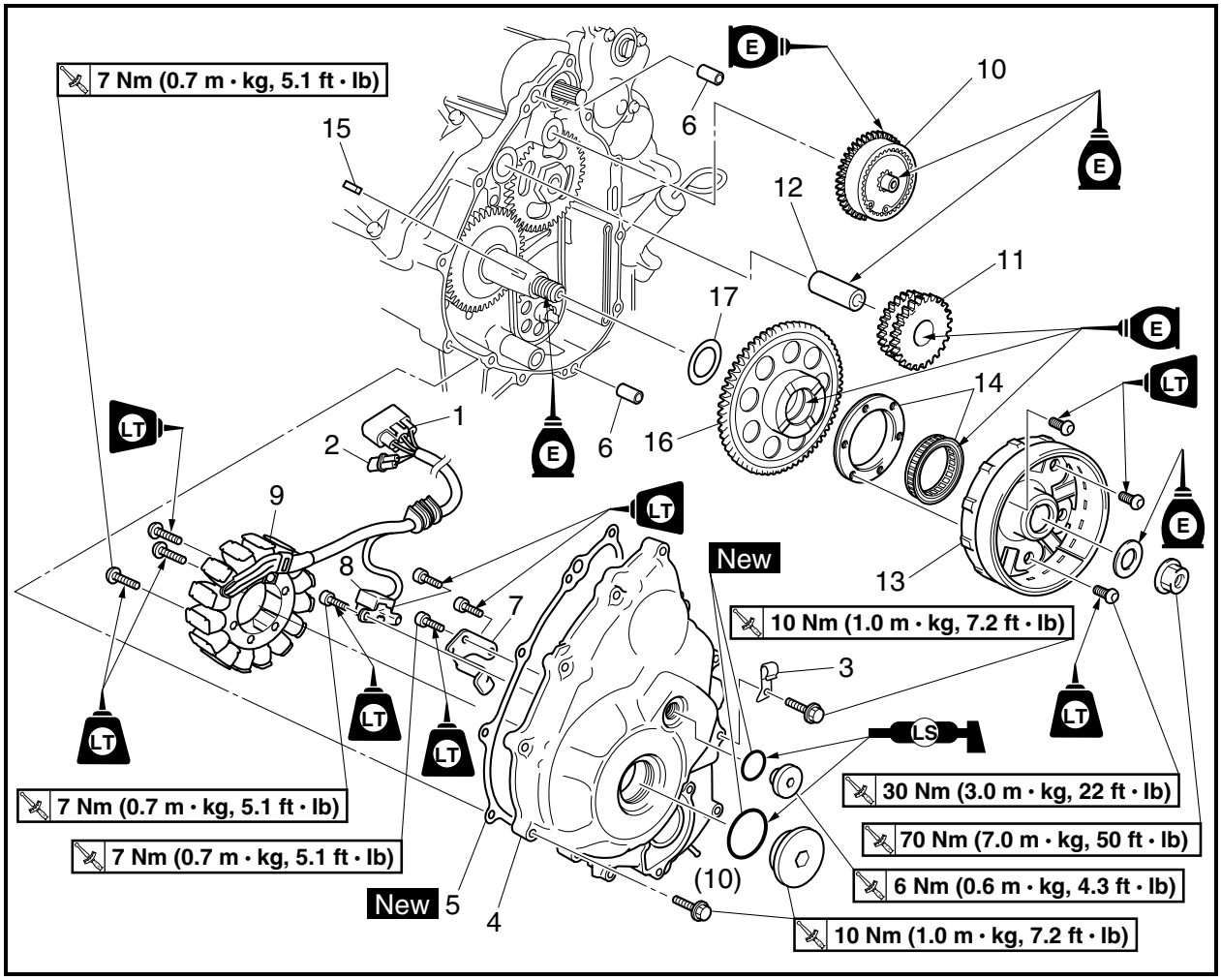
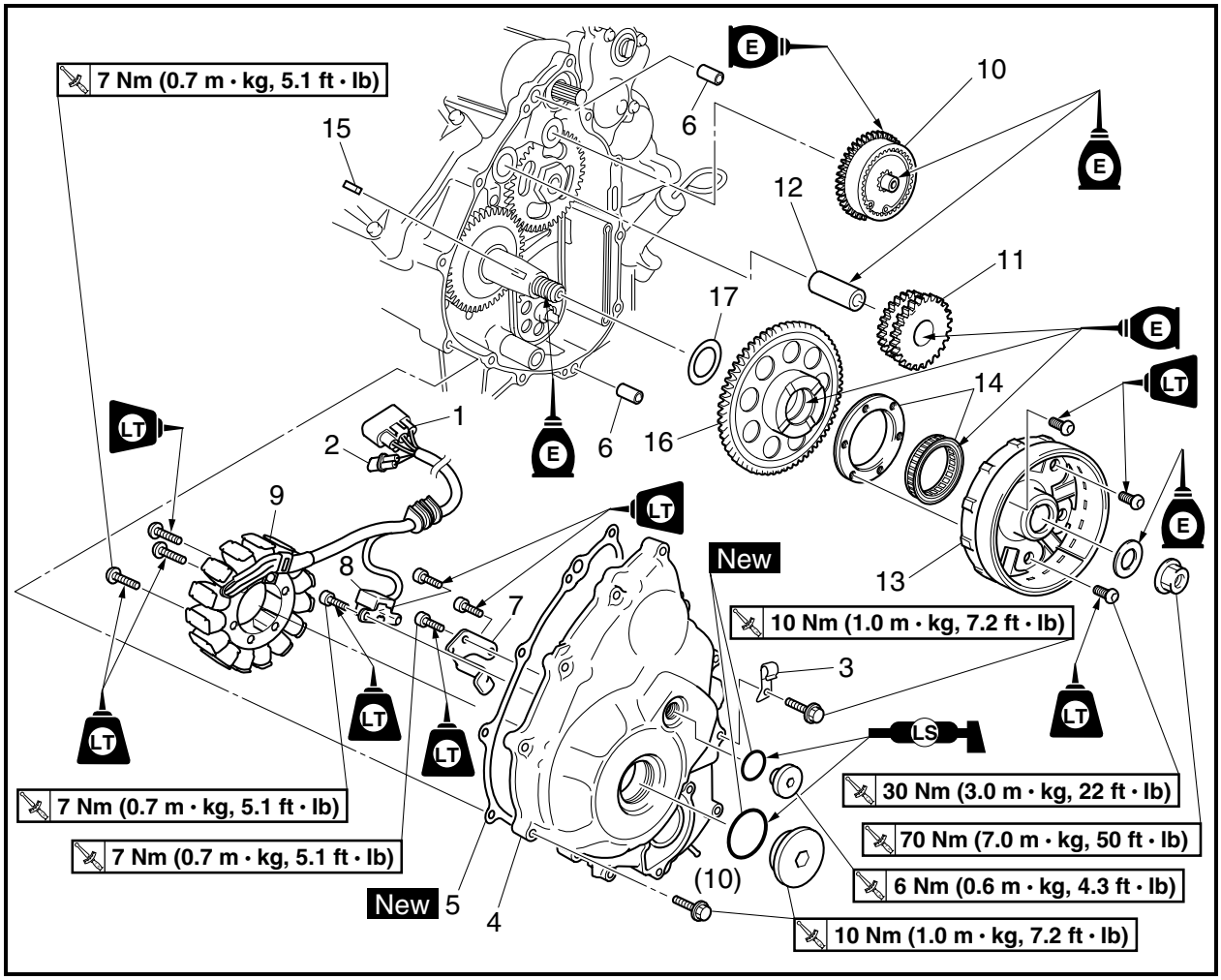
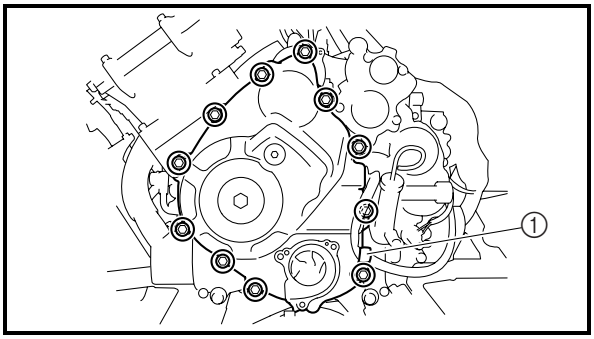



| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| 5 | AC magneto cover gasket | 1 | |
| 6 | Dowel pin | 2 | |
| 7 | Lead holder | 1 | |
| 8 | Crankshaft position sensor | 1 | |
| 9 | Stator coil | 1 | |
| 10 | Torque limiter | 1 | |
| 11 | Starter idle gear | 1 | |
| 12 | Starter idle gear shaft | 1 | |
| 13 | AC magneto rotor | 1 | Refer to "REMOVING THE AC MAGNETO ROTOR" and "INSTALLING THE AC MAGNETO ROTOR". |
| 14 | Starter clutch | 1 | |
| 15 | Woodruff key | 1 | |
| 16 | Starter wheel gear | 1 | |




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| 17 | Washer | 1 | For installation, reverse the removal procedure. |

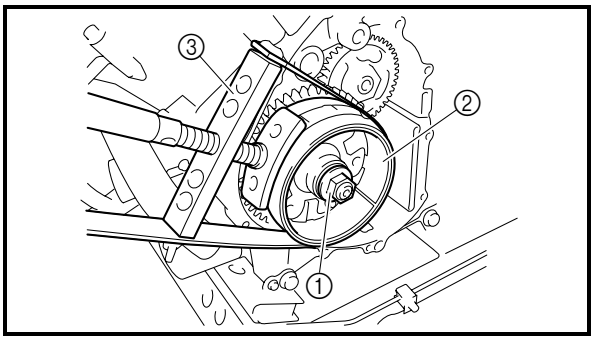



EBS00259
**REMOVING THE AC MAGNETO ROTOR**

1. Remove:
   - lead holder ①
   - AC magneto cover

**NOTE:**

Loosen each bolt 1/4 of a turn at a time, in stages and in a crisscross pattern. After all of the bolts are fully loosened, remove them.

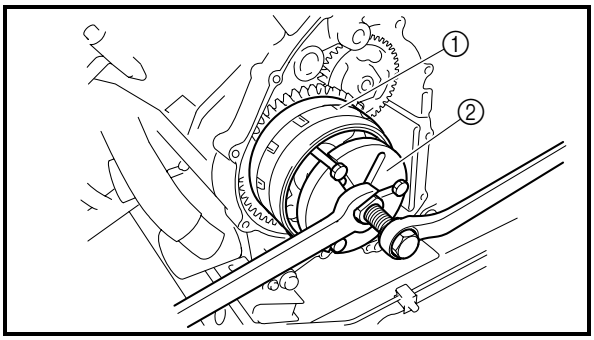



2. Remove:
   - AC magneto rotor nut ①
   - washer

**NOTE:**

- While holding the AC magneto rotor ② with the sheave holder ③, loosen the AC magneto rotor nut.
- Do not allow the sheave holder to touch the projection on the rotor.

**Sheave holder**
**90890-01701**
**Primary clutch holder**
**YS-01880-A**




3. Remove:
   - AC magneto rotor ①
     (with the starter clutch)
   - woodruff key

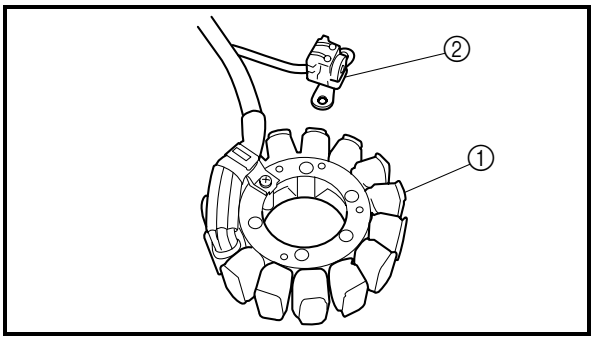
**CAUTION:**

**To protect the end of the crankshaft, place an appropriate sized socket between the flywheel puller set center bolt and the crankshaft.**

**NOTE:**

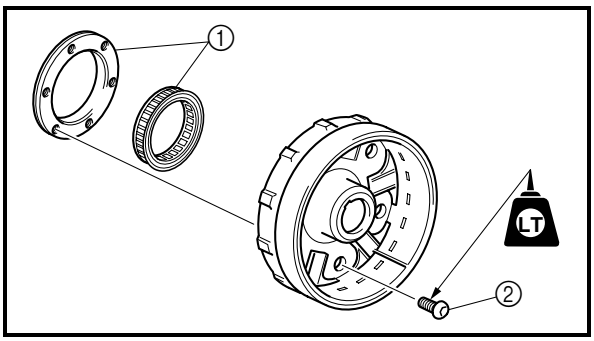
- Use the flywheel puller ②.
- Install the flywheel puller bolts to the threaded holes of the starter clutch.
- Make sure the flywheel puller is centered over the AC magneto rotor.

**Flywheel puller**
**90890-01362**
**Heavy duty puller**
**YU-33270-B**




EBS00262
## CHECKING THE STATOR COIL AND CRANKSHAFT POSITION SENSOR

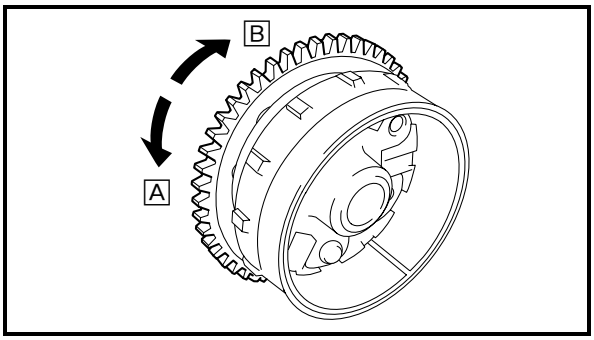
1. Check:
   - stator coil ①
   - crankshaft position sensor ②
     Damage → Replace the crankshaft position sensor/stator assembly.




EBS00263
## CHECKING THE STARTER CLUTCH

1. Check:
   - starter one-way clutch ①
     Cracks/damage → Replace.
   - bolts ②
     Loose → Replace with a new one, and clinch the end of the bolt.

**NOTE:**
The arrow mark on the starter clutch must face inward, away from the AC magneto rotor.




**Starter clutch bolt**
**30 Nm (3.0 m · kg, 22 ft · lb)**
**LOCTITE®**

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Install the starter wheel gear to the starter clutch, and hold the starter clutch.
b. When turning the starter wheel gear counter clockwise [A], the starter clutch and the wheel gear should be engaged.
   If not, the starter clutch is faulty. Replace it.
c. When turning the starter wheel gear clockwise [B], the starter wheel gear should turn freely.
   If not, the starter clutch is faulty. Replace it.

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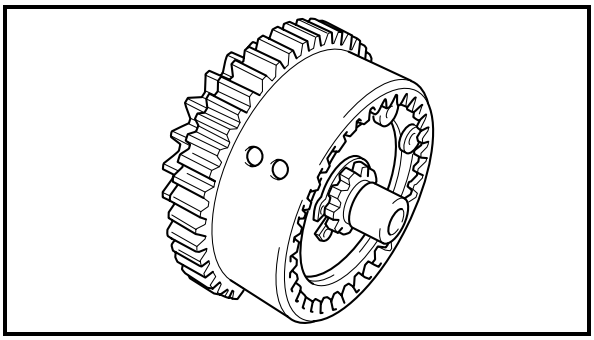
2. Check:
   - starter idle gear teeth
   - starter wheel gear teeth
   Burrs/clips/roughness/wear → Replace.
3. Check:
   - starter wheel gear
   (contacting surface)
   Damage/pitting/wear → Replace.

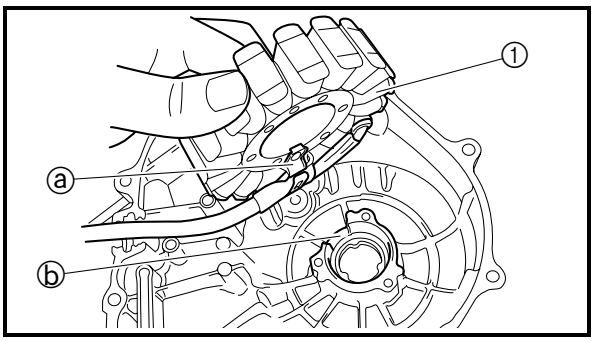


**CHECKING THE TORQUE LIMITER**

- torque limiter
  Damage/wear → Replace.

**NOTE:**

Do not disassemble the torque limiter.




EBS00268

**INSTALLING THE AC MAGNETO ROTOR**

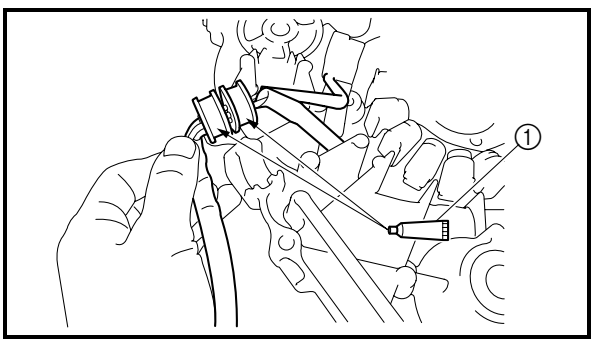
1. Install:
   - stator coil ①

LT **7 Nm (0.7 m · kg, 5.1 ft · lb)**

| | |
|---|---|
| | **Stator coil bolt**<br>**7 Nm (0.7 m · kg, 5.1 ft · lb)** |

**NOTE:**

Align the projection ⓐ on the stator coil with the slot ⓑ in the AC magneto cover.

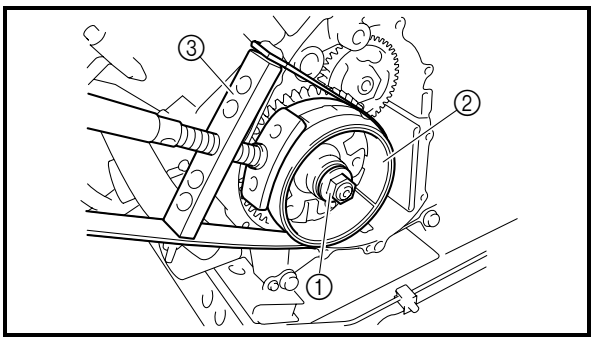



2. Apply:
   - Sealant ①
   (into the slit)

| | |
|---|---|
| | **Yamaha bond No. 1215**<br>**90890-85505**<br>**(Three bond No.1215®)** |

3. Install:
   - woodruff key
   - AC magneto rotor

**NOTE:**
- Before installing the rotor, clean the outside of the crankshaft and the inside of the rotor.
- After installing the rotor, check that the rotor rotates smoothly. If not, reinstall the key and rotor.

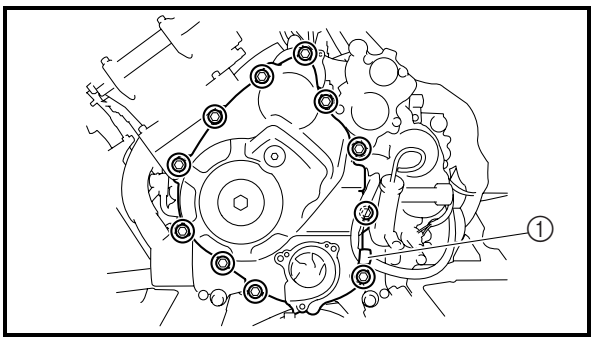



4. Tighten:
   - AC magneto rotor nut ①

**70 Nm (7.0 m · kg, 50 ft · lb)**

**NOTE:**
While holding the AC magneto rotor ② with the sheave holder ③, tighten the AC magneto rotor nut.

**Sheave holder**
**90890-01701**
**Primary clutch holder**
**YS-01880-A**

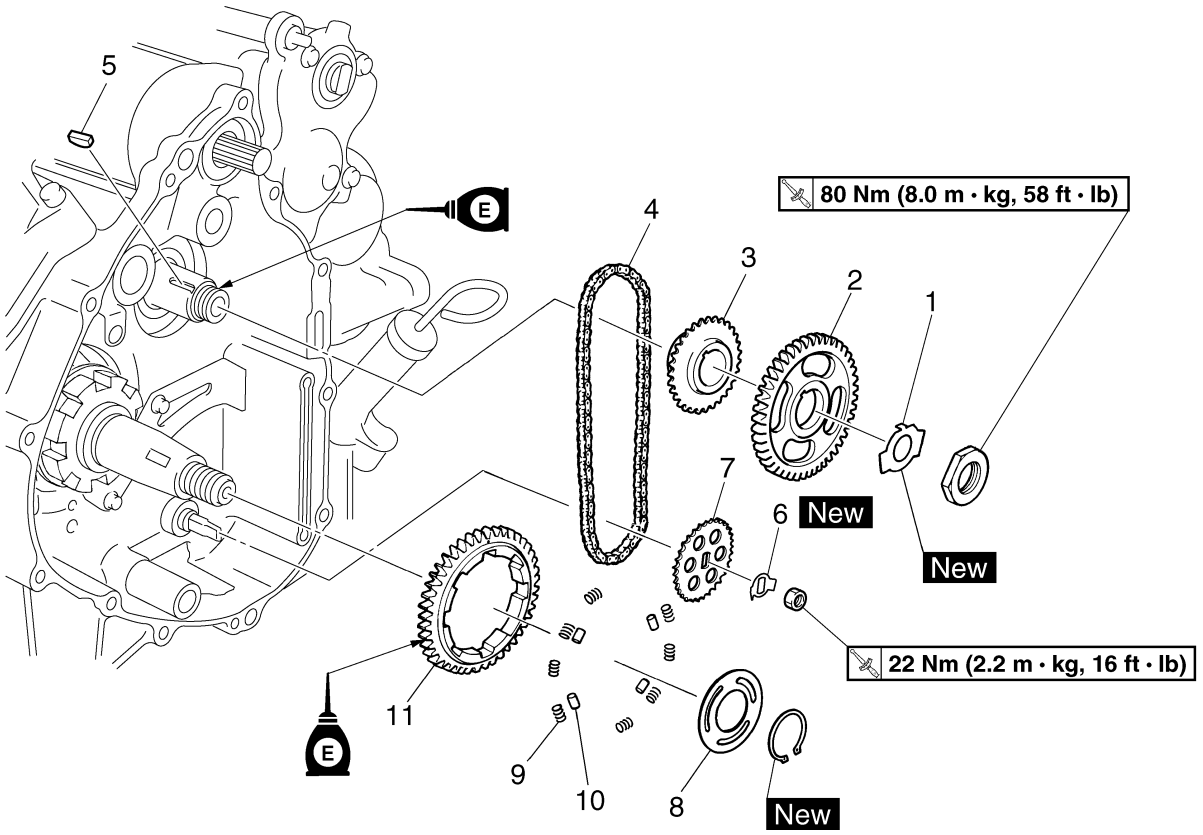



5. Install:
   - AC magneto cover
   - lead holder ①
   - AC magneto cover bolts

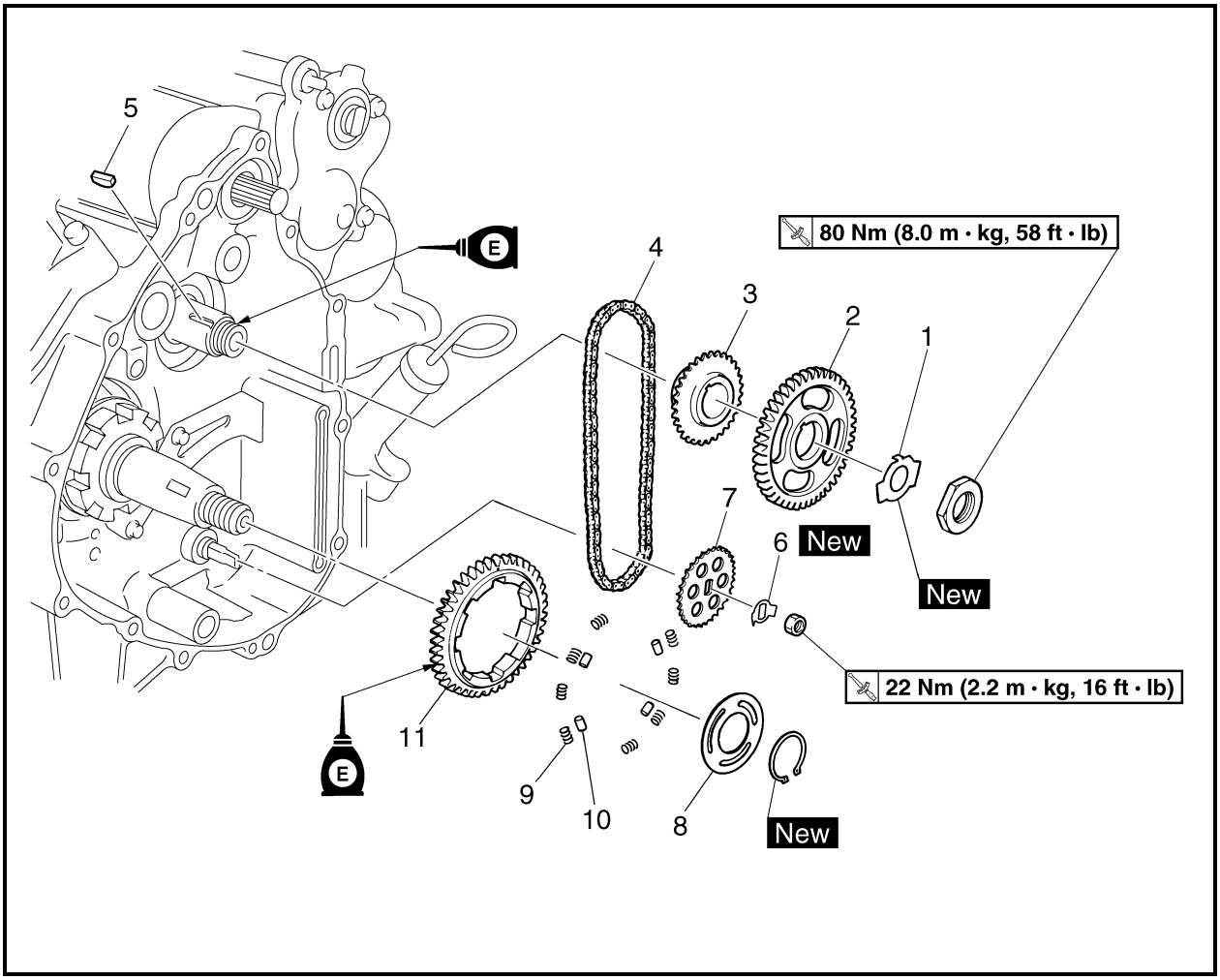
**10 Nm (1.0 m · kg, 7.2 ft · lb)**

**NOTE:**
Tighten the AC magneto cover bolts in stages, using a crisscross pattern.

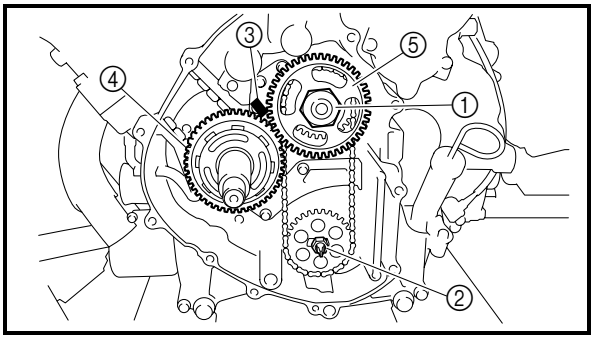
# BALANCER GEARS AND OIL PUMP GEARS




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the balancer gears and oil pump gears** | | Remove the parts in the order listed. |
| | Starter wheel gear | | Refer to "AC MAGNETO". |
| 1 | Lock washer | 1 | Refer to "REMOVING THE BALANCER DRIVEN GEAR AND OIL PUMP DRIVEN GEAR" and "INSTALLING THE BALANCER DRIVE GEAR, BALANCER DRIVEN GEAR, AND OIL PUMP DRIVEN GEAR". |
| 2 | Balancer driven gear | 1 | |
| 3 | Oil pump drive gear | 1 | |
| 4 | Chain | 1 | |
| 5 | Straight key | 1 | |




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| 6 | Lock washer | 1 | Refer to "REMOVING THE BALANCER DRIVEN GEAR AND OIL PUMP DRIVEN GEAR" and "INSTALLING THE BALANCER DRIVE GEAR, BALANCER DRIVEN GEAR, AND OIL PUMP DRIVEN GEAR". |
| 7 | Oil pump driven gear | 1 | |
| 8 | Plate | 1 | |
| 9 | Spring | 8 | Refer to "REMOVING THE BALANCER DRIVEN GEAR AND OIL PUMP DRIVEN GEAR" and "INSTALLING THE BALANCER DRIVE GEAR, BALANCER DRIVEN GEAR, AND OIL PUMP DRIVEN GEAR". For installation, reverse the removal procedure. |
| 10 | Pin | 4 | |
| 11 | Balancer drive gear | 1 | |




**REMOVING THE BALANCER DRIVEN GEAR AND OIL PUMP DRIVEN GEAR**

1. Straighten the lock washer tabs.
2. Loosen:
   - balancer driven gear nut ①
   - oil pump driven gear nut ②

**NOTE:**

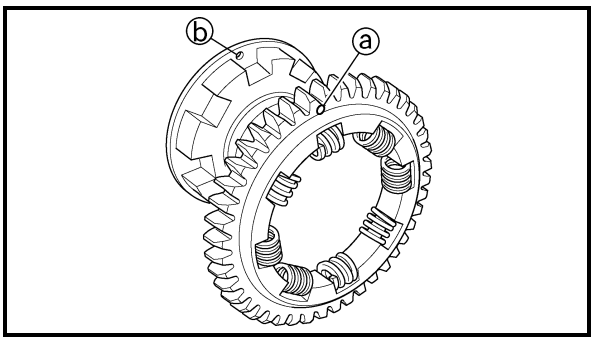
Place an aluminum plate ③ between the teeth of the balancer drive gear ④ and balancer driven gear ⑤, then loosen the nuts.

**CHECKING THE OIL PUMP DRIVE**

1. Check:
   - oil pump drive gear
   - oil pump driven gear
     Cracks/wear/damage → Replace.

**CHECKING THE BALANCER DRIVE**

1. Check:
   - balancer drive gear
   - balancer driven gear
     Damage/wear → Replace the balancer drive gear and balancer driven gear as a set.
     Excessive noise during operation → Replace the balancer drive gear and balancer driven gear as a set.

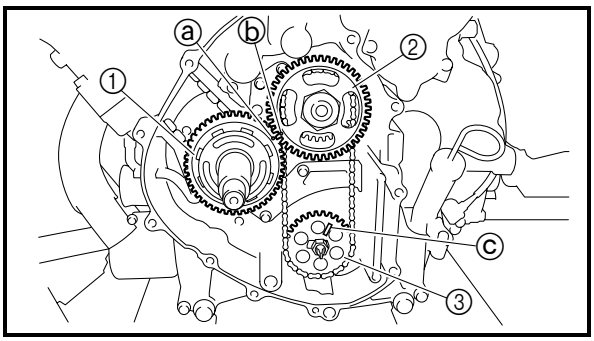



**INSTALLING THE BALANCER DRIVE GEAR, BALANCER DRIVEN GEAR, AND OIL PUMP DRIVEN GEAR**

1. Install:
   - pin
   - spring
   - balancer drive gear (onto the buffer boss)

**NOTE:**

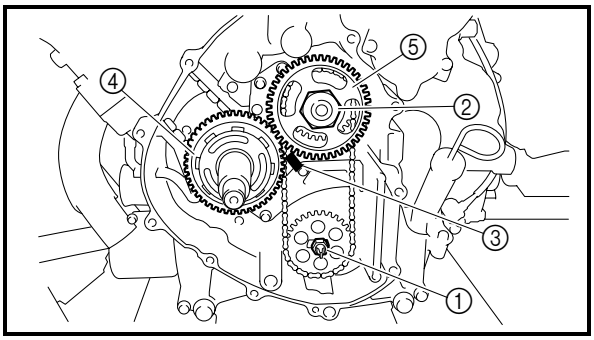
Align the punch mark ⓐ on the balancer drive gear with the hole ⓑ to the buffer boss.




2. Install:
   - balancer drive gear ①
   - balancer driven gear ②
   - oil pump driven gear ③

**NOTE:**

- Align the punch mark ⓐ on the balancer drive gear with the punch mark ⓑ on the balancer driven gear.
- Install the oil pump driven gear with the "3B4" mark ⓒ facing out.




3. Install:
   - lock washers New
   - oil pump driven gear nut ①

     **22 Nm (2.2 m · kg, 16 ft · lb)**
   - balancer driven gear nut ②

     **80 Nm (8.0 m · kg, 58 ft · lb)**

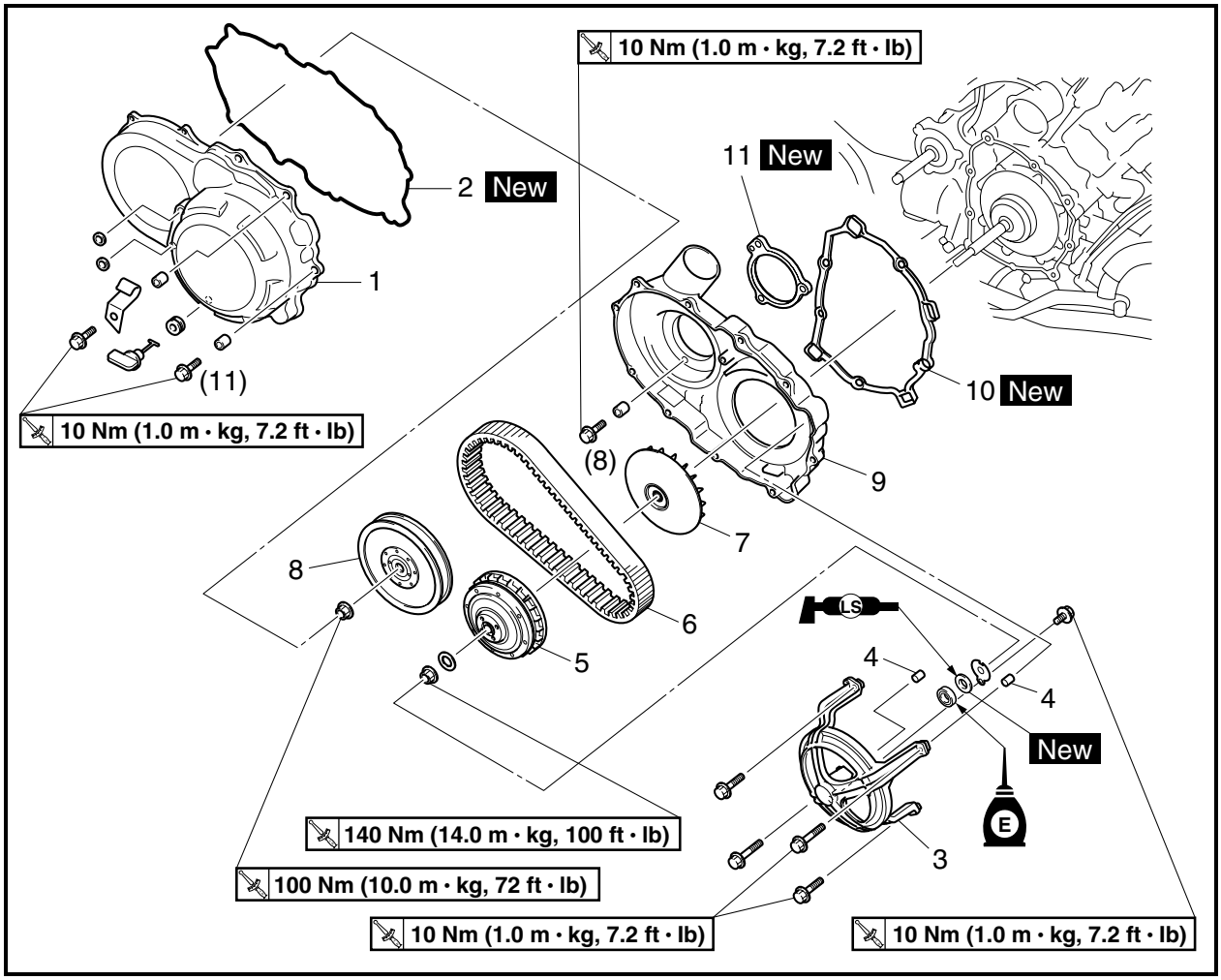
**NOTE:**

- Place an aluminum plate ③ between the teeth of the balancer drive gear ④ and balancer driven gear ⑤, then tighten the nuts.
- Apply the engine oil to the thread of axles and nuts.

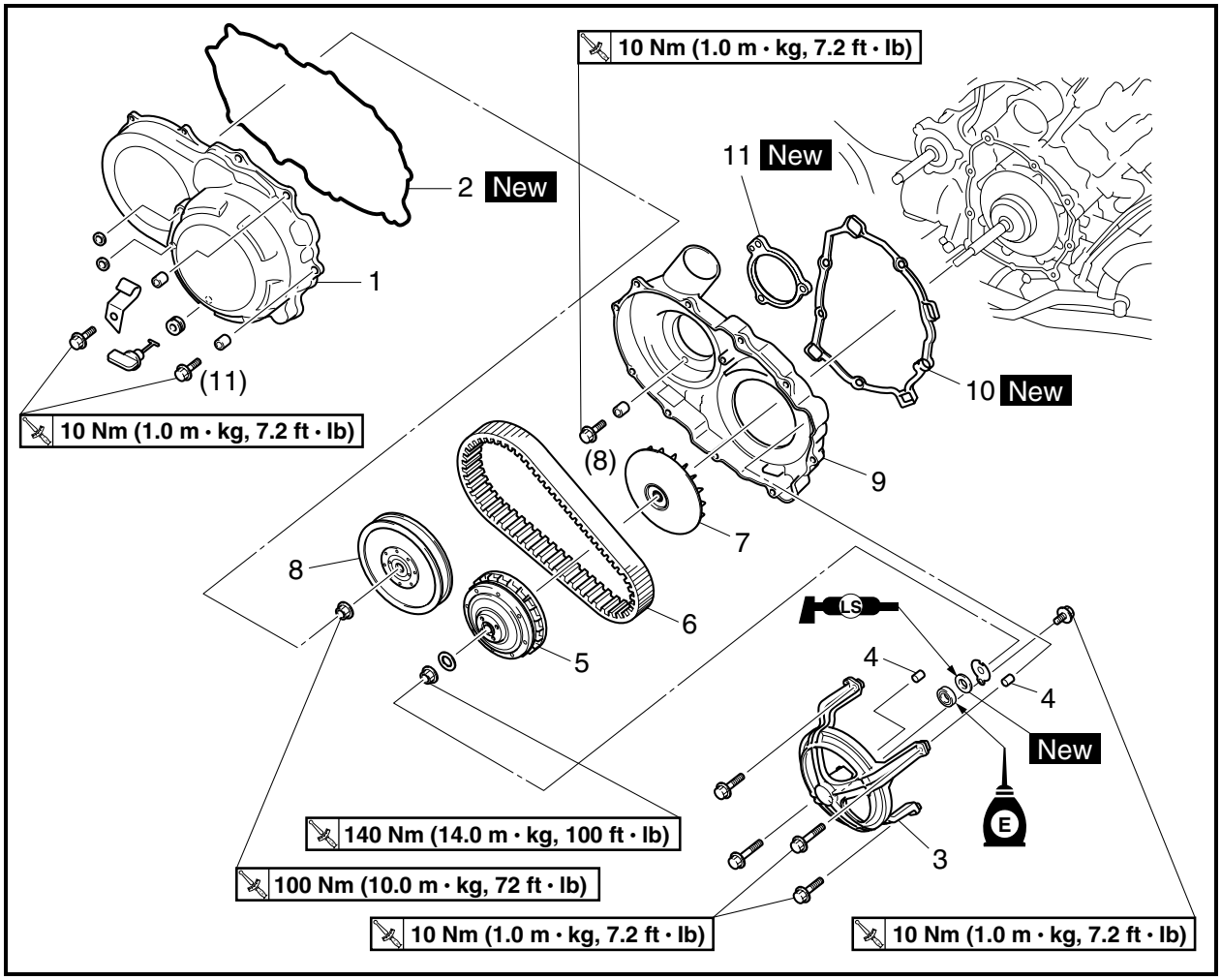
4. Bend the lock washer tabs along the balancer driven gear nut and oil pump driven gear nut.

EBS00269

# PRIMARY AND SECONDARY SHEAVES



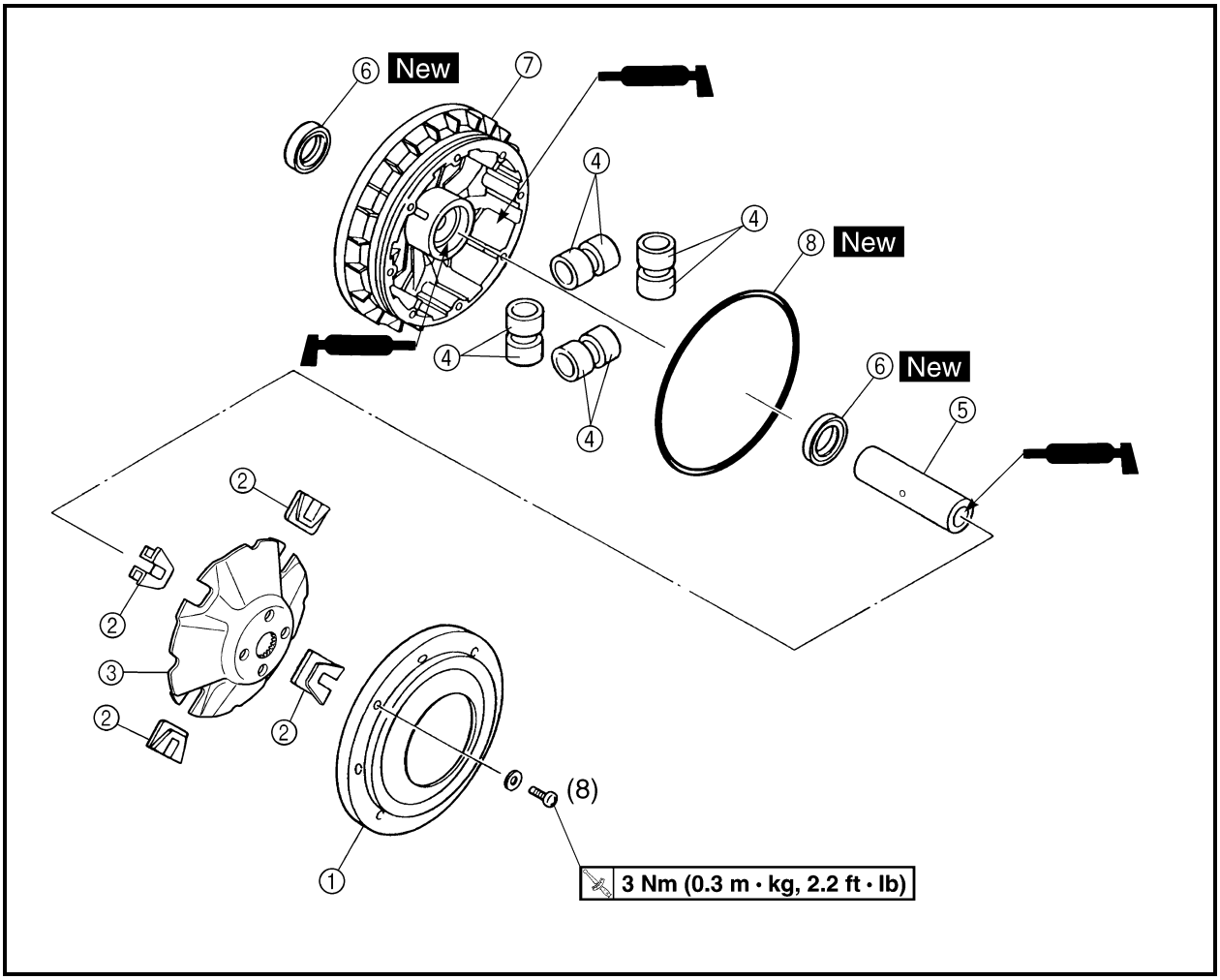

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the primary and secondary sheaves** | | Remove the parts in the order listed. |
| | Front fender/rear fender | | Refer to "ENGINE SKID PLATES, SEAT, CARRIERS AND FENDERS" in chapter 3. |
| | Right footrest board | | Refer to "FOOTREST BOARDS" in chapter 3. |
| | Air ducts | | Refer to "ENGINE REMOVAL". |
| 1 | Drive belt cover | 1 | |
| 2 | Rubber gasket | 1 | |
| 3 | Bearing housing | 1 | |
| 4 | Dowel pin | 2 | |
| 5 | Primary sheave assembly | 1 | Refer to "REMOVING THE PRIMARY AND SECONDARY SHEAVES" and "INSTALLING THE PRIMARY AND SECONDARY SHEAVES". |
| 6 | V-belt | 1 | |
| 7 | Primary fixed sheave | 1 | |
| 8 | Secondary sheave assembly | 1 | |




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| 9 | Drive belt case | 1 | |
| 10 | Rubber gasket | 1 | |
| 11 | Rubber gasket | 1 | |
| | | | For installation, reverse the removal procedure. |

EBS00270

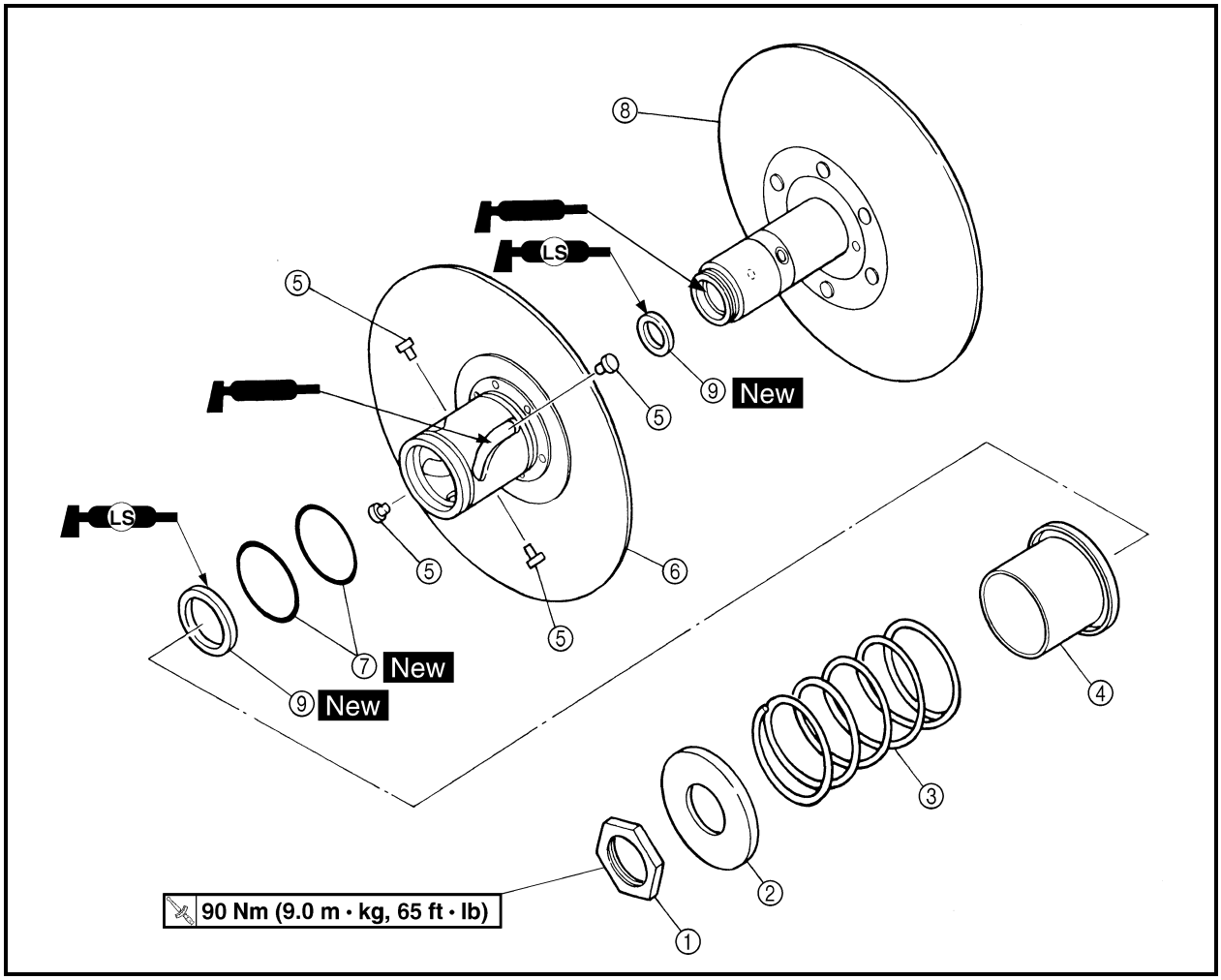
## PRIMARY SHEAVE



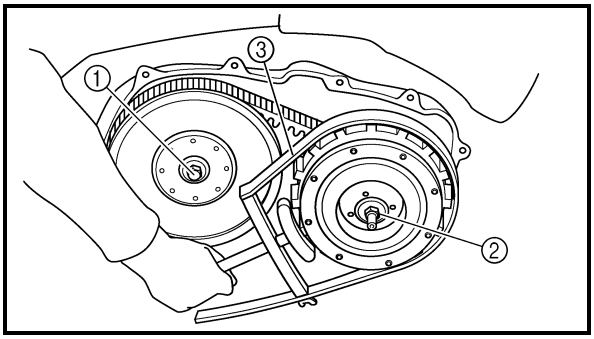

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Disassembling the primary sheave** | | Remove the parts in the order listed. |
| ① | Primary pulley sheave cap | 1 | |
| ② | Primary pulley slider | 4 | |
| ③ | Primary pulley cam | 1 | |
| ④ | Primary pulley weight | 8 | Refer to "ASSEMBLING THE PRIMARY SHEAVE". |
| ⑤ | Collar | 1 | |
| ⑥ | Oil seal | 2 | |
| ⑦ | Primary sliding sheave | 1 | |
| ⑧ | O-ring | 1 | |
| | | | For assembly, reverse the disassembly procedure. |

EBS00271

## SECONDARY SHEAVE




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Disassembling the secondary sheave** | | Remove the parts in the order listed. |
| ① | Nut | 1 | Refer to "DISASSEMBLING THE SECONDARY SHEAVE" and "ASSEMBLING THE SECONDARY SHEAVE". |
| ② | Spring seat | 1 | |
| ③ | Compression spring | 1 | |
| ④ | Spring seat | 1 | |
| ⑤ | Guide pin | 4 | |
| ⑥ | Secondary sliding sheave | 1 | |
| ⑦ | O-ring | 2 | |
| ⑧ | Secondary fixed sheave | 1 | |
| ⑨ | Oil seal | 2 | |
| | | | For assembly, reverse the disassembly procedure. |

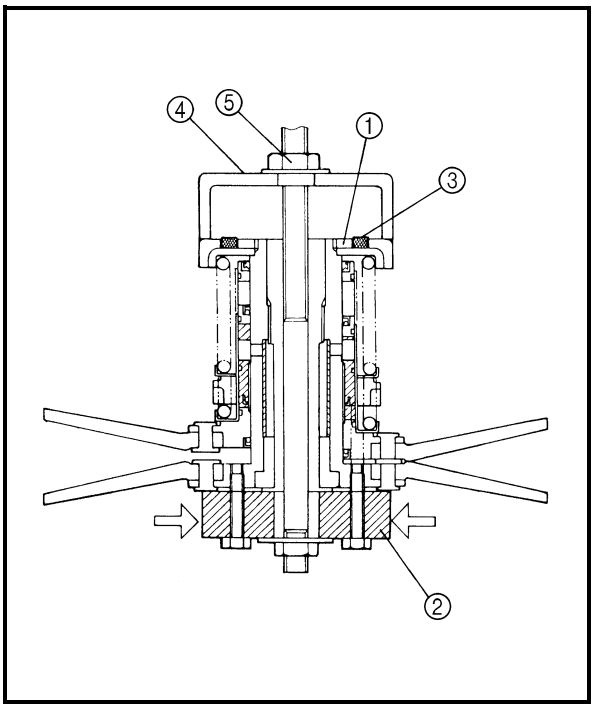


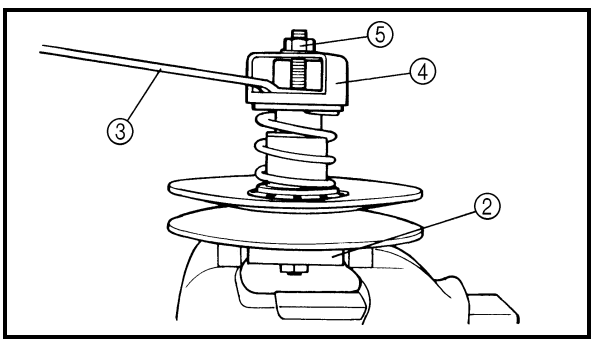

EBS00272
### REMOVING THE PRIMARY AND SECONDARY SHEAVES

1. Loosen:
   - secondary sheave nut ①
   - primary sheave nut ②

**NOTE:**
- Use the sheave holder ③ to hold the primary sheave.
- First, loosen the secondary sheave nut ②, then loosen the primary sheave nut ①.

**Sheave holder**
**90890-01701**
**Primary clutch holder**
**YS-01880-A**




EBS00273
### DISASSEMBLING THE SECONDARY SHEAVE

1. Remove:
   - nut ①

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Attach the sheave fixed block ②, locknut wrench ③ and sheave spring compressor ④ to the secondary sheave assembly.

**Sheave fixed block**
**90890-04135**
**Sheave fixed bracket**
**YM-04135**
**Locknut wrench**
**90890-01348, YM-01348**
**Sheave spring compressor**
**90890-04134, YM-04134**

b. Place the sheave fixed block in a vise and secure it.
c. Tighten the sheave spring compressor nut ⑤ and compress the spring.
d. Loosen the nut ① with the locknut wrench ③.
e. Remove the nut ①.
f. Remove the sheave spring compressor and locknut wrench.

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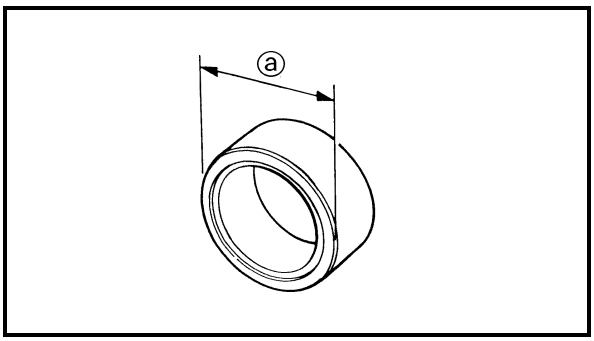
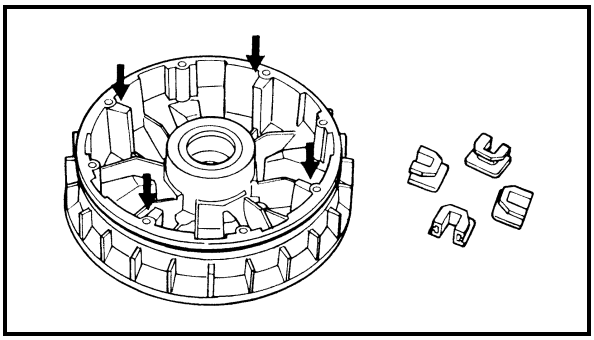



EBS00274
## CHECKING THE PRIMARY SHEAVE

1. Check:
   - weight outside diameter ⓐ
     Out of specification → Replace the weight.

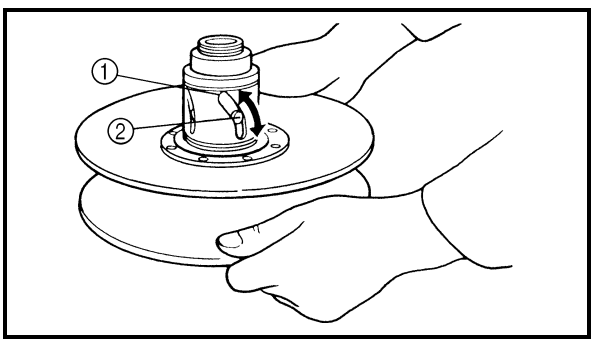
**Weight outside diameter**
**30 mm (1.18 in)**
**<Limit>: 29.5 mm (1.16 in)**



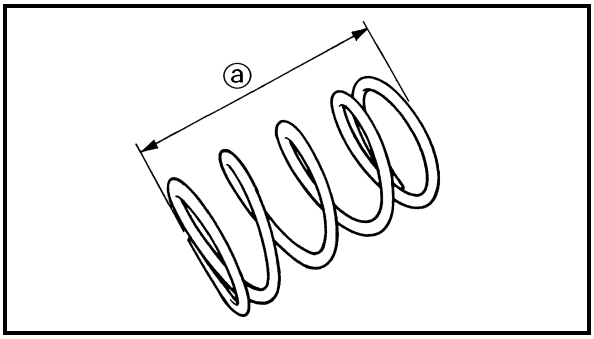
2. Check:
   - primary pulley slider
   - primary sliding sheave splines
     Wear/cracks/damage → Replace.
   - primary pulley cam
     Cracks/damage → Replace.
3. Check:
   - primary sliding sheave
   - primary fixed sheave
     Cracks/damage → Replace.

EBS00275
## CHECKING THE SECONDARY SHEAVE

1. Check:
   - secondary fixed sheave smooth operation
   - secondary sliding sheave smooth operation
     Scratches/damage → Replace as a set.

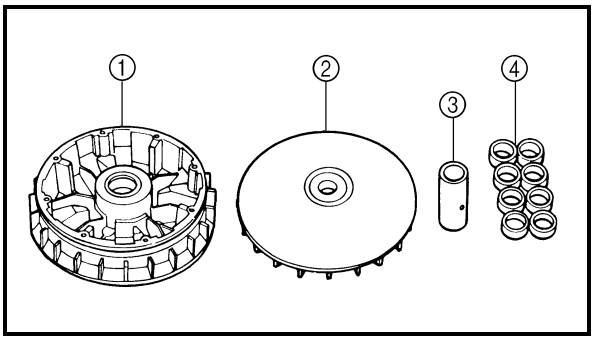



2. Check:
   - torque cam grooves ①
     Wear/damage → Replace.
3. Check:
   - guide pins ②
     Wear/damage → Replace.
4. Check:
   - secondary sheave spring
     Damage → Replace.




5. Measure:
   - secondary sheave spring free length ⓐ
     Out of specification → Replace the secondary sheave spring.

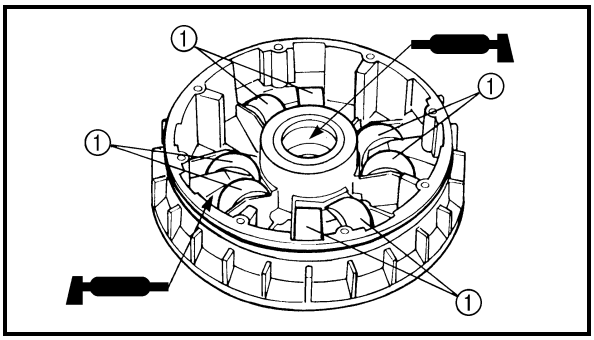
**Free length**
**130.6 mm (5.14 in)**
**<Limit>: 128.0 mm (5.04 in)**




EBS00276
**ASSEMBLING THE PRIMARY SHEAVE**

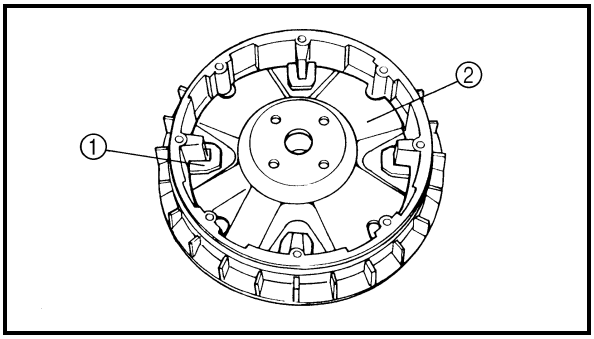
1. Clean:
   - primary sliding sheave face ①
   - primary fixed sheave face ②
   - collar ③
   - weights ④
   - primary sliding sheave cam face

**NOTE:**
Remove any excess grease.



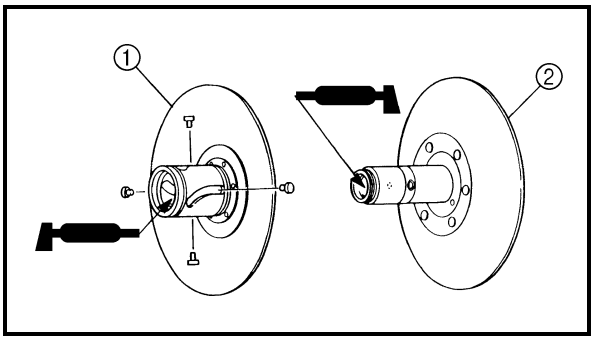

2. Install:
   - weights ①

**NOTE:**
- Apply Yamaha Grizzly grease (90 g) to the whole outer surface of the weights and install.
- Apply Yamaha Grizzly grease (2.5 g) to the inner surface of the collar.
- Apply Yamaha Grizzly grease (2.5 g) to the inner surface of the primary sliding sheave.



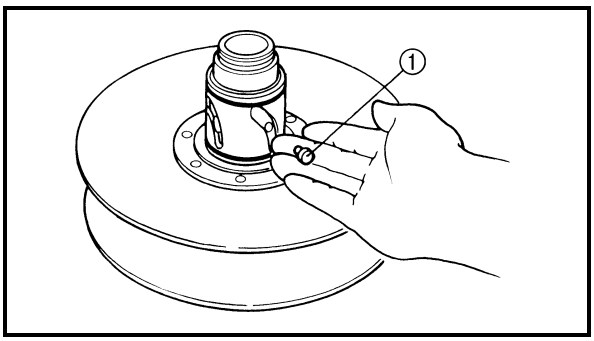

3. Install:
   - slider ①
   - cam ②
   - primary sliding sheave cap

| | |
|---|---|
| | 3 Nm (0.3 m · kg, 2.2 ft · lb) |

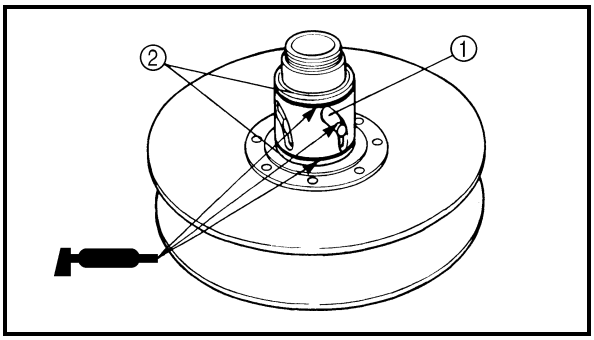



EBS00277
**ASSEMBLING THE SECONDARY SHEAVE**

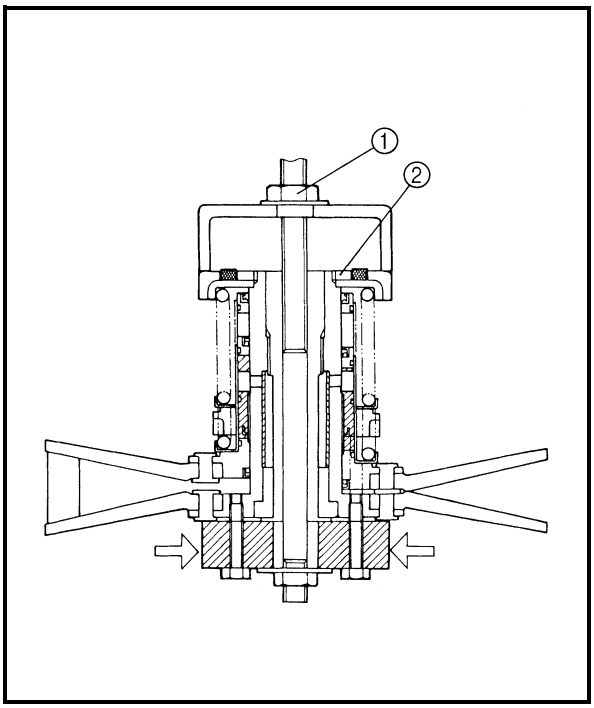
1. Apply:
   - BEL-RAY assembly lube®
     (to the secondary sliding sheave ① inner surface and oil seals)
   - BEL-RAY assembly lube®
     (to the bearings, oil seals and inner surface of the secondary fixed sheave ②)




2. Install:
   - guide pins ①




3. Apply:
   - BEL-RAY assembly lube®
     (to the guide pin sliding grooves ①, and oil seals ② New )




4. Install:
   - spring seat
   - compression spring
   - spring seat
   - nut

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a. Attach the sheave fixed block, locknut wrench and sheave spring compressor to the secondary sheave.

**Sheave fixed block**
**90890-04135**
**Sheave fixed bracket**
**YM-04135**
**Locknut wrench**
**90890-01348, YM-01348**
**Sheave spring compressor**
**90890-04134, YM-04134**

b. Place the sheave fixed block in a vise and secure it.
c. Tighten the sheave spring compressor nut ① and compress the spring.
d. Install the nut ② and tighten it to the specified torque using the locknut wrench.

**Nut**
**90 Nm (9.0 m · kg, 65 ft · lb)**

e. Remove the sheave spring compressor, locknut wrench, and sheave fixed block.

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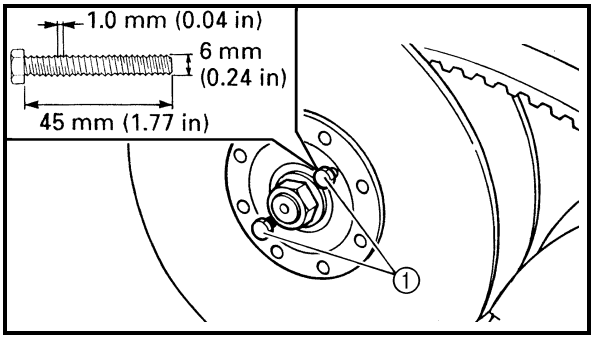
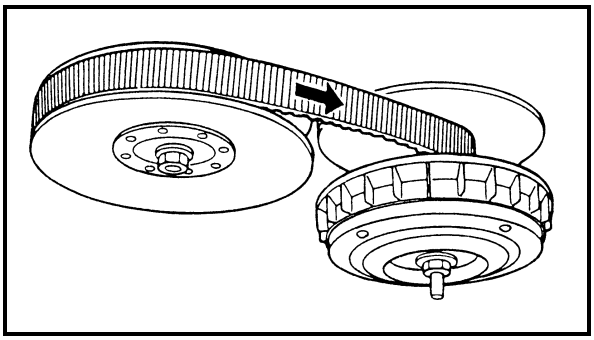
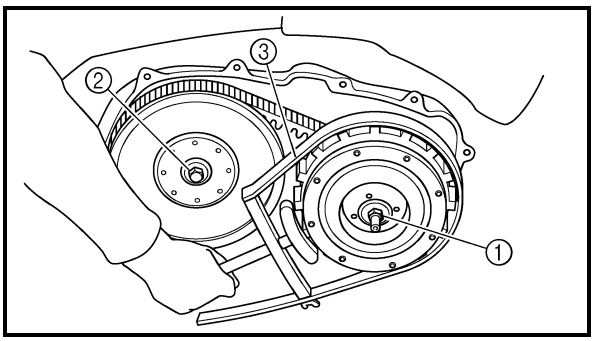





EBS00279

## INSTALLING THE PRIMARY AND SECONDARY SHEAVES

1. Install:
   - secondary sheave
   - V-belt
   - primary sheave

**NOTE:**

- Tightening the bolts ① will push the secondary sliding sheave away, causing the gap between the secondary fixed and sliding sheaves to widen.
- Install the V-belt so that its arrow faces the direction shown in the illustration.

2. Tighten:
   - primary sheave nut ①

     **140 Nm (14.0 m · kg, 100 ft · lb)**
   - secondary sheave nut ②

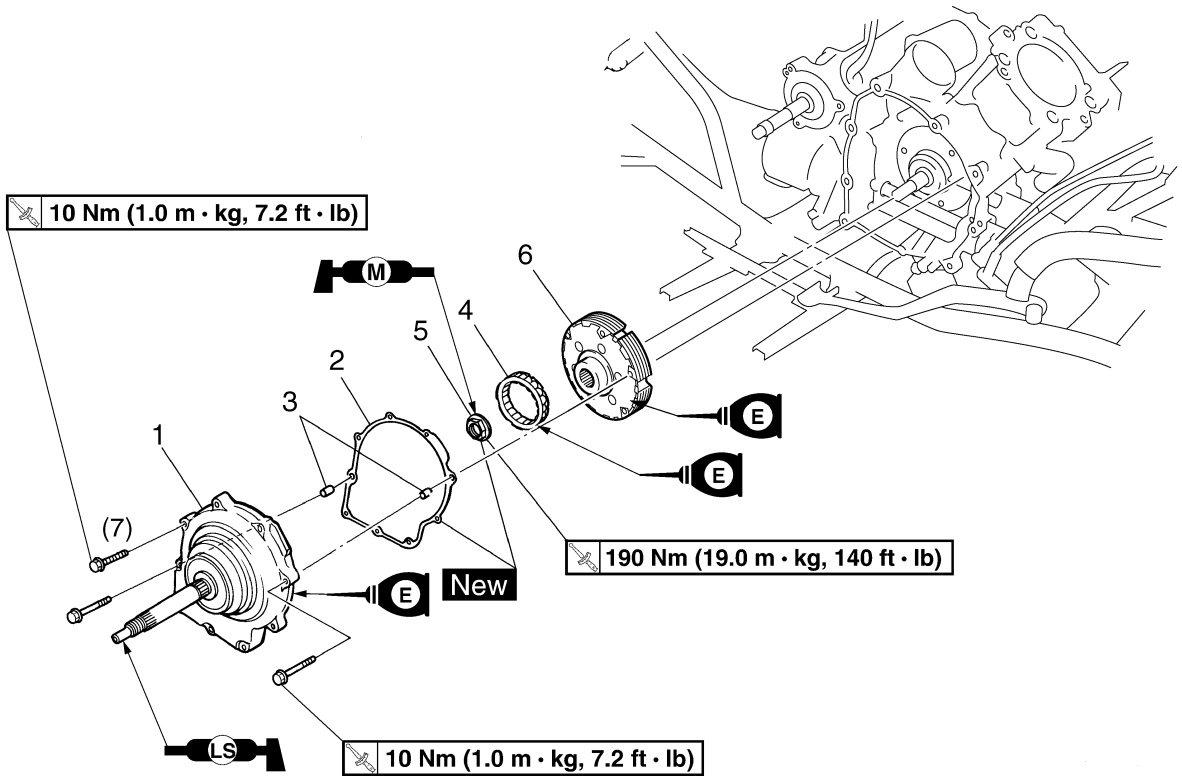
     **100 Nm (10.0 m · kg, 72 ft · lb)**

**NOTE:**

- Use the sheave holder ③ to hold the primary sheave.
- First, tighten the primary sheave nut ①, then tighten the secondary sheave nut ②.

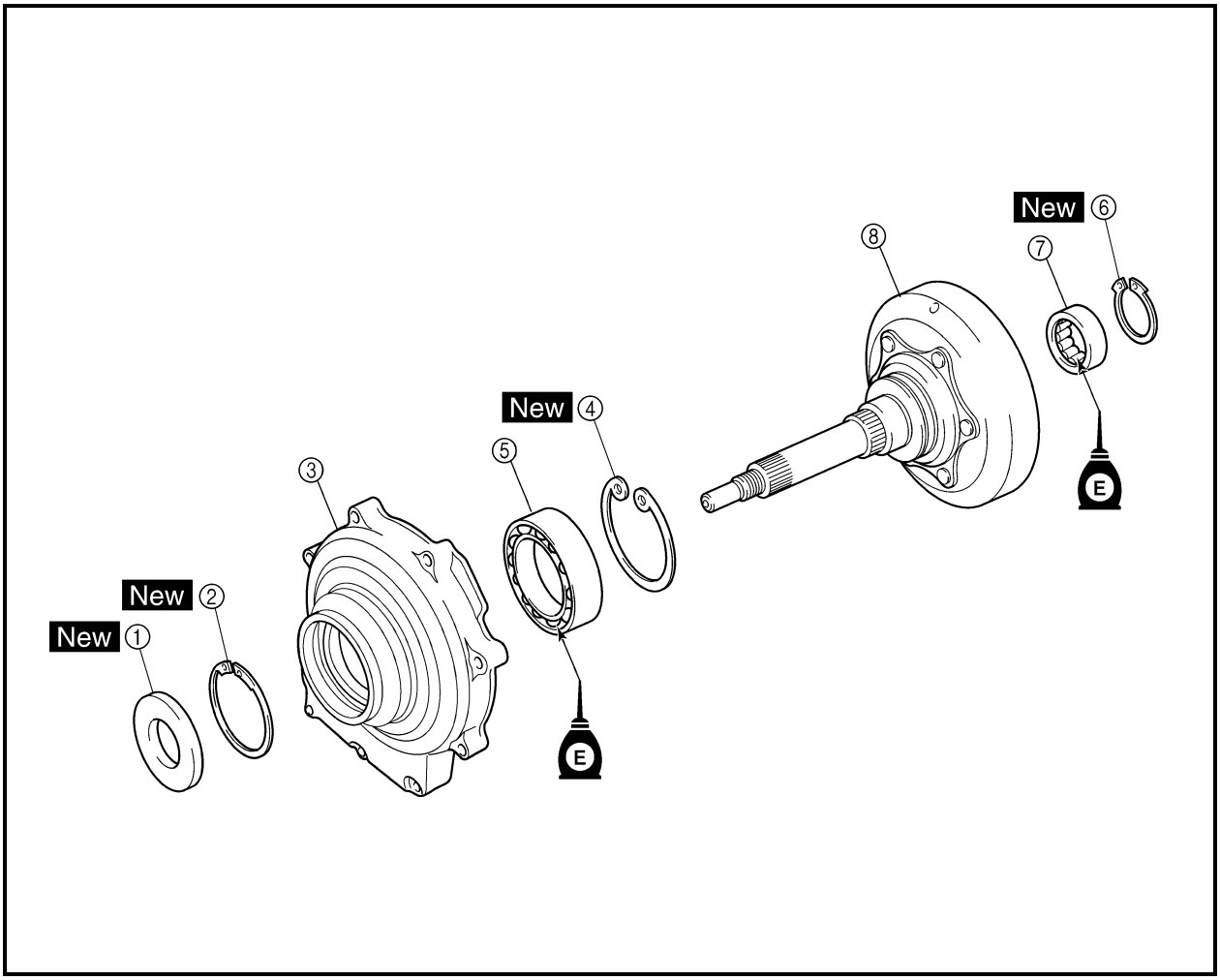
**Sheave holder**
**90890-01701**
**Primary clutch holder**
**YS-01880-A**

EBS00291
# CLUTCH

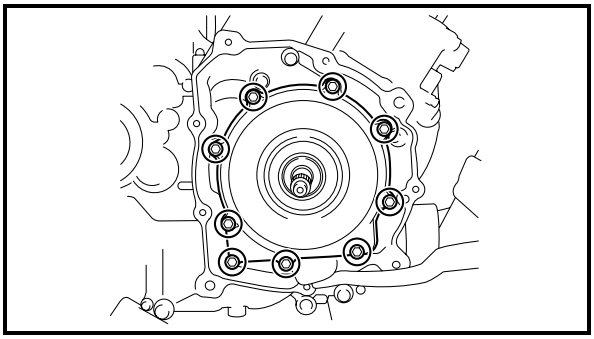



| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the clutch** | | Remove the parts in the order listed. |
| | Primary sheave/secondary sheave | | Refer to "PRIMARY AND SECONDARY SHEAVES". |
| 1 | Clutch housing assembly | 1 | Refer to "REMOVING THE CLUTCH" and "INSTALLING THE CLUTCH". |
| 2 | Gasket | 1 | |
| 3 | Dowel pin | 2 | |
| 4 | One-way clutch bearing | 1 | |
| 5 | Nut | 1 | |
| 6 | Clutch carrier assembly | 1 | |
| | | | For installation, reverse the removal procedure. |

EBS00292



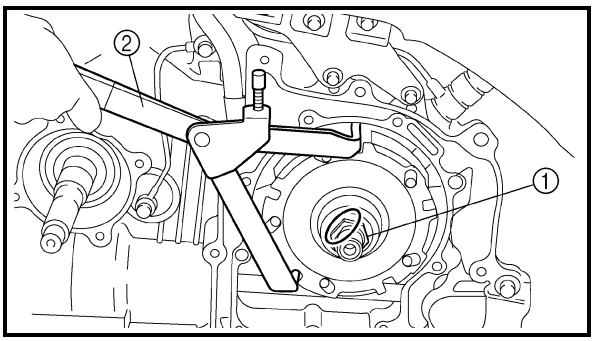

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Disassembling the clutch housing assembly** | | Remove the parts in the order listed. |
| ① | Oil seal | 1 | |
| ② | Circlip | 1 | |
| ③ | Bearing housing | 1 | |
| ④ | Circlip | 1 | |
| ⑤ | Bearing | 1 | |
| ⑥ | Circlip | 1 | |
| ⑦ | Bearing | 1 | |
| ⑧ | Clutch housing | 1 | |
| | | | For assembly, reverse the disassembly procedure. |



EBS00296
**REMOVING THE CLUTCH**

1. Remove:
   - clutch housing assembly
   - gasket
   - dowel pins

**NOTE:**
Working in crisscross pattern, loosen each bolt 1/4 of a turn. Remove them after all of them are loosened.




2. Straighten:
   - punched portion of the nut ①
3. Remove:
   - nut ①

**CAUTION:**
**The clutch carrier assembly nut has left-handed threads. To loosen the clutch carrier assembly nut turn it clockwise.**

**NOTE:**
Use a clutch holding tool ② to hold the clutch carrier assembly.

**Universal clutch holder**
**90890-04086, YM-91042**

EBS00299
**CHECKING THE CLUTCH**

1. Check:
   - clutch housing
     Heat damage/wear/damage → Replace.
   - one-way clutch bearing
     Chafing/wear/damage → Replace.

**NOTE:**
- Replace the one-way clutch assembly and clutch housing as a set.
- The one-way clutch bearing must be installed with the flange side facing in.

2. Check:
   - one-way clutch operation

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a. Install the one-way clutch bearing and clutch carrier assembly to the clutch housing and hold the clutch carrier assembly.
b. When turning the clutch housing clockwise [A], the clutch housing should turn freely.
   If not, the one-way clutch assembly is faulty.
   Replace it.
c. When turning the clutch housing counterclockwise [B], the clutch housing and crankshaft should be engaged.
   If not, the one-way clutch assembly is faulty.
   Replace it.

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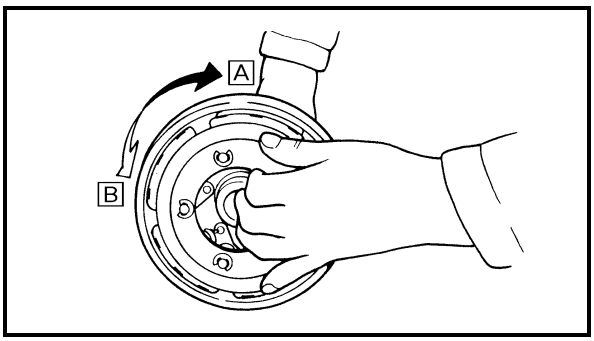
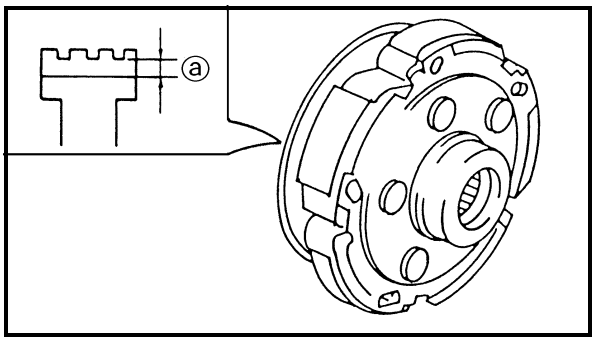
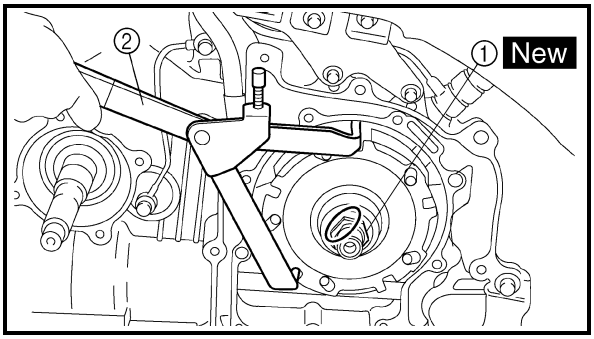



3. Check:
   - clutch shoe
     Heat damage → Replace.




4. Measure:
   - clutch shoe thickness
     Out of specification → Replace.

**Clutch shoe thickness**
**1.5 mm (0.06 in)**
**Clutch shoe wear limit ⓐ**
**1.0 mm (0.04 in)**




EBS00309
## INSTALLING THE CLUTCH

1. Install:
   - clutch carrier assembly
   - nut ① New

190 Nm (19.0 m · kg, 140 ft · lb)

**CAUTION:**

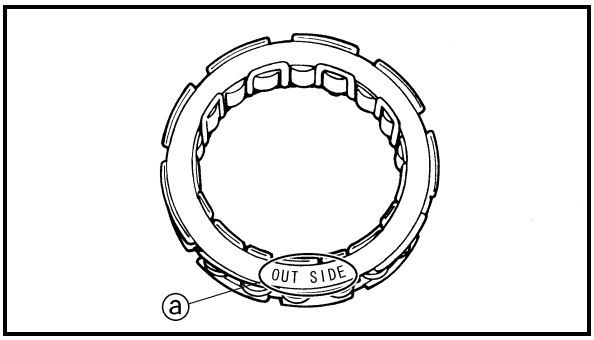
**The clutch carrier assembly nut has left-handed threads. To tighten the clutch carrier assembly nut turn it counterclockwise.**

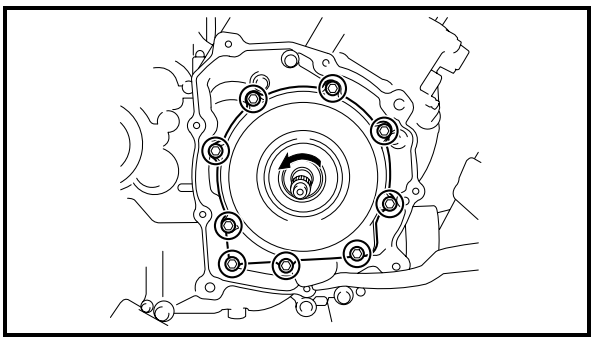
**NOTE:**

Use a clutch holding tool ② to hold the clutch carrier assembly.

**Universal clutch holder**
**90890-04086, YM-91042**

2. Lock the threads with a drift punch.



3. Install:
   - one-way clutch bearing

**NOTE:**

The one-way clutch bearing should be installed in the clutch carrier assembly with the "OUT SIDE" mark ⓐ facing toward the clutch housing.

4. Install:
   - dowel pins
   - gasket New
   - clutch housing assembly

10 Nm (1.0 m · kg, 7.2 ft · lb)

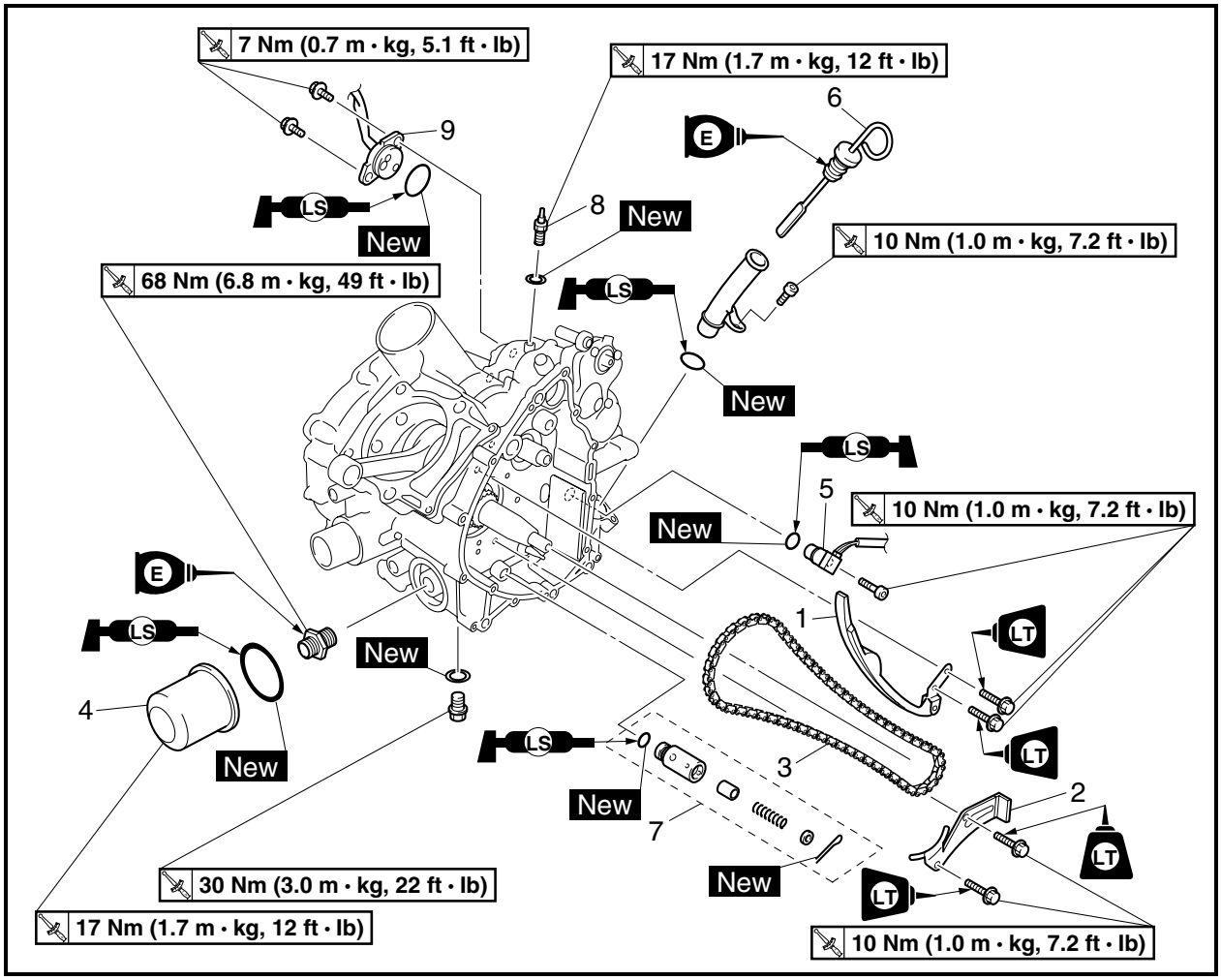
**NOTE:**

- Tighten the bolts in stages, using a criss-cross pattern.
- After tightening the bolts, check that the clutch housing assembly rotates smoothly.

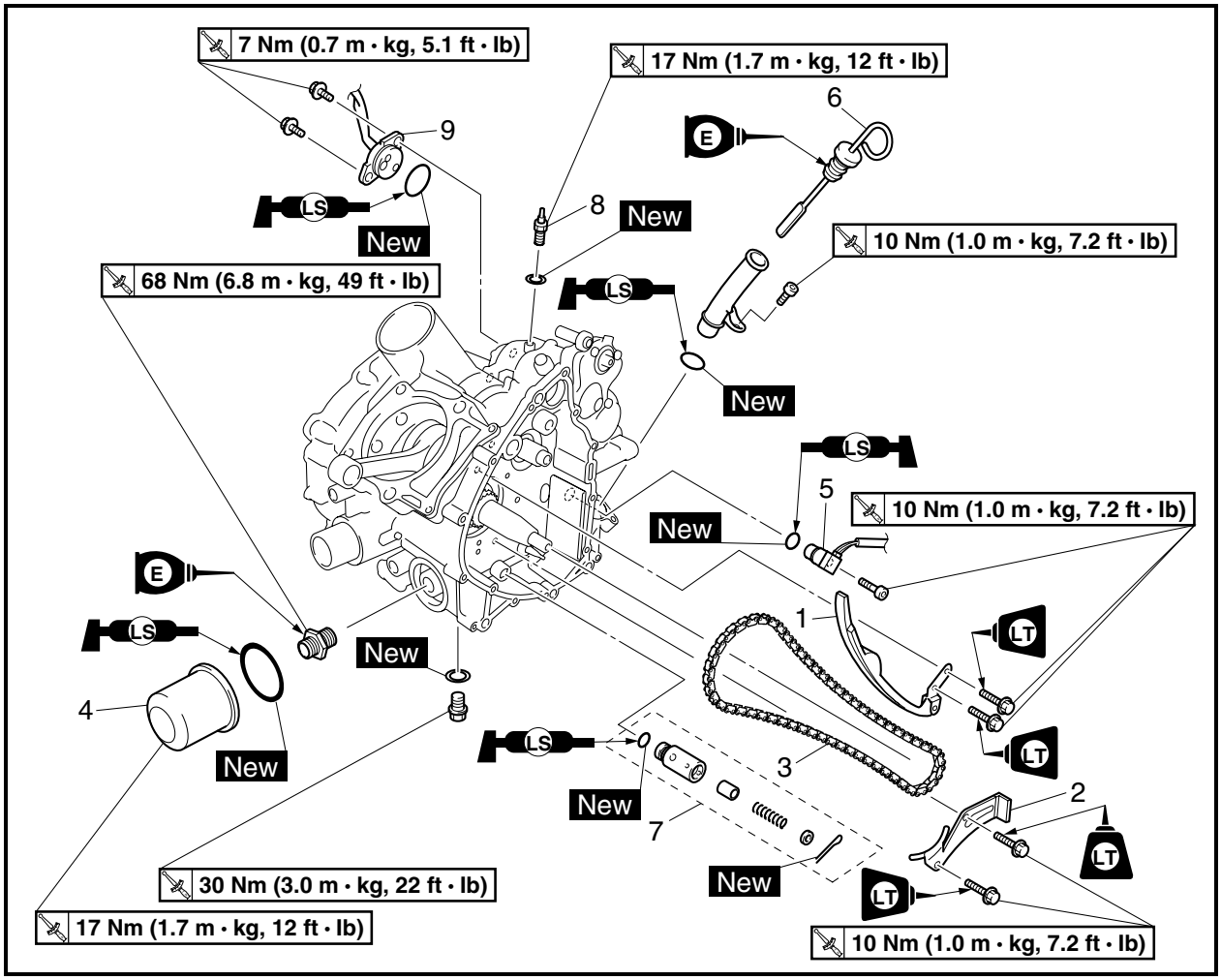
EBS00319

# CRANKCASE

## TIMING CHAIN AND OIL FILTER



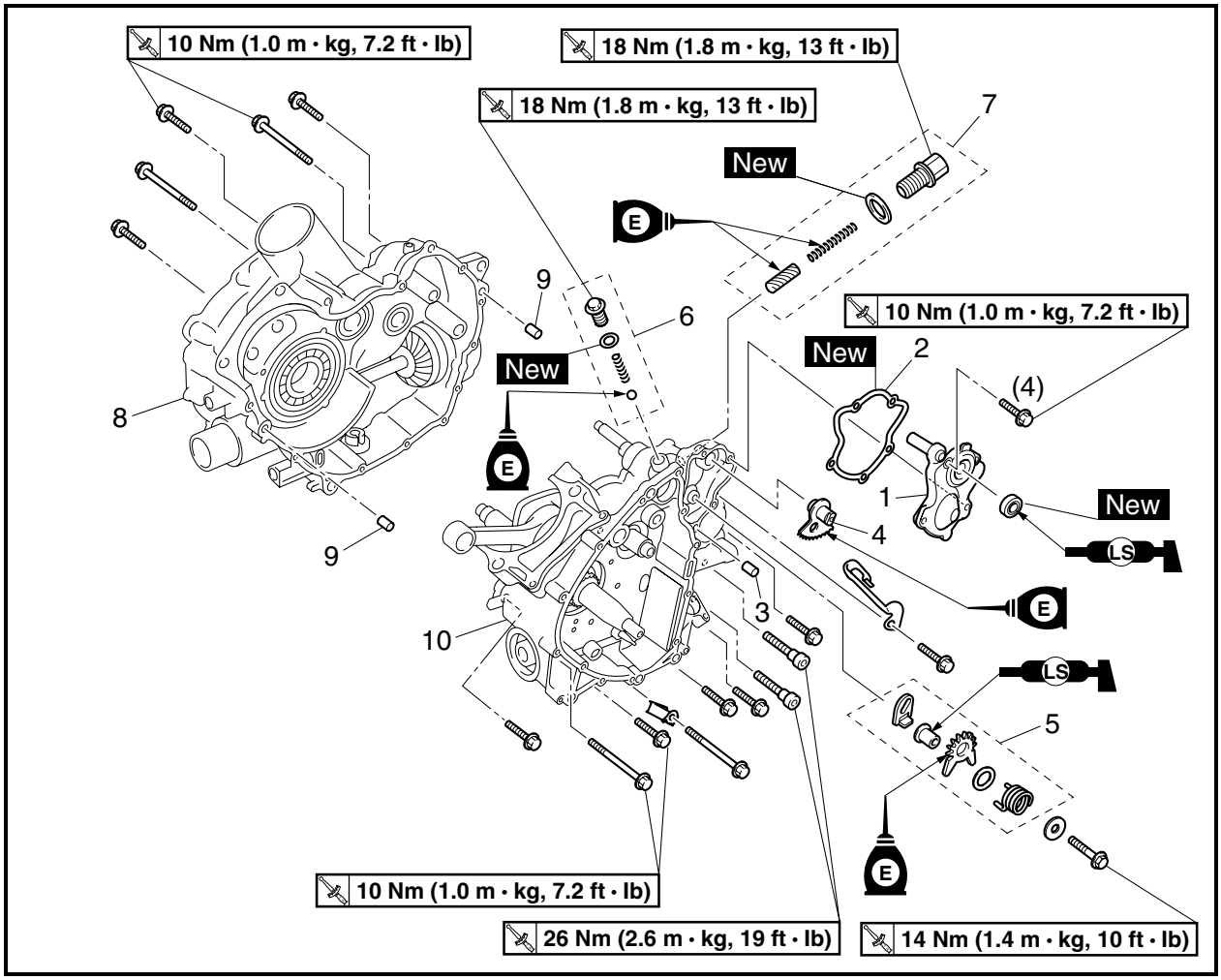

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the timing chain and oil filter** | | Remove the parts in the order listed. |
| | Engine | | Refer to "ENGINE REMOVAL". |
| | Cylinder head | | Refer to "CYLINDER HEAD". |
| | Cylinder/piston | | Refer to "CYLINDER AND PISTON". |
| | AC magneto rotor/starter wheel gear | | Refer to "AC MAGNETO". |
| | Balancer driven gear/oil pump driven gear | | Refer to "BALANCER GEARS AND OIL PUMP GEARS". |
| | Primary sheave assembly/secondary sheave assembly | | Refer to "PRIMARY AND SECONDARY SHEAVES". |
| | Clutch carrier assembly | | Refer to "CLUTCH". |
| 1 | Timing chain guide (intake side) | 1 | |
| 2 | Timing chain guide | 1 | |
| 3 | Timing chain | 1 | |
| 4 | Oil filter cartridge | 1 | |




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| 5 | Speed sensor | 1 | |
| 6 | Dipstick | 1 | |
| 7 | Relief valve assembly | 1 | |
| 8 | Reverse switch | 1 | |
| 9 | Gear position switch | 1 | |
| | | | For installation, reverse the removal procedure. |

EBS00320

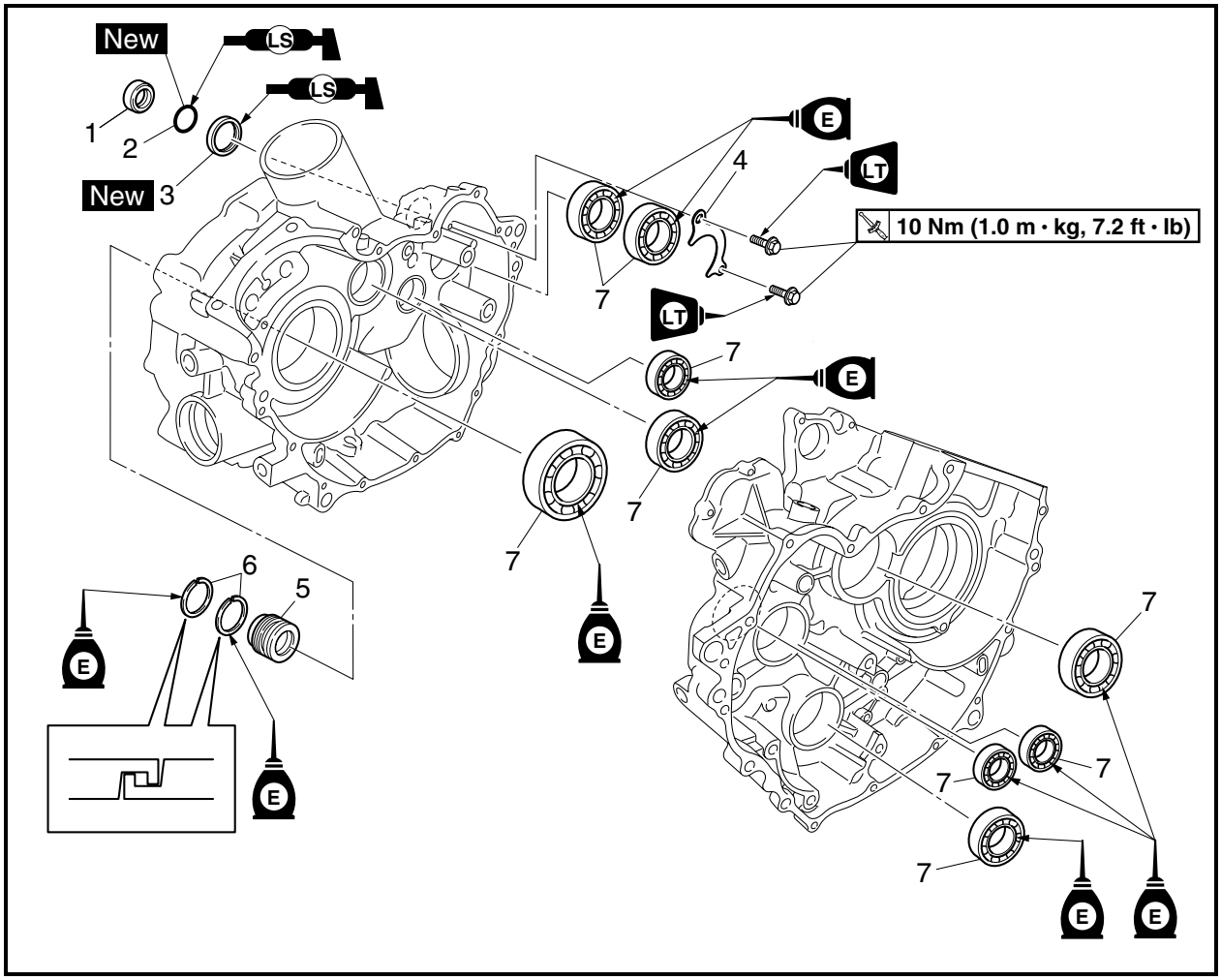
## CRANKCASE




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Separating the crankcase** | | Remove the parts in the order listed. |
| 1 | Shift lever cover | 1 | |
| 2 | Gasket | 1 | Refer to "INSTALLING THE SHIFT LEVER". |
| 3 | Dowel pin | 1 | |
| 4 | Shift lever 1 | 1 | |
| 5 | Shift lever 2 assembly | 1 | |
| 6 | Shift drum stopper | 1 | Spring identification color: red |
| 7 | Stopper lever stopper | 1 | Spring identification color: yellow |
| 8 | Right crankcase | 1 | Refer to "SEPARATING THE CRANKCASE" and "ASSEMBLING THE CRANKCASE". |
| 9 | Dowel pin | 2 | |
| 10 | Left crankcase | 1 | |
| | | | For installation, reverse the removal procedure. |

EBS00321

## CRANKCASE BEARINGS




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the crankcase bearings** | | Remove the parts in the order listed. |
| | Crankshaft/oil pump | | Refer to "CRANKSHAFT AND OIL PUMP". |
| | Transmission | | Refer to "TRANSMISSION". |
| | Middle drive shaft/middle driven shaft | | Refer to "MIDDLE GEAR". |
| 1 | Collar | 1 | |
| 2 | O-ring | 1 | |
| 3 | Oil seal | 1 | |
| 4 | Bearing retainer | 1 | |
| 5 | Spacer | 1 | |
| 6 | Crank seal | 2 | |
| 7 | Bearing | 9 | |
| | | | For installation, reverse the removal procedure. |

EBS00332
## SEPARATING THE CRANKCASE

1. Separate:
   - right crankcase
   - left crankcase

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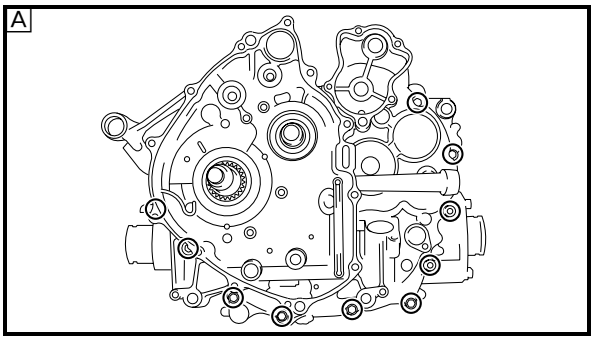
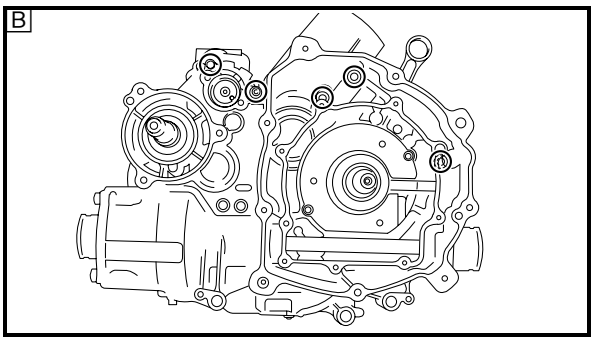
a. Remove the lead holders and crankcase bolts.

**NOTE:**

- Loosen each bolt 1/4 of a turn at a time and after all the bolts are loosened, remove them.
- Loosen the bolts in numerical order (see numbers on the illustration).




A Left crankcase
B Right crankcase




b. Remove the right crankcase.

**CAUTION:**

**Use a soft hammer to tap on one side of the crankcase. Tap only on reinforced portions of the crankcase. Do not tap on the crankcase mating surfaces. Work slowly and carefully. Make sure that the crankcase halves separate evenly.**

c. Remove the dowel pins.

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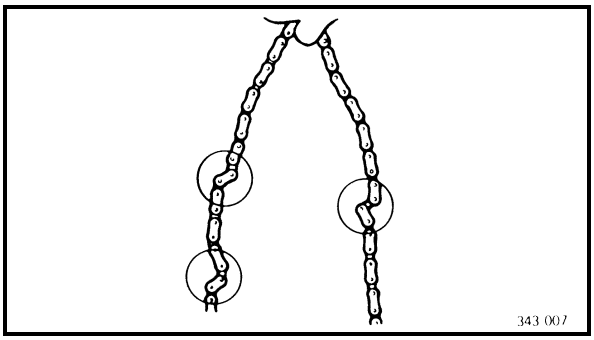
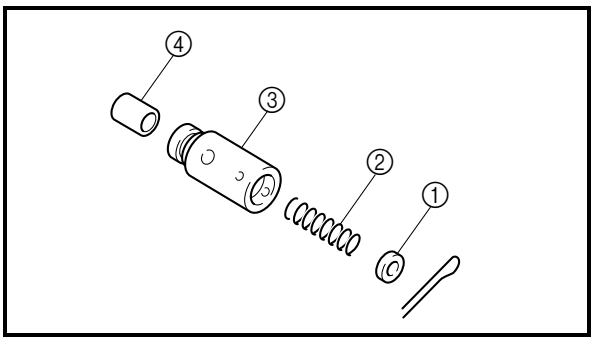
EBS00335
## CHECKING THE TIMING CHAIN AND GUIDE

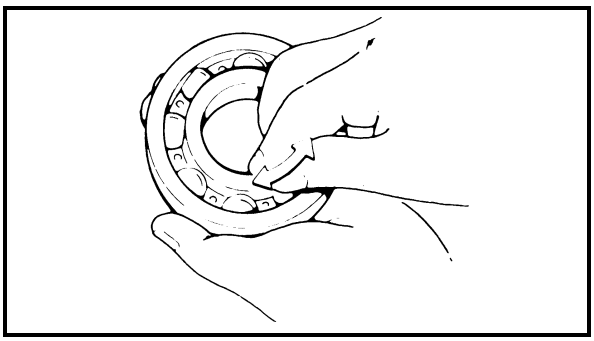
1. Check:
   - timing chain
     Cracks/stiff → Replace the timing chain and camshaft sprocket as a set.
2. Check:
   - intake side timing chain guide
     Wear/damage → Replace.




## CHECKING THE RELIEF VALVE

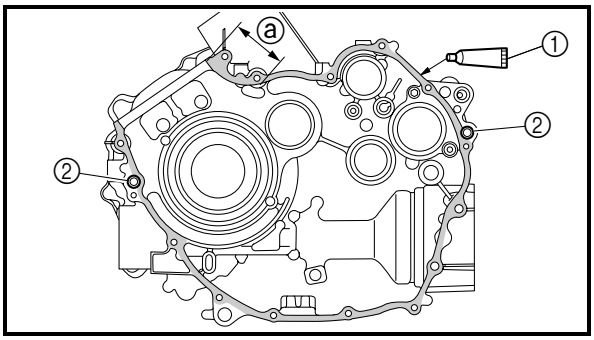
1. Check:
   - spring seat ①
   - spring ②
   - relief valve body ③
   - relief valve ④
     Damage/wear → Replace the defective part(s).





EBS00339
### CHECKING THE BEARINGS
1. Check:
   - bearings
     Clean and lubricate, then rotate the inner race with a finger.
     Roughness → Replace.

EBS00338
### CHECKING THE CRANKCASE
1. Thoroughly wash the case halves in a mild solvent.
2. Clean all the gasket mating surfaces and crankcase mating surfaces thoroughly.
3. Check:
   - crankcase
     Cracks/damage → Replace.
   - oil delivery passages
     Clogged → Blow out with compressed air.




EBS00342
### ASSEMBLING THE CRANKCASE
1. Apply:
   - sealant ①
     (to the mating surfaces of both case halves)

**Yamaha bond No. 1215**
**90890-85505**
**(Three bond No.1215®)**

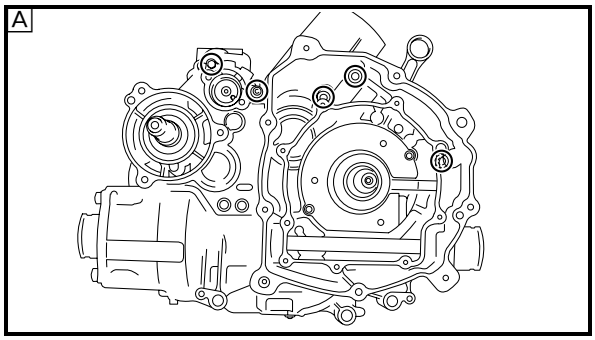
**NOTE:**
Apply two coats of sealant to the area ⓐ shown in the illustration.

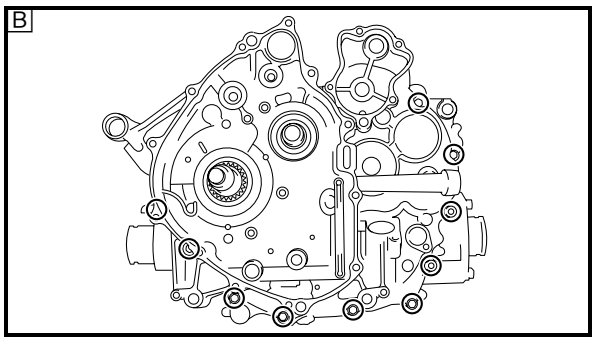
2. Install:
   - dowel pins ②

3. Fit the right crankcase onto the left crankcase. Tap lightly on the case with a soft hammer.

**CAUTION:**

**Before installing and torquing the crankcase holding bolts, be sure to check whether the transmission is functioning properly by manually rotating the shift drum in both directions.**




4. Install:
   - lead holder
   - crankcase bolts
5. Tighten:
   - crankcase bolts
     (follow the proper tightening sequence)

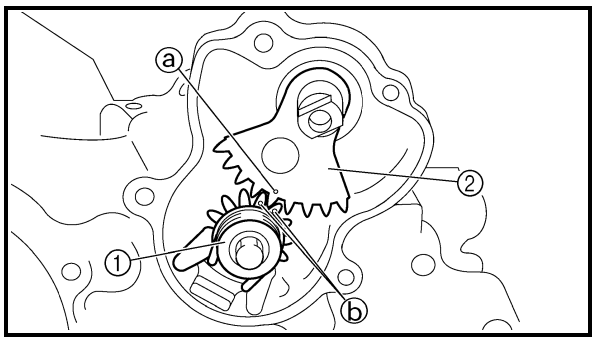
**10 Nm (1.0 m · kg, 7.2 ft · lb)**

A Right crankcase
B Left crankcase

**NOTE:**

Tighten the bolts in stages, using a crisscross pattern.

6. Apply:
   - 4-stroke engine oil
     (to the crankshaft pin, bearing and oil delivery hole)
7. Check:
   - crankshaft and transmission operation
     Unsmooth operation → Repair.




**INSTALLING THE SHIFT LEVER**

1. Install:
   - shift lever 2 assembly ①

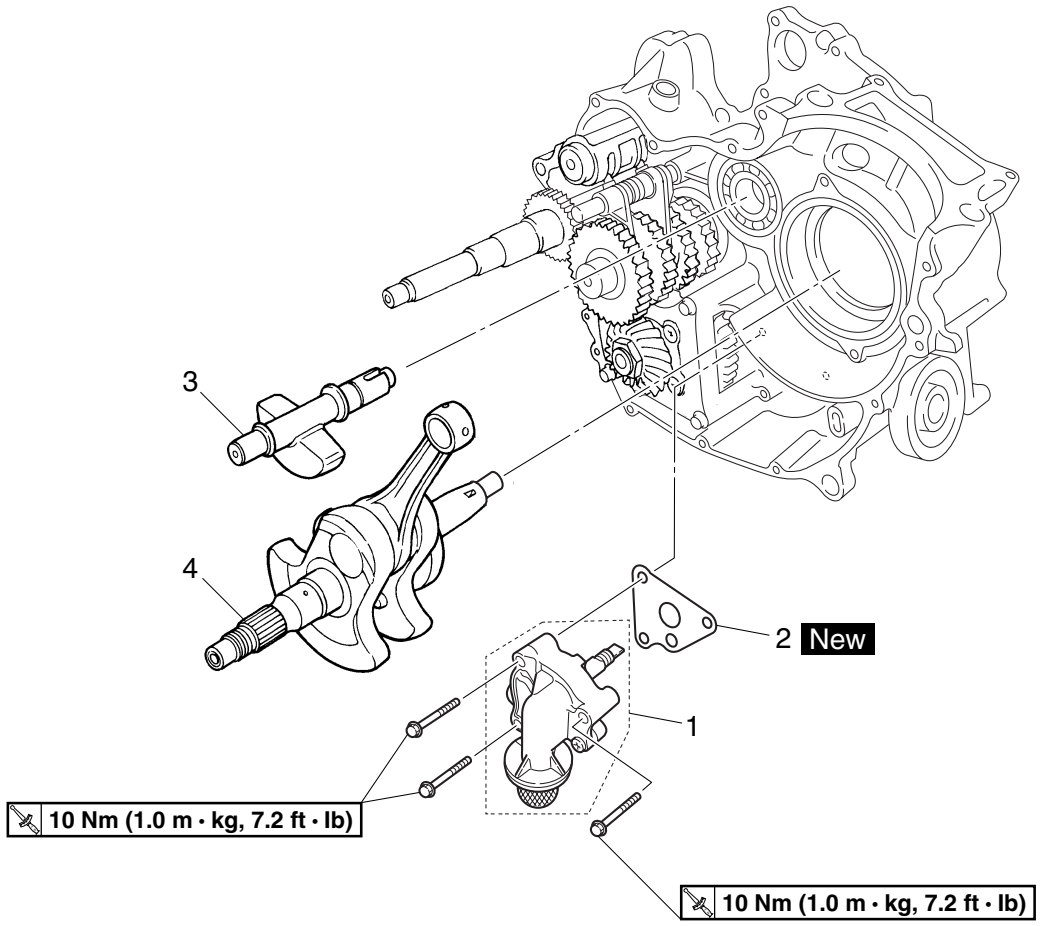
**14 Nm (1.4 m · kg, 10 ft · lb)**

   - shift lever 1 ②

**NOTE:**

When installing the shift lever 1, align the punch mark ⓐ on the shift lever 1 with the punch marks ⓑ on the shift lever 2.

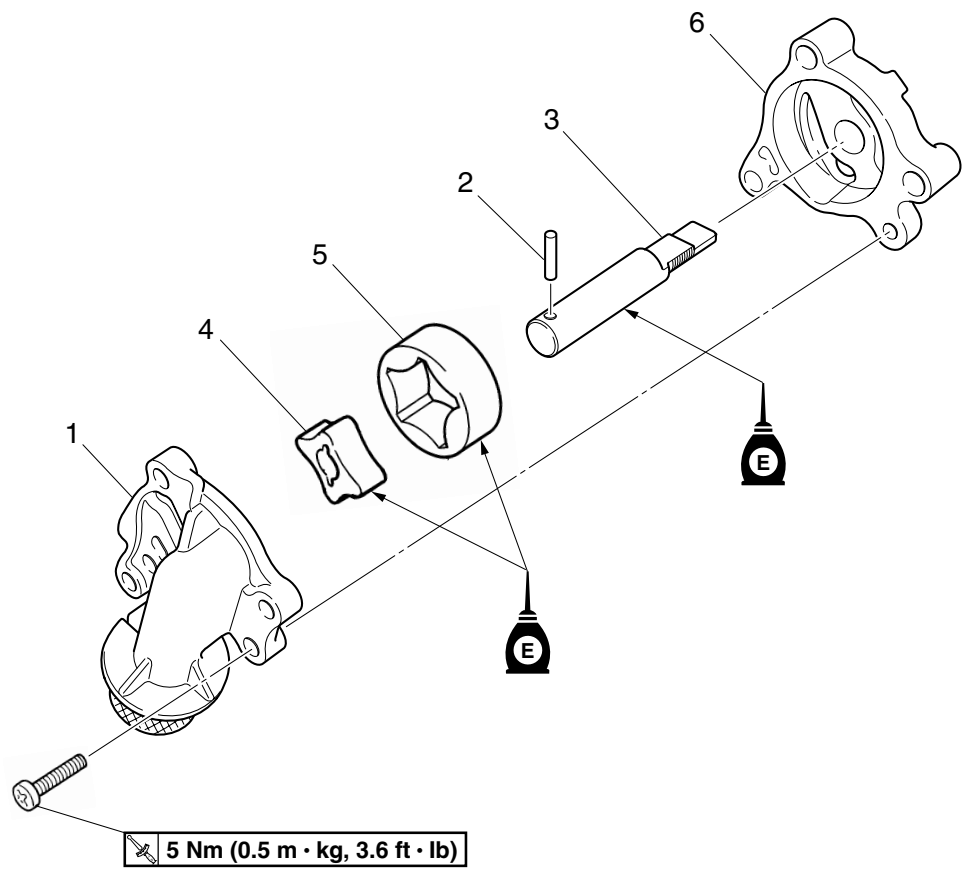
EBS00326
# CRANKSHAFT AND OIL PUMP



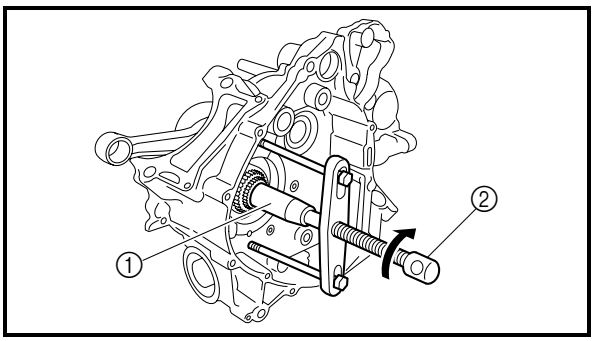

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the crankshaft and oil pump** | | Remove the parts in the order listed. |
| | Crankcase | | Separate.<br>Refer to "CRANKCASE". |
| 1 | Oil pump | 1 | |
| 2 | Gasket | 1 | |
| 3 | Balancer | 1 | |
| 4 | Crankshaft | 1 | Refer to "REMOVING THE CRANKSHAFT" and "INSTALLING THE CRANKSHAFT".<br>For installation, reverse the removal procedure. |

EBS00327

## OIL PUMP



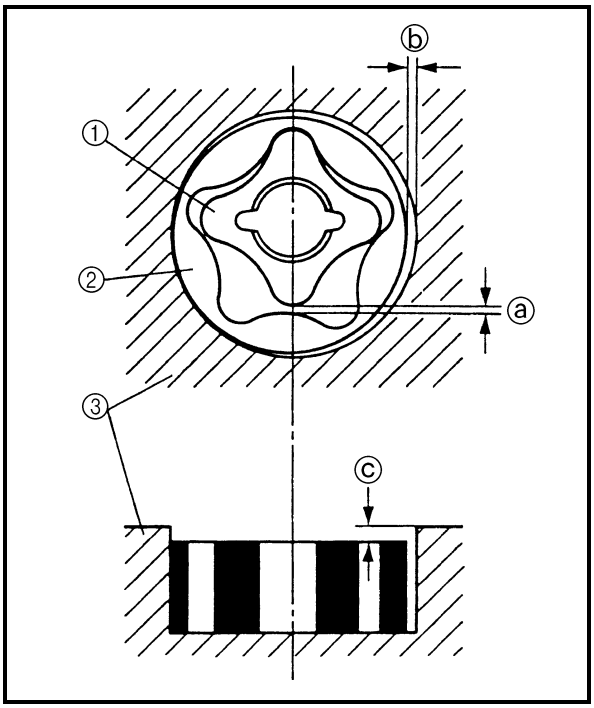

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Disassembling the oil pump** | | Remove the parts in the order listed. |
| 1 | Oil pump housing cover | 1 | |
| 2 | Pin | 1 | |
| 3 | Oil pump shaft | 1 | |
| 4 | Oil pump inner rotor | 1 | |
| 5 | Oil pump outer rotor | 1 | |
| 6 | Oil pump housing | 1 | |
| | | | For assembly, reverse the disassembly procedure. |




EBS00336
## REMOVING THE CRANKSHAFT

1. Remove:
   - crankshaft ①
     Use a crankcase separating tool ②.

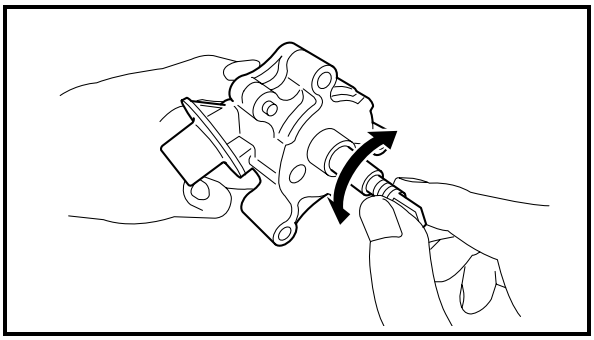
| | |
|---|---|
| | **Crankcase separating tool**<br>**90890-01135**<br>**Crankcase separator**<br>**YU-01135-B** |




EBS00331
## CHECKING THE OIL PUMP

1. Check:
   - oil pump housing
   - oil pump housing cover
     Cracks/wear/damage → Replace.
2. Measure:
   - inner-rotor-to-outer-rotor-tip clearance ⓐ
   - outer-rotor-to-oil-pump-housing clearance ⓑ
   - oil-pump-housing-to-inner-rotor-and-outer-rotor clearance ⓒ
     Out of specification → Replace the oil pump.

① Inner rotor
② Outer rotor
③ Oil pump housing

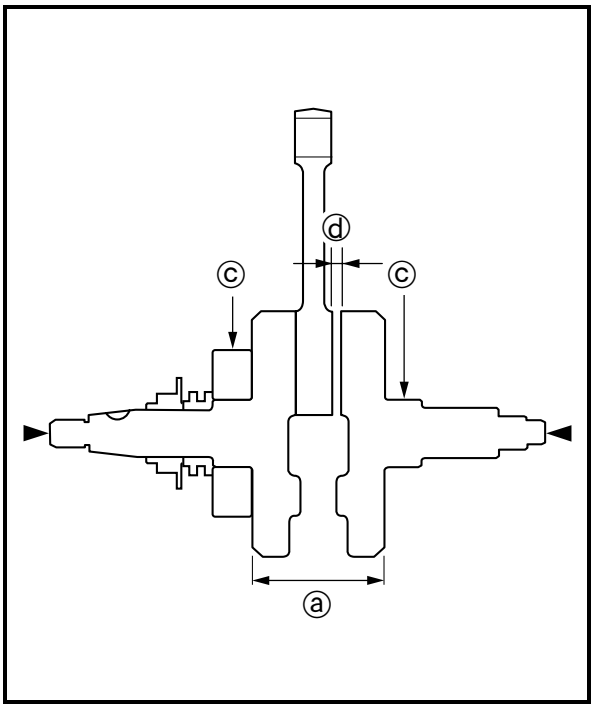


| | |
|---|---|
| | **Inner-rotor-to-outer-rotor-tip clearance**<br>**Less than 0.12 mm (0.0047 in)**<br>**<Limit>: 0.20 mm (0.0079 in)**<br>**Outer-rotor-to-oil-pump-housing clearance**<br>**0.090 ~ 0.170 mm**<br>**(0.0035 ~ 0.0067 in)**<br>**<Limit>: 0.24 mm (0.0094 in)**<br>**Oil-pump-housing-to-inner-rotor-and-outer-rotor clearance**<br>**0.030 ~ 0.100 mm**<br>**(0.0012 ~ 0.0039 in)**<br>**<Limit>: 0.17 mm (0.0067 in)** |

3. Check:
   - oil pump operation
     Rough movement → Repeat steps (1) and (2) or replace the defective part(s).

### CHECKING THE OIL STRAINER

1. Check:
   - oil strainer
     Damage → Replace.
     Contaminants → Clean with engine oil.




EBS00360

### CHECKING THE CRANKSHAFT

1. Measure:
   - crank width ⓐ
     Out of specification → Replace the crankshaft.

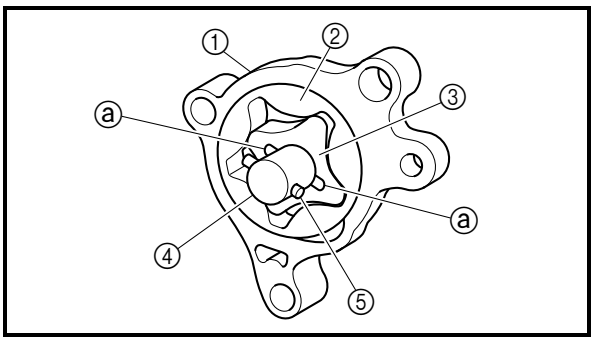
**Crank width**
**74.95 ~ 75.00 mm**
**(2.951 ~ 2.953 in)**

2. Measure:
   - side clearance ⓓ
     Out of specification → Replace the crankshaft.

**Big end side clearance**
**0.350 ~ 0.650 mm**
**(0.0138 ~ 0.0256 in)**
**<Limit>: 1.0 mm (0.04 in)**

3. Measure:
   - runout ⓒ
     Out of specification → Replace the crankshaft.

**Runout limit**
**0.030 mm (0.0012 in)**



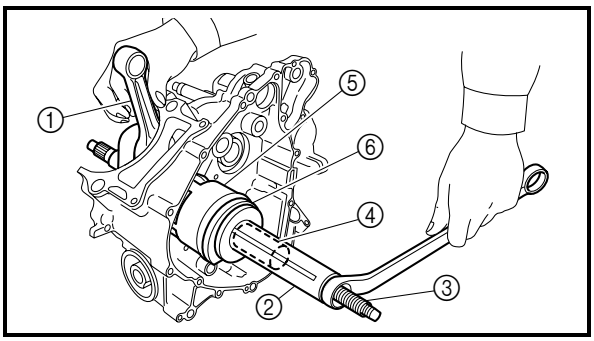

EBS00318

### ASSEMBLING THE OIL PUMP

1. Install:
   - oil pump housing ①
   - oil pump outer rotor ②
   - oil pump inner rotor ③
   - oil pump shaft ④
   - pin ⑤

**NOTE:**

When installing the oil pump shaft ④ align the pin ⑤ with the groove ⓐ in the inner rotor ③.




EBS00362

### INSTALLING THE CRANKSHAFT

1. Install:
   - crankshaft ①

**Crankshaft installer pot ②**
**90890-01274**
**Installing pot**
**YU-90058**
**Pot installer**
**YU-90059**
**Crankshaft installer bolt ③**
**90890-01275**
**Bolt**
**YU-90060**
**Adapter (M16) ④**
**90890-04130**
**Adapter #13**
**YM-04059**
**Spacer (crankshaft installer) ⑤**
**90890-04081**
**Pot spacer**
**YM-91044**
**Spacer ⑥**
**90890-01309**
**Pot spacer**
**YU-90059**

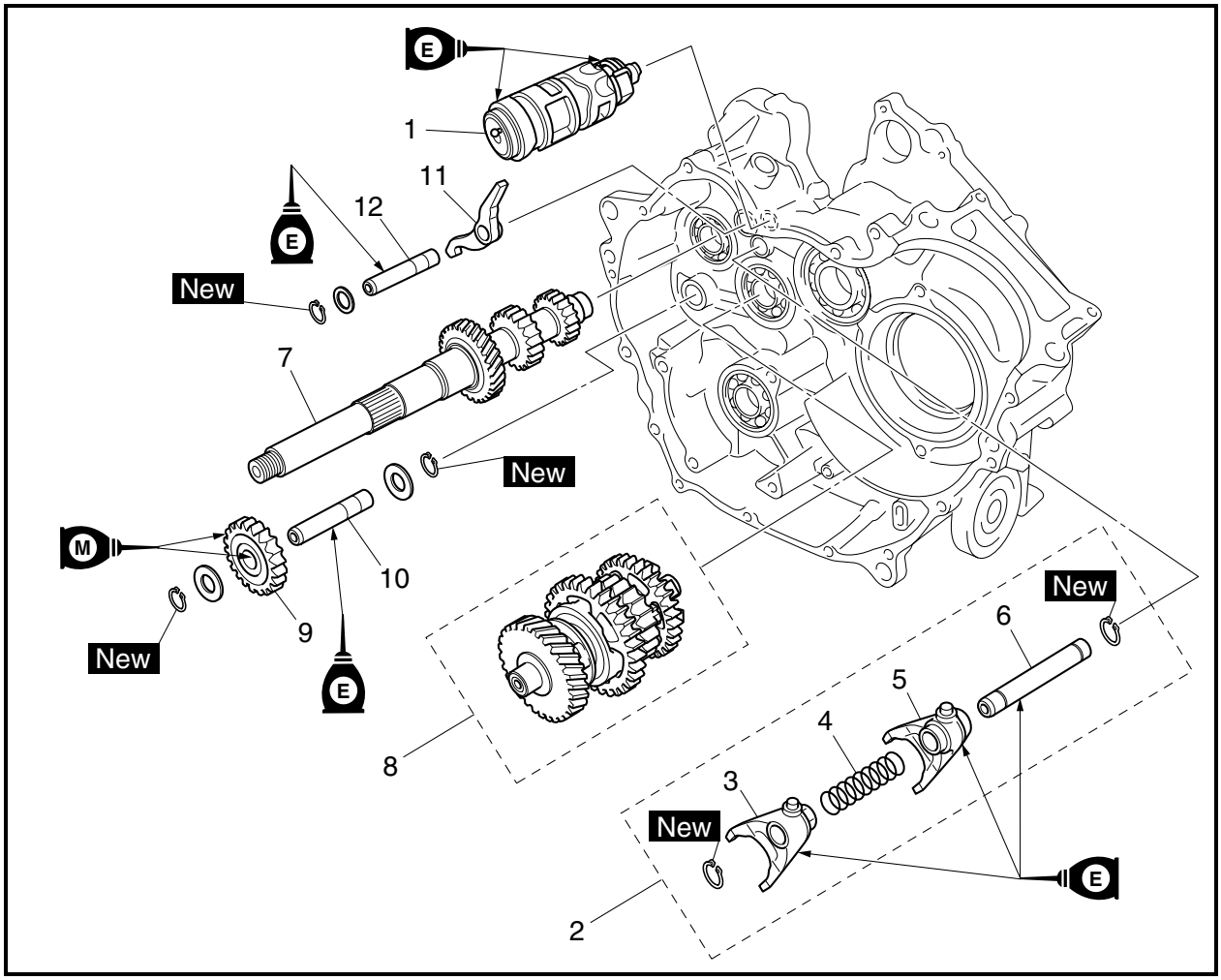
**NOTE:**

Hold the connecting rod at the Top Dead Center (TDC) with one hand while turning the nut of the installing tool with the other. Operate the installing tool until the crankshaft bottoms against the bearing.

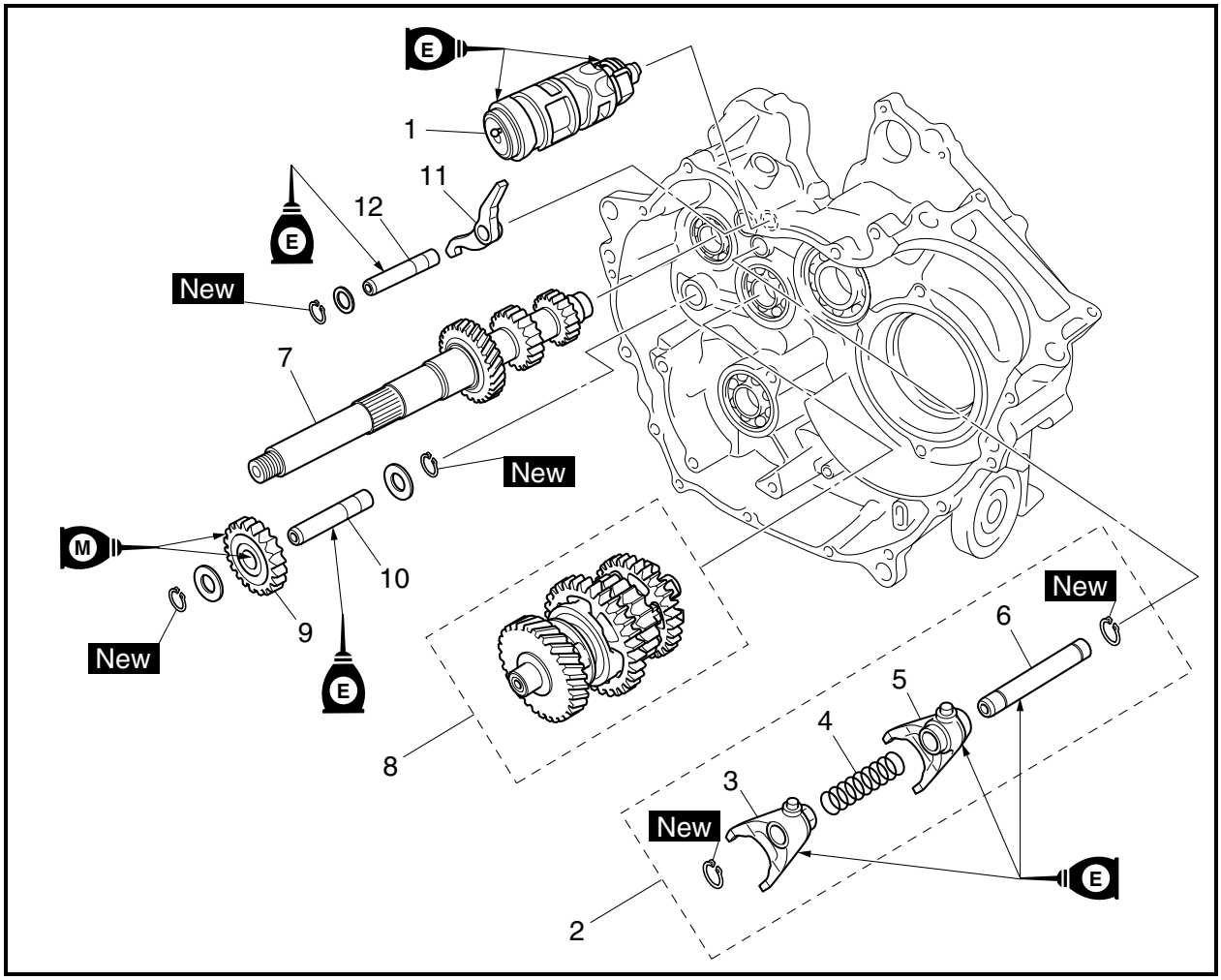
**CAUTION:**

**Apply engine oil to each bearing to protect the crankshaft against scratches and to make installation easier.**

EBS00345
# TRANSMISSION



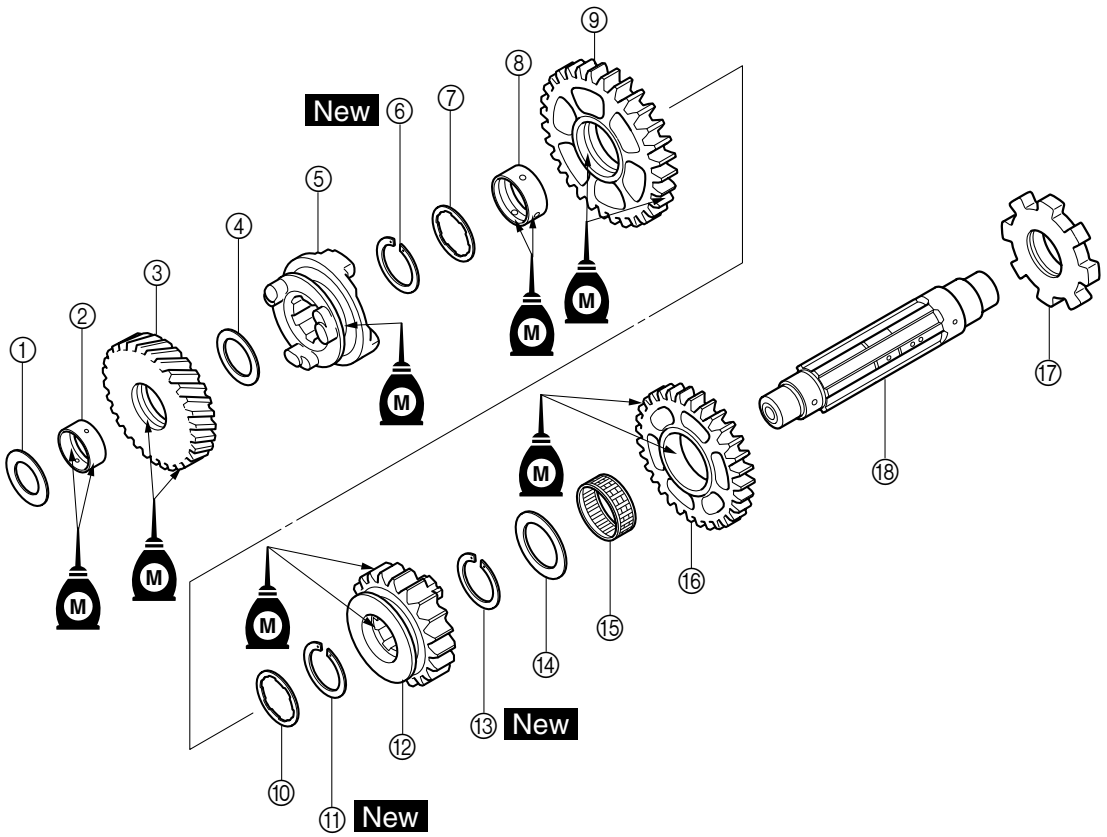

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the transmission** | | Remove the parts in the order listed. |
| | Crankcase | | Separate.<br>Refer to "CRANKCASE". |
| | Middle driven gear | | Refer to "MIDDLE GEAR". |
| 1 | Shift drum | 1 | Refer to "REMOVING THE TRANSMISSION" and "INSTALLING THE TRANSMISSION". |
| 2 | Shift fork assembly | 1 | |
| 3 | Shift fork "R" | 1 | |
| 4 | Spring | 1 | Refer to "ASSEMBLING THE SHIFT FORK ASSEMBLY". |
| 5 | Shift fork "L" | 1 | |
| 6 | Shift fork guide bar | 1 | |
| 7 | Secondary shaft | 1 | |
| 8 | Drive axle assembly | 1 | |
| 9 | Reverse idle gear | 1 | |
| 10 | Reverse idle gear shaft | 1 | |



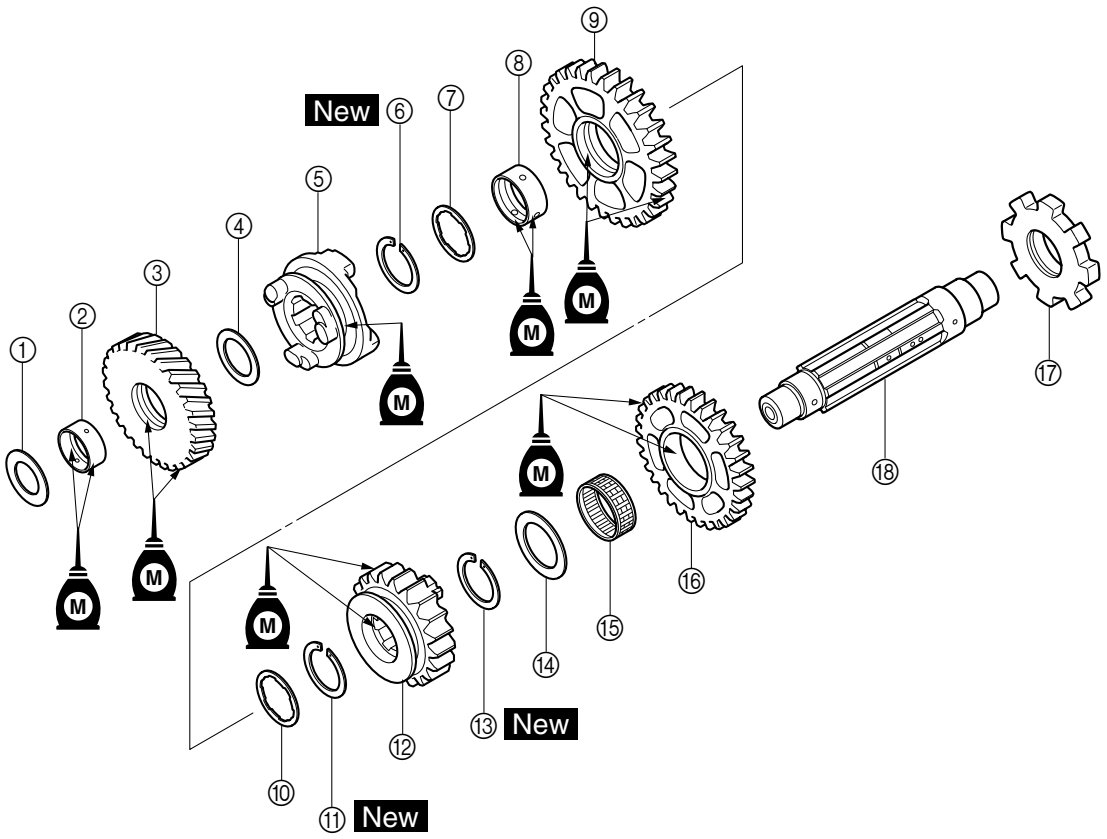

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| 11 | Stopper lever | 1 | Refer to "REMOVING THE TRANSMISSION" and "INSTALLING THE TRANSMISSION". |
| 12 | Stopper lever shaft | 1 | |
| | | | For installation, reverse the removal procedure. |

EBS00348

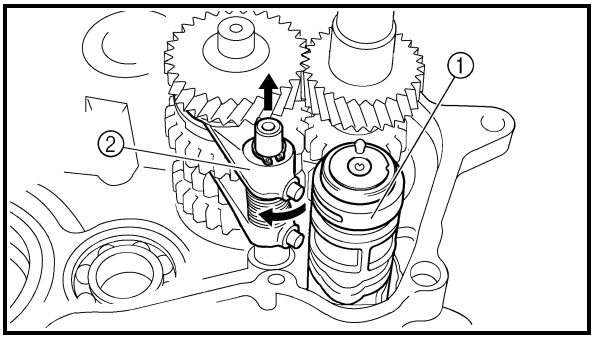
## DRIVE AXLE




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Disassembling the drive axle assembly** | | Remove the parts in the order listed. |
| ① | Washer | 1 | |
| ② | Collar | 1 | |
| ③ | High wheel gear | 1 | |
| ④ | Washer | 1 | |
| ⑤ | Clutch dog | 1 | |
| ⑥ | Circlip | 1 | |
| ⑦ | Washer | 1 | |
| ⑧ | Collar | 1 | |
| ⑨ | Low wheel gear | 1 | |
| ⑩ | Washer | 1 | |
| ⑪ | Circlip | 1 | |
| ⑫ | Middle drive gear | 1 | |
| ⑬ | Circlip | 1 | |




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| ⑭ | Washer | 1 | |
| ⑮ | Bearing | 1 | |
| ⑯ | Reverse wheel gear | 1 | |
| ⑰ | Stopper wheel | 1 | |
| ⑱ | Drive axle | 1 | |
| | | | For assembly, reverse the disassembly procedure. |



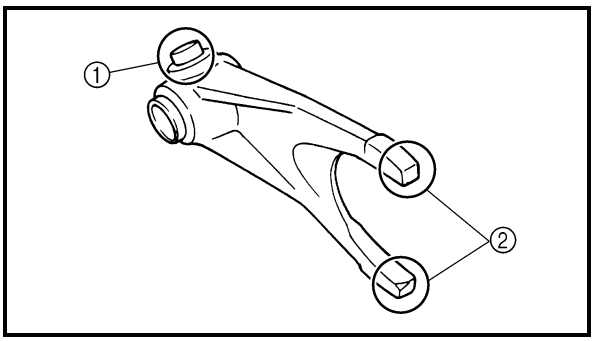

**REMOVING THE TRANSMISSION**

1. Remove:
   - shift drum ①
   - shift fork assembly ②

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Pull out the guide bar from the left crankcase.
b. Push down on the drive shaft, and then slide the shift fork assembly to remove the shift fork cam followers.
c. Remove the shift drum.
d. Remove the shift fork assembly.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

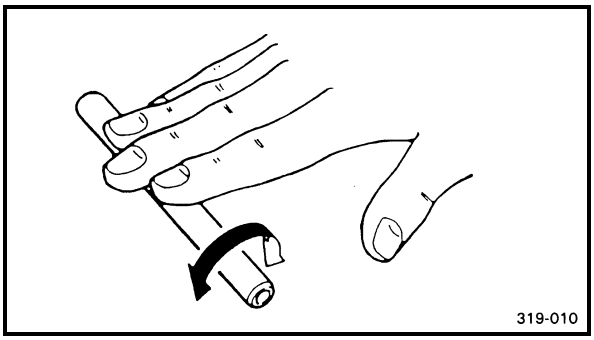



EBS00349

**CHECKING THE SHIFT FORKS**

1. Check:
   - shift fork cam follower ①
   - shift fork pawl ②

   Scoring/bends/wear/damage → Replace.

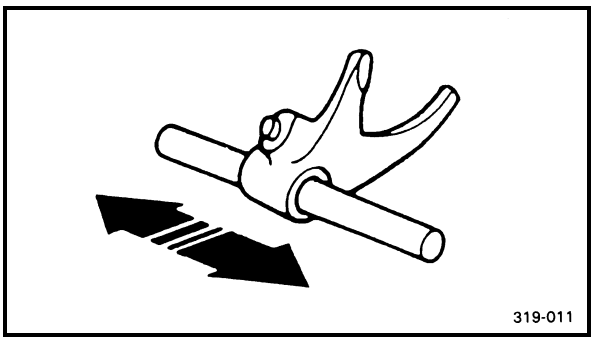



2. Check:
   - guide bar

   Roll the guide bar on a flat surface.
   Bends → Replace.

**⚠ WARNING**

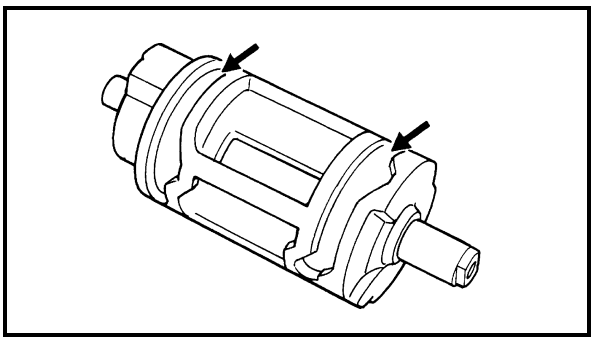
**Do not attempt to straighten a bent guide bar.**




3. Check:
   - shift fork movement

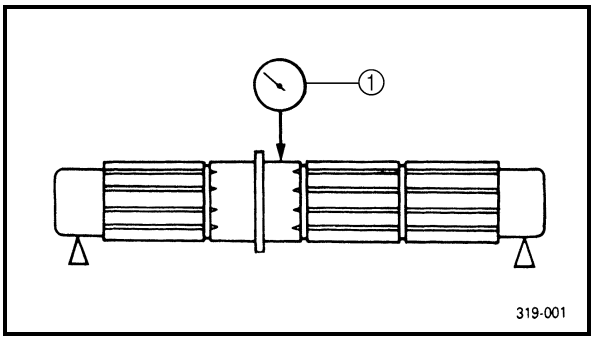
   (on the guide bar)
   Unsmooth operation → Replace the shift fork and the guide bar.
4. Check:
   - spring

   Cracks/damage → Replace.



EBS00351
**CHECKING THE SHIFT DRUM**

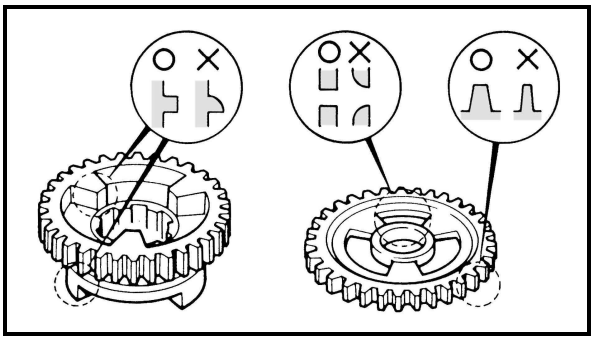
1. Check:
   - shift drum grooves
     Scratches/wear/damage → Replace.




EBS00354
**CHECKING THE TRANSMISSION**

1. Measure:
   - drive axle runout
     (with a centering device and dial gauge ①)
     Out of specification → Replace the drive axle.

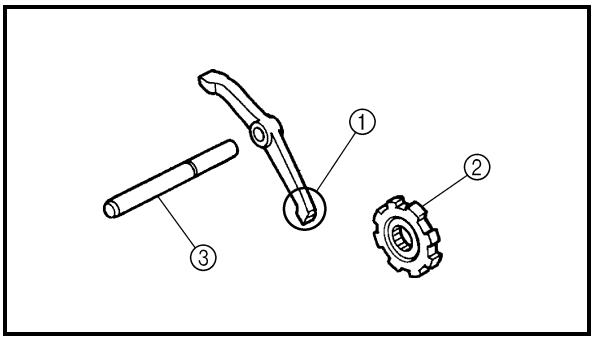
**Drive axle runout limit**
**0.06 mm (0.0024 in)**



2. Check:
   - transmission gears
     Blue discoloration/pitting/wear → Replace the defective gear(s).
   - transmission gear dogs
     Cracks/damage/rounded edges → Replace the defective gear(s).
3. Check:
   - transmission gear engagement
     (each pinion gear to its respective wheel gear)
     Incorrect → Reassemble the transmission axle assemblies.
4. Check:
   - transmission gear movement
     Rough movement → Replace the defective part(s).
5. Check:
   - circlips
     Bends/damage/looseness → Replace.

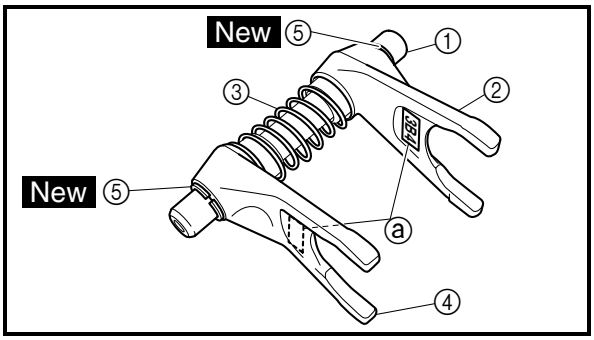
**CHECKING THE SECONDARY SHAFT**

1. Check:
   - gear teeth
     Blue discoloration/pitting/wear → Replace.




**CHECKING THE STOPPER LEVER AND STOPPER WHEEL**

1. Check:
   - stopper lever pawl ①
     Bends/damage/wear → Replace the stopper lever and stopper wheel as a set.
   - stopper wheel ②
     Damage/wear → Replace the stopper wheel and stopper lever as a set.
   - stopper lever shaft ③
     Bends/damage/wear → Replace.

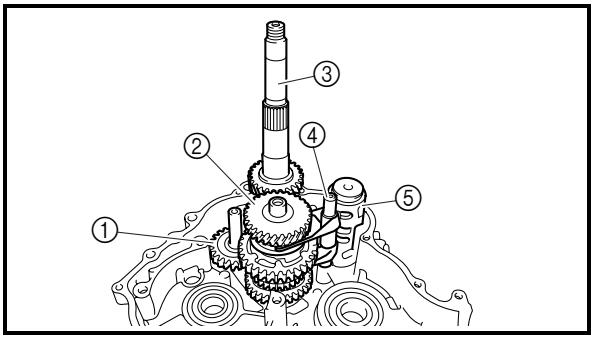


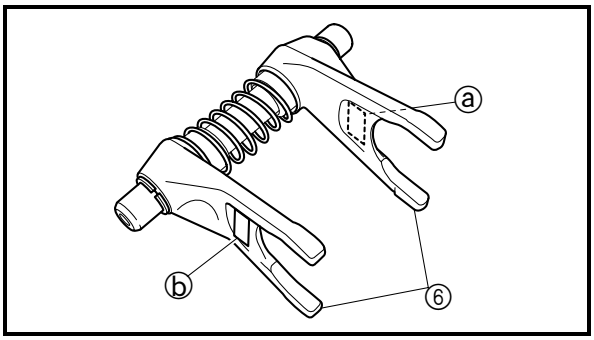

**ASSEMBLING THE SHIFT FORK ASSEMBLY**

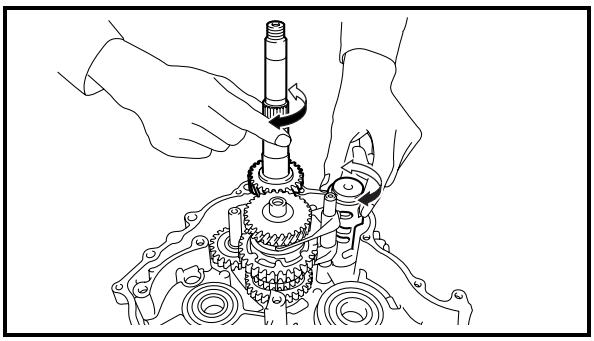
1. Install:
   - shift fork guide bar ①
   - shift fork "L" ②
   - spring ③
   - shift fork "R" ④
   - circlips ⑤ New

**NOTE:**

Install the shift forks with their "3B4" marks ⓐ facing each other.



EBS00356

**INSTALLING THE TRANSMISSION**

1. Install:
   - stopper lever shaft
   - stopper lever
   - reverse idle gear ①
   - drive axle assembly ②
   - secondary shaft ③
   - shift fork assembly ④
   - shift drum ⑤

**NOTE:**

Install the shift forks ⑥ with the "L" mark ⓐ and "R" mark ⓑ facing towards the left and right sides of the crankcase respectively.

2. Check:
   - shift operation
     Unsmooth operation → Repair.

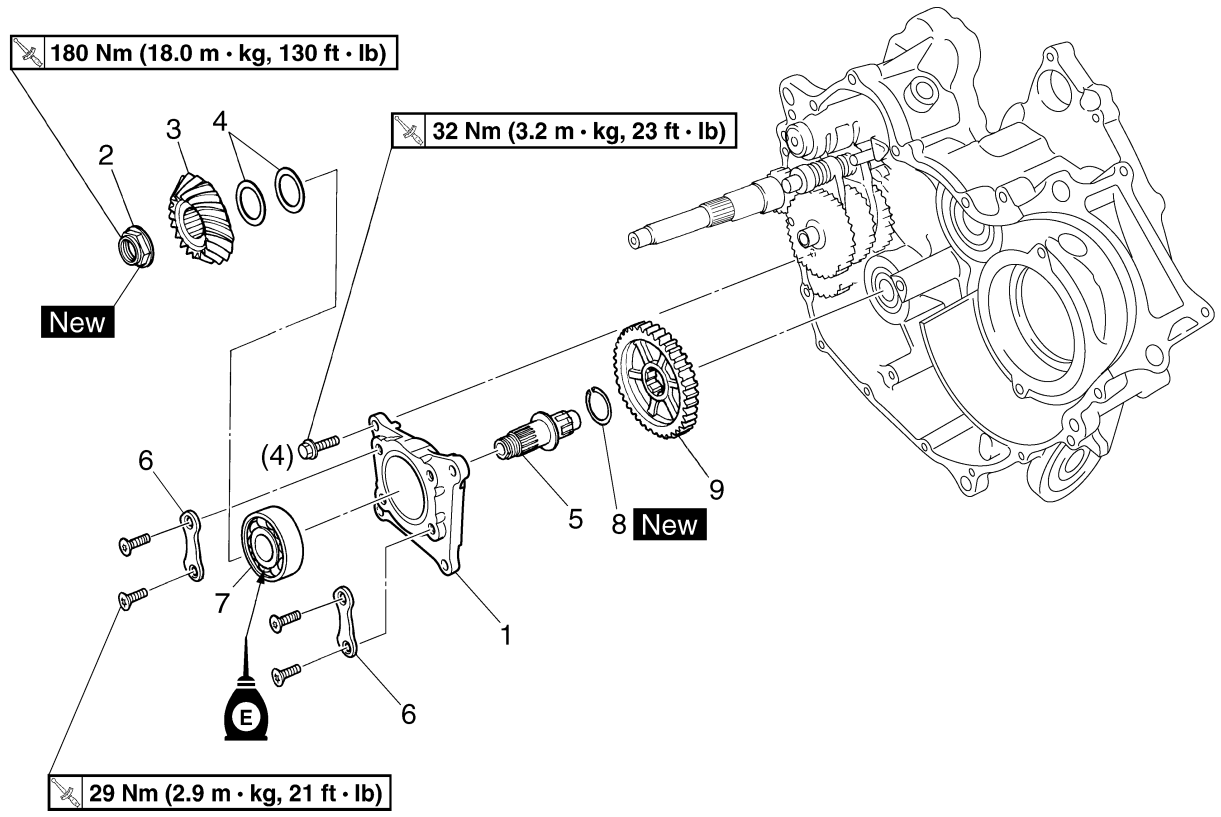
**NOTE:**

- Oil each gear and bearing thoroughly.
- Before assembling the crankcase, make sure that the transmission is in neutral and that the gears turn freely.

EBS00363

# MIDDLE GEAR

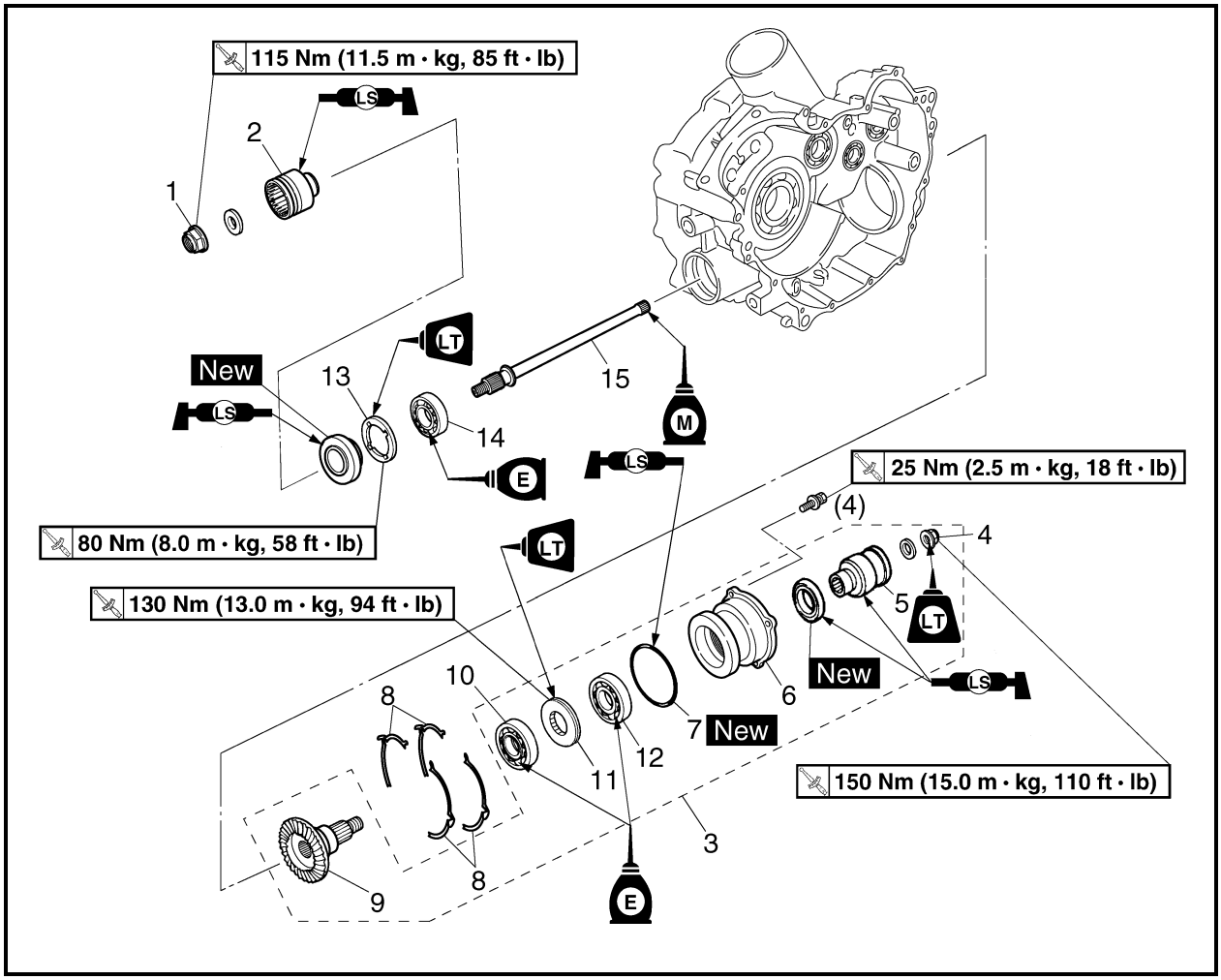
## MIDDLE DRIVE SHAFT



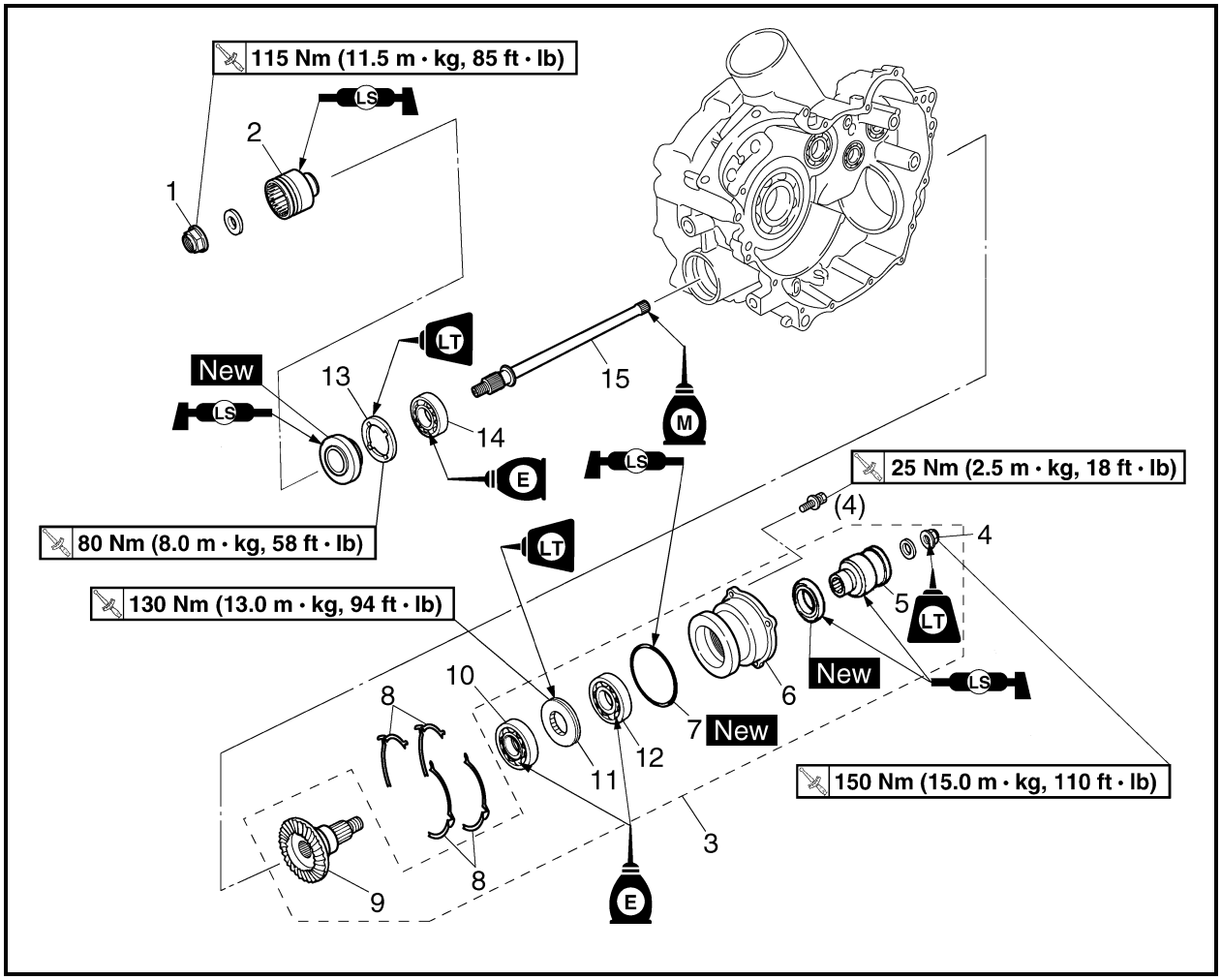

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the middle drive shaft** | | Remove the parts in the order listed. |
| | Crankcase | | Separate.<br>Refer to "CRANKCASE". |
| 1 | Bearing housing | 1 | |
| 2 | Middle drive pinion gear nut | 1 | Refer to "REMOVING THE MIDDLE DRIVE SHAFT" and "INSTALLING THE MIDDLE DRIVE SHAFT". |
| 3 | Middle drive pinion gear | 1 | |
| 4 | Middle drive gear shim | * | |
| 5 | Middle drive shaft | 1 | |
| 6 | Bearing retainer | 2 | |
| 7 | Bearing | 1 | |
| 8 | Circlip | 1 | |
| 9 | Middle driven gear | 1 | |
| | | | For installation, reverse the removal procedure. |

EBS00364

## MIDDLE DRIVEN SHAFT



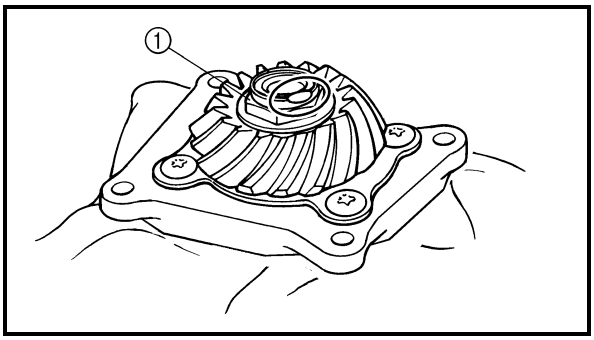

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the middle driven shaft** | | Remove the parts in the order listed. |
| | Crankcase | | Separate.<br>Refer to "CRANKCASE". |
| 1 | Front drive shaft coupling gear nut (middle gear side) | 1 | Refer to "REMOVING THE MIDDLE DRIVEN SHAFT" and "INSTALLING THE MIDDLE DRIVEN SHAFT". |
| 2 | Front drive shaft coupling gear (middle gear side) | 1 | |
| 3 | Middle driven pinion gear assembly | 1 | |
| 4 | Rear drive shaft coupling gear nut (middle gear side) | 1 | |
| 5 | Rear drive shaft coupling gear (middle gear side) | 1 | |
| 6 | Bearing housing | 1 | |
| 7 | O-ring | 1 | |
| 8 | Middle driven gear shim | * | |
| 9 | Middle driven pinion gear | 1 | |




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| 10 | Bearing | 1 | Refer to "REMOVING THE MIDDLE DRIVEN SHAFT" and "INSTALLING THE MIDDLE DRIVEN SHAFT". |
| 11 | Middle driven pinion gear bearing retainer | 1 | |
| 12 | Bearing | 1 | |
| 13 | Middle driven shaft bearing retainer | 1 | |
| 14 | Bearing | 1 | |
| 15 | Middle driven shaft | 1 | |
| | | | For installation, reverse the removal procedure. |

EBS00365
**REMOVING THE MIDDLE DRIVE SHAFT**

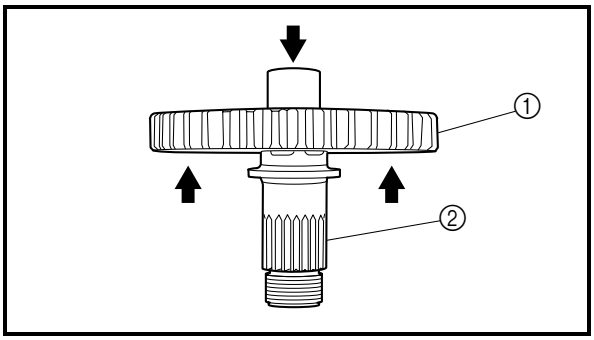
1. Straighten:
   - punched portion of the middle drive pinion gear nut




2. Loosen:
   - middle drive pinion gear nut ①

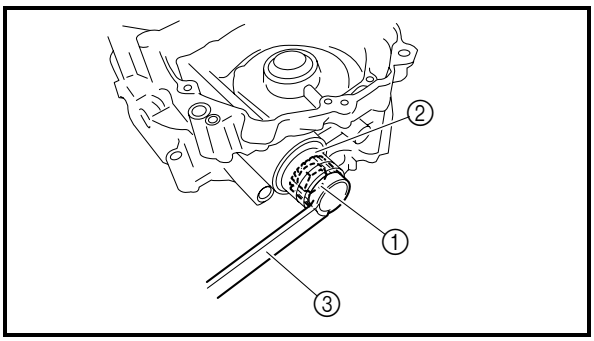
**NOTE:**
Secure the middle drive shaft in the vise with a clean rag.

3. Remove:
   - middle drive pinion gear nut
   - middle drive pinion gear
   - shim(s)




4. Remove:
   - middle driven gear ①
   - circlip
   - middle drive shaft ②

**NOTE:**
Press the middle drive shaft end and remove the middle driven gear.

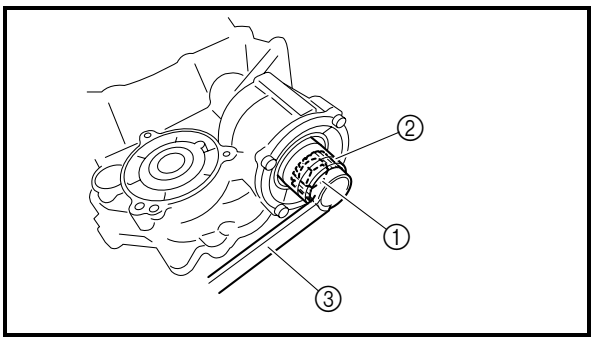



EBS01020
**REMOVING THE MIDDLE DRIVEN SHAFT**

1. Remove:
   - front drive shaft coupling gear nut (middle gear side) ①
   - washer
   - front drive shaft coupling gear (middle gear side) ②

**NOTE:**
Use the coupling gear/middle shaft tool ③ to hold the coupling gear.

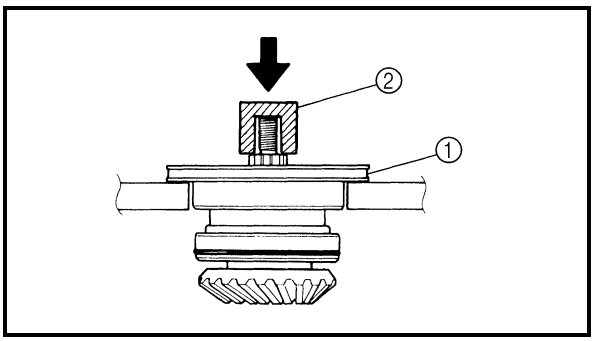
**Coupling gear/middle shaft tool**
**90890-01229**
**Gear holder**
**YM-01229**




2. Remove:
   - rear drive shaft coupling gear nut (middle gear side) ①
   - washer
   - rear drive shaft coupling gear (middle gear side) ②

**NOTE:**
Use the coupling gear/middle shaft tool ③ to hold the coupling gear.

**Coupling gear/middle shaft tool**
**90890-01229**
**Gear holder**
**YM-01229**




3. Remove:
   - bearing housing assembly ①

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a. Clean the outside of the bearing housing assembly.
b. Place the bearing housing assembly onto a hydraulic press.

**CAUTION:**

- **Never directly press the middle driven pinion gear end with a hydraulic press, this will result in damage to the middle driven pinion gear thread.**
- **Install a suitable socket ② on the middle driven pinion gear end to protect the thread from damage.**

c. Press the middle driven pinion gear end and remove the bearing housing.

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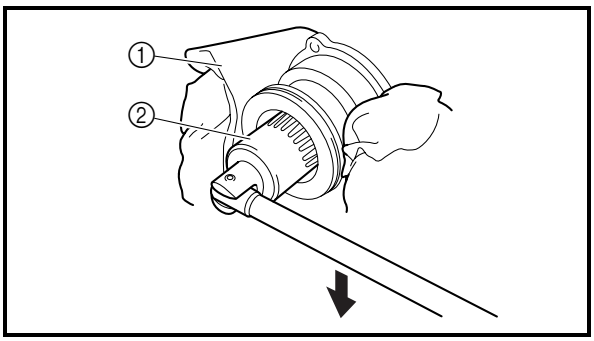


4. Remove:
   - middle driven pinion gear bearing retainer
   - bearing

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a. Attach the folded rag ①.
b. Secure the bearing housing edge in the vise.
c. Attach the bearing retainer wrench ②.

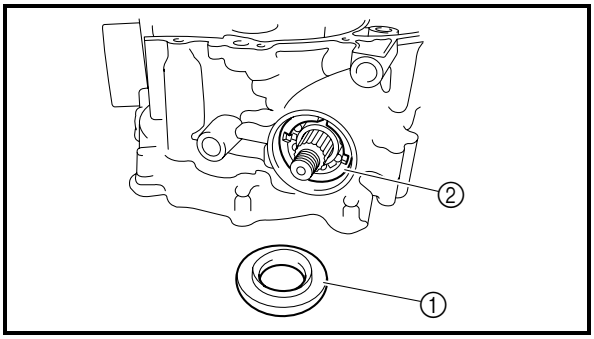
**Bearing retainer wrench**
**90890-04128**
**Middle gear bearing retainer**
**YM-04128**

**CAUTION:**

**The middle driven pinion gear bearing retainer has left-handed threads. To loosen the retainer, turn it clockwise.**

d. Remove the bearing retainer and bearing.

▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲

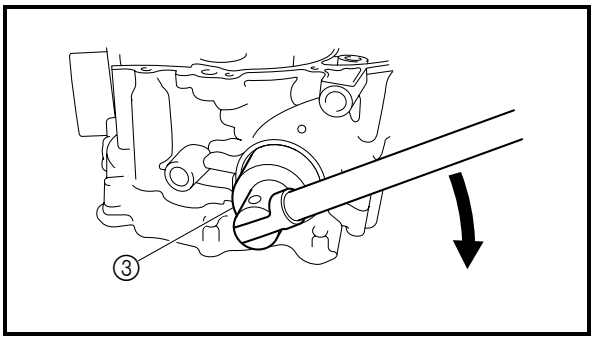


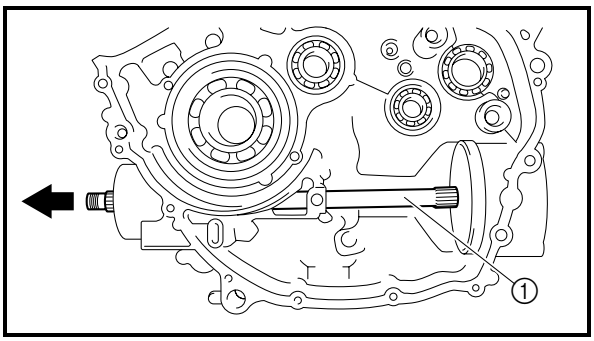

5. Remove:
   - oil seal ①
   - middle driven shaft bearing retainer ②

**NOTE:**
Attach the ring nut wrench ③.

| | |
|---|---|
| | **Ring nut wrench**<br>**90890-01430, YM-38404** |

**CAUTION:**
**The middle driven shaft bearing retainer has left-handed threads. To loosen the retainer turn it clockwise.**

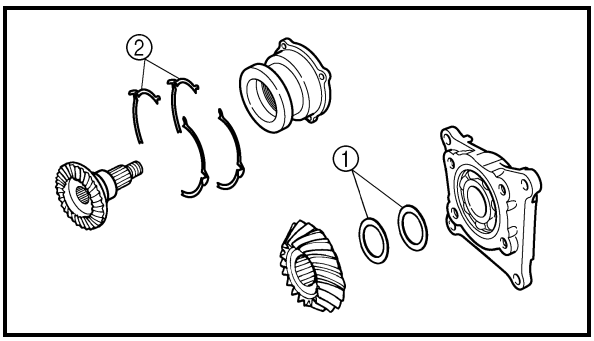



6. Remove:
   - middle driven shaft ①
     (with bearing)

EBS01021
## CHECKING THE PINION GEARS

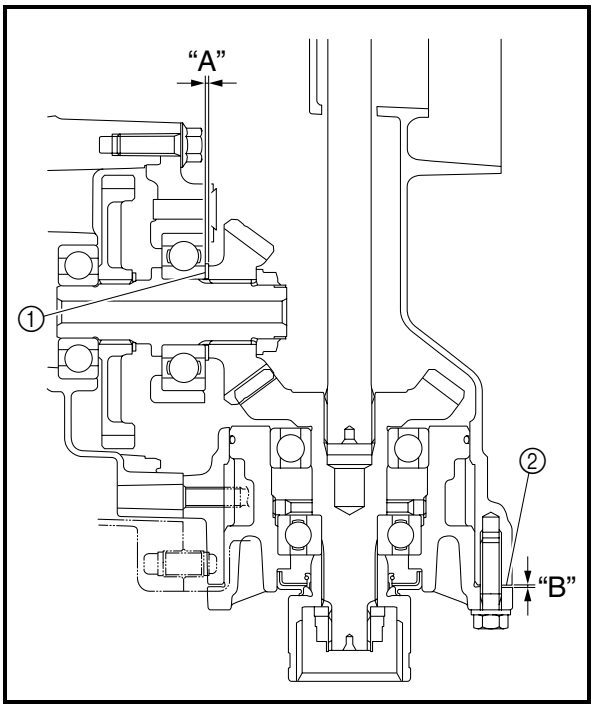
1. Check:
   - drive pinion gear teeth
   - driven pinion gear teeth
     Pitting/galling/wear → Replace.
2. Check:
   - O-ring
     Damage → Replace.
   - bearings
     Pitting/damage → Replace.




EBS00370
**SELECTING MIDDLE DRIVE AND DRIVEN GEAR SHIMS**

When the drive and driven gear, bearing housing assembly and/or crankcase replaced, be sure to adjust the gear shim ①, ②.

1. Select:
   - middle drive gear shim ①
   - middle driven gear shim ②

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a. Position middle drive and driven gear by using shims ① and ② with their respective thickness calculated from information marked on crankcase, bearing housing and drive gear end.

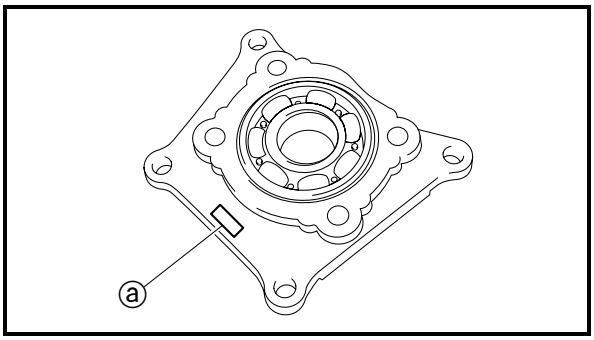
① Shim thickness "A"
② Shim thickness "B"

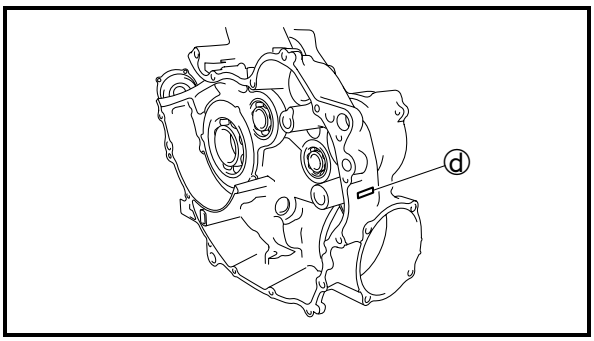
b. To find shim thickness "A" use following formula:

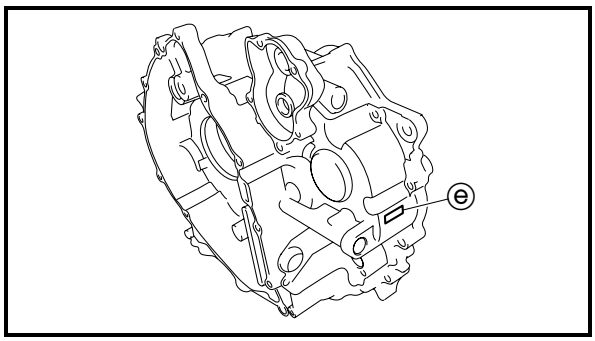
**Middle drive pinion gear shim thickness "A" = ⓔ + ⓓ – ⓑ – ⓒ – ⓐ**

Where:

ⓐ = a numeral (usually a decimal number) on the bearing housing is either added to or subtracted from "0.6"
ⓑ = 17.0
ⓒ = 55.0
ⓓ = a numeral (usually a decimal number) on the right crankcase specifies a thickness of "65.0"






ⓔ = a numeral (usually a decimal number) on the left crankcase specifies a thickness of "9.0"

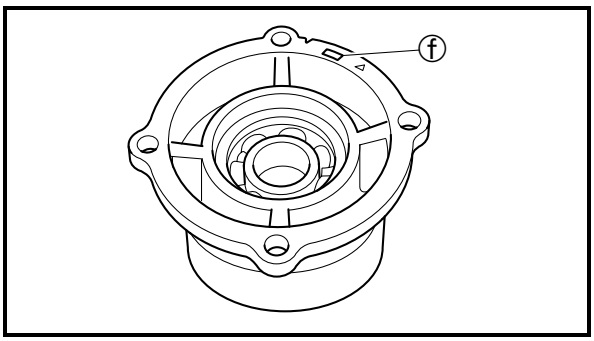
Example:

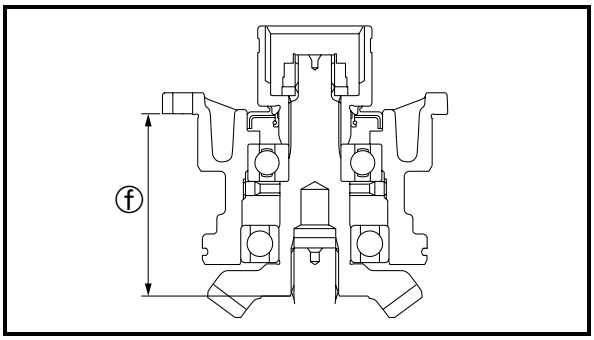
1) If the bearing housing is marked "–02", ..... ⓐ is 0.58
2) ⓑ is 17.0
3) ⓒ is 55.0
4) If the right crankcase is marked "64.97", ..... ⓓ is 64.97
5) If the left crankcase is marked "9.01", ..... ⓔ is 9.01
6) Therefore, the shim thickness is 1.40 mm.
   "A" = 9.01 + 64.97 – 17.0 – 55.0 – 0.58
   = 1.40
7) Round off hundredths digit and select appropriate shim(s). In the example above, the calculated shim thickness is 1.40 mm. The chart instructs you, however, to round off 0 to 0.

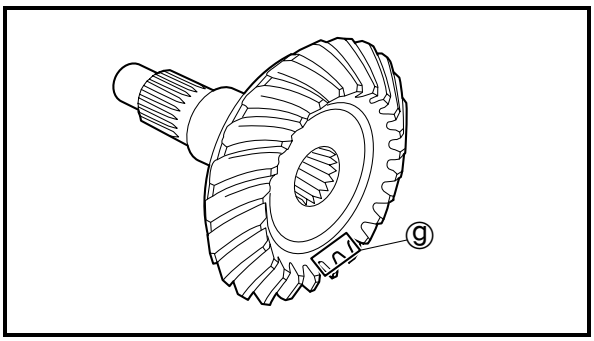
| Hundredths | Round value |
|---|---|
| 0, 1, 2 | 0 |
| 3, 4, 5, 6, 7 | 5 |
| 8, 9 | 10 |

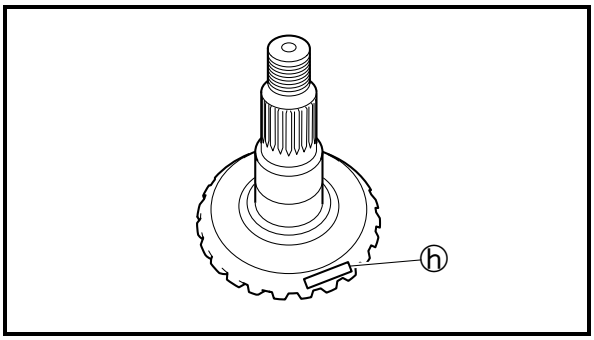
Shims are supplied in the following thickness.

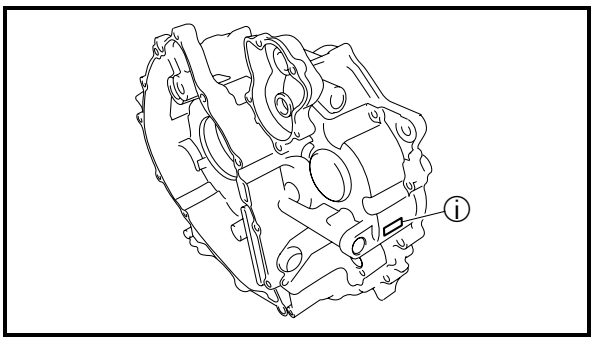
| | Middle drive pinion gear shim |
|---|---|
| Thickness (mm) | 0.50 0.70 1.00<br>0.55 0.80<br>0.60 0.90 |




c. To find shim thickness "B" use the following formula:

**Middle driven pinion gear shim thickness "B" = ⓕ – ⓖ + ⓗ – ⓘ – ⓙ – 0.05**

Where:

ⓕ = a numeral (usually a decimal number) on the bearing housing is either added to or subtracted from "77.5"

**NOTE:**

After replacing any part in the middle driven pinion gear assembly, the overall length of the assembly will change. Therefore, be sure to measure distance ⓕ to select the correct middle driven pinion gear shim thickness.

ⓖ = a numeral (usually a decimal number) on the middle driven pinion gear is either added to or subtracted from "49.0"

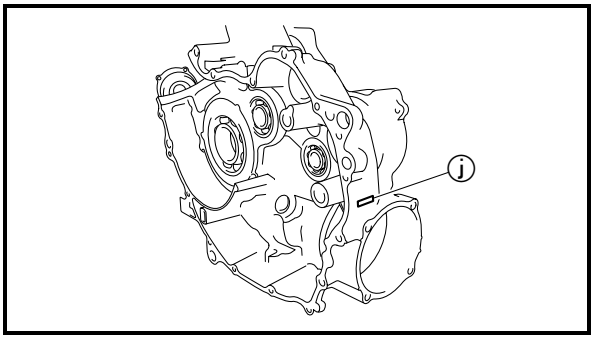
ⓗ = a numeral (usually a decimal number) on the middle driven pinion gear is either added to or subtracted from "80.5"

ⓘ = a numeral (usually a decimal number) on the left crankcase specifies a thickness of "99.98"

ⓙ = a numeral (usually a decimal number) on the right crankcase specifies a thickness of "8.12"

Example:

1) If the bearing housing is marked "+03", ..... ⓕ is 77.53
2) If the driven pinion gear is marked "+0", ..... ⓖ is 49.0
3) If the driven pinion gear is marked "–10", ..... ⓗ is 80.40
4) If the left crankcase is marked "99.99", ..... ⓘ is 99.99
5) If the right crankcase is marked "8.17", ..... ⓙ is 8.17
6) Therefore, the shim thickness is 0.72 mm.
   "B" = 77.53 – 49.0 + 80.40 – 99.99 – 8.17 – 0.05
   = 0.72




7) Round off hundredth digit and select appropriate shim(s). In the example above, the calculated shim thickness is 0.72 mm. The chart instructs you, however, to round off 2 to 0.

| Hundredths | Round value |
|---|---|
| 0, 1, 2 | 0 |
| 3, 4, 5, 6, 7 | 5 |
| 8, 9 | 10 |

Shims are supplied in the following thickness.

| Middle drive pinion gear shim | |
|---|---|
| Thickness (mm) | 0.10 0.40<br>0.15 0.50<br>0.20 0.60<br>0.30 |

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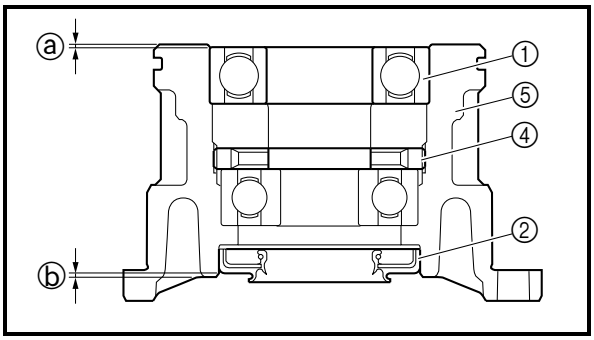
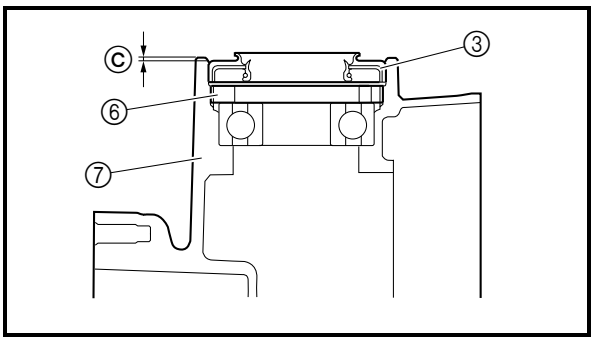


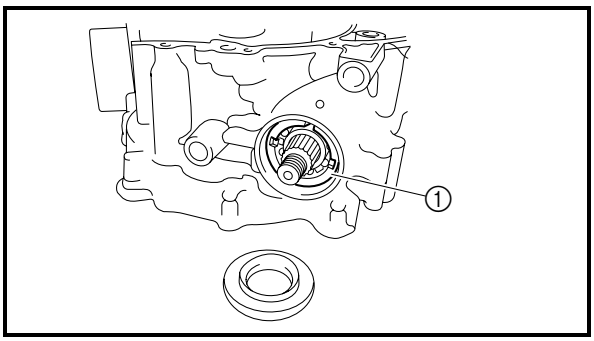



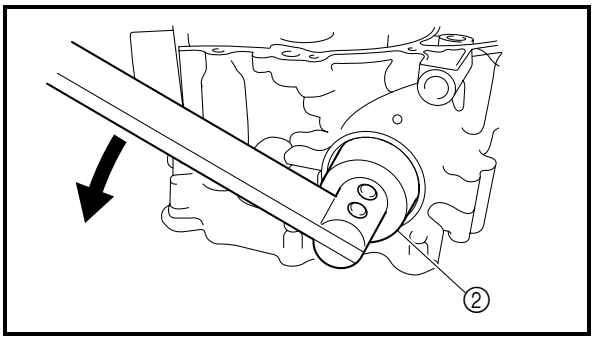

**INSTALLING THE BEARING AND OIL SEALS**

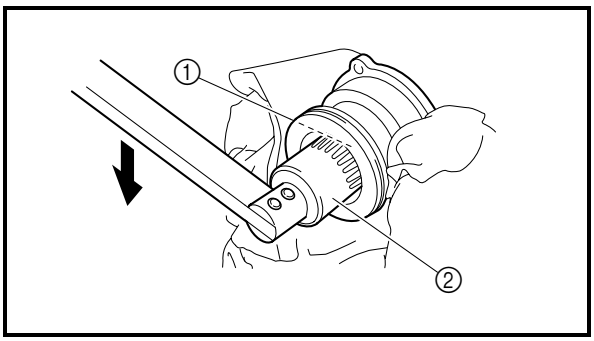
1. Install:
   - bearing ①
   - oil seal ②
   - oil seal ③

**Installed depth of bearing ⓐ**
**0.9 ~ 1.4 mm (0.035 ~ 0.055 in)**
**Installed depth of oil seal ⓑ**
**1.0 ~ 1.5 mm (0.039 ~ 0.059 in)**
**Installed depth of oil seal ⓒ**
**1.0 ~ 1.5 mm (0.039 ~ 0.059 in)**

④ Middle drive pinion gear bearing retainer
⑤ Bearing housing
⑥ Middle driven shaft bearing retainer
⑦ Crankcase




EBS00373

## INSTALLING THE MIDDLE DRIVEN SHAFT

1. Install:
   - middle driven shaft bearing retainer ①

LT | 80 Nm (8.0 m · kg, 58 ft · lb)

**NOTE:**

Attach the ring nut wrench ②.

| | |
|---|---|
| | **Ring nut wrench**<br>**90890-01430, YM-38404** |

**CAUTION:**

**The middle driven shaft bearing retainer has left-handed threads. To tighten the retainer turn it counterclockwise.**

2. Install:
   - middle driven pinion gear bearing retainer ①

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a. Secure the bearing housing edge in the vise with a clean rag.
b. Attach the bearing retainer wrench ②.

| | |
|---|---|
| | **Bearing retainer wrench**<br>**90890-04128**<br>**Middle gear bearing retainer**<br>**YM-04128** |

c. Tighten the bearing retainer.

**CAUTION:**

**The middle driven pinion gear bearing retainer has left-handed threads. To tighten the retainer turn it counterclockwise.**

| | |
|---|---|
| | **Bearing retainer**<br>**130 Nm (13.0 m · kg, 94 ft · lb)**<br>**LOCTITE®** |

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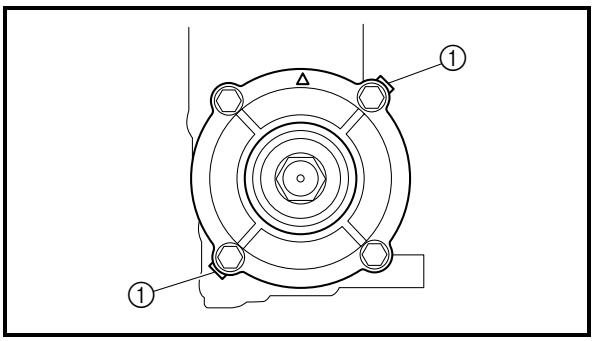
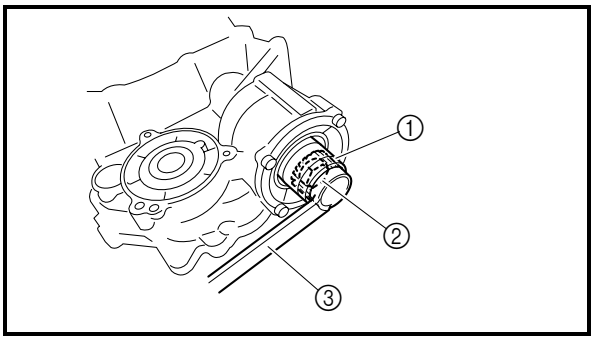



3. Install:
   - middle driven gear shim(s) ①
   - bearing housing

**NOTE:**
Install the shim(s) so that the tabs are positioned as shown in the illustration.

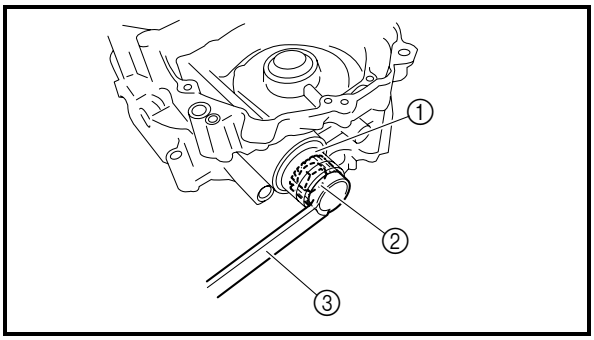



4. Install:
   - rear drive shaft coupling gear (middle gear side) ①
   - washer
   - rear drive shaft coupling gear nut (middle gear side) ②

**150 Nm (15.0 m · kg, 110 ft · lb)**

**NOTE:**
Use the coupling gear/middle shaft tool ③ to hold the coupling gear.

**Coupling gear/middle shaft tool**
**90890-01229**
**Gear holder**
**YM-01229**

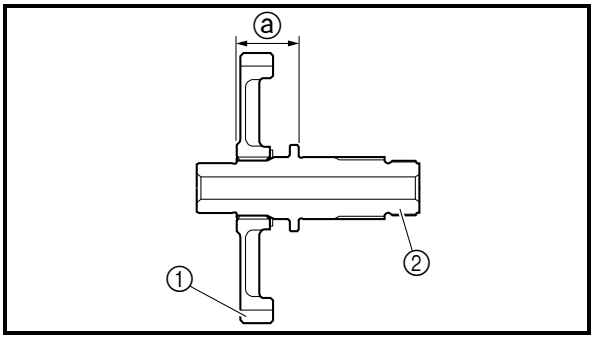


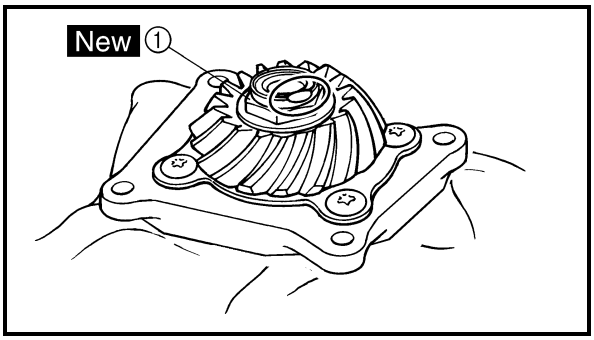

5. Install:
   - front drive shaft coupling gear (middle gear side) ①
   - washer
   - front drive shaft coupling gear nut (middle gear side) ②

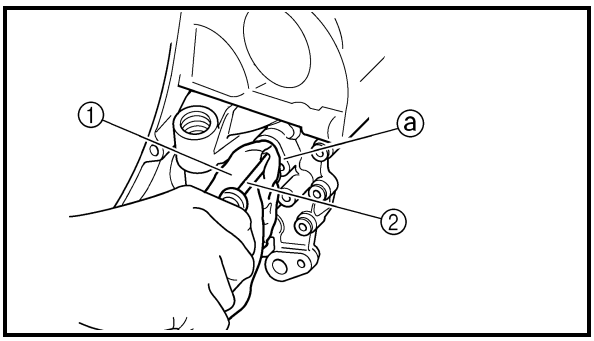
**115 Nm (11.5 m · kg, 85 ft · lb)**

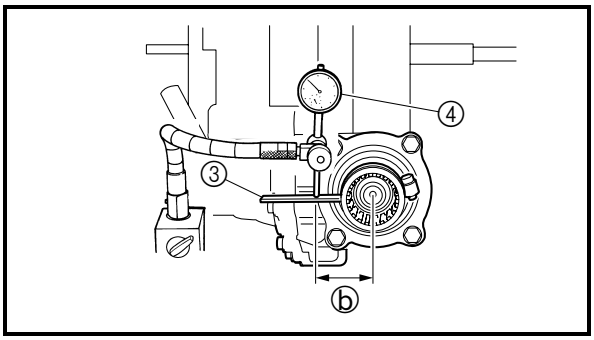
**NOTE:**
Use the coupling gear/middle shaft tool ③ to hold the coupling gear.

**Coupling gear/middle shaft tool**
**90890-01229**
**Gear holder**
**YM-01229**




**INSTALLING THE MIDDLE DRIVE SHAFT**

1. Install:
   - circlip
   - middle driven gear ①
     (to the middle drive shaft ②)

| | |
|---|---|
| | **Installed depth of middle driven gear ⓐ**<br>**24.7 ~ 24.9 mm (0.97 ~ 0.98 in)** |

2. Tighten:
   - middle drive pinion gear nut ① New

| | |
|---|---|
| | **180 Nm (18.0 m · kg, 130 ft · lb)** |

**NOTE:**

Secure the middle drive shaft in the vise with a clean rag.

3. Lock the threads with a drift punch.

EBS01022

**MEASURING THE MIDDLE GEAR BACKLASH**

1. Measure:
   - gear lash

| | |
|---|---|
| | **Middle gear lash**<br>**0.10 ~ 0.30 mm**<br>**(0.004 ~ 0.012 in)** |

▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼▼

a. Temporarily install the left crankcase.
b. Wrap a rag ① around a screwdriver ②, and then insert it into the installation hole ⓐ of the left crankcase speed sensor to hold the middle driven gear.
c. Attach the final gear backlash band ③ and dial gauge ④.

| | |
|---|---|
| | **Final gear backlash band**<br>**90890-01511** |

ⓑ 45 mm (1.8 in)

d. Measure the gear lash while rotating the middle driven shaft back and forth.

**NOTE:**

Measure the gear lash at 4 positions. Rotate the middle driven gear 90° each time.

e. If the gear lash is incorrect, adjust the gear lash by middle driven pinion gear shims and/or middle drive pinion gear shim(s).

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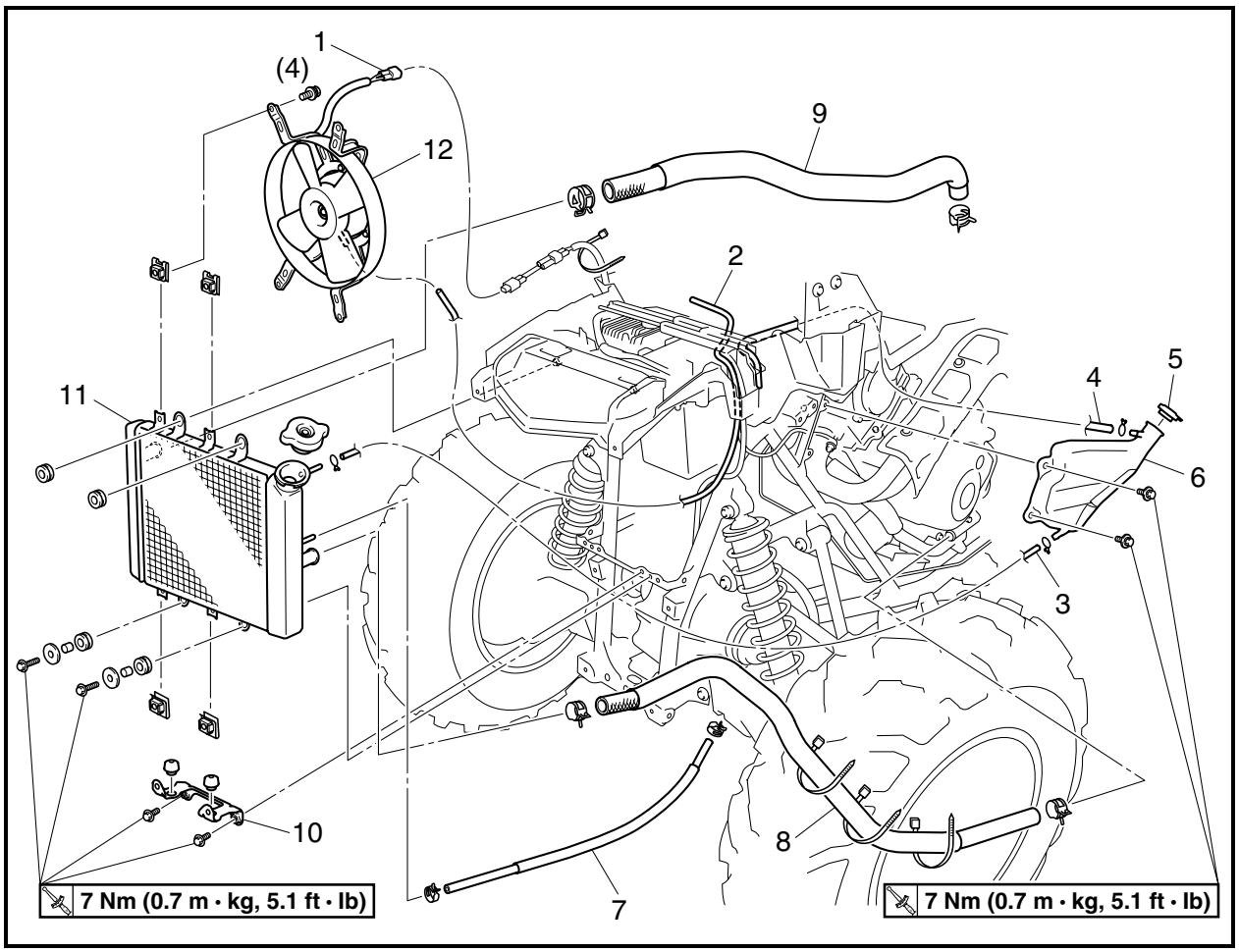
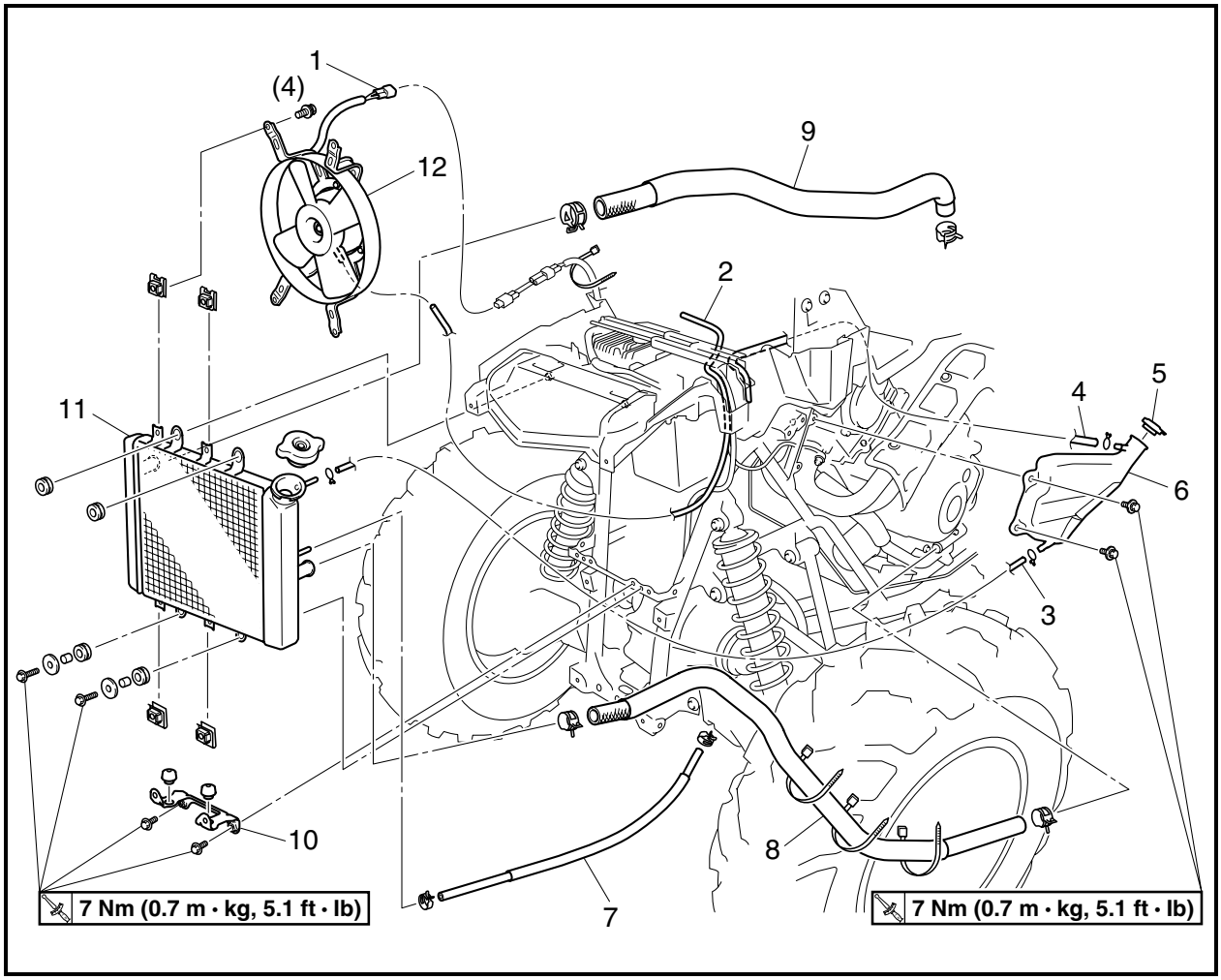
EBS00125

# COOLING SYSTEM

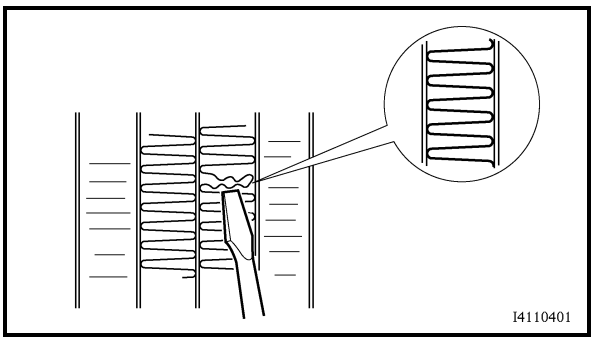
## RADIATOR




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the radiator** | | Remove the parts in the order listed. |
| | Front fenders | | Refer to "FRONT FENDERS AND FRONT GRILL" in chapter 3. |
| | Front guard | | Refer to "FRONT CARRIER AND FRONT GUARD" in chapter 3. |
| | Left footrest board | | Refer to "FOOTREST BOARDS" in chapter 3. |
| | Air filter case | | Refer to "AIR FILTER CASE" in chapter 3. |
| | Coolant | | Drain.<br>Refer to "CHANGING THE COOLANT" in chapter 3. |
| 1 | Radiator fan motor coupler | 1 | Disconnect. |
| 2 | Radiator fan breather hose | 1 | |
| 3 | Coolant reservoir hose | 1 | |
| 4 | Coolant reservoir breather hose | 1 | |




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| 5 | Coolant reservoir cap | 1 | |
| 6 | Coolant reservoir | 1 | |
| 7 | Fast idle plunger outlet hose | 1 | |
| 8 | Radiator outlet hose | 1 | |
| 9 | Radiator inlet hose | 1 | |
| 10 | Radiator bracket | 1 | |
| 11 | Radiator | 1 | |
| 12 | Radiator fan | 1 | |
| | | | For installation, reverse the removal procedure. |

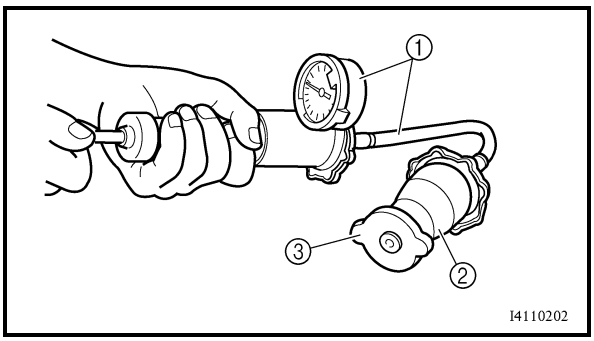



EBS00127
## CHECKING THE RADIATOR

1. Check:
   - radiator fins
     Obstruction → Clean.
     Apply compressed air to the rear of the radiator.
     Damage → Repair or replace.

**NOTE:**
Straighten any flattened fins with a thin, flat-head screwdriver.

2. Check:
   - radiator hoses
     Cracks/damage → Replace.
3. Measure:
   - radiator cap opening pressure
     Below the specified pressure → Replace the radiator cap.




**Radiator cap opening pressure**
**93.3 ~ 122.7 kPa**
**(0.933 ~ 1.227 kg/cm², 13.27 ~ 17.45 psi)**

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a. Install the radiator cap tester ① and radiator cap tester adapter ② to the radiator cap ③.

**Radiator cap tester**
**90890-01325**
**Radiator pressure tester**
**YU-24460-01**
**Radiator cap tester adapter**
**90890-01352**
**Radiator pressure tester adapter**
**YU-33984**

b. Apply the specified pressure for ten seconds and make sure there is no drop in pressure.

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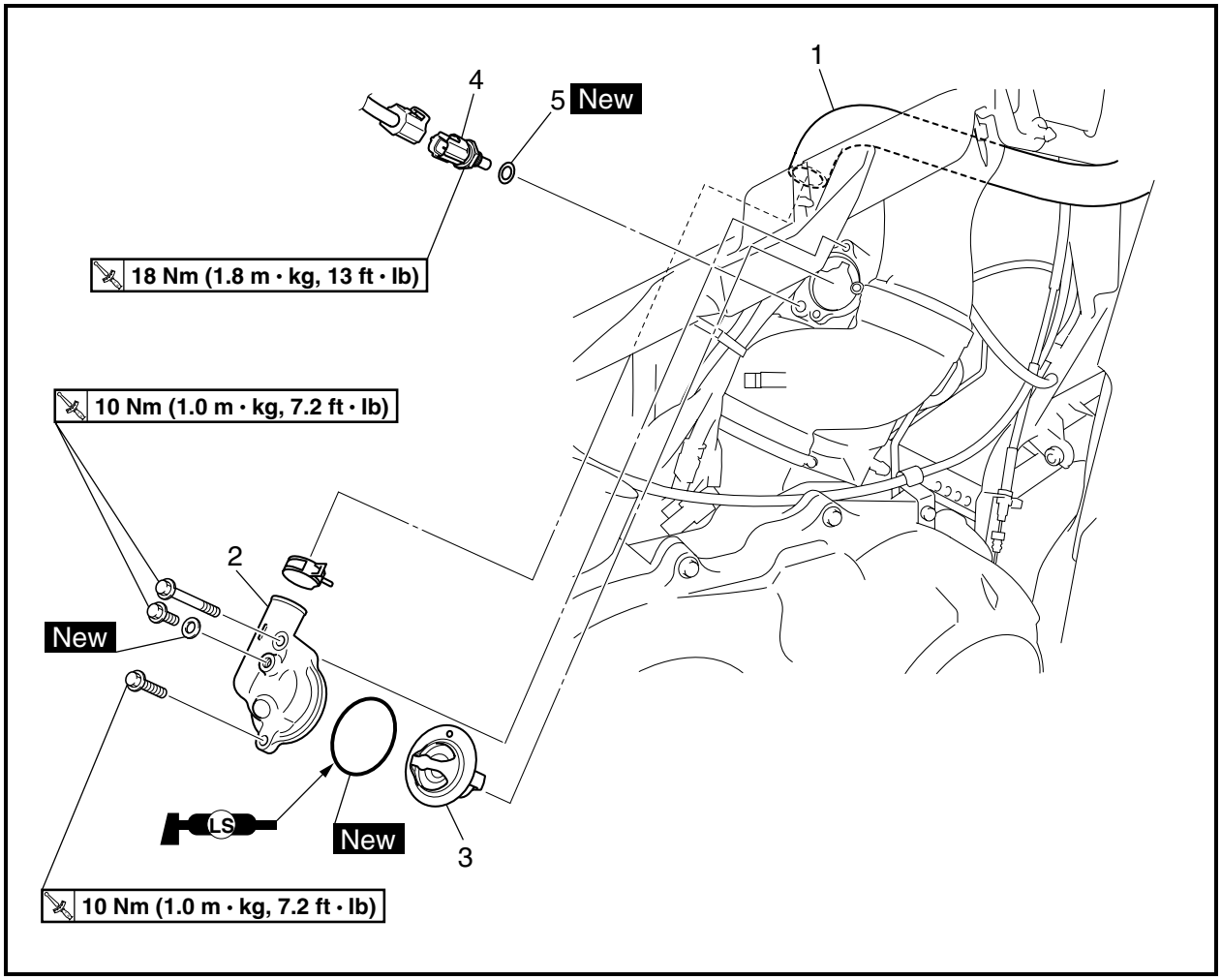
4. Check:
   - radiator fan
     Damage → Replace.
     Malfunction → Check and repair.
     Refer to “COOLING SYSTEM” in chapter 9.

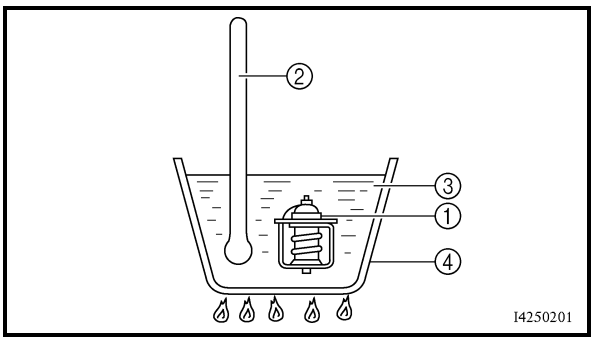
EBS00128
## INSTALLING THE RADIATOR

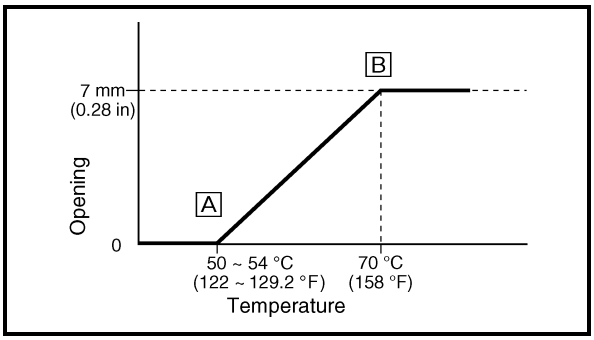
1. Fill:
   - cooling system
     (with the specified amount of the recommended coolant)
     Refer to “CHANGING THE COOLANT” in chapter 3.
2. Check:
   - cooling system
     Leaks → Repair or replace any faulty part.
3. Measure:
   - radiator cap opening pressure
     Below the specified pressure → Replace the radiator cap.
     Refer to “CHECKING THE RADIATOR”.

EBS00129
# THERMOSTAT




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the thermostat** | | Remove the parts in the order listed. |
| | Air filter case | | Refer to "AIR FILTER CASE" in chapter 3. |
| | Coolant | | Drain.<br>Refer to "CHANGING THE COOLANT" in chapter 3. |
| 1 | Radiator inlet hose | 1 | Disconnect. |
| 2 | Thermostat cover | 1 | |
| 3 | Thermostat | 1 | |
| 4 | Coolant temperature sensor | 1 | |
| 5 | Copper washer | 1 | |
| | | | For installation, reverse the removal procedure. |




EBS00132
## CHECKING THE THERMOSTAT

1. Check:
   - thermostat ①
     Does not open at 50 ~ 54 °C (122 ~ 129.2 °F) → Replace.

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a. Suspend the thermostat in a container filled with water.
b. Slowly heat the water.
c. Place a thermometer in the water.
d. While stirring the water, observe the thermostat and thermometer's indicated temperature.

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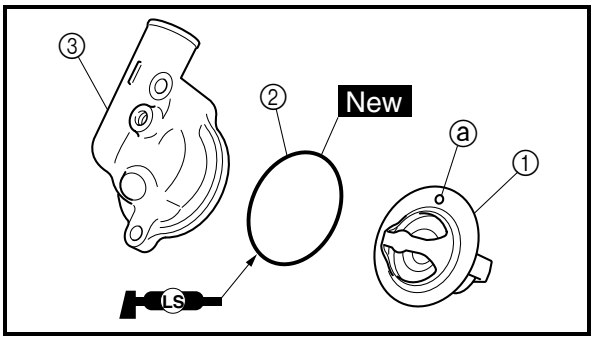
① Thermometer
② Water
③ Thermostat
④ Container
A Fully closed
B Fully open

**NOTE:**
If the accuracy of the thermostat is in doubt, replace it. A faulty thermostat could cause serious overheating or overcooling.

2. Check:
   - thermostat housing cover
   - thermostat housing (cylinder head)
     Cracks/damage → Replace.



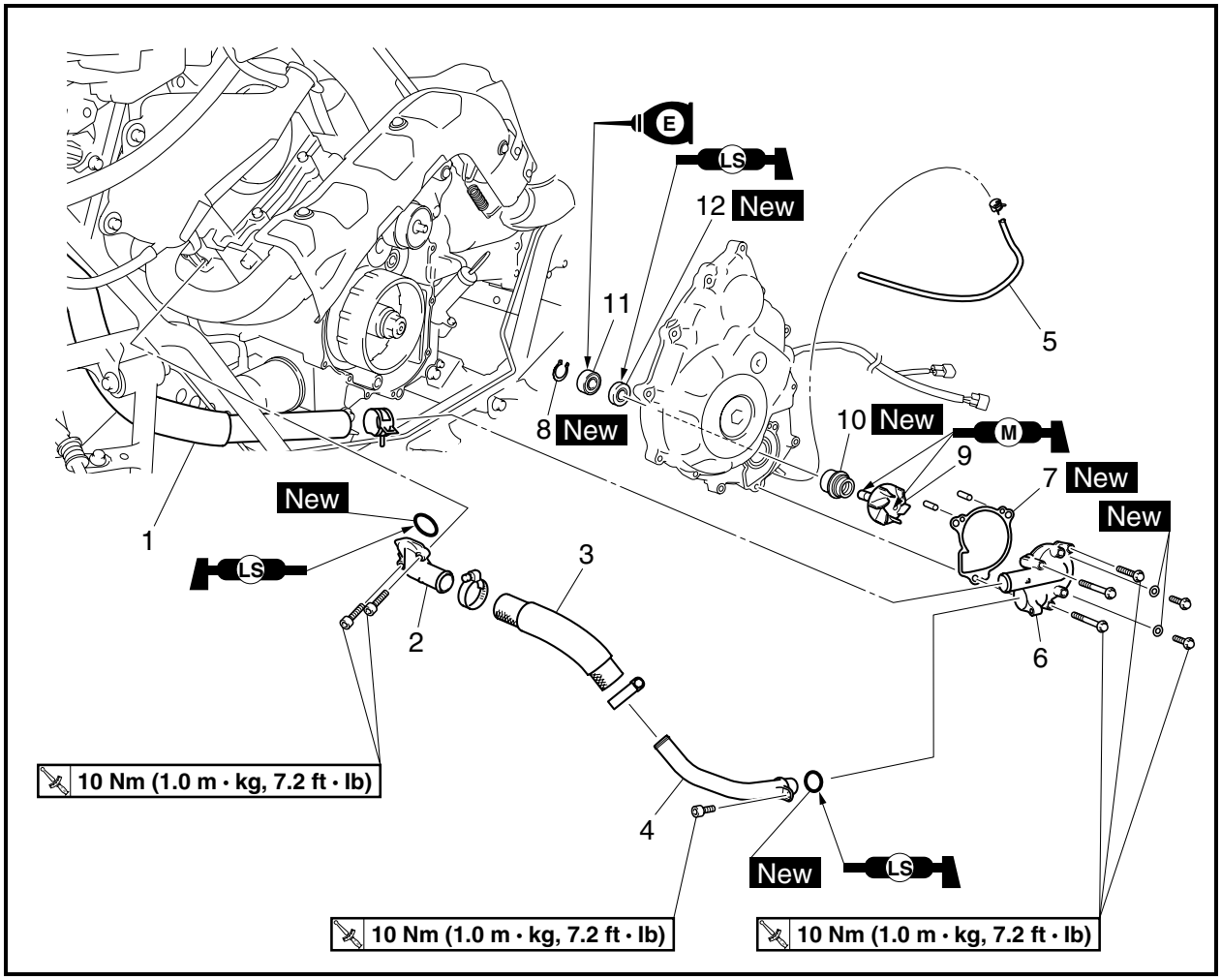

EBS00133
## INSTALLING THE THERMOSTAT

1. Install:
   - thermostat ①
   - O-ring ② New
   - thermostat cover ③

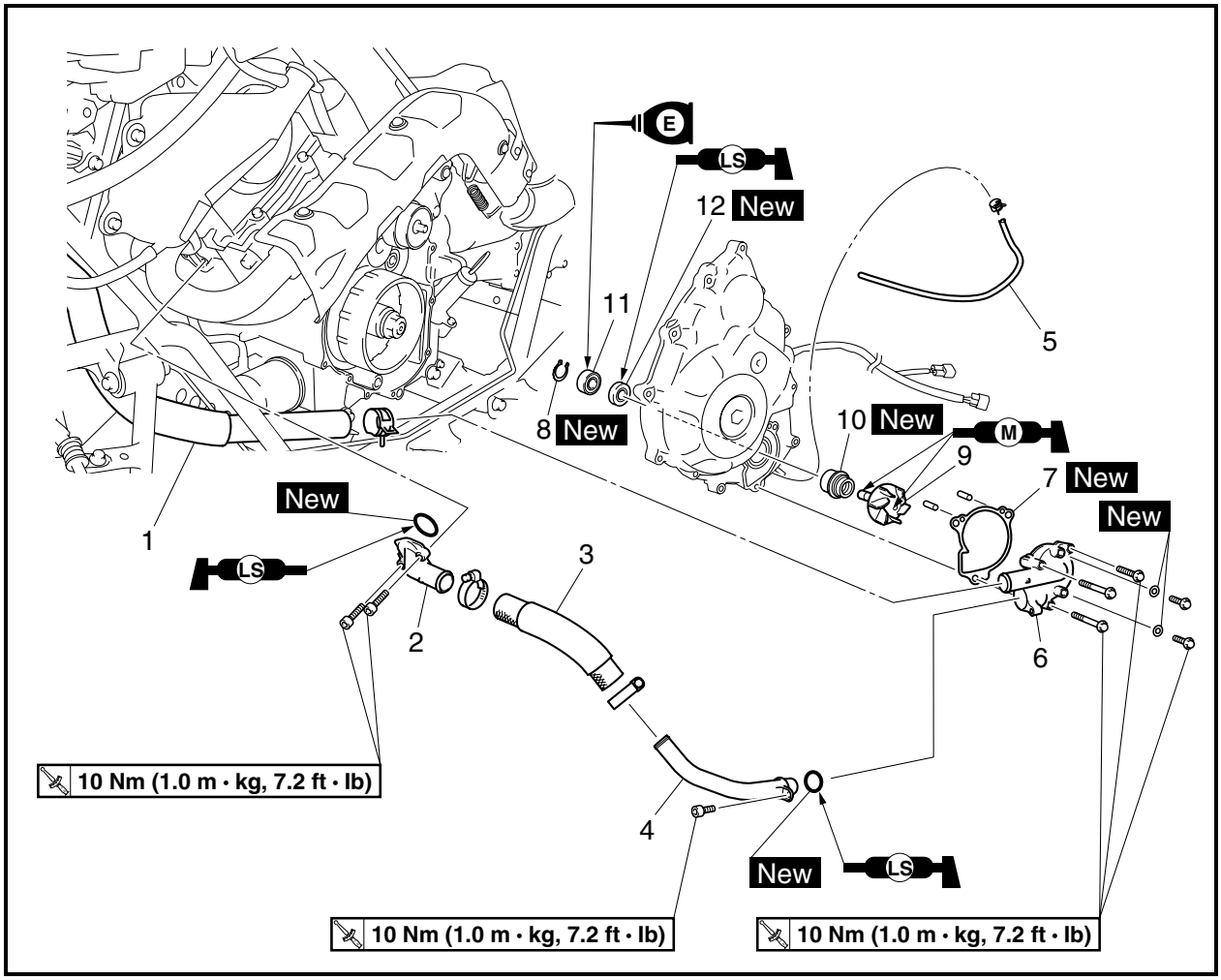
**NOTE:**
Install the thermostat with its breather hole ⓐ facing up.

2. Fill:
   - cooling system
     (with the specified amount of the recommended coolant)
     Refer to "CHANGING THE COOLANT" in chapter 3.
3. Check:
   - cooling system
     Leak → Repair or replace any faulty part.

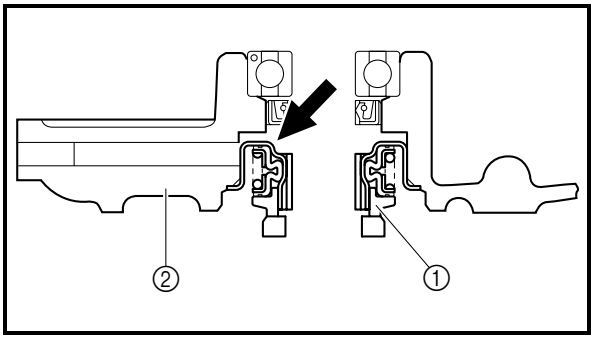
EBS00134
# WATER PUMP




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the water pump** | | Remove the parts in the order listed. |
| | Left footrest board | | Refer to "FOOTREST BOARDS" in chapter 3. |
| | Left front fender | | Refer to "FRONT FENDERS AND FRONT GRILL" in chapter 3. |
| | AC magneto cover | | Refer to "AC MAGNETO" in chapter 4. |
| | Coolant | | Drain.<br>Refer to "CHANGING THE COOLANT" in chapter 3. |
| 1 | Radiator outlet hose | 1 | Disconnect. |
| 2 | Water jacket joint | 1 | |
| 3 | Water pump outlet hose | 1 | |
| 4 | Water pump outlet pipe | 1 | |
| 5 | Water pump breather hose | 1 | |
| 6 | Water pump housing | 1 | |



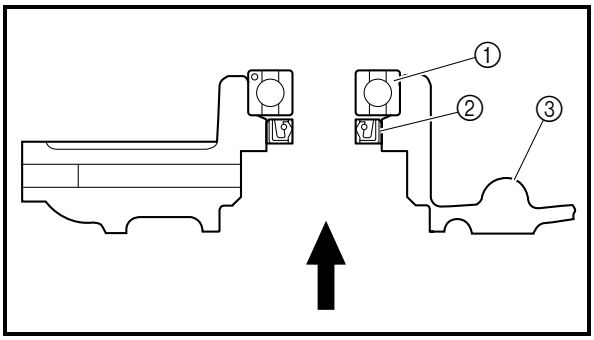

| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| 7 | Gasket | 1 | |
| 8 | Circlip | 1 | |
| 9 | Impeller shaft | 1 | |
| 10 | Water pump seal | 1 | |
| 11 | Bearing | 1 | |
| 12 | Oil seal | 1 | |
| | | | For installation, reverse the removal procedure. |




EBS00138
### DISASSEMBLING THE WATER PUMP

1. Remove:
   - water pump seal ①

**NOTE:**
Tap out the water pump seal from the inside of the AC magneto cover ②.

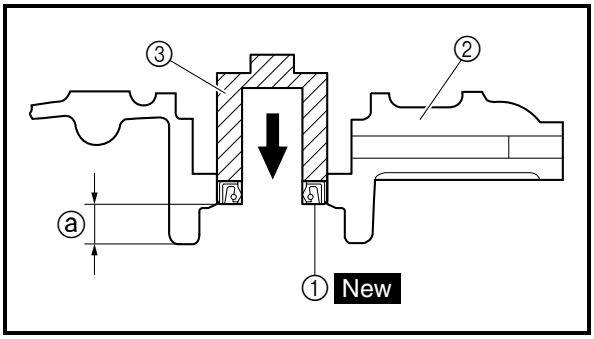



2. Remove:
   - bearing ①
   - oil seal ②

**NOTE:**
Tap out the bearing and oil seal from the outside of the AC magneto cover ③.

EBS00139
### CHECKING THE WATER PUMP

1. Check:
   - water pump housing
   - impeller shaft
     Cracks/damage/wear → Replace.
2. Check:
   - water jacket
   - water jacket outlet hose
   - water jacket outlet pipe
     Cracks/damage/wear → Replace.
   - bearing
     Rough movement → Replace.



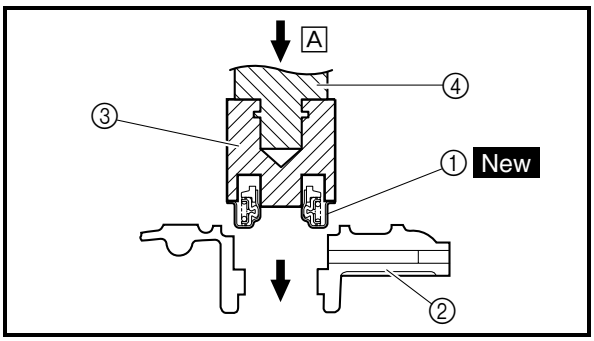

EBS00140
**ASSEMBLING THE WATER PUMP**

1. Install:
   - oil seal ① New
     (into the AC magneto cover ②)

**NOTE:**

- Before installing the oil seal, apply tap water or coolant onto its out surface.
- Install the oil seal with a socket ③ that matches its outside diameter.

**Installed depth of oil seal ⓐ**
**8.1 ~ 8.7 mm (0.32 ~ 0.34 in)**




2. Install:
   - water pump seal ① New
     (into the AC magneto cover ②)

**CAUTION:**

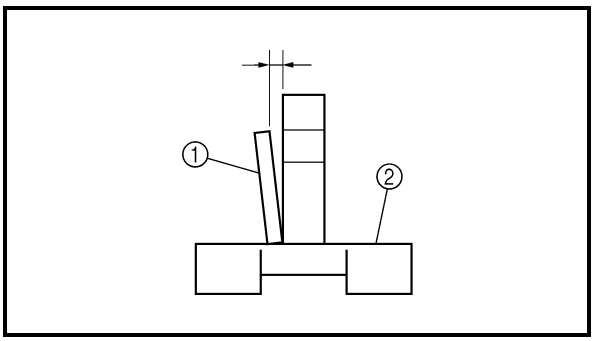
**Never lubricate the water pump seal surface with oil or grease.**

**NOTE:**

Install the water pump seal with the special tools.

**Mechanical seal installer ③**
**90890-04132**
**Water pump seal installer**
**YM-33221-A**
**Middle driven shaft bearing driver ④**
**90890-04058**
**Bearing driver 40 mm**
**YM-04058**

A Push down.




3. Measure:
   • impeller shaft tilt
   Out of specification → Replace.

**CAUTION:**

**Make sure the rubber damper and rubber damper holder are flush with the impeller.**

**Impeller shaft tilt limit**
**0.15 mm (0.006 in)**

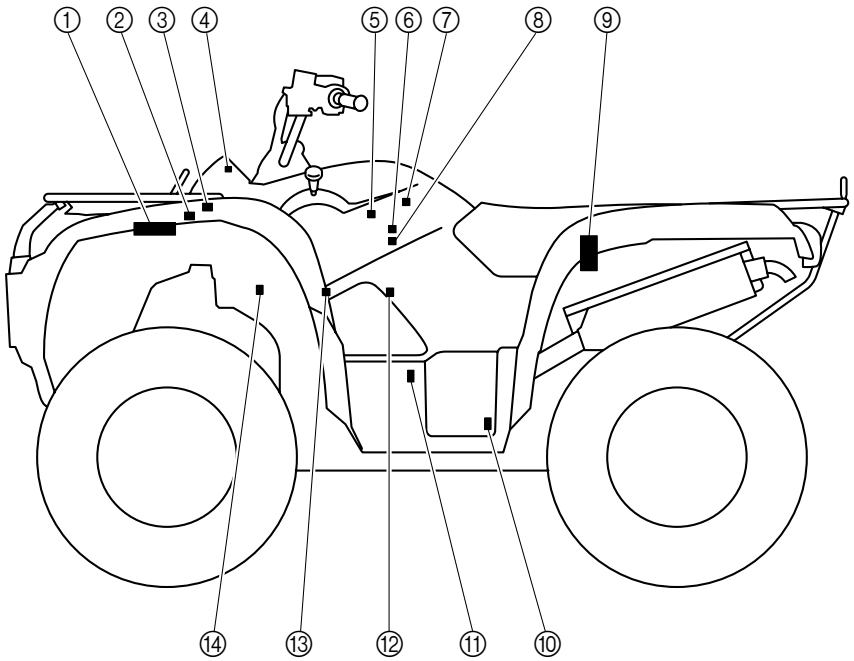
① Straightedge
② Impeller shaft

EAS00894

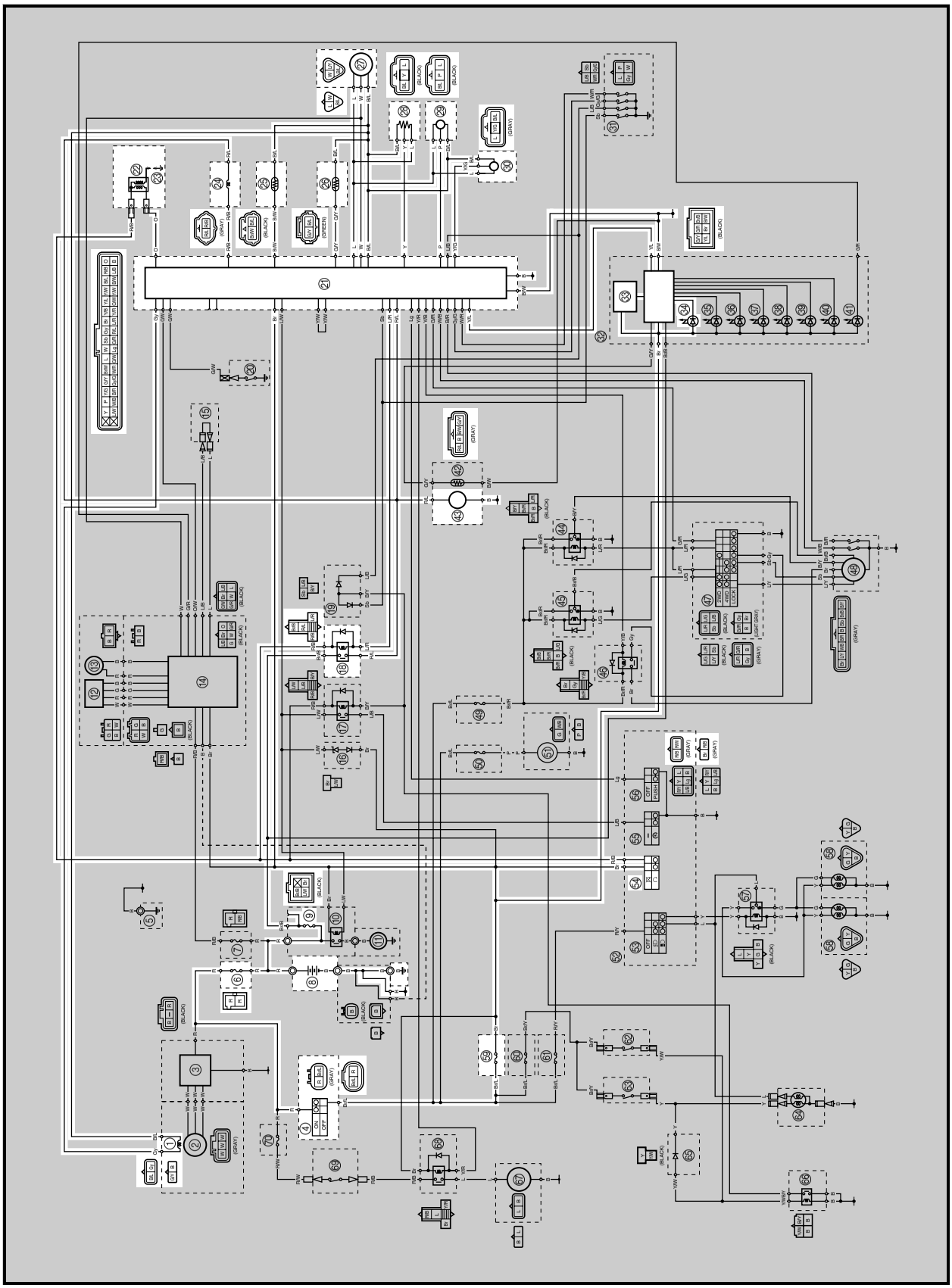
# FUEL INJECTION SYSTEM

## FUEL INJECTION SYSTEM

① ECU (engine control unit)
② Lean angle sensor
③ Fuel injection system relay
④ Engine trouble warning light
⑤ Intake air pressure sensor
⑥ TPS (throttle position sensor)
⑦ Intake air temperature sensor
⑧ Fuel injector
⑨ Fuel pump
⑩ Speed sensor
⑪ Crankshaft position sensor
⑫ Coolant temperature sensor
⑬ Spark plug
⑭ Ignition coil



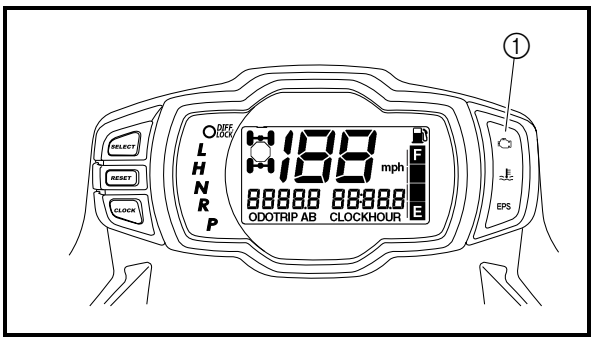
EAS27340
## CIRCUIT DIAGRAM



① Crankshaft position sensor
④ Main switch
⑥ Main fuse
⑧ Battery
⑨ Fuel injection system fuse
⑱ Fuel injection system relay
㉑ ECU (engine control unit)
㉒ Ignition coil
㉓ Spark plug
㉔ Fuel injector
㉕ Intake air temperature sensor
㉖ Coolant temperature sensor
㉗ Speed sensor
㉘ TPS (throttle position sensor)
㉙ Intake air pressure sensor
㉚ Lean angle sensor
㉝ Multifunction meter
㉞ Engine trouble warning light
㊸ Fuel pump
㊹ Engine stop switch
㊾ Ignition fuse

## ECU SELF-DIAGNOSTIC FUNCTION

The ECU is equipped with a self-diagnostic function in order to ensure that the fuel injection system is operating normally. If this function detects a malfunction in the system, it immediately operates the engine under substitute characteristics and illuminates the engine trouble warning light to alert the rider that a malfunction has occurred in the system. Once a malfunction has been detected, a fault code is stored in the memory of the ECU.




① Engine trouble warning light

- To inform the rider that the fuel injection system is not functioning, the engine trouble warning light flashes when the start switch is being pushed to start the engine.
- If a malfunction is detected in the system by the self-diagnostic function, the ECU provides an appropriate substitute characteristic operation, and alerts the rider of the detected malfunction by illuminating the engine trouble warning light.
- After the engine has been stopped, the lowest fault code number appears on the odometer/tripmeter LCD. Once a fault code has been displayed, it remains stored in the memory of the ECU until it is deleted.

**Engine trouble warning light indication and fuel injection system operation**

| Warning light indication | ECU operation | Fuel injection operation | Vehicle operation |
|---|---|---|---|
| Flashing* | Warning provided when unable to start engine | Operation stopped | Cannot be operated |
| Remains on | Malfunction detected | Operated with substitute characteristics in accordance with the description of the malfunction | Can or cannot be operated depending on the fault code |

*The warning light flashes when any one of the conditions listed below is present and the start switch is pushed:

| | | | |
|---|---|---|---|
| 12: | Crankshaft position sensor | 41: | Lean angle sensor (open or short-circuit) |
| 30: | Lean angle sensor (latch up detected) | 50: | ECU internal malfunction (memory check error) |

EAS27380
## SELF-DIAGNOSTIC FUNCTION TABLE

If the ECU detects an abnormal signal from a sensor while the vehicle is being driven, the ECU illuminates the engine trouble warning light and provides the engine with alternate operating instructions that are appropriate for the type of malfunction.
When an abnormal signal is received from a sensor, the ECU processes the specified values that are programmed for each sensor in order to provide the engine with alternate operating instructions that enable the engine to continue to operate or stop operating, depending on the conditions.

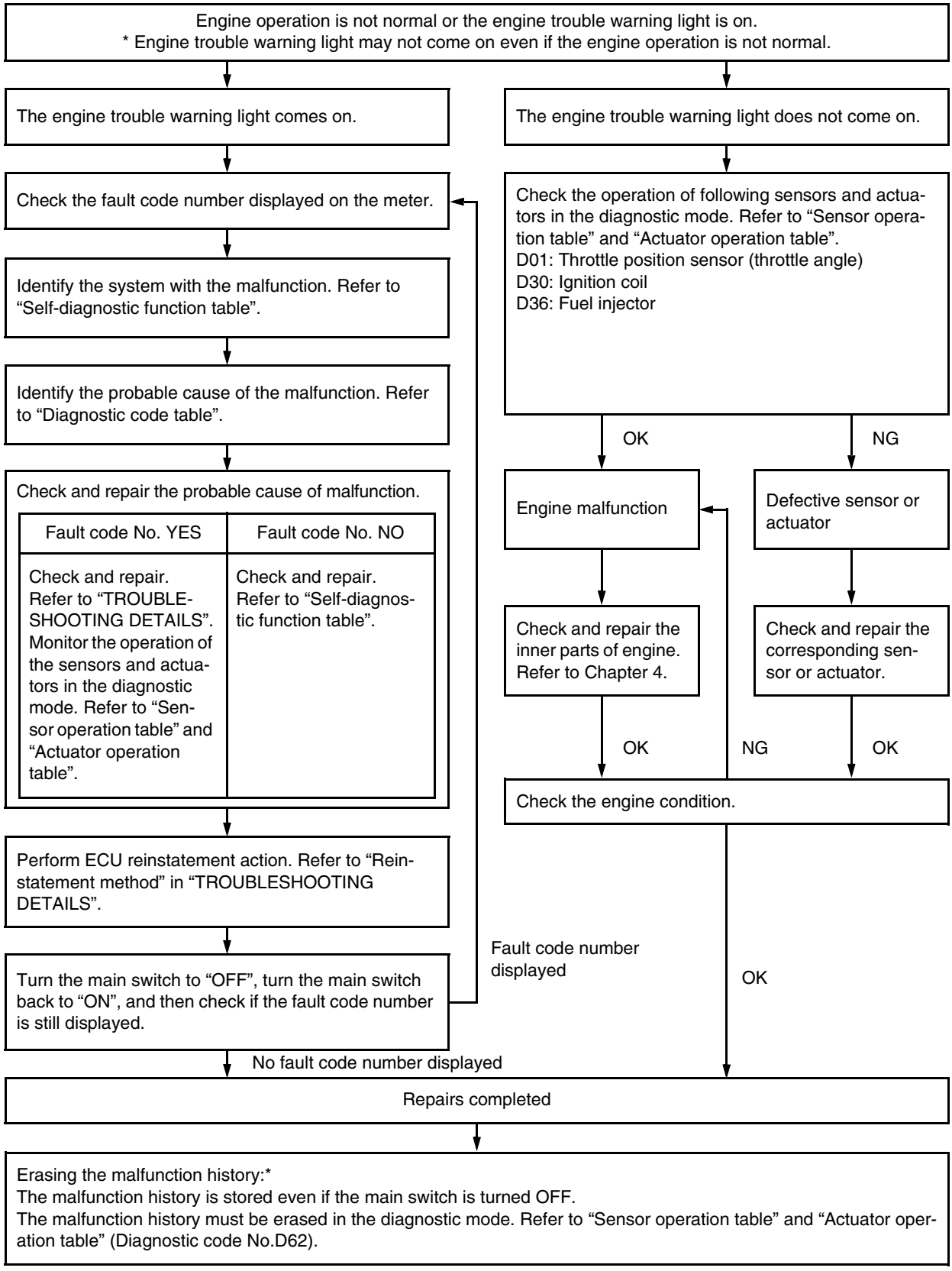
### Self-diagnostic function table

| Fault code No. | Item | Symptom | Able / unable to start | Able / unable to drive |
|---|---|---|---|---|
| 12 | Crankshaft position sensor | No normal signals are received from the crankshaft position sensor. | Unable | Unable |
| 13 | Intake air pressure sensor (open or short circuit) | Intake air pressure sensor: open or short circuit detected. | Able | Able |
| 14 | Intake air pressure sensor (hose line) | Intake air pressure sensor: hose system malfunction (clogged or detached hose). | Able | Able |
| 15 | Throttle position sensor (open or short circuit) | Throttle position sensor: open or short circuit detected. | Able | Able |
| 16 | Throttle position sensor | Stuck throttle position sensor detected. | Able | Able |
| 21 | Coolant temperature sensor | Coolant temperature sensor: open or short circuit detected. | Able | Able |
| 22 | Intake air temperature sensor (open or short circuit) | Intake air temperature sensor: open or short circuit detected. | Able | Able |
| 30 | Lean angle sensor (latch up detected) | The vehicle has overturned. | Unable | Unable |
| 33 | Ignition coil (faulty ignition) | Malfunction detected in the primary wire of ignition coil. | Unable | Unable |
| 39 | Injector (open circuit) | Injector: open circuit detected. | Unable | Unable |
| 41 | Lean angle sensor (open or short circuit) | Lean angle sensor: open or short circuit detected. | Unable | Unable |
| 42 | Speed sensor | No normal signals are received from the speed sensor. | Able | Able |
| 43 | Fuel system voltage (monitoring voltage) | The ECU is unable to monitor the battery voltage (an open or short circuit in the line to the ECU). | Able | Able |
| 44 | Error in writing the amount of CO adjustment on EEPROM | Error is detected while reading or writing on EEPROM (CO adjustment value). | Able | Able |
| 46 | Vehicle system power supply (Monitoring voltage) | Power supply is not normal. | Able | Able |
| 50 | ECU internal malfunction (memory check error) | Faulty ECU memory. (When this malfunction is detected in the ECU, the fault code number might not appear on the meter). | Unable | Unable |

### Communication error with the meter

| Fault code No. | Item | Symptom | Able / unable to start | Able / unable to drive |
|---|---|---|---|---|
| Er-1 | ECU internal malfunction (output signal error) | No signals are received from the ECU. | Unable | Unable |
| Er-2 | ECU internal malfunction (output signal error) | No signals are received from the ECU within the specified duration. | Unable | Unable |
| Er-3 | ECU internal malfunction (output signal error) | Data from the ECU cannot be received correctly. | Unable | Unable |
| Er-4 | ECU internal malfunction (input signal error) | Non-registered data has been received from the meter. | Unable | Unable |

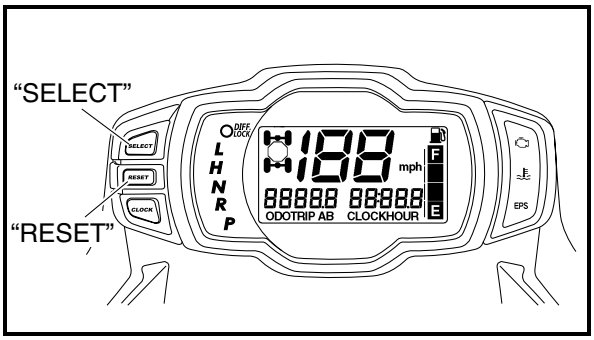
EAS00904
## TROUBLESHOOTING CHART




* Operated when the engine trouble warning light is on.

EAS00905
## DIAGNOSTIC MODE

It is possible to monitor the sensor output data or check the activation of actuators without connecting the measurement equipment by simply switching the meter indication from the normal mode to the diagnostic monitoring mode.



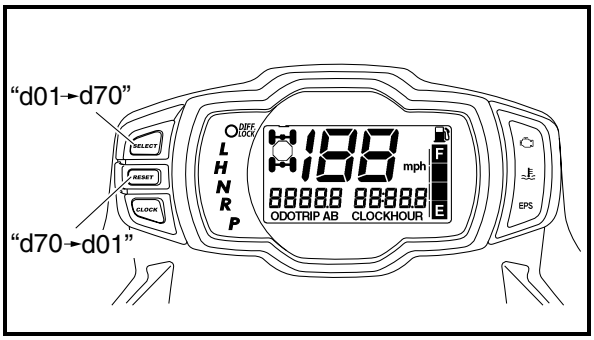

**Setting the diagnostic mode**

1. Turn the main switch to "OFF" and set the engine stop switch to "OFF".
2. Disconnect the wire harness coupler from the fuel pump.
3. Simultaneously press and hold the "SELECT" and "RESET" buttons, turn the main switch to "ON", and continue to press the buttons for 8 seconds or more.

**NOTE:**

- All displays on the meter disappear.
- "dIAG" appears on the LCD meter.

4. Simultaneously press the "SELECT" and "RESET" buttons for 2 seconds or more to execute the selection.
5. Select the diagnostic code number that applies to the item that was verified with the fault code number by pressing the "SELECT" and "RESET" buttons.




**NOTE:**

- The diagnostic code number appears on the LCD meter (01-70).
- To decrease the selected diagnostic code number, press the "RESET" button. Press the "RESET" button for 1 second or longer to automatically decrease the diagnostic code numbers.
- To increase the selected diagnostic code number, press the "SELECT" button. Press the "SELECT" button for 1 second or longer to automatically increase the diagnostic code numbers.

6. Verify the operation of the sensor or actuator.
   - Sensor operation
     The data representing the operating conditions of the sensor appears on the LCD meter.
   - Actuator operation
     Set the engine stop switch to “ON” to operate the actuator.
   * If the engine stop switch is set to “ON”, set it to “OFF”, and then set it to “ON” again.
7. Turn the main switch to “OFF” to cancel the diagnostic mode.

**NOTE:**
To perform a reliable diagnosis, make sure to turn off the power supply before every check and then start right from the beginning.

## Diagnostic code table

| Fault code No. | Symptom | Probable cause of malfunction | Diagnostic code No. |
|---|---|---|---|
| 12 | No normal signals are received from the crankshaft position sensor. | • Open or short circuit in wire harness.<br>• Defective crankshaft position sensor.<br>• Malfunction in pickup rotor.<br>• Malfunction in ECU.<br>• Improperly installed sensor. | — |
| 13 | Intake air pressure sensor: open or short circuit detected. | • Open or short circuit in wire harness.<br>• Defective intake air pressure sensor.<br>• Malfunction in ECU. | D03 |
| 14 | Intake air pressure sensor: hose system malfunction (clogged or detached hose). | • Intake air pressure sensor hose is detached, clogged, kinked, or pinched.<br>• Malfunction in ECU. | D03 |
| 15 | Throttle position sensor: open or short circuit detected. | • Open or short circuit in wire sub lead.<br>• Open or short circuit in wire harness.<br>• Defective throttle position sensor.<br>• Malfunction in ECU.<br>• Improperly installed throttle position sensor. | D01 |
| 16 | Stuck throttle position sensor detected. | • Stuck throttle position sensor.<br>• Malfunction in ECU. | D01 |
| 21 | Coolant temperature sensor: open or short circuit detected. | • Open or short circuit in wire harness.<br>• Defective coolant temperature sensor.<br>• Malfunction in ECU.<br>• Improperly installed coolant temperature sensor. | D06 |
| 22 | Intake air temperature sensor: open or short circuit detected. | • Open or short circuit in wire harness.<br>• Defective intake air temperature sensor.<br>• Malfunction in ECU.<br>• Improperly installed intake air temperature sensor. | D05 |
| 30 | The vehicle has overturned. | • Overturned.<br>• Malfunction in ECU. | D08 |
| 33 | Malfunction detected in the primary lead of the ignition coil. | • Open or short circuit in wire harness.<br>• Malfunction in ignition coil.<br>• Malfunction in ECU.<br>• Malfunction in a component of ignition cut-off circuit system. | D30<br>D32 |
| 39 | Open circuit detected in a injector. | • Open or short circuit in wire harness.<br>• Improperly installed injector.<br>• Defective injector. | D36 |
| 41 | Lean angle sensor: open or short circuit detected. | • Open or short circuit in wire harness.<br>• Defective lean angle sensor.<br>• Malfunction in ECU. | D08 |
| 42 | No normal signals are received from the speed sensor. | • Open circuit in wire harness.<br>• Defective speed sensor.<br>• Malfunction in vehicle speed sensor detected.<br>• Malfunction in the engine side of the neutral switch.<br>• Malfunction in ECU. | D07 |
| 43 | Power supply to the injector and fuel pump is not normal. | • Open or short circuit in wire harness.<br>• Malfunction in ECU. | D09 |
| 44 | Error is detected while reading or writing on EEPROM (CO adjustment value). | • Malfunction in ECU. (The CO adjustment value is not properly written on or read from the internal memory). | D60 |
| 46 | Power supply to the fuel injection system is not normal. | • Malfunction in the charging system. Refer to “CHARGING SYSTEM” in chapter 9. | — |
| 50 | Faulty ECU memory. (When this malfunction is detected in the ECU, the fault code number might not appear on the LCD of the meter.) | • Malfunction in ECU. (The program and data are not properly written on or read from the internal memory.) | — |

## Sensor operation table

| Diagnostic code No. | Item | Meter display | Checking method |
|---|---|---|---|
| D01 | Throttle angle<br>• Fully closed position<br>• Fully opened position | <br>15 ~ 20<br>95 ~ 100 | <br>Check with throttle fully closed.<br>Check with throttle fully open. |
| D03 | Pressure difference (atmospheric pressure and intake air pressure) | Displays the intake air pressure. | Set the engine stop switch to “RUN”, then operate the throttle while pushing the start switch. (If the display value changes, the performance is OK.) |
| D05 | Intake air temperature | Displays the intake air temperature. | Compare the actually measured intake air temperature with the meter. |
| D06 | Coolant temperature | Displays the coolant temperature. | Compare the actually measured coolant temperature with the meter. |
| D07 | Vehicle speed pulse | 0 ~ 999 | Check that the number increases when the rear wheel is rotated. The number is cumulative and does not reset each time the wheel is stopped. |
| D08 | Lean angle sensor<br>• Upright<br>• Overturned | <br>0.4 ~ 1.4<br>3.7 ~ 4.4 | Remove the lean angle sensor and incline it more than 65 degrees. |
| D09 | Fuel system voltage (battery voltage) | Approximately 12.0 | Set the engine stop switch to “RUN”, and then compare with the actually measured battery voltage. (If the battery voltage is lower, perform recharging.) |
| D21 | Neutral switch<br>• Neutral<br>• In gear | <br>ON<br>OFF | Shift the transmission. |
| D60 | EEPROM fault code display<br>• No history<br>• History exists | <br>00<br>01 | — |
| D61 | Malfunction history code display<br>• No history<br>• History exists | <br>00<br>Fault codes 12-50<br>• (If more than one code number is detected, the display alternates every two seconds to show all the detected code numbers. When all code numbers are shown, the display repeats the same process.) | — |
| D62 | Malfunction history code erasure<br>• No history<br>• History exists | <br>0<br>Up to 16 fault codes | <br>—<br>To erase the history, set the engine stop switch to “OFF” and then to “RUN”. |
| D70 | Control number | 00 ~ 255 | — |

**Actuator operation table**

• Actuator operation

Set the engine stop switch to “OFF” and then to “RUN”.

| Diagnostic code No. | Item | Actuation | Checking method |
|---|---|---|---|
| D30 | Ignition coil | Actuates the ignition coil five times in one-second intervals.<br>The engine trouble warning light also flashes five times. | Check the spark five times.<br>• Connect an ignition checker. |
| D36 | Injector | Actuates the injector five times in one-second intervals. | Check the operating sound of the injector five times. |
| D50 | Fuel pump relay | Actuates the fuel pump relay five times in one-second intervals.<br>The engine trouble warning light also flashes five times.<br>(The engine trouble warning light is OFF when the relay is ON, and the engine trouble warning light is ON when the relay is OFF). | Check the operating sound of the fuel pump relay five times. |
| D51 | Radiator fan motor relay | Actuates the radiator fan motor relay and illuminates the engine trouble warning light five cycles (5 seconds per cycle–2 seconds ON, 3 seconds OFF). (ON 2 seconds, OFF 3 seconds) | Check the operating sound of the radiator fan motor relay five times. |

EAS00908

## TROUBLESHOOTING DETAILS

This section describes the countermeasures per fault code number displayed on the meter. Check and service the items or components that are the probable cause of the malfunction following the order given.

After the check and service of the malfunctioning part has been completed, reset the meter display according to the “Reinstatement method”.

Fault code No.:

Fault code number displayed on the meter when the engine failed to work normally.

Refer to “Diagnostic code table”.

Diagnostic code No.:

Diagnostic code number to be used when the diagnostic mode is operated. Refer to “DIAGNOSTIC MODE”.

| Fault code No. | 12 | Symptom | No normal signals are received from the crankshaft position sensor. |
|---|---|---|---|
| Diagnostic code No. | | — | — |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Installed condition of crankshaft position sensor. | Check for looseness or pinching. | Cranking the engine. |
| 2 | Connections<br>• Crankshaft position sensor coupler<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may be pulled out.<br>• Check the locking condition of the coupler.<br>• If there is a malfunction, repair it and connect the coupler securely. | |
| 3 | Open or short circuit in wire harness. | • Repair or replace if there is an open or short circuit.<br>• Between the crankshaft position sensor coupler and ECU coupler.<br>(gray–gray)<br>(black/blue–black/blue) | |
| 4 | Defective crankshaft position sensor. | • Replace if defective.<br>Refer to “IGNITION SYSTEM” in chapter 9. | |

| Fault code No. | 13 | Symptom | Intake air pressure sensor: open or short circuit detected. |
|---|---|---|---|
| Diagnostic code No. | | D03 | Intake air pressure sensor |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Connections<br>• Intake air pressure sensor coupler<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may be pulled out.<br>• Check the locking condition of the coupler.<br>• If there is a malfunction, repair it and connect the coupler securely. | Turning the main switch to "ON". |
| 2 | Open or short circuit in wire harness. | • Repair or replace if there is an open or short circuit.<br>• Between intake air pressure sensor coupler and ECU coupler<br>(black/blue–black/blue)<br>(pink–pink)<br>(blue–blue) | |
| 3 | Defective intake air pressure sensor. | • Execute the diagnostic mode. (Code No.D03)<br>• Replace if defective.<br>Refer to "CHECKING THE INTAKE AIR PRESSURE SENSOR". | |

| Fault code No. | 14 | Symptom | Intake air pressure sensor: hose system malfunction (clogged or detached hose). |
|---|---|---|---|
| Diagnostic code No. | | D03 | Intake air pressure sensor |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Intake air pressure sensor hose | • Check the intake air pressure sensor hose condition.<br>• Repair or replace the sensor hose. | Starting the engine and operating it at idle. |
| 2 | Intake air pressure sensor malfunction at intermediate electrical potential. | • Check and repair the connection.<br>• Replace it if there is a malfunction. | |
| 3 | Connections<br>• Intake air pressure sensor coupler<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may be pulled out.<br>• Check the locking condition of the coupler.<br>• If there is a malfunction, repair it and connect the coupler securely. | |
| 4 | Defective intake air pressure sensor. | • Execute the diagnostic mode. (Code No.D03)<br>• Replace if defective. Refer to “CHECKING THE INTAKE AIR PRESSURE SENSOR”. | |

| Fault code No. | 15 | Symptom | Throttle position sensor: open or short circuit detected. |
|---|---|---|---|
| Diagnostic code No. | | D01 | Throttle position sensor |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Installed condition of throttle position sensor. | • Check for looseness or pinching.<br>• Check that the sensor is installed in the specified position. | Turning the main switch to "ON". |
| 2 | Connections<br>• Throttle position sensor coupler<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may be pulled out.<br>• Check the locking condition of the coupler.<br>• If there is a malfunction, repair it and connect the coupler securely. | |
| 3 | Open or short circuit in wire harness. | • Repair or replace if there is an open or short circuit.<br>• Between throttle position sensor coupler and ECU coupler<br>(blue–blue)<br>(yellow–yellow)<br>(black/blue–black/blue) | |
| 4 | Throttle position sensor lead wire open circuit output voltage check. | • Check for open circuit and replace the throttle position sensor.<br>(yellow–black/blue) | |
| 5 | Defective throttle position sensor. | • Execute the diagnostic mode. (Code No.D01)<br>• Replace if defective.<br>Refer to "CHECKING AND ADJUSTING THE THROTTLE POSITION SENSOR". | |

| Fault code No. | 16 | Symptom | Stuck throttle position sensor detected. |
|---|---|---|---|
| Diagnostic code No. | | D01 | Throttle position sensor |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Installed condition of throttle position sensor. | • Check the installed area for looseness or pinching.<br>• Check that the throttle position sensor is installed in the specified position.<br>Refer to “CHECKING AND ADJUSTING THE THROTTLE POSITION SENSOR”. | Reinstated by starting the engine, operating it at idle, and then racing it. |
| 2 | Defective throttle position sensor. | • Execute the diagnostic monitoring mode.<br>(Code No.D01)<br>• Replace if defective.<br>Refer to “CHECKING AND ADJUSTING THE THROTTLE POSITION SENSOR”. | |

| Fault code No. | 21 | Symptom | Coolant temperature sensor: open or short circuit detected. |
|---|---|---|---|
| Diagnostic code No. | | D06 | Coolant temperature sensor |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Installed condition of coolant temperature sensor. | Check the installed area for looseness or pinching. | Turning the main switch to “ON”. |
| 2 | Connections<br>• Coolant temperature sensor coupler<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may have pulled out.<br>• Check the locking condition of the coupler.<br>If there is a malfunction, repair it and connect the coupler securely. | |
| 3 | Open or short circuit in wire harness. | • Repair or replace if there is an open or short circuit.<br>• Between coolant temperature sensor coupler and ECU coupler.<br>(black/blue–black/blue)<br>(green/yellow–green/yellow) | |
| 4 | Defective coolant temperature sensor. | • Execute the diagnostic mode.<br>(Code No.D06)<br>• Replace if defective.<br>Refer to “SIGNALING SYSTEM” in chapter 9. | |

| Fault code No. | 22 | Symptom | Intake air temperature sensor: open or short circuit detected. |
|---|---|---|---|
| Diagnostic code No. | | D05 | Intake air temperature sensor |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Installed condition of air temperature sensor. | Check for looseness or pinching. | Turning the main switch to “ON”. |
| 2 | Connections<br>• Intake air temperature sensor coupler<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may be pulled out.<br>• Check the locking condition of the coupler.<br>• If there is a malfunction, repair it and connect the coupler securely. | |
| 3 | Open or short circuit in wire harness. | • Repair or replace if there is an open or short circuit.<br>• Between intake air temperature sensor coupler and ECU coupler (brown/white–brown/white) (black/blue–black/blue) | |
| 4 | Defective air temperature sensor. | • Execute the diagnostic mode. (Code No.D05)<br>• Replace if defective. Refer to “CHECKING THE INTAKE AIR TEMPERATURE SENSOR”. | |

| Fault code No. | 30 | Symptom | The vehicle has overturned. |
|---|---|---|---|
| Diagnostic code No. | | D08 | Lean angle sensor |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | The vehicle has overturned. | Raise the vehicle upright. | Turning the main switch to "ON" (however, the engine cannot be restarted unless the main switch is first turned "OFF"). |
| 2 | Installed condition of the lean angle sensor. | Check for looseness or pinching. | |
| 3 | Connections<br>• Lean angle sensor coupler<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may be pulled out.<br>• Check the locking condition of the coupler.<br>• If there is a malfunction, repair it and connect the coupler securely. | |
| 4 | Defective lean angle sensor. | • Execute the diagnostic mode. (Code No.D08)<br>• Replace if defective. Refer to "IGNITION SYSTEM" in chapter 9. | |

| Fault code No. | 33 | Symptom | Malfunction detected in the primary lead of the ignition coil. |
|---|---|---|---|
| Diagnostic code No. | | D30 | Ignition coil |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Connections<br>• Ignition coil connector (primary coil side)<br>• Main wire harness-ECU coupler | • Check the connector and coupler for any pins that may be pulled out.<br>• Check the locking condition of the connector and coupler.<br>• If there is a malfunction, repair it and connect the coupler or connector securely. | Starting the engine and operating it at idle. |
| 2 | Open or short circuit in wire harness. | • Repair or replace if there is an open or short circuit.<br>• Between ignition coil connector and ECU coupler. (orange–orange)<br>• Between ignition coil connector and left handlebar switch coupler. (red/black–red/black) | |
| 3 | Defective ignition coil. | • Execute the diagnostic mode. (Code No.D30)<br>• Test the primary and secondary coils for continuity.<br>• Replace if defective. Refer to “IGNITION SYSTEM” in chapter 9. | |

| Fault code No. | 39 | Symptom | Open circuit detected in a injector. |
|---|---|---|---|
| Diagnostic code No. | | D36 | Injector |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Connections<br>• Injector coupler<br>• Main wire harness-ECU coupler<br>• Main wire harness fuel pump coupler | • Check the couplers for any pins that may be pulled out.<br>• Check the locking condition of the couplers.<br>• If there is a malfunction, repair it and connect the coupler securely. | Cranking the engine. (Connect the fuel injector coupler.) |
| 2 | Open or short circuit in wire harness and/or sub-wire harness 2. | • Repair or replace if there is an open or short circuit.<br>• Between injector coupler and ECU coupler.<br>(red/blue–red/blue)<br>(red/black–red/black) | |
| 3 | Defective injector. | • Execute the diagnostic mode. (Code No.D36)<br>• Replace if defective.<br>Refer to “CHECKING THE FUEL INJECTOR”. | |

| Fault code No. | 41 | Symptom | Lean angle sensor: open or short circuit detected. |
|---|---|---|---|
| Diagnostic code No. | | D08 | Lean angle sensor |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Connections<br>• Lean angle sensor coupler<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may be pulled out.<br>• Check the locking condition of the coupler.<br>• If there is a malfunction, repair it and connect the coupler securely. | Turning the main switch to "ON". |
| 2 | Open or short circuit in lead wire. | • Repair or replace if there is an open or short circuit.<br>• Between lean angle sensor coupler and ECU coupler.<br>(blue–blue)<br>(yellow/green–yellow/green)<br>(black/blue–black/blue) | |
| 3 | Defective lean angle switch. | • Execute the diagnostic mode. (Code No.D08)<br>• Replace if defective.<br>Refer to "IGNITION SYSTEM" in chapter 9. | |

| Fault code No. | 42 | Symptom | No normal signals are received from the speed sensor. |
|---|---|---|---|
| Diagnostic code No. | | D07 | Speed sensor |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Connections<br>• Speed sensor coupler<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may be pulled out.<br>• Check the locking condition of the coupler.<br>• If there is a malfunction, repair it and connect the coupler securely. | Starting the engine, and activating the vehicle speed sensor by operating the vehicle at 20 to 30 km/h. |
| 2 | Open or short circuit in speed sensor lead. | • Repair or replace if there is an open or short circuit.<br>• Between speed sensor coupler and ECU coupler.<br>(blue–blue)<br>(white–white)<br>(black/blue–black/blue) | |
| 3 | Gear for detecting vehicle speed has broken. | • Replace if defective.<br>Refer to “TRANSMISSION” in chapter 4. | |
| 4 | Defective speed sensor. | • Execute the diagnostic mode. (Code No.D07)<br>• Replace if defective.<br>Refer to “SIGNALING SYSTEM” in chapter 9. | |

| Fault code No. | 43 | Symptom | Power supply to the injector and fuel pump is not normal. |
|---|---|---|---|
| Diagnostic code No. | | D09 | Fuel system voltage |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Connections<br>• Fuel injection system relay<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may be pulled out.<br>• Check the locking condition of the coupler.<br>• If there is a malfunction, repair it and connect the coupler securely. | Starting the engine and operating it at idle. |
| 2 | Open or short circuit in the wire harness. | • Repair or replace if there is an open or short circuit.<br>• Between fuel injection system relay coupler and ECU coupler. (blue/red–blue/red) (red/blue–red/blue)<br>• Between fuel injection system relay coupler and starter relay coupler. (brown/black–brown/black)<br>• Between fuel injection system relay coupler and left handlebar switch coupler. (red/black–red/black) | |
| 3 | Malfunction or open circuit in fuel pump relay. | • Execute the diagnostic mode. (Code No.D09)<br>• Replace if defective.<br>• If there is no malfunction with the relay unit, replace the ECU. | |

| Fault code No. | 44 | Symptom | Error is detected while reading or writing on EEPROM (CO adjustment value). |
|---|---|---|---|
| Diagnostic code No. | | D60 | EEPROM improper cylinder indication |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Malfunction in ECU. | • Execute the diagnostic mode. (Code No.D60)<br>1. Check the faulty cylinder.<br>• Replace ECU if defective. | Turning the main switch to “ON”. |

| Fault code No. | 46 | Symptom | Power supply is not normal. |
|---|---|---|---|
| Diagnostic code No. | | — | — |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Connections<br>• Main wire harness-ECU coupler | • Check the coupler for any pins that may be pulled out.<br>• Check the locking condition of the coupler.<br>• If there is a malfunction, repair it and connect the coupler securely. | Starting the engine and operating it at idle. |
| 2 | Faulty battery. | • Replace or charge the battery. Refer to “CHECKING AND CHARGING THE BATTERY” in chapter 3. | |
| 3 | Malfunction in rectifier/regulator | • Replace if defective. Refer to “CHARGING SYSTEM” in chapter 9. | |
| 4 | Open or short circuit in wire harness. | • Repair or replace if there is an open or short circuit.<br>• Between battery lead and main switch coupler (red–red)<br>• Between main switch coupler and ignition fuse (brown/blue–brown/blue)<br>• Between ignition fuse and ECU coupler (brown–brown) | |

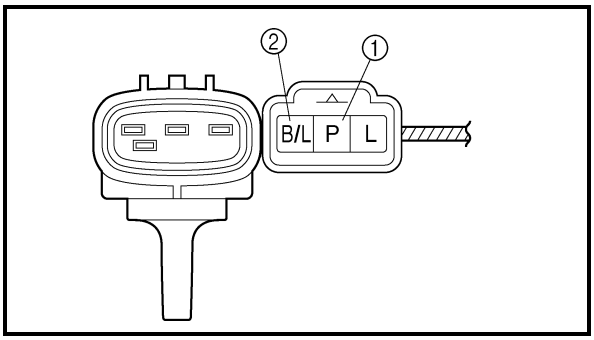
| Fault code No. | 50 | Symptom | Faulty ECU memory. (When this malfunction is detected in the ECU, the fault code number might not appear on the meter.) |
|---|---|---|---|
| Diagnostic code No. | | — | — |

| Order | Item/components and probable cause | Check or maintenance job | Reinstatement method |
|---|---|---|---|
| 1 | Malfunction in ECU. | Replace the ECU.<br>**NOTE:**<br>Do not perform this procedure with the main switch turned to “ON”. | Turning the main switch to “ON”. |

EAS28410
## CHECKING THE INTAKE AIR PRESSURE SENSOR

1. Check:
   • intake air pressure sensor output voltage
   Out of specification → Replace.

**Intake air pressure sensor output voltage**
**3.00 ~ 4.00 V**

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a. Connect the pocket tester (DC 20 V) to the intake air pressure sensor coupler as shown.

**Pocket tester**
**90890-03112**
**Analog pocket tester**
**YU-03112-C**

**Positive tester probe → pink terminal ①**
**Negative tester probe → black/blue terminal ②**

b. Turn the main switch to "ON".
c. Measure the intake air pressure sensor output voltage.

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## CHECKING THE INTAKE AIR TEMPERATURE SENSOR

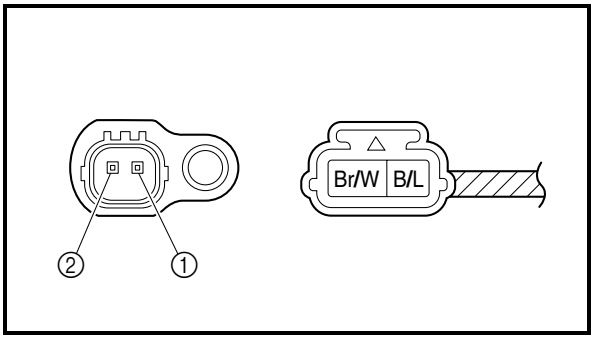
1. Remove:
   • intake air temperature sensor

**⚠ WARNING**

- **Handle the intake air temperature sensor with special care.**
- **Never subject the intake air temperature sensor to strong shocks. If the intake air temperature sensor is dropped, replace it.**

2. Check:
   • intake air temperature sensor resistance
   Out of specification → Replace.

**Intake air temperature sensor resistance**
**290 ~ 390 Ω at 80 °C (176 °F)**

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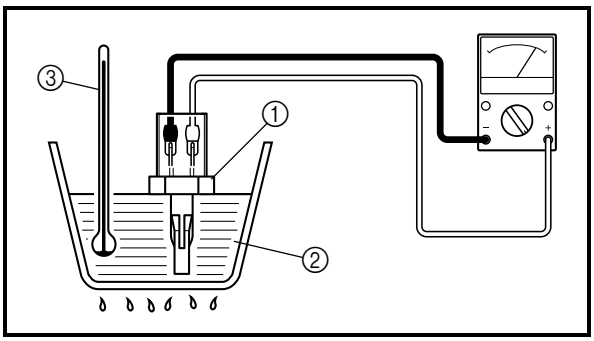
a. Connect the pocket tester (Ω × 100) to the intake air temperature sensor terminal as shown.

**Pocket tester**
**90890-03112**
**Analog pocket tester**
**YU-03112-C**

**Positive tester probe → brown/white ①**
**Negative tester probe → black/blue ②**




b. Immerse the air temperature sensor ① in a container filled with water ②.

**NOTE:**

Make sure that the air temperature sensor terminals do not get wet.

c. Place a thermometer ③ in the water.
d. Slowly heat the water, then let it cool down to the specified temperature.
e. Measure the air temperature sensor resistance.

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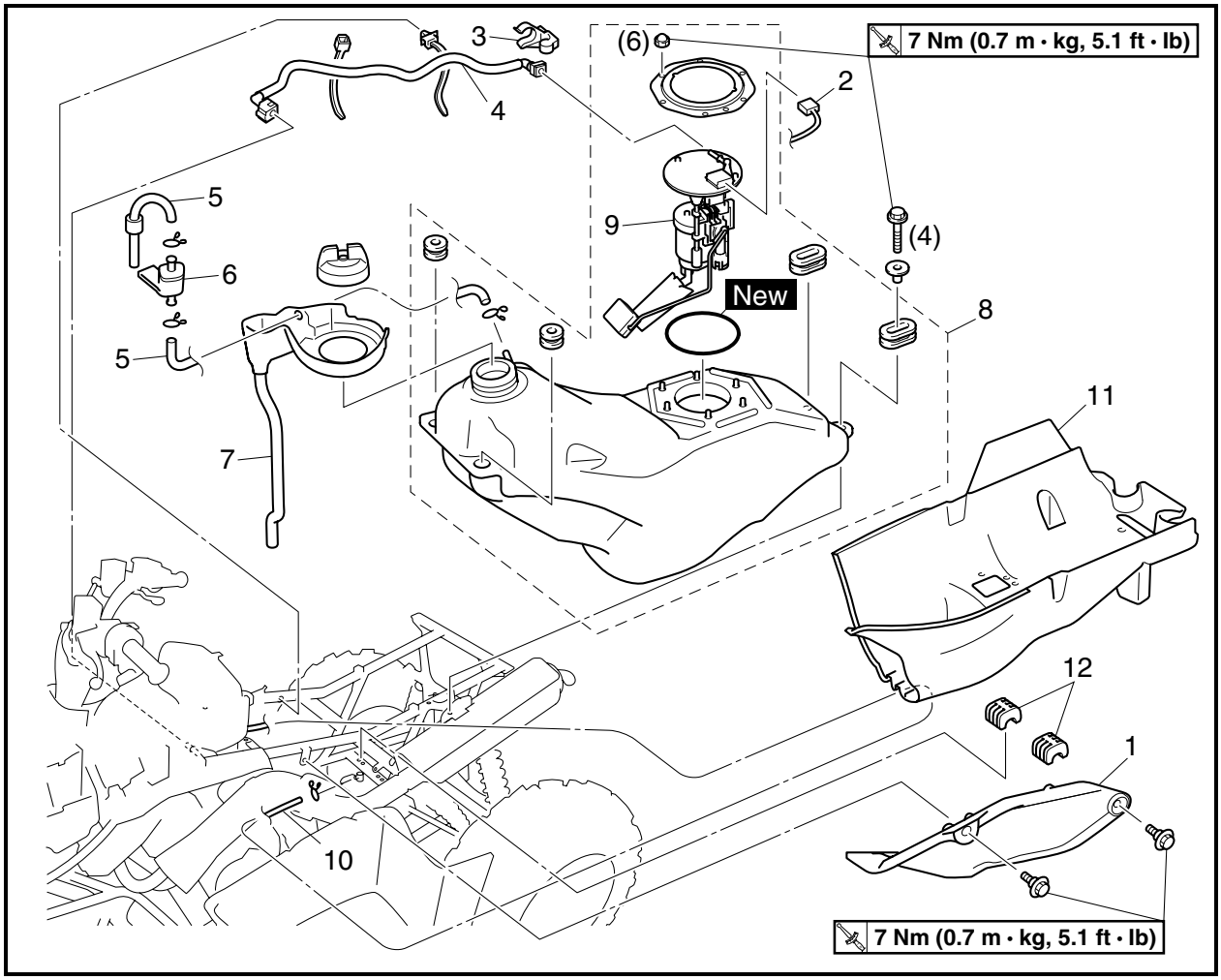
## FUEL TANK




| Order | Job/Part | Q'ty | Remarks |
|---|---|---|---|
| | **Removing the fuel tank** | | Remove the parts in the order listed. |
| | Rear fender | | Refer to "ENGINE SKID PLATES, SEAT, CARRIERS AND FENDERS" in chapter 3. |
| 1 | Fuel tank side cover | 1 | |
| 2 | Fuel pump coupler | 1 | Disconnect. |
| 3 | Fuel hose connector holder | 1 | Refer to "REMOVING THE FUEL TANK" and "INSTALLING THE FUEL HOSE". |
| 4 | Fuel hose | 1 | |
| 5 | Fuel tank breather hose | 2 | |
| 6 | Rollover valve | 1 | |
| 7 | Fuel tank overflow hose | 1 | |
| 8 | Fuel tank | 1 | |
| 9 | Fuel pump assembly | 1 | Refer to "REMOVING THE FUEL PUMP" and "INSTALLING THE FUEL PUMP". |
| 10 | Final drive case breather hose | 1 | Disconnect. |