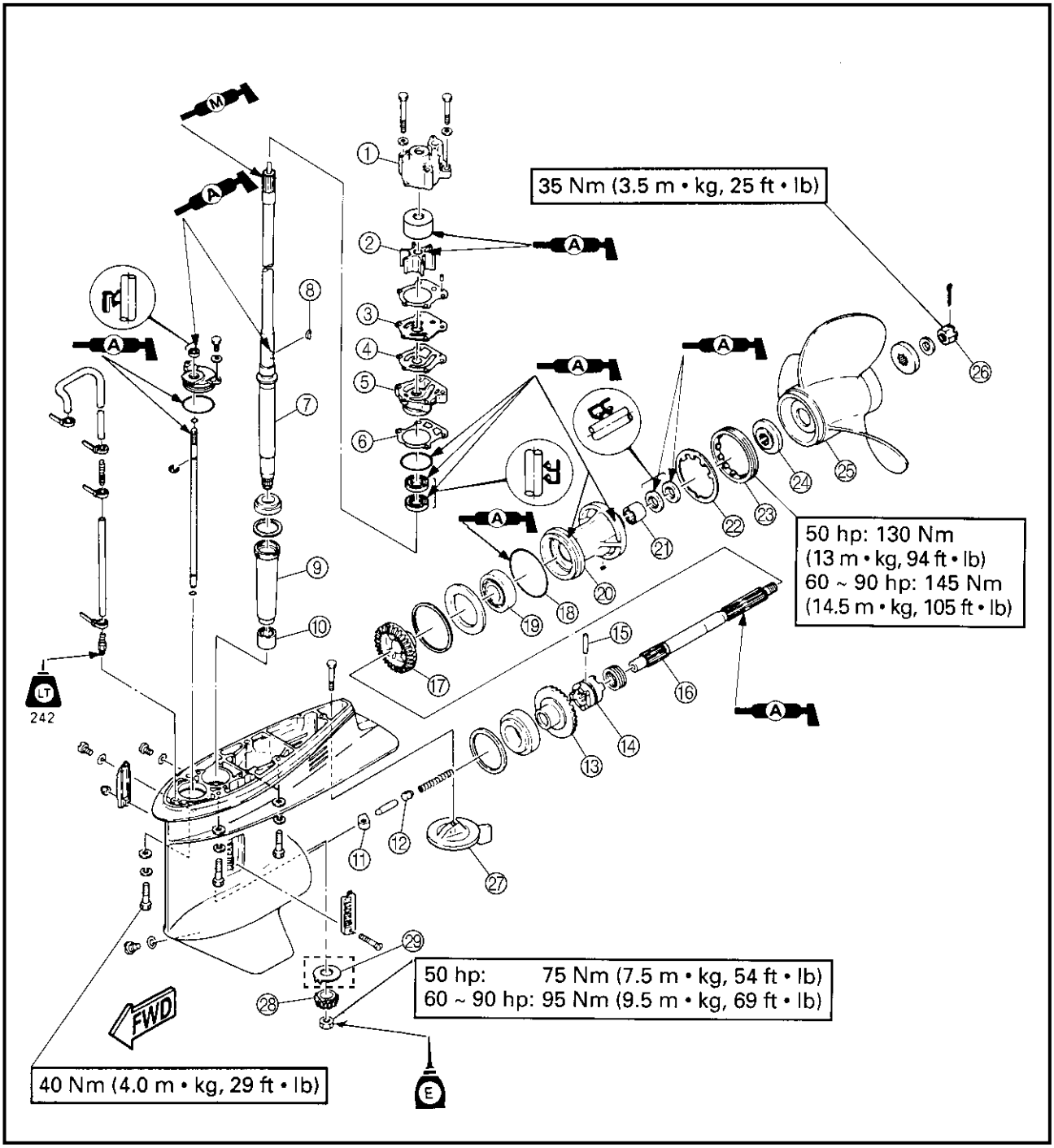
CHAPTER 6
LOWER UNIT

EXPLODED DIAGRAM (FOR 50GETO, C60ER, C60TR/60FET (OCEANIA), C75TR, 90AEHD, 90AED, C90TR/90AET)

① Water pump housing
② Impeller
③ Cartridge outer plate
④ Cartridge outer plate gasket
⑤ Oil-seal housing
⑥ Water pump gasket
⑦ Drive shaft
⑧ Woodruff key
⑨ Drive shaft sleeve
⑩ Needle bearing
⑪ Shifter
⑫ Shift slide
⑬ Forward gear
⑭ Clutch dog
⑮ Cross pin
⑯ Propeller shaft
⑰ Reverse gear
⑱ O-ring
⑲ Bearing
⑳ Bearing housing
㉑ Needle bearing
㉒ Claw washer
㉓ Ring nut
㉔ Spacer
㉕ Propeller
㉖ Castle nut
㉗ Trim tab
㉘ Pinion gear
㉙ Spacer (50GETO)



EXPLODED DIAGRAM (EXCEPT FOR 50GETO, C60ER, C60TR/60FET (OCEANIA), C75TR, 90AEHD, 90AED, C90TR/90AET)

① Water pump housing
② Impeller
③ Cartridge outer plate
④ Cartridge outer plate gasket
⑤ Oil-seal housing
⑥ Water pump gasket
⑦ Drive shaft
⑧ Woodruff key
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⑱ O-ring
⑲ Bearing
⑳ Bearing housing
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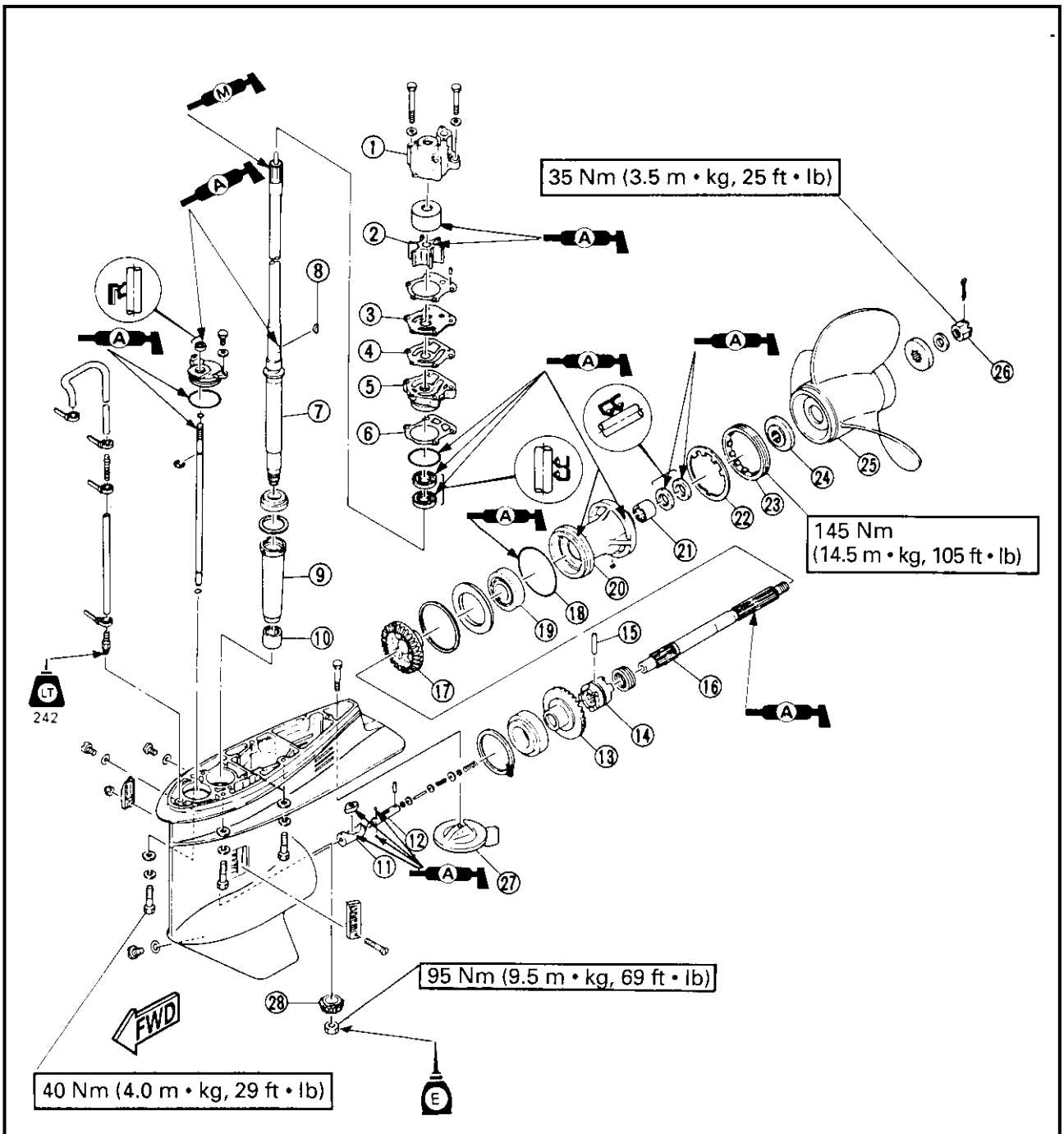
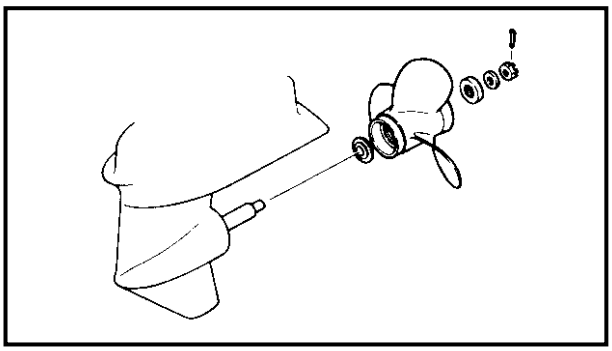
㉒ Claw washer
㉓ Ring nut
㉔ Spacer
㉕ Propeller
㉖ Castle nut
㉗ Trim tab
㉘ Pinion gear

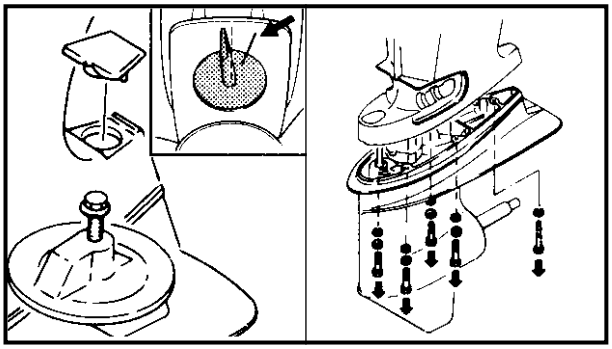




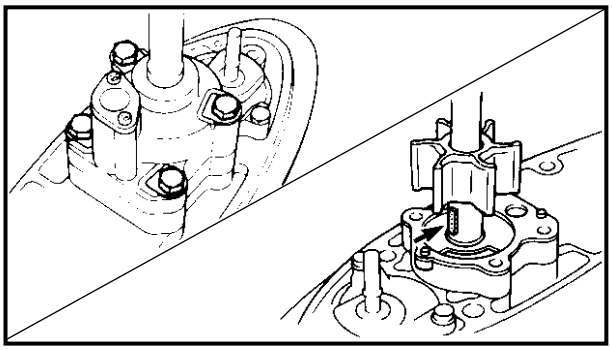
120001-0*

PREPARATION FOR REMOVAL

1. Remove the nut, washer, propeller and spacer from the propeller shaft.
2. Drain the gear oil by removing the plugs from the oil-filling hole and the oil-level hole. Be sure to remove the oil filling plug first.



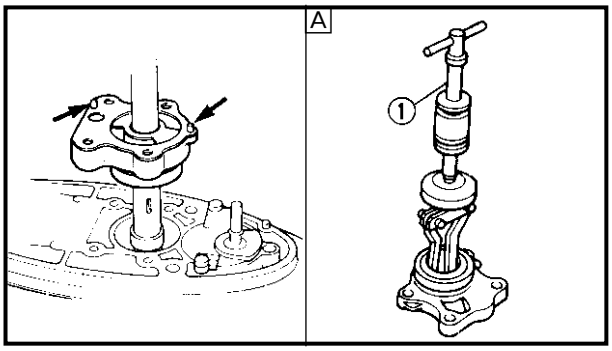
3. Set the shift lever into neutral position.
4. Tilt up the lower unit and lock it with the tilt lock lever.
5. Remove the trim tab. Before removing it, put a mark indicating its position on the anticavitation plate.
6. Remove the bolts.



140007-0

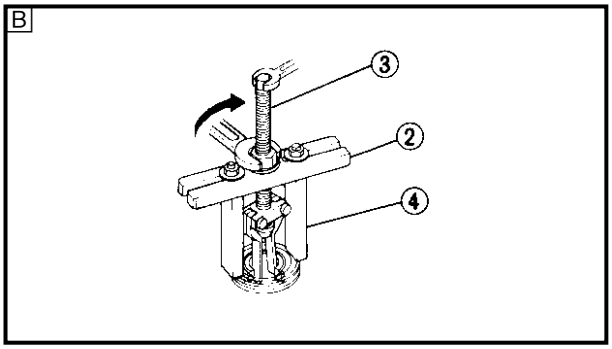
DISASSEMBLY

1. Referring to the exploded diagram, remove the following parts.
   1) Water pump housing and insert cartridge
   2) Impeller and woodruff key

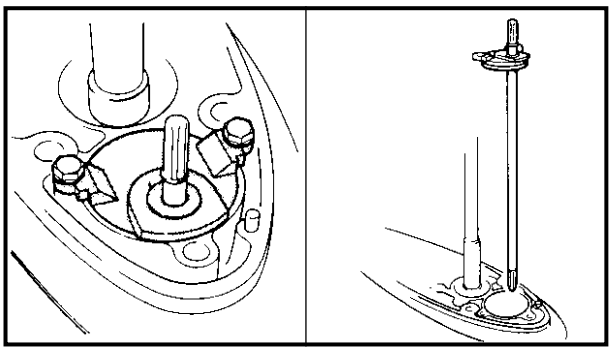


   3) Oil-seal housing
      (Water pump housing)
      Remove the oil seals, if necessary

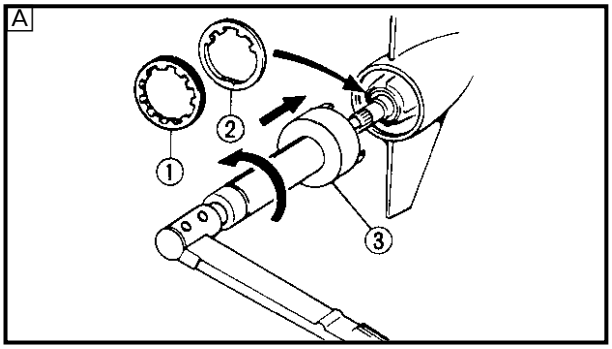
Slide hammer set:
YB-6096 ①
Stopper guide plate:
90890-06501 ②
Bearing puller:
90890-06535 ③
Stopper guide stand:
90890-06538 ④



A For USA and Canada
B Except for USA and Canada



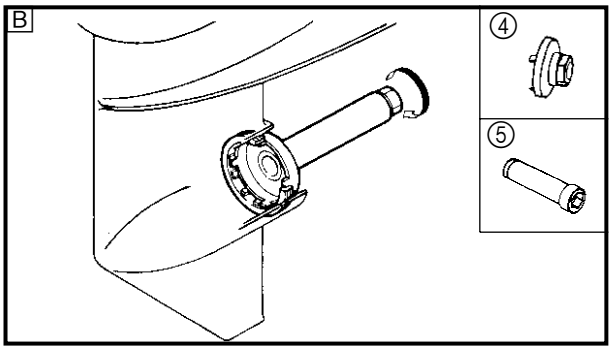
4) Shift-rod



5) Ring-nut ① and claw-washer ②

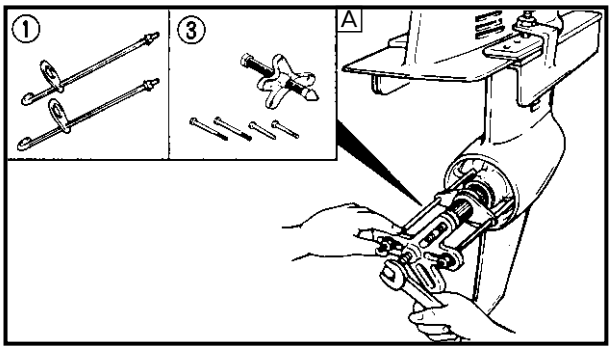
Ring nut wrench:	
YB-34447	③
90890-06511	④
Extension (ring nut wrench):	
90890-06513	⑤

A For USA and Canada
B Except for USA and Canada



NOTE:

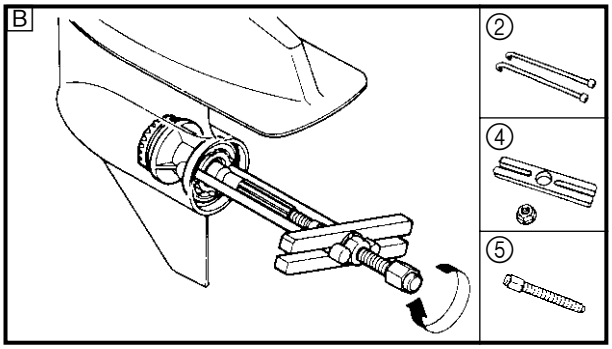
To remove the ring-nut: straighten the lobe of the claw-washer by using a screwdriver, then attach and turn it in the direction of the off mark using the special service tool.

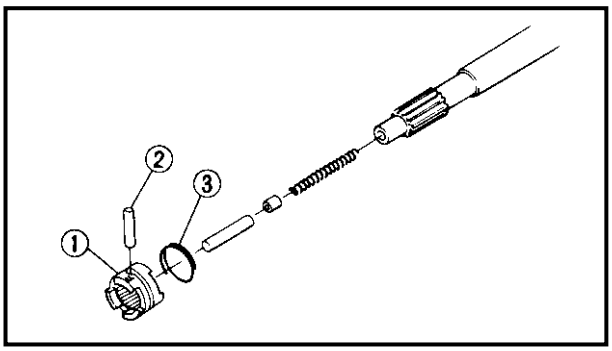


6) Bearing-housing
Using special service tool.

Claw:	
YB-6207	①
50, 60, 70 hp:	
90890-06503	②
75, 80, 90 hp:	
90890-06502	②
Flywheel puller:	
YB-6117	③
Stopper guide plate:	
90890-06501	④
Center bolt:	
90890-06504	⑤

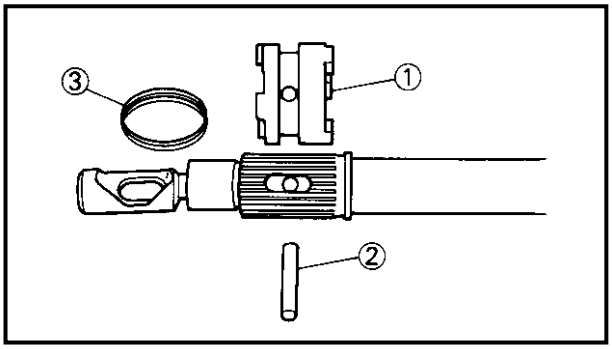
A For USA and Canada
B Except for USA and Canada





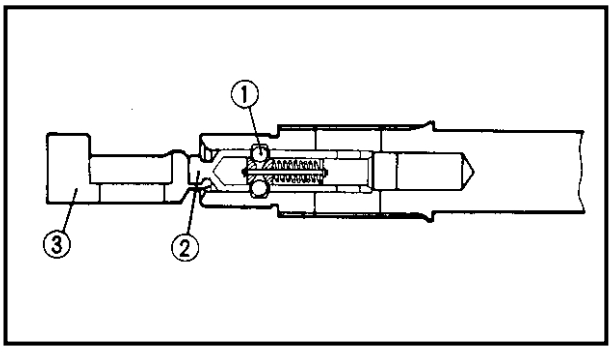
7) Propeller shaft
(For 50GETO, C60ER, C60TR/60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)

① Clutch dog
② Cross pin
③ Cross pin ring



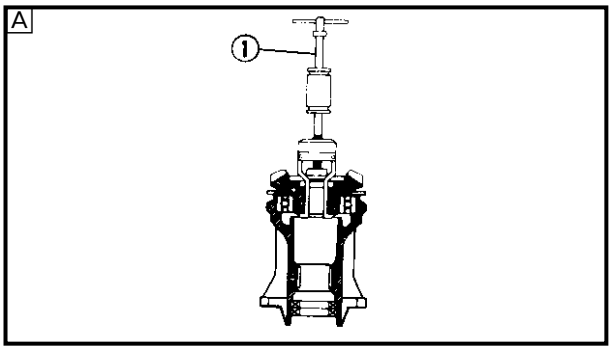
7) Propeller shaft
(Except for 50GETO, C60ER, C60TR/60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)

① Clutch dog
② Cross pin
③ Cross pin ring



8) Shift slide
(Except for 50GETO, C60ER, C60TR/60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)
Using a slotted screwdriver, remove the shift slide balls ① from the neutral position and pull out the shift slide ② and shifter ③.

A

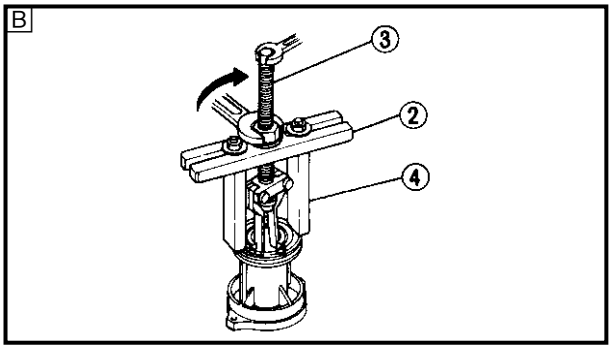


9) Reverse gear and bearing

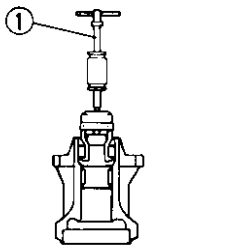
Slide hammer set:
YB-6096 ..... ①
Stopper guide plate:
90890-06501 ..... ②
Bearing puller:
90890-06535 ..... ③
Stopper guide stand:
90890-06538 ..... ④

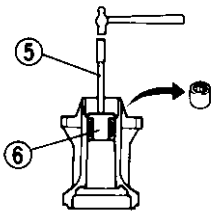
A For USA and Canada
B Except for USA and Canada

B



A





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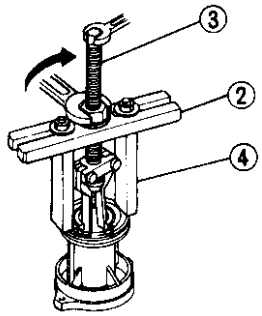
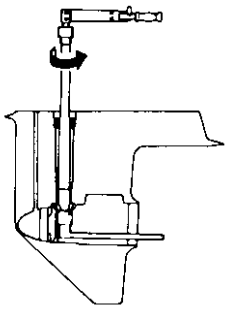


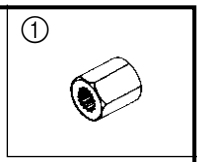
10) Oil seals and needle bearing

Slide hammer set:
YB-6096 ..... ①
Stopper guide plate:
90890-06501 ..... ②
Bearing puller:
90890-06535 ..... ③
Stopper guide stand:
90890-06538 ..... ④
Driver rod:
YB-6071/90890-06602 ..... ⑤
Needle bearing attachment:
YB-6153/90890-06612 ..... ⑥

A For USA and Canada
B Except for USA and Canada

A



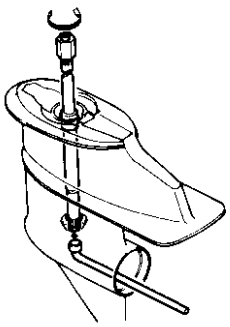


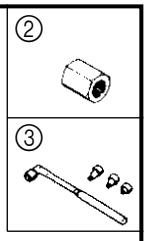
11) Pinion nut, pinion and drive shaft bearing inner race

Drive shaft holder:
50, 60, 70 hp:
YB-6049/90890-06518 ..... ①
75, 80, 90 hp:
YB-6151/90890-06519 ..... ②
Pinion nut holder:
90890-06505 ..... ③

A For USA and Canada
B Except for USA and Canada

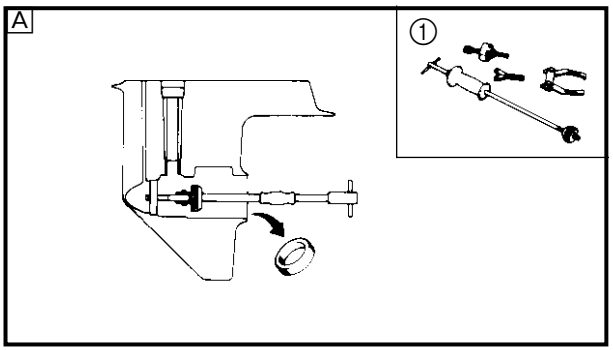
B





NOTE:

For ease of reassembly and adjustment, keep shim packs in their groups as removed.



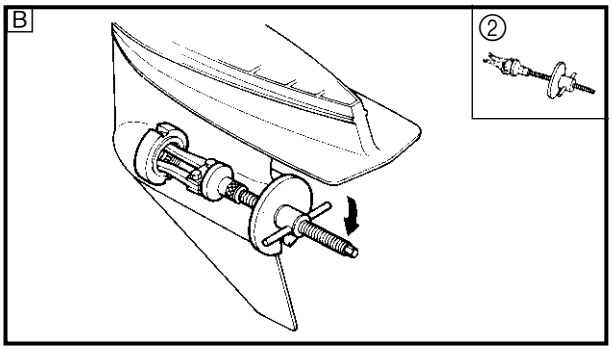
12) Forward gear bearing outer race

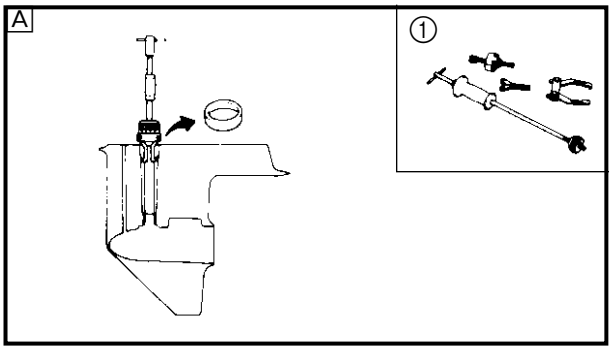
Slide hammer set:
YB-6096 ..... ①
Bearing outer race puller:
90890-06523 ..... ②

A For USA and Canada
B Except for USA and Canada

NOTE:

For ease of reassembly and adjustment, keep shim packs in their groups as removed.

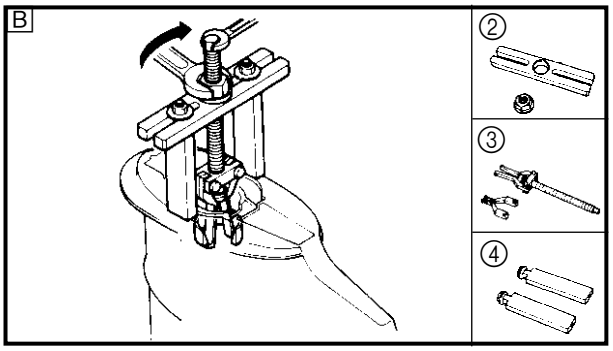


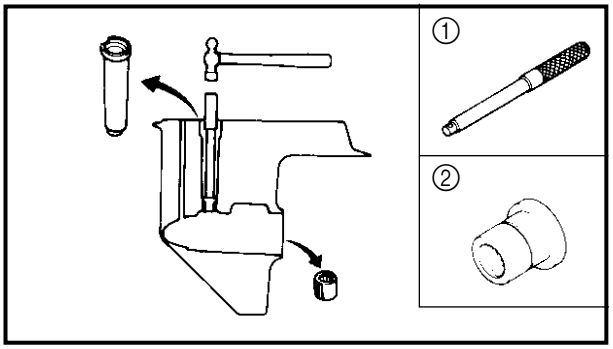


13) Drive shaft bearing outer race

Slide hammer set:
YB-6096 ..... ①
Stopper guide plate:
90890-06501 ..... ②
Bearing puller:
90890-06535 ..... ③
Stopper guide stand:
90890-06538 ..... ④

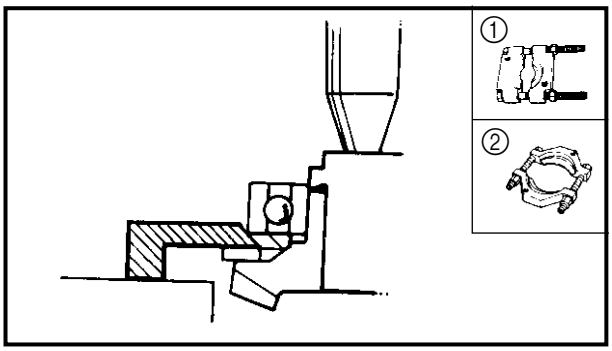
A For USA and Canada
B Except for USA and Canada

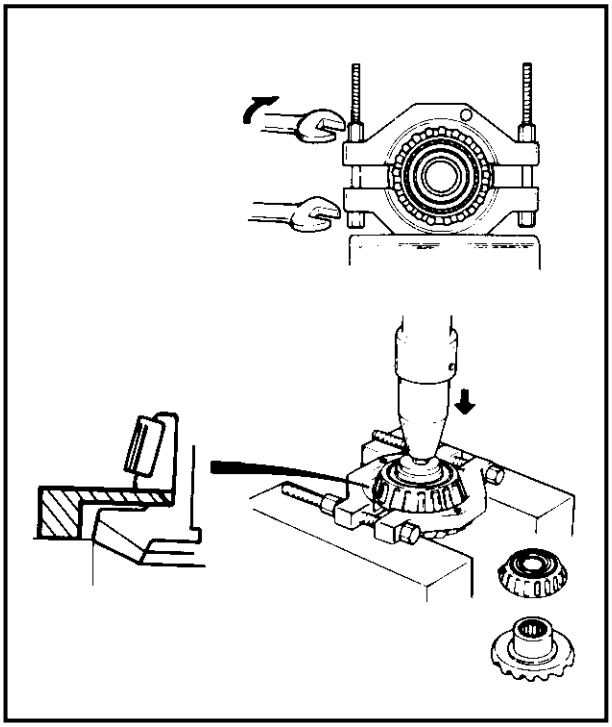




14) Drive shaft sleeve
15) Drive shaft needle bearing

Driver rod:
YB-6071/90890-06602 ..... ①
Needle bearing attachment:
YB-6155/90890-06611 ..... ②

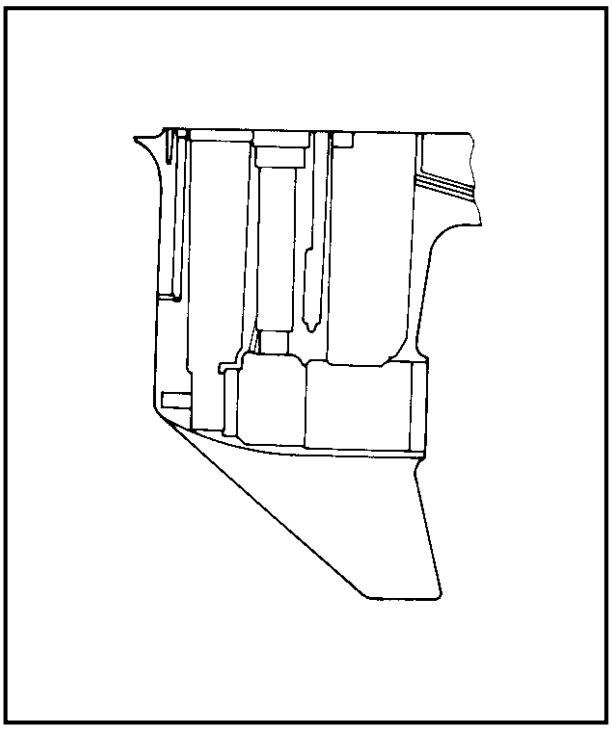




16) Reverse gear bearing and forward gear bearing

Bearing separator:
YB-6219 ..... ①
90890-06534 ..... ②

NOTE:
Separate the bearing from the gear using special service tool and hydraulic press.

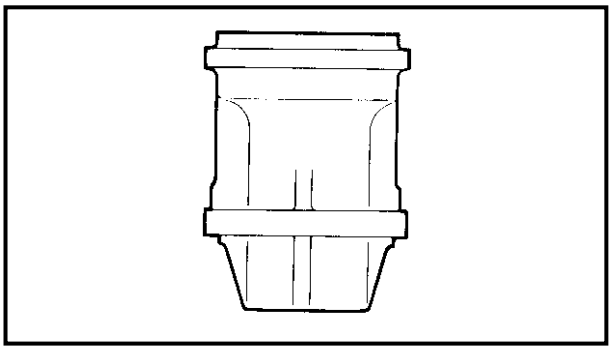


151001-0

INSPECTION

GEAR CASE

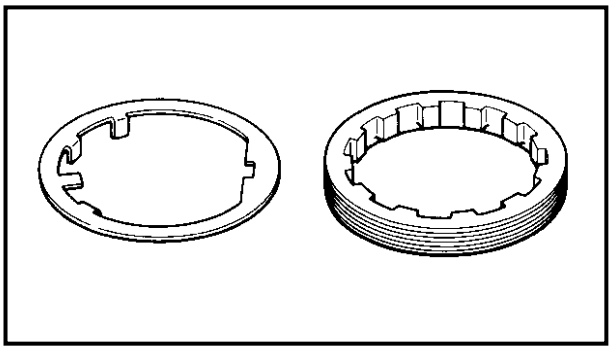
1. Using a soft brush and solvent, clean the case and water passage.
2. Visually inspect the gear case for cracks, corrosion or distortion. If any crack or excessive corrosion is found, replace the gear case.
3. Check the water inlet cover and water passage for clogging.



151500-0

BEARING HOUSING

1. Using a soft brush and solvent, clean the housing thoroughly.
2. Visually inspect the housing for cracks and corrosion. If any damage is found, replace the bearing housing.



152000-0

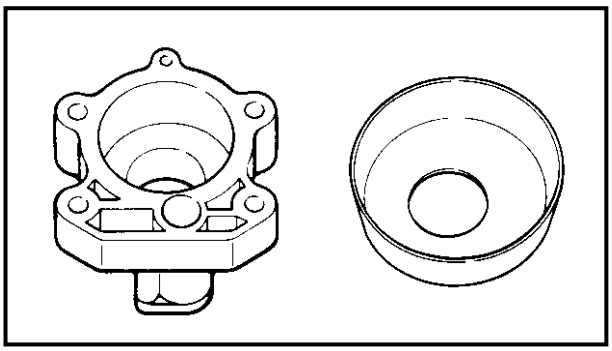
CLAW-WASHER

1. Visually inspect the washer for cracks. If a crack is found, replace the claw-washer.

152500-0

RING-NUT

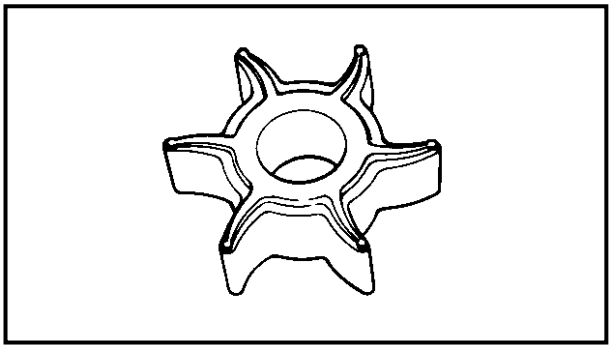
1. Using a soft brush and solvent, clean the thread of the ring-nut.
2. Visually inspect the ring-nut for cracks or damage to the thread. If cracked or damaged, replace the ring-nut.



153000-0

WATER PUMP HOUSING

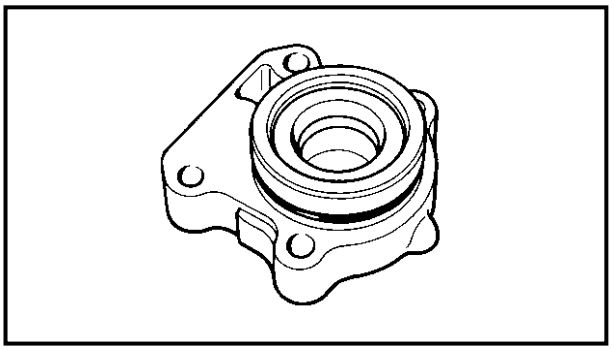
1. Inspect the water pump housing for signs of twisting or scratches of the inner cartridge. If twisted or scratched excessively, replace the housing.
2. During the above operation, inspect the impeller plate and replace this if damaged.



153500-0

IMPELLER

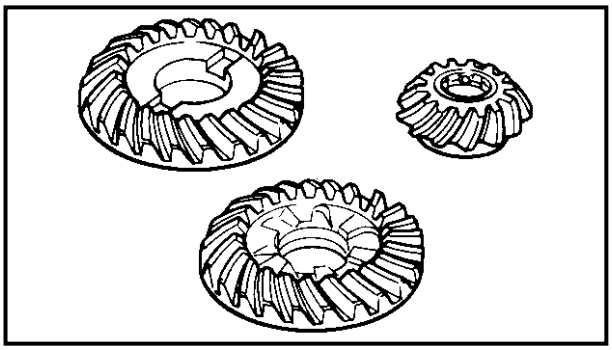
1. Visually inspect the impeller for cracks, distortion or burning. If any damage is found, replace the impeller.



154000-0

OIL-SEAL HOUSING
(Water pump housing)

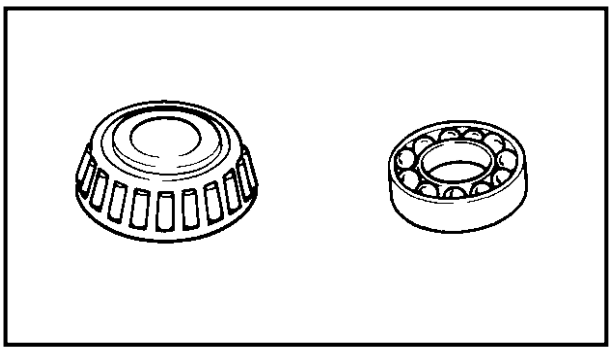
1. Using a soft brush and solvent, clean the oil-seal housing.
2. Visually inspect the housing for cracks or corrosion. If a crack and/or excessive corrosion is found, replace the oil-seal housing.



154500-0

GEAR

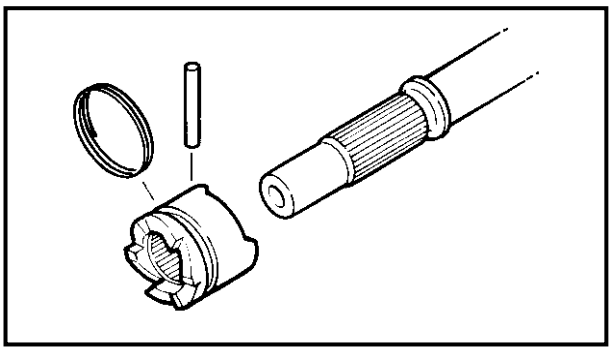
1. Visually inspect the teeth and dogs on the gears for cracks, peeling or distortion due to gear-crashing. If damage is found on any of the gears, replace with a new one.



155000-0

BEARING

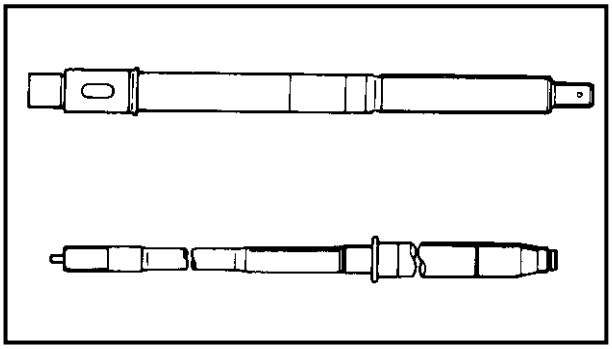
1. Inspect the bearings for pitting, scratching or rumbling (which may be detected by turning the bearing by hand), and replace them if they are not in good condition.



15500-0

CLUTCH DOG AND COMPONENTS

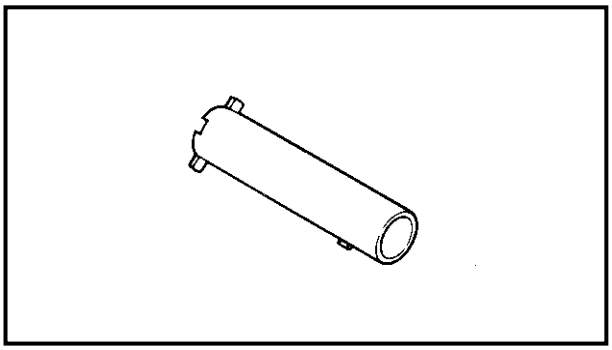
1. Visually inspect the clutch dog, looking particularly for rounding of the dog edge, cracks and other signs of damage or wear. If the dog is excessively rounded, inspect the mating gear, and replace both if necessary.



156000-0

DRIVE AND PROPELLER SHAFT

1. Visually inspect the shafts, looking for grooved wear on the surface in contact with the bearings and oil-seals and checking for wear on the splines. Replace if worn or damaged.



156300-0

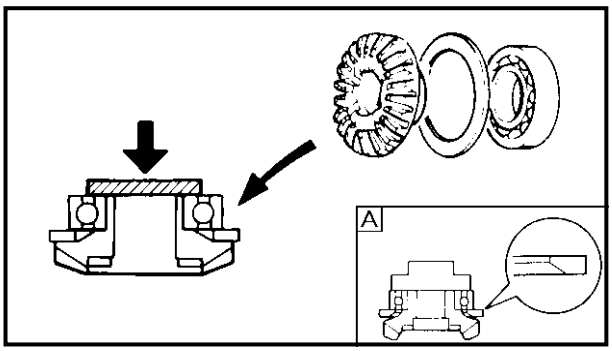
DRIVE SHAFT SLEEVE

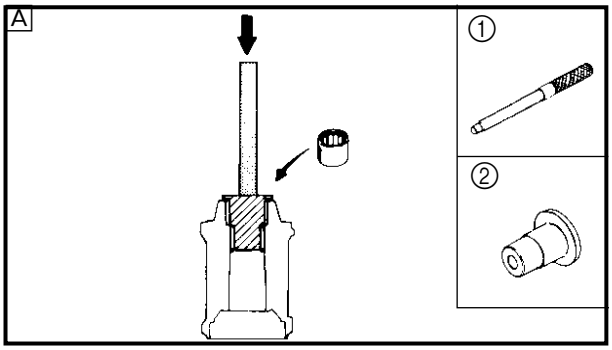
1. Visually inspect the sleeve for wear and cracks. If any damage is found, replace the sleeve.

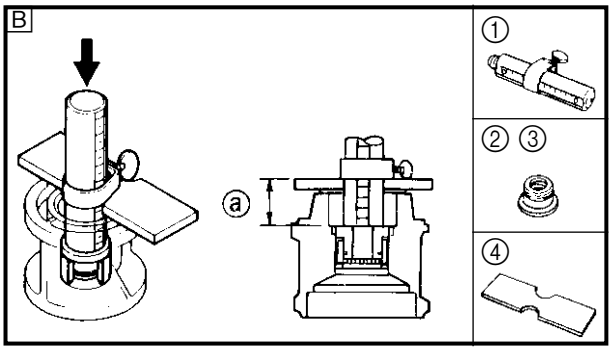
157000-0*

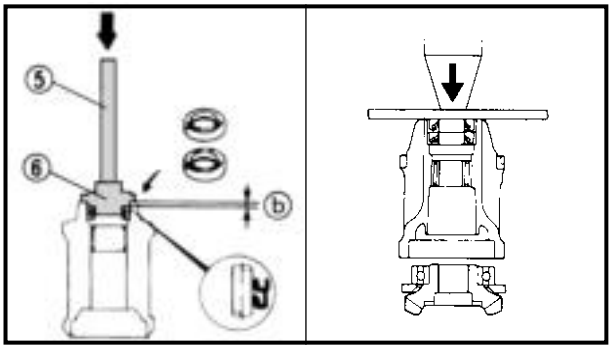
PROPELLER/TRIM TAB/ANODE

1. Refer to “PERIODIC SERVICE” section in chapter 3.









161009-0*

ASSEMBLY AND ADJUSTMENT

PROPELLER-SHAFT HOUSING

1. Install the thrust washer and press-fit a ball-bearing to the reverse gear.

A 50GETO

2. Install a needle-bearing and oil seals, and then press-fit the reverse gear complete into the bearing housing.

NOTE:

Install the needle bearing with its manufacture's marks or numbers facing outward.

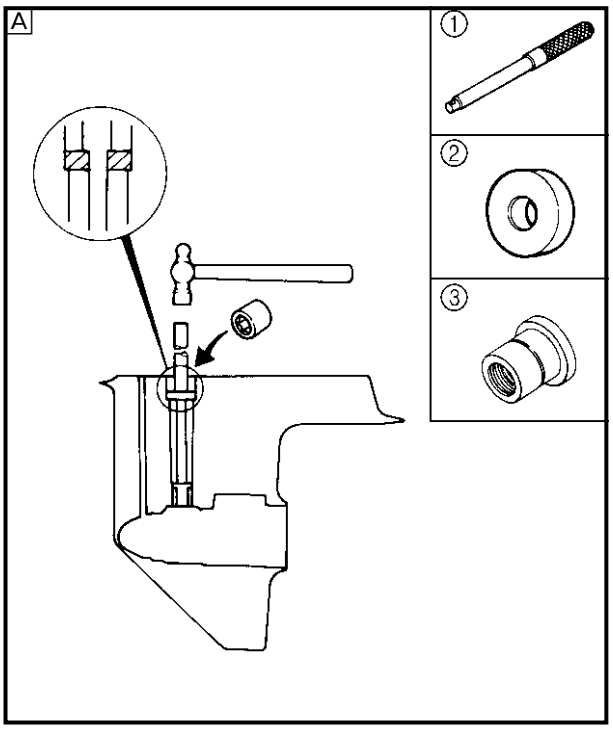
Depth ⓐ:
50 hp : 20.7 mm (1.06 in)
60 ~ 90 hp: 25.5 mm (1.00 in)

Drive rod:
YB-6071/90890-06604 ..... ①
Needle bearing attachment:
50 hp: 90890-06614 ..... ②
60 ~ 90 hp:
YB-6152/90890-06611 ..... ③
Bearing depth plate:
90890-06603..... ④

A For USA and Canada
B Except for USA and Canada

Depth ⓑ:
5 mm (0.20 in)

Driver rod:
YB-6071..... ⑤
Oil seal attachment:
60 ~ 90 hp:
YB-6259 ..... ⑥



GEAR CASE

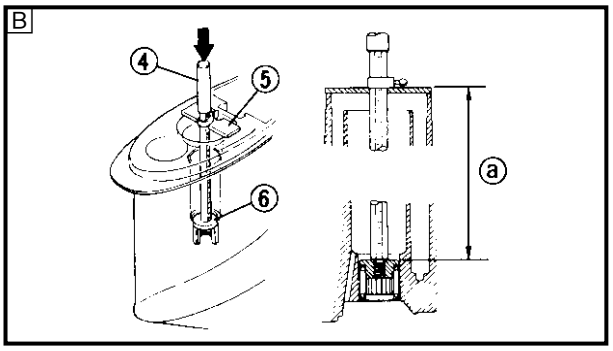
1. Install a new needle-bearing in position.

NOTE:

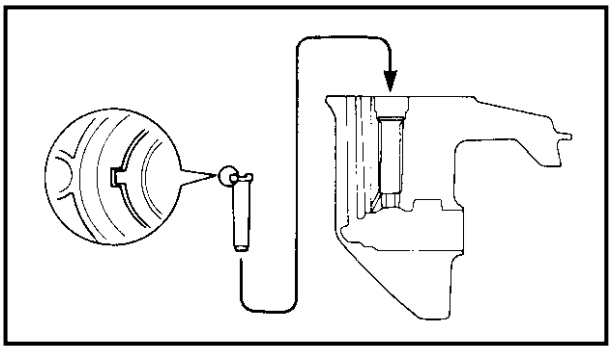
The needle bearing should be installed with the mark facing the flange side of attachment.

Driver rod:
YB-6071 ..... ①
Needle bearing depth stop:
YB-34473 ..... ②
Needle bearing attachment:
YB-6155 ..... ③
Driver rod:
90890-06602 ..... ④
Bearing depth plate:
90890-06603 ..... ⑤
Needle bearing attachment:
50 hp: 90890-06614 ..... ⑥
60 ~ 90 hp: 90890-06611 ..... ⑥

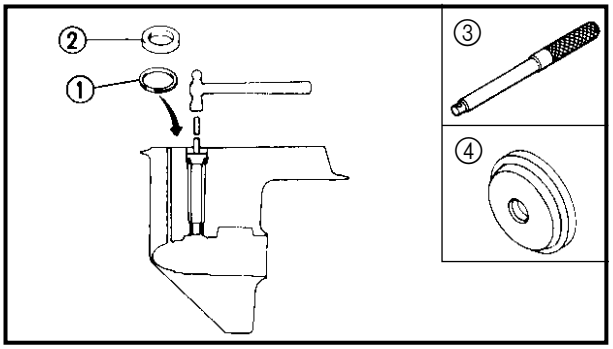
Depth ⓐ:
50 hp : 198.3 ~ 198.8 mm (7.81 ~ 7.83 in)
60 ~ 90 hp : 187.6 ~ 188.6 mm (7.39 ~ 7.43 in)



A For USA and Canada
B Except for USA and Canada

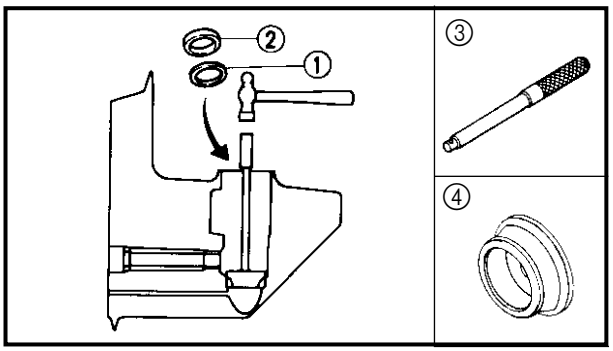


2. Align the drive-shaft sleeve locating-rib with the recess in the gear case and place the drive-shaft sleeve into the gear case.



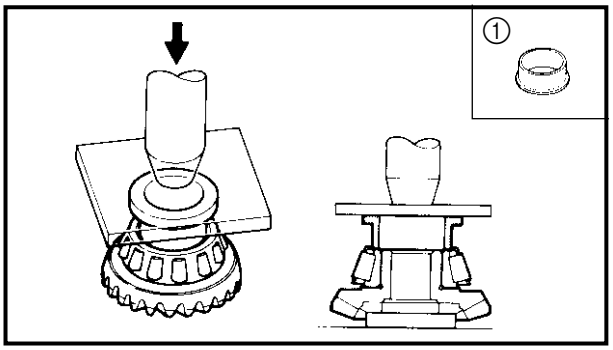
3. Place the pinion-gear shim-pack ① in position and install the taper-roller bearing outer race ② on the shim-pack.

Drive rod:
YB-6071/90890-06606 ..... ③
Bearing outer race attachment:
50 hp: 90890-06627 ..... ④
60 ~ 90 hp:
YB-6156/90890-06626 ..... ④



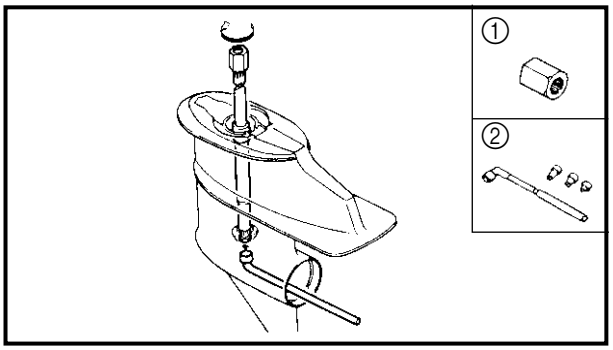
4. Place the forward-gear shim-pack ① in position and install the forward-gear outer race ② on the shim-pack.

Driver rod:
YB-6071/90890-06605 ..... ③
Bearing outer race attachment:
50 hp: 90890-06622 ..... ④
60 ~ 90 hp:
YB-6276B/90890-06621 ..... ④



5. Install the bearing inner race to the forward-gear, then place the forward-gear complete onto the outer race.

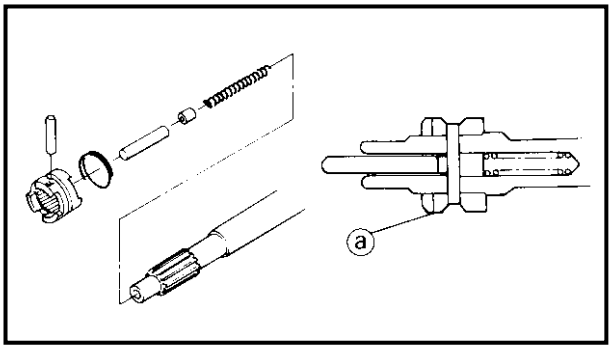
Bearing inner race attachment:
50 hp: 90890-06640 ..... ①
60 ~ 90 hp: 90890-06662 ..... ①



6. Place the drive-shaft in the gear case and insert it into the pinion.
Tighten the pinion nut to the specified torque.

Pinion nut:
50 hp:
75 Nm (7.5 m • kg, 54 ft • lb)
60 ~ 90 hp:
95 Nm (9.5 m • kg, 69 ft • lb)

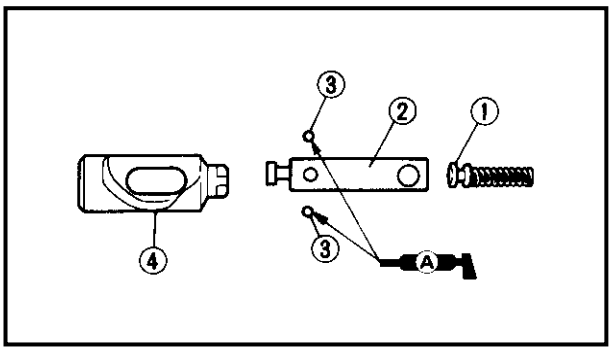
Drive shaft holder:
50, 60, 70 hp:
YB-6049/90890-06518 ..... ①
75, 80, 90 hp:
YB-6151/90890-06519 ..... ①
Pinion nut holder:
90890-06505..... ②

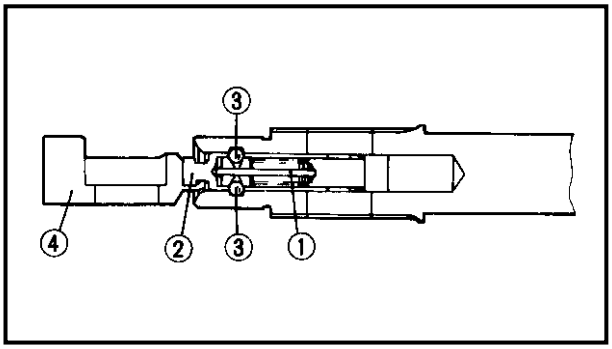


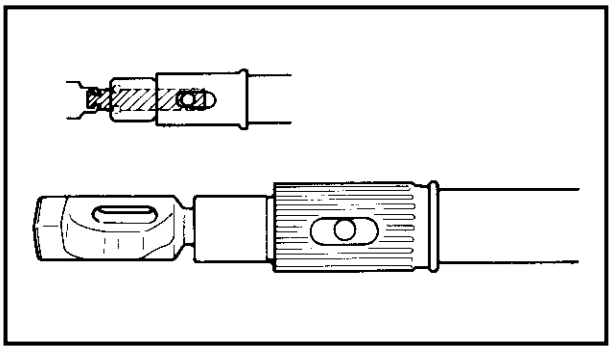
7. Assemble the propeller shaft.
(For 50GETO, C60ER, C60TR/60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)

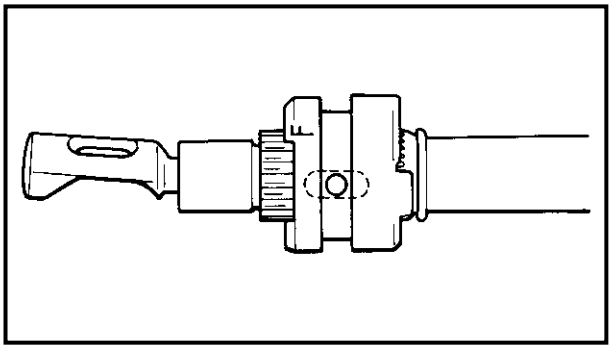
1) Referring to the illustration.

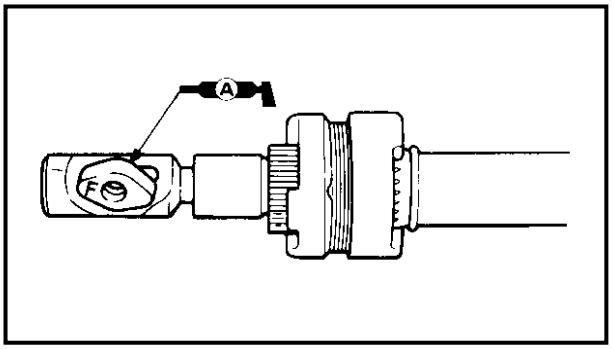
ⓐ "F" mark side











7. Assemble the propeller shaft.
(Except for 50GETO, C60ER, C60TR/60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)

1) Insert the free shaft ① into the shift slide ②.
2) Insert the two balls ③ and shifter ④ on the shift slide.

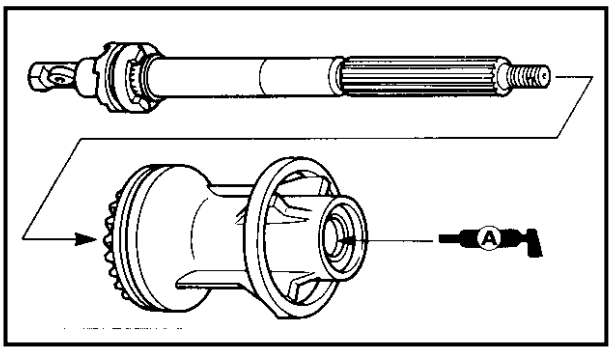
NOTE:
Grease the balls so that they will not come off easily from the shift slide, thus making your work easier.

3) Align the hole in the shift slide cross pin with the slot in the propeller shaft cross pin and insert the shift slide into the propeller shaft.
4) Push the shifter and stop pushing it when the balls move into the neutral groove in the propeller shaft making a slick.
If the balls move into the reverse groove passing the neutral, be sure to bring them back to neutral.
5) Install the clutch dog so that its cross pin hole is aligned with the slot in the splined portion of the propeller shaft.

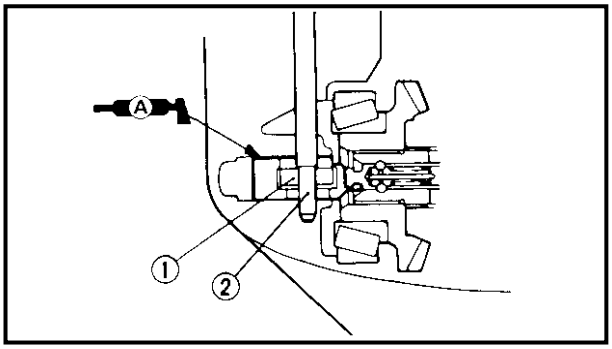
NOTE:
Install the clutch dog so that the "F" mark on the clutch dog is on the forward gear side.

6) Bring the cross pin hole in the clutch dog with the hole in the shift slide and insert the cross pin into these holes. Then, install the cross pin ring.

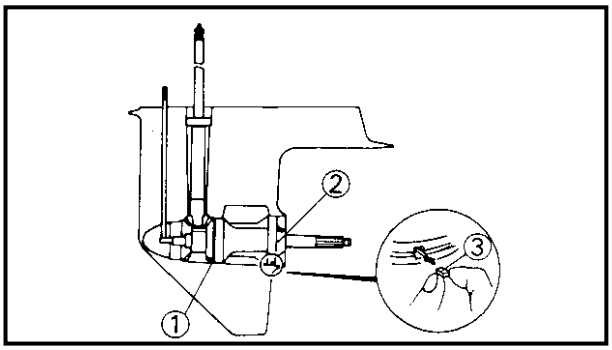
7) Place the shift cam on the shifter (with the "F" mark on the shift cam facing forward) and insert the propeller shaft into the forward gear.



8. Grease the lips of the oil-seals and insert the propeller shaft complete into the bearing housing. Then, place the bearing housing complete to the gear case.

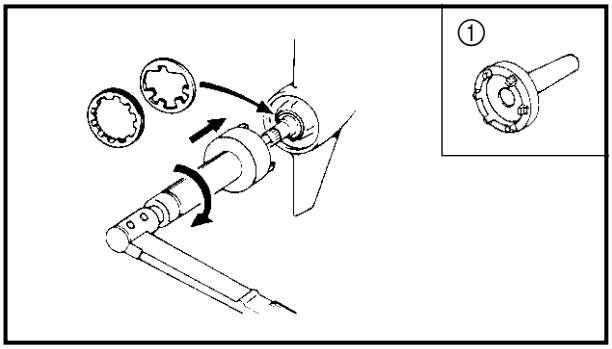


9. Look into the gear case through the hole and align the shift rod hole in the gear case with the splined hole in the shift cam ① and install the shift rod ②. (Except for 50GETO, C60ER, C60TR/60FET (Oceania), C75TR, 90AEHD, 90AED, C90TR/90AET)



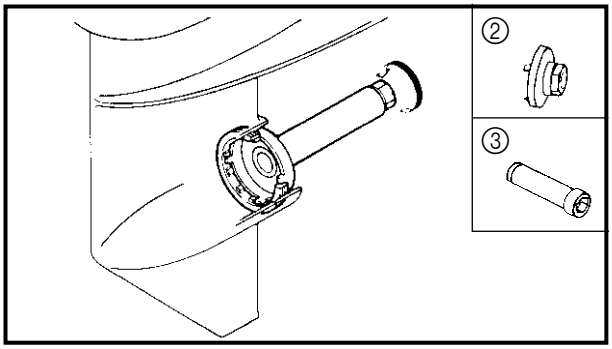
10. Place the reverse-gear shim ① in place, then install the bearing housing ② (aligning the key-way in the gear-case with that in the bearing housing) and insert the key ③.

11. Place a claw-washer in place, install a ring-nut (with its embossed marks facing outward away from the bearing housing), tighten the ring-nut to the specified torque and bend the claw-washer over the ring-nut to lock it.



Ring-nut:
50 hp:
130 Nm (13.0 m • kg, 0.94 ft • lb)
60, 70, 75, 80, 90 hp:
145 Nm (14.5 m • kg, 105 ft • lb)

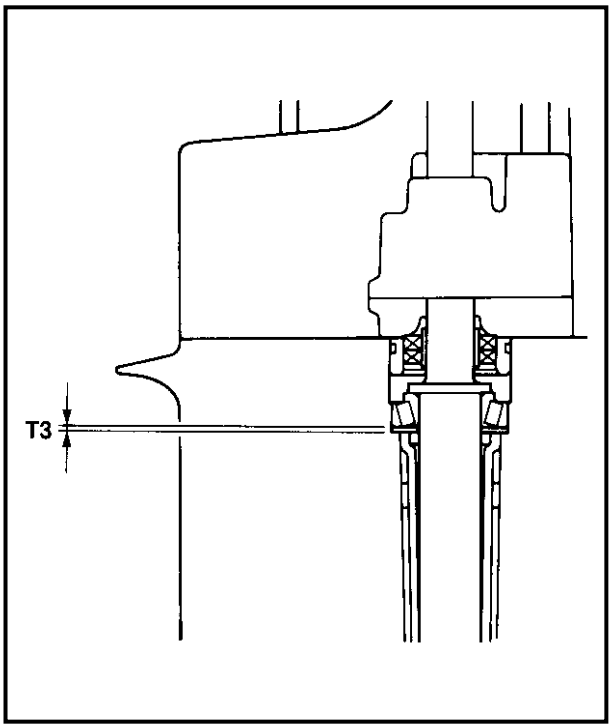
Ring nut wrench:
50 hp:
YB-06048/90890-06510
60 ~ 90 hp:
YB-34447 ..... ①
90890-06511..... ②
Extension (ring nut wrench):
90890-06513..... ③

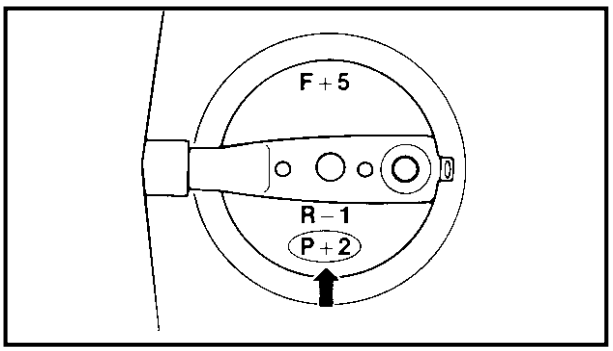


SHIM SELECTION

NOTE:

1. When reassembling the lower unit with the original gear case and inner parts, shim selection is not required.
2. When replacing the gear case only, read the numeral preceded by "**F**, **R**, **P**" and adjust the shims according to the difference between numerals of the original gear-case and the new gear-case.
3. If the bearing(s) and/or gear(s) are replaced, carry out the shim selection.





FOR USA AND CANADA
Pinion gear shim

NOTE:

Find pinion gear shim thickness (**T3**) by selecting shims until the specified measurement (**M**) with the special tool is obtained.

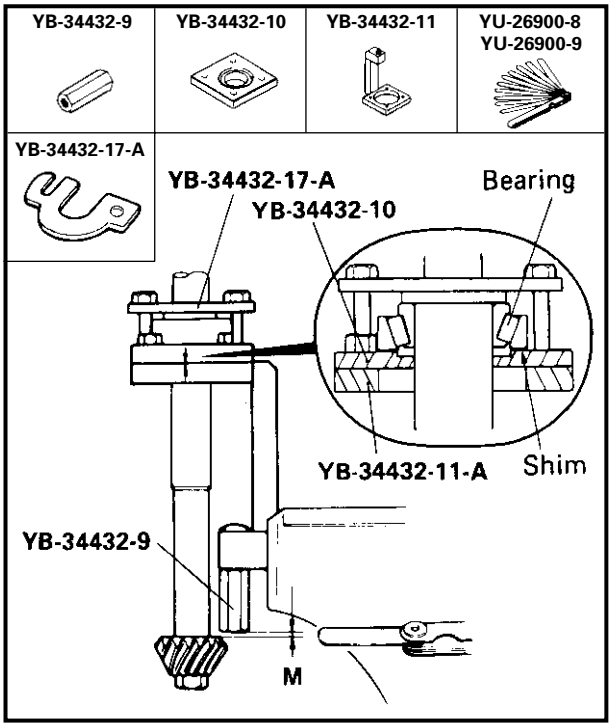
1. Find the specified measurement (M).

Specified Measurement (M) = 0.20 mm + P/100 mm

NOTE:

1. **P** is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the **P** mark is missing or unreadable, assume a **P** mark of "0" and check the backlash when the unit is assembled.
2. If the **P** value is negative (–), then **subtract** the **P** value from the measurement.

Example:
If **P** mark is "+5", then
M = 0.20 + (+5)/100 mm
= 0.20 + 0.05 mm
= 0.25 mm
If **P** mark is "–3", then
M = 0.20 + (–3)/100 mm
= 0.20 – 0.03 mm
= 0.17 mm



2. Assemble the shimming gauge with the drive shaft, bearing and shim(s) as shown in the illustration.

NOTE:
1. Attach the adapter plate to the gauge base using 4 bolts with appropriate sizes.
2. If the original shim(s) is unavailable, start with a 0.50 mm shim.

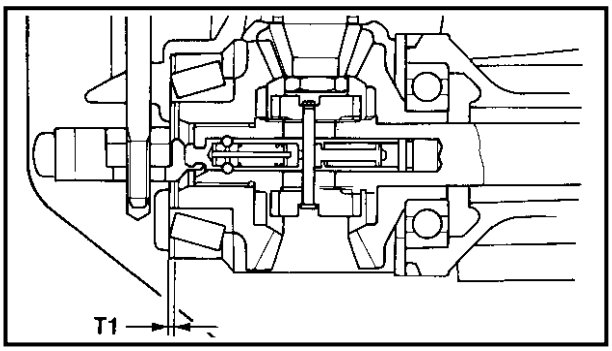
Gauge block:
YB-34432-9
Adapter plate:
YB-34432-10
Gauge base:
YB-34432-11-A
Clamp:
YB-34432-17-A

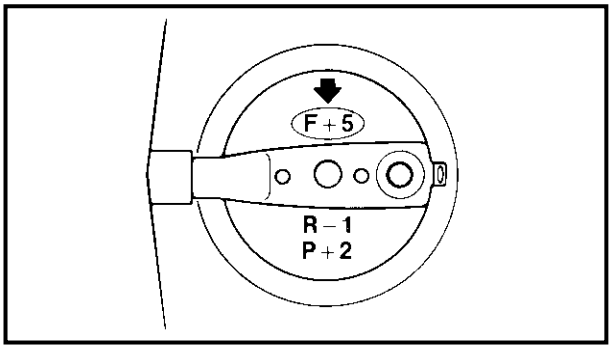
3. Install the pinion on the drive shaft and tighten the nut to the specified torque.
4. Using a thickness gauge at the specified measurement (**M**) established above, check the fit between the shimming gauge and lower surface of the pinion as shown.

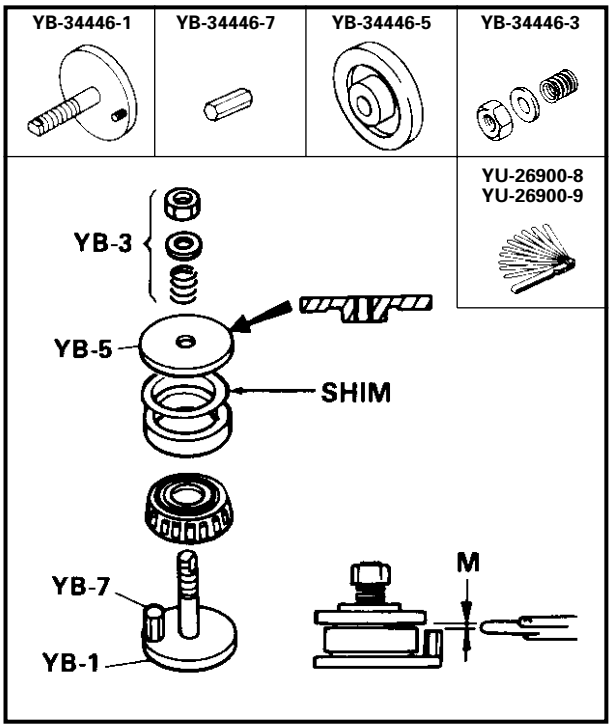
Thickness gauge:
YU-26900-8
YU-26900-9

5. If the thickness gauge at the **M** specification will not fit, then remove or add the shim(s) until the thickness gauge just fits between the tool surfaces.

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm







Forward gear shim

NOTE:

Find forward gear shim thickness (**T1**) by selecting shims until the specified measurement (**M**) with the special tool is obtained.

1. Find the specified measurement (M).

Specified Measurement (M) = 1.69 mm + F/100 mm

NOTE:

1. **F** is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the **F** mark is missing or unreadable, assume an **F** mark of "0" and check the backlash when the unit is assembled.
2. If the **F** value is negative (–), then **subtract** the **F** value from the measurement.

Example:
If **F** mark is "+5", then
M = 1.69 + (+5)/100 mm
= 1.69 + 0.05 mm
= 1.74mm
If **F** mark is "–3", then
M = 1.69 + (–3)/100 mm
= 1.69 – 0.03 mm
= 1.66 mm

2. Assemble the shimming gauge with the forward bearing and original shim(s) as shown in the illustration. Tighten the nut four turns after contacting the spring.

NOTE:

If the original shim(s) is unavailable, start with a 0.50 mm shim.

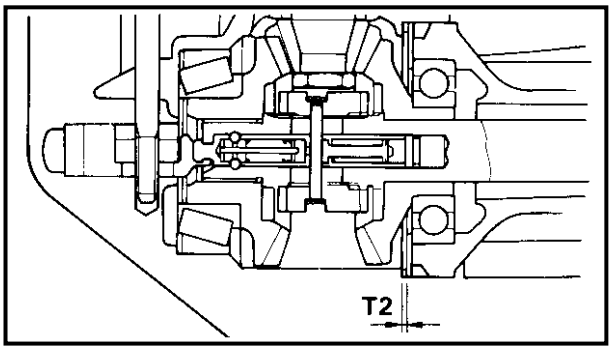
Base plate:
YB-34446-1
Compression spring:
YB-34446-3
Press plate:
YB-34446-5
Gauge pin:
YB-34446-7

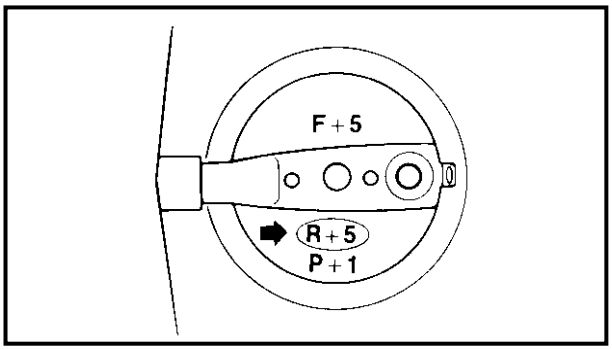
3. Using a thickness gauge at the specified measurement (**M**) established above, check the fit between the shimming gauge and upper disc of the tool.

Thickness gauge:
YU-26900-8
YU-26900-9

4. If the thickness gauge at the M specification will not fit, then remove or add the shim(s) until the thickness gauge just fits between the tool surfaces.

Available shim thicknesses:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm





Reverse gear shim

NOTE:

Find the reverse gear shim thickness (**T2**) by selecting shims until the specified measurement (**M**) with the special tool is obtained.

1. Find the specified measurement (**M**).

Specified Measurement (M) =
60, 70 hp:
1.00 mm – R/100 mm
75, 90 hp:
1.50 mm – R/100 mm

NOTE:

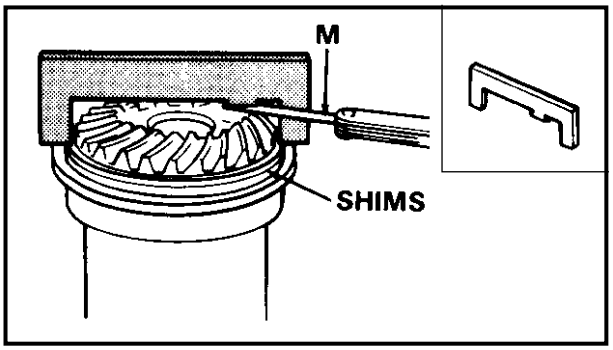
1. **R** is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the **R** mark is missing or unreadable, assume an **R** mark of "0" and check the backlash when the unit is assembled.
2. If the **R** value is negative(–), then **add** the **R** value to the measurement.

Example: (60, 70 hp)
If **R** mark is "+5", then
M = 1.00 – (+5)/100 mm
= 1.00 – 0.05 mm
= 0.95 mm
If **R** mark is "–3", then
M = 1.00 – (–3)/100 mm
= 1.00 + 0.03 mm
= 1.03 mm

Example: (75, 90 hp)
If **R** mark is "+5", then
M =1.50 – (+5)/100 mm
=1.50 – 0.05 mm
=0.45 mm
If **R** mark is "–3", then
M =1.50 – (–3)/100 mm
=1.50 + 0.03 mm
=1.53 mm

2. Place the original shim(s) on the thrust washer mounted on the bearing housing and place the shimming gauge on top of the shim(s) as shown in the illustration.

NOTE:
1. If the original shim(s) is unavailable, start with a 0.50 mm shim.
2. Be sure to remove the O-ring from under the thrust washer.



Shimming gauge:
YB-34468-5 (60, 70 hp)
YB-34468-3 (75, 90 hp)

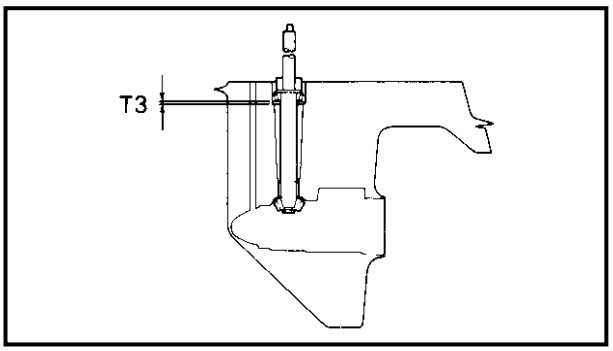
3. Using a thickness gauge at the specified measurement (**M**) established above, check the fit between the shimming gauge and the reverse gear. Force the shimming gauge against the shims and thrust washer when checking the fit.

Thickness gauge:
YU-26900-8
YU-26900-9

4. If the thickness gauge at the **M** specification will not fit, then remove or add the shim(s) until the thickness gauge just fits between the tool surfaces.

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

SHIM SELECTION (EXCEPT FOR USA AND CANADA)



EXCEPT FOR USA AND CANADA

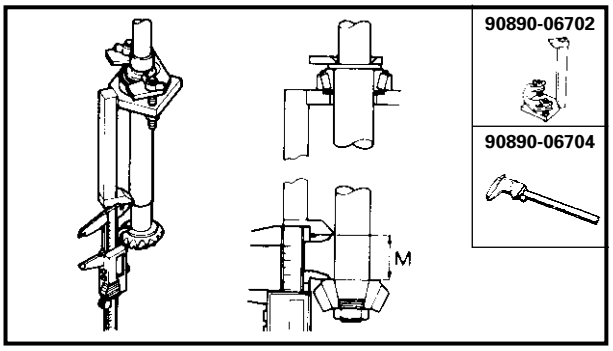
Pinion gear shim

1. Find pinion gear shim thickness (**T3**) by selecting shims until the specified measurement (**M**) with the special tool is obtained.

2. Install the pinion on the drive shaft and tighten the nut to the specified torque.

Pinion nut:
50 hp:
75 Nm (7.5 m • kg, 54 ft • lb)
60 ~ 90 hp:
95 Nm (9.5 m • kg, 69 ft • lb)

3. Assemble the pinion height gauge with the drive shaft and bearing as shown in the illustration. Bolt the bearing housing to the special tool with at least two bolts.



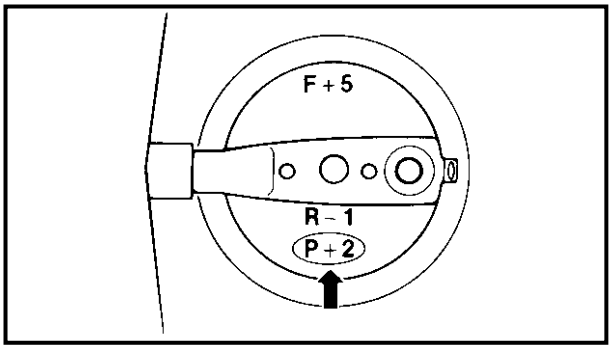
Pinion height gauge:
90890-06702
Digital caliper:
90890-06704

4. Using a digital caliper at the specified measurement (**M**) established above, measure the distance between the pinion height gauge and lower surface of the pinion as shown.

Shim thickness (T3)=
50 hp:
M – 40.2 mm – P/100 mm
60 ~ 90 hp:
M – 31.5 mm – P/100 mm

5. **P** is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the **P** mark is missing or unreadable, assume a **P** mark of "0" and check the backlash when the unit is assembled.

Example:
If **M** is "32.10 mm" **P** is "+2", then
T3 = 32.10 – 31.5 – 2/100 = 0.58

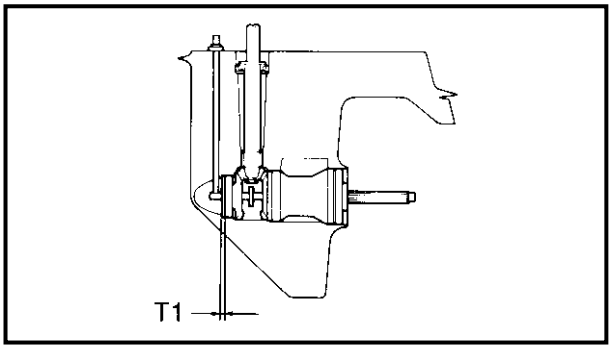


Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

SHIM SELECTION (EXCEPT FOR USA AND CANADA)

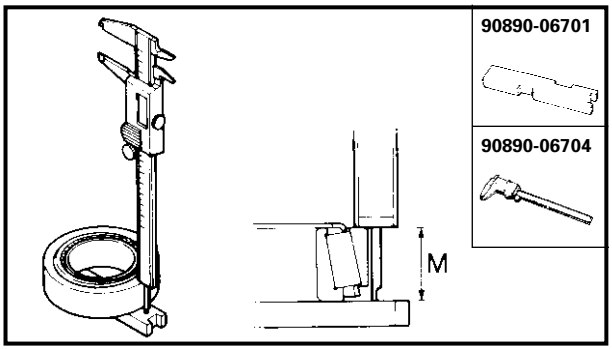
NOTE:

- Use a minimum number of shims to obtain the thickness equal or nearly equal to the calculation.
- Install the shims with the thicker one on the outer side.



Forward gear shim

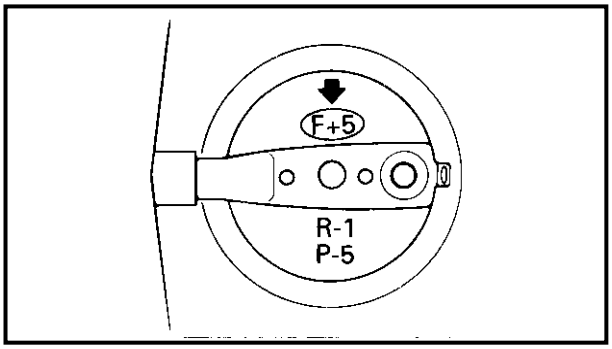
1. Find forward gear shim thickness (**T1**) by selecting shims until the specified measurement (**M**) with the special tool is obtained.



2. Using a digital caliper at the specified measurement (**M**) established above, measure the bearing height.

Shim thickness (T1)=
50 hp:
22.70 mm + F/100 mm – M
60 ~ 90 hp:
24.50 mm + F/100 mm – M

Shimming plate:
90890-06701
Digital caliper:
90890-06704



3. **F** is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the **F** mark is missing or unreadable, assume an **F** mark of "0" and check the backlash when the unit is assembled.

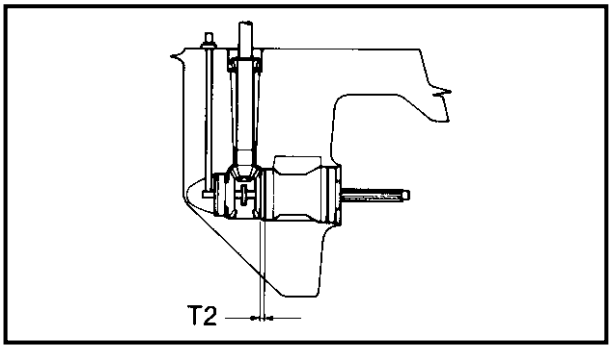
Example:
If **M** is "23.90 mm" **F** is "+5", then
T1 = 24.50 + 5/100 – 23.90 = 0.65

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

SHIM SELECTION (EXCEPT FOR USA AND CANADA)

NOTE:

- Use a minimum number of shims to obtain the thickness equal or nearly equal to the calculation.
- Install the shims with the thicker one on the outer side.

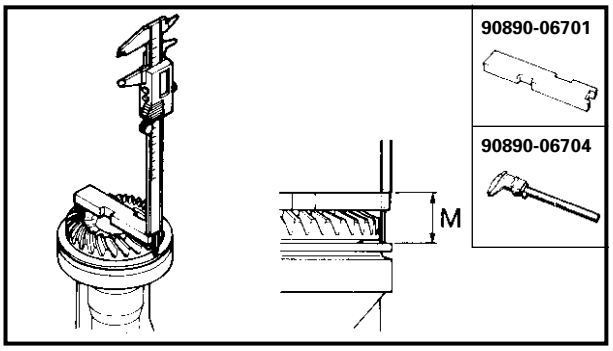


Reverse gear shim

1. Find reverse gear shim thickness (**T2**) by selecting shims until the specified measurement (**M**) with the special tool is obtained.

NOTE:

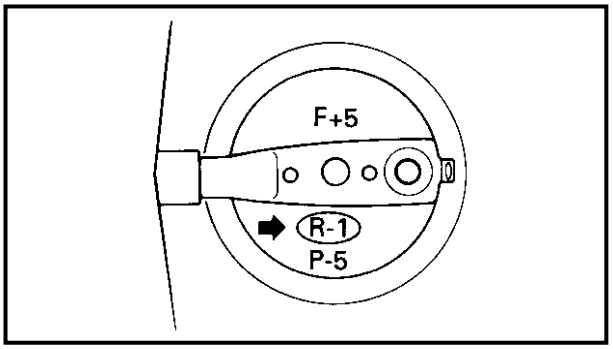
Be sure to remove the O-ring from under the thrust washer.



2. Using a digital caliper at the specified measurement (**M**) established above, measure the distance between the washer top and special tool top as shown.

Shim thickness (T2)=
50 hp:
M – 25.40 mm – R/100 mm
60, 70 hp
M – 28.00 mm – R/100 mm
75 ~ 90 hp:
M – 26.00 mm – R/100 mm

Shimming plate:
90890-06701
Digital caliper:
90890-06704



3. **R** is the deviation of the lower case dimension from standard. It is stamped on the trim tab mounting surface of the lower case in 0.01 mm units. If the **R** mark is missing or unreadable, assume an **R** mark of "0" and check the backlash when the unit is assembled.

Example:
If **M** is "28.60 mm" **R** is "–1", then
T2 = 28.60 – 28.00 + 1/100 = 0.61

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40 and 0.50 mm

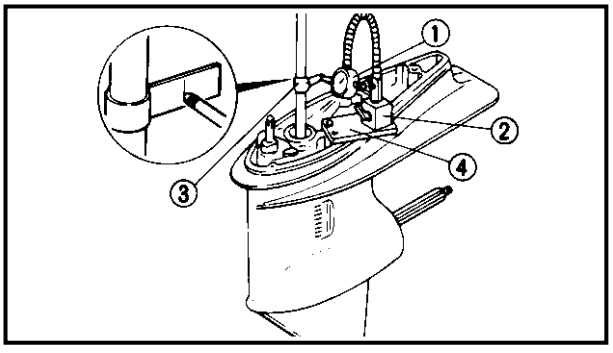
NOTE:
- Use a minimum number of shims to obtain the thickness equal or nearly equal to the calculation.
- Install the shims with the thicker one on the outer side.

163015-0*

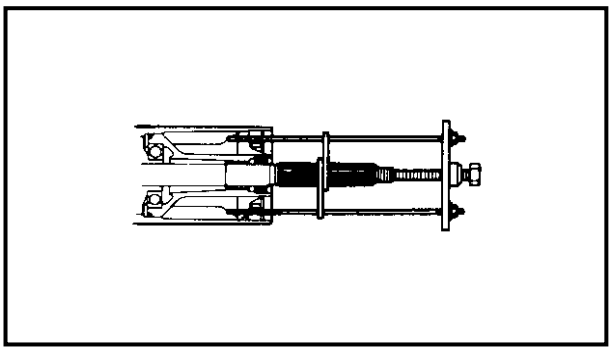
MEASURING THE BACKLASH

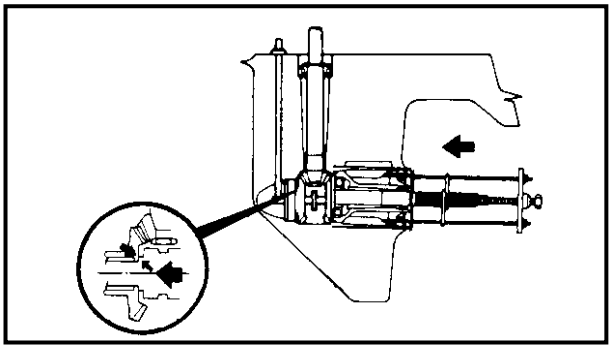
NOTE:
- Do not install the water pump components when measuring the backlash.
- Both forward and reverse gear backlashes should be measured.
- If both the forward and reverse gear backlashes are larger than specified, the pinion may be too high.
- If both forward and reverse gear backlashes are smaller than specified, the pinion may be too low.
- If either of these conditions exists, then check the pinion shim selection.

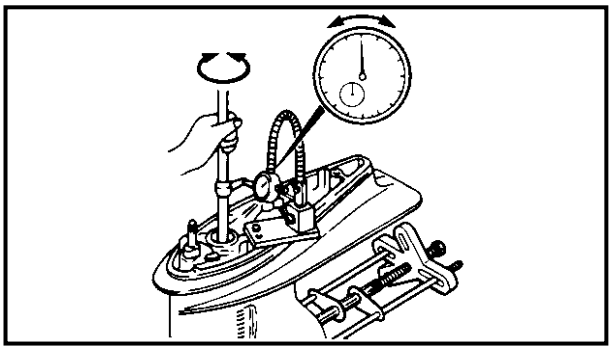
1. Place the shift rod in neutral.
2. Install a dial gauge on the gear case.
3. Install a backlash indicator gauge (special service tool) on the drive shaft (50, 60, 70 hp: 18 mm in diameter, 75, 80, 90 hp: 20 mm in diameter) and make the dial gauge stem contact the mark on the indicator gauge.



Dial gauge:
YU-3097/90890-01252..... ①
Magnet base:
YU-34481/90890-06705..... ②
Backlash indicator:
YB-6265/90890-06706..... ③
Backlash adjusting plate:
YB-7003..... ④







Forward gear

1. Install a bearing housing puller (special service tool) in the bearing housing so that it engages with the center bolt of the propeller shaft.

NOTE:

Tighten the center bolt while turning the propeller shaft a few times clockwise.

Center bolt:
5 Nm (0.5 m • kg, 3.6 ft • lb)

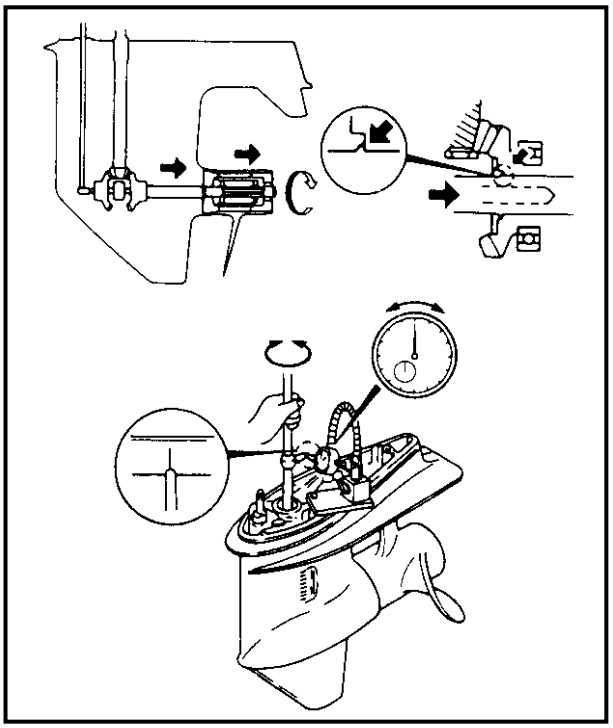
Claw:
YB-6207/90890-06503
50, 60, 70 hp:
90890-06502
Universal puller:
YB-6117
Stopper guide plate:
90890-06501
Center bolt:
90890-06504

2. Slowly turn the drive shaft in and out and read the dial gauge when the drive shaft stops in each direction.

3. Determine the shim size according to the chart.

50, 75, 80, 90 hp:

Forward gear backlash	Decrease or increase
Less than 0.08 mm (0.003 in)	Thickness of shim to be decreased (mm) = (0.17 – measurement) × 0.60
0.08 – 0.25 mm (0.003 – 0.009 in)	Decrease or increase will be unnecessary
More than 0.25 mm (0.009 in)	Thickness of shim to be increased (mm) = (measurement – 0.17) × 0.60

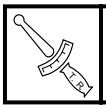


60, 70 hp:

Forward gear backlash	Decrease or increase
Less than 0.09 mm (0.004 in)	Thickness of shim to be decreased (mm) = (0.19 – measurement) × 0.53
0.09 – 0.28 mm (0.004 – 0.011 in)	Decrease or increase will be unnecessary
More than 0.28 mm (0.011 in)	Thickness of shim to be increased (mm) = (measurement – 0.19) × 0.53

Reverse gear

1. Install a propeller on the propeller shaft, with the front facing backward, fit the nut and tighten.

	**Nut (propeller): 5 Nm (0.5 m • kg, 3.6 ft • lb)**

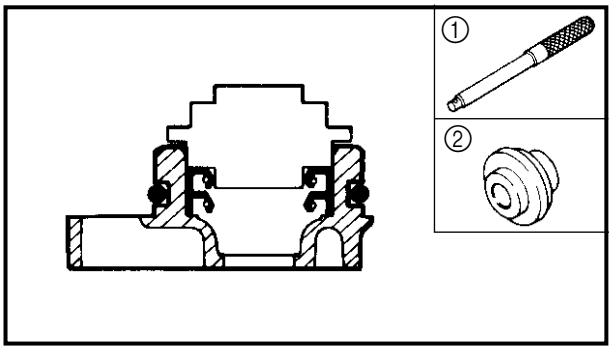
2. Slowly turn the drive shaft in and out and read the dial gauge when the drive shaft stops in each direction.
3. Determine the shim size according to the chart.

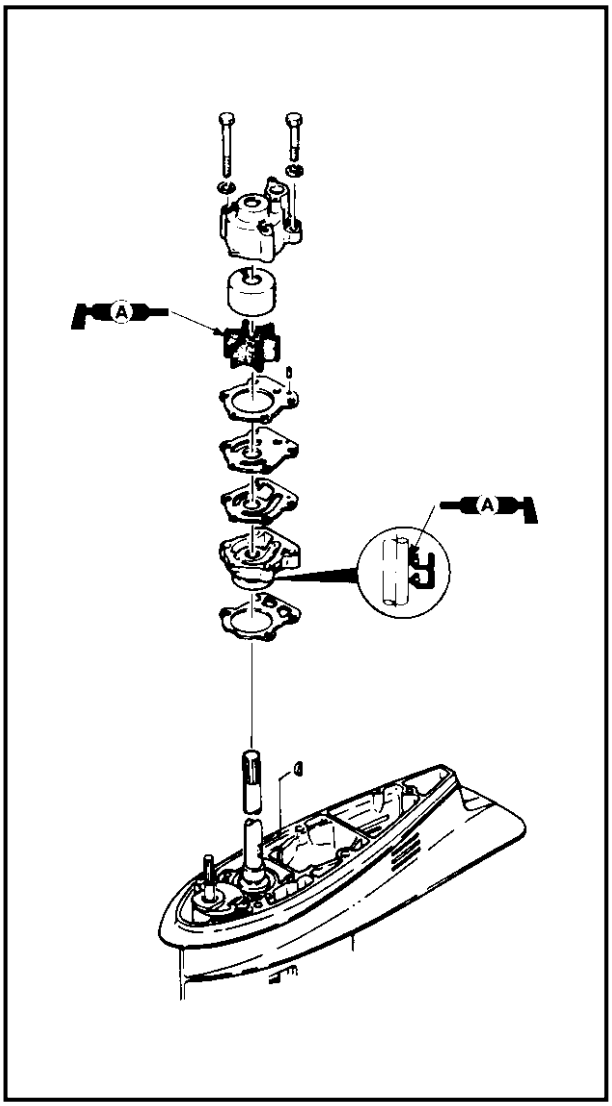
50 hp:

Reverse gear backlash	Decrease or increase
Less than 0.84 mm (0.033 in)	Thickness of shim to be increased (mm) = (1.01 – measurement) × 0.60
0.84 – 1.17 mm (0.033 – 0.046 in)	Decrease or increase will be unnecessary
More than 1.17 mm (0.046 in)	Thickness of shim to be decreased (mm) = (measurement – 1.01) × 0.60

60, 70 hp:

Reverse gear backlash	Decrease or increase
Less than 0.75 mm (0.033 in)	Thickness of shim to be increased (mm) = (0.94 – measurement) × 0.53
0.75 – 1.13 mm (0.033 – 0.044 in)	Decrease or increase will be unnecessary
More than 1.13 mm (0.044 in)	Thickness of shim to be decreased (mm) = (measurement – 0.94) × 0.53





75, 80, 90 hp:

Reverse gear backlash	Decrease or increase
Less than 0.67 mm (0.026 in)	Thickness of shim to be increased (mm) = (0.84 – measurement) × 0.60
0.67 – 1.00 mm (0.026 – 0.039 in)	Decrease or increase will be unnecessary
More than 1.00 mm (0.039 in)	Thickness of shim to be decreased (mm) = (measurement – 0.84) × 0.60

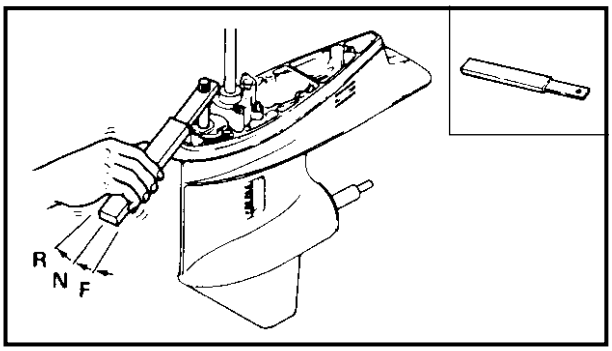
164000-0

WATER PUMP INSTALLATION

1. Install a new oil seal in the oil-seal housing, and fit a new O-ring in the O-ring groove.

Driver rod:
YB-6071 ..... ①
Oil seal attachment:
YB-6269 ..... ②

2. Grease the O-ring and the lip of the oil-seal, then install the oil-seal housing complete to the gear-case and fit the dowel-pins.
3. Aligning with the dowel-pins, install a new gasket, a plate and a new gasket on the oil-seal housing.
4. Install a key in the keyway on the drive-shaft and insert a impeller.
5. Grease the impeller and install the water-pump housing, turning the drive shaft clockwise, then tighten the bolts.

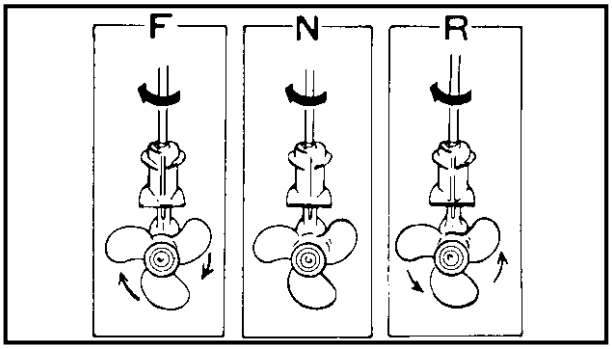


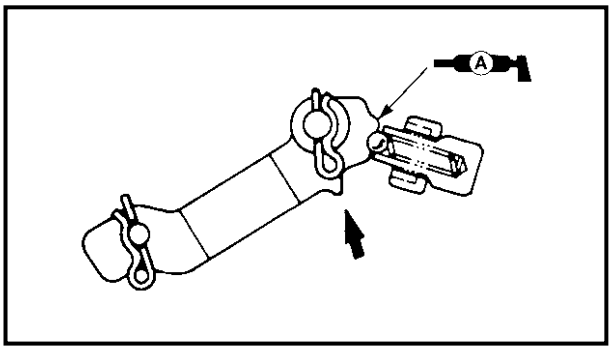
170003-0*

INSTALLATION

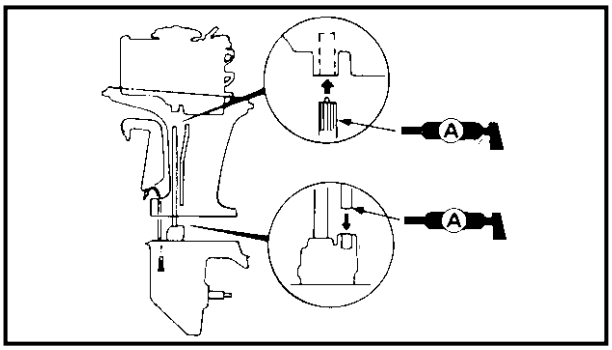
1. Check that the clutch dog shifts to "Forward", "Neutral" and "Reverse" correctly by turning the shift rod, and shift into "Neutral".

	**Shift rod wrench:** **YB-6052**

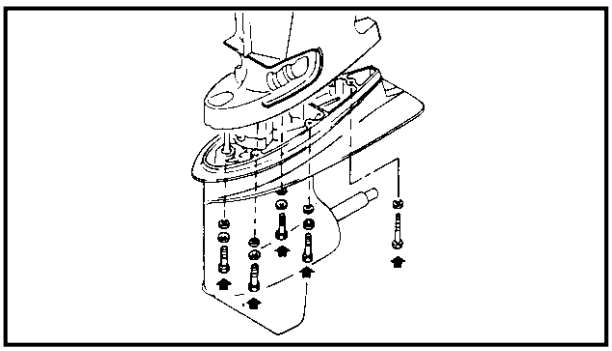


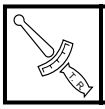


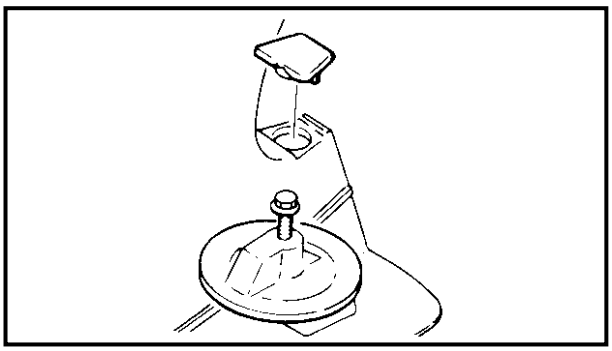
2. Align the mark on the shift lever with the arrow mark on the bottom cowling.



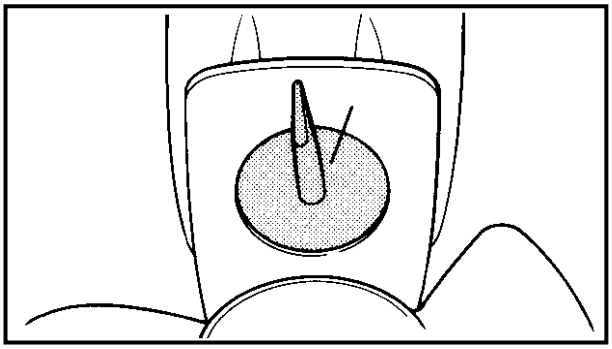
3. Grease the spline of the drive-shaft and the water-tube outer face, align the water-tube and drive-shaft, install the lower unit and tighten the bolts to the specified torque.

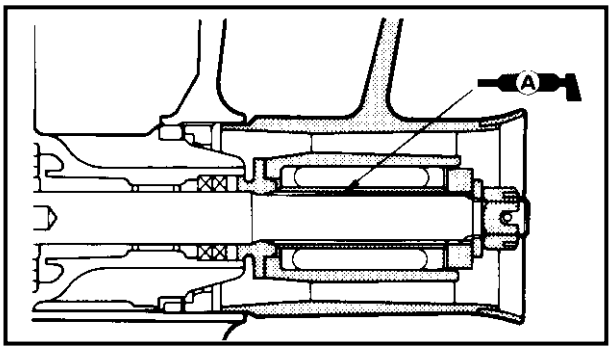


	**Lower unit mounting bolts:** **40 Nm (4.0 m • kg, 29 ft • lb)**



4. Install the trim tab on the gear case. Be sure to align the marks put on both of them when they were removed. Place the cap over the bolt hole.

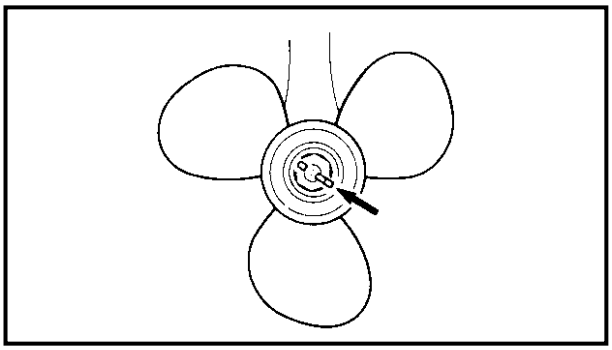




5. Install the spacers, propeller, washer, and propeller nut over the propeller shaft.

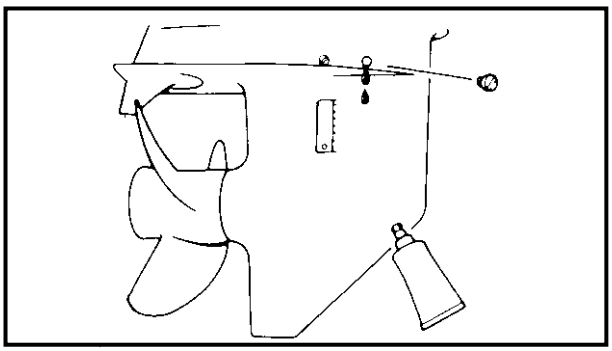
	Propeller nut: **35 Nm (3.5 m • kg, 25 ft • lb)**

6. Align the recess in the propeller nut with the hole in the propeller shaft and insert the cotter pin into the hole. Be sure to bend the cotter pin ends.

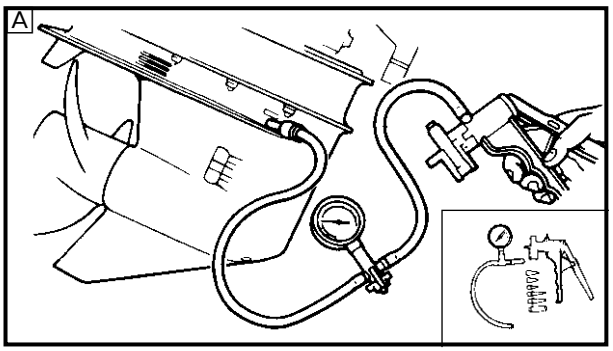


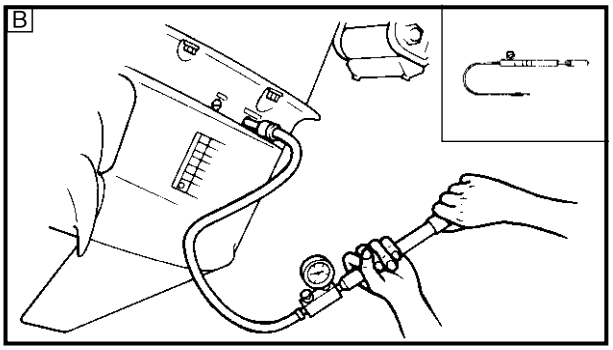
NOTE:

If the propeller nut does not align with the propeller shaft hole when the nut is tightened to specification, turn it in further so that they align.



7. Fill with fresh gear oil through the oil plug-hole until oil flows out through the level-plug hole, then secure the plugs in these two holes. (Secure the check plug first.)





165000-0

LOWER UNIT LEAKAGE CHECK

1. Tighten the gear oil-drain screw and connect the tester to the oil-level hole.
2. Pump the tester, and apply a pressure of 100 kPa (1.0 kg/cm^2, 14.2 psi). Then, place the gear case in the water tank.
3. Check that the pressure is held at 100 kPa (1.0 kg/cm^2, 14.2 psi) for 10 seconds.

CAUTION:

Do not overpressurize.

NOTE:

If the pressure falls, leakage from the lower unit is unacceptable, requiring re-inspection of its component parts.

Pressure tester:
YB-35956/90890-06762

A For USA and Canada
B Except for USA and Canada