YAMAHA

F50F
FT50G
F60C
FT60D

SERVICE MANUAL

290551

6C1-28197-3G-11

Outline of features

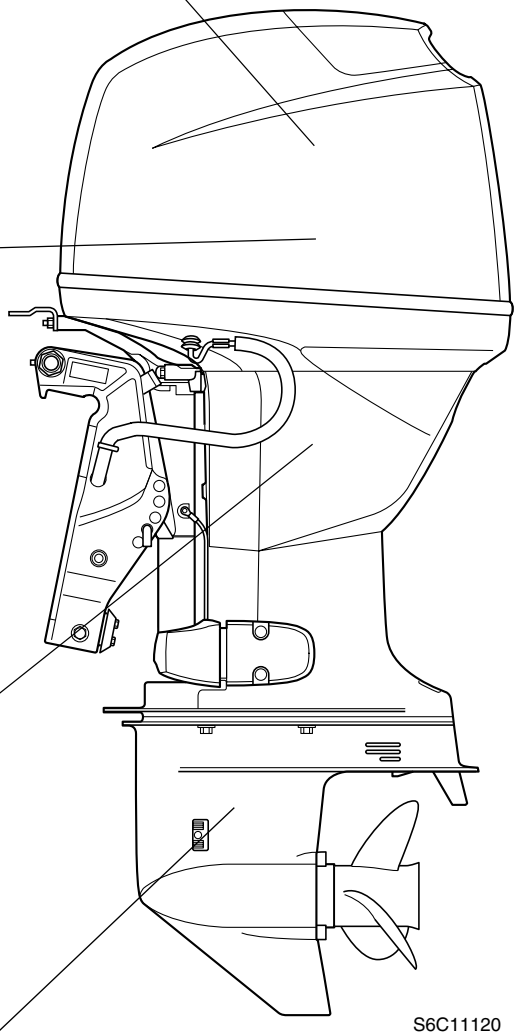
New electronic fuel injected F50 and F60 outboard motors have a mainly redesigned fuel and intake system based on the carbureted F60 outboard motor.

Power unit
- Single throttle body, single throttle valve
- Multi-point injection system, group injection (#1/#4 and #2/#3)
- Group ignition system (#1/#4 and #2/#3)
- Large plastic intake manifold
- Compact plastic fuel rail
- Modularized intake system components
- Vapor separator with built-in pressure regulator
- Solenoid valve
- Fuel cooler
- Aluminum rocker arm

Electrical
- Compact electronic fuel injection system
- Self-diagnosis system and Yamaha Diagnostic System
- Variable trolling RPM switch (optional for tiller handle model)
- Throttle position sensor with learning function (adjustment free)
- Compact charging system at low rpm
- Compact fuel injectors
- Fuel filter with water separator

Clamp bracket/upper case
- 2-piece upper case
- Upper portion case with oil sump
- Big capacity water wall structure around muffler
- Idle exhaust labyrinth structure
- Exclusive clamp bracket for permanent mounting

Lower unit
- Same lower drive unit as carbureted F60 model



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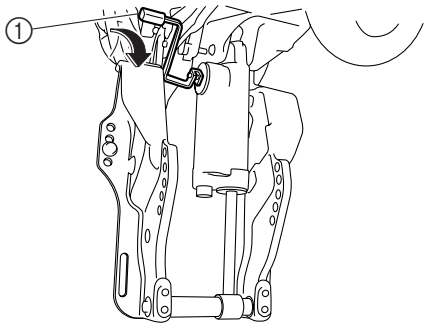


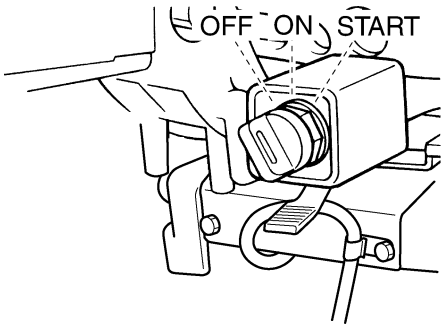
S6C11100

Checking the engine start switch and engine stop lanyard switch

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

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

A



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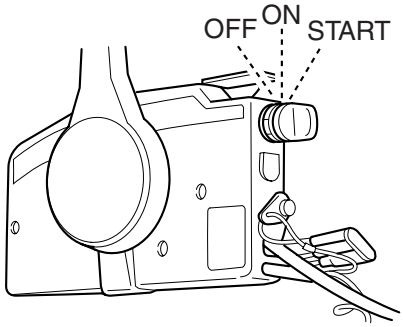
B

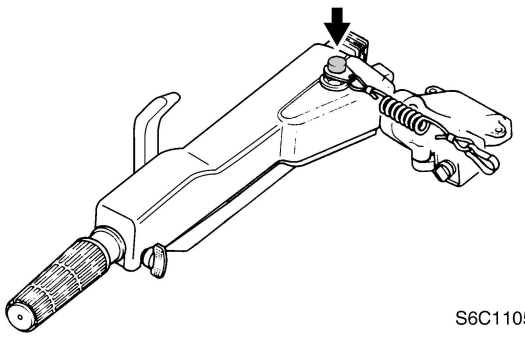


S60V1070

A Tiller handle model
B Remote control model

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

A



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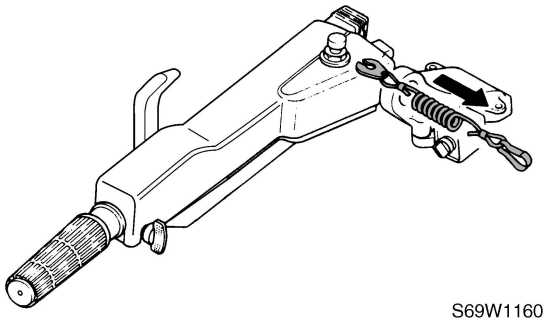

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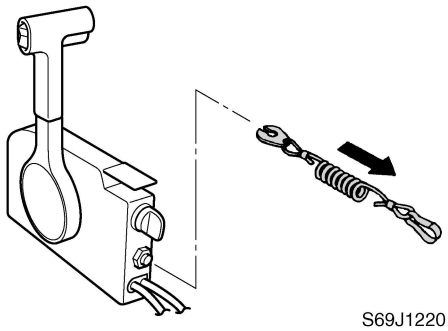
B

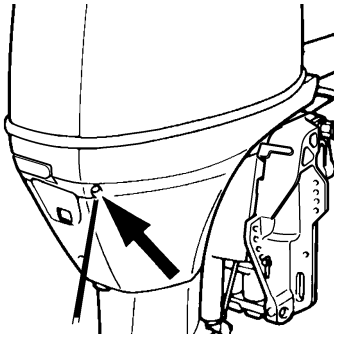


S69J1220

A Tiller handle model
B Remote control model

Checking the cooling water pilot hole

1. Check that cooling water is discharged from the cooling water pilot hole.



S68S1050

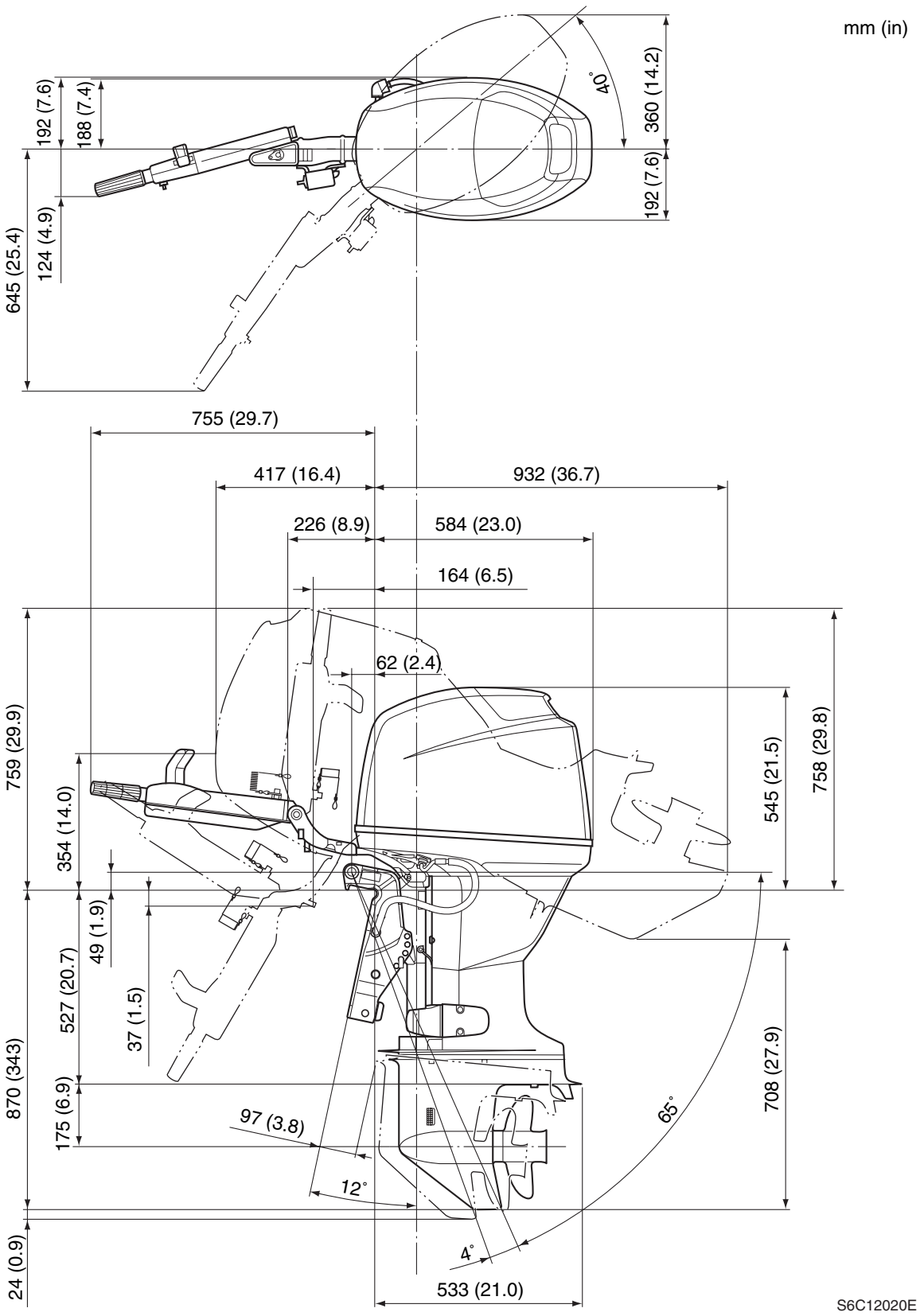
Item	Unit	Model			
		F50FED	F50FEHT	F50FET	FT50GET
Oil pump					
Type		Trochoid			
Outer rotor-to-housing clearance	mm (in)	0.09–0.15 (0.0035–0.0059)			
Outer rotor-to-inner rotor clearance limit	mm (in)	0.12 (0.0047)			
Rotor-to-cover clearance	mm (in)	0.03–0.08 (0.0012–0.0031)			
Relief valve operating pressure	kPa (kgf/cm^2, psi)	350–450 (3.5–4.5, 50.8–62.3)			
Thermostat					
Opening temperature	°C (°F)	58–62 (136–144)			
Fully open temperature	°C (°F)	70 (158)			
Valve open lower limit	mm (in)	3.0 (0.12)			

Lower unit

Item	Unit	Model			
		F50FED	F50FEHT	F50FET	FT50GET
Gear backlash					
Pinion-to-forward gear	mm (in)	0.35–0.81 (0.0138–0.0319)			0.09–0.62 (0.0035–0.0244)
Pinion-to-reverse gear	mm (in)	0.89–1.34 (0.0350–0.0528)			—
Pinion shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			
Forward gear shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			
Reverse gear shims	mm	0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50			—

F50, F60 (Tiller handle model)(*1)

mm (in)



Power trim and tilt model
(*1) For Oceania

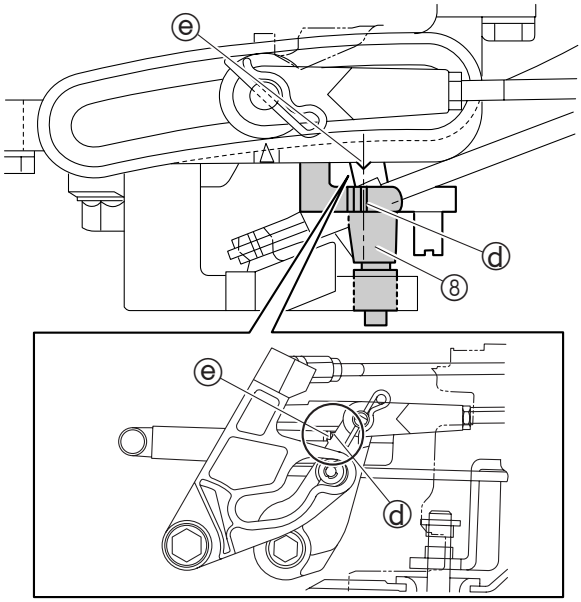
Maintenance interval chart

Use the following chart as a guideline for general maintenance.
Adjust the maintenance intervals according to the operating conditions of the outboard motor.

Item	Remarks	Initial		Every		Refer to page
		10 hours (1 month)	50 hours (3 months)	100 hours (6 months)	200 hours (1 year)	
Anodes (external)	Check/replace		○	○		3-16
Anodes (internal)	Check/replace				○	3-16
Battery	Check/charge	○				3-17
Cooling water passages	Clean		○	○		3-10
Top cowling	Check				○	3-3
Fuel filter (can be disassembled)	Check/replace	○	○	○		3-3
Fuel system	Check	○	○	○		3-3
Fuel tank (Yamaha portable tank)	Check/clean				○	—
Gear oil	Change	○		○		3-14
Lubrication points	Lubricate			○		3-18
Engine idle speed (EFI models)	Check/adjust				○	3-10
Power trim and tilt unit	Check				○	3-13
Propeller and cotter pin	Check/replace		○	○		3-16
Shift link/shift cable	Check/adjust				○	3-12
Thermostat	Check				○	3-9
Throttle link/throttle cable/ throttle pick-up timing	Check/adjust				○	3-10
Water pump	Check				○	6-7, 6-32
Engine oil	Check/change	○		○		3-3
Oil filter	Change				○	3-5
Spark plugs	Clean/adjust/ replace	○			○	3-8
Timing belt	Check/replace			○	○	3-6
Valve clearance (OHC)	Check/adjust	○		○		5-4

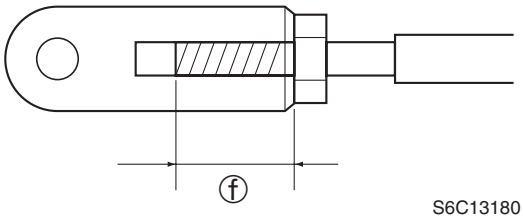
NOTE:
When operating in salt water, turbid or muddy water, the engine should be flushed with clean water after each use.

Item	Remarks	Every		Refer to page
		500 hours (2.5 years)	1,000 hours (5 years)	
Timing belt	Replace		○	3-6



S6C13170

10. Adjust the position of the throttle cable joint until its hole is aligned with the set pin.



S6C13180

NOTE:
Pull the throttle cable towards the set pin to remove any free play in the cable before adjusting the position of the throttle cable joint.

11. Connect the throttle cable joint, install the clip, and then tighten the locknut.

⚠ WARNING
The throttle cable joint must be screwed in a minimum of 8.0 mm (0.31 in) ⓕ.

12. Operate the throttle to check that the throttle valves fully close and fully open, and check that the throttle cam contacts the fully closed stopper when the throttle is in the fully closed position.

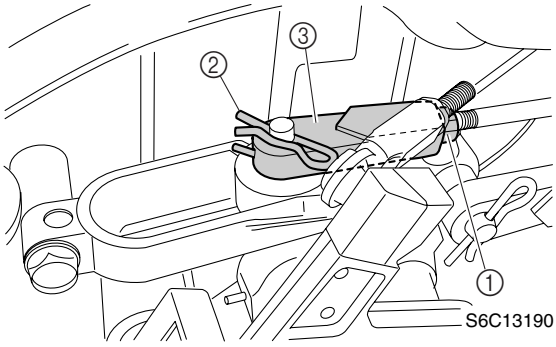
13. Check the throttle cable for smooth operation and, if necessary, repeat steps 1–12.

Checking the gear shift operation

1. Check that the gear shift operates smoothly when shifting it from neutral to forward or reverse. Adjust the shift cable length if necessary.

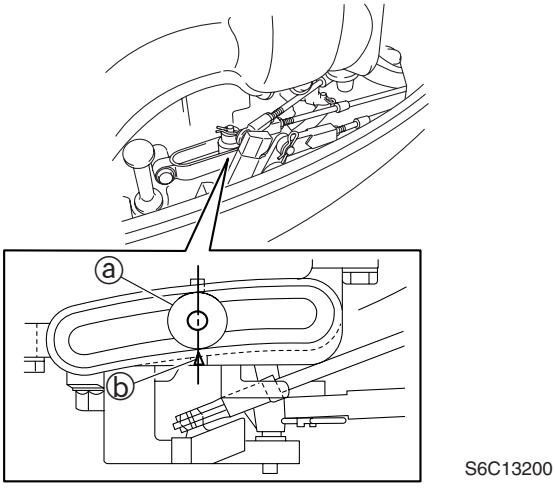
2. Set the gear shift to the neutral position.

3. Loosen the locknut ①, remove the clip ②, and then disconnect the shift cable joint ③.



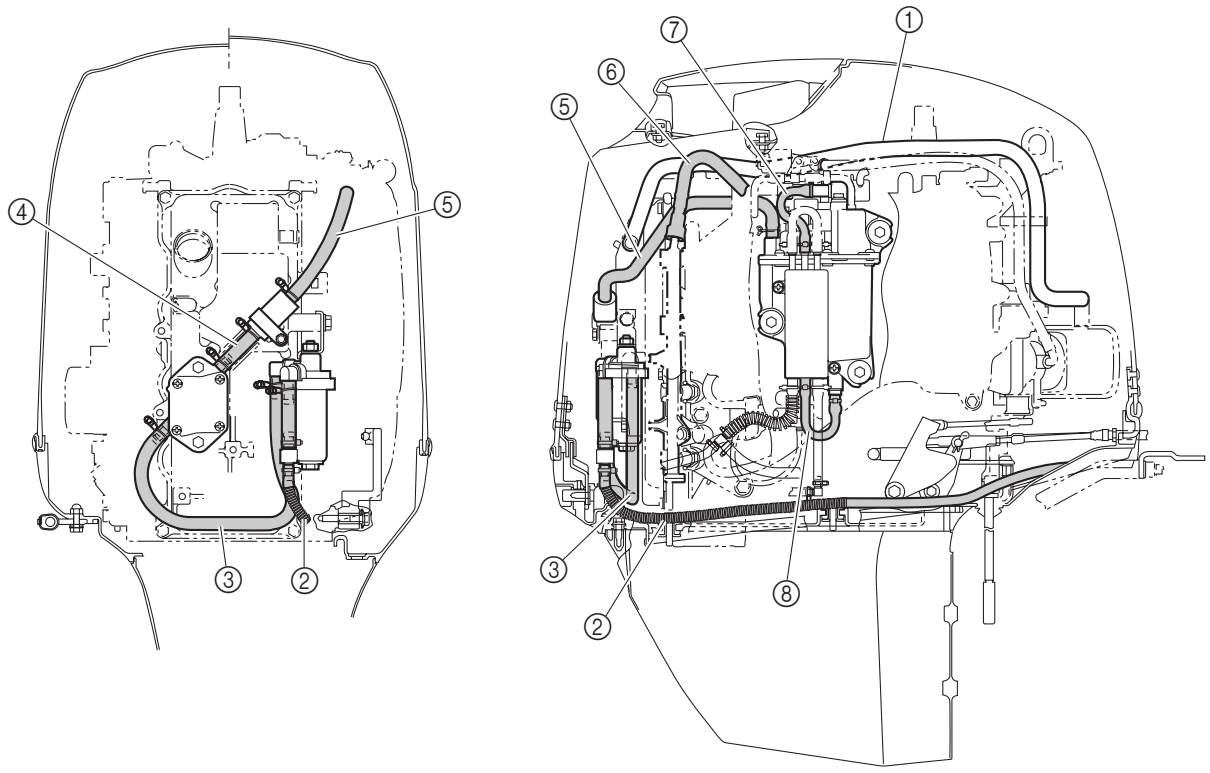
S6C13190

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



S6C13200

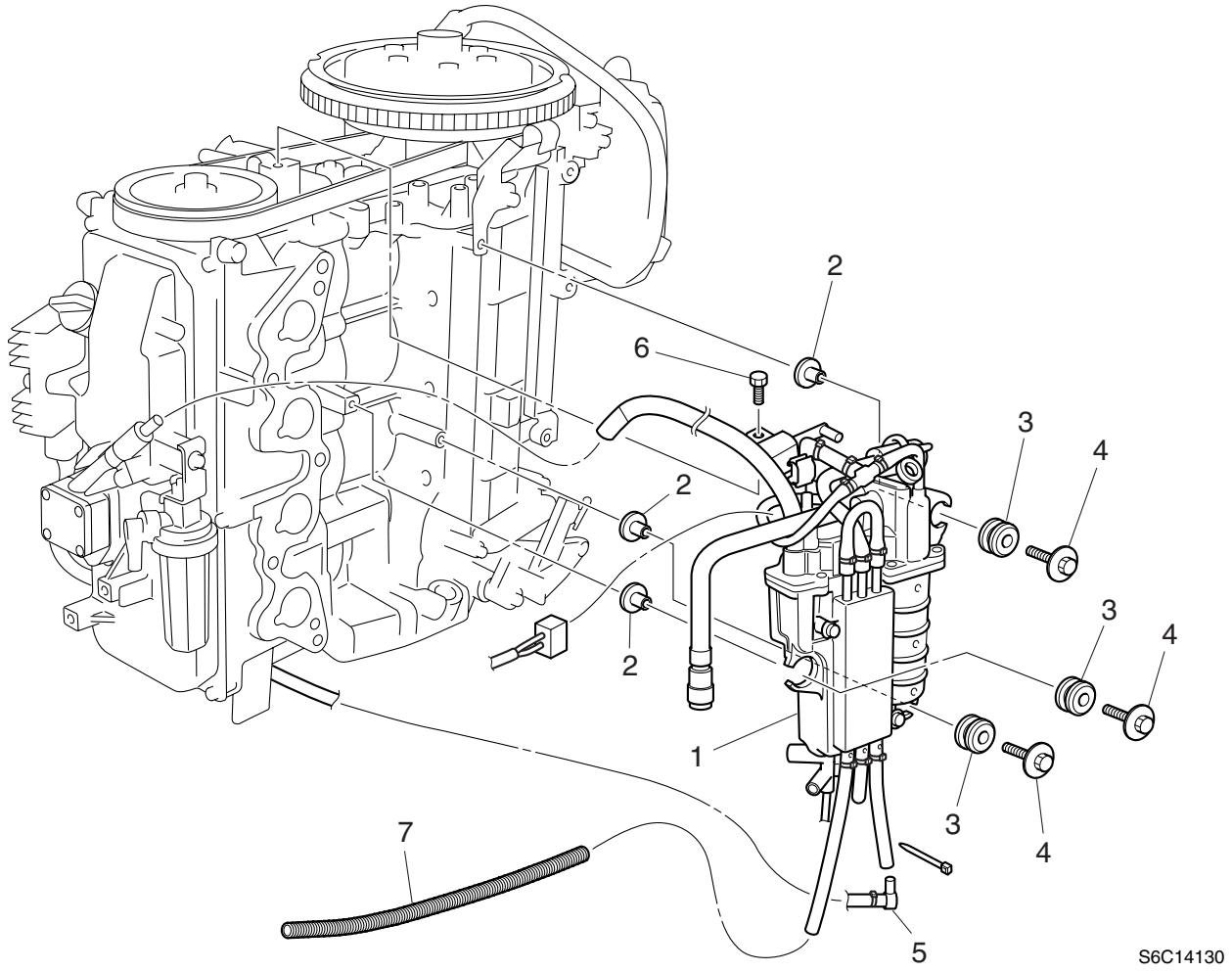
Hose routing
Fuel and blowby hoses



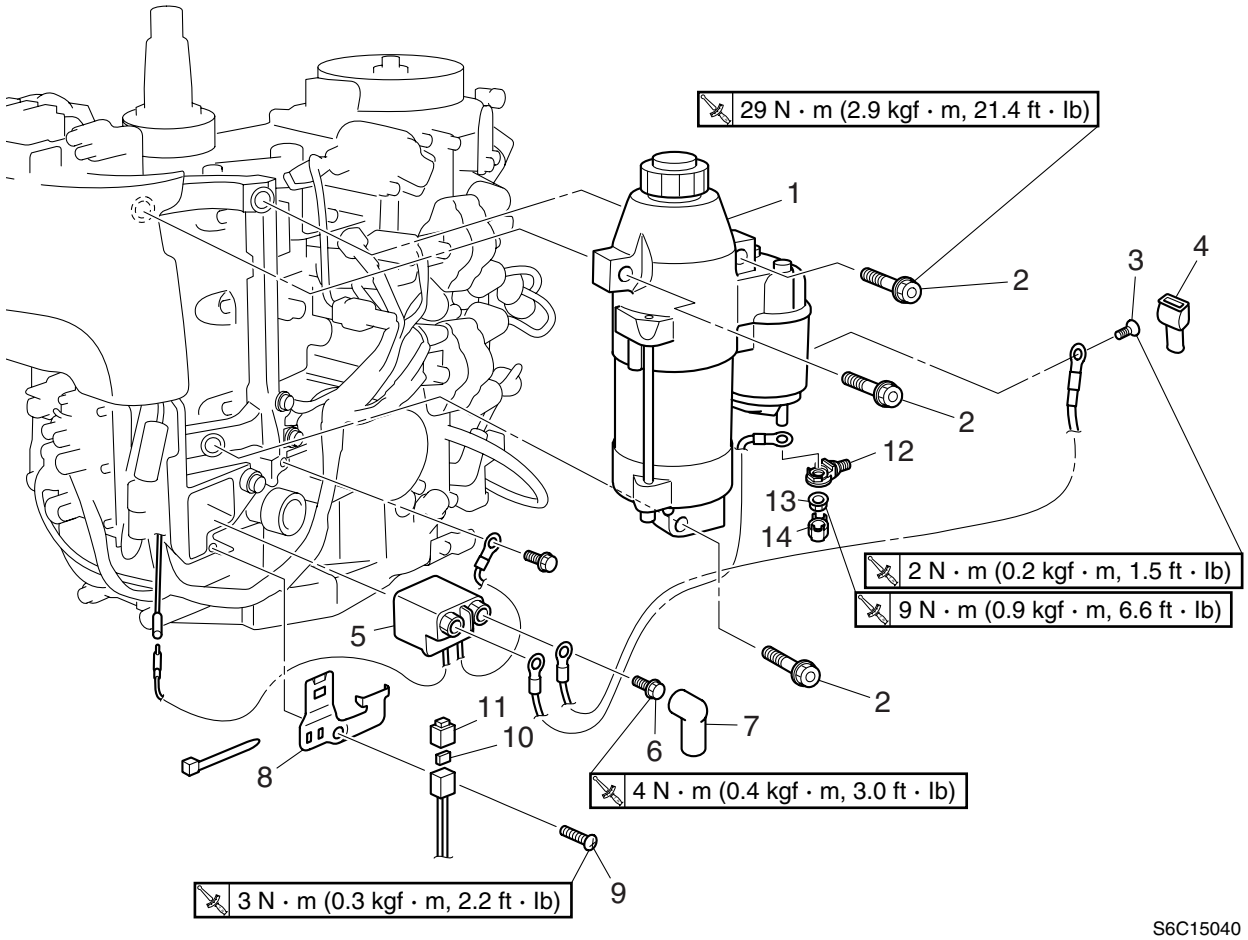
S6C14010

① Blowby hose
② Fuel hose (fuel joint-to-fuel filter)
③ Fuel hose (fuel filter-to-fuel pump)
④ Fuel hose (fuel pump-to-strainer)
⑤ Fuel hose (strainer-to-vapor separator)
⑥ High-pressure fuel hose (vapor separator-to-fuel rail)
⑦ Fuel hose (pressure regulator-to-fuel cooler)
⑧ Fuel hose (fuel cooler-to-vapor separator)

Vapor separator

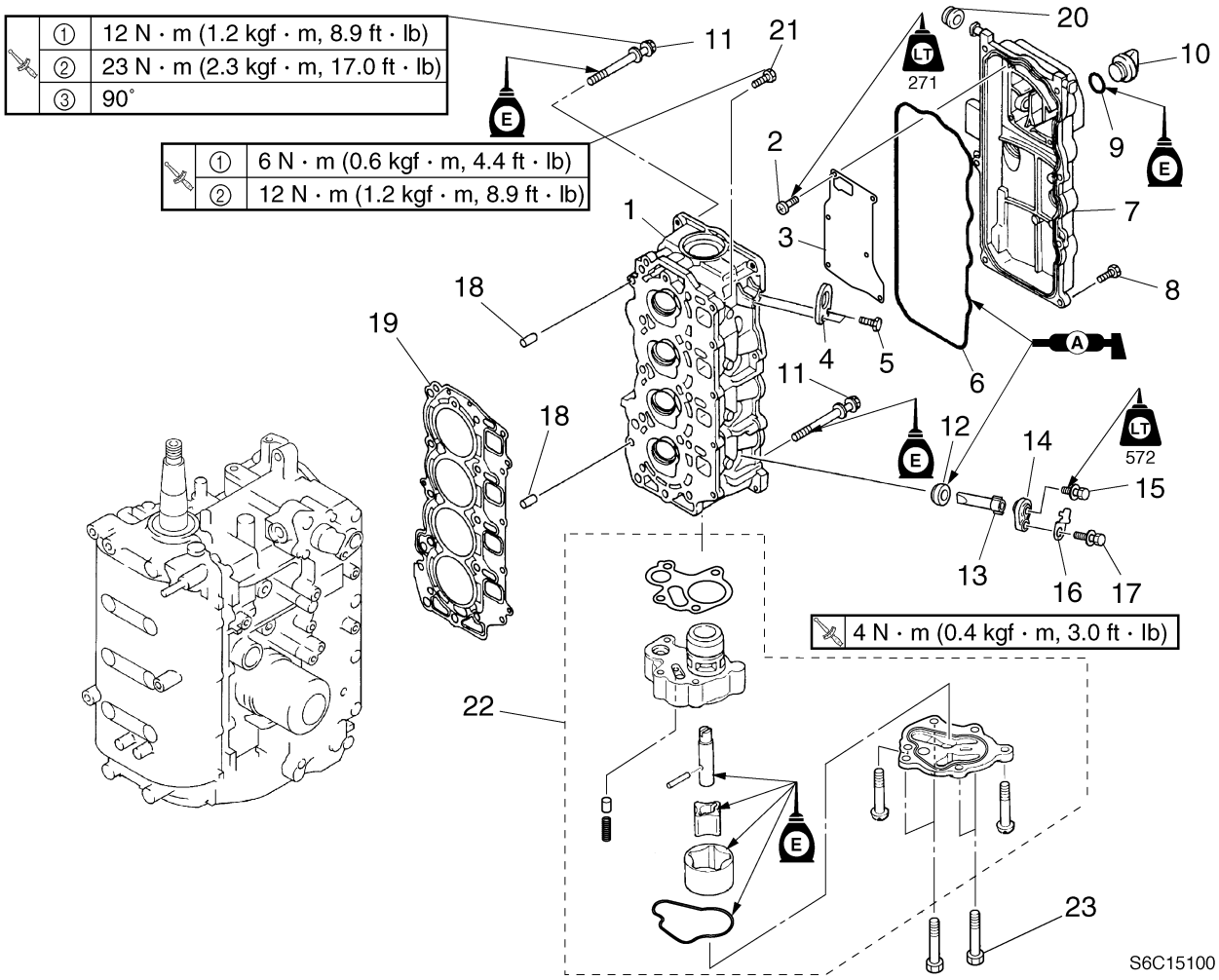


No.	Part name	Q'ty	Remarks
1	Vapor separator	1	
2	Collar	3	
3	Grommet	3	
4	Bolt	3	M6 × 30 mm
5	Cooling water pilot hose	1	
6	Bolt	1	M6 × 15 mm
7	Corrugated tube	1	



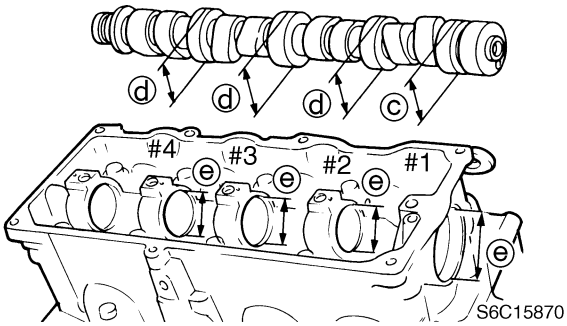
S6C15040

No.	Part name	Q'ty	Remarks
1	Starter motor	1	
2	Bolt	3	M8 × 45 mm
3	Screw	1	ø4 × 5 mm
4	Cap	1	
5	Starter relay	1	
6	Bolt	2	M6 × 10 mm
7	Cap	2	
8	Holder	1	
9	Screw	1	ø6 × 19 mm
10	Fuse	1	30 A
11	Cap	1	
12	Terminal	1	
13	Nut	1	
14	Cap	1	



No.	Part name	Q'ty	Remarks
18	Dowel	2	
19	Gasket	1	**Not reusable**
20	Grommet	2	
21	Bolt	5	M6 × 25 mm
22	Oil pump assembly	1	
23	Bolt	4	M6 × 45 mm

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

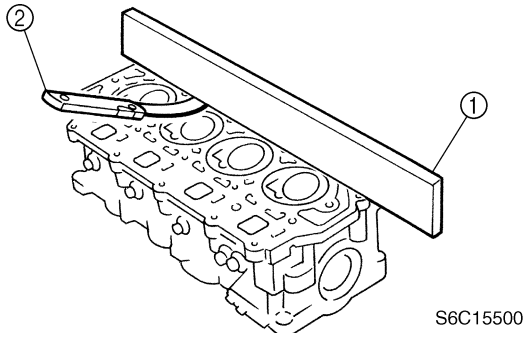


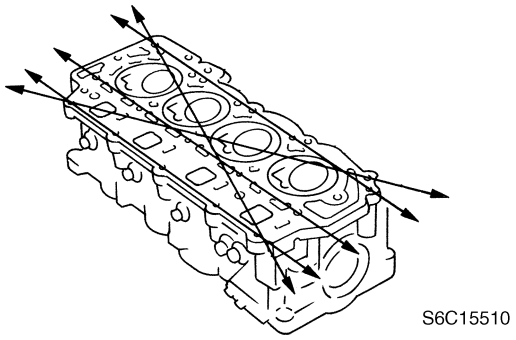
Camshaft journal diameter ⓒ:
36.925–36.945 mm
(1.4537–1.4545 in)
Camshaft journal diameter ⓓ:
36.935–36.955 mm
(1.4541–1.4549 in)
Cylinder head journal inside diameter ⓔ:
37.000–37.025 mm
(1.4567–1.4577 in)

Checking the cylinder head

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

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





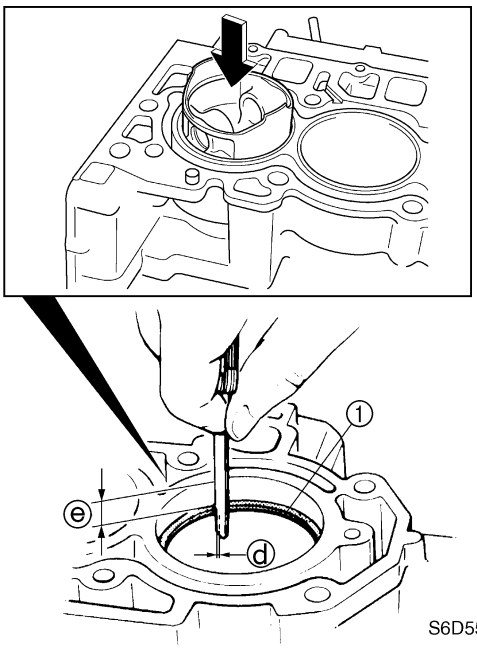
Cylinder head warpage limit:
0.10 mm (0.0039 in)

5

Piston ring dimensions:
Top ring ⓐ:
B: 1.17–1.19 mm
(0.0461–0.0469 in)
T: 2.30–2.50 mm
(0.0905–0.0984 in)
2nd ring ⓑ:
B: 1.47–1.49 mm
(0.0579–0.0587 in)
T: 2.60–2.80 mm
(0.1024–0.1102 in)
Oil ring ⓒ:
B: 2.36–2.48 mm
(0.0929–0.0976 in)
T: (reference data)
2.75 mm (0.1083 in)

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

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

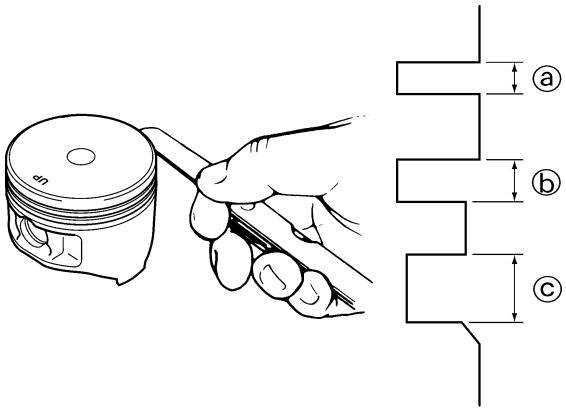


S6D55780

Piston ring end gap ⓓ:
Top ring:
0.15–0.30 mm
(0.0059–0.0118 in)
2nd ring:
0.30–0.50 mm
(0.0118–0.0197 in)
Oil ring:
0.20–0.70 mm
(0.0079–0.0276 in)
Measuring point ⓔ: 20 mm (0.8 in)

Checking the piston ring grooves

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



S6C15640

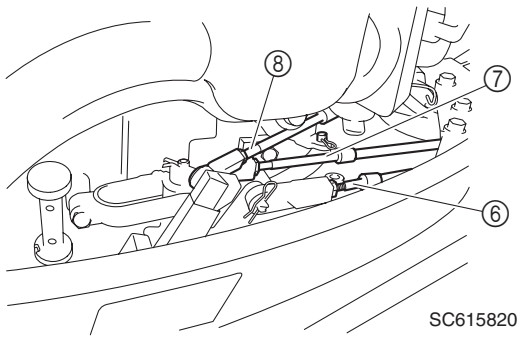
Piston ring groove:
Top ring ⓐ:
1.21–1.23 mm
(0.0476–0.0484 in)
2nd ring ⓑ:
1.51–1.53 mm
(0.0594–0.0602 in)
Oil ring ⓒ:
2.52–2.54 mm
(0.0992–0.1000 in)

5

7. Install the PTT switch coupler, PTT motor leads, and battery leads.

Positive battery lead nut:
9 N·m (0.9 kgf·m, 6.6 ft·lb)
PTT motor lead bolt:
4 N·m (0.4 kgf·m, 3.0 ft·lb)

8. Connect the throttle cable ⑥, shift cable ⑦, and throttle link rod ⑧, and then adjust their lengths. For adjustment procedures, see Chapter 3, "Adjusting the throttle link and throttle cable" and "Checking the gear shift operation."



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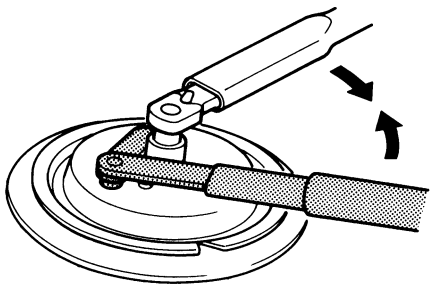
9. Connect the warning indicator couplers and main switch coupler (tiller handle model).

10. Install the Woodruff key, then the flywheel magnet.


S63P5370

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

NOTE:
Apply engine oil to the flywheel magnet nut before installation.

Flywheel holder: 90890-06522

Flywheel magnet nut:
157 N·m (15.7 kgf·m, 115.8 ft·lb)

11. Install all parts removed during disassembly.

12. Adjust the pulser coil air gap.

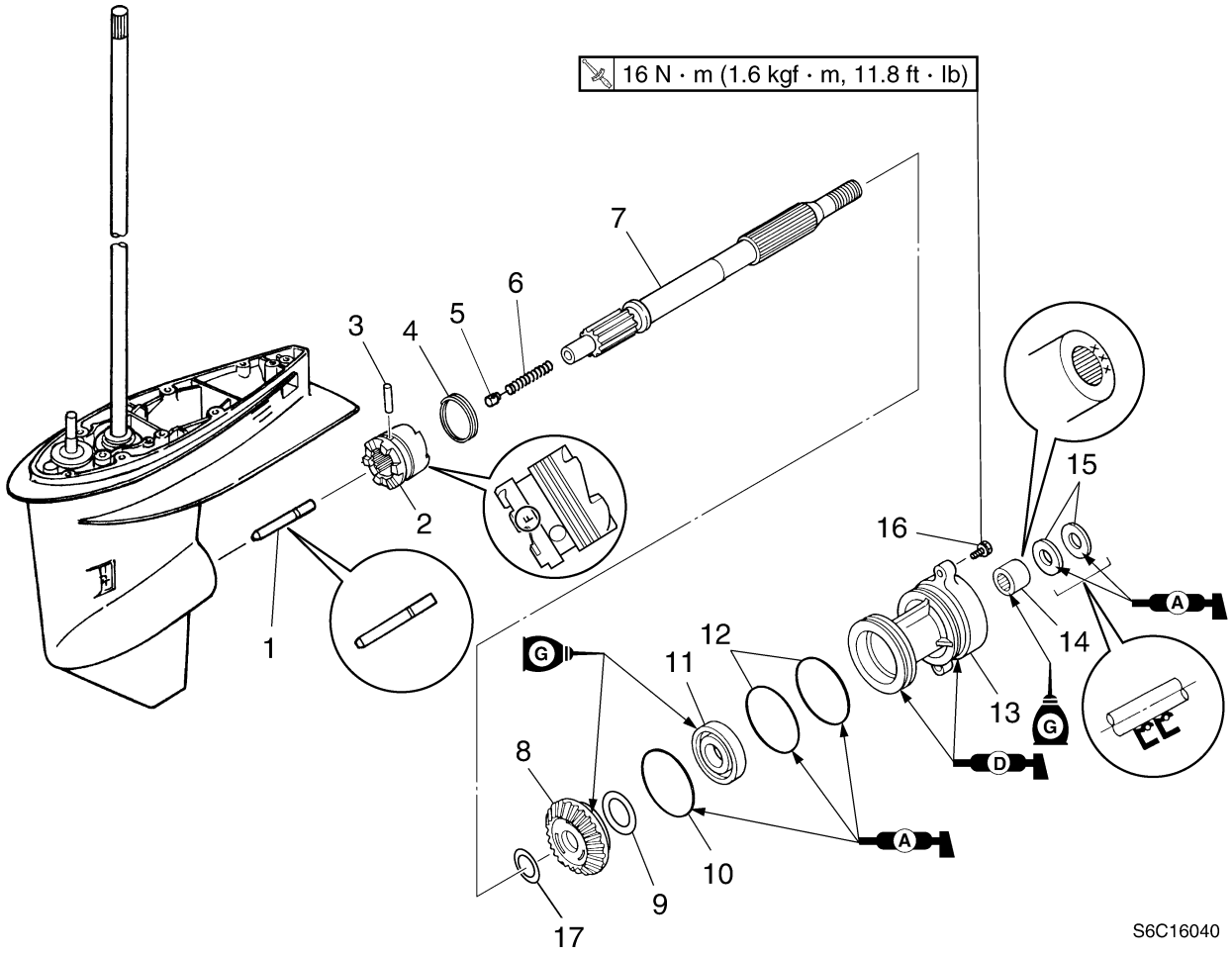
NOTE:
For adjustment procedures, see Chapter 8 "Checking the pulser coil air gap."

13. Fill the engine with the specified amount of the recommended engine oil.

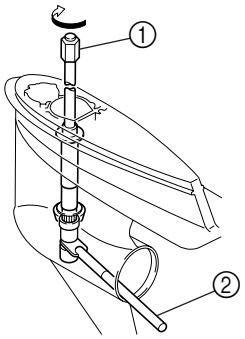
Recommended engine oil:
4-stroke motor oil
API: SE, SF, SG, SH or SJ
SAE: 10W-30 or 10W-40
Engine oil quantity:
Without oil filter element:
2.5 L (2.64 US qt, 2.20 Imp qt)
With oil filter element:
2.7 L (2.85 US qt, 2.38 Imp qt)

5

Propeller shaft housing (F50, F60)



No.	Part name	Q'ty	Remarks
1	Shift plunger	1	
2	Dog clutch	1	
3	Cross pin	1	
4	Spring	1	
5	Shift slider	1	
6	Spring	1	
7	Propeller shaft	1	
8	Reverse gear	1	
9	Reverse gear shim	—	
10	O-ring	1	**Not reusable**
11	Ball bearing	1	**Not reusable**
12	O-ring	2	**Not reusable**
13	Propeller shaft housing	1	
14	Needle bearing	1	
15	Oil seal	2	**Not reusable**
16	Bolt	2	M8 × 25 mm
17	Washer	1	



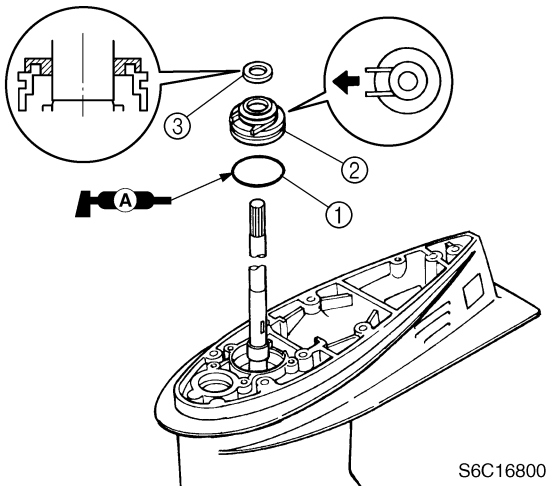
S68S6400

Drive shaft holder 4 ①: 90890-06518
Pinion nut holder ②:
New: 90890-06715
Current: 90890-06505

Pinion nut:
74 N·m (7.4 kgf·m, 54.6 ft·lb)

Installing the oil seal housing

1. Install a new O-ring ①, the oil seal housing ②, and the seal ③.



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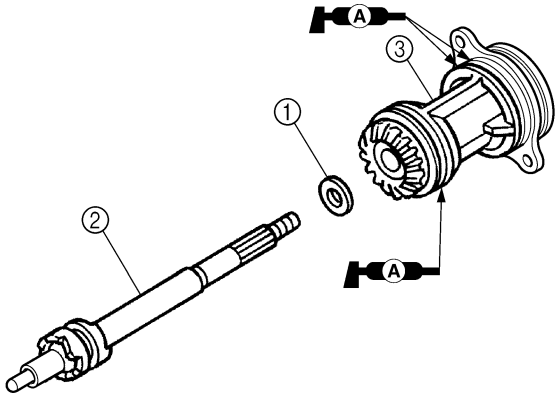
Installing the propeller shaft housing

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

2. Apply grease to a new O-rings.



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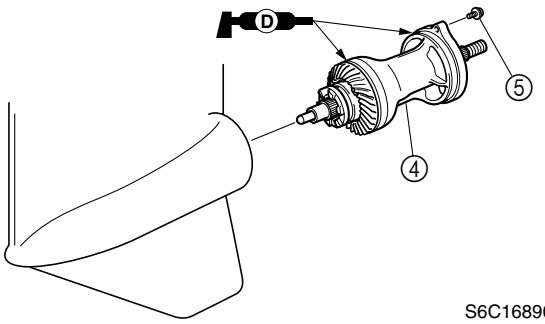
3. Install the propeller shaft housing assembly ④ into the lower case, and then tighten the bolts ⑤ to the specified torque.

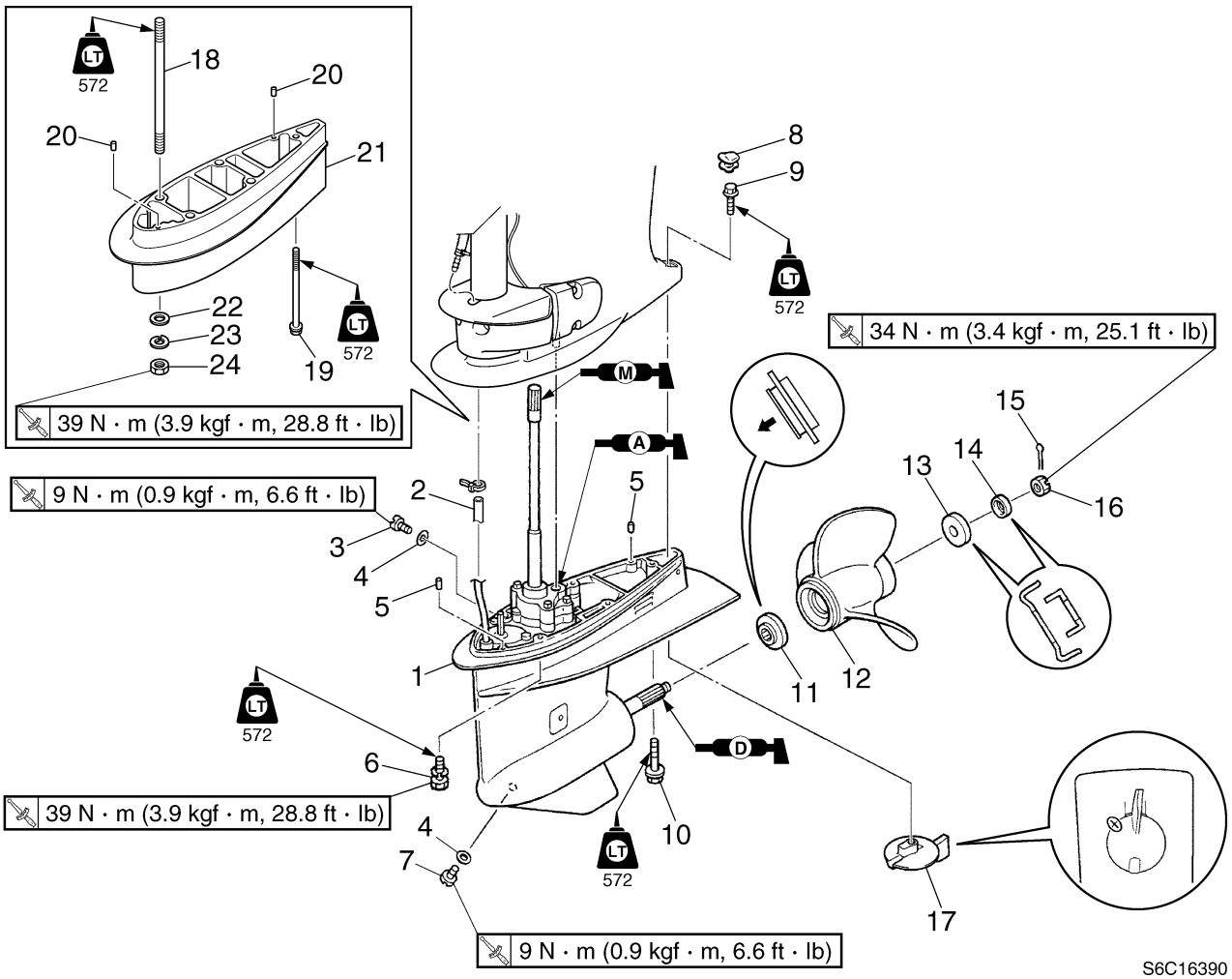


S6C16890

Propeller shaft housing bolt ⑤:
16 N·m (1.6 kgf·m, 11.8 ft·lb)

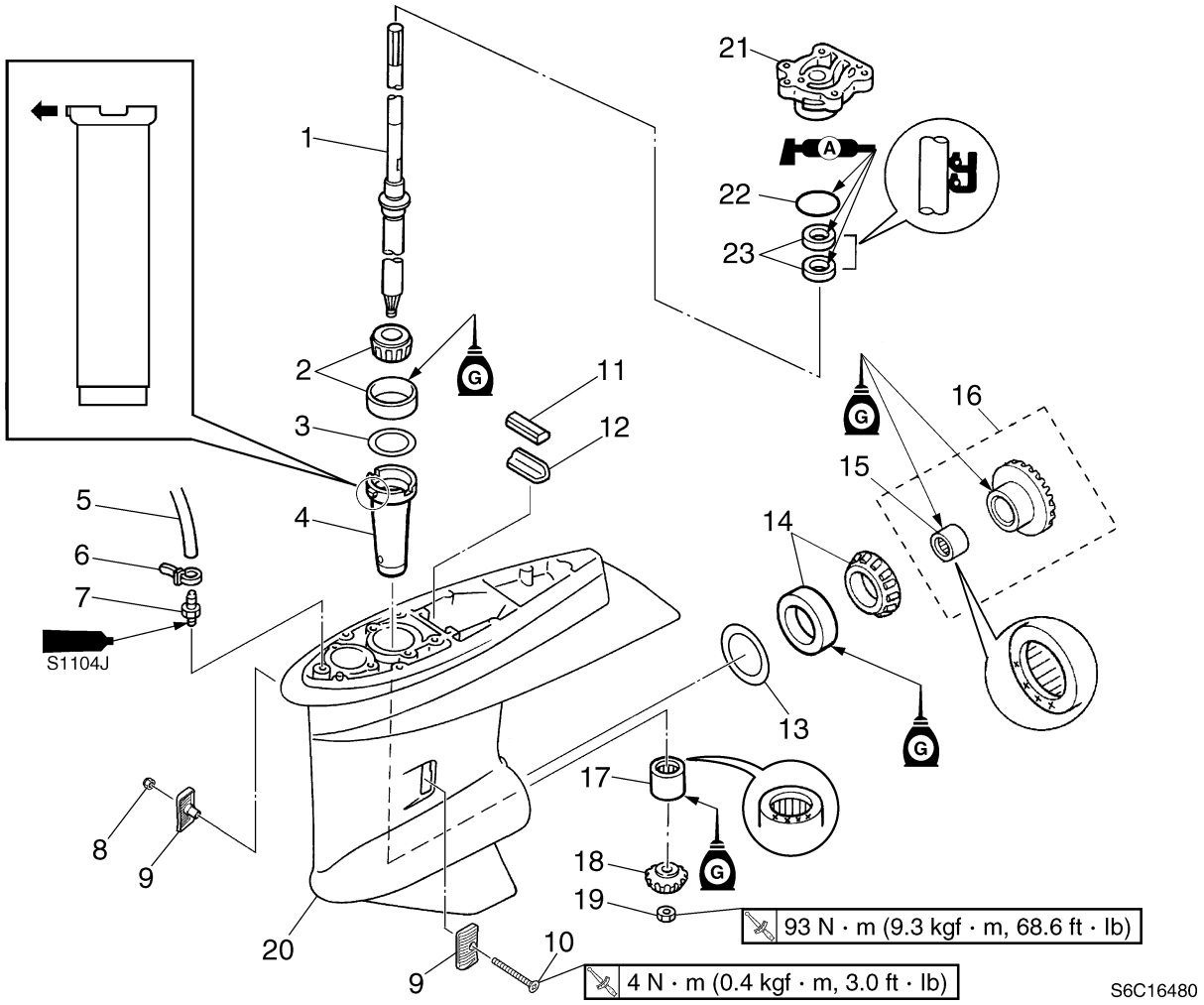
6

Lower unit (FT50, FT60)



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

6



No.	Part name	Q'ty	Remarks
18	Pinion	1	
19	Nut	1	
20	Lower case	1	
21	Oil seal housing	1	
22	O-ring	1	**Not reusable**
23	Oil seal	1	**Not reusable**

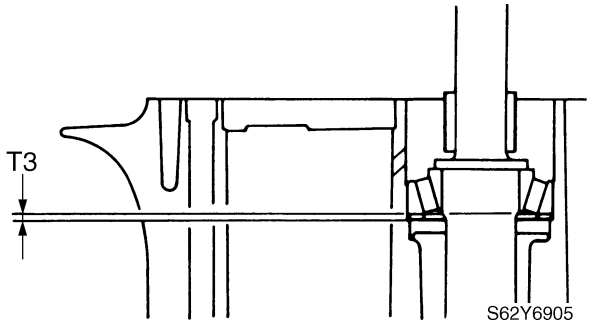
6

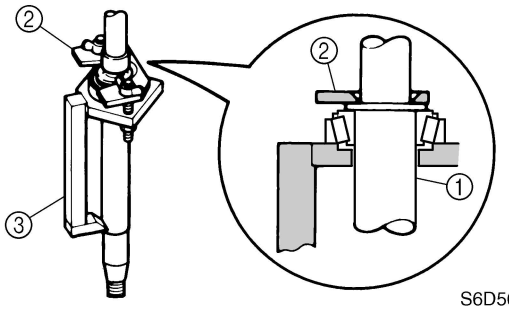
Shimming

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

Selecting the pinion shims

1. Install the special service tools onto the drive shaft ① and drive shaft bearing.





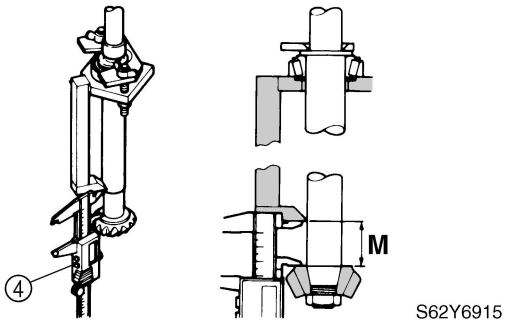
NOTE:
- Select the shim thickness (T3) by using the specified measurement(s) and the calculation formula.
- Install the special service tools to the drive shaft so that the shaft is at the center of the hole.
- Tighten the wing nuts another 1/4 of a turn after they contact the plate ②.

Pinion height gauge plate B ②:
90890-06712
Pinion height gauge ③:
90890-06710

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

Pinion nut:
93 N·m (9.3 kgf·m, 68.6 ft·lb)

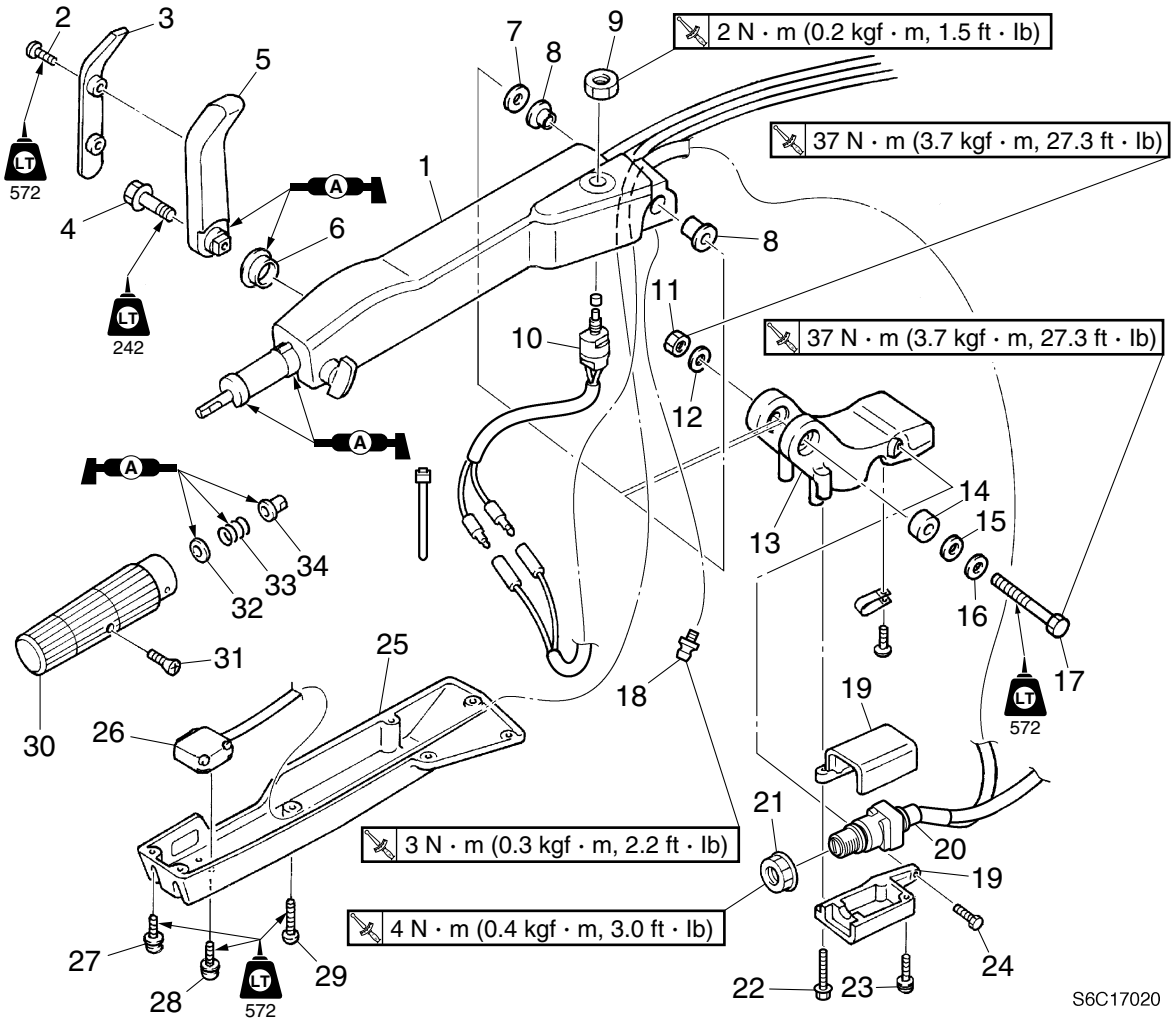
3. Measure the distance (M) between the special service tool and the pinion as shown.



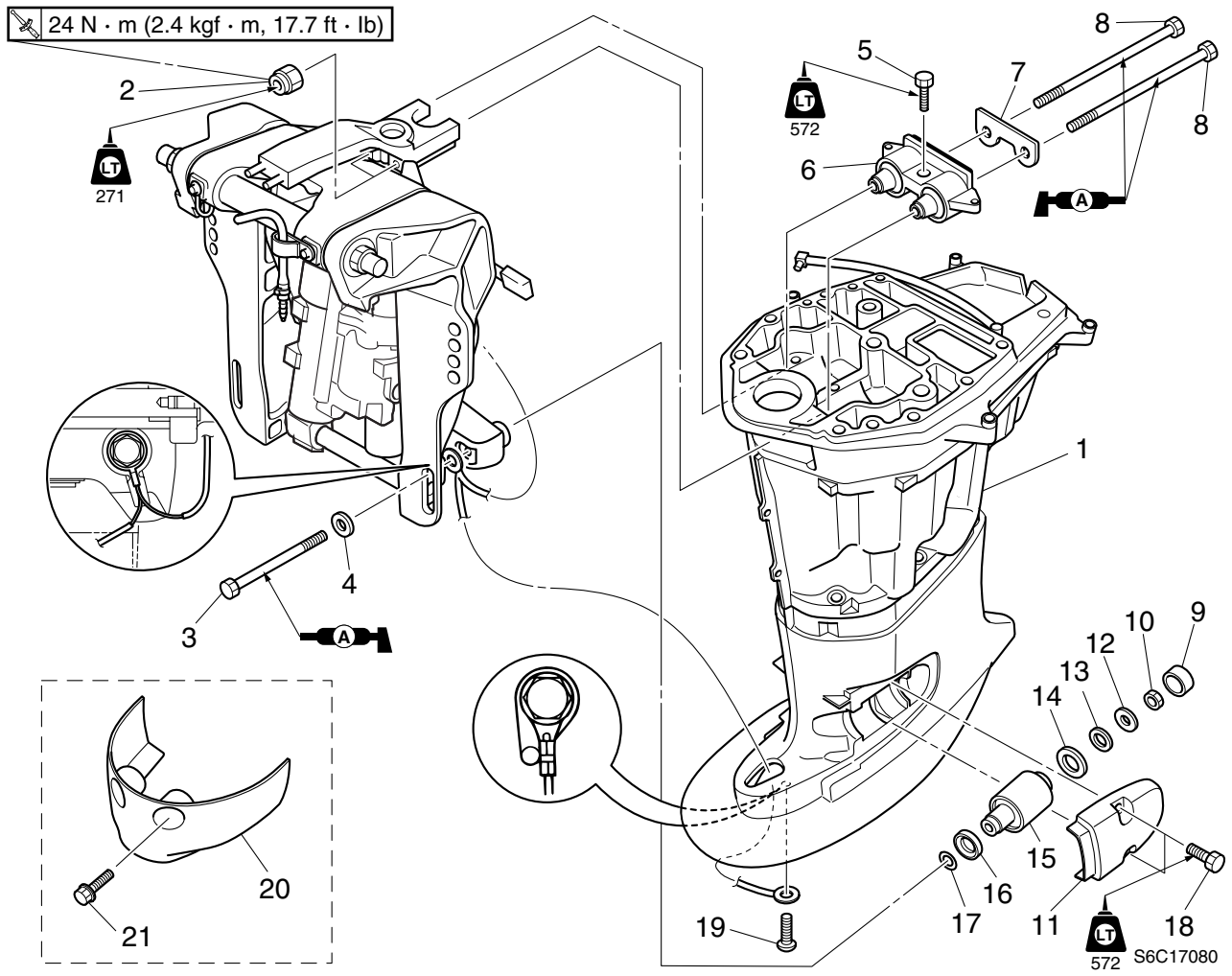
NOTE:
Measure the pinion at three points to find the distance average.

Digital caliper ④: 90890-06704

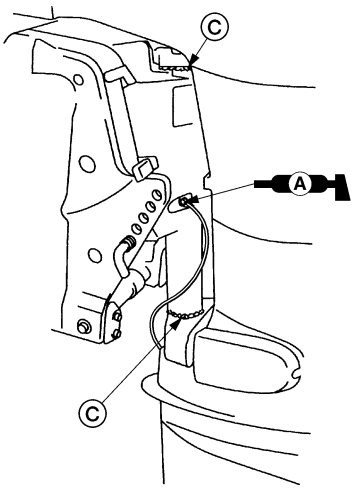
6



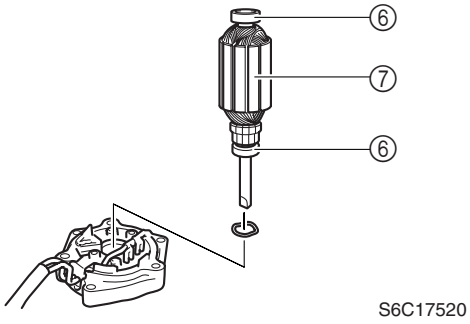
No.	Part name	Q'ty	Remarks
1	Tiller handle sub assembly	1	
2	Screw	2	ø6 × 10 mm
3	Shift lever cover	1	
4	Bolt	1	M8 × 40 mm
5	Shift lever	1	
6	Bushing	1	
7	Washer	1	
8	Bushing	2	
9	Nut	1	
10	Engine stop lanyard switch	1	
11	Nut	1	
12	Washer	1	
13	Bracket	1	
14	Collar	1	
15	Wave washer	1	
16	Washer	1	
17	Bolt	1	M12 × 80 mm



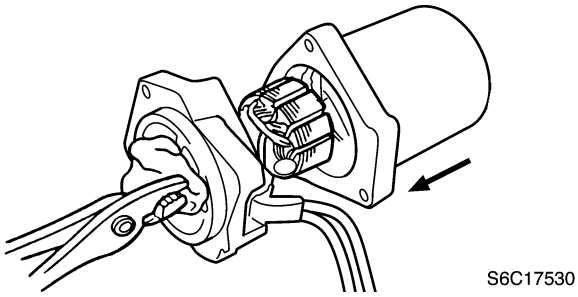
No.	Part name	Q'ty	Remarks
18	Bolt	4	M8 × 30 mm
19	Screw	1	ø6 × 7 mm
20	Cover	1	High thrust model
21	Bolt	2	M8 × 20 mm, High thrust model



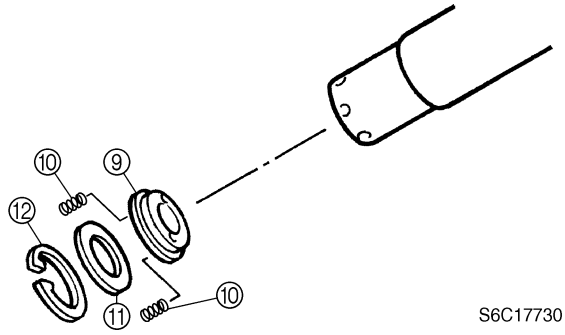
S6C17310



6. Install the stator onto the motor base.



NOTE:
Place a clean cloth over the end of the armature shaft, hold it with a pair of pliers, and then carefully slide the stator over the armature.



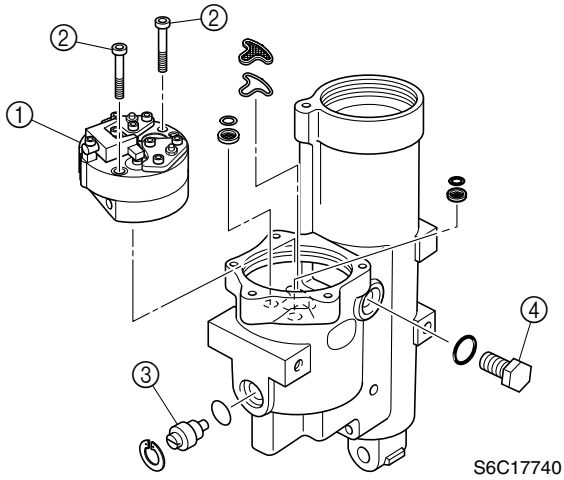
S6C17730

Assembling the power trim and tilt unit

1. Hold the trim cylinder in a vise using aluminum plates on both sides.

2. Install the filters and gear pump assembly ① by installing the bolts ②, then tightening them to the specified torque.

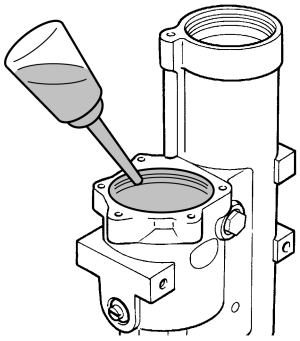
3. Install the manual valve ③ and reservoir cap ④.



S6C17740

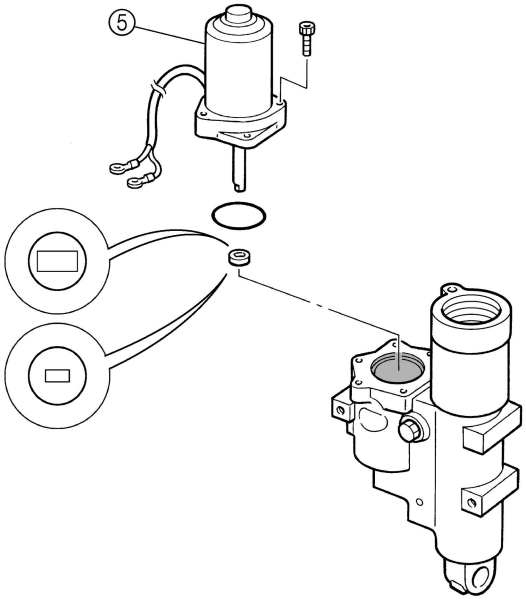
Gear pump bolt ②:
5 N·m (0.5 kgf·m, 3.7 ft·lb)
Reservoir cap ④:
7 N·m (0.7 kgf·m, 5.2 ft·lb)

4. Fill the reservoir with the recommended fluid to the correct level as shown.


S62Y7700

Recommended power trim and tilt fluid:
ATF Dexron II

5. Install the new O-ring, joint, and power trim and tilt motor ⑤ by installing the bolts, then tightening them to the specified torque.



S6C17750

PTT motor bolt:
4 N·m (0.4 kgf·m, 3.0 ft·lb)

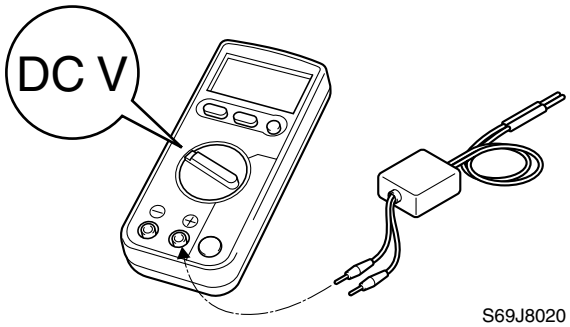
6. Add fluid of the recommended type to the first level at the bottom of the trim cylinder.

Checking the electrical components

Measuring the peak voltage

NOTE:
Before troubleshooting the peak voltage, check that all electrical connections are tight and free from corrosion, and that the battery is fully charged to 12 V.

The condition of the ignition system can be determined by measuring the peak voltage. Cranking speed is effected by many factors, such as fouled or weak spark plugs, or a weak battery. If one of these factors is present, the peak voltage will be lower than specification. In addition, if the peak voltage is lower than specification the engine will not operate properly.



S69J8020

⚠ WARNING

When checking the peak voltage, do not touch any of the connections of the digital tester leads.

NOTE:
- Use the peak voltage adapter with the digital circuit tester.
- When measuring the peak voltage, set the selector on the digital circuit tester to the **DC voltage mode**.
- Connect the positive pin on the peak voltage adapter to the positive terminal of the digital circuit tester.

Measuring the lower resistance

When measuring a resistance of 10 Ω or less with the digital circuit tester, the correct measurement cannot be obtained due to the internal resistance of the tester. To obtain the correct value, subtract the internal resistance from the displayed measurement.

NOTE:
To obtain the internal resistance of the digital circuit tester, connect both of its probes and check the display.

Correct value =
displayed measurement – internal resistance

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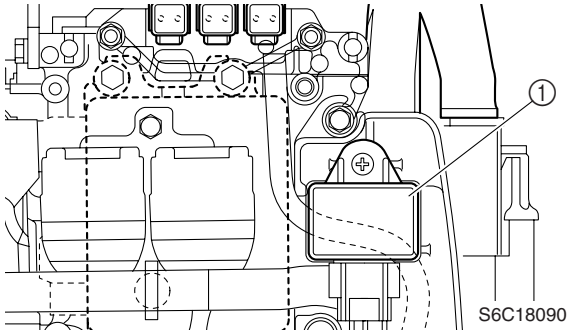
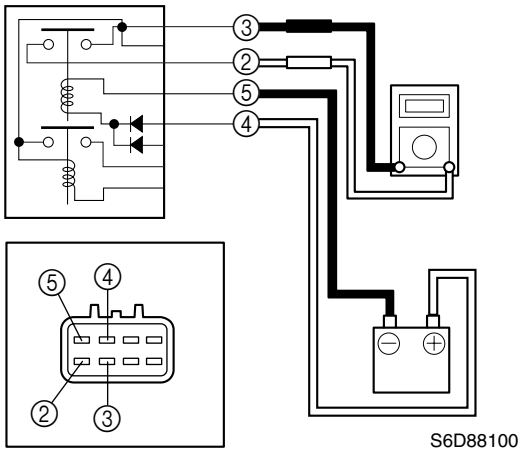
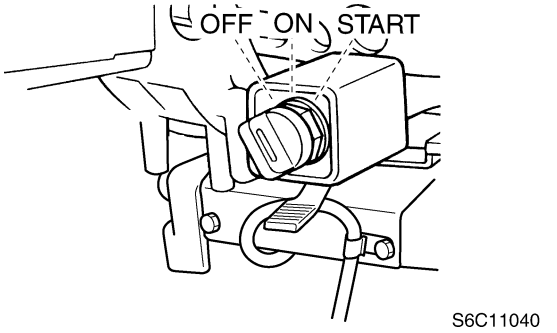


2. Connect the digital circuit tester leads to the relay terminals ② and ③.
3. Connect the positive battery terminal to the main and fuel pump relay terminal ④.
4. Connect the negative battery terminal to the main and fuel pump relay terminal ⑤.
5. Check for continuity between the relay terminals. Replace if there is no continuity.
6. Check that there is no continuity between the relay terminals after disconnecting a battery terminal from the relay terminal ④ or ⑤. Replace if there is continuity.



Checking the engine start switch (tiller handle model)

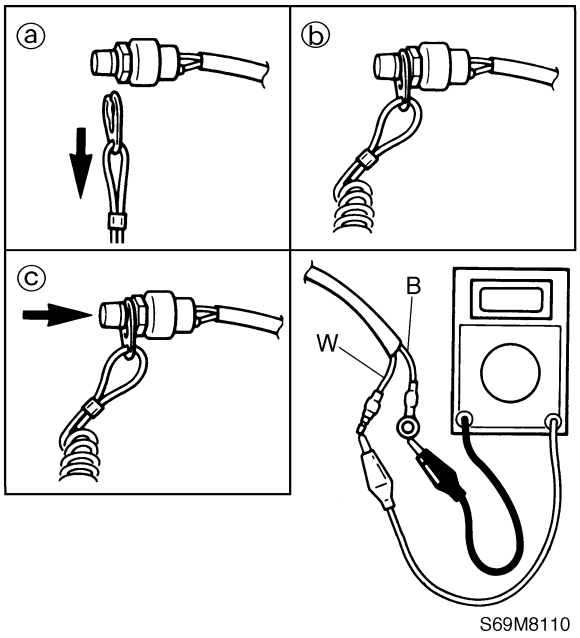
1. Check the engine start switch for continuity. Replace if there is no continuity.



Switch position	Lead color				
	White (W)	Black (B)	Red (R)	Pink (P)	Brown (Br)
Off	○—○				
On			○—○		
Start			○—○	○—○	

Checking the engine stop lanyard switch (tiller handle model)

1. Check the engine stop lanyard switch for continuity. Replace if out of specification.



Switch position	Lead color	
	White (W)	Black (B)
Clip removed ⓐ	○—○	
Clip installed ⓑ		
Engine stop button pushed ⓒ	○—○	

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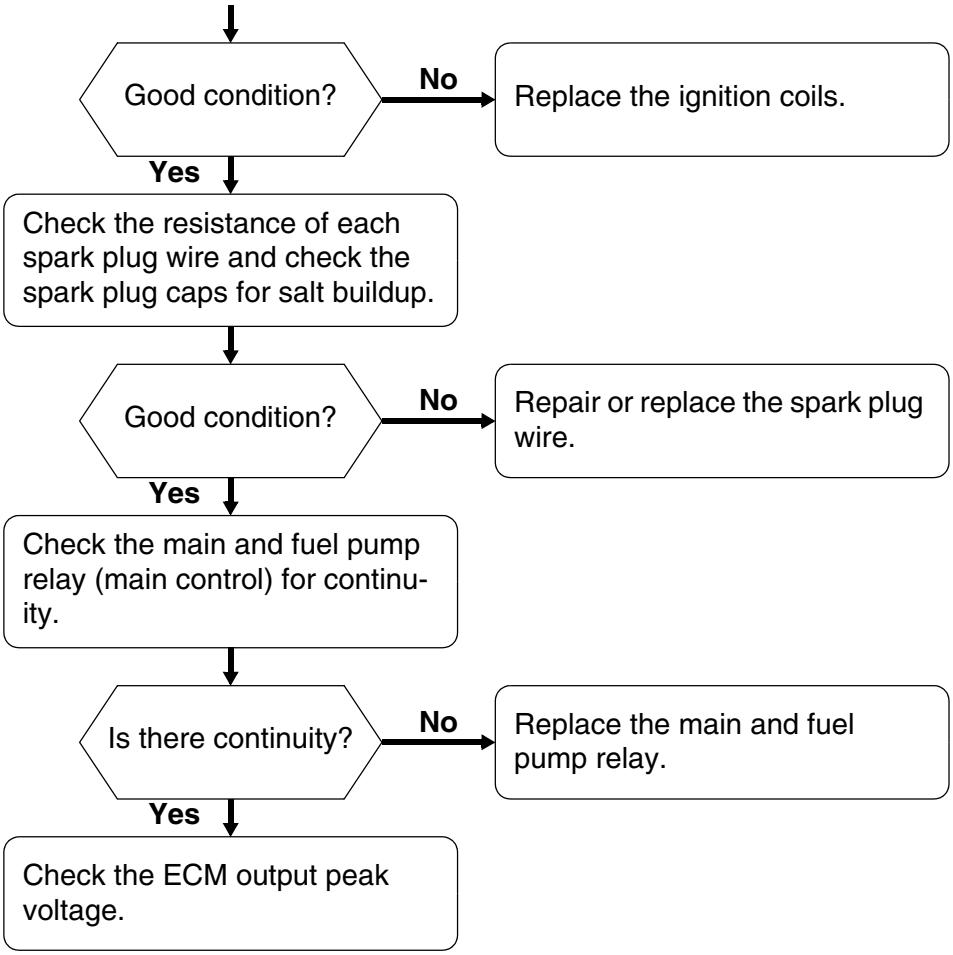
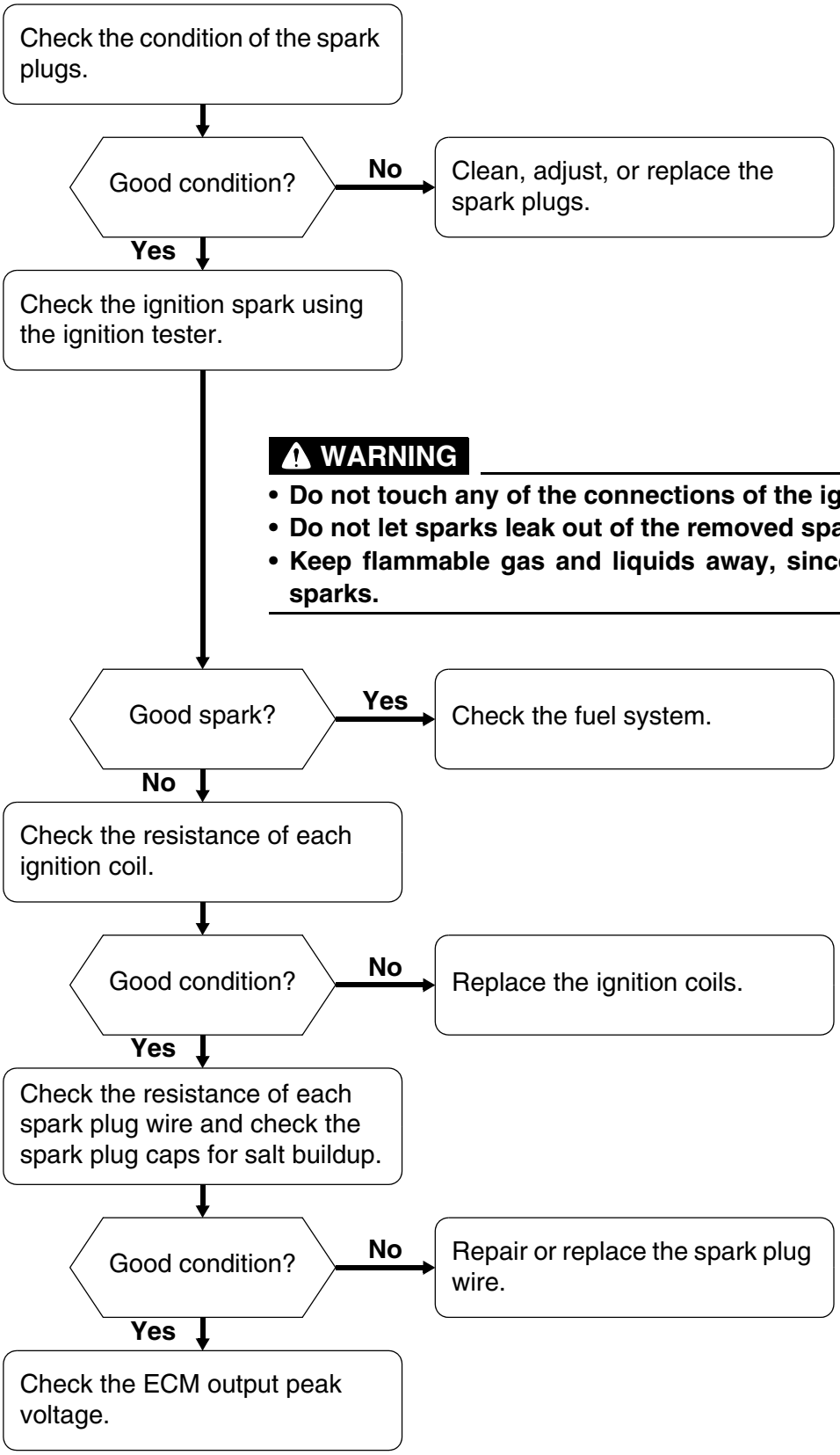
TRBL SHTG ?

Troubleshooting

9


Good condition?
No
Replace the ignition coils.
Yes
Check the resistance of each spark plug wire and check the spark plug caps for salt buildup.
Good condition?
No
Repair or replace the spark plug wire.
Yes
Check the main and fuel pump relay (main control) for continuity.
Is there continuity?
No
Replace the main and fuel pump relay.
Yes
Check the ECM output peak voltage.

Ignition system



⚠ WARNING

- **Do not touch any of the connections of the ignition tester leads.**
- **Do not let sparks leak out of the removed spark plug caps.**
- **Keep flammable gas and liquids away, since this test can produce sparks.**