RAIDER 50 SERVICE MANUAL

Two stroke - Multi-Fuel – Submersible Outboard Motor

Service Manual R50ES-002-1

Part No. SMR50ES-002-2

January 2017 Rev. 3

Introduction

Before reading this manual

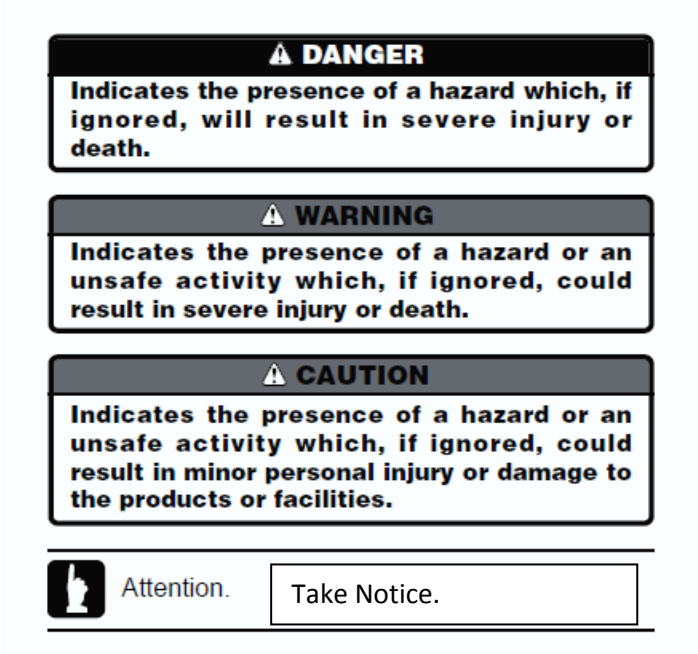
This service manual provides information that is needed for inspection, service and repair of the Raider 50 outboard motor. For information about operation of the products that are not described in this document, refer to the owner's manual (Part No. OMR50ES-002). For our users we have built the best outboard motor for long term, it is essential for the maintainer to prepare the outboard prior to the mission. To ensure this, the maintenance and service have to be done properly by a service technician with fundamental knowledge and skills. This manual is utilized so that our operators can always use their outboard motor with full satisfaction.

Raider Outboards are a Commercial Off The Shelf (COTS) based upon the Tohatsu MWX50D2 which uses the heavy duty gear case. Modifications to this COTS product are detailed in this service manual.

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 damage.

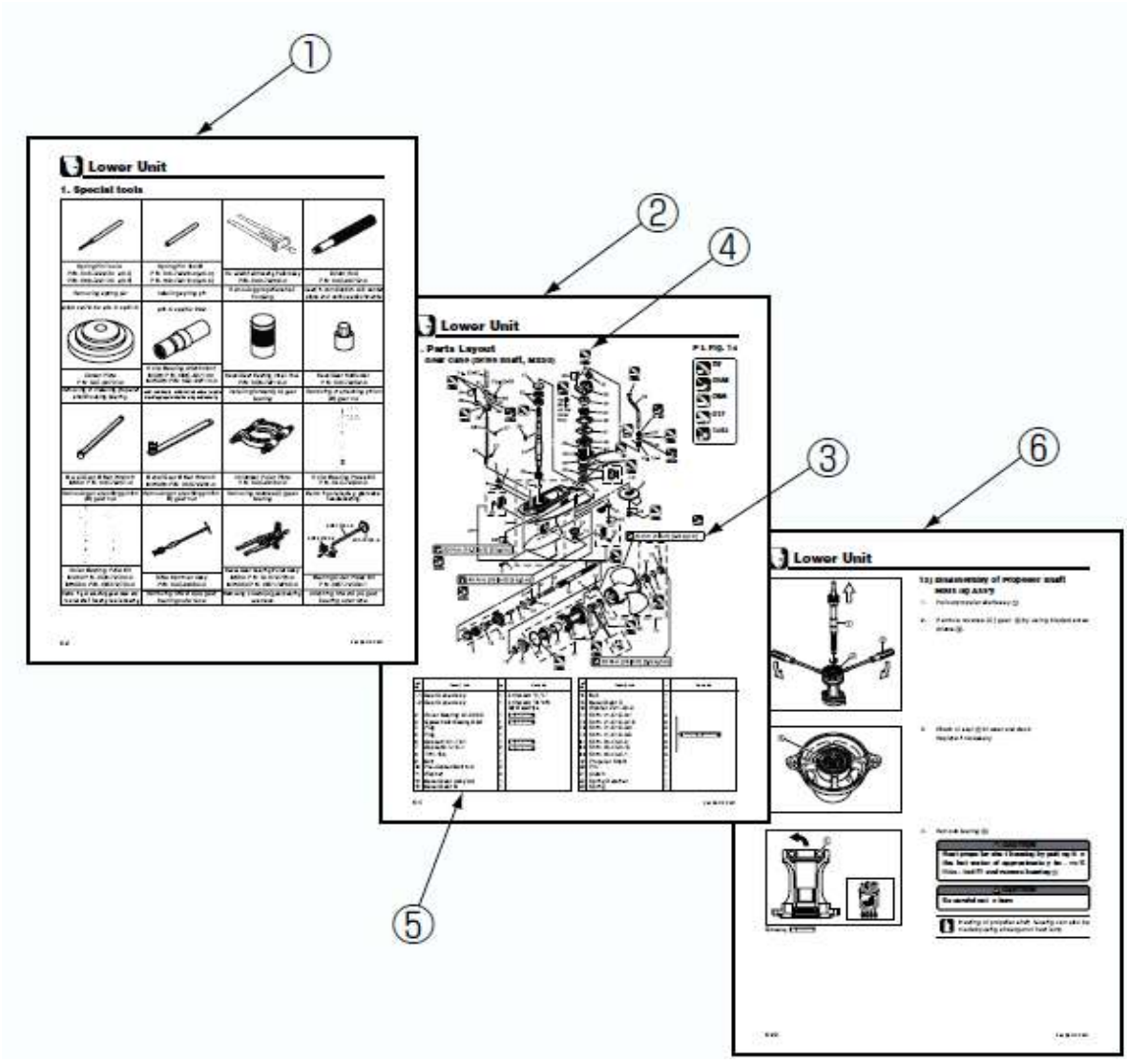


About this manual

Composition and use of this manual

This service manual is designed so that service personnel are able to perform repairs correctly. Understand the following subject matters well for efficient service and repair.

1 Each chapter begins with the introduction of special tools that are used for the work described.
2 Parts that are serviced in each chapter and their details are presented by using a component composition diagram.
3 Fastening torques are described in the component composition diagram. In the body text are critical points of the applicable work.
4 Pictograms indicate that there is an important work instruction for the relevant parts. It also shows the type of lubricant and its application point(s).
5 The component composition diagrams describe the names of the parts, the number of pieces of the parts used, size of fasteners and special notes.
6 Specific works are described in detail by using illustrations and adding advice on the work.



This manual uses the International System of Units (SI) unit system for the pressure, force (load), torque and stress. This manual 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/cm^2]

- [9.0 kgf/cm^2] — Conventional system (kilo-gram meter unit)
- (128 psi) — Conventional system (US pound inch unit)
- 0.90 MPa — SI unit (1 kgf/cm^2 = 0.0980665 MPa)

* 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 cm^3 (30.4 fl.oz)

Example : <Length>

<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 "Systéme 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 	Waterproof Grease 	Low Temperature Resistant Lithium Grease 
TEFLON Grease T.E.F 	Oil Compound [Shinetsu Silicon] S.O.C 	[Konishi Bond] ・G17 	Instant Adhesive [Three Bond®] ・1741 
Gasket Seal Agent [Loctite®] ・518 	Screw Lock Agent [Three Bond®] ・1342 	Corrosion Zero	

1.Service Information

2.Service Data

3.Maintenance

4.Fuel System

5.Power Unit

6.Lower Unit

7.Bracket

8.Electrical System

9.Troubleshooting

10. Safety Jet - Optional

INDEX

1

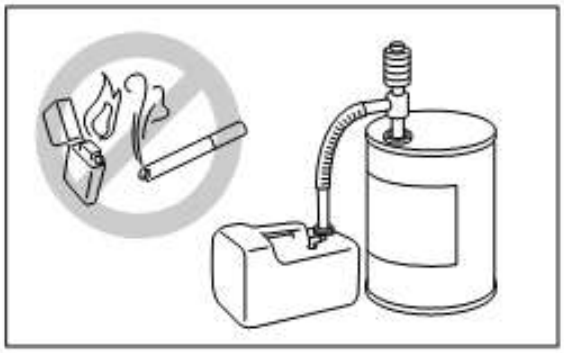
Service Information

1. Identification (Engine Serial Number)

Engine serial number is stamped on the front left hand side of the motor on stainless steel..

1 Serial Number

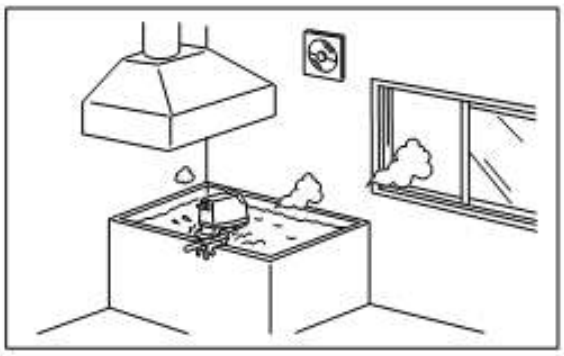
Serial #



2. Work Safety

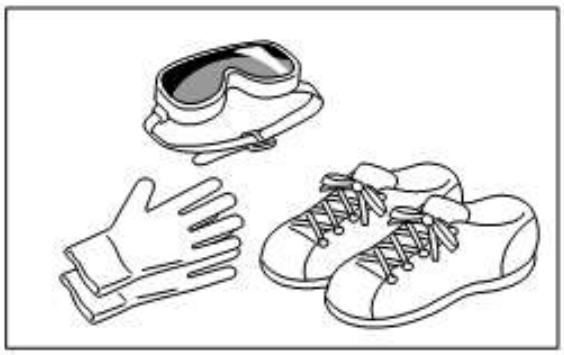
1) Fire Prevention

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



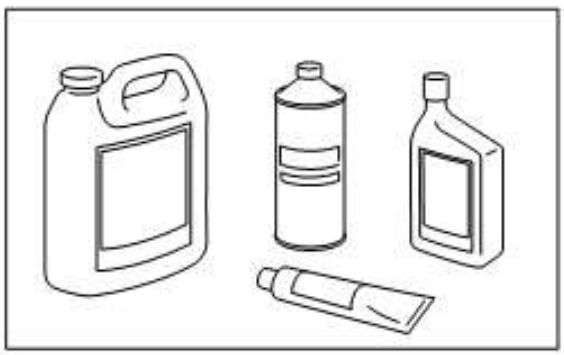
2) Ventilation

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



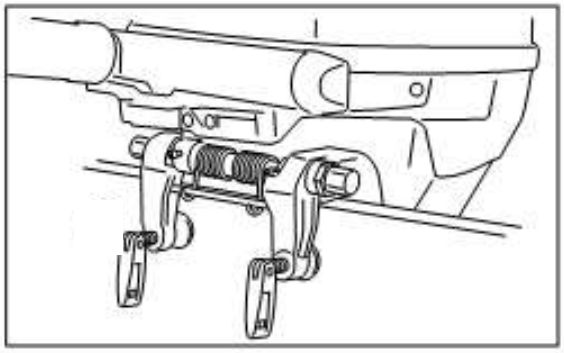
3) Protection

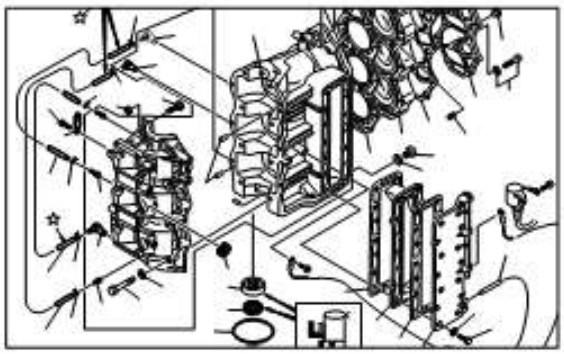
Wear a pair of goggles, working gloves and safety shoes to protect skin from chemicals and oils and eyes from particles generated by grinding or polishing. Avoid contact of oil, grease or sealing agent to the skin. In case of exposure to such matters, wash away with soap or warm water immediately.

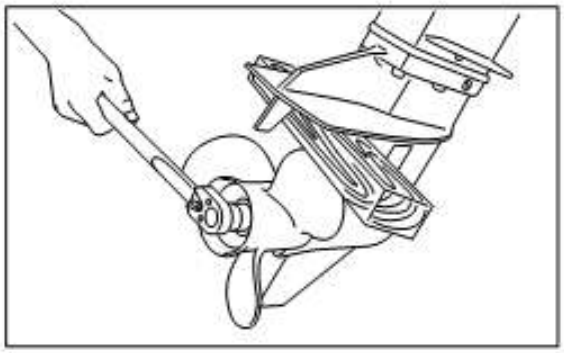


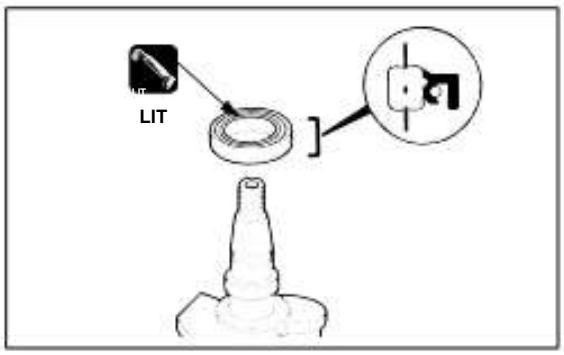
4) Genuine Parts

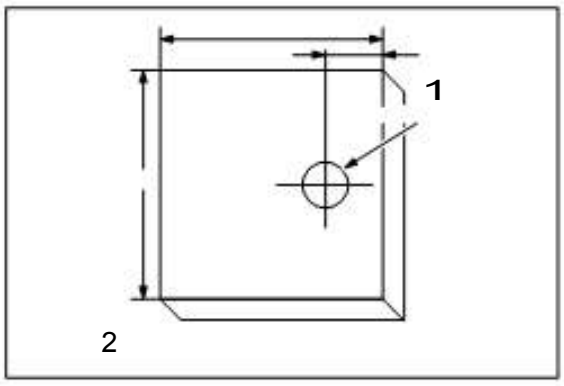
Use parts and/or chemicals that are genuine Raider items or recommended.











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.

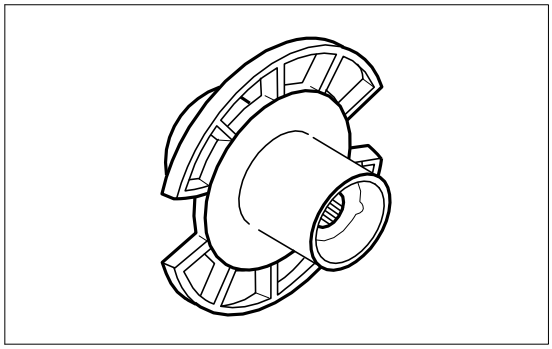
(12) When servicing power unit, use of wooden work board makes the work easier.

3. Tools and Instruments

1) Test Propeller

Test Propeller is used in shop to instrument Raider outboard motor.

Raider 50



Test Propeller :
P/N. 3F3-64110-0
Outer : 236mm
Width : 45mm

Model	Rotational speed at WOT (Wide Open Throttle) (r/min)
Raider 50	5000-5800

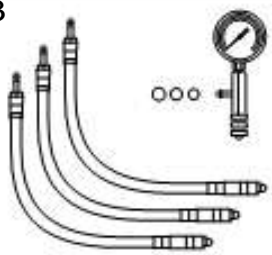
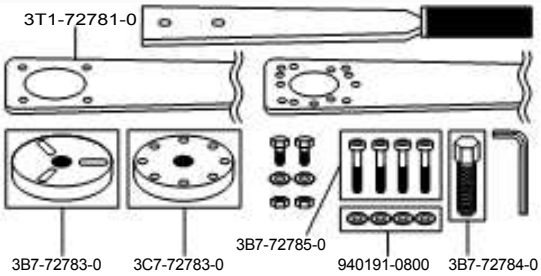
2) Measuring Instruments

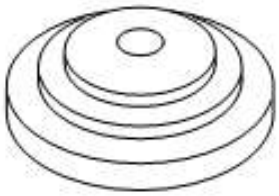
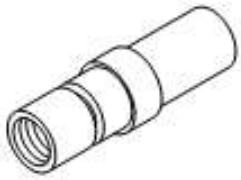
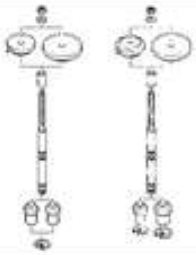
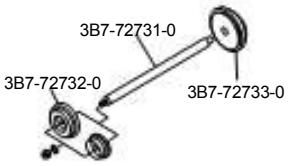
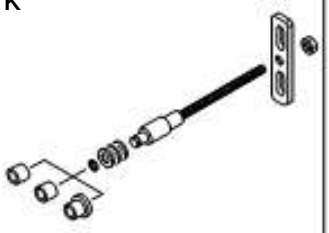
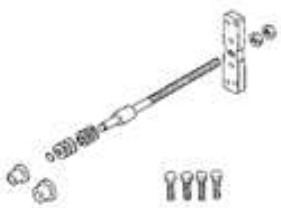
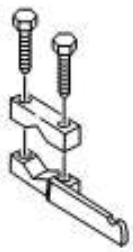
For the following measuring instruments, use commercially available ones.

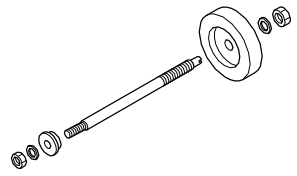
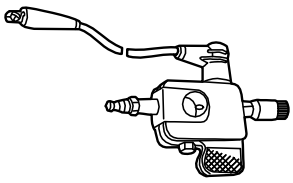
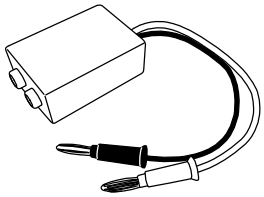
Circuit tester	(Resistance : 1Ω, 10Ω, 10 kΩ, AC voltage : 30 to 300V, DC voltage : 30V, Internal voltage 3V or less)
Vernier calipers	(M1 type, 300 mm)
Micrometer	(minimum graduation of 0.01, outer, 0 to 25 mm, 25 to 50 mm, 50 to 75 mm)
Cylinder gauge	(4 to 6 mm, 10 to 25 mm, 25 to 30 mm, 50 to 75 mm)
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)

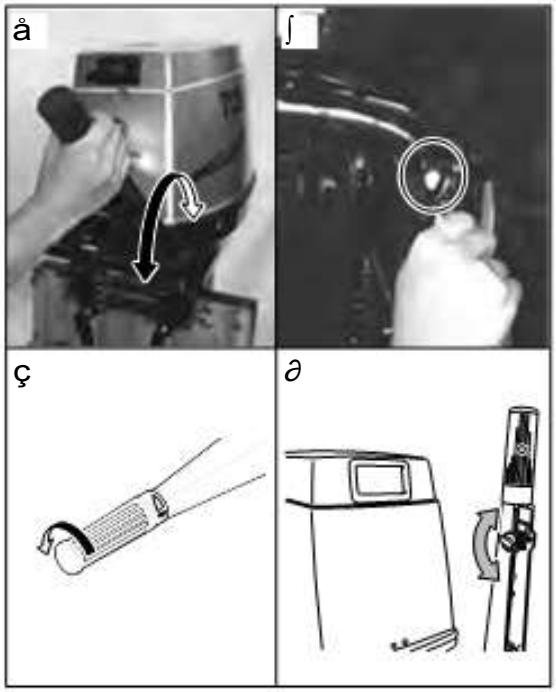
Dial gauge magnet base or dial gauge stand

3) Special Tools

1 	2 	3 	4 
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)	Compression Gauge P/N. 3AC-99030-0	Tachometer P/N. 3AC-99010-0
Removing spring pin	Installing spring pin	Measuring compression pressure	Measuring engine revolution speed
5 	6 		7 
Vacuum/Pressure Gauge P/N. 3AC-99020-0	Flywheel Puller Kit P/N. 3T1-72211-0		Piston Pin Tool P/N. 345-72215-0
Inspecting pressure	Removing or attaching flywheel		Detaching and re-attaching the piston
8 	9 	o 	q 
Piston Ring Tool P/N. 353-72249-0	Eye Bolt (Powerhead Lift Ring) P/N. 3T9-72212-0	Universal Puller Plate P/N. 3AC-99750-0	Roller Setting Piece P/N. 3LC-72216-0
Detaching and re-attaching the piston rings	Used to hook power unit when hanging	Removing main bearing and reverse (C) gear bearing	Installing roller bearing
w 	e 	r 	t 
Piston Pin Tool P/N. 3LC-72215-0	Propeller Shaft Housing Puller Ass'y P/N. 3A3-72259-0	Bevel Gear B Nut Wrench MX50:P/N. 346-72231-0	Bevel Gear B Nut Wrench P/N. 353-72231-0 (MWX50)
Installing piston pin	Removing propeller shaft housing	Removing or attaching pinion (B) gear nut	Removing or attaching pinion (B) gear nut

y 	u 	i 	o ø31.5 x ø25 x H32 
Bevel Gear Nut Socket P/N. 346-72232-0	Driver Rod P/N. 3AC-99702-0	Center Plate P/N. 3AC-99701-0	Roller Bearing Attachment MX50:P/N. 3MC-99710-0 MWX50:P/N. 3LC-99710-0
Removing or attaching pinion (B) gear nut	Used in combination with center place and various attachments	Removing or installing propeller shaft housing bearing	Used in combination with driver rod and center plate Attaching propeller shaft housing needle bearing
p 	a 	s 	d 
Bevel Gear Bearing Install Tool P/N. 3C8-72719-0	Roller Bearing Press Kit P/N. 3LC-72900-0	Roller Bearing Puller Kit MX50:P/N. 3C8-72700-0 MWX50:P/N. 3B7-72700-0	Slide Hammer Ass'y P/N. 3AC-99080-0
Installing forward (A) gear bearing	Removing or attaching gear case needle bearing	Removing or attaching gear case and propeller shaft housing needle bearing	Removing forward (A) gear bearing outer race
f 	g 	h 	j 
Bevel Gear Bearing Puller Ass'y MX50:P/N. 3A3-72755-0 MWX50:P/N. 3B7-72755-0	Bearing Outer Press Kit P/N. 3B7-72739-1	Shimming Gauge MX50:P/N. 3C8-72250-0 MWX50:P/N. 353-72250-0	Thickness Gauge P/N. 353-72251-0
Removing forward (A) gear bearing outer race	Attaching forward (A) gear bearing outer race	Adjusting pinion (B) gear height	Measuring gaps
k 	l 	; 	z 
Backlash Measuring Tool Kit MX50:P/N. 3C8-72234-1	Backlash Measuring Tool Kit MWX50:P/N. 3B7-72234-0	Dial Gauge Plate P/N. 3B7-72729-0	Backlash Measuring Tool Clamp P/N. 3B7-72720-0
Used to attach dial gauge when measuring backlash	Measuring backlash between forward (A) gear and pinion (B) gear	Used to attach dial gauge when measuring backlash	Measuring backlash

X	C	V
		
Backlash Measuring Tool Kit MWX50:P/N. 3A3-72255-0	Spark Tester P/N. 3F3-72540-0	Peak Voltage Adapter P/N. 3AC-99550-0
Measuring backlash between pinion (B) gear and reverse (C) gear	Inspecting spark	Checking Peak Voltage*



4. Pre-delivery Inspection

1) Tiller Handle

å Check installations for clattering and play.

∫ Adjust steering friction.

ç Check throttle grip for movement. (full open/full close).

∂ Adjust throttle friction.

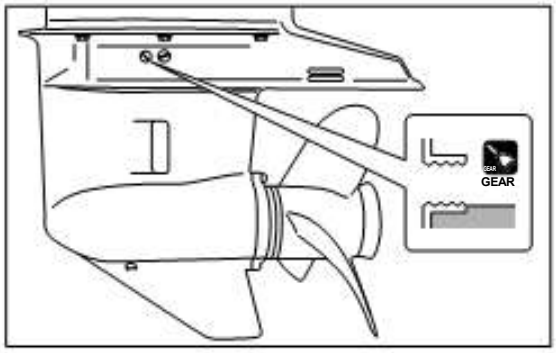
2) Gear Shift

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

⚠ DANGER

Remove lock plate (of stop switch lanyard) from stop switch before inspecting of gear shift and throttle operations. This will prevent engine from accidental starting.

Turn propeller then operate shift lever, to easily when will not shifting.



3) Gear Oil

Check quantity of gear oil.

Gear Oil :

MX50D2 : 500 cm^3 (16.9 fl.oz)

MWX50D2 : 700 cm^3 (23.65 fl.oz)

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

4) Fuel and Fuel Line

Check that fuel bladder contains sufficient amount of pre-mixed gasoline, fuel line is connected and does not leak.

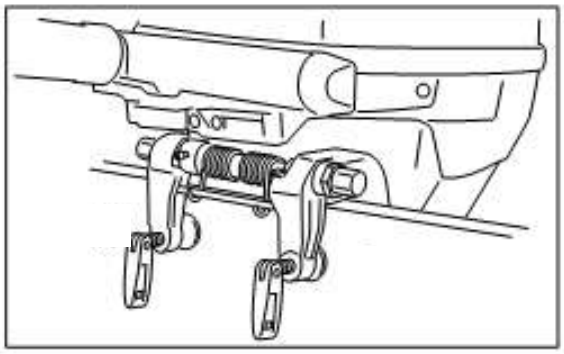
Heavy Fuel requires 50:1 oil mixing plus one can Raider additive into a six gallon bladder.

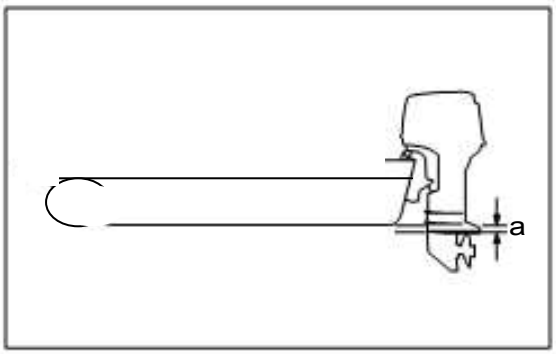
⚠ CAUTION

Supply only unleaded regular octane gasoline into fuel tank. Use fuel mixed with oil.
Fuel and oil mixing ratio is 50:1. For breaking period, 25:1 mixture shall be used.

5) Installation of Outboard Motor (Rigging)

Check that outboard motor is fixed on the hull with Raider Transom plate. Check location of anti-ventilation plate relative to boat bottom.

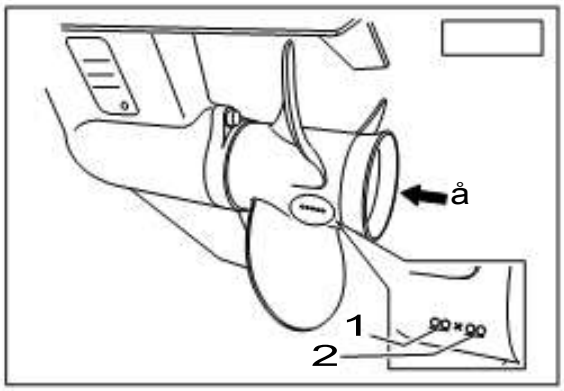




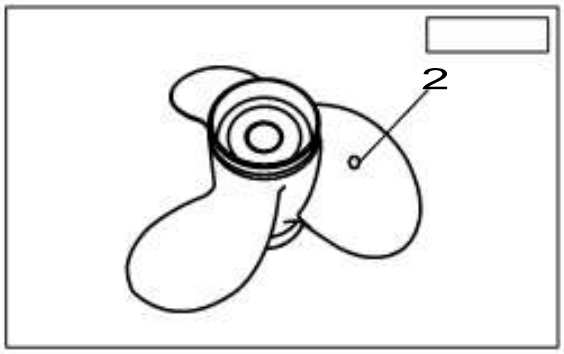
a 5-25 mm(0.2-1.0 in)

Test-run to determine the best installation height.

Anti-ventilation plate standard position a **:**
5 - 25 mm (0.2 - 1.0in) below boat bottom



1 Diameter 2 Pitch



2 Pitch

6) Propeller Selection

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

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

*WOT: Wide Open Throttle

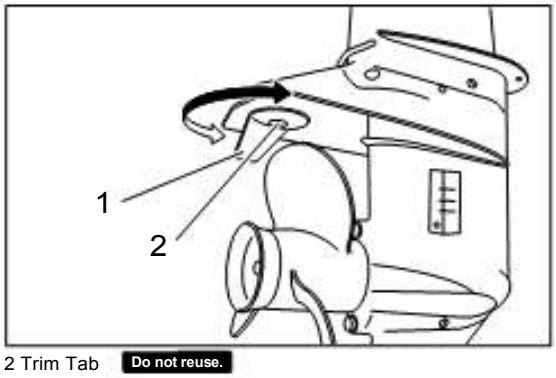
CAUTION

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		
Raider 50		
9P	(3 x 12.0 x 9.0	3x305x229
10P	(3 x 11.5 x 10.0)	3x292x254
11P	(3 x 11.5 x 11.0)	3x292x279
12P	(3 x 11.0 x 12.0)	3x292x305
13P	(3 x 11.5 x 13.0)	3x292x330
14P	(3 x 11.4 x 14.0)	3x289x355
15P	(3 x 11.0 x 15.0)	3x280x381
16.5P	(3 x 10.7 x 16.4)	3x273x417
17.5P	(3 x 10.7 x 17.6)	3x276x447

7) Cooling Water Check Port

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



2 Trim Tab **Do not reuse.**

8) 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 or bolt 2, adjust angle of trim tab 1 as described below, and then tighten the nut to specified torque.

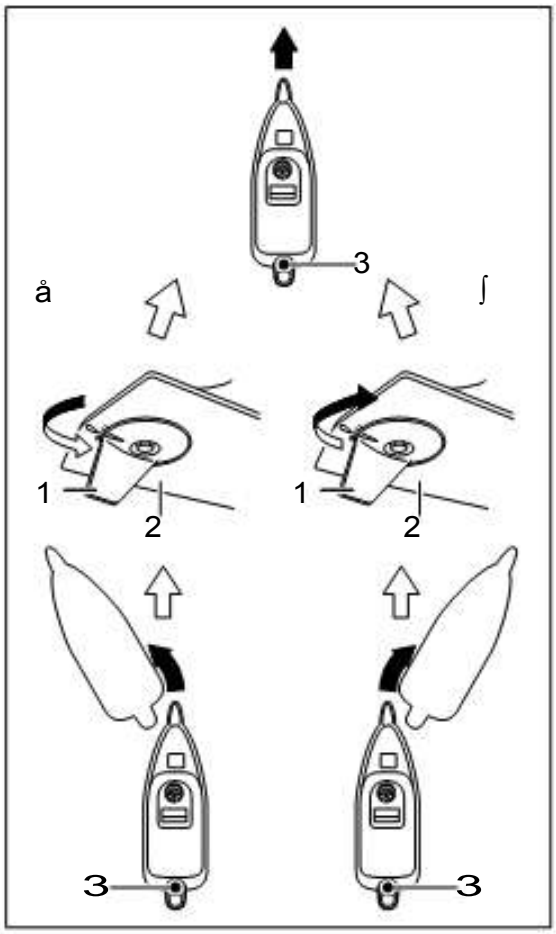
Trim Tab Nut or bolt 2 :
13 N · m (9 lb · ft) [1.3 kgf · m]

Example of Adjustment

å 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

∫ 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.

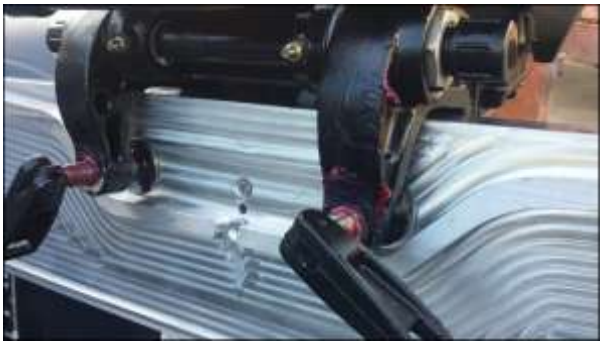


1 Trim Tab
2 Anti-Ventilation Plate
3 Steering Pivot (Swivel Shaft)

Transom Plates:

Transom plates are centered on the manufactured Rubber Inflatable Boat and fastened. This insures the motor is always centered even in high sea states or night time operations. When using dual or twin outboards the connecting pieces will always fit every time. The transom plates also feature a cutout to insure the motor stays in place even if the turnbuckle gets loose during a mission – especially when turning.

Available in single and dual configurations.



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 WOT for one minute every 10 minutes is acceptable.

▽ Running at WOT for short period is acceptable.

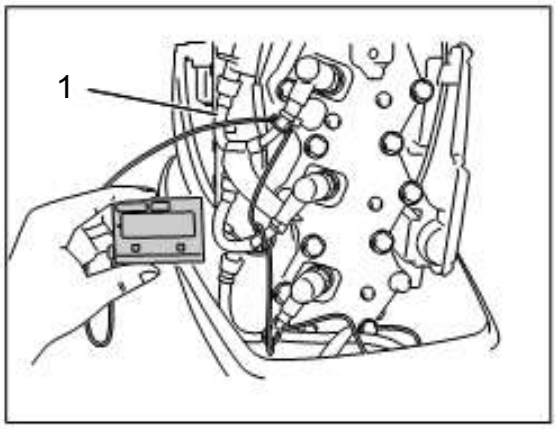
Test Run

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 Speed :- Neutral
950 r/min

Tachometer – on Raider (mounted)



1 High Tension Cable

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

Trolling Speed :- Shift in
750 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.

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.

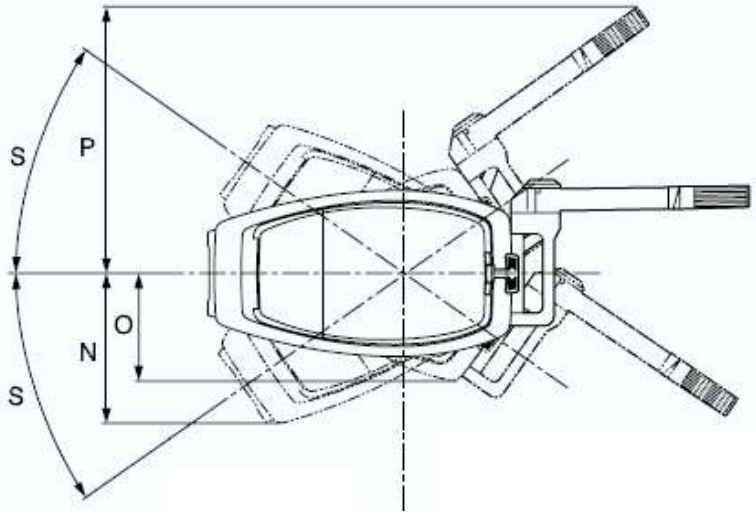
4. After test run, use flushing kit or flushing attachment and fresh water to wash cooling water path by idling engine.

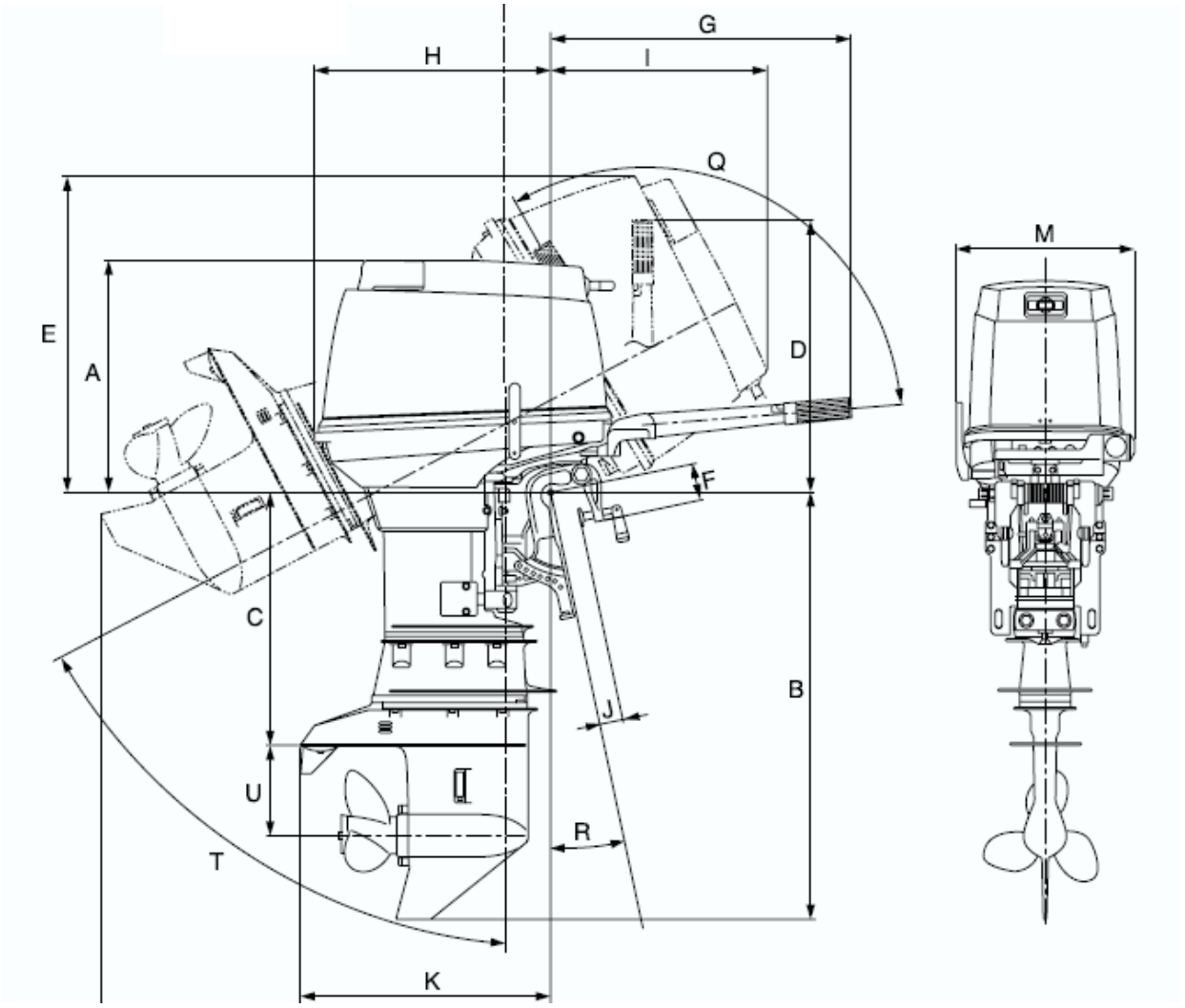
2

Service Data

Raider 50 (R50ES-002)

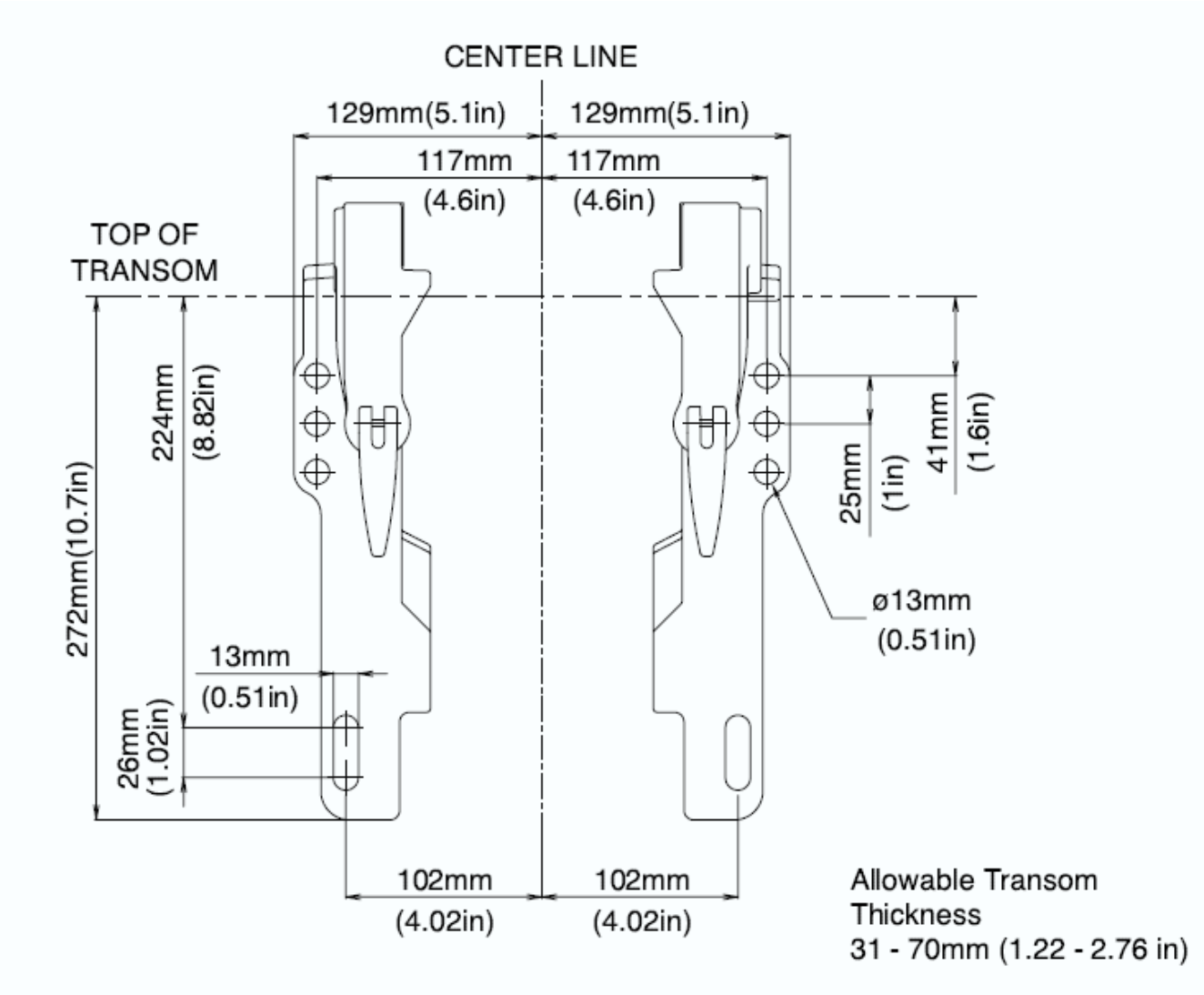
Item	Type	Unit	MWX50D2	
			mm	in
A		mm/in	497	19.57
B	Transom (L)	mm/in	916	36.06
C	Transom (L)	mm/in	550	21.65
D		mm/in	568	22.36
E		mm/in	676	26.61
F		mm/in	85	3.35
G		mm/in	600	23.62
H		mm/in	520	20.47
I		mm/in	440	17.32
J		mm/in	31~70	1.22~2.76
K		mm/in	550	21.65
L	Transom (L)	mm/in	973	38.31
M		mm/in	384	15.12
N		mm/in	310	12.20
O		mm/in	235	9.25
P		mm/in	565	22.24
Q		mm/in	120	4.72
R		deg.	12	
S		deg.	35	
T		deg.	74	
U		mm/in	189	7.44
Trim Angle (Position)		deg.	4~24 (6)	

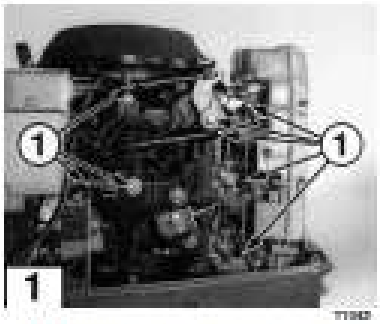


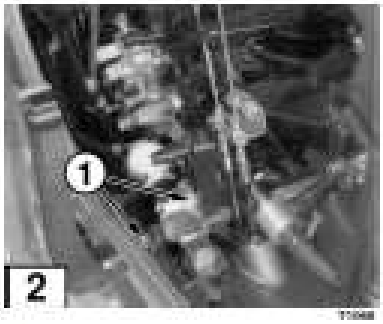


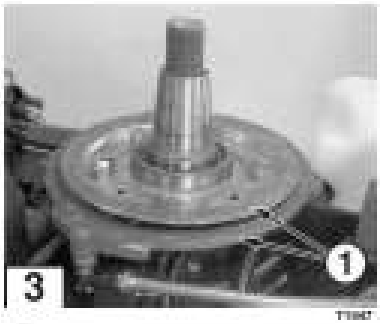
Service Data

2) Clamp Dimensions - Front View Looking at Raider from inside RIB







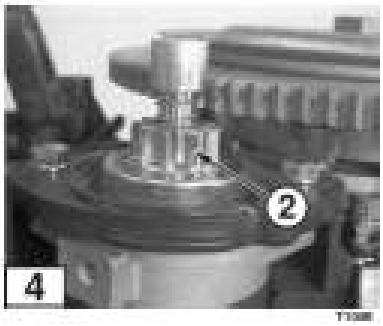


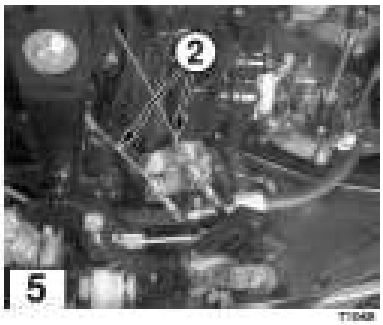
LUBRICATION CHART

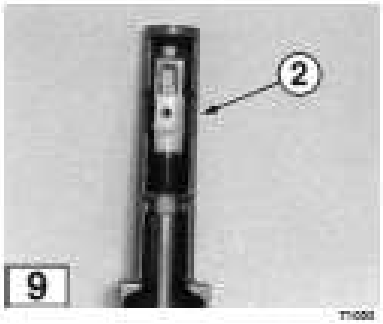
Location	Type of Lubricant	Frequency	
		Fresh Water	Salt Water
1 Advancer Arm, Throttle Cam, and Linkage Ball Joints	①	Every 50 hours (3 months)	Every 30 hours (1 months)
2 Shift Lever and Shift Arm	①		
3 Guide Plate and Set Ring	①		
4 Starter Motor Pinion	②		
5 Throttle Cables	②		
6 Manual Choke Lever	②		
7 Carburetor Choke Valve Control Levers	②		
8 Throttle Shaft and Steering Handle Bushings	②		
9 Steering Handle Grip Portion	②		

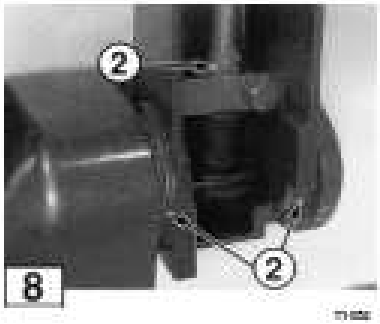
① Low temperature lithium grease

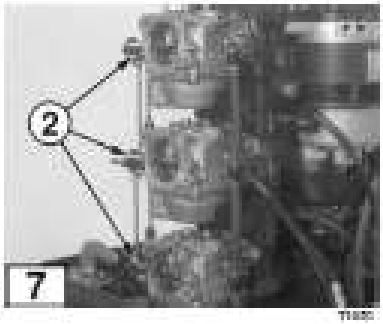
② Genuine grease or equivalent friction surface marine grease

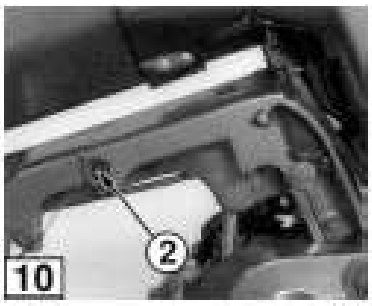


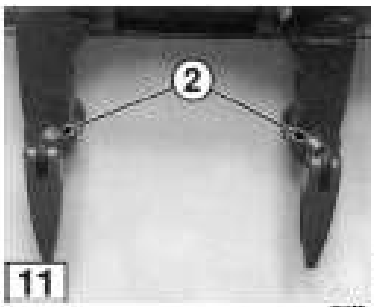


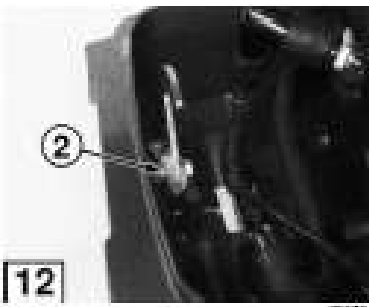






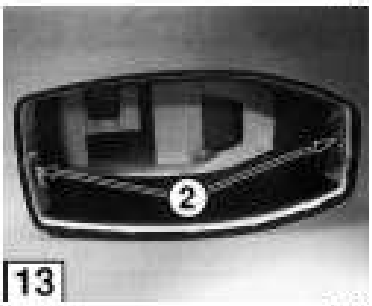


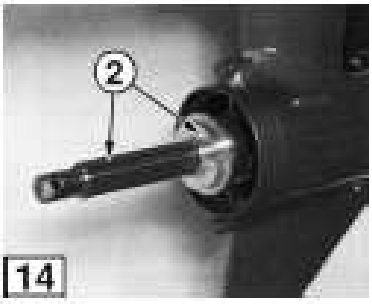


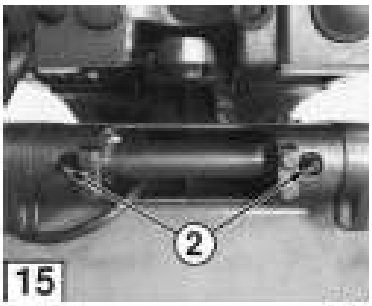


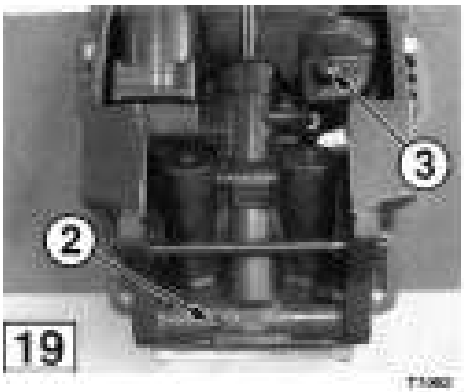
Location		Type of Lubricant	Frequency	
			Fresh Water	Salt Water
10	Swivel Bracket Grease Fitting	②	Every 50 hours (3 months)	Every 30 hours (1 month)
11	Clamp Screws	②		
12	Engine Cover Latches	②		
13				
14	Propeller Shaft and Thrust Holder	②		
15	Tilt Tube Grease Fittings	②		
16	Tilt Stopper Lever or Tilt	②		
17	Stopper Grease Fitting			
18	Upper Cylinder Pin	②		

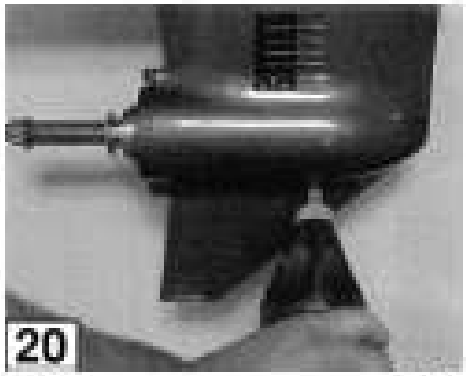
② Genuine grease or equivalent friction surface marine grease











Location	Type of Lubricant	Frequency	
		Fresh Water	Salt Water
19 Lower Cylinder Pin Grease Fitting	②	Every 50 hours (3 months)	Every 30 hours (1 month)
19 Trim/Tilt Reservoir	③	Check level at time of delivery, after first 10 hours of operation, and every 100 hours (6 months). Fill reservoir as needed but do not mix different brands of oil.	
20 Gearcase	④	Change oil after first 10 hours of operation. Check level every 50 hours (3 months). Change every 200 hours (1 year).	

⚠ CAUTION

Do not mix different brands or types of oil. Doing so can cause oil gelling which may cause serious engine damage.

① Low temperature lithium grease

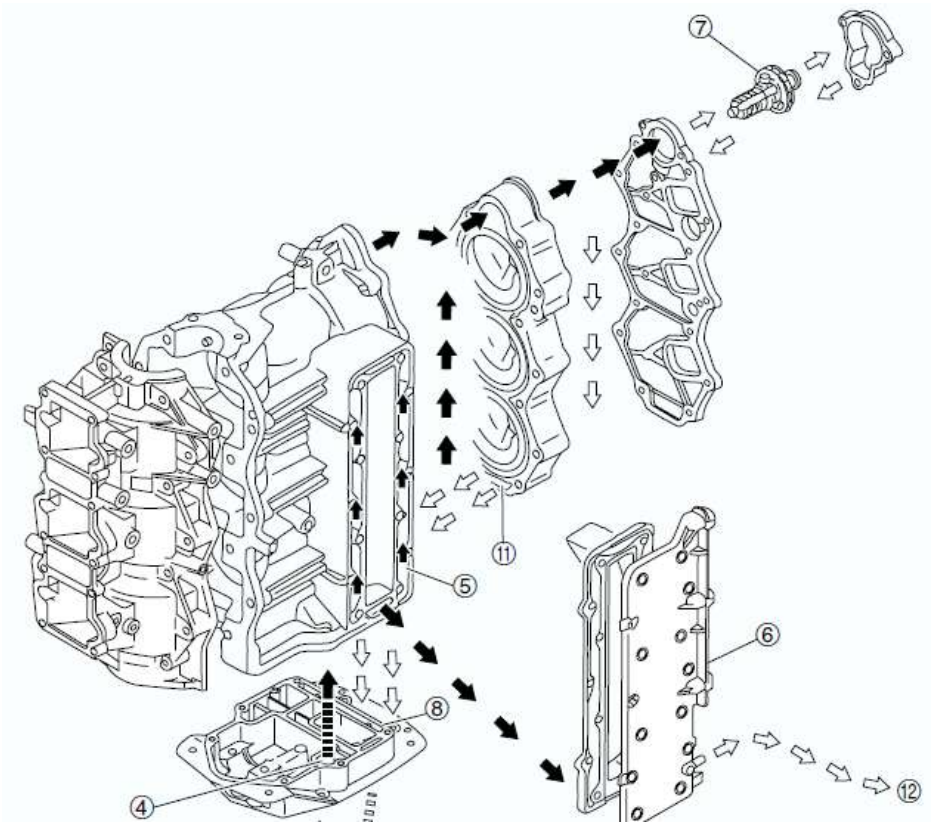
② Genuine grease or equivalent friction surface marine grease

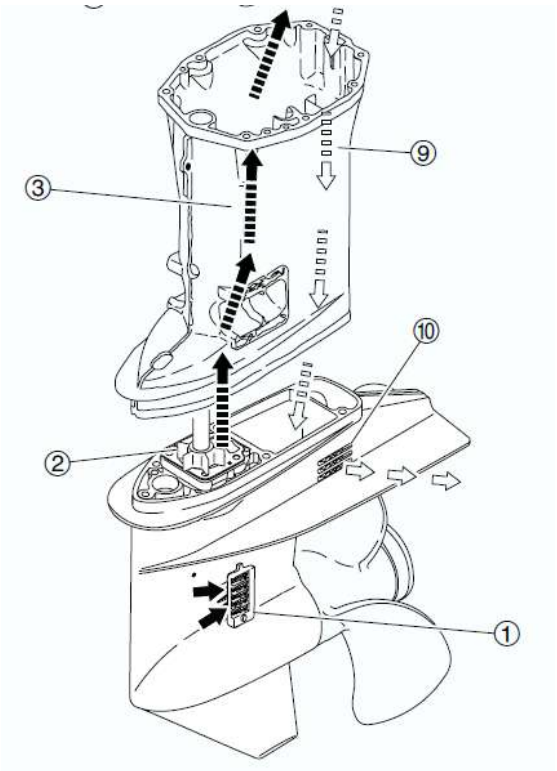
③ Nisseki power torque fluid (as shipped from factory) or any GM approved automatic transmission fluid:

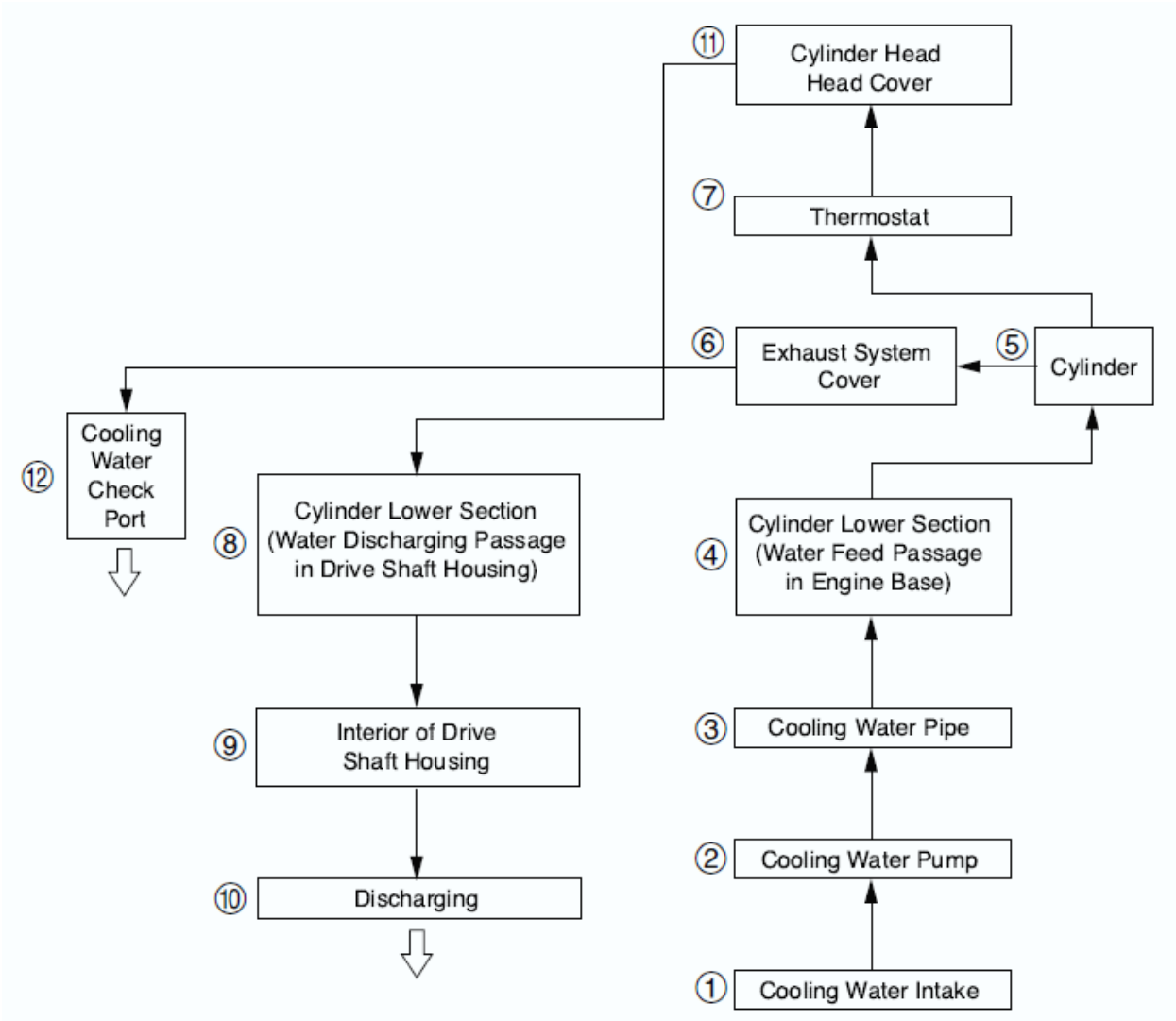
- Mobil DTE #22 or Mobil AFT 220
- Shell Dextron II or Shell Tellus Oil #22 K22
- Esso Automatic Transmission Fluid

④ Genuine gear oil or API GL5, SAE #80 - #90

2. Cooling Water System Diagram






⑪
Cylinder Head
Head Cover
⑦
Thermostat
⑥
Exhaust System
Cover
⑤
Cylinder
⑫
Cooling
Water
Check
Port
⑧
Cylinder Lower Section
(Water Discharging Passage
in Drive Shaft Housing)
④
Cylinder Lower Section
(Water Feed Passage
in Engine Base)
⑨
Interior of Drive
Shaft Housing
③
Cooling Water Pipe
⑩
Discharging
②
Cooling Water Pump
①
Cooling Water Intake

3. Specifications

Item	***Raider R50ES-002***	
Overall Length	1,143 mm	(45 inches)
Overall Width	384 mm	(15.12 inches)
Overall Height:		
Short Shaft	1,225 mm	(46.23 inches)
Long Shaft	1,352 mm	(53.23 inches)
Transom Height:		
Short Shaft	403 mm	(15.87 inches)
Long Shaft	530 mm	(20.87 inches)
Weight:	79.8 kg	(176 pounds)

Power Unit

Type of Engine			2 stroke
Number of Cylinders			3
Total Displacement		cm^3 (cu in)	697 (43)
Bore x Stroke		mm (in)	68 x 64 (2.68 x 2.52)
Compression Ratio			5.8 : 1
Compression			Refer : 0.80 MPa (117 psi) [8.2 kgf · cm^2]
Gear Shift Operation System			Side Shift (manual)
Engine Starting System			Recoil Starter
Lubrication System			Pre-Mix
Throttle Control			Tiller Handle
Cooling Water Control			Thermostat (with pressure relief valve)
Ignition System			Flywheel Magnet (CD ignition)
Cooling System			Water Cooling (Impeller type)
Air-Intake System			Reed Valve
Scavenging System			Loop 5 Port
Exhaust System			Thru-Hub Exhaust
Ignition Timing Control			ATDC 3° — BTDC 18°
Order of Ignition			1 – 2 – 3
Spark Plug			B8HS-10 [NGK]
Alternator Output			12V – 130W
Battery			**300 CA/12 Vdc –Sealed Lilron**

Bracket

Trim Angle	*2	Degrees	4– 24
Trim Steps.		Steps	6
Max. Tilt Angle	*2	Degrees	75
Allowable Transom Board Thickness	*3	mm(in)	31 – 70 (1.22 – 2.75)
Steering Angle	*4	Degrees	80

*1 To fill 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.

Accessory

Emergency Tool Kit: (3) Spark Plugs; 10/13/16 mm sockets; screw driver – flat/Phillips; crescent wrench; Starter rope; pliers; adapter (screw driver adapter to sockets); split pin – storage container

Recommended Spare Part Kits for each Raider R50-ES-002 outboard:

Kit A – R50ES-002-SPKA

Part Number	*Item*	*Part Number*	*Item*
BE1H10	6- Spark Plugs	DF52-73	1 – Fuel Pump
5187K63-10	1 – Fuel Line (10')	668230	3 – Decompression Valves
3C8060480M	1 – Coil	150785	1 – Battery
11305	1 – Primer	398068300M	2- Throttle Cables
398068300M	1 – Cut-Off Switch	3C8760101M	1 – Starter
15FLWB	1 – 15' Fuel Hose w/primer		

Kit B – R50ES-002-SPKB

Part Number	*Item*	*Part Number*	*Item*
3C8650212M	1- Water Pump Impeller	3C8061601M	1 – C.D.I.
3B7760655M	1 – Regulator	BR0165-3	3 – Carburetor De-watering Valves
361760260M	1 – Starter Switch	3T5B645320	1 – Propeller
RL-HM026A	1 – Tachometer/Hour Meter	3C8050902M	1- Recoil Starter
346760400M	1 – Starter Relay		

Kit C – R50ES-002-SPKC

Part Number	*Item*	*Part Number*	*Item*
3E3-032001M	1-Top Carburetor	3E3-032074M	1 – Middle Carburetor
3E3-032104M	1 – Bottom Carburetor		

Option Parts

Propeller :	pitch (in)	7"	9"
		9"	10"
		10"	11"
		11"	12"
		12"	13"
		13"	14"
		14"	15"
		15"	16.5"
		16"	17.5"

Option Safety Jet

To Replace propeller with “pump jet” Part No. KR011. This transforms the Raider 50 to a pump jet using this kit.

Used for: training purposes; brown water missions; areas of rocks/coral.

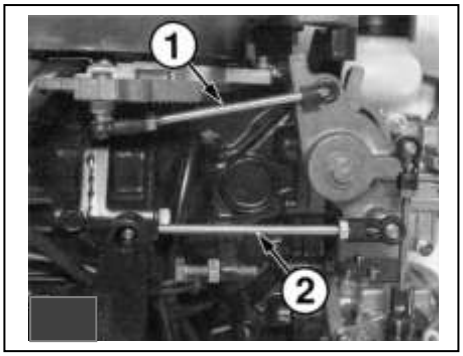
Service Data

1. Ignition Timing Adjustment – Raider 50

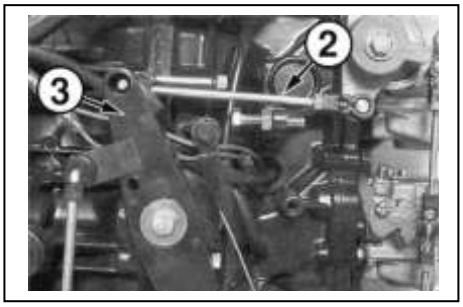
   Ignition Timing link (1) to specified length:

   3.86 in. (98 mm)

   Ignition throttle link (2) – 4.53 in. (115 mm)

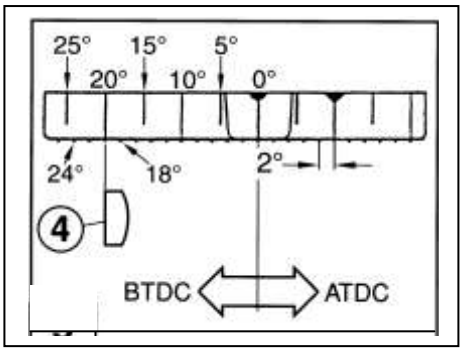


2. Place advancer arm (3) in the maximum speed position (wide open throttle) and make sure the carburetor throttle Is fully open. If throttle is not fully open, make fine Adjustments using throttle link (2).

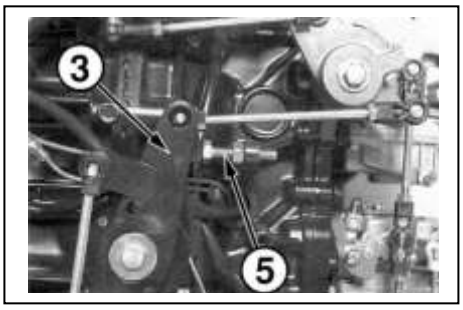


3. Adjust ignition timing link (1) so ignition timing at full Throttle is matches the following specifications: BTDC 20 degrees ± 1 degree.

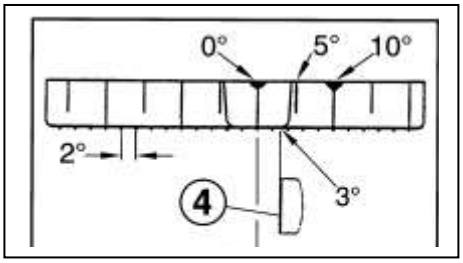
   Align flat surface (4) of crankcase mold boss with Calibration marks on set ring.



4. Place advancer arm (3) in the minimum speed Position (throttle fully closed) and adjust low speed Side stopper (5) so ignition timing matches the Following specification.
   ATDC 3 degrees ± 1 degree.



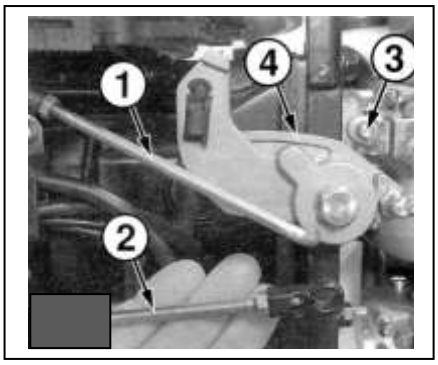
Align flat surface (4) of crankcase mold boss with Calibration marks on set ring.



Carburetor Synchronization

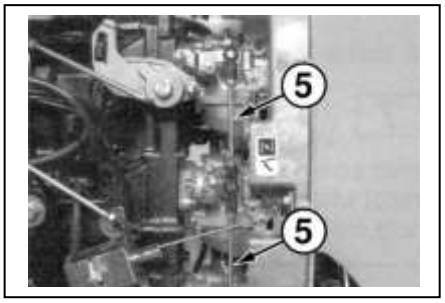
NOTE

Engine ignition timing must be properly adjusted before Synchronization the carburetors.



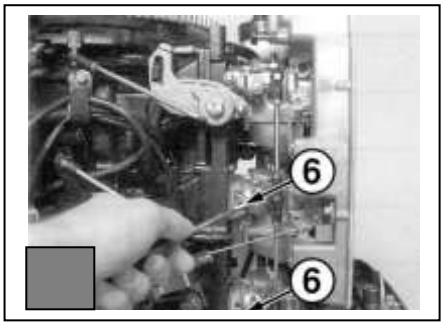
1. Remove the air silencer cover.

2. Disconnect ignition timing link (1) and throttle link (2) so Throttle lever roller (3) does not make contact with Throttle cam (4).

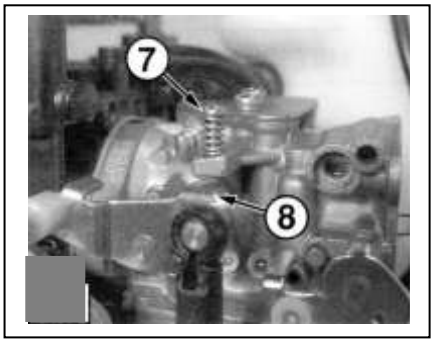


3. Adjust the length of each carburetor throttle link rod (5) To specification:
   Raider 50 – 3,54 inches (90 mm)

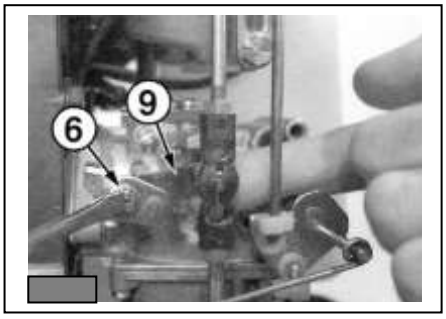
4. Reconnect timing link (1).



5. Turn all throttle lever screws (6) clockwise to loosen.



6. Loosen throttle stop- screw (7) on top carburetor so it does not Make contact with throttle lever (8).



7. Starting with the second carburetor from the top of the engine, Apply light upward pressure to linkage tab (9) and turn throttle Lever screw (6) counterclockwise to tighten the throttle lever. Repeat this step for each remaining carburetor, working Toward the bottom carburetor.

ANODES - INSPECTION AND TESTING

Engines are equipped with several sacrificial anodes to help protect metal parts from the effects of galvanic corrosion (electrolysis). Disintegration of the anodes indicates they are performing their function. An anode must be replaced when it has been reduced to 2/3 its original size (1/3 eroded). Engine corrosion will increase if eroded anodes are not replaced.

⚠ CAUTION

Do not paint or coat anodes or their mounting surfaces.

External Anodes

Anodes mounted externally on the engine should be inspected every 3 months, or more frequently if the engine is operated in salt or polluted water.

1 Inspect sacrificial trim tab **(1)** for erosion.

2 Inspect stern bracket anode **(2)** for erosion.

Crankcase Anode

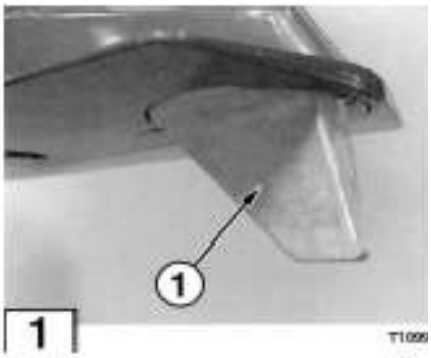
3 The powerhead is protected by an anode mounted in the crankcase under the cylinder head. Replace crankcase anode **(3)** when service work requires removal of the cylinder head or when a complete overhaul of the engine is performed.

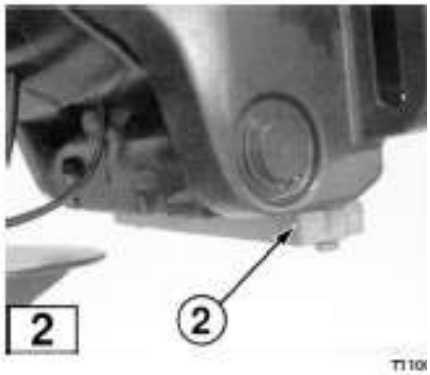
Installation Test

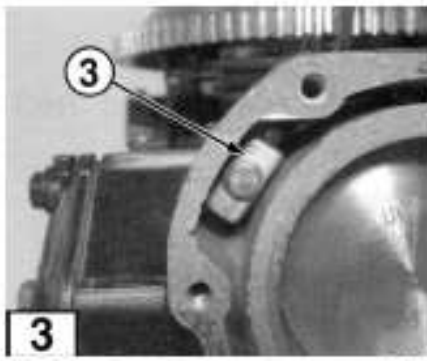
Use the following procedure to test for proper installation of anodes. Make sure anode surface is clean before testing.

1. Calibrate an ohmmeter on high ohms scale.

4 2. Connect one meter lead to a ground on the powerhead and the other lead to the anode. The ohmmetershould show a low reading. If not, remove the anode and clean the surface where it was mounted. The anode and its mounting hardware should also be cleaned. Install anode and retest.







Service Data

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/0.0012 in or less for scratches 0.03 mm/0.0012 in or less for distortion
		Corrosion	
		Cooling water passage clogged	
	Cylinder	Mating surface scratches and wear	0.03 mm (0.0012 in) or less for scratches 0.03 mm (0.0012 in) or less for distortion
		Seizure, cylinder liner damage, or wear	ø68.00 mm/2.677 in
	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/2.676 in <0.5 oversize : 68.46 mm/2.695 in>
		Piston clearance <The gap between cylinder and piston.>	0.08 – 0.12 mm/0.00315 in – 0.004724 in
		Carbon build up on piston crown and in ring grooves	
		Scratch on the sliding surface	
		Measure clearance between piston ring and ring groove.	0.04 – 0.08 mm/0.001575 in – 0.00315 in
		Measure piston pin hole diameter	ø17.55 mm/0.6909 in
		Clearance between piston pin and pin hole	0.007 – 0.003 mm/0.0002756 in – 0.0001181 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.	Top : 0.22 – 0.37 mm/ 0.008661 in – 0.01457 in Second : 0.33 – 0.48 mm/ 0.01299 in – 0.0189 in
	Piston Pin	Outer diameter	ø17.55 mm/0.6909 in
	Crank Shaft	Deflection <Measure with both ends supported.>	0.05 mm/0.001969 in or less
	Connecting Rod	Deflection	2 mm/0.07874 in or less
		Gap between the connecting rod thrust washer and the crank web.	0.28 – 0.65 mm/0.011 to 0.0256
	Reed Valve Stopper	Lift height	9.3 – 9.5 mm/0.3661 in – 0.374 in
	Reed Valve	Fails to close, is worn or damaged	
	Engine Block	Compression Note : Remove all three spark plugs and measure after warming with the throttle fully open. Remove air injector and fuel injector connectors.	0.80 MPa/117 psi [8.2 kgf/cm^2]
Fuel/Air Parts	Carburetor	Setting mark	3LC
		Venturi bore	26 mm/1.024 in
		Main jet (MJ)	#138
		Main air jet (MAJ)	ø2.3/0.091 in
		Main nozzle bore (MN)	ø4/0.1575 in
		Slow jet (SJ)	#80
		Slow air jet (SAJ)	ø1.5/0.059 in
		Throttle opening (at WOT)	77°
		Pilot screw (PS)	2 + 3/4
		Float height	14.5 ± 1 mm/0.571 ± 0.039 in
		Idling speed	900 rpm
		Troling speed	750 rpm

Service Data

Functional Limit	Action To Be Taken
	Clean and remove build up.
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.
	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.
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.	Bore and hone to ø68.50 (2.697 in) +0 – 0.02mm (0 to 0.0008 in). Check ports and grind if necessary. Use over size pistons and piston rings.
ø67.90 mm/2.673 in	Replace with new part.
0.21 mm/0.008268 in or more	
	Clean and remove build up.
	Repair or replace depending on the extent of damage. (Repair using #400 to #600 grit sandpaper.)
	Replace with new part.
When the difference in standard value.	
0.020 mm/0.0007874 in or more	
0.8 mm/0.0315 in or more	Replace with new piston ring if cylinder liner wear has not exceeded the repair limit.
0.05 mm/0.001969 in or more	Repair with new crankshaft assembly.
2 mm/0.07874 in or more	Repair with new crankshaft assembly.
Valve reed fails to close Excessive wear on seat Valve is damaged	Replace entire valve assembly
1) When difference in compression between cylinders exceeds 0.1 MPa/1.45 psi [1.05 kgf/cm^2]. 2) When abnormally higher than standard value.	1) Bore and hone to ø68.50 + 0 – 0.02 mm (0 to 0.0008 in). Check ports and grind if necessary. Use oversize pistons and piston rings. 2) Remove carbon from piston crown and cylinder head surfaces and clean exhaust gas bypass valve.

Service Data

5. Torque Specification

	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	13	M8 x 1.25	Bolt	②13	9	1.3	③32	18	3.2	Driving sequence ①→②→③→④
		10	M6 x 1.0	Bolt	①6	4	0.6	④6	4	0.6	
	Crankcase	13	M8 x 1.25	Bolt	①13	9	1.3	②25	18	2.5	
	Exhaust Cover	10	M6 x 1.0	Bolt	①6	4	0.6	②12	9	1.2	
	Flywheel	27	–	Nut	–	–	–	100	72	10	
	Spark Plug	–	–	–	–	–	–	27	20	2.7	
	Carburetor fitting	10	M6 x 1.0	Bolt	–	–	–	6	4	0.6	
Lower Unit	Engine Mounting Bolt	13	M8 x 1.25	Bolt	–	–	–	20	14.5	2	
	Bevel Gear B Nut	MX : 17 MWX : 19	–	Nut	–	–	–	49	36	5	
	Stern bracket	32	7/8	nylon	–	–	–	25	18	2.5	Loosen 1/8 turn
	Upper Mounting Rubber Bolt	13	3/8	Bolt	–	–	–	29	22	2.9	
	Lower Mounting Rubber Nut	19		Nut	–	–	–	41	27	4.2	
	Lower Mounting Rubber Bolt	17	M12	Bolt							
	Gear Case	13	M8 x 1.25	–	–	–	–	20	14.5	2	
	Propellor Nut	21	–	–	–	–	–	35	25	3.5	

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	Low-Strength Screw Lock Agent Lock Agent	Gasket Seal Agent	Adhesive	Instantaneous Adhesive	Low Temperature Resistant Lithium Grease LIT	Waterproof Grease OBM	Silicone Grease SOC	Tohatsu genuine 2st Engine Oil	Tohatsu genuine Gear Oil	Remarks
		Three Bond	Loctite	Konishi	Three Bond	CHUO YUKA		Shinetsu Silicones			
		1342	518	G17	1741	Centax L2	FM-531	KS-64			
Gear case	Water pump case, lower						○				Inside
	Water pump case, lower O-ring						○				
	Water pump case, lower oil seal						○				Lip area
	Pump case bolt						○				Below neck
	Water pipe						○				Upper face
	Water pipe seal rubber, upper									○	Outside
	Water pipe seal rubber, lower			a○						b○	a Case mounting section, b Inner face
	Water pipe seal lock rubber						○				Whole face
	Pump case						○				Thinly on the inner face
	Engine base seal rubber				○						
	Exhaust housing grommet			○	○						Apply either G17 or 1741 to installation face.
	Idling port grommet			○	○						Apply either G17 or 1741 to installation face.
	Trim tab retainer bolt						○				
	Drive shaft					○					Engine side spline section
	Cam rod bushing					○					Whole circumference
	Cam rod bushing O-ring, 2.4-5.9									○	
	Cam rod bushing O-ring, 3.5-21.7						○				
	Cam rod bushing stopper bolt						○				Below neck
	Gear case lubricating oil									○	Oil q'ty : 500ml
	Gear case bolt	○									Below neck
	Extension housing bolt	○									Below neck
	Propeller shaft housing bolt	○									Below neck
Stern bracket section	Bracket bolt						○				Fill with grease and apply to inside.
	Bracket bolt cap						○				Inside
	Stern bracket washer						○				Both faces
	Stern bracket						○				Fill with grease
	Steering shaft						○				Sliding face
	Steering shaft bushing						○				Sliding face
	Steering shaft seal ring						○				
	Thrust plate						○				Sliding face
	Mounting bolt, upper	○									Screw section
	Mounting bracket						○				Spline section
	Tilt stopper						○				Sliding face
	Tilt stopper knob			○							
Motor cover	Hook lever						○				Sliding face
	Hook lever bushing						○				Sliding face
	Hook lever seal ring						○				Sliding face
	Choke lever						○				
Nipples		○									Press-fit section

Service Data

Fuel System – Torque Values

Carburetor Mounting Bold: 53 in-lb (5-6 N-m)

Intake Manifold Bolt: 53 in-lb. (0.6 kg-m)

Carburetor Specifications:

Main Jet: #135 Main Air Jet: #230 Slow Jet: #74 Slow air jet: #130

Pilot Screw Turn – Out: 2 ¾ turn ± ¾ turn

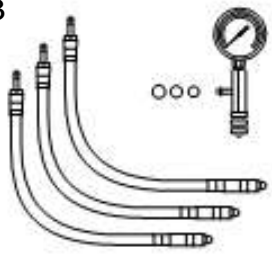
Neutral Idle Speed Adjustment (RPM) 900

Trolling Speed Adjustment (RPM) 750

3

Maintenance

1. Special Tool

1	2	3	4
			
Spring Pin Tool A P/N. 345-72227-0 (ø3.0)	Spring Pin Tool B P/N. 345-72228-0 (ø3.0)	Compression Gauge P/N. 3AC-99030-0	Tachometer P/N. 3AC-99010-0
Removing spring pin	Installing spring pin	Measuring compression pressure	Measuring engine revolution speed

2. Inspection Schedule

PERIODIC INSPECTIONS

NOTE

It is recommended that a complete engine overhaul be performed after 300 operating hours

Item	Inspection	Before Each Use	After First 10 Hours (2 weeks)	Every 30 Hours (1 month)	Every 50 Hours (3 month)	Every 100 Hours (6 month)	Remarks
Fastener Torque	Check the following: • Cylinder head bolts • Cylinder head cover bolts • Exhaust cover bolts • Carburetor mounting bolts or nuts • Intake manifold bolts • Crankcase bolts • Oil pump mounting bolt • Flywheel nut		•		•		Torque to specification.

	• Starter motor installation bolts • Driveshaft housing bolts • Gearcase bolts • Propeller shaft housing bolts • Propeller nut • Lower engine cover mounting bolts • Engine mounting bolts						
Gearcase	• Check oil level and add oil as required. • Check for water or metallic matter in gear oil.		•		•		See Lubrication Chart in this section.
Spark Plugs	• Check plug gap. • Remove carbon deposits.				•		Replace plugs when electrodes are worn.
Carburetors	• Disassemble and clean. • Check float valve for wear.					•	Replace worn parts as required.
Fuel Tank, Pick-up Tube, Filters, and Fuel Pump	• Disassemble, clean, and inspect. • Check for leakage. • Check for cracks.		•		•		

Item	Inspection	Before Each Use	After First 10 Hours (2 weeks)	Every 30 Hours (1 month)	Every 50 Hours (3 month)	Every 100 Hours (6 month)	Remarks
Fuel and Recirculation Hoses	• Clean and inspect. • Check all hose clips.					•	Replace hoses every 2 years.
Engine Compression	• Check with compression gauge.				•		Obtain normal operating temperature and check at full throttle.
Warning Systems	• Check function of warning horn or pilot lamp.			•			See Operator Alert Systems in this section.
Water Pump	• Check for wear and damage.				•		Replace impeller every 200 hours (12 months).

Cooling and Exhaust Components	Remove dirt and deposits from the following: • Water pump and impeller • Water pipe • Thermostat • Exhaust cover • Exhaust pipe • Engine base • Reverse gas passage					•	
Powerhead Cleaning	Inspect and remove carbon deposits from the following: • Cylinder head • Pistons • Rings • Inner exhaust cover • Outer exhaust cover						Check every 200 hours (12 months).

Item	Inspection	Before Each Use	After First 10 Hours (2 weeks)	Every 30 Hours (1 month)	Every 50 Hours (3 month)	Every 100 Hours (6 month)	Remarks
Electrical Wiring	• Check for loose connections. • Inspect wires and insulation for damage.		•			•	
Ignition Timing and Carburetor Adjustments	• Check and adjust timing. • Adjust linkage.		•			•	See Synchronization and Linkage Adjustments in this section.
Throttle and Choke Valve Linkage	Inspect for the following: • Loose ball joints and lock nuts • Bent link rods • Loose rod snaps		•	•			
Lubrication System	Clean and inspect the following: • Oil tank • Oil hoses • Oil filter • Check components for damage and leakage		•			•	Replace automixing check valve and oil hoses every 2 years.
Sacrificial Anodes	• Inspect amount of erosion. • Test for proper installation.				•		Replace when anode has been reduced to 2/3 its original size (1/3 eroded). See Anodes - Inspection and Testing in this section.
Water Intake Screens	• Check for blockages.	•					Remove and clean as required.

3. Inspection Items

1) Inspection of Top Cowl

Push cover to check for play, and crack.

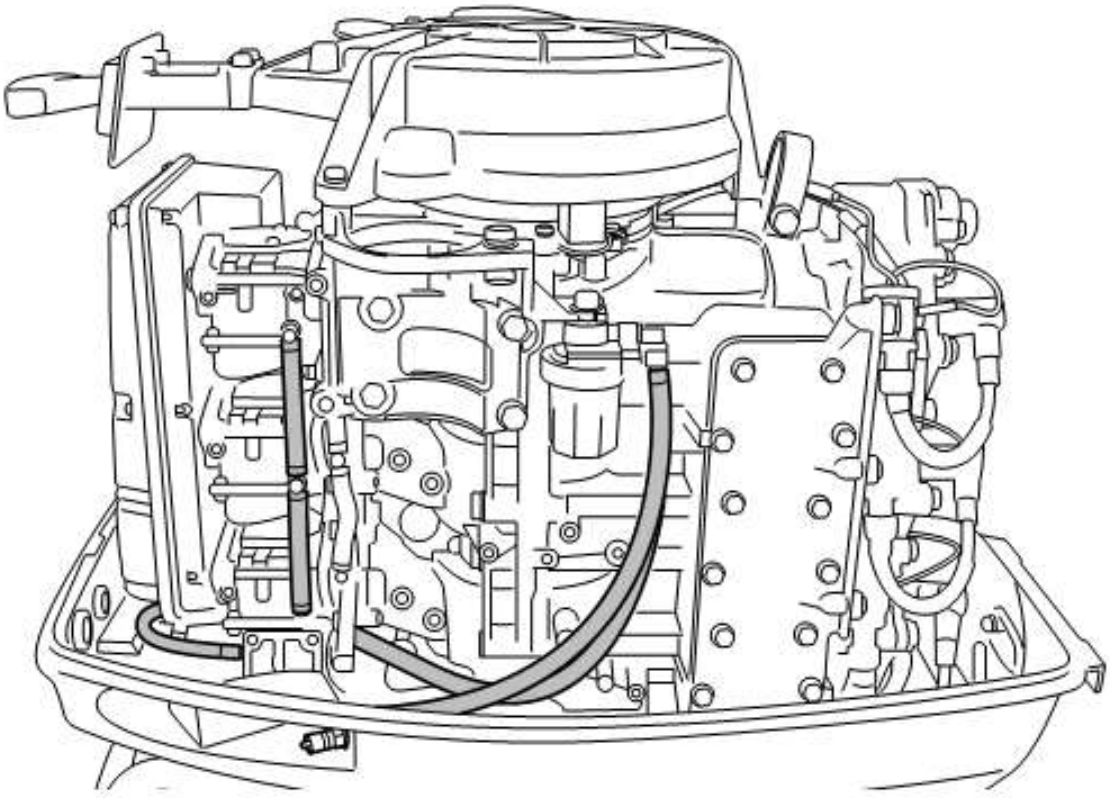
2) Inspection of Fuel Hose (Motor to Bladder)

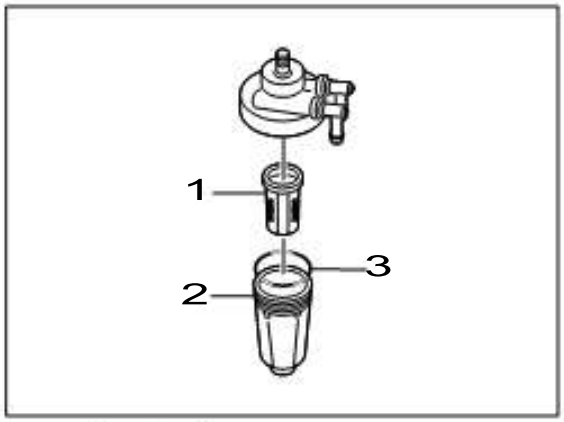
Hose contains bladder connection at end of Hose; insert the Connector into Bladder. 10 foot Fuel hose provided. Attached to each hose is connector to bladed (fuel tank).

3) Fuel System

Inspection of Fuel Pipes

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





3 O Ring **Do not reuse**

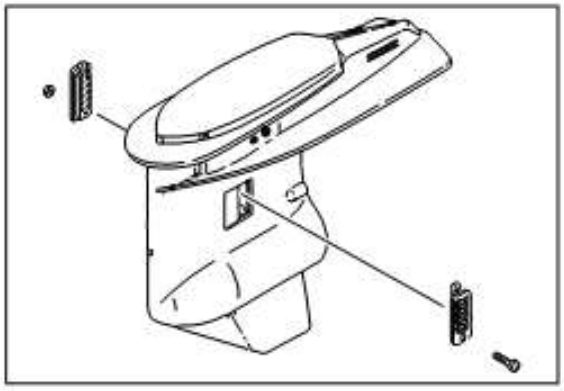
Inspection of Fuel Filter

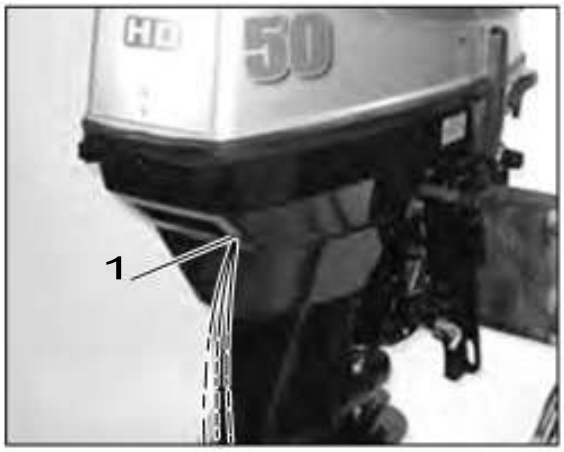
Check fuel filter 1 for contamination, and fuel filter cup 2 for invasion of foreign matter and cracks. Clean fuel filter cup with gasoline, and replace fuel filter 1 if necessary.

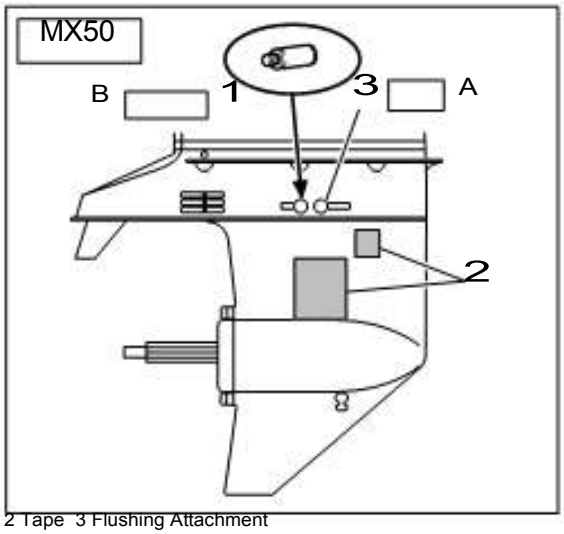
Do not spill fuel when removing fuel filter cup.

⚠ CAUTION

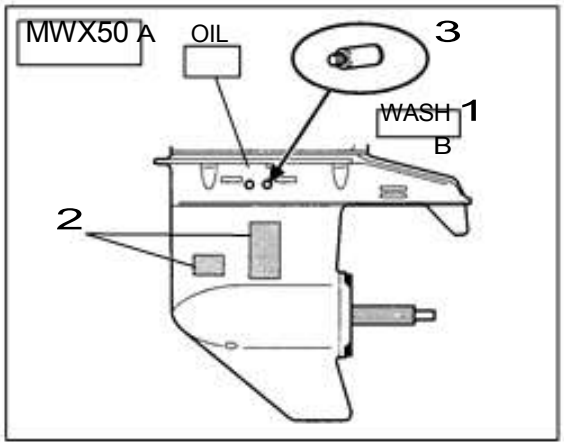
If water is in the cup. Remove the cup and drain the water.







2 Tape 3 Flushing Attachment



2 Tape 3 Flushing Attachment

4) Inspection of Cooling Water Passage

1. Check that cooling water intake is not clogged. Clean if necessary.

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

3. Check that cooling water check port 1 ejects water.

5) Flushing with Water

⚠ WARNING

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

⚠ WARNING

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

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

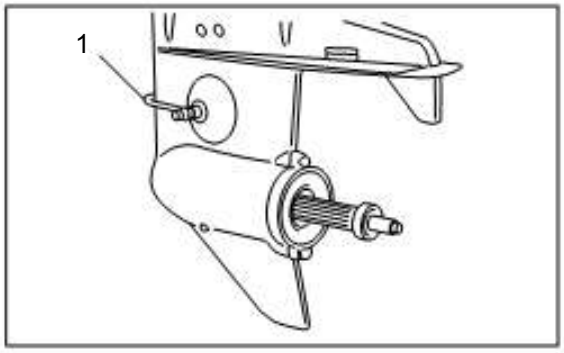
1. Remove the following parts.
   - Propeller and thrust holder

   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)

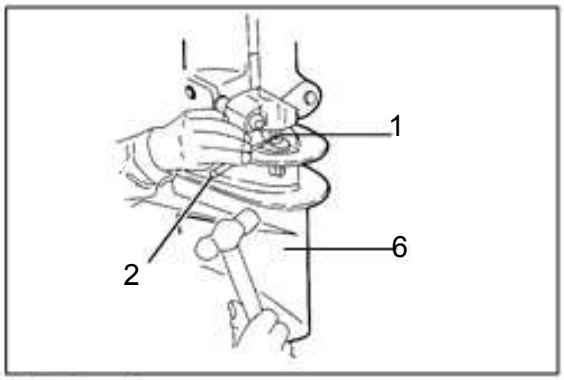
1. Put drive cleaner 1 on the gear case from the front so that the drive cleaner covers cooling water inlet as shown.

2. Put water hose to drive cleaner and run water.

Adjust water flow so that water leaks from driver 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.



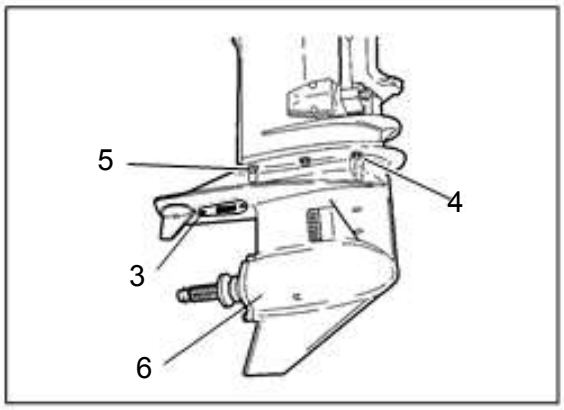
1 **Do not reuse.**

Inspection of Water Pump

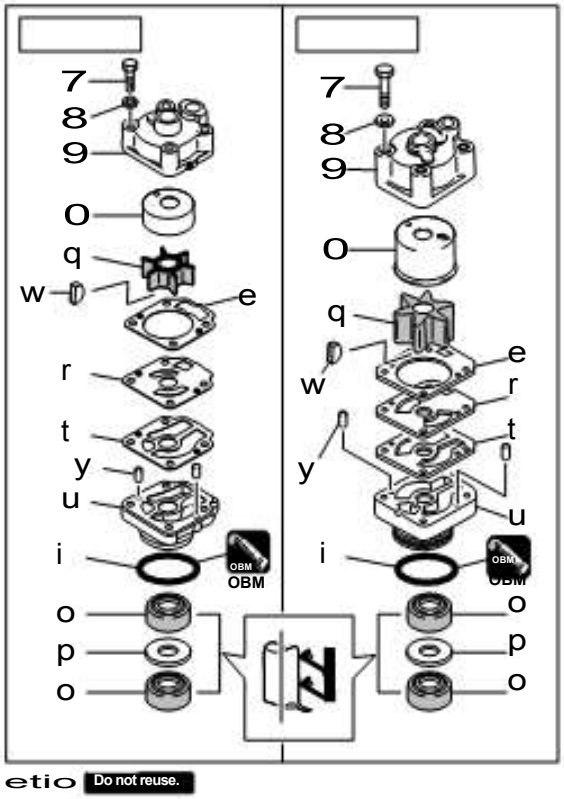
1. Remove the following part.
   Drive out spring pin 1 by using spring pin tool 2.

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

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



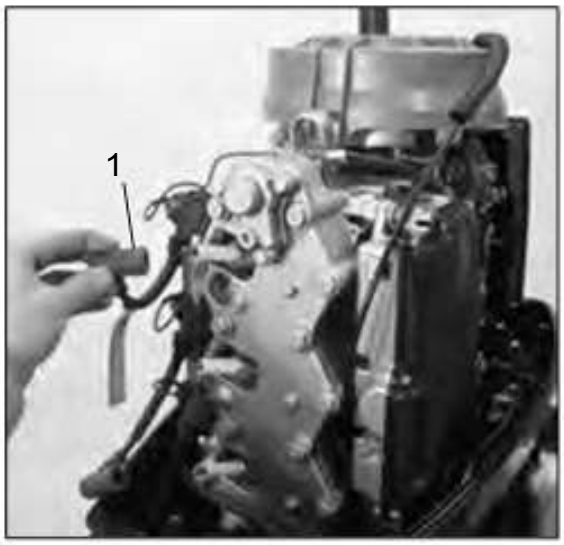
2. Remove the following parts.
   3 Gear Case Plate
   4 Bolts : M8 4 pcs. (MX50D2 : M8 6 pcs.)
   5 Bolts : M10 2 pcs.
   6 Gear Case Ass'y (Pull downward to remove.)



3. Check following parts.
   - 7 Bolts : M8 4 pcs.
   - 8 Washers 4 pcs.
   - 9 Pump Case (Upper)
   - 0 Pump Case Liner
   - q Pump Impeller ➞ Replace with new one.
   - w Key
   - e Gasket ➞ Replace with new one.
   - r Guide Plate
   - t Gasket ➞ Replace with new one.
   - y Dowel Pin
   - u Pump Case (Lower)
   - i O Ring
   - o Oil Seals
   - p Shim

Inspection

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



6) Inspection of Compression Pressure

1. Start and idle engine for 5 minutes to warm up, and then stop.

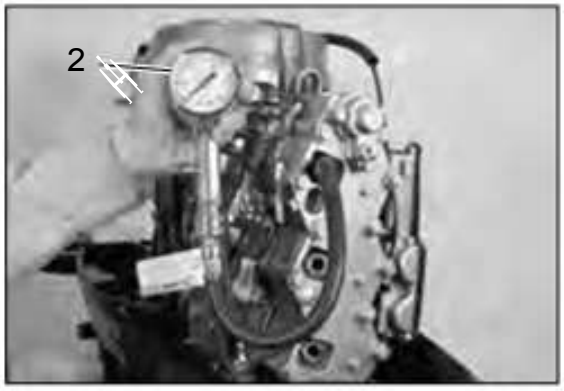
2. Shift gear into neutral (N).

3. Remove lock plate (of stop switch lanyard) from stop switch.

> **⚠ CAUTION**
> To prevent accidental start of the engine, remove lock plate (of stop switch lanyard) from stop switch before measuring compression pressure.

4. Remove all plug caps 1 and then all spark plugs.

> **⚠ CAUTION**
> Clean areas around spark plugs on the cylinder before removing spark plugs to prevent dirt from entering cylinder.



5. Install compression gauge 2 to plug hole.

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

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

Compression Pressure (Reference):
0.80 MPa (117 psi) [8.2 kgf/cm²]
Different between compression pressure of each cylinders:
within 0.105 MPa (15 psi) [1.05 kgf/cm²]

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

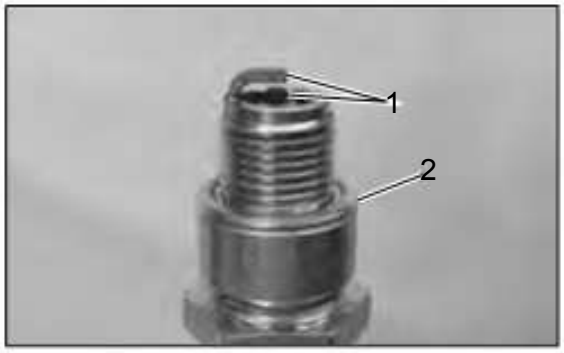
7. If compression pressure is below specified value or varies much among cylinders, put small amount of engine oil into cylinders, and perform the test again.

compression pressure increases after the e 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.

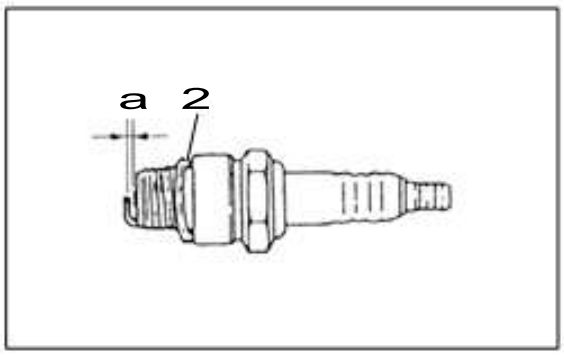
7) Inspection of Spark Plugs

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.

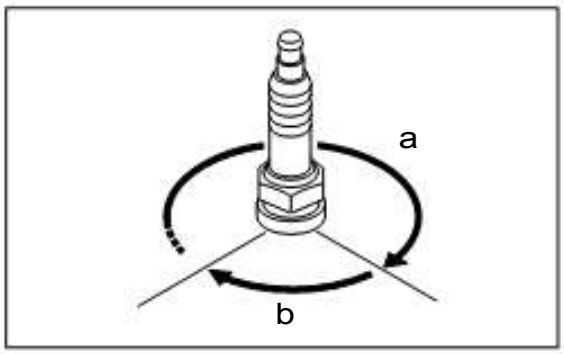


4. Check spark plug gap a. Replace if it is over specified value. Adjust gap if it is out of specified range.

Spark Plug Gap a:Standard Value
0.9 -1.0 mm (0.035 - 0.039 in)

Functional Limit:
1.2 mm (0.0472 in)

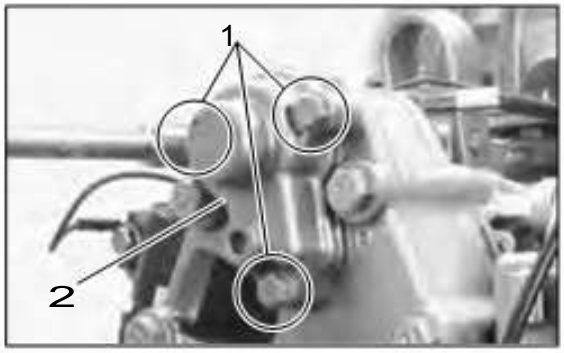
Specified Spark Plug:
B8HS-10

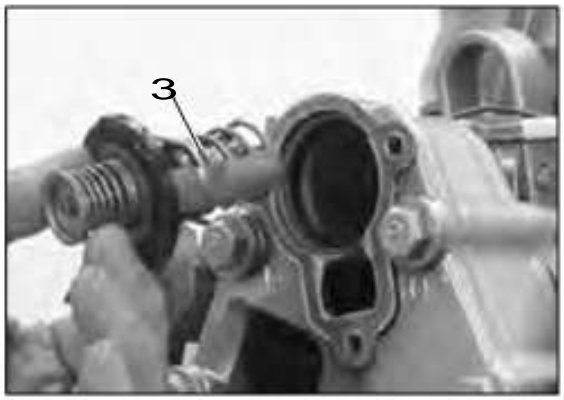


5. Install spark plug, fully hand-tighten a, and then use plug wrench to tighten to specified torque b.

Spark Plug:
27 N · m (20 lb · ft) [2.7 kgf · m]

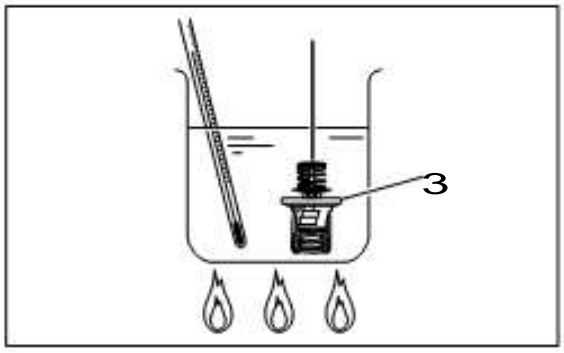
If a torque-wrench is not available when you are fitting a spark plug, a good estimate of the correct torque is 1/4 to 1/2 a turn past finger-tight. Have the spark plug adjusted to the correct torque as soon as possible with a torque-wrench.





8) Inspection of Thermostat

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

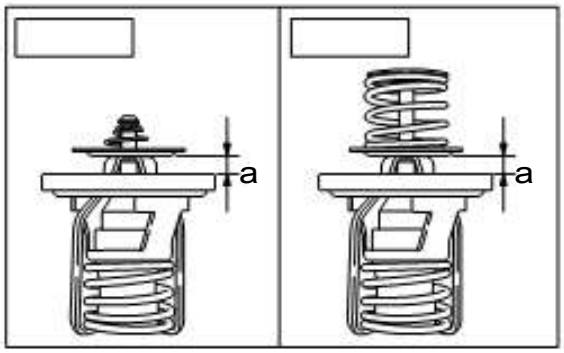


2. Hang thermostat 3 in the water contained in vessel.

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:
58.5 - 61.5˚C (137 - 143˚F)



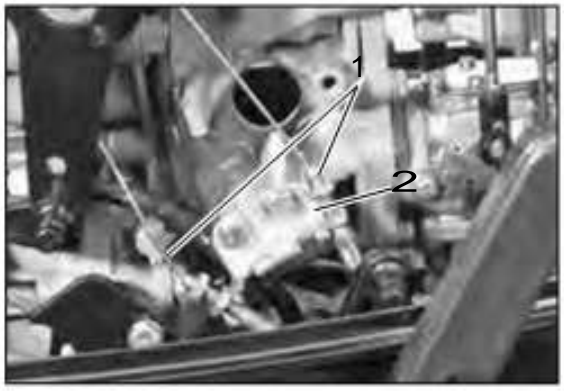
4. Measure valve lift a of thermostat when prescribed temperature has been reached. Replace if the length is less than specified value.

Water Temperature	Valve Lift a
75˚C (167˚F)	4.5 mm (0.177 in) or more

5. Install thermostat, new gasket and cover.

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

9) Adjustment of Throttle Cable



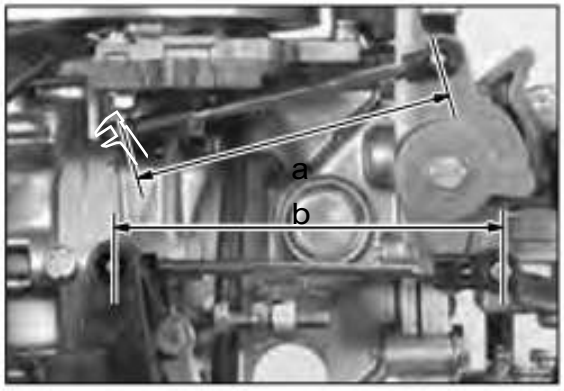
1. Remove throttle cable 1 from throttle cable bracket 2.

2. Temporally attach the left side cable to wire bracket, and adjust a nut so that advancer arm 3 contacts the stopper 4, when throttle fully opened.

3. Temporally attach the right side cable to wire bracket, and adjust a nut so that the throttle to be fully closed position.

4. Tighten each lock nut, and then fix the left and right cable.

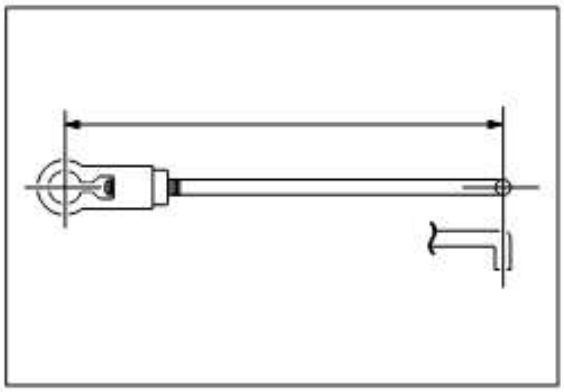
5. Adjust stopper bolt so that advancer arm contacts the stopper bolt, when throttle fully closed.



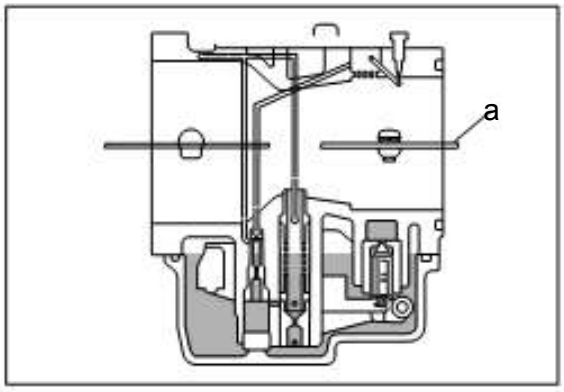
10) Ignition Timing Adjustment

1. Adjust ignition link and throttle link.

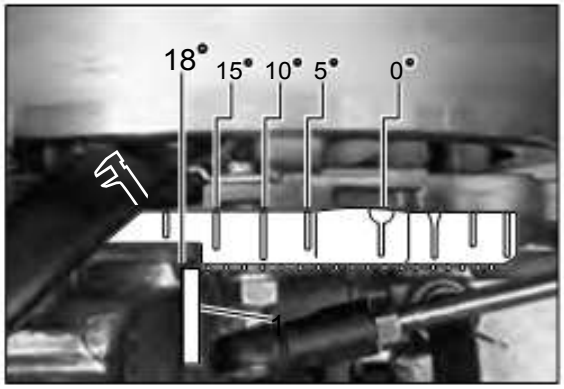
a **Ignition Timing Link : 101 mm (3.976 in)**
b **Throttle Link : 115 mm (4.528 in)**



Measure the length from ball joint center to shaft center.

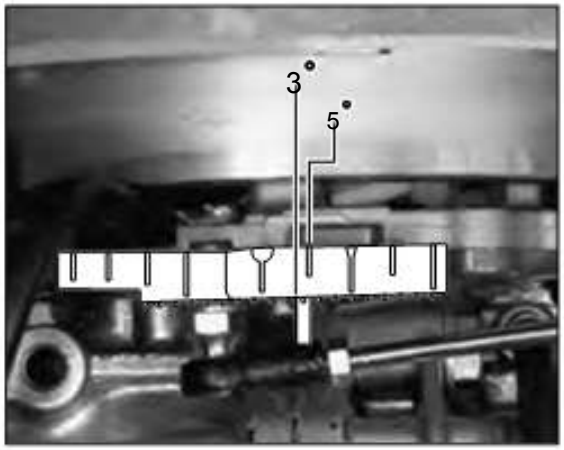


2. Place advancer arm in the maximum speed position (wide open throttle) and make sure the carburetor throttle is fully open a. If throttle is not fully open, make fine adjustments using throttle link.



3. Align flat surface of crankcase mold boss 1 with calibration marks on set ring and adjust ignition timing so ignition timing matches the following specifications.

Ignition Timing-Full Throttle : BTDC 18°

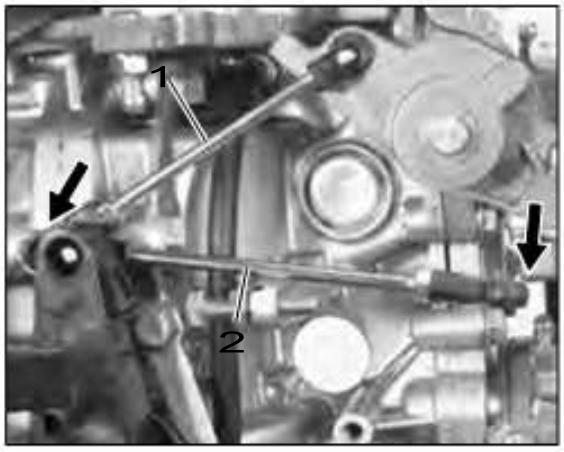


4. Place advancer arm in the minimum speed position (throttle fully closed) and adjust low, speed side stopper so ignition timing matches the following specifications.

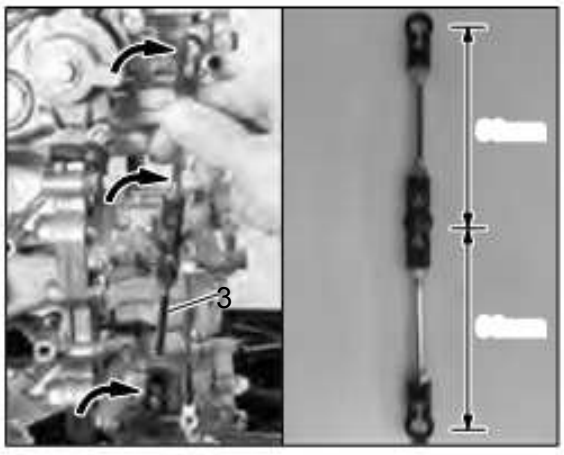
Ignition Timing-Throttle closed : ATDC 3°

11) Carburetor Synchronization

1. Remove the intake silencer cover.



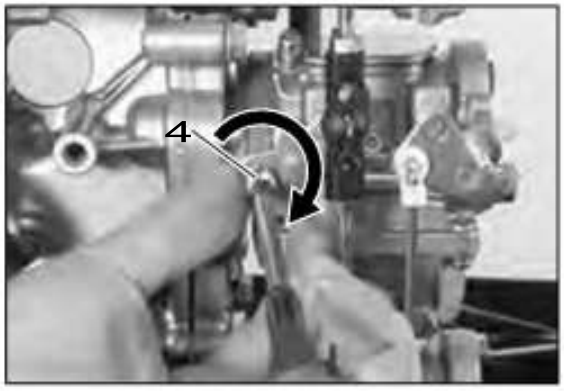
2. Disconnect ignition timing link 1 and throttle link 2 so throttle lever roller dose not make contact with throttle cam.



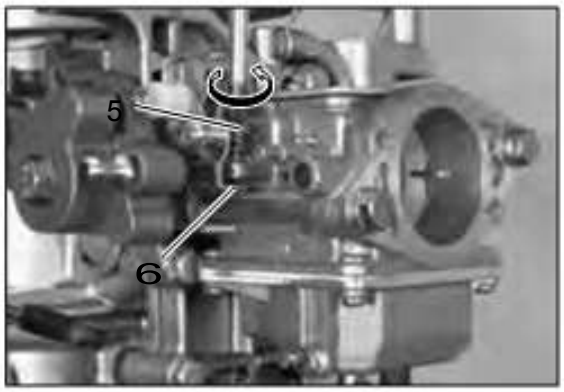
3. Adjust the length of each carburetor throttle link rod 3 to following specification.

Link Length : 90 mm (3.54 in)

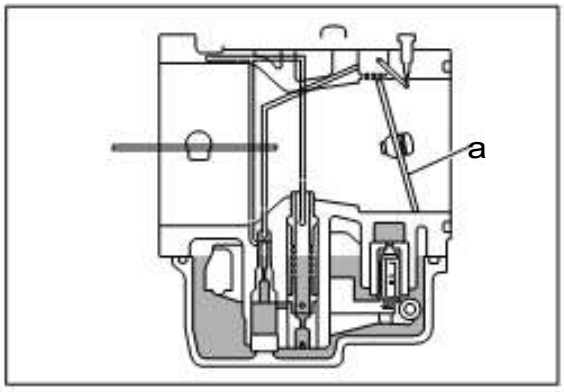
4. Reconnect timing link.

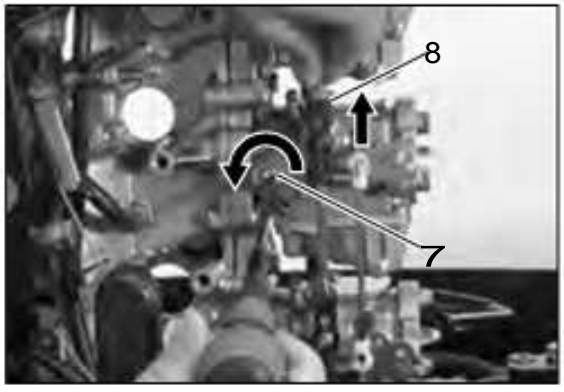


5. Turn the No.2 and No.3 throttle lever screws 4 clockwise to loosen the throttle butterfly valves.

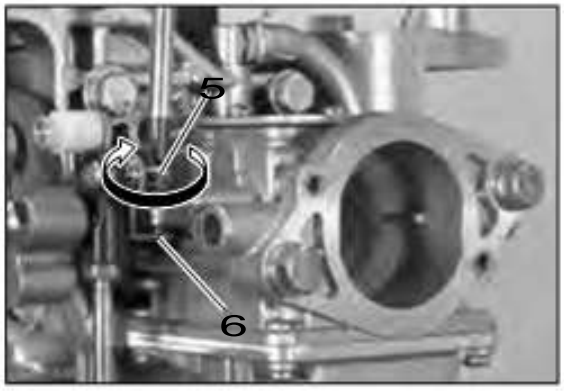


6. Loosen throttle stop screw 5 on top carburetor so it dose not make contact with throttle lever 6. All throttle butterfly valve should return to a fully closed position a.

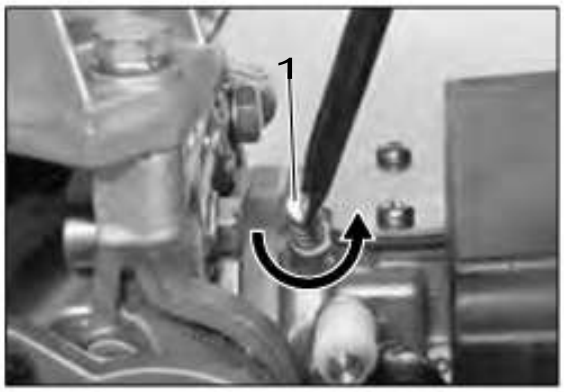




7. Tighten the No.2 and No.3 throttle lever screw 7 counterclockwise while pulling upward throttle link rod 8 on the carburetor.



8. Turn throttle stop screw 5 until it touches throttle lever 6 then tighten the screw to 2-1/2 turns.



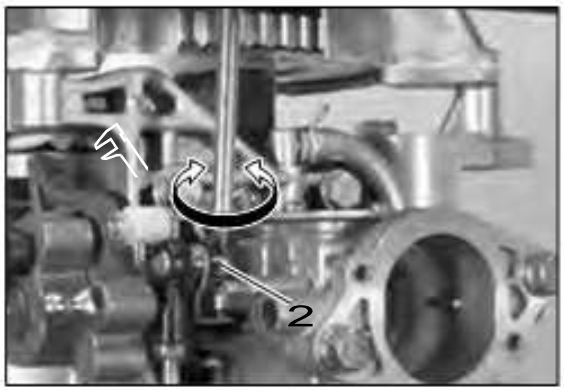
12) Pilot screw adjustment

1. At first, 2-3/4 turns out (loosen) the pilot screw 1 all of the carburetors from fully tighten. Start and run engine up to normal operating temperature with an tachometer installed.

Don't tighten too much strongly.

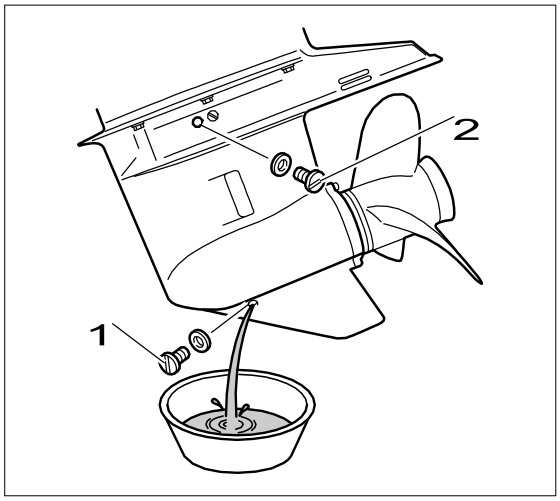
2. Adjust the pilot screw of the No.1 carburetor, check for setting highest in idle speed. Then adjust -1/8 turns from there, for cold engine starting.

3. Adjust same procedure for No.2 and No.3 carburetor.



4. Adjust the throttle stop screw 2 to obtain the specified RPM at neutral and trolling speeds.

Neutral Idle RPM : 900
Trolling RPM : 750



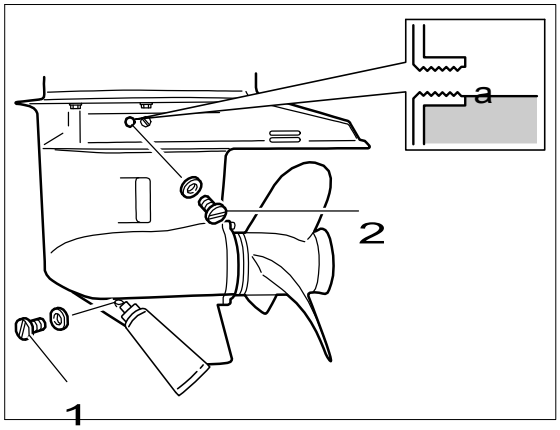
13) Replacement of Gear Oil

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.

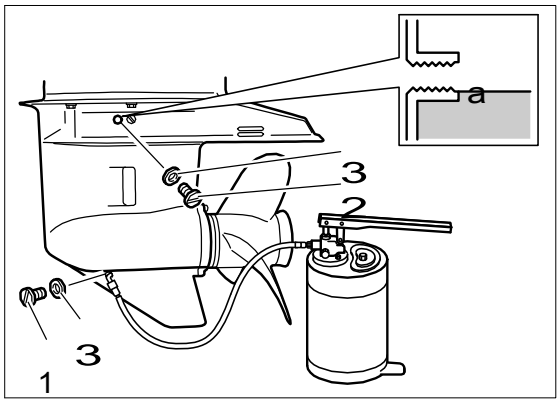
3. Check gear oil for presence of metal particles, change of color (abnormal if clouded), and viscosity. Check lower unit internal components if necessary.



4. Full tilt down outboard motor and then, 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 a without air bubble. **Gear Oil:**

Hypoid Gear Oil
API:GL-5 SAE:#90
Gear Oil Quantity:
MX50:500 cm^3 (16.9 fl.oz)
~~MWX50:700 cm^3 (23.15 fl.oz)~~

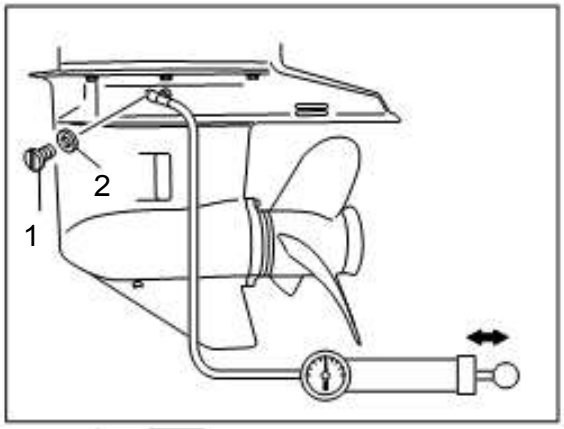
- Use lower plug hole when filling with gear oil. Upper hole cannot be used because doing so will not allow air to escape from gear case.
- Full tilt down outboard motor to fill gear oil proper quantity.



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 Gasket



2 Gasket [redacted]

14) 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.

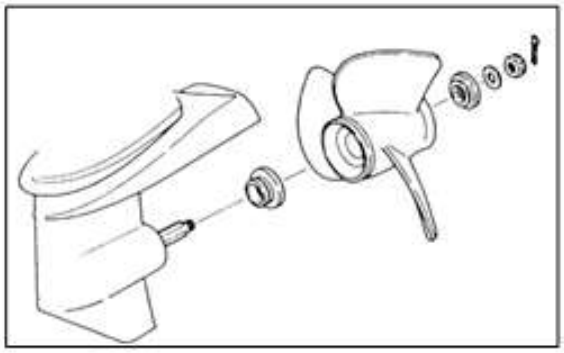
Specified Gear Case Maintained Pressure:
0.05 MPa (7 psi) [0.5 kgf/cm²]

· 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.

CAUTION

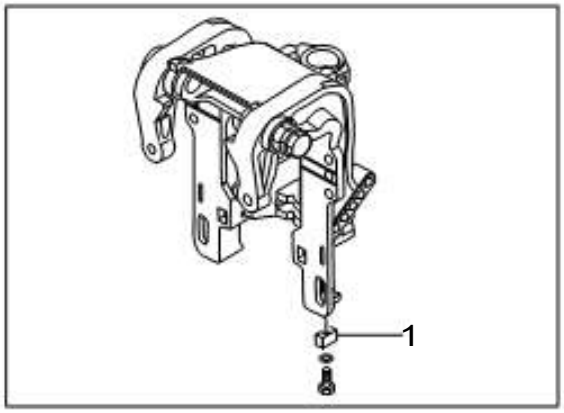
Do not apply pressure to gear case over specified value.
Doing so can cause damage to oil seal.

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.



15) Inspection of Propeller

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

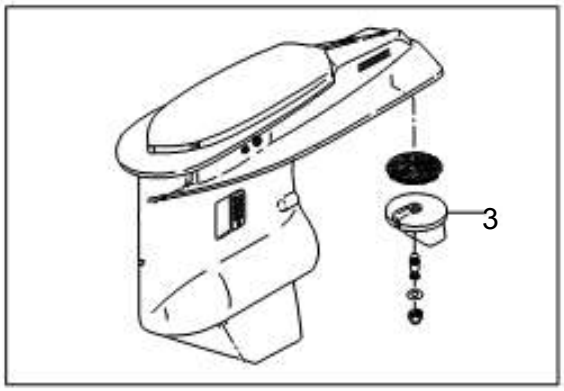


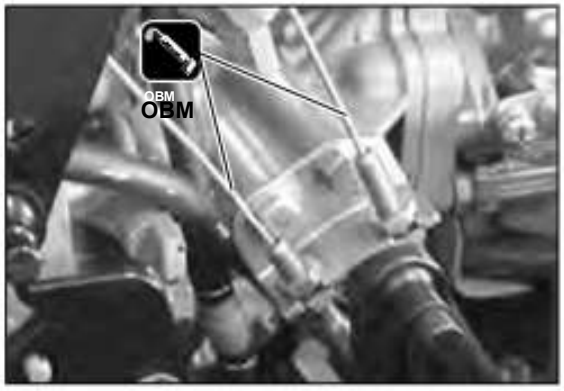
16) Replacement of Anode

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.

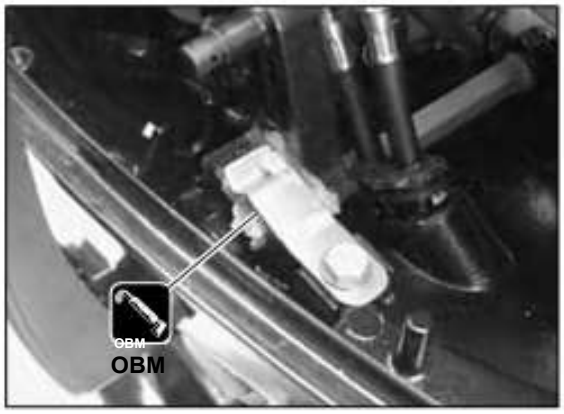
2. Check anode 1, 2 a and trim tab 3 for deterioration. Replace anode (or trim tab) if volume is reduced to 2/3 of new part.



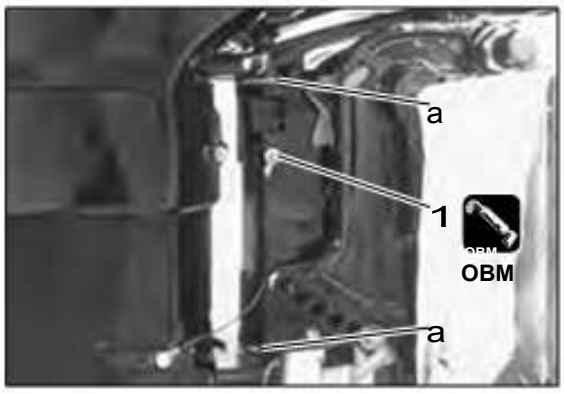


17) Greasing

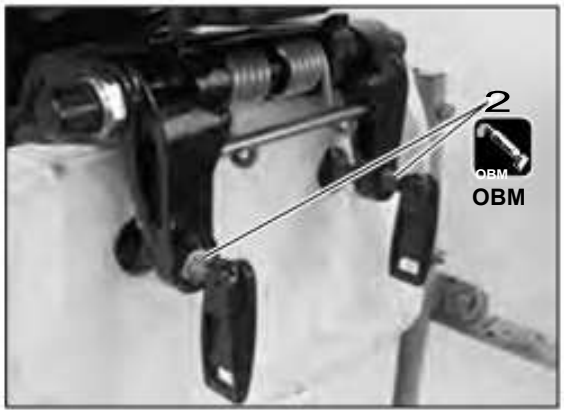
1. Apply grease to throttle cable and sliding areas.



2. Apply grease to shift cam sliding areas.

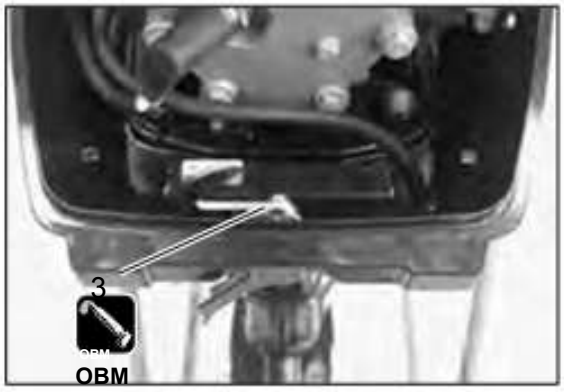


3. Inject grease through grease nipple 1 until excessive grease appears from a.
   Apply grease to 2 thread of clamp screws.

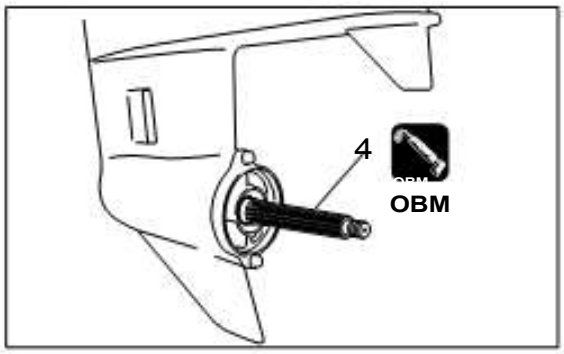


c Do not lubricate here.

4. Apply grease to throttle cable b and sliding areas.



5. Apply grease to seal ring and bushing 3 of hook lever.

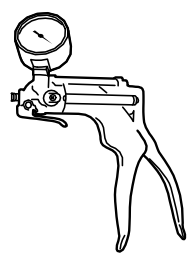


6. Apply grease to propeller shaft spline 4.

4

Fuel System

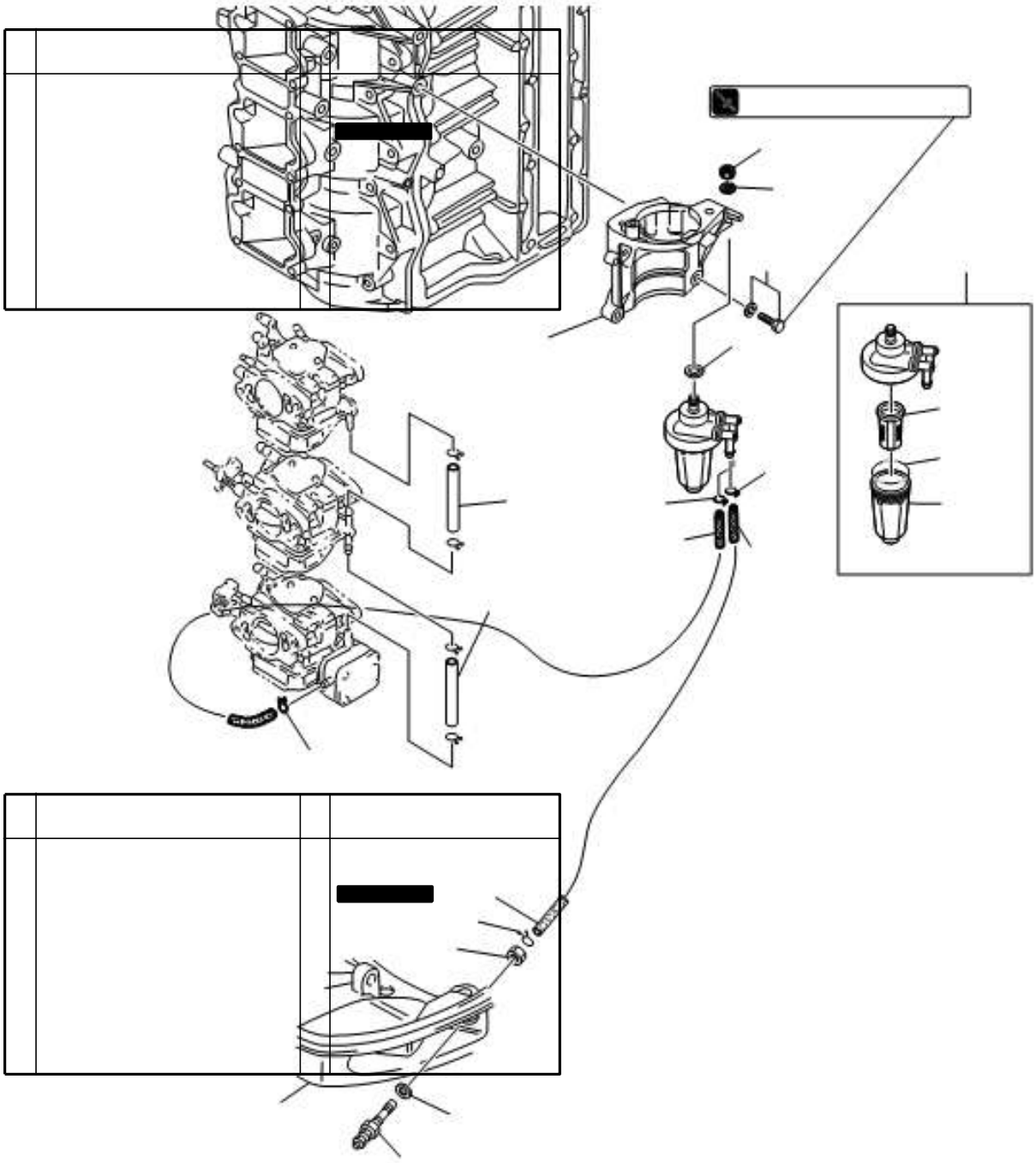
1. Special Tools

1 	
Vacuum Pressure gauge P/N. 3AC-99020-1	
Inspecting pressure	

2. Parts Layout

P/L Fig.5

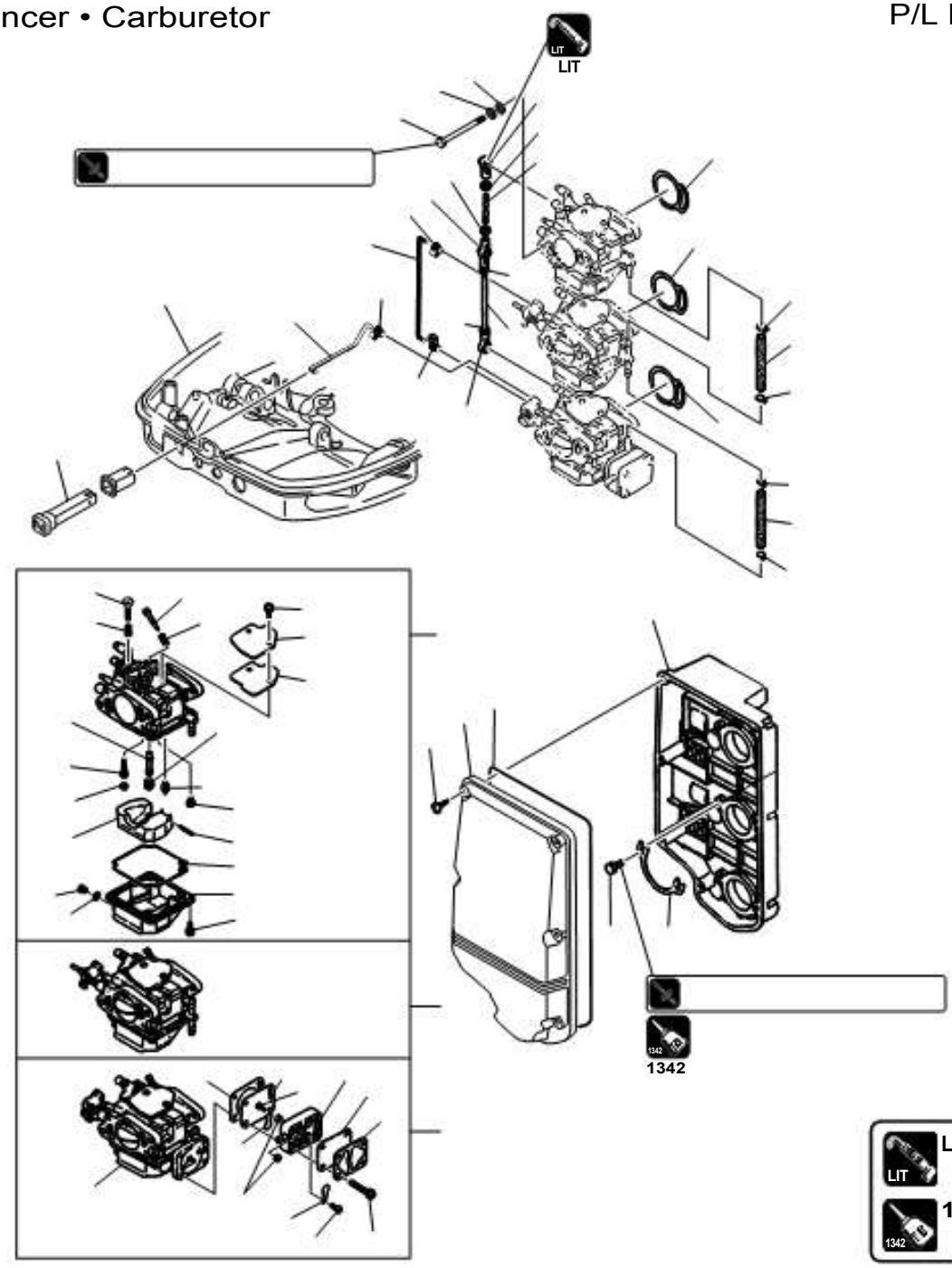
Fuel line



Ref. No.	Description	Q'ty	Remarks
1	Fuel Filter Ass'y	1	
2	Cup	1	
3	O-Ring	1	Do not reuse.
4	Filter	1	
5	Nut	1	
6	Washer	2	
5	Hose	1	
7	Hose	1	
8	Clip	4	
9	Bracket	1	
10	Bolt	4	

Intake Silencer • Carburetor

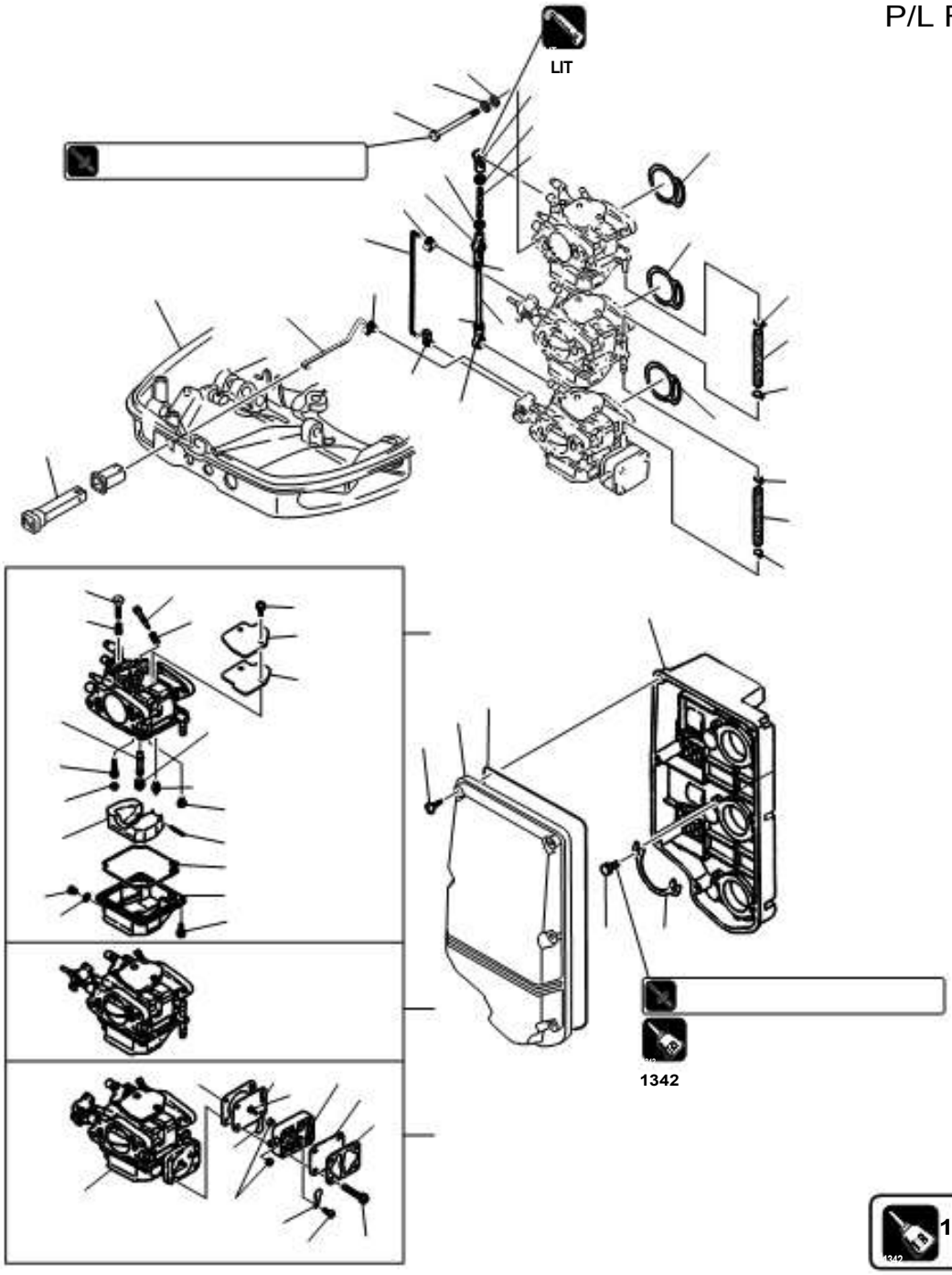
P/L Fig. 4



Ref. No.	Description	Q'ty	Remarks
1	Bolt 5-16	6	
2	Gasket	1	Do not reuse. Seal Rubber
3	Intake Silencer Cover	1	
4	Tapping Screw 5-30	7	
5	Carburetor Ass'y	1	3LC 5 Upper
6	Carburetor Ass'y (Second)	1	3LC 5 Center
7	Main Jet (#138)	3	
8	Slow Jet (#80)	3	
9	Plug	3	
10	Float Valve	3	
11	Float Arm Pin	3	
12	Float	3	
13	Screw	3	
14	Stop Screw	1	Upper X 1
15	Spring	2	Upper X 2, Center X 1, Lower X 1

Ref. No.	Description	Q'ty	Remarks
16	Adjust Screw	3	
17	Float Chamber	2	Upper, Center X 2
18	Float Chamber Gasket	3	Do not reuse. O-Ring
19	Bolt	3	
20	Gasket	3	Do not reuse. X 3
21	Main Nozzle	3	
22	Carburetor Cover	3	
23	Carburetor Cover Gasket	3	
24	Screw	6	
25	Carburetor Ass'y (Third)	1	3LC
26	Pump Cover	1	Lower
27	Screw	4	Lower
28	Pump Cover Gasket	1	Lower
29	Check Valve	2	Lower
30	Screw	2	Lower
31	Nut	2	Lower

P/L Fig. 4

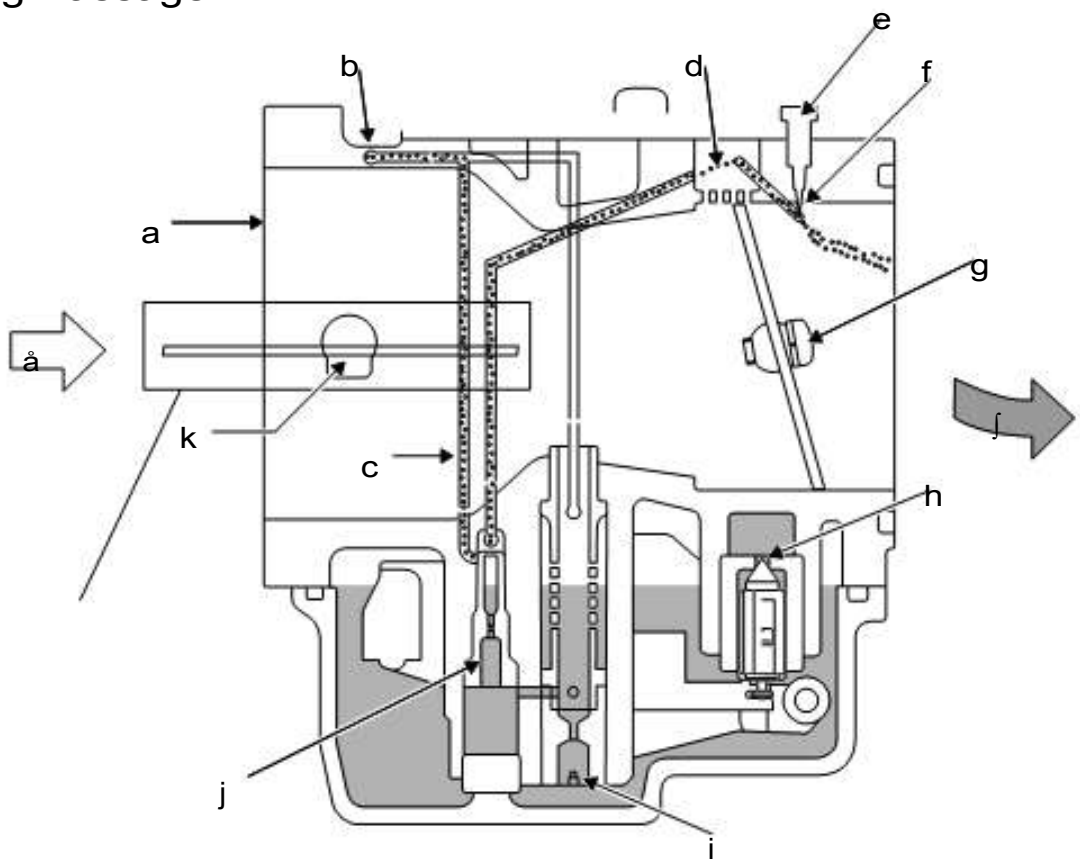


Ref. No.	Description	Q'ty	Remarks
32	Pump Diaphragm	1	Lower
33	Pump Body Gasket	1	[redacted] Lower
34	Pump Body	1	Lower
34a	Lower Float Chamber	1	
35	Carburetor Gasket	3	[redacted] Lower
36	Bolt	6	
37	Spring Washer	6	
38	Washer	6	
39	Hose	2	98AB-501000
40	Clip ø10	4	

Ref. No.	Description	Q'ty	Remarks
41	Rod 5-68	2	
42	Ball Joint Connector	1	
43	Ball Joint Connector	2	
44	Nut	4	
45	Choke Rod 3-90	1	
46	Intake Silencer	1	
47	Rod Snap 3-B	2	
48	Intake Silencer Lock Plate	3	
49	Choke Rod	1	
50	Rod Snap 3-B	1	

3. Carburetor Inner Passages

1) Idling Passage



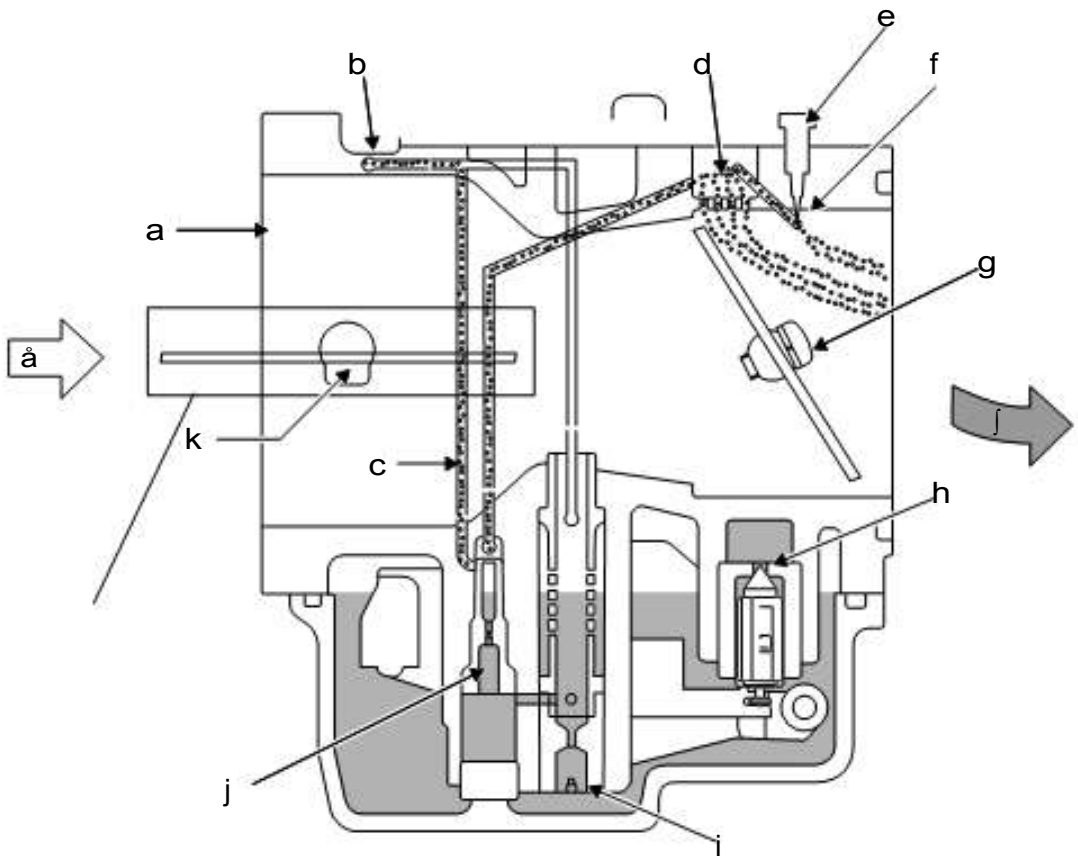
a - Air intake
b - Air-bleed inlet
c - Slow air jet
d - Bypass port
e - Pilot screw
f - Idle Port
g - Throttle valve
h - Fuel inlet
i - Main jet
j - Slow jet
k - Choke valve
å Air
ʃ Air-fuel mixture

As engine rotates, piston moves from top dead center toward bottom dead center, the piston movement causes vacuous area to occur in the back of throttle valve.

Then, the air enters carburetor through air intake port, runs through throat venturi and throttle valve, and then is sucked into the vacuous area in the cylinder that is in air intake stroke.

The float chamber receives atmospheric pressure through air vent. This pressure causes fuel to be sucked into vacuous area in the back of throttle valve. The fuel is sent to main fuel well through main jet, runs through idle passage, slow jet, bypass (off idle) port, and then is ejected from idle port. When this fuel goes through bypass port, it is mixed with air in the carburetor bore to be air-fuel mixture which is sucked into the cylinder.

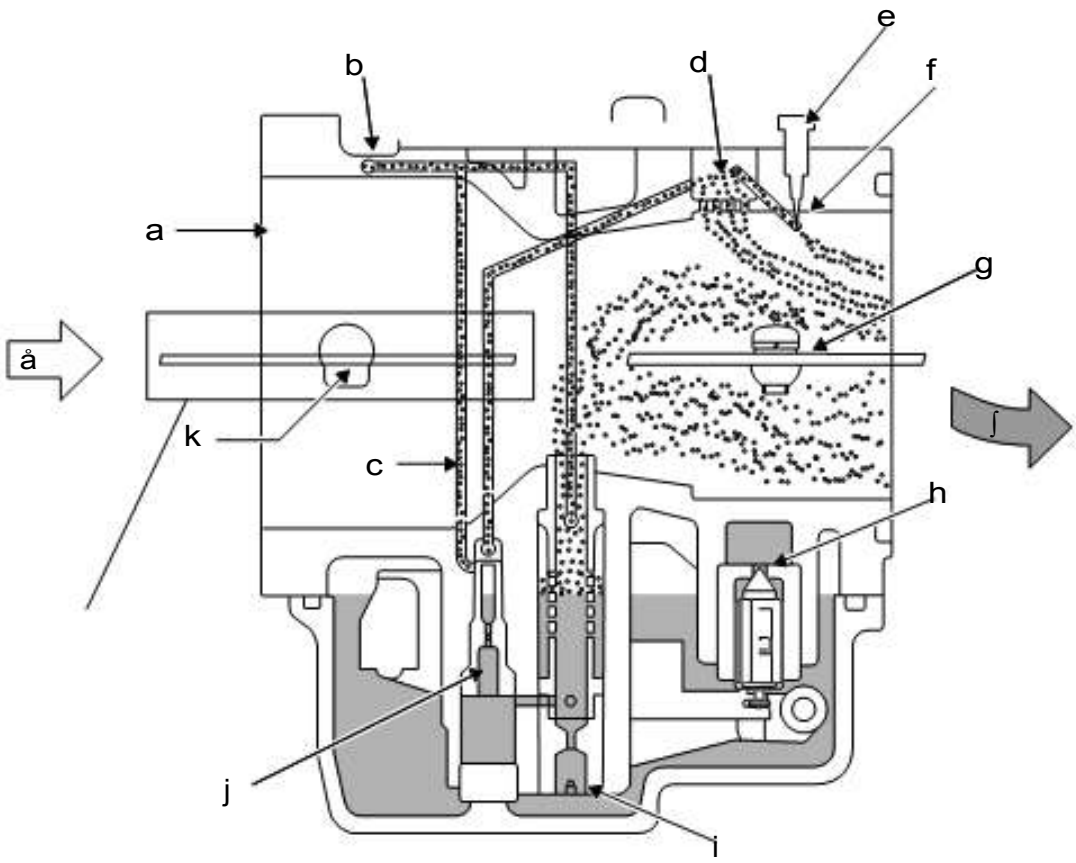
2) Off-Idle Passage



a - Air intake
b - Air-bleed inlet
c - Slow air jet
d - Bypass port
e - Pilot screw
f - Idle Port
g - Throttle valve
h - Fuel inlet
i - Main jet
j - Slow jet
k - Choke valve
å Air
∫ Air-fuel mixture

When throttle valve is turned to a position over bypass port, the bypass port is exposed to vacuous pressure existing in the back of throttle valve. The vacuous pressure causes the fuel to be ejected from bypass port and idle port.

3) High Speed Passage



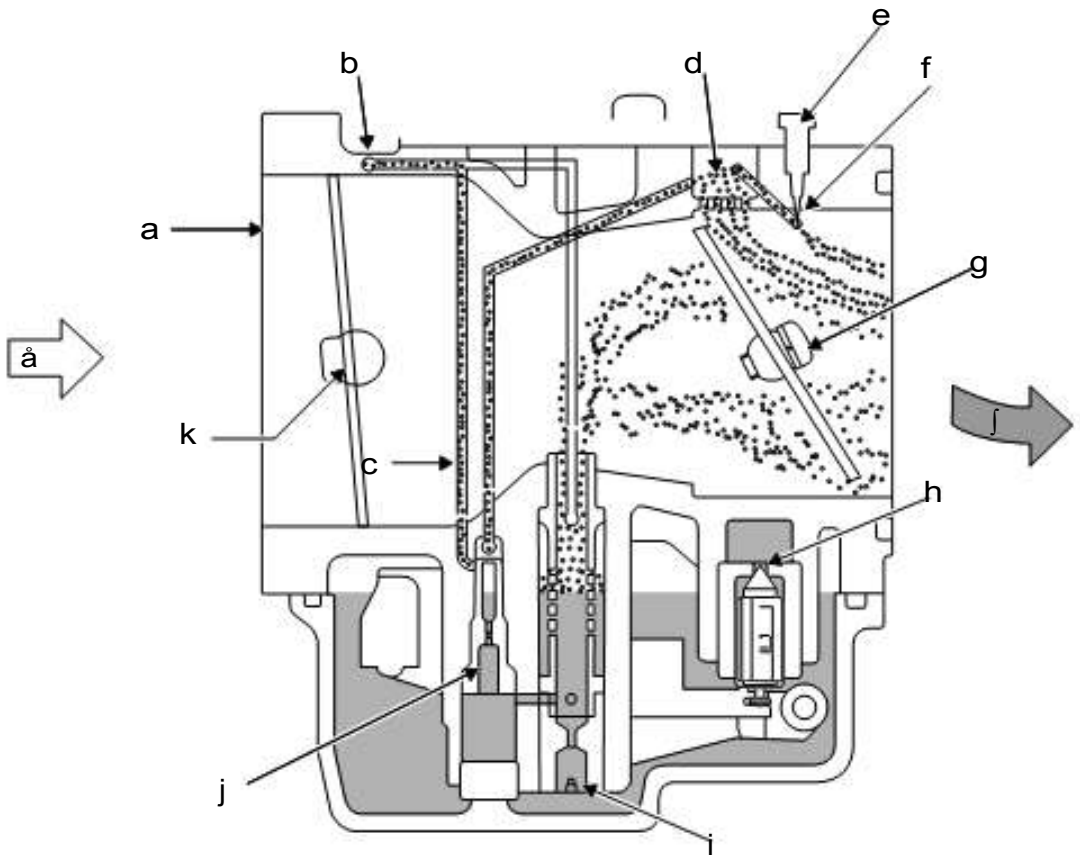
a - Air intake
b - Air-bleed inlet
c - Slow air jet
d - Bypass port
e - Pilot screw
f - Idle Port
g - Throttle valve
h - Fuel inlet
i - Main jet
j - Slow jet
k - Choke valve
å Air
∫ Air-fuel mixture

As throttle valve is turned to a position over bypass port, the vacuum produced in the back of throttle valve extends to an area near main nozzle. At the same time, as flow of air that runs through carburetor bore increase, the whole space in the venturi becomes vacuous. The vacuous pressure in this venturi causes large suction force in the main nozzle. The fuel goes through main jet, flows into main fuel well, goes through main nozzle, and ejects from venturi.

The fuel that runs through main nozzle is mixed with air that comes from air bleed hole made on the side of main nozzle to make the fuel lighter. When throttle valve is fully open, the amount of fuel is determined by the size of main jet.

The idle and off-idle passages keep feeding fuel as well as air to the engine.

4) Choking Passage (#2 and #3 carburetor)



a - Air intake
b - Air-bleed inlet
c - Slow air jet
d - Bypass port
e - Pilot screw
f - Idle Port
g - Throttle valve
h - Fuel inlet
i - Main jet
j - Slow jet
k - Choke valve
å Air
∫ Air-fuel mixture

Choke system consists of choke valve, detent and push-pull. When starting cold engine, the operator should judge whether it is necessary to operate the choke to make engine starting easier, and if necessary, to operate the handle of choke cable manually to set it to a proper position.

When attempting to start cold engine, pull choke lever to close choke valve. When engine starts, low pressure (vacuous) area is formed in the venturi on the back of choke valve. Then, the fuel goes through main nozzle, bypass port and idle port, and sucked into carburetor bore, where it is mixed with air that runs in from opening of the choke valve to form thick air-fuel mixture.

As engine warms up, operate choke cable manually to open choke valve. When engine has warmed up to a temperature suitable to the operation. Set choke lever to its original position.

4. Inspection Items

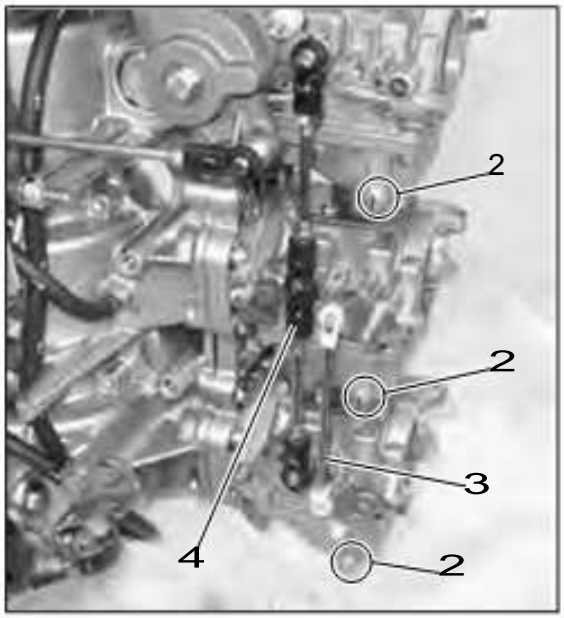
1) Removing Carburetors

⚠ WARNING

Before working on fuel system, make sure to disconnect stop switch lanyard, or electric sparks can occur, possibly igniting fuel or making fuel to explode.

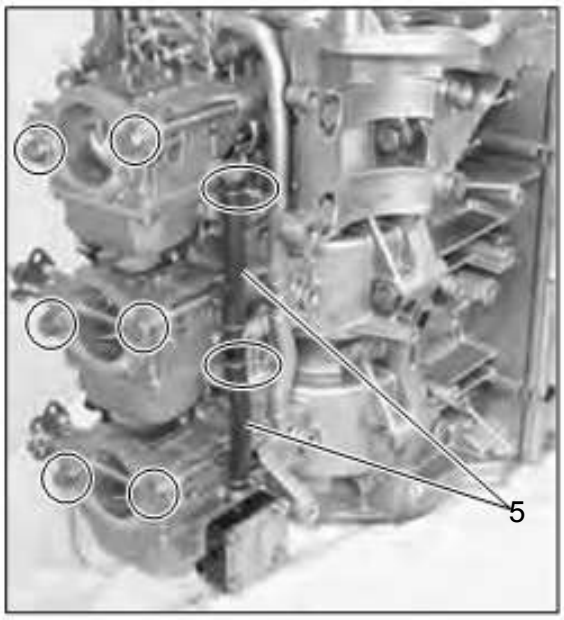
⚠ CAUTION

To prevent fuel from dripping on the floor,
use a vessel to catch the fuel.

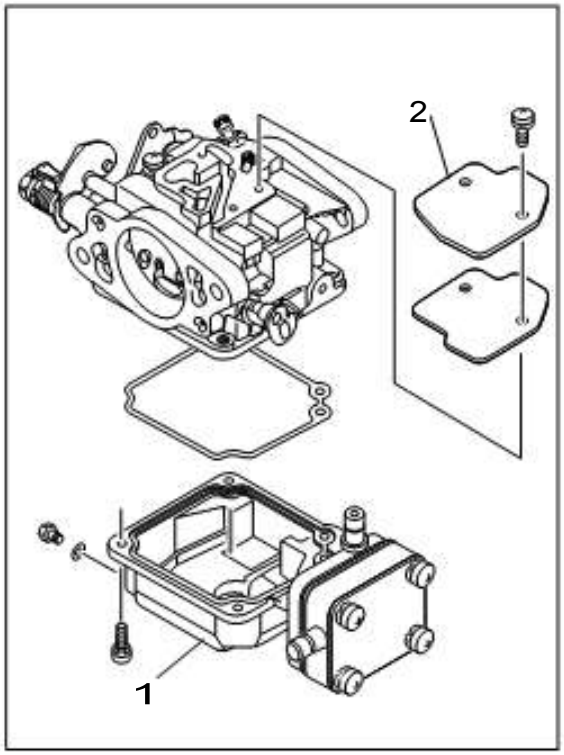


1. Remove Intake silencer 1 from carburetors.
   Refer to <Removing Intake Silencer and Carburetors> in Chapter 5.

2. Remove each drain screws 2 to drain fuel, and then remove choke link rod 3 and carburetor link rod 4 from each carburetors.



3. Disconnect fuel hoses 5, then remove carburetors from power unit.

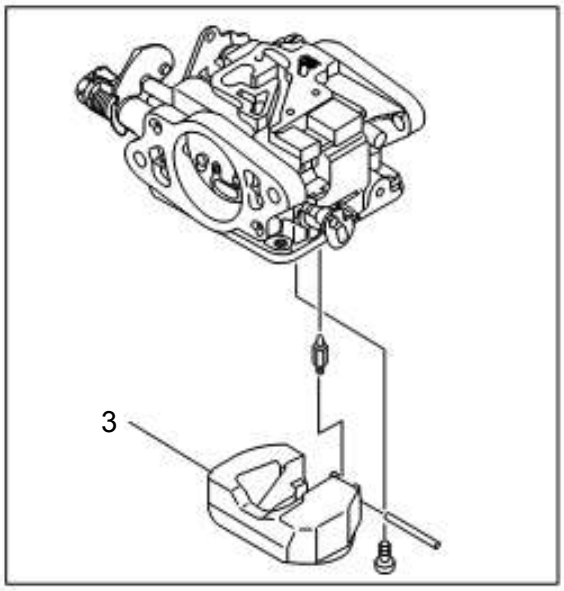


2) Disassembling Carburetors

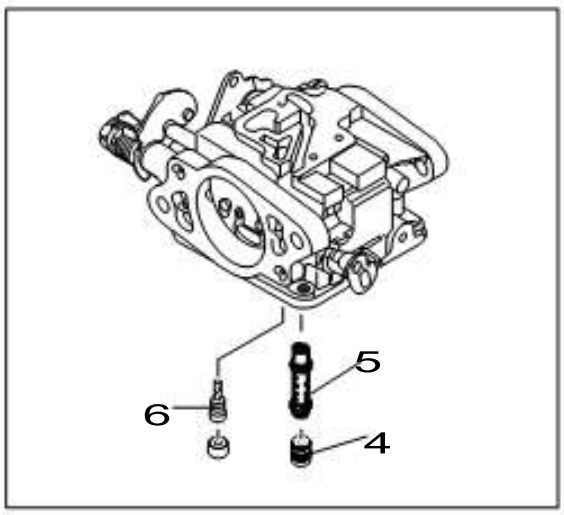
⚠ CAUTION

To prevent fuel from dripping on the floor, use a vessel to catch the fuel.

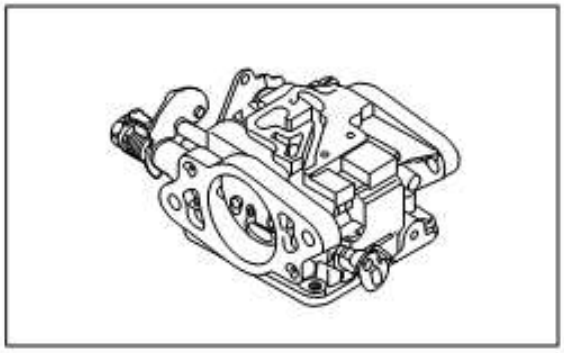
1. Remove float chamber 1.
2. Remove carburetor cover 2.



3. Remove float ass'y 3.



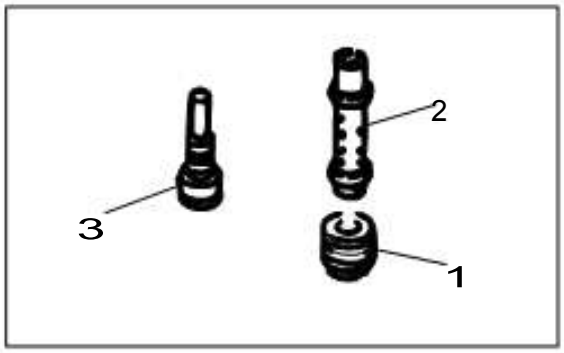
4. Remove main jet 4, main nozzle 5 and slow jet 6.



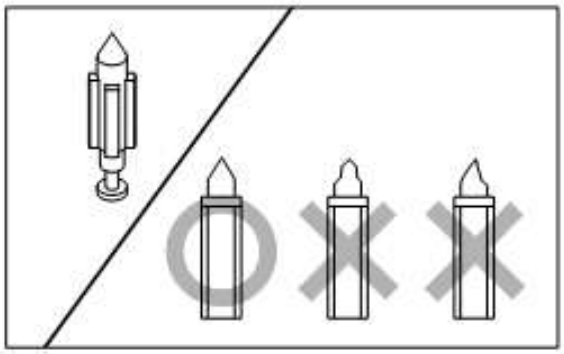
3) Cleaning and Inspection

1. Check carburetor body for crack, damage and dirt. Replace or clean as necessary.

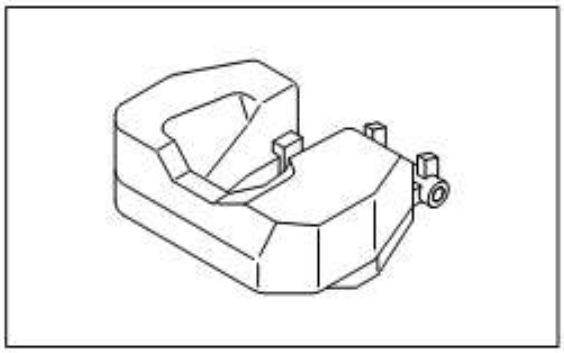
> **CAUTION**
>
> Use cleaning solution to remove dirt. Blow passages with compressed air to remove dirt. Do not use wire to remove dirt.



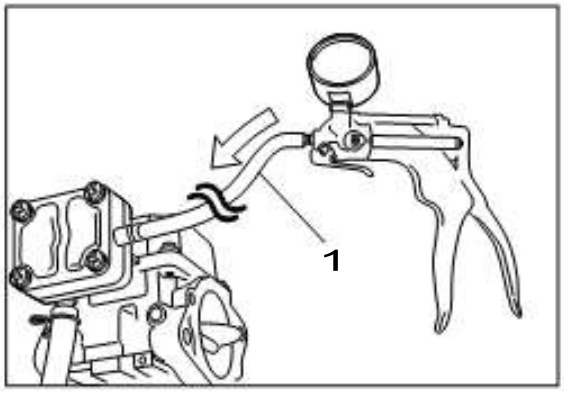
2. Check main jet 1, main nozzle 2 and slow jet 3. for dirt, and replace if necessary.

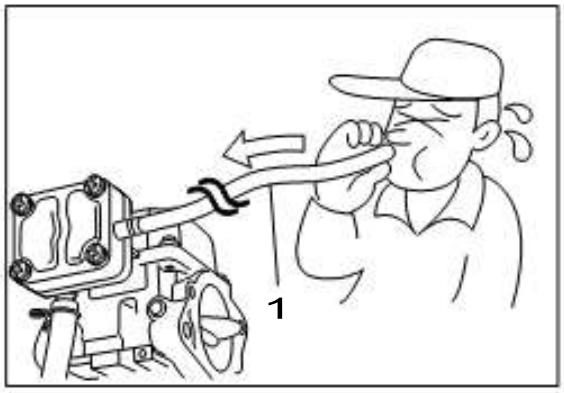


3. Check tip of needle valve, and replace if necessary.



4. Check float for crack and damage, and replace if necessary.





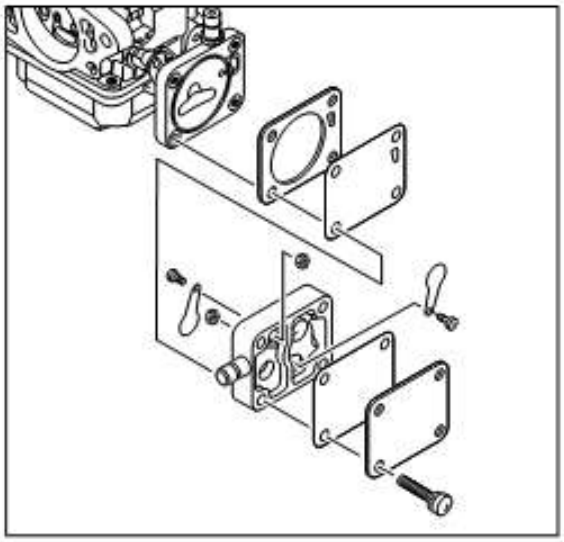
4) Inspection of Fuel Pump and Needle Valve

1. Connect vinyl hose 1 to inlet of fuel pump.
   Place carburetor body upside down to shut off needle valve.

2. Apply pressure, and check if the pressure is maintained for 10 seconds. Disassemble and inspection if necessary.

Vacuum Pressure Gauge
P/N. 3AC-99020-1

It can instantly check to apply pressure by your breath, when without pressure gauge.

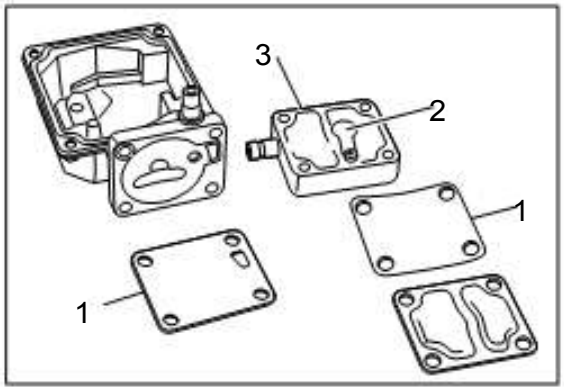


5) Disassembly and Inspection of Fuel Pump

CAUTION

To prevent fuel from dripping on the floor, use a vessel to catch the fuel.

1. Remove float chamber of #3 carburetor to disassemble Fuel Pump.



2. Check diaphragm 1 for break, crack and damage, and replace if necessary.

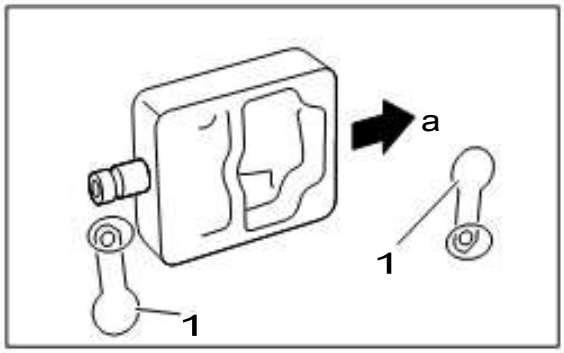
3. Check check valve 2 for damage and deterioration, and replace if necessary.

4. Check fuel pump body 3 for crack and damage, and replace if necessary.

5. Clean fuel pump body.

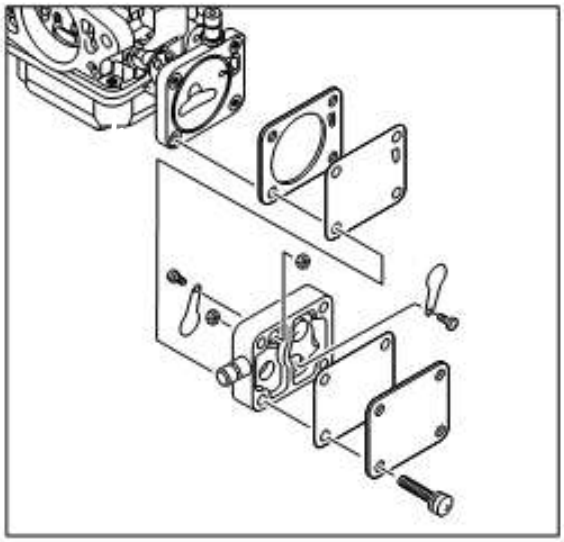
6) Assembly of Fuel Pump

To achieve higher tightness of gasket, wet interior of fuel pump with small amount of gasoline.



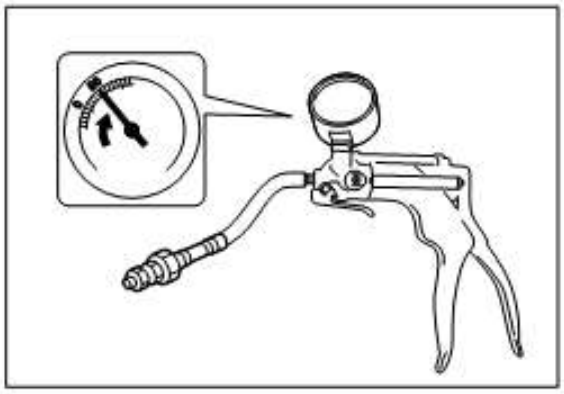
1. Attach check valves 1 as shown illustration.

Locate cutaway part of check valve toward a.



2. Attach new gasket and assemble fuel pump body using screws (4).

After assembling, check for air leak again.



7) Inspection of Fuel Connector

1. Check fuel connector for crack and damage.
2. Connect vacuum/pressure gauge to outlet of fuel connector.
3. Apply specified pressure, and check if the pressure is maintained for 10 seconds. Replace if necessary.

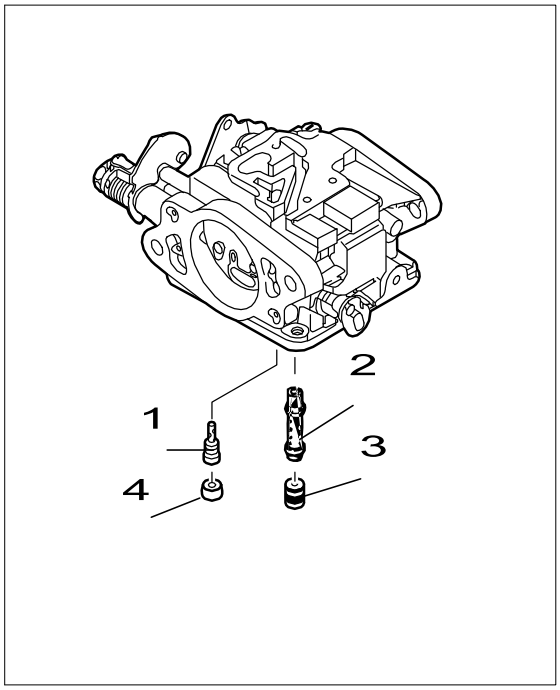
Vacuum Pressure Gauge
P/N. 3AC-99020-1

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

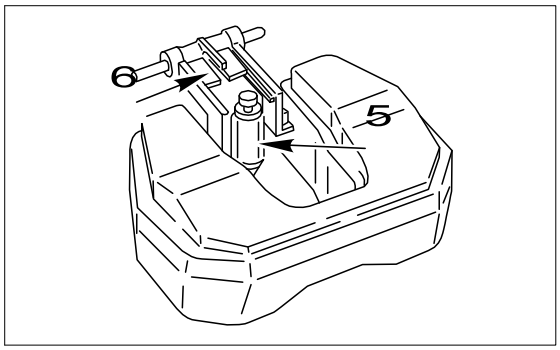
8) Inspection of Fuel Filter

<Refer to inspection items of Chapter 3.>

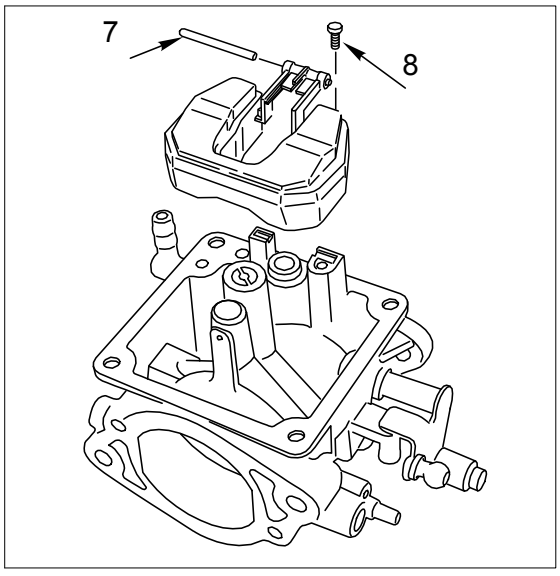
9) Assembling Carburetors



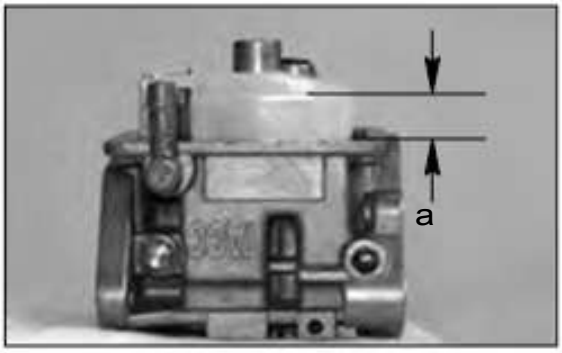
1. Install slow jet 1, main nozzle 2, main jet 3 and rubber plug 4.



2. Attach needle valve 5 to float hinge 6.



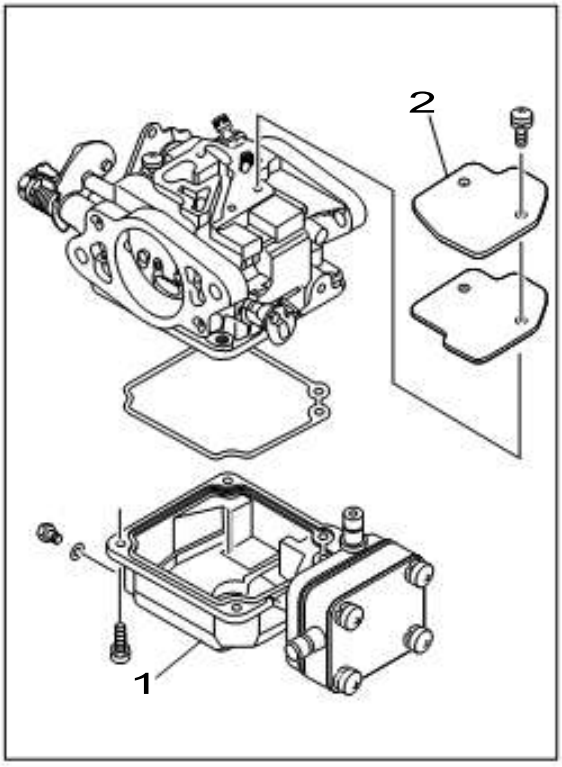
3. Attach float ass'y with float arm pin 7 and secure with screw 8.



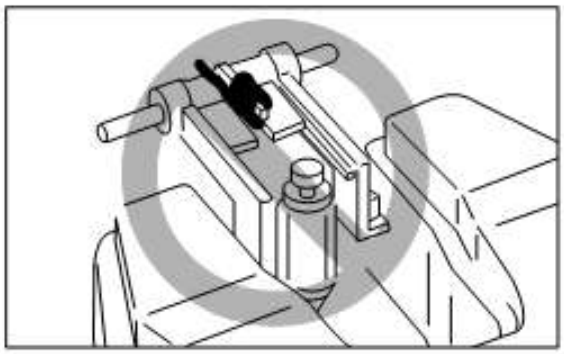
10) Adjusting Float Height

1. Measure float height as shown, and replace float if out of specification.

Float Height a :
14.5 1mm 0.571 0.039in



2. Install drain screw, float chamber 1 and cover 2.



CAUTION

Do not adjust float height by knotting the fishing line, etc. It promotes wear of the needle valve and can cause malfunction of the engine.

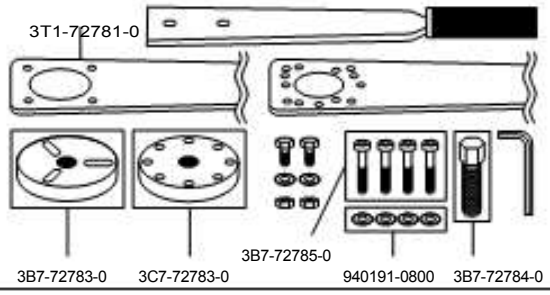
11) Installing Carburetors

1. Reverse carburetor removing steps to install.

5

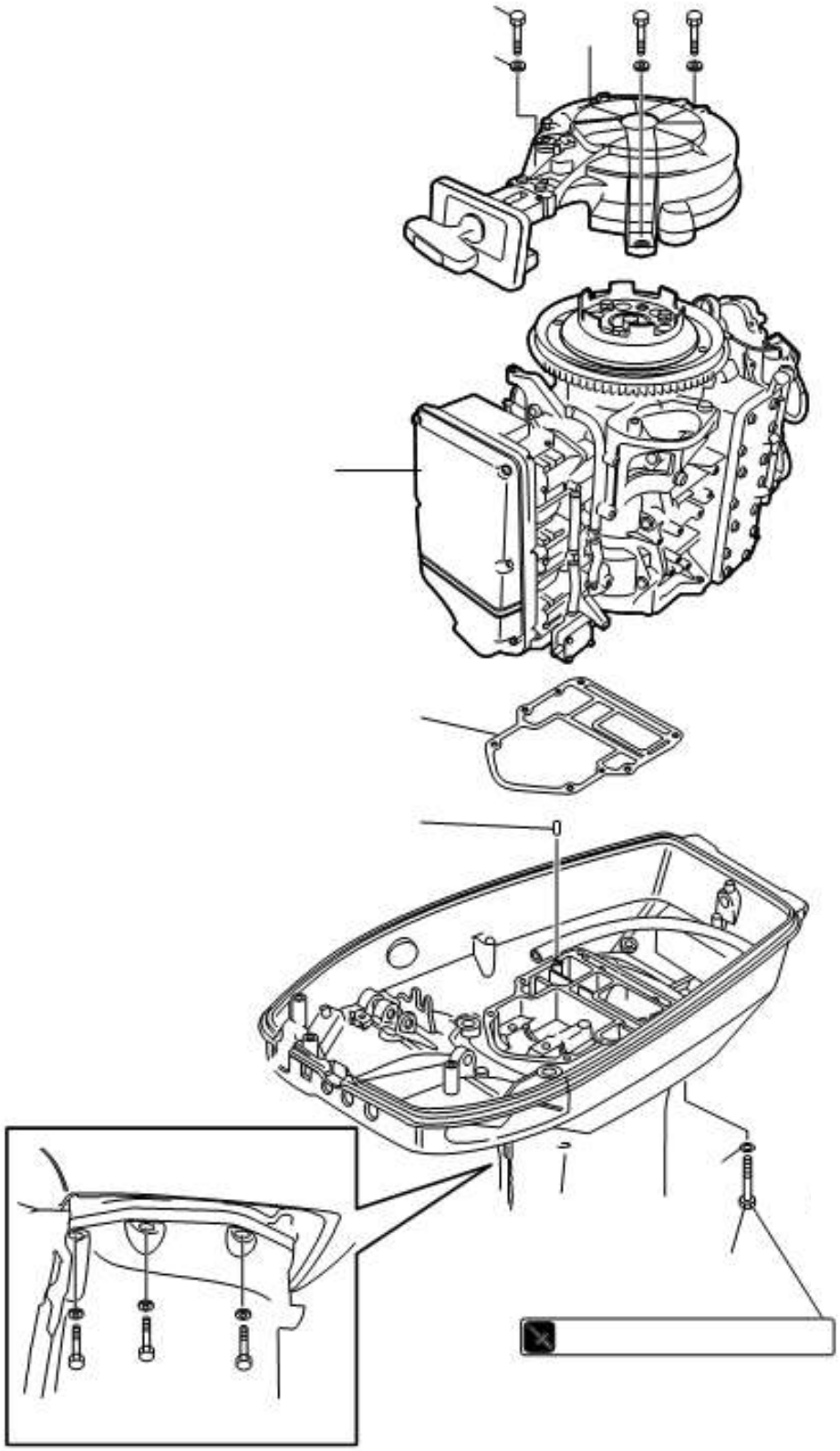
Power Unit

1. Special tools

1 	2 		3 
Eye Bolt (Powerhead Lift Ring) P/N. 3T9-72212-0	Flywheel Puller Kit P/N. 3T1-72211-0		Piston Pin Tool P/N. 345-72215-0
Used to hook power unit when hanging	Removing or attaching flywheel		Removing piston pin
4 	5 	6 	7 
Piston Ring Tool P/N. 353-72249-0	Universal Puller Plate P/N. 3AC-99750-0	Roller Setting Piece P/N. 3LC-72216-0	Piston Pin Tool P/N. 3LC-72215-0
Removing or attaching piston rings	Removing main bearing	Installing roller bearing	Installing piston pin

2. Parts Layout

Engine

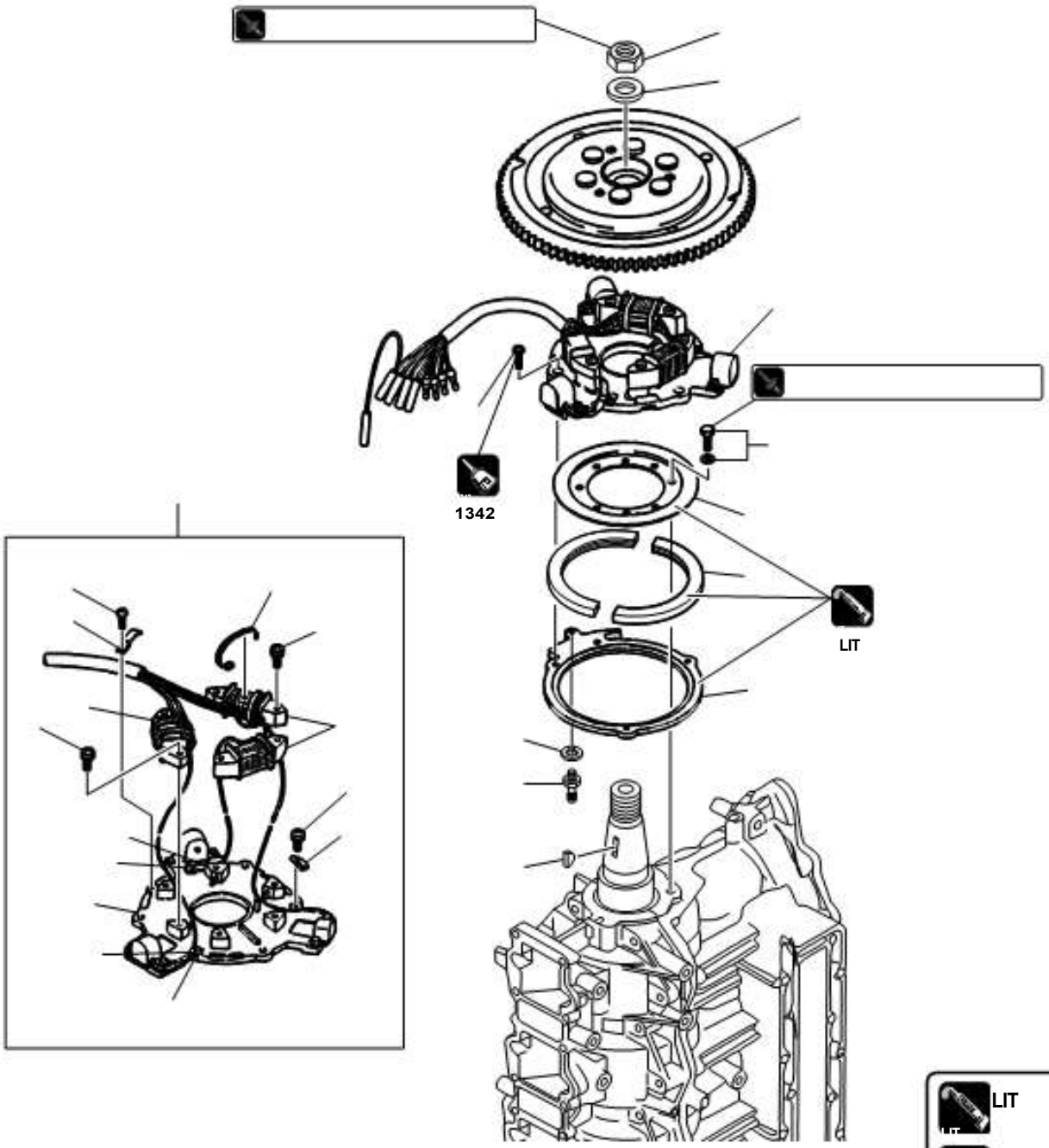


Ref. No.	Description	Q'ty	Remarks
1	Power Unit	1	
2	Recoil Starter Assembly	1	
3	Bolt	3	
4	Washer	3	
5	Engine Basement Gasket	1	[redacted]
6	Dowel Pin	2	

Ref. No.	Description	Q'ty	Remarks
7	Bolt	6	
8	Washer	6	
9	Apron	1	
10	Seal	1	
11	Screw	1	
12	Nylon Nut	1	(5-P0.8)

Magneto

P/L Fig. 8

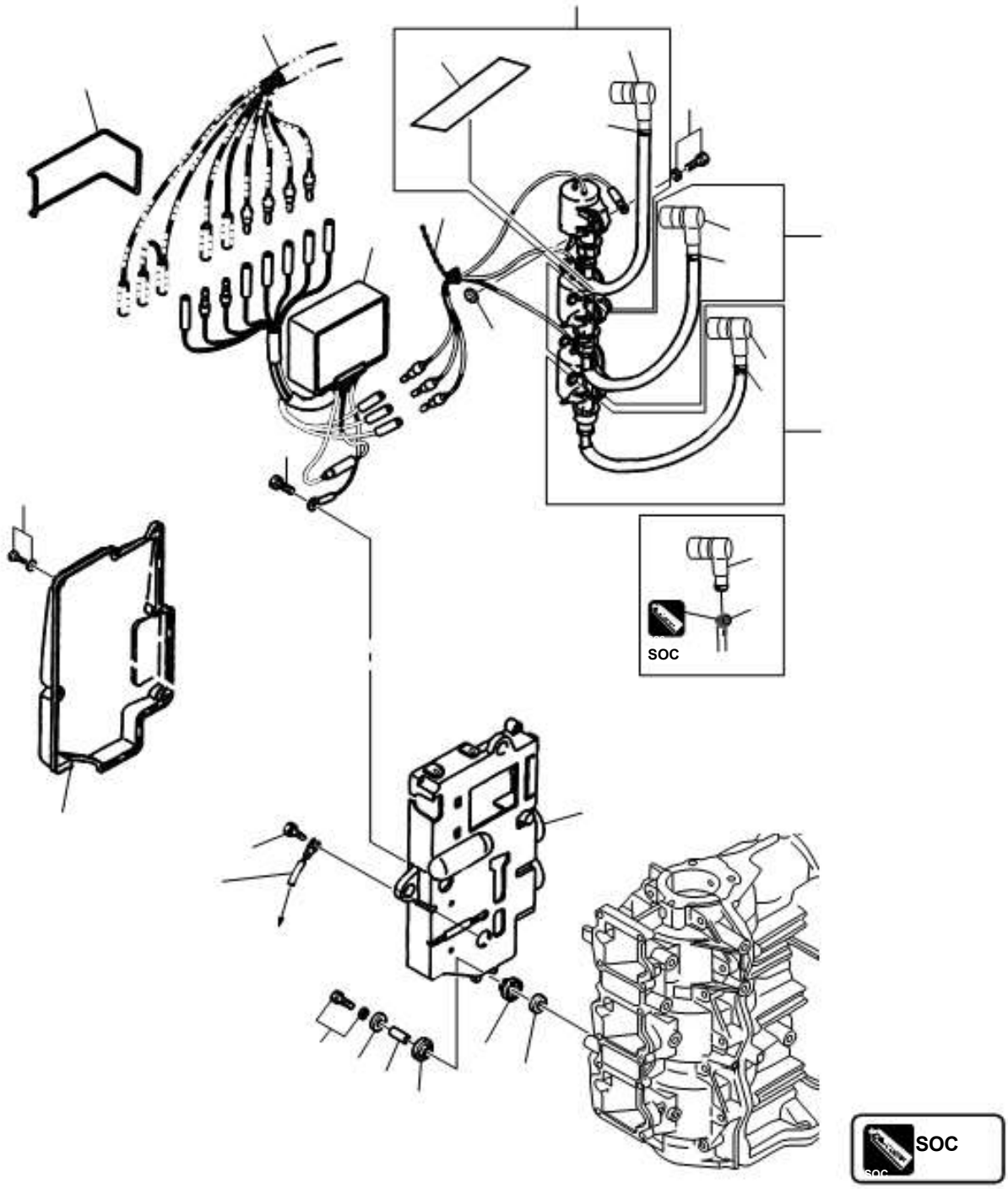


Ref. No.	Description	Q'ty	Remarks
1	Flywheel W/Ring Gear	1	F4T405-72
2	Coil Plate Ass'y W/Alternator	1	
3	Pulsar Coil & Plate Ass'y	1	
4	Pulsar Holder	1	
5	Exciter Coil	1	
6	Screw	6	
7	Alternator Ass'y	1	
8	Holder	1	
9	Screw	2	
10	Clamp	2	
11	Screw	2	

Ref. No.	Description	Q'ty	Remarks
12	Band	3	
13	Screw	3	
14	Key	1	
15	Nut 18-P1.5	1	
16	Washer 19-34-3	1	
17	Guide Plate	1	
18	Guide Plate Cover	2	
19	Setting Ring	1	
20	Ball Joint	1	
21	Spring Washer	1	
22	Bolt	3	

Electric Parts

P/L Fig. 10

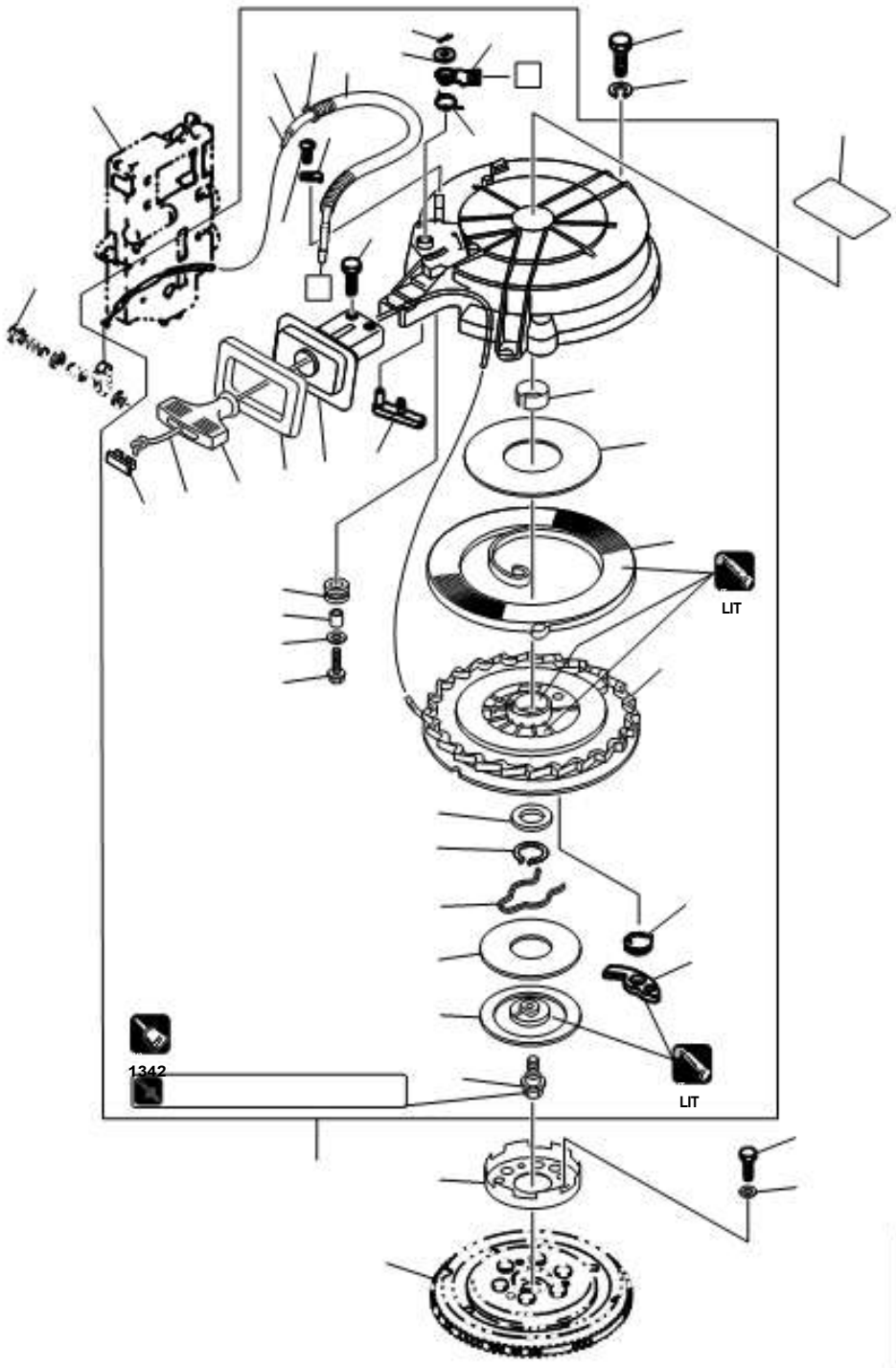


Ref. No.	Description	Q'ty	Remarks
1	Ignition Coil Ass'y W/Label	1	F6T530
2	Plug Cap	1	
3	Caution Decal (B)	1	
4	Ignition Coil W-Cap	2	F6T530
5	Band	3	
6	Plug Cap Terminal	3	
7	Plug Cap	1	
8	Bolt	3	
9	Gasket 6.2-11-1	3	
10	Lead Wire Band	1	
11	CD Unit	1	F8T20572
12	O-Ring 3.1-94.4	1	

Ref. No.	Description	Q'ty	Remarks
13	Bracket	1	
14	Cover	1	
15	Screw	5	
16	Mount 8.5-14-2.5	3	
17	Rubber Mount 8.5-14-2.5	3	
18	Spacer 6.2-9-15.7	3	
19	Bolt	3	
20	Washer 6.5-21-1		6
21	Ground Cable L=270	1	
22	Bolt	1	
23	Bolt	2	

Recoil Starter

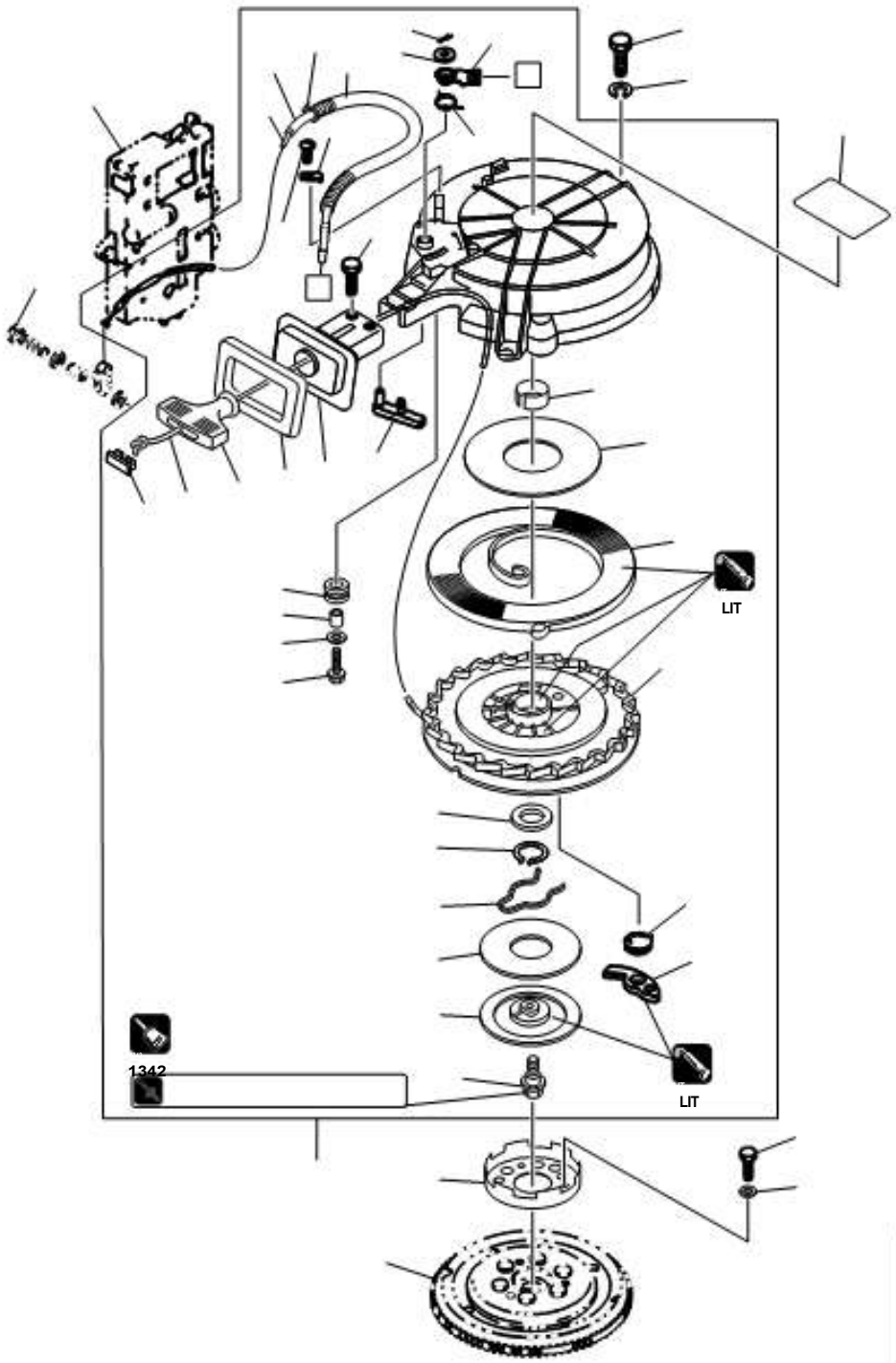
P/L Fig. 7



Ref. No.	Description	Q'ty	Remarks
1	Recoil Starter Ass'y	1	
2	Reel Ass'y	1	
3	Ratchet	1	
4	Starter Spring	1	
5	Friction Spring	1	
6	Return Spring	1	
7	Friction Plate	1	
8	Bushing	1	
9	Washer	1	
10	Sliding Plate	1	

Ref. No.	Description	Q'ty	Remarks
11	Sliding Plate	1	
12	C-Ring	1	
13	Bolt	3	
14	Starter Rope ø6-2250	1	
15	Starter Handle	1	
16	Rope Anchor	1	
17	Rope Guide	1	
18	Starter Lock	1	
19	Starter Lock Cam	1	
20	Starter Lock Spring	1	

P/L Fig. 7

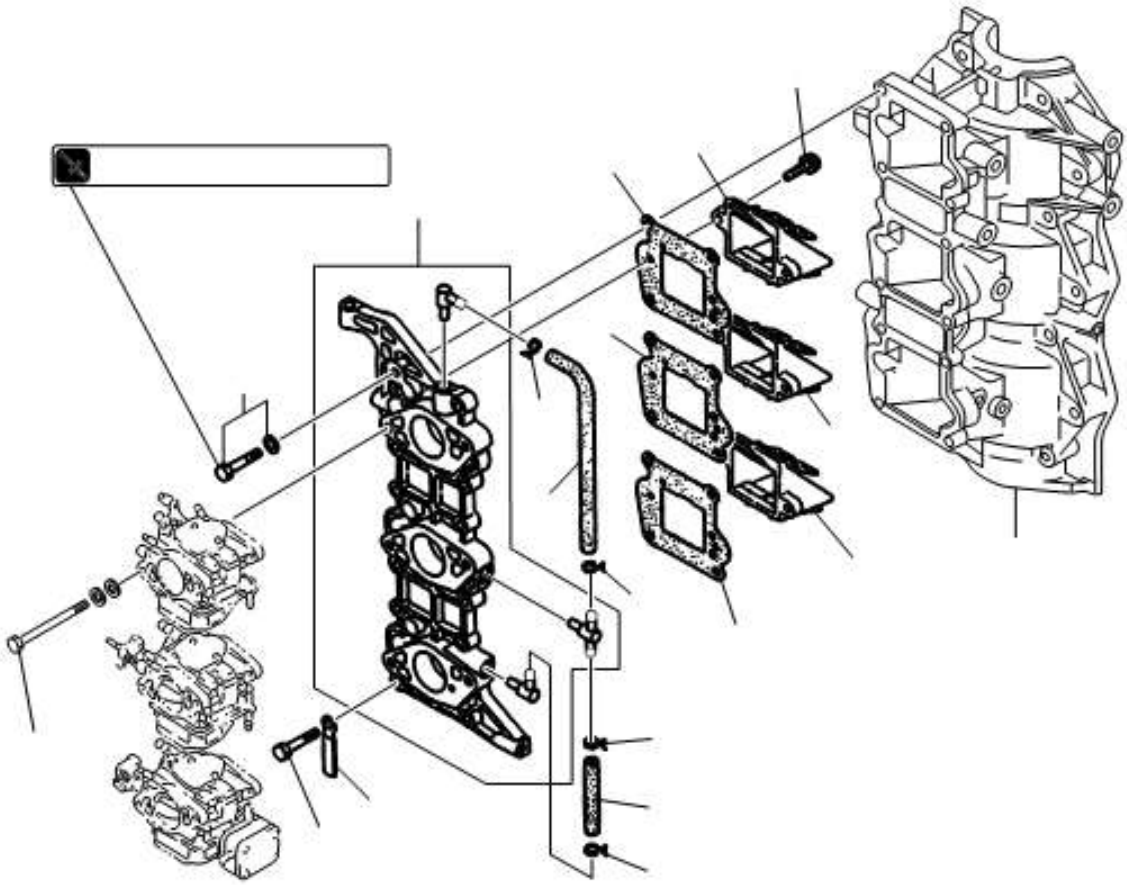


Ref. No.	Description	Q'ty	Remarks
21	Washer	1	
22	Split Pin	1	
23	Starter Lock Wire	1	
24	Cable Holder	1	
25	Screw	1	
26	Pipe	1	
27	Starter Roller	1	
28	Bolt	1	
29	Washer	1	
30	Collar	1	

Ref. No.	Description	Q'ty	Remarks
31	Starter Seal	1	
32	Protector	1	
33	Band	1	
34	Starter Pulley	1	
35	Bolt	3	
36	Washer	3	
37	Bolt	3	
38	Washer	3	

Intake Manifold · Reed Valve

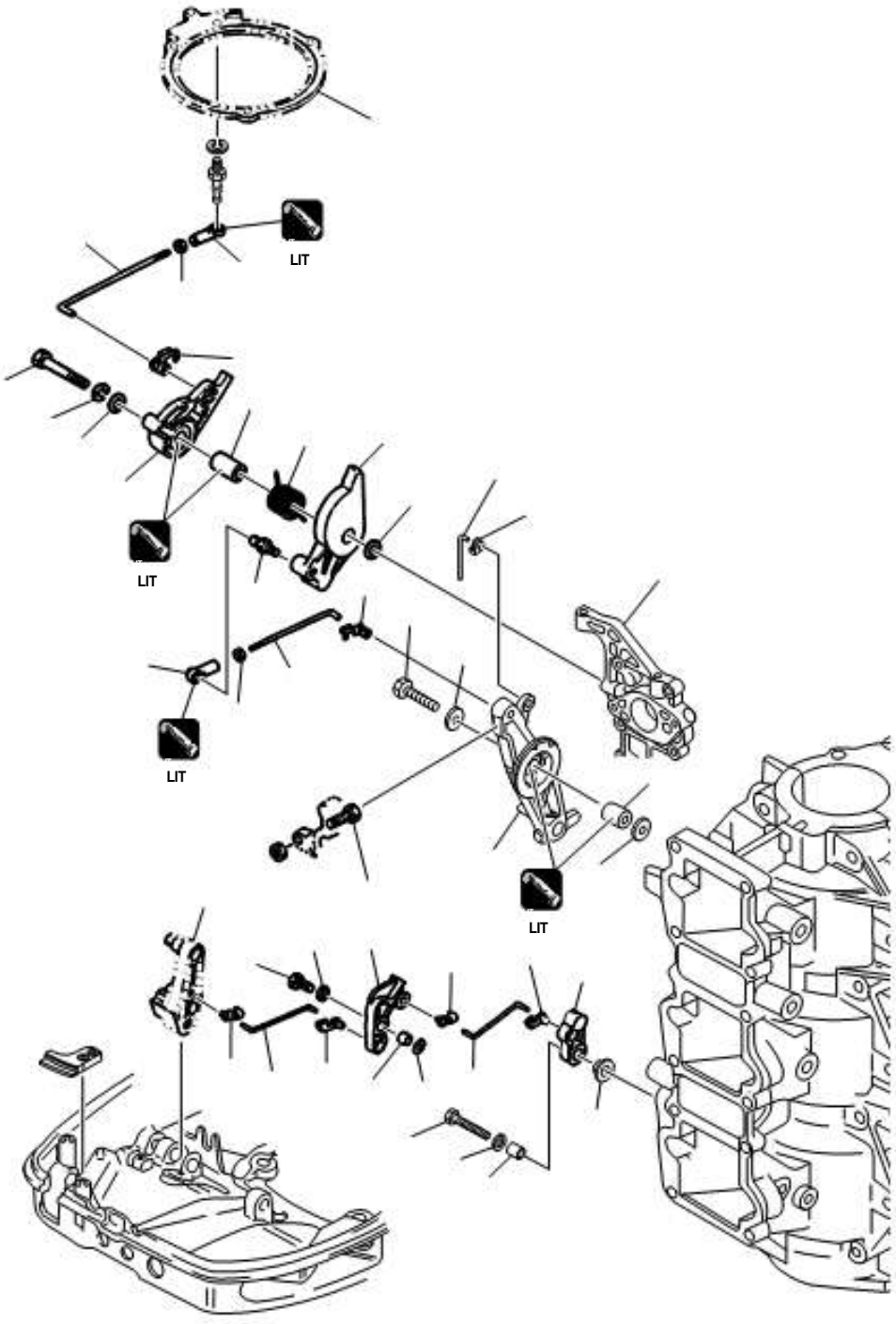
P/L Fig. 3



Ref. No.	Description	Q'ty	Remarks
1	Intake Manifold Ass'y	1	
2	Intake Manifold Gasket	3	Do not reuse.
3	Bolt	11	
4	Bolt	1	
5	Clamp 6.5-47.5P	1	
6	Hose	1	98AB-501000
7	Hose	1	98AB-501000
8	Clip ø10	4	
9	Reed Valve Ass'y	3	
10	Screw	6	

Throttle

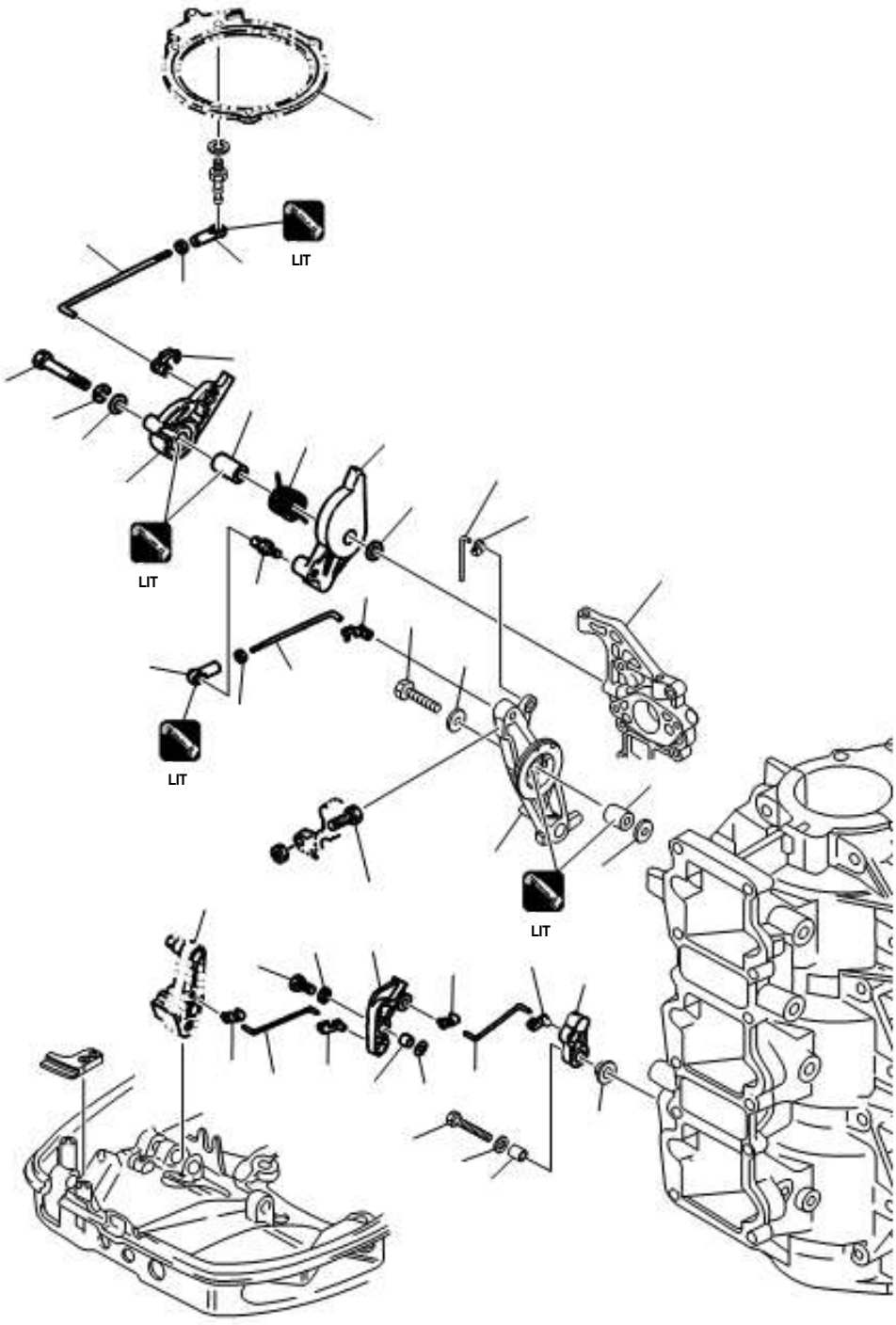
P/L Fig. 6



Ref. No.	Description	Q'ty	Remarks
1	Advancer Arm	1	
2	Bolt	1	
3	Washer 6.5-21-1	2	
4	Collar 6.2-12-17	1	
5	Rod Snap 5-3	2	
6	Throttle Cam	1	
7	Spring	1	
8	Advancer Lever	1	
9	Bolt	1	
10	Washer 6-16-1.5	2	
11	Spring Washer	1	

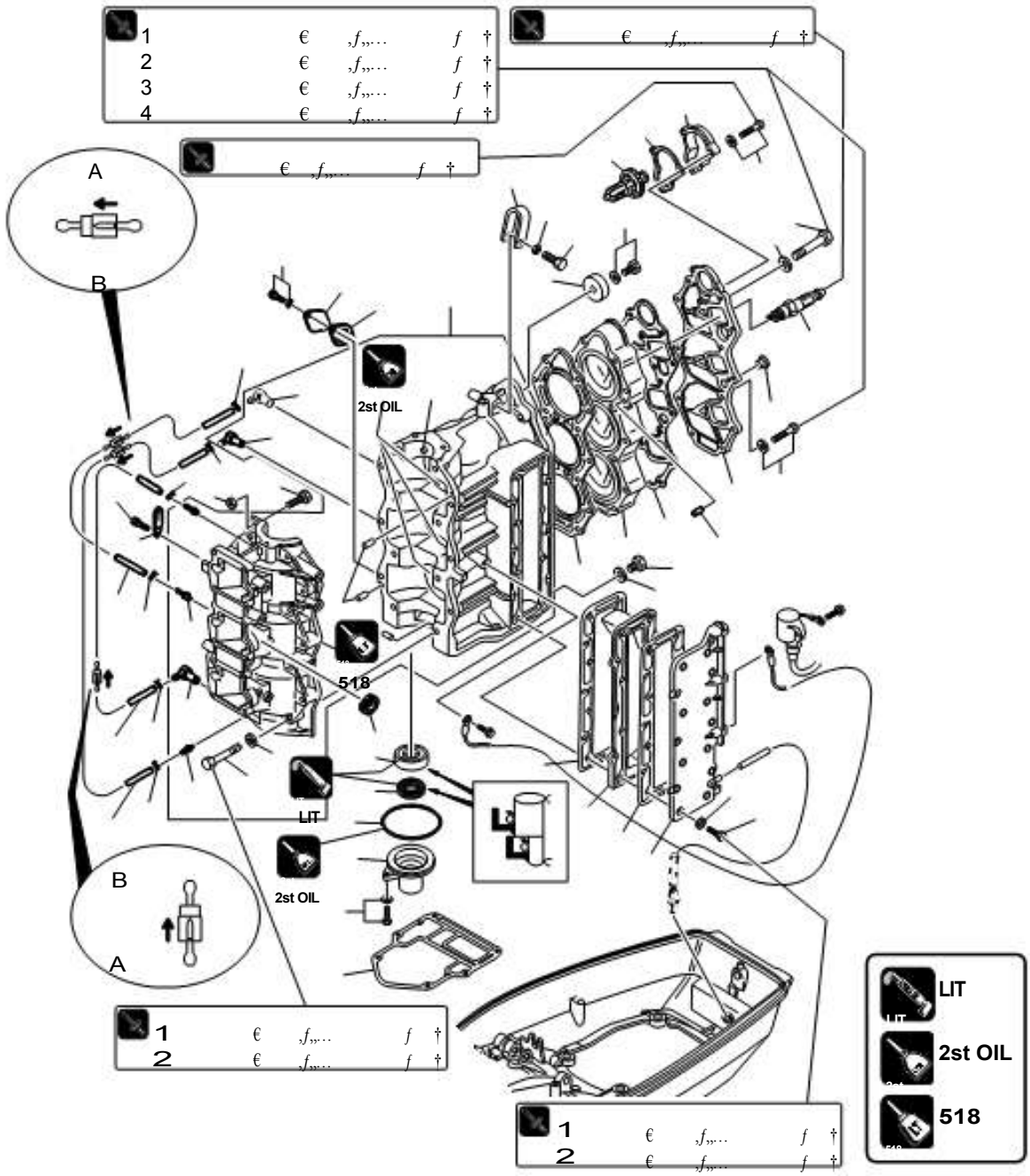
Ref. No.	Description	Q'ty	Remarks
12	Collar 6.5-10.5-26.3	1	
13	Ball Joint	1	
14	Rod 5-90	1	
15	Ball Joint Connector	1	
16	Throttle Rod 5-105	1	
17	Ball Joint Connector	1	
18	Nut	2	
19	Rod Snap 5-3	1	
20	Throttle Limiter Arm	1	
21	Bolt	1	
22	Washer	2	

P/L Fig. 6



Ref. No.	Description	Q'ty	Remarks
23	Collar 6.2-9-9.3	1	
24	Throttle Limiter Rod 3.5-56	1	
25	Rod Snap 3.5-4	2	
26	Throttle Limiter Rod 3.5-56	1	
27	Rod Snap 3.5-4	2	
28	Starter Lock Arm	1	
29	Bolt	1	
30	Washer	2	
31	Collar 6.2-9-9.3	1	

P/L Fig. 1

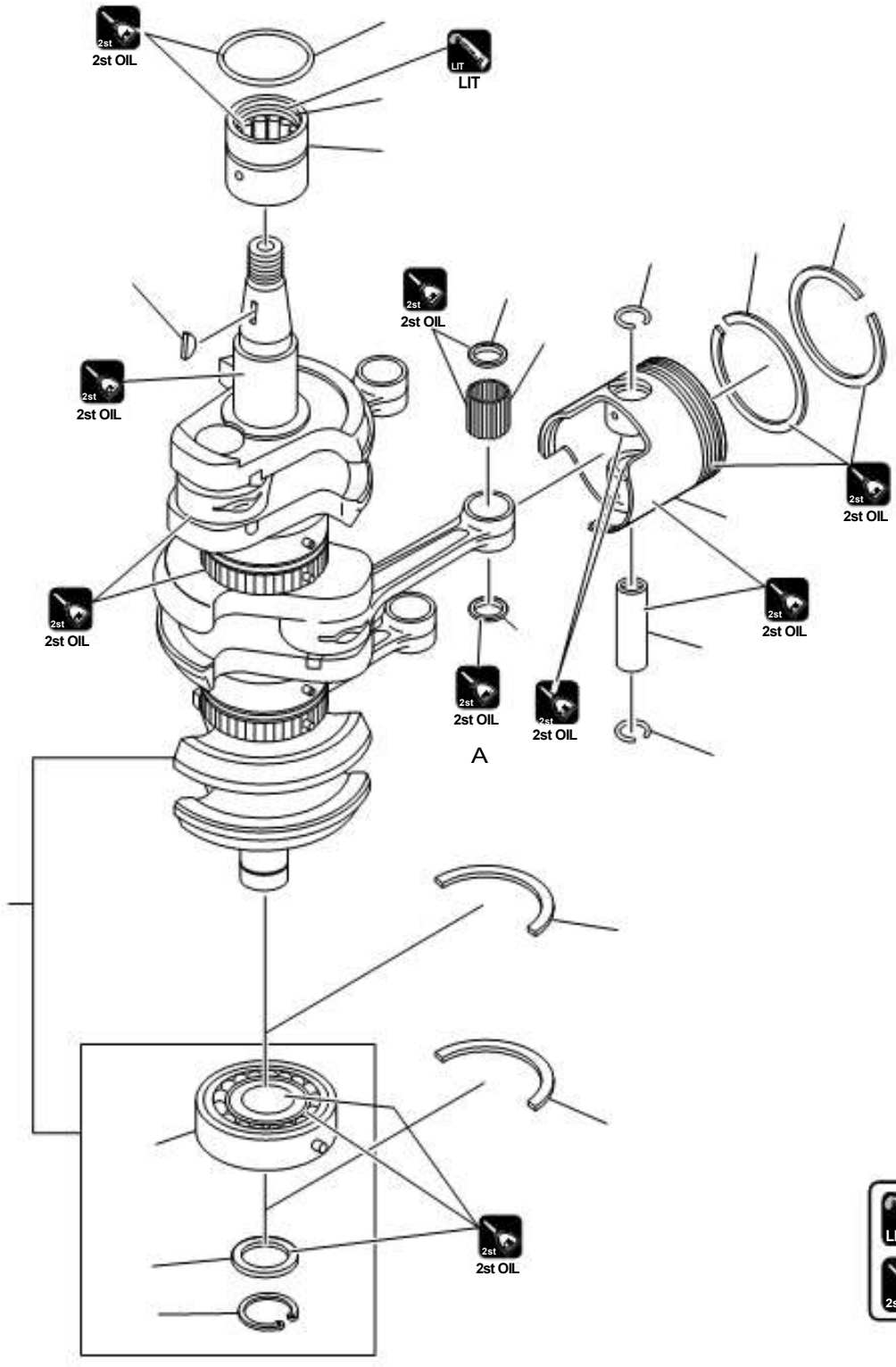


Ref. No.	Description	Q'ty	Remarks
27	Exhaust Cover (Inner)	1	
28	Exhaust Cover Gasket	2	
29	Bolt	14	
30	Washer	14	
31	Bolt	1	
32	Gasket 8.1-15-1	1	
33	Anode	1	
34	Bolt	1	
35	Cover	1	
36	Gasket	1	
37	Bolt	2	
38	Hose	1	98AL-401000
39	Hose	1	98AL-401000
40	Hose	1	98AL-401000
41	Check Valve	3	

Ref. No.	Description	Q'ty	Remarks
42	Clip	3	
43	Clip	3	
44	Spark Plug (B8HS10)	3	
45	Clamp 6.5-47.5P	1	
46	Bolt	1	
47	Bolt	1	
48	Nut	1	
49	Engine Basement Gasket	1	
50	Crankcase Head	1	
51	O-Ring 1.7-59	1	
52	Oil Seal 25-40-8	1	
53	Oil Seal 16-28-7	1	
54	Bolt	2	

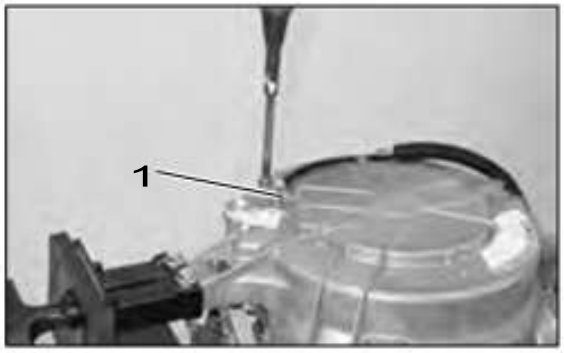
Piston & Crank Shaft

P/L Fig. 2



Ref. No.	Description	Q'ty	Remarks
1	Crankshaft Ass'y W/Gear	1	
2	Main Bearing 6305	1	Do not reuse.
3	C-Ring d=25	1	Do not reuse.
4	Washer	1	
5-1	Piston	3	STD
5-2	Piston (0.5 O/S)	3	OPT
6-1	Piston Ring	3	STD 1st
6-2	Piston Ring (0.5 O/S)	3	OPT 1st
7-1	Piston Ring	3	STD 2nd

Ref. No.	Description	Q'ty	Remarks
7-2	Piston Ring (0.5 O/S)	3	OPT 2nd
8	Piston Pin	3	
9	Needle Roller Bearing	75	
10	Small End Bearing Washer	6	
11	Piston Pin Clip	6	
12	Main Bearing	1	
13	Oil Seal 32-42-6	1	Do not reuse.
14	O-Ring 2.4-39.7	1	Do not reuse.
15	Thrust Plate	2	



3. Inspection Items

1) Removing Power Unit

1. Remove recoil starter.

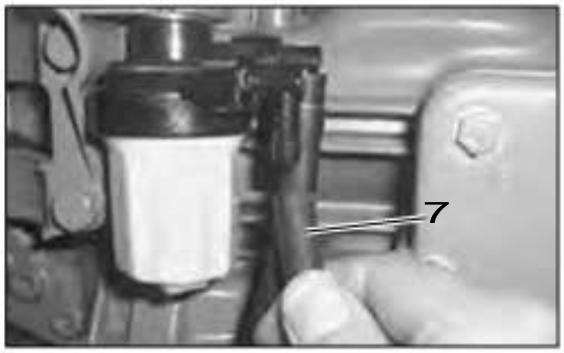
Disconnect starter lock cable 1.

2. Remove throttle cable 2, and shift link rod 3.

3. Remove electric box cover and disconnect stop switch wire 4.

4. Disconnect ground wire 5 from bottom cowl.

5. Disconnect cooling water hose 6 (exhaust cover - water check port)



6. Disconnect fuel hose 7 from fuel filter (fuel connector - fuel filter)

7. Remove choke rod 8.

8. Remove apron 9 and loosen engine mount bolts, then remove them.

9. Carefully pry power unit by using steel pipe 0 to remove power unit.

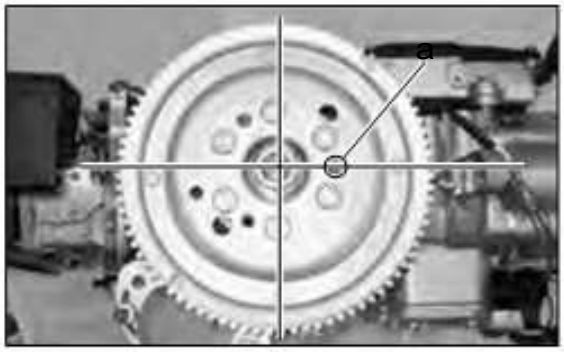
Easy to remove, when the part where the fulcrum and action point are close is raised.

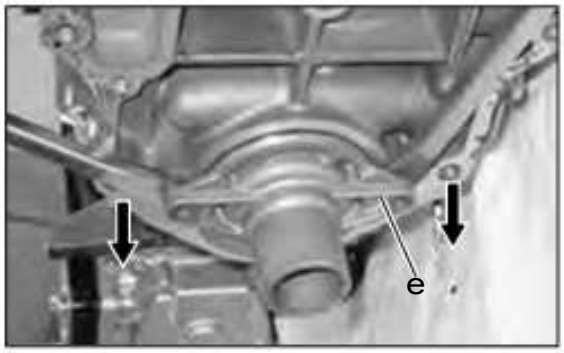
10. Loosen starter pully mounting bolts, and then remove starter pully q.

11. Hoist power unit by using eye bolt w.

Eye Bolt :
P/N. 3T9-72212-0

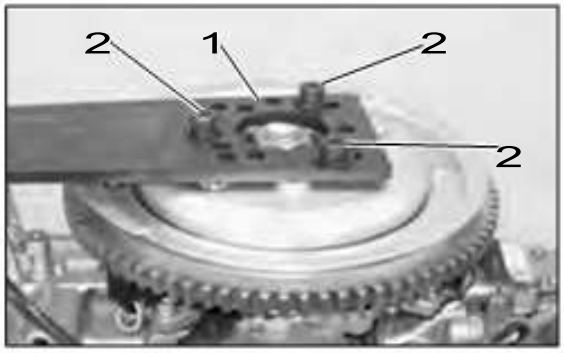
· Turn the flywheel to adjust, in order for installation position a of the eyebolt to be center.
· Hoist power unit taking care not to catch wires and hoses.





12. Remove two crank case bolts. Remove crank case head e.

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



2) Removing Flywheel

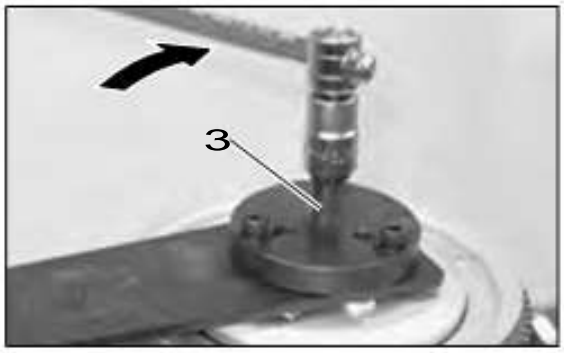
1. Attach flywheel puller kit 1 to flywheel.

CAUTION

Use 25mm bolts 2 for removing. Otherwise coil may be damaged and can short.

Fly Wheel Puller Kit 1 **:** P/N. 3T1-72211-0

2. Loosen flywheel nut and remove it.



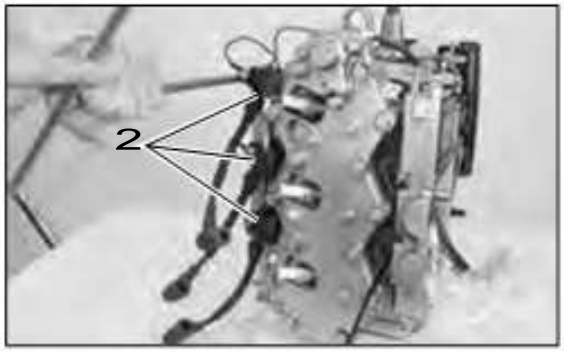
3. Remove flywheel by using pressing bolt 3.

· Turn center bolt clockwise to remove flywheel.
· Remove flywheel installing with fly wheel puller kit 1.

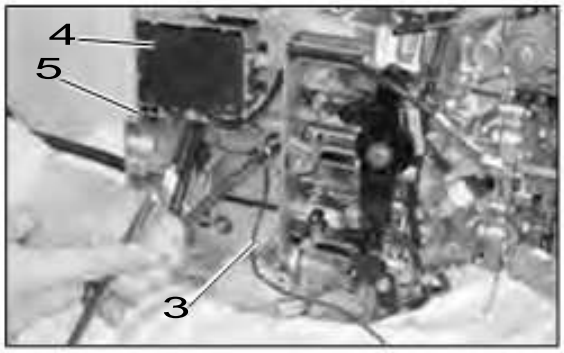
3) Removing Electric Parts

1. Remove coil plate ass'y 1 from power unit.

D isconnect coil wire and ignition coil wire from CD unit.

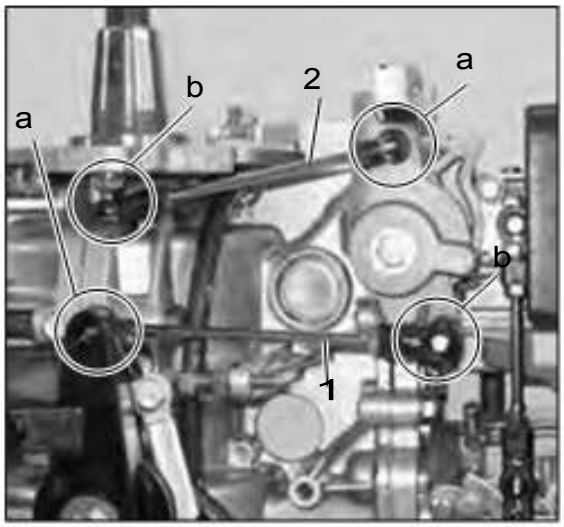


2. Remove all spark plug caps, ignition coils 2 and ground wires.



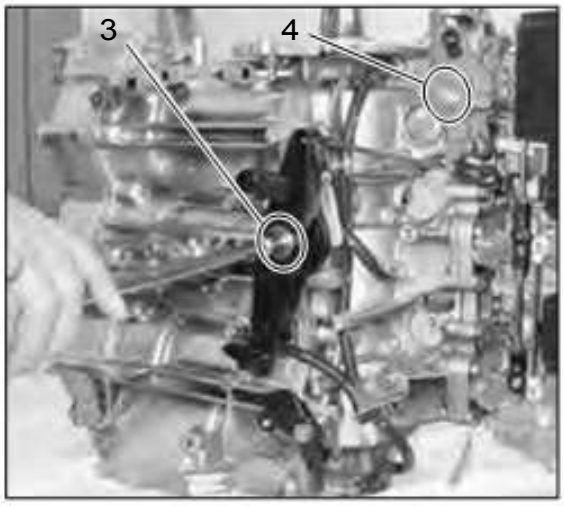
3. Disconnect ground wire 3 and CD unit 4, then remove electrical box 5.

4) Removing Throttle Link



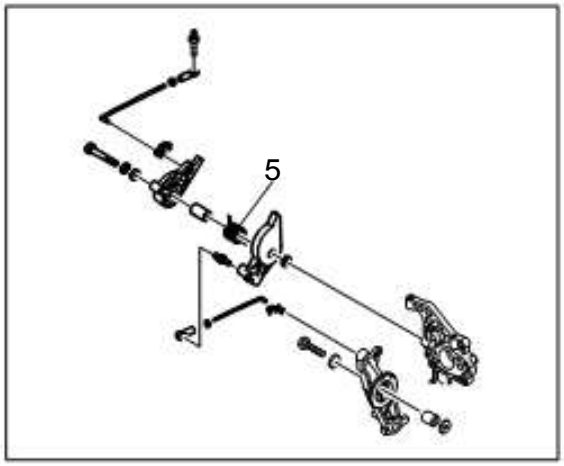
1. Remove throttle link rod 1, 2.

· Remove each link rod at the rod snap side a first.
· When removing each link rod at the ball joint side b, be careful not to apply force to the arm.



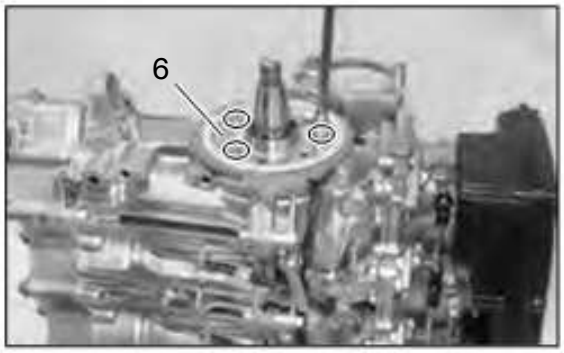
2. Loosen bolts, and then remove advancer arm 3 and advancer lever 4.

· Check ball joint cap, rod snap for wear and damage link rod for bend.
· After removal, use rubber band on bolt to keep assembly together.

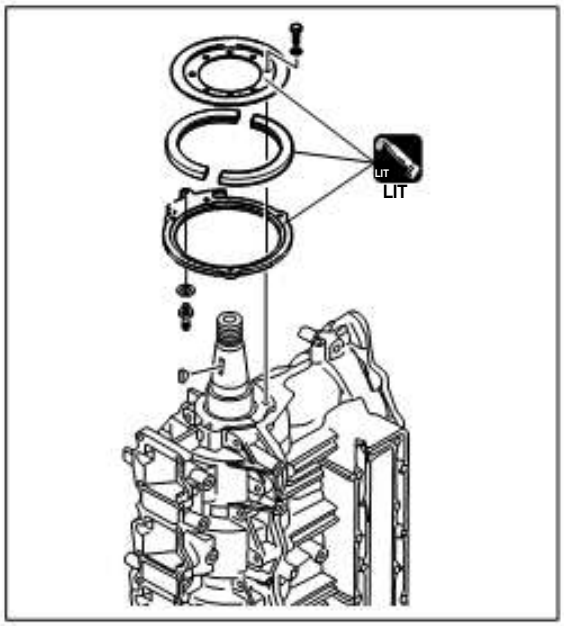


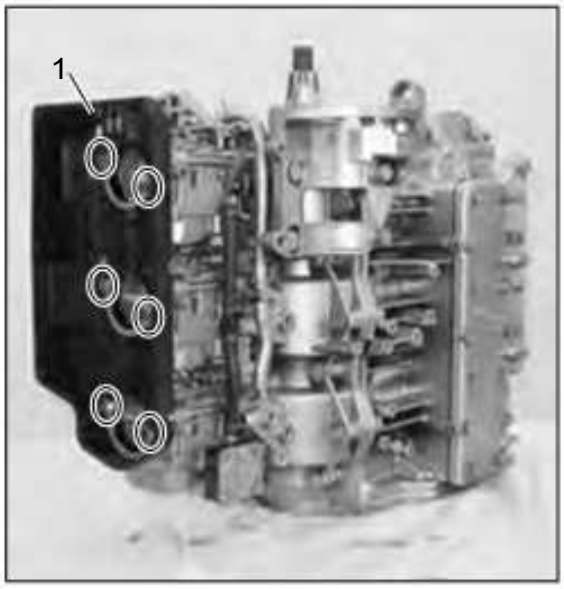
3. Disassemble advancer lever if necessary.

Check spring 5 for wear and damage.



4. Remove coil bracket plate 6 mounting bolt and remove them.

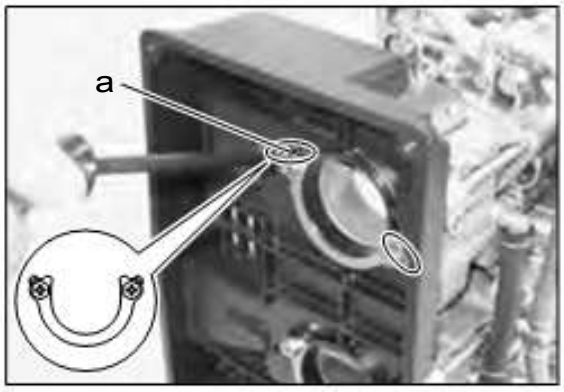




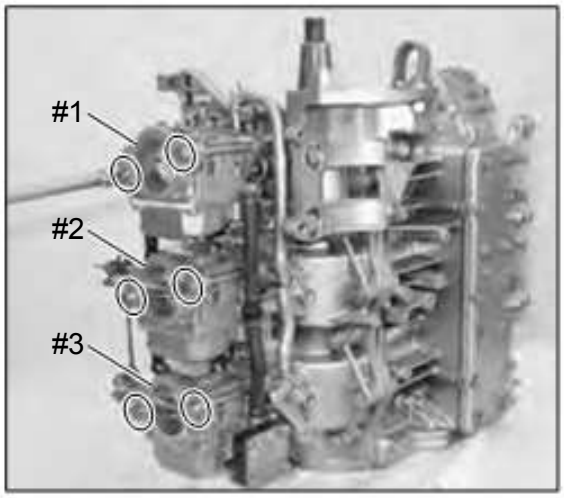
5) Removing Intake Silencer and Carburetors

1. Remove intake silencer cover and loosen mounting bolts, then remove intake silencer 1.

· Pry the tab a of lock plate as shown.
· When reuse intake silencer mounting bolts, apply Three Bond's thread lock # 1342.

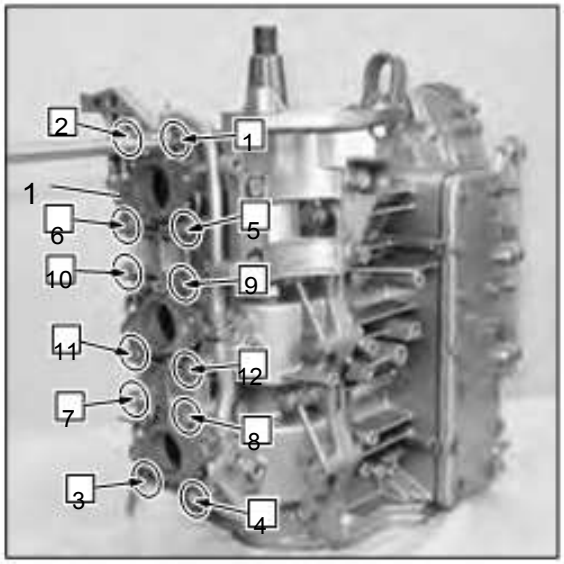


*Do not reuse lock plate.



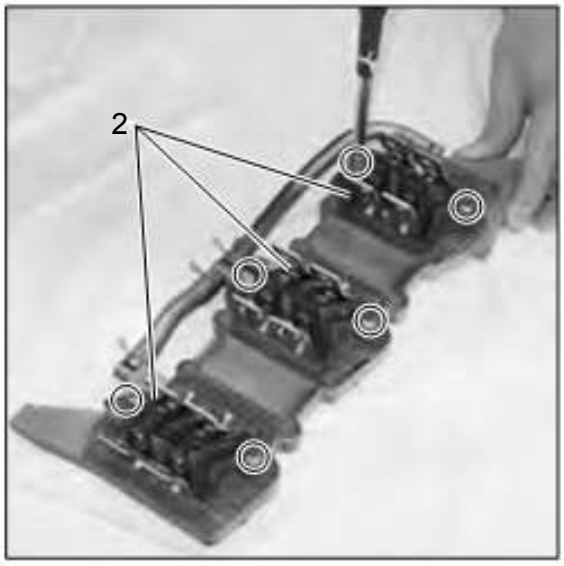
2. Loosen carburetor mounting bolts and remove the carburetors.

Loosen carburetor mounting bolts from #3 and #2 to #1.

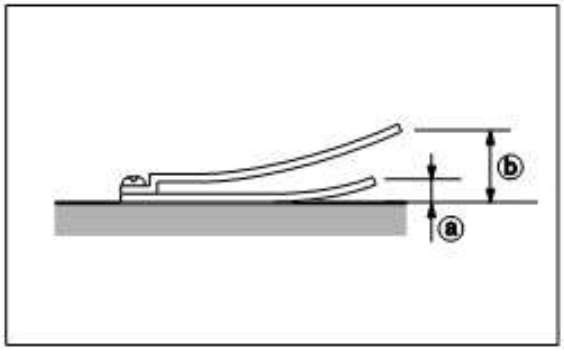


6) Removing Intake Manifold and Reed valves

1. Loosen intake manifold mounting bolts and remove intake manifold 1 in the order shown.



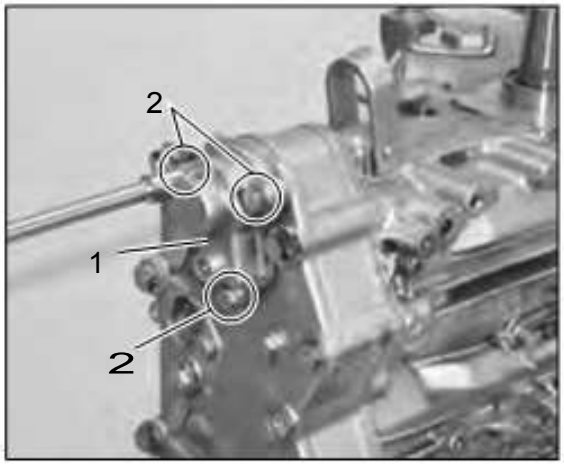
2. Loosen reed valve mounting screws, remove them, and remove reed valve ass'y 2.

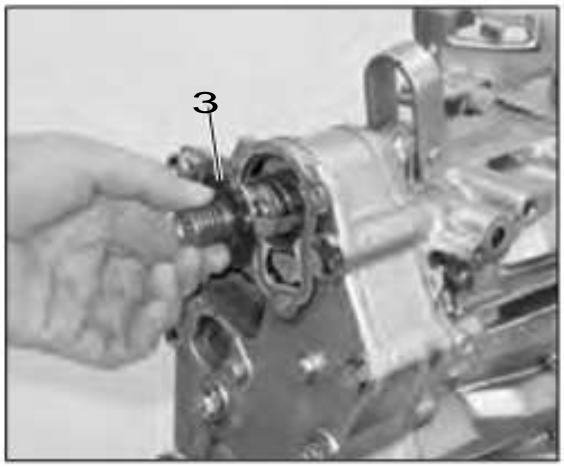


7) Inspection of Reed Valve Ass'y

1. 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 b **:**
9.3 - 9.5 mm (0.366 - 0.374 in)
Reed Valve Bend a **:**
0.4 mm (0.016 in)

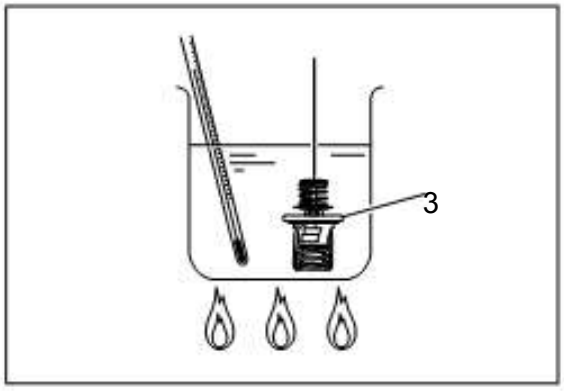




8) Removing Thermostat and Engine Anode

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.

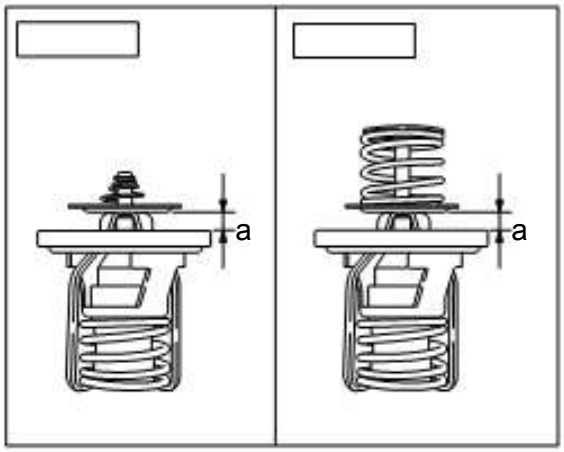


Inspection of Thermostat

1) Put thermostat 3 in the vessel containing water, heat it, and measure the temperature at which the thermostat starts to open.

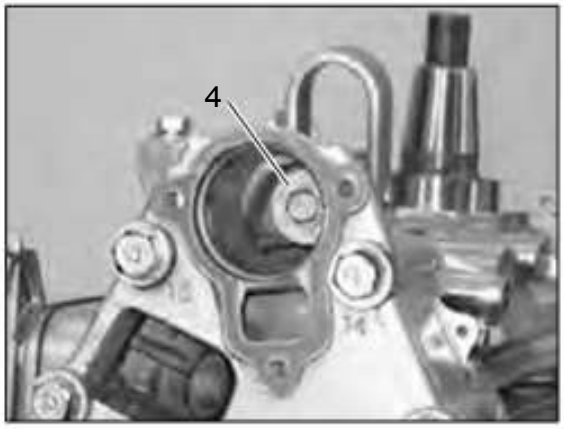
Valve Opening Temperature :
58.5 - 61.5˚C (136.5 - 143.5˚F)
Valve Full Open Temperature :
73.5 - 76.5˚C (163.5 - 170.5˚F)

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



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

Water Temperature	Valve Lift a
75˚C (167˚F)	4.5mm (0.177in) or over



2. Remove engine anode 4 and check it.

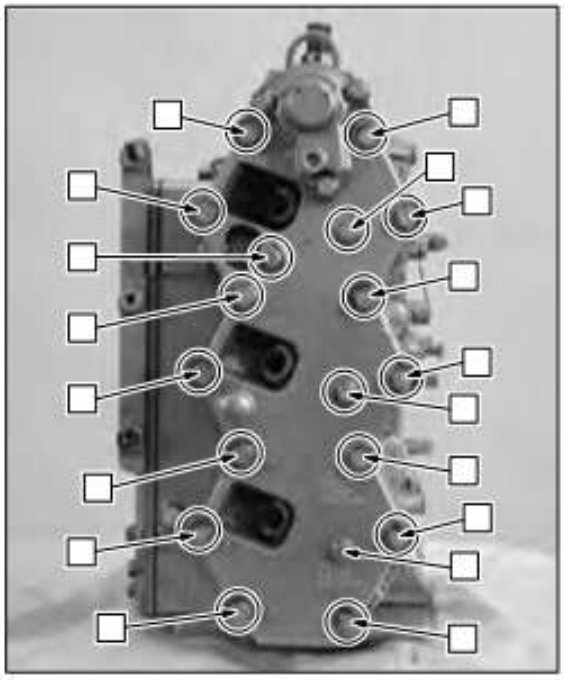
Replace it if it is reduced to 2/3 of the original size.

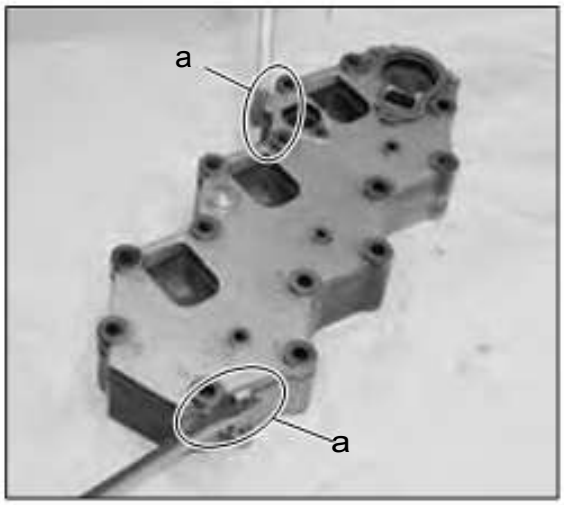
9) Removing Cylinder Head / Head Cover

1. Loosen cylinder head / head cover mounting bolts in the order shown, remove them, and remove cylinder head / head cover.

When loosening M8 bolts, loosen in descending order of the numbers shown embossed on the head cover.

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





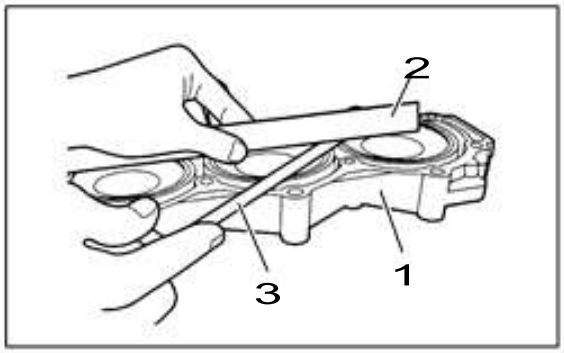
· Pry the gap a of the cover at two grooves one by one by using a bladed screw driver.
· The cover can be removed easier if parts cleaning agent is applied in the gap one by one from the top one. Be careful to pry the gap evenly, or the cover may be damaged or warped.

10) 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.

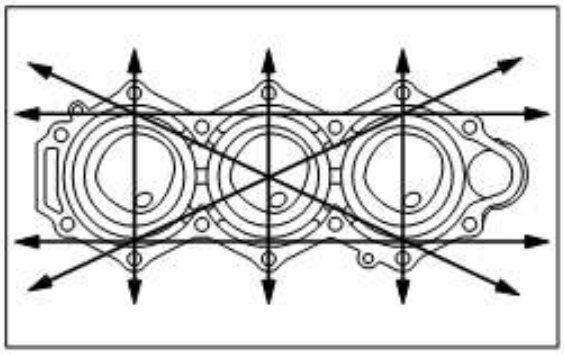
When cleaning mating surfaces of cylinder head by using a means such as a scraper or wire brush, be careful not to scratch the surfaces.

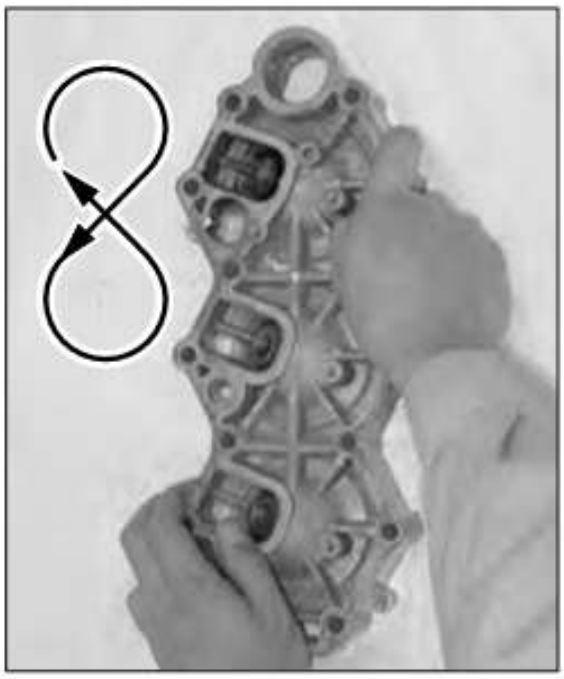


3. Use straight edge 2 and thickness gauge 3 to check distortion of cylinder head 1 in the directions shown. Repair or replace if the distortion is over the specified limit.

Thickness Gauge :
Commercially Available Item

Functional Limit :
0.03 mm (0.00118 in)



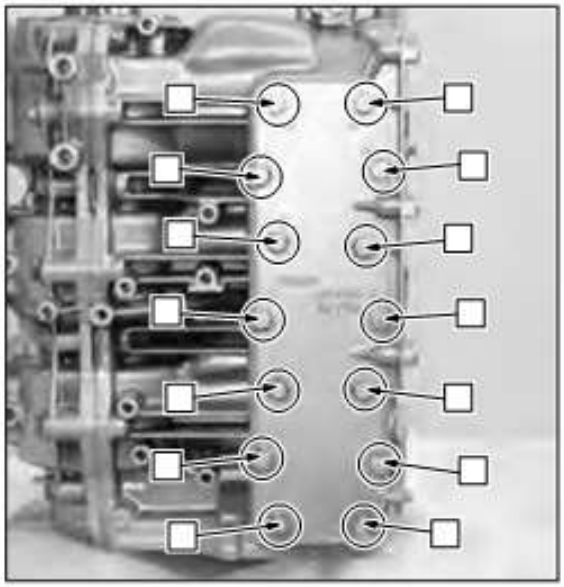


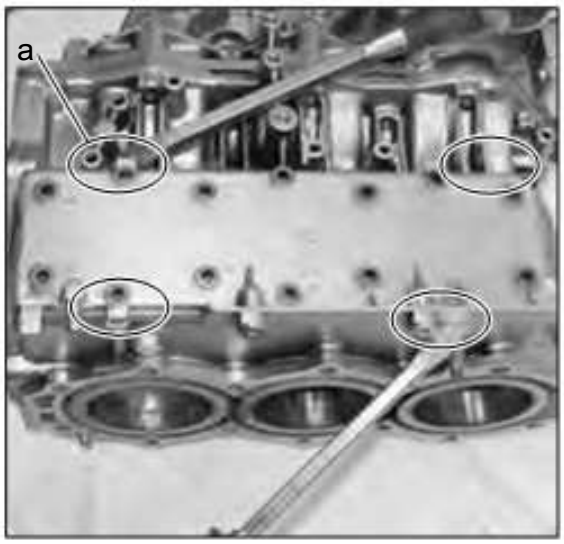
4. If the distortion is over the limit, lap the component by using a sheet of sand paper #240 - #400 placed on a surface plate or thick place glass and moving it on the paper drawing the letter “8" on it. Finish by using sand paper #600 - #1000.

11) 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.



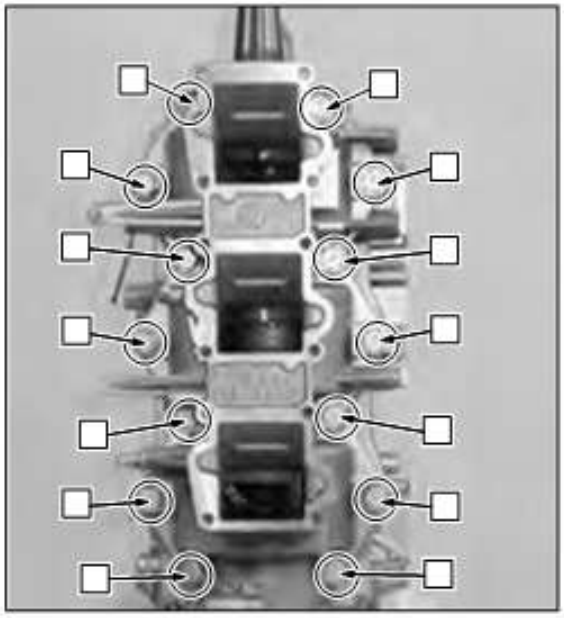


· Pry the gap of the cover at four grooves a one by one by using a bladed screw driver.
· The cover can be removed easier if parts cleaning agent is applied in the gap one by one from the top one. Be careful to pry the gap evenly, or the cover may be damaged or warped.

12) 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

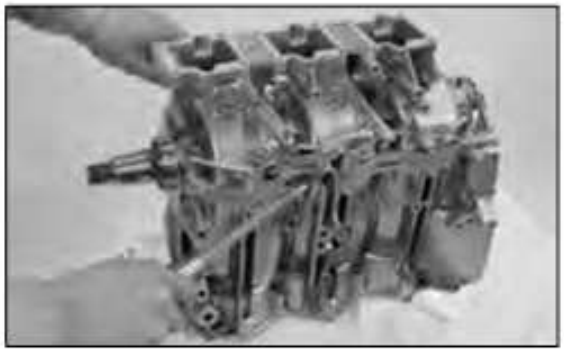
Remove clogs and debris from cooling water passage of exhaust cover.



13) Removing Crank Case

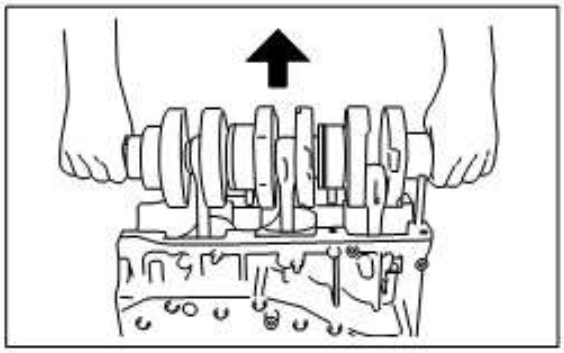
1. Remove shift arm, starter motor bracket and disconnect recirculation hoses.

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 ø13.5mm (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.

14) Removing Pistons

CAUTION

Make sure that the piston, piston pin and needle bearing in their original combination.

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

Remove another piston pin clip. Be careful not to damage the piston pin hole.

2. Remove piston pin 1.

Use piston pin tool if the pin cannot be removed with the pliers. Put the piston pin tool on the piston pin and tap is lightly taking care not to apply force to the connecting rod. Do not tap small end washer.

· Check needle bearing quantity. (1set: 25pieces)

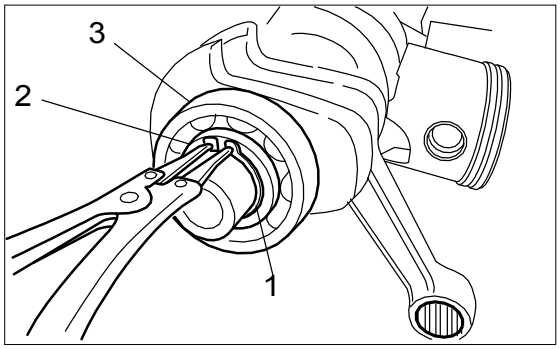
Piston Pin Tool 2 **:**
P/N. 345-72215-0

3. Remove piston rings 3.
Use piston ring remover.

4

3

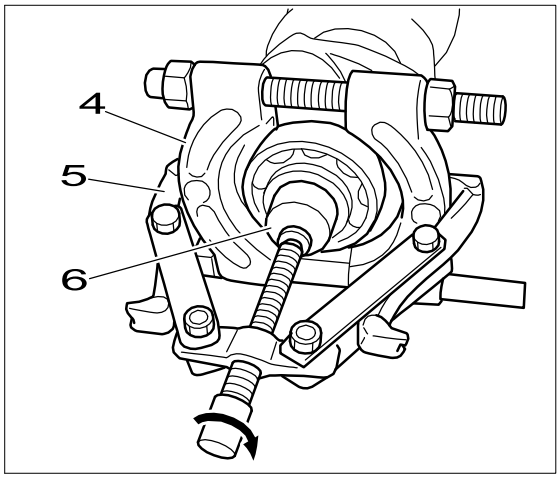
Piston Ring Tool 4 **:**
P/N. 353-72249-0

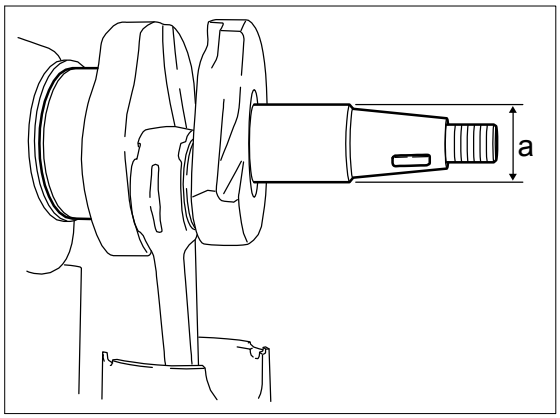


15) Disassembly of Crank Shaft

1. Remove "C" ring 1 and pull out washer 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 **:**

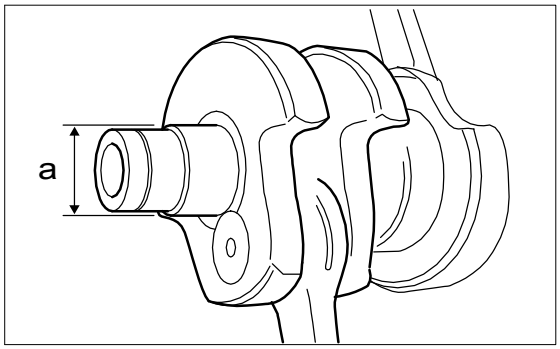


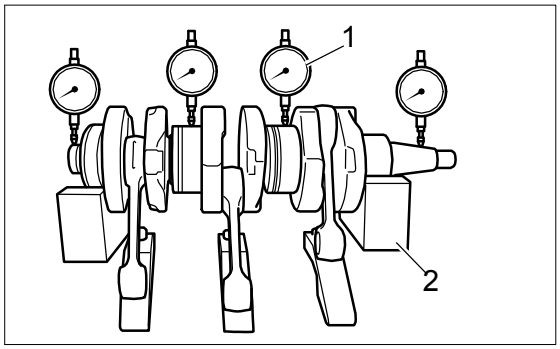


16) Inspection of Crank Shaft

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 a **:**
#1, Top ø40.0 mm (1.574 in)
#3, Bottom ø40.0 mm (1.574 in)





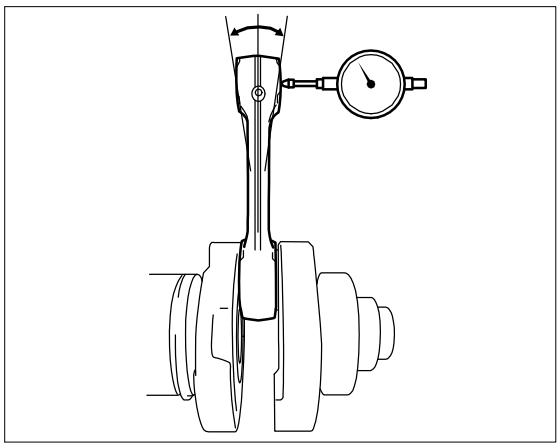
2. · Check if that main bearing rotates smoothly. Replace crank shaft ass'y if necessary.

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

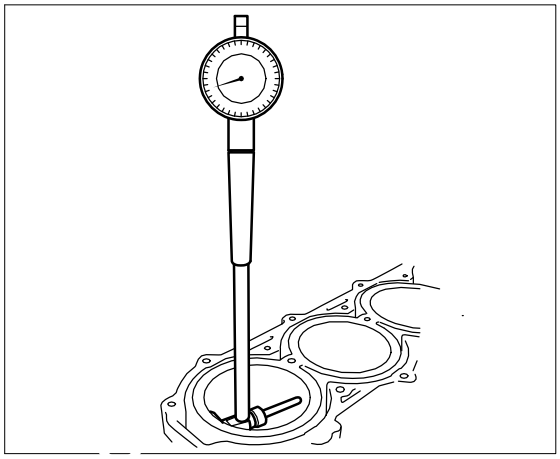
Dial Gauge 1 **: Commercially Available Item**
V Block 2 : Commercially Available Item

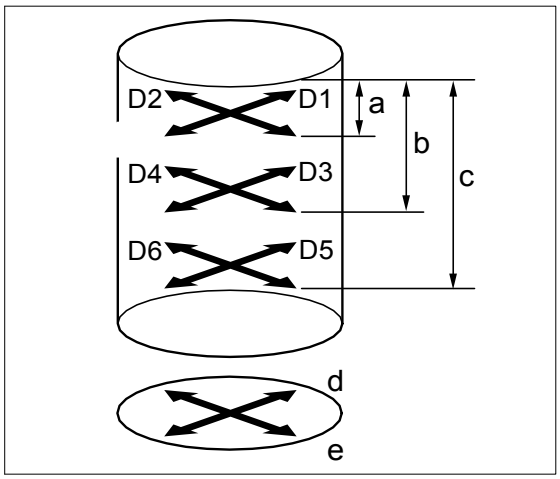
Crank Shaft Deflection Limit :
0.05 mm (0.0020 in)

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



Connecting Rod Deflection Limit :
2.0 mm (0.0800 in)





a 10mm (0.39 in)
b 30mm (1.18 in)
c 80mm (3.15 in)
d Crank Shaft Direction
e Crank Web Direction

17) Inspection of Engine Parts

1. Inspection of Cylinder

1) Measure cylinder inner diameters (D_1 - D_6) at a, b and c.

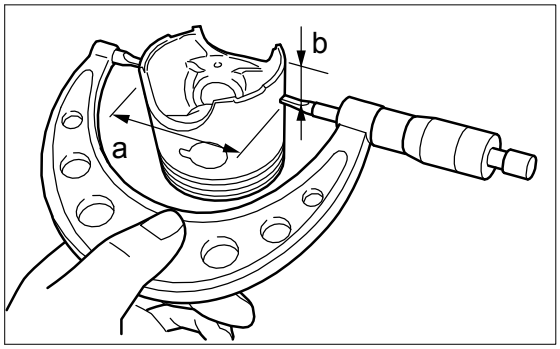
If any of the diameter is over the limit, replace the cylinder or bore the liner to make it compatible with an oversize piston.

Cylinder Inner Diameters (D_1 - D_6) : Standard Value
68.00 mm (2.677 in)
Oversize Piston :
68.50 mm (2.697 in)

Functional Limit :
68.06 mm (2.68 in)
Oversize Piston :
68.56 mm (2.699 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.



18) 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 (2.6756 in)
Oversized Piston : 68.46 mm (2.6953 in)

Functional Limit a **:**
Standard Piston : 67.90 mm (2.673 in)
Oversized Piston : 68.40 mm (2.69 in)

2. Inspection of Piston Clearance

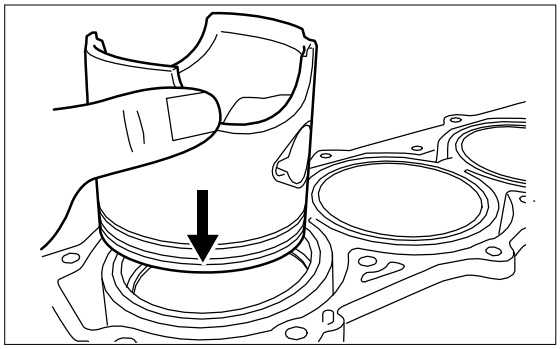
Calculate piston clearance, and if it is over the limit, replace piston or any of piston rings, replace cylinder, or use oversized piston.

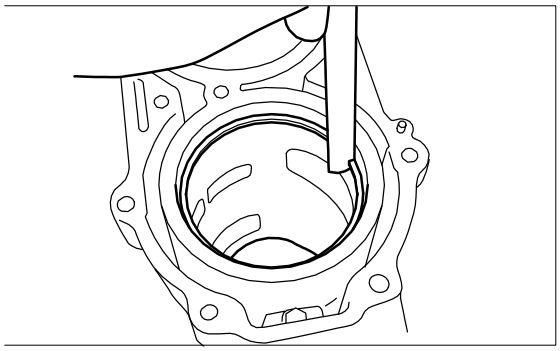
Piston Clearance :
Standard Value : 0.08 - 0.12 mm (0.00315 - 0.00472 in)

Functional Limit :
0.21 mm (0.00827 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.

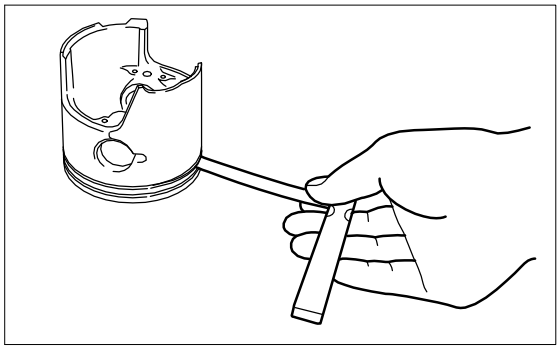
Thickness Gauge :
Commercially Available Item

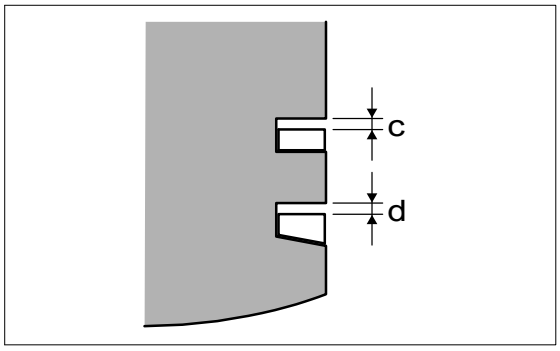
Piston Ring End Gap : Standard Value

Top Ring	0.22 - 0.37 mm (0.009 - 0.015 in)
Second Ring	0.33 - 0.48 mm (0.013 - 0.019 in)

Functional Limit :

Top Ring	1.0 mm
Second Ring	} (0.00394 in)





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.

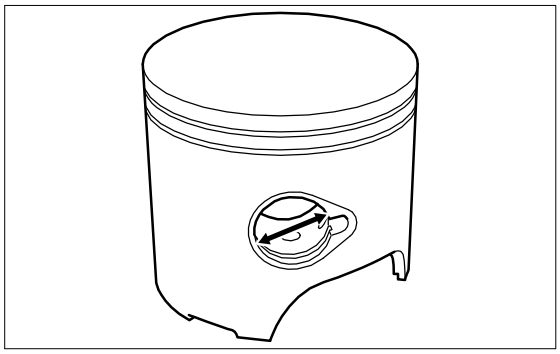
Piston Ring Tool :
P/N. 353-72249-0

Piston Ring Side Clearance :
Standard Value :

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

Functional Limit :

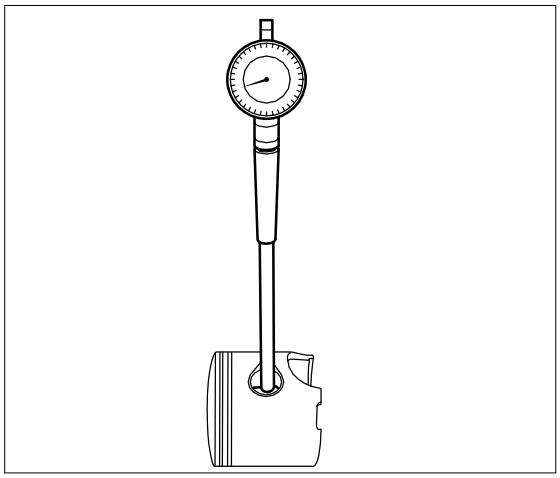
c Top Ring d Second Ring	}	0.10 mm (0.0039 in)

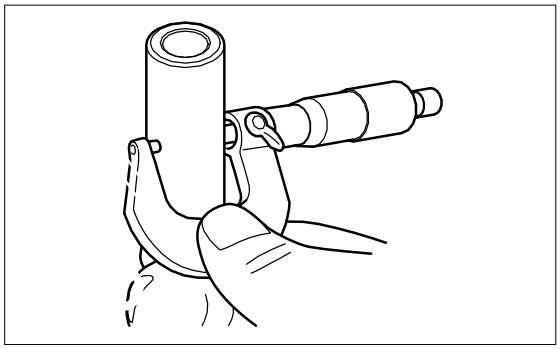


5. Inspection of Piston Pin Hole

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

Piston Pin Hole : Standard Value
17.55 mm (0.6909 in)





6. Inspection of Piston Pins

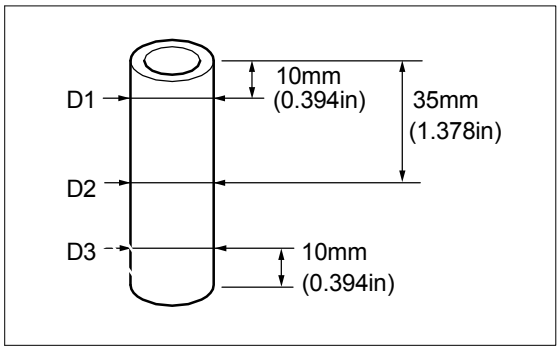
Measure piston pin outer diameter, and replace piston pin if the outer diameter is over the limit.

Piston Pin Outer Diameter : Standard Value
17.55 mm (0.6909 in)

Functional Limit :
22.97 mm (0.9045 in)

Measuring Locations :

D_1 and D_3	10 mm (0.394 in) from top end and bottom end respectively
D_2	35 mm (1.378 in) from the end



7. Inspection of Piston Pin Clearance

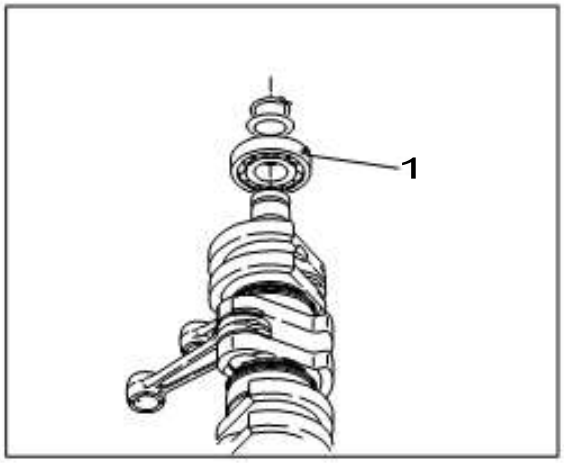
Calculate piston pin clearance, and replace piston and piston pin together if the clearance is over the limit.

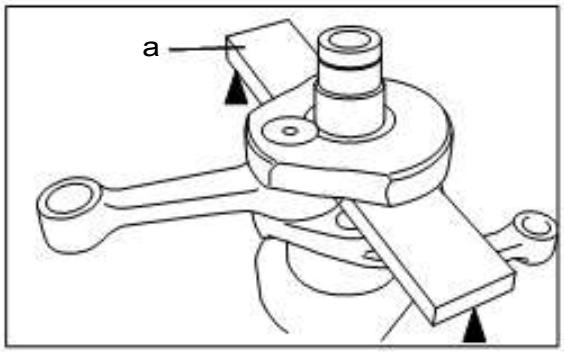
Calculation of Piston Pin Clearance :
Piston Pin Hole Inner Diameter - Piston Pin Outer Diameter

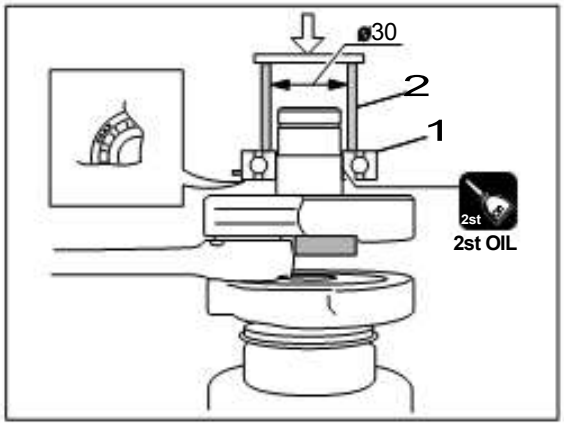
Standard Value :
0.003 - 0.007 mm (0.0001181 - 0.0002756 in)

Functional Limit :
0.020mm (0.000787 in)

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







19) Assembling Crank Shaft

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

Bearing Press-Fitting Tool 2 **:**
Inner Diameter : ø30 mm (1.181 in)

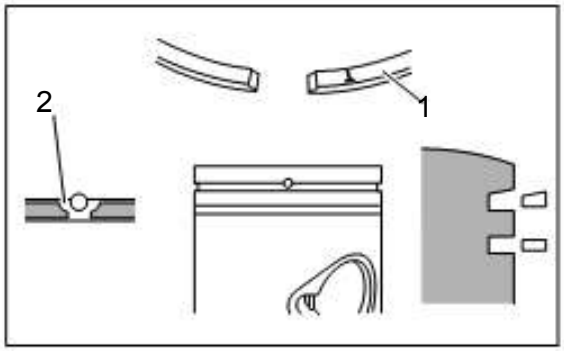
Do not reuse removed bearing.

2st OIL

20) Installing Needle Bearing and Pistons

⚠ CAUTION

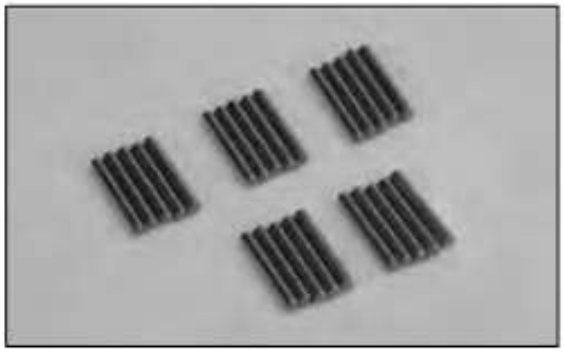
Make sure that the piston, piston pin and needle bearing in their original combination.



1. Installation of Piston Rings

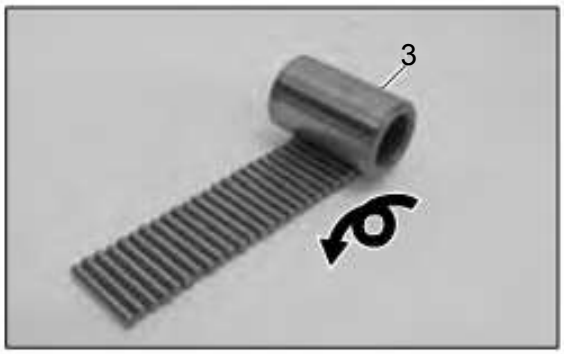
Complete 2nd piston first.

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



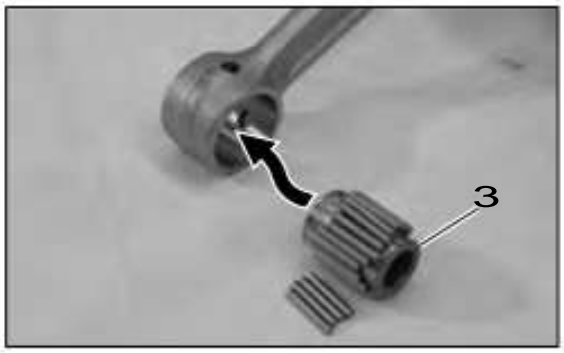
2. Installation of needle bearing

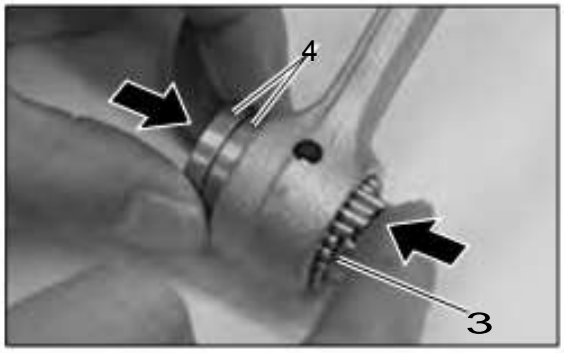
Check that the quantity of needle bearing 25 pieces, before assembling.

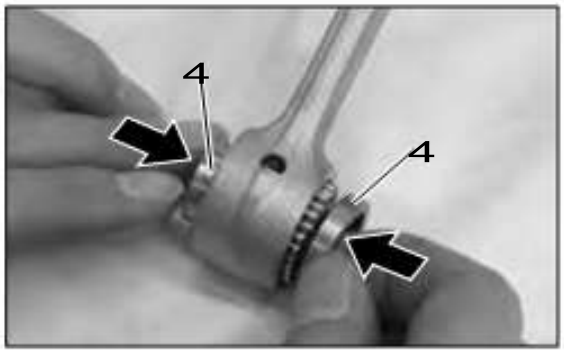


1) Apply grease to special tool 3, and then attach needle bearing. When in this procedure, need not attach all of needle bearing.

Roller Setting Piece 3 **:**
P/N. 3LC-72216-0

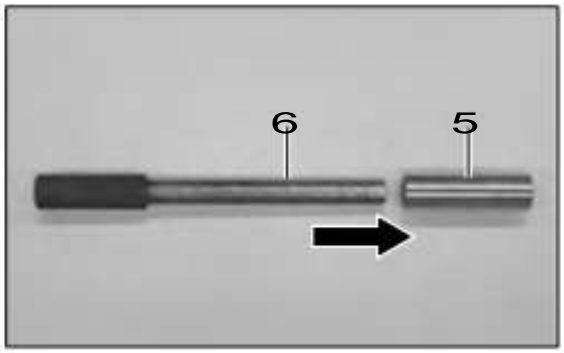






2) Insert special tool 3 with needle bearing, and then insert remaining needle bearing. Then attach washers 4 to both side.

· When assemble, attach two washers opposite side, for easy and even insert needle bearing.
· After insert needle bearing, re-attach washer to both side.



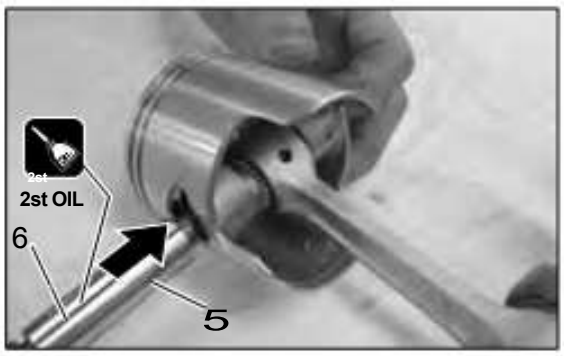
3. Installation of Piston Pin

1) Attach piston pin 5 to special tool 6, and apply two stroke engine oil. Place the piston to small end of connecting rod, and then insert piston pin with special tool 6 into them.

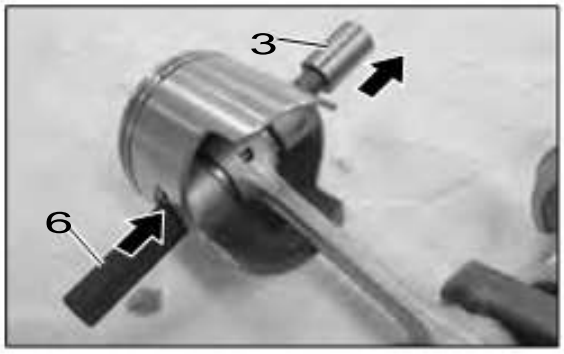
Piston Pin Tool 6 **:**
P/N. 3LC-72215-0

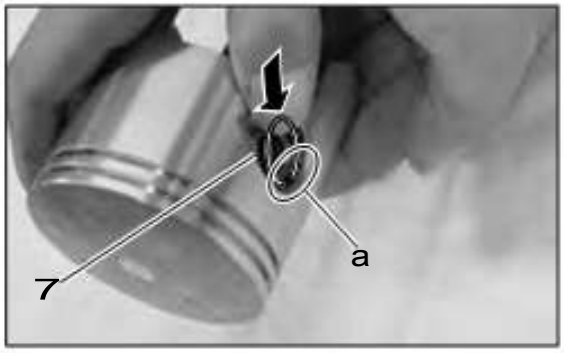
· Assemble the parts so that the side marked with "UP" on the piston head faces flywheel side.
· When a new piston is used, apply two-stroke engine oil to piston pin hole and piston pin.

2st OIL



2) Press out special tool from the piston, and then attach piston pin clip 6 to the piston.



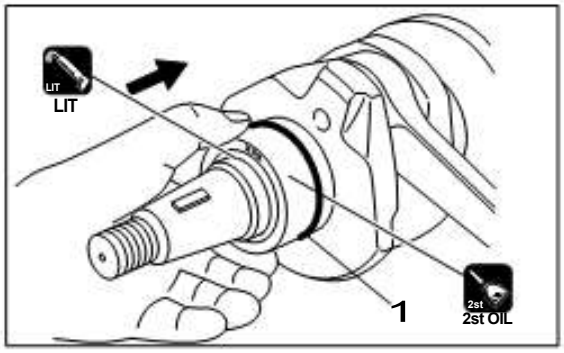


3) Fit piston pin clip 7 as shown.

CAUTION

Take care not to scratch to piston wall, when fit piston pin clip.

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.



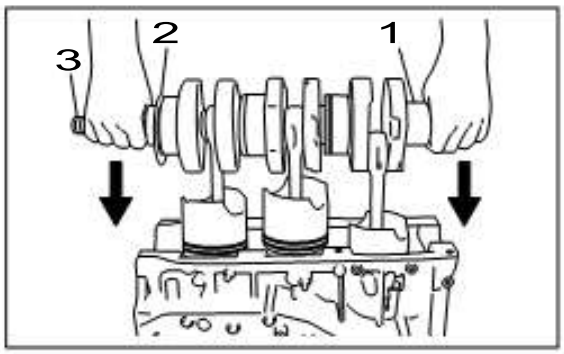
21) Assembling Power Unit Parts

1. Install main bearing (upper) 1 to crank shaft ass'y.

· Face the marking on the bearing to flywheel side.
· Apply LIT grease to the oil seal lip.
· Use new O ring.

2st OIL

LIT



2. Install crank shaft ass'y to cylinder.

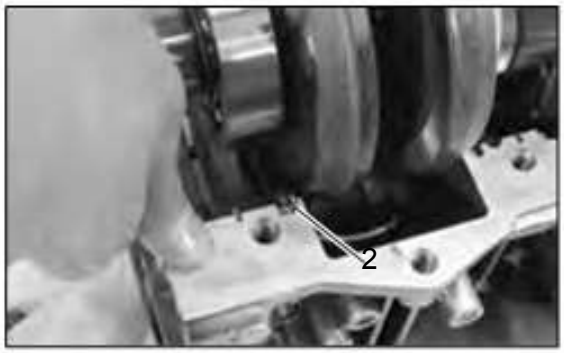
Apply genuine engine oil to the following parts before assembling them.

· Big End of Connecting Rod
· Small End of Connecting Rod
· Main Bearing and ball bearing
· Piston Ring and Entire Circumference of Piston, and Entire Cylinder Wall
· O Ring of Upper Bearing

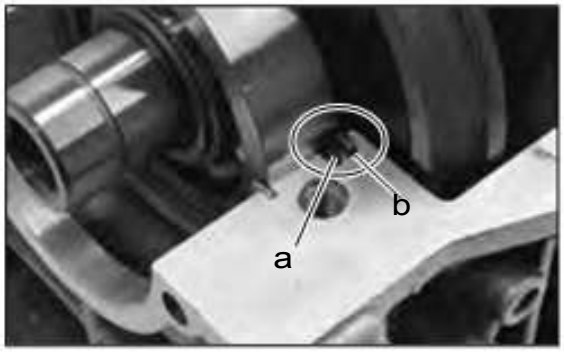
CAUTION

When the piston skirt enters into cylinder liner, thrust plate 2 is inserted in groove, and then crank shaft is lowered slowly.

· 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 ø13.5 mm (0.532 in) in the drive shaft opening to make it easier to hold.



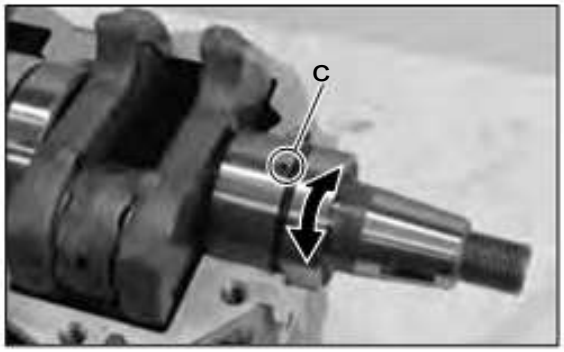
2st OIL



3. Positioning bearing

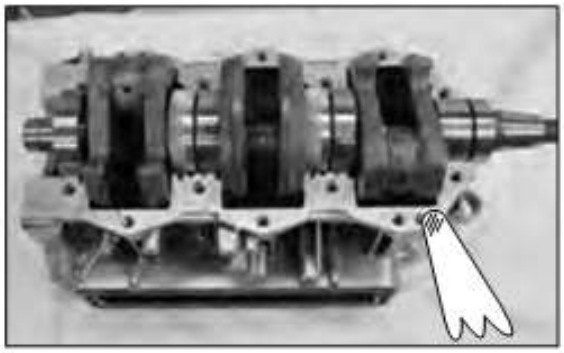
Put the pin a of bearing (lower) on the cylinder.

Face the pin of ball bearing of all, to upward. Rise crankshaft lightly, and then turn bearing to fit the pin in the cylinder grooves b.



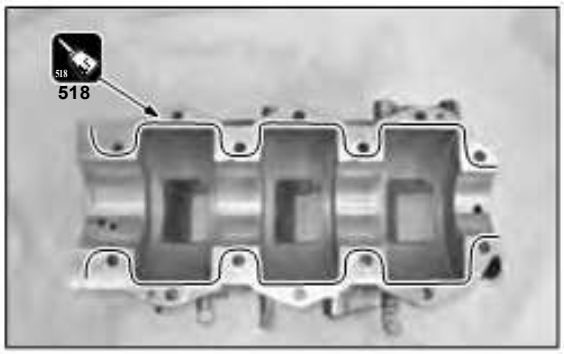
4. Positioning Bearing

- Attempt to move each bearing lightly to check if dowel pin is in the hole snugly.
- Main bearing is provided with a oil journal c on the opposite side of knock hole to check the location.



22) Assembling Crank Ass'y and Crank Case

1. Degrease crank case and cylinder mating faces.

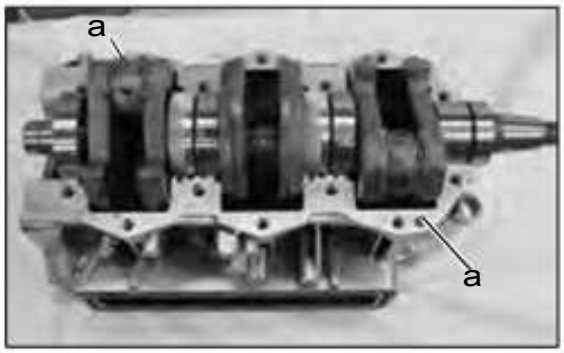


2. Apply sealing agent to crank case's mating surface.

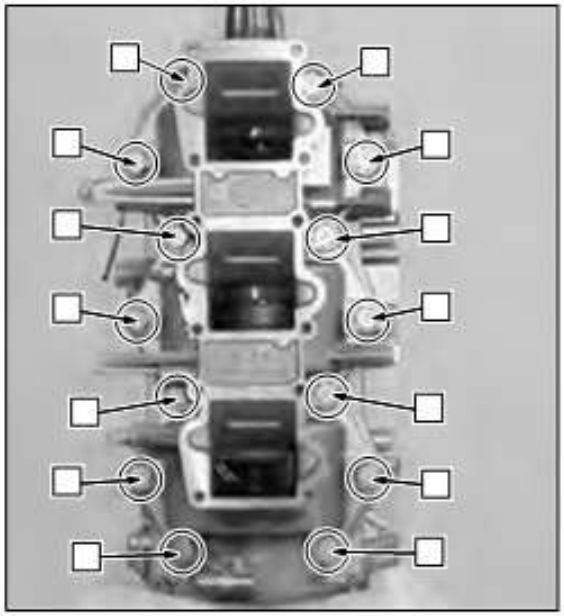
Crank Case Mating Surface :
Loctite #518

- 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.

518



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



4. Install crank case to cylinder.

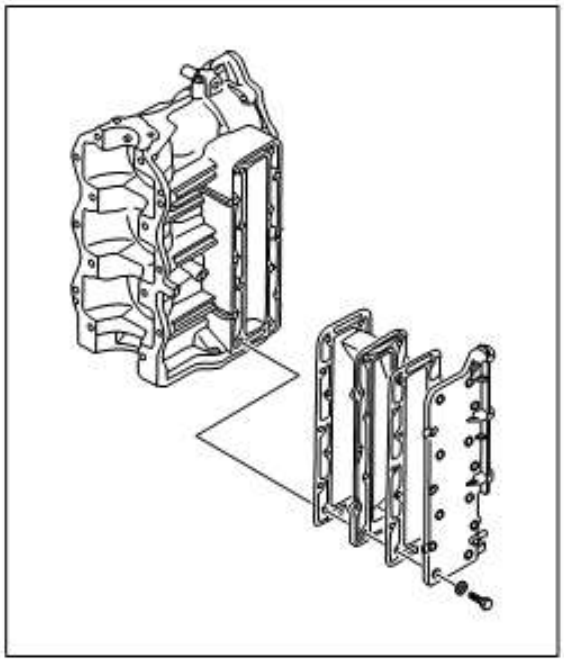
Before securing with bolts, fit crank case snugly to the cylinder by tapping with a plastic hammer not to make the gap between crank case and cylinder.

5. Tighten crank case securing bolts and nuts (M8) 1 to 14 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]

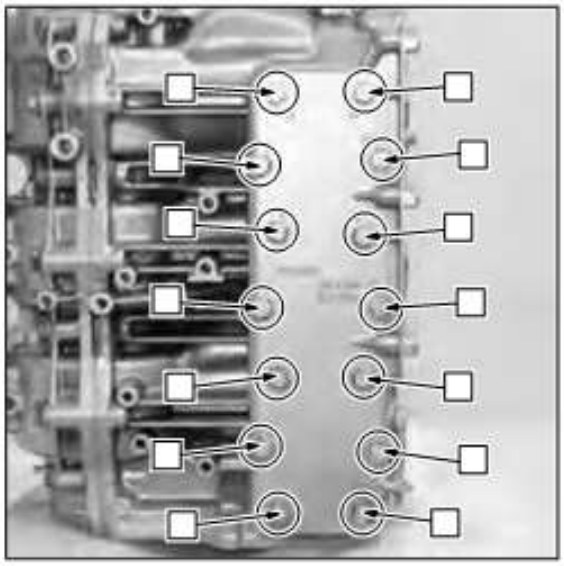
Make no forced assemblies, rotate crankshaft with flywheel after torquing crankcase bolts to ensure nothing binding.

Tighten crank case securing bolts in two steps to their specified torque.



23) Assembling Exhaust Cover Parts

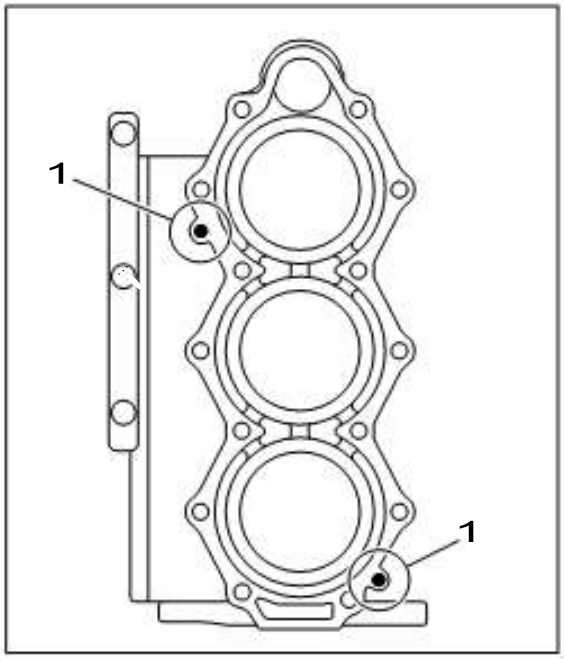
1. Assemble exhaust cover (inner), exhaust cover (outer) and gaskets.



2. Attach exhaust cover securing bolts 1 to 14 and tighten them in the order of their numbers shown to specified torque in two steps.

Temporary Tightening :
6 N · m (4 lb · ft) [0.6 kgf · m]
Final Tightening :
12 N · m (9 lb · ft) [1.2 kgf · m]

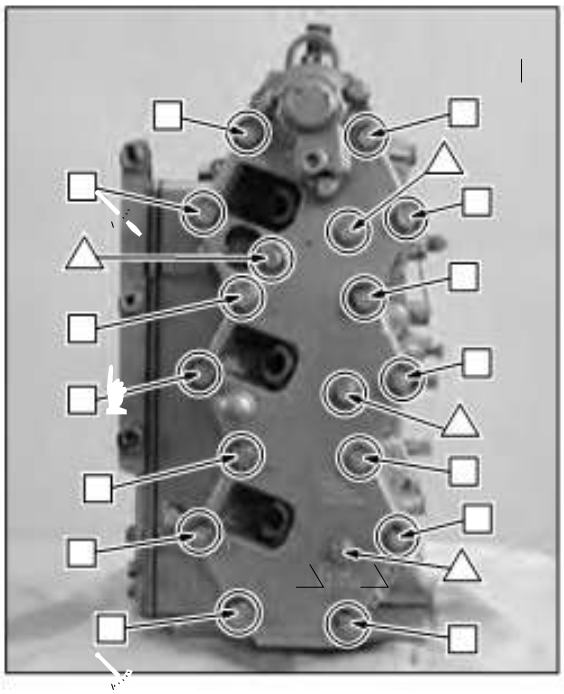
Tighten the bolts in the order of the numbers marked on the exhaust cover.



24) Assembling Cylinder Head Parts

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

Temporary Tightening :
6 N · m (4 lb · ft) [0.6 kgf · m]



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

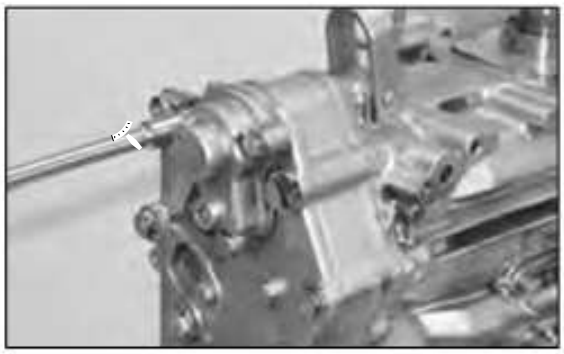
Temporary Tightening :
12 N · m (9 lb · ft) [1.2 kgf · m]
Final Tightening :
32 N · m (23 lb · ft) [3.2 kgf · m]

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

3. Tighten bolts (M6) △1 to △ to specified final torque.

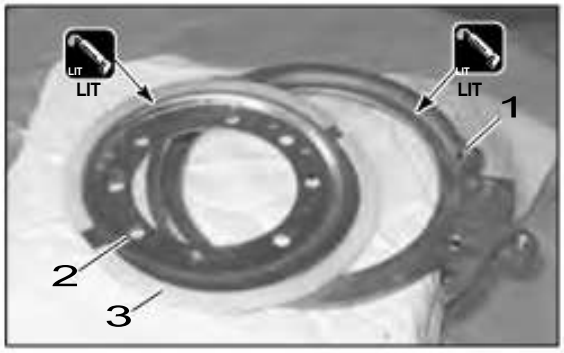
Final Tightening :
6 N · m (4 lb · ft) [0.6 kgf · m]

Tighten head cover bolts M6 after tightening bolts M8. Never tighten bolts M6 before tightening bolts M8.



4. Install thermostat, thermo-cap and gasket.

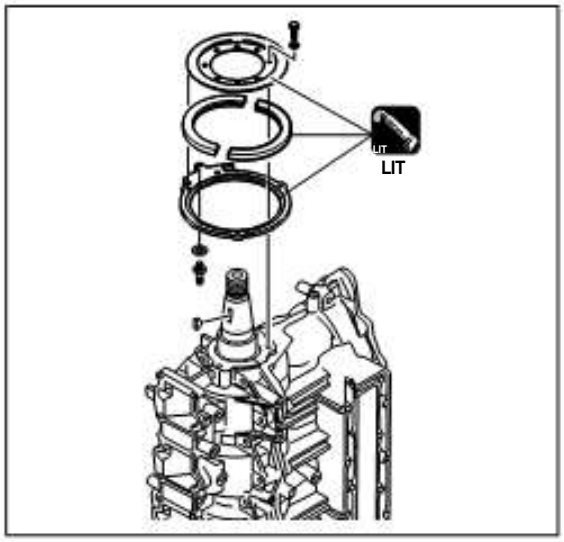
Thermostat cover bolt:
6 N · m (4 lb · ft) [0.6 kgf · m]

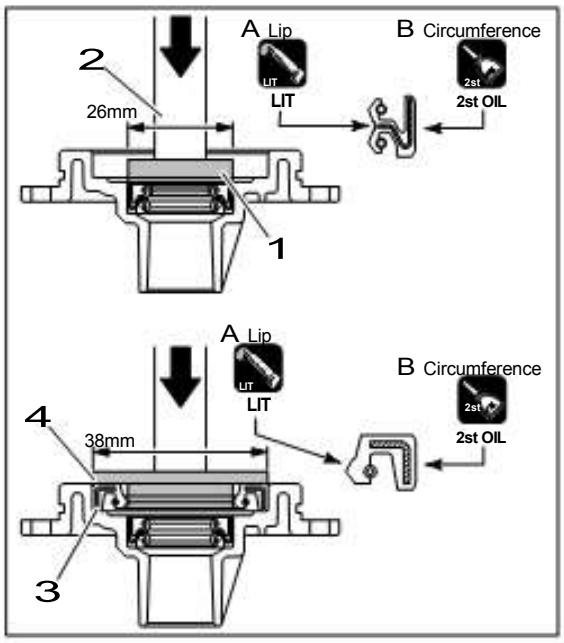


25) Assembling Coil Bracket Parts

1. Apply grease to sliding surface of coil bracket 1, guide plate 2 and bushing 3 surface, before installing.

LIT





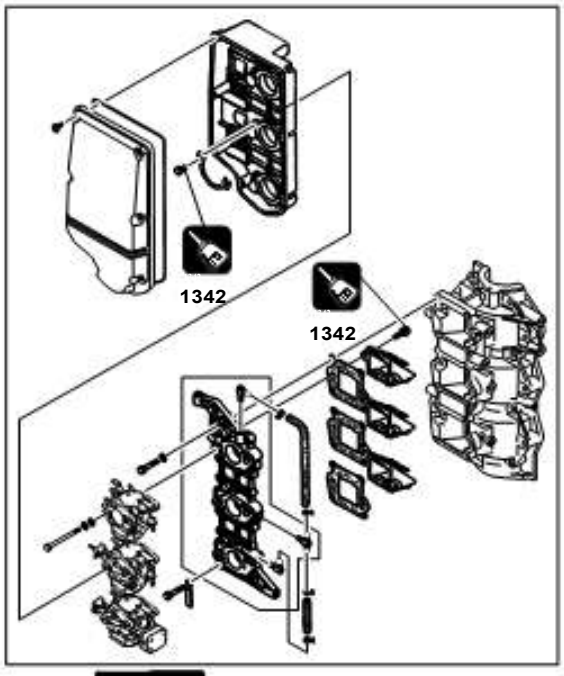
26) Assembling Crank Case Head Parts

1. Apply grease and oil to oil seal 1 16-28-7 and press-fit it to crank case head by using suitable press 2.

2. Apply grease and oil to oil seal 3 25-40-8 and press-fit it to crank case head by using suitable press 4.

2st OIL

LIT



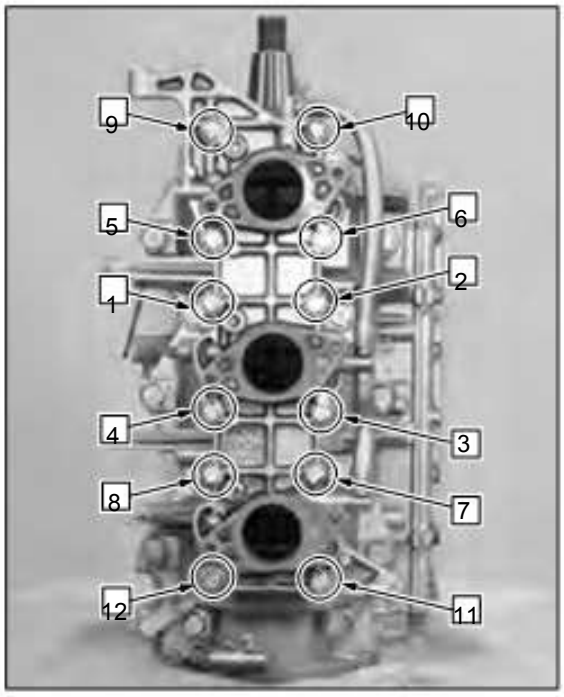
1 Gasket Do not reuse

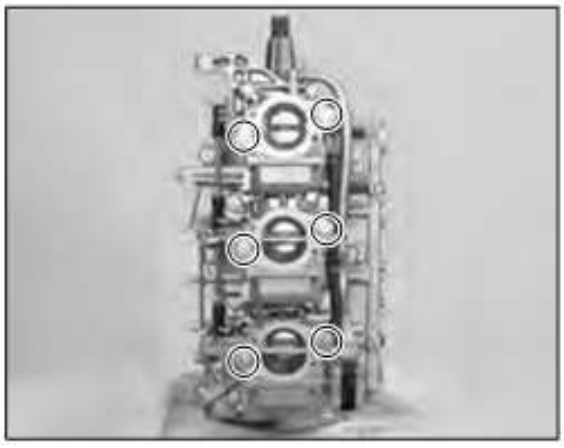
27) Installing Reed Valve, Intake Manifold and Intake Silencer.

1. Attach reed valve, intake manifold and gaskets to crank case. Attach and tighten securing bolts 1 to 12 to specified torque in the order of the numbers shown.

Bolts 1 - 12 :
9 N · m (7 lb · ft) [0.9 kgf · m]

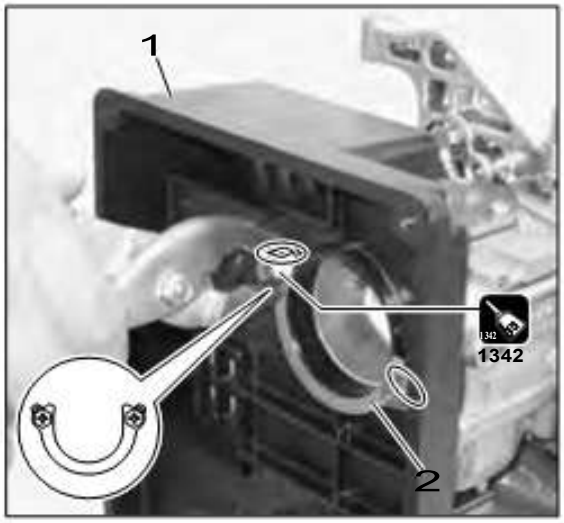
· Use new gaskets.
· When reusing reed valve mounting screw, apply screw lock #1342.

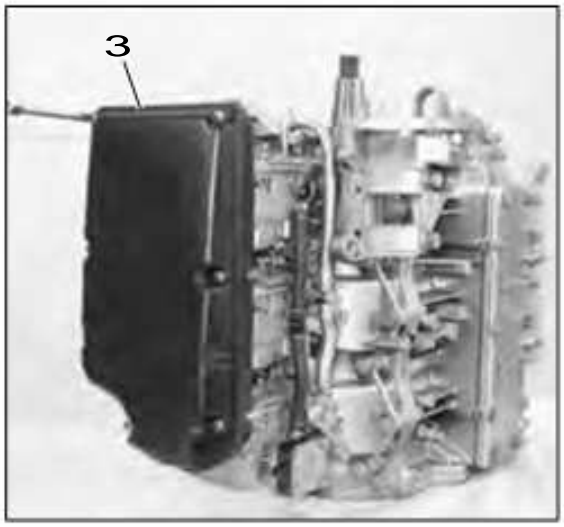




2. Install new o ring and carburetor. Tighten bolts to specified torque.

Bolts :
6 N · m (4 lb · ft) [0.6 kgf · m]





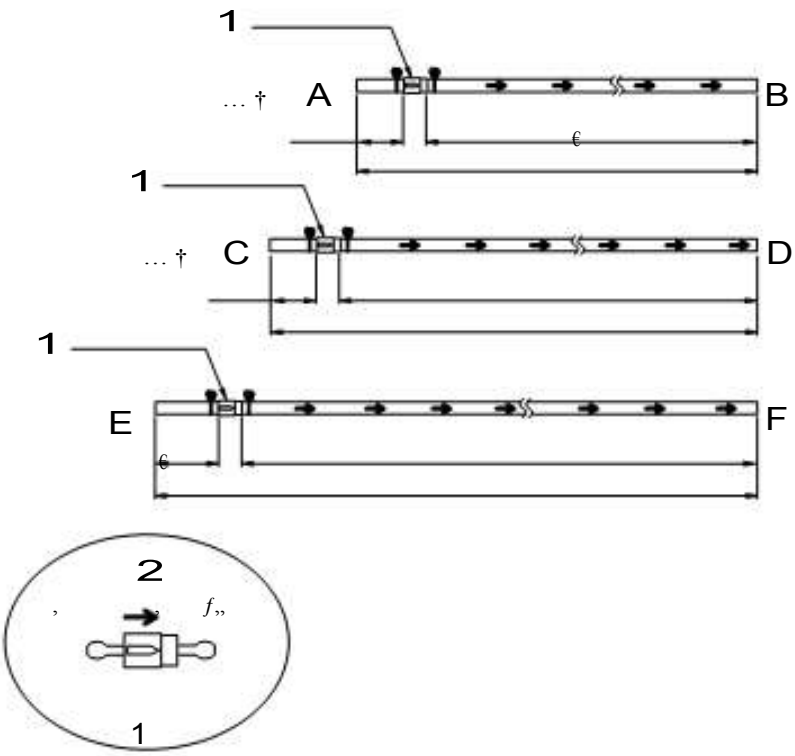
3. Attach intake silencer 1 and lock plate 2, then tighten bolts to specified torque.

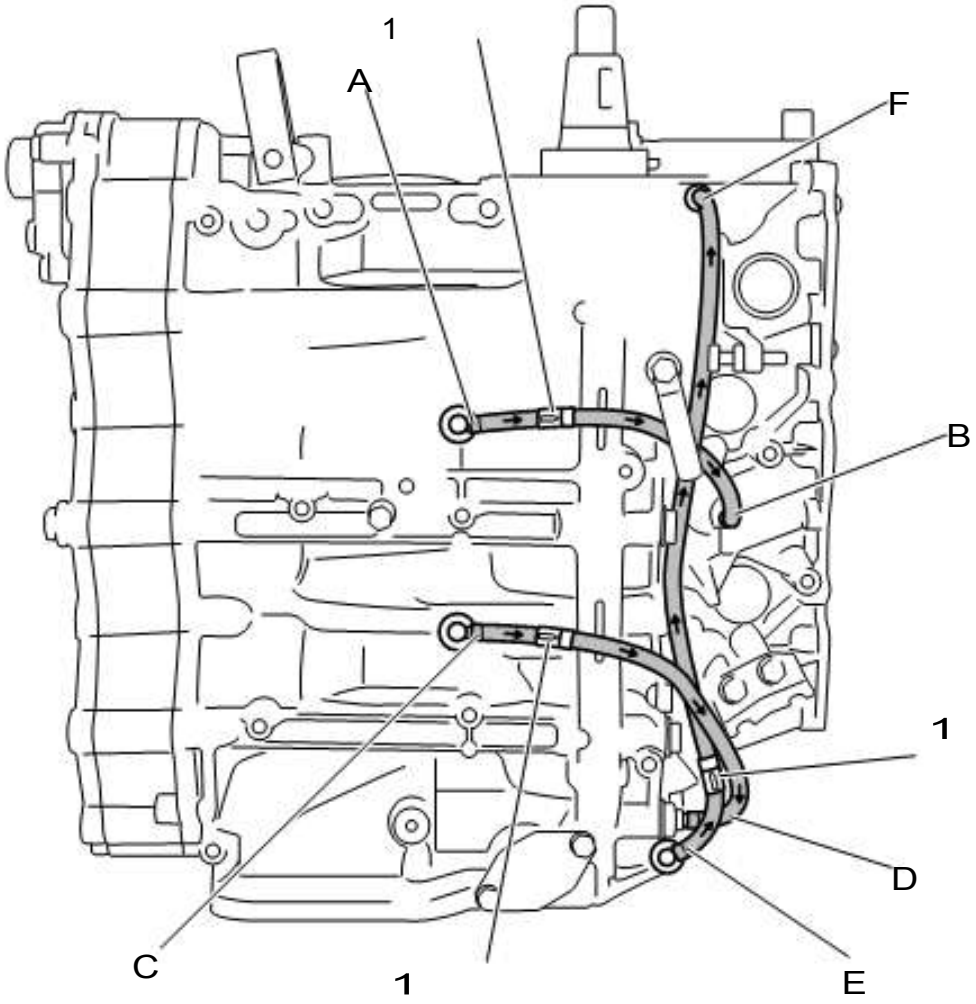
Intake Silencer Bolts :
6 N · m (4 lb · ft) [0.6 kgf · m]

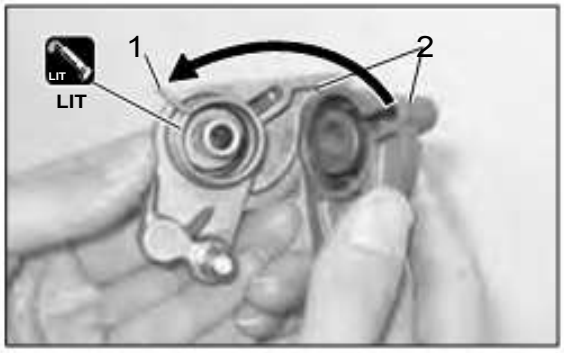
- When reuse intake silencer mounting bolts, apply ThreeBond's thread lock # 1342.
- Use new lock plate.
- After tightening bolts, ply the tab of lock plate as shown.

4. Attach intake silencer cover 3, then tighten screws.

28) Attaching Recirculation Hoses





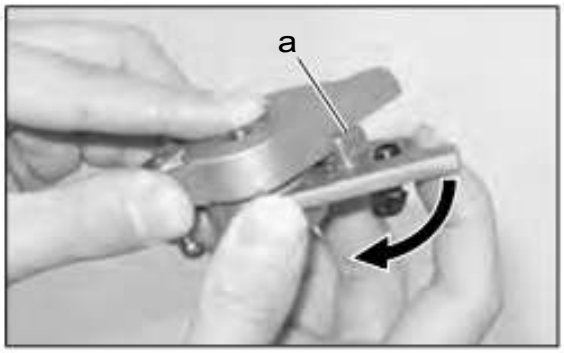


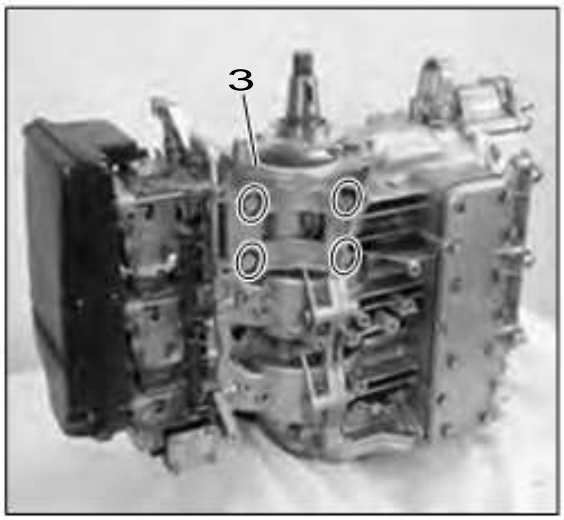
29) Installing Throttle Link

1. Assembling advancer lever.
   Align spring 1 and slot of the advancer lever 2, and turnover the stopper a to install as shown.

Apply grease to advancer lever spring and collar.

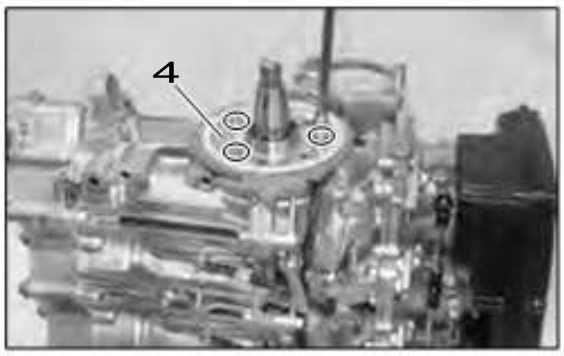
LIT





2. Attach starter motor bracket 3, and tighten the nut to specified torque.

Starter Motor Bracket Bolts :
12 N · m (9 lb · ft) [1.2 kgf · m]



3. Attach coil plate bracket 4 to cylinder ass'y and secure them with bolts.

Coil Bracket Bolts :
6 N · m (4 lb · ft) [0.6 kgf · m]

4. As for the installation of the following part, refer to the step of their removal.
   • Advancer arm
   • Throttle link rod

Apply grease to collar of advancer arm.

30) Installing Electric Parts

1. As for the installation of the following part, refer to the step of their removal.
   - Ground wire
   - Electric box
   - Starter lock cable
   - CD unit
   - Ignition coil and ground wire
   - Spark plug

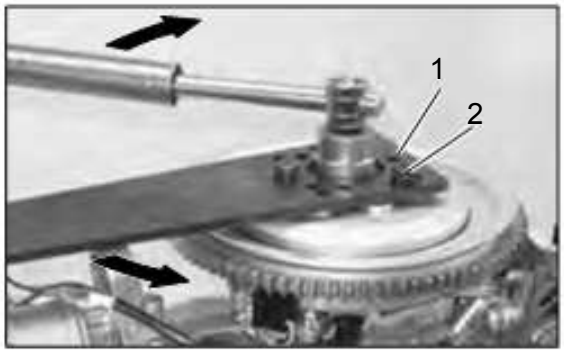
Spark plug:
27 N · m (20 lb · ft) [2.7 kgf · m]

Connect ground wire their original connecter.

2. Attach coil plate ass'y 1 to power unit, and tighten mounting screw.

· When reusing coil ass'y mounting screw, apply screw lock #1342.
· Connect coil plate ass'y wire and ignition coil wire to CD unit.

1342



31) Installing Flywheel

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

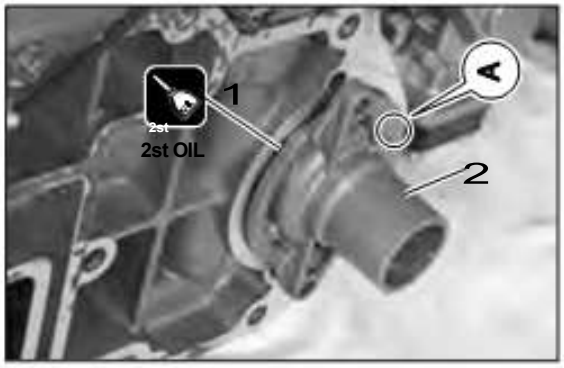
CAUTION

Use 25mm long bolts 2 for removing. Otherwise coil may be damaged and can short.

Flywheel Puller Kit 1 **:**
P/N. 3T1-72211-0

Flywheel Nut:
100 N · m (72 lb · ft) [10 kgf · m]

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



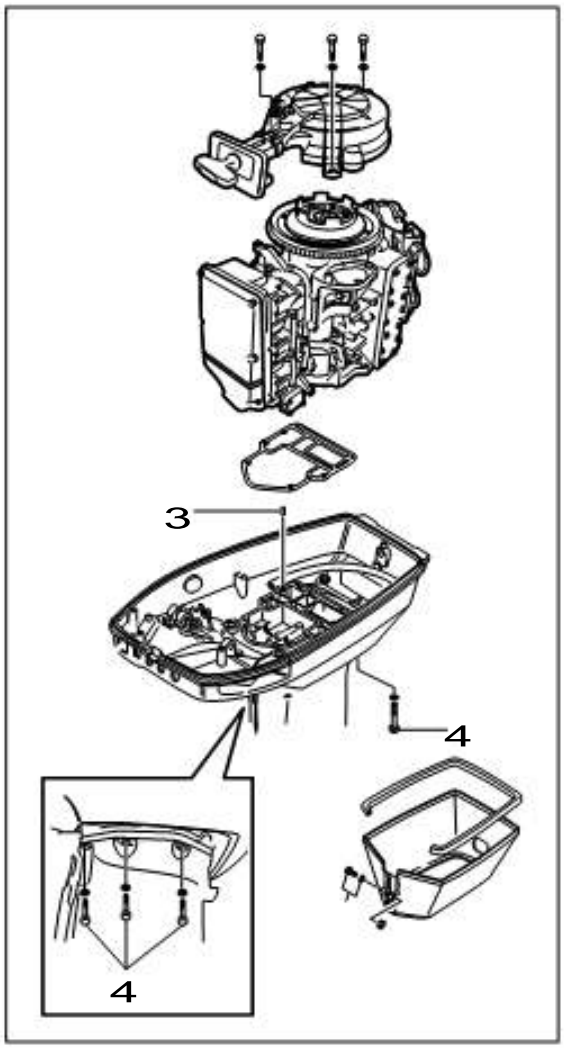
32) Installing Power Unit

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.

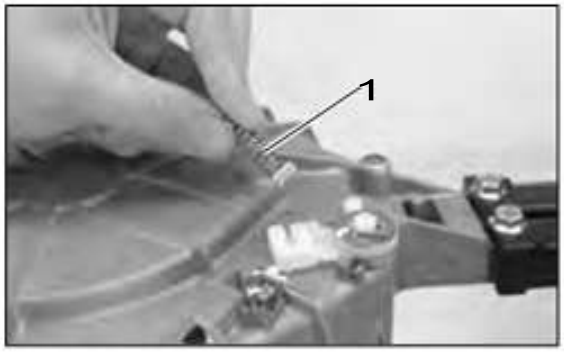
4. Install power unit securely, and tighten engine mount bolts 4 specified torque.

Engine Mount Bolts 4 **:**
20 N · m (14.5 lb · ft) [2 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.

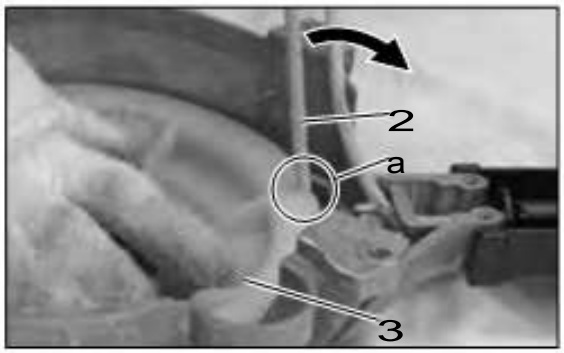
After installing power unit, make sure to check and adjust throttle cable.



33) Disassembly of Recoil Starter

1. Loosen screw and disconnect starter lock cable 1 (upper).

2. Remove bolts, and then, remove recoil starter.

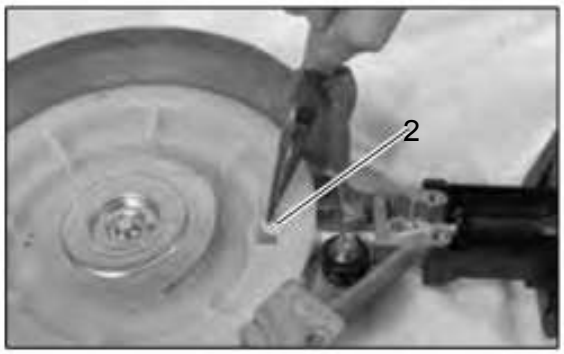


3 Reel

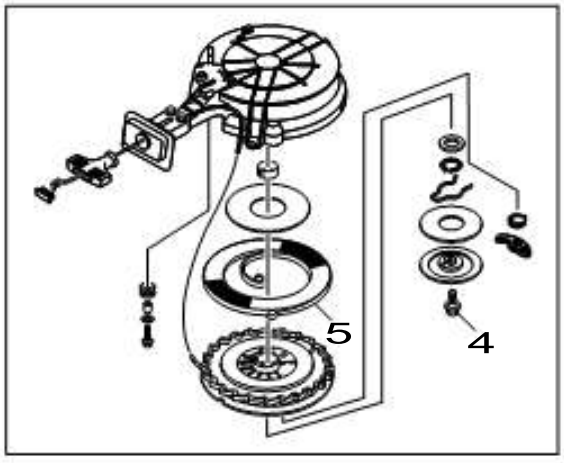
3. Put rope 2 in the groove a of reel 3 and gently turn reel clockwise to release tension of starter spring.

CAUTION

Wear the glove to protect your hands.



For replacing starter rope 2 only, do not remove reel. Loosen the tension spring, and then replace rope. Then, install new rope and put in groove and turn counterclockwise 5 or 6 rounds to get tension on spring.



4 Starter Shaft Bolt
5 Starter Spring

4. Remove starter shaft bolt 4, and then, remove all of illustrations.

CAUTION

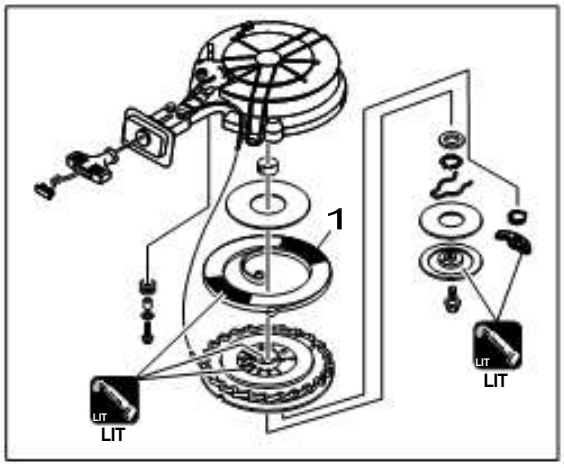
The starter spring 5 can pop out suddenly; do not nearby your face.

34) Inspection of Recoil Starter

1. Check ratchet, starter lock and all springs. Replace if any deformation, wear or damage is found.

2. Check reel and starter case. Replace if any crack or damage is found.

3. Check starter rope. Replace if any wear, unraveling or damage is found.

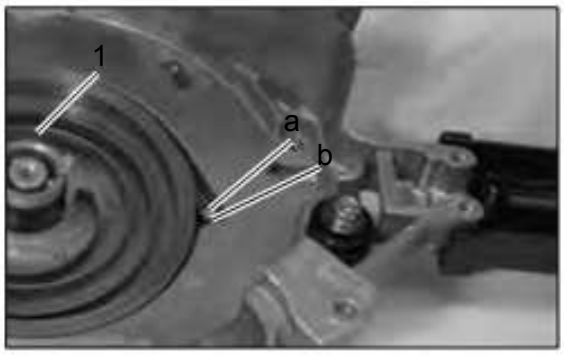


35) Assembling of Recoil Starter

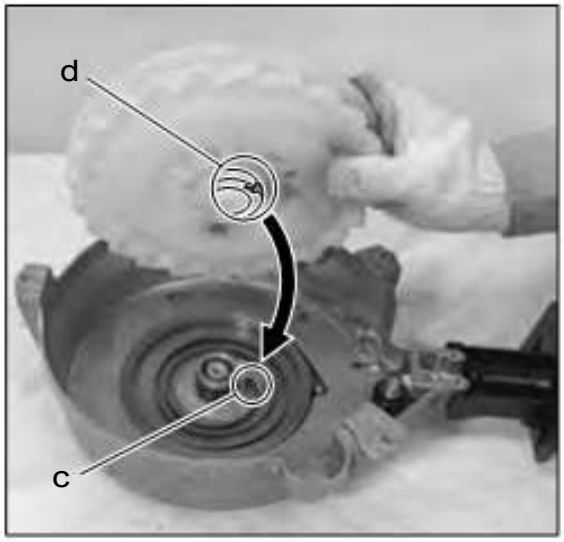
Reverse disassembly procedure to assemble by taking care of the following matters.

- Apply grease to parts as shown enough.

- When setting new starter spring 1 into starter case, face starter spring outer edge hook a to the right and set it into round projection b of starter case.
  Since newly delivered starter spring is bound by wire, cut the wire to release the tension after setting outer end hook in the case.



- When reinstalling starter spring 1 as same into starter case, face starter spring outer edge hook a to the right and set it into round projection b of starter case.
  Turn starter case and hold by hand to prevent the starter spring pop out, then attach starter spring.



- When attaching reel to starter case, put starter spring inner end hook c in the notch d of reel.

- Apply cold resistance lithium grease to the following parts.
  - · Starter Spring
  - · Reel Center Hole
  - · Ratchet
  - · Starter Lock
  - · Friction Plate

Attach return spring to friction plate, as shown.

- Apply "Three Bond" 1342 to starter shaft bolt, and tighten the bold to specified torque.

Starter Shaft Bolt :
6 N · m (4 lb · ft) (0.6 kgf · m)

1342

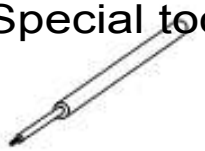
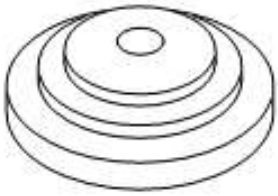
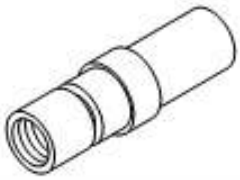
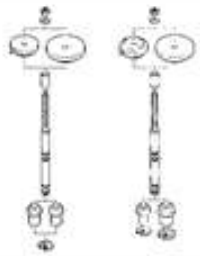
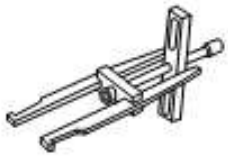
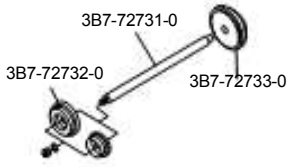
- When winding starter spring, turn reel 5 to 6 rounds to direction to which the reel rotates when pulling out starter rope (counterclockwise) . Then, set the spring so that the reel additionally turns 1/4 of a rotation to one rotation and 1/4 when the rope is fully pulled out. (approximately 5 to 6 rotations)

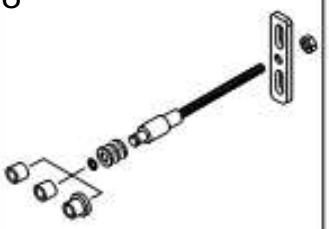
- After installing recoil starter to outboard motor, perform shift operation to check that recoil starter is locked at other than neutral (N) position.

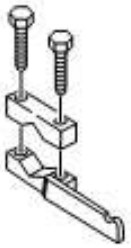
6

Lower Unit

1. Special tools

1  Spring Pin Tool A P/N. 345-72227-0 (ø3.0) P/N. 369-72217-0 (ø3.5) Removing spring pin	2  Spring Pin Tool B P/N. 345-72228-0 (ø3.0) P/N. 369-72218-0 (ø3.5) Installing spring pin	3  Propeller Shaft Housing Puller Ass'y P/N. 3A3-72259-0 Removing propeller shaft housing	4  Driver Rod P/N. 3AC-99702-0 Used in combination with center place and various attachments
5 ø100 x ø79.5 x ø51.5 x ø61.5  Center Plate P/N. 3AC-99701-0 Removing or installing propeller shaft housing bearing	6 ø31.5 x ø25 x H32  Roller Bearing Attachment MX50:P/N. 3MC-99710-0 MWX50:P/N. 3LC-99710-0 Used in combination with driver rod and center plate Attaching propeller shaft housing needle bearing	7  Bevel Gear Bearing Install Tool P/N. 3C8-72719-0 Installing forward (A) gear bearing	8  Bevel Gear Nut Socket P/N. 346-72232-0 Removing or attaching pinion (B) gear nut
9  Bevel Gear B Nut Wrench MX50:P/N. 346-72231-0 Removing or attaching pinion (B) gear nut	0  Bevel Gear B Nut Wrench MWX50:P/N. 353-72231-0 Removing or attaching pinion (B) gear nut	q  Universal Puller Plate P/N. 3AC-99750-0 Removing reverse (C) gear bearing	w  Roller Bearing Press Kit P/N. 3LC-72900-0 Removing or attaching gear case needle bearing
e  Roller Bearing Puller Kit MX50:P/N. 3C8-72700-0 MWX50:P/N. 3B7-72700-0 Removing or attaching gear case and propeller shaft housing needle bearing	r  Slide Hammer Ass'y P/N. 3AC-99080-0 Removing forward (A) gear bearing outer race	t  Bevel Gear Bearing Puller Ass'y MX50:P/N. 3A3-72755-0 MWX50:P/N. 3B7-72755-0 Removing forward (A) gear bearing outer race	y  Bearing Outer Press Kit P/N. 3B7-72739-1 Attaching forward (A) gear bearing outer race

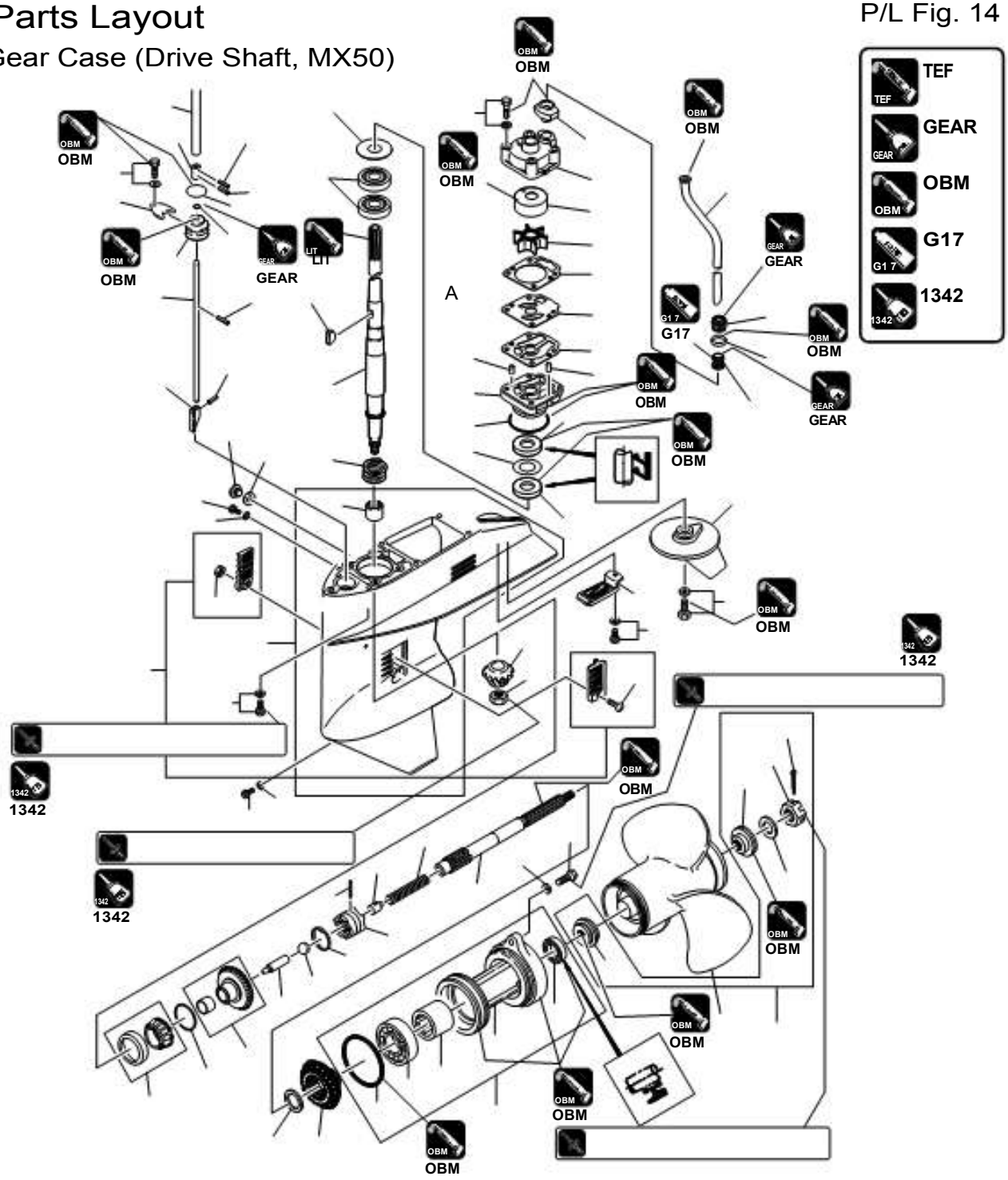
u	i	o	p
			
Shimming Gauge MX50:P/N. 3C8-72250-0 MWX50:P/N. 353-72250-0	Thickness Gauge P/N. 353-72251-0	Backlash Measuring Tool Kit MX50:P/N. 3C8-72234-1	Backlash Measuring Tool Kit MWX50:P/N. 3B7-72234-0
Adjusting pinion (B) gear height	Measuring gaps	Used to attach dial gauge when measuring backlash	Measuring backlash between forward (A) gear and pinion (B) gear

a	s	d
		
Dial Gauge Plate P/N. 3B7-72729-0	Backlash Measuring Tool Clamp P/N. 3B7-72720-0	Backlash Measuring Tool Kit MWX50: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

2. Parts Layout

P/L Fig. 14

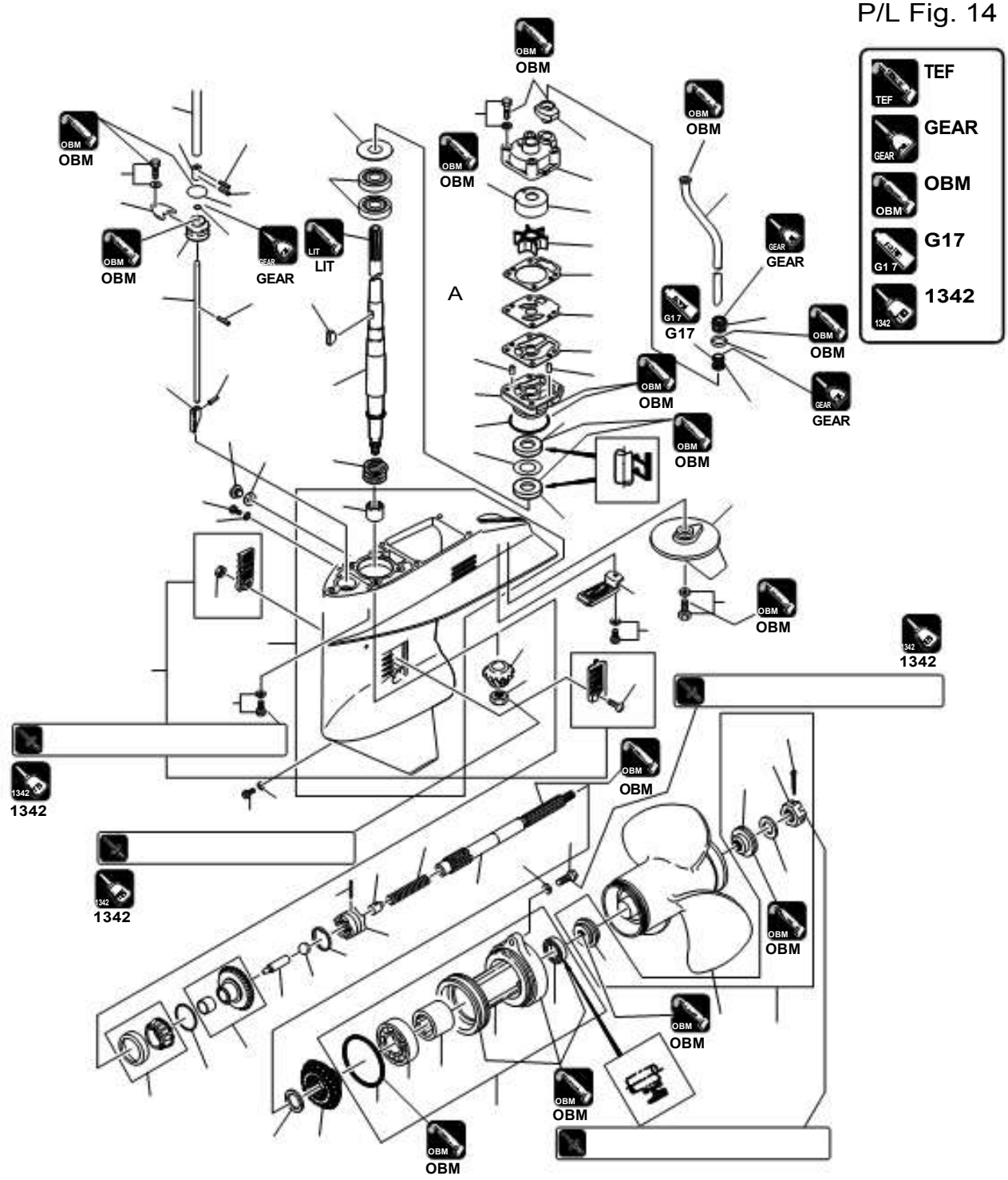
Gear Case (Drive Shaft, MX50)



Ref. 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	
10	Pre-Coated Bolt 6-2	2	
11	Washer	2	
12	Bevel Gear Ass'y (A)	1	
13	Bevel Gear B	1	

Ref. 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	

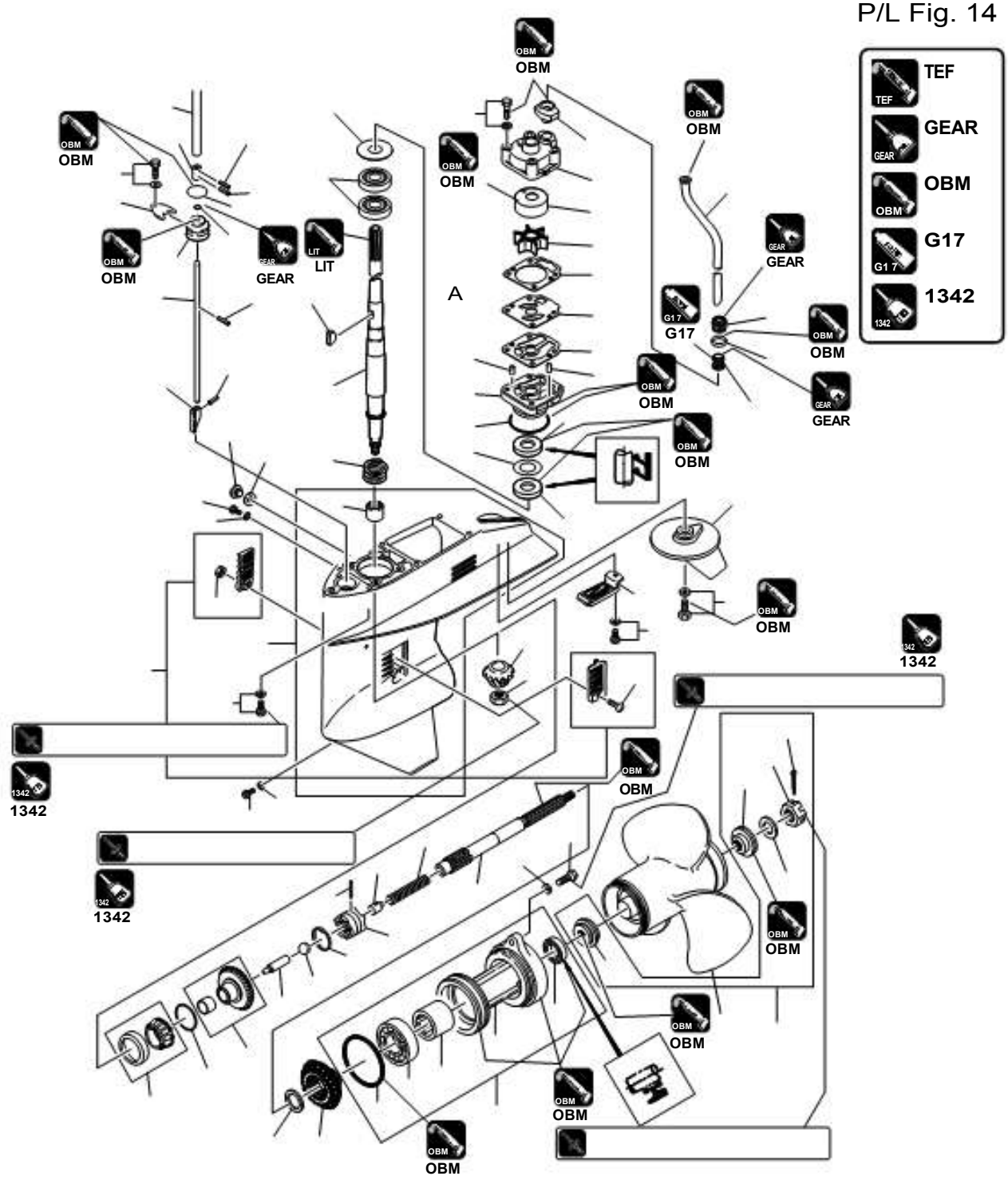
P/L Fig. 14



Ref. No.	Description	Q'ty	Remarks
24	Snap	1	
25	Propeller Shaft Housing Ass'y	1	MX50D2
26	Propeller Shaft Housing	1	
27	Roller Bearing 22-30-30	1	Do not reuse.
28	Oil Seal 22-36-10	1	Do not reuse.
29	Ball Bearing 6007	1	Do not reuse.
30	O-Ring 3.5-69.4	1	Do not reuse.
31-1	Drive Shaft (S)	1	for Transom "S"
31-2	Drive Shaft (L)	1	for Transom "L"
31-3	Drive Shaft (UL)	1	for Transom "UL"
32	Tapered Roller Bearing 6304	2	Do not reuse.
33	Drive Shaft Spring	1	
34	Water Strainer Set	1	MX50D2
35	Screw	1	
36	Nylon Nut 4-P0.7	1	

Ref. No.	Description	Q'ty	Remarks
37	Water Pump Impeller	1	
38	Key	1	
39	Pump Case (Upper)	1	
40	Pump Case Liner	1	
41	Water Pipe Seal (Lower)	1	
42	Pump Case (Lower)	1	
43	Shim 32.9-26-0.5	1	
44	Oil Seal 17-33-6	2	Do not reuse.
45	O-Ring 3.2-47	1	Do not reuse.
46	Dowel Pin 4-10	2	
47	Water Pump Guide Plate	1	
48	Guide Plate Gasket	1	Do not reuse.
49	Pump Case Gasket	1	Do not reuse.
50	Bolt	4	
51	Sub-Water Inlet Strainer	1	

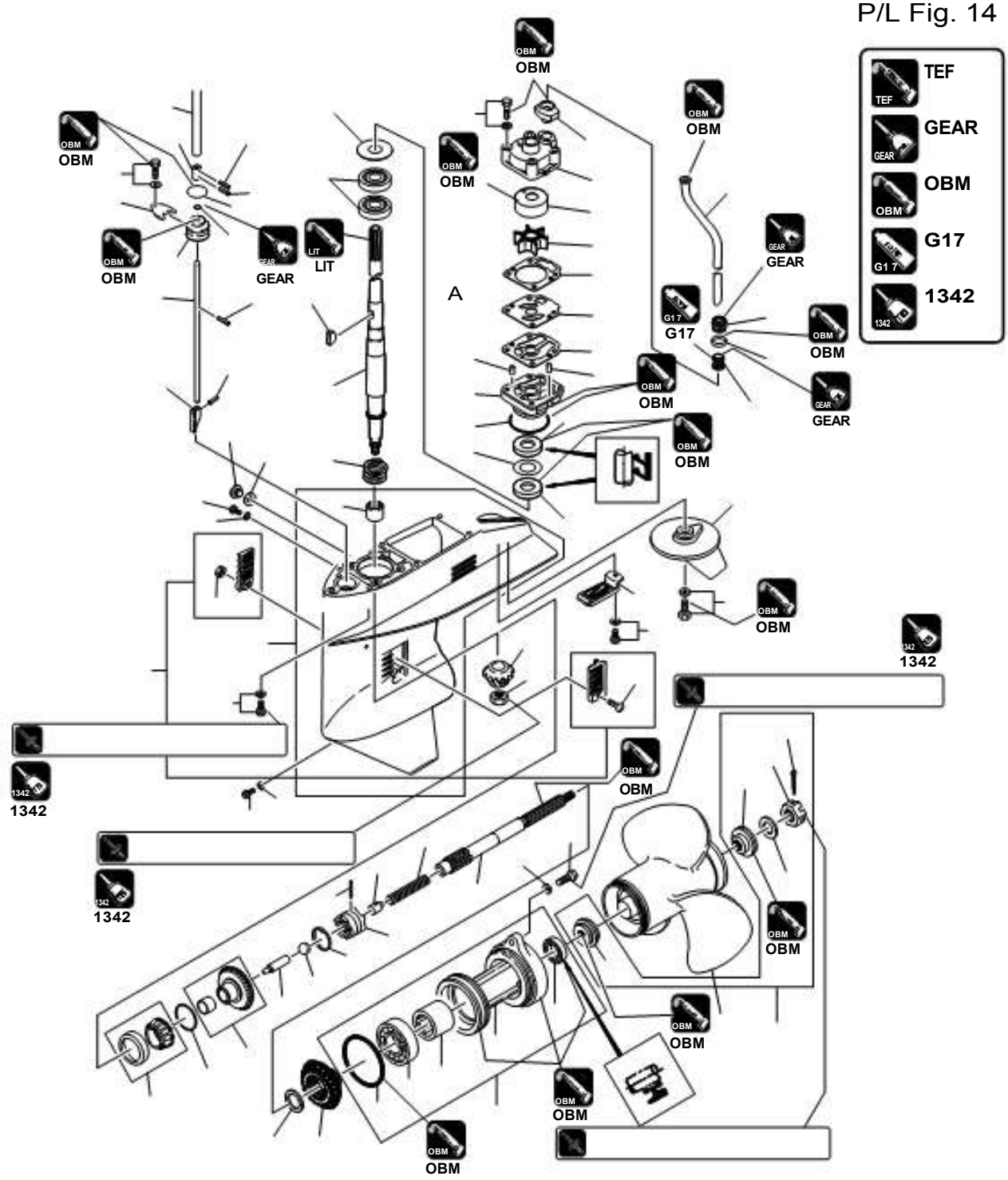
P/L Fig. 14



Ref. No.	Description	Q'ty	Remarks
52	Bolt	1	
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	

Ref. No.	Description	Q'ty	Remarks
65	Bolt	6	
66-1	Water Pipe (S)	1	MX50D2 for Transom "S", MWX50D2 for Transom "L"
66-2	Water Pipe (L)	1	MX50D2 for Transom "L"
66-3	Water Pipe (UL)	1	MX50D2 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	MX50D2

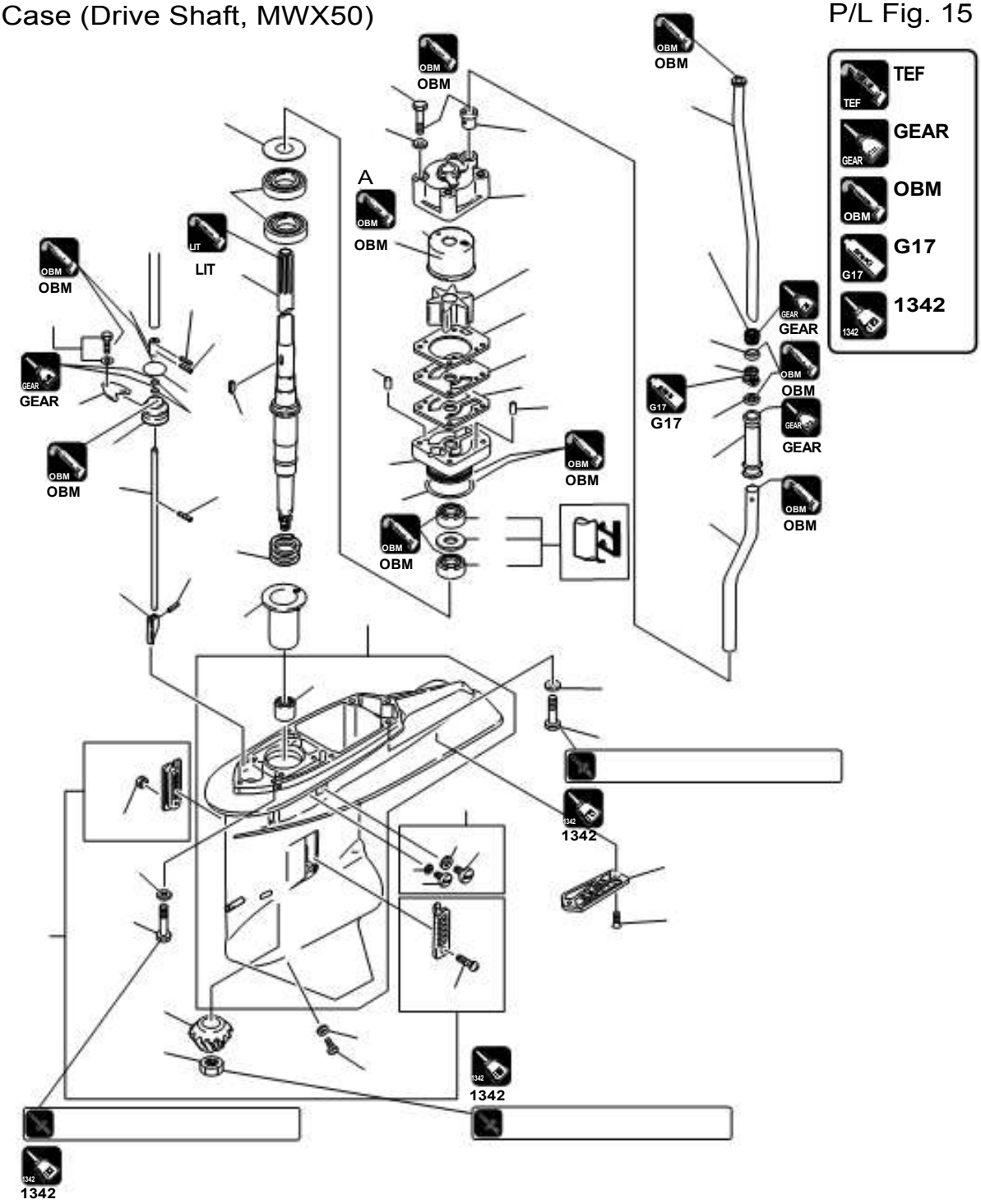
P/L Fig. 14



Ref. No.	Description	Q'ty	Remarks
71	Thrust Holder	1	
72	Stopper	1	
73	Propeller Nut	1	
74	Washer 17-32-3	1	
75	Split Pin 3-25	1	

Gear Case (Drive Shaft, MWX50)

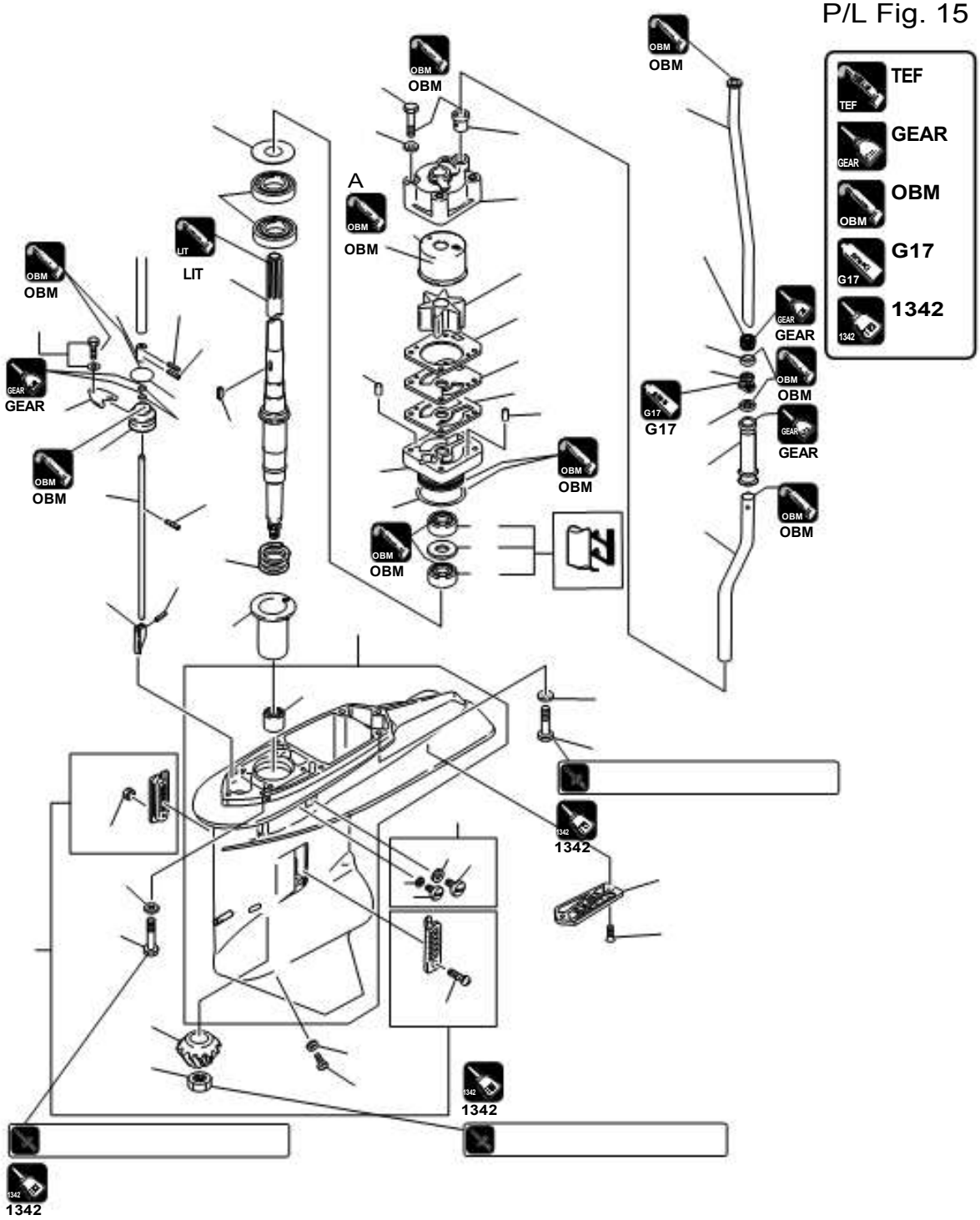
P/L Fig. 15



Ref. 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	

Ref. 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	
24	Washer	4	
25	Sub-Water Inlet Strainer	1	
26	Screw	2	
27	Clutch Cam	1	
28	Cam Rod (L)	1	

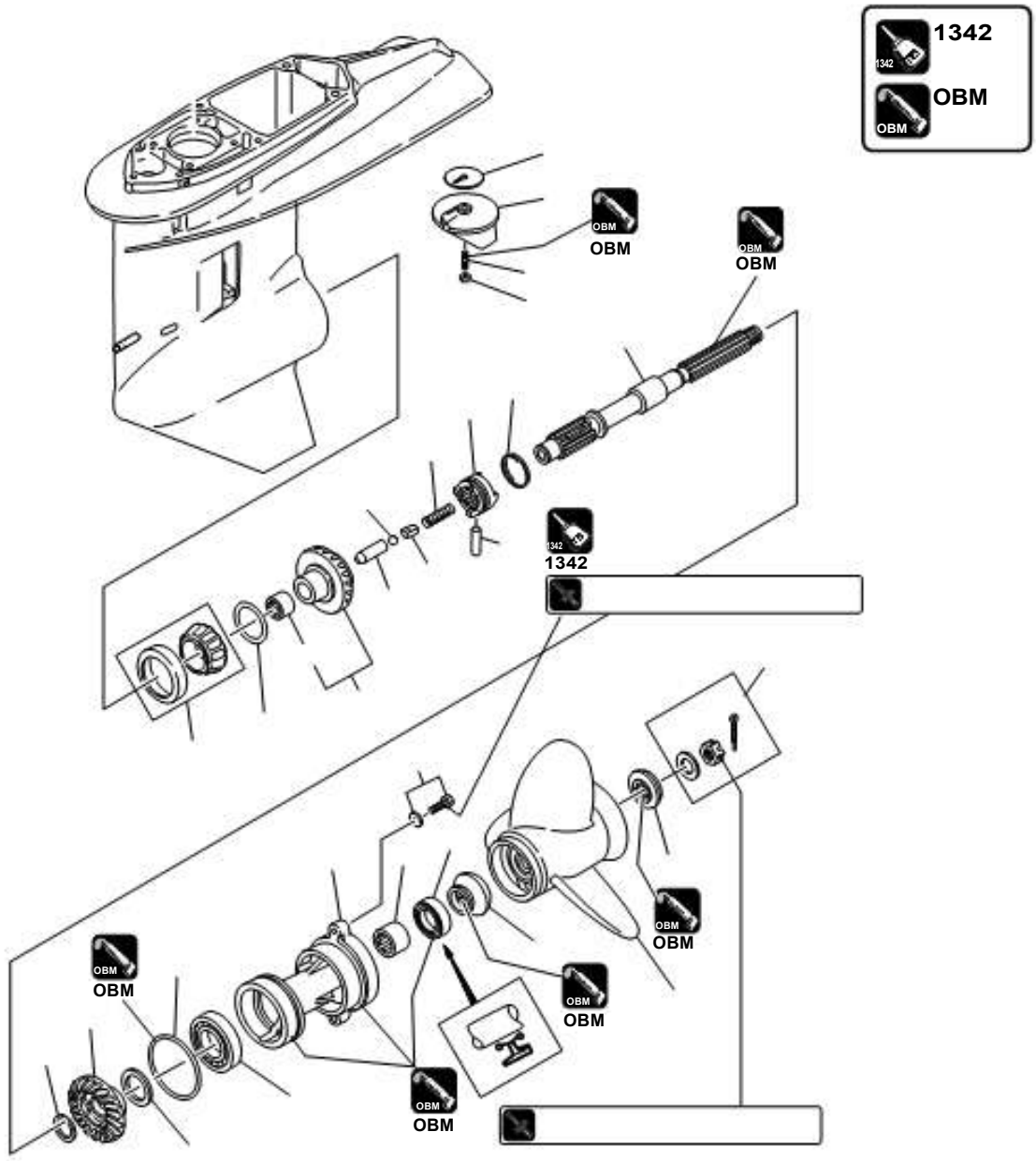
P/L Fig. 15



Ref. No.	Description	Q'ty	Remarks
29	Spring Pin 3.5-14	1	Do not reuse.
30	Spring Pin 3.5-10	1	Do not reuse.
31	Cam Rod Bushing	1	
32	O-Ring 1.9-6.8	2	Do not reuse.
33	O-Ring 3.5-27.7	1	Do not reuse.
34	Shift Rod Joint	1	
35	Bolt 8-35	4	
36	Washer	4	
37	Bolt 10-40	2	
38	Washer	2	
39	Extension Pipe	1	
40	Joint Hose	1	
41	Collar 18-20-4.5	1	
42	Water Strainer Set	1	

Gear Case (Propeller Shaft, MWX50)

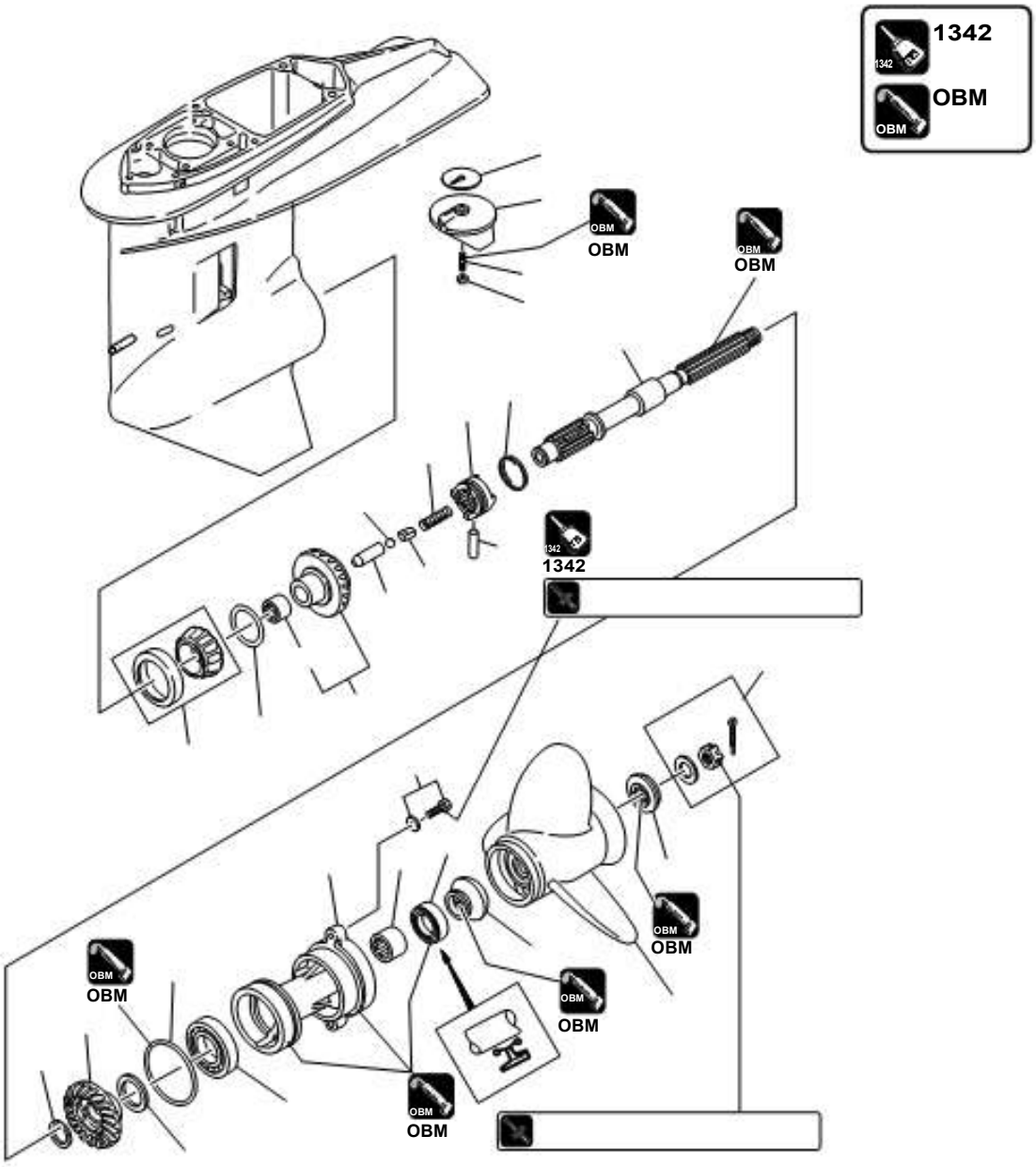
P/L Fig. 16



Ref. 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	
5	Nylon Nut 8-P1.25	1	
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	

Ref. 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

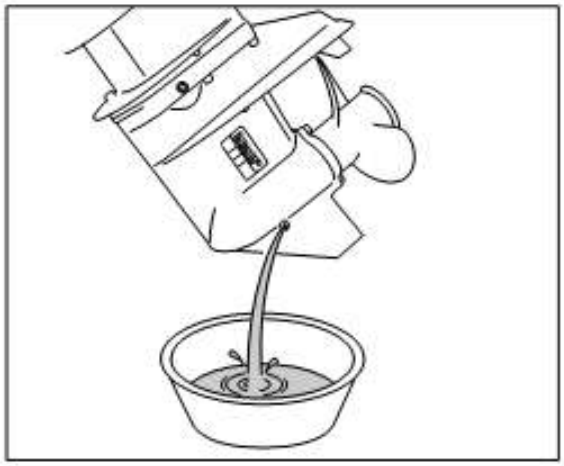
P/L Fig. 16



Ref. 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	

3. Inspection Items

1) Draining Gear Oil



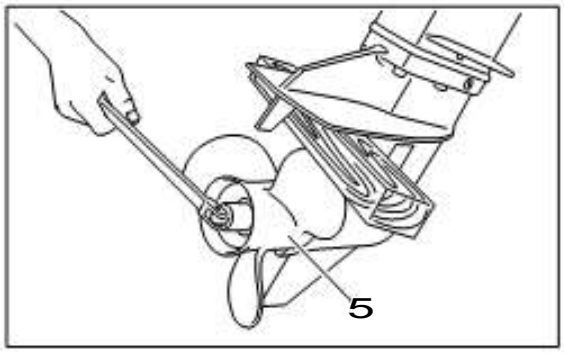
1. Drain gear oil. Refer to “Replacement of Gear Oil” in Chapter 3.

· 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.

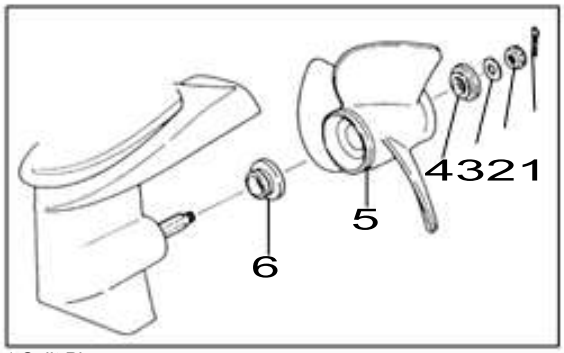
2) Removing Propeller

⚠ WARNING

· Before removing or installing propeller, be sure to 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 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

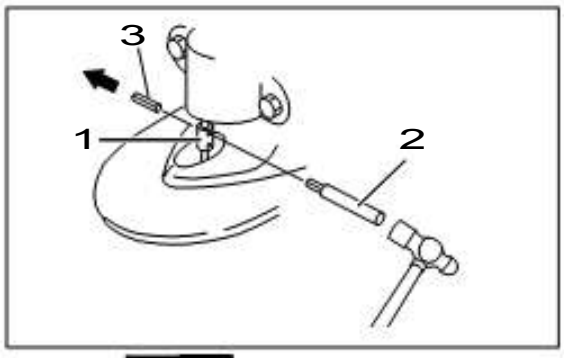
⚠ WARNING

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.



3 Spring Pin **Do not reuse.**

· 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.

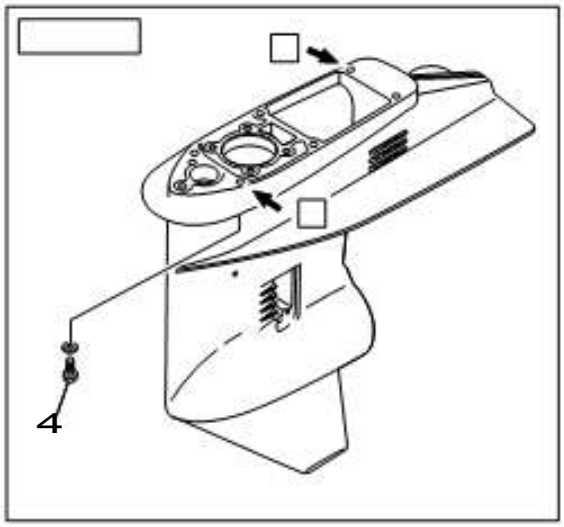
Spring Pin Tool A 2 **(ø3.0) :**
P/N. 345-72227-0

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

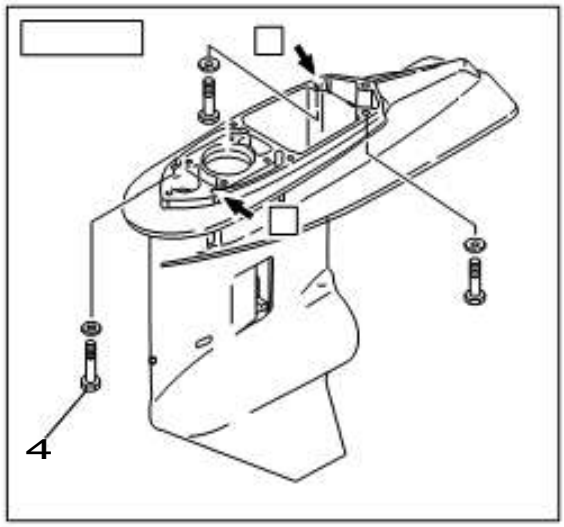
⚠ CAUTION

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

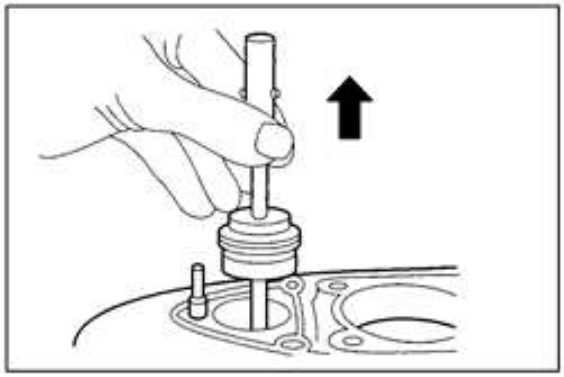
Loosen all lower unit securing bolts except B (2 pcs.) in diagonal order, remove bolts B, and then, remove all other bolts.



4 MX50:M8 6pcs.



4 MWX50:M8 4pcs., M10 2pcs.

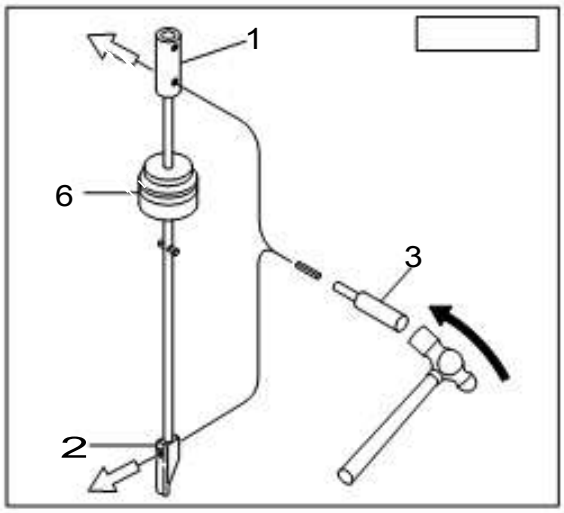


4) Disassembly of Cam Rod

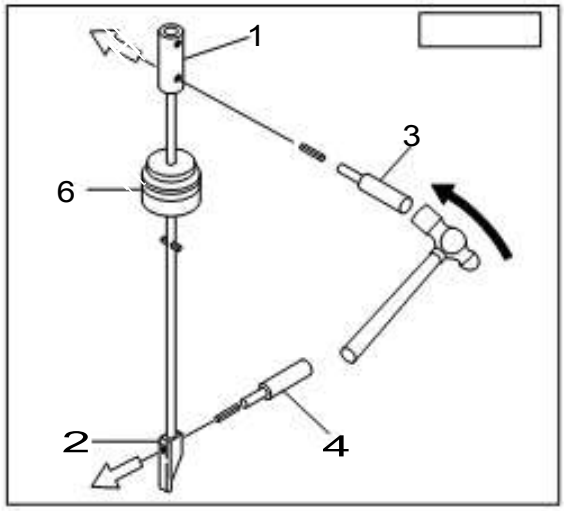
1. Remove stopper, pull out cam rod bushing, and take out cam rod from gear case.

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.

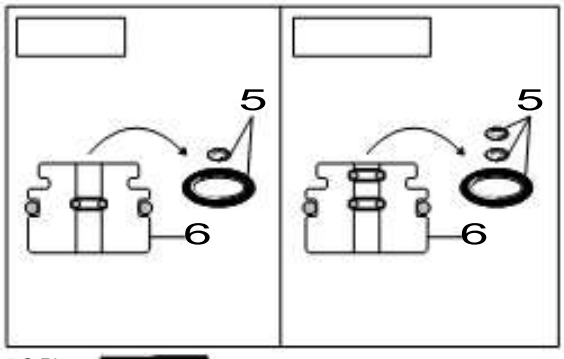


Spring Pin Tool A 3 **(ø3.0) :**
P/N. 345-72227-0



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.



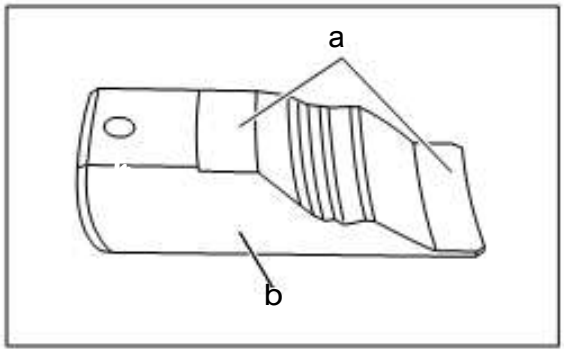
5 O Ring **Do not reuse.**

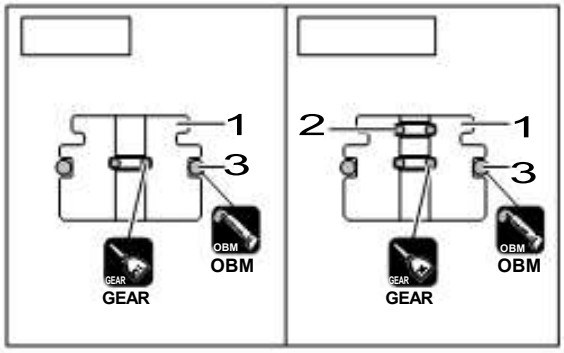
5) Inspection of Clutch Cam

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.





23 O Rings **Do not reuse.**

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.

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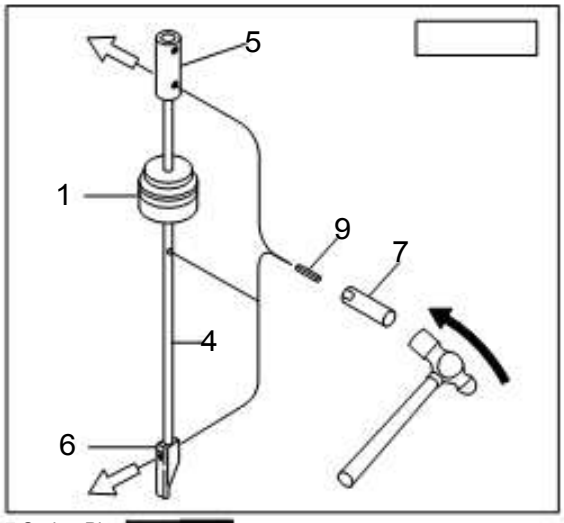
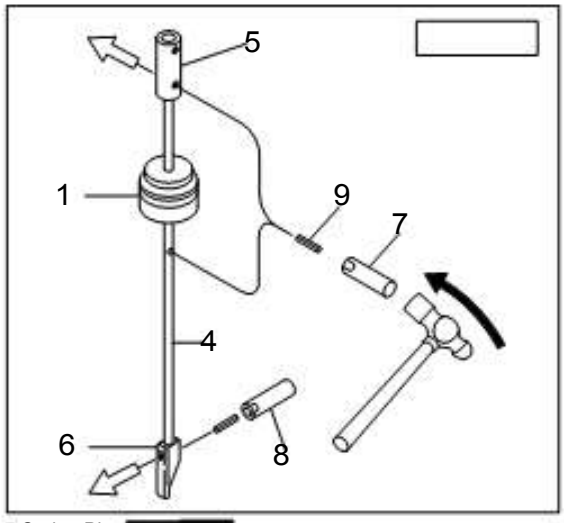
2. Attach cam rod bushing 1, shift rod joint 5 and clutch cam 6 to cam rod 4.



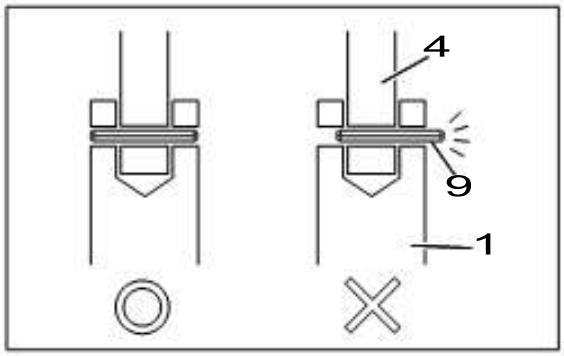
7 Spring Pin **Do not reuse.**

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



7 Spring Pin **Do not reuse.**

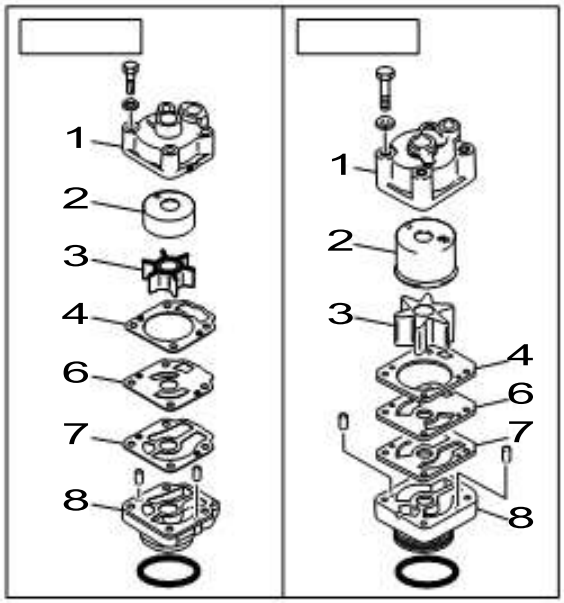
Spring Pin Tool B 7 **(ø3.0) :**
P/N. 345-72228-0
Spring Pin Tool B 8 **(ø3.5) :**
P/N. 369-72218-0



3. Drive spring pin 9.

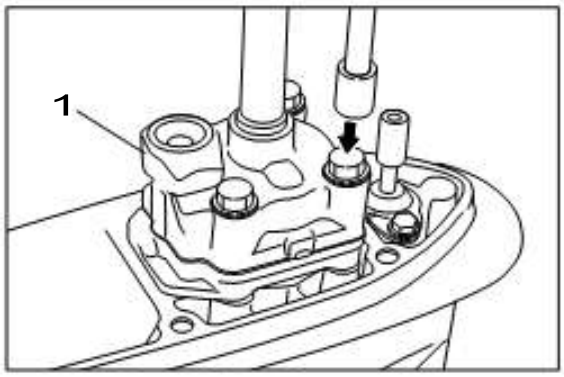
⚠ CAUTION

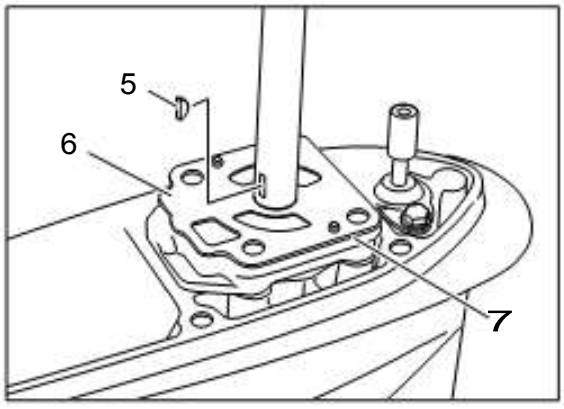
Drive spring pin 9 so that it is flush with clutch cam surface as shown.



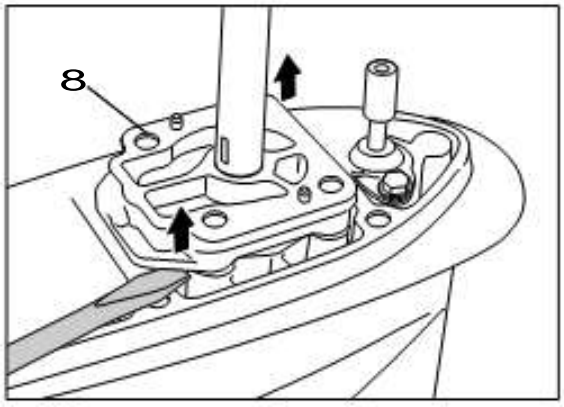
7) Removing Water Pump

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



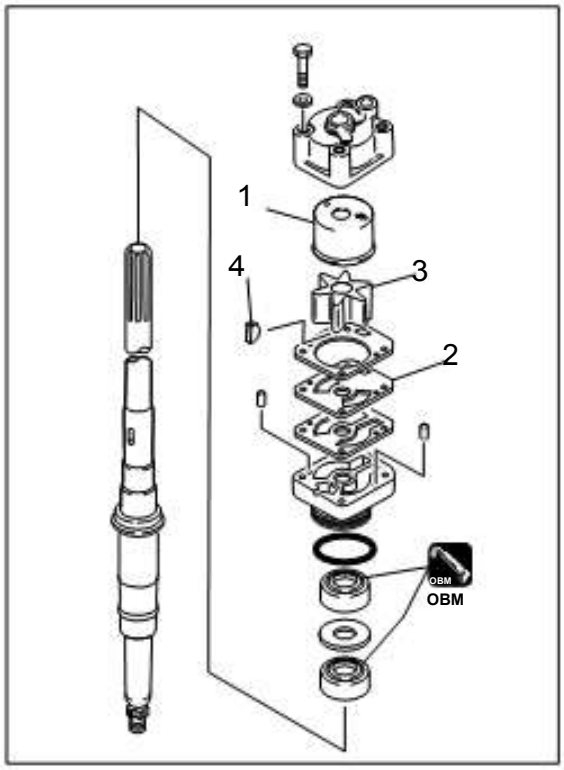


2. Remove water pump impeller key 5.



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

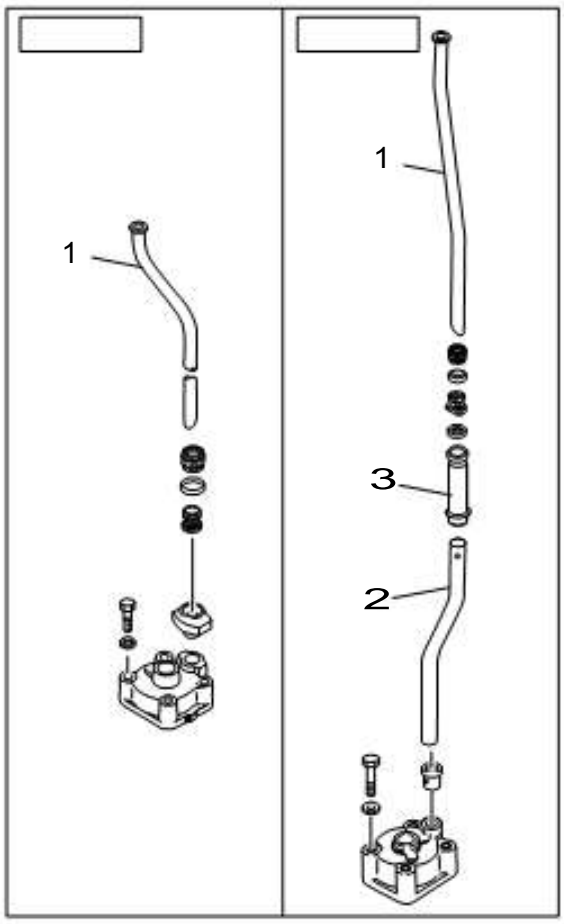
1. Check pump case liner 1 and guide plate 2 for deformation and wear.
   Replace if necessary.

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.

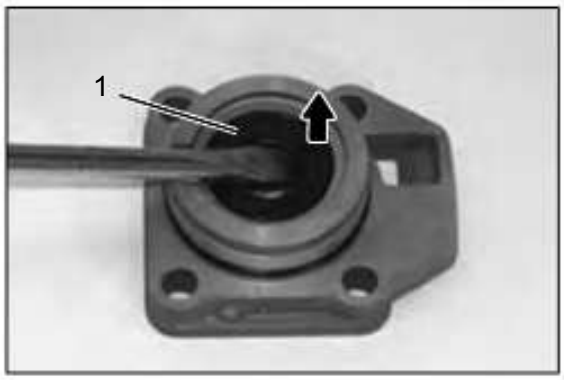


9) Inspection of Water Pipe

1. Remove water pipe 1 from drive shaft housing.
   Refer to 7-24 ~ 7-28.

2. Check water pipe 1 for corrosion, deformation and stuffing.

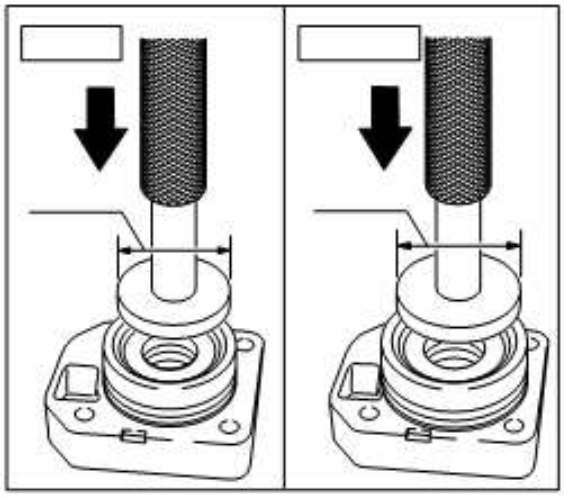
· For MWX50 ;
Extension water pipe 2 and joint hose 3 are in the extension housing. Refer to 7-40 “Assembling Extension Housing” and inspection and assembly.



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.



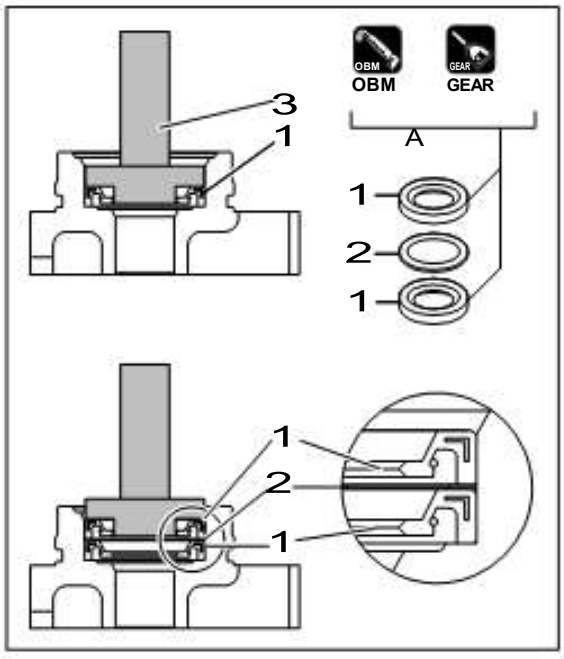
11) Assembly of Water Pump Case (Lower)

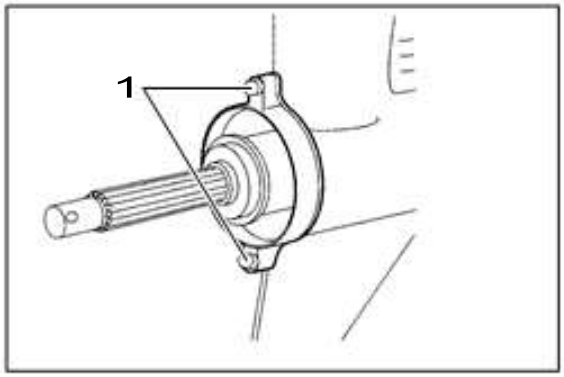
1. Install oil seal 1 and shim 2 by using suitable press 3 and then press-fit perpendicularly.

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

OBM

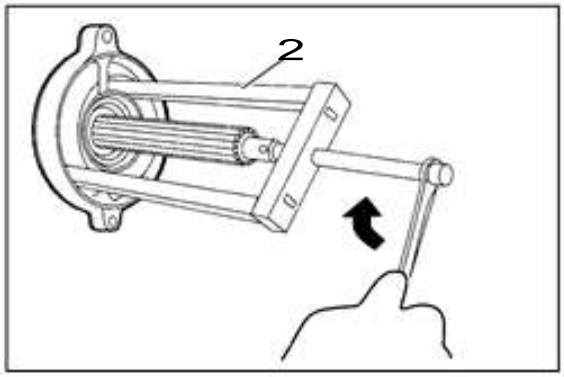
GEAR





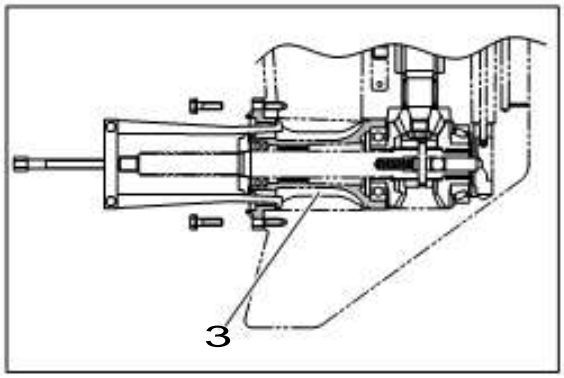
12) Removing Propeller Shaft Housing Ass'y

1. Loosen and remove bolts 1.

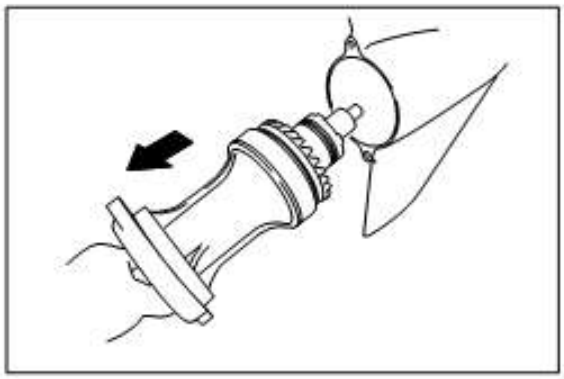


2. Use propeller shaft housing puller to pull out propeller shaft housing to the position where O ring of the housing can be removed.

Propeller Shaft Housing Puller Ass'y 2 **:**
P/N. 353-72252-0

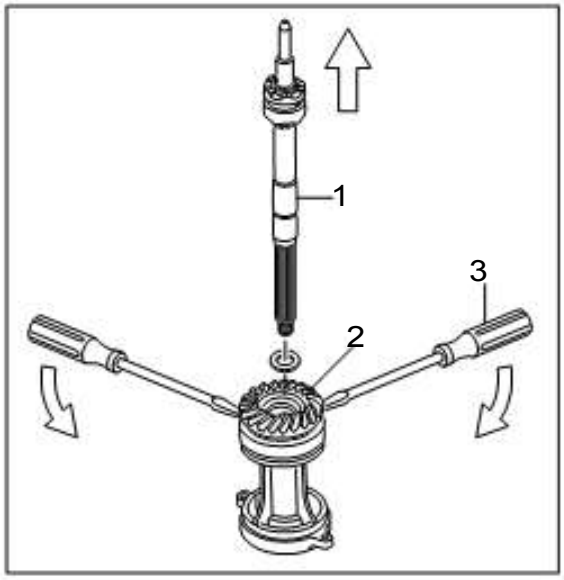


3 Propeller Shaft Housing Ass'y



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

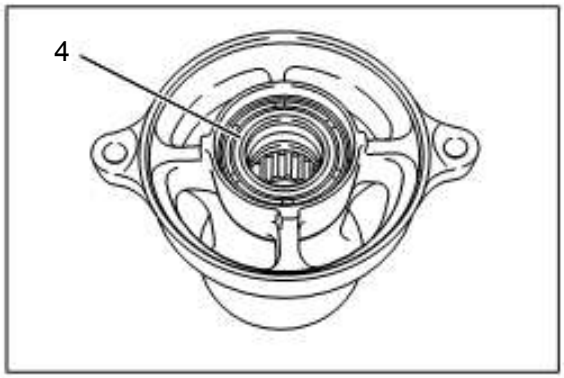
When pulling out propeller shaft housing ass'y, remove clutch push rod and steel balls together with the housing ass'y.



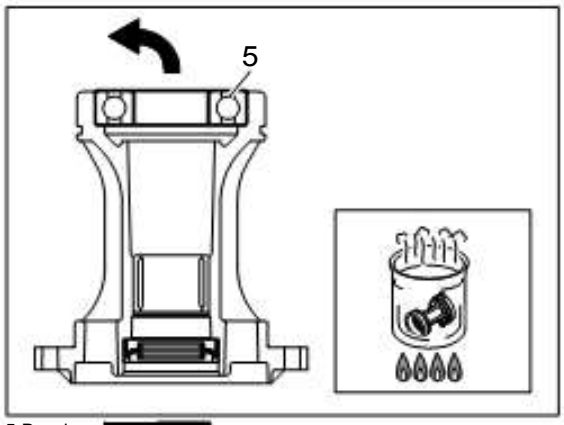
13) Disassembly of Propeller Shaft Housing Ass'y

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.



5 Bearing **Do not reuse.**

4. Remove bearing 5.

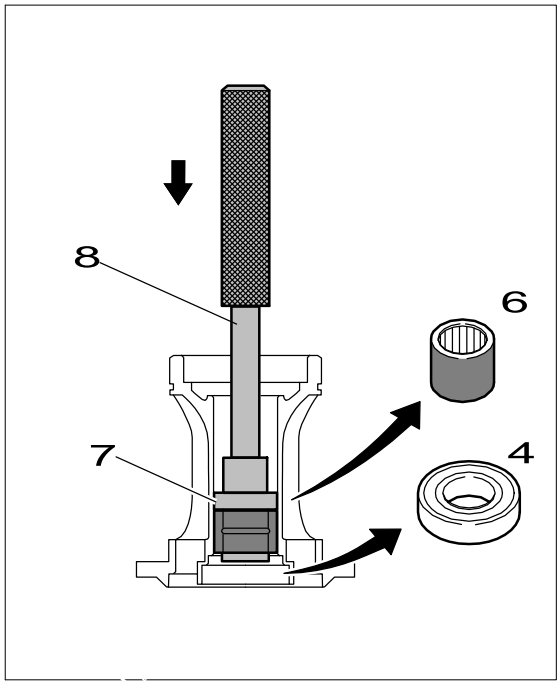
⚠ CAUTION

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.



4 Oil Seal **Do not reuse.**
6 Roller 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.

MX50

Roller Bearing Attachment 7 **:**
P/N. 3MC-99710-0
Driver Rod 8 **:**
P/N. 3AC-99702-0

MWX50

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.

MX50

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

MWX50

Needle 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.

14) Inspection of Propeller Shaft Housing

1. Clean the part by using a solvent and then check.
   Replace if necessary.

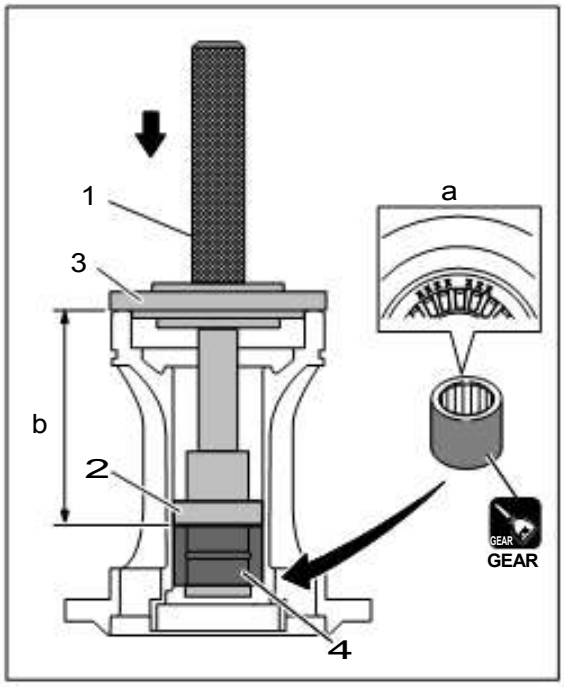
2. Check reverse (C) gear for crack or abnormal wear of the teeth and dog.
   Replace if necessary.

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.



4 Roller Bearing **Do not reuse.**

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.

MX50

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

MWX50

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

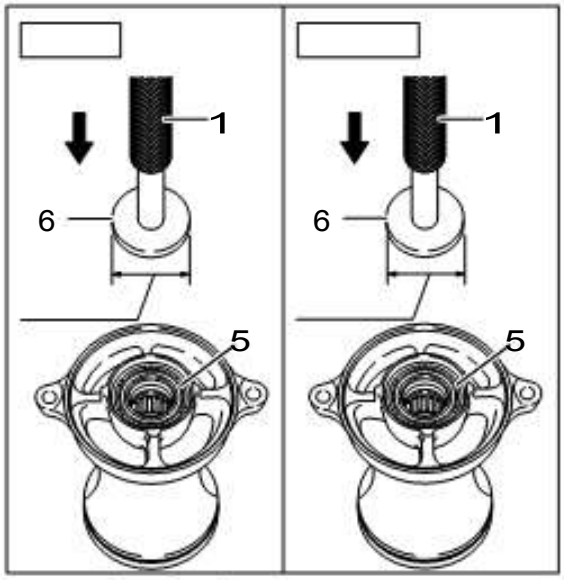
This work can be done also by using the following tool kit.

MX50

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

MWX50

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



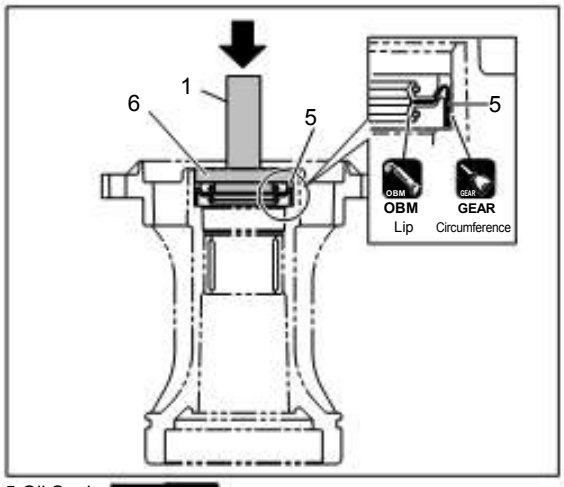
5 Oil seal **Do not reuse.**

2. Install oil seal 5.
Use a suitable press 6 to install new oil seal to propeller shaft housing.

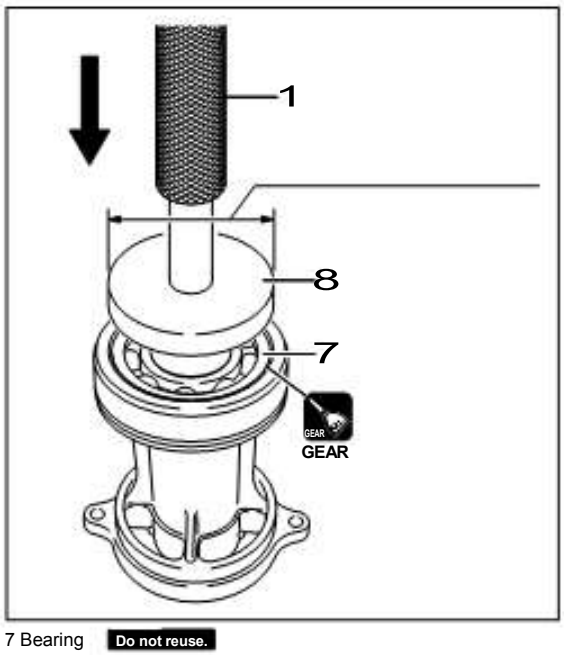
· Install oil seal with the marking facing tool side.
· Clean oil seal installation face and apply gear oil before installation.
· Apply grease to lip of oil seal after installing it.

OBM

GEAR



5 Oil Seal **Do not reuse.**

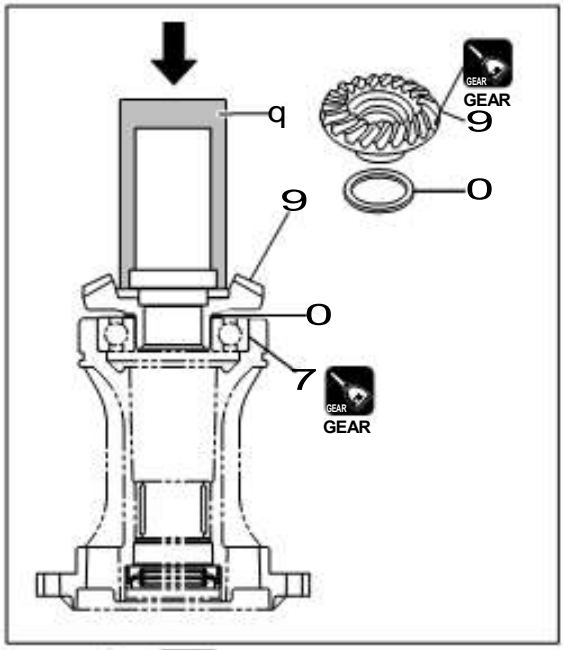


7 Bearing **Do not reuse.**

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



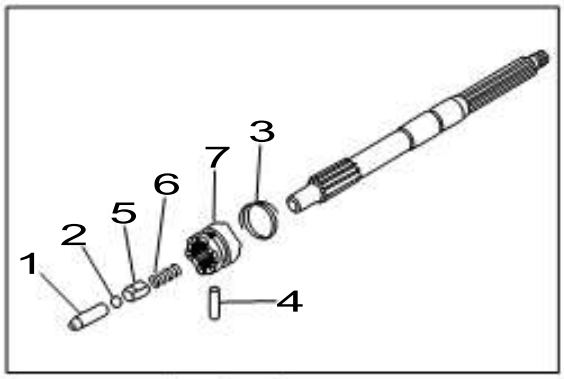
7 Bearing **Do not reuse.**

4. Attach shim 0 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 q **:**
P/N. 3C8-72719-0

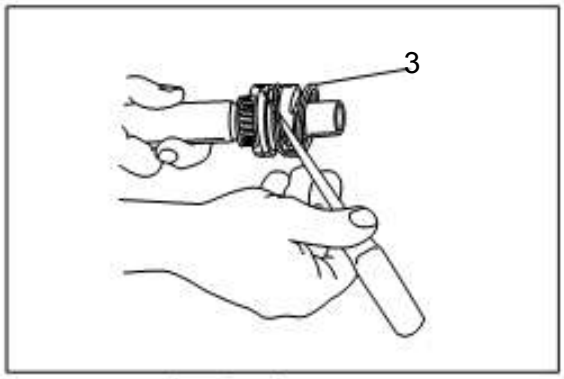
GEAR



3 Clutch Pin Snap **Do not reuse.**

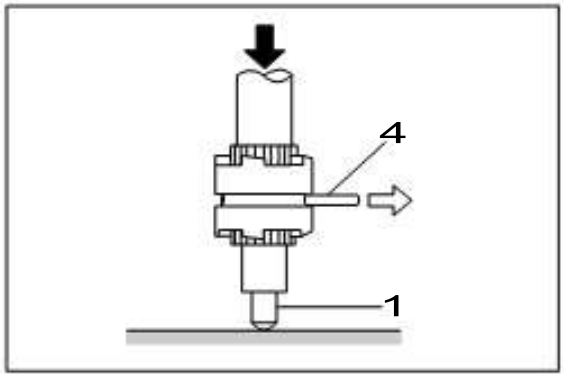
16) Disassembly of Propeller Shaft Ass'y

1. Remove push rod 1 and steel ball 2.



3 Clutch Pin Snap **Do not reuse.**

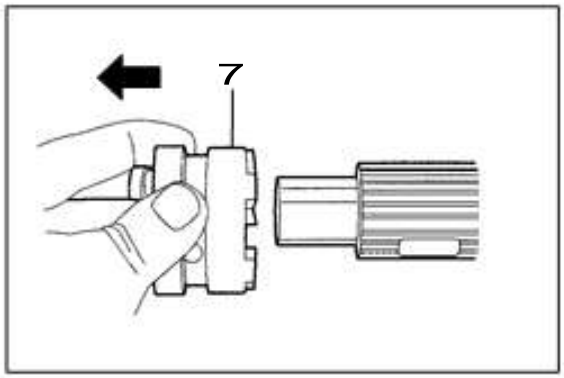
2. Put a bladed screw driver into one of clutch pin snap 3 end, and take the snap out from the clutch groove while winding it.



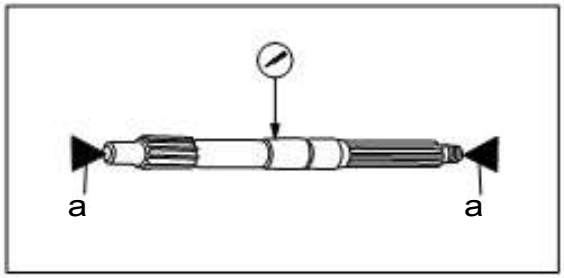
3. Pull out clutch pin 4, and remove clutch spring retainer 5, clutch spring 6, and clutch by referring to the figure.

⚠ 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.



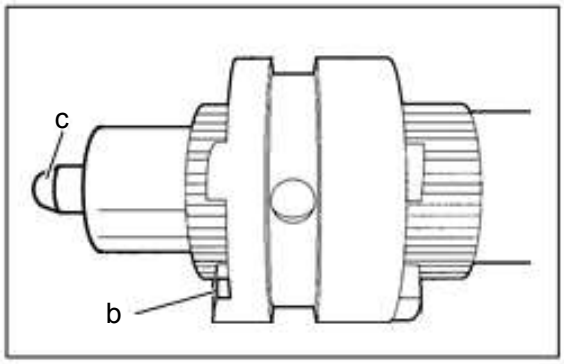
a Supporting Points

17) Inspection of Propeller Shaft Ass'y

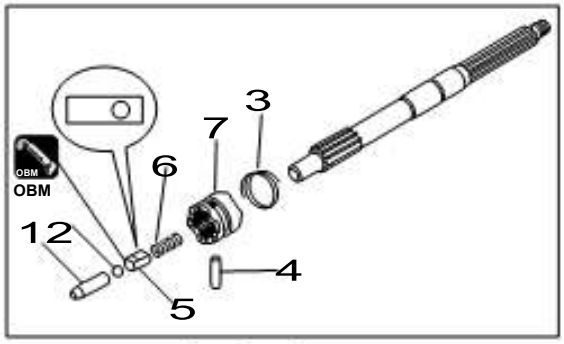
1. Check propeller shaft for bend, wear and damage. Replace if necessary.

2. Measure propeller shaft runout.

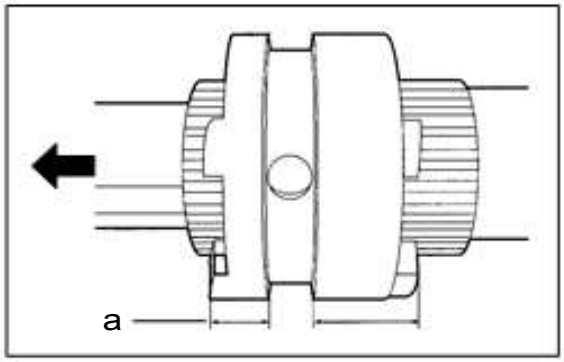
Runout Limit :
0.05 mm (0.0020 in)

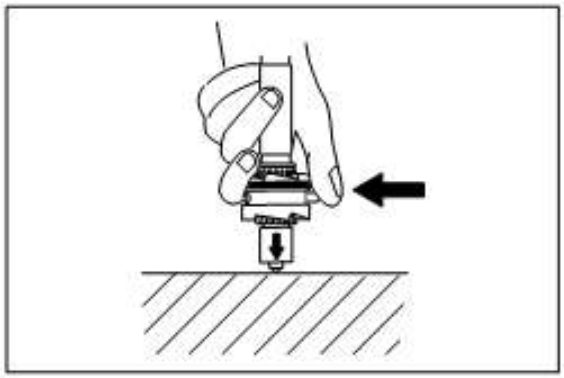


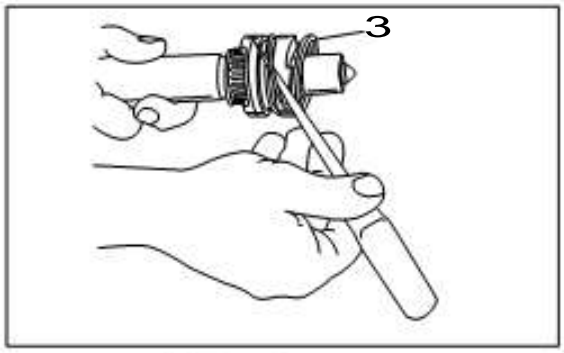
3. Check clutch claw b and push rod c for crack and wear. Replace if necessary.



3 Clutch Pin Snap **Do not reuse.**







3 Clutch Pin Snap **Do not reuse.**

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.

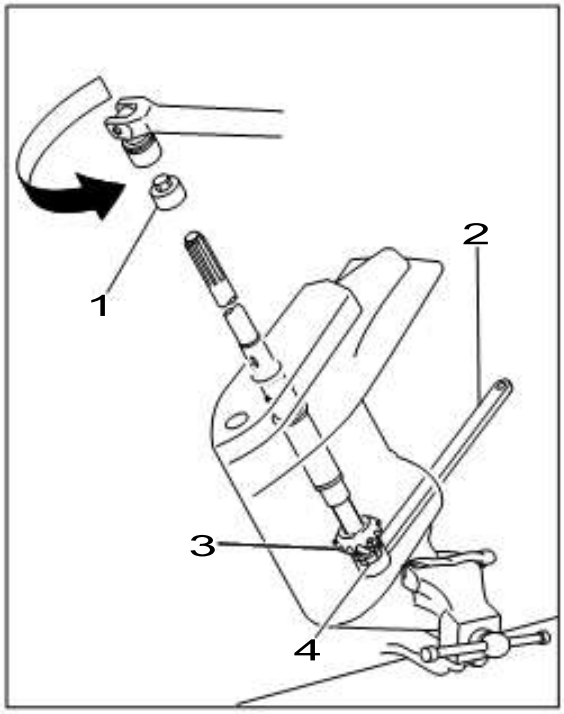
- When attaching clutch, face the narrower claw a to push rod side.
- When installing spring retainer, direct the end farther away from the hole toward forward gear a.
- Install clutch pin while applying preload to push rod.
- Apply OBM grease to spring retainer to prevent ball from dropping.
- Be careful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

OBM

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.

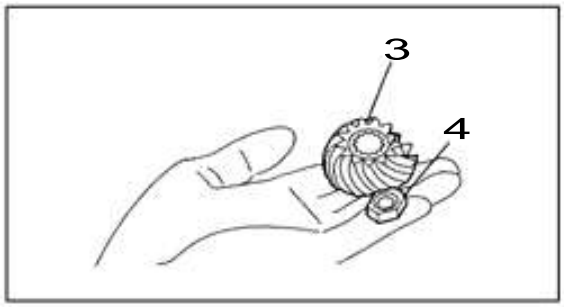


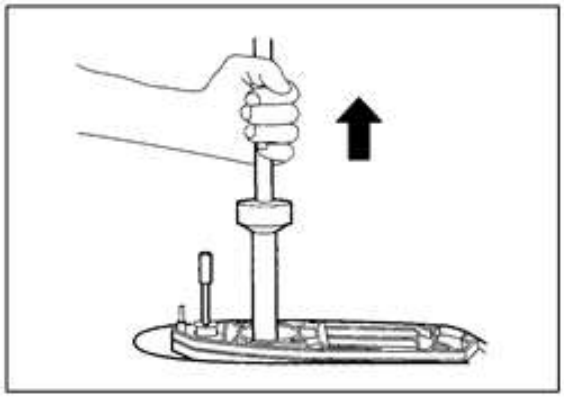
19) Removing Drive Shaft Ass'y

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.

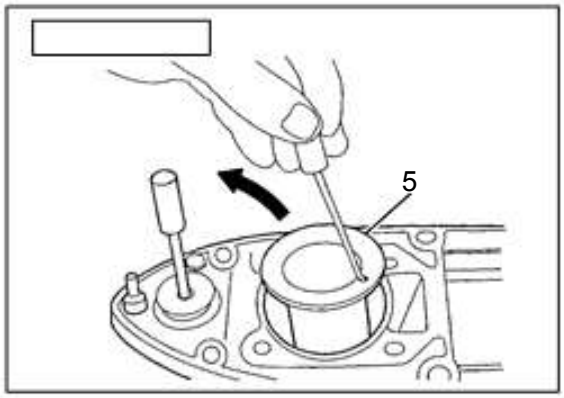
Drive Shaft Socket 1 **:**
P/N. 345-72232-0
Bevel Gear B Nut Wrench 2 **:**
MX:P/N. 346-72231-0
MWX:P/N. 353-72231-0



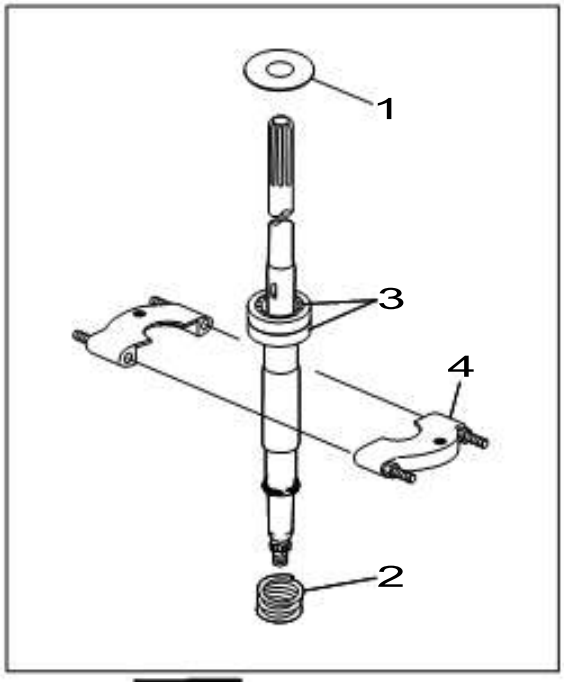


2. Pull out drive shaft from gear case.

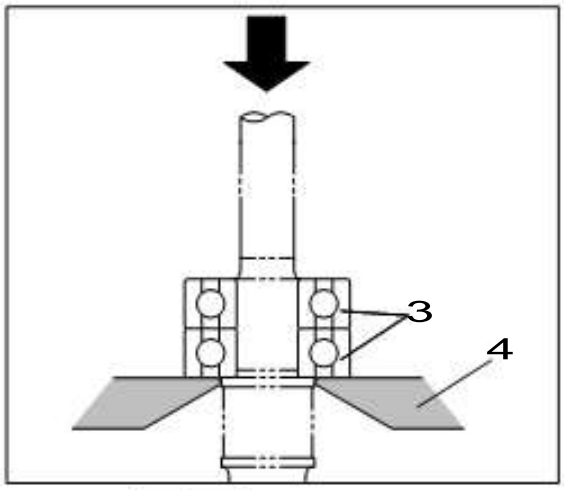
· When removing drive shaft, be careful not to give damage to shim on the bearing outer race and not to lose the part.
· Replace shim with new one of the same thickness if any deformation or damage is found on it.



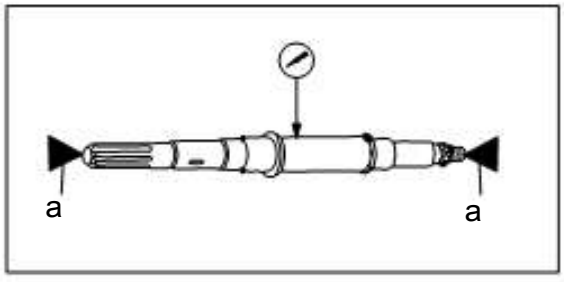
3. Remove drive shaft spring guide 5.



3 Bearings **Do not reuse.**



3 Bearings **Do not reuse.**



a Supporting Points

20) Disassembly of Drive Shaft Ass'y

1. Remove outer shim 1.
2. Remove drive shaft spring 2.
3. Remove 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

21) Inspection of Drive Shaft

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

Runout Limit :
0.4 mm (0.016 in)

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.

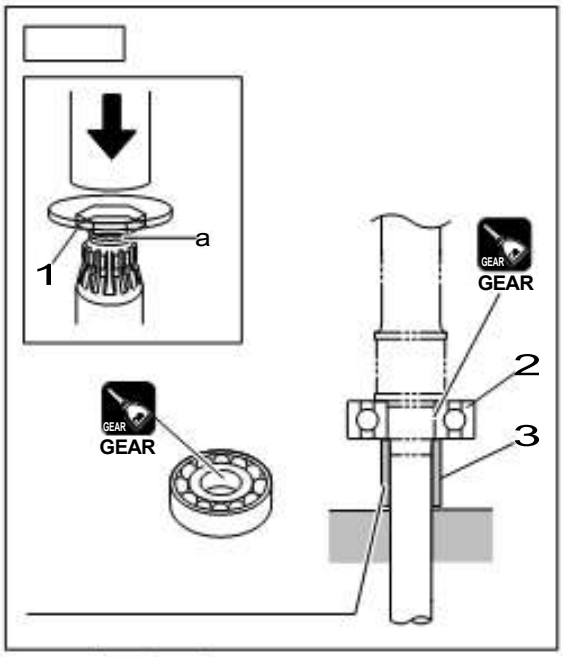
2. Install bearing 2 by using press and a suitable pipe 3. Before installing bearing, be sure to clean drive shaft installation face and apply gear oil.

⚠ CAUTION

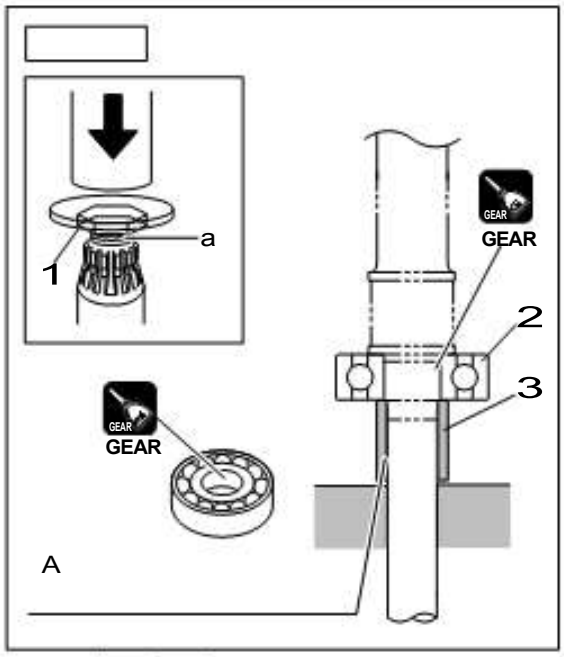
Do not press drive shaft thread a directly. Put a piece of protector (steel plate) on the tip of the shaft.

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

GEAR



2 Bearing **Do not reuse.**

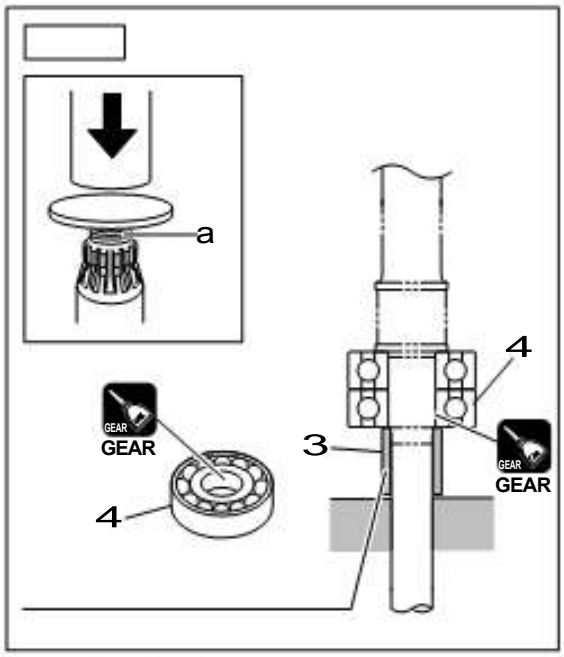


2 Bearing **Do not reuse.**

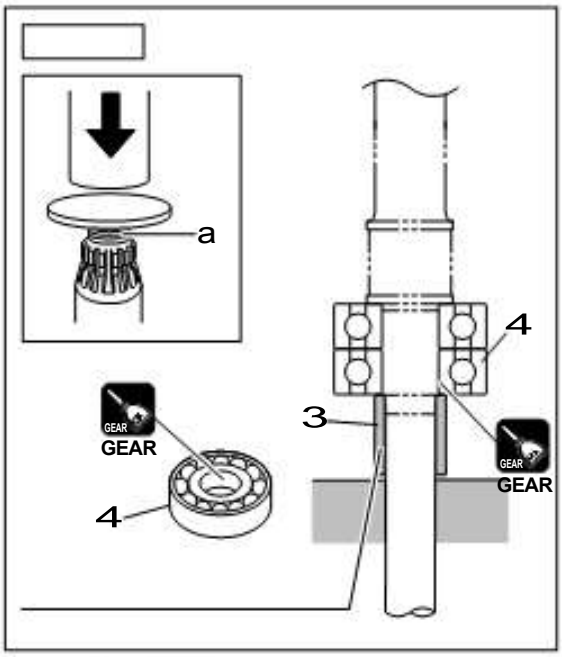
3. Install another ball bearing 4 by using press and a suitable pipe 3.
Before installing bearing, be sure to clean drive shaft installation face and apply gear oil.

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

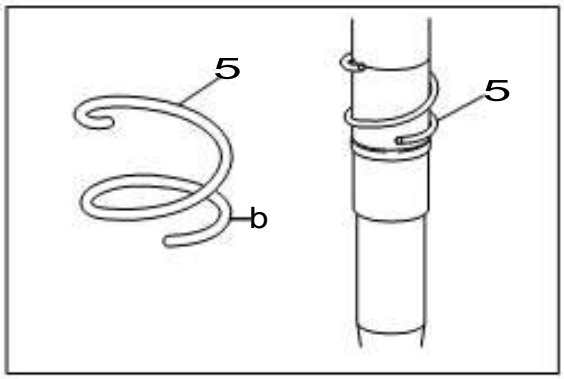
GEAR



4 Bearing Do not reuse.



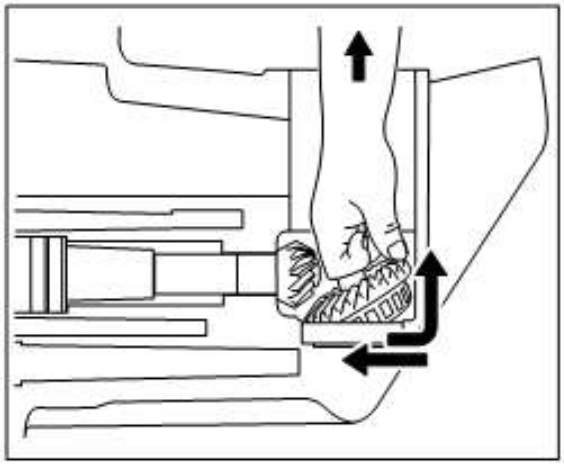
4 Bearing Do not reuse.



4. Attach drive shaft spring 5.

⚠ CAUTION
When attaching the spring, face the side b toward pinion (B) gear side.

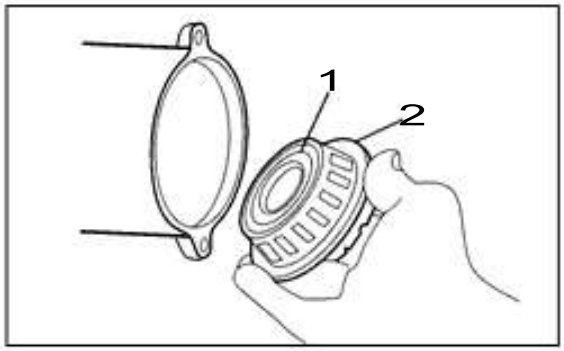
Attach spring as illustrated.

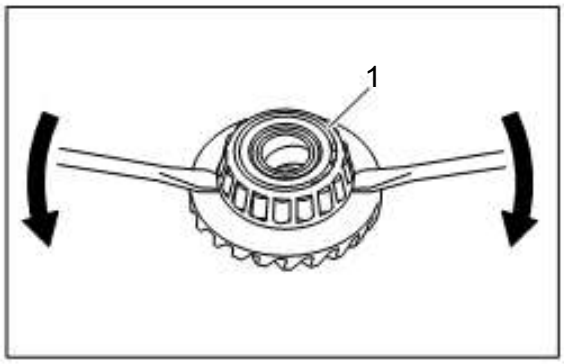


24) Removing Forward (A) Gear Ass'y

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 MWX50 models: Can not remove forward (A) gear when removed pinion (B) gear.
Refer to P6-52, remove pinion (B) gear, and then remove forward (A) gear.

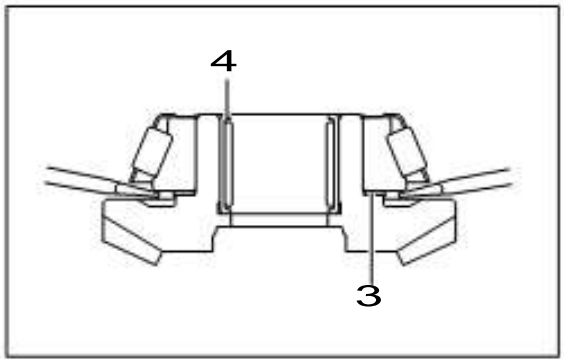


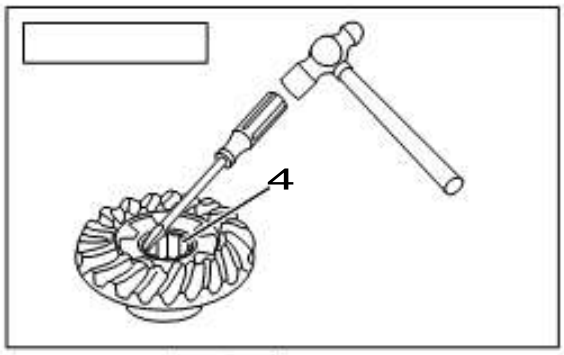


25) Disassembly of Forward Gear (A) Gear

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 3.





4 Roller Bearing **Do not reuse.**

MWX50 only

2. Remove roller bearing 4.
   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.

26) Inspection of Forward (A) Gear

1. 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”.

MWX50 only

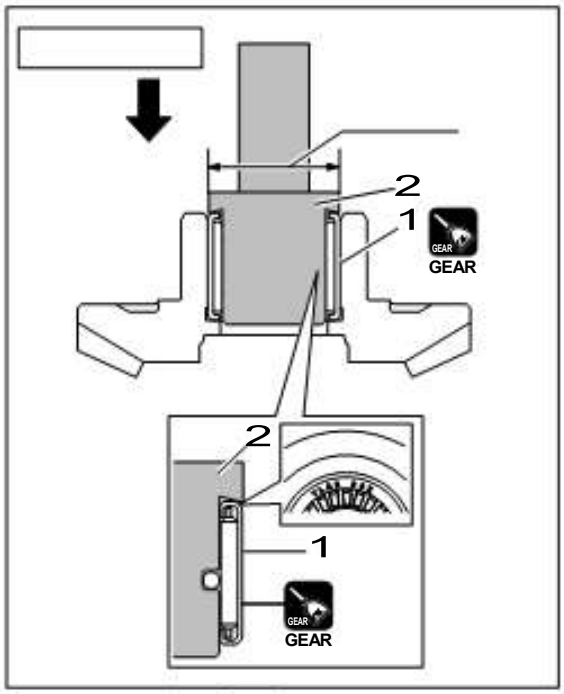
1. Install roller bearing 1.
   Apply gear oil to press-fit face when press-fitting roller bearing.

⚠ CAUTION

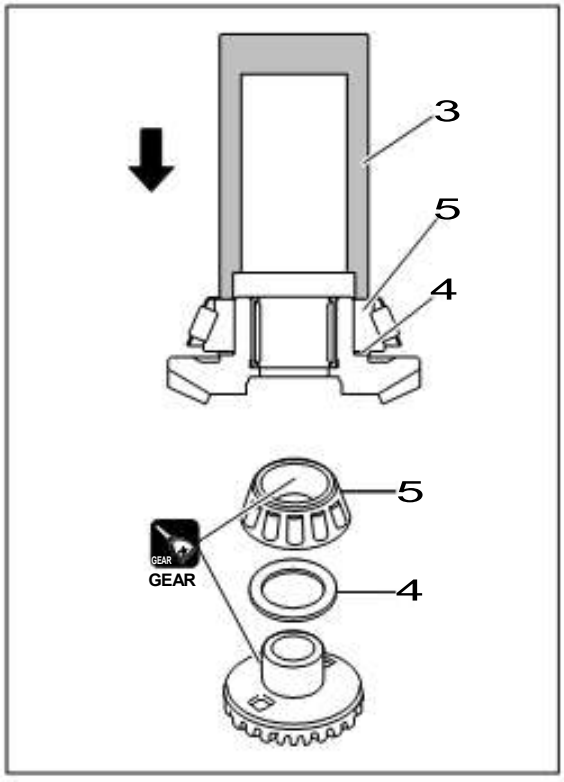
When press-fitting roller bearing, face the marking side to tool side.

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

GEAR



1 Needle 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

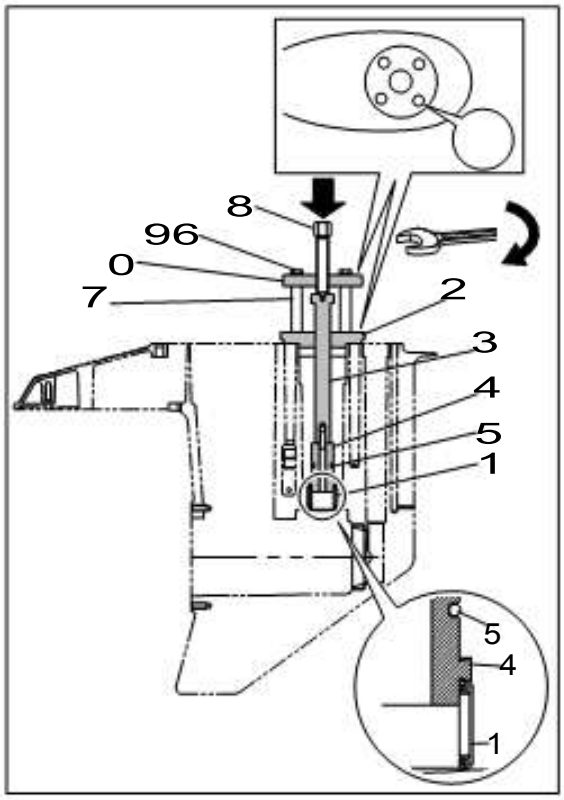
GEAR

28) Disassembly of Gear Case

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

Align following marks of the press guide 2 and installation hole of the pump case front-right side, then attach press guide.

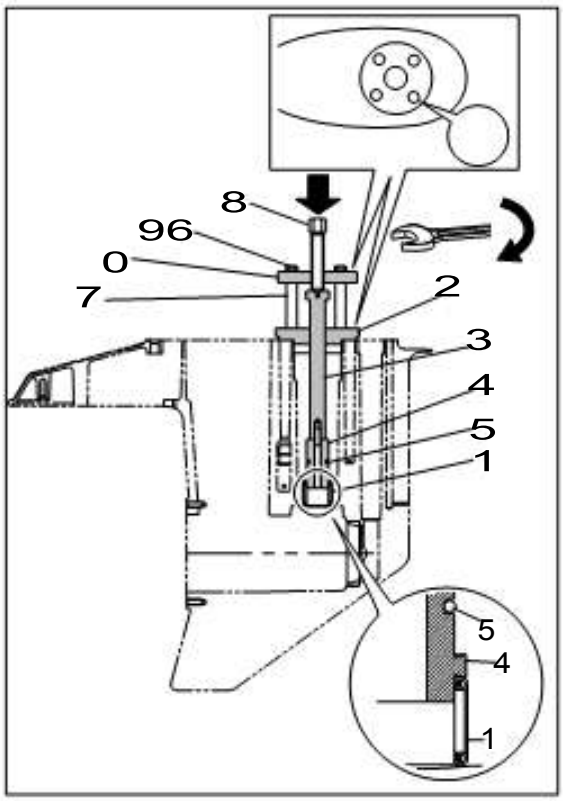
MX50



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 0 **:**
P/N. 3AC-72901-1

MWX50



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. 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 0 **:**
P/N. 3AC-72901-1

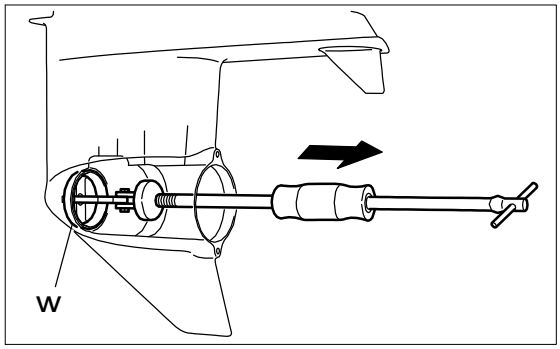
This work can be done also by using the following tool kit.

MX50

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

MWX50

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

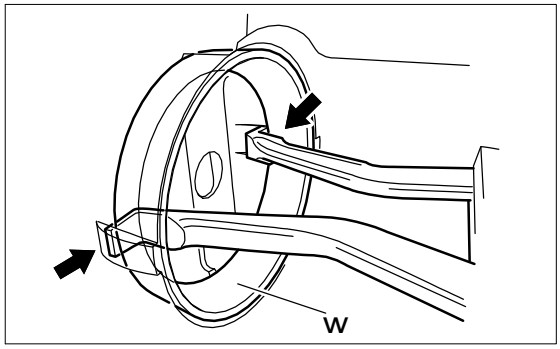


w Outer Race **Do not reuse.**

2. Remove taper roller bearing outer race w.
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.

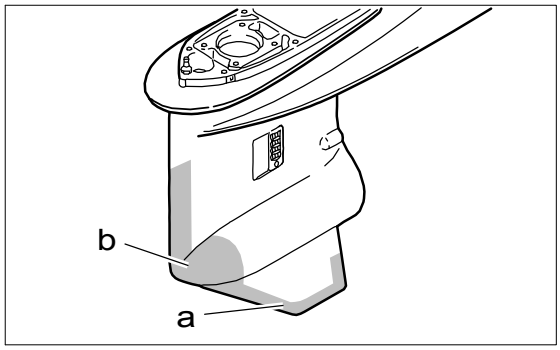
Slide Hammer Ass'y :
P/N. 3AC-99080-0

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



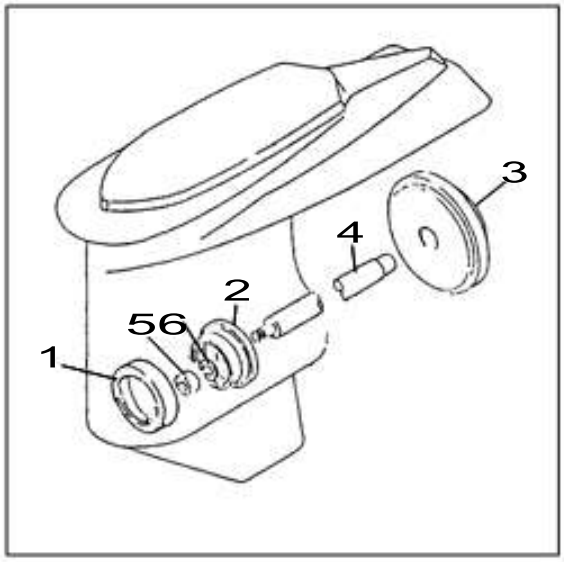
This work can also be done by using the following tool.

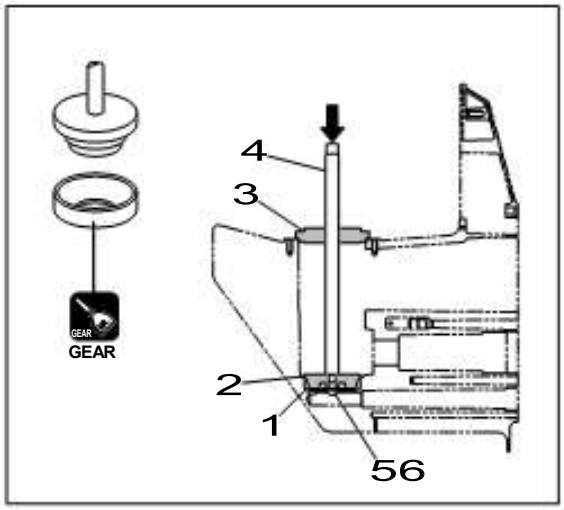
Bevel Gear Bearing Puller Ass'y :
MX50:P/N. 3A3-72755-0
MWX50:P/N. 3B7-72755-0

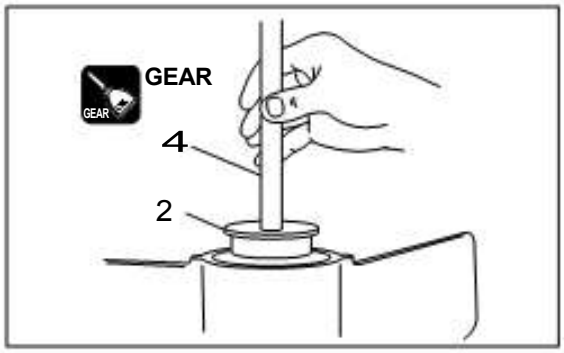


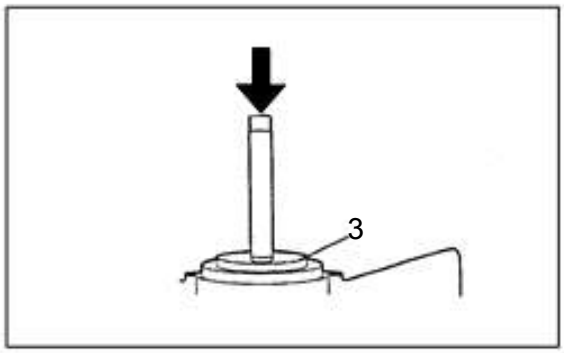
29) Inspection of Gear Case

1. Check skeg a and torpedo-like area b for crack and other damage.
Replace if necessary.









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

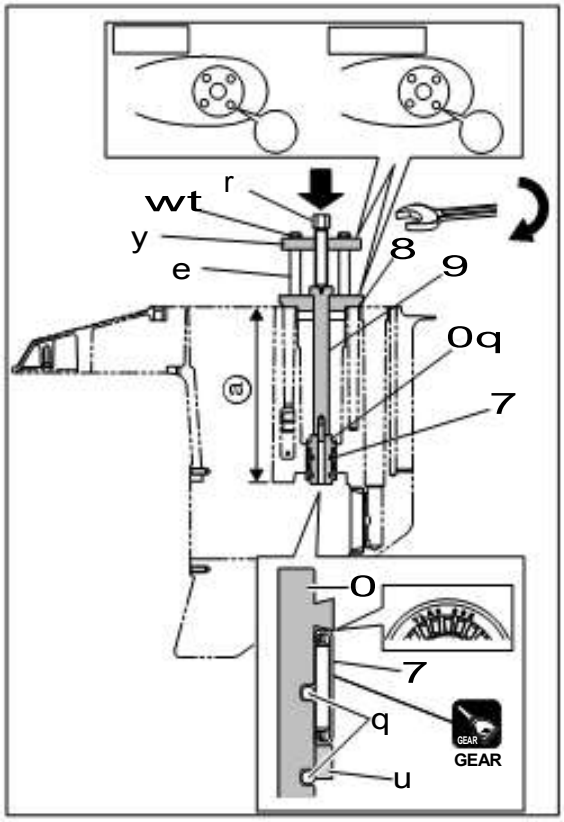
2. Fix gear case on a holder with its propeller shaft opening facing upward.

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.

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 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 Roller Bearing Do not reuse.

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

MX50

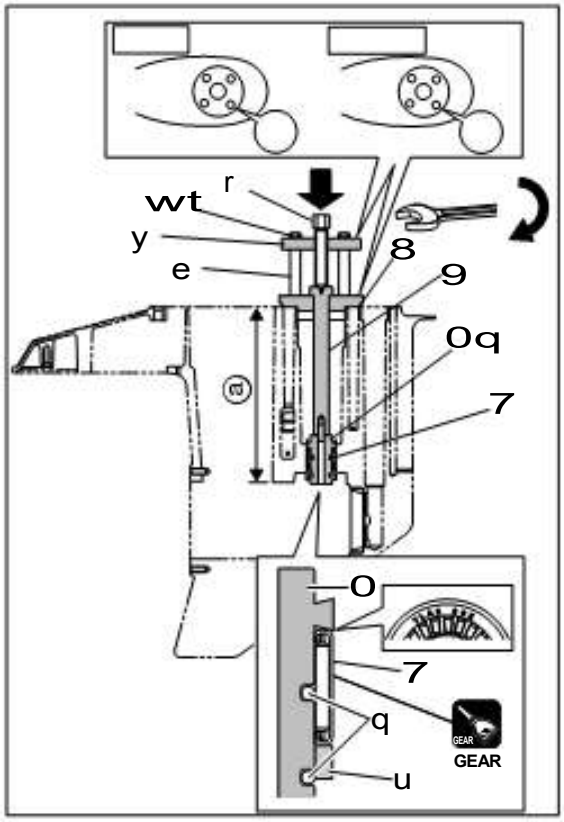
Roller Bearing Press Kit :
P/N. 3LC-72900-0
Bearing Outer Press Guide 8 **:**
P/N. 3T1-72765-0
Roller Bearing Press Rod 9 **:**
P/N. 3LC-72767-0
Roller Bearing Press 0 **:**
P/N. 3Z5-72770-0
O Ring q **:**
P/N. 6B3-32529-0
Washer M8 w **:**
P/N. 940191-0800
Roller Bearing Outer Press Collar e **:**
P/N. 3C7-72768-0
Roller Bearing Outer Press Bolt r **:**
P/N. 3C7-72766-0
Bolt M8-110 t **:**
P/N. 3C7-72773-0
Roller Bearing Press Flange y **:**
P/N. 3AC-72901-1
Roller Bearing Press Guide u **:**
P/N. 3Z5-72905-0

Installation Depth a **:**
173 mm (6.811 in)

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

MX50

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



MWX50

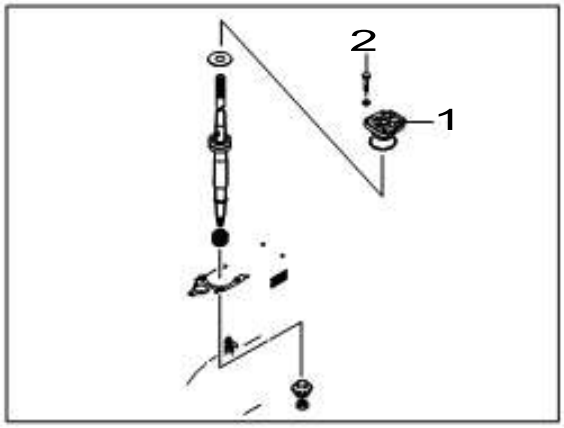
Roller Bearing Press Kit :
P/N. 3LC-72900-0
Bearing Outer Press Guide 8 **:**
P/N. 3T1-72765-0
Roller Bearing Press Rod 9 **:**
P/N. 3LC-72767-0
Roller Bearing Press 0 **:**
P/N. 3S7-72770-0
O Ring q **:**
P/N. 6H6-07422-0
Washer M8 w **:**
P/N. 940191-0800
Roller Bearing Outer Press Collar e **:**
P/N. 3C7-72768-0
Roller Bearing Outer Press Bolt r **:**
P/N. 3C7-72766-0
Bolt M8-110 t **:**
P/N. 3C7-72773-0
Roller Bearing Press Flange y **:**
P/N. 3AC-72901-1
Roller Bearing Press Guide u **:**
P/N. 3S7-72905-0

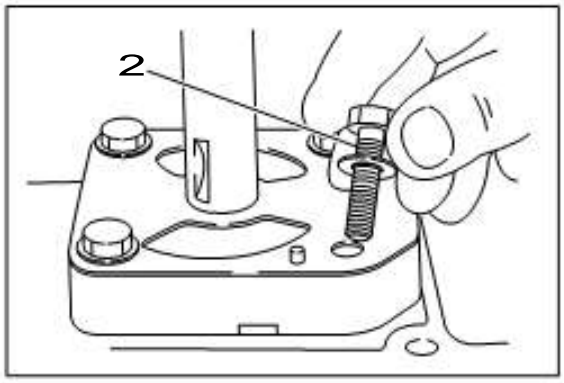
Installation Depth a **:**
201 mm (7.913 in)

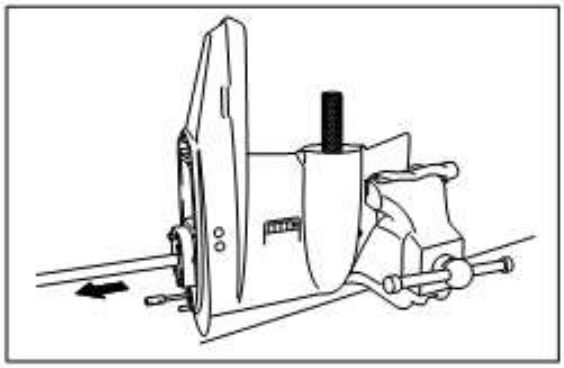
This work can be done also by using the following tool kit.

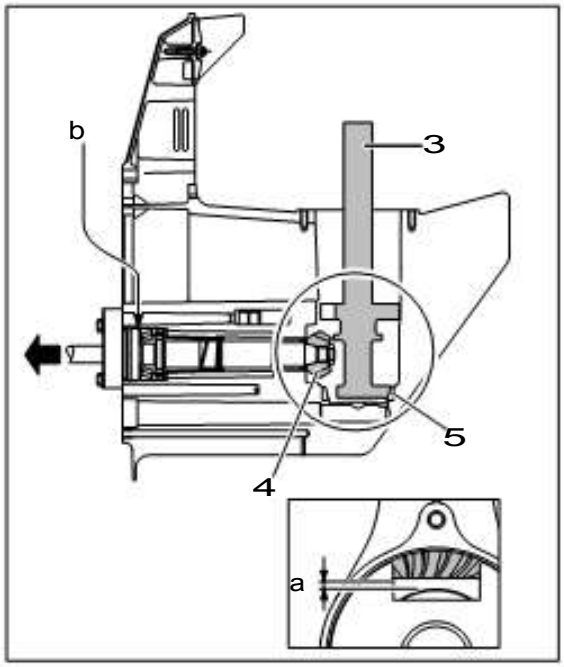
MWX50

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









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) bear 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 a 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.

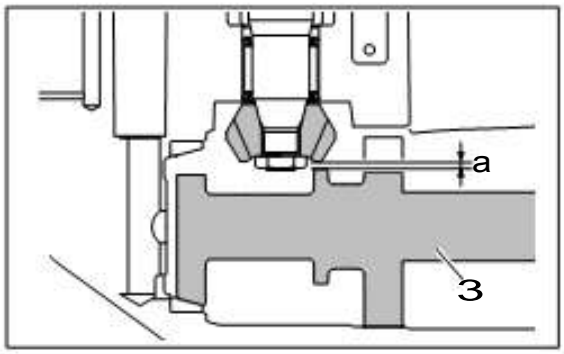
Thickness gauge measures the gap between shimming gauge 3 and pinion (B) gear end.

MX50

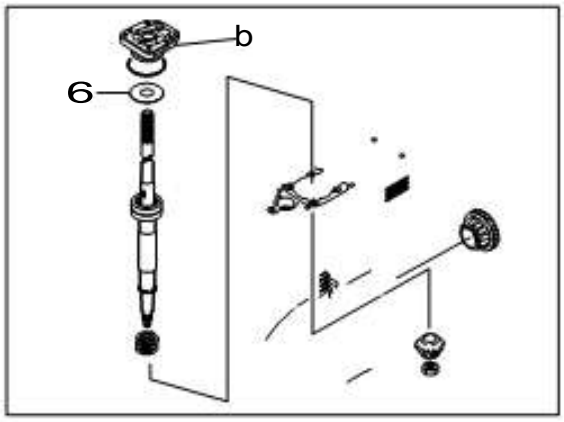
Shimming Gauge 3 **:**
P/N. 3C8-72250-0
Thickness Gauge :
P/N. 353-72251-0

MWX50

Shimming Gauge 3 **:**
P/N. 353-72250-0
Thickness Gauge :
P/N. 353-72251-0



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



MX50

Pinion (B) Gear Height a **:**
0.60 - 0.64 mm (0.0236 - 0.0252 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

MWX50

Pinion (B) Gear Height a **:**
0.95 - 1.00 mm (0.03740 - 0.03937 in)

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

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

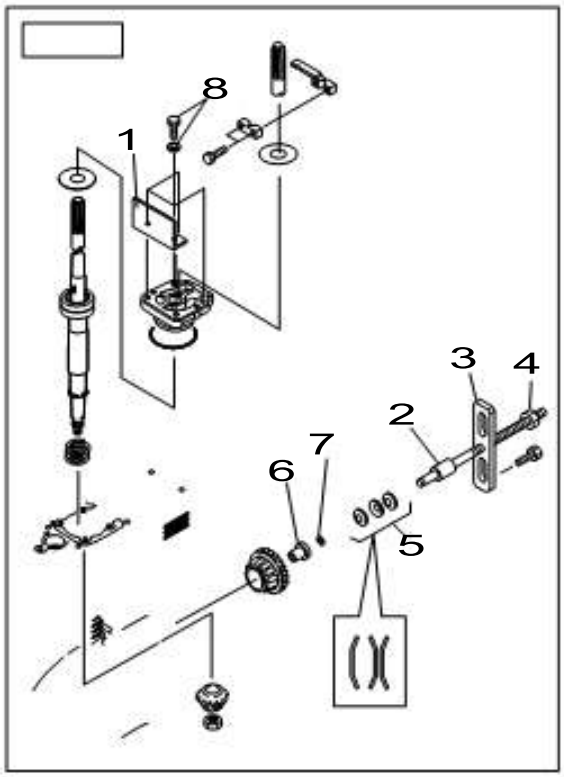
⚠ CAUTION

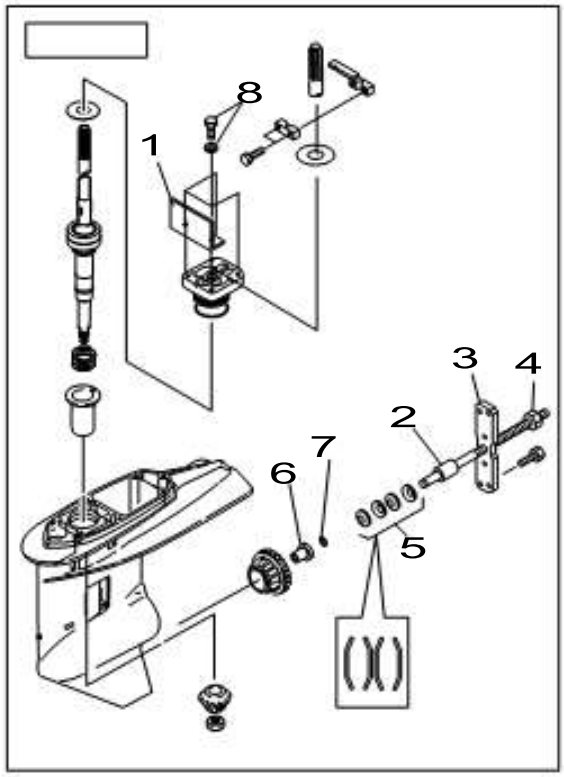
Before measuring backlash between forward (A) and pinion (B) gears, measure pinion (B) gear height.
Refer to “Measurement of Pinion (B) Gear Height and Shim Selection” in Chapter 6.

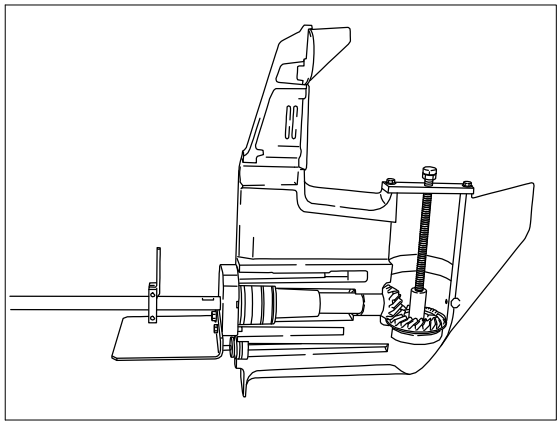
1. In accordance with procedure described in “Assembly of Lower Unit Parts” on Chapter 6, install parts up to pump case (lower).

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.

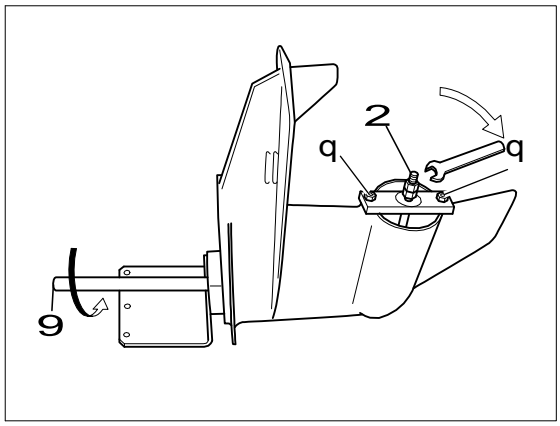
MX50

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

MWX50

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.

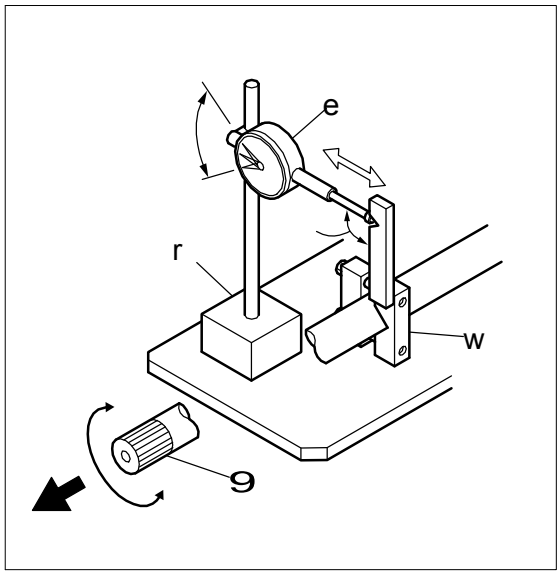


4. Tighten shaft 2 until drive shaft 9 starts to move (rotate). When drive shaft starts to move, additionally tighten shaft 2 1/2 of a turn (180˚).

· 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 q **:**
25 N · m (18 lb · ft) [2.5 kgf · m]

Tightening Torque for Inspection a **:**
Tighten bolt gradually until propeller shaft stops to turn.



5. Attach backlash measuring tool clamp w to drive shaft.

6. Turn drive shaft 9 clockwise / counterclockwise slowly while pulling it up, and read change of dial gauge e indication.

· When measuring, contact dial gauge tip to inside of V groove located in the clamp ass'y.
· Attach backlash measuring tool clamp w 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 pump case.

Backlash Measuring Tool Clamp w **:**
P/N. 3B7-72720-0
Dial Gauge e **:**
Commercially Available Item
Magnetic Stand r **:**
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.

MX50

Proper Backlash :
0.31 - 0.62 mm (0.0122 - 0.0244 in)

MWX50

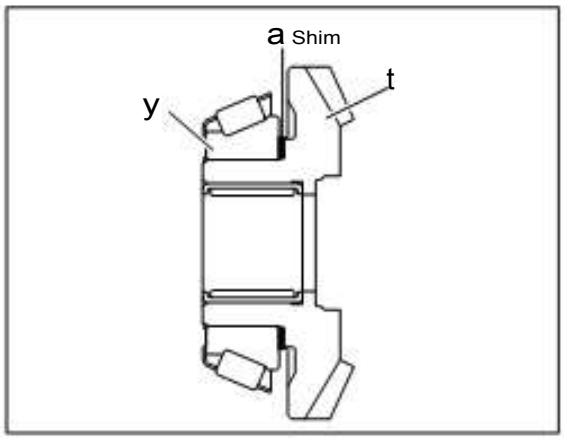
Proper Backlash :
0.29 - 0.58 mm (0.0114 - 0.0228 in)

MX50

å 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

MWX50

å 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

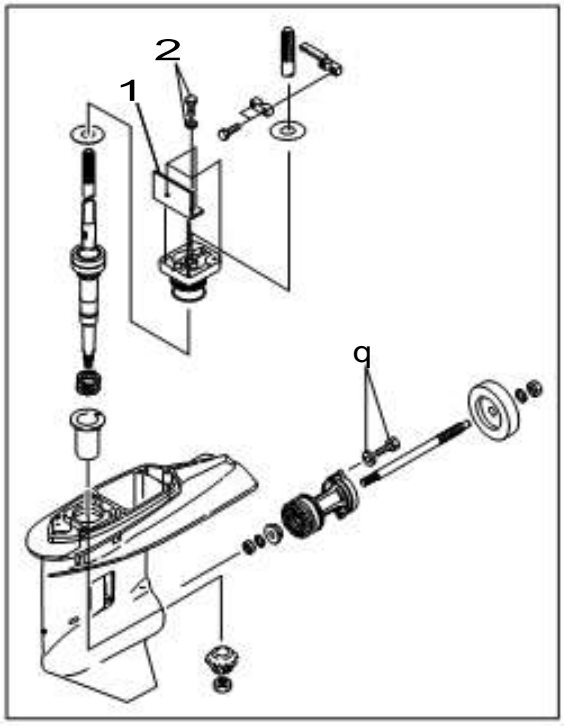


8. Add shim a into the gap between forward (A) gear t and taper roller bearing y if necessary.

⚠ 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 MX50 and MWX50
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



MWX50 only

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

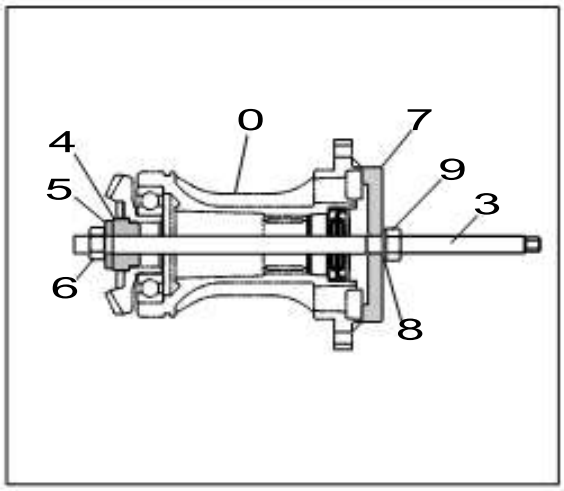
⚠ CAUTION

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).

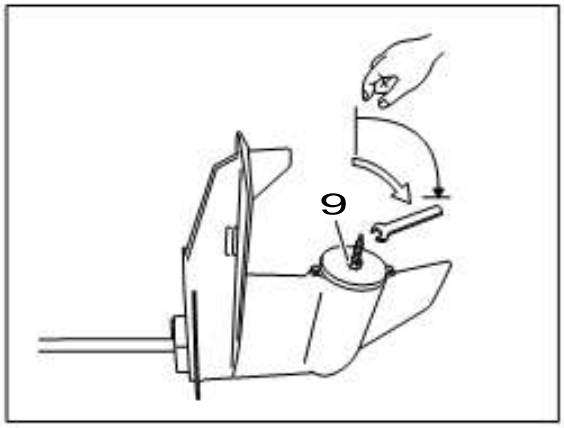
Remove forward (A) gear before beginning the work.

2. Attach dial gauge plate 1 and secure it using bolt (M8, L=35mm) 2 and flat washer 2.

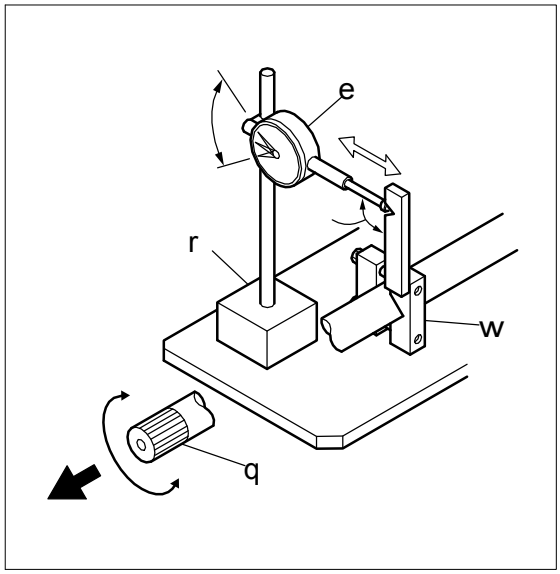


3. Attach backlash measuring tool kit parts 3 to 9 to propeller shaft housing ass’y 0, put the assembly in the gear case, and secure it using bolt (M8, L=30mm) q and flat washer q. Make sure to locate center of propeller shaft housing 0 matches center of backlash measuring tool plate 7.

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 e to drive shaft.

6. Turn drive shaft w clockwise / counterclockwise slowly while pulling it up, and read change of dial gauge indication.

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

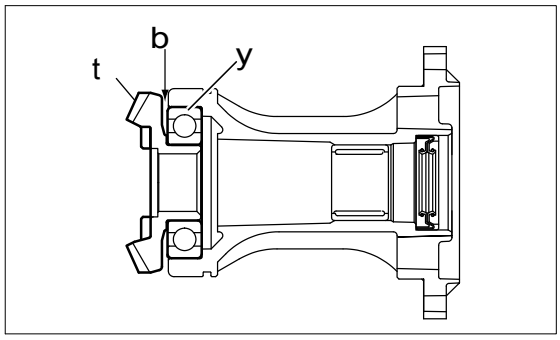
Backlash Measuring Tool Clamp e **:**
P/N. 3B7-72720-0
Dial Gauge r **:**
Commercially Available Item
Magnetic Stand t **:**
Commercially Available Item

å 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

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)



8. Add shim(s) into gap b between reverse (C) gear t and bearing y if necessary.

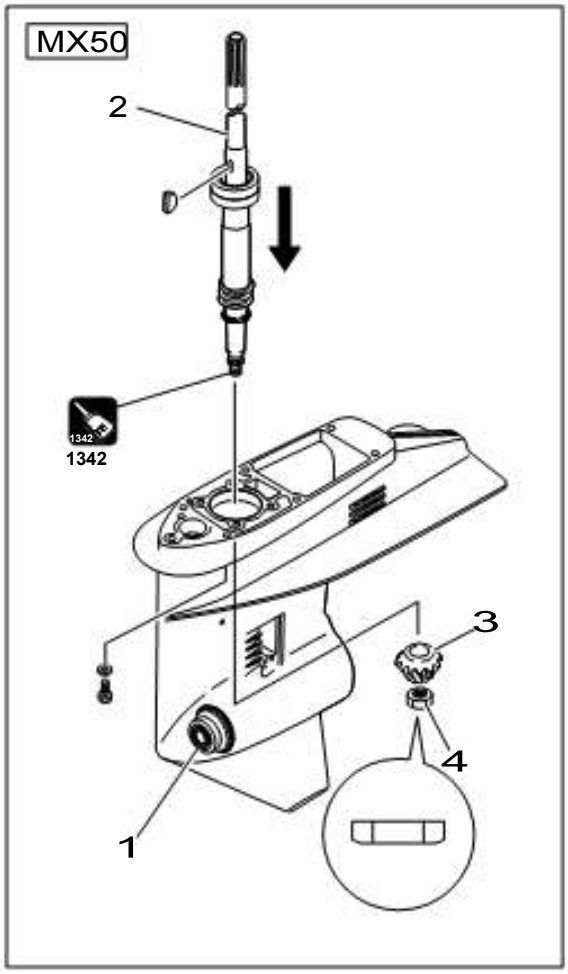
⚠ CAUTION

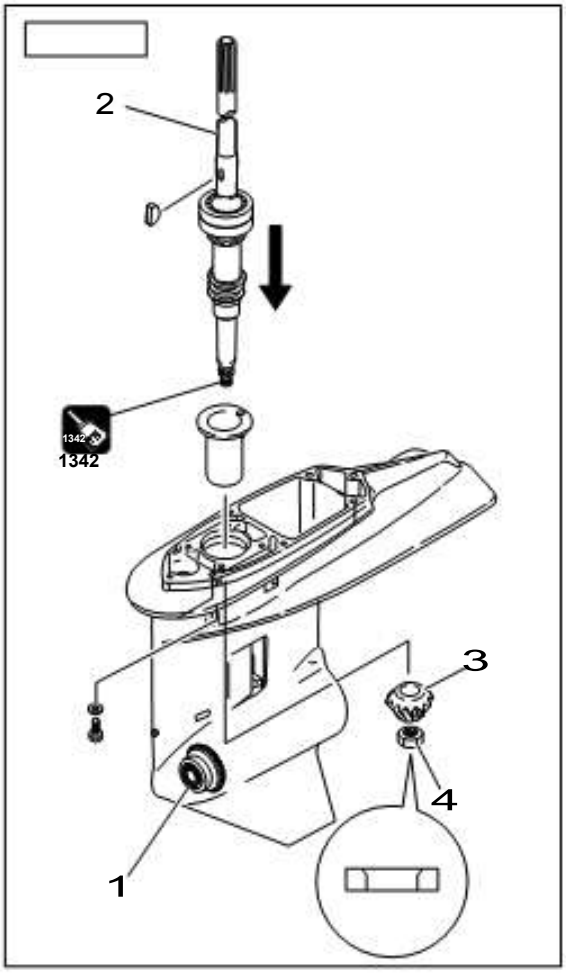
For removal or installation of reverse (C) gear, refer to;
"Disassembly of Propeller Shaft Housing Ass'y" or "Assembly of Lower Unit" in Chapter 6 respectively.

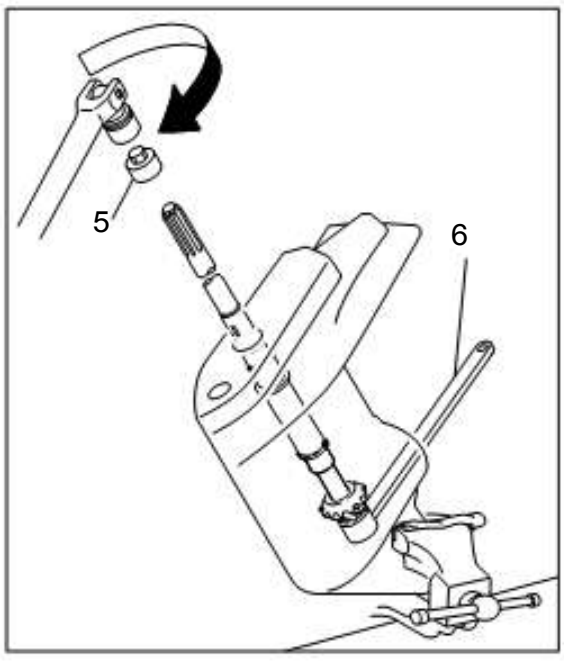
Type of Shims :
0.1 mm (0.0039 in) P/N. 353-64038-0
0.15 mm (0.0059 in) P/N. 353-64037-0
0.3 mm (0.0118 in) P/N. 353-64036-0

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.







OBM

GEAR

1342

· 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.

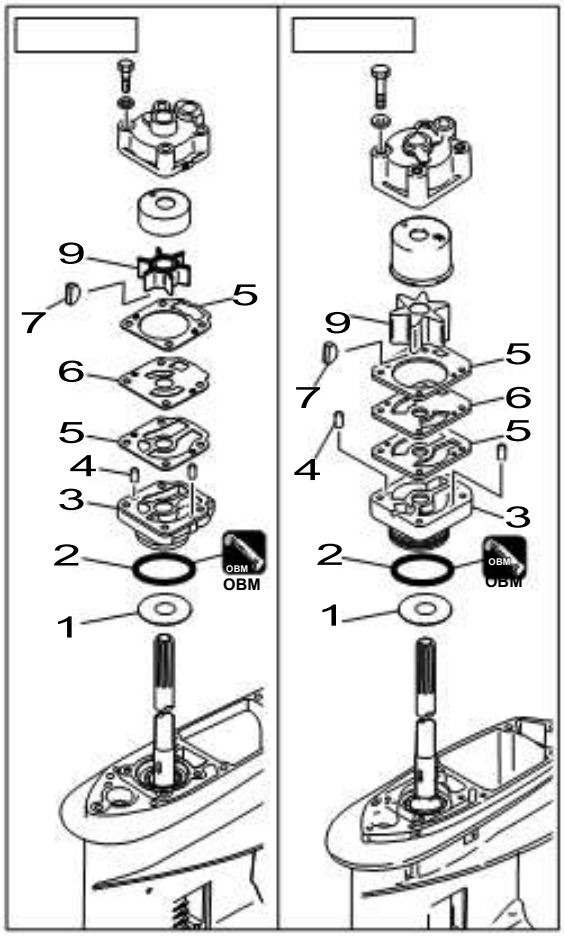
MX50

Bevel Gear B Nut Wrench 7 **:**
P/N. 346-72231-0
Drive Shaft Socket 8 **:**
P/N. 346-72232-0

Pinion (B) Gear Nut 6 **:**
54N · m (36 lb · ft) [5kgf · m]

MWX50

Bevel Gear B Nut Wrench 7 **:**
P/N. 353-72231-0
Drive Shaft Socket 8 **:**
P/N. 346-72232-0



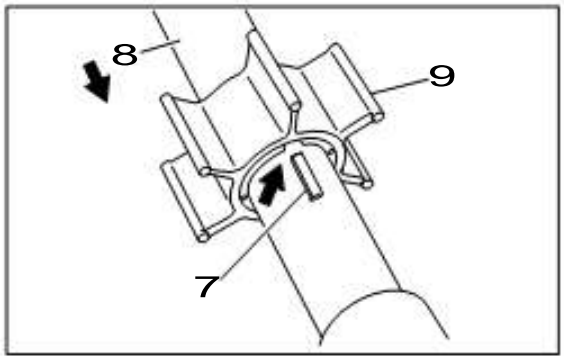
35) Assembly of Pump Case

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.

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.

q b a o

OBM

5. Attach water pump liner 0 to pump case (upper) q.

CAUTION

Align pump liner 0 protrusion a with pump case (upper) q concave b.

Apply OBM grease to inside of water pump liner.

OBM

6. Put pump case (upper) q and gasket (2 pcs.) on the drive shaft, and install them on the pump case (lower) w.

8 c

OBM

e

q

CAUTION

While installing pump case q, turn drive shaft 8 clockwise to bend all impeller blades in counterclockwise on power unit direction.

OBM

7. Attach water pipe seal e (RP).

Apply OBM grease thinly on the inside c of water pipe seal so that water pipe can be inserted smoothly.

36) Attaching Clutch Cam Ass'y

3

1

2

1. Install clutch cam ass'y 1.

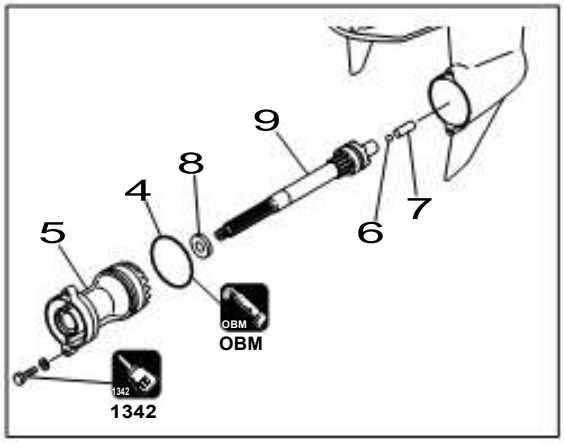
Apply OBM grease to O ring of clutch cam ass'y, and install the assembly by pushing cam rod bushing into gear case.
Be careful of direction of clutch cam.

OBM

OBM

2. Attach stopper 2 and bolt 3.

Forward Direction A



4 O Ring o not reuse.

3. Attach O ring 4 to propeller shaft housing 5.

Apply OBM grease to O ring.

4. Attach steel ball 6, clutch push rod 7 and washer 8 that was removed when disassembling to propeller shaft 9.
5. Install propeller shaft 9 to propeller shaft housing 5, 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.

MX50

Propeller Shaft Housing Bolts :
6 N · m (4 lb · ft) [0.6 kgf · m]

1342

MWX50

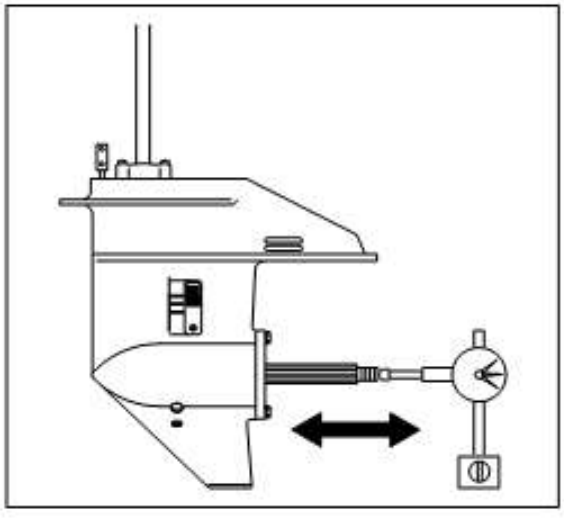
Propeller Shaft Housing Bolts :
13 N · m (9 lb · ft) [1.3 kgf · m]

MWX50 only

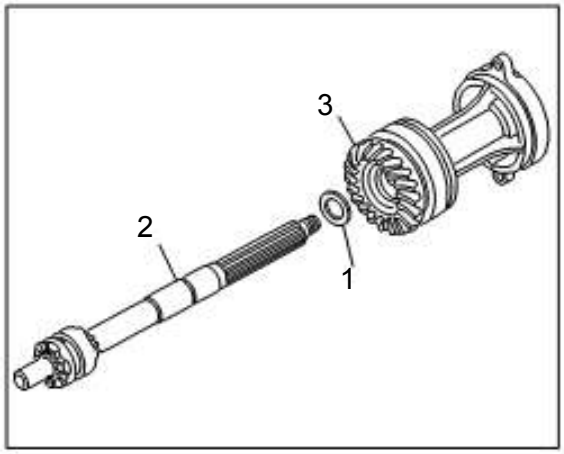
37) Measurement of Propeller Shaft Play and Selection of Washer Thickness

⚠ 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.



3. Select washer 1 thickness so that the play is within the specified range.

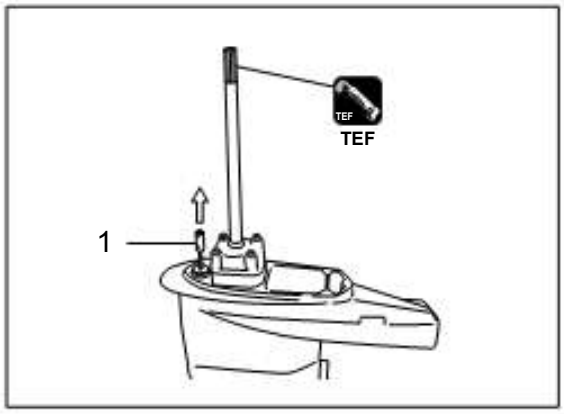
Specified Value of Play :
0.2 - 0.4 mm (0.0078 - 0.0157 in)

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.



38) Installation of Lower Unit

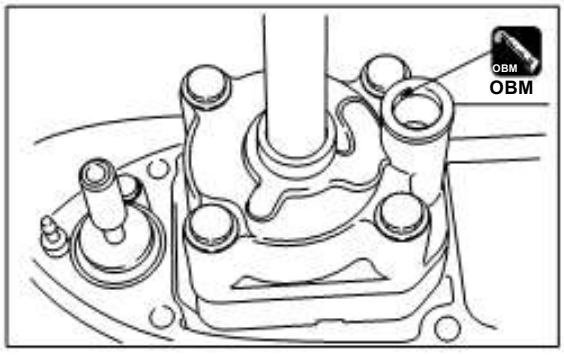
1. Tilt-up outboard motor and lock with tilt stopper.

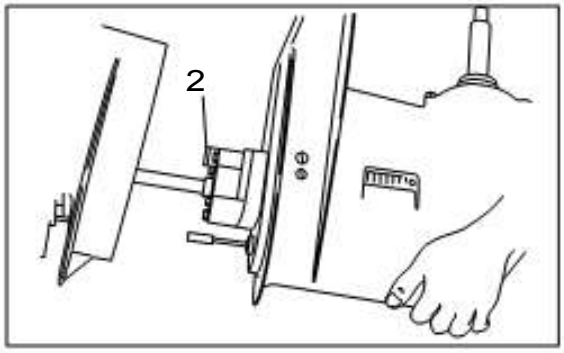
2. Set shift rod 1 to up position.

· 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





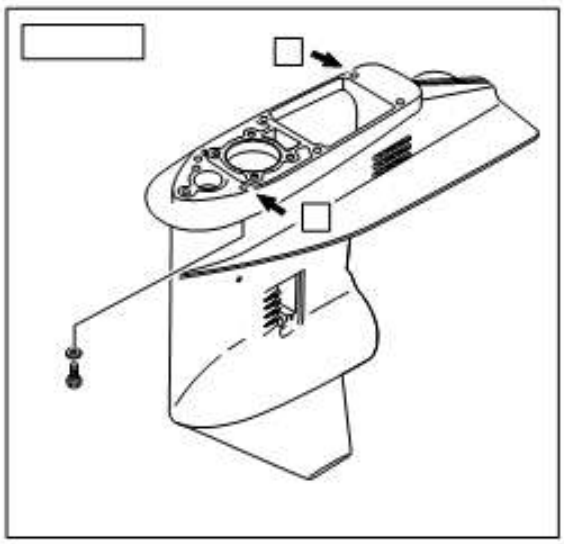
3. Put lower unit ass'y into drive shaft housing.
   Connect and align positions of water pipe and water pipe seal 2.

Apply OBM grease to O ring.

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.

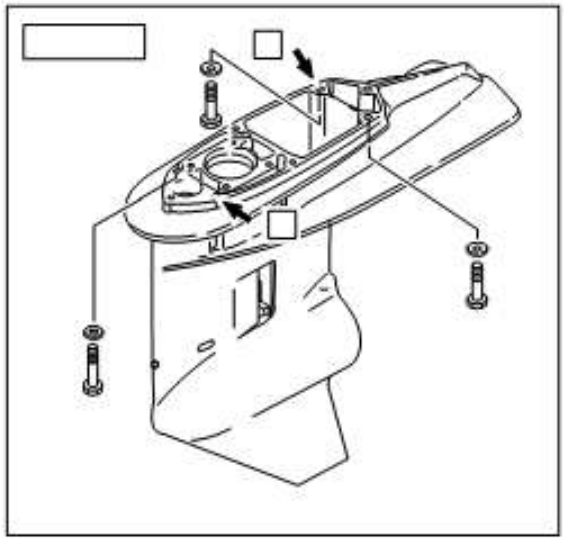


M8 6pcs.

25N · m (18 lb · ft) [2.5kgf · m]

OBM

OBM

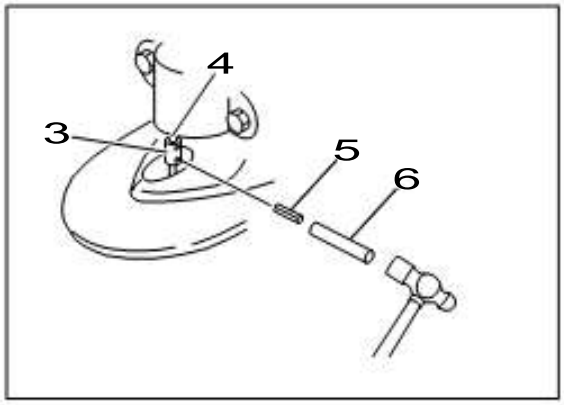


M8 4pcs.
M10 2pcs.

M8 :
25N · m (18 lb · ft) [2.5kgf · m]
M10 :
40N · m (29 lb · ft) [4.0kg · m]

OBM

OBM

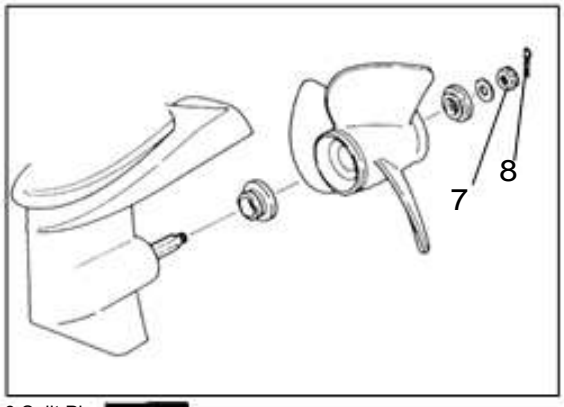


5 Spring Pin **Do not reuse.**

5. 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



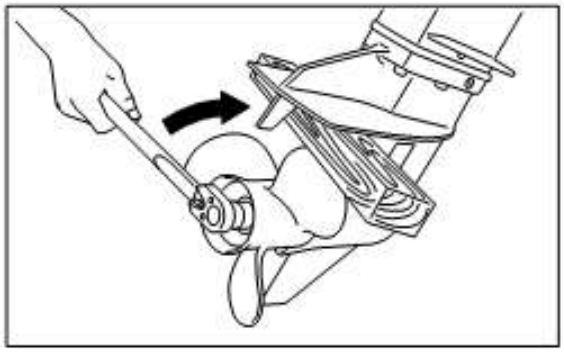
8 Split Pin **Do not reuse.**

6. 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]



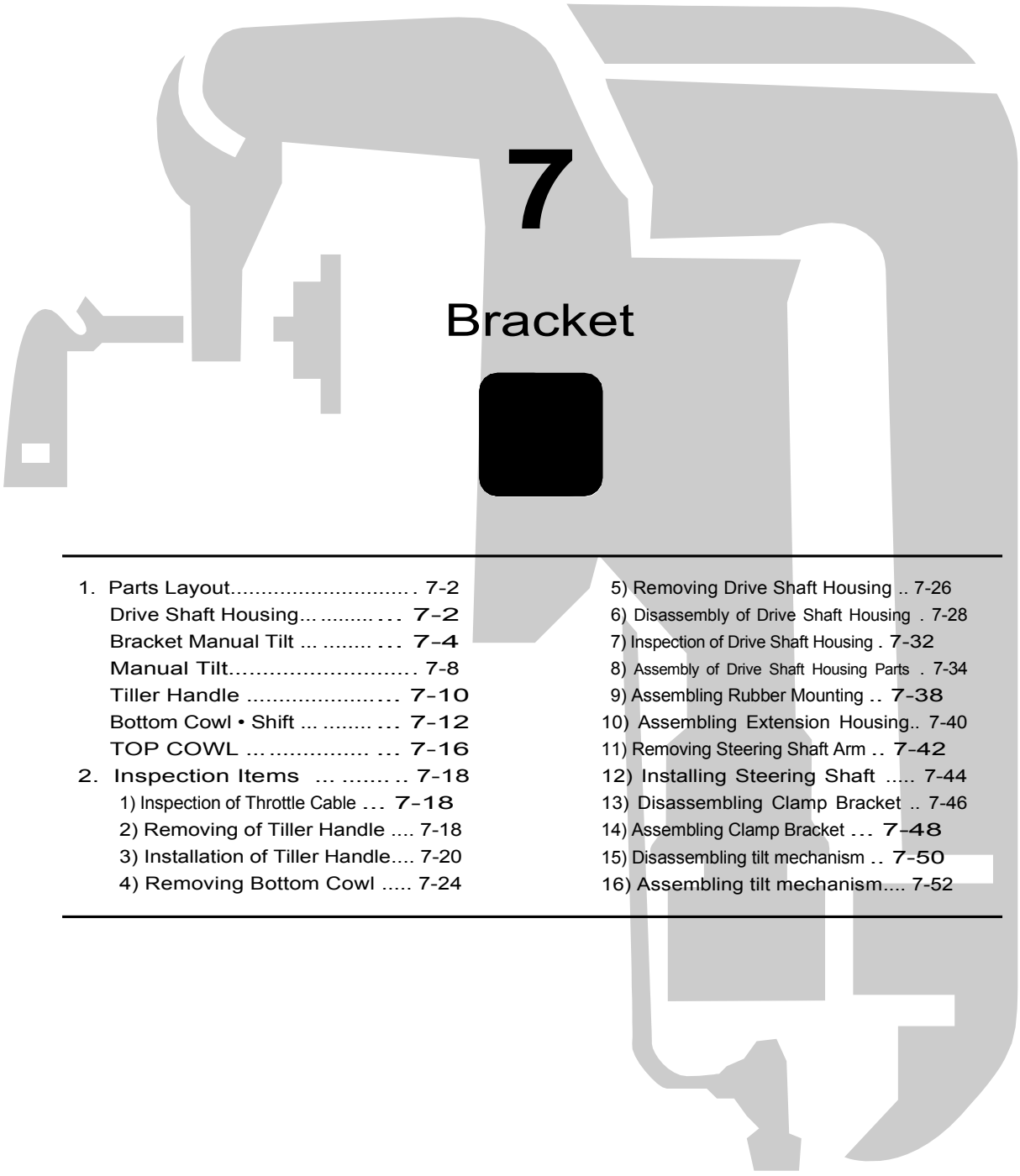
7. Attach split pin 8.

⚠ CAUTION

If propeller shaft pin hole and propeller nut pin groove do not align, additionally tighten the nut until they align.

8. 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.



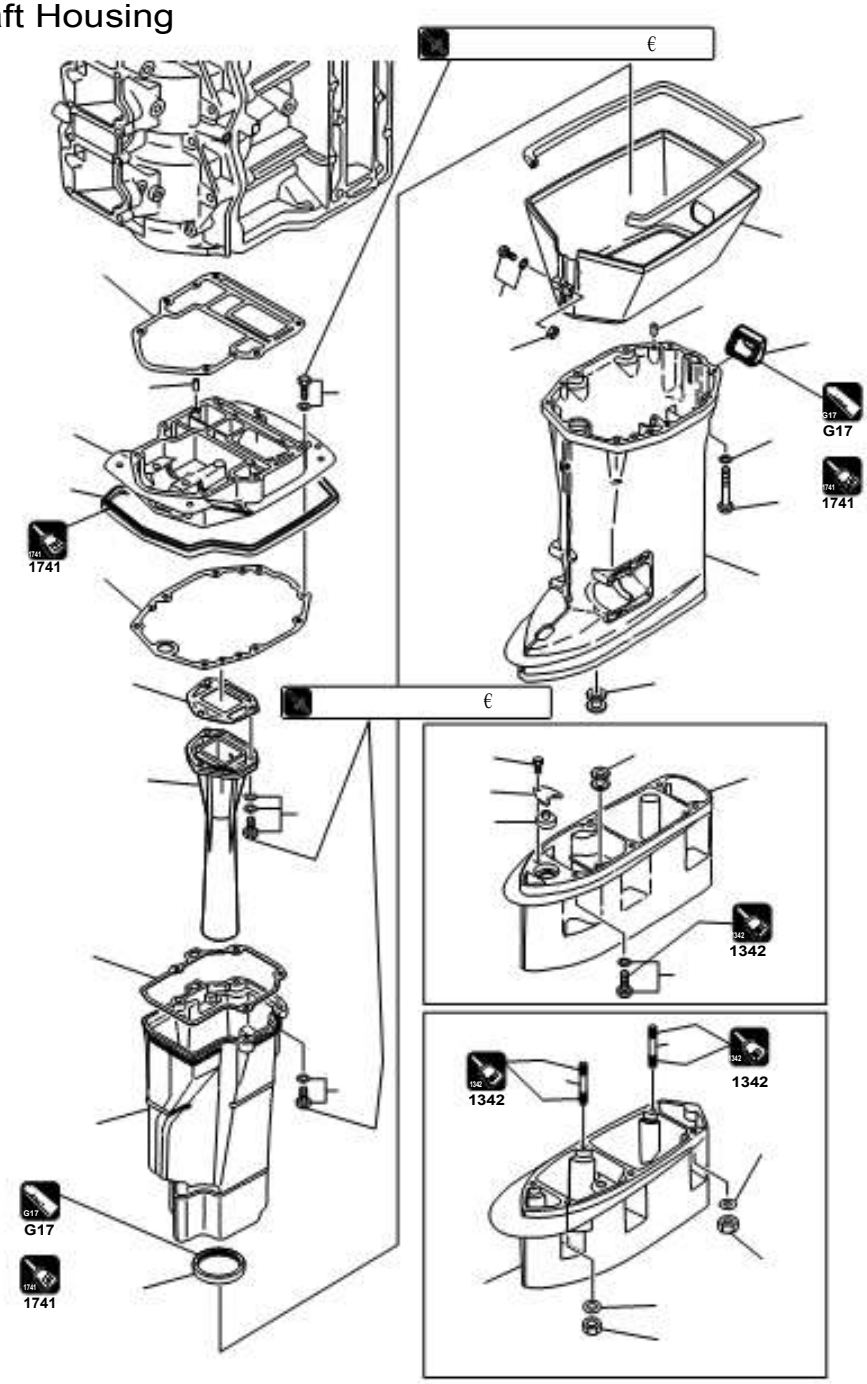
7

Bracket

1.Parts Layout

P/L Fig. 13

Drive Shaft Housing

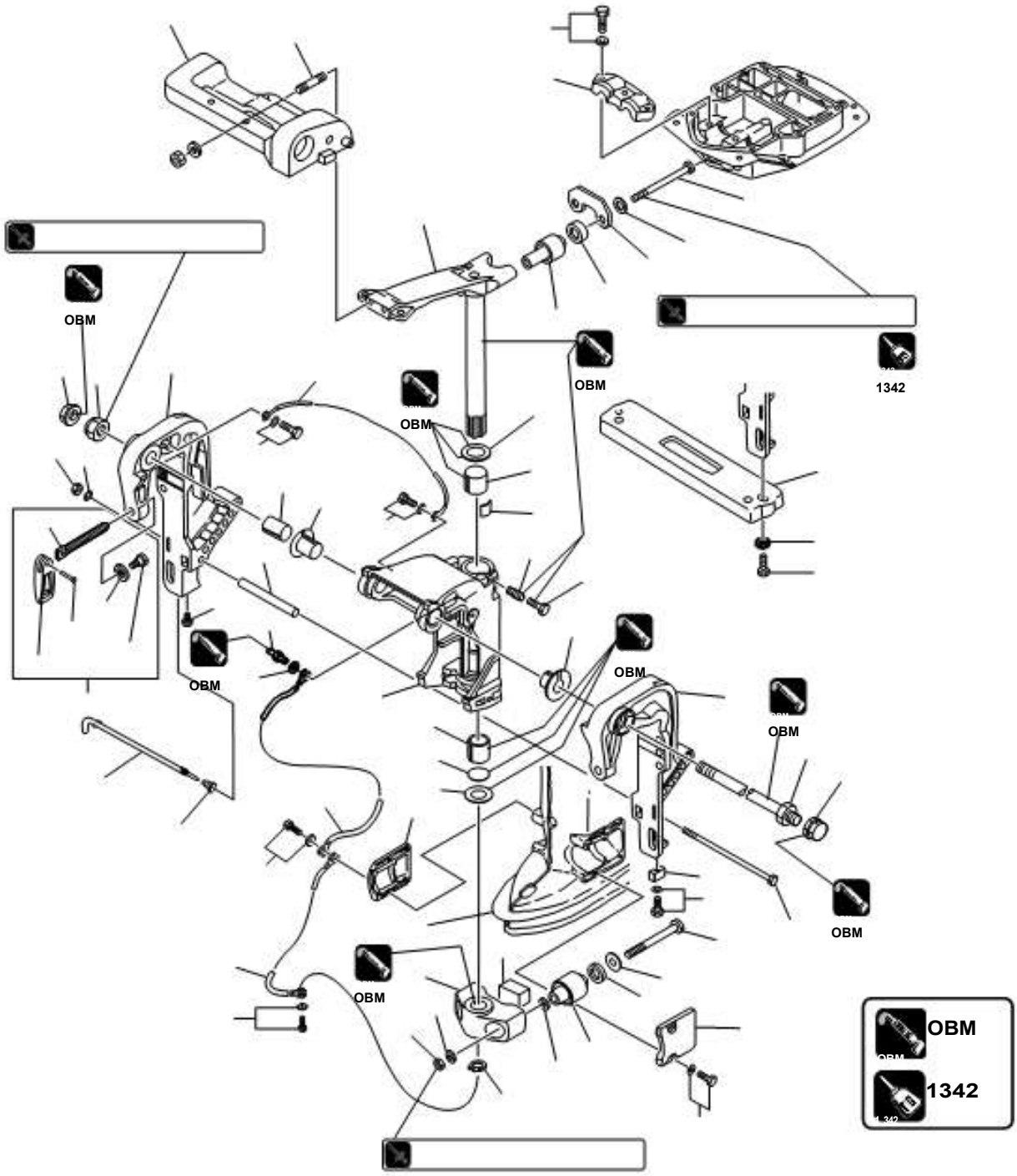


Ref. No.	Description	Q'ty	Remarks
1-1	Drive Shaft Housing (L)	1	MX50D2 for Transom “L”, “UL”
1-2	Drive Shaft Housing (S)	1	Transom “S”
2	Bolt	6	
3	Washer	6	
4	Water Pipe Auxiliary Mount	1	Water Pipe Locking Rubber
5	Extension Housing	1	MX50D2 for Transom “UL”
6	Water Pipe Auxiliary Mount	1	MX50D2 for Transom “UL”
7	Cam Rod Holder	1	MX50D2 for Transom “UL”
8	Stopper	1	MX50D2 for Transom “UL”
9	Bolt	1	MX50D2 for Transom “UL”
10	Bolt	6	MX50D2 for Transom “UL”
11	Extension Housing Ass'y	1	MWX50D2
12	Stud	6	MWX50D2
13	Nut	6	MWX50D2
14	Washer	6	MWX50D2
15	Drive Shaft Housing Gasket	1	Do not reuse.

Ref. No.	Description	Q'ty	Remarks
16	Engine Basemen	1	
17	Engine Basement Seal L=830	1	
18	Bolt	4	
19	Dowel Pin 6-12	4	
20	Exhaust Pipe	1	
21	Bolt 8-30	3	
22	Exhaust Pipe Gasket	1	Do not reuse.
23	Exhaust Housing	1	
24	Bolt	4	
25	Exhaust Housing Gasket	1	Do not reuse.
26	Grommet	1	
27	Apron	1	
28	Grommet	1	
29	Seal	1	
30	Screw	1	
31	Nylon Nut 5-P0.8	1	

Bracket Manual Tilt

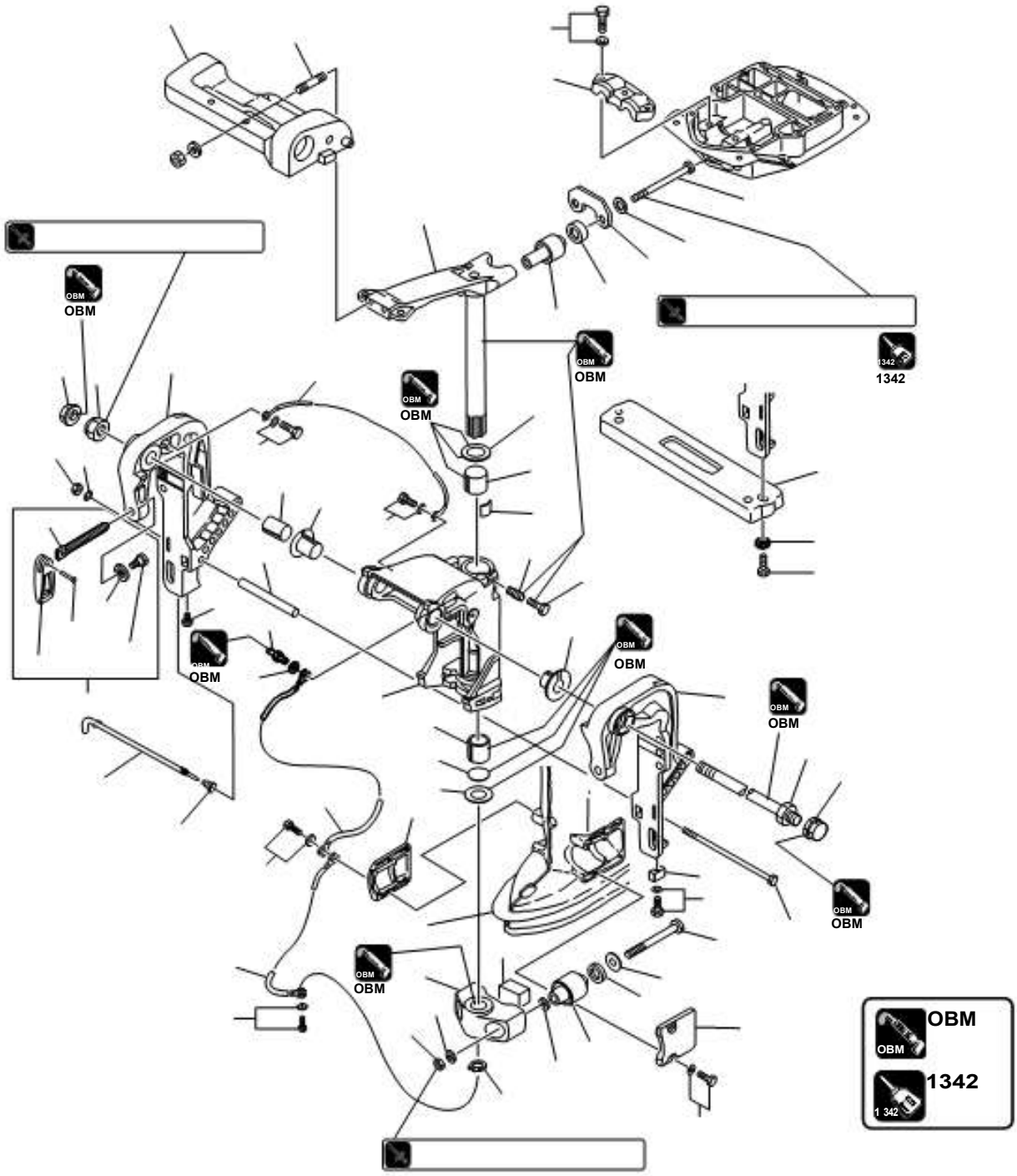
P/L Fig. 17



Ref. No.	Description	Q'ty	Remarks
1	Clamp Bracket (R)	1	Stern Bracket (Right) Starboard Side
2	Bolt	1	
3	Clamp Bracket (L)	1	Stern Bracket (Left) Port Side
4	Anode	1	
5	Bolt	1	
6	Swivel Bracket Shaft Ass'y	1	Bracket Bolt
7	Nylon Nut 7/8	1	
8	Bushing 26-32	2	
9	Bushing 22-25-35.5	1	
10	Cap Nut	2	
11	Distance Piece	1	
12	Nut	1	
13	Washer	1	
14	Bolt 8-170	1	
15	Thrust Rod	1	

Ref. No.	Description	Q'ty	Remarks
16	Thrust Rod Spring	1	
17	Swivel Bracket	1	
18	Grease Fitting	1	
19	Washer	1	
20	Friction Piece	1	
21	Friction Spring	1	
22	Bolt	1	
23	Steering Shaft Ass'y	1	
24	Bushing 26-32	2	
25	Thrust Plate (Upper) 27-50-1	1	
26	Thrust Plate (Lower) 26.5-46-1	1	
27	O-Ring 3.5-25.7	1	
28	C-Ring d=25	1	
29	Rubber Mount (Lower)	2	
30	Mount Bracket	1	

P/L Fig. 17

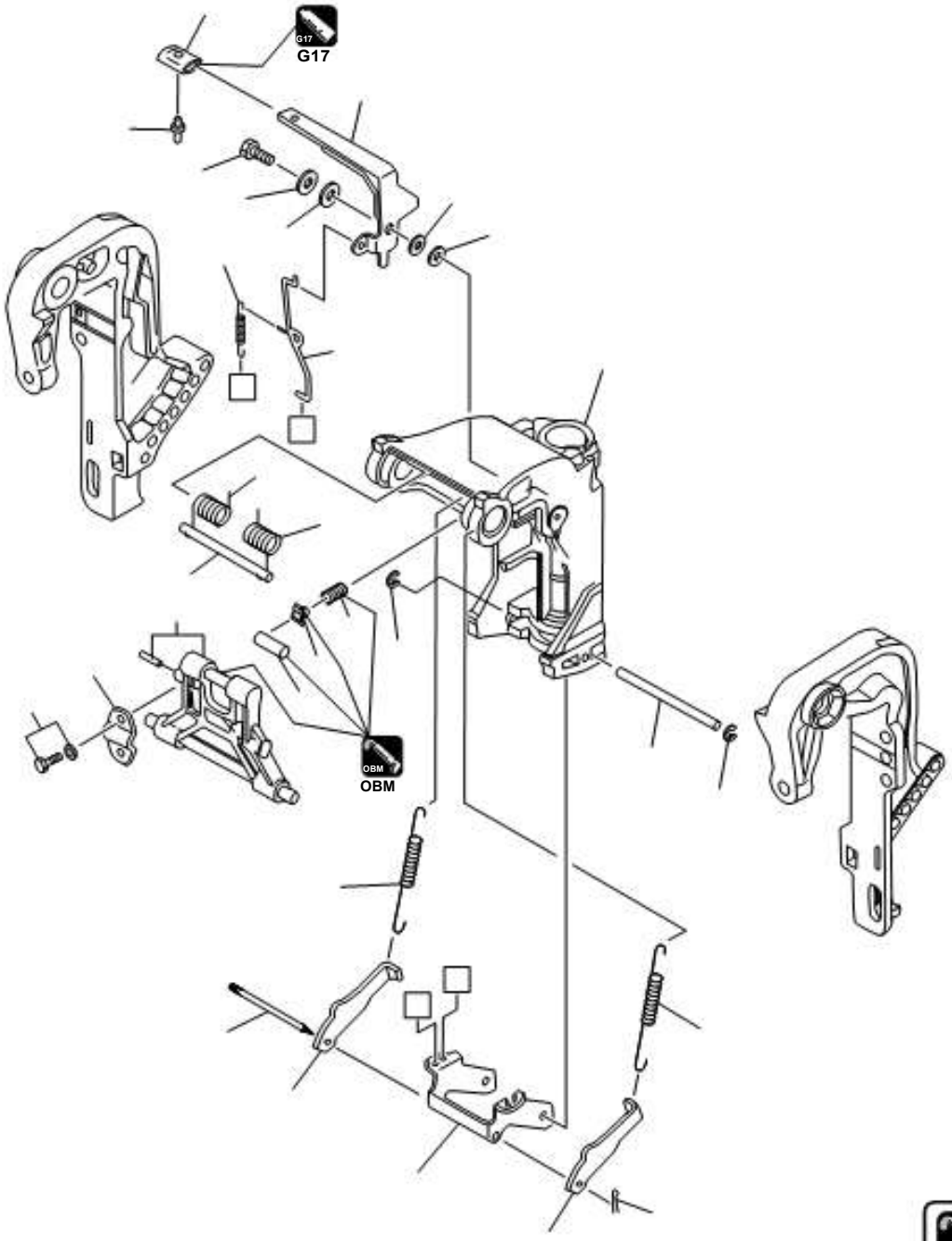


Ref. No.	Description	Q'ty	Remarks
31	Damper (Lower)	1	
32	Bolt	2	
33	Washer 13-34-3	2	
34	Damper 21-36-5	2	
35	Nylon Nut 12-P1.75	2	
36	Washer	4	
37	Mount Holding Plate (Lower)	2	Rubber Mount Cap (Lower)
38	Bolt	4	
39	Stud	2	
40	Rubber Mount (Upper)	2	
41	Bolt	2	
42	Damper (Upper)	2	
43	Washer	2	
44	Lock Plate	1	
45	Mount Holding Plate (Upper)	1	Rubber Mount Cap (Upper)

Ref. No.	Description	Q'ty	Remarks
46	Bolt	3	
47	Ground L=210	1	
48	Ground L=130	1	
49	Bolt	2	
50	Ground L=110	1	
51	Bolt	1	
52	Anode	1	OPT
53	Bolt	2	OPT
54	Spring Washer	2	OPT
55	Clamp Screw Kit	2	
56	Clamp Screw	1	
57	Clamp Screw Handle	1	
58	Rivet 3-22	1	Do not reuse.
59	Clamp Screw Pad	1	
60	Shoulder Bolt	1	Do not reuse.

Manual Tilt

P/L Fig. 18



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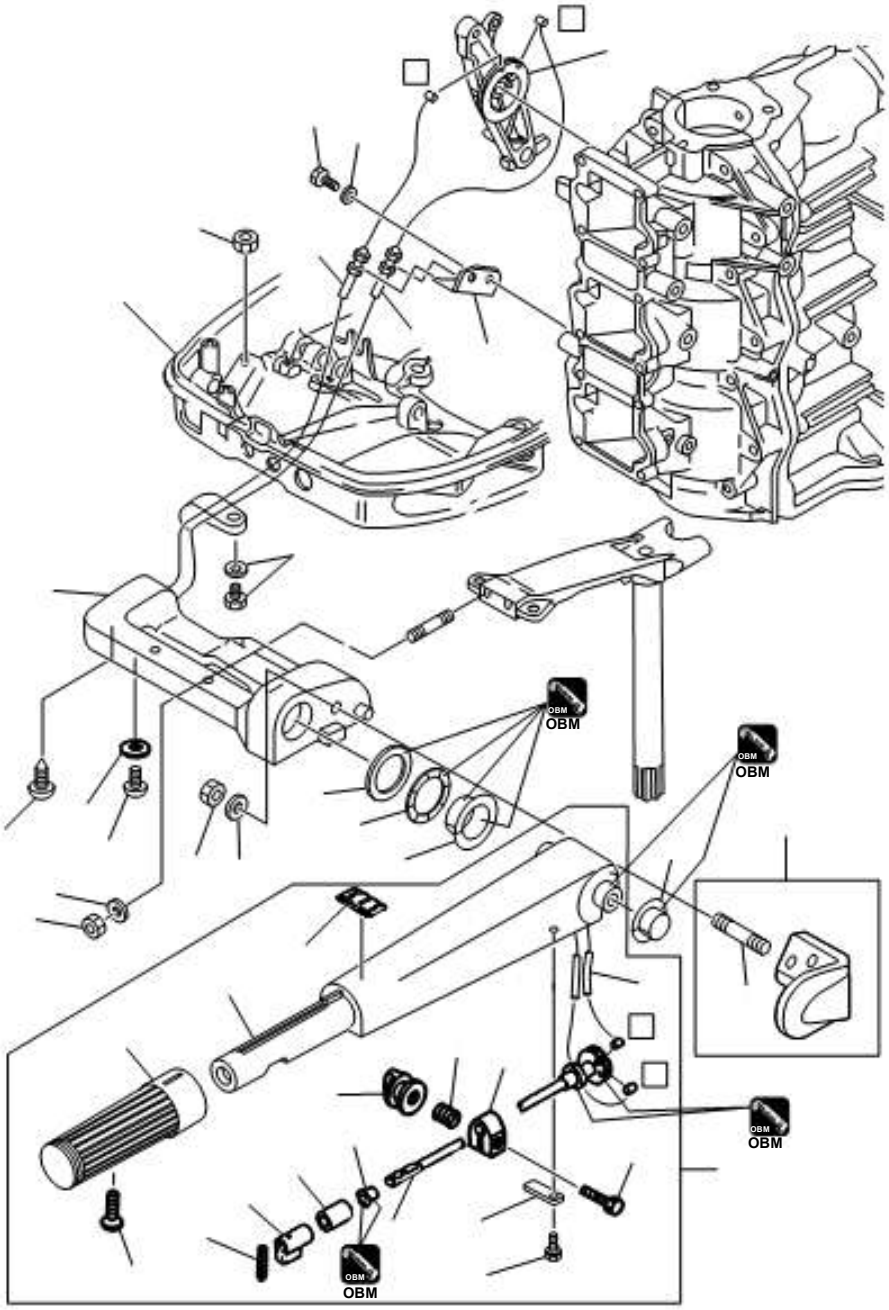
Ref. No.	Description	Q'ty	Remarks
1	Tilt Stopper Ass'y	1	
2	Bushing 10.2-12-29.5	1	
3	Setting Plate	1	
4	Bolt	2	
5	Friction Spring	1	
6	Setting Piece	1	
7	Tilt Assistant Spring (R)	1	MX50D2 for Transom “UL”
8	Tilt Assistant Spring (L)	1	MX50D2 for Transom “UL”
9	Tilt Assistant Shaft	1	MX50D2 for Transom “UL”
10	Reverse Lock (L)	1	
11	Reverse Lock (R)	1	
12	Reverse Lock Arm	1	
13	Reverse Lock Shaft	1	
14	E-Ring d=6	2	

Ref. No.	Description	Q'ty	Remarks
15	Reverse Lock Rod	1	
16	Split Pin 2-12	1	
17	Tilt Stopper Lever	1	
18	Reverse Lock Spring (L)	2	for Transom “L”, “UL”
19	Reverse Lock Spring (S)	2	for Transom “S”
20	Shoulder Bolt 6-8	1	
21	Washer 6-16-1.5	1	
22	Washer	1	
23	Bushing 8.1-20	1	
24	Washer 8.5-18-1.6	1	
25	Link	1	
26	Spring	1	
27	Reverse Lock Lever Grip	1	
28	Stopper	1	

*7 and 8 are discontinuing products for after January in 2012.

Tiller Handle

P/L Fig. 21



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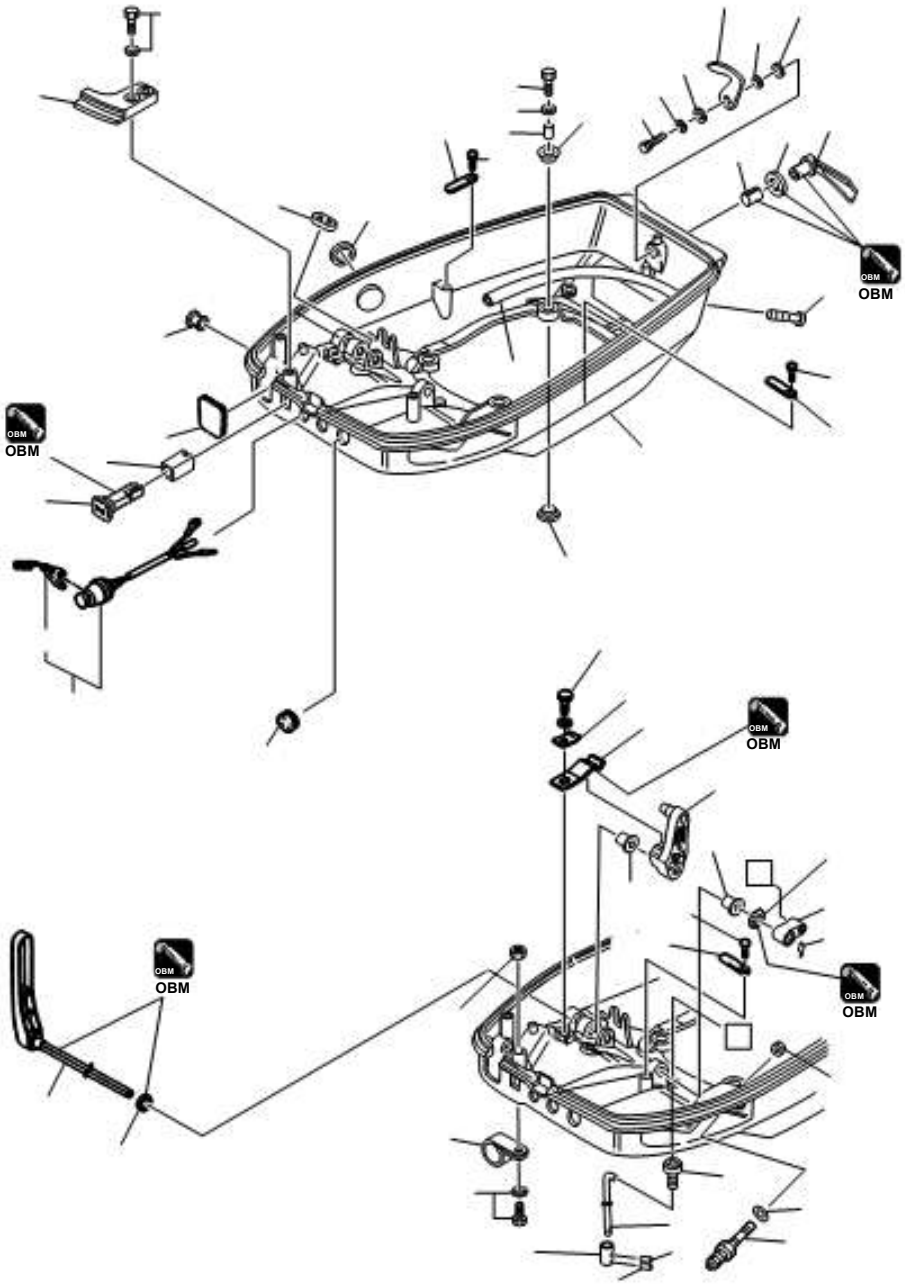
Ref. No.	Description	Q'ty	Remarks
1	Steering Bracket	1	
2	Nylon Nut 8-P1.25	2	
3	Washer	2	
4	Tiller Handle Ass'y	1	
5	Tiller Handle	1	
6	Grip	1	
7	Throttle Shaft	1	
8	Throttle Shaft Damper	1	
9	Spacer	1	
10	Spring Pin 3-10	1	Do not reuse.
11	Bushing 8.4-10-11	1	
12	Screw	1	
13	Throttle Shaft Support	1	
14	Bolt	1	
15	Friction Piece	1	
16	Adjusting Nut	1	
17	Spring	1	

Ref. No.	Description	Q'ty	Remarks
18	Bolt	1	
19	Throttle Decal	1	
20	Bushing	1	
21	Washer 30-45-1	1	
22	Wave Washer 30-45-1.2	1	
23	Bushing	1	
24	Washer	1	
25	Nut 10-P1.5	1	
26	Throttle Wire	2	
27	Clip	1	
28	Throttle Wire Bracket	1	
29	Bolt	2	
30	Washer	2	
31	Washer 6-16-1.5	1	
32	Screw	1	
33	Tiller Handle Holder Ass'y	1	
34	Stud	1	

Bottom Cowl • Shift

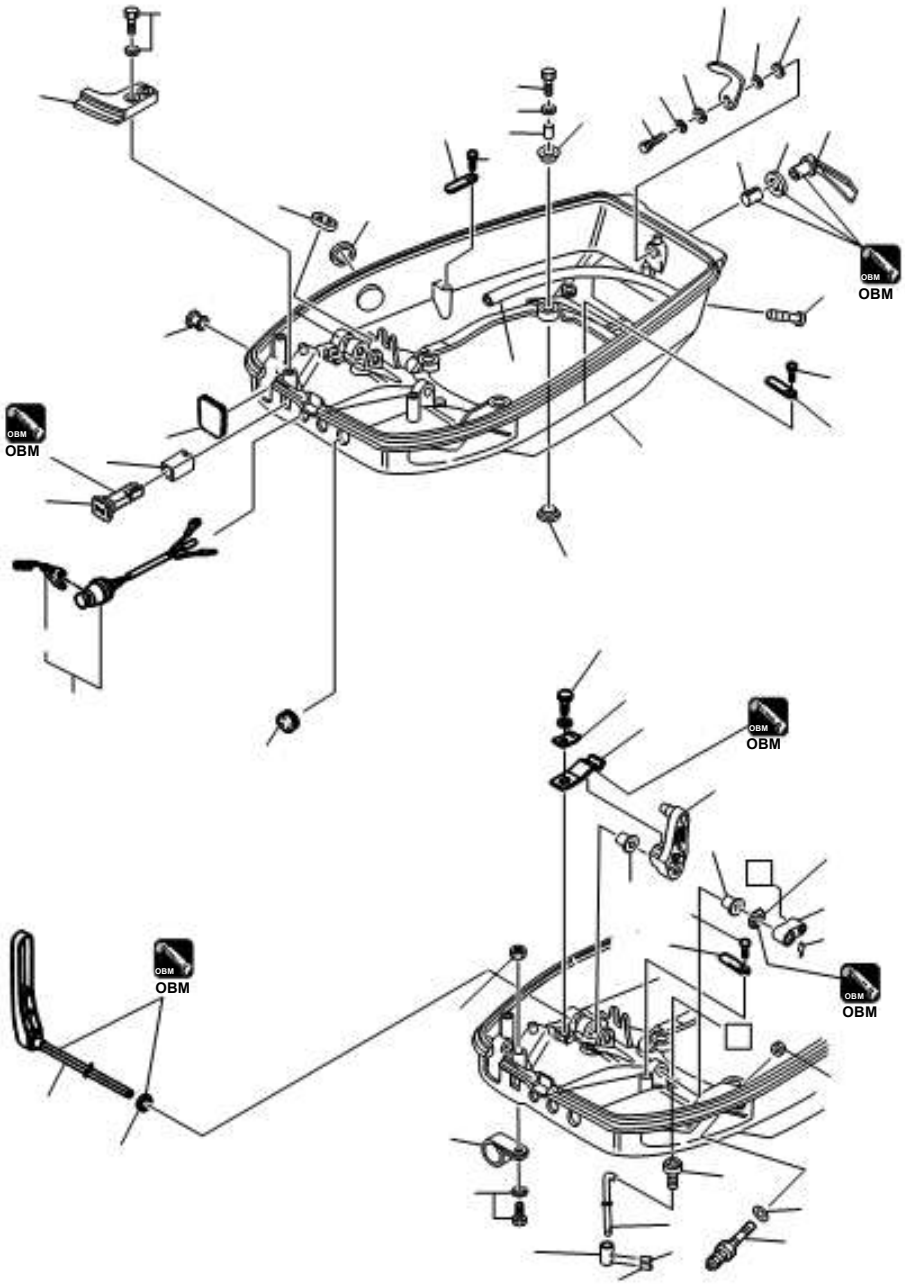
P/L Fig. 22



Ref. No.	Description	Q'ty	Remarks
1	Mount 8.5-14-2.5	8	
2	Spacer 6.2-9-15.7	4	
3	Choke Rod	1	
4	Bushing	1	
5	Hook Lever	1	
6	Washer 14-22-1	1	
7	Seal Ring	2	
8	Hook Lever Bushing	1	
9	Wave Washer d=14	1	
10	Cover Hook	1	
11	Bolt	1	
12	Washer 6-16-1.5	1	
13	Spring Washer	1	

Ref. No.	Description	Q'ty	Remarks
14	Grommet	1	
15	Grommet	1	
16	Grommet	1	
17	Clamp 6.5-14L	1	
18	Bolt	1	
19	Nut	1	
20	Clamp 6.5-47.5P	1	
21	Bolt	3	
22	Grommet	1	
23	Nipple	1	
24	Hose	1	98AB-501000
25	Stop Switch Ass'y	1	
26	Stop Switch Lanyard Ass'y	1	

P/L Fig. 22

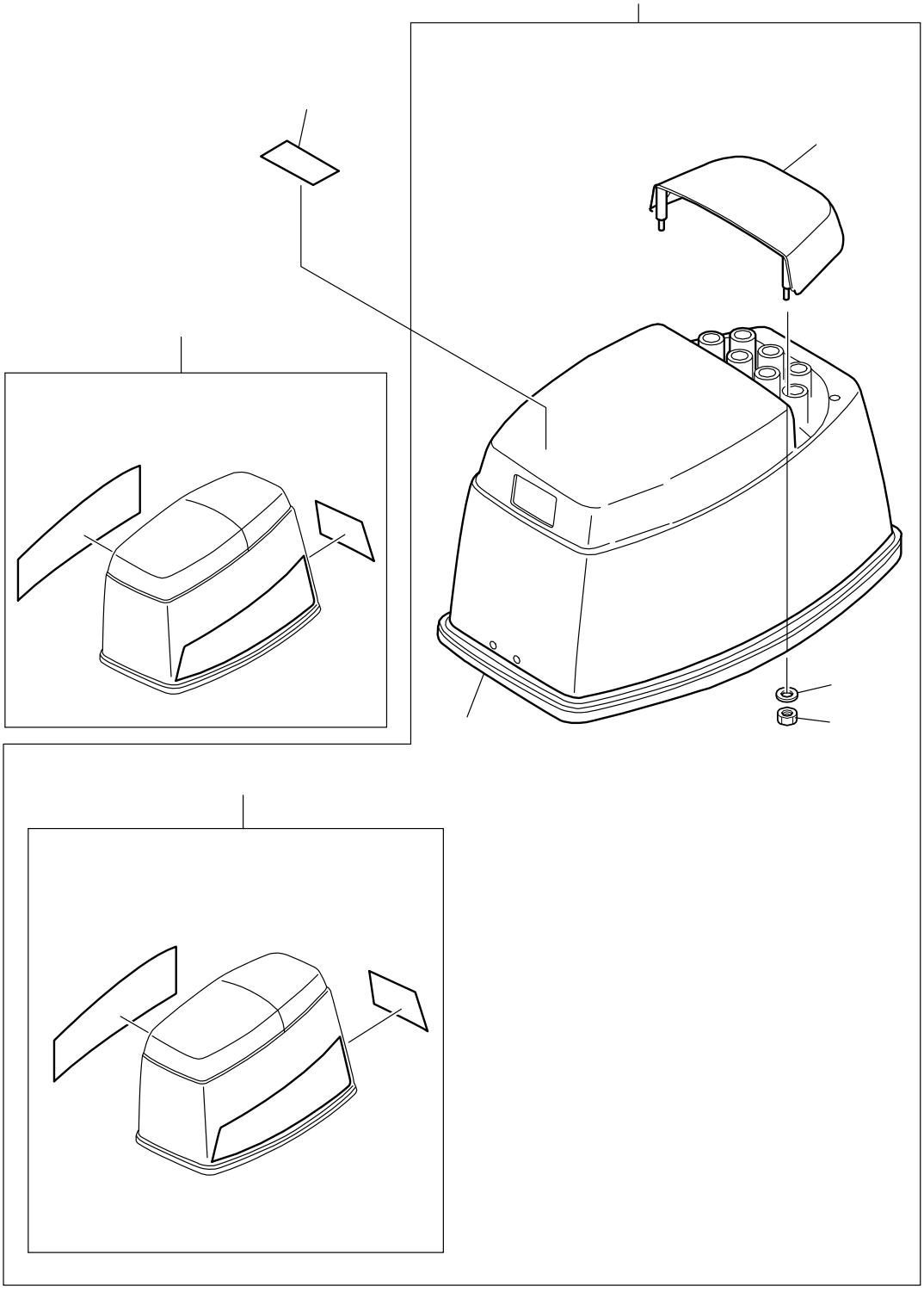


Ref. No.	Description	Q'ty	Remarks
27	Shift Lever	1	
28	Shift Arm	1	
29	Bushing	2	
30	Wave Washer d=12	1	
31-1	Shift Rod Lever	1	for MX50D2
31-2	Shift Rod Lever	1	for MWX50D2
32	Snap Retainer d=8	1	
33	Shift Lever Stopper	1	
34	Shift Lever Stopper	1	
35	Bolt	1	
36	Fuel Connector (Male)	1	
37	Nut 10-P1.25	1	
38	Gasket 10.2-16-0.5	1	Do not reuse.

Ref. No.	Description	Q'ty	Remarks
39	Bolt	4	
40	Washer 6.5-21-1	4	
41	Grommet 17-3	1	
42	Shift Rod	1	
43	Spring Pin 3-12	1	
44	Clamp	1	
45	Bolt	1	ALL
46	Spark Plug Decal	1	B8HS-10
47	Bottom Cowl	1	
48	Grommet	1	

TOP COWL

P/L Fig. 23



Ref. No.	Description	Q'ty	Remarks
1	Top Cowl Ass'y	1	
2	Tilt Handle	1	
3	Nylon Nut 6-P1.0	4	
4	Washer 6-16-1.5	4	
5	Top Cowl Seal	1	
6	Decal Set	1	for MX50D2
7	Decal Set	1	for MWX50D2
8	Caution Decal (A)	1	for MX50D2

2. Inspection Items

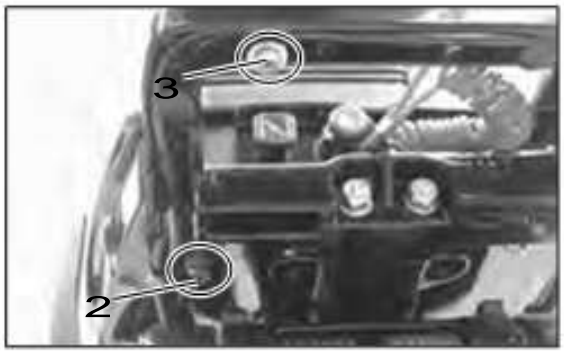
1) Inspection of Throttle Cable

1. Check operation of throttle cable.

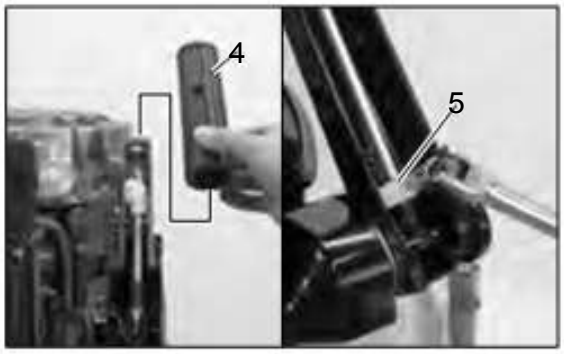
2. Check throttle cable inner wire and outer wire for bend and damage. Replace if necessary.

2) Removing of Tiller Handle

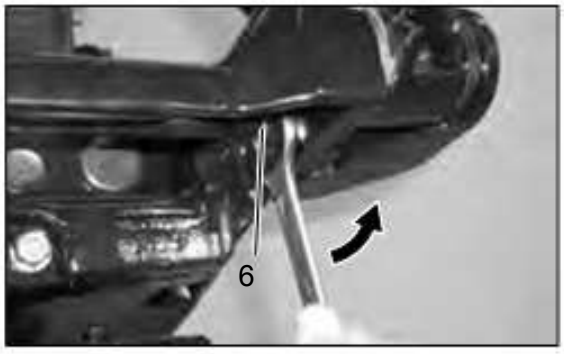
1. Remove advancer arm 1.



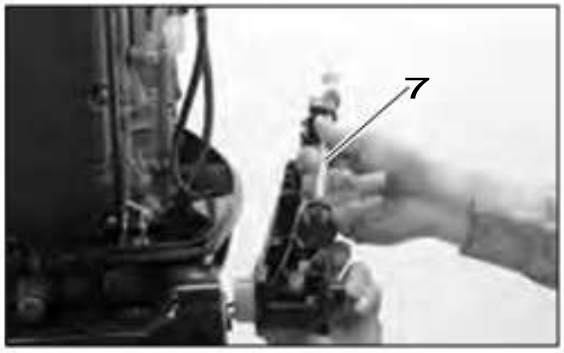
2. Remove throttle wire mounting clamp 2 and screw 3.



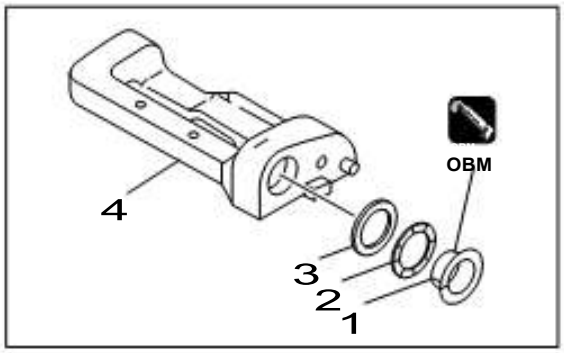
3. Remove throttle grip 4 and throttle shaft supporter 5.



4. Remove tiller handle holder installation nut 6.



5. Remove tiller handle and throttle shaft 7.



3) Installation of Tiller Handle

1. Install bushing 1, wave washer 2 and washer 3 on the steering bracket 4.

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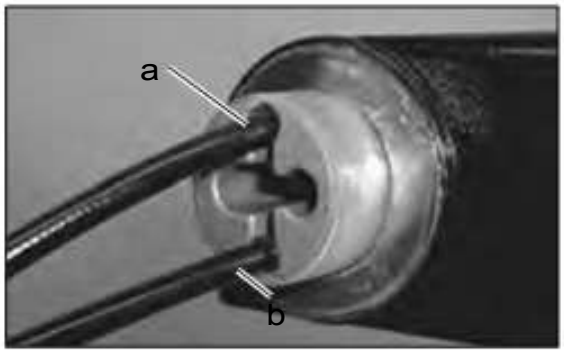
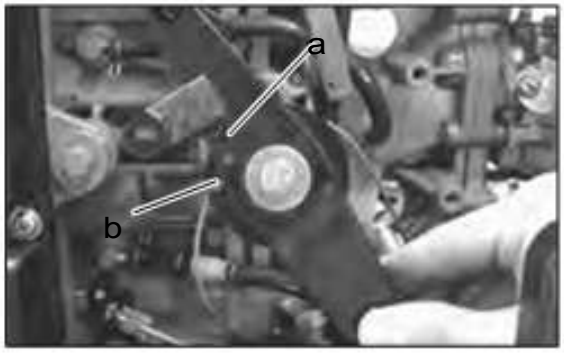
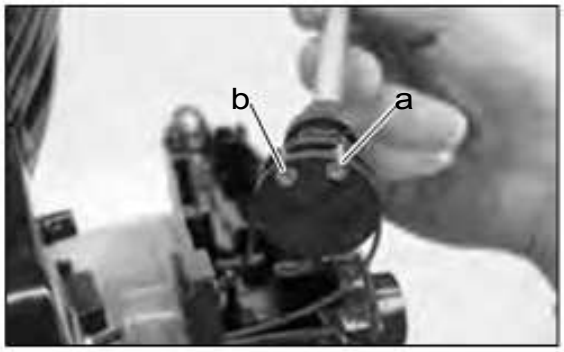
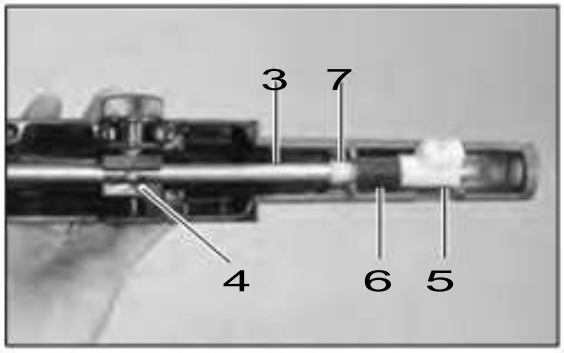


2. Install throttle cable as shown.







3. Install throttle shaft 3 with cable to Tiller handle. Be careful of location of throttle friction 4, throttle shaft spacer 5, throttle shaft damper 6 and bushing 7.

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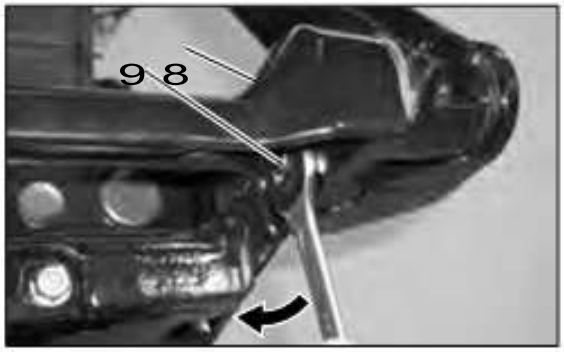


4. Attach Tiller handle ass'y to steering bracket 8, and tighten nut 9 to specified torque.

Arrange throttle cable as shown.

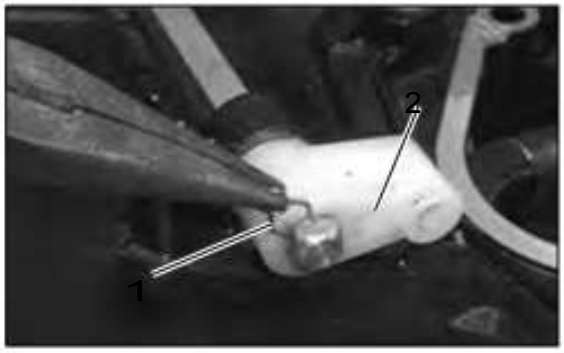
Tiller Handle Bolt 9 **:**
6 N · m (4 lb · ft) [0.6 kgf · m]

OBM

5. Install advancer arm and adjust position of lock nuts 0 of throttle cable.

6. Adjust position of lock nuts of throttle cable so that throttle grip can reach full open and full close positions.

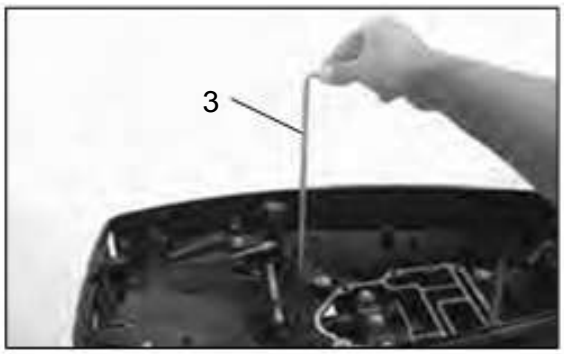
· Adjust cable tension so that it moves approximately 1mm when pushed lightly with a finger.
· For more detail, “Adjustment of Throttle Cable” in chapter 3.



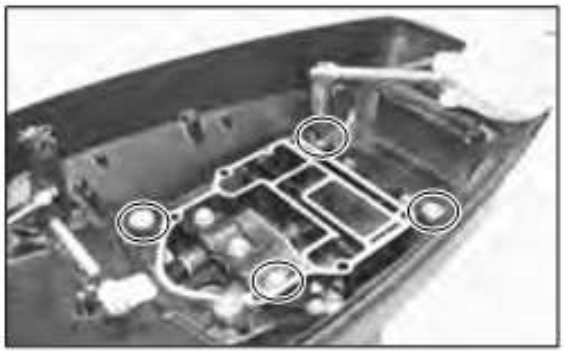
4) Removing Bottom Cowl

1. Remove power unit. Refer to “Removing Power Unit” in chapter 5.

2. Remove snap retainer 1. And then, remove shift rod lever 2.

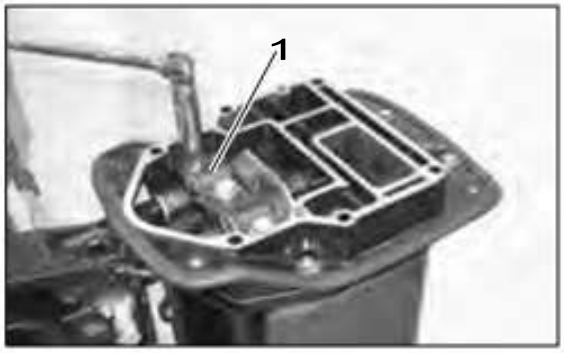


3. Remove shift rod 3.



4. Loosen and remove four bolts that secure bottom cowl to engine base.

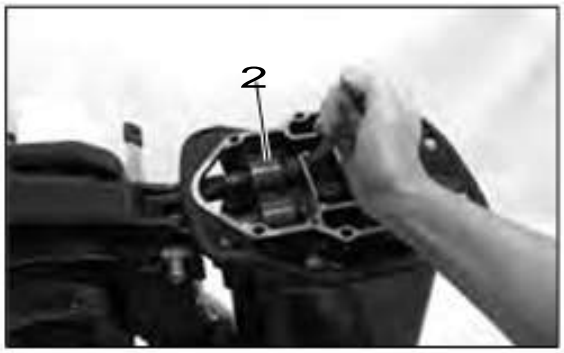
5. Remove bottom cowl.



5) Removing Drive Shaft Housing

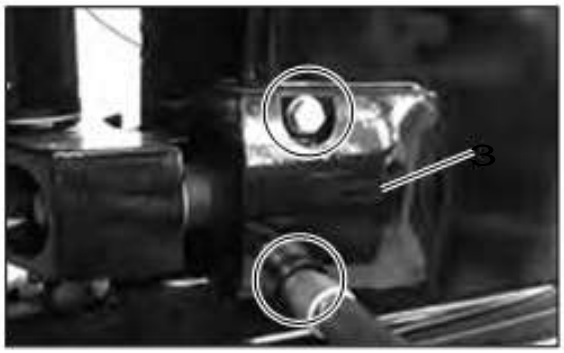
Use the following steps to remove drive shaft housing.

1. Loosen and remove upper rubber mount cap installation bolts to remove mount cap 1.



2. Loosen and remove upper rubber mount installation bolts to remove rubber mount 2.

Loosen right and left rubber mount installation bolts in several steps alternately and equally.



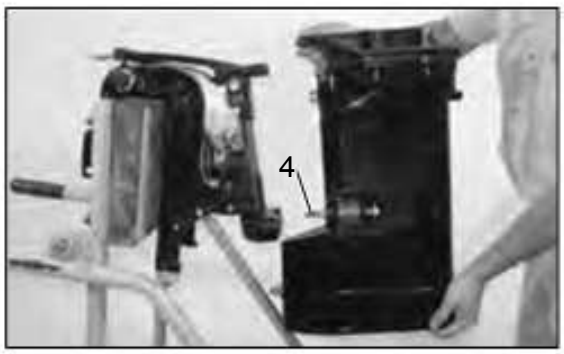
3. Loosen and remove lower rubber mount cap installation bolts to remove mount cap 3.

4. Loosen lower rubber mount installation bolt and remove the nut.

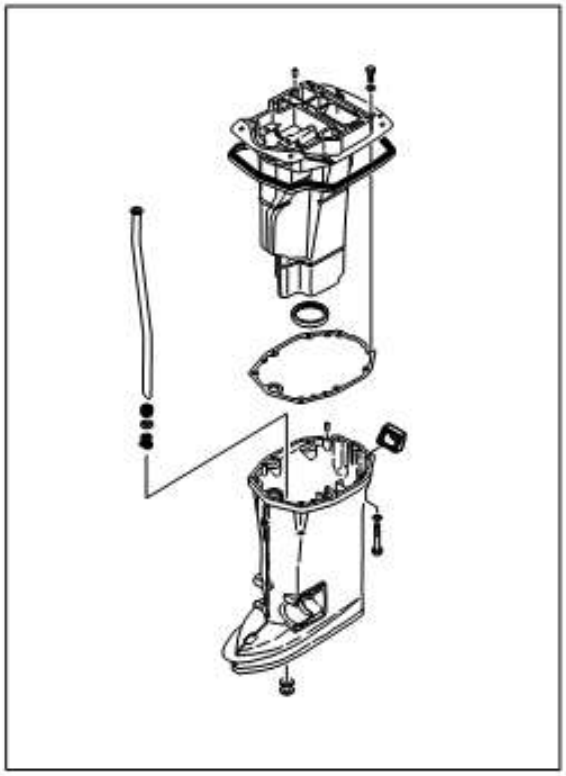
CAUTION

Drive shaft housing drops if mount bolt is removed in this step.

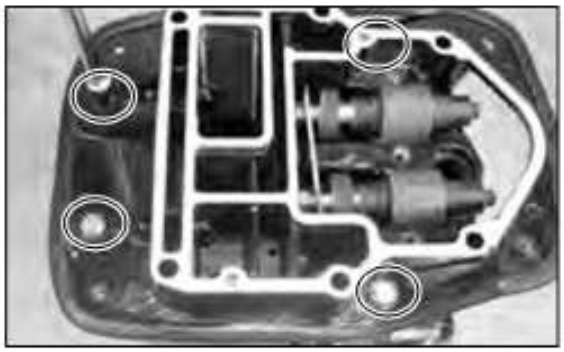
· Fully tilt down outboard motor when loosening mount bolt.
· Remove only the nut and do not remove mount bolt.



5. Pull out lower rubber mount bolt 4 while holding drive shaft housing at its top and bottom securely, and remove drive shaft housing.

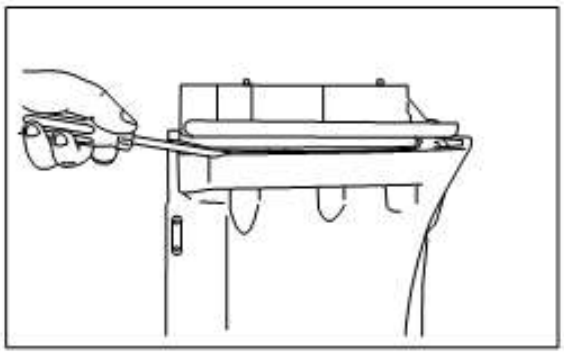


6) Disassembly of Drive Shaft Housing



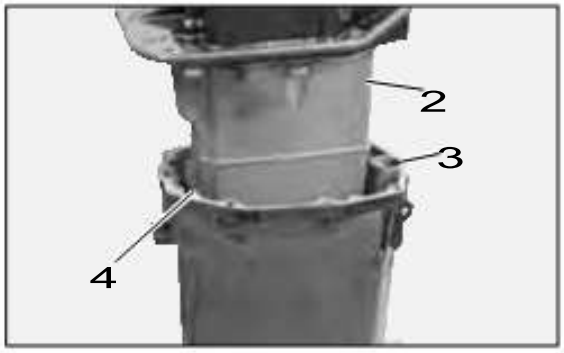
1. Remove bolts that secure engine base to drive shaft housing.

Remove M6 installation bolt located in the area shown by the arrow.

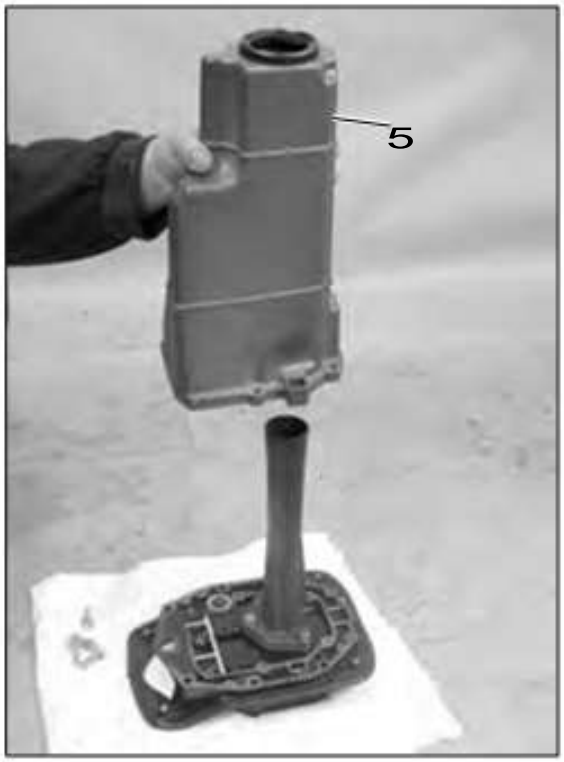


2. Tap lightly with a plastic hammer to separate engine base from the housing if it is seized.

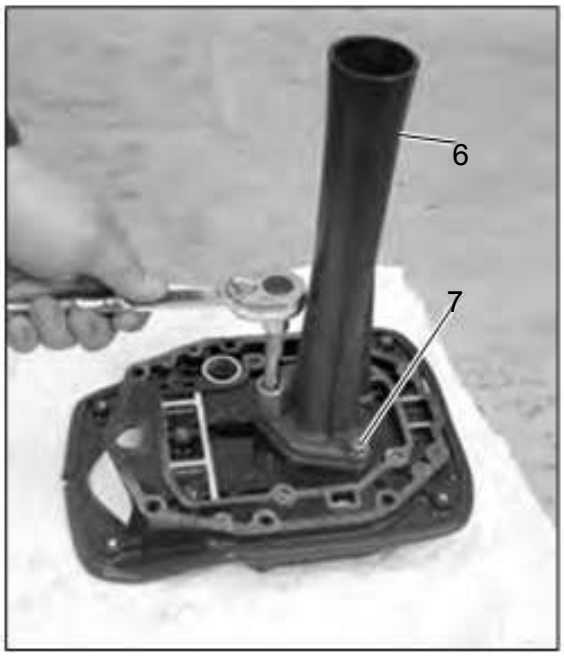
If necessary, use a bladed screw driver to pry the engine base taking care not to scratch mating surface.



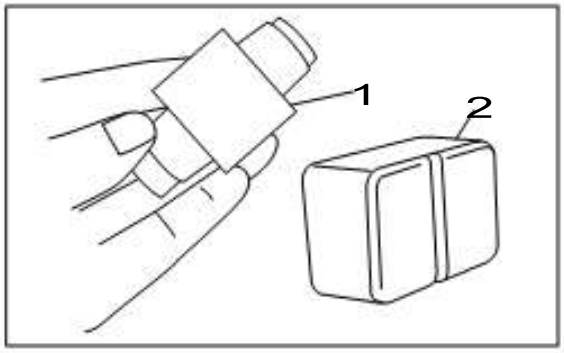
3. When removing drive shaft housing 3, be careful not to lose dowel pin 4 for locating engine base 2.



4. Loosen and remove bolts that secure exhaust housing 5 to engine base and remove exhaust housing.

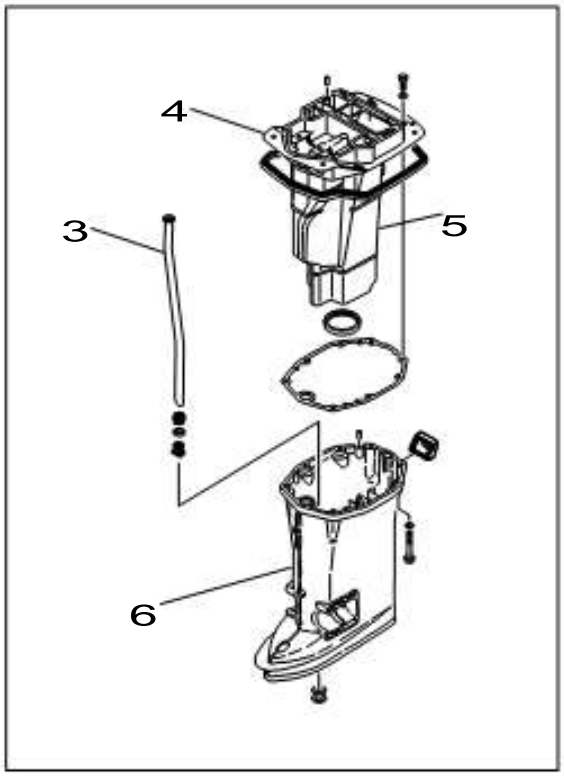


5. Loosen and remove bolts 7 that secure exhaust pipe 6 to engine base and remove exhaust pipe.



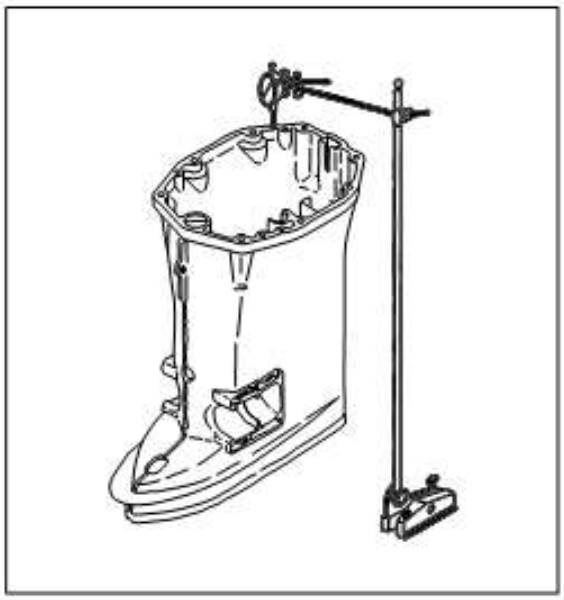
7) Inspection of Drive Shaft Housing

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.

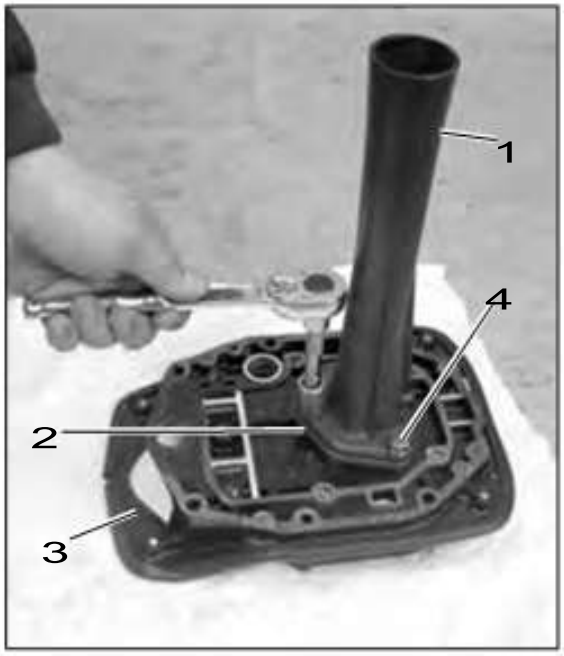
3. Check engine base 4, exhaust housing 5 and drive shaft housing 6 for corrosion for damage.



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

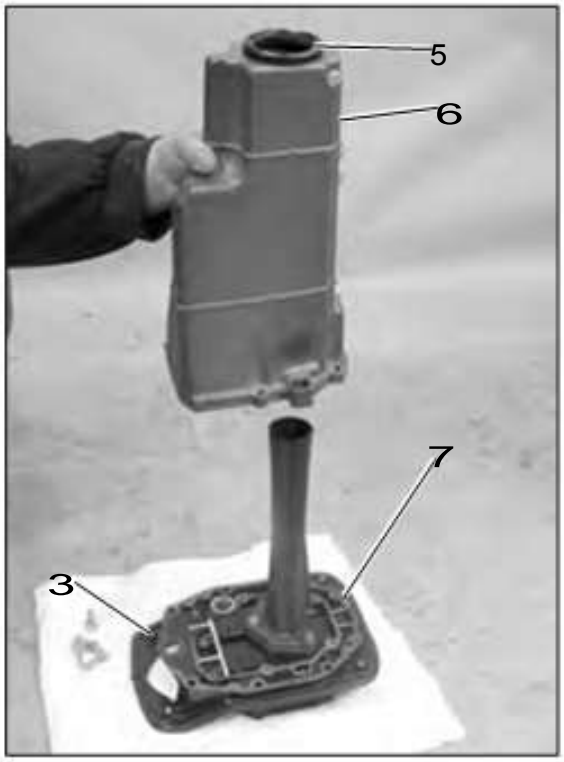
Use of distorted drive shaft housing may cause severe wear of drive shaft spline which may lead to damage on the crank shaft spline.



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]



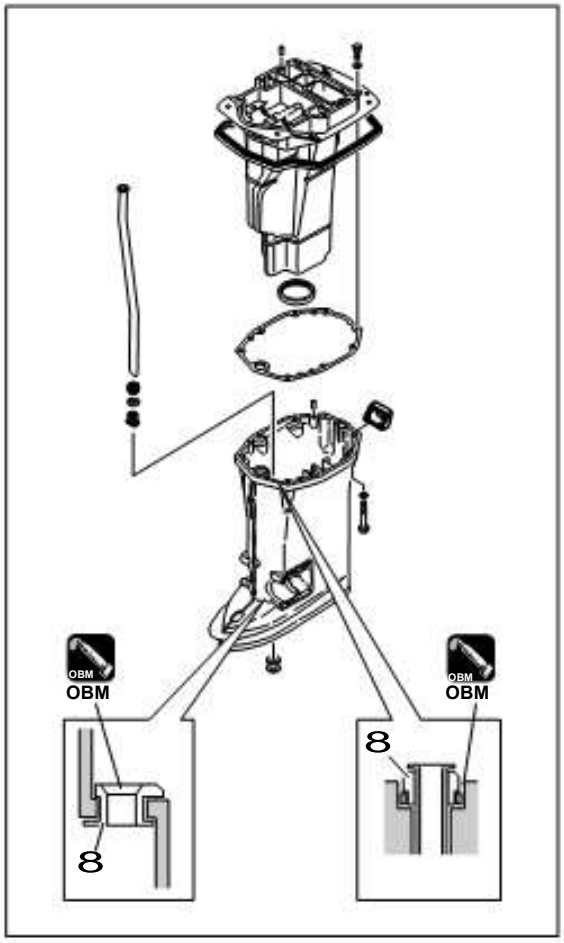
2. Install exhaust housing grommet 5 to exhaust housing 6.

When installing the grommet by using adhesive, clean adhering area to remove dirt and oil and dry the area before applying adhesive.

1741

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.

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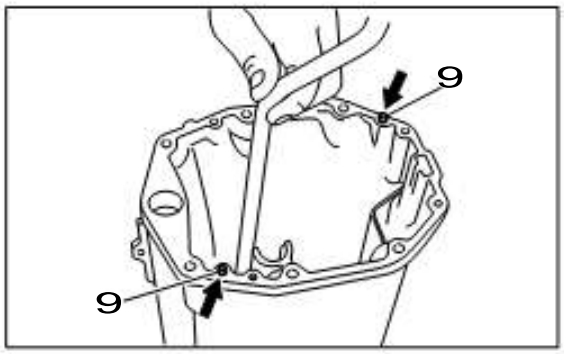
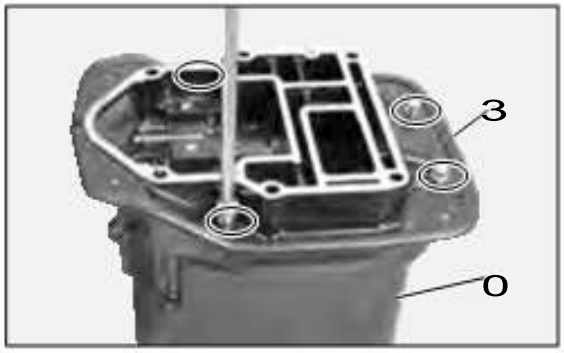


5. Install water pipe to drive shaft housing, and attach gasket after confirming that dowel pins 9 are on the drive shaft housing.

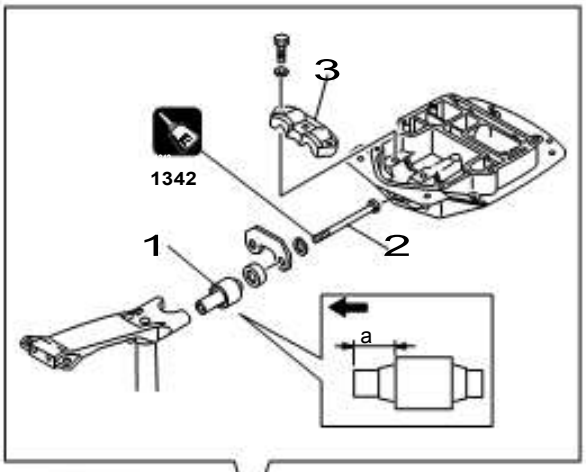
6. Check that drive shaft housing dowel pin is placed and secured to engine base properly.

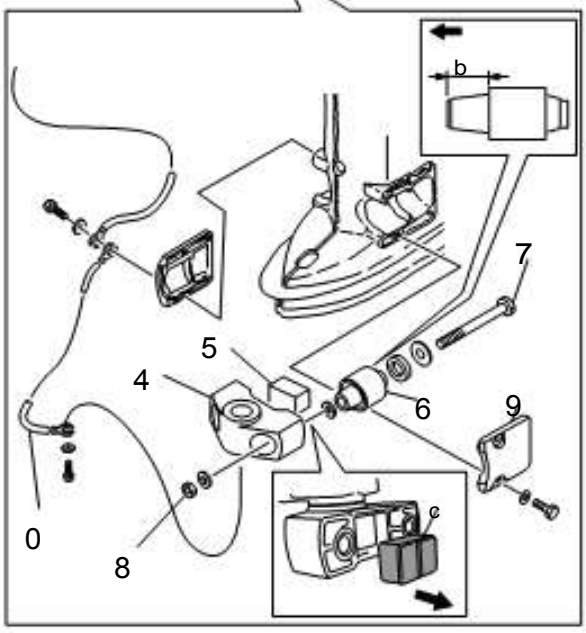
Check that water pipe is at joint of engine base.



7. Install engine base 3 to drive shaft housing 0 by tightening installation bolts to specified torque.

Engine Base Bolts :
20 N · m (14.5 lb · ft) [2.0 kgf · m]





9) Assembling Rubber Mounting

When assembling drive shaft housing parts, reverse the disassembling procedure.

1. Install upper mount 1 and tighten bolts 2 to specified torque.

CAUTION
Install the mount with the side of longer size a facing forward.

Upper Rubber Mount Bolts 2 **:**
29 N · m (22 lb · ft) [2.9 kgf · m]

2. Install upper mount holding plate 3.

3. Install dumper rubber 5 to mount bracket 4.

CAUTION
Install dumper rubber with the grooved side c facing drive shaft housing.

4. Put lower rubber mount 6 to drive shaft housing and tighten bolts 7 and nuts 8 to specified torque.

CAUTION
Install the mount with the side of longer size b facing forward.

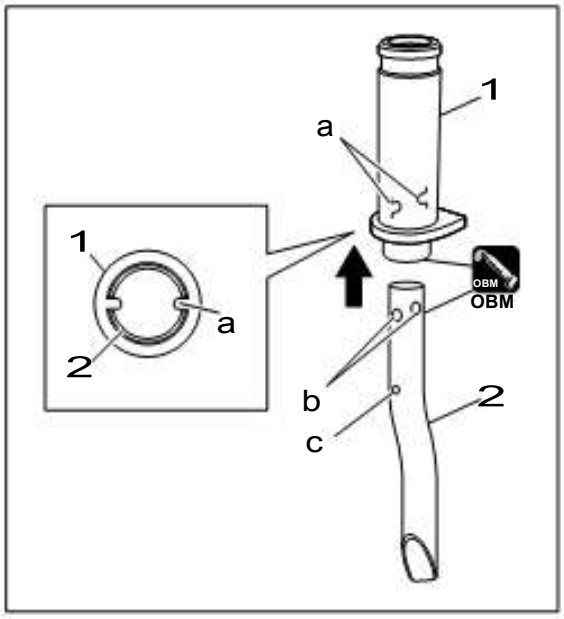
Lower Rubber Mount Bolt and Nut 7 **and** 8 **:**
41 N · m (27 lb · ft) [4.2 kgf · m]

5. Install mount holding plates 9.

6. Attach ground wire 0.

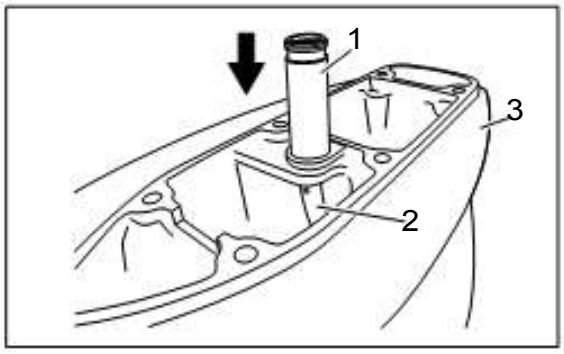
MWX50 Only

10) Assembling Extension Housing

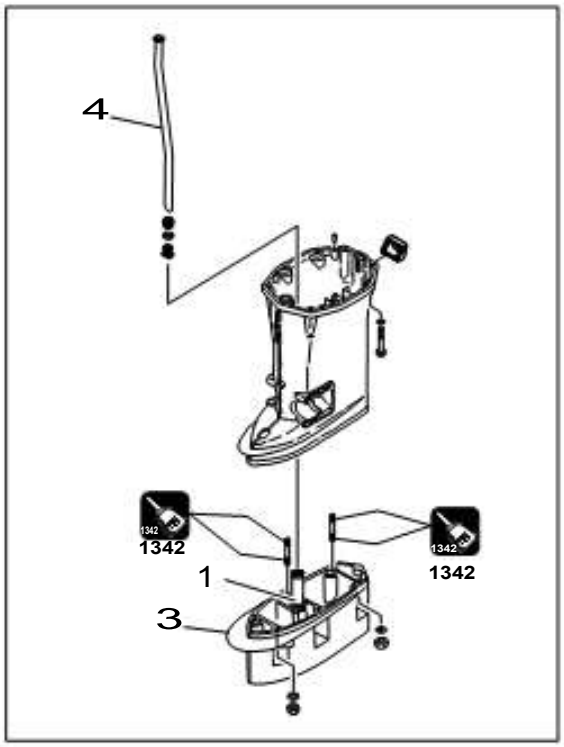


1. Align notches a inside the tube joint 1 with hole b of the extension pipe 2, then insert.

Passage c for adjusting water flow. Check the passage for clogged by salt, clean if necessary.



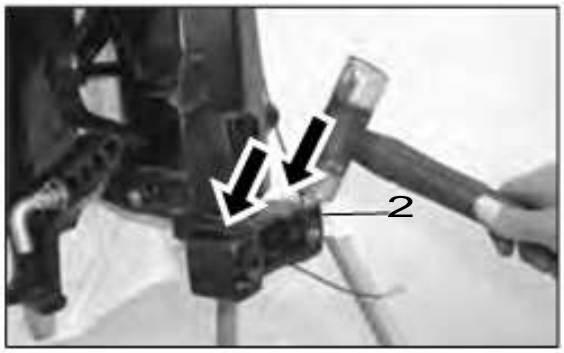
2. Insert tube joint 1 and extension pipe 2 to extension housing 3, as shown.



3. Insert tube joint 1 to the water pipe 4 and attach extension housing.

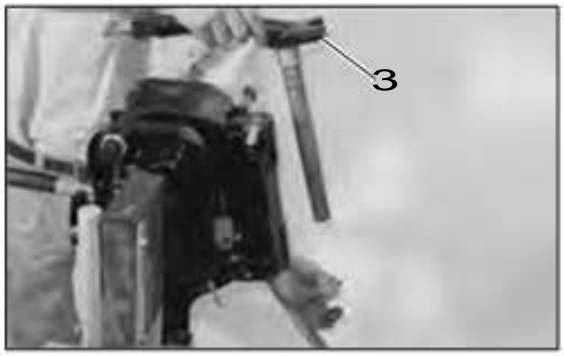
11) Removing Steering Shaft Arm

1. Remove "C" ring 1 that supports mount bracket 2.



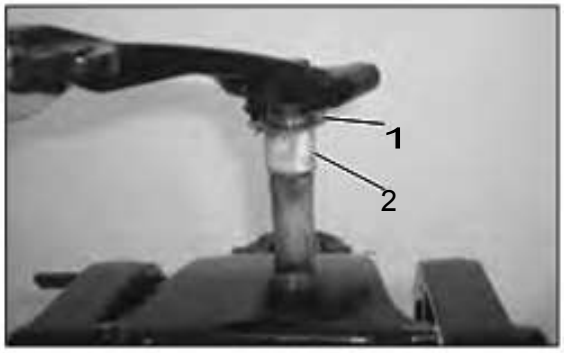
2. Remove mount bracket 2.

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.

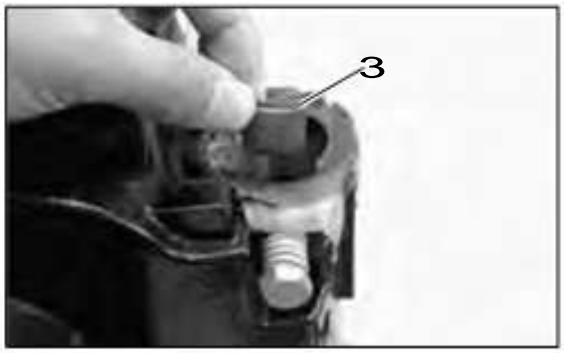
Do not lose bushing and O-ring.

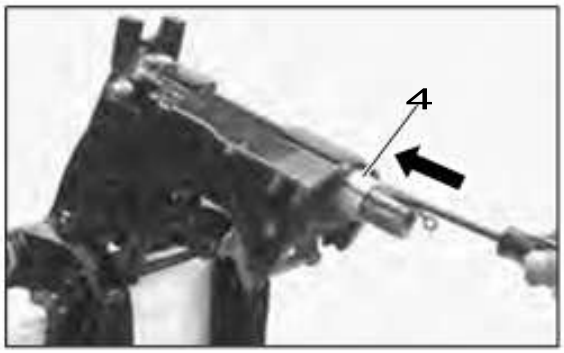


12) Installing Steering Shaft

1. Attach thrust plate 1 and bushing 2 friction piece 3 to steering shaft.

2. Stand swivel bracket ass'y vertically, and insert steering shaft into swivel bracket ass'y.

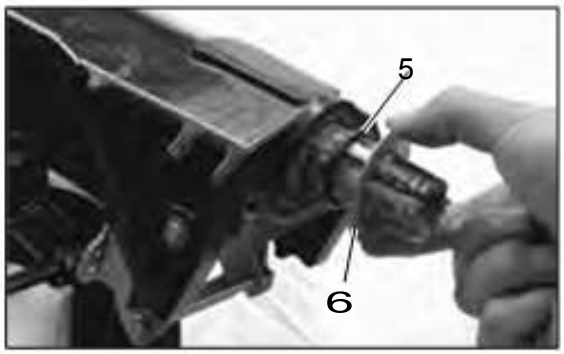




3. Attach bushing 4, new O ring 5, and thrust plate 6 to swivel bracket.

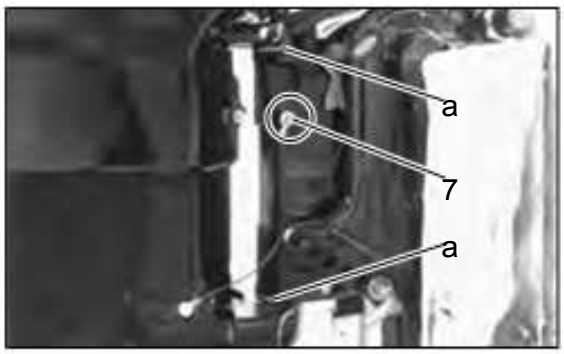
· Push bushing by using flat head screw driver until it stops.
· Put O ring until it contacts bushing.

OBM



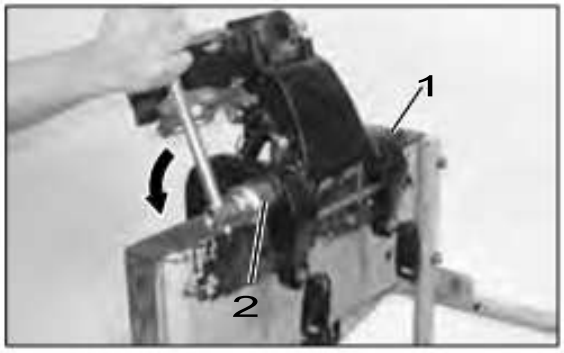
4. Put bushing and O ring into swivel bracket surely.

OBM



5. Put OBM grease into bushing a through grease nipple 7 until it overflows.

OBM



13) Disassembling Clamp Bracket

⚠ WARNING

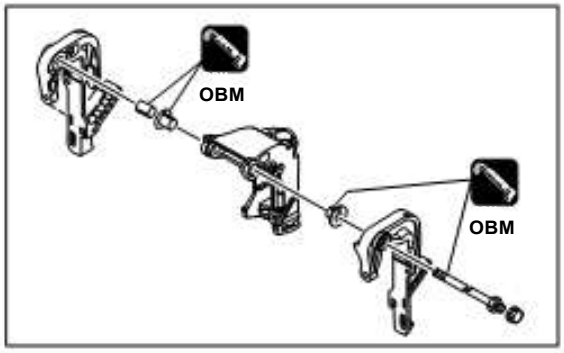
- When disassembling clamp bracket, be sure to fully tilt up outboard motor. If outboard motor is fully tilt down it can pop out spring suddenly and result in severe injury.
- When tilting up outboard motor without power unit installed, be careful to operate tilt lock lever to prevent swivel bracket rise up easy.

1. Remove drive shaft housing, steering shaft, thrust rod and copilot before beginning this procedure.

2. Loosen nut 2 of swivel bracket shaft 1.

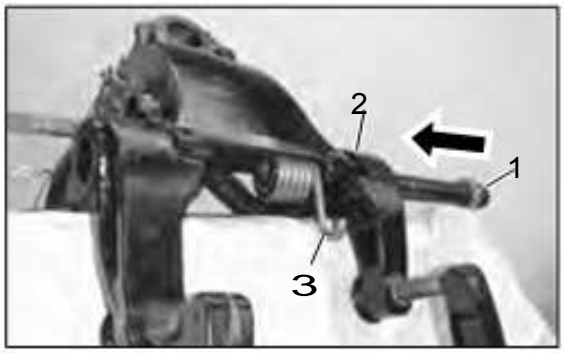
3. Remove ground cable on the swivel bracket.

4. Remove swivel bracket shaft with spring and swivel bracket.



14) Assembling Clamp Bracket

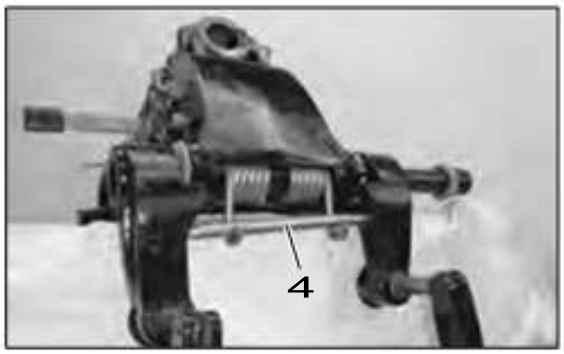
1. Apply grease to swivel bracket, swivel bracket shaft, bushing.



2. Put bushing to swivel bracket, and then, insert swivel bracket shaft 1 into clamp bracket 2 and tilt assistant spring 3.

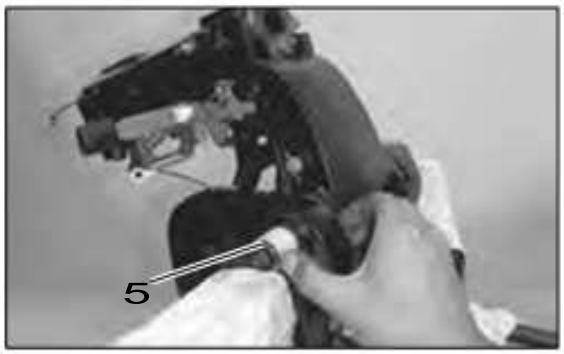
Set the tilt stop lever to “Release” position, then install swivel bracket shaft and assistant spring.

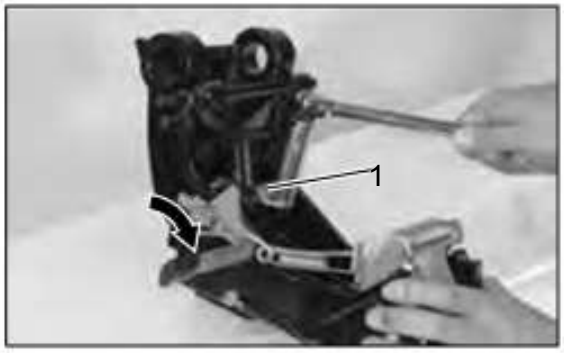
*Tilt assistant spring 3 is discontinuing products for after January in 2012.



3. Install tilt assistant shaft 4 and bushing 5. And then, tighten nylon nut to the specified torque.

Nylon Nut 5 **:**
25 N · m (18 lb · ft) [2.5 kgf · m]

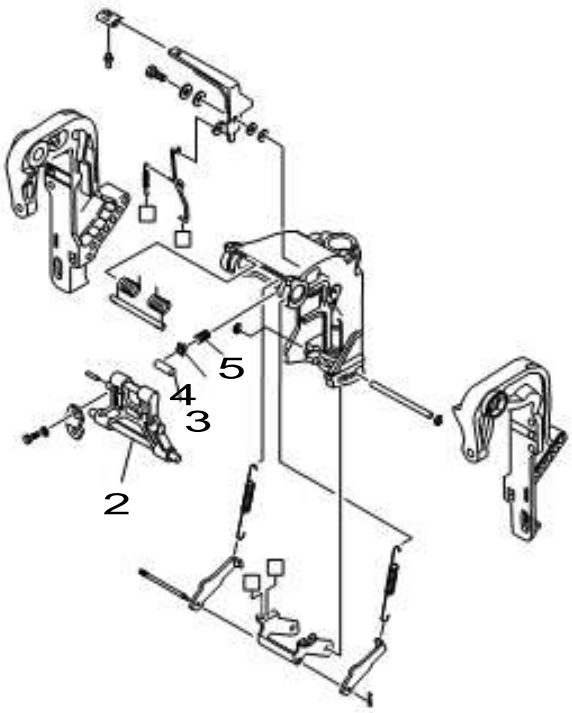


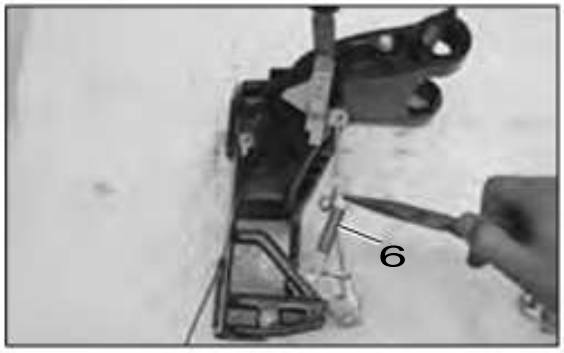


15) Disassembling tilt mechanism

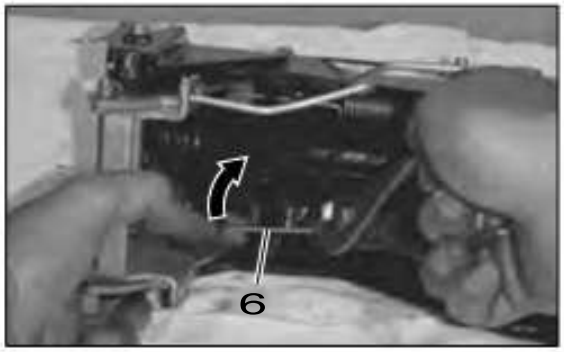
1. Set tilt stopper lever to "release" side, and then, remove tilt stopper setting plate 1.

2. Remove tilt stopper 2, bushing 3, set piece 4 and spring 5.

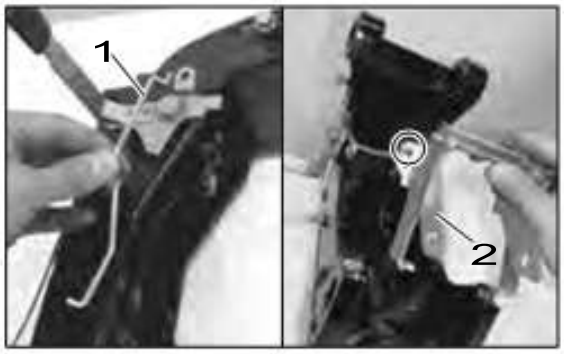




3. Remove springs 6.



4. Remove E-rings, and then, remove reverse lock shaft 7 by using screw driver.

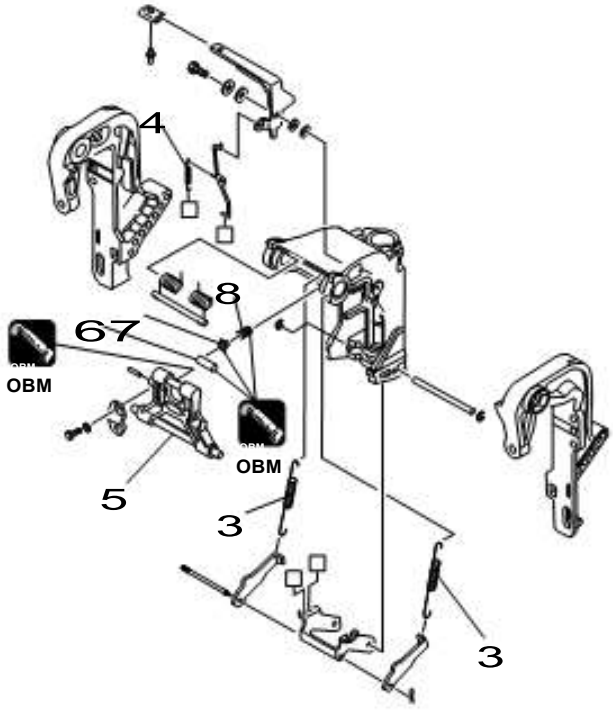


16) Assembling tilt mechanism

1. Install reverse lock link 1 and arm 2 as shown and then, install reverse lock shaft.

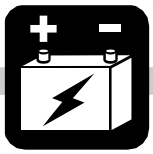
2. Install reverse lock spring 3 and spring 4 springs in reverse procedures of disassembling.

3. Install tilt stopper 5, bushing 6, set piece 7 and spring 8.

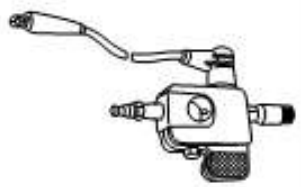


8

Electrical System



1.Special Tools

1	2	3
		
Spark Tester P/N. 3F3-72540-0	Peak Voltage Adapter P/N. 3AC-99550-0	Tachometer P/N. 3AC-99010-0
Inspecting spark	Checking Peak Voltage*	Measuring engine revolution speed

*What's Peak Voltage

It is the method peak voltage measurement, at one of decision method of ignition system and charge system, of turning the flywheel and peak voltage (instantaneous maximum voltage) measuring dynamically.

Merit of adoption of peak voltage measurement

1.At the precision which is higher than past of decision and defective place or parts can be executed much faster.

2. Good or faulty condition can be checking without removing the parts.

Recommended tester

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.

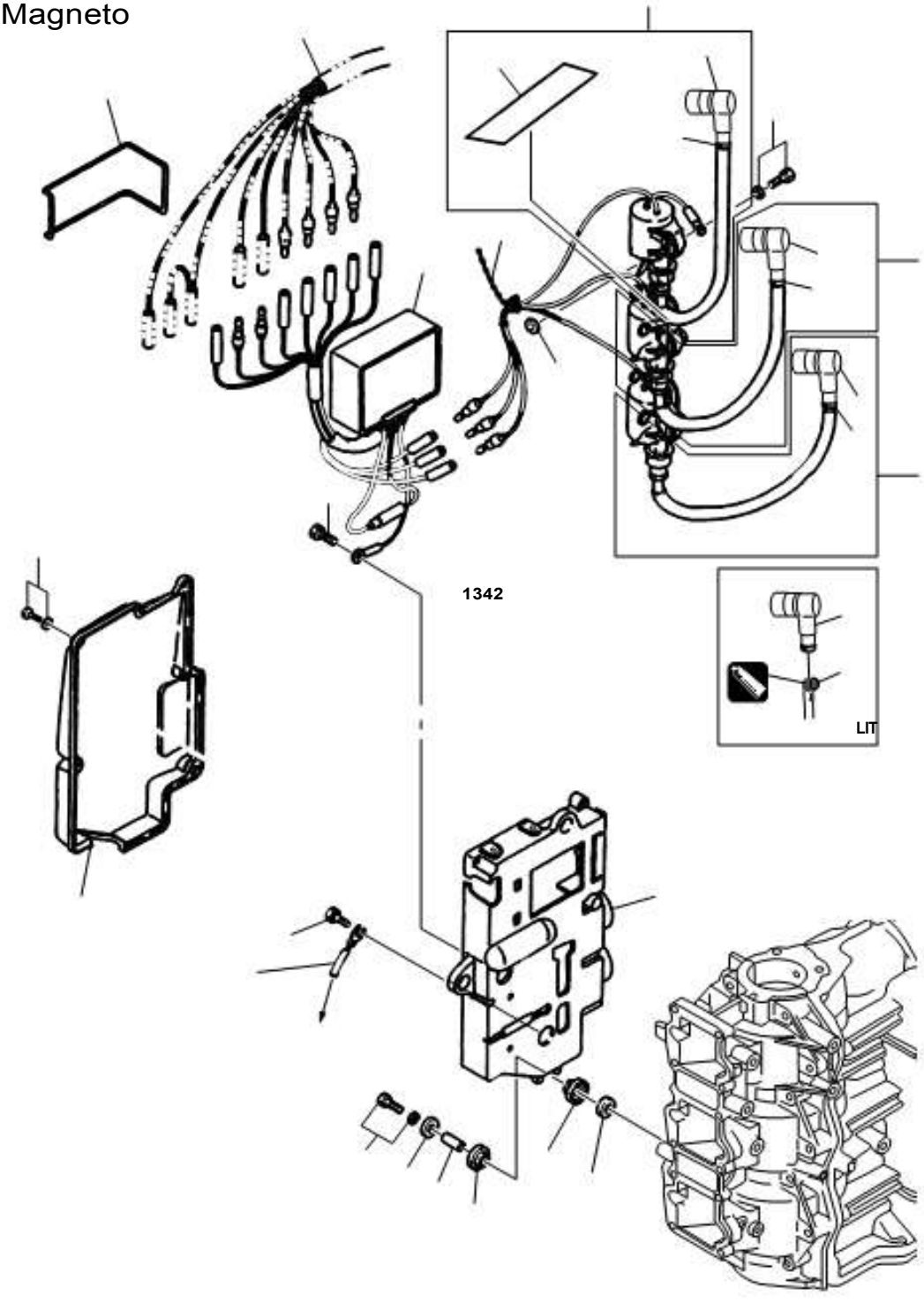
4 The value enclosed by ( ) is approximately value measured using 1kΩ range of the tester. Note that the value varies among conditions of the tester (internal power supply), measurement ranges and models.

5 Perform this inspection only as a guide.

2.Parts Layout

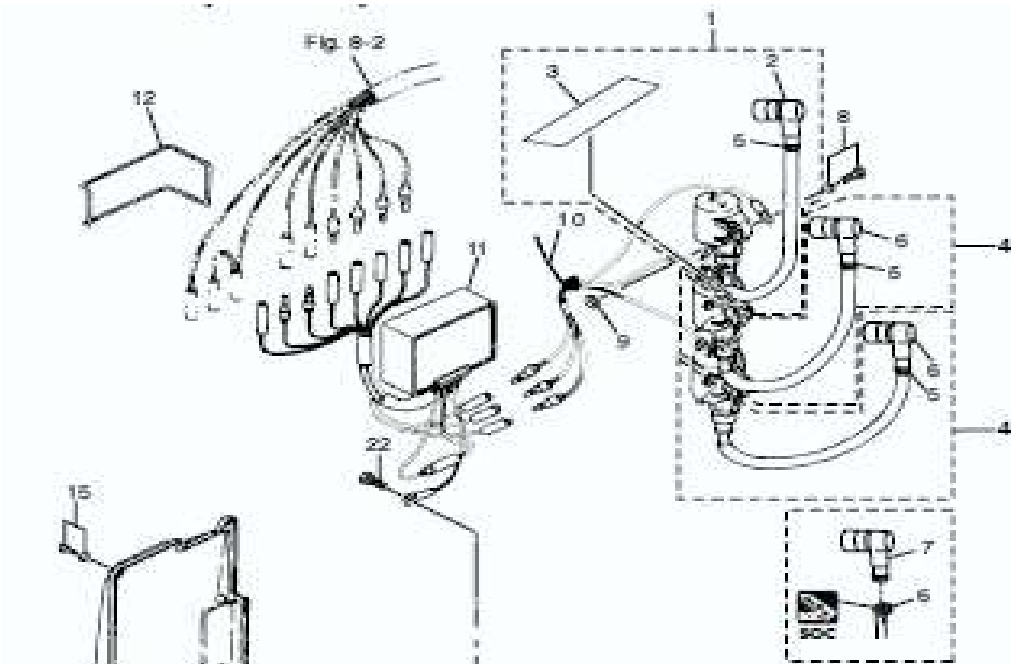
P/L Fig. 8

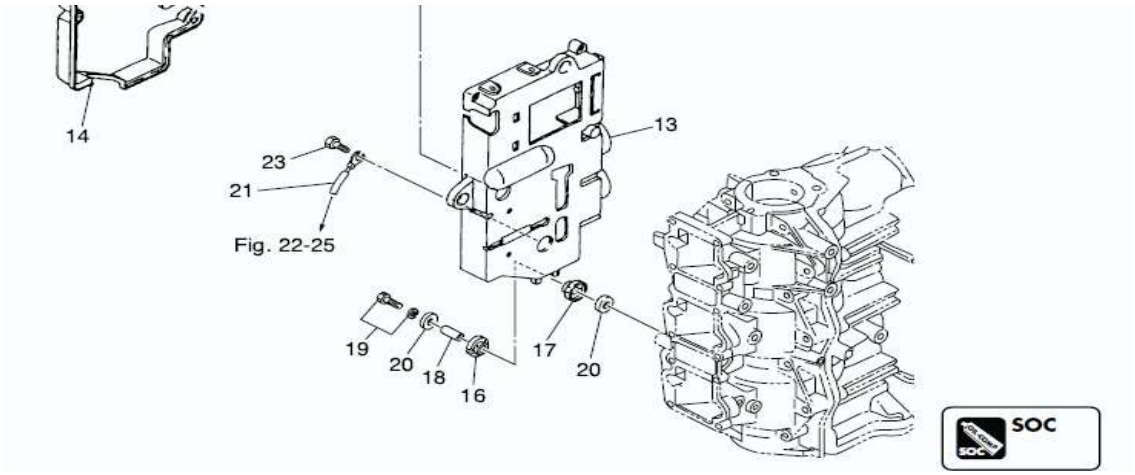
Magneto



Ref. No.	Description	Q'ty	Remarks
1	Flywheel W/Ring Gear	1	F4T405-72
2	Coil Plate Ass'y W/Alternator	1	
3	Pulsar Coil & Plate Ass'y	1	
4	Pulsar Holder	1	
5	Exciter Coil	1	
6	Screw	6	
7	Alternator Ass'y	1	
8	Holder	1	
9	Screw	2	
10	Clamp	2	
11	Screw	2	

Ref. No.	Description	Q'ty	Remarks
12	Band	3	
13	Screw	3	
14	Key	1	
15	Nut 18-P1.5	1	
16	Washer 19-34-3	1	
17	Guide Plate	1	
18	Guide Plate cover	2	
19	Setting Ring	1	
20	Ball Joint	1	
21	Spring Washer	1	
22	Bolt	3	





Ref. No.	Description	Q'ty	Remarks
1	Ignition Coil Ass'y W/Label	1	F6T530
2	Plug Cap	1	
3	Caution Decal (B)	1	
4	Ignition Coil W/R-Cap	2	F6T530
5	Band	3	
6	Plug Cap Terminal	3	
7	Plug Cap	1	
8	Bolt	3	
9	Gasket 6.2-11-1	3	
10	Lead Wire Band	1	
11	CD Unit	1	F8T20572
12	O-Ring 3.1-94.4	1	

Ref. No.	Description	Q'ty	Remarks
13	Bracket	1	
14	Cover	1	
15	Screw	5	
16	Mount 8.5-14-2.5	3	
17	Rubber Mount 8.5-14-2.5	3	
18	Spacer 6.2-9-15.7	3	
19	Bolt	3	
20	Washer 6.5-21-1	6	
21	Ground Cable L=270	1	
22	Bolt	1	
23	Bolt	2	

3.How to use Peak Voltage Adapter

Attention of measurement

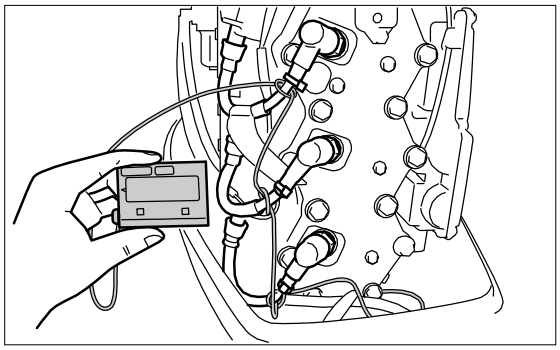
• Before measuring the peak voltage, check each wiring for proper connection and corrosion.

• Connected and disconnected, there is the respective value in peak voltage.

• As for usual system measurement in connected, as for coil single item measures in disconnected.

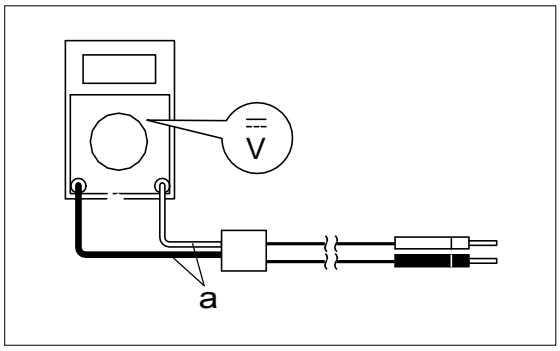
• Connected a state where the cable terminal of the outboard motor is connected, disconnected a state where the cable terminal of the outboard motor is disconnected.

Measurement procedure



1) Place the outboard motor in test tank for ready to engine starting.

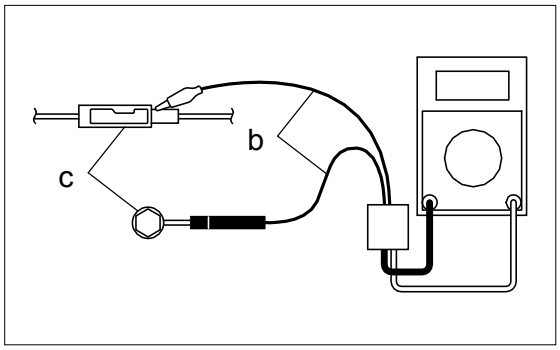
2) Attach tachometer to outboard motor. (without cranking)



3) Attach peak voltage adapter to tester.

The peak voltage adapter plug a, there is a positive pin and negative pin. Connect Red (positive) pin of peak voltage adapter to positive terminal of digital circuit tester.

4) Set selector of digital circuit tester to “DCV” mode.



5) Connect pin a of peak voltage adapter to measurement pin b.

• Insert stick pin, and then pinch the testing clip.
• Readings the same value, so there is no polarity in peak voltage adapter pins, connect to each measuring terminals c.
• To connect, refer to wiring color diagrams of each models. Indicate wire color on the outboard motor.

6) Measure peak voltage at engine cranking or engine starting.

• When measuring peak voltage at engine cranking, remove spark plug cap from spark plug and spark plug is attached.
• Variation occurs in output value with cranking speed.
• For manual start model:
Cranking speed is unstable, cranking measurement makes reference value.
• Because numerical value of the data of each model statement page is the lower limit, if it is above this, as for good condition.
• The faulty part it specifies, input voltage being properly, if there is a unit whose output voltage is not properly that is the faulty part.

4. Inspection date

Resistance test reference

Ignition coil	Primary	0.4 ~ 0.6Ω
	Secondary	6.8 ~ 10.2 kΩ
Pulser Coil	L/W - B #1	160 ~ 220Ω
	WB - B #2	160 ~ 220Ω
	WR - B #3	160 ~ 220Ω
Exciter Coil	W/G - B	□
	Or - B	□
	Or - W/G	520 ~ 720Ω

Peak voltage out put test reference

		Cranking	Idling	1500r/min
Pulser Coil	L/W - B #1	3V	7V	19V
	WB - B #2			
	WR - B #3			
Exciter Coil	Or - W/G	185V	210V	210V
C.D unit	B/W - B	160V	180V	180V
	B/R - B			
	B/G - B			

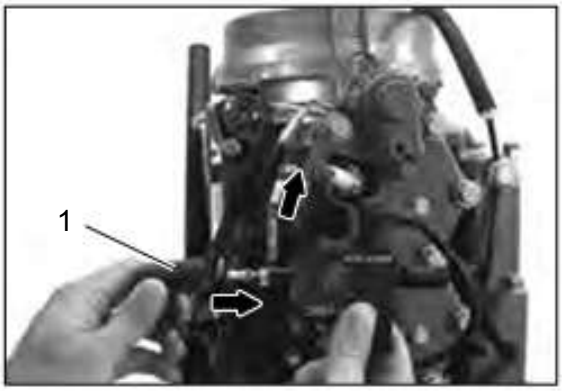
5. Inspection Items

1) Inspection of Ignition and spark

⚠ WARNING

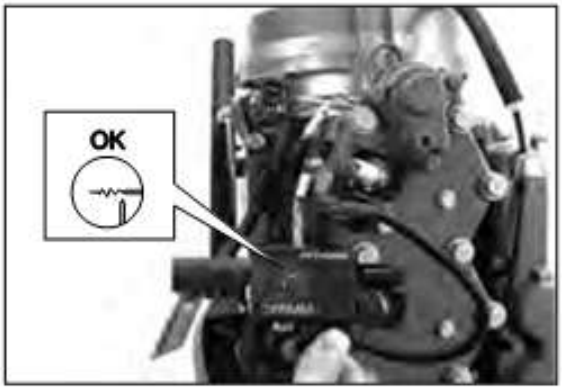
· Do not touch any connection of wires of "Spark Tester", while checking ignition spark.
· When testing, put electrode cap assuredly to prevent direct contact with spark tester wiring and leak of electrical current, and perform test carefully.
· Keep flammable gas, fuel, oil away from tester to prevent 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

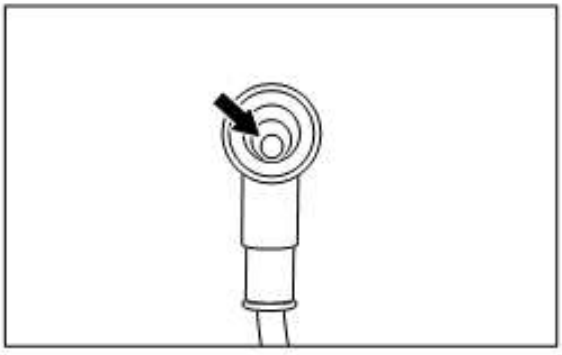


4. Start engine and check spark. Check spark system when sparks are weak.

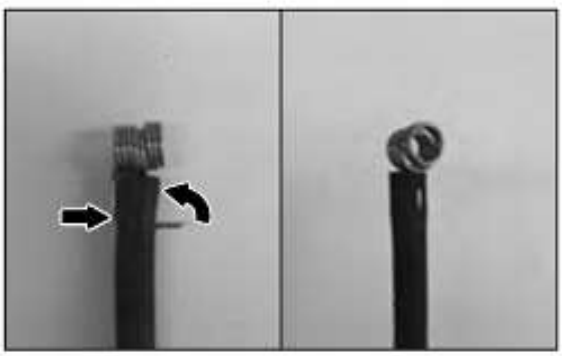
Spark Performance :
10 mm (0.4 in) or over

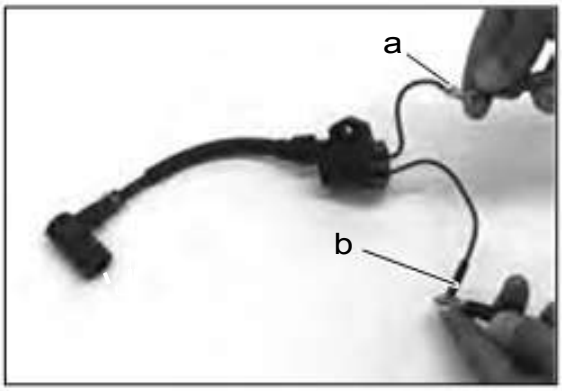
2) Inspection of Plug Cap Terminal

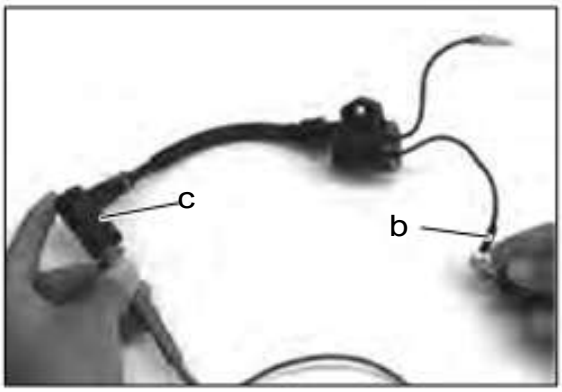
Remove the part and test it as a separate unit.



1. Disconnect plug cap from spark plug.
2. Check spark plug hole of spark plug cap and check position of spark plug terminal to properly.
3. Replace plug cap terminal if necessary.





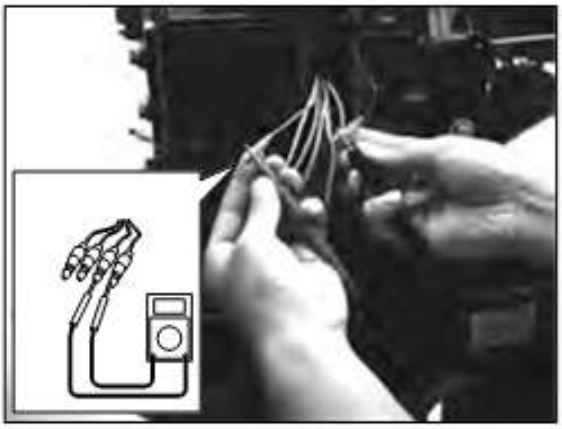


3) Inspection of Ignition Coils

This test can be made without removing parts.

1. Measure ignition coil resistance. Replace if other than specified value.

Ignition Coil Resistance :
Primary Side : Between a and b 0.4 - 0.6 Ω
Secondary Side : Between c and b 6.8 - 10.2 kΩ
(without plug cap)



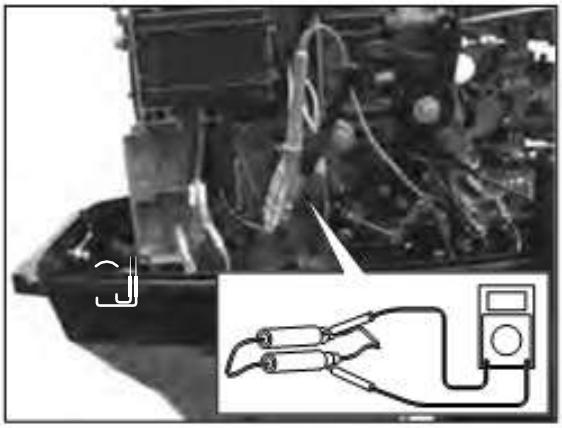
4) Inspection of Pulser Coil

• Measurement of resistance

1. Open electrical bracket.

2. Disconnect all connectors from coil plate ass`y, and measure resistance between terminals.
Replace pulser coil if the resistance is out of specified range.

Pulser Coil Resistance :
Blue (L)/White (W) - Black (B) #1
White (W)/Black (B) - Black (B) #2
White (W)/Red (R) - Black (B) #3
160 - 220 Ω

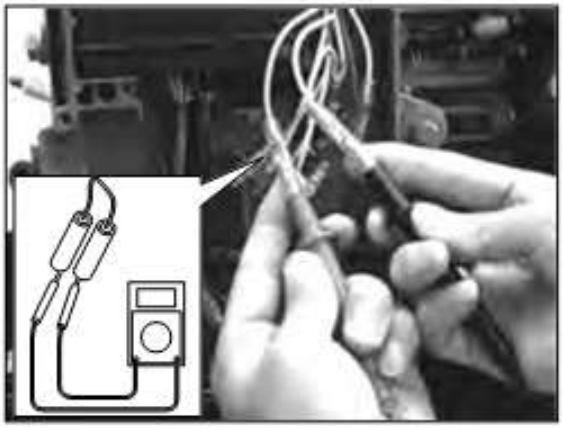


• Measurement of peak volts

1. Connect Peak Voltage adapter to pulser coil connectors.

2. Measure peak volts at shown below.
Replace pulser coil or check connection of wire harness if the peak volts out of specified range.

Pulser Coil Peak Volts: (Reference)
Blue (L)/White (W) - Black (B) #1
White (W)/Black (B) - Black (B) #2
White (W)/Red (R) - Black (B) #3
3 V at cranking
7 V at idling
19 V at 1.500 r/min

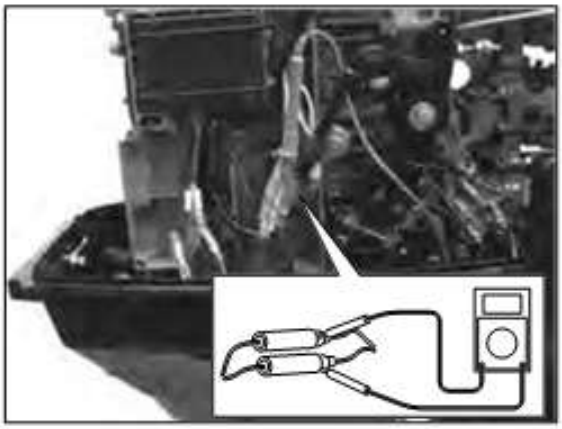


5) Inspection of Exciter Coil

• Measurement of resistance

1. Disconnect all connectors from coil plate ass`y, and measure resistance between terminals.
   Replace exciter coil if the resistance is out of specified range.

Exciter Coil Resistance :
White/Green (W/G) - Black (B): □
Orange (Or) - Black (B): □
Orange (Or) - White/Green (W/G): 520 - 720 Ω

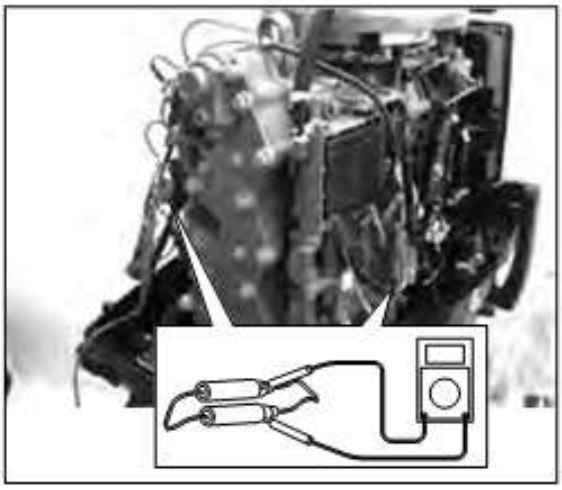


• Measurement of peak volts

1. Connect Peak Voltage adapter to exciter coil connectors.

2. Measure peak volts at shown below.
   Replace exciter coil or check connection of wire harness if the peak volts out of specified range.

Exciter Coil Peak Volts: (Reference)
Orange (Or) - White (W)/Green (G)
185 V at cranking
210 V at idling
210 V at 1.500 r/min



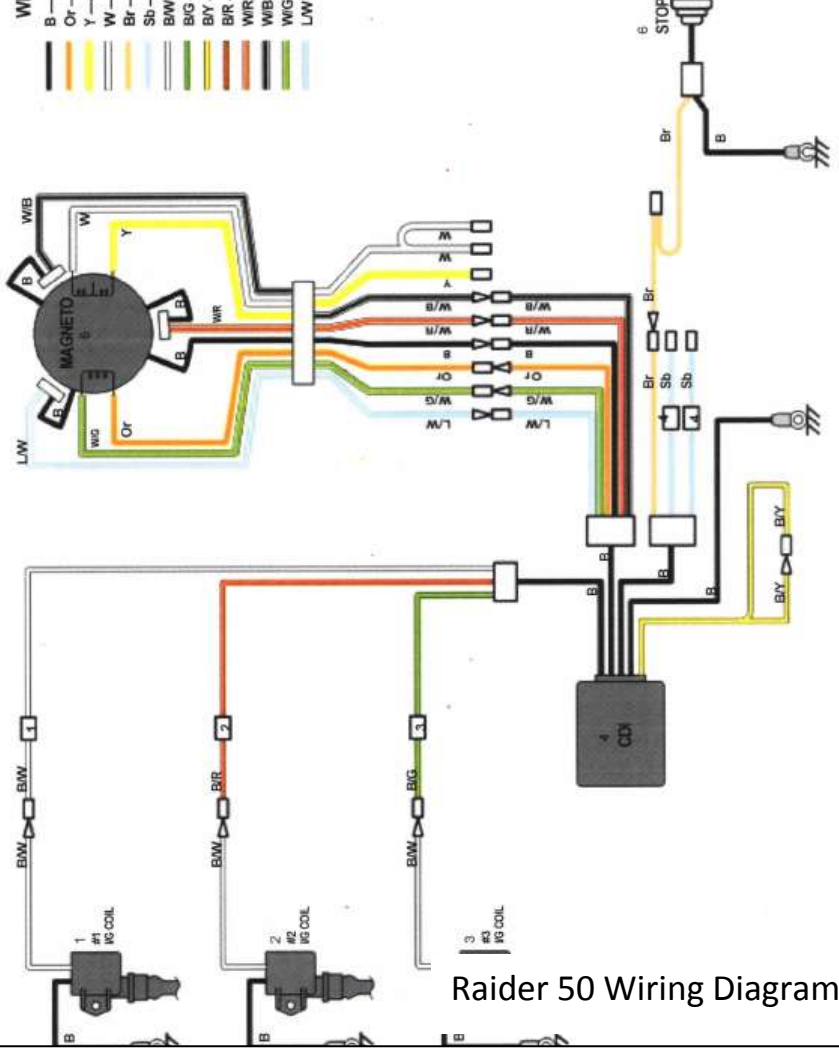
6) Inspection of C.D. unit

• Measurement of peak volts

1. Connect Peak Voltage adapter to C.D.unit connectors.

2. Measure peak volts at shown below.
   Replace C.D.unit or check connection of wire harness if the peak volts out of specified range.

C.D. Unit Peak Volts: (Reference)
Black/White (B/W) - Black (B)
Black/Red (B/R) - Black (B)
Black/Green (B/G) - Black (B)
160 V at cranking
180 V at idling
185 V at 1.500 r/min



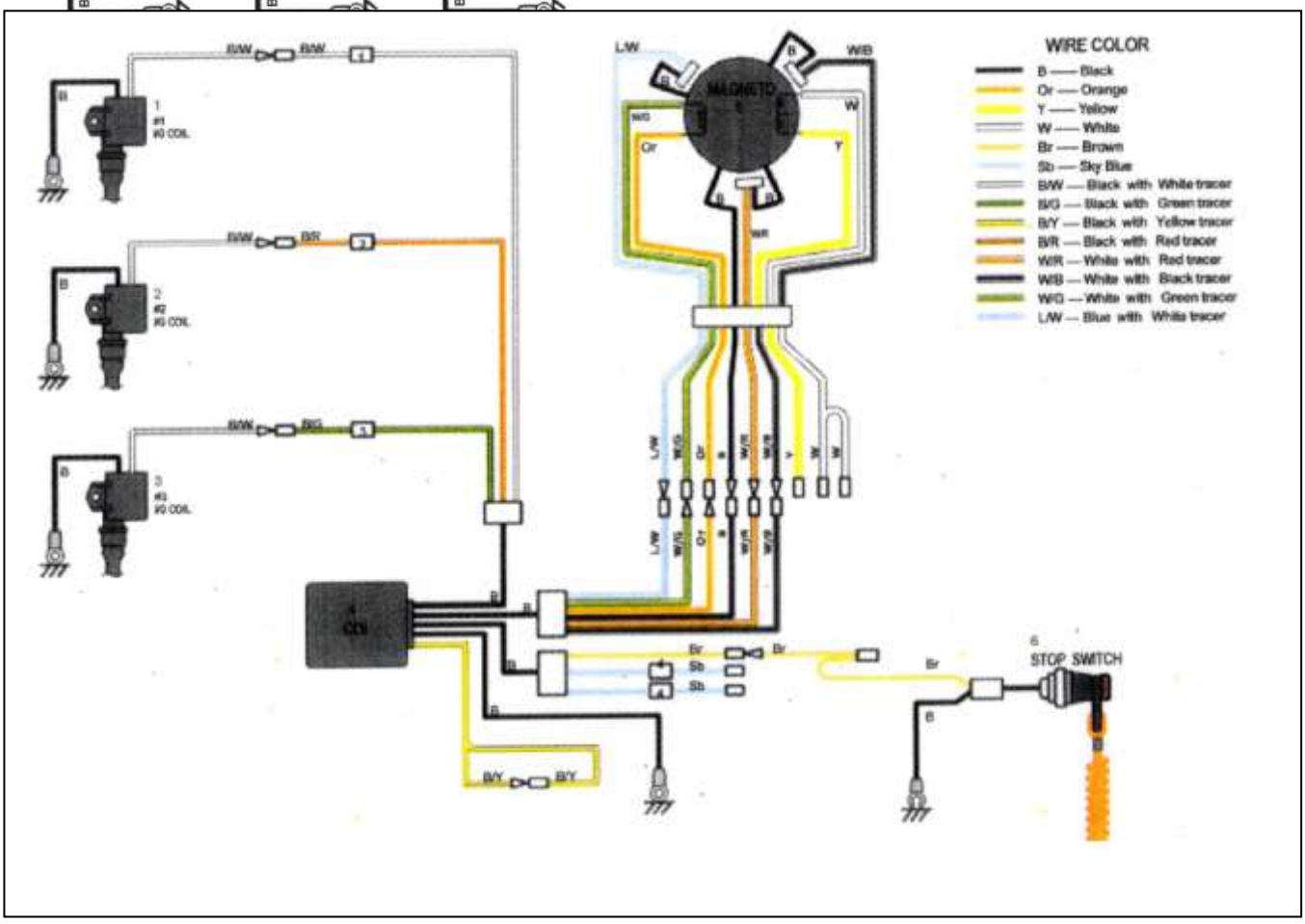
of Stop Switch

ction of stop switch, and replace if not

st can be made without removing parts.

Position		
	Brown (Br)	Black (B)
k a	○	○
b		
ı c	○	○

Raider 50 Wiring Diagram



9

Troubleshooting

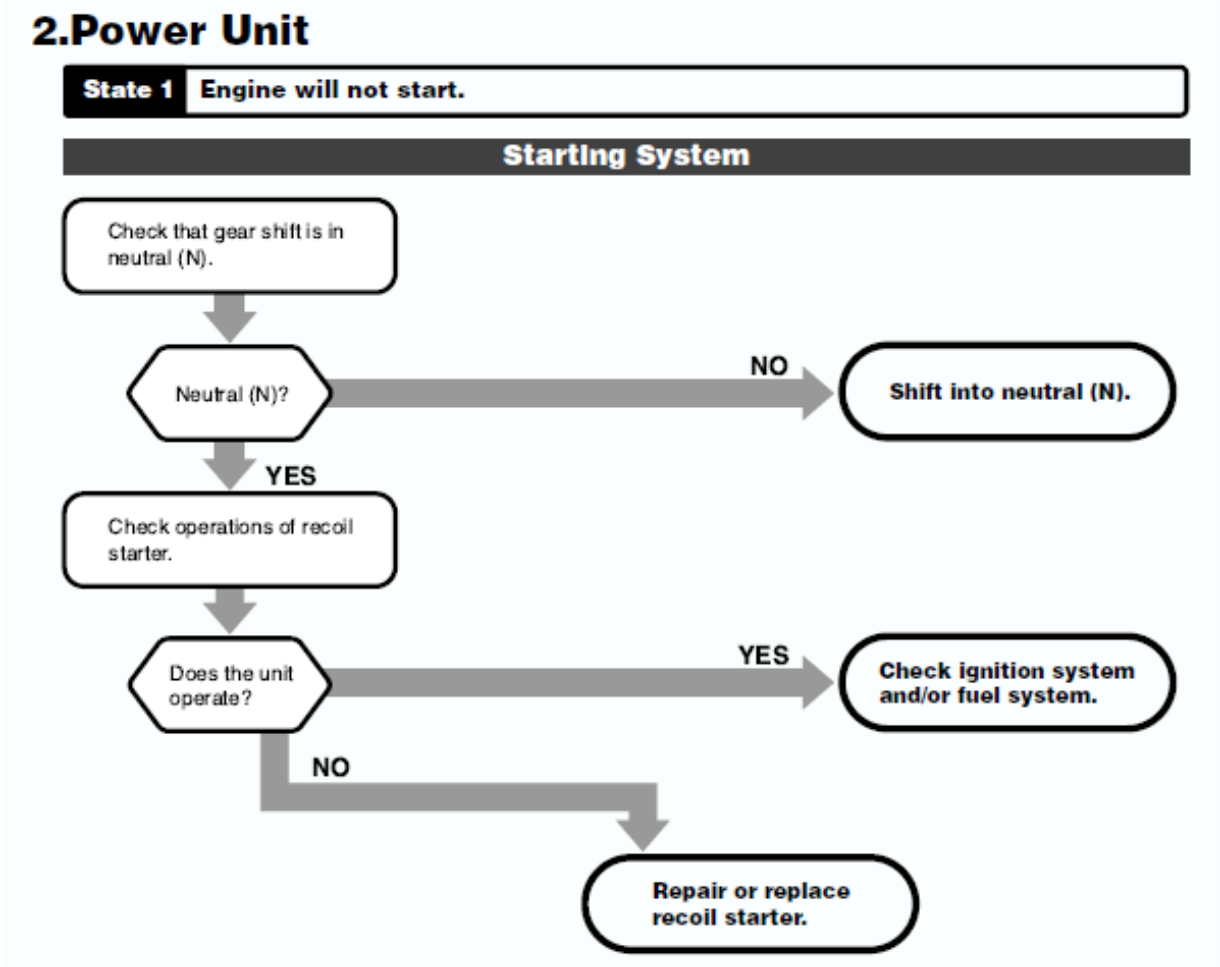
Troubleshooting

1.Troubleshooting Chart

	Engine will not start.	Engine stalls immediately after starting.	Idles abnormally.	Defective acceleration.	Engine speed is very high causing high speed ESG to operate.	Boat cannot run at high speed.	Engine overheats.	Estimated Cause	Refer to page
Fuel and Lubrication Systems	○	○						Fuel level is low in the tank.	Chapter 1
	○	○	○	○		○	○	Fuel system connection is incomplete.	Chapter 2
	○	○	○	○		○	○	Air suctioned through fuel system	-
	○	○	○	○		○	○	Fuel pipe is twisted.	Chapter 3
	○	○	○	○		○	○	Cap vent is closed.	-
	○	○	○	○		○	○	Fuel filter, fuel pump or carburetor is clogged.	Chapter 4
	○	○	○	○		○	○	Low quality gasoline is used.	-
	○	○	○	○		○		Fuel pump malfunction	Chapter 4
	○			○				Choke system malfunction	-
			○	○		○	○	Fuel is fed excessively.	Chapter 4
			○	○				Engine oil quantity excessive (Exhaust smoke is generated.)	Chapter 3
Compression			○	○		○		Piston, piston ring and/or cylinder is worn excessively.	Chapter 5
			○				○	Combustion chamber carbon deposition is too much.	Chapter 5
			○	○		○	○	Spark plug is loose.	Chapter 3
Electrical System	○	○	○	○		○	○	Use of spark plugs not specified	Chapter 3
	○	○	○	○		○		Spark plug is contaminated.	Chapter 3
	○	○	○	○		○		No sparks or weak sparks	Chapter 8
	○							Stop switch short-circuited	Chapter 8
	○		○	○		○		Ignition timing is not properly adjusted.	Chapter 3
	○							Stop switch lock is not attached.	Chapter 1
	○							Disconnection of lead wires or loose earth wire	Chapter 8
Others						○	○	Cooling water is not fed or low due to malfunction or clogging of pump	Chapter 6
			○		○	○	○	Thermostat operation is defective.	Chapter 3
				○	○	○	○	Anti-cavitation plate is damaged.	-
				○	○	○	○	Use of mismatched propeller.	Chapter 1
			○	○	○	○	○	Propeller is damaged or deformed.	Chapter 3
				○	○	○	○	Trim position is not correct.	-
				○	○	○	○	Boat is unbalanced due to improper load position.	-
				○		○	○	Transom is too high or too low.	Chapter 1
	○		○	○		○		Throttle link adjustment is defective.	Chapter 3

Before working on the engine, check that hull, rigging and engine installation are normal. For mechanical troubleshooting, refer to relevant troubleshooting section in this chapter. For checking and servicing the machine, refer to service procedures described in this manual to perform the works safely.

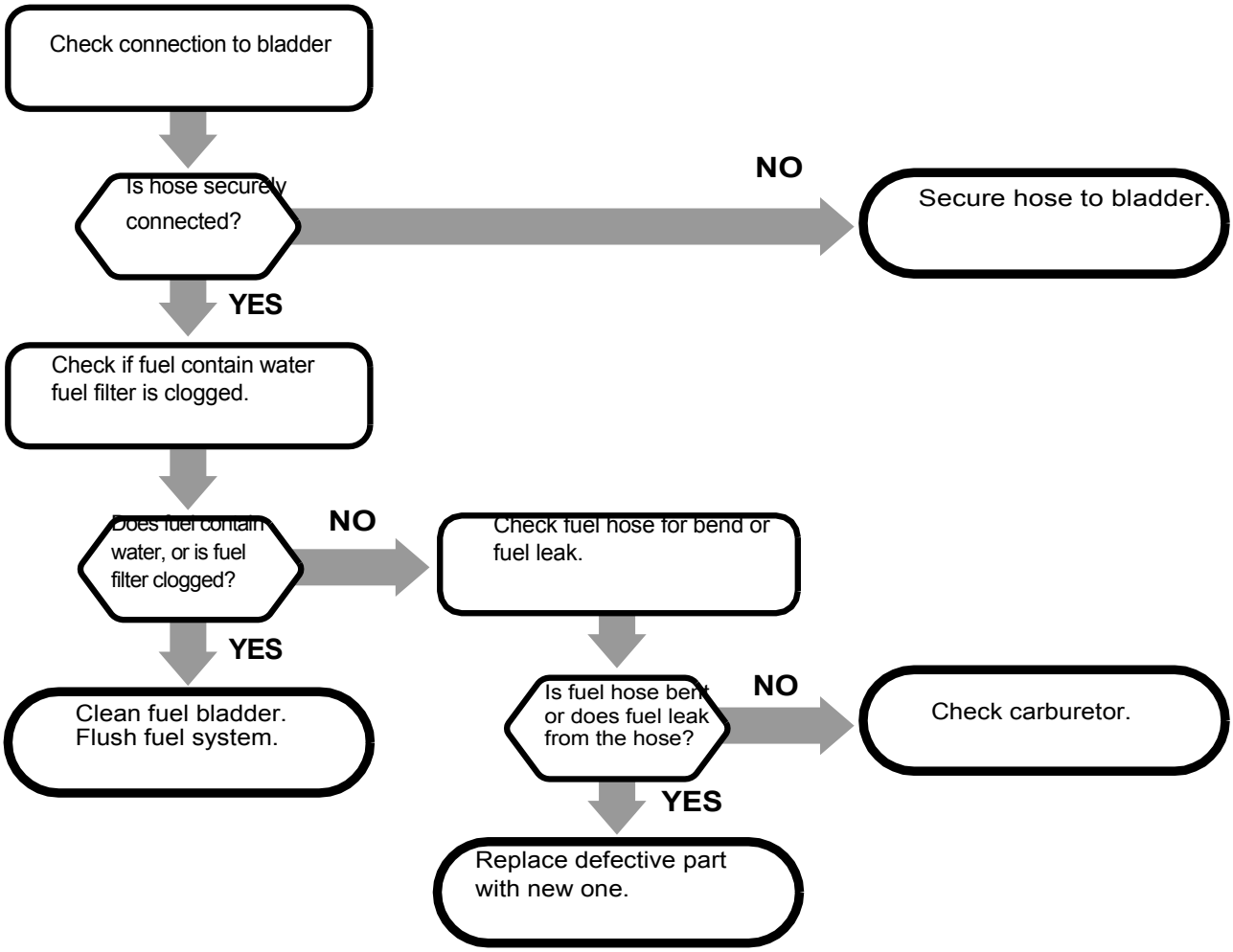
2.Power Unit



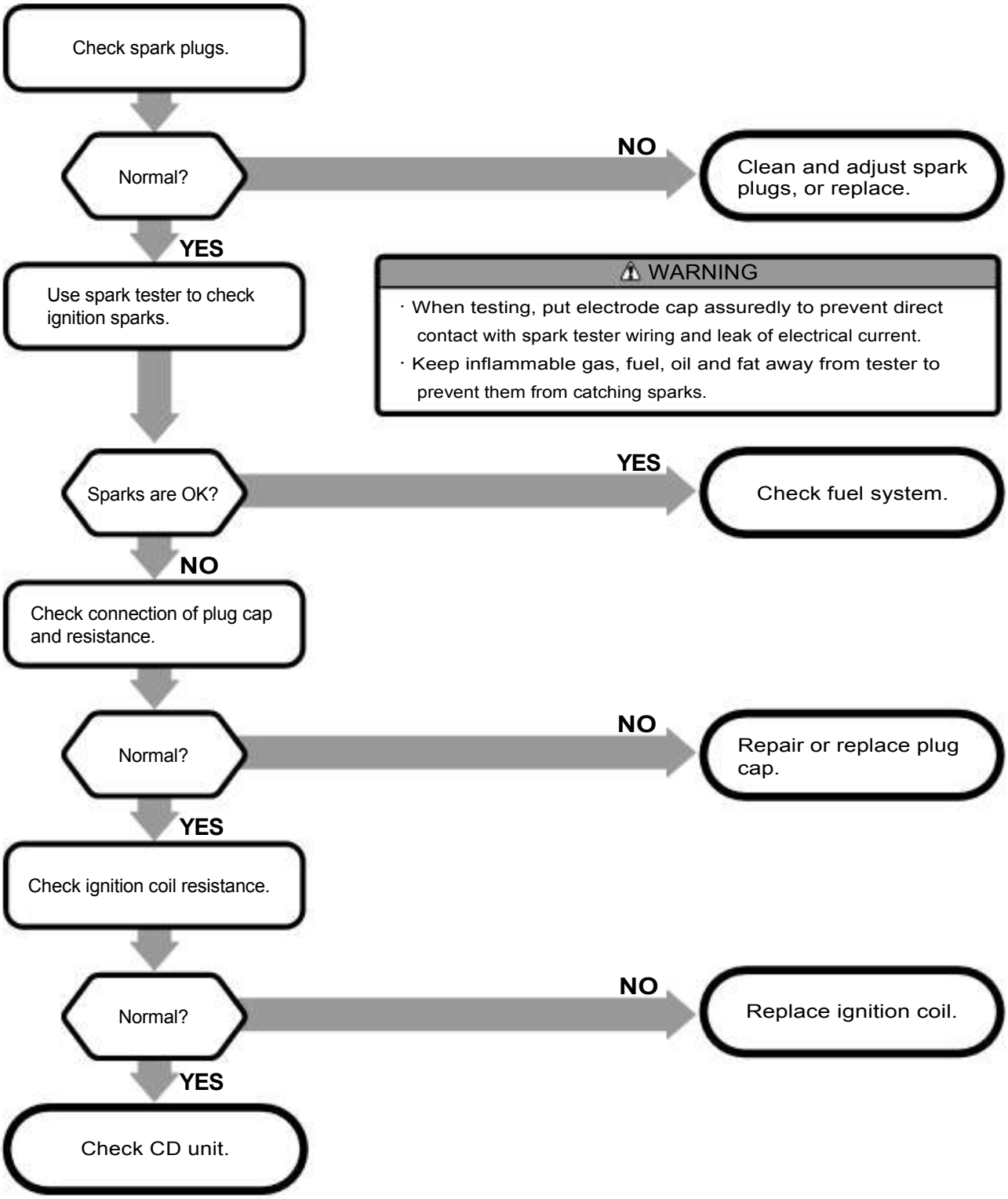
State 2 Engine starts but stalls soon.

• **Inspection of Fuel System, Ignition System, Compression Pressure.**

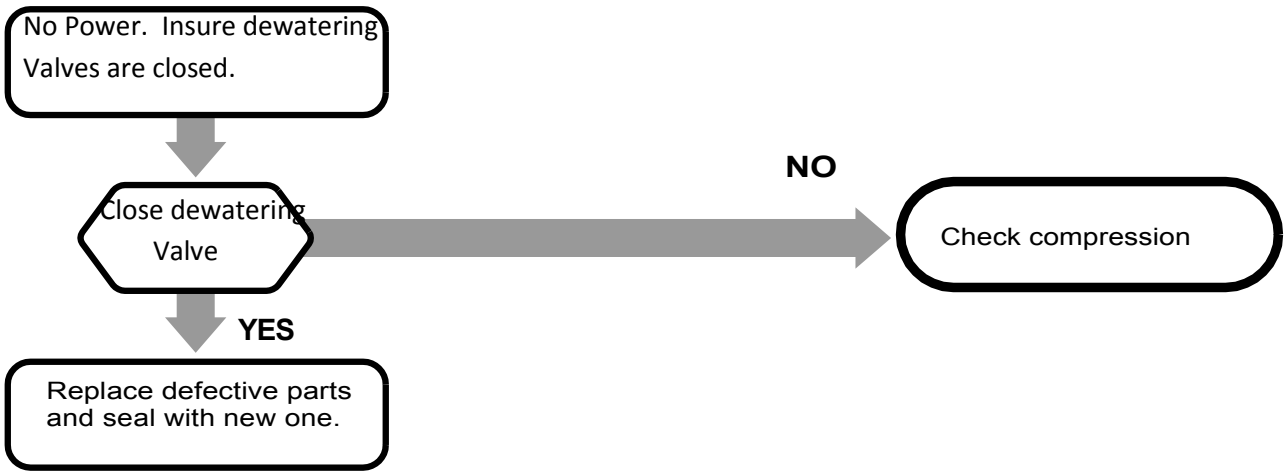
Fuel System

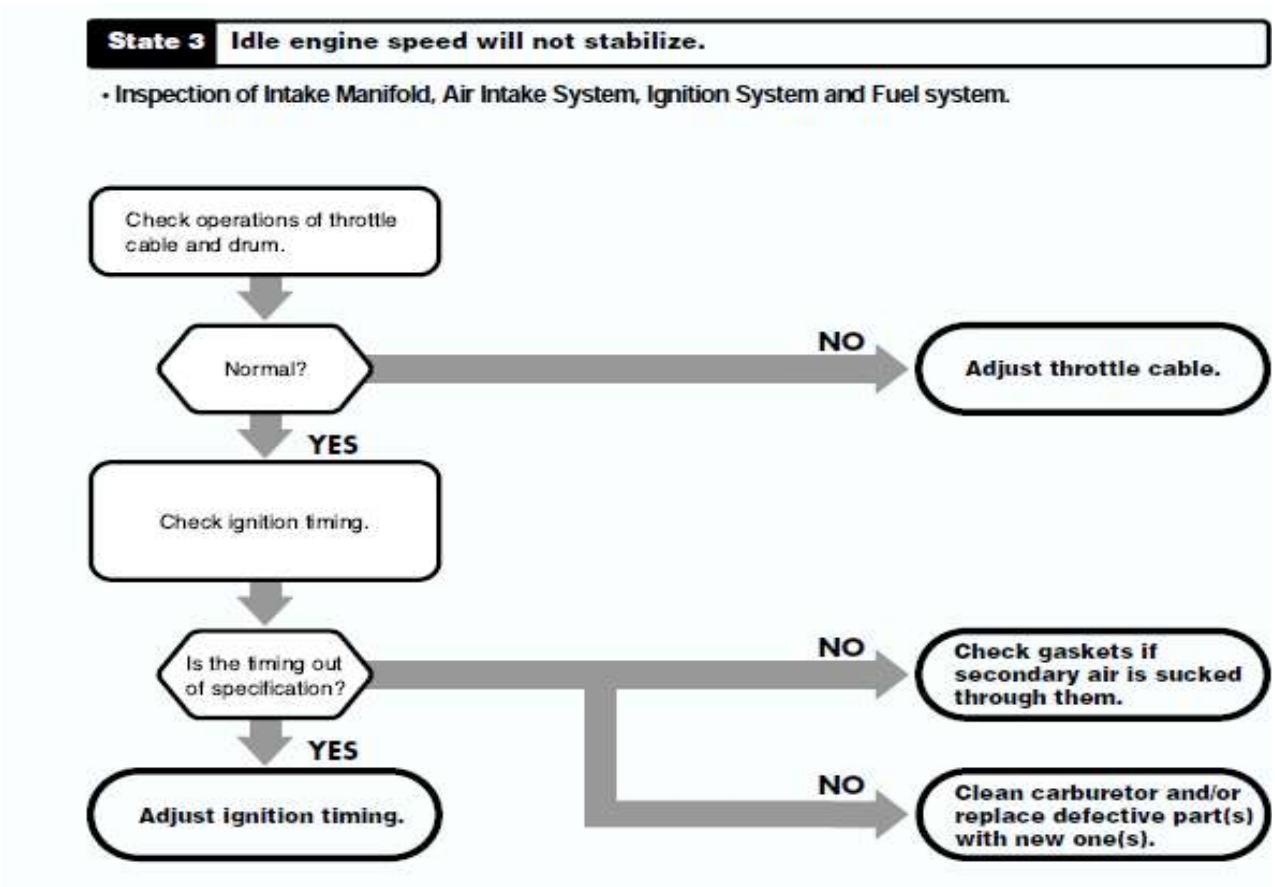


Ignition System



Compression Pressure





Dewatering System Trouble shooting:

1. Compression Loss. Check de-watering valves as they are not properly closing. Replace not closing valve.

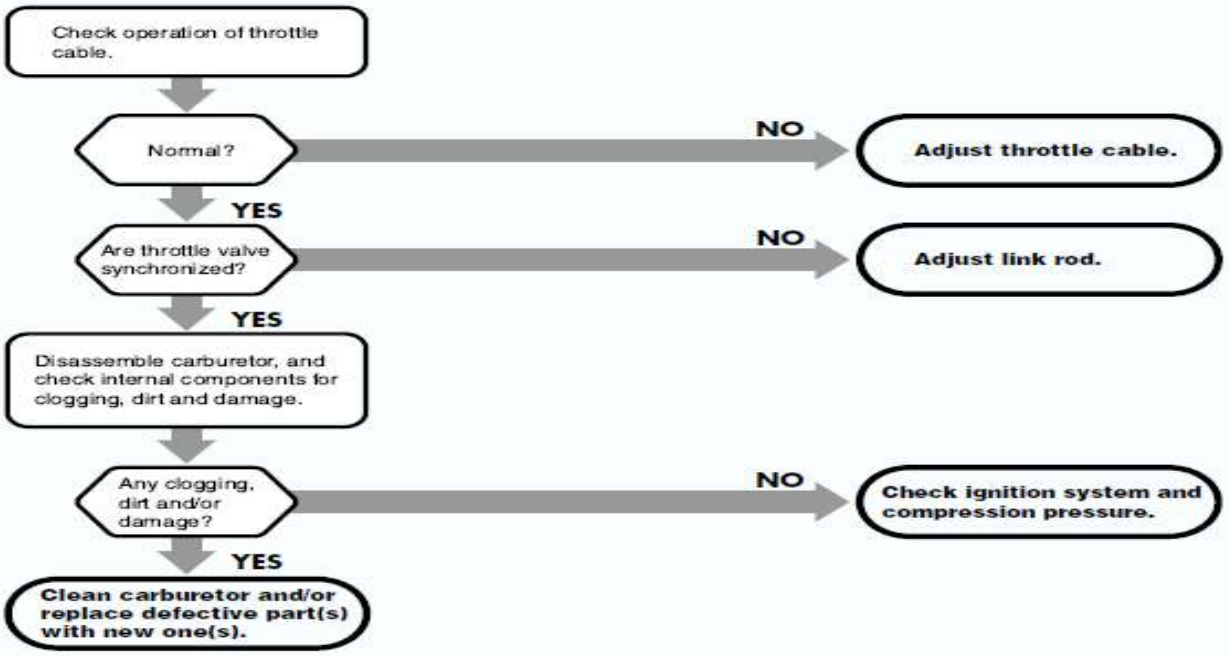
2. Dewatering system not working. Check rods to insure working properly. Tighten as required. The dewatering system is mechanical and should not be prone to failure.

3. Fuel is not discharging after submersion. Check brass valves that get initiated when the dewatering slide is moved toward back of engine. Blow out line; if still does not work replace all three valves (one assembly)

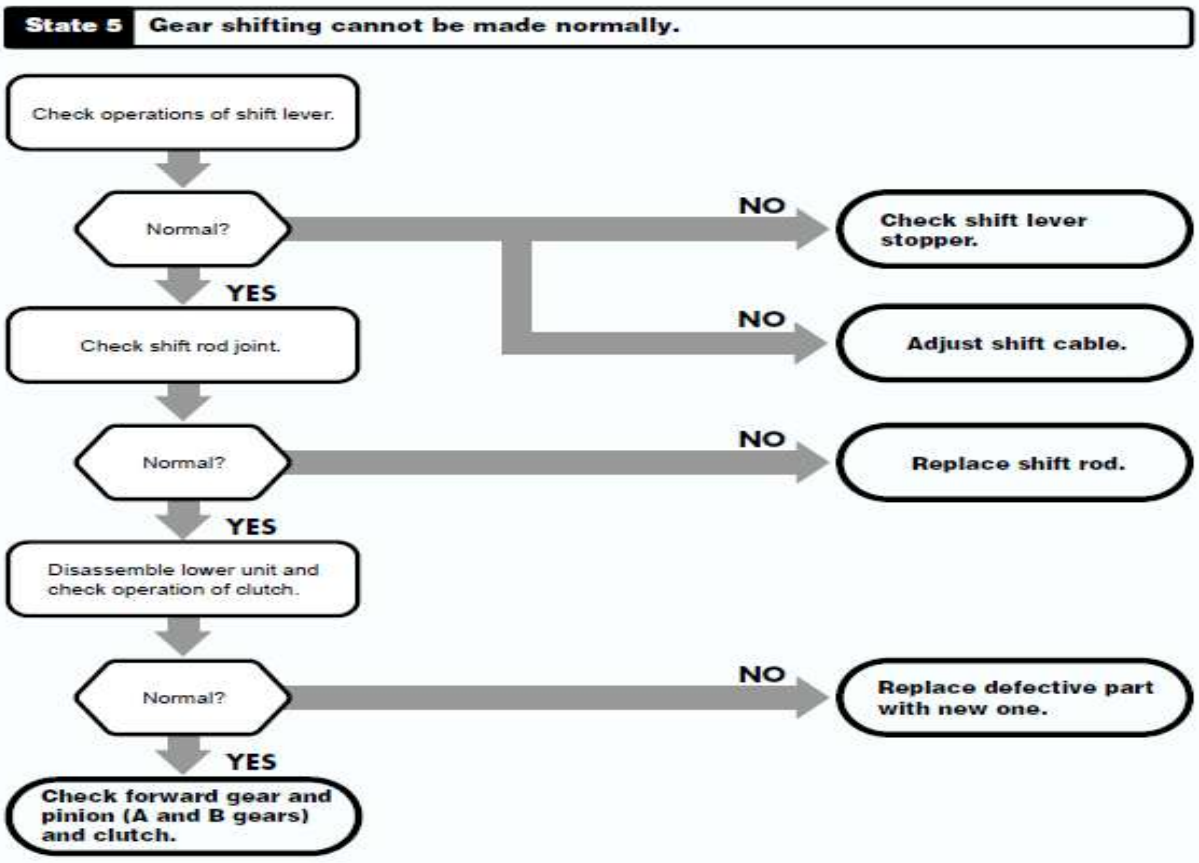
Troubleshooting

State 4 **Rapid opening of throttle fails acceleration.**

Rapid opening of throttle causes engine to stall. (Stops.)
Acceleration is not smooth.
• Inspection of Carburetor, Ignition System and Compression Pressure.



State 5 **Gear shifting cannot be made normally.**



Safety Jet

Option to Raider 50 – Part No. SJ-001