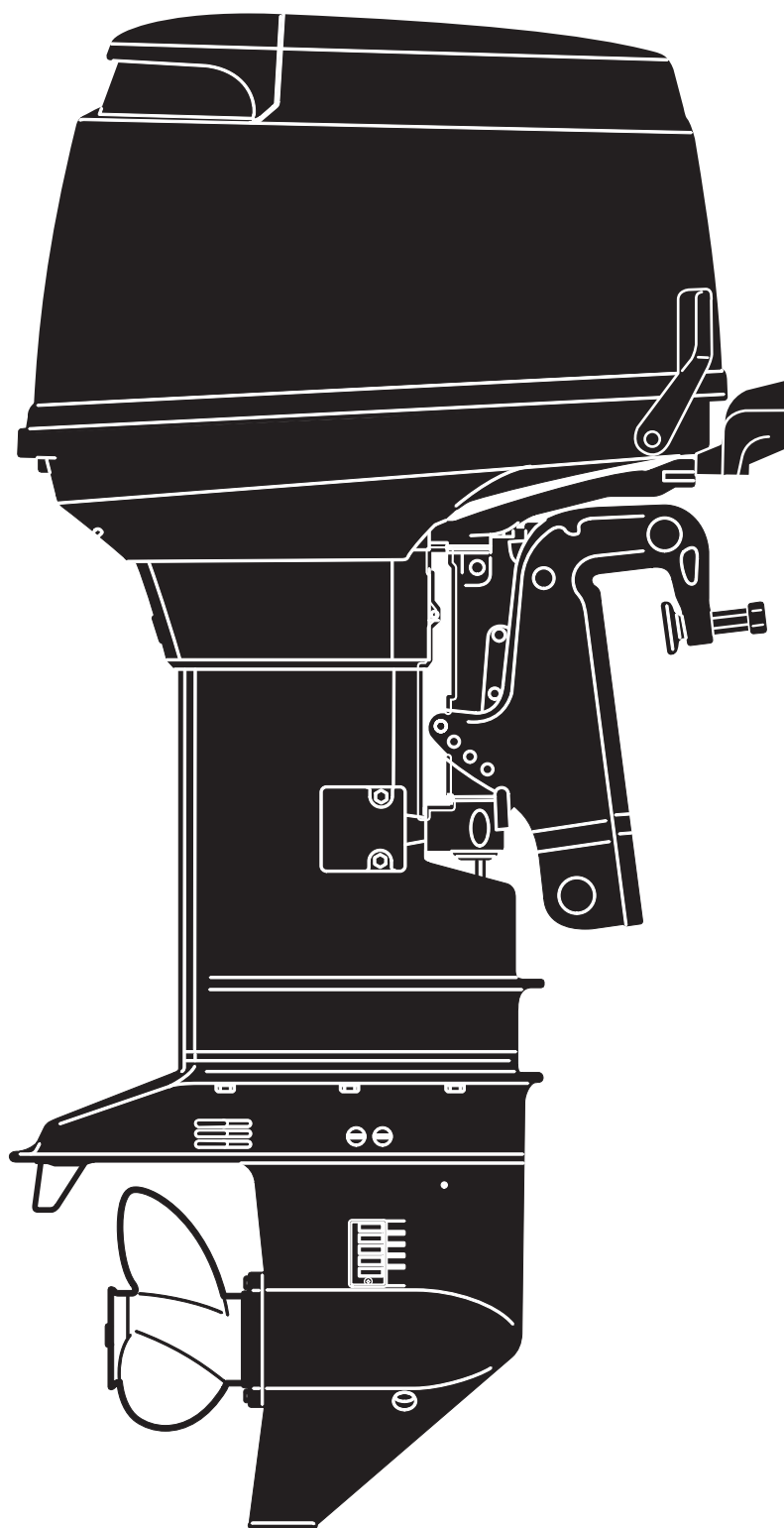


SERVICE MANUAL

 **TOHATSU**
Outboards



T~~LDI~~
**MD 30B2
40/50B2
Models**

**OB No.003-21050-3
13-10 NB**

Introduction

Before reading this manual

This service manual provides information that is needed for inspection, service and repair of applicable outboard motors. For information about operation of the products that are not described in this document, refer to the owners manual. For our customers' safe and comfortable use of the products for long term, it is essential to maintain the performance and quality of the outboard. To ensure this, the maintenance and service have to be done properly by service technicians with fundamental knowledge and skills. This manual is utilized so that our customers can always use their outboard motor with full satisfaction.

Safety Information

Safety Statements

The following safety statements are found throughout this manual and indicate information which, if ignored, could result in fatal safety hazards or property damages:

DANGER

Indicates the presence of a hazard which, if ignored, will result in severe injury or death.

WARNING

Indicates the presence of a hazard or an unsafe activity which, if ignored, could result in severe injury or death.

CAUTION

Indicates the presence of a hazard or an unsafe activity which, if ignored, could result in minor personal injury or damage to the products or facilities.

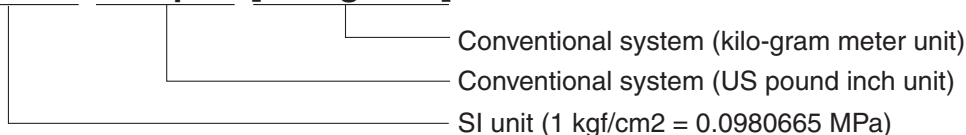


Attention.

This manual uses SI unit system (International System of Units) for the pressure, force (load), torque and stress. This manual newly adopts the international unit construction system (SI unit system) followed by the conventional imperial and metric systems enclosed by () and [] as described below.

Example : <Pressure>

0.90 MPa (128 psi) [9.0 kgf/cm²]



* Measurements are shown using SI unit followed by conventional units (US unit) and [Japanese domestic unit].

Example : <Driving torque>

18 N·m (13lb·ft) [1.8 kgf·m]

* The conventional unit for measurement of force uses "kgf (kilogram force)" to discriminate it from "kg (mass kilogram)" of SI unit system.

Example : <Volume>

900 cm³ (30.4 fl.oz)

Example : <Length>

10 mm (0.39 in)

<Reference>

What is the SI unit system?

Although the measurement unit is standardized mostly with metric system in the world, the metric system includes different kinds of unit systems.

Though the metric system was established expecting that a single unit system is used in the world, various physical units were established later, resulting in branching the metric system in different unit systems.












The new unit system is called "International System of Units" because it was established for the purpose of unifying the different unit systems.

Since the metric system was initially established in France, and International Bureau of Weights and Measures (IBWM) is located in Paris, General Conference of Weights and Measures (GCWM) passes a resolution of the international unit system as "Système International d'Unités (French)" that is abbreviated as "SI unit".










For example, conventional metric system uses the unit of mass (kg) and unit of force (kg or kgf) without discriminating them, but the SI unit system uses, for example, "kg" as the unit of mass, and "N" as the unit of force, aiming to apply a kind of unit for a kind of physical quantity.

Description of Pictograph















The following symbols represent the contents of individual chapters.

Service Information 	Service Data 	Inspections and Adjustments 	Fuel System 
Power Unit 	Lower Unit 	Bracket 	Electrical System 
Troubleshooting 	Rigging 	Wiring Diagrams 	

The following symbols indicate items needed for the service.

Special Tool 	Lubrication Oil 	Engine RPM 	Tightening Torque 
Specified Electrical Value 	Specified Measurement Value 	Use Limit 	Test Run Adjustment 
Specified Part 			

The following symbols indicate a point to which lubrication oil, sealing agent or screw-locking agent is to be applied.

2 stroke Engine Oil 	Gear Oil 	ATF DEXRON III 	Waterproof Grease 
Low Temperature Resistant Lithium Grease 	Heat Resistant Grease 	Oil Compound [Shinetsu Silicon] S.O.C 	[Konishi Bond] • G17 
Adhesive [Three Bond®] • 7471 	Adhesive [Three Bond®] • 648 	Instant Adhesive [Three Bond®] • 1741 	Gasket Seal Agent [Loctite®] • 518 
Screw Lock Agent [Three Bond®] • 1342 	Screw Lock Agent [Three Bond®] • 1373B 		

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Service Information

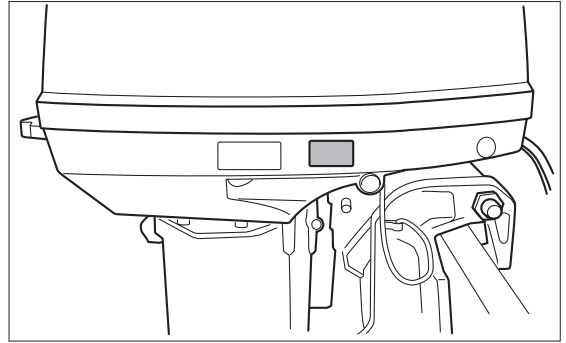
1. Identification (Engine Serial Number)

Engine serial number is stamped on the bottom cowl of outboard motor body.

- ① Model Name
- ② Model Type
- ③ Serial Number

Outboard Motor
② 3T5 (D50B2) ①
Rated Power: 36.8kW-5500r/min
Mass: 80 -108 kg
Serial No. XXXXXXXX ③

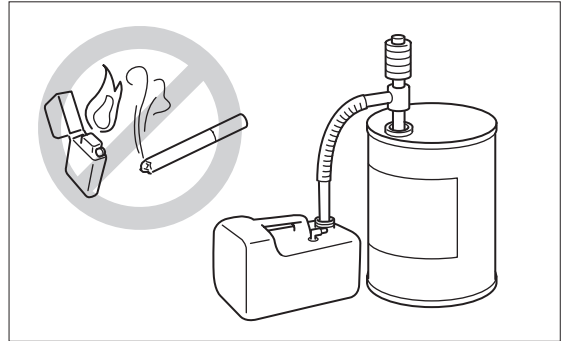
Made in Japan



2. Work Safety

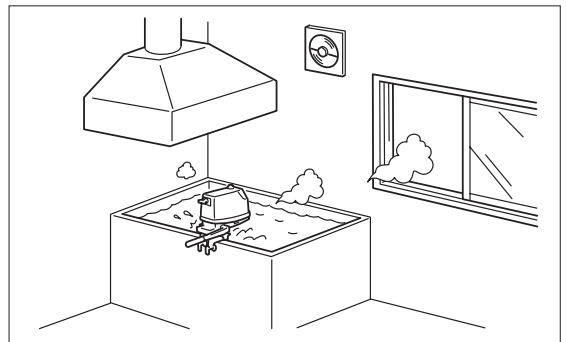
1) Fire Prevention

Gasoline is hazardous material and very flammable. Do not handle gasoline near ignition source such as spark or static electricity.



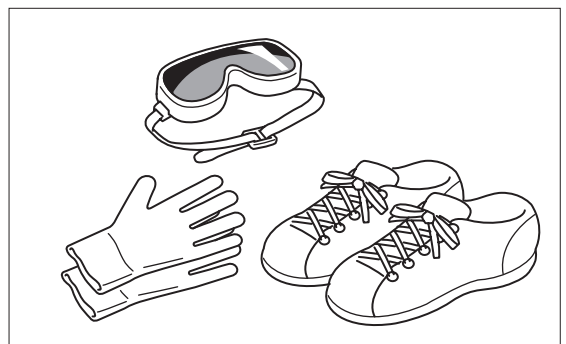
2) Ventilation

Exhaust gas or gasoline vapor is hazardous. Be sure to ventilate well when working indoors.



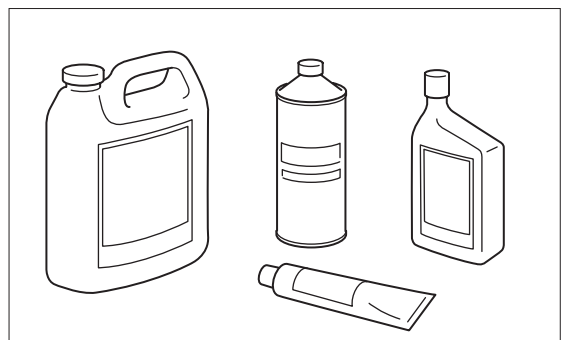
3) Protection

Wear a pair of goggles, working gloves and safety shoes to protect skin from chemicals and oils and eyes from particles generated by grinding or polishing. Avoid contact of oil, grease or sealing agent to the skin. In case of exposure to such matters, wash away with soap or warm water immediately.



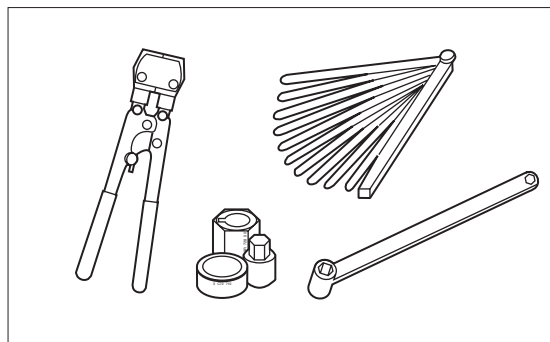
4) Genuine Parts

Use parts and/or chemicals that are genuine items or recommended.



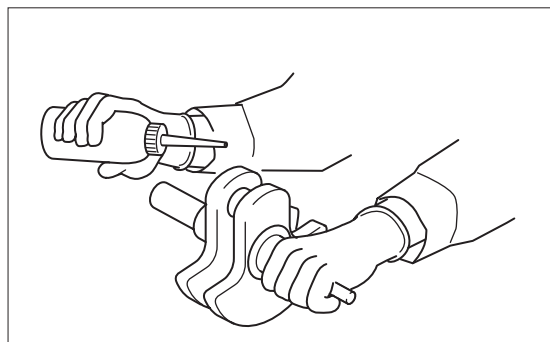
5) Tools

Use specified special tools to prevent damaging to parts and to perform work safely and surely. Be sure to follow installation procedures described in this manual and use tightening torque specified.



6) Recommendations on Service

Remove foreign substances and dirt from outboard motor and individual parts by cleaning. Apply recommended oil or grease to rotating areas and sliding surfaces. After individual assembly, always perform verifications such as ensuring smooth movement and sealing.

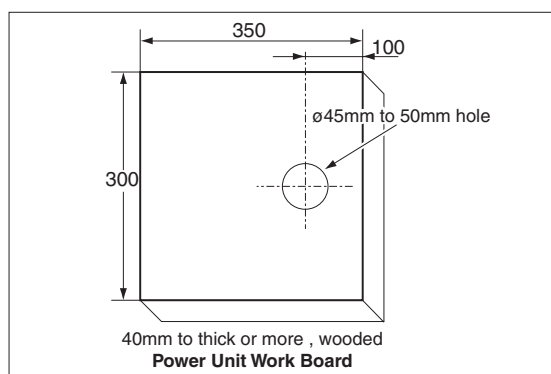
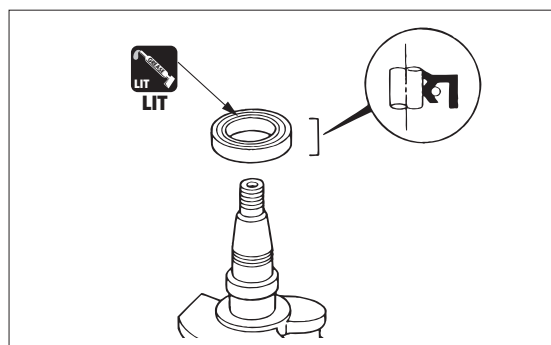
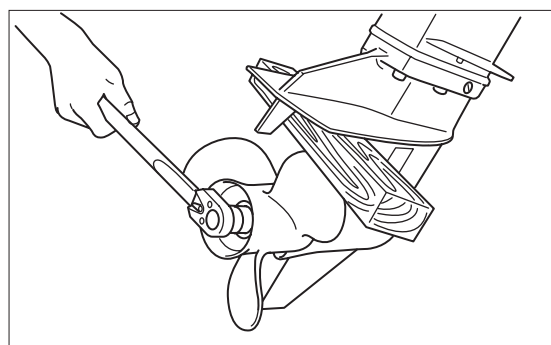
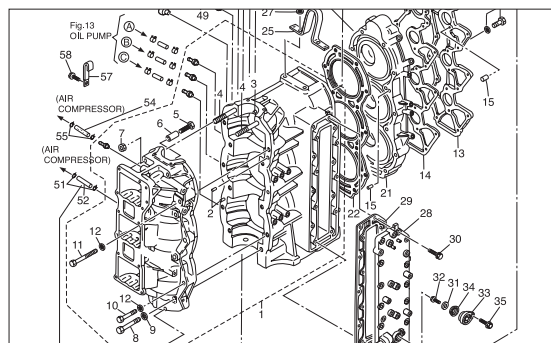
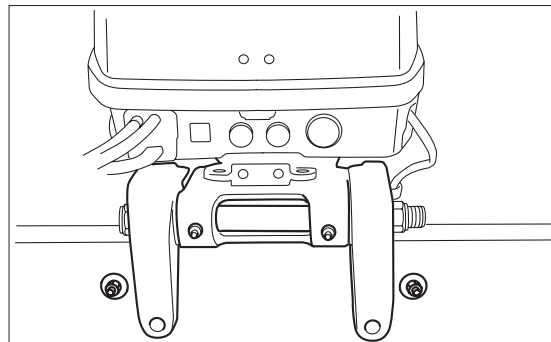




Service Information

7) Cautions in Disassembling and Assembling Components

- (1) Secure outboard motor to dedicated stand firmly.
- (2) Take special care not to scratch painted surfaces or mating surfaces of cylinder and crankcase.
- (3) Replace parts such as packings, gaskets, O rings, oil seals, spring pins or split pins with new ones after they are removed. Replace deformed snap rings with new ones.
- (4) When replacing parts, be sure to use genuine parts. For fluids such as gear oil, use genuine product.
- (5) Be sure to use special tools that are specified, and perform the work properly.
- (6) When reassembling parts, use their mating marks. For parts without mating marks, simple marking makes reassembling easier. Use applicable parts list for reference.
- (7) Clean individual parts that have been removed, and check their condition.
- (8) When assembling, be careful of the fit, repair limits, air-tightness, clogging of oil holes for oil feeding or greasing, packings, wirings, pipings and other detailed parts. For the components that use many bolts and nuts such as cylinder head or crank case, tighten the fasteners in the order shown by the numbers to prevent uneven tightening. If the numbers are not shown, tighten the fasteners in diagonal or clockwise order from inner ones to outer ones evenly to specified torque. In either case, tighten the fasteners to the specified torque in two or three steps. (Reverse the order when disassembling.)
- (9) When installing bearings, face the flat (numbered) side to the special assembling tool.
- (10) When installing oil seals, be careful not to scratch the surface of the lip that contacts with the shaft, and install them in correct orientation. Apply recommended grease to the lip before installation.
- (11) When applying liquid sealant, take care to use sparingly. Excessive application may be oozed out, adversely affecting interior of the crankcase. Use adhesive after thoroughly reading the instructions.
- (12) When servicing power unit, use of wooden work board makes the work easier.

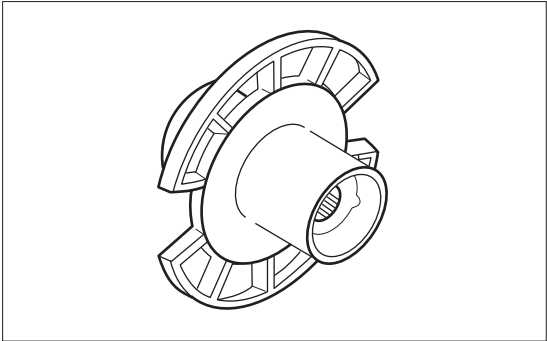


3. Tools and Instruments

1) Test Propeller

P/N. 3C8-64110-0
Outer diameter : 198mm
With : 20mm

Rotational speed at WOT (Wide Open Throttle) (r/min)
approximately 5,150 – 5,800



1

2) Measuring Instruments

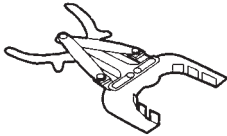
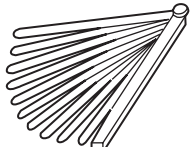
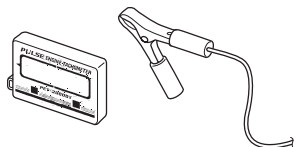
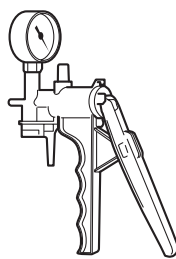
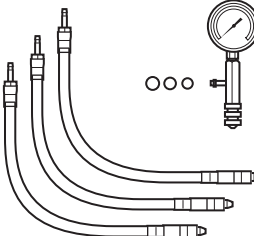
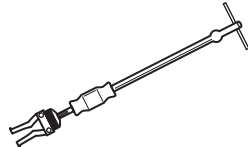
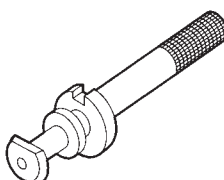
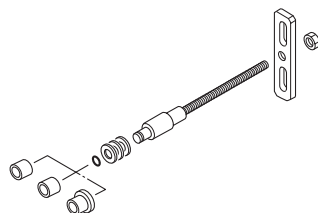
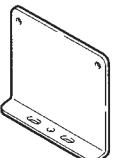
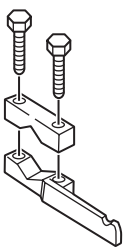
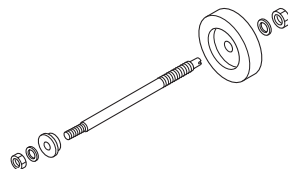

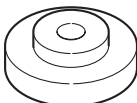
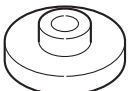

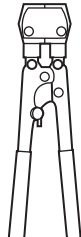
For the following measuring instruments, use commercially available ones.

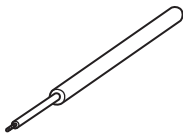
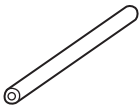
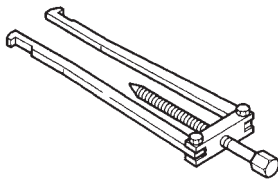
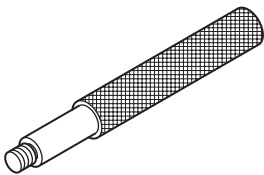

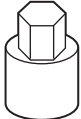
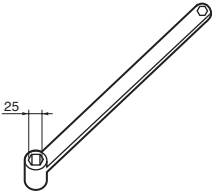
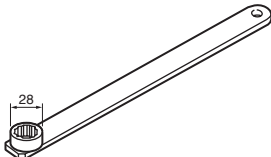
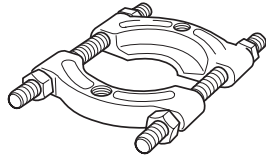
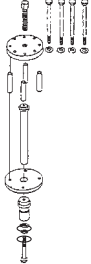
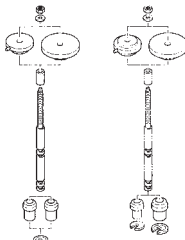
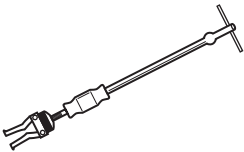
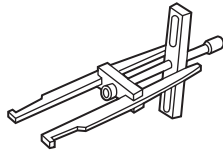
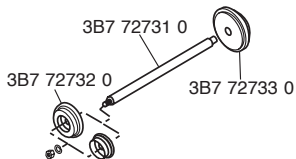
- Circuit tester (Resistance : 1Ω, 10Ω, 10 kΩ, AC voltage : 30 to 300V, DC voltage : 30V, Internal voltage 3V or less)
- Vernier calipers (M1 type, 300 mm)
- Micrometer (minimum graduation of 0.01, outer, 0 to 25 mm, 25 to 50 mm, 50 to 75 mm)
- Cylinder gauge (4 to 6 mm, 10 to 25 mm, 25 to 30 mm, 50 to 75 mm)
- Ring gauge (ø5.5, ø16, ø25, ø30, ø61)
- Dial gauge (minimum graduation of 0.01)
- Thickness gauge (0.03 to 0.3 mm)
- V block
- Surface plate (500 mm x 500 mm)
- Dial gauge magnet base or dial gauge stand



Service Information

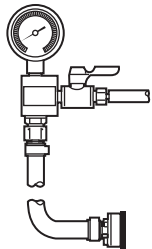
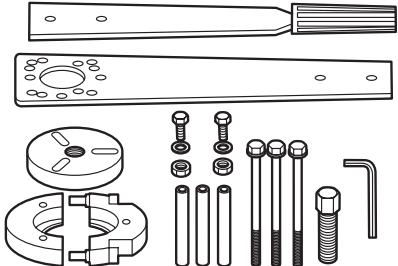
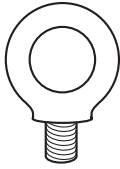
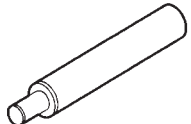
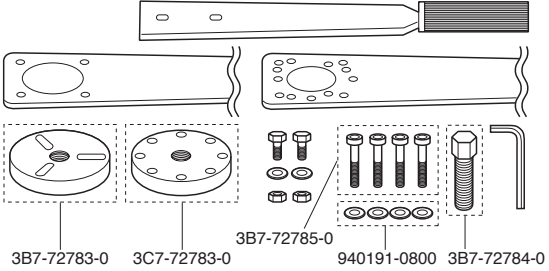

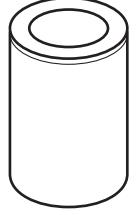
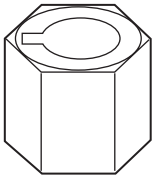
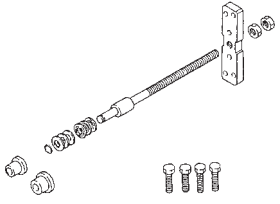
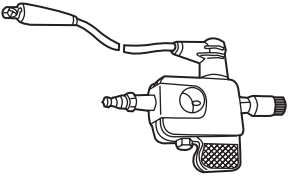
3) Special Tools

			
Piston Ring Tool P/N. 353-72249-0	Thickness Gauge P/N. 353-72251-0	Tachometer P/N. 3AC-99010-0	Vacuum/Pressure Gauge P/N. 3AC-99020-0
Removing or attaching piston rings	Measuring gaps	Measuring engine revolution speed	Inspecting pressure
			
Compression Gauge P/N. 3AC-99030-0	Slide Hammer Kit P/N. 3AC-99080-0	Shimming Gauge D40/50 P/N. 3C8 72250 0 WD50 P/N. 353 72250 0	Backlash Measuring Tool Kit D40/50:P/N. 3C8-72234-1
Measuring compression pressure	Removing forward (A) gear bearing outer race	Adjusting pinion (B) gear height	Measuring backlash between forward (A) gear and pinion (B) gear
			
Dial Gauge Plate P/N. 3B7-72729-0	Backlash Measuring Tool Clamp P/N. 3B7-72720-0	Backlash Measuring Tool Kit WD50:P/N. 3A3-72255-0	Piston Slider P/N. 3T5-72871-0
Used to attach dial gauge when measuring backlash	Measuring backlash	Measuring backlash between pinion (B) gear and reverse (C) gear	Assembling piston for air compressor
			
Oil Seal Attachment P/N. 3T1-99820-0	Bearing Attachment P/N. 3T1-99905-0	O Ring Set Tool (ø24) P/N. 3T5-72863-0	Clamp Pliers P/N. 3T5-72864-0
Attaching air compressor oil seal	Attaching air compressor bearing	Assembling O ring into fuel injector	Caulking clamps made by OETIKER

			
Spring Pin Tool A P/N. 345-72227-0 (ø3.0) P/N. 369-72217-0 (ø3.5)	Spring Pin Tool B P/N. 345-72228-0 (ø3.0) P/N. 369-72218-0 (ø3.5)	Propeller Shaft Housing Puller Ass'y P/N. 3A3-72259-0	Driver Rod P/N. 3AC-99702-0
Removing spring pin	Installing spring pin	Removing propeller shaft housing	Used in combination with center plate and various attachments
ø100 x ø79.5 x ø51.5 x ø61.5	ø31.5 x ø25 x H32		
Center Plate P/N. 3AC-99701-0	Roller Bearing Attachment D40/50 P/N. 3MC 99710 0 WD50 P/N. 3LC 99710 0	Bevel Gear Bearing Install Tool P/N. 3C8-72719-0	Drive Shaft Socket P/N. 346-72232-0
Removing or installing propeller shaft housing bearing	Used in combination with driver rod and center plate Attaching propeller shaft housing roller bearing	Installing forward (A) gear bearing	Removing or attaching pinion (B) gear nut
			
Bevel Gear B Nut Wrench D40/50:P/N. 346-72231-0	Bevel Gear B Nut Wrench WD50:P/N. 353-72231-0	Universal Puller Plate P/N. 3AC-99750-0	Roller Bearing Press Kit P/N. 3LC-72900-0
Removing or attaching pinion (B) gear nut	Removing or attaching pinion (B) gear nut	Removing reverse (C) gear bearing	Removing or attaching gear case roller bearing
			
Roller Bearing Puller Kit D40/50 P/N. 3C8 72700 0 WD50 P/N. 3B7 72700 0	Slide Hammer Kit P/N. 3AC-99080-0	Bevel Gear Bearing Puller Ass'y D40/50 P/N. 3A3 72755 0 WD50 P/N. 3B7 72755 0	Bearing Outer Press Kit P/N. 3B7-72739-1
Removing or attaching gear case and propeller shaft housing roller bearing	Removing forward (A) gear bearing outer race	Removing forward (A) gear bearing outer race	Attaching forward (A) gear bearing outer race



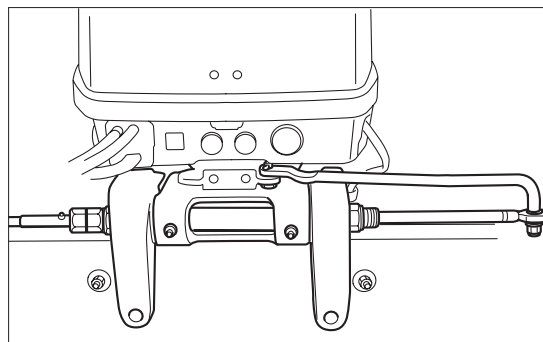
Service Information

		
Pressure Gauge Ass'y P/N. 3T5-72880-0	Drive Pulley Puller Ass'y P/N. 3T5-72890-0	Eye Bolt (Powerhead Lift Ring) P/N. 3T9-72212-0
Measuring air rail fuel pressure and air pressure	Removing of drive pulley	Used to hook power unit when hanging
	 <p>3B7-72783-0 3C7-72783-0 3B7-72785-0 940191-0800 3B7-72784-0</p>	ø51.5 x ø39.5 
Piston Pin Tool P/N. 345-72215-0	Flywheel Puller Kit P/N. 3T1-72211-0	Oil Seal Attachment P/N. 3U1-99820-0
Removing or attaching piston pin	Removing or attaching flywheel	Used to press-fit coil bracket oil seal
		
Drive Pulley Press P/N. 3T5-72868-0	Crankshaft Holder P/N. 3T5-72815-0	Backlash Measuring Tool A Kit WD50:P/N. 3B7-72234-0
Using for press fit drive pulley	Using for remove and tighten the drive pulley nut	Measuring backlash between forward (A) gear and pinion (B) gear
		
		Spark Tester P/N. 3F3-72540-0
		Checking sparks

4. Pre-delivery Inspection

1) Steering Handle

Check installation of drag link.



2) Gear Shift and Throttle

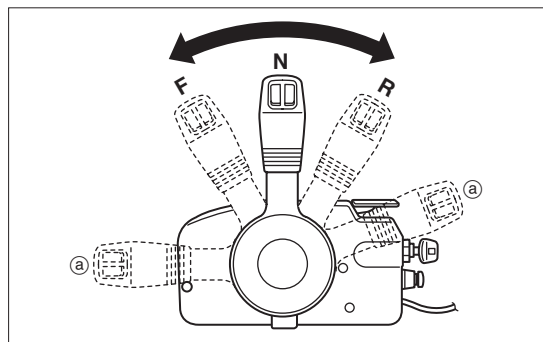
Remote Control Model

Shift into forward (F), back to neutral (N) and then shift into reverse (R) to check that the shift operations are smooth.

Then, set the lever to position ① to check that the throttle operations are smooth.

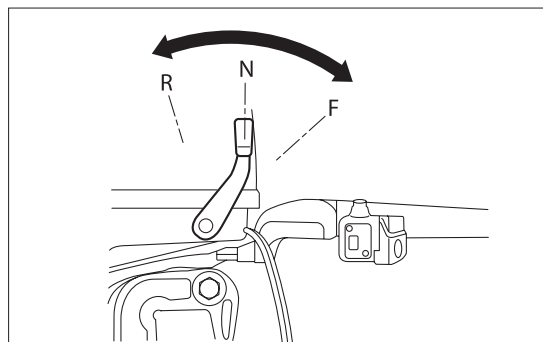


Rotate propeller to ensure shifting while engine is not running.

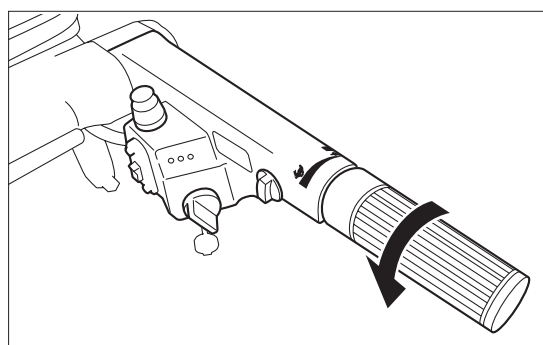


Tiller Handle Model

Shift into forward (F), back to neutral (N) and then shift into reverse (R) to check that the shift operations are smooth.



Turn the throttle grip full close to full open position to check that the throttle operations are smooth.





Service Information

3) Engine Oil

Supply engine oil.



Engine Oil :

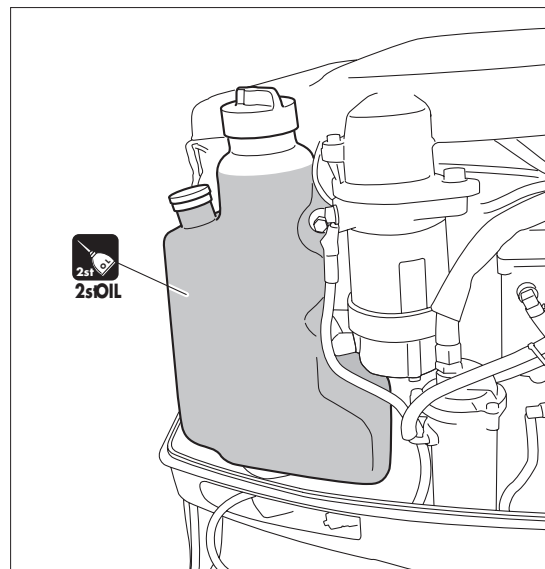
Genuine Oil

(Oil for two stroke direct injection engine recommended by the outboard manufacturer)



CAUTION

Engine oil is removed before shipment to prevent leakage during transportation.



4) Gear Oil

Full tilt down outboard motor to make it vertical, and then check gear oil quantity.



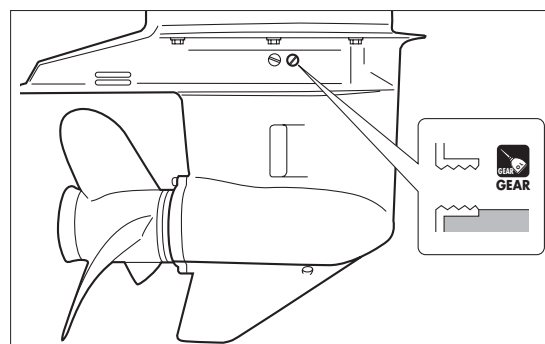
Gear Oil :

D30/40/50B2 : 500 cm³ (16.91 fl.oz)

WD50B2 : 700 cm³ (23.67 fl.oz)




Leaking of some oil from plug upper hole as plug is removed indicates that gear case is filled with specified quantity of gear oil.



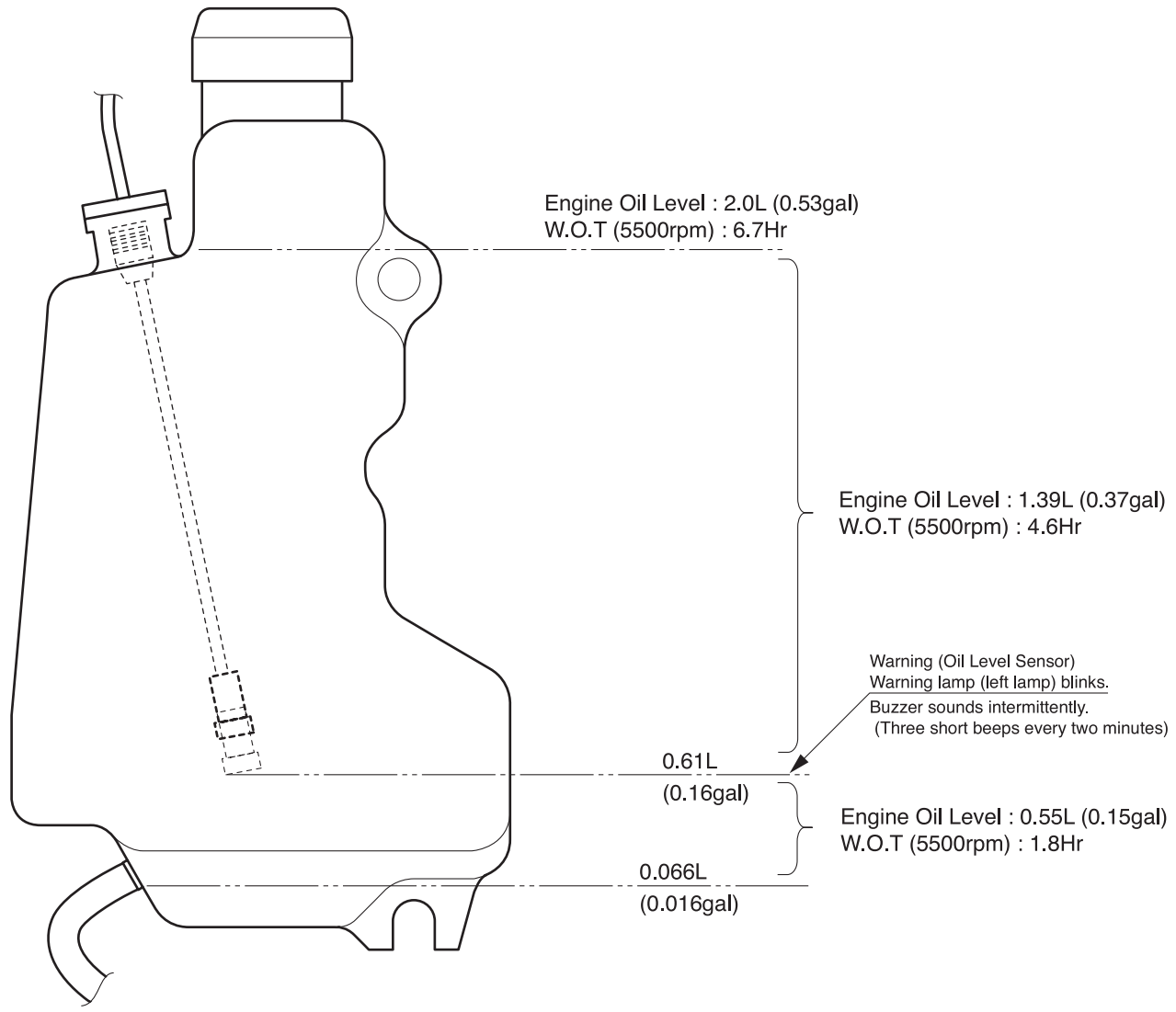
5) Check quantity of engine oil.

1. Set outboard motor to vertical position.
2. Check engine oil level.

 **Oil Tank Capacity :**
2.0L (0.53 gal)

 **Engine Oil :**
Genuine Oil
(Oil for two stroke direct injection engine
recommended by the outboard manufacturer)

⚠ CAUTION
**When quantity of fills below 1.1L (0.29gal),
oil warning lamp blinks and the buzzer
sounds three times successively every two
minutes.**





Service Information

6) Fuel Line

Check that fuel tank contains sufficient amount of gasoline, fuel line is connected and does not leak.

⚠ CAUTION

Supply only unleaded regular octane gasoline (Pump posted 87 Octane / Research octane rating of 91 or higher) into fuel tank. Never use fuel mixed with oil. Use of fuel mixed with engine oil will cause engine trouble.

7) Installation of Outboard Motor (Rigging)

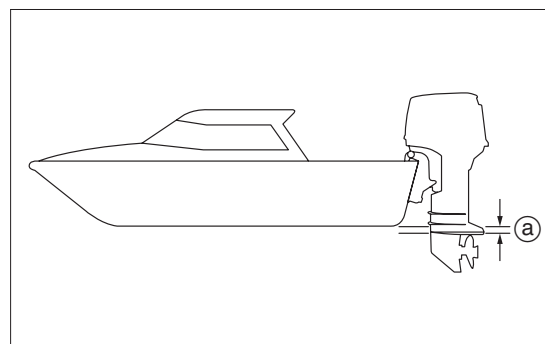
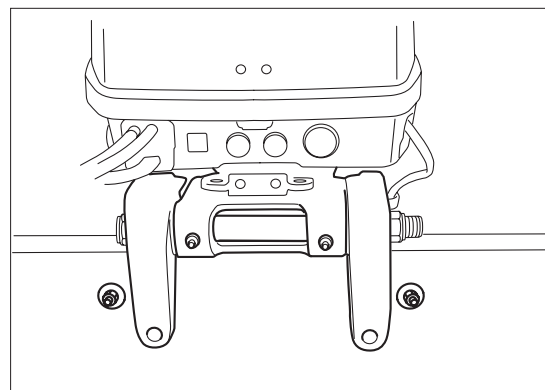
Check that outboard motor is fixed on the hull with installation bolts and nuts securely (For tiller handle model : Tighten the clamp screw too.). Check location of anti-ventilation plate relative to boat bottom.



Test-run to determine the best installation height.



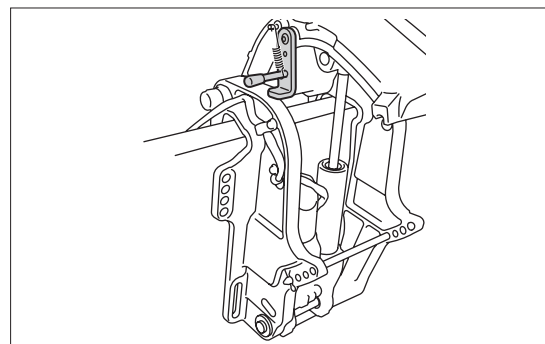
Anti-ventilation plate standard position (a) :
10 - 30 mm (0.4 - 1.2 in) below boat bottom



(a) 10 - 30 mm (0.4 - 1.2 in)

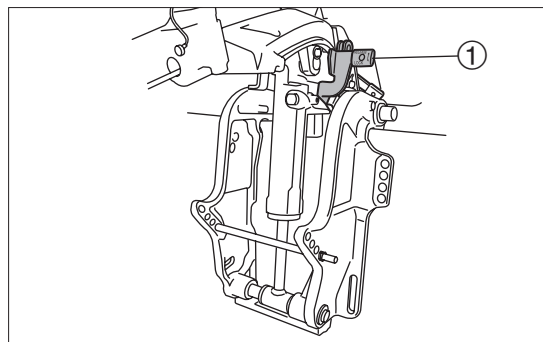
8) Inspection of PTT Unit

1. Operate PTT switch to check that outboard motor tilts up/down smoothly.
2. Operate PTT switch to check that tilting up/down outboard makes no abnormal noise.
3. Tilt up outboard motor and steer fully to the right and left to check that cables and hoses do not interfere with each other and with any part of hull.
4. Tilt outboard motor down to check that trim meter indicates the lowest position.



9) Inspection of Gas Shock Absorber

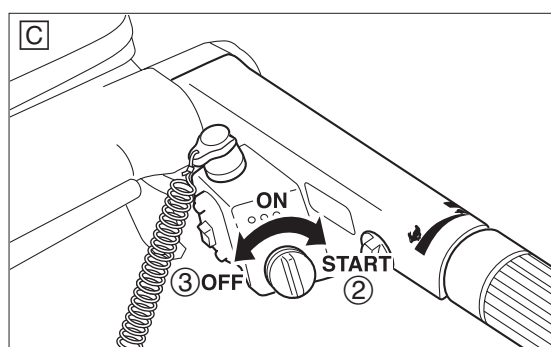
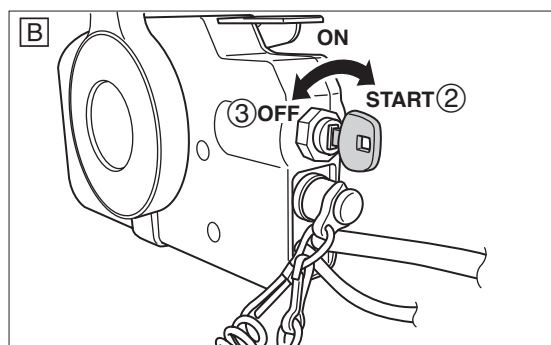
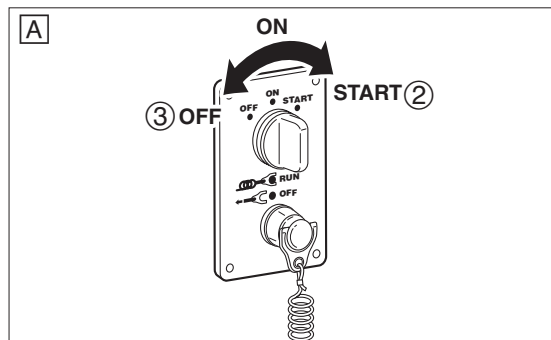
1. Check that outboard motor tilts up/down smoothly.
2. Tilt up outboard motor and lock it with tilt lock lever ① to check that gas assisted holding mechanism functions normally.



10) Inspection of Start Switch and Stop switch

1. Turn main switch to START ② to check that engine starts.
2. Turn main switch to OFF ③ to check that engine stops.

- [A] Switch Panel Model
- [B] Remote Control Model
- [C] Tiller Handle Model

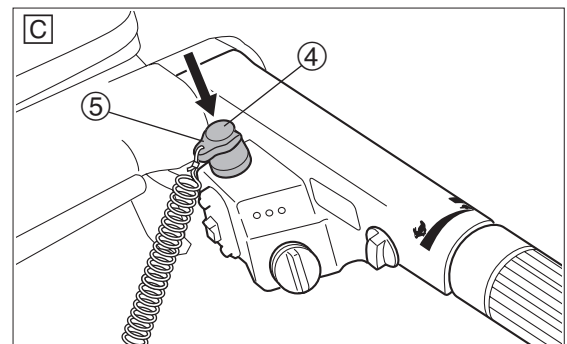
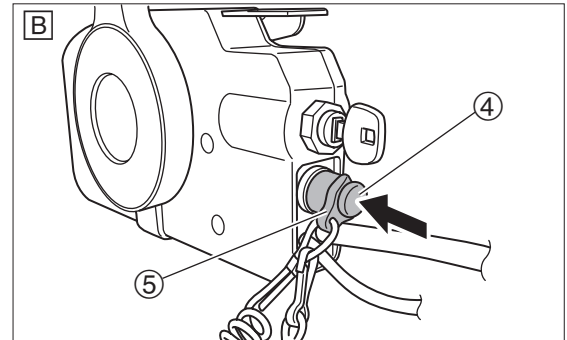
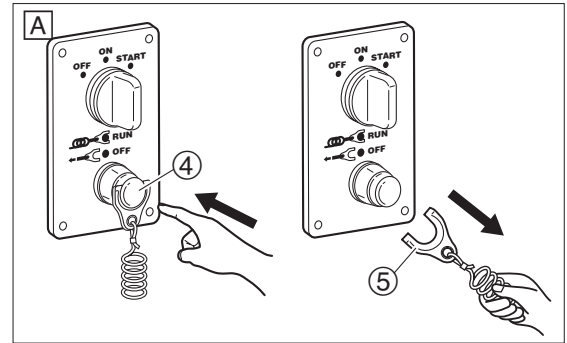




Service Information

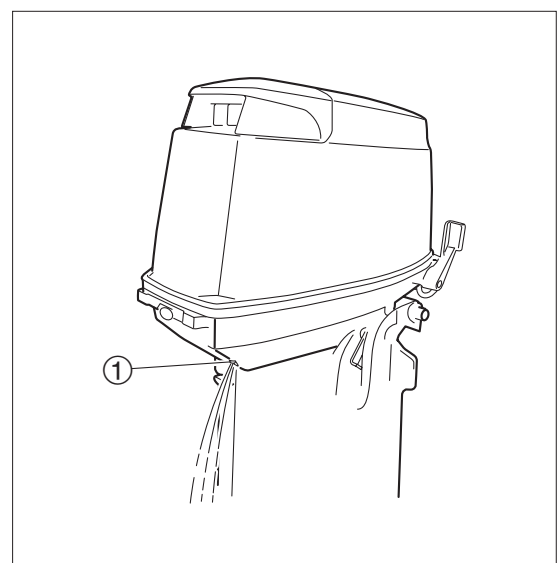
3. Press stop switch ④ hard or pull out lock plate ⑤ from stop switch ④ to check that engine stops.

- A Switch Panel Model
- B Remote Control Model
- C Tiller Handle Model




11) Cooling Water Check Port


Check that cooling water check port ① discharges water during engine operation.

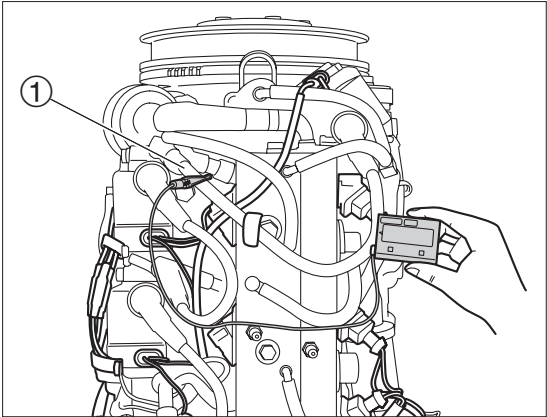


12) Idling

After engine has warmed up, use tachometer to check idle speed is as specified, using key switch depression.

**Idle Speed :**
700 800 900 r/min


**Tachometer :**
P/N. 3AC-99010-0




① High tension cord

13) Propeller Selection

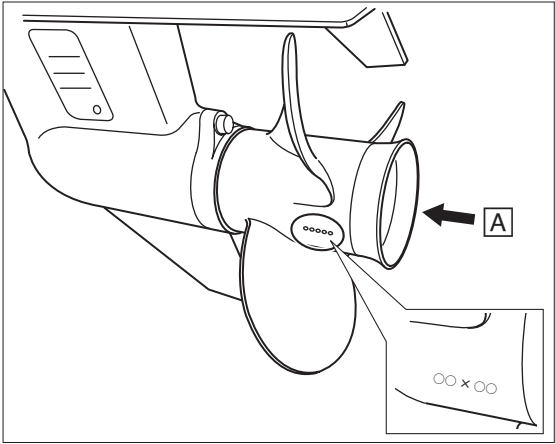
Select a propeller that is best-suited to type of boat and application.

**Range of operating engine speed at WOT* :**
5,150 - 5,850 r/min

 *WOT: Wide Open Throttle

CAUTION

Miss-selection of propeller can cause adverse effects on engine life, fuel consumption, etc. as well as on performance.



Propeller (No. of Blades x Diameter x Pitch) [in/mm]	D30/40/50B2	7P	(4×11.4×7)	[4×290×180]
		9P	(3×12.2×9)	[3×311×229]
		11P	(3×11.4×11)	[3×290×279]
		12P	(3×11.1×12)	[3×283×305]
		13P	(3×10.9×13)	[3×277×330]
		14P	(3×11.0×14)	[3×279×356]
		15P	(3×10.9×15)	[3×278×381]
	WD50B2	9P	(3×12.0×9)	[3×305×229]
		10P	(3×11.5×10)	[3×292×254]
		11P	(3×11.5×11)	[3×292×279]
		12P	(3×11.6×12)	[3×295×305]
		13P	(3×11.5×13)	[3×292×330]
		14P	(3×11.4×14)	[3×289×355]
		15P	(3×11.0×15)	[3×280×381]
		16.5P	(3×10.7×16.5)	[3×273×417]
		17.5P	(3×10.9×17.5)	[3×276×447]



Service Information

14) Trim Tab

Adjustment of trim tab angle

After installing outboard motor on the boat, use trim tab to achieve balance between port and starboard steering loads. Loosen trim tab nut ②, adjust angle of trim tab ① as described below, and then tighten the nut to specified torque.



Trim Tab Nut ② :

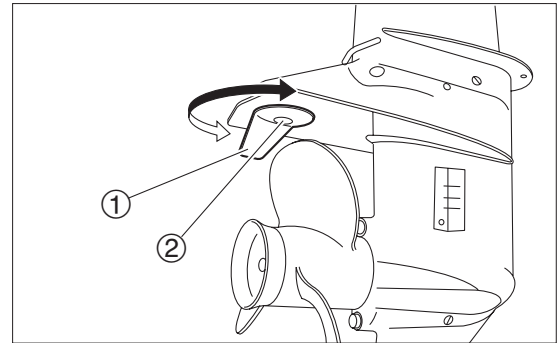
13 N · m (9 lb · ft) [1.3 kgf · m]

Example of Adjustment

- A** If it is necessary to steer to starboard to make boat run straight or if boat steers itself to port when steering is held amidships, move trailing edge of trim tab to port side, or
- B** If it is necessary to steer to port to make boat run straight or if boat steers itself to starboard when steering is held amidships, move trailing edge of trim tab to starboard side.

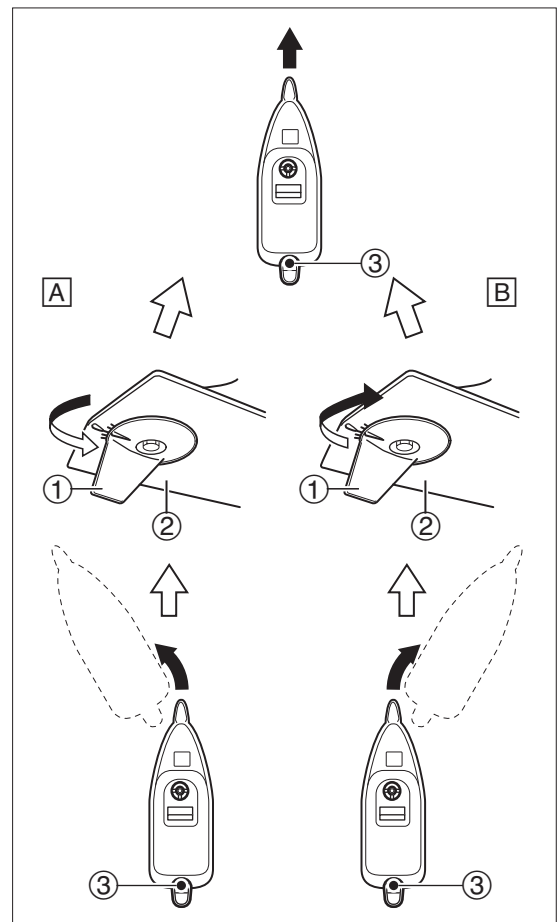


Change trim tab angle a little for each test run and repeat the process several times until the best position is found.



② Trim Tab

Do not reuse.



① Trim Tab

② Anti Ventilation Plate

③ Steering Pivot (Swivel Shaft)

5. Break-In Operation

Break-in operation is needed for the purpose of smoothening sliding surfaces between components such as pistons, piston rings, piston pins, cylinder, and gears.

Break-In Operation...10 Hours

Time	0	10 minutes	2 hours	3 hours	10 hours
Method of break-in operation	Trolling or idling	Throttle Opening 1/2 of WOT at approximately 3 000 r/min	Throttle Opening 3/4 of WOT at approximately 4 000 r/min	Throttle Opening 3/4 of WOT at approximately 4 000 r/min	Regular operation

▽
Run at the lowest speed

▽Running at WO or one minute every 10 minutes is acceptable

▽Running at WO or short period is acceptable

6. Test Run

1. Start engine and check if gear shift can be made smoothly.
2. After warming up the engine, read tachometer to check idling engine speeds specified below.



Idling Engine Speeds :

700 · 800 · 900 r/min



Tachometer :

P/N. 3AC-99010-0

3. Shift gear into forward (F) and at idle slow for approximately 10 minutes.



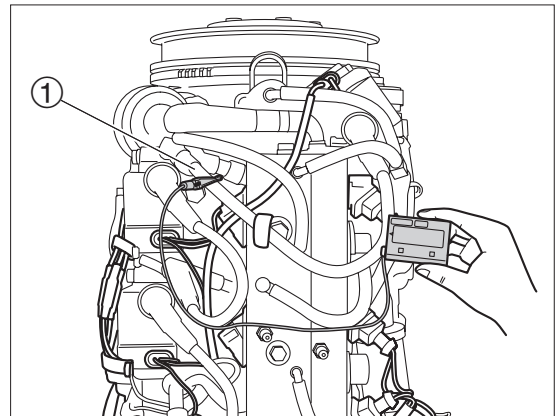
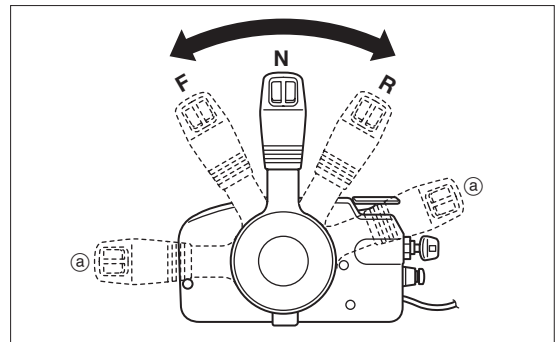
Trolling Engine Speeds :

700 · 800 · 900 r/min

4. Run at 3,000 r/min or half of WOT for initial 2 hours, then at 4,000r/min or 3/4 of WOT for 1 hour.
5. Check that shifting into reverse (R) will not tilt up outboard motor and allow water to run into boat.



Complete test run during break-in operation.



① High Tension Cable

7. Checks After Test Run

1. Check that no water is present in gear oil.



Gear oil turns to creamy white if mixed with water invading into gear case.

2. Check that no fuel leaks in the cowl.
3. Check that no oil and water leak in the cowl and no water is present in engine oil.
4. After test run, use flushing kit or flushing attachment and fresh water to wash cooling water path by idling engine.
<Refer to "Flushing with Water" in Chapter 3.>



Service Information

2

Service Data

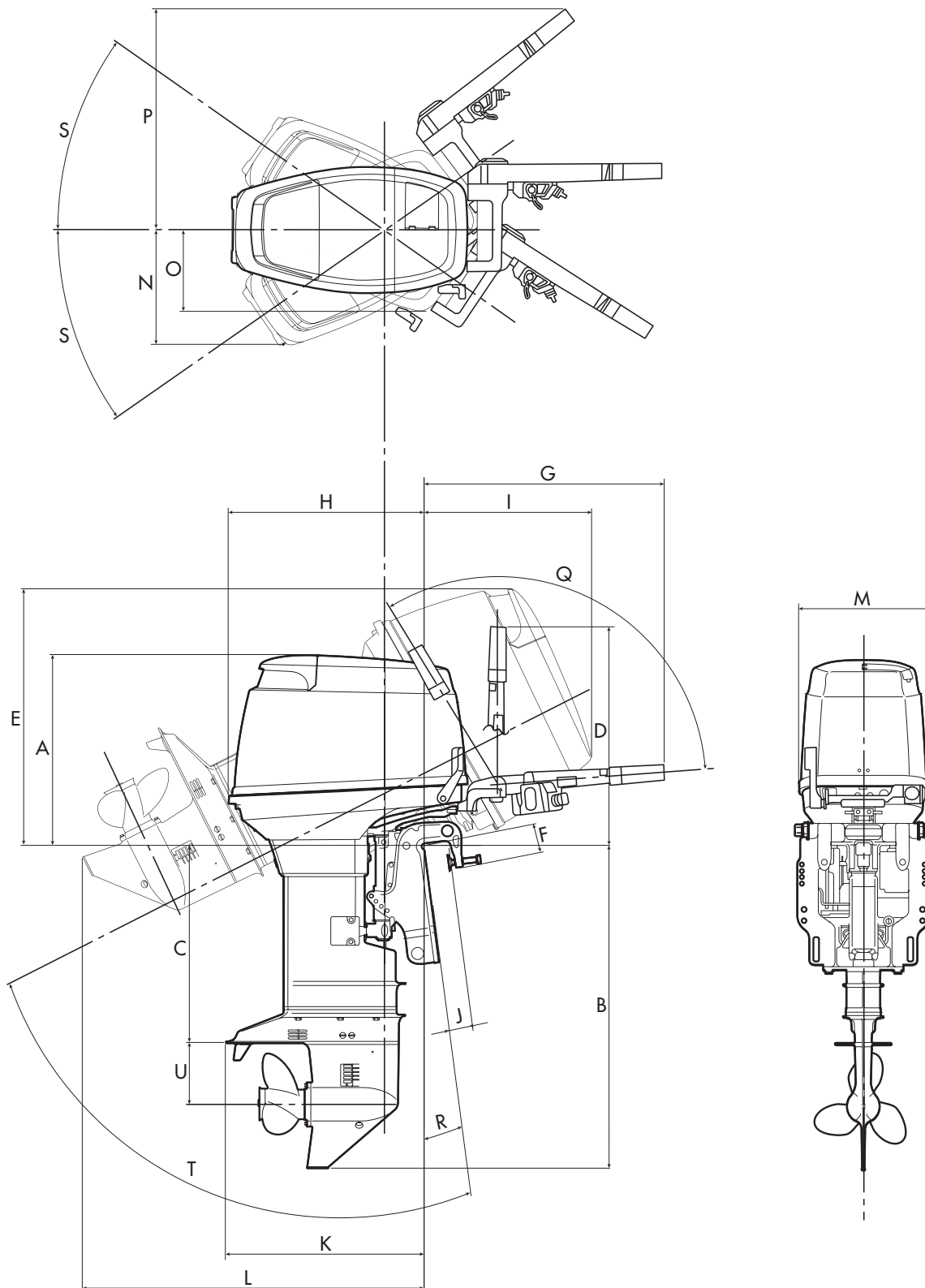


1. Outboard Dimensions	2-2	4. Maintenance Data	2-14
1) Body dimensions	2-2	5. Torque Specifications	2-20
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1. Outboard Dimensions

1) Body dimensions



Item	Type	Unit	EFTO		EFO	
			mm	in	mm	in
A		mm/in	499	19.65	499	19.65
B	S	mm/in	728	28.66	728	28.66
	L	mm/in	855	33.66	855	33.66
	UL	mm/in	982	38.66	982	38.66
C	S	mm/in	403	15.87	403	15.87
	L	mm/in	530	20.87	530	20.87
	UL	mm/in	657	25.87	657	25.87
D		mm/in	550	21.65	550	21.65
E		mm/in	680	26.77	680	26.77
F		mm/in	78	3.07	85	3.35
G		mm/in	600	23.62	600	23.62
H		mm/in	520	20.47	520	20.47
I		mm/in	429	16.89	440	17.32
J		mm/in	31–70	1.22–2.76	31–70	1.22–2.76
K		mm/in	490	19.29	490	19.29
L	S	mm/in	789	31.06	800	31.50
	L	mm/in	901	35.47	910	35.83
	UL	mm/in	1013	39.88	1025	40.35
M		mm/in	384	15.12	384	15.12
N		mm/in	310	12.20	324	12.76
O		mm/in	235	9.25	225	8.86
P		mm/in	565	22.24	587	23.11
Q		deg.	120		120	
R		deg.	12		12	
S		deg.	35		40	
T		deg.	74		75	
U		mm/in	161	6.34	161	6.34
Trim Angle (Position)		deg.	8–28 (4)		4–24 (4)	

Item	Type	Unit	EPTO		EPO		WD50 EPTO	
			mm	in	mm	in	mm	in
A		mm/in	499	19.65	499	19.65	499	19.65
B	S	mm/in	728	28.66	-	-	-	-
	L	mm/in	855	33.66	855	33.66	920	36.22
	UL	mm/in	982	38.66	-	-	1047	41.22
C	S	mm/in	403	15.87	-	-	-	-
	L	mm/in	530	20.87	530	20.87	554	21.81
	UL	mm/in	657	25.87	-	-	681	26.81
E		mm/in	680	26.77	680	26.77	680	26.77
F		mm/in	78	3.07	85	3.35	78	3.07
H		mm/in	520	20.47	520	20.47	520	20.47
I		mm/in	429	16.89	440	17.32	429	16.89
J		mm/in	31–70	1.22–2.76	31–70	1.22–2.76	31–70	1.22–2.76
K		mm/in	490	19.29	490	19.29	550	21.65
L	S	mm/in	789	31.06	-	-	-	-
	L	mm/in	901	35.47	910		971	38.23
	UL	mm/in	1013	39.88	-	-	1083	42.64
M		mm/in	345	13.58	345	13.58	345	13.58
N		mm/in	310	12.20	324	12.76	310	12.20
O		mm/in	235	9.25	225	8.86	235	9.25
R		deg.	12		12		12	
S		deg.	35		40		35	
T		deg.	74		75		74	
U		mm/in	161	6.34	161	6.34	189	7.44
Trim Angle (Position)		deg.	8–28 (4)		4–24 (4)		8–28 (4)	

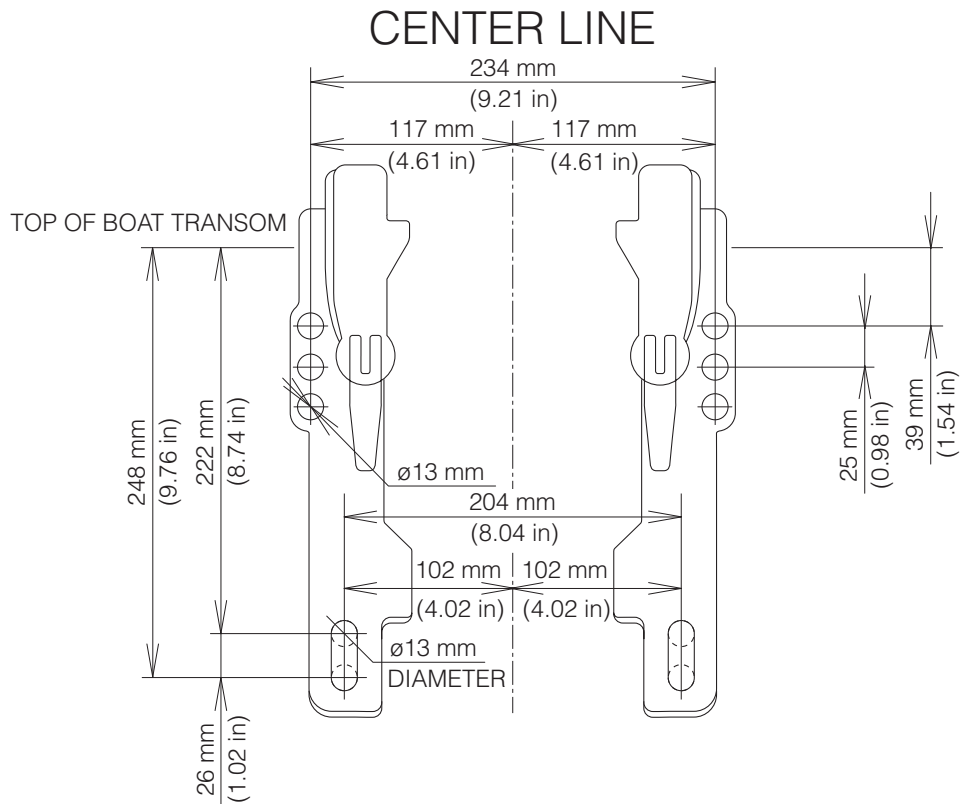


Service Data

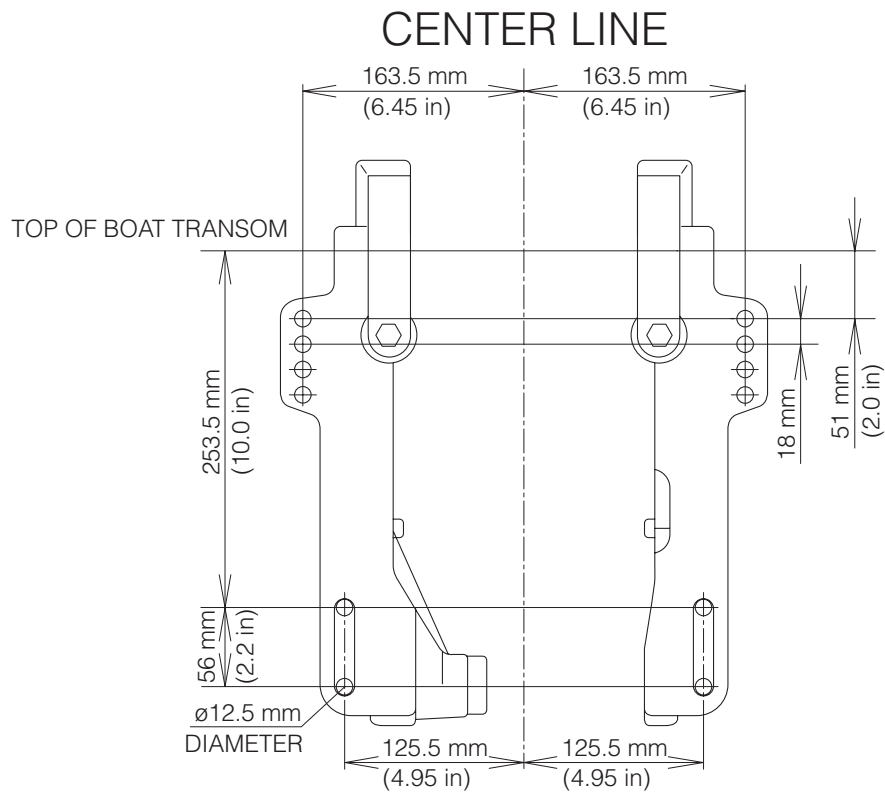
2) Clamp Dimensions

Template on page 11-13

Manual Tilt Model

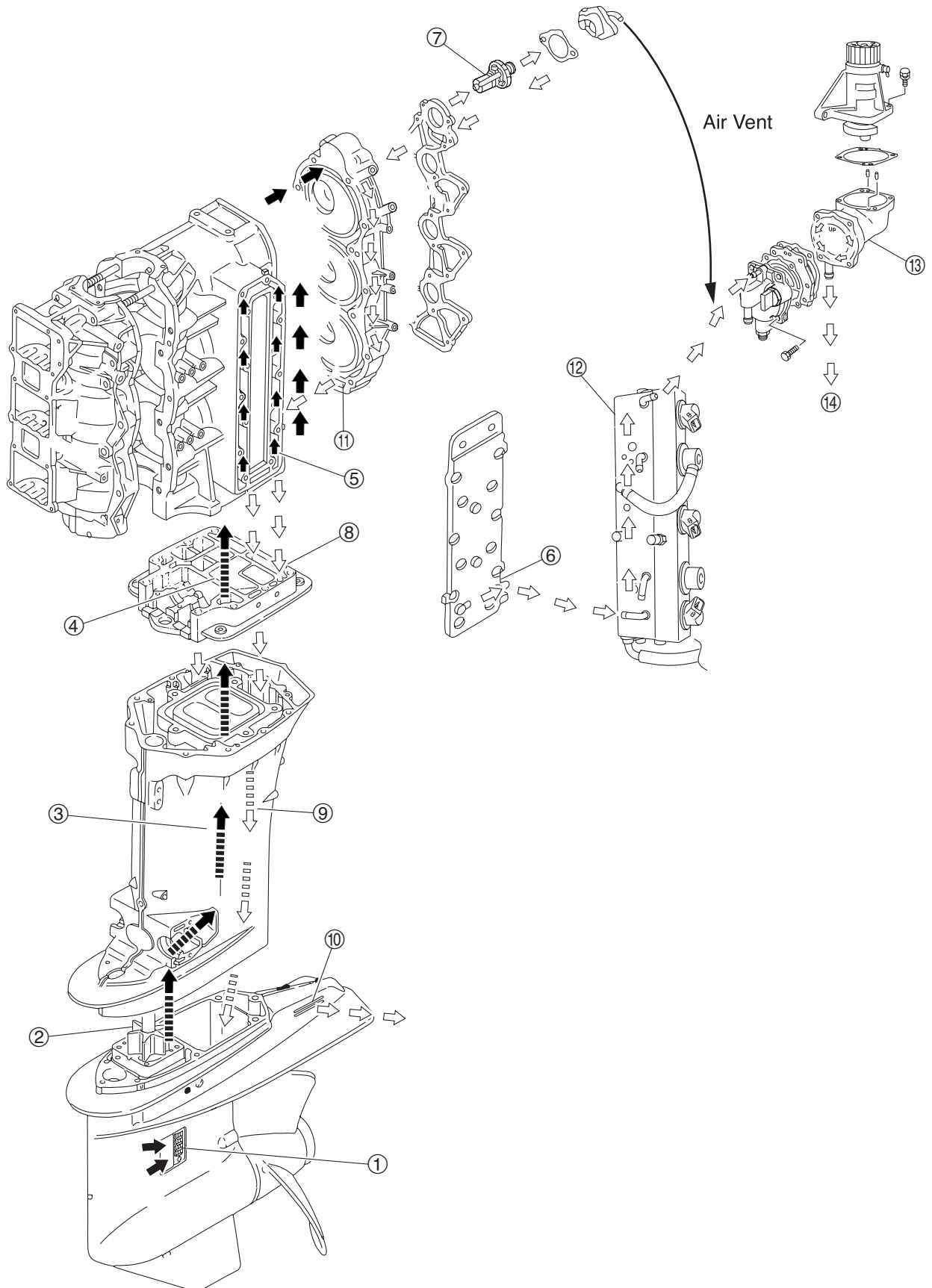


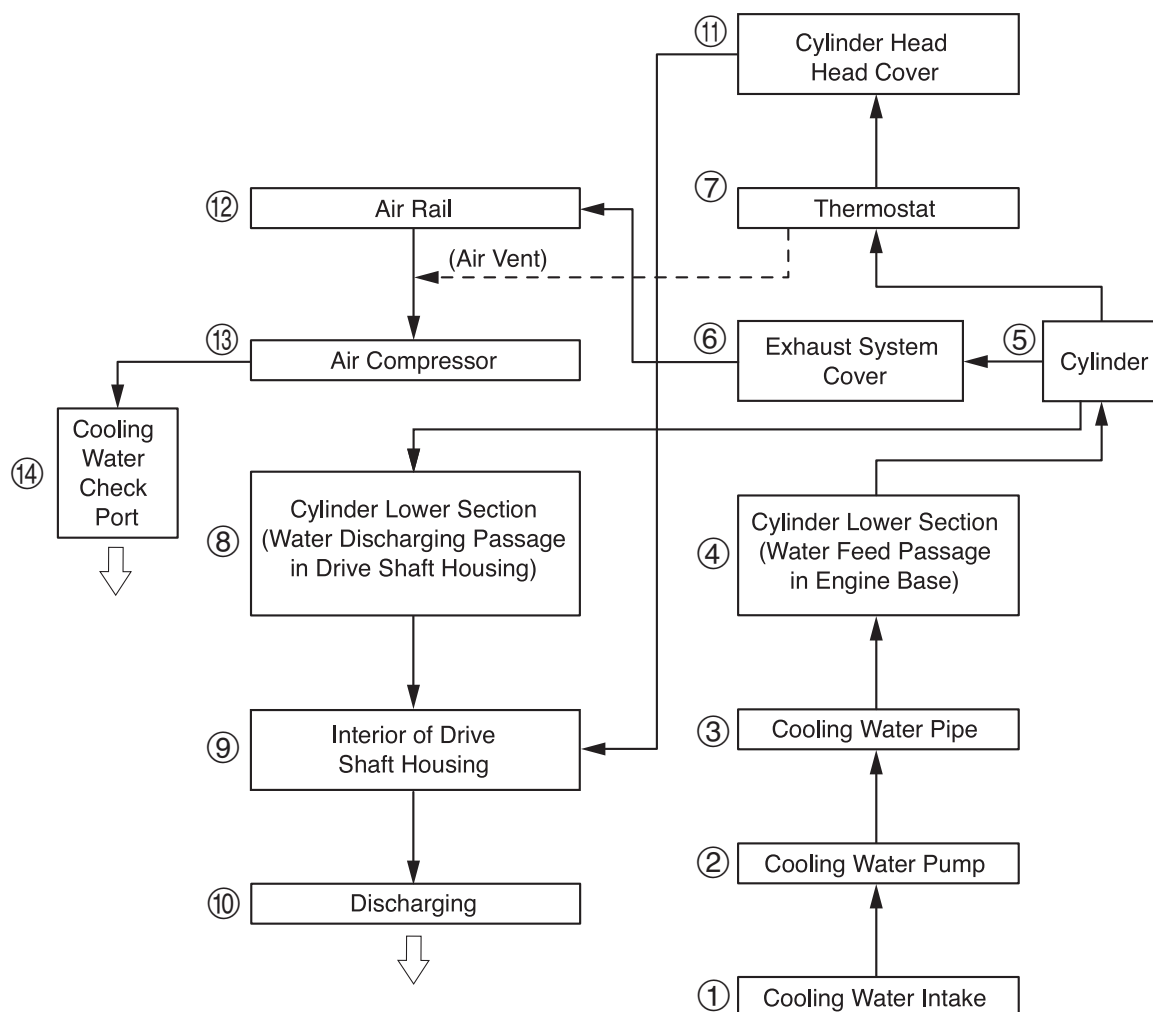
PTT/Gas Assist Model





2. Cooling Water System Diagram







3. Specifications

Item	Unit	Model		
		D40B2		D50B2
		EPTO	EFTO	EFO

Dimensions (Approximate)

Overall length		mm (in)	630 (24.80)	1,120 (44.09)
Overall width		mm (in)	345 (13.58)	384 (15.12)
Overall height	S	mm (in)	1,227 (48.31)	
	L	mm (in)	1,354 (53.31)	
	UL	mm (in)	1,481 (58.31)	
Transom length	S	mm (in)	403 (15.87)	
	L	mm (in)	530 (20.87)	
	UL	mm (in)	657 (25.87)	

Weight (Approximate)

	S	kg (lb)	93.5 (206)	96.5 (213)	88.5 (195)
	L	kg (lb)	94.5 (208)	97.5 (215)	89.5 (197)
	UL	kg (lb)	97 (214)	100 (221)	92 (203)

Performance

Maximum output		kW (ps)	29.4 (40)	36.8 (50)
W.O.T		r/min	5,150 – 5,850	
Full-throttle fuel consumption (approx.)		L (gal.)/hr	15 (3.96)	16.5 (4.36)
Idling Revolution (at [N] shift)		r/min	700/800/900 (3stages variable)	
Trolling Revolution (at [F] shift)		r/min	700/800/900 (3stages variable)	

Power Unit

Engine type			2-stroke gasoline engine direct injection (TLDI)	
No. of cylinders			3	
Piston displacement		cm³ (cu in)	697 (42.5)	
Bore & Stroke		mm (in)	68×64 (2.68×2.52)	
Compression ratio			7.2 : 1	
Compression			Refer : 0.83 MPa (120 psi) [8.5 kgf · cm²]	
Starting system			Electric starter motor	
Lubrication system			Oil injection	
Lubricant Control			Mechanical	
Water temp. control			Thermostat (with pressure relief valve)	
Ignition timing control			ECU	
Cooling system			Water-cooling	
Intake system			Reed valve	
Scavenging system			5-port loop Charge	
Exhaust system			Through hub	
Ignition system			Inductive ignition	
Firing order			1-2-3	
Spark plug			NGK IZFR6J	
Alternator			12V 280W (MAX.)	
Battery			12V 100 more than 120AH (850 – 1000 C.C.A)	

Item	Unit	Model		
		D40B2		D50B2
		EPTO	EFTO	EFO

Fuel and Oil

Type of Fuel			Unleaded Gasoline(Reserch Octane Number 90 or over, Pump posted Octane Number 87 or over)
Engine oil	Type		Genuine Oil (Oil for two stroke direct injection engine recommended by the outboard manufacturer)
	Quantity	L (gal)	2.0L (0.53 us gal)
Gear oil	Type		Hypoid Gear Oil
	Grade	*1 API	GL-5
		*1 SAE	#80 – #90
	Quantity	cm ³ (fl.oz)	500 (16.91)

Lower Unit

Gear Shift			F – N – R
Gear Ratio			1 : 1.85 (13 : 24)
Type of Gear			Spiral Bevel Gear
Type of Clutch			Dog Clutch
Propeller Shaft Driving Method			Spline
Propeller Rotation			Clockwise at forward (F) shift as view from rear
Propeller			7P, 9P, 11P, 12P, 13P, 14P, 15P

Bracket

Throttle Control			Remote Control	Tiller Handle
Trim Steps.		Steps	4	6
Trim Angle (Transom 12°)	*2	Degrees	8-28	4-24
Shallow Water Drive Angle (Transom 12°)	*2	Degrees	Adjustable	
Max. Tilt Angle	*3	Degrees	74	75
Steering Angle	*4	Degrees	70	80
Allowable Transom Board Thickness		mm (in)	31 – 70 (1.22 – 2.76)	

*1 To fit both API and SAE requirements.

*2 Angle with reference to horizontal propeller shaft when transom angle is 12 degrees

*3 Tilt operation range

*4 Angle between full starboard and port steering.



Service Data

Item	Unit	Model				
		D40B2Z			WD50B2	
		EPTO	EFTO	EFO	EPTO	EFTO

Dimensions (Approximate)

Overall length		mm (in)	630 (24.80)	1,120 (44.09)	630 (24.80)	1,120 (44.09)
Overall width		mm (in)	345 (13.58)	384 (15.12)	345 (13.58)	384 (15.12)
Overall height	S	mm (in)	1,227 (48.31)		—	
	L	mm (in)	1,354 (53.31)		1,374 (54.1)	
	UL	mm (in)	1,481 (58.31)		1,501 (59.1)	
Transom length	S	mm (in)	403 (15.87)		—	
	L	mm (in)	530 (20.87)		550 (21.7)	
	UL	mm (in)	657 (25.87)		677 (26.7)	

Weight (Approximate)

	S	kg (lb)	93.5 (206)	96.5 (213)	88.5 (195)	—	
	L	kg (lb)	94.5 (208)	97.5 (215)	89.5 (197)	100.5 (221)	103.5 (228)
	UL	kg (lb)	97 (214)	100 (221)	92 (203)	101.5 (224)	104.5 (230)

Performance

Maximum output		kW (ps)	29.4 (40)	36.8 (50)
W.O.T		r/min	5,150 – 5,850	
Full-throttle fuel consumption (approx.)		L (gal.)/hr	15 (3.96)	16.5 (4.36)
Idling Revolution (at [N] shift)		r/min	700/800/900 (3stages variable)	
Trolling Revolution (at [F] shift)		r/min	700/800/900 (3stages variable)	

Power Unit

Engine type			2-stroke gasoline engine direct injection (TLDI)				
No. of cylinders			3				
Piston displacement		cm³ (cu in)	697 (42.5)				
Bore & Stroke		mm (in)	68×64 (2.68×2.52)				
Compression ratio			7.2 : 1				
Compression			Refer : 0.83 MPa (120 psi) [8.5 kgf · cm²]				
Starting system			Electric starter motor				
Lubrication system			Oil injection				
Lubricant Control			Mechanical				
Water temp. control			Thermostat (with pressure relief valve)				
Ignition timing control			ECU				
Cooling system			Water-cooling				
Intake system			Reed valve				
Scavenging system			5-port loop Charge				
Exhaust system			Through hub				
Ignition system			Inductive ignition				
Firing order			1-2-3				
Spark plug			NGK IZFR6J				
Alternator			12V 280W (MAX.)				
Battery			12V 100 more than 120AH (850 – 1000 C.C.A)				

Item	Unit	Model				
		D40B2Z			WD50B2	
		EPTO	EFTO	EFO	EPTO	EFTO

Fuel and Oil

Type of Fuel			Unleaded Gasoline(Reserch Octane Number 90 or over, Pump posted Octane Number 87 or over)			
Engine oil	Type			Genuine Oil (Oil for two stroke direct injection engine recommended by the outboard manufacturer)		
	Quantity		L (gal)	2.0L (0.53 us gal)		
Gear oil	Type			Hypoid Gear Oil		
	Grade	*1	API	GL-5		
		*1	SAE	#80 – #90		
	Quantity		cm ³ (fl.oz)	500 (16.91)		700 (23.67)

Lower Unit

Gear Shift			F – N – R	
Gear Ratio			1 : 1.85 (13 : 24)	1 : 1.917 (12 : 23)
Type of Gear			Spiral Bevel Gear	
Type of Clutch			Dog Clutch	
Propeller Shaft Driving Method			Spline	
Propeller Rotation			Clockwise at forward (F) shift as view from rear	
Propeller			7P, 9P, 11P, 12P, 13P, 14P, 15P	9P, 10P, 11P, 12P, 13P, 14P, 15P, 16.5P, 17.5P

Bracket

Throttle Control			Remote Control	Tiller Handle	Remote Control	Tiller Handle
Trim Steps.		Steps	4	6	4	
Trim Angle (Transom 12°)	*2	Degrees	8-28	4-24	8-28	
Shallow Water Drive Angle (Transom 12°)	*2	Degrees	Adjustable			
Max. Tilt Angle	*3	Degrees	74	75	74	
Steering Angle	*4	Degrees	70	80	70	
Allowable Transom Board Thickness		mm (in)	31 – 70 (1.22 – 2.76)			

*1 To fit both API and SAE requirements.

*2 Angle with reference to horizontal propeller shaft when transom angle is 12 degrees

*3 Tilt operation range

*4 Angle between full starboard and port steering.



Service Data

Item	Unit	Model		
		D50B2	D30B2	
		EPOL	EPTO	EFTO

Dimensions (Approximate)

Overall length		mm (in)	630 (24.80)	1,120 (44.09)
Overall width		mm (in)	345 (13.58)	384 (15.12)
Overall height	L	mm (in)	1,354 (53.31)	
Transom length	L	mm (in)	530 (20.87)	

Weight (Approximate)

	L	kg (lb)	86.5 (191)	94.5 (208)	97.5 (215)
--	---	---------	------------	------------	------------

Performance

Maximum output		kW (ps)	36.8 (50)	22.1 (30)	36.8 (50)
W.O.T		r/min	5,150 – 5,850		
Full-throttle fuel consumption (approx.)		L (gal.)/hr	16.5 (4.36)	12 (3.2)	
Idling Revolution (at [N] shift)		r/min	700/800/900 (3stages variable)		
Trolling Revolution (at [F] shift)		r/min	700/800/900 (3stages variable)		

Power Unit

Engine type			2-stroke gasoline engine direct injection (TLDI)		
No. of cylinders			3		
Piston displacement		cm ³ (cu in)	697 (42.5)		
Bore & Stroke		mm (in)	68×64 (2.68×2.52)		
Compression ratio			7.2 : 1		
Compression			Refer : 0.83 MPa (120 psi) [8.5 kgf · cm ²]		
Starting system			Electric starter motor		
Lubrication system			Oil injection		
Lubricant Control			Mechanical		
Water temp. control			Thermostat (with pressure relief valve)		
Ignition timing control			ECU		
Cooling system			Water-cooling		
Intake system			Reed valve		
Scavenging system			5-port loop Charge		
Exhaust system			Through hub		
Ignition system			Inductive ignition		
Firing order			1-2-3		
Spark plug			NGK IZFR6J		
Alternator			12V 280W (MAX.)		
Battery			12V 100 more than 120AH (850 – 1000 C.C.A)		

Item	Unit	Model		
		D50B2	D30B2	
		EPOL	EPTO	EFTO

Fuel and Oil

Type of Fuel			Unleaded Gasoline(Reserch Octane Number 90 or over, Pump posted Octane Number 87 or over)
Engine oil	Type		Genuine Oil (Oil for two stroke direct injection engine recommended by the outboard manufacturer)
	Quantity	L (gal)	2.0L (0.53 us gal)
Gear oil	Type		Hypoid Gear Oil
	Grade	*1 API	GL-5
		*1 SAE	#80 – #90
	Quantity	cm ³ (fl.oz)	500 (16.91)

Lower Unit

Gear Shift			F – N – R
Gear Ratio			1 : 1.85 (13 : 24)
Type of Gear			Spiral Bevel Gear
Type of Clutch			Dog Clutch
Propeller Shaft Driving Method			Spline
Propeller Rotation			Clockwise at forward (F) shift as view from rear
Propeller			7P, 9P, 11P, 12P, 13P, 14P, 15P

Bracket

Throttle Control			Remote Control	Remote Control	Tiller Handle
Trim Steps.		Steps	6	4	
Trim Angle (Transom 12°)	*2	Degrees	4-24	8-28	
Shallow Water Drive Angle (Transom 12°)	*2	Degrees	Adjustable		
Max. Tilt Angle	*3	Degrees	75	74	
Steering Angle	*4	Degrees	80	70	
Allowable Transom Board Thickness		mm (in)	31 – 70 (1.22 – 2.76)		

*1 To fit both API and SAE requirements.

*2 Angle with reference to horizontal propeller shaft when transom angle is 12 degrees

*3 Tilt operation range

*4 Angle between full starboard and port steering.



4. Maintenance Data

	Description	Item	Standard Values
Engine Parts	Cylinder Head	Build up of carbon in combustion chamber	
		Distortion or damage on mating surface	0.03 mm (0.0012in) or less for scratches 0.03 mm (0.0012in) or less for distortion
		Corrosion	
		Cooling water passage clogged	
	Cylinder	Mating surface scratches and wear	0.03 mm (0.0012in) or less for scratches 0.03 mm (0.0012in) or less for distortion
		Seizure, cylinder liner damage, or wear	ø68.05 mm <0.5 oversize : ø68.55 mm> ø2.6791 in <0.0197 in oversize : ø2.6988 in>
		Deposits in water jacket	
		Engine anode	
	Piston	Diameter <Measure the external diameter at a point 11.5 mm (0.45 in) above the lower edge of the piston skirt.>	ø67.96 mm (2.6755 in) <0.5 oversize : ø68.46 mm (ø2.6953 in)> *Value with piston coating
		Piston clearance <The gap between cylinder and piston.>	0.08 – 0.12 mm (0.0031 – 0.0047 in) *Value with piston coating
		Carbon build up on piston crown and in ring grooves	
		Scratch on the sliding surface	
		Measure clearance between piston ring and ring groove.	Top : 0.04 – 0.08 mm (0.0016 – 0.0032 in) Second : 0.04 – 0.08 mm (0.0016 – 0.0032 in) Second : 0.04 – 0.08 mm (0.0016 – 0.0032 in)
		Measure piston pin hole diameter	ø17.00 mm (ø0.6693 in)
		Clearance between piston pin and pin hole	-0.007 – 0.003 mm (-0.00028 – 0.00012 in)
	Piston Rings	Ring end gap Note: Measurement of ring end gap ; If ring gauge is not available, use cylinder bore top or bottom with small wear.	0.38 – 0.53 mm (0.0150 – 0.0209 in)
	Piston Pin	Outer diameter	ø17.00 mm (0.6693 in)
	Crank Shaft	Deflection <Measure with both ends supported.>	0.05 mm (0.0020 in) or less
		Bearing external diameter	Upper area of #1: ø36.0 mm (1.4173 in) Lower area of #3 : ø25.0 mm (0.9843 in)
		Oil seal scratches	
	Connecting Rod	Small end area side gap	2 mm (0.08 in)
	Reed Valve Stopper	Lift height	9.3 – 9.5 mm (0.366 – 0.374 in)
	Reed Valve	Fails to close, is worn or damaged	
	Engine Block	Compression Note: Remove all spark plugs and measure after warming with the throttle fully open and safety lanyard removed.	0.83 MPa (120 psi) [8.5 kgf/cm ²]

Functional Limit	Action To Be Taken
	Clean and remove build up.
Scratches or deflection of 0.03mm (0.0012 in)	Repair by polishing the surface plate, starting with #240 to #400 grit sandpaper and finishing with #600 grit sandpaper. Replace if over specified limit.
	Repair or replace depending on the extent of damage.
	Clean and remove obstruction.
Scratches or deflection of 0.03 mm (0.0012 in)	Repair by polishing the surface plate, starting with #240 to #400 grit sandpaper and finishing with #600 grit sandpaper. Replace if over specified limit.
<p>ø68.11 mm (2.6815 in)</p> <p>When the cylinder liner cannot be repaired using #400 to #600 grit sandpaper due to deep scratching or scuffing to the sliding surface in contact with the piston or when the difference between the minimum and maximum points of wear in the liner bore is 0.06 mm (0.0024 in) or more.</p>	Bore and hone to $\phi 68.55 + 0 - 0.02$ mm ($\phi 2.6988 + 0 - 0.008$ in). Check ports and grind if necessary. (Use 0.5 oversize pistons and piston rings.) Replace if over specified limit.
	Clean and remove build up.
	Replace if excessively worn.
ø67.90 mm (ø2.6732 in)	Replace if less than specified limit.
0.21 mm (0.0083 in)	Replace if over specified limit.
	Clean and remove build up.
	Repair or replace depending on the extent of damage. (Repair using #400 to #600 grit sandpaper.)
	Replace if over specified limit.
When the difference in standard value	
0.020 mm (0.00079 in)	
0.80 mm (0.0315 in)	Replace with new piston ring if cylinder liner wear has not exceeded the repair limit.
0.05 mm (0.0020 in)	Replace with new crankshaft assembly. Replace if over specified limit.
Abnormally wear or damage	Replace with new part.
2 mm (0.08 in)	Replace if over specified limit.
When the difference in standard value	Replace with new part.
When the end reed valve fails to close Excessive wear on valve seat Valve is damaged	Replace entire valve assembly.
When the difference in compression between cylinders exceeds 0.1 MPa (14.9 psi) [1.05 kg/cm ²] When abnormally higher than standard value	Remove carbon from piston crown and cylinder head. Bore and hone to $\phi 68.55 + 0 - 0.02$ mm ($\phi 2.6988 + 0 - 0.008$ in). Check ports and grind if necessary. (Use 0.5 oversize pistons and piston rings.)



Service Data

	Description	Item	Standard Values									
Engine Parts	Air Rail	Wear and damage on O-rings										
	Air Regulator	Air pressure	0.65 MPa (94.3 psi) [6.5 kgf/cm ²] ±7%									
	Fuel Regulator	Fuel pressure	Measured air pressure + 0.07 MPa (10.1 psi) [0.71kgf/cm ²] ±10%									
	Vapor Separator	Seal ring wear and damage										
		Float										
	Air Compressor	Cylinder bore	39.00 — 39.02 mm (1.5354 — 1.5362 in)									
		Piston diameter <maximum diameter> <Measure at a point 10 mm(0.394 in) above the lower edge of the piston skirt.>	38.97 — 38.99 mm (1.5343 — 1.5350 in)									
		Piston ring end gap	Top : 0.10 — 0.25 mm (0.004 — 0.010 in) Second : 0.10 — 0.25 mm (0.004 — 0.010 in)									
		Reed valve stopper lift heights	1.7 — 2.3 mm (0.067 — 0.091 in) or less									
		Reed valve tip clearance	0.2 mm (0.008 in) or less									
	Drive Belt	Tension and appearance	Tension : 30 — 230N (Tension measuring instrument by Yunitta)									
Electrical Parts	Ignition Coil	Primary coil resistance (between L — B/R, B/W, B/G lines)	0.45 — 0.55 Ω 20°C (68°F)									
		Secondary coil resistance (between high tension cord and B line)	6.8 — 10.2 kΩ 20°C (68°F)									
			*10.8 — 16.2 kΩ (With spark plug cap)									
	Spark Plug Cap	Resistance	4— 6 kΩ 20°C (68°F)									
	Engine Control Unit (ECU)	Low-speed ESG trigger	App. 3,000 r/min									
		High-speed ESG trigger	App. 6,000 r/min									
	Magnetor (Alternator)	Alternator (max.)	280W									
		Charging performance	1500 r/min 12V — 19A or more 5500 r/min 12V — 22.5A or more									
		Charge coil resistance <Y—Y—Y wire>	0.374 — 0.506 Ω @20°C (68°F)									
	Spark Plug	Standard plug	IZFR6Q [NGK]									
		Plug gap	0.7 mm — 0.8 mm (0.029 — 0.032 in)									
	Air Injector	Resistance between terminals	1.2 — 1.4 Ω 20°C (68°F)									
		Operating condition										
	Fuel Injector	Resistance between terminals	1.7 — 1.9 Ω 20°C (68°F)									
	Fuel Feed Pump (FFP)	Wear and damage on seals and grommets										
		Operating condition										
	Crank-position Sensor	Gap with encoder ring <flywheel>	0.5 — 0.9 mm (0.020 — 0.035 in)									
		Pickup coil resistance value <L/B wire to G/R wire>	451 — 611 Ω 20°C (68°F)									
	Throttle Position Sensor (TPS)	Measured values of resistance between connector terminals	Between upper and lower terminals: 4.0 — 6.0 kΩ Between upper and middle terminals: resistance value <table><tr><td></td><td>Fully closed</td><td>Fully opened</td></tr><tr><td>TPS1</td><td>4 — 5</td><td>0.5 — 1</td></tr><tr><td>TPS2</td><td>0.5 — 1</td><td>4 — 5</td></tr></table>		Fully closed	Fully opened	TPS1	4 — 5	0.5 — 1	TPS2	0.5 — 1	4 — 5
		Fully closed	Fully opened									
	TPS1	4 — 5	0.5 — 1									
TPS2	0.5 — 1	4 — 5										
Water Temperature Sensor	Resistance between terminals	1.026 — 1.254 kΩ 40°C (104°F)										
		0.144 — 0.176 kΩ 100°C (212°F)										
Oil Level Sensor	Resistance between terminals	Sensor ON position : ∞ Sensor OFF position : 0 Ω										
MAT Sensor (option)	Resistance between terminals	2.21 — 2.70 Ω 20°C (68°F)										
		0.30 — 0.35 Ω 80°C (176°F)										
Stater Motor	Output	12 V 0.6 kW										
	Brush length	12.5 mm (0.49 in)										
	Commutator undercut	0.5 — 0.8 mm (0.020 — 0.032 in)										
	Commutator outer diameter	30 mm (1.18 in)										
Starter Solenoid	Rated voltage	12V (DC)										
	Rated timing	30sec (80A)										
	Exciting current	4A or less										
	Exciting coil resistance	3.96 — 4.84 Ω										
Fuse	Capacity	15A X 1, 25A X 1, 30A X 1										
MAP Sensor (option)	Output	3.1 — 4.6 V@25°C (77°F)										

*The spark plug cap (5kΩ resistance) is assembled to the ignition coil with an adhesive agent.

Functional Limit	Action To Be Taken
When parts are worn or damaged	Replace with new part.
When parts no longer conform to standard values	Replace with new part.
When parts no longer conform to standard values	Replace with new part.
When parts are worn or damaged	Replace with new part.
When parts show deterioration or contamination by fuel	
When parts are worn or damaged When parts no longer conform to standard values	Replace with new part.
When parts are worn, damaged or stretched out of shape	Replace with new part.
When parts no longer conform to standard values	Replace with new part.
When electrodes show excessive wear	Replace with new part.
When parts no longer conform to standard values	Replace with new part.
No clicking sound when 12 volts is applied to the terminal	
When parts no longer conform to standard values	Replace with new part.
When parts are worn or damaged	Replace with new part.
No clicking sound when 12 volts is applied to the terminal	
When parts no longer conform to standard values	Repair so that parts conform to standard values. Replace with new part.
When parts no longer conform to standard values When the resistance value between upper and lower connectors $\infty\Omega$ or 0Ω When the resistance value between upper and middle connectors becomes erratic	Replace with new part.
When parts no longer conform to standard values	Replace with new part.
When parts no longer conform to standard values	Replace with new part.
When parts no longer conform to standard values	Replace with new part.
9.5 mm (0.37 in) 0.2 mm (0.008 in) 29 mm (1.14 in)	Replace if less than specified limit.
	Replace with new part.
When the fuse burns out	After repairing the cause of the burn-out, replace with a new fuse.
When parts no longer conform to standard values	Replace with new part.



Service Data

	Description	Item	Standard Values
Power Trim & Tilt Parts	Pump Assembly	Relief valve opening pressure	Tilted up : 12.3 — 15.7 MPa (1784 — 2277 psi) [125 — 160 kgf/cm ²] Tilted down : 4.9 — 6.9 MPa (711 — 1001 psi) [50 — 70 kgf/cm ²]
		Spool check valve opening pressure	Upper chest : 0.2 MPa (29 psi) [2.0 kgf/cm ²] Lower chest : 0.12 MPa (17.1 psi) [1.2 kgf/cm ²]
		Oil capacity	325cm ³ (11.0 fl.oz)
		Recommended oil type	ATF <DEXRON III>
	Trim Cylinder	Piston diameter	48 mm (1.89 in)
		Piston rod diameter	41 mm (1.614 in)
		Stroke	45 mm (1.772 in)
	Tilt Cylinder	Shock absorber valve opening pressure	19.6 — 24.5 MPa (200 — 250 kgf/cm ²) 2842 — 3553 psi
		Piston diameter	32 mm (1.260 in)
		Piston rod diameter	16 mm (0.6299 in)
		Stroke	101 mm (3.976 in)
	PTT Motor	Rated timing	60 sec.
		Rated voltage	12 V (DC)
		Output	250 W
		Direction of rotation	Forward / Reverse
		Circuit Breaker Type	Bimetal
		ON/OFF	40sec or more (36A) / 30sec or more (@25°C / 77°F)
		Brush length	9.75 mm / 0.3839 in
		Commutator Outside Diameter	22.0 mm / 0.8661 in
		Undercut depth	1.8 mm / 0.07087 in
	PTT Solenoid (UP/DN)	Rated voltage	12V (DC)
		Rated timing	60sec
		Exciting current	4A or less
		Exciting coil resistance	4.68 — 5.72 Ω
Cooling System	Thermostat	Opening and closing of thermostat valve	With wax type Pressure Relief Valve (PRV) Valve start temperature: 52°C (125.6°F) Valve full-open temperature: 65°C (149°F) or higher Valve full-open lift : 3 mm / 0.1181 in or more
	Pump Impeller	Wear and cracks	
	Pump Case Liner	Wear	
	Guide Plate	Wear	
Lower Unit	Anode	Corrosion	
	Propeller Shaft	Damage to bearing	
		Wear on lip of oil seal	
	Drive Shaft	Damage to bearing	
		Shaft runout	0.3 mm (0.012 in) or less <Using both center holes for reference>
		Wear on lip of oil seal	
	Propeller	Wear, warping, cracking, chipping	
Other	Oil Seals	Wear, damage	

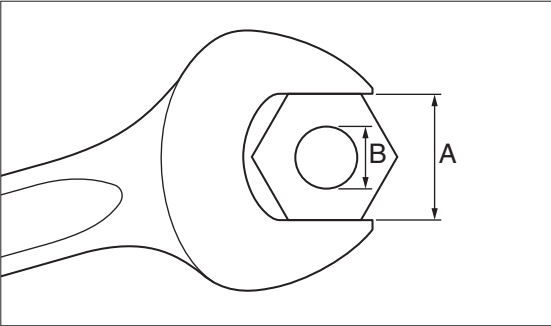
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5. Torque Specifications

Tightening Location		Wrench A	Screw B x Pitch	Type of Fastner	Temporary Driving Torque			Driving Torque			Remarks
					N • m	lb • ft	kgf • m	N • m	lb • ft	kgf • m	
Engine	Cylinder Head Cover	10	M6 x 1.0	Bolt	①2.5	1.8	0.25	④6	4	0.6	Driving sequence ①→②→③→④
	Cylinder Head Cover & Cylinder Head	13	M8 x 1.25	Bolt	②13	9	1.3	③32	23	3.2	
	Crankcase	13	M8 x 1.25	Bolt	①13	9	1.3	②25	18	2.5	
	Exhaust cover	10	M6 x 1.0	Bolt	①5	4	0.5	②12	9	1.2	
	Compressor Head	10	M6 x 1.0	Bolt	—	—	—	9	7	0.9	
	Air Box	10	M6 x 1.0	Bolt	—	—	—	9	7	0.9	
	Throttle Body	10	M6 x 1.0	Bolt	—	—	—	9	7	0.9	
	Water Temp Sensor	19	—	—	—	—	—	22	16	2.2	
	Driven Pulley	17	M10 x 1.5	Nut	—	—	—	47	35	4.7	
	Drive Pulley	36	M30 x 1.5	Nut	—	—	—	100	74	10	
	Fly wheel	36	M18 x 1.5	Nut	—	—	—	150	108	15	
	Spark Plug	16	M12 x 1.25	—	—	—	—	25	18	2.5	
	Hose Joint Adapter (FFP)	17	—	—	—	—	—	15	11	1.5	
	Hose Joint Nut (Air Compressor)	17	—	—	—	—	—	15	11	1.5	
Lower Unit	Engine Mount Bolt (Engine Base & Drive Shaft Housing)	13	M8 x 1.25	Bolt	—	—	—	20	14	2	
	Mount Rubber (Upper)	13	3/8-24UNF	Bolt	—	—	—	32	23	3.2	
	Mount Rubber (Lower)	17	M12 x 1.75	Nylon Nut	—	—	—	42	31	4.2	
	Stern Bracket	32	7/8-14UNF	Nylon Nut	—	—	—	25	18	2.5	
	Gear Case	13	M8 x 1.25	Bolt	—	—	—	20	14	2	
	Pinion Gear (B Gear)	19	M12 x 1.0	Nut	—	—	—	53	39	5.3	
	Propeller Nut	21	M16 x 1.5	Nut	—	—	—	35	25	3.5	

Tightening Location		Wrench A	Screw B x Pitch	Type of Fastner	Temporary Driving Torque			Driving Torque			Remarks
					N • m	lb • ft	kgf • m	N • m	lb • ft	kgf • m	
Power Trim & Tilt	Oil Reserve Tank Installation Bolt	5	M5 x 0.8	Cap Bolt	—	—	—	4.5	3.3	0.45	
	Oil Reserve Cap	—	3/8	—	—	—	—	1.2	0.9	0.12	
	Manual Valve	—	M12	—	—	—	—	1.8	1.3	0.18	
	Gear Pump Bolt	4	M5 x 0.8	Cap Bolt	—	—	—	5.2	3.8	0.52	
	Joint Metal	—	—	—	—	—	—	45	33	4.5	
	Motor Bracket	—	1/4	Screw	—	—	—	6	4	0.6	
Standard Torque	M4	—	—	—	—	—	—	1.5	1.1	0.15	
	M5	—	—	—	—	—	—	3	2	0.3	
	M6	—	—	—	—	—	—	6	4	0.6	
	M8	—	—	—	—	—	—	13	9	1.3	
	M10	—	—	—	—	—	—	27	20	2.7	





6. Sealant And Lubricant

		Application Points																				Remarks			
PTT Fluid		Specified Gear Oil		2st Engine Oil		Silicone Grease SOC		Heat Resistant Grease		Waterproof Grease OBM		Low Temperature Resistant Lithium Grease LT		Instantaneous Adhesive		Adhesive		Gasket Seal Agent		High Strength Screw Lock Agent		Low-Strength Screw Lock Agent			
						OI Center Research		Shinetsu Silicones		LOR # 0		KS 6		Cen ax L2		FM 53		Three Bond		Koniashi		Locktite		Locktite	
		ATF (
Engine Block	Piston																							Ring grooves, outer circumference and piston pin holes	
	Piston Pin																							Piston pin outer circumference	
	Piston Ring																								
	Cylinder Liner																							nner wall	
	Drive Pulley																							Apply 648 to shaft and hole faces	
	Pulley Nut																								
	Small End Bearing																							Sliding faces	
	Big End Bearing																							Sliding faces	
	Main Bearing																							Sliding faces	
	Big End Bearing Washer																							Sliding faces	
	Main Bearing Upper																							Sliding faces	
	Main Bearing Upper Oil Seal																							Lip area	
	Crankcase Head O Ring																								
	Crankshaft Oil Seal Lower																							Lip area (Oil seal in the crank case head)	
	Drive Shaft Oil Seal																							Lip area (Oil seal in the crank case head)	
	Oil Pump For Drive Gear																								
	Oil Pump For Driven Gear																								
	Cylinder Crankcase Mating Surface																								Becareful of application thickness
	Water Temperature Sensor																								a O ring b Terminal section
	Spark Plug Cap																								Plug cap side and ignition coil side
	Advancer Arm																								Sliding faces
	Throttle Cam																								Sliding faces
	Throttle Cam Bolt																								
	Clutch Arm																								Sliding faces
	Ball Joint Cap																								Sliding faces
	Cable Joint (Clutch)																								Sliding faces
	Starter Motor																								a Terminal section b Pinion section
	Solenoid Switch (Starter Motor), 2 Locations																								Terminal section
	Solenoid Switch (PTT) 6 Locations																								Terminal section
	ECU Mount Grommet																								ECU mounting section (3 locations)

Application Points		Remarks													
		PTT Fluid													
		Specified Gear Oil													
		2st Engine Oil													
Silicone Grease SOC		Heat Resistant Grease													
		Waterproof Grease OBM													
		Low Temperature Resistant Lithium Grease LT													
Instantaneous Adhesive		Adhesive													
		Gasket Seal Agent													
High Strength Screw Lock Agent		Low Strength Screw Lock Agent													
		Low-Strength Screw Lock Agent													
</															






Service Data

Application Points		Remarks									
		PTT Fluid									
		Specified Gear Oil									
		2st Engine Oil									
Application Points		Silicone Grease SOC									
		Heat Resistant Grease									
		Waterproof Grease OBM									
		Low Temperature Resistant Lithium Grease LT									
Application Points		Instantaneous Adhesive									
		Adhesive									
		Gasket Seal Agent									
		High Strength Screw Lock Agent									
Application Points		Low-Strength Screw Lock Agent									
		Three Bond									
		Locktite									
		Koniishi									
Application Points		Three Bond									
		Chuo Yuka									
		Oil Cement Research									
		Shinetsu Silicones									
Application Points		ATF ()									
		3 2									
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		5 8									
Application Points		6 8									
		G									
		Centax L2									
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Application Points		LOR # 0									
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		PTT Fluid										Specified Gear Oil										2st Engine Oil										Silicone Grease SOC										Heat Resistant Grease										Waterproof Grease OBM										Low Temperature Resistant Lithium Grease LT										Instantaneous Adhesive										Adhesive										Gasket Seal Agent										High Strength Screw Lock Agent										Low-Strength Screw Lock Agent																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			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7. Warning Indication List • • • Display for abnormalities during operation

Warning Indicators				ESG Speed Control (※1)
Buzzer Sounding	 Indicator A	 Indicator B	 Indicator C	
Continuous	x	x	x	High speed ESG
Intermittent (3 beeps for every 2 minutes)	Flashing	x	x	-
Continuous	x	Flashing	x	Low speed ESG
Continuous	x	Flashing	x	Forced idling
Continuous	x	Flashing	x	-
Continuous	x	Flashing	x	Low speed ESG
-	x	x	Flashing	Low speed ESG
-	x	x	Flashing	-
-	Flashing	Flashing	Flashing	Low speed ESG
-	Flashing	Flashing	Flashing	Engine stop
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	Forced idling
-	Flashing	Flashing	Flashing	Low speed ESG
-	Flashing	Flashing	Flashing	Forced idling
-	Flashing	Flashing	Flashing	Low speed ESG
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-

Fault Description	Reference	Remedy
Engine over-rev.	Approx. 6,000 r/min	Readjust propeller, outboard engine mounting height and/or trim.
Low oil level	Approx. 1.1L or less	Replenish engine oil in tank.
Cooling water temp. high	85°C (185°F)	Refer to troubleshooting.
Engine cooling water temp. abnormally high	90°C (194°F)	
Air compressor cooling water temp. high	90°C (194°F)	
Air compressor cooling water temp. abnormally high	100°C (212°F)	
Battery voltage abnormally low	Approx. 9V or less	
Battery voltage low	Approx. 10V or less	
Battery voltage high	Approx. 18V or over	Refer to fault indication table. *1.ESG speed control · High speed ESG : Regulated to approx. 6,000 rpm. · Low speed ESG : Regulated to approx. 3,000 rpm. Approx. · Forced idling : Regulated to idling speed *2.TPS : Throttle Position Sensor *3.FFP : Fuel Feed Pump (Electric) *4.CPS : Crank Position Sensor
Battery voltage abnormally high	Approx. 20V or over	
TPS (*2) Idling position faulty		
TPS malfunction (2)	TPS1 and TPS2	
TPS malfunction (1)	TPS1 or TPS2	
TPS power supply malfunction (2)	TPS1 and TPS2	
TPS power supply malfunction (1)	TPS1 or TPS2	
Air injector malfunction		
Fuel injector malfunction		
Ignition coil malfunction		
FFP (*3) malfunction		
CPS (*4) malfunction		
Temp. sensor malfunction	Engine or air compressor	
MAP sensor malfunction		
MAT sensor malfunction		



Service Data

3

Maintenance



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1. Special Tools

 A long, thin, tapered metal tool with a pointed tip.	 A long, thin, tapered metal tool with a rounded tip.	 A gauge with a circular face and a needle, connected to a long, flexible hose with a connector at the end.	 A gauge with a circular face and a needle, connected to a metal fitting with a hose and a connector at the end.
Spring Pin Tool A (ø3.0) P/N. 345-72227-0	Spring Pin Tool B (ø3.0) P/N. 345-72228-0	Compression Gauge P/N. 3AC-99030-0	Pressure Gauge Ass'y P/N. 3T5-72880-0
Removing spring pin	Installing spring pin	Measuring compression pressure	Measuring air rail fuel pressure and air pressure

 A rectangular device with a digital display and a cable with a clip at the end.			
Tachometer P/N. 3AC-99010-0			
Measuring engine revolution speed			

2. Inspection Schedule

Description		Inspection intervals				Inspection procedure	Remarks
		First 20 hours of 1 month	Every 50 hours of 3 months	Every 100 hours of 6 months	Every 200 hours of 1 year		
Fuel System/ Compression System	Fuel filter		○	○	○ Replace	Check and clean or Replace if necessary.	
	High pressure fuel filter				○ Replace	Replace every 200 hrs or 2 years	Cartridge
	Piping/Hoses	○	○	○	○ Replace	Check and clean or Replace if necessary	
	Fuel tank	○	○	○	○	Clean	Including filter
	Fuel tank cap	○	○	○	○	Check and clean or Replace if necessary.	
	Fuel pump	○	○	○	○	Check and clean or Replace if necessary.	
	Air filter			○	○	Check and clean or Replace if necessary.	
	Drive belt			○	○	Check and Replace if necessary.	
	Fuel Pressure			○	○	Check and replace defective parts if necessary.	
	Air Pressure			○	○	Check and replace defective parts if necessary.	
Ignition	Spark plug	○		○	○	Remove carbon deposits or Replace if necessary.	0.8 - 0.9 mm (0.031 - 0.035 in)
Starting System	Starter motor			○	○	Check for salt deposits and the battery cable condition.	
	Battery	○	○	○	○	Check installation, fluid quantity, gravity.	
Engine oil system	Oil tank	○		○	○	Check and clean or Replace if necessary.	
	Oil pipe	○		○	○	Check	
	Oil filter	○		○	○	Check and clean or Replace if necessary.	
Lower Unit	Propeller	○	○	○	○	Check for bent blades, damage, wear.	
	Gear oil	○ Replace		○ Replace	○ Replace	Change or replenish-oil and check for water leaks.	
	Water pump		○	○	○	Check for wear or damage.	Replace impeller every 12 months.
Thermostat				○	○	Check and Replace if necessary.	
Power trim & tilt		○		○	○	Check & replenish oil, manually operate	
Warning system			○	○	○	Check function	
Bolts and Nuts		○	○	○	○	Retighten	
Sliding and Rotating Parts. Grease Nipples		○	○	○	○	Apply and pump in grease.	
Outer Equipment		○	○	○	○	Check for corrosion.	
Anode			○	○	○	Check for corrosion and deformation.	Replace if necessary.

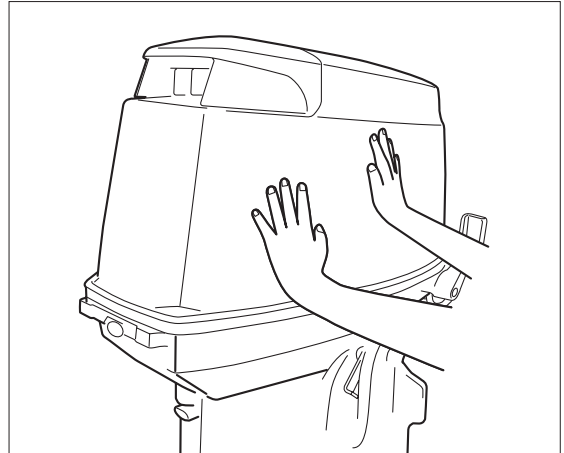
Note : It is recommended to perform complete inspection every 300 hours of operation



3. Top Cowl

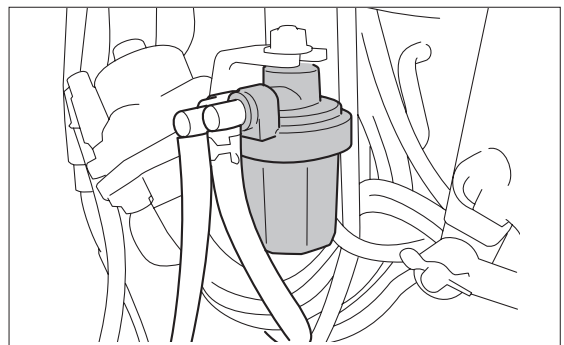
1) Inspection of Top Cowl

1. Push top cowl using both hands to check for looseness and state of closing. Replace top cowl if cracked or damaged.



2) Oil Filter and Oil Tank

1. Only clean if debris, water, or contamination is present. If cleaned then you must bleed the oil system.
2. Reinstall oil tank and fill the tank with fresh oil.
3. Set outboard motor to vertical position, and check amount of engine oil.
Refer to "Check quantity of engine oil" in Chapter 1. Replenish if necessary.



3) Air Bleeding

⚠ CAUTION

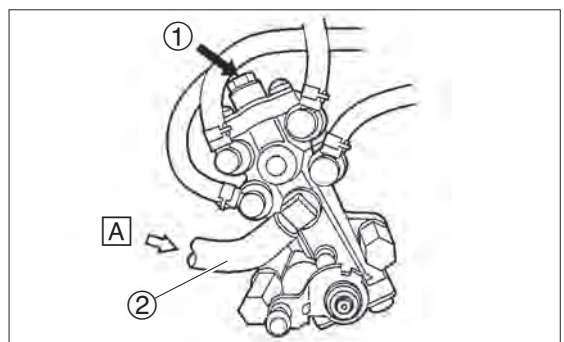
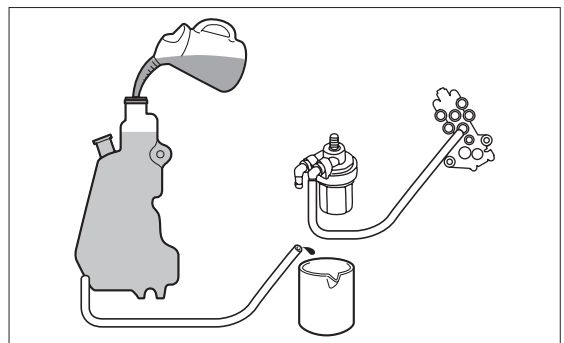
Wipe off completely leakage oil by rag.

1. Visually check if any air is found in the oil line from oil tank to cylinder block, and if any air is found, bleed the air by using the following procedure.
2. Fill oil tank.
3. Loosen the air bleeding screw ① and flows oil from the inlet pipe ② when containing no air bubble flows out.



Tighten screw when containing no air bubbles.

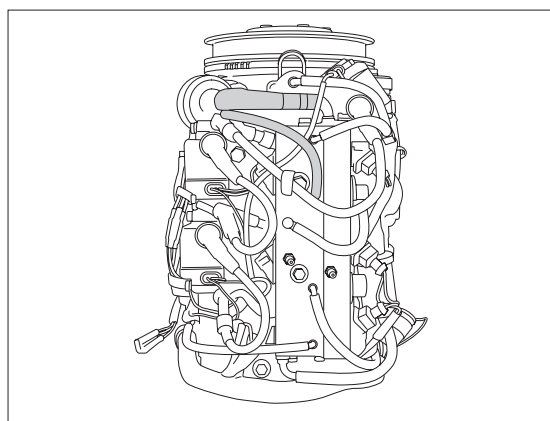
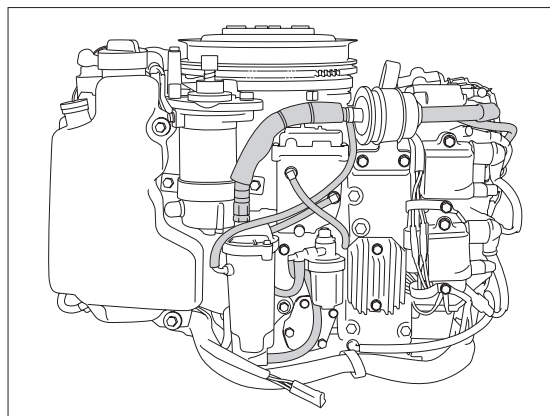
A From Oil Filter



4. Fuel System

1) Inspection of Fuel Pipes and Joints

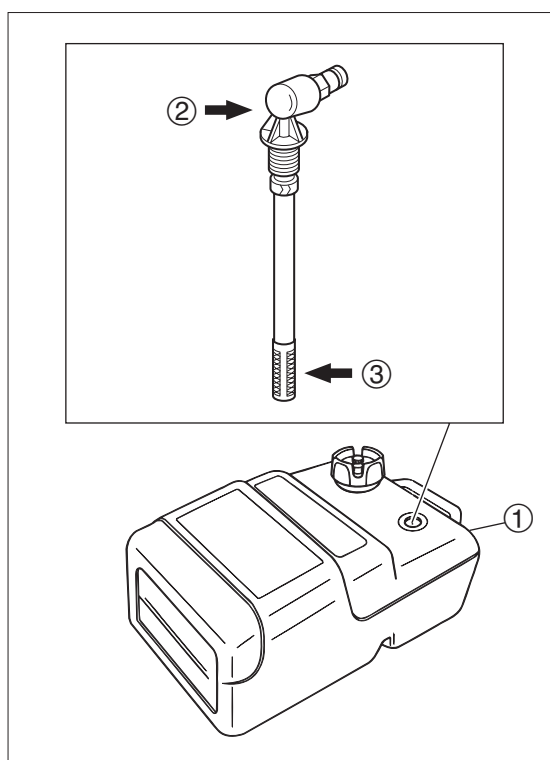
Check the fuel system piping for fuel leak, dirt, deterioration and damage, and replace or clean parts if necessary.



3

2) Inspection of Fuel Tank

Turn fuel pick up elbow ② of fuel tank ① counterclockwise to remove the part, and clean the filter ③. Remove dirt and water from fuel tank ① if any.



- ② Fuel pickup elbow
- ③ Filter



Maintenance

3) Inspection of Fuel Filter

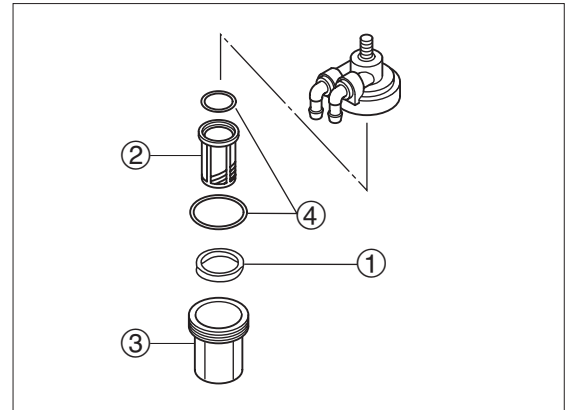
CAUTION

- If red float ① is floating in the filter, water is in the cup.
- Remove the cup and drain the water.

Check fuel filter ② for contamination, and fuel filter cup ③ for invasion of foreign matter and cracks. Clean fuel filter cup with gasoline, and replace fuel filter ② if necessary.



Since the high pressure fuel filter is disposable, replace it periodically.



④ O Ring Do not reuse.

4) Inspection of Air Compressor Air Filter

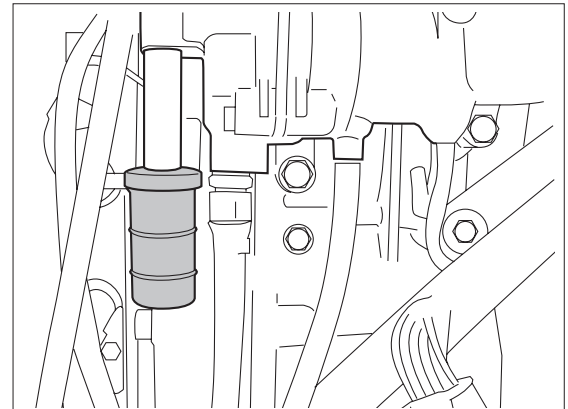
CAUTION

Continuing engine operation with the air filter clogged will lead to severe trouble of engine speed and power.

1. Replace the air filter if it is severely clogged.



The paper strainer of air filter turns brownish when it is clogged. Replace the part if it is brownish.



5) Inspection of Air Pressure

CAUTION

When attaching the pressure gauge ass'y, screw in carefully until it is set securely.

1. Remove cap ①.
2. Attach pressure gauge ass'y ② to air pressure inspection valve ③.



Pressure gauge ass'y:
P/N. 3T5-72880-0

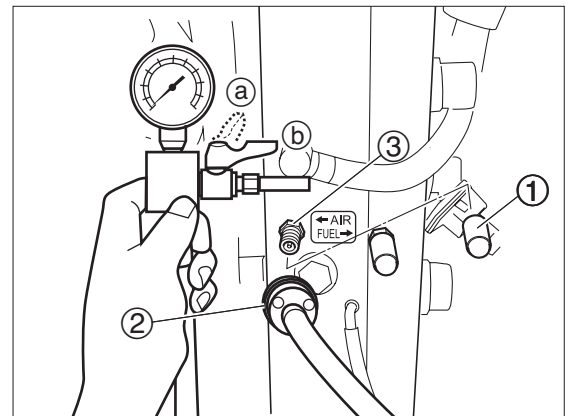
3. Set the lever of pressure gauge ass'y to position ①.
4. Measure air pressure while idling the engine or cranking for 15 seconds.



The air pressure reduces gradually after stopping the engine or cranking.



Air Pressure : Specified Value
0.65 MPa (94.3 psi) [6.5 kgf/cm²] ±7%



5. Set the lever of pressure gauge ass'y to position (b) to relief pressure, after engine stopping.
6. Remove pressure gauge ass'y and attach cap.

6) Inspection of Fuel Pressure

⚠ CAUTION

When attaching pressure gauge ass'y, cover the joint of inspection valve and gauge with rag to prevent spread of fuel that leaks.

Screw in the pressure gauge carefully until it is set securely.

1. Remove cap.
2. Attach pressure gauge ass'y to fuel pressure inspection valve ①.



Pressure Gauge Ass'y:
P/N. 3T5-72880-0

3. Set the lever of pressure gauge ass'y to position (a).
4. Measure fuel pressure while idling the engine or cranking for 15 seconds.

⚠ WARNING

Do not move the lever of the gauge during the measurement. Moving the lever causes highly pressurized fuel to blast out, which is very dangerous.



The fuel pressure reduces gradually after stopping the engine or cranking.



Fuel Pressure : Specified Value

Measured Air Pressure + 0.07 MPa (10.1 psi) [0.71 kgf/cm²] ±10%

5. Set the lever of pressure gauge ass'y to position (b) to relief pressure, after engine stopping.

⚠ CAUTION

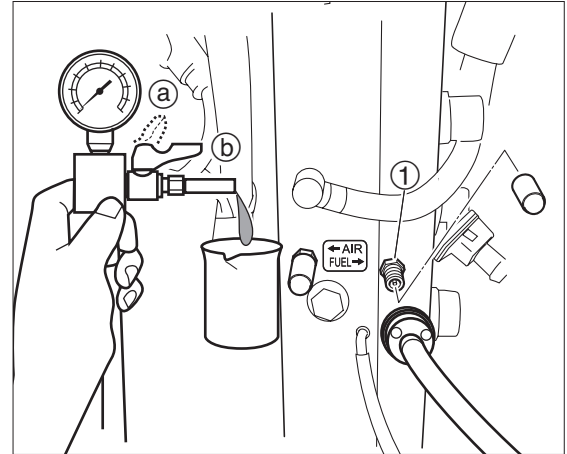
When depressuring, collect fuel that spills from the tip of the gauge.

6. Remove gauge.

⚠ CAUTION

Be careful not to let the fuel in the gauge leak when removing the gauge.

7. Attach the cap.





7) Inspection of Drive Belt

1. Remove ring gear cover.

⚠ DANGER

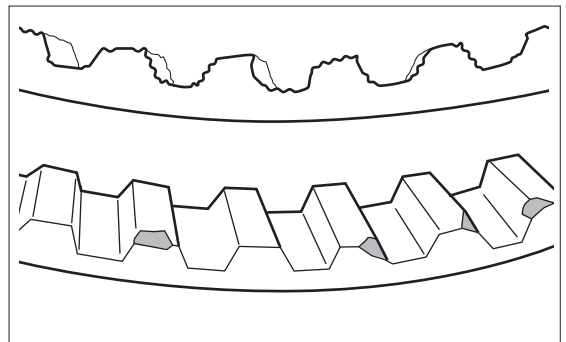
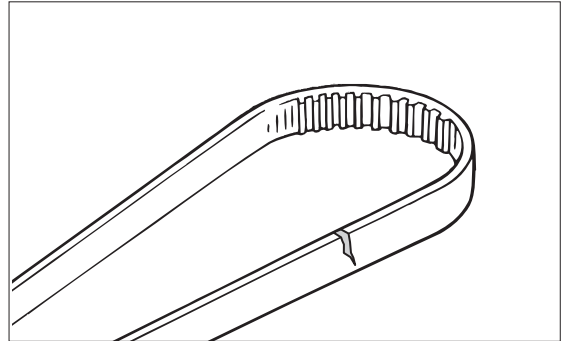
Make sure to check engine stopped.

2. Remove air compressor to check drive belt for wear and damage on the inner and outer faces while turning flywheel clockwise. Check if oil or dirt is adhered to the belt.

Replace with new one if any of the problems exists.



- For removing of air compressor, refer to “Removing Air Compressor”, “Installing Air Compressor” in Chapter 4.
- For replacement of drive belt, refer to “Removing Flywheel” in Chapter 5.



5. Power Unit

1) Inspection of Spark Plugs

1. Remove plug caps and then spark plugs.
2. Clean spark plug electrodes ① by using spark plug cleaner. Replace if necessary.
3. Check electrodes ① for corrosion or excessive build up of carbon, and washer ② for damage. Replace if necessary.
4. Check spark plug gap ③. Replace if it is over specified value. Adjust gap if it is out of specified range.



Spark Plug Gap ③: Standard Value

0.7 - 0.8 mm (0.029 - 0.032 in)



Functional Limit:

0.9 mm (0.036 in)



Specified Spark Plug:

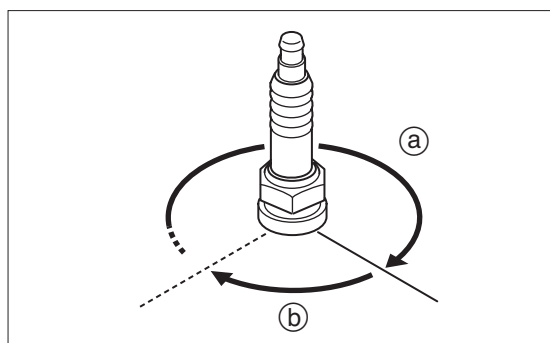
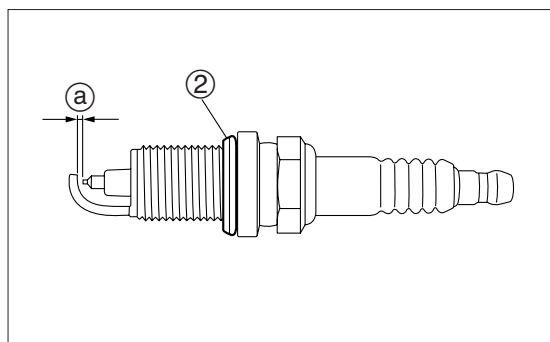
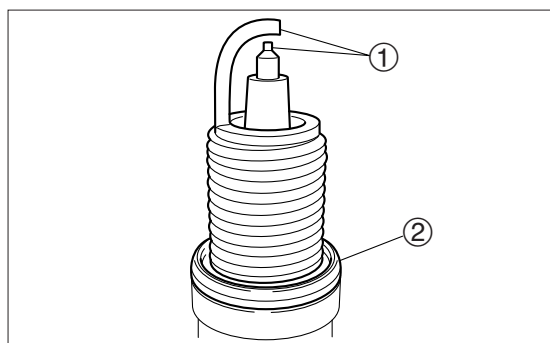
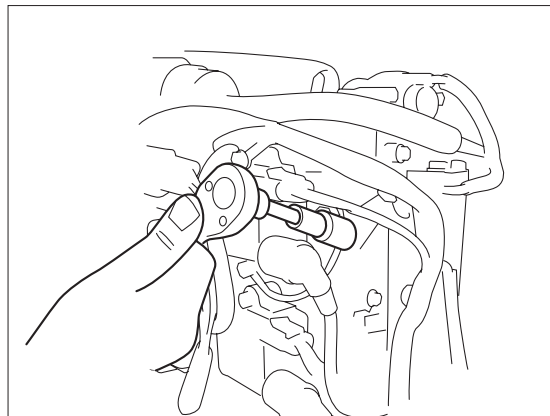
IZFR6Q [NGK]

5. Install spark plug, fully hand-tighten ④, and then use plug wrench to tighten to specified torque ⑤.



Spark Plug:

25 N · m (18 lb · ft) [2.5 kgf · m]





Maintenance

2) Inspection of Compression Pressure

⚠ CAUTION

- To prevent accidental start of the engine, remove lock plate (of stop switch lanyard) from stop switch before measuring compression pressure.
- Clean areas around spark plugs on the cylinder before removing spark plugs to prevent dirt from entering cylinder.

1. Start and idle engine for 5 minutes to warm up, and then stop.
2. Shift gear into neutral (N).
3. Remove lock plate (of stop switch lanyard) from stop switch.
4. Remove all spark plug caps and then all spark plugs ①.
5. Install compression gauge to plug hole.



Compression Gauge:
P/N. 3AC-99030-0

6. Set throttle grip or free throttle lever to full open position, crank engine until compression gauge indication stabilizes, and then measure compression pressure.



Compression Pressure (Reference):
0.83 MPa (120 psi) [8.5 kgf/cm²]



Compression pressure is affected much by cranking speed, and normally changes in the range from 10% to 20%. Charge the battery if low.

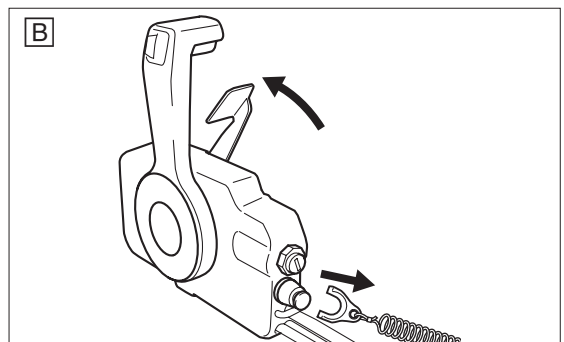
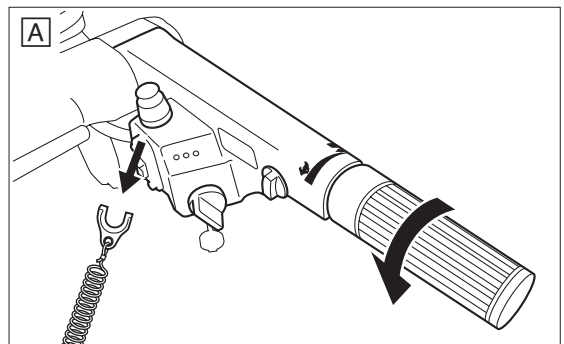
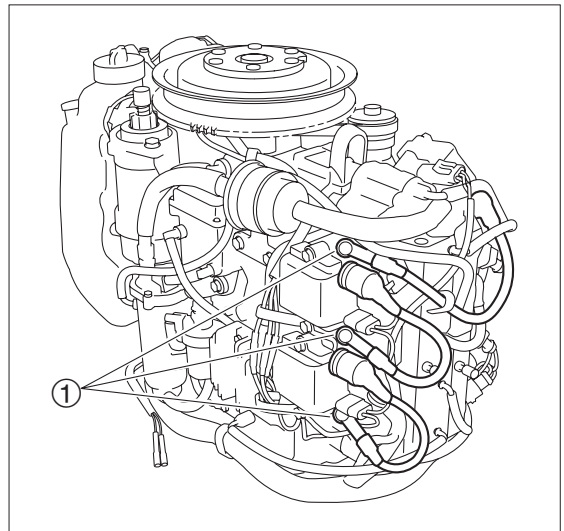
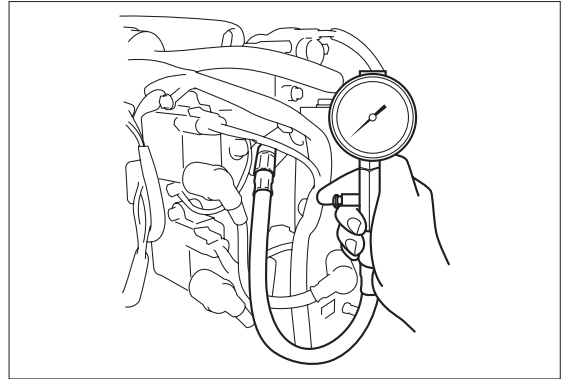
7. If compression pressure is below specified value or varies much among cylinders, put small amount of engine oil into cylinders, and perform the test again.



- If compression pressure increases after the above measure, check pistons and piston rings for wear. Replace if necessary.
- If compression pressure does not increase, check cylinder head gasket. Adjust or replace if necessary.

If any of the following results is obtained by the measurement, it is necessary to repair or replace relevant part(s).

- The measurement is lower than specified value,
- Different between compression pressure of the cylinders exceeds; 0.105 MPa (15 psi) [1.05 kgf/cm²], or
- The measurement is abnormally higher than specified value.

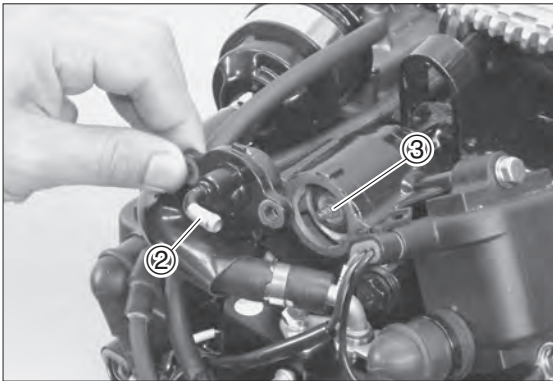
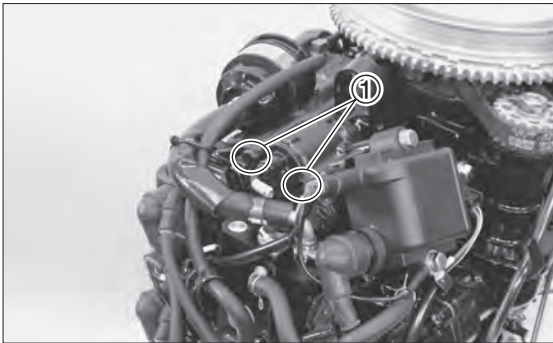


A Tiller handle model

B Remote control model

3) Inspection of Thermostat

1. Loosen cover installation bolts ①, remove them, and then remove cover ② and thermostat ③.

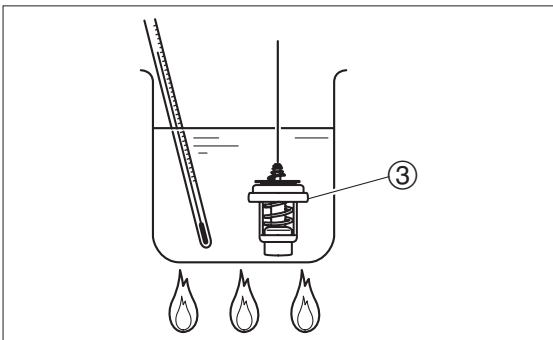


3

2. Hang thermostat ③ in the water contained in vessel.
3. Put thermometer in the water, and warm up water to measure valve opening temperature.



Put a piece of thread in the closed valve gap and hang it in the water. Valve opening moment can be known when thermostat is released to drop due to opening with rise of temperature.

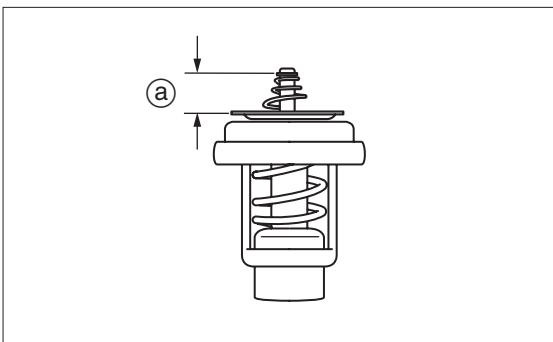


Valve Opening Temperature:
52°C (125.6°F)

4. Measure valve lift ① of thermostat when prescribed temperature has been reached. Replace if the length is less than specified value.



Water Temperature	Valve Lift ①
65°C or more (149°F)	3 mm (0.12 in) or more



5. Install thermostat, new gasket and cover.

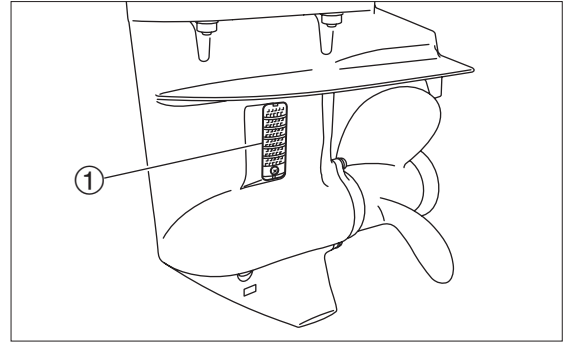


Thermostat Cover Bolt:
6 N · m (4 lb · ft) [0.6 kgf · m]



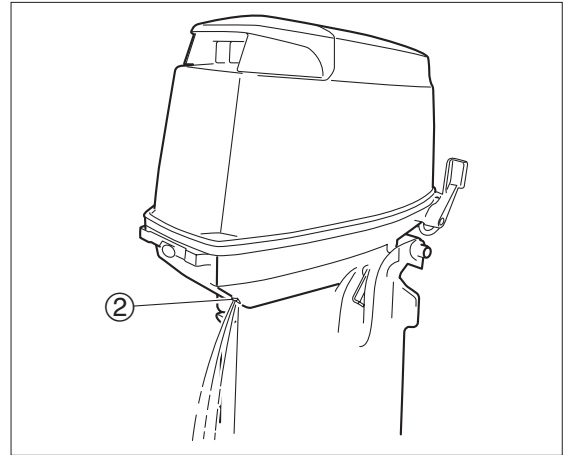
4) Inspection of Cooling Water Passage

1. Check cooling water intake for clog. Clean if necessary.



2. Set lower unit in the water and start engine.

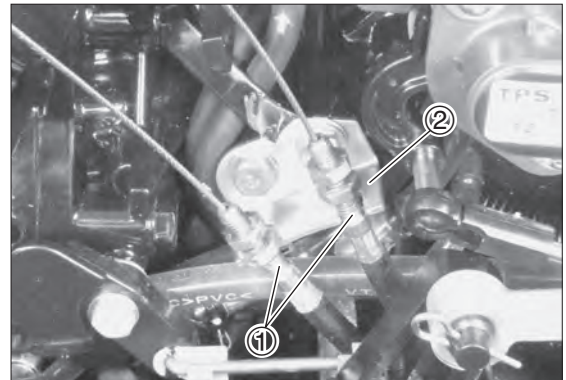
3. Check that cooling water check port ② ejects water.



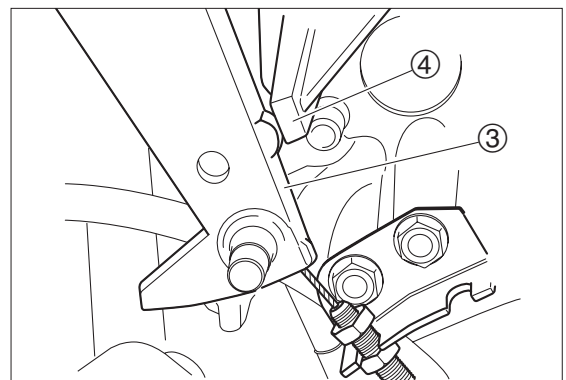
6. Operating System

1) Adjustment of Throttle Cable (for Tiller handle model)

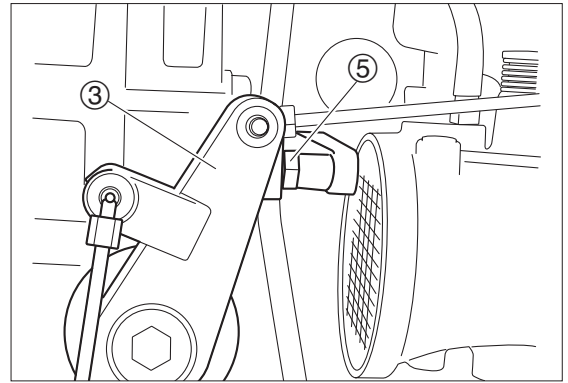
1. Remove throttle cable ① from throttle cable bracket ②.



2. Adjust left cable length so that the advancer arm ③ is touched to full open stopper ④ when throttle full open position, then temporary tighten the lock nut.



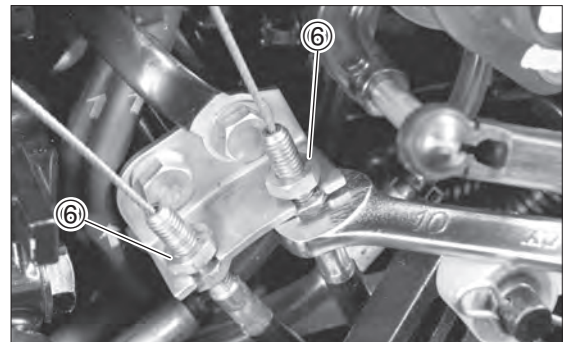
- Adjust right cable length so that the advancer arm ③ is touched to full close stopper ⑤ when throttle full close position, then temporary tighten the lock nut.



- Tighten left and right lock nut ⑥ to tend the throttle cable.



- Adjust throttle cable tension so that it moves approximately 1 mm when pushed lightly with a finger.
- Check advancer arm touches to full close stopper when throttle full close position.



3

2) Adjusting of Remote Control Cable

For adjusting, refer to “Installation of Remote Control Cable (Engine Side)” in Chapter 10.

3) Inspection of Idle Engine Speed

- Start engine and run for 5 minutes to warm up.
- Attach tachometer to high tension cord ① to check idle speed.



- More accurate and stable reading can be obtained when tachometer lead is connected with high tension cords of individual cylinders linked with each other.
- Idle engine speed that is set at variable troling is maintained. Idle speed is changed by depressing key switch while idling.



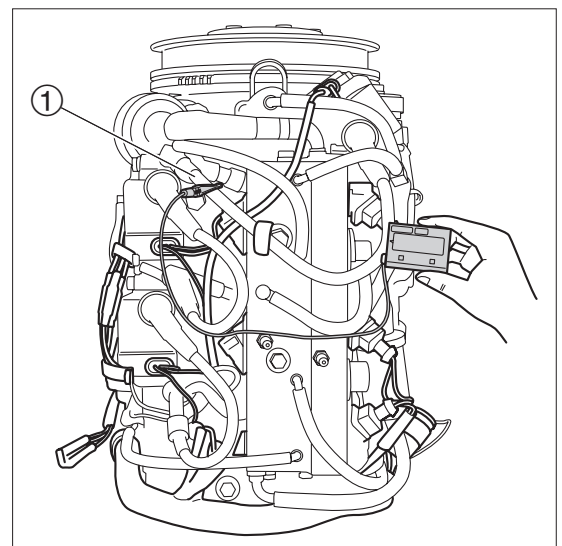
Tachometer :

P/N. 3AC-99010-0



Idle Speed :

700 · 800 · 900 r/min



①High tension cord



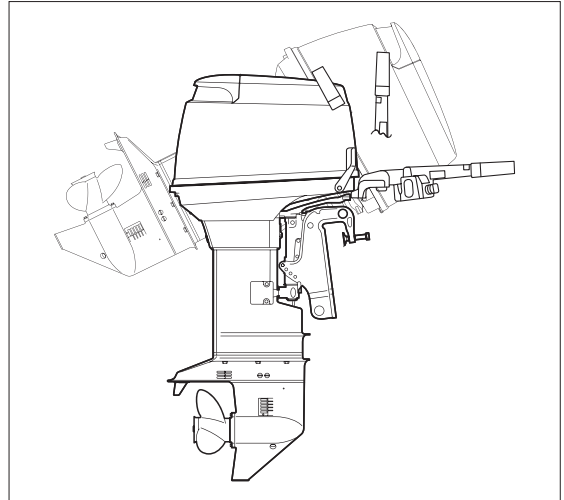
7. PTT System

1) Inspection of PTT Unit Operation

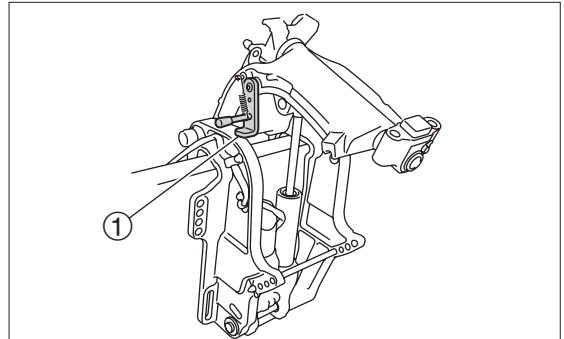
1. Tilt up and down outboard motor several times to check that unit operates smoothly in full range. Check PTT fluid quantity if necessary. Refer to “Inspection of PTT Fluid Quantity”.



Check that PTT motor produces noise of normal revolution.



2. Fully tilt up outboard motor, lock with tilt stopper ①, and check that stopper ① lock mechanism functions normally.

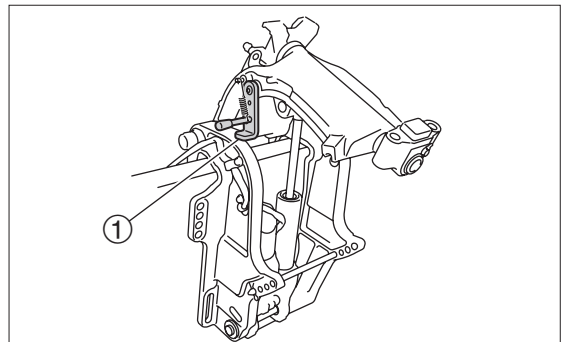


2) Inspection of PTT Fluid Quantity

⚠ WARNING

Be sure to lock outboard motor with tilt stopper after tilting up. Danger! Outboard motor may come down if hydraulic pressure of PTT unit reduces accidentally.

1. Fully tilt up outboard motor and lock with tilt stopper ①.



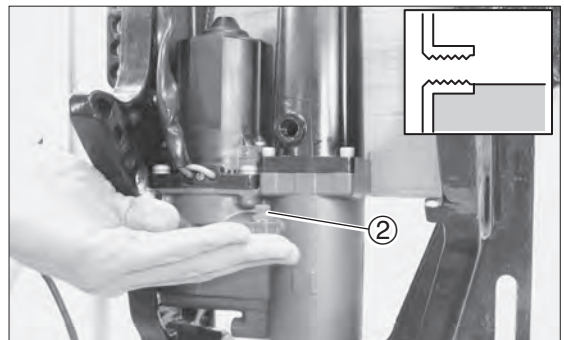
2. Remove cap ② and check PTT fluid quantity.

⚠ CAUTION

Be sure to remove the cap when outboard motor is in full tilt up position. Removal of the cap in other than full tilt up position may cause the fluid to blast out.



Quantity of PTT fluid is normal when some fluid spills out of cap hole when cap is removed.



3. Replenish to the specified quantity if the fluid lacks.

**PTT Fluid:**

ATF DEXRON III

PTT Fluid Quantity:325 cm³ (10.98 fl.oz)

4. Attach the cap.

**Reservoir Cap:**

1.8 N · m (0.9 lb · ft) [0.12 kgf · m]



8. Lower Unit

1) Inspection of Gear Oil Quantity

1. Tilt down outboard motor to make it vertical.
2. Remove upper oil plug ① and gasket ②, and check level of gear oil in the gear case.



Leaking of some oil from plug hole as plug is removed indicates that gear case is filled with specified quantity of gear oil.

3. Add recommended gear oil to specified level if it is low.

**Gear Oil:**

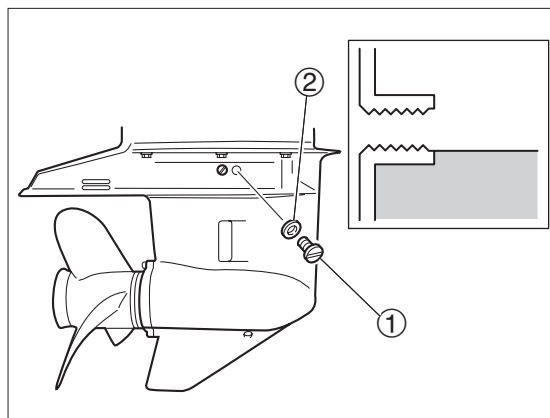
Hypoid Gear Oil

API : GL - 5 SAE : # 90



If the oil is low, add through lower oil plug hole.

4. Attach upper oil plug ① and new gasket ②.



② Gasket **Do not reuse.**



Maintenance

2) Replacement of Gear Oil

1. Tilt outboard motor a little as shown.
2. Place drain oil pan below oil plug ①, remove lower oil plug ① and then upper oil plug ② to drain oil.



Remove lower oil plug first when draining.

3. Check gear oil for presence of metal particles, change of color (abnormal if clouded), and viscosity. Check lower unit internal components if necessary.
4. Fill with gear oil (from oil tube or pump) through lower plug hole ① until gear oil starts to leak from upper oil plug hole ② without air bubble.



Use lower plug hole when filling with gear oil. Upper hole cannot be used because doing so will not allow air to escape from gear case.

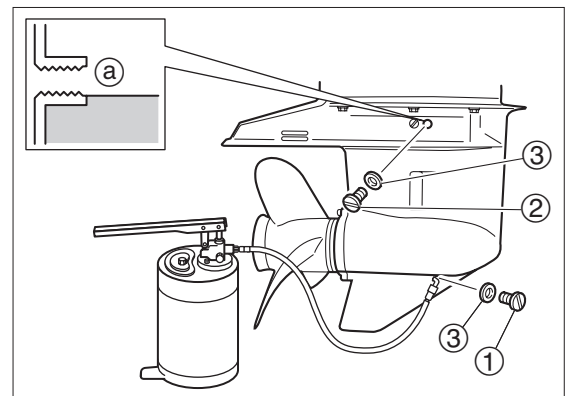
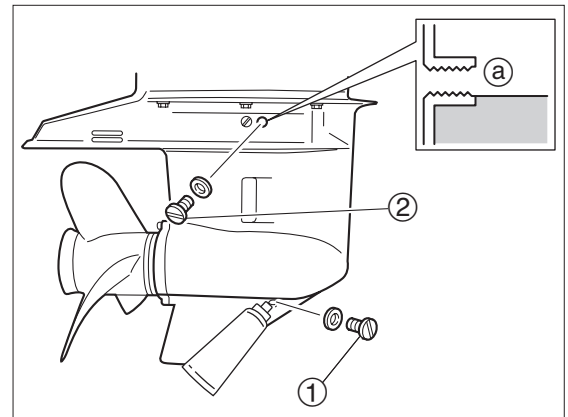
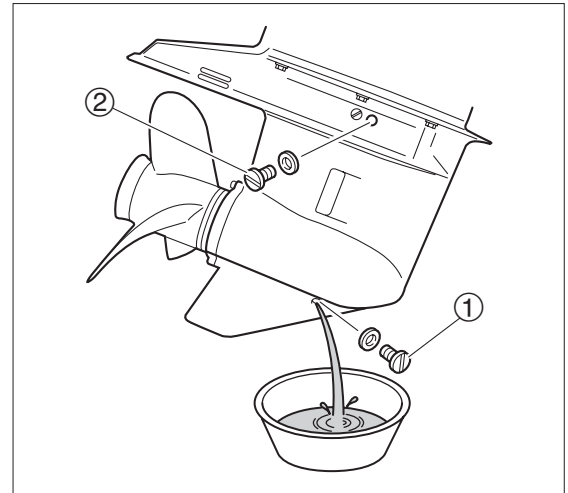


Gear Oil:

Genuine Gear Oil or Hypoid Gear Oil
API : GL-5 SAE : #80 – 90

Gear Oil Quantity:

D40/50:
500 cm³ (16.91 fl.oz)
WD50:
700 cm³ (23.67 fl.oz)



③ Gasket **Do not reuse.**

5. Attach new gasket ③ and upper oil plug ②, and then new gasket ③ and lower oil plug ① quickly.



When fully filled with oil, attach upper oil plug first.

3) Inspection of Gear Case (for leakage)

1. Drain gear oil.
2. Remove upper oil plug ① and connect a commercially available leakage tester to this hole.
3. Apply specified pressure to gear case, and check if the pressure is maintained without further compression for 10 seconds.

⚠ CAUTION

- Do not apply pressure to gear case over specified value.
- Doing so can cause damage to oil seal.

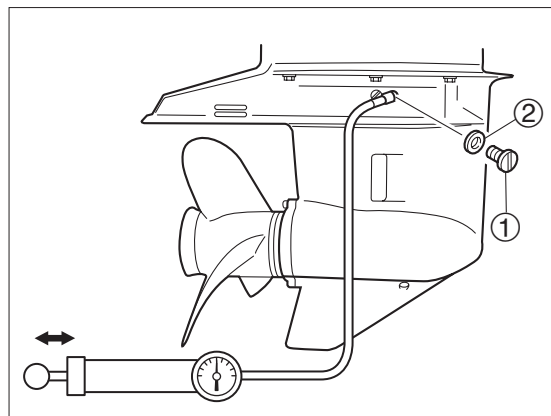


- Rotating propeller shaft while maintaining pressure and testing with gear oil drained make it easy to find leakage due to wear of oil seal lip.
- Depressurize gear case and cover oil plug area with a piece of rag before disconnecting leakage tester.



Specified Gear Case Maintained Pressure:
0.05 MPa (7 psi) [0.5 kgf/cm²]

4. If the specified pressure cannot be maintained, check oil seals of drive shaft and propeller shaft and O ring of shift shaft, and propeller shaft housing and water pump case lower for damages.



② Gasket **Do not reuse.**

3

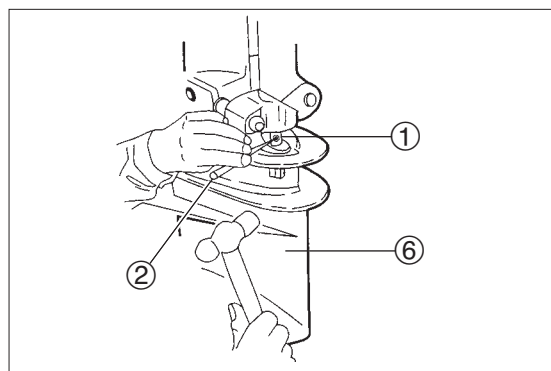
4) Inspection of Water Pump

1. Remove the following part.
Drive out spring pin ① on shift rod by using spring pin tool ②.



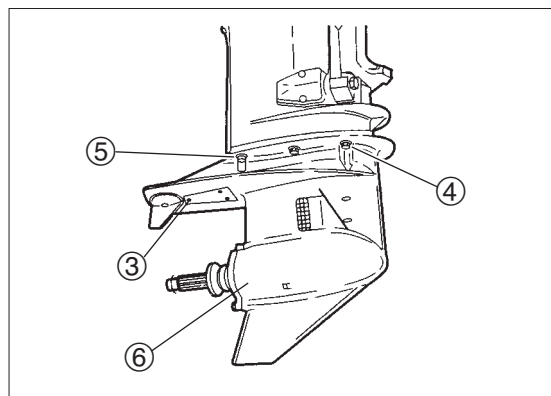
Spring Pin Tool A ② (ø3.0):
P/N. 345-72227-0

- Remove gear case ass'y from drive shaft housing.



① **Do not reuse.**

2. Remove the following parts.
 - ③ Gear Case Plate (One M10 bolt is behind the plate.)
 - ④ Bolts : M8 4 pcs.
 - ⑤ Bolts : M10 2 pcs.
 - ⑥ Gear Case Ass'y (Pull downward to remove.)





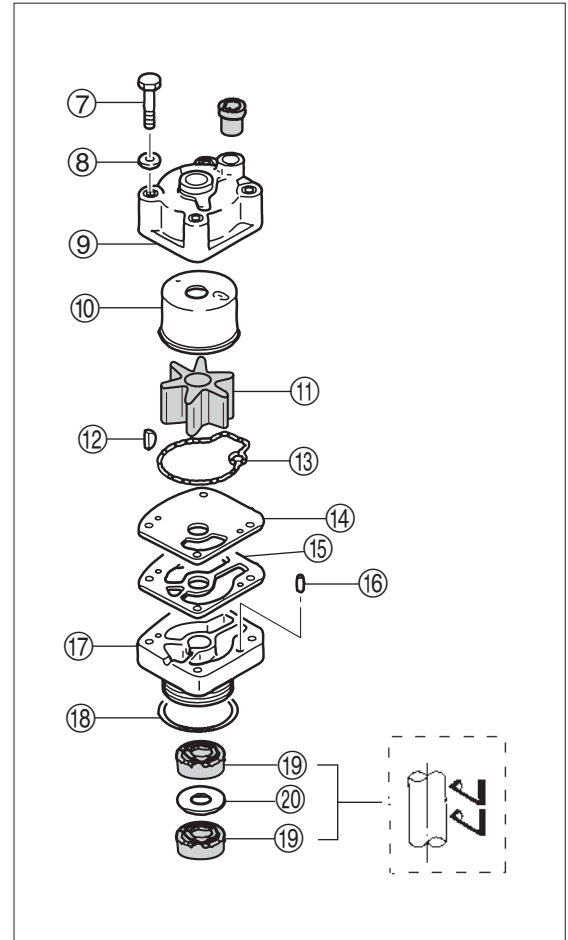
Maintenance

3. Check following parts.

- ⑦ Bolts : M8 4 pcs.
- ⑧ Washers 4 pcs.
- ⑨ Pump Case (Upper)
- ⑩ Pump Case Liner
- ⑪ Pump Impeller → Replace with new one.
- ⑫ Key
- ⑬ Seal → Replace with new one.
- ⑭ Guide Plate
- ⑮ Gasket → Replace with new one.
- ⑯ Dowel Pin
- ⑰ Pump Case (Lower)
- ⑱ O Ring
- ⑲ Oil Seals
- ⑳ Shim

Inspection

- 1. ⑥ - ⑮ : Replace with new one if worn or damaged.
- ⑲ Be sure to install oil seal in correct orientation.



⑪ ⑮ ⑱ ⑲ Do not reuse.

9. Others

1) Replacement of Anode

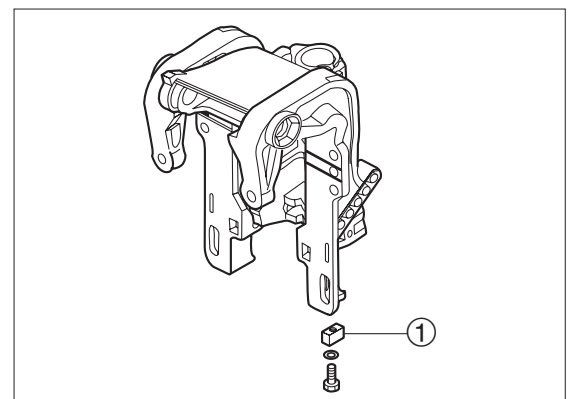
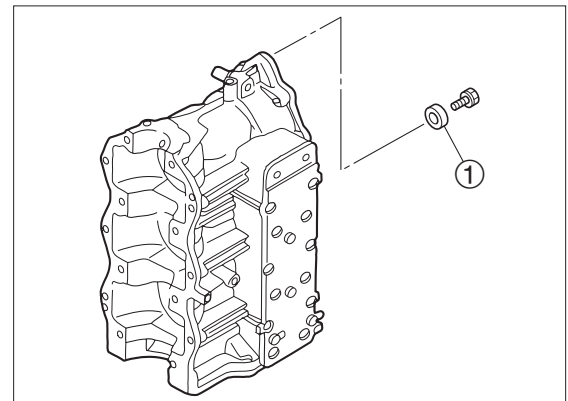
- 1. Dirt on Anode and Trim Tab
Check if grease or oil is adhered to the components. Clean if necessary.

⚠ CAUTION

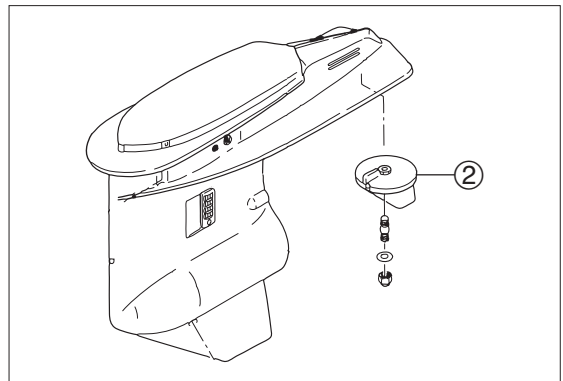
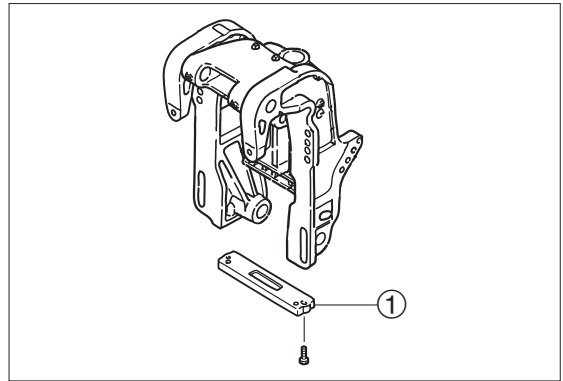
Anode protects outboard motor from galvanic corrosion. Do not paint or apply grease or oil to anode. Doing so disables the anode.



- Anodes ① are used in the exhaust cover, cylinder body, clamp bracket and gear case trim tab.
- When it is necessary to disassemble outboard motor for inspection of anode, refer to disassembly procedure described in this manual. Reduction of anode volume can lead to outboard motor body damage.



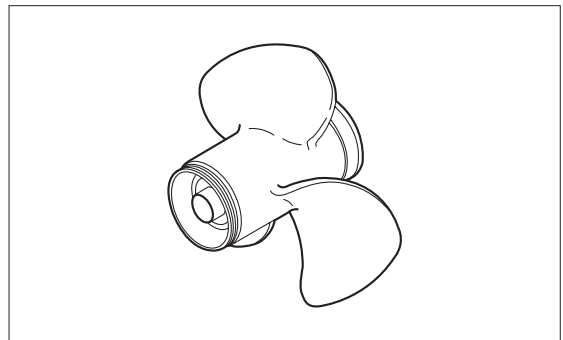
2. Check anode ① and trim tab ② for deterioration. Replace anode (or trim tab) if volume is reduced to 2/3 of new part.



3

2) Inspection of Propeller

1. Check propeller blades and hub for cracks, damages, wear and corrosion. Check spline for twist, and replace propeller if necessary.





3) Inspection of Battery

1. Inspect battery liquid level. If lower than “LOWER” mark (a) , add distilled water until the level goes in between “UPPER” and “LOWER” marks.
2. Measure specific gravity of battery liquid. Charge battery if specific gravity is less than specified value.

⚠ WARNING

Electrolyte contains sulfuric acid that is poisonous and highly corrosive, which is dangerous. Always be careful of the following matters to prevent accident.

- **Handle electrolyte carefully not to allow adherence to any part of body, or it could cause serious chemical burn or blindness.**
- **Wear protective glasses when working near battery or handling battery.**

First Aid in Emergency (if electrolyte adheres to body):

- **Flush well with fresh water if adhered to skin.**
- **If gets in eye, flush well with fresh water for 15 minutes, and have ophthalmologic evaluation immediately.**

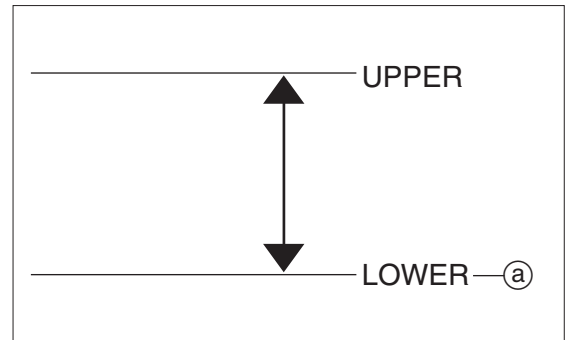
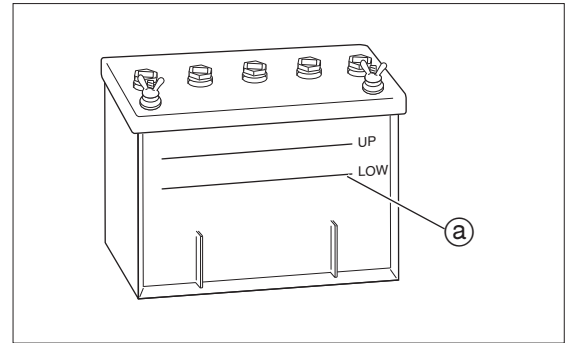
First Aid in Emergency (if swallowed)

- **Gargle using much water, drink much water or milk, and then, seek immediate medical attention.**

Battery produces highly inflammable hydrogen gas. Always be careful of the following matters to prevent accident.

- **Charge battery in well ventilated place.**
- **Keep battery away from fire, sparks or flame (such as live cigarette or operating welding machine).**
- **Do not allow smoking when handling or charging battery.**

Keep battery and electrolyte out of reach of children.



- Batteries are available with various types, varying among manufacturers. For any unclear matters, refer to manual attached to battery.
- Disconnect battery cables in the following order; negative (-) cable first and then positive cable (+).



Battery:

12V100AH or more	12V120AH or more (in cold regions)
CCA : 850	CCA : 1000
MCA : 1100	MCA : 1500



Specific Gravity of Battery Electrolyte:

1.280 (at 20°C) (68°F)



Charging data : Example 12V100AH Battery

Charging current : $100\text{AH} \times 1/10 = 10\text{A}$

Charging period : $100\text{AH} \div 10\text{A} = 10\text{H}$

4) Flushing with Water

⚠ WARNING

Exhaust gas contains carbon monoxide which can cause intoxication if inhaled. Do not operate engine in a closed space such as interior of boat house.

⚠ WARNING

Be careful not to touch rotating propeller. Be sure to remove propeller before running engine on the land.

Flushing using flushing attachment (P/N3B7-60007-0).

1. Remove the following parts.
 - Propeller and thrust holder
 - ① Water plug.
2. Attach the following parts.
 - ② Tape: Two locations (on the water strainer)
 - ③ Flushing attachment
 - Put water hose from water outlet to ③ and run water.
 - Set shift lever to neutral (N) and start engine.
 - Check that cooling water check port discharges water, and run engine for 3 to 5 minutes at idle speed.
 - Stop engine and stop water supply, remove ③, attach and tighten ①, and then, reinstall propeller parts removed.

Flushing using drive cleaner (Commercially available item)

1. Put drive cleaner ① on the gear case from the front so that the drive cleaner covers cooling water inlet as shown.
2. Put water hose to drive cleaner and run water.

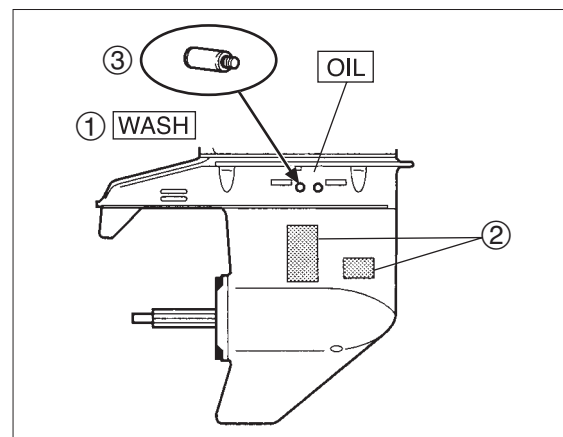


Adjust water flow so that water leaks from drive cleaner a little.

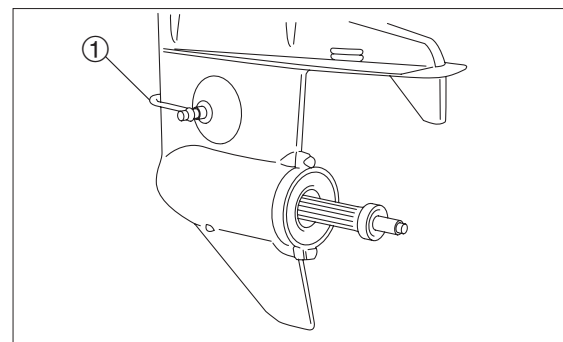
3. Set shift lever to neutral (N) and start engine.
4. Check that cooling water check port discharges water, and run engine for 3 to 5 minutes at idle speed.



After starting engine, no cooling water should spill from the drive cleaner and should be discharged from cooling water outlet because water is sucked by the impeller.



② Tape
③ Flushing Attachment



5) Greasing

For greasing, refer to "Sealant And Lubricant" in Chapter 2 and or "Parts Layout" in each Chapter.



Maintenance

4

Fuel System (TLDI)

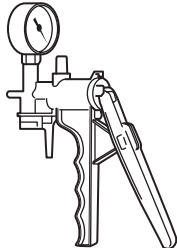
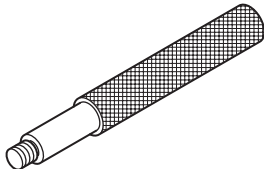

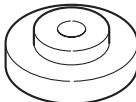
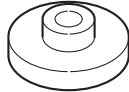
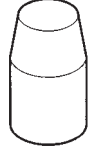

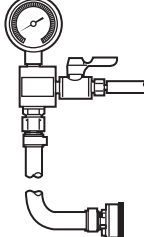


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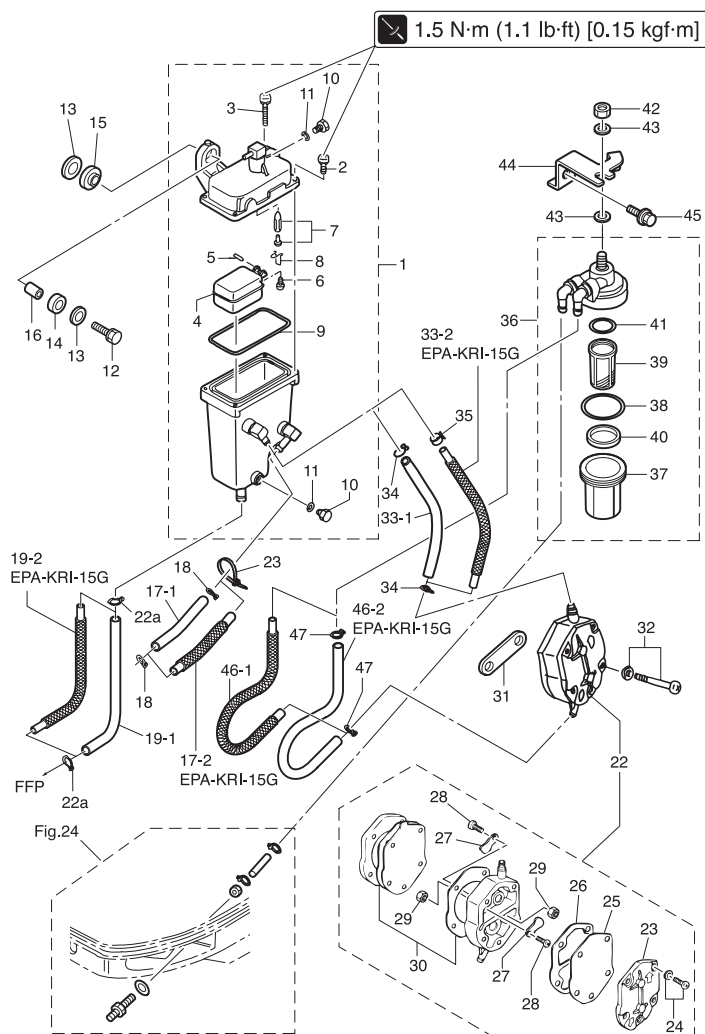
Fuel System (TLDI)

1. Special Tools

			
Vacuum/Pressure Gauge P/N. 3AC-99020-0	Driver Rod P/N. 3AC-99702-0	Piston Slider P/N. 3T1-72871-0	Oil Seal Attachment P/N. 3T1-99820-0
Inspecting pressure	Used in combination with center place and various attachments	Assembling piston for air compressor	Used to press-fit crank case head oil seal
$\varnothing 51.5 \times \varnothing 39.5$ 			
Bearing Attachment P/N. 3T1-99905-0	O Ring Set Tool ($\varnothing 24$) P/N. 3T5-72863-0	Clamp Pliers P/N. 3T5-72864-0	Pressure Gauge Ass'y P/N. 3T5-72880-0
Attaching air compressor bearing	Assembling O ring into fuel injector	Caulking clamps made by OETIKER	Measuring air rail fuel pressure and air pressure

2. Parts Layout

Vapor Separator & Fuel Line



Re No	Description	Q'ty	Remarks
1	Vapor Separator Ass'y	1	
2	Screw	3	M4 L=14mm
3	Screw	1	M4 L=30mm
4	Float Vapor Separator	1	
5	Float Arm Pin	1	
6	Screw	1	M4 L=8mm
7	Float Valve Ass'y (W/Valve Pin)	1	with Valve Pin
8	Cap	1	
9	O-Ring	1	Do not reuse.
10	Drain Screw	2	
11	O-Ring	2	Do not reuse.
12	Bot	2	M6 L=30mm
13	Washer 6.5-21-1	4	
14	Mount Motor Cover Lower	2	
15	Rubber Mount 8.5-14-2.5	2	
16	Spacer 6.2-9-15.7	2	
17-1	Hose	1	L=75mm
17-2	Low Permeation Hose	1	Low Permeation Parts (for USA model)
18	Cap Fuel Pipe φ10	2	
19-1	Hose	1	L=180mm
19-2	Fuel Hose (W/Protector)	1	Low Permeation Parts (for USA model)
22a	Cap φ12	2	
21	Band Lead Wire 104	1	
22	Fuel Pump Ass'y	1	
23	Pump Cover	1	
24	Screw	3	M5 L=28mm

Re No	Description	Q'ty	Remarks
25	Pump Diaphragm	1	
26	Diaphragm Gasket B	1	Do not reuse.
27	Check Valve	2	
28	Screw	2	M3 L=6mm
29	Nut	2	M3
30	Diaphragm Gasket Set	1	Do not reuse.
31	Gasket Fuel Pump	1	Do not reuse.
32	Bot	2	M6 L=40mm
33-1	Hose	1	STD L=190mm
33-2	Low Permeation Hose	1	Low Permeation Parts (for USA model)
34	Cap Fuel Pipe φ10	1	
35	Cap	1	
36	Fuel Filter Ass'y	1	
37	Cup	1	
38	O-Ring A	1	Do not reuse.
39	Filter	1	
40	Float Fuel Filter	1	
41	O-Ring B	1	Do not reuse.
42	Nut	1	M8
43	Washer	2	M8
44	Plate Filter	1	
45	Bot	1	M6 L=14mm
46-1	Hose	1	STD L=260mm
46-2	Fuel Hose (W/Protector)	1	Low Permeation Parts (for USA model)
47	Cap Fuel Pipe φ10	2	



This diagram illustrates the exploded view of the ABS hydraulic modulator assembly. The components are numbered 1 through 25. Key features include:

- Top Cover (1):** The uppermost housing component.
- Valve Body (4):** The central component containing the solenoid valves.
- Bottom Cover (3):** The lower housing component.
- Hydraulic Cylinder (2):** The central piston and cylinder assembly.
- Wiring Harness (14):** Labeled with "Yellow" and "Blue" wires.
- Mounting Brackets (10, 11):** Used for securing the unit to the vehicle frame.
- Fasteners:** Various bolts (5, 16, 20, 21) and washers (6, 22, 23, 24) are shown for assembly.
- Oil Level Indicator (13):** A plug for checking the brake fluid level.
- Pressure Sensor (19):** A sensor for monitoring hydraulic pressure.
- Electrical Connections:** Terminals (+ and -) are shown for the solenoid valves and the pressure sensor.

Technical specifications and torque values are provided for several components:

- Top Cover (1):** 15 N·m (11 lb·ft) [1.5 kgf·m]
- Valve Body (4):** 1342
- Oil Level Indicator (13):** 2st OIL
- Pressure Sensor (19):** 2st OIL
- Wiring Harness (14):** 2st OIL
- Bottom Cover (3):** 3 N·m (2 lb·ft) [0.3 kgf·m]

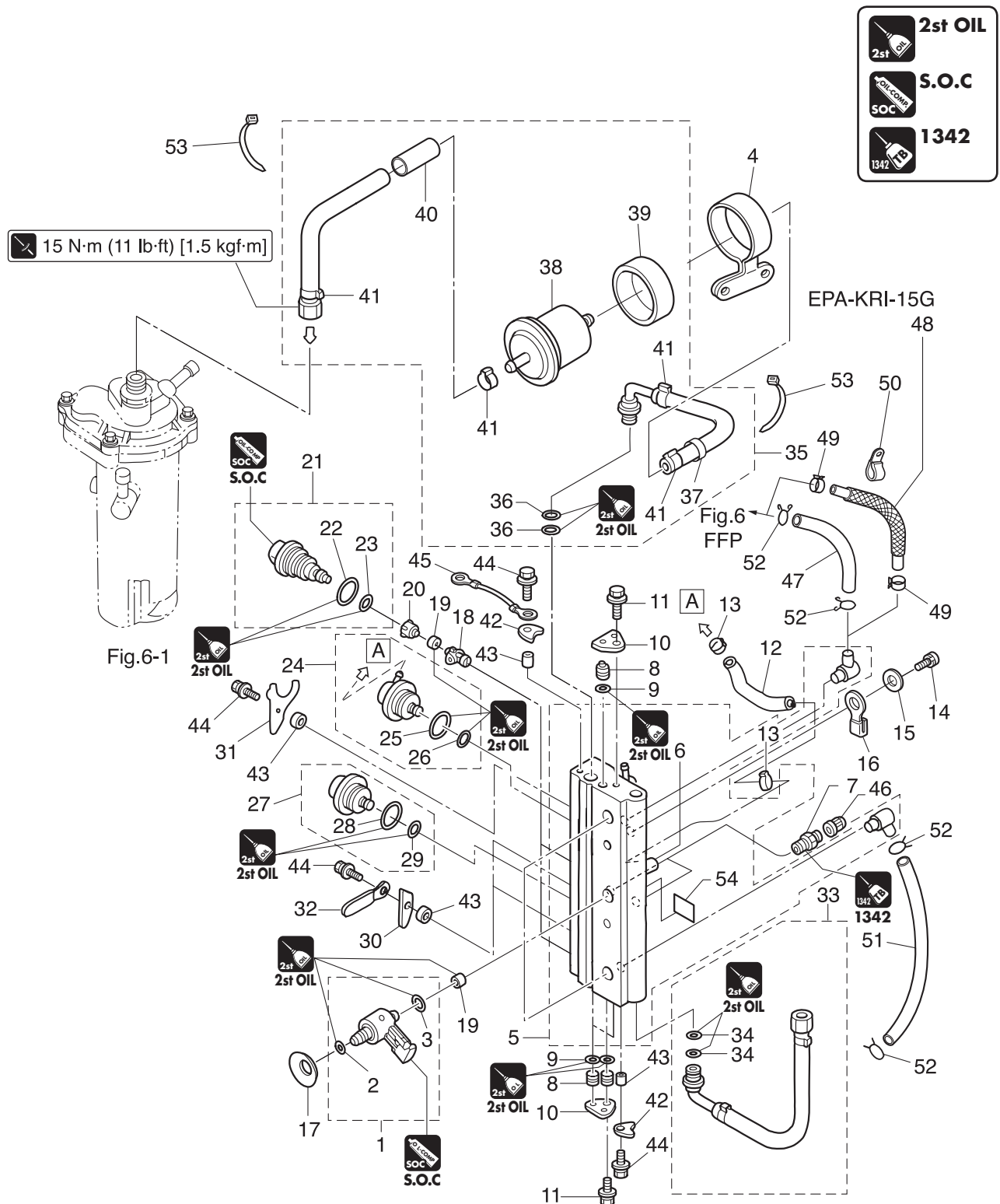


Ref. No.	Description	Q'ty	Remarks
1	Fue Feed Pump Ass y	1	
2	Fue Feed Pump	1	
3	Case Ass y FFP	1	
4	Upper Case Ass y FFP	1	
5	Adapter	1	
6	Washer Meta 10.2-17-2	1	Do not reuse.
7	Gasket FFP	1	Do not reuse.
8	Grommet FFP	1	Upper
9	Grommet FFP Lower	1	Lower
10	Cab e Term na Ass y (+)	1	
11	Cab e Term na Ass y (-)	1	
12	Grommet Cab e Term na	2	
13	Grommet Cab e Term na Upper	1	
14	Cord FFP	1	
15	Cord Cover FFP	1	
16	Bo t	1	M5 L=12mm
17	Washer	1	M5
18	C amp 6.5-47.5P	1	
19	Grommet P pe	1	
20	Bo t	4	M5 L=18mm
21	Bo t	2	M6 L=30mm
22	Washer 6-16-1.5	4	
23	Rubber Mount 8.5-12-2	2	
24	Spacer 6.2-9-15.7	2	
25	Rubber Mount	2	



Fuel System (TLDI)

Air Rail

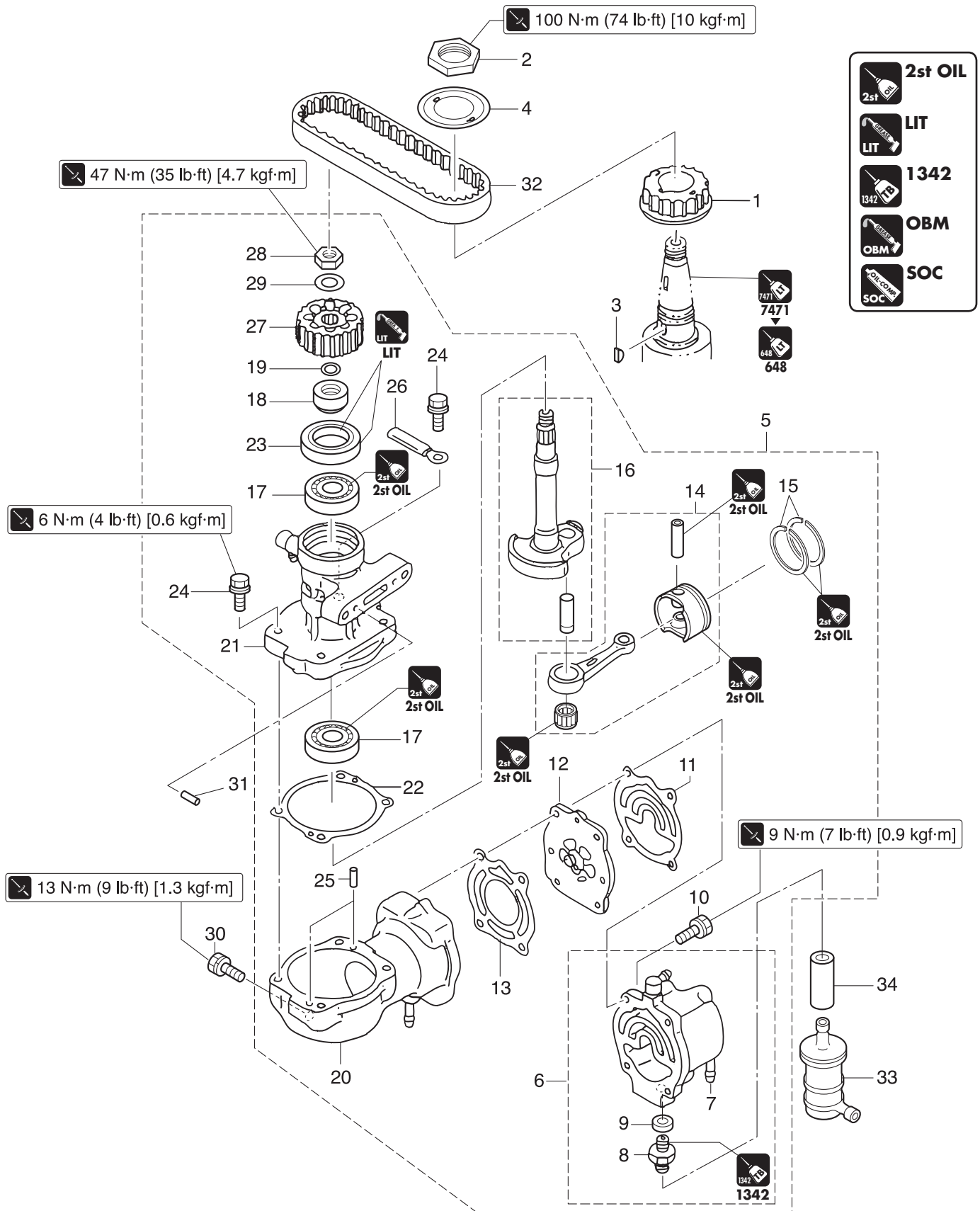


Ref. No.	Description	Q'ty	Remarks
1	Air Injector Complete	3	
2	O-Ring 5-52	1	Do not reuse.
3	O-Ring 2.4-9.5	1	Do not reuse.
4	Fuel Filter Band	1	
5	Air Rail Assy	1	
6	L-Nipple	1	
7	Valve Assy (Pressure Check)	2	
8	Pug 10.5	3	
9	O-Ring 6.8-1.9	3	Do not reuse.
10	Pug Stopper	2	
11	Bot	2	M6 L=12mm
12	Hose	1	L=105mm
13	Camp 29/64	2	
14	Bot	2	M8 L=65mm
15	Washer	2	M8
16	Camp 8.5-70P	1	
17	Disc Spring	3	
18	Fuel Injector Insert	3	
19	Sea Compression	6	
20	Fuel Injector Adapter	3	
21	Fuel Injector Assy	3	
22	O-Ring 2.8-20.2	1	Do not reuse.
23	O-Ring 3.5-735	1	Do not reuse.
24	Fuel Regulator Assy	1	
25	O-Ring 2.5-20	1	Do not reuse.
26	O-Ring 2.5-5	1	Do not reuse.
27	Air Regulator Assy	1	
28	O-Ring 2.5-20	1	Do not reuse.
29	O-Ring 2.5-5	1	Do not reuse.
30	Holding Plate	2	
31	Holding Plate	1	
32	Camp 6.5-47.5P	1	
33	Air Hose Assy	1	
34	O-Ring 9.8-1.9	2	Do not reuse.
35	Fuel Hose Assy	1	
36	O-Ring 9.8-1.9	2	Do not reuse.
37	Protector	1	
38	High Pressure Fuel Filter	1	
39	Fuel Filter Rubber Mount	1	
40	Protector ϕ 18-150	1	
41	Camp 21/32	4	
42	Holding Plate	2	
43	Coar 6.7-12.7-3	5	
44	Bot	5	M6 L=16mm
45	Ground (Earth Wire) L=110	1	
46	Cap Valve	2	
47	Hose	1	without for USA mode L=530mm
48	Fuel Hose (W/Protector)	1	Low Permeation Parts (for USA mode)
49	Cup	2	
50	Camp 6.5-14	1	
51	Hose	1	L=280mm
52	Cup Fuel Pipe ϕ 10	4	
53	Band Lead Wire 104	3	
54	Air Rail Deca	1	



Fuel System (TLDI)

Air Compressor

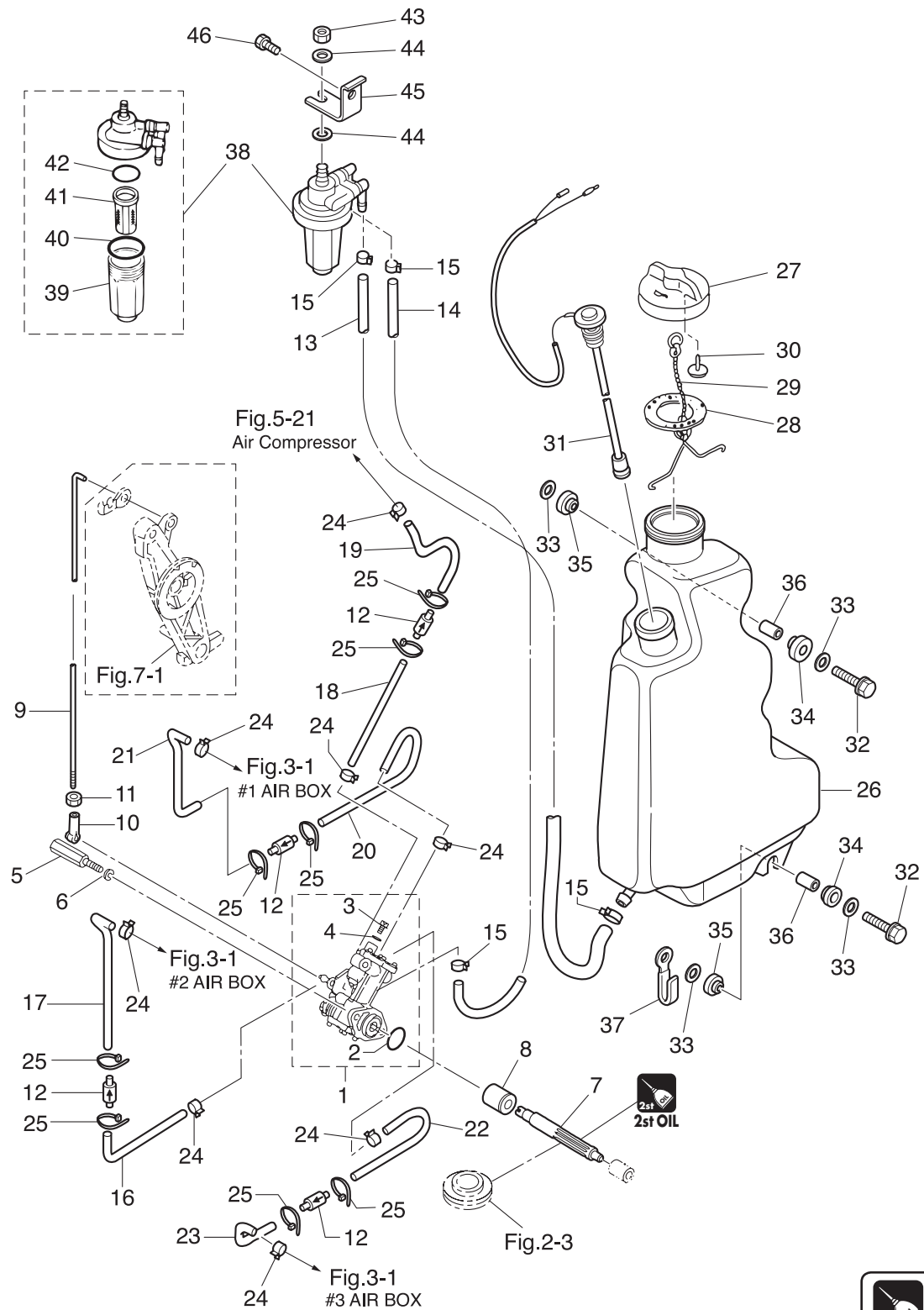


Ref. No.	Description	Q'ty	Remarks
1	Dr ve Pu ey	1	
2	Nut Pu ey	1	
3	Key Dr ve Pu ey	1	
4	Be t Gu de	1	
5	A r Compressor Ass y	1	
6	Compressor Head Ass y	1	
7	N pp e	1	
8	Adapter	1	
9	Meta Washer 10.2-17-2	1	Do not reuse.
10	Bo t	4	M6 L=30mm
11	Gasket Compressor Head	1	Do not reuse.
12	Reed Va ve Ass y	1	
13	Gasket Va ve Seat	1	Do not reuse.
14	P ston • Connect ng Rod Ass'y	1	
15	A r Compressor P ston R ng	2	Do not reuse.
16	Compressor Crankshaft Ass y	1	
17	Ba Bear ng 6203	2	Do not reuse.
18	Co ar 13.5-25-13	1	
19	O-R ng 1.9-13	1	Do not reuse.
20	A r Compressor Cy nder Ass y	1	
21	A r Compressor Hous ng Ass y	1	
22	Gasket Compressor Hous ng	1	Do not reuse.
23	O Sea 25-45-8	1	Do not reuse.
24	Bo t	4	M6 L=25mm
25	Dowe P n 4-10	2	
26	C amp 6.5-47.5P	1	
27	Dr ven Pu ey	1	
28	Nut (Magnet) 10-P1.25	1	
29	Washer 10.5-20-3.2	1	
30	Bo t	3	M8 L=35mm
31	Dowe P n 4-10	2	
32	Dr ve Be t	1	
33	A r F ter Ass y	1	
34	Hose	1	L=60mm



Fuel System (TLDI)

Oil Pump



Ref. No.	Description	Q'ty	Remarks
1	O Pump Ass y	1	
2	O-R ng 1.6-19.2	1	Do not reuse.
3	A r Vent Bo t	1	
4	Washer	1	
5	O Pump Bo t	2	
6	Spr ng Washer	2	M6
7	O Pump Dr ven Gear	1	
8	Bush ng 9-20-20.8	1	
9	O Pump Rod	1	
10	Ba Jo nt Connector	1	
11	Nut	1	M5
12	Check Va ve Comp ete	4	
13	P pe	1	L=570mm
14	P pe	1	L=175mm
15	C p ϕ 9.4	4	
16	P pe	1	L=200mm
17	P pe	1	L=140mm
18	P pe	1	L=120mm
19	P pe	1	L=160mm
20	P pe	1	L=140mm
21	P pe	1	L=200mm
22	P pe	1	L=200mm
23	P pe	1	L=100mm
24	C p ϕ 6.9	8	
25	Band Lead W re 104	8	Do not reuse.
26	O Tank	1	
27	O F er Cap	1	
28	Gasket 36-52-2	1	Do not reuse.
29	Cap Hook Tank	1	
30	O Tank Cap Check Va ve	1	
31	O Leve Sensor	1	
32	Bo t	2	M6 L=30mm
33	Washer 6.5-21-1	4	
34	Mount Motor Cover Lower 8.5-14-2.5	2	
35	Rubber Mount 8.5-14-2.5	2	
36	Spacer 6.2-9-15.7	2	
37	C amp 6.5-87P	1	
38	O F ter Ass y	1	
39	Cup	1	
40	O-R ng A	1	Do not reuse.
41	F ter	1	
42	O-R ng B	1	Do not reuse.
43	Nut	1	M8
44	Washer	2	M8
45	P ate F ter	1	
46	Bo t	1	M6 L=14mm



Fuel System (TLDI)

3. What is TLDI?

Direct Fuel Injection System

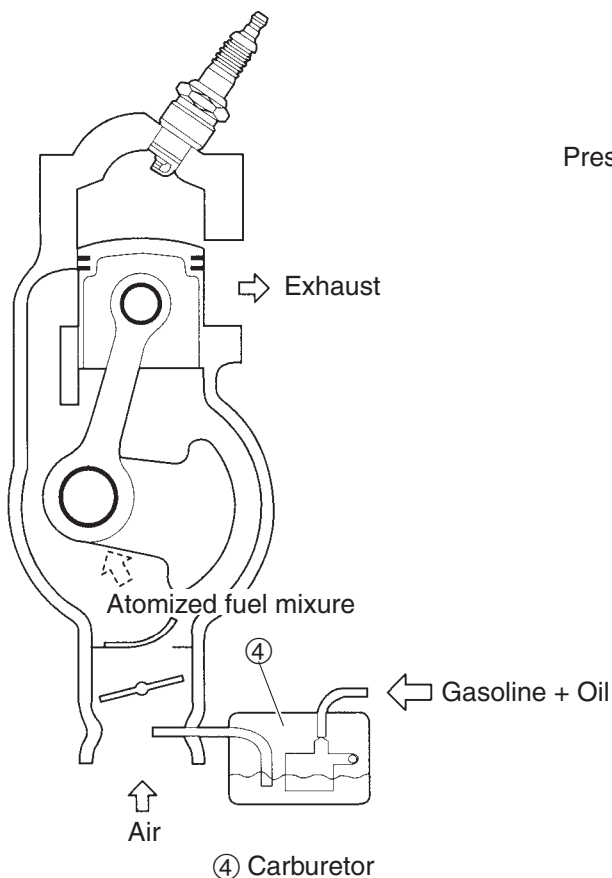
1. TLDI (Two-stroke Low-pressure Direct injection)

TLDI is a kind of two stroke engine system that adopts air-assisted low pressure direct fuel injection.

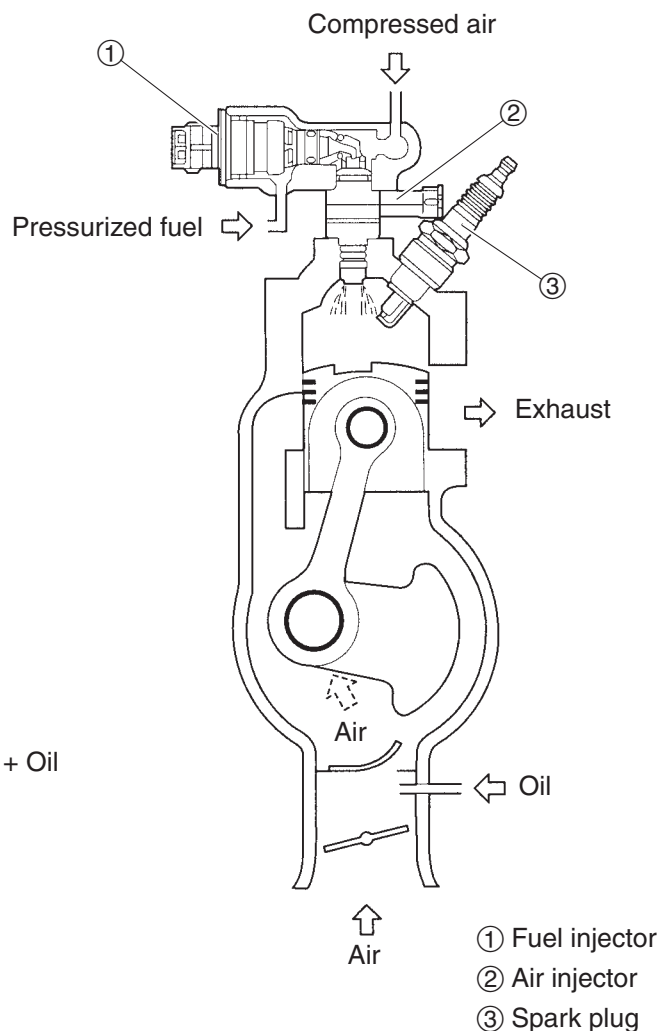
The adoptions of the air-assisted low pressure direct fuel injection system and digital inductive ignition system and control of factors by means of ECU (Engine Control Unit) such as fuel injection amount, fuel injection timing and ignition timing provide fuel combustion at higher efficiency, lower fuel consumption and lower emission, as well as powerful performance that is one of outstanding features of two stroke engines.

2. Air-assisted low pressure direct fuel injection

The air-assisted low pressure direct fuel injection is a system that directly injects fuel compressed with a fuel pump into the combustion chamber with the assistance of the air that is compressed with an air compressor. The injected fuel is an air-mixture that is very finely atomized, providing fuel combustion at higher efficiency.



ENGINE WITH CARBURETOR



TLDI

Inductive Ignition

TLDI adopts an inductive ignition system that provides the fuel combustion at higher efficiency, lower fuel consumption and lower emission.

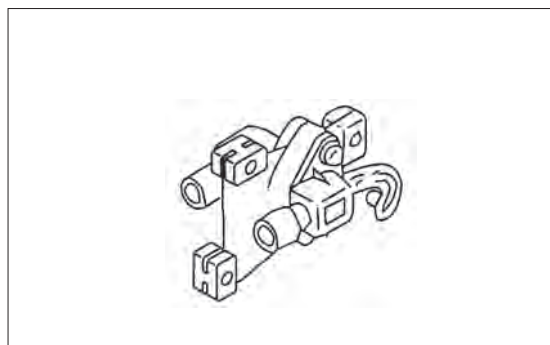
The inductive ignition of TLDI has spark plug ignition duration that is longer than that of conventional two stroke carbureted engines for surer combustion of the air-fuel mixture in the combustion chamber, ensuring more stabilized engine operation under varied operating environment. The adoption of this ignition system allows to achieve smoother engine operation with lower fluctuation of engine speeds during idling.

1. TPS (Throttle Position Sensor) Assembly

TPS consists of two sections, TPS1 and TPS2, that function together to detect openings of intake valve (throttle butterfly) and throttle (advancer arm) of the throttle body, and transmits the signals to ECU.

CAUTION

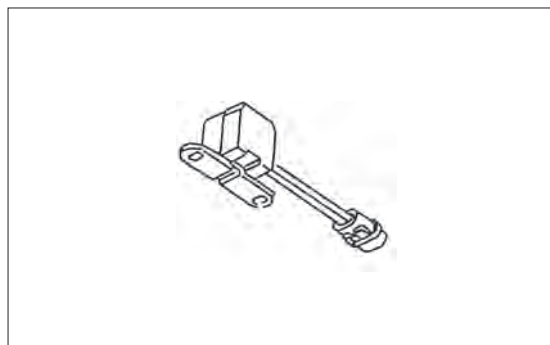
Remove only as an assembly. Do not remove the two-phillips head screws (with paint that hold sensors together).



4

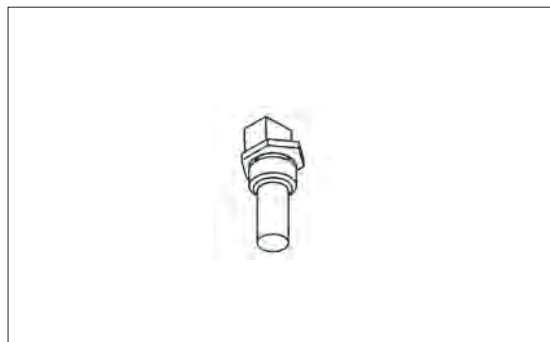
2. CPS (Crank Position Sensor)

CPS detects the crank shaft position and revolution speed by detecting the encoders located on the ring gear of the flywheel, and transmits the signals to ECU.



3. Water Temperature Sensor

The water temperature sensor detects the temperature of cooling water that flows through interior of cylinder and air compressor, and transmits the signals to ECU.



4. Oil Level Sensor

During operation of the engine, the oil level sensor operates and informs of low engine oil level through the oil lamp of tachometer and buzzer if the oil level is lower than the limit.

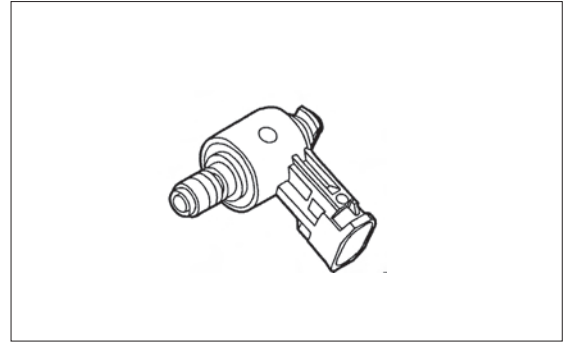




Fuel System (TLDI)

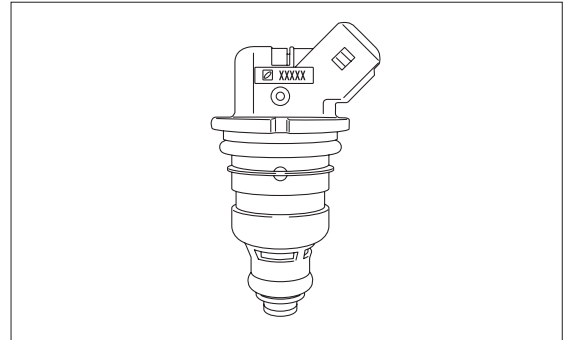
5. Air Injector

The air injector injects fuel and compressed air into the combustion chamber of each cylinder. The component is controlled by ECU to inject the amount of fuel mixture at the timing that is best suited to the current engine operation conditions based on the information from sensors.



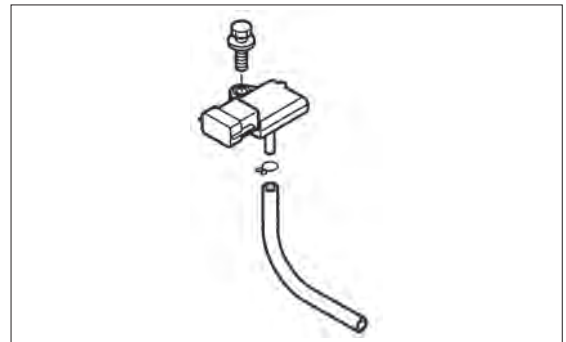
6. Fuel Injector

The fuel injector supplies the gasoline contained in the air rail to the air injector through the fuel injector insert. The component is controlled by ECU to supply the amount of fuel that is best suited to the current engine operation conditions based on the information from sensors.



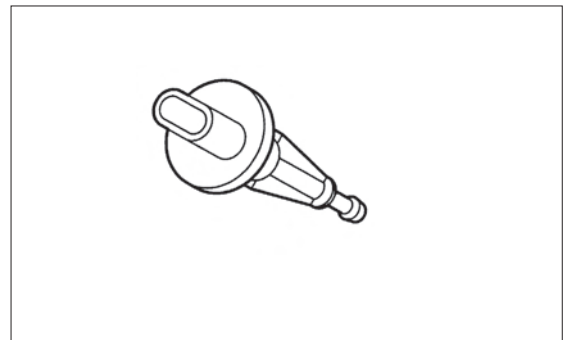
7. MAP (Manifold Pressure) Sensor (optional)

MAP sensor is located on the upper area of air chamber, and measures the air chamber inner pressure (vacuum pressure) and sends the signal to ECU. ECU uses this signal to establish fuel injection amount and ignition timing.



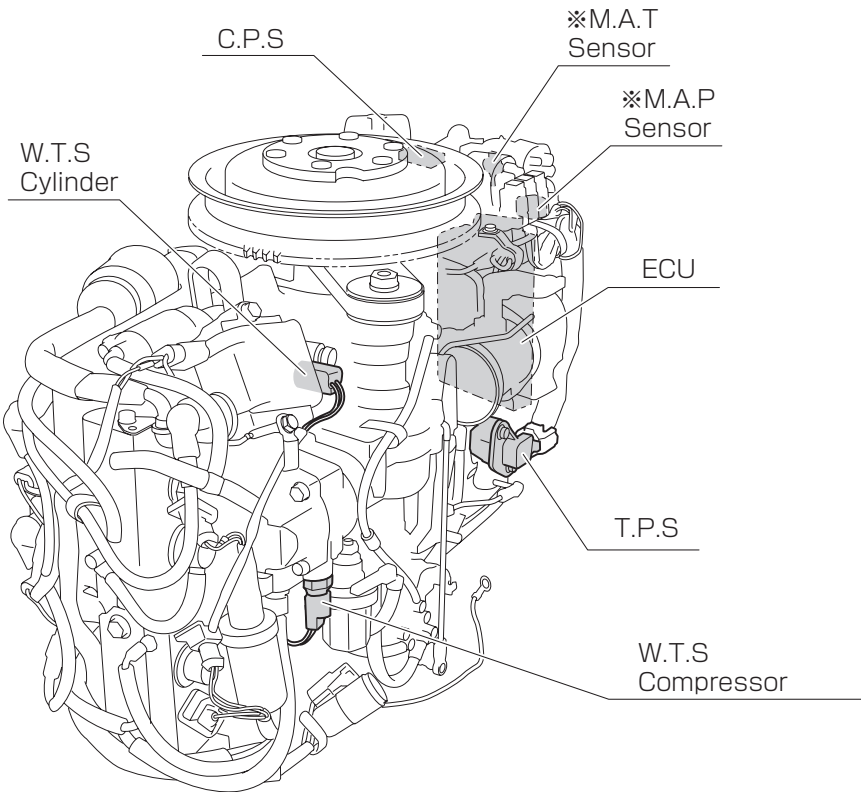
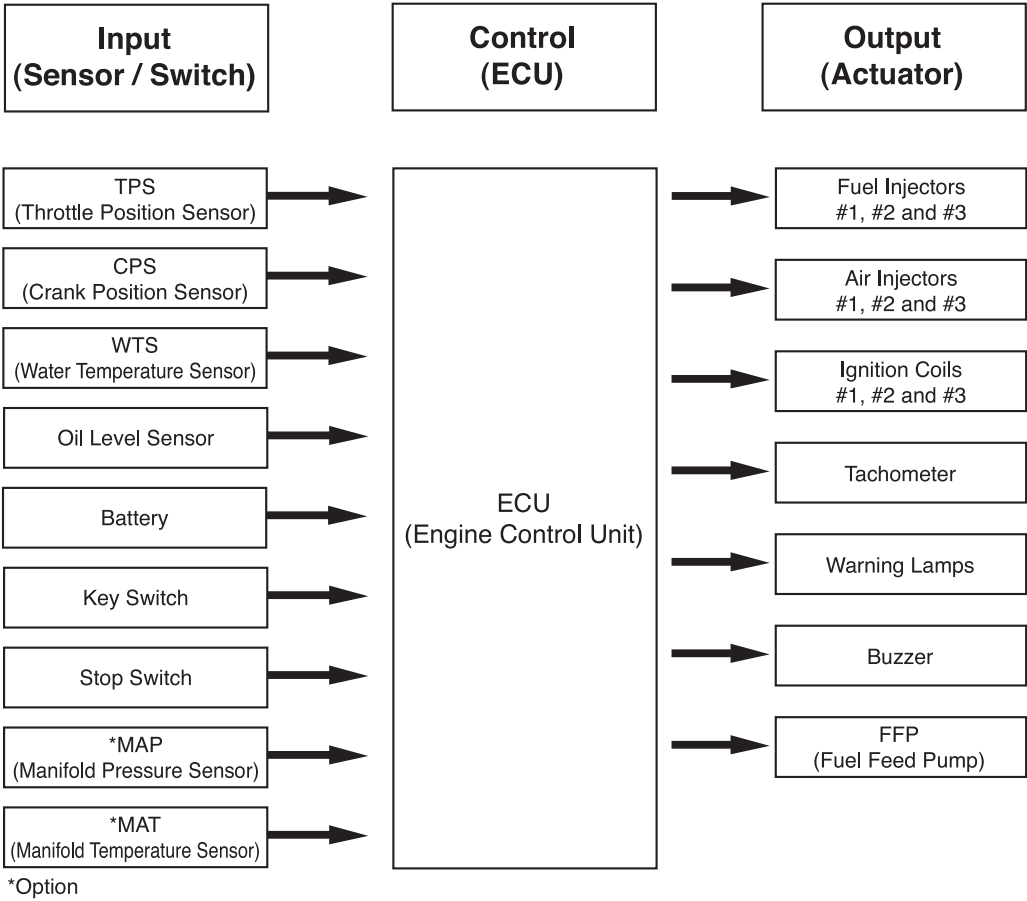
8. MAT (Manifold Temperature) Sensor (optional)

MAT sensor is located on the upper area of air chamber, and measures intake air temperature and sends the signal to ECU.



ECU

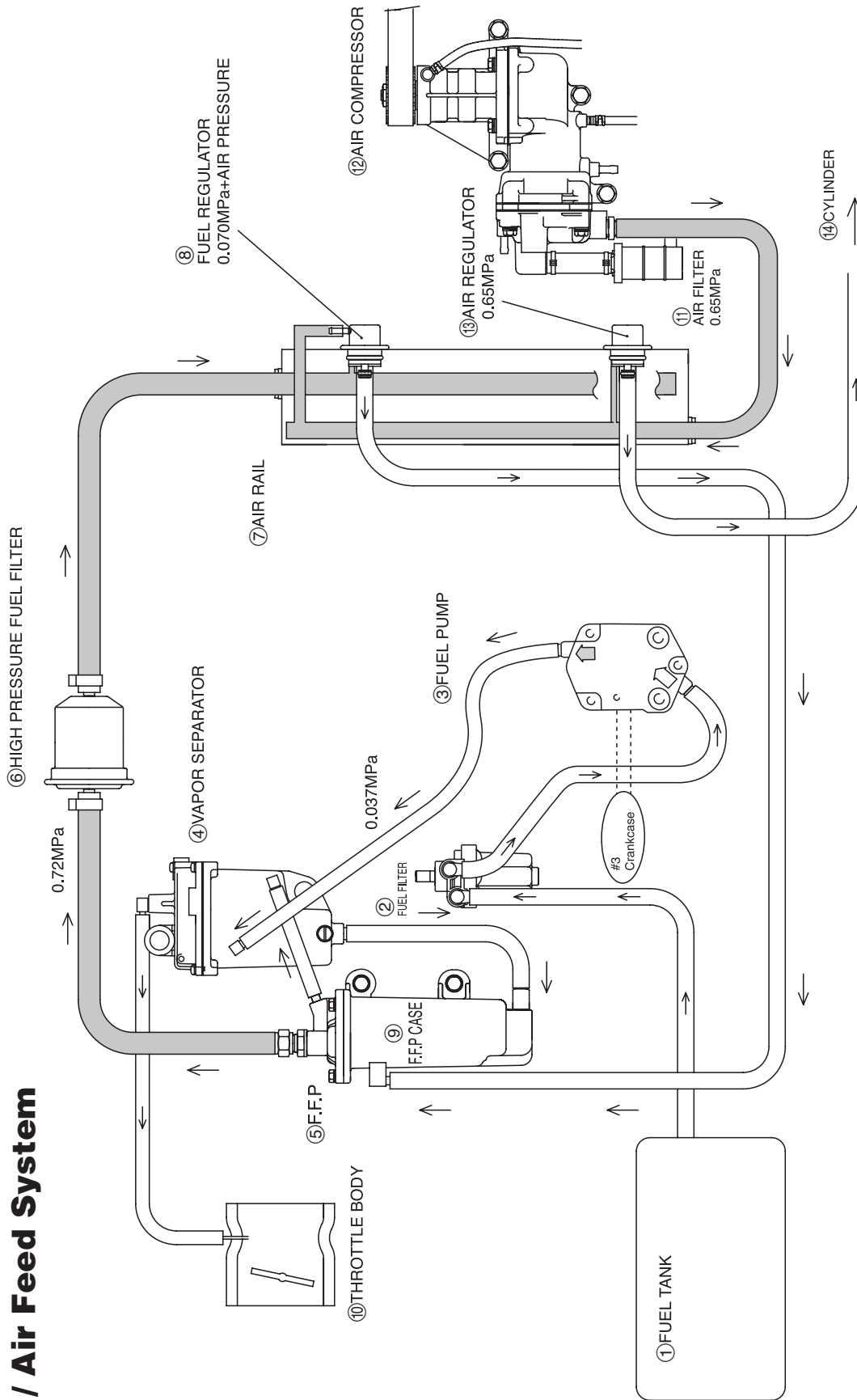
TLDI uses ECU to control factors such as fuel injection amount, injection timing and ignition timing to the best suited conditions based on the information from the sensors. Moreover, the TLDI achieves lean combustion through stratified charge in the low engine speed range, and highly efficient combustion through electronic control of premixed charge that provides homogeneous fuel distribution in the combustion chamber in the high speed range.





Fuel System (TLDI)

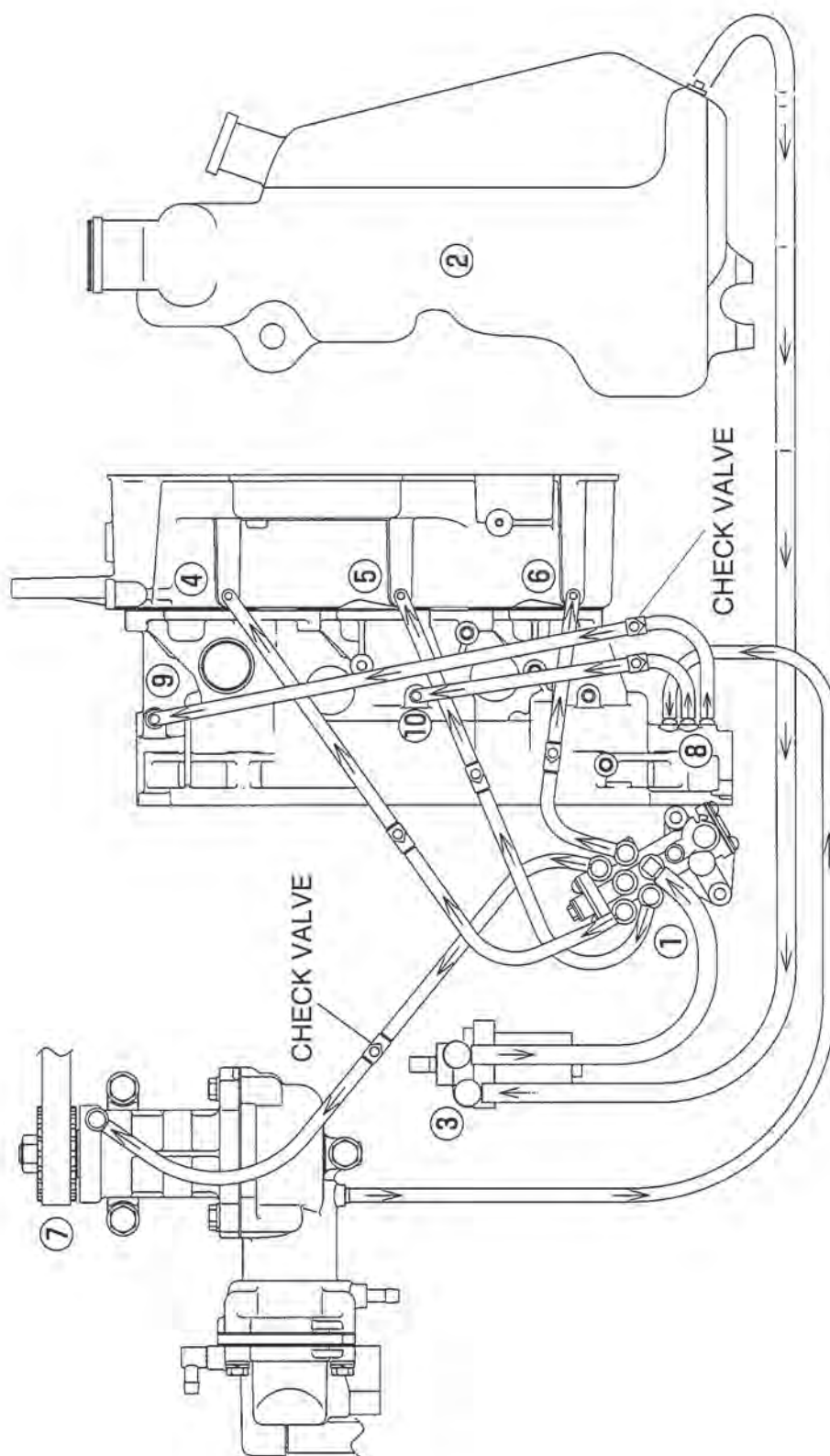
Fuel / Air Feed System



When the engine starts, the fuel pump ③ operates to feed gasoline from fuel tank ① to vapor separator ④ through the fuel filter ②. The gasoline is compressed with FFP ⑤, sent to air rail ⑦ through high pressure fuel filter ⑥ and then, injected into the combustion chamber. The pressure of ⑤ to ⑦ are controlled by the fuel regulator ⑧ so that the gasoline differential pressure is kept to 0.070MPa (10.1psi) for proper combustion. The gasoline that is not used here is decompressed and returned to ④ through FFP case ⑨. The returned gasoline contains small amount of air bubbles that are produced when the gasoline was compressed with ⑤. The air bubbles are

sent to the throttle body ⑩ from upper part of ④ and are sucked as intake air of the engine. In the same way, when the engine starts, the air compressor ⑫ operates to suck air through air filter ⑪. Moreover, the air that is compressed with ⑫ is sent to the air rail ⑦, mixed with fuel and injected into the combustion chamber through air injectors. The air pressure is controlled to 0.65MPa (94.3psi) by the air regulator ⑬ to maintain appropriate combustion. The air that is not used here is decompressed and disposed to exhaust passage of the cylinders ⑭.

Oil System/Recirculation System



Starting the engine operates the oil pump ①, which draws oil from the oil tank ② and routes it through the oil filter ③ to the oil pump ①. The oil pump channels the oil through four ports to #1 air box ④, #2 air box ⑤, #3 air box ⑥ and the air compressor ⑦. Ports ④, ⑤ and ⑥ serve to lubricate the engines pistons, while ports ⑦ lubricates the aircompressor.

TLDI includes a oil recirculation system in which the excess oil from the aircompressor ⑦ is diverted to #3 crankcase ⑧ for use in lubricating the drive gear of oilpump ①. Any oil left over from there is diverted to crank upper bearing and #1 crankcase ⑨, and the crankcase ⑩ where it is added to oil from ④ and ⑤ and reused to lubricate the engine.



Fuel System (TLDI)

4. Removing Air Rail

⚠ WARNING

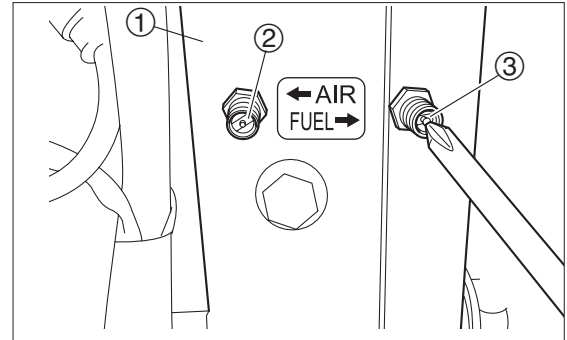
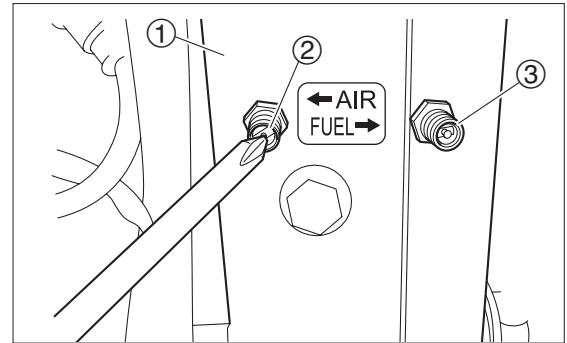
- Be sure to decompress fuel and air before disassembling fuel system components.
- Disassembling fuel system components can cause spurting of compressed fuel.

1) Decompression of Fuel Line and Air Line

1. Push in the air valve ② attached to air rail ① to decompress the air line.
2. Push in the fuel valve ③ attached to air rail ① to decompress the fuel line.



Cover the fuel valve area with clean cloth to prevent fuel from spurting when decompressing.

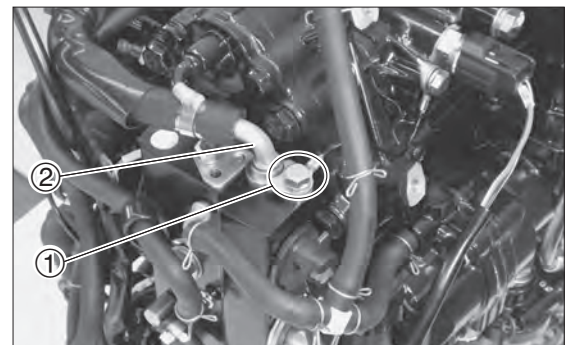


2) Removing Air Rail Ass'y

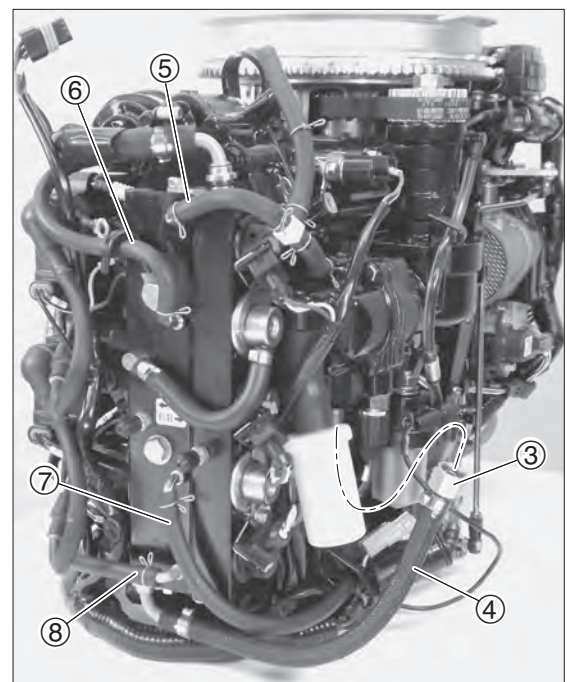
1. Remove #1 ignition coil and stopper plate ① and pull out hose ②.



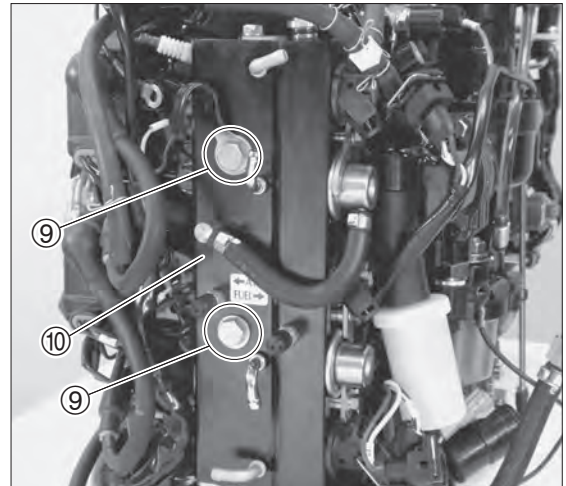
- Cover fuel hose by waste textile when disconnect fuel hose before removing the air rail.
- Disconnect fuel injector cord wires before removing the air rail. Refer to "Chapter 5 Removing Cord Ass'y and electrical parts".



2. Remove compressor side hose joint ③ and remove air hose ass'y ④.
3. Remove fuel injector connector and cooling water outlet hose ⑤, and then, fuel return hose ⑥, air exhaust hose ⑦ and cooling water inlet hose ⑧.



4. Loosen two bolts ⑨ that secure air rail, and remove air rail ass'y ⑩ carefully.

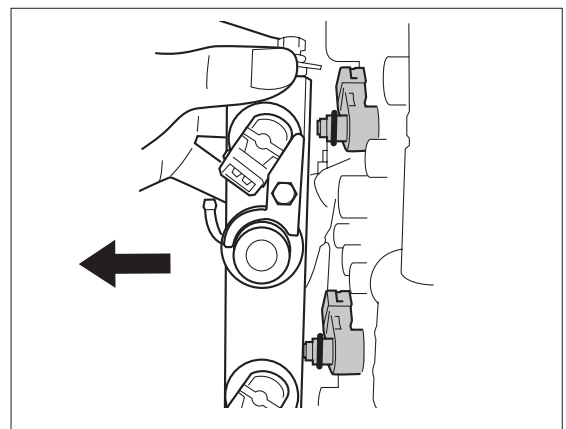


5. When removing the air rail, leave the air injectors on the cylinder side.



Be careful not to drop O ring located on the air injectors.

Pull the air rail straight without applying force to the air injectors.



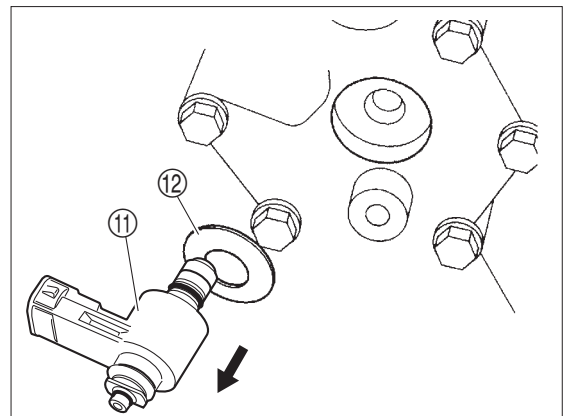
6. After removing air rail ass'y, remove three air injectors ⑪ and air injector set pieces ⑫.

CAUTION

Handle air injectors carefully. Impacting their tips can cause malfunction.



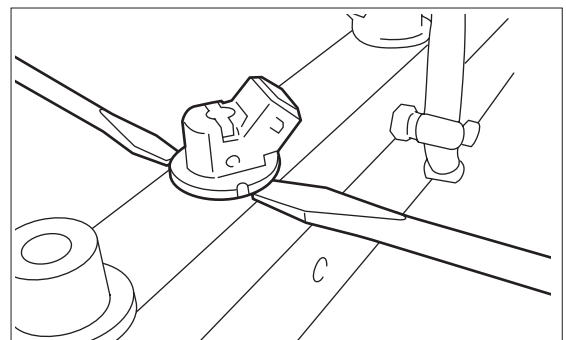
When removing the air injectors, pull out them straight without applying force to their tips.



7. Turn each fuel injector carefully to loosen O ring, and insert bladed screw drivers from both sides to remove it up straight evenly.

CAUTION

Handle fuel injectors carefully. Impacting their tips can cause malfunction.





Fuel System (TLDI)

3) Inspection of Injectors

1. Check air injectors and fuel injectors for cracks and damages. Replace if necessary.
2. Check disc springs of air injectors for dirt, correct position settling and damages Clean, or replace if necessary. (Refer to "Injector Assembling Diagram" in page 4-22.)

5. Assembly of Air Rail

⚠ CAUTION

Impacting the tip of air injector or fuel injector can cause defective operation of the injector, possibly damaging the engine.

1) Installing of Injectors and Regulators

1. Use O ring set tool ① to attach O rings ③ to fuel injector ②.



O Ring Set Tool (ø24) ①:
P/N. 3T5-72863-0

⚠ CAUTION

To avoid incorrect installation of the fuel injectors, check the marking ① on each injector.

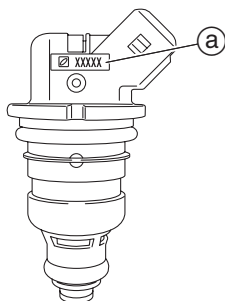
For TLDI40/50B, TLDI40/50B2,

TLDI70/90B and 75/90C2 :

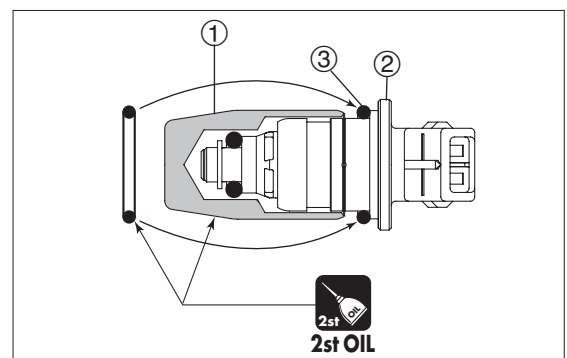
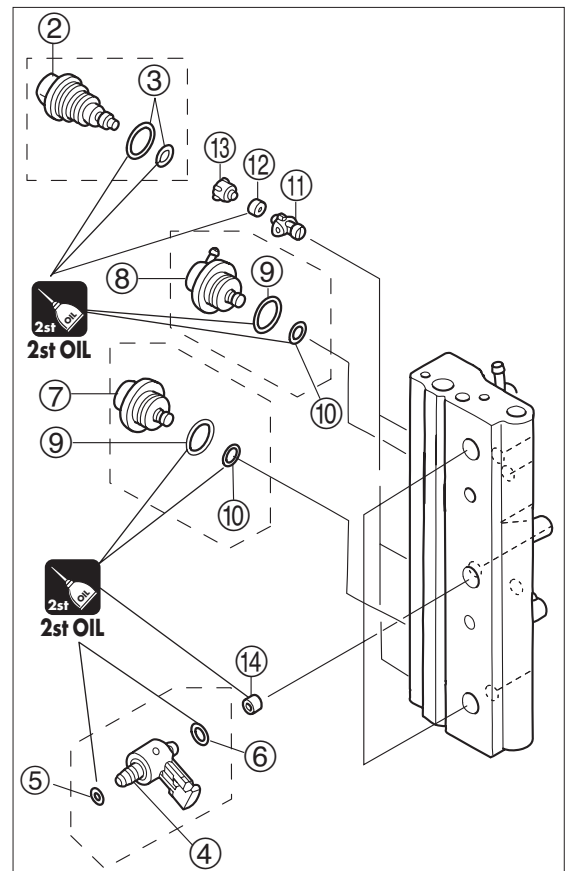
Marking of "37003" on the blue plastic area

For 115A and TLDI115A2 :

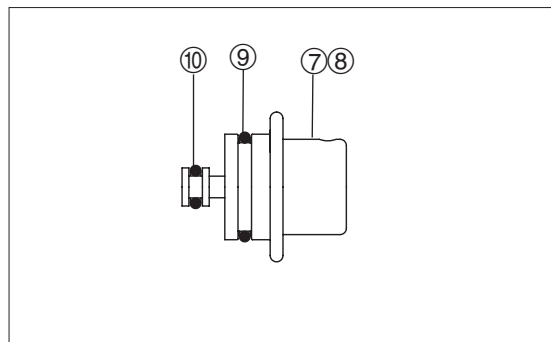
Marking of "37001" on the pink plastic area



2st OIL



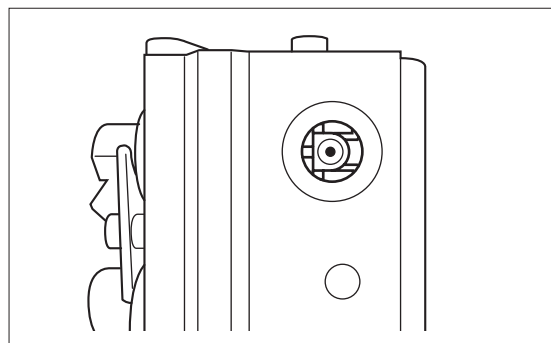
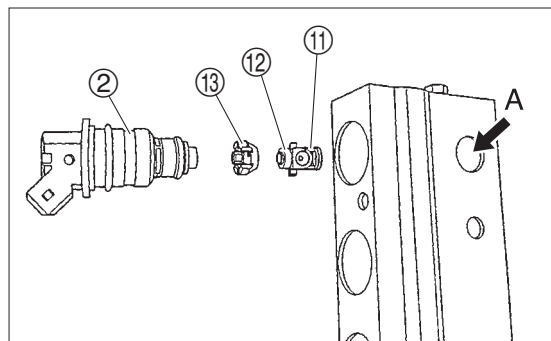
2. Attach O rings ⑨ and ⑩ to air regulator ⑦ and fuel regulator ⑧.



3. Attach compression seal ⑫ to fuel injector insert ⑪, and then, attach the assembly to the air rail.



- Attach the insert ⑪ in a correct orientation shown by arrow A.
- Check that injectors are free from waste textile and other dirt before installing.

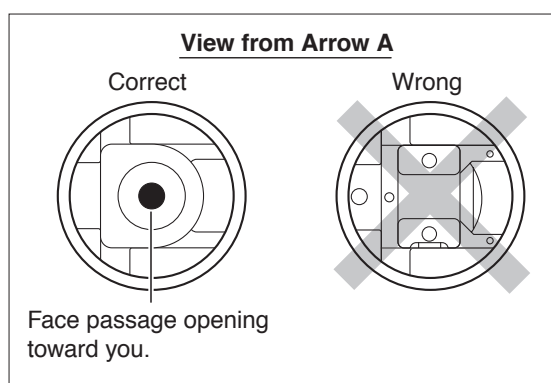


4. Attach fuel injector adapter ⑬ and fuel injector ② to the air rail.

5. Install air regulator ⑦ and fuel regulator ⑧.



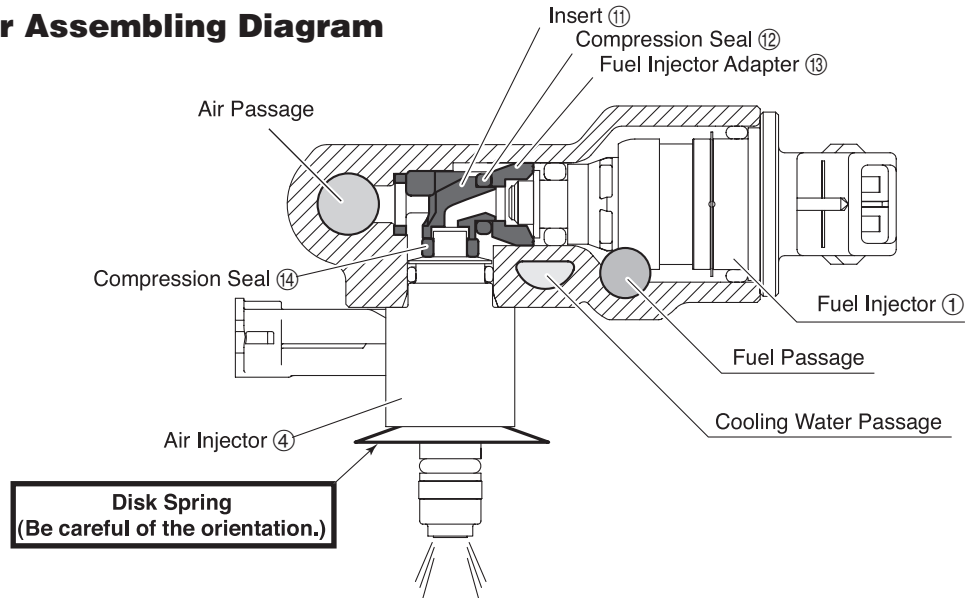
Air regulator is marked with orange paint. Fuel regulator is marked with white paint.





Fuel System (TLDI)

Injector Assembling Diagram



6. Attaching Hose Clamps

- (1) Attach the following parts.
Install fuel regulator (8) and air regulator (7), secure them using collars (15), plate (16) and bolt (17).



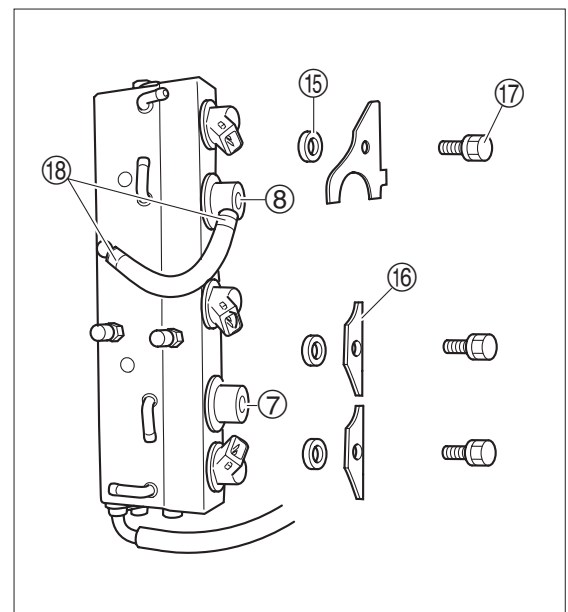
Be sure to install collar (15) below plate (16).

Attach hose to fuel regulator by using hose clamp (18).

Do not reuse hose clamp. Always use new one.



Clamp Pliers :
P/N. 3T5-72864-0

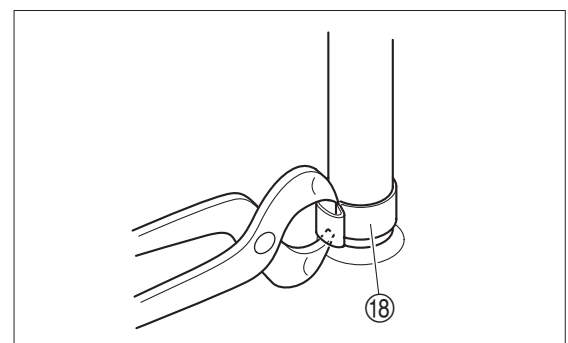


18 Do not reuse

- (2) Removing hose clamp
Cut joint of hose clamp (18) and remove the clamp.

CAUTION

Remove hose clamp without cutting joint will damage fuel hose.



18 Do not reuse

- (3) Attaching hose clamp. Lightly Lubricate inside of clamp to prevent hose damage.
Crush hose clamp ⑱ as shown to tighten the hose securely.

⚠ WARNING

Do not reuse hose clamp. Be sure to use new one.

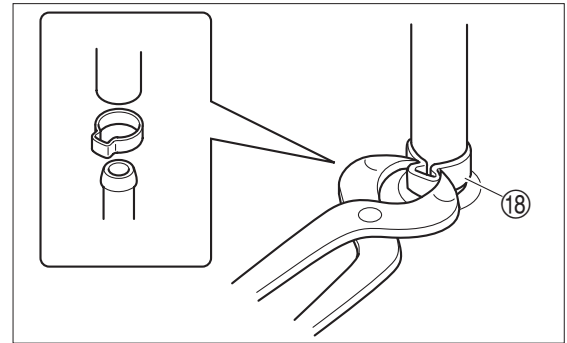


Clamp Pliers :

P/N. 3T5-72864-0

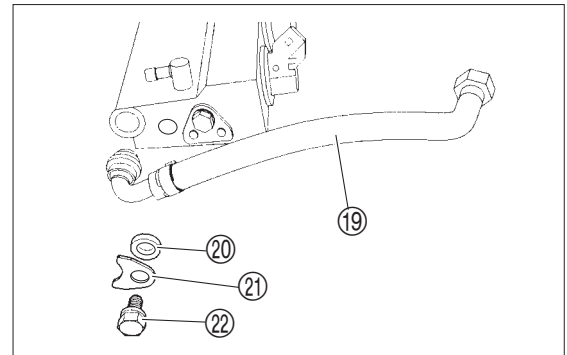


Do not crush hose clamp too much, or the hose may be damaged.



18 Do not reuse

7. Attach the following parts.
- (1) Attach air hose ass'y ⑲ using collar ⑳, nipple plate ㉑ and bolt ㉒ in this order.

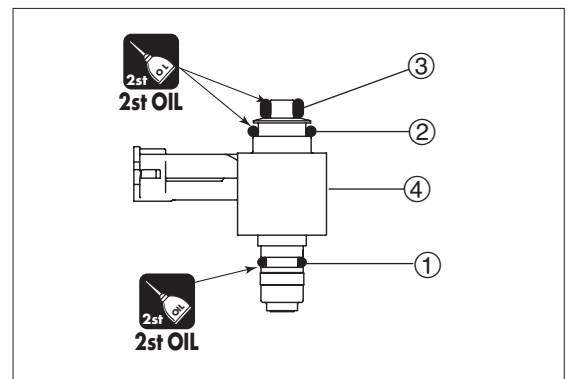


2) Installation of Air Injector and Air Rail

1. Attach O rings ① and ② and compression seal ③ to air injector ④.



2st OIL





Fuel System (TLDI)

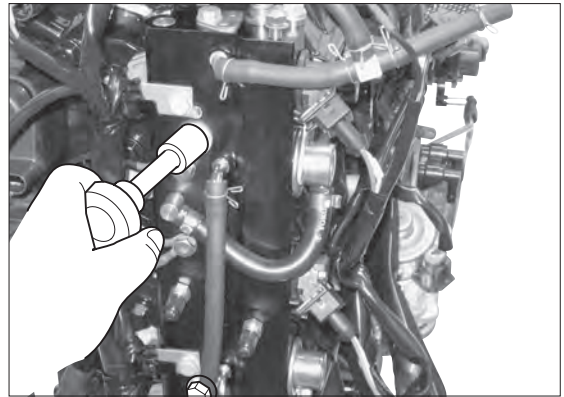
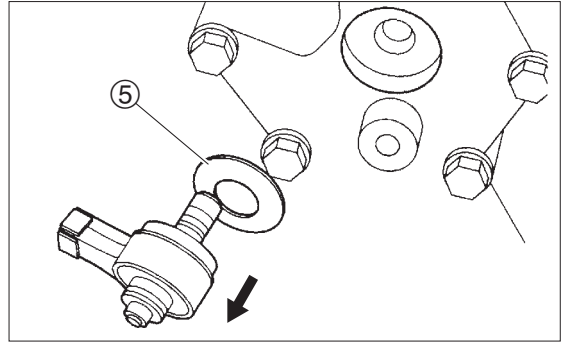
2. Install air rail ass'y to cylinder head, and secure with bolts.

CAUTION

When installing air rail ass'y, be careful of orientation of disc spring ⑤. Installing the part in wrong orientation can cause squirt of fuel. Refer to "Injector Assembling Diagram" in page 4-22.



- Set air injector with coupler side directing to port side of engine.
- Check that injectors are free from waste textile and other dirt before installing.
- Install air rail ass'y on the cylinder head horizontally, and tighten all bolts evenly.



3. Arrange the pipes as shown.
Attach air hose ass'y ⑥ to air compressor hose joint adapter with fasteners tightened to specified torque.

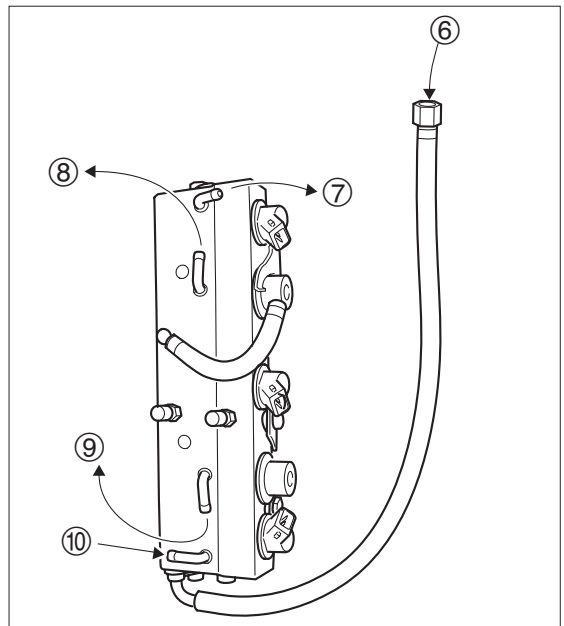


Air Hose Ass'y ⑥ :
15 N·m (11 lb·ft) [1.5 kgf·m]



Do not tighten with excessive torque. The part may be damaged.

- ⑥ from air compressor (air)
- ⑦ to air compressor (cooling water)
- ⑧ to FFP (fuel)
- ⑨ to cylinder (air)
- ⑩ from exhaust cover (cooling water)



6. Removing and installation of Fuel System

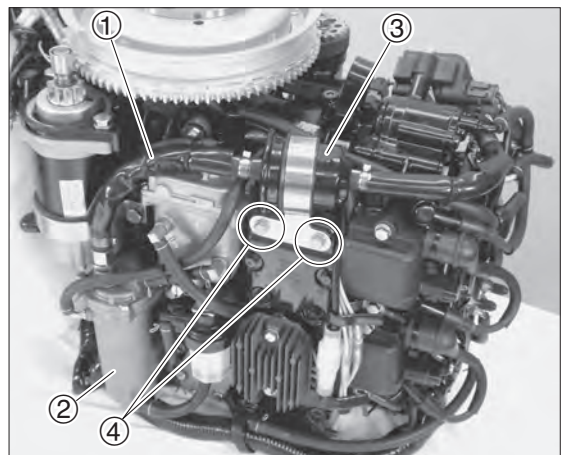
1) Removing High Pressure Fuel Hose Ass'y

Remove following parts.

1. Remove fuel hose ass'y ① after loosening joint between FFP ② and air rail.
2. Remove high pressure fuel filter ③, from mounting bolt ④ and exhaust cover.



Use waste textile to catch fuel that spills from the fuel hose ass'y ① when they are removed.



2) Installation of Fuel Hose Ass'y

Reverse the removing steps.

Fuel Filter Band Securing Bolt ④



Fuel Filter Band Bolt ④ :

12 N·m (9 lb·ft) [1.2 kgf·m]

Nut for attaching to FFP

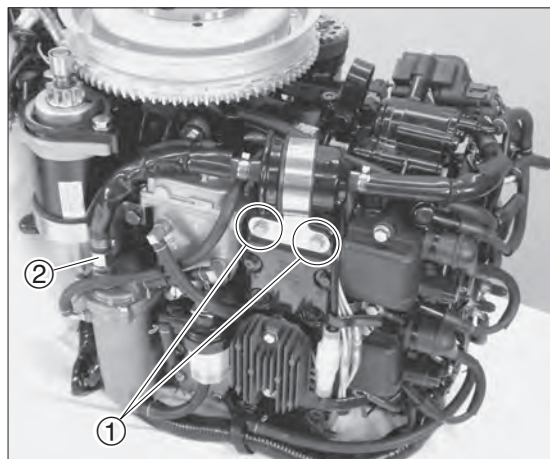


Fuel Hose Ass'y Nut ⑦ :

15 N·m (11 lb·ft) [1.5 kgf·m]



Do not tighten with excessive torque. The part may be damaged.



3) Draining Fuel from FFP Vapor Separator

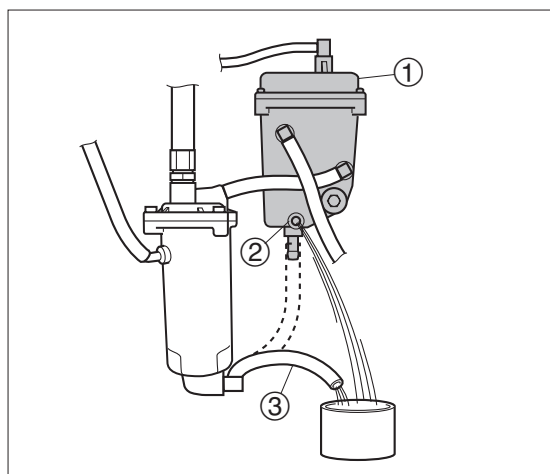
- Decompress fuel and air pressures.



WARNING

Compressed fuel and/or air may spurt if it is not decompressed.

- Loosen air vent screw ①, and then, drain screw ② to drain fuel from vapor separator and collect it in a container.
- Disconnect hose ③ at vapor separator side to drain fuel from FFP and collect it in a container.

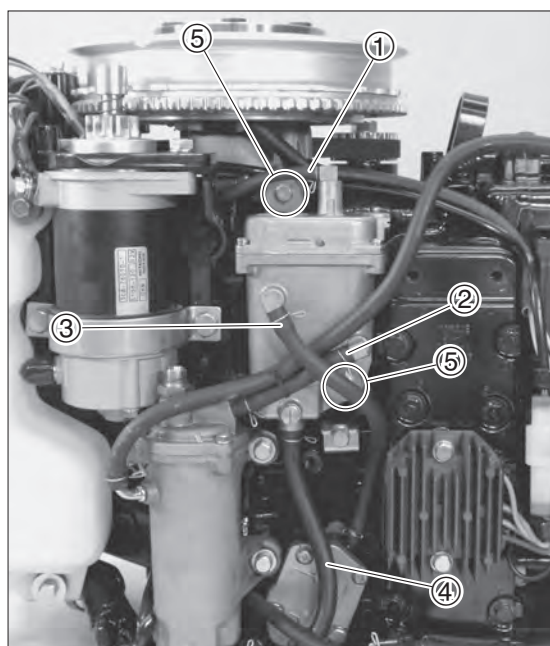


4

4) Removing Vapor Separator

Drain fuel from vapor separator.

- Pull out following hoses.
 Vapor Exhaust Hose ① : Vapor Separator → Throttle Body
 Vapor Return Hose ② : FFP → Vapor Separator
 Fuel Inlet Hose ③ : Fuel Pump → Vapor Separator
 Fuel outlet Hose ④ : Vapor Separator → Fuel Pump
- Loosen the bolt 5, and then remove vapor separator

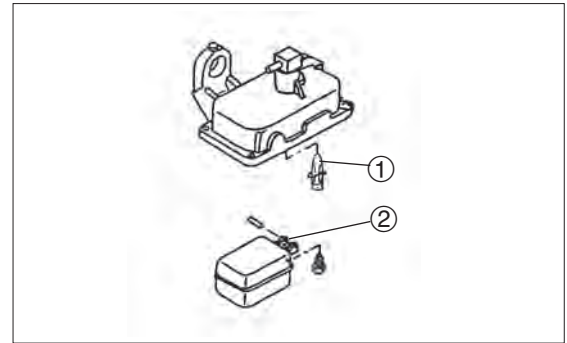




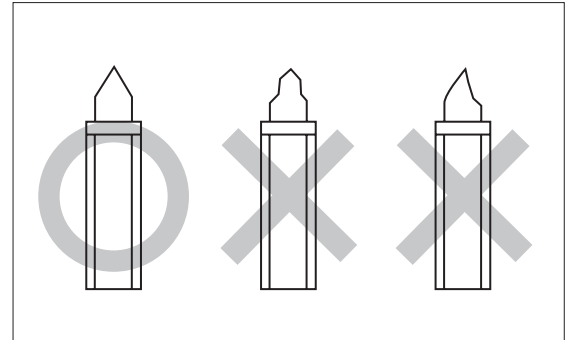
Fuel System (TLDI)

5) Disassembly and Inspection of Vapor Separator

1. Remove float chamber of vapor separator, and then, remove float valve ① and float ②.



2. Inspection of Vapor Separator
 1. Check needle valve ① for deformation and wear.
 2. Check float ② for deformation, crack and other defects.
Replace if necessary.
 3. Check if any dirt or dust is in the vapor separator.
Replace if necessary.



6) Assembly of Vapor Separator

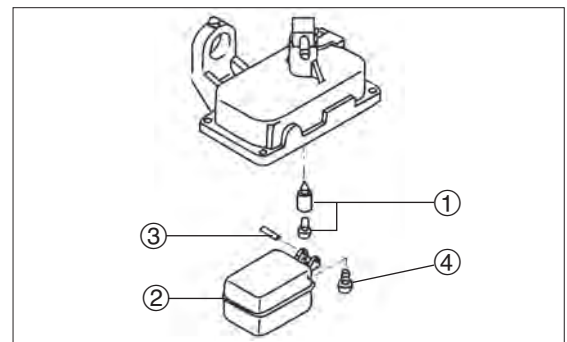
1. Assemble following parts.

- ① Float Valve
- ② Float
- ③ Float Arm Pin
- ④ Tighten screw.



Screw ④-:

1.5 N·m (1.1 lb·ft) [0.15 kgf·m]



- ⑤ Drain Screws : Tighten two screws.

- ⑥ O Rings : 2 pcs.



Draw Screw ⑤ :

6 N·m (0.4 lb·ft) [0.6 kgf·m]

- ⑦ O Ring

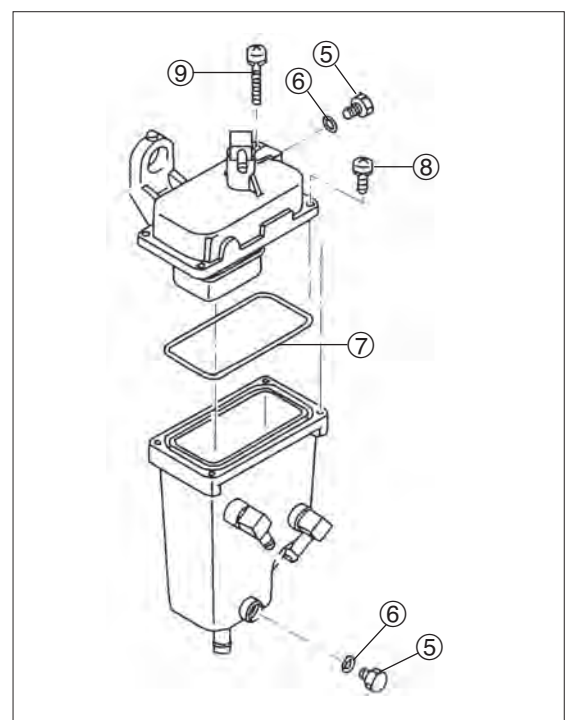
- ⑧ Tighten Screw.

- ⑨ Tighten Screw.



Screws ⑧ and ⑨ :

1.5 N·m (1.1 lb·ft) [0.15 kgf·m]



7) Installation of Vapor Separator Ass'y

- Reverse the removing steps.

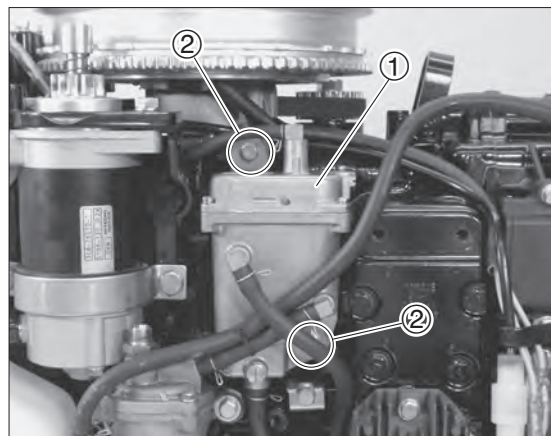
① Vapor Separator Ass'y

② Tighten bolts.



Bolts ② :

6 N·m (4 lb·ft) [0.6 kgf·m]



8) Removing FFP* Ass'y

* FFP : Fuel Feed Pump

- Remove parts in the order described below.
Disconnect FFP connector ①, loosen hose joint ②, and then remove fuel hose ass'y.

- Remove following hoses.

Fuel Return Hose ③ : Air Rail → FFP

Fuel Hose ④ : Vapor Separator → FFP

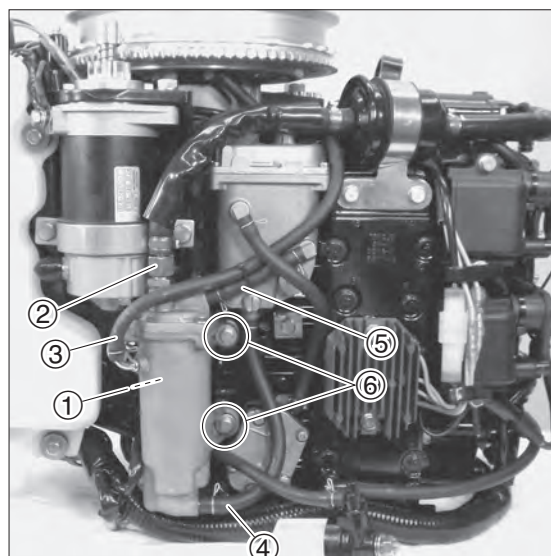
Vapor Return Hose ⑤ : FFP → Vapor Separator

- Loosen two bolts ⑥ and remove FFP.



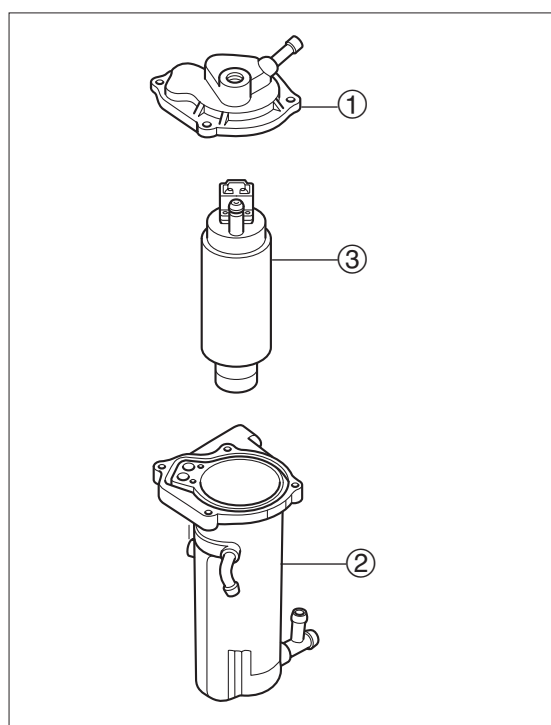
Use waste textile to catch fuel that spills from each hose when it is disconnected.

- Remove low pressure side fuel pump.



9) Disassembly and Inspection of FFP

- Loosen upper case ① securing bolts and take out FFP from FFP case ②.
- Inspection of FFP
Check if any contamination is found in the case ②.
Clean if necessary.
- Check if any corrosion found on the FFP body ③, or upper or lower resin part is damaged or cracked, and clean or replace if necessary.





Fuel System (TLDI)

10) Assembly of FFP Ass'y

Assemble following parts.

1. Attach hose joint adapter ① and metal washer ② to upper case ③.



Hose Joint Adapter ① :

1.5 N·m (11 lb·ft) [1.5 kgf·m]



Degrease edge and then apply adhesive :

ThreeBond 1342



Replace metal washer ② with new one if FFP is disassembled.

2. Attach pipe grommet ④ and lower grommet ⑤ to FFP ⑥.



Pipe Grommet ④, Lower Grommet ⑤ :

Genuine Engine Oil

3. Install FFP ⑥ to case ⑦.

⚠ CAUTION

To avoid the use of FFP ⑥ on another model, check the marking a on the body, before assembly.

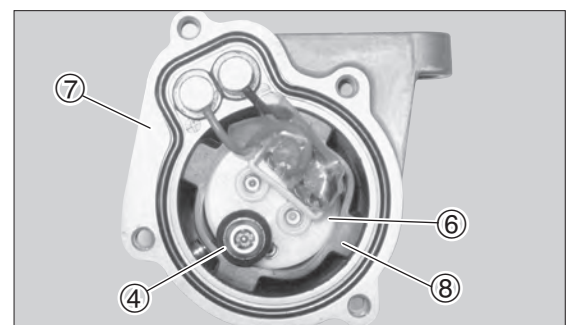
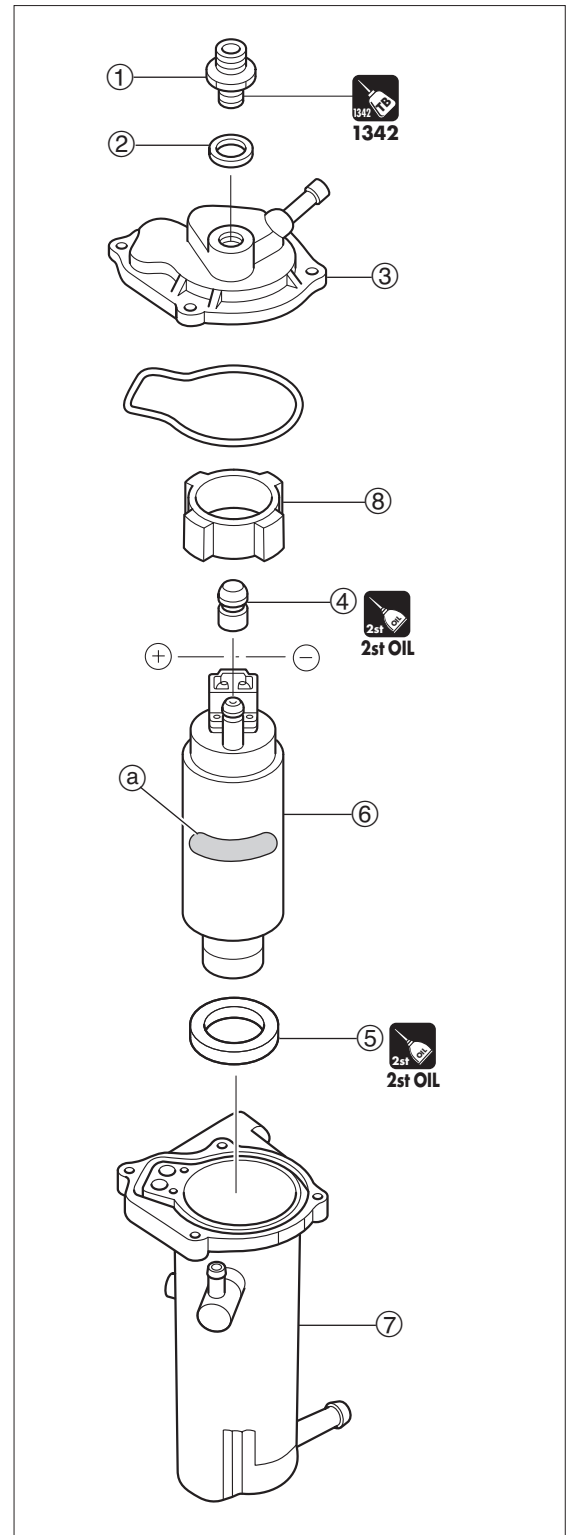
For TLDI40/50B, TLDI40/50B2,

TLDI70/90B and TLDI90C : "GSC434"

**For TLDI75/90C2, TLDI115A and TLDI115A2 :
"GSC295"**



- Adjust position of FFP body so that pipe grommet ④ can be inserted into upper case ③.
- Lightly applying 2 stroke engine oil on inside and outside of pipe grommet ④ makes adjustment of position of FFP body easier.
- Installation orientation of ⑥ to ⑦ is as shown. Put upper case ③ on the top and check the position.
- Install upper case taking care that motor leads are not caught between upper case and FFP body.



4. Attach upper grommet ⑧ and cable terminal grommets ⑨.



Grommets ⑧, ⑨ :
Genuine Engine Oil

Attach black wire ⑩ (⊖) and red wire ⑪ (⊕) of cable terminal to FFP case.



Be sure to connect the wires to their corresponding flat terminals (⊖ and ⊕).

5. Connect FFP cords ⑫ to their corresponding terminals ⑩ and ⑪.. (Y... Yellow⊖ L... Blue⊕)



Push down cables terminals to connect terminals securely. Be careful that the cords are not caught.

Attach cord cover ⑮ and clamp ⑯ to the body by using spacer (washer) ⑬ and bolt ⑭.



FFP Bolt ⑭ :
3 N·m (2 lb·ft) [0.3 kgf·m]

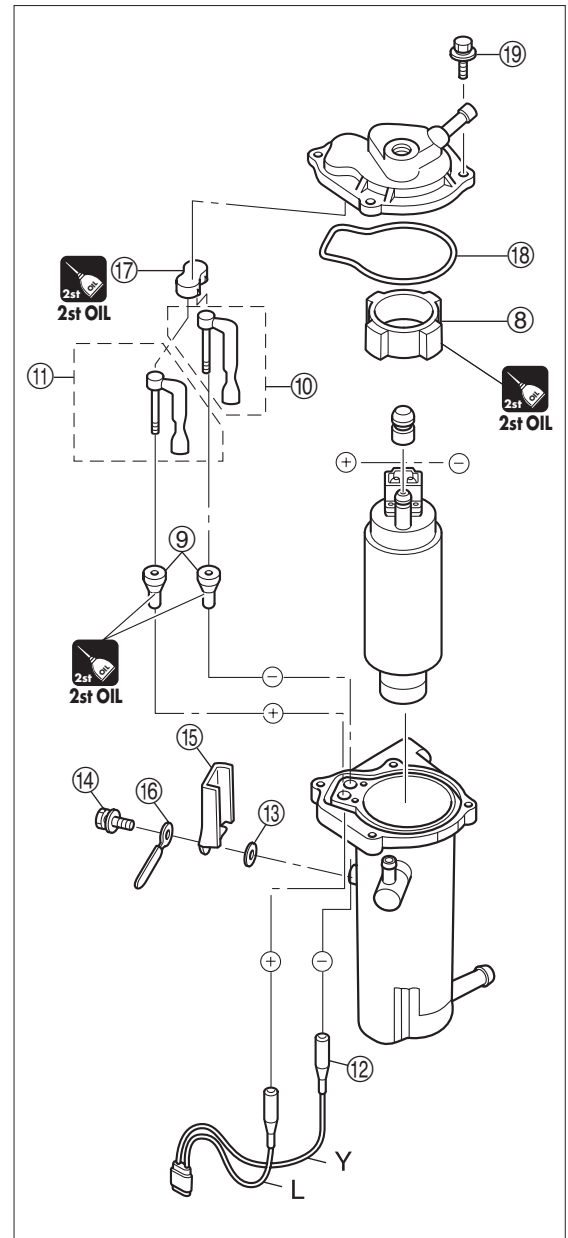
6. Attach cable terminal grommet (upper) ⑰, put seal ring (O ring) ⑱ and upper case ③ and then, secure the parts with bolts ⑲.



Cable Terminal Grommet Upper ⑰ :
Genuine Engine Oil



FFP Case (Upper) Bolt ⑲ :
3.2 N·m (2.3 lb·ft) [0.32 kgf·m]



4

12) Removing Fuel Pump

1. Remove Low pressure fuel pump.



Disconnect hose from vapor separator and fuel filter.



Fuel System (TLDI)

11) Inspection of Fuel Pump

1. Remove fuel hoses (2) from fuel pump.

CAUTION

Catch fuel that spills when the hoses are removed.

2. Connect vacuum/pressure gauge to inlet of fuel pump.



Fill fuel pump with 20:1 gasoline-oil mixture.

3. Close fuel pump outlet with a finger and apply specified pressure. Check if no air leaks through diaphragm.



Vacuum/Pressure Gauge :
P/N. 3AC-99020-0



Specified Pressure :
0.05 MPa (7 psi) [0.5 kgf/cm²]

4. Apply specified vacuum pressure to check that no air leaks through check valve located in the fuel pump.



Specified Vacuum Pressure :
-0.03MPa (-4 psi) [-0.3 kgf/cm²]

5. Connect vacuum / pressure gauge to outlet of fuel pump.

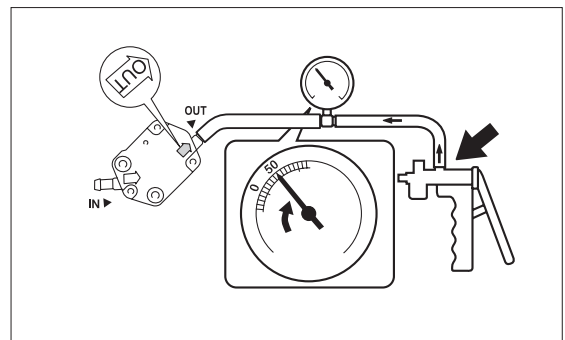
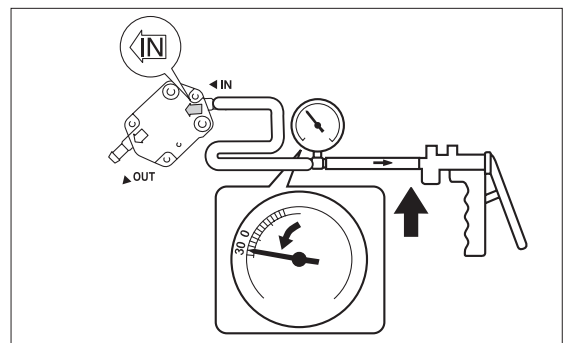
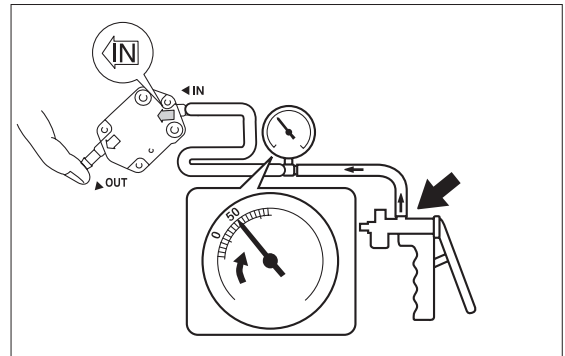
6. Apply specified pressure to check that no air leaks through check valve located in the fuel pump. Replace fuel pump if necessary.



Air-tightness of fuel pump can be increased by making the interior wet with gasoline.



Specified Pressure :
0.03 MPa (4 psi) [0.3 kgf/cm²]



12) Installation of FFP Ass'y to Cylinder

1. Put fuel hose ③, fuel return hose ④ and vapor return hose ⑤ and secure them by using hose clips.
2. Attach FFP Ass'y ① by using bolt ②.



Bolt ② :

6 N·m (4 lb·ft) [0.6 kgf·m]

3. Attach high pressure fuel hose ⑥ to FFP ①.



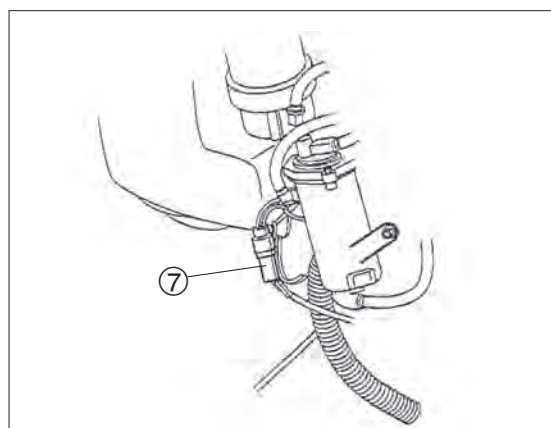
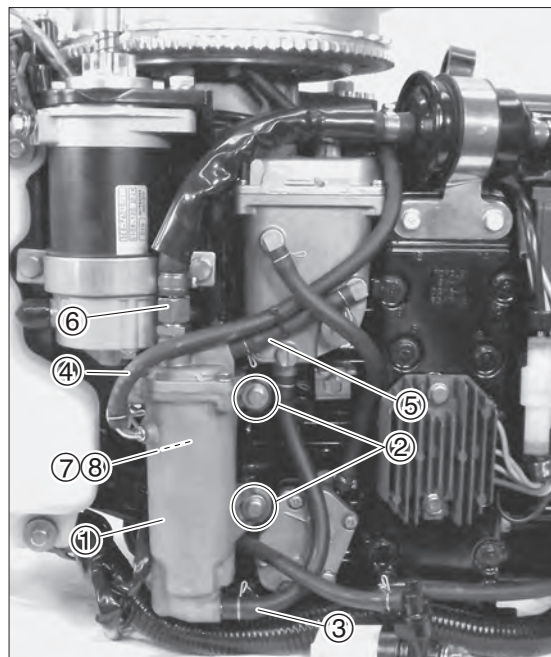
High Pressure Fuel Hose Nut ⑥ :

15 N·m (11 lb·ft) [1.5 kgf·m]

Connect FFP cord connector (cord ass'y) ⑦ and secure it with clamp ⑧.



Use clamp of FFP ass'y to secure FFP cord connector.





7. Removing and Installation of Air Compressor

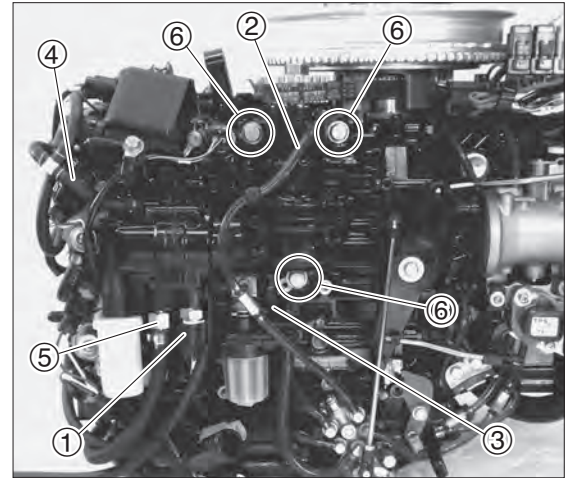
1) Removing Air Compressor

Remove compressor by using the following steps.

1. Remove water temperature sensor coupler ① of compressor.
2. Loose the clamps of oil pipe ②, Recirculation pipe ③ and cooling water pipe ④ at compressor side and pull hoses out.
3. Loosen nut of high pressure air hose ⑤ and disconnect the hose.
4. Remove bolts ⑥ and remove the compressor. Pull away from block dowel pins and drop the compressor down from belt.



If performing the work after stopping the engine, do it after cooling the high pressure hose because it is made hot during the operation.



2) Inspection of Drive Belt

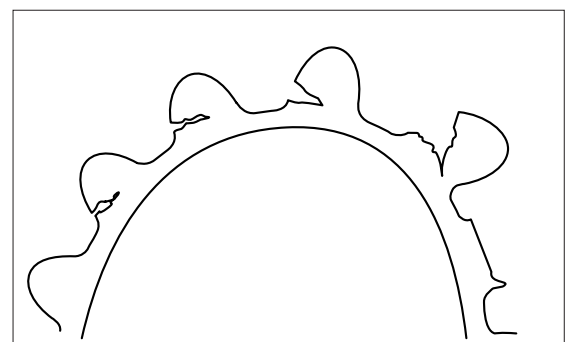
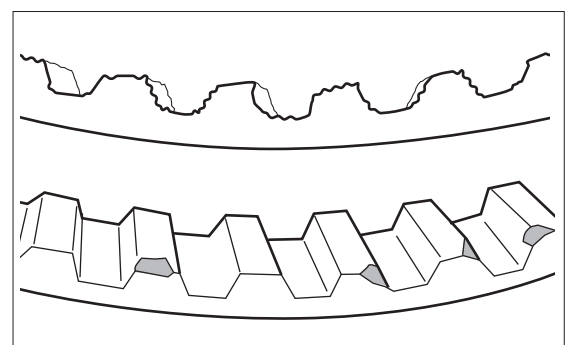
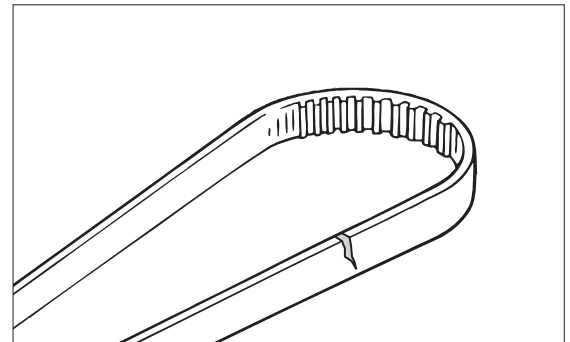
1. Check drive belt for crack, damage and wear on both faces.
2. Check drive belt for missing tooth (teeth) and adherence of oil.



Replace the belt with new one if any of the above problems exists.

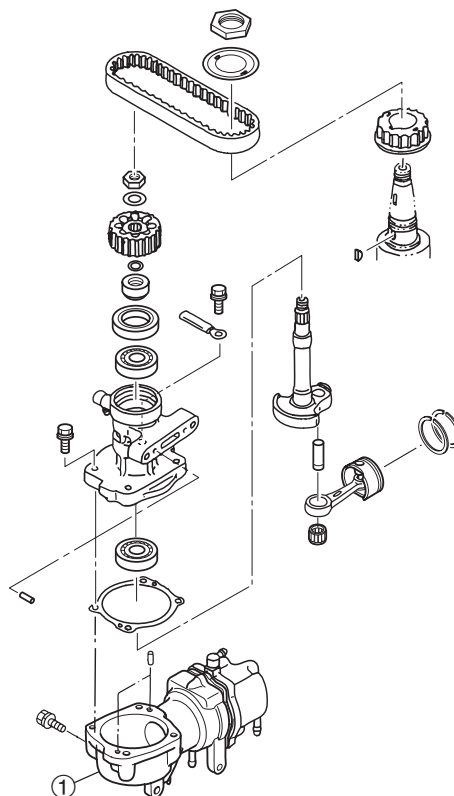


Crack or chip of the belt, if any, can be found easily when it is turned over.



3) Removing Driven Pulley

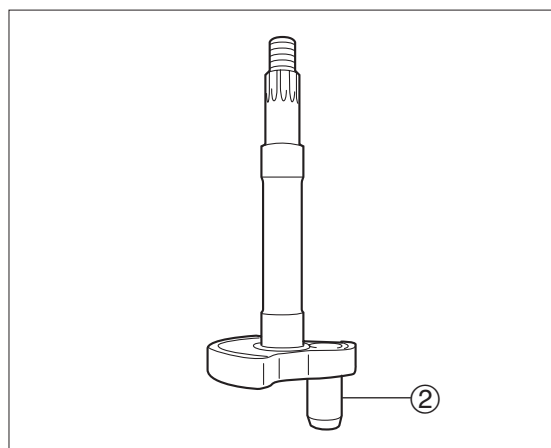
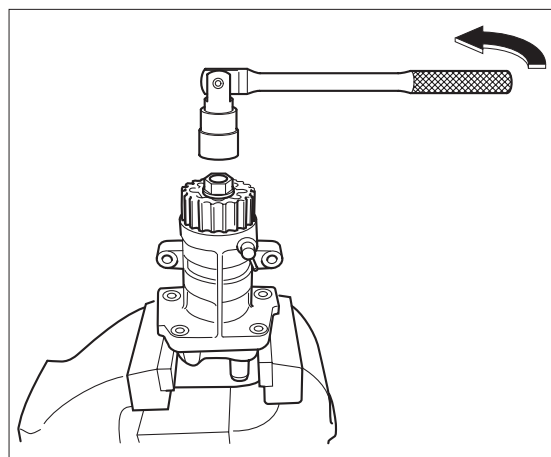
1. Remove compressor cylinder ① from air compressor ass'y by referring to exploded diagram.



2. Fix crank shaft at its lower end by using a vice, loosen driven pulley securing nut, and then remove driven pulley.

⚠ CAUTION

Be careful not to damage the crank pin ② area when fixing crank shaft using a vice.



② Crank Pin



Fuel System (TLDI)

4) Disassembly of Compressor Housing

1. Remove oil seal ① and bearing ②.



Heat compressor housing to 60 to 70 degrees Centigrade (140 to 158 degrees Fahrenheit) by using hot water before removing bearing ②.

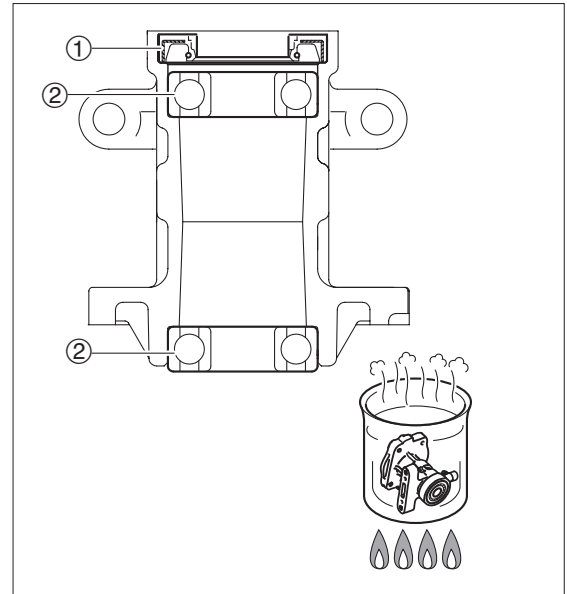


CAUTION

Do not reuse removed bearing.



Heating of compressor housing can also be made by using a heat gun or heat lamp.



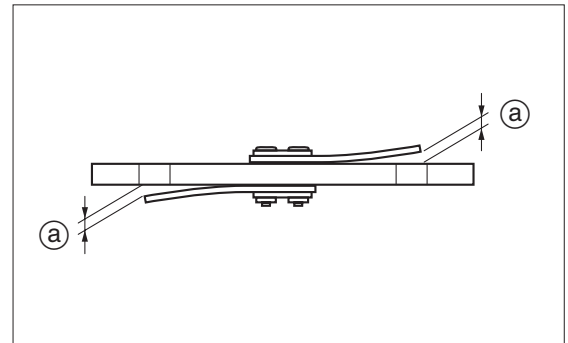
① ② **Do not reuse**

5) Inspection of Reed Valve

1. Check if reed valve is bent, damaged or worn.
Replace reed valve ass'y if the reed valve gap is over the specified limit.

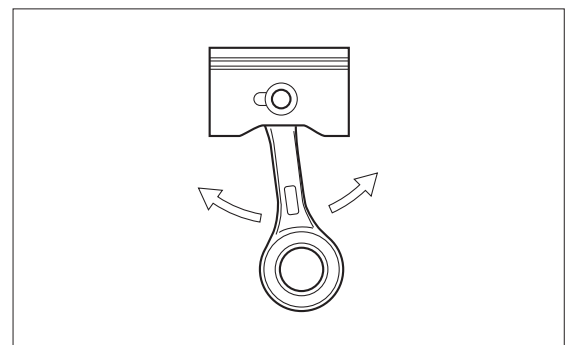


Gap of Reed Valve at the Tip (a) :
0.2 mm (0.008 in) or less



6) Inspection of Cylinder and Piston

1. Clean compressor cylinder, compressor head and compressor housing, check the parts for cracks damages.
Replace if necessary.
2. Check cylinder wall for wear or scuffing.
Replace if necessary.
3. Clean piston and check for crack and damages.
Replace if necessary.
4. Check that connecting rod small end moves smoothly.
Replace if necessary.



7) Assembly of Compressor Housing

1. Apply two stroke engine oil to periphery of bearing ③, and install it into compressor housing by using a press.



Driver Rod ① :

P/N. 3AC-99702-0

Bearing Attachment ② :

P/N. 3T1-99905-0



- Do not reuse removed bearing.
- Install bearing with manufacturer's mark facing bearing driving tool.



2st OIL

2. Apply two stroke engine oil to periphery of oil seal ⑤, lithium grease to the lip area, and install it into compressor housing by using a press.



Driver Rod ① :

P/N. 3AC-99702-0

Oil Seal Attachment ④ :

P/N. 3T1-99820-0



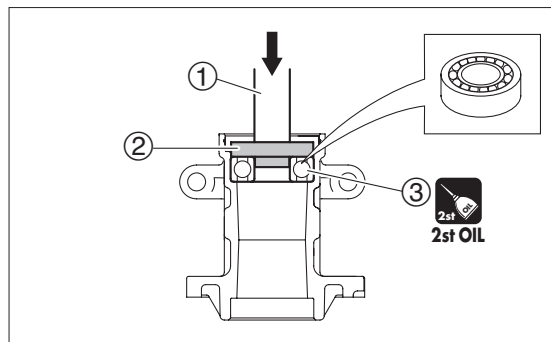
Be careful of orientation of oil seal when it is installed.



2st OIL

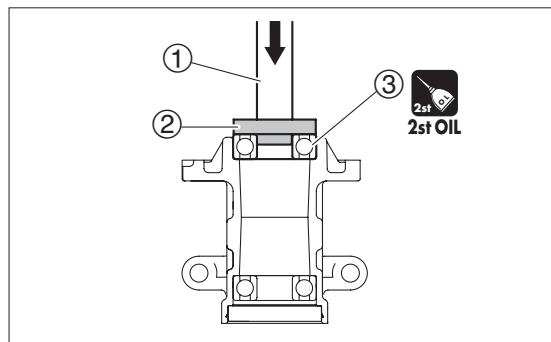


LIT



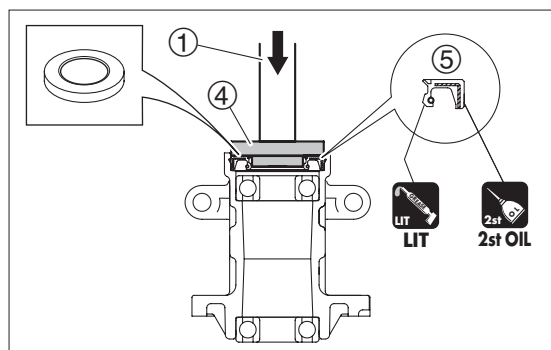
③ Bearing

Do not reuse



③ Bearing

Do not reuse



⑤ Oil seal

Do not reuse



Fuel System (TLDI)

8) Installation of Crank Shaft

1. Install crank shaft ① to the housing ②, and fix the crank shaft at its lower end by using a vice.
2. Attach collar ③, O ring ④, and driven pulley ⑤, and tighten nut ⑥ to the specified torque.



Driven Pulley Nut ⑥

47 N·m (35 lb·ft) [4.7 kgf·m]

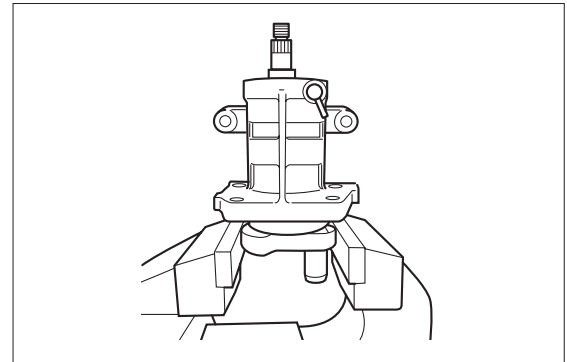
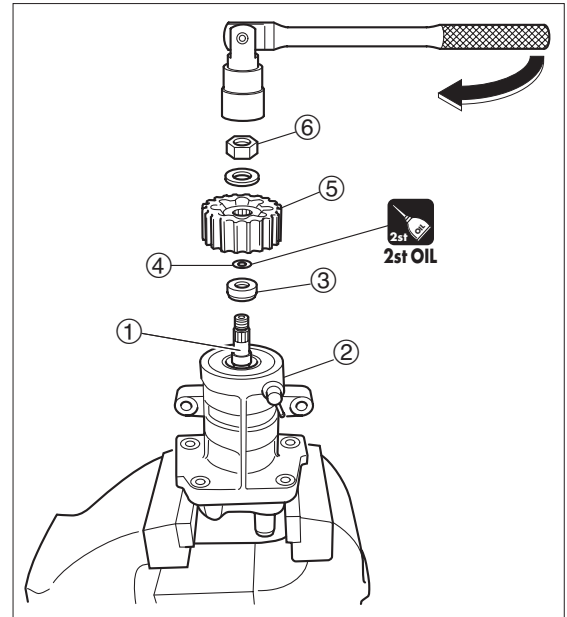


CAUTION

Be careful not to damage the crank pin area ⑦ when fixing crank shaft using a vice.



2st OIL



9) Installation of Piston

1. Attach piston rings ② to piston ①.



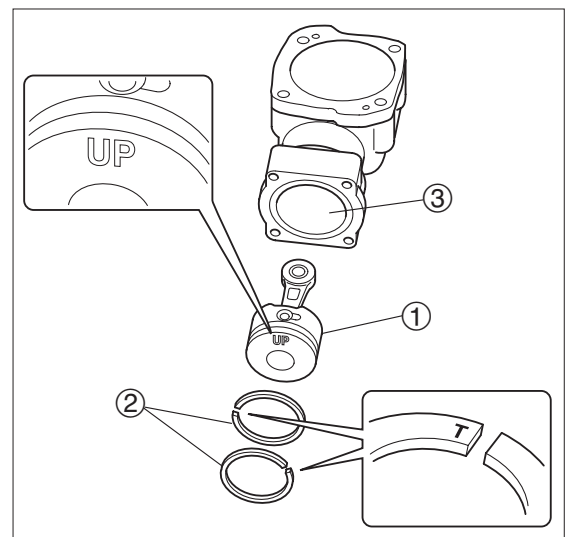
CAUTION

Bring piston ring gaps away from each other.




CAUTION

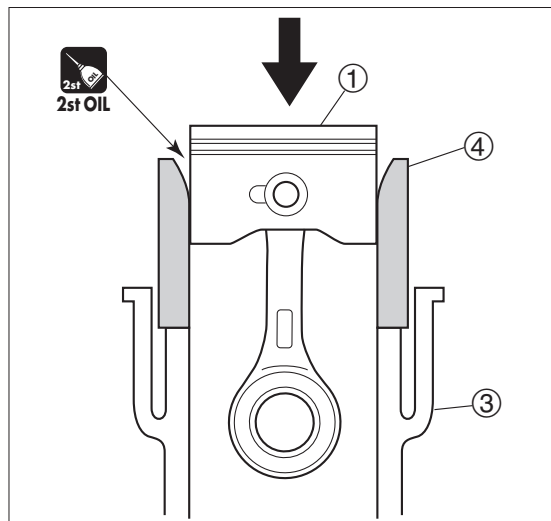
Be careful not to scratch piston when attaching the rings.



2. Apply two stroke engine oil to cylinder inner wall ③, piston periphery, and piston rings, and install piston ass'y to the cylinder so that "UP" mark of the piston head is at the pulley side.

 **Piston Slider ④ :**
P/N. 3T5-72871-0

 **2st OIL**




10) Installation of Compressor Housing Ass'y

1. Attach dowel pins ② to compressor cylinder ①.
2. Install compressor housing ass'y ③ and gasket by using bolt ④.



Put crank pin into connecting rod big end and install the assembly while shaking crank shaft a little.

 **Compressor Housing Bolt ④ :**
6N·m (4 lb·ft) [0.6kgf·m]


3. Install head ⑤, reed valve ass'y ⑥ and gasket ⑦ by using bolt ⑧.

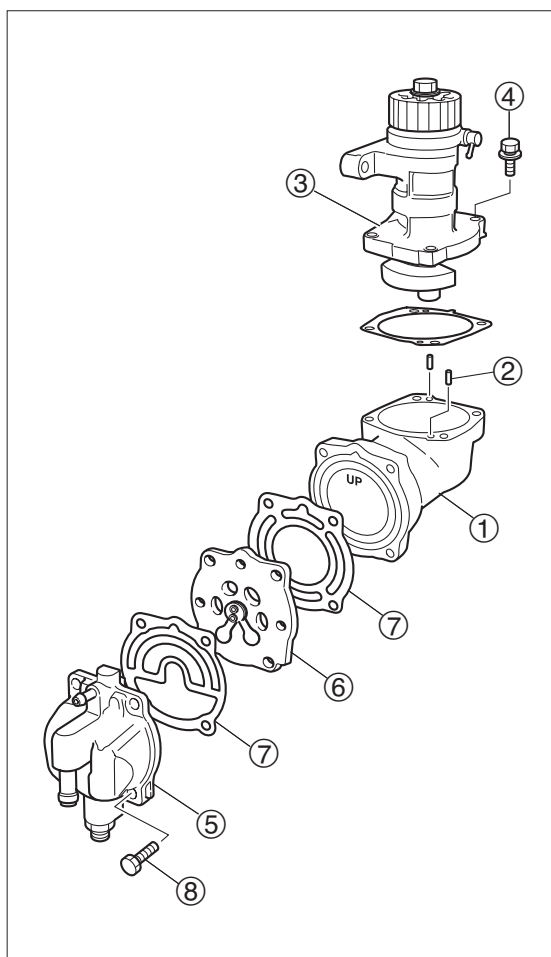


Be careful of the orientations of reed valve ass'y and gasket when installing them.



Degrease both mating faces of compressor head gasket and valve seat gasket before installing them.

 **Cylinder Head Bolt ⑧ :**
9N·m (7 lb·ft) [0.9kgf·m]





Fuel System (TLDI)

11) Installing Air Compressor

Install compressor by using the following steps.

1. Install compressor slide up into belt and on dowel pins, and then tighten the bolts to specified torque.



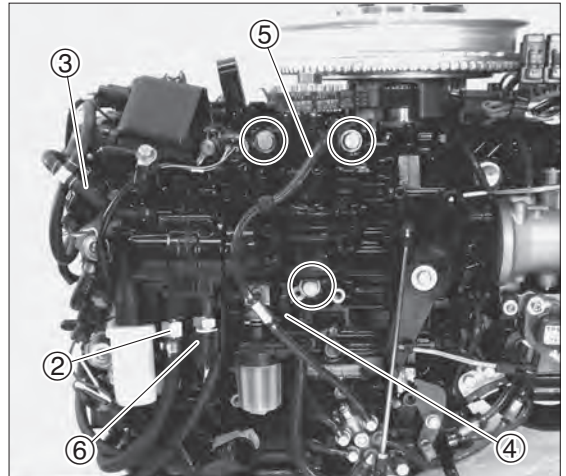
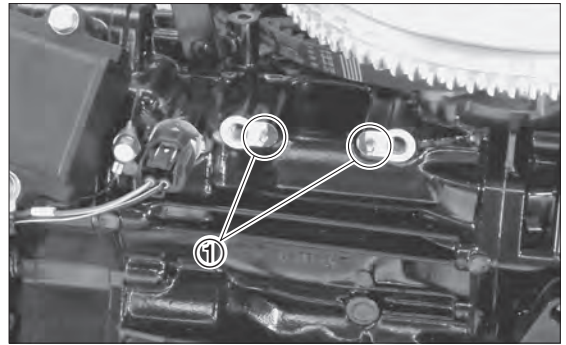
Air Compressor Mounting Bolt ⑧ :

13N·m (9 lb·ft) [1.3 kgf·m]



Check the knock pin ①, installed to crank case.

2. Tighten the nut of high pressure air hose ②.
3. Connect the pipe ③, recirculation pipe ④ and oil pipe ⑤.
4. Connect the water temp sensor ⑥ to compressor.



12) Measurement of Fuel Pressure and Air Pressure

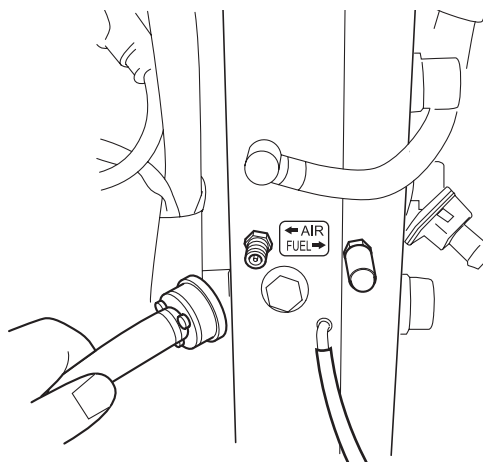
1. Use pressure gauge ass'y to measure fuel pressure and air pressure in the air rail.



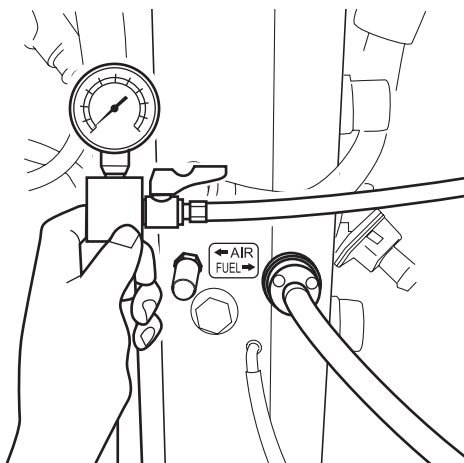
Pressure Gauge Ass'y :

P/N. 3T5-72880-0

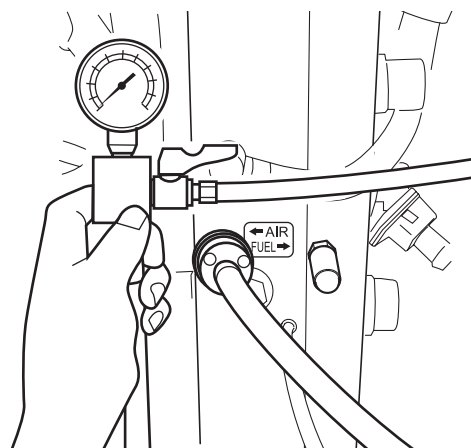
Perform the measurements by using the method described below.



Fuel Pressure



Air Pressure





Fuel System (TLDI)

How to Use Pressure Gauge

1. Pressure Gauge Ass'y

Measurement of Fuel Pressure and Air Pressure

1. Set the lever (3T5-72883-0) to position "A" shown below.
2. Screw adapter B (3T5-72884-0) into a valve of air rail for measuring air pressure or fuel pressure.

⚠ WARNING

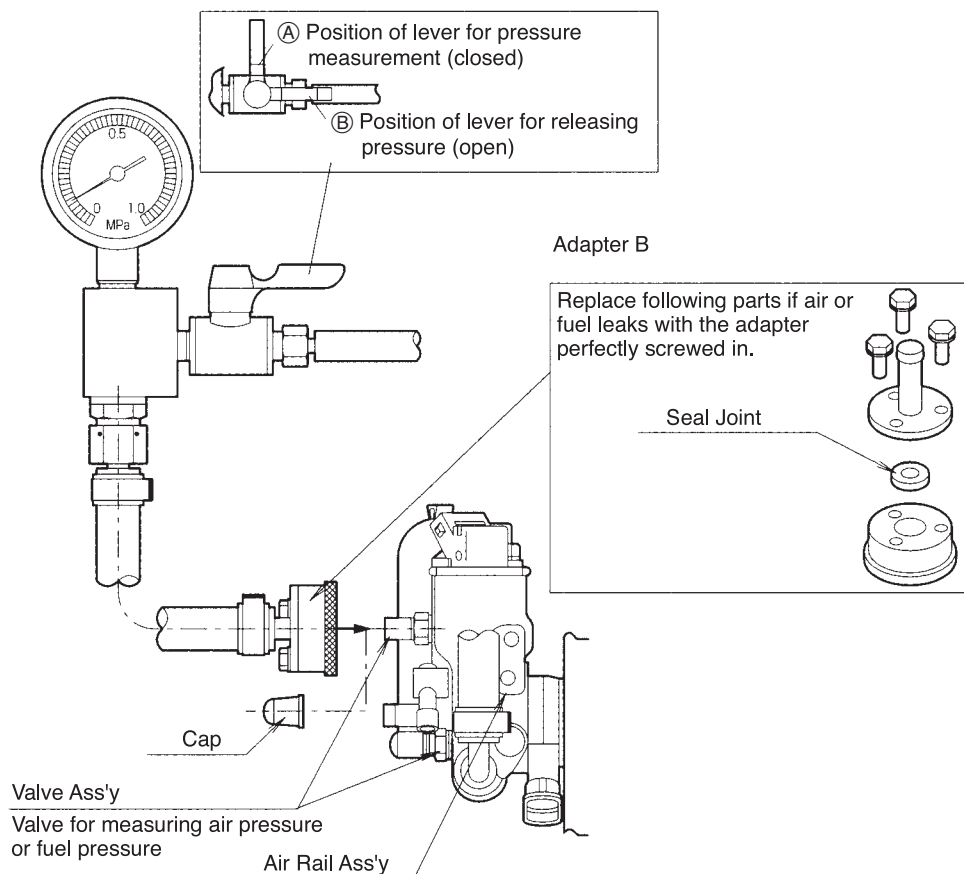
Be careful of fuel that spurts when screwing the adapter into the fuel pressure measuring valve.

3. Turn key switch from "OFF" to "START" position to crank the engine for approximately 15 seconds. (Run the engine for 15 seconds at idling speed of 700 r/min.)
4. The fuel system and air system are normal when the gauge indicates specified air and fuel pressures.
(If the measurement of the pressure is out of the specified range, troubleshoot by referring to this service manual.)

Pressure Measurement	Typical Value	Specified Range of Pressure	Remarks
AIR PRESSURE	0.65 MPa (94.3 psi) [6.5 kgf/cm ²]	0.61 - 0.58 MPa (88.47 - 101.53 psi) [6.1 - 7.0 kgf/cm ²]	The pressure reduces gradually after stopping the cranking.
FUEL PRESSURE	0.72 MPa (104.4 psi) [7.2 kgf/cm ²]	Air pressure +0.06 - 0.08 MPa (8.70 - 11.60 psi) [0.6 - 0.8 kgf/cm ²]	

5. After the measurement, set the key switch to "OFF", cock lever to position "B" to release the inner pressure, and then, remove adapter B from the measuring valve.

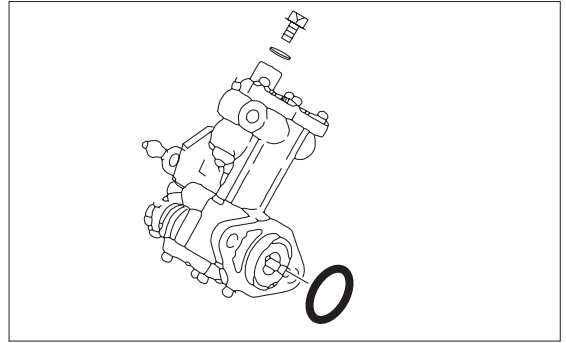
After measuring the fuel pressure, use a container to catch fuel that flows out from the tip of hose when the cock lever is set to position "B" (open). Bring cock side below the valve to drain fuel completely from the hose before removing adapter B.



8. Inspection of Lubrication System

1) Inspection of oil Pump

1. Check if O-ring is cracked, damaged or leaks.
Replace if necessary.



2) Inspection of Oil Filter

Check if oil filter is cracked, damaged or leaks, or if dirt or water is in it.

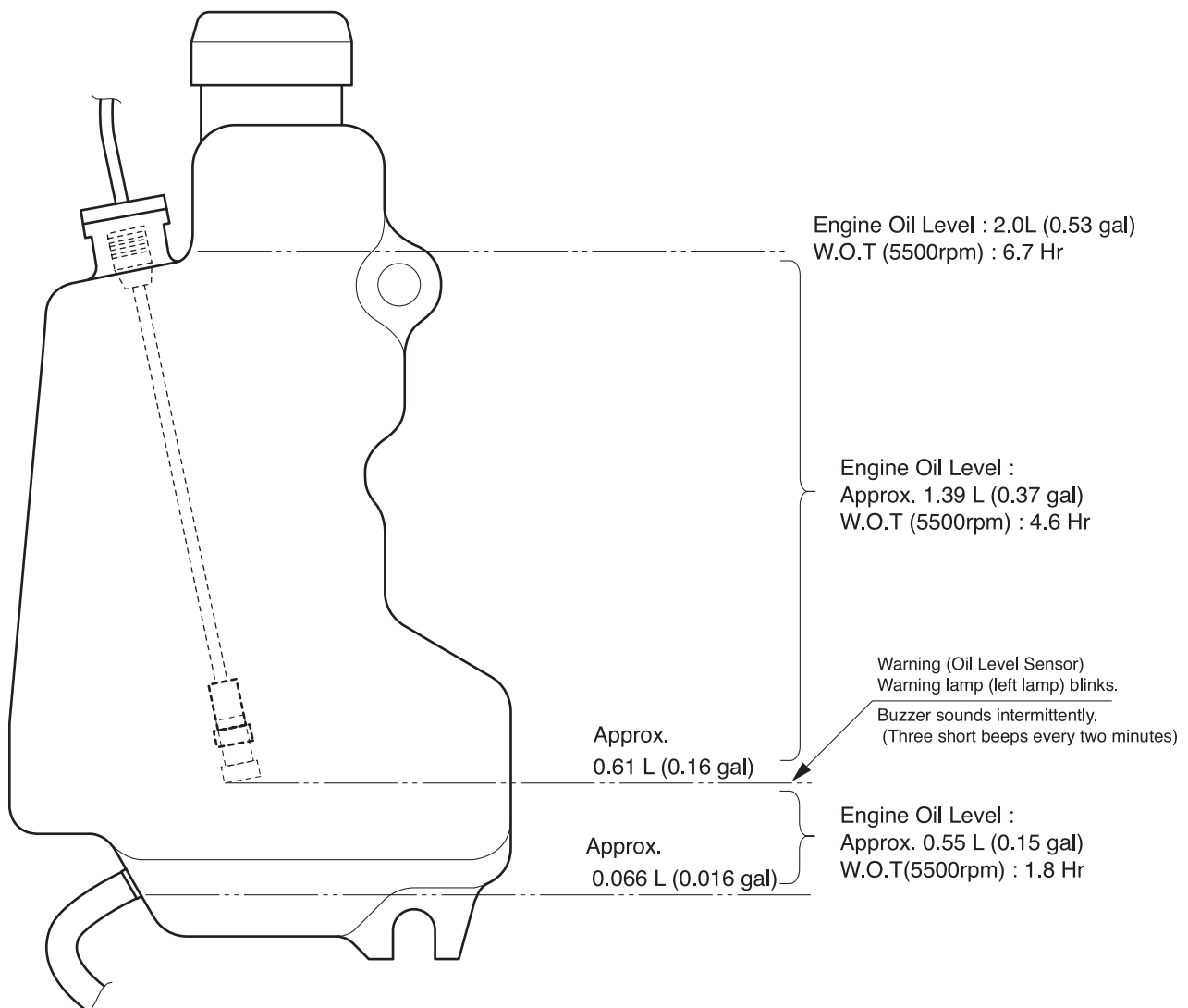
Clean or replace if necessary.

3) Inspection of Oil Tank

Check if oil tank is cracked, damaged or leaks, or if dirt or water is in it.

Clean or replace if necessary.

4





Fuel System (TLDI)

4) Air Bleeding

⚠ CAUTION

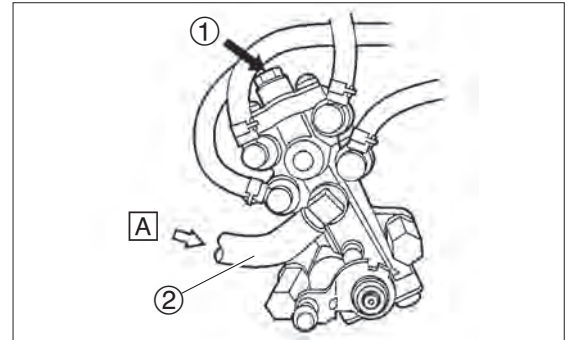
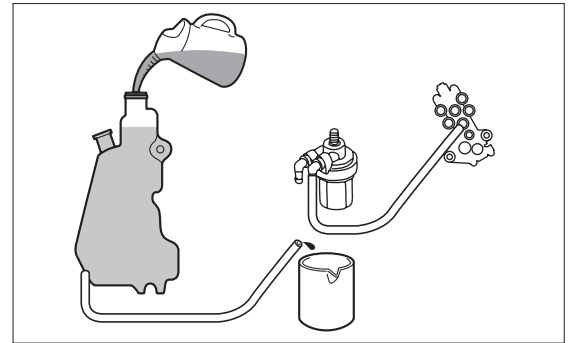
Be sure to clean up any oil spills by waste textile.

1. Visually check if any air is found in the oil line from oil tank to cylinder block, and if any air is found, bleed the air by using the following procedure.
2. Fill oil tank.
3. Loosen the air bleeding screw ① and flows oil from the inlet pipe ② when containing no air bubble flows out.



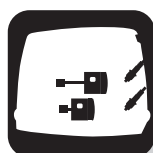
Tighten screw when containing no air bubbles.

A From Oil Filter



5

Power Unit

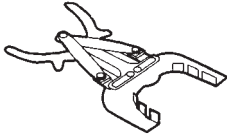
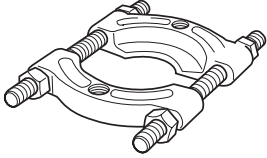
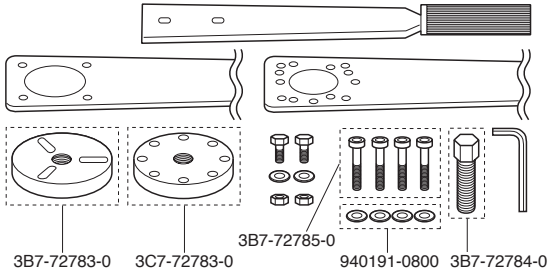
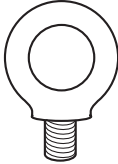
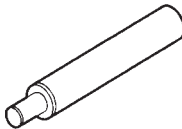
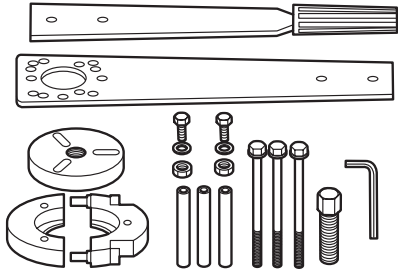
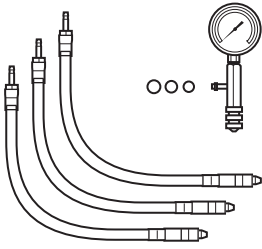
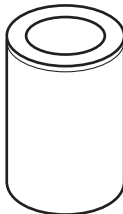
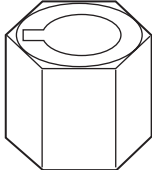


1. Special tools	5-2	22) Removing of Recirculation Hoses	5-33
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5) Removing Flywheel	5-20	37) Installation of Drive Pulley	5-49
6) Removing Oil Tank	5-21	38) Installation of Recirculation Hoses	5-50
7) Removing Alternator	5-21	39) Installation of Air Chamber	5-51
8) Removing Starter Motor	5-22	40) Installation of Oil Pump	5-51
9) Removing Cord Assy and ECU	5-22	41) Installation of Throttle Body	5-52
10) Removing Oil Pump	5-25	42) Installation of Throttle Link	5-53
11) Removing Throttle Link	5-26	43) Installation of Fuel System	5-53
12) Inspection of Throttle Body	5-27	44) Installation of Air Compressor	5-53
13) Removing Air Chamber	5-27	45) Installing Sprocket Bracket	5-54
14) Removing Drive Pulley Nut	5-29	46) Installation of Cord Assy and	
15) Removing Thermostat	5-29	Electrical Parts	5-55
16) Inspection of Thermostat	5-30	47) Installation of Starter Motor	5-55
17) Removing Fuel System	5-30	48) Installation of Alternator	5-55
18) Removing Cylinder Head / Head Cover	5-30	49) Installing Oil Tank	5-55
19) Inspection of Cylinder Head	5-31	50) Installation of Flywheel	5-56
20) Removing Exhaust Cover	5-32	51) Installation of Power Unit	5-56
21) Inspection of Exhaust Cover	5-32		



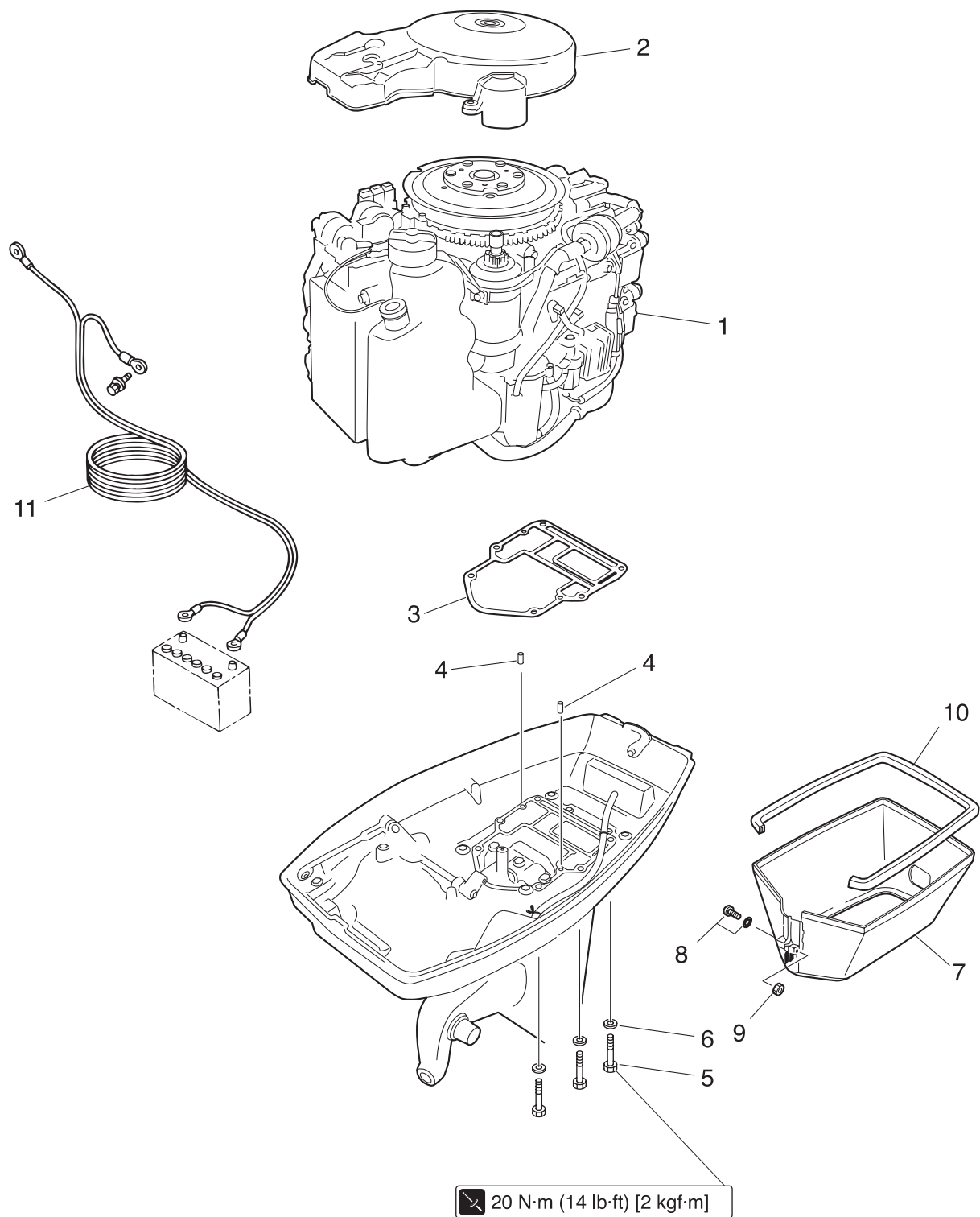
Power Unit

1. Special tools

		 <p>3B7-72783-0 3C7-72783-0 3B7-72785-0 940191-0800 3B7-72784-0</p>
<p>Piston Ring Tool P/N. 353-72249-0</p>	<p>Universal Puller Plate P/N. 3AC-99750-0</p>	<p>Flywheel Puller Kit P/N. 3T1-72211-0</p>
<p>Removing and installing the piston rings</p>	<p>Removing reverse (C) gear bearing</p>	<p>Removing or attaching flywheel</p>
		
<p>Eye Bolt (Powerhead Lift Ring) P/N. 3T9-72212-0</p>	<p>Piston Pin Tool P/N. 345-72215-0</p>	<p>Drive Pulley Puller Ass'y P/N. 3T5-72890-0</p>
<p>Used to hook power unit when hanging</p>	<p>Removing or attaching piston pin</p>	<p>Removing of drive pulley</p>
		
<p>Compression Gauge P/N. 3AC-99030-0</p>	<p>Drive Pulley Press P/N. 3T5-72868-0</p>	<p>Crankshaft Holder P/N. 3T5-72815-0</p>
<p>Measuring compression pressure</p>	<p>Using for press fit drive pulley</p>	<p>Using for remove and tighten the drive pulley nut</p>

2. Parts Layout

Engine

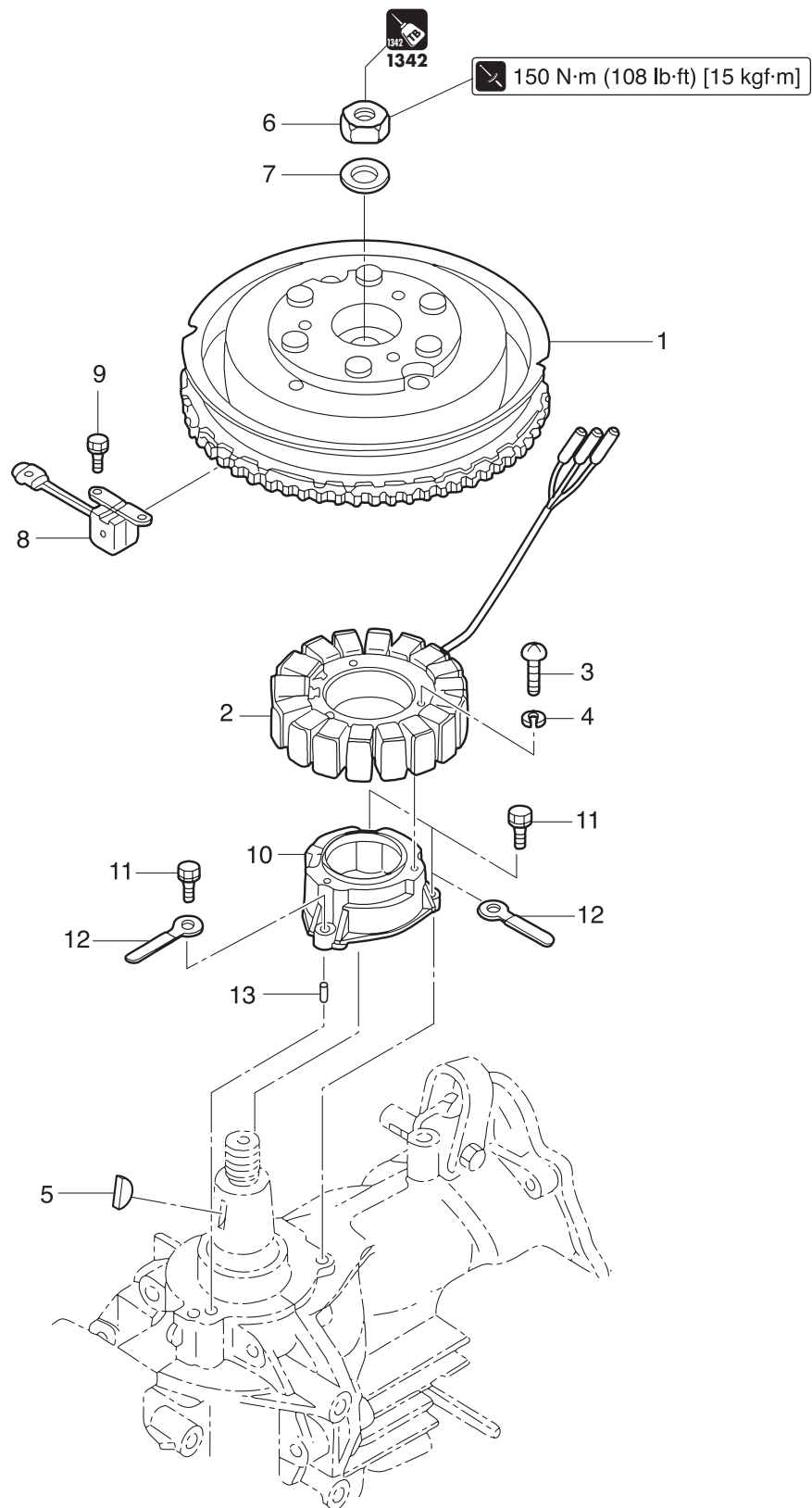


Re No	Description	Qty	Remarks
1	Power Unit	1	
2	Ring Gear Cover Assy	1	
3	Gasket	1	
4	Dowel Pin	2	
5	Bolt	6	M8 L=80mm
6	Washer	6	M8

Re No	Description	Qty	Remarks
7	Apron	1	
8	Screw	1	M5 L=40mm W/PW
9	Nylon Nut	1	M5
10	Sea Rubber	1	
11	Battery Cord	1	



Magneto

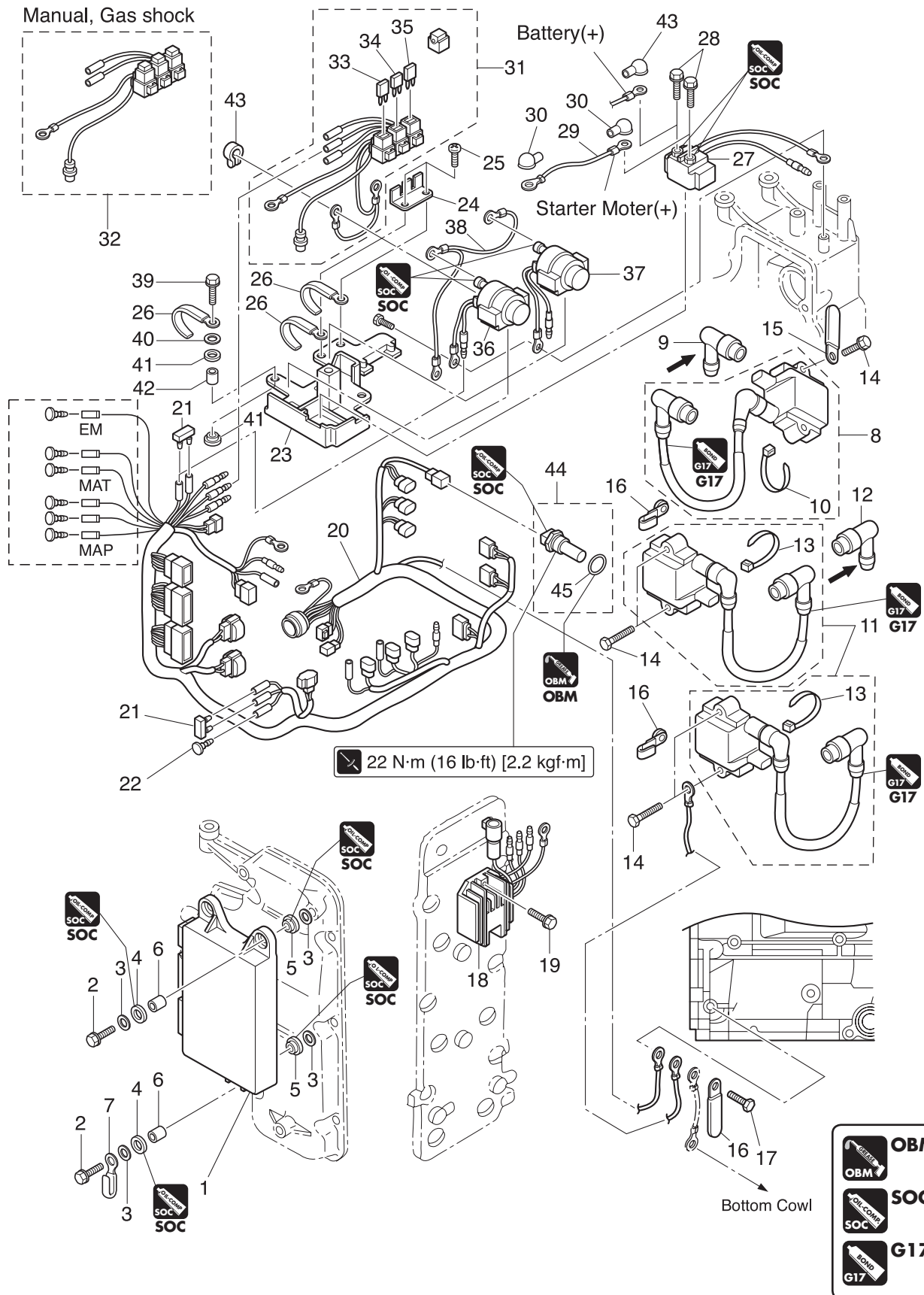


Ref. No.	Description	Q'ty	Remarks
1	Flywheel (W/Ring Gear)	1	
2	Alternator Assy	1	
3	Screw	3	M6 L=35mm
4	Spring Washer	3	M6
5	Key (Magnet)	1	
6	Nut 18P1.5	1	
7	Washer 19-34-3	1	
8	Pick-Up Coil	1	Crank Position Sensor
9	Bolt	2	M5 L=12mm
10	Cover Bracket	1	
11	Bolt	3	M6 L=25mm
12	Clamp 6.5-47.5P	2	
13	Dowel Pin 4-10	2	



Power Unit

Electric Parts (ECU • Diagram)



Ref. No.	Description	Q'ty	Remarks
1	ECU Ass y	1	50ps 40ps (lta y) Labe 3GF09AA
2	Bo t	3	M6 L=30mm
3	Washer 6.5-21-1	6	
4	Mount Moter Cover Lower	3	
5	Rubber Mount 8.5-14-2.5	3	
6	Spacer 6.2-9-16.6	3	
7	C amp 6.5-47.5P	1	
8	Ign t on Co (W/Res stance Cap) #1	1	#1
9	P ug Cap (W/Res stance)	1	#1
10	Band Lead W re 158	1	#1
11	Ign t on Co (W/Res stance Cap) #2, 3	2	#2, #3
12	P ug Cap (W/Res stance)	1	#2, #3
13	Band Lead W re 158	1	#2, #3
14	Bo t	6	M6 L=35mm
15	C amp 6.5-47.5P	1	
16	C amp 6.5-87P	3	
17	Bo t	1	M6 L=14mm
18	Rect fier Comp ete	1	
19	Bo t	2	M6 L=20mm
20	Cord Ass y	1	
21-1	Cab e Term na P ug	1	for "EFT" Type
21-2	Cab e Term na P ug	2	for Manua & Gas Ass st
21-3	Cab e Term na P ug	2	for D50B2EPOL-EXEU
22-1	Cab e Term na P ug	1	for "EFT" Type
22-2	Cab e Term na P ug	1	for Manua & Gas Ass st
22-3	Cab e Term na P ug	1	for D50B2EPOL-EXEU
23	So eno d Sw tch Bracket Ass y	1	
24	Fuse Ho der Bracket	1	
25	Tapp ng Screw 6-16	2	
26	C amp 6.5-87P	3	
27	Starter So eno d	1	
28	Bo t	2	M6 L=10mm
29	Starter Cab e L=270	1	
30	Term na Cap Starter	2	
31	Fuse W re Ass y	1	for "PTT" Type
32	Fuse W re Ass y	1	for Manua & Gas Ass st
33	Fuse 30A	1	
34	Fuse 25A	1	
35	Fuse 15A	1	
36	PTT So eno d Sw tch (A)	1	UP, for "PTT" Type
37	PTT So eno d Sw tch (B)	1	DN, for "PTT" Type
38	Ground Cab e	1	for "PTT" Type L=285, L=140
39	Bo t	3	M6 L=25mm
40	Washer 6-16-1.5	3	
41	Rubber Mount 8.5-12-2	6	
42	Co ar 6.2-9-10.7	3	
43	Term na Cap Starter	3	for "PTT" Type
44	Water Temperature Sensor (W/O-R ng)	1	
45	O-R ng 2.0-10.0	1	



Electric Parts (Starter Motor)

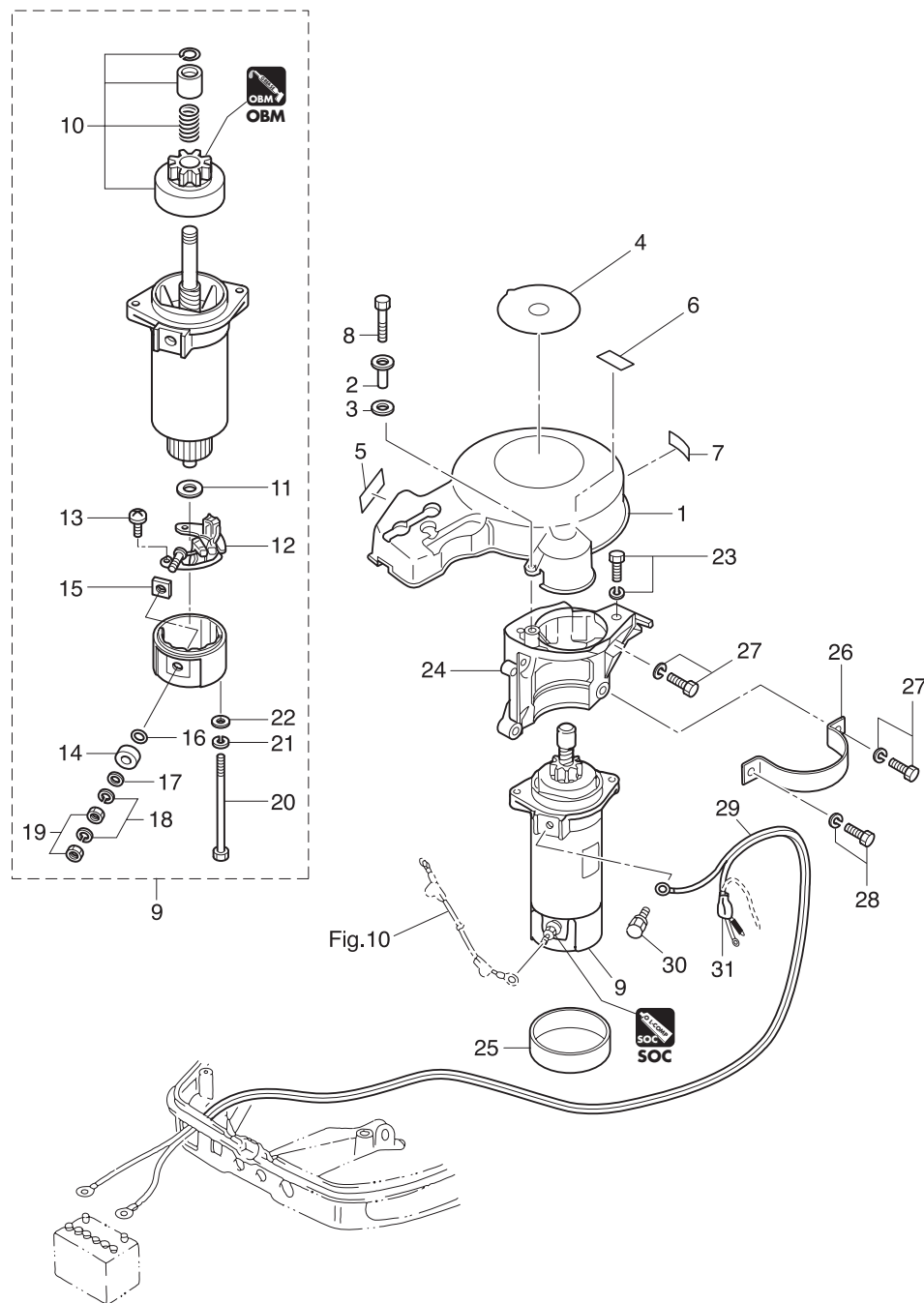


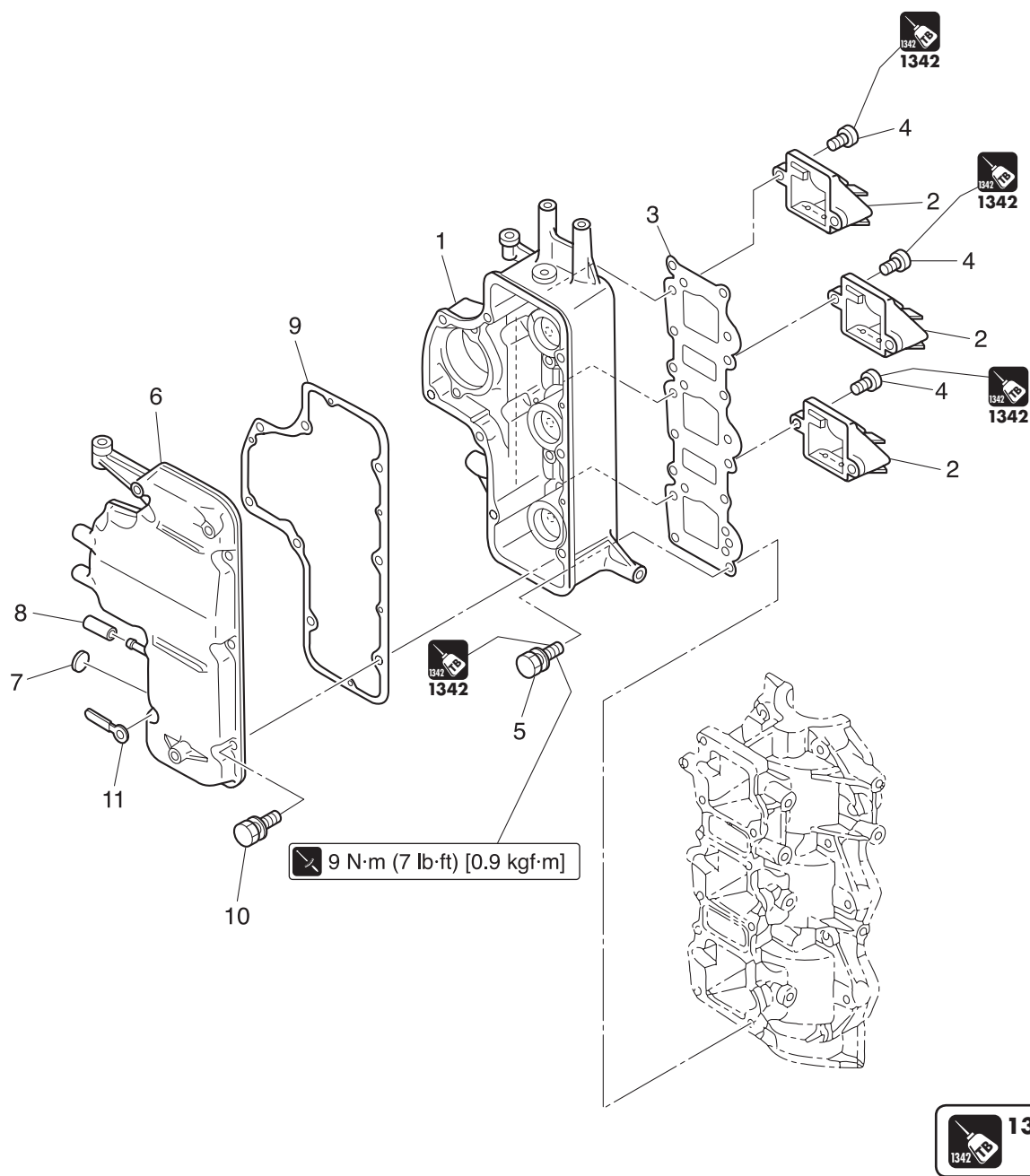
Fig.10



Re No	Description	Q'ty	Remarks
1	Ring Gear Cover	1	
2	Coar	3	
3	Rubber Mount 9-16-4.3	3	
4	Caution Deca (B)	1	
5	Fuse Deca	1	
6	Pressure Deca	1	
7	Spark Plug Deca	1	
8	Bolt	3	M6 L=25mm
9	Starter Motor Assy	1	
10	Pin on Assy	1	
11	Washer	1	
12	Brush Holder Assy	1	
13	Screw	2	M4 L=8mm
14	Bushing 1	1	
15	Bushing 2	1	
16	O-Ring	1	Do not reuse.

Re No	Description	Q'ty	Remarks
17	Washer	1	M6
18	Spring Washer	2	M6
19	Nut	2	M6
20	Bolt	2	
21	Spring Washer	2	M5
22	Washer	2	M5
23	Bolt	2	M8 L=25mm
24	Bracket Fan Motor	1	
25	Damper Starter Motor	1	
26	Starter Motor Band	1	
27	Bolt	4	M8 L=25mm
28	Bolt	1	M8 L=20mm
29	Battery Cable L=3000	1	
30	Bolt	1	M6 L=16mm
31	Terminal Cap	1	

Air Chamber (Air Box)

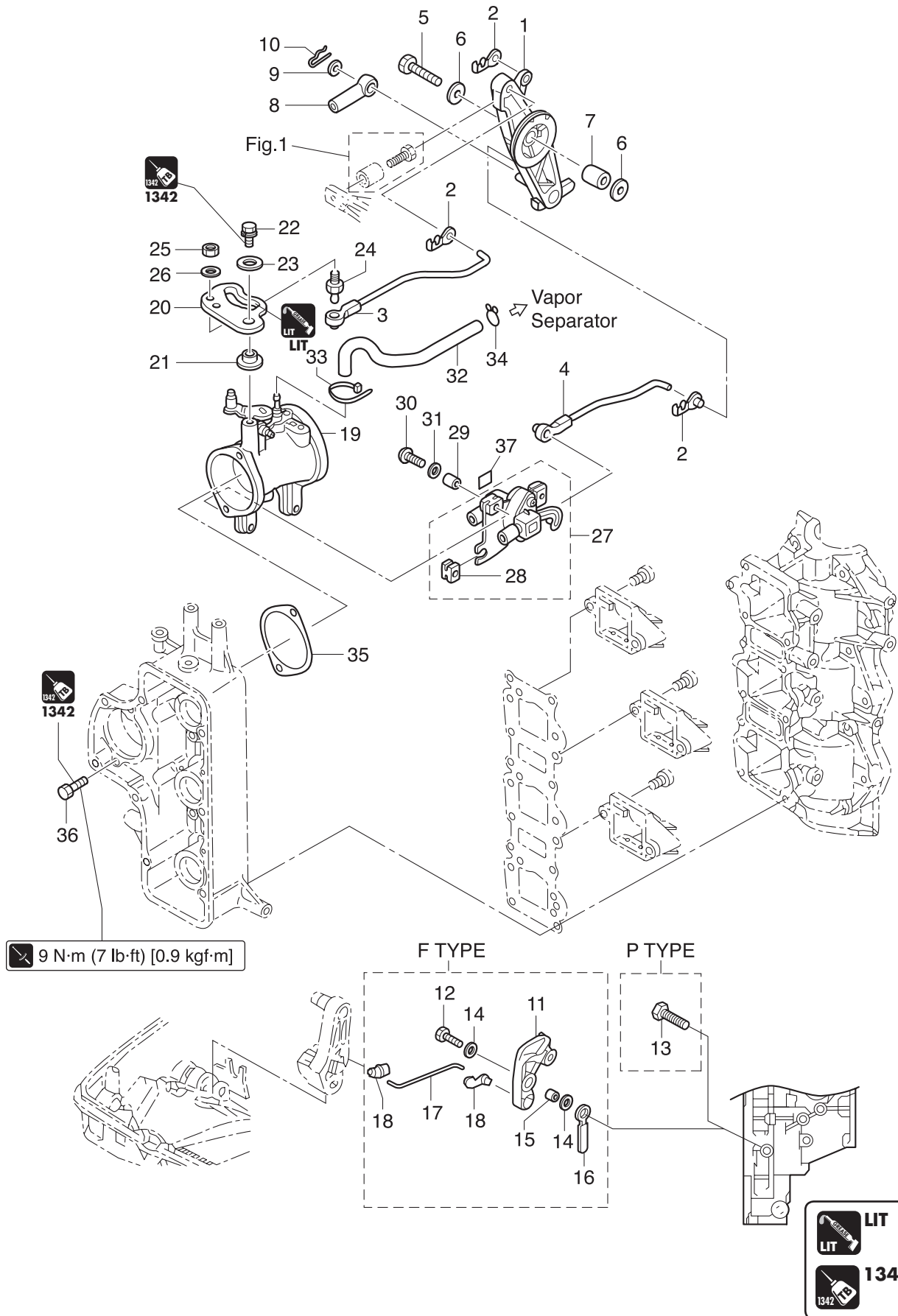


Re No	Description	Q'ty	Remarks
1	Air Chamber Ass'y	1	
2	Reed Valve Ass'y	3	
3	Intake Manifold Gasket	1	Do not reuse.
4	Screw	6	M5 L=16mm
5	Pre Coated Bolt 6-25	12	
6	Air Chamber Cover Ass'y	1	with Nipple
7	Grommet	1	
8	Sealing Cap	1	
9	Air Chamber Cover Gasket	1	Do not reuse.
10	Bolt	8	M6 L=25mm
11	Camp 7-120P	1	



Power Unit

Throttle

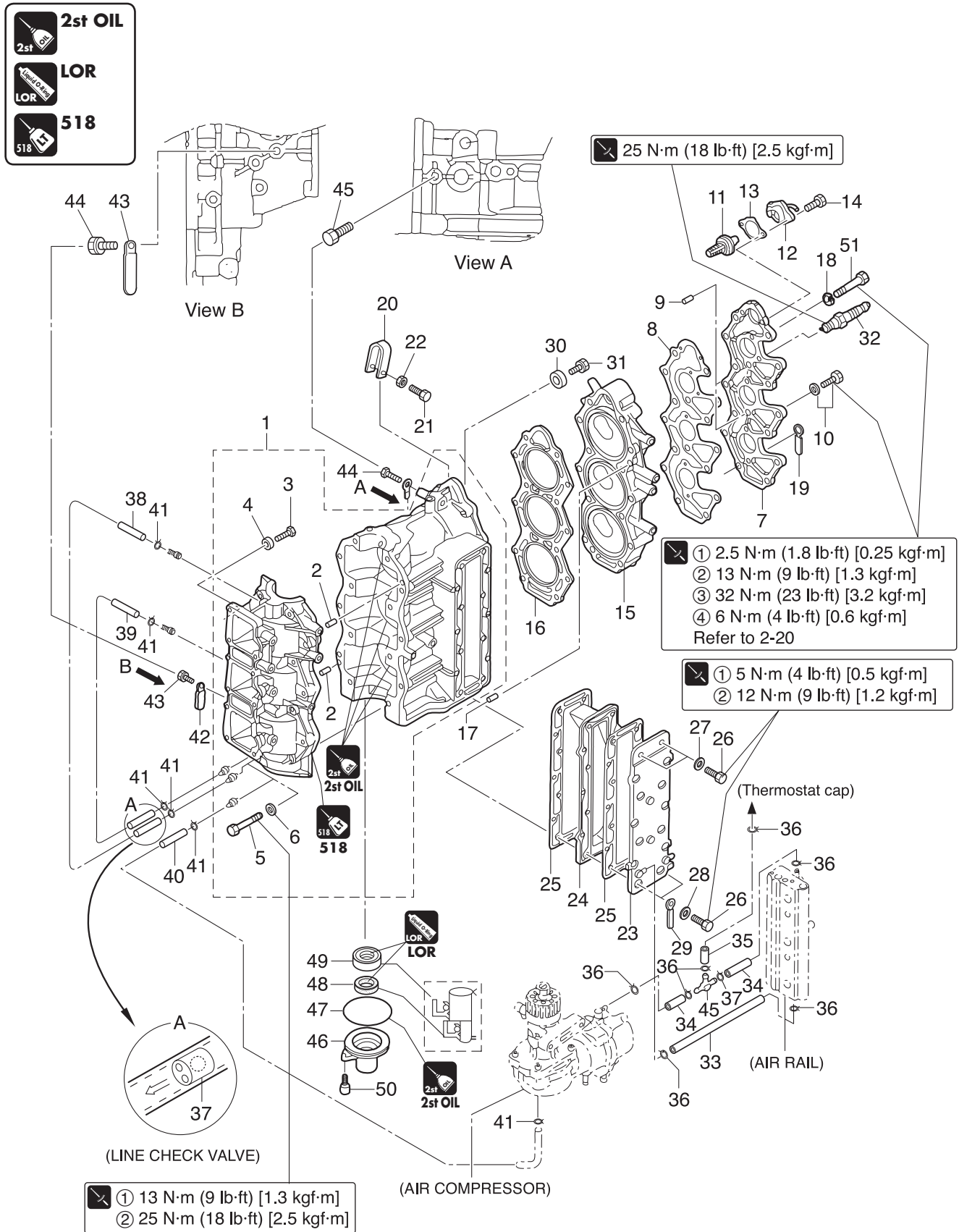


Ref. No.	Description	Q'ty	Remarks
1	Advancer Arm	1	
2	Rod Snap 5-3	3	
3	Link Rod Ass y (Throttle)	1	
4	Link Rod Ass y (TPS)	1	
5	Bot	1	M6 L=35mm
6	Washer 6.5-21-1	2	
7	Co ar 6.2-12-17	1	
8	Cable Jo nt	1	for "P" Type
9	Washer 8.5-18-1.6	1	for "P" Type
10	Snap Pin d=8	1	for "P" Type
11	Throttle Limiter Arm	1	for "F" Type
12	Bot	1	for "F" Type M6 L=25mm
13	Bot	1	for "P" Type M6 L=10mm
14	Washer	2	for "F" Type M6
15	Co ar 6.2-9-9.3	1	for "F" Type
16	Camp 6.5-67P	1	
17	Throttle Limiter Rod 3.5-56	1	for "F" Type
18	Rod Snap B 3.5-4	2	for "F" Type
19-1	Throttle Body Ass y	1	50ps/40ps (for Italy mode) mark 3GF
19-2	Throttle Body Ass y	1	40ps mark 3GG
19-3	Throttle Body Ass y	1	30ps mark 3GM
20	Throttle Cam	1	
21	Bushing 6-24-7	1	
22	Bot	1	M6 L=18mm
23	Washer 6.5-21-1	1	
24	Ball Joint B	1	
25	Nut	1	M6
26	Washer	1	M6
27	TPS Ass y	1	
28	Rubber Mount	3	
29	Co ar 4.2-6-10.5	3	
30	Screw	3	M4 L=20mm
31	Washer 4.2-12.5-0.8	3	
32	Hose	1	L=310mm
33	Band Lead Wire 104	1	Do not reuse.
34	Cable 7	1	
35	Gasket Throttle Body	1	Do not reuse.
36	Bot 6-25 Precoated	2	
37	TPS Deca	1	



Power Unit

Cylinder Crank Case



Ref. No.	Description	Q'ty	Remarks
1	Cy Bock • Crankcase Ass'y	1	
2	Dowe P n 6-12	2	
3	Bo t	1	M6 L=18mm
4	Co ar 6.2-9-9.3	1	
5	Bo t	14	M8 L=45mm
6	Washer	14	
7	Cy nder Head Cover	1	
8	Cy nder Head Cover Gasket	1	Do not reuse.
9	Dowe P n 4-10	2	
10	Bo t	4	M6 L=20mm
11	Thermostat	1	
12	Thermostat Cap Ass'y	1	
13	Thermostat Cap Gasket	1	Do not reuse.
14	Bo t	2	M6 L=25mm
15	Cy nder Head	1	
16	Cy nder Head Gasket	1	Do not reuse.
17	Dowe P n 6-12	2	
18	Washer 8.5-19.5-3.2	14	
19	C amp 8.5-85P	1	
20	Hanger	1	
21	Bo t	1	M8 L=35mm
22	Washer	1	M8
23	Exhaust Cover Ass'y	1	
24	Exhaust Cover (Inner)	1	
25	Exhaust Cover Gasket	2	Do not reuse.
26	Bo t	14	M6 L=30mm
27	Washer	2	M6
28	Washer	12	M6
29	C amp 6.5-87P	1	
30	Anode	1	
31	Bo t	1	M6 L=20mm
32	Spark P ug (IZFR6Q)	3	
33	Hose	1	L=250mm
34	Hose	2	L=75mm
35	Hose	1	L=115mm
36	C p Fue P pe ϕ 10	8	
37	Check Va ve	2	for Lubr cat on P pe
38	Hose	1	L=355mm
39	Hose	1	L=205mm
40	Hose	1	L=335mm
41	C p ϕ 7	6	
42	C amp 6.5-47.5P	1	
43	Bo t	1	M6 L=10mm
44	Bo t	1	M6 L=10mm
45	T-N pp e Ass'y (W/Va ve)	1	
46	Crankcase Head	1	
47	O-R ng 1.7-59	1	Do not reuse.
48	O Sea 25-40-8	1	Do not reuse.
49	O Sea 16-28-7	1	Do not reuse.
50	Bo t	2	M6 L=20mm
51	Bo t	14	M8 L=65mm



This exploded view diagram illustrates the assembly of a 2-stroke engine. The components are numbered as follows:

- 1**: Piston and pin assembly.
- 2**: Piston ring.
- 3**: Piston pin.
- 4**: Piston pin clip.
- 5**: Crankcase.
- 6**: Piston rings.
- 7**: Crankshaft.
- 8**: Crankshaft pin.
- 9**: Crankshaft pin clip.
- 10**: Piston pin clip.
- 11**: Piston pin clip.
- 12**: Piston pin clip.
- 13**: Crankcase gasket.

Oil application points are indicated by icons labeled "2st OIL" and "LOR".

- 2st OIL**: Apply to the piston rings (6), the crankcase (5), the crankshaft (7), and the piston pin clip (4).
- LOR**: Apply to the piston pin clip (10).

Re No	Description	Q'ty	Remarks
7	Piston P n	3	
8	Piston P n C p	6	Do not reuse.
9	Roller Bearing 17-21-27	3	
10	Main Bearing Upper	1	
11	Oil Seal 36-46-6	1	Do not reuse.
12	Oil Ring 2.4-44.7	1	Do not reuse.
13	Thrust Plate Crankshaft	2	

3. Inspection Items

1) Inspection of Compression Pressure

⚠ CAUTION

- To prevent accidental start of the engine, remove lock plate (of stop switch lanyard) from stop switch before measuring compression pressure.
- Clean areas around spark plugs on the cylinder before removing spark plugs to prevent dirt from entering cylinder.

1. Start and idle engine for 5 minutes to warm up, and then stop.
2. Shift gear into neutral (N).
3. Remove lock plate (of stop switch lanyard) from stop switch.
4. Remove all spark plug caps and then all spark plugs ①.
5. Install compression gauge to plug hole.



Compression Gauge:

P/N. 3AC-99030-0

6. Set throttle grip or free throttle lever to full open position, crank engine until compression gauge indication stabilizes, and then measure compression pressure.



Compression Pressure (Reference):

0.83 MPa (120 psi) [8.5 kgf/cm²]



Compression pressure is affected much by cranking speed, and normally changes in the range from 10% to 20%. Charge the battery.

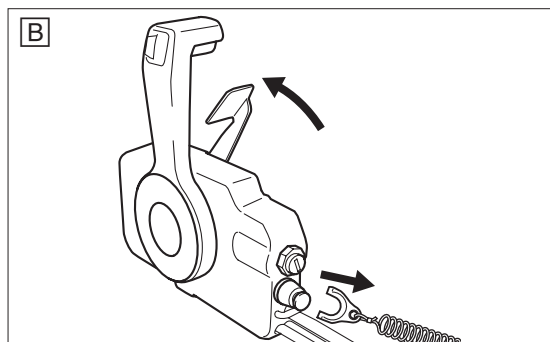
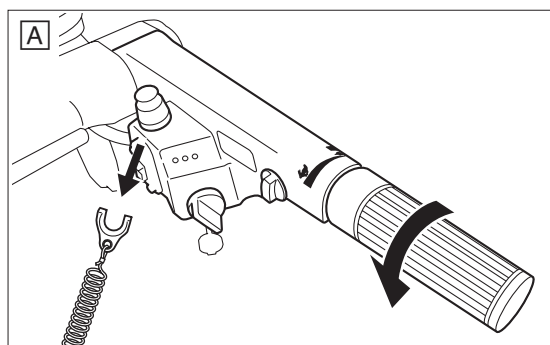
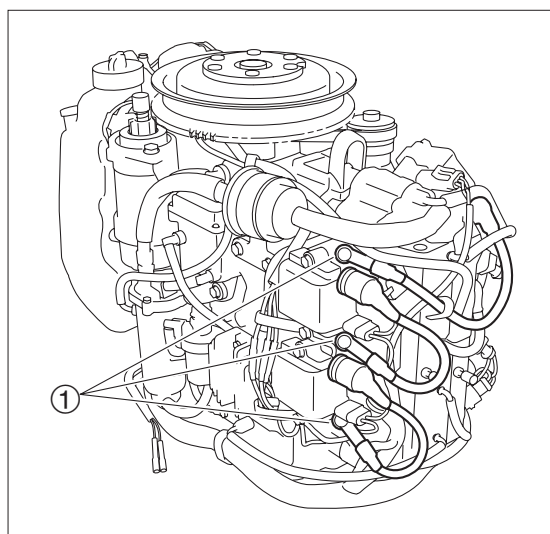
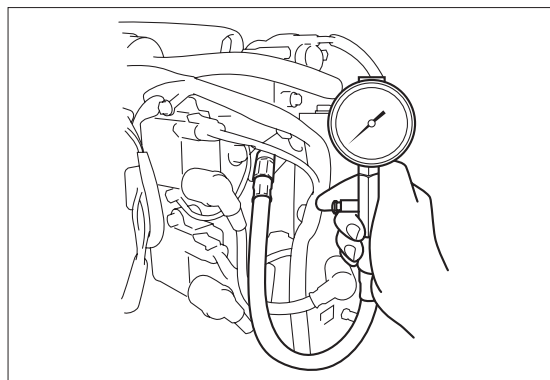
7. If compression pressure is below specified value or varies much among cylinders, put small amount of engine oil into cylinders, and perform the test again.



- If compression pressure increases after the above measure, check pistons and piston rings for wear. Replace if necessary.
- Check cylinder head gasket if the compression pressure does not rise. Adjust or replace if necessary.

If any of the following results is obtained by the measurement, it is necessary to repair or replace relevant part(s).

- The measurement is lower than specified value,
- Different between compression pressure of the cylinders exceeds; 0.105 MPa (15 psi) [1.05 kgf/cm²], or
- The measurement is abnormally higher than specified value.



A Tiller handle model

B Remote control model



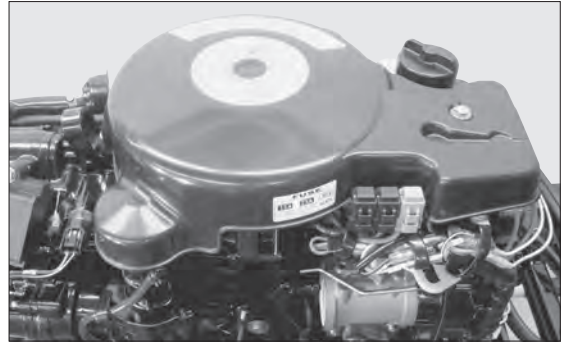
Power Unit

2) Removing Power Unit

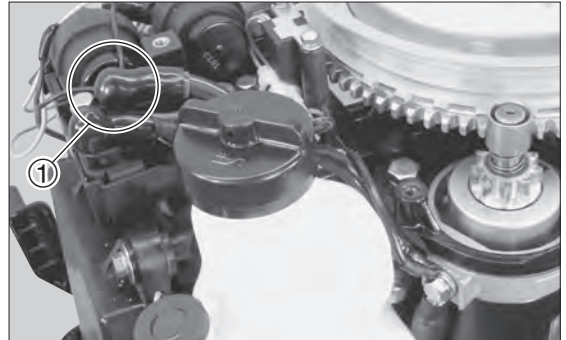
1. Remove ring gear cover.



Disconnect battery cables from battery terminal.



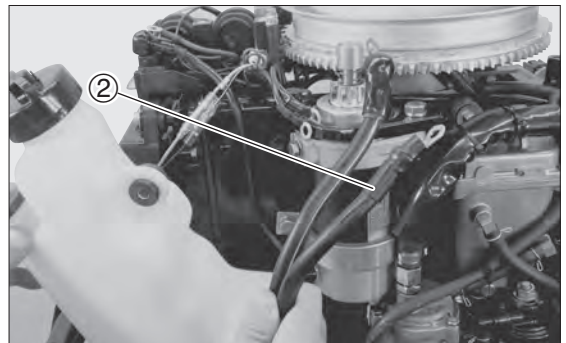
2. Disconnect battery cables \oplus ① from starter solenoid.



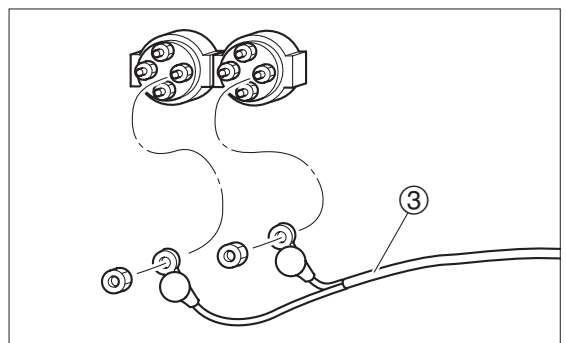
3. Remove oil tank bolt and oil tank temporarily, then disconnect battery cables \ominus ②.



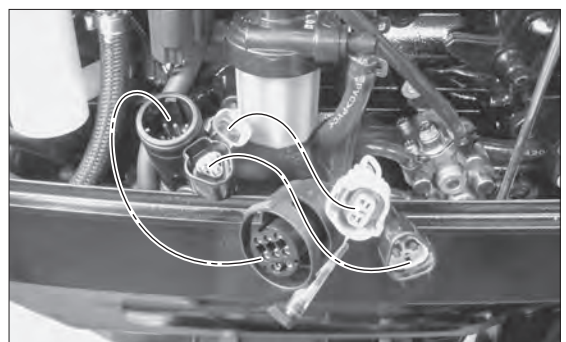
After disconnect battery cables, temporarily tighten oil tank bolt.



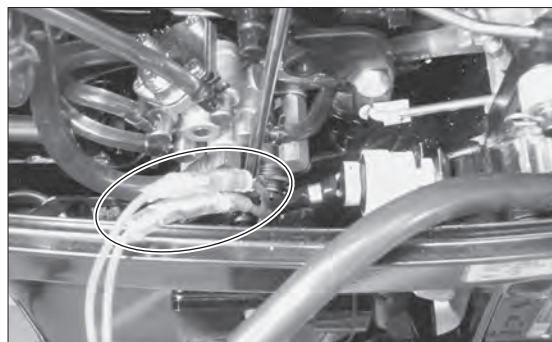
4. Remove PTT cable ③ from solenoid switch. (PTT model)



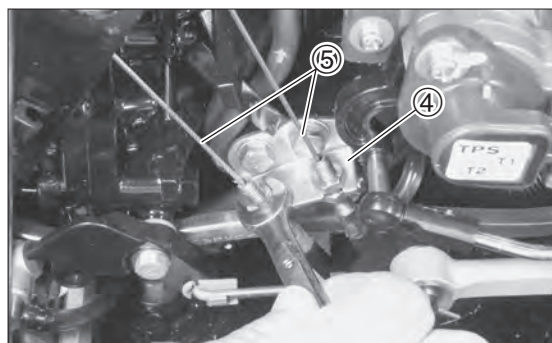
5. Disconnect connector of PTT switch.



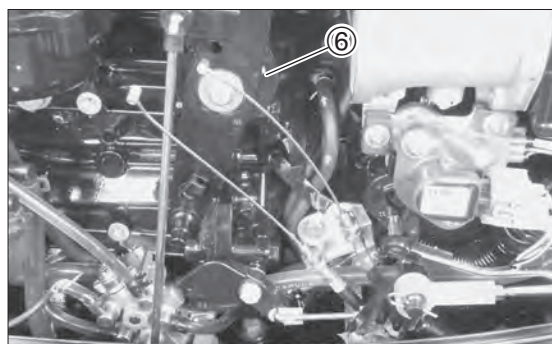
6. Disconnect neutral switch connector. (F type)



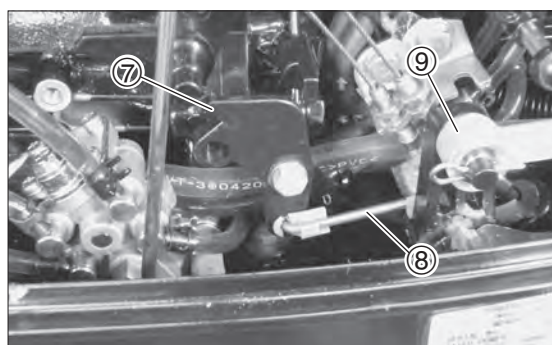
7. Loosen lock nut, then remove throttle cable ⑤ from throttle holder ④. (F type)



8. Remove throttle cable from advancer arm ⑥. (F type)



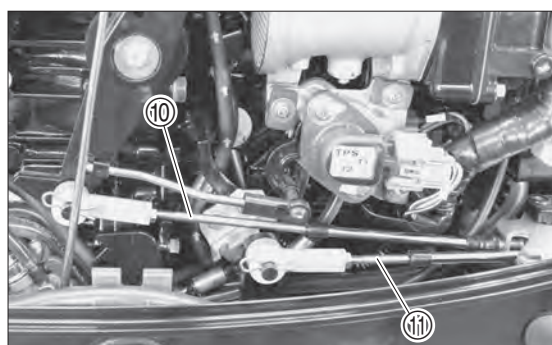
9. Remove throttle limiter rod ⑧ from throttle stopper arm ⑦. Remove shift lever rod ⑨ from shift arm (F type).



10. Remove "R" shaped pins and then throttle cable ⑩ and shift cable ⑪. (P type)



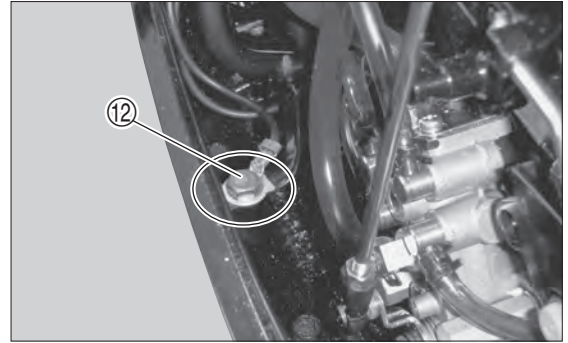
Be careful not to lose washers that are removed together with cables.



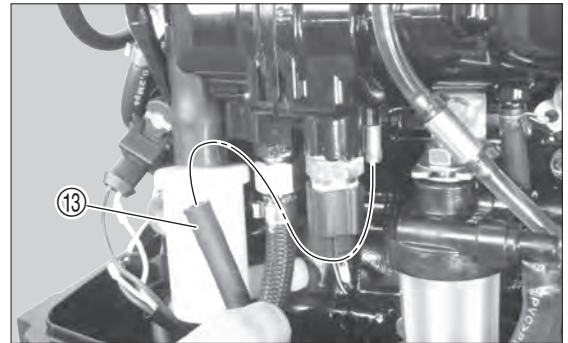


Power Unit

11. Remove ground cable ⑫ from bottom cowl.



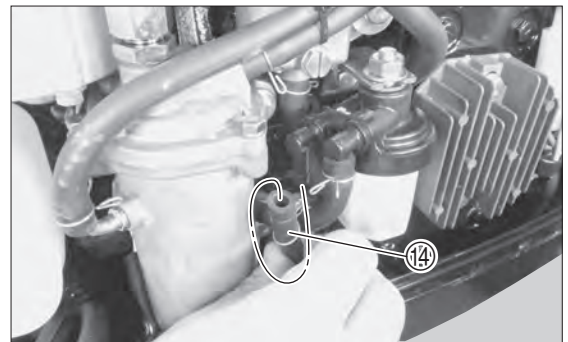
12. Disconnect cooling water check port hose ⑬ under the air compressor.



13. Disconnect fuel hose ⑭ from fuel filter.

⚠ WARNING

Disconnect hose while holding with waste cloth to soak fuel that spills.



14. Remove apron ⑮.



15. Loosen outside engine mount bolts first and then remove all of them.



16. Hoist power unit by using eye bolt ⑯.

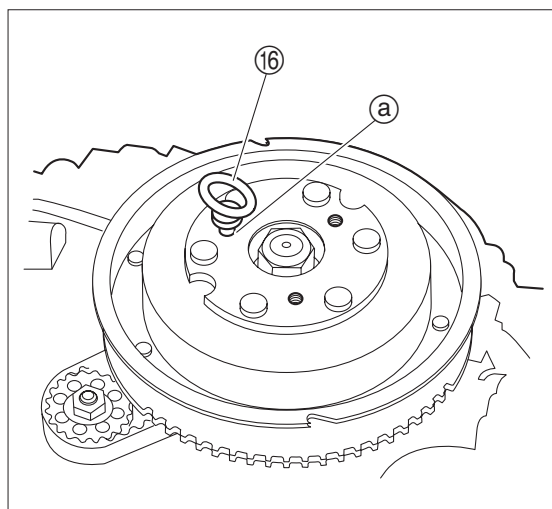


- Set eye bolt installation hole ① illustration shown and install eye bolt to cylinder head side.
- Hoist power unit taking care not to catch wires and hoses.



Eye Bolt ⑯ :

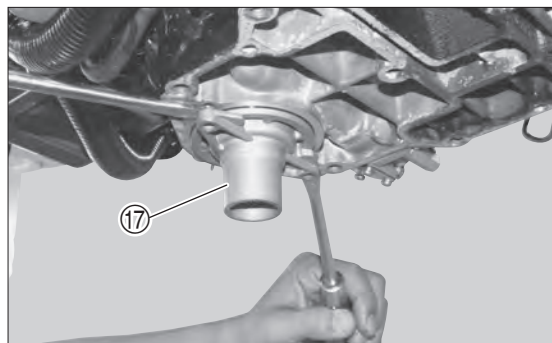
P/N. 3T9-72212-0



17. Remove 2-crank case bolts. Remove crank case head ⑰.



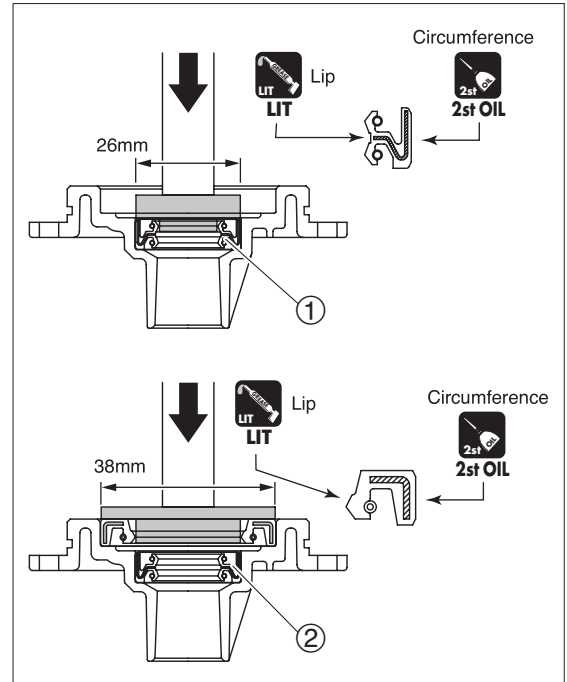
- Put the tip of bladed screw driver in the mating face of crank case head as shown to separate from the engine body evenly.





3) Assembly of Crank Case Head

1. Apply grease and oil to oil seal 19.6-35-10 ① and press-fit it to crank case head.
2. Apply grease and oil to oil seal 35-589 ② and press-fit it to crank case head.



4) Removing Air Compressor

Refer to "Removing Air Compressor" in chapter 4.

5) Removing Flywheel

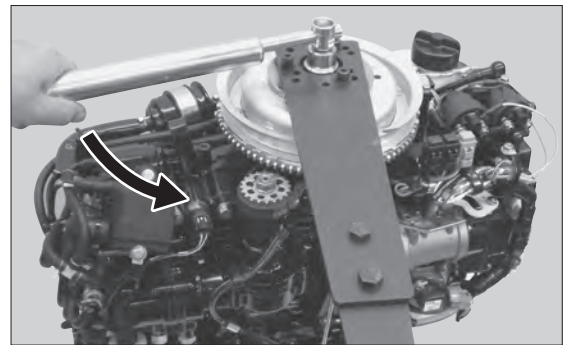
1. Attach flywheel puller kit to flywheel, then loosen flywheel nut and remove it.



Flywheel Puller Kit :
P/N. 3T1-72211-0



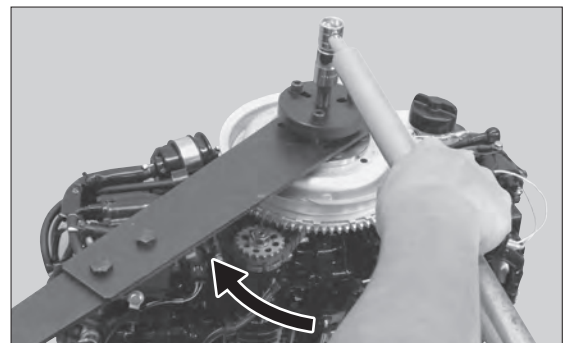
- Use M8-20 bolts. (3 pieces.)
- Turn magneto nut clockwise.



2. Remove flywheel by using flywheel puller kit and flywheel center plate.



Turn center bolt clockwise to remove flywheel.



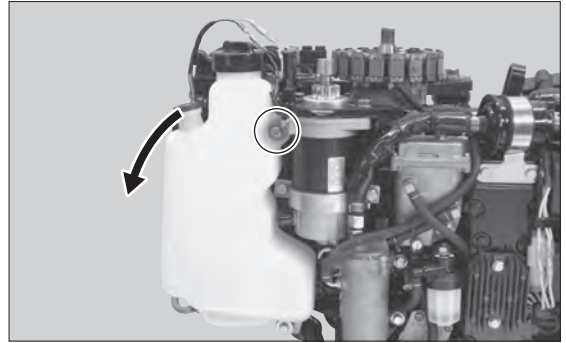
3. Remove magneto key.

6) Removing Oil Tank

1. Remove oil tank installation bolt (upper one) and move oil tank a little.

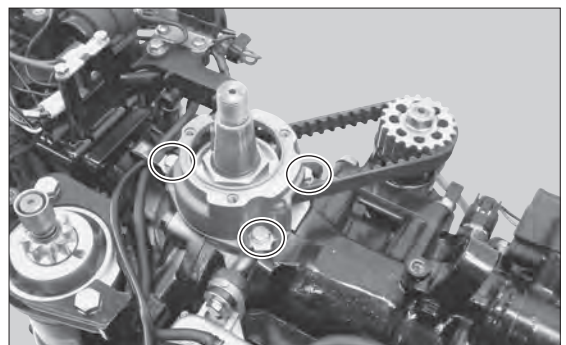
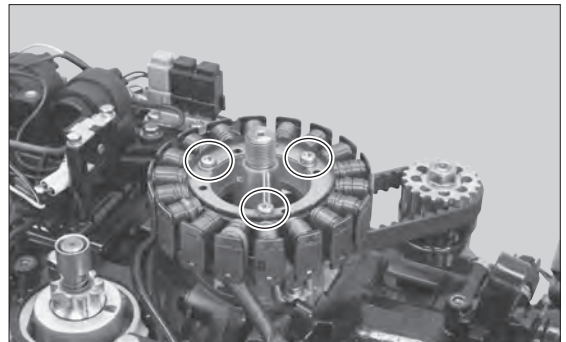
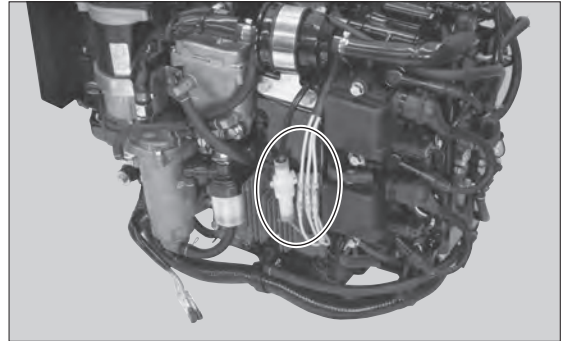


- Before removing oil tank, disconnect oil level gage connector, and oil hose at oil filter side.
- Bend oil hose at the tip to prevent oil from spilling.



7) Removing Alternator

1. Disconnect alternator connectors.
2. Loosen alternator securing bolts (M6, 3 pieces) and remove alternator.
3. Loosen coil bracket securing bolts (M6, 3 pieces) and remove bracket.



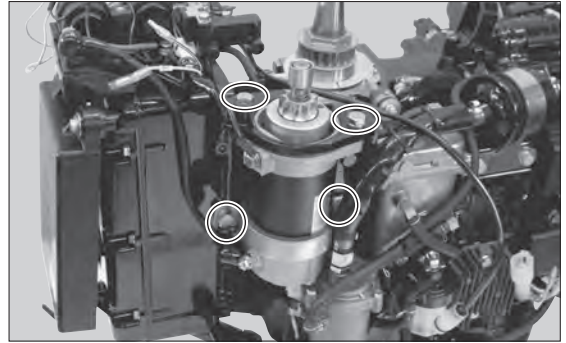


8) Removing Starter Motor

1. Remove starter motor securing band and securing bolts (M8, 4 pcs.) on the upper surface, and then, starter motor from bracket.

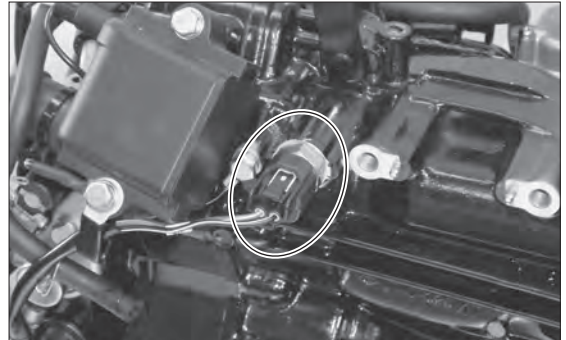


- Disconnect grounding wire from air chamber.
- Loosen FFP bolts.

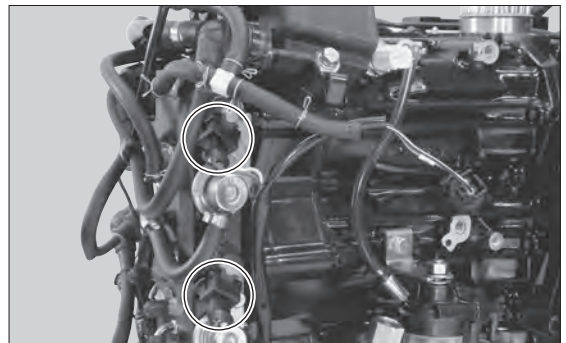


9) Removing Cord Ass'y and ECU

1. Disconnect overhear sensor connector located on the cylinder block and the air compressor.



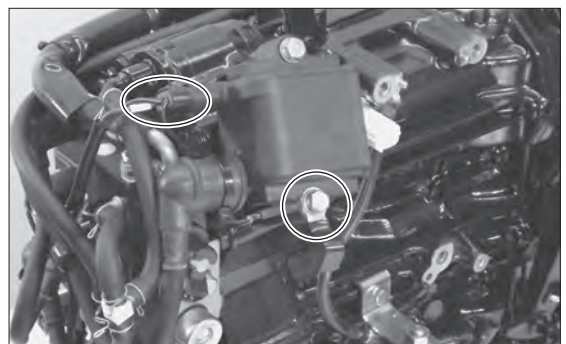
2. Disconnect fuel injector connector while pushing hook of the connector. Repeat this step for three cylinders.



3. Remove ignition coil connectors while pulling locks of the connector. Repeat this step for three cylinders.



- Remove ground wires from each ignition coil.



4. Disconnect air injector connector while opening locks located on both sides of the connector by using a bladed screw driver. Repeat this step for three cylinders.



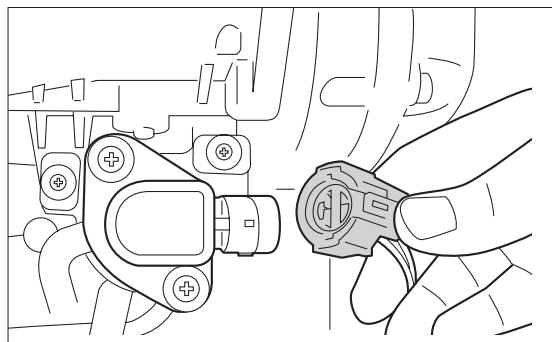
5. Disconnect FFP connector while pushing hook of the connector.



6. Disconnect TPS connectors while pushing hook of the connector.



- Connector on the outer → Blue (T2)
- Connector in the inner → Gray (T1)



7. Disconnect crank position sensor pushing hook of the connector.



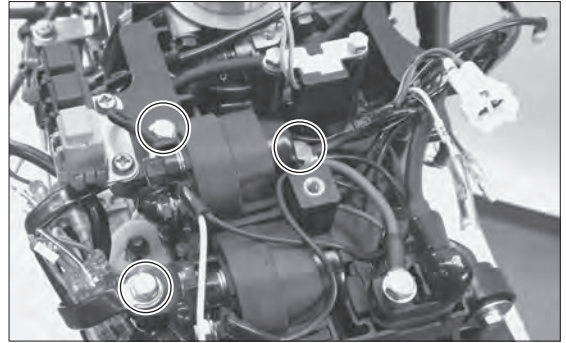


Power Unit

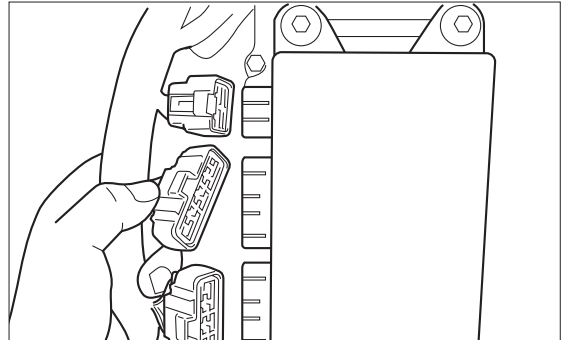
8. Remove solenoid bracket and electric sub ass'y from power unit.



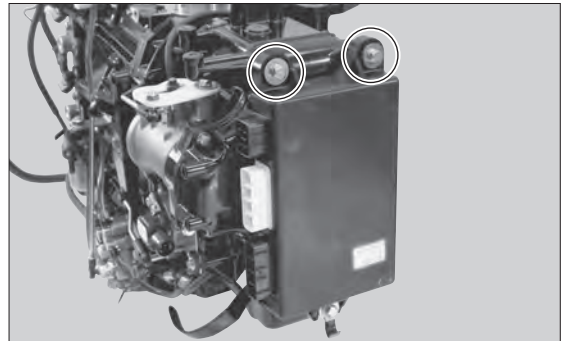
Note that grounding wire of cord ass'y is secured together.



9. Disconnect ECU connectors while pushing hook of ECU connector and pull apart.



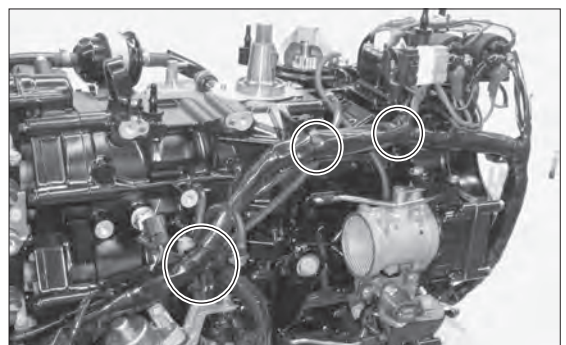
10. After removing top two ECU mount rubber bolts, remove ECU by pulling it upward.



11. Loosen band that secures cord ass'y, and then, remove cord ass'y from power unit.

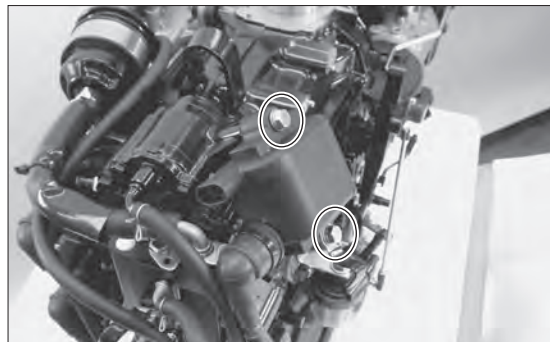


- Note that grounding wire of cord ass'y is secured together.
- Refer to "Electrical Wiring Assembling Instruction Diagrams" in Chapter 11.



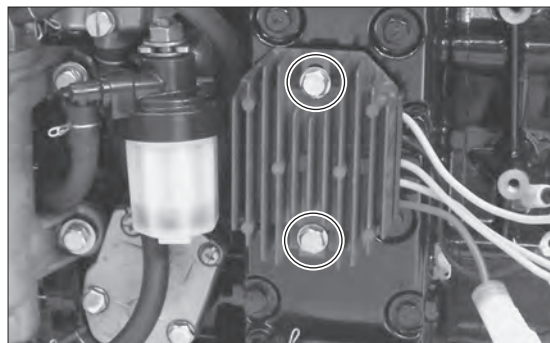
Removing Ignition Coils

1. Loosen mounting bolt of ignition coils #1, #2 and #3, and remove the coils.



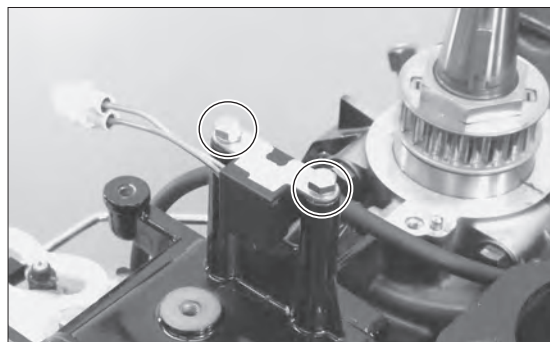
Removing Rectifier

1. Loosen two rectifier mounting bolts and remove the unit.



Removing Crank Position Sensor

1. Loosen two mounting bolts and remove the crank position sensor.



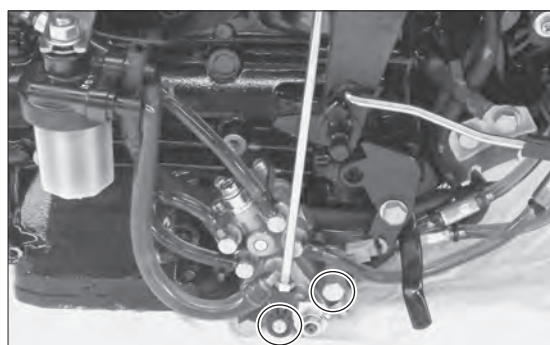
5

10) Removing Oil Pump

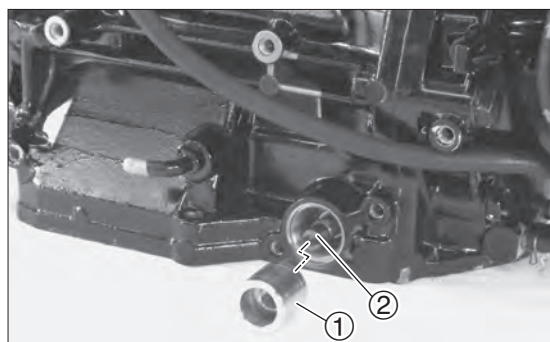
1. Remove oil pump securing bolts (M6, 2 pcs.), and then, remove pump together with pump bracket.



- Disconnect oil hose from crank case. Refer to "Oil System" in Chapter 4.
- Use waste cloth to let it soak with oil if spilt from hose.



2. Remove bushing ① and oil pump driven gear ②.



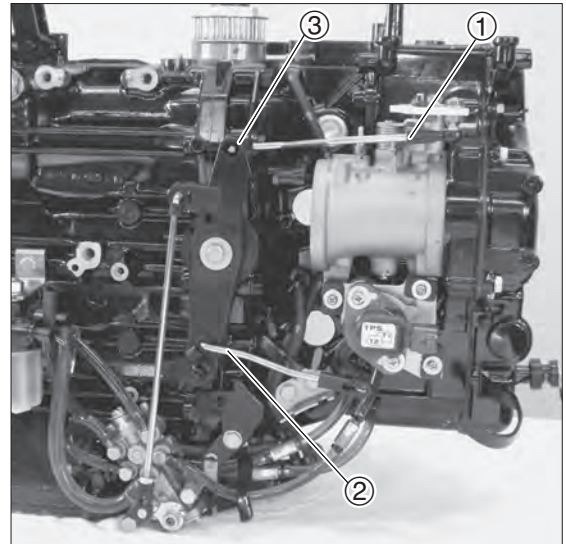


11) Removing Throttle Link

1. Remove throttle link rod ① and TPS link rod ②.



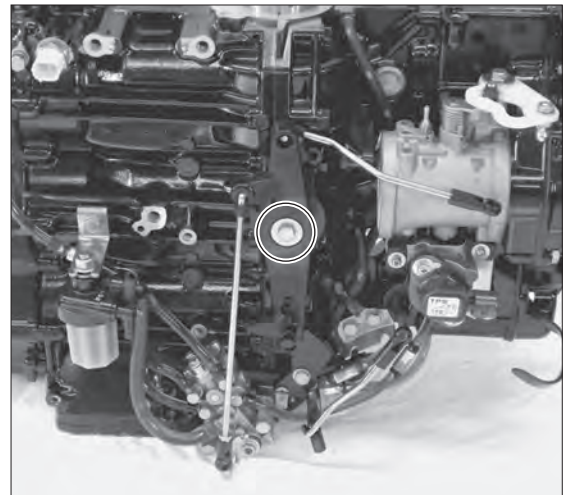
- Remove each link rod at the advancer arm side ③ first.
- When removing each link rod at the ball joint side, be careful not to apply force to the arm.



2. Loosen advancer arm mounting bolt and remove the arm.



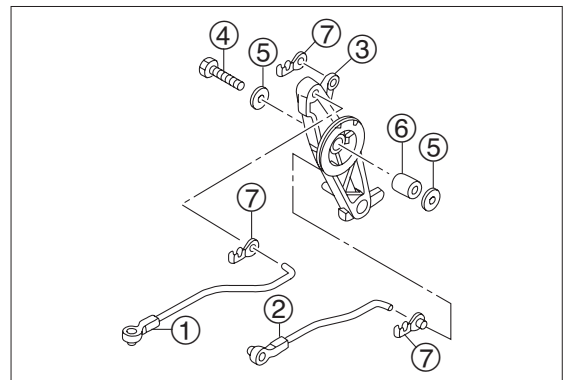
- Check ball joint cap for wear and damage link rod for bend.



- ④ Mount Bolt
- ⑤ Washer
- ⑥ Collar
- ⑦ Throttle Link Rod Snap



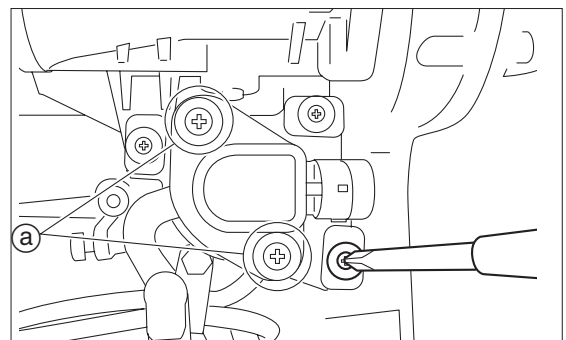
- Check link rod snap for wear and damage.



3. Remove throttle position sensor's lower mounting screws. Those are rubber mounted.



- Do not remove or loosen screws (a).

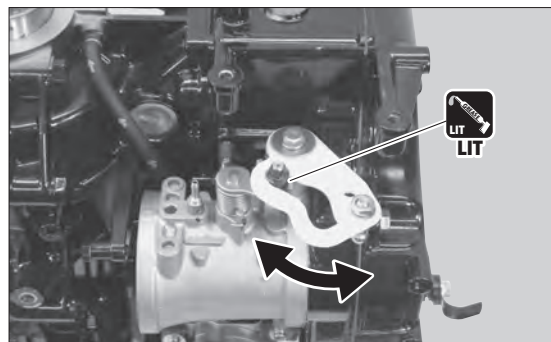


12) Inspection of Throttle Body

1. Check throttle body for wear of throttle cam and cam roller, and check if throttle cam and roller move smoothly.



Do not move adjust screw located on the upper part of throttle body.

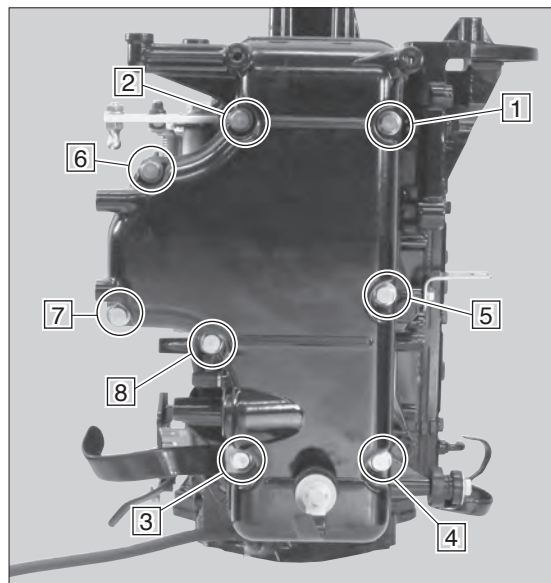


13) Removing Air Chamber

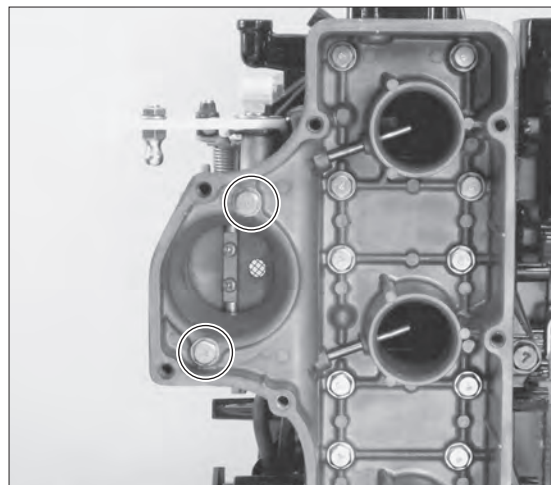
1. Loosen air chamber cover mounting bolts in the order shown, remove them, and remove air chamber cover.



- Disconnect recirculation hose. Refer to "Recirculation System" in Chapter 4.
- When air chamber cover is removed, the oil collected in the cover may flow out. Use rag to catch the oil.



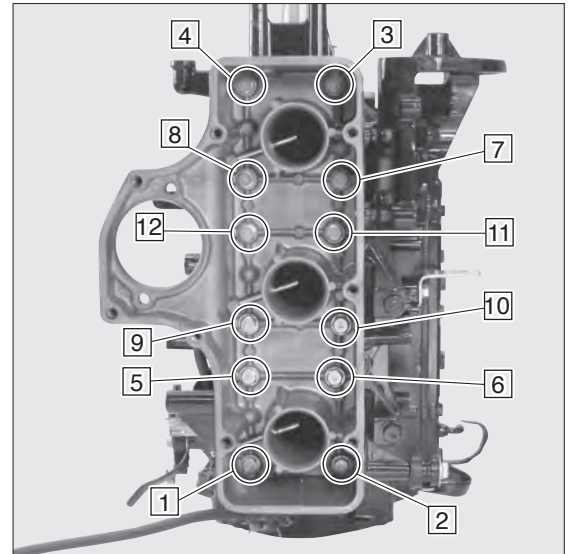
2. Loosen throttle body mounting bolt and remove the throttle body.



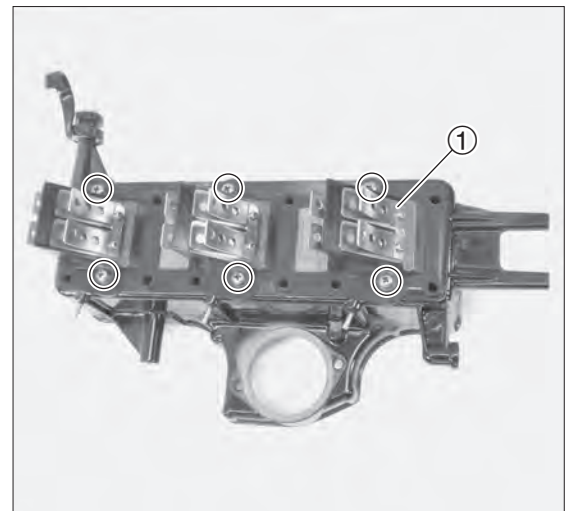


Power Unit

3. Loosen air chamber mounting bolts in the order shown, remove them, and remove air chamber.



4. Remove air chamber and remove reed valve ass'y ①.



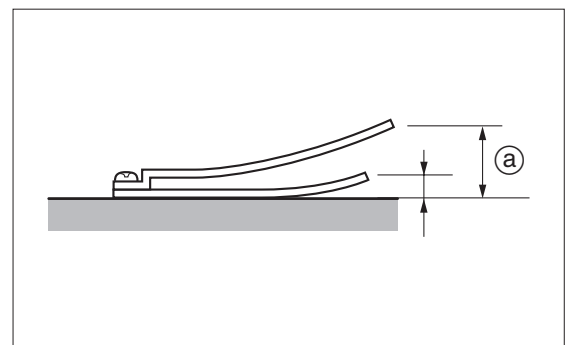
5. Inspection of Reed Valve Ass'y
Check reed valve and valve seat surface for bend, wear and damage. Replace if the bend is out of the specified range.

**Reed Valve Stopper Height ① :**

9.3 – 9.5 mm (0.366 – 0.374 in)

Reed Valve Bend :

Replace reed valve with new one if its bend is over the limit.



14) Removing Drive Pulley Nut

1. Remove drive pulley nut ① and belt guide ②.

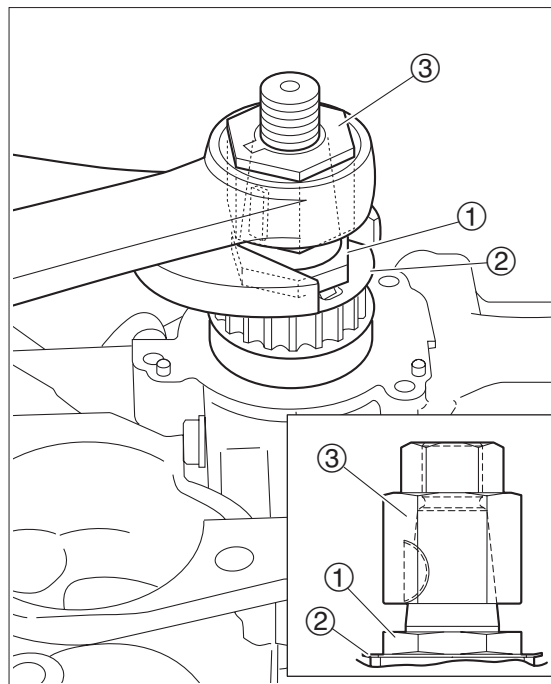


Crankshaft Holder ③

P/N. 3T5-72815-0



Hold drive pulley nut by crankshaft holder ③, and then loosen nut using spanner and wrench (36 mm).

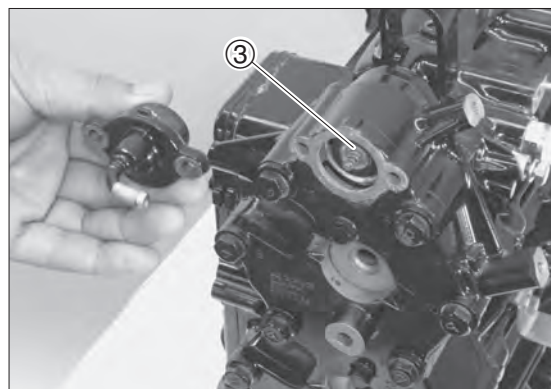
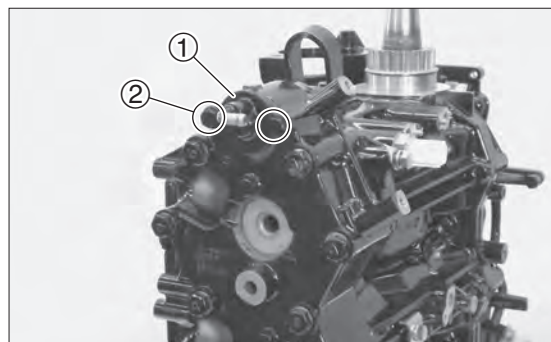


15) Removing Thermostat

1. Loosen thermostat cap mounting bolts ②, remove them, remove cap ①, and take out thermostat ③.



If thermostat cap is seized, tap lightly using a plastic hammer and then remove.





16) Inspection of Thermostat

1. Put thermostat in the vessel containing water, heat it, and measure the temperature at which the thermostat starts to open.



Replace thermostat if the valve is open even a little at ambient temperature.



Valve Opening Temperature :

52°C (125.6°F)

Valve Full Open Temperature :

65°C (149°F)

2. Measure valve lift of thermostat when prescribed temperature has been reached. Replace if the length is less than specified value.

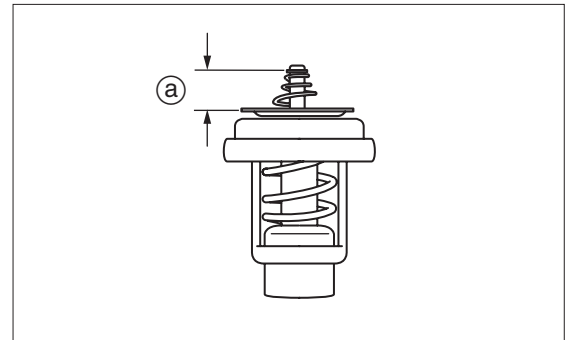
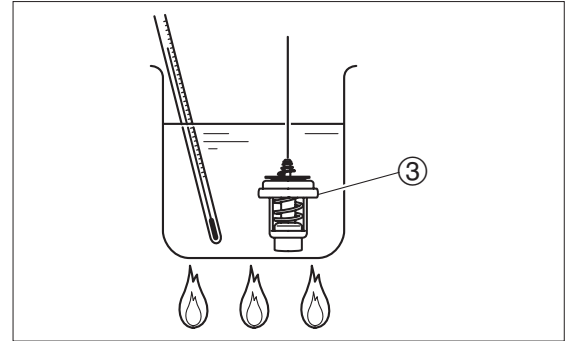


Water Temperature

65°C (149°F)

Valve Lift (a)

3 mm (0.12 in) or over



17) Removing Fuel System

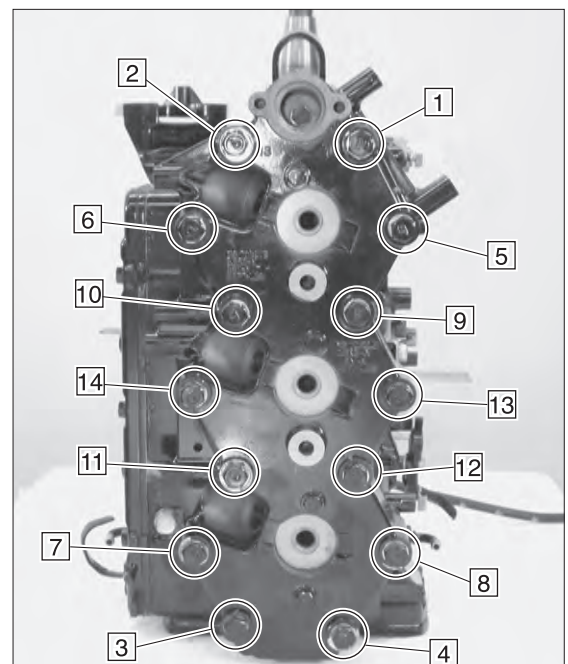
Refer to “Removing and Installation of Fuel System” in Chapter 4.

18) Removing Cylinder Head / Head Cover

1. Remove air rail and air injectors.
Refer to “Removing Air Rail” in chapter 4.
2. Loosen cylinder head / head cover mounting bolts in the order shown, remove them, and remove cylinder head / head cover.



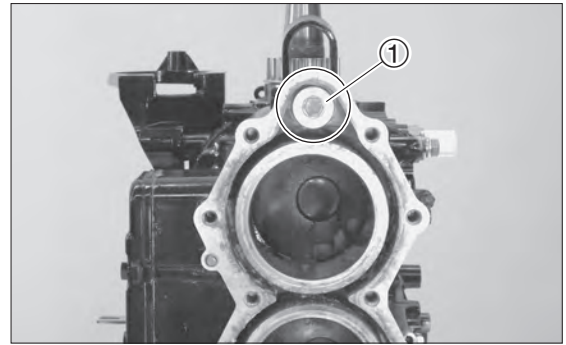
Handle cylinder head / head cover taking care not to scratch their mating surfaces.



3. Remove engine anode ① and check it.



Replace it if it is reduced to 2/3 of the original size.



19) Inspection of Cylinder Head

1. Remove carbon deposit in the combustion chamber of cylinder head, and check the interior for degradation, damage and other defects.
2. Check water jacket interior for deposits.



When cleaning mating surfaces of cylinder head by using a means such as a scraper or wire brush, be careful not to scratch the surfaces.

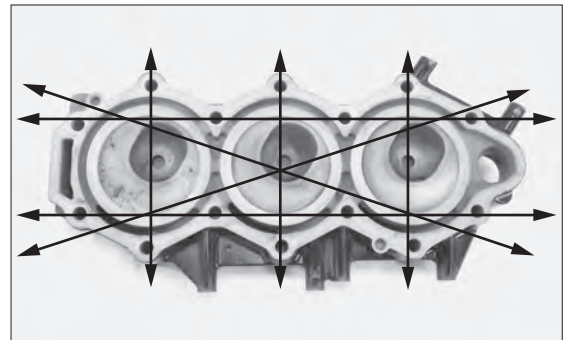
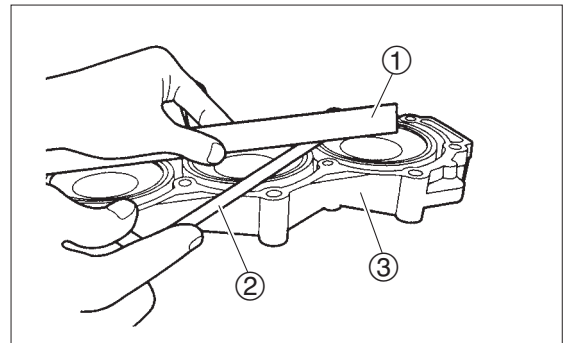
3. Use straight edge ① and thickness gauge ② to check distortion of cylinder head ③ in the directions shown. Repair or replace if the distortion is over the specified limit.



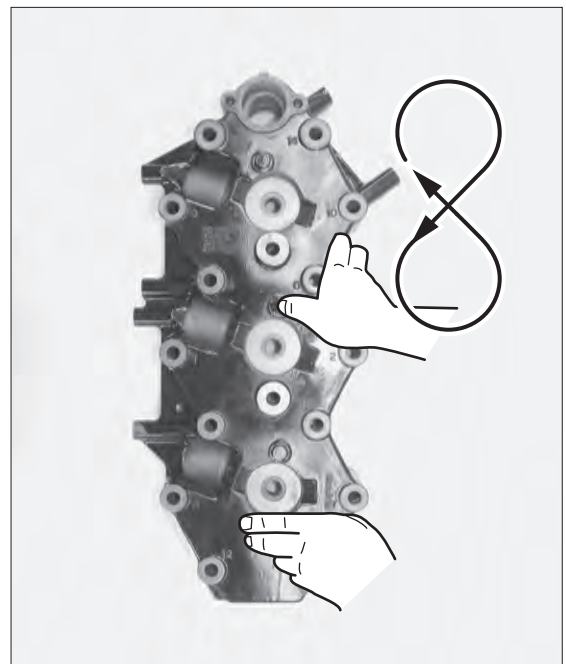
Thickness Gauge :
Commercially Available Item



Functional Limit :
0.03 mm (0.0012 in)



4. If the distortion is over the limit, lap the component by using a sheet of sand paper #240 - #400 placed on a surface plate or thick plate glass and moving it on the paper drawing the letter "8" on it. Finish by using sand paper #600.



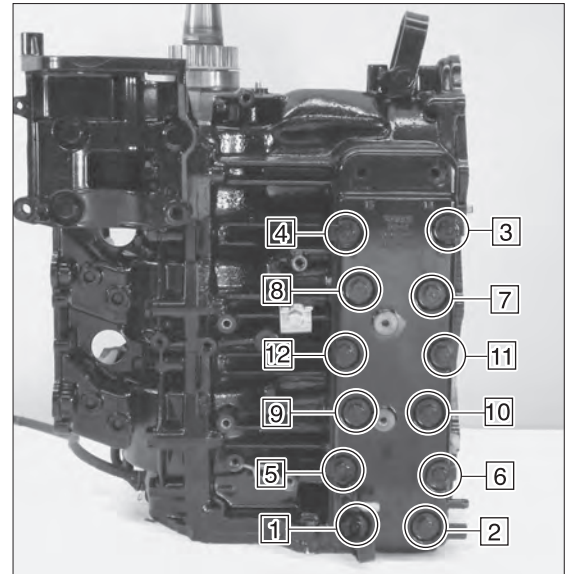


20) Removing Exhaust Cover

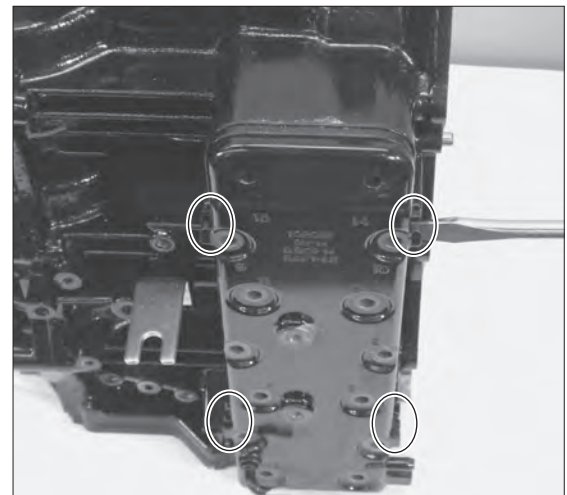
1. Loosen exhaust cover mounting bolts in the order shown, remove them, and remove exhaust cover.



Loosen the bolts in descending order of the numbers embossed on the exhaust cover.



- Pry the gap of the cover at five grooves one by one by using a bladed screw driver.
- The cover can be removed easier if parts cleaning agent is applied in the gap one by one from the top one.
- Be careful to pry the gap evenly, or the cover may be damaged or warped.



21) Inspection of Exhaust Cover

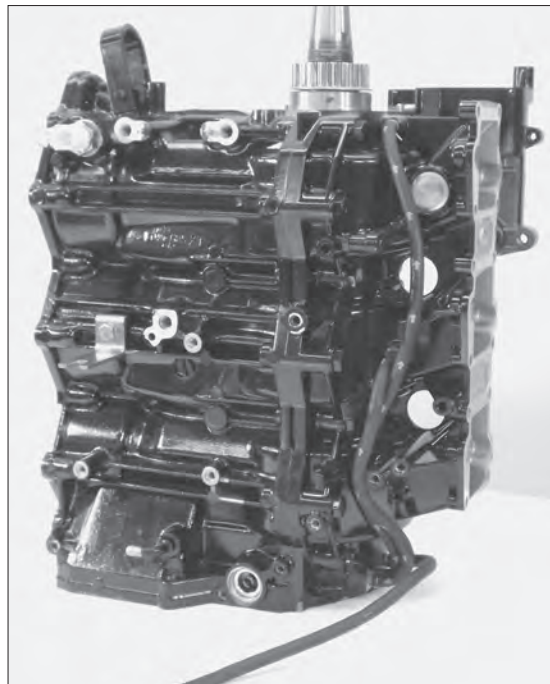
1. Check the removed outer exhaust cover and inner exhaust cover for damages such as distortion or scratches on their mating surface.



Remove clogs and debris from cooling water passage of exhaust cover.

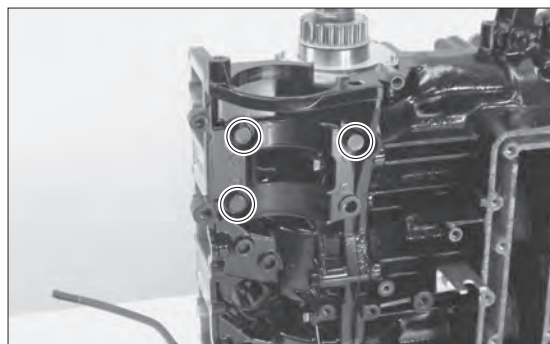
22) Removing of Recirculation Hoses

1. Remove recirculation hoses.



23) Removing Crank Case

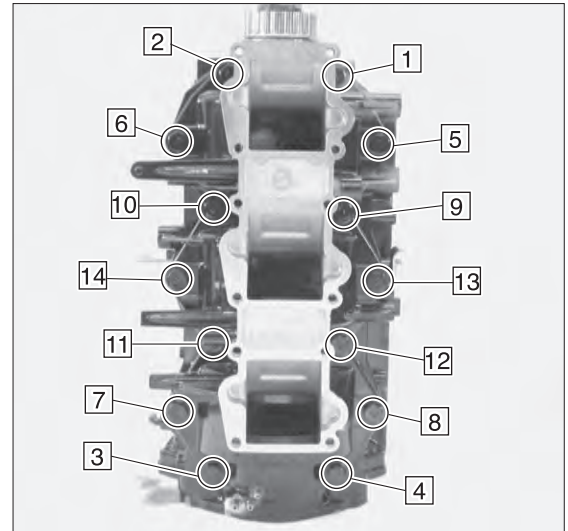
1. Remove starter motor bracket.



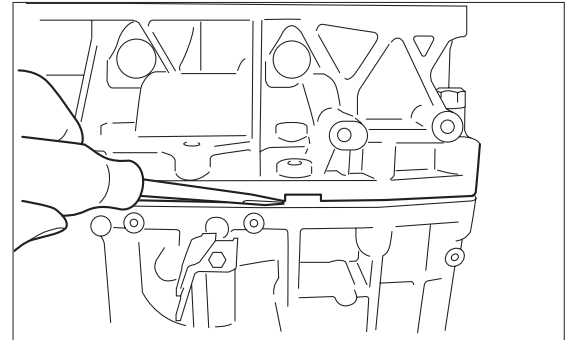


Power Unit

2. Loosen crank case mounting bolts in the order shown, remove them, and remove crank case.



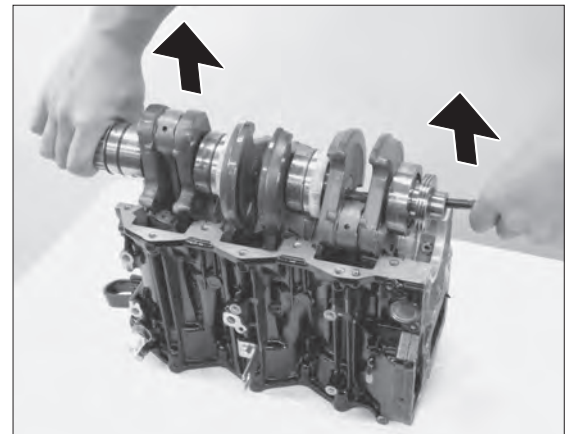
- When removing crank case, pry the gap at the groove of crank case by using a bladed screw driver.
- Note that there are two knock pins on the mating surface of crank case.



3. Remove crank shaft ass'y.
Put a pipe of $\varnothing 13.5\text{mm}$ (0.532 in) in the drive shaft side of crank shaft ass'y, hold the crank shaft ass'y using both hands, lift it in parallel with the cylinder block to remove taking care not to damage the piston rings.



- The crank shaft ass'y can be removed easier by lifting it while rocking it up and down a little.

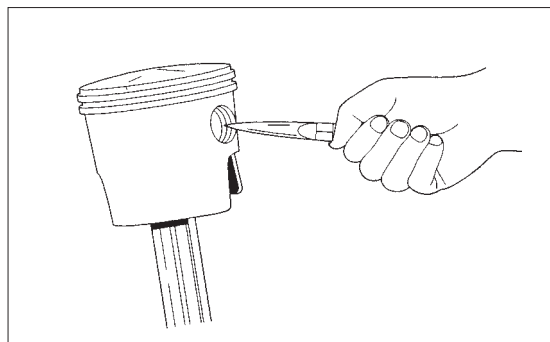


24) Removing Pistons

1. Remove piston pin clip by using a pair of pointed nose pliers.



When removing piston pin clip, be careful not to damage the piston pin hole.



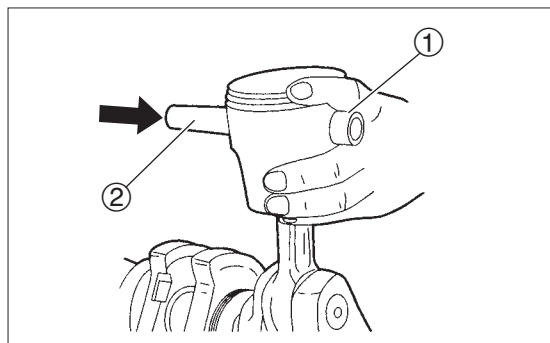
2. Remove piston pin ①, washer and needle bearing.



Use piston pin tool ② if necessary. Put the piston pin tool on the piston pin and tap it lightly taking care not to apply excessive force to the connecting rod. Be careful not to tap small end washer.



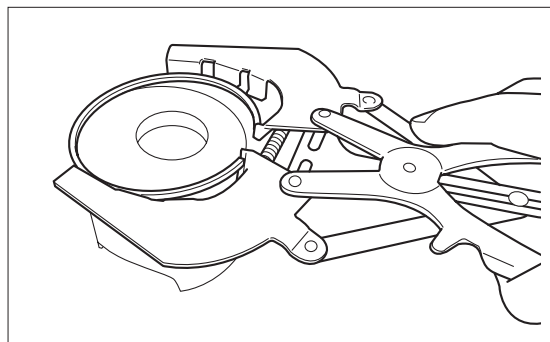
Piston Pin Tool ② :
P/N. 345-72215-0



3. Remove piston rings.
Use piston ring remover.



Piston Ring Tool :
P/N. 353-72249-0





25) Disassembly of Crank Shaft

1. Remove main bearing (Lower).
Remove "C" ring ① and pull out spacer ②.
Remove main bearing (lower) ③ by using universal puller plate and universal puller.



Universal Puller Plate ④ :

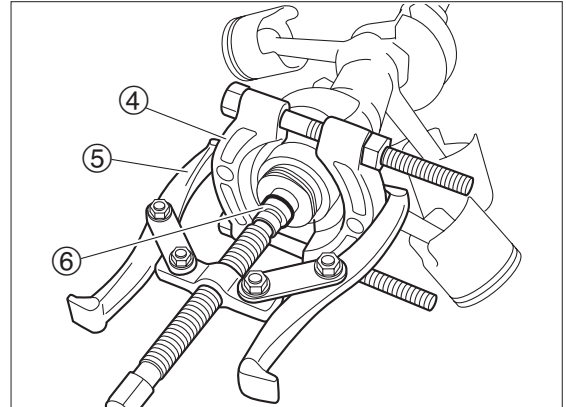
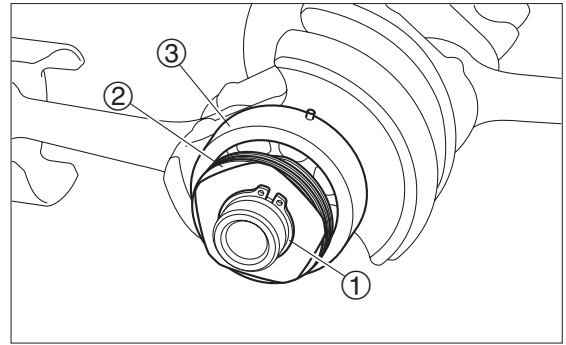
3AC-99750-0

Puller ⑤ : Commercially Available Item

Protecting Plate ⑥



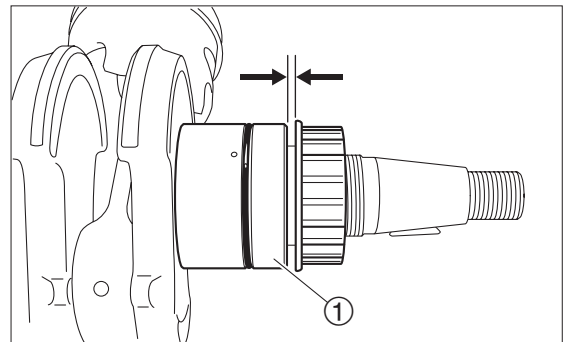
- Use 25 mm (0.984 in) protecting plate.
- Set protecting plate ⑥ to main bearing side for protect the damage of oil pump drive gear.



26) Removing of Drive Pulley



- Fully move main bearing (upper) ① to crank web side for set the tool.



1. Install drive pulley puller ass'y ② to drive pulley ③.

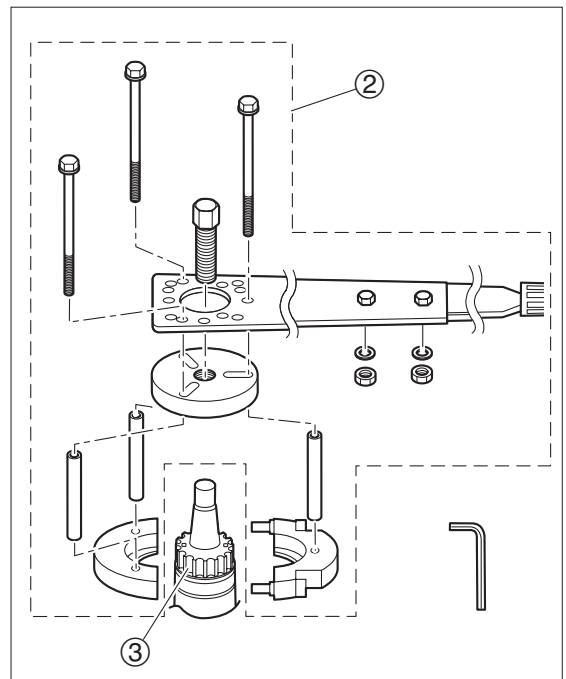


Drive Pulley Puller Ass'y ② :

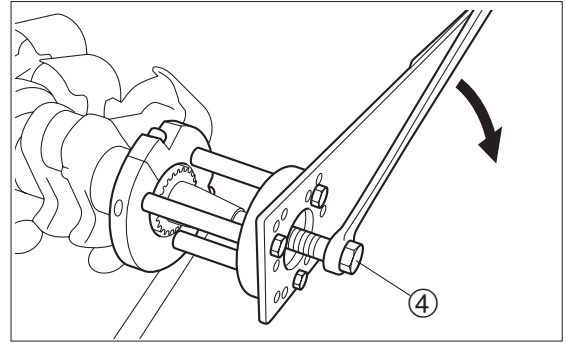
3T5-72890-0



- Add grease to top of crankshaft and thread part of the plate.



2. Slowly removing drive pulley, while tightening center bolt (19 mm) ④ step by step.



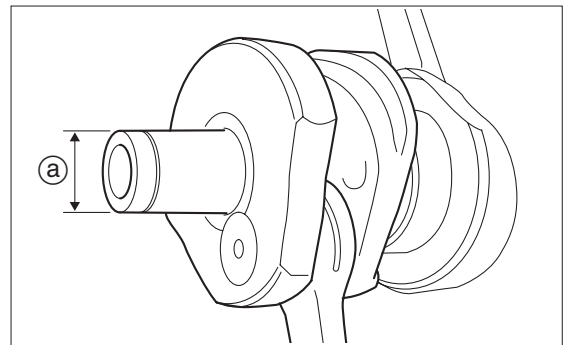
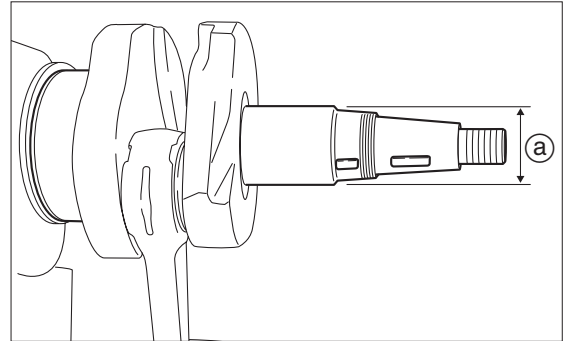
27) Inspection of Crank Shaft

1. Visually check crank shaft ass'y upper and lower end bearings for flaws, wear and other damages. Replace crank shaft ass'y if necessary.



Specified Value ③ :

- #1, Top $\varnothing 36.0$ mm (1.4173 in)
- #3, Under $\varnothing 25.0$ mm (0.9843 in)



2. Check if main bearing rotates smoothly. Replace crank shaft ass'y if necessary.

Measure crank shaft deflection. Replace crank shaft if the deflection is over the specified value.



Dial Gauge ① : Commercially Available Item

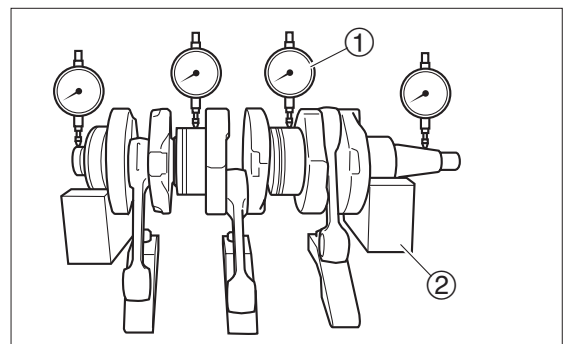


V Block ② : Commercially Available Item



Crank Shaft Deflection Limit :

0.05 mm (0.0020 in)



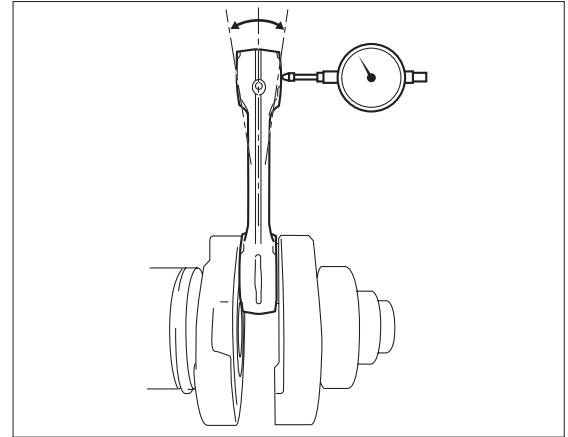


Power Unit

- Replace crank shaft ass'y if the deflection is over the standard value.



Connecting Rod Deflection Limit :
2.0 mm (0.08 in)



28) Inspection of Cylinder

- Measure cylinder inner diameters (D1 - D6) at (a), (b) and (c).
If any of the diameter is over the limit, replace the cylinder or bore the liner to make it compatible with an oversize piston.

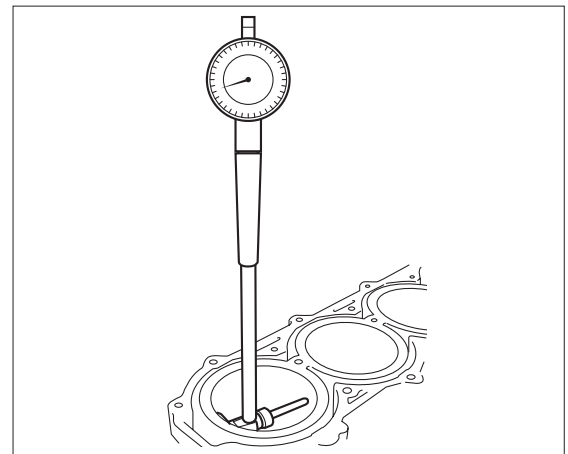


Cylinder Inner Diameters (D1 - D6) : Standard Value
68.05 mm (2.6791 in)

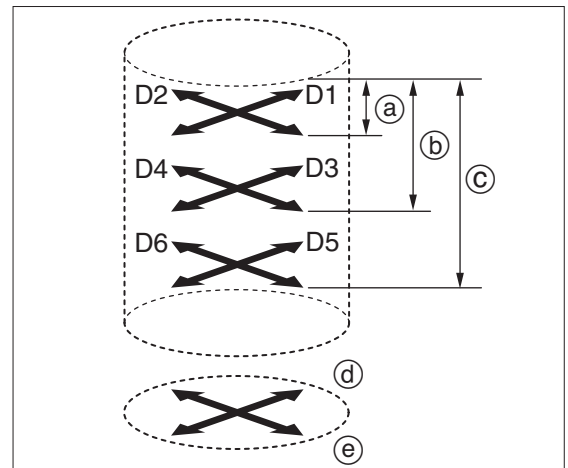
Oversize Piston :
68.55 mm (2.6988 in)



Functional Limit :
68.11 mm (2.6815 in)



- Measure at the area of the largest wear.
- The measurement heights (b) and (c) represent location 5 mm above and below exhaust port. (d) represents diameter in crank shaft direction, (e) represents the one in crank web direction.
- Replace the cylinder in any of the following cases; the piston sliding surface is severely damaged such as deeply scratched or scuffed so that it cannot be repaired with water-proof sand paper of #400 – 600, or the difference of liner inner diameter between the largest worn area and minimum worn area is 0.06mm (0.0024 in) or over.



(a) 10mm (0.39 in)
(b) 30mm (1.18 in)
(c) 80mm (3.15 in)

(d) Crank Shaft Direction
(e) Crank Web Direction

29) Inspection of Pistons

1. Inspection of Piston Outer Diameter

Measure piston outer diameter, and replace the piston if the outer diameter is less than the functional Limit.



Measurement Point (b) :

12 mm (0.47 in) above bottom end of piston skirt.
approximately 90 degrees from pin hole.

Standard Value (a) :

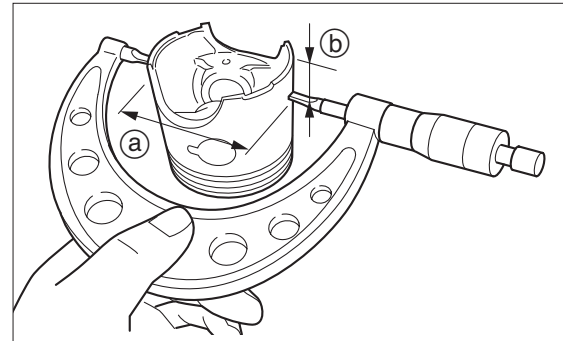
Standard Piston : 67.96 mm (2.6755 in)

Oversized Piston : 68.46 mm (2.6953 in)



Functional Limit (a) :

67.90 mm (2.6732 in)



2. Inspection of Piston Clearance

Calculate piston clearance, and if it is over the limit, replace piston or any of piston rings, replace cylinder, or use oversized piston.



Piston Clearance :

Standard Value : 0.08 – 0.12 mm (0.0031 – 0.0047 in)



Functional Limit :

0.21 mm (0.0083 in)



Calculation of Piston Clearance :

Cylinder Inner Diameter – Piston Outer Diameter



Use the maximum value of the cylinder inner diameter measured.

3. Inspection of Piston Rings

1) Push a piston ring into the cylinder by using top surface of a piston.

2) Use thickness gauge to measure piston ring gap.
Replace piston ring if the gap is over specified value.



Thickness Gauge :

Commercially Available Item



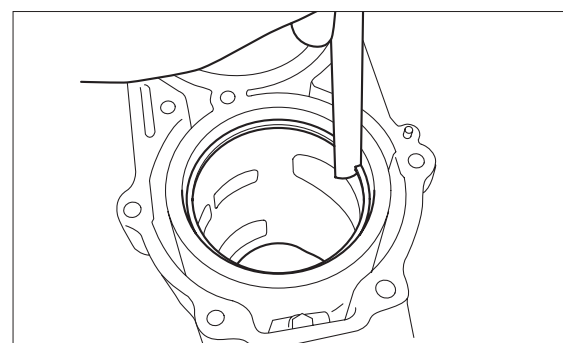
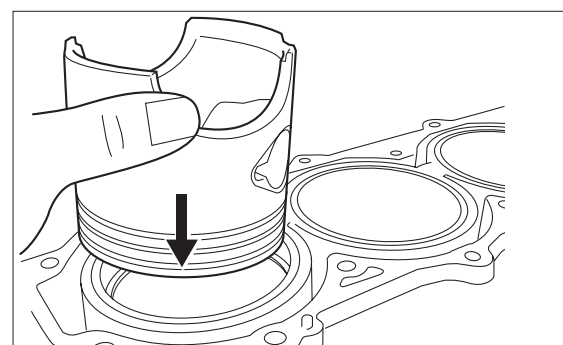
Piston Ring End Gap : Standard Value

Top Ring	} 0.38 – 0.53 mm (0.0150 – 0.0209 in)
Second Ring	
Third Ring	



Functional Limit :

(a) Top Ring	} 0.80 mm (0.0315 in)
(b) Second Ring	
(c) Third Ring	





Power Unit

4. Inspection of Piston Ring Side Clearance

- 1) Attach a piston ring to piston, and measure piston ring side clearance. Replace piston ring if the clearance is over specified value.



Piston Ring Tool :

P/N. 353-72249-0



Piston Ring Side Clearance :

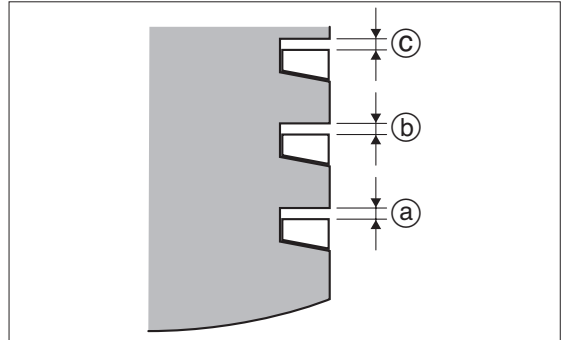
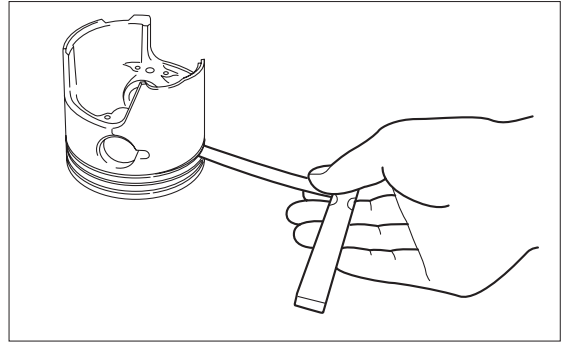
Standard Value :

Top Ring	} 0.04 – 0.08 mm (0.0016 – 0.0032 in)
Second Ring	
Third Ring	



Functional Limit :

Ⓐ Top Ring	} 0.10 mm (0.0039 in)
Ⓑ Second Ring	
Ⓒ Third Ring	



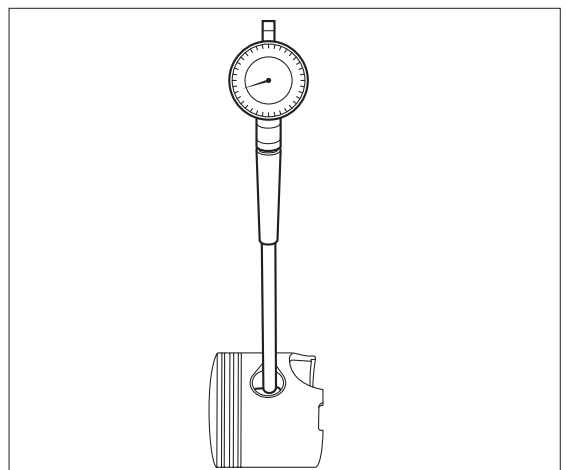
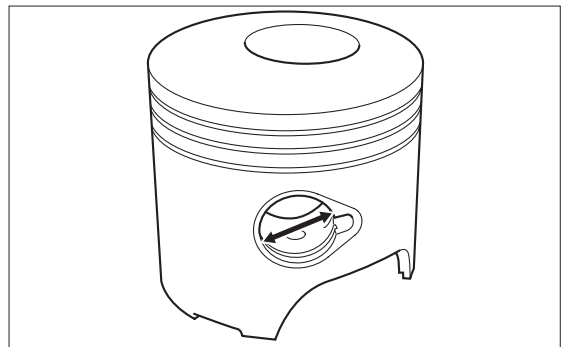
5. Inspection of Piston Pin Hole

- Measure piston pin hole inner diameter, and replace piston if the inner diameter is over the limit.



Piston Pin Hole : Standard Value

17.00 mm (0.6693 in)



6. Inspection of Piston Pins

Measure piston pin outer diameter, and replace piston pin if the outer diameter is over the limit.



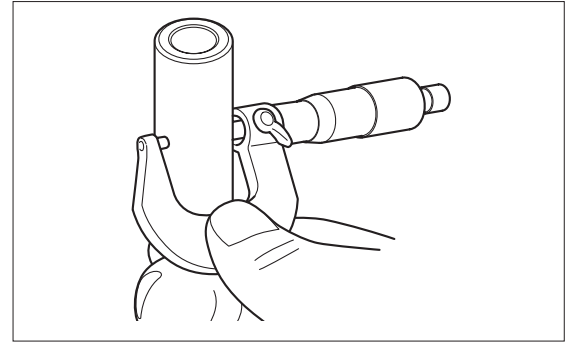
Piston Pin Outer Diameter : Standard Value

17.00 mm (0.6693 in)



Measuring Locations :

D1 and D3 10 mm (0.394 in) from top end
and bottom end respectively
D2 27.5 mm (1.083 in) from the end



7. Inspection of Piston Pin Clearance

Calculate piston pin clearance, and replace piston and piston pin together if the clearance is over the limit.



Calculation of Piston Pin Clearance :

Piston Pin Hole Inner Diameter - Piston Pin
Outer Diameter

Standard Value :

- 0.007 - 0.003 mm (- 0.00028 - 0.00012 in)

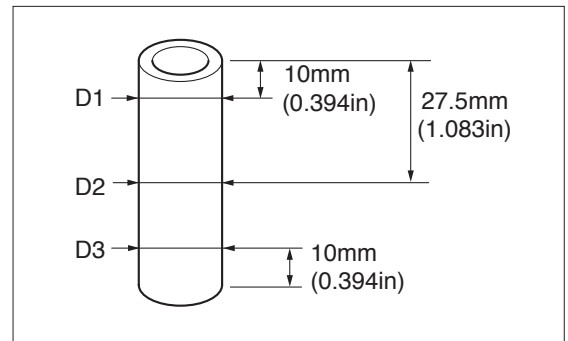


Functional Limit :

0.020mm (0.00079 in)



Use the maximum values of piston pin hole inner diameters and piston pin outer diameters measured respectively.





30) Assembly of Crank Shaft

1. Press-fitting Bearing

- 1) Insert a holding bar ① in between crank webs and press-fit bearing ①.



Bearing Press-Fitting Tool ② :

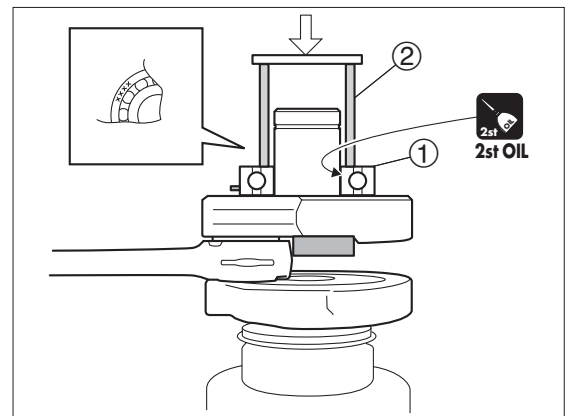
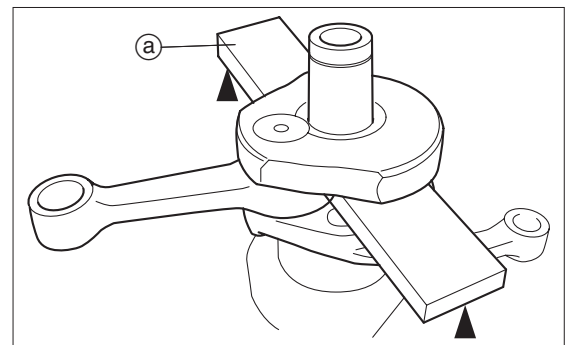
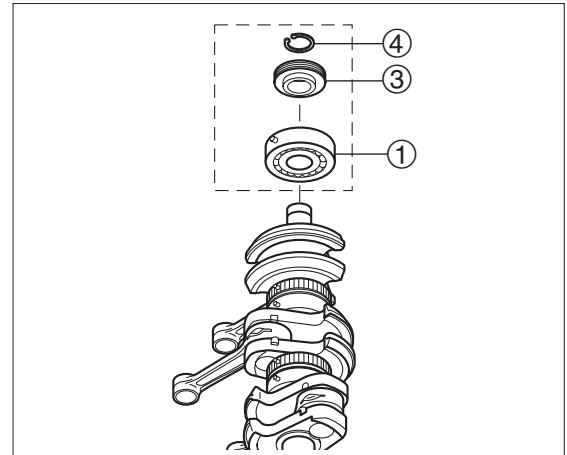
Inner Diameter: $\varnothing 30$ mm (1.181 in)



Do not reuse removed bearing.



2st OIL



2. Press-fit spacer 35-48.6-16 ③ and attach "C" ring ④.

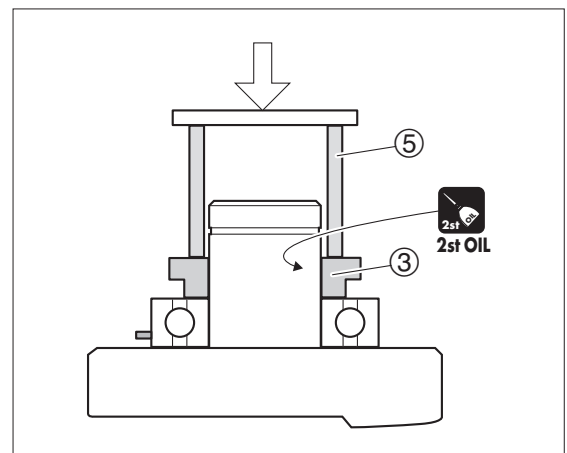


Spacer Press-Fitting Tool ⑤ :

Inner Diameter: $\varnothing 30$ mm (1.181 in)



2st OIL



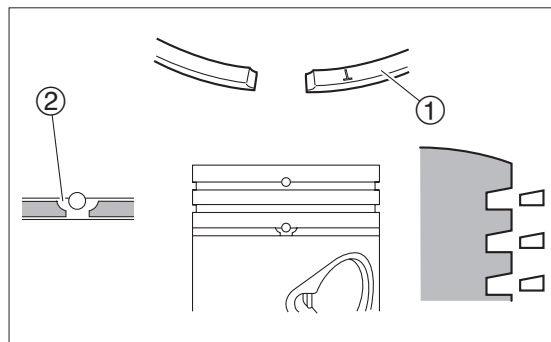
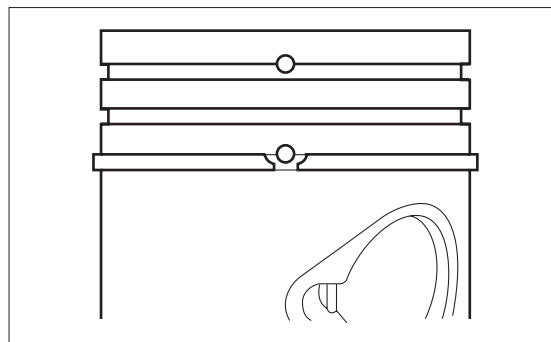
31) Installation of Pistons

1. Installation of Piston Rings

Complete 3rd ring first.



- When attaching a piston ring, face the side of the ring marked with "T" upward ①.
- Bring piston ring gap to knock pin ②.

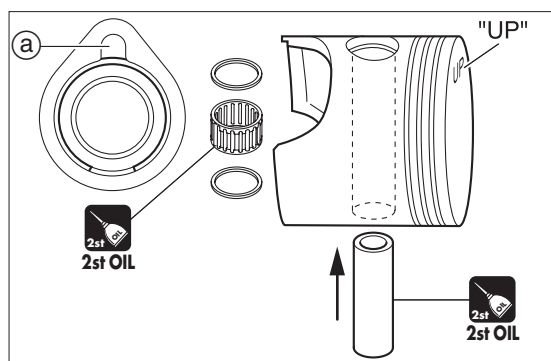


2. Installation of Piston Pin

Attach piston to washer, needle bearing and connecting rod by using piston pin.



- Attach a piston pin clip to a groove in the piston pin hole.
- Assemble the parts so that the side marked with "UP" on the piston head faces flywheel side.
- Set the piston pin clip so that the gap of the clip is at the opposite side of the opening (a) located in the piston pin clip groove.
- When a piston pin and needle bearing are used, apply two-stroke engine oil.
- Use piston pin tool if necessary.



Piston Pin Tool :

P/N. 345-72215-0



2st OIL

32) Inspection of Crankcase

1. Check the crankcase for cracks and damages.
Replace if necessary.



Power Unit

33) Assembly of Power Unit Parts

1. Install main bearing (upper) ① to crank shaft ass'y, if remove drive pulley.



- Face the marking on the bearing to flywheel side.
- Apply LIT grease to the oil seal lip.



2st OIL



LIT

2. Install crank shaft ass'y to cylinder.
Apply genuine engine oil to the following parts before assembling them.
 - Big End of Connecting Rod
 - Small End of Connecting Rod
 - Main Bearing
 - Piston Ring and Entire Circumference of Piston, and Entire Cylinder Wall
 - O Ring of Upper Bearing

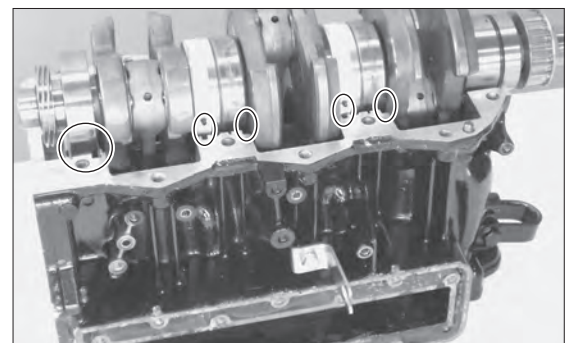
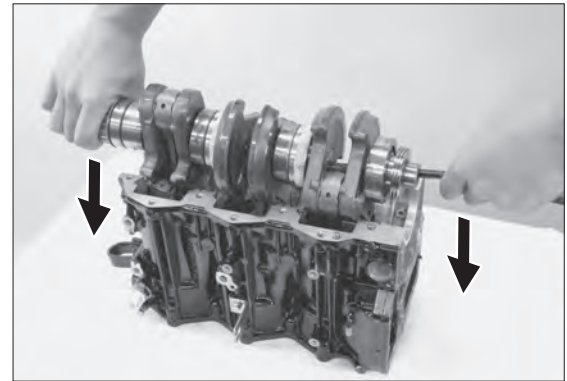
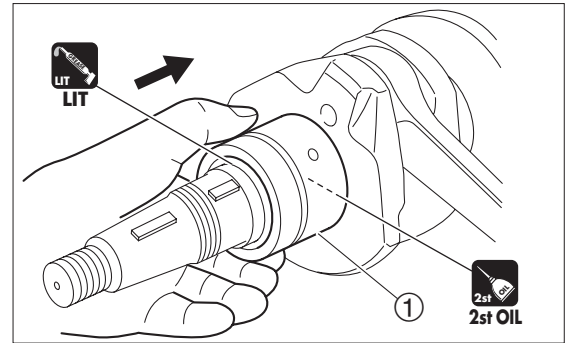


- Before assembling parts, remove residual gasket on the surface of bearings and mating surfaces of crankcase halves.
- When installing crank shaft ass'y, lower the ass'y gradually so that crank shaft is held parallel with the cylinder face.
- Insert pistons one by one while confirming that each piston enters vertically in the cylinder liner. Pistons can be inserted easier while moving them up and down a little.
- Put a piece of round bar or pipe ③ of $\varnothing 13.5$ mm (0.532 in) in the drive shaft opening to make it easier to hold.



2st OIL

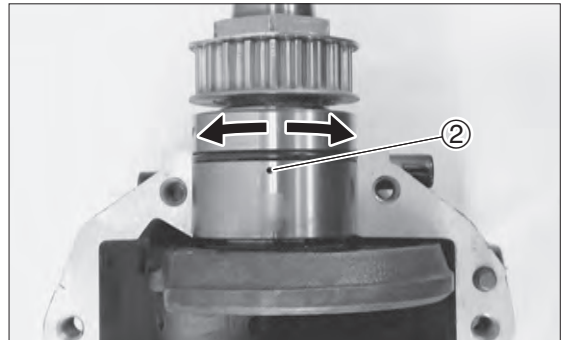
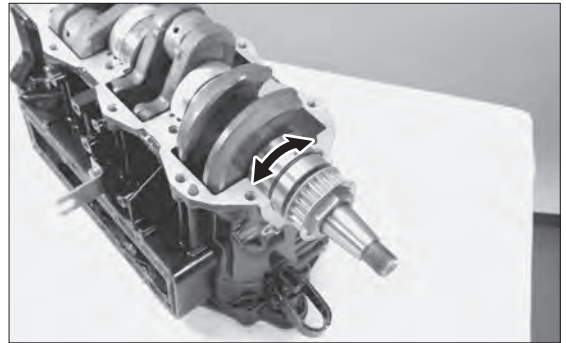
3. Positioning bearing
Put the pin of bearing (lower) on the cylinder and then, put washers in the cylinder grooves snugly.



4. Positioning Upper Bearing and Main Bearing

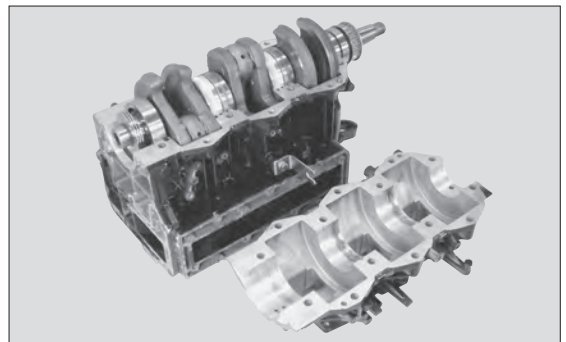


- Attempt to move each bearing lightly to check if dowel pin is in the hole snugly.
- Each bearing is provided with a bearing lubrication hole ② on the opposite side of knock hole to check the location.



34) Assembly of Crank Case Halves

1. Degrease crank case and cylinder mating faces.



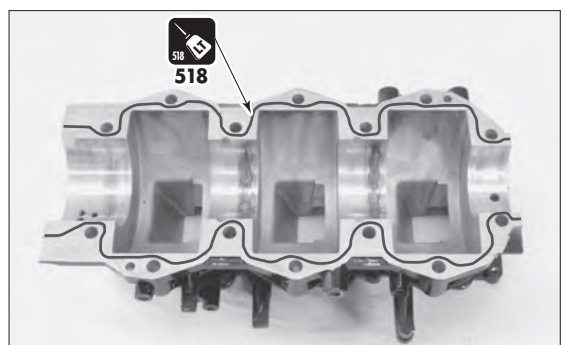
2. Apply sealing agent to crank case's mating surface.



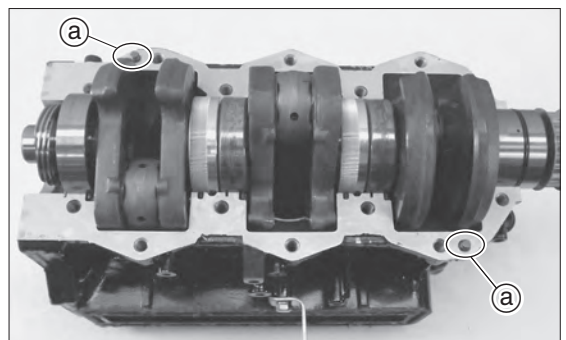
- Be careful not to allow sealing agent to squeeze out.
- Apply sealing agent on the area inside of the bolt holes continuously in width of approximately 1 mm as shown.



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3. When installing crank case, check position of dowel pins (a).



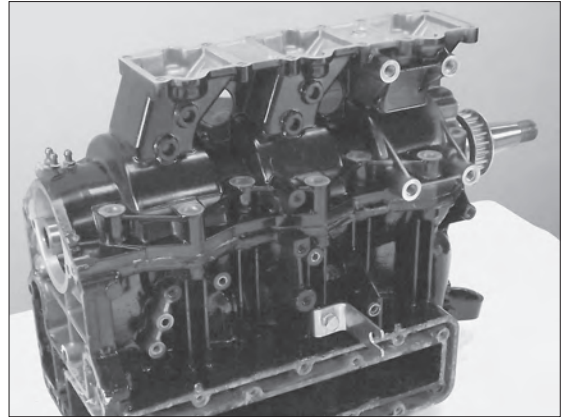


Power Unit

4. Install crank case to cylinder.



Before securing with bolts, fit crank case snugly to the cylinder by tapping with a plastic hammer to make the gap between surfaces even.



5. Tighten crank case securing bolts and nuts **1** to **14** (M8) in the order of the numbers shown.



Temporary Tightening :

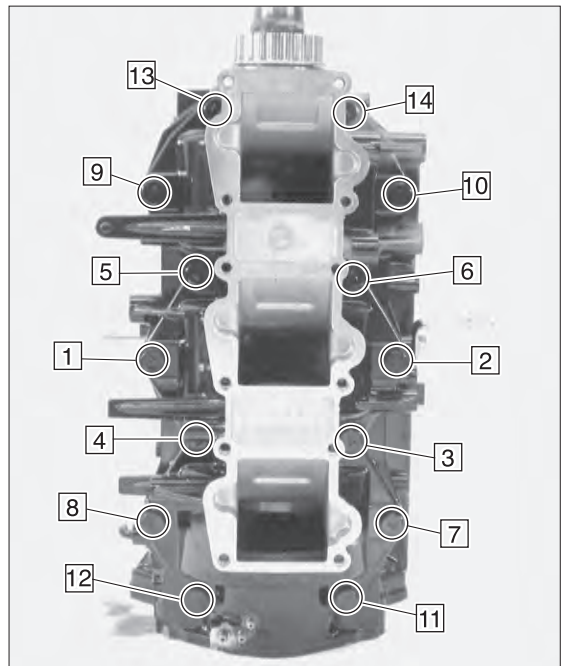
13 N · m (9 lb · ft) [1.3 kgf · m]

Final Tightening :

25 N · m (18 lb · ft) [2.5 kgf · m]



- Tighten crank case securing bolts and nuts in two steps to their specified torque.
- Rotate Crankshaft to ensure it is not binding.

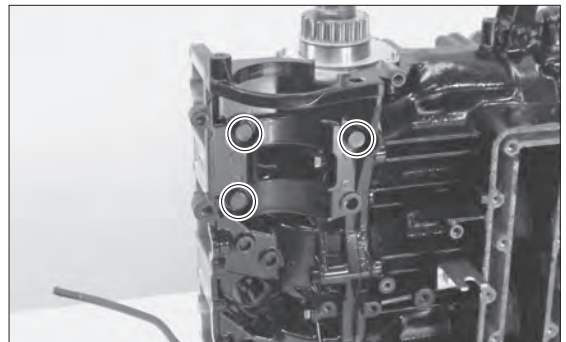


6. Install starter motor bracket.



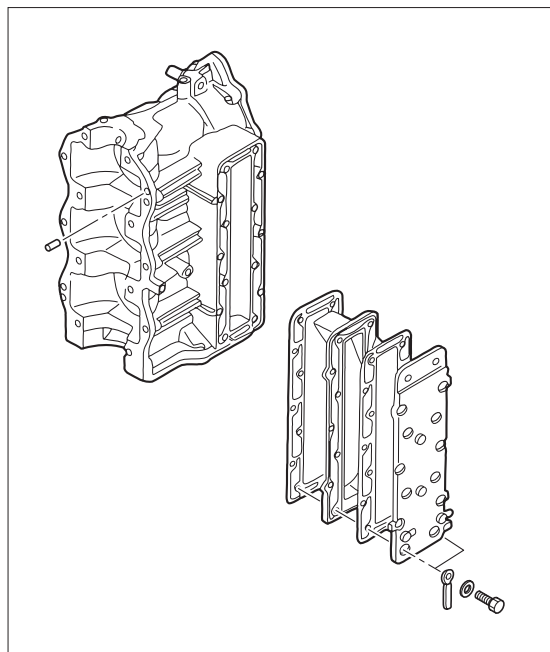
Starter Motor Bracket Bolt :

13 N·m (9 lb · ft) [1.3 kgf · m]



35) Installation of Exhaust Cover

1. Assemble exhaust cover, gasket, anode and anode cap.



2. Attach exhaust cover securing bolts 1 to 12 (M6) and tighten them in the order of their numbers shown to specified torque.

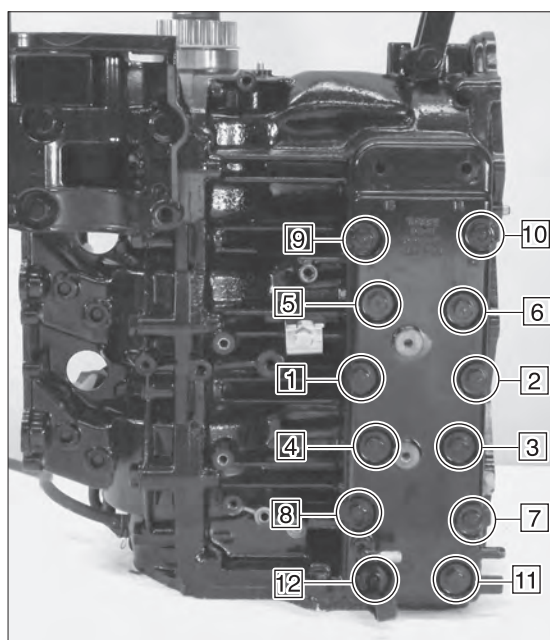


Exhaust cover Bolts :

12 N · m (9 lb · ft) [1.2 kgf · m]



Tighten the bolts in the order of the numbers marked on the exhaust cover.



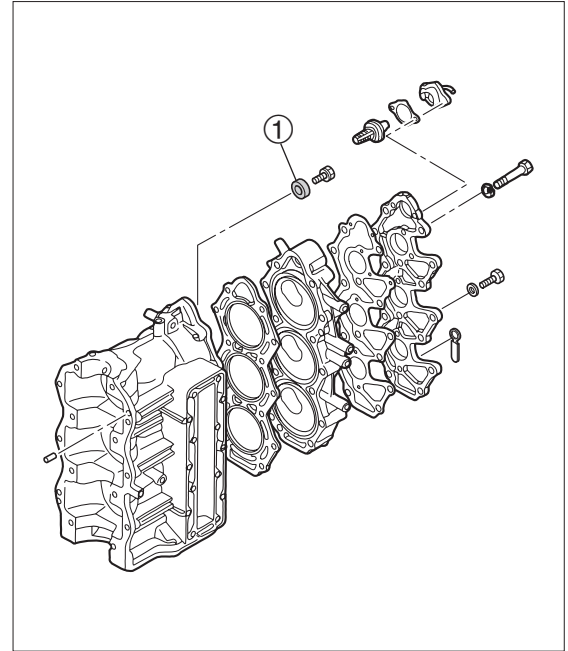


36) Installation of Cylinder Head

1. Attach anode ① to cylinder.
2. Attach dowel pins to cylinder head, and then attach gaskets and cylinder head cover.
Temporary tighten cylinder cover securing bolts (M6) in the order of the numbers shown.

**Temporary Tightening :**

2.5 N · m (1.8 lb · ft) [0.25 kgf · m]



3. Attach cylinder head with head cover and cylinder head gasket to cylinder.
Tighten cylinder head securing bolts ① to ⑭ (M8) in the order of the numbers shown.

**Temporary Tightening :**

13 N · m (9 lb · ft) [1.3 kgf · m]

Final Tightening :

32 N · m (23 lb · ft) [3.2 kgf · m]



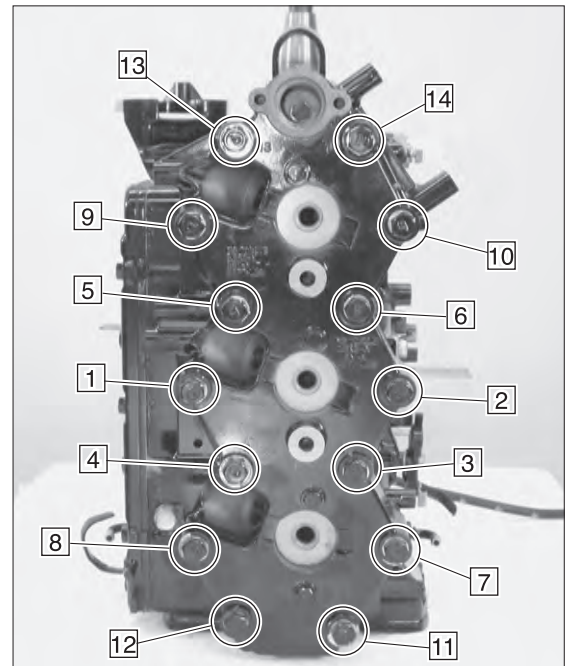
Tighten cylinder head securing bolts in two steps to specified torque.

4. Finally tighten cylinder head cover securing bolts (M6).

**Final Tightening :**

6 N · m (4 lb · ft) [0.6 kgf · m]

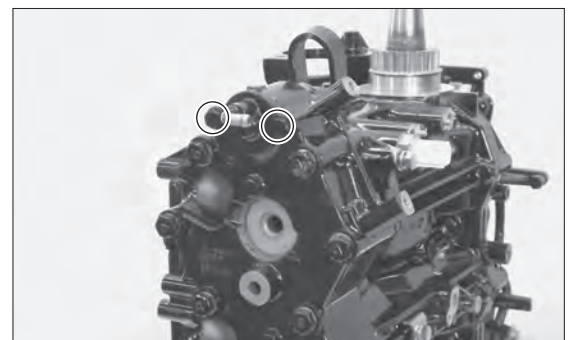
5. Attach air injectors and air rail to cylinder head.
Refer to "Assembly of Air Rail" in Chapter 4.



6. Install thermostat, thermostat cap and gasket.

**Thermostat Cap Bolt :**

6 N · m (4 lb · ft) [0.6 kgf · m]



37) Installation of Drive Pulley

1. Clean and remove grease at installation surface (inside) of crankshaft and drive pulley.



- Apply Loctite 7471 (primer) to crankshaft after cleaning, and dry approximate 5 minutes.
- Apply Loctite 648 to installation surface (inside) of drive pulley.



7471



648

2. Install key (drive pulley) ①, then set drive pulley ② using drive pulley press ③.



Drive Pulley Press ③ :

P/N. 3T5-72868-0



- Align key slot.
- Press fit drive pulley press ② using plastic hammer to lightly hitting the top of pulley press.

3. Remove drive pulley press ③, then set belt guide ④ and pulley nut ⑤, and tighten nut ⑧ after install crankshaft holder ⑦ to crankshaft ⑥.



Crankshaft Holder ⑦ :

P/N. 3T5-72815-0



- Insert projection of belt guide to the hole of pulley.
- Apply Bond 1342 to thread part of crankshaft. (pulley nut)
- Tighten magnet nut ⑧ lightly and hold crankshaft holder ⑦ after install it.

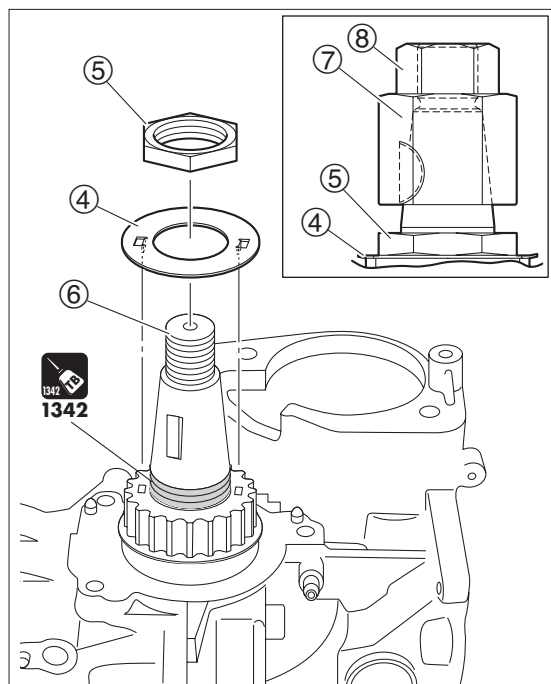
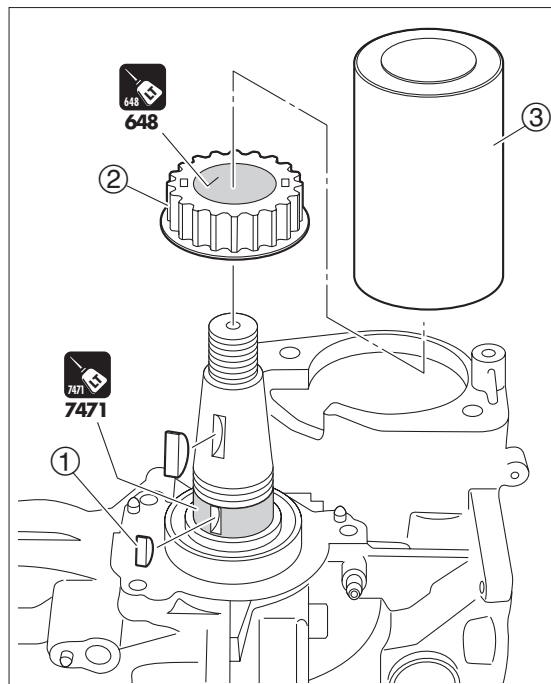


1342



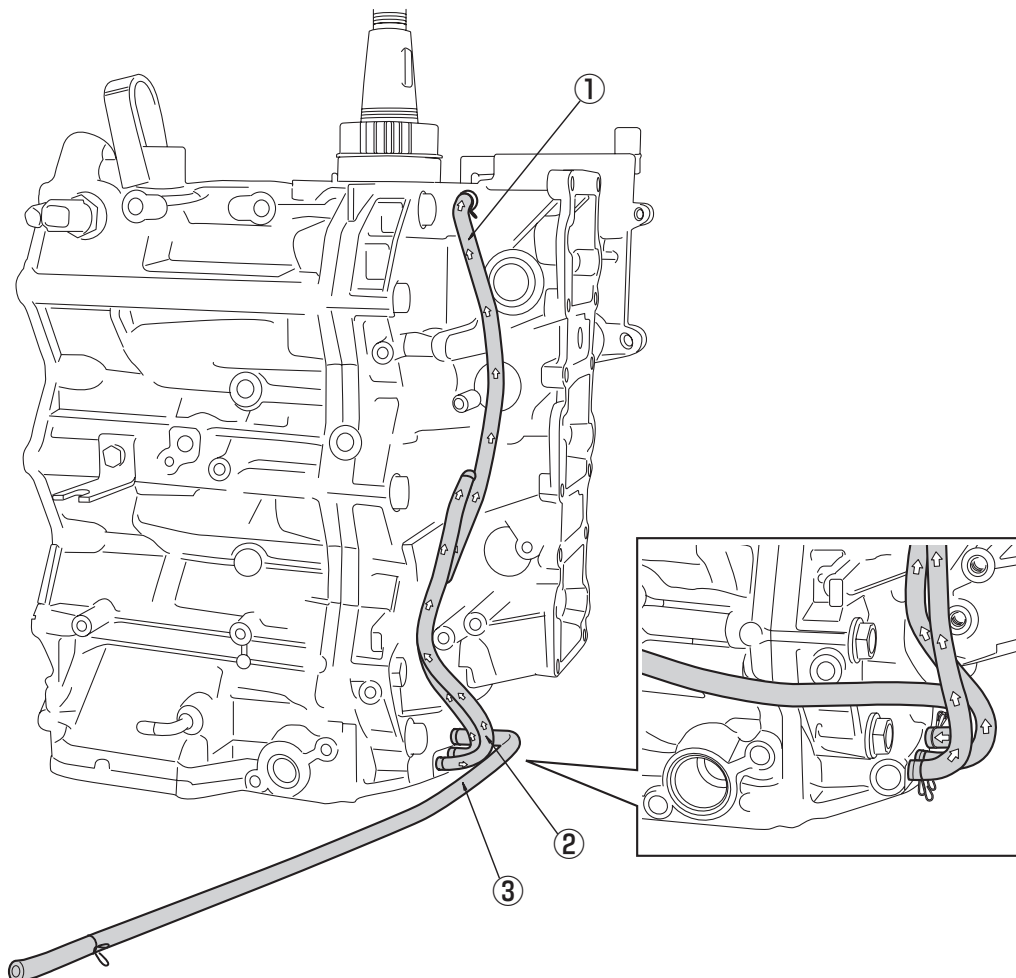
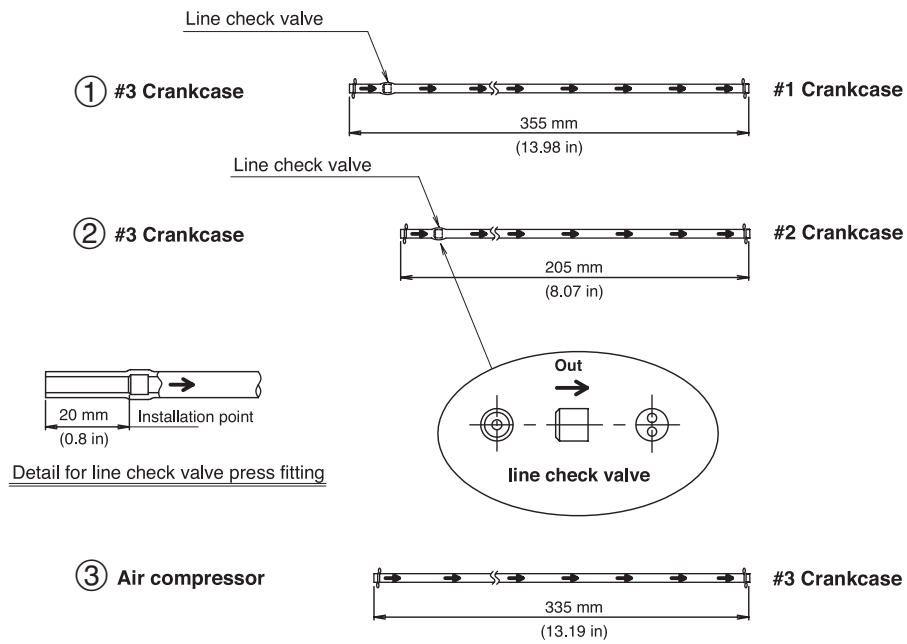
Pulley Nut ⑤ :

100 N · m (74 lb · ft) [10 kgf · m]





38) Installation of Recirculation Hoses



39) Installation of Air Chamber

1. Attach reed valve, air chamber and gaskets to crank case. Attach and tighten securing bolts (M6) ① to ⑫ (M6) to specified torque in the order of the numbers shown.



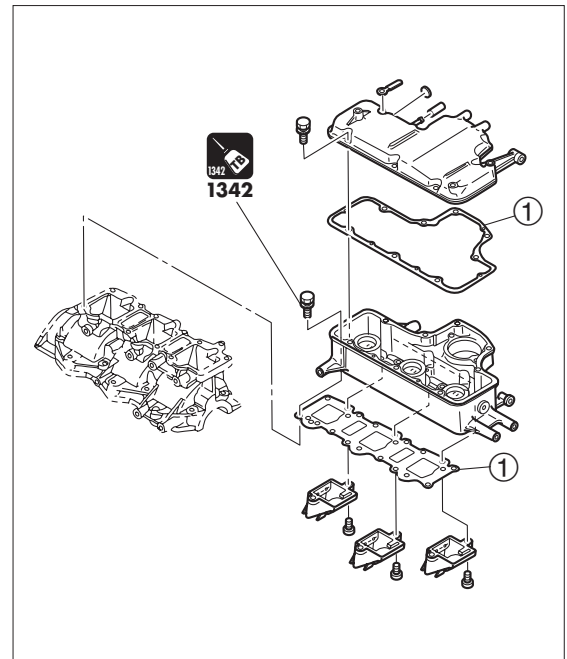
- Use new gaskets.
- When reusing bolts, apply screw lock #1342.



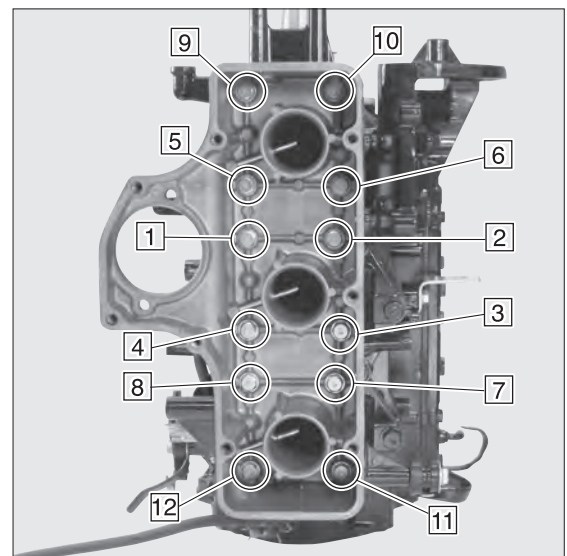
Air Chamber Bolts (M6) ① – ⑫ :
9 N · m (7 lb · ft) [0.9 kgf · m]



1342



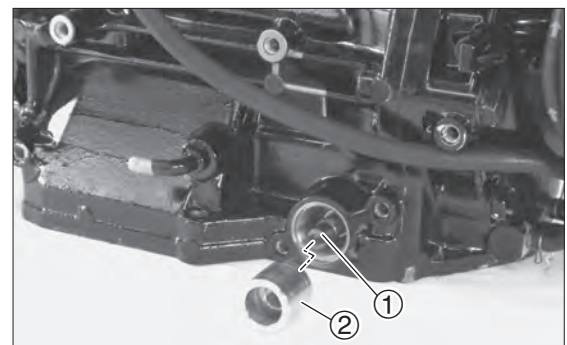
① Gasket **Do not reuse.**



5

40) Installation of Oil Pump

1. Install oil pump driven gear ① and bushing ② to cylinder ass'y.





Power Unit

2. Install new O-ring to oil pump ass'y, then cylinder ass'y.

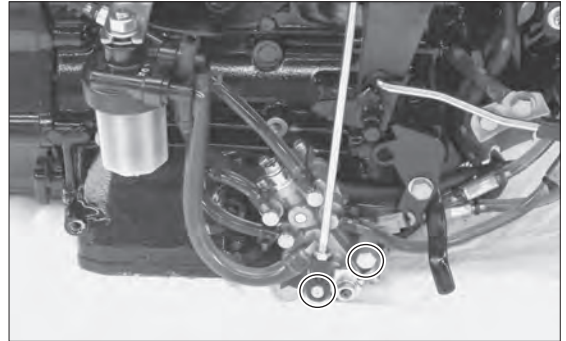
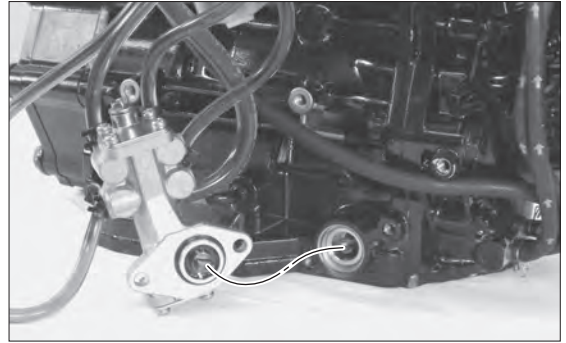


- Align slot of oil pump drive gear and drive shaft.
- Reconnect oil hose to crankcase. "Refer to Oil System diagram" in Chapter 4.
- Use waste cloth to let it soak with oil if spilled from hose.



Oil pump bolts :

6 N · m (4 lb · ft) [0.6 kgf · m]



41) Installation of Throttle Body

1. Install throttle body, then tighten bolts (M6) to specified torque.



When reusing bolts, apply screw lock #1342.

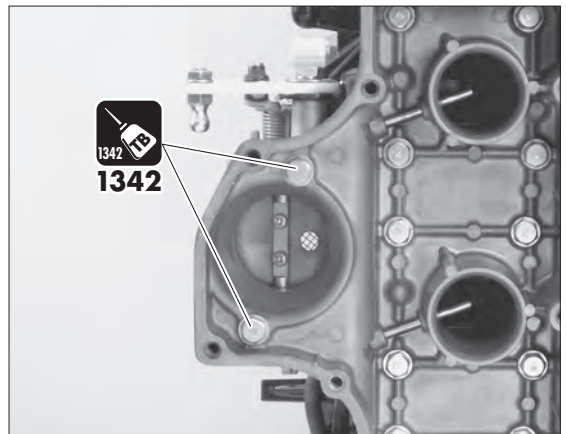


Throttle Body Bolts (M6) :

9 N · m (7 lb · ft) [0.9 kgf · m]

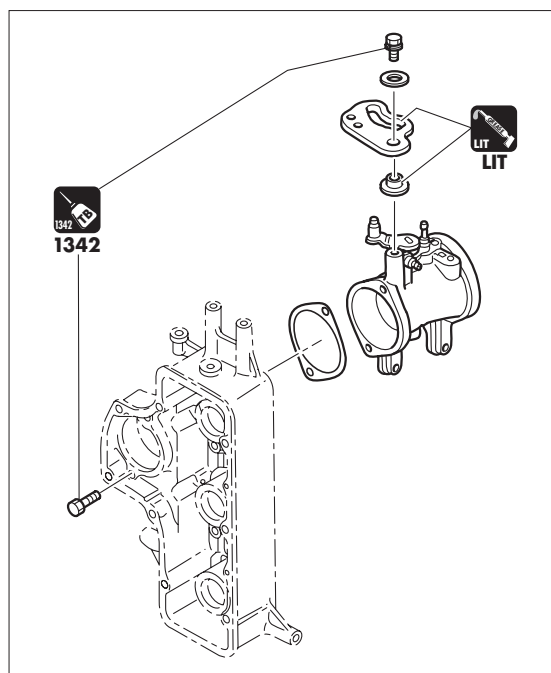


1342





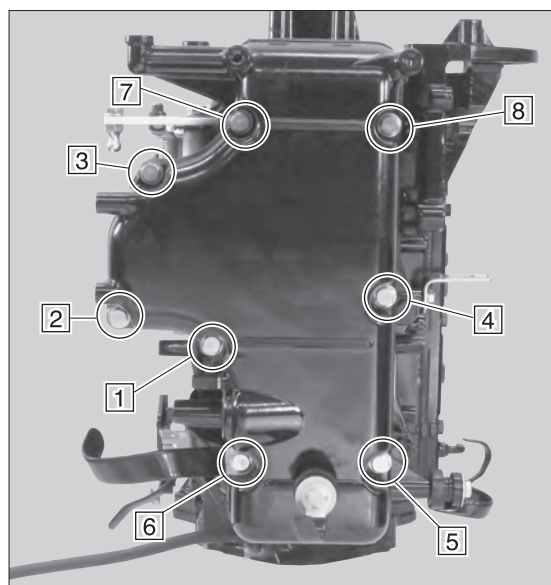
- Apply LIT grease to sliding faces of throttle cam and roller.
- Apply ThreeBond 1342 to throttle body securing bolts.



2. Attach air chamber cover and gasket. Attach and tighten air chamber securing bolts (M6) 1 to 8 to specified torque in the order of the numbers shown.

**Air Chamber Cover Bolts :**

6 N · m (4 lb · ft) [0.6 kgf · m]

**5**

42) Installation of Throttle Link

Reverse throttle link removing procedure described in “Removing Throttle Link” in Chapter 5.

43) Installation of Fuel System

Refer to “Removing and Installation of Fuel System” in Chapter 4.

44) Installation of Air Compressor

Refer to “Removing and Installation of Air Compressor” in Chapter 4.

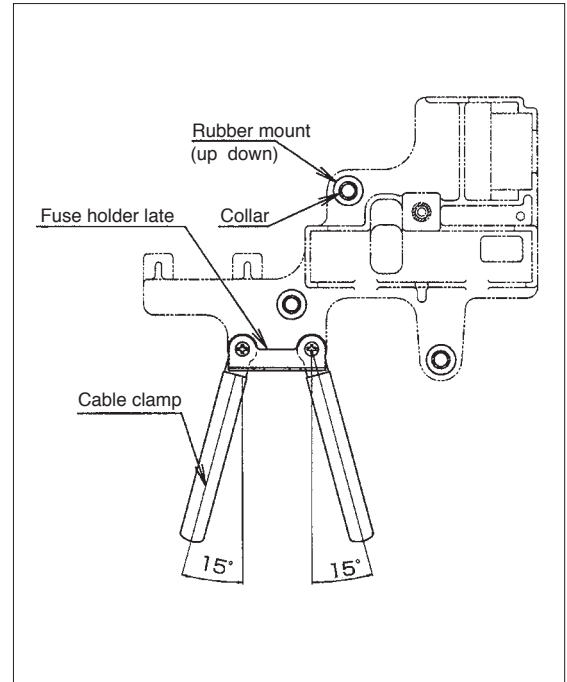


45) Installing Solenoid Bracket

1. Install fuse holder plate, cord clamp and rubber mount.



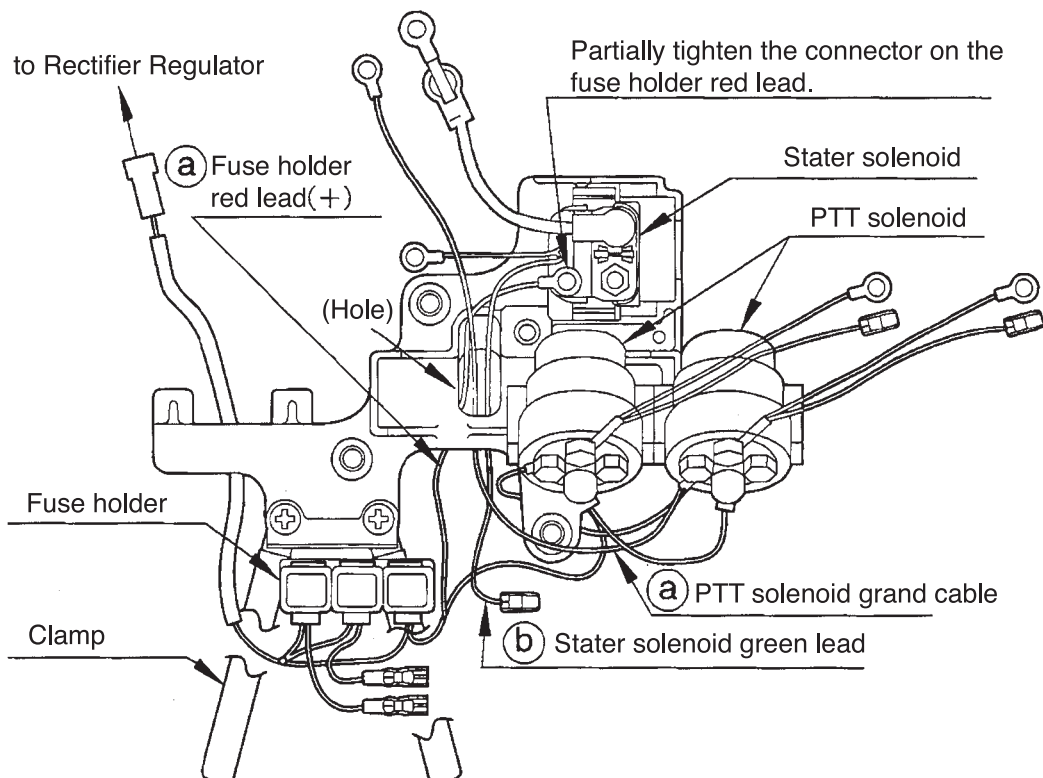
Set cord clamp angle to 15 degree.



2. Install starter solenoid, PTT solenoid and fuse holder to solenoid bracket.



- Pass the Red wire (fuse holder +), Ground wire (PTT solenoid -) and Green wire into the center hole of solenoid bracket.
- Refer to "Electric Circuit"



46) Installation of Cord Ass'y and Electrical Parts

Reverse cord ass'y removing procedure described in "Removing Cord Ass'y" in Chapter 5.

47) Installation of Starter Motor

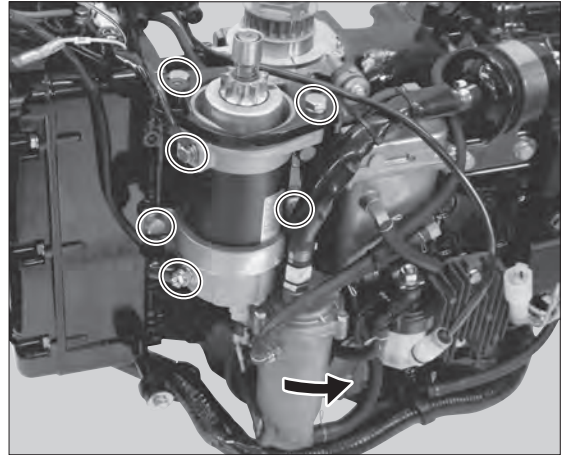
1. Secure starter motor mounting band by using bolts (M8, 4 pcs.) on the upper surface of the motor, and then, install starter motor to bracket.



Connect grounding cord to air chamber.



- Install ground wire to starter motor.
- Move FFP to allow direction, then tighten M8 bolts.



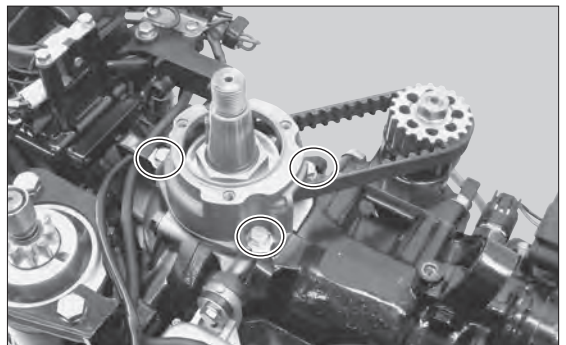
48) Installation of Alternator

1. Tighten coil bracket securing bolts to specified torque.



Coil Bracket Bolts :

6 N · m (4 lb · ft) [0.6 kgf · m]

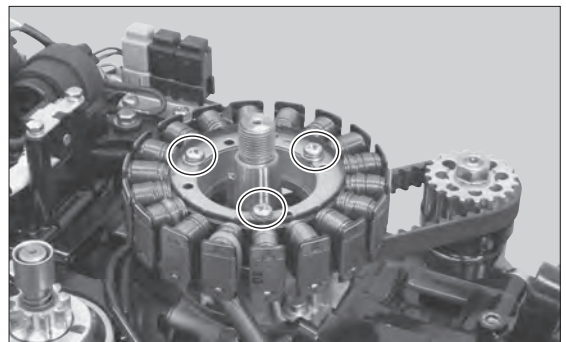


2. tighten alternator securing bolts to specified torque.



Alternator Securing Bolts :

6 N · m (4 lb · ft) [0.6 kgf · m]



49) Installing Oil Tank

Refer to "Removing Oil Tank In chapter 5", then install reverse procedure.



Power Unit

50) Installation of Flywheel

1. Attach key, flywheel and drive pulley to crank shaft, and tighten the nut to specified torque.



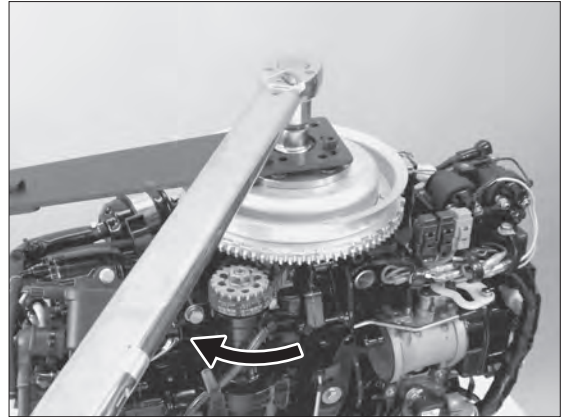
Flywheel Puller Kit :
P/N. 3T1-72211-0



Drive Pulley :
150 N · m (118 lb · ft) [15 kgf · m]



Degrease tapered areas of crank shaft and flywheel before installing them.



51) Installation of Power Unit

1. Attach O ring ① coated with two stroke engine oil to crank case head ②.
2. Attach crank case head to cylinder ass'y taking care of the orientation.



Install crank case head so that the mark "A" is at front side (crank case side) of engine.



2st OIL

3. Clean mating faces of engine base and cylinder ass'y, and then, attach dowel pins ③ gasket.



Use new engine base gasket.

4. Install power unit securely, and tighten engine mount bolts ④ specified torque.



Engine Mount Bolts ④ :
20 N · m (14 lb · ft) [2.0 kgf · m]

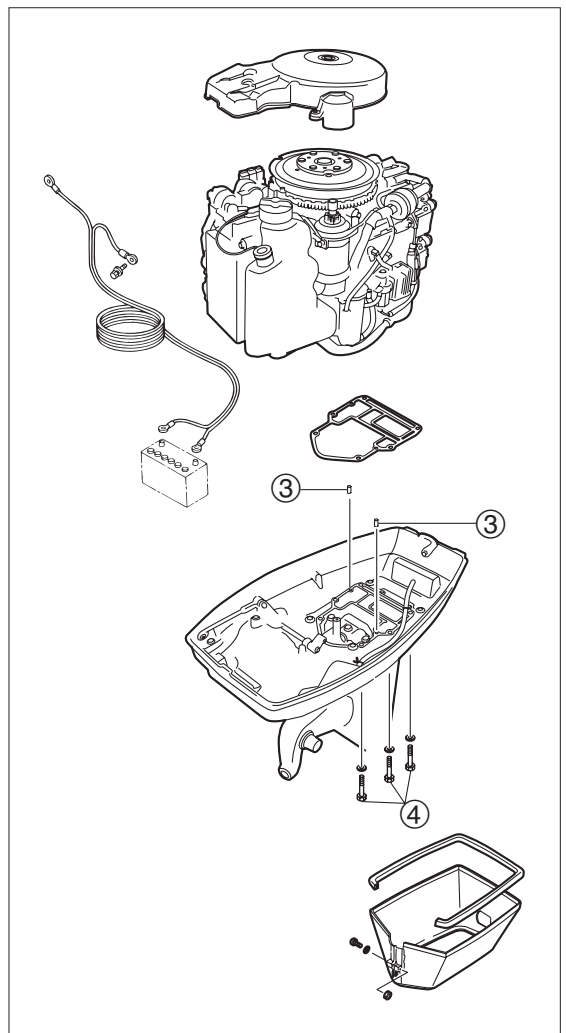
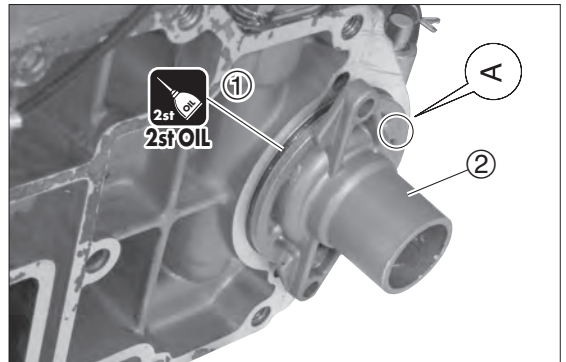


Be careful not to catch wires and hoses and other parts between engine base mating surfaces.

5. Install other parts reverse of their removing steps.



Refer to "Electrical Wiring Assembling Instruction Diagrams" in Chapter 11.



6

Lower Unit

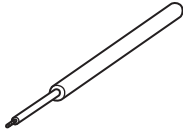
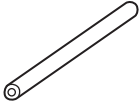
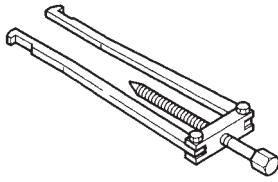
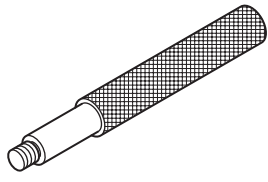
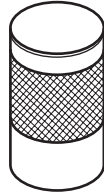
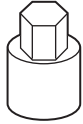
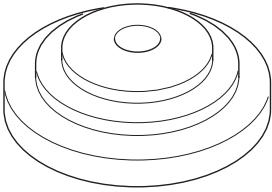
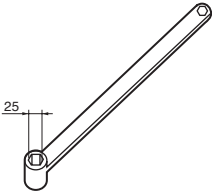
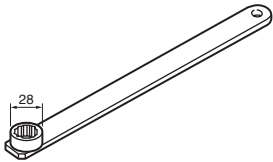
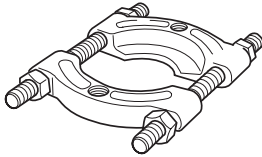
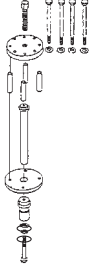
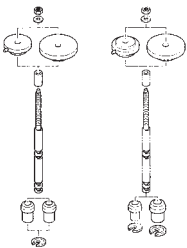
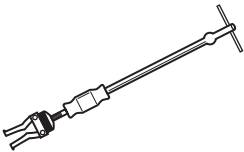
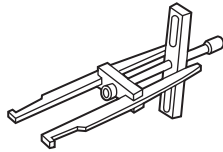
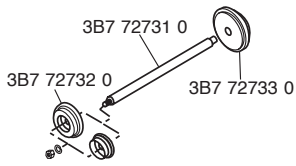


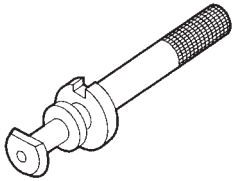
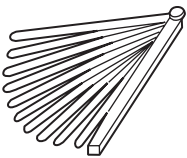
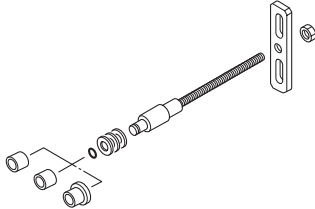
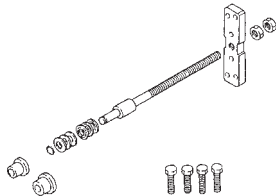
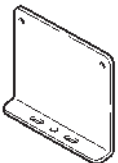
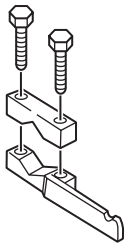
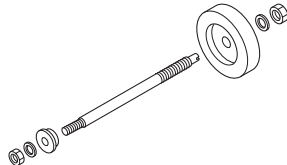
1. Special tools	6-2	21) Inspection of Drive Shaft	6-28
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Lower Unit

1. Special tools

			
Spring Pin Tool A P/N. 345-72227-0 (ø3.0) P/N. 369-72217-0 (ø3.5)	Spring Pin Tool B P/N. 345-72228-0 (ø3.0) P/N. 369-72218-0 (ø3.5)	Propeller Shaft Housing Puller Ass'y P/N. 3A3-72259-0	Driver Rod P/N. 3AC-99702-0
Removing spring pin	Installing spring pin	Removing propeller shaft housing	Used in combination with center plate and various attachments
ø100 x ø79.5 x ø51.5 x ø61.5	ø31.5 x ø25 x H32		
	Roller Bearing Attachment D30/40/50:P/N. 3MC-99710-0 WD50:P/N. 3LC-99710-0	Bevel Gear Bearing Install Tool P/N. 3C8-72719-0	Bevel Gear Nut Socket P/N. 346-72232-0
Center Plate P/N. 3AC-99701-0	Used in combination with driver rod and center plate Attaching propeller shaft housing needle bearing	Installing forward (A) gear bearing	Removing or attaching pinion (B) gear nut
			
Bevel Gear B Nut Wrench D30/40/50:P/N. 346-72231-0	Bevel Gear B Nut Wrench WD50:P/N. 353-72231-0	Universal Puller Plate P/N. 3AC-99750-0	Roller Bearing Press Kit P/N. 3LC-72900-0
Removing or attaching pinion (B) gear nut	Removing or attaching pinion (B) gear nut	Removing reverse (C) gear bearing	Removing or attaching gear case needle bearing
			
Roller Bearing Puller Kit D30/40/50:P/N. 3C8-72700-0 WD50:P/N. 3B7-72700-0	Slide Hammer Ass'y P/N. 3AC-99080-0	Bevel Gear Bearing Puller Ass'y D30/40/50:P/N. 3A3-72755-0 WD50:P/N. 3B7-72755-0	Bearing Outer Press Kit P/N. 3B7-72739-1
Removing or attaching gear case and propeller shaft housing needle bearing	Removing forward (A) gear bearing outer race	Removing forward (A) gear bearing outer race	Attaching forward (A) gear bearing outer race

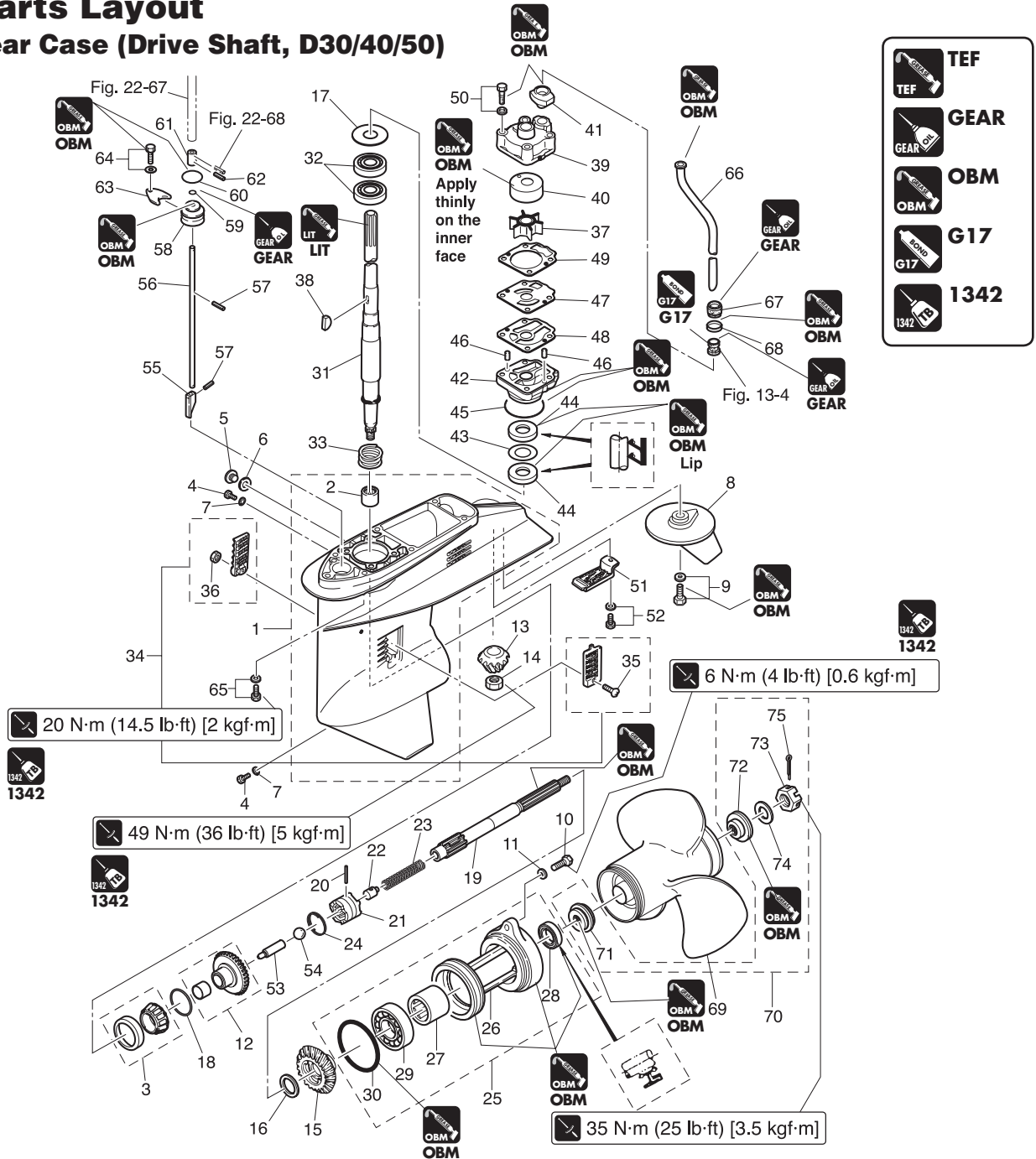
			
Shimming Gauge D30/40/50:P/N. 3C8-72250-0 WD50:P/N. 353-72250-0	Thickness Gauge P/N. 353-72251-0	Backlash Measuring Tool Kit D30/40/50:P/N. 3C8-72234-1	Backlash Measuring Tool Kit WD50:P/N. 3B7-72234-0
Adjusting pinion (B) gear height	Measuring gaps	Used to attach dial gauge when measuring backlash	Measuring backlash between forward (A) gear and pinion (B) gear
			
Dial Gauge Plate P/N. 3B7-72729-0	Backlash Measuring Tool Clamp P/N. 3B7-72720-0	Backlash Measuring Tool Kit WD50:P/N. 3A3-72255-0	
Used to attach dial gauge when measuring backlash	Measuring backlash	Measuring backlash between pinion (B) gear and reverse (C) gear	



Lower Unit

2. Parts Layout

Gear Case (Drive Shaft, D30/40/50)

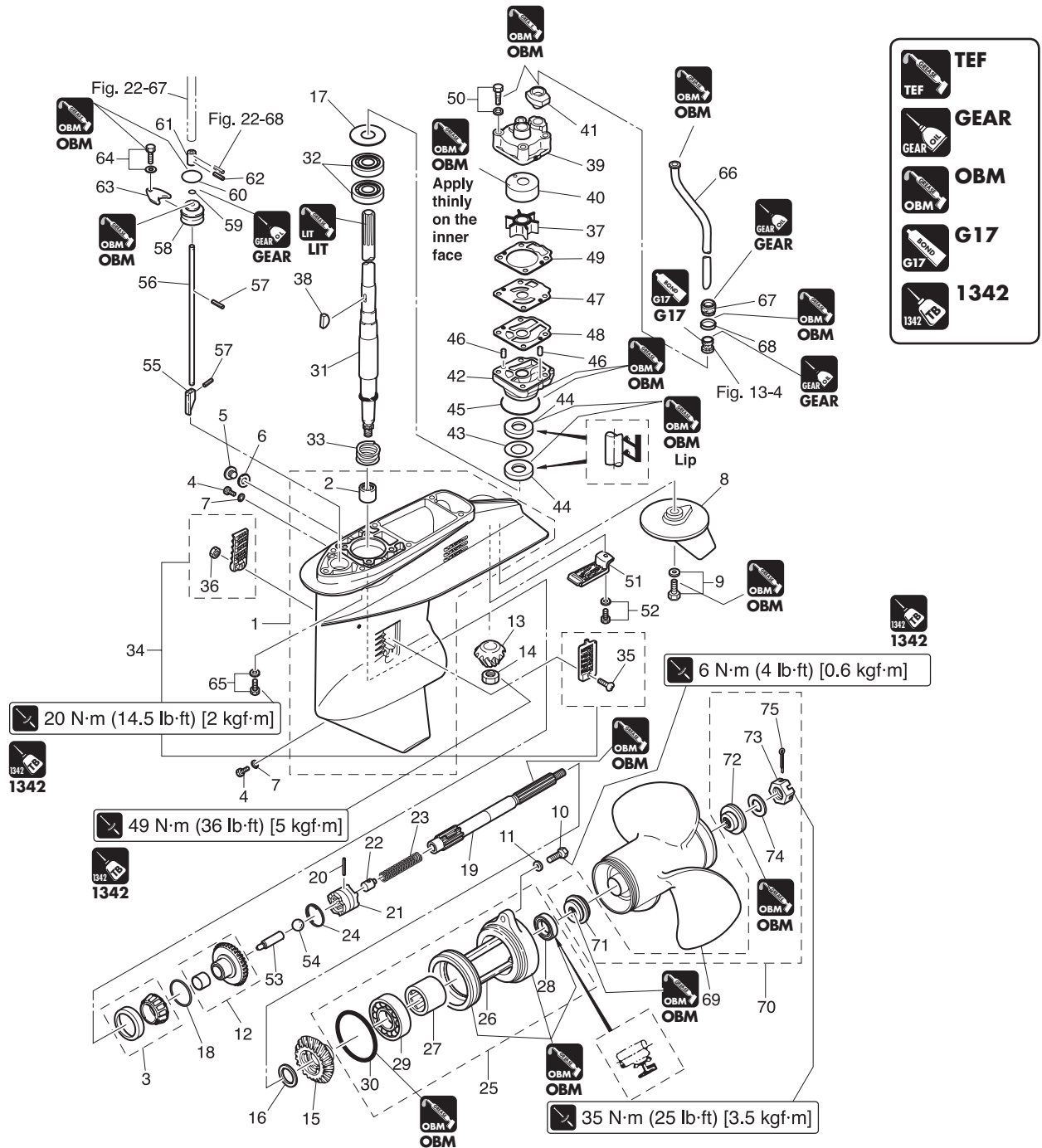


Re No	Description	Q'ty	Remarks
1-1	Gear Case Ass'y	1	for Transom "S", "L"
1-2	Gear Case Ass'y	1	for Transom "UL" with Sub Water Pipe
2	Roller Bearing 22-30-30	1	Do not reuse.
3	Tapered Roller Bearing 32007	1	Do not reuse.
4	Plug	2	
5	Plug	1	
6	Gasket 10.1-15-1	1	Do not reuse.
7	Gasket 8.1-15-1	2	Do not reuse.
8	Trim Tab	1	
9	Bolt	1	M6 L=20mm
10	Pre-Coated Bolt 6-25	2	
11	Washer	2	M6
12	Bevel Gear Ass'y (A)	1	
13	Bevel Gear B	1	

Re No	Description	Q'ty	Remarks
14	Nut	1	
15	Bevel Gear C	1	
16	Washer 22.1-28-3	1	
17-1	Shim 41-51.5-0.1	A	Selection if necessary
17-2	Shim 41-51.5-0.15	A	
17-3	Shim 41-51.5-0.3	A	
17-4	Shim 41-51.5-0.5	A	
18-1	Shim 36-44-0.3	A	
18-2	Shim 36-44-0.15	A	
18-3	Shim 36-44-0.1	A	
19	Propeller Shaft	1	
20	Pin	1	
21	Clutch	1	
22	Spring Retainer	1	
23	Spring	1	



Lower Unit



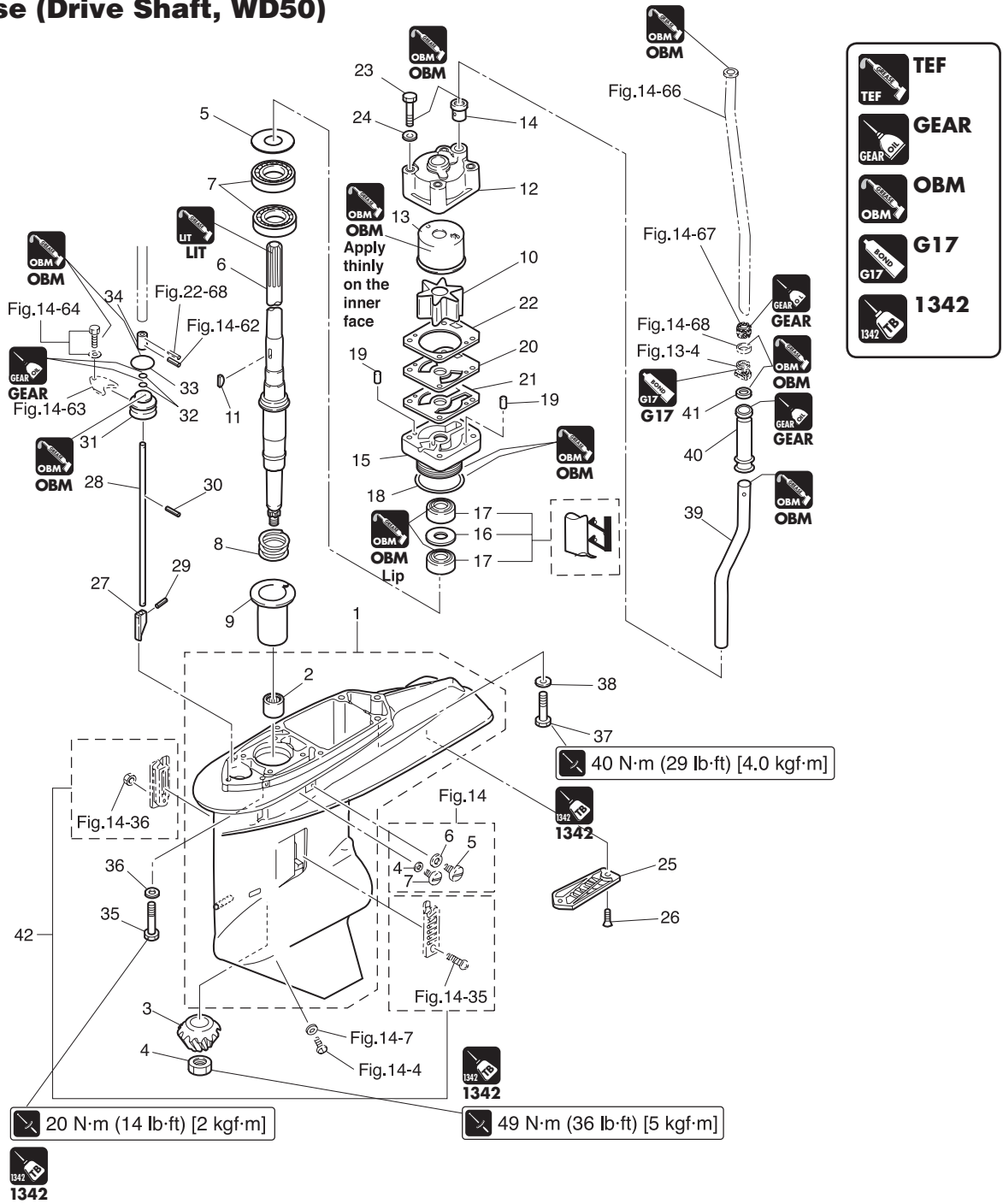
Re No	Description	Q'ty	Remarks
52	Bolt	1	M6 L=16mm
53	Push Rod	1	
54	Ball 3/8	1	
55	Clutch Cam	1	
56-1	Cam Rod (S)	1	for Transom "S"
56-2	Cam Rod (L)	1	for Transom "L"
56-3	Cam Rod (UL)	1	for Transom "UL"
57	Spring Pin 3-12	2	Do not reuse.
58	Cam Rod Bushing	1	
59	O-Ring 2.4-5.8	1	Do not reuse.
60	O-Ring 3.5-21.7	1	Do not reuse.
61	Shift Rod Joint	1	
62	Spring Pin 3-12	1	Do not reuse.
63	Stopper	1	
64	Bolt	1	M6 L=12mm

Re No	Description	Q'ty	Remarks
65	Bolt	6	M8 L=35mm
66-1	Water Pipe (S)	1	D30/40/50B2 for Transom "S", WD50D2 for Transom "L"
66-2	Water Pipe (L)	1	D30/40/50B2 for Transom "L"
66-3	Water Pipe (UL)	1	D30/40/50B2 for Transom "UL"
67	Water Pipe Seal (Upper)	1	
68	Collar 18-20-4.5	1	
69-1	Propeller Ass'y (7")	1	4 X 290 X 180
69-2	Propeller Ass'y (9")	1	3 X 307 X 229
69-3	Propeller Ass'y (11")	1	3 X 295 X 279
69-4	Propeller Ass'y (12")	1	3 X 290 X 305
69-5	Propeller Ass'y (13")	1	3 X 282 X 330
69-6	Propeller Ass'y (14")	1	3 X 282 X 356
69-7	Propeller Ass'y (15")	1	3 X 278 X 381
70	Propeller Hardware Kit	1	D30/40/50B2



Lower Unit

Gear Case (Drive Shaft, WD50)



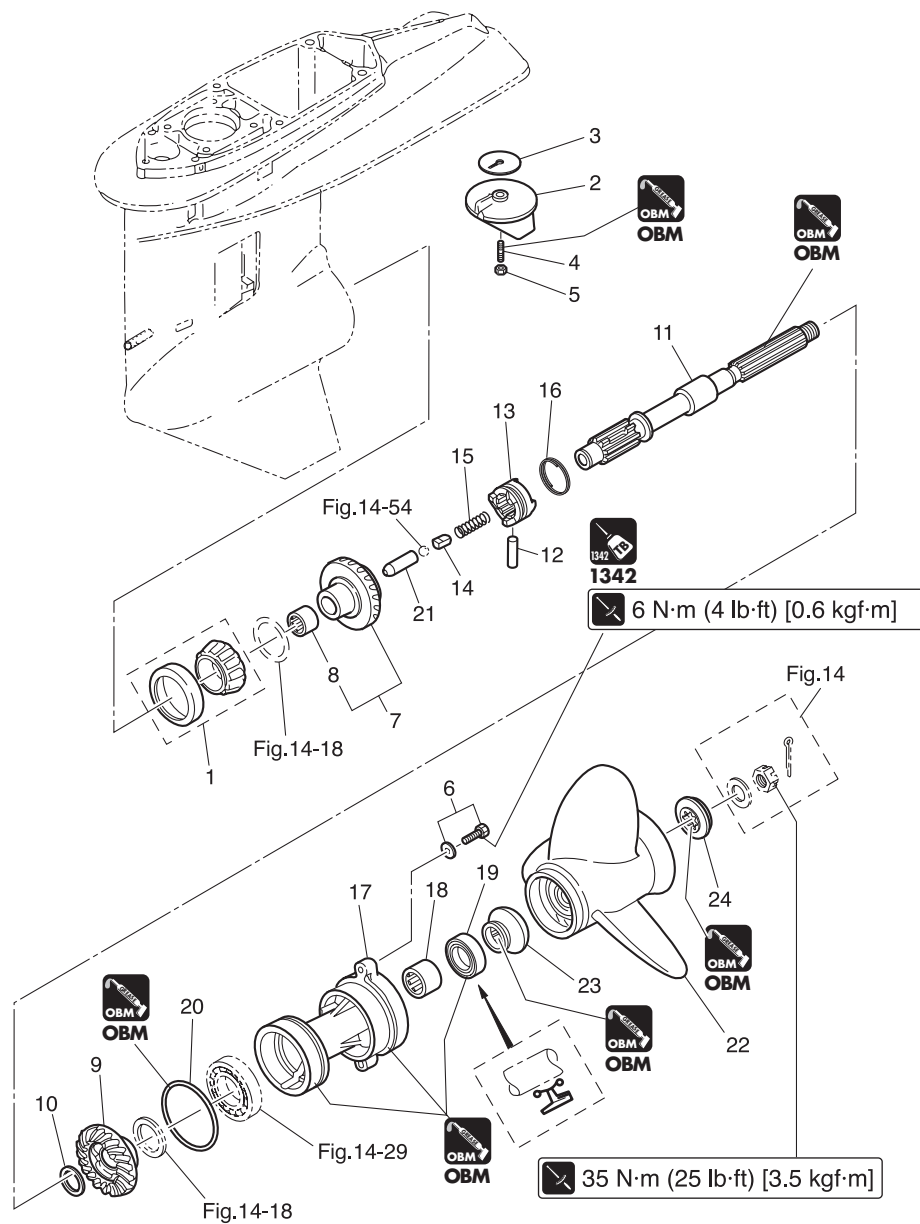
Re No	Description	Q'ty	Remarks
1	Gear Case Ass'y	1	with Sub Water Pipe
2	Roller Bearing 25-33-30	1	Do not reuse.
3	Bevel Gear B	1	
4	Nut (Bevel Gear B)	1	
5	Shim 44-50.5-0.1	A	Selection if necessary
5	Shim 44-50.5-0.15	A	
5	Shim 44-50.5-0.3	A	
6	Drive Shaft (L)	1	
7	Ball Bearing 6205R	2	Do not reuse.
8	Drive Shaft Spring	1	
9	Drive Shaft Spring Guide	1	
10	Water Pump Impeller	1	
11	Key	1	
12	Pump Case Sub-Ass'y (Upper)	1	
13	Pump Case Liner	1	

Re No	Description	Q'ty	Remarks
14	Water Pipe Seal (Lower)	1	
15	Pump Case (Lower)	1	
16	Shim 36.9-30-0.5	1	
17	Oil Seal 22-37-8	2	Do not reuse.
18	O-Ring 3.2-47	1	Do not reuse.
19	Dowel Pin 4-10	2	
20	Water Pump Guide Plate	1	
21	Guide Plate Gasket	1	Do not reuse.
22	Pump Case Gasket	1	Do not reuse.
23	Bolt 8-80	4	M8 L=80mm
24	Washer	4	M8
25	Sub-Water Inlet Strainer	1	
26	Screw	2	M6 L=8mm
27	Clutch Cam	1	
28	Cam Rod (L)	1	



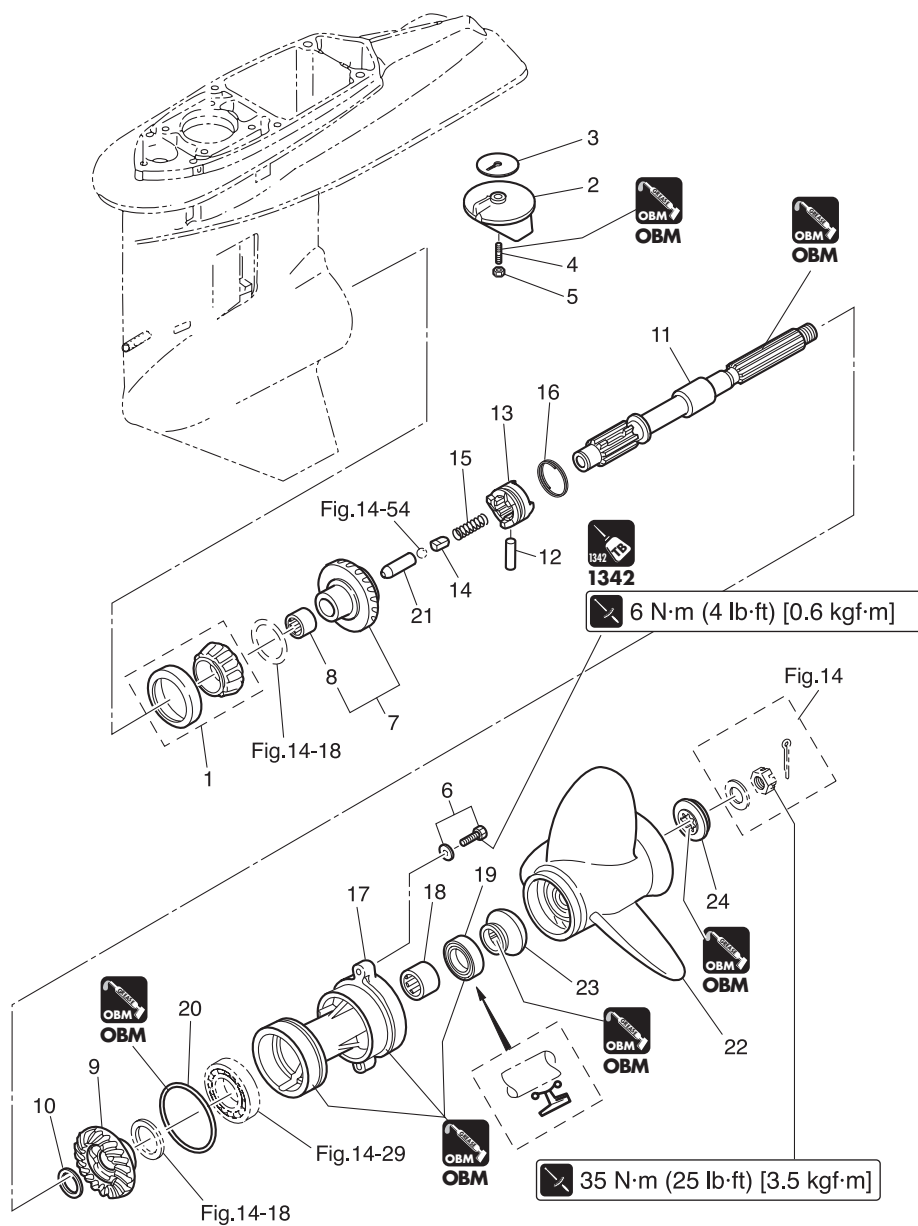
Lower Unit

Gear Case (Propeller Shaft, WD50)



Re No	Description	Q'ty	Remarks
1	Tapered Roller Bearing 32007JR	1	Do not reuse.
2	Trim Tab	1	
3	Trim Tab Gasket	1	Do not reuse.
4	Stud	1	M8 L=25
5	Nylon Nut 8-P1.25	1	M8
6	Pre-Coated Bolt 8-30	2	
7	Bevel Gear Ass'y (A)	1	
8	Roller Bearing 202720	1	Do not reuse.
9	Bevel Gear C	1	
10-1	Washer t=3.0	A	
10-2	Washer t=2.75	A	
10-3	Washer t=2.5	A	
11	Propeller Shaft	1	
12	Pin	1	
13	Clutch	1	

Re No	Description	Q'ty	Remarks
14	Spring Retainer	1	
15	Spring	1	
16	Snap	1	
17	Propeller Shaft Housing	1	
18	Roller Bearing 25-33-30	1	Do not reuse.
19	Oil Seal 25-38-10	1	Do not reuse.
20	O-Ring 3.5-74.6	1	Do not reuse.
21	Push Rod	1	
22-1	Propeller Ass'y 9"	1	3 X 305 X 229
22-2	Propeller Ass'y 10"	1	3 X 292 X 254
22-3	Propeller Ass'y 11"	1	3 X 292 X 279
22-4	Propeller Ass'y 12"	1	3 X 292 X 305
22-5	Propeller Ass'y 13"	1	3 X 292 X 330
22-6	Propeller Ass'y 14"	1	3 X 289 X 355
22-7	Propeller Ass'y 15"	1	3 X 280 X 381



Re No	Description	Q'ty	Remarks
22-8	Propeller Ass'y 16.5"	1	3 X 273 X 417
22-9	Propeller Ass'y 17.5"	1	3 X 276 X 447
23	Thrust Holder	1	
24	Stopper	1	



Lower Unit

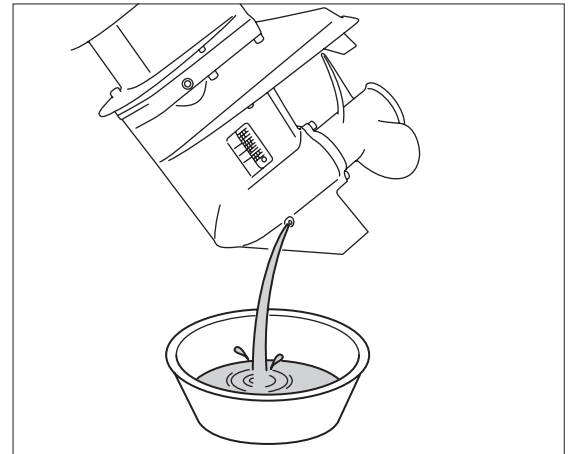
3. Inspection Items

1) Draining Gear Oil

1. Drain gear oil. Refer to "Replacement of Gear Oil" in Chapter 3.



- Drain all gear oil, and check if any metal particle is found in the drained oil.
- Check gear oil color. White or cream color possibly indicates that water is contained in the gear oil.
- Note the above matters and use them as a reference if disassemble is required.

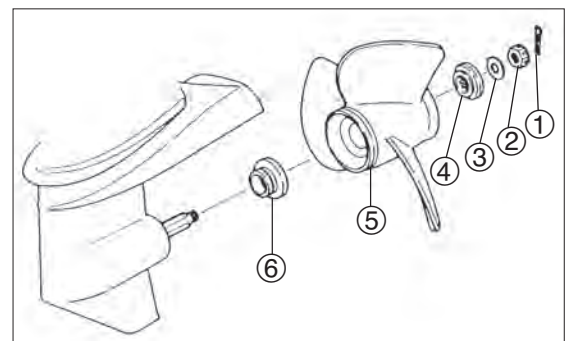
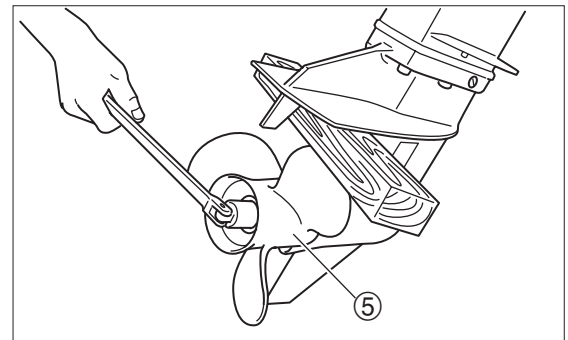


2) Removing Propeller

⚠ WARNING

- Before removing or installing propeller, be sure to disconnect battery cables from battery and remove stop switch lock plate.
- When removing or installing propeller, do not handle propeller with bare hands.
- Put a piece of wooden block between anti-cavitation plate and propeller to prevent rotation of propeller when removing or installing propeller.

1. Shift gear into forward (F).
2. Put a piece of wood between anti-cavitation plate and propeller ⑤ to prevent the propeller ⑤ from accidental rotation. Pull out split pin ①, loosen propeller nut ②, and then, propeller ⑤.



- ① Split Pin
- ② Propeller Nut
- ③ Washer
- ④ Stopper
- ⑤ Propeller
- ⑥ Thrust Holder

3) Removing Lower Unit

⚠ WARNING

When working with outboard motor in tilt up position, be sure to lock with tilt stopper.



- Removal of lower unit does not require removal of power unit from outboard motor body.
- When removing lower unit from outboard motor, tilting the outboard motor makes the work easier.

1. Shift the gear into forward (F) to set shift rod to upper position.
2. Remove spring pin and disconnect shift rod.



- Disconnect shift rod at upper side of shift rod joint ①.
- Use spring pin tool A ② to remove spring pin.
- Do not reuse removed spring pin.
- To hold lower unit, keep spring pin tool inserted until the step of removal of lower unit.



Spring Pin Tool A ② (ø3.0) :
P/N. 345-72227-0

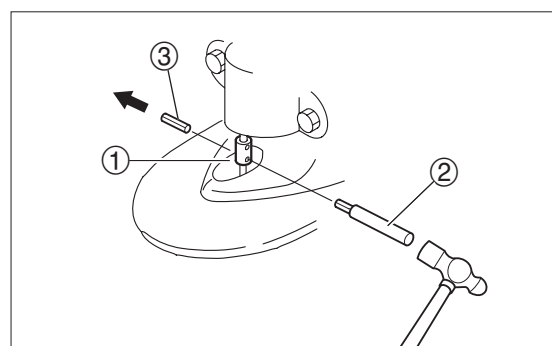
3. Remove lower unit installation bolts ④, and pull lower unit ass'y downward to remove.

⚠ CAUTION

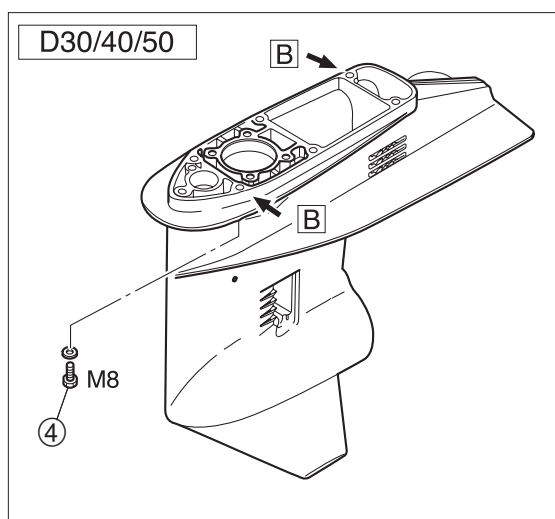
Hold lower unit while removing it to prevent it dropping on the floor.



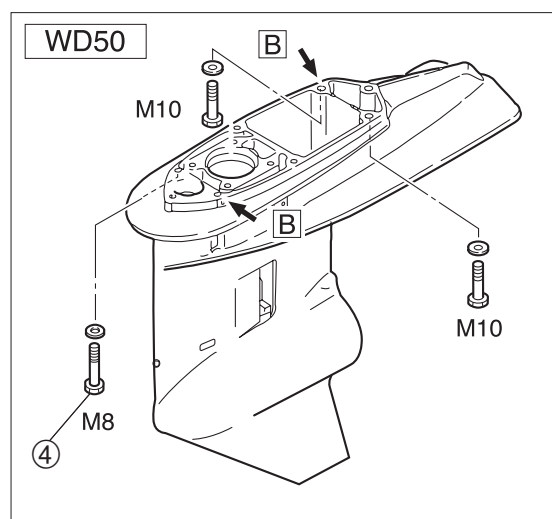
- Loosen all lower unit securing bolts except B (2 pcs.) in diagonal order, remove bolts B, and then, remove all other bolts.



③ Spring Pin **Do not reuse.**



④ D30/40/50 M8 6pcs



④ WD50 M8 4pcs M10 2pcs



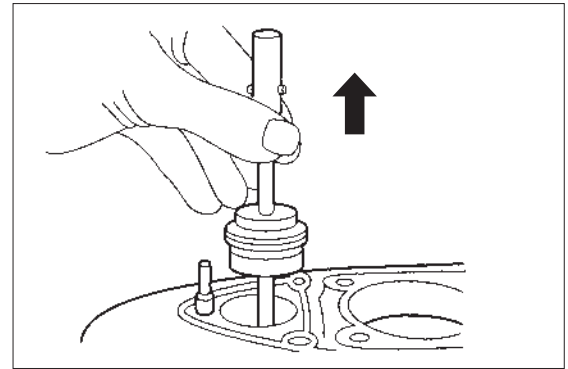
Lower Unit

4) Disassembly of Cam Rod

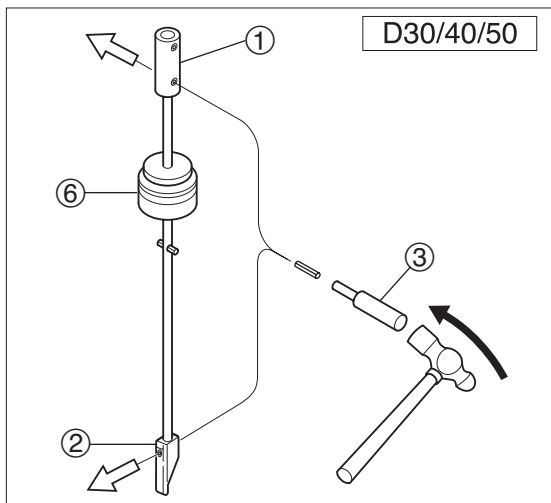
1. Remove stopper, pull out cam rod bushing, and take out cam rod from gear case.



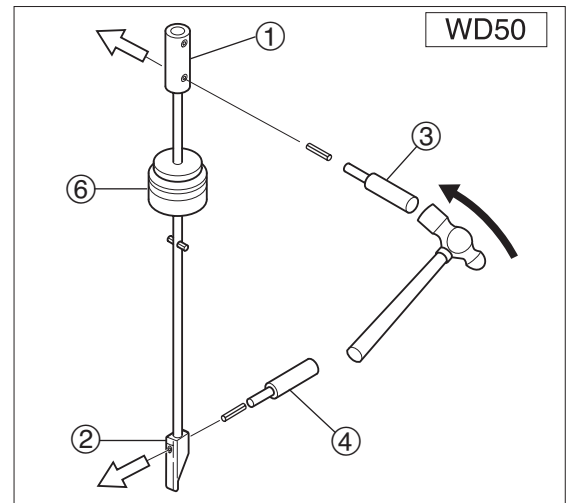
When removing cam rod bushing, put a bladed screw driver into groove of the bushing and pull out while lifting it.



2. Remove shift rod joint ① and clutch cam ②.

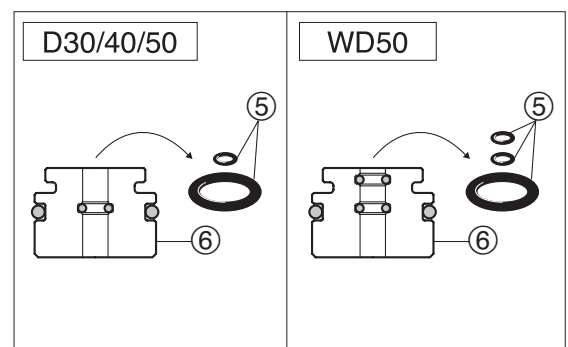


Spring Pin Tool A ③ (ø3.0) :
P/N. 345-72227-0



Spring Pin Tool A ③ (ø3.0) :
P/N. 345-72227-0
Spring Pin Tool A ④ (ø3.5) :
P/N. 369-72217-0

3. Remove O ring ⑤ from cam rod bushing ⑥.



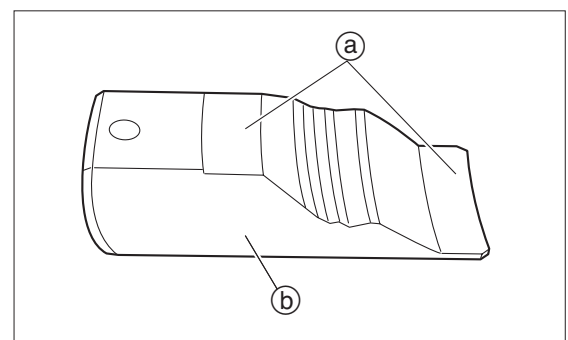
⑥ O Ring **Do not reuse.**

5) Inspection of Clutch Cam

1. Check the part for wear and damage.
Replace if necessary.



Check especially for wear on the face (a) that scrapes against push rod and flaws on the circumference (b).



6) Assembly of Clutch Cam Parts

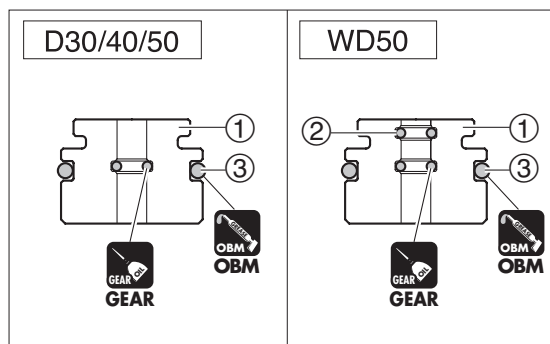
1. Attach O rings 1.9-6.8 ② and O ring 3.5-27.7 ③ to cam rod bushing ①.



OBM

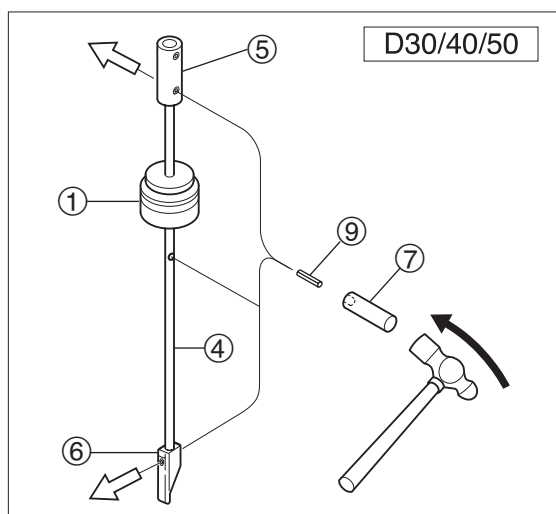


GEAR



②③ O Rings **Do not reuse.**

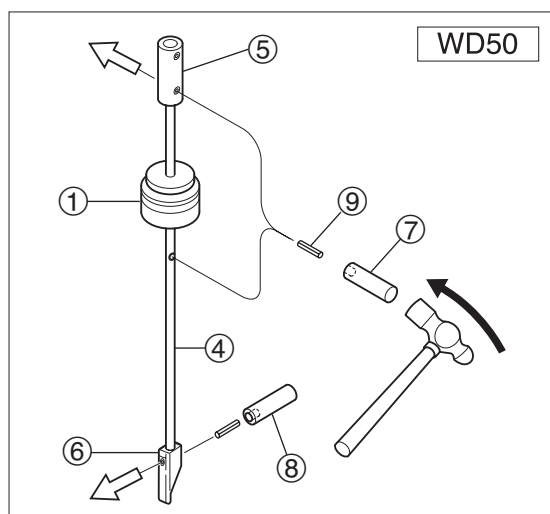
2. Attach cam rod bushing ①, shift rod joint ⑤ and clutch cam ⑥ to cam rod ④.



⑨ Spring Pin **Do not reuse.**



Spring Pin Tool B ⑦ (ø3.0) :
P/N. 345-72228-0



⑨ Spring Pin **Do not reuse.**



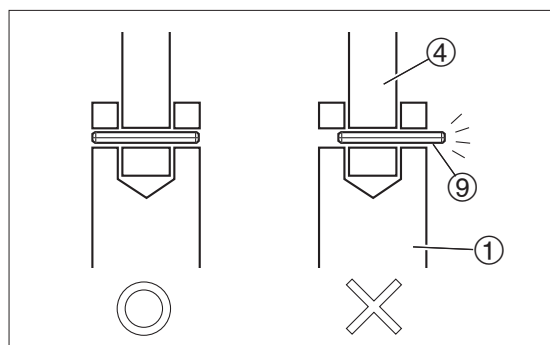
Spring Pin Tool B ⑦ (ø3.0) :
P/N. 345-72228-0

Spring Pin Tool B ⑧ (ø3.5) :
P/N. 369-72218-0

3. Drive spring pin ⑨.

⚠ CAUTION

Drive spring pin ⑨ so that it is flush with clutch cam surface as shown.

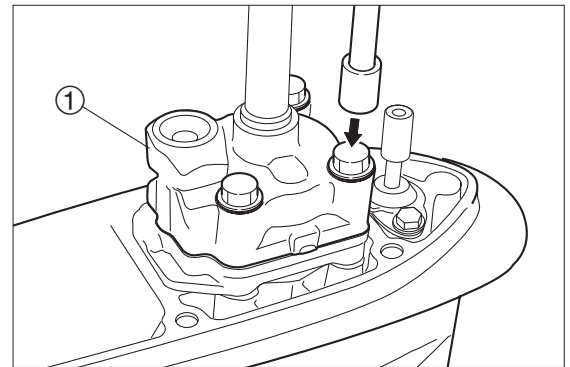
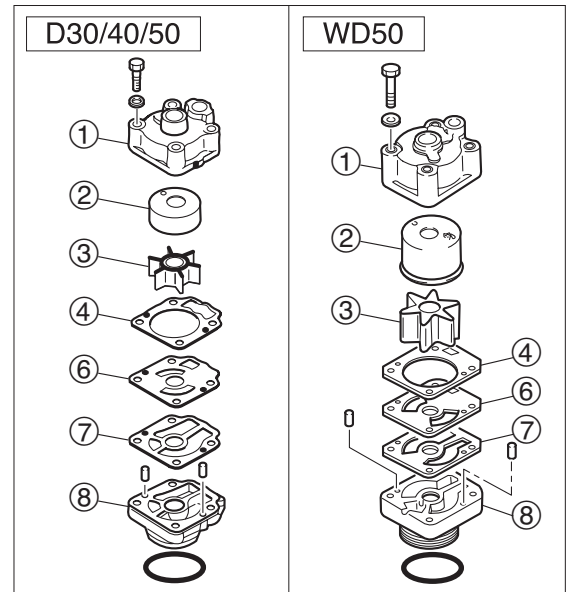




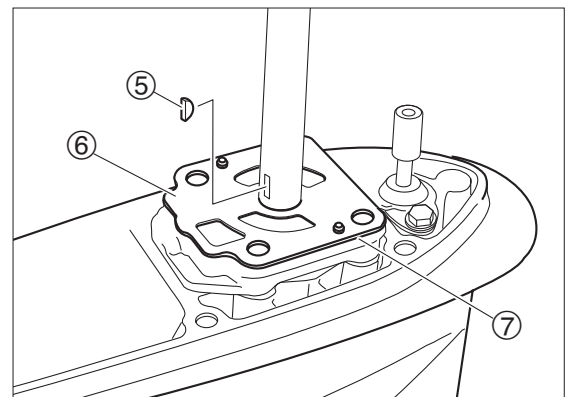
Lower Unit

7) Removing Water Pump

1. Loosen and remove pump case (upper) bolts, and remove pump case (upper) parts ①, ②, ③ and ④ in this order.



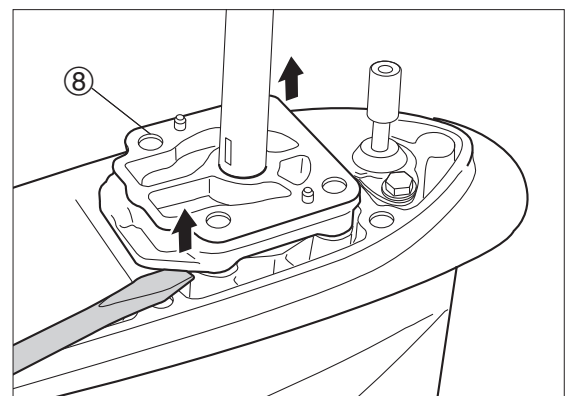
2. Remove water pump impeller key ⑤.



3. Remove guide plate ⑥, gasket ⑦ and pump case (lower) ⑧.



When removing pump case (lower), insert bladed screw driver into the groove of the case, and pry slowly to separate the part.



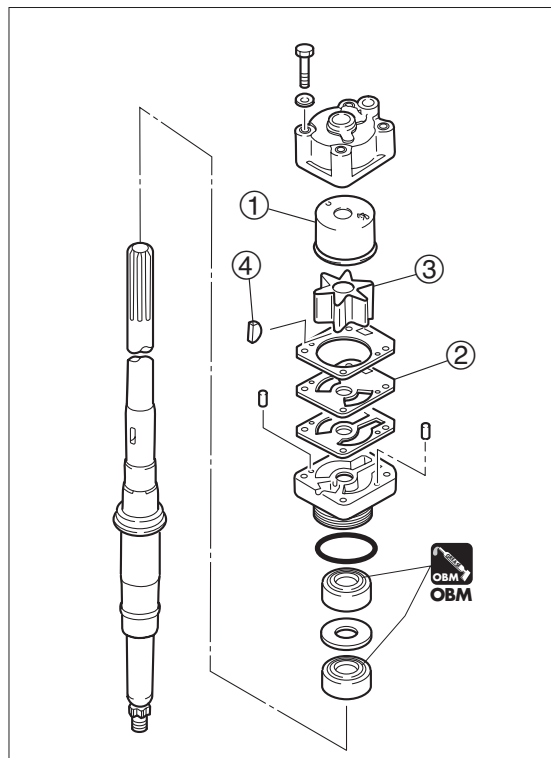
8) Inspection of Water Pump

1. Check pump case liner ① and guide plate ② for deformation and wear.
Replace if necessary.
2. Check pump impeller ③ for crack, damage and wear.
Replace if necessary.



- The impeller may show gloss or have melted area if it is rotated with insufficient water.
- Even if impeller shows no abnormality on its surface, the blade(s) may be separated from the hub.
- Replace guide plate if a groove(s) of 0.5 mm or over is produced on it due to wear by impeller.

3. Check impeller key ④ and key groove for wear.
Replace if necessary.

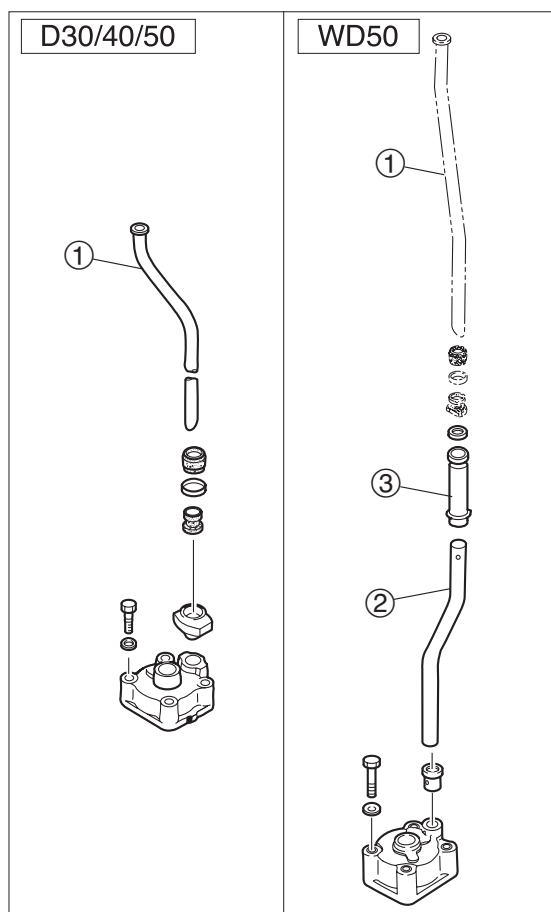


9) Inspection of Water Pipe

1. Remove water pipe ① from drive shaft housing.
Refer to 7-27.
2. Check water pipe ① for corrosion, deformation and stuffing.



- For WD50 ;
Extension water pipe ② and joint hose ③ are in the extension housing. Refer to 7-21 "Assembling Extension Housing" and inspection and assembly.





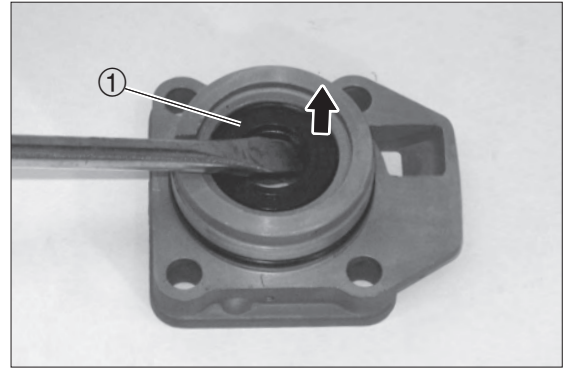
Lower Unit

10) Disassembly of Water Pump Case (Lower)

1. Use bladed screw driver or seal remover to remove oil seal ①.



- Two oil seals are used. Note that there is a shim in between oil seals.
- Be careful not to give flaw to oil seal press fit face.



11) Assembly of Water Pump Case (Lower)

1. Install oil seal ① and shim ② by using suitable press ③ and then press-fit perpendicularly.



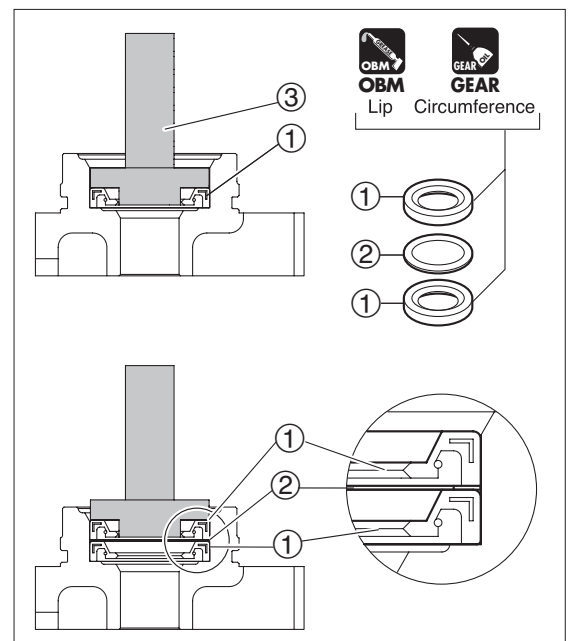
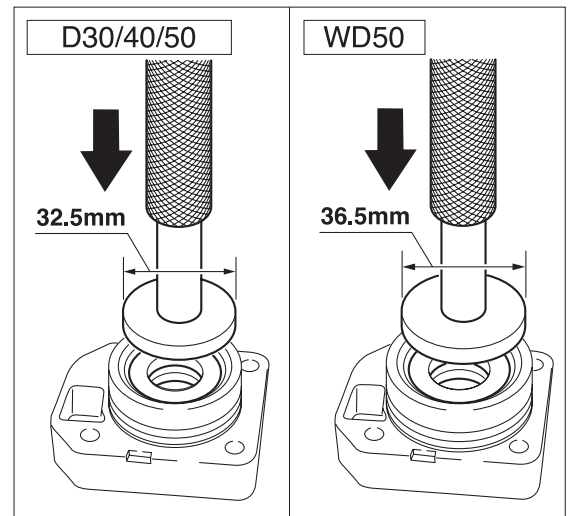
- Apply gear oil to oil seal circumference before installing oil seal.
- Apply OBM grease to oil seal lip.



OBM

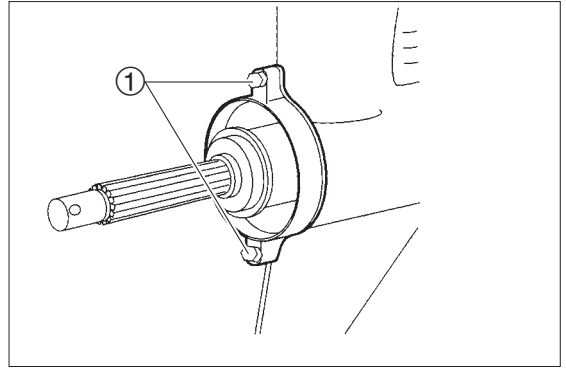


GEAR



12) Removing Propeller Shaft Housing Ass'y

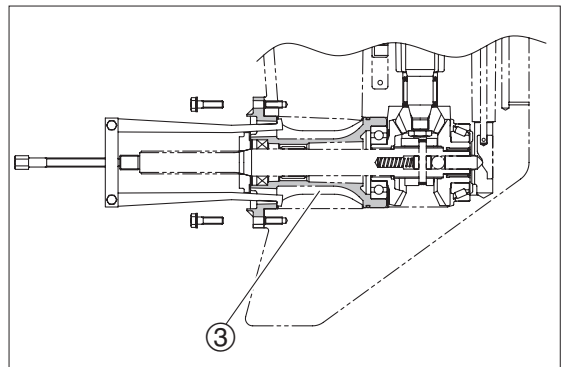
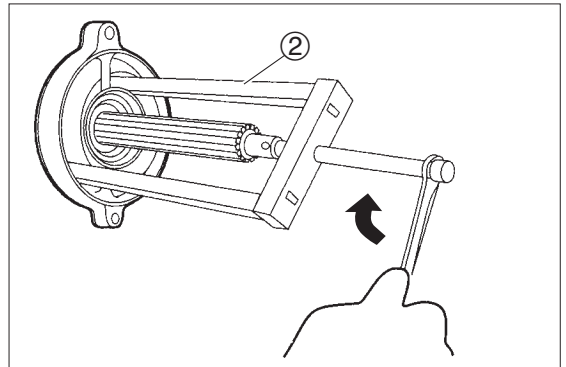
1. Loosen and remove bolts ①.



2. Use propeller shaft housing puller to pull out propeller shaft housing to the position where O ring of the housing can be removed.



Propeller Shaft Housing Puller Ass'y ② :
P/N. 3A3-72259-0

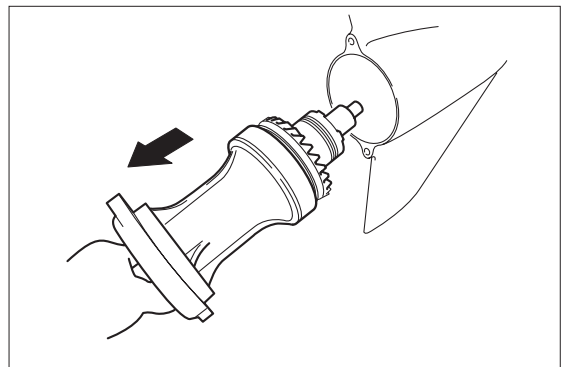


③ Propeller Shaft Housing Ass'y

3. Hold propeller shaft and remove propeller shaft housing ass'y.



When pulling out propeller shaft housing ass'y, remove clutch push rod and steel balls together with the housing ass'y.

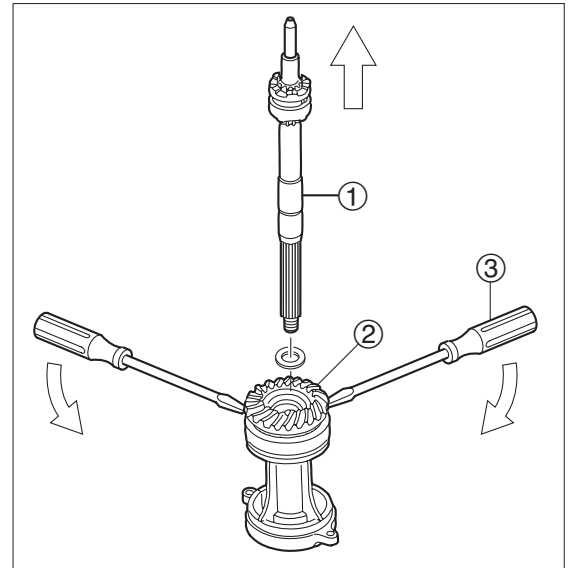




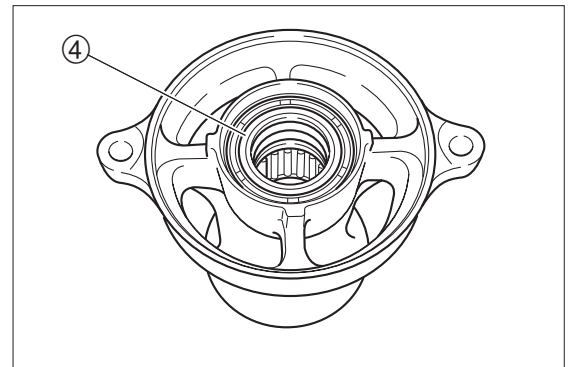
Lower Unit

13) Disassembly of Propeller Shaft Housing Ass'y

1. Pull out propeller shaft ass'y ①.
2. Remove reverse (C) gear ② by using bladed screw drivers ③.



3. Check oil seal ④ for wear and crack.
Replace if necessary.



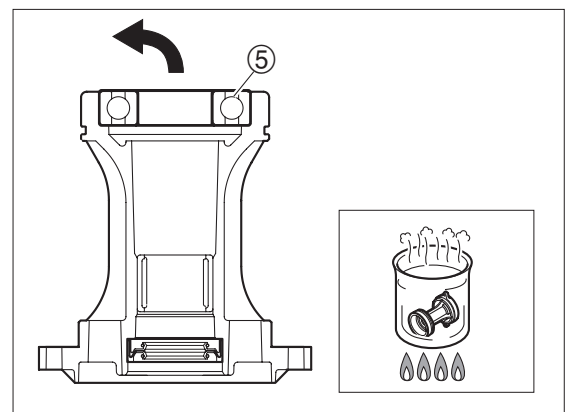
4. Remove bearing ⑤.

CAUTION
Heat propeller shaft housing by putting it in the hot water of approximately 60 - 70°C (140 - 158°F), and remove bearing ④.

CAUTION
Be careful not to burn.



Heating of propeller shaft housing can also be made by using a heat gun or heat lamp.

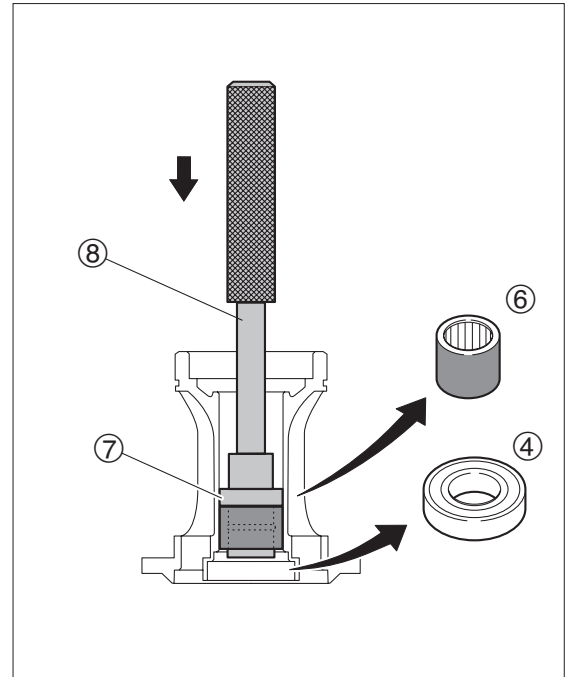


⑤ Bearing **Do not reuse.**

5. Use a press to remove oil seal ④ and roller bearing ⑥ at the same time.



- Before removing, check bearing for play or deflection. Replace if necessary.
- Direct the side of attachment without O-ring to roller bearing.



⑤ Oil Seal

⑥ Roller Bearing

Do not reuse.

Do not reuse.

D30/40/50



Roller Bearing Attachment ⑦ :

P/N. 3MC-99710-0

Driver Rod ⑧ :

P/N. 3AC-99702-0

WD50



Roller Bearing Attachment ⑦ :

P/N. 3LC-99710-0

Driver Rod ⑧ :

P/N. 3AC-99702-0

This work can be done also by using the following tool kit.

D30/40/50



Roller Bearing Puller Kit :

P/N. 3C8-72700-0

WD50



Roller Bearing Puller Kit :

P/N. 3B7-72700-0

6. When removing only oil seal, use bladed screw driver to pry apart.



- Be careful not to give flaw to propeller shaft housing when removing oil seal.



Lower Unit

14) Inspection of Propeller Shaft Housing

1. Clean the part by using a solvent and then check.
Replace if necessary.
2. Check reverse (C) gear for crack or abnormal wear of the teeth and dog.
Replace if necessary.
3. Check bearing for abnormality.
Replace if necessary.

15) Assembly of Propeller Shaft Housing

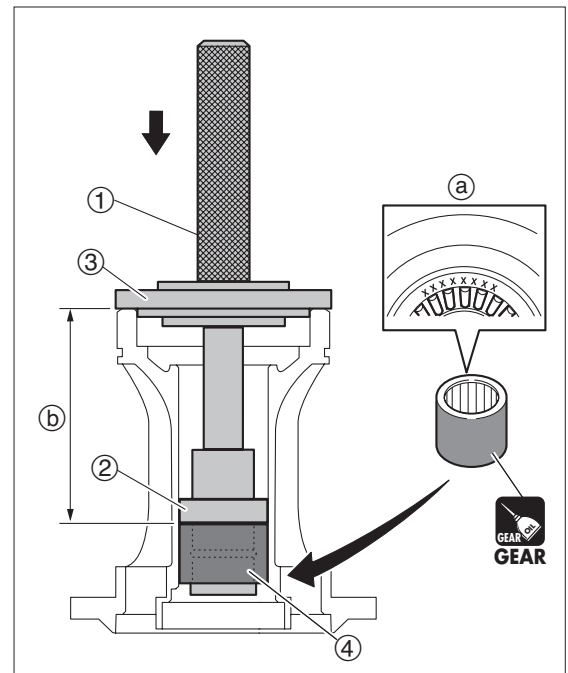
CAUTION

When gear case, propeller shaft, bearing, housing or reverse (C) gear is replaced, measure the backlash and perform shim adjustment.

1. Use a press to push new roller bearing ④ into propeller shaft bearing to specified depth.



- Install roller bearing with the manufacturer's mark (a) facing the tool side.
- Screw in roller bearing attachment ② lightly by a hand so that no gap is made at driver rod ①.
- Clean roller bearing installation face and apply gear oil before installation.



④ Roller Bearing **Do not reuse.**

D30/40/50



Roller Bearing Attachment ② :

P/N. 3MC-99710-0

Driver Rod ① :

P/N. 3AC-99702-0

Center Plate ③ :

P/N. 3AC-99701-0



Depth of Installation (b) :

59.3 - 59.7 mm (2.335 - 2.35 in)



GEAR

This work can be done also by using the following tool kit.

D30/40/50



Roller Bearing Puller Kit :

P/N. 3C8-72700-0

WD50



Roller Bearing Attachment ② :

P/N. 3LC-99710-0

Driver Rod ① :

P/N. 3AC-99702-0

Center Plate ③ :

P/N. 3AC-99701-0



Depth of Installation (b) :

70.8 - 71.2 mm (2.787 - 2.803 in)



GEAR

WD50



Roller Bearing Puller Kit :

P/N. 3B7-72700-0

2. Install oil seal ⑤.

Use a suitable press ⑥ to install new oil seal to propeller shaft housing.



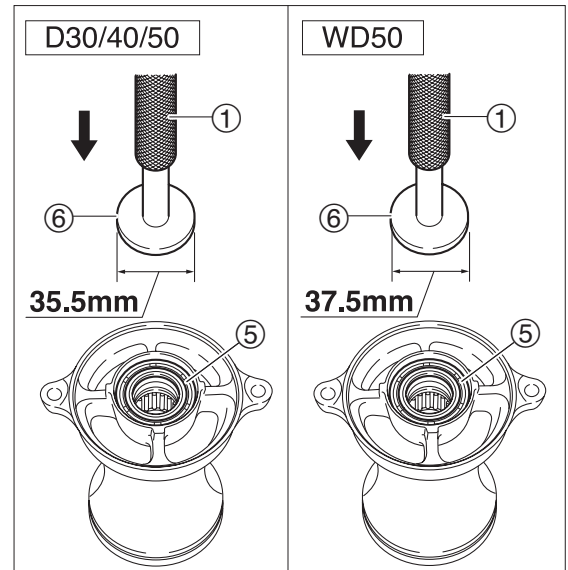
- Install oil seal with the marking facing tool side.
- Clean oil seal installation face and apply gear oil before installation.
- Apply grease to lip of oil seal after installing it.



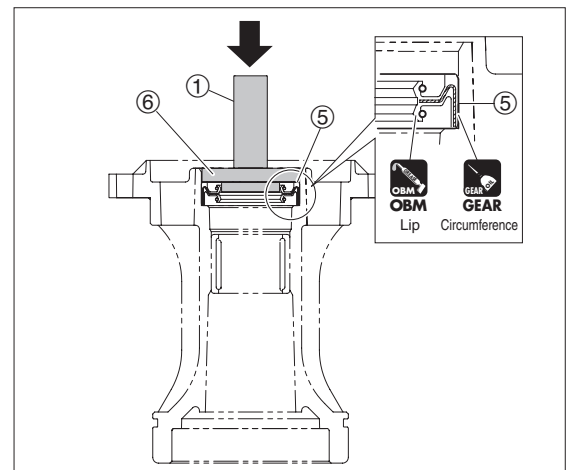
OBM



GEAR



⑤ Oil seal **Do not reuse.**



⑤ Oil Seal **Do not reuse.**

3. Install bearing ⑦.

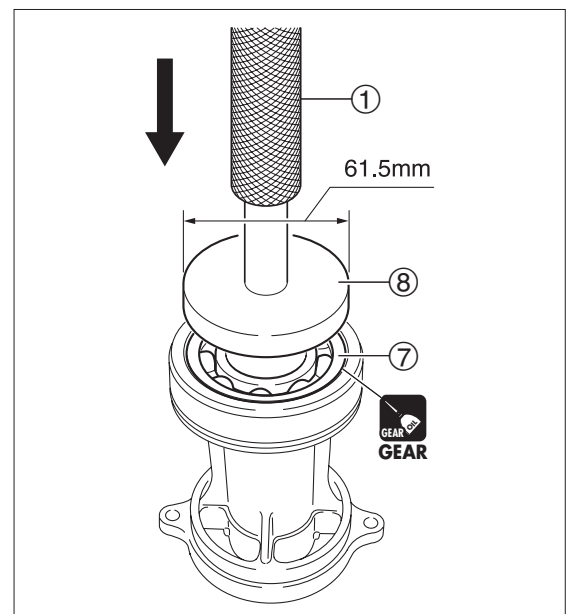
Use a suitable press ⑧ to install new bearing to propeller shaft housing.



- Clean bearing installation face and apply gear oil before installation.



GEAR



⑦ Bearing **Do not reuse.**



Lower Unit

- Attach shim ⑩ used on the reverse (C) gear ⑨ to the gear.

Use a suitable press to install reverse (C) gear ⑨.



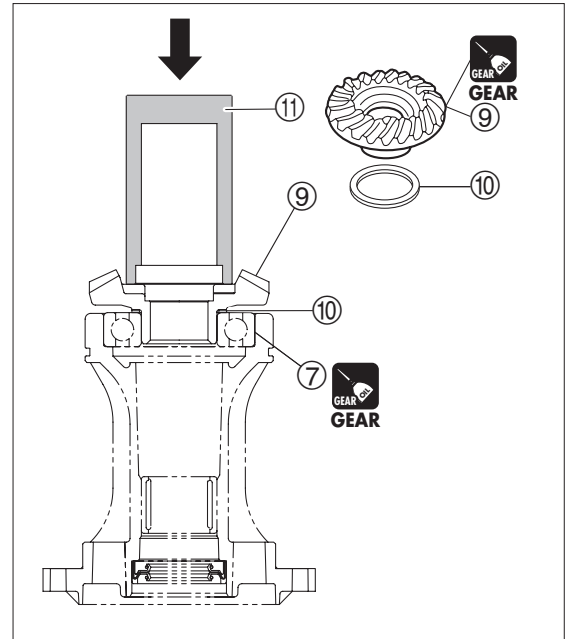
Clean reverse (C) gear bearing installation face and apply gear oil before installation.



Bevel Gear Bearing Install Tool ⑪ :
P/N. 3C8-72719-0



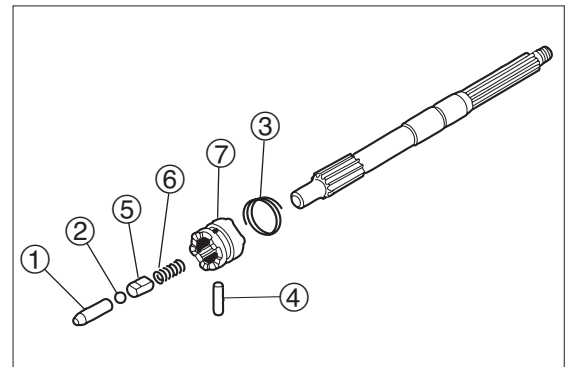
GEAR



⑦ Bearing **Do not reuse.**

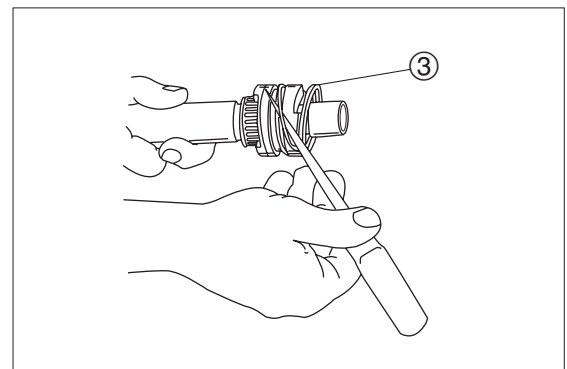
16) Disassembly of Propeller Shaft Ass'y

- Remove push rod ① and steel ball ②.



③ Clutch Pin Snap **Do not reuse.**

- Put a bladed screw driver into one of clutch pin snap ③ end, and take the snap out from the clutch groove while winding it.

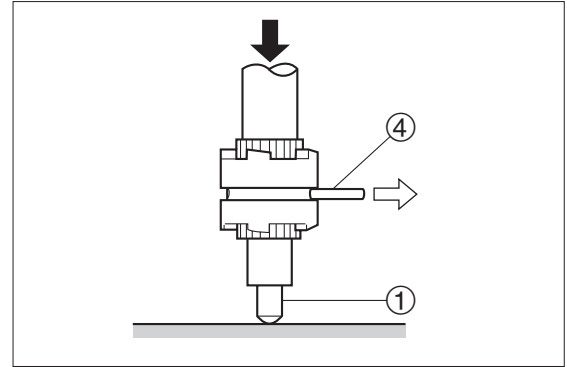


③ Clutch Pin Snap **Do not reuse.**

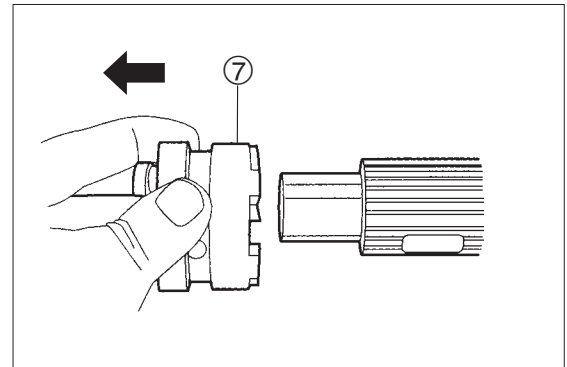
3. Pull out clutch pin ④, and remove clutch spring retainer ⑤, clutch spring ⑥, and clutch by referring to the figure.

⚠ WARNING

- When removing clutch pin, wear protective glasses, and do not point opening of propeller shaft to your face or body while holding the propeller shaft. Clutch pin or spring holder may fly out very quickly.
- Install push rod ①, and pull out pin ④ while pushing propeller shaft onto a plane to prevent retainer ⑤ and spring ⑥ from flying out.



4. After taking out clutch spring retainer ⑤ and clutch spring ⑥, remove clutch ⑦ from propeller shaft.



17) Inspection of Propeller Shaft Ass'y

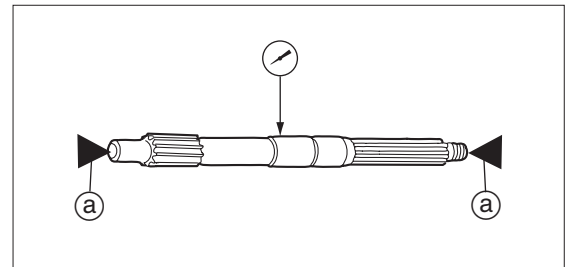
1. Check propeller shaft for bend, wear and damage. Replace if necessary.
2. Measure propeller shaft runout.



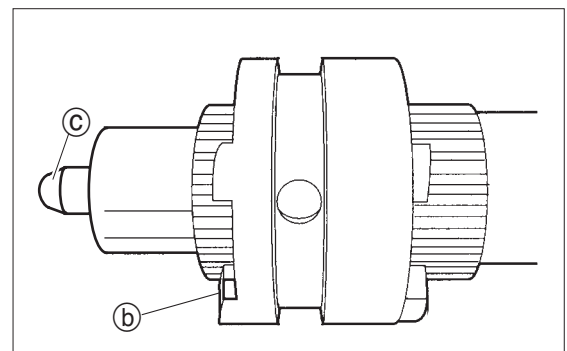
Runout Limit :

0.05 mm (0.0020 in)

3. Check clutch claw (b) and push rod (c) for crack and wear. Replace if necessary.



① Supporting Points





Lower Unit

18) Assembly of Propeller Shaft Ass'y

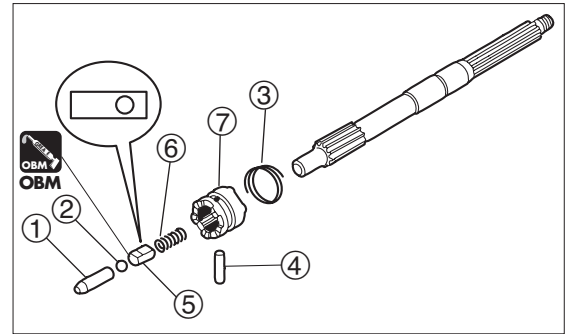
1. Attach spring ⑥, spring retainer ⑤, steel ball ②, push rod ①, clutch ⑦ and clutch pin ④ to propeller shaft.



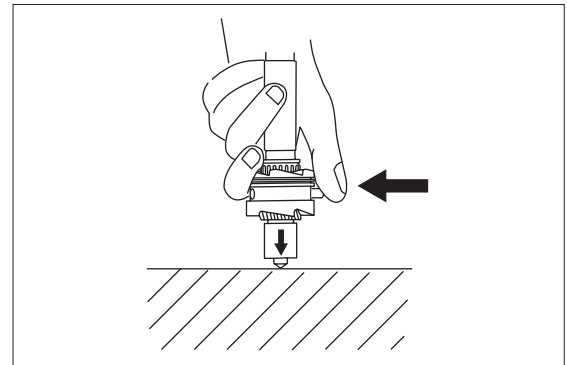
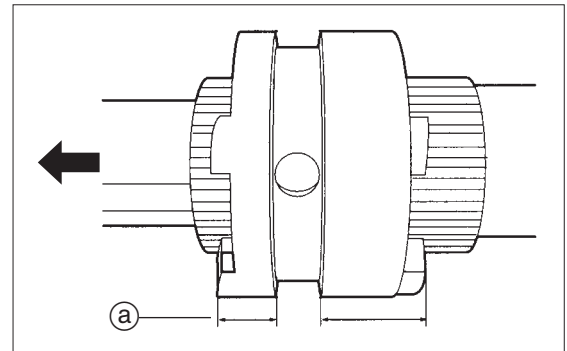
- When attaching clutch, face the narrower claw ① to push rod side.
- When installing spring retainer, direct the end farther away from the hole toward forward gear ②.
- Install clutch pin while applying preload to push rod.
- Apply OBM grease to spring retainer to prevent ball from dropping.
- Be careful not to allow ball to fly out by spring tension.



OBM



③ Clutch Pin Snap **Do not reuse.**

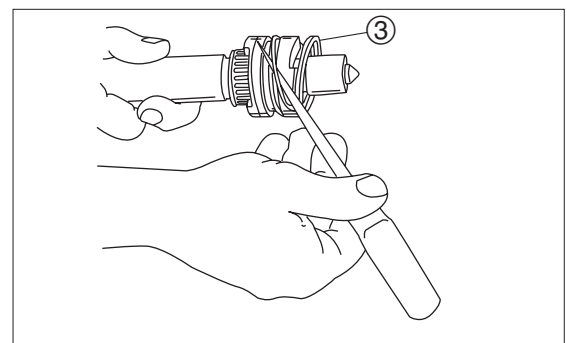


2. Attach new clutch pin snap ③ by using a bladed screw driver to turn the snap.



- When attaching clutch pin snap, do not apply excessive force to the part, or the snap may expand during operation of the engine, resulting in damaging gear and/or other parts severely.

3. After assembling, check that clutch can be operated smoothly, taking care not to allow push rod to drop out.



③ Clutch Pin Snap **Do not reuse.**

19) Removing Drive Shaft Ass'y

1. Remove pinion (B) gear nut ④, and then, remove pinion (B) gear ③ and drive shaft.



- Degrease pinion (B) gear nut completely so that the nut wrench does not slip on the nut.
- Loosen and remove the nut by using a drive shaft socket and a wrench and turning the wrench counterclockwise. Cover the wrench ② with rag to prevent it from hitting the case directly.
- This work can be made easier when the opening of gear case of propeller shaft side is faced upward and fixed horizontally with a holder.



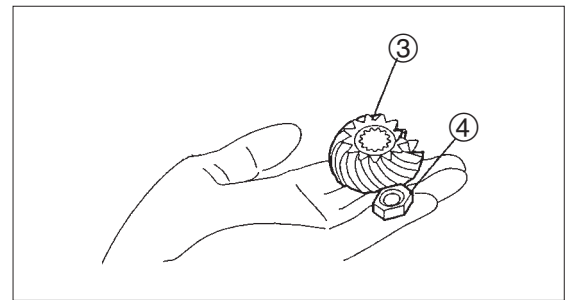
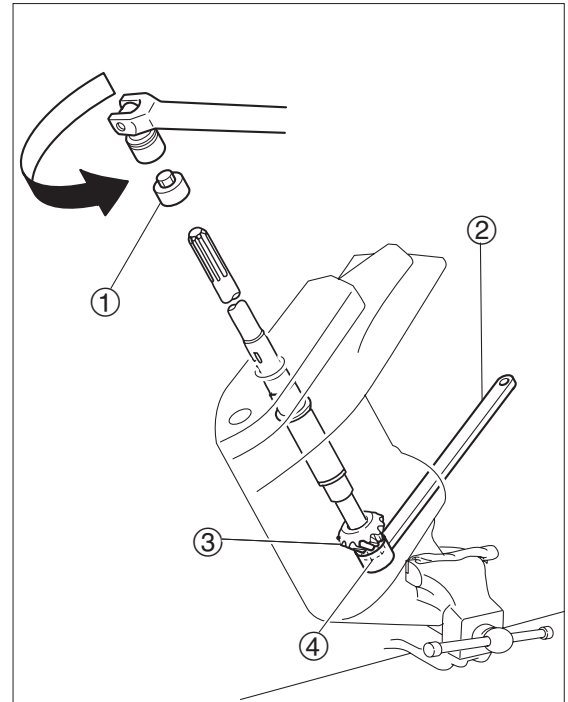
Bevel Gear Nut Socket ① :

P/N. 346-72232-0

Bevel Gear B Nut Wrench ② :

D30/40/50:P/N. 346-72231-0

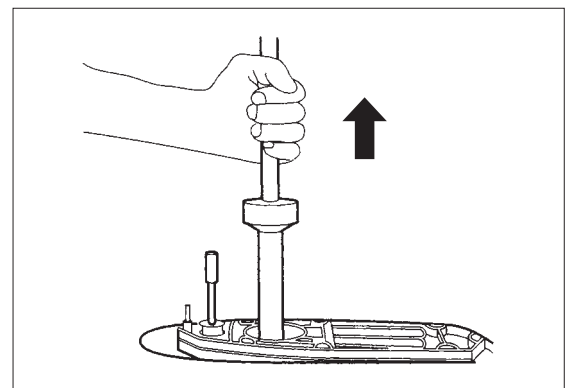
WD50:P/N. 353-72231-0



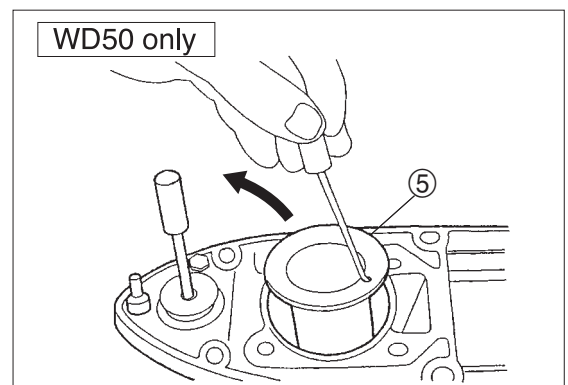
2. Pull out drive shaft from gear case.



- When removing drive shaft, be careful not to give damage to shim on the bearing outer race and not to lose the part.
- Replace shim with new one of the same thickness if any deformation or damage is found on it.



3. Remove drive shaft spring guide ⑤.





Lower Unit

20) Disassembly of Drive Shaft Ass'y

1. Remove outer shim ①.
2. Remove drive shaft spring ②.
3. Remove taper ball bearings ③ by using press and universal puller ④.

CAUTION

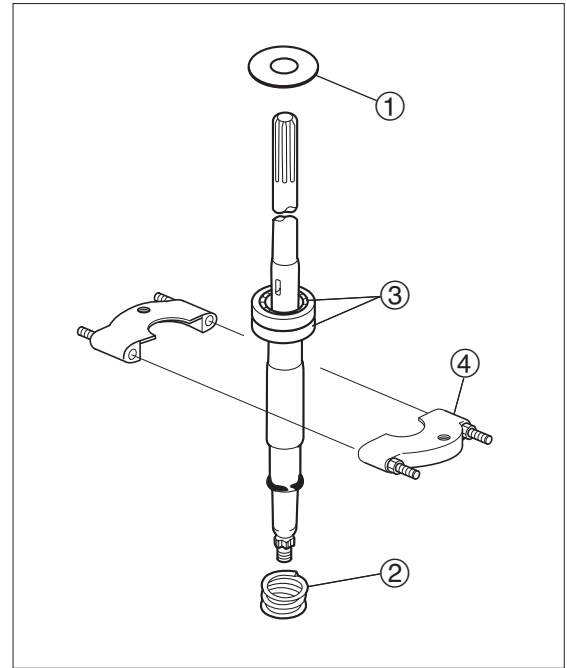
**Do not reuse removed bearing.
Be sure to replace with new one.**



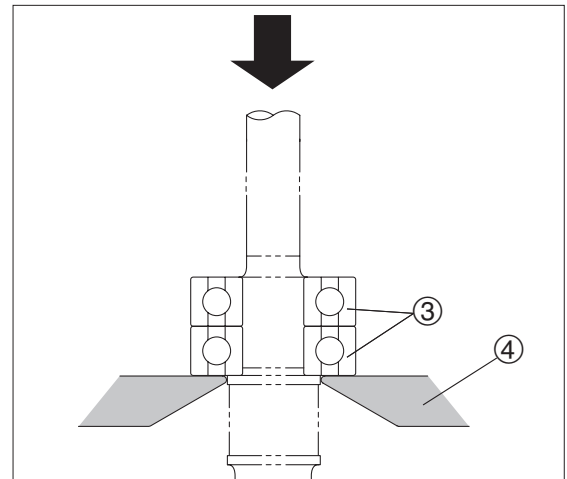
- Check bearing for play or deflection before removing, and replace if necessary.
- When putting universal puller plate on the bearing, hook the tip of puller's claw on the inner race of bearing correctly.



Universal Puller Plate ④ :
P/N. 3AC-99750-0



③ Bearings **Do not reuse.**



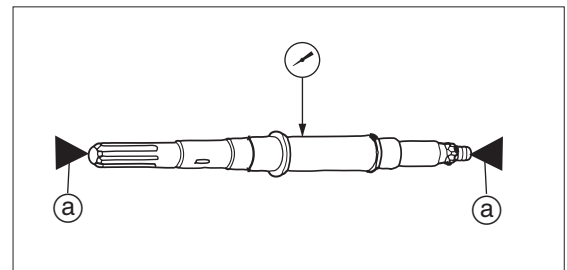
③ Bearings **Do not reuse.**

21) Inspection of Drive Shaft

1. Check drive shaft for bend and wear.
Replace if necessary.
2. Measure drive shaft runout.



Runout Limit :
0.3 mm (0.013 in)



① Supporting Points

22) Inspection of Pinion (B) Gear

1. Check gear teeth and dog for crack, wear and damage.
Replace if necessary.

23) Assembly of Drive Shaft Parts

1. Attach pinion (B) gear nut ① to drive shaft temporarily.
2. Install bearing ② by using press and a suitable pipe ③.
Before installing bearing, be sure to clean drive shaft installation face and apply gear oil.

⚠ CAUTION

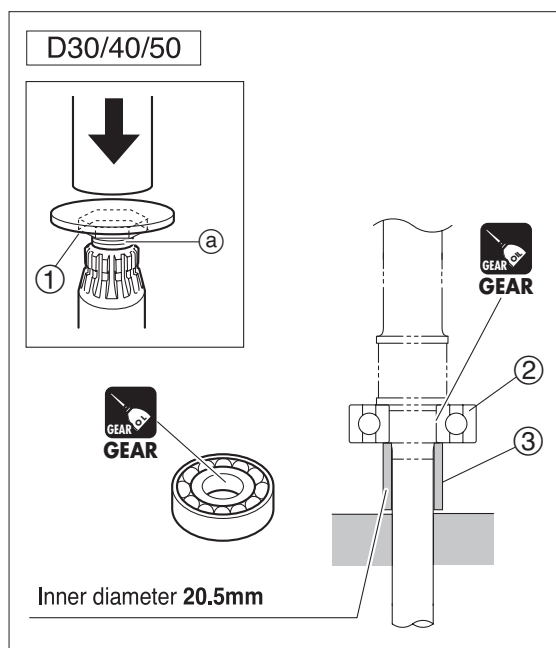
Do not press drive shaft thread ① directly.
Put ① piece of protector (steel plate) on the tip of the shaft.



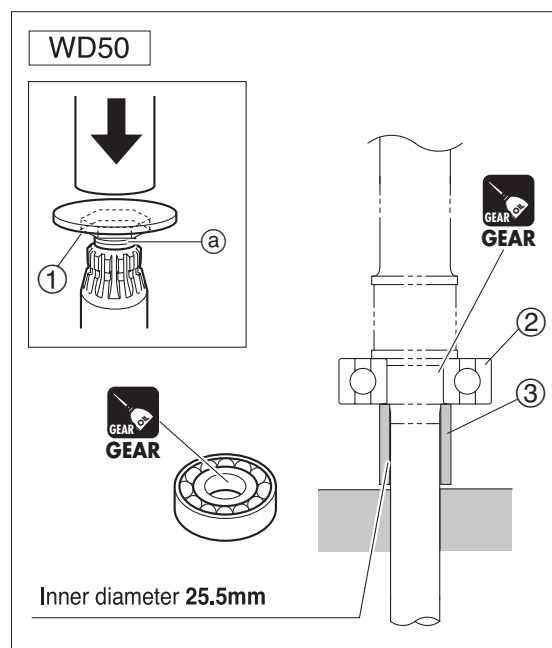
A nut that fits the thread can be used to protect the shaft tip when pressing.



GEAR



② Bearing **Do not reuse.**

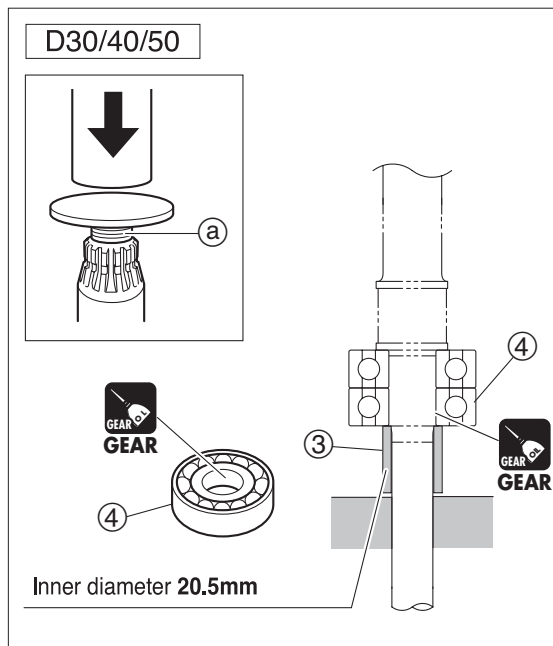


② Bearing **Do not reuse.**

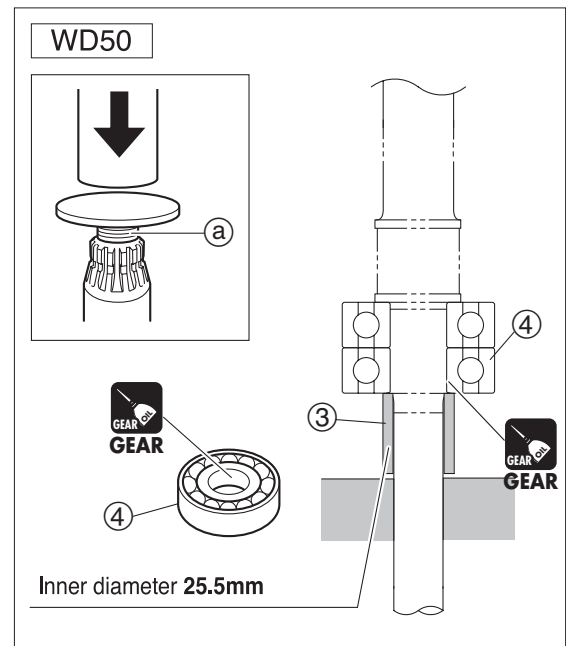


Lower Unit

3. Install another bearing ④ as same.



④ Bearing **Do not reuse.**



④ Bearing **Do not reuse.**

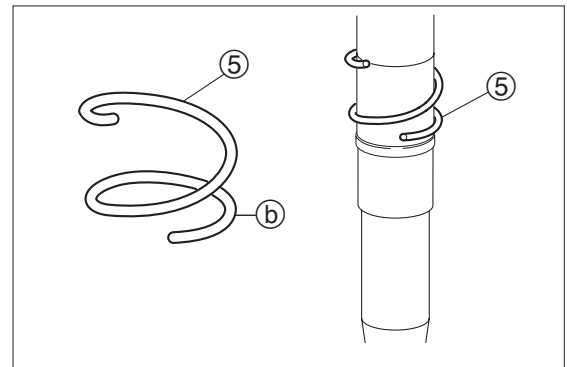
4. Attach drive shaft spring ⑤.

CAUTION

When attaching the spring, face the side ⑥ toward pinion (B) gear side.



Attach spring as illustrated.

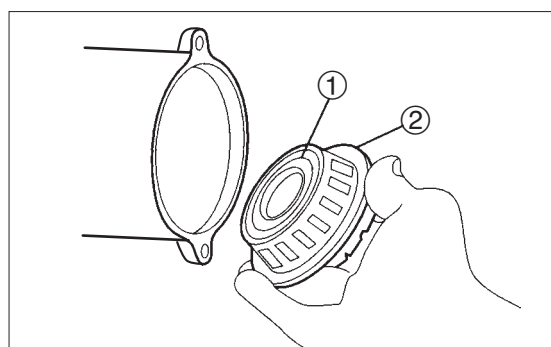
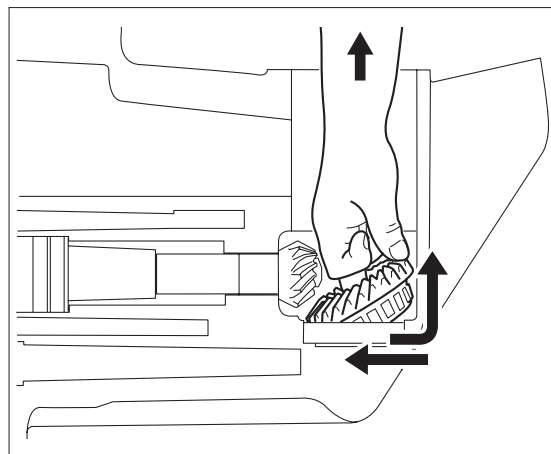


24) Removing Forward (A) Gear Ass'y

1. Take out bearing ① and forward (A) gear ② by using a hand put in the gear case.



- Put mid finger into forward (A) gear hole and take it between the finger and the first finger (thumb), and lift the thumb side of the gear to remove it.
- Take forward (A) gear out taking care not to hit pinion (B) gear.
- For WD50 models: Can not remove forward (A) gear without removing pinion (B) gear. Refer to P6-31, remove pinion (B) gear, and then remove forward (A) gear.

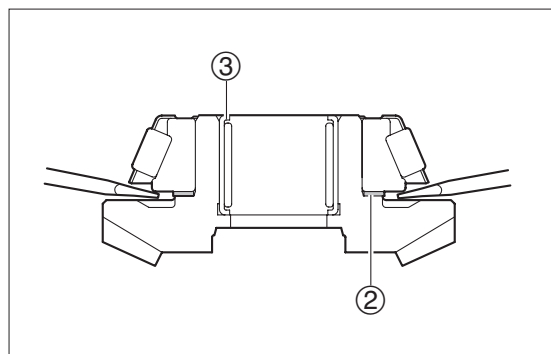
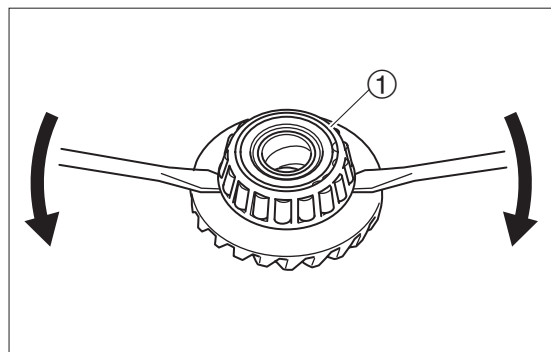


25) Disassembly of Forward Gear (A) Gear

1. Remove taper roller bearing ①.
Use two bladed screw drivers to remove taper roller bearing from forward gear (A) gear.
Put the drivers into grooves of forward (A) gear, and pry out taking care not to damage the shim.

⚠ CAUTION

Be careful not to damage shim ②.





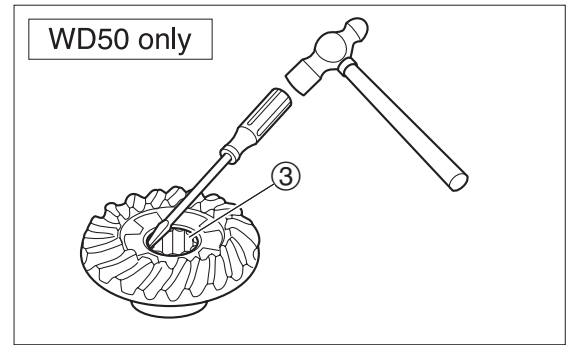
Lower Unit

WD50 only

- Remove roller bearing ③.
Drive out roller bearing from the gear by using a bladed screw driver or a punch and a hammer at teeth side of the gear.

CAUTION

- When removing roller bearing, take care not to scratch forward (A) gear bearing face.
- Do not reuse removed roller bearing.



③ Roller Bearing

Do not reuse.

26) Inspection of Forward (A) Gear

- Check forward (A) gear teeth and clutch claws for crack, damage and wear.
Replace if necessary.

27) Assembly of Forward (A) Gear Parts

CAUTION

When gear case, forward (A) gear or bearing is replaced, measure backlash and attach a proper shim.
Refer to "Chapter 6 Shim Adjustment".

WD50 only

- Press-fit roller bearing ① using a suitable mandrel and hydraulic press.

CAUTION

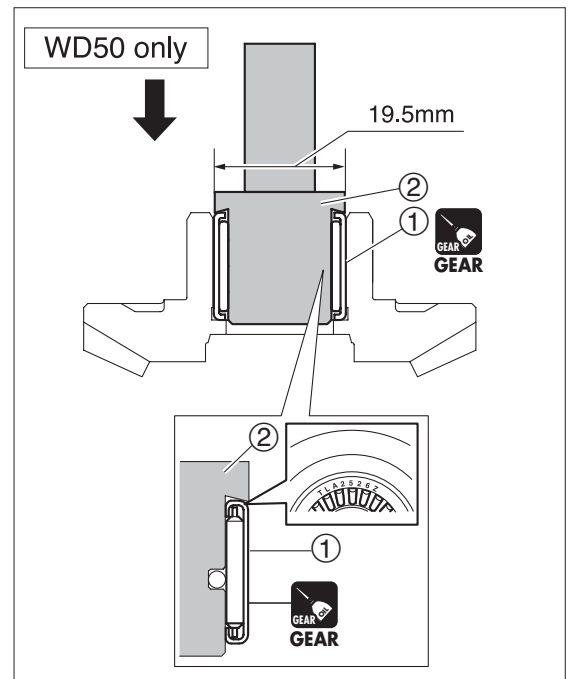
When press-fitting roller bearing, face the marking side to tool side.



Apply gear oil to press-fit face when press-fitting roller bearing.



GEAR



① Roller Bearing

Do not reuse.

2. Attach shim ④ used before disassembly to taper roller bearing ⑤, and press-fit the part.



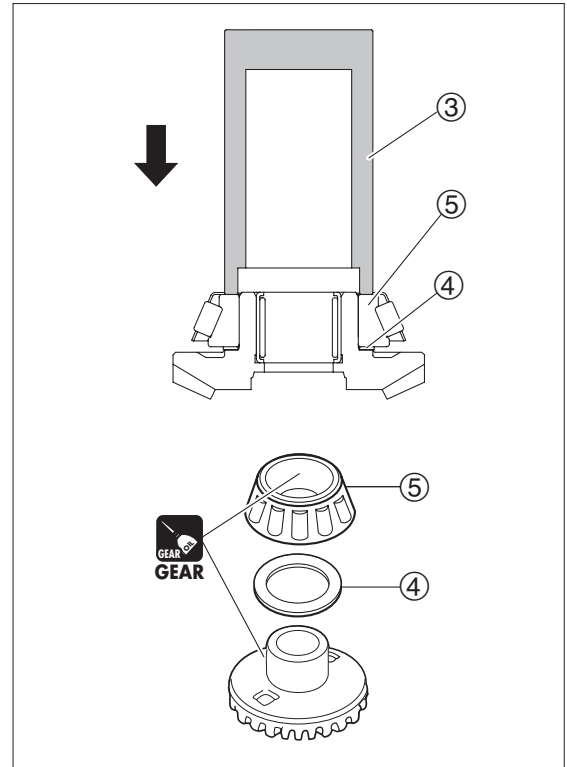
Apply gear oil to press-fit face when press-fitting taper roller bearing.



Bevel Gear Bearing Install Tool ③ :
P/N. 3C8-72719-0



GEAR





Lower Unit

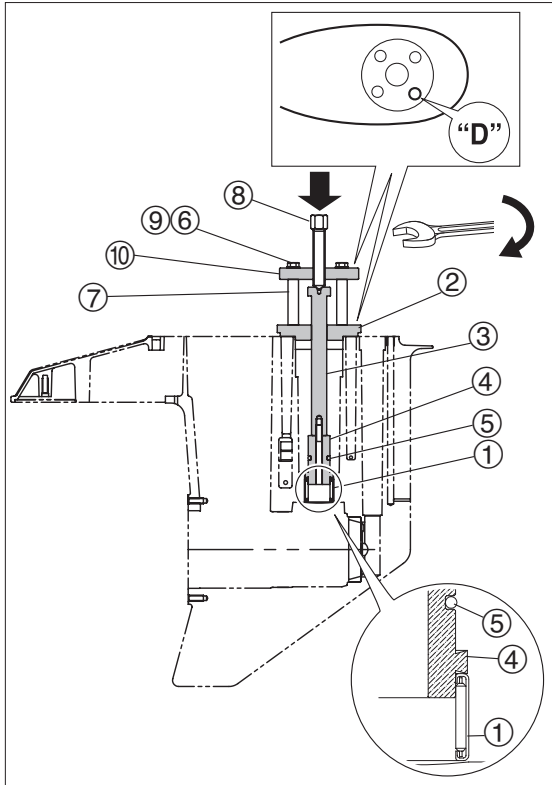
28) Disassembly of Gear Case

1. Remove roller bearing ① by using the following tools.



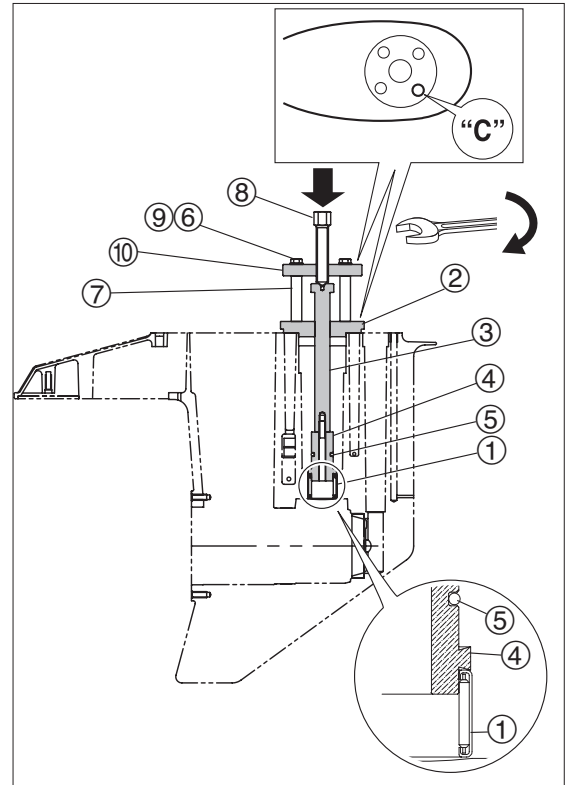
Align the mark (C or D) of press guide ② with right side installation hole on the pump case.

D30/40/50



① Roller Bearing **Do not reuse.**

WD50



① Roller Bearing **Do not reuse.**



Roller Bearing Press Kit :

P/N. 3LC-72900-0
Bearing Outer Press Guide ② :

P/N. 3T1-72765-0

Roller Bearing Press Rod ③ :

P/N. 3LC-72767-0

Roller Bearing Press ④ :

P/N. 3Z5-72770-0

O Ring ⑤ :

P/N. 6B3-32529-0

Washer M8 ⑥ :

P/N. 940191-0800

Roller Bearing Outer Press Collar ⑦ :

P/N. 3C7-72768-0

Roller Bearing Outer Press Bolt ⑧ :

P/N. 3C7-72766-0

Bolt M8-110 ⑨ :

P/N. 3C7-72773-0

Roller Bearing Press Flange ⑩ :

P/N. 3AC-72901-1



Roller Bearing Press Kit :

P/N. 3LC-72900-0
Bearing Outer Press Guide ② :

P/N. 3T1-72765-0

Roller Bearing Press Rod ③ :

P/N. 3LC-72767-0

Roller Bearing Press ④ :

P/N. 3S7-72770-0

O Ring ⑤ :

P/N. 6H6-07422-0

Washer M8 ⑥ :

P/N. 940191-0800

Roller Bearing Outer Press Collar ⑦ :

P/N. 3C7-72768-0

Roller Bearing Outer Press Bolt ⑧ :

P/N. 3C7-72766-0

Bolt M8-110 ⑨ :

P/N. 3C7-72773-0

Roller Bearing Press Flange ⑩ :

P/N. 3AC-72901-1

This work can be done also by using the following tool kit.

D30/40/50



Roller Bearing Puller Kit :
P/N. 3C8-72700-0

WD50



Roller Bearing Puller Kit :
P/N. 3B7-72700-0

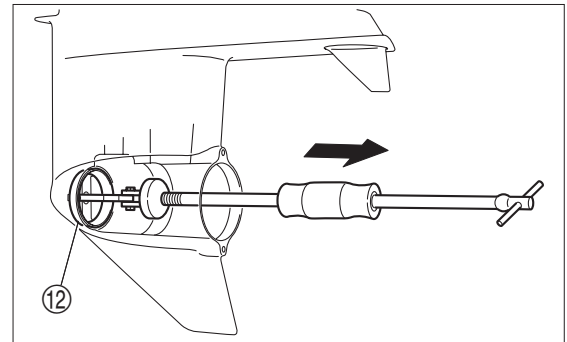
2. Remove taper roller bearing outer race ⑫.
Put the slide hammer in the gear case, hook claw of slide hammer on the outer race to fix it, and slide the hammer to pull out the outer race.



Slide Hammer Ass'y :
P/N. 3AC-99080-0



Confirm the position of insertion groove in the back of outer race, and put the claw of slide hammer in the groove.

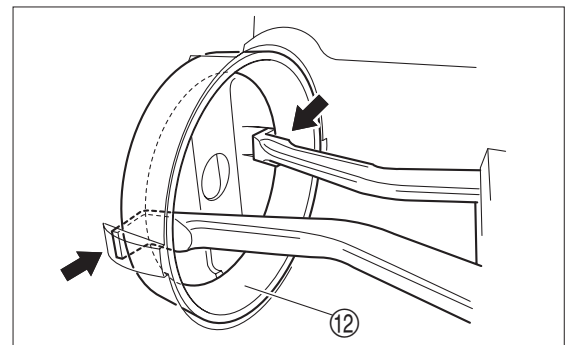


⑫ Outer Race **Do not reuse.**

This work can also be done by using the following tool.

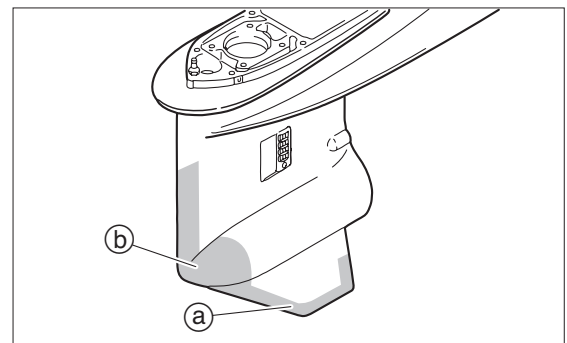


Bevel Gear Bearing Puller Ass'y :
D30/40/50:P/N. 3A3-72755-0
WD50:P/N. 3B7-72755-0



29) Inspection of Gear Case

1. Check skag ① and torpedo-like area ② for crack and other damage.
Replace if necessary.





Lower Unit

30) Assembly of Gear Case Parts

⚠ CAUTION

When gear case, forward (A) gear or bearing is replaced, measure backlash and attach a proper shim.

Refer to “Chapter 6 Shim Adjustment”.

1. Use the following tools to install taper roller bearing ① outer race.



Bearing Outer Press Kit :

P/N. 3B7-72739-1

Bearing Outer Press Plate ② :

P/N. 353-72732-0

Bearing Outer Press Guide ③ :

P/N. 3BJ-72733-0

Bearing Outer Press Rod ④ :

P/N. 3B7-72731-0

Nut M10 ⑤ :

P/N. 930191-1000

Spring Washer ⑥ :

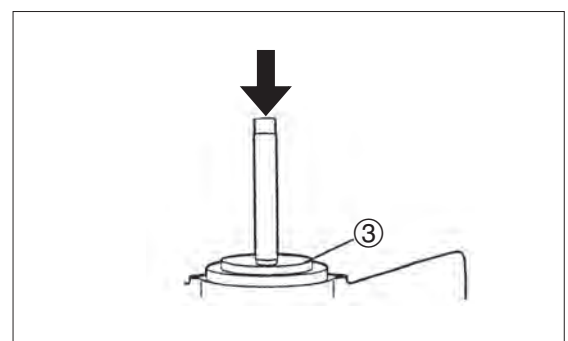
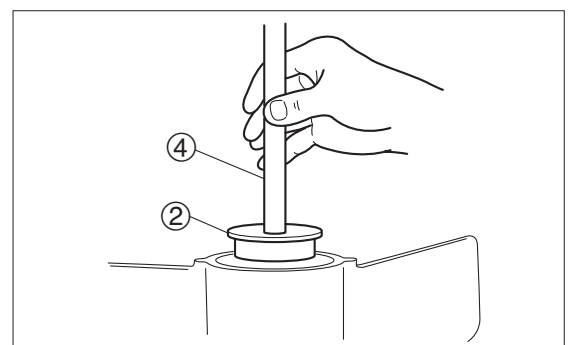
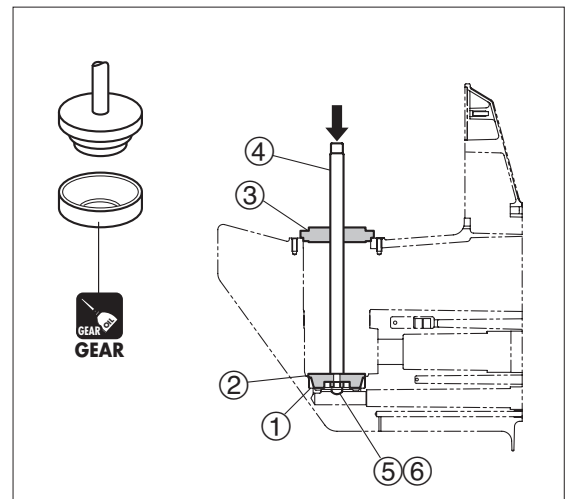
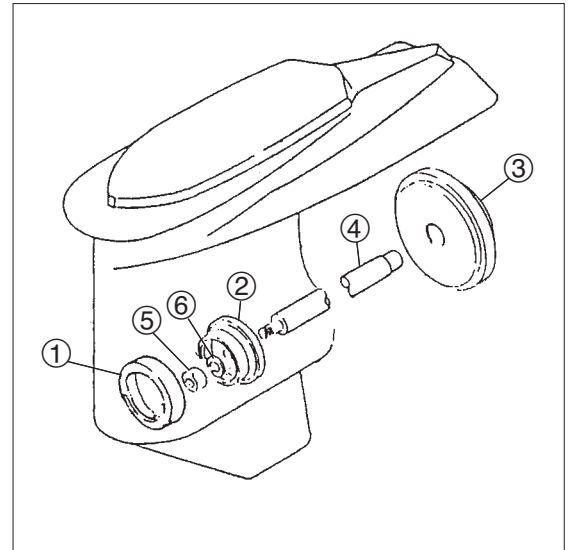
P/N. 941392-1000

2. Fix gear case on a holder with its propeller shaft opening facing upward.
3. Clean outer race installation face in the gear case and apply gear oil.
4. Apply gear oil to external face of outer race, and put the outer race in the center of the housing with the marked face of the race facing in the housing.



GEAR

5. Put rod ass'y into gear case slowly so that plate ② contacts inside of the outer race, and put the guide ③ on the rod ④ and set it in the opening of the gear case.
6. Tap the end of the rod with a hammer to press-fit the outer race in the housing securely.



7. Install roller bearing ⑦ by using the following tools.

CAUTION

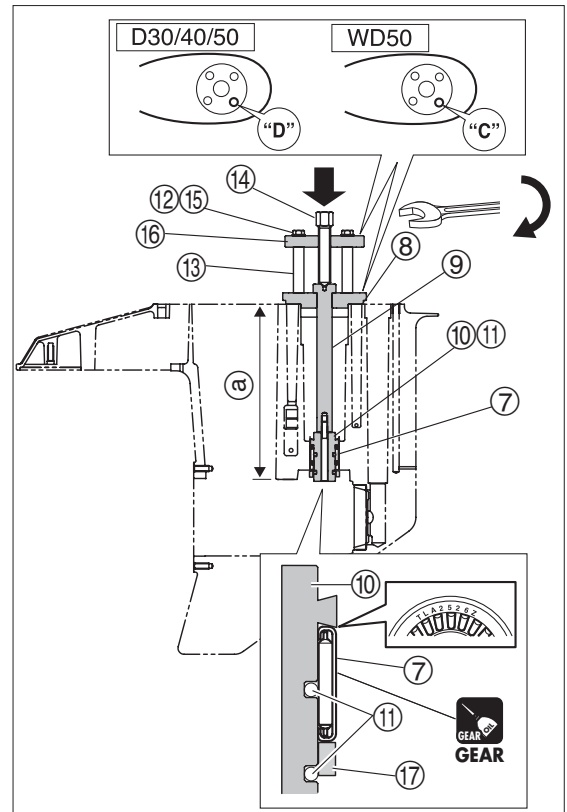
Install bearing so that marked side faces upward.



- Align following marks of the press guide ⑧ and installation hole of the pump case front-right side, then attach press guide.
- Before installing bearing, be sure to clean bearing installation face and apply gear oil.
- Do not reuse roller bearing. Use new part.



GEAR



⑦ Roller Bearing **Do not reuse.**

D30/40/50



Roller Bearing Press Kit :

- P/N. 3LC-72900-0
- Bearing Outer Press Guide ⑧ :**
P/N. 3T1-72765-0
- Roller Bearing Press Rod ⑨ :**
P/N. 3LC-72767-0
- Roller Bearing Press ⑩ :**
P/N. 3Z5-72770-0
- O Ring ⑪ :**
P/N. 6B3-32529-0
- Washer M8 ⑫ :**
P/N. 940191-0800
- Roller Bearing Outer Press Collar ⑬ :**
P/N. 3C7-72768-0
- Roller Bearing Outer Press Bolt ⑭ :**
P/N. 3C7-72766-0
- Bolt M8-110 ⑮ :**
P/N. 3C7-72773-0
- Roller Bearing Press Flange ⑯ :**
P/N. 3AC-72901-1
- Roller Bearing Press Guide ⑰ :**
P/N. 3Z5-72905-0



Installation Depth ① :
173 mm (6.811 in)

This work can be done also by using the following tool kit.

D30/40/50



Roller Bearing Puller Kit :

- P/N. 3C8-72700-0

WD50



Roller Bearing Press Kit :

- P/N. 3LC-72900-0
- Bearing Outer Press Guide ⑧ :**
P/N. 3T1-72765-0
- Roller Bearing Press Rod ⑨ :**
P/N. 3LC-72767-0
- Roller Bearing Press ⑩ :**
P/N. 3S7-72770-0
- O Ring ⑪ :**
P/N. 6H6-07422-0
- Washer M8 ⑫ :**
P/N. 940191-0800
- Roller Bearing Outer Press Collar ⑬ :**
P/N. 3C7-72768-0
- Roller Bearing Outer Press Bolt ⑭ :**
P/N. 3C7-72766-0
- Bolt M8-110 ⑮ :**
P/N. 3C7-72773-0
- Roller Bearing Press Flange ⑯ :**
P/N. 3AC-72901-1
- Roller Bearing Press Guide ⑰ :**
P/N. 3S7-72905-0



Installation Depth ① :
201 mm (7.913 in)

WD50



Roller Bearing Puller Kit :

- P/N. 3B7-72700-0



Lower Unit

31) Measurement of Pinion (B) Gear Height and Shim Selection

⚠ CAUTION

When gear case, drive shaft or pump case (lower) is replaced, measure pinion (B) gear height and back lash between gears, and perform shim adjustment.

1. Before measuring back lash of each gear, measure drive shaft pinion (B) gear height and adjust the height to proper value if necessary.

In accordance with procedure described in "Assembly of Lower Unit Parts" on Chapter 6, install the parts up to pump case ①, and secure it by using M8 bolt (L=30mm) and flat washer ②.



Remove forward (A) gear before beginning the work.



M8 Bolt (L=30mm) + Flat Washer ② :
13N · m (9.0 lb · ft) [1.3kgf · m]

2. This work can be made easier when the opening of gear case of propeller shaft side is faced upward and fixed horizontally with a holder.

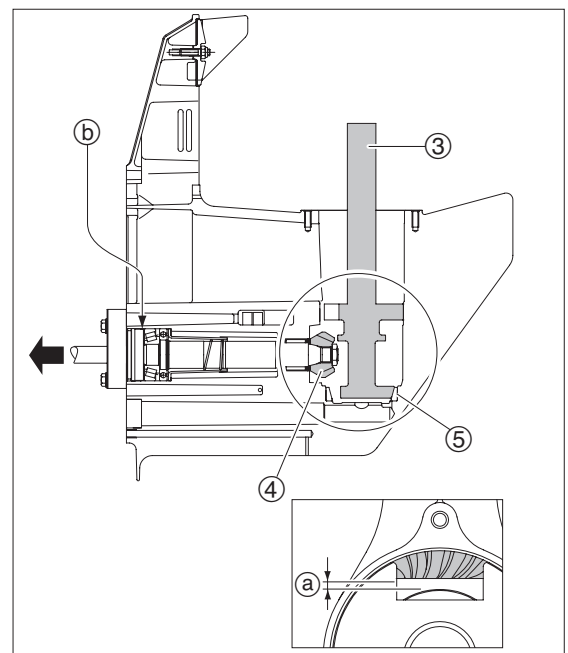
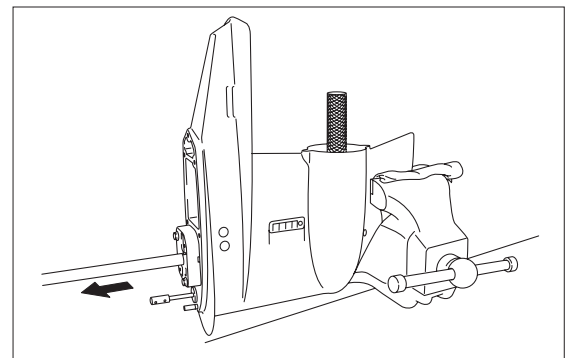
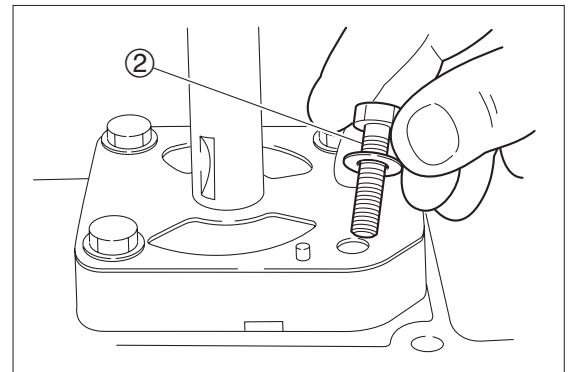
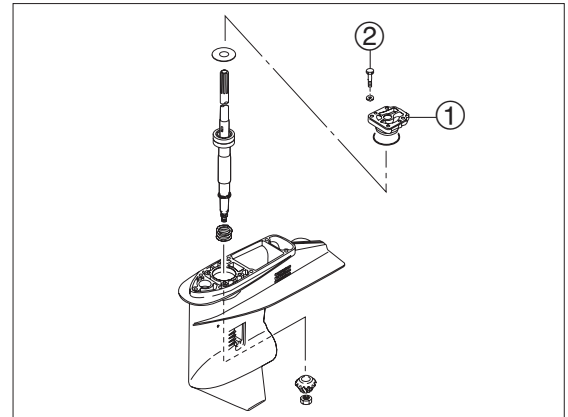
Put a shimming gauge ③ into gear case, and measure gap ④ between shimming gauge ③ and pinion (B) gear ④.

⚠ CAUTION

- **Contact shimming gauge ③ with taper roller bearing ⑤ outer race tapered face.**
- **When measuring the gap, fully pull up drive shaft to eliminate the play.**



Thickness gauge measures the gap between shimming gauge ③ and pinion (B) gear end.



D30/40/50**Shimming Gauge ③ :**

P/N. 3C8-72250-0

Thickness Gauge :

P/N. 353-72251-0

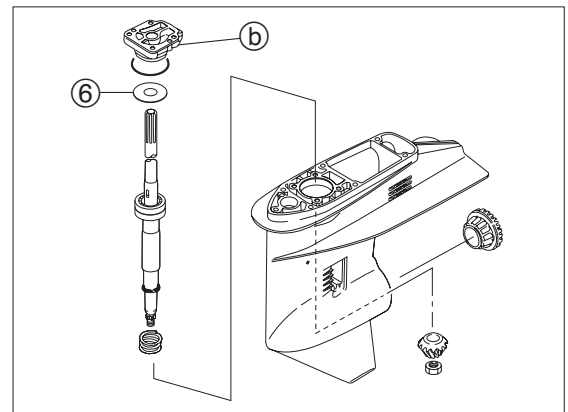
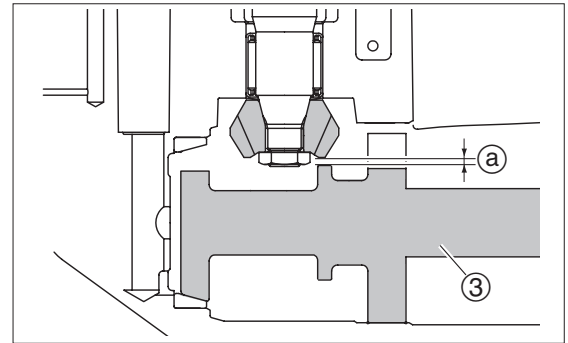
WD50**Shimming Gauge ③ :**

P/N. 353-72250-0

Thickness Gauge :

P/N. 353-72251-0

3. Add shim ⑥ to bottom of ⑤ pump case (lower) to adjust the gap ④ to specified value.

**D30/40/50****Pinion (B) Gear Height ④ :**

0.60 - 0.64 mm (0.0236 - 0.0252 in)

WD50**Pinion (B) Gear Height ④ :**

0.95 - 1.00 mm (0.03740 - 0.03937 in)

**Type of Shims ⑥ Applicable :**

0.1 mm (0.0039 in) P/N. 345-64081-0
 0.15 mm (0.0059 in) P/N. 345-64082-0
 0.3 mm (0.0118 in) P/N. 345-64083-0
 0.5 mm (0.0197 in) P/N. 345-64084-0

**Type of Shims ⑥ Applicable :**

0.1 mm (0.0039 in) P/N. 353-64081-0
 0.15 mm (0.0059 in) P/N. 353-64082-0
 0.3 mm (0.0118 in) P/N. 353-64083-0



Lower Unit

32) Measurement of Back Lash between Forward (A) and Pinion (B) Gears and Shim Selection

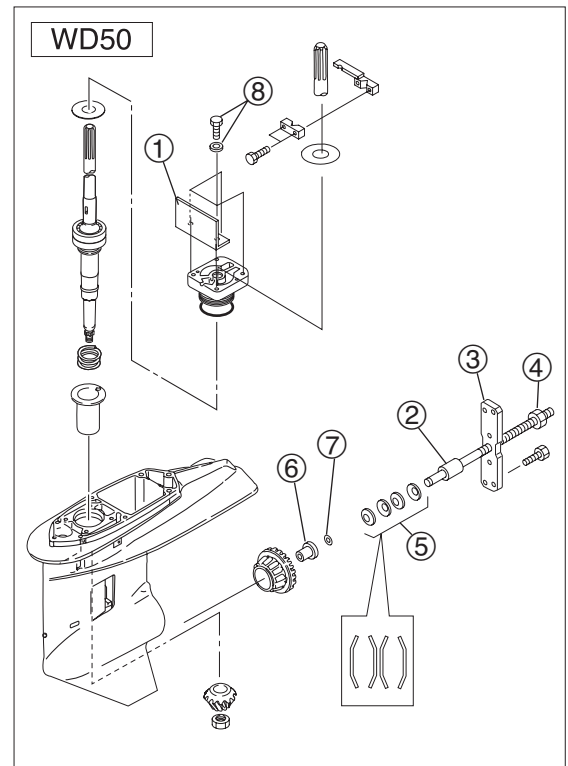
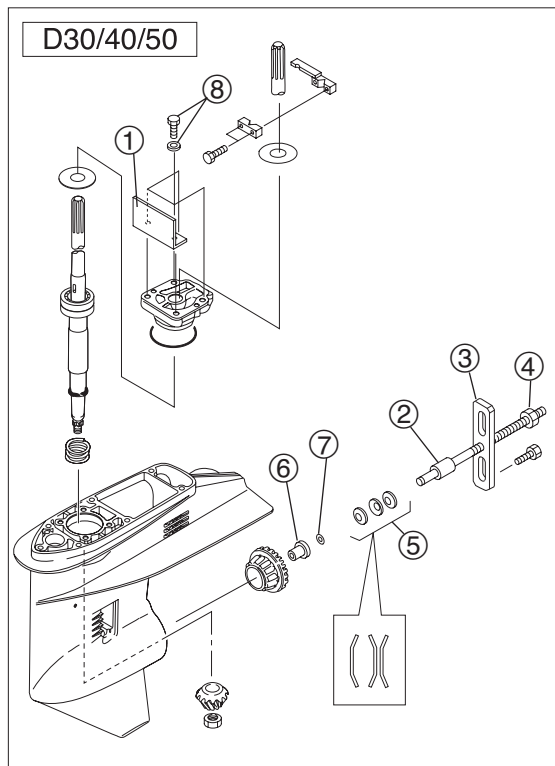
⚠ CAUTION

**Before measuring backlash between forward (A) and pinion (B) gears, measure pinion (B) gear height.
Refer to “Measurement of Pinion (B) Gear Height and Shim Selection” in Chapter 6.**

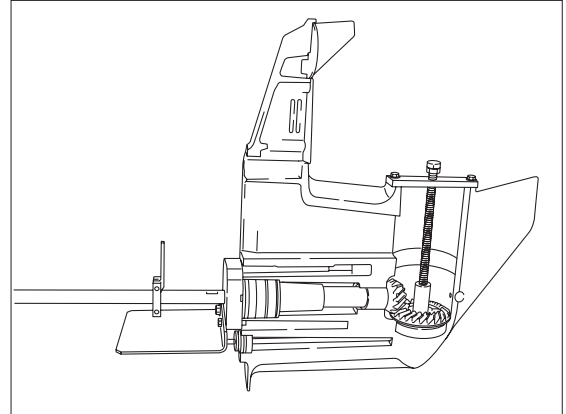
1. In accordance with procedure described in “Assembly of Lower Unit Parts” on Chapter 6, install parts up to pump case (lower).
2. Install dial gauge plate ① and secure it with bolt (M8-35) and flat washer ⑧.



M8 Bolt (L=35mm) +Flat Washer ⑧ :
13N · m (9.0 lb · ft) [1.3kgf · m]



3. Install backlash measuring tool parts ② to ⑦ and secure them with installation bolts (M8 L=30mm) ⑧.



D30/40/50



Dial Gauge Plate ① :

P/N. 3B7-72729-0

Backlash Measuring Tool Kit :

P/N. 3C8-72234-1

Backlash Measuring Tool Shaft ② :

P/N. 345-72723-0

Backlash Measuring Tool Plate ③ :

P/N. 3A3-72724-0

Nut ④ :

P/N. 930191-1000

Coned Disk Spring ⑤ :

P/N. 3B7-72734-0 (3pcs.)

Measuring Setting Piece ⑥ :

P/N. 353-72245-1

O Ring ⑦ :

P/N. 332-60002-0

WD50



Dial Gauge Plate ① :

P/N. 3B7-72729-0

Backlash Measuring Tool Kit :

P/N. 3B7-72234-0

Backlash Measuring Tool Shaft ② :

P/N. 3B7-72723-0

Backlash Measuring Tool Plate ③ :

P/N. 3B7-72724-0

Nut ④ :

P/N. 3B7-72735-0

Coned Disk Spring ⑤ :

P/N. 3B7-72734-0 (4pcs.)

Measuring Setting Piece ⑥ :

P/N. 3A3-72245-0

O Ring ⑦ :

P/N. 332-60002-0



- Fixing gear case on the holder with its propeller shaft opening facing upward makes the work easier.
- Be sure that cone discs ⑤ are arranged as illustrated. Put three of the parts aligned in the same direction, and then, put both sets of the parts with their convex sides face-to-face.

4. Tighten shaft ② until drive shaft ⑨ starts to move (rotate). When drive shaft starts to move, additionally tighten shaft ② 1/2 of a turn (180°).



- As an alternative to the above measuring tool, a tool used for pulling out the following propeller shaft housing can be used to secure forward gear (A) gear.
- When performing the work, assemble propeller shaft ass'y and housing ass'y and bolts to tighten to specified torque.



Propeller Shaft Housing Bolt ⑪ :

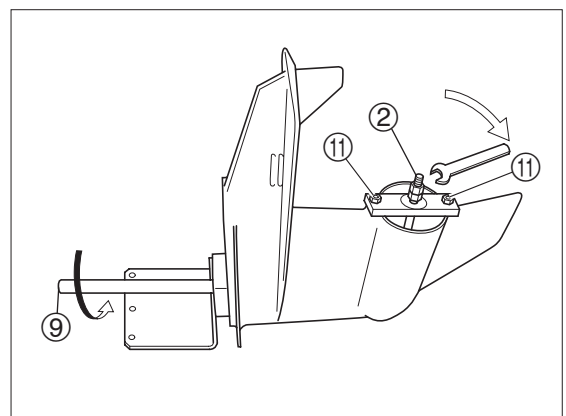
D30/40/50 : 6 N · m (4 lb · ft) [0.6 kgf · m]

WD50 : 13 N · m (9 lb · ft) [1.3 kgf · m]



Tightening Torque for Inspection ⑩ :

Tighten bolt gradually until propeller shaft stops to turn.





Lower Unit

5. Attach backlash measuring tool clamp ⑫ to drive shaft.
6. Turn drive shaft ⑨ clockwise / counterclockwise slowly while pulling it up, and read change of dial gauge ⑬ indication.



- When measuring, contact dial gauge tip to inside of V groove located in the clamp ass'y.
- Attach backlash measuring tool clamp ⑫ onto drive shaft so that the place near as possible to pump case.
- When pull up drive shaft, make sure to hold drive shaft that the place near as possible to pump case.



Backlash Measuring Tool Clamp ⑫ :

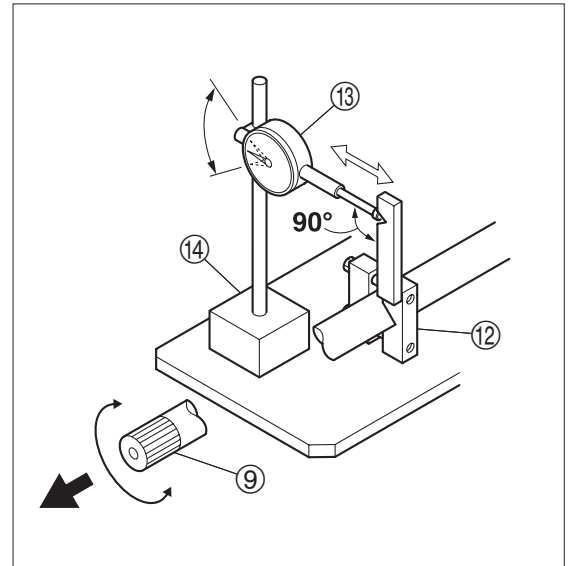
P/N. 3B7-72720-0

Dial Gauge ⑬ :

Commercially Available Item

Magnetic Stand ⑭ :

Commercially Available Item



7. Select proper thickness of shim based on the backlash measured with dial gauge and on the table shown.



- Confirm dial gauge reading and adjust backlash by using thickness of shim selected.
- Measure backlash several times while changing gear teeth contact position.
- When measuring backlash, make drive shaft pulling up force equal among the measurements.
- This work can be made easier when the opening of gear case of propeller shaft side is faced upward and fixed horizontally with a holder.

D30/40/50



Proper Backlash :

0.31 - 0.62 mm (0.0122 - 0.0244 in)

WD50



Proper Backlash :

0.29 - 0.58 mm (0.0114 - 0.0228 in)

D30/40/50

Dial Gauge Reading : mm (in)	Shim Thickness : mm (in) +means addition of shim/ -means removal of shim
0 00 ~ 0 16 (0 00 ~ 0 0063)	-0 10 (0 0039)
0 17 ~ 0 35 (0 0067 ~ 0 0138)	-0 05 (0 0019)
0 36 ~ 0 62 (0 0142 ~ 0 0244)	0 00
0 63 ~ 0 74 (0 0248 ~ 0 0291)	+0 05 (0 0019)
0 75 ~ 0 94 (0 0295 ~ 0 0370)	+0 10 (0 0039)
0 95 ~ 1 13 (0 0374 ~ 0 0445)	+0 15 (0 0059)
1 14 ~ 1 33 (0 0449 ~ 0 0524)	+0 20 (0 0078)
1 34 ~ 1 52 (0 0528 ~ 0 0598)	+0 25 (0 0098)
1 53 ~ 1 72 (0 0602 ~ 0 0677)	+0 30 (0 0118)
1 73 ~ 1 92 (0 0681 ~ 0 0756)	+0 35 (0 0137)
1 93 ~ 2 11 (0 0760 ~ 0 0831)	+0 40 (0 0157)
2 12 ~ 2 31 (0 0835 ~ 0 0909)	+0 45 (0 0177)
2 32 ~ 2 51 (0 0913 ~ 0 0988)	+0 50 (0 0196)

WD50

Dial Gauge Reading : mm (in)	Shim Thickness : mm (in) +means addition of shim/ -means removal of shim
0 00 ~ 0 18 (0 00 ~ 0 0071)	-0 10 (0 0039)
0 19 ~ 0 28 (0 0075 ~ 0 0110)	-0 05 (0 0019)
0 29 ~ 0 58 (0 0114 ~ 0 0228)	0 00
0 59 ~ 0 67 (0 0232 ~ 0 0264)	+0 05 (0 0019)
0 68 ~ 0 83 (0 0268 ~ 0 0327)	+0 10 (0 0039)
0 84 ~ 0 99 (0 0331 ~ 0 0390)	+0 15 (0 0059)
1 00 ~ 1 15 (0 0394 ~ 0 0453)	+0 20 (0 0078)
1 16 ~ 1 31 (0 0457 ~ 0 0516)	+0 25 (0 0098)
1 32 ~ 1 47 (0 0520 ~ 0 0579)	+0 30 (0 0118)
1 48 ~ 1 63 (0 0583 ~ 0 0642)	+0 35 (0 0137)
1 64 ~ 1 79 (0 0646 ~ 0 0705)	+0 40 (0 0157)
1 80 ~ 1 95 (0 0709 ~ 0 0768)	+0 45 (0 0177)
1 96 ~ 2 11 (0 0772 ~ 0 0831)	+0 50 (0 0196)

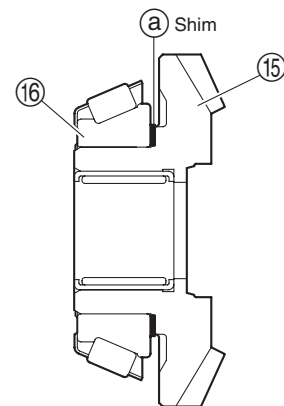
8. Add shim (a) into the gap between forward (A) gear (15) and taper roller bearing (16) if necessary.

CAUTION

For removal or installation of taper roller bearing, refer to;
“Disassembly of Forward (A) Gear”
or “Assembly of Forward (A) Gear”
respectively.

**Types of Shims (a) :**

Common select D30/40/50 and WD50
 0.1 mm (0.0039 in) P/N. 353-64038-0
 0.15 mm (0.0059 in) P/N. 353-64037
 0.3 mm (0.0118 in) P/N. 353-64036-0





Lower Unit

WD50 only

33) Measurement of Back Lash between Pinion (B) and Reverse (C) Gears and Shim Selection

⚠ CAUTION

Before measuring backlash between pinion (B) and reverse (C) gears, establish pinion (B) gear height.

Refer to “Measurement of Pinion (B) Gear Height and Shim Selection” in Chapter 6.

1. In accordance with procedure described in “Assembly of Lower Unit Parts” on Chapter 6, install parts up to pump case (lower).



Remove forward (A) gear before beginning the work.

2. Attach dial gauge plate ① and secure it using bolt (M8, L=35mm) ② and flat washer ②.
3. Attach backlash measuring tool kit parts ③ to ⑨ to propeller shaft housing ass'y ⑩, put the assembly in the gear case, and secure it using bolt (M8, L=30mm) ⑪ and flat washer ⑪. Make sure to locate center of propeller shaft housing ⑩ matches center of backlash measuring tool plate ⑦.



Backlash Measuring Tool Kit :

P/N. 3A3-72255-0

Backlash Measuring Tool Shaft ③ :

P/N. 3A3-72726-0

Measuring Tool Setting Piece ④ :

P/N. 3A3-72727-0

Washer ⑤ :

P/N. 940191-0800

Nut M8 ⑥ :

P/N. 930191-0800

Backlash Measuring Tool Plate ⑦ :

P/N. 353-72725-0

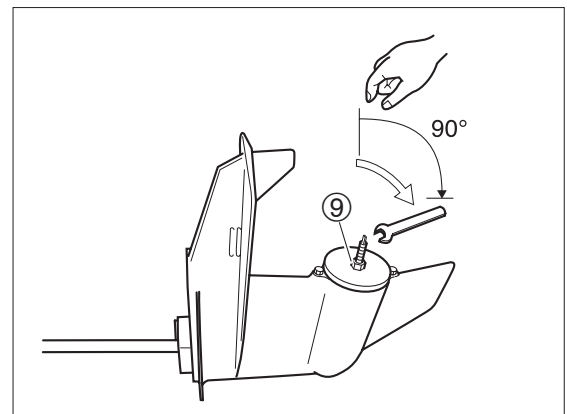
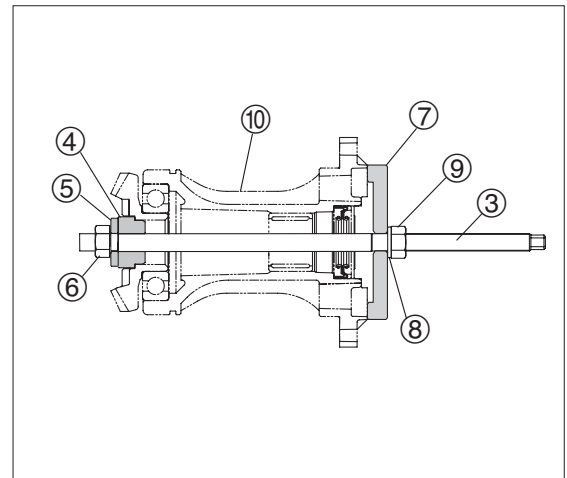
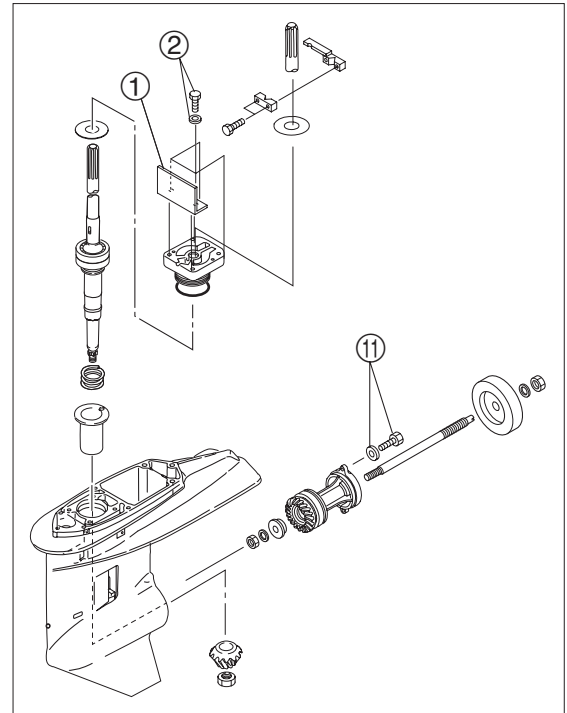
Washer ⑧ :

P/N. 940191-1000

Nut M10 ⑨ :

P/N. 930191-1000

4. Fix shaft ③ at the tip by using a tool, finger-tighten nut ⑨ until stop it, and then additionally tighten 1/4 of a turn (90°) by using a tool.



5. Attach backlash measuring tool clamp ⑫ to drive shaft.
6. Turn drive shaft ⑮ clockwise / counterclockwise slowly while pulling it up, and read change of dial gauge ⑬ indication.



When measuring, contact dial gauge tip to inside of V groove located in the clamp ass'y.



Backlash Measuring Tool Clamp ⑫ :

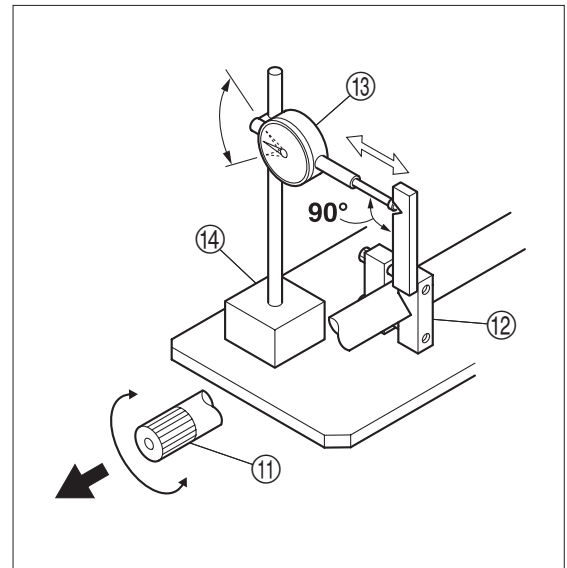
P/N. 3B7-72720-0

Dial Gauge ⑬ :

Commercially Available Item

Magnetic Stand ⑭ :

Commercially Available Item



7. Select shim thickness required based on the change of dial gauge indication and the table shown.



- Confirm dial gauge reading and adjust backlash by using thickness of shim selected.
- Measure backlash several times while changing gear teeth contact position.
- When measuring backlash, make drive shaft pulling up force equal among the measurements.
- This work can be made easier when the opening of gear case of propeller shaft side is faced upward and fixed horizontally with a holder.



Proper Backlash :

0.29 - 0.58 mm (0.0114 - 0.0228 in)

Dial Gauge Reading : mm (in)		Shim Thickness : mm (in) +means addition of shim/ -means removal of shim
0 00 ~ 0 18	(0 00 ~ 0 0071)	-0 10 (0 0039)
0 19 ~ 0 28	(0 0075 ~ 0 0110)	-0 05 (0 0019)
0 29 ~ 0 58	(0 0114 ~ 0 0228)	0 00
0 59 ~ 0 67	(0 0232 ~ 0 0264)	+0 05 (0 0019)
0 68 ~ 0 83	(0 0268 ~ 0 0327)	+0 10 (0 0039)
0 84 ~ 0 99	(0 0331 ~ 0 0390)	+0 15 (0 0059)
1 00 ~ 1 15	(0 0394 ~ 0 0453)	+0 20 (0 0078)
1 16 ~ 1 31	(0 0457 ~ 0 0516)	+0 25 (0 0098)
1 32 ~ 1 47	(0 0520 ~ 0 0579)	+0 30 (0 0118)
1 48 ~ 1 63	(0 0583 ~ 0 0642)	+0 35 (0 0137)
1 64 ~ 1 79	(0 0646 ~ 0 0705)	+0 40 (0 0157)
1 80 ~ 1 95	(0 0709 ~ 0 0768)	+0 45 (0 0177)
1 96 ~ 2 11	(0 0772 ~ 0 0831)	+0 50 (0 0196)

8. Add shim(s) into gap ⑬ between reverse (C) gear ⑮ and bearing ⑯ if necessary.

CAUTION

For removal or installation of reverse (C) gear, refer to;

“Disassembly of Propeller Shaft Housing Ass’y” or “Assembly of Lower Unit” in Chapter 6 respectively.

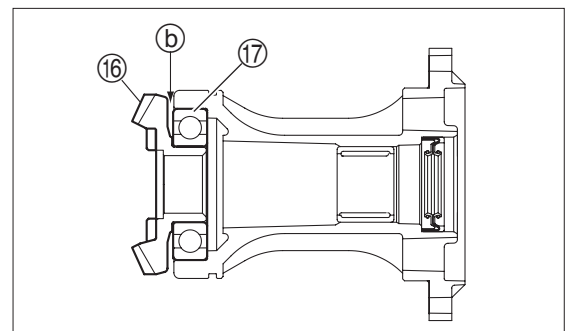


Type of Shims :

0.1 mm (0.0039 in) P/N. 353-64038-0

0.15 mm (0.0059 in) P/N. 353-64037-0

0.3 mm (0.0118 in) P/N. 353-64036-0

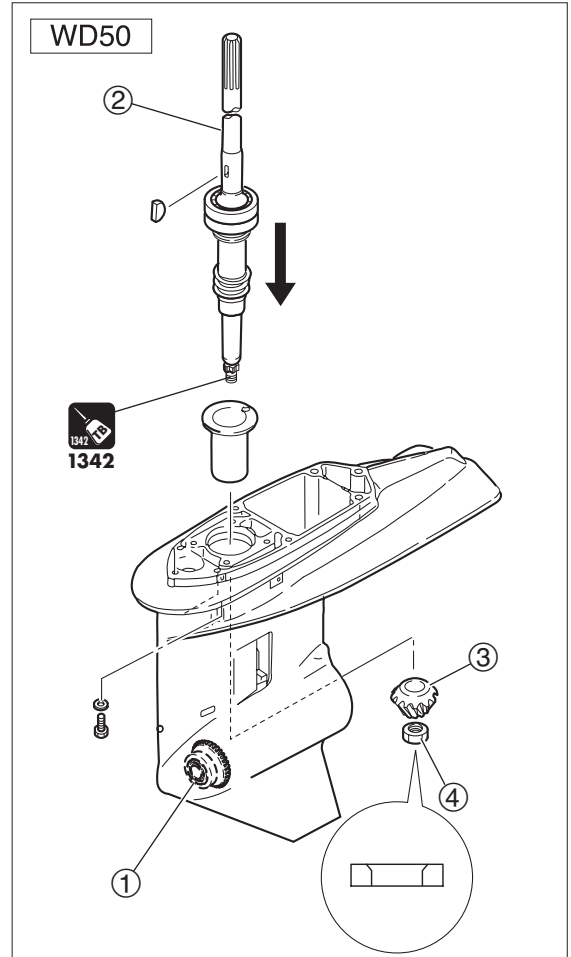
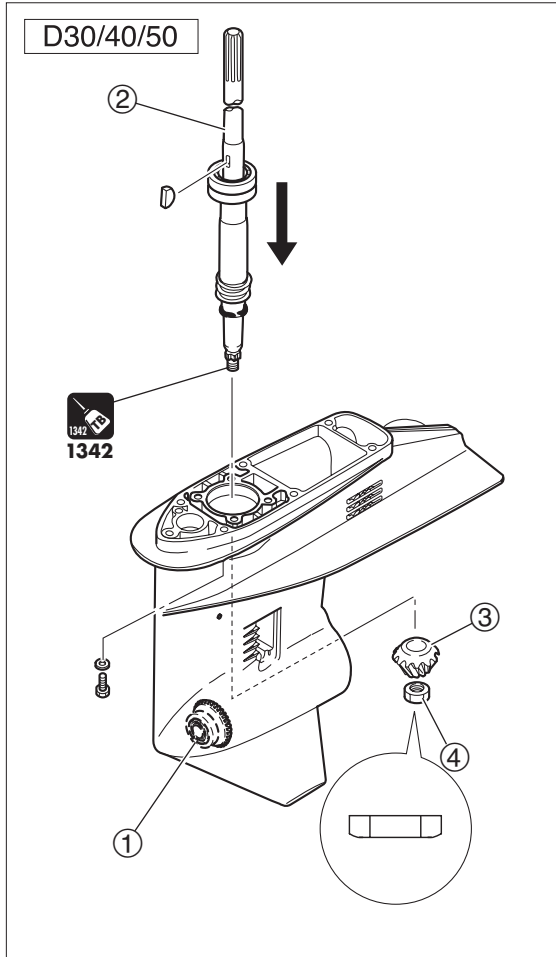




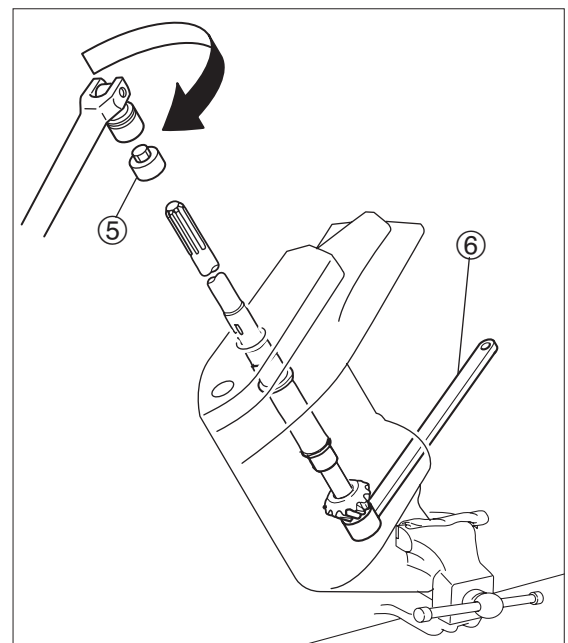
Lower Unit

34) Assembly of Lower Unit Parts

1. After installing forward (A) gear with taper roller bearing ①, install drive shaft ass'y ②, pinion (B) gear ③ and pinion (B) gear nut ④, and tighten the nut to specified torque.



- Tighten the nut by using a drive shaft socket ⑤ and a wrench and turning the wrench clockwise. Cover the wrench ⑥ with rag to prevent it from hitting the case directly.
- This work can be made easier when the opening of gear housing of propeller shaft side is faced upward and fixed horizontally with a holder.
- Before tightening pinion (B) gear and nut, apply ThreeBond 1342 to the thread.
- Degrease taper area of drive shaft pinion (C) gear installation section and thread of gear nut completely.



D30/40/50**Bevel Gear B Nut Wrench ⑥ :**

P/N. 346-72231-0

Bevel Gear Nut Socket ⑤ :

P/N. 346-72232-0

**Pinion (B) Gear Nut ④ :**

53 N · m (39 lb · ft) [5.3 kgf · m]

WD50**Bevel Gear B Nut Wrench ⑥ :**

P/N. 353-72231-0

Bevel Gear Nut Socket ⑤ :

P/N. 346-72232-0

35) Assembly of Pump Case

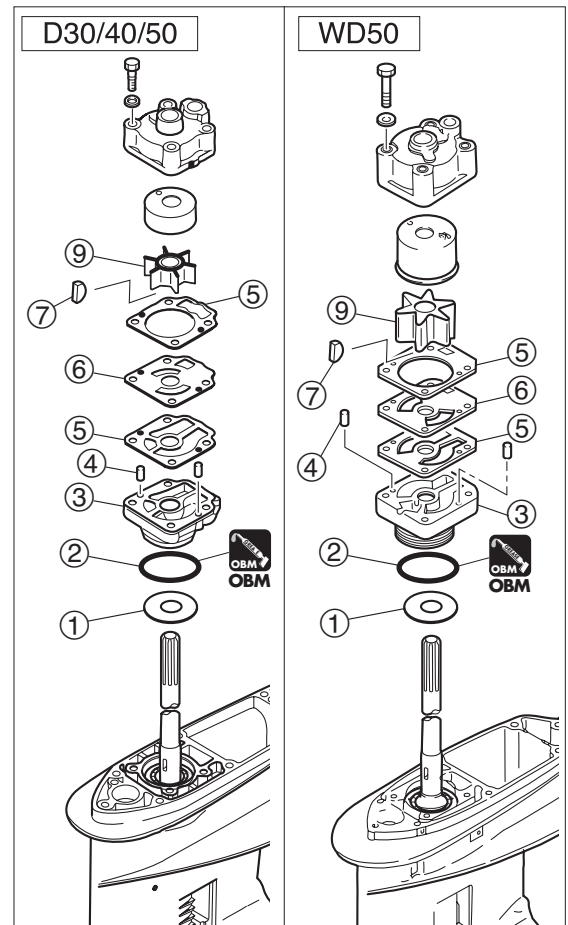
1. Attach shim ① that is removed when disassembly.
2. Attach O ring ② to pump case (lower) ③ and install pump case (lower) to gear case.



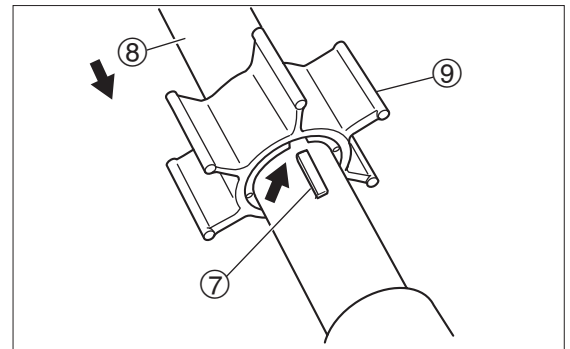
Apply OBM grease to O ring and oil seal rip.

**OBM**

3. Put dowel pin ④ on the pump case (lower) ③, and attach pump case guide plate gasket ⑤ and pump case guide plate ⑥.



4. Attach water pump impeller key ⑦ to drive shaft ⑧, align the key with the water pump impeller ⑨ side key groove, and install the impeller.





Lower Unit

- Attach water pump liner ⑩ to pump case (upper) ⑪.

CAUTION

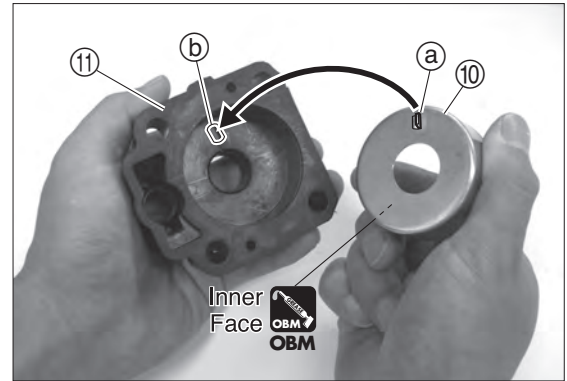
Align pump liner ⑩ protrusion a with pump case (upper) ⑪ concave b.



Apply OBM grease to inside of water pump liner.



OBM



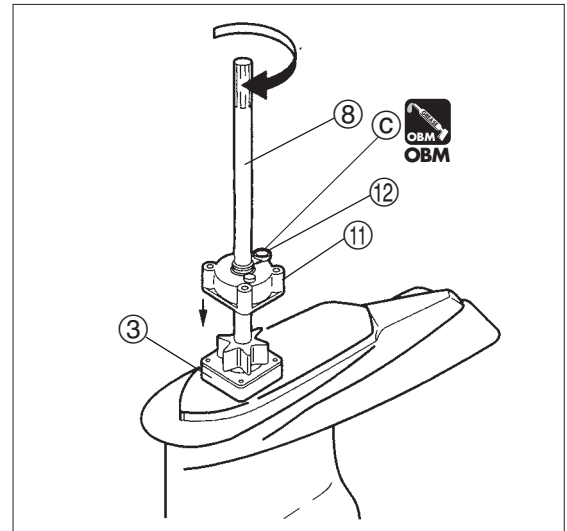
- Put pump case (upper) ⑪ and gasket (2 pcs.) on the drive shaft, and install them on the pump case (lower) ③.

CAUTION

While installing pump case ⑪, turn drive shaft ⑧ clockwise to bend all impeller blades in counterclockwise on power unit direction.



OBM



- Attach water pipe seal ⑫ (RP).



Apply OBM grease thinly on the inside ③ of water pipe seal so that water pipe can be inserted smoothly.

36) Attaching Clutch Cam Ass'y

- Install clutch cam ass'y ①.

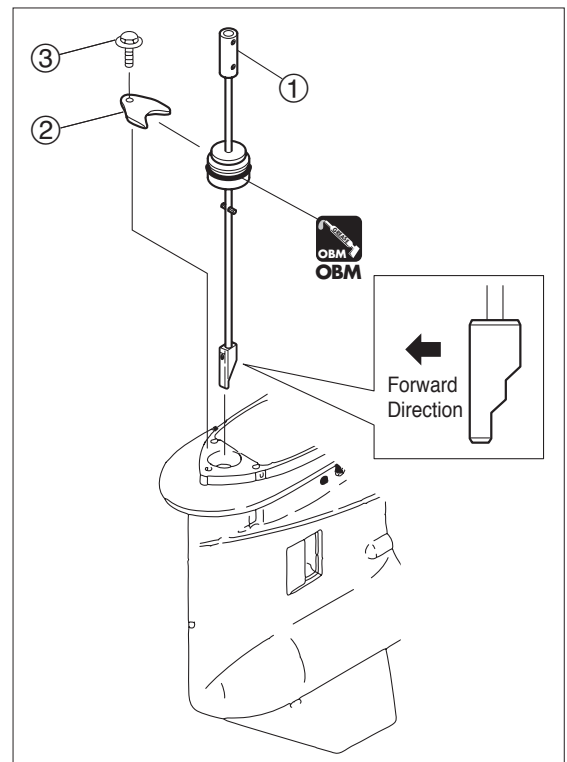


Apply OBM grease to O ring of clutch cam ass'y, and install the assembly by pushing cam rod bushing into gear case. Be careful of direction of clutch cam.



OBM

- Attach stopper ② and bolt ③.



37) Installing Propeller Shaft Housing Ass'y

1. Attach O ring ② to propeller shaft housing ①.

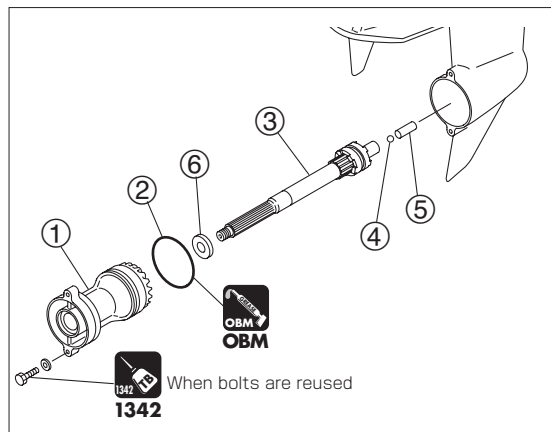


Apply OBM grease to O ring.

2. Attach steel ball ④, clutch push rod ⑤ and washer ⑥ that was removed when disassembling to propeller shaft ③.
3. Install propeller shaft ③ to propeller shaft housing ①, and install the assembly to gear case.



- Install propeller shaft housing to gear case securely, and tighten the securing bolts after confirming that O ring is set in the case properly.
- Apply ThreeBond 1342 to thread of propeller shaft housing installation bolts.



② O Ring Do not reuse.

D30/40/50



Propeller Shaft Housing Bolts :
6 N · m (4 lb · ft) [0.6 kgf · m]



1342

WD50



Propeller Shaft Housing Bolts :
13 N · m (9 lb · ft) [1.3 kgf · m]

WD50 only

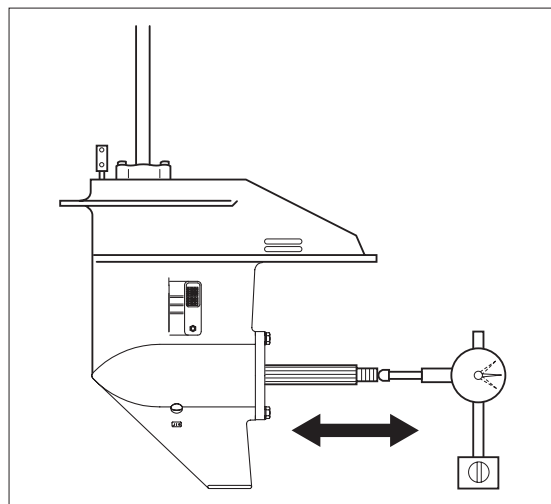
38) Measurement of Propeller Shaft Play and Selection of Washer Thickness

CAUTION

Before measuring propeller shaft play, adjust backlash between forward (A) and pinion (B) gears and reverse (C) and pinion (B) gears.

Refer to “Measurement of Backlash between Forward (A) and Pinion (B) Gears and Shim Selection” and “Measurement of Backlash between Pinion (B) and Reverse (C) Gears and Shim Selection” in Chapter 6.

1. Assemble lower unit parts in accordance with procedure described in “Assembly of Lower Unit Parts” on Chapter 6.
2. Measure play of propeller shaft in forward and reverse directions.





Lower Unit

3. Select washer ① thickness so that the play is within the specified range.



Specified Value of Play :

0.2 - 0.4 mm (0.0078 - 0.0157 in)



Type of Washers :

3.0 mm (0.118 in) P/N. 353-64032-0

2.75 mm (0.1083 in) P/N. 353-64034-0

2.5 mm (0.0984 in) P/N. 353-64035-0

4. Replace washer ① between propeller shaft ② and reverse (C) gear ③ if necessary.



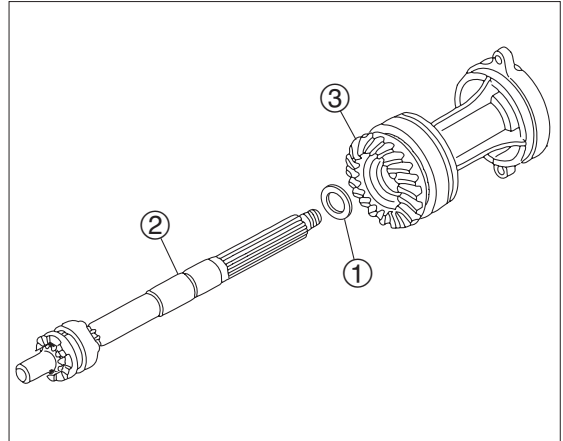
CAUTION

For removal or installation of propeller shaft housing, refer to;

“Removing Propeller Shaft” and “Assembling Lower Unit Parts” in Chapter 6.



Play of propeller shaft in forward-reverse direction out of the specified range can cause revolution of propeller even in neutral gear while engine is operating.



39) Installation of Lower Unit

1. Tilt-up outboard motor and lock with tilt stopper.
2. Set shift rod ① to up position.



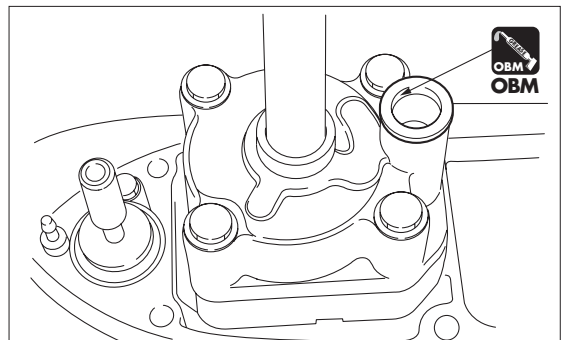
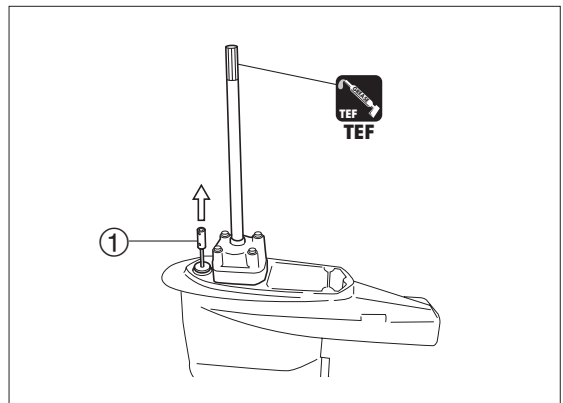
- Apply thin coat of OBM grease to spline of drive shaft before assembling.
- Apply thin coat of OBM grease to water pipe seal rubber.
- Lower unit installation can be made easier with the outboard motor tilted up.
- When installing the lower unit, insert water pipe into seal rubber properly.



TEF



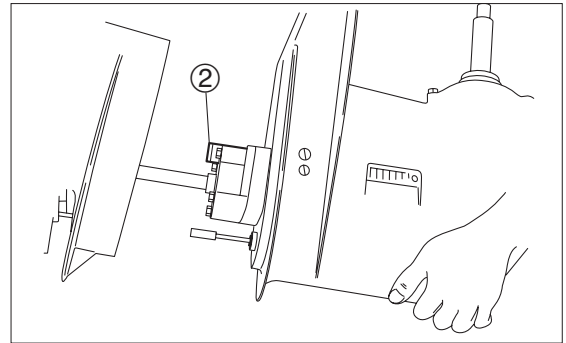
OBM



3. Put lower unit ass'y into drive shaft housing.
Connect and align positions of water pipe and water pipe seal ②.



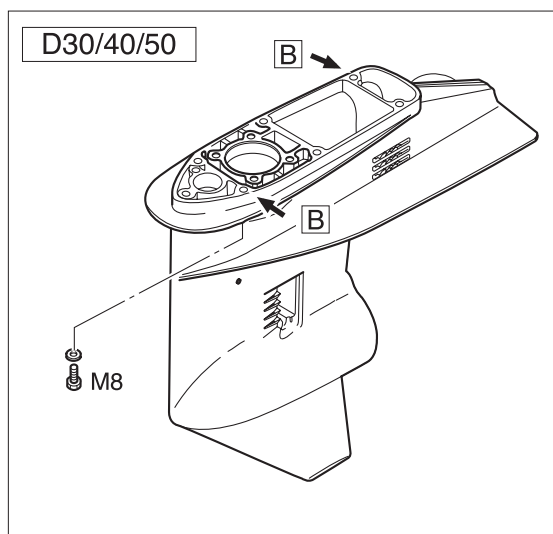
Move flywheel clockwise if necessary to align crank splines.



4. Tighten lower unit ass'y installation bolts and nut to specified torque.

CAUTION

To make centering of lower unit ass'y to drive shaft housing, attach bolts to two locations **B marked on the lower unit ass'y first. After all bolts are attached, tighten the two bolts first.**



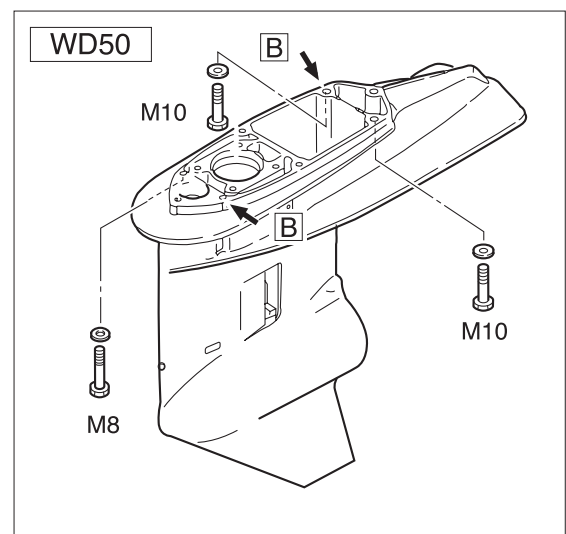
M8 6pcs



20N · m (14 lb · ft) [2.0kgf · m]



1342



M8 4pcs
M10 2pcs



M8 :
20N · m (14 lb · ft) [2.0kgf · m]

M10 :
40N · m (29 lb · ft) [4.0kg · m]



1342



Lower Unit

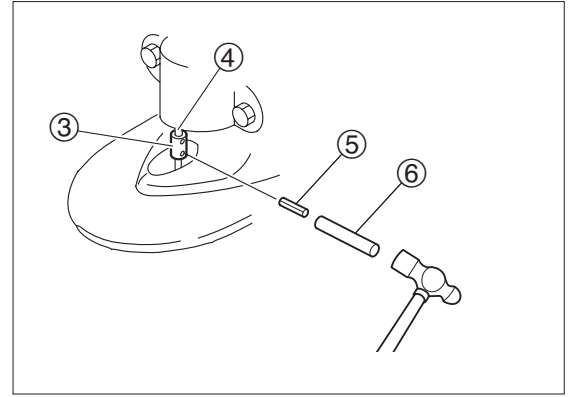
- Connect shift rod joint ③ and shift rod ④, and drive in spring pin ⑤.



- Do not reuse spring pin.
- Replace with new one when removed.



Spring Pin Tool B ⑥ : (ø3.0)
P/N. 345-72228-0



⑤ Spring Pin **Do not reuse.**

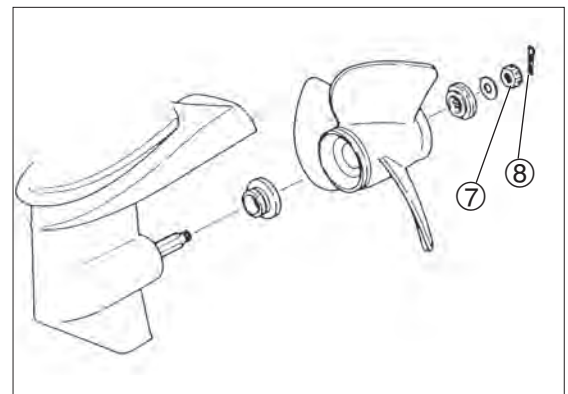
- Attach propeller and tighten propeller nut ⑦ to specified torque.

CAUTION

- Before removing or installing propeller, be sure to remove stop switch lock plate.
- When removing or installing propeller, do not handle propeller with bare hands.
- Put a piece of wooden block between anti-ventilation plate and propeller to prevent rotation of propeller when removing or installing propeller.



Propeller Nut ⑦ :
35 N · m (25 lb · ft) [3.5 kgf · m]

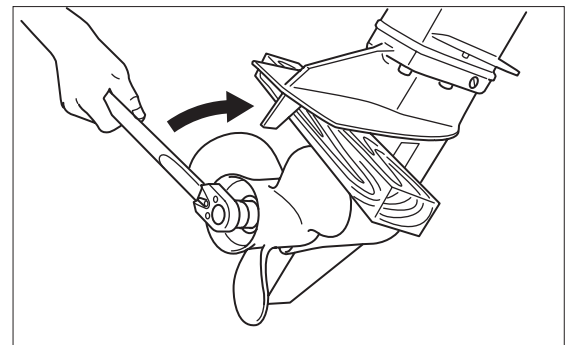


⑧ Split Pin **Do not reuse.**

- Attach split pin ⑧.

CAUTION

If propeller shaft pin hole and propeller nut pin groove do not align, additionally tighten the nut until they align.



- Fill gear case with gear oil to specified level.
Refer to "Replacement of Gear Oil" in Chapter 3.



Perform "Inspection of Gear Case (Air Leakage)" in Chapter 3 if necessary.

7

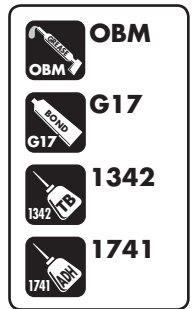
Cowl, Bracket and PTT Unit



1. Parts Layout	7-2	13) Remov ng PTT Un t/	
Dr ve Shaft Hous ng	7-2	Gas Shock Absorber	7-35
Bracket Power Tr m and T t.....	7-4	14) D sassem ng C amp Bracket	7-36
Power Tr m And T t	7-6	15) Assemb ng C amp Bracket	7-37
Bracket Manua T t	7-8	16) D sassem ng t t mechan sm	7-38
Manua T t	7-10	17) Assemb ng t t mechan sm	7-39
T er Hand e (F Type)	7-12	18) Remov ng PTT Motor.....	7-40
Bottom Cow (Motor Cover Lower)	7-14	19) D sassem ng PTT Motor.....	7-41
Sh ft	7-16	20) Inspect on of PTT Motor	7-42
Sw tch Box (F type)	7-18	21) Assemb ng PTT Motor Parts	7-43
Top Cow (Motor Cover Upper)	7-19	22) Remov ng PTT Pump	
2. Inspection Items	7-20	and Va ves	7-43
1) Inspect on of Thrott e Cab e	7-20	23) Inspect on of PTT Pump	
2) Remov ng of T er Hand e	7-20	and Va ves	7-44
3) Insta at on of T er Hand e	7-22	24) Remov ng Reserver Tank	7-44
4) Remov ng Bottom Cow	7-24	25) Inspect on of T t Cy nder and	
5) Remov ng Dr ve Shaft Hous ng	7-25	Reserve Tank	7-45
6) D sassem y of		26) Insta at on of T er Hand e	7-45
Dr ve Shaft Hous ng	7-26	27) Insta at on of PTT Pump	
7) Inspect on of Dr ve Shaft Hous ng ...	7-27	and Motor	7-46
8) Assemb y of Dr ve Shaft		28) A r-Purg ng PTT Un t	
Hous ng Parts	7-28	(separated from outboard motor) ...	7-47
9) Assemb ng Rubber Mount ng	7-31	29) Insta at on of PTT Un t/	
10) Assemb ng Extens on Hous ng ...	7-32	Gas Shock Absorber	7-49
11) Remov ng Steer ng Shaft Arm	7-33	30) A r-Purg ng PTT Un t	
12) Insta ng Steer ng Shaft.....	7-34	(nsta ed on the outboard motor) ...	7-50



Drive Shaft Housing

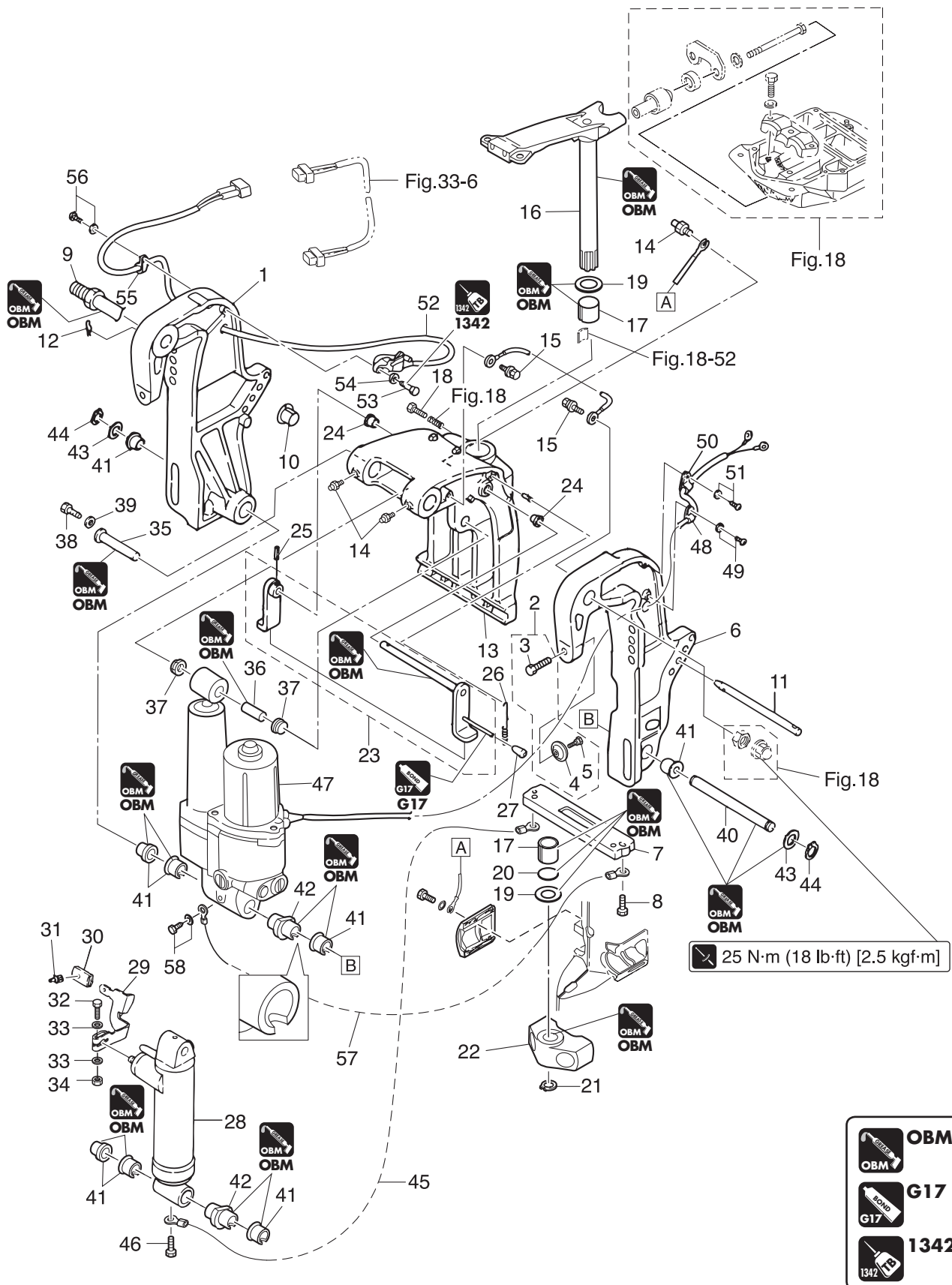


Ref. No.	Description	Q'ty	Remarks
1	Eng ne Basement	1	
2	Exhaust P ug	1	
3	Eng ne Basement Gasket	1	Do not reuse.
4	Eng ne Basement Sea	1	Do not reuse.
5	Bo t	4	M6 L=25mm
6	Dowe P n 6-12	4	
7	Exhaust P pe	1	
8	Bo t	3	
9	Exhaust P pe Gasket	1	
10-1	Dr ve Shaft Hous ng (S)	1	for Transom "S"
10-2	Dr ve Shaft Hous ng (L)	1	for Transom "L" / "UL"
11	Dr ve Shaft Hous ng Gasket	1	
12	Bo t	6	M8 L=80mm
13	Washer	6	M8
14	Extens on Hous ng	1	for Transom "UL"
15	Bo t	6	for Transom "UL" M8 L=35mm
16	Extens on Hous ng Ass y (UL)	1	for WD50 (B g Foot)
17	Stud Bo t	6	for WD50 (B g Foot) M8 L=25mm
18	Nut	6	for WD50 (B g Foot)
19	Washer	6	for WD50 (B g Foot)
20-1	Water P pe Aux ary Mount	1	for Transom "S" "L"
20-2	Water P pe Aux ary Mount	1	for Transom "UL" Water P pe Lock ng Rubber
21	Cam Rod Ho der	1	for Transom "UL"
22	Stopper Dr ve Shaft Hous ng	1	for Transom "UL"
23	Bo t	1	for Transom "UL" M6 L=12mm
24	Exhaust Hous ng	1	
25	Grommet Exhaust Hous ng	1	
26	Bo t	4	
27	Exhaust Hous ng Gasket	1	Do not reuse.
28	Apron	1	
29	Grommet Sp ash Pan	1	
30	Sea Rubber Sp ash Pan	1	
31	Screw	1	M5 L=40mm
32	Ny on Nut	1	M5



Cowl, Bracket and PTT Unit

Bracket Power Trim and Tilt



Ref. No.	Description	Q'ty	Remarks
1	C amp Bracket (PTT-R)	1	Stern Bracket (R) Starboard
2	C amp Screw K t	1	
3	C amp Screw (PTT)	1	
4	C amp Screw Pad	1	
5	Shou der Bo t	1	
6	C amp Bracket (PTT-L)	1	Stern Bracket (L) Port
7	Anode Stern Bracket	1	
8	Bo t	2	M6 L=30mm
9	Sw ve Bracket Shaft Ass y	1	Bracket Bo t
10	Bush ng Bracket Bo t	2	
11	PTT Thrust Rod	1	
12	Snap P n	1	
13	Sw ve Bracket Ass y (PTT)	1	
14	Grease F tting	3	
15	Bo t	1	M6 L=12mm
16	Steer ng Shaft Ass y	1	
17	Bush ng Bracket Shaft	2	
18	Bo t	1	M8 L=30mm
19	Thrust P ate (Upper)	2	
20	O-R ng Bracket Shaft 3.5-29.7	1	
21	C-R ng d=28	1	
22	Mount Bracket	1	Do not reuse.
23	T t Stopper Ass y	1	
24	Co ar 10.2-12-12	2	
25	Spr ng P n	1	
26	T t Stopper Spr ng	1	
27	T t Stopper Gr p	1	
28	Gas Shock Absorber	1	for Gas Ass st Mode
29	Reverse Lock Lever	1	for Gas Ass st Mode
30	Reverse Lock Lever Gr p	1	for Gas Ass st Mode
31	Stopper Reverse Lock Lever Gr p	1	for Gas Ass st Mode
32	Bo t	1	for Gas Ass st Mode
33	Washer	1	for Gas Ass st Mode M6
34	Nut	1	for Gas Ass st Mode M6
35	Cy nder P n (Upper)	1	
36	Bush ng 13-16-40	1	
37	Bush ng 13-17-19.5	2	
38	Bo t	1	M6 L=12mm
39	Washer 6.5-23-1.5	1	
40	Cy nder P n (Lower)	1	
41	Bush ng 18-24-22	5	
42	Bush ng 18-24-60	1	
43	Washer 18.2-34-1	2	
44	C-R ng d=18	2	
45	Earth W re (Ground)	1	for Gas Ass st Mode
46	Bo t	1	for Gas Ass st Mode M6 L=8mm
47	PTT Ass y	1	for PTT Mode
48	C amp 6-9.5L	1	for PTT Mode
49	Screw	1	for PTT Mode M6 L=12mm
50	C amp 6.5-14	1	for PTT Mode
51	Screw	1	for PTT Mode M6 L=12mm
52	Tr m Sensor L=1700	1	for PTT Mode
53	Bo t	2	for "P" Type M6 L=20mm
54	Washer 6-16-1.5	2	for "P" Type
55	C amp 6-9.5L	1	for "P" Type
56	Screw	1	for "P" Type M6 L=12mm
57	Ground (Earth W re) L=130	1	PTT Ass y – Anode Stern Bracket
58	Bo t	1	for PTT Mode M6 L=12mm

[illegible]

Ref. No.	Description	Q'ty	Remarks
1	Motor Ass y	1	
2	Armature Ass y	1	
3	Motor Bracket Ass y	1	
4	Breaker	1	
5	O-R ng 2-55.5	1	Do not reuse.
6	Screw	3	M5 L=20mm
7	Coup ng Pump	1	
8	O-R ng 1.8-69.6	1	Do not reuse.
9	Screw	4	
10	Va ve Ass y	1	
11	Re ef Va ve Ass y	1	
12	Pump	1	
13	Bo t	2	
14	Bo t	1	
15	O-R ng 1.5-6.5	2	Do not reuse.
16	F ter	1	
17	Reserve Tank	1	
18	Bo t	4	
19	Cap Ass y (W/O-R ng)	1	
20	Manua Va ve Ass y (W/O-R ng × 2)	1	
21	Sea Washer	1	
22	C-R ng	1	
23	Jo nt Meta	1	
24	PTT O-R ng Set	1	Do not reuse.



32 N·m (23 lb·ft) [3.2 kgf·m]

25 N·m (18 lb·ft) [2.5 kgf·m]

Fig.20-14

42 N·m (31 lb·ft) [4.2 kgf·m]

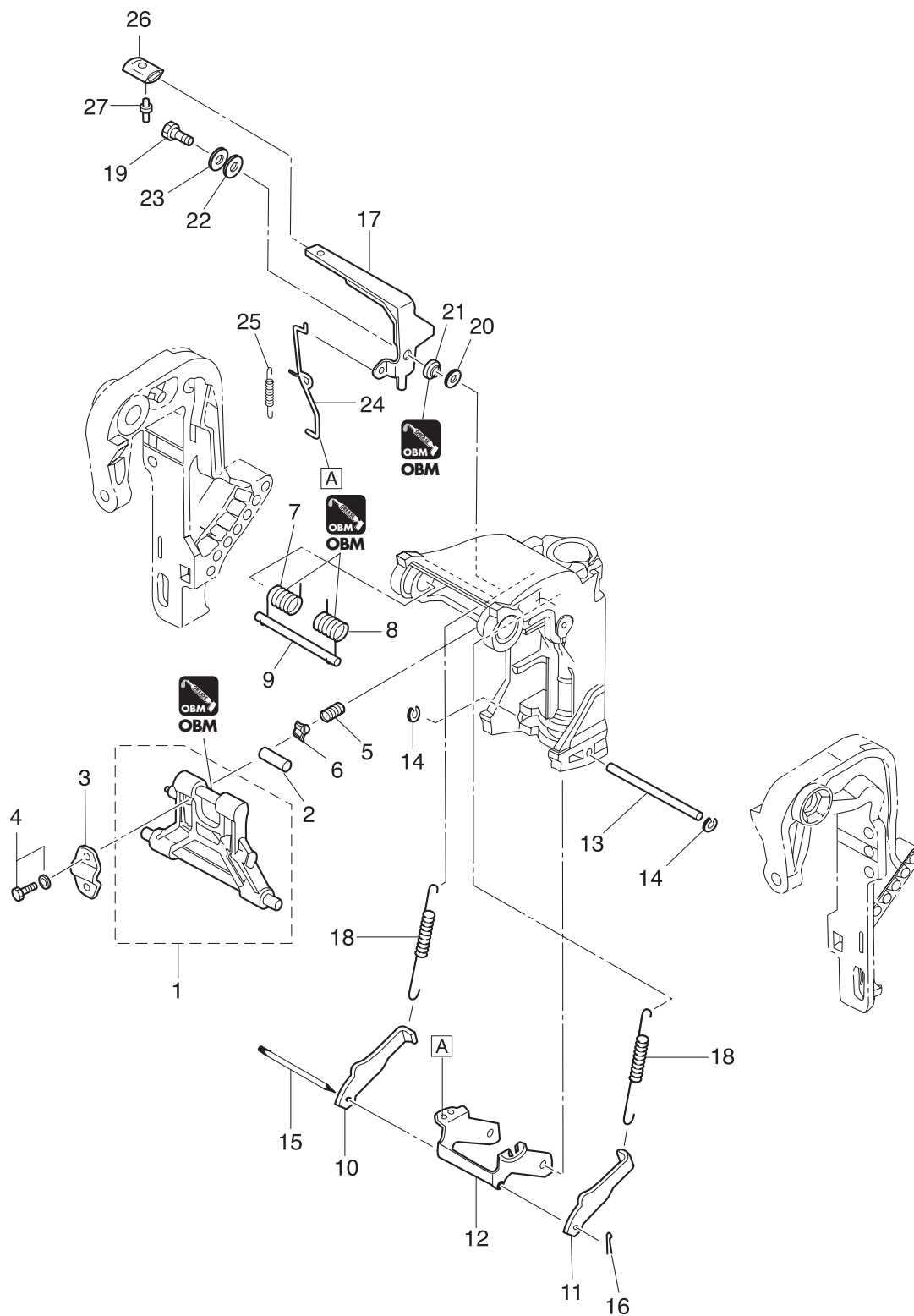
The diagram is an exploded view of a mechanical assembly, likely a vehicle's suspension or steering component. It shows various parts numbered 1 through 54. Key components include a main housing (1), a control arm (2), a ball joint (3), a tie rod end (4), a steering knuckle (5), a lower control arm (6), a steering knuckle (7), a steering knuckle (8), a steering knuckle (9), a steering knuckle (10), a steering knuckle (11), a steering knuckle (12), a steering knuckle (13), a steering knuckle (14), a steering knuckle (15), a steering knuckle (16), a steering knuckle (17), a steering knuckle (18), a steering knuckle (19), a steering knuckle (20), a steering knuckle (21), a steering knuckle (22), a steering knuckle (23), a steering knuckle (24), a steering knuckle (25), a steering knuckle (26), a steering knuckle (27), a steering knuckle (28), a steering knuckle (29), a steering knuckle (30), a steering knuckle (31), a steering knuckle (32), a steering knuckle (33), a steering knuckle (34), a steering knuckle (35), a steering knuckle (36), a steering knuckle (37), a steering knuckle (38), a steering knuckle (39), a steering knuckle (40), a steering knuckle (41), a steering knuckle (42), a steering knuckle (43), a steering knuckle (44), a steering knuckle (45), a steering knuckle (46), a steering knuckle (47), a steering knuckle (48), a steering knuckle (49), a steering knuckle (50), a steering knuckle (51), a steering knuckle (52), a steering knuckle (53), a steering knuckle (54). Torque specifications are provided for several assembly points: 32 N·m (23 lb·ft) [3.2 kgf·m] for the top right, 25 N·m (18 lb·ft) [2.5 kgf·m] for the middle left, and 42 N·m (31 lb·ft) [4.2 kgf·m] for the bottom center. The diagram also includes a reference to 'Fig.20-14' and an 'OBM' logo.

Ref. No.	Description	Q'ty	Remarks
1	C amp Bracket (R)	1	Stern Bracket (R ght) Starboard
2	C amp Screw K t	1	
3	C amp Screw	1	
4	C amp Screw Hand e	1	
5	R vet 3-22	1	
6	C amp Screw Pad	1	
7	Shou der Bo t	1	
8	C amp Bracket (L)	1	Stern Bracket (Left) Port
9	Sw ve Bracket Shaft Ass y	1	Bracket Bo t
10	Ny on Nut 7/8	1	
11	Bush ng 26-32	2	
12	Bush ng 22-25-35.5	1	
13	Cap Nut Bracket Bo t	2	for "F" Type F g20 "P" Type
14	D stance P ece	1	
15	Nut	1	M8
16	Washer	1	M8
17	Bo t 8-170	1	
18	Thrust Rod	1	
19	Thrust Rod Spr ng	1	
20	Sw ve Bracket	1	
21	Steer ng Shaft Ass y	1	
22	Bush ng 26-32	2	
23	Thrust P ate (Upper)	1	
24	Thrust P ate (Lower)	1	
25	O-R ng 3.5-25.7	1	Do not reuse.
26	C-R ng d=25	1	
27	Washer	1	M6
28	Rubber Mount (Lower)	2	
29	Mount Bracket	1	
30	Damper (Lower)	1	
31	Bo t Lower Mount Rubber	2	
32	Washer 13-34-3	2	
33	Damper Rubber	2	
34	Ny on Nut	2	
35	Washer	4	M12
36	Mount Ho d ng P ate (Lower)	2	Rubber Mount Cap (Lower)
37	Bo t	4	M6 L=20mm
38	Anode	1	
39	Bo t	1	M6 L=35mm
40	Rubber Mount (Upper)	2	
41	Bo t	2	
42	Damper (Upper)	2	
43	Washer	2	
44	Lock P ate Upper	1	
45	Mount Ho d ng P ate (Upper)	1	Rubber Mount Cap (Upper)
46	Bo t	3	M8 L=35mm
47	Earth W re (Ground) L=210	1	
48	Earth W re (Ground) L=130	1	
49	Bo t	2	M6 L=12mm
50	Earth W re (Ground) L=110	1	
51	Bo t	1	M6 L=12mm
52	Fr ct on P ece	1	
53	Fr ct on Spr ng	1	
54	Bo t	1	M8 L=30mm



Cowl, Bracket and PTT Unit

Manual Tilt

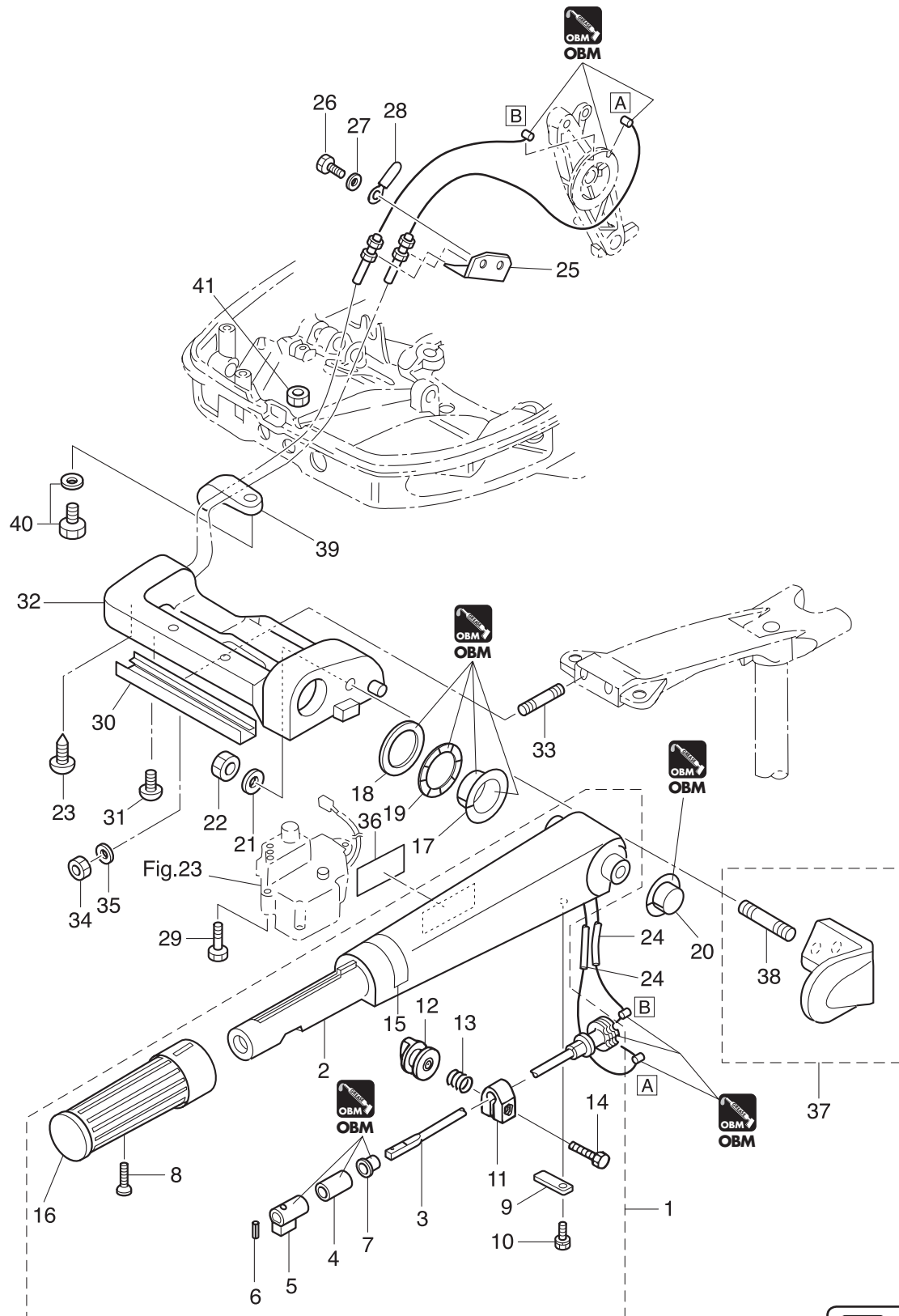


Ref. No.	Description	Q'ty	Remarks
1	T t Stopper Ass'y	1	
2	Bush ng 10.2-12-29.5	1	
3	Sett ng P ate	1	
4	Bo t	2	M8 L=20mm
5	Fr ct on Spr ng	1	
6	Sett ng P ece T t Stopper	1	
7	T t Ass stant Spr ng (R)	1	
8	T t Ass stant Spr ng (L)	1	
9	T t Ass stant Shaft	1	
10	Reverse Lock (L)	1	
11	Reverse Lock (R)	1	
12	Reverse Lock Arm	1	
13	Reverse Lock Shaft	1	
14	E-R ng d=6	2	
15	Reverse Lock Rod	1	
16	Sp t P n	1	
17	T t Stopper Lever	1	
18-1	Reverse Lock Spr ng (L)	2	for Transom "L"
18-2	Reverse Lock Spr ng (S)	2	for Transom "S"
19	Shou der Bo t 6-8	1	
20	Washer 6-16-1.5	1	
21	Bush ng	1	
22	Washer 8.5-18-1.6	1	
23	Washer	1	M8
24	L nk B	1	
25	Spr ng B	1	
26	Reverse Lock Lever Gr p	1	
27	Stopper Reverse Lock Lever Gr p	1	



Cowl, Bracket and PTT Unit

Tiller Handle (F Type)

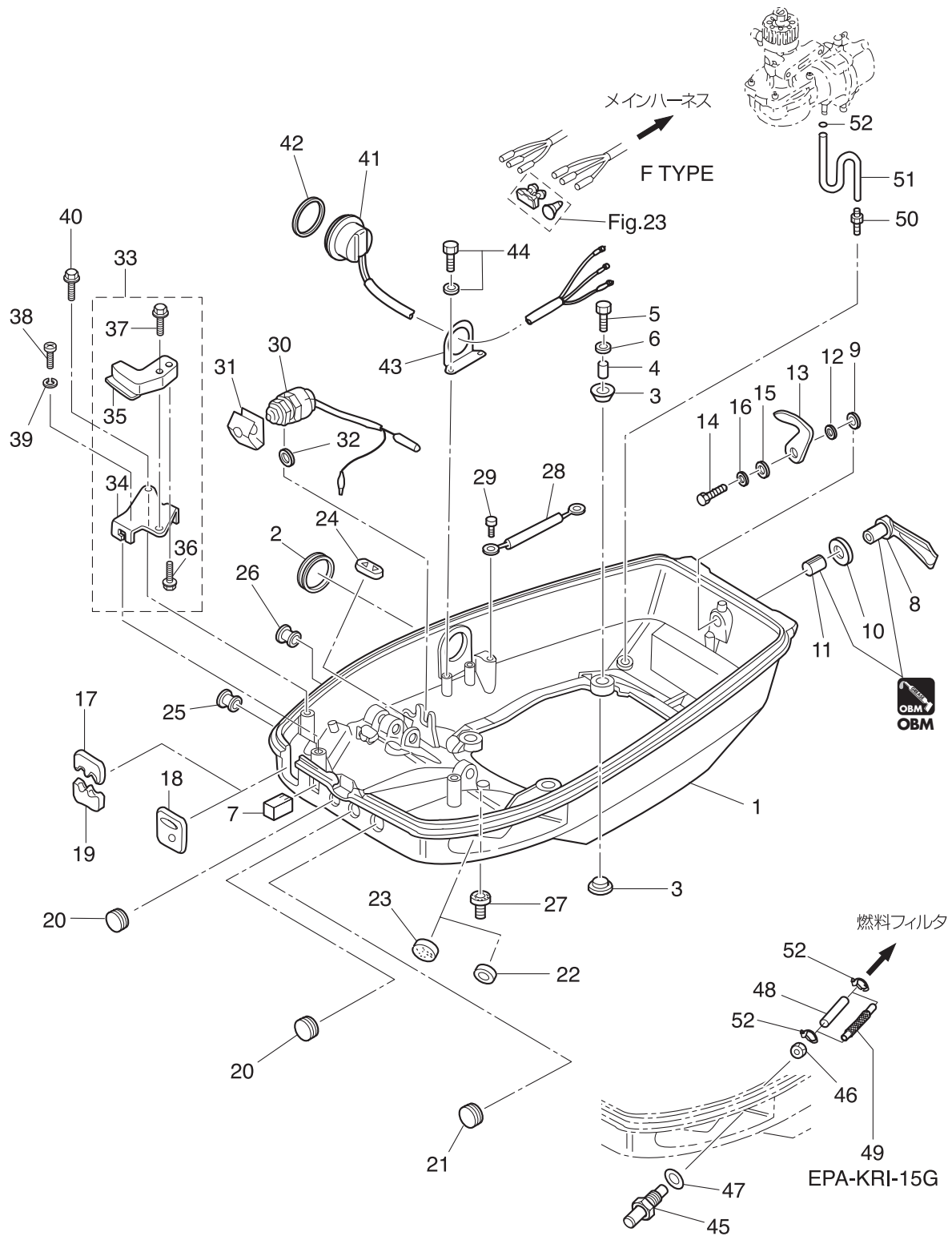


Ref. No.	Description	Q'ty	Remarks
1	Throttle Hand e Assy	1	Steering Hand e Assy
2	Throttle Hand e	1	
3	Throttle Shaft	1	
4	Throttle Shaft Damper A	1	
5	Spacer Throttle Shaft A	1	
6	Spring Pin	1	
7	Bushing 8.4-10-11	1	
8	Screw	1	M5 L=25mm
9	Throttle Shaft Support	1	
10	Bracket	1	M6 L=12mm
11	Friction Piece	1	
12	Adjusting Nut	1	
13	Spring	1	
14	Bracket	1	M6 L=25mm
15	Throttle Deca	1	
16	Group	1	
17	Bushing A Steering Hand e	1	
18	Washer 30-45-1	1	
19	Wave Washer 30-45-1.2	1	
20	Bushing B Steering Hand e	1	
21	Washer	1	M10
22	Nut	1	M10
23	Cable Throttle Wire	1	
24	Throttle Wire	2	
25	Throttle Wire Bracket	1	
26	Bracket	2	M6 L=14mm
27	Washer	2	M6
28	Cable 6.5-47.5P	1	
29	Bracket	2	M6 L=25mm
30	Cable Holder	1	
31	Screw	2	M6 L=25mm
32	Steering Bracket	1	
33	Stud Bracket	2	M8 L=45mm
34	Nylon Nut	2	M8
35	Washer	2	M8
36	Main Switch Deca	1	
37	Throttle Hand e Holder Assy	1	
38	Stud Bracket	1	
39	Cable 6.5-14	1	
40	Bracket	1	M6 L=25mm
41	Nut	1	M6



Cowl, Bracket and PTT Unit

Bottom Cowl (Motor Cover Lower)



Ref. No.	Description	Q'ty	Remarks
1	Bottom Cow	1	
2	Grommet Power Tr m • T t Sw tch	1	
3	Mount Moter Cover Lower	8	
4	Spacer 6.2-9-15.7	4	
5	Bo t	4	M6 L=30mm
6	Washer 6.5-21-1	4	
7	P ug Choke Knob	1	
8	Hook Lever	1	
9	Washer 14-22-1	1	
10	Sea R ng Hook Lever	1	
11	Hook Lever Bush ng	1	
12	Wave Washer	1	
13	Cover Hook	1	
14	Bo t	1	M6 L=12mm
15	Washer 6-16-1.5	1	
16	Spr ng Washer	1	
17	Grommet Remote Contro Cab e	1	for "P" Type
18	Grommet Battery Cord	1	for "F" Type
19	Grommet Cord	1	for "P" Type
20	Grommet 17-2.7	2	for PTT Mode
21	Grommet	1	
22	Grommet 18-2.5	1	for PTT Mode
23	Grommet 17-2.7	3	for Manua /Gas Ass st
24-1	Grommet Thrott e W re	1	for "F" Type
24-2	Grommet Thrott e Ho e	1	for "P" Type
25	Grommet Thrott e Shaft	1	for "P" Type
26	P ug	1	
27	Grommet 17-3	1	
28	Earth W re (Ground) L=270	1	
29	Bo t	1	M6 L=12mm
30	Neutra Sw tch	1	for "F" Type
31	Neutra Sw tch Actuator	1	for "F" Type
32	Washer 12.5-24-1	1	for "F" Type
33	Cab e C p Bracket Ass y	1	for "P" Type
34	C utch Cab e C p Bracket	1	for "P" Type
35	C amp	1	for "P" Type
36	Bo t	1	for "P" Type M6 L=12mm
37	Bo t	1	M6 L=25mm
38	Screw 4-20 P0.5	1	for "P" Type
39	Spr ng Washer	1	for "P" Type M4
40	Bo t	1	for "P" Type M6 L=16mm
41	PTT Sw tch (B) Ass y	1	for "P" Type
42	Gasket PTT Sw tch	1	for "P" Type
43	PTT Sw tch Ass y Bracket	1	for "P" Type
44	Bo t	2	for "P" Type M6 L=14mm
45	Fue Connector (Eng ne Ma e)	1	
46	Nut M10P1.25	1	
47	Gasket 10.2-16-0.5	1	Do not reuse.
48	Hose	1	L=260mm
49	Fue Hose (W/Protector)	1	Low Permeat on Parts (for USA mode)
50	N pp e Water	1	
51	Hose	1	L=250mm
52	C p Fue P pe φ10	3	



Exploded view diagram of a vehicle chassis assembly, showing various components and their assembly sequence. The diagram includes a main chassis assembly, a detailed view of the rear suspension assembly (Fig. 15-35), and a detailed view of the front suspension assembly (Fig. 15-36). Components are numbered 1 through 40. The diagram also includes a table of parts and quantities, and a note 'For F Type'.

Parts and Quantities:

Part Number	Quantity
P	1枚
F	3枚

Note: For F Type

Fig. 15-35



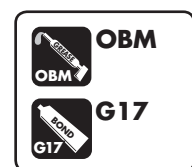
Ref. No.	Description	Q'ty	Remarks
1	Sh ft Arm	1	
2	Bush ng Sh ft Lever Shaft	2	
3	Wave Washer d=12 DWG	1	M12
4	Sh ft Rod Lever	1	
5	Sh ft Rod Lever	1	MW
6-1	Sh ft Lever Stopper	1	for "P" Type
6-2	Sh ft Lever Stopper	3	for "F" Type
7	Sh ft Lever Stopper	1	for "P" Type
8	C amp 6.5-47.5P	1	for "F" Type
9	Bo t	1	M6 L=14mm
10	Washer	1	M6
11	Sh ft Lever Shaft	1	
12	Snap Reta ner d=8	2	
13	Washer 8.5-18-1.6	1	
14	Sh ft Lever	1	for "F" Type
15	Sea R ng 13.8-22-5	1	for "F" Type
16	Washer 14-22-1	2	for "F" Type
17	Bush ng 14-16.5-17.7	1	for "F" Type
18	Wave Washer	2	for "F" Type M14
19	Sh ft Lever (Remote Contro)	1	for "F" Type
20	Washer 6-16-1.5	3	for "F" Type
21	Bo t	1	for "F" Type M6 L=70mm
22	Spr ng Washer	2	for "F" Type M6
23	Ny on Nut	1	for "F" Type M6
24	Sh ft Lever Rod	1	for "F" Type
25	Cab e Jo nt	1	
26	Nut (No.10-32VNF)	1	for "F" Type
27	Sp t P n	1	for "F" Type
28-1	Washer 8.5-18-1.6	2	for "F" Type
28-2	Washer 8.5-18-1.6	1	for "P" Type
29	Snap P n d=8	1	
30	Washer	2	for "F" Type M5
31	Sh ft Rod	1	
32	Drag L nk Ass y E	1	for "P" Type
33	Co ar 9.6-13-6.5	1	for "P" Type
34	Co ar 9.6-19-6	1	for "P" Type
35	Sp t P n	1	for "P" Type
36	Bo t 3/8-19	1	for "P" Type
37	Ny on Nut 3/8	1	for "P" Type
38	Washer 9.6-18-2	2	for "P" Type
39	Sea R ng Drag L nk	1	for "P" Type
40	Sh ft Deca	1	for "F" Type



コード色 Cord Colors

Re No	Description	Q'ty	Remarks
13	Screw	2	for "EFT" Type M2 L=6mm
14	Grommet PTT Sw tch Ass y	1	for "EFT" Type
15	PTT Sw tch Cover (B)	1	for Manua /Gas Ass st
16	Screw	2	M5 L=12mm
17	Washer	2	M5
18	Overheat Buzzer	1	
19	Stay Buzzer	1	
20	Bo t	1	M6 L=12mm
21	Cord Ass y C L=1000	1	
22	Cover	1	
23	Warn ng Lamp Deca	1	
24	Cab e Term na P ug	1	
25	Cab e Term na P ug	1	for Manua /Gas Ass st
26	Cab e Term na P ug	1	for Manua /Gas Ass st

7



Re No	Description	Q'ty	Remarks
10	Ny on Nut 6P1.0	4	for T t Hand e M6
11	Washer 6-16-1.5	4	M6
12	Sea Rubber F er L d	1	
13-1	Deca Set (D50B2)	1	50ps
13-2	Deca Set (D40B2)	1	40ps
13-3	Deca Set (D30B2EU)	1	for EU 30ps
13-4	Deca Set (D40B2 Ita y)	1	for Ita y 40ps
14	Caut on Deca (A)	1	
15	O Caut on Deca	1	



Cowl, Bracket and PTT Unit

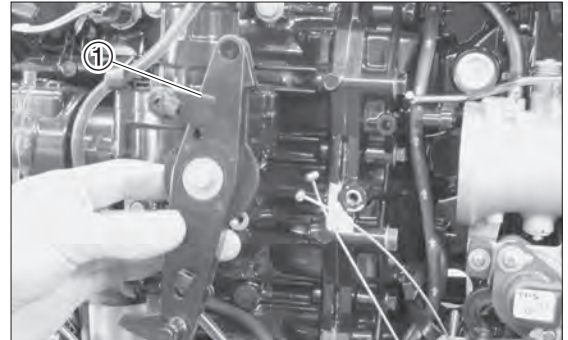
2. Inspection Items

1) Inspection of Throttle Cable

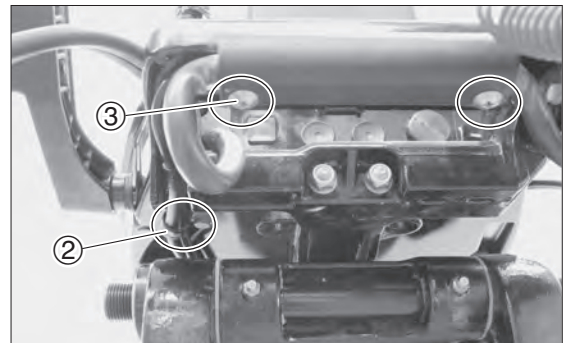
1. Check operation of throttle cable.
2. Check throttle cable inner wire and outer wire for bend and damage. Replace if necessary.

2) Removing of Tiller Handle

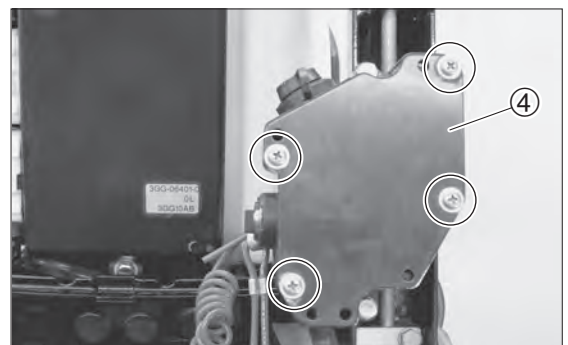
1. Remove advancer arm ① and remove throttle wire from advancer arm.



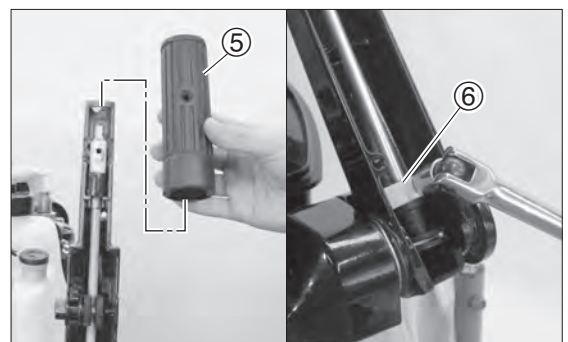
2. Remove throttle wire mounting clamp (2) and screw (3).



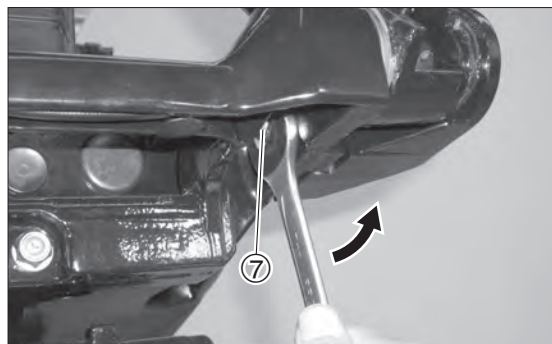
3. Remove switch box (4).



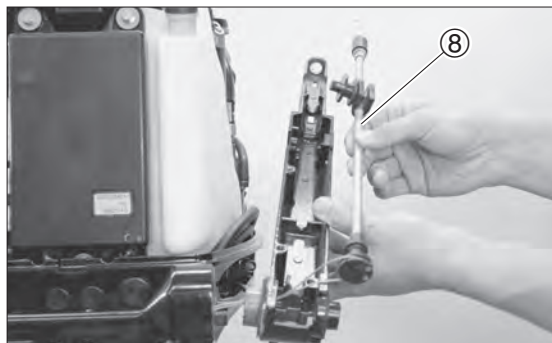
4. Remove throttle grip (5) and throttle shaft supporter (6).



5. Remove tiller handle holder installation nut ⑦.



6. Remove tiller handle and throttle shaft ⑧.

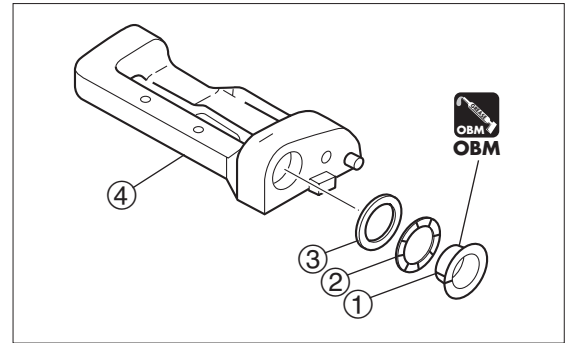




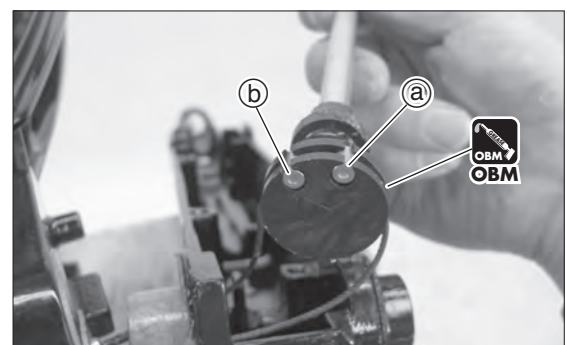
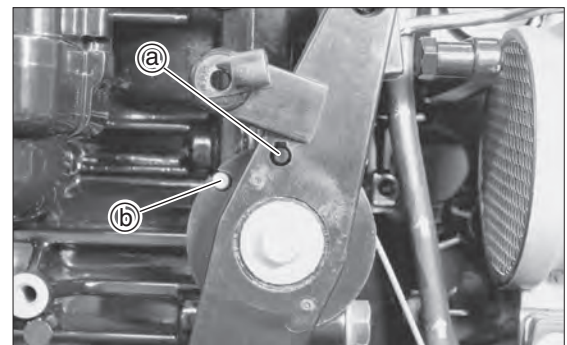
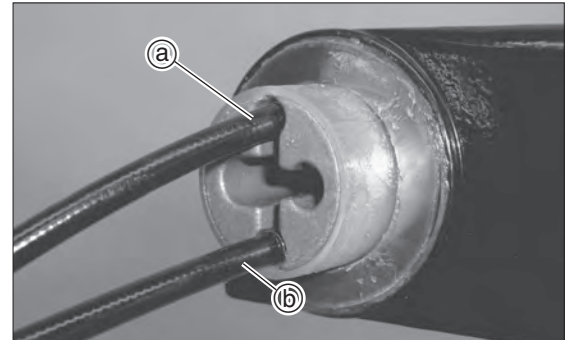
Cowl, Bracket and PTT Unit

3) Installation of Tiller Handle

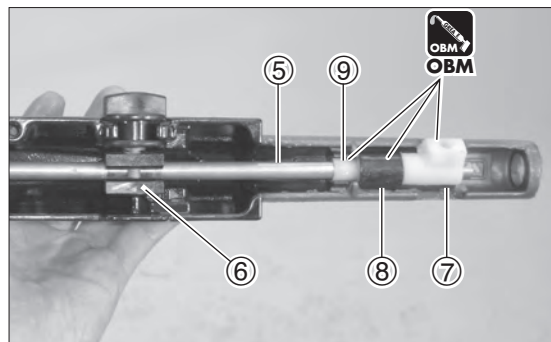
1. Install bushing ①, wave washer ② and washer ③ on the steering bracket ④.




2. Install throttle cable as shown.

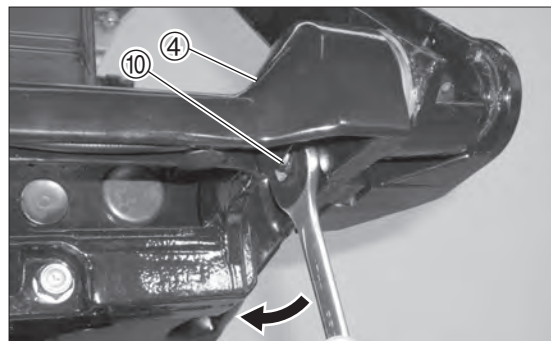


3. Install throttle shaft ⑤ with wire to Tiller handle. Be careful of location of throttle friction ⑥, throttle shaft spacer ⑦, throttle shaft damper ⑧ and bushing ⑨.



4. Attach Tiller handle ass'y to steering bracket ④, and tighten nut ⑩ to specified torque.

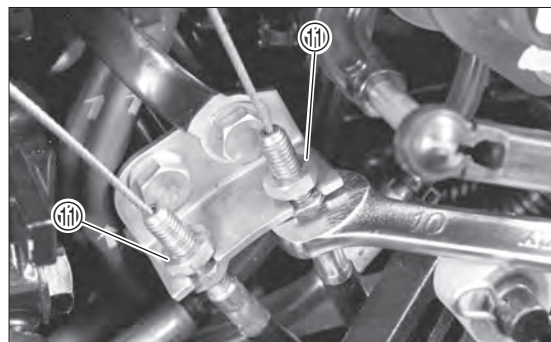
 **Tiller Handle Nut ⑩ :**
27 N · m (20 lb · ft) [2.7 kgf · m]



5. Install advancer arm and adjust position of lock nuts ⑪ of throttle cable.



- Adjust cable tension so that it moves approximately 1mm when pushed lightly with a finger.
- For more detail, "Adjustment of Throttle Cable" in chapter 3.

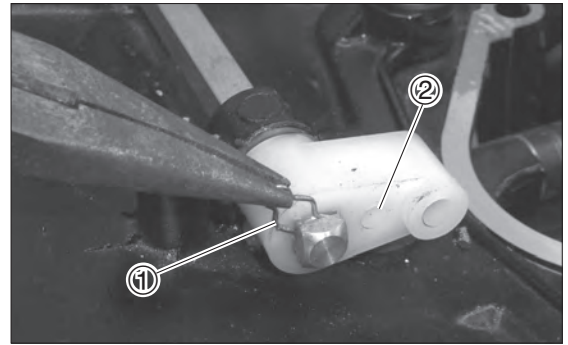




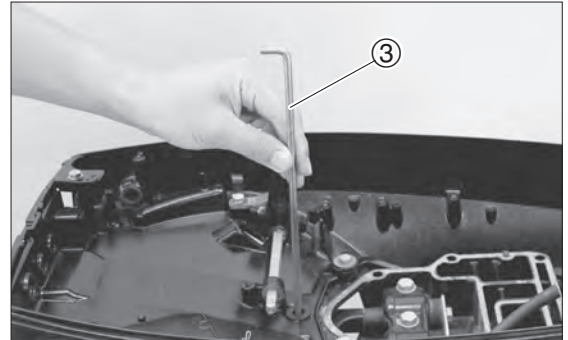
Cowl, Bracket and PTT Unit

4) Removing Bottom Cowl

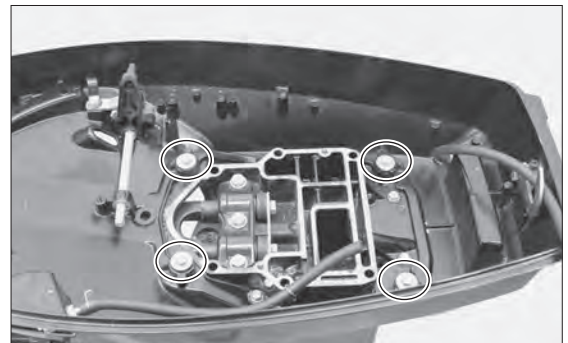
1. Remove power unit. Refer to “Removing Power Unit” in chapter 5.
2. Remove snap retainer ①. And then, remove shift rod lever ②.



3. Remove shift rod ③.



4. Loosen and remove four bolts that secure bottom cowl to engine base.



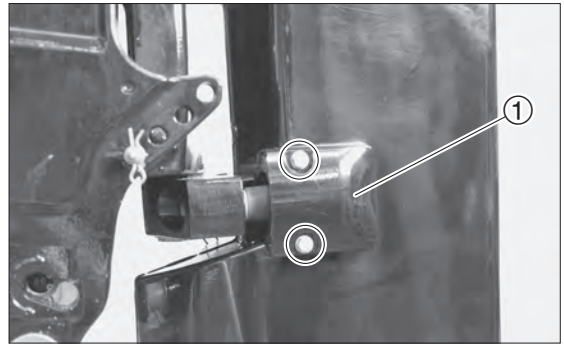
5. Remove bottom cowl.



5) Removing Drive Shaft Housing

Use the following steps to remove drive shaft housing.

1. Loosen and remove lower rubber mount cap installation bolts to remove mount cap ①.



2. Loosen and remove lower rubber mount installation nuts to remove rubber mount ②.



Remove only the nut and do not remove mount bolt.



3. Loosen upper rubber mount ③ installation bolts.

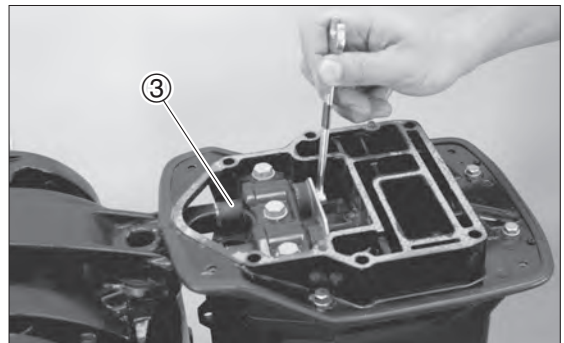


CAUTION

Drive shaft housing drops if mount bolt is removed in this step.



Loosen right and left rubber mount installation bolts in several steps alternately and equally.



4. While holding drive shaft housing at its top and bottom securely, and remove drive shaft housing.





Cowl, Bracket and PTT Unit

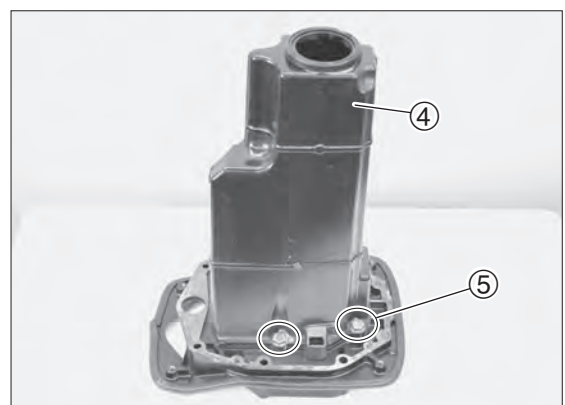
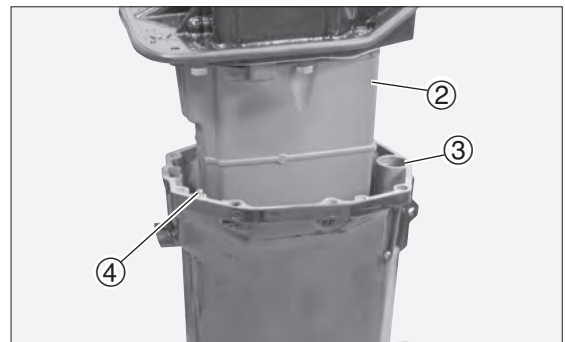
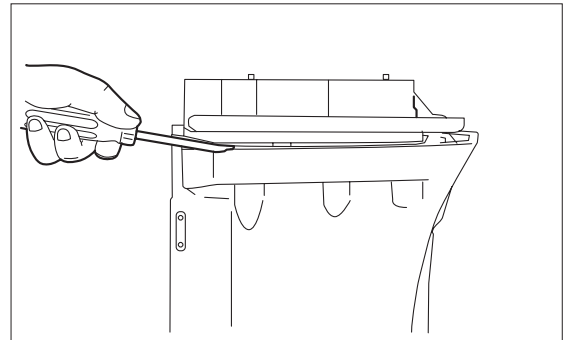
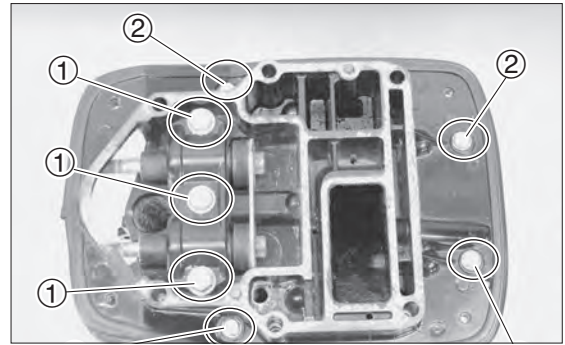
6) Disassembly of Drive Shaft Housing

1. Loosen upper mount lubber cap mounting bolts ①, and remove it.
2. Remove engine base bolts ②.
3. Tap lightly with a plastic hammer to separate engine base from the housing if it is seized.

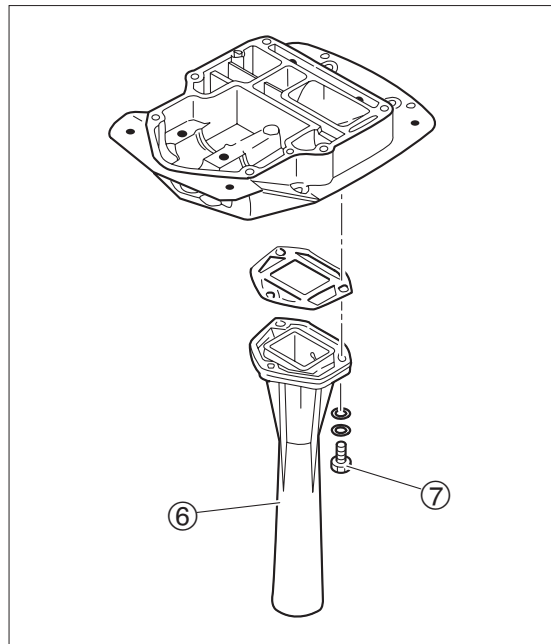


If necessary, use a bladed screw driver to pry the engine base taking care not to scratch mating surface.

4. When removing drive shaft housing, be careful not to lose dowel pin ④ for locating engine base.
5. Loosen and remove bolts ⑤ that secure exhaust housing ④ to engine base and remove exhaust housing.

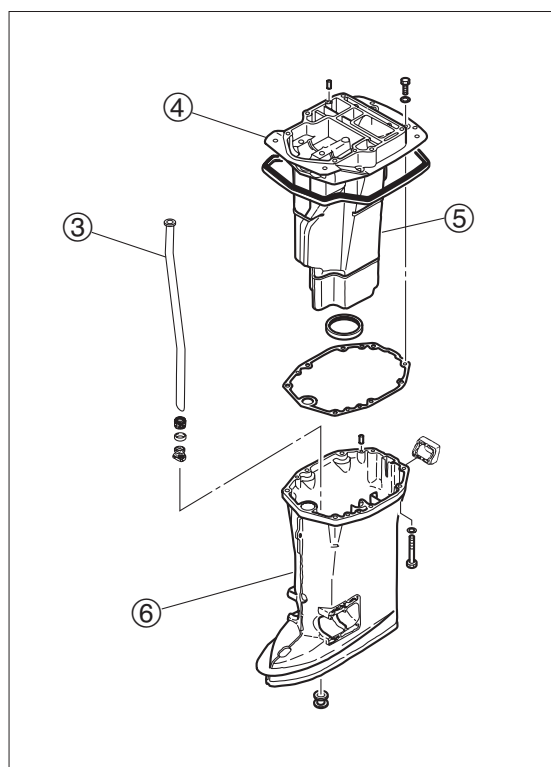
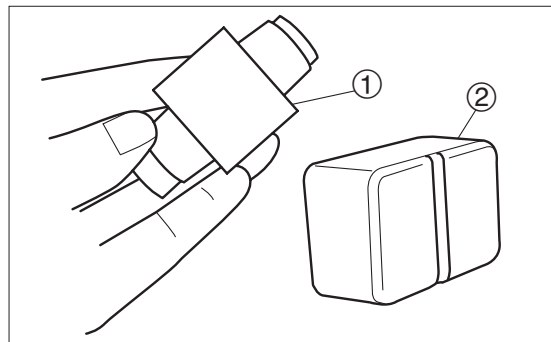


6. Loosen and remove bolts ⑦ that secure exhaust pipe ⑥ to engine base and remove exhaust pipe.



7) Inspection of Drive Shaft Housing

1. Check mount rubber ① and dumper rubber ② for crack and deterioration. Replace if necessary.
2. Check water pipe ③ for corrosion and deformation. Replace if necessary.
3. Check engine base ④, exhaust housing ⑤ and drive shaft housing ⑥ for corrosion for damage.



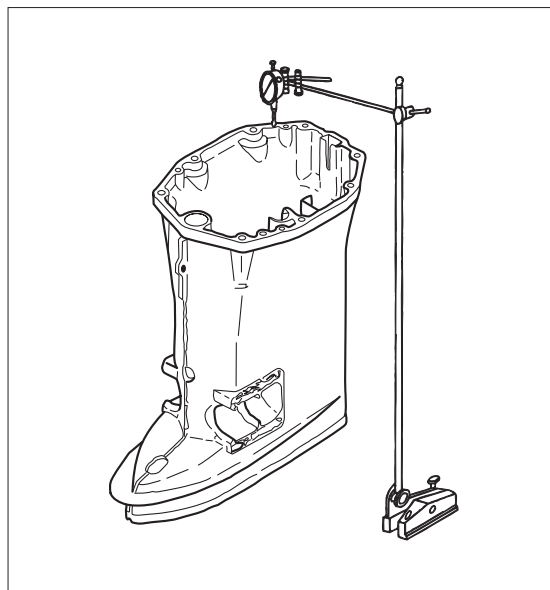


Cowl, Bracket and PTT Unit

4. Check if drive shaft housing is distorted.
Place the housing on the surface plate and use dial gauge to measure distortion on the upper face of the housing.
Replace if the difference is over 0.228mm (0.0090in) on each measuring point.

CAUTION

Use of distorted drive shaft housing may cause severe wear of drive shaft spline which may lead to damage on the crank shaft spline.



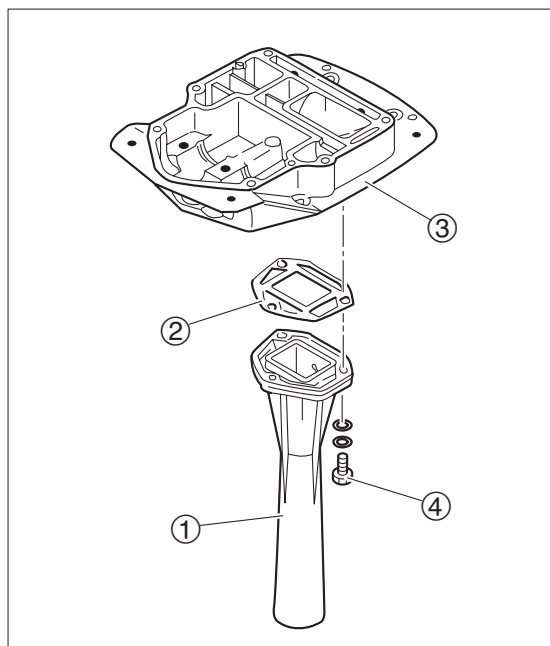
8) Assembly of Drive Shaft Housing Parts

1. Install exhaust pipe ① and gasket ② to engine base ③ and tighten bolts ④ to specified torque.



Exhaust Pipe Bolts ④ :

13 N · m (9 lb · ft) [1.3 kgf · m]



2. Install exhaust housing grommet ⑤ to exhaust housing ⑥.



When installing the grommet by using adhesive, clean adhering area to remove dirt and oil and dry the area before applying adhesive.



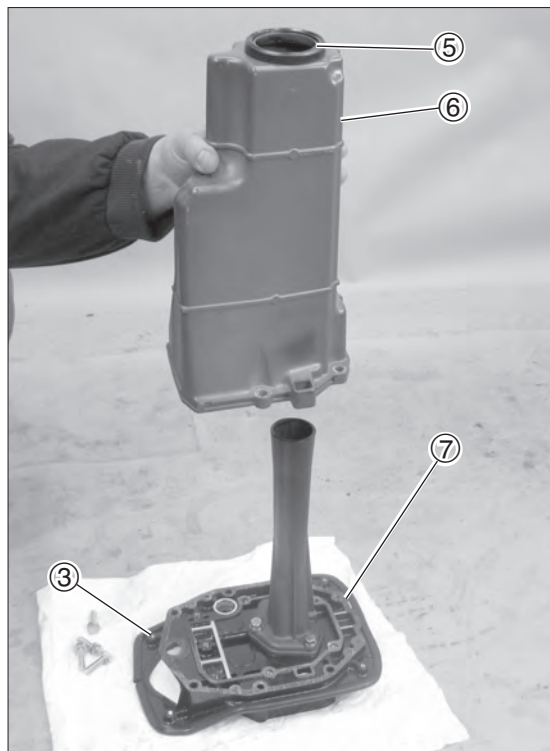
1741
or
G17

3. Install exhaust housing ⑥ and gasket ⑦ to engine base ③ and tighten bolts to specified torque.



Exhaust Housing Bolts :

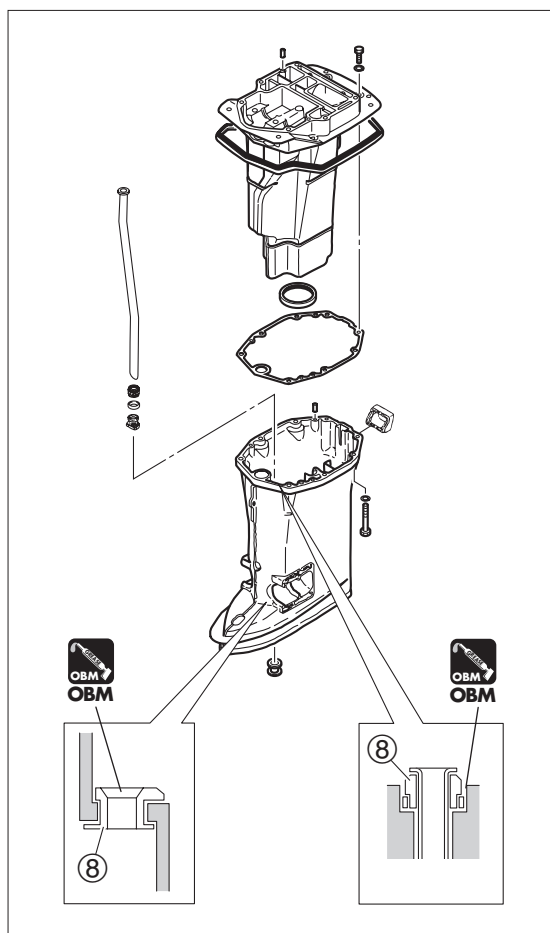
13 N · m (9 lb · ft) [1.3 kgf · m]



4. Install water pipe auxiliary mount ⑧ to drive shaft housing.



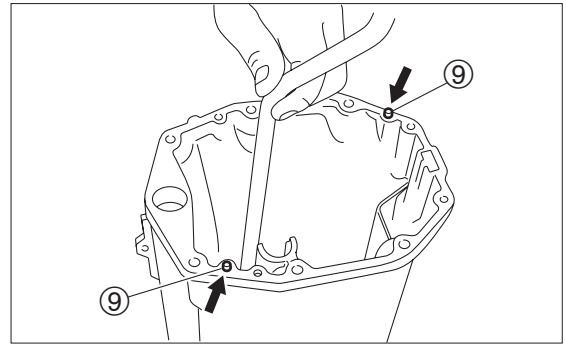
OBM





Cowl, Bracket and PTT Unit

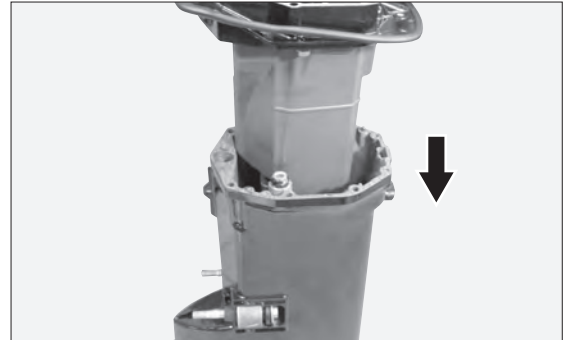
5. Install water pipe to drive shaft housing, and attach gasket after confirming that dowel pins ⑨ are on the drive shaft housing.



6. Check that drive shaft housing dowel pin is placed and secured to engine base properly.



Check that water pipe is at joint of engine base.

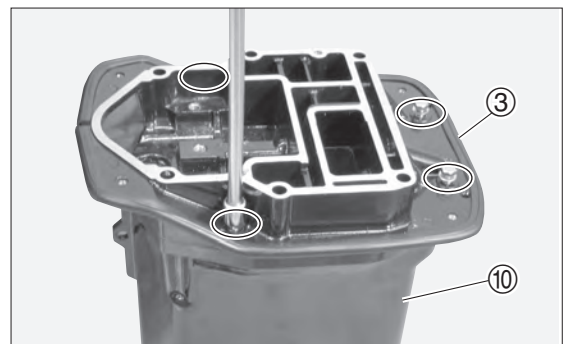


7. Install engine base ③ to drive shaft housing ⑩ by tightening installation bolts to specified torque.



Engine Base Bolts :

6 N · m (4 lb · ft) [0.6 kgf · m]



9) Assembling Rubber Mounting

1. Install upper mount ① and bolts ② install by upper mount holding plate ③.

⚠ CAUTION

Install the mount with the side of longer size ① facing forward.

2. Attach lower mount ⑥ and bolt ⑦ to drive shaft housing.

⚠ CAUTION

Install the mount with the side of longer size ⑥ facing forward.

3. Install dumper rubber ⑤ to mount bracket ④.

⚠ CAUTION

Install dumper rubber with the grooved side ⑤ facing drive shaft housing.

4. Put lower rubber mount ⑥ to drive shaft housing and tighten bolts ②, ⑦ and nuts ⑧ to specified torque.



Upper Rubber Mount Bolt and Nut ② :

32 N · m (23 lb · ft) [3.2 kgf · m]

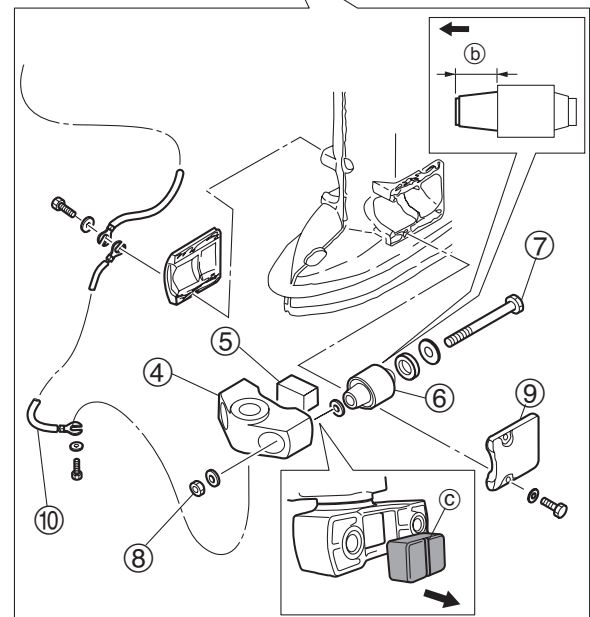
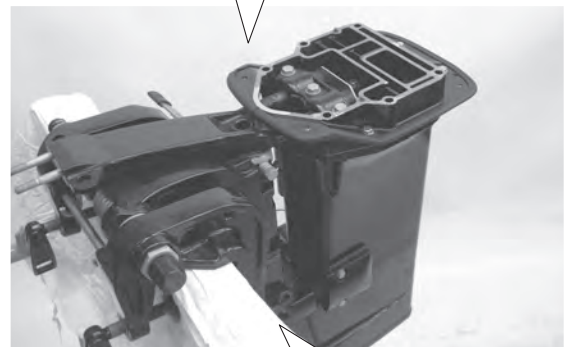
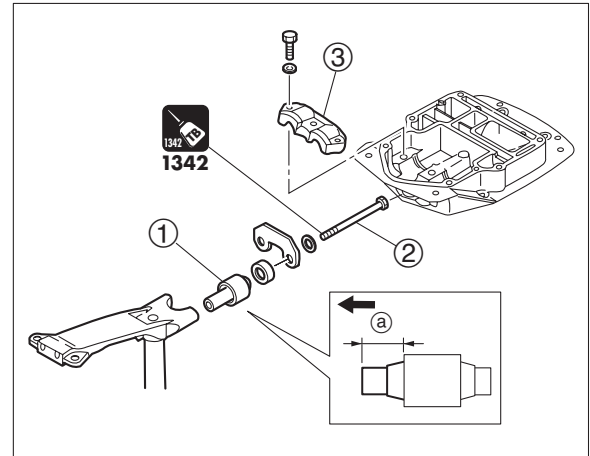


Lower Rubber Mount Bolt and Nut ⑦ and ⑧ :

42 N · m (31 lb · ft) [4.2 kgf · m]

5. Install mount holding plates ⑨.

6. Attach ground wire ⑩.





Cowl, Bracket and PTT Unit

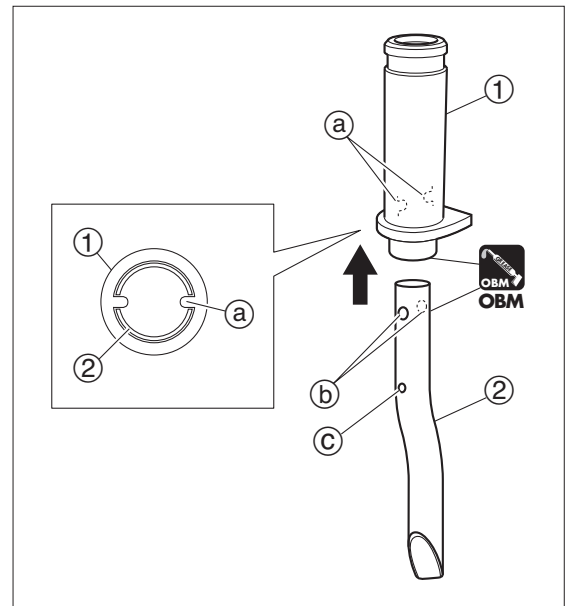
WD50 Only

10) Assembling Extension Housing

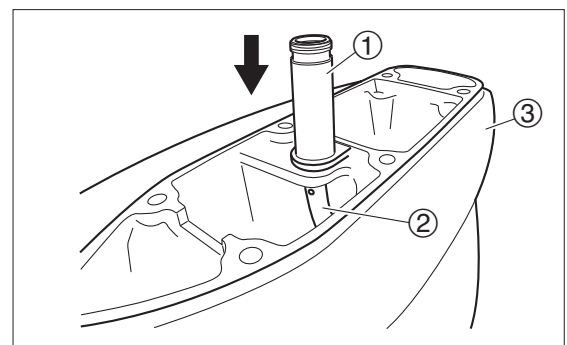
1. Align notches (a) inside the tube joint (1) with hole (b) of the extension pipe (2), then insert.



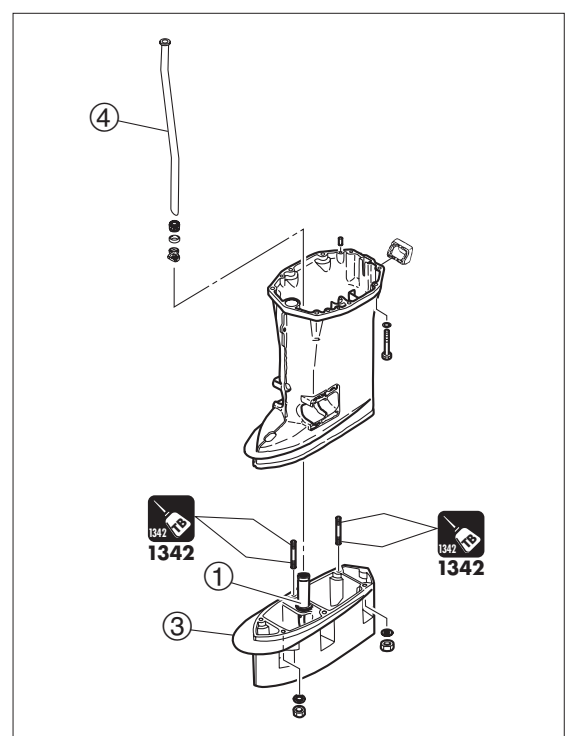
Passage (c) for adjusting water flow. Check the passage for clogged by salt, clean if necessary.



2. Insert tube joint (1) and extension pipe (2) to extension housing (3), as shown.

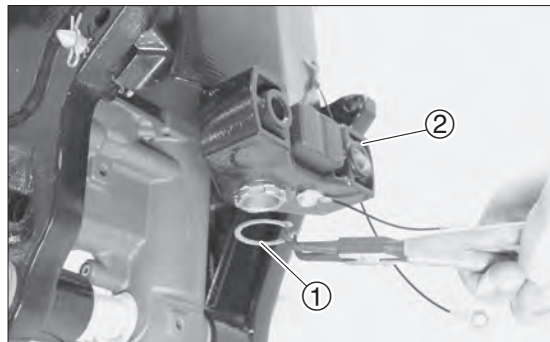


3. Insert tube joint (1) to the water pipe (4), and then attach extension housing (3) to drive shaft housing.



11) Removing Steering Shaft Arm

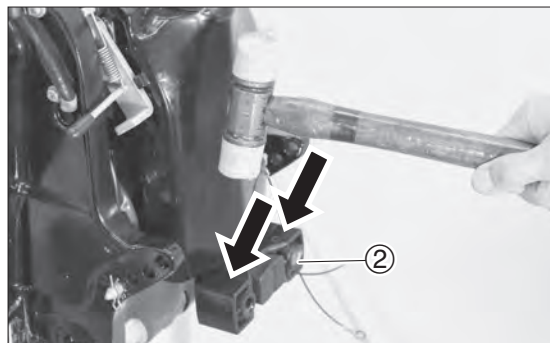
1. Remove "C" ring ① that supports mount bracket ②.



2. Remove mount bracket ②.



When mount bracket cannot be removed, tap the bracket at both ends alternately by using a plastic hammer.



3. Pull up steering shaft arm ③ to remove.



Do not lose bushing ④ and O-ring ⑤.





Cowl, Bracket and PTT Unit

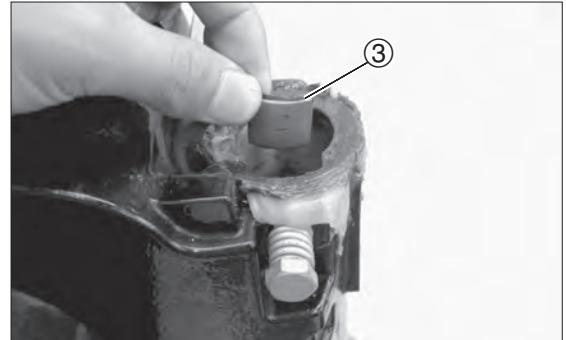
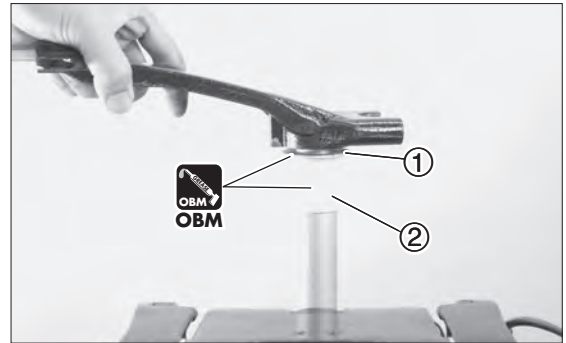
12) Installing Steering Shaft

1. Attach thrust plate ① and bushing ② friction piece ③ to steering shaft.



OBM

2. Stand swivel bracket ass'y vertically, and insert steering shaft into swivel bracket ass'y.



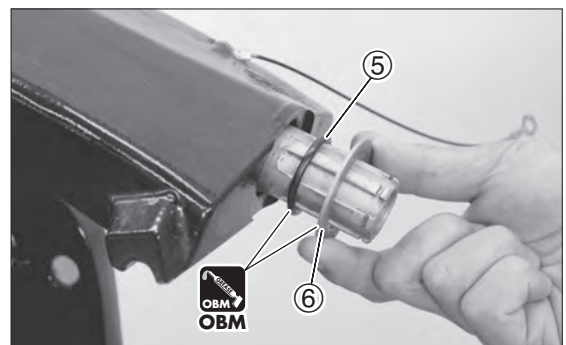
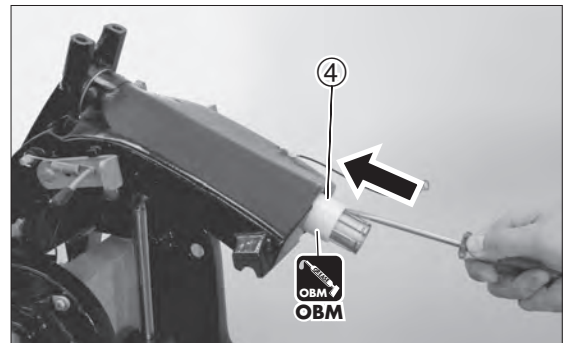
3. Attach bushing ④, new O ring ⑤, and thrust plate ⑥ to swivel bracket.



- Push bushing by using flat head screw driver until it stops.
- Put O ring until it contacts bushing.



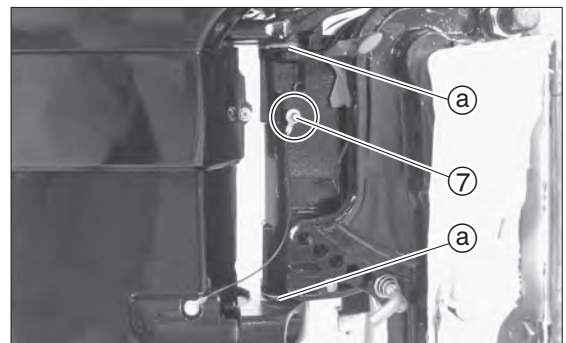
OBM



4. Put OBM grease into bushing ④ through grease nipple ⑦ until it overflows.



OBM



13) Removing PTT Unit/Gas Shock Absorber

1. Fully tilt up outboard motor and lock with tilt stopper ①.

⚠ WARNING

Be sure to lock outboard motor with tilt stopper after tilting up. Leaving outboard motor without locking may lead to accidental descent due to reduction of PTT hydraulic pressure.

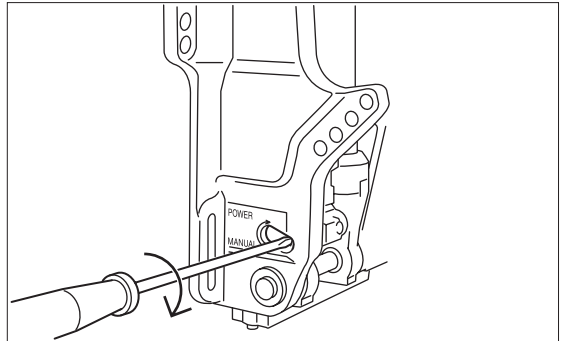
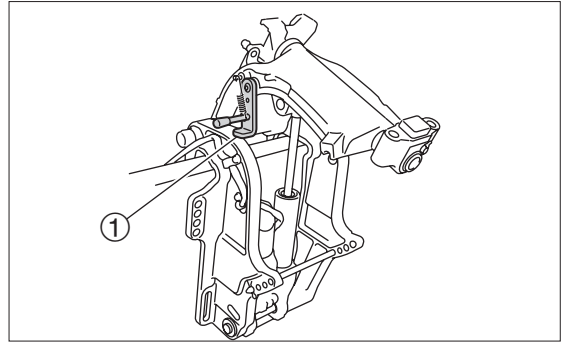


- If PTT unit will not operate, open manual valve and lift up outboard motor with hands.
- When manual valve is opened, be sure to tighten it with specified torque after tilting up outboard motor.



Manual Valve :

1.8 N·m (1.3 lb·ft) [0.18 kgf·m]

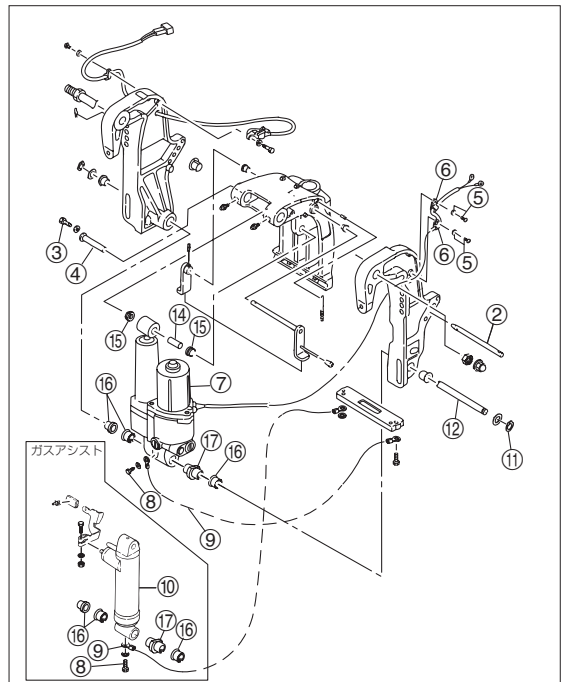


2. Remove thrust rod ②.
3. Remove bolt ③ and remove cylinder pin (upper) ④.
4. Perform tilt down operation to retract tilt rod a little.
5. Disconnect PTT motor leads from PTT solenoid. (PTT model)
6. Remove screw ⑤ and clamps ⑥, and pull out PTT motor leads. (PTT model)
7. Remove bolt ⑧ and ground lead ⑨ from bottom of PTT unit ⑦ / gas shock absorber ⑩.
8. Remove "C" ring ⑪, and then cylinder pin (lower) ⑫.



Hold PTT unit or gas shock absorber with a hand, and use another hand to pull out cylinder pin (lower) and remove PTT unit rearward.

9. Remove PTT unit ⑦ or gas shock absorber ⑩.
10. Remove bushings ⑭, ⑮, ⑯ and ⑰.



- ② Thrust Rod
- ③ Bolt
- ④ Cylinder Pin (Upper)
- ⑤ Screw
- ⑥ Clamps
- ⑦ PTT Unit
- ⑧ Bolt
- ⑨ Ground Lead
- ⑩ Gas Shock Absorber
- ⑪ "C" Ring
- ⑫ Cylinder Pin (Lower)
- ⑭ ⑮ ⑯ ⑰ Bushings



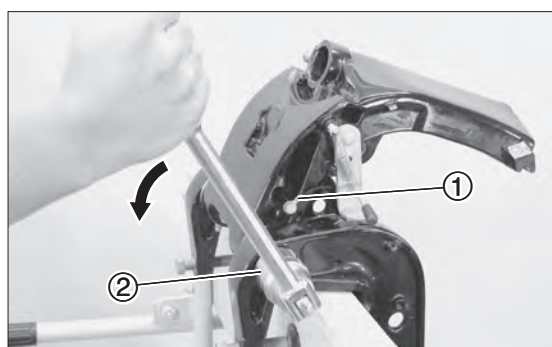
Cowl, Bracket and PTT Unit

14) Disassembling Clamp Bracket

WARNING

- When disassembling clamp bracket, be sure to fully tilt up outboard motor. If outboard motor is fully tilt down it can pop out spring suddenly and result in severe injury.
- When tilting up outboard motor without power unit installed, be careful to operate tilt lock lever to prevent swivel bracket rise up easy.

1. Remove drive shaft housing, steering shaft, thrust rod and PTT unit/Gas shock absorber before beginning this procedure.
2. Remove ground cable ① on the swivel bracket.
3. Loosen nut ② of swivel bracket shaft.
4. Remove swivel bracket shaft with spring and swivel bracket.

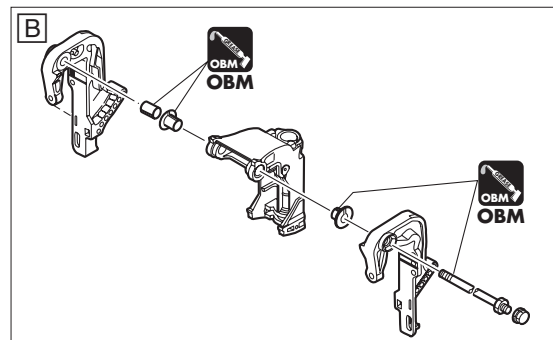
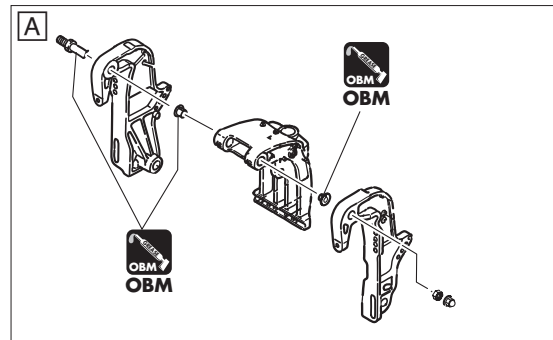


15) Assembling Clamp Bracket

1. Apply grease to swivel bracket, swivel bracket shaft, bushing.

A : PTT/ Gas assist model

B : Manual tilt model



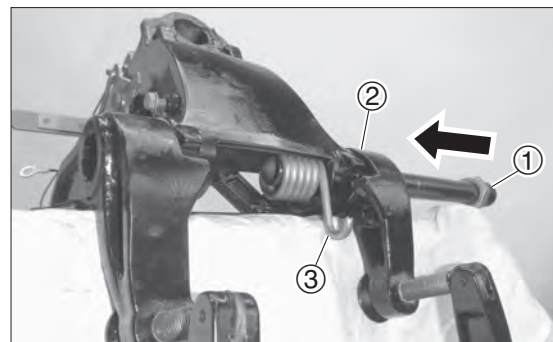
Manual Tilt Model Only

2. Put bushing to swivel bracket, and then, insert swivel bracket shaft ① into clamp bracket ② and tilt assistant spring ③.

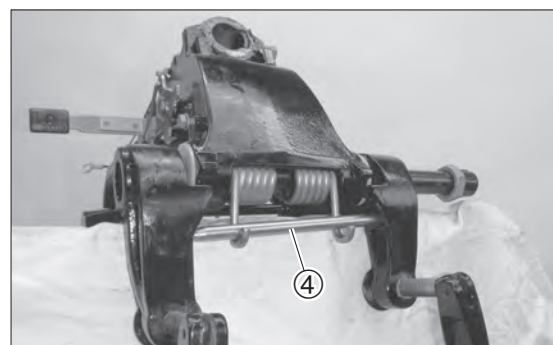


Set the tilt stop lever to “Release” position, then install swivel bracket shaft and assistant spring.

*Tilt assistant spring ③ is discontinuing products for after January in 2012



3. Install tilt assistant shaft ④.



4. Tighten nylon nut ⑤ to the specified torque.



Nylon Nut ⑤ :

25 N · m (18 lb · ft) [2.5 kgf · m]

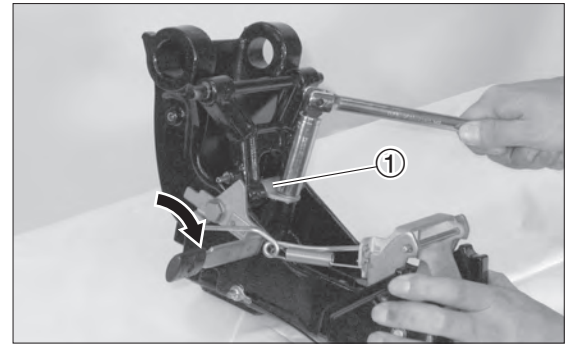




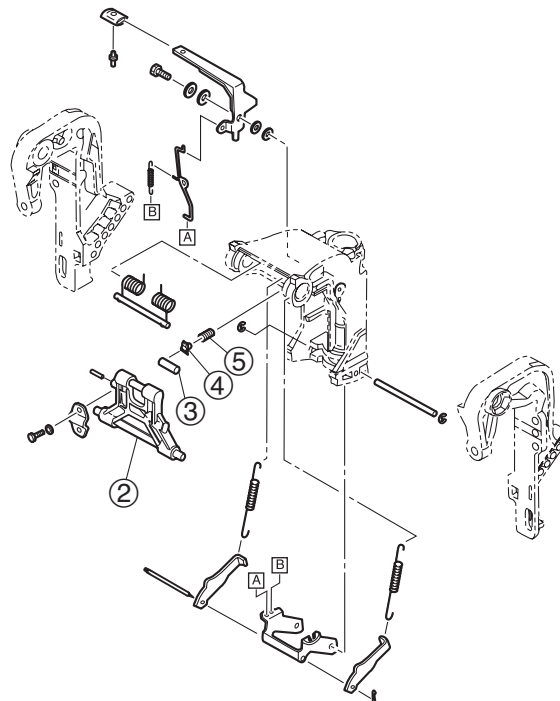
Cowl, Bracket and PTT Unit

16) Disassembling tilt mechanism

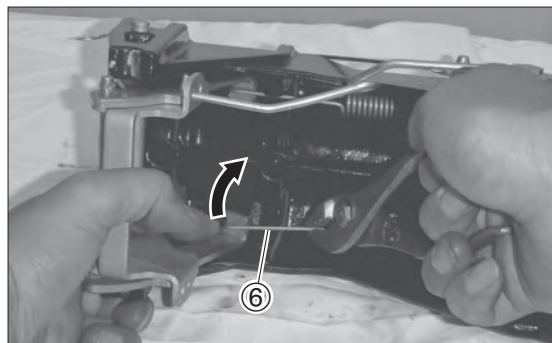
1. Set tilt stopper lever to "release" side, and then, remove tilt stopper setting plate ①.



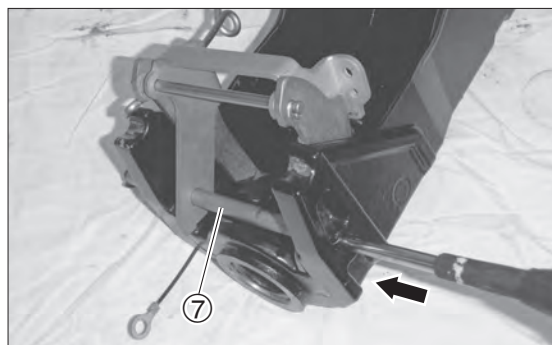
2. Remove tilt stopper ②, bushing ③, set piece ④ and spring ⑤.



3. Remove springs ⑥.

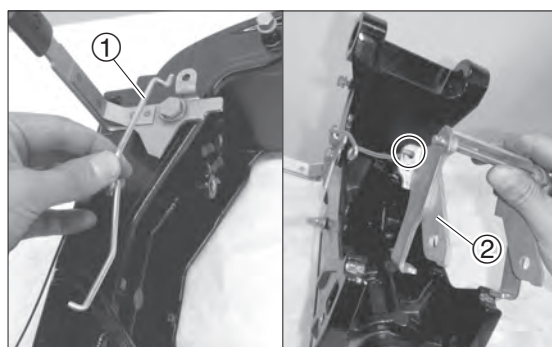


4. Remove E-rings, and then, remove reverse lock shaft ⑦ by using screw driver.



17) Assembling tilt mechanism

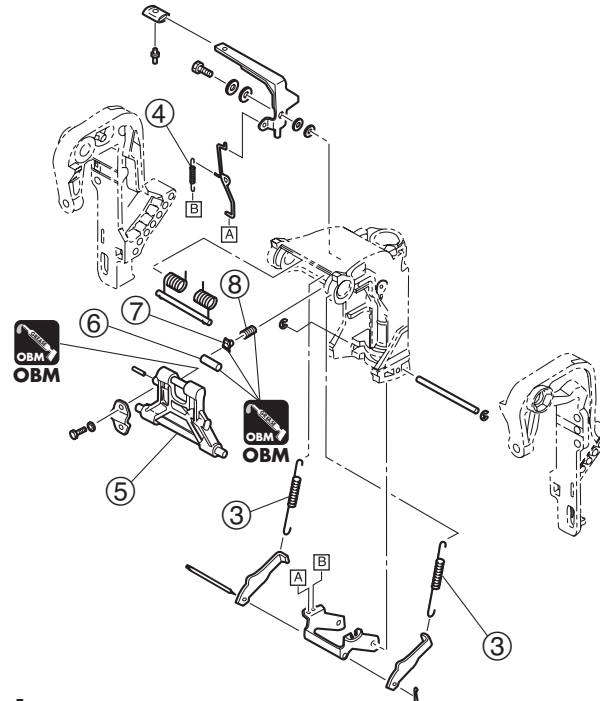
1. Install reverse lock link ① and arm ② as shown and then, install reverse lock shaft.





Cowl, Bracket and PTT Unit

2. Install reverse lock spring ③ and spring ④ springs in reverse procedures of disassembling.
3. Install tilt stopper ⑤, bushing ⑥, set piece ⑦ and spring ⑧.



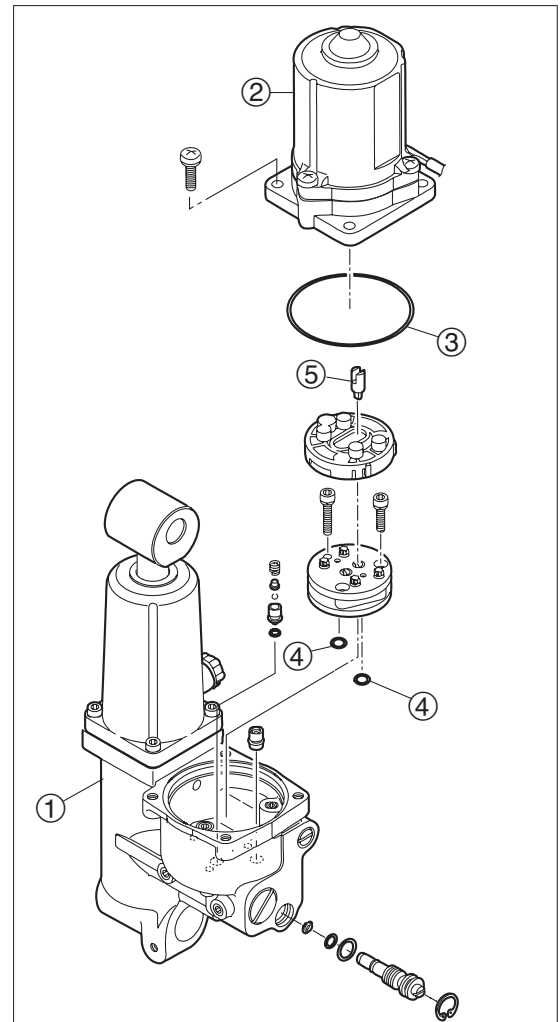
18) Removing PTT Motor

1. Remove PTT motor ②, O-rings ③, ④ and coupling ⑤ from PTT unit ①.

⚠ CAUTION

- When removing PTT motor (reservoir tank), fully extend tilt rod to prevent fluid from blasting out due to internal pressure.
- Do not push down tilt rod with PTT motor removed from PTT unit, or fluid will blast out from PTT unit.

2. Energize removed PTT motor to check that it operates. If not, replace PTT motor ass'y.

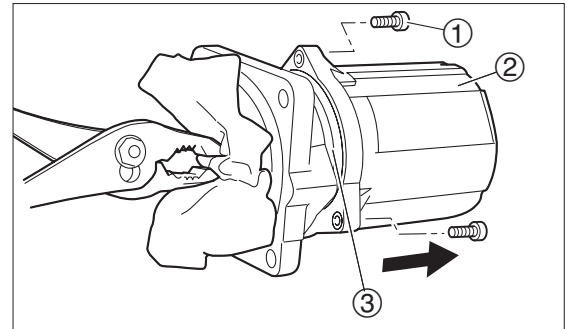


19) Disassembling PTT Motor

1. Remove bolt ①, and then remove stator ②.



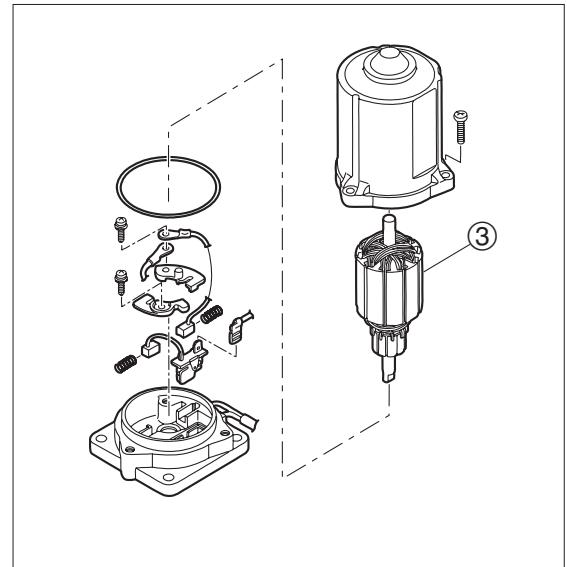
Cover armature shaft end with clean cloth, hold the shaft using a pair of pliers, and remove armature ③ from stator carefully.



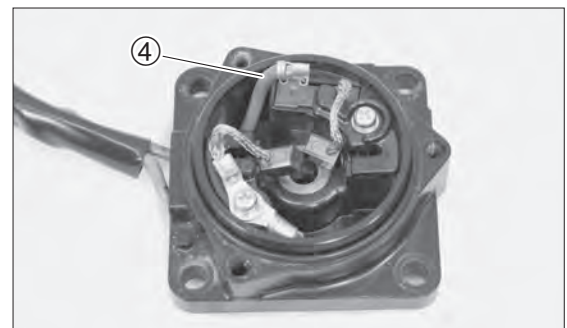
2. Remove armature ③ from PTT motor base.



Do not apply grease or oil to commutator.



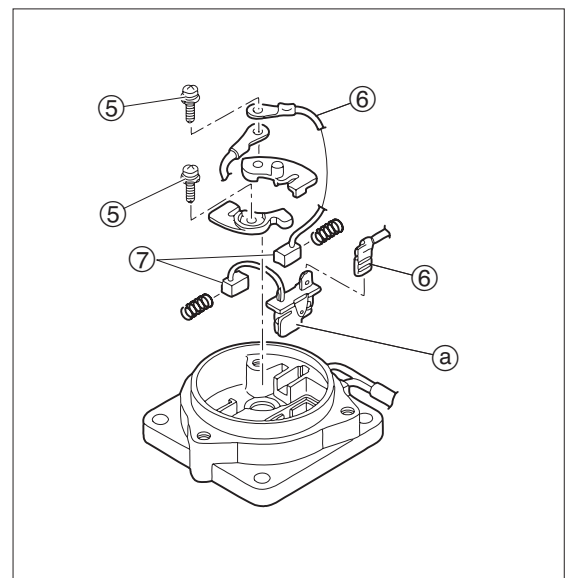
3. Disconnect PTT motor lead wire ④.



4. Remove screw ⑤, disconnect PTT motor lead ⑥, and then, remove brushes ⑦.

⚠ CAUTION

- Do not disconnect PTT motor lead from stator.
- Do not touch bi-metal ①. Doing so affects operation of circuit breaker.





Cowl, Bracket and PTT Unit

20) Inspection of PTT Motor

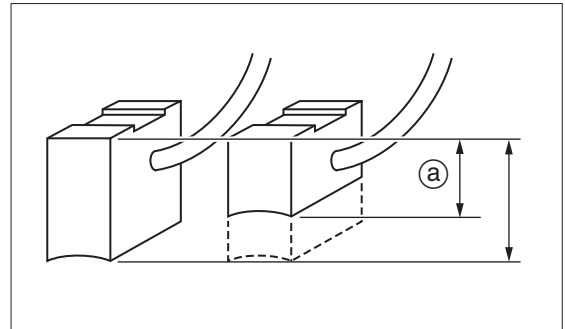
1. Measure brush length.

Replace if it is less than specified value.



Brush Wear Limit (a) :

5.0 mm (0.1969 in.)

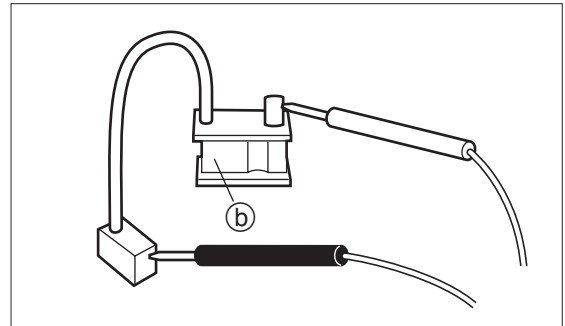


2. Check electrical conductivity of brush and circuit breaker.

Replace if not conductive.

⚠ CAUTION

- Do not disconnect PTT motor lead from stator.
- Do not touch bi-metal (b). Doing so affects operation of circuit breaker.



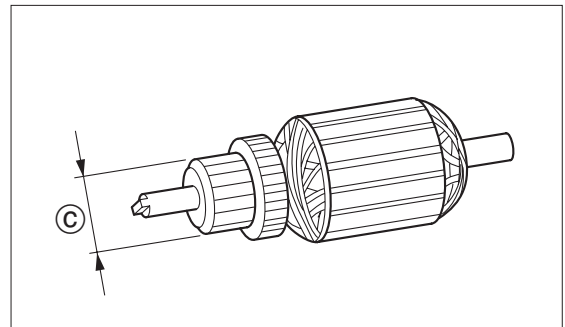
3. Measure diameter of commutator.

Replace if the following specification is not met.



Lower Limit of Commutator Diameter (c) :

20.4 mm (0.8032 in.)



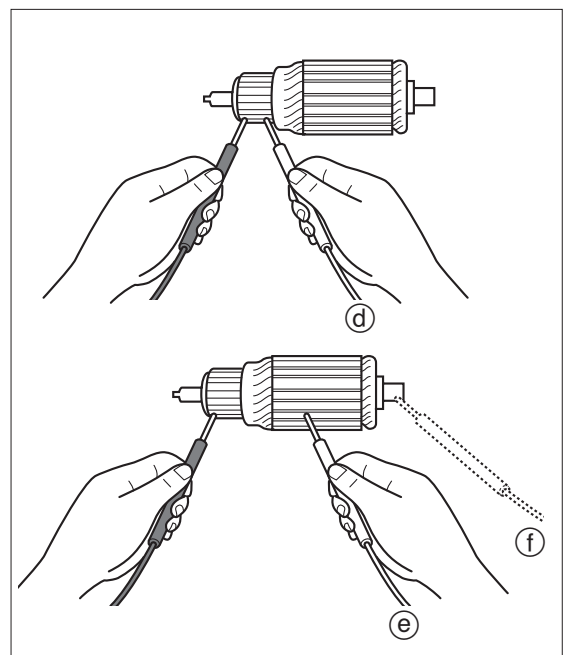
4. Check electrical conductivity of armature.

Replace if any of the following conditions is not met.



Armature Conductivity

Commutator	Conductive
Commutator (d) - Armature Core (e)	Not Conductive
Commutator (d) - Armature Shaft (f)	Not Conductive



5. Check the base for crack and damage, and replace if necessary.

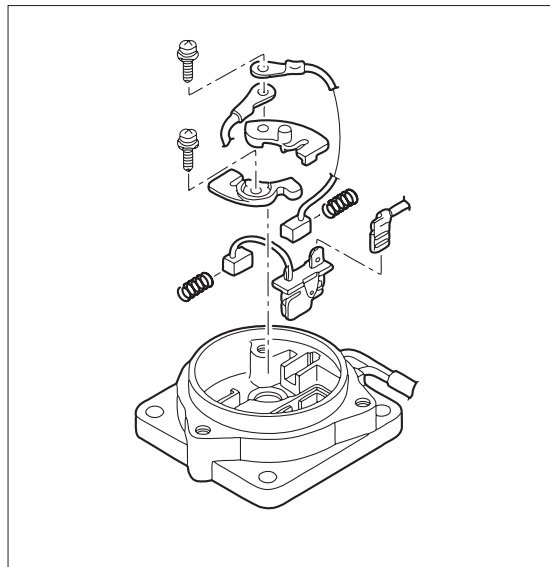
6. Check bearing and oil seal for damage, and replace if necessary.

⚠ CAUTION

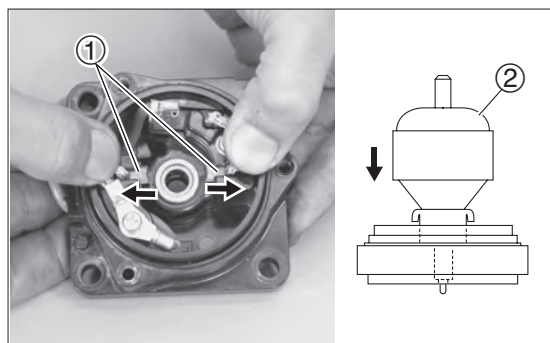
When bearing or oil seal is removed, replace it with new one.

21) Assembling PTT Motor Parts

1. Connect PTT motor leads and secure them with screws.



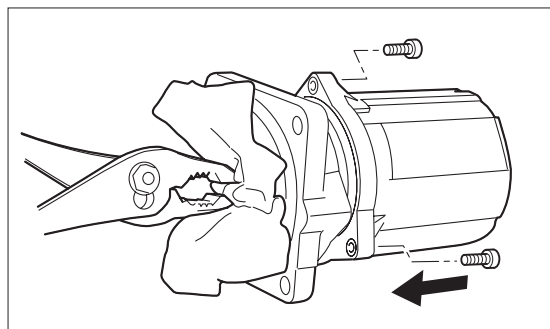
2. Put brushes ① into brush holders, and attach armature ②.



3. Install stator to base.



Cover armature shaft end with clean cloth, hold the shaft using a pair of pliers, and install armature to stator carefully.

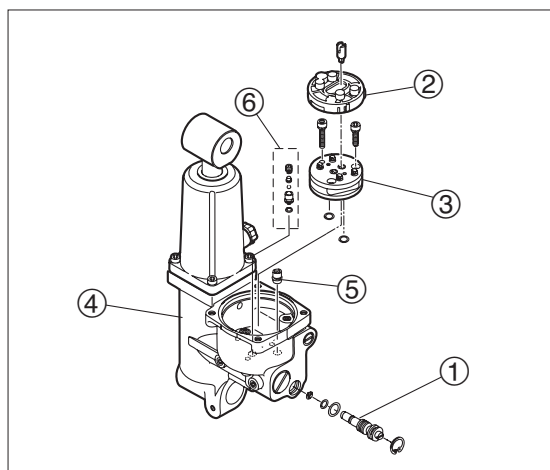


22) Removing PTT Pump and Valves

1. Remove manual valve ① and filter ② then PTT pump ass'y ③.
2. Remove valve ass'y's ⑤ and releaf valve ass'y ⑥ from PTT unit ④.



Be careful not to lose removed parts which are small.





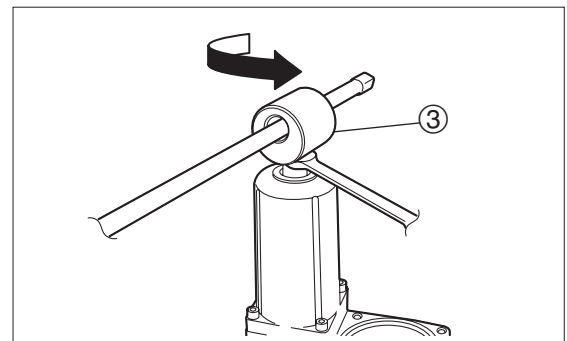
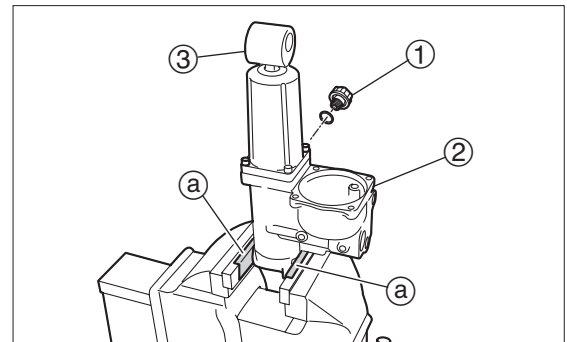
Cowl, Bracket and PTT Unit

23) Inspection of PTT Pump and Valves

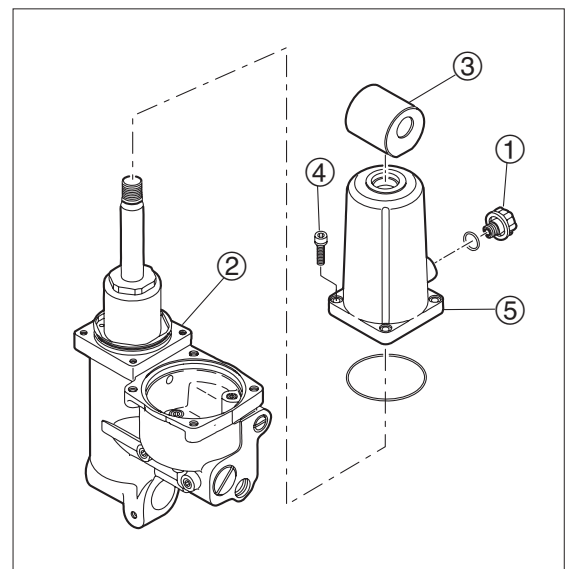
1. Clean piston and ball, and check them for damages and wear. Replace PTT pump if necessary.
2. Check drive gear and driven gear for damages and wear. Replace PTT pump if necessary.
3. Check valve for damage and clogging. Replace if necessary.

24) Removing Reserver Tank

1. Loosen reserver tank cap ① and then drain PTT fluid.
2. Use vise to fix PTT unit ② that is protected at both sides with wood pieces or aluminum plates ③.
3. Secure tilt rod and loosen joint metal (rod eye) ③ by using wrench, and remove them.

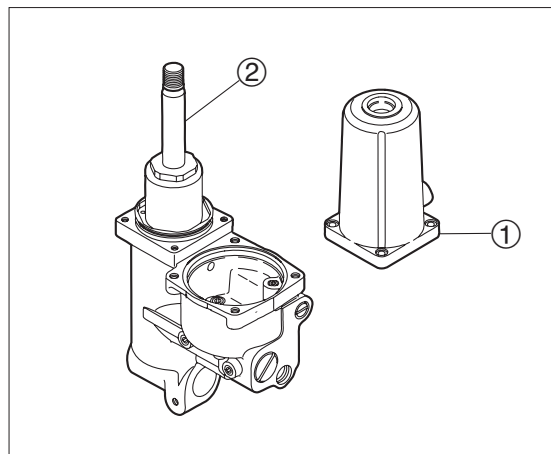


4. Loosen reserve tank bolt ④ and then remove reserve tank ⑤.



25) Inspection of Tilt Cylinder and Reserve Tank

1. Check reservoir ① and upper oil seal for damages and wear. Replace reserve tank if necessary.
2. Check tilt rod ② for bend, any scratched of sliding surface and wear. Replace tilt rod if necessary.
3. Check tilt rod for bend and hard rusting. If lightly rusting, finish by using sand paper #400 - #600, and or replace tilt rod if necessary.



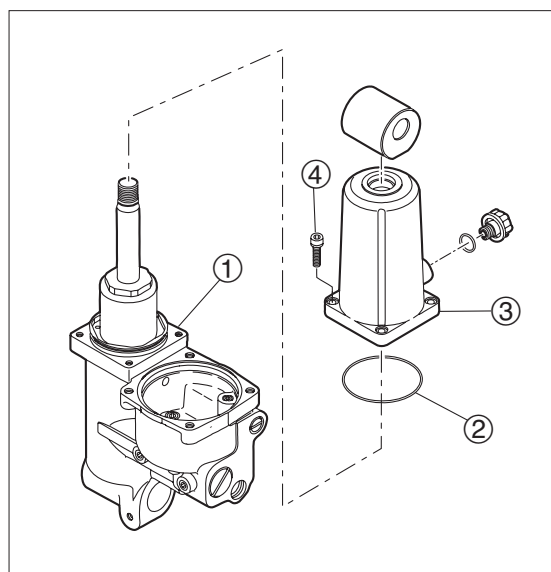
26) Installation of Tiller Handle

1. Install new o-ring ① to PTT unit ①.
2. Install reservoir ③ to PTT unit and tighten bolts ④ to specified torque.

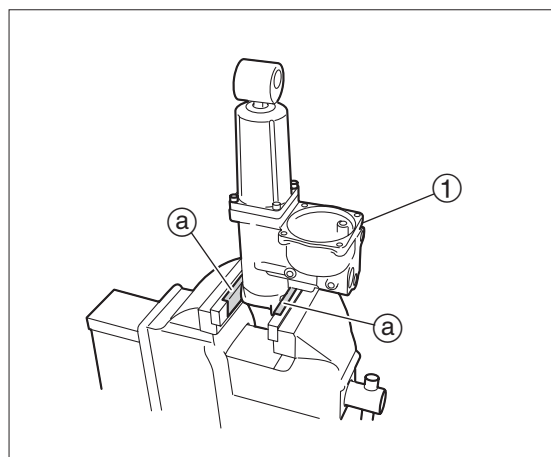


Reserve Tank Bolt ④ :

4.5 N · m (3.3 lb · ft) [0.45 kgf · m]



3. Use vise to fix PTT unit ① that is protected at both sides with wood pieces or aluminum plates (a).

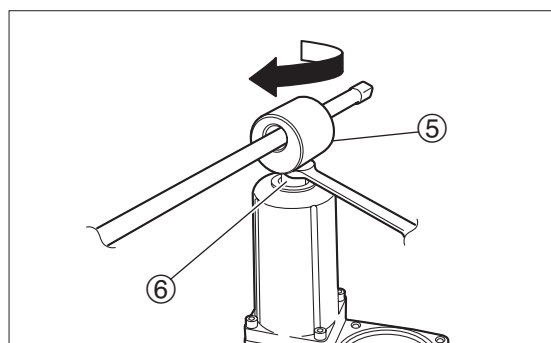


4. Secure tilt rod ⑥ and tighten joint metal (rod eye) ⑤ by using wrench.



Joint Metal ⑤ :

4.5 N · m (3.3 lb · ft) [0.45 kgf · m]





Cowl, Bracket and PTT Unit

27) Installation of PTT Pump and Motor

1. Use vise to fix PTT unit ① that is protected at both sides with wood pieces or aluminum plates.
2. Assemble valve ass'y ②, releaf valve ass'y ③ and PTT pump ass'y ④, and tighten bolt ⑤ to specified torque.



PTT Pump Bolt :

5.2 N·m (3.8 lb·ft) [0.52 kgf·m]

3. Install filter ⑥ to PTT unit.
4. Install manual valve ⑦ and tighten to specified torque.



Manual Valve :

1.8 N·m (1.3 lb·ft) [0.18 kgf·m]

4. Fill pump chamber with PTT fluid to top edge as shown.



Recommended PTT Fluid :

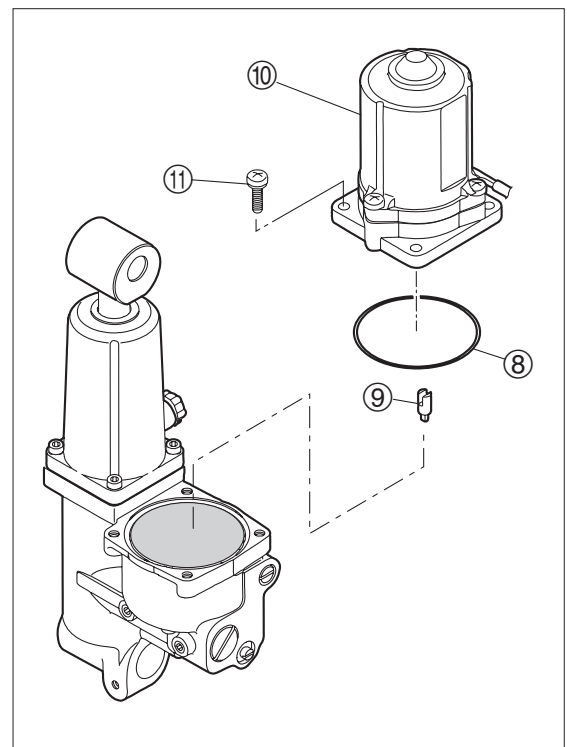
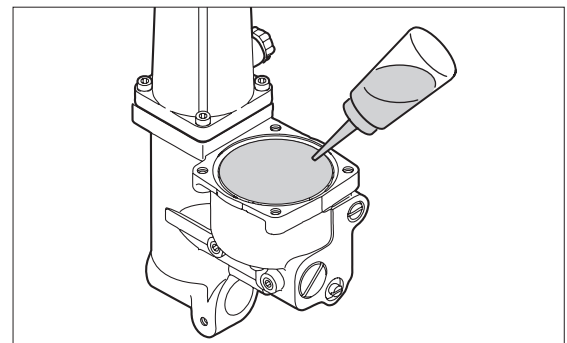
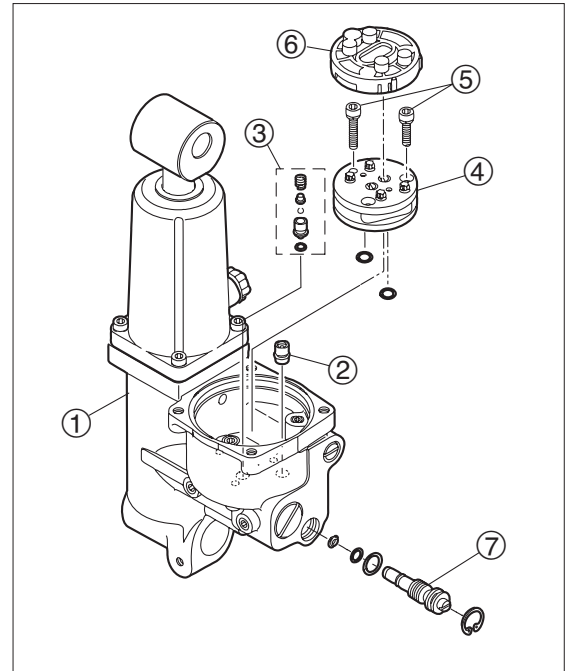
ATF DEXRON III

5. Install new o-ring ⑧, cupling ⑨ and PTT motor ass'y ⑩ and tighten to specified torque.




Screw :

6 N·m (4 lb·ft) [0.6 kgf·m]




28) Air-Purging PTT Unit (separated from outboard motor)

1. Turn manual valve ① clockwise fully.

 **Manual Valve :**
1.8 N·m (1.3 lb·ft) [0.18 kgf·m]


2. Place PTT unit ② vertically.

 PTT unit must be in vertical position as shown.

3. Remove cap ③ and check fluid level in the reservoir tank.
Add recommended PTT fluid, if disassemble PTT unit.

WARNING


Check fluid level with tilt rod fully stretched. Removing reservoir cap at halfway position can cause blasting out of PTT fluid, which is dangerous, and also result in inaccurate fluid level reading.

 Spill of some fluid from plug hole as cap is removed indicates that gear case is filled with specified quantity of gear oil.

4. Add recommended PTT fluid to specified level if it is lacking.

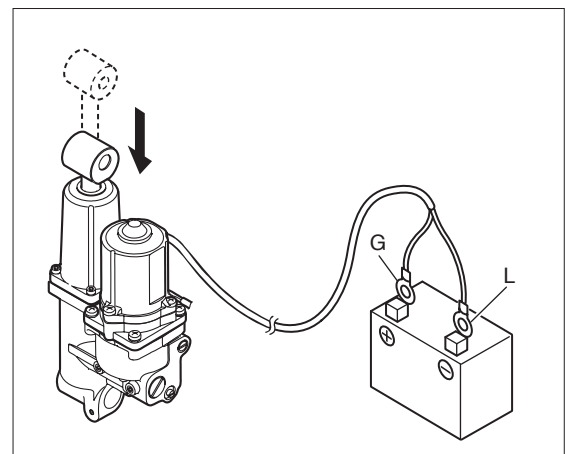
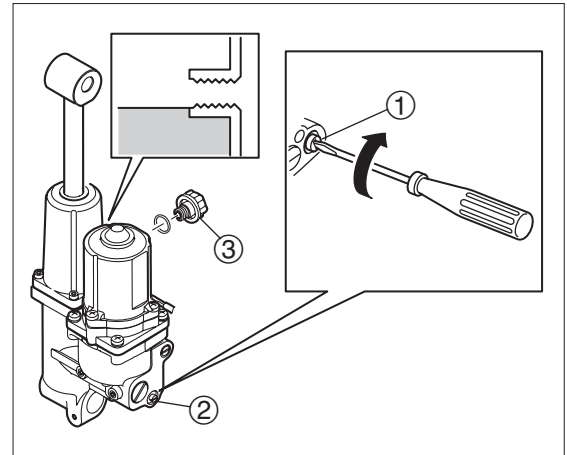
 **Recommended PTT Fluid :**
ATF DEXRON III

5. Put cap ③ and tighten to specified torque.

 **Reserve Tank Cap :**
1.2 N·m (0.9 lb·ft) [0.12 kgf·m]

6. Reconnect PTT motor lead wires to battery terminals to fully retract tilt rod.

Tilt Rod	PTT Motor Lead Wires	Battery Terminals
Retract on	Green (G)	+ : Positive Terminal
	Blue (L)	- : Negative Terminal





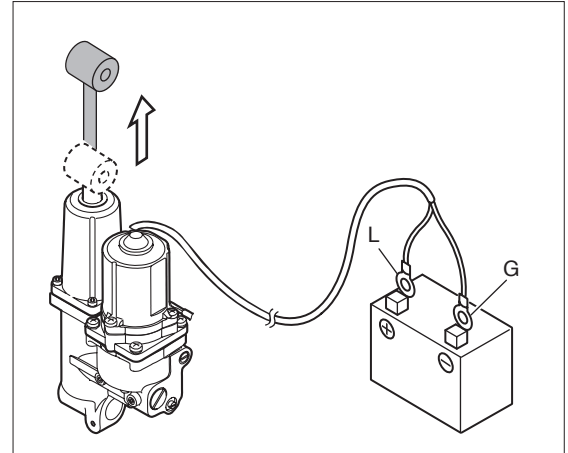
Cowl, Bracket and PTT Unit

7. Reverse connection of PTT motor lead wires to battery terminals to fully stretch tilt rod.

Tilt Rod	PTT Motor Lead Wires	Battery Terminals
Stretch	Blue (L)	+ : Positive Terminal
	Green (G)	- : Negative Terminal



- Repeat above steps several times to move up and down tilt rod (When reversing motor lead wire connection, keep the connection open for two or three seconds.).
- If tilt rod does not move smoothly when connected to battery, assist the movement with hand.



8. Check fluid level with tilt rod fully stretched. Add recommended PTT fluid to specified level if it is lacking.



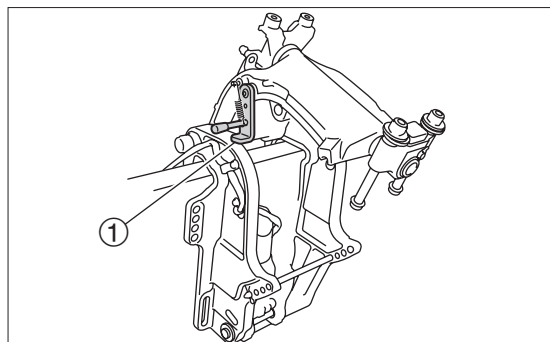
Recommended PTT Fluid :
ATF DEXRON III

29) Installation of PTT Unit/Gas Shock Absorber

1. Fully tilt up outboard motor and lock with tilt stopper ①.

WARNING

Be sure to lock outboard motor with tilt stopper after tilting up. Leaving outboard motor without locking may lead to accidental descent due to reduction of PTT hydraulic pressure.



2. Reinstall bushings ②, ③, ④ and ⑤ to their original positions.



3. Install PTT unit ⑥ or gas shock absorber ⑦, and then cylinder shaft (lower) ⑧.



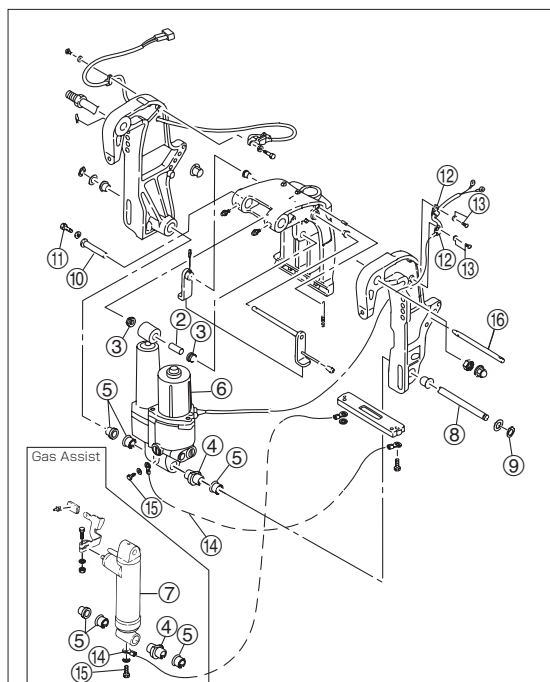
Retract tilt rod a little.



4. Attach "C" ring ⑨.
5. Connect lead wires to battery to fully stretch tilt rod.
6. Install cylinder shaft (upper) ⑩ and tighten bolt ⑪.



7. Run PTT motor lead wires through hole and secure them using clamps ⑫ and screws ⑬.
8. Connect ground lead ⑭ to PTT unit bottom and secure with bolt ⑮.
9. Install thrust rod ⑯.



- ② ③ ④ ⑤ Bushings
- ⑥ PTT unit
- ⑦ Gas Shock Absorber
- ⑧ Cylinder Pin (Lower)
- ⑨ "C" Ring
- ⑩ Cylinder Pin (Upper)
- ⑪ Bolt
- ⑫ Clamps
- ⑬ Screw
- ⑭ Ground Lead
- ⑮ Bolt
- ⑯ Thrust Rod



Cowl, Bracket and PTT Unit

30) Air-Purging PTT Unit (installed on the outboard motor)

1. Install outboard motor on the boat.
2. Fully tilt up outboard motor and lock with tilt stopper.
3. Remove cap ② and check fluid level in the reservoir tank.
4. Turn manual valve counterclockwise fully.
5. Tilt up outboard motor fully with hands and let it tilt down gravitationally.
6. Turn manual valve clockwise fully.



Manual Valve :

1.8 N·m (1.3 lb·ft) [0.18 kgf·m]

7. Leave the unit for five minutes to stabilize PTT fluid.
8. Push PTT switch to check that outboard motor fully tilt up.



If not, loosen manual valve, tilt up with hands and lock with tilt stopper.

9. Lock outboard motor with tilt stopper ①.

⚠ WARNING

Be sure to lock outboard motor with tilt stopper after tilting up. Leaving outboard motor without locking may lead to accidental descent due to reduction of PTT hydraulic pressure.

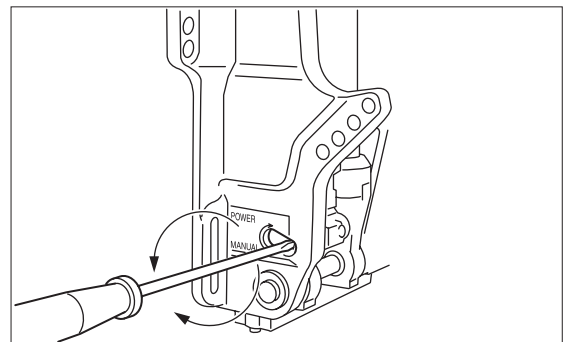
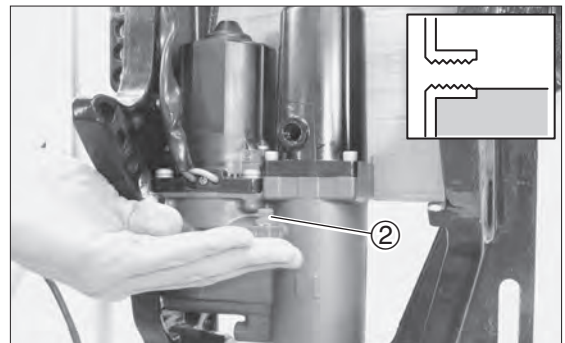
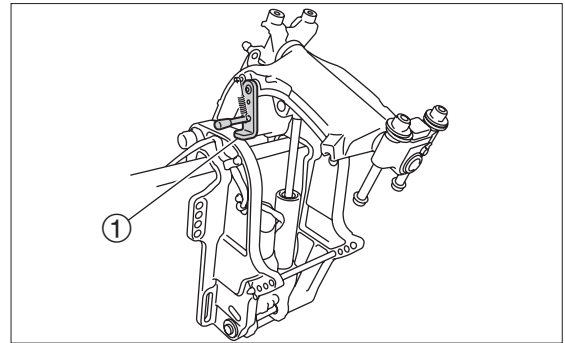
10. Remove cap ② and check fluid level in the reservoir tank.

⚠ WARNING

Check PTT fluid level with outboard motor fully tilted up. Removing reserve tank cap at halfway position can cause blasting out of PTT fluid, which is dangerous, and also result in inaccurate fluid level reading.



Spill of some fluid from plug hole as cap is removed indicates that gear case is filled with specified quantity of gear oil.



11. Add recommended PTT fluid to specified level if it is lacking.



Recommended PTT Fluid :

ATF DEXRON III

12. Reservoir tank cap and tighten to specified torque.



Reserve Tank Cap :

1.2 N·m (0.9 lb·ft) [0.12 kgf·m]

13. Repeat steps from 5. to 12. until specified PTT fluid level is attained.



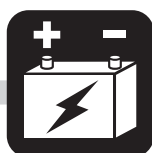


Cowl, Bracket and PTT Unit



8

Electrical System

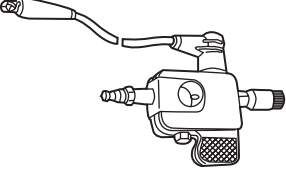


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9) Inspection of Pick Up Coil Air Gap	8-7	22) Inspection of PTT Switch	8-14
10) Inspection of Alternator	8-8		



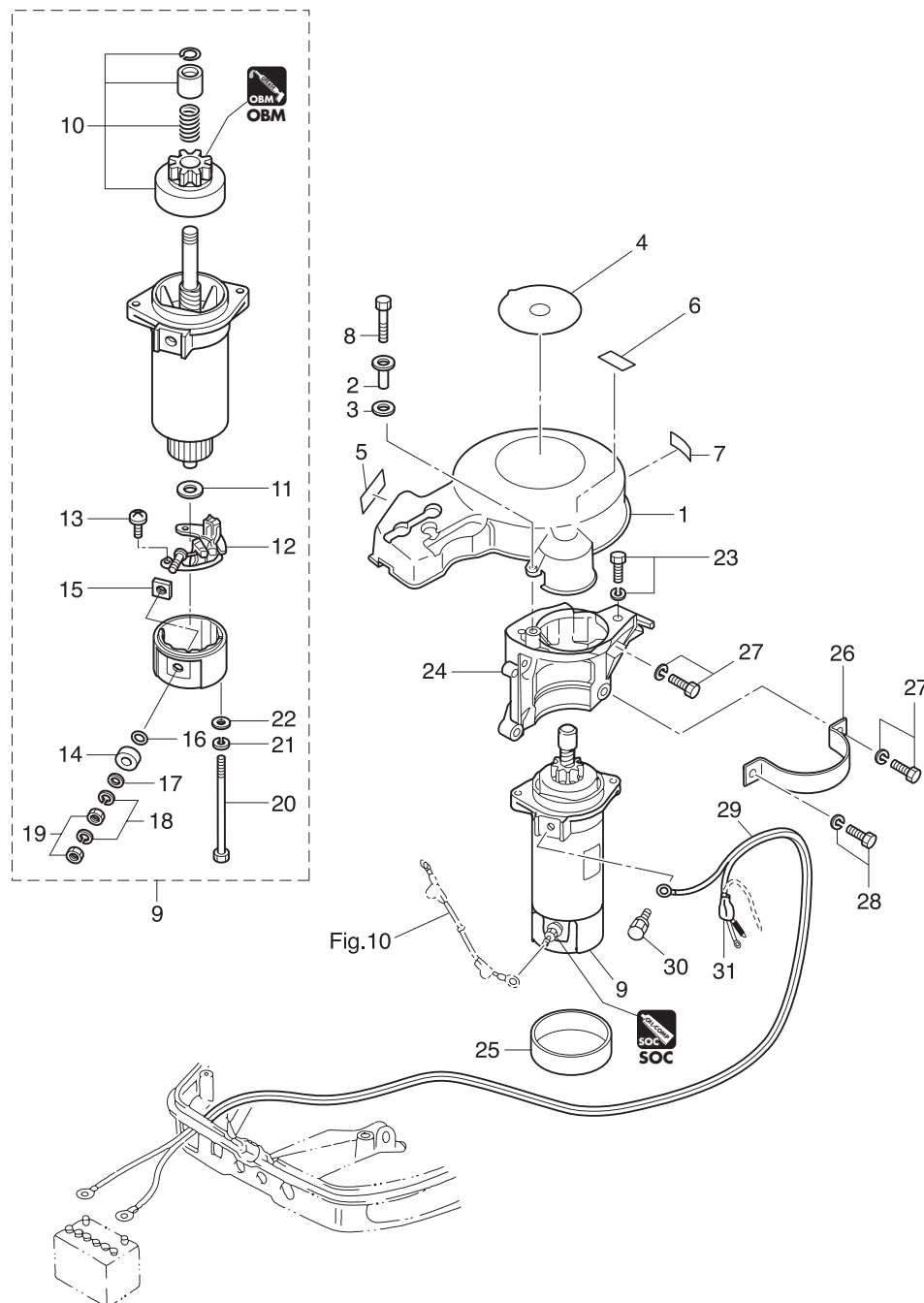
Electrical System

1. Special Tools

	
Spark Tester P/N. 3F3-72540-0	
Checking sparks	

2. Parts Layout

Electric Parts (Starter Motor)



Re No	Description	Q'ty	Remarks
1	Ring Gear Cover	1	
2	Coil	3	
3	Rubber Mount 9-16-4.3	3	
4	Caution Deca (B)	1	
5	Fuse Deca	1	
6	Pressure Deca	1	
7	Spark Plug Deca	1	
8	Boat	3	M6 L=25mm
9	Starter Motor Ass'y	1	
10	Pinion Ass'y	1	
11	Washer	1	
12	Brush Holder Ass'y	1	
13	Screw	2	M4 L=8mm
14	Bush ng1	1	
15	Bush ng 2	1	
16	O-Ring	1	Do not reuse.

Re No	Description	Q'ty	Remarks
17	Washer	1	M6
18	Spr ng Washer	2	M6
19	Nut	2	M6
20	Boat	2	
21	Spr ng Washer	2	M5
22	Washer	2	M5
23	Boat	2	M8 L=25mm
24	Bracket Fan Motor	1	
25	Damper Starter Motor	1	
26	Starter Motor Band	1	
27	Boat	4	M8 L=25mm
28	Boat	1	M8 L=20mm
29	Battery Cable L=3000	1	
30	Boat	1	M6 L=16mm
31	Terminal Cap	1	

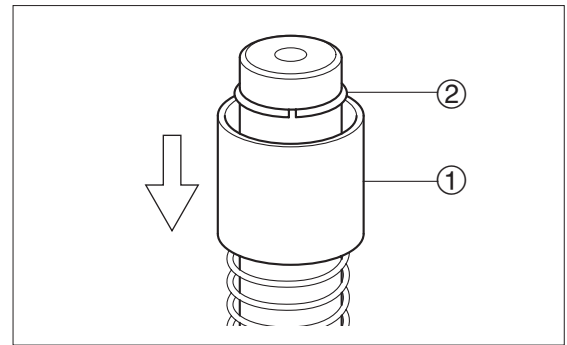


Electrical System

3. Inspection Items

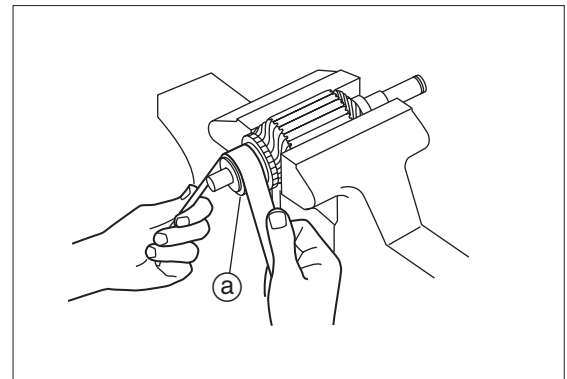
1) Disassembly of Starter Motor

1. Push down pinion stopper ①, remove pinion stopper clip ②, and then, remove pinion return spring and pinion.
2. Remove bolt and screw, and disassemble starter motor.



2) Inspection of Armature

1. Check armature commutator (a) for deposit of carbon and other dirt. Clean by using sand paper #600 if necessary.

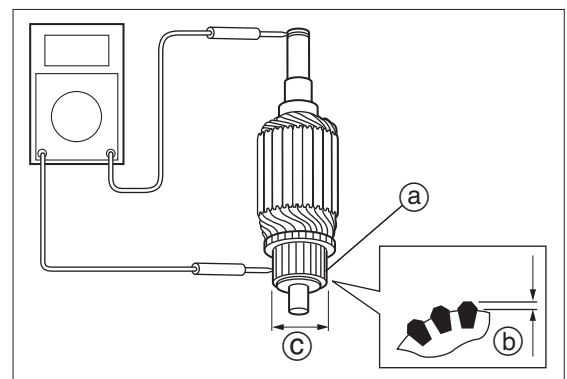


2. Measure commutator (a) groove depth (b).
Replace starter motor if the depth is less than specified value.

	Groove Depth (b) : 0.5 - 0.8 mm (0.020 - 0.032 in)
	Wear Limit : 0.2 mm (0.008 in)



3. Check conductivity between commutator (a) and shaft.
Replace starter motor if conductive.
4. Measure commutator (a) outer diameter (c).
Replace starter motor ass'y if the diameter is less than specified value.

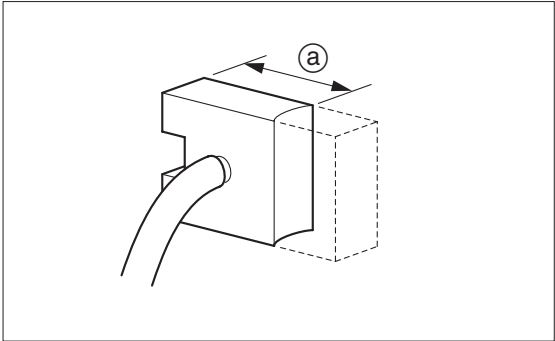
	Diameter (c) : 30 mm (1.18 in)
	Wear Limit : 29 mm (1.14 in)




3) Inspection of Brushes

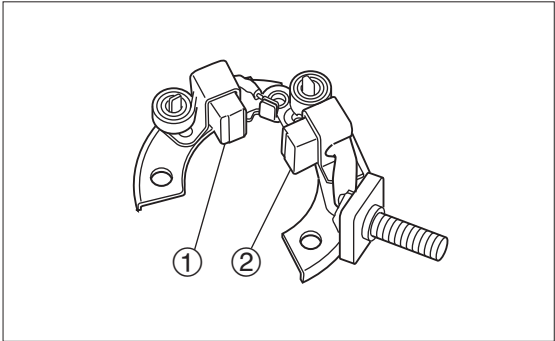
1. Measure brush length (a), and replace brush if the length is less than specified value.

	Brush Length (a) : Standard Value 12.5 mm (0.49 in)
	Wear Limit : 9.5 mm (0.37 in)



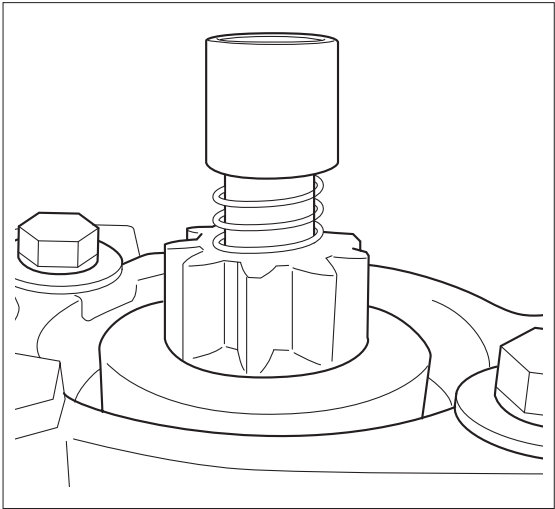
2. Check conductivity of brush holder ass'y. Replace if other than specified value.

	Conductivity Between Brushed
Between Brush ① – Brush ②	Non-conductive
Between Brush ①② – Earth	Non-conductive



4) Inspection of Pinion

1. Check pinion teeth for nick and wear.
Replace if necessary.





Electrical System

5) Inspection of Ignition and spark

⚠ WARNING

- When testing, put electrode cap assuredly to prevent direct contact with spark tester wiring and leak of electrical current, and perform test carefully.
- Keep flammable gas, fuel, oil away from tester to prevent them from catching sparks. If not using an in-line tester, remove fuel injector connectors when checking spark.



This test can be made without removing parts.

1. Disconnect plug cap ① from spark plugs.
2. Connect plug cap ① to spark tester.
3. Connect spark tester clip to spark plug tip electrode.



Spark Tester :

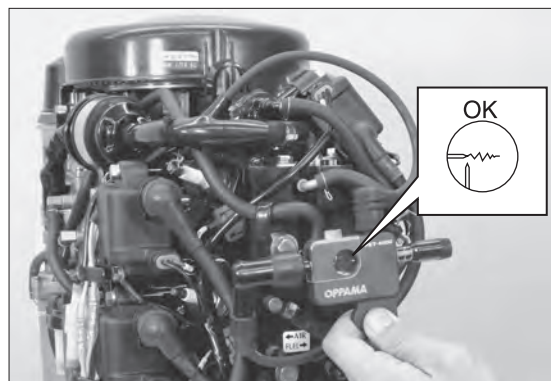
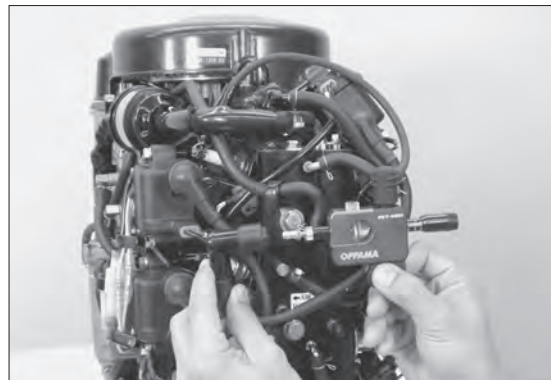
P/N. 3F3-72540-0

4. Crank engine and check spark. Check spark system when sparks are weak.



Spark Performance :

10 mm (0.4 in) or over



6) Inspection of Plug Cap



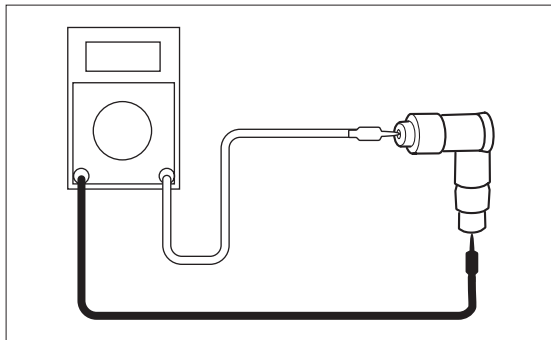
Remove the part and test it as a separate unit.

1. Disconnect plug cap from spark plug.
2. Remove plug cap from high tension cable. by twisting counterclockwise.
3. Measure plug cap resistance. Replace if other than specified value.



Plug Cap Resistance :

5 kΩ @20°C (68 °F)



7) Inspection of Ignition Coils



This test can be made without removing parts.

1. Remove ignition coil coupler.
2. Measure ignition coil resistance. Replace if other than specified value.



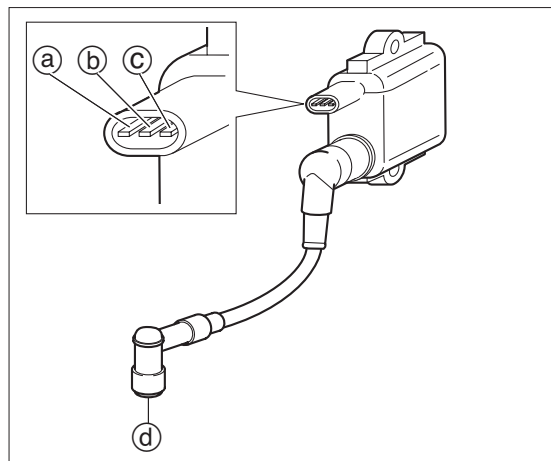
Ignition Coil Resistance :

Primary Side : Between (a) and (b) 0.45 - 0.55 Ω

Secondary Side : Between (c) and (d) 10.8 - 16.2 k Ω

(6.8 - 10.2 k Ω without plug cap)

3. Install plug cap onto high tension cord by twisting clockwise.
4. Connect plug cap to spark plug.



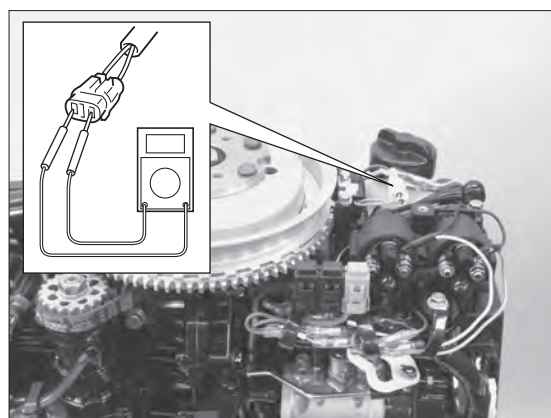
8) Inspection of Pick Up Coil (Crank Position Sensor)

2. Disconnect pick up coil ① connector.
3. Measure resistance between terminals.
Replace pick up coil if the resistance is out of specified range.



Resistance between Terminals : @20°C (68 °F)

451 - 611 Ω



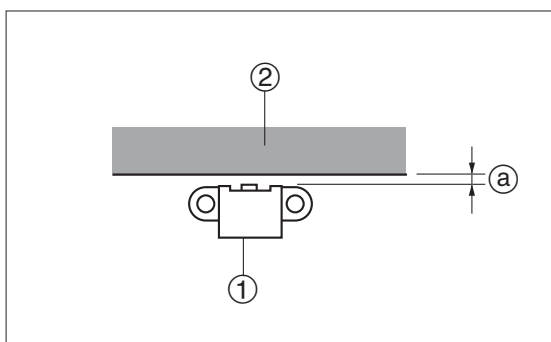
9) Inspection of Pick Up Coil Air Gap

1. Measure air gap (a) between pick up coil ① and flywheel ②.
Adjust air gap if out of specified range.



Air Gap (a) :

0.5 - 0.9 mm (0.020 - 0.035 in)





Electrical System

10) Inspection of Alternator

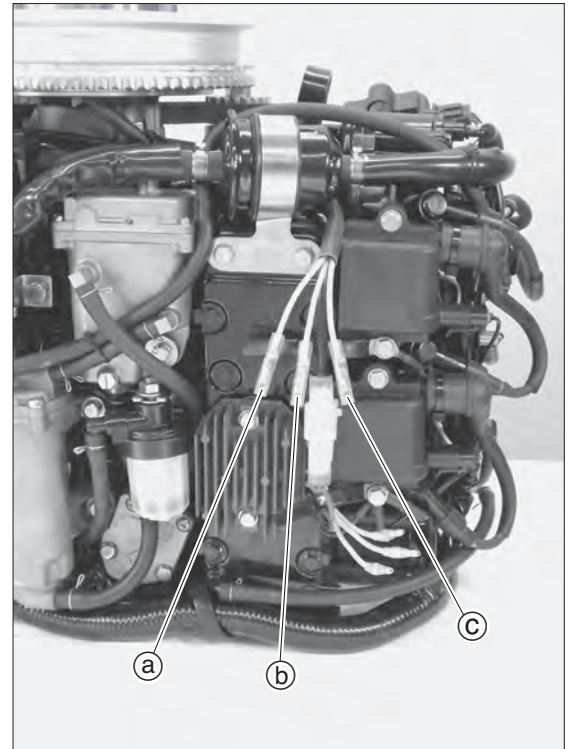
1. Disconnect alternator connector and measure resistance between terminals.
Replace alternator if the resistance is out of specified range.



Resistance between Terminals of Connectors

Ⓐ, Ⓑ and Ⓒ : @20°C (68 °F)

0.374 - 0.506 Ω

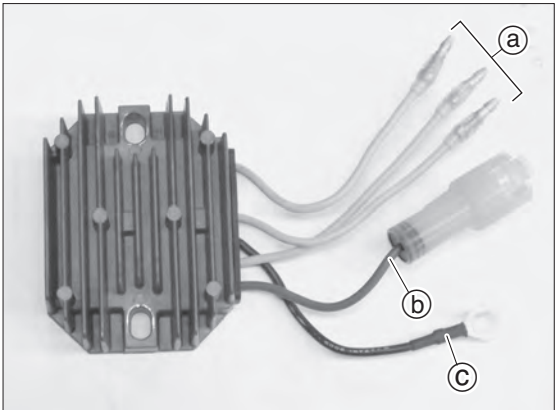


11) Inspection of Rectifier Complete

1. Measure resistance between terminals.



This test can be made without removing parts.



- (a) Yellow
(b) Red
(c) Black

Rectifier Tester Check Table

“ON” means conductive and “OFF” means no conductivity.

		Positive Tester Lead (Red)				
Tester Lead Negative (-) Side (Black)		Red	Black	Yellow	Yellow	Yellow
	Red		OFF	OFF	OFF	OFF
	Black	ON (4.2kΩ)		ON (2.3kΩ)	ON (2.3kΩ)	ON (2.3kΩ)
	Yellow	ON (3.5kΩ)	ON (2.4kΩ)		ON (4.8kΩ)	ON (4.8kΩ)
	Yellow	ON (3.5kΩ)	ON (2.4kΩ)	ON (4.8kΩ)		ON (4.8kΩ)
	Yellow	ON (3.5kΩ)	ON (2.4kΩ)	ON (4.8kΩ)	ON (4.8kΩ)	

Notes:

- ① Use HIOKI HiTESTER MODEL 3030 or equivalent tester for this measurement, and do not use megger or other instrument.
- ② Disconnect all connections, and measure as an independent unit.
- ③ When the tester’s pointer moves, the result is “ON”, or “OFF” when not.
- ④ The value enclosed by () is approximately value measured using 1kΩ range of the tester. Note that the value varies among conditions of the tester (internal power supply), measurement ranges and models.
- ⑤ Perform this inspection only as a guide.



Electrical System

12) Inspection of Throttle Position Sensor



This test can be made without removing parts.

1. Measure resistance between terminals.
Replace throttle position sensor if the resistance is out of specified range.

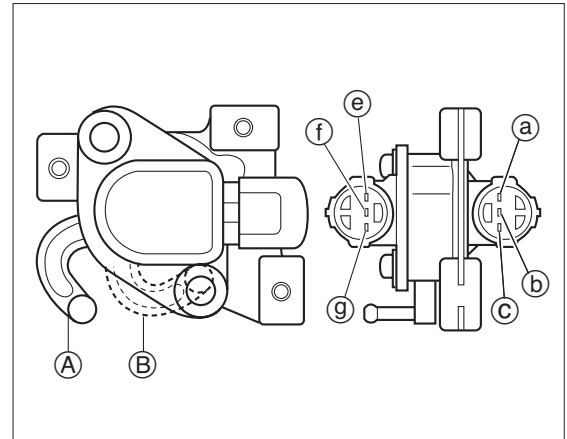


When lever is at position A (wide open throttle) :

Between (a) - (c) : 4 - 6 k Ω
Between (e) - (g) : 4 - 6 k Ω
Between (a) - (b) : 4 - 5 k Ω (e) - (f) : 0.5 - 1 k Ω

When lever is at position B (fully closed throttle) :

Between (a) - (c) : 4 - 6 k Ω
Between (e) - (g) : 4 - 6 k Ω
Between (a) - (b) : 0.5 - 1 k Ω (e) - (f) : 4 - 5 k Ω



13) Inspection of Water Temperature Sensor



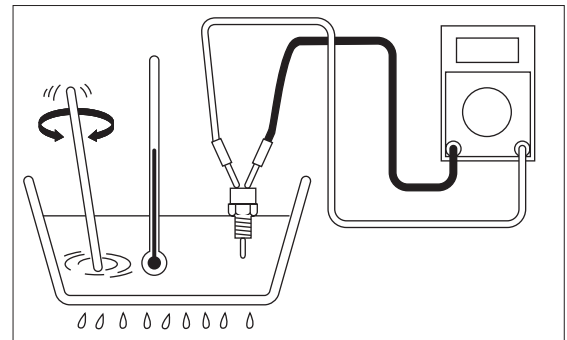
Remove the part and test it as a separate unit.

1. ***
2. Put water temperature sensor in the water, and warm up water slowly.
3. Measure water temperature sensor resistance. Replace if other than specified value.



Water Temperature Sensor Resistance (Reference Value) :

1.026 - 1.254 k Ω at 40°C (104 °F)
0.144 - 0.176 k Ω at 100°C (212 °F)



14) Inspection of Air Injectors



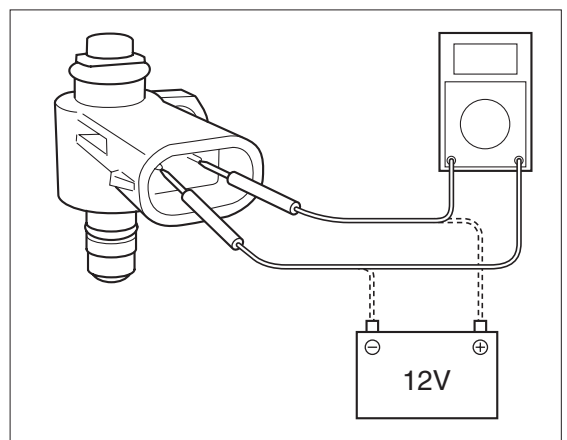
This test can be made without removing parts.

1. Measure resistance between terminals.
Replace air injector if the resistance is out of specified range.



Resistance between terminals : @20°C (68 °F)
1.2 - 1.4 Ω

2. Apply 12V to the terminals to check if the part "clicks".
If not, replace air injector.



15) Inspection of Fuel Injectors



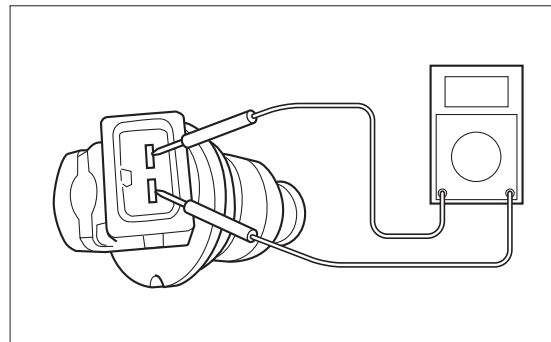
This test can be made without removing parts.

1. Measure resistance between the terminals, and replace fuel injector if the resistance is out of specified range.



Resistance between terminals : @20°C (68°F)
1.7 - 1.9 Ω

2. Apply 12V to the terminals to check if the part “clicks”
If not, replace fuel injector.



16) Inspection of MAT sensor (Manifold Temperature Sensor) (Option)

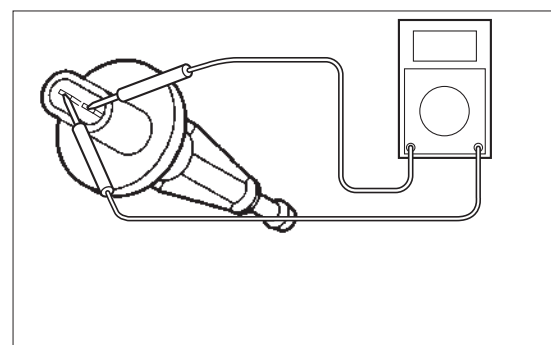


This test can be made without removing parts.

1. Measure MAT sensor resistance. Replace if other than specified value.



MAT (Manifold Temperature) Sensor
Temperature (Reference Value) :
2.21 - 2.70kΩ at 20°C (68°F)
0.30 - 0.35kΩ at 80°C (176°F)



17) Inspection of MAP Sensor (Manifold Absolute Air Pressure Sensor) (Option)

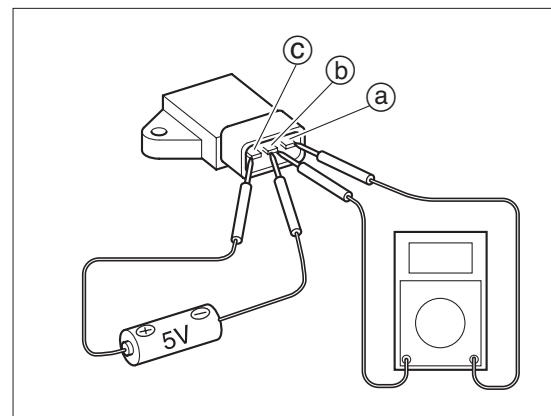


This test can be made without removing parts.

1. Apply 5V between terminals ② and ③, and measure output voltage between terminals ① and ②.
Replace MAP sensor if the output voltage is out of specified range.



Output Voltage between ① and ② : @25°C (77°F) and atmospheric pressure
3.1 - 4.6V





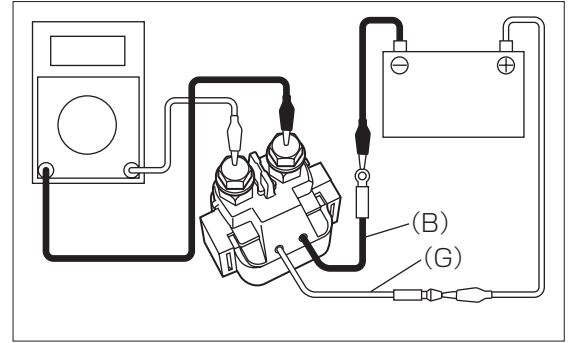
Electrical System

18) Inspection of Starter Solenoid



This test can be made without removing parts.

1. Connect tester lead wires to both terminal of starter solenoid.
2. Connector green (G) lead wire to battery positive terminal.
3. Connector black (B) lead wire to battery negative terminal.
4. Check electrical conductivity between terminals of starter solenoid. Replace if no conductivity.
5. Remove battery terminal from green (G) or black (B) lead wire, and check there is no conductivity between starter solenoid terminals. Replace if conductive.



19) Inspection of Oil Level Sensor

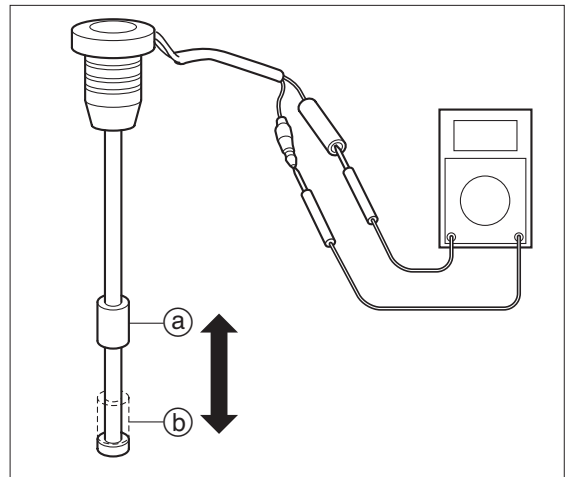


This test can be made without removing parts.

1. Check electrical conductivity between terminals of oil level sensor.
Check oil level sensor if out of specified range.



To be non conductive if float is at position (a).
To be conductive if float is at position (b).



20) Inspection of Fuel Feed Pump (FFP).



- This test can be performed without removing parts.
- Fuel feed pump (FFP) operates approximately 2 seconds when main switch is set to "ON".

1. Check that fuel feed pump (FFP) operation noise is heard. If no noise is heard, check fuel system.

21) Inspection of PTT Solenoid

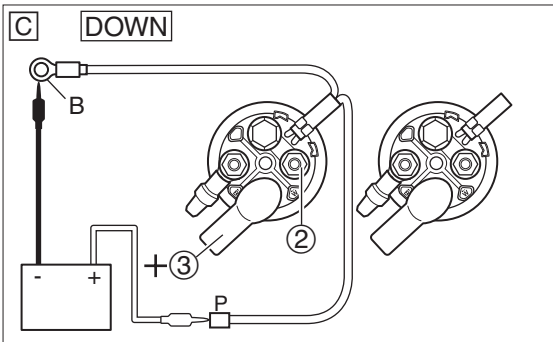
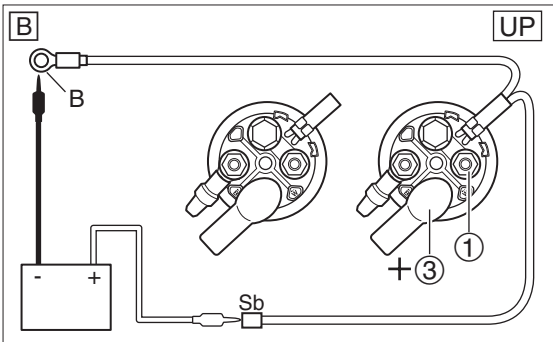
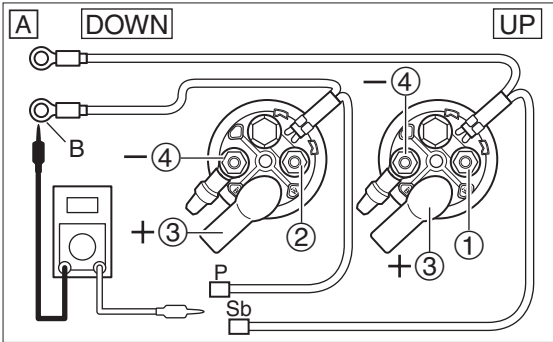


This test can be made without removing parts.

1. Disconnect positive and negative cables from battery.
2. Disconnect PTT leads from terminals ① and ②.
3. Check electrical conductivity of PTT solenoid. Replace if other than specified value.

PTT Solenoid Conductivity		
	Sky Blue (Sb) -Black (B)	Conductive
	Pink (P) -Black (B)	Conductive
	Terminal ① - Terminal ④ (-)	Conductive
	Terminal ② - Terminal ④ (-)	Conductive
	Terminal ① - Terminal ③ (+)	No Conductivity
	Terminal ② - Terminal ③ (+)	No Conductivity

4. Connect circuit tester leads between terminals ① and ③ of PTT solenoid.
5. As shown in diagram [B], connect sky blue (Sb) terminal to positive battery terminal, and black (B) lead wire to negative battery terminal.
6. Check electrical conductivity between terminals ① and ③. If non conductive, replace UP side PTT solenoid.
7. Connect circuit tester leads between terminals ② and ③ of PTT solenoid.
8. As shown in diagram [C], connect pink (P) terminal to positive battery terminal, and black (B) lead wire to negative battery terminal.
9. Check electrical conductivity between terminals ② and ③. If non conductive, replace DOWN side PTT solenoid.








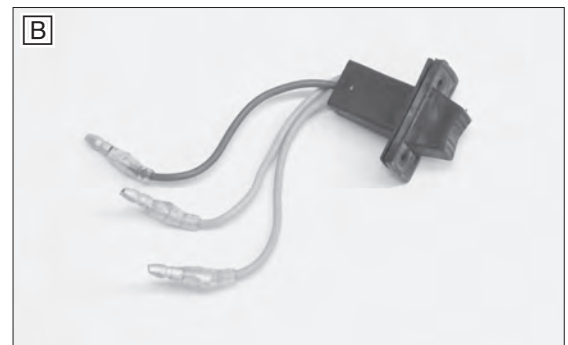


Electrical System

22) Inspection of PTT Switch

1. Check electrical conductivity of PTT switch. Replace if other than specified value.

	Lead Wires			
	Switch Position	Sky Blue (Sb)	Red (R)	Pink (P)
	Up (Ascend)			
	Free			
	Down (Descend)			



A EPT model

B EFT model

9

Troubleshooting



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Troubleshooting

1. Troubleshooting

Note: This information is applicable also to 40B/50B and 70B/90B.

This troubleshooting information covers malfunctions and abnormalities of electrical parts which are warned of by the buzzer and warning lamp.

For the operations of the buzzer and warning lamp, refer to "Warning Indication List".




Symptom	Item		Self-diagnosable (○)	Beep	Warning indicator A (Oil level) 	Warning lamp B (Water temp.) 	Warning lamp C (Battery volt.) 
1. Starter motor will not rotate or is slow.	1-1.	Shift					
	1-2.	Battery	○				Flashing
	1-3.	Fuse					
	1-4.	Wiring					
	1-5.	Electrical components					
2. Engine can be cranked but will not start.	2-1. Power head	Fuel tank					
	2-2. Fuel system	Fuel tank					
		Fuel filter					
		Fuel pressure is low. Normal value range: 0.7 - 0.74 MPa					
			○		Flashing	Flashing	Flashing

FFP(*1) : Fuel Feed Pump

Cause		Action to be taken (Refer to reference value or service data.)
1-1-1.	Shift is in "F" or "R" position.	Shift into neutral position.
1-2-1.	Battery is low, or battery cable or circuit connection is loose or corroded.	Replace battery or charge. Check terminals and cables.
1-3-1.	Fuse is burned.	Check all of three fuses. Check areas related to the fuses, and repair the part(s) and then, replace the fuse.
1-4-1.	Defective wire or electrical connections	
1-5-1.	Main switch, neutral switch, starter solenoid or starter motor malfunctions.	Check and replace as necessary.
2-1-1.	Piston ring(s) is seized.	Check, repair or replace as necessary.
2-1-2.	Reed valve has a gap, is worn or damaged.	
2-2-1.	Fuel tank is empty or fuel level is low.	Replenish fuel and perform operation described in 2-2-3.
2-2-2.	Air vent is closed.	Open air vent and perform operation described in 2-2-3.
2-2-3.	Water is found in the fuel filter. (Water raises red float in the filter.)	Check if any water exists in the fuel line, and clean if necessary.
2-2-4.	Fuel is not supplied to fuel line.	Check if primary bulb is hard. Squeeze to make it hard if necessary, and set main switch to ON for 2 seconds. Repeat the operation until the bulb becomes hard.
2-2-5.	Lack of or no operation to feed fuel to fuel line after replenishing fuel.	
2-2-6.	Fuel filter is clogged.	Check interior of fuel tank, hull, and engine fuel filter, and clean or replace fuel filter if necessary.
2-2-7.	Air pressure in the air rail is low.	Refer to 2-3.
2-2-8.	Fuel hose is clogged.	Check fuel hose if they are twisted, collapsed or bent.
2-2-9.	FFP (*1) is not operating.	Check that the motor in the FFP (*1) assembly generates operating noise for approximately 2 seconds when main switch key is turned from [OFF] to [ON] position.
2-2-10.	FFP (*1) internal component(s) is damaged.	Replace FFP (*1) with new one.
2-2-11.	FFP (*1) leaks in the case.	Check FFP or seal rubber of its internal parts.






Troubleshooting

Symptom	Item		Self-diagnosable (○)	Beep	Warning indicator A (Oil level) 	Warning lamp B (Water temp.) 	Warning lamp C (Battery volt.) 
2. Engine can be cranked but will not start.	2-2. Fuel System	Fuel pressure is low. Normal value range: 0.7 - 0.74MPa					
		Air rail internal fuel pressure is high. Normal value range: 0.7 - 0.74MPa					
	2-3. Air Compressor System	Air pressure is low. Normal value range: 0.63 - 0.67MPa					
		Air pressure is high. Normal value range: 0.63 - 0.67MPa					
	2-4. Electrical System	Fuse					
		Stop Switch					
		Air Injector					
		Spark Plug					

Cause		Action to be taken (Refer to reference value or service data.)
2-2-12.	Fuel regulator leaks.	Replace.
2-2-13.	Fuel leak	Check hose damage and joints.
2-2-14.	Return circuit from fuel regulator outlet to vapor separator is obstructed.	Check, and repair if necessary.
2-2-15.	Fuel regulator is faulty.	Replace.
2-2-16.	Fuel pressure is high.	Refer to 2-3-9 and 2-3-10.
2-3-1.	Air hose joint nut is loose.	Check, and repair if necessary.
2-3-2.	Air filter is clogged.	Check, and replace if necessary.
2-3-3.	Orifice is clogged in the air rail.	Check, and replace if necessary.
2-3-4.	Air hose joint O ring is damaged.	Check, and repair if necessary.
2-3-5.	Air hose is collapsed.	
2-3-6.	Air regulator leaks.	Replace.
2-3-7.	Air compressor reed valve is damaged.	Check, and replace if necessary.
2-3-8.	Air compressor cylinder or piston ring is worn much.	
2-3-9.	Air regulator malfunctions.	Replace.
2-3-10.	Passage following air regulator is clogged.	Check, and repair if necessary.
2-4-1.	Fuse is burnt.	Check the cause of fuse burning (overload), and replace the fuse after repairing.
2-4-2.	Lock is removed.	Check.
2-4-3.	Stop switch is short-circuited.	Check, and repair if necessary.
2-4-4.	Fuel injector is deposited with carbon or malfunctions.	Clean, or replace if necessary. Connect injector(s) to harness, and the injector should produce operating noise (click) during cranking.
2-4-5.	Spark plug (s) is faulty.	Correct the gap is out of specified range. Electrode is worn much. Replace if cracked or damaged. Replace if electricity leaks at the gap due to carbon deposit or electrode is entirely black due to carbon deposits. Replace if fuel fouled, also a carbon fouled plug will give an ignition coil code replace plug and clear the code.



Troubleshooting

Symptom	Item		Self-diagnosable (○)	Beep	Warning indicator A (Oil level) 	Warning lamp B (Water temp.) 	Warning lamp C (Battery volt.) 
2. Engine can be cranked but will not start.	2-4. Electrical System	Spark Plug Cap					
		Crank Position Sensor					
		ECU					
		Self-diag. reports that battery voltage is abnormally low.	○				Flashing
		Self-diag. reports that a component is abnormal.	○				
		Self-diag. reports that TPS (*3) idle position is faulty.	○				
		Engine revolution is slow (seizure).	○				
3. Engine can be cranked and starts, but idling cannot be maintained or is unstable.	3-1. Power Head	Compression insufficient					
	3-2. Fuel System	Fuel Tank					
		Fuel Tank					
		Fuel pressure is low. Normal value range: 0.7 - 0.74MPa					

TPS(*2) : Throttle Position Sensor

Lift Pump (*3) : Diaphragm type fuel pump

Reset TPS when (*4): ① The set of remote control cables were readjusted because TPS error message was displayed due to incorrect setting of the cables.

② TPS or ECU was replaced.




③ Link or rod snap was replaced due to wear or deformation of links.

It is necessary to reset ECU and TPS after performing the above work. Reset TPS initial value by referring to the chapter of self-diagnosis function.

Cause		Action to be taken (Refer to reference value or service data.)
2-4-6.	Cap is loose.	Check.
2-4-7.	Cap is faulty.	Replace.
2-4-8.	CPS Gap.	Check, and adjust if necessary.
2-4-9.	ECU malfunction.	Replace ECU.
2-4-10.	Battery power is low. Battery voltage becomes less than 10 V at cranking due to faulty starter motor.	Replace battery or charge. Check terminals and cables. Check starter motor.
2-4-11.	AS component malfunction, connection is faulty or wire-harness is broken.	Check, and repair or replace if necessary.
2-4-12.	TPS(*2) initial setting is incorrect.	Check, and repair if necessary. Then, reset TPS (*4).
2-4-13.	TPS(*2) or ECU was replaced.	Reset TPS (*4).
3-1-1.	Piston has a scratch or a cause that produces resistance.	Check, and repair if necessary.
3-1-2.	Piston ring(s) is seized.	
3-1-3.	Reed valve has a gap, is worn or damaged.	
3-1-4.	Cylinder head gasket or engine base gasket is faulty.	
3-1-5.	Head bolt(s) or crank case bolt(s) is loose.	
3-2-1.	Fuel is empty or low in the tank.	Refer to 2-2-1.
3-2-2.	Air vent is closed.	Refer to 2-2-2.
3-2-3.	Water is deposited in the fuel filter.	Check interior of fuel tank, hull, and engine fuel filter, and clean or replace fuel filter if necessary.
3-2-4.	Fuel filter is clogged.	
3-2-5.	Fuel hose is clogged.	Check fuel hoses if they are twisted, collapsed or bent.
3-2-6.	Lift pump (*3) is not operating.	Check, and repair if necessary. Or replace.
3-2-7.	FFP leaks in the case.	Refer to 2-2-11.






Troubleshooting

Symptom	Item		Self-diagnosable (○)	Beep	Warning indicator A (Oil level) 	Warning lamp B (Water temp.) 	Warning lamp C (Battery volt.) 
3. Engine can be cranked and starts, but idling revolution cannot be maintained or is unstable.	3-2. Fuel System	Fuel pressure is low. Normal value range: 0.7 - 0.74MPa					
		Fuel pressure is high. Normal value range: 0.7 - 0.74MPa					
	3-3. Air System	Air pressure is low. [Normal value range: 0.63 - 0.67MPa					
		Air pressure is high.					
	3-4. Electrical System	Spark Plug					
		Spark Plug Cap					
		Self-diag. reports component abnormality.	○				
		Self-diag. reports component abnormality.	○				
		Self-diag. reports component abnormality.	○				
		Air Injector					
4. Idling speed is too high.	4-1. Electrical System	Key switch					
		Self-diag. reports TPS idle position incorrect.	○		Flashing	Flashing	Flashing
			○		Flashing	Flashing	Flashing
5. Engine revolution is unstable at 3000rpm or higher.	5-1.	Spark Plug					
	5-2.	Engine speed is controlled. (due to ESG)					
	5-3.	Fuel or air pressure is low.					
	5-4.	TPS(*1) function is faulty.					
6. Engine will not fully increase speed with wide open throttle.	6-1. Power Head	Advancer arm will not move.					
		Compression insufficient					

Cause		Action to be taken (Refer to reference value or service data.)
3-2-8.	Fuel regulator leaks.	Refer to 2-2-12.
3-2-9.	Fuel leaks.	Refer to 2-2-13.
3-2-10.	Air rail internal air pressure is low.	Refer to 2-3.
3-2-11.	Fuel regulator is faulty.	Replace.
3-2-12.	Return circuit from fuel regulator outlet to vapor separator is obstructed.	Check, and repair if necessary.
3-3-1.	Refer to 2-3.	Refer to 2-3.
3-3-2.		
3-4-1.	Refer to 2-4-3.	Refer to 2-4-3.
3-4-2.	Cap is loose.	Check.
3-4-3.	Cap is faulty.	Replace.
3-4-4.	Component malfunction or loose connection	Check, and repair if necessary. Or replace.
3-4-5.	TPS initial setting is incorrect.	Refer to 2-4-13.
3-4-6.	TPS or ECU was replaced.	Refer to 2-4-13.
3-4-7.	Malfunction	Clean, or replace if necessary. Connect injector(s) to harness, and the injector should produce operating noise (click) during cranking.
4-1-1.	Idle revolution setting is changed.	Change setting of idling revolution by using variable idle switch.
4-1-2.	TPS initial setting is incorrect.	Refer to 2-4-13.
4-1-3.	TPS or ECU was replaced.	Refer to 2-4-13.
5-1-1	Refer to 2-4-3.	Refer to 2-4-3.
5-1-2	Refer to 10-1.	Refer to 10-1.
5-1-3	Refer to 3-3.	Refer to 3-3.
5-1-4	2-4-12, Refer to 2-4-13.	2-4-12, Refer to 2-4-13.
6-1-1.	Remote control cable is installed incorrectly.	Check, and adjust if necessary.
6-1-2.	Throttle link component(s) is deformed or worn.	Check, and replace if necessary.
6-1-3.	Piston or cylinder liner is scratched.	Check, and repair if necessary.
6-1-4.	Combustion chamber is deposited with carbon.	
6-1-5.	Piston ring is worn abnormally or seized.	






Troubleshooting

Symptom	Item		Self-diagnosable (○)	Beep	Warning indicator A (Oil level) 	Warning lamp B (Water temp.) 	Warning lamp C (Battery volt.) 
6 Engine will not fully increase speed with wide open throttle.	6-1. Power Head	Compression insufficient					
	6-2. Air System	Air rail internal air pressure is low.					
		Air rail internal air pressure is high.					
	6-3. Fuel System	Fuel Tank					
		Fuel Hose					
		Fuel Filter					
		Fuel pressure is low. Normal value range: 0.7 - 0.74MPa					
	6-4. Electrical System	Spark Plug					
		Air Injector					
		Self-diag. reports component abnormality.	○				
7 Engine accelerates but boat will not.	7-1. Outboard Motor	Propeller					
		Installation					
		Boat					
8 Turning of main switch will not stop engine.	8-1. Electrical System	Main Switch					
		Stop Switch					
		Ground Wire					

Cause		Action to be taken (Refer to reference value or service data.)
6-1-6.	Crankcase head oil seal is faulty.	Check, and repair if necessary.
6-2-1.	Refer to 2-3.	Refer to 2-3.
6-3-1.	Fuel tank is empty or fuel level is low.	Refer to 2-2-1.
6-3-2.	Air vent is closed.	Refer to 2-2-2.
6-3-3.	Sucks air through crack or loose connection.	Check, and repair if necessary.
6-3-4.	Water is in the fuel filter.	Check and clean if necessary.
6-3-5.	Fuel filter is clogged.	Check interior of fuel tank, hull, and engine fuel filter, and clean or replace fuel filter if necessary.
6-3-6.	Fuel hose is clogged.	Check fuel pipes if they are twisted, collapsed or bent.
6-3-7.	Lift pump is not operating.	Check, and repair if necessary. Or replace.
6-3-8.	FFP leaks in the case.	Check internal component rubber seal and electric fuel pump.
6-3-9.	Fuel regulator leaks.	Replace.
6-3-10.	Fue leaks.	Check hose damage and connections.
6-3-11.	Air pressure is low.	Refer to 2-3.
6-4-1.	Refer to 2-4-3.	Refer to 2-4-3.
6-4-2.	Fuel injector deposited with carbon.	Check. and clean, or replace if necessary.
6-4-3.	Component(s) malfunctions or connections are loose.	Check, and repair or replace if necessary.
7-1-1.	Incorrect propeller selection	Check, and repair or replace if necessary.
7-1-2.	Propeller slips on the shaft.	
7-1-3.	Propeller is deformed or damaged.	
7-1-4.	Shaft length - boat transom mismatching	Check, and adjust if necessary.
7-1-5.	Trim angle incorrect	
7-1-6.	Boat's bottom is foul.	Check, and clean if necessary.
7-1-7.	Boat loading position incorrect	Check, and adjust if necessary.
7-1-8.	Boat is overloaded.	
7-1-9.	Hull shape incorrect.	
8-1-1.	Main switch contact point is faulty or harness is internally broken.	Check, and repair if necessary. Or replace.
8-1-2.	Stop switch contact point is faulty or harness is internally broken.	
8-1-3.	Ground wire connection is loose or harness is internally broken.	



Troubleshooting

Symptom	Item		Self-diagnosable (○)	Beep	Warning indicator A (Oil level) 	Warning lamp B (Water temp.) 	Warning lamp C (Battery volt.) 
9. Throttling up will not increase engine speed. Engine speed is reduced to idling during operation.	9-1. Electrical Control	Cooling water temp. is high. (Water temp. lamp is	○	Continuous sounding		Flashing	
			○	Continuous sounding		Flashing	
		Battery voltage is abnormally high. (Battery lamp is flashing.)	○				Flashing
			○				Flashing
		TPS does not function.	○		Flashing	Flashing	Flashing
	9-2. Remote Control	Advancer arm is not operating.					
10 Throttling up will not increase engine speed over 3000rpm. Engine speed is reduced to 3000rpm and is limited.	10-1. Electrical Control	Cooling water temp. is high. (Water temp. lamp is flashing.)	○	Continuous sounding		Flashing	
			○	Continuous sounding		Flashing	
			○	Continuous sounding		Flashing	
			○	Continuous sounding		Flashing	
		Battery voltage is abnormally low. (Battery lamp is flashing.)	○				Flashing
			○				Flashing
			○				Flashing
			○				Flashing
			○				Flashing
			○				Flashing
		TPS does not function.	○		Flashing	Flashing	Flashing
		Remote control					

Cause		Action to be taken (Refer to reference value or service data.)
9-1-1.	Cooling water inlet is blocked.	Check.
9-1-2.	Water pump is faulty.	Check, and repair if necessary. Replace.
9-1-3.	Battery is faulty, or two batteries are connected in series.	Check.
9-1-4.	Rectifier-regulator is faulty.	Check, and replace if necessary.
9-1-5.	TPS malfunctions, wire is not connected or wire harness is broken.	Check, and repair if necessary. Replace.
9-1-6.	TPS connectors (TPS1 and TPS2) are connected in reverse.	Connected to normal positions.
9-2-1.	Remote control cable is installed incorrectly, or remote control box is faulty.	Check, and repair if necessary. Replace.
10-1-1.	Cooling water inlet is blocked.	Check, and repair if necessary. Replace. Air compressor cooling water temp is high (Cooling water does not come of from water nipple)
10-1-2.	Water pump is faulty.	
10-1-3.	Thermostat is faulty.	
10-1-4.	Cooling water passage is blocked.	
10-1-5.	Battery is faulty.	Replace.
10-1-6.	Charging coil is faulty.	Check, and replace if necessary.
10-1-7.	Charging coil wiring is broken.	Check, and repair if necessary.
10-1-8.	Battery cable or electrical connection is faulty.	
10-1-9.	Rectifier-regulator is faulty.	Check, and replace if necessary.
10-1-10.	TPS malfunctions, wire is not connected or wire harness is broken.	Check, and repair if necessary. Replace.
10-1-11.	Warm up lever was raised to start the engine.	Return the lever and try to start the engine again.



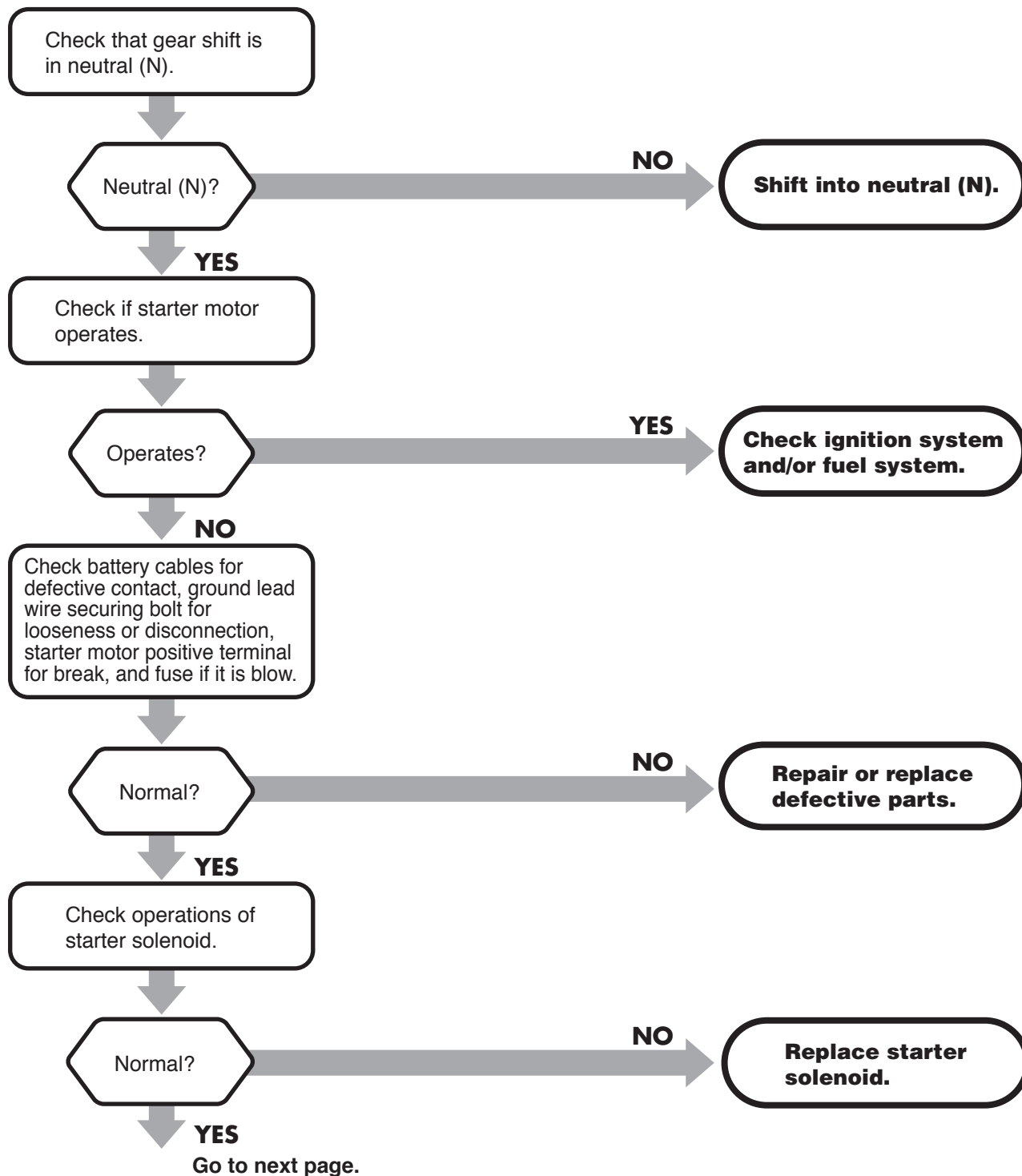
Troubleshooting

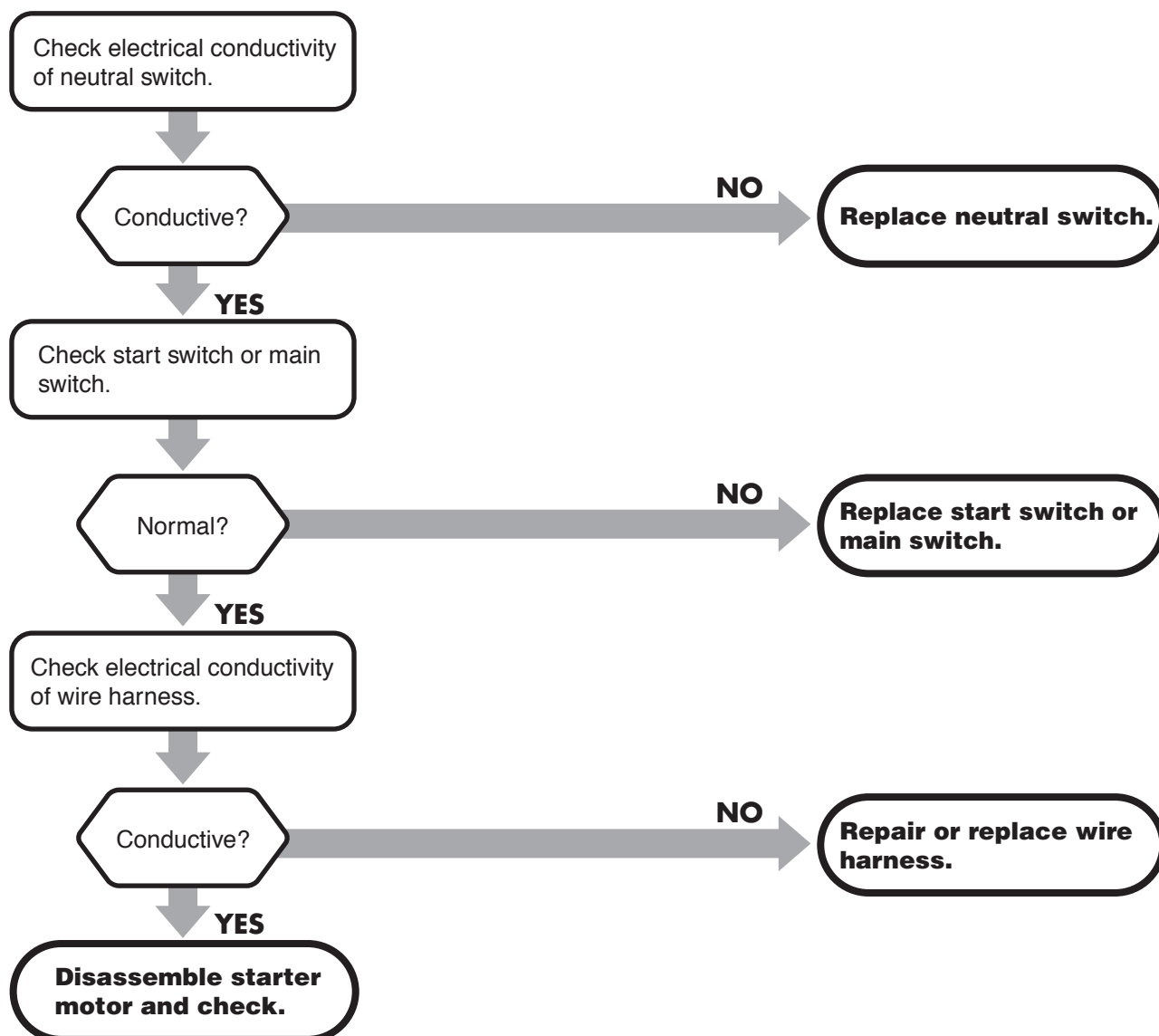
Before working on the engine, check that hull, rigging and engine installation are normal, and then battery is fully charged. For mechanical troubleshooting, refer to relevant troubleshooting section in this chapter. For checking and servicing outboard motor, refer to service procedures described in this manual to perform the work safely.

Power Unit

State 1 Engine will not start or is hard to start.

Starting System

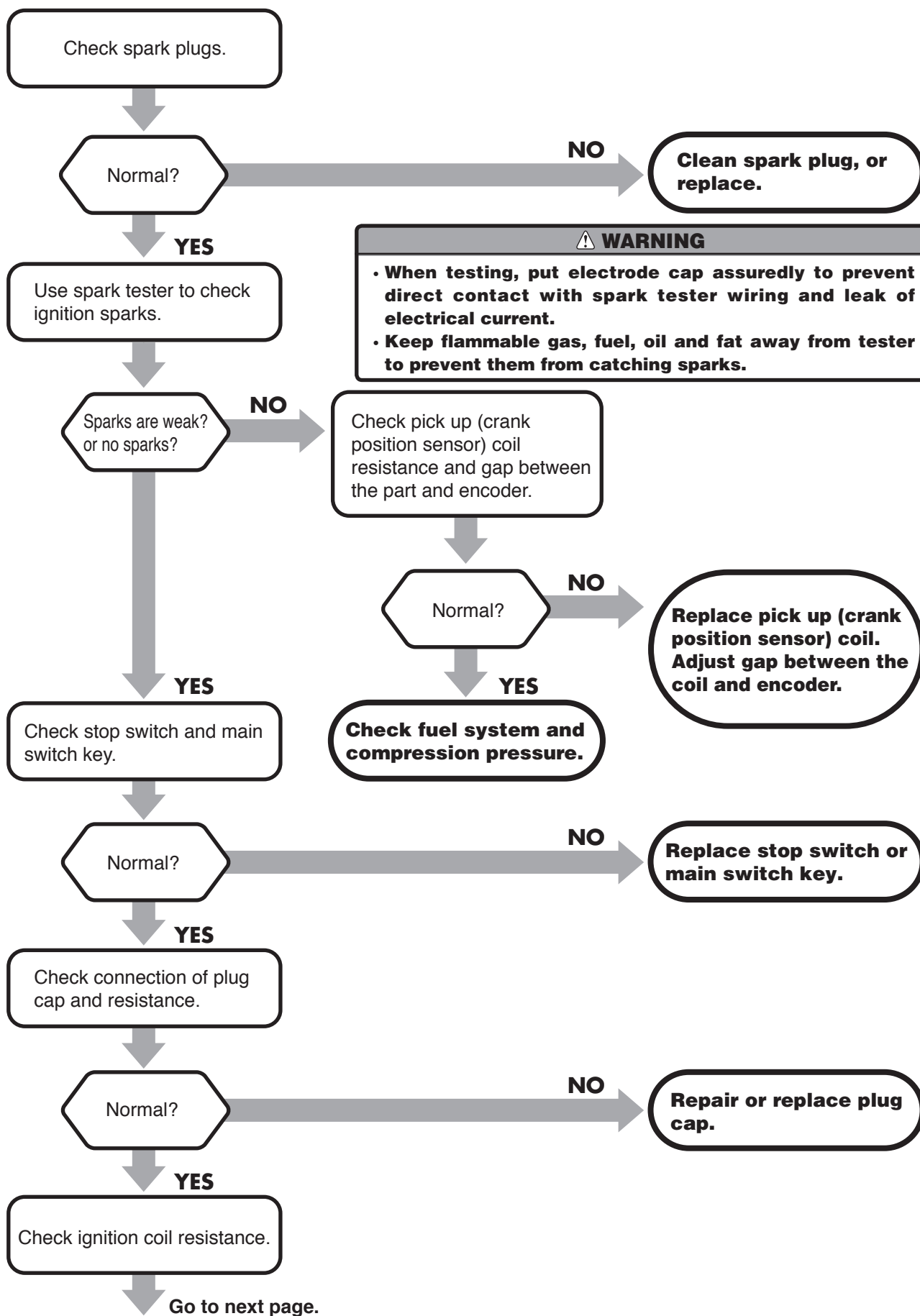






Troubleshooting

Ignition System

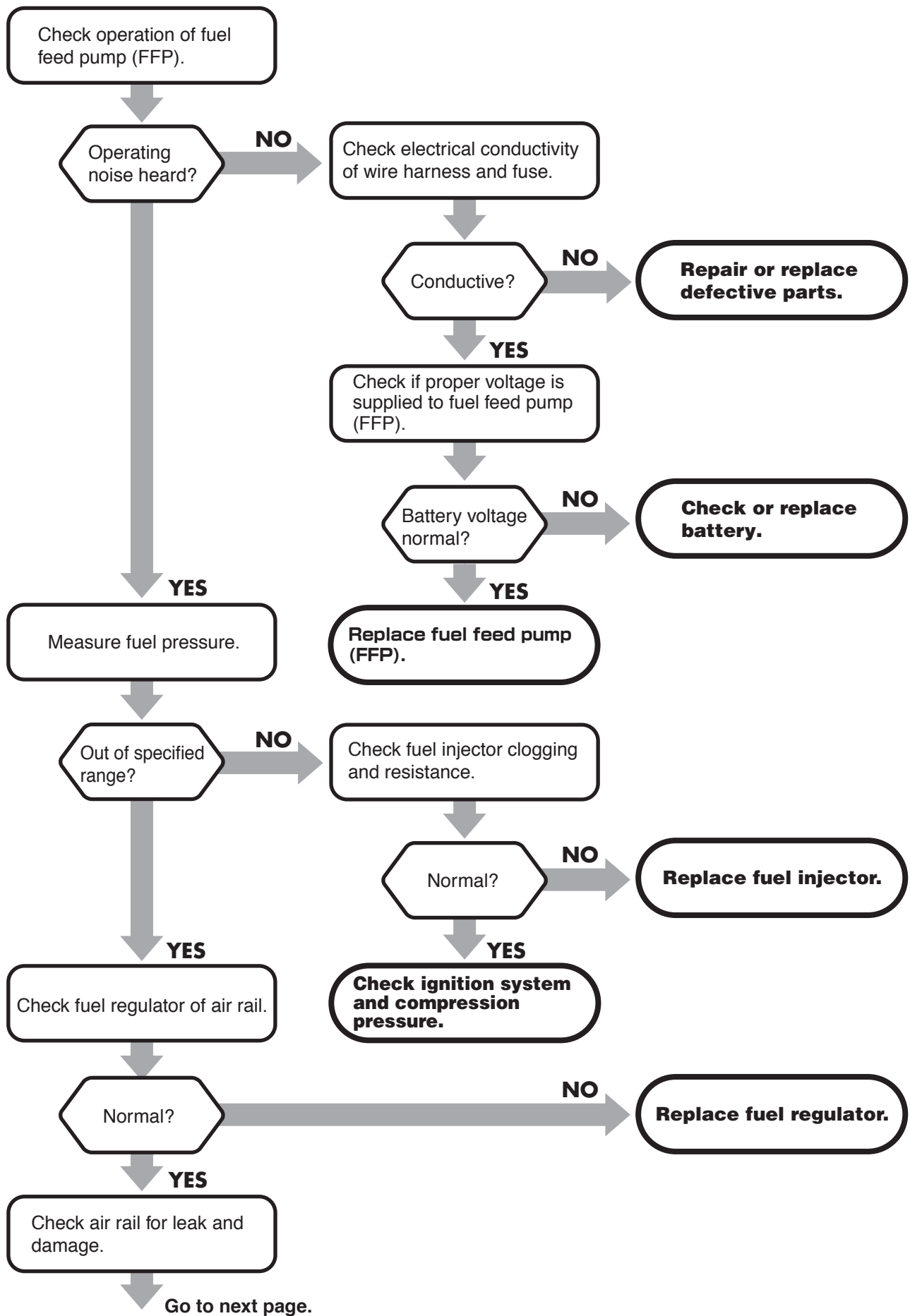


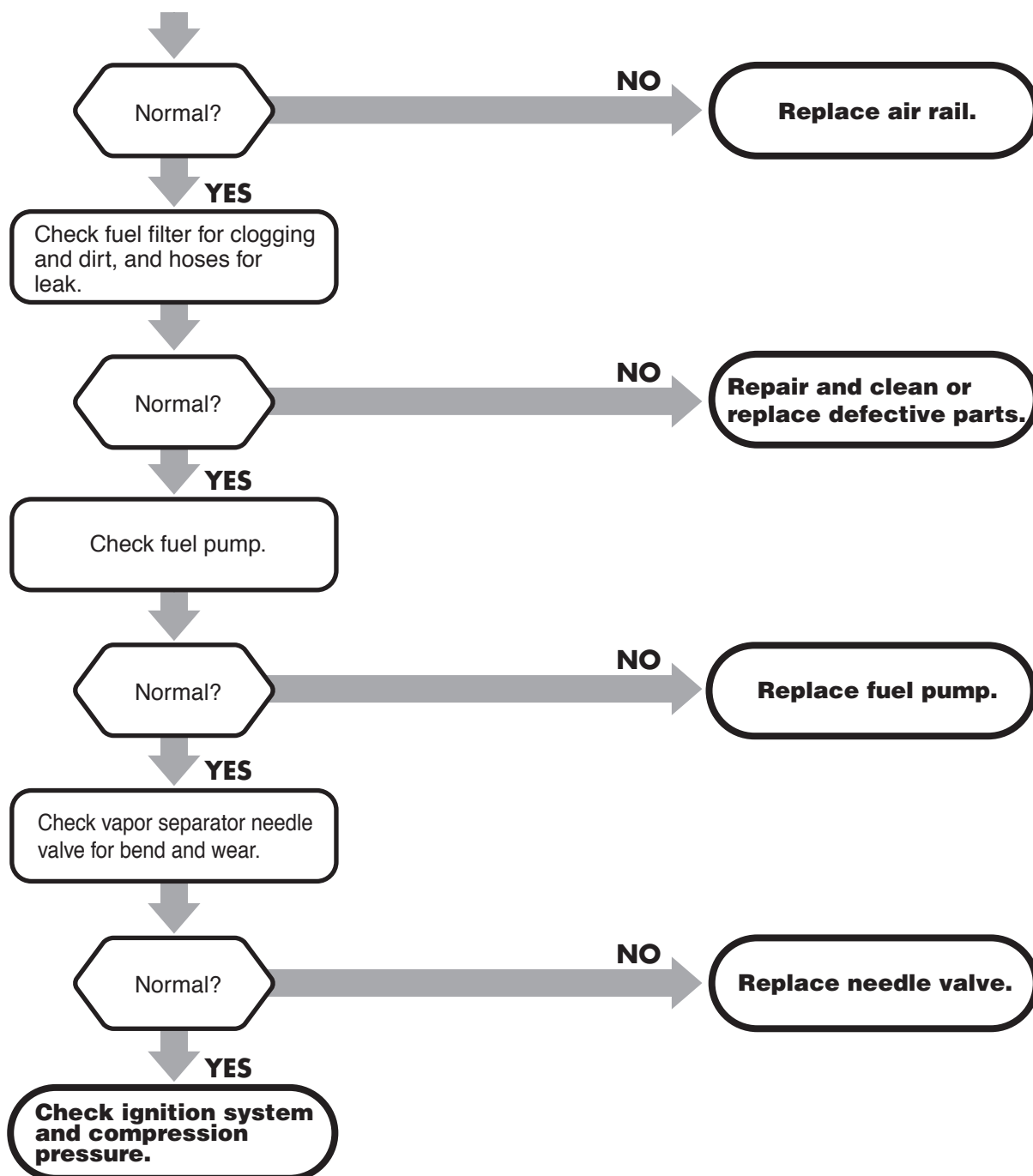




Troubleshooting

Fuel System

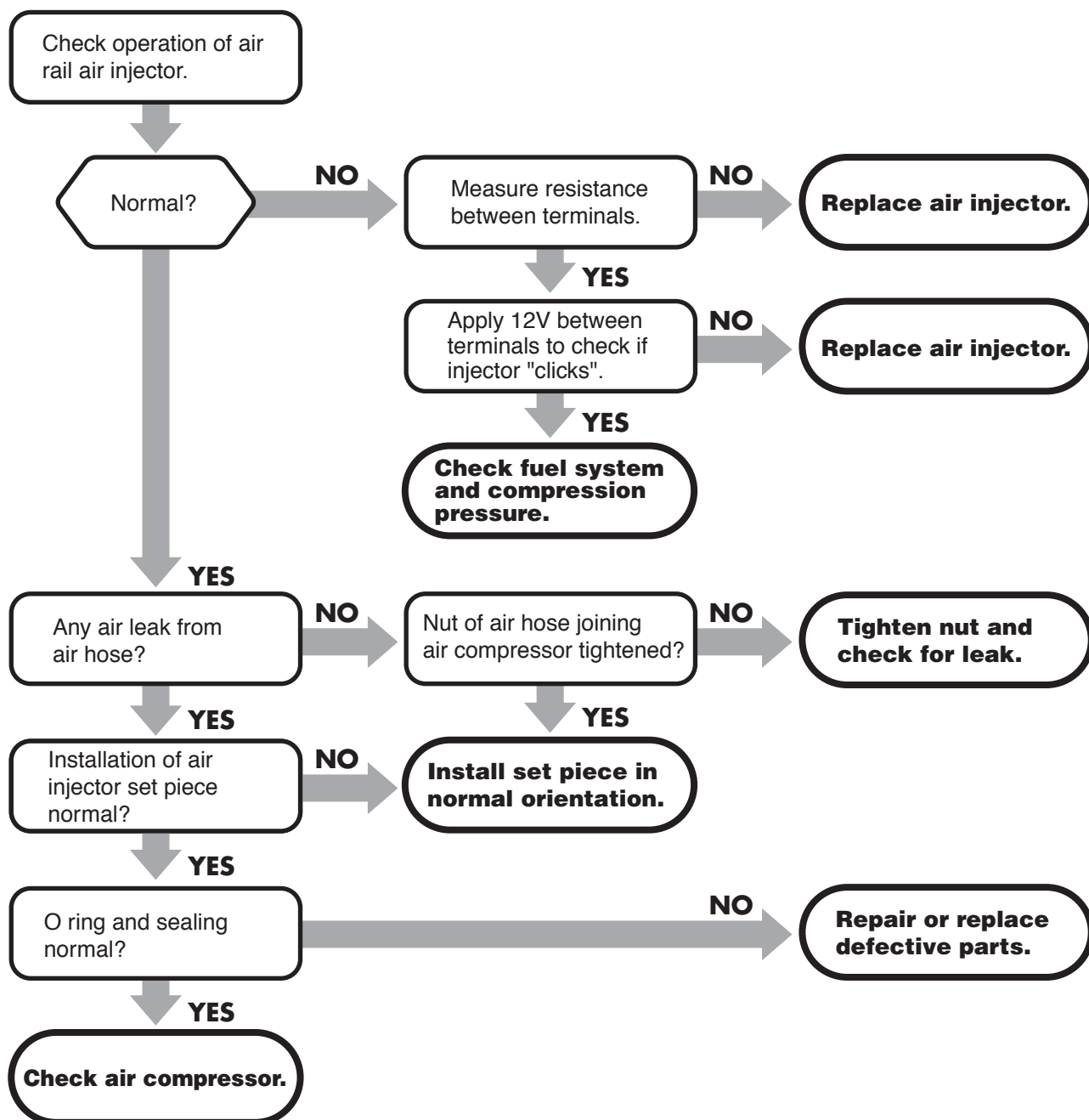


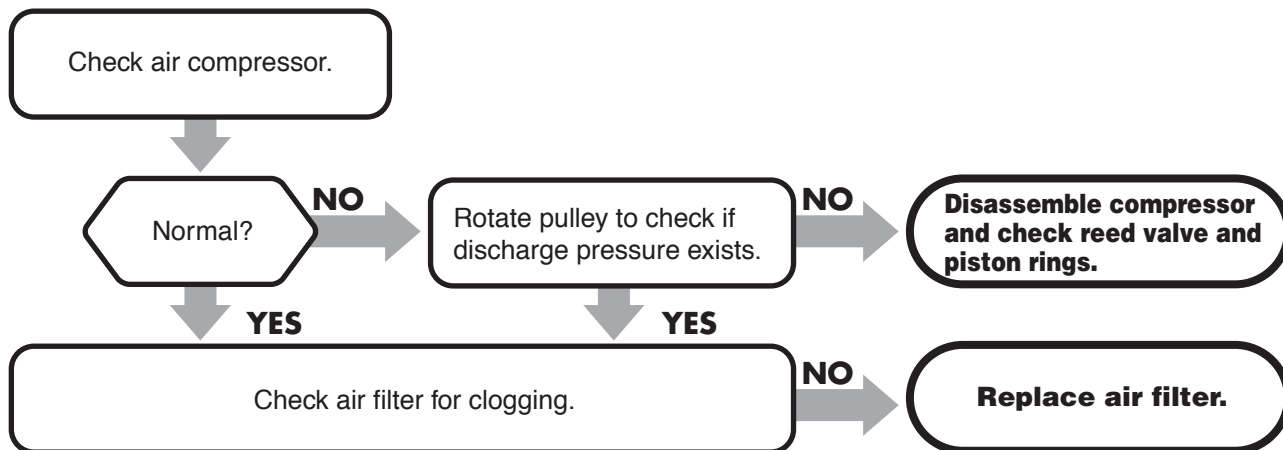




Troubleshooting

Air System

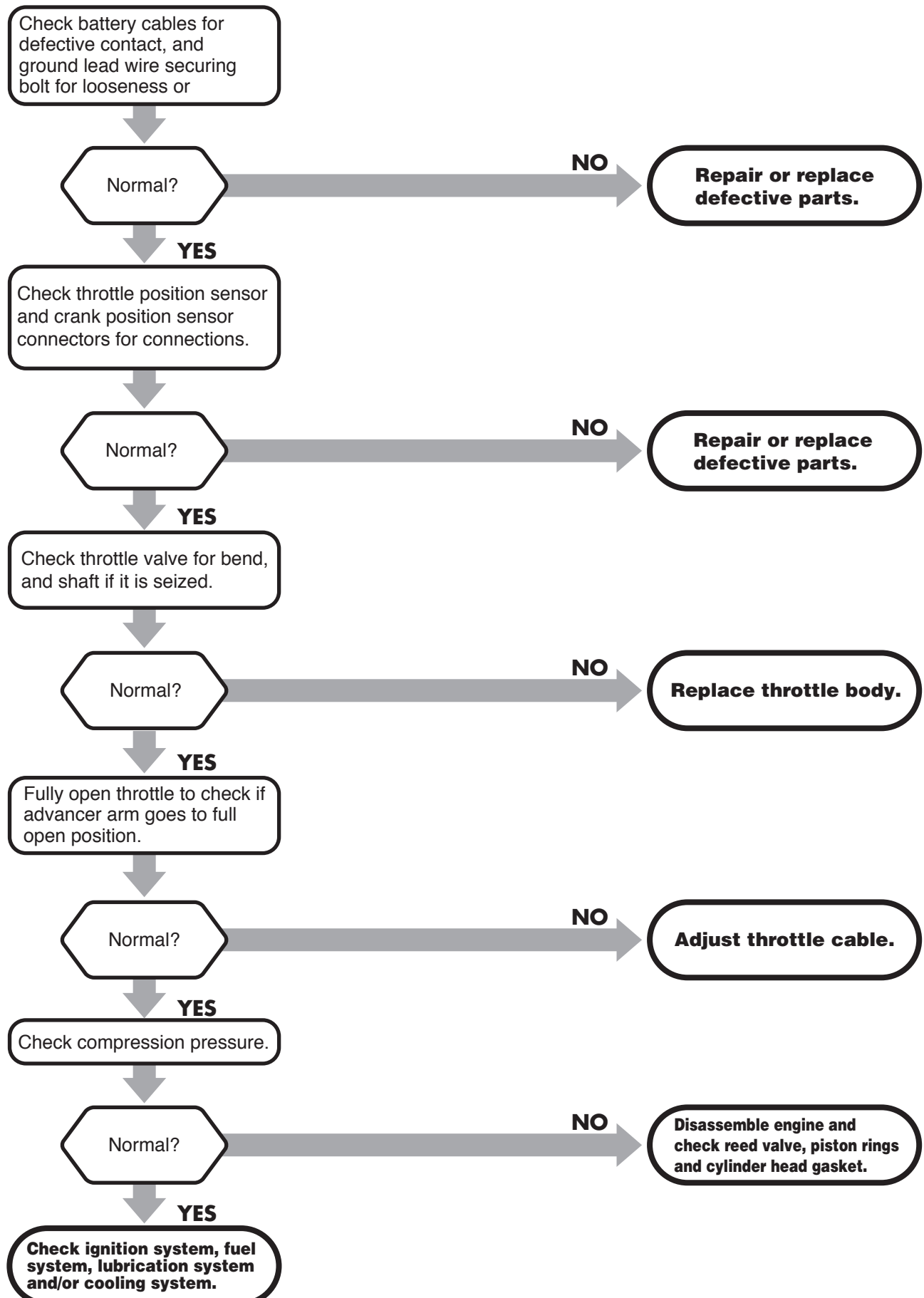




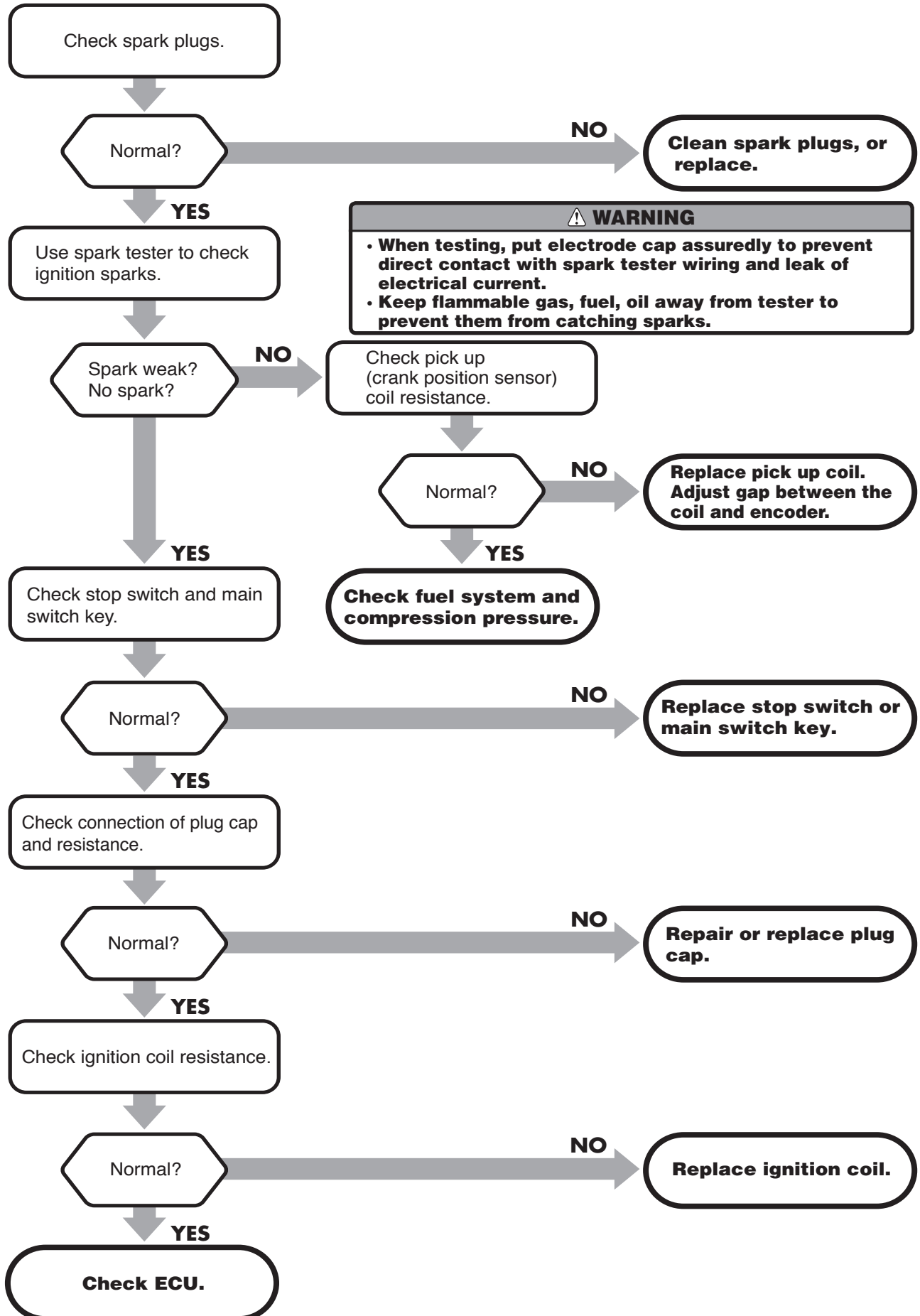


Troubleshooting

State 2 Full throttle engine revolution speed is low, engine revolution speed falls off, or engine stalls.



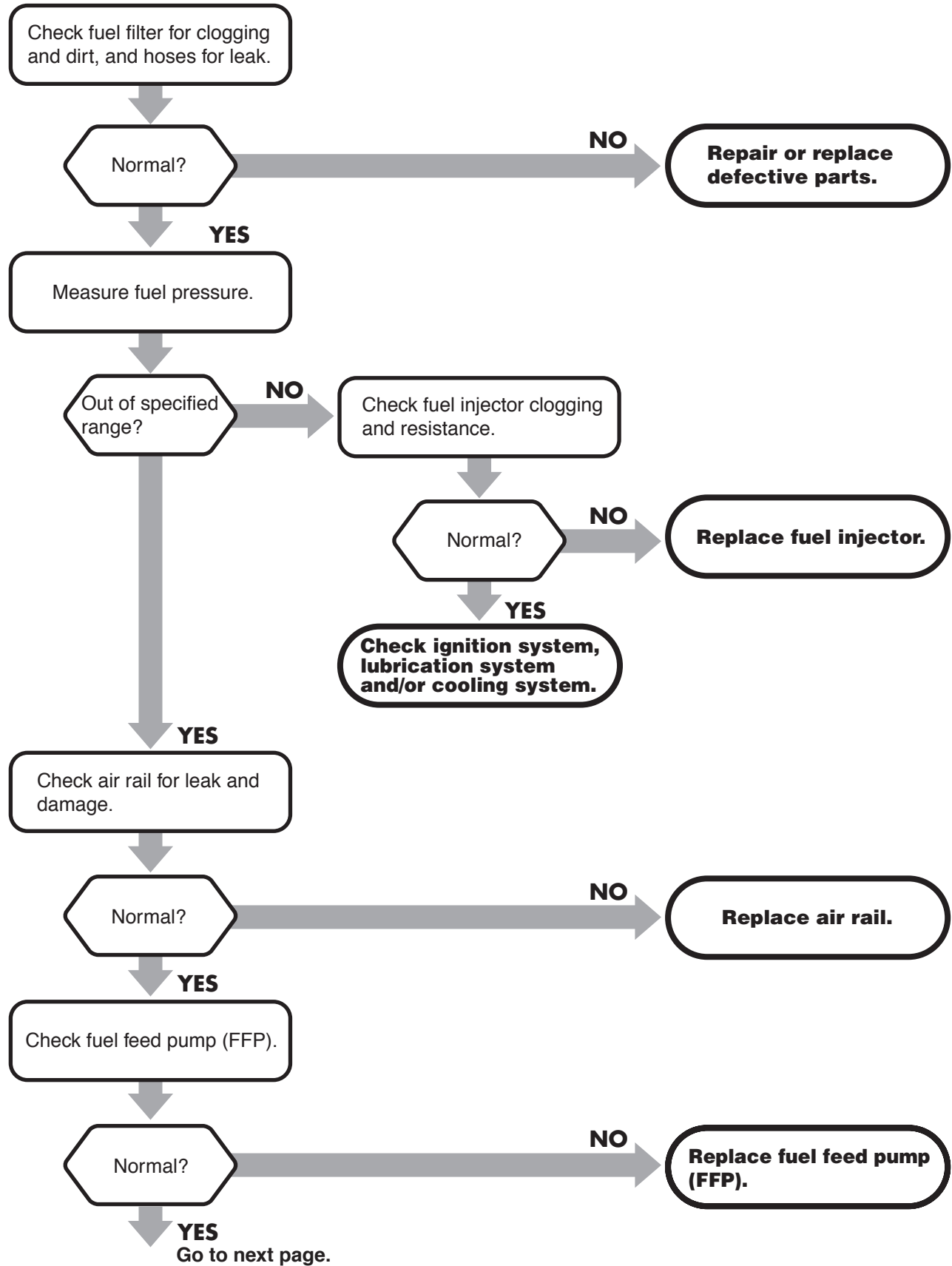
Ignition System

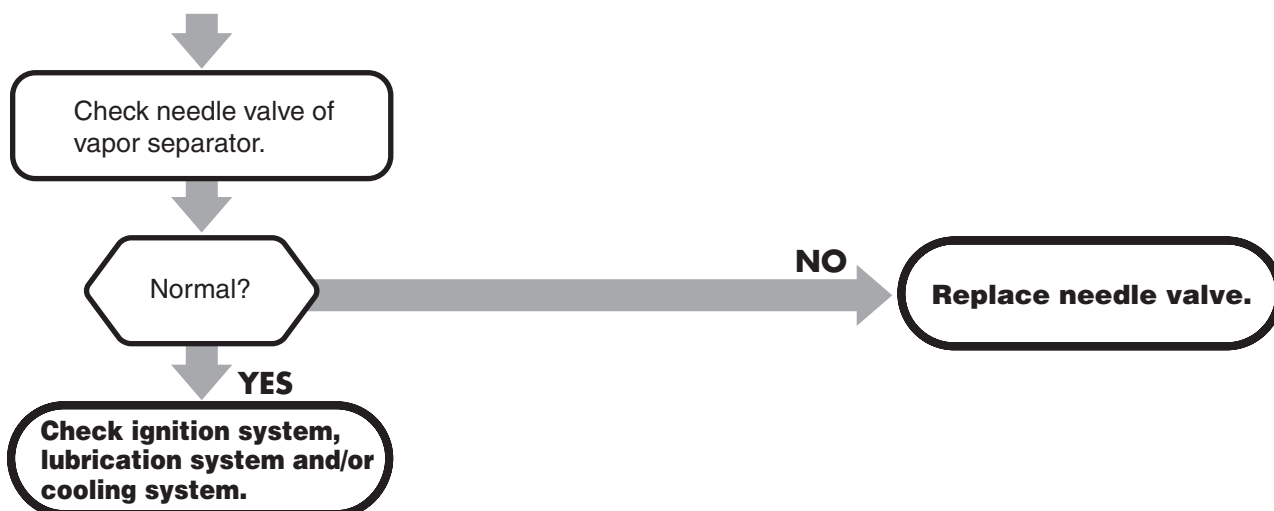




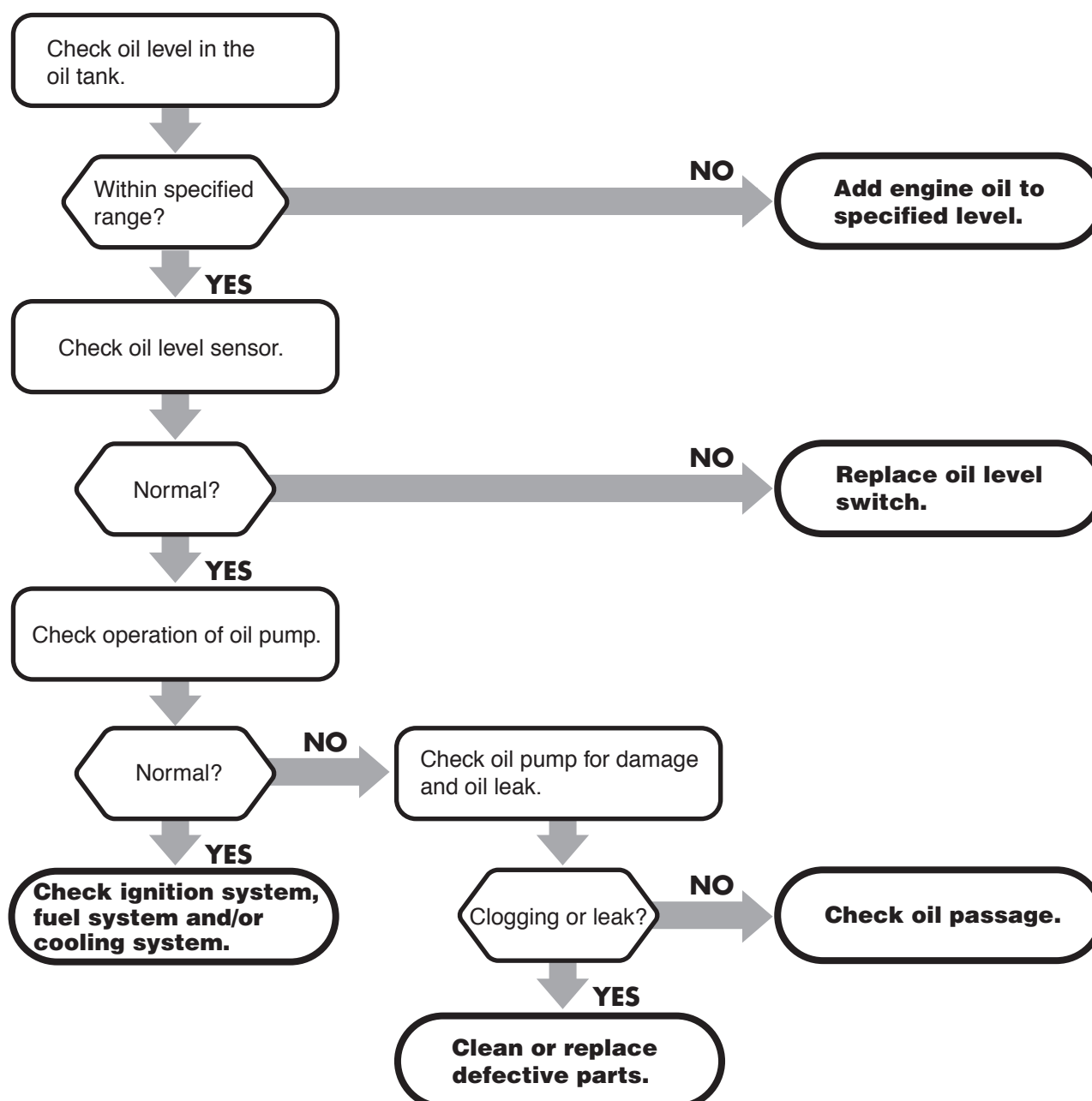
Troubleshooting

Fuel System





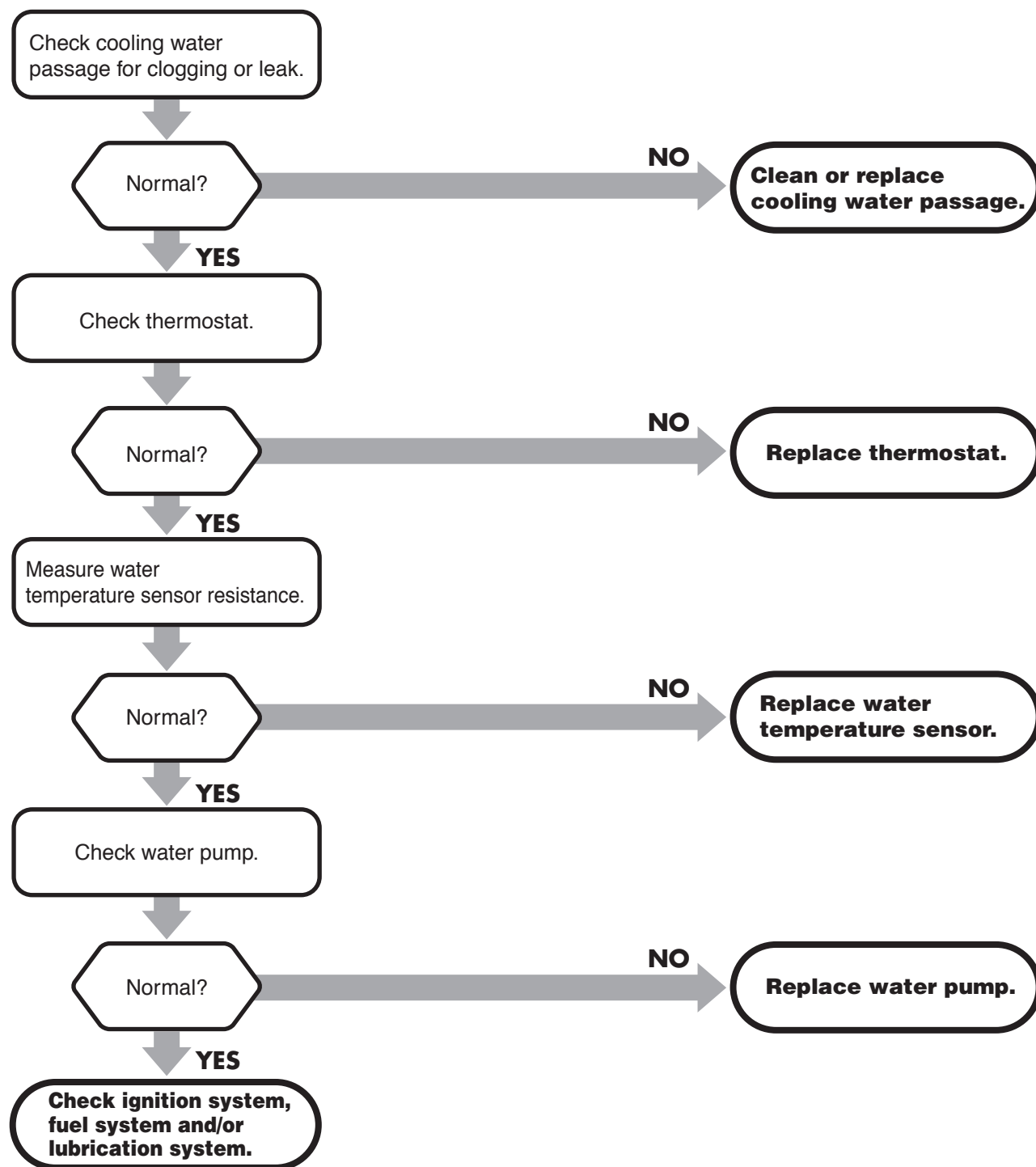
Lubrication system



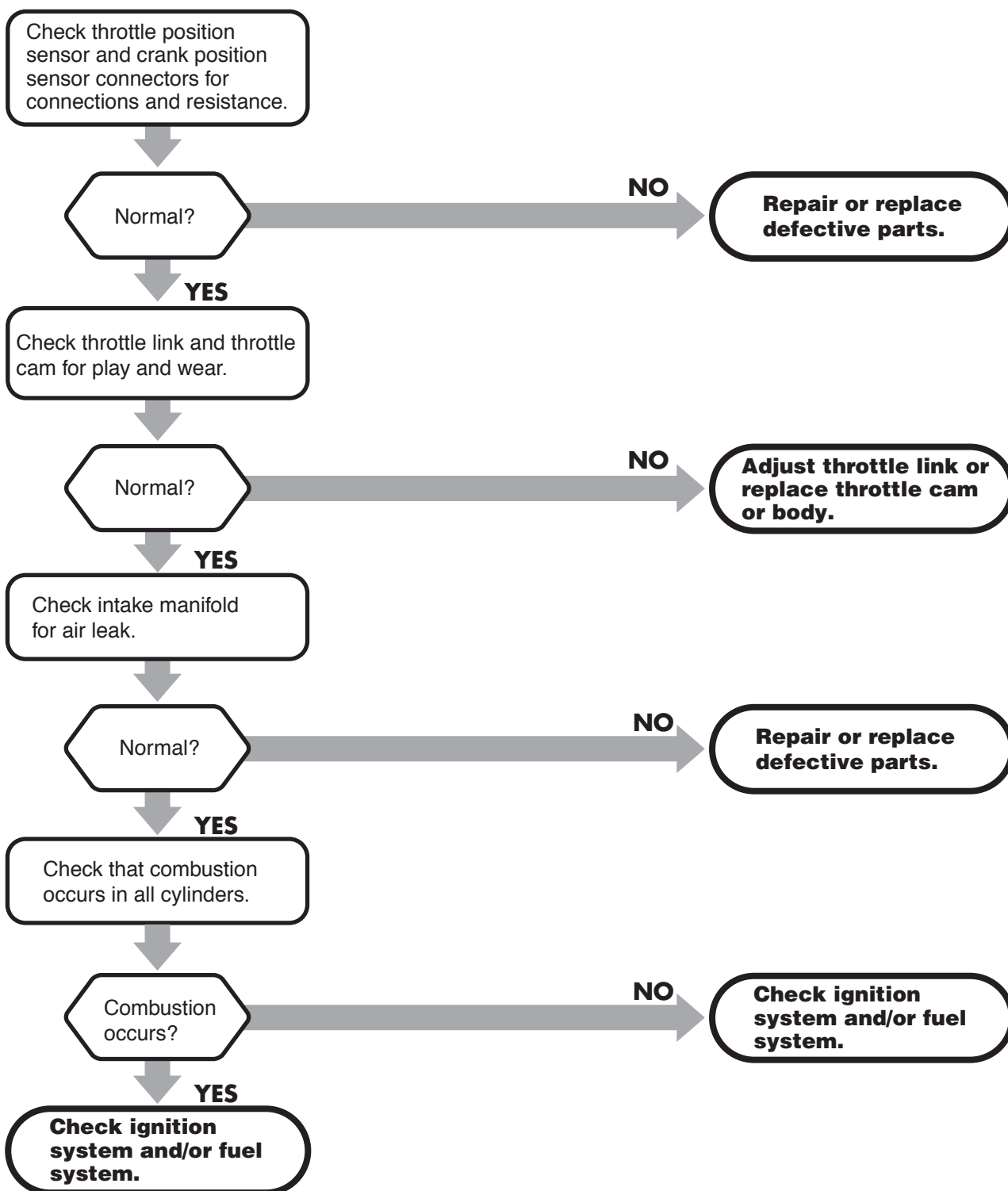


Troubleshooting

Cooling System



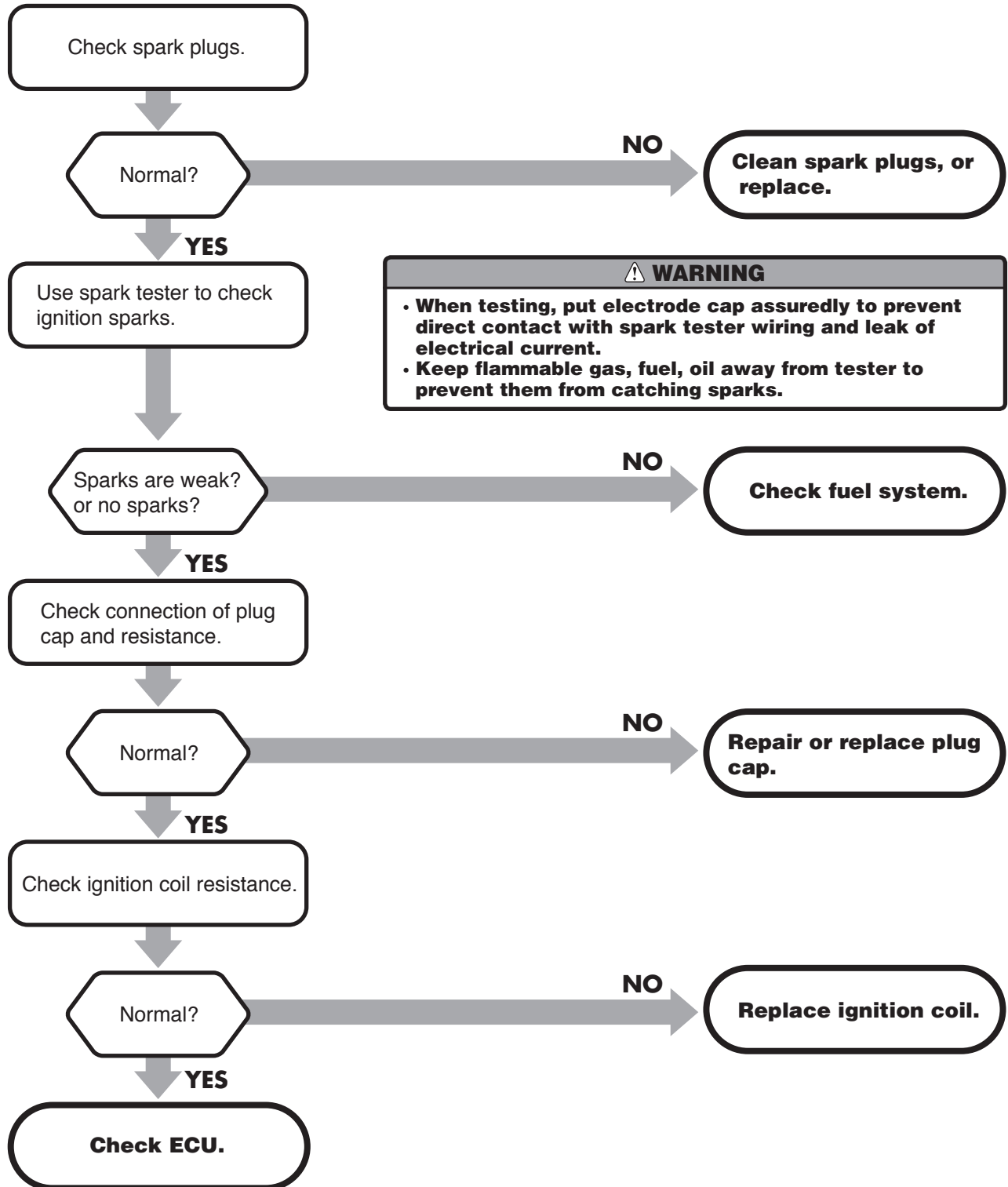
State 3 Engine rotation is unstable or surging occurs in low speed range.



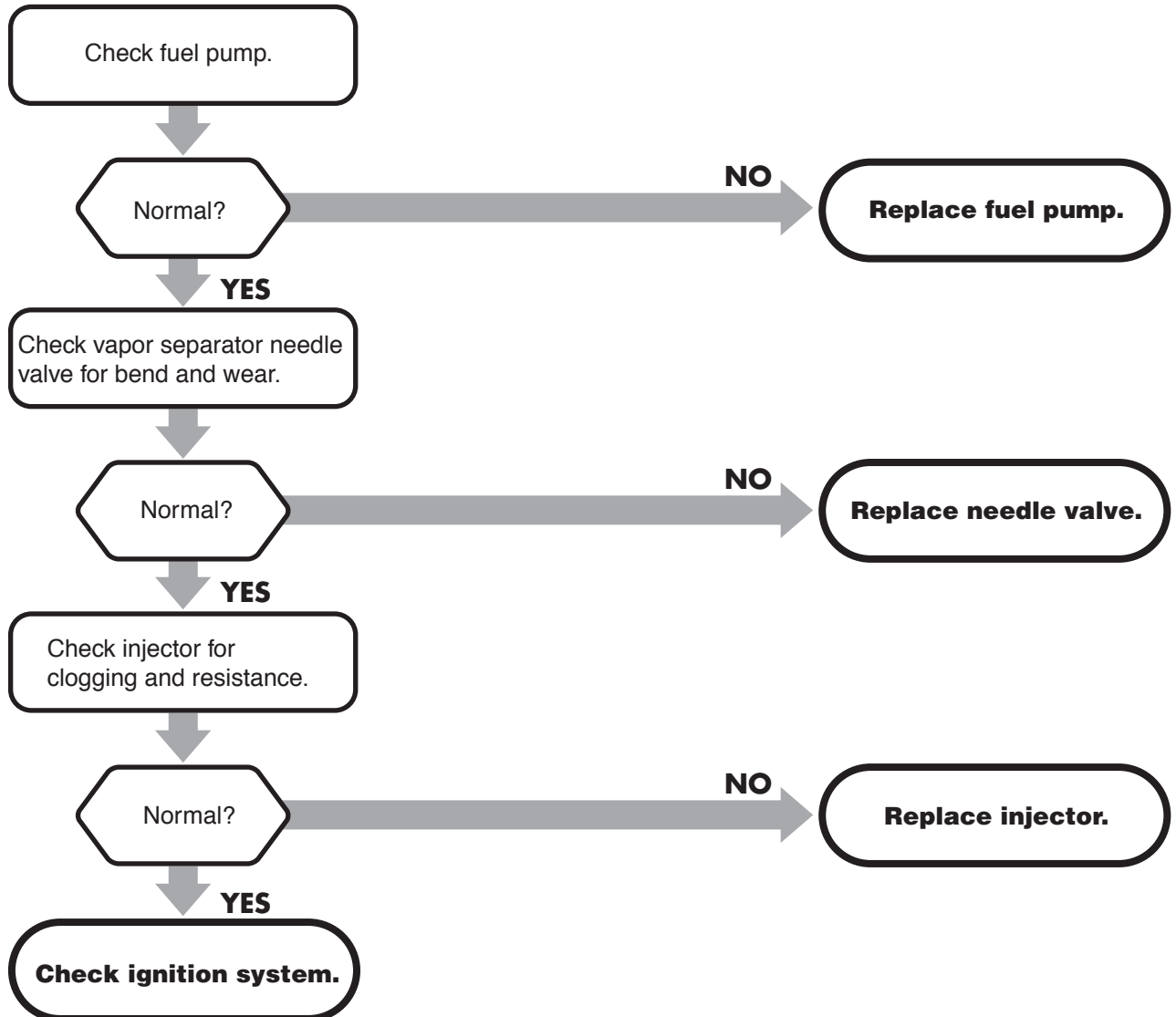


Troubleshooting

Ignition System



Fuel System

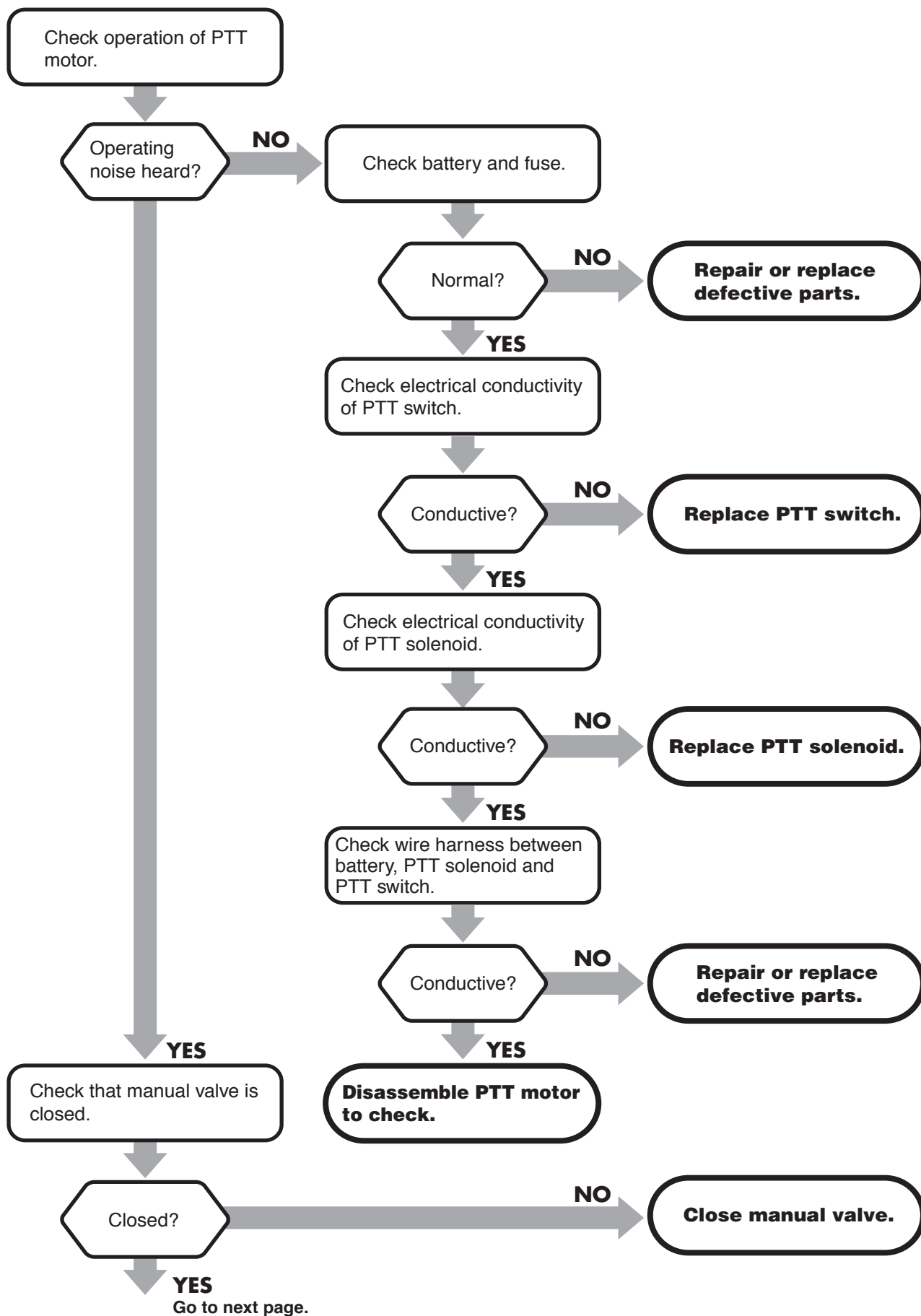


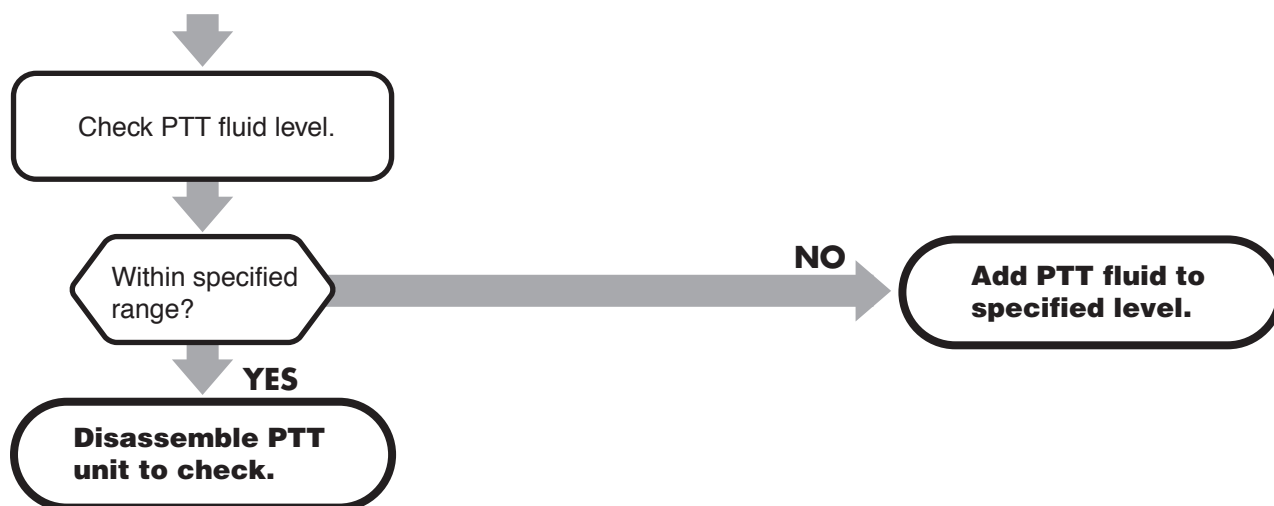


Troubleshooting

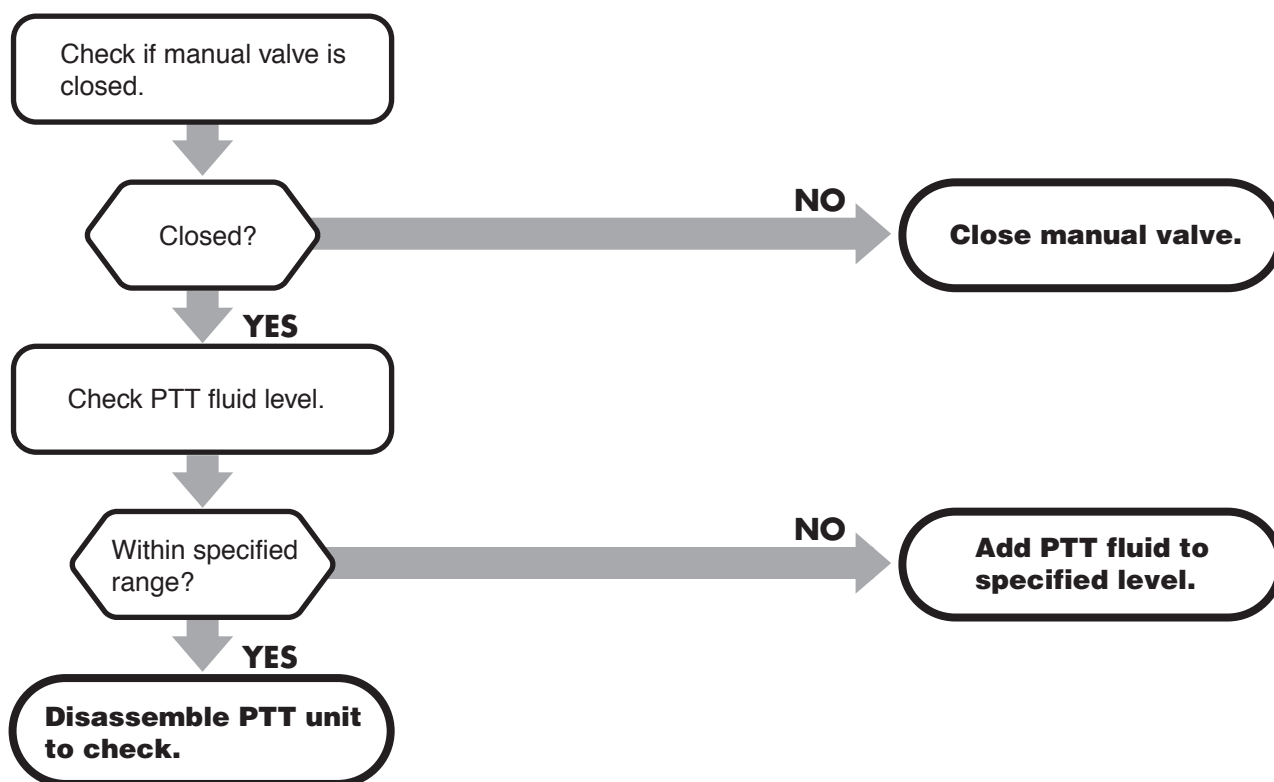
PTT Unit

State 1 PTT unit will not operate.





State 2 PTT is not capable of sustaining outboard motor.





2. Self-Diagnosis Function of TLDI

The self-diagnosis function detects a trouble(s) of electrical system of TLDI engine and displays the part by using ECU installed in the engine. TLDI engine requires no instruments and special equipment such as personal computer when executing the self-diagnosis function that uses key switch operation, tachometer's RPM indication and a combination of three warning lamps to show information necessary for troubleshooting through the following four modes.

The self-diagnosis function of TLDI engine consists of the following four modes.

- Mode 1.....Tachometer operation test
- Mode 2.....Display of engine operation hours
- Mode 3.....Display of fault location and fault history
- Mode 4.....Deletion of fault history

1) Terms related to self-diagnosis function

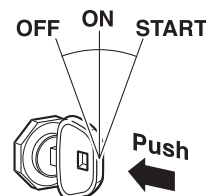
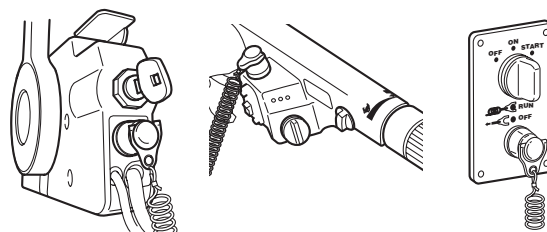
Key Switch

Key switch is on the remote control box, switch box or switch panel.

The key positions include the following four positions; "OFF", "ON", "START" and push-in position when it is at "ON".

The self-diagnosis function is enabled when the key is at "ON".

Remote Control Box Switch Box Switch Panel

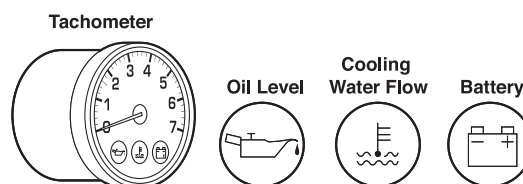


Warning Lamp

The warning lamp is mounted on the tachometer or switch box to indicate abnormality of cooling water temperature, oil level and battery in case it occurred.

In case of electrical part trouble or abnormality, three lamps blink at the same time to inform of the trouble. (Refer to Warning Indications List.)

The self-diagnosis function uses combinations of these three lamps and tachometer indication to inform of the type of trouble occurred. (Refer to Trouble Indication List.)



Warning Buzzer

The warning buzzer is built in the remote control box, tiller handle switch box or switch panel.

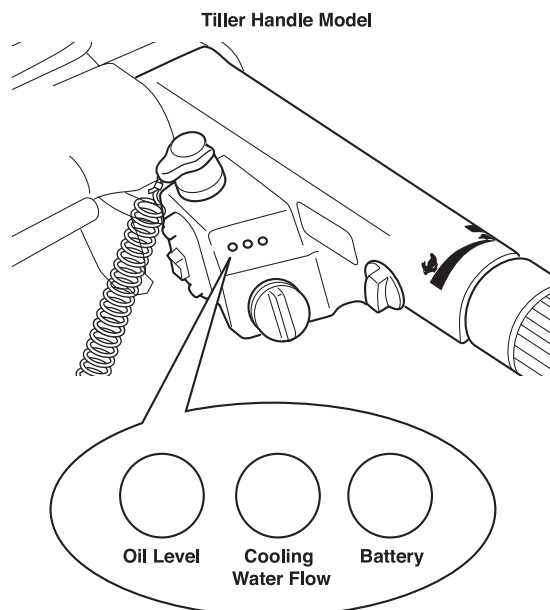
The buzzer uses one of the following four operation patterns to inform of a trouble.

- Beep...Two seconds
- Beep...0.3 second
- Beep, Beep, Beep...Three times in every two minutes
- Continuous sounding

Trouble History

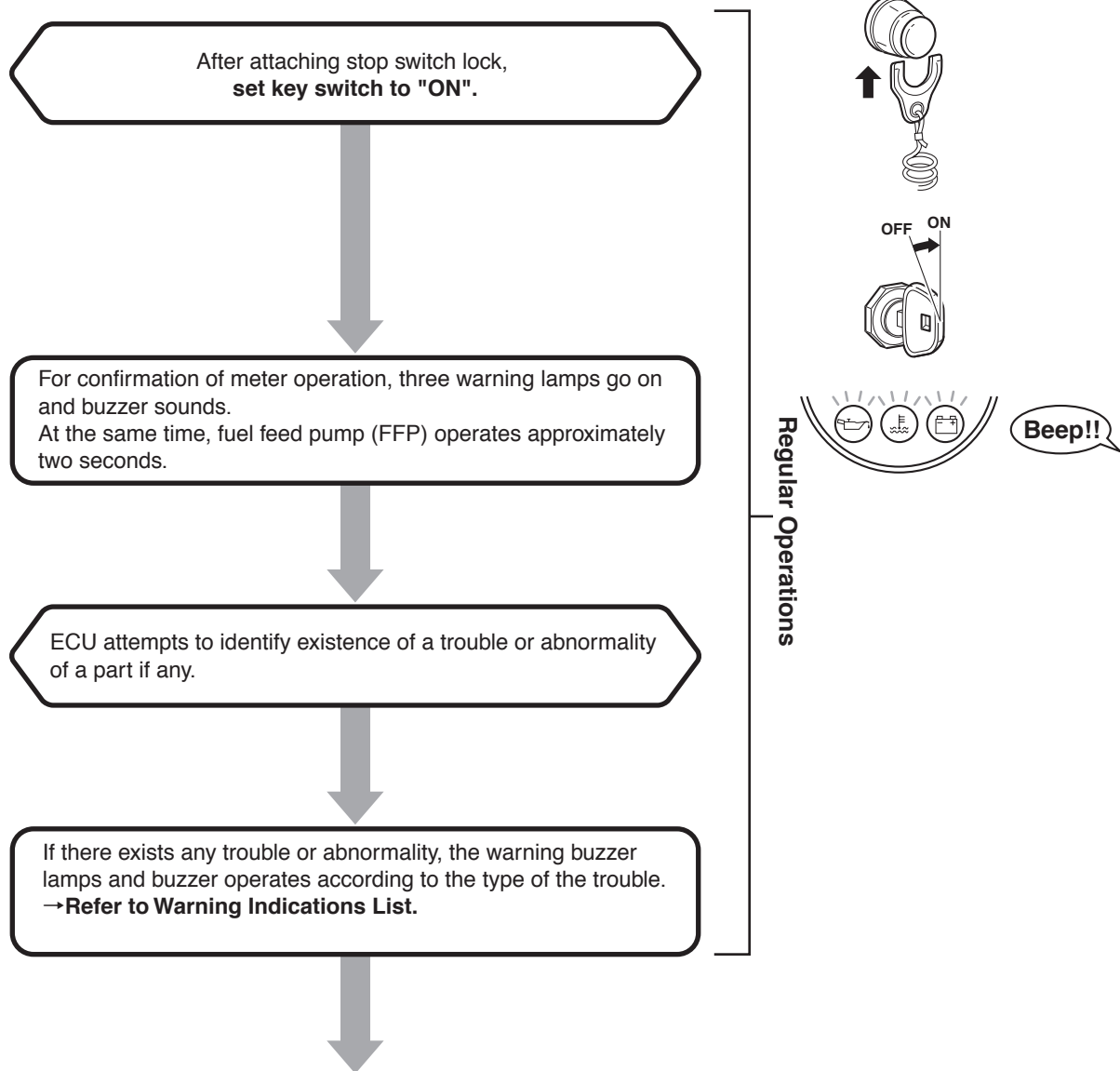
The function stores the history of the troubles or abnormalities that occurred and then recovered in the memory of ECU.

The function allows confirmation of the trouble history.



2) Operation Procedure of Self-Diagnosis Function

- * The self-diagnosis function is enabled only when the engine is stopped state.
- * The self-diagnosis function is stopped at any moment during the following procedure when the key switch is set to "OFF".

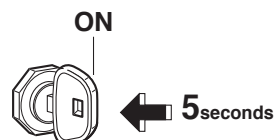




Troubleshooting

Go into process of the self-diagnosis operation from here.

Set the key to "ON", and push it in (for approximately 5 seconds) until the buzzer sounds.



Self-Diagnosis Mode 1[Tachometer Operation Test]

After the pointer returns to "zero", the process goes to mode 2 automatically.

Beep!! Beep!!

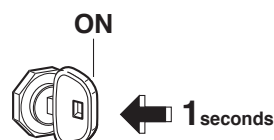


Self-Diagnosis Mode 2[Indication of engine operation hours]

A combination of tachometer indication and three warning lamps represents engine operation hours.

→**Refer to Operating Hours Indication List.**

Set the key to "ON", and push it in (for approximately 1 seconds) until the buzzer sounds to proceed to mode 3.



Self-Diagnosis Mode 3[Indication of fault location(s) and fault history]

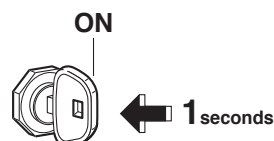
After the buzzer "Beeps" once, a combination of tachometer indication and three warning lamps represents the first fault location and fault history.

→**Take action(s) by referring to the fault indication list.**

Then, every time the key switch is pushed in at "ON" position for approximately 1 second until the buzzer sound, the next fault location and the fault history are represented.

When all the fault locations are represented by going through the above operations, a state of no indication occurs. Then, when the key switch is pressed, representation of the fault locations starts again from the first one.

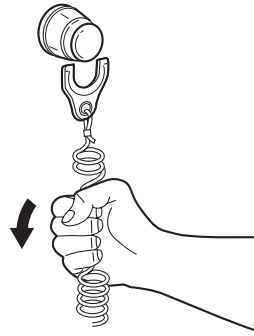
No indications are represented when there is no fault history (Tachometer and warning lamps do not operate.)



Self-Diagnosis Mode 4 [Deletion of fault history]

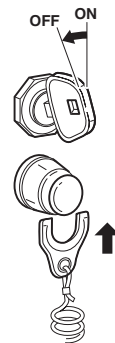
In any of the states in the self-diagnosis mode 3, the fault history is deleted by removing stop switch lock plate and pushing in key for approximately 3 seconds. At this moment, the buzzer "Beeps" three times.

Note: The operating hours is not deleted.



Beep!!
Beep!!
Beep!!

Set key switch to "OFF".
The self-diagnosis function ends.
Attach stop switch lock plate.



Regular operation is resumed.

The warning lamps and buzzer operate if any fault or abnormality is left unsolved.




→**Refer to Warning Indications List.**

Note : The self-diagnosis function is stopped at any moment during the above procedure when the key switch is set to "OFF".



Troubleshooting

3) Warning Indication List • • • Display for abnormalities during operation





Warning Indicators				ESG Speed Control (*1)
Buzzer Sounding	 Indicator A	 Indicator B	 Indicator C	
Continuous	×	×	×	High speed ESG
Intermittent (3 beeps for every 2 minutes)	Flashing	×	×	-
Continuous	×	Flashing	×	Low speed ESG
Continuous	×	Flashing	×	Forced idling
Continuous	×	Flashing	×	-
Continuous	×	Flashing	×	Low speed ESG
-	×	×	Flashing	Low speed ESG
-	×	×	Flashing	-
-	Flashing	Flashing	Flashing	Low speed ESG
-	Flashing	Flashing	Flashing	Engine stop
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	Forced idling
-	Flashing	Flashing	Flashing	Low speed ESG
-	Flashing	Flashing	Flashing	Forced idling
-	Flashing	Flashing	Flashing	Low speed ESG
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-
-	Flashing	Flashing	Flashing	-

Fault Description	Reference	Remedy
Engine over-rev.	Approx. 6,000 r/min	Readjust propeller, outboard engine mounting height and/or trim.
Low oil level	Approx. 610 mL (0.16 gal) or less	Replenish engine oil.
Cooling water temp. high	Approx. 85°C (185°F) *	} *Varies depending on engine speed.
Engine cooling water temp. abnormally high	Approx. 90°C (194°F) *	
Air compressor cooling water temp. high	90°C (194°F)	Refer to troubleshooting.
Air compressor cooling water temp. abnormally high	95°C (212°F)	
Battery voltage abnormally low	Approx. 9V or less	
Battery voltage low	Approx. 10V or less	
Battery voltage high	Approx. 18V or over	Refer to fault indication table. *1.ESG speed control •High speed ESG : Regulated to approx. 6,000 rpm. •Low speed ESG : Regulated to approx. 3,000 rpm. Approx. •Forced idling : Regulated to idling speed *2.TPS : Throttle Position Sensor *3.FFP : Fuel Feed Pump (Electric) *4.CPS : Crank Position Sensor
Battery voltage abnormally high	Approx. 20V or over	
TPS(*2) Idling position faulty		
TPS malfunction	TPS1 and TPS2	
TPS malfunction	TPS1 or TPS2	
TPS power supply malfunction	TPS1 and TPS2	
TPS power supply malfunction	TPS1 or TPS2	
Air injector malfunction		
Fuel injector malfunction		
Ignition coil malfunction		
FFP(*3) malfunction		
CPS(*4) malfunction		
Temp. sensor malfunction	Engine or air compressor	
MAP sensor malfunction		
MAT sensor malfunction		



Troubleshooting





4) Operating Hour Indication List (Self Diagnosis • Mode 2)

Engine Operating Hours (hours)	 Tach. Indication (r/min)	Lamp Indication		
		 Lamp A	 Lamp B	 Lamp C
0 - 1	1,000	—	—	—
1 - 2	2,000	—	—	—
2 - 3	3,000	—	—	—
3 - 4	4,000	—	—	—
4 - 5	5,000	—	—	—
5 - 6	6,000	—	—	—
6 - 7	7,000	—	—	—
7 - 8	800	—	—	Goes on.
8 - 9	900	—	—	Goes on.
9 - 10	1,000	—	—	Goes on.
10 - 20	2,000	—	—	Goes on.
20 - 30	3,000	—	—	Goes on.
30 - 40	4,000	—	—	Goes on.
40 - 50	5,000	—	—	Goes on.
50 - 60	6,000	—	—	Goes on.
60 - 70	7,000	—	—	Goes on.
70 - 80	800	—	Goes on.	Goes on.
80 - 90	900	—	Goes on.	Goes on.
90 - 100	1,000	—	Goes on.	Goes on.
100 - 200	2,000	—	Goes on.	Goes on.
200 - 300	3,000	—	Goes on.	Goes on.
300 - 400	4,000	—	Goes on.	Goes on.
400 - 500	5,000	—	Goes on.	Goes on.
500 - 600	6,000	—	Goes on.	Goes on.
600 - 700	7,000	—	Goes on.	Goes on.
700 - 800	800	Goes on.	Goes on.	Goes on.
800 - 900	900	Goes on.	Goes on.	Goes on.
900 - 1,000	1,000	Goes on.	Goes on.	Goes on.
1,000 - 2,000	2,000	Goes on.	Goes on.	Goes on.
2,000 - 3,000	3,000	Goes on.	Goes on.	Goes on.



Troubleshooting

5) Trouble Indication List (Self Diagnosis • Mode 3)

Malfunction / Failure Indication		Description of Problem	Fault Log	
			Fault	Fault Log (Yes)
 Tachometer Indication (r/min)	 Indicator A		 Indicator B	 Indicator C
0	Off	No malfunction of failure	Off	Off
0	On	Battery voltage high	Lighting of the lamp means that the wiring is broken or a component malfunctions.	Lighting of the lamp means that the wiring is broken or a component malfunctions.
0	Flashing	Battery voltage abnormally high		
1,000	Off	#1 Air injector malfunction	Off Does not go on even when the wiring is broken or a component malfunctions. →Refer to *1.	Refer to *2.
1,000	On	# 1Fuel injector malfunction		
1,000	Flashing	#1 Ignition coil malfunction		
2,000	Off	#2 Air injector malfunction		
2,000	On	#2 Fuel injector malfunction		
2,000	Flashing	#2 Ignition coil malfunction		
3,000	Off	#3 Air injector malfunction		
3,000	On	#3 Fuel injector malfunction		
3,000	Flashing	#3 Ignition coil malfunction		
500	Off	Oil level low	Lighting of the lamp means that oil level is low.	Lighting means that oil level was once low.
500	On	Battery voltage low	Lighting means that battery voltage is low.	Lighting of the lamp means that battery voltage was once low.
500	Flashing	Battery voltage abnormally low		
5,000	Off	CPS (*3) malfunction	Lighting of the lamp means that the wiring is broken or a component malfunctions.	Lighting of the lamp means that the wiring was once broken or a component once malfunctioned.
5,000	On	#1TPS (*4) Idle position incorrect	Lighting of the lamp means that TPS initial setting is incorrect.	Lighting of the lamp means that TPS initial setting was once incorrect.
5,000	Flashing	#2TPS Idle position incorrect		
5,500	Off	#1TPS malfunction	Lighting of the lamp means that the wiring is broken or a component malfunctions.	Lighting of the lamp means that the wiring was once broken or a component once malfunctioned.
5,500	On	#1TPS Power voltage high		
5,500	Flashing	#1TPS Power voltage low		
6,000	Off	#2TPS malfunction		
6,000	On	#2TPS Power voltage high		
6,000	Flashing	#2TPS Power voltage low		
6,500	Off	Engine water temp. sensor malfunction		
3,500	On	Air compressor water temp. sensor malfunction		

*3.CPS:Crank Position Sensor

*4.TPS:Throttle Position Sensor

*5.FFP:Fuel Feed Pump (electric)

Remedial Measures and Added Notes

Refer to troubleshooting.

Replace the component, or check wiring and connections for abnormality, and repair if necessary.

*1. When an injector or ignition coil malfunctions, the lamp B does not go on in the self-diagnosing mode where engine is not operating to check that the components are under control of ECU.

*2. If the lamp C goes on, the wiring may be broken or a component may be faulty at present.

→Corrective action : Delete current fault log (Mode 4. Refer to "Deleting Malfunction Log".) Then, start the engine (or crank for 5 seconds or longer) to confirm the details of malfunction or abnormality in the self-diagnosing mode. Take a corrective action if the same malfunction or abnormality is indicated with the lamp C.

→If an ignition is suspected to be defective --- Check wirings and connectors, and if no problem is found, replace injector.

→If an ignition coil is suspected to be defective --- If "only one malfunctions" indication is displayed, replace the component with new one, and if the fault indication still appears, check the wiring.
If "all of four malfunction" indication is displayed, a short-circuit may exist, or any one of the ignition coils may be short-circuited internally.

*3. Ignition coil malfunction may be indicated if the insulation resistance is reduced due to build up of carbon on the spark plug. Thus, check spark plug also before replacing ignition coil.

Replenish engine oil.

* If the lamp indicating a malfunction is still lit after replenishing engine oil, a short-circuit may exist or a component may be faulty.

Refer to troubleshooting.

Replace the component, or check wiring and connections for abnormality, and repair if necessary.





* The lamp may show malfunction even when no faulty component or wiring exists if the engine revolution changes much.

Refer to TPS initial value resetting method.

Replace the component, or check wiring and connections for abnormality, and repair if necessary.



Troubleshooting

Malfunction / Failure Indication		Description of Problem	Fault Log	
			Fault	Fault Log (Yes)
 Tachometer Indication (r/min)	 Indicator A		 Indicator B	 Indicator C
6,500	On	Engine cooling water temp high		
6,500	Flashing	Engine cooling water temp. abnormally high		
7,000	On	Air compressor cooling water temp. high		
7,000	Flashing	Air compressor cooling water temp. abnormally high		
7,000	Off	FFP (*5) malfunction		
4,500	On	MAP sensor malfunction		
4,500	Off	MAT sensor malfunction		

*5 FFP : Fuel Feed Pump

Remedial Measures and Added Notes
Refer to troubleshooting.
Refer to troubleshooting.

6) Resetting TPS Initial Values

Use the following procedures to reset the ECU and TPS idling position in case where self-diagnosing indicates idling position errors for TPS1 and TPS2.

- ① When either the TPS or ECU is replaced or control cables replaced :
- ② When the self-diagnosing function indicates “TPS Idling Position Error” :
- ③ When links and rod snap rings are replaced due to warping or wear in the linkage :
- ④ When the TPS idling Position Error indication appears after performing engine disassembly and assembly operations :
- ⑤ When a new engine is first put into service :

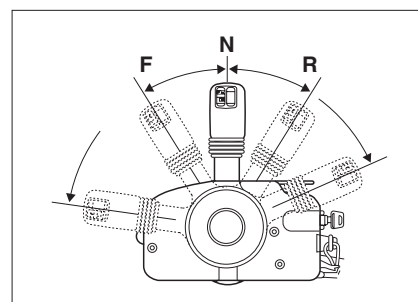
It is necessary to reset the ECU and TPS idling position if any of the above conditions occurs.

Reset Procedure

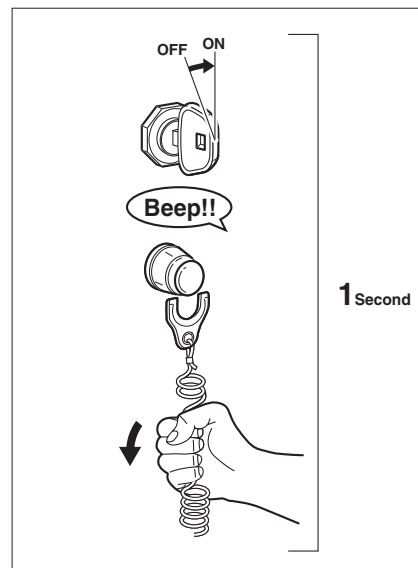
1. With the throttle in the fully closed position adjust the cables or wires in order bring the advancer arm into contact with the fully closed stopper position. Then, move the throttle or throttle grip several times to confirm that the arm is seated snugly against the fully closed stopper.

Refer of chapter3.

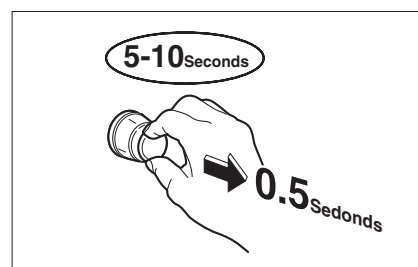
2. Perform the following procedures with the throttle in the fully closed position. (Refer to the figure below.)



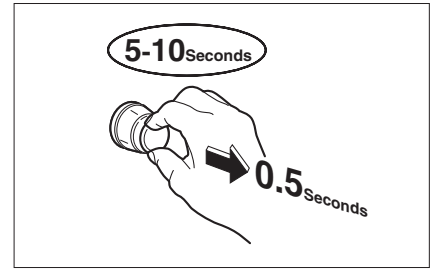
- ① set the key switch to the On position. Disconnect the stop lock switch with in one second after the beep stops sounding.



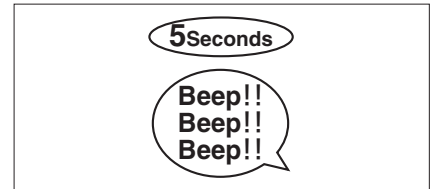
- ② Wait about 5 to 10 seconds. Pull the red knob on the stop switch and immediately release the switch.



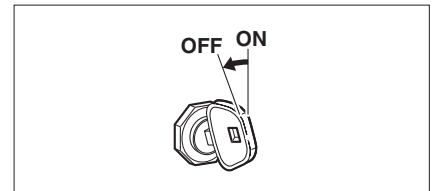
- ③ Wait another 5 to 10 seconds, again pull the red knob on the stop switch for about 0.5 seconds, then release the switch.



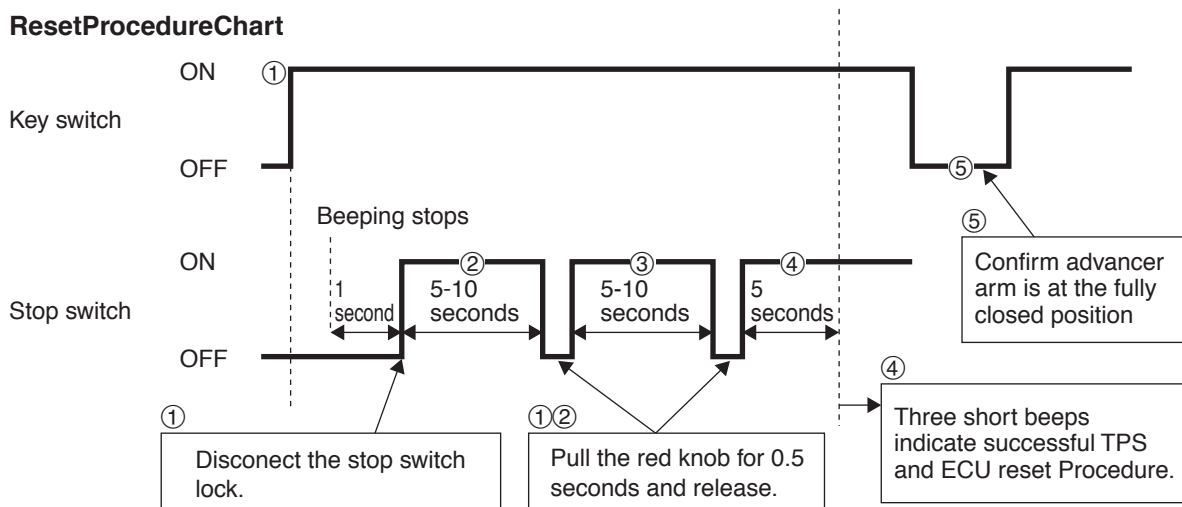
- ④ Resetting of TPS and ECU is completed when the buzzer “Beeps” three times approximately 5 seconds after the knob of stop switch is returned to original position.



- ⑤ Next, set the key switch to the Off position, confirm that the throttle (advancer arm) is at the fully closed position, then turn the key switch to the On position.



ResetProcedureChart





10

Rigging



r/min

1. Service Information	10-2	4. Connections to	
2. Service Data	10-2	Outboard Motor	10-8
1) Load Limit of Boat	10-2	1) Steering Cable	10-8
2) Installation Dimensions	10-2	2) Drag Link	10-9
3) Clamp Dimensions	10-3	3) Installation of Remote Control Cable	
4) Hanging Outboard Motor	10-5	(Engine Side)	10-10
5) Installation of Outboard Motor	10-5	5. Lower Unit	10-13
3. Fuel System	10-6	1) Installation of Propeller	10-13
1) Fuel	10-6	6. Electric System	10-14
2) Oil	10-6	1) Battery Capacity	10-14
3) Electric Fuel Pump	10-6	2) Connection of Battery Cables	10-14
4) Installation of Fuel Filter	10-6	3) Installation of Battery (es)	10-14
5) Connection of Fuel Hose	10-7	7. Accessories and Meters	10-15
6) Filling Fuel System	10-7	1) Accessories	10-15
7) Filling Oil Tank	10-7	2) Installation of Meters	10-15
8) Priming Oil Pump	10-8		



Rigging

1. Service Information

The persons who perform the rigging should take sufficient care for prevention of damages to himself or herself and the products, prevention of fire, and ventilation of the shop.

The persons who operate the boat equipped with this product for test run should read the operating instructions of the outboard, and be familiar with the operating procedure.

2. Service Data

1) Load Limit of Boat

Do not over-power the boat and take care not to over-load the engine. Boat manufacturers specify the maximum allowable engine power and complement of their boats in accordance with certain standards and show the data on the plate attached to the boats. For unknown matters, if any, inquire of the dealer or manufacturer of the boat.

WARNING

Never use boat equipped with an outboard motor(s) that outputs power exceeding the maximum allowable limit specified by the manufacturer of the boat, or the following problems can occur.

- **The boat can go out of control.**
- **The buoyancy property of the boat varies from the designed value if the boat is overloaded especially at the transom.**
- **The boat may crack or be damaged around the transom.**

Over-powering boats can cause serious injury, fatal accident and/or serious damages to the hull.

2) Installation Dimensions

Minimum Allowable Size of Transom Opening : ①

Single Machine Installation (Remove Control Models)

848 mm (33.39 in.)

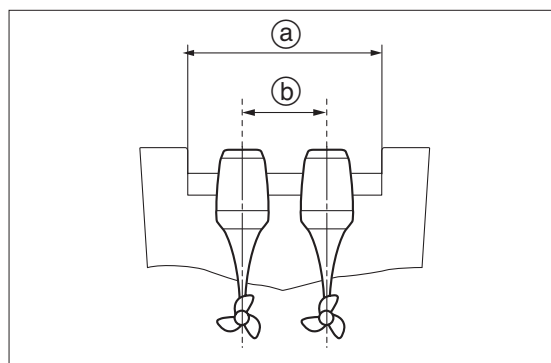
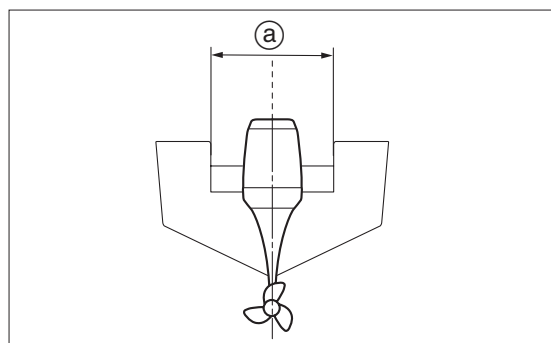
Twin Machine Installation 1,518mm (59.76 in.)

Minimum center-to-center distance for twin installation : ②

470 - 660 mm (18.50 - 25.98 in.)



Installation of an outboard motor(s) at higher position(s) can cause engine overheating and/or damages to gear case components.



Manual Tilt Model





* Full scale transom dimensions and drilling template is shown at the end of this manual.

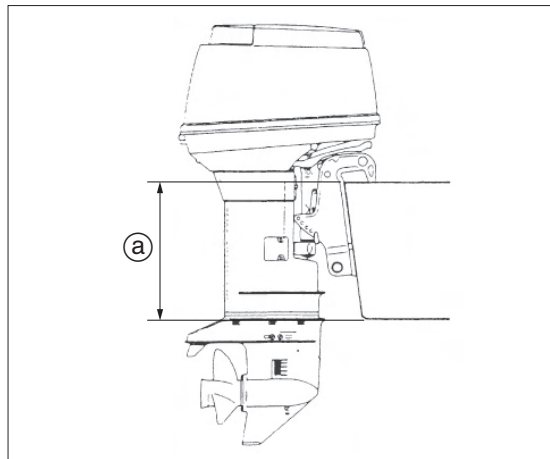




Installation of an outboard motor at higher position can cause the matters described below.

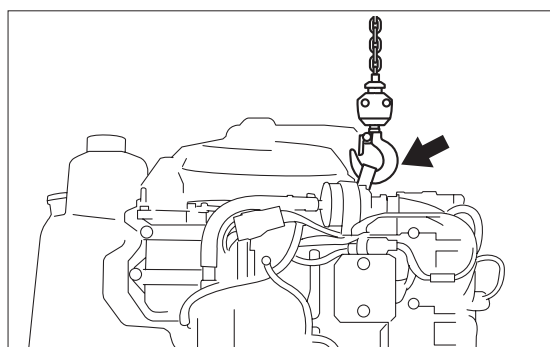
- 1) Suck in air from a cooling water inlet, and overheat can easily.
- 2) Deterioration of steering feeling.
- 3) Propeller can easily run above water surface (over-revs) during planning or when the boat is heavily loaded.

- ①: Outboard installation height is the distance from the boat's bottom to upper edge of outboard motor transom bracket.



4) Hanging Outboard Motor

Use hanger installed on the engine.

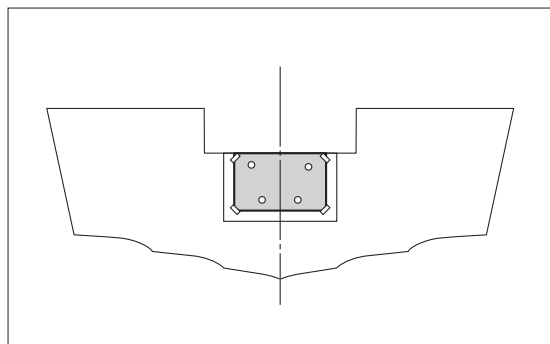


5) Installation of Outboard Motor

1. Put the outboard motor installation template on the transom.



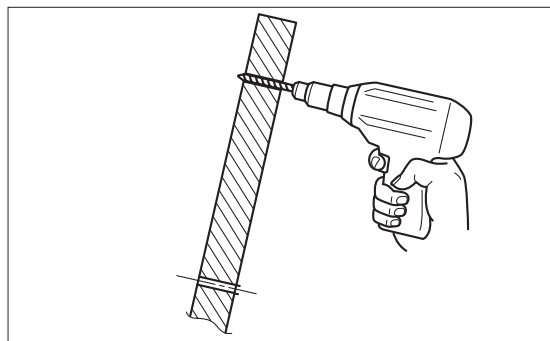
Align center line of template with center line of transom accurately.



2. Mark up the transom with four 12.5 mm (0.49 in) mounting holes and drill.



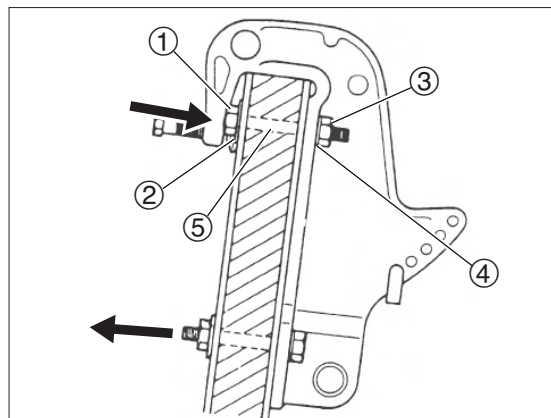
Drill at right angle to transom surface to align the transom holes with outboard motor's transom bracket holes accurately.





Rigging

3. Install outboard motor(s).
4. Secure the outboard motor by using fasteners contained in the package of the product.
 - ① : 12mm diameter, Bolts (4 pcs.)
 - ② : Flat Washers (4 pcs.)
 - ③ : Lock Nuts (4 pcs.)
 - ④ : Flat Washers (4 pcs.)
 - ⑤ : Marine Sealant : Apply to the bolts' surface excluding their threaded area.



3. Fuel System

It is recommended to install additional large sized fuel/water separator on the boat to effectively remove water and foreign substances contained in the fuel. At the same time however, note that the fuel filter added to the fuel system may prevent smooth flow of fuel, possibly causing the engine to stall at low speeds, or fuel to be lean at higher engine speed resulting in giving damage to the engine. Use of valve fitting can also cause similar troubles.

1) Fuel

Avoid the use of old gasoline or gasoline containing impurities such as sand or mud in any occasion such as break-in operation of the engine and even after the break-in.

WARNING

Do not use gasoline pre-mixed with engine oil for this engine.

2) Oil

Use Genuine Oil. (Oil for two stroke direct injection engine recommended by the outboard manufacture)



Use of low quality engine oil can cause serious damage to the engine.

3) Electric Fuel Pump

Electric fuel pump pressure, if used in conjunction with engine mechanical fuel pump, must be limited to no more than 0.03 MPa (4 psi) [0.3kg/cm²].

4) Installation of Fuel Filter

<Portable Fuel Tank>

Fix the tank on the proper location of the boat taking into consideration the engine's fuel hose length.

<Stationary Fuel Tank>

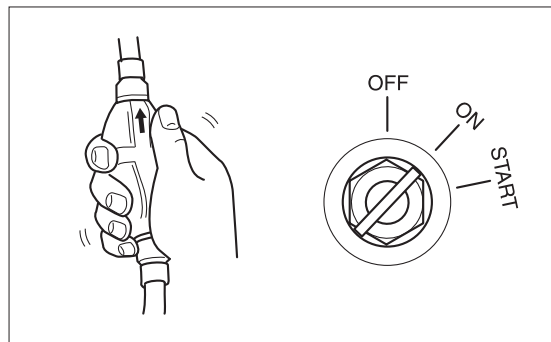
Install the tank in accordance with regulations relevant to grounding, anti-siphoning protection, ventilation and other matters.

5) Filling Fuel System

Fill the fuel system as described below before initially starting new engine, after engine exhausted fuel, or after draining fuel from engine.

WARNING

To prevent damaging to fuel pump, fill engine's fuel system with fuel. If not, the fuel pump operates without fuel during priming of oil pump.

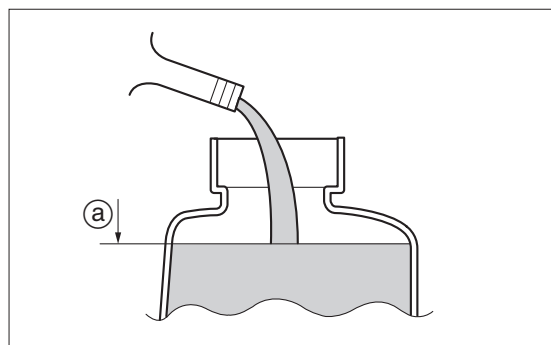
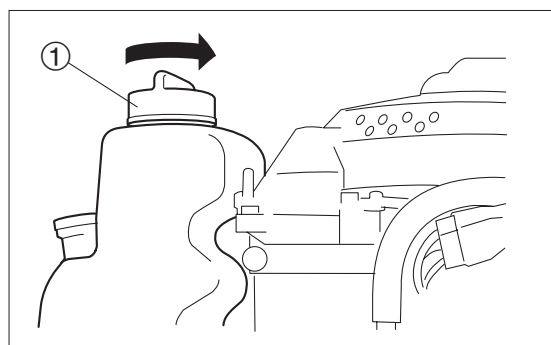


1. Squeeze priming bulb of fuel hose until it becomes stiff.
2. Set key switch to "ON" position for three seconds to operate electric fuel pump.
3. Return key switch to "OFF" position and squeeze priming bulb again until it becomes stiff. Set key switch to "ON" position for three seconds again. Repeat these steps until primary bulb of fuel hose becomes stiff.

6) Filling Oil Tank

Note: Oil tank capacity is 2.0 L (0.53 gal).

1. Remove top cowl, and then turn oil tank cap ① counter clockwise to remove.
2. Pour specified quantity of engine oil into oil tank. Do not overfill. Oil level should be below filler neck ②.
3. Put oil tank cap on the tank and tighten. Reinstall top cowl.
② : Oil Upper Level 4.3L (1.14gal)

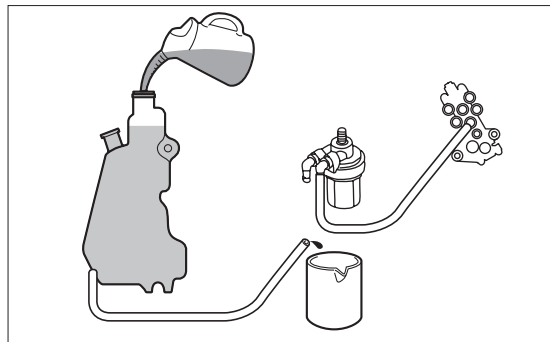




Rigging

8) Priming Oil Pump

After installing outboard motor, prime oil pump before initially starting the engine. The priming removes all air bubbles contained in the pump, oil feed hose and internal oil passage. Refer to “Air Purging” in Chapter 4.

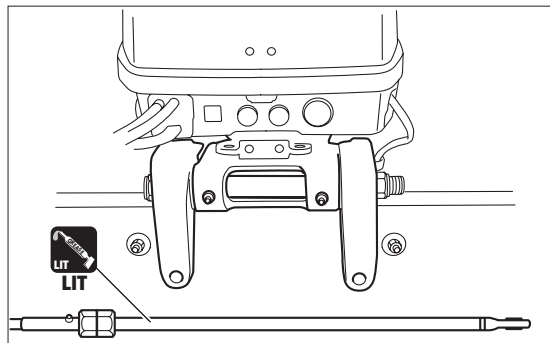


4. Connections to Outboard Motor

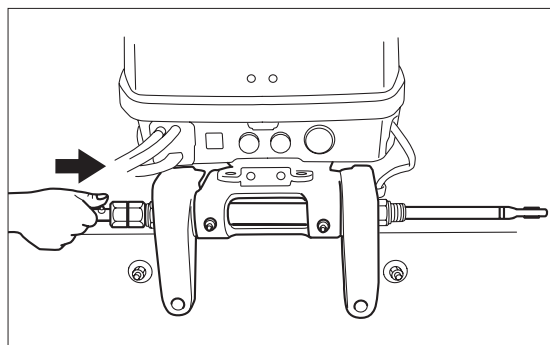
1) Steering Cable

Cable arranged on the starboard side

1. Apply thin coat of grease to entire area of cable end.



2. Run steering cable into tilt tube.



3. Tighten nut to specified torque.

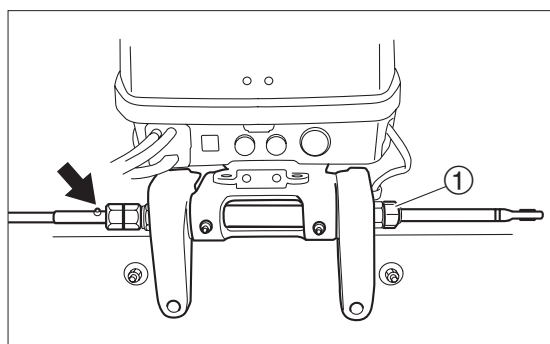


Nut :

48 N · m (35 lb · ft) [4.8 kgf · m]



Be sure to attach drag link seal ring ①
3F3-84908-0.



2) Drag Link

1. Attach drag link as shown.



When installing steering rod that connects engine and steering cable, be sure to use special bolt ①, split pin ② and nylon lock nuts ③. Do not use regular bolts and non-lock type nuts in place of these bolts and lock nuts, or the nuts may be loosened due to mechanical vibration resulting in disconnection of the link rod.

WARNING

Disconnection of steering rod will cause the boat to turn accidentally. The sudden turn of the boat may cause the passenger to be thrown overboard, leading to serious injury or fatal accident.



Bolt ① :

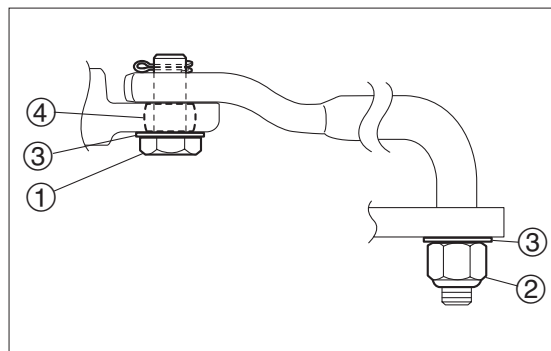
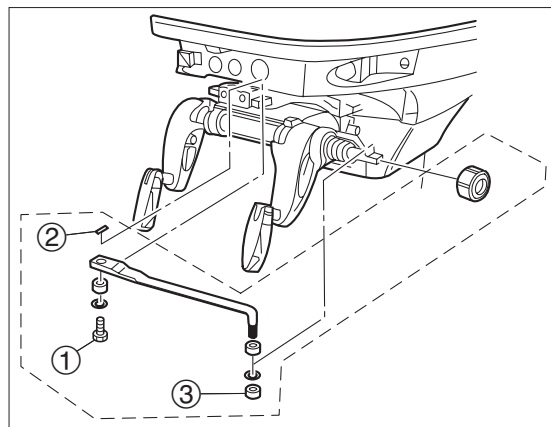
27 N · m (20 lb · ft) [2.7 kgf · m]

Nylon Nuts ② :

Fully tighten, and then loosen 1/4 of a turn.

Washer ③

Coller ④

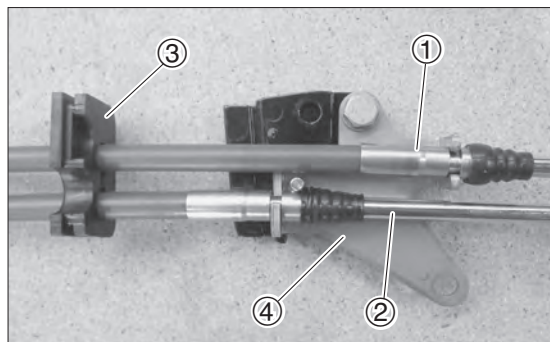




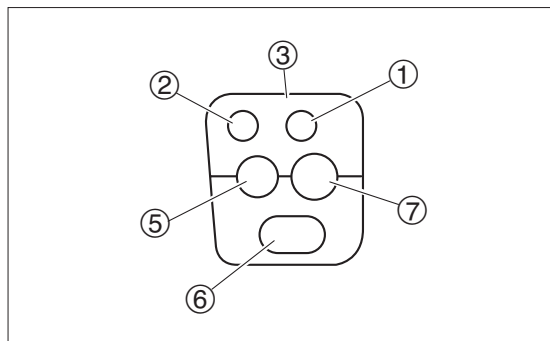
Rigging

3) Installation of Remote Control Cable (Engine Side)

1. Turn upper motor cover hook levers ① and ② and remove upper motor cover.



- ① Throttle cable
- ② Shift cable
- ③ Grommet
- ⑤ Cord ass'y (B) (Remote control harness)
- ⑥ Battery cables
- ⑦ Meter cord Ass'y



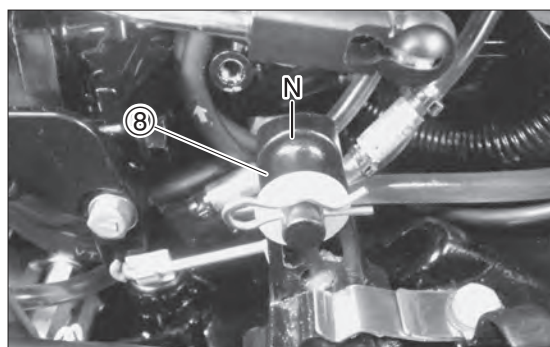
2. Install cable clip bracket to the bottom cowl.



Pass the battery cable, cord ass'y (B) and meter cord ass'y into grommet (lower).



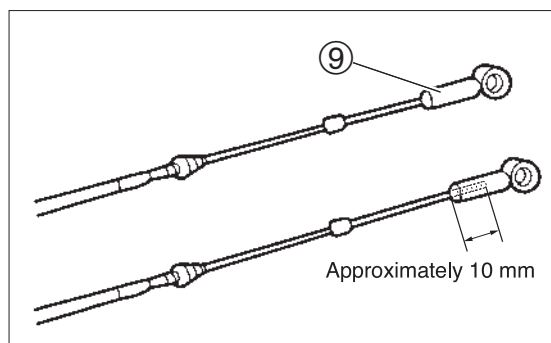
3. Set shift arm ⑧ to F, N, R positions and then to N.



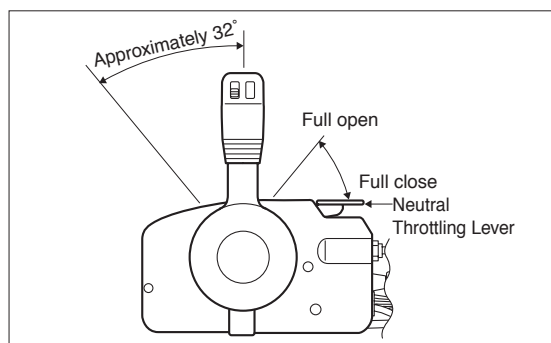
4. Screw cable joint ⑨ on the tip of remote control cable by approximately 10mm.



The screw-in distance of cable joint, 10 mm, is equivalent to approximately 9 threads.



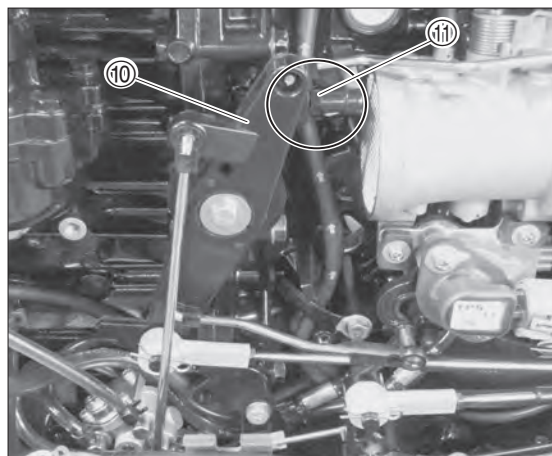
5. Shift cable is the one of which tip is moved when remote control lever is set to forward (F) side until it stops once (approx. 32 degrees).
6. Set remote control lever to neutral (N), and check that neutral throttling lever is at full close position.



7. Set advancer arm to full close position.



- Check that advancer arm ⑩ is surely in contact with full close side stopper ⑪.
- Also check and adjust that advancer arm is surely in contact with full open side stopper.





Rigging

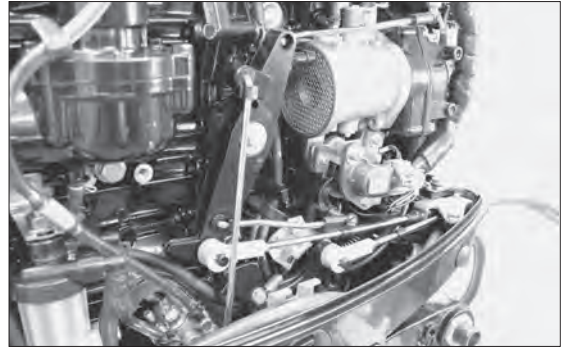
8. Adjust screw in length of cable joint so that cable joint hole aligns with shift arm and advancer arm pins, lock the joint with nut, and then, set it on the arm pin and secure with "R" pin and washer.

Put the cable in cable clip groove, and then secure it by using cord clamp.



Check that shifting control lever forward (F) by approximately 32 degrees, where it is stopped once, makes the gear engage, and fully shifting the lever makes throttle valve fully open, and then, check that shifting the lever reverse (R) by approximately 32 degrees, where it is stopped once, makes the gear engage, and fully shifting the lever makes throttle valve fully open.

Then, check that, when control lever is returned to neutral position (N), advancer arm of the outboard motor side is at full close position. Since throttle position sensor (TPS) operates incorrectly if advancer arm does not contact with full close stopper, readjust cable joint position at outboard motor side and reinstall it if the valve is not fully closed in this case.



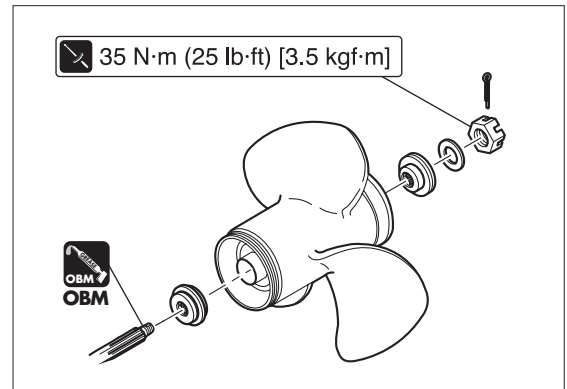
5. Lower Unit

1) Installation of Propeller

WARNING

- Before removing or installing propeller, be sure to disconnect battery cables from battery and remove stop switch lock plate.
- When removing or installing propeller, do not handle propeller with bare hands.
- Put a piece of wooden block between anti-cavitation plate and propeller to prevent rotation of propeller when removing or installing propeller.

1. Set shift lever to neutral (N) position.
2. Remove spark plug caps from spark plugs.
3. Apply grease to propeller shaft.
4. Put propeller parts on the propeller shaft in the order as shown.
5. Put a piece of wood in between gear case and propeller, and tighten nut to specified torque.



Propeller Nut :

35 N · m (25 lb · ft) [3.5 kgf · m]

6. Put split pin in the nut and bend.

CAUTION

Check nut for looseness at least every 20 hours of operation.



Rigging

6. Electric System

1) Battery Capacity



12V100 AH or more

CCA : 850

MCA : 1100

12V120 AH or more (in cold regions)

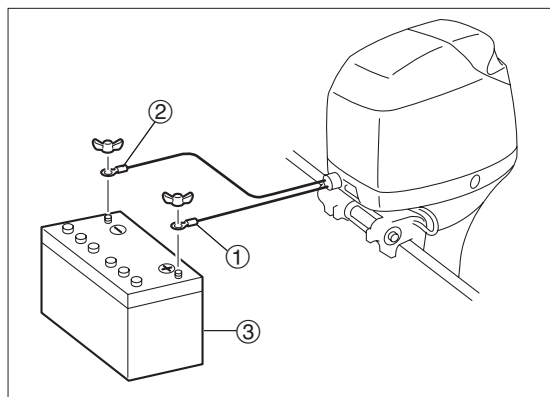
CCA : 1000

MCA : 1500

2) Connection of Battery Cables

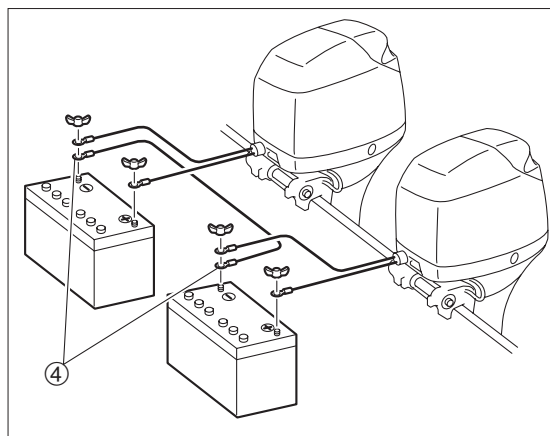
1. Single Outboard Installation

- ① : Red Sleeve (Positive Side)
- ② : Black Sleeve (Negative Side)
- ③ : Starting Battery



2. Twin Outboard Installation

Be sure to connect negative terminals of the starting batteries by using common earth lead ④ of which size is equal to that of the main battery cables.

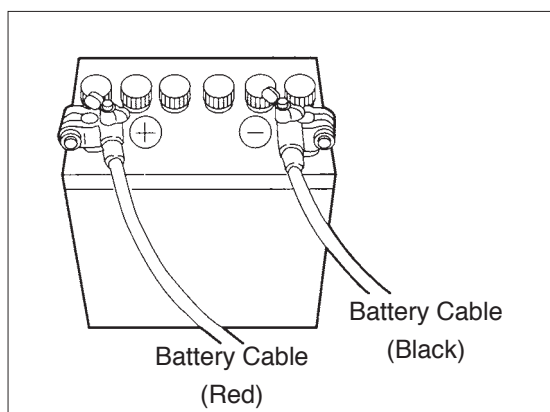


3) Installation of Battery (ies)

This outboard motor cannot be operated without using battery.

Use battery of 12V.100AH (12V.120AH for use in cold areas)

1. Battery should be stored in battery storage box and secured to hull to prevent it from falling due to rolling or pitching or any shock in the place where it is protected from water spray.
2. When connecting battery cables, connect red cable first, and then black one. (Reverse the order when disconnecting.)
Positive cable is the one with red tube on the terminal end.



CAUTION

- Before using battery, thoroughly read warning label.
- Do not disconnect battery cable during engine operation.

7. Accessories and Meters

1) Accessories.

Start In-Gear Protection (Neutral Safe Starting Switch)

The remote control box connected to the outboard motor is equipped with start in-gear protection (neutral safe starting switch) This function disables the engine starting when shift gear is engaged.

WARNING

If engine starts with the shift gear engaged, the boat may start to move unexpectedly, possibly leading to serious injury or fatal accident. To prevent this accident, the outboard motor is equipped with the start in-gear protection (neutral safe starting switch), which must not be disabled.

<Selection of Outboard Motor Accessories>

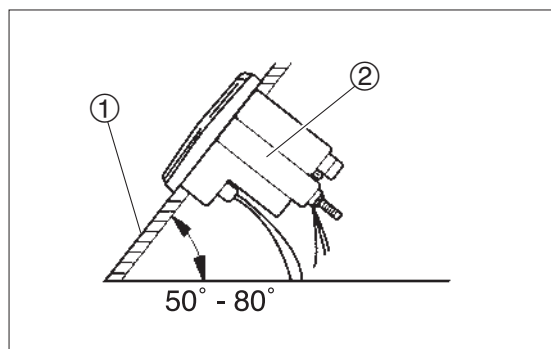
For this outboard motor, use the manufacturer's genuine parts and accessories.

For safety reasons, it is not recommended to use parts and accessories supplied by other than the manufacturer. Before using any accessories, thoroughly read the installation manual and operation manual.

2) Installation of Meters

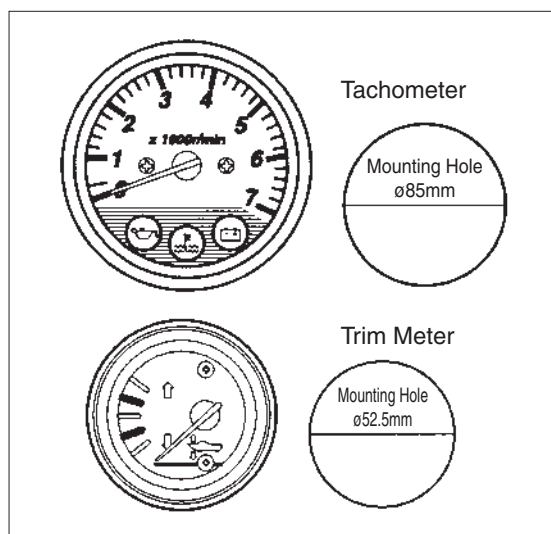
When installing meters, select a place on the dash board ① where operator can watch them easily and they are not exposed to water spray.

The meters can be installed on the dashboard of 2 to 11 mm thick. When the thickness is over 11mm, cut fitting plate ② so that the meters can be installed.



<Installation Angle>

Install meters so that the angle is in between 50 to 80 degrees from horizontal plane.

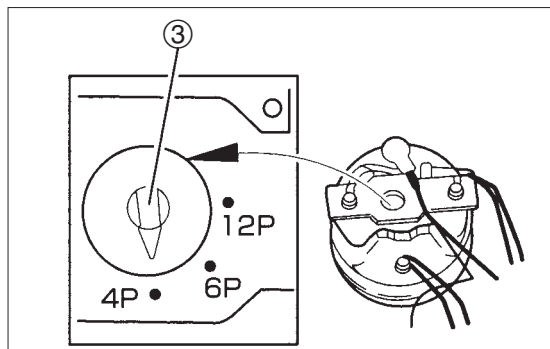




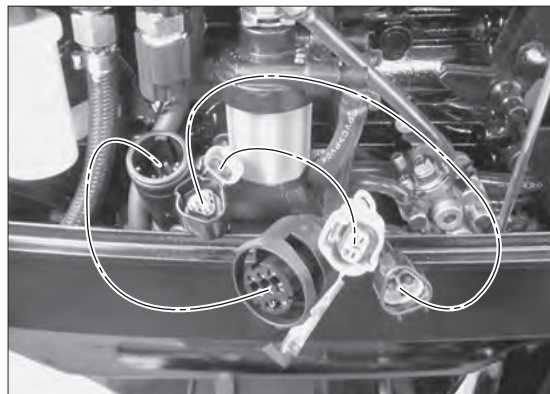
Rigging

<Tachometer>

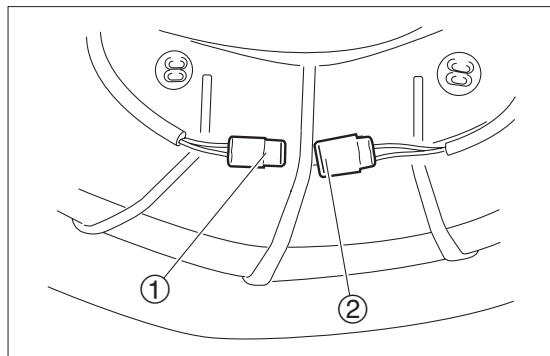
Set selector ③ to “4P” on the back of the meter.



1. Connect cord ass'y B and meter lead wire to cord ass'y A.



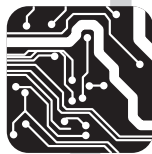
2. Connect trim sensor ① with trim sensor extension cord ②.
(option)



3. Refer to <Electrical Wiring Assembling Instruction Diagram in the Chapter 11> and install remote control and meter wiring.

11

Wiring Diagram



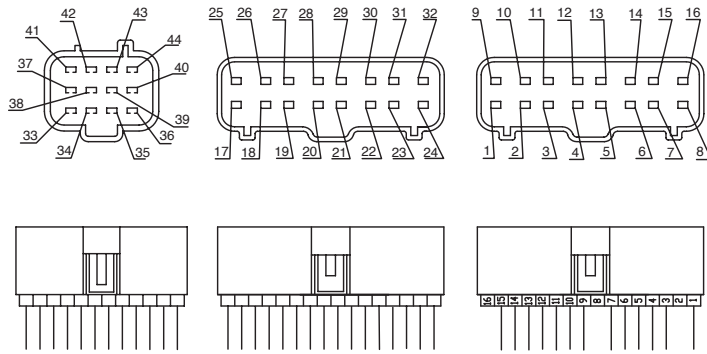
TLDI Wire Harness Terminals and Connections	11-2
Main Harness Diagram	11-3
D40/50B2 EPTO, EPO, D30B2 EPTO Electrical Circuit	11-5
D40/50B2 EFTO, EFO, D30B2 EFTO Electrical Circuit	11-8
Electrical Wiring Assembling Instruction Diagram -1	11-10

Electrical Wiring Assembling Instruction Diagram -2	11-11
Completed Pre-Assembly	11-12
Assembly Step -1	11-12
Assembly Step -2	11-12
Assembly Step -2	11-12
Outboard Motor Installation Template	11-13



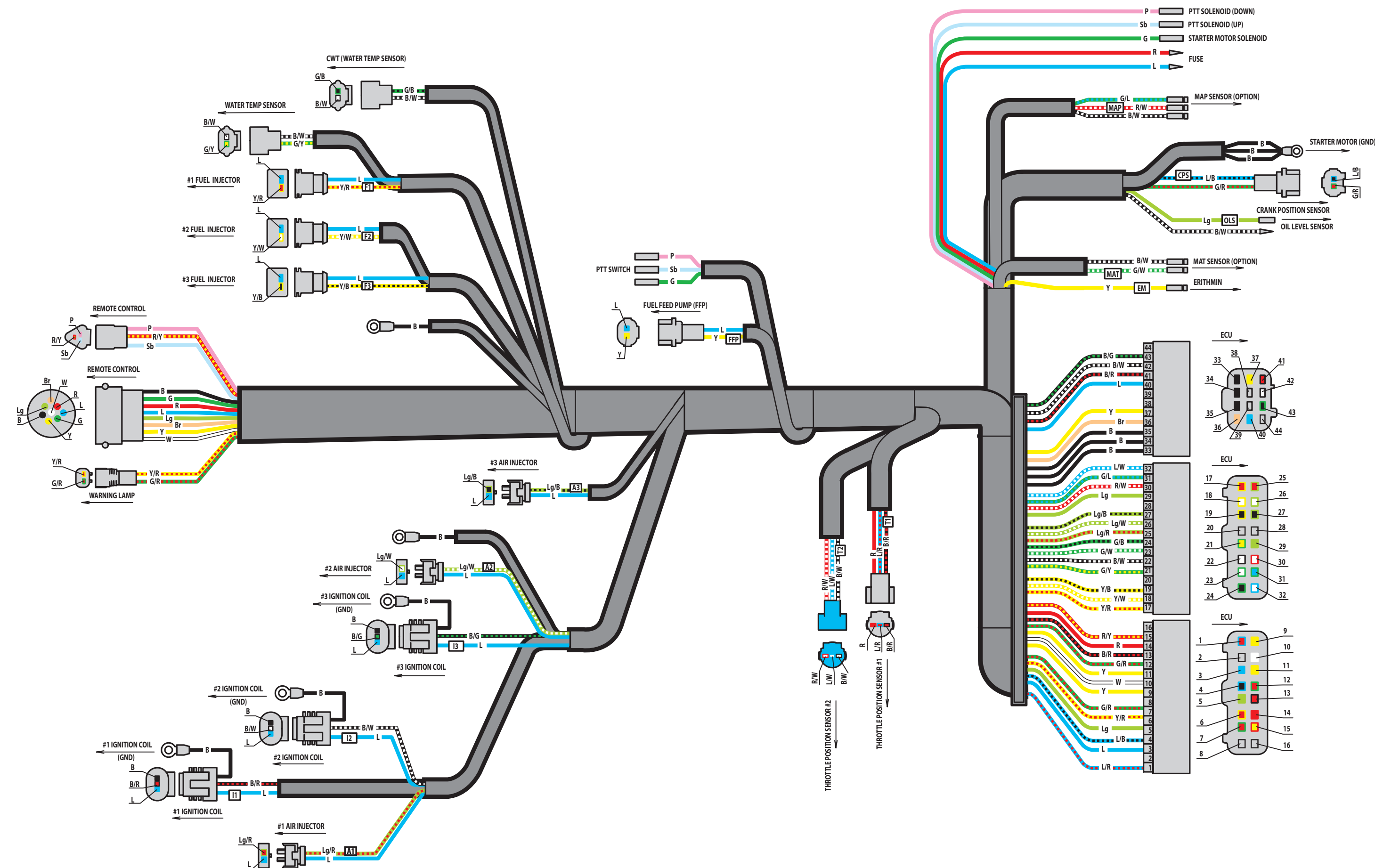
Wiring Diagram

TLDI Wire Harness Terminals and Connections



NO	Component	Lead Wire Color	
1	TPS1 (Throttle Position Sensor 1)	L/R	Blue/Red
2			
3	Key Switch (PUSH)	L	Blue
4	CPS (Crank Position Sensor)	L/B	Blue/Black
5	Warning Lamp (Oil)	Lg	Light Green
6	Warning Lamp (Temp.)	Y/R	Yellow/Red
7	Warning Lamp (Battery)	G/R	Green/Red
8			
9	Buzzer	Y	Yellow
10	Tachometer	W	White
11	EM (Engine Monitor)	Y	Yellow
12	CPS (Crank Position Sensor)	G/R	Green/Red
13	Ground (TPS1)	B/R	Black/Red
14	Power Source (TPS1)	R	Red
15	Power Source (Key Switch)	R/Y	Red/Yellow
16			
17	#1 Fuel Injector	Y/R	Yellow/Red
18	#2 Fuel Injector	Y/W	Yellow/White
19	#3 Fuel Injector	Y/B	Yellow/Black
20			
21	WTS (Water Temp. Sensor)	G/Y	Green/Yellow
22	Ground (TPS2, MAP, Water Temp. Sensor, MAT, Oil Level Sensor and Air Compressor Water Temp. Sensor)	B/W	Black/White
23	MAT Sensor (Optional)	G/W	Green/White
24	CWT (Air Compressor Water Temp. Sensor)	G/B	Green/Black
25	#1 Air Injector	Lg/R	Light green/Red
26	#2 Air Injector	Lg/W	Light green/White
27	#3 Air Injector	Lg/B	Light green/Black
28			
29	Oil Level Sensor	Lg	Light green
30	Power Source (TPS2, MAP)	R/W	Red/White
31	MAP Sensor (Optional)	G/L	Green/Blue
32	TPS2 (Throttle Position Sensor 2)	L/W	Blue/White
33	Ground Terminal	B	Black
34	Ground Terminal	B	Black
35	Ground Terminal	B	Black
36	Stop Switch	Br	Brown
37	FFP (Fuel Feed Pump)	Y	Yellow
38			
39			
40	Main Power Source (ECU)	L	Blue
41	#1 Ignition Coil	B/R	Black/Red
42	#2 Ignition Coil	B/W	Black/White
43	#3 Ignition Coil	B/G	Black/Green
44			

Main Harness Diagram







Wiring Diagram

D40/50B2 EPTO, EPO, D30B2 EPTO Electrical Circuit

NO	Name of Component	NO	Name of Component
1	Alternator Assy	27	Cord Assy B
2	Rectifier Compete	28	Neutra Swtch
3	Battery (Loca)	29	Buzzer
4	PTT swtch *	30	Main Swtch
5	Oil Level Sensor	31	Lanyard Stop Swtch
6	Throttle Position Sensor	32	PTT Swtch
7	Water Temp. Sensor	33	Tach Meter
8	Crank Position Sensor	34	Meter Lead Wire
9	ECU (Engine Control Unit)	35	Air Compressor Water Temp. Sensor
10	Fuse Holder Assy	36	Trim Sender *
11	Starter Solenoid	37	Trim Meter *
12	PTT Solenoid Switch A *	38	Water Pressure Meter
13	PTT Solenoid Switch B *	39	Speed Meter
14	Fuel Injector	40	Hour Meter
15	Air Injector	41	Volt Meter
16	Ignition Coil	42	Meter Lamp Switch
17	Starter Motor	43	Assist Cord Red
18	PTT (Power Trim & Tilt) *	44	Assist Cord Black
19	FFP (Fuel Feed Pump)	45	Assist Cord Blue
20	FFP Cord	46	MAP Sensor (Optional)
21	Battery Cable	47	Assist Cord (MAP)
22	Starter Cord	48	MAT Sensor (Optional)
23	Earth Cord	49	Assist Cord (MAT)
24	Cord Assy A		
25	Ground Cord		
26	Lower Motor Cover		

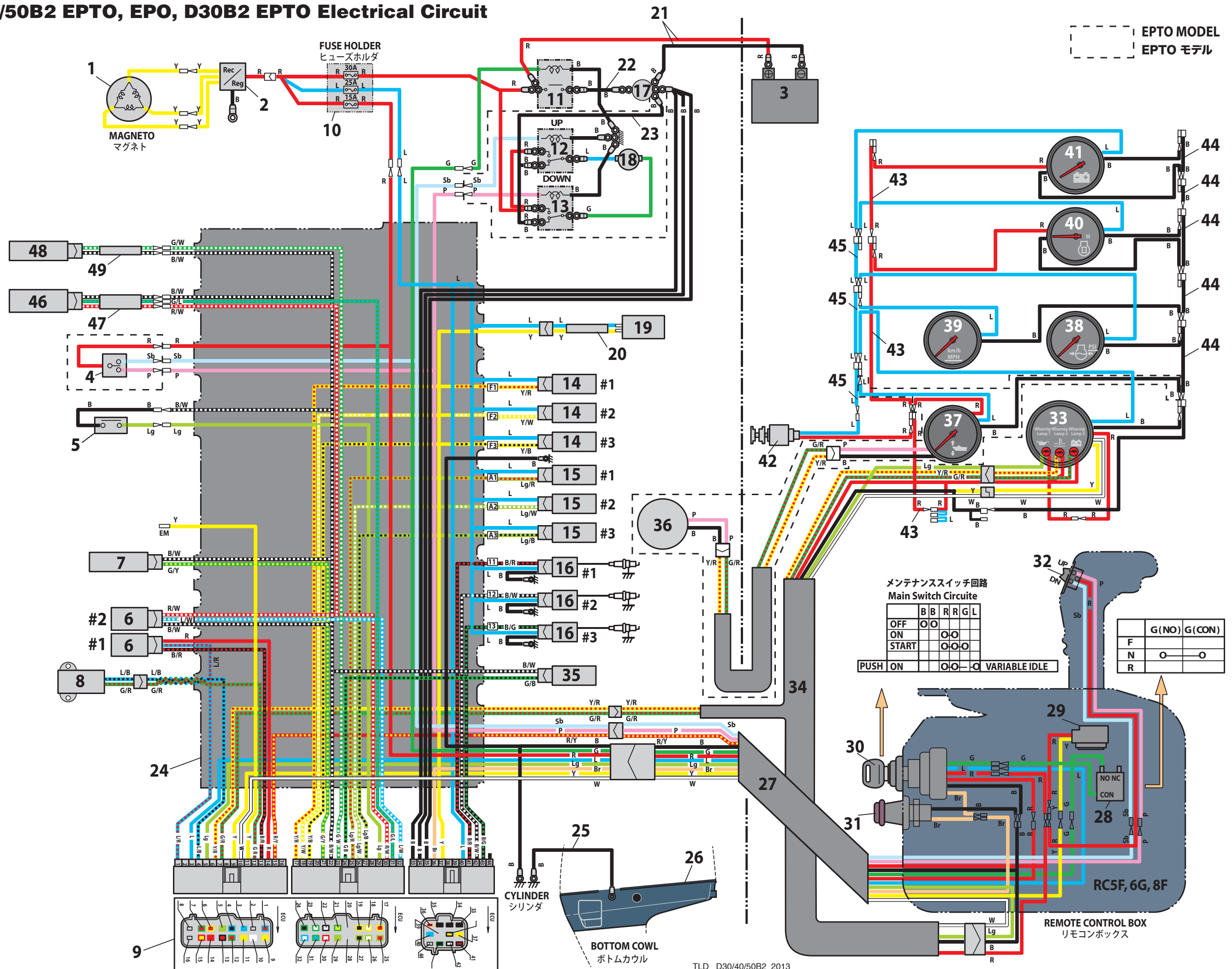
Mark * : EPTO Mode

Cord Color

B	Black	G/W	Green/White
Br	Brown	G/Y	Green/Yellow
L	Blue	L/B	Blue/Black
Lg	Light green	L/R	Blue/Red
P	Pink	L/W	Blue/White
R	Red	Lg/B	Light green/Black
Sb	Sky blue	Lg/R	Light green/Red
W	White	Lg/W	Light green/White
Y	Yellow	R/W	Red/White
B/G	Black/Green	R/Y	Red/Yellow
B/R	Black/Red	Y/B	Yellow/Black
B/W	Black/White	Y/R	Yellow/Red
G/B	Green/Black	G/B	Green/Black
G/L	Green/Blue		
G/R	Green/Red		

Note: "/" means cords with striped colors.

D40/50B2 EPTO, EPO, D30B2 EPTO Electrical Circuit







Wiring Diagram

D40/50B2 EFTO, EFO, D30B2 EFTO Electrical Circuit

NO	Name of Component	NO	Name of Component
1	Alternator Assy	27	Cord Assy B
2	Rectifier Compete	28	Neutral Switch
3	Battery (Loca)	29	Buzzer
4	PTT switch *	30	Main Switch
5	Oil Level Sensor	31	Lanyard Stop Switch
6	Throttle Position Sensor	32	PTT Switch
7	Water Temp. Sensor	33	Tach Meter
8	Crank Position Sensor	34	Meter Lead Wire
9	ECU (Engine Control Unit)	35	Air Compressor Water Temp. Sensor
10	Fuse Holder Assy	—	—
11	Starter Solenoid	—	—
12	PTT Solenoid Switch A *	—	—
13	PTT Solenoid Switch B *	—	—
14	Fuel Injector	—	—
15	Air Injector	—	—
16	Ignition Coil	—	—
17	Starter Motor	—	—
18	PTT (Power Trim & Tilt) *	—	—
19	FFP (Fuel Feed Pump)	—	—
20	FFP Cord	46	MAP Sensor (Optional)
21	Battery Cable	47	Assist Cord (MAP)
22	Starter Cord	48	MAT Sensor (Optional)
23	Earth Cord	49	Assist Cord (MAT)
24	Cord Assy A		
25	Ground Cord		
26	Lower Motor Cover		

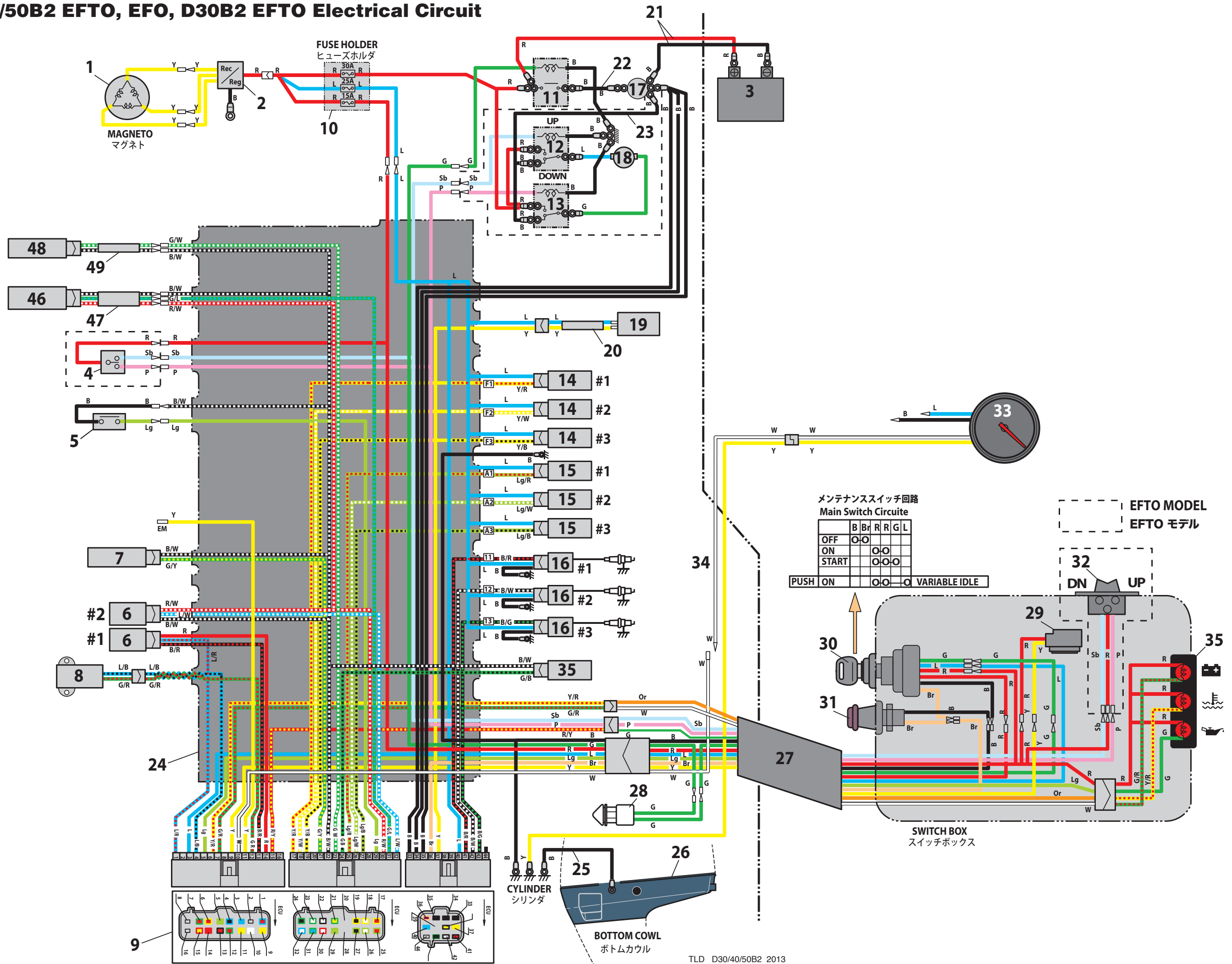
Mark * : EPTO Mode

Cord Color

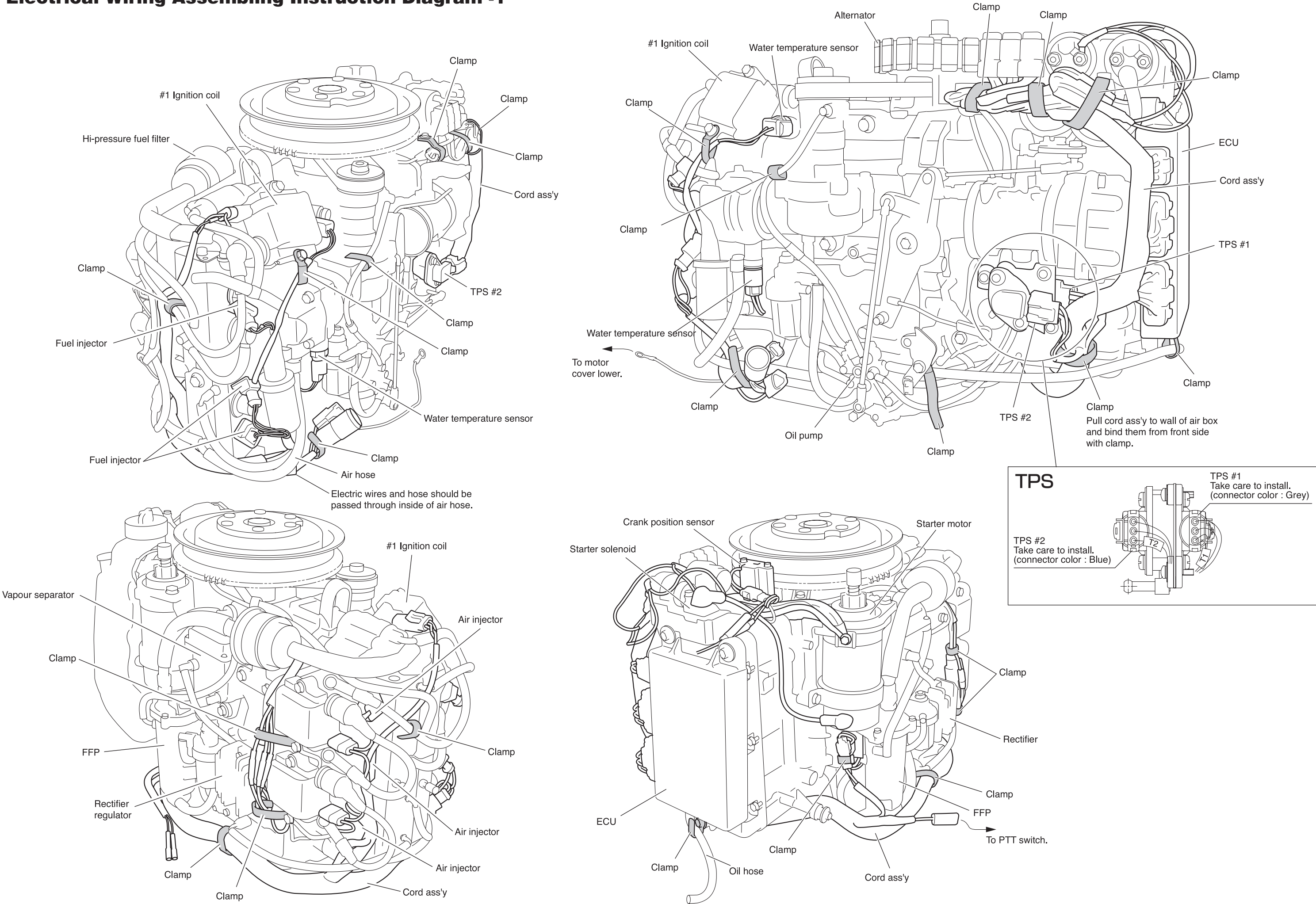
B	Black	G/W	Green/White
Br	Brown	G/Y	Green/Yellow
L	Blue	L/B	Blue/Black
Lg	Light green	L/R	Blue/Red
P	Pink	L/W	Blue/White
R	Red	Lg/B	Light green/Black
Sb	Sky blue	Lg/R	Light green/Red
W	White	Lg/W	Light green/White
Y	Yellow	R/W	Red/White
B/G	Black/Green	R/Y	Red/Yellow
B/R	Black/Red	Y/B	Yellow/Black
B/W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

Note: "/" means cords with striped colors.

D40/50B2 EFTO, EFO, D30B2 EFTO Electrical Circuit



Electrical Wiring Assembling Instruction Diagram -1



Water temperature sensor
To motor cover lower.

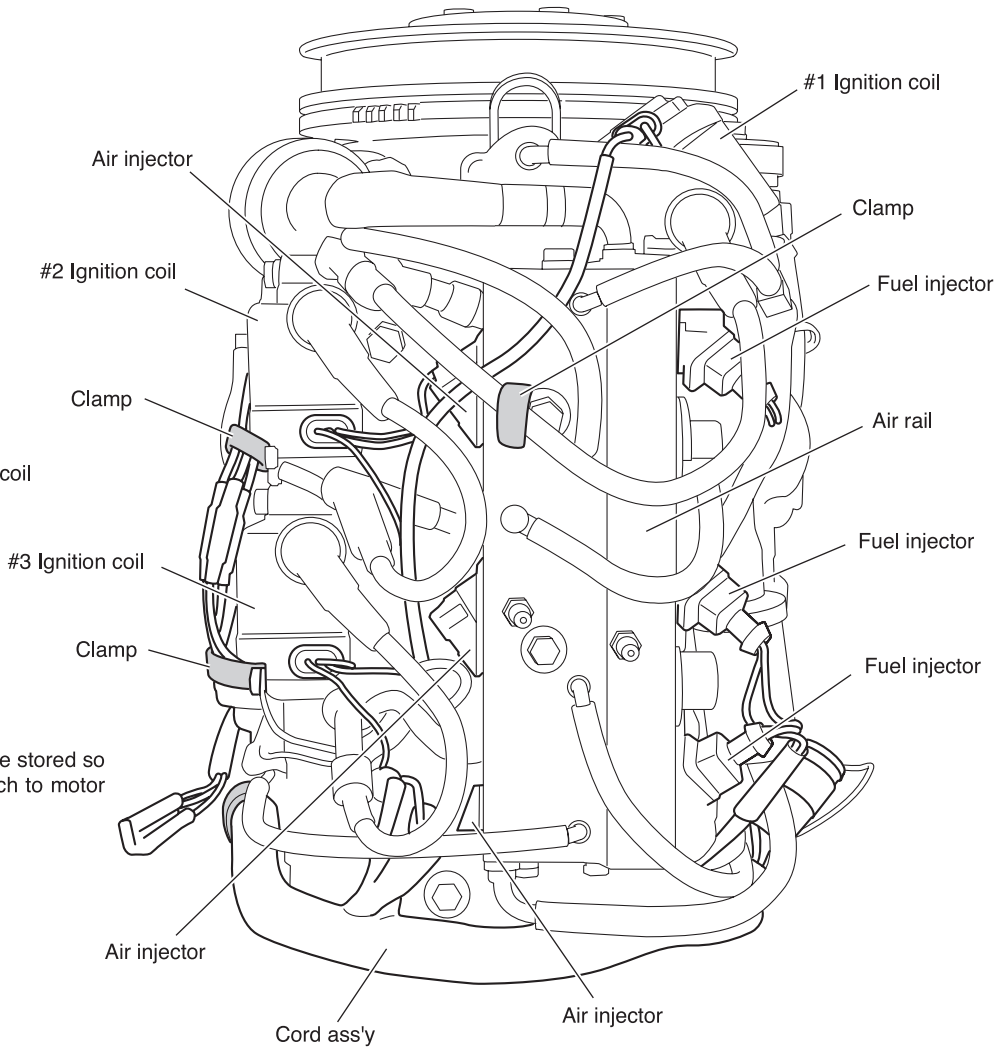
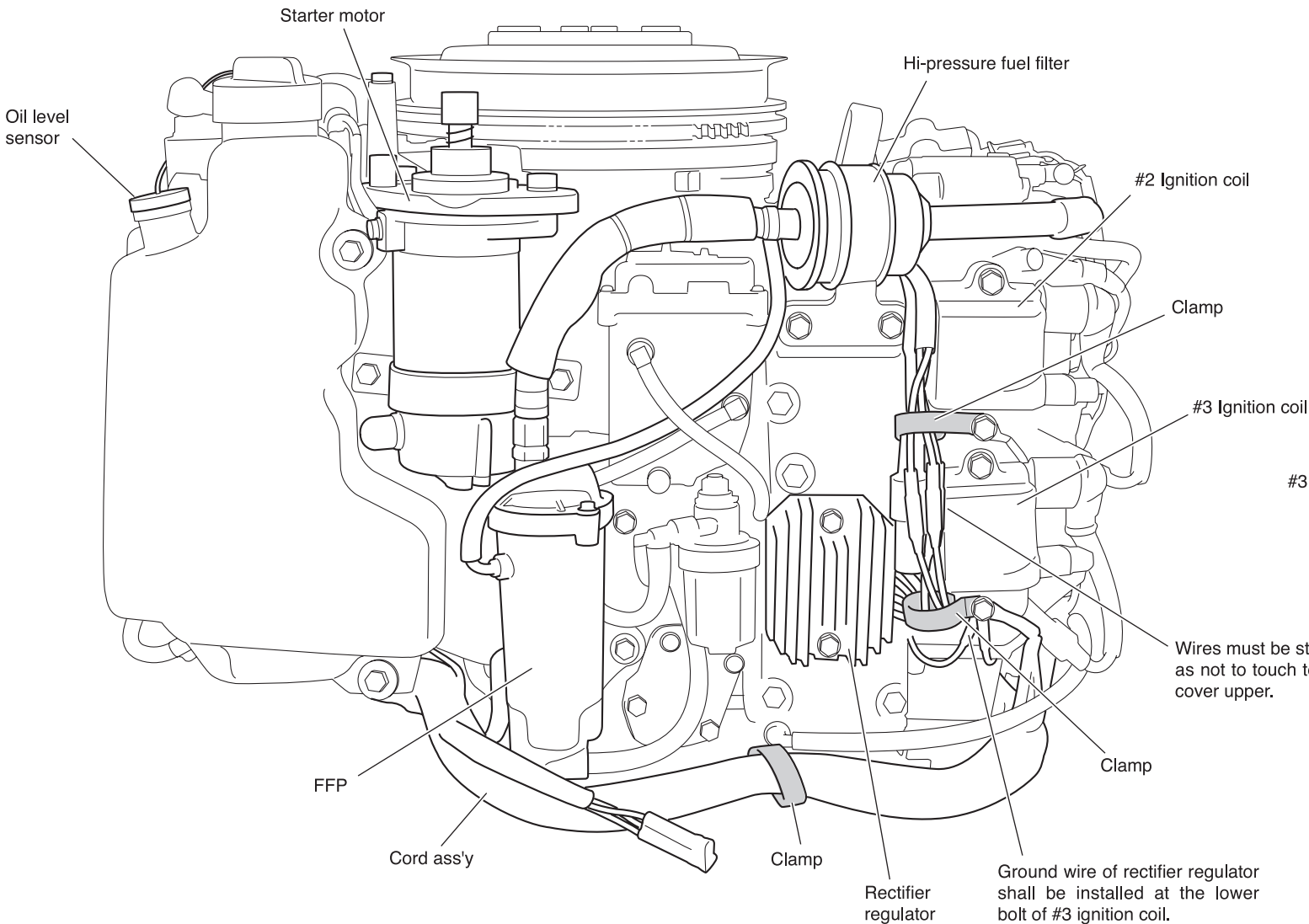
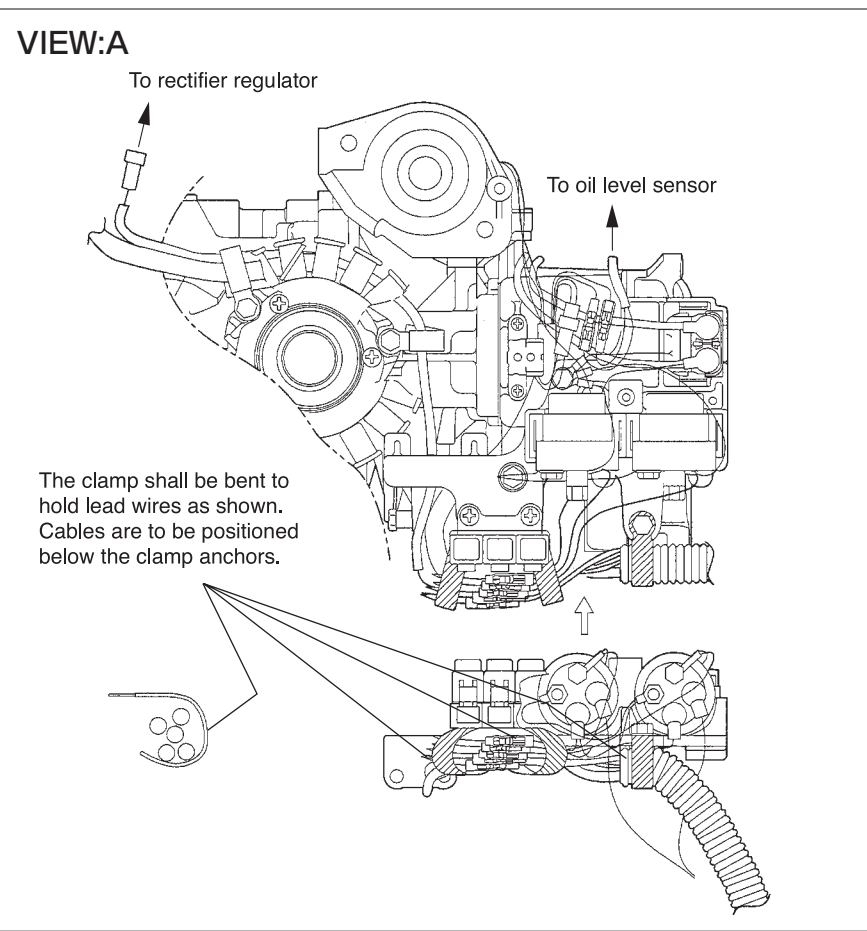
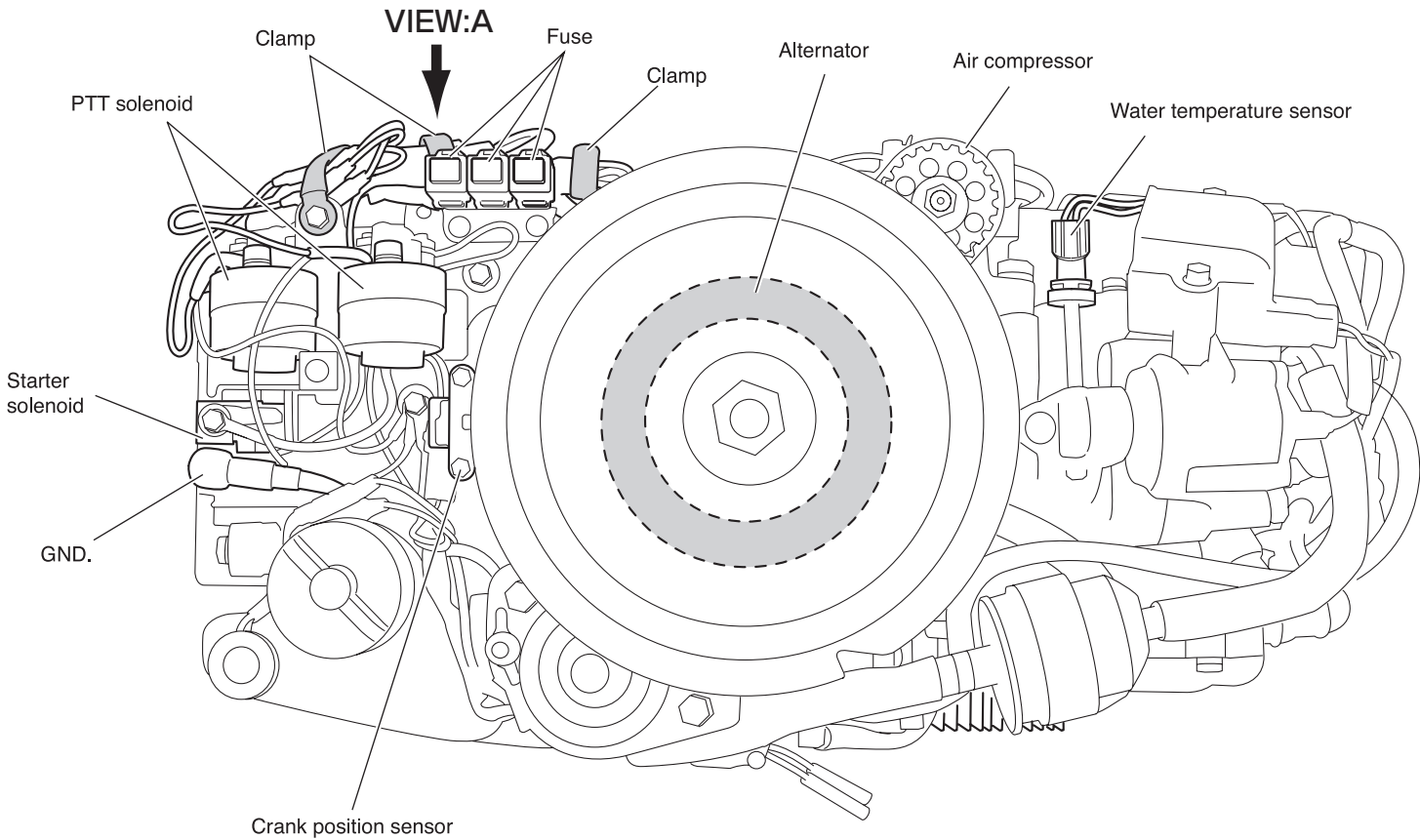
Clamp
Pull cord ass'y to wall of air box and bind them from front side with clamp.

TPS

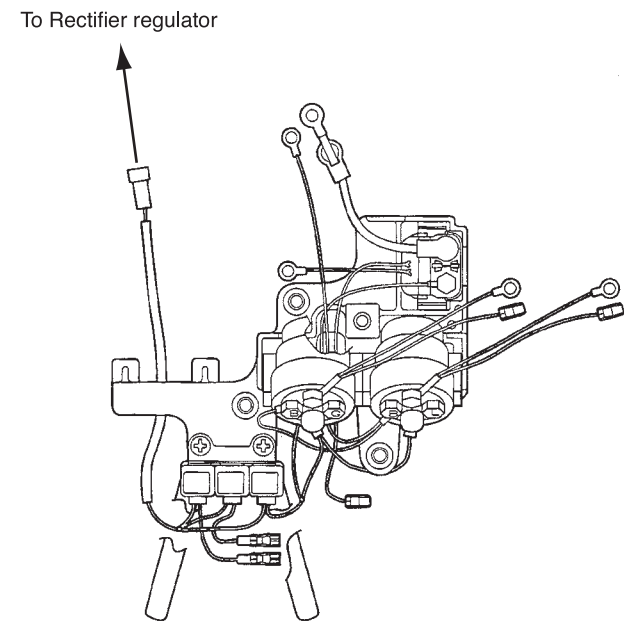
TPS #1
Take care to install.
(connector color : Grey)

TPS #2
Take care to install.
(connector color : Blue)

Electrical Wiring Assembling Instruction Diagram -2

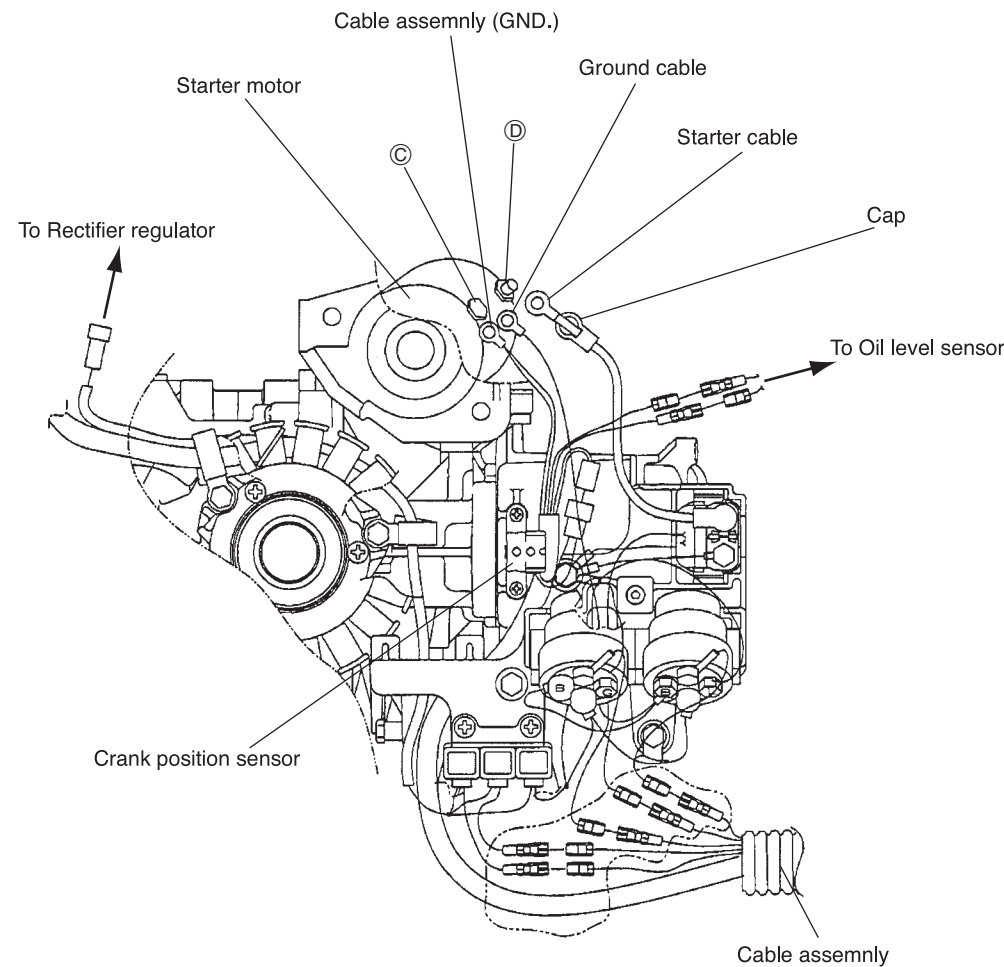


Completed Pre-Assembly



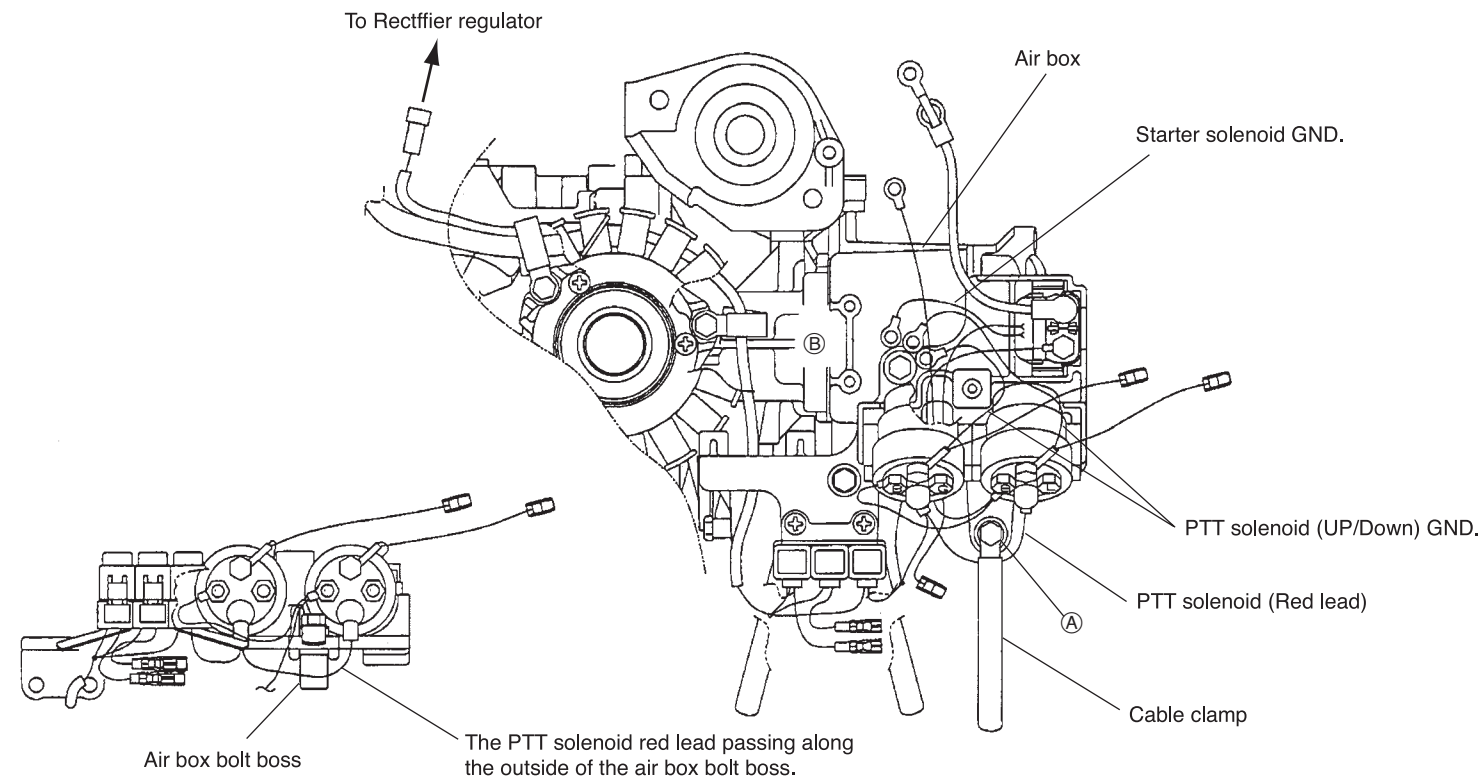
Assembly Step 2

- ① Install the crank position sensor and cable assembly sensor and connect wiring.
- ② Connect the three ground cables to the starter motor.
- ③ Connect wiring to the oil level sensor.



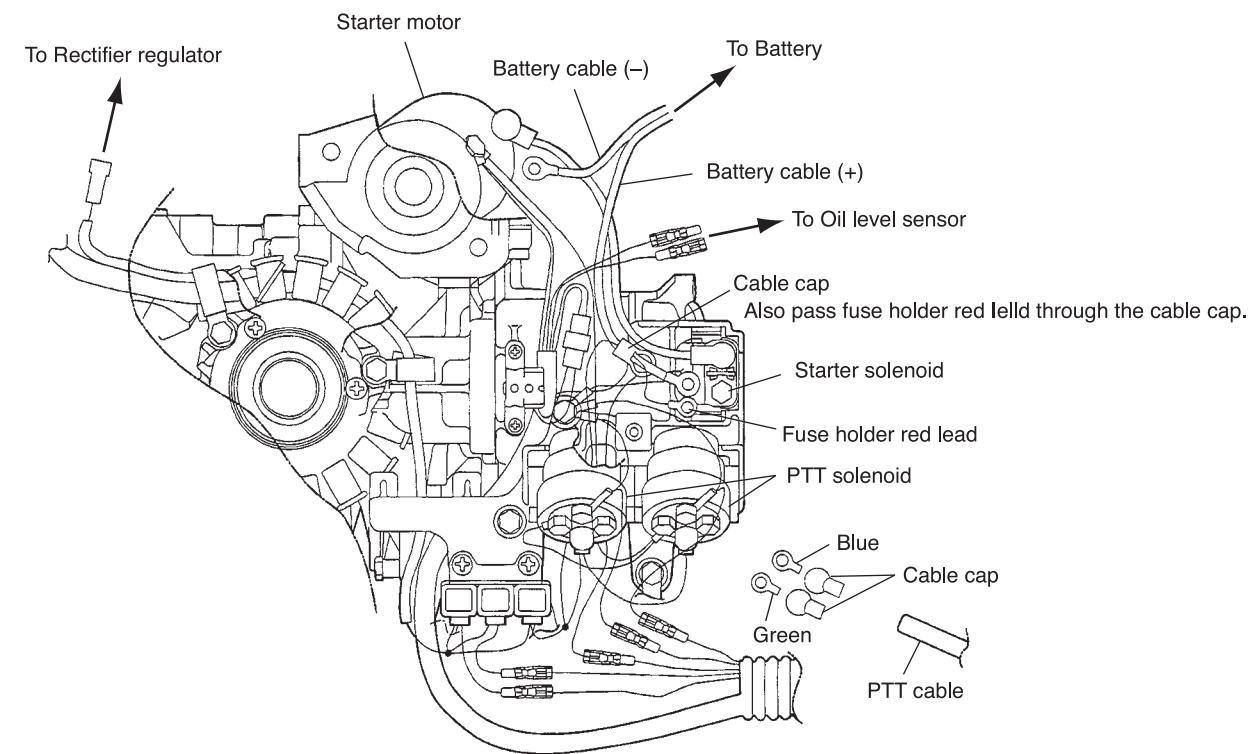
Assembly Step 1

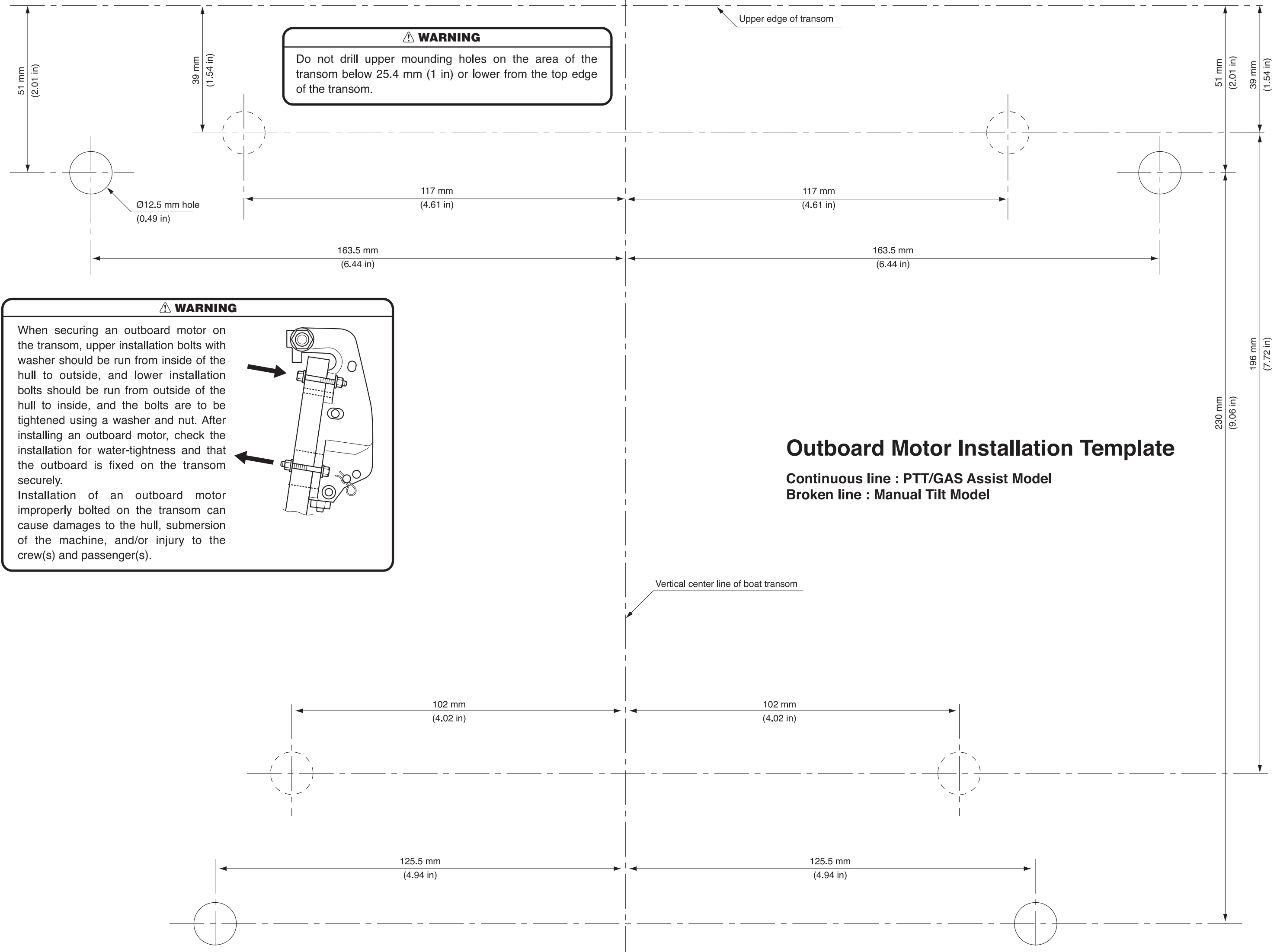
Install bracket on air box.
When installing bracket be sure to install starter solenoid and PTT solenoid ground cables on bolt (A) and the cable clamp on bolt (B).



Assembly Step 3

- ① Install the battery cable (+) in the starter solenoid. At the same time, pass the red (+) wire of fuse holder through the cable cap and install it in the starter solenoid.
- ② Install the battery cable (-) in the starter motor.
- ③ Install the Blue and Green wires from PTT in the PTT solenoid and cover each terminal by the cap.





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SERVICE MANUAL

TLPI

**MD 30B2
40/50B2
Models**

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