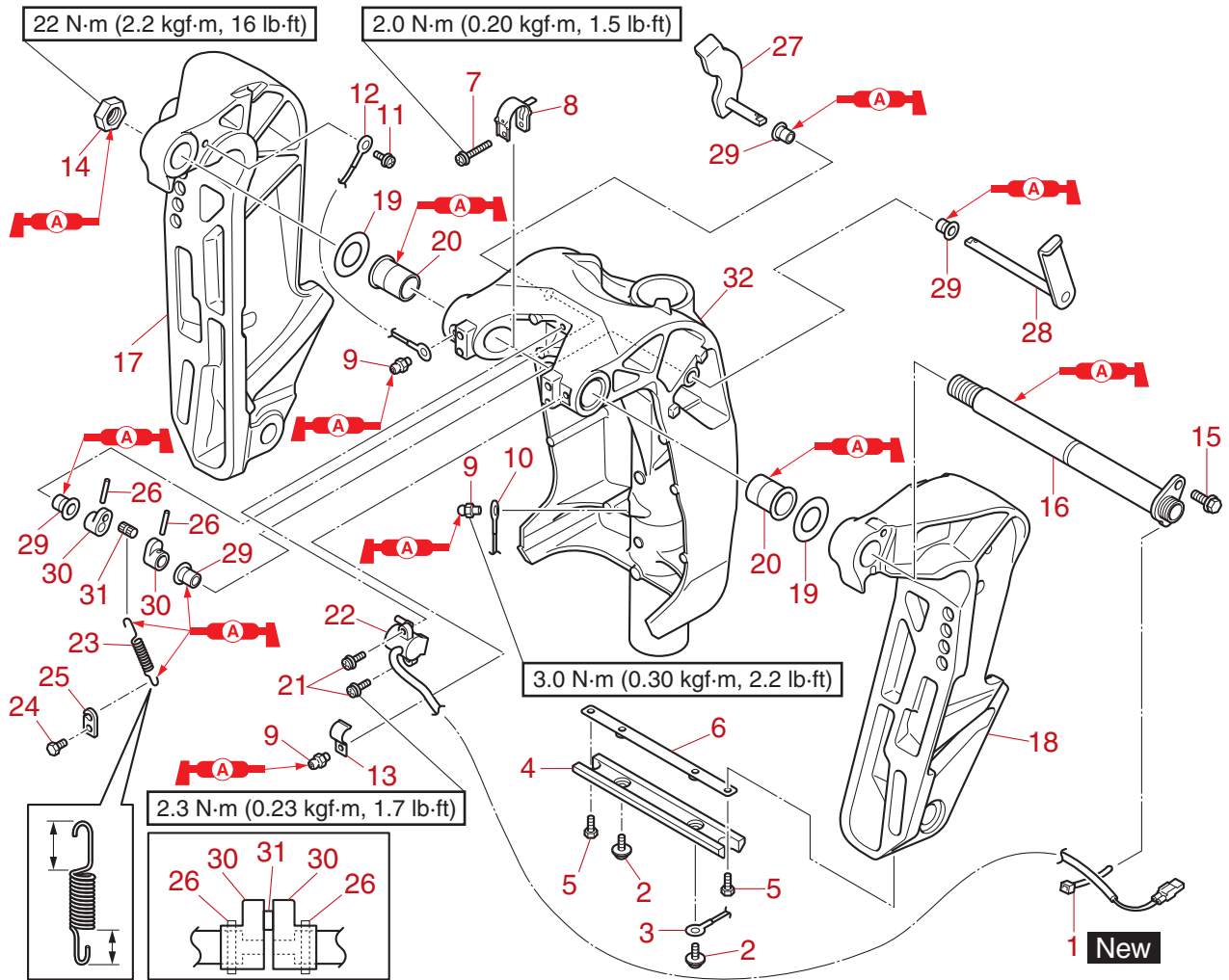
4. Install:
 - Ground lead
 - Ground lead bolt

5. Install:

- Plastic tie
- Plastic tie **New**
 - a. Fasten the PTT motor lead and trim sensor lead using the plastic tie “1” and new plastic ties “2”.



Clamp bracket and swivel bracket



№	Part name	Q'ty	Remarks
1	Plastic tie	1	
2	Bolt M6 × 14 mm	2	
3	Ground lead	1	
4	Anode	1	
5	Bolt M6 × 16 mm	2	
6	Plate	1	
7	Screw M5 × 35 mm	1	
8	Trim sensor cam	1	
9	Grease nipple M6	3	
10	Ground lead	1	
11	Screw M6 × 12 mm	1	
12	Ground lead	1	
13	Clamp	1	
14	Self-locking nut M22	1	
15	Bolt M8 × 20 mm	1	
16	Through tube	1	
17	Clamp bracket (STBD)	1	
18	Clamp bracket (PORT)	1	

№	Part name	Q'ty	Remarks
19	Washer	2	
20	Bushing	2	
21	Screw M6 × 16 mm	2	
22	Trim sensor	1	
23	Spring	1	
24	Bolt M6 × 10 mm	1	
25	Hook	1	
26	Pin	2	
27	Tilt stop lever	1	
28	Tilt stop lever	1	
29	Bushing	4	
30	Distance collar	2	
31	Pin	1	
32	Swivel bracket	1	

Checking the clamp bracket anode

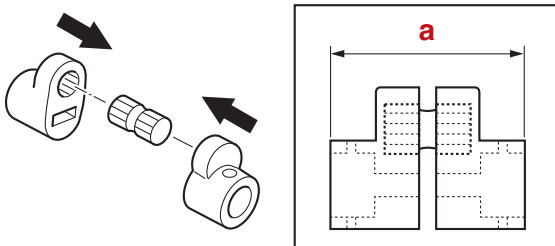
1. Check:
 - Anode
Eroded (1/2 or more) → Replace.
 - There is grease, oil, or scales → Clean.


NOTICE

Do not apply grease, oil, or paint to the anode.

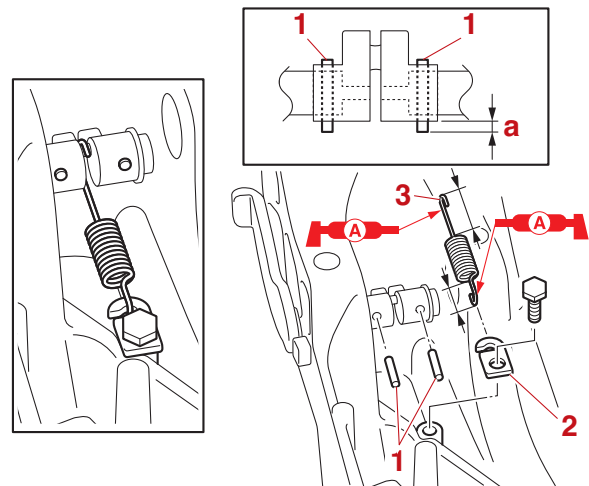
Installing the clamp bracket


1. Assemble:
 - Pin
 - Distance collar
 - a. Assemble the distance collar assembly.




	Distance "a" 30.3–30.6 mm (1.19–1.20 in)
---	---

2. Install:
 - Bushing
 - Distance collar assembly
 - Tilt stop lever
3. Install:
 - Pin "1"
 - Hook "2"
 - Hook bolt
 - Spring "3"




	Distance "a" 2.5–3.5 mm (0.10–0.14 in)
---	---

4. Install:
 - Trim sensor
 - Trim sensor screw

	Trim sensor screw 2.3 N·m (0.23 kgf·m, 1.7 lb·ft)
---	--

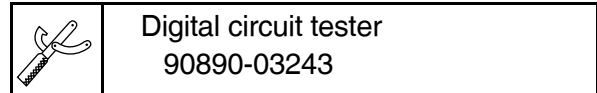
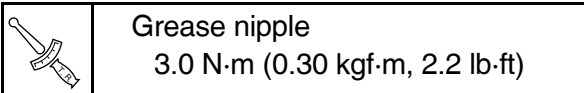
5. Install:
 - Bushing
 - Washer
 - Clamp bracket
 - Through tube
 - Bolt (to the through tube)
 - Self-locking nut (temporarily tighten)
 - Plate
 - Plate bolt
 - Anode
 - Ground lead (to the anode)
 - Bolt (to the anode)

6. Tighten:
 - Self-locking nut

	Self-locking nut 23 N·m (2.3 kgf·m, 17 lb·ft)
---	--

7. Install:
 - Clamp
 - Ground lead
 - Ground lead screw
 - Grease nipple

Clamp bracket and swivel bracket

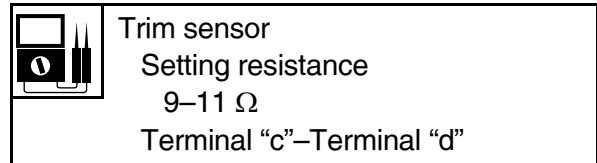
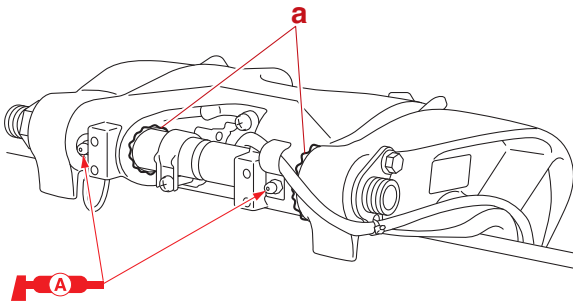


8. Install:

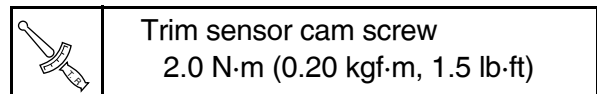
- Trim sensor cam
- Trim sensor cam screw
- Plastic tie **New**

9. Inject:

- Grease
 - a. Inject grease into the grease nipples until grease comes out from the bushings “a”.



- d. Tighten the trim sensor cam screw to the specified torque.



2. Check:

- Trim sensor setting resistance
Out of specification → Repeat from step (1).

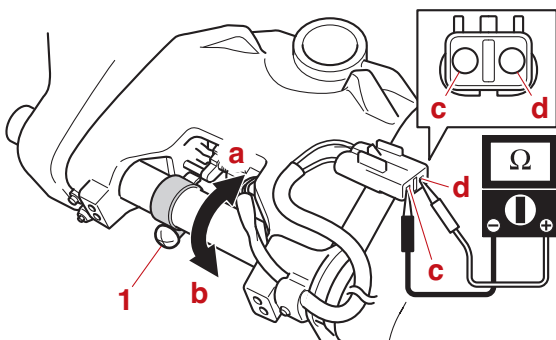
Adjusting the trim sensor cam

1. Adjust:

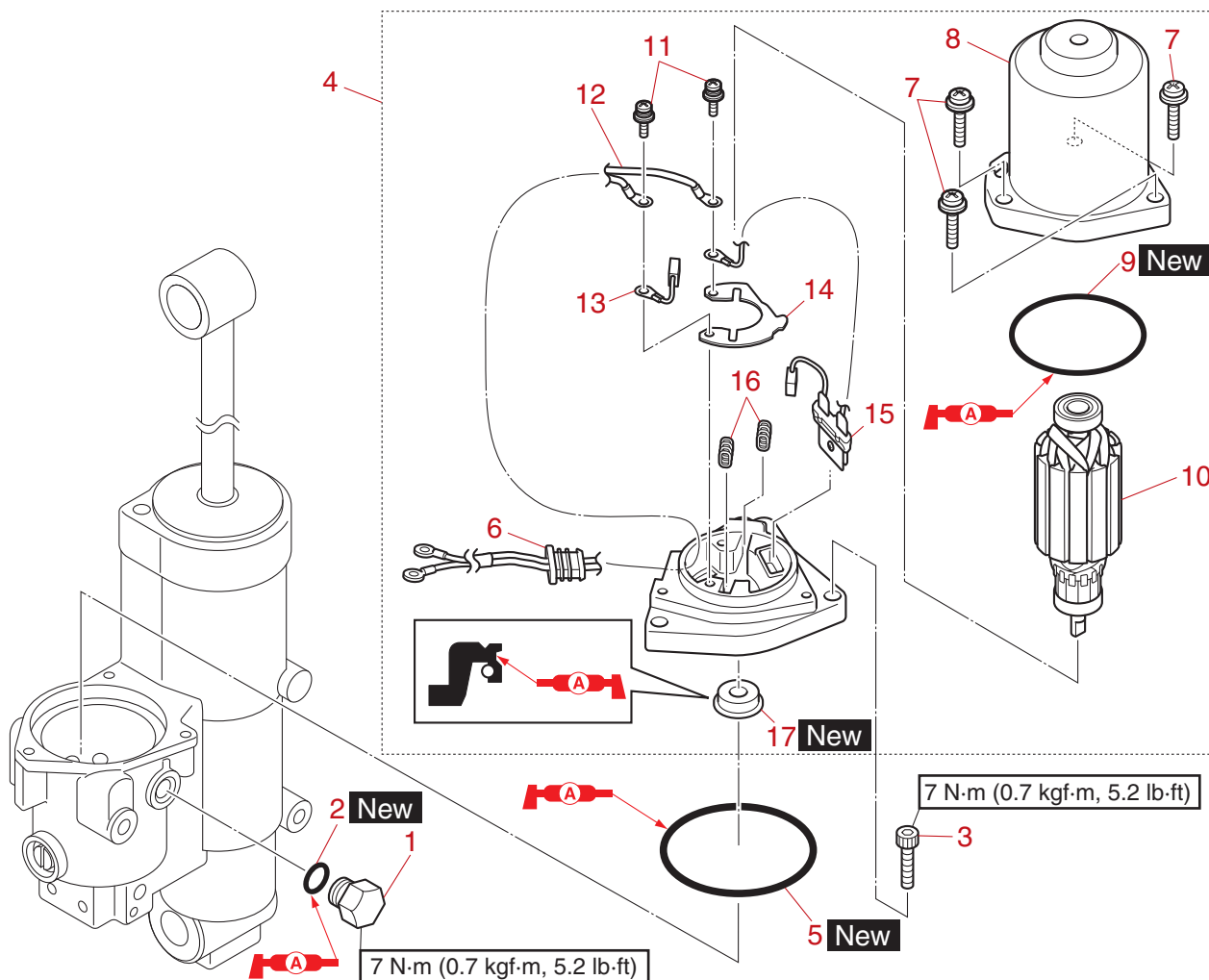
- Trim sensor setting resistance
 - a. Fully tilt the swivel bracket down.
 - b. Loosen the trim sensor cam screw “1”.
 - c. Measure the trim sensor setting resistance. Adjust if out of specification.

TIP:

- To decrease the resistance, turn the trim sensor cam in direction “a”.
- To increase the resistance, turn the trim sensor cam in direction “b”.



PTT motor



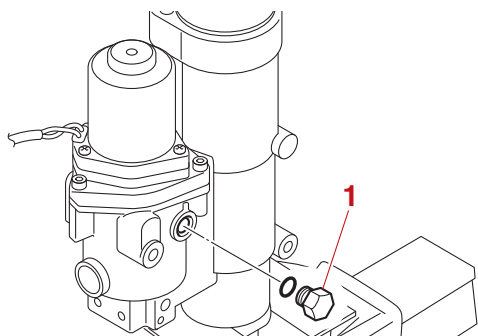
↑↓	Part name	Q'ty	Remarks
1	Reservoir cap M12 × 10 mm	1	
2	O-ring	1	
3	Bolt M6 × 25 mm	3	
4	PTT motor assembly	1	
5	O-ring	1	
6	Rubber cap	1	
7	Screw M5 × 20 mm	3	
8	Stator	1	
9	O-ring	1	
10	Armature	1	
11	Screw M4 × 16 mm	2	
12	PTT motor lead	1	
13	Brush	1	
14	Brush holder	1	
15	Circuit breaker	1	
16	Spring	2	
17	Oil seal	1	

Removing the PTT motor

WARNING

Before removing the reservoir cap, make sure that the trim and tilt ram is fully extended. Otherwise, fluid could be expelled forcefully from the PTT unit due to internal pressure.

1. Drain:
 - PTT fluid
 - a. Fully extend the trim and tilt ram.
 - b. Remove the reservoir cap "1", and then drain the PTT fluid.

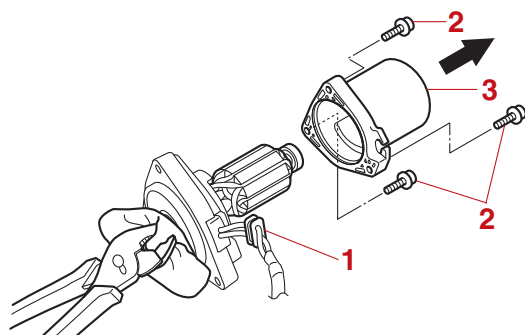


Disassembling the PTT motor

1. Remove:
 - Rubber cap "1"
 - Screw "2"
 - Stator "3"

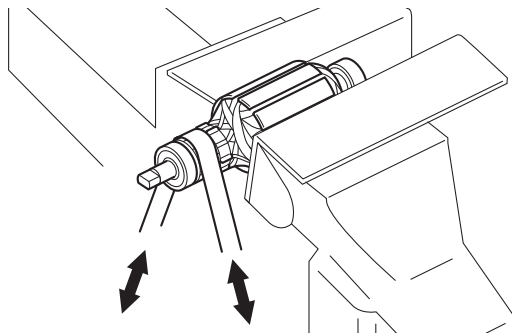
NOTICE

When removing or installing the armature along with the motor base assembly, secure the end of the armature shaft using a pair of pliers. Otherwise, the armature could separate from the motor base assembly due to the magnetic force of the stator and damage the brushes.

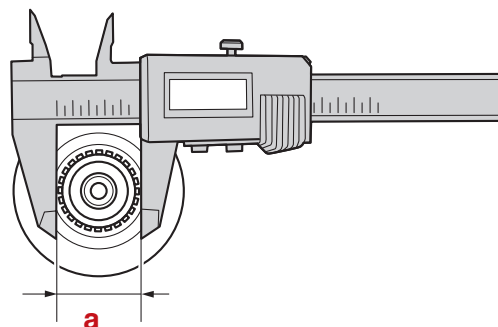



Checking the armature (PTT motor)

1. Check:
 - Commutator
 - Dirty → Clean using 600-grit sandpaper and compressed air.

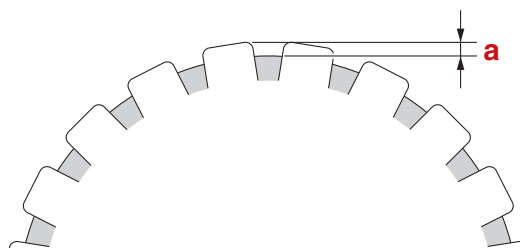



2. Measure:
 - Commutator diameter "a"
 - Below specification → Replace the armature.



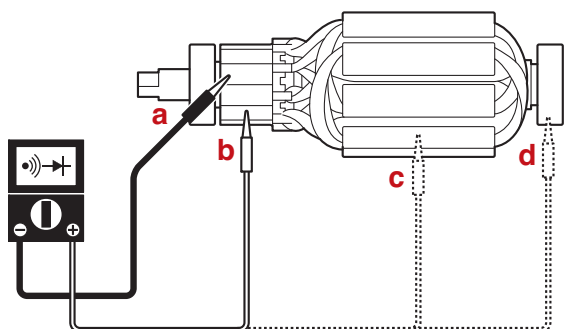
	Standard commutator diameter
	22.00 mm (0.8661 in)
	Wear limit
	21.00 mm (0.8268 in)


3. Measure:
 - Commutator undercut "a"
 - Below specification → Replace the armature.



	Standard commutator undercut
	1.50 mm (0.0591 in)
	Wear limit
	1.00 mm (0.0394 in)

4. Check:
- Armature continuity
- Out of specification → Replace the armature.

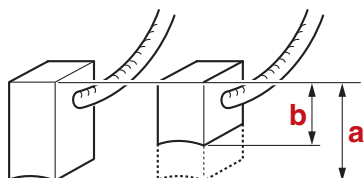


	Digital circuit tester
	90890-03243


Armature continuity			
"a"	"b"	"c"	"d"
○ — ○			

Checking the brush

1. Measure:
- Brush length
- Below specification → Replace the brush.



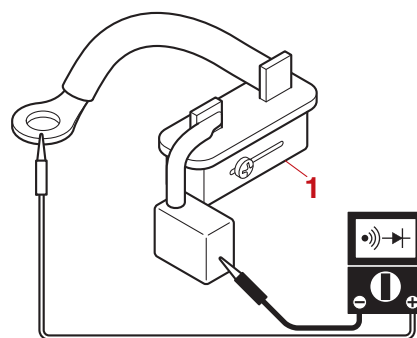
- a. Standard brush length
b. Wear limit

	Standard brush length
	10.00 mm (0.3937 in)
	Wear limit
	3.5 mm (0.14 in)

2. Check:
- Circuit breaker continuity
- No continuity → Replace.

NOTICE

Do not touch the bimetal "1". Otherwise, the operation of the circuit breaker can be affected.

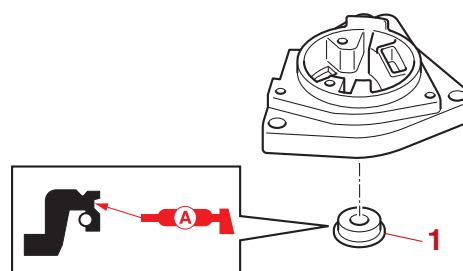


Assembling the PTT motor

NOTICE

Do not apply grease or oil to the commutator of the armature.


1. Install:
- Oil seal "1" **New**

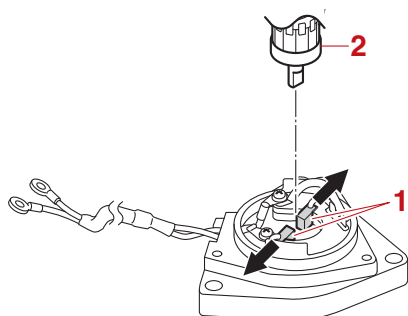


2. Install:
- Spring
 - Circuit breaker
 - Brush holder
 - Brush
 - PTT motor lead
 - Screw
 - O-ring **New** (to the motor base assembly)

3. Install:

- Armature
 - a. Push the brushes "1" into the brush holder, and then install the armature "2".

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

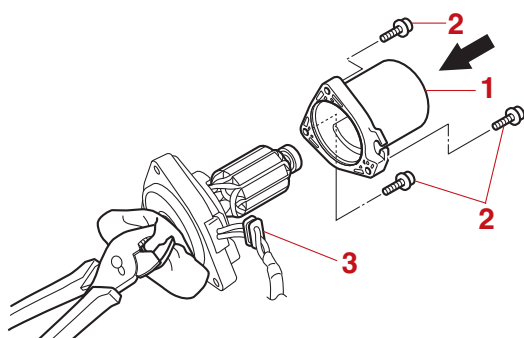


4. Install:

- Stator "1"
- Screw "2"
- Rubber cap "3"


NOTICE

When removing or installing the armature along with the motor base assembly, secure the end of the armature shaft using a pair of pliers. Otherwise, the armature could separate from the motor base assembly due to the magnetic force of the stator and damage the brushes.

**Installing the PTT motor**

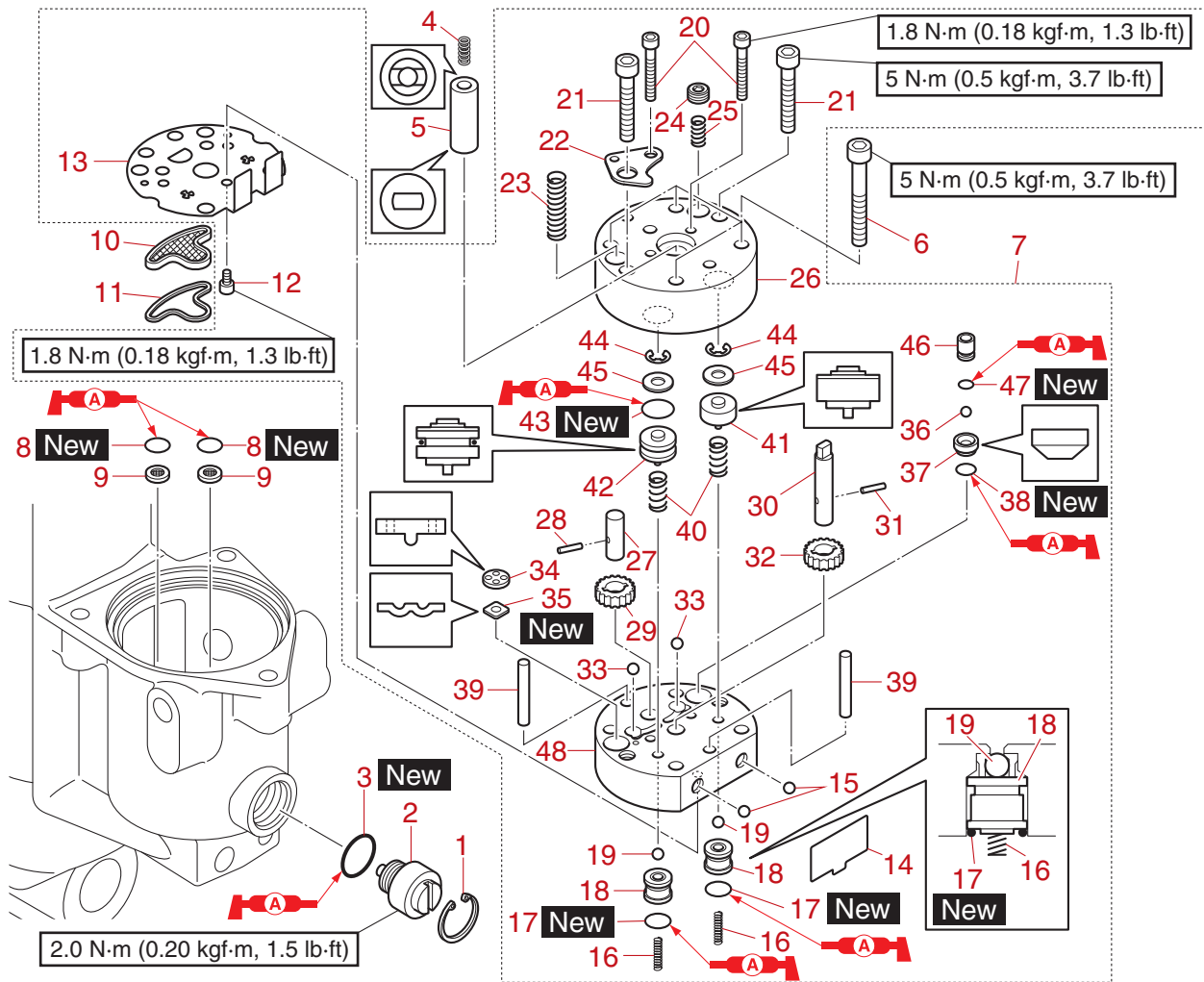
1. Install:

- O-ring **New**
- PTT motor assembly
- PTT motor mounting bolt

	PTT motor mounting bolt 7 N·m (0.7 kgf·m, 5.2 lb·ft)
---	---

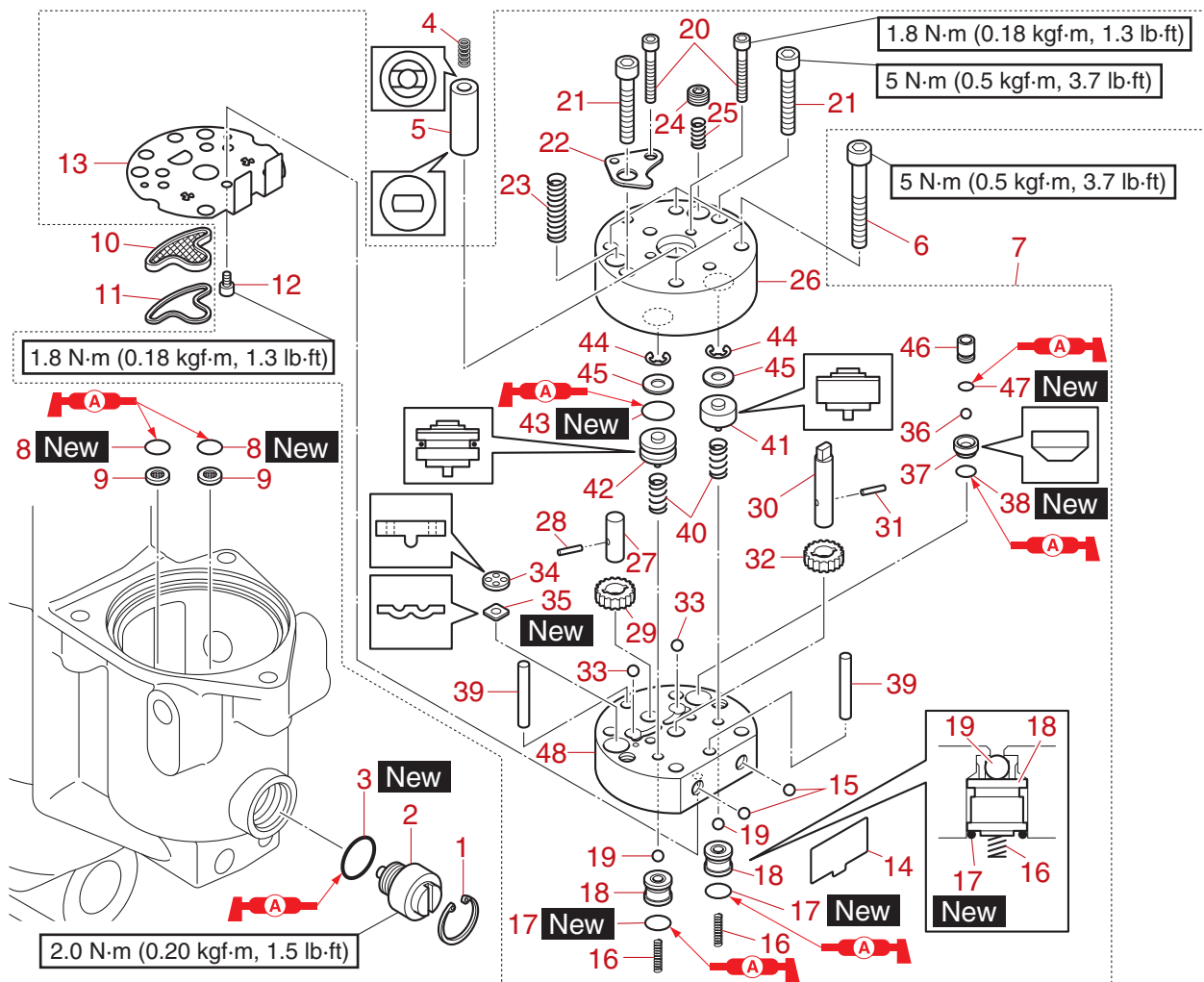
- O-ring **New**
- Reservoir cap

PTT gear pump



∩	Part name	Q'ty	Remarks
1	Circlip	1	
2	Manual valve M12	1	
3	O-ring	1	
4	Spring	1	
5	Shaft	1	
6	Bolt M5 × 45 mm	4	
7	Gear pump assembly	1	
8	O-ring	2	
9	Filter	2	
10	Filter	1	
11	Plate	1	
12	Bolt M3 × 5 mm	1	
13	Relief valve seat	1	
14	Manual release plate	1	
15	Ball 3.95 mm (0.16 in) *1	2	
16	Spring	2	
17	O-ring	2	

∩	Part name	Q'ty	Remarks
18	Adapter	2	
19	Ball 3.95 mm (0.16 in) *1	2	
20	Bolt M3 × 25 mm	2	
21	Bolt M5 × 30 mm	2	
22	Cap	1	
23	Spring	1	
24	Valve lock screw M8	1	
25	Spring	1	
26	Gear housing (upper side)	1	
27	Shaft	1	
28	Pin	1	
29	Driven gear	1	
30	Shaft	1	
31	Pin	1	
32	Drive gear	1	



∩	Part name	Q'ty	Remarks
33	Ball 3.95 mm (0.16 in) *1	2	
34	Down-relief valve	1	
35	Valve seal	1	
36	Ball 3.15 mm (0.12 in) *1	1	
37	Valve seat	1	
38	O-ring	1	
39	Pin	2	
40	Spring	2	

∩	Part name	Q'ty	Remarks
41	Up-main valve	1	
42	Down-main valve	1	
43	O-ring	1	
44	E-clip	2	
45	Main valve seal	2	
46	Up-relief valve	1	
47	O-ring	1	
48	Gear housing (lower side)	1	

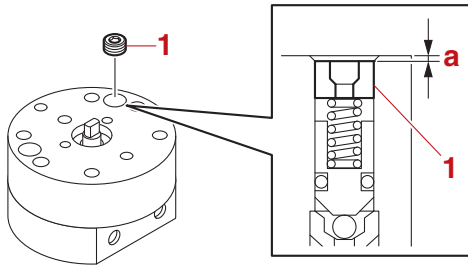
*1: Reference data

Disassembling the gear pump assembly

- Remove:
 - Valve lock screw "1"

TIP:

Before removing the valve lock screw "1", measure and write down the screw depth "a".



Checking the gear pump

- Check:
 - Valve
 - Ball
 - Gear
 Damaged/worn → Replace.
- Check:
 - Filter
 Clogged/damaged → Replace.

Assembling the gear pump housing

Lubricate the parts using recommended fluid during assembly.

- Install:
 - O-ring **New** (to the up-relief valve)
 - Up-relief valve (to the gear housing (upper side))
 - Main valve seal
 - E-clip
 - O-ring **New** (to the down-main valve)
 - Down-main valve
 - Up-main valve
 - Spring (to the down-main valve)
 - Spring (to the up-main valve)
 - Pin (to the gear housing (lower side))
 - O-ring **New** (to the gear housing (lower side))
 - Valve seat (to the gear housing (lower side))
 - Ball (to the valve seat)
 - Valve seal **New** (to the gear housing (lower side))
 - Down-relief valve (to the gear housing (lower side))
 - Ball (to the gear housing (lower side))
 - Pin (to the shaft)
 - Drive gear (to the shaft)
 - Driven gear (to the shaft)
 - Shaft (to the gear housing (lower side))
 - Gear housing (upper side) (to the gear housing (lower side))

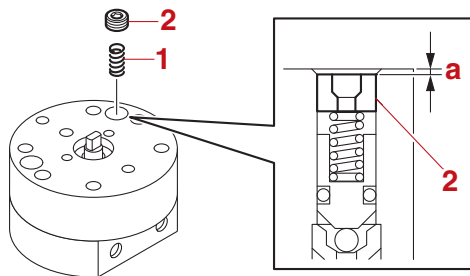
NOTICE


Make sure that there is no gap between the gear housings. If there is a gap, parts between them may not be installed properly.

- Install:
 - Spring "1"
 - Valve lock screw "2"


TIP: _____

- Install the valve lock screw “2” to the position “a” where it was measured before removing the screw.
- When installing new parts, install them according to the following reference data.




	Installation depth “a” (reference data) 0.26 mm (0.0102 in)
---	--


3. Install:
 - Spring (to the gear housing (upper side))
 - Cap
 - Gear pump housing bolt (M3) (temporarily tighten)
 - Gear pump housing bolt (M5) (temporarily tighten)
4. Check:
 - Gear pump movement
Not smooth → Repeat from step (1).
5. Tighten:
 - Gear pump housing bolt (M3)
 - Gear pump housing bolt (M5)

	Gear pump housing bolt (M3) 1.8 N·m (0.18 kgf·m, 1.3 lb·ft)
	Gear pump housing bolt (M5) 5 N·m (0.5 kgf·m, 3.7 lb·ft)


6. Install:
 - Ball (to the gear housing (lower side))
 - Adapter
 - O-ring **New**
 - Spring
 - Ball (to the gear housing (lower side))
 - Manual release plate
 - Relief valve seat
 - Relief valve seat bolt

	Relief valve seat bolt 1.8 N·m (0.18 kgf·m, 1.3 lb·ft)
---	---

7. Install:
 - Plate (to the trim cylinder)
 - Filter
 - Filter
 - O-ring **New**
 - Gear pump assembly
 - Gear pump assembly bolt

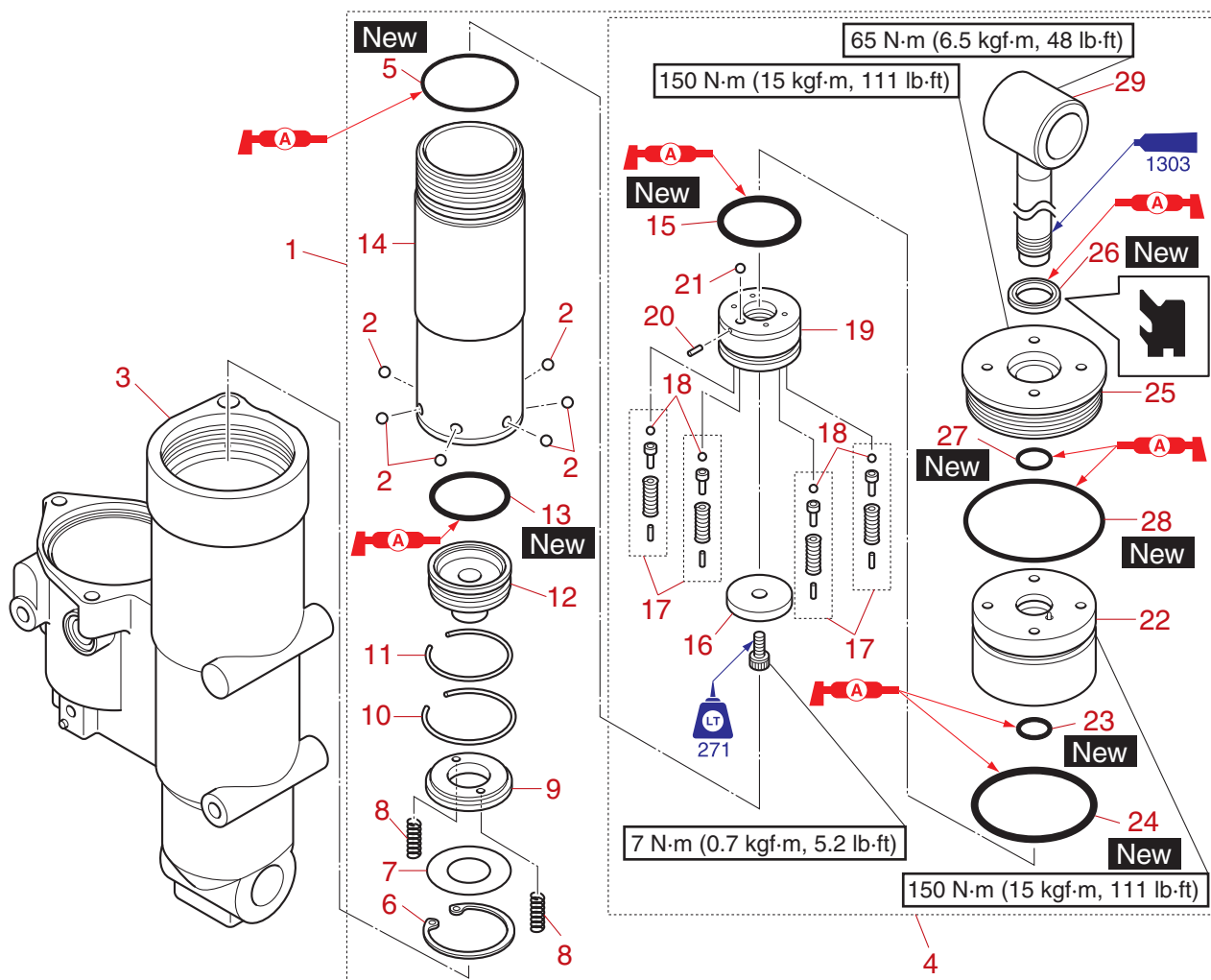
	Gear pump assembly bolt 5 N·m (0.5 kgf·m, 3.7 lb·ft)
---	---

8. Install:
 - Shaft (to the gear pump assembly)
 - Spring
 - O-ring **New** (to the trim cylinder)
 - Manual valve

	Manual valve 2.0 N·m (0.20 kgf·m, 1.5 lb·ft)
---	---

9. Install:
 - Circlip

PTT cylinder



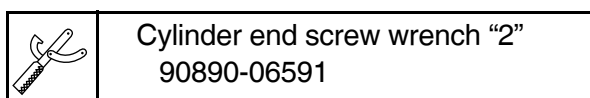
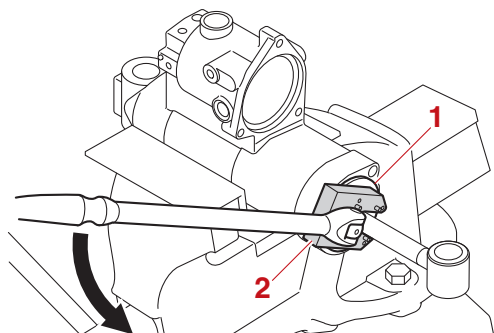
↑↓	Part name	Q'ty	Remarks
1	Trim piston assembly	1	
2	Ball 4.76 mm (0.19 in) *1	6	
3	Trim cylinder	1	
4	Tilt piston assembly	1	
5	O-ring	1	
6	Circlip	1	
7	Plate	1	
8	Spring	2	
9	Plate	1	
10	Circlip	1	
11	Circlip	1	
12	Free piston	1	
13	O-ring	1	
14	Tilt cylinder M55	1	
15	O-ring	1	
16	Plate	1	
17	Absorber valve	4	

↑↓	Part name	Q'ty	Remarks
18	Ball 3.97 mm (0.16 in) *1	4	
19	Tilt piston	1	
20	Pin	1	
21	Ball 3.97 mm (0.16 in) *1	1	
22	Tilt cylinder end screw	1	
23	O-ring	1	
24	O-ring	1	
25	Trim cylinder end screw M68	1	
26	Dust seal	1	
27	O-ring	1	
28	O-ring	1	
29	Trim and tilt ram	1	

*1: Reference data

Disassembling the trim cylinder

- Loosen:
 - Trim cylinder end screw "1"



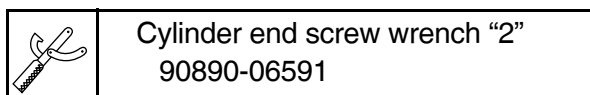
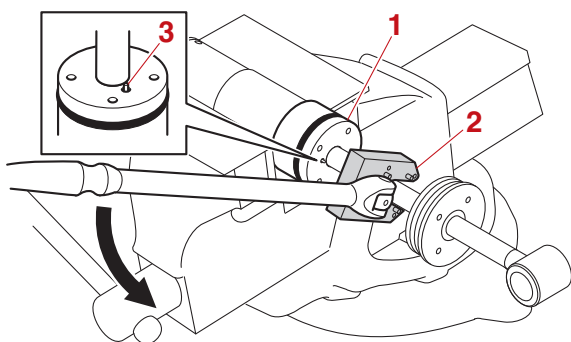
- Drain:
 - PTT fluid

Disassembling the tilt cylinder

- Loosen:
 - Tilt cylinder end screw "1"

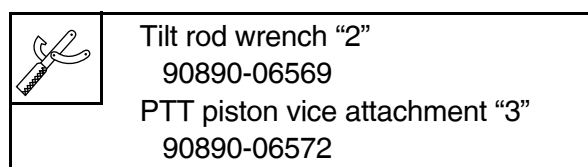
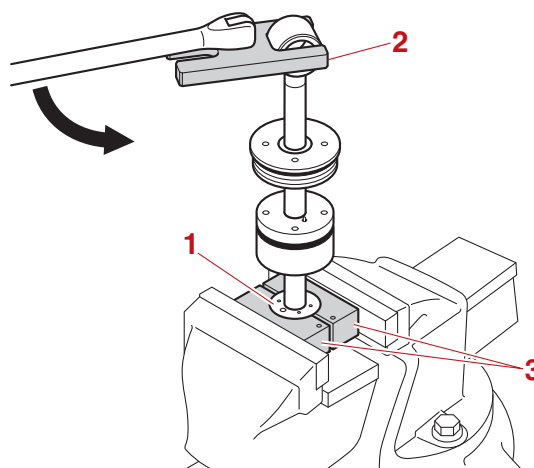
NOTICE

When loosening the tilt cylinder end screw, be careful not to damage the check valve "3".



Disassembling the trim and tilt ram assembly

- Remove:
 - Tilt piston "1"



Checking the PTT cylinder and piston

- Check:
 - PTT body
 - Corroded/cracked → Replace.
 - Inner surface of the PTT body
 - Scratched → Replace.
- Check:
 - Outer surface of the tilt piston
 - Outer surface of the free piston
 - Scratched → Replace.
- Check:
 - Trim and tilt ram
 - Rust → Clean using 400–600-grit sandpaper.
 - Bent/corroded → Replace.
- Check:
 - Check valve of the tilt cylinder end screw
 - Dirt/residue → Clean.

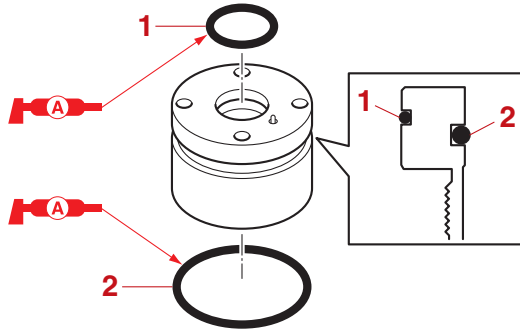
Checking the absorber valve

- Check:
 - Absorber valve
 - Dirt/residue → Clean.

Assembling the trim and tilt ram assembly

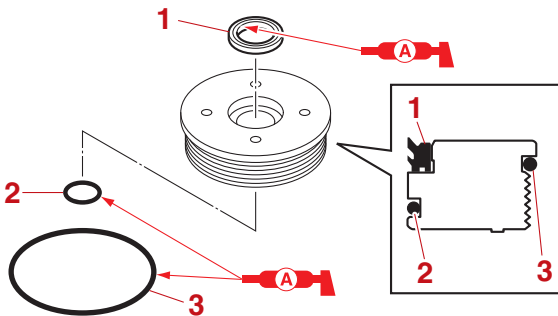
1. Install:

- O-ring "1" **New**
- O-ring "2" **New**



2. Install:

- Dust seal "1" **New**
- O-ring "2" **New**
- O-ring "3" **New**

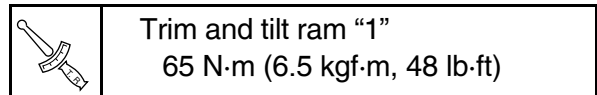
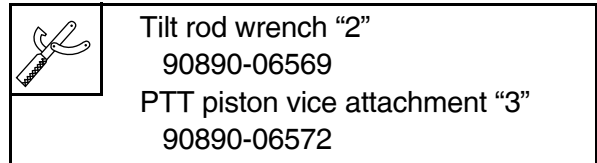
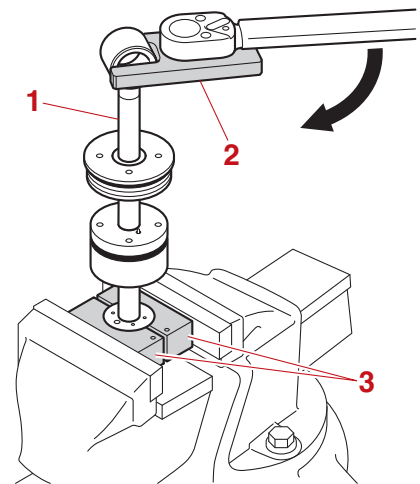


3. Install:

- Trim cylinder end screw (to the trim and tilt ram)
- Tilt cylinder end screw (to the trim and tilt ram)
- Ball (to the tilt piston)
- Pin (to the tilt piston)

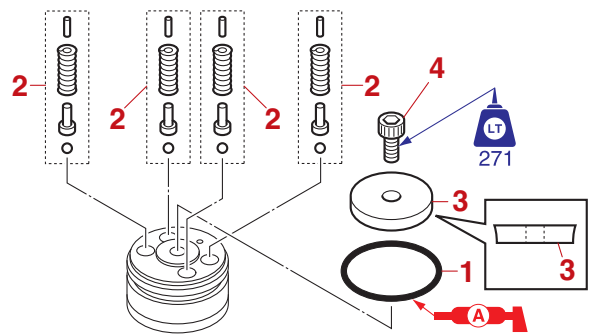
4. Install:

- Trim and tilt ram "1"

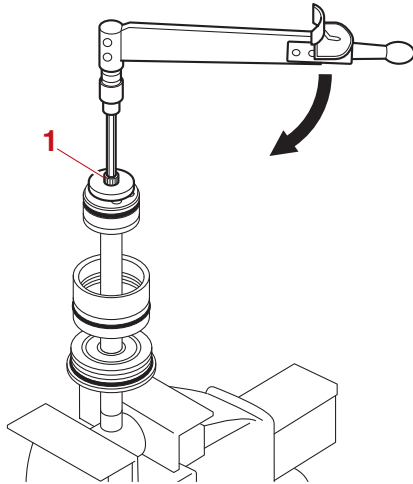



5. Install:

- O-ring "1" **New**
- Absorber valve "2"
- Plate "3"
- Tilt piston bolt "4"



6. Tighten:
- Tilt piston bolt "1"

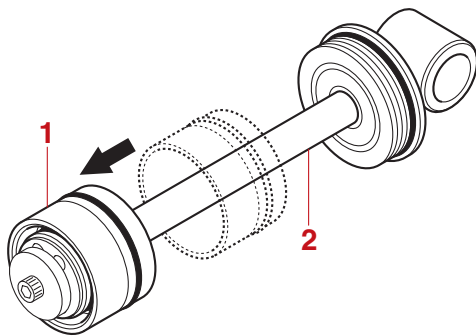


	<p>Tilt piston bolt "1"</p> <p>7 N·m (0.7 kgf·m, 5.2 lb·ft)</p>
---	---

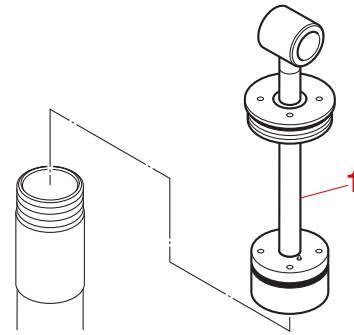
Assembling the tilt cylinder

1. Install:
- O-ring **New** (to the free piston)
 - Free piston
 - Circlip
 - Circlip
 - Plate
 - Spring
 - Plate
 - Circlip
 - O-ring **New** (to the tilt cylinder)

2. Install:
- Tilt piston assembly
 - Slide the tilt cylinder end screw "1" to the bottom of the trim and tilt ram "2".



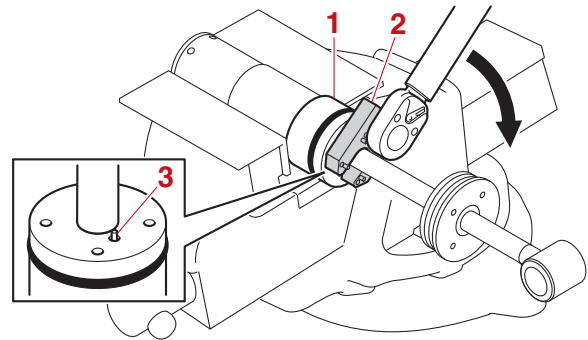
- Install the tilt piston assembly "1" onto the tilt cylinder.





- Tighten the tilt cylinder end screw "1" to the specified torque.

NOTICE

When tightening the tilt cylinder end screw, be careful not to damage the check valve "3".



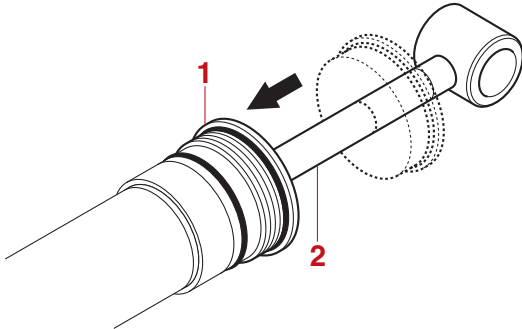
	<p>Cylinder end screw wrench "2"</p> <p>90890-06591</p>
---	---

	<p>Tilt cylinder end screw "1"</p> <p>150 N·m (15 kgf·m, 111 lb·ft)</p>
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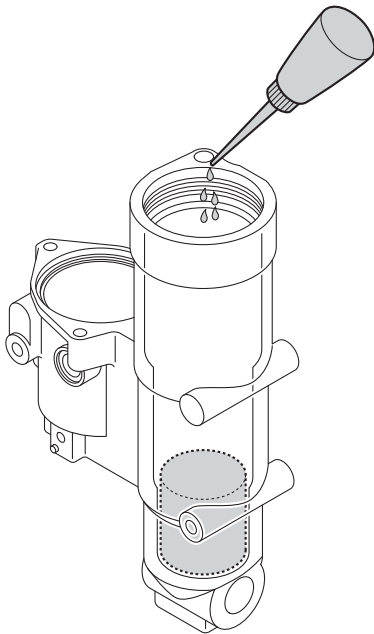
Assembling the trim cylinder

1. Install:

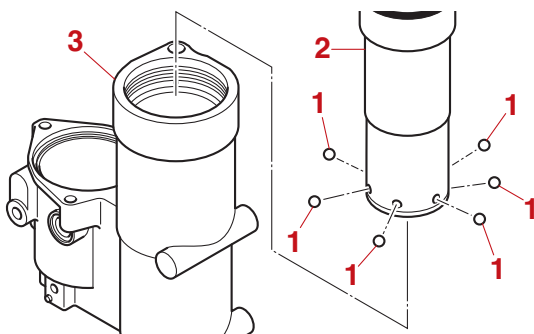
- Ball
- Trim piston assembly
 - a. Slide the trim cylinder end screw "1" to the bottom of the trim and tilt ram "2".



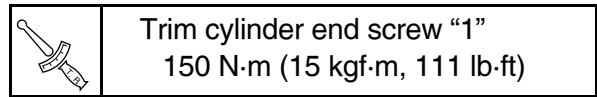
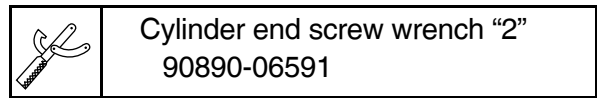
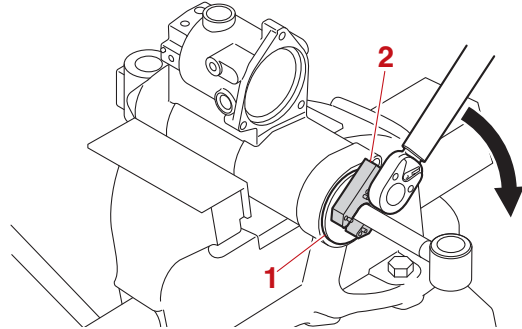
- b. Fill the trim cylinder with the recommended PTT fluid to about 20 % of the cylinder capacity.



- c. Install the balls "1" into the tilt cylinder "2", and then install the tilt cylinder "2" into the trim cylinder "3".



- d. Tighten the trim cylinder end screw "1" to the specified torque.



Maintenance

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Outline

- To obtain long product life, Yamaha strongly recommends that the specified periodic checks and maintenance be performed according to the maintenance interval charts.
- If replacement parts are necessary, use only genuine Yamaha parts of equivalent design and quality. Any parts of inferior quality may cause a malfunction, and the resulting loss of control could endanger the operator and passengers. Yamaha genuine parts and accessories are available from Yamaha dealers.
- The service intervals provided in the maintenance interval charts are based upon “typical” operating conditions that include speed variations, sufficient time for engine warm up and cool-down, medium to light load, and an average cruising speed in the 3000–4000 r/min range. If your normal operating conditions are more intensive, more frequent servicing will be required, especially the engine oil and gear oil changes. Examples of the intensive operation will be: wide-open-throttle, trolling, or idling operation for extended periods of time, carrying heavy loads, and frequent starting and stopping or shifting. In most cases, the frequent maintenance pays off in increased engine life and greater owner satisfaction.
- The maintenance cycle on these charts is based on usage of 100 hours per year and regular flushing of the cooling water passages. Adjust the maintenance frequency when operating the engine under adverse conditions, such as extended trolling.
- Disassembly or repairs may be necessary depending on the outcome of maintenance checks.
- Expendable or consumable parts and lubricants will lose their effectiveness over time and through normal usage regardless of the warranty period.
- When operating the outboard motor in salt water, or in muddy, turbid (cloudy), or acidic water, flush the engine using clean water after each use.

Maintenance interval chart 1

The “●” symbol indicates the check-ups which the owners or operators may carry out themselves.
The “○” symbol indicates work to be carried out by a Yamaha dealer.

Item	Actions	Initial	Every		
		20 hours (3 months)	100 hours (1 year)	300 hours (3 years)	500 hours (5 years)
Anode(s) (external)	Inspection or replacement as necessary		●/○		
Anode(s) (internal) ^{*1}	Inspection or replacement as necessary		○		
Anode(s) (internal) ^{*2}	Replacement				○
Battery (electrolyte level, terminal)	Inspection	●/○	●/○		
Battery (electrolyte level, terminal)	Fill, charging or replacing as necessary		○		
Cooling water leakage	Inspection or replacement as necessary	○	○		
Cowling lock lever	Inspection		●/○		
Engine starting condition/noise	Inspection	●/○	●/○		
Engine idle speed/noise	Inspection	●/○	●/○		
Engine oil	Replacement	●/○	●/○		
Engine oil filter (cartridge)	Replacement		●/○		
Fuel filter (can be disassembled)	Inspection or replacement as necessary	●/○	●/○		
Fuel line (High pressure)	Inspection	●	●		
Fuel line (High pressure)	Inspection or replacement as necessary	○	○		
Fuel line (Low pressure)	Inspection	●	●		
Fuel line (Low pressure)	Inspection or replacement as necessary	○	○		
Fuel pump	Inspection or replacement as necessary			○	
Fuel/engine oil leakage	Inspection	○	○		
Gear oil	Replacement	●/○	●/○		
Greasing points	Greasing	●/○	●/○		
Clamp bracket bolt (through tube)	Inspection and greasing		○		
Impeller/water pump housing	Inspection or replacement as necessary		○		

Item	Actions	Initial	Every		
		20 hours (3 months)	100 hours (1 year)	300 hours (3 years)	500 hours (5 years)
Impeller/water pump housing	Replacement			○	
Power trim and tilt unit	Inspection	●/○	●/○		
Propeller/propeller nut/cotter pin	Inspection or replacement as necessary	●/○	●/○		
PCV (Pressure Control Valve)	Inspection or replacement as necessary		○		
Shift link/shift cable	Inspection, adjustment or replacement as necessary	○	○		
Spark plug(s)	Inspection or replacement as necessary		●/○		
Spark plug caps/spark plug wires	Inspection or replacement as necessary	○	○		
Water from the cooling water pilot hole	Inspection	●/○	●/○		
Throttle link/throttle cable	Inspection, adjustment or replacement as necessary	○	○		
Thermostat	Inspection or replacement as necessary		○		
Timing belt	Inspection or replacement as necessary		○		
Valve clearance	Inspection and adjustment				○
Cooling water inlet	Inspection	●/○	●/○		
Main switch/stop switch	Inspection or replacement as necessary	○	○		
Wire harness connections/wire coupler connections	Inspection or replacement as necessary	○	○		
(Yamaha) Meter/gauge	Inspection	○	○		
Fuel tank (Yamaha portable tank)	Inspection and cleaning as necessary		○		

*1. Cylinder head, cylinder block

*2. Cylinder head, cylinder block, fuel cooler, exhaust guide

Maintenance interval chart 2

Item	Actions	Every
		1000 hours
Exhaust guide/exhaust manifold	Inspection or replacement as necessary	○
Timing belt	Replacement	○

Predelivery check

To make the delivery process smooth and efficient, complete the predelivery checks as explained in the following procedures.

Item	Procedures	See
Engine oil level	Check the oil level using the dipstick. Oil is not at the proper level → Add or extract engine oil.	10-8
Battery	Check the battery electrolyte level. Below the minimum level mark → Add distilled water.	10-8
	Check the specific gravity of the electrolyte. Below specification → Fully charge the battery.	
Cooling water pilot hole	Start the engine.	—
	Check that the cooling water is discharged from the cooling water pilot hole. Not discharged → Check the cooling system.	2-23 10-9
Main switch/stop switch	Check that the engine starts when the engine start switch is turned to START. Out of specification → Check the engine start switch.	5-33
	Start the engine. Check that the engine stops when the engine start switch is turned to OFF. Out of specification → Check the engine start switch.	5-33
Engine shut-off switch	Check that the engine stops when the clip is removed from the engine shut-off switch. Out of specification → Check the engine shut-off switch.	5-33
Fuel line	Check the fuel line connection. Disconnected → Connect.	2-26
	Check all the fuel lines for leakage. Leaking → Check the related parts.	2-26
Gear oil level	Check the gear oil level. Below the proper level → Add the recommended gear oil.	10-9
Shift and throttle operation	Check that the gear shift operates smoothly when the remote control lever or gear shift lever is moved from the N position to the F or R position. Not smooth → Adjust the shift cable joints or check the related parts.	3-5
	Check that the throttle operates smoothly when the remote control lever is moved from the F or R position to the fully open position (remote control model). Check that the throttle operates smoothly when the throttle grip is turned to the fully open position (tiller handle model). Not smooth → Adjust the throttle cable joints or check the related parts.	3-6
Outboard motor mounting height	Check the outboard motor mounting height. Improper → Adjust.	10-10

Predelivery check

Item	Procedures	See
PTT unit	Check the PTT unit operation.	10-21
	Check that there is no abnormal noise produced when the outboard motor is tilted up or down. Abnormal noise → Check the PTT unit.	9-24
	Steer the tilted-up outboard motor. Interference → Check the hose and wire harness routing, or mounting of the outboard motor.	2-26 5-1 1-1
	Check that the trim meter on the boat's gauge displays full down when the outboard motor is in the full-down position. Full down not displayed → Adjust the trim sensor cam.	9-30
Steering system	Check that the steering operates smoothly. Not smooth → Check the upper case, steering arm, and swivel bracket, or related parts.	9-14 9-16 9-21 9-28
	Steer the outboard motor. Interference → Check the hose and wire harness routing.	2-26 5-1
Shift cable/throttle cable	Check the shift cable when the remote control lever or gear shift lever is moved to the N position. Not at the proper position → Adjust the shift cable joints or check the related parts.	3-5
	Check the throttle cable when the remote control lever is moved to the N position (remote control model). Check the throttle cable when the throttle grip is turned to the fully closed position (tiller handle model). Not at the proper position → Adjust the throttle cable joint or check the related parts.	3-6 6-22
Test run	Start the engine, and then check that the gear shift operates smoothly.	—
	Warm up the engine, and then check the engine idle speed. Out of specification → Perform the troubleshooting procedures.	—
	Operate the boat at trolling speed.	—
	Operate the outboard motor according to the break-in procedure.	—
	Check that the outboard motor does not tilt up when reverse operation. Tilts up → Check the PTT unit.	9-24
	Check that the power trim operates smoothly while cruising. Not smooth → Check the PTT if the power trim operates.	9-24

Predelivery check

Item	Procedures	See
Break-in	Operate the engine under load (in gear with a propeller installed) for 10 hours.	—
	For the first hour of operation: Operate the engine at varying speeds up to 2000 r/min or approximately 1/2 throttle.	—
	For the second hour of operation: Increase the engine speed until the boat is on plane (but do not fully open the throttle), and then back off on the throttle while keeping the boat at a planing speed.	—
	For the remaining 8 hours of operation: Operate the engine at any engine speed. However, do not operate the engine at full throttle for more than 5 minutes at a time.	—
	After the first 10 hours of operation: Operate the engine normally.	—
After test run	Check for water in the gear oil. Oil is milky → Check the lower case for airtightness and oil seal.	8-18
	Check all the fuel lines for leakage. Leaking → Check the connection or replace affected parts.	2-26
	Flush the cooling water passages using fresh water. When using the equipped flashing device, flush the cooling water passages without starting the engine.	—

Checking the engine oil level

NOTICE

Make sure that the engine is filled with engine oil before operating the outboard motor for the first time. Otherwise, the engine could be damaged severely.

TIP:

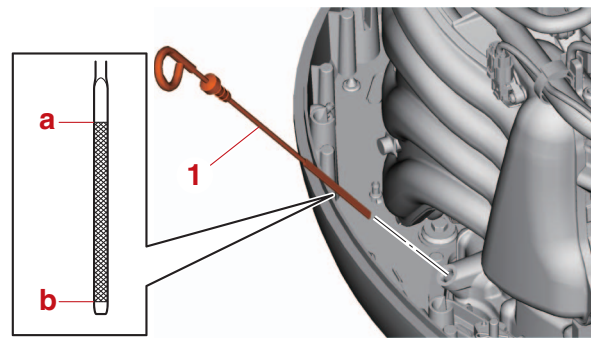
The outboard motor is shipped from the factory without engine oil.

1. Check:
 - Engine oil level
Not at the proper level → Add or extract engine oil.
 - a. Place the outboard motor in an upright position.

NOTICE

If the outboard motor is not level, the oil level indicated on the dipstick may not be correct.

- b. Start the engine and warm it up for 5–10 minutes.
- c. Stop the engine and leave it off for 5–10 minutes.
- d. Remove the top cowling.
- e. Remove the dipstick “1” and wipe it clean.
- f. Insert the dipstick “1” completely for a correct measurement and remove it again.
- g. Check that the oil level indicated on the dipstick “1” is between the upper mark “a” and the lower mark “b”. If the engine oil is not at the proper level, add or extract engine oil.



Checking the battery

WARNING

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

- Avoid bodily contact with electrolyte as it can cause severe burns or permanent eye injury.
- Wear protective eye gear when handling or working near batteries.

Antidote (EXTERNAL):

- SKIN - Wash with water.
- EYES - Flush with water for 15 minutes and get immediate medical attention.

Antidote (INTERNAL):

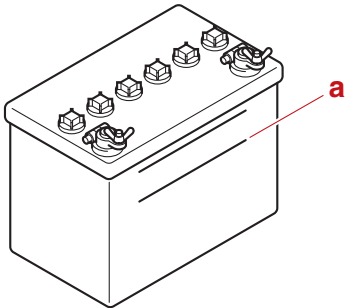
- Drink large quantities of water or milk followed with milk of magnesia, beaten egg, or vegetable oil. Get immediate medical attention.

Batteries generate explosive, hydrogen gas. Always follow these preventive measures:

- Charge batteries in a well-ventilated area.
- Keep batteries away from fire, sparks, or open flames (for example, welding equipment and lighted cigarettes).
- DO NOT SMOKE when charging or handling batteries.

KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.

1. Check:
 - Battery electrolyte level
Below the minimum level mark “a” → Add distilled water until the level is between the maximum and minimum level marks.



2. Check:
 - Specific gravity of the electrolyte
Below specification → Fully charge the battery.

TIP: _____

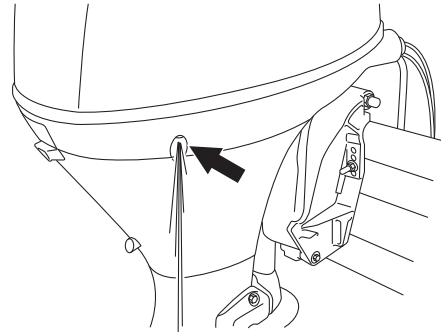
- Batteries vary depending on the manufacturer. The procedures mentioned in this manual may not always apply. Therefore, see the instruction manual of the battery.
- Disconnect the negative battery cable first, and then disconnect the positive battery cable.



Representative examples
 Recommended battery capacity
 Battery rating (CCA/SAE)
 380–1150 A (F100GET_CRB (EPA))
 Battery rating (MCA/ABYC)
 502–1370 A (F100GET_CRB (EPA))
 Battery rating (RC/SAE)
 124 minutes (F100GET_CRB (EPA))
 Battery rating (CCA/EN)
 430–1080 A
 Battery rating (20HR/IEC)
 70 Ah
 Electrolyte specific gravity
 1.280 at 20 °C (68 °F)

Checking the cooling water pilot hole

1. Place the lower unit in the water, and then start the engine.
2. Check:
 - Cooling water is discharged from the cooling water pilot hole
Not discharged → Check the cooling water passages for clog.

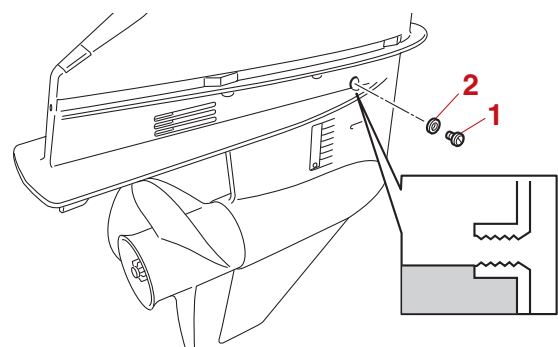


Checking the gear oil level


1. Check:
 - Gear oil level
Below the proper level → Add the recommended gear oil.
 - a. Place the outboard motor in an upright position.
 - b. Remove the oil level plug “1” and gasket “2”, and then check the gear oil level. If the gear oil is below the proper level, add the recommended gear oil.

TIP: _____

If the oil is at the proper level, a small amount of oil should flow out of the check hole.



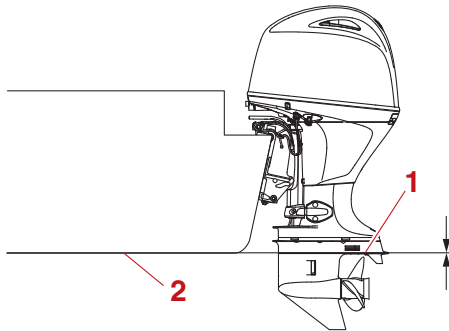
- c. Install a new gasket and the oil level plug, and then tighten the oil level plug to the specified torque.

	<p>Oil level plug 7 N·m (0.7 kgf·m, 5.2 lb·ft)</p>
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Checking the outboard motor mounting height

1. Check:
 - Outboard motor mounting height
Improper → Adjust.
 - a. Check that the anti-cavitation plate “1” is aligned with the bottom of the boat “2”. If the mounting height is too high, cavitation will occur and propulsion will decrease. Besides, the engine speed will increase abnormally and cause the engine to overheat. If the mounting height is too low, water resistance will increase, which will decrease engine efficiency and performance.

TIP: _____
 The appropriate mounting height depends on the combination of the boat and outboard motor. To determine the appropriate mounting height, test run the outboard motor at different heights.



2. Check:
 - Mount bolt
Looseness → Tighten.

General periodic maintenance

Item	Procedures	See
Anodes	Check the anodes. Eroded (1/2 or more worn out) → Replace. Adhered grease, oil, paint, or scales → Clean.	7-26 7-28 7-43 8-2 9-19 9-29
Battery	Check the battery electrolyte level. Below the minimum level mark → Add distilled water.	10-8
	Check the specific gravity of the electrolyte. Below specification → Fully charge the battery.	
Cooling water inlets	Check the cooling water inlets. Clogged → Clean.	10-15
Cooling water pilot hole	Start the engine.	—
	Check that the cooling water is discharged from the cooling water pilot hole. Not discharged → Check the cooling system.	10-9 2-23
Engine idle speed	Check the engine idle speed.	10-15
Engine oil	Check the oil level using the dipstick. Not at the proper level → Add or extract engine oil.	10-8
	Check the engine oil. Replacement interval has been exceeded/deterioration → Change. Milky → Overhaul the outboard motor.	10-15 10-16
Oil filter	Replace the oil filter.	10-18
Main switch/stop switch	Check that the engine starts when the engine start switch is turned to START. Out of specification → Check the engine start switch.	5-33
	Start the engine. Check that the engine stops when the engine start switch is turned to OFF. Out of specification → Check the engine start switch.	5-33
Engine shut-off switch	Check that the engine stops when the clip is removed from the engine shut-off switch. Out of specification → Check the engine shut-off switch.	5-33
Exhaust guide Exhaust manifold	Check the exhaust guide and exhaust manifold. Corroded/cracked/damaged → Replace.	9-19

General periodic maintenance

Item	Procedures	See
Fuel filter	Check the fuel filter element. Dirt/residue → Replace. Water accumulated → Drain.	6-6
	Checking the fuel cup assembly. Foreign material → Clean. Cracked → Replace.	
	Checking the fuel inlet or fuel outlet holding pressure. Out of specification → Replace the O-ring, fuel cup assembly, or fuel filter assembly.	
Fuel strainer	Check the fuel strainer. Cracked/damaged → Replace. Dirt/residue → Replace.	6-9
	Check the fuel strainer holding pressure. Out of specification → Replace.	
Fuel pump	Check the operation of the fuel pump using the YDIS “Stationary test” and check the operating sound. Not sound → Check the fuel pump internal parts.	5-23
Fuel leakage	Check the fuel line. Leaking → Check the related parts.	2-26
Engine oil leakage	Check the engine oil line. Leaking → Check the related parts.	2-21
Gear oil	Check the gear oil level. Below the proper level → Add the recommended gear oil.	10-9
	Check the gear oil. Replacement interval has been exceeded/deterioration → Change. Milky → Overhaul the lower unit.	10-18 8-1
Greasing	Apply lubricants.	10-20
Propeller Propeller nut Cotter pin	Check the propeller blade and spline. Cracked/damaged/worn → Replace.	8-2
	Check the installed condition of the propeller nut and cotter pin. Improperly installed → Reinstall.	8-18
PCV	Check the PCV. Damaged/worn → Replace.	9-19
	Check the grommet. Deformed → Replace.	
	Check the spring. Deformed/fatigued → Replace.	
PTT fluid level	Check that a small amount of fluid flows out of the filler hole. Below the proper level → Add the recommended fluid.	10-21

General periodic maintenance

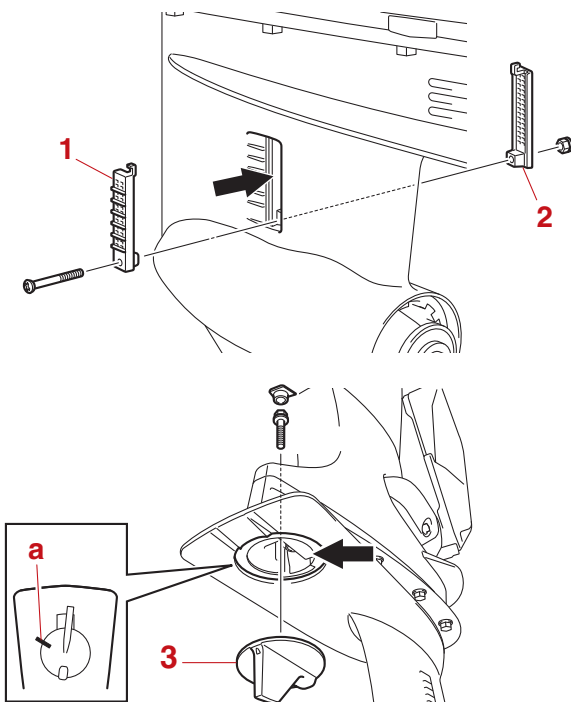
Item	Procedures	See
PTT unit operation	Check the PTT unit operation. PTT operation is not smoothly → Check the PTT fluid level.	10-21
	Check the tilt stop lever. Tilt stop lever does not operate properly → Check the related parts.	9-25
	Check the PTT fluid leakage. Leaking → Check the related parts.	9-24
Shift link/shift cable	Check the shift cable when the remote control lever or gear shift lever is moved to the N position. Not at the proper position → Adjust the shift cable joints or check the related parts.	3-5
Spark plug	Clean the electrodes using a spark plug cleaner.	—
	Check the spark plug. Electrodes are damaged/worn or insulator is abnormal color → Replace.	7-18
	Check the spark plug gap. Out of specification → Replace.	
Spark plug caps/spark plug wires	Measure the spark plug cap resistance. Out of specification → Replace.	5-28 5-29
Throttle link/throttle cable	Check the throttle cable when the remote control lever is moved to the N position (remote control model). Check the throttle cable when the throttle grip is turned to the fully closed position (tiller handle model). Not at the proper position → Adjust the throttle cable joint or check the related parts.	3-6 6-22
Timing belt	Check the timing belt. Cracked/damaged/worn → Replace.	7-13
Thermostat	Measure the thermostat valve opening. Out of specification → Replace.	7-26
Cowling lock lever	Check the fitting by pushing the top cowling. Looseness/rattling → Adjust or replace the top cowling stopper.	10-22
Valve clearance	Check the valve clearance. Out of specification → Adjust.	7-2
Water pump	Check the water pump housing. Deformed → Replace.	8-4
	Check the impeller, insert cartridge, and outer plate cartridge. Cracked/worn → Replace.	
	Check the impeller key and keyway in the drive shaft. Deformed/worn → Replace.	
Wire harness lead	Check the wire harness coupler and lead coupler connections.	—
(Yamaha) Meter/gauge	Check the meter/gauge display.	—

General periodic maintenance

Item	Procedures	See
Fuel tank (Yamaha portable tank)	Check the fuel tank. Cracked/damaged → Replace. Leaking → Check the related parts. Dirt/residue → Clean.	—


Checking the cooling water inlet

1. Check:
 - Cooling water inlet
Clogged → Clean.
 - a. Remove the water inlet covers “1” and “2”.
 - b. Mark the trim tab “3” with an identification mark “a”, and then remove the trim tab “3”.
 - c. Check the water inlet covers and water inlets. Clean if clogged.




- d. Install the water inlet covers and trim tab, and then tighten the water inlet cover screw and trim tab bolt to the specified torque.

TIP: After installing the water inlet covers, make sure that there is no rattling.

	Water inlet cover screw
	1.1 N·m (0.11 kgf·m, 0.81 lb·ft)
	Trim tab bolt
	42 N·m (4.2 kgf·m, 31 lb·ft)

Checking the engine idle speed/noise

1. Check:
 - Engine idling speed
Out of specification → Perform the troubleshooting procedures.
See “Troubleshooting procedure” (4-4).
 - a. Start the engine and warm it up for 5–10 minutes.
 - b. Check the engine idle speed using the Yamaha genuine tachometer (on-board meter) or the YDIS. See the YDIS (Ver. 2.40 or later) instruction manual.

	Idle speed (in neutral) 700–800 r/min
---	--

Changing the engine oil using an oil changer

NOTICE

Change the engine oil after the first 20 hours of operation or 3 months, and every 100 hours or at 1-year intervals thereafter. Otherwise the engine will wear quickly.

1. Warm up:
 - Engine
 - a. Place the outboard motor in an upright position.

NOTICE

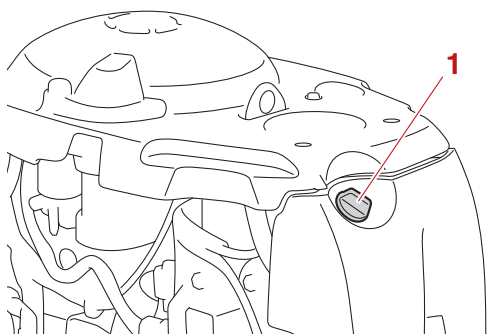
If the outboard motor is not level, the oil level indicated on the dipstick may not be correct.

- b. Start the engine and warm it up for 5–10 minutes.
 - c. Stop the engine and leave it off for 5–10 minutes.
2. Remove:
 - Top cowling

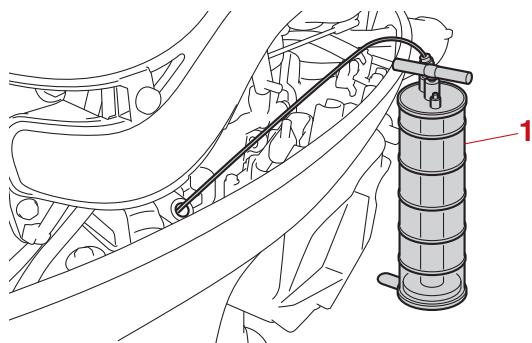
General periodic maintenance

3. Drain:

- Engine oil
 - a. Remove the oil filler cap “1”.



- b. Remove the dipstick and extract the engine oil using the oil changer “1”.



4. Fill:

- Recommended engine oil
 - a. Fill the engine with the specified amount of the recommended engine oil through the oil filler hole. Install the oil filler cap and dipstick.

NOTICE

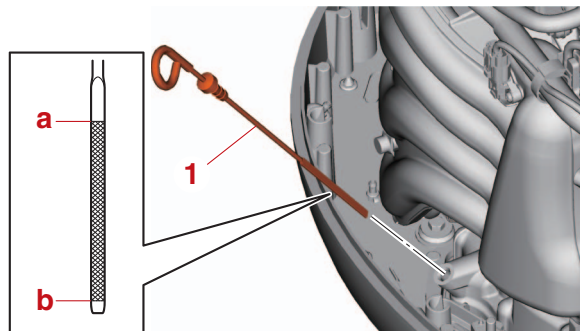
Do not overfill the engine with engine oil. Otherwise, the engine could be damaged or oil could leak. If the engine oil is above the upper level, extract the excess engine oil until the oil is at the proper level.



Engine oil quantity (without oil filter replacement)
3.0 L (3.17 US qt, 2.64 Imp.qt)

- b. Leave the outboard motor off for 5–10 minutes.
 - c. Remove the dipstick “1” and wipe it clean.

- d. Insert the dipstick “1” completely for a correct measurement and remove it again.
 - e. Check that the oil level indicated on the dipstick “1” is between the upper mark “a” and the lower mark “b”.



- f. Start the engine and check that the oil pressure alert indicator does not come on. Also, check that there is no oil leakage.

NOTICE

If the oil pressure alert indicator comes on or if there is oil leakage, stop the engine and find the cause. Continued operation with a problem could cause severe engine damage.

5. Install:

- Top cowling

Changing the engine oil by removing the drain bolt

NOTICE

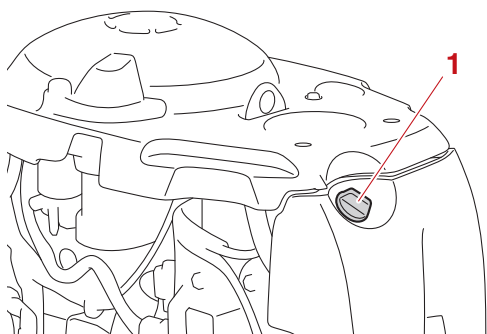
Change the engine oil after the first 20 hours of operation or 3 months, and every 100 hours or at 1-year intervals thereafter. Otherwise the engine will wear quickly.

1. Warm up:
 - Engine
See step (1) in “Changing the engine oil using an oil changer” (10-15).
2. Remove:
 - Top cowling

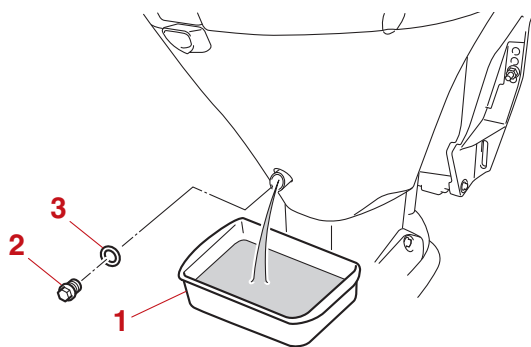
General periodic maintenance

3. Drain:

- Engine oil
 - a. Remove the oil filler cap "1".

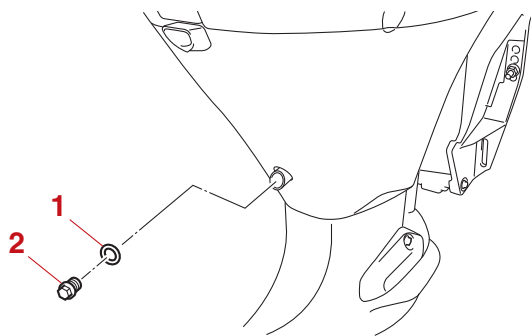


- b. Place a drain pan "1" under the engine oil drain hole.
- c. Remove the drain bolt "2" and gasket "3" and let the oil drain completely.



4. Install:

- Gasket "1" **New**
- Drain bolt "2"



Drain bolt "2"
27 N·m (2.7 kgf·m, 20 lb·ft)

5. Fill:

- Recommended engine oil
 - a. Fill the engine with the specified amount of the recommended engine oil through the oil filler hole. Install the oil filler cap.

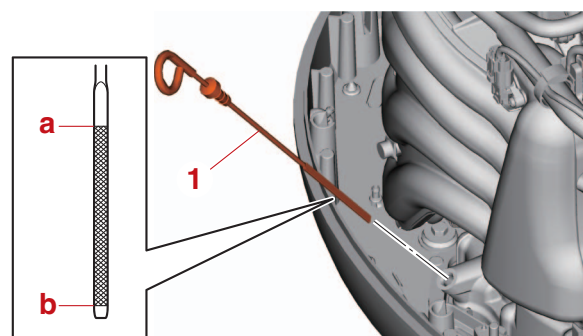
NOTICE

Do not overfill the engine with engine oil. Otherwise, the engine could be damaged or oil could leak. If the engine oil is above the upper level, extract the excess engine oil until the oil is at the proper level.



Engine oil quantity (without oil filter replacement)
3.0 L (3.17 US qt, 2.64 Imp. qt)

- b. Leave the outboard motor off for 5–10 minutes.
- c. Remove the dipstick "1" and wipe it clean.
- d. Insert the dipstick "1" completely for a correct measurement and remove it again.
- e. Check that the oil level indicated on the dipstick "1" is between the upper mark "a" and the lower mark "b".



- f. Start the engine and check that the oil pressure alert indicator does not come on. Also, check that there is no oil leakage.

NOTICE

If the oil pressure alert indicator comes on or if there is oil leakage, stop the engine and find the cause. Continued operation with a problem could cause severe engine damage.

6. Install:
 - Top cowling

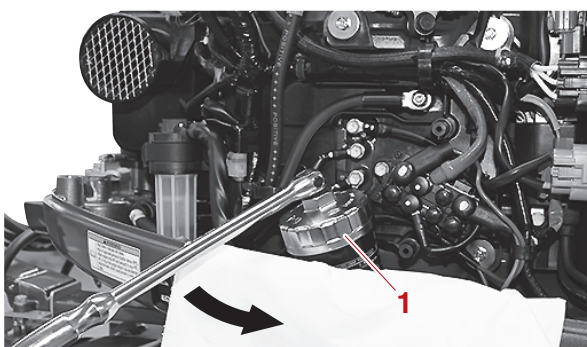
Replacing the oil filter


1. Warm up:
 - Engine
See step (1) in “Changing the engine oil using an oil changer” (10-15).
2. Remove:
 - Top cowling
3. Drain:
 - Engine oil
See step (3) in “Changing the engine oil using an oil changer” (10-15) or step (2) in “Changing the engine oil by removing the drain bolt” (10-16).

TIP: If the engine oil was changed by removing the drain bolt, install the drain bolt. See step (3) in “Changing the engine oil by removing the drain bolt” (10-16).

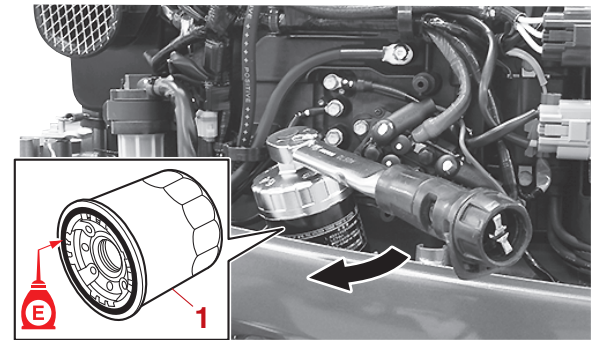
4. Replace:
 - Oil filter
 - a. Place a rag under the oil filter, and then remove the oil filter.


TIP: Make sure to clean up any oil spills.




	Oil filter wrench “1” 90890-01426
---	--------------------------------------

- b. Install a new oil filter “1”, and then tighten it to the specified torque.



	Oil filter “1” 18 N·m (1.8 kgf·m, 13 lb·ft)
---	--

5. Fill:
 - Recommended engine oil
 - a. Fill the engine with the specified amount of the recommended engine oil through the oil filler hole.

	Engine oil quantity (with oil filter replacement) 3.2 L (3.38 US qt, 2.82 Imp.qt)
---	--

- b. Install the oil filler cap and dipstick, and then start the engine and warm it up for 5–10 minutes.
- c. Stop the engine, and then leave it off for 5–10 minutes.
- d. Check the oil level.

6. Install:
 - Top cowling

Changing the gear oil

⚠ WARNING

Never get under the lower unit while it is tilted.

General periodic maintenance

1. Drain:
 - Gear oil
 - a. Tilt the outboard motor so that the drain screw is at the lowest point.
 - b. Place a drain pan "1" under the gear oil drain hole.
 - c. Remove the drain screw "2" and gasket "3".

NOTICE

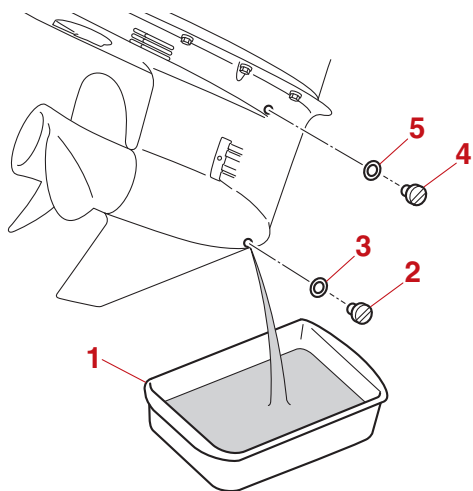
If there is a significant amount of metal particles on the magnetic drain screw, the lower unit may have a problem.

- d. Remove the oil level plug "4" and gasket "5" and let the oil drain completely.

NOTICE

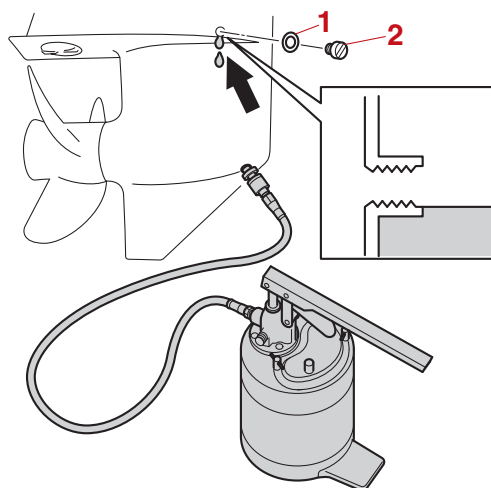
After the gear oil has been drained, check the used oil. If the oil is milky, water is getting into the lower case, which can cause gear damage.

- e. After the gear oil has been drained, check the used oil. Pressure test the lower case and inspect the oil seal for damage if the oil is milky. See "Checking the lower unit for air leakage" (8-18).



2. Fill:
 - Gear oil
 - a. Place the outboard motor in an upright position.

- b. Insert the gear oil pump into the drain hole, and then fill the lower unit slowly with gear oil until oil flows out of the check hole and no air bubbles are visible.
 - c. Install a new gasket "1" and the oil level plug "2".



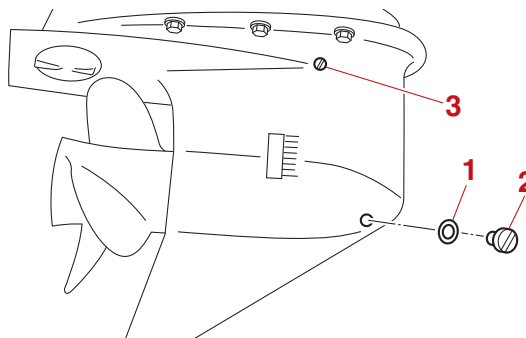
Gear oil quantity
0.760 L (0.803 US qt, 0.669
Imp.qt)


- d. Remove the gear oil pump, and then install a new gasket "1" and the drain screw "2".

TIP:

Before installing the magnetic drain screw, make sure to remove all metal particles.

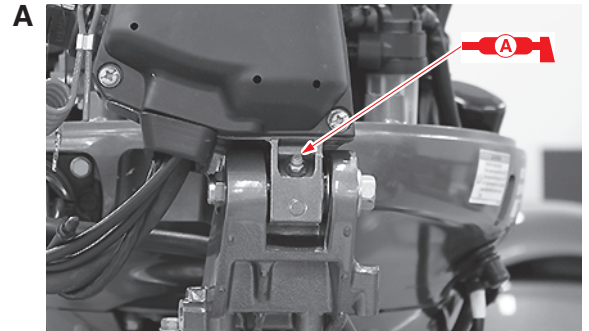
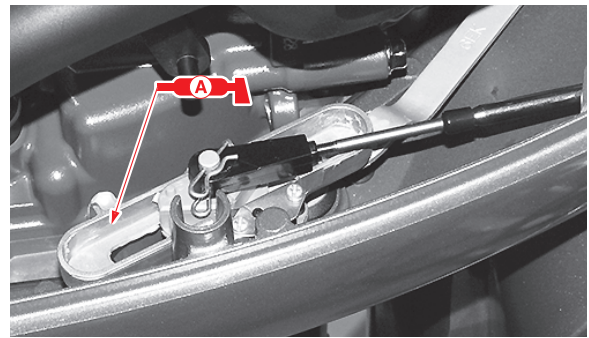
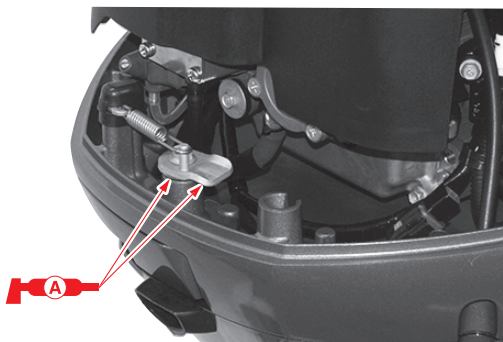
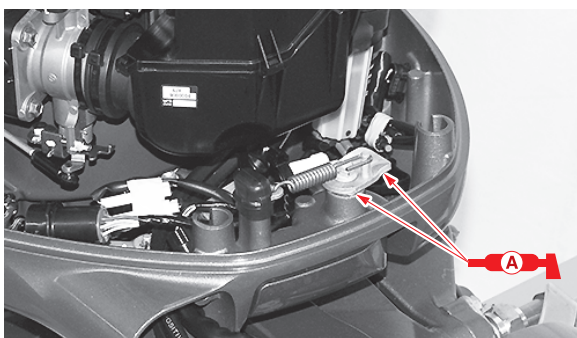
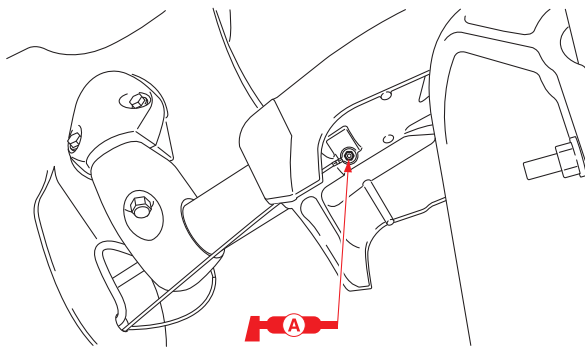
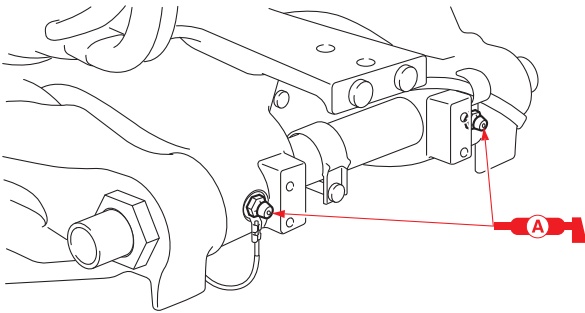
- e. Tighten the oil level plug "3" and drain screw "2" to the specified torque.



	Drain screw "2"
	7 N·m (0.7 kgf·m, 5.2 lb·ft)
	Oil level plug "3"
	7 N·m (0.7 kgf·m, 5.2 lb·ft)

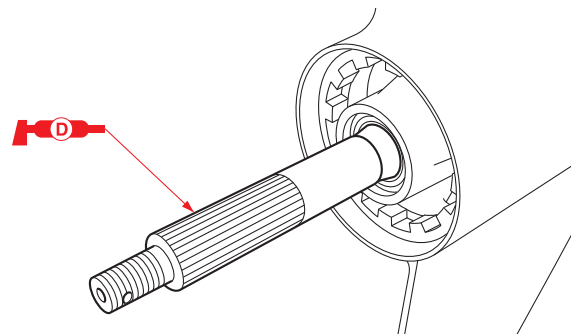
Greasing points

1. Apply:
 - Specified lubrication points
 - a. Apply water resistant grease to the specified lubrication points.



A. F75FEHT, F100GEHT

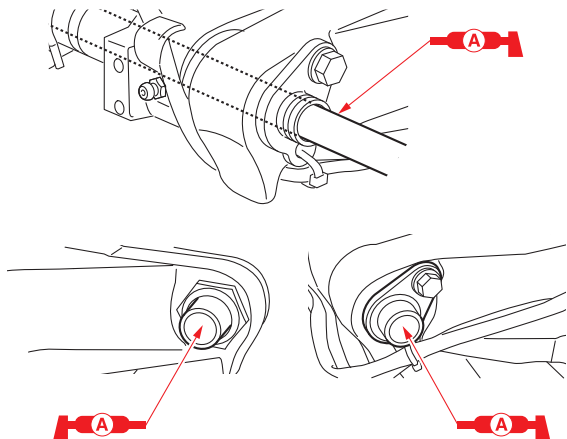
- a. Apply corrosion resistant grease to the specified lubrication points.



Greasing the clamp bracket bolt (through tube)

1. Remove the hydraulic steering cylinder or steering cable from the through tube.
2. Clean inside of the through tube and the hydraulic steering cylinder rod or steering cable.

3. Apply a sufficient amount of grease to the inside of the through tube and to the hydraulic steering cylinder rod or steering cable.



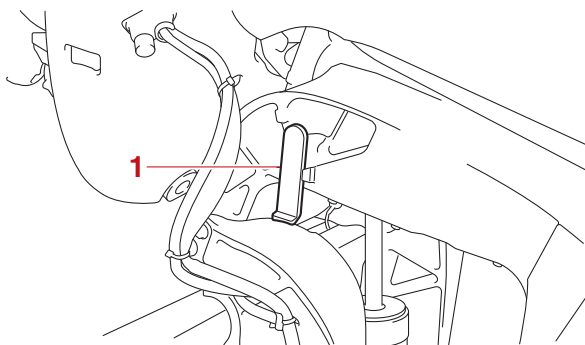
4. Assemble the hydraulic steering cylinder or steering cable to the through tube.

Checking the PTT fluid level

WARNING

Never get under the outboard motor while it is tilted.

1. Check:
 - PTT fluid level
 - a. Fully tilt the outboard motor up, and then support it using the tilt stop lever "1".



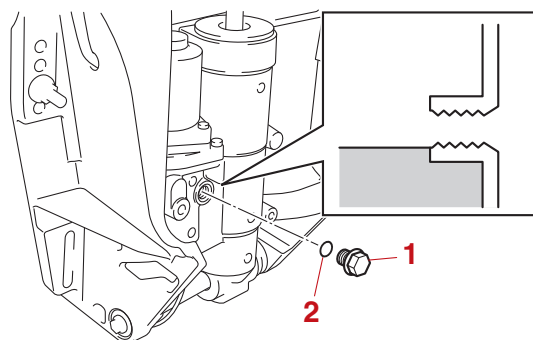
- b. Remove the reservoir cap "1" and O-ring "2", and then check the fluid level in the reservoir.

WARNING


Before removing the reservoir cap, make sure that the PTT ram is fully extended. Otherwise, fluid could be expelled forcefully from the unit due to internal pressure.

TIP:

If the fluid is at the proper level, a small amount of fluid should flow out of the filler hole when the reservoir cap is removed.



- c. If the fluid is below the proper level, add the recommended fluid.
- d. Install a new O-ring and the reservoir cap, and then tighten the reservoir cap to the specified torque.

	Reservoir cap 7 N·m (0.7 kgf·m, 5.2 lb·ft)
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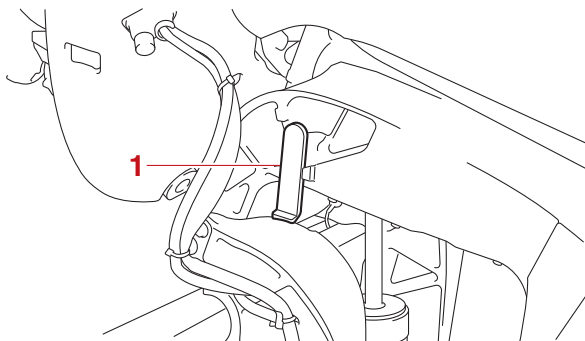
Checking the power trim and tilt unit operation

1. Check:
 - PTT unit operation
 - a. Fully tilt the outboard motor up and down a few times and check that it tilts up and down smoothly. Check the PTT fluid level if the tilt operation is not smooth.

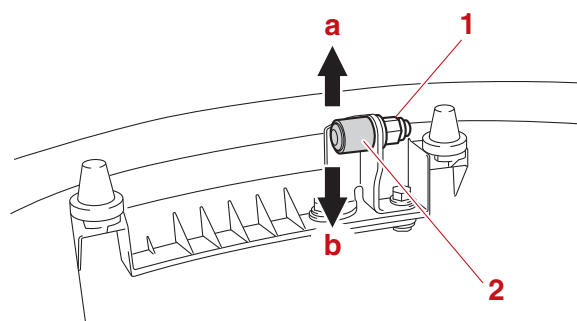
TIP:

The motor will have a consistent sound when operating properly and there is no air in the system.

- b. Fully tilt the outboard motor up, and then support it using the tilt stop lever "1". Check that the tilt stop lever operates properly.



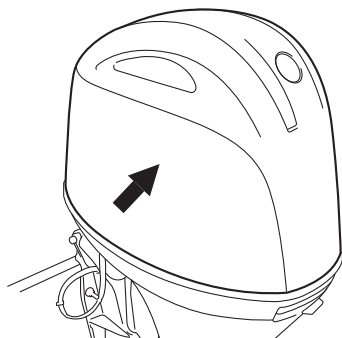
- c. Check the PTT unit for fluid leakage.



- c. Tighten the nut.
d. Recheck the fitting. Replace the cowling seal if the looseness or rattling cannot be adjusted.

Checking the cowling lock lever

1. Check:
- Top cowling fitting
Looseness/rattling → Adjust.
- a. Check the fitting by pushing the top cowling.



2. Adjust:
- Top cowling fitting
Looseness/rattling → Replace the cowling seal.
- a. Loosen the nuts "1".
- b. Move the stopper "2" up or down slightly to adjust its position.

- TIP:** _____
- To loosen the fitting, move the stopper in direction "a".
 - To tighten the fitting, move the stopper in direction "b".

Appendix

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Specification

Model data

Dimension and weight

Model	F75FEHT	F75FET	F100GEHT	F100GET
Overall length	1547 mm (60.9 in)	803 mm (31.6 in)	1547 mm (60.9 in)	803 mm (31.6 in)
Overall width	488 mm (19.2 in)			
Overall height L	1622 mm (63.9 in)	1622 mm (63.9 in) (CRB, OTH)	—	1622 mm (63.9 in) (CRB, CRB(EPA), NME, OTH)
Overall height X	1749 mm (68.9 in)	1749 mm (68.9 in) (CRB, OTH)	1749 mm (68.9 in)	1749 mm (68.9 in) (CRB, CRB(EPA), CHN, NME, OTH)
Motor transom height L	516 mm (20.3 in)	516 mm (20.3 in) (CRB, OTH)	—	516 mm (20.3 in) (CRB, CRB(EPA), NME, OTH)
Motor transom height X	643 mm (25.3 in)	643 mm (25.3 in) (CRB, OTH)	643 mm (25.3 in)	643 mm (25.3 in) (CRB, CRB(EPA), CHN, NME, OTH)
Dry weight (AL) L	167 kg (368 lb)	162 kg (357 lb) (CRB, OTH)	—	162 kg (357 lb) (CRB, CRB(EPA), NME, OTH)
Dry weight (AL) X	171 kg (377 lb)	166 kg (366 lb) (CRB, OTH)	171 kg (377 lb)	166 kg (366 lb) (CRB, CRB(EPA), CHN, NME, OTH)

* Dry weight: With AL (aluminum) propeller

Performance

Model	F75FEHT	F75FET	F100GEHT	F100GET
Rated power	55.2 kW (75 HP)		73.6 kW (100 HP)	
Full throttle operating range	5000–6000 r/min			
Maximum fuel consumption (reference data)	28.7 L/h at 6000 r/min (7.6 US gal/h at 6000 r/min, 6.3 Imp.gal/h at 6000 r/min)		36.9 L/h at 6000 r/min (9.7 US gal/h at 6000 r/min, 8.1 Imp.gal/h at 6000 r/min)	
Idle speed (in neutral)	700–800 r/min			

Power unit

Type	4-stroke SOHC L4 16 valves			
Total displacement	1832 cm ³ (111.8 c.i.)			
Bore × stroke	81.0 × 88.9 mm (3.19 × 3.50 in)			
Compression ratio	10.0 : 1			
Throttle & shift control system	Handle gear shift & grip handle	Remote control	Handle gear shift & grip handle	Remote control
Starting system	Electric starter			
Fuel system	Fuel injection			
Starting carburetion system	Fuel injection			
Ignition system	TCI			
Advance type	Microcomputer			
Maximum generator output	35 A			
Maximum charging capacity	21 A			
Spark plug (NGK)	LKR6E-9N			
Firing order	1-3-4-2			
Steering system	Tiller handle	Remote steering	Tiller handle	Remote steering
Cooling system	Water			
Exhaust system	Through propeller boss			
Lubrication system	Wet sump			

Lower unit

Model	F75FEHT	F75FET	F100GEHT	F100GET
Gear shift positions	Forward-neutral-reverse			
Gear ratio	2.15 (28/13)			
Gear type	Spiral bevel gear			
Clutch type	Dog clutch			
Propeller fitting mechanism	Spline			
Propeller direction (rear view)	Clockwise			
Propeller mark	K/K2			

Bracket unit

Trim angle	-4 ~ +17°
Full Tilt-up angle	70°
Tilt support angle	61°
Steering angle	35+35°
Trim and tilt system	Power trim and tilt

Fuel and oil

Recommended fuel	Regular unleaded gasoline	
Min. research octane number (RON)	90	
Min. pump octane number (PON)	—	86 (CRB(EPA))
Recommended engine oil	YAMALUBE 4 or 4-stroke outboard motor oil	
Recommended engine oil grade 1	SAE 10W-30/10W-40/5W-30 API SG/SH/SJ/SL	
Recommended engine oil grade 2	SAE 15W-40/20W-40/20W-50 API SH/SJ/SL	
Engine oil quantity (total amount)	4.2 L (4.44 US qt, 3.70 Imp.qt)	
Engine oil quantity (without oil filter replacement)	3.0 L (3.17 US qt, 2.64 Imp.qt)	
Engine oil quantity (with oil filter replacement)	3.2 L (3.38 US qt, 2.82 Imp.qt)	
Recommended gear oil	YAMALUBE outboard gear oil or Hypoid gear oil	

Model	F75FEHT	F75FET	F100GEHT	F100GET
Recommended gear oil grade	SAE 90 API GL-4 / SAE 80W API GL-5 / SAE 90 API GL-5			
Gear oil quantity	0.760 L (0.803 US qt, 0.669 Imp.qt)			

* Recommended engine oil and gear oil grade: Meeting both API and SAE requirements.

Battery requirement

Battery rating (CCA/SAE)	—	380–1150 A (CRB(EPA))
Battery rating (MCA/ABYC)	—	502–1370 A (CRB(EPA))
Battery rating (RC/SAE)	—	124 minutes (CRB(EPA))
Battery rating (CCA/EN)	430–1080 A	
Battery rating (20HR/IEC)	70 Ah	
Battery cable length	2.83 m (9.3 ft)	
Battery cable conductor cross sectional area	15 mm ² (AWG 5)	

PTT system

Recommended fluid	Yamalube Marine Power Trim and Tilt fluid or ATF Dexron II
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Electrical system technical data

Ignition timing control system

Spark plug	
Spark plug gap	0.8–0.9 mm (0.031–0.035 in)
Ignition coil	
Input voltage	12 V
Primary coil resistance	1.870–2.530 Ω
Secondary coil resistance	10.80–14.61 kΩ
Pulser coil	
Air gap	0.36–1.14 mm (0.014–0.045 in)
Resistance	396.0–594.0 Ω
Output peak voltage at cranking (unloaded) (reference data)	9.6 V

Model	F75FEHT	F75FET	F100GEHT	F100GET
Output peak voltage at cranking (loaded) (reference data)	9.0 V			
Output peak voltage at 1500 r/min (loaded) (reference data)	26.8 V			
Output peak voltage at 3500 r/min (loaded) (reference data)	31.6 V			
Intake air pressure/temperature sensor				
Input voltage	5 V			
Thermo sensor				
Resistance at 75 °C (167 °F)	0.360–0.383 kΩ			
Shift position switch				
Input voltage	5 V			
Knock sensor				
Resistance	504–616 kΩ			

Fuel injection control system

Water detection switch				
Input voltage	12 V			
Fuel injector				
Input voltage	12 V			
Resistance (reference data)	12.20 Ω			
High-pressure fuel pump				
Input voltage	12 V			
Resistance (reference data)	0.7 Ω			
ISC valve				
Resistance	27.0–33.0 Ω			
Vapor shut-off valve				
Input voltage	12 V			
Resistance	30.0–34.0 Ω			

Engine speed control system

Model	F75FEHT	F75FET	F100GEHT	F100GET
TPS				
Output voltage at throttle valve fully closed	0.58 V			
Throttle valve opening angle at throttle valve fully closed (reference data)	0.0°			
Input voltage	5 V			
Oil pressure switch				
Working pressure	127.50–166.70 kPa (1.275–1.667 kgf/cm ² , 18.49–24.17 psi)			

PTT system

Trim sensor				
Free position resistance	239–379 Ω			
Setting resistance	9–11 Ω			

Charging system

Lighting coil				
Output peak voltage at cranking (unloaded) (reference data)	11.1 V			
Output peak voltage at 1500 r/min (unloaded) (reference data)	40.7 V			
Output peak voltage at 3500 r/min (unloaded) (reference data)	93.7 V			
Resistance (reference data)	0.2 Ω			
Rectifier/Regulator				
Output voltage at 1500 r/min (loaded) (reference data)	13 V			
Output voltage at 3500 r/min (loaded) (reference data)	13 V			

Starting system

Model	F75FEHT	F75FET	F100GEHT	F100GET
Starter motor				
Type	Sliding gear			
Output	1.40 kW			
Cranking time limit	30 sec			
Standard brush length	15.5 mm (0.61 in)			
Wear limit	9.5 mm (0.37 in)			
Standard commutator diameter	29.0 mm (1.14 in)			
Wear limit	28.0 mm (1.10 in)			
Standard commutator undercut	0.7 mm (0.03 in)			
Wear limit	0.2 mm (0.01 in)			

Fuel system technical data

Fuel system

Fuel line		
Fuel pressure at engine start switch to "ON" within 5 seconds	310 kPa (3.1 kgf/cm ² , 45.0 psi)	
Fuel pressure at idle speed	320 kPa (3.2 kgf/cm ² , 46.4 psi)	
Primer pump		
Positive pressure	166.7 kPa (1.67 kgf/cm ² , 24.2 psi)	166.7 kPa (1.67 kgf/cm ² , 24.2 psi) (CRB, CHN, NME, OTH) 179.5 kPa (1.80 kgf/cm ² , 26.0 psi) (CRB(EPA))
Fuel strainer		
Holding pressure (positive pressure)	200.0 kPa (2.00 kgf/cm ² , 29.0 psi)	
Fuel filter assembly		
Fuel inlet holding pressure (positive pressure)	200 kPa (2.00 kgf/cm ² , 29.0 psi)	
Fuel outlet holding pressure (negative pressure)	80 kPa (0.80 kgf/cm ² , 11.6 psi)	

Model	F75FEHT	F75FET	F100GEHT	F100GET
Fuel pump				
Fuel inlet holding pressure (positive pressure)	196.0 kPa (1.96 kgf/cm ² , 28.4 psi)			
Fuel outlet holding pressure (positive pressure)	196.0 kPa (1.96 kgf/cm ² , 28.4 psi)			
Vapor separator tank				
Float height	50.5 mm (1.99 in)			
Canister				
Holding pressure (positive pressure)	19.6 kPa (0.20 kgf/cm ² , 2.8 psi)			

Power unit technical data

Power unit

Compression pressure	
Minimum (reference data)	854.0 kPa (8.54 kgf/cm ² , 123.8 psi)
Engine oil	
Engine oil pressure at idle speed (reference data)	470.0 kPa (4.70 kgf/cm ² , 68.2 psi)
Engine oil pressure at 3000 r/min (reference data)	580.0 kPa (5.80 kgf/cm ² , 84.1 psi)

* For the checking method, see "Checking the oil pressure" (7-1). The figures are for reference only.

Thermostat	
Valve opening temperature	58–62 °C (136–144 °F)
Fully open temperature	70 °C (158 °F)
Fully open stroke	4.3 mm (0.17 in)
Timing belt	
Installation height	0.7 mm (0.03 in)

Cylinder head assembly

Model	F75FEHT	F75FET	F100GEHT	F100GET
Cylinder head				
Warpage limit	0.10 mm (0.0039 in)			
Journal inside diameter	37.000–37.025 mm (1.4567–1.4577 in)			
Camshaft journal oil clearance	0.057–0.102 mm (0.0022–0.0040 in)			
Limit	0.137 mm (0.0054 in)			
Camshaft				
Cam lobe height IN	30.439–30.539 mm (1.1984–1.2023 in)			
Limit	30.389 mm (1.1964 in)			
Cam lobe height EX	30.397–30.497 mm (1.1967–1.2007 in)			
Limit	30.347 mm (1.1948 in)			
Cam lobe width IN	25.950–26.050 mm (1.0217–1.0256 in)			
Cam lobe width EX	25.590–26.050 mm (1.0075–1.0256 in)			
Journal diameter	36.923–36.943 mm (1.4537–1.4544 in)			
Runout	0.030 mm (0.0012 in)			
Valve clearance				
Valve clearance IN (cold engine)	0.15–0.25 mm (0.0059–0.0098 in)			
Valve clearance EX (cold engine)	0.25–0.35 mm (0.0098–0.0138 in)			
Valve				
Margin thickness IN	0.80–1.20 mm (0.0315–0.0472 in)			
Margin thickness EX	1.00–1.40 mm (0.0394–0.0551 in)			
Seat contact width IN	1.10–1.50 mm (0.0433–0.0591 in)			
Limit	1.950 mm (0.0768 in)			
Seat contact width EX	1.10–1.50 mm (0.0433–0.0591 in)			
Limit	1.950 mm (0.0768 in)			
Valve stem				
Diameter IN	5.475–5.490 mm (0.2156–0.2161 in)			
Limit	5.445 mm (0.2144 in)			
Diameter EX	5.460–5.475 mm (0.2150–0.2156 in)			
Limit	5.430 mm (0.2138 in)			
Runout limit IN	0.01 mm (0.0004 in)			
Runout limit EX	0.01 mm (0.0004 in)			

Model	F75FEHT	F75FET	F100GEHT	F100GET
Valve guide				
Inside diameter IN	5.504–5.522 mm (0.2167–0.2174 in)			
Clearance IN	0.014–0.047 mm (0.0006–0.0019 in)			
Limit	0.070 mm (0.0028 in)			
Inside diameter EX	5.504–5.522 mm (0.2167–0.2174 in)			
Clearance EX	0.029–0.062 mm (0.0011–0.0024 in)			
Limit	0.080 mm (0.0032 in)			
Installation height	16.00–16.40 mm (0.6299–0.6457 in)			
Valve spring				
Free length IN	40.69 mm (1.60 in)			
Limit	38.66 mm (1.52 in)			
Tilt limit IN	1.7 mm (0.07 in)			
Free length EX	40.69 mm (1.60 in)			
Limit	38.66 mm (1.52 in)			
Tilt limit EX	1.7 mm (0.07 in)			
Rocker arm shaft				
Outside diameter IN	20.971–20.991 mm (0.8256–0.8264 in)			
Outside diameter EX	20.971–20.991 mm (0.8256–0.8264 in)			
Rocker arm				
Inside diameter IN	21.000–21.018 mm (0.8268–0.8275 in)			
Inside diameter EX	21.000–21.018 mm (0.8268–0.8275 in)			

Crankcase assembly

Cylinder	
Bore	81.000–81.012 mm (3.1890–3.1894 in)
Limit	81.060 mm (3.1913 in)
Piston	
Diameter	80.950–80.962 mm (3.1870–3.1875 in)
Limit	80.910 mm (3.1854 in)
1st oversize diameter	81.200–81.212 mm (3.1968–3.1973 in)
Measuring point	9.5 mm (0.37 in)
Piston clearance	0.038–0.062 mm (0.0015–0.0024 in)
Limit	0.150 mm (0.0059 in)
Ring groove (Top)	1.23–1.25 mm (0.0484–0.0492 in)
Ring groove (2nd)	1.22–1.24 mm (0.0480–0.0488 in)
Ring groove (Oil)	2.51–2.53 mm (0.0988–0.0996 in)
Pin boss inside diameter	18.004–18.015 mm (0.7088–0.7093 in)

Model	F75FEHT	F75FET	F100GEHT	F100GET
Limit	18.035 mm (0.7100 in)			
Pin outside diameter	17.991–18.000 mm (0.7083–0.7087 in)			
Limit	17.981 mm (0.7079 in)			
Piston ring (Top)				
Type	Barrel			
Height (B)	1.170–1.190 mm (0.0461–0.0469 in)			
Width (T)	2.400–2.600 mm (0.0945–0.1024 in)			
End gap	0.15–0.30 mm (0.0059–0.0118 in)			
Limit	0.470 mm (0.0185 in)			
Side clearance	0.04–0.08 mm (0.0016–0.0032 in)			
Limit	0.130 mm (0.0051 in)			
Piston ring (2nd)				
Type	Taper			
Height (B)	1.170–1.190 mm (0.0461–0.0469 in)			
Width (T)	2.600–2.800 mm (0.1024–0.1102 in)			
End gap	0.70–0.90 mm (0.0276–0.0354 in)			
Limit	1.050 mm (0.0413 in)			
Side clearance	0.03–0.07 mm (0.0012–0.0028 in)			
Limit	0.110 mm (0.0043 in)			
Piston ring (Oil)				
Height (B)	2.380–2.480 mm (0.0937–0.0976 in)			
Width (T)	2.400 mm (0.0945 in)			
End gap	0.20–0.70 mm (0.0079–0.0276 in)			
Side clearance	0.03–0.15 mm (0.0012–0.0059 in)			
Connecting rod				
Small end inside diameter	18.005–18.018 mm (0.7089–0.7094 in)			
Big end inside diameter	50.025–50.045 mm (1.9695–1.9703 in)			
Big end side clearance	0.150–0.300 mm (0.0059–0.0118 in)			
Limit	0.35 mm (0.0138 in)			
Big end oil clearance	0.017–0.040 mm (0.0007–0.0016 in)			
Limit	0.070 mm (0.0028 in)			
Crankshaft				
Journal diameter	51.980–52.000 mm (2.0465–2.0472 in)			
Crankshaft pin diameter	46.980–47.000 mm (1.8496–1.8504 in)			
Runout	0.03 mm (0.0012 in)			
Limit	0.04 mm (0.0016 in)			

Model	F75FEHT	F75FET	F100GEHT	F100GET
Crankshaft pin width	21.00–21.10 mm (0.8268–0.8307 in)			
Journal oil clearance	0.026–0.050 mm (0.0010–0.0020 in)			
Limit	0.070 mm (0.0028 in)			

Lower unit technical data

Lower unit assembly

Lower unit	
Holding pressure	68.6 kPa (0.69 kgf/cm ² , 9.9 psi)
Gear backlash	
Forward gear backlash	0.15–0.88 mm (0.0059–0.0346 in)
Reverse gear backlash	0.74–1.57 mm (0.0291–0.0618 in)

* Figures obtained using the special service tools.

Available shim thicknesses	
Pinion shims	0.10/0.12/0.15/0.18/0.30/0.40/0.50 mm
Forward shims	0.10/0.12/0.15/0.18/0.30/0.40/0.50 mm
Reverse shims	0.10/0.12/0.15/0.18/0.30/0.40/0.50 mm
Propeller shaft	
Runout	0.02 mm (0.0008 in)
Drive shaft	
Runout	1.0 mm (0.039 in)

Bracket unit technical data

PTT system

Hydraulic pressure	
Up	12.50 Mpa (125.0 kgf/cm ² , 1812.5 psi)
Down	3.00 Mpa (30.0 kgf/cm ² , 435.0 psi)
Motor	
Standard commutator diameter	22.00 mm (0.8661 in)
Wear limit	21.00 mm (0.8268 in)
Standard commutator undercut	1.50 mm (0.0591 in)
Wear limit	1.00 mm (0.0394 in)
Standard brush length	10.00 mm (0.3937 in)
Wear limit	3.5 mm (0.14 in)







Wiring diagram

How to use the wiring diagram

Composition of the wiring diagrams

The wiring diagram consists of five categories; “Engine control unit, fuel unit, and ignition unit (tiller handle model)”, “Charging unit, starting unit, and PTT unit (tiller handle model)”, “Engine control unit, fuel unit, and ignition unit (remote control model)”, “Charging unit, starting unit, and PTT unit (remote control model)”, and “Control unit”.

Legend symbols in the wiring diagrams

1	2	3
		
4	5	6
		

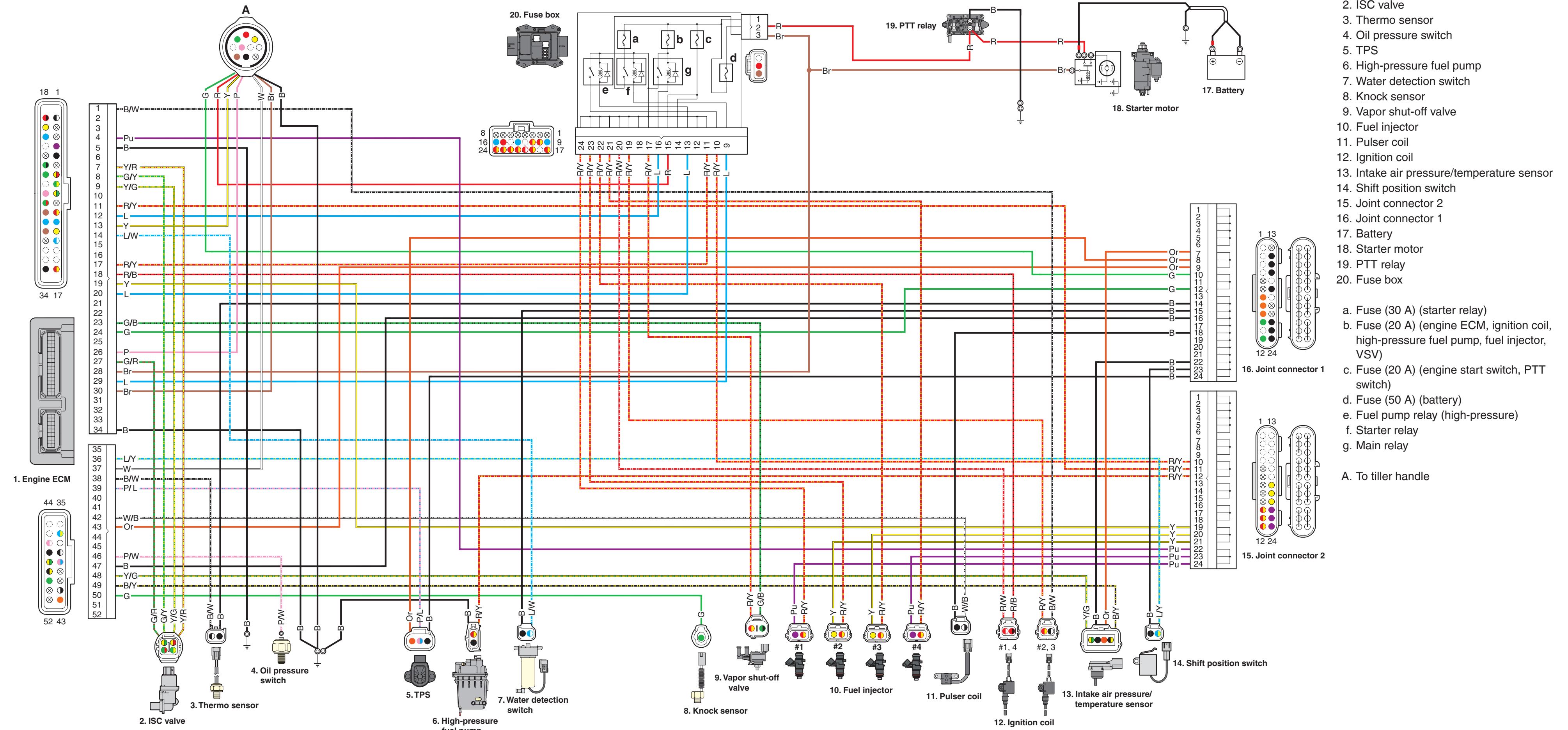
1. Double colors wire
2. Not used (vacant)
3. A wire is not included in the selected wiring unit.
4. Alert buzzer
5. Optional parts
6. Continuity

Terminal numbers

- Terminal numbers are indicated for cases where terminal locations of wires are unclear.
- In the coupler illustrations, only the rightmost and leftmost terminal numbers are indicated, and terminal numbers between them are omitted.



Engine control unit, fuel unit, and ignition unit (tiller handle model)

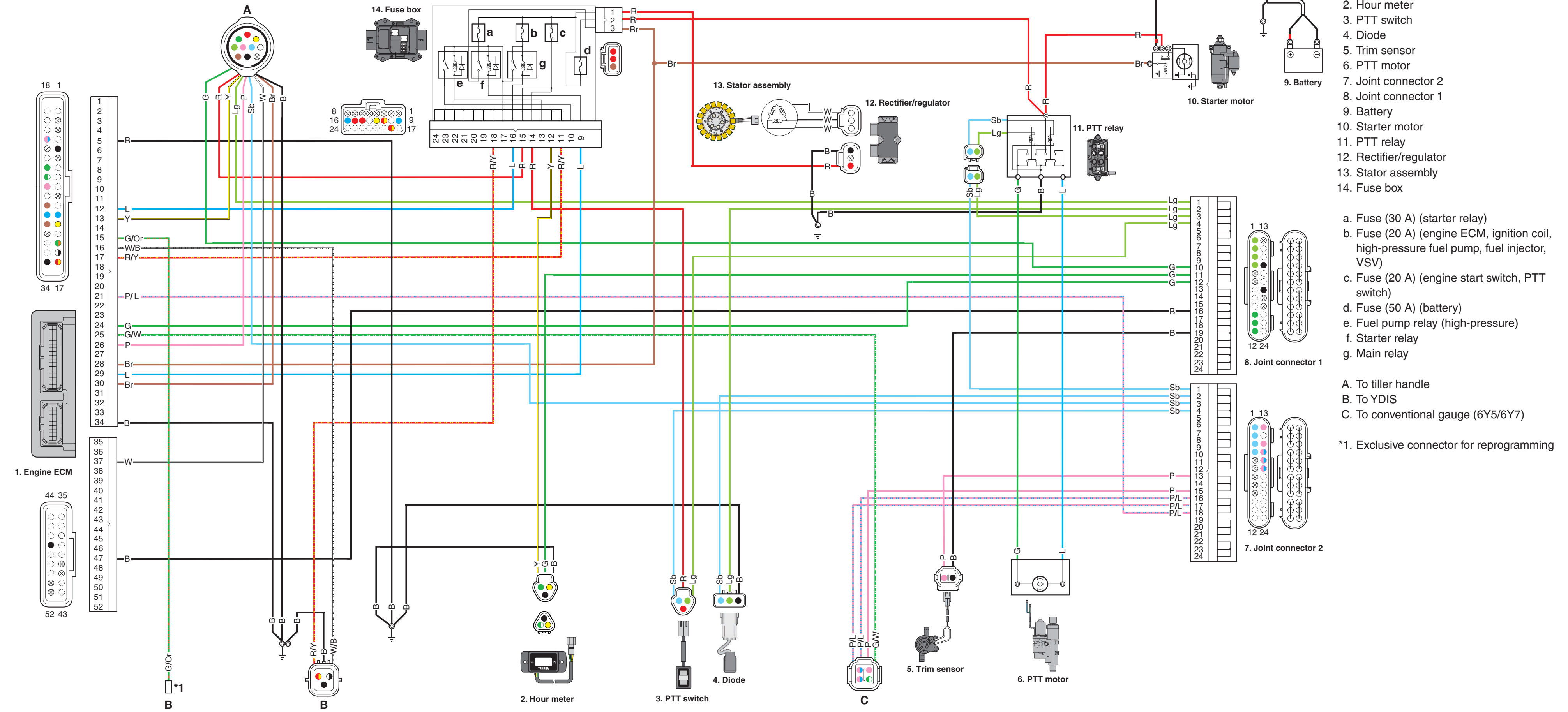


1. Engine ECM
2. ISC valve
3. Thermo sensor
4. Oil pressure switch
5. TPS
6. High-pressure fuel pump
7. Water detection switch
8. Knock sensor
9. Vapor shut-off valve
10. Fuel injector
11. Pulser coil
12. Ignition coil
13. Intake air pressure/temperature sensor
14. Shift position switch
15. Joint connector 2
16. Joint connector 1
17. Battery
18. Starter motor
19. PTT relay
20. Fuse box

- a. Fuse (30 A) (starter relay)
- b. Fuse (20 A) (engine ECM, ignition coil, high-pressure fuel pump, fuel injector, VSV)
- c. Fuse (20 A) (engine start switch, PTT switch)
- d. Fuse (50 A) (battery)
- e. Fuel pump relay (high-pressure)
- f. Starter relay
- g. Main relay

A. To tiller handle

Charging unit, starting unit, and PTT unit (tiller handle model)

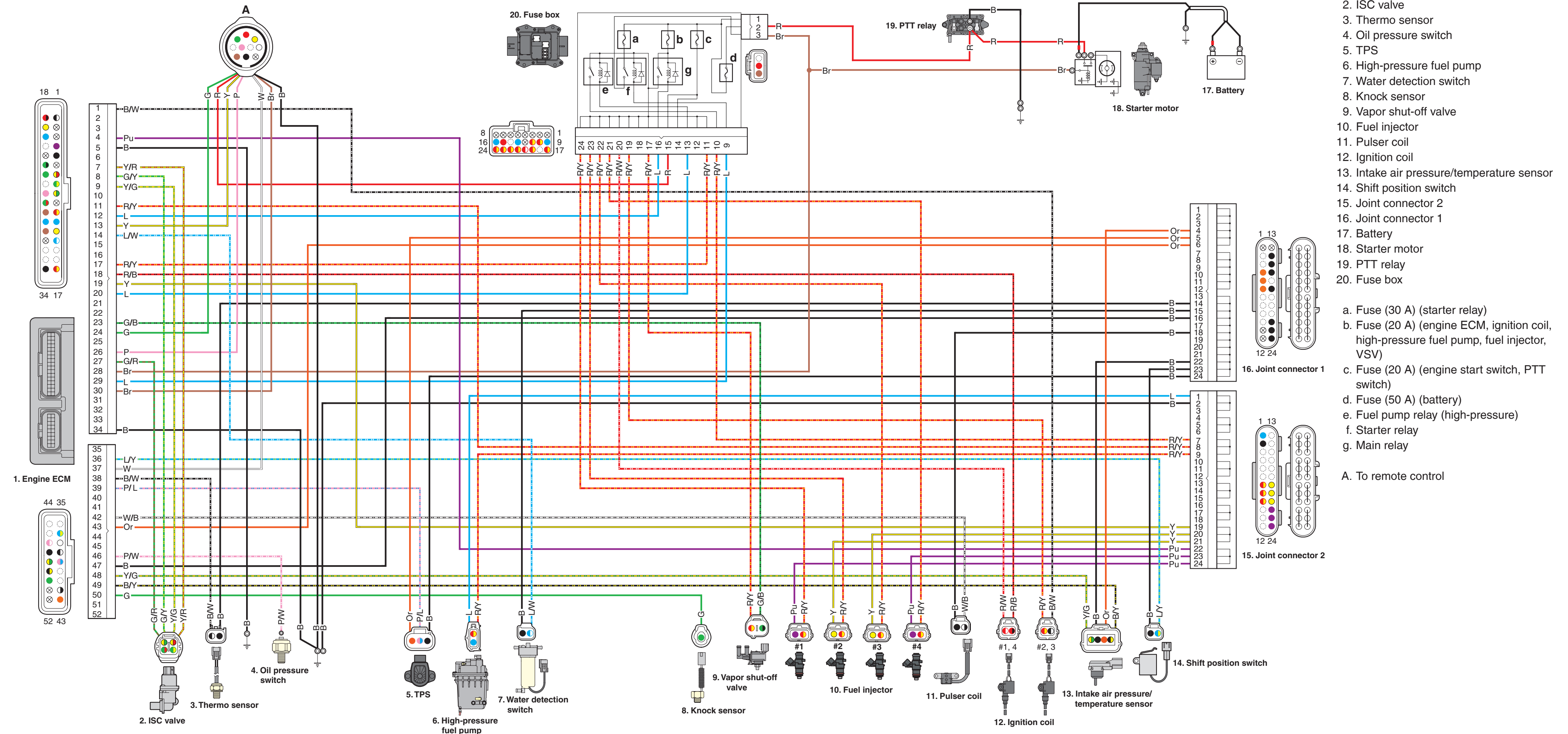


1. Engine ECM
2. Hour meter
3. PTT switch
4. Diode
5. Trim sensor
6. PTT motor
7. Joint connector 2
8. Joint connector 1
9. Battery
10. Starter motor
11. PTT relay
12. Rectifier/regulator
13. Stator assembly
14. Fuse box

- a. Fuse (30 A) (starter relay)
- b. Fuse (20 A) (engine ECM, ignition coil, high-pressure fuel pump, fuel injector, VSV)
- c. Fuse (20 A) (engine start switch, PTT switch)
- d. Fuse (50 A) (battery)
- e. Fuel pump relay (high-pressure)
- f. Starter relay
- g. Main relay

- A. To tiller handle
 - B. To YDIS
 - C. To conventional gauge (6Y5/6Y7)
- *1. Exclusive connector for reprogramming

Engine control unit, fuel unit, and ignition unit (remote control model)

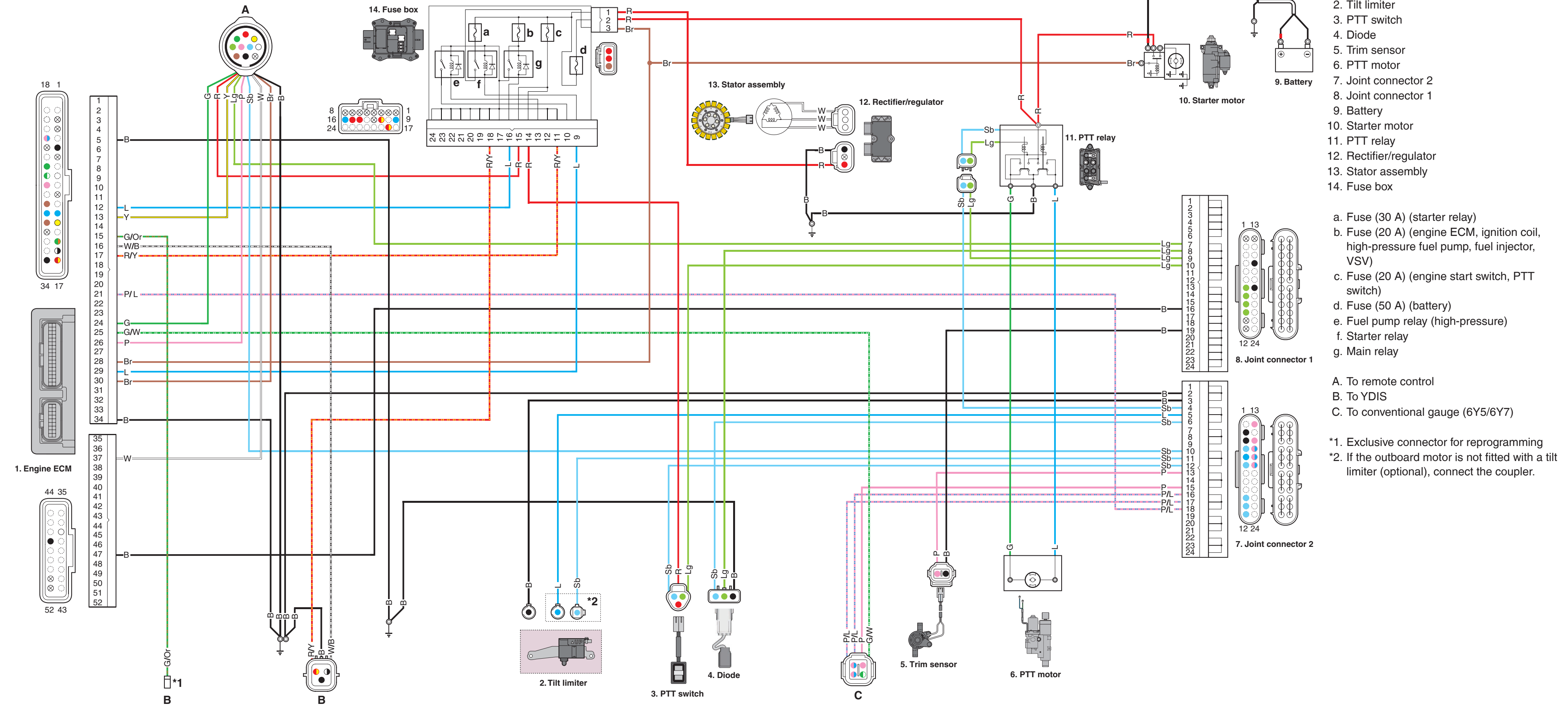


- 1. Engine ECM
- 2. ISC valve
- 3. Thermo sensor
- 4. Oil pressure switch
- 5. TPS
- 6. High-pressure fuel pump
- 7. Water detection switch
- 8. Knock sensor
- 9. Vapor shut-off valve
- 10. Fuel injector
- 11. Pulser coil
- 12. Ignition coil
- 13. Intake air pressure/temperature sensor
- 14. Shift position switch
- 15. Joint connector 2
- 16. Joint connector 1
- 17. Battery
- 18. Starter motor
- 19. PTT relay
- 20. Fuse box

- a. Fuse (30 A) (starter relay)
- b. Fuse (20 A) (engine ECM, ignition coil, high-pressure fuel pump, fuel injector, VSV)
- c. Fuse (20 A) (engine start switch, PTT switch)
- d. Fuse (50 A) (battery)
- e. Fuel pump relay (high-pressure)
- f. Starter relay
- g. Main relay

A. To remote control

Charging unit, starting unit, and PTT unit (remote control model)



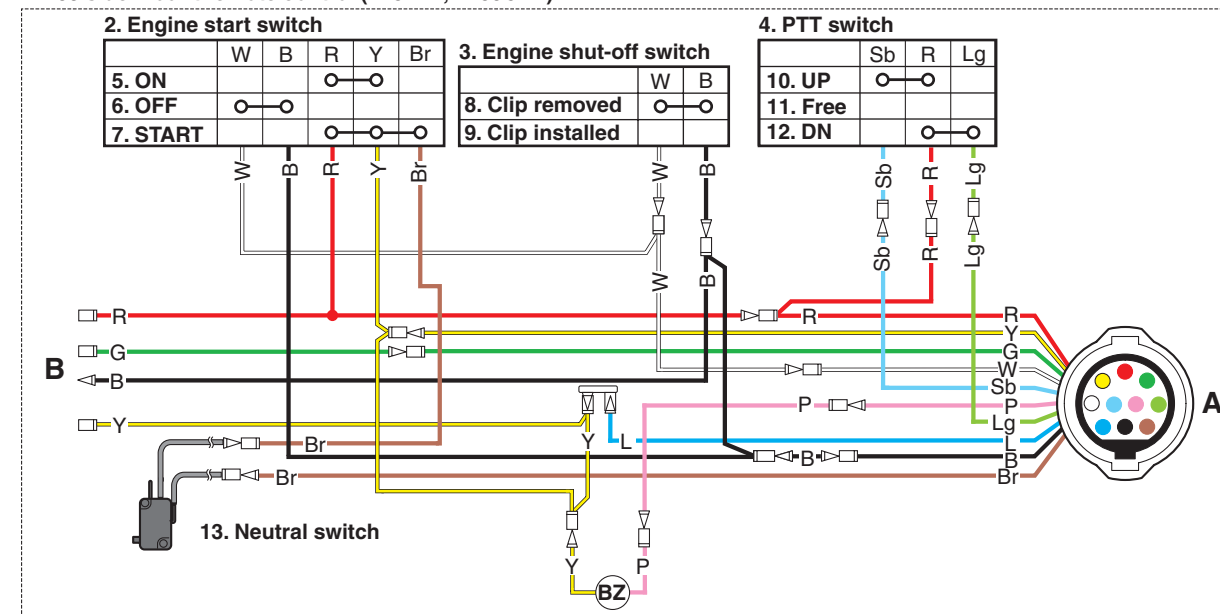
- 1. Engine ECM
- 2. Tilt limiter
- 3. PTT switch
- 4. Diode
- 5. Trim sensor
- 6. PTT motor
- 7. Joint connector 2
- 8. Joint connector 1
- 9. Battery
- 10. Starter motor
- 11. PTT relay
- 12. Rectifier/regulator
- 13. Stator assembly
- 14. Fuse box

- a. Fuse (30 A) (starter relay)
- b. Fuse (20 A) (engine ECM, ignition coil, high-pressure fuel pump, fuel injector, VSV)
- c. Fuse (20 A) (engine start switch, PTT switch)
- d. Fuse (50 A) (battery)
- e. Fuel pump relay (high-pressure)
- f. Starter relay
- g. Main relay

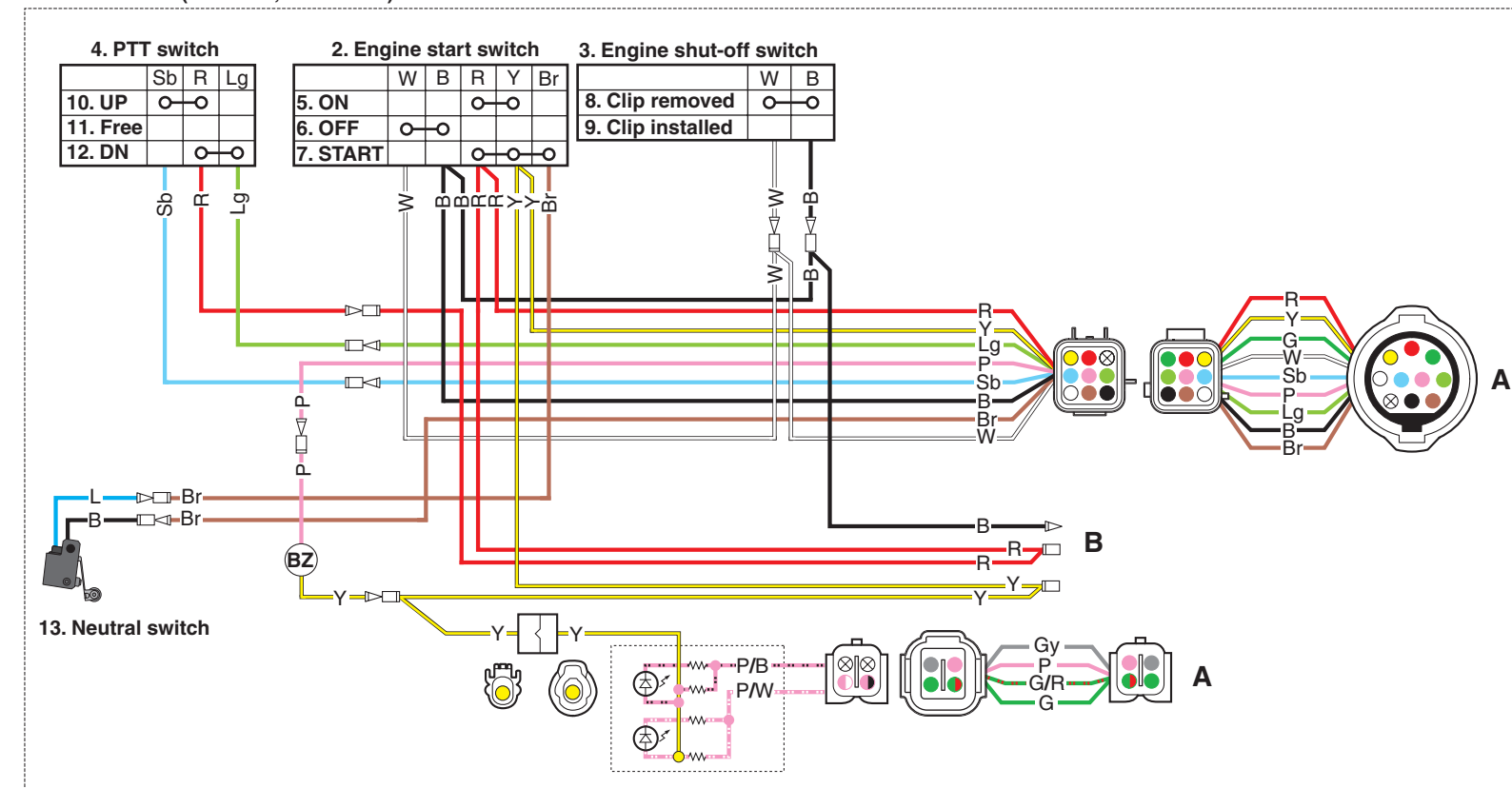
- A. To remote control
 - B. To YDIS
 - C. To conventional gauge (6Y5/6Y7)
- *1. Exclusive connector for reprogramming
 *2. If the outboard motor is not fitted with a tilt limiter (optional), connect the coupler.

Control unit

1. 703 side mount remote control (F75FET, F100GET)

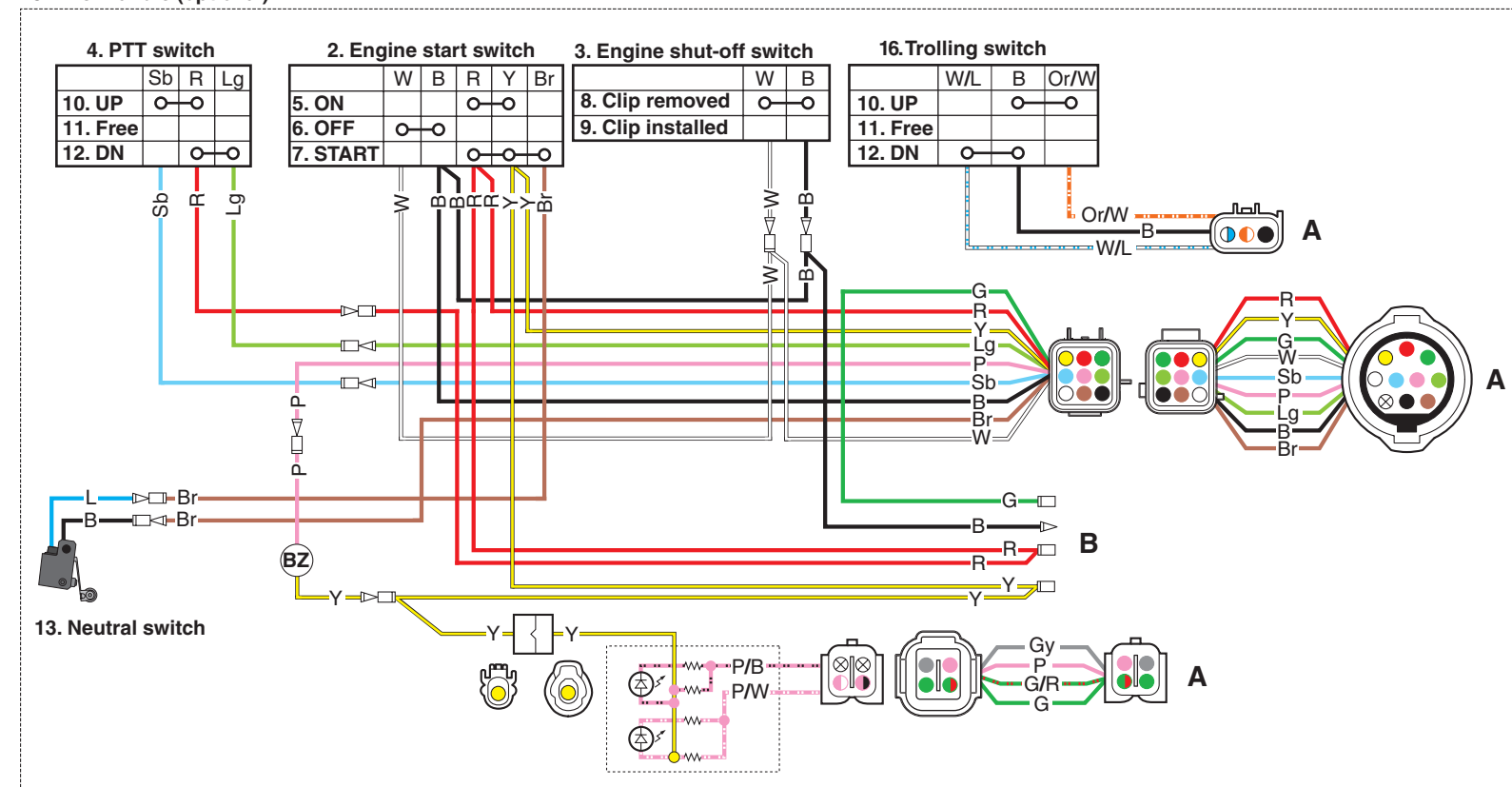


14. Tiller handle (F75FEHT, F100GEHT)



1. 703 side mount remote control (F75FET, F100GET)
 2. Engine start switch
 3. Engine shut-off switch
 4. PTT switch
 5. ON
 6. OFF
 7. START
 8. Clip removed
 9. Clip installed
 10. UP
 11. Free
 12. DN
 13. Neutral switch
 14. Tiller handle (F75FEHT, F100GEHT)
 15. Tiller handle (optional)
 16. Trolling switch
- A. To power unit
B. To gauge

15. Tiller handle (optional)



List of optional parts

			Destinations					
			CHN	CRB	CRB (EPA)	OTH		NME
Combination symbol	Kit P/N	Optional parts	F100GET	F75FET, F100GET	F100GET	F75FET, F100GET	F75FEHT, F100GEHT	F100GET
A	6X4-42103-6A	Tiller handle kit	✓	✓	✓	✓	—	✓
B	6X4-42102-G2	Handle fitting kit	✓	✓	✓	✓	—	✓
C	63P-825EY-02	Tilt limiter kit	✓	✓	✓	✓	—	✓
To change from remote control to tiller handle			A + B	A + B	A + B	A + B	—	A + B

✓: Available

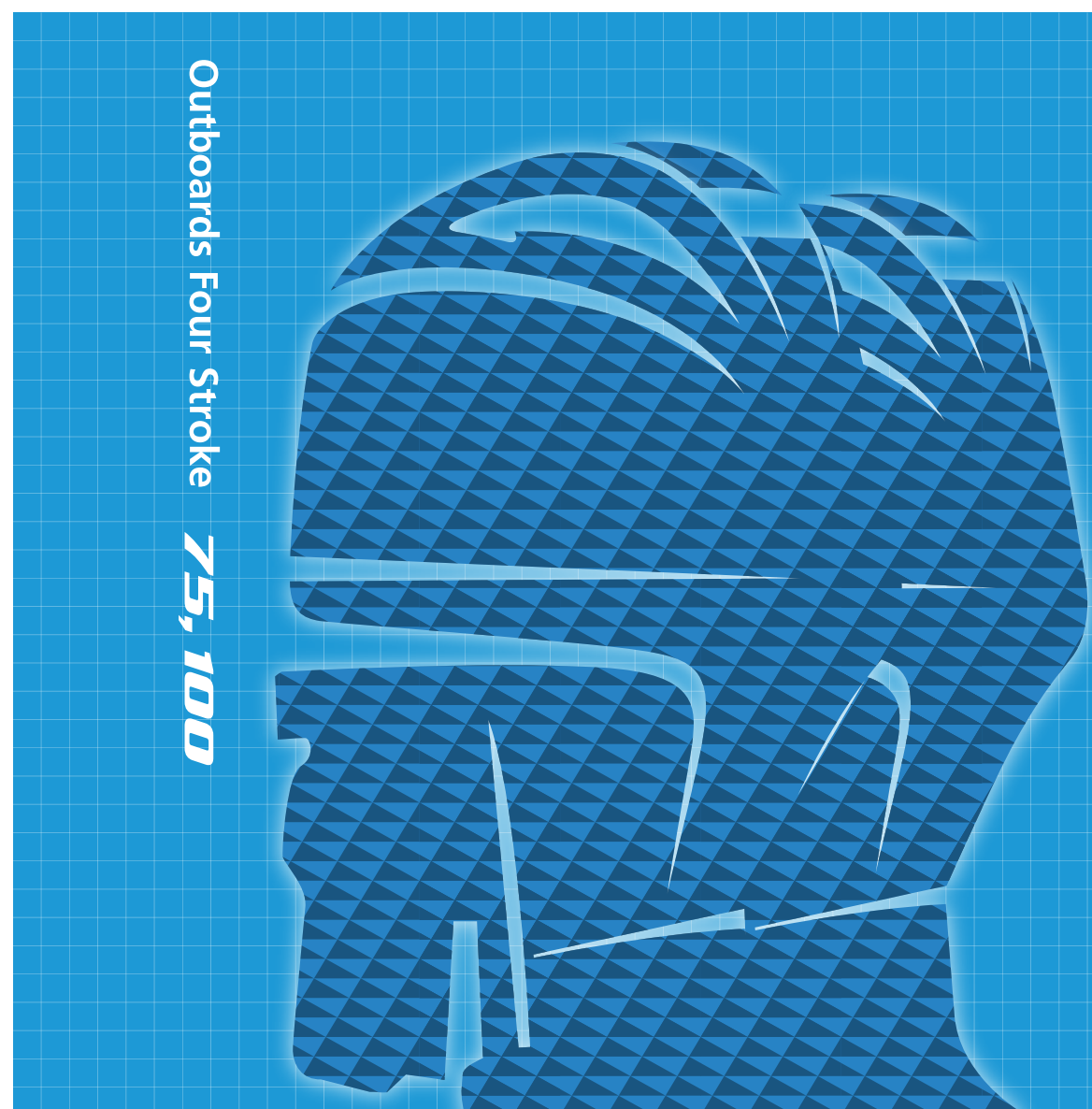
—: Not available





SERVICE
MANUAL

F75F ^(6JX)
F100G ^(6JY)



SERVICE MANUAL

6JY-28197-Z0-11

6JY-28197-Z0-11

