

LOWER UNIT

CONTENTS

REMOVAL & DISASSEMBLY	9- 2
PINION BEARING	9- 7
INSPECTION	9- 9
PROPELLER	9- 9
GEARCASE	9- 9
GEAR	9-10
PROPELLER SHAFT COMPONENTS	9-10
PROPELLER SHAFT BEARING HOUSING	9-11
SHIFT ROD AND SHIFT CAM	9-11
WATER PUMP AND RELATED ITEMS	9-12
DRIVESHAFT OIL SEAL HOUSING	9-12
DRIVESHAFT	9-13
ASSEMBLY & INSTALLATION	9-14
TRIM TAB	9-24
LOWER UNIT GEARS-SHIMMING AND ADJUSTMENT	9-25

REMOVAL & DISASSEMBLY

⚠ WARNING

Before removing lower unit:

- **Disconnect spark plug caps from all spark plugs.**
- **Disconnect the battery cable.**

Loosen the clutch rod lock nut ①.

To separate the clutch rod from the shift rod, unscrew the connector ②.

Remove four (4) bolts ③ and separate gearcase ④ from drive-shaft housing.

Place a drain pan under the oil drain plug.

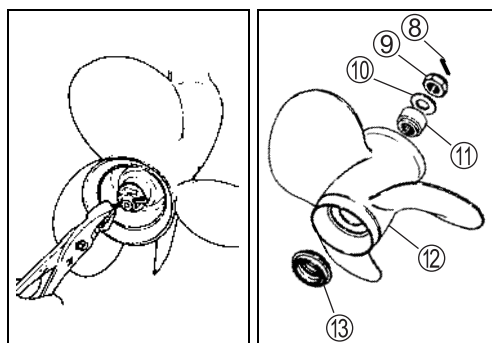
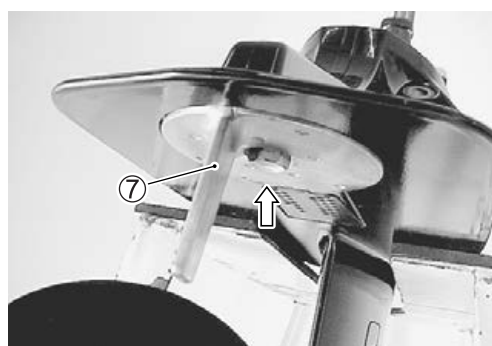
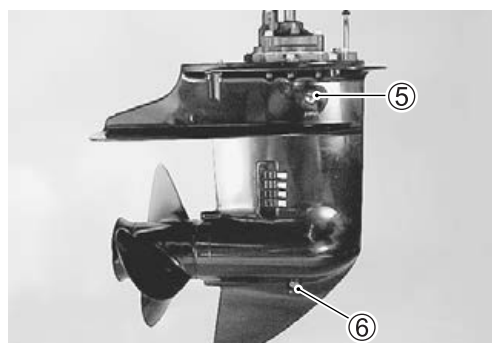
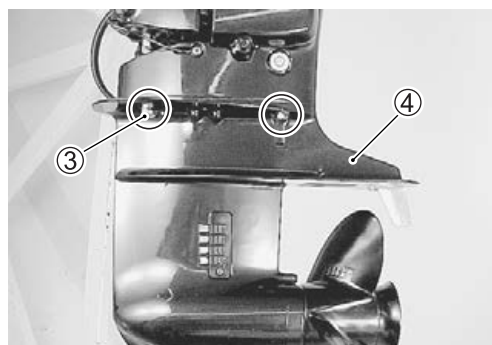
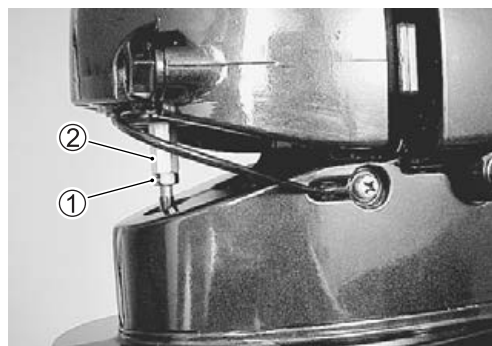
Remove oil drain plug ⑥ first then oil level plug ⑤ and allow gear oil to drain.

Inspect oil for water, contaminates or metal.

Remove bolt and trim tab ⑦ (if necessary).

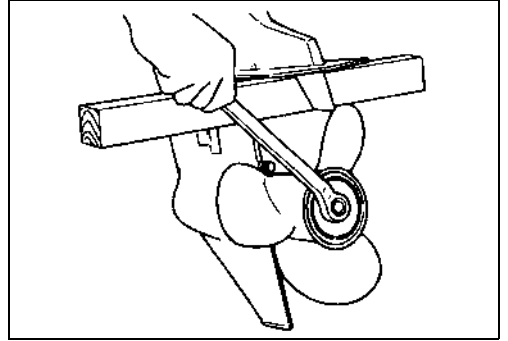
Remove cotter pin ⑧ from propeller nut and remove propeller nut ⑨.

Remove washer ⑩, spacer ⑪, propeller ⑫ and stopper ⑬ from the propeller shaft.

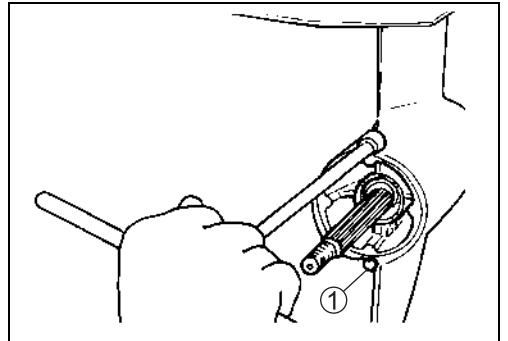


⚠ WARNING

To prevent injury from propeller blades, wear gloves and place a block of wood between the anti-cavitation plate and the propeller blade tips to lock the propeller in place before attempting to remove propeller nut.

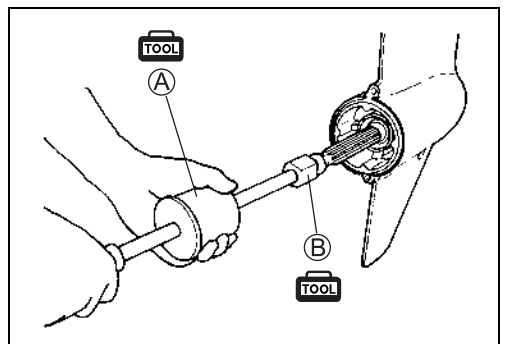


Remove the two (2) bolts ① securing the propeller shaft bearing housing to the gearcase.

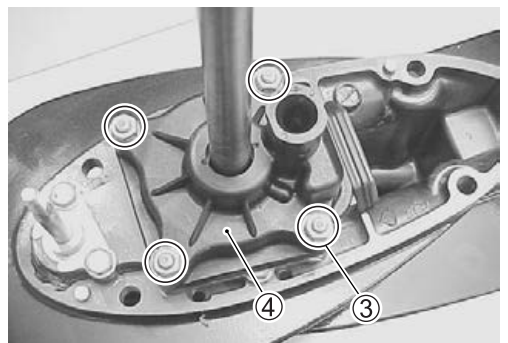


Using special tools, pull out the propeller shaft bearing housing. Remove the propeller shaft and bearing housing assembly.

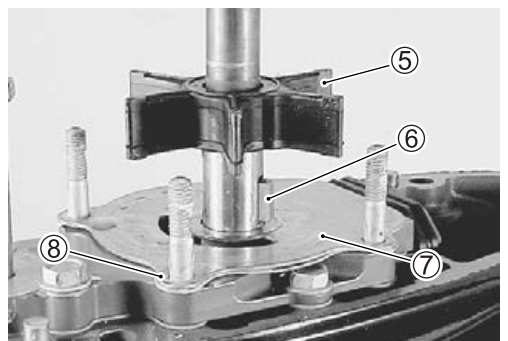
TOOL 09930-30104: Sliding hammer – (A)
09950-59310: Propeller shaft remover – (B)



Loosen the four (4) nuts ③, then remove the water pump case ④.

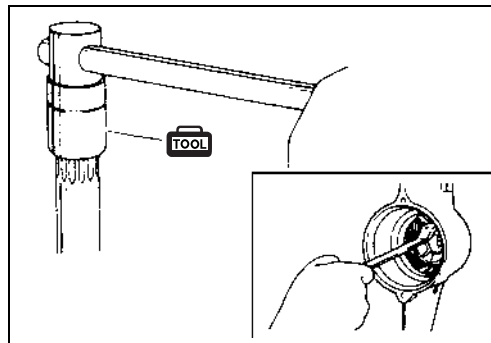


Remove impeller ⑤, impeller key ⑥ and pump under plate ⑦. Keep the impeller key ⑥ for reuse and discard the plate gasket ⑧.

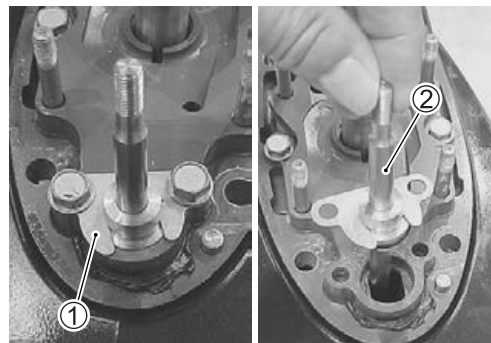


Hold the pinion nut securely, then fit special tool to the driveshaft and loosen the pinion nut.

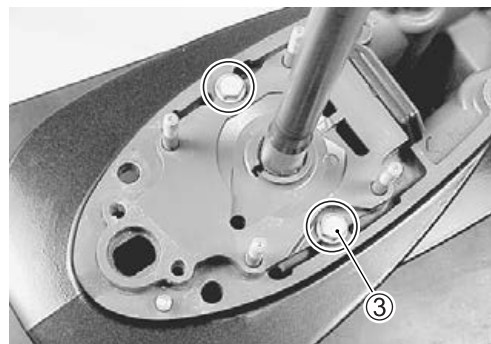
TOOL 09921-29610: Driveshaft holder



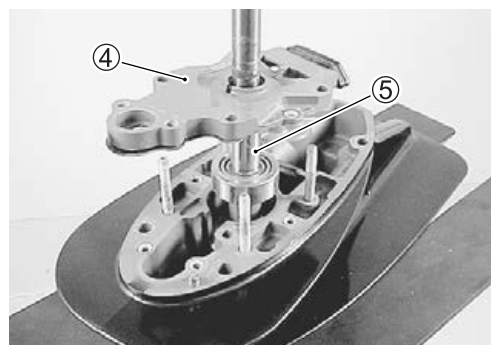
Remove the two (2) bolts and shift rod guide stopper ①.
Lift out the shift rod/shift cam assembly ②.



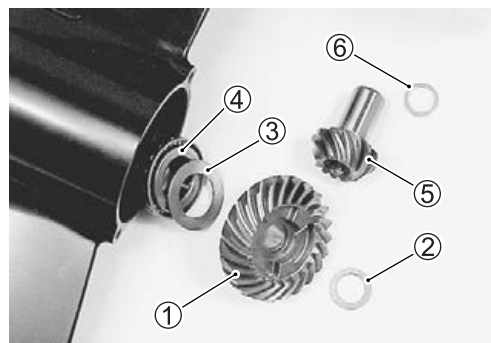
Remove the two (2) bolts ③ securing the driveshaft oil seal housing to the gearcase.



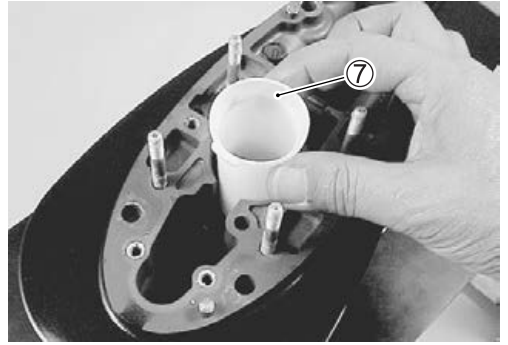
Remove the driveshaft oil seal housing ④.
Lift out driveshaft assembly ⑤.



Remove the forward gear ①. (with thrust washer ②, back-up shim ③ and bearing ④)
Remove the pinion gear ⑤ and pinion shim ⑥.



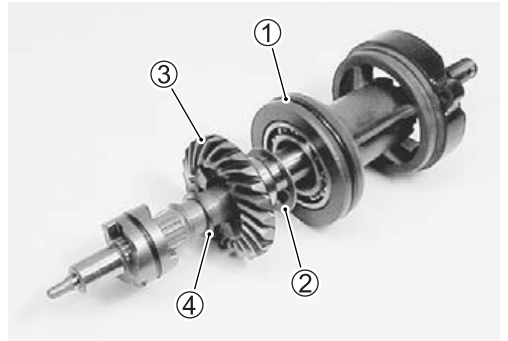
Remove the driveshaft collar ⑦.



Disassembly of propeller shaft components

Slide propeller shaft away from reverse gear ③ and bearing housing assembly ①.

Account for the reverse gear back-up shim ② and reverse gear thrust washer ④.



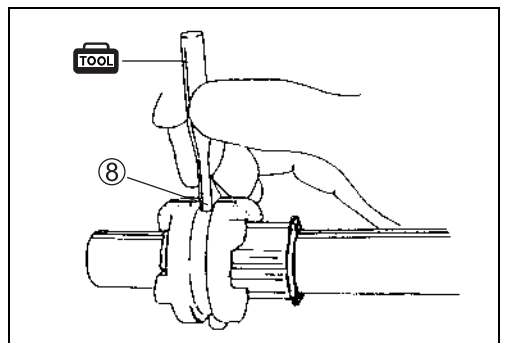
To disassemble propeller shaft components, refer to the following:

- (a) Pull the push rod ⑥ out of the propeller shaft.
- (b) Remove the spring ⑦ from the clutch dog shifter.

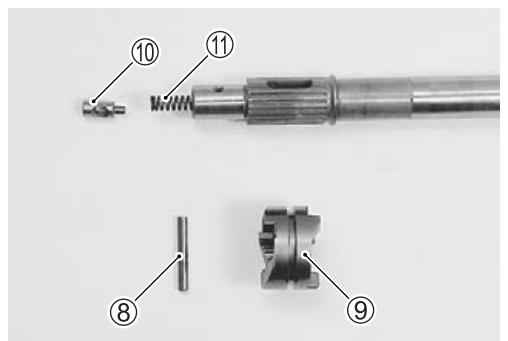


- (c) Use special tool to push the dog pin ⑧ out of the clutch dog shifter.

 **09922-89810: Shift pin remover**

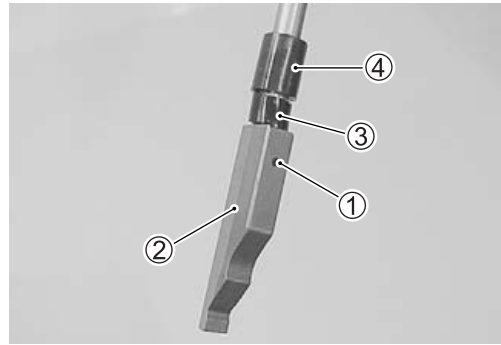


- (d) Remove the clutch dog shifter ⑨, push pin ⑩, and return spring ⑪ from propeller shaft.

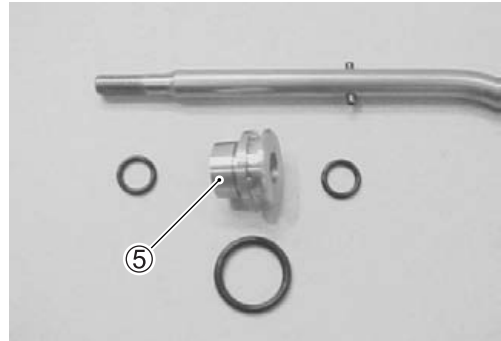


Disassembly of shift rod components

1. Push the pin ① out and remove the shift cam ②.
Remove the spacer ③ and magnet ④.



2. Remove the shift rod guide ⑤.
There are two O-rings at inside of shift rod guide ⑤ and one O-ring at outside of it.

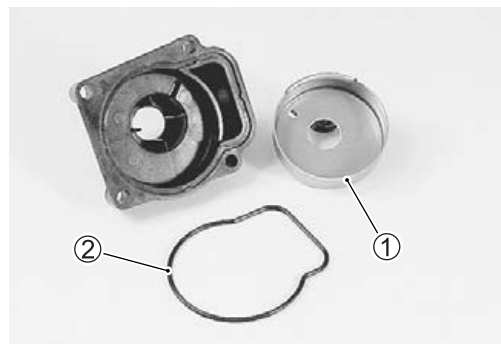


Disassembly of water pump case

Remove inner sleeve ① and rubber seal ring ②.

NOTE:

To facilitate the removal of inner sleeve from the pump case, warm up the entire case using a heater like hair dryer.

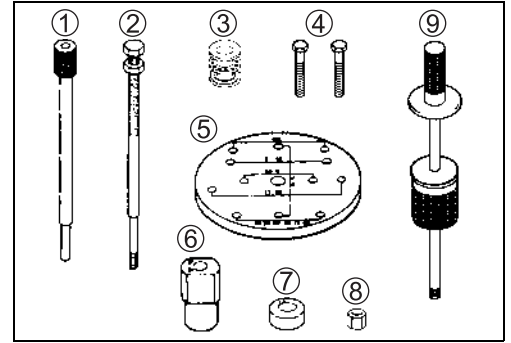


PINION BEARING

Removal/installation is in following procedure.

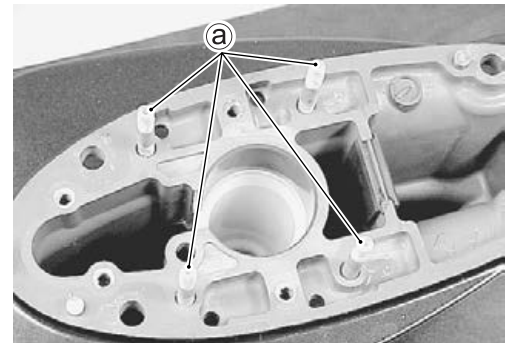
Removal & Installation tools

- TOOL** 09951-59910: Shaft (Installation) ①
 09951-49910: Shaft (Removal) ②
 09951-69910: Bearing ③
 01500-08403: Bolt ④
 09951-39914: Plate ⑤
 09951-19610: Attachment ⑥
 09951-79510: Spacer (Attachment) ⑦
 09951-29910: Nut ⑧
 09930-30104: Sliding hammer ⑨



[REMOVAL]

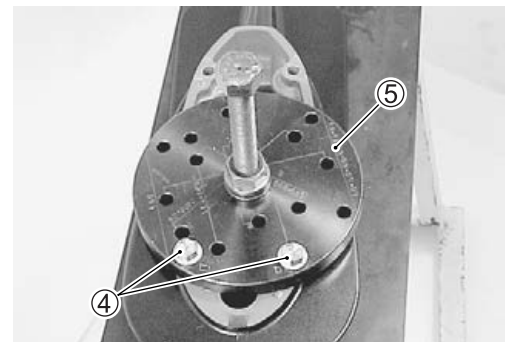
1. Remove the water pump stud bolts ①.



2. Set the plate ⑤ on the gearcase with two bolts ④ and nuts.

NOTE:

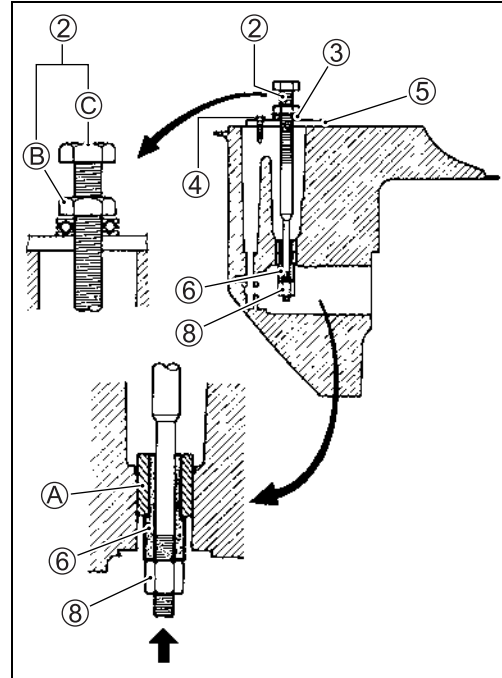
Using the two gearcase mounting bolt holes of forward side.



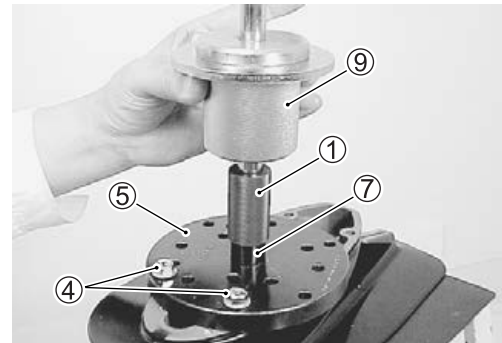
3. Set the shaft (removal) ②, bearing ③, attachment ⑥ and nut ⑧ as shown.
4. To push the pinion bearing ① out of gearcase, turn the lower nut ② clockwise while holding bolt ③ tightly.

CAUTION

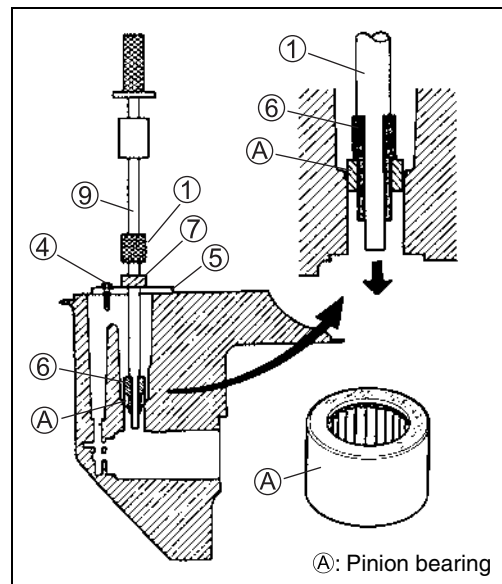
**Do not reuse the pinion bearing once removed.
Always use a new pinion bearing.**


[INSTALLATION]
CAUTION

- Before installing bearing, ensure that inside of gearcase is clean and free of debris.
- Ensure that the bearing stamped mark faces upward.



5. Set the installer shaft ①, plate ⑤, spacer ⑦, attachment ⑥ and pinion bearing ① as shown.
6. Place the installer shaft (with pinion bearing on end of installer) into the gearcase.
7. Secure the plate ⑤ by tightening the bolts ④ and nuts.
8. Thread the sliding hammer ⑨ into the top of the installer shaft ①.
9. Drive the bearing ① down into position by gently striking the installer shaft ① until the coupler touches the spacer ⑦.



INSPECTION

NOTE:

If any component is worn excessively, cracked, defective or damaged in any way, it must be replaced.

NOTE:

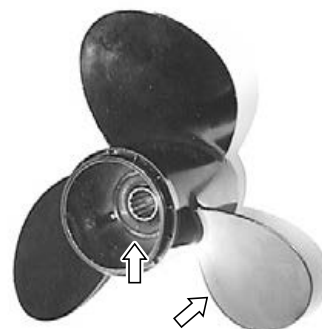
Thoroughly wash all metal components with cleaning solvent and dry with compressed air.

⚠ WARNING

Wear safety glasses when using compressed air.

PROPELLER

- Inspect the propeller for bent, chipped or broken blades. Replace or repair propeller if in damaged condition.
- Inspect propeller bush splines. Replace or repair propeller if splines are worn or damaged.
- Inspect propeller bush for deterioration or slipping. Replace if necessary.



GEARCASE

- Inspect the gearcase. Replace if cracked, damaged or other abnormal condition.
- Visually check the pinion bearing. Replace if pitted, noisy, rough or other abnormal condition.

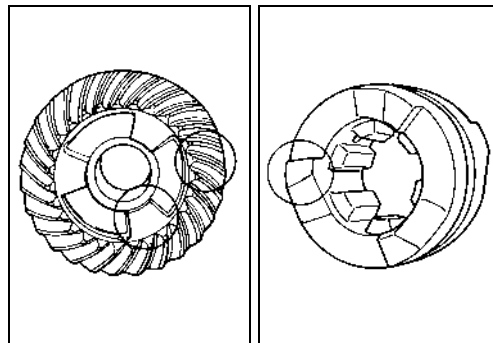
NOTE:

If removal and replacement are required, see the "PINION BEARING" section on page 9-7.



GEAR

- Inspect forward, reverse and pinion gear teeth and engaging dogs.
Replace gears if damaged, worn or other abnormal condition.



- Inspect forward gear bearing. Replace bearing if pitted, noisy, rough or other abnormal condition.



PROPELLER SHAFT COMPONENTS

- Inspect push rod/push pin, replace if worn, broken, or tip is flattened.
- Inspect clutch dog shifter. Replace if chipped, worn, damaged or other abnormal condition.
- Inspect dog pin. Replace if bent, worn or other abnormal condition.
- Inspect propeller shaft/splines. Replace if worn, twisted, damaged or other abnormal condition.

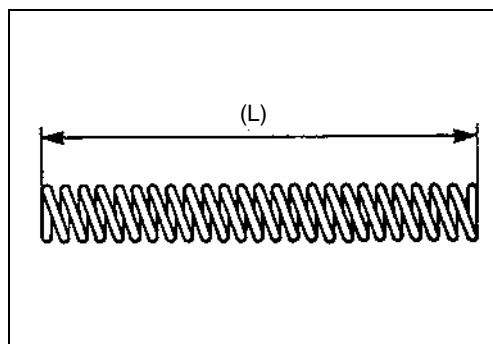


- Check clutch return spring by measuring its free length.
If free length is not within specifications, replace the return spring.

Clutch return spring free length (L)

Standard: 58.5 mm (2.30 in)

Service limit: 56.5 mm (2.22 in)



PROPELLER SHAFT BEARING HOUSING

- Inspect housing. Replace if cracked, damaged, or other abnormal condition.
- Inspect reverse gear bearing. Replace bearing if pitted, noisy, rough or other abnormal condition.
- Inspect bearing. Replace bearing if pitted, noisy, rough or other abnormal condition.
- Check condition of oil seal and O-ring.
Replace the seals if nicked, cut, worn or other abnormal condition.

Replacing propeller shaft oil seal

1. Extract the seals with oil seal remover.

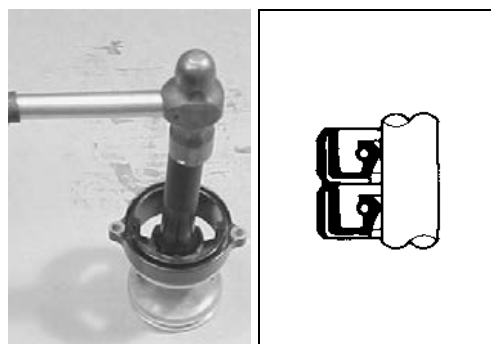
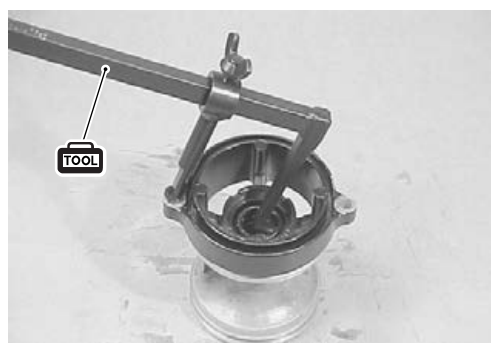
 **09913-50121: Oil seal remover**

CAUTION

**Do not reuse oil seal once removed.
Always use new oil seals.**

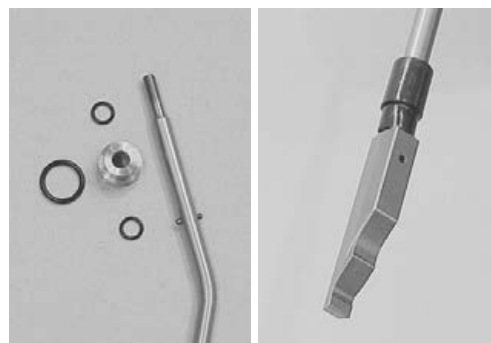
2. Apply Water Resistant Grease to the inner circumference of the housing.
3. Using an oil seal installer, drive the two oil seals (one at a time) into the propeller shaft bearing housing.
The lipped portion of the seal must face towards the propeller.
Apply Water Resistant Grease to the seal lips.

 **99000-25160: SUZUKI WATER RESISTANT GREASE**



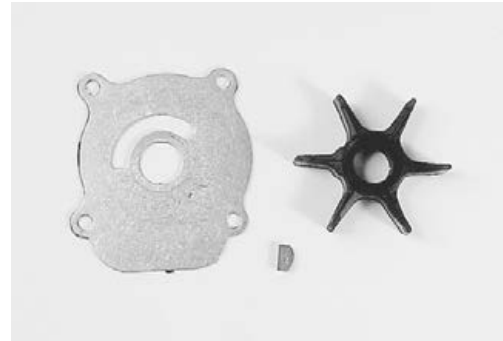
SHIFT ROD AND SHIFT CAM

- Inspect the "stepped" surfaces of the shift cam.
Replace if chipped, damaged or excessively worn.
- Inspect shift rod guide. Replace if cracked, damaged or other abnormal condition.
- Inspect O-ring. Replace if nicked, cut, torn, swelled or other abnormal condition.



WATER PUMP AND RELATED ITEMS

- Inspect impeller. Replace if vanes are cut, torn, worn or other abnormal condition.
- Inspect pump case. Replace if cracked, distorted or other abnormal condition.
- Inspect pump inner sleeve. Replace if worn, cracked, distorted, corroded or other abnormal condition.
- Inspect seal ring. Replace if nicked, cut, torn, swollen or other abnormal condition.
- Inspect under panel. Replace if cracked, distorted, corroded or other abnormal condition.



DRIVESHAFT OIL SEAL HOUSING

- Inspect housing. Replace if cracked, damaged or other abnormal condition.
- Check condition of oil seals. Replace if nicked, cut, worn or other abnormal condition.



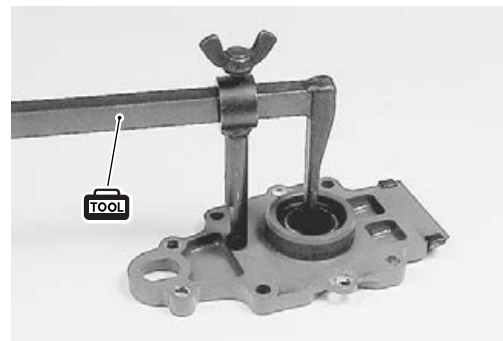
Replacing driveshaft oil seal

1. Using special tool, remove two (2) oil seals out of the driveshaft oil seal housing.

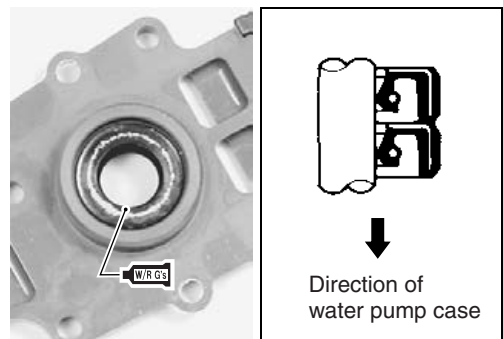
 **09913-50121: Oil seal remover**

2. Apply Water Resistant Grease to the inner circumference of the driveshaft oil seal housing.

 **99000-25160: SUZUKI WATER RESISTANT GREASE**

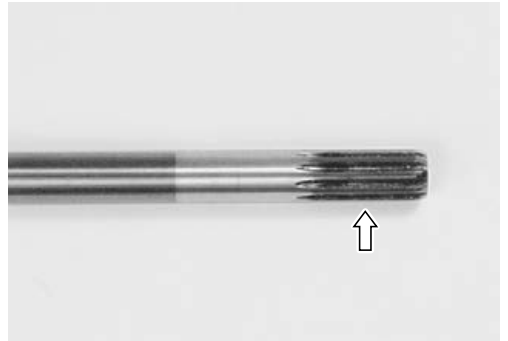
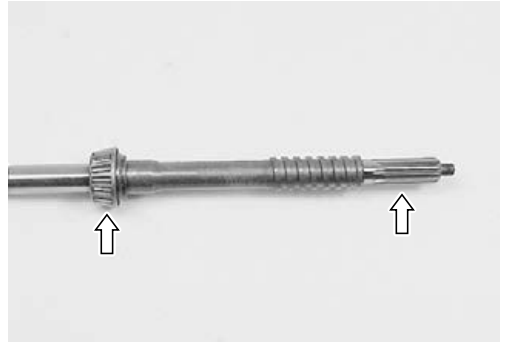


3. Grease the inner lips of the oil seal.
With the lips facing away from driveshaft bearing, place seal in position and drive it into the oil seal housing.



DRIVESHAFT

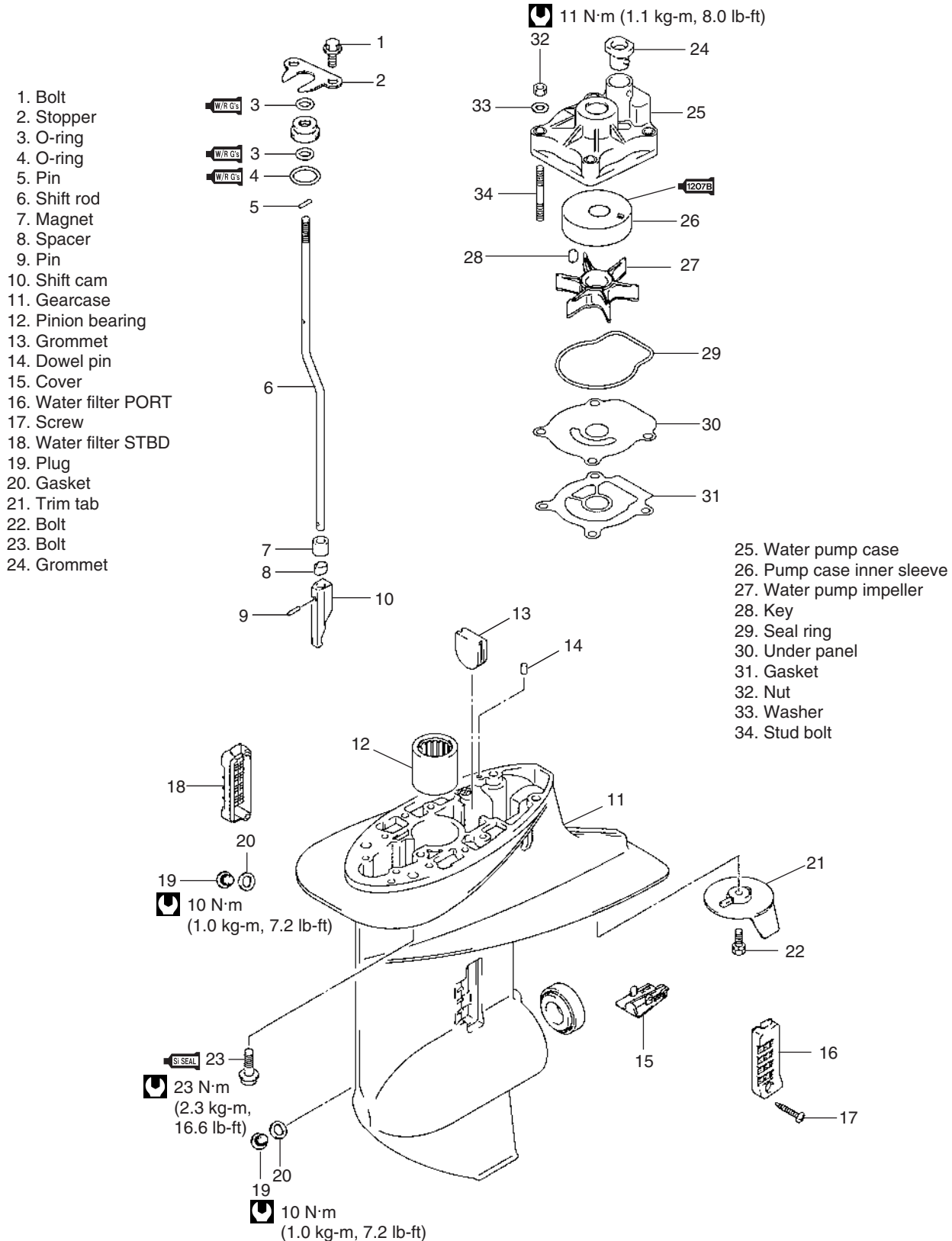
- Inspect driveshaft/splines. Replace if worn, twisted, damaged or other abnormal condition.
- Inspect driveshaft bearing, replace if pitted, noisy, rough or other abnormal condition.



ASSEMBLY & INSTALLATION

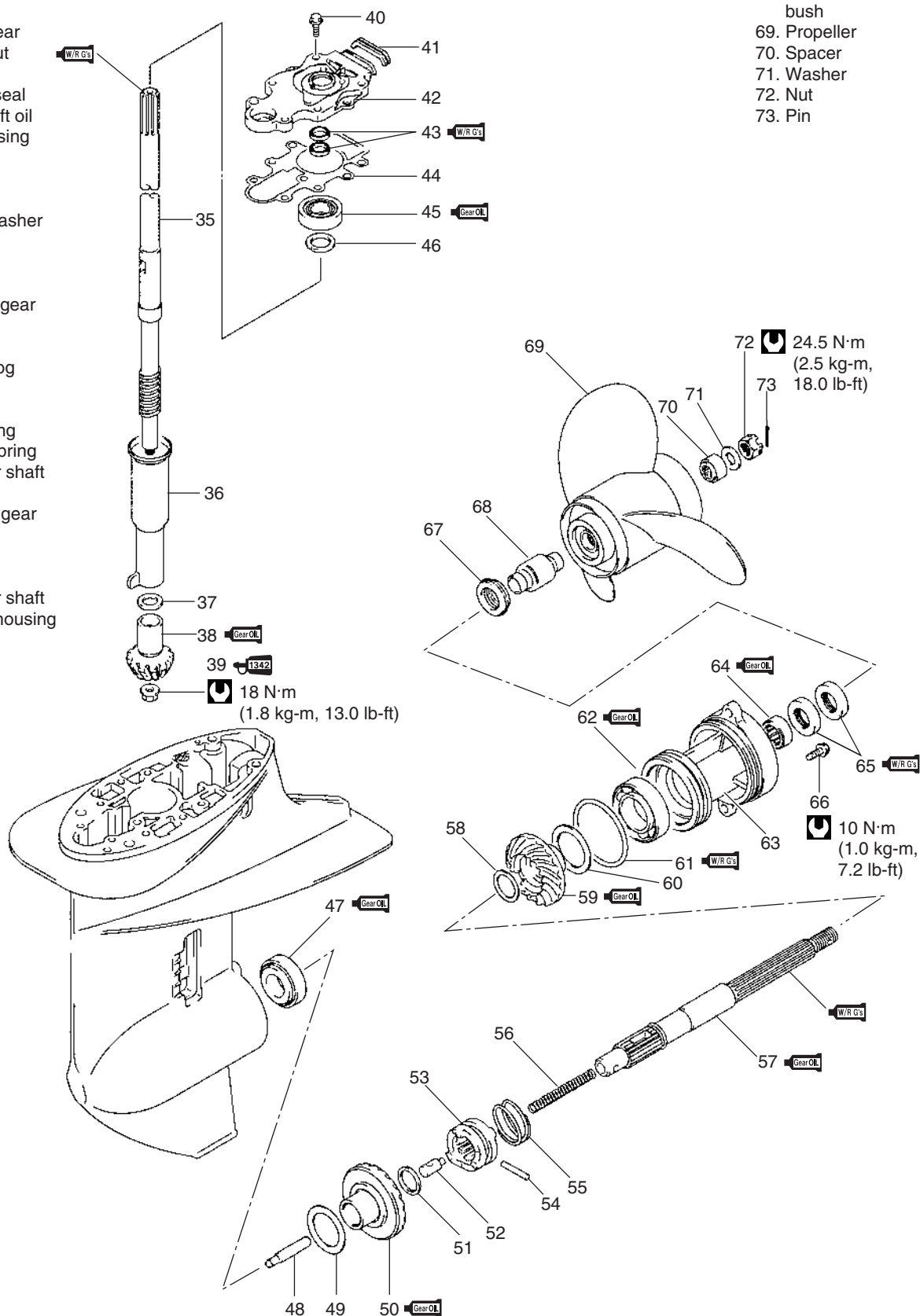
Assembly & Installation are reverse order of disassembly with special attention to the following steps.

System construction



- 35. Driveshaft
- 36. Collar
- 37. Washer
- 38. Pinion gear
- 39. Pinion nut
- 40. Bolt
- 41. Rubber seal
- 42. Driveshaft oil seal housing
- 43. Oil seal
- 44. Gasket
- 45. Bearing
- 46. Thrust washer
- 47. Bearing
- 48. Push rod
- 49. Shim
- 50. Forward gear
- 51. Washer
- 52. Push pin
- 53. Clutch dog shifter
- 54. Dog pin
- 55. Dog spring
- 56. Return spring
- 57. Propeller shaft
- 58. Washer
- 59. Reverse gear
- 60. Shim
- 61. O-ring
- 62. Bearing
- 63. Propeller shaft bearing housing
- 64. Bearing
- 65. Oil seal
- 66. Bolt

- 67. Stopper
- 68. Propeller bush
- 69. Propeller
- 70. Spacer
- 71. Washer
- 72. Nut
- 73. Pin

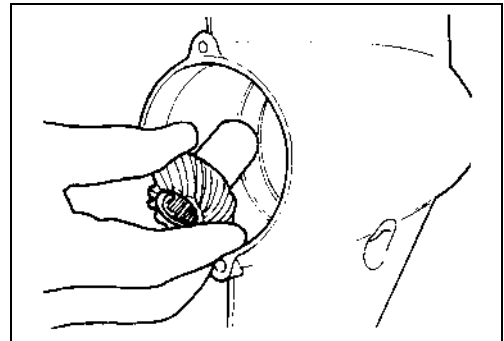


CAUTION

- Make sure that all parts used in assembly are clean and lubricated.
 - It is recommended that all seals, gaskets and O-rings be replaced with new on assembly.
 - After assembly, check parts for tightness and smoothness of operation.
 - Before final assembly, be absolutely certain that all gear contact, shim adjustments and tolerances are correct.
- Failure to correctly adjust these areas will result in lower unit damage.
(See “GEARS-SHIMMING AND ADJUSTMENT” section on page 9-25.)

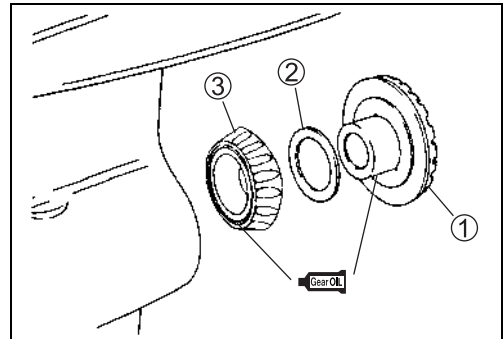
PINION GEAR

Place pinion gear in gearcase.

**FORWARD GEAR**

Place the forward gear bearing ③ and back-up shim ② in position, then install forward gear ①.

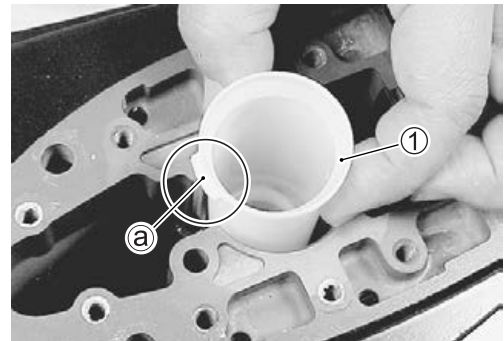
 **99000-22540: SUZUKI OUTBOARD MOTOR GEAR OIL**

**DRIVESHAFT COLLAR**

Install driveshaft collar ①.

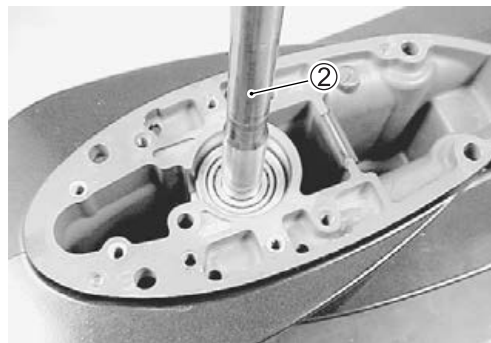
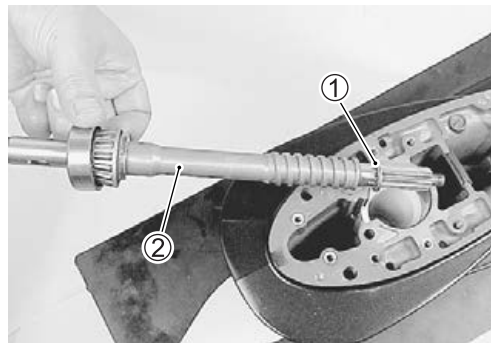
NOTE:

The tongue Ⓐ of collar must be located into groove on the gearcase.



DRIVESHAFT

Install pinion shim ①, then lower the driveshaft assembly ② down into the gearcase until the bottom of shaft protrudes through center of pinion gear.



PINION NUT

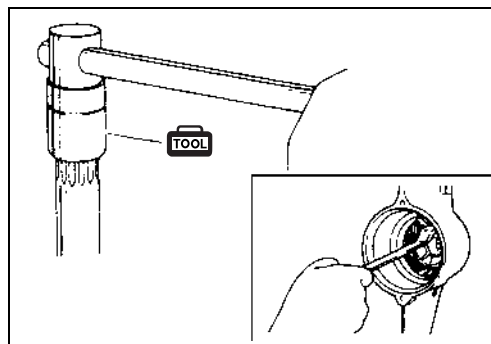
Apply THREAD LOCK "1342" to the threads of the pinion nut before threading it onto the driveshaft.

Tighten nut to the specified torque.

 Pinion nut: 18.0 N·m (1.8 kg-m, 13.0 lb-ft)

 99000-32050: THREAD LOCK "1342"

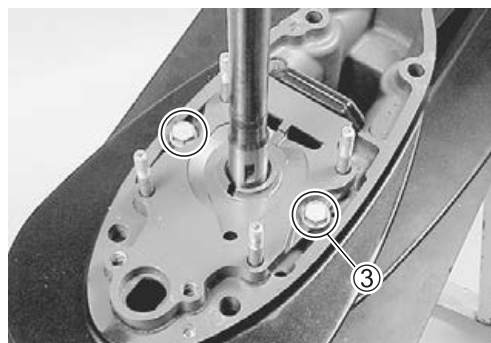
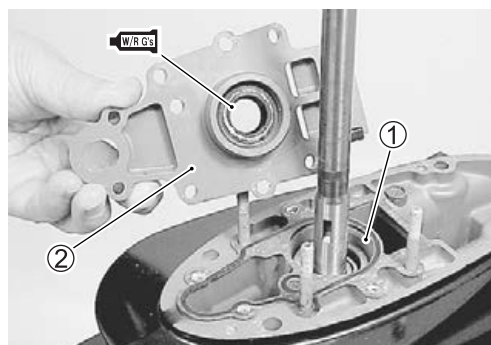
 09921-29610: Driveshaft holder



DRIVESHAFT OIL SEAL HOUSING

- Apply Water Resistant Grease to the driveshaft oil seal.
- Install gasket ① and oil seal housing ②, then tighten two (2) housing bolts ③ securely.

 99000-25160: SUZUKI WATER RESISTANT GREASE



SHIFT ROD ASSEMBLY

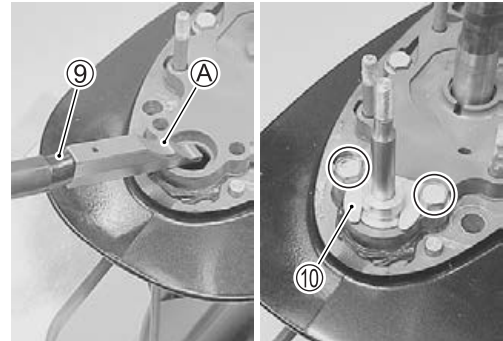
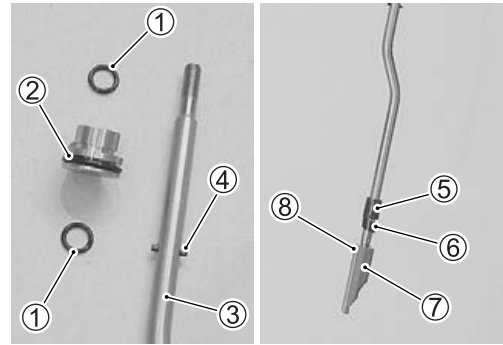
- Apply Water Resistant Grease to the shift rod guide O-ring ①-②.
- Slide complete shift rod guide and O-rings onto the shift rod ③, then install pin ④.
- Attach magnet ⑤ and spacer ⑥ to shift rod.
- Attach shift cam ⑦ to shift rod, then insert pin ⑧.

 **99000-25160: SUZUKI WATER RESISTANT GREASE**

- Install shift rod assembly ⑨ and guide stopper ⑩ to the gearcase and secure stopper to the gearcase with screws.

NOTE:

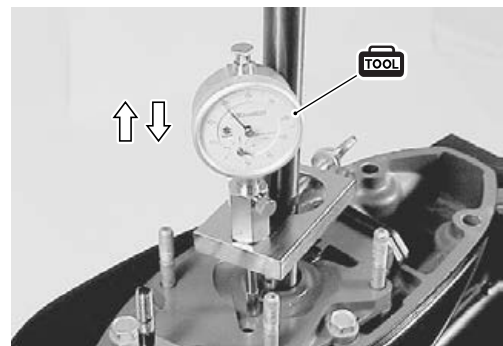
Be sure the stepped section A of shift cam faces towards propeller shaft.

**CHECKING DRIVESHAFT THRUST PLAY**

Before installing reverse gear, driveshaft thrust play should be checked.

(See the "GEARS-SHIMMING AND ADJUSTMENT/CHECKING DRIVESHAFT THRUST PLAY" section on page 9-26.)

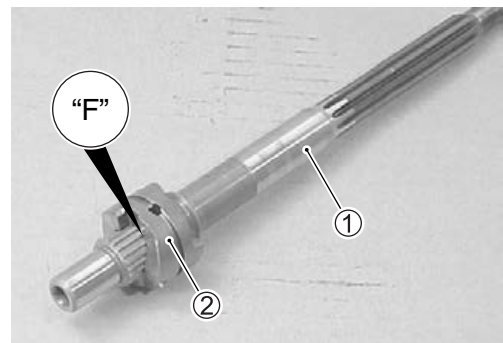
 **09951-09511: Gear adjusting gauge**

**PROPELLER SHAFT**

Slide the clutch dog shifter ② onto the propeller shaft ①.

NOTE:

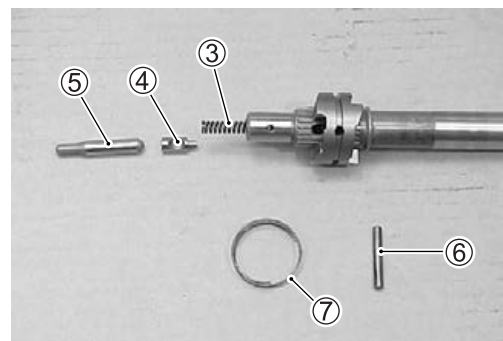
For correct installation, the side of the clutch dog shifter marked with the letter "F" must face towards forward gear.



Insert the return spring ③, push pin ④ and push rod ⑤ into propeller shaft.

Align the holes in the shifter dog and push pin. Depress the push rod and slide the dog pin ⑥ through both dog and push pin.

Install the dog pin retaining spring ⑦, ensuring that it fits snugly into the groove on the dog shifter.



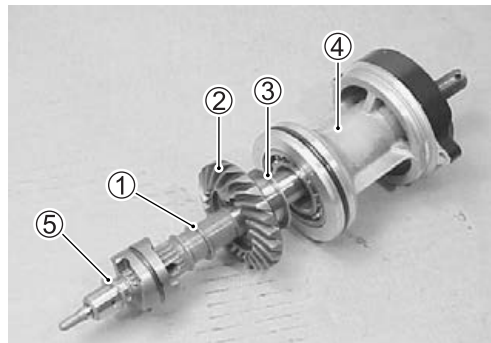
PROPELLER SHAFT/BEARING HOUSING

Assemble the propeller shaft in the following sequence:

forward thrust washer ⑤, reverse thrust washer ①, reverse gear ②, reverse gear back-up shim ③ and propeller shaft housing ④.

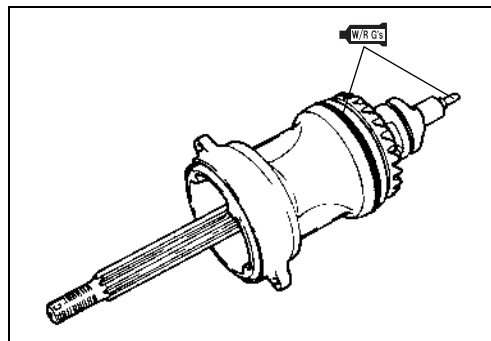
 **99000-25160: SUZUKI WATER RESISTANT GREASE**

 **99000-22540: SUZUKI OUTBOARD MOTOR GEAR OIL**



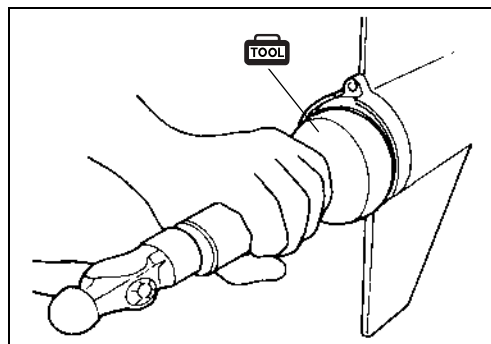
NOTE:

Before installing propeller shaft/bearing housing assembly, bring shift cam to the forward position by moving shift rod up or down.



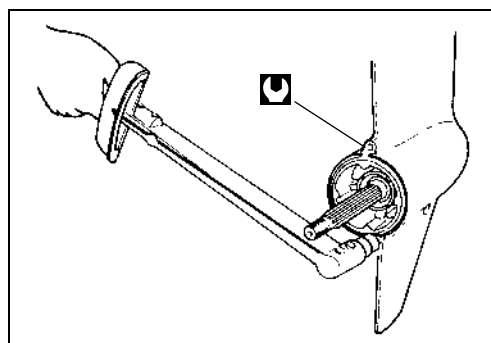
Using special tools, install the propeller shaft and housing assembly in the gearcase.

 **09922-59410: Propeller shaft housing installer**
09922-59420: Housing Installer Handle



When the housing is fully seated, tighten both retaining bolts to the specified torque.

 **Bearing housing bolt: 10 N·m (1.0 kg-m, 7.2 lb-ft)**

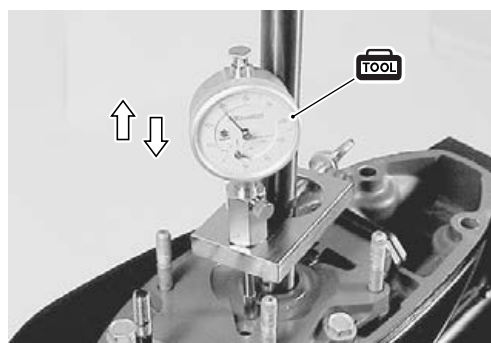


RECHECKING DRIVESHAFT THRUST PLAY

Recheck the driveshaft thrust play.

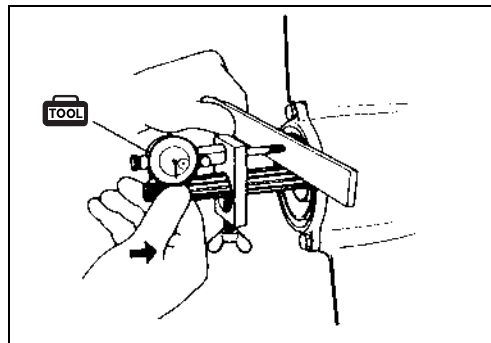
This should not be less than previously checked. If less, reduce the number/thickness of reverse gear back-up shims.

 **09951-09511: Gear adjusting gauge**



CHECKING PROPELLER SHAFT THRUST PLAY

See the “GEARS-SHIMMING AND ADJUSTMENT/CHECKING PROPELLER SHAFT THRUST PLAY” section on page 9-29.

**LEAKAGE CHECK**

Check for leakage of oil seal and O-ring when applying specified pressure inside of the gearcase.

TOOL 09950-69512: Oil leakage tester
09952-99310: Air Pump

Procedure

1. Install the test tool into the oil level hole.
2. Connect the air pump to the tester.
3. Rotate driveshaft and propeller shaft clockwise several times and then apply specified pressure for the test.

NOTE:

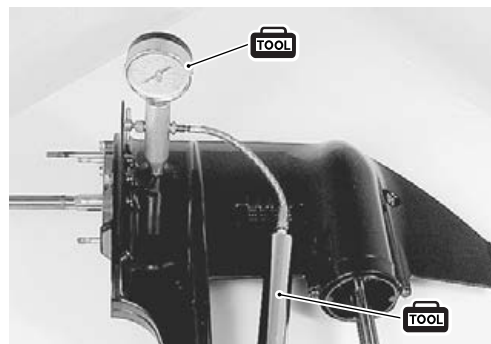
Apply low initial pressure of 20 – 40 kPa (0.2 – 0.4 kg/cm², 2.8 – 5.7 psi) first, then apply specified pressure.

Leakage test pressure: 100 kPa (1.0 kg/cm², 14.2 psi)

CAUTION

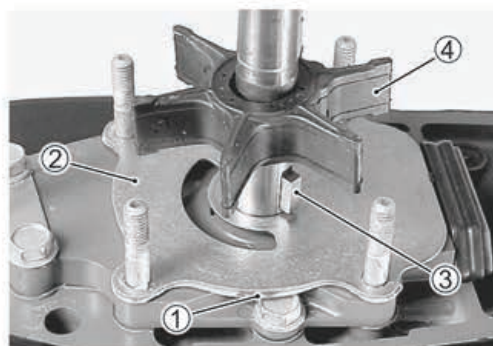
Do not exceed pressure of 110 kPa (1.1 kg/cm², 15.6 psi) or damage to oil seals will result.

4. Once stabilized, pressure should remain steady for at least 5 minutes.
If pressure does not fall, sealing performance is correct.

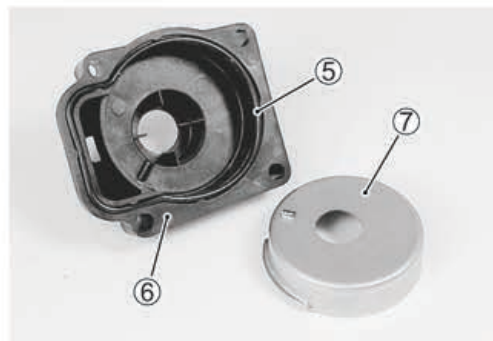


WATER PUMP (Impeller & Case)

- Place the under panel gasket ① and under panel ② into position.
- Insert the key ③ in the driveshaft and slide the impeller ④ onto driveshaft, ensuring that key and keyway are aligned.



- Place the seal ring ⑤ into groove of the pump case ⑥, then install inner sleeve ⑦ to pump case.



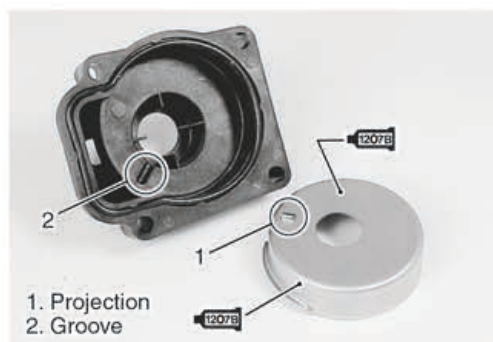
CAUTION

**Do not re-use seal ring once removed.
Always use new ring.**

NOTE:

- Before installing pump inner sleeve, apply sealant lightly between inner sleeve and pump case mating surfaces.
- The projection of inner sleeve must be located into groove on the pump case.

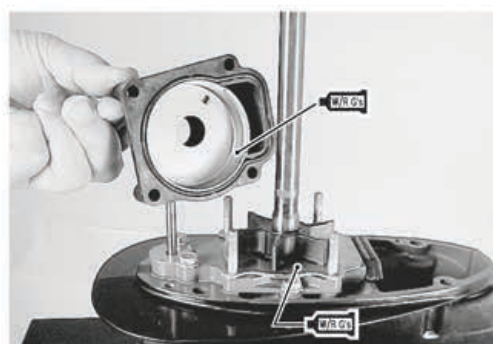
1207B 99000-31140: SUZUKI BOND "1207B"



NOTE:

Before installing water pump case assembly, apply Water Resistant Grease lightly on pump case inner sleeve and under panel for initial lubrication.

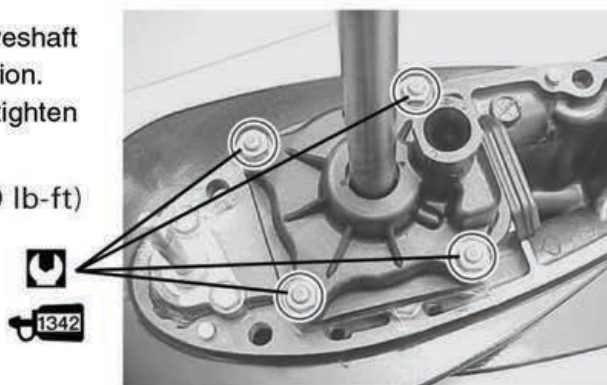
W/R G's 99000-25160: SUZUKI WATER RESISTANT GREASE



- Install the pump case assembly ⑦ while rotating driveshaft clockwise to flex the impeller vanes in the correct direction.
- Install washers and pump case nuts ⑧, then securely tighten the four (4) pump case nuts to the specified torque.

Water pump case nut: 8 N·m (0.8 Kg-m, 6.0 lb-ft)

1342 Thread Lock 1342: 99000-32050



PROPELLER INSTALLATION

Apply Water Resistant Grease to the propeller shaft.

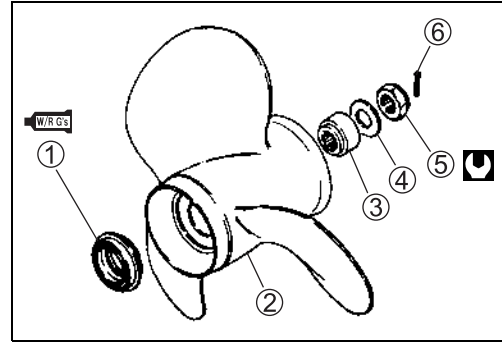
Install propeller stopper ①, propeller ②, spacer ③, washer ④ and nut ⑤ in turn.

Tighten the propeller nut to the specified torque.

 **99000-25160: SUZUKI WATER RESISTANT GREASE**

 **Propeller nut: 24.5 N·m (2.5 kg-m, 18.0 lb-ft)**

Push cotter pin ⑥ through nut and shaft, then bend to secure.

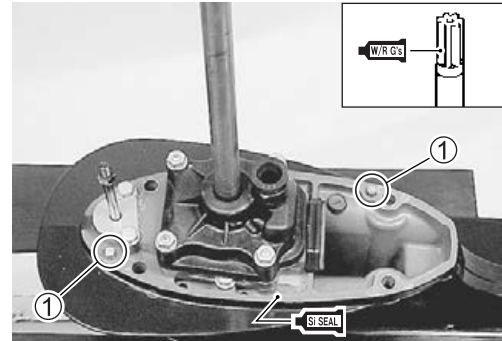


LOWER UNIT INSTALLATION

Insert dowel pins ①.

Coat the driveshaft splines with Water Resistant Grease.

Apply a light coat of SUZUKI SILICONE SEAL to mating surfaces of gearcase and driveshaft housing.



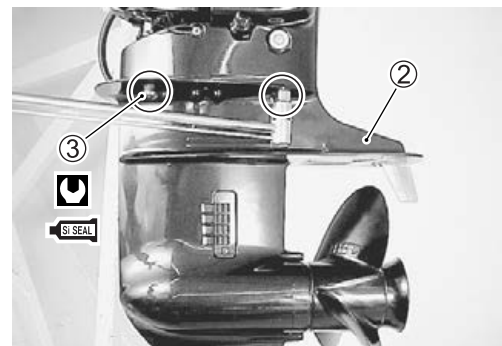
Slide the lower unit ② into place, making sure that the top of the driveshaft engages properly with the crankshaft and that water tube locates in the water pump case outlet.

Apply SUZUKI SILICONE SEAL to the retaining bolts ③ and tighten them to specified torque.

 **99000-25160: SUZUKI WATER RESISTANT GREASE**

 **99000-31120: SUZUKI SILICONE SEAL**

 **Gearcase bolt: 23 N·m (2.3 kg-m, 16.6 lb-ft)**



NOTE:

Apply SUZUKI SILICONE SEAL to the four (4) gearcase bolts.

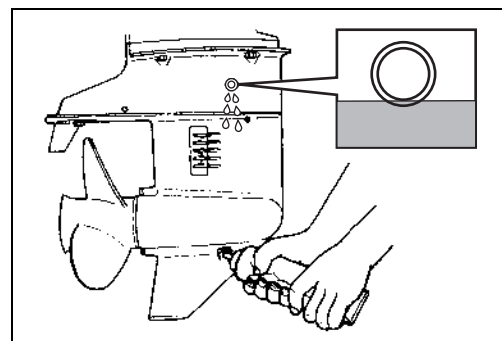
GEAR OIL

Fill the gearcase with specified gear oil for initial testing and recheck the level after 10 minutes.

Top up if necessary.

(See the "PERIODIC MAINTENANCE/GEAR OIL" section on page 2-6.)

 **99000-22540: SUZUKI OUTBOARD MOTOR GEAR OIL**



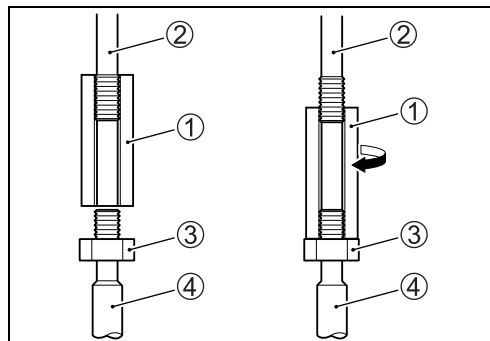
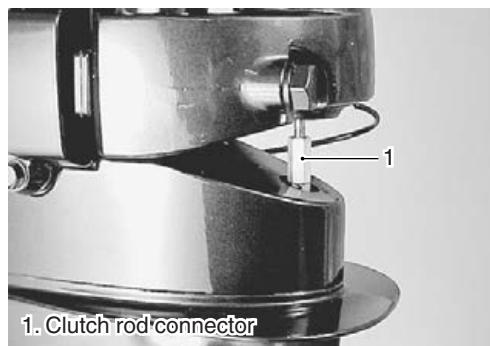
CLUTCH ROD and SHIFT ROD CONNECTION

Connect the clutch rod and the shift rod using the clutch rod connector in the following procedure:

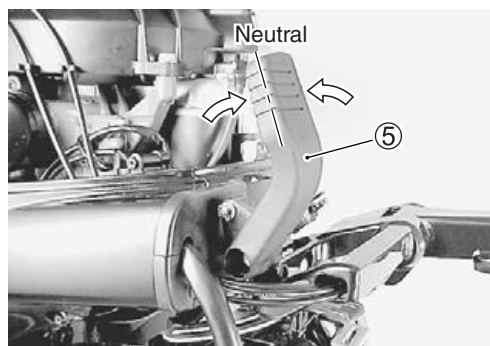
NOTE:

The clutch rod connector is not a turnbuckle but just a long nut with right-hand thread.

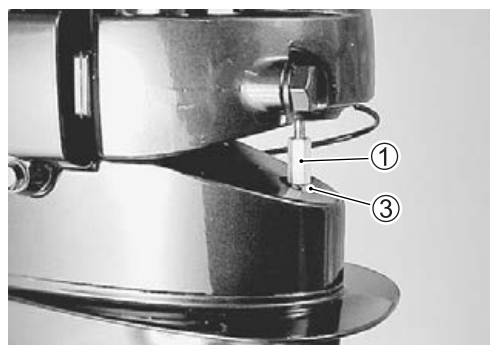
1. Screw the clutch rod connector ① onto the clutch rod ② all the way to the end of its thread.
2. Screw the lower nut ③ onto the shift rod ④ all the way to the end of its thread.
3. Locate the shift cam at Neutral position by moving shift rod ④ up or down and then hold it at the position.



4. While holding the shift lever ⑤ and shift cam at neutral position, screw the clutch rod connector ① onto the shift rod ④ until the connector contacts the lower nut ③.



5. With the clutch rod connector ① securely held, tighten the lower nut ③ firmly against the connector.
6. Shift the shift lever from Neutral to Forward and Reverse to check that the gear starts engagement of both gears are at an equal angle from Neutral.



TRIM TAB

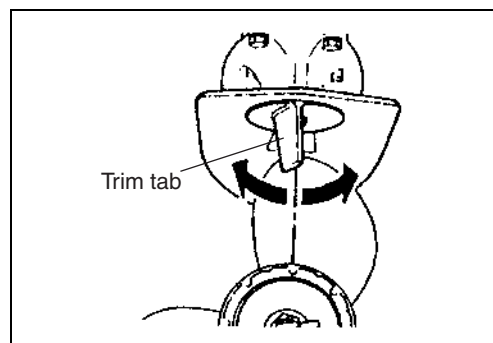
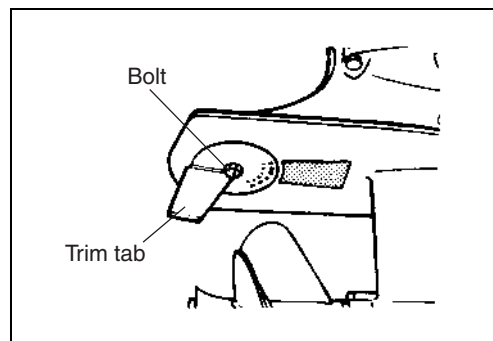
The trim tab counteracts or minimizes propeller torque “pull” felt through the steering system.

If the steering is pulled to starboard or port side, adjust trim tab with following procedure:

Adjusting

1. Loosen the bolt of trim tab.
2. Change the direction of trim tab.
 - To compensate for a veer to starboard, set trailing edge of tab to the right (as viewed from behind).
 - To compensate for a veer to port, set trailing edge of tab to the left.
3. Tighten the bolt of trim tab.
4. Test ride the boat and repeat the procedure 1 – 3 to set the trim tab in the best position.

With a properly adjusted trim tab, steering should be neutral and there should be no tendency for the steering to be pulled to either port or starboard.

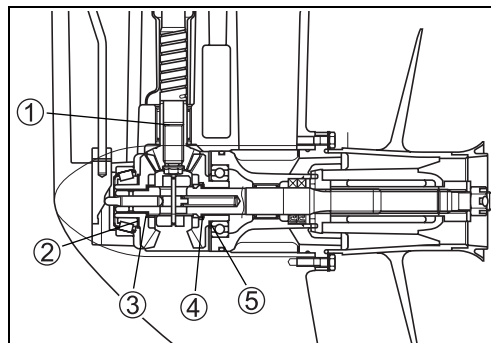


LOWER UNIT GEARS-SHIMMING AND ADJUSTMENT

If lower unit has been rebuilt or has had components replaced, shimming for correct gear contact and backlash will have to be adjusted to ensure smooth, reliable operation of gears.

Shim/Washer & Mounting position

	Numerical index/item	Available thickness (mm)	Design specification Thickness (mm)
①	Pinion gear back-up shim	1.7, 1.8, 1.9, 2.0, 2.1, 2.2	2.0
②	Forward gear back-up shim	0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5	1.2
③	Forward gear thrust washer	2.0	2.0
④	Reverse gear thrust washer	1.6, 1.8, 2.0, 2.2, 2.4, 2.6	2.0
⑤	Reverse gear back-up shim	0.2, 0.5, 0.8, 1.0	1.5



FORWARD GEAR/PINION GEAR

Follow the procedure below to adjust forward gear/pinion gear.

Step to prior to adjustment

1. Correctly assemble driveshaft oil seal housing, driveshaft, forward gear, pinion gear and related components. (See page 9-16 to 9-17.)

NOTE:

When installing forward gear back-up shim, choose shim thinner than design specification for calculating adjustment.

2. Tighten pinion nut to specified torque.

 **Pinion nut: 18 N·m (1.8 kg-m, 13.0 lb-ft)**



Checking driveshaft thrust play

1. Affix gear adjusting gauge to driveshaft.

 **09951-09511: Gear adjusting gauge**

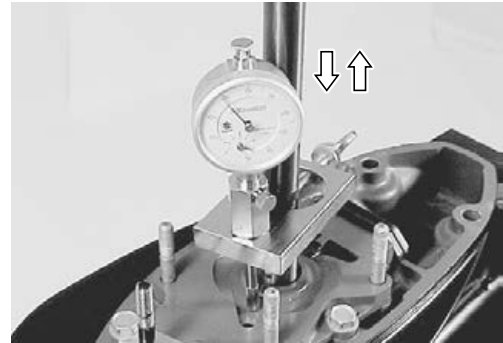


2. To check driveshaft thrust play, push forward gear inward and fix by hand.

Slowly driveshaft downward completely, then slowly pull driveshaft outward and read the maximum thrust play.

Driveshaft thrust play: 0.4 – 0.6 mm (0.016 – 0.023 in)

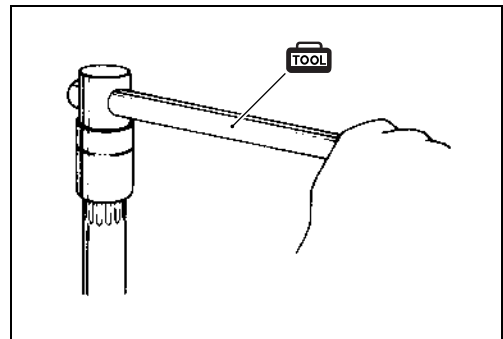
- If thrust play is larger than the specified, thickness of forward gear back-up shim must be increased.
- If thrust play is smaller, back-up shim thickness must be decreased.



Checking and adjusting tooth contact pattern (Pinion and Forward gear)

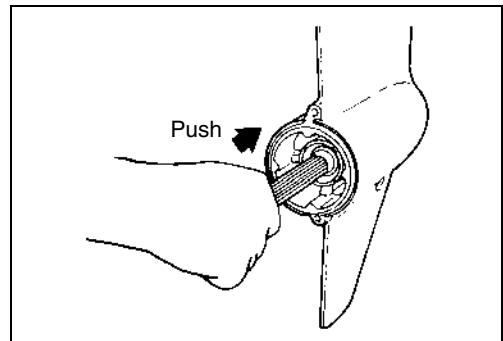
Check tooth contact pattern by using the following procedure:

1. To assess tooth contact, apply a light coat of Prussian Blue on the convex surface of forward gear.

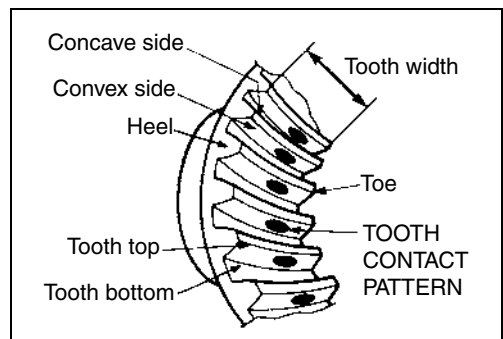


2. Install propeller shaft and housing assembly (minus reverse gear and internal components).
3. Push propeller shaft inward and hold in position.
4. Using driveshaft holder tool, rotate the driveshaft 5 – 6 times.

 **09921-29610: Driveshaft holder**



5. Carefully pull out propeller shaft and housing to check tooth contact pattern.



Optimum tooth contact

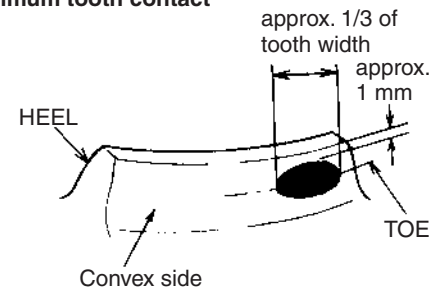
The optimum tooth contact is shown at right.

A shim adjustment may be necessary to obtain this contact pattern.

CAUTION

The driveshaft thrust play should be checked when increasing or decreasing the thickness of the shim to adjust tooth contact.

Optimum tooth contact



Example (1)

Incorrect topside toe contact:

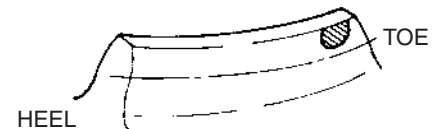
Correction measures:

- Decrease thickness of forward gear shim.
- Slightly increase pinion gear shim thickness.

CAUTION

Do not set tooth contact in this position (top side toe contact). Damage and chipping of forward and pinion gear may result.

EXAMPLE OF INCORRECT Top side toe contact



Example (2)

Incorrect bottom side toe contact:

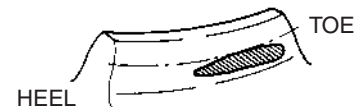
Correction measures:

- Increase thickness of forward gear shim.
- Slightly decrease pinion gear shim thickness.

CAUTION

Do not set tooth contact in this position (bottom side toe contact). Chipping of pinion gear may result.

EXAMPLE OF INCORRECT Bottom side toe contact



CHECKING DRIVESHAFT THRUST PLAY

After obtaining optimum tooth contact, driveshaft thrust play should be measured.

1. Affix gear adjusting gauge to driveshaft.

 **09951-09511: Gear adjusting gauge**

2. To check driveshaft thrust play, push forward gear inward and fix by hand.

Slowly driveshaft downward completely, then slowly pull driveshaft outward and read the maximum thrust play.

Designate this amount of play as (A).

**Driveshaft thrust play: Approx. 0.4 – 0.6 mm
(0.016 – 0.023 in)**

NOTE:

Driveshaft thrust play (A) must be known to adjust reverse gear shim.

RECHECKING DRIVESHAFT THRUST PLAY**(Reverse gear back-up shim adjustment)**

1. After adjusting forward gear tooth contact pattern, correctly assemble propeller shaft, housing assembly, reverse gear and related components. (See page 9-18 to 9-19.)

2. Screw sliding hammer assembly onto propeller shaft and strike a few gentle outward taps.

 **09950-59310: Propeller shaft remover – (B)**

09930-30104: Sliding hammer – (A)

3. Affix gear adjusting gauge to driveshaft.

 **09951-09511: Gear adjusting gauge**

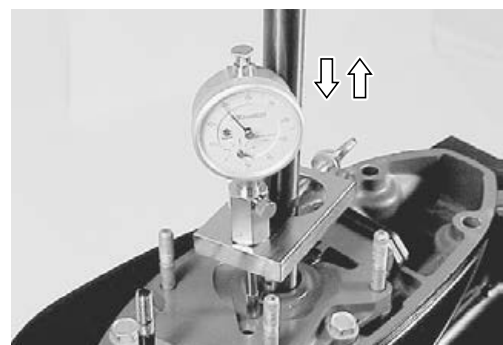
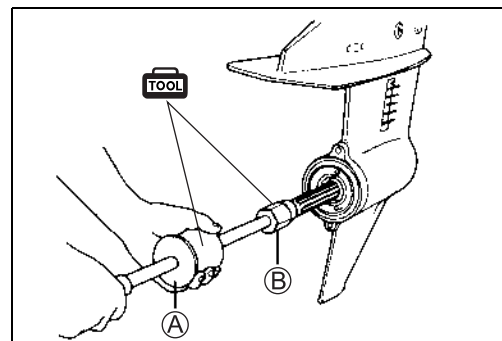
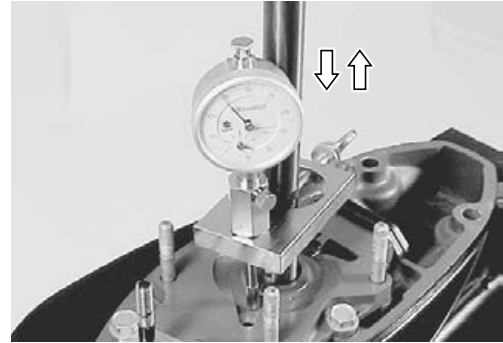
4. Slowly driveshaft downward completely, then slowly pull driveshaft outward and read the maximum thrust play.

Designate this measurement as play (B).

5. Compare play (B) to play (A). (See page 9-28.)

6. Reverse gear back-up shim adjustment is correct if (B) is equal to (A).

- If (B) is less than (A), reduce reverse gear back-up shim thickness.



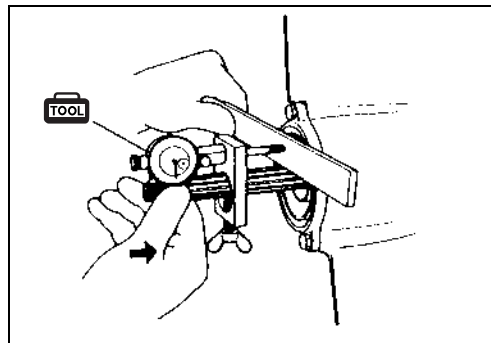
CHECKING PROPELLER SHAFT THRUST PLAY

After adjusting all gear positions, measure the propeller shaft thrust play. If not within the following specification, a shim adjustment is required.

**Propeller shaft thrust play: 0.2 – 0.4 mm
(0.008 – 0.016 in)**

NOTE:

Maintain the forward gear thrust washer at standard thickness (2.0 mm) and adjust only the reverse gear thrust washer with shim.



Measurement step:

1. Assemble gear adjusting gauge to the propeller shaft.



09951-09511: Gear adjusting gauge

2. Push propeller shaft inward.
3. Hold shaft in and set dial gauge pointer to zero.
4. Slowly pull shaft outward and read the maximum thrust play on the dial.
 - If measurement is more than specification, increase reverse gear thrust washer thickness.
 - If measurement is less than specification, reduce reverse gear thrust washer thickness.

