YAMAHA

F150
LF150

SERVICE MANUAL

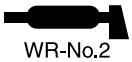
LIT-18616-03-35

63P-28197-1P-12

Lubricant, sealant, and thread locking agent

Symbol

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

Symbol	Name	Application
	YAMALUBE 4-M FC-W oil or Yamaha 4-stroke motor oil	Lubricant
	Yamalube Marine Lower Unit Gearcase Lube or hypoid gear oil	Lubricant
	Water resistant grease (Yamalube Marine Grease)	Lubricant
	Low temperature resistant grease (Yamalube Molybdenum Disulfide grease)	Lubricant
	Corrosion resistant grease (Yamalube Marine Grease)	Lubricant
	Molybdenum disulfide grease (Yamalube Molybdenum Disulfide grease)	Lubricant
	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.

Symbol	Name	Application
	Gasket Maker	Sealant
	ThreeBond 1280B (Yamabond 4 Marine)	Sealant
	ThreeBond 1303N	Thread locking agent
	ThreeBond 1322	Thread locking agent
	ThreeBond 1377B	Thread locking agent
	ThreeBond 1386B	Sealant

Specification

Fuel system technical data

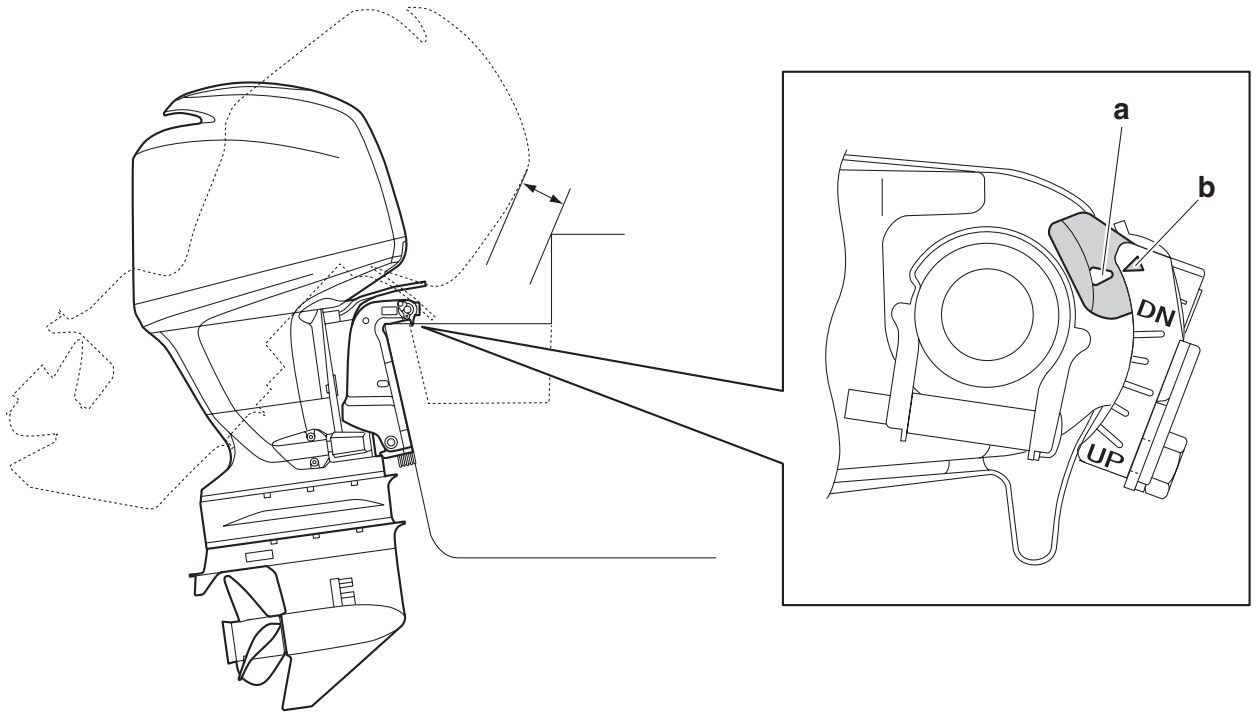
Fuel system

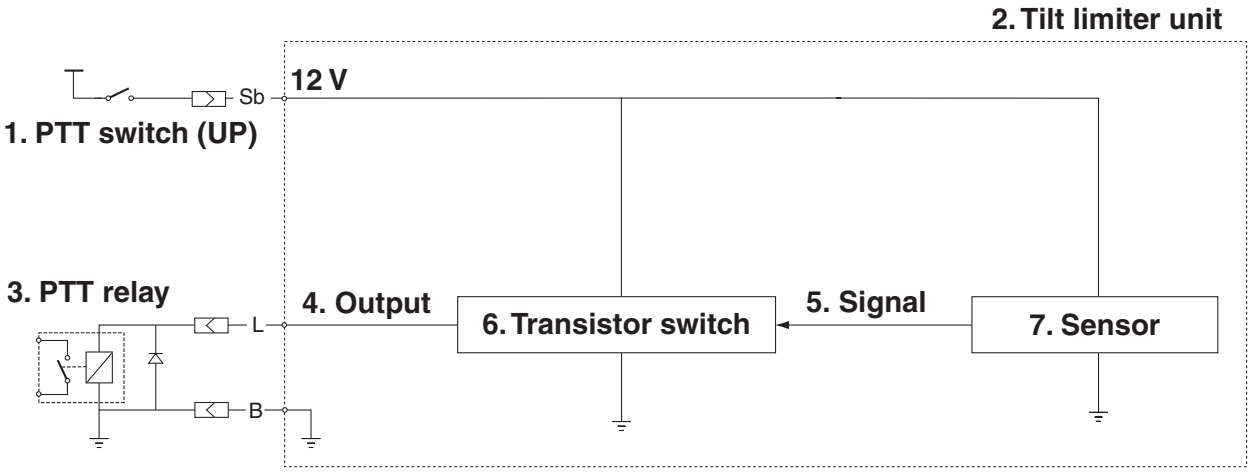
Fuel pressure (reference data)	
	300.0 kPa (3.00 kgf/cm^2, 43.5 psi) within 3 seconds after engine start switch turned to ON 260.0 kPa (2.60 kgf/cm^2, 37.7 psi) at engine idle speed
Fuel filter assembly	
Fuel inlet holding pressure (positive pressure)	200 kPa (2.0 kgf/cm^2, 29.0 psi)
Fuel outlet holding pressure (negative pressure)	80 kPa (0.8 kgf/cm^2, 11.6 psi)
Primer pump	
Fuel inlet holding pressure (positive pressure)	166.7 kPa (1.67 kgf/cm^2, 24.2 psi)
Throttle link	
Roller clearance	0.50 mm (0.02 in)
Vapor separator tank	
Float height	55.0–61.0 mm (2.2–2.4 in)
Canister	
Holding pressure (positive pressure)	19.6 kPa (0.20 kgf/cm^2, 2.8 psi)

— MEMO —

Tilt limiter (optional)

The outboard motors (with applicable serial numbers) covered by this manual can be fitted with an optional tilt limiter that allows the tilt-up action to be halted at a set angle, preventing the outboard motor from coming into contact with the motor well when tilted up.
This tilt limiter consists of a magnet affixed to a through tube, and a sensor on a swivel bracket. The movement of the swivel bracket when tilting the outboard motor up will move the sensor position. When the mark “a” on the magnet is aligned with the mark “b” on the sensor, power to the PTT for tilting the outboard motor up will be cut off.



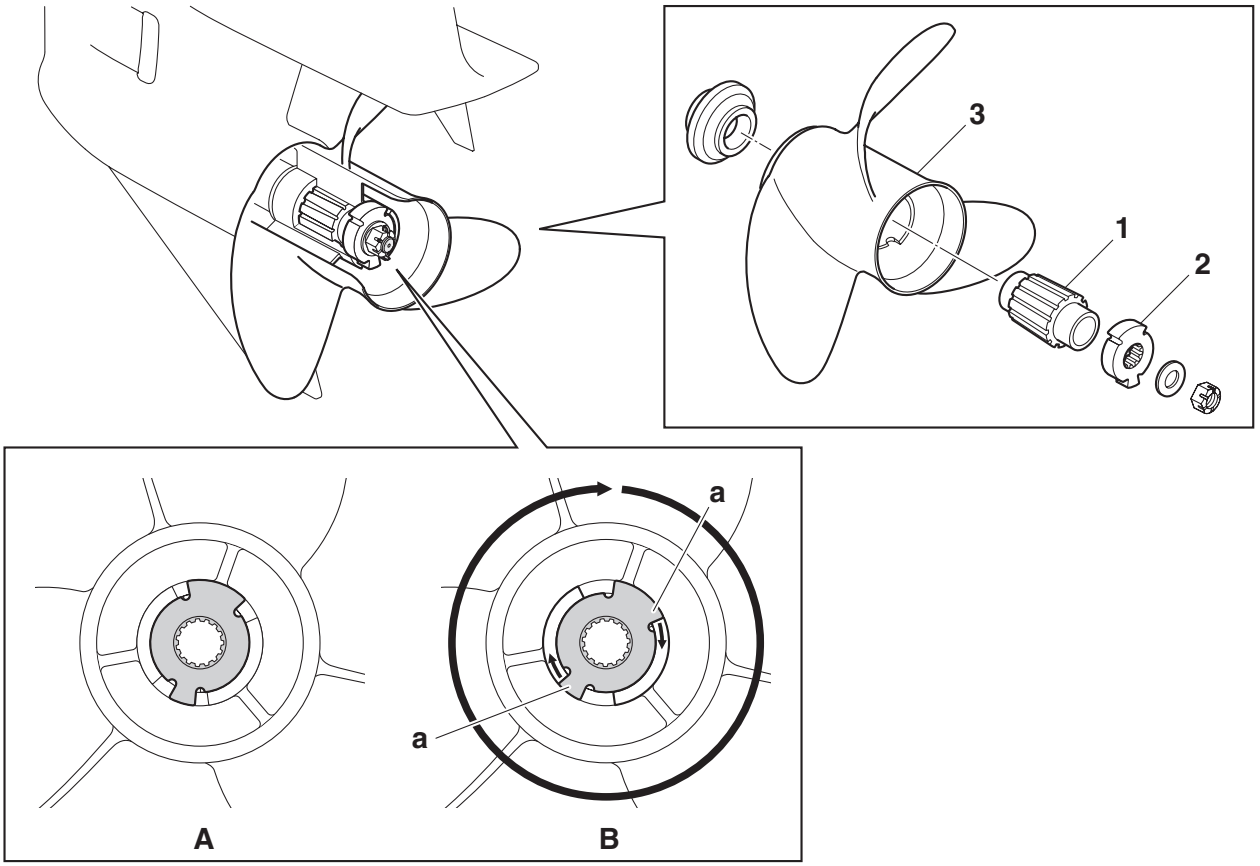


1. PTT switch (UP)
2. Tilt limiter unit
3. PTT relay
4. Output
5. Signal
6. Transistor switch
7. Sensor

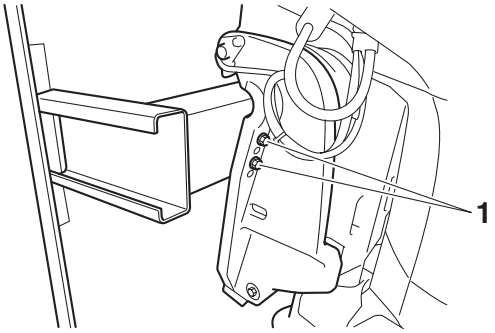
Lower unit

Propeller (SDS)

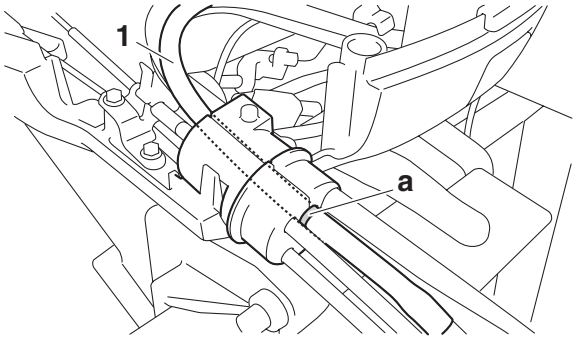
The optional Shift Dampener System (SDS) uses a damper “1” to reduce the shock when the outboard motor is shifted into gear, and eliminates the clunk that is sometimes heard.
When shifting gears, the protrusions “a” on the dedicated spacer “2” transmit the rotational force of the propeller shaft directly to the propeller “3”.



A. Neutral
B. Shift in



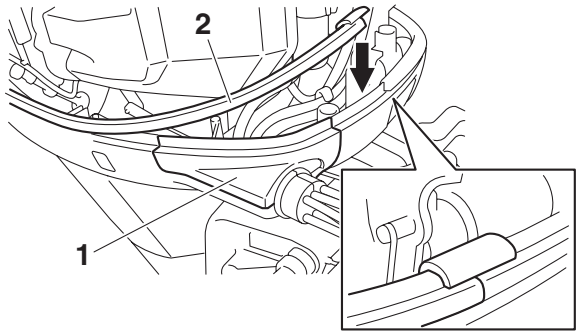
11. Remove the steering retainer, and then install a hydraulic steering cylinder or steering cable following the recommendation of the manufacturer.



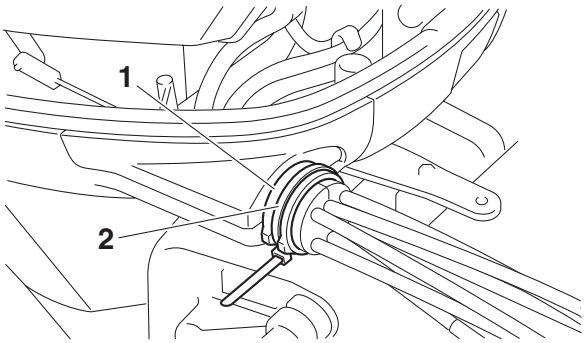
4. Install the retaining plate “1”.

5. Install the rubber seal “2”.

TIP:
Make sure that the rubber seal is installed securely.



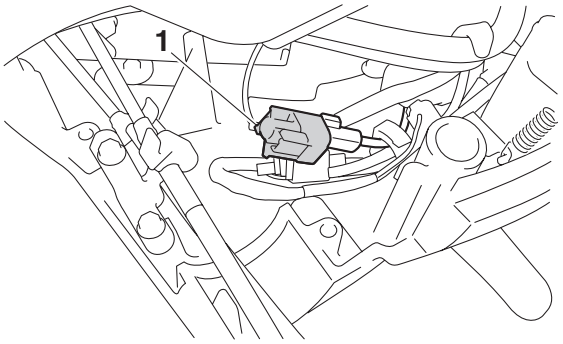
6. Install the rigging tube retainer “1”, and then fasten it using the plastic tie “2”.



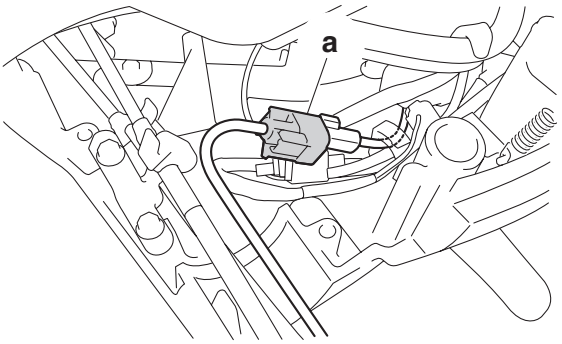
Optional equipment

Installing the isolator lead

1. Remove the cap “1” from the isolator coupler.



2. Connect the isolator lead coupler “a”.

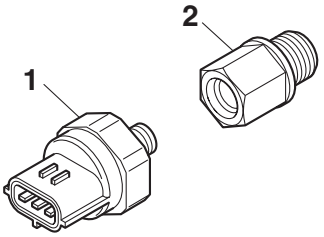


3. Route the isolator lead through the proper hole in the rigging grommet. See “Rigging grommet description” (3-9).

Installing the water pressure sensor

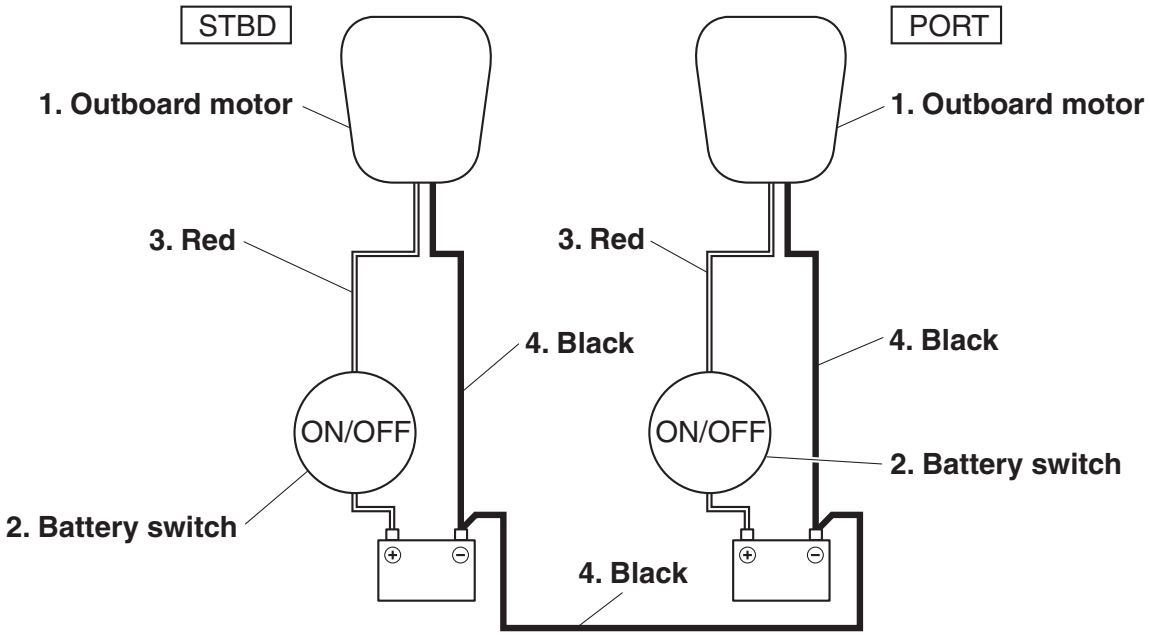
See Command Link Multifunction Meter set up manual for details of the components.

1. Install the water pressure sensor “1” to the water pressure sensor adapter “2”, and then tighten the water pressure sensor “1” to the specified torque.

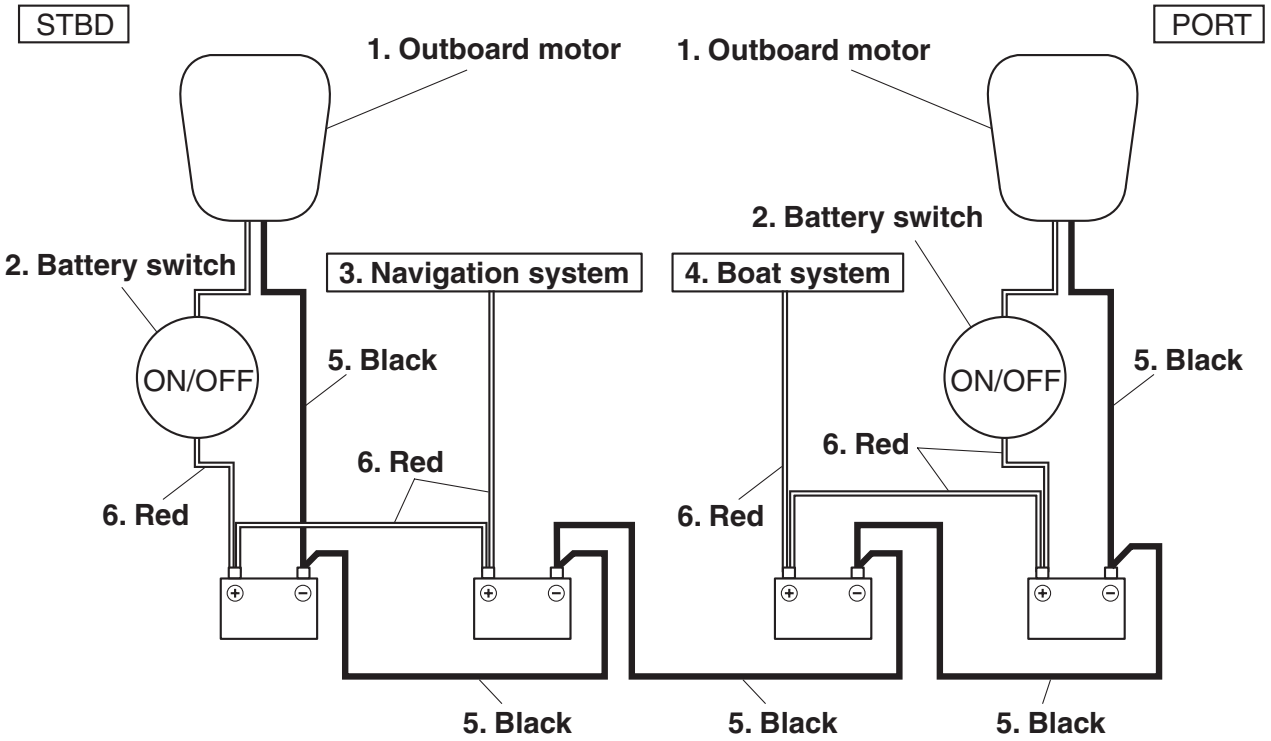


Water pressure sensor “1”:
18 N·m (1.8 kgf·m, 13.3 ft·lb)

2. Remove the plug “1”.



1. Outboard motor
2. Battery switch
3. Red
4. Black



1. Outboard motor
2. Battery switch
3. Navigation system
4. Boat system
5. Black
6. Red

1. Engine ECM
2. Speed sensor
3. Water pressure sensor
4. Trim sensor
5. Main wiring harness
6. Remote control box
7. Engine start switch (with engine shut-off switch)
8. Fuse (10 A)
9. Hub
10. Power wire
11. Terminal resistor
12. Pigtail bus wire
13. Main bus wire
14. Cap (red)
15. Cap (white)
16. Tachometer unit
17. Fuel meter unit
18. Speedometer unit
19. Fuel tank (fuel level sensor)
20. GPS
21. Multisensor (speed, water temperature, and water depth)
22. Receiver
23. Power distribution wire

a. Power port
b. Bus port
c. Device port

A. PORT
B. STBD

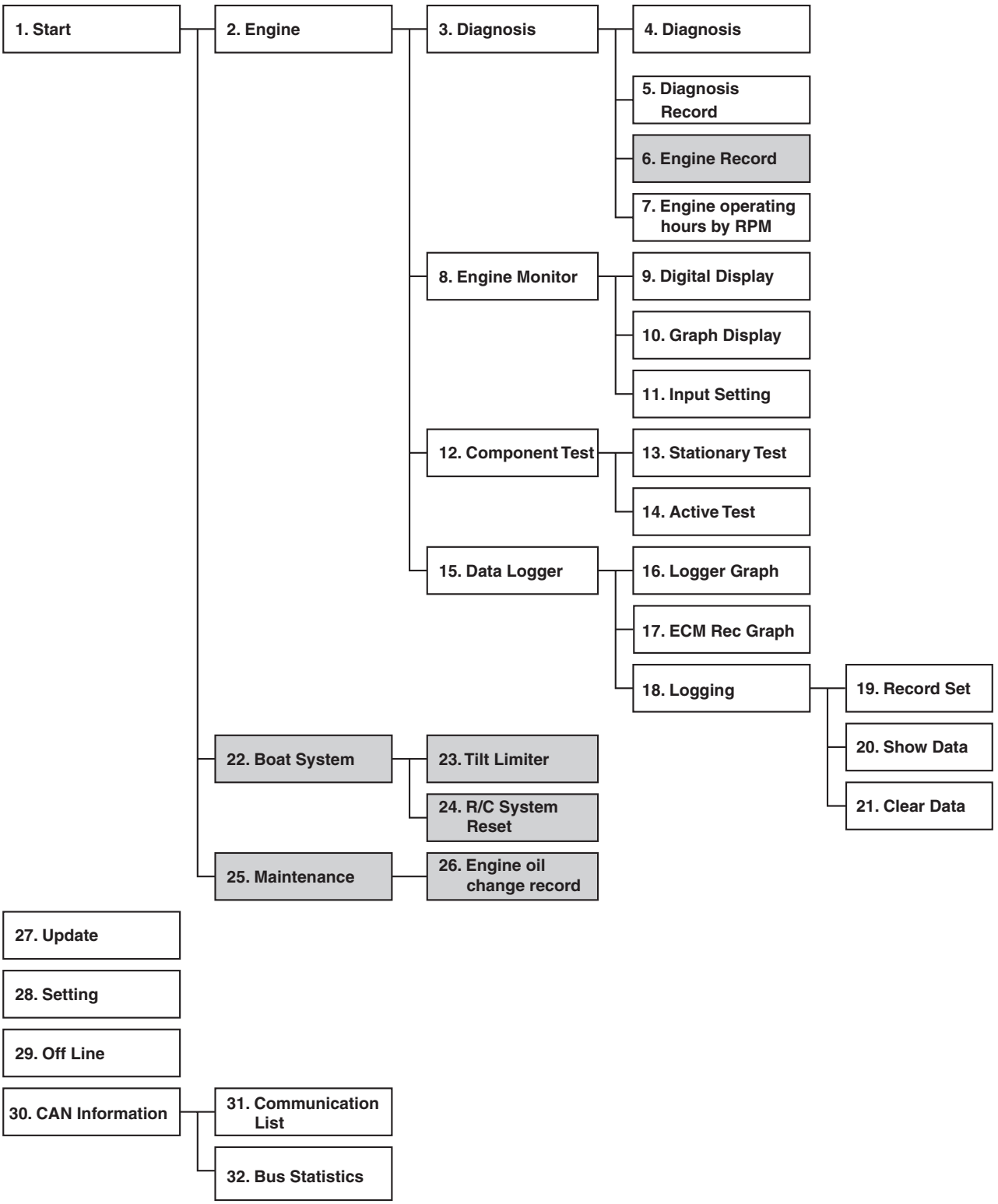
*1. Y-COP (optional)

Color code

B : Black
L : Blue
P : Pink
R : Red
W : White
Y : Yellow
P/B : Pink/Black

Function

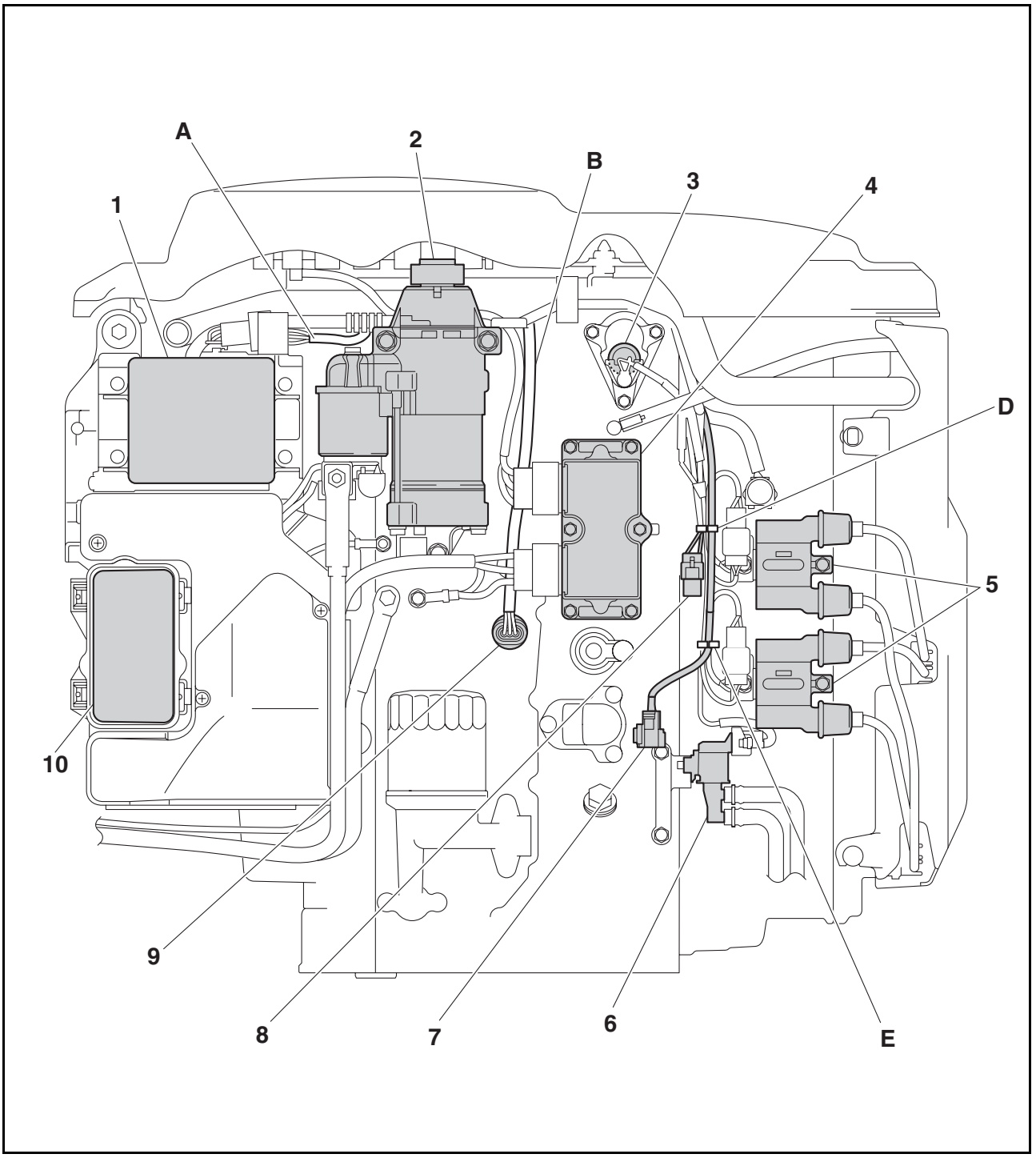
YDIS version 2.00 comprises the following items. Items in grey do not apply to the models covered by this manual.



Symptom 2	Cause	Checking steps	See page
Fuel not supplied (all cylinders)	—	Measure the fuel pressure.	6-5
	Clogged filter	Check the fuel filter for dirt and obstructions.	6-9
	Fuel leakage	Check the fuel line for leakage.	6-1
	High-pressure fuel pump malfunction	Check the high-pressure fuel pump operation using the YDIS.	5-18
		Measure the high-pressure fuel pump resistance.	5-18
	Main relay malfunction	Check the main relay.	5-13
	Short, open, or loose connection in high-pressure fuel pump circuit	Measure the high-pressure fuel pump input voltage.	5-18
		Check for wiring harness continuity between the high-pressure fuel pump and the main relay.	A-2
		Check for wiring harness continuity between the high-pressure fuel pump and engine ECM.	A-2
	Fuel pump malfunction	Check the fuel pump for leakage.	6-13
		Check the diaphragm for tears.	6-14
		Check the camshaft.	7-35
	Y-COP is locked.	Unlock Y-COP.	3-20
Compression pressure is low	Improper valve timing	Check the timing belt.	7-17
	Compression leakage	Measure the compression pressure.	7-1
		Check the valve for bends or sticking.	7-41
		Check the piston and piston rings for damage.	7-61
		Check the cylinder for scratches.	7-61
—	Intake air passage malfunction	Check the ISC valve for sticking.	5-15
		Check the intake manifold and throttle body for air leakage.	6-34

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.	6-25
	Throttle valves do not synchronize.	Synchronize the throttle valves.	6-29
	Throttle link and throttle cable are not installed properly.	Adjust the throttle link and throttle cable.	3-11 6-27



D. Install the ignition coil lead, water pressure sensor lead, vapor shut-off valve lead, and speed sensor lead to the holder.
E. Install the ignition coil lead, vapor shut-off valve lead, and speed sensor lead to the holder.

Checking the electrical component

Using the YDIS

When checking the TPS, ISC valve, high-pressure fuel pump, fuel injector, or each sensor, 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. 2.00 or later) instruction manual.

Measuring the peak voltage

⚠ WARNING

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

NOTICE

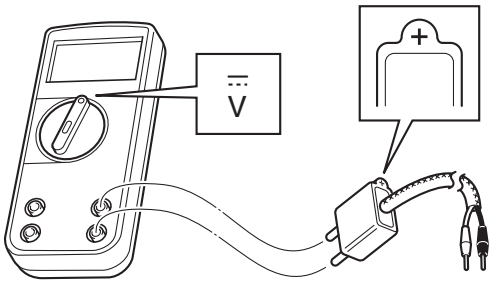
When measuring the peak voltage between the terminals of an electrical component using the digital tester, make sure that the leads do not contact any metal parts. Otherwise, the electrical component may short-circuit and be damaged.

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.

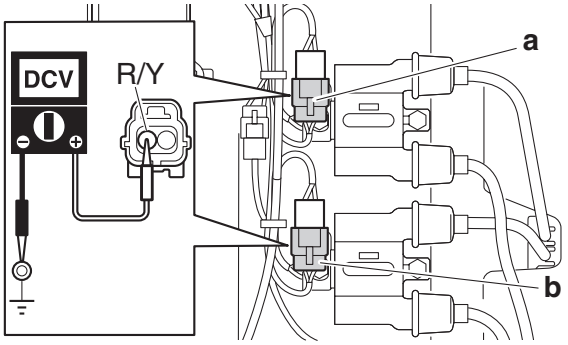
TIP:

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

To check the electrical components or measure the peak voltage, use the special service tools. A faulty electrical component can be easily checked by measuring the peak voltage. The specified engine speed when measuring the peak voltage is affected by many factors such as fouled spark plugs or a weak battery. If one of these factors is present, the peak voltage cannot be measured properly.



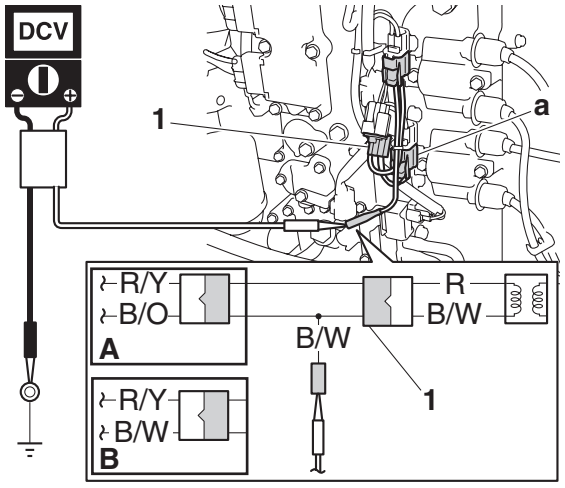
Digital multimeter: YU-34899-A
Peak volt adapter: YU-39991



Ignition coil input voltage:
Red/Yellow (R/Y)–Ground
12 V (battery voltage)

3. Turn the engine start switch to OFF.
4. Connect the ignition coil coupler “a”.
5. Connect the special service tool “1”, and then measure the ignition coil output peak voltage.

TIP:
- When measuring the ignition coil output peak voltage under the cranking (unloaded) condition, disconnect all fuel injector couplers to prevent the engine from starting.
- Measure the output peak voltage of ignition coil (for cylinders #2 and #3) in the same way.

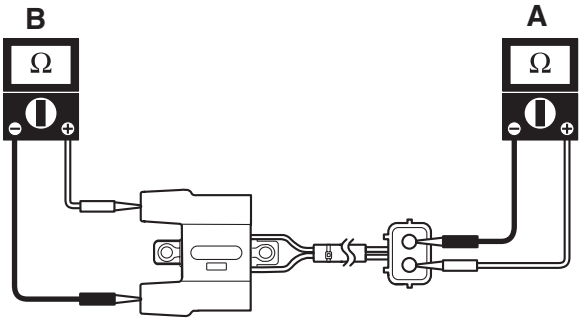


Test harness (2 pins) “1”: YB-06792

Ignition coil output peak voltage:
#1, #4 “A”:
Black/Orange (B/O)–Ground
#2, #3 “B”:
Black/White (B/W)–Ground

r/min	Loaded		
	Cranking	1500	3500
DC V	210.0	260.0	270.0

6. Disconnect the special service tool and spark plug wires from the ignition coils.
7. Measure the ignition coil resistance.

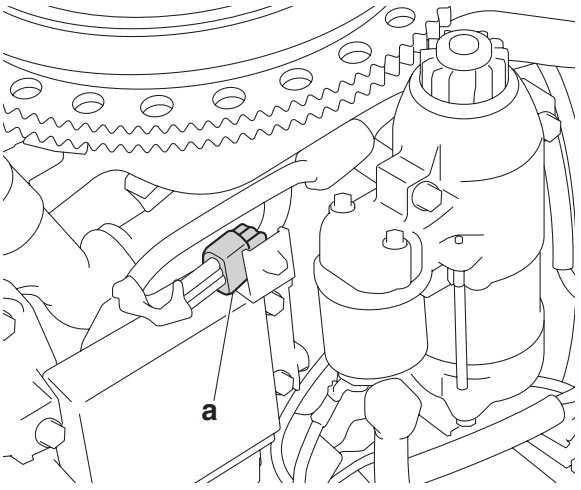


Ignition coil resistance:
Primary coil “A”:
1.530–2.070 Ω at 20 °C (68 °F)
Secondary coil “B”:
12.50–16.91 kΩ at 20 °C (68 °F)

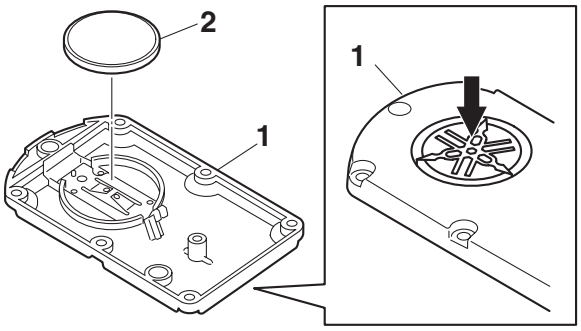
8. Connect the spark plug wires and ignition coil couplers.

Checking the pulser coil

1. Disconnect the pulser coil coupler “a”.

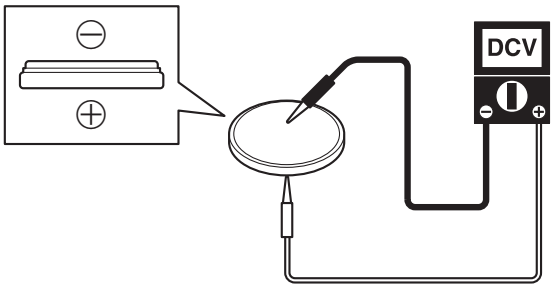


2. Connect the special service tool “1”.



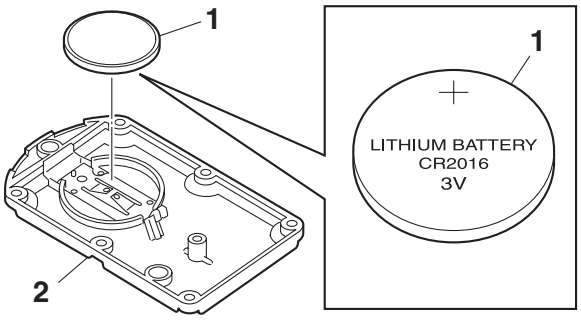
3. Measure the button cell battery voltage.

TIP:
When disposing of button cell battery, make sure to follow local disposal regulations.

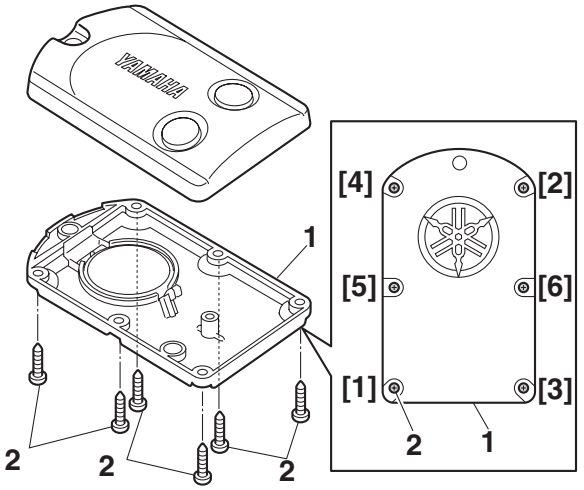


Button cell battery voltage - CR2016 (reference data): 3 V

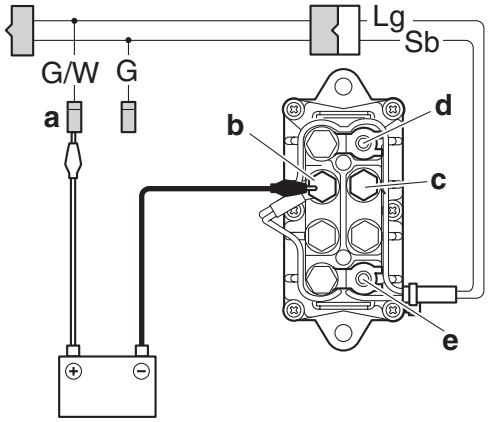
4. Install the button cell battery “1” so that the positive side is facing the transmitter cover “2”.



5. Install the transmitter cover “1”, and then tighten the transmitter screws “2” to the specified torque in the order [1], [2], and so on.

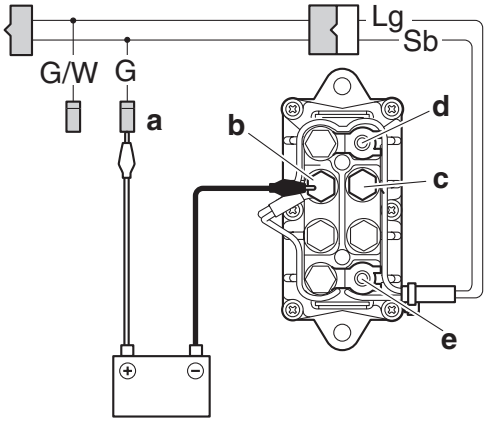


Transmitter screw “2”:
0.1 N·m (0.01 kgf·m, 0.1 ft·lb)



PTT relay continuity:
Terminal “c”–Terminal “e”
Terminal “b”–Terminal “d”

7. 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. Replace the PTT relay if out of specification.



PTT relay continuity:
Terminal “c”–Terminal “d”
Terminal “b”–Terminal “e”

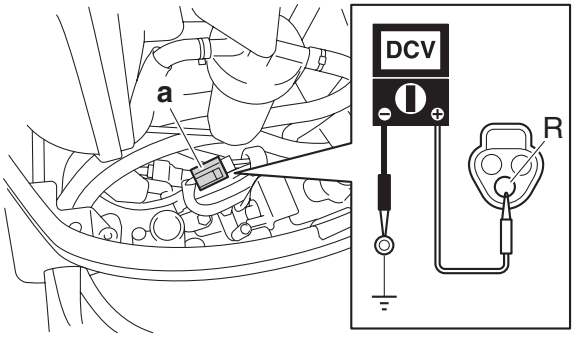
8. Connect the PTT relay coupler, battery power source, ground lead, and PTT motor leads.

9. Install the PTT relay and junction box cover.

Checking the PTT switch (on bottom cowling)

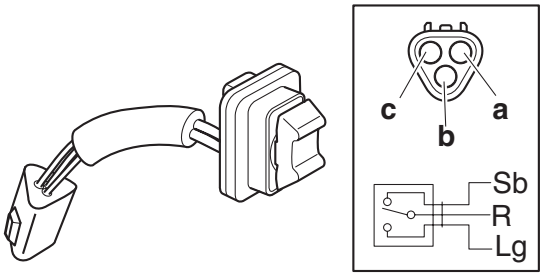
1. Disconnect the PTT switch coupler “a”.

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



PTT switch input voltage:
Red (R)–Ground
12 V (battery voltage)

3. Check the PTT switch for continuity. Replace the PTT switch if out of specification.



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

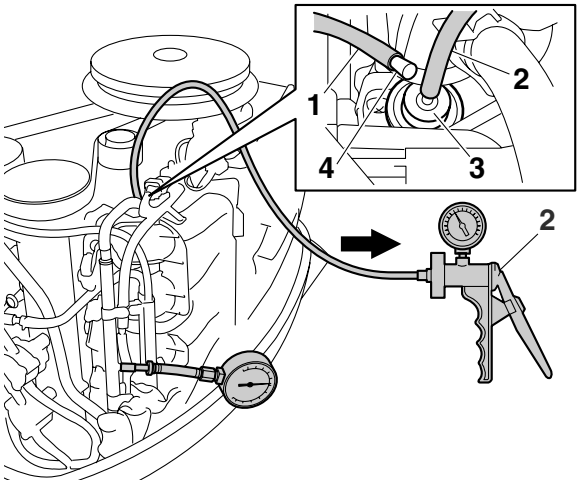
4. Connect the PTT switch coupler.

Checking the trim sensor

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

3. Disconnect the pressure regulator hose “1”, and then connect the special service tool “2” to the pressure regulator “3”.

4. Block the end of the pressure regulator hose “1” using a rubber plug “4”.



Pressure/vacuum tester “2”: YB-35956-A

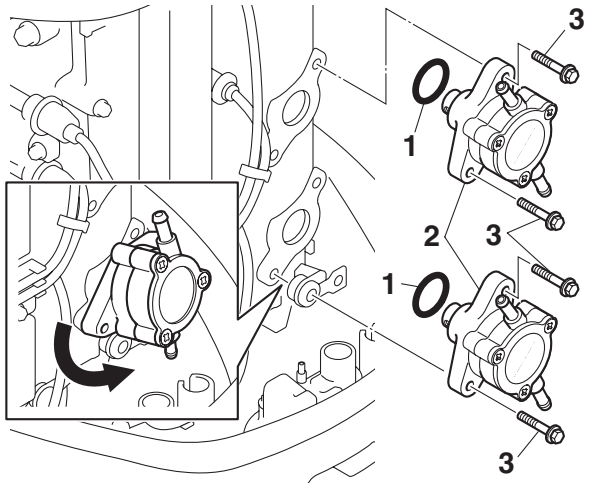
5. Start the engine and let it idle.

6. Check that the fuel pressure is reduced when negative pressure is applied to the pressure regulator.

7. Turn the engine start switch to OFF.

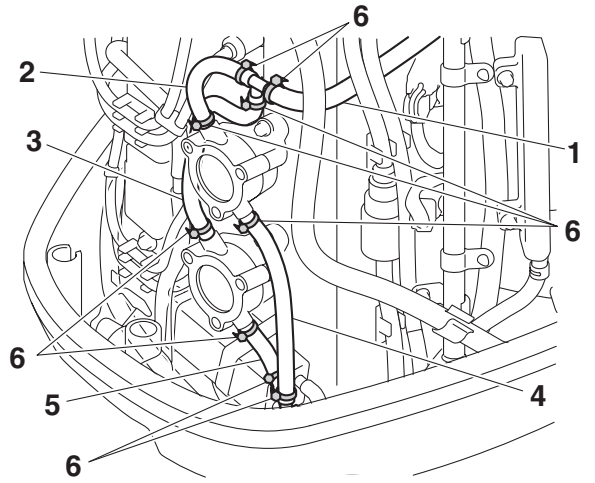
8. Disconnect the special service tool, and then connect the pressure regulator hose.

9. Disconnect the special service tools. See step 6 in “Measuring the fuel pressure” (6-5).



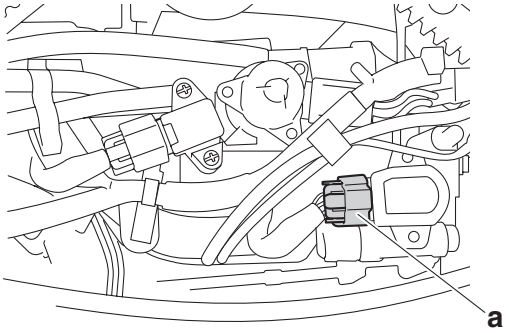
Fuel pump bolt “3”:
10 N·m (1.0 kgf·m, 7.4 ft·lb)

2. Connect the fuel hoses “1”, “2”, “3”, “4”, and “5”, and then fasten them using the plastic ties “6”.

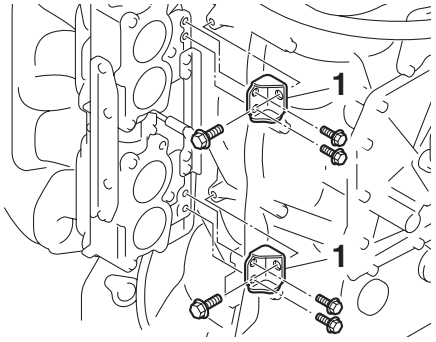


Removing the throttle body assembly

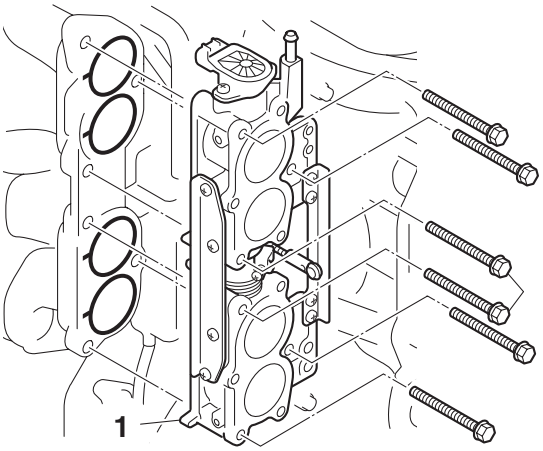
1. Disconnect the TPS coupler “a”.



2. Remove the brackets “1”.



3. Remove the throttle body assembly “1”.



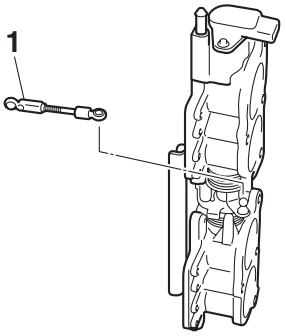
Checking the TPS

1. Check the TPS exterior. Replace if cracked.

2. Check the electrical performance of the TPS. See “Checking the TPS” (5-15).

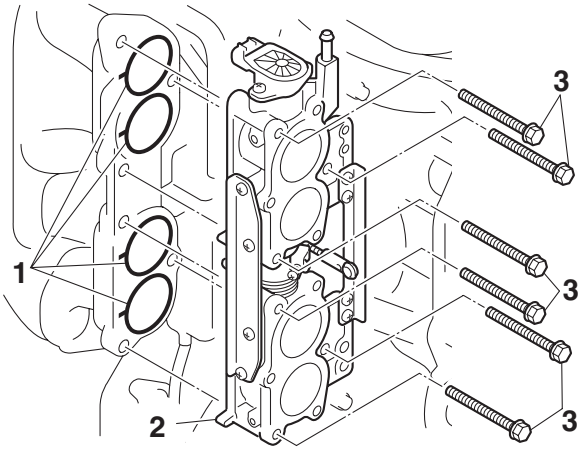
Installing the throttle body assembly

1. Install the throttle link joint assembly “1”.



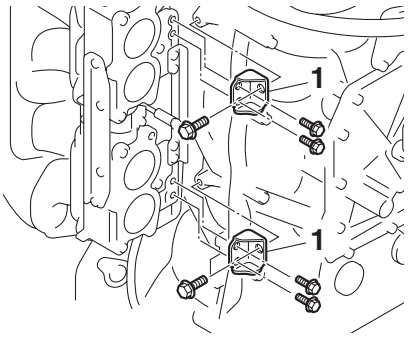
2. Install new gaskets “1”.

3. Install the throttle body assembly “2”, and then tighten the throttle body assembly bolts “3” to the specified torque.

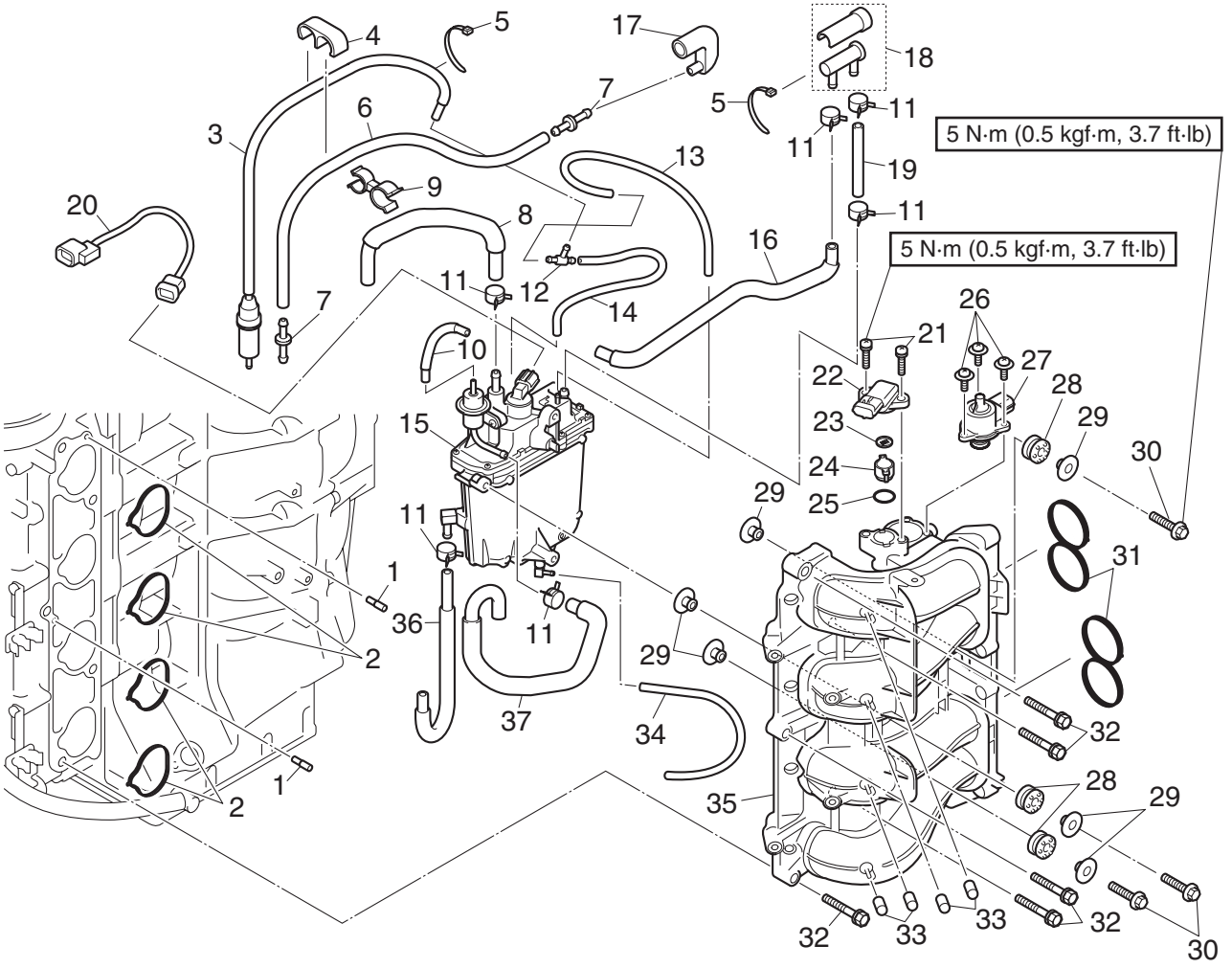


Throttle body assembly bolt “3”: 13 N·m (1.3 kgf·m, 9.6 ft·lb)

4. Install the brackets “1”.

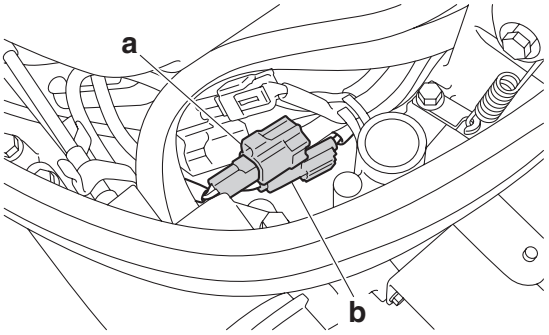


5. Connect the TPS coupler “a”.

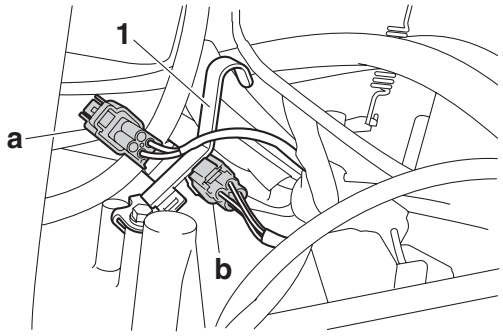


No.	Part name	Q'ty	Remarks
35	Intake manifold	1	
36	Hose	1	Fuel cooler to vapor separator
37	Hose	1	Pressure regulator to fuel cooler

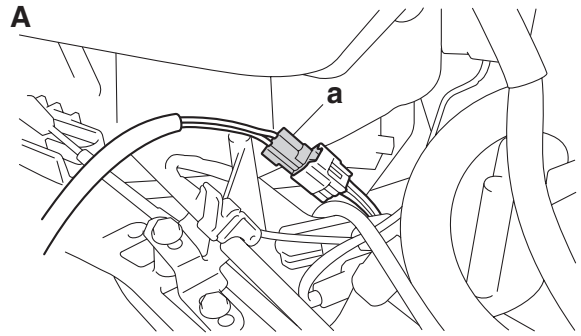
Power unit

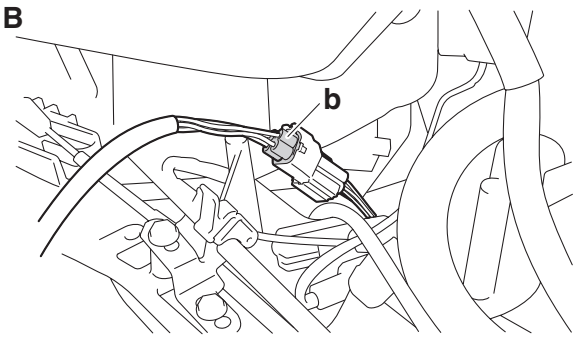


10. Remove the Command Link Multifunction Meter harness coupler “a” and gauge harness coupler “b” from the bracket “1”.



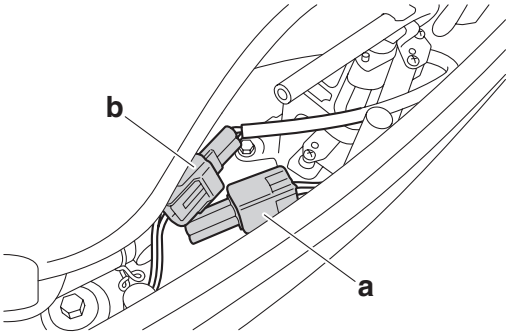
11. Disconnect the Command Link Multifunction Meter harness coupler “a” or gauge coupler “b”.



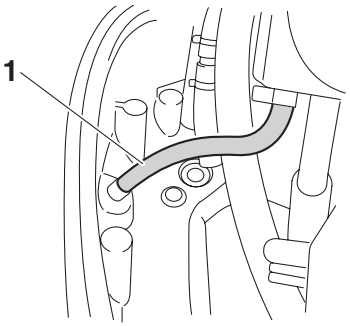


A. Command Link Multifunction Meter
B. Conventional gauge

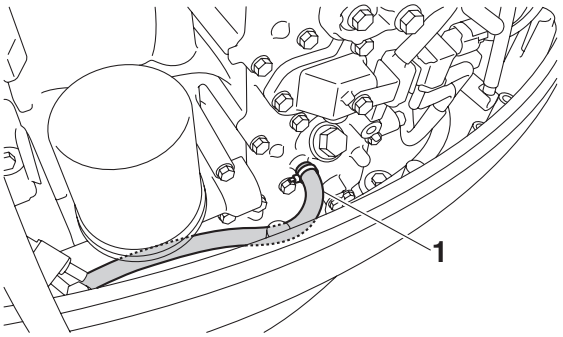
12. Disconnect the shift cut-off switch coupler “a” and shift position switch coupler “b”.



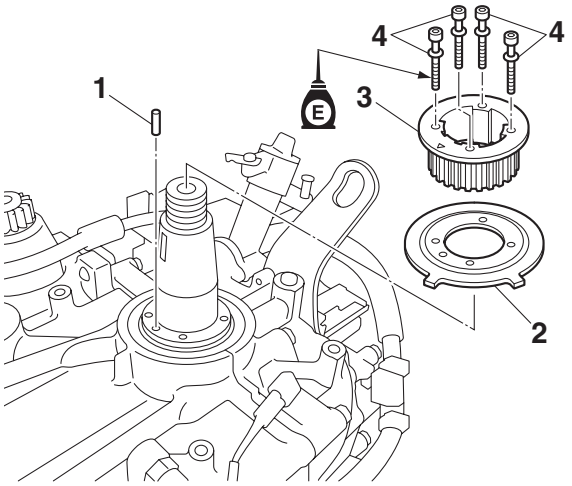
13. Disconnect the cooling water pilot hose “1”.



14. Disconnect the flushing hose “1”.



15. Remove the apron “1”.



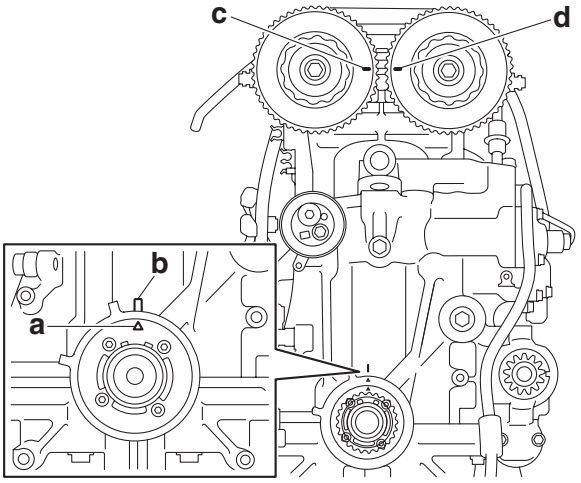
Drive sprocket bolt “4”:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

Installing the 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.

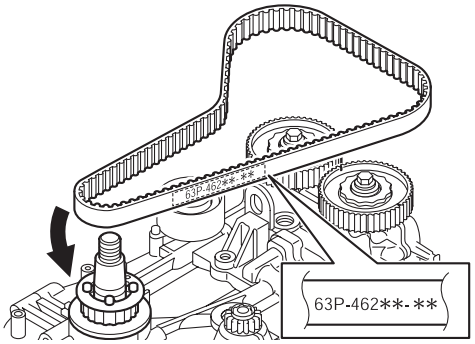
1. Check that the mark “a” in the drive sprocket and the protrusion “b” on the cylinder block are aligned. Check that the “I” marks “c” and “d” on the driven sprockets are aligned.



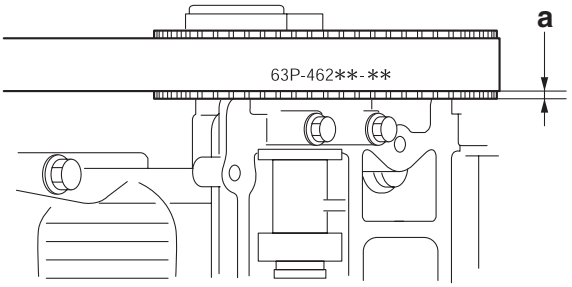
2. Install a new timing belt with its part number in the proper orientation, from the drive sprocket side to the port and starboard driven sprockets, in the counterclockwise direction.

NOTICE

Do not apply grease or oil to the timing belt.



3. Adjust the timing belt to the specified installation height “a”.

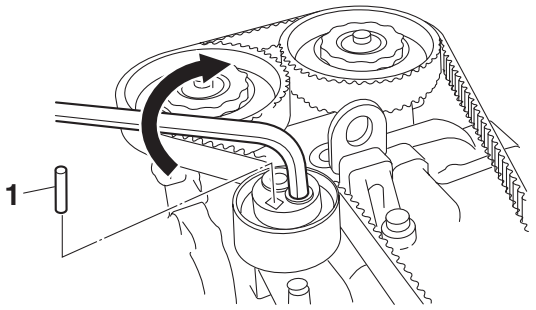


Timing belt installation height “a”:
2.0 mm (0.08 in)

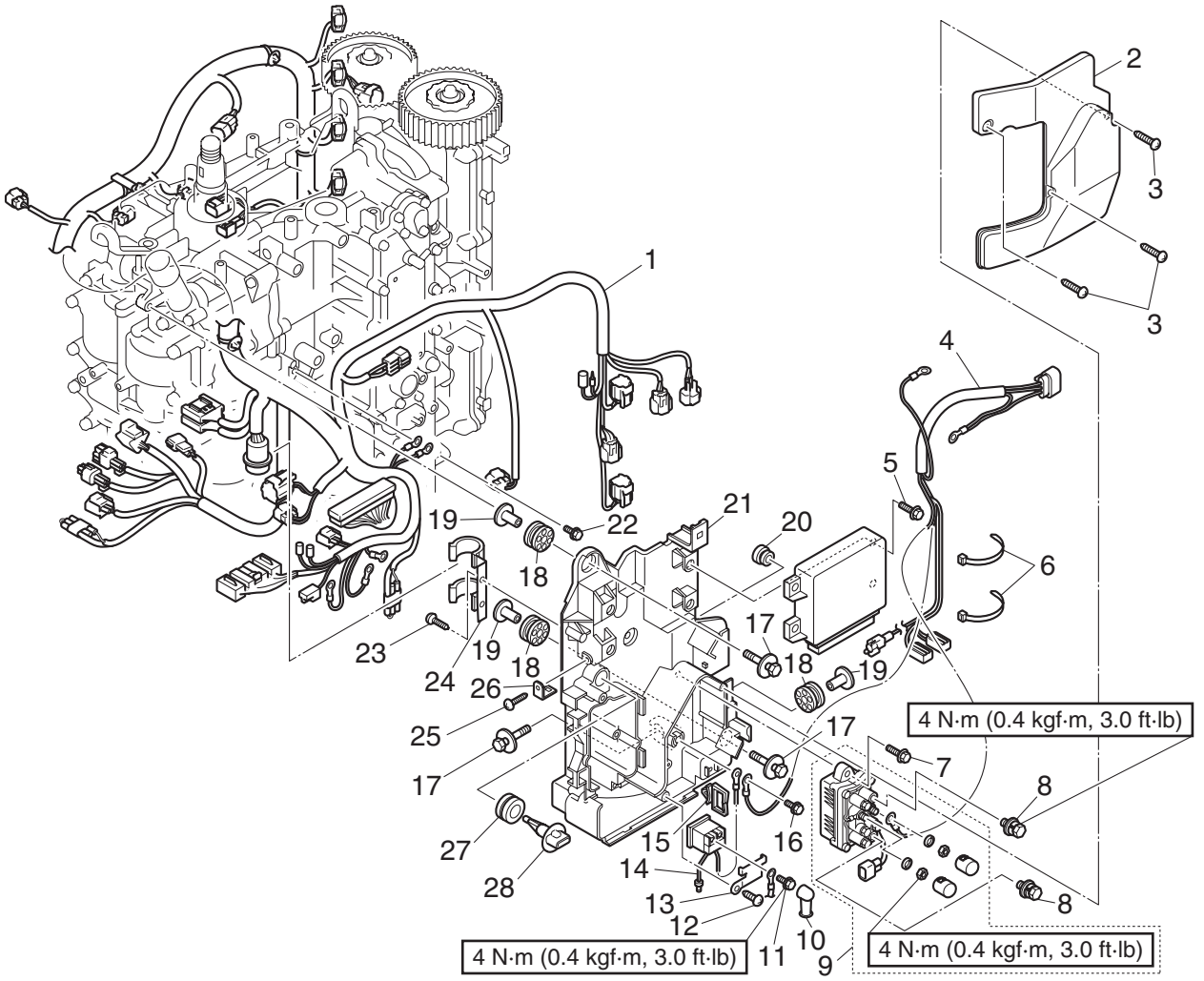
4. Turn the timing belt tensioner gradually clockwise using a hexagon wrench, and then remove the pin “1”.

TIP:

When turning the timing belt tensioner, apply a force of 15 N·m (1.5 kgf·m, 11.1 ft·lb) or less.

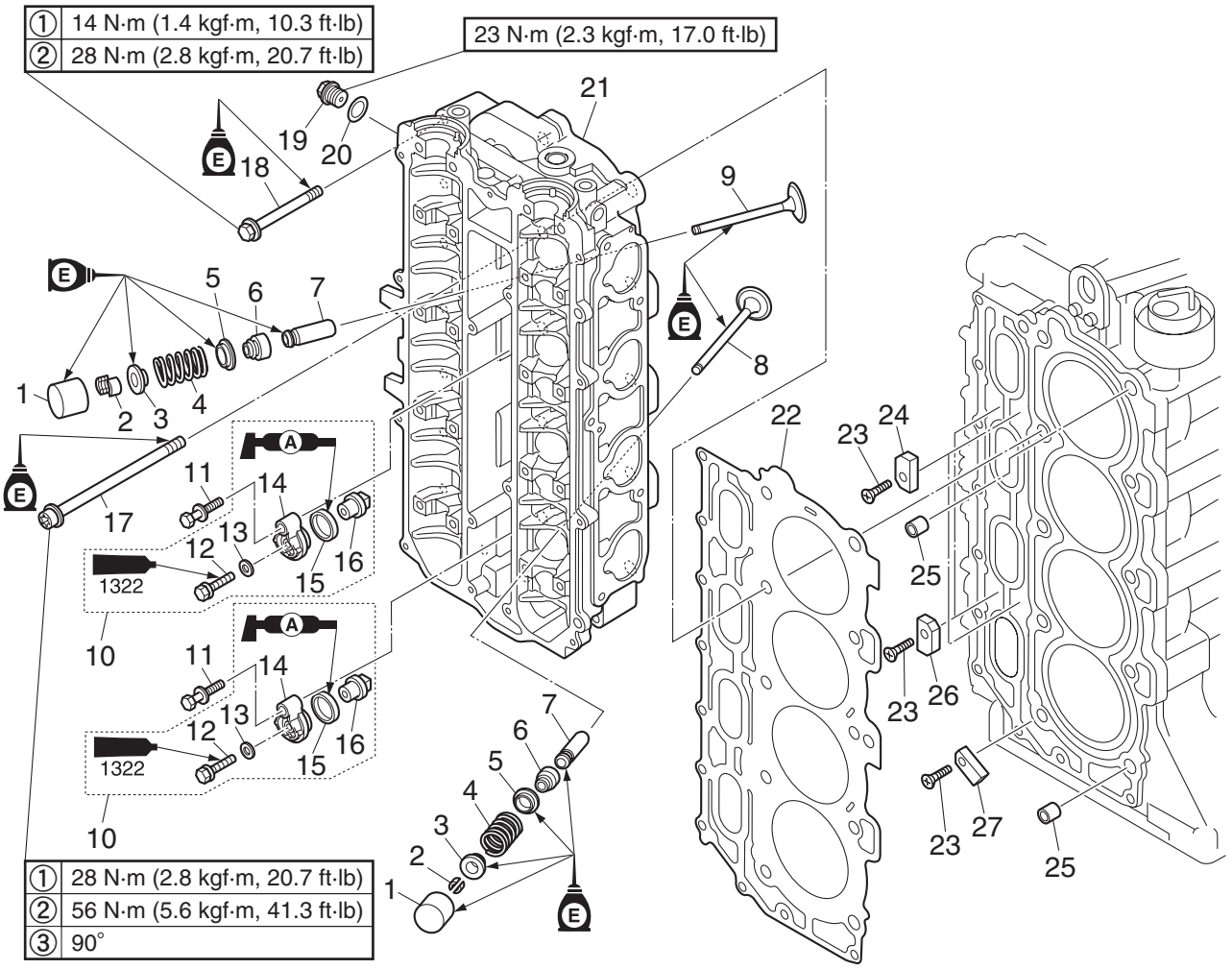


Wiring harness



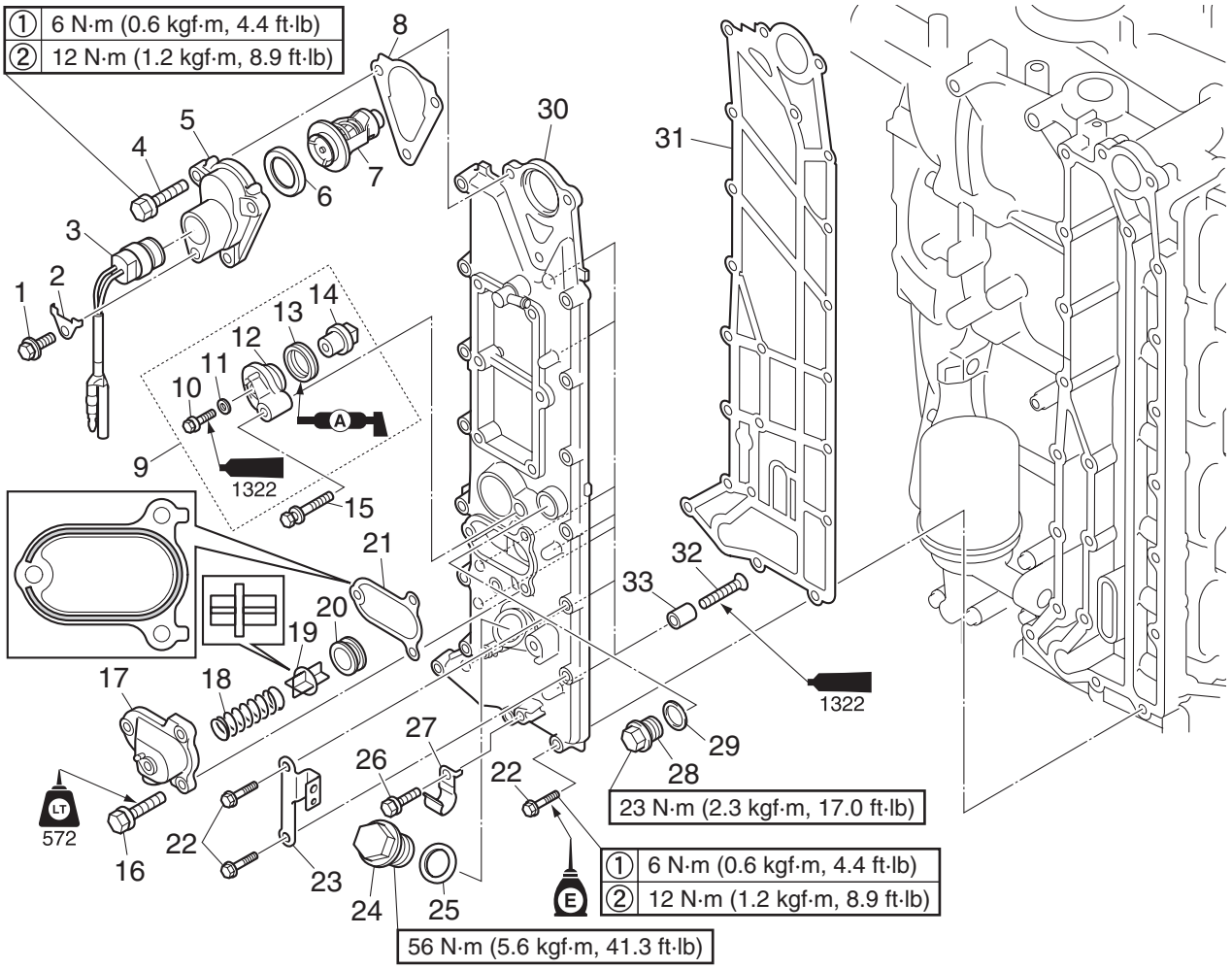
No.	Part name	Q'ty	Remarks
1	Wiring harness	1	
2	Cover	1	
3	Screw	3	ø6 × 19 mm
4	Wiring harness	1	
5	Bolt	4	M6 × 16 mm
6	Plastic tie	2	
7	Bolt	2	M6 × 20 mm
8	Bolt	2	M6 × 10 mm
9	PTT relay	1	
10	Cap	1	
11	Bolt	1	M6 × 10 mm
12	Screw	1	ø6 × 19 mm
13	Bracket	1	
14	Starter relay	1	
15	Holder	1	
16	Bolt	1	M6 × 12 mm
17	Bolt	3	M6 × 35 mm

Cylinder head



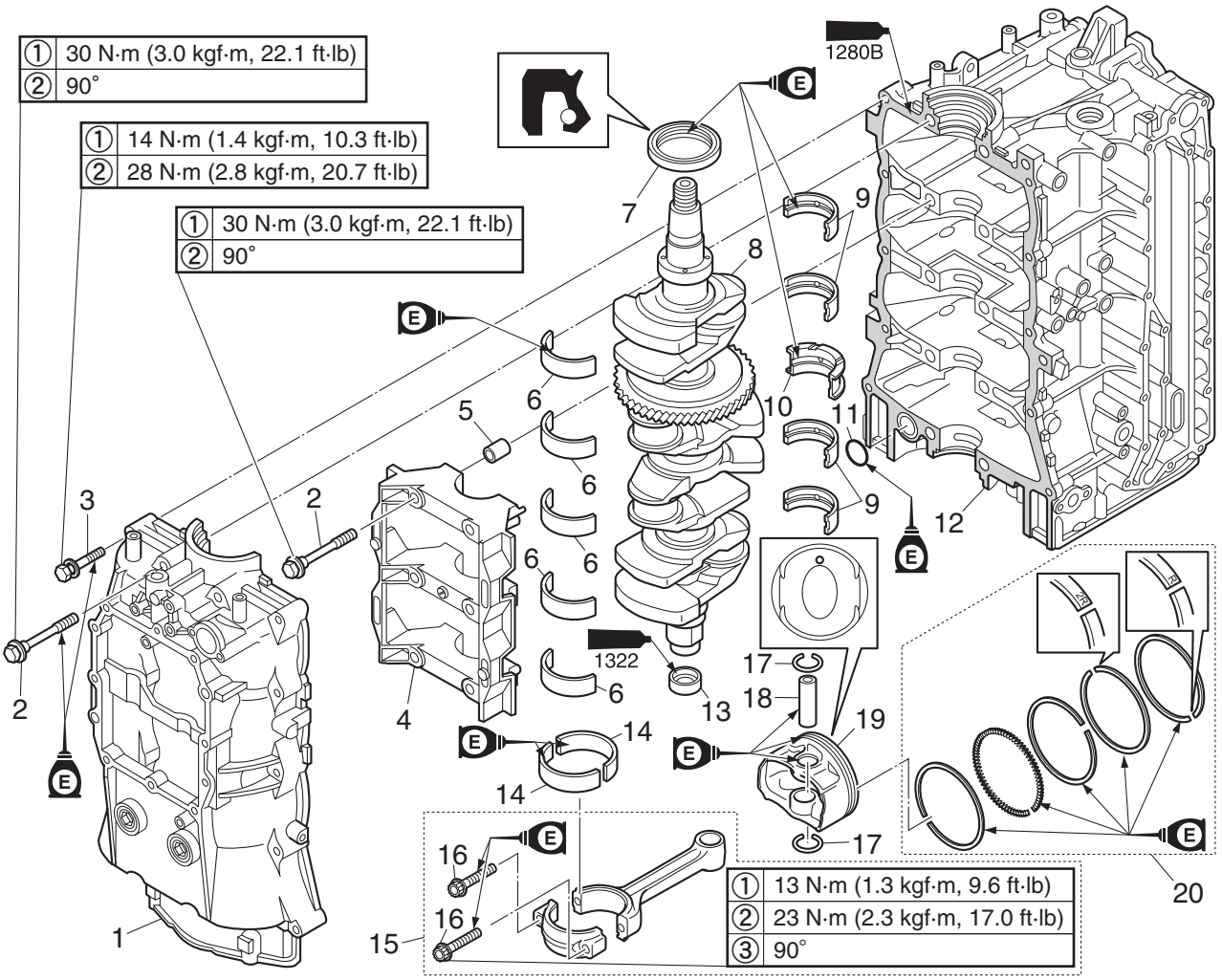
No.	Part name	Q'ty	Remarks
1	Valve lifter	16	
2	Valve cotter	32	
3	Valve spring retainer	16	
4	Valve spring	16	
5	Valve spring seat	16	
6	Valve seal	16	Not reusable
7	Valve guide	16	Not reusable
8	Intake valve	8	
9	Exhaust valve	8	
10	Anode assembly	2	
11	Bolt	2	M8 × 40 mm
12	Bolt	2	M6 × 20 mm
13	Gasket	2	Not reusable
14	Cover	2	
15	Grommet	2	
16	Anode	2	
17	Bolt	10	M10 × 120 mm

Exhaust cover



No.	Part name	Q'ty	Remarks
1	Bolt	1	M6 × 16 mm
2	Holder	1	
3	Thermoswitch	1	
4	Bolt	3	M6 × 30 mm
5	Cover	1	
6	Gasket	1	Not reusable
7	Thermostat	1	
8	Gasket	1	Not reusable
9	Anode assembly	1	
10	Bolt	1	M6 × 20 mm
11	Gasket	1	Not reusable
12	Cover	1	
13	Grommet	1	
14	Anode	1	
15	Bolt	1	M8 × 40 mm
16	Bolt	3	M6 × 20 mm
17	Cover	1	

Crankcase

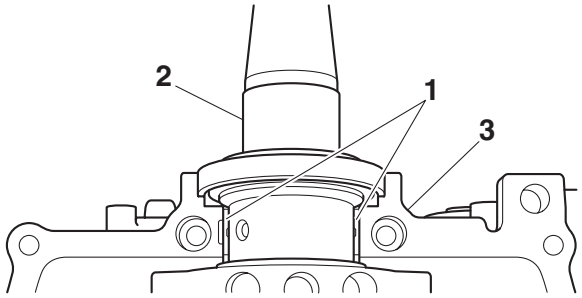


No.	Part name	Q'ty	Remarks
1	Crankcase	1	
2	Bolt	10	M10 × 85 mm
3	Bolt	10	M8 × 55 mm
4	Main bearing cap	1	
5	Dowel	10	
6	Crankshaft journal bearing	5	
7	Oil seal	1	Not reusable
8	Crankshaft	1	
9	Crankshaft journal bearing	4	
10	Thrust bearing	1	
11	O-ring	1	Not reusable
12	Cylinder block	1	
13	Collar	1	Not reusable
14	Crankpin bearing	8	
15	Connecting rod assembly	4	
16	Connecting rod bolt	8	Not reusable, M9 × 44 mm
17	Clip	8	Not reusable

Checking the journal oil clearance

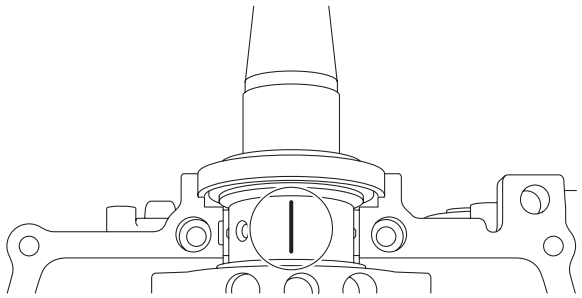
1. Clean the crankshaft journal bearings, crankshaft journals, and bearing portions of the crankcase and cylinder block.
2. Place the cylinder block upside down.
3. Install the crankshaft journal bearings “1” and crankshaft “2” into the cylinder block “3”.

TIP:
Install the crankshaft journal bearings “1” in the original positions.



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

TIP:
Do not place the Plastigauge (PG-1) over the oil hole in each crankshaft journal.

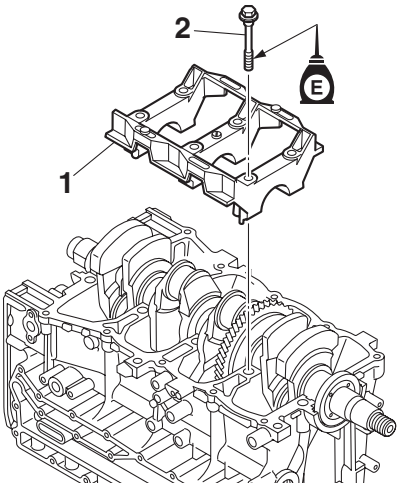


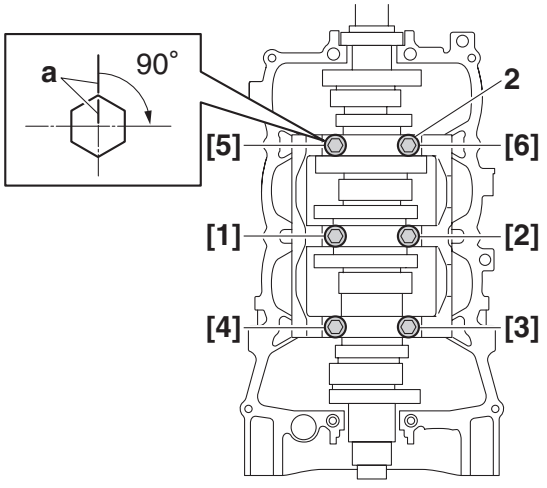
5. Install the crankshaft journal bearings into the main bearing cap and crankcase.

TIP:
Install the crankshaft journal bearings in the original positions.

6. Install the main bearing cap “1”, and then tighten the main bearing cap bolts “2” to the specified torques in 2 stages and in the order [1], [2], and so on.

TIP:
- Do not turn the crankshaft until the journal oil clearance measurement has been completed.
- In the second tightening stage for the main bearing cap bolts “2”, mark the main bearing cap bolts and the main bearing cap with identification marks “a”, and then tighten the bolts 90° from the marks on the main bearing cap.





Main bearing cap bolts “2”:
1st: 30 N·m (3.0 kgf·m, 22.1 ft·lb)
2nd: 90°

Removing the lower unit

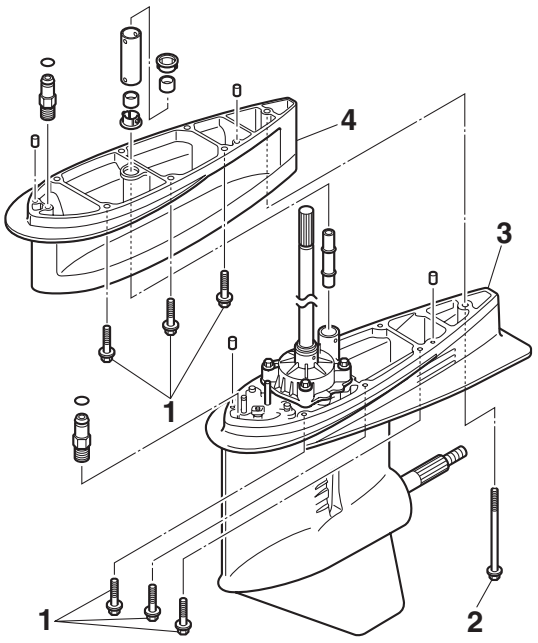
⚠ WARNING

- **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.**

1. Drain the gear oil.
2. Remove the propeller and trim tab. See steps 2–6 in “Removing the lower unit” (8-3).
3. Remove the lower case mounting bolts “1” and “2”, and then remove the lower unit “3” and extension “4”.

TIP:

When disassembling the lower unit, measure the backlash before disassembly. See “Measuring the forward gear backlash and reverse gear backlash before disassembly” (8-69).



Disassembling the propeller (SDS propeller)

See “Disassembling the propeller (SDS propeller)” (8-3).

Checking the propeller

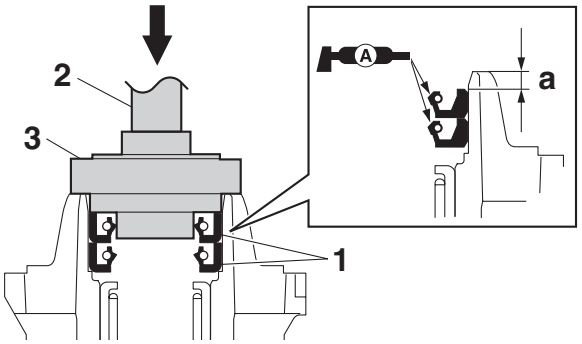
See “Checking the propeller” (8-3).

Checking the lower unit anode

See “Checking the lower unit anode” (8-3).

Assembling the propeller (SDS propeller)

See “Assembling the propeller (SDS propeller)” (8-4).

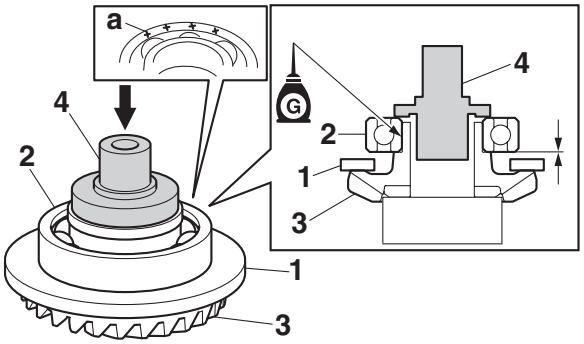


Driver handle (large) “2”: YB-06071
Oil seal installer-A “3”: YB-06195

Installation depth “a”:
4.75–5.25 mm (0.187–0.207 in)

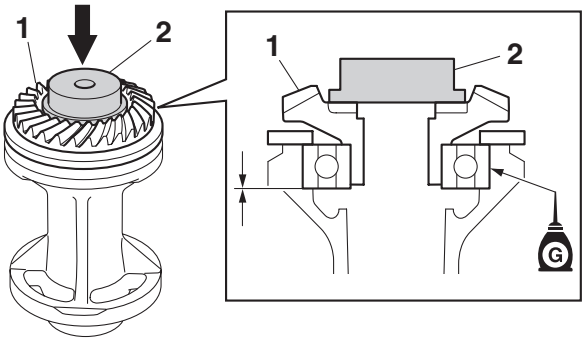
3. Install the thrust washer “1” and a new ball bearing “2” onto the reverse gear “3”.

TIP:
Face the bearing identification mark “a” on the ball bearing toward the propeller.



Reverse/forward gear bearing installer “4”:
YB-06200

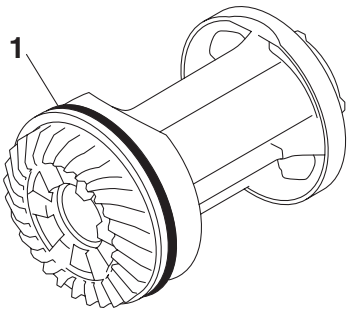
4. Install the reverse gear assembly “1”.



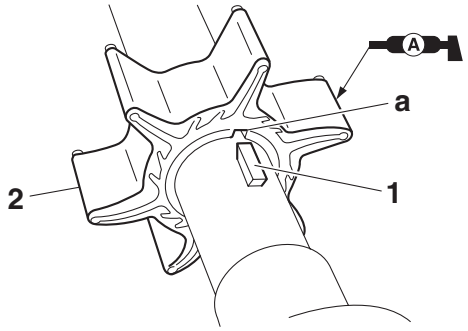
Needle bearing installer “2”:
YB-06434

5. Check that the reverse gear turns smoothly.

6. Install a new O-ring “1”.

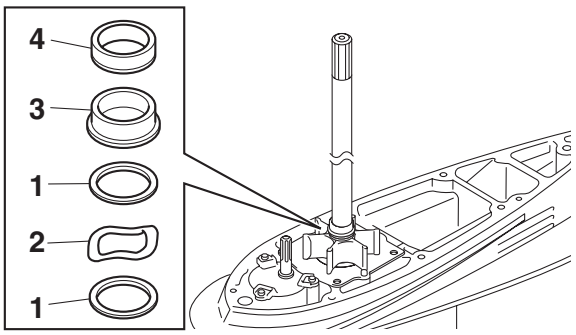


4. Align the slot “a” in the impeller “2” with the Woodruff key “1”, and then install the impeller “2”.

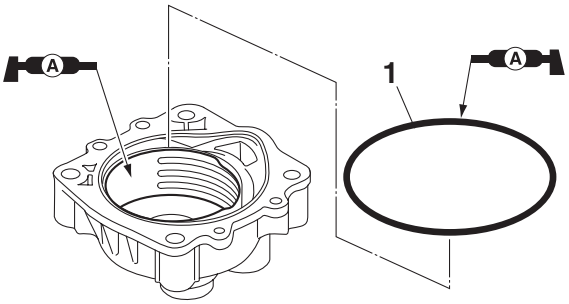


5. Install the washers “1”, wave washer “2”, spacer “3”, and collar “4”.

TIP:
The spacer “3” and collar “4” should fit together firmly.



6. Install a new O-ring “1”.

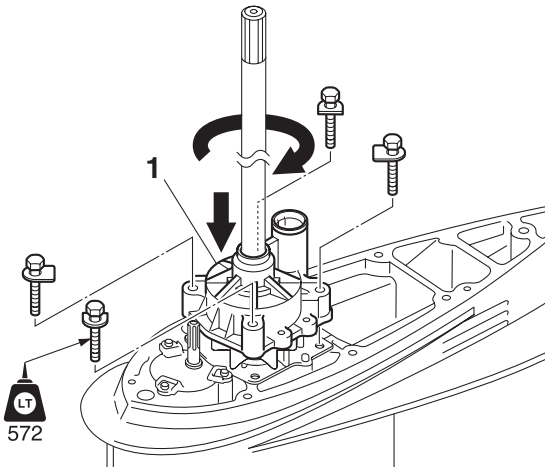


7. Install the water pump housing “1”.

NOTICE

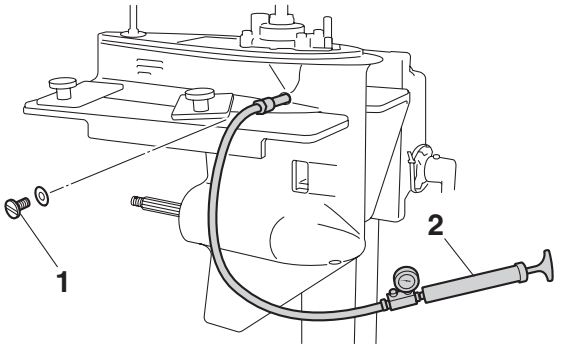
Do not turn the drive shaft counterclockwise. Otherwise, the water pump impeller could be damaged.

TIP:
While turning the drive shaft clockwise, push the water pump housing down to install it.



Checking the lower unit for air leakage

1. Remove the check screw “1”, and then install the leakage tester “2”.



Leakage tester “2”:
(commercially available)

2. Apply the specified pressure. Check that the pressure is maintained in the lower unit for 10 seconds or more.

NOTICE

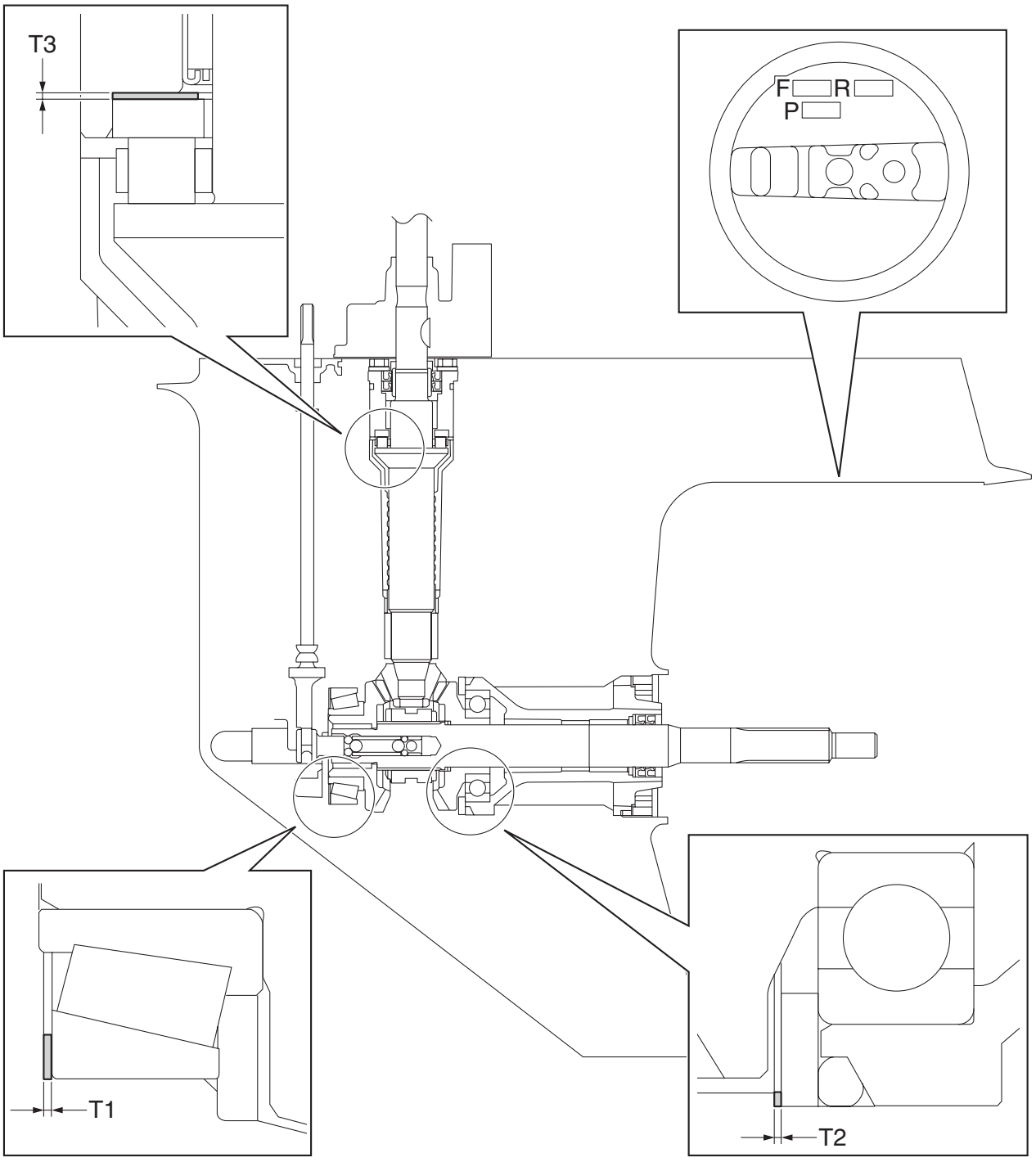
Do not overpressurize the lower unit. Otherwise, the oil seals could be damaged.

Lower unit holding pressure:
69.0 kPa (0.69 kgf/cm^2, 10.0 psi)

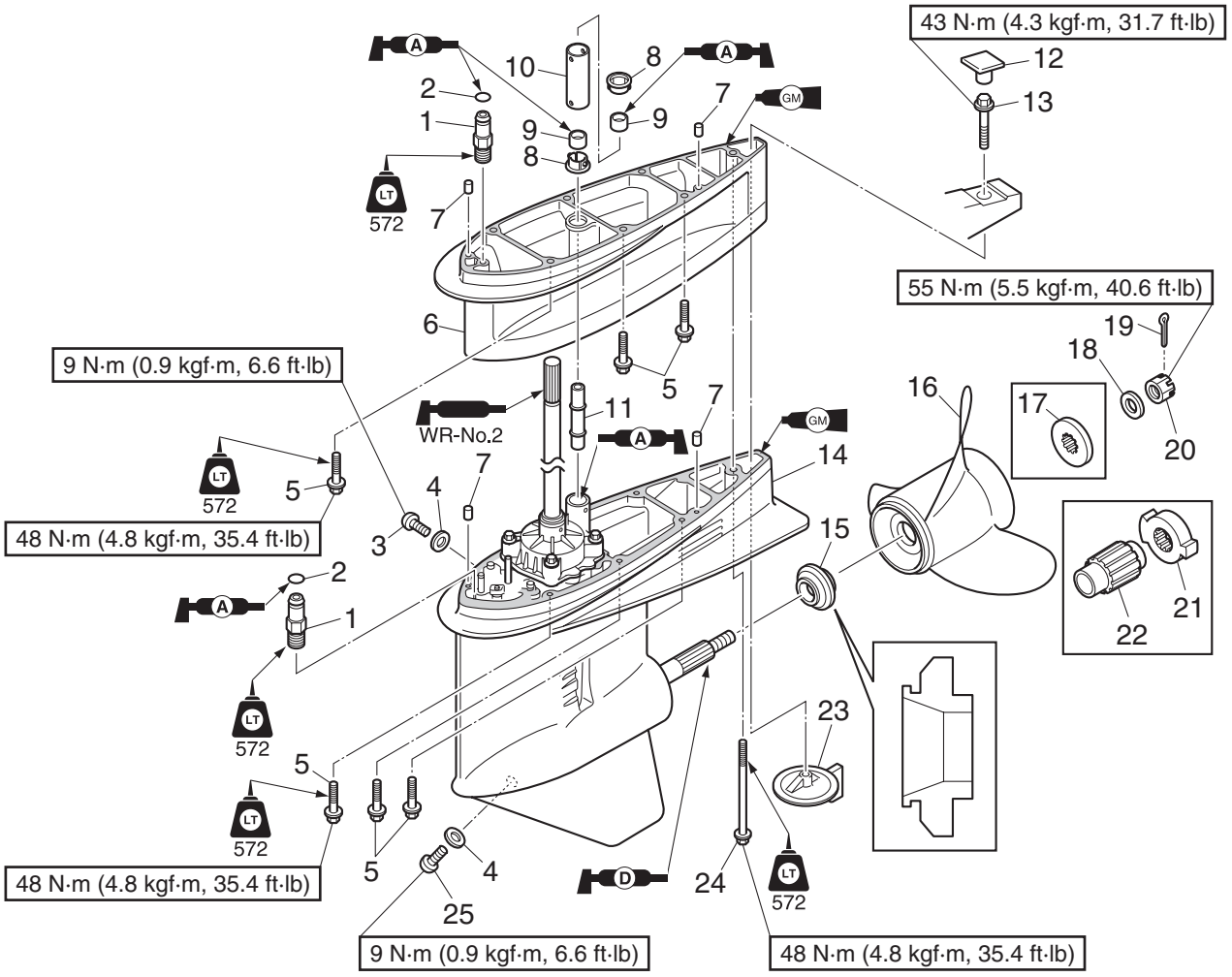
Shimming procedure

- 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



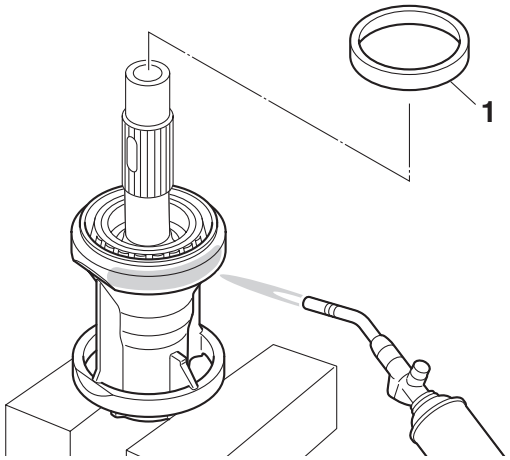
Lower unit (counter rotation model, X-transom model)



No.	Part name	Q'ty	Remarks
1	Hose nipple	2	
2	O-ring	2	Not reusable
3	Check screw	1	
4	Gasket	2	Not reusable
5	Bolt	12	M10 × 45 mm
6	Extension	1	
7	Dowel	4	
8	Cover	2	
9	Seal	2	
10	Water pipe	1	
11	Water pipe	1	
12	Grommet	1	
13	Bolt	1	M10 × 45 mm
14	Lower unit	1	
15	Spacer	1	
16	Propeller	1	
17	Spacer	1	Except SDS propeller

NOTICE

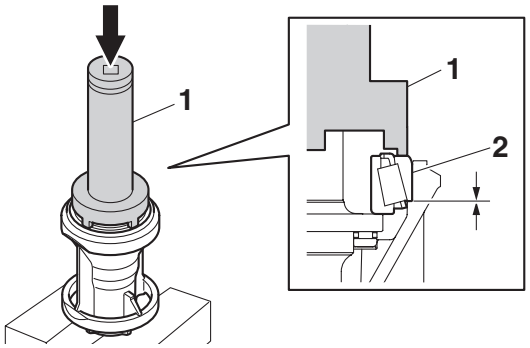
When heating the propeller shaft housing, heat the entire installation area evenly. Otherwise, the propeller shaft housing could be damaged.



5. While holding the special service tool “1”, strike the tool to check that the taper roller bearing “2” is installed properly.

TIP:

If a high-pitched metallic sound is produced when the special service tool is struck, the taper roller bearing outer race is installed properly.

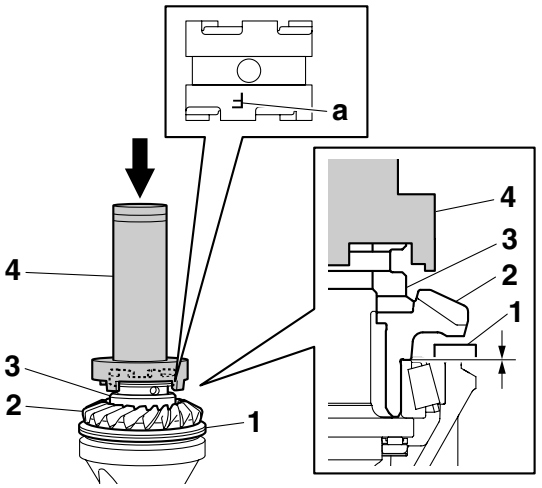


Gland nut wrench “1”: YB-06578

6. Install the thrust washer “1” and forward gear “2” using the dog clutch “3” and special service tool “4”.

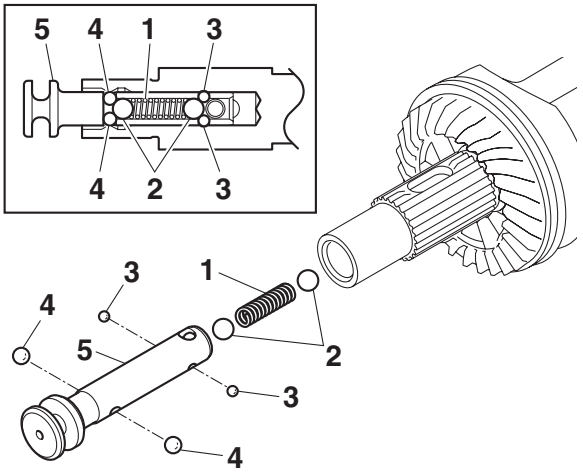
TIP:

Face the “F” mark “a” on the dog clutch “3” toward the forward gear.



Gland nut wrench “4”: YB-06578

7. Install the spring “1”, balls “2”, “3”, and “4”, and slider “5”.



8. 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:

Face the “F” mark “d” on the dog clutch “1” toward the forward gear.

Forward gear shim (T2) thickness adjustment in 2 places (mm)

	Number of shim(s)			Subtotal
0.10				
0.12				
0.15				
0.18				
0.30				
0.40				
0.50				
Total				

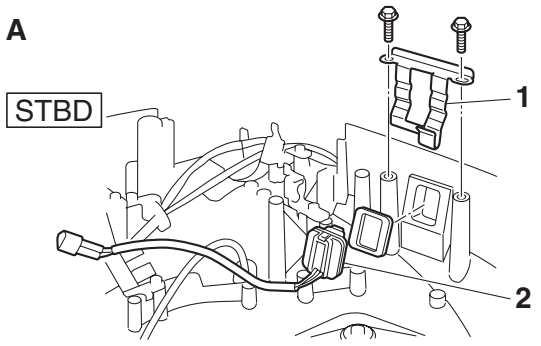
Reverse gear shim (T1) thickness adjustment in 2 places (mm)

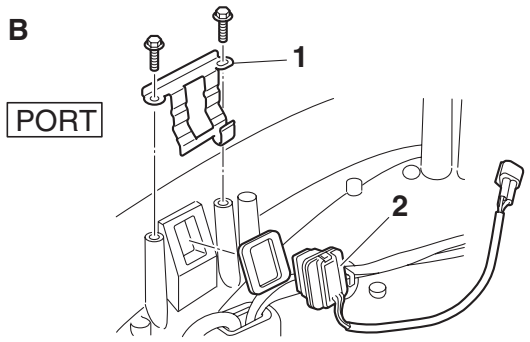
	Number of shim(s)			Subtotal
0.10				
0.12				
0.15				
0.18				
0.30				
0.40				
0.50				
Total				

— MEMO —

Removing the PTT switch

1. Remove the holder “1”, and then remove the PTT switch “2”.

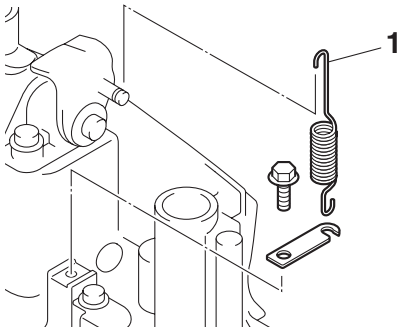




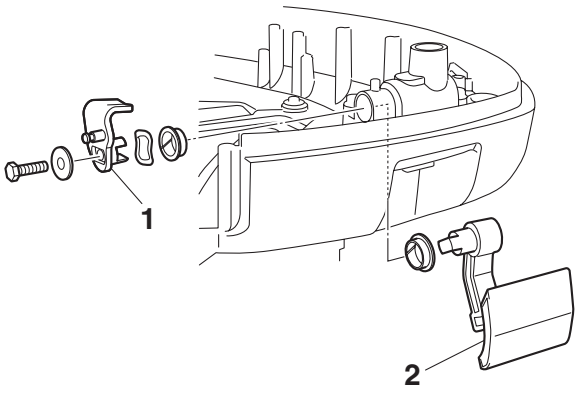
A. Regular rotation model
B. Counter rotation model

Removing the cowling lock lever

1. Remove the spring “1”.

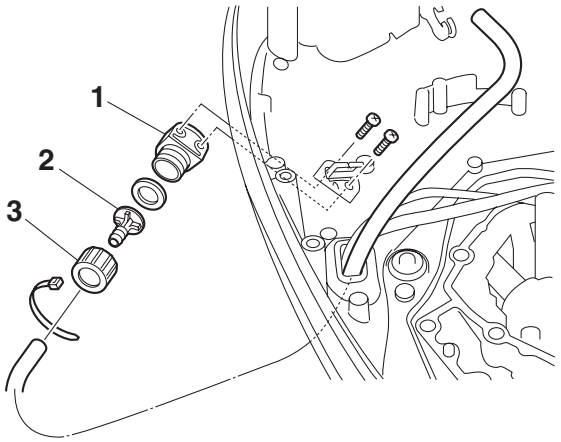


2. Remove the lever “1” and cowling lock lever “2”.

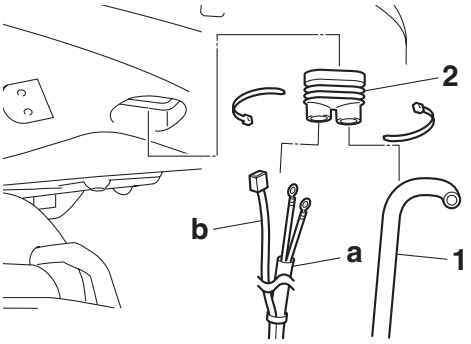


Removing the flushing hose

1. Remove the adapter “1” and hose joints “2”, and “3”.



2. Remove the flushing hose “1”, PTT motor leads “a”, trim sensor lead “b”, and grommet “2”.

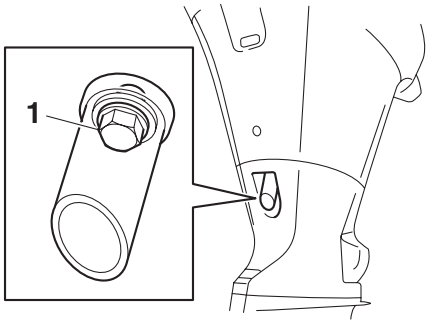


Installing the flushing hose

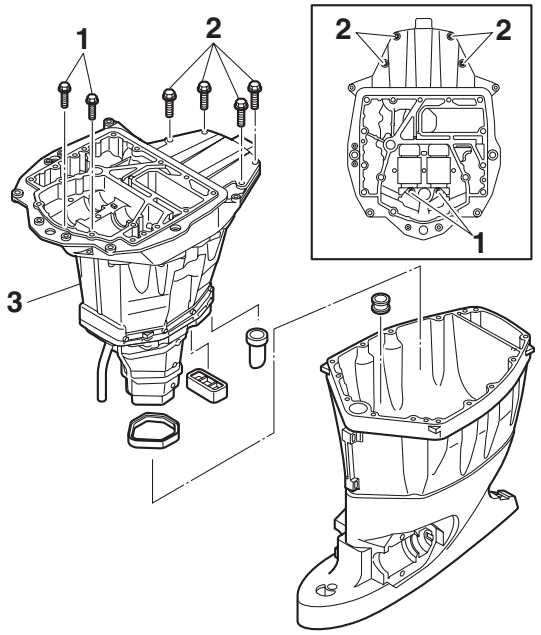
1. Install the grommet “1” to the bottom cowling.

Disassembling the upper case

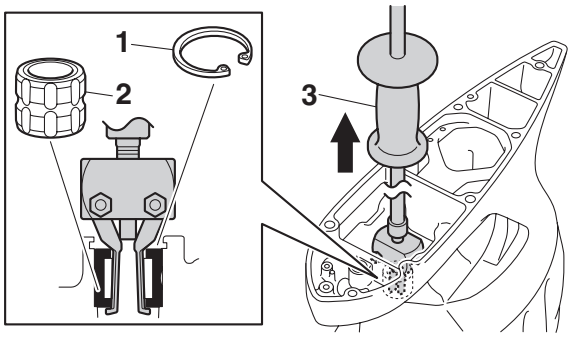
1. Remove the drain bolt “1”.



2. Remove the upper case bolts “1” and “2”, and then remove the oil pan assembly “3”.



3. Remove the circlip “1”, and then remove the bushing “2”.



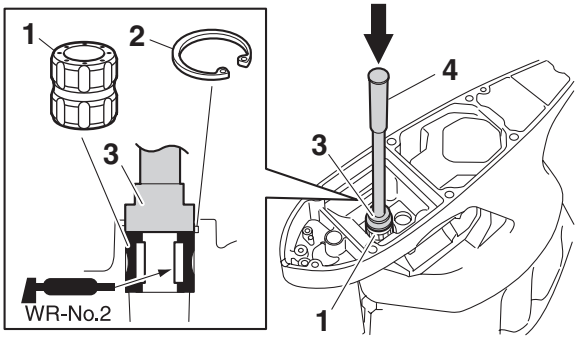
Slide hammer “3”: YB-06096

Checking the drive shaft bushing

1. Check the bushing. Replace if cracked or worn.

Assembling the upper case

1. Install the bushing “1”, and then install the circlip “2”.



Driveshaft needle bearing installer and remover “3”: YB-06196 Driver handle (large) “4”: YB-06071

2. Install the dowels “1”.

3. Install the baffle plate “2”, and then tighten the baffle plate screws “3” to the specified torque.

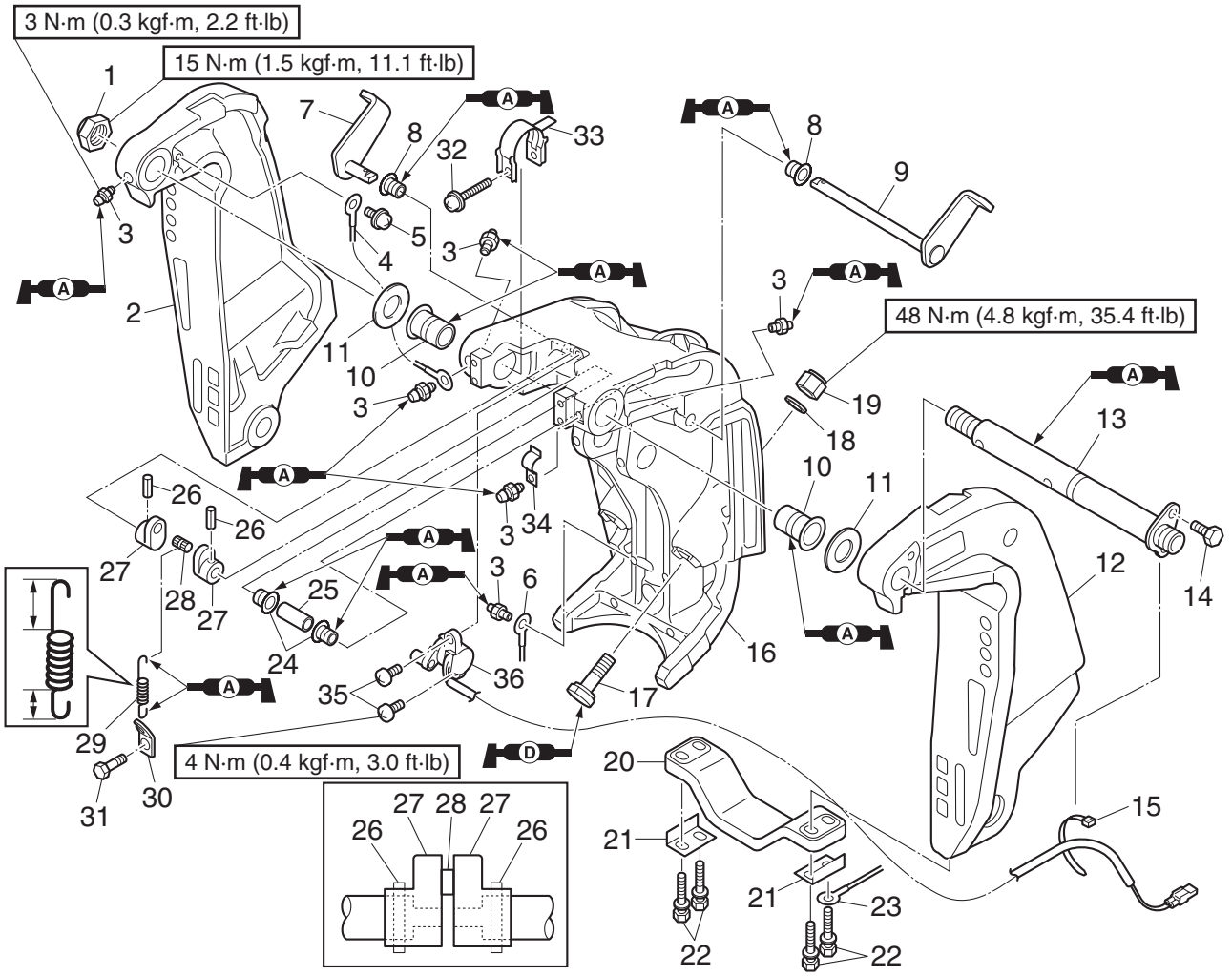
4. Install the rubber seal “4” to the joint hole “a” in the upper case.

5. Install a new rubber seal “5”, the rubber seal “6”, and the damper “7”, and then install the oil pan assembly “8”.

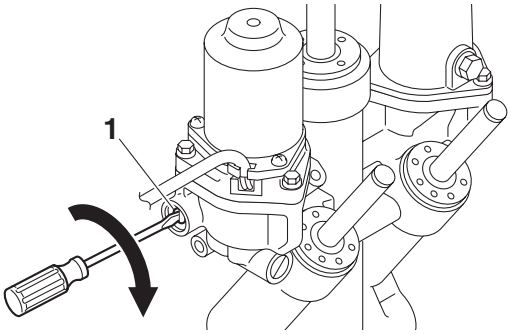
TIP:

Make sure to fit the tip of the cooling water pipe “9” into the joint hole “a” in the upper case.

6. Install the oil pan bolts “10” and “11”, and then tighten them to the specified torques.



No.	Part name	Q'ty	Remarks
18	Washer	2	
19	Nut	2	
20	Anode	1	
21	Plate	2	
22	Bolt	4	M6 × 30 mm
23	Ground lead	1	
24	Bushing	2	
25	Collar	1	
26	Pin	2	
27	Distance collar	2	
28	Pin	1	
29	Spring	1	
30	Hook	1	
31	Bolt	1	M6 × 10 mm
32	Screw	1	M5 × 35 mm
33	Trim sensor cam	1	
34	Clamp	1	

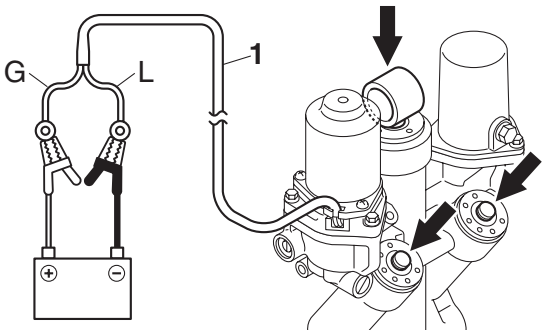


Manual valve “1”:
3 N·m (0.3 kgf·m, 2.2 ft·lb)

3. Check the fluid level. See steps 2–4 in “Checking the hydraulic pressure” (9-35).

4. Connect the battery jumper leads to the PTT motor lead “1” to fully retract the PTT rams.

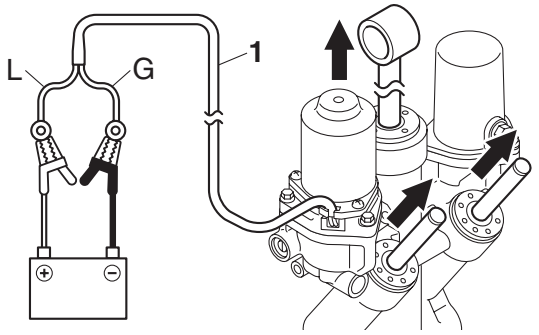
TIP:
If the PTT rams do not move down easily, push on the PTT rams to assist operation.



Ram	PTT motor lead	Battery
Retract	Green (G)	(+)
	Blue (L)	(–)

5. Reverse the connection between battery jumper leads and the PTT motor lead “1” to fully extend the PTT rams.

TIP:
If the PTT rams do not move down easily, pull on the PTT rams to assist operation.



Ram	PTT motor lead	Battery
Extend	Blue (L)	(+)
	Green (G)	(–)

6. Repeat steps 4 and 5 to fully extend and retract the PTT rams 4 or 5 times.

7. Fully extend the tilt ram.

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

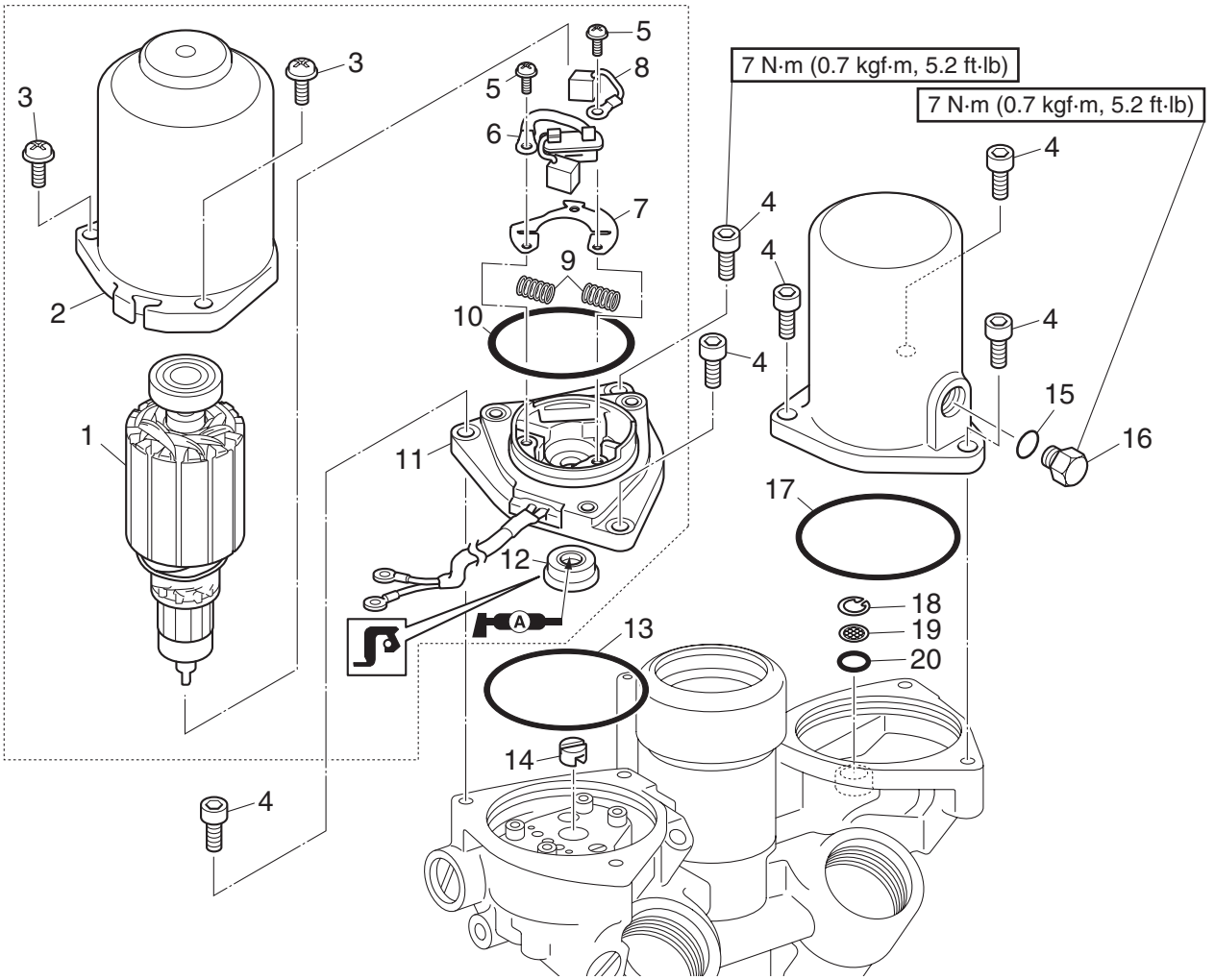
⚠ WARNING
Before removing the reservoir cap, make sure that the PTT rams are fully extended. Otherwise, fluid could be expelled forcefully from the PTT unit due to internal pressure.

TIP:
If the fluid is below the proper level, add the recommended PTT fluid. Repeat steps 3–7 until the fluid remains at the proper level.

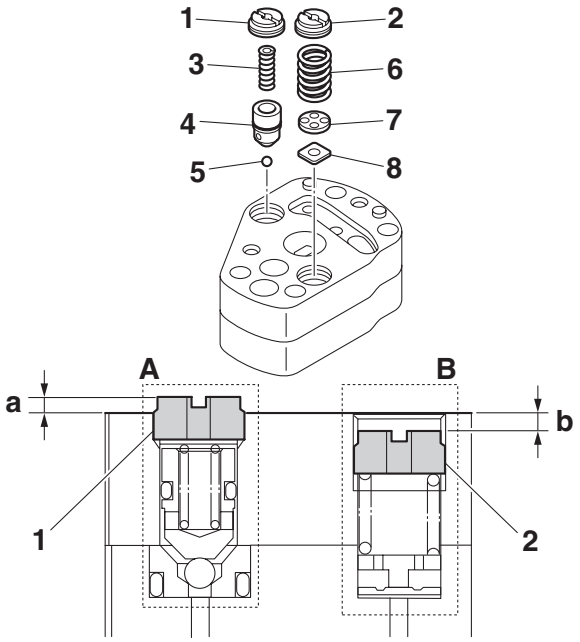
9. Install a new O-ring and the reservoir cap, and then tighten the reservoir cap to the specified torque.

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

PTT motor

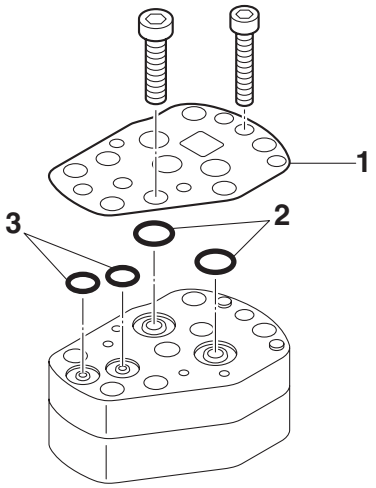


No.	Part name	Q'ty	Remarks
1	Armature	1	
2	Stator	1	
3	Screw	3	M5 × 20 mm
4	Bolt	6	M6 × 25 mm
5	Screw	2	M4 × 16 mm
6	Circuit breaker	1	
7	Brush holder	1	
8	Brush	1	
9	Spring	2	
10	O-ring	1	Not reusable
11	Motor base assembly	1	
12	Oil seal	1	Not reusable
13	O-ring	1	Not reusable
14	Joint	1	
15	O-ring	1	Not reusable
16	Reservoir cap	1	
17	O-ring	1	Not reusable

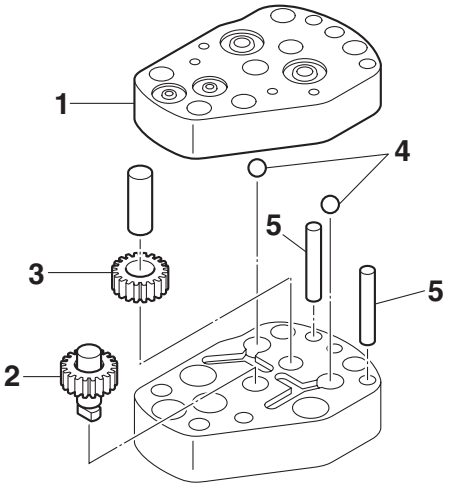


A. Up-relief valve
B. Down-relief valve

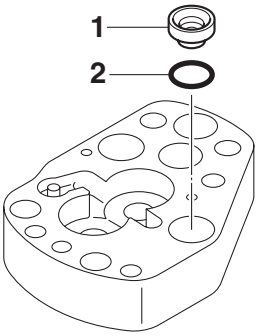
2. Remove the bracket “1” and O-rings “2” and “3”.



3. Remove the gear housing “1”, and then remove the drive gear “2”, driven gear “3”, balls “4”, and pins “5”.



4. Remove the valve seat “1” and O-ring “2”.



Checking the gear pump

1. Check the drive gear and driven gear. Replace the gear pump assembly if damaged or worn.

2. Check the up-relief valve and down-relief valve. Clean if there is dirt or residue.

Checking the gear pump housing

1. Check the PTT body. Replace if corroded or cracked.

Checking the valve seal

1. Check the main valves and the shuttle piston. Replace if damaged.

2. Check the manual valve, manual valve seat, adapter, and springs. Replace if damaged.

Checking the filter

1. Check the filters. Clean if there is dirt or residue.

Predelivery check

To make the delivery process smooth and efficient, complete the predelivery checks as explained in the following procedures.

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):

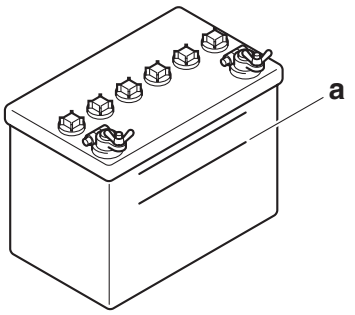
- **Drink large quantities of water or milk followed with milk of magnesia, beaten egg, or vegetable oil. Get immediate medical attention.**

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

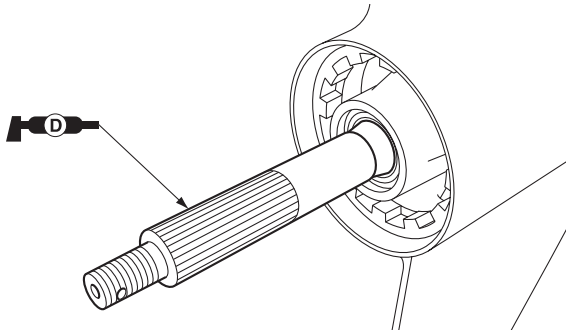


2. Check the specific gravity of the electrolyte. Fully charge the battery if below specification.

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:
CCA/SAE: 512.0 Amps
MCA/ABYC: 675.0 Amps
RC/SAE: 182 minutes
Electrolyte specific gravity:
1.280 at 20 °C (68 °F)



Checking the PCV

1. Check the PCV. See “Checking the PCV” (7-50).

Checking the propeller/propeller nut/ cotter pin

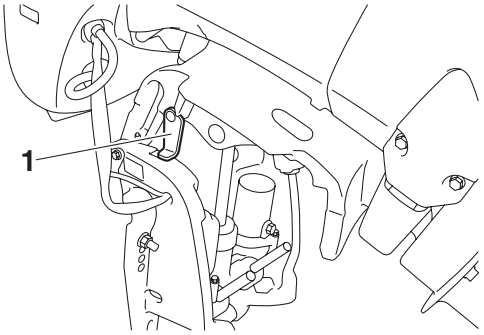
1. Check the propeller. See “Checking the propeller” (8-3).
2. Check the propeller nut and cotter pin. See “Installing the lower unit (L-transom model)” (8-29).

Checking the PTT fluid level

⚠ WARNING

Never get under the outboard motor while it is tilted.

1. Fully tilt the outboard motor up, and then support it using the tilt stop lever “1”.



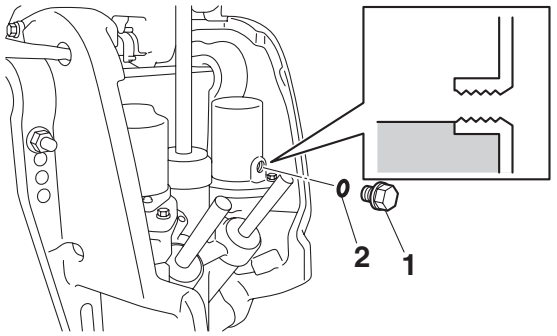
2. Remove the reservoir cap “1” and O-ring “2”, and then check the fluid level in the reservoir.

⚠ 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.



3. If the fluid is below the proper level, add the recommended fluid.

Recommended PTT fluid:
Yamalube Marine Power Trim and Tilt fluid or ATF Dexron II

4. 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 ft·lb)

Checking the power trim and tilt unit operation

1. Fully tilt the outboard motor up and down a few times and check that the outboard motor tilts up and down smoothly. Check the PTT fluid level if the tilt operation is not smooth.

TIP:

Make sure that the PTT motor makes a winding sound when it is operating smoothly.